IPython Documentation

Release 7.3.0.dev

The IPython Development Team

December 10, 2018

Contents

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CHAPTER 1

Overview

One of Python's most useful features is its interactive interpreter. It allows for very fast testing of ideas without the overhead of creating test files as is typical in most programming languages. However, the interpreter supplied with the standard Python distribution is somewhat limited for extended interactive use.

The goal of IPython is to create a comprehensive environment for interactive and exploratory computing. To support this goal, IPython has three main components:

- An enhanced interactive Python shell.
- A decoupled *two-process communication model*, which allows for multiple clients to connect to a computation kernel, most notably the web-based notebook provided with Jupyter.
- An architecture for interactive parallel computing now part of the `ipyparallel` package.

All of IPython is open source (released under the revised BSD license).

1.1 Enhanced interactive Python shell

IPython's interactive shell (**`ipython`**), has the following goals, amongst others:

1. Provide an interactive shell superior to Python's default. IPython has many features for tab-completion, object introspection, system shell access, command history retrieval across sessions, and its own special command system for adding functionality when working interactively. It tries to be a very efficient environment both for Python code development and for exploration of problems using Python objects (in situations like data analysis).
2. Serve as an embeddable, ready to use interpreter for your own programs. An interactive IPython shell can be started with a single call from inside another program, providing access to the current namespace. This can be very useful both for debugging purposes and for situations where a blend of batch-processing and interactive exploration are needed.
3. Offer a flexible framework which can be used as the base environment for working with other systems, with Python as the underlying bridge language. Specifically scientific environments like Mathematica, IDL and Matlab inspired its design, but similar ideas can be useful in many fields.

4. Allow interactive testing of threaded graphical toolkits. IPython has support for interactive, non-blocking control of GTK, Qt, WX, GLUT, and OS X applications via special threading flags. The normal Python shell can only do this for Tkinter applications.

1.1.1 Main features of the interactive shell

- Dynamic object introspection. One can access docstrings, function definition prototypes, source code, source files and other details of any object accessible to the interpreter with a single keystroke (`?`, and using `??` provides additional detail).
- Searching through modules and namespaces with `*` wildcards, both when using the `?` system and via the `%psearch` command.
- Completion in the local namespace, by typing `TAB` at the prompt. This works for keywords, modules, methods, variables and files in the current directory. This is supported via the `prompt_toolkit` library. Custom completers can be implemented easily for different purposes (system commands, magic arguments etc.)
- Numbered input/output prompts with command history (persistent across sessions and tied to each profile), full searching in this history and caching of all input and output.
- User-extensible 'magic' commands. A set of commands prefixed with `%` or `%%` is available for controlling IPython itself and provides directory control, namespace information and many aliases to common system shell commands.
- Alias facility for defining your own system aliases.
- Complete system shell access. Lines starting with `!` are passed directly to the system shell, and using `!!` or `var = !cmd` captures shell output into python variables for further use.
- The ability to expand python variables when calling the system shell. In a shell command, any python variable prefixed with `$` is expanded. A double `$$` allows passing a literal `$` to the shell (for access to shell and environment variables like `PATH`).
- Filesystem navigation, via a magic `%cd` command, along with a persistent bookmark system (using `%bookmark`) for fast access to frequently visited directories.
- A lightweight persistence framework via the `%store` command, which allows you to save arbitrary Python variables. These get restored when you run the `%store -r` command.
- Automatic indentation and highlighting of code as you type (through the `prompt_toolkit` library).
- Macro system for quickly re-executing multiple lines of previous input with a single name via the `%macro` command. Macros can be stored persistently via `%store` and edited via `%edit`.
- Session logging (you can then later use these logs as code in your programs). Logs can optionally timestamp all input, and also store session output (marked as comments, so the log remains valid Python source code).
- Session restoring: logs can be replayed to restore a previous session to the state where you left it.
- Verbose and colored exception traceback printouts. Easier to parse visually, and in verbose mode they produce a lot of useful debugging information (basically a terminal version of the cgitb module).
- Auto-parentheses via the `%autocall` command: callable objects can be executed without parentheses: `sin 3` is automatically converted to `sin(3)`
- Auto-quoting: using `,`, or `;` as the first character forces auto-quoting of the rest of the line: `,my_function a b` becomes automatically `my_function("a","b")`, while `;my_function a b` becomes `my_function("a b")`.
- Extensible input syntax. You can define filters that pre-process user input to simplify input in special situations. This allows for example pasting multi-line code fragments which start with `>>>` or `...` such as those from other python sessions or the standard Python documentation.

- Flexible *configuration system*. It uses a configuration file which allows permanent setting of all command-line options, module loading, code and file execution. The system allows recursive file inclusion, so you can have a base file with defaults and layers which load other customizations for particular projects.
- Embeddable. You can call IPython as a python shell inside your own python programs. This can be used both for debugging code or for providing interactive abilities to your programs with knowledge about the local namespaces (very useful in debugging and data analysis situations).
- Easy debugger access. You can set IPython to call up an enhanced version of the Python debugger (pdb) every time there is an uncaught exception. This drops you inside the code which triggered the exception with all the data live and it is possible to navigate the stack to rapidly isolate the source of a bug. The `%run` magic command (with the `-d` option) can run any script under pdb's control, automatically setting initial breakpoints for you. This version of pdb has IPython-specific improvements, including tab-completion and traceback coloring support. For even easier debugger access, try `%debug` after seeing an exception.
- Profiler support. You can run single statements (similar to `profile.run()`) or complete programs under the profiler's control. While this is possible with standard cProfile or profile modules, IPython wraps this functionality with magic commands (see `%prun` and `%run -p`) convenient for rapid interactive work.
- Simple timing information. You can use the `%timeit` command to get the execution time of a Python statement or expression. This machinery is intelligent enough to do more repetitions for commands that finish very quickly in order to get a better estimate of their running time.

```
In [1]: %timeit 1+1
10000000 loops, best of 3: 25.5 ns per loop

In [2]: %timeit [math.sin(x) for x in range(5000)]
1000 loops, best of 3: 719 µs per loop
```

  To get the timing information for more than one expression, use the `%%timeit` cell magic command.

- Doctest support. The special `%doctest_mode` command toggles a mode to use doctest-compatible prompts, so you can use IPython sessions as doctest code. By default, IPython also allows you to paste existing doctests, and strips out the leading `>>>` and `...` prompts in them.

1.2 Decoupled two-process model

IPython has abstracted and extended the notion of a traditional *Read-Evaluate-Print Loop* (REPL) environment by decoupling the *evaluation* into its own process. We call this process a **kernel**: it receives execution instructions from clients and communicates the results back to them.

This decoupling allows us to have several clients connected to the same kernel, and even allows clients and kernels to live on different machines. With the exclusion of the traditional single process terminal-based IPython (what you start if you run `ipython` without any subcommands), all other IPython machinery uses this two-process model. Most of this is now part of the `Jupyter` project, which includes `jupyter console`, `jupyter qtconsole`, and `jupyter notebook`.

As an example, this means that when you start `jupyter qtconsole`, you're really starting two processes, a kernel and a Qt-based client can send commands to and receive results from that kernel. If there is already a kernel running that you want to connect to, you can pass the `--existing` flag which will skip initiating a new kernel and connect to the most recent kernel, instead. To connect to a specific kernel once you have several kernels running, use the `%connect_info` magic to get the unique connection file, which will be something like `--existing kernel-19732.json` but with different numbers which correspond to the Process ID of the kernel.

You can read more about using jupyter qtconsole, and jupyter notebook. There is also a message spec which documents the protocol for communication between kernels and clients.

See also:

Frontend/Kernel Model example notebook

1.3 Interactive parallel computing

This functionality is optional and now part of the ipyparallel project.

1.3.1 Portability and Python requirements

Version 7.0+ supports Python 3.4 and higher. Versions 6.x support Python 3.3 and higher. Versions 2.0 to 5.x work with Python 2.7.x releases and Python 3.3 and higher. Version 1.0 additionally worked with Python 2.6 and 3.2. Version 0.12 was the first version to fully support Python 3.

IPython is known to work on the following operating systems:

- Linux
- Most other Unix-like OSs (AIX, Solaris, BSD, etc.)
- Mac OS X
- Windows (CygWin, XP, Vista, etc.)

See *here* for instructions on how to install IPython.

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CHAPTER 2

What's new in IPython

Development version in-progress features:

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2.1 Development version

This document describes in-flight development work.

Warning: Please do not edit this file by hand (doing so will likely cause merge conflicts for other Pull Requests). Instead, create a new file in the `docs/source/whatsnew/pr` folder

Released . . . ., 2017

Need to be updated:

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2.1.1 Antigravity feature

Example new antigravity feature. Try `import antigravity` in a Python 3 console.

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2.1.2 Incompatible change switch to perl

Document which filename start with `incompat-` will be gathers in their own incompatibility section.

Starting with IPython 42, only perl code execution is allowed. See PR #42

2.1.3 Backwards incompatible changes

This section documents the changes that have been made in various versions of IPython. Users should consult these pages to learn about new features, bug fixes and backwards incompatibilities. Developers should summarize the development work they do here in a user friendly format.

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2.2 7.x Series

2.2.1 IPython 7.2.0

IPython 7.2.0 brings minor bugfixes, improvements, and new configuration options:

- Fix a bug preventing PySide2 GUI integration from working PR #11464
- Run CI on Mac OS ! PR #11471
- Fix IPython “Demo” mode. PR #11498
- Fix `%run` magic with path in name PR #11499
- Fix: add CWD to sys.path *after* stdlib PR #11502
- Better rendering of signatures, especially long ones. PR #11505
- Re-enable jedi by default if it’s installed PR #11506
- Add New `minimal` exception reporting mode (useful for educational purpose). See PR #11509

Added ability to show subclasses when using pinfo and other utilities

When using `?/??` on a class, IPython will now list the first 10 subclasses.

Special Thanks to Chris Mentzel of the Moore Foundation for this feature. Chris is one of the people who played a critical role in IPython/Jupyter getting funding.

We are grateful for all the help Chris has given us over the years, and we’re now proud to have code contributed by Chris in IPython.

OSMagics.cd_force_quiet configuration option

You can set this option to force the %cd magic to behave as if `-q` was passed:

```
In [1]: cd /
/

In [2]: %config OSMagics.cd_force_quiet = True

In [3]: cd /tmp

In [4]:
```

See PR #11491

In vi editing mode, whether the prompt includes the current vi mode can now be configured

Set the `TerminalInteractiveShell.prompt_includes_vi_mode` to a boolean value (default: True) to control this feature. See PR #11492

2.2.2 IPython 7.1.0

IPython 7.1.0 is the first minor release after 7.0.0 and mostly brings fixes to new features, internal refactoring, and fixes for regressions that happened during the 6.x->7.x transition. It also brings **Compatibility with Python 3.7.1**, as we're unwillingly relying on a bug in CPython.

New Core Dev:

- We welcome Jonathan Slenders to the commiters. Jonathan has done a fantastic work on prompt_toolkit, and we'd like to recognise his impact by giving him commit rights. #11397

Notable Changes

- Major update of "latex to unicode" tab completion map (see below)

Notable New Features:

- Restore functionality and documentation of the **sphinx directive**, which is now stricter (fail on error by daefault), has new configuration options, has a brand new documentation page *IPython Sphinx Directive* (which needs some cleanup). It is also now *tested* so we hope to have less regressions. PR #11402
- `IPython.display.Video` now supports `width` and `height` arguments, allowing a custom width and height to be set instead of using the video's width and height. PR #11353
- Warn when using `HTML('<iframe>')` instead of `IFrame` PR #11350
- Allow Dynamic switching of editing mode between vi/emacs and show normal/input mode in prompt when using vi. PR #11390. Use `%config TerminalInteractiveShell.editing_mode = 'vi'` or `%config TerminalInteractiveShell.editing_mode = 'emacs'` to dynamically switch between modes.

Notable Fixes:

- Fix entering of **multi-line blocks in terminal** IPython, and various crashes in the new input transformation machinery PR #11354, PR #11356, PR #11358. These also fix a **Compatibility bug with Python 3.7.1**.
- Fix moving through generator stack in ipdb PR #11266
- %Magic command arguments now support quoting. PR #11330
- Re-add `rprint` and `rprinte` aliases. PR #11331
- Remove implicit dependency on `ipython_genutils` PR #11317
- Make `nonlocal` raise `SyntaxError` instead of silently failing in async mode. PR #11382
- Fix mishandling of magics and `= !` assignment just after a dedent in nested code blocks PR #11418
- Fix instructions for custom shortcuts PR #11426

Notable Internals improvements:

- Use of `os.scandir` (Python 3 only) to speed up some file system operations. PR #11365
- use `perf_counter` instead of `clock` for more precise timing results with `%time` PR #11376

Many thanks to all the contributors and in particular to `bartskowron` and `tonyfast` who handled some pretty complicated bugs in the input machinery. We had a number of first time contributors and maybe hacktoberfest participants that made significant contributions and helped us free some time to focus on more complicated bugs.

You can see all the closed issues and Merged PR, new features and fixes here.

Unicode Completion update

In IPython 7.1 the Unicode completion map has been updated and synchronized with the Julia language.

Added and removed character characters:

> `\jmath` (), `\\underleftrightarrow` (U+034D, combining) have been added, while `\\textasciicaron` have been removed

Some sequences have seen their prefix removed:

- 6 characters `\text...<tab>` should now be inputed with `\...<tab>` directly,
- 45 characters `\Elz...<tab>` should now be inputed with `\...<tab>` directly,
- 65 characters `\B...<tab>` should now be inputed with `\...<tab>` directly,
- 450 characters `\m...<tab>` should now be inputed with `\...<tab>` directly,

Some sequences have seen their prefix shortened:

- 5 characters `\mitBbb...<tab>` should now be inputed with `\bbi...<tab>` directly,
- 52 characters `\mit...<tab>` should now be inputed with `\i...<tab>` directly,
- 216 characters `\mbfit...<tab>` should now be inputed with `\bi...<tab>` directly,
- 222 characters `\mbf...<tab>` should now be inputed with `\b...<tab>` directly,

A couple of characters had their sequence simplified:

- ð, type `\dh<tab>`, instead of `\eth<tab>`
- , type `\hbar<tab>`, instead of `\Elzxh<tab>`
- , type `\ltphi<tab>`, instead of `\textphi<tab>`
- , type `\varTheta<tab>`, instead of `\textTheta<tab>`
- , type `\eulermascheroni<tab>`, instead of `\Eulerconst<tab>`
- , type `\planck<tab>`, instead of `\Planckconst<tab>`
- U+0336 (COMBINING LONG STROKE OVERLAY), type `\strike<tab>`, instead of `\Elzbar<tab>`.

A couple of sequences have been updated:

- `\varepsilon` now gives (GREEK SMALL LETTER EPSILON) instead of ϵ (GREEK LUNATE EPSILON SYMBOL),
- `\underbar` now gives U+0331 (COMBINING MACRON BELOW) instead of U+0332 (COMBINING LOW LINE).

2.2.3 IPython 7.0.0

Released Thursday September 27th, 2018

IPython 7 includes major feature improvements. This is also the second major version of IPython to support only Python 3 – starting at Python 3.4. Python 2 is still community-supported on the bugfix only 5.x branch, but we remind you that Python 2 "end of life" is on Jan 1st 2020.

We were able to backport bug fixes to the 5.x branch thanks to our backport bot which backported more than 70 Pull-Requests, but there are still many PRs that required manual work. This is an area of the project where you can easily contribute by looking for PRs that still need manual backport

The IPython 6.x branch will likely not see any further release unless critical bugs are found.

Make sure you have pip > 9.0 before upgrading. You should be able to update by running:

```
pip install ipython --upgrade
```

If you are trying to install or update an `alpha`, `beta`, or `rc` version, use pip `--pre` flag.

```
pip install ipython --upgrade --pre
```

Or, if you have conda installed:

```
conda install ipython
```

Prompt Toolkit 2.0

IPython 7.0+ now uses `prompt_toolkit 2.0`. If you still need to use an earlier `prompt_toolkit` version, you may need to pin IPython to `<7.0`.

Autowait: Asynchronous REPL

Staring with IPython 7.0 on Python 3.6+, IPython can automatically `await` top level code. You should not need to access an event loop or runner yourself. To learn more, read the *Asynchronous in REPL: Autoawait* section of our docs, see PR #11265, or try the following code:

```
Python 3.6.0
Type 'copyright', 'credits' or 'license' for more information
IPython 7.0.0 -- An enhanced Interactive Python. Type '?' for help.

In [1]: import aiohttp
   ...: result = aiohttp.get('https://api.github.com')

In [2]: response = await result
<pause for a few 100s ms>

In [3]: await response.json()
Out[3]:
{'authorizations_url': 'https://api.github.com/authorizations',
 'code_search_url': 'https://api.github.com/search/code?q={query}{&page,per_page,sort,
↪order}',
...
}
```

Note: Async integration is experimental code, behavior may change or be removed between Python and IPython versions without warnings.

Integration is by default with `asyncio`, but other libraries can be configured – like `curio` or `trio` – to improve concurrency in the REPL:

```
In [1]: %autoawait trio

In [2]: import trio

In [3]: async def child(i):
   ...:     print("   child %s goes to sleep"%i)
```

(continues on next page)

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```
   ...:     await trio.sleep(2)
   ...:     print("   child %s wakes up"%i)

In [4]: print('parent start')
   ...: async with trio.open_nursery() as n:
   ...:     for i in range(3):
   ...:         n.spawn(child, i)
   ...: print('parent end')
parent start
   child 2 goes to sleep
   child 0 goes to sleep
   child 1 goes to sleep
   <about 2 seconds pause>
   child 2 wakes up
   child 1 wakes up
   child 0 wakes up
parent end
```

See *Asynchronous in REPL: Autoawait* for more information.

Asynchronous code in a Notebook interface or any other frontend using the Jupyter Protocol will require further updates to the IPykernel package.

Non-Asynchronous code

As the internal API of IPython is now asynchronous, IPython needs to run under an event loop. In order to allow many workflows, (like using the `%run` magic, or copy-pasting code that explicitly starts/stop event loop), when top-level code is detected as not being asynchronous, IPython code is advanced via a pseudo-synchronous runner, and may not advance pending tasks.

Change to Nested Embed

The introduction of the ability to run async code had some effect on the `IPython.embed()` API. By default, embed will not allow you to run asynchronous code unless an event loop is specified.

Effects on Magics

Some magics will not work with async until they're updated. Contributions welcome.

Expected Future changes

We expect more internal but public IPython functions to become `async`, and will likely end up having a persistent event loop while IPython is running.

Thanks

This release took more than a year in the making. The code was rebased a number of times; leading to commit authorship that may have been lost in the final Pull-Request. Huge thanks to many people for contribution, discussion, code, documentation, use-cases: dalejung, danielballan, ellisonbg, fperez, gnestor, minrk, njsmith, pganssle, tacaswell, takluyver , vidartf . . . And many others.

Autoreload Improvement

The magic `%autoreload 2` now captures new methods added to classes. Earlier, only methods existing as of the initial import were being tracked and updated.

This new feature helps dual environment development - Jupyter+IDE - where the code gradually moves from notebook cells to package files as it gets structured.

Example: An instance of the class `MyClass` will be able to access the method `cube()` after it is uncommented and the file `file1.py` is saved on disk.

```
# notebook

from mymodule import MyClass
first = MyClass(5)
```

```
# mymodule/file1.py

class MyClass:

    def __init__(self, a=10):
        self.a = a

    def square(self):
        print('compute square')
        return self.a*self.a

    # def cube(self):
    #     print('compute cube')
    #     return self.a*self.a*self.a
```

Misc

The autoindent feature that was deprecated in 5.x was re-enabled and un-deprecated in PR #11257

Make `%run -n -i ...` work correctly. Earlier, if `%run` was passed both arguments, `-n` would be silently ignored. See PR #10308

The `%%script` (as well as `%%bash`, `%%ruby`...) cell magics now raise by default if the return code of the given code is non-zero (thus halting execution of further cells in a notebook). The behavior can be disable by passing the `--no-raise-error` flag.

Deprecations

A couple of unused functions and methods have been deprecated and will be removed in future versions:

- `IPython.utils.io.raw_print_err`
- `IPython.utils.io.raw_print`

Backwards incompatible changes

- The API for transforming input before it is parsed as Python code has been completely redesigned: any custom input transformations will need to be rewritten. See *Custom input transformation* for details of the new API.

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2.3 Issues closed in the 7.x development cycle

2.3.1 Issues closed in 7.2

GitHub stats for 2018/10/28 - 2018/11/29 (tag: 7.1.1)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 2 issues and merged 18 pull requests. The full list can be seen on GitHub

The following 16 authors contributed 95 commits.

- Antony Lee
- Benjamin Ragan-Kelley
- CarsonGSmith
- Chris Mentzel
- Christopher Brown
- Dan Allan
- Elliott Morgan Jobson
- is-this-valid
- kd2718
- Kevin Hess
- Martin Bergtholdt
- Matthias Bussonnier
- Nicholas Bollweg
- Pavel Karateev
- Philipp A
- Reuben Morais

2.3.2 Issues closed in 7.1

GitHub stats for 2018/09/27 - 2018/10/27 (since tag: 7.0.1)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 31 issues and merged 54 pull requests. The full list can be seen on GitHub

The following 33 authors contributed 254 commits.

- ammarmallik
- Audrey Dutcher
- Bart Skowron
- Benjamin Ragan-Kelley
- BinaryCrochet
- Chris Barker
- Christopher Moura
- Dedipyaman Das
- Dominic Kuang
- Elyashiv
- Emil Hessman
- felixzhuologist
- hongshaoyang
- Hugo
- kd2718
- kory donati
- Kory Donati
- koryd
- luciana
- luz.paz
- Massimo Santini
- Matthias Bussonnier
- Matthias Geier
- meeseeksdev[bot]
- Michael Penkov
- Mukesh Bhandarkar
- Nguyen Duy Hai
- Roy Wellington
- Sha Liu
- Shao Yang
- Shashank Kumar
- Tony Fast
- wim glenn

2.3.3 Issues closed in 7.0

GitHub stats for 2018/07/29 - 2018/09/27 (since tag: 6.5.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 20 issues and merged 76 pull requests. The full list can be seen on GitHub

The following 49 authors contributed 471 commits.

- alphaCTzo7G
- Alyssa Whitwell
- Anatol Ulrich
- apunisal
- Benjamin Ragan-Kelley
- Chaz Reid
- Christoph
- Dale Jung
- Dave Hirschfeld
- dhirschf
- Doug Latornell
- Fernando Perez
- Fred Mitchell
- Gabriel Potter
- gpotter2
- Grant Nestor
- hongshaoyang
- Hugo
- J Forde
- Jonathan Slenders
- Jörg Dietrich
- Kyle Kelley
- luz.paz
- M Pacer
- Matthew R. Scott
- Matthew Seal
- Matthias Bussonnier
- meeseeksdev[bot]
- Michael Käufl
- Olesya Baranova
- oscar6echo

- Paul Ganssle
- Paul Ivanov
- Peter Parente
- prasanth
- Shailyn javier Ortiz jimenez
- Sourav Singh
- Srinivas Reddy Thatiparthy
- Steven Silvester
- stonebig
- Subhendu Ranjan Mishra
- Takafumi Arakaki
- Thomas A Caswell
- Thomas Kluyver
- Todd
- Wei Yen
- Yarko Tymciurak
- Yutao Yuan
- Zi Chong Kao

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If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

2.4 6.x Series

2.4.1 IPython 6.5.0

Miscellaneous bug fixes and compatibility with Python 3.7.

- Autocompletion fix for modules with out `__init__.py` PR #11227
- update the `%pastebin` magic to use `dpaste.com` instead og GitHub Gist which now requires authentication PR #11182
- Fix crash with multiprocessing PR #11185

2.4.2 IPython 6.4.0

Everything new in *IPython 5.7*

- Fix display object not emitting metadata PR #11106
- Comments failing Jedi test PR #11110

2.4.3 IPython 6.3.1

This is a bugfix release to switch the default completions back to IPython's own completion machinery. We discovered some problems with the completions from Jedi, including completing column names on pandas data frames.

You can switch the completions source with the config option `Completer.use_jedi`.

2.4.4 IPython 6.3

IPython 6.3 contains all the bug fixes and features in *IPython 5.6*. In addition:

- A new display class `IPython.display.Code` can be used to display syntax highlighted code in a notebook (PR #10978).
- The `%%html` magic now takes a `--isolated` option to put the content in an iframe (PR #10962).
- The code to find completions using the Jedi library has had various adjustments. This is still a work in progress, but we hope this version has fewer annoyances (PR #10956, PR #10969, PR #10999, PR #11035, PR #11063, PR #11065).
- The *post* event callbacks are now always called, even when the execution failed (for example because of a `SyntaxError`).
- The execution info and result objects are now made available in the corresponding *pre* or *post* `*_run_cell` *event callbacks* in a backward compatible manner (#10774 and PR #10795).
- Performance with very long code cells (hundreds of lines) is greatly improved (PR #10898). Further improvements are planned for IPython 7.

You can see all pull requests for the 6.3 milestone.

2.4.5 IPython 6.2

IPython 6.2 contains all the bugs fixes and features *available in IPython 5.5*, like built in progress bar support, and system-wide configuration

The following features are specific to IPython 6.2:

Function signature in completions

Terminal IPython will now show the signature of the function while completing. Only the currently highlighted function will show its signature on the line below the completer by default. This functionality is recent, so it might be limited; we welcome bug reports and requests for enhancements. PR #10507

Assignments return values

IPython can now trigger the display hook on the last assignment of cells. Up until 6.2 the following code wouldn't show the value of the assigned variable:

```
In[1]: xyz = "something"
# nothing shown
```

You would have to actually make it the last statement:

```
In [2]: xyz = "something else"
...   : xyz
Out[2]: "something else"
```

With the option `InteractiveShell.ast_node_interactivity='last_expr_or_assign'` you can now do:

```
In [2]: xyz = "something else"
Out[2]: "something else"
```

This option can be toggled at runtime with the `%config` magic, and will trigger on assignment `a = 1`, augmented assignment `+=`, `-=`, `|=...` as well as type annotated assignments: `a:int = 2`.

See PR #10598

Recursive Call of ipdb

Advanced users of the debugger can now correctly recursively enter ipdb. This is thanks to `@segevfiner` on PR #10721.

2.4.6 IPython 6.1

- Quotes in a filename are always escaped during tab-completion on non-Windows. PR #10069
- Variables now shadow magics in autocompletion. See #4877 and PR #10542.
- Added the ability to add parameters to alias_magic. For example:

  ```
  In [2]: %alias_magic hist history --params "-l 2" --line
  Created `%hist` as an alias for `%history -l 2`.

  In [3]: hist
  %alias_magic hist history --params "-l 30" --line
  %alias_magic hist history --params "-l 2" --line
  ```

  Previously it was only possible to have an alias attached to a single function, and you would have to pass in the given parameters every time:

  ```
  In [4]: %alias_magic hist history --line
  Created `%hist` as an alias for `%history`.

  In [5]: hist -l 2
  hist
  %alias_magic hist history --line
  ```

- To suppress log state messages, you can now either use `%logstart -q`, pass `--LoggingMagics.quiet=True` on the command line, or set `c.LoggingMagics.quiet=True` in your configuration file.

- An additional flag `--TerminalInteractiveShell.term_title_format` is introduced to allow the user to control the format of the terminal title. It is specified as a python format string, and currently the only variable it will format is `{cwd}`.
- `??/%pinfo2` will now show object docstrings if the source can't be retrieved. PR #10532
- `IPython.display` has gained a `%markdown` cell magic. PR #10563
- `%config` options can now be tab completed. PR #10555
- `%config` with no arguments are now unique and sorted. PR #10548
- Completion on keyword arguments does not duplicate = sign if already present. PR #10547
- `%run -m <module>` now `<module>` passes extra arguments to `<module>`. PR #10546
- completer now understand "snake case auto complete": if `foo_bar_kittens` is a valid completion, I can type `f_b<tab>` will complete to it. PR #10537
- tracebacks are better standardized and will compress `/path/to/home` to `~`. PR #10515

The following changes were also added to IPython 5.4, see *what's new in IPython 5.4* for more detail description:

- `TerminalInteractiveShell` is configurable and can be configured to (re)-use the readline interface.
- objects can now define a `_repr_mimebundle_`
- Execution heuristics improve for single line statements
- `display()` can now return a display id to update display areas.

2.4.7 IPython 6.0

Released April 19th, 2017

IPython 6 features a major improvement in the completion machinery which is now capable of completing non-executed code. It is also the first version of IPython to stop compatibility with Python 2, which is still supported on the bugfix only 5.x branch. Read below for a non-exhaustive list of new features.

Make sure you have pip > 9.0 before upgrading. You should be able to update by using:

```
pip install ipython --upgrade
```

Note: If your pip version is greater than or equal to pip 9.0.1 you will automatically get the most recent version of IPython compatible with your system: on Python 2 you will get the latest IPython 5.x bugfix, while in Python 3 you will get the latest 6.x stable version.

New completion API and Interface

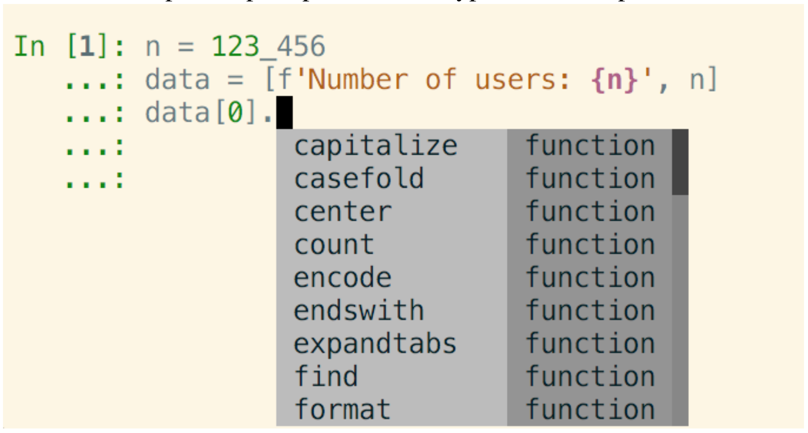
The completer Completion API has seen an overhaul, and the new completer has plenty of improvements both from the end users of terminal IPython and for consumers of the API.

This new API is capable of pulling completions from `jedi`, thus allowing type inference on non-executed code. If `jedi` is installed, completions like the following are now possible without code evaluation:

```
>>> data = ['Number of users', 123_456]
... data[0].<tab>
```

That is to say, IPython is now capable of inferring that `data[0]` is a string, and will suggest completions like `.capitalize`. The completion power of IPython will increase with new Jedi releases, and a number of bug-fixes and more completions are already available on the development version of `jedi` if you are curious.

With the help of prompt toolkit, types of completions can be shown in the completer interface:



```
In [1]: n = 123_456
   ...: data = [f'Number of users: {n}', n]
   ...: data[0].
   ...:          capitalize  function
   ...:          casefold    function
                 center      function
                 count       function
                 encode      function
                 endswith    function
                 expandtabs  function
                 find        function
                 format      function
```

The appearance of the completer is controlled by the `c.TerminalInteractiveShell.display_completions` option that will show the type differently depending on the value among `'column'`, `'multicolumn'` and `'readlinelike'`

The use of Jedi also fulfills a number of requests and fixes a number of bugs like case-insensitive completion and completion after division operator: See PR #10182.

Extra patches and updates will be needed to the `ipykernel` package for this feature to be available to other clients like Jupyter Notebook, Lab, Nteract, Hydrogen. . .

The use of Jedi should be barely noticeable on recent machines, but can be slower on older ones. To tweak the performance, the amount of time given to Jedi to compute type inference can be adjusted with `c.IPCompleter.jedi_compute_type_timeout`. The objects whose type were not inferred will be shown as `<unknown>`. Jedi can also be completely deactivated by using the `c.Completer.use_jedi=False` option.

The old `Completer.complete()` API is waiting deprecation and should be replaced replaced by `Completer.completions()` in the near future. Feedback on the current state of the API and suggestions are welcome.

Python 3 only codebase

One of the large challenges in IPython 6.0 has been the adoption of a pure Python 3 codebase, which has led to upstream patches in pip, pypi and warehouse to make sure Python 2 systems still upgrade to the latest compatible Python version.

We remind our Python 2 users that IPython 5 is still compatible with Python 2.7, still maintained and will get regular releases. Using pip 9+, upgrading IPython will automatically upgrade to the latest version compatible with your system.

Warning: If you are on a system using an older version of pip on Python 2, pip may still install IPython 6.0 on your system, and IPython will refuse to start. You can fix this by upgrading pip, and reinstalling ipython, or forcing pip to install an earlier version: `pip install 'ipython<6'`

The ability to use only Python 3 on the code base of IPython brings a number of advantages. Most of the newly written code make use of optional function type annotation leading to clearer code and better documentation.

The total size of the repository has also decreased by about 1500 lines (for the first time excluding the big split for 4.0). The decrease is potentially a bit more for the sour as some documents like this one are append only and are about 300 lines long.

The removal of the Python2/Python3 shim layer has made the code quite a lot clearer and more idiomatic in a number of locations, and much friendlier to work with and understand. We hope to further embrace Python 3 capabilities in the next release cycle and introduce more of the Python 3 only idioms (yield from, kwarg only, general unpacking) in the IPython code base, and see if we can take advantage of these to improve user experience with better error messages and hints.

Configurable TerminalInteractiveShell, readline interface

IPython gained a new `c.TerminalIPythonApp.interactive_shell_class` option that allows customizing the class used to start the terminal frontend. This should allow a user to use custom interfaces, like reviving the former readline interface which is now a separate package not actively maintained by the core team. See the project to bring back the readline interface: rlipython.

This change will be backported to the IPython 5.x series.

Misc improvements

- The `%%capture` magic can now capture the result of a cell (from an expression on the last line), as well as printed and displayed output. PR #9851.
- Pressing Ctrl-Z in the terminal debugger now suspends IPython, as it already does in the main terminal prompt.
- Autoreload can now reload `Enum`. See #10232 and PR #10316
- IPython.display has gained a `GeoJSON` object. PR #10288 and PR #10253

Functions Deprecated in 6.x Development cycle

- Loading extensions from `ipython_extension_dir` prints a warning that this location is pending deprecation. This should only affect users still having extensions installed with `%install_ext` which has been deprecated since IPython 4.0, and removed in 5.0. Extensions still present in `ipython_extension_dir` may shadow more recently installed versions using pip. It is thus recommended to clean `ipython_extension_dir` of any extension now available as a package.
- `IPython.utils.warn` was deprecated in IPython 4.0, and has now been removed. instead of `IPython.utils.warn` inbuilt `warnings` module is used.
- The function `IPython.core.oinspect.py:call_tip` is unused, was marked as deprecated (raising a `DeprecationWarning`) and marked for later removal. PR #10104

Backward incompatible changes

Functions Removed in 6.x Development cycle

The following functions have been removed in the development cycle marked for Milestone 6.0.

- `IPython/utils/process.py` - `is_cmd_found`
- `IPython/utils/process.py` - `pycmd2argv`
- The `--deep-reload` flag and the corresponding options to inject `dreload` or `reload` into the interactive namespace have been removed. You have to explicitly import `reload` from `IPython.lib.deepreload` to use it.

- The `%profile` used to print the current IPython profile, and which was deprecated in IPython 2.0 does now raise a `DeprecationWarning` error when used. It is often confused with the *%prun* and the deprecation removal should free up the `profile` name in future versions.

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2.5 Issues closed in the 6.x development cycle

2.5.1 Issues closed in 6.3

GitHub stats for 2017/09/15 - 2018/04/02 (tag: 6.2.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 10 issues and merged 50 pull requests. The full list can be seen on GitHub

The following 35 authors contributed 253 commits.

- Anatoly Techtonik
- Antony Lee
- Benjamin Ragan-Kelley
- Corey McCandless
- Craig Citro
- Cristian Ciupitu
- David Cottrell
- David Straub
- Doug Latornell
- Fabio Niephaus
- Gergely Nagy
- Henry Fredrick Schreiner
- Hugo
- Ismael Venegas Castelló
- Ivan Gonzalez
- J Forde
- Jeremy Sikes
- Joris Van den Bossche

- Lesley Cordero
- luzpaz
- madhu94
- Matthew R. Scott
- Matthias Bussonnier
- Matthias Geier
- Olesya Baranova
- Peter Williams
- Rastislav Barlik
- Roshan Rao
- rs2
- Samuel Lelièvre
- Shailyn javier Ortiz jimenez
- Sjoerd de Vries
- Teddy Rendahl
- Thomas A Caswell
- Thomas Kluyver

2.5.2 Issues closed in 6.2

GitHub stats for 2017/05/31 - 2017/09/15 (tag: 6.1.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 3 issues and merged 37 pull requests. The full list can be seen on GitHub

The following 32 authors contributed 196 commits.

- adityausathe
- Antony Lee
- Benjamin Ragan-Kelley
- Carl Smith
- Eren Halici
- Erich Spaker
- Grant Nestor
- Jean Cruypenynck
- Jeroen Demeyer
- jfbu
- jlstevens
- jus1tin
- Kyle Kelley

- M Pacer
- Marc Richter
- Marius van Niekerk
- Matthias Bussonnier
- mpacer
- Mradul Dubey
- ormung
- pepie34
- Ritesh Kadmawala
- ryan thielke
- Segev Finer
- Srinath
- Srinivas Reddy Thatiparthy
- Steven Maude
- Sudarshan Raghunathan
- Sudarshan Rangarajan
- Thomas A Caswell
- Thomas Ballinger
- Thomas Kluyver

2.5.3 Issues closed in 6.1

GitHub stats for 2017/04/19 - 2017/05/30 (tag: 6.0.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 10 issues and merged 43 pull requests. The full list can be seen on GitHub

The following 26 authors contributed 116 commits.

- Alex Alekseyev
- Benjamin Ragan-Kelley
- Brian E. Granger
- Christopher C. Aycock
- Dave Willmer
- David Bradway
- ICanWaitAndFishAllDay
- Ignat Shining
- Jarrod Janssen
- Joshua Storck
- Luke Pfister

- Matthias Bussonnier
- Matti Remes
- meeseeksdev[bot]
- memeplex
- Ming Zhang
- Nick Weseman
- Paul Ivanov
- Piotr Zielinski
- ryan thielke
- sagnak
- Sang Min Park
- Srinivas Reddy Thatiparthy
- Steve Bartz
- Thomas Kluyver
- Tory Haavik

2.5.4 Issues closed in 6.0

GitHub stats for 2017/04/10 - 2017/04/19 (milestone: 6.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 49 issues and merged 145 pull requests. The full list can be seen on GitHub

The following 34 authors contributed 176 commits.

- Adam Eury
- anantkaushik89
- Antonino Ingargiola
- Benjamin Ragan-Kelley
- Carol Willing
- Chilaka Ramakrishna
- chillaranand
- Denis S. Tereshchenko
- Diego Garcia
- fatData
- Fermi paradox
- fuho
- Grant Nestor
- Ian Rose
- Jeroen Demeyer

- kaushikanant
- Keshav Ramaswamy
- Matteo
- Matthias Bussonnier
- mbyt
- Michael Käufl
- michaelpacer
- Moez Bouhlel
- Pablo Galindo
- Paul Ivanov
- Piotr Przetacznik
- Rounak Banik
- sachet-mittal
- Srinivas Reddy Thatiparthy
- Tamir Bahar
- Thomas Hisch
- Thomas Kluyver
- Utkarsh Upadhyay
- Yuri Numerov

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2.6 5.x Series

2.6.1 IPython 5.7

- Fix IPython trying to import non-existing matplotlib backends PR #11087
- fix for display hook not publishing object metadata PR #11101

2.6.2 IPython 5.6

- In Python 3.6 and above, dictionaries preserve the order items were added to them. On these versions, IPython will display dictionaries in their native order, rather than sorting by the keys (PR #10958).
- *ProgressBar* can now be used as an iterator (PR #10813).
- The shell object gains a *check_complete()* method, to allow a smoother transition to new input processing machinery planned for IPython 7 (PR #11044).
- IPython should start faster, as it no longer looks for all available pygments styles on startup (PR #10859).

You can see all the PR marked for the 5.6. milestone, and all the backport versions.

2.6.3 IPython 5.5

System Wide config

- IPython now looks for config files in `{sys.prefix}/etc/ipython` for environment-specific configuration.
- Startup files can be found in `/etc/ipython/startup` or `{sys.prefix}/etc/ipython/startup` in addition to the profile directory, for system-wide or env-specific startup files.

See PR #10644

ProgressBar

IPython now has built-in support for progressbars:

```
In[1]: from IPython.display import ProgressBar
...   : pb = ProgressBar(100)
...   : pb

In[2]: pb.progress = 50

# progress bar in cell 1 updates.
```

See PR #10755

Misc

- Fix `IPython.core.display:Pretty._repr_pretty_` had the wrong signature. (PR #10625)
- *%timeit* now give a correct `SyntaxError` if naked `return` used. (PR #10637)
- Prepare the `:ipython:` directive to be compatible with Sphinx 1.7. (PR #10668)
- Make IPython work with OpenSSL in FIPS mode; change hash algorithm of input from md5 to sha1. (PR #10696)
- Clear breakpoints before running any script with debugger. (PR #10699)
- Document that `%profile` is deprecated, not to be confused with *%prun*. (PR #10707)
- Limit default number of returned completions to 500. (PR #10743)

You can see all the PR marked for the 5.5. milestone, and all the backport versions.

2.6.4 IPython 5.4

IPython 5.4-LTS is the first release of IPython after the release of the 6.x series which is Python 3 only. It backports most of the new exposed API additions made in IPython 6.0 and 6.1 and avoid having to write conditional logics depending of the version of IPython.

Please upgrade to pip 9 or greater before upgrading IPython. Failing to do so on Python 2 may lead to a broken IPython install.

Configurable TerminalInteractiveShell

Backported from the 6.x branch as an exceptional new feature. See PR #10373 and #10364

IPython gained a new `c.TerminalIPythonApp.interactive_shell_class` option that allow to customize the class used to start the terminal frontend. This should allow user to use custom interfaces, like reviving the former readline interface which is now a separate package not maintained by the core team.

Define `_repr_mimebundle_`

Object can now define `_repr_mimebundle_` in place of multiple `_repr_*_` methods and return a full mimebundle. This greatly simplify many implementation and allow to publish custom mimetypes (like geojson, plotly, dataframes. . . .). See the `Custom Display Logic` example notebook for more information.

Execution Heuristics

The heuristic for execution in the command line interface is now more biased toward executing for single statement. While in IPython 4.x and before a single line would be executed when enter is pressed, IPython 5.x would insert a new line. For single line statement this is not true anymore and if a single line is valid Python, IPython will execute it regardless of the cursor position. Use `Ctrl-O` to insert a new line. PR #10489

Implement Display IDs

Implement display id and ability to update a given display. This should greatly simplify a lot of code by removing the need for widgets and allow other frontend to implement things like progress-bars. See PR #10048

Display function

The *`display()`* function is now available by default in an IPython session, meaning users can call it on any object to see their rich representation. This should allow for better interactivity both at the REPL and in notebook environment.

Scripts and library that rely on display and may be run outside of IPython still need to import the display function using `from IPython.display import display`. See PR #10596

Miscs

- `_mp_main_` is not reloaded which fixes issues with multiprocessing. PR #10523
- Use user colorscheme in Pdb as well PR #10479
- Faster shutdown. PR #10408
- Fix a crash in reverse search. PR #10371

- added `Completer.backslash_combining_completions` boolean option to deactivate backslash-tab completion that may conflict with windows path.

2.6.5 IPython 5.3

Released on February 24th, 2017. Remarkable changes and fixes:

- Fix a bug in `set_next_input` leading to a crash of terminal IPython. PR #10231, #10296, #10229
- Always wait for editor inputhook for terminal IPython PR #10239, PR #10240
- Disable `_ipython_display_` in terminal PR #10249, PR #10274
- Update terminal colors to be more visible by default on windows PR #10260, PR #10238, #10281
- Add Ctrl-Z shortcut (suspend) in terminal debugger PR #10254, #10273
- Indent on new line by looking at the text before the cursor PR #10264, PR #10275, #9283
- Update QtEventloop integration to fix some matplotlib integration issues PR #10201, PR #10311, #10201
- Respect completions display style in terminal debugger PR #10305, PR #10313
- Add a config option `TerminalInteractiveShell.extra_open_editor_shortcuts` to enable extra shortcuts to open the input in an editor. These are `v` in vi mode, and `C-X C-E` in emacs mode (PR #10330). The `F2` shortcut is always enabled.

2.6.6 IPython 5.2.2

- Fix error when starting with `IPCompleter.limit_to__all__` configured.

2.6.7 IPython 5.2.1

- Fix tab completion in the debugger. PR #10223

2.6.8 IPython 5.2

Released on January 29th, 2017. Remarkable changes and fixes:

- restore IPython's debugger to raise on quit. PR #10009
- The configuration value `c.TerminalInteractiveShell.highlighting_style` can now directly take a class argument for custom color style. PR #9848
- Correctly handle matplotlib figures dpi PR #9868
- Deprecate `-e` flag for the `%notebook` magic that had no effects. PR #9872
- You can now press F2 while typing at a terminal prompt to edit the contents in your favourite terminal editor. Set the `EDITOR` environment variable to pick which editor is used. PR #9929
- sdists will now only be `.tar.gz` as per upstream PyPI requirements. PR #9925
- *`IPython.core.debugger`* have gained a `set_trace()` method for convenience. PR #9947
- The 'smart command mode' added to the debugger in 5.0 was removed, as more people preferred the previous behaviour. Therefore, debugger commands such as `c` will act as debugger commands even when `c` is defined as a variable. PR #10050

- Fixes OS X event loop issues at startup, PR #10150
- Deprecate the `%autoindent` magic. PR #10176
- Emit a `DeprecationWarning` when setting the deprecated `limit_to_all` option of the completer. PR #10198
- The `%%capture` magic can now capture the result of a cell (from an expression on the last line), as well as printed and displayed output. PR #9851.

Changes of behavior to `InteractiveShellEmbed`.

`InteractiveShellEmbed` interactive behavior have changed a bit in between 5.1 and 5.2. By default `%kill_embedded` magic will prevent further invocation of the current `call location` instead of preventing further invocation of the current instance creation location. For most use case this will not change much for you, though previous behavior was confusing and less consistent with previous IPython versions.

You can now deactivate instances by using `%kill_embedded --instance` flag, (or `-i` in short). The `%kill_embedded` magic also gained a `--yes`/`-y` option which skip confirmation step, and `-x`/`--exit` which also exit the current embedded call without asking for confirmation.

See PR #10207.

2.6.9 IPython 5.1

- Broken `%timeit` on Python2 due to the use of `__qualname__`. PR #9804
- Restore `%gui qt` to create and return a `QApplication` if necessary. PR #9789
- Don't set terminal title by default. PR #9801
- Preserve indentation when inserting newlines with `Ctrl-O`. PR #9770
- Restore completion in debugger. PR #9785
- Deprecate `IPython.core.debugger.Tracer()` in favor of simpler, newer, APIs. PR #9731
- Restore `NoOpContext` context manager removed by mistake, and add `DeprecationWarning`. PR #9765
- Add option allowing `Prompt_toolkit` to use 24bits colors. PR #9736
- Fix for closing interactive matplotlib windows on OS X. PR #9854
- An embedded interactive shell instance can be used more than once. PR #9843
- More robust check for whether IPython is in a terminal. PR #9833
- Better pretty-printing of dicts on PyPy. PR #9827
- Some coloured output now looks better on dark background command prompts in Windows. PR #9838
- Improved tab completion of paths on Windows . PR #9826
- Fix tkinter event loop integration on Python 2 with `future` installed. PR #9824
- Restore `Ctrl-\` as a shortcut to quit IPython.
- Make `get_ipython()` accessible when modules are imported by startup files. PR #9818
- Add support for running directories containing a `__main__.py` file with the `ipython` command. PR #9813

True Color feature

`prompt_toolkit` uses pygments styles for syntax highlighting. By default, the colors specified in the style are approximated using a standard 256-color palette. `prompt_toolkit` also supports 24bit, a.k.a. "true", a.k.a. 16-million color escape sequences which enable compatible terminals to display the exact colors specified instead of an approximation. This true_color option exposes that capability in prompt_toolkit to the IPython shell.

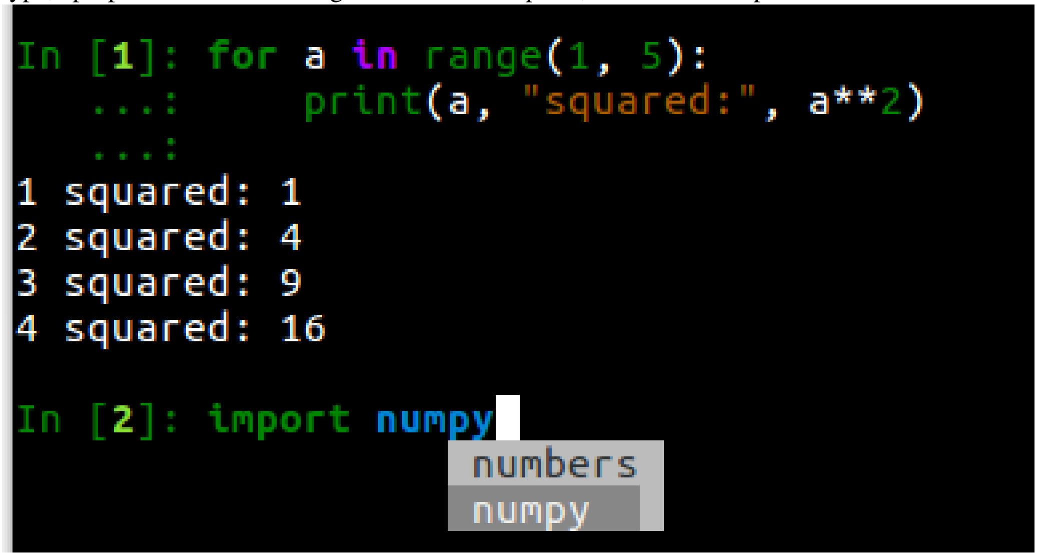
Here is a good source for the current state of true color support in various terminal emulators and software projects: https://gist.github.com/XVilka/8346728

2.6.10 IPython 5.0

Released July 7, 2016

New terminal interface

IPython 5 features a major upgrade to the terminal interface, bringing live syntax highlighting as you type, proper multiline editing and multiline paste, and tab completions that don't clutter up your history.



```
In [1]: for a in range(1, 5):
   ...:     print(a, "squared:", a**2)
   ...:
1 squared: 1
2 squared: 4
3 squared: 9
4 squared: 16

In [2]: import numpy
                   numbers
                   numpy
```

These features are provided by the Python library prompt_toolkit, which replaces `readline` throughout our terminal interface.

Relying on this pure-Python, cross platform module also makes it simpler to install IPython. We have removed dependencies on `pyreadline` for Windows and `gnureadline` for Mac.

Backwards incompatible changes

- The `%install_ext` magic function, deprecated since 4.0, has now been deleted. You can distribute and install extensions as packages on PyPI.
- Callbacks registered while an event is being handled will now only be called for subsequent events; previously they could be called for the current event. Similarly, callbacks removed while handling an event *will* always get that event. See #9447 and PR #9453.
- Integration with pydb has been removed since pydb development has been stopped since 2012, and pydb is not installable from PyPI.
- The `autoedit_syntax` option has apparently been broken for many years. It has been removed.

New terminal interface

The overhaul of the terminal interface will probably cause a range of minor issues for existing users. This is inevitable for such a significant change, and we've done our best to minimise these issues. Some changes that we're aware of, with suggestions on how to handle them:

IPython no longer uses readline configuration (`~/.inputrc`). We hope that the functionality you want (e.g. vi input mode) will be available by configuring IPython directly (see *Terminal IPython options*). If something's missing, please file an issue.

The `PromptManager` class has been removed, and the prompt machinery simplified. See *Custom Prompts* to customise prompts with the new machinery.

`IPython.core.debugger` now provides a plainer interface. *`IPython.terminal.debugger`* contains the terminal debugger using prompt_toolkit.

There are new options to configure the colours used in syntax highlighting. We have tried to integrate them with our classic `--colors` option and `%colors` magic, but there's a mismatch in possibilities, so some configurations may produce unexpected results. See *Terminal Colors* for more information.

The new interface is not compatible with Emacs 'inferior-shell' feature. To continue using this, add the `--simple-prompt` flag to the command Emacs runs. This flag disables most IPython features, relying on Emacs to provide things like tab completion.

Provisional Changes

Provisional changes are experimental functionality that may, or may not, make it into a future version of IPython, and which API may change without warnings. Activating these features and using these API are at your own risk, and may have security implication for your system, especially if used with the Jupyter notebook,

When running via the Jupyter notebook interfaces, or other compatible client, you can enable rich documentation experimental functionality:

When the `docrepr` package is installed setting the boolean flag `InteractiveShell.sphinxify_docstring` to `True`, will process the various object through sphinx before displaying them (see the `docrepr` package documentation for more information.

You need to also enable the IPython pager display rich HTML representation using the `InteractiveShell.enable_html_pager` boolean configuration option. As usual you can set these configuration options globally in your configuration files, alternatively you can turn them on dynamically using the following snippet:

```
ip = get_ipython()
ip.sphinxify_docstring = True
ip.enable_html_pager = True
```

You can test the effect of various combinations of the above configuration in the Jupyter notebook, with things example like :

```
import numpy as np
np.histogram?
```

This is part of an effort to make Documentation in Python richer and provide in the long term if possible dynamic examples that can contain math, images, widgets. . . As stated above this is nightly experimental feature with a lot of (fun) problem to solve. We would be happy to get your feedback and expertise on it.

Deprecated Features

Some deprecated features are listed in this section. Don't forget to enable `DeprecationWarning` as an error if you are using IPython in a Continuous Integration setup or in your testing in general:

```
import warnings
warnings.filterwarnings('error', '.*', DeprecationWarning, module='yourmodule.*')
```

- `hooks.fix_error_editor` seems unused and is pending deprecation.
- `IPython/core/excolors.py:ExceptionColors` is deprecated.
- `IPython.core.InteractiveShell:write()` is deprecated; use `sys.stdout` instead.
- `IPython.core.InteractiveShell:write_err()` is deprecated; use `sys.stderr` instead.
- The `formatter` keyword argument to `Inspector.info` in `IPython.core.oinspec` has no effect.
- The `global_ns` keyword argument of IPython Embed was deprecated, and has no effect. Use `module` keyword argument instead.

Known Issues:

- `<Esc>` Key does not dismiss the completer and does not clear the current buffer. This is an on purpose modification due to current technical limitation. Cf PR #9572. Escape the control character which is used for other shortcut, and there is no practical way to distinguish. Use Ctr-G or Ctrl-C as an alternative.
- Cannot use `Shift-Enter` and `Ctrl-Enter` to submit code in terminal. cf #9587 and #9401. In terminal there is no practical way to distinguish these key sequences from a normal new line return.
- `PageUp` and `pageDown` do not move through completion menu.
- Color styles might not adapt to terminal emulator themes. This will need new version of Pygments to be released, and can be mitigated with custom themes.

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2.7 Issues closed in the 5.x development cycle

2.7.1 Issues closed in 5.6

GitHub stats for 2017/09/15 - 2018/04/02 (tag: 5.5.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 2 issues and merged 28 pull requests. The full list can be seen on GitHub

The following 10 authors contributed 47 commits.

- Benjamin Ragan-Kelley
- Henry Fredrick Schreiner
- Joris Van den Bossche
- Matthias Bussonnier
- Mradul Dubey
- Roshan Rao
- Samuel Lelièvre
- Teddy Rendahl
- Thomas A Caswell
- Thomas Kluyver

2.7.2 Issues closed in 5.4

GitHub stats for 2017/02/24 - 2017/05/30 (tag: 5.3.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 8 issues and merged 43 pull requests. The full list can be seen on GitHub

The following 11 authors contributed 64 commits.

- Benjamin Ragan-Kelley
- Carol Willing
- Kyle Kelley
- Leo Singer
- Luke Pfister
- Lumir Balhar
- Matthias Bussonnier
- meeseeksdev[bot]
- memeplex
- Thomas Kluyver
- Ximin Luo

2.7.3 Issues closed in 5.3

GitHub stats for 2017/02/24 - 2017/05/30 (tag: 5.3.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 6 issues and merged 28 pull requests. The full list can be seen on GitHub

The following 11 authors contributed 53 commits.

- Benjamin Ragan-Kelley
- Carol Willing

- Justin Jent
- Kyle Kelley
- Lumir Balhar
- Matthias Bussonnier
- meeseeksdev[bot]
- Segev Finer
- Steven Maude
- Thomas A Caswell
- Thomas Kluyver

2.7.4 Issues closed in 5.2

GitHub stats for 2016/08/13 - 2017/01/29 (tag: 5.1.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 30 issues and merged 74 pull requests. The full list can be seen on GitHub

The following 40 authors contributed 434 commits.

- Adam Eury
- anantkaushik89
- anatoly techtonik
- Benjamin Ragan-Kelley
- Bibo Hao
- Carl Smith
- Carol Willing
- Chilaka Ramakrishna
- Christopher Welborn
- Denis S. Tereshchenko
- Diego Garcia
- fatData
- Fermi paradox
- Fernando Perez
- fuho
- Hassan Kibirige
- Jamshed Vesuna
- Jens Hedegaard Nielsen
- Jeroen Demeyer
- kaushikanant
- Kenneth Hoste

- Keshav Ramaswamy
- Kyle Kelley
- Matteo
- Matthias Bussonnier
- mbyt
- memeplex
- Moez Bouhlel
- Pablo Galindo
- Paul Ivanov
- pietvo
- Piotr Przetacznik
- Rounak Banik
- sachet-mittal
- Srinivas Reddy Thatiparthy
- Tamir Bahar
- Thomas A Caswell
- Thomas Kluyver
- tillahoffmann
- Yuri Numerov

2.7.5 Issues closed in 5.1

GitHub stats for 2016/07/08 - 2016/08/13 (tag: 5.0.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 33 issues and merged 43 pull requests. The full list can be seen on GitHub

The following 17 authors contributed 129 commits.

- Antony Lee
- Benjamin Ragan-Kelley
- Carol Willing
- Danilo J. S. Bellini
- (dongweiming)
- Fernando Perez
- Gavin Cooper
- Gil Forsyth
- Jacob Niehus
- Julian Kuhlmann
- Matthias Bussonnier

- Michael Pacer
- Nik Nyby
- Pavol Juhas
- Luke Deen Taylor
- Thomas Kluyver
- Tamir Bahar

2.7.6 Issues closed in 5.0

GitHub stats for 2016/07/05 - 2016/07/07 (tag: 5.0.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 95 issues and merged 191 pull requests. The full list can be seen on GitHub

The following 27 authors contributed 229 commits.

- Adam Greenhall
- Adrian
- Antony Lee
- Benjamin Ragan-Kelley
- Carlos Cordoba
- Carol Willing
- Chris
- Craig Citro
- Dmitry Zotikov
- Fernando Perez
- Gil Forsyth
- Jason Grout
- Jonathan Frederic
- Jonathan Slenders
- Justin Zymbaluk
- Kelly Liu
- klonuo
- Matthias Bussonnier
- nvdv
- Pavol Juhas
- Pierre Gerold
- sukisuki
- Sylvain Corlay
- Thomas A Caswell

- Thomas Kluyver
- Trevor Bekolay
- Yuri Numerov

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2.8 4.x Series

2.8.1 IPython 4.2

IPython 4.2 (April, 2016) includes various bugfixes and improvements over 4.1.

- Fix `ipython -i` on errors, which was broken in 4.1.
- The delay meant to highlight deprecated commands that have moved to jupyter has been removed.
- Improve compatibility with future versions of traitlets and matplotlib.
- Use stdlib `shutil.get_terminal_size()` to measure terminal width when displaying tracebacks (provided by `backports.shutil_get_terminal_size` on Python 2).

You can see the rest on GitHub.

2.8.2 IPython 4.1

IPython 4.1.2 (March, 2016) fixes installation issues with some versions of setuptools.

Released February, 2016. IPython 4.1 contains mostly bug fixes, though there are a few improvements.

- IPython debugger (IPdb) now supports the number of context lines for the `where` (and `w`) commands. The `context` keyword is also available in various APIs. See PR PR #9097
- YouTube video will now show thumbnail when exported to a media that do not support video. (PR #9086)
- Add warning when running `ipython <subcommand>` when subcommand is deprecated. `jupyter` should now be used.
- Code in `%pinfo` (also known as `??`) are now highlighter (PR #8947)
- `%aimport` now support module completion. (PR #8884)
- `ipdb` output is now colored ! (PR #8842)
- Add ability to transpose columns for completion: (PR #8748)

Many many docs improvements and bug fixes, you can see the list of changes

2.8.3 IPython 4.0

Released August, 2015

IPython 4.0 is the first major release after the Big Split. IPython no longer contains the notebook, qtconsole, etc. which have moved to jupyter. IPython subprojects, such as IPython.parallel and widgets have moved to their own repos as well.

The following subpackages are deprecated:

- IPython.kernel (now jupyter_client and ipykernel)
- IPython.consoleapp (now jupyter_client.consoleapp)
- IPython.nbformat (now nbformat)
- IPython.nbconvert (now nbconvert)
- IPython.html (now notebook)
- IPython.parallel (now ipyparallel)
- IPython.utils.traitlets (now traitlets)
- IPython.config (now traitlets.config)
- IPython.qt (now qtconsole)
- IPython.terminal.console (now jupyter_console)

and a few other utilities.

Shims for the deprecated subpackages have been added, so existing code should continue to work with a warning about the new home.

There are few changes to the code beyond the reorganization and some bugfixes.

IPython highlights:

- Public APIs for discovering IPython paths is moved from *`IPython.utils.path`* to *`IPython.paths`*. The old function locations continue to work with deprecation warnings.
- Code raising `DeprecationWarning` entered by the user in an interactive session will now display the warning by default. See PR #8480 an #8478.
- The `--deep-reload` flag and the corresponding options to inject `dreload` or `reload` into the interactive namespace have been deprecated, and will be removed in future versions. You should now explicitly import `reload` from `IPython.lib.deepreload` to use it.

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2.9 Issues closed in the 4.x development cycle

2.9.1 Issues closed in 4.2

GitHub stats for 2015/02/02 - 2016/04/20 (since 4.1)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 10 issues and merged 22 pull requests. The full list can be seen on GitHub

The following 10 authors contributed 27 commits.

- Benjamin Ragan-Kelley
- Carlos Cordoba
- Gökhan Karabulut
- Jonas Rauber
- Matthias Bussonnier
- Paul Ivanov
- Sebastian Bank
- Thomas A Caswell
- Thomas Kluyver
- Vincent Woo

2.9.2 Issues closed in 4.1

GitHub stats for 2015/08/12 - 2016/02/02 (since 4.0.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 60 issues and merged 148 pull requests. The full list can be seen on GitHub

The following 52 authors contributed 468 commits.

- Aaron Meurer
- Alexandre Avanian
- Anthony Sottile
- Antony Lee
- Arthur Loder
- Ben Kasel
- Ben Rousch
- Benjamin Ragan-Kelley
- bollwyvl
- Carol Willing
- Christopher Roach
- Douglas La Rocca
- Fairly

- Fernando Perez
- Frank Sachsenheim
- Guillaume DOUMENC
- Gábor Luk
- Hoyt Koepke
- Ivan Timokhin
- Jacob Niehus
- JamshedVesuna
- Jan Schulz
- Jan-Philip Gehrcke
- jc
- Jessica B. Hamrick
- jferrara
- John Bohannon
- John Kirkham
- Jonathan Frederic
- Kyle Kelley
- Lev Givon
- Lilian Besson
- lingxz
- Matthias Bussonnier
- memeplex
- Michael Droettboom
- naught101
- Peter Waller
- Pierre Gerold
- Rémy Léone
- Scott Sanderson
- Shanzhuo Zhang
- Sylvain Corlay
- Tayfun Sen
- Thomas A Caswell
- Thomas Ballinger
- Thomas Kluyver
- Vincent Legoll
- Wouter Bolsterlee

- xconverge
- Yuri Numerov
- Zachary Pincus

2.9.3 Issues closed in 4.0

GitHub stats for 2015/02/27 - 2015/08/11 (since 3.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 35 issues and merged 125 pull requests. The full list can be seen on GitHub

The following 69 authors contributed 1186 commits.

- Abe Guerra
- Adal Chiriliuc
- Alexander Belopolsky
- Andrew Murray
- Antonio Russo
- Benjamin Ragan-Kelley
- Björn Linse
- Brian Drawert
- chebee7i
- Daniel Rocco
- Donny Winston
- Drekin
- Erik Hvatum
- Fernando Perez
- Francisco de la Peña
- Frazer McLean
- Gareth Elston
- Gert-Ludwig Ingold
- Giuseppe Venturini
- Ian Barfield
- Ivan Pozdeev
- Jakob Gager
- Jan Schulz
- Jason Grout
- Jeff Hussmann
- Jessica B. Hamrick
- Joe Borg

- Joel Nothman
- Johan Forsberg
- Jonathan Frederic
- Justin Tyberg
- Koen van Besien
- Kyle Kelley
- Lorena Pantano
- Lucretiel
- Marin Gilles
- mashenjun
- Mathieu
- Matthias Bussonnier
- Merlijn van Deen
- Mikhail Korobov
- Naveen Nathan
- Nicholas Bollweg
- nottaanibot
- Omer Katz
- onesandzeroes
- Patrick Snape
- patter001
- Peter Parente
- Pietro Battiston
- RickWinter
- Robert Smith
- Ryan Nelson
- Scott Sanderson
- Sebastiaan Mathot
- Sylvain Corlay
- thethomask
- Thomas A Caswell
- Thomas Adriaan Hellinger
- Thomas Kluyver
- Tianhui Michael Li
- tmtabor
- unknown

- Victor Ramirez
- Volker Braun
- Wieland Hoffmann
- Yuval Langer
- Zoltán Vörös
- Élie Michel

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2.10 3.x Series

2.10.1 IPython 3.2.3

Fixes compatibility with Python 3.4.4.

2.10.2 IPython 3.2.2

Address vulnerabilities when files have maliciously crafted filenames (CVE-2015-6938), or vulnerability when opening text files with malicious binary content (CVE pending).

Users are **strongly** encouraged to upgrade immediately. There are also a few small unicode and nbconvert-related fixes.

2.10.3 IPython 3.2.1

IPython 3.2.1 is a small bugfix release, primarily for cross-site security fixes in the notebook. Users are **strongly** encouraged to upgrade immediately. There are also a few small unicode and nbconvert-related fixes.

See *Issues closed in the 3.x development cycle* for details.

2.10.4 IPython 3.2

IPython 3.2 contains important security fixes. Users are **strongly** encouraged to upgrade immediately.

Highlights:

- Address cross-site scripting vulnerabilities CVE-2015-4706, CVE-2015-4707
- A security improvement that set the secure attribute to login cookie to prevent them to be sent over http

- Revert the face color of matplotlib axes in the inline backend to not be transparent.
- Enable mathjax safe mode by default
- Fix XSS vulnerability in JSON error messages
- Various widget-related fixes

See *Issues closed in the 3.x development cycle* for details.

2.10.5 IPython 3.1

Released April 3, 2015

The first 3.x bugfix release, with 33 contributors and 344 commits. This primarily includes bugfixes to notebook layout and focus problems.

Highlights:

- Various focus jumping and scrolling fixes in the notebook.
- Various message ordering and widget fixes in the notebook.
- Images in markdown and output are confined to the notebook width. An `.unconfined` CSS class is added to disable this behavior per-image. The resize handle on output images is removed.
- Improved ordering of tooltip content for Python functions, putting the signature at the top.
- Fix UnicodeErrors when displaying some objects with unicode reprs on Python 2.
- Set the kernel's working directory to the notebook directory when running `nbconvert --execute`, so that behavior matches the live notebook.
- Allow setting custom SSL options for the tornado server with `NotebookApp.ssl_options`, and protect against POODLE with default settings by disabling SSLv3.
- Fix memory leak in the IPython.parallel Controller on Python 3.

See *Issues closed in the 3.x development cycle* for details.

2.10.6 Release 3.0

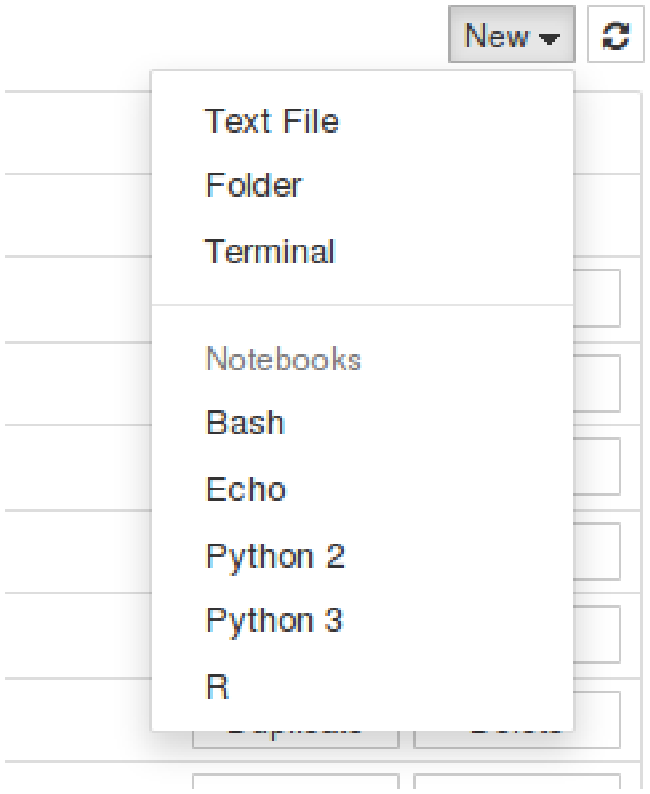
Released February 27, 2015

This is a really big release. Over 150 contributors, and almost 6000 commits in a bit under a year. Support for languages other than Python is greatly improved, notebook UI has been significantly redesigned, and a lot of improvement has happened in the experimental interactive widgets. The message protocol and document format have both been updated, while maintaining better compatibility with previous versions than prior updates. The notebook webapp now enables editing of any text file, and even a web-based terminal (on Unix platforms).

3.x will be the last monolithic release of IPython, as the next release cycle will see the growing project split into its Python-specific and language-agnostic components. Language-agnostic projects (notebook, qtconsole, etc.) will move under the umbrella of the new Project Jupyter name, while Python-specific projects (interactive Python shell, Python kernel, IPython.parallel) will remain under IPython, and be split into a few smaller packages. To reflect this, IPython is in a bit of a transition state. The logo on the notebook is now the Jupyter logo. When installing kernels system-wide, they go in a `jupyter` directory. We are going to do our best to ease this transition for users and developers.

Big changes are ahead.

Using different kernels



You can now choose a kernel for a notebook within the user interface, rather than starting up a separate notebook server for each kernel you want to use. The syntax highlighting adapts to match the language you're working in.

Information about the kernel is stored in the notebook file, so when you open a notebook, it will automatically start the correct kernel.

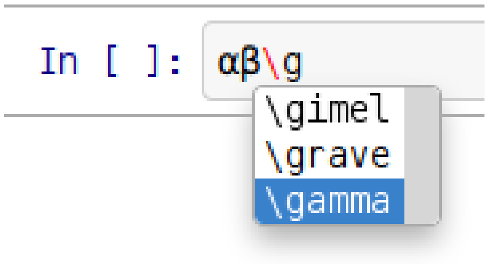
It is also easier to use the Qt console and the terminal console with other kernels, using the –kernel flag:

```
ipython qtconsole --kernel bash
ipython console --kernel bash

# To list available kernels
ipython kernelspec list
```

Kernel authors should see Kernel specs for how to register their kernels with IPython so that these mechanisms work.

Typing unicode identifiers



```
In [ ]: αβ\g
        \gimel
        \grave
        \gamma
```

Complex expressions can be much cleaner when written with a wider choice of characters. Python 3 allows unicode identifiers, and IPython 3 makes it easier to type those, using a feature from Julia. Type a backslash followed by a LaTeX style short name, such as `\alpha`. Press tab, and it will turn into α.

Widget migration guide

The widget framework has a lot of backwards incompatible changes. For information about migrating widget notebooks and custom widgets to 3.0 refer to the *widget migration guide*.

Other new features

- `TextWidget` and `TextareaWidget` objects now include a `placeholder` attribute, for displaying placeholder text before the user has typed anything.
- The `%load` magic can now find the source for objects in the user namespace. To enable searching the namespace, use the `-n` option.

```
In [1]: %load -n my_module.some_function
```

- `DirectView` objects have a new `use_cloudpickle()` method, which works like `view.use_dill()`, but causes the `cloudpickle` module from PiCloud's cloud library to be used rather than dill or the builtin pickle module.
- Added a .ipynb exporter to nbconvert. It can be used by passing `--to notebook` as a commandline argument to nbconvert.
- New nbconvert preprocessor called `ClearOutputPreprocessor`. This clears the output from IPython notebooks.
- New preprocessor for nbconvert that executes all the code cells in a notebook. To run a notebook and save its output in a new notebook:

```
ipython nbconvert InputNotebook --ExecutePreprocessor.enabled=True --to notebook -
↪-output Executed
```

- Consecutive stream (stdout/stderr) output is merged into a single output in the notebook document. Previously, all output messages were preserved as separate output fields in the JSON. Now, the same merge is applied to the stored output as the displayed output, improving document load time for notebooks with many small outputs.
- `NotebookApp.webapp_settings` is deprecated and replaced with the more informatively named `NotebookApp.tornado_settings`.
- Using `%timeit` prints warnings if there is at least a 4x difference in timings between the slowest and fastest runs, since this might meant that the multiple runs are not independent of one another.

- It's now possible to provide mechanisms to integrate IPython with other event loops, in addition to the ones we already support. This lets you run GUI code in IPython with an interactive prompt, and to embed the IPython kernel in GUI applications. See *Integrating with GUI event loops* for details. As part of this, the direct `enable_*` and `disable_*` functions for various GUIs in `IPython.lib.inputhook` have been deprecated in favour of `enable_gui()` and `disable_gui()`.
- A `ScrollManager` was added to the notebook. The `ScrollManager` controls how the notebook document is scrolled using keyboard. Users can inherit from the `ScrollManager` or `TargetScrollManager` to customize how their notebook scrolls. The default `ScrollManager` is the `SlideScrollManager`, which tries to scroll to the nearest slide or sub-slide cell.
- The function `interact_manual()` has been added which behaves similarly to `interact()`, but adds a button to explicitly run the interacted-with function, rather than doing it automatically for every change of the parameter widgets. This should be useful for long-running functions.
- The `%cython` magic is now part of the Cython module. Use `%load_ext Cython` with a version of Cython >= 0.21 to have access to the magic now.
- The Notebook application now offers integrated terminals on Unix platforms, intended for when it is used on a remote server. To enable these, install the `terminado` Python package.
- The Notebook application can now edit any plain text files, via a full-page CodeMirror instance.
- Setting the default highlighting language for nbconvert with the config option `NbConvertBase.default_language` is deprecated. Nbconvert now respects metadata stored in the kernel spec.
- IPython can now be configured systemwide, with files in `/etc/ipython` or `/usr/local/etc/ipython` on Unix systems, or `%PROGRAMDATA%\ipython` on Windows.
- Added support for configurable user-supplied Jinja HTML templates for the notebook. Paths to directories containing template files can be specified via `NotebookApp.extra_template_paths`. User-supplied template directories searched first by the notebook, making it possible to replace existing templates with your own files.

  For example, to replace the notebook's built-in `error.html` with your own, create a directory like `/home/my_templates` and put your override template at `/home/my_templates/error.html`. To start the notebook with your custom error page enabled, you would run:

  ```
  ipython notebook '--extra_template_paths=["/home/my_templates/"]'
  ```

  It's also possible to override a template while also inheriting from that template, by prepending `templates/` to the `{% extends %}` target of your child template. This is useful when you only want to override a specific block of a template. For example, to add additional CSS to the built-in `error.html`, you might create an override that looks like:

  ```
  {% extends "templates/error.html" %}

  {% block stylesheet %}
  {{super()}}
  <style type="text/css">
    /* My Awesome CSS */
  </style>
  {% endblock %}
  ```

- Added a widget persistence API. This allows you to persist your notebooks interactive widgets. Two levels of control are provided: 1. Higher level- `WidgetManager.set_state_callbacks` allows you to register callbacks for loading and saving widget state. The callbacks you register are automatically called when necessary. 2. Lower level- the `WidgetManager` Javascript class now has `get_state` and `set_state` methods that allow you to get and set the state of the widget runtime.

Example code for persisting your widget state to session data:

```
%%javascript
require(['widgets/js/manager'], function(manager) {
    manager.WidgetManager.set_state_callbacks(function() { // Load
        return JSON.parse(sessionStorage.widgets_state || '{}');
    }, function(state) { // Save
        sessionStorage.widgets_state = JSON.stringify(state);
    });
});
```

- Enhanced support for `%env` magic. As before, `%env` with no arguments displays all environment variables and values. Additionally, `%env` can be used to get or set individual environment variables. To display an individual value, use the `%env var` syntax. To set a value, use `env var val` or `env var=val`. Python value expansion using `$` works as usual.

Backwards incompatible changes

- The message protocol has been updated from version 4 to version 5. Adapters are included, so IPython frontends can still talk to kernels that implement protocol version 4.
- The notebook format has been updated from version 3 to version 4. Read-only support for v4 notebooks has been backported to IPython 2.4. Notable changes:
  - heading cells are removed in favor or markdown headings
  - notebook outputs and output messages are more consistent with each other
  - use `IPython.nbformat.read()` and `write()` to read and write notebook files instead of the deprecated `IPython.nbformat.current` APIs.

  You can downgrade a notebook to v3 via `nbconvert`:

  ```
  ipython nbconvert --to notebook --nbformat 3 <notebook>
  ```

  which will create `notebook.v3.ipynb`, a copy of the notebook in v3 format.
- `IPython.core.oinspect.getsource()` call specification has changed:
  - `oname` keyword argument has been added for property source formatting
  - `is_binary` keyword argument has been dropped, passing `True` had previously short-circuited the function to return `None` unconditionally
- Removed the octavemagic extension: it is now available as `oct2py.ipython`.
- Creating PDFs with LaTeX no longer uses a post processor. Use `nbconvert --to pdf` instead of `nbconvert --to latex --post pdf`.
- Used https://github.com/jdfreder/bootstrap2to3 to migrate the Notebook to Bootstrap 3.

  Additional changes:
  - Set `.tab-content .row` `0px;` left and right margin (bootstrap default is `-15px;`)
  - Removed `height: @btn_mini_height;` from `.list_header>div, .list_item>div` in `tree.less`
  - Set `#header` div `margin-bottom: 0px;`
  - Set `#menus` to `float: left;`
  - Set `#maintoolbar .navbar-text` to `float: none;`

   - Added no-padding convenience class.
   - Set border of #maintoolbar to 0px

- Accessing the `container` DOM object when displaying javascript has been deprecated in IPython 2.0 in favor of accessing `element`. Starting with IPython 3.0 trying to access `container` will raise an error in browser javascript console.
- `IPython.utils.py3compat.open` was removed: `io.open()` provides all the same functionality.
- The NotebookManager and `/api/notebooks` service has been replaced by a more generic ContentsManager and `/api/contents` service, which supports all kinds of files.
- The Dashboard now lists all files, not just notebooks and directories.
- The `--script` hook for saving notebooks to Python scripts is removed, use `ipython nbconvert --to python notebook` instead.
- The `rmagic` extension is deprecated, as it is now part of rpy2. See `rpy2.ipython.rmagic`.
- `start_kernel()` and `format_kernel_cmd()` no longer accept a `executable` parameter. Use the kernelspec machinery instead.
- The widget classes have been renamed from `*Widget` to `*`. The old names are still functional, but are deprecated. i.e. `IntSliderWidget` has been renamed to `IntSlider`.
- The ContainerWidget was renamed to Box and no longer defaults as a flexible box in the web browser. A new FlexBox widget was added, which allows you to use the flexible box model.
- The notebook now uses a single websocket at `/kernels/<kernel-id>/channels` instead of separate `/kernels/<kernel-id>/{shell|iopub|stdin}` channels. Messages on each channel are identified by a `channel` key in the message dict, for both send and recv.

Content Security Policy

The Content Security Policy is a web standard for adding a layer of security to detect and mitigate certain classes of attacks, including Cross Site Scripting (XSS) and data injection attacks. This was introduced into the notebook to ensure that the IPython Notebook and its APIs (by default) can only be embedded in an iframe on the same origin.

Override `headers['Content-Security-Policy']` within your notebook configuration to extend for alternate domains and security settings.:

```
c.NotebookApp.tornado_settings = {
    'headers': {
        'Content-Security-Policy': "frame-ancestors 'self'"
    }
}
```

Example policies:

```
Content-Security-Policy: default-src 'self' https://*.jupyter.org
```

Matches embeddings on any subdomain of jupyter.org, so long as they are served over SSL.

There is a report-uri endpoint available for logging CSP violations, located at `/api/security/csp-report`. To use it, set `report-uri` as part of the CSP:

```
c.NotebookApp.tornado_settings = {
    'headers': {
        'Content-Security-Policy': "frame-ancestors 'self'; report-uri /api/security/
↪csp-report"
```

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```
    }
}
```

It simply provides the CSP report as a warning in IPython's logs. The default CSP sets this report-uri relative to the `base_url` (not shown above).

For a more thorough and accurate guide on Content Security Policies, check out MDN's Using Content Security Policy for more examples.

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2.11 Issues closed in the 3.x development cycle

2.11.1 Issues closed in 3.2.1

GitHub stats for 2015/06/22 - 2015/07/12 (since 3.2)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 1 issue and merged 3 pull requests. The full list can be seen on GitHub

The following 5 authors contributed 9 commits.

- Benjamin Ragan-Kelley
- Matthias Bussonnier
- Nitin Dahyabhai
- Sebastiaan Mathot
- Thomas Kluyver

2.11.2 Issues closed in 3.2

GitHub stats for 2015/04/03 - 2015/06/21 (since 3.1)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 7 issues and merged 30 pull requests. The full list can be seen on GitHub

The following 15 authors contributed 74 commits.

- Benjamin Ragan-Kelley
- Brian Gough
- Damián Avila

- Ian Barfield
- Jason Grout
- Jeff Hussmann
- Jessica B. Hamrick
- Kyle Kelley
- Matthias Bussonnier
- Nicholas Bollweg
- Randy Lai
- Scott Sanderson
- Sylvain Corlay
- Thomas A Caswell
- Thomas Kluyver

2.11.3 Issues closed in 3.1

GitHub stats for 2015/02/27 - 2015/04/03 (since 3.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 46 issues and merged 133 pull requests. The full list can be seen on GitHub.

The following 33 authors contributed 344 commits:

- Abe Guerra
- Adal Chiriliuc
- Benjamin Ragan-Kelley
- Brian Drawert
- Fernando Perez
- Gareth Elston
- Gert-Ludwig Ingold
- Giuseppe Venturini
- Jakob Gager
- Jan Schulz
- Jason Grout
- Jessica B. Hamrick
- Jonathan Frederic
- Justin Tyberg
- Lorena Pantano
- mashenjun
- Mathieu
- Matthias Bussonnier

- Morten Enemark Lund
- Naveen Nathan
- Nicholas Bollweg
- onesandzeroes
- Patrick Snape
- Peter Parente
- RickWinter
- Robert Smith
- Ryan Nelson
- Scott Sanderson
- Sylvain Corlay
- Thomas Kluyver
- tmtabor
- Wieland Hoffmann
- Yuval Langer

2.11.4 Issues closed in 3.0

GitHub stats for 2014/04/02 - 2015/02/13 (since 2.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

We closed 469 issues and merged 925 pull requests. The full list can be seen on GitHub.

The following 155 authors contributed 5975 commits.

- A.J. Holyoake
- abalkin
- Adam Hodgen
- Adrian Price-Whelan
- Amin Bandali
- Andreas Amann
- Andrew Dawes
- Andrew Jesaitis
- Andrew Payne
- AnneTheAgile
- Aron Ahmadia
- Ben Duffield
- Benjamin ABEL
- Benjamin Ragan-Kelley
- Benjamin Schultz

- Björn Grüning
- Björn Linse
- Blake Griffith
- Boris Egorov
- Brian E. Granger
- bsvh
- Carlos Cordoba
- Cedric GESTES
- cel
- chebee7i
- Christoph Gohlke
- CJ Carey
- Cyrille Rossant
- Dale Jung
- Damián Avila
- Damon Allen
- Daniel B. Vasquez
- Daniel Rocco
- Daniel Wehner
- Dav Clark
- David Hirschfeld
- David Neto
- dexterdev
- Dimitry Kloper
- dongweiming
- Doug Blank
- drevicko
- Dustin Rodriguez
- Eric Firing
- Eric Galloway
- Erik M. Bray
- Erik Tollerud
- Ezequiel (Zac) Panepucci
- Fernando Perez
- foogunlana
- Francisco de la Peña

- George Titsworth
- Gordon Ball
- gporras
- Grzegorz Rożniecki
- Helen ST
- immerrr
- Ingolf Becker
- Jakob Gager
- James Goppert
- James Porter
- Jan Schulz
- Jason Goad
- Jason Gors
- Jason Grout
- Jason Newton
- jdavidheiser
- Jean-Christophe Jaskula
- Jeff Hemmelgarn
- Jeffrey Bush
- Jeroen Demeyer
- Jessica B. Hamrick
- Jessica Frazelle
- jhemmelg
- Jim Garrison
- Joel Nothman
- Johannes Feist
- John Stowers
- John Zwinck
- jonasc
- Jonathan Frederic
- Juergen Hasch
- Julia Evans
- Justyna Ilczuk
- Jörg Dietrich
- K.-Michael Aye
- Kalibri

- Kester Tong
- Kyle Kelley
- Kyle Rawlins
- Lev Abalkin
- Manuel Riel
- Martin Bergtholdt
- Martin Spacek
- Mateusz Paprocki
- Mathieu
- Matthias Bussonnier
- Maximilian Albert
- mbyt
- MechCoder
- Mohan Raj Rajamanickam
- mvr
- Narahari
- Nathan Goldbaum
- Nathan Heijermans
- Nathaniel J. Smith
- ncornette
- Nicholas Bollweg
- Nick White
- Nikolay Koldunov
- Nile Geisinger
- Olga Botvinnik
- Osada Paranaliyanage
- Pankaj Pandey
- Pascal Bugnion
- patricktokeeffe
- Paul Ivanov
- Peter Odding
- Peter Parente
- Peter Würtz
- Phil Elson
- Phillip Nordwall
- Pierre Gerold

- Pierre Haessig
- Raffaele De Feo
- Ramiro Gómez
- Reggie Pierce
- Remi Rampin
- Renaud Richardet
- Richard Everson
- Scott Sanderson
- Silvia Vinyes
- Simon Guillot
- Spencer Nelson
- Stefan Zimmermann
- Steve Chan
- Steven Anton
- Steven Silvester
- sunny
- Susan Tan
- Sylvain Corlay
- Tarun Gaba
- Thomas Ballinger
- Thomas Kluyver
- Thomas Robitaille
- Thomas Spura
- Tobias Oberstein
- Torsten Bittner
- unknown
- v923z
- vaibhavsagar
- W. Trevor King
- weichm
- Xiuming Chen
- Yaroslav Halchenko
- zah

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2.12 Migrating Widgets to IPython 3

2.12.1 Upgrading Notebooks

1. The first thing you'll notice when upgrading an IPython 2.0 widget notebook to IPython 3.0 is the "Notebook converted" dialog. Click "ok".
2. All of the widgets distributed with IPython have been renamed. The "Widget" suffix was removed from the end of the class name. i.e. `ButtonWidget` is now `Button`.
3. `ContainerWidget` was renamed to `Box`.
4. `PopupWidget` was removed from IPython, because bootstrapjs was problematic (creates global variables, etc.). If you use the `PopupWidget`, try using a `Box` widget instead. If your notebook can't live without the popup functionality, subclass the `Box` widget (both in Python and JS) and use JQuery UI's `draggable()` and `resizable()` methods to mimic the behavior.
5. `add_class` and `remove_class` were removed. More often than not a new attribute exists on the widget that allows you to achieve the same explicitly. i.e. the `Button` widget now has a `button_style` attribute which you can set to 'primary', 'success', 'info', 'warning', 'danger', or '' instead of using `add_class` to add the bootstrap class. `VBox` and `HBox` classes (flexible `Box` subclasses) were added that allow you to avoid using `add_class` and `remove_class` to make flexible box model layouts. As a last resort, if you can't find a built in attribute for the class you want to use, a new `_dom_classes` list trait was added, which combines `add_class` and `remove_class` into one stateful list.
6. `set_css` and `get_css` were removed in favor of explicit style attributes - `visible`, `width`, `height`, `padding`, `margin`, `color`, `background_color`, `border_color`, `border_width`, `border_radius`, `border_style`, `font_style`, `font_weight`, `font_size`, and `font_family` are a few. If you can't find a trait to see the css attribute you need, you can, in order of preference, (A) subclass to create your own custom widget, (B) use CSS and the `_dom_classes` trait to set `_dom_classes`, or (C) use the `_css` dictionary to set CSS styling like `set_css` and `get_css`.
7. For selection widgets, such as `Dropdown`, the `values` argument has been renamed to `options`.

2.12.2 Upgrading Custom Widgets

Javascript

1. If you are distributing your widget and decide to use the deferred loading technique (preferred), you can remove all references to the WidgetManager and the register model/view calls (see the Python section below for more information).
2. In 2.0 require.js was used incorrectly, that has been fixed and now loading works more like Python's import. Requiring `widgets/js/widget` doesn't import the `WidgetManager` class, instead it imports a dictionary that exposes the classes within that module:

```
{
'WidgetModel': WidgetModel,
'WidgetView': WidgetView,
'DOMWidgetView': DOMWidgetView,
'ViewList': ViewList,
}
```

If you decide to continue to use the widget registry (by registering your widgets with the manager), you can import a dictionary with a handle to the WidgetManager class by requiring `widgets/js/manager`. Doing so will import:

```
{'WidgetManager': WidgetManager}
```

3. Don't rely on the `IPython` namespace for anything. To inherit from the DOMWidgetView, WidgetView, or WidgetModel, require `widgets/js/widget` as `widget`. If you were inheriting from DOMWidgetView, and the code looked like this:

```
IPython.DOMWidgetView.extend({...})
```

It would become this:

```
widget.DOMWidgetView.extend({...})
```

4. Custom models are encouraged. When possible, it's recommended to move your code into a custom model, so actions are performed 1 time, instead of N times where N is the number of displayed views.

Python

Generally, custom widget Python code can remain unchanged. If you distribute your custom widget, you may be using `display` and `Javascript` to publish the widget's Javascript to the front-end. That is no longer the recommended way of distributing widget Javascript. Instead have the user install the Javascript to his/her nbextension directory or their profile's static directory. Then use the new `_view_module` and `_model_module` traitlets in combination with `_view_name` and `_model_name` to instruct require.js on how to load the widget's Javascript. The Javascript is then loaded when the widget is used for the first time.

2.12.3 Details

Asynchronous

In the IPython 2.x series the only way to register custom widget views and models was to use the registry in the widget manager. Unfortunately, using this method made distributing and running custom widgets difficult. The widget maintainer had to either use the rich display framework to push the widget's Javascript to the notebook or instruct the users to install the Javascript by hand in a custom profile. With the first method, the maintainer would have to be careful about when the Javascript was pushed to the front-end. If the Javascript was pushed on Python widget `import`, the widgets wouldn't work after page refresh. This is because refreshing the page does not restart the kernel, and the Python `import` statement only runs once in a given kernel instance (unless you reload the Python modules, which isn't straight forward). This meant the maintainer would have to have a separate `push_js()` method that the user would have to call after importing the widget's Python code.

Our solution was to add support for loading widget views and models using require.js paths. Thus the comm and widget frameworks now support lazy loading. To do so, everything had to be converted to asynchronous code. HTML5 promises are used to accomplish that (#6818, #6914).

Symmetry

In IPython 3.0, widgets can be instantiated from the front-end (#6664). On top of this, a widget persistence API was added (#7163, #7227). With the widget persistence API, you can persist your widget instances using Javascript. This makes it easy to persist your widgets to your notebook document (with a small amount of custom JS). By default, the widgets are persisted to your web browsers local storage which makes them reappear when your refresh the page.

Smaller Changes

- Latex math is supported in widget `descriptions` (#5937).
- Widgets can be display more than once within a single container widget (#5963, #6990).
- `FloatRangeSlider` and `IntRangeSlider` were added (#6050).
- "Widget" was removed from the ends of all of the widget class names (#6125).
- `ContainerWidget` was renamed to `Box` (#6125).
- `HBox` and `VBox` widgets were added (#6125).
- `add\_class` and `remove\_class` were removed in favor of a `_dom_classes` list (#6235).
- `get\_css` and `set\_css` were removed in favor of explicit traits for widget styling (#6235).
- `jslink` and `jsdlink` were added (#6454, #7468).
- An `Output` widget was added, which allows you to `print` and `display` within widgets (#6670).
- `PopupWidget` was removed (#7341).
- A visual cue was added for widgets with 'dead' comms (#7227).
- A `SelectMultiple` widget was added (a `Select` widget that allows multiple things to be selected at once) (#6890).
- A class was added to help manage children views (#6990).
- A warning was added that shows on widget import because it's expected that the API will change again by IPython 4.0. This warning can be suppressed (#7107, #7200, #7201, #7204).

2.12.4 Comm and Widget PR Index

Here is a chronological list of PRs affecting the widget and comm frameworks for IPython 3.0. Note that later PRs may revert changes made in earlier PRs:

- Add placeholder attribute to text widgets #5652
- Add latex support in widget labels, #5937
- Allow widgets to display more than once within container widgets. #5963
- use require.js, #5980
- Range widgets #6050
- Interact on_demand option #6051
- Allow text input on slider widgets #6106
- support binary buffers in comm messages #6110
- Embrace the flexible box model in the widgets #6125

- Widget trait serialization #6128
- Make Container widgets take children as the first positional argument #6153
- once-displayed #6168
- Validate slider value, when limits change #6171
- Unregistering comms in Comm Manager #6216
- Add EventfulList and EventfulDict trait types. #6228
- Remove add/remove_class and set/get_css. #6235
- avoid unregistering widget model twice #6250
- Widget property lock should compare json states, not python states #6332
- Strip the IPY_MODEL_ prefix from widget IDs before referencing them. #6377
- "event" is not defined error in Firefox #6437
- Javascript link #6454
- Bulk update of widget attributes #6463
- Creating a widget registry on the Python side. #6493
- Allow widget views to be loaded from require modules #6494
- Fix Issue #6530 #6532
- Make comm manager (mostly) independent of InteractiveShell #6540
- Add semantic classes to top-level containers for single widgets #6609
- Selection Widgets: forcing 'value' to be in 'values' #6617
- Allow widgets to be constructed from Javascript #6664
- Output widget #6670
- Minor change in widgets.less to fix alignment issue #6681
- Make Selection widgets respect values order. #6747
- Widget persistence API #6789
- Add promises to the widget framework. #6818
- SelectMultiple widget #6890
- Tooltip on toggle button #6923
- Allow empty text box *while typing* for numeric widgets #6943
- Ignore failure of widget MathJax typesetting #6948
- Refactor the do_diff and manual child view lists into a separate ViewList object #6990
- Add warning to widget namespace import. #7107
- lazy load widgets #7120
- Fix padding of widgets. #7139
- Persist widgets across page refresh #7163
- Make the widget experimental error a real python warning #7200
- Make the widget error message shorter and more understandable. #7201

- Make the widget warning brief and easy to filter #7204
- Add visual cue for widgets with dead comms #7227
- Widget values as positional arguments #7260
- Remove the popup widget #7341
- document and validate link, dlink #7468
- Document interact 5637 #7525
- Update some broken examples of using widgets #7547
- Use Output widget with Interact #7554
- don't send empty execute_result messages #7560
- Validation on the python side #7602
- only show prompt overlay if there's a prompt #7661
- Allow predictate to be used for comparison in selection widgets #7674
- Fix widget view persistence. #7680
- Revert "Use Output widget with Interact" #7703

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2.13 2.x Series

2.13.1 Release 2.4

January, 2014

Note: Some of the patches marked for 2.4 were left out of 2.4.0. Please use 2.4.1.

- backport read support for nbformat v4 from IPython 3
- support for PyQt5 in the kernel (not QtConsole)
- support for Pygments 2.0

For more information on what fixes have been backported to 2.4, see our *detailed release info*.

2.13.2 Release 2.3.1

November, 2014

- Fix CRCRLF line-ending bug in notebooks on Windows

For more information on what fixes have been backported to 2.3.1, see our *detailed release info*.

2.13.3 Release 2.3.0

October, 2014

- improve qt5 support
- prevent notebook data loss with atomic writes

For more information on what fixes have been backported to 2.3, see our *detailed release info*.

2.13.4 Release 2.2.0

August, 2014

- Add CORS configuration

For more information on what fixes have been backported to 2.2, see our *detailed release info*.

2.13.5 Release 2.1.0

May, 2014

IPython 2.1 is the first bugfix release for 2.0. For more information on what fixes have been backported to 2.1, see our *detailed release info*.

2.13.6 Release 2.0.0

April, 2014

IPython 2.0 requires Python 2.7.2 or 3.3.0. It does not support Python 3.0, 3.1, 3.2, 2.5, or 2.6.

The principal milestones of 2.0 are:

- interactive widgets for the notebook
- directory navigation in the notebook dashboard
- persistent URLs for notebooks
- a new modal user interface in the notebook
- a security model for notebooks

Contribution summary since IPython 1.0 in August, 2013:

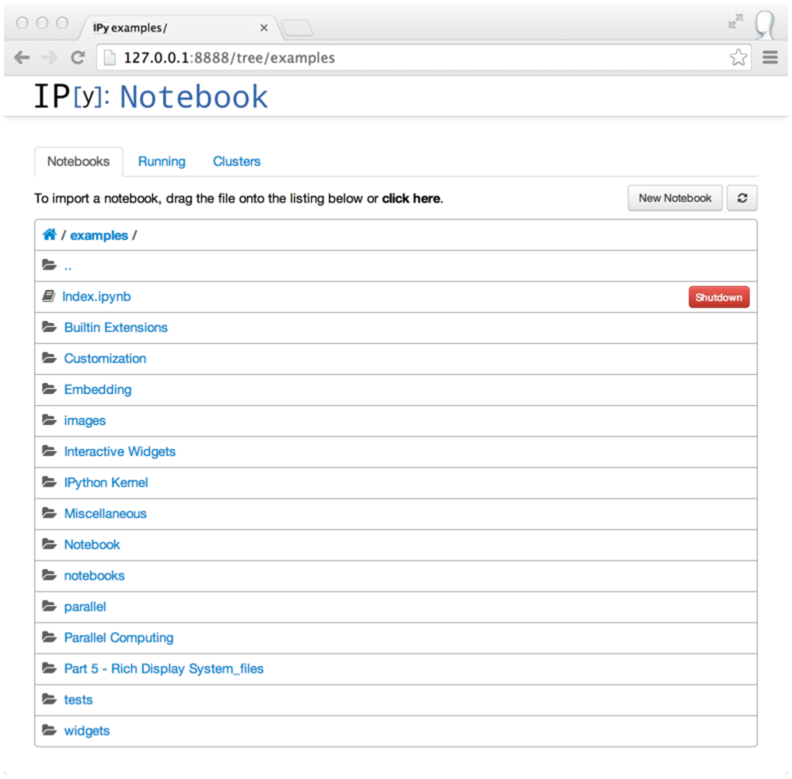
- ~8 months of work
- ~650 pull requests merged
- ~400 issues closed (non-pull requests)
- contributions from ~100 authors

- ~4000 commits

The amount of work included in this release is so large that we can only cover here the main highlights; please see our *detailed release statistics* for links to every issue and pull request closed on GitHub as well as a full list of individual contributors.

New stuff in the IPython notebook

Directory navigation



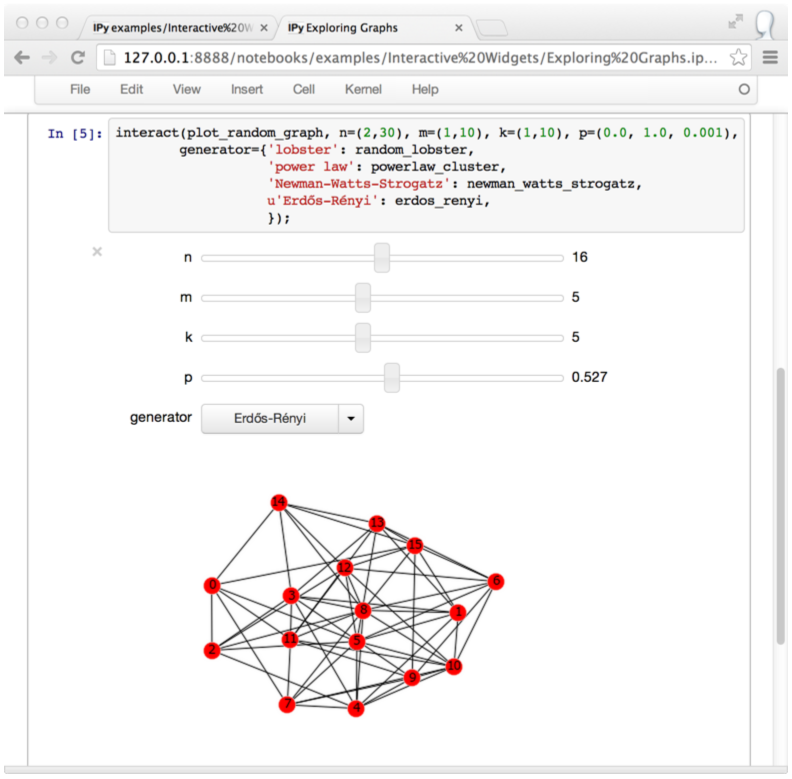
To import a notebook, drag the file onto the listing below or **click here**.

/ examples /
..
Index.ipynb
Builtin Extensions
Customization
Embedding
images
Interactive Widgets
IPython Kernel
Miscellaneous
Notebook
notebooks
parallel
Parallel Computing
Part 5 - Rich Display System_files
tests
widgets

The IPython notebook dashboard allows navigation into subdirectories. URLs are persistent based on the notebook's path and name, so no more random UUID URLs.

Serving local files no longer needs the `files/` prefix. Relative links across notebooks and other files should work just as if notebooks were regular HTML files.

Interactive widgets


IPy examples/Interactive%20W
IPy Exploring Graphs
127.0.0.1:8888/notebooks/examples/Interactive%20Widgets/Exploring%20Graphs.ip...
File
Edit
View
Insert
Cell
Kernel
Help
n
16
m
5
k
5
p
0.527
generator
Erdős-Rényi

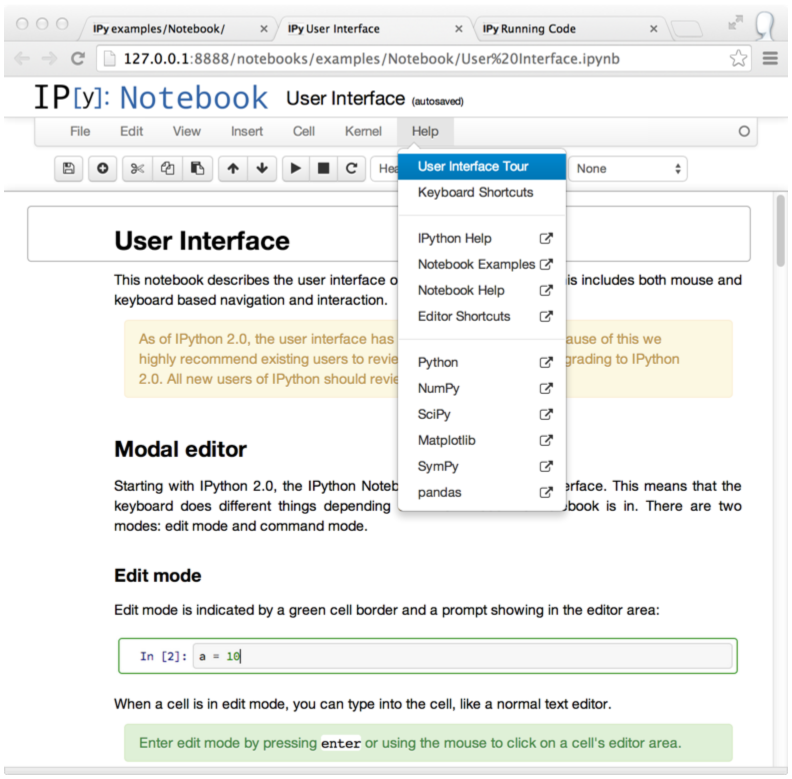
```
In [5]: interact(plot_random_graph, n=(2,30), m=(1,10), k=(1,10), p=(0.0, 1.0, 0.001),
                 generator={'lobster': random_lobster,
                            'power law': powerlaw_cluster,
                            'Newman-Watts-Strogatz': newman_watts_strogatz,
                            u'Erdős-Rényi': erdos_renyi,
                            });
```

IPython 2.0 adds `IPython.html.widgets`, for manipulating Python objects in the kernel with GUI controls in the notebook. IPython comes with a few built-in widgets for simple data types, and an API designed for developers to build more complex widgets. See the widget docs for more information.

Modal user interface

The notebook has added separate Edit and Command modes, allowing easier keyboard commands and making keyboard shortcut customization possible. See the new User Interface notebook for more information.

You can familiarize yourself with the updated notebook user interface, including an explanation of Edit and Command modes, by going through the short guided tour which can be started from the Help menu.



User Interface

This notebook describes the user interface o is includes both mouse and keyboard based navigation and interaction.

As of IPython 2.0, the user interface has ause of this we highly recommend existing users to revie grading to IPython 2.0. All new users of IPython should revie

Modal editor

Starting with IPython 2.0, the IPython Noteb erface. This means that the keyboard does different things depending book is in. There are two modes: edit mode and command mode.

Edit mode

Edit mode is indicated by a green cell border and a prompt showing in the editor area:

```
In [2]: a = 10
```

When a cell is in edit mode, you can type into the cell, like a normal text editor.

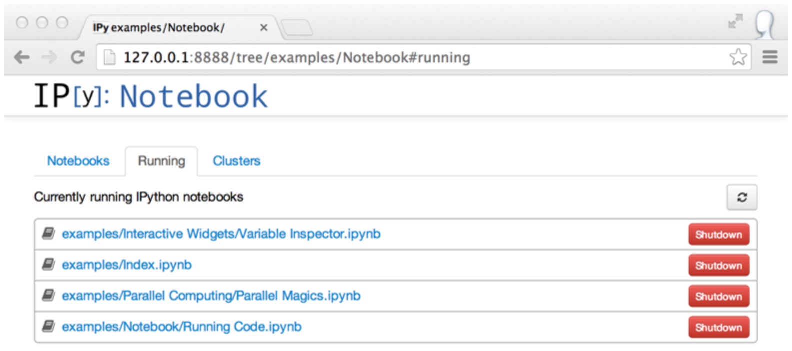
Enter edit mode by pressing `enter` or using the mouse to click on a cell's editor area.

Security

2.0 introduces a security model for notebooks, to prevent untrusted code from executing on users' behalf when notebooks open. A quick summary of the model:

- Trust is determined by signing notebooks.
- Untrusted HTML output is sanitized.
- Untrusted Javascript is never executed.
- HTML and Javascript in Markdown are never trusted.

Dashboard "Running" tab



Currently running IPython notebooks

examples/Interactive Widgets/Variable Inspector.ipynb
examples/Index.ipynb
examples/Parallel Computing/Parallel Magics.ipynb
examples/Notebook/Running Code.ipynb

The dashboard now has a "Running" tab which shows all of the running notebooks.

Single codebase Python 3 support

IPython previously supported Python 3 by running 2to3 during setup. We have now switched to a single codebase which runs natively on Python 2.7 and 3.3.

For notes on how to maintain this, see /development/pycompat.

Selecting matplotlib figure formats

Deprecate single-format `InlineBackend.figure_format` configurable in favor of `InlineBackend.figure_formats`, which is a set, supporting multiple simultaneous figure formats (e.g. png, pdf).

This is available at runtime with the new API function *`IPython.display.set_matplotlib_formats()`*.

clear_output changes

- There is no longer a 500ms delay when calling `clear_output`.
- The ability to clear stderr and stdout individually was removed.
- A new `wait` flag that prevents `clear_output` from being executed until new output is available. This eliminates animation flickering by allowing the user to double buffer the output.
- The output div height is remembered when the `wait=True` flag is used.

Extending configurable containers

Some configurable traits are containers (list, dict, set) Config objects now support calling `extend`, `update`, `insert`, etc. on traits in config files, which will ultimately result in calling those methods on the original object.

The effect being that you can now add to containers without having to copy/paste the initial value:

```
c = get_config()
c.InlineBackend.rc.update({ 'figure.figsize' : (6, 4) })
```

Changes to hidden namespace on startup

Previously, all names declared in code run at startup (startup files, `ipython -i script.py`, etc.) were added to the hidden namespace, which hides the names from tools like `%whos`. There are two changes to this behavior:

1. Scripts run on the command-line `ipython -i script.py``now behave the same as if they were passed to ``%run`, so their variables are never hidden.
2. A boolean config flag `InteractiveShellApp.hide_initial_ns` has been added to optionally disable the hidden behavior altogether. The default behavior is unchanged.

Using dill to expand serialization support

The new function `use_dill()` allows dill to extend serialization support in `IPython.parallel` (closures, etc.). A `DirectView.use_dill()` convenience method was also added, to enable dill locally and on all engines with one call.

New IPython console lexer

The IPython console lexer has been rewritten and now supports tracebacks and customized input/output prompts. See the *new lexer docs* for details.

DisplayFormatter changes

There was no official way to query or remove callbacks in the Formatter API. To remedy this, the following methods are added to `BaseFormatter`:

- `lookup(instance)` - return appropriate callback or a given object
- `lookup_by_type(type_or_str)` - return appropriate callback for a given type or `'mod.name'` type string
- `pop(type_or_str)` - remove a type (by type or string). Pass a second argument to avoid KeyError (like dict).

All of the above methods raise a KeyError if no match is found.

And the following methods are changed:

- `for_type(type_or_str)` - behaves the same as before, only adding support for `'mod.name'` type strings in addition to plain types. This removes the need for `for_type_by_name()`, but it remains for backward compatibility.

Formatters can now raise NotImplementedError in addition to returning None to indicate that they cannot format a given object.

Exceptions and Warnings

Exceptions are no longer silenced when formatters fail. Instead, these are turned into a *`FormatterWarning`*. A FormatterWarning will also be issued if a formatter returns data of an invalid type (e.g. an integer for 'image/png').

Other changes

- `%%capture` cell magic now captures the rich display output, not just stdout/stderr
- In notebook, Showing tooltip on tab has been disables to avoid conflict with completion, Shift-Tab could still be used to invoke tooltip when inside function signature and/or on selection.
- `object_info_request` has been replaced by `object_info` for consistency in the javascript API. `object_info` is a simpler interface to register callback that is incompatible with `object_info_request`.
- Previous versions of IPython on Linux would use the XDG config directory, creating `~/.config/ipython` by default. We have decided to go back to `~/.ipython` for consistency among systems. IPython will issue a warning if it finds the XDG location, and will move it to the new location if there isn't already a directory there.
- Equations, images and tables are now centered in Markdown cells.
- Multiline equations are now centered in output areas; single line equations remain left justified.
- IPython config objects can be loaded from and serialized to JSON. JSON config file have the same base name as their `.py` counterpart, and will be loaded with higher priority if found.
- bash completion updated with support for all ipython subcommands and flags, including nbconvert
- `ipython history trim`: added `--keep=<N>` as an alias for the more verbose `--HistoryTrim.keep=<N>`

- New `ipython history clear` subcommand, which is the same as the newly supported `ipython history trim --keep=0`
- You can now run notebooks in an interactive session via `%run notebook.ipynb`.
- Print preview is back in the notebook menus, along with options to download the open notebook in various formats. This is powered by nbconvert.
- `PandocMissing` exceptions will be raised if Pandoc is unavailable, and warnings will be printed if the version found is too old. The recommended Pandoc version for use with nbconvert is 1.12.1.
- The InlineBackend.figure_format now supports JPEG output if PIL/Pillow is available.
- Input transformers (see *Custom input transformation*) may now raise `SyntaxError` if they determine that input is invalid. The input transformation machinery in IPython will handle displaying the exception to the user and resetting state.
- Calling `container.show()` on javascript display is deprecated and will trigger errors on future IPython notebook versions. `container` now show itself as soon as non-empty
- Added `InlineBackend.print_figure_kwargs` to allow passing keyword arguments to matplotlib's `Canvas.print_figure`. This can be used to change the value of `bbox_inches`, which is 'tight' by default, or set the quality of JPEG figures.
- A new callback system has been introduced. For details, see *IPython Events*.
- jQuery and require.js are loaded from CDNs in the default HTML template, so javascript is available in static HTML export (e.g. nbviewer).

Backwards incompatible changes

- Python 2.6 and 3.2 are no longer supported: the minimum required Python versions are now 2.7 and 3.3.
- The Transformer classes have been renamed to Preprocessor in nbconvert and their `call` methods have been renamed to `preprocess`.
- The `call` methods of nbconvert post-processsors have been renamed to `postprocess`.
- The module `IPython.core.fakemodule` has been removed.
- The alias system has been reimplemented to use magic functions. There should be little visible difference while automagics are enabled, as they are by default, but parts of the *`AliasManager`* API have been removed.
- We fixed an issue with switching between matplotlib inline and GUI backends, but the fix requires matplotlib 1.1 or newer. So from now on, we consider matplotlib 1.1 to be the minimally supported version for IPython. Older versions for the most part will work, but we make no guarantees about it.
- The **`pycolor`** command has been removed. We recommend the much more capable **`pygmentize`** command from the Pygments project. If you need to keep the exact output of **`pycolor`**, you can still use `python -m IPython.utils.PyColorize foo.py`.
- `IPython.lib.irunner` and its command-line entry point have been removed. It had fallen out of use long ago.
- The `input_prefilter` hook has been removed, as it was never actually used by the code. The input transformer system offers much more powerful APIs to work with input code. See *Custom input transformation* for details.
- *`IPython.core.inputsplitter.IPythonInputSplitter`* no longer has a method `source_raw_reset()`, but gains *`raw_reset()`* instead. Use of `source_raw_reset` can be replaced with:

```
raw = isp.source_raw
transformed = isp.source_reset()
```

- The Azure notebook manager was removed as it was no longer compatible with the notebook storage scheme.
- Simplifying configurable URLs
  - base_project_url is renamed to base_url (base_project_url is kept as a deprecated alias, for now)
  - base_kernel_url configurable is removed (use base_url)
  - websocket_url configurable is removed (use base_url)

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

2.14 Issues closed in the 2.x development cycle

2.14.1 Issues closed in 2.4.1

GitHub stats for 2014/11/01 - 2015/01/30

Note: IPython 2.4.0 was released without a few of the backports listed below. 2.4.1 has the correct patches intended for 2.4.0.

These lists are automatically generated, and may be incomplete or contain duplicates.

The following 7 authors contributed 35 commits.

- Benjamin Ragan-Kelley
- Carlos Cordoba
- Damon Allen
- Jessica B. Hamrick
- Mateusz Paprocki
- Peter Würtz
- Thomas Kluyver

We closed 10 issues and merged 6 pull requests; this is the full list (generated with the script `tools/github_stats.py`):

Pull Requests (10):

- PR #7106: Changed the display order of rich output in the live notebook.

- PR #6878: Update pygments monkeypatch for compatibility with Pygments 2.0
- PR #6778: backport nbformat v4 to 2.x
- PR #6761: object_info_reply field is oname, not name
- PR #6653: Fix IPython.utils.ansispan() to ignore stray [0m
- PR #6706: Correctly display prompt numbers that are `None`
- PR #6634: don't use contains in SelectWidget item_query
- PR #6593: note how to start the qtconsole
- PR #6281: more minor fixes to release scripts
- PR #5458: Add support for PyQt5.

Issues (6):

- #7272: qtconsole problems with pygments
- #7049: Cause TypeError: 'NoneType' object is not callable in qtconsole
- #6877: Qt console doesn't work with pygments 2.0rc1
- #6689: Problem with string containing two or more question marks
- #6702: Cell numbering after `ClearOutput` preprocessor
- #6633: selectwidget doesn't display 1 as a selection choice when passed in as a member of values list

2.14.2 Issues closed in 2.3.1

Just one bugfix: fixed bad CRCRLF line-endings in notebooks on Windows

Pull Requests (1):

- PR #6911: don't use text mode in mkstemp

Issues (1):

- #6599: Notebook.ipynb CR+LF turned into CR+CR+LF

2.14.3 Issues closed in 2.3.0

GitHub stats for 2014/08/06 - 2014/10/01

These lists are automatically generated, and may be incomplete or contain duplicates.

The following 6 authors contributed 31 commits.

- Benjamin Ragan-Kelley
- David Hirschfeld
- Eric Firing
- Jessica B. Hamrick
- Matthias Bussonnier
- Thomas Kluyver

We closed 16 issues and merged 9 pull requests; this is the full list (generated with the script `tools/github_stats.py`):

Pull Requests (16):

- PR #6587: support `%matplotlib qt5` and `%matplotlib nbagg`
- PR #6583: Windows symlink test fixes
- PR #6585: fixes #6473
- PR #6581: Properly mock winreg functions for test
- PR #6556: Use some more informative asserts in inprocess kernel tests
- PR #6514: Fix for copying metadata flags
- PR #6453: Copy file metadata in atomic save
- PR #6480: only compare host:port in Websocket.check_origin
- PR #6483: Trim anchor link in heading cells, fixes #6324
- PR #6410: Fix relative import in appnope
- PR #6395: update mathjax CDN url in nbconvert template
- PR #6269: Implement atomic save
- PR #6374: Rename `abort_queues` –> `_abort_queues`
- PR #6321: Use appnope in qt and wx gui support from the terminal; closes #6189
- PR #6318: use write_error instead of get_error_html
- PR #6303: Fix error message when failing to load a notebook

Issues (9):

- #6057: `%matplotlib` + qt5
- #6518: Test failure in atomic save on Windows
- #6473: Switching between "Raw Cell Format" and "Edit Metadata" does not work
- #6405: Creating a notebook should respect directory permissions; saving should respect prior permissions
- #6324: Anchors in Heading don't work.
- #6409: No module named '_dummy'
- #6392: Mathjax library link broken
- #6329: IPython Notebook Server URL now requires "tree" at the end of the URL? (version 2.2)
- #6189: ipython console freezes for increasing no of seconds in %pylab mode

2.14.4 Issues closed in 2.2.0

GitHub stats for 2014/05/21 - 2014/08/06 (tag: rel-2.1.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

The following 13 authors contributed 36 commits.

- Adam Hodgen
- Benjamin Ragan-Kelley

- Björn Grüning
- Dara Adib
- Eric Galloway
- Jonathan Frederic
- Kyle Kelley
- Matthias Bussonnier
- Paul Ivanov
- Shayne Hodge
- Steven Anton
- Thomas Kluyver
- Zahari

We closed 23 issues and merged 11 pull requests; this is the full list (generated with the script `tools/github_stats.py`):

Pull Requests (23):

- PR #6279: minor updates to release scripts
- PR #6273: Upgrade default mathjax version.
- PR #6249: always use HTTPS getting mathjax from CDN
- PR #6114: update hmac signature comparison
- PR #6195: Close handle on new temporary files before returning filename
- PR #6143: pin tornado to < 4 on travis js tests
- PR #6134: remove rackcdn https workaround for mathjax cdn
- PR #6120: Only allow iframe embedding on same origin.
- PR #6117: Remove / from route of TreeRedirectHandler.
- PR #6105: only set allow_origin_pat if defined
- PR #6102: Add newline if missing to end of script magic cell
- PR #6077: allow unicode keys in dicts in json_clean
- PR #6061: make CORS configurable
- PR #6081: don't modify dict keys while iterating through them
- PR #5803: unify visual line handling
- PR #6005: Changed right arrow key movement function to mirror left arrow key
- PR #6029: add pickleutil.PICKLE_PROTOCOL
- PR #6003: Set kernel_id before checking websocket
- PR #5994: Fix ssh tunnel for Python3
- PR #5973: Do not create checkpoint_dir relative to current dir
- PR #5933: fix qt_loader import hook signature
- PR #5944: Markdown rendering bug fix.

- PR #5917: use shutil.move instead of os.rename

Issues (11):

- #6246: Include MathJax by default or access the CDN over a secure connection
- #5525: Websocket origin check fails when used with Apache WS proxy
- #5901: 2 test failures in Python 3.4 in parallel group
- #5926: QT console: text selection cannot be made from left to right with keyboard
- #5998: use_dill does not work in Python 3.4
- #5964: Traceback on Qt console exit
- #5787: Error in Notebook-Generated latex (nbconvert)
- #5950: qtconsole truncates help
- #5943: 2.x: notebook fails to load when using HTML comments
- #5932: Qt ImportDenier Does Not Adhere to PEP302
- #5898: OSError when moving configuration file

2.14.5 Issues closed in 2.1.0

GitHub stats for 2014/04/02 - 2014/05/21 (since 2.0.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

The following 35 authors contributed 145 commits.

- Adrian Price-Whelan
- Aron Ahmadia
- Benjamin Ragan-Kelley
- Benjamin Schultz
- Björn Linse
- Blake Griffith
- chebee7i
- Damián Avila
- Dav Clark
- dexterdev
- Erik Tollerud
- Grzegorz Rożniecki
- Jakob Gager
- jdavidheiser
- Jessica B. Hamrick
- Jim Garrison
- Jonathan Frederic
- Matthias Bussonnier

- Maximilian Albert
- Mohan Raj Rajamanickam
- ncornette
- Nikolay Koldunov
- Nile Geisinger
- Pankaj Pandey
- Paul Ivanov
- Pierre Haessig
- Raffaele De Feo
- Renaud Richardet
- Spencer Nelson
- Steve Chan
- sunny
- Susan Tan
- Thomas Kluyver
- Yaroslav Halchenko
- zah

We closed a total of 129 issues, 92 pull requests and 37 regular issues; this is the full list (generated with the script `tools/github_stats.py --milestone 2.1`):

Pull Requests (92):

- PR #5871: specify encoding in msgpack.unpackb
- PR #5869: Catch more errors from clipboard access on Windows
- PR #5866: Make test robust against differences in line endings
- PR #5605: Two cell toolbar fixes.
- PR #5843: remove Firefox-specific CSS workaround
- PR #5845: Pass Windows interrupt event to kernels as an environment variable
- PR #5835: fix typo in v2 convert
- PR #5841: Fix writing history with output to a file in Python 2
- PR #5842: fix typo in nbconvert help
- PR #5846: Fix typos in Cython example
- PR #5839: Close graphics dev in finally clause
- PR #5837: pass on install docs
- PR #5832: Fixed example to work with python3
- PR #5826: allow notebook tour instantiation to fail
- PR #5560: Minor expansion of Cython example
- PR #5818: interpret any exception in getcallargs as not callable

- PR #5816: Add output to IPython directive when in verbatim mode.
- PR #5822: Don’t overwrite widget description in interact
- PR #5782: Silence exception thrown by completer when dir() does not return a list
- PR #5807: Drop log level to info for Qt console shutdown
- PR #5814: Remove -i options from mv, rm and cp aliases
- PR #5812: Fix application name when printing subcommand help.
- PR #5804: remove an inappropriate `!`
- PR #5805: fix engine startup files
- PR #5806: Don’t auto-move .config/ipython if symbolic link
- PR #5716: Add booktabs package to latex base.tplx
- PR #5669: allows threadsafe sys.stdout.flush from background threads
- PR #5668: allow async output on the most recent request
- PR #5768: fix cursor keys in long lines wrapped in markdown
- PR #5788: run cells with `silent=True` in `%run nb.ipynb`
- PR #5715: log all failed ajax API requests
- PR #5769: Don’t urlescape the text that goes into a title tag
- PR #5762: Fix check for pickling closures
- PR #5766: View.map with empty sequence should return empty list
- PR #5758: Applied bug fix: using fc and ec did not properly set the figure canvas . . .
- PR #5754: Format command name into subcommand_description at run time, not import
- PR #5744: Describe using PyPI/pip to distribute & install extensions
- PR #5712: monkeypatch inspect.findsource only when we use it
- PR #5708: create checkpoints dir in notebook subdirectories
- PR #5714: log error message when API requests fail
- PR #5732: Quick typo fix in nbformat/convert.py
- PR #5713: Fix a NameError in IPython.parallel
- PR #5704: Update nbconvertapp.py
- PR #5534: cleanup some `pre` css inheritance
- PR #5699: don’t use common names in require decorators
- PR #5692: Update notebook.rst fixing broken reference to notebook examples readme
- PR #5693: Update parallel_intro.rst to fix a broken link to examples
- PR #5486: disambiguate to location when no IPs can be determined
- PR #5574: Remove the outdated keyboard shortcuts from notebook docs
- PR #5568: Use `__qualname__` in pretty reprs for Python 3
- PR #5678: Fix copy & paste error in docstring of ImageWidget class
- PR #5677: Fix %bookmark -l for Python 3

- PR #5670: nbconvert: Fix CWD imports
- PR #5647: Mention git hooks in install documentation
- PR #5671: Fix blank slides issue in Reveal slideshow pdf export
- PR #5657: use 'localhost' as default for the notebook server
- PR #5584: more semantic icons
- PR #5594: update components with marked-0.3.2
- PR #5500: check for Python 3.2
- PR #5582: reset readline after running PYTHONSTARTUP
- PR #5630: Fixed Issue #4012 Added Help menubar link to Github markdown doc
- PR #5613: Fixing bug #5607
- PR #5633: Provide more help if lessc is not found.
- PR #5620: fixed a typo in IPython.core.formatters
- PR #5619: Fix typo in storemagic module docstring
- PR #5592: add missing `browser` to notebook_aliases list
- PR #5506: Fix ipconfig regex pattern
- PR #5581: Fix rmagic for cells ending in comment.
- PR #5576: only process cr if it's found
- PR #5478: Add git-hooks install script. Update README.md
- PR #5546: do not shutdown notebook if 'n' is part of answer
- PR #5527: Don't remove upload items from nav tree unless explicitly requested.
- PR #5501: remove inappropriate wheel tag override
- PR #5548: FileNotebookManager: Use shutil.move() instead of os.rename()
- PR #5524: never use `for (var i in array)`
- PR #5459: Fix interact animation page jump FF
- PR #5559: Minor typo fix in "Cython Magics.ipynb"
- PR #5507: Fix typo in interactive widgets examples index notebook
- PR #5554: Make HasTraits pickleable
- PR #5535: fix n^2 performance issue in coalesce_streams preprocessor
- PR #5522: fix iteration over Client
- PR #5488: Added missing require and jquery from cdn.
- PR #5516: ENH: list generated config files in generated, and rm them upon clean
- PR #5493: made a minor fix to one of the widget examples
- PR #5512: Update tooltips to refer to shift-tab
- PR #5505: Make backport_pr work on Python 3
- PR #5503: check explicitly for 'dev' before adding the note to docs
- PR #5498: use milestones to indicate backport

- PR #5492: Polish whatsnew docs
- PR #5495: Fix various broken things in docs
- PR #5496: Exclude whatsnew/pr directory from docs builds
- PR #5489: Fix required Python versions

Issues (37):

- #5364: Horizontal scrollbar hides cell's last line on Firefox
- #5192: horisontal scrollbar overlaps output or touches next cell
- #5840: Third-party Windows kernels don't get interrupt signal
- #2412: print history to file using qtconsole and notebook
- #5703: Notebook doesn't render with "ask me every time" cookie setting in Firefox
- #5817: calling mock object in IPython 2.0.0 under Python 3.4.0 raises AttributeError
- #5499: Error running widgets nbconvert example
- #5654: Broken links from ipython documentation
- #5019: print in QT event callback doesn't show up in ipython notebook.
- #5800: Only last In prompt number set ?
- #5801: startup_command specified in ipengine_config.py is not executed
- #5690: ipython 2.0.0 and pandoc 1.12.2.1 problem
- #5408: Add checking/flushing of background output from kernel in mainloop
- #5407: clearing message handlers on status=idle loses async output
- #5467: Incorrect behavior of up/down keyboard arrows in code cells on wrapped lines
- #3085: nicer notebook error message when lacking permissions
- #5765: map_sync over empty list raises IndexError
- #5553: Notebook matplotlib inline backend: can't set figure facecolor
- #5710: inspect.findsource monkeypatch raises wrong exception for C extensions
- #5706: Multi-Directory notebooks overwrite each other's checkpoints
- #5698: can't require a function named `f`
- #5569: Keyboard shortcuts in documentation are out of date
- #5566: Function name printing should use `__qualname__` instead of `__name__` (Python 3)
- #5676: "bookmark -l" not working in ipython 2.0
- #5555: Differentiate more clearly between Notebooks and Folders in new UI
- #5590: Marked double escape
- #5514: import tab-complete fail with ipython 2.0 shell
- #4012: Notebook: link to markdown formatting reference
- #5611: Typo in 'storemagic' documentation
- #5589: Kernel start fails when using –browser argument
- #5491: Bug in Windows ipconfig ip address regular expression

- #5579: rmagic extension throws 'Error while parsing the string.' when last line is comment
- #5518: Ipython2 will not open ipynb in example directory
- #5561: New widget documentation has missing notebook link
- #5128: Page jumping when output from widget interaction replaced
- #5519: IPython.parallel.Client behavior as iterator
- #5510: Tab-completion for function argument list

2.14.6 Issues closed in 2.0.0

GitHub stats for 2013/08/09 - 2014/04/01 (since 1.0.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

The following 94 authors contributed 3949 commits.

- Aaron Meurer
- Abhinav Upadhyay
- Adam Riggall
- Alex Rudy
- Andrew Mark
- Angus Griffith
- Antony Lee
- Aron Ahmadia
- Arun Persaud
- Benjamin Ragan-Kelley
- Bing Xia
- Blake Griffith
- Bouke van der Bijl
- Bradley M. Froehle
- Brian E. Granger
- Carlos Cordoba
- chapmanb
- chebee7i
- Christoph Gohlke
- Christophe Pradal
- Cyrille Rossant
- Damián Avila
- Daniel B. Vasquez
- Dav Clark
- David Hirschfeld

- David P. Sanders
- David Wyde
- David Österberg
- Doug Blank
- Dražen Lučanin
- epifanio
- Fernando Perez
- Gabriel Becker
- Geert Barentsen
- Hans Meine
- Ingolf Becker
- Jake Vanderplas
- Jakob Gager
- James Porter
- Jason Grout
- Jeffrey Tratner
- Jonah Graham
- Jonathan Frederic
- Joris Van den Bossche
- Juergen Hasch
- Julian Taylor
- Katie Silverio
- Kevin Burke
- Kieran O'Mahony
- Konrad Hinsen
- Kyle Kelley
- Lawrence Fu
- Marc Molla
- Martín Gaitán
- Matt Henderson
- Matthew Brett
- Matthias Bussonnier
- Michael Droettboom
- Mike McKerns
- Nathan Goldbaum
- Pablo de Oliveira

- Pankaj Pandey
- Pascal Schetelat
- Paul Ivanov
- Paul Moore
- Pere Vilas
- Peter Davis
- Philippe Mallet-Ladeira
- Preston Holmes
- Puneeth Chaganti
- Richard Everson
- Roberto Bonvallet
- Samuel Ainsworth
- Sean Vig
- Shashi Gowda
- Skipper Seabold
- Stephan Rave
- Steve Fox
- Steven Silvester
- stonebig
- Susan Tan
- Sylvain Corlay
- Takeshi Kanmae
- Ted Drain
- Thomas A Caswell
- Thomas Kluyver
- Théophile Studer
- Volker Braun
- Wieland Hoffmann
- Yaroslav Halchenko
- Yoval P.
- Yung Siang Liau
- Zachary Sailer
- zah

We closed a total of 1121 issues, 687 pull requests and 434 regular issues; this is the full list (generated with the script `tools/github_stats.py`):

Pull Requests (687):

- PR #5487: remove weird unicode space in the new copyright header
- PR #5476: For 2.0: Fix links in Notebook Help Menu
- PR #5337: Examples reorganization
- PR #5436: CodeMirror shortcuts in QuickHelp
- PR #5444: Fix numeric verification for Int and Float text widgets.
- PR #5449: Stretch keyboard shortcut dialog
- PR #5473: Minor corrections of git-hooks setup instructions
- PR #5471: Add coding magic comment to nbconvert Python template
- PR #5452: print_figure returns unicode for svg
- PR #5450: proposal: remove codename
- PR #5462: DOC : fixed minor error in using topological sort
- PR #5463: make spin_thread tests more forgiving of slow VMs
- PR #5464: Fix starting notebook server with file/directory at command line.
- PR #5453: remove gitwash
- PR #5454: Improve history API docs
- PR #5431: update github_stats and gh_api for 2.0
- PR #5290: Add dual mode JS tests
- PR #5451: check that a handler is actually registered in ShortcutManager.handles
- PR #5447: Add %%python2 cell magic
- PR #5439: Point to the stable SymPy docs, not the dev docs
- PR #5437: Install jquery-ui images
- PR #5434: fix check for empty cells in rst template
- PR #5432: update links in notebook help menu
- PR #5435: Update whatsnew (notebook tour)
- PR #5433: Document extraction of octave and R magics
- PR #5428: Update COPYING.txt
- PR #5426: Separate get_session_info between HistoryAccessor and HistoryManager
- PR #5419: move prompts from margin to main column on small screens
- PR #5430: Make sure `element` is correct in the context of displayed JS
- PR #5396: prevent saving of partially loaded notebooks
- PR #5429: Fix tooltip pager feature
- PR #5330: Updates to shell reference doc
- PR #5404: Fix broken accordion widget
- PR #5339: Don't use fork to start the notebook in js tests
- PR #5320: Fix for Tooltip & completer click focus bug.
- PR #5421: Move configuration of Python test controllers into setup()

- PR #5418: fix typo in ssh launcher send_file
- PR #5403: remove alt– shortcut
- PR #5389: better log message in deprecated files/ redirect
- PR #5333: Fix filenbmanager.list_dirs fails for Windows user profile directory
- PR #5390: finish PR #5333
- PR #5326: Some gardening on iptest result reporting
- PR #5375: remove unnecessary onload hack from mathjax macro
- PR #5368: Flexbox classes specificity fixes
- PR #5331: fix raw_input CSS
- PR #5395: urlencode images for rst files
- PR #5049: update quickhelp on adding and removing shortcuts
- PR #5391: Fix Gecko (Netscape) keyboard handling
- PR #5387: Respect 'r' characters in nbconvert.
- PR #5399: Revert PR #5388
- PR #5388: Suppress output even when a comment follows ;. Fixes #4525.
- PR #5394: nbconvert doc update
- PR #5359: do not install less sources
- PR #5346: give hint on where to find custom.js
- PR #5357: catch exception in copystat
- PR #5380: Remove DefineShortVerb... line from latex base template
- PR #5376: elide long containers in pretty
- PR #5310: remove raw cell placeholder on focus, closes #5238
- PR #5332: semantic names for indicator icons
- PR #5386: Fix import of socketserver on Python 3
- PR #5360: remove some redundant font-family: monospace
- PR #5379: don't instantiate Application just for default logger
- PR #5372: Don't autoclose strings
- PR #5296: unify keyboard shortcut and codemirror interaction
- PR #5349: Make Hub.registration_timeout configurable
- PR #5340: install bootstrap-tour css
- PR #5335: Update docstring for deepreload module
- PR #5321: Improve assignment regex to match more tuple unpacking syntax
- PR #5325: add NotebookNotary to NotebookApp's class list
- PR #5313: avoid loading preprocessors twice
- PR #5308: fix HTML capitalization in Highlight2HTML
- PR #5295: OutputArea.append_type functions are not prototype methods

- PR #5318: Fix local import of select_figure_formats
- PR #5300: Fix NameError: name '_rl' is not defined
- PR #5292: focus next cell on shift+enter
- PR #5291: debug occasional error in test_queue_status
- PR #5289: Finishing up #5274 (widget paths fixes)
- PR #5232: Make nbconvert html full output like notebook's html.
- PR #5288: Correct initial state of kernel status indicator
- PR #5253: display any output from this session in terminal console
- PR #4802: Tour of the notebook UI (was UI elements inline with highlighting)
- PR #5285: Update signature presentation in pinfo classes
- PR #5268: Refactoring Notebook.command_mode
- PR #5226: Don't run PYTHONSTARTUP file if a file or code is passed
- PR #5283: Remove Widget.closed attribute
- PR #5279: nbconvert: Make sure node is atleast version 0.9.12
- PR #5281: fix a typo introduced by a rebased PR
- PR #5280: append Firefox overflow-x fix
- PR #5277: check that PIL can save JPEG to BytesIO
- PR #5044: Store timestamps for modules to autoreload
- PR #5278: Update whatsnew doc from pr files
- PR #5276: Fix kernel restart in case connection file is deleted.
- PR #5272: allow highlighting language to be set from notebook metadata
- PR #5158: log refusal to serve hidden directories
- PR #5188: New events system
- PR #5265: Missing class def for TimeoutError
- PR #5267: normalize unicode in notebook API tests
- PR #5076: Refactor keyboard handling
- PR #5241: Add some tests for utils
- PR #5261: Don't allow edit mode up arrow to continue past index == 0
- PR #5223: use on-load event to trigger resizable images
- PR #5252: make one strptime call at import of jsonutil
- PR #5153: Dashboard sorting
- PR #5169: Allow custom header
- PR #5242: clear _reply_content cache before using it
- PR #5194: require latex titles to be ascii
- PR #5244: try to avoid EADDRINUSE errors on travis
- PR #5245: support extracted output in HTML template

- PR #5209: make input_area css generic to cells
- PR #5246: less %pylab, more cowbell!
- PR #4895: Improvements to %run completions
- PR #5243: Add Javscript to base display priority list.
- PR #5175: Audit .html() calls take #2
- PR #5146: Dual mode bug fixes.
- PR #5207: Children fire event
- PR #5215: Dashboard "Running" Tab
- PR #5240: Remove unused IPython.nbconvert.utils.console module
- PR #5239: Fix exclusion of tests directories from coverage reports
- PR #5203: capture some logging/warning output in some tests
- PR #5216: fixup positional arg handling in notebook app
- PR #5229: get _ipython_display_ method safely
- PR #5234: DOC : modified docs is HasTraits.traits and HasTraits.class_traits
- PR #5221: Change widget children List to Tuple.
- PR #5231: don't forget base_url when updating address bar in rename
- PR #5173: Moved widget files into static/widgets/*
- PR #5222: Unset PYTHONWARNINGS envvar before running subprocess tests.
- PR #5172: Prevent page breaks when printing notebooks via print-view.
- PR #4985: Add automatic Closebrackets function to Codemirror.
- PR #5220: Make traitlets notify check more robust against classes redefining equality and bool
- PR #5197: If there is an error comparing traitlet values when setting a trait, default to go ahead and notify of the new value.
- PR #5210: fix pyreadline import in rlineimpl
- PR #5212: Wrap nbconvert Markdown/Heading cells in live divs
- PR #5200: Allow to pass option to jinja env
- PR #5202: handle nodejs executable on debian
- PR #5112: band-aid for completion
- PR #5187: handle missing output metadata in nbconvert
- PR #5181: use gnureadline on OS X
- PR #5136: set default value from signature defaults in interact
- PR #5132: remove application/pdf->pdf transform in javascript
- PR #5116: reorganize who knows what about paths
- PR #5165: Don't introspect __call__ for simple callables
- PR #5170: Added msg_throttle sync=True widget traitlet
- PR #5191: Translate markdown link to rst

- PR #5037: FF Fix: alignment and scale of text widget
- PR #5179: remove websocket url
- PR #5110: add InlineBackend.print_figure_kwargs
- PR #5147: Some template URL changes
- PR #5100: remove base_kernel_url
- PR #5163: Simplify implementation of TemporaryWorkingDirectory.
- PR #5166: remove mktemp usage
- PR #5133: don't use combine option on ucs package
- PR #5089: Remove legacy azure nbmanager
- PR #5159: remove append_json reference
- PR #5095: handle image size metadata in nbconvert html
- PR #5156: fix IPython typo, closes #5155
- PR #5150: fix a link that was broken
- PR #5114: use non-breaking space for button with no description
- PR #4778: add APIs for installing notebook extensions
- PR #5125: Fix the display of functions with keyword-only arguments on Python 3.
- PR #5097: minor notebook logging changes
- PR #5047: only validate package_data when it might be used
- PR #5121: fix remove event in KeyboardManager.register_events
- PR #5119: Removed 'list' view from Variable Inspector example
- PR #4925: Notebook manager api fixes
- PR #4996: require print_method to be a bound method
- PR #5108: require specifying the version for gh-pages
- PR #5111: Minor typo in docstring of IPython.parallel DirectView
- PR #5098: mostly debugging changes for IPython.parallel
- PR #5087: trust cells with no output
- PR #5059: Fix incorrect `Patch` logic in widget code
- PR #5075: More flexible box model fixes
- PR #5091: Provide logging messages in ipcluster log when engine or controllers fail to start
- PR #5090: Print a warning when iptest is run from the IPython source directory
- PR #5077: flush replies when entering an eventloop
- PR #5055: Minimal changes to import IPython from IronPython
- PR #5078: Updating JS tests README.md
- PR #5083: don't create js test directories unless they are being used
- PR #5062: adjust some events in nb_roundtrip
- PR #5043: various unicode / url fixes

- PR #5066: remove (almost) all mentions of pylab from our examples
- PR #4977: ensure scp destination directories exist (with mkdir -p)
- PR #5053: Move&rename JS tests
- PR #5067: show traceback in widget handlers
- PR #4920: Adding PDFFormatter and kernel side handling of PDF display data
- PR #5048: Add edit/command mode indicator
- PR #5061: make execute button in menu bar match shift-enter
- PR #5052: Add q to toggle the pager.
- PR #5070: fix flex: auto
- PR #5065: Add example of using annotations in interact
- PR #5063: another pass on Interact example notebooks
- PR #5051: FF Fix: code cell missing hscroll (2)
- PR #4960: Interact/Interactive for widget
- PR #5045: Clear timeout in multi-press keyboard shortcuts.
- PR #5060: Change 'bind' to 'link'
- PR #5039: Expose kernel_info method on inprocess kernel client
- PR #5058: Fix iopubwatcher.py example script.
- PR #5035: FF Fix: code cell missing hscroll
- PR #5040: Polishing some docs
- PR #5001: Add directory navigation to dashboard
- PR #5042: Remove duplicated Channel ABC classes.
- PR #5036: FF Fix: ext link icon same line as link text in help menu
- PR #4975: setup.py changes for 2.0
- PR #4774: emit event on appended element on dom
- PR #5023: Widgets- add ability to pack and unpack arrays on JS side.
- PR #5003: Fix pretty reprs of super() objects
- PR #4974: make paste focus the pasted cell
- PR #5012: Make `SelectionWidget.values` a dict
- PR #5018: Prevent 'iptest IPython' from trying to run.
- PR #5025: citation2latex filter (using HTMLParser)
- PR #5027: pin lessc to 1.4
- PR #4952: Widget test inconsistencies
- PR #5014: Fix command mode & popup view bug
- PR #4842: more subtle kernel indicator
- PR #5017: Add notebook examples link to help menu.
- PR #5015: don't write cell.trusted to disk

- PR #5007: Update whatsnew doc from PR files
- PR #5010: Fixes for widget alignment in FF
- PR #4901: Add a convenience class to sync traitlet attributes
- PR #5008: updated explanation of 'pyin' messages
- PR #5004: Fix widget vslider spacing
- PR #4933: Small Widget inconsistency fixes
- PR #4979: add versioning notes to small message spec changes
- PR #4893: add font-awesome 3.2.1
- PR #4982: Live readout for slider widgets
- PR #4813: make help menu a template
- PR #4939: Embed qtconsole docs (continued)
- PR #4964: remove shift-= merge keyboard shortcut
- PR #4504: Allow input transformers to raise SyntaxError
- PR #4929: Fixing various modal/focus related bugs
- PR #4971: Fixing issues with js tests
- PR #4972: Work around problem in doctest discovery in Python 3.4 with PyQt
- PR #4937: pickle arrays with dtype=object
- PR #4934: `ipython profile create` respects `--ipython-dir`
- PR #4954: generate unicode filename
- PR #4845: Add Origin Checking.
- PR #4916: Fine tuning the behavior of the modal UI
- PR #4966: Ignore sys.argv for NotebookNotary in tests
- PR #4967: Fix typo in warning about web socket being closed
- PR #4965: Remove mention of iplogger from setup.py
- PR #4962: Fixed typos in quick-help text
- PR #4953: add utils.wait_for_idle in js tests
- PR #4870: ipython_directive, report except/warn in block and add :okexcept: :okwarning: options to suppress
- PR #4662: Menu cleanup
- PR #4824: sign notebooks
- PR #4943: Docs shotgun 4
- PR #4848: avoid import of nearby temporary with %edit
- PR #4950: Two fixes for file upload related bugs
- PR #4927: there shouldn't be a 'files/' prefix in FileLink[s]
- PR #4928: use importlib.machinery when available
- PR #4949: Remove the docscrape modules, which are part of numpydoc
- PR #4849: Various unicode fixes (mostly on Windows)

- PR #4932: always point py3compat.input to builtin_mod.input
- PR #4807: Correct handling of ansi colour codes when nbconverting to latex
- PR #4922: Python nbconvert output shouldn't have output
- PR #4912: Skip some Windows io failures
- PR #4919: flush output before showing tracebacks
- PR #4915: ZMQCompleter inherits from IPCompleter
- PR #4890: better cleanup channel FDs
- PR #4880: set profile name from profile_dir
- PR #4853: fix setting image height/width from metadata
- PR #4786: Reduce spacing of heading cells
- PR #4680: Minimal pandoc version warning
- PR #4908: detect builtin docstrings in oinspect
- PR #4911: Don't use `python -m package` on Windows Python 2
- PR #4909: sort dictionary keys before comparison, ordering is not guaranteed
- PR #4374: IPEP 23: Backbone.js Widgets
- PR #4903: use https for all embeds
- PR #4894: Shortcut changes
- PR #4897: More detailed documentation about kernel_cmd
- PR #4891: Squash a few Sphinx warnings from nbconvert.utils.lexers docstrings
- PR #4679: JPG compression for inline pylab
- PR #4708: Fix indent and center
- PR #4789: fix IPython.embed
- PR #4655: prefer marked to pandoc for markdown2html
- PR #4876: don't show tooltip if object is not found
- PR #4873: use 'combine' option to ucs package
- PR #4732: Accents in notebook names and in command-line (nbconvert)
- PR #4867: Update URL for Lawrence Hall of Science webcam image
- PR #4868: Static path fixes
- PR #4858: fix tb_offset when running a file
- PR #4826: some $.html(-> $.text(
- PR #4847: add js kernel_info request
- PR #4832: allow NotImplementedError in formatters
- PR #4803: BUG: fix cython magic support in ipython_directive
- PR #4865: `build` listed twice in .gitignore. Removing one.
- PR #4851: fix tooltip token regex for single-character names
- PR #4846: Remove some leftover traces of irunner

- PR #4820: fix regex for cleaning old logs with ipcluster
- PR #4844: adjustments to notebook app logging
- PR #4840: Error in Session.send_raw()
- PR #4819: update CodeMirror to 3.21
- PR #4823: Minor fixes for typos/inconsistencies in parallel docs
- PR #4811: document code mirror tab and shift-tab
- PR #4795: merge reveal templates
- PR #4796: update components
- PR #4806: Correct order of packages for unicode in nbconvert to LaTeX
- PR #4800: Qt frontend: Handle 'aborted' prompt replies.
- PR #4794: Compatibility fix for Python3 (Issue #4783)
- PR #4799: minor js test fix
- PR #4788: warn when notebook is started in pylab mode
- PR #4772: Notebook server info files
- PR #4797: be conservative about kernel_info implementation
- PR #4787: non-python kernels run python code with qtconsole
- PR #4565: various display type validations
- PR #4703: Math macro in jinja templates.
- PR #4781: Fix "Source" text for the "Other Syntax" section of the "Typesetting Math" notebook
- PR #4776: Manually document py3compat module.
- PR #4533: propagate display metadata to all mimetypes
- PR #4785: Replacing a for-in loop by an index loop on an array
- PR #4780: Updating CSS for UI example.
- PR #3605: Modal UI
- PR #4758: Python 3.4 fixes
- PR #4735: add some HTML error pages
- PR #4775: Update whatsnew doc from PR files
- PR #4760: Make examples and docs more Python 3 aware
- PR #4773: Don't wait forever for notebook server to launch/die for tests
- PR #4768: Qt console: Fix _prompt_pos accounting on timer flush output.
- PR #4727: Remove Nbconvert template loading magic
- PR #4763: Set numpydoc options to produce fewer Sphinx warnings.
- PR #4770: always define aliases, even if empty
- PR #4766: add `python -m` entry points for everything
- PR #4767: remove manpages for irunner, iplogger
- PR #4751: Added –post-serve explanation into the nbconvert docs.

- PR #4762: whitelist alphanumeric characters for cookie_name
- PR #4625: Deprecate %profile magic
- PR #4745: warn on failed formatter calls
- PR #4746: remove redundant cls alias on Windows
- PR #4749: Fix bug in determination of public ips.
- PR #4715: restore use of tornado static_url in templates
- PR #4748: fix race condition in profiledir creation.
- PR #4720: never use ssh multiplexer in tunnels
- PR #4658: Bug fix for #4643: Regex object needs to be reset between calls in toolt…
- PR #4561: Add Formatter.pop(type)
- PR #4712: Docs shotgun 3
- PR #4713: Fix saving kernel history in Python 2
- PR #4744: don't use lazily-evaluated rc.ids in wait_for_idle
- PR #4740: %env can't set variables
- PR #4737: check every link when detecting virutalenv
- PR #4738: don't inject help into user_ns
- PR #4739: skip html nbconvert tests when their dependencies are missing
- PR #4730: Fix stripping continuation prompts when copying from Qt console
- PR #4725: Doc fixes
- PR #4656: Nbconvert HTTP service
- PR #4710: make @interactive decorator friendlier with dill
- PR #4722: allow purging local results as long as they are not outstanding
- PR #4549: Updated IPython console lexers.
- PR #4570: Update IPython directive
- PR #4719: Fix comment typo in prefilter.py
- PR #4575: make sure to encode URL components for API requests
- PR #4718: Fixed typo in displaypub
- PR #4716: Remove input_prefilter hook
- PR #4691: survive failure to bind to localhost in zmq.iostream
- PR #4696: don't do anything if add_anchor fails
- PR #4711: some typos in the docs
- PR #4700: use if main block in entry points
- PR #4692: setup.py symlink improvements
- PR #4265: JSON configuration file
- PR #4505: Nbconvert latex markdown images2
- PR #4608: transparent background match … all colors

- PR #4678: allow ipython console to handle text/plain display
- PR #4706: remove irunner, iplogger
- PR #4701: Delete an old dictionary available for selecting the aligment of text.
- PR #4702: Making reveal font-size a relative unit.
- PR #4649: added a quiet option to %cpaste to suppress output
- PR #4690: Option to spew subprocess streams during tests
- PR #4688: Fixed various typos in docstrings.
- PR #4645: CasperJs utility functions.
- PR #4670: Stop bundling the numpydoc Sphinx extension
- PR #4675: common IPython prefix for ModIndex
- PR #4672: Remove unused 'attic' module
- PR #4671: Fix docstrings in utils.text
- PR #4669: add missing help strings to HistoryManager configurables
- PR #4668: Make non-ASCII docstring unicode
- PR #4650: added a note about sharing of nbconvert tempates
- PR #4646: Fixing various output related things:
- PR #4665: check for libedit in readline on OS X
- PR #4606: Make running PYTHONSTARTUP optional
- PR #4654: Fixing left padding of text cells to match that of code cells.
- PR #4306: add raw_mimetype metadata to raw cells
- PR #4576: Tighten up the vertical spacing on cells and make the padding of cells more consistent
- PR #4353: Don't reset the readline completer after each prompt
- PR #4567: Adding prompt area to non-CodeCells to indent content.
- PR #4446: Use SVG plots in OctaveMagic by default due to lack of Ghostscript on Windows Octave
- PR #4613: remove configurable.created
- PR #4631: Use argument lists for command help tests
- PR #4633: Modifies test_get_long_path_name_winr32() to allow for long path names in temp dir
- PR #4642: Allow docs to build without PyQt installed.
- PR #4641: Don't check for wx in the test suite.
- PR #4622: make QtConsole Lexer configurable
- PR #4594: Fixed #2923 Move Save Away from Cut in toolbar
- PR #4593: don't interfere with set_next_input contents in qtconsole
- PR #4640: Support matplotlib's Gtk3 backend in –pylab mode
- PR #4639: Minor import fix to get qtconsole with –pylab=qt working
- PR #4637: Fixed typo in links.txt.
- PR #4634: Fix nbrun in notebooks with non-code cells.

- PR #4632: Restore the ability to run tests from a function.
- PR #4624: Fix crash when $EDITOR is non-ASCII
- PR #4453: Play nice with App Nap
- PR #4541: relax ipconfig matching on Windows
- PR #4552: add pickleutil.use_dill
- PR #4590: Font awesome for IPython slides
- PR #4589: Inherit the width of pre code inside the input code cells.
- PR #4588: Update reveal.js CDN to 2.5.0.
- PR #4569: store cell toolbar preset in notebook metadata
- PR #4609: Fix bytes regex for Python 3.
- PR #4581: Writing unicode to stdout
- PR #4591: Documenting codemirror shorcuts.
- PR #4607: Tutorial doc should link to user config intro
- PR #4601: test that rename fails with 409 if it would clobber
- PR #4599: re-cast int/float subclasses to int/float in json_clean
- PR #4542: new `ipython history clear` subcommand
- PR #4568: don't use lazily-evaluated rc.ids in wait_for_idle
- PR #4572: DOC: %profile docstring should reference %prun
- PR #4571: no longer need 3 suffix on travis, tox
- PR #4566: Fixing cell_type in CodeCell constructor.
- PR #4563: Specify encoding for reading notebook file.
- PR #4452: support notebooks in %run
- PR #4546: fix warning condition on notebook startup
- PR #4540: Apidocs3
- PR #4553: Fix Python 3 handling of urllib
- PR #4543: make hiding of initial namespace optional
- PR #4517: send shutdown_request on exit of `ipython console`
- PR #4528: improvements to bash completion
- PR #4532: Hide dynamically defined metaclass base from Sphinx.
- PR #4515: Spring Cleaning, and Load speedup
- PR #4529: note routing identities needed for input requests
- PR #4514: allow restart in `%run -d`
- PR #4527: add redirect for 1.0-style 'files/' prefix links
- PR #4526: Allow unicode arguments to passwd_check on Python 2
- PR #4403: Global highlight language selection.
- PR #4250: outputarea.js: Wrap inline SVGs inside an iframe

- PR #4521: Read wav files in binary mode
- PR #4444: Css cleaning
- PR #4523: Use username and password for MongoDB on ShiningPanda
- PR #4510: Update whatsnew from PR files
- PR #4441: add `setup.py jsversion`
- PR #4518: Fix for race condition in url file decoding.
- PR #4497: don't automatically unpack datetime objects in the message spec
- PR #4506: wait for empty queues as well as load-balanced tasks
- PR #4492: Configuration docs refresh
- PR #4508: Fix some uses of map() in Qt console completion code.
- PR #4498: Daemon StreamCapturer
- PR #4499: Skip clipboard test on unix systems if headless.
- PR #4460: Better clipboard handling, esp. with pywin32
- PR #4496: Pass nbformat object to write call to save .py script
- PR #4466: various pandoc latex fixes
- PR #4473: Setup for Python 2/3
- PR #4459: protect against broken repr in lib.pretty
- PR #4457: Use ~/.ipython as default config directory
- PR #4489: check realpath of env in init_virtualenv
- PR #4490: fix possible race condition in test_await_data
- PR #4476: Fix: Remove space added by display(JavaScript) on page reload
- PR #4398: [Notebook] Deactivate tooltip on tab by default.
- PR #4480: Docs shotgun 2
- PR #4488: fix typo in message spec doc
- PR #4479: yet another JS race condition fix
- PR #4477: Allow incremental builds of the html_noapi docs target
- PR #4470: Various Config object cleanups
- PR #4410: make close-and-halt work on new tabs in Chrome
- PR #4469: Python 3 & getcwdu
- PR #4451: fix: allow JS test to run after shutdown test
- PR #4456: Simplify StreamCapturer for subprocess testing
- PR #4464: Correct description for Bytes traitlet type
- PR #4465: Clean up MANIFEST.in
- PR #4461: Correct TypeError message in svg2pdf
- PR #4458: use signalstatus if exit status is undefined
- PR #4438: Single codebase Python 3 support (again)

- PR #4198: Version conversion, support for X to Y even if Y < X (nbformat)
- PR #4415: More tooltips in the Notebook menu
- PR #4450: remove monkey patch for older versions of tornado
- PR #4423: Fix progress bar and scrolling bug.
- PR #4435: raise 404 on not found static file
- PR #4442: fix and add shim for change introduce by #4195
- PR #4436: allow `require("nbextensions/extname")` to load from IPYTHONDIR/nbextensions
- PR #4437: don't compute etags in static file handlers
- PR #4427: notebooks should always have one checkpoint
- PR #4425: fix js pythonisme
- PR #4195: IPEP 21: widget messages
- PR #4434: Fix broken link for Dive Into Python.
- PR #4428: bump minimum tornado version to 3.1.0
- PR #4302: Add an Audio display class
- PR #4285: Notebook javascript test suite using CasperJS
- PR #4420: Allow checking for backports via milestone
- PR #4426: set kernel cwd to notebook's directory
- PR #4389: By default, Magics inherit from Configurable
- PR #4393: Capture output from subprocs during test, and display on failure
- PR #4419: define InlineBackend configurable in its own file
- PR #4303: Multidirectory support for the Notebook
- PR #4371: Restored ipython profile locate dir and fixed typo. (Fixes #3708).
- PR #4414: Specify unicode type properly in rmagic
- PR #4413: don't instantiate IPython shell as class attr
- PR #4400: Remove 5s wait on inactivity on GUI inputhook loops
- PR #4412: Fix traitlet _notify_trait by-ref issue
- PR #4378: split adds new cell above, rather than below
- PR #4405: Bring display of builtin types and functions in line with Py 2
- PR #4367: clean up of documentation files
- PR #4401: Provide a name of the HistorySavingThread
- PR #4384: fix menubar height measurement
- PR #4377: fix tooltip cancel
- PR #4293: Factorise code in tooltip for julia monkeypatching
- PR #4292: improve js-completer logic.
- PR #4363: set_next_input: keep only last input when repeatedly called in a single cell
- PR #4382: Use safe_hasattr in dir2

- PR #4379: fix (CTRL-M -) shortcut for splitting cell in FF
- PR #4380: Test and fixes for localinterfaces
- PR #4372: Don't assume that SyntaxTB is always called with a SyntaxError
- PR #4342: Return value directly from the try block and avoid a variable
- PR #4154: Center LaTeX and figures in markdown
- PR #4311: %load -s to load specific functions or classes
- PR #4350: WinHPC launcher fixes
- PR #4345: Make irunner compatible with upcoming pexpect 3.0 interface
- PR #4276: Support container methods in config
- PR #4359: test_pylabtools also needs to modify matplotlib.rcParamsOrig
- PR #4355: remove hardcoded box-orient
- PR #4333: Add Edit Notebook Metadata to Edit menu
- PR #4349: Script to update What's New file
- PR #4348: Call PDF viewer after latex compiling (nbconvert)
- PR #4346: getpass() on Windows & Python 2 needs bytes prompt
- PR #4304: use netifaces for faster IPython.utils.localinterfaces
- PR #4305: Add even more ways to populate localinterfaces
- PR #4313: remove strip_math_space
- PR #4325: Some changes to improve readability.
- PR #4281: Adjust tab completion widget if too close to bottom of page.
- PR #4347: Remove pycolor script
- PR #4322: Scroll to the top after change of slides in the IPython slides
- PR #4289: Fix scrolling output (not working post clear_output changes)
- PR #4343: Make parameters for kernel start method more general
- PR #4237: Keywords should shadow magic functions
- PR #4338: adjust default value of level in sync_imports
- PR #4328: Remove unused loop variable.
- PR #4340: fix mathjax download url to new GitHub format
- PR #4336: use simple replacement rather than string formatting in format_kernel_cmd
- PR #4264: catch unicode error listing profiles
- PR #4314: catch EACCES when binding notebook app
- PR #4324: Remove commented addthis toolbar
- PR #4327: Use the with statement to open a file.
- PR #4318: fix initial sys.path
- PR #4315: Explicitly state what version of Pandoc is supported in docs/install
- PR #4316: underscore missing on notebook_p4

- PR #4295: Implement boundary option for load magic (#1093)
- PR #4300: traits defauts are strings not object
- PR #4297: Remove an unreachable return statement.
- PR #4260: Use subprocess for system_raw
- PR #4277: add nbextensions
- PR #4294: don't require tornado 3 in `--post serve`
- PR #4270: adjust Scheduler timeout logic
- PR #4278: add `-a` to easy_install command in libedit warning
- PR #4282: Enable automatic line breaks in MathJax.
- PR #4279: Fixing line-height of list items in tree view.
- PR #4253: fixes #4039.
- PR #4131: Add module's name argument in %%cython magic
- PR #4269: Add mathletters option and longtable package to latex_base.tplx
- PR #4230: Switch correctly to the user's default matplotlib backend after inline.
- PR #4271: Hopefully fix ordering of output on ShiningPanda
- PR #4239: more informative error message for bad serialization
- PR #4263: Fix excludes for IPython.testing
- PR #4112: nbconvert: Latex template refactor
- PR #4261: Fixing a formatting error in the custom display example notebook.
- PR #4259: Fix Windows test exclusions
- PR #4229: Clear_output: Animation & widget related changes.
- PR #4151: Refactor alias machinery
- PR #4153: make timeit return an object that contains values
- PR #4258: to-backport label is now 1.2
- PR #4242: Allow passing extra arguments to iptest through for nose
- PR #4257: fix unicode argv parsing
- PR #4166: avoid executing code in utils.localinterfaces at import time
- PR #4214: engine ID metadata should be unicode, not bytes
- PR #4232: no highlight if no language specified
- PR #4218: Fix display of SyntaxError when .py file is modified
- PR #4207: add `setup.py css` command
- PR #4224: clear previous callbacks on execute
- PR #4180: Iptest refactoring
- PR #4105: JS output area misaligned
- PR #4220: Various improvements to docs formatting
- PR #4187: Select adequate highlighter for cell magic languages

- PR #4228: update -dev docs to reflect latest stable version
- PR #4219: Drop bundled argparse
- PR #3851: Adds an explicit newline for pretty-printing.
- PR #3622: Drop fakemodule
- PR #4080: change default behavior of database task storage
- PR #4197: enable cython highlight in notebook
- PR #4225: Updated docstring for core.display.Image
- PR #4175: nbconvert: Jinjaless exporter base
- PR #4208: Added a lightweight "htmlcore" Makefile entry
- PR #4209: Magic doc fixes
- PR #4217: avoid importing numpy at the module level
- PR #4213: fixed dead link in examples/notebooks readme to Part 3
- PR #4183: ESC should be handled by CM if tooltip is not on
- PR #4193: Update for #3549: Append Firefox overflow-x fix
- PR #4205: use TextIOWrapper when communicating with pandoc subprocess
- PR #4204: remove some extraneous print statements from IPython.parallel
- PR #4201: HeadingCells cannot be split or merged
- PR #4048: finish up speaker-notes PR
- PR #4079: trigger `Kernel.status_started` after websockets open
- PR #4186: moved DummyMod to proper namespace to enable dill pickling
- PR #4190: update version-check message in setup.py and IPython.__init__
- PR #4188: Allow user_ns trait to be None
- PR #4189: always fire LOCAL_IPS.extend(PUBLIC_IPS)
- PR #4174: various issues in markdown and rst templates
- PR #4178: add missing data_javascript
- PR #4168: Py3 failing tests
- PR #4181: nbconvert: Fix, sphinx template not removing new lines from headers
- PR #4043: don't 'restore_bytes' in from_JSON
- PR #4149: reuse more kernels in kernel tests
- PR #4163: Fix for incorrect default encoding on Windows.
- PR #4136: catch javascript errors in any output
- PR #4171: add nbconvert config file when creating profiles
- PR #4172: add ability to check what PRs should be backported in backport_pr
- PR #4167: –fast flag for test suite!
- PR #4125: Basic exercise of `ipython [subcommand] -h` and help-all
- PR #4085: nbconvert: Fix sphinx preprocessor date format string for Windows

- PR #4159: don't split `.cell` and `div.cell` CSS
- PR #4165: Remove use of parametric tests
- PR #4158: generate choices for `--gui` configurable from real mapping
- PR #4083: Implement a better check for hidden values for %who etc.
- PR #4147: Reference notebook examples, fixes #4146.
- PR #4065: do not include specific css in embedable one
- PR #4092: nbconvert: Fix for unicode html headers, Windows + Python 2.x
- PR #4074: close Client sockets if connection fails
- PR #4064: Store default codemirror mode in only 1 place
- PR #4104: Add way to install MathJax to a particular profile
- PR #4161: Select name when renaming a notebook
- PR #4160: Add quotes around ".[notebook]" in readme
- PR #4144: help_end transformer shouldn't pick up ? in multiline string
- PR #4090: Add LaTeX citation handling to nbconvert
- PR #4143: update example custom.js
- PR #4142: DOC: unwrap openssl line in public_server doc
- PR #4126: update tox.ini
- PR #4141: add files with a separate `add` call in backport_pr
- PR #4137: Restore autorestore option for storemagic
- PR #4098: pass profile-dir instead of profile name to Kernel
- PR #4120: support `input` in Python 2 kernels
- PR #4088: nbconvert: Fix coalescestreams line with incorrect nesting causing strange behavior
- PR #4060: only strip continuation prompts if regular prompts seen first
- PR #4132: Fixed name error bug in function safe_unicode in module py3compat.
- PR #4121: move test_kernel from IPython.zmq to IPython.kernel
- PR #4118: ZMQ heartbeat channel: catch EINTR exceptions and continue.
- PR #4070: New changes should go into pr/ folder
- PR #4054: use unicode for HTML export
- PR #4106: fix a couple of default block values
- PR #4107: update parallel magic tests with capture_output API
- PR #4102: Fix clashes between debugger tests and coverage.py
- PR #4115: Update docs on declaring a magic function
- PR #4101: restore accidentally removed EngineError
- PR #4096: minor docs changes
- PR #4094: Update target branch before backporting PR
- PR #4069: Drop monkeypatch for pre-1.0 nose

- PR #4056: respect `pylab_import_all` when `--pylab` specified at the command-line
- PR #4091: Make Qt console banner configurable
- PR #4086: fix missing errno import
- PR #4084: Use msvcrt.getwch() for Windows pager.
- PR #4073: rename `post_processors` submodule to `postprocessors`
- PR #4075: Update supported Python versions in tools/test_pr
- PR #4068: minor bug fix, define 'cell' in dialog.js.
- PR #4044: rename call methods to transform and postprocess
- PR #3744: capture rich output as well as stdout/err in capture_output
- PR #3969: "use strict" in most (if not all) our javascript
- PR #4030: exclude `.git` in MANIFEST.in
- PR #4047: Use istype() when checking if canned object is a dict
- PR #4031: don't close_fds on Windows
- PR #4029: bson.Binary moved
- PR #3883: skip test on unix when x11 not available
- PR #3863: Added working speaker notes for slides.
- PR #4035: Fixed custom jinja2 templates being ignored when setting template_path
- PR #4002: Drop Python 2.6 and 3.2
- PR #4026: small doc fix in nbconvert
- PR #4016: Fix IPython.start_* functions
- PR #4021: Fix parallel.client.View map() on numpy arrays
- PR #4022: DOC: fix links to matplotlib, notebook docs
- PR #4018: Fix warning when running IPython.kernel tests
- PR #4017: Add REPL-like printing of final/return value to %%R cell magic
- PR #4019: Test skipping without unicode paths
- PR #4008: Transform code before %prun/%%prun runs
- PR #4014: Fix typo in ipapp
- PR #3997: DOC: typos + rewording in examples/notebooks/Cell Magics.ipynb
- PR #3914: nbconvert: Transformer tests
- PR #3987: get files list in backport_pr
- PR #3923: nbconvert: Writer tests
- PR #3974: nbconvert: Fix app tests on Window7 w/ Python 3.3
- PR #3937: make tab visible in codemirror and light red background
- PR #3933: nbconvert: Post-processor tests
- PR #3978: fix `--existing` with non-localhost IP
- PR #3939: minor checkpoint cleanup

- PR #3955: complete on % for magic in notebook
- PR #3981: BF: fix nbconert rst input prompt spacing
- PR #3960: Don’t make sphinx a dependency for importing nbconvert
- PR #3973: logging.Formatter is not new-style in 2.6

Issues (434):

- #5476: For 2.0: Fix links in Notebook Help Menu
- #5337: Examples reorganization
- #5436: CodeMirror shortcuts in QuickHelp
- #5444: Fix numeric verification for Int and Float text widgets.
- #5443: Int and Float Widgets don’t allow negative signs
- #5449: Stretch keyboard shortcut dialog
- #5471: Add coding magic comment to nbconvert Python template
- #5470: UTF-8 Issue When Converting Notebook to a Script.
- #5369: FormatterWarning for SVG matplotlib output in notebook
- #5460: Can’t start the notebook server specifying a notebook
- #2918: CodeMirror related issues.
- #5431: update github_stats and gh_api for 2.0
- #4887: Add tests for modal UI
- #5290: Add dual mode JS tests
- #5448: Cmd+/ shortcut doesn’t work in IPython master
- #5447: Add %%python2 cell magic
- #5442: Make a “python2” alias or rename the “python”cell magic.
- #2495: non-ascii characters in the path
- #4554: dictDB: Exception due to str to datetime comparission
- #5006: Comm code is not run in the same context as notebook code
- #5118: Weird interact behavior
- #5401: Empty code cells in nbconvert rst output cause problems
- #5434: fix check for empty cells in rst template
- #4944: Trouble finding ipynb path in Windows 8
- #4605: Change the url of Editor Shorcuts in the notebook menu.
- #5425: Update COPYING.txt
- #5348: BUG: HistoryAccessor.get_session_info(0) - exception
- #5293: Javascript(“element.append()”) looks broken.
- #5363: Disable saving if notebook has stopped loading
- #5189: Tooltip pager mode is broken
- #5330: Updates to shell reference doc

- #5397: Accordion widget broken
- #5106: Flexbox CSS specificity bugs
- #5297: tooltip triggers focus bug
- #5417: scp checking for existence of directories: directory names are incorrect
- #5302: Parallel engine registration fails for slow engines
- #5334: notebook's split-cell shortcut dangerous / incompatible with Neo layout (for instance)
- #5324: Style of `raw_input` UI is off in notebook
- #5350: Converting notebooks with spaces in their names to RST gives broken images
- #5049: update quickhelp on adding and removing shortcuts
- #4941: Eliminating display of intermediate stages in progress bars
- #5345: nbconvert to markdown does not use backticks
- #5357: catch exception in copystat
- #5351: Notebook saving fails on smb share
- #4946: TeX produced cannot be converted to PDF
- #5347: pretty print list too slow
- #5238: Raw cell placeholder is not removed when you edit the cell
- #5382: Qtconsole doesn't run in Python 3
- #5378: Unexpected and new conflict between PyFileConfigLoader and IPythonQtConsoleApp
- #4945: Heading/cells positioning problem and cell output wrapping
- #5084: Consistent approach for HTML/JS output on nbviewer
- #4902: print preview does not work, custom.css not found
- #5336: TypeError in bootstrap-tour.min.js
- #5303: Changed Hub.registration_timeout to be a config input.
- #995: Paste-able mode in terminal
- #5305: Tuple unpacking for shell escape
- #5232: Make nbconvert html full output like notebook's html.
- #5224: Audit nbconvert HTML output
- #5253: display any output from this session in terminal console
- #5251: ipython console ignoring some stream messages?
- #4802: Tour of the notebook UI (was UI elements inline with highlighting)
- #5103: Moving Constructor definition to the top like a Function definition
- #5264: Test failures on master with Anaconda
- #4833: Serve /usr/share/javascript at /_sysassets/javascript/ in notebook
- #5071: Prevent %pylab from clobbering interactive
- #5282: Exception in widget __del__ methods in Python 3.4.
- #5280: append Firefox overflow-x fix

- #5120: append Firefox overflow-x fix, again
- #4127: autoreload shouldn't rely on .pyc modification times
- #5272: allow highlighting language to be set from notebook metadata
- #5050: Notebook cells truncated with Firefox
- #4839: Error in Session.send_raw()
- #5188: New events system
- #5076: Refactor keyboard handling
- #4886: Refactor and consolidate different keyboard logic in JavaScript code
- #5002: the green cell border moving forever in Chrome, when there are many code cells.
- #5259: Codemirror still active in command mode
- #5219: Output images appear as small thumbnails (Notebook)
- #4829: Not able to connect qtconsole in Windows 8
- #5152: Hide __pycache__ in dashboard directory list
- #5151: Case-insesitive sort for dashboard list
- #4603: Warn when overwriting a notebook with upload
- #4895: Improvements to %run completions
- #3459: Filename completion when run script with %run
- #5225: Add JavaScript to nbconvert HTML display priority
- #5034: Audit the places where we call `.html(something)`
- #5094: Dancing cells in notebook
- #4999: Notebook focus effects
- #5149: Clicking on a TextBoxWidget in FF completely breaks dual mode.
- #5207: Children fire event
- #5227: display_method of objects with custom __getattr__
- #5236: Cursor keys do not work to leave Markdown cell while it's being edited
- #5205: Use CTuple traitlet for Widget children
- #5230: notebook rename does not respect url prefix
- #5218: Test failures with Python 3 and enabled warnings
- #5115: Page Breaks for Print Preview Broken by display: flex - Simple CSS Fix
- #5024: Make nbconvert HTML output smart about page breaking
- #4985: Add automatic Closebrackets function to Codemirror.
- #5184: print 'xa' crashes the interactive shell
- #5214: Downloading notebook as Python (.py) fails
- #5211: AttributeError: 'module' object has no attribute '_outputfile'
- #5206: [CSS?] Inconsistencies in nbconvert divs and IPython Notebook divs?
- #5201: node != nodejs within Debian packages

- #5112: band-aid for completion
- #4860: Completer As-You-Type Broken
- #5116: reorganize who knows what about paths
- #4973: Adding security.js with 1st attempt at is_safe
- #5164: test_oinspect.test_calltip_builtin failure with python3.4
- #5127: Widgets: skip intermediate callbacks during throttling
- #5013: Widget alignment differs between FF and Chrome
- #5141: tornado error static file
- #5160: TemporaryWorkingDirectory incompatible with python3.4
- #5140: WIP: %kernels magic
- #4987: Widget lifecycle problems
- #5129: UCS package break latex export on non-ascii
- #4986: Cell horizontal scrollbar is missing in FF but not in Chrome
- #4685: nbconvert ignores image size metadata
- #5155: Notebook logout button does not work (source typo)
- #2678: Ctrl-m keyboard shortcut clash on Chrome OS
- #5113: ButtonWidget without caption wrong height.
- #4778: add APIs for installing notebook extensions
- #5046: python setup.py failed vs git submodule update worked
- #4925: Notebook manager api fixes
- #5073: Cannot align widgets horizontally in the notebook
- #4996: require print_method to be a bound method
- #4990: _repr_html_ exception reporting corner case when using type(foo)
- #5099: Notebook: Changing base_project_url results in failed WebSockets call
- #5096: Client.map is not fault tolerant
- #4997: Inconsistent %matplotlib qt behavior
- #5041: Remove more .html(. . .) calls.
- #5078: Updating JS tests README.md
- #4977: ensure scp destination directories exist (with mkdir -p)
- #3411: ipython parallel: scp failure.
- #5064: Errors during interact display at the terminal, not anywhere in the notebook
- #4921: Add PDF formatter and handling
- #4920: Adding PDFFormatter and kernel side handling of PDF display data
- #5048: Add edit/command mode indicator
- #4889: Add UI element for indicating command/edit modes
- #5052: Add q to toggle the pager.

- #5000: Closing pager with keyboard in modal UI
- #5069: Box model changes broke the Keyboard Shortcuts help modal
- #4960: Interact/Interactive for widget
- #4883: Implement interact/interactive for widgets
- #5038: Fix multiple press keyboard events
- #5054: UnicodeDecodeError: 'ascii' codec can't decode byte 0xc6 in position 1: ordinal not in range(128)
- #5031: Bug during integration of IPython console in Qt application
- #5057: iopubwatcher.py example is broken.
- #4747: Add event for output_area adding an output
- #5001: Add directory navigation to dashboard
- #5016: Help menu external-link icons break layout in FF
- #4885: Modal UI behavior changes
- #5009: notebook signatures don't work
- #4975: setup.py changes for 2.0
- #4774: emit event on appended element on dom
- #5020: Python Lists translated to javascript objects in widgets
- #5003: Fix pretty reprs of super() objects
- #5012: Make `SelectionWidget.values` a dict
- #4961: Bug when constructing a selection widget with both values and labels
- #4283: A < in a markdown cell strips cell content when converting to latex
- #4006: iptest IPython broken
- #4251: & escaped to &amp; in tex ?
- #5027: pin lessc to 1.4
- #4323: Take 2: citation2latex filter (using HTMLParser)
- #4196: Printing notebook from browser gives 1-page truncated output
- #4842: more subtle kernel indicator
- #4057: No path to notebook examples from Help menu
- #5015: don't write cell.trusted to disk
- #4617: Changed url link in Help dropdown menu.
- #4976: Container widget layout broken on Firefox
- #4981: Vertical slider layout broken
- #4793: Message spec changes related to `clear_output`
- #4982: Live readout for slider widgets
- #4813: make help menu a template
- #4989: Filename tab completion completely broken
- #1380: Tab should insert 4 spaces in # comment lines

- #2888: spaces vs tabs
- #1193: Allow resizing figures in notebook
- #4504: Allow input transformers to raise SyntaxError
- #4697: Problems with height after toggling header and toolbar. . .
- #4951: TextWidget to code cell command mode bug.
- #4809: Arbitrary scrolling (jumping) in clicks in modal UI for notebook
- #4971: Fixing issues with js tests
- #4972: Work around problem in doctest discovery in Python 3.4 with PyQt
- #4892: IPython.qt test failure with python3.4
- #4863: BUG: cannot create an OBJECT array from memory buffer
- #4704: Subcommand `profile` ignores –ipython-dir
- #4845: Add Origin Checking.
- #4870: ipython_directive, report except/warn in block and add :okexcept: :okwarning: options to suppress
- #4956: Shift-Enter does not move to next cell
- #4662: Menu cleanup
- #4824: sign notebooks
- #4848: avoid import of nearby temporary with %edit
- #4731: %edit files mistakenly import modules in /tmp
- #4950: Two fixes for file upload related bugs
- #4871: Notebook upload fails after Delete
- #4825: File Upload URL set incorrectly
- #3867: display.FileLinks should work in the exported html verion of a notebook
- #4948: reveal: ipython css overrides reveal themes
- #4947: reveal: slides that are too big?
- #4051: Test failures with Python 3 and enabled warnings
- #3633: outstanding issues over in ipython/nbconvert repo
- #4087: Sympy printing in the example notebook
- #4627: Document various QtConsole embedding approaches.
- #4849: Various unicode fixes (mostly on Windows)
- #3653: autocompletion in “from package import <tab>”
- #4583: overwrite? prompt gets EOFError in 2 process
- #4807: Correct handling of ansi colour codes when nbconverting to latex
- #4611: Document how to compile .less files in dev docs.
- #4618: “Editor Shortcuts” link is broken in help menu dropdown notebook
- #4522: DeprecationWarning: the sets module is deprecated
- #4368: No symlink from ipython to ipython3 when inside a python3 virtualenv

- #4234: Math without $$ doesn't show up when converted to slides
- #4194: config.TerminalIPythonApp.nosep does not work
- #1491: prefilter not called for multi-line notebook cells
- #4001: Windows IPython executable /scripts/ipython not working
- #3959: think more carefully about text wrapping in nbconvert
- #4907: Test for traceback depth fails on Windows
- #4906: Test for IPython.embed() fails on Windows
- #4912: Skip some Windows io failures
- #3700: stdout/stderr should be flushed printing exception output…
- #1181: greedy completer bug in terminal console
- #2032: check for a few places we should be using DEFAULT_ENCODING
- #4882: Too many files open when starting and stopping kernel repeatedly
- #4880: set profile name from profile_dir
- #4238: parallel.Client() not using profile that notebook was run with?
- #4853: fix setting image height/width from metadata
- #4786: Reduce spacing of heading cells
- #4680: Minimal pandoc version warning
- #3707: nbconvert: Remove IPython magic commands from –format="python" output
- #4130: PDF figures as links from png or svg figures
- #3919: Allow –profile to be passed a dir.
- #2136: Handle hard newlines in pretty printer
- #4790: Notebook modal UI: "merge cell below" key binding, `shift+=`, does not work with some keyboard layouts
- #4884: Keyboard shortcut changes
- #1184: slow handling of keyboard input
- #4913: Mathjax, Markdown, tex, env* and italic
- #3972: nbconvert: Template output testing
- #4903: use https for all embeds
- #4874: –debug does not work if you set .kernel_cmd
- #4679: JPG compression for inline pylab
- #4708: Fix indent and center
- #4789: fix IPython.embed
- #4759: Application._load_config_files log parameter default fails
- #3153: docs / file menu: explain how to exit the notebook
- #4791: Did updates to ipython_directive bork support for cython magic snippets?
- #4385: "Part 4 - Markdown Cells.ipynb" nbviewer example seems not well referenced in current online documentation page https://ipython.org/ipython-doc/stable/interactive/notebook.htm

- #4655: prefer marked to pandoc for markdown2html
- #3441: Fix focus related problems in the notebook
- #3402: Feature Request: Save As (latex, html,..etc) as a menu option in Notebook rather than explicit need to invoke nbconvert
- #3224: Revisit layout of notebook area
- #2746: rerunning a cell with long output (exception) scrolls to much (html notebook)
- #2667: can't save opened notebook if accidentally delete the notebook in the dashboard
- #3026: Reporting errors from _repr_<type>_ methods
- #1844: Notebook does not exist and permalinks
- #2450: [closed PR] Prevent jumping of window to input when output is clicked.
- #3166: IPEP 16: Notebook multi directory dashboard and URL mapping
- #3691: Slight misalignment of Notebook menu bar with focus box
- #4875: Empty tooltip with `object_found = false` still being shown
- #4432: The SSL cert for the MathJax CDN is invalid and URL is not protocol agnostic
- #2633: Help text should leave current cell active
- #3976: DOC: Pandas link on the notebook help menu?
- #4082: /new handler redirect cached by browser
- #4298: Slow ipython –pylab and ipython notebook startup
- #4545: %store magic not working
- #4610: toolbar UI enhancements
- #4782: New modal UI
- #4732: Accents in notebook names and in command-line (nbconvert)
- #4752: link broken in docs/examples
- #4835: running ipython on python files adds an extra traceback frame
- #4792: repr_html exception warning on qtconsole with pandas #4745
- #4834: function tooltip issues
- #4808: Docstrings in Notebook not displayed properly and introspection
- #4846: Remove some leftover traces of irunner
- #4810: ipcluster bug in clean_logs flag
- #4812: update CodeMirror for the notebook
- #671: add migration guide for old IPython config
- #4783: ipython 2dev under windows / (win)python 3.3 experiment
- #4772: Notebook server info files
- #4765: missing build script for highlight.js
- #4787: non-python kernels run python code with qtconsole
- #4703: Math macro in jinja templates.

- #4595: ipython notebook XSS vulnerable
- #4776: Manually document py3compat module.
- #4686: For-in loop on an array in cell.js
- #3605: Modal UI
- #4769: Ipython 2.0 will not startup on py27 on windows
- #4482: reveal.js converter not including CDN by default?
- #4761: ipv6 address triggers cookie exception
- #4580: rename or remove %profile magic
- #4643: Docstring does not open properly
- #4714: Static URLs are not auto-versioned
- #2573: document code mirror keyboard shortcuts
- #4717: hang in parallel.Client when using SSHAgent
- #4544: Clarify the requirement for pyreadline on Windows
- #3451: revisit REST /new handler to avoid systematic crawling.
- #2922: File => Save as '.py' saves magic as code
- #4728: Copy/Paste stripping broken in version > 0.13.x in QTConsole
- #4539: Nbconvert: Latex to PDF conversion fails on notebooks with accented letters
- #4721: purge_results with jobid crashing - looking for insight
- #4620: Notebook with ? in title defies autosave, renaming and deletion.
- #4574: Hash character in notebook name breaks a lot of things
- #4709: input_prefilter hook not called
- #1680: qtconsole should support –no-banner and custom banner
- #4689: IOStream IP address configurable
- #4698: Missing "if __name__ == '__main__':" check in /usr/bin/ipython
- #4191: NBConvert: markdown inline and locally referenced files have incorrect file location for latex
- #2865: %%!? does not display the shell execute docstring
- #1551: Notebook should be saved before printing
- #4612: remove `Configurable.created` ?
- #4629: Lots of tests fail due to space in sys.executable
- #4644: Fixed URLs for notebooks
- #4621: IPython 1.1.0 Qtconsole syntax highlighting highlights python 2 only built-ins when using python 3
- #2923: Move Delete Button Away from Save Button in the HTML notebook toolbar
- #4615: UnicodeDecodeError
- #4431: ipython slow in os x mavericks?
- #4538: DOC: document how to change ipcontroller-engine.json in case controller was started with –ip="*"
- #4551: Serialize methods and closures

- #4081: [Nbconvert][reveal] link to font awesome ?
- #4602: "ipcluster stop" fails after "ipcluster start –daemonize" using python3.3
- #4578: NBconvert fails with unicode errors when `--stdout` and file redirection is specified and HTML entities are present
- #4600: Renaming new notebook to an exist name silently deletes the old one
- #4598: Qtconsole docstring pop-up fails on method containing defaulted enum argument
- #951: Remove Tornado monkeypatch
- #4564: Notebook save failure
- #4562: nbconvert: Default encoding problem on OS X
- #1675: add file_to_run=file.ipynb capability to the notebook
- #4516: `ipython console` doesn't send a `shutdown_request`
- #3043: can't restart pdb session in ipython
- #4524: Fix bug with non ascii passwords in notebook login
- #1866: problems rendering an SVG?
- #4520: unicode error when trying Audio('data/Bach Cello Suite #3.wav')
- #4493: Qtconsole cannot print an ISO8601 date at nanosecond precision
- #4502: intermittent parallel test failure test_purge_everything
- #4495: firefox 25.0: notebooks report "Notebook save failed", .py script save fails, but .ipynb save succeeds
- #4245: nbconvert latex: code highlighting causes error
- #4486: Test for whether inside virtualenv does not work if directory is symlinked
- #4485: Incorrect info in "Messaging in IPython" documentation.
- #4447: Ipcontroller broken in current HEAD on windows
- #4241: Audio display object
- #4463: Error on empty c.Session.key
- #4454: UnicodeDecodeError when starting Ipython notebook on a directory containing a file with a non-ascii character
- #3801: Autocompletion: Fix issue #3723 – ordering of completions for magic commands and variables with same name
- #3723: Code completion: 'matplotlib' and '%matplotlib'
- #4396: Always checkpoint al least once ?
- #2524: [Notebook] Clear kernel queue
- #2292: Client side tests for the notebook
- #4424: Dealing with images in multidirectory environment
- #4388: Make writing configurable magics easier
- #852: Notebook should be saved before downloading
- #3708: ipython profile locate should also work
- #1349: `?` may generate hundreds of cell

- #4381: Using hasattr for trait_names instead of just looking for it directly/using __dir__?
- #4361: Crash Ultratraceback/ session history
- #3044: IPython notebook autocomplete for filename string converts multiple spaces to a single space
- #3346: Up arrow history search shows duplicates in Qtconsole
- #3496: Fix import errors when running tests from the source directory
- #4114: If default profile doesn't exist, can't install mathjax to any location
- #4335: TestPylabSwitch.test_qt fails
- #4291: serve like option for nbconvert –to latex
- #1824: Exception before prompting for password during ssh connection
- #4309: Error in nbconvert - closing </code> tag is not inserted in HTML under some circumstances
- #4351: /parallel/apps/launcher.py error
- #3603: Upcoming issues with nbconvert
- #4296: sync_imports() fails in python 3.3
- #4339: local mathjax install doesn't work
- #4334: NotebookApp.webapp_settings static_url_prefix causes crash
- #4308: Error when use "ipython notebook" in win7 64 with python2.7.3 64.
- #4317: Relative imports broken in the notebook (Windows)
- #3658: Saving Notebook clears "Kernel Busy" status from the page and titlebar
- #4312: Link broken on ipython-doc stable
- #1093: Add boundary options to %load
- #3619: Multi-dir webservice design
- #4299: Nbconvert, default_preprocessors to list of dotted name not list of obj
- #3210: IPython.parallel tests seem to hang on ShiningPanda
- #4280: MathJax Automatic Line Breaking
- #4039: Celltoolbar example issue
- #4247: nbconvert –to latex: error when converting greek letter
- #4273: %%capture not capturing rich objects like plots (IPython 1.1.0)
- #3866: Vertical offsets in LaTeX output for nbconvert
- #3631: xkcd mode for the IPython notebook
- #4243: Test exclusions not working on Windows
- #4256: IPython no longer handles unicode file names
- #3656: Audio displayobject
- #4223: Double output on Ctrl-enter-enter
- #4184: nbconvert: use r pygmentize backend when highlighting "%%R" cells
- #3851: Adds an explicit newline for pretty-printing.
- #3622: Drop fakemodule

- #4122: Nbconvert [windows]: Inconsistent line endings in markdown cells exported to latex
- #3819: nbconvert add extra blank line to code block on Windows.
- #4203: remove spurious print statement from parallel annoted functions
- #4200: Notebook: merging a heading cell and markdown cell cannot be undone
- #3747: ipynb -> ipynb transformer
- #4024: nbconvert markdown issues
- #3903: on Windows, 'ipython3 nbconvert "C:/blabla/first_try.ipynb" –to slides' gives an unexpected result, and '–post serve' fails
- #4095: Catch js error in append html in stream/pyerr
- #1880: Add parallelism to test_pr
- #4085: nbconvert: Fix sphinx preprocessor date format string for Windows
- #4156: Specifying –gui=tk at the command line
- #4146: Having to prepend 'files/' to markdown image paths is confusing
- #3818: nbconvert can't handle Heading with Chinese characters on Japanese Windows OS.
- #4134: multi-line parser fails on '" in comment, qtconsole and notebook.
- #3998: sample custom.js needs to be updated
- #4078: StoreMagic.autorestore not working in 1.0.0
- #3990: Buitlin `input` doesn't work over zmq
- #4015: nbconvert fails to convert all the content of a notebook
- #4059: Issues with Ellipsis literal in Python 3
- #2310: "ZMQError: Interrupted system call" from RichIPythonWidget
- #3807: qtconsole ipython 0.13.2 - html/xhtml export fails
- #4103: Wrong default argument of DirectView.clear
- #4100: parallel.client.client references undefined error.EngineError
- #484: Drop nosepatch
- #3350: Added longlist support in ipdb.
- #1591: Keying 'q' doesn't quit the interactive help in Wins7
- #40: The tests in test_process fail under Windows
- #3744: capture rich output as well as stdout/err in capture_output
- #3742: %%capture to grab rich display outputs
- #3863: Added working speaker notes for slides.
- #4013: Iptest fails in dual python installation
- #4005: IPython.start_kernel doesn't work.
- #4020: IPython parallel map fails on numpy arrays
- #3914: nbconvert: Transformer tests
- #3923: nbconvert: Writer tests

- #3945: nbconvert: commandline tests fail Win7x64 Py3.3
- #3937: make tab visible in codemirror and light red background
- #3935: No feedback for mixed tabs and spaces
- #3933: nbconvert: Post-processor tests
- #3977: unable to complete remote connections for two-process
- #3939: minor checkpoint cleanup
- #3955: complete on % for magic in notebook
- #3954: all magics should be listed when completing on %
- #3980: nbconvert rst output lacks needed blank lines
- #3968: TypeError: super() argument 1 must be type, not classobj (Python 2.6.6)
- #3880: nbconvert: R&D remaining tests
- #2440: IPEP 4: Python 3 Compatibility

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

2.15 1.0 Series

2.15.1 Release 1.0.0: An Afternoon Hack

IPython 1.0 requires Python 2.6.5 or 3.2.1. It does not support Python 3.0, 3.1, or 2.5.

This is a big release. The principal milestone is the addition of `IPython.nbconvert`, but there has been a great deal of work improving all parts of IPython as well.

The previous version (0.13) was released on June 30, 2012, and in this development cycle we had:

- ~12 months of work.
- ~700 pull requests merged.
- ~600 issues closed (non-pull requests).
- contributions from ~150 authors.
- ~4000 commits.

The amount of work included in this release is so large that we can only cover here the main highlights; please see our *detailed release statistics* for links to every issue and pull request closed on GitHub as well as a full list of individual contributors. It includes

Reorganization

There have been two major reorganizations in IPython 1.0:

- Added `IPython.kernel` for all kernel-related code. This means that `IPython.zmq` has been removed, and much of it is now in `IPython.kernel.zmq`, some of it being in the top-level `IPython.kernel`.
- We have removed the `frontend` subpackage, as it caused unnecessary depth. So what was `IPython.frontend.qt` is now `IPython.qt`, and so on. The one difference is that the notebook has been further flattened, so that `IPython.frontend.html.notebook` is now just `IPython.html`. There is a shim module, so `IPython.frontend` is still importable in 1.0, but there will be a warning.
- The IPython sphinx directives are now installed in `IPython.sphinx`, so they can be imported by other projects.

Public APIs

For the first time since 0.10 (sorry, everyone), there is an official public API for starting IPython:

```
from IPython import start_ipython
start_ipython()
```

This is what packages should use that start their own IPython session, but don't actually want embedded IPython (most cases). `IPython.embed()` is used for embedding IPython into the calling namespace, similar to calling `Pdb.set_trace()`, whereas `start_ipython()` will start a plain IPython session, loading config and startup files as normal.

We also have added:

```
from IPython import get_ipython
```

Which is a *library* function for getting the current IPython instance, and will return `None` if no IPython instance is running. This is the official way to check whether your code is called from inside an IPython session. If you want to check for IPython without unnecessarily importing IPython, use this function:

```
def get_ipython():
    """return IPython instance if there is one, None otherwise"""
    import sys
    if "IPython" in sys.modules:
        import IPython
        return IPython.get_ipython()
```

Core

- The input transformation framework has been reworked. This fixes some corner cases, and adds more flexibility for projects which use IPython, like SymPy & SAGE. For more details, see *Custom input transformation*.
- Exception types can now be displayed with a custom traceback, by defining a `_render_traceback_()` method which returns a list of strings, each containing one line of the traceback.
- A new command, `ipython history trim` can be used to delete everything but the last 1000 entries in the history database.
- `__file__` is defined in both config files at load time, and `.ipy` files executed with `%run`.
- `%logstart` and `%logappend` are no longer broken.
- Add glob expansion for `%run`, e.g. `%run -g script.py *.txt`.

- Expand variables (`$foo`) in Cell Magic argument line.
- By default, **`iptest`** will exclude various slow tests. All tests can be run with **`iptest --all`**.
- SQLite history can be disabled in the various cases that it does not behave well.
- `%edit` works on interactively defined variables.
- editor hooks have been restored from quarantine, enabling TextMate as editor, etc.
- The env variable PYTHONSTARTUP is respected by IPython.
- The `%matplotlib` magic was added, which is like the old `%pylab` magic, but it does not import anything to the interactive namespace. It is recommended that users switch to `%matplotlib` and explicit imports.
- The `--matplotlib` command line flag was also added. It invokes the new `%matplotlib` magic and can be used in the same way as the old `--pylab` flag. You can either use it by itself as a flag (`--matplotlib`), or you can also pass a backend explicitly (`--matplotlib qt` or `--matplotlib=wx`, etc).

Backwards incompatible changes

- Calling `InteractiveShell.prefilter()` will no longer perform static transformations - the processing of escaped commands such as `%magic` and `!system`, and stripping input prompts from code blocks. This functionality was duplicated in *`IPython.core.inputsplitter`*, and the latter version was already what IPython relied on. A new API to transform input will be ready before release.
- Functions from *`IPython.lib.inputhook`* to control integration with GUI event loops are no longer exposed in the top level of `IPython.lib`. Code calling these should make sure to import them from *`IPython.lib.inputhook`*.
- For all kernel managers, the `sub_channel` attribute has been renamed to `iopub_channel`.
- Users on Python versions before 2.6.6, 2.7.1 or 3.2 will now need to call `IPython.utils.doctestreload.doctest_reload()` to make doctests run correctly inside IPython. Python releases since those versions are unaffected. For details, see PR #3068 and Python issue 8048.
- The `InteractiveShell.cache_main_mod()` method has been removed, and *`new_main_mod()`* has a different signature, expecting a filename where earlier versions expected a namespace. See PR #3555 for details.
- The short-lived plugin system has been removed. Extensions are the way to go.

NbConvert

The major milestone for IPython 1.0 is the addition of `IPython.nbconvert` - tools for converting IPython notebooks to various other formats.

Warning: nbconvert is α-level preview code in 1.0

To use nbconvert to convert various file formats:

```
ipython nbconvert --to html *.ipynb
```

See `ipython nbconvert --help` for more information. nbconvert depends on pandoc for many of the translations to and from various formats.

Notebook

Major changes to the IPython Notebook in 1.0:

- The notebook is now autosaved, by default at an interval of two minutes. When you press 'save' or Ctrl-S, a *checkpoint* is made, in a hidden folder. This checkpoint can be restored, so that the autosave model is strictly safer than traditional save. If you change nothing about your save habits, you will always have a checkpoint that you have written, and an autosaved file that is kept up to date.
- The notebook supports `raw_input()` / `input()`, and thus also `%debug`, and many other Python calls that expect user input.
- You can load custom javascript and CSS in the notebook by editing the files `$(ipython locate profile)/static/custom/custom.`*js*`,`*css*.
- Add `%%html`, `%%svg`, `%%javascript`, and `%%latex` cell magics for writing raw output in notebook cells.
- add a redirect handler and anchors on heading cells, so you can link across notebooks, directly to heading cells in other notebooks.
- Images support width and height metadata, and thereby 2x scaling (retina support).
- `_repr_foo_` methods can return a tuple of (data, metadata), where metadata is a dict containing metadata about the displayed object. This is used to set size, etc. for retina graphics. To enable retina matplotlib figures, simply set `InlineBackend.figure_format = 'retina'` for 2x PNG figures, in your *IPython config file* or via the `%config` magic.
- Add display.FileLink and FileLinks for quickly displaying HTML links to local files.
- Cells have metadata, which can be edited via cell toolbars. This metadata can be used by external code (e.g. reveal.js or exporters), when examining the notebook.
- Fix an issue parsing LaTeX in markdown cells, which required users to type `\\\`, instead of `\\`.
- Notebook templates are rendered with Jinja instead of Tornado.
- `%%file` has been renamed `%%writefile` (`%%file` is deprecated).
- ANSI (and VT100) color parsing has been improved in both performance and supported values.
- The static files path can be found as `IPython.html.DEFAULT_STATIC_FILES_PATH`, which may be changed by package managers.
- IPython's CSS is installed in `static/css/style.min.css` (all style, including bootstrap), and `static/css/ipython.min.css`, which only has IPython's own CSS. The latter file should be useful for embedding IPython notebooks in other pages, blogs, etc.
- The Print View has been removed. Users are encouraged to test *ipython nbconvert* to generate a static view.

Javascript Components

The javascript components used in the notebook have been updated significantly.

- updates to jQuery (2.0) and jQueryUI (1.10)
- Update CodeMirror to 3.14
- Twitter Bootstrap (2.3) for layout
- Font-Awesome (3.1) for icons
- highlight.js (7.3) for syntax highlighting
- marked (0.2.8) for markdown rendering

- require.js (2.1) for loading javascript

Some relevant changes that are results of this:

- Markdown cells now support GitHub-flavored Markdown (GFM), which includes ```` ```python ```` code blocks and tables.
- Notebook UI behaves better on more screen sizes.
- Various code cell input issues have been fixed.

Kernel

The kernel code has been substantially reorganized.

New features in the kernel:

- Kernels support ZeroMQ IPC transport, not just TCP
- The message protocol has added a top-level metadata field, used for information about messages.
- Add a `data_pub` message that functions much like `display_pub`, but publishes raw (usually pickled) data, rather than representations.
- Ensure that `sys.stdout.encoding` is defined in Kernels.
- Stdout from forked subprocesses should be forwarded to frontends (instead of crashing).

IPEP 13

The KernelManager has been split into a `KernelManager` and a `KernelClient`. The Manager owns a kernel and starts / signals / restarts it. There is always zero or one KernelManager per Kernel. Clients communicate with Kernels via zmq channels, and there can be zero-to-many Clients connected to a Kernel at any given time.

The KernelManager now automatically restarts the kernel when it dies, rather than requiring user input at the notebook or QtConsole UI (which may or may not exist at restart time).

In-process kernels

The Python-language frontends, particularly the Qt console, may now communicate with in-process kernels, in addition to the traditional out-of-process kernels. An in-process kernel permits direct access to the kernel namespace, which is necessary in some applications. It should be understood, however, that the in-process kernel is not robust to bad user input and will block the main (GUI) thread while executing. Developers must decide on a case-by-case basis whether this tradeoff is appropriate for their application.

Parallel

IPython.parallel has had some refactoring as well. There are many improvements and fixes, but these are the major changes:

- Connections have been simplified. All ports and the serialization in use are written to the connection file, rather than the initial two-stage system.
- Serialization has been rewritten, fixing many bugs and dramatically improving performance serializing large containers.
- Load-balancing scheduler performance with large numbers of tasks has been dramatically improved.

- There should be fewer (hopefully zero) false-positives for engine failures.
- Increased compatibility with various use cases that produced serialization / argument errors with map, etc.
- The controller can attempt to resume operation if it has crashed, by passing `ipcontroller --restore`.
- Engines can monitor the Hub heartbeat, and shutdown if the Hub disappears for too long.
- add HTCondor support in launchers

QtConsole

Various fixes, including improved performance with lots of text output, and better drag and drop support. The initial window size of the qtconsole is now configurable via `IPythonWidget.width` and `IPythonWidget.height`.

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If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

2.16 Issues closed in the 1.0 development cycle

2.16.1 Issues closed in 1.2

GitHub stats for 2013/09/09 - 2014/02/21

These lists are automatically generated, and may be incomplete or contain duplicates.

The following 13 authors contributed 84 commits.

- Benjamin Ragan-Kelley
- Daryl Herzmann
- Doug Blank
- Fernando Perez
- James Porter
- Juergen Hasch
- Julian Taylor
- Kyle Kelley
- Lawrence Fu
- Matthias Bussonnier
- Paul Ivanov
- Pascal Schetelat

- Puneeth Chaganti
- Takeshi Kanmae
- Thomas Kluyver

We closed a total of 55 issues, 38 pull requests and 17 regular issues; this is the full list (generated with the script `tools/github_stats.py`):

Pull Requests (38):

1.2.1:

- PR #4372: Don't assume that SyntaxTB is always called with a SyntaxError
- PR #5166: remove mktemp usage
- PR #5163: Simplify implementation of TemporaryWorkingDirectory.
- PR #5105: add index to format to support py2.6

1.2.0:

- PR #4972: Work around problem in doctest discovery in Python 3.4 with PyQt
- PR #4934: `ipython profile create` respects `--ipython-dir`
- PR #4845: Add Origin Checking.
- PR #4928: use importlib.machinery when available
- PR #4849: Various unicode fixes (mostly on Windows)
- PR #4880: set profile name from profile_dir
- PR #4908: detect builtin docstrings in oinspect
- PR #4909: sort dictionary keys before comparison, ordering is not guaranteed
- PR #4903: use https for all embeds
- PR #4868: Static path fixes
- PR #4820: fix regex for cleaning old logs with ipcluster
- PR #4840: Error in Session.send_raw()
- PR #4762: whitelist alphanumeric characters for cookie_name
- PR #4748: fix race condition in profiledir creation.
- PR #4720: never use ssh multiplexer in tunnels
- PR #4738: don't inject help into user_ns
- PR #4722: allow purging local results as long as they are not outstanding
- PR #4668: Make non-ASCII docstring unicode
- PR #4639: Minor import fix to get qtconsole with –pylab=qt working
- PR #4453: Play nice with App Nap
- PR #4609: Fix bytes regex for Python 3.
- PR #4488: fix typo in message spec doc
- PR #4346: getpass() on Windows & Python 2 needs bytes prompt
- PR #4230: Switch correctly to the user's default matplotlib backend after inline.

- PR #4214: engine ID metadata should be unicode, not bytes
- PR #4232: no highlight if no language specified
- PR #4218: Fix display of SyntaxError when .py file is modified
- PR #4217: avoid importing numpy at the module level
- PR #4213: fixed dead link in examples/notebooks readme to Part 3
- PR #4183: ESC should be handled by CM if tooltip is not on
- PR #4193: Update for #3549: Append Firefox overflow-x fix
- PR #4205: use TextIOWrapper when communicating with pandoc subprocess
- PR #4204: remove some extraneous print statements from IPython.parallel
- PR #4201: HeadingCells cannot be split or merged

1.2.1:

- #5101: IPython 1.2.0: notebook fail with "500 Internal Server Error"

1.2.0:

- #4892: IPython.qt test failure with python3.4
- #4810: ipcluster bug in clean_logs flag
- #4765: missing build script for highlight.js
- #4761: ipv6 address triggers cookie exception
- #4721: purge_results with jobid crashing - looking for insight
- #4602: "ipcluster stop" fails after "ipcluster start –daemonize" using python3.3
- #3386: Magic %paste not working in Python 3.3.2. TypeError: Type str doesn't support the buffer API
- #4485: Incorrect info in "Messaging in IPython" documentation.
- #4351: /parallel/apps/launcher.py error
- #4334: NotebookApp.webapp_settings static_url_prefix causes crash
- #4039: Celltoolbar example issue
- #4256: IPython no longer handles unicode file names
- #4122: Nbconvert [windows]: Inconsistent line endings in markdown cells exported to latex
- #3819: nbconvert add extra blank line to code block on Windows.
- #4203: remove spurious print statement from parallel annoted functions
- #4200: Notebook: merging a heading cell and markdown cell cannot be undone

2.16.2 Issues closed in 1.1

GitHub stats for 2013/08/08 - 2013/09/09 (since 1.0)

These lists are automatically generated, and may be incomplete or contain duplicates.

The following 25 authors contributed 337 commits.

- Benjamin Ragan-Kelley
- Bing Xia

- Bradley M. Froehle
- Brian E. Granger
- Damián Avila
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- Matthew Brett
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- Pankaj Pandey
- Paul Ivanov
- rossant
- Samuel Ainsworth
- Stephan Rave
- stonebig
- Thomas Kluyver
- Yaroslav Halchenko
- Zachary Sailer

We closed a total of 76 issues, 58 pull requests and 18 regular issues; this is the full list (generated with the script `tools/github_stats.py`):

Pull Requests (58):

- PR #4188: Allow user_ns trait to be None
- PR #4189: always fire LOCAL_IPS.extend(PUBLIC_IPS)
- PR #4174: various issues in markdown and rst templates
- PR #4178: add missing data_javascript
- PR #4181: nbconvert: Fix, sphinx template not removing new lines from headers
- PR #4043: don't 'restore_bytes' in from_JSON
- PR #4163: Fix for incorrect default encoding on Windows.
- PR #4136: catch javascript errors in any output
- PR #4171: add nbconvert config file when creating profiles
- PR #4125: Basic exercise of `ipython [subcommand] -h` and help-all

- PR #4085: nbconvert: Fix sphinx preprocessor date format string for Windows
- PR #4159: don't split `.cell` and `div.cell` CSS
- PR #4158: generate choices for `--gui` configurable from real mapping
- PR #4065: do not include specific css in embedable one
- PR #4092: nbconvert: Fix for unicode html headers, Windows + Python 2.x
- PR #4074: close Client sockets if connection fails
- PR #4064: Store default codemirror mode in only 1 place
- PR #4104: Add way to install MathJax to a particular profile
- PR #4144: help_end transformer shouldn't pick up ? in multiline string
- PR #4143: update example custom.js
- PR #4142: DOC: unwrap openssl line in public_server doc
- PR #4141: add files with a separate `add` call in backport_pr
- PR #4137: Restore autorestore option for storemagic
- PR #4098: pass profile-dir instead of profile name to Kernel
- PR #4120: support `input` in Python 2 kernels
- PR #4088: nbconvert: Fix coalescestreams line with incorrect nesting causing strange behavior
- PR #4060: only strip continuation prompts if regular prompts seen first
- PR #4132: Fixed name error bug in function safe_unicode in module py3compat.
- PR #4121: move test_kernel from IPython.zmq to IPython.kernel
- PR #4118: ZMQ heartbeat channel: catch EINTR exceptions and continue.
- PR #4054: use unicode for HTML export
- PR #4106: fix a couple of default block values
- PR #4115: Update docs on declaring a magic function
- PR #4101: restore accidentally removed EngineError
- PR #4096: minor docs changes
- PR #4056: respect `pylab_import_all` when `--pylab` specified at the command-line
- PR #4091: Make Qt console banner configurable
- PR #4086: fix missing errno import
- PR #4030: exclude `.git` in MANIFEST.in
- PR #4047: Use istype() when checking if canned object is a dict
- PR #4031: don't close_fds on Windows
- PR #4029: bson.Binary moved
- PR #4035: Fixed custom jinja2 templates being ignored when setting template_path
- PR #4026: small doc fix in nbconvert
- PR #4016: Fix IPython.start_* functions
- PR #4021: Fix parallel.client.View map() on numpy arrays

- PR #4022: DOC: fix links to matplotlib, notebook docs
- PR #4018: Fix warning when running IPython.kernel tests
- PR #4019: Test skipping without unicode paths
- PR #4008: Transform code before %prun/%%prun runs
- PR #4014: Fix typo in ipapp
- PR #3987: get files list in backport_pr
- PR #3974: nbconvert: Fix app tests on Window7 w/ Python 3.3
- PR #3978: fix `--existing` with non-localhost IP
- PR #3939: minor checkpoint cleanup
- PR #3981: BF: fix nbconvert rst input prompt spacing
- PR #3960: Don't make sphinx a dependency for importing nbconvert
- PR #3973: logging.Formatter is not new-style in 2.6

Issues (18):

- #4024: nbconvert markdown issues
- #4095: Catch js error in append html in stream/pyerr
- #4156: Specifying –gui=tk at the command line
- #3818: nbconvert can't handle Heading with Chinese characters on Japanese Windows OS.
- #4134: multi-line parser fails on '" in comment, qtconsole and notebook.
- #3998: sample custom.js needs to be updated
- #4078: StoreMagic.autorestore not working in 1.0.0
- #3990: Buitlin `input` doesn't work over zmq
- #4015: nbconvert fails to convert all the content of a notebook
- #4059: Issues with Ellipsis literal in Python 3
- #4103: Wrong default argument of DirectView.clear
- #4100: parallel.client.client references undefined error.EngineError
- #4005: IPython.start_kernel doesn't work.
- #4020: IPython parallel map fails on numpy arrays
- #3945: nbconvert: commandline tests fail Win7x64 Py3.3
- #3977: unable to complete remote connections for two-process
- #3980: nbconvert rst output lacks needed blank lines
- #3968: TypeError: super() argument 1 must be type, not classobj (Python 2.6.6)

2.16.3 Issues closed in 1.0

GitHub stats for 2012/06/30 - 2013/08/08 (since 0.13)

These lists are automatically generated, and may be incomplete or contain duplicates.

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- Yoav Ram
- Zbigniew Jędrzejewski-Szmek
- Zoltán Vörös

We closed a total of 1484 issues, 793 pull requests and 691 regular issues; this is the full list (generated with the script `tools/github_stats.py`):

Pull Requests (793):

- PR #3958: doc update
- PR #3965: Fix ansi color code for background yellow
- PR #3964: Fix casing of message.
- PR #3942: Pass on install docs
- PR #3962: exclude IPython.lib.kernel in iptest
- PR #3961: Longpath test fix
- PR #3905: Remove references to 0.11 and 0.12 from config/overview.rst
- PR #3951: nbconvert: fixed latex characters not escaped properly in nbconvert
- PR #3949: log fatal error when PDF conversion fails
- PR #3947: nbconvert: Make writer & post-processor aliases case insensitive.
- PR #3938: Recompile css.
- PR #3948: sphinx and PDF tweaks
- PR #3943: nbconvert: Serve post-processor Windows fix
- PR #3934: nbconvert: fix logic of verbose flag in PDF post processor
- PR #3929: swallow enter event in rename dialog
- PR #3924: nbconvert: Backport fixes
- PR #3925: Replace –pylab flag with –matplotlib in usage
- PR #3910: Added explicit error message for missing configuration arguments.
- PR #3913: grffile to support spaces in notebook names
- PR #3918: added check_for_tornado, closes #3916
- PR #3917: change docs/examples refs to be just examples
- PR #3908: what's new tweaks
- PR #3896: two column quickhelp dialog, closes #3895

- PR #3911: explicitly load python mode before IPython mode
- PR #3901: don't force . relative path, fix #3897
- PR #3891: fix #3889
- PR #3892: Fix documentation of Kernel.stop_channels
- PR #3888: posixify paths for Windows latex
- PR #3882: quick fix for #3881
- PR #3877: don't use `shell=True` in PDF export
- PR #3878: minor template loading cleanup
- PR #3855: nbconvert: Filter tests
- PR #3879: finish 3870
- PR #3870: Fix for converting notebooks that contain unicode characters.
- PR #3876: Update parallel_winhpc.rst
- PR #3872: removing vim-ipython, since it has it's own repo
- PR #3871: updating docs
- PR #3873: remove old examples
- PR #3868: update CodeMirror component to 3.15
- PR #3865: Escape filename for pdflatex in nbconvert
- PR #3861: remove old external.js
- PR #3864: add keyboard shortcut to docs
- PR #3834: This PR fixes a few issues with nbconvert tests
- PR #3840: prevent profile_dir from being undefined
- PR #3859: Add "An Afternoon Hack" to docs
- PR #3854: Catch errors filling readline history on startup
- PR #3857: Delete extra auto
- PR #3845: nbconvert: Serve from original build directory
- PR #3846: Add basic logging to nbconvert
- PR #3850: add missing store_history key to Notebook execute_requests
- PR #3844: update payload source
- PR #3830: mention metadata / display_data similarity in pyout spec
- PR #3848: fix incorrect `empty-docstring`
- PR #3836: Parse markdown correctly when mathjax is disabled
- PR #3849: skip a failing test on windows
- PR #3828: signature_scheme lives in Session
- PR #3831: update nbconvert doc with new CLI
- PR #3822: add output flag to nbconvert
- PR #3780: Added serving the output directory if html-based format are selected.

- PR #3764: Cleanup nbconvert templates
- PR #3829: remove now-duplicate 'this is dev' note
- PR #3814: add `ConsoleWidget.execute_on_complete_input` flag
- PR #3826: try rtfd
- PR #3821: add sphinx prolog
- PR #3817: relax timeouts in terminal console and tests
- PR #3825: fix more tests that fail when pandoc is missing
- PR #3824: don't set target on internal markdown links
- PR #3816: s/pylab/matplotlib in docs
- PR #3812: Describe differences between start_ipython and embed
- PR #3805: Print View has been removed
- PR #3820: Make it clear that 1.0 is not released yet
- PR #3784: nbconvert: Export flavors & PDF writer (ipy dev meeting)
- PR #3800: semantic-versionify version number for non-releases
- PR #3802: Documentation .txt to .rst
- PR #3765: cleanup terminal console iopub handling
- PR #3720: Fix for #3719
- PR #3787: re-raise KeyboardInterrupt in raw_input
- PR #3770: Organizing reveal's templates.
- PR #3751: Use link(2) when possible in nbconvert
- PR #3792: skip tests that require pandoc
- PR #3782: add Importing Notebooks example
- PR #3752: nbconvert: Add cwd to sys.path
- PR #3789: fix raw_input in qtconsole
- PR #3756: document the wire protocol
- PR #3749: convert IPython syntax to Python syntax in nbconvert python template
- PR #3793: Closes #3788
- PR #3794: Change logo link to ipython.org
- PR #3746: Raise a named exception when pandoc is missing
- PR #3781: comply with the message spec in the notebook
- PR #3779: remove bad `if logged_in` preventing new-notebook without login
- PR #3743: remove notebook read-only view
- PR #3732: add delay to autosave in beforeunload
- PR #3761: Added rm_math_space to markdown cells in the basichtml.tpl to be rendered ok by mathjax after the nbconvertion.
- PR #3758: nbconvert: Filter names cleanup

- PR #3769: Add configurability to tabcompletion timeout
- PR #3771: Update px pylab test to match new output of pylab
- PR #3741: better message when notebook format is not supported
- PR #3753: document Ctrl-C not working in ipython kernel
- PR #3766: handle empty metadata in pyout messages more gracefully.
- PR #3736: my attempt to fix #3735
- PR #3759: nbconvert: Provide a more useful error for invalid use case.
- PR #3760: nbconvert: Allow notebook filenames without their extensions
- PR #3750: nbconvert: Add cwd to default templates search path.
- PR #3748: Update nbconvert docs
- PR #3734: Nbconvert: Export extracted files into `nbname_files` subdirectory
- PR #3733: Nicer message when pandoc is missing, closes #3730
- PR #3722: fix two failing test in IPython.lib
- PR #3704: Start what's new for 1.0
- PR #3705: Complete rewrite of IPython Notebook documentation: docs/source/interactive/htmlnotebook.txt
- PR #3709: Docs cleanup
- PR #3716: raw_input fixes for kernel restarts
- PR #3683: use `%matplotlib` in example notebooks
- PR #3686: remove quarantine
- PR #3699: svg2pdf unicode fix
- PR #3695: fix SVG2PDF
- PR #3685: fix Pager.detach
- PR #3675: document new dependencies
- PR #3690: Fixing some css minors in full_html and reveal.
- PR #3671: nbconvert tests
- PR #3692: Fix rename notebook - show error with invalid name
- PR #3409: Prevent qtconsole frontend freeze on lots of output.
- PR #3660: refocus active cell on dialog close
- PR #3598: Statelessify mathjaxutils
- PR #3673: enable comment/uncomment selection
- PR #3677: remove special-case in get_home_dir for frozen dists
- PR #3674: add CONTRIBUTING.md
- PR #3670: use Popen command list for ipexec
- PR #3568: pylab import adjustments
- PR #3559: add create.Cell and delete.Cell js events
- PR #3606: push cell magic to the head of the transformer line

- PR #3607: NbConvert: Writers, No YAML, and stuff…
- PR #3665: Pywin32 skips
- PR #3669: set default client_class for QtKernelManager
- PR #3662: add strip_encoding_cookie transformer
- PR #3641: increase patience for slow kernel startup in tests
- PR #3651: remove a bunch of unused `default_config_file` assignments
- PR #3630: CSS adjustments
- PR #3645: Don't require HistoryManager to have a shell
- PR #3643: don't assume tested ipython is on the PATH
- PR #3654: fix single-result AsyncResults
- PR #3601: Markdown in heading cells (take 2)
- PR #3652: Remove old `docs/examples`
- PR #3621: catch any exception appending output
- PR #3585: don't blacklist builtin names
- PR #3647: Fix `frontend` deprecation warnings in several examples
- PR #3649: fix AsyncResult.get_dict for single result
- PR #3648: Fix store magic test
- PR #3650: Fix, config_file_name was ignored
- PR #3640: Gcf.get_active() can return None
- PR #3571: Added shorcuts to split cell, merge cell above and merge cell below.
- PR #3635: Added missing slash to print-pdf call.
- PR #3487: Drop patch for compatibility with pyreadline 1.5
- PR #3338: Allow filename with extension in find_cmd in Windows.
- PR #3628: Fix test for Python 3 on Windows.
- PR #3642: Fix typo in docs
- PR #3627: use DEFAULT_STATIC_FILES_PATH in a test instead of package dir
- PR #3624: fix some unicode in zmqhandlers
- PR #3460: Set calling program to UNKNOWN, when argv not in sys
- PR #3632: Set calling program to UNKNOWN, when argv not in sys (take #2)
- PR #3629: Use new entry point for python -m IPython
- PR #3626: passing cell to showInPager, closes #3625
- PR #3618: expand terminal color support
- PR #3623: raise UsageError for unsupported GUI backends
- PR #3071: Add magic function %drun to run code in debugger
- PR #3608: a nicer error message when using %pylab magic
- PR #3592: add extra_config_file

- PR #3612: updated .mailmap
- PR #3616: Add examples for interactive use of MPI.
- PR #3615: fix regular expression for ANSI escapes
- PR #3586: Corrected a typo in the format string for strftime the sphinx.py transformer of nbconvert
- PR #3611: check for markdown no longer needed, closes #3610
- PR #3555: Simplify caching of modules with %run
- PR #3583: notebook small things
- PR #3594: Fix duplicate completion in notebook
- PR #3600: parallel: Improved logging for errors during BatchSystemLauncher.stop
- PR #3595: Revert "allow markdown in heading cells"
- PR #3538: add IPython.start_ipython
- PR #3562: Allow custom nbconvert template loaders
- PR #3582: pandoc adjustments
- PR #3560: Remove max_msg_size
- PR #3591: Refer to Setuptools instead of Distribute
- PR #3590: IPython.sphinxext needs an __init__.py
- PR #3581: Added the possibility to read a custom.css file for tweaking the final html in full_html and reveal templates.
- PR #3576: Added support for markdown in heading cells when they are nbconverted.
- PR #3575: tweak `run -d` message to 'continue execution'
- PR #3569: add PYTHONSTARTUP to startup files
- PR #3567: Trigger a single event on js app initialized
- PR #3565: style.min.css should always exist…
- PR #3531: allow markdown in heading cells
- PR #3577: Simplify codemirror ipython-mode
- PR #3495: Simplified regexp, and suggestions for clearer regexps.
- PR #3578: Use adjustbox to specify figure size in nbconvert -> latex
- PR #3572: Skip import irunner test on Windows.
- PR #3574: correct static path for CM modes autoload
- PR #3558: Add IPython.sphinxext
- PR #3561: mention double-control-C to stop notebook server
- PR #3566: fix event names
- PR #3564: Remove trivial nbconvert example
- PR #3540: allow cython cache dir to be deleted
- PR #3527: cleanup stale, unused exceptions in parallel.error
- PR #3529: ensure raw_input returns str in zmq shell

- PR #3541: respect image size metadata in qtconsole
- PR #3550: Fixing issue preventing the correct read of images by full_html and reveal exporters.
- PR #3557: open markdown links in new tabs
- PR #3556: remove mention of nonexistent `_margv` in macro
- PR #3552: set overflow-x: hidden on Firefox only
- PR #3554: Fix missing import os in latex exporter.
- PR #3546: Don't hardcode **latex** posix paths in nbconvert
- PR #3551: fix path prefix in nbconvert
- PR #3533: Use a CDN to get reveal.js library.
- PR #3498: When a notebook is written to file, name the metadata name u''.
- PR #3548: Change to standard save icon in Notebook toolbar
- PR #3539: Don't hardcode posix paths in nbconvert
- PR #3508: notebook supports raw_input and %debug now
- PR #3526: ensure 'default' is first in cluster profile list
- PR #3525: basic timezone info
- PR #3532: include nbconvert templates in installation
- PR #3515: update CodeMirror component to 3.14
- PR #3513: add 'No Checkpoints' to Revert menu
- PR #3536: format positions are required in Python 2.6.x
- PR #3521: Nbconvert fix, silent fail if template doesn't exist
- PR #3530: update %store magic docstring
- PR #3528: fix local mathjax with custom base_project_url
- PR #3518: Clear up unused imports
- PR #3506: %store -r restores saved aliases and directory history, as well as variables
- PR #3516: make css highlight style configurable
- PR #3523: Exclude frontend shim from docs build
- PR #3514: use bootstrap `disabled` instead of `ui-state-disabled`
- PR #3520: Added relative import of RevealExporter to __init__.py inside exporters module
- PR #3507: fix HTML capitalization in nbconvert exporter classes
- PR #3512: fix nbconvert filter validation
- PR #3511: Get Tracer working after ipapi.get replaced with get_ipython
- PR #3510: use `window.onbeforeunload=` for nav-away warning
- PR #3504: don't use parent=self in handlers
- PR #3500: Merge nbconvert into IPython
- PR #3478: restore "unsaved changes" warning on unload
- PR #3493: add a dialog when the kernel is auto-restarted

- PR #3488: Add test suite for autoreload extension
- PR #3484: Catch some pathological cases inside oinspect
- PR #3481: Display R errors without Python traceback
- PR #3468: fix `%magic` output
- PR #3430: add parent to Configurable
- PR #3491: Remove unexpected keyword parameter to remove_kernel
- PR #3485: SymPy has changed its recommended way to initialize printing
- PR #3486: Add test for non-ascii characters in docstrings
- PR #3483: Inputtransformer: Allow classic prompts without space
- PR #3482: Use an absolute path to iptest, because the tests are not always run from $IPYTHONDIR.
- PR #3381: enable 2x (retina) display
- PR #3450: Flatten IPython.frontend
- PR #3477: pass config to subapps
- PR #3466: Kernel fails to start when username has non-ascii characters
- PR #3465: Add HTCondor bindings to IPython.parallel
- PR #3463: fix typo, closes #3462
- PR #3456: Notice for users who disable javascript
- PR #3453: fix cell execution in firefox, closes #3447
- PR #3393: [WIP] bootstrapify
- PR #3440: Fix installing mathjax from downloaded file via command line
- PR #3431: Provide means for starting the Qt console maximized and with the menu bar hidden
- PR #3425: base IPClusterApp inherits from BaseIPythonApp
- PR #3433: Update IPythonexternalpath__init__.py
- PR #3298: Some fixes in IPython Sphinx directive
- PR #3428: process escapes in mathjax
- PR #3420: thansk -> thanks
- PR #3416: Fix doc: “principle” not “principal”
- PR #3413: more unique filename for test
- PR #3364: Inject requirejs in notebook and start using it.
- PR #3390: Fix %paste with blank lines
- PR #3403: fix creating config objects from dicts
- PR #3401: rollback #3358
- PR #3373: make cookie_secret configurable
- PR #3307: switch default ws_url logic to js side
- PR #3392: Restore anchor link on h2-h6
- PR #3369: Use different threshold for (auto)scroll in output

- PR #3370: normalize unicode notebook filenames
- PR #3372: base default cookie name on request host+port
- PR #3378: disable CodeMirror drag/drop on Safari
- PR #3358: workaround spurious CodeMirror scrollbars
- PR #3371: make setting the notebook dirty flag an event
- PR #3366: remove long-dead zmq frontend.py and completer.py
- PR #3382: cull Session digest history
- PR #3330: Fix get_ipython_dir when $HOME is /
- PR #3319: IPEP 13: user-expressions and user-variables
- PR #3384: comments in tools/gitwash_dumper.py changed (“” to “”“)
- PR #3387: Make submodule checks work under Python 3.
- PR #3357: move anchor-link off of heading text
- PR #3351: start basic tests of ipcluster Launchers
- PR #3377: allow class.__module__ to be None
- PR #3340: skip submodule check in package managers
- PR #3328: decode subprocess output in launchers
- PR #3368: Reenable bracket matching
- PR #3356: Mpr fixes
- PR #3336: Use new input transformation API in %time magic
- PR #3325: Organize the JS and less files by component.
- PR #3342: fix test_find_cmd_python
- PR #3354: catch socket.error in utils.localinterfaces
- PR #3341: fix default cluster count
- PR #3286: don’t use `get_ipython` from builtins in library code
- PR #3333: notebookapp: add missing whitespace to warnings
- PR #3323: Strip prompts even if the prompt isn’t present on the first line.
- PR #3321: Reorganize the python/server side of the notebook
- PR #3320: define `__file__` in config files
- PR #3317: rename `%%file` to `%%writefile`
- PR #3304: set unlimited HWM for all relay devices
- PR #3315: Update Sympy_printing extension load
- PR #3310: further clarify Image docstring
- PR #3285: load extensions in builtin trap
- PR #3308: Speed up AsyncResult._wait_for_outputs(0)
- PR #3294: fix callbacks as optional in js kernel.execute
- PR #3276: Fix: “python ABS/PATH/TO/ipython.py” fails

- PR #3301: allow python3 tests without python installed
- PR #3282: allow view.map to work with a few more things
- PR #3284: remove `ipython.py` entry point
- PR #3281: fix ignored IOPub messages with no parent
- PR #3275: improve submodule messages / git hooks
- PR #3239: Allow "x" icon and esc key to close pager in notebook
- PR #3290: Improved heartbeat controller to engine monitoring for long running tasks
- PR #3142: Better error message when CWD doesn't exist on startup
- PR #3066: Add support for relative import to %run -m (fixes #2727)
- PR #3269: protect highlight.js against unknown languages
- PR #3267: add missing return
- PR #3101: use marked / highlight.js instead of pagedown and prettify
- PR #3264: use https url for submodule
- PR #3263: fix set_last_checkpoint when no checkpoint
- PR #3258: Fix submodule location in setup.py
- PR #3254: fix a few URLs from previous PR
- PR #3240: remove js components from the repo
- PR #3158: IPEP 15: autosave the notebook
- PR #3252: move images out of _static folder into _images
- PR #3251: Fix for cell magics in Qt console
- PR #3250: Added a simple __html__() method to the HTML class
- PR #3249: remove copy of sphinx inheritance_diagram.py
- PR #3235: Remove the unused print notebook view
- PR #3238: Improve the design of the tab completion UI
- PR #3242: Make changes of Application.log_format effective
- PR #3219: Workaround so only one CTRL-C is required for a new prompt in –gui=qt
- PR #3190: allow formatters to specify metadata
- PR #3231: improve discovery of public IPs
- PR #3233: check prefixes for swallowing kernel args
- PR #3234: Removing old autogrow JS code.
- PR #3232: Update to CodeMirror 3 and start to ship our components
- PR #3229: The HTML output type accidentally got removed from the OutputArea.
- PR #3228: Typo in IPython.Parallel documentation
- PR #3226: Text in rename dialog was way too big - making it <p>.
- PR #3225: Removing old restuctured text handler and web service.
- PR #3222: make BlockingKernelClient the default Client

- PR #3223: add missing mathjax_url to new settings dict
- PR #3089: add stdin to the notebook
- PR #3221: Remove references to HTMLCell (dead code)
- PR #3205: add ignored `*args` to HasTraits constructor
- PR #3088: cleanup IPython handler settings
- PR #3201: use much faster regexp for ansi coloring
- PR #3220: avoid race condition in profile creation
- PR #3011: IPEP 12: add KernelClient
- PR #3217: informative error when trying to load directories
- PR #3174: Simple class
- PR #2979: CM configurable Take 2
- PR #3215: Updates storemagic extension to allow for specifying variable name to load
- PR #3181: backport If-Modified-Since fix from tornado
- PR #3200: IFrame (VimeoVideo, ScribdDocument, . . .)
- PR #3186: Fix small inconsistency in nbconvert: etype -> ename
- PR #3212: Fix issue #2563, "core.profiledir.check_startup_dir() doesn't work inside py2exe'd installation"
- PR #3211: Fix inheritance_diagram Sphinx extension for Sphinx 1.2
- PR #3208: Update link to extensions index
- PR #3203: Separate InputSplitter for transforming whole cells
- PR #3189: Improve completer
- PR #3194: finish up PR #3116
- PR #3188: Add new keycodes
- PR #2695: Key the root modules cache by sys.path entries.
- PR #3182: clarify %%file docstring
- PR #3163: BUG: Fix the set and frozenset pretty printer to handle the empty case correctly
- PR #3180: better UsageError for cell magic with no body
- PR #3184: Cython cache
- PR #3175: Added missing s
- PR #3173: Little bits of documentation cleanup
- PR #2635: Improve Windows start menu shortcuts (#2)
- PR #3172: Add missing import in IPython parallel magics example
- PR #3170: default application logger shouldn't propagate
- PR #3159: Autocompletion for zsh
- PR #3105: move DEFAULT_STATIC_FILES_PATH to IPython.html
- PR #3144: minor bower tweaks
- PR #3141: Default color output for ls on OSX

- PR #3137: fix dot syntax error in inheritance diagram
- PR #3072: raise UnsupportedOperation on iostream.fileno()
- PR #3147: Notebook support for a reverse proxy which handles SSL
- PR #3152: make qtconsole size at startup configurable
- PR #3162: adding stream kwarg to current.new_output
- PR #2981: IPEP 10: kernel side filtering of display formats
- PR #3058: add redirect handler for notebooks by name
- PR #3041: support non-modules in @require
- PR #2447: Stateful line transformers
- PR #3108: fix some O(N) and O(N^2) operations in parallel.map
- PR #2791: forward stdout from forked processes
- PR #3157: use Python 3-style for pretty-printed sets
- PR #3148: closes #3045, #3123 for tornado < version 3.0
- PR #3143: minor heading-link tweaks
- PR #3136: Strip useless ANSI escape codes in notebook
- PR #3126: Prevent errors when pressing arrow keys in an empty notebook
- PR #3135: quick dev installation instructions
- PR #2889: Push pandas dataframes to R magic
- PR #3068: Don't monkeypatch doctest during IPython startup.
- PR #3133: fix argparse version check
- PR #3102: set `spellcheck=false` in CodeCell inputarea
- PR #3064: add anchors to heading cells
- PR #3097: PyQt 4.10: use self._document = self.document()
- PR #3117: propagate automagic change to shell
- PR #3118: don't give up on weird os names
- PR #3115: Fix example
- PR #2640: fix quarantine/ipy_editors.py
- PR #3070: Add info make target that was missing in old Sphinx
- PR #3082: A few small patches to image handling
- PR #3078: fix regular expression for detecting links in stdout
- PR #3054: restore default behavior for automatic cluster size
- PR #3073: fix ipython usage text
- PR #3083: fix DisplayMagics.html docstring
- PR #3080: noted sub_channel being renamed to iopub_channel
- PR #3079: actually use IPKernelApp.kernel_class
- PR #3076: Improve notebook.js documentation

- PR #3063: add missing `%%html` magic
- PR #3075: check for SIGUSR1 before using it, closes #3074
- PR #3051: add width:100% to vbox for webkit / FF consistency
- PR #2999: increase registration timeout
- PR #2997: fix DictDB default size limit
- PR #3033: on resume, print server info again
- PR #3062: test double pyximport
- PR #3046: cast kernel cwd to bytes on Python 2 on Windows
- PR #3038: remove xml from notebook magic docstrings
- PR #3032: fix time format to international time format
- PR #3022: Fix test for Windows
- PR #3024: changed instances of 'outout' to 'output' in alt texts
- PR #3013: py3 workaround for reload in cythonmagic
- PR #2961: time magic: shorten unnecessary output on windows
- PR #2987: fix local files examples in markdown
- PR #2998: fix css in .output_area pre
- PR #3003: add $include /etc/inputrc to suggested ~/.inputrc
- PR #2957: Refactor qt import logic. Fixes #2955
- PR #2994: expanduser on %%file targets
- PR #2983: fix run-all (that-> this)
- PR #2964: fix count when testing composite error output
- PR #2967: shows entire session history when only startsess is given
- PR #2942: Move CM IPython theme out of codemirror folder
- PR #2929: Cleanup cell insertion
- PR #2933: Minordocupdate
- PR #2968: fix notebook deletion.
- PR #2966: Added assert msg to extract_hist_ranges()
- PR #2959: Add command to trim the history database.
- PR #2681: Don't enable pylab mode, when matplotlib is not importable
- PR #2901: Fix inputhook_wx on osx
- PR #2871: truncate potentially long CompositeErrors
- PR #2951: use istype on lists/tuples
- PR #2946: fix qtconsole history logic for end-of-line
- PR #2954: fix logic for append_javascript
- PR #2941: fix baseUrl
- PR #2903: Specify toggle value on cell line number

- PR #2911: display order in output area configurable
- PR #2897: Don't rely on BaseProjectUrl data in body tag
- PR #2894: Cm configurable
- PR #2927: next release will be 1.0
- PR #2932: Simplify using notebook static files from external code
- PR #2915: added small config section to notebook docs page
- PR #2924: safe_run_module: Silence SystemExit codes 0 and None.
- PR #2906: Unpatch/Monkey patch CM
- PR #2921: add menu item for undo delete cell
- PR #2917: Don't add logging handler if one already exists.
- PR #2910: Respect DB_IP and DB_PORT in mongodb tests
- PR #2926: Don't die if stderr/stdout do not support set_parent() #2925
- PR #2885: get monospace pager back
- PR #2876: fix celltoolbar layout on FF
- PR #2904: Skip remaining IPC test on Windows
- PR #2908: fix last remaining KernelApp reference
- PR #2905: fix a few remaining KernelApp/IPKernelApp changes
- PR #2900: Don't assume test case for %time will finish in 0 time
- PR #2893: exclude fabfile from tests
- PR #2884: Correct import for kernelmanager on Windows
- PR #2882: Utils cleanup
- PR #2883: Don't call ast.fix_missing_locations unless the AST could have been modified
- PR #2855: time(it) magic: Implement minutes/hour formatting and "%%time" cell magic
- PR #2874: Empty cell warnings
- PR #2819: tweak history prefix search (up/^p) in qtconsole
- PR #2868: Import performance
- PR #2877: minor css fixes
- PR #2880: update examples docs with kernel move
- PR #2878: Pass host environment on to kernel
- PR #2599: func_kw_complete for builtin and cython with embededsignature=True using docstring
- PR #2792: Add key "unique" to history_request protocol
- PR #2872: fix payload keys
- PR #2869: Fixing styling of toolbar selects on FF.
- PR #2708: Less css
- PR #2854: Move kernel code into IPython.kernel
- PR #2864: Fix %run -t -N<N> TypeError

- PR #2852: future pyzmq compatibility
- PR #2863: whatsnew/version0.9.txt: Fix '~./ipython' -> '~/.ipython' typo
- PR #2861: add missing KernelManager to ConsoleApp class list
- PR #2850: Consolidate host IP detection in utils.localinterfaces
- PR #2859: Correct docstring of ipython.py
- PR #2831: avoid string version comparisons in external.qt
- PR #2844: this should address the failure in #2732
- PR #2849: utils/data: Use list comprehension for uniq_stable()
- PR #2839: add jinja to install docs / setup.py
- PR #2841: Miscellaneous docs fixes
- PR #2811: Still more KernelManager cleanup
- PR #2820: add '=' to greedy completer delims
- PR #2818: log user tracebacks in the kernel (INFO-level)
- PR #2828: Clean up notebook Javascript
- PR #2829: avoid comparison error in dictdb hub history
- PR #2830: BUG: Opening parenthesis after non-callable raises ValueError
- PR #2718: try to fallback to pysqlite2.dbapi2 as sqlite3 in core.history
- PR #2816: in %edit, don't save "last_call" unless last call succeeded
- PR #2817: change ol format order
- PR #2537: Organize example notebooks
- PR #2815: update release/authors
- PR #2808: improve patience for slow Hub in client tests
- PR #2812: remove nonfunctional `-la` short arg in cython magic
- PR #2810: remove dead utils.upgradedir
- PR #1671: __future__ environments
- PR #2804: skip ipc tests on Windows
- PR #2789: Fixing styling issues with CellToolbar.
- PR #2805: fix KeyError creating ZMQStreams in notebook
- PR #2775: General cleanup of kernel manager code.
- PR #2340: Initial Code to reduce parallel.Client caching
- PR #2799: Exit code
- PR #2800: use `type(obj) is cls` as switch when canning
- PR #2801: Fix a breakpoint bug
- PR #2795: Remove outdated code from extensions.autoreload
- PR #2796: P3K: fix cookie parsing under Python 3.x (+ duplicate import is removed)
- PR #2724: In-process kernel support (take 3)

- PR #2687: [WIP] Metaui slideshow
- PR #2788: Chrome frame awareness
- PR #2649: Add version_request/reply messaging protocol
- PR #2753: add `%%px --local` for local execution
- PR #2783: Prefilter shouldn't touch execution_count
- PR #2333: UI For Metadata
- PR #2396: create a ipynbv3 json schema and a validator
- PR #2757: check for complete pyside presence before trying to import
- PR #2782: Allow the %run magic with '-b' to specify a file.
- PR #2778: P3K: fix DeprecationWarning under Python 3.x
- PR #2776: remove non-functional View.kill method
- PR #2755: can interactively defined classes
- PR #2774: Removing unused code in the notebook MappingKernelManager.
- PR #2773: Fixed minor typo causing AttributeError to be thrown.
- PR #2609: Add 'unique' option to history_request messaging protocol
- PR #2769: Allow shutdown when no engines are registered
- PR #2766: Define __file__ when we %edit a real file.
- PR #2476: allow %edit <variable> to work when interactively defined
- PR #2763: Reset readline delimiters after loading rmagic.
- PR #2460: Better handling of `__file__` when running scripts.
- PR #2617: Fix for `units` argument. Adds a `res` argument.
- PR #2738: Unicode content crashes the pager (console)
- PR #2749: Tell Travis CI to test on Python 3.3 as well
- PR #2744: Don't show 'try %paste' message while using magics
- PR #2728: shift tab for tooltip
- PR #2741: Add note to `%cython` Black-Scholes example warning of missing erf.
- PR #2743: BUG: Octavemagic inline plots not working on Windows: Fixed
- PR #2740: Following #2737 this error is now a name error
- PR #2737: Rmagic: error message when moving an non-existant variable from python to R
- PR #2723: diverse fixes for project url
- PR #2731: %Rpush: Look for variables in the local scope first.
- PR #2544: Infinite loop when multiple debuggers have been attached.
- PR #2726: Add qthelp docs creation
- PR #2730: added blockquote CSS
- PR #2729: Fix Read the doc build, Again
- PR #2446: [alternate 2267] Offline mathjax

- PR #2716: remove unexisting headings level
- PR #2717: One liner to fix debugger printing stack traces when lines of context are larger than source.
- PR #2713: Doc bugfix: user_ns is not an attribute of Magic objects.
- PR #2690: Fix 'import '... completion for py3 & egg files.
- PR #2691: Document OpenMP in %%cython magic
- PR #2699: fix jinja2 rendering for password protected notebooks
- PR #2700: Skip notebook testing if jinja2 is not available.
- PR #2692: Add %%cython magics to generated documentation.
- PR #2685: Fix pretty print of types when __`module`__ is not available.
- PR #2686: Fix tox.ini
- PR #2604: Backslashes are misinterpreted as escape-sequences by the R-interpreter.
- PR #2689: fix error in doc (arg->kwarg) and pep-8
- PR #2683: for downloads, replaced window.open with window.location.assign
- PR #2659: small bugs in js are fixed
- PR #2363: Refactor notebook templates to use Jinja2
- PR #2662: qtconsole: wrap argument list in tooltip to match width of text body
- PR #2328: addition of classes to generate a link or list of links from files local to the IPython HTML notebook
- PR #2668: pylab_not_importable: Catch all exceptions, not just RuntimeErrors.
- PR #2663: Fix issue #2660: parsing of help and version arguments
- PR #2656: Fix irunner tests when $PYTHONSTARTUP is set
- PR #2312: Add bracket matching to code cells in notebook
- PR #2571: Start to document Javascript
- PR #2641: undefinied that -> this
- PR #2638: Fix %paste in Python 3 on Mac
- PR #2301: Ast transfomers
- PR #2616: Revamp API docs
- PR #2572: Make 'Paste Above' the default paste behavior.
- PR #2574: Fix #2244
- PR #2582: Fix displaying history when output cache is disabled.
- PR #2591: Fix for Issue #2584
- PR #2526: Don't kill paramiko tunnels when receiving ^C
- PR #2559: Add psource, pfile, pinfo2 commands to ipdb.
- PR #2546: use 4 Pythons to build 4 Windows installers
- PR #2561: Fix display of plain text containing multiple carriage returns before line feed
- PR #2549: Add a simple 'undo' for cell deletion.
- PR #2525: Add event to kernel execution/shell reply.

- PR #2554: Avoid stopping in ipdb until we reach the main script.
- PR #2404: Option to limit search result in history magic command
- PR #2294: inputhook_qt4: Use QEventLoop instead of starting up the QCoreApplication
- PR #2233: Refactored Drag and Drop Support in Qt Console
- PR #1747: switch between hsplit and vsplit paging (request for feedback)
- PR #2530: Adding time offsets to the video
- PR #2542: Allow starting IPython as `python -m IPython`.
- PR #2534: Do not unescape backslashes in Windows (shellglob)
- PR #2517: Improved MathJax, bug fixes
- PR #2511: trigger default remote_profile_dir when profile_dir is set
- PR #2491: color is supported in ironpython
- PR #2462: Track which extensions are loaded
- PR #2464: Locate URLs in text output and convert them to hyperlinks.
- PR #2490: add ZMQInteractiveShell to IPEngineApp class list
- PR #2498: Don't catch tab press when something selected
- PR #2527: Run All Above and Run All Below
- PR #2513: add GitHub uploads to release script
- PR #2529: Windows aware tests for shellglob
- PR #2478: Fix doctest_run_option_parser for Windows
- PR #2519: clear In[ ] prompt numbers again
- PR #2467: Clickable links
- PR #2500: Add `encoding` attribute to `OutStream` class.
- PR #2349: ENH: added StackExchange-style MathJax filtering
- PR #2503: Fix traceback handling of SyntaxErrors without line numbers.
- PR #2492: add missing 'qtconsole' extras_require
- PR #2480: Add deprecation warnings for sympyprinting
- PR #2334: Make the ipengine monitor the ipcontroller heartbeat and die if the ipcontroller goes down
- PR #2479: use new _winapi instead of removed _subprocess
- PR #2474: fix bootstrap name conflicts
- PR #2469: Treat __init__.pyc same as __init__.py in module_list
- PR #2165: Add -g option to %run to glob expand arguments
- PR #2468: Tell git to ignore __pycache__ directories.
- PR #2421: Some notebook tweaks.
- PR #2291: Remove old plugin system
- PR #2127: Ability to build toolbar in JS
- PR #2445: changes for ironpython

- PR #2420: Pass ipython_dir to __init__() method of TerminalInteractiveShell's superclass.
- PR #2432: Revert #1831, the `__file__` injection in safe_execfile / safe_execfile_ipy.
- PR #2216: Autochange highlight with cell magics
- PR #1946: Add image message handler in ZMQTerminalInteractiveShell
- PR #2424: skip find_cmd when setting up script magics
- PR #2389: Catch sqlite DatabaseErrors in more places when reading the history database
- PR #2395: Don't catch ImportError when trying to unpack module functions
- PR #1868: enable IPC transport for kernels
- PR #2437: don't let log cleanup prevent engine start
- PR #2441: `sys.maxsize` is the maximum length of a container.
- PR #2442: allow iptest to be interrupted
- PR #2240: fix message built for engine dying during task
- PR #2369: Block until kernel termination after sending a kill signal
- PR #2439: Py3k: Octal (0777 -> 0o777)
- PR #2326: Detachable pager in notebook.
- PR #2377: Fix installation of man pages in Python 3
- PR #2407: add IPython version to message headers
- PR #2408: Fix Issue #2366
- PR #2405: clarify TaskScheduler.hwm doc
- PR #2399: IndentationError display
- PR #2400: Add scroll_to_cell(cell_number) to the notebook
- PR #2401: unmock read-the-docs modules
- PR #2311: always perform requested trait assignments
- PR #2393: New option `n` to limit history search hits
- PR #2386: Adapt inline backend to changes in matplotlib
- PR #2392: Remove suspicious double quote
- PR #2387: Added -L library search path to cythonmagic cell magic
- PR #2370: qtconsole: Create a prompt newline by inserting a new block (w/o formatting)
- PR #1715: Fix for #1688, traceback-unicode issue
- PR #2378: use Singleton.instance() for embed() instead of manual global
- PR #2373: fix missing imports in core.interactiveshell
- PR #2368: remove notification widget leftover
- PR #2327: Parallel: Support get/set of nested objects in view (e.g. dv['a.b'])
- PR #2362: Clean up ProgressBar class in example notebook
- PR #2346: Extra xterm identification in set_term_title
- PR #2352: Notebook: Store the username in a cookie whose name is unique.

- PR #2358: add backport_pr to tools
- PR #2365: fix names of notebooks for download/save
- PR #2364: make clients use 'location' properly (fixes #2361)
- PR #2354: Refactor notebook templates to use Jinja2
- PR #2339: add bash completion example
- PR #2345: Remove references to 'version' no longer in argparse. Github issue #2343.
- PR #2347: adjust division error message checking to account for Python 3
- PR #2305: RemoteError._render_traceback_ calls self.render_traceback
- PR #2338: Normalize line endings for ipexec_validate, fix for #2315.
- PR #2192: Introduce Notification Area
- PR #2329: Better error messages for common magic commands.
- PR #2337: ENH: added StackExchange-style MathJax filtering
- PR #2331: update css for qtconsole in doc
- PR #2317: adding cluster_id to parallel.Client.__init__
- PR #2130: Add -l option to %R magic to allow passing in of local namespace
- PR #2196: Fix for bad command line argument to latex
- PR #2300: bug fix: was crashing when sqlite3 is not installed
- PR #2184: Expose store_history to execute_request messages.
- PR #2308: Add welcome_message option to enable_pylab
- PR #2302: Fix variable expansion on 'self'
- PR #2299: Remove code from prefilter that duplicates functionality in inputsplitter
- PR #2295: allow pip install from github repository directly
- PR #2280: fix SSH passwordless check for OpenSSH
- PR #2290: nbmanager
- PR #2288: s/assertEquals/assertEqual (again)
- PR #2287: Removed outdated dev docs.
- PR #2218: Use redirect for new notebooks
- PR #2277: nb: up/down arrow keys move to begin/end of line at top/bottom of cell
- PR #2045: Refactoring notebook managers and adding Azure backed storage.
- PR #2271: use display instead of send_figure in inline backend hooks
- PR #2278: allow disabling SQLite history
- PR #2225: Add "–annotate" option to `%%cython` magic.
- PR #2246: serialize individual args/kwargs rather than the containers
- PR #2274: CLN: Use name to id mapping of notebooks instead of searching.
- PR #2270: SSHLauncher tweaks
- PR #2269: add missing location when disambiguating controller IP

- PR #2263: Allow docs to build on http://readthedocs.io/
- PR #2256: Adding data publication example notebook.
- PR #2255: better flush iopub with AsyncResults
- PR #2261: Fix: longest_substr([]) -> ‘’
- PR #2260: fix mpr again
- PR #2242: Document globbing in `%history -g <pattern>`.
- PR #2250: fix html in notebook example
- PR #2245: Fix regression in embed() from pull-request #2096.
- PR #2248: track sha of master in test_pr messages
- PR #2238: Fast tests
- PR #2211: add data publication message
- PR #2236: minor test_pr tweaks
- PR #2231: Improve Image format validation and add html width,height
- PR #2232: Reapply monkeypatch to inspect.findsource()
- PR #2235: remove spurious print statement from setupbase.py
- PR #2222: adjust how canning deals with import strings
- PR #2224: fix css typo
- PR #2223: Custom tracebacks
- PR #2214: use KernelApp.exec_lines/files in IPEngineApp
- PR #2199: Wrap JS published by %%javascript in try/catch
- PR #2212: catch errors in markdown javascript
- PR #2190: Update code mirror 2.22 to 2.32
- PR #2200: documentation build broken in bb429da5b
- PR #2194: clean nan/inf in json_clean
- PR #2198: fix mpr for earlier git version
- PR #2175: add FileFindHandler for Notebook static files
- PR #1990: can func_defaults
- PR #2069: start improving serialization in parallel code
- PR #2202: Create a unique & temporary IPYTHONDIR for each testing group.
- PR #2204: Work around lack of os.kill in win32.
- PR #2148: win32 iptest: Use subprocess.Popen() instead of os.system().
- PR #2179: Pylab switch
- PR #2124: Add an API for registering magic aliases.
- PR #2169: ipdb: pdef, pdoc, pinfo magics all broken
- PR #2174: Ensure consistent indentation in `%magic`.
- PR #1930: add size-limiting to the DictDB backend

- PR #2189: Fix IPython.lib.latextools for Python 3
- PR #2186: removed references to h5py dependence in octave magic documentation
- PR #2183: Include the kernel object in the event object passed to kernel events
- PR #2185: added test for %store, fixed storemagic
- PR #2138: Use breqn.sty in dvipng backend if possible
- PR #2182: handle undefined param in notebooklist
- PR #1831: fix #1814 set __file__ when running .ipy files
- PR #2051: Add a metadata attribute to messages
- PR #1471: simplify IPython.parallel connections and enable Controller Resume
- PR #2181: add %%javascript, %%svg, and %%latex display magics
- PR #2116: different images in 00_notebook-tour
- PR #2092: %prun: Restore `stats.stream` after running `print_stream`.
- PR #2159: show message on notebook list if server is unreachable
- PR #2176: fix git mpr
- PR #2152: [qtconsole] Namespace not empty at startup
- PR #2177: remove numpy install from travis/tox scripts
- PR #2090: New keybinding for code cell execution + cell insertion
- PR #2160: Updating the parallel options pricing example
- PR #2168: expand line in cell magics
- PR #2170: Fix tab completion with IPython.embed_kernel().
- PR #2096: embed(): Default to the future compiler flags of the calling frame.
- PR #2163: fix 'remote_profie_dir' typo in SSH launchers
- PR #2158: [2to3 compat] Tuple params in func defs
- PR #2089: Fix unittest DeprecationWarnings
- PR #2142: Refactor test_pr.py
- PR #2140: 2to3: Apply `has_key` fixer.
- PR #2131: Add option append (-a) to %save
- PR #2117: use explicit url in notebook example
- PR #2133: Tell git that `*.py` files contain Python code, for use in word-diffs.
- PR #2134: Apply 2to3 `next` fix.
- PR #2126: ipcluster broken with any batch launcher (PBS/LSF/SGE)
- PR #2104: Windows make file for Sphinx documentation
- PR #2074: Make BG color of inline plot configurable
- PR #2123: BUG: Look up the `_repr_pretty_` method on the class within the MRO rath…
- PR #2100: [in progress] python 2 and 3 compatibility without 2to3, second try
- PR #2128: open notebook copy in different tabs

- PR #2073: allows password and prefix for notebook
- PR #1993: Print View
- PR #2086: re-aliad %ed to %edit in qtconsole
- PR #2110: Fixes and improvements to the input splitter
- PR #2101: fix completer deletting newline
- PR #2102: Fix logging on interactive shell.
- PR #2088: Fix (some) Python 3.2 ResourceWarnings
- PR #2064: conform to pep 3110
- PR #2076: Skip notebook 'static' dir in test suite.
- PR #2063: Remove umlauts so py3 installations on LANG=C systems succeed.
- PR #2068: record sysinfo in sdist
- PR #2067: update tools/release_windows.py
- PR #2065: Fix parentheses typo
- PR #2062: Remove duplicates and auto-generated files from repo.
- PR #2061: use explicit tuple in exception
- PR #2060: change minus to - or (hy in manpages

Issues (691):

- #3940: Install process documentation overhaul
- #3946: The PDF option for `--post` should work with lowercase
- #3957: Notebook help page broken in Firefox
- #3894: nbconvert test failure
- #3887: 1.0.0a1 shows blank screen in both firefox and chrome (windows 7)
- #3703: `nbconvert`: Output options – names and documentation
- #3931: Tab completion not working during debugging in the notebook
- #3936: Ipcluster plugin is not working with Ipython 1.0dev
- #3941: IPython Notebook kernel crash on Win7x64
- #3926: Ending Notebook renaming dialog with return creates new-line
- #3932: Incorrect empty docstring
- #3928: Passing variables to script from the workspace
- #3774: Notebooks with spaces in their names breaks nbconvert latex graphics
- #3916: tornado needs its own check
- #3915: Link to Parallel examples "found on GitHub" broken in docs
- #3895: Keyboard shortcuts box in notebook doesn't fit the screen
- #3912: IPython.utils fails automated test for RC1 1.0.0
- #3636: Code cell missing highlight on load

- #3897: under Windows, “ipython3 nbconvert “C:/blabla/first_try.ipynb” –to latex –post PDF” POST processing action fails because of a bad parameter
- #3900: python3 install syntax errors (OS X 10.8.4)
- #3899: nbconvert to latex fails on notebooks with spaces in file name
- #3881: Temporary Working Directory Test Fails
- #2750: A way to freeze code cells in the notebook
- #3893: Resize Local Image Files in Notebook doesn’t work
- #3823: nbconvert on windows: tex and paths
- #3885: under Windows, “ipython3 nbconvert “C:/blabla/first_try.ipynb” –to latex” write “” instead of “/” to reference file path in the .tex file
- #3889: test_qt fails due to assertion error ‘qt4’ != ‘qt’
- #3890: double post, disregard this issue
- #3689: nbconvert, remaining tests
- #3874: Up/Down keys don’t work to “Search previous command history” (besides Ctrl-p/Ctrl-n)
- #3853: CodeMirror locks up in the notebook
- #3862: can only connect to an ipcluster started with v1.0.0-dev (master branch) using an older ipython (v0.13.2), but cannot connect using ipython (v1.0.0-dev)
- #3869: custom css not working.
- #2960: Keyboard shortcuts
- #3795: ipcontroller process goes to 100% CPU, ignores connection requests
- #3553: Ipython and pylab crashes in windows and canopy
- #3837: Cannot set custom mathjax url, crash notebook server.
- #3808: “Naming” releases ?
- #2431: TypeError: must be string without null bytes, not str
- #3856: `?` at end of comment causes line to execute
- #3731: nbconvert: add logging for the different steps of nbconvert
- #3835: Markdown cells do not render correctly when mathjax is disabled
- #3843: nbconvert to rst: leftover “In[ ]”
- #3799: nbconvert: Ability to specify name of output file
- #3726: Document when IPython.start_ipython() should be used versus IPython.embed()
- #3778: Add no more readonly view in what’s new
- #3754: No Print View in Notebook in 1.0dev
- #3798: IPython 0.12.1 Crashes on autocompleting sqlalchemy.func.row_number properties
- #3811: Opening notebook directly from the command line with multi-directory support installed
- #3775: Annoying behavior when clicking on cell after execution (Ctrl+Enter)
- #3809: Possible to add some bpython features?
- #3810: Printing the contents of an image file messes up shell text

- #3702: `nbconvert`: Default help message should be that of –help
- #3735: Nbconvert 1.0.0a1 does not take into account the pdf extensions in graphs
- #3719: Bad strftime format, for windows, in nbconvert exporter
- #3786: Zmq errors appearing with `Ctrl-C` in console/qtconsole
- #3019: disappearing scrollbar on tooltip in Chrome 24 on Ubuntu 12.04
- #3785: ipdb completely broken in Qt console
- #3796: Document the meaning of milestone/issues-tags for users.
- #3788: Do not auto show tooltip if docstring empty.
- #1366: [Web page] No link to front page from documentation
- #3739: nbconvert (to slideshow) misses some of the math in markdown cells
- #3768: increase and make timeout configurable in console completion.
- #3724: ipcluster only running on one cpu
- #1592: better message for unsupported nbformat
- #2049: Can not stop "ipython kernel" on windows
- #3757: Need direct entry point to given notebook
- #3745: ImportError: cannot import name check_linecache_ipython
- #3701: `nbconvert`: Final output file should be in same directory as input file
- #3738: history -o works but history with -n produces identical results
- #3740: error when attempting to run 'make' in docs directory
- #3737: ipython nbconvert crashes with ValueError: Invalid format string.
- #3730: nbconvert: unhelpful error when pandoc isn't installed
- #3718: markdown cell cursor misaligned in notebook
- #3710: multiple input fields for %debug in the notebook after resetting the kernel
- #3713: PyCharm has problems with IPython working inside PyPy created by virtualenv
- #3712: Code completion: Complete on dictionary keys
- #3680: –pylab and –matplotlib flag
- #3698: nbconvert: Unicode error with minus sign
- #3693: nbconvert does not process SVGs into PDFs
- #3688: nbconvert, figures not extracting with Python 3.x
- #3542: note new dependencies in docs / setup.py
- #2556: [pagedown] do not target_blank anchor link
- #3684: bad message when %pylab fails due import *other* than matplotlib
- #3682: ipython notebook pylab inline import_all=False
- #3596: MathjaxUtils race condition?
- #1540: Comment/uncomment selection in notebook
- #2702: frozen setup: permission denied for default ipython_dir

- #3672: allow_none on Number-like traits.
- #2411: add CONTRIBUTING.md
- #481: IPython terminal issue with Qt4Agg on XP SP3
- #2664: How to preserve user variables from import clashing?
- #3436: enable_pylab(import_all=False) still imports np
- #2630: lib.pylabtools.figsize : NameError when using Qt4Agg backend and %pylab magic.
- #3154: Notebook: no event triggered when a Cell is created
- #3579: Nbconvert: SVG are not transformed to PDF anymore
- #3604: MathJax rendering problem in `%%latex` cell
- #3668: AttributeError: 'BlockingKernelClient' object has no attribute 'started_channels'
- #3245: SyntaxError: encoding declaration in Unicode string
- #3639: %pylab inline in IPYTHON notebook throws "RuntimeError: Cannot activate multiple GUI eventloops"
- #3663: frontend deprecation warnings
- #3661: run -m not behaving like python -m
- #3597: re-do PR #3531 - allow markdown in Header cell
- #3053: Markdown in header cells is not rendered
- #3655: IPython finding its way into pasted strings.
- #3620: uncaught errors in HTML output
- #3646: get_dict() error
- #3004: `%load_ext rmagic` fails when legacy ipy_user_conf.py is installed (in ipython 0.13.1 / OSX 10.8)
- #3638: setp() issue in ipython notebook with figure references
- #3634: nbconvert reveal to pdf conversion ignores styling, prints only a single page.
- #1307: Remove pyreadline workarounds, we now require pyreadline >= 1.7.1
- #3316: find_cmd test failure on Windows
- #3494: input() in notebook doesn't work in Python 3
- #3427: Deprecate `$` as mathjax delimiter
- #3625: Pager does not open from button
- #3149: Miscellaneous small nbconvert feedback
- #3617: 256 color escapes support
- #3609: %pylab inline blows up for single process ipython
- #2934: Publish the Interactive MPI Demo Notebook
- #3614: ansi escapes broken in master (ls –color)
- #3610: If you don't have markdown, python setup.py install says no pygments
- #3547: %run modules clobber each other
- #3602: import_item fails when one tries to use DottedObjectName instead of a string
- #3563: Duplicate tab completions in the notebook

- #3599: Problems trying to run IPython on python3 without installing…
- #2937: too long completion in notebook
- #3479: Write empty name for the notebooks
- #3505: nbconvert: Failure in specifying user filter
- #1537: think a bit about namespaces
- #3124: Long multiline strings in Notebook
- #3464: run -d message unclear
- #2706: IPython 0.13.1 ignoring $PYTHONSTARTUP
- #3587: LaTeX escaping bug in nbconvert when exporting to HTML
- #3213: Long running notebook died with a coredump
- #3580: Running ipython with pypy on windows
- #3573: custom.js not working
- #3544: IPython.lib test failure on Windows
- #3352: Install Sphinx extensions
- #2971: [notebook]user needs to press ctrl-c twice to stop notebook server should be put into terminal window
- #2413: ipython3 qtconsole fails to install: ipython 0.13 has no such extra feature 'qtconsole'
- #2618: documentation is incorrect for install process
- #2595: mac 10.8 qtconsole export history
- #2586: cannot store aliases
- #2714: ipython qtconsole print unittest messages in console instead his own window.
- #2669: cython magic failing to work with openmp.
- #3256: Vagrant pandas instance of IPython Notebook does not respect additional plotting arguments
- #3010: cython magic fail if cache dir is deleted while in session
- #2044: prune unused names from parallel.error
- #1145: Online help utility broken in QtConsole
- #3439: Markdown links no longer open in new window (with change from pagedown to marked)
- #3476: _margv for macros seems to be missing
- #3499: Add reveal.js library (version 2.4.0) inside IPython
- #2771: Wiki Migration to GitHub
- #2887: ipcontroller purging some engines during connect
- #626: Enable Resuming Controller
- #2824: Kernel restarting after message "Kernel XXXX failed to respond to heartbeat"
- #2823: %%cython magic gives ImportError: dlopen(long_file_name.so, 2): image not found
- #2891: In IPython for Python 3, system site-packages comes before user site-packages
- #2928: Add magic "watch" function (example)
- #2931: Problem rendering pandas dataframe in Firefox for Windows

- #2939: [notebook] Figure legend not shown in inline backend if ouside the box of the axes
- #2972: [notebook] in Markdown mode, press Enter key at the end of <some http link>, the next line is indented unexpectly
- #3069: Instructions for installing IPython notebook on Windows
- #3444: Encoding problem: cannot use if user's name is not ascii?
- #3335: Reenable bracket matching
- #3386: Magic %paste not working in Python 3.3.2. TypeError: Type str doesn't support the buffer API
- #3543: Exception shutting down kernel from notebook dashboard (0.13.1)
- #3549: Codecell size changes with selection
- #3445: Adding newlines in %%latex cell
- #3237: [notebook] Can't close a notebook without errors
- #2916: colon invokes auto(un)indent in markdown cells
- #2167: Indent and dedent in htmlnotebook
- #3545: Notebook save button icon not clear
- #3534: nbconvert incompatible with Windows?
- #3489: Update example notebook that raw_input is allowed
- #3396: Notebook checkpoint time is displayed an hour out
- #3261: Empty revert to checkpoint menu if no checkpoint…
- #2984: "print" magic does not work in Python 3
- #3524: Issues with pyzmq and ipython on EPD update
- #2434: %store magic not auto-restoring
- #2720: base_url and static path
- #2234: Update various low resolution graphics for retina displays
- #2842: Remember passwords for pw-protected notebooks
- #3244: qtconsole: ValueError('close_fds is not supported on Windows platforms if you redirect stdin/stdout/stderr',)
- #2215: AsyncResult.wait(0) can hang waiting for the client to get results?
- #2268: provide mean to retrieve static data path
- #1905: Expose UI for worksheets within each notebook
- #2380: Qt inputhook prevents modal dialog boxes from displaying
- #3185: prettify on double //
- #2821: Test failure: IPython.parallel.tests.test_client.test_resubmit_header
- #2475: [Notebook] Line is deindented when typing eg a colon in markdown mode
- #2470: Do not destroy valid notebooks
- #860: Allow the standalone export of a notebook to HTML
- #2652: notebook with qt backend crashes at save image location popup
- #1587: Improve kernel restarting in the notebook

- #2710: Saving a plot in Mac OS X backend crashes IPython
- #2596: notebook "Last saved:" is misleading on file opening.
- #2671: TypeError :NoneType when executed "ipython qtconsole" in windows console
- #2703: Notebook scrolling breaks after pager is shown
- #2803: KernelManager and KernelClient should be two separate objects
- #2693: TerminalIPythonApp configuration fails without ipython_config.py
- #2531: IPython 0.13.1 python 2 32-bit installer includes 64-bit ipython*.exe launchers in the scripts folder
- #2520: Control-C kills port forwarding
- #2279: Setting `__file__` to None breaks Mayavi import
- #2161: When logged into notebook, long titles are incorrectly positioned
- #1292: Notebook, Print view should not be editable…
- #1731: test parallel launchers
- #3227: Improve documentation of ipcontroller and possible BUG
- #2896: IPController very unstable
- #3517: documentation build broken in head
- #3522: UnicodeDecodeError: 'ascii' codec can't decode byte on Pycharm on Windows
- #3448: Please include MathJax fonts with IPython Notebook
- #3519: IPython Parallel map mysteriously turns pandas Series into numpy ndarray
- #3345: IPython embedded shells ask if I want to exit, but I set confirm_exit = False
- #3509: IPython won't close without asking "Are you sure?" in Firefox
- #3471: Notebook jinja2/markupsafe dependencies in manual
- #3502: Notebook broken in master
- #3302: autoreload does not work in ipython 0.13.x, python 3.3
- #3475: no warning when leaving/closing notebook on master without saved changes
- #3490: No obvious feedback when kernel crashes
- #1912: Move all autoreload tests to their own group
- #2577: sh.py and ipython for python 3.3
- #3467: %magic doesn't work
- #3501: Editing markdown cells that wrap has off-by-one errors in cursor positioning
- #3492: IPython for Python3
- #3474: unexpected keyword argument to remove_kernel
- #2283: TypeError when using '?' after a string in a %logstart session
- #2787: rmagic and pandas DataFrame
- #2605: Ellipsis literal triggers AttributeError
- #1179: Test unicode source in pinfo
- #2055: drop Python 3.1 support

- #2293: IPEP 2: Input transformations
- #2790: %paste and %cpaste not removing "…" lines
- #3480: Testing fails because iptest.py cannot be found
- #2580: will not run within PIL build directory
- #2797: RMagic, Dataframe Conversion Problem
- #2838: Empty lines disappear from triple-quoted literals.
- #3050: Broken link on IPython.core.display page
- #3473: Config not passed down to subcommands
- #3462: Setting log_format in config file results in error (and no format changes)
- #3311: Notebook (occasionally) not working on windows (Sophos AV)
- #3461: Cursor positioning off by a character in auto-wrapped lines
- #3454: _repr_html_ error
- #3457: Space in long Paragraph Markdown cell with Chinese or Japanese
- #3447: Run Cell Does not Work
- #1373: Last lines in long cells are hidden
- #1504: Revisit serialization in IPython.parallel
- #1459: Can't connect to 2 HTTPS notebook servers on the same host
- #678: Input prompt stripping broken with multiline data structures
- #3001: IPython.notebook.dirty flag is not set when a cell has unsaved changes
- #3077: Multiprocessing semantics in parallel.view.map
- #3056: links across notebooks
- #3120: Tornado 3.0
- #3156: update pretty to use Python 3 style for sets
- #3197: Can't escape multiple dollar signs in a markdown cell
- #3309: `Image()` signature/doc improvements
- #3415: Bug in IPython/external/path/__init__.py
- #3446: Feature suggestion: Download matplotlib figure to client browser
- #3295: autoexported notebooks: only export explicitly marked cells
- #3442: Notebook: Summary table extracted from markdown headers
- #3438: Zooming notebook in chrome is broken in master
- #1378: Implement autosave in notebook
- #3437: Highlighting matching parentheses
- #3435: module search segfault
- #3424: ipcluster –version
- #3434: 0.13.2 Ipython/genutils.py doesn't exist
- #3426: Feature request: Save by cell and not by line #: IPython %save magic

- #3412: Non Responsive Kernel: Running a Django development server from an IPython Notebook
- #3408: Save cell toolbar and slide type metadata in notebooks
- #3246: %paste regression with blank lines
- #3404: Weird error with $variable and grep in command line magic (!command)
- #3405: Key auto-completion in dictionaries?
- #3259: Codemirror linenumber css broken
- #3397: Vertical text misalignment in Markdown cells
- #3391: Revert #3358 once fix integrated into CM
- #3360: Error 500 while saving IPython notebook
- #3375: Frequent Safari/Webkit crashes
- #3365: zmq frontend
- #2654: User_expression issues
- #3389: Store history as plain text
- #3388: Ipython parallel: open TCP connection created for each result returned from engine
- #3385: setup.py failure on Python 3
- #3376: Setting `__module__` to None breaks pretty printing
- #3374: ipython qtconsole does not display the prompt on OSX
- #3380: simple call to kernel
- #3379: TaskRecord key ‘started’ not set
- #3241: notebook connection time out
- #3334: magic interpreter interprets non magic commands?
- #3326: python3.3: Type error when launching SGE cluster in IPython notebook
- #3349: pip3 doesn’t run 2to3?
- #3347: Longlist support in ipdb
- #3343: Make pip install / easy_install faster
- #3337: git submodules broke nightly PPA builds
- #3206: Copy/Paste Regression in QtConsole
- #3329: Buggy linewrap in Mac OSX Terminal (Mountain Lion)
- #3327: Qt version check broken
- #3303: parallel tasks never finish under heavy load
- #1381: ‘’ for equation continuations require an extra ‘’ in markdown cells
- #3314: Error launching IPython
- #3306: Test failure when running on a Vagrant VM
- #3280: IPython.utils.process.getoutput returns stderr
- #3299: variables named _ or __ exhibit incorrect behavior
- #3196: add an “x” or similar to htmlnotebook pager

- #3293: Several 404 errors for js files Firefox
- #3292: syntax highlighting in chrome on OSX 10.8.3
- #3288: Latest dev version hangs on page load
- #3283: ipython dev retains directory information after directory change
- #3279: custom.css is not overridden in the dev IPython (1.0)
- #2727: %run -m doesn't support relative imports
- #3268: GFM triple backquote and unknown language
- #3273: Suppressing all plot related outputs
- #3272: Backspace while completing load previous page
- #3260: Js error in savewidget
- #3247: scrollbar in notebook when not needed?
- #3243: notebook: option to view json source from browser
- #3265: 404 errors when running IPython 1.0dev
- #3257: setup.py not finding submodules
- #3253: Incorrect Qt and PySide version comparison
- #3248: Cell magics broken in Qt console
- #3012: Problems with the less based style.min.css
- #2390: Image width/height don't work in embedded images
- #3236: cannot set TerminalIPythonApp.log_format
- #3214: notebook kernel dies if started with invalid parameter
- #2980: Remove HTMLCell ?
- #3128: qtconsole hangs on importing pylab (using X forwarding)
- #3198: Hitting recursive depth causing all notebook pages to hang
- #3218: race conditions in profile directory creation
- #3177: OverflowError execption in handlers.py
- #2563: core.profiledir.check_startup_dir() doesn't work inside py2exe'd installation
- #3207: [Feature] folders for ipython notebook dashboard
- #3178: cell magics do not work with empty lines after #2447
- #3204: Default plot() colors unsuitable for red-green colorblind users
- #1789: `:\n/*foo` turns into `:\n*(foo)` in triple-quoted strings.
- #3202: File cell magic fails with blank lines
- #3199: %%cython -a stopped working?
- #2688: obsolete imports in import autocompletion
- #3192: Python2, Unhandled exception, __builtin__.True = False
- #3179: script magic error message loop
- #3009: use XDG_CACHE_HOME for cython objects

- #3059: Bugs in 00_notebook_tour example.
- #3104: Integrate a javascript file manager into the notebook front end
- #3176: Particular equation not rendering (notebook)
- #1133: [notebook] readonly and upload files/UI
- #2975: [notebook] python file and cell toolbar
- #3017: SciPy.weave broken in IPython notebook/ qtconsole
- #3161: paste macro not reading spaces correctly
- #2835: %paste not working on WinXpSP3/ipython-0.13.1.py2-win32-PROPER.exe/python27
- #2628: Make transformers work for lines following decorators
- #2612: Multiline String containing ":n?foon" confuses interpreter to replace ?foo with get_ipython().magic(u'pinfo foo')
- #2539: Request: Enable cell magics inside of .ipy scripts
- #2507: Multiline string does not work (includes `...`) with doctest type input in IPython notebook
- #2164: Request: Line breaks in line magic command
- #3106: poor parallel performance with many jobs
- #2438: print inside multiprocessing crashes Ipython kernel
- #3155: Bad md5 hash for package 0.13.2
- #3045: [Notebook] Ipython Kernel does not start if disconnected from internet(/network?)
- #3146: Using celery in python 3.3
- #3145: The notebook viewer is down
- #2385: grep –color not working well with notebook
- #3131: Quickly install from source in a clean virtualenv?
- #3139: Rolling log for ipython
- #3127: notebook with pylab=inline appears to call figure.draw twice
- #3129: Walking up and down the call stack
- #3123: Notebook crashed if unplugged ethernet cable
- #3121: NB should use normalize.css? was #3049
- #3087: Disable spellchecking in notebook
- #3084: ipython pyqt 4.10 incompatibilty, QTextBlockUserData
- #3113: Fails to install under Jython 2.7 beta
- #3110: Render of h4 headers is not correct in notebook (error in renderedhtml.css)
- #3109: BUG: read_csv: dtype={'id' : np.str}: Datatype not understood
- #3107: Autocompletion of object attributes in arrays
- #3103: Reset locale setting in qtconsole
- #3090: python3.3 Entry Point not found
- #3081: UnicodeDecodeError when using Image(data="some.jpeg")

- #2834: url regexp only finds one link
- #3091: qtconsole breaks doctest.testmod() in Python 3.3
- #3074: SIGUSR1 not available on Windows
- #2996: registration::purging stalled registration high occurrence in small clusters
- #3065: diff-ability of notebooks
- #3067: Crash with pygit2
- #3061: Bug handling Ellipsis
- #3049: NB css inconsistent behavior between ff and webkit
- #3039: unicode errors when opening a new notebook
- #3048: Installning ipython qtConsole should be easyer att Windows
- #3042: Profile creation fails on 0.13.2 branch
- #3035: docstring typo/inconsistency: mention of an xml notebook format?
- #3031: HDF5 library segfault (possibly due to mismatching headers?)
- #2991: In notebook importing sympy closes ipython kernel
- #3027: f.__globals__ causes an error in Python 3.3
- #3020: Failing test test_interactiveshell.TestAstTransform on Windows
- #3023: alt text for "click to expand output" has typo in alt text
- #2963: %history to print all input history of a previous session when line range is omitted
- #3018: IPython installed within virtualenv. WARNING "Please install IPython inside the virtualtenv"
- #2484: Completion in Emacs *Python* buffer causes prompt to be increased.
- #3014: Ctrl-C finishes notebook immediately
- #3007: cython_pyximport reload broken in python3
- #2955: Incompatible Qt imports when running inprocess_qtconsole
- #3006: [IPython 0.13.1] The check of PyQt version is wrong
- #3005: Renaming a notebook to an existing notebook name overwrites the other file
- #2940: Abort trap in IPython Notebook after installing matplotlib
- #3000: issue #3000
- #2995: ipython_directive.py fails on multiline when prompt number < 100
- #2993: File magic (%%file) does not work with paths beginning with tilde (e.g., ~/anaconda/stuff.txt)
- #2992: Cell-based input for console and qt frontends?
- #2425: Liaise with Spyder devs to integrate newer IPython
- #2986: requesting help in a loop can damage a notebook
- #2978: v1.0-dev build errors on Arch with Python 3.
- #2557: [refactor] Insert_cell_at_index()
- #2969: ipython command does not work in terminal
- #2762: OSX wxPython (osx_cocoa, 64bit) command "%gui wx" blocks the interpreter

- #2956: Silent importing of submodules differs from standard Python3.2 interpreter's behavior
- #2943: Up arrow key history search gets stuck in QTConsole
- #2953: using 'nonlocal' declaration in global scope causes ipython3 crash
- #2952: qtconsole ignores exec_lines
- #2949: ipython crashes due to atexit()
- #2947: From rmagic to an R console
- #2938: docstring pane not showing in notebook
- #2936: Tornado assumes invalid signature for parse_qs on Python 3.1
- #2935: unable to find python after easy_install / pip install
- #2920: Add undo-cell deletion menu
- #2914: BUG:saving a modified .py file after loading a module kills the kernel
- #2925: BUG: kernel dies if user sets sys.stderr or sys.stdout to a file object
- #2909: LaTeX sometimes fails to render in markdown cells with some curly bracket + underscore combinations
- #2898: Skip ipc tests on Windows
- #2902: ActiveState attempt to build ipython 0.12.1 for python 3.2.2 for Mac OS failed
- #2899: Test failure in IPython.core.tests.test_magic.test_time
- #2890: Test failure when fabric not installed
- #2892: IPython tab completion bug for paths
- #1340: Allow input cells to be collapsed
- #2881: ? command in notebook does not show help in Safari
- #2751: %%timeit should use minutes to format running time in long running cells
- #2879: When importing a module with a wrong name, ipython crashes
- #2862: %%timeit should warn of empty contents
- #2485: History navigation breaks in qtconsole
- #2785: gevent input hook
- #2843: Sliently running code in clipboard (with paste, cpaste and variants)
- #2784: %run -t -N<N> error
- #2732: Test failure with FileLinks class on Windows
- #2860: ipython help notebook -> KeyError: 'KernelManager'
- #2858: Where is the installed `ipython` script?
- #2856: Edit code entered from ipython in external editor
- #2722: IPC transport option not taking effect ?
- #2473: Better error messages in ipengine/ipcontroller
- #2836: Cannot send builtin module definitions to IP engines
- #2833: Any reason not to use super() ?
- #2781: Cannot interrupt infinite loops in the notebook

- #2150: clippath_demo.py in matplotlib example does not work with inline backend
- #2634: Numbered list in notebook markdown cell renders with Roman numerals instead of numbers
- #2230: IPython crashing during startup with "AttributeError: 'NoneType' object has no attribute 'rstrip'"
- #2483: nbviewer bug? with multi-file gists
- #2466: mistyping `ed -p` breaks `ed -p`
- #2477: Glob expansion tests fail on Windows
- #2622: doc issue: notebooks that ship with Ipython .13 are written for python 2.x
- #2626: Add "Cell -> Run All Keep Going" for notebooks
- #1223: Show last modification date of each notebook
- #2621: user request: put link to example notebooks in Dashboard
- #2564: grid blanks plots in ipython pylab inline mode (interactive)
- #2532: Django shell (IPython) gives NameError on dict comprehensions
- #2188: ipython crashes on ctrl-c
- #2391: Request: nbformat API to load/save without changing version
- #2355: Restart kernel message even though kernel is perfectly alive
- #2306: Garbled input text after reverse search on Mac OS X
- #2297: ipdb with separate kernel/client pushing stdout to kernel process only
- #2180: Have [kernel busy] overridden only by [kernel idle]
- #1188: Pylab with OSX backend keyboard focus issue and hang
- #2107: test_octavemagic.py[everything] fails
- #1212: Better understand/document browser compatibility
- #1585: Refactor notebook templates to use Jinja2 and make each page a separate directory
- #1443: xticks scaling factor partially obscured with qtconsole and inline plotting
- #1209: can't make %result work as in doc.
- #1200: IPython 0.12 Windows install fails on Vista
- #1127: Interactive test scripts for Qt/nb issues
- #959: Matplotlib figures hide
- #2071: win32 installer issue on Windows XP
- #2610: ZMQInteractiveShell.colors being ignored
- #2505: Markdown Cell incorrectly highlighting after "<"
- #165: Installer fails to create Start Menu entries on Windows
- #2356: failing traceback in terminal ipython for first exception
- #2145: Have dashboad show when server disconect
- #2098: Do not crash on kernel shutdow if json file is missing
- #2813: Offline MathJax is broken on 0.14dev
- #2807: Test failure: IPython.parallel.tests.test_client.TestClient.test_purge_everything

- #2486: Readline's history search in ipython console does not clear properly after cancellation with Ctrl+C
- #2709: Cython -la doesn't work
- #2767: What is IPython.utils.upgradedir ?
- #2210: Placing matplotlib legend outside axis bounds causes inline display to clip it
- #2553: IPython Notebooks not robust against client failures
- #2536: ImageDraw in Ipython notebook not drawing lines
- #2264: Feature request: Versioning messaging protocol
- #2589: Creation of ~300+ MPI-spawned engines causes instability in ipcluster
- #2672: notebook: inline option without pylab
- #2673: Indefinite Articles & Traitlets
- #2705: Notebook crashes Safari with select and drag
- #2721: dreload kills ipython when it hits zmq
- #2806: ipython.parallel doesn't discover globals under Python 3.3
- #2794: _exit_code behaves differently in terminal vs ZMQ frontends
- #2793: IPython.parallel issue with pushing pandas TimeSeries
- #1085: In process kernel for Qt frontend
- #2760: IndexError: list index out of range with Python 3.2
- #2780: Save and load notebooks from github
- #2772: AttributeError: 'Client' object has no attribute 'kill'
- #2754: Fail to send class definitions from interactive session to engines namespaces
- #2764: TypeError while using 'cd'
- #2765: name '__file__' is not defined
- #2540: Wrap tooltip if line exceeds threshold?
- #2394: Startup error on ipython qtconsole (version 0.13 and 0.14-dev
- #2440: IPEP 4: Python 3 Compatibility
- #1814: __file__ is not defined when file end with .ipy
- #2759: R magic extension interferes with tab completion
- #2615: Small change needed to rmagic extension.
- #2748: collapse parts of a html notebook
- #1661: %paste still bugs about IndentationError and says to use %paste
- #2742: Octavemagic fails to deliver inline images in IPython (on Windows)
- #2739: wiki.ipython.org contaminated with prescription drug spam
- #2588: Link error while executing code from cython example notebook
- #2550: Rpush magic doesn't find local variables and doesn't support comma separated lists of variables
- #2675: Markdown/html blockquote need css.
- #2419: TerminalInteractiveShell.__init__() ignores value of ipython_dir argument

- #1523: Better LaTeX printing in the qtconsole with the sympy profile
- #2719: ipython fails with `pkg_resources.DistributionNotFound:  ipython==0.13`
- #2715: url crashes nbviewer.ipython.org
- #2555: "import" module completion on MacOSX
- #2707: Problem installing the new version of IPython in Windows
- #2696: SymPy magic bug in IPython Notebook
- #2684: pretty print broken for types created with PyType_FromSpec
- #2533: rmagic breaks on Windows
- #2661: Qtconsole tooltip is too wide when the function has many arguments
- #2679: ipython3 qtconsole via Homebrew on Mac OS X 10.8 - pyqt/pyside import error
- #2646: pylab_not_importable
- #2587: cython magic pops 2 CLI windows upon execution on Windows
- #2660: Certain arguments (-h, –help, –version) never passed to scripts run with ipython
- #2665: Missing docs for rmagic and some other extensions
- #2611: Travis wants to drop 3.1 support
- #2658: Incorrect parsing of raw multiline strings
- #2655: Test fails if `from __future__ import print_function` in .pythonrc.py
- #2651: nonlocal with no existing variable produces too many errors
- #2645: python3 is a pain (minor unicode bug)
- #2637: %paste in Python 3 on Mac doesn't work
- #2624: Error on launching IPython on Win 7 and Python 2.7.3
- #2608: disk IO activity on cursor press
- #1275: Markdown parses LaTeX math symbols as its formatting syntax in notebook
- #2613: display(Math(. . .)) doesn't render tau correctly
- #925: Tab-completion in Qt console needn't use pager
- #2607: %load_ext sympy.interactive.ipythonprinting dammaging output
- #2593: Toolbar button to open qtconsole from notebook
- #2602: IPython html documentation for downloading
- #2598: ipython notebook –pylab=inline replaces built-in any()
- #2244: small issue: wrong printout
- #2590: add easier way to execute scripts in the current directory
- #2581: %hist does not work when InteractiveShell.cache_size = 0
- #2584: No file COPYING
- #2578: AttributeError: 'module' object has no attribute 'TestCase'
- #2576: One of my notebooks won't load any more – is there a maximum notebook size?
- #2560: Notebook output is invisible when printing strings with rrn line endings

- #2566: if pyside partially present ipython qtconsole fails to load even if pyqt4 present
- #1308: ipython qtconsole –ssh=server –existing . . . hangs
- #1679: List command doesn’t work in ipdb debugger the first time
- #2545: pypi win32 installer creates 64bit executibles
- #2080: Event loop issues with IPython 0.12 and PyQt4 (`QDialog.exec_` and more)
- #2541: Allow `python -m IPython`
- #2508: subplots_adjust() does not work correctly in ipython notebook
- #2289: Incorrect mathjax rendering of certain arrays of equations
- #2487: Selecting and indenting
- #2521: more fine-grained ‘run’ controls, such as ‘run from here’ and ‘run until here’
- #2535: Funny bounding box when plot with text
- #2523: History not working
- #2514: Issue with zooming in qtconsole
- #2220: No sys.stdout.encoding in kernel based IPython
- #2512: ERROR: Internal Python error in the inspect module.
- #2496: Function passwd does not work in QtConsole
- #1453: make engines reconnect/die when controller was restarted
- #2481: ipython notebook – clicking in a code cell’s output moves the screen to the top of the code cell
- #2488: Undesired plot outputs in Notebook inline mode
- #2482: ipython notebook – download may not get the latest notebook
- #2471: _subprocess module removed in Python 3.3
- #2374: Issues with man pages
- #2316: parallel.Client.__init__ should take cluster_id kwarg
- #2457: Can a R library wrapper be created with Rmagic?
- #1575: Fallback frontend for console when connecting pylab=inlnie -enabled kernel?
- #2097: Do not crash if history db is corrupted
- #2435: ipengines fail if clean_logs enabled
- #2429: Using warnings.warn() results in TypeError
- #2422: Multiprocessing in ipython notebook kernel crash
- #2426: ipython crashes with the following message. I do not what went wrong. Can you help me identify the problem?
- #2423: Docs typo?
- #2257: pip install -e fails
- #2418: rmagic can’t run R’s read.csv on data files with NA data
- #2417: HTML notebook: Backspace sometimes deletes multiple characters
- #2275: notebook: “Down_Arrow” on last line of cell should move to end of line

- #2414: 0.13.1 does not work with current EPD 7.3-2
- #2409: there is a redundant None
- #2410: Use /usr/bin/python3 instead of /usr/bin/python
- #2366: Notebook Dashboard –notebook-dir and fullpath
- #2406: Inability to get docstring in debugger
- #2398: Show line number for IndentationErrors
- #2314: HTML lists seem to interfere with the QtConsole display
- #1688: unicode exception when using %run with failing script
- #1884: IPython.embed changes color on error
- #2381: %time doesn't work for multiline statements
- #1435: Add size keywords in Image class
- #2372: interactiveshell.py misses urllib and io_open imports
- #2371: IPython not working
- #2367: Tab expansion moves to next cell in notebook
- #2359: nbviever alters the order of print and display() output
- #2227: print name for IPython Notebooks has become uninformative
- #2361: client doesn't use connection file's 'location' in disambiguating 'interface'
- #2357: failing traceback in terminal ipython for first exception
- #2343: Installing in a python 3.3b2 or python 3.3rc1 virtual environment.
- #2315: Failure in test: "Test we're not loading modules on startup that we shouldn't."
- #2351: Multiple Notebook Apps: cookies not port specific, clash with each other
- #2350: running unittest from qtconsole prints output to terminal
- #2303: remote tracebacks broken since 952d0d6 (PR #2223)
- #2330: qtconsole does not highlight tab-completion suggestion with custom stylesheet
- #2325: Parsing Tex formula fails in Notebook
- #2324: Parsing Tex formula fails
- #1474: Add argument to `run -n` for custom namespace
- #2318: C-m n/p don't work in Markdown cells in the notebook
- #2309: time.time() in ipython notebook producing impossible results
- #2307: schedule tasks on newly arrived engines
- #2313: Allow Notebook HTML/JS to send messages to Python code
- #2304: ipengine throws KeyError: url
- #1878: shell access using ! will not fill class or function scope vars
- #2253: %paste does not retrieve clipboard contents under screen/tmux on OS X
- #1510: Add-on (or Monkey-patch) infrastructure for HTML notebook
- #2273: triple quote and %s at beginning of line with %paste

- #2243: Regression in .embed()
- #2266: SSH passwordless check with OpenSSH checks for the wrong thing
- #2217: Change NewNotebook handler to use 30x redirect
- #2276: config option for disabling history store
- #2239: can't use parallel.Reference in view.map
- #2272: Sympy piecewise messed up rendering
- #2252: %paste throws an exception with empty clipboard
- #2259: git-mpr is currently broken
- #2247: Variable expansion in shell commands should work in substrings
- #2026: Run 'fast' tests only
- #2241: read a list of notebooks on server and bring into browser only notebook
- #2237: please put python and text editor in the web only ipython
- #2053: Improvements to the IPython.display.Image object
- #1456: ERROR: Internal Python error in the inspect module.
- #2221: Avoid importing from IPython.parallel in core
- #2213: Can't trigger startup code in Engines
- #1464: Strange behavior for backspace with lines ending with more than 4 spaces in notebook
- #2187: NaN in object_info_reply JSON causes parse error
- #214: system command requiring administrative privileges
- #2195: Unknown option `no-edit` in git-mpr
- #2201: Add documentation build to tools/test_pr.py
- #2205: Command-line option for default Notebook output collapsing behavior
- #1927: toggle between inline and floating figures
- #2171: Can't start StarCluster after upgrading to IPython 0.13
- #2173: oct2py v >= 0.3.1 doesn't need h5py anymore
- #2099: storemagic needs to use self.shell
- #2166: DirectView map_sync() with Lambdas Using Generators
- #2091: Unable to use print_stats after %prun -r in notebook
- #2132: Add fail-over for pastebin
- #2156: Make it possible to install ipython without nasty gui dependencies
- #2154: Scrolled long output should be off in print view by default
- #2162: Tab completion does not work with IPython.embed_kernel()
- #2157: IPython 0.13 / github-master cannot create logfile from scratch
- #2151: missing newline when a magic is called from the qtconsole menu
- #2139: 00_notebook_tour Image example broken on master
- #2143: Add a %%cython_annotate magic

- #2135: Running IPython from terminal
- #2093: Makefile for building Sphinx documentation on Windows
- #2122: Bug in pretty printing
- #2120: Notebook "Make a Copy…" keeps opening duplicates in the same tab
- #1997: password cannot be used with url prefix
- #2129: help/doc displayed multiple times if requested in loop
- #2121: ipdb does not support input history in qtconsole
- #2114: %logstart doesn't log
- #2085: %ed magic fails in qtconsole
- #2119: IPython fails to run on MacOS Lion
- #2052: %pylab inline magic does not work on windows
- #2111: Ipython won't start on W7
- #2112: Strange internal traceback
- #2108: Backslash () at the end of the line behavior different from default Python
- #1425: Ampersands can't be typed sometimes in notebook cells
- #1513: Add expand/collapse support for long output elements like stdout and tracebacks
- #2087: error when starting ipython
- #2103: Ability to run notebook file from commandline
- #2082: Qt Console output spacing
- #2083: Test failures with Python 3.2 and PYTHONWARNINGS="d"
- #2094: about inline
- #2077: Starting IPython3 on the terminal
- #1760: easy_install ipython fails on py3.2-win32
- #2075: Local Mathjax install causes iptest3 error under python3
- #2057: setup fails for python3 with LANG=C
- #2070: shebang on Windows
- #2054: sys_info missing git hash in sdists
- #2059: duplicate and modified files in documentation
- #2056: except-shadows-builtin osm.py:687
- #2058: hyphen-used-as-minus-sign in manpages

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

2.17 0.13 Series

2.17.1 Release 0.13

IPython 0.13 contains several major new features, as well as a large amount of bug and regression fixes. The previous version (0.12) was released on December 19 2011, and in this development cycle we had:

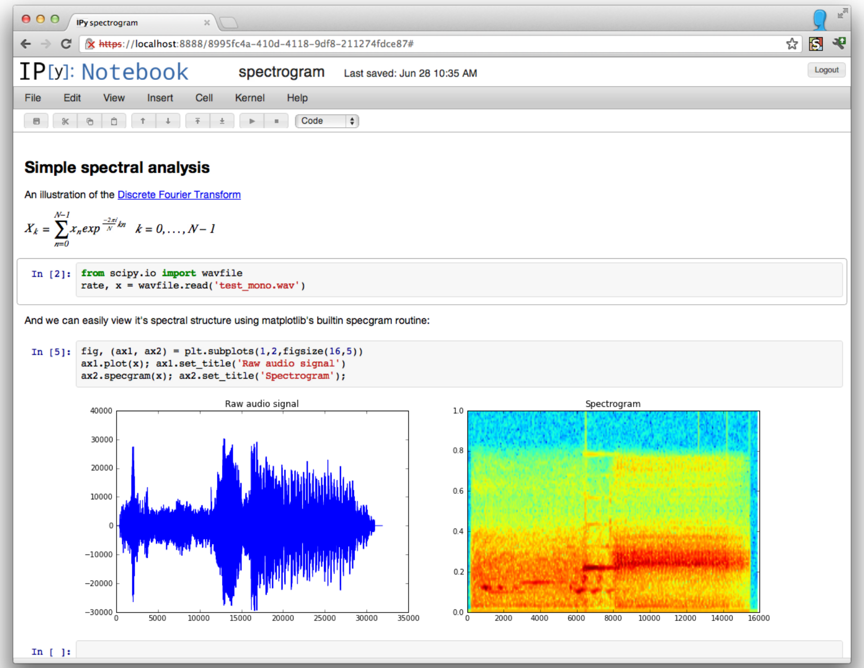
- ~6 months of work.
- 373 pull requests merged.
- 742 issues closed (non-pull requests).
- contributions from 62 authors.
- 1760 commits.
- a diff of 114226 lines.

The amount of work included in this release is so large, that we can only cover here the main highlights; please see our *detailed release statistics* for links to every issue and pull request closed on GitHub as well as a full list of individual contributors.

Major Notebook improvements: new user interface and more

The IPython Notebook, which has proven since its release to be wildly popular, has seen a massive amount of work in this release cycle, leading to a significantly improved user experience as well as many new features.

The first user-visible change is a reorganization of the user interface; the left panel has been removed and was replaced by a real menu system and a toolbar with icons. Both the toolbar and the header above the menu can be collapsed to leave an unobstructed working area:


IPy spectrogram
https://localhost:8888/8995fc4a-410d-4118-9df8-211274fdce87#
IP[y]: Notebook
spectrogram
Last saved: Jun 28 10:35 AM
Logout
File Edit View Insert Cell Kernel Help
Code
Raw audio signal
Spectrogram

Simple spectral analysis

An illustration of the Discrete Fourier Transform

$$X_k = \sum_{n=0}^{N-1} x_n exp^{\frac{-2\pi i}{N}kn} \quad k = 0, \ldots, N-1$$

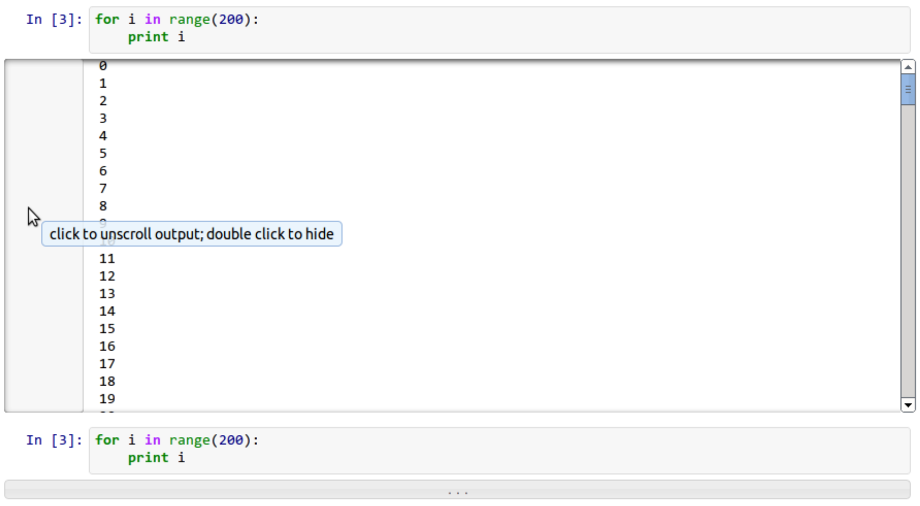
```
In [2]: from scipy.io import wavfile
        rate, x = wavfile.read('test_mono.wav')
```

And we can easily view it's spectral structure using matplotlib's builtin specgram routine:

```
In [5]: fig, (ax1, ax2) = plt.subplots(1,2,figsize(16,5))
        ax1.plot(x); ax1.set_title('Raw audio signal')
        ax2.specgram(x); ax2.set_title('Spectrogram');
```

```
In [ ]:
```

The notebook handles very long outputs much better than before (this was a serious usability issue when running processes that generated massive amounts of output). Now, in the presence of outputs longer than ~100 lines, the notebook will automatically collapse to a scrollable area and the entire left part of this area controls the display: one click in this area will expand the output region completely, and a double-click will hide it completely. This figure shows both the scrolled and hidden modes:



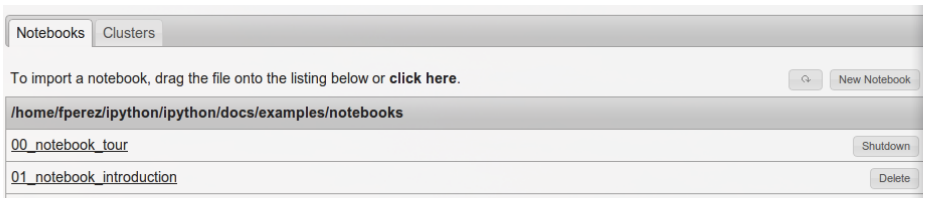
```
In [3]: for i in range(200):
            print i
```

```
0
1
2
3
4
5
6
7
8
11
12
13
14
15
16
17
18
19
```

```
In [3]: for i in range(200):
            print i
```

Note: The auto-folding of long outputs is disabled in Firefox due to bugs in its scrolling behavior. See PR #2047 for details.

Uploading notebooks to the dashboard is now easier: in addition to drag and drop (which can be finicky sometimes), you can now click on the upload text and use a regular file dialog box to select notebooks to upload. Furthermore, the notebook dashboard now auto-refreshes its contents and offers buttons to shut down any running kernels (PR #1739):



To import a notebook, drag the file onto the listing below or **click here**.

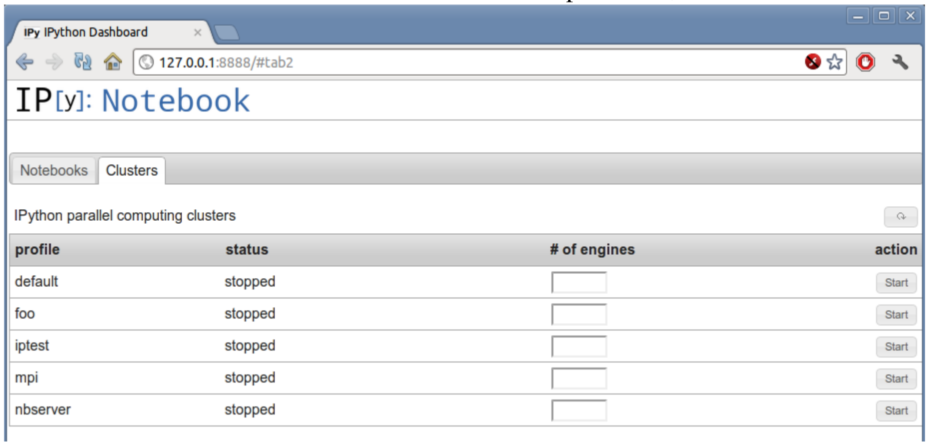
/home/fperez/ipython/ipython/docs/examples/notebooks

00_notebook_tour

01_notebook_introduction

Cluster management

The notebook dashboard can now also start and stop clusters, thanks to a new tab in the dashboard user interface:



IPython parallel computing clusters

profile	status	# of engines	action
default	stopped		Start
foo	stopped		Start
iptest	stopped		Start
mpi	stopped		Start
nbserver	stopped		Start

This interface allows, for each profile you have configured, to start and stop a cluster (and optionally override the default number of engines corresponding to that configuration). While this hides all error reporting, once you have a configuration that you know works smoothly, it is a very convenient interface for controlling your parallel resources.

New notebook format

The notebooks saved now use version 3 of our format, which supports heading levels as well as the concept of 'raw' text cells that are not rendered as Markdown. These will be useful with converters we are developing, to pass raw markup (say LaTeX). That conversion code is still under heavy development and not quite ready for prime time, but we welcome help on this front so that we can merge it for full production use as soon as possible.

Note: v3 notebooks can *not* be read by older versions of IPython, but we provide a simple script that you can use in case you need to export a v3 notebook to share with a v2 user.

JavaScript refactoring

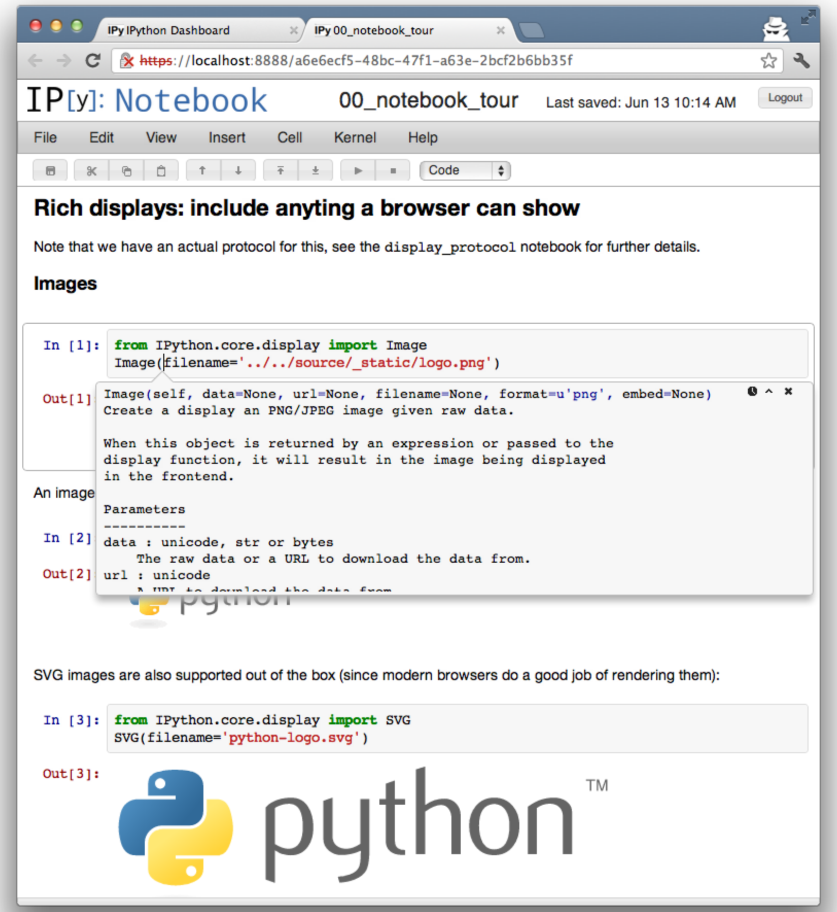
All the client-side JavaScript has been decoupled to ease reuse of parts of the machinery without having to build a full-blown notebook. This will make it much easier to communicate with an IPython kernel from existing web pages and to integrate single cells into other sites, without loading the full notebook document-like UI. PR #1711.

This refactoring also enables the possibility of writing dynamic javascript widgets that are returned from Python code and that present an interactive view to the user, with callbacks in Javascript executing calls to the Kernel. This will enable many interactive elements to be added by users in notebooks.

An example of this capability has been provided as a proof of concept in `examples/widgets` that lets you directly communicate with one or more parallel engines, acting as a mini-console for parallel debugging and introspection.

Improved tooltips

The object tooltips have gained some new functionality. By pressing tab several times, you can expand them to see more of a docstring, keep them visible as you fill in a function's parameters, or transfer the information to the pager at the bottom of the screen. For the details, look at the example notebook `01_notebook_introduction.ipynb`.



Rich displays: include anyting a browser can show

Note that we have an actual protocol for this, see the `display_protocol` notebook for further details.

Images

```
In [1]: from IPython.core.display import Image
        Image(filename='../../source/_static/logo.png')

Out[1]
```

```
Image(self, data=None, url=None, filename=None, format=u'png', embed=None)
Create a display an PNG/JPEG image given raw data.

When this object is returned by an expression or passed to the
display function, it will result in the image being displayed
in the frontend.

Parameters
----------
data : unicode, str or bytes
    The raw data or a URL to download the data from.
url : unicode
```

An image

```
In [2]

Out[2]
```

SVG images are also supported out of the box (since modern browsers do a good job of rendering them):

```
In [3]: from IPython.core.display import SVG
        SVG(filename='python-logo.svg')

Out[3]:
```

Fig. 1: The new notebook tooltips.

Other improvements to the Notebook

These are some other notable small improvements to the notebook, in addition to many bug fixes and minor changes to add polish and robustness throughout:

- The notebook pager (the area at the bottom) is now Resizable by dragging its divider handle, a feature that had been requested many times by just about anyone who had used the notebook system. PR #1705.
- It is now possible to open notebooks directly from the command line; for example: `ipython notebook path/` will automatically set `path/` as the notebook directory, and `ipython notebook path/foo.ipynb` will further start with the `foo.ipynb` notebook opened. PR #1686.

- If a notebook directory is specified with `--notebook-dir` (or with the corresponding configuration flag `NotebookManager.notebook_dir`), all kernels start in this directory.
- Fix codemirror clearing of cells with `Ctrl-Z`; PR #1965.
- Text (markdown) cells now line wrap correctly in the notebook, making them much easier to edit PR #1330.
- PNG and JPEG figures returned from plots can be interactively resized in the notebook, by dragging them from their lower left corner. PR #1832.
- Clear `In []` prompt numbers on "Clear All Output". For more version-control-friendly `.ipynb` files, we now strip all prompt numbers when doing a "Clear all output". This reduces the amount of noise in commit-to-commit diffs that would otherwise show the (highly variable) prompt number changes. PR #1621.
- The notebook server now requires *two* consecutive `Ctrl-C` within 5 seconds (or an interactive confirmation) to terminate operation. This makes it less likely that you will accidentally kill a long-running server by typing `Ctrl-C` in the wrong terminal. PR #1609.
- Using `Ctrl-S` (or `Cmd-S` on a Mac) actually saves the notebook rather than providing the fairly useless browser html save dialog. PR #1334.
- Allow accessing local files from the notebook (in urls), by serving any local file as the url `files/<relativepath>`. This makes it possible to, for example, embed local images in a notebook. PR #1211.

Cell magics

We have completely refactored the magic system, finally moving the magic objects to standalone, independent objects instead of being the mixin class we'd had since the beginning of IPython (PR #1732). Now, a separate base class is provided in *`IPython.core.magic.Magics`* that users can subclass to create their own magics. Decorators are also provided to create magics from simple functions without the need for object orientation. Please see the *Magic command system* docs for further details.

All builtin magics now exist in a few subclasses that group together related functionality, and the new `IPython.core.magics` package has been created to organize this into smaller files.

This cleanup was the last major piece of deep refactoring needed from the original 2001 codebase.

We have also introduced a new type of magic function, prefixed with `%%` instead of `%`, which operates at the whole-cell level. A cell magic receives two arguments: the line it is called on (like a line magic) and the body of the cell below it.

Cell magics are most natural in the notebook, but they also work in the terminal and qt console, with the usual approach of using a blank line to signal cell termination.

For example, to time the execution of several statements:

```
%%timeit x = 0    # setup
for i in range(100000):
    x += i**2
```

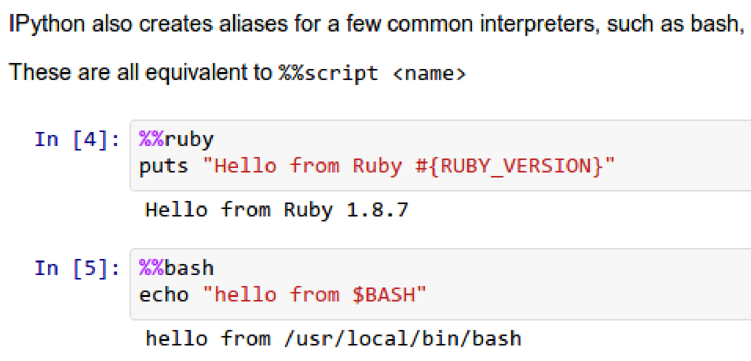
This is particularly useful to integrate code in another language, and cell magics already exist for shell scripts, Cython, R and Octave. Using `%%script /usr/bin/foo`, you can run a cell in any interpreter that accepts code via stdin.

Another handy cell magic makes it easy to write short text files: `%%file ~/save/to/here.txt`.

The following cell magics are now included by default; all those that use special interpreters (Perl, Ruby, bash, etc.) assume you have the requisite interpreter installed:

- `%%!`: run cell body with the underlying OS shell; this is similar to prefixing every line in the cell with `!`.
- `%%bash`: run cell body under bash.

- `%%capture`: capture the output of the code in the cell (and stderr as well). Useful to run codes that produce too much output that you don't even want scrolled.
- `%%file`: save cell body as a file.
- `%%perl`: run cell body using Perl.
- `%%prun`: run cell body with profiler (cell extension of `%prun`).
- `%%python3`: run cell body using Python 3.
- `%%ruby`: run cell body using Ruby.
- `%%script`: run cell body with the script specified in the first line.
- `%%sh`: run cell body using sh.
- `%%sx`: run cell with system shell and capture process output (cell extension of `%sx`).
- `%%system`: run cell with system shell (`%%!` is an alias to this).
- `%%timeit`: time the execution of the cell (extension of `%timeit`).

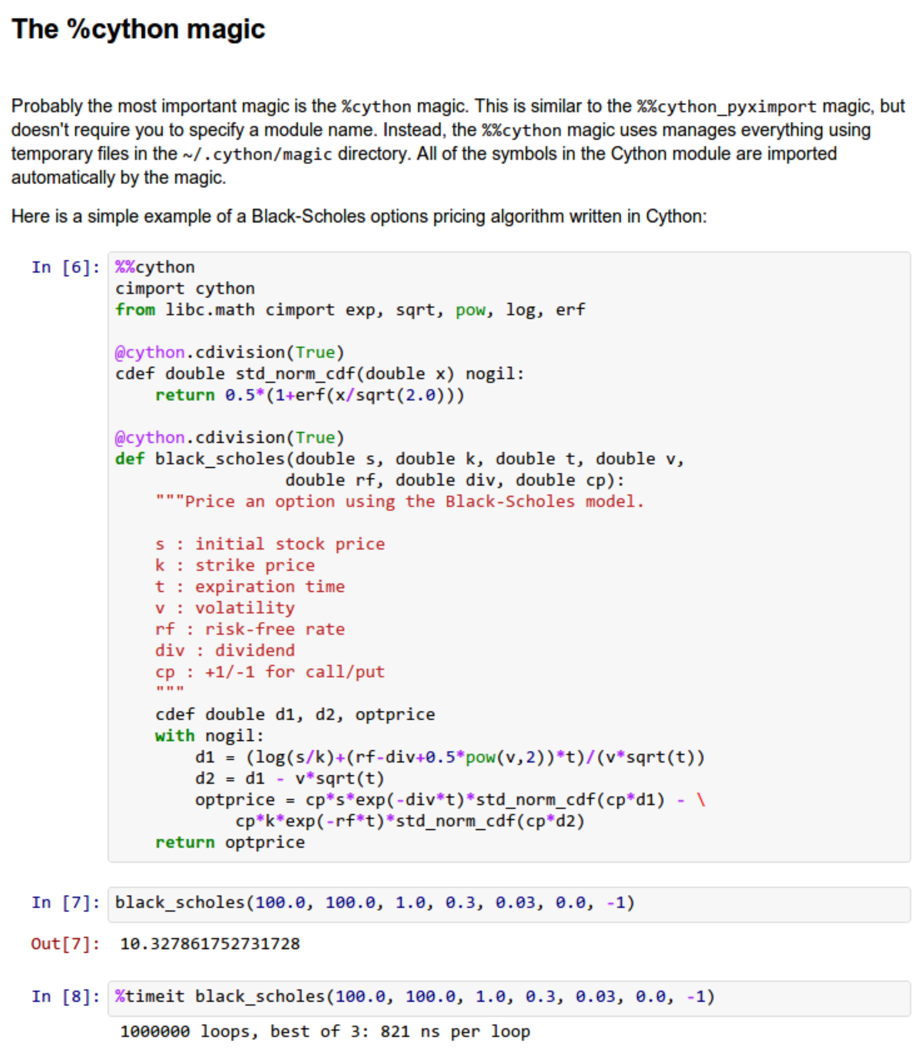

IPython also creates aliases for a few common interpreters, such as bash,

These are all equivalent to `%%script <name>`

```
In [4]: %%ruby
        puts "Hello from Ruby #{RUBY_VERSION}"

         Hello from Ruby 1.8.7

In [5]: %%bash
        echo "hello from $BASH"

         hello from /usr/local/bin/bash
```

This is what some of the script-related magics look like in action:
In addition, we have also a number of *extensions* that provide specialized magics. These typically require additional software to run and must be manually loaded via `%load_ext <extension name>`, but are extremely useful. The following extensions are provided:

Cython magics (extension `cythonmagic`) This extension provides magics to automatically build and compile Python extension modules using the Cython language. You must install Cython separately, as well as a C compiler, for this to work. The examples directory in the source distribution ships with a full notebook demonstrating these capabilities:



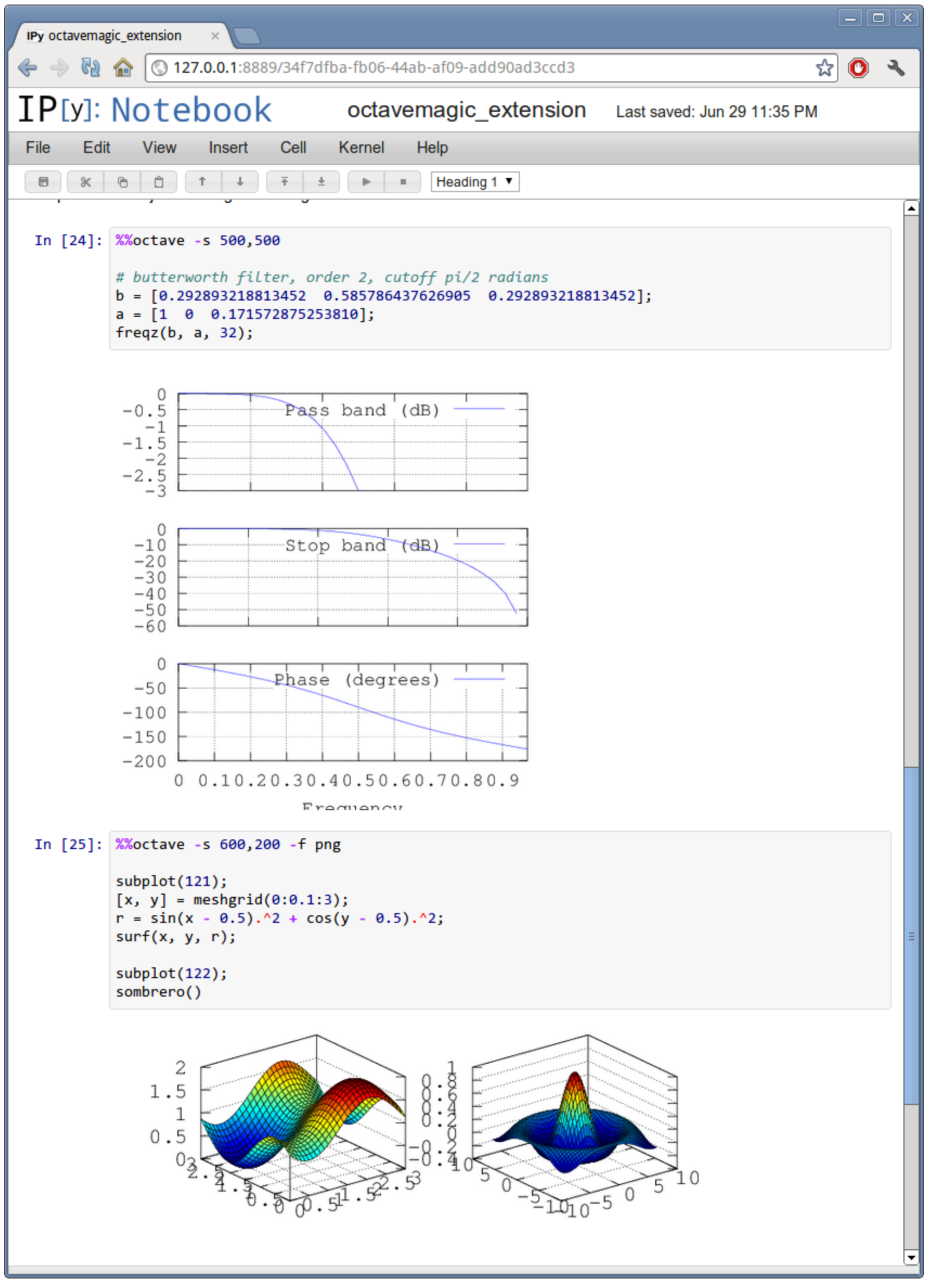
The %cython magic

Probably the most important magic is the `%cython` magic. This is similar to the `%%cython_pyximport` magic, but doesn't require you to specify a module name. Instead, the `%%cython` magic uses manages everything using temporary files in the `~/.cython/magic` directory. All of the symbols in the Cython module are imported automatically by the magic.

Here is a simple example of a Black-Scholes options pricing algorithm written in Cython:

```
In [6]: %%cython
        cimport cython
        from libc.math cimport exp, sqrt, pow, log, erf

        @cython.cdivision(True)
        cdef double std_norm_cdf(double x) nogil:
            return 0.5*(1+erf(x/sqrt(2.0)))

        @cython.cdivision(True)
        def black_scholes(double s, double k, double t, double v,
                         double rf, double div, double cp):
            """Price an option using the Black-Scholes model.

            s : initial stock price
            k : strike price
            t : expiration time
            v : volatility
            rf : risk-free rate
            div : dividend
            cp : +1/-1 for call/put
            """
            cdef double d1, d2, optprice
            with nogil:
                d1 = (log(s/k)+(rf-div+0.5*pow(v,2))*t)/(v*sqrt(t))
                d2 = d1 - v*sqrt(t)
                optprice = cp*s*exp(-div*t)*std_norm_cdf(cp*d1) - \
                    cp*k*exp(-rf*t)*std_norm_cdf(cp*d2)
            return optprice

In [7]: black_scholes(100.0, 100.0, 1.0, 0.3, 0.03, 0.0, -1)

Out[7]: 10.327861752731728

In [8]: %timeit black_scholes(100.0, 100.0, 1.0, 0.3, 0.03, 0.0, -1)
         1000000 loops, best of 3: 821 ns per loop
```

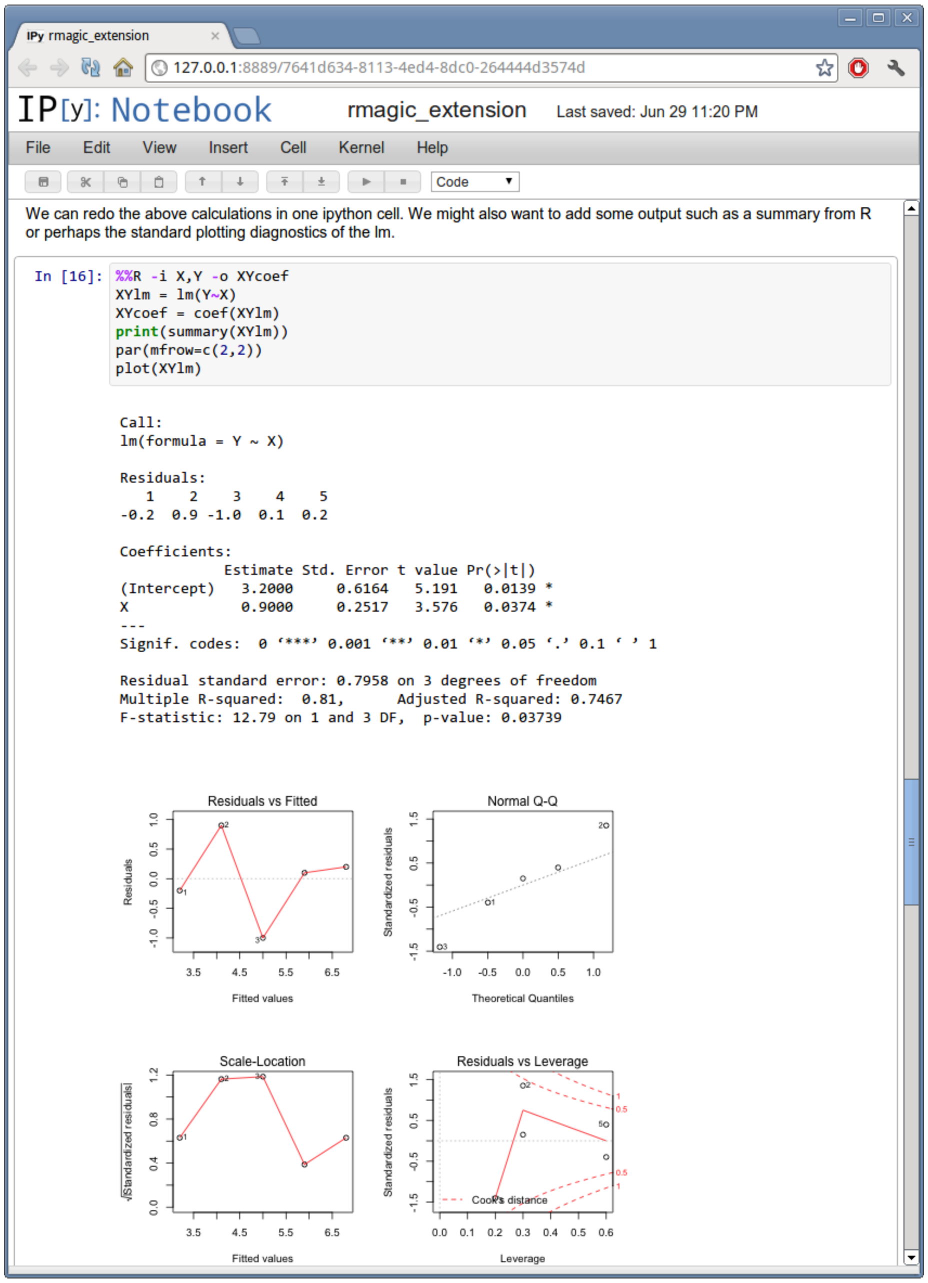
Octave magics (extension `octavemagic`) This extension provides several magics that support calling code written in the Octave language for numerical computing. You can execute single-lines or whole blocks of Octave code, capture both output and figures inline (just like matplotlib plots), and have variables automatically converted between the two languages. To use this extension, you must have Octave installed as well as the oct2py package. The examples directory in the source distribution ships with a full notebook demonstrating these capabilities:



```
In [24]: %%octave -s 500,500

         # butterworth filter, order 2, cutoff pi/2 radians
         b = [0.292893218813452  0.585786437626905  0.292893218813452];
         a = [1  0  0.171572875253810];
         freqz(b, a, 32);
```

```
In [25]: %%octave -s 600,200 -f png

         subplot(121);
         [x, y] = meshgrid(0:0.1:3);
         r = sin(x - 0.5).^2 + cos(y - 0.5).^2;
         surf(x, y, r);

         subplot(122);
         sombrero()
```

R magics (extension `rmagic`) This extension provides several magics that support calling code written in the R language for statistical data analysis. You can execute single-lines or whole blocks of R code, capture both output and figures inline (just like matplotlib plots), and have variables automatically converted between the two languages. To use this extension, you must have R installed as well as the rpy2 package that bridges Python and R. The examples directory in the source distribution ships with a full notebook demonstrating these capabilities:



We can redo the above calculations in one ipython cell. We might also want to add some output such as a summary from R or perhaps the standard plotting diagnostics of the lm.

```
In [16]: %%R -i X,Y -o XYcoef
         XYlm = lm(Y~X)
         XYcoef = coef(XYlm)
         print(summary(XYlm))
         par(mfrow=c(2,2))
         plot(XYlm)
```

```
Call:
lm(formula = Y ~ X)

Residuals:
   1    2    3    4    5 
-0.2  0.9 -1.0  0.1  0.2 

Coefficients:
            Estimate Std. Error t value Pr(>|t|)  
(Intercept)   3.2000     0.6164   5.191   0.0139 *
X             0.9000     0.2517   3.576   0.0374 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1 

Residual standard error: 0.7958 on 3 degrees of freedom
Multiple R-squared:  0.81,	Adjusted R-squared: 0.7467 
F-statistic: 12.79 on 1 and 3 DF,  p-value: 0.03739
```

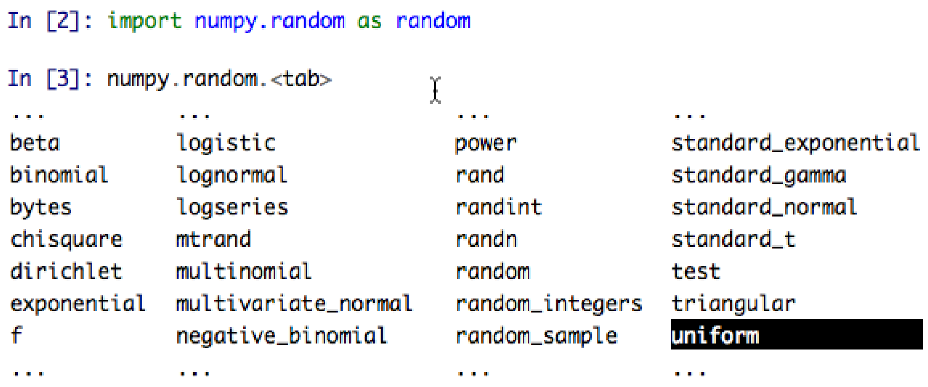
Tab completer improvements

Useful tab-completion based on live inspection of objects is one of the most popular features of IPython. To make this process even more user-friendly, the completers of both the Qt console and the Notebook have been reworked.

The Qt console comes with a new ncurses-like tab completer, activated by default, which lets you cycle through the available completions by pressing tab, or select a completion with the arrow keys (PR #1851).

In the notebook, completions are now sourced both from object introspection and analysis of surrounding code, so limited completions can be offered for variables defined in the current cell, or while the kernel is busy (PR #1711).

We have implemented a new configurable flag to control tab completion on modules that provide the `__all__` attribute:



```
In [2]: import numpy.random as random

In [3]: numpy.random.<tab>
...             ...                  ...              ...
beta            logistic             power            standard_exponential
binomial        lognormal            rand             standard_gamma
bytes           logseries            randint          standard_normal
chisquare       mtrand               randn            standard_t
dirichlet       multinomial          random           test
exponential     multivariate_normal  random_integers  triangular
f               negative_binomial    random_sample    uniform
...             ...                  ...              ...
```

Fig. 2: The new improved Qt console's ncurses-like completer allows to easily navigate thought long list of completions.

```
IPCompleter.limit_to__all__= Boolean
```

This instructs the completer to honor `__all__` for the completion. Specifically, when completing on `object.<tab>`, if True: only those names in `obj.__all__` will be included. When False [default]: the `__all__` attribute is ignored. PR #1529.

Improvements to the Qt console

The Qt console continues to receive improvements and refinements, despite the fact that it is by now a fairly mature and robust component. Lots of small polish has gone into it, here are a few highlights:

- A number of changes were made to the underlying code for easier integration into other projects such as Spyder (PR #2007, PR #2024).
- Improved menus with a new Magic menu that is organized by magic groups (this was made possible by the reorganization of the magic system internals). PR #1782.
- Allow for restarting kernels without clearing the qtconsole, while leaving a visible indication that the kernel has restarted. PR #1681.
- Allow the native display of jpeg images in the qtconsole. PR #1643.

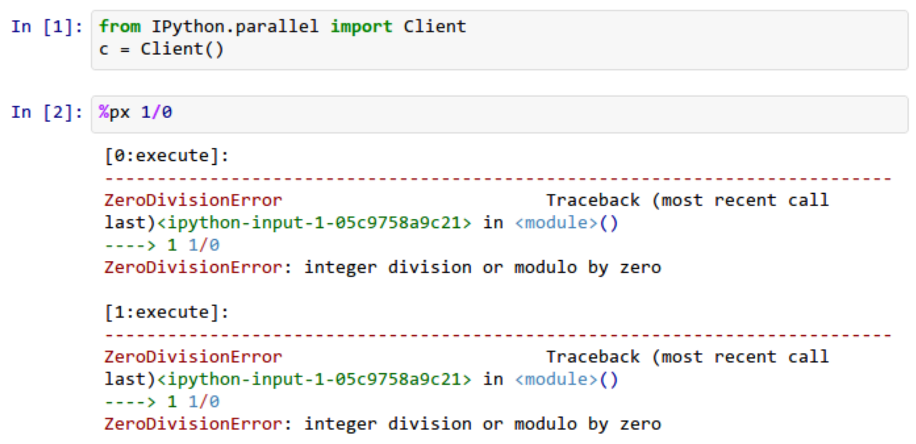
Parallel

The parallel tools have been improved and fine-tuned on multiple fronts. Now, the creation of an `IPython.parallel.Client` object automatically activates a line and cell magic function `px` that sends its code to all the engines. Further magics can be easily created with the `Client.activate()` method, to conveniently execute code on any subset of engines. PR #1893.

The `%%px` cell magic can also be given an optional targets argument, as well as a `--out` argument for storing its output.

A new magic has also been added, `%pxconfig`, that lets you configure various defaults of the parallel magics. As usual, type `%pxconfig?` for details.

The exception reporting in parallel contexts has been improved to be easier to read. Now, IPython directly reports the remote exceptions without showing any of the internal execution parts:



```
In [1]: from IPython.parallel import Client
        c = Client()

In [2]: %px 1/0

        [0:execute]:
        ---------------------------------------------------------------------------
        ZeroDivisionError                         Traceback (most recent call
        last)<ipython-input-1-05c9758a9c21> in <module>()
        ----> 1 1/0
        ZeroDivisionError: integer division or modulo by zero

        [1:execute]:
        ---------------------------------------------------------------------------
        ZeroDivisionError                         Traceback (most recent call
        last)<ipython-input-1-05c9758a9c21> in <module>()
        ----> 1 1/0
        ZeroDivisionError: integer division or modulo by zero
```

The parallel tools now default to using `NoDB` as the storage backend for intermediate results. This means that the default usage case will have a significantly reduced memory footprint, though certain advanced features are not available with this backend.

The parallel magics now display all output, so you can do parallel plotting or other actions with complex display. The `px` magic has now both line and cell modes, and in cell mode finer control has been added about how to collate output from multiple engines. PR #1768.

There have also been incremental improvements to the SSH launchers:

- add to_send/fetch steps for moving connection files around.
- add SSHProxyEngineSetLauncher, for invoking to `ipcluster engines` on a remote host. This can be used to start a set of engines via PBS/SGE/MPI *remotely*.

This makes the SSHLauncher usable on machines without shared filesystems.

A number of 'sugar' methods/properties were added to AsyncResult that are quite useful (PR #1548) for everday work:

- `ar.wall_time` = received - submitted
- `ar.serial_time` = sum of serial computation time
- `ar.elapsed` = time since submission (wall_time if done)
- `ar.progress` = (int) number of sub-tasks that have completed
- `len(ar)` = # of tasks
- `ar.wait_interactive()`: prints progress

Added `Client.spin_thread()` / `stop_spin_thread()` for running spin in a background thread, to keep zmq queue clear. This can be used to ensure that timing information is as accurate as possible (at the cost of having a background thread active).

Set TaskScheduler.hwm default to 1 instead of 0. 1 has more predictable/intuitive behavior, if often slower, and thus a more logical default. Users whose workloads require maximum throughput and are largely homogeneous in time per task can make the optimization themselves, but now the behavior will be less surprising to new users. PR #1294.

Kernel/Engine unification

This is mostly work 'under the hood', but it is actually a *major* achievement for the project that has deep implications in the long term: at last, we have unified the main object that executes as the user's interactive shell (which we refer to as the *IPython kernel*) with the objects that run in all the worker nodes of the parallel computing facilities (the *IPython engines*). Ever since the first implementation of IPython's parallel code back in 2006, we had wanted to have these two roles be played by the same machinery, but a number of technical reasons had prevented that from being true.

In this release we have now merged them, and this has a number of important consequences:

- It is now possible to connect any of our clients (qtconsole or terminal console) to any individual parallel engine, with the *exact* behavior of working at a 'regular' IPython console/qtconsole. This makes debugging, plotting, etc. in parallel scenarios vastly easier.
- Parallel engines can always execute arbitrary 'IPython code', that is, code that has magics, shell extensions, etc. In combination with the `%%px` magics, it is thus extremely natural for example to send to all engines a block of Cython or R code to be executed via the new Cython and R magics. For example, this snippet would send the R block to all active engines in a cluster:

```
%%px
%%R
... R code goes here
```

- It is possible to embed not only an interactive shell with the `IPython.embed()` call as always, but now you can also embed a *kernel* with *`IPython.embed_kernel()`*. Embedding an IPython kernel in an application is useful when you want to use `IPython.embed()` but don't have a terminal attached on stdin and stdout.
- The new `IPython.parallel.bind_kernel()` allows you to promote Engines to listening Kernels, and connect QtConsoles to an Engine and debug it directly.

In addition, having a single core object through our entire architecture also makes the project conceptually cleaner, easier to maintain and more robust. This took a lot of work to get in place, but we are thrilled to have this major piece of architecture finally where we'd always wanted it to be.

Official Public API

We have begun organizing our API for easier public use, with an eye towards an official IPython 1.0 release which will firmly maintain this API compatible for its entire lifecycle. There is now an *`IPython.display`* module that aggregates all display routines, and the `traitlets.config` namespace has all public configuration tools. We will continue improving our public API layout so that users only need to import names one level deeper than the main `IPython` package to access all public namespaces.

IPython notebook file icons

The directory `docs/resources` in the source distribution contains SVG and PNG versions of our file icons, as well as an `Info.plist.example` file with instructions to install them on Mac OSX. This is a first draft of our icons, and we encourage contributions from users with graphic talent to improve them in the future.

New top-level `locate` command

Add `locate` entry points; these would be useful for quickly locating IPython directories and profiles from other (non-Python) applications. PR #1762.

Examples:

```
$> ipython locate
/Users/me/.ipython

$> ipython locate profile foo
/Users/me/.ipython/profile_foo

$> ipython locate profile
/Users/me/.ipython/profile_default
```

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```
$> ipython locate profile dne
[ProfileLocate] Profile u'dne' not found.
```

Other new features and improvements

- **%install_ext**: A new magic function to install an IPython extension from a URL. E.g. `%install_ext https://bitbucket.org/birkenfeld/ipython-physics/raw/default/physics.py`.
- The `%loadpy` magic is no longer restricted to Python files, and has been renamed `%load`. The old name remains as an alias.
- New command line arguments will help external programs find IPython folders: `ipython locate` finds the user's IPython directory, and `ipython locate profile foo` finds the folder for the 'foo' profile (if it exists).
- The `IPYTHON_DIR` environment variable, introduced in the Great Reorganization of 0.11 and existing only in versions 0.11-0.13, has been deprecated. As described in PR #1167, the complexity and confusion of migrating to this variable is not worth the aesthetic improvement. Please use the historical *`IPYTHONDIR`* environment variable instead.
- The default value of *interactivity* passed from *`run_cell()`* to *`run_ast_nodes()`* is now configurable.
- New `%alias_magic` function to conveniently create aliases of existing magics, if you prefer to have shorter names for personal use.
- We ship unminified versions of the JavaScript libraries we use, to better comply with Debian's packaging policies.
- Simplify the information presented by `obj?/obj??` to eliminate a few redundant fields when possible. PR #2038.
- Improved continuous integration for IPython. We now have automated test runs on Shining Panda and Travis-CI, as well as Tox support.
- The vim-ipython functionality (externally developed) has been updated to the latest version.
- The `%save` magic now has a `-f` flag to force overwriting, which makes it much more usable in the notebook where it is not possible to reply to interactive questions from the kernel. PR #1937.
- Use dvipng to format sympy.Matrix, enabling display of matrices in the Qt console with the sympy printing extension. PR #1861.
- Our messaging protocol now has a reasonable test suite, helping ensure that we don't accidentally deviate from the spec and possibly break third-party applications that may have been using it. We encourage users to contribute more stringent tests to this part of the test suite. PR #1627.
- Use LaTeX to display, on output, various built-in types with the SymPy printing extension. PR #1399.
- Add Gtk3 event loop integration and example. PR #1588.
- `clear_output` improvements, which allow things like progress bars and other simple animations to work well in the notebook (PR #1563):
  - `clear_output()` clears the line, even in terminal IPython, the QtConsole and plain Python as well, by printing `r` to streams.
  - `clear_output()` avoids the flicker in the notebook by adding a delay, and firing immediately upon the next actual display message.

  - `display_javascript` hides its `output_area` element, so using display to run a bunch of javascript doesn't result in ever-growing vertical space.

- Add simple support for running inside a virtualenv. While this doesn't supplant proper installation (as users should do), it helps ad-hoc calling of IPython from inside a virtualenv. PR #1388.

Major Bugs fixed

In this cycle, we have *closed over 740 issues*, but a few major ones merit special mention:

- The `%pastebin` magic has been updated to point to gist.github.com, since unfortunately http://paste.pocoo.org has closed down. We also added a -d flag for the user to provide a gist description string. PR #1670.
- Fix `%paste` that would reject certain valid inputs. PR #1258.
- Fix sending and receiving of Numpy structured arrays (those with composite dtypes, often used as recarrays). PR #2034.
- Reconnect when the websocket connection closes unexpectedly. PR #1577.
- Fix truncated representation of objects in the debugger by showing at least 80 characters' worth of information. PR #1793.
- Fix logger to be Unicode-aware: logging could crash ipython if there was unicode in the input. PR #1792.
- Fix images missing from XML/SVG export in the Qt console. PR #1449.
- Fix deepreload on Python 3. PR #1625, as well as having a much cleaner and more robust implementation of deepreload in general. PR #1457.

Backwards incompatible changes

- The exception *`IPython.core.error.TryNext`* previously accepted arguments and keyword arguments to be passed to the next implementation of the hook. This feature was removed as it made error message propagation difficult and violated the principle of loose coupling.

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

2.18 Issues closed in the 0.13 development cycle

2.18.1 Issues closed in 0.13

GitHub stats since IPython 0.12 (2011/12/19 - 2012/06/30)

These lists are automatically generated, and may be incomplete or contain duplicates.

The following 62 authors contributed 1760 commits.

- Aaron Culich
- Aaron Meurer
- Alex Kramer
- Andrew Giessel
- Andrew Straw
- André Matos
- Aron Ahmadia
- Ben Edwards
- Benjamin Ragan-Kelley
- Bradley M. Froehle
- Brandon Parsons
- Brian E. Granger
- Carlos Cordoba
- David Hirschfeld
- David Zderic
- Ernie French
- Fernando Perez
- Ian Murray
- Jason Grout
- Jens H Nielsen
- Jez Ng
- Jonathan March
- Jonathan Taylor
- Julian Taylor
- Jörgen Stenarson
- Kent Inverarity
- Marc Abramowitz
- Mark Wiebe
- Matthew Brett
- Matthias BUSSONNIER
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- Paul Ivanov
- Piotr Zolnierczuk
- Piti Ongmongkolkul
- Puneeth Chaganti
- Robert Kern
- Ross Jones
- Roy Hyunjin Han
- Scott Tsai
- Skipper Seabold
- Stefan van der Walt
- Steven Johnson
- Takafumi Arakaki
- Ted Wright
- Thomas Hisch
- Thomas Kluyver
- Thomas Spura
- Thomi Richards
- Tim Couper
- Timo Paulssen
- Toby Gilham
- Tony S Yu
- W. Trevor King
- Walter Doerwald
- anatoly techtonik
- fawce
- mcelrath
- wilsaj

We closed a total of 1115 issues, 373 pull requests and 742 regular issues; this is the full list (generated with the script `tools/github_stats.py`):

Pull Requests (373):

- PR #1943: add screenshot and link into releasenotes
- PR #1954: update some example notebooks
- PR #2048: move _encode_binary to jsonutil.encode_images
- PR #2050: only add quotes around xunit-file on Windows
- PR #2047: disable auto-scroll on mozilla
- PR #2015: Fixes for %paste with special transformations

- PR #2046: Iptest unicode
- PR #1939: Namespaces
- PR #2042: increase auto-scroll threshold to 100 lines
- PR #2043: move RemoteError import to top-level
- PR #2036: %alias_magic
- PR #1968: Proposal of icons for .ipynb files
- PR #2037: remove `ipython-qtconsole` gui-script
- PR #2038: add extra clear warning to shell doc
- PR #2029: Ship unminified js
- PR #2007: Add custom_control and custom_page_control variables to override the Qt widgets used by qtconsole
- PR #2034: fix&test push/pull recarrays
- PR #2028: Reduce unhelpful information shown by pinfo
- PR #2030: check wxPython version in inputhook
- PR #2024: Make interactive_usage a bit more rst friendly
- PR #2031: disable ^C^C confirmation on Windows
- PR #2027: match stdin encoding in frontend readline test
- PR #2025: Fix parallel test on WinXP - wait for resource cleanup.
- PR #2016: BUG: test runner fails in Windows if filenames contain spaces.
- PR #2020: Fix home path expansion test in Windows.
- PR #2021: Fix Windows pathname issue in 'odd encoding' test.
- PR #2022: don't check writability in test for get_home_dir when HOME is undefined
- PR #1996: frontend test tweaks
- PR #2014: relax profile regex in notebook
- PR #2012: Mono cursor offset
- PR #2004: Clarify generic message spec vs. Python message API in docs
- PR #2010: notebook: Print a warning (but do not abort) if no webbrowser can be found.
- PR #2002: Refactor %magic into a lsmagic_docs API function.
- PR #1999: `%magic` help: display line and cell magics in alphabetical order.
- PR #1981: Clean BG processes created by %%script on kernel exit
- PR #1994: Fix RST misformatting.
- PR #1951: minor notebook startup/notebook-dir adjustments
- PR #1974: Allow path completion on notebook.
- PR #1964: allow multiple instances of a Magic
- PR #1991: fix _ofind attr in %page
- PR #1988: check for active frontend in update_restart_checkbox
- PR #1979: Add support for tox (https://tox.readthedocs.io/) and Travis CI (http://travis-ci.org/)

- PR #1970: dblclick to restore size of images
- PR #1978: Notebook names truncating at the first period
- PR #1825: second attempt at scrolled long output
- PR #1934: Cell/Worksheet metadata
- PR #1746: Confirm restart (configuration option, and checkbox UI)
- PR #1944: [qtconsole] take %,%% prefix into account for completion
- PR #1973: fix another FreeBSD $HOME symlink issue
- PR #1967: Fix psums example description in docs
- PR #1965: fix for #1678, undo no longer clears cells
- PR #1952: avoid duplicate "Websockets closed" dialog on ws close
- PR #1962: Support unicode prompts
- PR #1955: update to latest version of vim-ipython
- PR #1945: Add –proc option to %%script
- PR #1956: move import RemoteError after get_exc_info
- PR #1950: Fix for copy action (Ctrl+C) when there is no pager defined in qtconsole
- PR #1948: Fix help string for InteractiveShell.ast_node_interactivity
- PR #1942: swallow stderr of which in utils.process.find_cmd
- PR #1940: fix completer css on some Chrome versions
- PR #1938: remove remaining references to deprecated XREP/XREQ names
- PR #1925: Fix styling of superscripts and subscripts. Closes #1924.
- PR #1936: increase duration of save messages
- PR #1937: add %save -f
- PR #1935: add version checking to pyreadline import test
- PR #1849: Octave magics
- PR #1759: github, merge PR(s) just by number(s)
- PR #1931: Win py3fixes
- PR #1933: oinspect.find_file: Additional safety if file cannot be found.
- PR #1932: Fix adding functions to CommandChainDispatcher with equal priority on Py 3
- PR #1928: Select NoDB by default
- PR #1923: Add IPython syntax support to the %timeit magic, in line and cell mode
- PR #1926: Make completer recognize escaped quotes in strings.
- PR #1893: Update Parallel Magics and Exception Display
- PR #1921: magic_arguments: dedent but otherwise preserve indentation.
- PR #1919: Use oinspect in CodeMagics._find_edit_target
- PR #1918: don't warn in iptest if deathrow/quarantine are missing
- PR #1917: Fix for %pdef on Python 3

- PR #1913: Fix for #1428
- PR #1911: temporarily skip autoreload tests
- PR #1909: Fix for #1908, use os.path.normcase for safe filename comparisons
- PR #1907: py3compat fixes for %%script and tests
- PR #1906: ofind finds non-unique cell magics
- PR #1845: Fixes to inspection machinery for magics
- PR #1902: Workaround fix for gh-1632; minimal revert of gh-1424
- PR #1900: Cython libs
- PR #1899: add ScriptMagics to class list for generated config
- PR #1898: minimize manpages
- PR #1897: use glob for bad exclusion warning
- PR #1855: %%script and %%file magics
- PR #1870: add %%capture for capturing stdout/err
- PR #1861: Use dvipng to format sympy.Matrix
- PR #1867: Fix 1px margin bouncing of selected menu item.
- PR #1889: Reconnect when the websocket connection closes unexpectedly
- PR #1886: Fix a bug in renaming notebook
- PR #1895: Fix error in test suite with ip.system()
- PR #1762: add `locate` entry points
- PR #1883: Fix vertical offset due to bold/italics, and bad browser fonts.
- PR #1875: re-write columnize, with intermediate step.
- PR #1851: new completer for qtconsole.
- PR #1892: Remove suspicious quotes in interactiveshell.py
- PR #1864: Rmagic exceptions
- PR #1829: [notebook] don't care about leading prct in completion
- PR #1832: Make svg, jpeg and png images resizable in notebook.
- PR #1674: HTML Notebook carriage-return handling, take 2
- PR #1882: Remove importlib dependency which not available in Python 2.6.
- PR #1879: Correct stack depth for variable expansion in !system commands
- PR #1841: [notebook] deduplicate completion results
- PR #1850: Remove args/kwargs handling in TryNext, fix %paste error messages.
- PR #1663: Keep line-endings in ipynb
- PR #1815: Make : invalid in filenames in the Notebook JS code.
- PR #1819: doc: cleanup the parallel psums example a little
- PR #1839: External cleanup
- PR #1782: fix Magic menu in qtconsole, split in groups

- PR #1862: Minor bind_kernel improvements
- PR #1857: Prevent jumping of window to input when output is clicked.
- PR #1856: Fix 1px jumping of cells and menus in Notebook.
- PR #1852: fix chained resubmissions
- PR #1780: Rmagic extension
- PR #1847: add InlineBackend to ConsoleApp class list
- PR #1836: preserve header for resubmitted tasks
- PR #1828: change default extension to .ipy for %save -r
- PR #1800: Reintroduce recall
- PR #1830: lsmagic lists magics in alphabetical order
- PR #1773: Update SymPy profile: SymPy's latex() can now print set and frozenset
- PR #1761: Edited documentation to use IPYTHONDIR in place of ~/.ipython
- PR #1822: aesthetics pass on AsyncResult.display_outputs
- PR #1821: ENTER submits the rename notebook dialog.
- PR #1820: NotebookApp: Make the number of ports to retry user configurable.
- PR #1816: Always use filename as the notebook name.
- PR #1813: Add assert_in method to nose for Python 2.6
- PR #1711: New Tooltip, New Completer and JS Refactor
- PR #1798: a few simple fixes for docs/parallel
- PR #1812: Ensure AsyncResult.display_outputs doesn't display empty streams
- PR #1811: warn on nonexistent exclusions in iptest
- PR #1810: fix for #1809, failing tests in IPython.zmq
- PR #1808: Reposition alternate upload for firefox [need cross browser/OS/language test]
- PR #1742: Check for custom_exceptions only once
- PR #1807: add missing cython exclusion in iptest
- PR #1805: Fixed a vcvarsall.bat error on win32/Py2.7 when trying to compile with m…
- PR #1739: Dashboard improvement (necessary merge of #1658 and #1676 + fix #1492)
- PR #1770: Cython related magic functions
- PR #1707: Accept –gui=<…> switch in IPython qtconsole.
- PR #1797: Fix comment which breaks Emacs syntax highlighting.
- PR #1795: fix %gui magic
- PR #1793: Raise repr limit for strings to 80 characters (from 30).
- PR #1794: don't use XDG path on OS X
- PR #1792: Unicode-aware logger
- PR #1791: update zmqshell magics
- PR #1787: DOC: Remove regression from qt-console docs.

- PR #1758: test_pr, fallback on http if git protocol fail, and SSL errors…
- PR #1748: Fix some tests for Python 3.3
- PR #1755: test for pygments before running qt tests
- PR #1771: Make default value of interactivity passed to run_ast_nodes configurable
- PR #1784: restore loadpy to load
- PR #1768: Update parallel magics
- PR #1779: Tidy up error raising in magic decorators.
- PR #1769: Allow cell mode timeit without setup code.
- PR #1716: Fix for fake filenames in verbose traceback
- PR #1763: [qtconsole] fix append_plain_html -> append_html
- PR #1732: Refactoring of the magics system and implementation of cell magics
- PR #1630: Merge divergent Kernel implementations
- PR #1705: [notebook] Make pager resizable, and remember size…
- PR #1606: Share code for %pycat and %loadpy, make %pycat aware of URLs
- PR #1757: Open IPython notebook hyperlinks in a new window using target=_blank
- PR #1754: Fix typo enconters->encounters
- PR #1753: Clear window title when kernel is restarted
- PR #1449: Fix for bug #735 : Images missing from XML/SVG export
- PR #1743: Tooltip completer js refactor
- PR #1681: add qt config option to clear_on_kernel_restart
- PR #1733: Tooltip completer js refactor
- PR #1727: terminate kernel after embed_kernel tests
- PR #1737: add HistoryManager to ipapp class list
- PR #1686: ENH: Open a notebook from the command line
- PR #1709: fixes #1708, failing test in arg_split on windows
- PR #1718: Use CRegExp trait for regular expressions.
- PR #1729: Catch failure in repr() for %whos
- PR #1726: use eval for command-line args instead of exec
- PR #1724: fix scatter/gather with targets='all'
- PR #1725: add –no-ff to git pull in test_pr
- PR #1721: Tooltip completer js refactor
- PR #1657: Add `wait` optional argument to `hooks.editor`
- PR #1717: Define generic sys.ps{1,2,3}, for use by scripts.
- PR #1691: Finish PR #1446
- PR #1710: update MathJax CDN url for https
- PR #1713: Make autocall regexp's configurable.

- PR #1703: Allow TryNext to have an error message without it affecting the command chain
- PR #1714: minor adjustments to test_pr
- PR #1704: ensure all needed qt parts can be imported before settling for one
- PR #1706: Mark test_push_numpy_nocopy as a known failure for Python 3
- PR #1698: fix tooltip on token with number
- PR #1245: pythonw py3k fixes for issue #1226
- PR #1685: Add script to test pull request
- PR #1693: deprecate IPYTHON_DIR in favor of IPYTHONDIR
- PR #1695: Avoid deprecated warnings from ipython-qtconsole.desktop.
- PR #1694: Add quote to notebook to allow it to load
- PR #1689: Fix sys.path missing '' as first entry in `ipython kernel`.
- PR #1687: import Binary from bson instead of pymongo
- PR #1616: Make IPython.core.display.Image less notebook-centric
- PR #1684: CLN: Remove redundant function definition.
- PR #1670: Point %pastebin to gist
- PR #1669: handle pyout messages in test_message_spec
- PR #1295: add binary-tree engine interconnect example
- PR #1642: Cherry-picked commits from 0.12.1 release
- PR #1659: Handle carriage return characters ("r") in HTML notebook output.
- PR #1656: ensure kernels are cleaned up in embed_kernel tests
- PR #1664: InteractiveShell.run_code: Update docstring.
- PR #1662: Delay flushing softspace until after cell finishes
- PR #1643: handle jpg/jpeg in the qtconsole
- PR #1652: add patch_pyzmq() for backporting a few changes from newer pyzmq
- PR #1650: DOC: moving files with SSH launchers
- PR #1357: add IPython.embed_kernel()
- PR #1640: Finish up embed_kernel
- PR #1651: Remove bundled Itpl module
- PR #1634: incremental improvements to SSH launchers
- PR #1649: move examples/test_embed into examples/tests/embed
- PR #1633: Fix installing extension from local file on Windows
- PR #1645: Exclude UserDict when deep reloading NumPy.
- PR #1637: Removed a ':' which shouldn't have been there
- PR #1631: TST: QApplication doesn't quit early enough with PySide.
- PR #1629: evaluate a few dangling validate_message generators
- PR #1621: clear In[] prompt numbers on "Clear All Output"

- PR #1627: Test the Message Spec
- PR #1624: Fixes for byte-compilation on Python 3
- PR #1615: Add show() method to figure objects.
- PR #1625: Fix deepreload on Python 3
- PR #1620: pyin message now have execution_count
- PR #1457: Update deepreload to use a rewritten knee.py. Fixes dreload(numpy).
- PR #1613: allow map / parallel function for single-engine views
- PR #1609: exit notebook cleanly on SIGINT, SIGTERM
- PR #1607: cleanup sqlitedb temporary db file after tests
- PR #1608: don't rely on timedelta.total_seconds in AsyncResult
- PR #1599: Fix for %run -d on Python 3
- PR #1602: Fix %env magic on Python 3.
- PR #1603: Remove python3 profile
- PR #1604: Exclude IPython.quarantine from installation
- PR #1600: Specify encoding for io.open in notebook_reformat tests
- PR #1605: Small fixes for Animation and Progress notebook
- PR #1529: __all__ feature, improvement to dir2, and tests for both
- PR #1548: add sugar methods/properties to AsyncResult
- PR #1535: Fix pretty printing dispatch
- PR #1399: Use LaTeX to print various built-in types with the SymPy printing extension
- PR #1597: re-enter kernel.eventloop after catching SIGINT
- PR #1490: rename plaintext cell -> raw cell
- PR #1480: Fix %notebook magic, etc. nbformat unicode tests and fixes
- PR #1588: Gtk3 integration with ipython works.
- PR #1595: Examples syntax (avoid errors installing on Python 3)
- PR #1526: Find encoding for Python files
- PR #1594: Fix writing git commit ID to a file on build with Python 3
- PR #1556: shallow-copy DictDB query results
- PR #1502: small changes in response to pyflakes pass
- PR #1445: Don't build sphinx docs for sdists
- PR #1538: store git commit hash in utils._sysinfo instead of hidden data file
- PR #1546: attempt to suppress exceptions in channel threads at shutdown
- PR #1559: update tools/github_stats.py to use GitHub API v3
- PR #1563: clear_output improvements
- PR #1560: remove obsolete discussion of Twisted/trial from testing docs
- PR #1569: BUG: qtconsole – non-standard handling of a and b. [Fixes #1561]

- PR #1573: BUG: Ctrl+C crashes wx pylab kernel in qtconsole.
- PR #1568: fix PR #1567
- PR #1567: Fix: openssh_tunnel did not parse port in `server`
- PR #1565: fix AsyncResult.abort
- PR #1552: use os.getcwdu in NotebookManager
- PR #1541: display_pub flushes stdout/err
- PR #1544: make MultiKernelManager.kernel_manager_class configurable
- PR #1517: Fix indentation bug in IPython/lib/pretty.py
- PR #1519: BUG: Include the name of the exception type in its pretty format.
- PR #1489: Fix zero-copy push
- PR #1477: fix dangling `buffer` in IPython.parallel.util
- PR #1514: DOC: Fix references to IPython.lib.pretty instead of the old location
- PR #1481: BUG: Improve placement of CallTipWidget
- PR #1496: BUG: LBYL when clearing the output history on shutdown.
- PR #1508: fix sorting profiles in clustermanager
- PR #1495: BUG: Fix pretty-printing for overzealous objects
- PR #1472: more general fix for #662
- PR #1483: updated magic_history docstring
- PR #1383: First version of cluster web service.
- PR #1398: fix %tb after SyntaxError
- PR #1440: Fix for failing testsuite when using –with-xml-coverage on windows.
- PR #1419: Add %install_ext magic function.
- PR #1424: Win32 shell interactivity
- PR #1468: Simplify structure of a Job in the TaskScheduler
- PR #1447: 1107 - Tab autocompletion can suggest invalid syntax
- PR #1469: Fix typo in comment (insert space)
- PR #1463: Fix completion when importing modules in the cwd.
- PR #1466: Fix for issue #1437, unfriendly windows qtconsole error handling
- PR #1432: Fix ipython directive
- PR #1465: allow `ipython help subcommand` syntax
- PR #1416: Conditional import of ctypes in inputhook
- PR #1462: expedite parallel tests
- PR #1410: Add javascript library and css stylesheet loading to JS class.
- PR #1448: Fix for #875 Never build unicode error messages
- PR #1458: use eval to uncan References
- PR #1450: load mathjax from CDN via https

- PR #1451: include heading level in JSON
- PR #1444: Fix pyhton -> python typos
- PR #1414: ignore errors in shell.var_expand
- PR #1430: Fix for tornado check for tornado < 1.1.0
- PR #1413: get_home_dir expands symlinks, adjust test accordingly
- PR #1385: updated and prettified magic doc strings
- PR #1406: Browser selection
- PR #1377: Saving non-ascii history
- PR #1402: fix symlinked /home issue for FreeBSD
- PR #1405: Only monkeypatch xunit when the tests are run using it.
- PR #1395: Xunit & KnownFailure
- PR #1396: Fix for %tb magic.
- PR #1386: Jsd3
- PR #1388: Add simple support for running inside a virtualenv
- PR #1391: Improve Hub/Scheduler when no engines are registered
- PR #1369: load header with engine id when engine dies in TaskScheduler
- PR #1353: Save notebook as script using unicode file handle.
- PR #1352: Add '-m mod : run library module as a script' option.
- PR #1363: Fix some minor color/style config issues in the qtconsole
- PR #1371: Adds a quiet keyword to sync_imports
- PR #1387: Fixing Cell menu to update cell type select box.
- PR #1296: Wx gui example: fixes the broken example for `%gui wx`.
- PR #1372: ipcontroller cleans up connection files unless reuse=True
- PR #1374: remove calls to meaningless ZMQStream.on_err
- PR #1370: allow draft76 websockets (Safari)
- PR #1368: Ensure handler patterns are str, not unicode
- PR #1361: Notebook bug fix branch
- PR #1364: avoid jsonlib returning Decimal
- PR #1362: Don't log complete contents of history replies, even in debug
- PR #1347: fix weird magic completion in notebook
- PR #1346: fixups for alternate URL prefix stuff
- PR #1336: crack at making notebook.html use the layout.html template
- PR #1331: RST and heading cells
- PR #1247: fixes a bug causing extra newlines after comments.
- PR #1332: notebook - allow prefixes in URL path.
- PR #1341: Don't attempt to tokenize binary files for tracebacks

- PR #1334: added key handler for control-s to notebook, seems to work pretty well
- PR #1338: Fix see also in docstrings so API docs build
- PR #1335: Notebook toolbar UI
- PR #1299: made notebook.html extend layout.html
- PR #1318: make Ctrl-D in qtconsole act same as in terminal (ready to merge)
- PR #1328: Coverage
- PR #1206: don't preserve fixConsole output in json
- PR #1330: Add linewrapping to text cells (new feature in CodeMirror).
- PR #1309: Inoculate clearcmd extension into %reset functionality
- PR #1327: Updatecm2
- PR #1326: Removing Ace edit capability.
- PR #1325: forgotten selected_cell -> get_selected_cell
- PR #1316: Pass subprocess test runners a suitable location for xunit output
- PR #1303: Updatecm
- PR #1312: minor heartbeat tweaks
- PR #1306: Fix %prun input parsing for escaped characters (closes #1302)
- PR #1301: New "Fix for issue #1202" based on current master.
- PR #1289: Make autoreload extension work on Python 3.
- PR #1288: Don't ask for confirmation when stdin isn't available
- PR #1294: TaskScheduler.hwm default to 1 instead of 0
- PR #1283: HeartMonitor.period should be an Integer
- PR #1264: Aceify
- PR #1284: a fix for GH 1269
- PR #1213: BUG: Minor typo in history_console_widget.py
- PR #1267: add NoDB for non-recording Hub
- PR #1222: allow Reference as callable in map/apply
- PR #1257: use self.kernel_manager_class in qtconsoleapp
- PR #1253: set auto_create flag for notebook apps
- PR #1262: Heartbeat no longer shares the app's Context
- PR #1229: Fix display of SyntaxError in Python 3
- PR #1256: Dewijmoize
- PR #1246: Skip tests that require X, when importing pylab results in RuntimeError.
- PR #1211: serve local files in notebook-dir
- PR #1224: edit text cells on double-click instead of single-click
- PR #1187: misc notebook: connection file cleanup, first heartbeat, startup flush
- PR #1207: fix loadpy duplicating newlines

- PR #1129: Unified setup.py
- PR #1199: Reduce IPython.external.*
- PR #1218: Added -q option to %prun for suppression of the output, along with editing the dochelp string.
- PR #1217: Added -q option to %prun for suppression of the output, along with editing the dochelp string
- PR #1175: core.completer: Clean up excessive and unused code.
- PR #1196: docs: looks like a file path might have been accidentally pasted in the middle of a word
- PR #1190: Fix link to Chris Fonnesbeck blog post about 0.11 highlights.

Issues (742):

- #1943: add screenshot and link into releasenotes
- #1570: [notebook] remove 'left panel' references from example.
- #1954: update some example notebooks
- #2048: move _encode_binary to jsonutil.encode_images
- #2050: only add quotes around xunit-file on Windows
- #2047: disable auto-scroll on mozilla
- #1258: Magic %paste error
- #2015: Fixes for %paste with special transformations
- #760: Windows: test runner fails if repo path contains spaces
- #2046: Iptest unicode
- #1939: Namespaces
- #2042: increase auto-scroll threshold to 100 lines
- #2043: move RemoteError import to top-level
- #641: In %magic help, remove duplicate aliases
- #2036: %alias_magic
- #1968: Proposal of icons for .ipynb files
- #825: keyboardinterrupt crashes gtk gui when gtk.set_interactive is not available
- #1971: Remove duplicate magics docs
- #2040: Namespaces for cleaner public APIs
- #2039: ipython parallel import exception
- #2035: Getdefaultencoding test error with sympy 0.7.1_git
- #2037: remove `ipython-qtconsole` gui-script
- #1516: ipython-qtconsole script isn't installed for Python 2.x
- #1297: "ipython -p sh" is in documentation but doesn't work
- #2038: add extra clear warning to shell doc
- #1265: please ship unminified js and css sources
- #2029: Ship unminified js
- #1920: Provide an easy way to override the Qt widget used by qtconsole

- #2007: Add custom_control and custom_page_control variables to override the Qt widgets used by qtconsole
- #2009: In %magic help, remove duplicate aliases
- #2033: ipython parallel pushing and pulling recarrays
- #2034: fix&test push/pull recarrays
- #2028: Reduce unhelpful information shown by pinfo
- #1992: Tab completion fails with many spaces in filename
- #1885: handle too old wx
- #2030: check wxPython version in inputhook
- #2024: Make interactive_usage a bit more rst friendly
- #2031: disable ^C^C confirmation on Windows
- #2023: Unicode test failure on OS X
- #2027: match stdin encoding in frontend readline test
- #1901: Windows: parallel test fails assert, leaves 14 python processes alive
- #2025: Fix parallel test on WinXP - wait for resource cleanup.
- #1986: Line magic function `%R` not found. (Rmagic)
- #1712: test failure in ubuntu package daily build
- #1183: 0.12 testsuite failures
- #2016: BUG: test runner fails in Windows if filenames contain spaces.
- #1806: Alternate upload methods in firefox
- #2019: Windows: home directory expansion test fails
- #2020: Fix home path expansion test in Windows.
- #2017: Windows core test error - filename quoting
- #2021: Fix Windows pathname issue in 'odd encoding' test.
- #1998: call to nt.assert_true(path._writable_dir(home)) returns false in test_path.py
- #2022: don't check writability in test for get_home_dir when HOME is undefined
- #1589: Test failures and docs don't build on Mac OS X Lion
- #1996: frontend test tweaks
- #2011: Notebook server can't start cluster with hyphen-containing profile name
- #2014: relax profile regex in notebook
- #2013: brew install pyqt
- #2005: Strange output artifacts in footer of notebook
- #2012: Mono cursor offset
- #2004: Clarify generic message spec vs. Python message API in docs
- #2006: Don't crash when starting notebook server if runnable browser not found
- #2010: notebook: Print a warning (but do not abort) if no webbrowser can be found.
- #2008: pip install virtualenv

- #2003: Wrong case of rmagic in docs
- #2002: Refactor %magic into a lsmagic_docs API function.
- #2000: kernel.js consistency with generic IPython message format.
- #1999: `%magic` help: display line and cell magics in alphabetical order.
- #1635: test_prun_quotes fails on Windows
- #1984: Cannot restart Notebook when using `%%script --bg`
- #1981: Clean BG processes created by %%script on kernel exit
- #1994: Fix RST misformatting.
- #1949: Introduce Notebook Magics
- #1985: Kernels should start in notebook dir when manually specified
- #1980: Notebook should check that –notebook-dir exists
- #1951: minor notebook startup/notebook-dir adjustments
- #1969: tab completion in notebook for paths not triggered
- #1974: Allow path completion on notebook.
- #1964: allow multiple instances of a Magic
- #1960: %page not working
- #1991: fix _ofind attr in %page
- #1982: Shutdown qtconsole problem?
- #1988: check for active frontend in update_restart_checkbox
- #1979: Add support for tox (https://tox.readthedocs.io/) and Travis CI (http://travis-ci.org/)
- #1989: Parallel: output of %px and %px${suffix} is inconsistent
- #1966: ValueError: packer could not serialize a simple message
- #1987: Notebook: MathJax offline install not recognized
- #1970: dblclick to restore size of images
- #1983: Notebook does not save heading level
- #1978: Notebook names truncating at the first period
- #1553: Limited size of output cells and provide scroll bars for such output cells
- #1825: second attempt at scrolled long output
- #1915: add cell-level metadata
- #1934: Cell/Worksheet metadata
- #1746: Confirm restart (configuration option, and checkbox UI)
- #1790: Commenting function.
- #1767: Tab completion problems with cell magics
- #1944: [qtconsole] take %,%% prefix into account for completion
- #1973: fix another FreeBSD $HOME symlink issue
- #1972: Fix completion of '%tim' in the Qt console

- #1887: Make it easy to resize jpeg/png images back to original size.
- #1967: Fix psums example description in docs
- #1678: ctrl-z clears cell output in notebook when pressed enough times
- #1965: fix for #1678, undo no longer clears cells
- #1952: avoid duplicate "Websockets closed" dialog on ws close
- #1961: UnicodeDecodeError on directory with unicode chars in prompt
- #1963: styling prompt, {color.Normal} excepts
- #1962: Support unicode prompts
- #1959: %page not working on qtconsole for Windows XP 32-bit
- #1955: update to latest version of vim-ipython
- #1945: Add –proc option to %%script
- #1957: fix indentation in kernel.js
- #1956: move import RemoteError after get_exc_info
- #1950: Fix for copy action (Ctrl+C) when there is no pager defined in qtconsole
- #1948: Fix help string for InteractiveShell.ast_node_interactivity
- #1941: script magics cause terminal spam
- #1942: swallow stderr of which in utils.process.find_cmd
- #1833: completer draws slightly too small on Chrome
- #1940: fix completer css on some Chrome versions
- #1938: remove remaining references to deprecated XREP/XREQ names
- #1924: HTML superscripts not shown raised in the notebook
- #1925: Fix styling of superscripts and subscripts. Closes #1924.
- #1461: User notification if notebook saving fails
- #1936: increase duration of save messages
- #1542: %save magic fails in clients without stdin if file already exists
- #1937: add %save -f
- #1572: pyreadline version dependency not correctly checked
- #1935: add version checking to pyreadline import test
- #1849: Octave magics
- #1759: github, merge PR(s) just by number(s)
- #1931: Win py3fixes
- #1646: Meaning of restart parameter in client.shutdown() unclear
- #1933: oinspect.find_file: Additional safety if file cannot be found.
- #1916: %paste doesn't work on py3
- #1932: Fix adding functions to CommandChainDispatcher with equal priority on Py 3
- #1928: Select NoDB by default

- #1923: Add IPython syntax support to the %timeit magic, in line and cell mode
- #1926: Make completer recognize escaped quotes in strings.
- #1929: Ipython-qtconsole (0.12.1) hangs with Python 2.7.3, Windows 7 64 bit
- #1409: [qtconsole] forward delete bring completion into current line
- #1922: py3k compatibility for setupegg.py
- #1598: document that sync_imports() can't handle "import foo as bar"
- #1893: Update Parallel Magics and Exception Display
- #1890: Docstrings for magics that use @magic_arguments are rendered wrong
- #1921: magic_arguments: dedent but otherwise preserve indentation.
- #1919: Use oinspect in CodeMagics._find_edit_target
- #1918: don't warn in iptest if deathrow/quarantine are missing
- #1914: %pdef failing on python3
- #1917: Fix for %pdef on Python 3
- #1428: Failing test that prun does not clobber string escapes
- #1913: Fix for #1428
- #1911: temporarily skip autoreload tests
- #1549: autoreload extension crashes ipython
- #1908: find_file errors on windows
- #1909: Fix for #1908, use os.path.normcase for safe filename comparisons
- #1907: py3compat fixes for %%script and tests
- #1904: %%px? doesn't work, shows info for %px, general cell magic problem
- #1906: ofind finds non-unique cell magics
- #1894: Win64 binary install fails
- #1799: Source file not found for magics
- #1845: Fixes to inspection machinery for magics
- #1774: Some magics seems broken
- #1586: Clean up tight coupling between Notebook, CodeCell and Kernel Javascript objects
- #1632: Win32 shell interactivity apparently broke qtconsole "cd" magic
- #1902: Workaround fix for gh-1632; minimal revert of gh-1424
- #1900: Cython libs
- #1503: Cursor is offset in notebook in Chrome 17 on Linux
- #1426: Qt console doesn't handle the `--gui` flag correctly.
- #1180: Can't start IPython kernel in Spyder
- #581: test IPython.zmq
- #1593: Name embedded in notebook overrides filename
- #1899: add ScriptMagics to class list for generated config

- #1618: generate or minimize manpages
- #1898: minimize manpages
- #1896: Windows: apparently spurious warning 'Excluding nonexistent file' … test_exampleip
- #1897: use glob for bad exclusion warning
- #1215: updated %quickref to show short-hand for %sc and %sx
- #1855: %%script and %%file magics
- #1863: Ability to silence a cell in the notebook
- #1870: add %%capture for capturing stdout/err
- #1861: Use dvipng to format sympy.Matrix
- #1867: Fix 1px margin bouncing of selected menu item.
- #1889: Reconnect when the websocket connection closes unexpectedly
- #1577: If a notebook loses its network connection WebSockets won't reconnect
- #1886: Fix a bug in renaming notebook
- #1895: Fix error in test suite with ip.system()
- #1762: add `locate` entry points
- #1883: Fix vertical offset due to bold/italics, and bad browser fonts.
- #1875: re-write columnize, with intermediate step.
- #1860: IPython.utils.columnize sometime wrong…
- #1851: new completer for qtconsole.
- #1892: Remove suspicious quotes in interactiveshell.py
- #1854: Class `%hierarchy` and graphiz `%%dot` magics
- #1827: Sending tracebacks over ZMQ should protect against unicode failure
- #1864: Rmagic exceptions
- #1829: [notebook] don't care about leading prct in completion
- #1832: Make svg, jpeg and png images resizable in notebook.
- #1674: HTML Notebook carriage-return handling, take 2
- #1874: cython_magic uses importlib, which doesn't ship with py2.6
- #1882: Remove importlib dependency which not available in Python 2.6.
- #1878: shell access using ! will not fill class or function scope vars
- #1879: Correct stack depth for variable expansion in !system commands
- #1840: New JS completer should merge completions before display
- #1841: [notebook] deduplicate completion results
- #1736: no good error message on missing tkinter and %paste
- #1741: Display message from TryNext error in magic_paste
- #1850: Remove args/kwargs handling in TryNext, fix %paste error messages.
- #1663: Keep line-endings in ipynb

- #1872: Matplotlib window freezes using intreractive plot in qtconsole
- #1869: Improve CodeMagics._find_edit_target
- #1781: Colons in notebook name causes notebook deletion without warning
- #1815: Make : invalid in filenames in the Notebook JS code.
- #1819: doc: cleanup the parallel psums example a little
- #1838: externals cleanup
- #1839: External cleanup
- #1782: fix Magic menu in qtconsole, split in groups
- #1862: Minor bind_kernel improvements
- #1859: kernmagic during console startup
- #1857: Prevent jumping of window to input when output is clicked.
- #1856: Fix 1px jumping of cells and menus in Notebook.
- #1848: task fails with "AssertionError: not enough buffers!" after second resubmit
- #1852: fix chained resubmissions
- #1780: Rmagic extension
- #1853: Fix jumpy notebook behavior
- #1842: task with UnmetDependency error still owned by engine
- #1847: add InlineBackend to ConsoleApp class list
- #1846: Exceptions within multiprocessing crash Ipython notebook kernel
- #1843: Notebook does not exist and permalinks
- #1837: edit magic broken in head
- #1834: resubmitted tasks doesn't have same session name
- #1836: preserve header for resubmitted tasks
- #1776: fix magic menu in qtconsole
- #1828: change default extension to .ipy for %save -r
- #1800: Reintroduce recall
- #1671: __future__ environments
- #1830: lsmagic lists magics in alphabetical order
- #1835: Use Python import in ipython profile config
- #1773: Update SymPy profile: SymPy's latex() can now print set and frozenset
- #1761: Edited documentation to use IPYTHONDIR in place of ~/.ipython
- #1772: notebook autocomplete fail when typing number
- #1822: aesthetics pass on AsyncResult.display_outputs
- #1460: Redirect http to https for notebook
- #1287: Refactor the notebook tab completion/tooltip
- #1596: In rename dialog, <return> should submit

- #1821: ENTER submits the rename notebook dialog.
- #1750: Let the user disable random port selection
- #1820: NotebookApp: Make the number of ports to retry user configurable.
- #1816: Always use filename as the notebook name.
- #1775: assert_in not present on Python 2.6
- #1813: Add assert_in method to nose for Python 2.6
- #1498: Add tooltip keyboard shortcuts
- #1711: New Tooltip, New Completer and JS Refactor
- #1798: a few simple fixes for docs/parallel
- #1818: possible bug with latex / markdown
- #1647: Aborted parallel tasks can't be resubmitted
- #1817: Change behavior of ipython notebook –port=…
- #1738: IPython.embed_kernel issues
- #1610: Basic bold and italic in HTML output cells
- #1576: Start and stop kernels from the notebook dashboard
- #1515: impossible to shutdown notebook kernels
- #1812: Ensure AsyncResult.display_outputs doesn't display empty streams
- #1811: warn on nonexistent exclusions in iptest
- #1809: test suite error in IPython.zmq on windows
- #1810: fix for #1809, failing tests in IPython.zmq
- #1808: Reposition alternate upload for firefox [need cross browser/OS/language test]
- #1742: Check for custom_exceptions only once
- #1802: cythonmagic tests should be skipped if Cython not available
- #1062: warning message in IPython.extensions test
- #1807: add missing cython exclusion in iptest
- #1805: Fixed a vcvarsall.bat error on win32/Py2.7 when trying to compile with m…
- #1803: MPI parallel %px bug
- #1804: Fixed a vcvarsall.bat error on win32/Py2.7 when trying to compile with mingw.
- #1492: Drag target very small if IPython Dashboard has no notebooks
- #1562: Offer a method other than drag-n-drop to upload notebooks
- #1739: Dashboard improvement (necessary merge of #1658 and #1676 + fix #1492)
- #1770: Cython related magic functions
- #1532: qtconsole does not accept –gui switch
- #1707: Accept –gui=<…> switch in IPython qtconsole.
- #1797: Fix comment which breaks Emacs syntax highlighting.
- #1796: %gui magic broken

- #1795: fix %gui magic
- #1788: extreme truncating of return values
- #1793: Raise repr limit for strings to 80 characters (from 30).
- #1794: don't use XDG path on OS X
- #1777: ipython crash on wrong encoding
- #1792: Unicode-aware logger
- #1791: update zmqshell magics
- #1787: DOC: Remove regression from qt-console docs.
- #1785: IPython.utils.tests.test_process.SubProcessTestCase
- #1758: test_pr, fallback on http if git protocol fail, and SSL errors…
- #1786: Make notebook save failures more salient
- #1748: Fix some tests for Python 3.3
- #1755: test for pygments before running qt tests
- #1771: Make default value of interactivity passed to run_ast_nodes configurable
- #1783: part of PR #1606 (loadpy -> load) erased by magic refactoring.
- #1784: restore loadpy to load
- #1768: Update parallel magics
- #1778: string exception in IPython/core/magic.py:232
- #1779: Tidy up error raising in magic decorators.
- #1769: Allow cell mode timeit without setup code.
- #1716: Fix for fake filenames in verbose traceback
- #1763: [qtconsole] fix append_plain_html -> append_html
- #1766: Test failure in IPython.parallel
- #1611: IPEP1: Cell magics and general cleanup of the Magic system
- #1732: Refactoring of the magics system and implementation of cell magics
- #1765: test_pr should clearn PYTHONPATH for the subprocesses
- #1630: Merge divergent Kernel implementations
- #1705: [notebook] Make pager resizable, and remember size…
- #1606: Share code for %pycat and %loadpy, make %pycat aware of URLs
- #1720: Adding interactive inline plotting to notebooks with flot
- #1701: [notebook] Open HTML links in a new window by default
- #1757: Open IPython notebook hyperlinks in a new window using target=_blank
- #1735: Open IPython notebook hyperlinks in a new window using target=_blank
- #1754: Fix typo enconters->encounters
- #1753: Clear window title when kernel is restarted
- #735: Images missing from XML/SVG export (for me)

- #1449: Fix for bug #735 : Images missing from XML/SVG export
- #1752: Reconnect Websocket when it closes unexpectedly
- #1751: Reconnect Websocket when it closes unexpectedly
- #1749: Load MathJax.js using HTTPS when IPython notebook server is HTTPS
- #1743: Tooltip completer js refactor
- #1700: A module for sending custom user messages from the kernel.
- #1745: htmlnotebook: Cursor is off
- #1728: ipython crash with matplotlib during picking
- #1681: add qt config option to clear_on_kernel_restart
- #1733: Tooltip completer js refactor
- #1676: Kernel status/shutdown from dashboard
- #1658: Alternate notebook upload methods
- #1727: terminate kernel after embed_kernel tests
- #1737: add HistoryManager to ipapp class list
- #945: Open a notebook from the command line
- #1686: ENH: Open a notebook from the command line
- #1709: fixes #1708, failing test in arg_split on windows
- #1718: Use CRegExp trait for regular expressions.
- #1729: Catch failure in repr() for %whos
- #1726: use eval for command-line args instead of exec
- #1723: scatter/gather fail with targets='all'
- #1724: fix scatter/gather with targets='all'
- #1725: add –no-ff to git pull in test_pr
- #1722: unicode exception when evaluating expression with non-ascii characters
- #1721: Tooltip completer js refactor
- #1657: Add `wait` optional argument to `hooks.editor`
- #123: Define sys.ps{1,2}
- #1717: Define generic sys.ps{1,2,3}, for use by scripts.
- #1442: cache-size issue in qtconsole
- #1691: Finish PR #1446
- #1446: Fixing Issue #1442
- #1710: update MathJax CDN url for https
- #81: Autocall fails if first function argument begins with "-" or "+
- #1713: Make autocall regexp's configurable.
- #211: paste command not working
- #1703: Allow TryNext to have an error message without it affecting the command chain

- #1714: minor adjustments to test_pr
- #1509: New tooltip for notebook
- #1697: Major refactoring of the Notebook, Kernel and CodeCell JavaScript.
- #788: Progress indicator in the notebook (and perhaps the Qt console)
- #1034: Single process Qt console
- #1557: magic function conflict while using –pylab
- #1476: Pylab figure objects not properly updating
- #1704: ensure all needed qt parts can be imported before settling for one
- #1708: test failure in arg_split on windows
- #1706: Mark test_push_numpy_nocopy as a known failure for Python 3
- #1696: notebook tooltip fail on function with number
- #1698: fix tooltip on token with number
- #1226: Windows GUI only (pythonw) bug for IPython on Python 3.x
- #1245: pythonw py3k fixes for issue #1226
- #1417: Notebook Completer Class
- #1690: [Bogus] Deliberately make a test fail
- #1685: Add script to test pull request
- #1167: Settle on a choice for $IPYTHONDIR
- #1693: deprecate IPYTHON_DIR in favor of IPYTHONDIR
- #1672: ipython-qtconsole.desktop is using a deprecated format
- #1695: Avoid deprecated warnings from ipython-qtconsole.desktop.
- #1694: Add quote to notebook to allow it to load
- #1240: sys.path missing `''` as first entry when kernel launched without interface
- #1689: Fix sys.path missing ‘’ as first entry in `ipython kernel`.
- #1683: Parallel controller failing with Pymongo 2.2
- #1687: import Binary from bson instead of pymongo
- #1614: Display Image in Qtconsole
- #1616: Make IPython.core.display.Image less notebook-centric
- #1684: CLN: Remove redundant function definition.
- #1655: Add %open magic command to open editor in non-blocking manner
- #1677: middle-click paste broken in notebook
- #1670: Point %pastebin to gist
- #1667: Test failure in test_message_spec
- #1668: Test failure in IPython.zmq.tests.test_message_spec.test_complete “‘pyout’ != ‘status’”
- #1669: handle pyout messages in test_message_spec
- #1295: add binary-tree engine interconnect example

- #1642: Cherry-picked commits from 0.12.1 release
- #1659: Handle carriage return characters ("r") in HTML notebook output.
- #1313: Figure out MathJax 2 support
- #1653: Test failure in IPython.zmq
- #1656: ensure kernels are cleaned up in embed_kernel tests
- #1666: pip install ipython==dev installs version 0.8 from an old svn repo
- #1664: InteractiveShell.run_code: Update docstring.
- #1512: `print stuff,` should avoid newline
- #1662: Delay flushing softspace until after cell finishes
- #1643: handle jpg/jpeg in the qtconsole
- #966: dreload fails on Windows XP with IPython 0.11 "Unexpected Error"
- #1500: dreload doesn't seem to exclude numpy
- #1520: kernel crash when showing tooltip (?)
- #1652: add patch_pyzmq() for backporting a few changes from newer pyzmq
- #1650: DOC: moving files with SSH launchers
- #1357: add IPython.embed_kernel()
- #1640: Finish up embed_kernel
- #1651: Remove bundled Itpl module
- #1634: incremental improvements to SSH launchers
- #1649: move examples/test_embed into examples/tests/embed
- #1171: Recognise virtualenvs
- #1479: test_extension failing in Windows
- #1633: Fix installing extension from local file on Windows
- #1644: Update copyright date to 2012
- #1636: Test_deepreload breaks pylab irunner tests
- #1645: Exclude UserDict when deep reloading NumPy.
- #1454: make it possible to start engine in 'disabled' mode and 'enable' later
- #1641: Escape code for the current time in PromptManager
- #1638: ipython console clobbers custom sys.path
- #1637: Removed a ':' which shouldn't have been there
- #1536: ipython 0.12 embed shell won't run startup scripts
- #1628: error: QApplication already exists in TestKillRing
- #1631: TST: QApplication doesn't quit early enough with PySide.
- #1629: evaluate a few dangling validate_message generators
- #1621: clear In[] prompt numbers on "Clear All Output"
- #1627: Test the Message Spec

- #1470: SyntaxError on setup.py install with Python 3
- #1624: Fixes for byte-compilation on Python 3
- #1612: pylab=inline fig.show() non-existent in notebook
- #1615: Add show() method to figure objects.
- #1622: deepreload fails on Python 3
- #1625: Fix deepreload on Python 3
- #1626: Failure in new `dreload` tests under Python 3.2
- #1623: IPython / matplotlib Memory error with imshow
- #1619: pyin messages should have execution_count
- #1620: pyin message now have execution_count
- #32: dreload produces spurious traceback when numpy is involved
- #1457: Update deepreload to use a rewritten knee.py. Fixes dreload(numpy).
- #1613: allow map / parallel function for single-engine views
- #1609: exit notebook cleanly on SIGINT, SIGTERM
- #1531: Function keyword completion fails if cursor is in the middle of the complete parentheses
- #1607: cleanup sqlitedb temporary db file after tests
- #1608: don't rely on timedelta.total_seconds in AsyncResult
- #1421: ipython32 %run -d breaks with NameError name 'execfile' is not defined
- #1599: Fix for %run -d on Python 3
- #1201: %env magic fails with Python 3.2
- #1602: Fix %env magic on Python 3.
- #1603: Remove python3 profile
- #1604: Exclude IPython.quarantine from installation
- #1601: Security file is not removed after shutdown by Ctrl+C or kill -INT
- #1600: Specify encoding for io.open in notebook_reformat tests
- #1605: Small fixes for Animation and Progress notebook
- #1452: Bug fix for approval
- #13: Improve robustness and debuggability of test suite
- #70: IPython should prioritize __all__ during tab completion
- #1529: __all__ feature, improvement to dir2, and tests for both
- #1475: Custom namespace for %run
- #1564: calling .abort on AsyncMapResult results in traceback
- #1548: add sugar methods/properties to AsyncResult
- #1535: Fix pretty printing dispatch
- #1522: Discussion: some potential Qt console refactoring
- #1399: Use LaTeX to print various built-in types with the SymPy printing extension

- #1597: re-enter kernel.eventloop after catching SIGINT
- #1490: rename plaintext cell -> raw cell
- #1487: %notebook fails in qtconsole
- #1545: trailing newline not preserved in splitline ipynb
- #1480: Fix %notebook magic, etc. nbformat unicode tests and fixes
- #1588: Gtk3 integration with ipython works.
- #1595: Examples syntax (avoid errors installing on Python 3)
- #1526: Find encoding for Python files
- #1594: Fix writing git commit ID to a file on build with Python 3
- #1556: shallow-copy DictDB query results
- #1499: various pyflakes issues
- #1502: small changes in response to pyflakes pass
- #1445: Don't build sphinx docs for sdists
- #1484: unhide .git_commit_info.ini
- #1538: store git commit hash in utils._sysinfo instead of hidden data file
- #1546: attempt to suppress exceptions in channel threads at shutdown
- #1524: unhide git_commit_info.ini
- #1559: update tools/github_stats.py to use GitHub API v3
- #1563: clear_output improvements
- #1558: Ipython testing documentation still mentions twisted and trial
- #1560: remove obsolete discussion of Twisted/trial from testing docs
- #1561: Qtconsole - nonstandard a and b
- #1569: BUG: qtconsole – non-standard handling of a and b. [Fixes #1561]
- #1574: BUG: Ctrl+C crashes wx pylab kernel in qtconsole
- #1573: BUG: Ctrl+C crashes wx pylab kernel in qtconsole.
- #1590: 'IPython3 qtconsole' doesn't work in Windows 7
- #602: User test the html notebook
- #613: Implement Namespace panel section
- #879: How to handle Javascript output in the notebook
- #1255: figure.show() raises an error with the inline backend
- #1467: Document or bundle a git-integrated facility for stripping VCS-unfriendly binary data
- #1237: Kernel status and logout button overlap
- #1319: Running a cell with ctrl+Enter selects text in cell
- #1571: module member autocomplete should respect __all__
- #1566: ipython3 doesn't run in Win7 with Python 3.2
- #1568: fix PR #1567

- #1567: Fix: openssh_tunnel did not parse port in `server`
- #1565: fix AsyncResult.abort
- #1550: Crash when starting notebook in a non-ascii path
- #1552: use os.getcwdu in NotebookManager
- #1554: wrong behavior of the all function on iterators
- #1541: display_pub flushes stdout/err
- #1539: Asynchrous issue when using clear_display and print x,y,z
- #1544: make MultiKernelManager.kernel_manager_class configurable
- #1494: Untrusted Secure Websocket broken on latest chrome dev
- #1521: only install ipython-qtconsole gui script on Windows
- #1528: Tab completion optionally respects __all__ (+ dir2() cleanup)
- #1527: Making a progress bar work in IPython Notebook
- #1497: __all__ functionality added to dir2(obj)
- #1518: Pretty printing exceptions is broken
- #811: Fixes for ipython unhandeled OSError exception on failure of os.getcwdu()
- #1517: Fix indentation bug in IPython/lib/pretty.py
- #1519: BUG: Include the name of the exception type in its pretty format.
- #1525: A hack for auto-complete numpy recarray
- #1489: Fix zero-copy push
- #1401: numpy arrays cannot be used with View.apply() in Python 3
- #1477: fix dangling `buffer` in IPython.parallel.util
- #1514: DOC: Fix references to IPython.lib.pretty instead of the old location
- #1511: Version comparison error ('2.1.11' < '2.1.4' ==> True)
- #1506: "Fixing" the Notebook scroll to help in visually comparing outputs
- #1481: BUG: Improve placement of CallTipWidget
- #1241: When our debugger class is used standalone `_oh` key errors are thrown
- #676: IPython.embed() from ipython crashes twice on exit
- #1496: BUG: LBYL when clearing the output history on shutdown.
- #1507: python3 notebook: TypeError: unorderable types
- #1508: fix sorting profiles in clustermanager
- #1495: BUG: Fix pretty-printing for overzealous objects
- #1505: SQLite objects created in a thread can only be used in that same thread
- #1482: %history documentation out of date?
- #1501: dreload doesn't seem to exclude numpy
- #1472: more general fix for #662
- #1486: save state of qtconsole

- #1485: add history search to qtconsole
- #1483: updated magic_history docstring
- #1383: First version of cluster web service.
- #482: test_run.test_tclass fails on Windows
- #1398: fix %tb after SyntaxError
- #1478: key function or lambda in sorted function doesn't find global variables
- #1415: handle exit/quit/exit()/quit() variants in zmqconsole
- #1440: Fix for failing testsuite when using –with-xml-coverage on windows.
- #1419: Add %install_ext magic function.
- #1424: Win32 shell interactivity
- #1434: Controller should schedule tasks of multiple clients at the same time
- #1268: notebook %reset magic fails with StdinNotImplementedError
- #1438: from cherrypy import expose fails when running script form parent directory
- #1468: Simplify structure of a Job in the TaskScheduler
- #875: never build unicode error messages
- #1107: Tab autocompletion can suggest invalid syntax
- #1447: 1107 - Tab autocompletion can suggest invalid syntax
- #1469: Fix typo in comment (insert space)
- #1463: Fix completion when importing modules in the cwd.
- #1437: unfriendly error handling with pythonw and ipython-qtconsole
- #1466: Fix for issue #1437, unfriendly windows qtconsole error handling
- #1432: Fix ipython directive
- #1465: allow `ipython help subcommand` syntax
- #1394: Wishlist: Remove hard dependency on ctypes
- #1416: Conditional import of ctypes in inputhook
- #1462: expedite parallel tests
- #1418: Strict mode in javascript
- #1410: Add javascript library and css stylesheet loading to JS class.
- #1427: #922 again
- #1448: Fix for #875 Never build unicode error messages
- #1458: use eval to uncan References
- #1455: Python3 install fails
- #1450: load mathjax from CDN via https
- #1182: Qtconsole, multiwindow
- #1439: Notebook not storing heading celltype information
- #1451: include heading level in JSON

- #1444: Fix pyhton -> python typos
- #1412: Input parsing issue with %prun
- #1414: ignore errors in shell.var_expand
- #1441: (1) Enable IPython.notebook.kernel.execute to publish display_* even it is not called with a code cell and (2) remove empty html element when execute "display_*"
- #1431: Beginner Error: ipython qtconsole
- #1436: "ipython-qtconsole –gui qt" hangs on 64-bit win7
- #1433: websocket connection fails on Chrome
- #1430: Fix for tornado check for tornado < 1.1.0
- #1408: test_get_home_dir_3 failed on Mac OS X
- #1413: get_home_dir expands symlinks, adjust test accordingly
- #1420: fixes #922
- #823: KnownFailure tests appearing as errors
- #1385: updated and prettified magic doc strings
- #1406: Browser selection
- #1411: ipcluster starts 8 engines "successfully" but Client only finds two
- #1375: %history -g -f file encoding issue
- #1377: Saving non-ascii history
- #797: Source introspection needs to be smarter in python 3.2
- #846: Autoreload extension doesn't work with Python 3.2
- #1360: IPython notebook not starting on winXP
- #1407: Qtconsole segfaults on OSX when displaying some pop-up function tooltips
- #1402: fix symlinked /home issue for FreeBSD
- #1403: pyreadline cyclic dependency with pdb++/pdbpp module
- #1405: Only monkeypatch xunit when the tests are run using it.
- #1404: Feature Request: List/Dictionary tab completion
- #1395: Xunit & KnownFailure
- #1396: Fix for %tb magic.
- #1397: Stay or leave message not working, Safari session lost.
- #1389: pylab=inline inoperant through ssh tunnelling?
- #1386: Jsd3
- #1388: Add simple support for running inside a virtualenv
- #826: Add support for creation of parallel task when no engine is running
- #1391: Improve Hub/Scheduler when no engines are registered
- #1369: load header with engine id when engine dies in TaskScheduler
- #1345: notebook can't save unicode as script

- #1353: Save notebook as script using unicode file handle.
- #1352: Add '-m mod : run library module as a script' option.
- #1363: Fix some minor color/style config issues in the qtconsole
- #1371: Adds a quiet keyword to sync_imports
- #1390: Blank screen for notebooks on Safari
- #1387: Fixing Cell menu to update cell type select box.
- #645: Standalone WX GUI support is broken
- #1296: Wx gui example: fixes the broken example for `%gui wx`.
- #1254: typo in notebooklist.js breaks links
- #781: Users should be able to clone a notebook
- #1372: ipcontroller cleans up connection files unless reuse=True
- #1374: remove calls to meaningless ZMQStream.on_err
- #1382: Update RO for Notebook
- #1370: allow draft76 websockets (Safari)
- #1368: Ensure handler patterns are str, not unicode
- #1379: Sage link on website homepage broken
- #1376: FWIW does not work with Chrome 16.0.912.77 Ubuntu 10.10
- #1358: Cannot install ipython on Windows 7 64-bit
- #1367: Ctrl - m t does not toggle output in chrome
- #1359: [sympyprinting] MathJax can't render root{m}{n}
- #1337: Tab in the notebook after `(` should not indent, only give a tooltip
- #1339: Notebook printing broken
- #1344: Ctrl + M + L does not toggle line numbering in htmlnotebook
- #1348: Ctrl + M + M does not switch to markdown cell
- #1361: Notebook bug fix branch
- #1364: avoid jsonlib returning Decimal
- #1362: Don't log complete contents of history replies, even in debug
- #888: ReST support in notebooks
- #1205: notebook stores HTML escaped text in the file
- #1351: add IPython.embed_kernel()
- #1243: magic commands without % are not completed properly in htmlnotebook
- #1347: fix weird magic completion in notebook
- #1355: notebook.html extends layout.html now
- #1354: min and max in the notebook
- #1346: fixups for alternate URL prefix stuff
- #1336: crack at making notebook.html use the layout.html template

- #1331: RST and heading cells
- #1350: Add '-m mod : run library module as a script' option
- #1247: fixes a bug causing extra newlines after comments.
- #1329: add base_url to notebook configuration options
- #1332: notebook - allow prefixes in URL path.
- #1317: Very slow traceback construction from Cython extension
- #1341: Don't attempt to tokenize binary files for tracebacks
- #1300: Cell Input collapse
- #1334: added key handler for control-s to notebook, seems to work pretty well
- #1338: Fix see also in docstrings so API docs build
- #1335: Notebook toolbar UI
- #1299: made notebook.html extend layout.html
- #1318: make Ctrl-D in qtconsole act same as in terminal (ready to merge)
- #873: ReST support in notebook frontend
- #1139: Notebook webkit notification
- #1314: Insertcell
- #1328: Coverage
- #1206: don't preserve fixConsole output in json
- #1330: Add linewrapping to text cells (new feature in CodeMirror).
- #1309: Inoculate clearcmd extension into %reset functionality
- #1327: Updatecm2
- #1326: Removing Ace edit capability.
- #1325: forgotten selected_cell -> get_selected_cell
- #1316: Pass subprocess test runners a suitable location for xunit output
- #1315: Collect results from subprocess runners and spit out Xunit XML output.
- #1233: Update CodeMirror to the latest version
- #1234: Refactor how the notebook focuses cells
- #1235: After upgrading CodeMirror check the status of some bugs
- #1236: Review how select is called when notebook cells are inserted
- #1303: Updatecm
- #1311: Fixing CM related indentation problems.
- #1304: controller/server load can disrupt heartbeat
- #1312: minor heartbeat tweaks
- #1302: Input parsing with %prun clobbers escapes
- #1306: Fix %prun input parsing for escaped characters (closes #1302)
- #1251: IPython-0.12 can't import map module on Python 3.1

- #1202: Pyreadline install exclusion for 64 bit windows no longer required, version dependency not correctly specified.
- #1301: New "Fix for issue #1202" based on current master.
- #1242: changed key map name to match changes to python mode
- #1203: Fix for issue #1202
- #1289: Make autoreload extension work on Python 3.
- #1263: Different 'C-x' for shortcut, 'C-m c' not toCodeCell anymore
- #1259: Replace "from (.|..) import" with absolute imports.
- #1278: took a crack at making notebook.html extend layout.html
- #1210: Add 'quiet' option to suppress screen output during %prun calls, edited dochelp
- #1288: Don't ask for confirmation when stdin isn't available
- #1290: Cell-level cut & paste overwrites multiple cells
- #1291: Minor, but important fixes to cut/copy/paste.
- #1293: TaskScheduler.hwm default value
- #1294: TaskScheduler.hwm default to 1 instead of 0
- #1281: in Hub: registration_timeout must be an integer, but heartmonitor.period is CFloat
- #1283: HeartMonitor.period should be an Integer
- #1162: Allow merge/split adjacent cells in notebook
- #1264: Aceify
- #1261: Mergesplit
- #1269: Another strange input handling error
- #1284: a fix for GH 1269
- #1232: Dead kernel loop
- #1279: ImportError: cannot import name S1 (from logging)
- #1276: notebook menu item to send a KeyboardInterrupt to the kernel
- #1213: BUG: Minor typo in history_console_widget.py
- #1248: IPython notebook doesn't work with lastest version of tornado
- #1267: add NoDB for non-recording Hub
- #1222: allow Reference as callable in map/apply
- #1257: use self.kernel_manager_class in qtconsoleapp
- #1220: Open a new notebook while connecting to an existing kernel (opened by qtconsole or terminal or standalone)
- #1253: set auto_create flag for notebook apps
- #1260: heartbeat failure on long gil-holding operation
- #1262: Heartbeat no longer shares the app's Context
- #1225: SyntaxError display broken in Python 3
- #1229: Fix display of SyntaxError in Python 3

- #1256: Dewijmoize
- #1246: Skip tests that require X, when importing pylab results in RuntimeError.
- #1250: Wijmoize
- #1244: can not imput chinese word "" , exit right now
- #1194: Adding Opera 11 as a compatible browser for ipython notebook
- #1198: Kernel Has Died error in Notebook
- #1211: serve local files in notebook-dir
- #1224: edit text cells on double-click instead of single-click
- #1187: misc notebook: connection file cleanup, first heartbeat, startup flush
- #1207: fix loadpy duplicating newlines
- #1060: Always save the .py file to disk next to the .ipynb
- #1066: execute cell in place should preserve the current insertion-point in the notebook
- #1141: "In" numbers are not invalidated when restarting kernel
- #1231: pip on OSX tries to install files in /System directory.
- #1129: Unified setup.py
- #1199: Reduce IPython.external.*
- #1219: Make all the static files path absolute.
- #1218: Added -q option to %prun for suppression of the output, along with editing the dochelp string.
- #1217: Added -q option to %prun for suppression of the output, along with editing the dochelp string
- #1216: Pdb tab completion does not work in QtConsole
- #1197: Interactive shell trying to: from … import history
- #1175: core.completer: Clean up excessive and unused code.
- #1208: should dv.sync_import print failed imports ?
- #1186: payloadpage.py not used by qtconsole
- #1204: double newline from %loadpy in python notebook (at least on mac)
- #1192: Invalid JSON data
- #1196: docs: looks like a file path might have been accidentally pasted in the middle of a word
- #1189: Right justify of 'in' prompt in variable prompt size configurations
- #1185: ipython console not work proper with stdout…
- #1191: profile/startup files not executed with "notebook"
- #1190: Fix link to Chris Fonnesbeck blog post about 0.11 highlights.
- #1174: Remove %install_default_config and %install_profiles

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

2.19 0.12 Series

2.19.1 Release 0.12.1

IPython 0.12.1 is a bugfix release of 0.12, pulling only bugfixes and minor cleanup from 0.13, timed for the Ubuntu 12.04 LTS release.

See the *list of fixed issues* for specific backported issues.

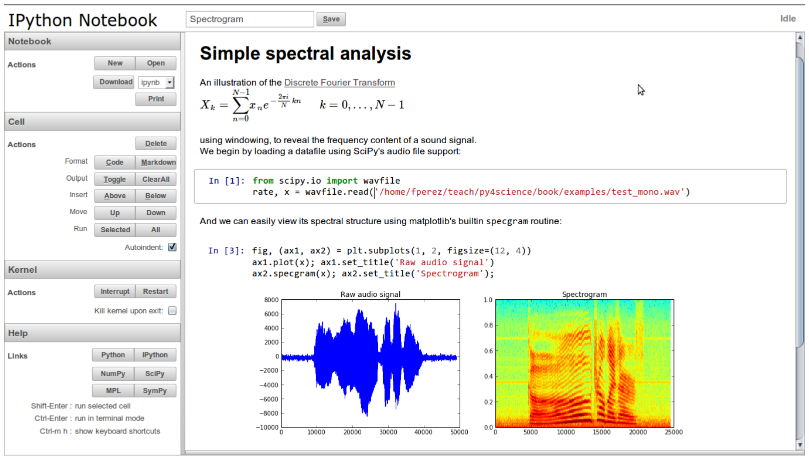
2.19.2 Release 0.12

IPython 0.12 contains several major new features, as well as a large amount of bug and regression fixes. The 0.11 release brought with it a lot of new functionality and major refactorings of the codebase; by and large this has proven to be a success as the number of contributions to the project has increased dramatically, proving that the code is now much more approachable. But in the refactoring inevitably some bugs were introduced, and we have also squashed many of those as well as recovered some functionality that had been temporarily disabled due to the API changes.

The following major new features appear in this version.

An interactive browser-based Notebook with rich media support

A powerful new interface puts IPython in your browser. You can start it with the command `ipython notebook`:



Simple spectral analysis

An illustration of the Discrete Fourier Transform

$$X_k = \sum_{n=0}^{N-1} x_n e^{-\frac{2\pi i}{N} kn} \qquad k = 0, \ldots, N-1$$

using windowing, to reveal the frequency content of a sound signal.
We begin by loading a datafile using SciPy's audio file support:

```
In [1]: from scipy.io import wavfile
        rate, x = wavfile.read('/home/fperez/teach/py4science/book/examples/test_mono.wav')
```

And we can easily view its spectral structure using matplotlib's builtin specgram routine:

```
In [3]: fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(12, 4))
        ax1.plot(x); ax1.set_title('Raw audio signal')
        ax2.specgram(x); ax2.set_title('Spectrogram');
```

Fig. 3: The new IPython notebook showing text, mathematical expressions in LaTeX, code, results and embedded figures created with Matplotlib.

This new interface maintains all the features of IPython you are used to, as it is a new client that communicates with the same IPython kernels used by the terminal and Qt console. But the web notebook provides for a different workflow where you can integrate, along with code execution, also text, mathematical expressions, graphics, video, and virtually any content that a modern browser is capable of displaying.

You can save your work sessions as documents that retain all these elements and which can be version controlled, emailed to colleagues or saved as HTML or PDF files for printing or publishing statically on the web. The internal storage format is a JSON file that can be easily manipulated for manual exporting to other formats.

This Notebook is a major milestone for IPython, as for years we have tried to build this kind of system. We were inspired originally by the excellent implementation in Mathematica, we made a number of attempts using older technologies in earlier Summer of Code projects in 2005 (both students and Robert Kern developed early prototypes), and in recent years we have seen the excellent implementation offered by the `Sage <http://sagemath.org>` system. But we continued to work on something that would be consistent with the rest of IPython's design, and it is clear now that the effort was worth it: based on the ZeroMQ communications architecture introduced in version 0.11, the notebook can now retain 100% of the features of the real IPython. But it can also provide the rich media support and high quality Javascript libraries that were not available in browsers even one or two years ago (such as high-quality mathematical rendering or built-in video).

The notebook has too many useful and important features to describe in these release notes; our documentation now contains a directory called `examples/notebooks` with several notebooks that illustrate various aspects of the system. You should start by reading those named `00_notebook_tour.ipynb` and `01_notebook_introduction.ipynb` first, and then can proceed to read the others in any order you want.

To start the notebook server, go to a directory containing the notebooks you want to open (or where you want to create new ones) and type:

```
ipython notebook
```

You can see all the relevant options with:

```
ipython notebook --help
ipython notebook --help-all  # even more
```

and just like the Qt console, you can start the notebook server with pylab support by using:

```
ipython notebook --pylab
```

for floating matplotlib windows or:

```
ipython notebook --pylab inline
```

for plotting support with automatically inlined figures. Note that it is now possible also to activate pylab support at runtime via `%pylab`, so you do not need to make this decision when starting the server.

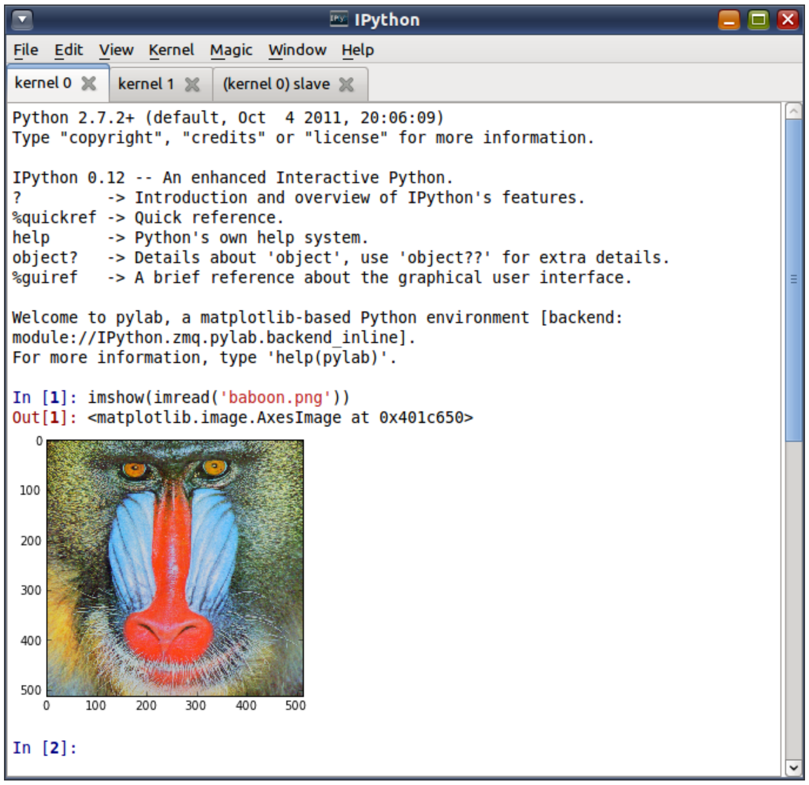
Two-process terminal console

Based on the same architecture as the notebook and the Qt console, we also have now a terminal-based console that can connect to an external IPython kernel (the same kernels used by the Qt console or the notebook, in fact). While this client behaves almost identically to the usual IPython terminal application, this capability can be very useful to attach an interactive console to an existing kernel that was started externally. It lets you use the interactive `%debug` facilities in a notebook, for example (the web browser can't interact directly with the debugger) or debug a third-party code where you may have embedded an IPython kernel.

This is also something that we have wanted for a long time, and which is a culmination (as a team effort) of the work started last year during the 2010 Google Summer of Code project.

Tabbed QtConsole

The QtConsole now supports starting multiple kernels in tabs, and has a menubar, so it looks and behaves more like a real application. Keyboard enthusiasts can disable the menubar with ctrl-shift-M (PR #887).



```
Python 2.7.2+ (default, Oct  4 2011, 20:06:09)
Type "copyright", "credits" or "license" for more information.

IPython 0.12 -- An enhanced Interactive Python.
?         -> Introduction and overview of IPython's features.
%quickref -> Quick reference.
help      -> Python's own help system.
object?   -> Details about 'object', use 'object??' for extra details.
%guiref   -> A brief reference about the graphical user interface.

Welcome to pylab, a matplotlib-based Python environment [backend:
module://IPython.zmq.pylab.backend_inline].
For more information, type 'help(pylab)'.

In [1]: imshow(imread('baboon.png'))
Out[1]: <matplotlib.image.AxesImage at 0x401c650>

In [2]:
```

Fig. 4: The improved Qt console for IPython, now with tabs to control multiple kernels and full menu support.

Full Python 3 compatibility

IPython can now be installed from a single codebase on Python 2 and Python 3. The installation process for Python 3 automatically runs 2to3. The same 'default' profile is now used for Python 2 and 3 (the previous version had a separate 'python3' profile).

Standalone Kernel

The `ipython kernel` subcommand has been added, to allow starting a standalone kernel, that can be used with various frontends. You can then later connect a Qt console or a terminal console to this kernel by typing e.g.:

```
ipython qtconsole --existing
```

if it's the only one running, or by passing explicitly the connection parameters (printed by the kernel at startup).

PyPy support

The terminal interface to IPython now runs under PyPy. We will continue to monitor PyPy's progress, and hopefully before long at least we'll be able to also run the notebook. The Qt console may take longer, as Qt is a very complex set of bindings to a huge C++ library, and that is currently the area where PyPy still lags most behind. But for everyday interactive use at the terminal, with this release and PyPy 1.7, things seem to work quite well from our admittedly limited testing.

Other important new features

- **SSH Tunnels**: In 0.11, the `IPython.parallel` Client could tunnel its connections to the Controller via ssh. Now, the QtConsole supports ssh tunneling, as do parallel engines.
- **relaxed command-line parsing**: 0.11 was released with overly-strict command-line parsing, preventing the ability to specify arguments with spaces, e.g. `ipython --pylab qt` or `ipython -c "print 'hi'"`. This has been fixed, by using argparse. The new parsing is a strict superset of 0.11, so any commands in 0.11 should still work in 0.12.
- **HistoryAccessor**: The *`HistoryManager`* class for interacting with your IPython SQLite history database has been split, adding a parent *`HistoryAccessor`* class, so that users can write code to access and search their IPython history without being in an IPython session (PR #824).
- **kernel %gui and %pylab**: The `%gui` and `%pylab` magics have been restored to the IPython kernel (e.g. in the qtconsole or notebook). This allows activation of pylab-mode, or eventloop integration after starting the kernel, which was unavailable in 0.11. Unlike in the terminal, this can be set only once, and cannot be changed.
- **%config**: A new `%config` magic has been added, giving easy access to the IPython configuration system at runtime (PR #923).
- **Multiline History**: Multiline readline history has been restored to the Terminal frontend by default (PR #838).
- **%store**: The `%store` magic from earlier versions has been updated and re-enabled (*storemagic*; PR #1029). To autorestore stored variables on startup, specify `c.StoreMagic.autorestore = True` in `ipython_config.py`.

Major Bugs fixed

In this cycle, we have *closed over 500 issues*, but a few major ones merit special mention:

- Simple configuration errors should no longer crash IPython. In 0.11, errors in config files, as well as invalid trait values, could crash IPython. Now, such errors are reported, and help is displayed.
- Certain SyntaxErrors no longer crash IPython (e.g. just typing keywords, such as `return`, `break`, etc.). See #704.
- IPython path utils, such as `get_ipython_dir()` now check for write permissions, so IPython should function on systems where the default path resolution might point to a read-only location, such as `HOMESHARE` on Windows (#669).
- `raw_input()` now works in the kernel when multiple frontends are in use. The request will be sent to the frontend that made the request, and an exception is raised if that frontend does not support stdin requests (e.g. the notebook) (#673).
- `zmq` version detection no longer uses simple lexicographical comparison to check minimum version, which prevents 0.11 from working with pyzmq-2.1.10 (PR #758).
- A bug in PySide < 1.0.7 caused crashes on OSX when tooltips were shown (#711). these tooltips are now disabled on old PySide (PR #963).
- IPython no longer crashes when started on recent versions of Python 3 in Windows (#737).
- Instances of classes defined interactively can now be pickled (#29; PR #648). Note that pickling saves a reference to the class definition, so unpickling the instances will only work where the class has been defined.

Backwards incompatible changes

- IPython connection information is no longer specified via ip/port directly, rather via json connection files. These files are stored in the security directory, and enable us to turn on HMAC message authentication by default, significantly improving the security of kernels. Various utility functions have been added to `IPython.lib.kernel`, for easier connecting to existing kernels.
- `KernelManager` now has one ip, and several port traits, rather than several ip/port pair `_addr` traits. This better matches the rest of the code, where the ip cannot not be set separately for each channel.
- Custom prompts are now configured using a new class, `PromptManager`, which has traits for `in_template`, `in2_template` (the `...:` continuation prompt), `out_template` and `rewrite_template`. This uses Python's string formatting system, so you can use `{time}` and `{cwd}`, although we have preserved the abbreviations from previous versions, e.g. `\#` (prompt number) and `\w` (working directory). For the list of available fields, refer to the source of `IPython/core/prompts.py`.
- The class inheritance of the Launchers in `IPython.parallel.apps.launcher` used by ipcluster has changed, so that trait names are more consistent across batch systems. This may require a few renames in your config files, if you customized the command-line args for launching controllers and engines. The configurable names have also been changed to be clearer that they point to class names, and can now be specified by name only, rather than requiring the full import path of each class, e.g.:

  ```
  IPClusterEngines.engine_launcher = 'IPython.parallel.apps.launcher.
  ↪MPIExecEngineSetLauncher'
  IPClusterStart.controller_launcher = 'IPython.parallel.apps.launcher.
  ↪SSHControllerLauncher'
  ```

  would now be specified as:

  ```
  IPClusterEngines.engine_launcher_class = 'MPI'
  IPClusterStart.controller_launcher_class = 'SSH'
  ```

  The full path will still work, and is necessary for using custom launchers not in IPython's launcher module.

  Further, MPIExec launcher names are now prefixed with just MPI, to better match other batch launchers, and be generally more intuitive. The MPIExec names are deprecated, but continue to work.
- For embedding a shell, note that the parameters `user_global_ns` and `global_ns` have been deprecated in favour of `user_module` and `module` respsectively. The new parameters expect a module-like object, rather than a namespace dict. The old parameters remain for backwards compatibility, although `user_global_ns` is now ignored. The `user_ns` parameter works the same way as before, and calling `embed()` with no arguments still works as before.

Development summary and credits

The previous version (IPython 0.11) was released on July 31 2011, so this release cycle was roughly 4 1/2 months long, we closed a total of 515 issues, 257 pull requests and 258 regular issues (a *detailed list* is available).

Many users and developers contributed code, features, bug reports and ideas to this release. Please do not hesitate in contacting us if we've failed to acknowledge your contribution here. In particular, for this release we have had commits from the following 45 contributors, a mix of new and regular names (in alphabetical order by first name):

- Alcides <alcides-at-do-not-span-me.com>
- Ben Edwards <bedwards-at-cs.unm.edu>
- Benjamin Ragan-Kelley <benjaminrk-at-gmail.com>
- Benjamin Thyreau <benjamin.thyreau-at-gmail.com>

- Bernardo B. Marques <bernardo.fire-at-gmail.com>
- Bernard Paulus <bprecyclebin-at-gmail.com>
- Bradley M. Froehle <brad.froehle-at-gmail.com>
- Brian E. Granger <ellisonbg-at-gmail.com>
- Christian Boos <cboos-at-bct-technology.com>
- Daniel Velkov <danielv-at-mylife.com>
- Erik Tollerud <erik.tollerud-at-gmail.com>
- Evan Patterson <epatters-at-enthought.com>
- Felix Werner <Felix.Werner-at-kit.edu>
- Fernando Perez <Fernando.Perez-at-berkeley.edu>
- Gabriel <g2p.code-at-gmail.com>
- Grahame Bowland <grahame-at-angrygoats.net>
- Hannes Schulz <schulz-at-ais.uni-bonn.de>
- Jens Hedegaard Nielsen <jenshnielsen-at-gmail.com>
- Jonathan March <jmarch-at-enthought.com>
- Jörgen Stenarson <jorgen.stenarson-at-bostream.nu>
- Julian Taylor <jtaylor.debian-at-googlemail.com>
- Kefu Chai <tchaikov-at-gmail.com>
- macgyver <neil.rabinowitz-at-merton.ox.ac.uk>
- Matt Cottingham <matt.cottingham-at-gmail.com>
- Matthew Brett <matthew.brett-at-gmail.com>
- Matthias BUSSONNIER <bussonniermatthias-at-gmail.com>
- Michael Droettboom <mdboom-at-gmail.com>
- Nicolas Rougier <Nicolas.Rougier-at-inria.fr>
- Olivier Verdier <olivier.verdier-at-gmail.com>
- Omar Andres Zapata Mesa <andresete.chaos-at-gmail.com>
- Pablo Winant <pablo.winant-at-gmail.com>
- Paul Ivanov <pivanov314-at-gmail.com>
- Pauli Virtanen <pav-at-iki.fi>
- Pete Aykroyd <aykroyd-at-gmail.com>
- Prabhu Ramachandran <prabhu-at-enthought.com>
- Puneeth Chaganti <punchagan-at-gmail.com>
- Robert Kern <robert.kern-at-gmail.com>
- Satrajit Ghosh <satra-at-mit.edu>
- Stefan van der Walt <stefan-at-sun.ac.za>
- Szabolcs Horvát <szhorvat-at-gmail.com>

- Thomas Kluyver <takowl-at-gmail.com>
- Thomas Spura <thomas.spura-at-gmail.com>
- Timo Paulssen <timonator-at-perpetuum-immobile.de>
- Valentin Haenel <valentin.haenel-at-gmx.de>
- Yaroslav Halchenko <debian-at-onerussian.com>

Note: This list was generated with the output of `git log rel-0.11..HEAD --format='* %aN <%aE>' | sed 's/@/\-at\-/' | sed 's/<>//' | sort -u` after some cleanup. If you should be on this list, please add yourself.

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2.20 Issues closed in the 0.12 development cycle

2.20.1 Issues closed in 0.12.1

GitHub stats for bugfix release 0.12.1 (12/28/2011-04/16/2012), backporting pull requests from 0.13.

We closed a total of 71 issues: 44 pull requests and 27 issues; this is the full list (generated with the script `tools/github_stats.py`).

This list is automatically generated, and may be incomplete:

Pull Requests (44):

- PR #1175: core.completer: Clean up excessive and unused code.
- PR #1187: misc notebook: connection file cleanup, first heartbeat, startup flush
- PR #1190: Fix link to Chris Fonnesbeck blog post about 0.11 highlights.
- PR #1196: docs: looks like a file path might have been accidentally pasted in the middle of a word
- PR #1206: don't preserve fixConsole output in json
- PR #1207: fix loadpy duplicating newlines
- PR #1213: BUG: Minor typo in history_console_widget.py
- PR #1218: Added -q option to %prun for suppression of the output, along with editing the dochelp string.
- PR #1222: allow Reference as callable in map/apply
- PR #1229: Fix display of SyntaxError in Python 3
- PR #1246: Skip tests that require X, when importing pylab results in RuntimeError.

- PR #1253: set auto_create flag for notebook apps
- PR #1257: use self.kernel_manager_class in qtconsoleapp
- PR #1262: Heartbeat no longer shares the app's Context
- PR #1283: HeartMonitor.period should be an Integer
- PR #1284: a fix for GH 1269
- PR #1289: Make autoreload extension work on Python 3.
- PR #1306: Fix %prun input parsing for escaped characters (closes #1302)
- PR #1312: minor heartbeat tweaks
- PR #1318: make Ctrl-D in qtconsole act same as in terminal (ready to merge)
- PR #1341: Don't attempt to tokenize binary files for tracebacks
- PR #1353: Save notebook as script using unicode file handle.
- PR #1363: Fix some minor color/style config issues in the qtconsole
- PR #1364: avoid jsonlib returning Decimal
- PR #1369: load header with engine id when engine dies in TaskScheduler
- PR #1370: allow draft76 websockets (Safari)
- PR #1374: remove calls to meaningless ZMQStream.on_err
- PR #1377: Saving non-ascii history
- PR #1396: Fix for %tb magic.
- PR #1402: fix symlinked /home issue for FreeBSD
- PR #1413: get_home_dir expands symlinks, adjust test accordingly
- PR #1414: ignore errors in shell.var_expand
- PR #1430: Fix for tornado check for tornado < 1.1.0
- PR #1445: Don't build sphinx docs for sdists
- PR #1463: Fix completion when importing modules in the cwd.
- PR #1477: fix dangling `buffer` in IPython.parallel.util
- PR #1495: BUG: Fix pretty-printing for overzealous objects
- PR #1496: BUG: LBYL when clearing the output history on shutdown.
- PR #1514: DOC: Fix references to IPython.lib.pretty instead of the old location
- PR #1517: Fix indentation bug in IPython/lib/pretty.py
- PR #1538: store git commit hash in utils._sysinfo instead of hidden data file
- PR #1599: Fix for %run -d in Python 3
- PR #1602: Fix %env for Python 3
- PR #1607: cleanup sqlitedb temporary db file after tests

Issues (27):

- #676: IPython.embed() from ipython crashes twice on exit
- #846: Autoreload extension doesn't work with Python 3.2

- #1187: misc notebook: connection file cleanup, first heartbeat, startup flush
- #1191: profile/startup files not executed with "notebook"
- #1197: Interactive shell trying to: from … import history
- #1198: Kernel Has Died error in Notebook
- #1201: %env magic fails with Python 3.2
- #1204: double newline from %loadpy in python notebook (at least on mac)
- #1208: should dv.sync_import print failed imports ?
- #1225: SyntaxError display broken in Python 3
- #1232: Dead kernel loop
- #1241: When our debugger class is used standalone `_oh` key errors are thrown
- #1254: typo in notebooklist.js breaks links
- #1260: heartbeat failure on long gil-holding operation
- #1268: notebook %reset magic fails with StdinNotImplementedError
- #1269: Another strange input handling error
- #1281: in Hub: registration_timeout must be an integer, but heartmonitor.period is CFloat
- #1302: Input parsing with %prun clobbers escapes
- #1304: controller/server load can disrupt heartbeat
- #1317: Very slow traceback construction from Cython extension
- #1345: notebook can't save unicode as script
- #1375: %history -g -f file encoding issue
- #1401: numpy arrays cannot be used with View.apply() in Python 3
- #1408: test_get_home_dir_3 failed on Mac OS X
- #1412: Input parsing issue with %prun
- #1421: ipython32 %run -d breaks with NameError name 'execfile' is not defined
- #1484: unhide .git_commit_info.ini

2.20.2 Issues closed in 0.12

In this cycle, from August 1 to December 28 2011, we closed a total of 515 issues, 257 pull requests and 258 regular issues; this is the full list (generated with the script `tools/github_stats.py`).

Pull requests (257):

- 1174: Remove %install_default_config and %install_profiles
- 1178: Correct string type casting in pinfo.
- 1096: Show class init and call tooltips in notebook
- 1176: Modifications to profile list
- 1173: don't load gui/pylab in console frontend
- 1168: Add –script flag as shorthand for notebook save_script option.

- 1165: encode image_tag as utf8 in [x]html export
- 1161: Allow %loadpy to load remote URLs that don't end in .py
- 1158: Add coding header when notebook exported to .py file.
- 1160: don't ignore ctrl-C during `%gui qt`
- 1159: Add encoding header to Python files downloaded from notebooks.
- 1155: minor post-execute fixes (#1154)
- 1153: Pager tearing bug
- 1152: Add support for displaying maptlotlib axes directly.
- 1079: Login/out button cleanups
- 1151: allow access to user_ns in prompt_manager
- 1120: updated vim-ipython (pending)
- 1150: BUG: Scrolling pager in vsplit on Mac OSX tears.
- 1149: #1148 (win32 arg_split)
- 1147: Put qtconsole forground when launching
- 1146: allow saving notebook.py next to notebook.ipynb
- 1128: fix pylab StartMenu item
- 1140: Namespaces for embedding
- 1132: [notebook] read-only: disable name field
- 1125: notebook : update logo
- 1135: allow customized template and static file paths for the notebook web app
- 1122: BUG: Issue #755 qt IPythonWidget.execute_file fails if filename contains…
- 1137: rename MPIExecLaunchers to MPILaunchers
- 1130: optionally ignore shlex's ValueError in arg_split
- 1116: Shlex unicode
- 1073: Storemagic plugin
- 1143: Add post_install script to create start menu entries in Python 3
- 1138: Fix tests to work when ~/.config/ipython contains a symlink.
- 1121: Don't transform function calls on IPyAutocall objects
- 1118: protect CRLF from carriage-return action
- 1105: Fix for prompts containing newlines.
- 1126: Totally remove pager when read only (notebook)
- 1091: qtconsole : allow copy with shortcut in pager
- 1114: fix magics history in two-process ipython console
- 1113: Fixing #1112 removing failing asserts for test_carriage_return and test_beep
- 1089: Support carriage return ('r') and beep ('b') characters in the qtconsole
- 1108: Completer usability 2 (rebased of pr #1082)

- 864: Two-process terminal frontend (ipython core branch)
- 1082: usability and cross browser compat for completer
- 1053: minor improvements to text placement in qtconsole
- 1106: Fix display of errors in compiled code on Python 3
- 1077: allow the notebook to run without MathJax
- 1072: If object has a getdoc() method, override its normal docstring.
- 1059: Switch to simple `__IPYTHON__` global
- 1070: Execution count after SyntaxError
- 1098: notebook: config section UI
- 1101: workaround spawnb missing from pexpect.__all__
- 1097: typo, should fix #1095
- 1099: qtconsole export xhtml/utf8
- 1083: Prompts
- 1081: Fix wildcard search for updated namespaces
- 1084: write busy in notebook window title…
- 1078: PromptManager fixes
- 1064: Win32 shlex
- 1069: As you type completer, fix on Firefox
- 1039: Base of an as you type completer.
- 1065: Qtconsole fix racecondition
- 507: Prompt manager
- 1056: Warning in code. qtconsole ssh -X
- 1036: Clean up javascript based on js2-mode feedback.
- 1052: Pylab fix
- 648: Usermod
- 969: Pexpect-u
- 1007: Fix paste/cpaste bug and refactor/cleanup that code a lot.
- 506: make ENTER on a previous input field replace current input buffer
- 1040: json/jsonapi cleanup
- 1042: fix firefox (windows) break line on empty prompt number
- 1015: emacs freezes when tab is hit in ipython with latest python-mode
- 1023: flush stdout/stderr at the end of kernel init
- 956: Generate "All magics…" menu live
- 1038: Notebook: don't change cell when selecting code using shift+up/down.
- 987: Add Tooltip to notebook.
- 1028: Cleaner minimum version comparison

- 998: defer to stdlib for path.get_home_dir()
- 1033: update copyright to 2011/20xx-2011
- 1032: Intercept <esc> avoid closing websocket on Firefox
- 1030: use pyzmq tools where appropriate
- 1029: Restore pspersistence, including %store magic, as an extension.
- 1025: Dollar escape
- 999: Fix issue #880 - more useful message to user when %paste fails
- 938: changes to get ipython.el to work with the latest python-mode.el
- 1012: Add logout button.
- 1020: Dollar formatter for ! shell calls
- 1019: Use repr() to make quoted strings
- 1008: don't use crash_handler by default
- 1003: Drop consecutive duplicates when refilling readline history
- 997: don't unregister interrupted post-exec functions
- 996: add Integer traitlet
- 1016: Fix password hashing for Python 3
- 1014: escape minus signs in manpages
- 1013: [NumPyExampleDocstring] link was pointing to raw file
- 1011: Add hashed password support.
- 1005: Quick fix for os.system requiring str parameter
- 994: Allow latex formulas in HTML output
- 955: Websocket Adjustments
- 979: use system_raw in terminal, even on Windows
- 989: fix arguments for commands in _process_posix
- 991: Show traceback, continuing to start kernel if pylab init fails
- 981: Split likely multiline text when writing JSON notebooks
- 957: allow change of png DPI in inline backend
- 968: add wantDirectory to ipdoctest, so that directories will be checked for e
- 984: Do not expose variables defined at startup to %who etc.
- 985: Fixes for parallel code on Python 3
- 963: disable calltips in PySide < 1.0.7 to prevent segfault
- 976: Getting started on what's new
- 929: Multiline history
- 964: Default profile
- 961: Disable the pager for the test suite
- 953: Physics extension

- 950: Add directory for startup files
- 940: allow setting HistoryManager.hist_file with config
- 948: Monkeypatch Tornado 2.1.1 so it works with Google Chrome 16.
- 916: Run p (https://github.com/ipython/ipython/pull/901)
- 923: %config magic
- 920: unordered iteration of AsyncMapResults (+ a couple fixes)
- 941: Follow-up to 387dcd6a, `_rl.__doc__` is `None` with pyreadline
- 931: read-only notebook mode
- 921: Show invalid config message on TraitErrors during init
- 815: Fix #481 using custom qt4 input hook
- 936: Start webbrowser in a thread. Prevents lockup with Chrome.
- 937: add dirty trick for readline import on OSX
- 913: Py3 tests2
- 933: Cancel in qt console closeevent should trigger event.ignore()
- 930: read-only notebook mode
- 910: Make import checks more explicit in %whos
- 926: reincarnate -V cmdline option
- 928: BUG: Set context for font size change shortcuts in ConsoleWidget
- 901: - There is a bug when running the profiler in the magic command (prun) with python3
- 912: Add magic for cls on windows. Fix for #181.
- 905: enable %gui/%pylab magics in the Kernel
- 909: Allow IPython to run without sqlite3
- 887: Qtconsole menu
- 895: notebook download implies save
- 896: Execfile
- 899: Brian's Notebook work
- 892: don't close figures every cycle with inline matplotlib backend
- 893: Adding clear_output to kernel and HTML notebook
- 789: Adding clear_output to kernel and HTML notebook.
- 898: Don't pass unicode sys.argv with %run or `ipython script.py`
- 897: Add tooltips to the notebook via 'title' attr.
- 877: partial fix for issue #678
- 838: reenable multiline history for terminals
- 872: The constructor of Client() checks for AssertionError in validate_url to open a file instead of connection to a URL if it fails.
- 884: Notebook usability fixes

- 883: User notification if notebook saving fails
- 889: Add drop_by_id method to shell, to remove variables added by extensions.
- 891: Ability to open the notebook in a browser when it starts
- 813: Create menu bar for qtconsole
- 876: protect IPython from bad custom exception handlers
- 856: Backgroundjobs
- 868: Warn user if MathJax can't be fetched from notebook closes #744
- 878: store_history=False default for run_cell
- 824: History access
- 850: Update codemirror to 2.15 and make the code internally more version-agnostic
- 861: Fix for issue #56
- 819: Adding -m option to %run, similar to -m for python interpreter.
- 855: promote aliases and flags, to ensure they have priority over config files
- 862: BUG: Completion widget position and pager focus.
- 847: Allow connection to kernels by files
- 708: Two-process terminal frontend
- 857: make sdist flags work again (e.g. –manifest-only)
- 835: Add Tab key to list of keys that scroll down the paging widget.
- 859: Fix for issue #800
- 848: Python3 setup.py install failiure
- 845: Tests on Python 3
- 802: DOC: extensions: add documentation for the bundled extensions
- 830: contiguous stdout/stderr in notebook
- 761: Windows: test runner fails if repo path (e.g. home dir) contains spaces
- 801: Py3 notebook
- 809: use CFRunLoop directly in `ipython kernel --pylab osx`
- 841: updated old scipy.org links, other minor doc fixes
- 837: remove all trailling spaces
- 834: Issue https://github.com/ipython/ipython/issues/832 resolution
- 746: ENH: extensions: port autoreload to current API
- 828: fixed permissions (sub-modules should not be executable) + added shebang for run_ipy_in_profiler.py
- 798: pexpect & Python 3
- 804: Magic 'range' crash if greater than len(input_hist)
- 821: update tornado dependency to 2.1
- 807: Facilitate ssh tunnel sharing by announcing ports
- 795: Add cluster-id for multiple cluster instances per profile

- 742: Glut
- 668: Greedy completer
- 776: Reworking qtconsole shortcut, add fullscreen
- 790: TST: add future unicode_literals test (#786)
- 775: redirect_in/redirect_out should be constrained to windows only
- 793: Don't use readline in the ZMQShell
- 743: Pyglet
- 774: basic/initial .mailmap for nice shortlog summaries
- 770: #769 (reopened)
- 784: Parse user code to AST using compiler flags.
- 783: always use StringIO, never cStringIO
- 782: flush stdout/stderr on displayhook call
- 622: Make pylab import all configurable
- 745: Don't assume history requests succeed in qtconsole
- 725: don't assume cursor.selectedText() is a string
- 778: don't override execfile on Python 2
- 663: Python 3 compatilibility work
- 762: qtconsole ipython widget's execute_file fails if filename contains spaces or quotes
- 763: Set context for shortcuts in ConsoleWidget
- 722: PyPy compatibility
- 757: ipython.el is broken in 0.11
- 764: fix "–colors=<color>" option in py-python-command-args.
- 758: use ROUTER/DEALER socket names instead of XREP/XREQ
- 736: enh: added authentication ability for webapp
- 748: Check for tornado before running frontend.html tests.
- 754: restore msg_id/msg_type aliases in top level of msg dict
- 769: Don't treat bytes objects as json-safe
- 753: DOC: msg['msg_type'] removed
- 766: fix "–colors=<color>" option in py-python-command-args.
- 765: fix "–colors=<color>" option in py-python-command-args.
- 741: Run PyOs_InputHook in pager to keep plot windows interactive.
- 664: Remove ipythonrc references from documentation
- 750: Tiny doc fixes
- 433: ZMQ terminal frontend
- 734: Allow %magic argument filenames with spaces to be specified with quotes under win32
- 731: respect encoding of display data from urls

- 730: doc improvements for running notebook via secure protocol
- 729: use null char to start markdown cell placeholder
- 727: Minor fixes to the htmlnotebook
- 726: use bundled argparse if system argparse is < 1.1
- 705: Htmlnotebook
- 723: Add 'import time' to IPython/parallel/apps/launcher.py as time.sleep is called without time being imported
- 714: Install mathjax for offline use
- 718: Underline keyboard shortcut characters on appropriate buttons
- 717: Add source highlighting to markdown snippets
- 716: update EvalFormatter to allow arbitrary expressions
- 712: Reset execution counter after cache is cleared
- 713: Align colons in html notebook help dialog
- 709: Allow usage of '.' in notebook names
- 706: Implement static publishing of HTML notebook
- 674: use argparse to parse aliases & flags
- 679: HistoryManager.get_session_info()
- 696: Fix columnize bug, where tab completion with very long filenames would crash Qt console
- 686: add ssh tunnel support to qtconsole
- 685: Add SSH tunneling to engines
- 384: Allow pickling objects defined interactively.
- 647: My fix rpmlint
- 587: don't special case for py3k+numpy
- 703: make config-loading debug messages more explicit
- 699: make calltips configurable in qtconsole
- 666: parallel tests & extra readline escapes
- 683: BF - allow nose with-doctest setting in environment
- 689: Protect ipkernel from bad messages
- 702: Prevent ipython.py launcher from being imported.
- 701: Prevent ipython.py from being imported by accident
- 670: check for writable dirs, not just existence, in utils.path
- 579: Sessionwork
- 687: add `ipython kernel` for starting just a kernel
- 627: Qt Console history search
- 646: Generate package list automatically in find_packages
- 660: i658
- 659: don't crash on bad config files

Regular issues (258):

- 1177: UnicodeDecodeError in py3compat from "xlrd??"
- 1094: Tooltip doesn't show constructor docstrings
- 1170: double pylab greeting with c.InteractiveShellApp.pylab = "tk" in zmqconsole
- 1166: E-mail cpaste broken
- 1164: IPython qtconsole (0.12) can't export to html with external png
- 1103: %loadpy should cut out encoding declaration
- 1156: Notebooks downloaded as Python files require a header stating the encoding
- 1157: Ctrl-C not working when GUI/pylab integration is active
- 1154: We should be less aggressive in de-registering post-execution functions
- 1134: "select-all, kill" leaves qtconsole in unusable state
- 1148: A lot of testerrors
- 803: Make doctests work with Python 3
- 1119: Start menu shortcuts not created in Python 3
- 1136: The embedding machinery ignores user_ns
- 607: Use the new IPython logo/font in the notebook header
- 755: qtconsole ipython widget's execute_file fails if filename contains spaces or quotes
- 1115: shlex_split should return unicode
- 1109: timeit with string ending in space gives "ValueError: No closing quotation"
- 1142: Install problems
- 700: Some SVG images render incorrectly in htmlnotebook
- 1117: quit() doesn't work in terminal
- 1111: ls broken after merge of #1089
- 1104: Prompt spacing weird
- 1124: Seg Fault 11 when calling PySide using "run" command
- 1088: QtConsole : can't copy from pager
- 568: Test error and failure in IPython.core on windows
- 1112: testfailure in IPython.frontend on windows
- 1102: magic in IPythonDemo fails when not located at top of demo file
- 629: r and b in qtconsole don't behave as expected
- 1080: Notebook: tab completion should close on "("
- 973: Qt Console close dialog and on-top Qt Console
- 1087: QtConsole xhtml/Svg export broken ?
- 1067: Parallel test suite hangs on Python 3
- 1018: Local mathjax breaks install
- 993: `raw_input` redirection to foreign kernels is extremely brittle

- 1100: ipython3 traceback unicode issue from extensions
- 1071: Large html-notebooks hang on load on a slow machine
- 89: %pdoc np.ma.compress shows docstring twice
- 22: Include improvements from anythingipython.el
- 633: Execution count & SyntaxError
- 1095: Uncaught TypeError: Object has no method 'remove_and_cancell_tooltip'
- 1075: We're ignoring prompt customizations
- 1086: Can't open qtconsole from outside source tree
- 1076: namespace changes broke `foo.*bar*?` syntax
- 1074: pprinting old-style class objects fails (TypeError: 'tuple' object is not callable)
- 1063: IPython.utils test error due to missing unicodedata module
- 592: Bug in argument parsing for %run
- 378: Windows path escape issues
- 1068: Notebook tab completion broken in Firefox
- 75: No tab completion after "/
- 103: customizable cpaste
- 324: Remove code in IPython.testing that is not being used
- 131: Global variables not seen by cprofile.run()
- 851: IPython shell swallows exceptions in certain circumstances
- 882: ipython freezes at start if IPYTHONDIR is on an NFS mount
- 1057: Blocker: Qt console broken after "all magics" menu became dynamic
- 1027: ipython does not like white space at end of file
- 1058: New bug: Notebook asks for confirmation to leave even saved pages.
- 1061: rep (magic recall) under pypy
- 1047: Document the notebook format
- 102: Properties accessed twice for classes defined interactively
- 16: %store raises exception when storing compiled regex
- 67: tab expansion should only take one directory level at the time
- 62: Global variables undefined in interactive use of embedded ipython shell
- 57: debugging with ipython does not work well outside ipython
- 38: Line entry edge case error
- 980: Update parallel docs for new parallel architecture
- 1017: Add small example about ipcluster/ssh startup
- 1041: Proxy Issues
- 967: KernelManagers don't use zmq eventloop properly
- 1055: "All Magics" display on Ubuntu

- 1054: ipython explodes on syntax error
- 1051: ipython3 set_next_input() failure
- 693: "run -i" no longer works after %reset in terminal
- 29: cPickle works in standard interpreter, but not in IPython
- 1050: ipython3 broken by commit 8bb887c8c2c447bf7
- 1048: Update docs on notebook password
- 1046: Searies of questions/issues?
- 1045: crash when exiting - previously launched embedded sub-shell
- 1043: pylab doesn't work in qtconsole
- 1044: run -p doesn't work in python 3
- 1010: emacs freezes when ipython-complete is called
- 82: Update devel docs with discussion about good changelogs
- 116: Update release management scipts and release.revision for git
- 1022: Pylab banner shows up with first cell to execute
- 787: Keyboard selection of multiple lines in the notebook behaves inconsistently
- 1037: notepad + jsonlib: TypeError: Only whitespace may be used for indentation.
- 970: Default home not writable, %HOME% does not help (windows)
- 747: HOMESHARE not a good choice for "writable homedir" on Windows
- 810: cleanup utils.path.get_home_dir
- 2: Fix the copyright statement in source code files to be accurate
- 1031: <esc> on Firefox crash websocket
- 684: %Store eliminated in configuration and magic commands in 0.11
- 1026: BUG: wrong default parameter in ask_yes_no
- 880: Better error message if %paste fails
- 1024: autopx magic broken
- 822: Unicode bug in Itpl when expanding shell variables in syscalls with !
- 1009: Windows: regression in cd magic handling of paths
- 833: Crash python with matplotlib and unequal length arrays
- 695: Crash handler initialization is too aggressive
- 1000: Remove duplicates when refilling readline history
- 992: Interrupting certain matplotlib operations leaves the inline backend 'wedged'
- 942: number traits should cast if value doesn't change
- 1006: ls crashes when run on a UNC path or with non-ascii args
- 944: Decide the default image format for inline figures: SVG or PNG?
- 842: Python 3 on Windows (pyreadline) - expected an object with the buffer interface
- 1002: ImportError due to incorrect version checking

- 1001: Ipython "source" command?
- 954: IPython embed doesn't respect namespaces
- 681: pdb freezes inside qtconsole
- 698: crash report "TypeError: can only concatenate list (not "unicode") to list"
- 978: ipython 0.11 buffers external command output till the cmd is done
- 952: Need user-facing warning in the browser if websocket connection fails
- 988: Error using idlsave
- 990: ipython notebook - kernel dies if matplotlib is not installed
- 752: Matplotlib figures showed only once in notebook
- 54: Exception hook should be optional for embedding IPython in GUIs
- 918: IPython.frontend tests fail without tornado
- 986: Views created with c.direct_view() fail
- 697: Filter out from %who names loaded at initialization time
- 932: IPython 0.11 quickref card has superfluous "%recall and"
- 982: png files with executable permissions
- 914: Simpler system for running code after InteractiveShell is initialised
- 911: ipython crashes on startup if readline is missing
- 971: bookmarks created in 0.11 are corrupt in 0.12
- 974: object feature tab-completion crash
- 939: ZMQShell always uses default profile
- 946: Multi-tab Close action should offer option to leave all kernels alone
- 949: Test suite must not require any manual interaction
- 643: enable gui eventloop integration in ipkernel
- 965: ipython is crashed without launch.(python3.2)
- 958: Can't use os X clipboard on with qtconsole
- 962: Don't require tornado in the tests
- 960: crash on syntax error on Windows XP
- 934: The latest ipython branch doesn't work in Chrome
- 870: zmq version detection
- 943: HISTIGNORE for IPython
- 947: qtconsole segfaults at startup
- 903: Expose a magic to control config of the inline pylab backend
- 908: bad user config shouldn't crash IPython
- 935: Typing `break` causes IPython to crash.
- 869: Tab completion of `~/` shows no output post 0.10.x
- 904: whos under pypy1.6

- 773: check_security_dir() and check_pid_dir() fail on network filesystem
- 915: OS X Lion Terminal.app line wrap problem
- 886: Notebook kernel crash when specifying –notebook-dir on commandline
- 636: debugger.py: pydb broken
- 808: Ctrl+C during %reset confirm message crash Qtconsole
- 927: Using return outside a function crashes ipython
- 919: Pop-up segfault when moving cursor out of qtconsole window
- 181: cls command does not work on windows
- 917: documentation typos
- 818: %run does not work with non-ascii characeters in path
- 907: Errors in custom completer functions can crash IPython
- 867: doc: notebook password authentication howto
- 211: paste command not working
- 900: Tab key should insert 4 spaces in qt console
- 513: [Qt console] cannot insert new lines into console functions using tab
- 906: qtconsoleapp 'parse_command_line' doen't like –existing anymore
- 638: Qt console –pylab=inline and getfigs(), etc.
- 710: unwanted unicode passed to args
- 436: Users should see tooltips for all buttons in the notebook UI
- 207: ipython crashes if atexit handler raises exception
- 692: use of Tracer() when debugging works but gives error messages
- 690: debugger does not print error message by default in 0.11
- 571: history of multiline entries
- 749: IPython.parallel test failure under Windows 7 and XP
- 890: ipclusterapp.py - helep
- 885: `ws-hostname` alias not recognized by notebook
- 881: Missing manual.pdf?
- 744: cannot create notebook in offline mode if mathjax not installed
- 865: Make tracebacks from %paste show the code
- 535: exception unicode handling in %run is faulty in qtconsole
- 817: IPython crashed
- 799: %edit magic not working on windows xp in qtconsole
- 732: QTConsole wrongly promotes the index of the input line on which user presses Enter
- 662: ipython test failures on Mac OS X Lion
- 650: Handle bad config files better
- 829: We should not insert new lines after all print statements in the notebook

- 874: ipython-qtconsole: pyzmq Version Comparison
- 640: matplotlib macosx windows don't respond in qtconsole
- 624: ipython intermittently segfaults when figure is closed (Mac OS X)
- 871: Notebook crashes if a profile is used
- 56: Have %cpaste accept also Ctrl-D as a termination marker
- 849: Command line options to not override profile options
- 806: Provide single-port connection to kernels
- 691: [wishlist] Automatically find existing kernel
- 688: local security vulnerability: all ports visible to any local user.
- 866: DistributionNotFound on running ipython 0.11 on Windows XP x86
- 673: raw_input appears to be round-robin for qtconsole
- 863: Graceful degradation when home directory not writable
- 800: Timing scripts with run -t -N <N> fails on report output
- 858: Typing 'continue' makes ipython0.11 crash
- 840: all processes run on one CPU core
- 843: "import braces" crashes ipython
- 836: Strange Output after IPython Install
- 839: Qtconsole segfaults when mouse exits window with active tooltip
- 827: Add support for checking several limits before running task on engine
- 826: Add support for creation of parallel task when no engine is running
- 832: Improve error message for %logstop
- 831: %logstart in read-only directory forbid any further command
- 814: ipython does not start – DistributionNotFound
- 794: Allow >1 controller per profile
- 820: Tab Completion feature
- 812: Qt console crashes on Ubuntu 11.10
- 816: Import error using Python 2.7 and dateutil2.0 No module named _thread
- 756: qtconsole Windows fails to print error message for '%run nonexistent_file'
- 651: Completion doesn't work on element of a list
- 617: [qtconsole] %hist doesn't show anything in qtconsole
- 786: from __future__ import unicode_literals does not work
- 779: Using irunner from virtual evn uses systemwide ipython
- 768: codepage handling of output from scripts and shellcommands are not handled properly by qtconsole
- 785: Don't strip leading whitespace in repr() in notebook
- 737: in pickleshare.py line52 should be "if not os.path.isdir(self.root):"?
- 738: in ipthon_win_post_install.py line 38

- 777: print(. . . , sep=. . .) raises SyntaxError
- 728: ipcontroller crash with MPI
- 780: qtconsole Out value prints before the print statements that precede it
- 632: IPython Crash Report (0.10.2)
- 253: Unable to install ipython on windows
- 80: Split IPClusterApp into multiple Application subclasses for each subcommand
- 34: non-blocking pendingResult partial results
- 739: Tests fail if tornado not installed
- 719: Better support Pypy
- 667: qtconsole problem with default pylab profile
- 661: ipythonrc referenced in magic command in 0.11
- 665: Source introspection with ?? is broken
- 724: crash - ipython qtconsole, %quickref
- 655: ipython with qtconsole crashes
- 593: HTML Notebook Prompt can be deleted . . .
- 563: use argparse instead of kvloader for flags&aliases
- 751: Tornado version greater than 2.0 needed for firefox 6
- 720: Crash report when importing easter egg
- 740: Ctrl-Enter clears line in notebook
- 772: ipengine fails on Windows with "XXX lineno: 355, opcode: 0"
- 771: Add python 3 tag to setup.py
- 767: non-ascii in __doc__ string crashes qtconsole kernel when showing tooltip
- 733: In Windows, %run fails to strip quotes from filename
- 721: no completion in emacs by ipython(ipython.el)
- 669: Do not accept an ipython_dir that's not writeable
- 711: segfault on mac os x
- 500: "RuntimeError: Cannot change input buffer during execution" in console_widget.py
- 707: Copy and paste keyboard shortcuts do not work in Qt Console on OS X
- 478: PyZMQ's use of memoryviews breaks reconstruction of numpy arrays
- 694: Turning off callout tips in qtconsole
- 704: return kills IPython
- 442: Users should have intelligent autoindenting in the notebook
- 615: Wireframe and implement a project dashboard page
- 614: Wireframe and implement a notebook dashboard page
- 606: Users should be able to use the notebook to import/export a notebook to .py or .rst
- 604: A user should be able to leave a kernel running in the notebook and reconnect

- 298: Users should be able to save a notebook and then later reload it
- 649: ipython qtconsole (v0.11): setting "c.IPythonWidget.in_prompt = '>>> ' crashes
- 672: What happened to Exit?
- 658: Put the InteractiveShellApp section first in the auto-generated config files
- 656: [suggestion] dependency checking for pyqt for Windows installer
- 654: broken documentation link on download page
- 653: Test failures in IPython.parallel

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

2.21 0.11 Series

2.21.1 Release 0.11

IPython 0.11 is a *major* overhaul of IPython, two years in the making. Most of the code base has been rewritten or at least reorganized, breaking backward compatibility with several APIs in previous versions. It is the first major release in two years, and probably the most significant change to IPython since its inception. We plan to have a relatively quick succession of releases, as people discover new bugs and regressions. Once we iron out any significant bugs in this process and settle down the new APIs, this series will become IPython 1.0. We encourage feedback now on the core APIs, which we hope to maintain stable during the 1.0 series.

Since the internal APIs have changed so much, projects using IPython as a library (as opposed to end-users of the application) are the most likely to encounter regressions or changes that break their existing use patterns. We will make every effort to provide updated versions of the APIs to facilitate the transition, and we encourage you to contact us on the development mailing list with questions and feedback.

Chris Fonnesbeck recently wrote an excellent post that highlights some of our major new features, with examples and screenshots. We encourage you to read it as it provides an illustrated, high-level overview complementing the detailed feature breakdown in this document.

A quick summary of the major changes (see below for details):

- **Standalone Qt console**: a new rich console has been added to IPython, started with `ipython qtconsole`. In this application we have tried to retain the feel of a terminal for fast and efficient workflows, while adding many features that a line-oriented terminal simply can not support, such as inline figures, full multiline editing with syntax highlighting, graphical tooltips for function calls and much more. This development was sponsored by Enthought Inc.. See *below* for details.
- **High-level parallel computing with ZeroMQ**. Using the same architecture that our Qt console is based on, we have completely rewritten our high-level parallel computing machinery that in prior versions used the Twisted networking framework. While this change will require users to update their codes, the improvements in performance, memory control and internal consistency across our codebase convinced us it was a price worth paying.

We have tried to explain how to best proceed with this update, and will be happy to answer questions that may arise. A full tutorial describing these features was presented at SciPy'11, more details *below*.

- **New model for GUI/plotting support in the terminal**. Now instead of the various `-Xthread` flags we had before, GUI support is provided without the use of any threads, by directly integrating GUI event loops with Python's `PyOS_InputHook` API. A new command-line flag `--gui` controls GUI support, and it can also be enabled after IPython startup via the new `%gui` magic. This requires some changes if you want to execute GUI-using scripts inside IPython, see *the GUI support section* for more details.
- **A two-process architecture.** The Qt console is the first use of a new model that splits IPython between a kernel process where code is executed and a client that handles user interaction. We plan on also providing terminal and web-browser based clients using this infrastructure in future releases. This model allows multiple clients to interact with an IPython process through a well-documented messaging protocol using the ZeroMQ networking library.
- **Refactoring.** the entire codebase has been refactored, in order to make it more modular and easier to contribute to. IPython has traditionally been a hard project to participate because the old codebase was very monolithic. We hope this (ongoing) restructuring will make it easier for new developers to join us.
- **Vim integration**. Vim can be configured to seamlessly control an IPython kernel, see the files in `docs/examples/vim` for the full details. This work was done by Paul Ivanov, who prepared a nice video demonstration of the features it provides.
- **Integration into Microsoft Visual Studio**. Thanks to the work of the Microsoft Python Tools for Visual Studio team, this version of IPython has been integrated into Microsoft Visual Studio's Python tools open source plug-in. *Details below*
- **Improved unicode support**. We closed many bugs related to unicode input.
- **Python 3**. IPython now runs on Python 3.x. See *Python 3 support* for details.
- **New profile model**. Profiles are now directories that contain all relevant information for that session, and thus better isolate IPython use-cases.
- **SQLite storage for history**. All history is now stored in a SQLite database, providing support for multiple simultaneous sessions that won't clobber each other as well as the ability to perform queries on all stored data.
- **New configuration system**. All parts of IPython are now configured via a mechanism inspired by the Enthought Traits library. Any configurable element can have its attributes set either via files that now use real Python syntax or from the command-line.
- **Pasting of code with prompts**. IPython now intelligently strips out input prompts , be they plain Python ones (`>>>` and `...`) or IPython ones (`In [N]:` and `...:`). More details *here*.

Authors and support

Over 60 separate authors have contributed to this release, see *below* for a full list. In particular, we want to highlight the extremely active participation of two new core team members: Evan Patterson implemented the Qt console, and Thomas Kluyver started with our Python 3 port and by now has made major contributions to just about every area of IPython.

We are also grateful for the support we have received during this development cycle from several institutions:

- Enthought Inc funded the development of our new Qt console, an effort that required developing major pieces of underlying infrastructure, which now power not only the Qt console but also our new parallel machinery. We'd like to thank Eric Jones and Travis Oliphant for their support, as well as Ilan Schnell for his tireless work integrating and testing IPython in the Enthought Python Distribution.
- Nipy/NIH: funding via the NiPy project (NIH grant 5R01MH081909-02) helped us jumpstart the development of this series by restructuring the entire codebase two years ago in a way that would make modular development

and testing more approachable. Without this initial groundwork, all the new features we have added would have been impossible to develop.

- Sage/NSF: funding via the grant Sage: Unifying Mathematical Software for Scientists, Engineers, and Mathematicians (NSF grant DMS-1015114) supported a meeting in spring 2011 of several of the core IPython developers where major progress was made integrating the last key pieces leading to this release.
- Microsoft's team working on Python Tools for Visual Studio developed the integraton of IPython into the Python plugin for Visual Studio 2010.
- Google Summer of Code: in 2010, we had two students developing prototypes of the new machinery that is now maturing in this release: Omar Zapata and Gerardo Gutiérrez.

Development summary: moving to Git and Github

In April 2010, after one breakage too many with bzr, we decided to move our entire development process to Git and Github.com. This has proven to be one of the best decisions in the project's history, as the combination of git and github have made us far, far more productive than we could be with our previous tools. We first converted our bzr repo to a git one without losing history, and a few weeks later ported all open Launchpad bugs to github issues with their comments mostly intact (modulo some formatting changes). This ensured a smooth transition where no development history or submitted bugs were lost. Feel free to use our little Launchpad to Github issues porting script if you need to make a similar transition.

These simple statistics show how much work has been done on the new release, by comparing the current code to the last point it had in common with the 0.10 series. A huge diff and ~2200 commits make up this cycle:

```
git diff $(git merge-base 0.10.2 HEAD)  | wc -l
288019

git log $(git merge-base 0.10.2 HEAD)..HEAD --oneline | wc -l
2200
```

Since our move to github, 511 issues were closed, 226 of which were pull requests and 285 regular issues (*a full list with links* is available for those interested in the details). Github's pull requests are a fantastic mechanism for reviewing code and building a shared ownership of the project, and we are making enthusiastic use of it.

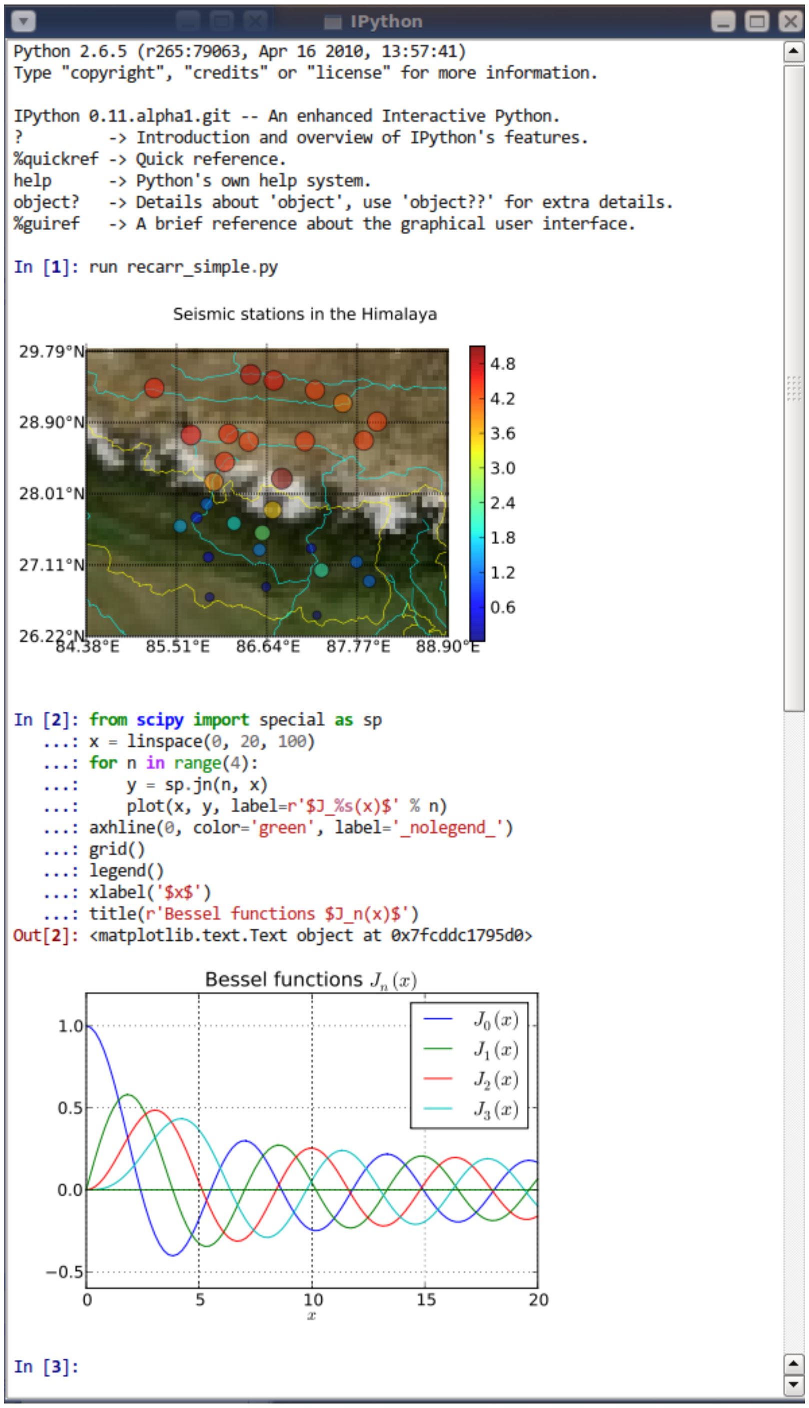
Note: This undercounts the number of issues closed in this development cycle, since we only moved to github for issue tracking in May 2010, but we have no way of collecting statistics on the number of issues closed in the old Launchpad bug tracker prior to that.

Qt Console

IPython now ships with a Qt application that feels very much like a terminal, but is in fact a rich GUI that runs an IPython client but supports inline figures, saving sessions to PDF and HTML, multiline editing with syntax highlighting, graphical calltips and much more:

We hope that many projects will embed this widget, which we've kept deliberately very lightweight, into their own environments. In the future we may also offer a slightly more featureful application (with menus and other GUI elements), but we remain committed to always shipping this easy to embed widget.

See the Jupyter Qt Console site for a detailed description of the console's features and use.



```
Python 2.6.5 (r265:79063, Apr 16 2010, 13:57:41)
Type "copyright", "credits" or "license" for more information.

IPython 0.11.alpha1.git -- An enhanced Interactive Python.
?         -> Introduction and overview of IPython's features.
%quickref -> Quick reference.
help      -> Python's own help system.
object?   -> Details about 'object', use 'object??' for extra details.
%guiref   -> A brief reference about the graphical user interface.

In [1]: run recarr_simple.py

In [2]: from scipy import special as sp
   ...: x = linspace(0, 20, 100)
   ...: for n in range(4):
   ...:     y = sp.jn(n, x)
   ...:     plot(x, y, label=r'$J_%s(x)$' % n)
   ...: axhline(0, color='green', label='_nolegend_')
   ...: grid()
   ...: legend()
   ...: xlabel('$x$')
   ...: title(r'Bessel functions $J_n(x)$')
Out[2]: <matplotlib.text.Text object at 0x7fcddc1795d0>

In [3]:
```

Fig. 5: The Qt console for IPython, using inline matplotlib plots.

High-level parallel computing with ZeroMQ

We have completely rewritten the Twisted-based code for high-level parallel computing to work atop our new ZeroMQ architecture. While we realize this will break compatibility for a number of users, we hope to make the transition as easy as possible with our docs, and we are convinced the change is worth it. ZeroMQ provides us with much tighter control over memory, higher performance, and its communications are impervious to the Python Global Interpreter Lock because they take place in a system-level C++ thread. The impact of the GIL in our previous code was something we could simply not work around, given that Twisted is itself a Python library. So while Twisted is a very capable framework, we think ZeroMQ fits our needs much better and we hope you will find the change to be a significant improvement in the long run.

Our manual contains a full description of how to use IPython for parallel computing, and the tutorial presented by Min Ragan-Kelley at the SciPy 2011 conference provides a hands-on complement to the reference docs.

Refactoring

As of this release, a signifiant portion of IPython has been refactored. This refactoring is founded on a number of new abstractions. The main new classes that implement these abstractions are:

- `traitlets.HasTraits`.
- `traitlets.config.configurable.Configurable`.
- `traitlets.config.application.Application`.
- `traitlets.config.loader.ConfigLoader`.
- `traitlets.config.loader.Config`

We are still in the process of writing developer focused documentation about these classes, but for now our *configuration documentation* contains a high level overview of the concepts that these classes express.

The biggest user-visible change is likely the move to using the config system to determine the command-line arguments for IPython applications. The benefit of this is that *all* configurable values in IPython are exposed on the command-line, but the syntax for specifying values has changed. The gist is that assigning values is pure Python assignment. Simple flags exist for commonly used options, these are always prefixed with '–'.

The IPython command-line help has the details of all the options (via `ipython --help`), but a simple example should clarify things; the `pylab` flag can be used to start in pylab mode with the qt4 backend:

```
ipython --pylab=qt
```

which is equivalent to using the fully qualified form:

```
ipython --TerminalIPythonApp.pylab=qt
```

The long-form options can be listed via `ipython --help-all`.

ZeroMQ architecture

There is a new GUI framework for IPython, based on a client-server model in which multiple clients can communicate with one IPython kernel, using the ZeroMQ messaging framework. There is already a Qt console client, which can be started by calling `ipython qtconsole`. The protocol is documented.

The parallel computing framework has also been rewritten using ZMQ. The protocol is described here, and the code is in the new `IPython.parallel` module.

Python 3 support

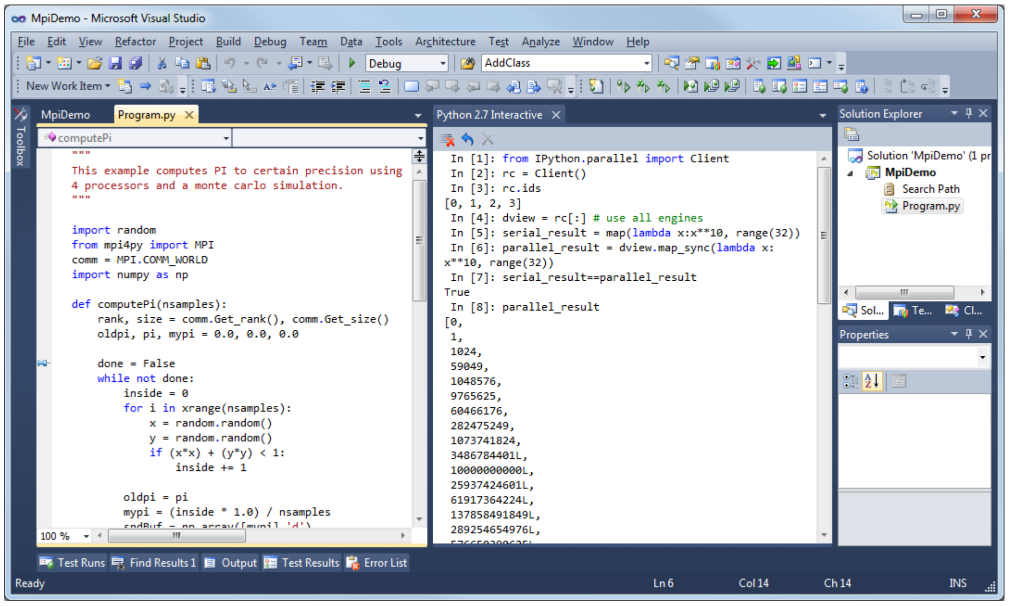
A Python 3 version of IPython has been prepared. For the time being, this is maintained separately and updated from the main codebase. Its code can be found here. The parallel computing components are not perfect on Python3, but most functionality appears to be working. As this work is evolving quickly, the best place to find updated information about it is our Python 3 wiki page.

Unicode

Entering non-ascii characters in unicode literals (`u"€ø"`) now works properly on all platforms. However, entering these in byte/string literals (`"€ø"`) will not work as expected on Windows (or any platform where the terminal encoding is not UTF-8, as it typically is for Linux & Mac OS X). You can use escape sequences (`"\xe9\x82"`) to get bytes above 128, or use unicode literals and encode them. This is a limitation of Python 2 which we cannot easily work around.

Integration with Microsoft Visual Studio

IPython can be used as the interactive shell in the Python plugin for Microsoft Visual Studio, as seen here:



```
"""
This example computes PI to certain precision using
4 processors and a monte carlo simulation.
"""

import random
from mpi4py import MPI
comm = MPI.COMM_WORLD
import numpy as np

def computePi(nsamples):
    rank, size = comm.Get_rank(), comm.Get_size()
    oldpi, pi, mypi = 0.0, 0.0, 0.0

    done = False
    while not done:
        inside = 0
        for i in xrange(nsamples):
            x = random.random()
            y = random.random()
            if (x*x) + (y*y) < 1:
                inside += 1

        oldpi = pi
        mypi = (inside * 1.0) / nsamples
```

```
 In [1]: from IPython.parallel import Client
 In [2]: rc = Client()
 In [3]: rc.ids
[0, 1, 2, 3]
 In [4]: dview = rc[:] # use all engines
 In [5]: serial_result = map(lambda x:x**10, range(32))
 In [6]: parallel_result = dview.map_sync(lambda x:
x**10, range(32))
 In [7]: serial_result==parallel_result
True
 In [8]: parallel_result
[0,
 1,
 1024,
 59049,
 1048576,
 9765625,
 60466176,
 282475249,
 1073741824,
 3486784401L,
 10000000000L,
 25937424601L,
 61917364224L,
 137858491849L,
 289254654976L,
```

Fig. 6: IPython console embedded in Microsoft Visual Studio.

The Microsoft team developing this currently has a release candidate out using IPython 0.11. We will continue to collaborate with them to ensure that as they approach their final release date, the integration with IPython remains smooth. We'd like to thank Dino Viehland and Shahrokh Mortazavi for the work they have done towards this feature, as well as Wenming Ye for his support of our WinHPC capabilities.

Additional new features

- Added `Bytes` traitlet, removing `Str`. All 'string' traitlets should either be `Unicode` if a real string, or `Bytes` if a C-string. This removes ambiguity and helps the Python 3 transition.
- New magic `%loadpy` loads a python file from disk or web URL into the current input buffer.

- New magic `%pastebin` for sharing code via the 'Lodge it' pastebin.
- New magic `%precision` for controlling float and numpy pretty printing.
- IPython applications initiate logging, so any object can gain access to a the logger of the currently running Application with:

```
from traitlets.config.application import Application
logger = Application.instance().log
```

- You can now get help on an object halfway through typing a command. For instance, typing `a = zip?` shows the details of `zip()`. It also leaves the command at the next prompt so you can carry on with it.
- The input history is now written to an SQLite database. The API for retrieving items from the history has also been redesigned.
- The `IPython.extensions.pretty` extension has been moved out of quarantine and fully updated to the new extension API.
- New magics for loading/unloading/reloading extensions have been added: `%load_ext`, `%unload_ext` and `%reload_ext`.
- The configuration system and configuration files are brand new. See the configuration system *documentation* for more details.
- The *`InteractiveShell`* class is now a `Configurable` subclass and has traitlets that determine the defaults and runtime environment. The `__init__` method has also been refactored so this class can be instantiated and run without the old `ipmaker` module.
- The methods of *`InteractiveShell`* have been organized into sections to make it easier to turn more sections of functionality into components.
- The embedded shell has been refactored into a truly standalone subclass of `InteractiveShell` called `InteractiveShellEmbed`. All embedding logic has been taken out of the base class and put into the embedded subclass.
- Added methods of *`InteractiveShell`* to help it cleanup after itself. The `cleanup()` method controls this. We couldn't do this in `__del__()` because we have cycles in our object graph that prevent it from being called.
- Created a new module *`IPython.utils.importstring`* for resolving strings like `foo.bar.Bar` to the actual class.
- Completely refactored the *`IPython.core.prefilter`* module into `Configurable` subclasses. Added a new layer into the prefilter system, called "transformations" that all new prefilter logic should use (rather than the older "checker/handler" approach).
- Aliases are now components (*`IPython.core.alias`*).
- New top level `embed()` function that can be called to embed IPython at any place in user's code. On the first call it will create an `InteractiveShellEmbed` instance and call it. In later calls, it just calls the previously created `InteractiveShellEmbed`.
- Created a configuration system (`traitlets.config.configurable`) that is based on `traitlets`. Configurables are arranged into a runtime containment tree (not inheritance) that i) automatically propagates configuration information and ii) allows singletons to discover each other in a loosely coupled manner. In the future all parts of IPython will be subclasses of `Configurable`. All IPython developers should become familiar with the config system.
- Created a new `Config` for holding configuration information. This is a dict like class with a few extras: i) it supports attribute style access, ii) it has a merge function that merges two `Config` instances recursively and iii) it will automatically create sub-`Config` instances for attributes that start with an uppercase character.

- Created new configuration loaders in `traitlets.config.loader`. These loaders provide a unified loading interface for all configuration information including command line arguments and configuration files. We have two default implementations based on `argparse` and plain python files. These are used to implement the new configuration system.
- Created a top-level `Application` class in *`IPython.core.application`* that is designed to encapsulate the starting of any basic Python program. An application loads and merges all the configuration objects, constructs the main application, configures and initiates logging, and creates and configures any `Configurable` instances and then starts the application running. An extended `BaseIPythonApplication` class adds logic for handling the IPython directory as well as profiles, and all IPython entry points extend it.
- The `Type` and `Instance` traitlets now handle classes given as strings, like `foo.bar.Bar`. This is needed for forward declarations. But, this was implemented in a careful way so that string to class resolution is done at a single point, when the parent `HasTraitlets` is instantiated.
- *`IPython.utils.ipstruct`* has been refactored to be a subclass of dict. It also now has full docstrings and doctests.
- Created a Traits like implementation in `traitlets`. This is a pure Python, lightweight version of a library that is similar to Enthought's Traits project, but has no dependencies on Enthought's code. We are using this for validation, defaults and notification in our new component system. Although it is not 100% API compatible with Enthought's Traits, we plan on moving in this direction so that eventually our implementation could be replaced by a (yet to exist) pure Python version of Enthought Traits.
- Added a new module *`IPython.lib.inputhook`* to manage the integration with GUI event loops using `PyOS_InputHook`. See the docstrings in this module or the main IPython docs for details.
- For users, GUI event loop integration is now handled through the new **`%gui`** magic command. Type `%gui?` at an IPython prompt for documentation.
- For developers *`IPython.lib.inputhook`* provides a simple interface for managing the event loops in their interactive GUI applications. Examples can be found in our `examples/lib` directory.

Backwards incompatible changes

- The Twisted-based `IPython.kernel` has been removed, and completely rewritten as `IPython.parallel`, using ZeroMQ.
- Profiles are now directories. Instead of a profile being a single config file, profiles are now self-contained directories. By default, profiles get their own IPython history, log files, and everything. To create a new profile, do `ipython profile create <name>`.
- All IPython applications have been rewritten to use `KeyValueConfigLoader`. This means that command-line options have changed. Now, all configurable values are accessible from the command-line with the same syntax as in a configuration file.
- The command line options `-wthread`, `-qthread` and `-gthread` have been removed. Use `--gui=wx`, `--gui=qt`, `--gui=gtk` instead.
- The extension loading functions have been renamed to `load_ipython_extension()` and `unload_ipython_extension()`.
- *`InteractiveShell`* no longer takes an `embedded` argument. Instead just use the `InteractiveShellEmbed` class.
- `__IPYTHON__` is no longer injected into `__builtin__`.
- `Struct.__init__()` no longer takes `None` as its first argument. It must be a `dict` or `Struct`.
- `ipmagic()` has been renamed `()`

- The functions `ipmagic()` and `ipalias()` have been removed from `__builtins__`.
- The references to the global `InteractiveShell` instance (`_ip`, and `__IP`) have been removed from the user's namespace. They are replaced by a new function called `get_ipython()` that returns the current *`InteractiveShell`* instance. This function is injected into the user's namespace and is now the main way of accessing the running IPython.
- Old style configuration files `ipythonrc` and `ipy_user_conf.py` are no longer supported. Users should migrate there configuration files to the new format described *here* and *here*.
- The old IPython extension API that relied on `ipapi()` has been completely removed. The new extension API is described *here*.
- Support for `qt3` has been dropped. Users who need this should use previous versions of IPython.
- Removed `shellglobals` as it was obsolete.
- Removed all the threaded shells in `IPython.core.shell`. These are no longer needed because of the new capabilities in *`IPython.lib.inputhook`*.
- New top-level sub-packages have been created: `IPython.core`, `IPython.lib`, `IPython.utils`, `IPython.deathrow`, `IPython.quarantine`. All existing top-level modules have been moved to appropriate sub-packages. All internal import statements have been updated and tests have been added. The build system (setup.py and friends) have been updated. See *The IPython API* for details of these new sub-packages.
- `IPython.ipapi` has been moved to `IPython.core.ipapi`. `IPython.Shell` and `IPython.iplib` have been split and removed as part of the refactor.
- `Extensions` has been moved to `extensions` and all existing extensions have been moved to either `IPython.quarantine` or `IPython.deathrow`. `IPython.quarantine` contains modules that we plan on keeping but that need to be updated. `IPython.deathrow` contains modules that are either dead or that should be maintained as third party libraries.
- Previous IPython GUIs in `IPython.frontend` and `IPython.gui` are likely broken, and have been removed to `IPython.deathrow` because of the refactoring in the core. With proper updates, these should still work.

Known Regressions

We do our best to improve IPython, but there are some known regressions in 0.11 relative to 0.10.2. First of all, there are features that have yet to be ported to the new APIs, and in order to ensure that all of the installed code runs for our users, we have moved them to two separate directories in the source distribution, `quarantine` and `deathrow`. Finally, we have some other miscellaneous regressions that we hope to fix as soon as possible. We now describe all of these in more detail.

Quarantine

These are tools and extensions that we consider relatively easy to update to the new classes and APIs, but that we simply haven't had time for. Any user who is interested in one of these is encouraged to help us by porting it and submitting a pull request on our development site.

Currently, the quarantine directory contains:

```
clearcmd.py          ipy_fsops.py          ipy_signals.py
envpersist.py        ipy_gnuglobal.py      ipy_synchronize_with.py
ext_rescapture.py    ipy_greedycompleter.py ipy_system_conf.py
InterpreterExec.py   ipy_jot.py            ipy_which.py
```

(continues on next page)

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```
ipy_app_completers.py  ipy_lookfor.py         ipy_winpdb.py
ipy_autoreload.py      ipy_profile_doctest.py ipy_workdir.py
ipy_completers.py      ipy_pydb.py            jobctrl.py
ipy_editors.py         ipy_rehashdir.py       ledit.py
ipy_exportdb.py        ipy_render.py          pspersistence.py
ipy_extutil.py         ipy_server.py          win32clip.py
```

Deathrow

These packages may be harder to update or make most sense as third-party libraries. Some of them are completely obsolete and have been already replaced by better functionality (we simply haven't had the time to carefully weed them out so they are kept here for now). Others simply require fixes to code that the current core team may not be familiar with. If a tool you were used to is included here, we encourage you to contact the dev list and we can discuss whether it makes sense to keep it in IPython (if it can be maintained).

Currently, the deathrow directory contains:

```
astyle.py              ipy_defaults.py         ipy_vimserver.py
dtutils.py             ipy_kitcfg.py           numeric_formats.py
Gnuplot2.py            ipy_legacy.py           numutils.py
GnuplotInteractive.py  ipy_p4.py               outputtrap.py
GnuplotRuntime.py      ipy_profile_none.py     PhysicalQInput.py
ibrowse.py             ipy_profile_numpy.py    PhysicalQInteractive.py
igrid.py               ipy_profile_scipy.py    quitter.py*
ipipe.py               ipy_profile_sh.py       scitedirector.py
iplib.py               ipy_profile_zope.py     Shell.py
ipy_constants.py       ipy_traits_completer.py twshell.py
```

Other regressions

- The machinery that adds functionality to the 'sh' profile for using IPython as your system shell has not been updated to use the new APIs. As a result, only the aesthetic (prompt) changes are still implemented. We intend to fix this by 0.12. Tracked as issue 547.
- The installation of scripts on Windows was broken without setuptools, so we now depend on setuptools on Windows. We hope to fix setuptools-less installation, and then remove the setuptools dependency. Issue 539.
- The directory history `_dh` is not saved between sessions. Issue 634.

Removed Features

As part of the updating of IPython, we have removed a few features for the purposes of cleaning up the codebase and interfaces. These removals are permanent, but for any item listed below, equivalent functionality is available.

- The magics Exit and Quit have been dropped as ways to exit IPython. Instead, the lowercase forms of both work either as a bare name (`exit`) or a function call (`exit()`). You can assign these to other names using exec_lines in the config file.

Credits

Many users and developers contributed code, features, bug reports and ideas to this release. Please do not hesitate in contacting us if we've failed to acknowledge your contribution here. In particular, for this release we have contribution from the following people, a mix of new and regular names (in alphabetical order by first name):

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- Walter Doerwald <walter-at-livinglogic.de>

Note: This list was generated with the output of `git log dev-0.11 HEAD --format='* %aN <%aE>' | sed 's/@/\-at\-/' | sed 's/<>//' | sort -u` after some cleanup. If you should be on this list, please add yourself.

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

2.22 Issues closed in the 0.11 development cycle

In this cycle, we closed a total of 511 issues, 226 pull requests and 285 regular issues; this is the full list (generated with the script `tools/github_stats.py`). We should note that a few of these were made on the 0.10.x series, but we have no automatic way of filtering the issues by branch, so this reflects all of our development over the last two years, including work already released in 0.10.2:

Pull requests (226):

- 620: Release notes and updates to GUI support docs for 0.11
- 642: fix typo in docs/examples/vim/README.rst
- 631: two-way vim-ipython integration
- 637: print is a function, this allows to properly exit ipython
- 635: support html representations in the notebook frontend
- 639: Updating the credits file
- 628: import pexpect from IPython.external in irunner
- 596: Irunner
- 598: Fix templates for CrashHandler
- 590: Desktop
- 600: Fix bug with non-ascii reprs inside pretty-printed lists.
- 618: I617
- 599: Gui Qt example and docs
- 619: manpage update
- 582: Updating sympy profile to match the exec_lines of isympy.
- 578: Check to see if correct source for decorated functions can be displayed
- 589: issue 588
- 591: simulate shell expansion on %run arguments, at least tilde expansion
- 576: Show message about %paste magic on an IndentationError
- 574: Getcwdu
- 565: don't move old config files, keep nagging the user
- 575: Added more docstrings to IPython.zmq.session.

- 567: fix trailing whitespace from resetting indentation
- 564: Command line args in docs
- 560: reorder qt support in kernel
- 561: command-line suggestions
- 556: qt_for_kernel: use matplotlib rcParams to decide between PyQt4 and PySide
- 557: Update usage.py to newapp
- 555: Rm default old config
- 552: update parallel code for py3k
- 504: Updating string formatting
- 551: Make pylab import all configurable
- 496: Qt editing keybindings
- 550: Support v2 PyQt4 APIs and PySide in kernel's GUI support
- 546: doc update
- 548: Fix sympy profile to work with sympy 0.7.
- 542: issue 440
- 533: Remove unused configobj and validate libraries from externals.
- 538: fix various tests on Windows
- 540: support `-pylab` flag with deprecation warning
- 537: Docs update
- 536: `setup.py install` depends on setuptools on Windows
- 480: Get help mid-command
- 462: Str and Bytes traitlets
- 534: Handle unicode properly in IPython.zmq.iostream
- 527: ZMQ displayhook
- 526: Handle asynchronous output in Qt console
- 528: Do not import deprecated functions from external decorators library.
- 454: New BaseIPythonApplication
- 532: Zmq unicode
- 531: Fix Parallel test
- 525: fallback on lsof if otool not found in libedit detection
- 517: Merge IPython.parallel.streamsession into IPython.zmq.session
- 521: use dict.get(key) instead of dict[key] for safety from KeyErrors
- 492: add QtConsoleApp using newapplication
- 485: terminal IPython with newapp
- 486: Use newapp in parallel code
- 511: Add a new line before displaying multiline strings in the Qt console.

- 509: i508
- 501: ignore EINTR in channel loops
- 495: Better selection of Qt bindings when QT_API is not specified
- 498: Check for .pyd as extension for binary files.
- 494: QtConsole zoom adjustments
- 490: fix UnicodeEncodeError writing SVG string to .svg file, fixes #489
- 491: add QtConsoleApp using newapplication
- 479: embed() doesn't load default config
- 483: Links launchpad -> github
- 419: %xdel magic
- 477: Add n to lines in the log
- 459: use os.system for shell.system in Terminal frontend
- 475: i473
- 471: Add test decorator onlyif_unicode_paths.
- 474: Fix support for raw GTK and WX matplotlib backends.
- 472: Kernel event loop is robust against random SIGINT.
- 460: Share code for magic_edit
- 469: Add exit code when running all tests with iptest.
- 464: Add home directory expansion to IPYTHON_DIR environment variables.
- 455: Bugfix with logger
- 448: Separate out skip_doctest decorator
- 453: Draft of new main BaseIPythonApplication.
- 452: Use list/tuple/dict/set subclass's overridden __repr__ instead of the pretty
- 398: allow toggle of svg/png inline figure format
- 381: Support inline PNGs of matplotlib plots
- 413: Retries and Resubmit (#411 and #412)
- 370: Fixes to the display system
- 449: Fix issue 447 - inspecting old-style classes.
- 423: Allow type checking on elements of List,Tuple,Set traits
- 400: Config5
- 421: Generalise mechanism to put text at the next prompt in the Qt console.
- 443: pinfo code duplication
- 429: add check_pid, and handle stale PID info in ipcluster.
- 431: Fix error message in test_irunner
- 427: handle different SyntaxError messages in test_irunner
- 424: Irunner test failure

- 430: Small parallel doc typo
- 422: Make ipython-qtconsole a GUI script
- 420: Permit kernel std* to be redirected
- 408: History request
- 388: Add Emacs-style kill ring to Qt console
- 414: Warn on old config files
- 415: Prevent prefilter from crashing IPython
- 418: Minor configuration doc fixes
- 407: Update What's new documentation
- 410: Install notebook frontend
- 406: install IPython.zmq.gui
- 393: ipdir unicode
- 397: utils.io.Term.cin/out/err -> utils.io.stdin/out/err
- 389: DB fixes and Scheduler HWM
- 374: Various Windows-related fixes to IPython.parallel
- 362: fallback on defaultencoding if filesystemencoding is None
- 382: Shell's reset method clears namespace from last %run command.
- 385: Update iptest exclusions (fix #375)
- 383: Catch errors in querying readline which occur with pyreadline.
- 373: Remove runlines etc.
- 364: Single output
- 372: Multiline input push
- 363: Issue 125
- 361: don't rely on setuptools for readline dependency check
- 349: Fix %autopx magic
- 355: History save thread
- 356: Usability improvements to history in Qt console
- 357: Exit autocall
- 353: Rewrite quit()/exit()/Quit()/Exit() calls as magic
- 354: Cell tweaks
- 345: Attempt to address (partly) issue ipython/#342 by rewriting quit(), exit(), etc.
- 352: #342: Try to recover as intelligently as possible if user calls magic().
- 346: Dedent prefix bugfix + tests: #142
- 348: %reset doesn't reset prompt number.
- 347: Make ip.reset() work the same in interactive or non-interactive code.
- 343: make readline a dependency on OSX

- 344: restore auto debug behavior
- 339: fix for issue 337: incorrect/phantom tooltips for magics
- 254: newparallel branch (add zmq.parallel submodule)
- 334: Hard reset
- 316: Unicode win process
- 332: AST splitter
- 325: Removetwisted
- 330: Magic pastebin
- 309: Bug tests for GH Issues 238, 284, 306, 307. Skip module machinery if not installed. Known failures reported as 'K'
- 331: Tweak config loader for PyPy compatibility.
- 319: Rewrite code to restore readline history after an action
- 329: Do not store file contents in history when running a .ipy file.
- 179: Html notebook
- 323: Add missing external.pexpect to packages
- 295: Magic local scope
- 315: Unicode magic args
- 310: allow Unicode Command-Line options
- 313: Readline shortcuts
- 311: Qtconsole exit
- 312: History memory
- 294: Issue 290
- 292: Issue 31
- 252: Unicode issues
- 235: Fix history magic command's bugs wrt to full history and add -O option to display full history
- 236: History minus p flag
- 261: Adapt magic commands to new history system.
- 282: SQLite history
- 191: Unbundle external libraries
- 199: Magic arguments
- 204: Emacs completion bugfix
- 293: Issue 133
- 249: Writing unicode characters to a log file. (IPython 0.10.2.git)
- 283: Support for 256-color escape sequences in Qt console
- 281: Refactored and improved Qt console's HTML export facility
- 237: Fix185 (take two)

- 251: Issue 129
- 278: add basic XDG_CONFIG_HOME support
- 275: inline pylab cuts off labels on log plots
- 280: Add %precision magic
- 259: Pyside support
- 193: Make ipython cProfile-able
- 272: Magic examples
- 219: Doc magic pycat
- 221: Doc magic alias
- 230: Doc magic edit
- 224: Doc magic cpaste
- 229: Doc magic pdef
- 273: Docs build
- 228: Doc magic who
- 233: Doc magic cd
- 226: Doc magic pwd
- 218: Doc magic history
- 231: Doc magic reset
- 225: Doc magic save
- 222: Doc magic timeit
- 223: Doc magic colors
- 203: Small typos in zmq/blockingkernelmanager.py
- 227: Doc magic logon
- 232: Doc magic profile
- 264: Kernel logging
- 220: Doc magic edit
- 268: PyZMQ >= 2.0.10
- 267: GitHub Pages (again)
- 266: OSX-specific fixes to the Qt console
- 255: Gitwash typo
- 265: Fix string input2
- 260: Kernel crash with empty history
- 243: New display system
- 242: Fix terminal exit
- 250: always use Session.send
- 239: Makefile command & script for GitHub Pages

- 244: My exit
- 234: Timed history save
- 217: Doc magic lsmagic
- 215: History fix
- 195: Formatters
- 192: Ready colorize bug
- 198: Windows workdir
- 174: Whitespace cleanup
- 188: Version info: update our version management system to use git.
- 158: Ready for merge
- 187: Resolved Print shortcut collision with ctrl-P emacs binding
- 183: cleanup of exit/quit commands for qt console
- 184: Logo added to sphinx docs
- 180: Cleanup old code
- 171: Expose Pygments styles as options
- 170: HTML Fixes
- 172: Fix del method exit test
- 164: Qt frontend shutdown behavior fixes and enhancements
- 167: Added HTML export
- 163: Execution refactor
- 159: Ipy3 preparation
- 155: Ready startup fix
- 152: 0.10.1 sge
- 151: mk_object_info -> object_info
- 149: Simple bug-fix

Regular issues (285):

- 630: new.py in pwd prevents ipython from starting
- 623: Execute DirectView commands while running LoadBalancedView tasks
- 437: Users should have autocompletion in the notebook
- 583: update manpages
- 594: irunner command line options defer to file extensions
- 603: Users should see colored text in tracebacks and the pager
- 597: UnicodeDecodeError: ‘ascii’ codec can’t decode byte 0xc2
- 608: Organize and layout buttons in the notebook panel sections
- 609: Implement controls in the Kernel panel section
- 611: Add kernel status widget back to notebook

- 610: Implement controls in the Cell section panel
- 612: Implement Help panel section
- 621: [qtconsole] on windows xp, cannot PageUp more than once
- 616: Store exit status of last command
- 605: Users should be able to open different notebooks in the cwd
- 302: Users should see a consistent behavior in the Out prompt in the html notebook
- 435: Notebook should not import anything by default
- 595: qtconsole command issue
- 588: ipython-qtconsole uses 100% CPU
- 586: ? + plot() Command B0rks QTConsole Strangely
- 585: %pdoc throws Errors for classes without __init__ or docstring
- 584: %pdoc throws TypeError
- 580: Client instantiation AssertionError
- 569: UnicodeDecodeError during startup
- 572: Indented command hits error
- 573: -wthread breaks indented top-level statements
- 570: "–pylab inline" vs. "–pylab=inline"
- 566: Can't use exec_file in config file
- 562: update docs to reflect '–args=values'
- 558: triple quote and %s at beginning of line
- 554: Update 0.11 docs to explain Qt console and how to do a clean install
- 553: embed() fails if config files not installed
- 8: Ensure %gui qt works with new Mayavi and pylab
- 269: Provide compatibility api for IPython.Shell().start().mainloop()
- 66: Update the main What's New document to reflect work on 0.11
- 549: Don't check for 'linux2' value in sys.platform
- 505: Qt windows created within imported functions won't show()
- 545: qtconsole ignores exec_lines
- 371: segfault in qtconsole when kernel quits
- 377: Failure: error (nothing to repeat)
- 544: Ipython qtconsole pylab config issue.
- 543: RuntimeError in completer
- 440: %run filename autocompletion "The kernel heartbeat has been inactive . . . " error
- 541: log_level is broken in the ipython Application
- 369: windows source install doesn't create scripts correctly
- 351: Make sure that the Windows installer handles the top-level IPython scripts.

- 512: Two displayhooks in zmq
- 340: Make sure that the Windows HPC scheduler support is working for 0.11
- 98: Should be able to get help on an object mid-command
- 529: unicode problem in qtconsole for windows
- 476: Separate input area in Qt Console
- 175: Qt console needs configuration support
- 156: Key history lost when debugging program crash
- 470: decorator: uses deprecated features
- 30: readline in OS X does not have correct key bindings
- 503: merge IPython.parallel.streamsession and IPython.zmq.session
- 456: pathname in document punctuated by dots not slashes
- 451: Allow switching the default image format for inline mpl backend
- 79: Implement more robust handling of config stages in Application
- 522: Encoding problems
- 524: otool should not be unconditionally called on osx
- 523: Get profile and config file inheritance working
- 519: qtconsole –pure: "TypeError: string indices must be integers, not str"
- 516: qtconsole –pure: "KeyError: 'ismagic'"
- 520: qtconsole –pure: "TypeError: string indices must be integers, not str"
- 450: resubmitted tasks sometimes stuck as pending
- 518: JSON serialization problems with ObjectId type (MongoDB)
- 178: Channels should be named for their function, not their socket type
- 515: [ipcluster] termination on os x
- 510: qtconsole: indentation problem printing numpy arrays
- 508: "AssertionError: Missing message part." in ipython-qtconsole –pure
- 499: "ZMQError: Interrupted system call" when saving inline figure
- 426: %edit magic fails in qtconsole
- 497: Don't show info from .pyd files
- 493: QFont::setPointSize: Point size <= 0 (0), must be greater than 0
- 489: UnicodeEncodeError in qt.svg.save_svg
- 458: embed() doesn't load default config
- 488: Using IPython with RubyPython leads to problems with IPython.parallel.client.client.Client.__init()
- 401: Race condition when running lbview.apply() fast multiple times in loop
- 168: Scrub Launchpad links from code, docs
- 141: garbage collection problem (revisited)
- 59: test_magic.test_obj_del fails on win32

- 457: Backgrounded Tasks not Allowed? (but easy to slip by . . .)
- 297: Shouldn't use pexpect for subprocesses in in-process terminal frontend
- 110: magic to return exit status
- 473: OSX readline detection fails in the debugger
- 466: tests fail without unicode filename support
- 468: iptest script has 0 exit code even when tests fail
- 465: client.db_query() behaves different with SQLite and MongoDB
- 467: magic_install_default_config test fails when there is no .ipython directory
- 463: IPYTHON_DIR (and IPYTHONDIR) don't expand tilde to '~' directory
- 446: Test machinery is imported at normal runtime
- 438: Users should be able to use Up/Down for cell navigation
- 439: Users should be able to copy notebook input and output
- 291: Rename special display methods and put them lower in priority than display functions
- 447: Instantiating classes without __init__ function causes kernel to crash
- 444: Ctrl + t in WxIPython Causes Unexpected Behavior
- 445: qt and console Based Startup Errors
- 428: ipcluster doesn't handle stale pid info well
- 434: 10.0.2 seg fault with rpy2
- 441: Allow running a block of code in a file
- 432: Silent request fails
- 409: Test failure in IPython.lib
- 402: History section of messaging spec is incorrect
- 88: Error when inputting UTF8 CJK characters
- 366: Ctrl-K should kill line and store it, so that Ctrl-y can yank it back
- 425: typo in %gui magic help
- 304: Persistent warnings if old configuration files exist
- 216: crash of ipython when alias is used with %s and echo
- 412: add support to automatic retry of tasks
- 411: add support to continue tasks
- 417: IPython should display things unsorted if it can't sort them
- 416: wrong encode when printing unicode string
- 376: Failing InputsplitterTest
- 405: TraitError in traitlets.py(332) on any input
- 392: UnicodeEncodeError on start
- 137: sys.getfilesystemencoding return value not checked
- 300: Users should be able to manage kernels and kernel sessions from the notebook UI

- 301: Users should have access to working Kernel, Tabs, Edit, Help menus in the notebook
- 396: cursor move triggers a lot of IO access
- 379: Minor doc nit: –paging argument
- 399: Add task queue limit in engine when load-balancing
- 78: StringTask won't take unicode code strings
- 391: MongoDB.add_record() does not work in 0.11dev
- 365: newparallel on Windows
- 386: FAIL: test that pushed functions have access to globals
- 387: Interactively defined functions can't access user namespace
- 118: Snow Leopard ipy_vimserver POLL error
- 394: System escape interpreted in multi-line string
- 26: find_job_cmd is too hasty to fail on Windows
- 368: Installation instructions in dev docs are completely wrong
- 380: qtconsole pager RST - HTML not happening consistently
- 367: Qt console doesn't support ibus input method
- 375: Missing libraries cause ImportError in tests
- 71: temp file errors in iptest IPython.core
- 350: Decide how to handle displayhook being triggered multiple times
- 360: Remove `runlines` method
- 125: Exec lines in config should not contribute to line numbering or history
- 20: Robust readline support on OS X's builtin Python
- 147: On Windows, %page is being too restrictive to split line by rn only
- 326: Update docs and examples for parallel stuff to reflect movement away from Twisted
- 341: FIx Parallel Magics for newparallel
- 338: Usability improvements to Qt console
- 142: unexpected auto-indenting when variables names that start with 'pass'
- 296: Automatic PDB via %pdb doesn't work
- 337: exit(and quit(in Qt console produces phantom signature/docstring popup, even though quit() or exit() raises NameError
- 318: %debug broken in master: invokes missing save_history() method
- 307: lines ending with semicolon should not go to cache
- 104: have ipengine run start-up scripts before registering with the controller
- 33: The skip_doctest decorator is failing to work on Shell.MatplotlibShellBase.magic_run
- 336: Missing figure development/figs/iopubfade.png for docs
- 49: %clear should also delete _NN references and Out[NN] ones
- 335: using setuptools installs every script twice

- 306: multiline strings at end of input cause noop
- 327: PyPy compatibility
- 328: %run script.ipy raises "ERROR! Session/line number was not unique in database."
- 7: Update the changes doc to reflect the kernel config work
- 303: Users should be able to scroll a notebook w/o moving the menu/buttons
- 322: Embedding an interactive IPython shell
- 321: %debug broken in master
- 287: Crash when using %macros in sqlite-history branch
- 55: Can't edit files whose names begin with numbers
- 284: In variable no longer works in 0.11
- 92: Using multiprocessing module crashes parallel IPython
- 262: Fail to recover history after force-kill.
- 320: Tab completing re.search objects crashes IPython
- 317: IPython.kernel: parallel map issues
- 197: ipython-qtconsole unicode problem in magic ls
- 305: more readline shortcuts in qtconsole
- 314: Multi-line, multi-block cells can't be executed.
- 308: Test suite should set sqlite history to work in :memory:
- 202: Matplotlib native 'MacOSX' backend broken in '-pylab' mode
- 196: IPython can't deal with unicode file name.
- 25: unicode bug - encoding input
- 290: try/except/else clauses can't be typed, code input stops too early.
- 43: Implement SSH support in ipcluster
- 6: Update the Sphinx docs for the new ipcluster
- 9: Getting "DeadReferenceError: Calling Stale Broker" after ipcontroller restart
- 132: Ipython prevent south from working
- 27: generics.complete_object broken
- 60: Improve absolute import management for iptest.py
- 31: Issues in magic_whos code
- 52: Document testing process better
- 44: Merge history from multiple sessions
- 182: ipython q4thread in version 10.1 not starting properly
- 143: Ipython.gui.wx.ipython_view.IPShellWidget: ignores user*_ns arguments
- 127: %edit does not work on filenames consisted of pure numbers
- 126: Can't transfer command line argument to script
- 28: Offer finer control for initialization of input streams

- 58: ipython change char '0xe9' to 4 spaces
- 68: Problems with Control-C stopping ipcluster on Windows/Python2.6
- 24: ipcluster does not start all the engines
- 240: Incorrect method displayed in %psource
- 120: inspect.getsource fails for functions defined on command line
- 212: IPython ignores exceptions in the first evaulation of class attrs
- 108: ipython disables python logger
- 100: Overzealous introspection
- 18: %cpaste freeze sync frontend
- 200: Unicode error when starting ipython in a folder with non-ascii path
- 130: Deadlock when importing a module that creates an IPython client
- 134: multline block scrolling
- 46: Input to %timeit is not preparsed
- 285: ipcluster local -n 4 fails
- 205: In the Qt console, Tab should insert 4 spaces when not completing
- 145: Bug on MSW systems: idle can not be set as default IPython editor. Fix Suggested.
- 77: ipython oops in cygwin
- 121: If plot windows are closed via window controls, no more plotting is possible.
- 111: Iterator version of TaskClient.map() that returns results as they become available
- 109: WinHPCLauncher is a hard dependency that causes errors in the test suite
- 86: Make IPython work with multiprocessing
- 15: Implement SGE support in ipcluster
- 3: Implement PBS support in ipcluster
- 53: Internal Python error in the inspect module
- 74: Manager() [from multiprocessing module] hangs ipythonx but not ipython
- 51: Out not working with ipythonx
- 201: use session.send throughout zmq code
- 115: multiline specials not defined in 0.11 branch
- 93: when looping, cursor appears at leftmost point in newline
- 133: whitespace after Source introspection
- 50: Ctrl-C with -gthread on Windows, causes uncaught IOError
- 65: Do not use .message attributes in exceptions, deprecated in 2.6
- 76: syntax error when raise is inside except process
- 107: bdist_rpm causes traceback looking for a non-existant file
- 113: initial magic ? (question mark) fails before wildcard
- 128: Pdb instance has no attribute 'curframe'

- 139: running with -pylab pollutes namespace
- 140: malloc error during tab completion of numpy array member functions starting with 'c'
- 153: ipy_vimserver traceback on Windows
- 154: using ipython in Slicer3 show how os.environ['HOME'] is not defined
- 185: show() blocks in pylab mode with ipython 0.10.1
- 189: Crash on tab completion
- 274: bashism in sshx.sh
- 276: Calling `sip.setapi` does not work if app has already imported from PyQt4
- 277: matplotlib.image imgshow from 10.1 segfault
- 288: Incorrect docstring in zmq/kernelmanager.py
- 286: Fix IPython.Shell compatibility layer
- 99: blank lines in history
- 129: psearch: TypeError: expected string or buffer
- 190: Add option to format float point output
- 246: Application not conforms XDG Base Directory Specification
- 48: IPython should follow the XDG Base Directory spec for configuration
- 176: Make client-side history persistence readline-independent
- 279: Backtraces when using ipdb do not respect -colour LightBG setting
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- 271: Intermittent problem with print output in Qt console.
- 270: Small typo in IPython developer's guide
- 166: Add keyboard accelerators to Qt close dialog
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- 45: Autosave history for robustness
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- 161: make ipythonqt exit without dialog when exit() is called
- 263: [ipython + numpy] Some test errors
- 256: reset docstring ipython 0.10
- 258: allow caching to avoid matplotlib object references
- 248: Can't open and read files after upgrade from 0.10 to 0.10.0
- 247: ipython + Stackless
- 245: Magic save and macro missing newlines, line ranges don't match prompt numbers.
- 241: "exit" hangs on terminal version of IPython
- 213: ipython -pylab no longer plots interactively on 0.10.1
- 4: wx frontend don't display well commands output
- 5: ls command not supported in ipythonx wx frontend

- 1: Document winhpcjob.py and launcher.py
- 83: Usage of testing.util.DeferredTestCase should be replace with twisted.trial.unittest.TestCase
- 117: Redesign how Component instances are tracked and queried
- 47: IPython.kernel.client cannot be imported inside an engine
- 105: Refactor the task dependencies system
- 210: 0.10.1 doc mistake - New IPython Sphinx directive error
- 209: can't activate IPython parallel magics
- 206: Buggy linewrap in Mac OSX Terminal
- 194: !sudo <command> displays password in plain text
- 186: %edit issue under OS X 10.5 - IPython 0.10.1
- 11: Create a daily build PPA for ipython
- 144: logo missing from sphinx docs
- 181: cls command does not work on windows
- 169: Kernel can only be bound to localhost
- 36: tab completion does not escape ()
- 177: Report tracebacks of interactively entered input
- 148: dictionary having multiple keys having frozenset fails to print on IPython
- 160: magic_gui throws TypeError when gui magic is used
- 150: History entries ending with parentheses corrupt command line on OS X 10.6.4
- 146: -ipythondir - using an alternative .ipython dir for rc type stuff
- 114: Interactive strings get mangled with "_ip.magic"
- 135: crash on invalid print
- 69: Usage of "mycluster" profile in docs and examples
- 37: Fix colors in output of ResultList on Windows

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Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

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2.23 0.10 series

2.23.1 Release 0.10.2

IPython 0.10.2 was released April 9, 2011. This is a minor bugfix release that preserves backward compatibility. At this point, all IPython development resources are focused on the 0.11 series that includes a complete architectural restructuring of the project as well as many new capabilities, so this is likely to be the last release of the 0.10.x series. We have tried to fix all major bugs in this series so that it remains a viable platform for those not ready yet to transition to the 0.11 and newer codebase (since that will require some porting effort, as a number of APIs have changed).

Thus, we are not opening a 0.10.3 active development branch yet, but if the user community requires new patches and is willing to maintain/release such a branch, we'll be happy to host it on the IPython github repositories.

Highlights of this release:

- The main one is the closing of github ticket #185, a major regression we had in 0.10.1 where pylab mode with GTK (or gthread) was not working correctly, hence plots were blocking with GTK. Since this is the default matplotlib backend on Unix systems, this was a major annoyance for many users. Many thanks to Paul Ivanov for helping resolve this issue.
- Fix IOError bug on Windows when used with -gthread.
- Work robustly if $HOME is missing from environment.
- Better POSIX support in ssh scripts (remove bash-specific idioms).
- Improved support for non-ascii characters in log files.
- Work correctly in environments where GTK can be imported but not started (such as a linux text console without X11).

For this release we merged 24 commits, contributed by the following people (please let us know if we omitted your name and we'll gladly fix this in the notes for the future):

- Fernando Perez
- MinRK
- Paul Ivanov
- Pieter Cristiaan de Groot
- TvrtkoM

2.23.2 Release 0.10.1

IPython 0.10.1 was released October 11, 2010, over a year after version 0.10. This is mostly a bugfix release, since after version 0.10 was released, the development team's energy has been focused on the 0.11 series. We have nonetheless tried to backport what fixes we could into 0.10.1, as it remains the stable series that many users have in production systems they rely on.

Since the 0.11 series changes many APIs in backwards-incompatible ways, we are willing to continue maintaining the 0.10.x series. We don't really have time to actively write new code for 0.10.x, but we are happy to accept patches and pull requests on the IPython github site. If sufficient contributions are made that improve 0.10.1, we will roll them into future releases. For this purpose, we will have a branch called 0.10.2 on github, on which you can base your contributions.

For this release, we applied approximately 60 commits totaling a diff of over 7000 lines:

```
(0.10.1)amirbar[dist]> git diff --oneline rel-0.10.. | wc -l
7296
```

Highlights of this release:

- The only significant new feature is that IPython's parallel computing machinery now supports natively the Sun Grid Engine and LSF schedulers. This work was a joint contribution from Justin Riley, Satra Ghosh and Matthieu Brucher, who put a lot of work into it. We also improved traceback handling in remote tasks, as well as providing better control for remote task IDs.
- New IPython Sphinx directive contributed by John Hunter. You can use this directive to mark blocks in reSructuredText documents as containing IPython syntax (including figures) and the will be executed during the build:

  ```
  In [2]: plt.figure()  # ensure a fresh figure

  @savefig psimple.png width=4in
  In [3]: plt.plot([1,2,3])
  Out[3]: [<matplotlib.lines.Line2D object at 0x9b74d8c>]
  ```

- Various fixes to the standalone ipython-wx application.
- We now ship internally the excellent argparse library, graciously licensed under BSD terms by Steven Bethard. Now (2010) that argparse has become part of Python 2.7 this will be less of an issue, but Steven's relicensing allowed us to start updating IPython to using argparse well before Python 2.7. Many thanks!
- Robustness improvements so that IPython doesn't crash if the readline library is absent (though obviously a lot of functionality that requires readline will not be available).
- Improvements to tab completion in Emacs with Python 2.6.
- Logging now supports timestamps (see `%logstart?` for full details).
- A long-standing and quite annoying bug where parentheses would be added to `print` statements, under Python 2.5 and 2.6, was finally fixed.
- Improved handling of libreadline on Apple OSX.
- Fix `reload` method of IPython demos, which was broken.
- Fixes for the ipipe/ibrowse system on OSX.
- Fixes for Zope profile.
- Fix %timeit reporting when the time is longer than 1000s.
- Avoid lockups with ? or ?? in SunOS, due to a bug in termios.
- The usual assortment of miscellaneous bug fixes and small improvements.

The following people contributed to this release (please let us know if we omitted your name and we'll gladly fix this in the notes for the future):

- Beni Cherniavsky
- Boyd Waters.
- David Warde-Farley
- Fernando Perez
- Gökhan Sever
- John Hunter
- Justin Riley

- Kiorky
- Laurent Dufrechou
- Mark E. Smith
- Matthieu Brucher
- Satrajit Ghosh
- Sebastian Busch
- Václav Šmilauer

2.23.3 Release 0.10

This release brings months of slow but steady development, and will be the last before a major restructuring and cleanup of IPython's internals that is already under way. For this reason, we hope that 0.10 will be a stable and robust release so that while users adapt to some of the API changes that will come with the refactoring that will become IPython 0.11, they can safely use 0.10 in all existing projects with minimal changes (if any).

IPython 0.10 is now a medium-sized project, with roughly (as reported by David Wheeler's **`sloccount`** utility) 40750 lines of Python code, and a diff between 0.9.1 and this release that contains almost 28000 lines of code and documentation. Our documentation, in PDF format, is a 495-page long PDF document (also available in HTML format, both generated from the same sources).

Many users and developers contributed code, features, bug reports and ideas to this release. Please do not hesitate in contacting us if we've failed to acknowledge your contribution here. In particular, for this release we have contribution from the following people, a mix of new and regular names (in alphabetical order by first name):

- Alexander Clausen: fix #341726.
- Brian Granger: lots of work everywhere (features, bug fixes, etc).
- Daniel Ashbrook: bug report on MemoryError during compilation, now fixed.
- Darren Dale: improvements to documentation build system, feedback, design ideas.
- Fernando Perez: various places.
- Gaël Varoquaux: core code, ipythonx GUI, design discussions, etc. Lots…
- John Hunter: suggestions, bug fixes, feedback.
- Jorgen Stenarson: work on many fronts, tests, fixes, win32 support, etc.
- Laurent Dufréchou: many improvements to ipython-wx standalone app.
- Lukasz Pankowski: prefilter, `%edit`, demo improvements.
- Matt Foster: TextMate support in `%edit`.
- Nathaniel Smith: fix #237073.
- Pauli Virtanen: fixes and improvements to extensions, documentation.
- Prabhu Ramachandran: improvements to `%timeit`.
- Robert Kern: several extensions.
- Sameer D'Costa: help on critical bug #269966.
- Stephan Peijnik: feedback on Debian compliance and many man pages.
- Steven Bethard: we are now shipping his `argparse` module.
- Tom Fetherston: many improvements to `IPython.demo` module.

- Ville Vainio: lots of work everywhere (features, bug fixes, etc).
- Vishal Vasta: ssh support in ipcluster.
- Walter Doerwald: work on the `IPython.ipipe` system.

Below we give an overview of new features, bug fixes and backwards-incompatible changes. For a detailed account of every change made, feel free to view the project log with **bzr log**.

New features

- New `%paste` magic automatically extracts current contents of clipboard and pastes it directly, while correctly handling code that is indented or prepended with >>> or `...` python prompt markers. A very useful new feature contributed by Robert Kern.
- IPython 'demos', created with the `IPython.demo` module, can now be created from files on disk or strings in memory. Other fixes and improvements to the demo system, by Tom Fetherston.
- Added `find_cmd()` function to `IPython.platutils` module, to find commands in a cross-platform manner.
- Many improvements and fixes to Gaël Varoquaux's **ipythonx**, a WX-based lightweight IPython instance that can be easily embedded in other WX applications. These improvements have made it possible to now have an embedded IPython in Mayavi and other tools.
- `MultiengineClient` objects now have a `benchmark()` method.
- The manual now includes a full set of auto-generated API documents from the code sources, using Sphinx and some of our own support code. We are now using the Numpy Documentation Standard for all docstrings, and we have tried to update as many existing ones as possible to this format.
- The new `IPython.Extensions.ipy_pretty` extension by Robert Kern provides configurable pretty-printing.
- Many improvements to the **ipython-wx** standalone WX-based IPython application by Laurent Dufréchou. It can optionally run in a thread, and this can be toggled at runtime (allowing the loading of Matplotlib in a running session without ill effects).
- IPython includes a copy of Steven Bethard's argparse in the `IPython.external` package, so we can use it internally and it is also available to any IPython user. By installing it in this manner, we ensure zero conflicts with any system-wide installation you may already have while minimizing external dependencies for new users. In IPython 0.10, We ship argparse version 1.0.
- An improved and much more robust test suite, that runs groups of tests in separate subprocesses using either Nose or Twisted's **trial** runner to ensure proper management of Twisted-using code. The test suite degrades gracefully if optional dependencies are not available, so that the **iptest** command can be run with only Nose installed and nothing else. We also have more and cleaner test decorators to better select tests depending on runtime conditions, do setup/teardown, etc.
- The new ipcluster now has a fully working ssh mode that should work on Linux, Unix and OS X. Thanks to Vishal Vatsa for implementing this!
- The wonderful TextMate editor can now be used with %edit on OS X. Thanks to Matt Foster for this patch.
- The documentation regarding parallel uses of IPython, including MPI and PBS, has been significantly updated and improved.
- The developer guidelines in the documentation have been updated to explain our workflow using **bzr** and Launchpad.

- Fully refactored **ipcluster** command line program for starting IPython clusters. This new version is a complete rewrite and 1) is fully cross platform (we now use Twisted's process management), 2) has much improved performance, 3) uses subcommands for different types of clusters, 4) uses argparse for parsing command line options, 5) has better support for starting clusters using **mpirun**, 6) has experimental support for starting engines using PBS. It can also reuse FURL files, by appropriately passing options to its subcommands. However, this new version of ipcluster should be considered a technology preview. We plan on changing the API in significant ways before it is final.
- Full description of the security model added to the docs.
- cd completer: show bookmarks if no other completions are available.
- sh profile: easy way to give 'title' to prompt: assign to variable '_prompt_title'. It looks like this:

```
[~]|1> _prompt_title = 'sudo!'
sudo![~]|2>
```

- %edit: If you do '%edit pasted_block', pasted_block variable gets updated with new data (so repeated editing makes sense)

Bug fixes

- Fix #368719, removed top-level debian/ directory to make the job of Debian packagers easier.
- Fix #291143 by including man pages contributed by Stephan Peijnik from the Debian project.
- Fix #358202, effectively a race condition, by properly synchronizing file creation at cluster startup time.
- `%timeit` now handles correctly functions that take a long time to execute even the first time, by not repeating them.
- Fix #239054, releasing of references after exiting.
- Fix #341726, thanks to Alexander Clausen.
- Fix #269966. This long-standing and very difficult bug (which is actually a problem in Python itself) meant long-running sessions would inevitably grow in memory size, often with catastrophic consequences if users had large objects in their scripts. Now, using `%run` repeatedly should not cause any memory leaks. Special thanks to John Hunter and Sameer D'Costa for their help with this bug.
- Fix #295371, bug in `%history`.
- Improved support for py2exe.
- Fix #270856: IPython hangs with PyGTK
- Fix #270998: A magic with no docstring breaks the '%magic magic'
- fix #271684: -c startup commands screw up raw vs. native history
- Numerous bugs on Windows with the new ipcluster have been fixed.
- The ipengine and ipcontroller scripts now handle missing furl files more gracefully by giving better error messages.
- %rehashx: Aliases no longer contain dots. python3.0 binary will create alias python30. Fixes: #259716 "commands with dots in them don't work"
- %cpaste: %cpaste -r repeats the last pasted block. The block is assigned to pasted_block even if code raises exception.
- Bug #274067 'The code in get_home_dir is broken for py2exe' was fixed.
- Many other small bug fixes not listed here by number (see the bzr log for more info).

Backwards incompatible changes

- `ipykit` and related files were unmaintained and have been removed.
- The `IPython.genutils.doctest_reload()` does not actually call `reload(doctest)` anymore, as this was causing many problems with the test suite. It still resets `doctest.master` to None.
- While we have not deliberately broken Python 2.4 compatibility, only minor testing was done with Python 2.4, while 2.5 and 2.6 were fully tested. But if you encounter problems with 2.4, please do report them as bugs.
- The **`ipcluster`** now requires a mode argument; for example to start a cluster on the local machine with 4 engines, you must now type:

  ```
  $ ipcluster local -n 4
  ```

- The controller now has a `-r` flag that needs to be used if you want to reuse existing furl files. Otherwise they are deleted (the default).
- Remove ipy_leo.py. You can use **`easy_install ipython-extension`** to get it. (done to decouple it from ipython release cycle)

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2.24 0.9 series

2.24.1 Release 0.9.1

This release was quickly made to restore compatibility with Python 2.4, which version 0.9 accidentally broke. No new features were introduced, other than some additional testing support for internal use.

2.24.2 Release 0.9

New features

- All furl files and security certificates are now put in a read-only directory named ~/.ipython/security.
- A single function `get_ipython_dir()`, in `IPython.genutils` that determines the user's IPython directory in a robust manner.
- Laurent's WX application has been given a top-level script called ipython-wx, and it has received numerous fixes. We expect this code to be architecturally better integrated with Gael's WX 'ipython widget' over the next few releases.
- The Editor synchronization work by Vivian De Smedt has been merged in. This code adds a number of new editor hooks to synchronize with editors under Windows.

- A new, still experimental but highly functional, WX shell by Gael Varoquaux. This work was sponsored by Enthought, and while it's still very new, it is based on a more cleanly organized arhictecture of the various IPython components. We will continue to develop this over the next few releases as a model for GUI components that use IPython.
- Another GUI frontend, Cocoa based (Cocoa is the OSX native GUI framework), authored by Barry Wark. Currently the WX and the Cocoa ones have slightly different internal organizations, but the whole team is working on finding what the right abstraction points are for a unified codebase.
- As part of the frontend work, Barry Wark also implemented an experimental event notification system that various ipython components can use. In the next release the implications and use patterns of this system regarding the various GUI options will be worked out.
- IPython finally has a full test system, that can test docstrings with IPython-specific functionality. There are still a few pieces missing for it to be widely accessible to all users (so they can run the test suite at any time and report problems), but it now works for the developers. We are working hard on continuing to improve it, as this was probably IPython's major Achilles heel (the lack of proper test coverage made it effectively impossible to do large-scale refactoring). The full test suite can now be run using the **`iptest`** command line program.
- The notion of a task has been completely reworked. An `ITask` interface has been created. This interface defines the methods that tasks need to implement. These methods are now responsible for things like submitting tasks and processing results. There are two basic task types: `IPython.kernel.task.StringTask` (this is the old `Task` object, but renamed) and the new `IPython.kernel.task.MapTask`, which is based on a function.
- A new interface, `IPython.kernel.mapper.IMapper` has been defined to standardize the idea of a `map` method. This interface has a single `map` method that has the same syntax as the built-in `map`. We have also defined a `mapper` factory interface that creates objects that implement `IPython.kernel.mapper.IMapper` for different controllers. Both the multiengine and task controller now have mapping capabilties.
- The parallel function capabilities have been reworks. The major changes are that i) there is now an `@parallel` magic that creates parallel functions, ii) the syntax for multiple variable follows that of `map`, iii) both the multiengine and task controller now have a parallel function implementation.
- All of the parallel computing capabilities from `ipython1-dev` have been merged into IPython proper. This resulted in the following new subpackages: `IPython.kernel`, `IPython.kernel.core`, `traitlets.config`, `IPython.tools` and *`IPython.testing`*.
- As part of merging in the `ipython1-dev` stuff, the `setup.py` script and friends have been completely refactored. Now we are checking for dependencies using the approach that matplotlib uses.
- The documentation has been completely reorganized to accept the documentation from `ipython1-dev`.
- We have switched to using Foolscap for all of our network protocols in `IPython.kernel`. This gives us secure connections that are both encrypted and authenticated.
- We have a brand new `COPYING.txt` files that describes the IPython license and copyright. The biggest change is that we are putting "The IPython Development Team" as the copyright holder. We give more details about exactly what this means in this file. All developer should read this and use the new banner in all IPython source code files.
- sh profile: ./foo runs foo as system command, no need to do !./foo anymore
- String lists now support `sort(field, nums = True)` method (to easily sort system command output). Try it with `a = !ls -l ; a.sort(1, nums=1)`.
- '%cpaste foo' now assigns the pasted block as string list, instead of string
- The ipcluster script now run by default with no security. This is done because the main usage of the script is for starting things on localhost. Eventually when ipcluster is able to start things on other hosts, we will put security back.

- 'cd –foo' searches directory history for string foo, and jumps to that dir. Last part of dir name is checked first. If no matches for that are found, look at the whole path.

Bug fixes

- The Windows installer has been fixed. Now all IPython scripts have `.bat` versions created. Also, the Start Menu shortcuts have been updated.
- The colors escapes in the multiengine client are now turned off on win32 as they don't print correctly.
- The `IPython.kernel.scripts.ipengine` script was exec'ing mpi_import_statement incorrectly, which was leading the engine to crash when mpi was enabled.
- A few subpackages had missing `__init__.py` files.
- The documentation is only created if Sphinx is found. Previously, the `setup.py` script would fail if it was missing.
- Greedy `cd` completion has been disabled again (it was enabled in 0.8.4) as it caused problems on certain platforms.

Backwards incompatible changes

- The `clusterfile` options of the **`ipcluster`** command has been removed as it was not working and it will be replaced soon by something much more robust.
- The `IPython.kernel` configuration now properly find the user's IPython directory.
- In ipapi, the `make_user_ns()` function has been replaced with `make_user_namespaces()`, to support dict subclasses in namespace creation.
- `IPython.kernel.client.Task` has been renamed `IPython.kernel.client.StringTask` to make way for new task types.
- The keyword argument `style` has been renamed `dist` in `scatter`, `gather` and `map`.
- Renamed the values that the rename `dist` keyword argument can have from `'basic'` to `'b'`.
- IPython has a larger set of dependencies if you want all of its capabilities. See the `setup.py` script for details.
- The constructors for `IPython.kernel.client.MultiEngineClient` and `IPython.kernel.client.TaskClient` no longer take the (ip,port) tuple. Instead they take the filename of a file that contains the FURL for that client. If the FURL file is in your IPYTHONDIR, it will be found automatically and the constructor can be left empty.
- The asynchronous clients in `IPython.kernel.asyncclient` are now created using the factory functions `get_multiengine_client()` and `get_task_client()`. These return a `Deferred` to the actual client.
- The command line options to `ipcontroller` and `ipengine` have changed to reflect the new Foolscap network protocol and the FURL files. Please see the help for these scripts for details.
- The configuration files for the kernel have changed because of the Foolscap stuff. If you were using custom config files before, you should delete them and regenerate new ones.

Changes merged in from IPython1

New features

- Much improved `setup.py` and `setupegg.py` scripts. Because Twisted and zope.interface are now easy installable, we can declare them as dependencies in our setupegg.py script.
- IPython is now compatible with Twisted 2.5.0 and 8.x.
- Added a new example of how to use `ipython1.kernel.asynclient`.
- Initial draft of a process daemon in `ipython1.daemon`. This has not been merged into IPython and is still in `ipython1-dev`.
- The `TaskController` now has methods for getting the queue status.
- The `TaskResult` objects not have information about how long the task took to run.
- We are attaching additional attributes to exceptions `(_ipython_*)` that we use to carry additional info around.
- New top-level module `asyncclient` that has asynchronous versions (that return deferreds) of the client classes. This is designed to users who want to run their own Twisted reactor.
- All the clients in `client` are now based on Twisted. This is done by running the Twisted reactor in a separate thread and using the `blockingCallFromThread()` function that is in recent versions of Twisted.
- Functions can now be pushed/pulled to/from engines using `MultiEngineClient.push_function()` and `MultiEngineClient.pull_function()`.
- Gather/scatter are now implemented in the client to reduce the work load of the controller and improve performance.
- Complete rewrite of the IPython docuementation. All of the documentation from the IPython website has been moved into docs/source as restructured text documents. PDF and HTML documentation are being generated using Sphinx.
- New developer oriented documentation: development guidelines and roadmap.
- Traditional `ChangeLog` has been changed to a more useful `changes.txt` file that is organized by release and is meant to provide something more relevant for users.

Bug fixes

- Created a proper `MANIFEST.in` file to create source distributions.
- Fixed a bug in the `MultiEngine` interface. Previously, multi-engine actions were being collected with a `DeferredList` with `fireononeerrback=1`. This meant that methods were returning before all engines had given their results. This was causing extremely odd bugs in certain cases. To fix this problem, we have 1) set `fireononeerrback=0` to make sure all results (or exceptions) are in before returning and 2) introduced a `CompositeError` exception that wraps all of the engine exceptions. This is a huge change as it means that users will have to catch `CompositeError` rather than the actual exception.

Backwards incompatible changes

- All names have been renamed to conform to the lowercase_with_underscore convention. This will require users to change references to all names like `queueStatus` to `queue_status`.

- Previously, methods like `MultiEngineClient.push()` and `MultiEngineClient.push()` used `*args` and `**kwargs`. This was becoming a problem as we weren't able to introduce new keyword arguments into the API. Now these methods simple take a dict or sequence. This has also allowed us to get rid of the `*All` methods like `pushAll()` and `pullAll()`. These things are now handled with the `targets` keyword argument that defaults to `'all'`.
- The `MultiEngineClient.magicTargets` has been renamed to `MultiEngineClient.targets`.
- All methods in the MultiEngine interface now accept the optional keyword argument `block`.
- Renamed `RemoteController` to `MultiEngineClient` and `TaskController` to `TaskClient`.
- Renamed the top-level module from `api` to `client`.
- Most methods in the multiengine interface now raise a `CompositeError` exception that wraps the user's exceptions, rather than just raising the raw user's exception.
- Changed the `setupNS` and `resultNames` in the `Task` class to `push` and `pull`.

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2.25 0.8 series

2.25.1 Release 0.8.4

This was a quick release to fix an unfortunate bug that slipped into the 0.8.3 release. The `--twisted` option was disabled, as it turned out to be broken across several platforms.

2.25.2 Release 0.8.3

- pydb is now disabled by default (due to %run -d problems). You can enable it by passing -pydb command line argument to IPython. Note that setting it in config file won't work.

2.25.3 Release 0.8.2

- %pushd/%popd behave differently; now "pushd /foo" pushes CURRENT directory and jumps to /foo. The current behaviour is closer to the documented behaviour, and should not trip anyone.

2.25.4 Older releases

Changes in earlier releases of IPython are described in the older file `ChangeLog`. Please refer to this document for details.

CHAPTER 3

Installation

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If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

3.1 Installing IPython

IPython 6 requires Python 3.3. IPython 5.x can be installed on Python 2.

3.1.1 Quick Install

With `pip` already installed :

```
$ pip install ipython
```

This installs IPython as well as its dependencies.

If you want to use IPython with notebooks or the Qt console, you should also install Jupyter `pip install jupyter`.

3.1.2 Overview

This document describes in detail the steps required to install IPython. For a few quick ways to get started with package managers or full Python distributions, see the install page of the IPython website.

Please let us know if you have problems installing IPython or any of its dependencies.

IPython and most dependencies should be installed via **pip**. In many scenarios, this is the simplest method of installing Python packages. More information about `pip` can be found on its PyPI page.

More general information about installing Python packages can be found in Python's documentation.

Dependencies

IPython relies on a number of other Python packages. Installing using a package manager like pip or conda will ensure the necessary packages are installed. Manual installation without dependencies is possible, but not recommended. The dependencies can be viewed with package manager commands, such as **pip show ipython** or **conda info ipython**.

Installing IPython itself

IPython requires several dependencies to work correctly, it is not recommended to install IPython and all its dependencies manually as this can be quite long and troublesome. You should use the python package manager `pip`.

Installation using pip

Make sure you have the latest version of `pip` (the Python package manager) installed. If you do not, head to Pip documentation and install `pip` first.

The quickest way to get up and running with IPython is to install it with pip:

```
$ pip install ipython
```

That's it.

Installation from source

To install IPython from source, grab the latest stable tarball of IPython from PyPI. Then do the following:

```
tar -xzf ipython-5.1.0.tar.gz
cd ipython-5.1.0
# The [test] extra ensures test dependencies are installed too:
pip install .[test]
```

Do not invoke `setup.py` directly as this can have undesirable consequences for further upgrades. We do not recommend using `easy_install` either.

If you are installing to a location (like `/usr/local`) that requires higher permissions, you may need to run the last command with **sudo**. You can also install in user specific location by using the `--user` flag in conjunction with pip.

To run IPython's test suite, use the **iptest** command from outside of the IPython source tree:

```
$ iptest
```

Installing the development version

It is also possible to install the development version of IPython from our Git source code repository. To do this you will need to have Git installed on your system.

Then do:

```
$ git clone https://github.com/ipython/ipython.git
$ cd ipython
$ pip install -e .[test]
```

The **`pip install -e .`** command allows users and developers to follow the development branch as it changes by creating links in the right places and installing the command line scripts to the appropriate locations.

Then, if you want to update your IPython at any time, do:

```
$ git pull
```

If the dependencies or entrypoints have changed, you may have to run

```
$ pip install -e .
```

again, but this is infrequent.

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3.2 Installing the IPython kernel

See also:

Installing Jupyter The IPython kernel is the Python execution backend for Jupyter.

The Jupyter Notebook and other frontends automatically ensure that the IPython kernel is available. However, if you want to use a kernel with a different version of Python, or in a virtualenv or conda environment, you'll need to install that manually.

3.2.1 Kernels for Python 2 and 3

If you're running Jupyter on Python 3, you can set up a Python 2 kernel after checking your version of pip is greater than 9.0:

```
python2 -m pip --version
```

Then install with

```
python2 -m pip install ipykernel
python2 -m ipykernel install --user
```

Or using conda, create a Python 2 environment:

```
conda create -n ipykernel_py2 python=2 ipykernel
source activate ipykernel_py2    # On Windows, remove the word 'source'
python -m ipykernel install --user
```

Note: IPython 6.0 stopped support for Python 2, so installing IPython on Python 2 will give you an older version (5.x series).

If you're running Jupyter on Python 2 and want to set up a Python 3 kernel, follow the same steps, replacing `2` with `3`.

The last command installs a kernel spec file for the current python installation. Kernel spec files are JSON files, which can be viewed and changed with a normal text editor.

3.2.2 Kernels for different environments

If you want to have multiple IPython kernels for different virtualenvs or conda environments, you will need to specify unique names for the kernelspecs.

Make sure you have ipykernel installed in your environment. If you are using `pip` to install `ipykernel` in a conda env, make sure `pip` is installed:

```
source activate myenv
conda install pip
conda install ipykernel # or pip install ipykernel
```

For example, using conda environments, install a `Python (myenv)` Kernel in a first environment:

```
source activate myenv
python -m ipykernel install --user --name myenv --display-name "Python (myenv)"
```

And in a second environment, after making sure ipykernel is installed in it:

```
source activate other-env
python -m ipykernel install --user --name other-env --display-name "Python (other-env)
↪"
```

The `--name` value is used by Jupyter internally. These commands will overwrite any existing kernel with the same name. `--display-name` is what you see in the notebook menus.

Using virtualenv or conda envs, you can make your IPython kernel in one env available to Jupyter in a different env. To do so, run ipykernel install from the kernel's env, with –prefix pointing to the Jupyter env:

```
/path/to/kernel/env/bin/python -m ipykernel install --prefix=/path/to/jupyter/env --
↪name 'python-my-env'
```

Note that this command will create a new configuration for the kernel in one of the preferred location (see `jupyter --paths` command for more details):

- system-wide (e.g. /usr/local/share),
- in Jupyter's env (sys.prefix/share),

- per-user (~/.local/share or ~/Library/share)

If you want to edit the kernelspec before installing it, you can do so in two steps. First, ask IPython to write its spec to a temporary location:

```
ipython kernel install --prefix /tmp
```

edit the files in /tmp/share/jupyter/kernels/python3 to your liking, then when you are ready, tell Jupyter to install it (this will copy the files into a place Jupyter will look):

```
jupyter kernelspec install /tmp/share/jupyter/kernels/python3
```

This sections will guide you through *installing IPython itself*, and installing *kernels for Jupyter* if you wish to work with multiple version of Python, or multiple environments.

3.3 Quick install reminder

Here is a quick reminder of the commands needed for installation if you are already familiar with IPython and are just searching to refresh your memory:

Install IPython:

```
$ pip install ipython
```

Install and register an IPython kernel with Jupyter:

```
$ python -m pip install ipykernel

$ python -m ipykernel install [--user] [--name <machine-readable-name>] [--display-
↪name <"User Friendly Name">]
```

for more help see

```
$ python -m ipykernel install  --help
```

See also:

Installing Jupyter The Notebook, nbconvert, and many other former pieces of IPython are now part of Project Jupyter.

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CHAPTER 4

Tutorial

This section of IPython documentation will walk you through most of the IPython functionality. You do not need to have any deep knowledge of Python to read this tutorial, though some sections might make slightly more sense if you have already done some work in the classic Python REPL.

Note: Some part of this documentation are more than a decade old so might be out of date, we welcome any report of inaccuracy, and Pull Requests that make that up to date.

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4.1 Introducing IPython

You don't need to know anything beyond Python to start using IPython – just type commands as you would at the standard Python prompt. But IPython can do much more than the standard prompt. Some key features are described here. For more information, check the *tips page*, or look at examples in the IPython cookbook.

If you haven't done that yet see how to install ipython .

If you've never used Python before, you might want to look at the official tutorial or an alternative, Dive into Python.

Start IPython by issuing the `ipython` command from your shell, you should be greeted by the following:

```
Python 3.6.0
Type 'copyright', 'credits' or 'license' for more information
IPython 6.0.0.dev -- An enhanced Interactive Python. Type '?' for help.

In [1]:
```

Unlike the Python REPL, you will see that the input prompt is `In [N]:` instead of `>>>`. The number `N` in the prompt will be used later in this tutorial but should usually not impact the computation.

You should be able to type single line expressions and press enter to evaluate them. If an expression is incomplete, IPython will automatically detect this and add a new line when you press `Enter` instead of executing right away.

Feel free to explore multi-line text input. Unlike many other REPLs, with IPython you can use the up and down arrow keys when editing multi-line code blocks.

Here is an example of a longer interaction with the IPython REPL, which we often refer to as an IPython *session*

```
In [1]: print('Hello IPython')
Hello IPython

In [2]: 21 * 2
Out[2]: 42

In [3]: def say_hello(name):
   ...:     print('Hello {name}'.format(name=name))
   ...:
```

We won't get into details right now, but you may notice a few differences to the standard Python REPL. First, your code should be syntax-highlighted as you type. Second, you will see that some results will have an `Out[N]:` prompt, while some other do not. We'll come to this later.

Depending on the exact command you are typing you might realize that sometimes `Enter` will add a new line, and sometimes it will execute the current statement. IPython tries to guess what you are doing, so most of the time you should not have to care. Though if by any chance IPython does not the right thing you can force execution of the current code block by pressing in sequence `Esc` and `Enter`. You can also force the insertion of a new line at the position of the cursor by using `Ctrl-o`.

4.1.1 The four most helpful commands

The four most helpful commands, as well as their brief description, is shown to you in a banner, every time you start IPython:

command	description
?	Introduction and overview of IPython's features.
%quickref	Quick reference.
help	Python's own help system.
object?	Details about 'object', use 'object??' for extra details.

4.1.2 Tab completion

Tab completion, especially for attributes, is a convenient way to explore the structure of any object you're dealing with. Simply type `object_name.<TAB>` to view the object's attributes. Besides Python objects and keywords, tab completion also works on file and directory names.

Starting with IPython 6.0, if `jedi` is installed, IPython will try to pull completions from Jedi as well. This allows to not only inspect currently existing objects, but also to infer completion statically without executing code. There is nothing particular need to get this to work, simply use tab completion on more complex expressions like the following:

```
>>> data = ['Number of users', 123456]
... data[0].<tab>
```

IPython and Jedi will be able to infer that `data[0]` is actually a string and should show relevant completions like `upper()`, `lower()` and other string methods. You can use the `Tab` key to cycle through completions, and while a completion is highlighted, its type will be shown as well. When the type of the completion is a function, the completer will also show the signature of the function when highlighted.

4.1.3 Exploring your objects

Typing `object_name?` will print all sorts of details about any object, including docstrings, function definition lines (for call arguments) and constructor details for classes. To get specific information on an object, you can use the magic commands `%pdoc`, `%pdef`, `%psource` and `%pfile`

4.1.4 Magic functions

IPython has a set of predefined 'magic functions' that you can call with a command line style syntax. There are two kinds of magics, line-oriented and cell-oriented. **Line magics** are prefixed with the `%` character and work much like OS command-line calls: they get as an argument the rest of the line, where arguments are passed without parentheses or quotes. **Lines magics** can return results and can be used in the right hand side of an assignment. **Cell magics** are prefixed with a double `%%`, and they are functions that get as an argument not only the rest of the line, but also the lines below it in a separate argument.

Magics are useful as convenient functions where Python syntax is not the most natural one, or when one want to embed invalid python syntax in their work flow.

The following examples show how to call the built-in *`%timeit`* magic, both in line and cell mode:

```
In [1]: %timeit range(1000)
100000 loops, best of 3: 7.76 us per loop

In [2]: %%timeit x = range(10000)
...: max(x)
...:
1000 loops, best of 3: 223 us per loop
```

The built-in magics include:

- Functions that work with code: *`%run`*, *`%edit`*, *`%save`*, *`%macro`*, *`%recall`*, etc.
- Functions which affect the shell: *`%colors`*, *`%xmode`*, *`%automagic`*, etc.
- Other functions such as *`%reset`*, *`%timeit`*, *`%%writefile`*, *`%load`*, or `%paste`.

You can always call magics using the `%` prefix, and if you're calling a line magic on a line by itself, as long as the identifier is not defined in your namespace, you can omit even that:

```
run thescript.py
```

You can toggle this behavior by running the *`%automagic`* magic. Cell magics must always have the `%%` prefix.

A more detailed explanation of the magic system can be obtained by calling `%magic`, and for more details on any magic function, call `%somemagic?` to read its docstring. To see all the available magic functions, call `%lsmagic`.

See also:

The *Magic command system* section of the documentation goes more in depth into how the magics works and how to define your own, and *Built-in magic commands* for a list of built-in magics.

Cell magics example notebook

Running and Editing

The *%run* magic command allows you to run any python script and load all of its data directly into the interactive namespace. Since the file is re-read from disk each time, changes you make to it are reflected immediately (unlike imported modules, which have to be specifically reloaded). IPython also includes *dreload*, a recursive reload function.

`%run` has special flags for timing the execution of your scripts (-t), or for running them under the control of either Python's pdb debugger (-d) or profiler (-p).

The *%edit* command gives a reasonable approximation of multi-line editing, by invoking your favorite editor on the spot. IPython will execute the code you type in there as if it were typed interactively. Note that for *%edit* to work, the call to startup your editor has to be a blocking call. In a GUI environment, your editor likely will have such an option.

Debugging

After an exception occurs, you can call *%debug* to jump into the Python debugger (pdb) and examine the problem. Alternatively, if you call *%pdb*, IPython will automatically start the debugger on any uncaught exception. You can print variables, see code, execute statements and even walk up and down the call stack to track down the true source of the problem. This can be an efficient way to develop and debug code, in many cases eliminating the need for print statements or external debugging tools.

You can also step through a program from the beginning by calling `%run -d theprogram.py`.

4.1.5 History

IPython stores both the commands you enter, and the results it produces. You can easily go through previous commands with the up- and down-arrow keys, or access your history in more sophisticated ways.

Input and output history are kept in variables called `In` and `Out`, keyed by the prompt numbers, e.g. `In[4]`. The last three objects in output history are also kept in variables named _, __ and ___.

You can use the `%history` magic function to examine past input and output. Input history from previous sessions is saved in a database, and IPython can be configured to save output history.

Several other magic functions can use your input history, including `%edit`, `%rerun`, `%recall`, `%macro`, `%save` and `%pastebin`. You can use a standard format to refer to lines:

```
%pastebin 3 18-20 ~1/1-5
```

This will take line 3 and lines 18 to 20 from the current session, and lines 1-5 from the previous session.

4.1.6 System shell commands

To run any command at the system shell, simply prefix it with `!`, e.g.:

```
!ping www.bbc.co.uk
```

You can capture the output into a Python list, e.g.: `files = !ls`. To pass the values of Python variables or expressions to system commands, prefix them with $: `!grep -rF $pattern ipython/*` or wrap in `{braces}`. See *our shell section* for more details.

Define your own system aliases

It's convenient to have aliases to the system commands you use most often. This allows you to work seamlessly from inside IPython with the same commands you are used to in your system shell. IPython comes with some pre-defined aliases and a complete system for changing directories, both via a stack (see *%pushd*, *%popd* and *%dhist*) and via direct *%cd*. The latter keeps a history of visited directories and allows you to go to any previously visited one.

4.1.7 Configuration

Much of IPython can be tweaked through *configuration*. To get started, use the command `ipython profile create` to produce the default config files. These will be placed in `~/.ipython/profile_default`, and contain comments explaining what the various options do.

Profiles allow you to use IPython for different tasks, keeping separate config files and history for each one. More details in *the profiles section*.

Startup Files

If you want some code to be run at the beginning of every IPython session, the easiest way is to add Python (.py) or IPython (.ipy) scripts to your `profile_default/startup/` directory. Files here will be executed as soon as the IPython shell is constructed, before any other code or scripts you have specified. The files will be run in order of their names, so you can control the ordering with prefixes, like `10-myimports.py`.

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4.2 Rich Outputs

One of the main feature of IPython when used as a kernel is its ability to show rich output. This means that object that can be representing as image, sounds, animation, (etc…) can be shown this way if the frontend support it.

In order for this to be possible, you need to use the `display()` function, that should be available by default on IPython 5.4+ and 6.1+, or that you can import with `from IPython.display import display`. Then use `display(<your object>)` instead of `print()`, and if possible your object will be displayed with a richer representation. In the terminal of course, there won't be much difference as object are most of the time represented by text, but in notebook and similar interface you will get richer outputs.

4.3 Plotting

Note: Starting with IPython 5.0 and matplotlib 2.0 you can avoid the use of IPython's specific magic and use `matplotlib.pyplot.ion()`/`matplotlib.pyplot.ioff()` which have the advantages of working outside of IPython as well.

One major feature of the IPython kernel is the ability to display plots that are the output of running code cells. The IPython kernel is designed to work seamlessly with the matplotlib plotting library to provide this functionality.

To set this up, before any plotting or import of matplotlib is performed you must execute the `%matplotlib` *magic command*. This performs the necessary behind-the-scenes setup for IPython to work correctly hand in hand with `matplotlib`; it does *not*, however, actually execute any Python `import` commands, that is, no names are added to the namespace.

If the `%matplotlib` magic is called without an argument, the output of a plotting command is displayed using the default `matplotlib` backend in a separate window. Alternatively, the backend can be explicitly requested using, for example:

```
%matplotlib gtk
```

A particularly interesting backend, provided by IPython, is the `inline` backend. This is available only for the Jupyter Notebook and the Jupyter QtConsole. It can be invoked as follows:

```
%matplotlib inline
```

With this backend, the output of plotting commands is displayed *inline* within frontends like the Jupyter notebook, directly below the code cell that produced it. The resulting plots will then also be stored in the notebook document.

See also:

Plotting with Matplotlib example notebook

The matplotlib library also ships with `%matplotlib notebook` command that allows interactive figures if your environment allows it.

See the matplotlib documentation for more information.

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4.4 IPython reference

4.4.1 Command-line usage

You start IPython with the command:

```
$ ipython [options] files
```

If invoked with no options, it executes all the files listed in sequence and exits. If you add the `-i` flag, it drops you into the interpreter while still acknowledging any options you may have set in your `ipython_config.py`. This behavior is different from standard Python, which when called as python `-i` will only execute one file and ignore your configuration setup.

Please note that some of the configuration options are not available at the command line, simply because they are not practical here. Look into your configuration files for details on those. There are separate configuration files for each profile, and the files look like `ipython_config.py` or `ipython_config_`*`frontendname`*`.py`. Profile directories look like `profile_`*`profilename`* and are typically installed in the *`IPYTHONDIR`* directory, which defaults to `$HOME/.ipython`. For Windows users, `HOME` resolves to `C:\Users{YourUserName}` in most instances.

Command-line Options

To see the options IPython accepts, use `ipython --help` (and you probably should run the output through a pager such as `ipython --help | less` for more convenient reading). This shows all the options that have a single-word alias to control them, but IPython lets you configure all of its objects from the command-line by passing the full class name and a corresponding value; type `ipython --help-all` to see this full list. For example:

```
$ ipython --help-all
<...snip...>
--matplotlib=<CaselessStrEnum> (InteractiveShellApp.matplotlib)
    Default: None
    Choices: ['auto', 'gtk', 'gtk3', 'inline', 'nbagg', 'notebook', 'osx', 'qt', 'qt4
↪', 'qt5', 'tk', 'wx']
    Configure matplotlib for interactive use with the default matplotlib
    backend.
<...snip...>
```

Indicate that the following:

```
$ ipython --matplotlib qt
```

is equivalent to:

```
$ ipython --TerminalIPythonApp.matplotlib='qt'
```

Note that in the second form, you *must* use the equal sign, as the expression is evaluated as an actual Python assignment. While in the above example the short form is more convenient, only the most common options have a short form, while any configurable variable in IPython can be set at the command-line by using the long form. This long form is the same syntax used in the configuration files, if you want to set these options permanently.

4.4.2 Interactive use

IPython is meant to work as a drop-in replacement for the standard interactive interpreter. As such, any code which is valid python should execute normally under IPython (cases where this is not true should be reported as bugs). It does, however, offer many features which are not available at a standard python prompt. What follows is a list of these.

Caution for Windows users

Windows, unfortunately, uses the ‘’ character as a path separator. This is a terrible choice, because ‘’ also represents the escape character in most modern programming languages, including Python. For this reason, using ‘/’ character is recommended if you have problems with `\`. However, in Windows commands '/' flags options, so you can not use it for the root directory. This means that paths beginning at the root must be typed in a contrived manner like: `%copy \opt/foo/bar.txt \tmp`

Magic command system

IPython will treat any line whose first character is a % as a special call to a 'magic' function. These allow you to control the behavior of IPython itself, plus a lot of system-type features. They are all prefixed with a % character, but parameters are given without parentheses or quotes.

Lines that begin with `%%` signal a *cell magic*: they take as arguments not only the rest of the current line, but all lines below them as well, in the current execution block. Cell magics can in fact make arbitrary modifications to the input they receive, which need not even be valid Python code at all. They receive the whole block as a single string.

As a line magic example, the `%cd` magic works just like the OS command of the same name:

```
In [8]: %cd
/home/fperez
```

The following uses the builtin `%timeit` in cell mode:

```
In [10]: %%timeit x = range(10000)
    ...: min(x)
    ...: max(x)
    ...:
1000 loops, best of 3: 438 us per loop
```

In this case, `x = range(10000)` is called as the line argument, and the block with `min(x)` and `max(x)` is called as the cell body. The `%timeit` magic receives both.

If you have 'automagic' enabled (as it is by default), you don't need to type in the single `%` explicitly for line magics; IPython will scan its internal list of magic functions and call one if it exists. With automagic on you can then just type `cd mydir` to go to directory 'mydir':

```
In [9]: cd mydir
/home/fperez/mydir
```

Cell magics *always* require an explicit `%%` prefix, automagic calling only works for line magics.

The automagic system has the lowest possible precedence in name searches, so you can freely use variables with the same names as magic commands. If a magic command is 'shadowed' by a variable, you will need the explicit `%` prefix to use it:

```
In [1]: cd ipython     # %cd is called by automagic
/home/fperez/ipython

In [2]: cd=1           # now cd is just a variable

In [3]: cd ..          # and doesn't work as a function anymore
File "<ipython-input-3-9fedb3aff56c>", line 1
  cd ..
     ^
SyntaxError: invalid syntax


In [4]: %cd ..         # but %cd always works
/home/fperez
```

(continues on next page)

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```
In [5]: del cd      # if you remove the cd variable, automagic works again

In [6]: cd ipython

/home/fperez/ipython
```

Line magics, if they return a value, can be assigned to a variable using the syntax `l = %sx ls` (which in this particular case returns the result of `ls` as a python list). See *below* for more information.

Type `%magic` for more information, including a list of all available magic functions at any time and their docstrings. You can also type `%magic_function_name?` (see *below* for information on the '?' system) to get information about any particular magic function you are interested in.

The API documentation for the `IPython.core.magic` module contains the full docstrings of all currently available magic commands.

See also:

Built-in magic commands A list of the line and cell magics available in IPython by default

Defining custom magics How to define and register additional magic functions

Access to the standard Python help

Simply type `help()` to access Python's standard help system. You can also type `help(object)` for information about a given object, or `help('keyword')` for information on a keyword. You may need to configure your PYTHONDOCS environment variable for this feature to work correctly.

Dynamic object information

Typing `?word` or `word?` prints detailed information about an object. If certain strings in the object are too long (e.g. function signatures) they get snipped in the center for brevity. This system gives access variable types and values, docstrings, function prototypes and other useful information.

If the information will not fit in the terminal, it is displayed in a pager (`less` if available, otherwise a basic internal pager).

Typing `??word` or `word??` gives access to the full information, including the source code where possible. Long strings are not snipped.

The following magic functions are particularly useful for gathering information about your working environment:

- `%pdoc` **<object>**: Print (or run through a pager if too long) the docstring for an object. If the given object is a class, it will print both the class and the constructor docstrings.
- `%pdef` **<object>**: Print the call signature for any callable object. If the object is a class, print the constructor information.
- `%psource` **<object>**: Print (or run through a pager if too long) the source code for an object.
- `%pfile` **<object>**: Show the entire source file where an object was defined via a pager, opening it at the line where the object definition begins.
- `%who`/`%whos`: These functions give information about identifiers you have defined interactively (not things you loaded or defined in your configuration files). %who just prints a list of identifiers and %whos prints a table with some basic details about each identifier.

The dynamic object information functions (?/??, `%pdoc`, `%pfile`, `%pdef`, `%psource`) work on object attributes, as well as directly on variables. For example, after doing `import os`, you can use `os.path.abspath??`.

Command line completion

At any time, hitting TAB will complete any available python commands or variable names, and show you a list of the possible completions if there's no unambiguous one. It will also complete filenames in the current directory if no python names match what you've typed so far.

Search command history

IPython provides two ways for searching through previous input and thus reduce the need for repetitive typing:

1. Start typing, and then use the up and down arrow keys (or `Ctrl-p` and `Ctrl-n`) to search through only the history items that match what you've typed so far.
2. Hit `Ctrl-r`: to open a search prompt. Begin typing and the system searches your history for lines that contain what you've typed so far, completing as much as it can.

IPython will save your input history when it leaves and reload it next time you restart it. By default, the history file is named `.ipython/profile_`*name*`/history.sqlite`.

Autoindent

Starting with 5.0, IPython uses `prompt_toolkit` in place of `readline`, it thus can recognize lines ending in ':' and indent the next line, while also un-indenting automatically after 'raise' or 'return', and support real multi-line editing as well as syntactic coloration during edition.

This feature does not use the `readline` library anymore, so it will not honor your `~/.inputrc` configuration (or whatever file your `INPUTRC` environment variable points to).

In particular if you want to change the input mode to `vi`, you will need to set the `TerminalInteractiveShell.editing_mode` configuration option of IPython.

Session logging and restoring

You can log all input from a session either by starting IPython with the command line switch `--logfile=foo.py` (see *here*) or by activating the logging at any moment with the magic function *`%logstart`*.

Log files can later be reloaded by running them as scripts and IPython will attempt to 'replay' the log by executing all the lines in it, thus restoring the state of a previous session. This feature is not quite perfect, but can still be useful in many cases.

The log files can also be used as a way to have a permanent record of any code you wrote while experimenting. Log files are regular text files which you can later open in your favorite text editor to extract code or to 'clean them up' before using them to replay a session.

The *`%logstart`* function for activating logging in mid-session is used as follows:

```
%logstart [log_name [log_mode]]
```

If no name is given, it defaults to a file named 'ipython_log.py' in your current working directory, in 'rotate' mode (see below).

'%logstart name' saves to file 'name' in 'backup' mode. It saves your history up to that point and then continues logging.

%logstart takes a second optional parameter: logging mode. This can be one of (note that the modes are given unquoted):

- [over:] overwrite existing log_name.
- [backup:] rename (if exists) to log_name~ and start log_name.
- [append:] well, that says it.
- [rotate:] create rotating logs log_name.1~, log_name.2~, etc.

Adding the '-o' flag to '%logstart' magic (as in '%logstart -o [log_name [log_mode]]') will also include output from iPython in the log file.

The *%logoff* and *%logon* functions allow you to temporarily stop and resume logging to a file which had previously been started with %logstart. They will fail (with an explanation) if you try to use them before logging has been started.

System shell access

Any input line beginning with a `!` character is passed verbatim (minus the `!`, of course) to the underlying operating system. For example, typing `!ls` will run 'ls' in the current directory.

Manual capture of command output and magic output

You can assign the result of a system command to a Python variable with the syntax `myfiles = !ls`. Similarly, the result of a magic (as long as it returns a value) can be assigned to a variable. For example, the syntax `myfiles = %sx ls` is equivalent to the above system command example (the *%sx* magic runs a shell command and captures the output). Each of these gets machine readable output from stdout (e.g. without colours), and splits on newlines. To explicitly get this sort of output without assigning to a variable, use two exclamation marks (`!!ls`) or the *%sx* magic command without an assignment. (However, `!!` commands cannot be assigned to a variable.)

The captured list in this example has some convenience features. `myfiles.n` or `myfiles.s` returns a string delimited by newlines or spaces, respectively. `myfiles.p` produces path objects from the list items. See *String lists* for details.

IPython also allows you to expand the value of python variables when making system calls. Wrap variables or expressions in {braces}:

```
In [1]: pyvar = 'Hello world'
In [2]: !echo "A python variable: {pyvar}"
A python variable: Hello world
In [3]: import math
In [4]: x = 8
In [5]: !echo {math.factorial(x)}
40320
```

For simple cases, you can alternatively prepend $ to a variable name:

```
In [6]: !echo $sys.argv
[/home/fperez/usr/bin/ipython]
In [7]: !echo "A system variable: $$HOME"  # Use $$ for literal $
A system variable: /home/fperez
```

Note that `$$` is used to represent a literal `$`.

System command aliases

The *%alias* magic function allows you to define magic functions which are in fact system shell commands. These aliases can have parameters.

`%alias alias_name cmd` defines 'alias_name' as an alias for 'cmd'

Then, typing `alias_name params` will execute the system command 'cmd params' (from your underlying operating system).

You can also define aliases with parameters using `%s` specifiers (one per parameter). The following example defines the parts function as an alias to the command `echo first %s second %s` where each `%s` will be replaced by a positional parameter to the call to %parts:

```
In [1]: %alias parts echo first %s second %s
In [2]: parts A B
first A second B
In [3]: parts A
ERROR: Alias <parts> requires 2 arguments, 1 given.
```

If called with no parameters, *%alias* prints the table of currently defined aliases.

The *%rehashx* magic allows you to load your entire $PATH as ipython aliases. See its docstring for further details.

Recursive reload

The *IPython.lib.deepreload* module allows you to recursively reload a module: changes made to any of its dependencies will be reloaded without having to exit. To start using it, do:

```
from IPython.lib.deepreload import reload as dreload
```

Verbose and colored exception traceback printouts

IPython provides the option to see very detailed exception tracebacks, which can be especially useful when debugging large programs. You can run any Python file with the %run function to benefit from these detailed tracebacks. Furthermore, both normal and verbose tracebacks can be colored (if your terminal supports it) which makes them much easier to parse visually.

See the magic *%xmode* and *%colors* functions for details.

These features are basically a terminal version of Ka-Ping Yee's cgitb module, now part of the standard Python library.

Input caching system

IPython offers numbered prompts (In/Out) with input and output caching (also referred to as 'input history'). All input is saved and can be retrieved as variables (besides the usual arrow key recall), in addition to the `%rep` magic command that brings a history entry up for editing on the next command line.

The following variables always exist:

- `_i`, `_ii`, `_iii`: store previous, next previous and next-next previous inputs.
- `In`, `_ih` : a list of all inputs; `_ih[n]` is the input from line `n`. If you overwrite In with a variable of your own, you can remake the assignment to the internal list with a simple `In=_ih`.

Additionally, global variables named `_i<n>` are dynamically created (`<n>` being the prompt counter), so `_i<n> == _ih[<n>] == In[<n>]`.

For example, what you typed at prompt 14 is available as `_i14`, `_ih[14]` and `In[14]`.

This allows you to easily cut and paste multi line interactive prompts by printing them out: they print like a clean string, without prompt characters. You can also manipulate them like regular variables (they are strings), modify or exec them.

You can also re-execute multiple lines of input easily by using the magic *%rerun* or *%macro* functions. The macro system also allows you to re-execute previous lines which include magic function calls (which require special processing). Type %macro? for more details on the macro system.

A history function *%history* allows you to see any part of your input history by printing a range of the _i variables.

You can also search ('grep') through your history by typing `%hist -g somestring`. This is handy for searching for URLs, IP addresses, etc. You can bring history entries listed by '%hist -g' up for editing with the %recall command, or run them immediately with *%rerun*.

Output caching system

For output that is returned from actions, a system similar to the input cache exists but using _ instead of _i. Only actions that produce a result (NOT assignments, for example) are cached. If you are familiar with Mathematica, IPython's _ variables behave exactly like Mathematica's % variables.

The following variables always exist:

- [_] (a single underscore): stores previous output, like Python's default interpreter.
- [__] (two underscores): next previous.
- [___] (three underscores): next-next previous.

Additionally, global variables named _<n> are dynamically created (<n> being the prompt counter), such that the result of output <n> is always available as _<n> (don't use the angle brackets, just the number, e.g. `_21`).

These variables are also stored in a global dictionary (not a list, since it only has entries for lines which returned a result) available under the names _oh and Out (similar to _ih and In). So the output from line 12 can be obtained as `_12`, `Out[12]` or `_oh[12]`. If you accidentally overwrite the Out variable you can recover it by typing `Out=_oh` at the prompt.

This system obviously can potentially put heavy memory demands on your system, since it prevents Python's garbage collector from removing any previously computed results. You can control how many results are kept in memory with the configuration option `InteractiveShell.cache_size`. If you set it to 0, output caching is disabled. You can also use the *%reset* and *%xdel* magics to clear large items from memory.

Directory history

Your history of visited directories is kept in the global list _dh, and the magic *%cd* command can be used to go to any entry in that list. The *%dhist* command allows you to view this history. Do `cd -<TAB>` to conveniently view the directory history.

Automatic parentheses and quotes

These features were adapted from Nathan Gray's LazyPython. They are meant to allow less typing for common situations.

Callable objects (i.e. functions, methods, etc) can be invoked like this (notice the commas between the arguments):

```
In [1]: callable_ob arg1, arg2, arg3
------> callable_ob(arg1, arg2, arg3)
```

Note: This feature is disabled by default. To enable it, use the `%autocall` magic command. The commands below with special prefixes will always work, however.

You can force automatic parentheses by using '/' as the first character of a line. For example:

```
In [2]: /globals # becomes 'globals()'
```

Note that the '/' MUST be the first character on the line! This won't work:

```
In [3]: print /globals # syntax error
```

In most cases the automatic algorithm should work, so you should rarely need to explicitly invoke /. One notable exception is if you are trying to call a function with a list of tuples as arguments (the parenthesis will confuse IPython):

```
In [4]: zip (1,2,3),(4,5,6) # won't work
```

but this will work:

```
In [5]: /zip (1,2,3),(4,5,6)
------> zip ((1,2,3),(4,5,6))
Out[5]: [(1, 4), (2, 5), (3, 6)]
```

IPython tells you that it has altered your command line by displaying the new command line preceded by `--->`.

You can force automatic quoting of a function's arguments by using `,` or `;` as the first character of a line. For example:

```
In [1]: ,my_function /home/me   # becomes my_function("/home/me")
```

If you use ';' the whole argument is quoted as a single string, while ',' splits on whitespace:

```
In [2]: ,my_function a b c    # becomes my_function("a","b","c")

In [3]: ;my_function a b c    # becomes my_function("a b c")
```

Note that the ',' or ';' MUST be the first character on the line! This won't work:

```
In [4]: x = ,my_function /home/me # syntax error
```

4.4.3 IPython as your default Python environment

Python honors the environment variable `PYTHONSTARTUP` and will execute at startup the file referenced by this variable. If you put the following code at the end of that file, then IPython will be your working environment anytime you start Python:

```
import os, IPython
os.environ['PYTHONSTARTUP'] = ''  # Prevent running this again
IPython.start_ipython()
raise SystemExit
```

The `raise SystemExit` is needed to exit Python when it finishes, otherwise you'll be back at the normal Python >>> prompt.

This is probably useful to developers who manage multiple Python versions and don't want to have correspondingly multiple IPython versions. Note that in this mode, there is no way to pass IPython any command-line options, as those are trapped first by Python itself.

4.4.4 Embedding IPython

You can start a regular IPython session with

```
import IPython
IPython.start_ipython(argv=[])
```

at any point in your program. This will load IPython configuration, startup files, and everything, just as if it were a normal IPython session. For information on setting configuration options when running IPython from python, see *Running IPython from Python*.

It is also possible to embed an IPython shell in a namespace in your Python code. This allows you to evaluate dynamically the state of your code, operate with your variables, analyze them, etc. For example, if you run the following code snippet:

```
import IPython

a = 42
IPython.embed()
```

and within the IPython shell, you reassign `a` to `23` to do further testing of some sort, you can then exit:

```
>>> IPython.embed()
Python 3.6.2 (default, Jul 17 2017, 16:44:45)
Type 'copyright', 'credits' or 'license' for more information
IPython 6.2.0.dev -- An enhanced Interactive Python. Type '?' for help.

In [1]: a = 23

In [2]: exit()
```

Once you exit and print `a`, the value 23 will be shown:

```
In: print(a)
23
```

It's important to note that the code run in the embedded IPython shell will *not* change the state of your code and variables, **unless** the shell is contained within the global namespace. In the above example, `a` is changed because this is true.

To further exemplify this, consider the following example:

```
import IPython
def do():
    a = 42
    print(a)
    IPython.embed()
    print(a)
```

Now if call the function and complete the state changes as we did above, the value `42` will be printed. Again, this is because it's not in the global namespace:

```
do()
```

Running a file with the above code can lead to the following session:

```
>>> do()
42
Python 3.6.2 (default, Jul 17 2017, 16:44:45)
Type 'copyright', 'credits' or 'license' for more information
IPython 6.2.0.dev -- An enhanced Interactive Python. Type '?' for help.

In [1]: a = 23

In [2]: exit()
42
```

Note: At present, embedding IPython cannot be done from inside IPython. Run the code samples below outside IPython.

This feature allows you to easily have a fully functional python environment for doing object introspection anywhere in your code with a simple function call. In some cases a simple print statement is enough, but if you need to do more detailed analysis of a code fragment this feature can be very valuable.

It can also be useful in scientific computing situations where it is common to need to do some automatic, computationally intensive part and then stop to look at data, plots, etc. Opening an IPython instance will give you full access to your data and functions, and you can resume program execution once you are done with the interactive part (perhaps to stop again later, as many times as needed).

The following code snippet is the bare minimum you need to include in your Python programs for this to work (detailed examples follow later):

```
from IPython import embed

embed() # this call anywhere in your program will start IPython
```

You can also embed an IPython *kernel*, for use with qtconsole, etc. via `IPython.embed_kernel()`. This should function work the same way, but you can connect an external frontend (`ipython qtconsole` or `ipython console`), rather than interacting with it in the terminal.

You can run embedded instances even in code which is itself being run at the IPython interactive prompt with '%run <filename>'. Since it's easy to get lost as to where you are (in your top-level IPython or in your embedded one), it's a good idea in such cases to set the in/out prompts to something different for the embedded instances. The code examples below illustrate this.

You can also have multiple IPython instances in your program and open them separately, for example with different options for data presentation. If you close and open the same instance multiple times, its prompt counters simply continue from each execution to the next.

Please look at the docstrings in the `embed` module for more details on the use of this system.

The following sample file illustrating how to use the embedding functionality is provided in the examples directory as embed_class_long.py. It should be fairly self-explanatory:

```
#!/usr/bin/env python
"""An example of how to embed an IPython shell into a running program.

Please see the documentation in the IPython.Shell module for more details.
```

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```
The accompanying file embed_class_short.py has quick code fragments for
embedding which you can cut and paste in your code once you understand how
things work.

The code in this file is deliberately extra-verbose, meant for learning."""

# The basics to get you going:

# IPython injects get_ipython into builtins, so you can know if you have nested
# copies running.

# Try running this code both at the command line and from inside IPython (with
# %run example-embed.py)

from IPython.terminal.prompts import Prompts, Token

class CustomPrompt(Prompts):

    def in_prompt_tokens(self, cli=None):

       return [
            (Token.Prompt, 'In <'),
            (Token.PromptNum, str(self.shell.execution_count)),
            (Token.Prompt, '>: '),
            ]

    def out_prompt_tokens(self):
       return [
            (Token.OutPrompt, 'Out<'),
            (Token.OutPromptNum, str(self.shell.execution_count)),
            (Token.OutPrompt, '>: '),
        ]


from traitlets.config.loader import Config
try:
    get_ipython
except NameError:
    nested = 0
    cfg = Config()
    cfg.TerminalInteractiveShell.prompts_class=CustomPrompt
else:
    print("Running nested copies of IPython.")
    print("The prompts for the nested copy have been modified")
    cfg = Config()
    nested = 1

# First import the embeddable shell class
from IPython.terminal.embed import InteractiveShellEmbed

# Now create an instance of the embeddable shell. The first argument is a
# string with options exactly as you would type them if you were starting
# IPython at the system command line. Any parameters you want to define for
# configuration can thus be specified here.
ipshell = InteractiveShellEmbed(config=cfg,
                       banner1 = 'Dropping into IPython',
```

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```
                       exit_msg = 'Leaving Interpreter, back to program.')

# Make a second instance, you can have as many as you want.
ipshell2 = InteractiveShellEmbed(config=cfg,
                        banner1 = 'Second IPython instance.')

print('\nHello. This is printed from the main controller program.\n')

# You can then call ipshell() anywhere you need it (with an optional
# message):
ipshell('***Called from top level. '
        'Hit Ctrl-D to exit interpreter and continue program.\n'
        'Note that if you use %kill_embedded, you can fully deactivate\n'
        'This embedded instance so it will never turn on again')

print('\nBack in caller program, moving along...\n')

#---------------------------------------------------------------------------
# More details:

# InteractiveShellEmbed instances don't print the standard system banner and
# messages. The IPython banner (which actually may contain initialization
# messages) is available as get_ipython().banner in case you want it.

# InteractiveShellEmbed instances print the following information everytime they
# start:

# - A global startup banner.

# - A call-specific header string, which you can use to indicate where in the
# execution flow the shell is starting.

# They also print an exit message every time they exit.

# Both the startup banner and the exit message default to None, and can be set
# either at the instance constructor or at any other time with the
# by setting the banner and exit_msg attributes.

# The shell instance can be also put in 'dummy' mode globally or on a per-call
# basis. This gives you fine control for debugging without having to change
# code all over the place.

# The code below illustrates all this.


# This is how the global banner and exit_msg can be reset at any point
ipshell.banner2 = 'Entering interpreter - New Banner'
ipshell.exit_msg = 'Leaving interpreter - New exit_msg'

def foo(m):
    s = 'spam'
    ipshell('***In foo(). Try %whos, or print s or m:')
    print('foo says m = ',m)

def bar(n):
    s = 'eggs'
    ipshell('***In bar(). Try %whos, or print s or n:')
```

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```
    print('bar says n = ',n)

# Some calls to the above functions which will trigger IPython:
print('Main program calling foo("eggs")\n')
foo('eggs')

# The shell can be put in 'dummy' mode where calls to it silently return. This
# allows you, for example, to globally turn off debugging for a program with a
# single call.
ipshell.dummy_mode = True
print('\nTrying to call IPython which is now "dummy":')
ipshell()
print('Nothing happened...')
# The global 'dummy' mode can still be overridden for a single call
print('\nOverriding dummy mode manually:')
ipshell(dummy=False)

# Reactivate the IPython shell
ipshell.dummy_mode = False

print('You can even have multiple embedded instances:')
ipshell2()

print('\nMain program calling bar("spam")\n')
bar('spam')

print('Main program finished. Bye!')
```

Once you understand how the system functions, you can use the following code fragments in your programs which are ready for cut and paste:

```
"""Quick code snippets for embedding IPython into other programs.

See embed_class_long.py for full details, this file has the bare minimum code for
cut and paste use once you understand how to use the system."""

#---------------------------------------------------------------------------
# This code loads IPython but modifies a few things if it detects it's running
# embedded in another IPython session (helps avoid confusion)

try:
    get_ipython
except NameError:
    banner=exit_msg=''
else:
    banner = '*** Nested interpreter ***'
    exit_msg = '*** Back in main IPython ***'

# First import the embed function
from IPython.terminal.embed import InteractiveShellEmbed
# Now create the IPython shell instance. Put ipshell() anywhere in your code
# where you want it to open.
ipshell = InteractiveShellEmbed(banner1=banner, exit_msg=exit_msg)

#---------------------------------------------------------------------------
# This code will load an embeddable IPython shell always with no changes for
```

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```
# nested embededings.

from IPython import embed
# Now embed() will open IPython anywhere in the code.

#------------------------------------------------------------------------------
# This code loads an embeddable shell only if NOT running inside
# IPython. Inside IPython, the embeddable shell variable ipshell is just a
# dummy function.

try:
    get_ipython
except NameError:
    from IPython.terminal.embed import InteractiveShellEmbed
    ipshell = InteractiveShellEmbed()
    # Now ipshell() will open IPython anywhere in the code
else:
    # Define a dummy ipshell() so the same code doesn't crash inside an
    # interactive IPython
    def ipshell(): pass
```

4.4.5 Using the Python debugger (pdb)

Running entire programs via pdb

pdb, the Python debugger, is a powerful interactive debugger which allows you to step through code, set breakpoints, watch variables, etc. IPython makes it very easy to start any script under the control of pdb, regardless of whether you have wrapped it into a 'main()' function or not. For this, simply type `%run -d myscript` at an IPython prompt. See the *%run* command's documentation for more details, including how to control where pdb will stop execution first.

For more information on the use of the pdb debugger, see Debugger Commands in the Python documentation.

IPython extends the debugger with a few useful additions, like coloring of tracebacks. The debugger will adopt the color scheme selected for IPython.

The `where` command has also been extended to take as argument the number of context line to show. This allows to a many line of context on shallow stack trace:

```
In [5]: def foo(x):
...:     1
...:     2
...:     3
...:     return 1/x+foo(x-1)
...:     5
...:     6
...:     7
...:

In[6]: foo(1)
# ...
ipdb> where 8
<ipython-input-6-9e45007b2b59>(1)<module>
----> 1 foo(1)
```

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```
<ipython-input-5-7baadc3d1465>(5)foo()
    1 def foo(x):
    2     1
    3     2
    4     3
----> 5     return 1/x+foo(x-1)
    6     5
    7     6
    8     7

> <ipython-input-5-7baadc3d1465>(5)foo()
    1 def foo(x):
    2     1
    3     2
    4     3
----> 5     return 1/x+foo(x-1)
    6     5
    7     6
    8     7
```

And less context on shallower Stack Trace:

```
ipdb> where 1
<ipython-input-13-afa180a57233>(1)<module>
----> 1 foo(7)

<ipython-input-5-7baadc3d1465>(5)foo()
----> 5     return 1/x+foo(x-1)

<ipython-input-5-7baadc3d1465>(5)foo()
----> 5     return 1/x+foo(x-1)

<ipython-input-5-7baadc3d1465>(5)foo()
----> 5     return 1/x+foo(x-1)

<ipython-input-5-7baadc3d1465>(5)foo()
----> 5     return 1/x+foo(x-1)
```

Post-mortem debugging

Going into a debugger when an exception occurs can be extremely useful in order to find the origin of subtle bugs, because pdb opens up at the point in your code which triggered the exception, and while your program is at this point 'dead', all the data is still available and you can walk up and down the stack frame and understand the origin of the problem.

You can use the *%debug* magic after an exception has occurred to start post-mortem debugging. IPython can also call debugger every time your code triggers an uncaught exception. This feature can be toggled with the *%pdb* magic command, or you can start IPython with the `--pdb` option.

For a post-mortem debugger in your programs outside IPython, put the following lines toward the top of your 'main' routine:

```
import sys
from IPython.core import ultratb
sys.excepthook = ultratb.FormattedTB(mode='Verbose',
color_scheme='Linux', call_pdb=1)
```

The mode keyword can be either 'Verbose' or 'Plain', giving either very detailed or normal tracebacks respectively. The color_scheme keyword can be one of 'NoColor', 'Linux' (default) or 'LightBG'. These are the same options which can be set in IPython with `--colors` and `--xmode`.

This will give any of your programs detailed, colored tracebacks with automatic invocation of pdb.

4.4.6 Pasting of code starting with Python or IPython prompts

IPython is smart enough to filter out input prompts, be they plain Python ones (`>>>` and `...`) or IPython ones (`In [N]:` and `...:`). You can therefore copy and paste from existing interactive sessions without worry.

The following is a 'screenshot' of how things work, copying an example from the standard Python tutorial:

```
In [1]: >>> # Fibonacci series:

In [2]: ... # the sum of two elements defines the next

In [3]: ... a, b = 0, 1

In [4]: >>> while b < 10:
   ...:     ...     print(b)
   ...:     ...     a, b = b, a+b
   ...:
1
1
2
3
5
8
```

And pasting from IPython sessions works equally well:

```
In [1]: In [5]: def f(x):
   ...:        ...:     "A simple function"
   ...:        ...:     return x**2
   ...:    ...:

In [2]: f(3)
Out[2]: 9
```

4.4.7 GUI event loop support

IPython has excellent support for working interactively with Graphical User Interface (GUI) toolkits, such as wxPython, PyQt4/PySide, PyGTK and Tk. This is implemented by running the toolkit's event loop while IPython is waiting for input.

For users, enabling GUI event loop integration is simple. You simple use the *%gui* magic as follows:

```
%gui [GUINAME]
```

With no arguments, `%gui` removes all GUI support. Valid `GUINAME` arguments include `wx`, `qt`, `qt5`, `gtk`, `gtk3` and `tk`.

Thus, to use wxPython interactively and create a running `wx.App` object, do:

```
%gui wx
```

You can also start IPython with an event loop set up using the `--gui` flag:

```
$ ipython --gui=qt
```

For information on IPython's matplotlib integration (and the `matplotlib` mode) see *this section*.

For developers that want to integrate additional event loops with IPython, see *Integrating with GUI event loops*.

When running inside IPython with an integrated event loop, a GUI application should *not* start its own event loop. This means that applications that are meant to be used both in IPython and as standalone apps need to have special code to detects how the application is being run. We highly recommend using IPython's support for this. Since the details vary slightly between toolkits, we point you to the various examples in our source directory `examples/IPython Kernel/gui/` that demonstrate these capabilities.

PyQt and PySide

When you use `--gui=qt` or `--matplotlib=qt`, IPython can work with either PyQt4 or PySide. There are three options for configuration here, because PyQt4 has two APIs for QString and QVariant: v1, which is the default on Python 2, and the more natural v2, which is the only API supported by PySide. v2 is also the default for PyQt4 on Python 3. IPython's code for the QtConsole uses v2, but you can still use any interface in your code, since the Qt frontend is in a different process.

The default will be to import PyQt4 without configuration of the APIs, thus matching what most applications would expect. It will fall back to PySide if PyQt4 is unavailable.

If specified, IPython will respect the environment variable `QT_API` used by ETS. ETS 4.0 also works with both PyQt4 and PySide, but it requires PyQt4 to use its v2 API. So if `QT_API=pyside` PySide will be used, and if `QT_API=pyqt` then PyQt4 will be used *with the v2 API* for QString and QVariant, so ETS codes like MayaVi will also work with IPython.

If you launch IPython in matplotlib mode with `ipython --matplotlib=qt`, then IPython will ask matplotlib which Qt library to use (only if QT_API is *not set*), via the 'backend.qt4' rcParam. If matplotlib is version 1.0.1 or older, then IPython will always use PyQt4 without setting the v2 APIs, since neither v2 PyQt nor PySide work.

Warning: Note that this means for ETS 4 to work with PyQt4, `QT_API` *must* be set to work with IPython's qt integration, because otherwise PyQt4 will be loaded in an incompatible mode.

It also means that you must *not* have `QT_API` set if you want to use `--gui=qt` with code that requires PyQt4 API v1.

4.4.8 Plotting with matplotlib

matplotlib provides high quality 2D and 3D plotting for Python. matplotlib can produce plots on screen using a variety of GUI toolkits, including Tk, PyGTK, PyQt4 and wxPython. It also provides a number of commands useful for scientific computing, all with a syntax compatible with that of the popular Matlab program.

To start IPython with matplotlib support, use the `--matplotlib` switch. If IPython is already running, you can run the *`%matplotlib`* magic. If no arguments are given, IPython will automatically detect your choice of matplotlib backend. You can also request a specific backend with `%matplotlib backend`, where `backend` must be one of: 'tk', 'qt', 'wx', 'gtk', 'osx'. In the web notebook and Qt console, 'inline' is also a valid backend value, which produces static figures inlined inside the application window instead of matplotlib's interactive figures that live in separate windows.

4.4.9 Interactive demos with IPython

IPython ships with a basic system for running scripts interactively in sections, useful when presenting code to audiences. A few tags embedded in comments (so that the script remains valid Python code) divide a file into separate blocks, and the demo can be run one block at a time, with IPython printing (with syntax highlighting) the block before executing it, and returning to the interactive prompt after each block. The interactive namespace is updated after each block is run with the contents of the demo's namespace.

This allows you to show a piece of code, run it and then execute interactively commands based on the variables just created. Once you want to continue, you simply execute the next block of the demo. The following listing shows the markup necessary for dividing a script into sections for execution as a demo:

```
# -*- coding: utf-8 -*-
"""A simple interactive demo to illustrate the use of IPython's Demo class.

Any python script can be run as a demo, but that does little more than showing
it on-screen, syntax-highlighted in one shot.  If you add a little simple
markup, you can stop at specified intervals and return to the ipython prompt,
resuming execution later.

This is a unicode test, åäö
"""

print('Hello, welcome to an interactive IPython demo.')
print('Executing this block should require confirmation before proceeding,')
print('unless auto_all has been set to true in the demo object')

# The mark below defines a block boundary, which is a point where IPython will
# stop execution and return to the interactive prompt.
# <demo> --- stop ---

x = 1
y = 2

# <demo> --- stop ---

# the mark below makes this block as silent
# <demo> silent

print('This is a silent block, which gets executed but not printed.')

# <demo> --- stop ---
# <demo> auto
print('This is an automatic block.')
print('It is executed without asking for confirmation, but printed.')
z = x+y

print('z=',x)

# <demo> --- stop ---
# This is just another normal block.
print('z is now:', z)

print('bye!')
```

In order to run a file as a demo, you must first make a Demo object out of it. If the file is named myscript.py, the following code will make a demo:

```
from IPython.lib.demo import Demo

mydemo = Demo('myscript.py')
```

This creates the mydemo object, whose blocks you run one at a time by simply calling the object with no arguments. Then call it to run each step of the demo:

```
mydemo()
```

Demo objects can be restarted, you can move forward or back skipping blocks, re-execute the last block, etc. See the *IPython.lib.demo* module and the *Demo* class for details.

Limitations: These demos are limited to fairly simple uses. In particular, you cannot break up sections within indented code (loops, if statements, function definitions, etc.) Supporting something like this would basically require tracking the internal execution state of the Python interpreter, so only top-level divisions are allowed. If you want to be able to open an IPython instance at an arbitrary point in a program, you can use IPython's *embedding facilities*.

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

4.5 IPython as a system shell

4.5.1 Overview

It is possible to adapt IPython for system shell usage. In the past, IPython shipped a special 'sh' profile for this purpose, but it had been quarantined since 0.11 release, and in 1.0 it was removed altogether. Nevertheless, much of this section relies on machinery which does not require a custom profile.

You can set up your own 'sh' *profile* to be different from the default profile such that:

- Prompt shows the current directory (see *Prompt customization*)
- Make system commands directly available (in alias table) by running the `%rehashx` magic. If you install new programs along your PATH, you might want to run `%rehashx` to update the alias table
- turn `%autocall` to full mode

4.5.2 Environment variables

Rather than manipulating os.environ directly, you may like to use the magic `%env` command. With no arguments, this displays all environment variables and values. To get the value of a specific variable, use `%env var`. To set the value of a specific variable, use `%env foo bar`, `%env foo=bar`. By default values are considered to be strings so quoting them is unnecessary. However, Python variables are expanded as usual in the magic command, so `%env foo=$bar` means "set the environment variable foo to the value of the Python variable `bar`".

4.5.3 Aliases

Once you run `%rehashx`, all of your $PATH has been loaded as IPython aliases, so you should be able to type any normal system command and have it executed. See `%alias?` and `%unalias?` for details on the alias facilities. See also `%rehashx?` for details on the mechanism used to load $PATH.

4.5.4 Directory management

Since each command passed by IPython to the underlying system is executed in a subshell which exits immediately, you can NOT use !cd to navigate the filesystem.

IPython provides its own builtin `%cd` magic command to move in the filesystem (the % is not required with automagic on). It also maintains a list of visited directories (use `%dhist` to see it) and allows direct switching to any of them. Type `cd?` for more details.

`%pushd`, `%popd` and `%dirs` are provided for directory stack handling.

4.5.5 Prompt customization

See *Custom Prompts*.

4.5.6 String lists

String lists (IPython.utils.text.SList) are handy way to process output from system commands. They are produced by `var = !cmd` syntax.

First, we acquire the output of 'ls -l':

```
[Q:doc/examples]|2> lines = !ls -l
 ==
['total 23',
 '-rw-rw-rw- 1 ville None 1163 Sep 30  2006 example-demo.py',
 '-rw-rw-rw- 1 ville None 1927 Sep 30  2006 example-embed-short.py',
 '-rwxrwxrwx 1 ville None 4606 Sep  1 17:15 example-embed.py',
 '-rwxrwxrwx 1 ville None 1017 Sep 30  2006 example-gnuplot.py',
 '-rwxrwxrwx 1 ville None  339 Jun 11 18:01 extension.py',
 '-rwxrwxrwx 1 ville None  113 Dec 20  2006 seteditor.py',
 '-rwxrwxrwx 1 ville None  245 Dec 12  2006 seteditor.pyc']
```

Now, let's take a look at the contents of 'lines' (the first number is the list element number):

```
[Q:doc/examples]|3> lines
                <3> SList (.p, .n, .l, .s, .grep(), .fields() available). Value:

0: total 23
1: -rw-rw-rw- 1 ville None 1163 Sep 30  2006 example-demo.py
2: -rw-rw-rw- 1 ville None 1927 Sep 30  2006 example-embed-short.py
3: -rwxrwxrwx 1 ville None 4606 Sep  1 17:15 example-embed.py
4: -rwxrwxrwx 1 ville None 1017 Sep 30  2006 example-gnuplot.py
5: -rwxrwxrwx 1 ville None  339 Jun 11 18:01 extension.py
6: -rwxrwxrwx 1 ville None  113 Dec 20  2006 seteditor.py
7: -rwxrwxrwx 1 ville None  245 Dec 12  2006 seteditor.pyc
```

Now, let's filter out the 'embed' lines:

```
[Q:doc/examples]|4> l2 = lines.grep('embed',prune=1)
[Q:doc/examples]|5> l2
                <5> SList (.p, .n, .l, .s, .grep(), .fields() available). Value:

0: total 23
1: -rw-rw-rw- 1 ville None 1163 Sep 30  2006 example-demo.py
2: -rwxrwxrwx 1 ville None 1017 Sep 30  2006 example-gnuplot.py
3: -rwxrwxrwx 1 ville None  339 Jun 11 18:01 extension.py
4: -rwxrwxrwx 1 ville None  113 Dec 20  2006 seteditor.py
5: -rwxrwxrwx 1 ville None  245 Dec 12  2006 seteditor.pyc
```

Now, we want strings having just file names and permissions:

```
[Q:doc/examples]|6> l2.fields(8,0)
                <6> SList (.p, .n, .l, .s, .grep(), .fields() available). Value:

0: total
1: example-demo.py -rw-rw-rw-
2: example-gnuplot.py -rwxrwxrwx
3: extension.py -rwxrwxrwx
4: seteditor.py -rwxrwxrwx
5: seteditor.pyc -rwxrwxrwx
```

Note how the line with 'total' does not raise IndexError.

If you want to split these (yielding lists), call fields() without arguments:

```
[Q:doc/examples]|7> _.fields()
                <7>
[['total'],
 ['example-demo.py', '-rw-rw-rw-'],
 ['example-gnuplot.py', '-rwxrwxrwx'],
 ['extension.py', '-rwxrwxrwx'],
 ['seteditor.py', '-rwxrwxrwx'],
 ['seteditor.pyc', '-rwxrwxrwx']]
```

If you want to pass these separated with spaces to a command (typical for lists if files), use the .s property:

```
[Q:doc/examples]|13> files = l2.fields(8).s
[Q:doc/examples]|14> files
                <14> 'example-demo.py example-gnuplot.py extension.py seteditor.py␣
↪seteditor.pyc'
[Q:doc/examples]|15> ls $files
example-demo.py  example-gnuplot.py  extension.py  seteditor.py  seteditor.pyc
```

SLists are inherited from normal Python lists, so every list method is available:

```
[Q:doc/examples]|21> lines.append('hey')
```

Real world example: remove all files outside version control

First, capture output of "hg status":

```
[Q:/ipython]|28> out = !hg status
 ==
['M IPython\\extensions\\ipy_kitcfg.py',
```

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```
 'M IPython\\extensions\\ipy_rehashdir.py',
...
 '? build\\lib\\IPython\\Debugger.py',
 '? build\\lib\\IPython\\extensions\\InterpreterExec.py',
 '? build\\lib\\IPython\\extensions\\InterpreterPasteInput.py',
...
```

(lines starting with ? are not under version control).

```
[Q:/ipython]|35> junk = out.grep(r'^\?').fields(1)
[Q:/ipython]|36> junk
            <36> SList (.p, .n, .l, .s, .grep(), .fields() availab
...
10: build\bdist.win32\winexe\temp\_ctypes.py
11: build\bdist.win32\winexe\temp\_hashlib.py
12: build\bdist.win32\winexe\temp\_socket.py
```

Now we can just remove these files by doing 'rm $junk.s'.

The .s, .n, .p properties

The `.s` property returns one string where lines are separated by single space (for convenient passing to system commands). The `.n` property return one string where the lines are separated by a newline (i.e. the original output of the function). If the items in string list are file names, `.p` can be used to get a list of "path" objects for convenient file manipulation.

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If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

4.6 Asynchronous in REPL: Autoawait

Note: This feature is experimental and behavior can change between python and IPython version without prior deprecation.

Starting with IPython 7.0, and when user Python 3.6 and above, IPython offer the ability to run asynchronous code from the REPL. Constructs which are `SyntaxError` s in the Python REPL can be used seamlessly in IPython.

The examples given here are for terminal IPython, running async code in a notebook interface or any other frontend using the Jupyter protocol needs IPykernel version 5.0 or above. The details of how async code runs in IPykernel will differ between IPython, IPykernel and their versions.

When a supported library is used, IPython will automatically allow Futures and Coroutines in the REPL to be await ed. This will happen if an await (or any other async constructs like async-with, async-for) is use at top level scope, or if any structure valid only in async def function context are present. For example, the following being a syntax error in the Python REPL:

```
Python 3.6.0
[GCC 4.2.1]
Type "help", "copyright", "credits" or "license" for more information.
>>> import aiohttp
>>> result = aiohttp.get('https://api.github.com')
>>> response = await result
  File "<stdin>", line 1
    response = await result
                          ^
SyntaxError: invalid syntax
```

Should behave as expected in the IPython REPL:

```
Python 3.6.0
Type 'copyright', 'credits' or 'license' for more information
IPython 7.0.0 -- An enhanced Interactive Python. Type '?' for help.

In [1]: import aiohttp
   ...: result = aiohttp.get('https://api.github.com')

In [2]: response = await result
<pause for a few 100s ms>

In [3]: await response.json()
Out[3]:
{'authorizations_url': 'https://api.github.com/authorizations',
 'code_search_url': 'https://api.github.com/search/code?q={query}...',
...
}
```

You can use the c.InteractiveShell.autoawait configuration option and set it to False to deactivate automatic wrapping of asynchronous code. You can also use the *%autoawait* magic to toggle the behavior at runtime:

```
In [1]: %autoawait False

In [2]: %autoawait
IPython autoawait is `Off`, and set to use `asyncio`
```

By default IPython will assume integration with Python's provided asyncio, but integration with other libraries is provided. In particular we provide experimental integration with the curio and trio library.

You can switch current integration by using the c.InteractiveShell.loop_runner option or the autoawait <name integration> magic.

For example:

```
In [1]: %autoawait trio

In [2]: import trio

In [3]: async def child(i):
   ...:     print("   child %s goes to sleep"%i)
```

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```
   ...:     await trio.sleep(2)
   ...:     print("   child %s wakes up"%i)

In [4]: print('parent start')
   ...: async with trio.open_nursery() as n:
   ...:     for i in range(5):
   ...:         n.spawn(child, i)
   ...: print('parent end')
parent start
   child 2 goes to sleep
   child 0 goes to sleep
   child 3 goes to sleep
   child 1 goes to sleep
   child 4 goes to sleep
   <about 2 seconds pause>
   child 2 wakes up
   child 1 wakes up
   child 0 wakes up
   child 3 wakes up
   child 4 wakes up
parent end
```

In the above example, `async with` at top level scope is a syntax error in Python.

Using this mode can have unexpected consequences if used in interaction with other features of IPython and various registered extensions. In particular if you are a direct or indirect user of the AST transformers, these may not apply to your code.

When using command line IPython, the default loop (or runner) does not process in the background, so top level asynchronous code must finish for the REPL to allow you to enter more code. As with usual Python semantic, the awaitables are started only when awaited for the first time. That is to say, in first example, no network request is done between `In[1]` and `In[2]`.

4.6.1 Effects on IPython.embed()

IPython core being asynchronous, the use of `IPython.embed()` will now require a loop to run. By default IPython will use a fake coroutine runner which should allow `IPython.embed()` to be nested. Though this will prevent usage of the *`%autoawait`* feature when using IPython embed.

You can set explicitly a coroutine runner for `embed()` if you desire to run asynchronous code, the exact behavior is though undefined.

4.6.2 Effects on Magics

A couple of magics (`%%timeit`, `%timeit`, `%%time`, `%%prun`) have not yet been updated to work with asynchronous code and will raise syntax errors when trying to use top-level `await`. We welcome any contribution to help fix those, and extra cases we haven't caught yet. We hope for better support in Cor Python for top-level Async code.

4.6.3 Internals

As running asynchronous code is not supported in interactive REPL (as of Python 3.7) we have to rely to a number of complex workaround and heuristic to allow this to happen. It is interesting to understand how this works in order to comprehend potential bugs, or provide a custom runner.

Among the many approaches that are at our disposition, we find only one that suited out need. Under the hood we use the code object from a async-def function and run it in global namespace after modifying it to not create a new `locals()` scope:

```
async def inner_async():
    locals().update(**global_namespace)
    #
    # here is user code
    #
    return last_user_statement
codeobj = modify(inner_async.__code__)
coroutine = eval(codeobj, user_ns)
display(loop_runner(coroutine))
```

The first thing you'll notice is that unlike classical `exec`, there is only one namespace. Second, user code runs in a function scope, and not a module scope.

On top of the above there are significant modification to the AST of `function`, and `loop_runner` can be arbitrary complex. So there is a significant overhead to this kind of code.

By default the generated coroutine function will be consumed by Asyncio's `loop_runner = asyncio.get_evenloop().run_until_complete()` method if `async` mode is deemed necessary, otherwise the coroutine will just be exhausted in a simple runner. It is though possible to change the default runner.

A loop runner is a *synchronous* function responsible from running a coroutine object.

The runner is responsible from ensuring that `coroutine` run to completion, and should return the result of executing the coroutine. Let's write a runner for `trio` that print a message when used as an exercise, `trio` is special as it usually prefer to run a function object and make a coroutine by itself, we can get around this limitation by wrapping it in an async-def without parameters and passing this value to `trio`:

```
In [1]: import trio
   ...: from types import CoroutineType
   ...:
   ...: def trio_runner(coro:CoroutineType):
   ...:     print('running asynchronous code')
   ...:     async def corowrap(coro):
   ...:         return await coro
   ...:     return trio.run(corowrap, coro)
```

We can set it up by passing it to `%autoawait`:

```
In [2]: %autoawait trio_runner

In [3]: async def async_hello(name):
   ...:     await trio.sleep(1)
   ...:     print(f'Hello {name} world !')
   ...:     await trio.sleep(1)

In [4]: await async_hello('async')
running asynchronous code
Hello async world !
```

Asynchronous programming in python (and in particular in the REPL) is still a relatively young subject. We expect some code to not behave as you expect, so feel free to contribute improvements to this codebase and give us feedback.

We invite you to thoroughly test this feature and report any unexpected behavior as well as propose any improvement.

4.6.4 Using Autoawait in a notebook (IPykernel)

Update ipykernel to version 5.0 or greater:

```
pip install ipykernel ipython --upgrade
# or
conda install ipykernel ipython --upgrade
```

This should automatically enable `%autoawait` integration. Unlike terminal IPython, all code runs on `asyncio` eventloop, so creating a loop by hand will not work, including with magics like `%run` or other frameworks that create the eventloop themselves. In cases like these you can try to use projects like nest_asyncio and follow this discussion

4.6.5 Difference between terminal IPython and IPykernel

The exact asynchronous code running behavior varies between Terminal IPython and IPykernel. The root cause of this behavior is due to IPykernel having a *persistent* `asyncio` loop running, while Terminal IPython starts and stops a loop for each code block. This can lead to surprising behavior in some case if you are used to manipulate asyncio loop yourself, see for example #11303 for a longer discussion but here are some of the astonishing cases.

This behavior is an implementation detail, and should not be relied upon. It can change without warnings in future versions of IPython.

In terminal IPython a loop is started for each code blocks only if there is top level async code:

```
$ ipython
In [1]: import asyncio
   ...: asyncio.get_event_loop()
Out[1]: <_UnixSelectorEventLoop running=False closed=False debug=False>

In [2]:

In [2]: import asyncio
   ...: await asyncio.sleep(0)
   ...: asyncio.get_event_loop()
Out[2]: <_UnixSelectorEventLoop running=True closed=False debug=False>
```

See that `running` is `True` only in the case were we `await sleep()`

In a Notebook, with ipykernel the asyncio eventloop is always running:

```
$ jupyter notebook
In [1]: import asyncio
   ...: loop1 = asyncio.get_event_loop()
   ...: loop1
Out[1]: <_UnixSelectorEventLoop running=True closed=False debug=False>

In [2]: loop2 = asyncio.get_event_loop()
   ...: loop2
Out[2]: <_UnixSelectorEventLoop running=True closed=False debug=False>

In [3]: loop1 is loop2
Out[3]: True
```

In Terminal IPython background tasks are only processed while the foreground task is running, if and only if the foreground task is async:

```
$ ipython
In [1]: import asyncio
   ...:
   ...: async def repeat(msg, n):
   ...:     for i in range(n):
   ...:         print(f"{msg} {i}")
   ...:         await asyncio.sleep(1)
   ...:     return f"{msg} done"
   ...:
   ...: asyncio.ensure_future(repeat("background", 10))
Out[1]: <Task pending coro=<repeat() running at <ipython-input-1-02d0ef250fe7>:3>>

In [2]: await asyncio.sleep(3)
background 0
background 1
background 2
background 3

In [3]: import time
...: time.sleep(5)

In [4]: await asyncio.sleep(3)
background 4
background 5
background 6g
```

In a Notebook, QtConsole, or any other frontend using IPykernel, background tasks should behave as expected.

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4.7 IPython Tips & Tricks

The IPython cookbook details more things you can do with IPython.

4.7.1 Embed IPython in your programs

A few lines of code are enough to load a complete IPython inside your own programs, giving you the ability to work with your data interactively after automatic processing has been completed. See *the embedding section*.

4.7.2 Run doctests

Run your doctests from within IPython for development and debugging. The special %doctest_mode command toggles a mode where the prompt, output and exceptions display matches as closely as possible that of the default Python interpreter. In addition, this mode allows you to directly paste in code that contains leading '>>>' prompts, even if they have extra leading whitespace (as is common in doctest files). This combined with the `%history -t` call to see your translated history allows for an easy doctest workflow, where you can go from doctest to interactive execution to pasting into valid Python code as needed.

4.7.3 Use IPython to present interactive demos

Use the *`IPython.lib.demo.Demo`* class to load any Python script as an interactive demo. With a minimal amount of simple markup, you can control the execution of the script, stopping as needed. See *here* for more.

4.7.4 Suppress output

Put a ';' at the end of a line to suppress the printing of output. This is useful when doing calculations which generate long output you are not interested in seeing. It also keeps the object out of the output cache, so if you're working with large temporary objects, they'll be released from memory sooner.

4.7.5 Lightweight 'version control'

When you call `%edit` with no arguments, IPython opens an empty editor with a temporary file, and it returns the contents of your editing session as a string variable. Thanks to IPython's output caching mechanism, this is automatically stored:

```
In [1]: %edit

IPython will make a temporary file named: /tmp/ipython_edit_yR-HCN.py

Editing... done. Executing edited code...

hello - this is a temporary file

Out[1]: "print('hello - this is a temporary file')\n"
```

Now, if you call `%edit -p`, IPython tries to open an editor with the same data as the last time you used %edit. So if you haven't used %edit in the meantime, this same contents will reopen; however, it will be done in a new file. This means that if you make changes and you later want to find an old version, you can always retrieve it by using its output number, via '%edit _NN', where NN is the number of the output prompt.

Continuing with the example above, this should illustrate this idea:

```
In [2]: edit -p

IPython will make a temporary file named: /tmp/ipython_edit_nA09Qk.py

Editing... done. Executing edited code...

hello - now I made some changes

Out[2]: "print('hello - now I made some changes')\n"

```

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```
In [3]: edit _1

IPython will make a temporary file named: /tmp/ipython_edit_gy6-zD.py

Editing... done. Executing edited code...

hello - this is a temporary file

IPython version control at work :)

Out[3]: "print('hello - this is a temporary file')\nprint('IPython version control at␣
↪work :)')\n"
```

This section was written after a contribution by Alexander Belchenko on the IPython user list.

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4.8 Python vs IPython

This document is meant to highlight the main differences between the Python language and what are the specific construct you can do only in IPython.

Unless expressed otherwise all of the construct you will see here will raise a `SyntaxError` if run in a pure Python shell, or if executing in a Python script.

Each of these features are describe more in details in further part of the documentation.

4.8.1 Quick overview:

All the following construct are valid IPython syntax:

```
In [1]: ?
```

```
In [1]: ?object
```

```
In [1]: object?
```

```
In [1]: *pattern*?
```

```
In [1]: %shell like --syntax
In [1]: !ls
```

```
In [1]: my_files = !ls ~/
In [1]: for i,file in enumerate(my_file):
   ...:     raw = !echo $file
   ...:     !echo {files[0].upper()} $raw
```

```
In [1]: %%perl magic --function
   ...: @months = ("July", "August", "September");
   ...: print $months[0];
```

Each of these construct is compile by IPython into valid python code and will do most of the time what you expect it will do. Let see each of these example in more detail.

4.8.2 Accessing help

As IPython is mostly an interactive shell, the question mark is a simple shortcut to get help. A question mark alone will bring up the IPython help:

```
In [1]: ?

IPython -- An enhanced Interactive Python
=========================================

IPython offers a combination of convenient shell features, special commands
and a history mechanism for both input (command history) and output (results
caching, similar to Mathematica). It is intended to be a fully compatible
replacement for the standard Python interpreter, while offering vastly
improved functionality and flexibility.

At your system command line, type 'ipython -h' to see the command line
options available. This document only describes interactive features.

MAIN FEATURES
-------------
...
```

A single question mark before, or after an object available in current namespace will show help relative to this object:

```
In [6]: object?
Docstring: The most base type
Type:      type
```

A double question mark will try to pull out more information about the object, and if possible display the python source code of this object.

```
In[1]: import collections
In[2]: collections.Counter??

Init signature: collections.Counter(*args, **kwds)
Source:
class Counter(dict):
    '''Dict subclass for counting hashable items.  Sometimes called a bag
    or multiset.  Elements are stored as dictionary keys and their counts
    are stored as dictionary values.
```

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```
    >>> c = Counter('abcdeabcdabcaba')  # count elements from a string

    >>> c.most_common(3)                # three most common elements
    [('a', 5), ('b', 4), ('c', 3)]
    >>> sorted(c)                       # list all unique elements
    ['a', 'b', 'c', 'd', 'e']
    >>> ''.join(sorted(c.elements()))   # list elements with repetitions
    'aaaaabbbbcccdde'
    ...
```

If you are looking for an object, the use of wildcards `*` in conjunction with question mark will allow you to search current namespace for object with matching names:

```
In [24]: *int*?
FloatingPointError
int
print
```

4.8.3 Shell Assignment

When doing interactive computing it is common to need to access the underlying shell. This is doable through the use of the exclamation mark `!` (or bang).

This allow to execute simple command when present in beginning of line:

```
In[1]: !pwd
/User/home/
```

Change directory:

```
In[1]: !cd /var/etc
```

Or edit file:

```
In[1]: !mvim myfile.txt
```

The line after the bang can call any program installed in the underlying shell, and support variable expansion in the form of `$variable` or `{variable}`. The later form of expansion supports arbitrary python expression:

```
In[1]: file = 'myfile.txt'

In[2]: !mv $file {file.upper()}
```

The bang can also be present in the right hand side of an assignment, just after the equal sign, or separated from it by a white space. In which case the standard output of the command after the bang `!` will be split out into lines in a list-like object and assign to the left hand side.

This allow you for example to put the list of files of the current working directory in a variable:

```
In[1]: my_files = !ls
```

You can combine the different possibilities in for loops, condition, functions. . . :

```
my_files = !ls ~/
b = "backup file"
for i,file in enumerate(my_file):
    raw = !echo $backup $file
    !cp $file {file.split('.')[0]+'.bak'}
```

Magics

Magics function are often present in the form of shell-like syntax, but are under the hood python function. The syntax and assignment possibility are similar to the one with the bang (`!`) syntax, but with more flexibility and power. Magic function start with a percent sign (`%`) or double percent (`%%`).

A magic call with a sign percent will act only one line:

```
In[1]: %xmode
Exception reporting mode: Verbose
```

And support assignment:

```
In [1]: results = %timeit -r1 -n1 -o list(range(1000))
1 loops, best of 1: 21.1 µs per loop

In [2]: results
Out[2]: <TimeitResult : 1 loops, best of 1: 21.1 µs per loop>
```

Magic with two percent sign can spread over multiple lines, but do not support assignment:

```
In[1]: %%bash
...   : echo "My shell is:" $SHELL
...   : echo "My disk usage is:"
...   : df -h
My shell is: /usr/local/bin/bash
My disk usage is:
Filesystem      Size   Used  Avail Capacity  iused   ifree %iused  Mounted on
/dev/disk1     233Gi  216Gi   16Gi    94% 56788108 4190706   93%   /
devfs          190Ki  190Ki    0Bi   100%      656       0  100%   /dev
map -hosts       0Bi    0Bi    0Bi   100%        0       0  100%   /net
map auto_home    0Bi    0Bi    0Bi   100%        0       0  100%   /hom
```

Combining it all

```
find a snippet that combine all that into one thing!
```

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4.9 Built-in magic commands

Note: To Jupyter users: Magics are specific to and provided by the IPython kernel. Whether Magics are available on a kernel is a decision that is made by the kernel developer on a per-kernel basis. To work properly, Magics must use a syntax element which is not valid in the underlying language. For example, the IPython kernel uses the `%` syntax element for Magics as `%` is not a valid unary operator in Python. However, `%` might have meaning in other languages.

Here is the help auto-generated from the docstrings of all the available Magics function that IPython ships with.

You can create an register your own Magics with IPython. You can find many user defined Magics on PyPI. Feel free to publish your own and use the `Framework :: IPython` trove classifier.

4.9.1 Line magics

%alias

Define an alias for a system command.

'%alias alias_name cmd' defines 'alias_name' as an alias for 'cmd'

Then, typing 'alias_name params' will execute the system command 'cmd params' (from your underlying operating system).

Aliases have lower precedence than magic functions and Python normal variables, so if 'foo' is both a Python variable and an alias, the alias can not be executed until 'del foo' removes the Python variable.

You can use the %l specifier in an alias definition to represent the whole line when the alias is called. For example:

```
In [2]: alias bracket echo "Input in brackets: <%l>"
In [3]: bracket hello world
Input in brackets: <hello world>
```

You can also define aliases with parameters using %s specifiers (one per parameter):

```
In [1]: alias parts echo first %s second %s
In [2]: %parts A B
first A second B
In [3]: %parts A
Incorrect number of arguments: 2 expected.
parts is an alias to: 'echo first %s second %s'
```

Note that %l and %s are mutually exclusive. You can only use one or the other in your aliases.

Aliases expand Python variables just like system calls using ! or !! do: all expressions prefixed with '$' get expanded. For details of the semantic rules, see PEP-215: http://www.python.org/peps/pep-0215.html. This is the library used by IPython for variable expansion. If you want to access a true shell variable, an extra $ is necessary to prevent its expansion by IPython:

```
In [6]: alias show echo
In [7]: PATH='A Python string'
In [8]: show $PATH
A Python string
In [9]: show $$PATH
/usr/local/lf9560/bin:/usr/local/intel/compiler70/ia32/bin:...
```

You can use the alias facility to access all of $PATH. See the %rehashx function, which automatically creates aliases for the contents of your $PATH.

If called with no parameters, %alias prints the current alias table for your system. For posix systems, the default aliases are 'cat', 'cp', 'mv', 'rm', 'rmdir', and 'mkdir', and other platform-specific aliases are added. For windows-based systems, the default aliases are 'copy', 'ddir', 'echo', 'ls', 'ldir', 'mkdir', 'ren', and 'rmdir'.

You can see the definition of alias by adding a question mark in the end:

```
In [1]: cat?
Repr: <alias cat for 'cat'>
```

%alias_magic

```
%alias_magic [-l] [-c] [-p PARAMS] name target
```

Create an alias for an existing line or cell magic.

Examples

```
In [1]: %alias_magic t timeit
Created `%t` as an alias for `%timeit`.
Created `%%t` as an alias for `%%timeit`.

In [2]: %t -n1 pass
1 loops, best of 3: 954 ns per loop

In [3]: %%t -n1
   ...: pass
   ...:
1 loops, best of 3: 954 ns per loop

In [4]: %alias_magic --cell whereami pwd
UsageError: Cell magic function `%%pwd` not found.
In [5]: %alias_magic --line whereami pwd
Created `%whereami` as an alias for `%pwd`.

In [6]: %whereami
Out[6]: u'/home/testuser'

In [7]: %alias_magic h history -p "-l 30" --line
Created `%h` as an alias for `%history -l 30`.
```

positional arguments: name Name of the magic to be created. target Name of the existing line or cell magic.

optional arguments:

-l, --line	Create a line magic alias.
-c, --cell	Create a cell magic alias.
-p PARAMS, --params PARAMS	Parameters passed to the magic function.

%autoawait

Allow to change the status of the autoawait option.

This allow you to set a specific asynchronous code runner.

If no value is passed, print the currently used asynchronous integration and whether it is activated.

It can take a number of value evaluated in the following order:

- False/false/off deactivate autoawait integration
- True/true/on activate autoawait integration using configured default loop
- asyncio/curio/trio activate autoawait integration and use integration with said library.
- `sync` turn on the pseudo-sync integration (mostly used for `IPython.embed()` which does not run IPython with a real eventloop and deactivate running asynchronous code. Turning on Asynchronous code with the pseudo sync loop is undefined behavior and may lead IPython to crash.

If the passed parameter does not match any of the above and is a python identifier, get said object from user namespace and set it as the runner, and activate autoawait.

If the object is a fully qualified object name, attempt to import it and set it as the runner, and activate autoawait.

The exact behavior of autoawait is experimental and subject to change across version of IPython and Python.

%autocall

Make functions callable without having to type parentheses.

Usage:

%autocall [mode]

The mode can be one of: 0->Off, 1->Smart, 2->Full. If not given, the value is toggled on and off (remembering the previous state).

In more detail, these values mean:

0 -> fully disabled

1 -> active, but do not apply if there are no arguments on the line.

In this mode, you get:

```
In [1]: callable
Out[1]: <built-in function callable>

In [2]: callable 'hello'
------> callable('hello')
Out[2]: False
```

2 -> Active always. Even if no arguments are present, the callable object is called:

```
In [2]: float
------> float()
Out[2]: 0.0
```

Note that even with autocall off, you can still use '/' at the start of a line to treat the first argument on the command line as a function and add parentheses to it:

```
In [8]: /str 43
------> str(43)
Out[8]: '43'
```

# all-random (note for auto-testing)

%automagic

Make magic functions callable without having to type the initial %.

Without arguments toggles on/off (when off, you must call it as %automagic, of course). With arguments it sets the value, and you can use any of (case insensitive):

- on, 1, True: to activate
- off, 0, False: to deactivate.

Note that magic functions have lowest priority, so if there's a variable whose name collides with that of a magic fn, automagic won't work for that function (you get the variable instead). However, if you delete the variable (del var), the previously shadowed magic function becomes visible to automagic again.

%bookmark

Manage IPython's bookmark system.

%bookmark <name> - set bookmark to current dir %bookmark <name> <dir> - set bookmark to <dir> %bookmark -l - list all bookmarks %bookmark -d <name> - remove bookmark %bookmark -r - remove all bookmarks

You can later on access a bookmarked folder with:

```
%cd -b <name>
```

or simply '%cd <name>' if there is no directory called <name> AND there is such a bookmark defined.

Your bookmarks persist through IPython sessions, but they are associated with each profile.

%cd

Change the current working directory.

This command automatically maintains an internal list of directories you visit during your IPython session, in the variable _dh. The command %dhist shows this history nicely formatted. You can also do 'cd -<tab>' to see directory history conveniently.

Usage:

cd 'dir': changes to directory 'dir'.

cd -: changes to the last visited directory.

cd -<n>: changes to the n-th directory in the directory history.

cd –foo: change to directory that matches 'foo' in history

cd -b <bookmark_name>: jump to a bookmark set by %bookmark

(note: cd <bookmark_name> is enough if there is no directory <bookmark_name>, but a bookmark with the name exists.) 'cd -b <tab>' allows you to tab-complete bookmark names.

Options:

-q: quiet. Do not print the working directory after the cd command is executed. By default IPython's cd command does print this directory, since the default prompts do not display path information.

Note that !cd doesn't work for this purpose because the shell where !command runs is immediately discarded after executing 'command'.

Examples

```
In [10]: cd parent/child
/home/tsuser/parent/child
```

%colors

Switch color scheme for prompts, info system and exception handlers.

Currently implemented schemes: NoColor, Linux, LightBG.

Color scheme names are not case-sensitive.

Examples

To get a plain black and white terminal:

```
%colors nocolor
```

%config

configure IPython

%config Class[.trait=value]

This magic exposes most of the IPython config system. Any Configurable class should be able to be configured with the simple line:

```
%config Class.trait=value
```

Where `value` will be resolved in the user's namespace, if it is an expression or variable name.

Examples

To see what classes are available for config, pass no arguments:

```
In [1]: %config
Available objects for config:
    TerminalInteractiveShell
    HistoryManager
    PrefilterManager
    AliasManager
    IPCompleter
    DisplayFormatter
```

To view what is configurable on a given class, just pass the class name:

```
In [2]: %config IPCompleter
IPCompleter options

IPCompleter.omit__names=<Enum>
    Current: 2
    Choices: (0, 1, 2)
    Instruct the completer to omit private method names
    Specifically, when completing on ``object.<tab>``.
    When 2 [default]: all names that start with '_' will be excluded.
    When 1: all 'magic' names (``__foo__``) will be excluded.
    When 0: nothing will be excluded.
IPCompleter.merge_completions=<CBool>
    Current: True
    Whether to merge completion results into a single list
    If False, only the completion results from the first non-empty
    completer will be returned.
IPCompleter.limit_to__all__=<CBool>
    Current: False
    Instruct the completer to use __all__ for the completion
    Specifically, when completing on ``object.<tab>``.
    When True: only those names in obj.__all__ will be included.
    When False [default]: the __all__ attribute is ignored
IPCompleter.greedy=<CBool>
    Current: False
    Activate greedy completion
    This will enable completion on elements of lists, results of
    function calls, etc., but can be unsafe because the code is
    actually evaluated on TAB.
```

but the real use is in setting values:

```
In [3]: %config IPCompleter.greedy = True
```

and these values are read from the user_ns if they are variables:

```
In [4]: feeling_greedy=False

In [5]: %config IPCompleter.greedy = feeling_greedy
```

%debug

```
%debug [--breakpoint FILE:LINE] [statement [statement ...]]
```

Activate the interactive debugger.

This magic command support two ways of activating debugger. One is to activate debugger before executing code. This way, you can set a break point, to step through the code from the point. You can use this mode by giving statements to execute and optionally a breakpoint.

The other one is to activate debugger in post-mortem mode. You can activate this mode simply running %debug without any argument. If an exception has just occurred, this lets you inspect its stack frames interactively. Note that this will always work only on the last traceback that occurred, so you must call this quickly after an exception that you wish to inspect has fired, because if another one occurs, it clobbers the previous one.

If you want IPython to automatically do this on every exception, see the %pdb magic for more details.

positional arguments:

statement Code to run in debugger. You can omit this in cell magic mode.

optional arguments:

--breakpoint <FILE:LINE>, -b <FILE:LINE> Set break point at LINE in FILE.

%dhist

Print your history of visited directories.

%dhist -> print full history%dhist n -> print last n entries only%dhist n1 n2 -> print entries between n1 and n2 (n2 not included)

This history is automatically maintained by the %cd command, and always available as the global list variable _dh. You can use %cd -<n> to go to directory number <n>.

Note that most of time, you should view directory history by entering cd -<TAB>.

%dirs

Return the current directory stack.

%doctest_mode

Toggle doctest mode on and off.

This mode is intended to make IPython behave as much as possible like a plain Python shell, from the perspective of how its prompts, exceptions and output look. This makes it easy to copy and paste parts of a session into doctests. It does so by:

- Changing the prompts to the classic >>> ones.
- Changing the exception reporting mode to 'Plain'.
- Disabling pretty-printing of output.

Note that IPython also supports the pasting of code snippets that have leading '>>>' and '...' prompts in them. This means that you can paste doctests from files or docstrings (even if they have leading whitespace), and the code will execute correctly. You can then use '%history -t' to see the translated history; this will give you the input after removal of all the leading prompts and whitespace, which can be pasted back into an editor.

With these features, you can switch into this mode easily whenever you need to do testing and changes to doctests, without having to leave your existing IPython session.

`%edit`

Bring up an editor and execute the resulting code.

Usage: %edit [options] [args]

%edit runs IPython's editor hook. The default version of this hook is set to call the editor specified by your $EDITOR environment variable. If this isn't found, it will default to vi under Linux/Unix and to notepad under Windows. See the end of this docstring for how to change the editor hook.

You can also set the value of this editor via the `TerminalInteractiveShell.editor` option in your configuration file. This is useful if you wish to use a different editor from your typical default with IPython (and for Windows users who typically don't set environment variables).

This command allows you to conveniently edit multi-line code right in your IPython session.

If called without arguments, %edit opens up an empty editor with a temporary file and will execute the contents of this file when you close it (don't forget to save it!).

Options:

-n <number>: open the editor at a specified line number. By default, the IPython editor hook uses the unix syntax 'editor +N filename', but you can configure this by providing your own modified hook if your favorite editor supports line-number specifications with a different syntax.

-p: this will call the editor with the same data as the previous time it was used, regardless of how long ago (in your current session) it was.

-r: use 'raw' input. This option only applies to input taken from the user's history. By default, the 'processed' history is used, so that magics are loaded in their transformed version to valid Python. If this option is given, the raw input as typed as the command line is used instead. When you exit the editor, it will be executed by IPython's own processor.

-x: do not execute the edited code immediately upon exit. This is mainly useful if you are editing programs which need to be called with command line arguments, which you can then do using %run.

Arguments:

If arguments are given, the following possibilities exist:

- If the argument is a filename, IPython will load that into the editor. It will execute its contents with execfile() when you exit, loading any code in the file into your interactive namespace.
- The arguments are ranges of input history, e.g. "7 ~1/4-6". The syntax is the same as in the %history magic.
- If the argument is a string variable, its contents are loaded into the editor. You can thus edit any string which contains python code (including the result of previous edits).
- If the argument is the name of an object (other than a string), IPython will try to locate the file where it was defined and open the editor at the point where it is defined. You can use `%edit function` to load an editor exactly at the point where 'function' is defined, edit it and have the file be executed automatically.
- If the object is a macro (see %macro for details), this opens up your specified editor with a temporary file containing the macro's data. Upon exit, the macro is reloaded with the contents of the file.

Note: opening at an exact line is only supported under Unix, and some editors (like kedit and gedit up to Gnome 2.8) do not understand the '+NUMBER' parameter necessary for this feature. Good editors like (X)Emacs, vi, jed, pico and joe all do.

After executing your code, %edit will return as output the code you typed in the editor (except when it was an existing file). This way you can reload the code in further invocations of %edit as a variable, via _<NUMBER> or Out[<NUMBER>], where <NUMBER> is the prompt number of the output.

Note that %edit is also available through the alias %ed.

This is an example of creating a simple function inside the editor and then modifying it. First, start up the editor:

```
In [1]: edit
Editing... done. Executing edited code...
Out[1]: 'def foo():\n    print "foo() was defined in an editing
session"\n'
```

We can then call the function foo():

```
In [2]: foo()
foo() was defined in an editing session
```

Now we edit foo. IPython automatically loads the editor with the (temporary) file where foo() was previously defined:

```
In [3]: edit foo
Editing... done. Executing edited code...
```

And if we call foo() again we get the modified version:

```
In [4]: foo()
foo() has now been changed!
```

Here is an example of how to edit a code snippet successive times. First we call the editor:

```
In [5]: edit
Editing... done. Executing edited code...
hello
Out[5]: "print 'hello'\n"
```

Now we call it again with the previous output (stored in _):

```
In [6]: edit _
Editing... done. Executing edited code...
hello world
Out[6]: "print 'hello world'\n"
```

Now we call it with the output #8 (stored in _8, also as Out[8]):

```
In [7]: edit _8
Editing... done. Executing edited code...
hello again
Out[7]: "print 'hello again'\n"
```

Changing the default editor hook:

If you wish to write your own editor hook, you can put it in a configuration file which you load at startup time. The default hook is defined in the IPython.core.hooks module, and you can use that as a starting example for further modifications. That file also has general instructions on how to set a new hook for use once you've defined it.

%env

Get, set, or list environment variables.

Usage:

%env: lists all environment variables/values %env var: get value for var %env var val: set value for var %env var=val: set value for var %env var=$val: set value for var, using python expansion if possible

%gui

Enable or disable IPython GUI event loop integration.

%gui [GUINAME]

This magic replaces IPython's threaded shells that were activated using the (pylab/wthread/etc.) command line flags. GUI toolkits can now be enabled at runtime and keyboard interrupts should work without any problems. The following toolkits are supported: wxPython, PyQt4, PyGTK, Tk and Cocoa (OSX):

```
%gui wx      # enable wxPython event loop integration
%gui qt4|qt  # enable PyQt4 event loop integration
%gui qt5     # enable PyQt5 event loop integration
%gui gtk     # enable PyGTK event loop integration
%gui gtk3    # enable Gtk3 event loop integration
%gui tk      # enable Tk event loop integration
%gui osx     # enable Cocoa event loop integration
             # (requires %matplotlib 1.1)
%gui         # disable all event loop integration
```

WARNING: after any of these has been called you can simply create an application object, but DO NOT start the event loop yourself, as we have already handled that.

%history

```
%history [-n] [-o] [-p] [-t] [-f FILENAME] [-g [PATTERN [PATTERN ...]]]
             [-l [LIMIT]] [-u]
             [range [range ...]]
```

Print input history (_i<n> variables), with most recent last.

By default, input history is printed without line numbers so it can be directly pasted into an editor. Use -n to show them.

By default, all input history from the current session is displayed. Ranges of history can be indicated using the syntax:

`4` Line 4, current session

`4-6` Lines 4-6, current session

`243/1-5` Lines 1-5, session 243

`~2/7` Line 7, session 2 before current

`~8/1-~6/5` From the first line of 8 sessions ago, to the fifth line of 6 sessions ago.

Multiple ranges can be entered, separated by spaces

The same syntax is used by %macro, %save, %edit, %rerun

Examples

```
In [6]: %history -n 4-6
4:a = 12
5:print a**2
6:%history -n 4-6
```

positional arguments: range

optional arguments:

-n	print line numbers for each input. This feature is only available if numbered prompts are in use.
-o	also print outputs for each input.
-p	print classic '>>>' python prompts before each input. This is useful for making documentation, and in conjunction with -o, for producing doctest-ready output.
-t	print the 'translated' history, as IPython understands it. IPython filters your input and converts it all into valid Python source before executing it (things like magics or aliases are turned into function calls, for example). With this option, you'll see the native history instead of the user-entered version: '%cd /' will be seen as 'get_ipython().run_line_magic("cd", "/")' instead of '%cd /'.
-f FILENAME	FILENAME: instead of printing the output to the screen, redirect it to the given file. The file is always overwritten, though *when it can*, IPython asks for confirmation first. In particular, running the command 'history -f FILENAME' from the IPython Notebook interface will replace FILENAME even if it already exists *without* confirmation.
-g <[PATTERN [PATTERN ...]]>	treat the arg as a glob pattern to search for in (full) history. This includes the saved history (almost all commands ever written). The pattern may contain '?' to match one unknown character and '*' to match any number of unknown characters. Use '%hist -g' to show full saved history (may be very long).
-l <[LIMIT]>	get the last n lines from all sessions. Specify n as a single arg, or the default is the last 10 lines.
-u	when searching history using `-g`, show only unique history.

`%killbgscripts`

Kill all BG processes started by %%script and its family.

`%load`

Load code into the current frontend.

Usage: %load [options] source

where source can be a filename, URL, input history range, macro, or element in the user namespace

Options:

-r <lines>: Specify lines or ranges of lines to load from the source. Ranges could be specified as x-y (x..y) or in python-style x:y (x..(y-1)). Both limits x and y can be left blank (meaning the beginning and end of the file, respectively).

-s <symbols>: Specify function or classes to load from python source.

-y : Don't ask confirmation for loading source above 200 000 characters.

-n : Include the user's namespace when searching for source code.

This magic command can either take a local filename, a URL, an history range (see %history) or a macro as argument, it will prompt for confirmation before loading source with more than 200 000 characters, unless -y flag is passed or if the frontend does not support raw_input:

```
%load myscript.py
%load 7-27
%load myMacro
%load http://www.example.com/myscript.py
%load -r 5-10 myscript.py
%load -r 10-20,30,40: foo.py
%load -s MyClass,wonder_function myscript.py
%load -n MyClass
%load -n my_module.wonder_function
```

%load_ext
Load an IPython extension by its module name.

%loadpy
Alias of `%load`

`%loadpy` has gained some flexibility and dropped the requirement of a `.py` extension. So it has been renamed simply into %load. You can look at `%load`'s docstring for more info.

%logoff
Temporarily stop logging.

You must have previously started logging.

%logon
Restart logging.

This function is for restarting logging which you've temporarily stopped with %logoff. For starting logging for the first time, you must use the %logstart function, which allows you to specify an optional log filename.

%logstart
Start logging anywhere in a session.

%logstart [-o|-r|-t|-q] [log_name [log_mode]]

If no name is given, it defaults to a file named 'ipython_log.py' in your current directory, in 'rotate' mode (see below).

'%logstart name' saves to file 'name' in 'backup' mode. It saves your history up to that point and then continues logging.

%logstart takes a second optional parameter: logging mode. This can be one of (note that the modes are given unquoted):

append Keep logging at the end of any existing file.

backup Rename any existing file to name~ and start name.

global Append to a single logfile in your home directory.

over Overwrite any existing log.

rotate Create rotating logs: name.1~, name.2~, etc.

Options:

-o log also IPython's output. In this mode, all commands which generate an Out[NN] prompt are recorded to the logfile, right after their corresponding input line. The output lines are always prepended with a '#[Out]# ' marker, so that the log remains valid Python code.

Since this marker is always the same, filtering only the output from a log is very easy, using for example a simple awk call:

```
awk -F'#\[Out\]# ' '{if($2) {print $2}}' ipython_log.py
```

-r log 'raw' input. Normally, IPython's logs contain the processed input, so that user lines are logged in their final form, converted into valid Python. For example, %Exit is logged as _ip.magic("Exit"). If the -r flag is given, all input is logged exactly as typed, with no transformations applied.

-t put timestamps before each input line logged (these are put in comments).

-q suppress output of logstate message when logging is invoked

`%logstate`
Print the status of the logging system.

`%logstop`
Fully stop logging and close log file.

In order to start logging again, a new %logstart call needs to be made, possibly (though not necessarily) with a new filename, mode and other options.

`%lsmagic`
List currently available magic functions.

`%macro`
Define a macro for future re-execution. It accepts ranges of history, filenames or string objects.

Usage: %macro [options] name n1-n2 n3-n4 … n5 .. n6 …

Options:

-r: use 'raw' input. By default, the 'processed' history is used, so that magics are loaded in their transformed version to valid Python. If this option is given, the raw input as typed at the command line is used instead.

-q: quiet macro definition. By default, a tag line is printed to indicate the macro has been created, and then the contents of the macro are printed. If this option is given, then no printout is produced once the macro is created.

This will define a global variable called `name` which is a string made of joining the slices and lines you specify (n1,n2,… numbers above) from your input history into a single string. This variable acts like an automatic function which re-executes those lines as if you had typed them. You just type 'name' at the prompt and the code executes.

The syntax for indicating input ranges is described in %history.

Note: as a 'hidden' feature, you can also use traditional python slice notation, where N:M means numbers N through M-1.

For example, if your history contains (print using %hist -n):

```
44: x=1
45: y=3
46: z=x+y
47: print x
48: a=5
49: print 'x',x,'y',y
```

you can create a macro with lines 44 through 47 (included) and line 49 called my_macro with:

```
In [55]: %macro my_macro 44-47 49
```

Now, typing `my_macro` (without quotes) will re-execute all this code in one pass.

You don't need to give the line-numbers in order, and any given line number can appear multiple times. You can assemble macros with any lines from your input history in any order.

The macro is a simple object which holds its value in an attribute, but IPython's display system checks for macros and executes them as code instead of printing them when you type their name.

You can view a macro's contents by explicitly printing it with:

```
print macro_name
```

%magic
Print information about the magic function system.

Supported formats: -latex, -brief, -rest

%matplotlib

```
%matplotlib [-l] [gui]
```

Set up matplotlib to work interactively.

This function lets you activate matplotlib interactive support at any point during an IPython session. It does not import anything into the interactive namespace.

If you are using the inline matplotlib backend in the IPython Notebook you can set which figure formats are enabled using the following:

```
In [1]: from IPython.display import set_matplotlib_formats

In [2]: set_matplotlib_formats('pdf', 'svg')
```

The default for inline figures sets `bbox_inches` to 'tight'. This can cause discrepancies between the displayed image and the identical image created using `savefig`. This behavior can be disabled using the `%config` magic:

```
In [3]: %config InlineBackend.print_figure_kwargs = {'bbox_inches':None}
```

In addition, see the docstring of `IPython.display.set_matplotlib_formats` and `IPython.display.set_matplotlib_close` for more information on changing additional behaviors of the inline backend.

Examples

To enable the inline backend for usage with the IPython Notebook:

```
In [1]: %matplotlib inline
```

In this case, where the matplotlib default is TkAgg:

```
In [2]: %matplotlib
Using matplotlib backend: TkAgg
```

But you can explicitly request a different GUI backend:

```
In [3]: %matplotlib qt
```

You can list the available backends using the -l/–list option:

```
In [4]: %matplotlib --list
Available matplotlib backends: ['osx', 'qt4', 'qt5', 'gtk3', 'notebook', 'wx', 'qt
↪', 'nbagg',
'gtk', 'tk', 'inline']
```

positional arguments:

gui Name of the matplotlib backend to use ('agg', 'gtk', 'gtk3', 'inline', 'ipympl', 'nbagg', 'notebook', 'osx', 'pdf', 'ps', 'qt', 'qt4', 'qt5', 'svg', 'tk', 'widget', 'wx'). If given, the corresponding matplotlib backend is used, otherwise it will be matplotlib's default (which you can set in your matplotlib config file).

optional arguments:

-l, --list	Show available matplotlib backends

%notebook

```
%notebook filename
```

Export and convert IPython notebooks.

This function can export the current IPython history to a notebook file. For example, to export the history to "foo.ipynb" do "%notebook foo.ipynb".

The -e or –export flag is deprecated in IPython 5.2, and will be removed in the future.

positional arguments: filename Notebook name or filename

%page

Pretty print the object and display it through a pager.

%page [options] OBJECT

If no object is given, use _ (last output).

Options:

-r: page str(object), don't pretty-print it.

%pastebin

Upload code to dpaste's paste bin, returning the URL.

Usage: %pastebin [-d "Custom description"] 1-7

The argument can be an input history range, a filename, or the name of a string or macro.

Options:

-d: Pass a custom description for the gist. The default will say "Pasted from IPython".

%pdb

Control the automatic calling of the pdb interactive debugger.

Call as '%pdb on', '%pdb 1', '%pdb off' or '%pdb 0'. If called without argument it works as a toggle.

When an exception is triggered, IPython can optionally call the interactive pdb debugger after the traceback printout. %pdb toggles this feature on and off.

The initial state of this feature is set in your configuration file (the option is `InteractiveShell.pdb`).

If you want to just activate the debugger AFTER an exception has fired, without having to type '%pdb on' and rerunning your code, you can use the %debug magic.

%pdef

Print the call signature for any callable object.

If the object is a class, print the constructor information.

Examples

```
In [3]: %pdef urllib.urlopen
urllib.urlopen(url, data=None, proxies=None)
```

%pdoc

Print the docstring for an object.

If the given object is a class, it will print both the class and the constructor docstrings.

%pfile

Print (or run through pager) the file where an object is defined.

The file opens at the line where the object definition begins. IPython will honor the environment variable PAGER if set, and otherwise will do its best to print the file in a convenient form.

If the given argument is not an object currently defined, IPython will try to interpret it as a filename (automatically adding a .py extension if needed). You can thus use %pfile as a syntax highlighting code viewer.

%pinfo

Provide detailed information about an object.

'%pinfo object' is just a synonym for object? or ?object.

%pinfo2

Provide extra detailed information about an object.

'%pinfo2 object' is just a synonym for object?? or ??object.

%pip

Intercept usage of `pip` in IPython and direct user to run command outside of IPython.

%popd

Change to directory popped off the top of the stack.

%pprint

Toggle pretty printing on/off.

%precision

Set floating point precision for pretty printing.

Can set either integer precision or a format string.

If numpy has been imported and precision is an int, numpy display precision will also be set, via `numpy.set_printoptions`.

If no argument is given, defaults will be restored.

Examples

```
In [1]: from math import pi

In [2]: %precision 3
Out[2]: u'%.3f'

In [3]: pi
Out[3]: 3.142

In [4]: %precision %i
Out[4]: u'%i'

In [5]: pi
Out[5]: 3

In [6]: %precision %e
Out[6]: u'%e'

In [7]: pi**10
Out[7]: 9.364805e+04

In [8]: %precision
Out[8]: u'%r'

In [9]: pi**10
Out[9]: 93648.047476082982
```

%prun

Run a statement through the python code profiler.

Usage, in line mode: %prun [options] statement

Usage, in cell mode: %%prun [options] [statement] code… code…

In cell mode, the additional code lines are appended to the (possibly empty) statement in the first line. Cell mode allows you to easily profile multiline blocks without having to put them in a separate function.

The given statement (which doesn't require quote marks) is run via the python profiler in a manner similar to the profile.run() function. Namespaces are internally managed to work correctly; profile.run cannot be used in IPython because it makes certain assumptions about namespaces which do not hold under IPython.

Options:

-l <limit> you can place restrictions on what or how much of the profile gets printed. The limit value can be:

- A string: only information for function names containing this string is printed.
- An integer: only these many lines are printed.
- A float (between 0 and 1): this fraction of the report is printed (for example, use a limit of 0.4 to see the topmost 40% only).

You can combine several limits with repeated use of the option. For example, `-l __init__ -l 5` will print only the topmost 5 lines of information about class constructors.

-r return the pstats.Stats object generated by the profiling. This object has all the information about the profile in it, and you can later use it for further analysis or in other functions.

-s <key> sort profile by given key. You can provide more than one key by using the option several times: '-s key1 -s key2 -s key3. . . '. The default sorting key is 'time'.

The following is copied verbatim from the profile documentation referenced below:

When more than one key is provided, additional keys are used as secondary criteria when the there is equality in all keys selected before them.

Abbreviations can be used for any key names, as long as the abbreviation is unambiguous. The following are the keys currently defined:

Valid Arg	Meaning
"calls"	call count
"cumulative"	cumulative time
"file"	file name
"module"	file name
"pcalls"	primitive call count
"line"	line number
"name"	function name
"nfl"	name/file/line
"stdname"	standard name
"time"	internal time

Note that all sorts on statistics are in descending order (placing most time consuming items first), where as name, file, and line number searches are in ascending order (i.e., alphabetical). The subtle distinction between "nfl" and "stdname" is that the standard name is a sort of the name as printed, which means that the embedded line numbers get compared in an odd way. For example, lines 3, 20, and 40 would (if the file names were the same) appear in the string order "20" "3" and "40". In contrast, "nfl" does a numeric compare of the line numbers. In fact, sort_stats("nfl") is the same as sort_stats("name", "file", "line").

-T <filename> save profile results as shown on screen to a text file. The profile is still shown on screen.

-D <filename> save (via dump_stats) profile statistics to given filename. This data is in a format understood by the pstats module, and is generated by a call to the dump_stats() method of profile objects. The profile is still shown on screen.

-q suppress output to the pager. Best used with -T and/or -D above.

If you want to run complete programs under the profiler's control, use `%run -p [prof_opts] filename.py [args to program]` where prof_opts contains profiler specific options as described here.

You can read the complete documentation for the profile module with:

```
In [1]: import profile; profile.help()
```

%psearch

Search for object in namespaces by wildcard.

%psearch [options] PATTERN [OBJECT TYPE]

Note: ? can be used as a synonym for %psearch, at the beginning or at the end: both a*? and ?a* are equivalent to '%psearch a*'. Still, the rest of the command line must be unchanged (options come first), so for example the following forms are equivalent

%psearch -i a* function -i a* function? ?-i a* function

Arguments:

PATTERN

where PATTERN is a string containing * as a wildcard similar to its use in a shell. The pattern is matched in all namespaces on the search path. By default objects starting with a single _ are not matched, many IPython generated objects have a single underscore. The default is case insensitive matching. Matching is also done on the attributes of objects and not only on the objects in a module.

[OBJECT TYPE]

Is the name of a python type from the types module. The name is given in lowercase without the ending type, ex. StringType is written string. By adding a type here only objects matching the given type are matched. Using all here makes the pattern match all types (this is the default).

Options:

-a: makes the pattern match even objects whose names start with a single underscore. These names are normally omitted from the search.

-i/-c: make the pattern case insensitive/sensitive. If neither of these options are given, the default is read from your configuration file, with the option `InteractiveShell.wildcards_case_sensitive`. If this option is not specified in your configuration file, IPython's internal default is to do a case sensitive search.

-e/-s NAMESPACE: exclude/search a given namespace. The pattern you specify can be searched in any of the following namespaces: 'builtin', 'user', 'user_global','internal', 'alias', where 'builtin' and 'user' are the search defaults. Note that you should not use quotes when specifying namespaces.

'Builtin' contains the python module builtin, 'user' contains all user data, 'alias' only contain the shell aliases and no python objects, 'internal' contains objects used by IPython. The 'user_global' namespace is only used by embedded IPython instances, and it contains module-level globals. You can add namespaces to the search with -s or exclude them with -e (these options can be given more than once).

Examples

```
%psearch a*            -> objects beginning with an a
%psearch -e builtin a* -> objects NOT in the builtin space starting in a
%psearch a* function   -> all functions beginning with an a
%psearch re.e*         -> objects beginning with an e in module re
%psearch r*.e*         -> objects that start with e in modules starting in r
%psearch r*.* string   -> all strings in modules beginning with r
```

Case sensitive search:

```
%psearch -c a*         list all object beginning with lower case a
```

Show objects beginning with a single _:

```
%psearch -a _*         list objects beginning with a single underscore
```

%psource

Print (or run through pager) the source code for an object.

%pushd

Place the current dir on stack and change directory.

Usage: %pushd ['dirname']

%pwd

Return the current working directory path.

Examples

```
In [9]: pwd
Out[9]: '/home/tsuser/sprint/ipython'
```

%pycat

Show a syntax-highlighted file through a pager.

This magic is similar to the cat utility, but it will assume the file to be Python source and will show it with syntax highlighting.

This magic command can either take a local filename, an url, an history range (see %history) or a macro as argument

```
%pycat myscript.py
%pycat 7-27
%pycat myMacro
%pycat http://www.example.com/myscript.py
```

%pylab

```
%pylab [--no-import-all] [gui]
```

Load numpy and matplotlib to work interactively.

This function lets you activate pylab (matplotlib, numpy and interactive support) at any point during an IPython session.

%pylab makes the following imports:

```
import numpy
import matplotlib
from matplotlib import pylab, mlab, pyplot
np = numpy
plt = pyplot

from IPython.display import display
from IPython.core.pylabtools import figsize, getfigs

from pylab import *
from numpy import *
```

If you pass `--no-import-all`, the last two * imports will be excluded.

See the %matplotlib magic for more details about activating matplotlib without affecting the interactive namespace.

positional arguments:

gui Name of the matplotlib backend to use ('agg', 'gtk', 'gtk3', 'inline', 'ipympl', 'nbagg', 'notebook', 'osx', 'pdf', 'ps', 'qt', 'qt4', 'qt5', 'svg', 'tk', 'widget', 'wx'). If given, the corresponding matplotlib backend is used, otherwise it will be matplotlib's default (which you can set in your matplotlib config file).

optional arguments:

--no-import-all	Prevent IPython from performing `import *` into the interactive namespace. You can govern the default behavior of this flag with the InteractiveShellApp.pylab_import_all configurable.

`%quickref`

Show a quick reference sheet

`%recall`

Repeat a command, or get command to input line for editing.

%recall and %rep are equivalent.

- %recall (no arguments):

Place a string version of last computation result (stored in the special '_' variable) to the next input prompt. Allows you to create elaborate command lines without using copy-paste:

```
 In[1]: l = ["hei", "vaan"]
 In[2]: "".join(l)
Out[2]: heivaan
 In[3]: %recall
 In[4]: heivaan_ <== cursor blinking
```

%recall 45

Place history line 45 on the next input prompt. Use %hist to find out the number.

%recall 1-4

Combine the specified lines into one cell, and place it on the next input prompt. See %history for the slice syntax.

%recall foo+bar

If foo+bar can be evaluated in the user namespace, the result is placed at the next input prompt. Otherwise, the history is searched for lines which contain that substring, and the most recent one is placed at the next input prompt.

`%rehashx`

Update the alias table with all executable files in $PATH.

rehashx explicitly checks that every entry in $PATH is a file with execute access (os.X_OK).

Under Windows, it checks executability as a match against a '|'-separated string of extensions, stored in the IPython config variable win_exec_ext. This defaults to 'exe|com|bat'.

This function also resets the root module cache of module completer, used on slow filesystems.

`%reload_ext`

Reload an IPython extension by its module name.

`%rerun`

Re-run previous input

By default, you can specify ranges of input history to be repeated (as with %history). With no arguments, it will repeat the last line.

Options:

-l <n> : Repeat the last n lines of input, not including the current command.

-g foo : Repeat the most recent line which contains foo

%reset

Resets the namespace by removing all names defined by the user, if called without arguments, or by removing some types of objects, such as everything currently in IPython's In[] and Out[] containers (see the parameters for details).

Parameters

-f : force reset without asking for confirmation.

-s ['Soft' reset: Only clears your namespace, leaving history intact.] References to objects may be kept. By default (without this option), we do a 'hard' reset, giving you a new session and removing all references to objects from the current session.

in : reset input history

out : reset output history

dhist : reset directory history

array : reset only variables that are NumPy arrays

See Also

reset_selective : invoked as `%reset_selective`

Examples

```
In [6]: a = 1

In [7]: a
Out[7]: 1

In [8]: 'a' in _ip.user_ns
Out[8]: True

In [9]: %reset -f

In [1]: 'a' in _ip.user_ns
Out[1]: False

In [2]: %reset -f in
Flushing input history

In [3]: %reset -f dhist in
Flushing directory history
Flushing input history
```

Notes

Calling this magic from clients that do not implement standard input, such as the ipython notebook interface, will reset the namespace without confirmation.

%reset_selective

Resets the namespace by removing names defined by the user.

Input/Output history are left around in case you need them.

%reset_selective [-f] regex

No action is taken if regex is not included

Options -f : force reset without asking for confirmation.

See Also

reset : invoked as `%reset`

Examples

We first fully reset the namespace so your output looks identical to this example for pedagogical reasons; in practice you do not need a full reset:

```
In [1]: %reset -f
```

Now, with a clean namespace we can make a few variables and use `%reset_selective` to only delete names that match our regexp:

```
In [2]: a=1; b=2; c=3; b1m=4; b2m=5; b3m=6; b4m=7; b2s=8

In [3]: who_ls
Out[3]: ['a', 'b', 'b1m', 'b2m', 'b2s', 'b3m', 'b4m', 'c']

In [4]: %reset_selective -f b[2-3]m

In [5]: who_ls
Out[5]: ['a', 'b', 'b1m', 'b2s', 'b4m', 'c']

In [6]: %reset_selective -f d

In [7]: who_ls
Out[7]: ['a', 'b', 'b1m', 'b2s', 'b4m', 'c']

In [8]: %reset_selective -f c

In [9]: who_ls
Out[9]: ['a', 'b', 'b1m', 'b2s', 'b4m']

In [10]: %reset_selective -f b

In [11]: who_ls
Out[11]: ['a']
```

Notes

Calling this magic from clients that do not implement standard input, such as the ipython notebook interface, will reset the namespace without confirmation.

`%run`

Run the named file inside IPython as a program.

Usage:

```
%run [-n -i -e -G]
     [( -t [-N<N>] | -d [-b<N>] | -p [profile options] )]
     ( -m mod | file ) [args]
```

Parameters after the filename are passed as command-line arguments to the program (put in sys.argv). Then, control returns to IPython's prompt.

This is similar to running at a system prompt `python file args`, but with the advantage of giving you IPython's tracebacks, and of loading all variables into your interactive namespace for further use (unless -p is used, see below).

The file is executed in a namespace initially consisting only of `__name__=='__main__'` and sys.argv constructed as indicated. It thus sees its environment as if it were being run as a stand-alone program (except for sharing global objects such as previously imported modules). But after execution, the IPython interactive namespace gets updated with all variables defined in the program (except for __name__ and sys.argv). This allows for very convenient loading of code for interactive work, while giving each program a 'clean sheet' to run in.

Arguments are expanded using shell-like glob match. Patterns '*', '?', '[seq]' and '[!seq]' can be used. Additionally, tilde '~' will be expanded into user's home directory. Unlike real shells, quotation does not suppress expansions. Use *two* back slashes (e.g. `\\*`) to suppress expansions. To completely disable these expansions, you can use -G flag.

On Windows systems, the use of single quotes `'` when specifying a file is not supported. Use double quotes `"`.

Options:

-n __name__ is NOT set to '__main__', but to the running file's name without extension (as python does under import). This allows running scripts and reloading the definitions in them without calling code protected by an `if __name__ == "__main__"` clause.

-i run the file in IPython's namespace instead of an empty one. This is useful if you are experimenting with code written in a text editor which depends on variables defined interactively.

-e ignore sys.exit() calls or SystemExit exceptions in the script being run. This is particularly useful if IPython is being used to run unittests, which always exit with a sys.exit() call. In such cases you are interested in the output of the test results, not in seeing a traceback of the unittest module.

-t print timing information at the end of the run. IPython will give you an estimated CPU time consumption for your script, which under Unix uses the resource module to avoid the wraparound problems of time.clock(). Under Unix, an estimate of time spent on system tasks is also given (for Windows platforms this is reported as 0.0).

If -t is given, an additional `-N<N>` option can be given, where <N> must be an integer indicating how many times you want the script to run. The final timing report will include total and per run results.

For example (testing the script uniq_stable.py):

```
In [1]: run -t uniq_stable

IPython CPU timings (estimated):
  User  :    0.19597 s.
  System:        0.0 s.

In [2]: run -t -N5 uniq_stable

IPython CPU timings (estimated):
Total runs performed: 5
  Times :      Total       Per run
  User  :   0.910862 s,  0.1821724 s.
  System:        0.0 s,        0.0 s.
```

-d run your program under the control of pdb, the Python debugger. This allows you to execute your program step by step, watch variables, etc. Internally, what IPython does is similar to calling:

```
pdb.run('execfile("YOURFILENAME")')
```

with a breakpoint set on line 1 of your file. You can change the line number for this automatic breakpoint to be <N> by using the -bN option (where N must be an integer). For example:

```
%run -d -b40 myscript
```

will set the first breakpoint at line 40 in myscript.py. Note that the first breakpoint must be set on a line which actually does something (not a comment or docstring) for it to stop execution.

Or you can specify a breakpoint in a different file:

```
%run -d -b myotherfile.py:20 myscript
```

When the pdb debugger starts, you will see a (Pdb) prompt. You must first enter 'c' (without quotes) to start execution up to the first breakpoint.

Entering 'help' gives information about the use of the debugger. You can easily see pdb's full documentation with "import pdb;pdb.help()" at a prompt.

-p run program under the control of the Python profiler module (which prints a detailed report of execution times, function calls, etc).

You can pass other options after -p which affect the behavior of the profiler itself. See the docs for %prun for details.

In this mode, the program's variables do NOT propagate back to the IPython interactive namespace (because they remain in the namespace where the profiler executes them).

Internally this triggers a call to %prun, see its documentation for details on the options available specifically for profiling.

There is one special usage for which the text above doesn't apply: if the filename ends with .ipy[nb], the file is run as ipython script, just as if the commands were written on IPython prompt.

-m specify module name to load instead of script path. Similar to the -m option for the python interpreter. Use this option last if you want to combine with other %run options. Unlike the python interpreter only source modules are allowed no .pyc or .pyo files. For example:

```
%run -m example
```

will run the example module.

-G disable shell-like glob expansion of arguments.

`%save`

Save a set of lines or a macro to a given filename.

Usage: %save [options] filename n1-n2 n3-n4 … n5 .. n6 …

Options:

-r: use 'raw' input. By default, the 'processed' history is used, so that magics are loaded in their transformed version to valid Python. If this option is given, the raw input as typed as the command line is used instead.

-f: force overwrite. If file exists, %save will prompt for overwrite unless -f is given.

-a: append to the file instead of overwriting it.

This function uses the same syntax as %history for input ranges, then saves the lines to the filename you specify.

It adds a '.py' extension to the file if you don't do so yourself, and it asks for confirmation before overwriting existing files.

If `-r` option is used, the default extension is `.ipy`.

%sc

Shell capture - run shell command and capture output (DEPRECATED use !).

DEPRECATED. Suboptimal, retained for backwards compatibility.

You should use the form 'var = !command' instead. Example:

"%sc -l myfiles = ls ~" should now be written as

"myfiles = !ls ~"

myfiles.s, myfiles.l and myfiles.n still apply as documented below.

%sc [options] varname=command

IPython will run the given command using commands.getoutput(), and will then update the user's interactive namespace with a variable called varname, containing the value of the call. Your command can contain shell wildcards, pipes, etc.

The '=' sign in the syntax is mandatory, and the variable name you supply must follow Python's standard conventions for valid names.

(A special format without variable name exists for internal use)

Options:

-l: list output. Split the output on newlines into a list before assigning it to the given variable. By default the output is stored as a single string.

-v: verbose. Print the contents of the variable.

In most cases you should not need to split as a list, because the returned value is a special type of string which can automatically provide its contents either as a list (split on newlines) or as a space-separated string. These are convenient, respectively, either for sequential processing or to be passed to a shell command.

For example:

```
# Capture into variable a
In [1]: sc a=ls *py

# a is a string with embedded newlines
In [2]: a
Out[2]: 'setup.py\nwin32_manual_post_install.py'

# which can be seen as a list:
In [3]: a.l
Out[3]: ['setup.py', 'win32_manual_post_install.py']

# or as a whitespace-separated string:
In [4]: a.s
Out[4]: 'setup.py win32_manual_post_install.py'

# a.s is useful to pass as a single command line:
```

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```
In [5]: !wc -l $a.s
  146 setup.py
  130 win32_manual_post_install.py
  276 total

# while the list form is useful to loop over:
In [6]: for f in a.l:
  ...:      !wc -l $f
  ...:
146 setup.py
130 win32_manual_post_install.py
```

Similarly, the lists returned by the -l option are also special, in the sense that you can equally invoke the .s attribute on them to automatically get a whitespace-separated string from their contents:

```
In [7]: sc -l b=ls *py

In [8]: b
Out[8]: ['setup.py', 'win32_manual_post_install.py']

In [9]: b.s
Out[9]: 'setup.py win32_manual_post_install.py'
```

In summary, both the lists and strings used for output capture have the following special attributes:

```
.l (or .list) : value as list.
.n (or .nlstr): value as newline-separated string.
.s (or .spstr): value as space-separated string.
```

%set_env

Set environment variables. Assumptions are that either "val" is a name in the user namespace, or val is something that evaluates to a string.

Usage: %set_env var val: set value for var %set_env var=val: set value for var %set_env var=$val: set value for var, using python expansion if possible

%sx

Shell execute - run shell command and capture output (!! is short-hand).

%sx command

IPython will run the given command using commands.getoutput(), and return the result formatted as a list (split on 'n'). Since the output is _returned_, it will be stored in ipython's regular output cache Out[N] and in the '_N' automatic variables.

Notes:

1) If an input line begins with '!!', then %sx is automatically invoked. That is, while:

```
!ls
```

causes ipython to simply issue system('ls'), typing:

```
!!ls
```

is a shorthand equivalent to:

```
%sx ls
```

2) %sx differs from %sc in that %sx automatically splits into a list, like '%sc -l'. The reason for this is to make it as easy as possible to process line-oriented shell output via further python commands. %sc is meant to provide much finer control, but requires more typing.

3) Just like %sc -l, this is a list with special attributes:

```
.l (or .list) : value as list.
.n (or .nlstr): value as newline-separated string.
.s (or .spstr): value as whitespace-separated string.
```

This is very useful when trying to use such lists as arguments to system commands.

%system

Shell execute - run shell command and capture output (!! is short-hand).

%sx command

IPython will run the given command using commands.getoutput(), and return the result formatted as a list (split on 'n'). Since the output is _returned_, it will be stored in ipython's regular output cache Out[N] and in the '_N' automatic variables.

Notes:

1) If an input line begins with '!!', then %sx is automatically invoked. That is, while:

```
!ls
```

causes ipython to simply issue system('ls'), typing:

```
!!ls
```

is a shorthand equivalent to:

```
%sx ls
```

2) %sx differs from %sc in that %sx automatically splits into a list, like '%sc -l'. The reason for this is to make it as easy as possible to process line-oriented shell output via further python commands. %sc is meant to provide much finer control, but requires more typing.

3) Just like %sc -l, this is a list with special attributes:

```
.l (or .list) : value as list.
.n (or .nlstr): value as newline-separated string.
.s (or .spstr): value as whitespace-separated string.
```

This is very useful when trying to use such lists as arguments to system commands.

%tb

Print the last traceback.

Optionally, specify an exception reporting mode, tuning the verbosity of the traceback. By default the currently-active exception mode is used. See %xmode for changing exception reporting modes.

Valid modes: Plain, Context, Verbose, and Minimal.

%time

Time execution of a Python statement or expression.

The CPU and wall clock times are printed, and the value of the expression (if any) is returned. Note that under Win32, system time is always reported as 0, since it can not be measured.

This function can be used both as a line and cell magic:

- In line mode you can time a single-line statement (though multiple ones can be chained with using semi-colons).
- In cell mode, you can time the cell body (a directly following statement raises an error).

This function provides very basic timing functionality. Use the timeit magic for more control over the measurement.

Examples

```
In [1]: %time 2**128
CPU times: user 0.00 s, sys: 0.00 s, total: 0.00 s
Wall time: 0.00
Out[1]: 340282366920938463463374607431768211456L

In [2]: n = 1000000

In [3]: %time sum(range(n))
CPU times: user 1.20 s, sys: 0.05 s, total: 1.25 s
Wall time: 1.37
Out[3]: 499999500000L

In [4]: %time print 'hello world'
hello world
CPU times: user 0.00 s, sys: 0.00 s, total: 0.00 s
Wall time: 0.00

Note that the time needed by Python to compile the given expression
will be reported if it is more than 0.1s.  In this example, the
actual exponentiation is done by Python at compilation time, so while
the expression can take a noticeable amount of time to compute, that
time is purely due to the compilation:

In [5]: %time 3**9999;
CPU times: user 0.00 s, sys: 0.00 s, total: 0.00 s
Wall time: 0.00 s

In [6]: %time 3**999999;
CPU times: user 0.00 s, sys: 0.00 s, total: 0.00 s
Wall time: 0.00 s
Compiler : 0.78 s
```

%timeit

Time execution of a Python statement or expression

Usage, in line mode: %timeit [-n<N> -r<R> [-t|-c] -q -p<P> -o] statement

or in cell mode: %%timeit [-n<N> -r<R> [-t|-c] -q -p<P> -o] setup_code code code…

Time execution of a Python statement or expression using the timeit module. This function can be used both as a line and cell magic:

- In line mode you can time a single-line statement (though multiple ones can be chained with using semi-colons).
- In cell mode, the statement in the first line is used as setup code (executed but not timed) and the body of the cell is timed. The cell body has access to any variables created in the setup code.

Options: -n<N>: execute the given statement <N> times in a loop. If <N> is not provided, <N> is determined so as to get sufficient accuracy.

-r<R>: number of repeats <R>, each consisting of <N> loops, and take the best result. Default: 7

-t: use time.time to measure the time, which is the default on Unix. This function measures wall time.

-c: use time.clock to measure the time, which is the default on Windows and measures wall time. On Unix, resource.getrusage is used instead and returns the CPU user time.

-p<P>: use a precision of <P> digits to display the timing result. Default: 3

-q: Quiet, do not print result.

-o: return a TimeitResult that can be stored in a variable to inspect the result in more details.

Examples

```
In [1]: %timeit pass
8.26 ns ± 0.12 ns per loop (mean ± std. dev. of 7 runs, 100000000 loops each)

In [2]: u = None

In [3]: %timeit u is None
29.9 ns ± 0.643 ns per loop (mean ± std. dev. of 7 runs, 10000000 loops each)

In [4]: %timeit -r 4 u == None

In [5]: import time

In [6]: %timeit -n1 time.sleep(2)
```

The times reported by %timeit will be slightly higher than those reported by the timeit.py script when variables are accessed. This is due to the fact that %timeit executes the statement in the namespace of the shell, compared with timeit.py, which uses a single setup statement to import function or create variables. Generally, the bias does not matter as long as results from timeit.py are not mixed with those from %timeit.

%unalias
Remove an alias

%unload_ext
Unload an IPython extension by its module name.

Not all extensions can be unloaded, only those which define an `unload_ipython_extension` function.

%who
Print all interactive variables, with some minimal formatting.

If any arguments are given, only variables whose type matches one of these are printed. For example:

```
%who function str
```

will only list functions and strings, excluding all other types of variables. To find the proper type names, simply use type(var) at a command line to see how python prints type names. For example:

```
In [1]: type('hello')\
Out[1]: <type 'str'>
```

indicates that the type name for strings is ‘str’.

`%who` always excludes executed names loaded through your configuration file and things which are internal to IPython.

This is deliberate, as typically you may load many modules and the purpose of %who is to show you only what you’ve manually defined.

Examples

Define two variables and list them with who:

```
In [1]: alpha = 123

In [2]: beta = 'test'

In [3]: %who
alpha   beta

In [4]: %who int
alpha

In [5]: %who str
beta
```

%who_ls

Return a sorted list of all interactive variables.

If arguments are given, only variables of types matching these arguments are returned.

Examples

Define two variables and list them with who_ls:

```
In [1]: alpha = 123

In [2]: beta = 'test'

In [3]: %who_ls
Out[3]: ['alpha', 'beta']

In [4]: %who_ls int
Out[4]: ['alpha']

In [5]: %who_ls str
Out[5]: ['beta']
```

%whos

Like %who, but gives some extra information about each variable.

The same type filtering of %who can be applied here.

For all variables, the type is printed. Additionally it prints:

- For {},[],(): their length.
- For numpy arrays, a summary with shape, number of elements, typecode and size in memory.
- Everything else: a string representation, snipping their middle if too long.

Examples

Define two variables and list them with whos:

```
In [1]: alpha = 123

In [2]: beta = 'test'

In [3]: %whos
Variable   Type        Data/Info
```

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```
alpha      int         123
beta       str         test
```

%xdel

Delete a variable, trying to clear it from anywhere that IPython's machinery has references to it. By default, this uses the identity of the named object in the user namespace to remove references held under other names. The object is also removed from the output history.

Options -n : Delete the specified name from all namespaces, without checking their identity.

%xmode

Switch modes for the exception handlers.

Valid modes: Plain, Context, Verbose, and Minimal.

If called without arguments, acts as a toggle.

4.9.2 Cell magics

%%bash

%%bash script magic

Run cells with bash in a subprocess.

This is a shortcut for `%%script bash`

%%capture

```
%capture [--no-stderr] [--no-stdout] [--no-display] [output]
```

run the cell, capturing stdout, stderr, and IPython's rich display() calls.

positional arguments:

output The name of the variable in which to store output. This is a utils.io.CapturedIO object with stdout/err attributes for the text of the captured output. CapturedOutput also has a show() method for displaying the output, and __call__ as well, so you can use that to quickly display the output. If unspecified, captured output is discarded.

optional arguments:

--no-stderr	Don't capture stderr.
--no-stdout	Don't capture stdout.
--no-display	Don't capture IPython's rich display.

%%html

```
%html [--isolated]
```

Render the cell as a block of HTML

optional arguments:

--isolated	Annotate the cell as 'isolated'. Isolated cells are rendered inside their own <iframe> tag

%%javascript
Run the cell block of Javascript code

%%js
Run the cell block of Javascript code

Alias of `%%javascript`

%%latex
Render the cell as a block of latex

The subset of latex which is support depends on the implementation in the client. In the Jupyter Notebook, this magic only renders the subset of latex defined by MathJax [here](https://docs.mathjax.org/en/v2.5-latest/tex.html).

%%markdown
Render the cell as Markdown text block

%%perl
%%perl script magic

Run cells with perl in a subprocess.

This is a shortcut for `%%script perl`

%%pypy
%%pypy script magic

Run cells with pypy in a subprocess.

This is a shortcut for `%%script pypy`

%%python
%%python script magic

Run cells with python in a subprocess.

This is a shortcut for `%%script python`

%%python2
%%python2 script magic

Run cells with python2 in a subprocess.

This is a shortcut for `%%script python2`

%%python3
%%python3 script magic

Run cells with python3 in a subprocess.

This is a shortcut for `%%script python3`

%%ruby
%%ruby script magic

Run cells with ruby in a subprocess.

This is a shortcut for `%%script ruby`

%%script

```
%shebang [--no-raise-error] [--proc PROC] [--bg] [--err ERR] [--out OUT]
```

Run a cell via a shell command

The `%%script` line is like the #! line of script, specifying a program (bash, perl, ruby, etc.) with which to run.

The rest of the cell is run by that program.

Examples

```
In [1]: %%script bash
   ...: for i in 1 2 3; do
   ...:   echo $i
   ...: done
1
2
3
```

optional arguments:

--no-raise-error	Whether you should raise an error message in addition to a stream on stderr if you get a nonzero exit code.
--proc PROC	The variable in which to store Popen instance. This is used only when –bg option is given.
--bg	Whether to run the script in the background. If given, the only way to see the output of the command is with –out/err.
--err ERR	The variable in which to store stderr from the script. If the script is backgrounded, this will be the stderr *pipe*, instead of the stderr text itself and will not be autoclosed.
--out OUT	The variable in which to store stdout from the script. If the script is backgrounded, this will be the stdout *pipe*, instead of the stderr text itself and will not be auto closed.

`%%sh`

%%sh script magic

Run cells with sh in a subprocess.

This is a shortcut for `%%script sh`

`%%svg`

Render the cell as an SVG literal

`%%writefile`

```
%writefile [-a] filename
```

Write the contents of the cell to a file.

The file will be overwritten unless the -a (–append) flag is specified.

positional arguments: filename file to write

optional arguments:

-a, --append	Append contents of the cell to an existing file. The file will be created if it does not exist.

See also:

A Qt Console for Jupyter The Jupyter Notebook

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

CHAPTER 5

Configuration and customization

5.1 Configuring IPython

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5.1.1 Introduction to IPython configuration

Setting configurable options

Many of IPython's classes have configurable attributes (see *IPython options* for the list). These can be configured in several ways.

Python config files

To create the blank config files, run:

```
ipython profile create [profilename]
```

If you leave out the profile name, the files will be created for the `default` profile (see *Profiles*). These will typically be located in `~/.ipython/profile_default/`, and will be named `ipython_config.py`, `ipython_notebook_config.py`, etc. The settings in `ipython_config.py` apply to all IPython commands.

The files typically start by getting the root config object:

```
c = get_config()
```

You can then configure class attributes like this:

```
c.InteractiveShell.automagic = False
```

Be careful with spelling–incorrect names will simply be ignored, with no error.

To add to a collection which may have already been defined elsewhere, you can use methods like those found on lists, dicts and sets: append, extend, `prepend()` (like extend, but at the front), add and update (which works both for dicts and sets):

```
c.InteractiveShellApp.extensions.append('Cython')
```

New in version 2.0: list, dict and set methods for config values

Example config file

```
# sample ipython_config.py
c = get_config()

c.TerminalIPythonApp.display_banner = True
c.InteractiveShellApp.log_level = 20
c.InteractiveShellApp.extensions = [
    'myextension'
]
c.InteractiveShellApp.exec_lines = [
    'import numpy',
    'import scipy'
]
c.InteractiveShellApp.exec_files = [
    'mycode.py',
    'fancy.ipy'
]
c.InteractiveShell.colors = 'LightBG'
c.InteractiveShell.confirm_exit = False
c.InteractiveShell.editor = 'nano'
c.InteractiveShell.xmode = 'Context'

c.PrefilterManager.multi_line_specials = True

c.AliasManager.user_aliases = [
 ('la', 'ls -al')
]
```

Command line arguments

Every configurable value can be set from the command line, using this syntax:

```
ipython --ClassName.attribute=value
```

Many frequently used options have short aliases and flags, such as `--matplotlib` (to integrate with a matplotlib GUI event loop) or `--pdb` (automatic post-mortem debugging of exceptions).

To see all of these abbreviated options, run:

```
ipython --help
ipython notebook --help
# etc.
```

Options specified at the command line, in either format, override options set in a configuration file.

The config magic

You can also modify config from inside IPython, using a magic command:

```
%config IPCompleter.greedy = True
```

At present, this only affects the current session - changes you make to config are not saved anywhere. Also, some options are only read when IPython starts, so they can't be changed like this.

Running IPython from Python

If you are using *Embedding IPython* to start IPython from a normal python file, you can set configuration options the same way as in a config file by creating a traitlets config object and passing it to start_ipython like in the example below.

```
"""Quick snippet explaining how to set config options when using start_ipython."""

# First create a config object from the traitlets library
from traitlets.config import Config
c = Config()

# Now we can set options as we would in a config file:
#   c.Class.config_value = value
# For example, we can set the exec_lines option of the InteractiveShellApp
# class to run some code when the IPython REPL starts
c.InteractiveShellApp.exec_lines = [
    'print("\\nimporting some things\\n")',
    'import math',
    "math"
]
c.InteractiveShell.colors = 'LightBG'
c.InteractiveShell.confirm_exit = False
c.TerminalIPythonApp.display_banner = False

# Now we start ipython with our configuration
import IPython
IPython.start_ipython(config=c)
```

Profiles

IPython can use multiple profiles, with separate configuration and history. By default, if you don't specify a profile, IPython always runs in the `default` profile. To use a new profile:

```
ipython profile create foo   # create the profile foo
ipython --profile=foo        # start IPython using the new profile
```

Profiles are typically stored in *The IPython directory*, but you can also keep a profile in the current working directory, for example to distribute it with a project. To find a profile directory on the filesystem:

```
ipython locate profile foo
```

The IPython directory

IPython stores its files—config, command history and extensions—in the directory `~/.ipython/` by default.

`IPYTHONDIR`
If set, this environment variable should be the path to a directory, which IPython will use for user data. IPython will create it if it does not exist.

`--ipython-dir``=<path>`
This command line option can also be used to override the default IPython directory.

To see where IPython is looking for the IPython directory, use the command `ipython locate`, or the Python function *`IPython.paths.get_ipython_dir()`*.

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If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

5.1.2 IPython options

Any of the options listed here can be set in config files, at the command line, or from inside IPython. See *Setting configurable options* for details.

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

Terminal IPython options

`InteractiveShellApp.code_to_run`
Execute the given command string.

Trait type Unicode

CLI option `-c`

`InteractiveShellApp.exec_PYTHONSTARTUP`
Run the file referenced by the PYTHONSTARTUP environment variable at IPython startup.

Trait type Bool

Default `True`

`InteractiveShellApp.exec_files`
List of files to run at IPython startup.

Trait type List

`InteractiveShellApp.exec_lines`
lines of code to run at IPython startup.

Trait type List

`InteractiveShellApp.extensions`
A list of dotted module names of IPython extensions to load.

Trait type List

`InteractiveShellApp.extra_extension`
dotted module name of an IPython extension to load.

Trait type Unicode

CLI option `--ext`

`InteractiveShellApp.file_to_run`
A file to be run

Trait type Unicode

`InteractiveShellApp.gui`
Enable GUI event loop integration with any of (‘glut’, ‘gtk’, ‘gtk2’, ‘gtk3’, ‘osx’, ‘pyglet’, ‘qt’, ‘qt4’, ‘qt5’, ‘tk’, ‘wx’, ‘gtk2’, ‘qt4’).

Options `'glut'`, `'gtk'`, `'gtk2'`, `'gtk3'`, `'osx'`, `'pyglet'`, `'qt'`, `'qt4'`, `'qt5'`, `'tk'`, `'wx'`, `'gtk2'`, `'qt4'`

CLI option `--gui`

`InteractiveShellApp.hide_initial_ns`
Should variables loaded at startup (by startup files, exec_lines, etc.) be hidden from tools like %who?

Trait type Bool

Default `True`

`InteractiveShellApp.matplotlib`
Configure matplotlib for interactive use with the default matplotlib backend.

Options `'auto'`, `'agg'`, `'gtk'`, `'gtk3'`, `'inline'`, `'ipympl'`, `'nbagg'`, `'notebook'`, `'osx'`, `'pdf'`, `'ps'`, `'qt'`, `'qt4'`, `'qt5'`, `'svg'`, `'tk'`, `'widget'`, `'wx'`

CLI option `--matplotlib`

`InteractiveShellApp.module_to_run`
Run the module as a script.

Trait type Unicode

CLI option `-m`

`InteractiveShellApp.pylab`
Pre-load matplotlib and numpy for interactive use, selecting a particular matplotlib backend and loop integration.

Options `'auto'`, `'agg'`, `'gtk'`, `'gtk3'`, `'inline'`, `'ipympl'`, `'nbagg'`, `'notebook'`, `'osx'`, `'pdf'`, `'ps'`, `'qt'`, `'qt4'`, `'qt5'`, `'svg'`, `'tk'`, `'widget'`, `'wx'`

CLI option `--pylab`

`InteractiveShellApp.pylab_import_all`
If true, IPython will populate the user namespace with numpy, pylab, etc. and an `import *` is done from numpy and pylab, when using pylab mode.

When False, pylab mode should not import any names into the user namespace.

Trait type Bool

Default `True`

`InteractiveShellApp.reraise_ipython_extension_failures`
Reraise exceptions encountered loading IPython extensions?

Trait type Bool

Default `False`

`Application.log_datefmt`
The date format used by logging formatters for %(asctime)s

Trait type Unicode

Default `'%Y-%m-%d %H:%M:%S'`

`Application.log_format`
The Logging format template

Trait type Unicode

Default `'[%(name)s]%(highlevel)s %(message)s'`

`Application.log_level`
Set the log level by value or name.

Options `0`, `10`, `20`, `30`, `40`, `50`, `'DEBUG'`, `'INFO'`, `'WARN'`, `'ERROR'`, `'CRITICAL'`

Default `30`

CLI option `--log-level`

`BaseIPythonApplication.auto_create`
Whether to create profile dir if it doesn't exist

Trait type Bool

Default `False`

`BaseIPythonApplication.copy_config_files`

Whether to install the default config files into the profile dir. If a new profile is being created, and IPython contains config files for that profile, then they will be staged into the new directory. Otherwise, default config files will be automatically generated.

Trait type Bool

Default `False`

`BaseIPythonApplication.extra_config_file`

Path to an extra config file to load.

If specified, load this config file in addition to any other IPython config.

Trait type Unicode

CLI option `--config`

`BaseIPythonApplication.ipython_dir`

The name of the IPython directory. This directory is used for logging configuration (through profiles), history storage, etc. The default is usually $HOME/.ipython. This option can also be specified through the environment variable IPYTHONDIR.

Trait type Unicode

CLI option `--ipython-dir`

`BaseIPythonApplication.log_datefmt`

The date format used by logging formatters for %(asctime)s

Trait type Unicode

Default `'%Y-%m-%d %H:%M:%S'`

`BaseIPythonApplication.log_format`

The Logging format template

Trait type Unicode

Default `'[%(name)s]%(highlevel)s %(message)s'`

`BaseIPythonApplication.log_level`

Set the log level by value or name.

Options `0`, `10`, `20`, `30`, `40`, `50`, `'DEBUG'`, `'INFO'`, `'WARN'`, `'ERROR'`, `'CRITICAL'`

Default `30`

`BaseIPythonApplication.overwrite`

Whether to overwrite existing config files when copying

Trait type Bool

Default `False`

`BaseIPythonApplication.profile`

The IPython profile to use.

Trait type Unicode

Default `'default'`

CLI option `--profile`

BaseIPythonApplication.verbose_crash
Create a massive crash report when IPython encounters what may be an internal error. The default is to append a short message to the usual traceback

Trait type Bool

Default `False`

TerminalIPythonApp.code_to_run
Execute the given command string.

Trait type Unicode

TerminalIPythonApp.copy_config_files
Whether to install the default config files into the profile dir. If a new profile is being created, and IPython contains config files for that profile, then they will be staged into the new directory. Otherwise, default config files will be automatically generated.

Trait type Bool

Default `False`

TerminalIPythonApp.display_banner
Whether to display a banner upon starting IPython.

Trait type Bool

Default `True`

CLI option `--banner`

TerminalIPythonApp.exec_PYTHONSTARTUP
Run the file referenced by the PYTHONSTARTUP environment variable at IPython startup.

Trait type Bool

Default `True`

TerminalIPythonApp.exec_files
List of files to run at IPython startup.

Trait type List

TerminalIPythonApp.exec_lines
lines of code to run at IPython startup.

Trait type List

TerminalIPythonApp.extensions
A list of dotted module names of IPython extensions to load.

Trait type List

TerminalIPythonApp.extra_config_file
Path to an extra config file to load.

If specified, load this config file in addition to any other IPython config.

Trait type Unicode

TerminalIPythonApp.extra_extension
dotted module name of an IPython extension to load.

Trait type Unicode

TerminalIPythonApp.file_to_run
A file to be run

Trait type Unicode

TerminalIPythonApp.force_interact

If a command or file is given via the command-line, e.g. 'ipython foo.py', start an interactive shell after executing the file or command.

Trait type Bool

Default `False`

CLI option `-i`

TerminalIPythonApp.gui

Enable GUI event loop integration with any of ('glut', 'gtk', 'gtk2', 'gtk3', 'osx', 'pyglet', 'qt', 'qt4', 'qt5', 'tk', 'wx', 'gtk2', 'qt4').

Options `'glut'`, `'gtk'`, `'gtk2'`, `'gtk3'`, `'osx'`, `'pyglet'`, `'qt'`, `'qt4'`, `'qt5'`, `'tk'`, `'wx'`, `'gtk2'`, `'qt4'`

TerminalIPythonApp.hide_initial_ns

Should variables loaded at startup (by startup files, exec_lines, etc.) be hidden from tools like %who?

Trait type Bool

Default `True`

TerminalIPythonApp.interactive_shell_class

Class to use to instantiate the TerminalInteractiveShell object. Useful for custom Frontends

Trait type Type

Default `'IPython.terminal.interactiveshell.TerminalInteractiveShell'`

TerminalIPythonApp.ipython_dir

The name of the IPython directory. This directory is used for logging configuration (through profiles), history storage, etc. The default is usually $HOME/.ipython. This option can also be specified through the environment variable IPYTHONDIR.

Trait type Unicode

TerminalIPythonApp.log_datefmt

The date format used by logging formatters for %(asctime)s

Trait type Unicode

Default `'%Y-%m-%d %H:%M:%S'`

TerminalIPythonApp.log_format

The Logging format template

Trait type Unicode

Default `'[%(name)s]%(highlevel)s %(message)s'`

TerminalIPythonApp.log_level

Set the log level by value or name.

Options `0`, `10`, `20`, `30`, `40`, `50`, `'DEBUG'`, `'INFO'`, `'WARN'`, `'ERROR'`, `'CRITICAL'`

Default `30`

TerminalIPythonApp.matplotlib

Configure matplotlib for interactive use with the default matplotlib backend.

Options `'auto'`, `'agg'`, `'gtk'`, `'gtk3'`, `'inline'`, `'ipympl'`, `'nbagg'`, `'notebook'`, `'osx'`, `'pdf'`, `'ps'`, `'qt'`, `'qt4'`, `'qt5'`, `'svg'`, `'tk'`, `'widget'`, `'wx'`

`TerminalIPythonApp.module_to_run`
Run the module as a script.

Trait type Unicode

`TerminalIPythonApp.overwrite`
Whether to overwrite existing config files when copying

Trait type Bool

Default `False`

`TerminalIPythonApp.profile`
The IPython profile to use.

Trait type Unicode

Default `'default'`

`TerminalIPythonApp.pylab`
Pre-load matplotlib and numpy for interactive use, selecting a particular matplotlib backend and loop integration.

Options `'auto'`, `'agg'`, `'gtk'`, `'gtk3'`, `'inline'`, `'ipympl'`, `'nbagg'`, `'notebook'`, `'osx'`, `'pdf'`, `'ps'`, `'qt'`, `'qt4'`, `'qt5'`, `'svg'`, `'tk'`, `'widget'`, `'wx'`

`TerminalIPythonApp.pylab_import_all`
If true, IPython will populate the user namespace with numpy, pylab, etc. and an `import *` is done from numpy and pylab, when using pylab mode.

When False, pylab mode should not import any names into the user namespace.

Trait type Bool

Default `True`

`TerminalIPythonApp.quick`
Start IPython quickly by skipping the loading of config files.

Trait type Bool

Default `False`

CLI option `--quick`

`TerminalIPythonApp.reraise_ipython_extension_failures`
Reraise exceptions encountered loading IPython extensions?

Trait type Bool

Default `False`

`TerminalIPythonApp.verbose_crash`
Create a massive crash report when IPython encounters what may be an internal error. The default is to append a short message to the usual traceback

Trait type Bool

Default `False`

InteractiveShell.ast_node_interactivity

'all', 'last', 'last_expr' or 'none', 'last_expr_or_assign' specifying which nodes should be run interactively (displaying output from expressions).

Options `'all'`, `'last'`, `'last_expr'`, `'none'`, `'last_expr_or_assign'`

Default `'last_expr'`

InteractiveShell.ast_transformers

A list of ast.NodeTransformer subclass instances, which will be applied to user input before code is run.

Trait type List

InteractiveShell.autoawait

Automatically run await statement in the top level repl.

Trait type Bool

Default `True`

InteractiveShell.autocall

Make IPython automatically call any callable object even if you didn't type explicit parentheses. For example, 'str 43' becomes 'str(43)' automatically. The value can be '0' to disable the feature, '1' for 'smart' autocall, where it is not applied if there are no more arguments on the line, and '2' for 'full' autocall, where all callable objects are automatically called (even if no arguments are present).

Options `0`, `1`, `2`

Default `0`

CLI option `--autocall`

InteractiveShell.autoindent

Autoindent IPython code entered interactively.

Trait type Bool

Default `True`

CLI option `--autoindent`

InteractiveShell.automagic

Enable magic commands to be called without the leading %.

Trait type Bool

Default `True`

CLI option `--automagic`

InteractiveShell.banner1

The part of the banner to be printed before the profile

Trait type Unicode

Default `"Python 3.6.7 | packaged by conda-forge | (default, Nov 21 20...`

InteractiveShell.banner2

The part of the banner to be printed after the profile

Trait type Unicode

InteractiveShell.cache_size

Set the size of the output cache. The default is 1000, you can change it permanently in your config file. Setting it to 0 completely disables the caching system, and the minimum value accepted is 3 (if you provide a value less than 3, it is reset to 0 and a warning is issued). This limit is defined because otherwise you'll spend more time re-flushing a too small cache than working

Trait type Int

Default `1000`

CLI option `--cache-size`

`InteractiveShell.color_info`
Use colors for displaying information about objects. Because this information is passed through a pager (like 'less'), and some pagers get confused with color codes, this capability can be turned off.

Trait type Bool

Default `True`

CLI option `--color-info`

`InteractiveShell.colors`
Set the color scheme (NoColor, Neutral, Linux, or LightBG).

Options `'Neutral'`, `'NoColor'`, `'LightBG'`, `'Linux'`

Default `'Neutral'`

CLI option `--colors`

`InteractiveShell.debug`
No description

Trait type Bool

Default `False`

`InteractiveShell.disable_failing_post_execute`
Don't call post-execute functions that have failed in the past.

Trait type Bool

Default `False`

`InteractiveShell.display_page`
If True, anything that would be passed to the pager will be displayed as regular output instead.

Trait type Bool

Default `False`

`InteractiveShell.enable_html_pager`
(Provisional API) enables html representation in mime bundles sent to pagers.

Trait type Bool

Default `False`

`InteractiveShell.history_length`
Total length of command history

Trait type Int

Default `10000`

`InteractiveShell.history_load_length`
The number of saved history entries to be loaded into the history buffer at startup.

Trait type Int

Default `1000`

`InteractiveShell.ipython_dir`
No description

Trait type Unicode

`InteractiveShell.logappend`
Start logging to the given file in append mode. Use `logfile` to specify a log file to **overwrite** logs to.

Trait type Unicode

CLI option `--logappend`

`InteractiveShell.logfile`
The name of the logfile to use.

Trait type Unicode

CLI option `--logfile`

`InteractiveShell.logstart`
Start logging to the default log file in overwrite mode. Use `logappend` to specify a log file to **append** logs to.

Trait type Bool

Default `False`

`InteractiveShell.loop_runner`
Select the loop runner that will be used to execute top-level asynchronous code

Trait type Any

Default `'IPython.core.interactiveshell._asyncio_runner'`

`InteractiveShell.object_info_string_level`
No description

Options `0`, `1`, `2`

Default `0`

`InteractiveShell.pdb`
Automatically call the pdb debugger after every exception.

Trait type Bool

Default `False`

CLI option `--pdb`

`InteractiveShell.prompt_in1`
Deprecated since IPython 4.0 and ignored since 5.0, set TerminalInteractiveShell.prompts object directly.

Trait type Unicode

Default `'In [\\#]:  '`

`InteractiveShell.prompt_in2`
Deprecated since IPython 4.0 and ignored since 5.0, set TerminalInteractiveShell.prompts object directly.

Trait type Unicode

Default `' .\\D.: '`

`InteractiveShell.prompt_out`
Deprecated since IPython 4.0 and ignored since 5.0, set TerminalInteractiveShell.prompts object directly.

Trait type Unicode

Default `'Out[\\#]: '`

`InteractiveShell.prompts_pad_left`
Deprecated since IPython 4.0 and ignored since 5.0, set TerminalInteractiveShell.prompts object directly.

Trait type Bool

Default `True`

`InteractiveShell.quiet`
No description

Trait type Bool

Default `False`

`InteractiveShell.separate_in`
No description

Trait type SeparateUnicode

Default `'\\n'`

`InteractiveShell.separate_out`
No description

Trait type SeparateUnicode

`InteractiveShell.separate_out2`
No description

Trait type SeparateUnicode

`InteractiveShell.show_rewritten_input`
Show rewritten input, e.g. for autocall.

Trait type Bool

Default `True`

`InteractiveShell.sphinxify_docstring`
Enables rich html representation of docstrings. (This requires the docrepr module).

Trait type Bool

Default `False`

`InteractiveShell.wildcards_case_sensitive`
No description

Trait type Bool

Default `True`

`InteractiveShell.xmode`
Switch modes for the IPython exception handlers.

Options `'Context'`, `'Plain'`, `'Verbose'`, `'Minimal'`

Default `'Context'`

`TerminalInteractiveShell.ast_node_interactivity`
'all', 'last', 'last_expr' or 'none', 'last_expr_or_assign' specifying which nodes should be run interactively (displaying output from expressions).

Options `'all'`, `'last'`, `'last_expr'`, `'none'`, `'last_expr_or_assign'`

Default `'last_expr'`

`TerminalInteractiveShell.ast_transformers`
A list of ast.NodeTransformer subclass instances, which will be applied to user input before code is run.

Trait type List

`TerminalInteractiveShell.autoawait`
Automatically run await statement in the top level repl.

Trait type Bool

Default `True`

`TerminalInteractiveShell.autocall`
Make IPython automatically call any callable object even if you didn't type explicit parentheses. For example, 'str 43' becomes 'str(43)' automatically. The value can be '0' to disable the feature, '1' for 'smart' autocall, where it is not applied if there are no more arguments on the line, and '2' for 'full' autocall, where all callable objects are automatically called (even if no arguments are present).

Options `0`, `1`, `2`

Default `0`

`TerminalInteractiveShell.autoindent`
Autoindent IPython code entered interactively.

Trait type Bool

Default `True`

`TerminalInteractiveShell.automagic`
Enable magic commands to be called without the leading %.

Trait type Bool

Default `True`

`TerminalInteractiveShell.banner1`
The part of the banner to be printed before the profile

Trait type Unicode

Default `"Python 3.6.7 | packaged by conda-forge | (default, Nov 21 20...`

`TerminalInteractiveShell.banner2`
The part of the banner to be printed after the profile

Trait type Unicode

`TerminalInteractiveShell.cache_size`
Set the size of the output cache. The default is 1000, you can change it permanently in your config file. Setting it to 0 completely disables the caching system, and the minimum value accepted is 3 (if you provide a value less than 3, it is reset to 0 and a warning is issued). This limit is defined because otherwise you'll spend more time re-flushing a too small cache than working

Trait type Int

Default `1000`

`TerminalInteractiveShell.color_info`
Use colors for displaying information about objects. Because this information is passed through a pager (like 'less'), and some pagers get confused with color codes, this capability can be turned off.

Trait type Bool

Default `True`

TerminalInteractiveShell.colors
Set the color scheme (NoColor, Neutral, Linux, or LightBG).

Options `'Neutral'`, `'NoColor'`, `'LightBG'`, `'Linux'`

Default `'Neutral'`

TerminalInteractiveShell.confirm_exit
Set to confirm when you try to exit IPython with an EOF (Control-D in Unix, Control-Z/Enter in Windows). By typing 'exit' or 'quit', you can force a direct exit without any confirmation.

Trait type Bool

Default `True`

CLI option `--confirm-exit`

TerminalInteractiveShell.debug
No description

Trait type Bool

Default `False`

TerminalInteractiveShell.disable_failing_post_execute
Don't call post-execute functions that have failed in the past.

Trait type Bool

Default `False`

TerminalInteractiveShell.display_completions
Options for displaying tab completions, 'column', 'multicolumn', and 'readlinelike'. These options are for `prompt_toolkit`, see `prompt_toolkit` documentation for more information.

Options `'column'`, `'multicolumn'`, `'readlinelike'`

Default `'multicolumn'`

TerminalInteractiveShell.display_page
If True, anything that would be passed to the pager will be displayed as regular output instead.

Trait type Bool

Default `False`

TerminalInteractiveShell.editing_mode
Shortcut style to use at the prompt. 'vi' or 'emacs'.

Trait type Unicode

Default `'emacs'`

TerminalInteractiveShell.editor
Set the editor used by IPython (default to $EDITOR/vi/notepad).

Trait type Unicode

Default `'vi'`

TerminalInteractiveShell.enable_history_search
Allows to enable/disable the prompt toolkit history search

Trait type Bool

Default `True`

`TerminalInteractiveShell.enable_html_pager`
(Provisional API) enables html representation in mime bundles sent to pagers.

Trait type Bool

Default `False`

`TerminalInteractiveShell.extra_open_editor_shortcuts`
Enable vi (v) or Emacs (C-X C-E) shortcuts to open an external editor. This is in addition to the F2 binding, which is always enabled.

Trait type Bool

Default `False`

`TerminalInteractiveShell.handle_return`
Provide an alternative handler to be called when the user presses Return. This is an advanced option intended for debugging, which may be changed or removed in later releases.

Trait type Any

`TerminalInteractiveShell.highlight_matching_brackets`
Highlight matching brackets.

Trait type Bool

Default `True`

`TerminalInteractiveShell.highlighting_style`
The name or class of a Pygments style to use for syntax highlighting. To see available styles, run `pygmentize -L styles`.

Trait type Union

`TerminalInteractiveShell.highlighting_style_overrides`
Override highlighting format for specific tokens

Trait type Dict

`TerminalInteractiveShell.history_length`
Total length of command history

Trait type Int

Default `10000`

`TerminalInteractiveShell.history_load_length`
The number of saved history entries to be loaded into the history buffer at startup.

Trait type Int

Default `1000`

`TerminalInteractiveShell.ipython_dir`
No description

Trait type Unicode

`TerminalInteractiveShell.logappend`
Start logging to the given file in append mode. Use `logfile` to specify a log file to **overwrite** logs to.

Trait type Unicode

`TerminalInteractiveShell.logfile`
The name of the logfile to use.

Trait type Unicode

TerminalInteractiveShell.logstart
Start logging to the default log file in overwrite mode. Use `logappend` to specify a log file to **append** logs to.

Trait type Bool

Default `False`

TerminalInteractiveShell.loop_runner
Select the loop runner that will be used to execute top-level asynchronous code

Trait type Any

Default `'IPython.core.interactiveshell._asyncio_runner'`

TerminalInteractiveShell.mouse_support
Enable mouse support in the prompt (Note: prevents selecting text with the mouse)

Trait type Bool

Default `False`

TerminalInteractiveShell.object_info_string_level
No description

Options `0`, `1`, `2`

Default `0`

TerminalInteractiveShell.pdb
Automatically call the pdb debugger after every exception.

Trait type Bool

Default `False`

TerminalInteractiveShell.prompt_in1
Deprecated since IPython 4.0 and ignored since 5.0, set TerminalInteractiveShell.prompts object directly.

Trait type Unicode

Default `'In [\\#]:  '`

TerminalInteractiveShell.prompt_in2
Deprecated since IPython 4.0 and ignored since 5.0, set TerminalInteractiveShell.prompts object directly.

Trait type Unicode

Default `' .\\D.: '`

TerminalInteractiveShell.prompt_includes_vi_mode
Display the current vi mode (when using vi editing mode).

Trait type Bool

Default `True`

TerminalInteractiveShell.prompt_out
Deprecated since IPython 4.0 and ignored since 5.0, set TerminalInteractiveShell.prompts object directly.

Trait type Unicode

Default `'Out[\\#]:  '`

TerminalInteractiveShell.prompts_class
Class used to generate Prompt token for prompt_toolkit

Trait type Type

Default `'IPython.terminal.prompts.Prompts'`

`TerminalInteractiveShell.prompts_pad_left`
Deprecated since IPython 4.0 and ignored since 5.0, set TerminalInteractiveShell.prompts object directly.

Trait type Bool

Default `True`

`TerminalInteractiveShell.quiet`
No description

Trait type Bool

Default `False`

`TerminalInteractiveShell.separate_in`
No description

Trait type SeparateUnicode

Default `'\\n'`

`TerminalInteractiveShell.separate_out`
No description

Trait type SeparateUnicode

`TerminalInteractiveShell.separate_out2`
No description

Trait type SeparateUnicode

`TerminalInteractiveShell.show_rewritten_input`
Show rewritten input, e.g. for autocall.

Trait type Bool

Default `True`

`TerminalInteractiveShell.simple_prompt`
Use `raw_input` for the REPL, without completion and prompt colors.

Useful when controlling IPython as a subprocess, and piping STDIN/OUT/ERR. Known usage are: IPython own testing machinery, and emacs inferior-shell integration through elpy.

This mode default to `True` if the `IPY_TEST_SIMPLE_PROMPT` environment variable is set, or the current terminal is not a tty.

Trait type Bool

Default `True`

CLI option `--simple-prompt`

`TerminalInteractiveShell.space_for_menu`
Number of line at the bottom of the screen to reserve for the completion menu

Trait type Int

Default `6`

`TerminalInteractiveShell.sphinxify_docstring`
Enables rich html representation of docstrings. (This requires the docrepr module).

Trait type Bool

Default `False`

TerminalInteractiveShell.term_title

Automatically set the terminal title

Trait type Bool

Default `True`

CLI option `--term-title`

TerminalInteractiveShell.term_title_format

Customize the terminal title format. This is a python format string. Available substitutions are: {cwd}.

Trait type Unicode

Default `'IPython: {cwd}'`

TerminalInteractiveShell.true_color

Use 24bit colors instead of 256 colors in prompt highlighting. If your terminal supports true color, the following command should print 'TRUECOLOR' in orange: printf "x1b[38;2;255;100;0mTRUECOLORx1b[0mn"

Trait type Bool

Default `False`

TerminalInteractiveShell.wildcards_case_sensitive

No description

Trait type Bool

Default `True`

TerminalInteractiveShell.xmode

Switch modes for the IPython exception handlers.

Options `'Context'`, `'Plain'`, `'Verbose'`, `'Minimal'`

Default `'Context'`

HistoryAccessor.connection_options

Options for configuring the SQLite connection

These options are passed as keyword args to sqlite3.connect when establishing database connections.

Trait type Dict

HistoryAccessor.enabled

enable the SQLite history

set enabled=False to disable the SQLite history, in which case there will be no stored history, no SQLite connection, and no background saving thread. This may be necessary in some threaded environments where IPython is embedded.

Trait type Bool

Default `True`

HistoryAccessor.hist_file

Path to file to use for SQLite history database.

By default, IPython will put the history database in the IPython profile directory. If you would rather share one history among profiles, you can set this value in each, so that they are consistent.

Due to an issue with fcntl, SQLite is known to misbehave on some NFS mounts. If you see IPython hanging, try setting this to something on a local disk, e.g:

```
ipython --HistoryManager.hist_file=/tmp/ipython_hist.sqlite
```

you can also use the specific value `:memory:` (including the colon at both end but not the back ticks), to avoid creating an history file.

Trait type Unicode

HistoryManager.connection_options

Options for configuring the SQLite connection

These options are passed as keyword args to sqlite3.connect when establishing database connections.

Trait type Dict

HistoryManager.db_cache_size

Write to database every x commands (higher values save disk access & power). Values of 1 or less effectively disable caching.

Trait type Int

Default `0`

HistoryManager.db_log_output

Should the history database include output? (default: no)

Trait type Bool

Default `False`

HistoryManager.enabled

enable the SQLite history

set enabled=False to disable the SQLite history, in which case there will be no stored history, no SQLite connection, and no background saving thread. This may be necessary in some threaded environments where IPython is embedded.

Trait type Bool

Default `True`

HistoryManager.hist_file

Path to file to use for SQLite history database.

By default, IPython will put the history database in the IPython profile directory. If you would rather share one history among profiles, you can set this value in each, so that they are consistent.

Due to an issue with fcntl, SQLite is known to misbehave on some NFS mounts. If you see IPython hanging, try setting this to something on a local disk, e.g:

```
ipython --HistoryManager.hist_file=/tmp/ipython_hist.sqlite
```

you can also use the specific value `:memory:` (including the colon at both end but not the back ticks), to avoid creating an history file.

Trait type Unicode

ProfileDir.location

Set the profile location directly. This overrides the logic used by the `profile` option.

Trait type Unicode

CLI option `--profile-dir`

BaseFormatter.deferred_printers

No description

Trait type Dict

`BaseFormatter.enabled`
No description

Trait type Bool

Default `True`

`BaseFormatter.singleton_printers`
No description

Trait type Dict

`BaseFormatter.type_printers`
No description

Trait type Dict

`PlainTextFormatter.deferred_printers`
No description

Trait type Dict

`PlainTextFormatter.float_precision`
No description

Trait type CUnicode

`PlainTextFormatter.max_seq_length`
Truncate large collections (lists, dicts, tuples, sets) to this size.

Set to 0 to disable truncation.

Trait type Int

Default `1000`

`PlainTextFormatter.max_width`
No description

Trait type Int

Default `79`

`PlainTextFormatter.newline`
No description

Trait type Unicode

Default `'\\n'`

`PlainTextFormatter.pprint`
No description

Trait type Bool

Default `True`

CLI option `--pprint`

`PlainTextFormatter.singleton_printers`
No description

Trait type Dict

`PlainTextFormatter.type_printers`
No description

Trait type Dict

PlainTextFormatter.verbose
No description

Trait type Bool

Default `False`

Completer.backslash_combining_completions
Enable unicode completions, e.g. alpha<tab> . Includes completion of latex commands, unicode names, and expanding unicode characters back to latex commands.

Trait type Bool

Default `True`

Completer.debug
Enable debug for the Completer. Mostly print extra information for experimental jedi integration.

Trait type Bool

Default `False`

Completer.greedy
Activate greedy completion PENDING DEPRECTION. this is now mostly taken care of with Jedi.

This will enable completion on elements of lists, results of function calls, etc., but can be unsafe because the code is actually evaluated on TAB.

Trait type Bool

Default `False`

Completer.jedi_compute_type_timeout
Experimental: restrict time (in milliseconds) during which Jedi can compute types. Set to 0 to stop computing types. Non-zero value lower than 100ms may hurt performance by preventing jedi to build its cache.

Trait type Int

Default `400`

Completer.use_jedi
Experimental: Use Jedi to generate autocompletions. Default to True if jedi is installed.

Trait type Bool

Default `True`

IPCompleter.backslash_combining_completions
Enable unicode completions, e.g. alpha<tab> . Includes completion of latex commands, unicode names, and expanding unicode characters back to latex commands.

Trait type Bool

Default `True`

IPCompleter.debug
Enable debug for the Completer. Mostly print extra information for experimental jedi integration.

Trait type Bool

Default `False`

IPCompleter.greedy
Activate greedy completion PENDING DEPRECTION. this is now mostly taken care of with Jedi.

This will enable completion on elements of lists, results of function calls, etc., but can be unsafe because the code is actually evaluated on TAB.

Trait type Bool

Default `False`

`IPCompleter.jedi_compute_type_timeout`

Experimental: restrict time (in milliseconds) during which Jedi can compute types. Set to 0 to stop computing types. Non-zero value lower than 100ms may hurt performance by preventing jedi to build its cache.

Trait type Int

Default `400`

`IPCompleter.limit_to__all__`

DEPRECATED as of version 5.0.

Instruct the completer to use __all__ for the completion

Specifically, when completing on `object.<tab>`.

When True: only those names in obj.__all__ will be included.

When False [default]: the __all__ attribute is ignored

Trait type Bool

Default `False`

`IPCompleter.merge_completions`

Whether to merge completion results into a single list

If False, only the completion results from the first non-empty completer will be returned.

Trait type Bool

Default `True`

`IPCompleter.omit__names`

Instruct the completer to omit private method names

Specifically, when completing on `object.<tab>`.

When 2 [default]: all names that start with '_' will be excluded.

When 1: all 'magic' names (`__foo__`) will be excluded.

When 0: nothing will be excluded.

Options `0`, `1`, `2`

Default `2`

`IPCompleter.use_jedi`

Experimental: Use Jedi to generate autocompletions. Default to True if jedi is installed.

Trait type Bool

Default `True`

`ScriptMagics.script_magics`

Extra script cell magics to define

This generates simple wrappers of `%%script foo` as `%%foo`.

If you want to add script magics that aren't on your path, specify them in script_paths

Trait type List

`ScriptMagics.script_paths`

Dict mapping short 'ruby' names to full paths, such as '/opt/secret/bin/ruby'

Only necessary for items in script_magics where the default path will not find the right interpreter.

Trait type Dict

`LoggingMagics.quiet`

Suppress output of log state when logging is enabled

Trait type Bool

Default `False`

`StoreMagics.autorestore`

If True, any %store-d variables will be automatically restored when IPython starts.

Trait type Bool

Default `False`

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

IPython kernel options

These options can be used in `ipython_kernel_config.py`. The kernel also respects any options in `ipython_config.py`

`ConnectionFileMixin.connection_file`

JSON file in which to store connection info [default: kernel-<pid>.json]

This file will contain the IP, ports, and authentication key needed to connect clients to this kernel. By default, this file will be created in the security dir of the current profile, but can be specified by absolute path.

Trait type Unicode

`ConnectionFileMixin.control_port`

set the control (ROUTER) port [default: random]

Trait type Int

Default `0`

`ConnectionFileMixin.hb_port`

set the heartbeat port [default: random]

Trait type Int

Default `0`

`ConnectionFileMixin.iopub_port`

set the iopub (PUB) port [default: random]

Trait type Int

Default `0`

ConnectionFileMixin.ip
Set the kernel's IP address [default localhost]. If the IP address is something other than localhost, then Consoles on other machines will be able to connect to the Kernel, so be careful!

Trait type Unicode

ConnectionFileMixin.shell_port
set the shell (ROUTER) port [default: random]

Trait type Int

Default `0`

ConnectionFileMixin.stdin_port
set the stdin (ROUTER) port [default: random]

Trait type Int

Default `0`

ConnectionFileMixin.transport
No description

Options `'tcp'`, `'ipc'`

Default `'tcp'`

InteractiveShellApp.code_to_run
Execute the given command string.

Trait type Unicode

CLI option `-c`

InteractiveShellApp.exec_PYTHONSTARTUP
Run the file referenced by the PYTHONSTARTUP environment variable at IPython startup.

Trait type Bool

Default `True`

InteractiveShellApp.exec_files
List of files to run at IPython startup.

Trait type List

InteractiveShellApp.exec_lines
lines of code to run at IPython startup.

Trait type List

InteractiveShellApp.extensions
A list of dotted module names of IPython extensions to load.

Trait type List

InteractiveShellApp.extra_extension
dotted module name of an IPython extension to load.

Trait type Unicode

CLI option `--ext`

InteractiveShellApp.file_to_run
A file to be run

Trait type Unicode

InteractiveShellApp.gui
Enable GUI event loop integration with any of ('glut', 'gtk', 'gtk2', 'gtk3', 'osx', 'pyglet', 'qt', 'qt4', 'qt5', 'tk', 'wx', 'gtk2', 'qt4').

Options `'glut'`, `'gtk'`, `'gtk2'`, `'gtk3'`, `'osx'`, `'pyglet'`, `'qt'`, `'qt4'`, `'qt5'`, `'tk'`, `'wx'`, `'gtk2'`, `'qt4'`

CLI option `--gui`

InteractiveShellApp.hide_initial_ns
Should variables loaded at startup (by startup files, exec_lines, etc.) be hidden from tools like %who?

Trait type Bool

Default `True`

InteractiveShellApp.matplotlib
Configure matplotlib for interactive use with the default matplotlib backend.

Options `'auto'`, `'agg'`, `'gtk'`, `'gtk3'`, `'inline'`, `'ipympl'`, `'nbagg'`, `'notebook'`, `'osx'`, `'pdf'`, `'ps'`, `'qt'`, `'qt4'`, `'qt5'`, `'svg'`, `'tk'`, `'widget'`, `'wx'`

CLI option `--matplotlib`

InteractiveShellApp.module_to_run
Run the module as a script.

Trait type Unicode

CLI option `-m`

InteractiveShellApp.pylab
Pre-load matplotlib and numpy for interactive use, selecting a particular matplotlib backend and loop integration.

Options `'auto'`, `'agg'`, `'gtk'`, `'gtk3'`, `'inline'`, `'ipympl'`, `'nbagg'`, `'notebook'`, `'osx'`, `'pdf'`, `'ps'`, `'qt'`, `'qt4'`, `'qt5'`, `'svg'`, `'tk'`, `'widget'`, `'wx'`

CLI option `--pylab`

InteractiveShellApp.pylab_import_all
If true, IPython will populate the user namespace with numpy, pylab, etc. and an `import *` is done from numpy and pylab, when using pylab mode.

When False, pylab mode should not import any names into the user namespace.

Trait type Bool

Default `True`

InteractiveShellApp.reraise_ipython_extension_failures
Reraise exceptions encountered loading IPython extensions?

Trait type Bool

Default `False`

Application.log_datefmt
The date format used by logging formatters for %(asctime)s

Trait type Unicode

Default `'%Y-%m-%d %H:%M:%S'`

`Application.log_format`
The Logging format template

Trait type Unicode

Default `'[%(name)s]%(highlevel)s %(message)s'`

`Application.log_level`
Set the log level by value or name.

Options `0`, `10`, `20`, `30`, `40`, `50`, `'DEBUG'`, `'INFO'`, `'WARN'`, `'ERROR'`, `'CRITICAL'`

Default `30`

CLI option `--log-level`

`BaseIPythonApplication.auto_create`
Whether to create profile dir if it doesn't exist

Trait type Bool

Default `False`

`BaseIPythonApplication.copy_config_files`
Whether to install the default config files into the profile dir. If a new profile is being created, and IPython contains config files for that profile, then they will be staged into the new directory. Otherwise, default config files will be automatically generated.

Trait type Bool

Default `False`

`BaseIPythonApplication.extra_config_file`
Path to an extra config file to load.

If specified, load this config file in addition to any other IPython config.

Trait type Unicode

CLI option `--config`

`BaseIPythonApplication.ipython_dir`
The name of the IPython directory. This directory is used for logging configuration (through profiles), history storage, etc. The default is usually $HOME/.ipython. This option can also be specified through the environment variable IPYTHONDIR.

Trait type Unicode

CLI option `--ipython-dir`

`BaseIPythonApplication.log_datefmt`
The date format used by logging formatters for %(asctime)s

Trait type Unicode

Default `'%Y-%m-%d %H:%M:%S'`

`BaseIPythonApplication.log_format`
The Logging format template

Trait type Unicode

Default `'[%(name)s]%(highlevel)s %(message)s'`

BaseIPythonApplication.log_level
Set the log level by value or name.

Options `0`, `10`, `20`, `30`, `40`, `50`, `'DEBUG'`, `'INFO'`, `'WARN'`, `'ERROR'`, `'CRITICAL'`

Default `30`

BaseIPythonApplication.overwrite
Whether to overwrite existing config files when copying

Trait type Bool

Default `False`

BaseIPythonApplication.profile
The IPython profile to use.

Trait type Unicode

Default `'default'`

CLI option `--profile`

BaseIPythonApplication.verbose_crash
Create a massive crash report when IPython encounters what may be an internal error. The default is to append a short message to the usual traceback

Trait type Bool

Default `False`

IPKernelApp.auto_create
Whether to create profile dir if it doesn't exist

Trait type Bool

Default `False`

IPKernelApp.code_to_run
Execute the given command string.

Trait type Unicode

IPKernelApp.connection_file
JSON file in which to store connection info [default: kernel-<pid>.json]

This file will contain the IP, ports, and authentication key needed to connect clients to this kernel. By default, this file will be created in the security dir of the current profile, but can be specified by absolute path.

Trait type Unicode

CLI option `-f`

IPKernelApp.control_port
set the control (ROUTER) port [default: random]

Trait type Int

Default `0`

CLI option `--control`

IPKernelApp.copy_config_files
Whether to install the default config files into the profile dir. If a new profile is being created, and IPython contains config files for that profile, then they will be staged into the new directory. Otherwise, default config files will be automatically generated.

Trait type Bool

Default `False`

IPKernelApp.displayhook_class
The importstring for the DisplayHook factory

Trait type DottedObjectName

Default `'ipykernel.displayhook.ZMQDisplayHook'`

IPKernelApp.exec_PYTHONSTARTUP
Run the file referenced by the PYTHONSTARTUP environment variable at IPython startup.

Trait type Bool

Default `True`

IPKernelApp.exec_files
List of files to run at IPython startup.

Trait type List

IPKernelApp.exec_lines
lines of code to run at IPython startup.

Trait type List

IPKernelApp.extensions
A list of dotted module names of IPython extensions to load.

Trait type List

IPKernelApp.extra_config_file
Path to an extra config file to load.

If specified, load this config file in addition to any other IPython config.

Trait type Unicode

IPKernelApp.extra_extension
dotted module name of an IPython extension to load.

Trait type Unicode

IPKernelApp.file_to_run
A file to be run

Trait type Unicode

IPKernelApp.gui
Enable GUI event loop integration with any of (‘glut’, ‘gtk’, ‘gtk2’, ‘gtk3’, ‘osx’, ‘pyglet’, ‘qt’, ‘qt4’, ‘qt5’, ‘tk’, ‘wx’, ‘gtk2’, ‘qt4’).

Options `'glut'`, `'gtk'`, `'gtk2'`, `'gtk3'`, `'osx'`, `'pyglet'`, `'qt'`, `'qt4'`, `'qt5'`, `'tk'`, `'wx'`, `'gtk2'`, `'qt4'`

IPKernelApp.hb_port
set the heartbeat port [default: random]

Trait type Int

Default `0`

CLI option `--hb`

IPKernelApp.hide_initial_ns
Should variables loaded at startup (by startup files, exec_lines, etc.) be hidden from tools like %who?

Trait type Bool

Default `True`

IPKernelApp.interrupt
ONLY USED ON WINDOWS Interrupt this process when the parent is signaled.

Trait type Int

Default `0`

IPKernelApp.iopub_port
set the iopub (PUB) port [default: random]

Trait type Int

Default `0`

CLI option `--iopub`

IPKernelApp.ip
Set the kernel's IP address [default localhost]. If the IP address is something other than localhost, then Consoles on other machines will be able to connect to the Kernel, so be careful!

Trait type Unicode

CLI option `--ip`

IPKernelApp.ipython_dir
The name of the IPython directory. This directory is used for logging configuration (through profiles), history storage, etc. The default is usually $HOME/.ipython. This option can also be specified through the environment variable IPYTHONDIR.

Trait type Unicode

IPKernelApp.kernel_class
The Kernel subclass to be used.

This should allow easy re-use of the IPKernelApp entry point to configure and launch kernels other than IPython's own.

Trait type Type

Default `'ipykernel.ipkernel.IPythonKernel'`

IPKernelApp.log_datefmt
The date format used by logging formatters for %(asctime)s

Trait type Unicode

Default `'%Y-%m-%d %H:%M:%S'`

IPKernelApp.log_format
The Logging format template

Trait type Unicode

Default `'[%(name)s]%(highlevel)s %(message)s'`

IPKernelApp.log_level
Set the log level by value or name.

Options `0`, `10`, `20`, `30`, `40`, `50`, `'DEBUG'`, `'INFO'`, `'WARN'`, `'ERROR'`, `'CRITICAL'`

Default `30`

`IPKernelApp.matplotlib`
Configure matplotlib for interactive use with the default matplotlib backend.

Options `'auto'`, `'agg'`, `'gtk'`, `'gtk3'`, `'inline'`, `'ipympl'`, `'nbagg'`, `'notebook'`, `'osx'`, `'pdf'`, `'ps'`, `'qt'`, `'qt4'`, `'qt5'`, `'svg'`, `'tk'`, `'widget'`, `'wx'`

`IPKernelApp.module_to_run`
Run the module as a script.

Trait type Unicode

`IPKernelApp.no_stderr`
redirect stderr to the null device

Trait type Bool

Default `False`

CLI option `--no-stderr`

`IPKernelApp.no_stdout`
redirect stdout to the null device

Trait type Bool

Default `False`

CLI option `--no-stdout`

`IPKernelApp.outstream_class`
The importstring for the OutStream factory

Trait type DottedObjectName

Default `'ipykernel.iostream.OutStream'`

`IPKernelApp.overwrite`
Whether to overwrite existing config files when copying

Trait type Bool

Default `False`

`IPKernelApp.parent_handle`
kill this process if its parent dies. On Windows, the argument specifies the HANDLE of the parent process, otherwise it is simply boolean.

Trait type Int

Default `0`

`IPKernelApp.profile`
The IPython profile to use.

Trait type Unicode

Default `'default'`

`IPKernelApp.pylab`
Pre-load matplotlib and numpy for interactive use, selecting a particular matplotlib backend and loop integration.

Options `'auto'`, `'agg'`, `'gtk'`, `'gtk3'`, `'inline'`, `'ipympl'`, `'nbagg'`, `'notebook'`, `'osx'`, `'pdf'`, `'ps'`, `'qt'`, `'qt4'`, `'qt5'`, `'svg'`, `'tk'`, `'widget'`, `'wx'`

IPKernelApp.pylab_import_all

If true, IPython will populate the user namespace with numpy, pylab, etc. and an `import *` is done from numpy and pylab, when using pylab mode.

When False, pylab mode should not import any names into the user namespace.

Trait type Bool

Default `True`

IPKernelApp.quiet

Only send stdout/stderr to output stream

Trait type Bool

Default `True`

IPKernelApp.reraise_ipython_extension_failures

Reraise exceptions encountered loading IPython extensions?

Trait type Bool

Default `False`

IPKernelApp.shell_port

set the shell (ROUTER) port [default: random]

Trait type Int

Default `0`

CLI option `--shell`

IPKernelApp.stdin_port

set the stdin (ROUTER) port [default: random]

Trait type Int

Default `0`

CLI option `--stdin`

IPKernelApp.transport

No description

Options `'tcp'`, `'ipc'`

Default `'tcp'`

CLI option `--transport`

IPKernelApp.verbose_crash

Create a massive crash report when IPython encounters what may be an internal error. The default is to append a short message to the usual traceback

Trait type Bool

Default `False`

Kernel._darwin_app_nap

Whether to use appnope for compatibility with OS X App Nap.

Only affects OS X >= 10.9.

Trait type Bool

Default `True`

`Kernel._execute_sleep`
No description

Trait type Float

Default `0.0005`

`Kernel._poll_interval`
No description

Trait type Float

Default `0.01`

`Kernel.stop_on_error_timeout`
time (in seconds) to wait for messages to arrive when aborting queued requests after an error.

Requests that arrive within this window after an error will be cancelled.

Increase in the event of unusually slow network causing significant delays, which can manifest as e.g. "Run all" in a notebook aborting some, but not all, messages after an error.

Trait type Float

Default `0.1`

`IPythonKernel._darwin_app_nap`
Whether to use appnope for compatibility with OS X App Nap.

Only affects OS X >= 10.9.

Trait type Bool

Default `True`

`IPythonKernel._execute_sleep`
No description

Trait type Float

Default `0.0005`

`IPythonKernel._poll_interval`
No description

Trait type Float

Default `0.01`

`IPythonKernel.help_links`
No description

Trait type List

`IPythonKernel.stop_on_error_timeout`
time (in seconds) to wait for messages to arrive when aborting queued requests after an error.

Requests that arrive within this window after an error will be cancelled.

Increase in the event of unusually slow network causing significant delays, which can manifest as e.g. "Run all" in a notebook aborting some, but not all, messages after an error.

Trait type Float

Default `0.1`

`IPythonKernel.use_experimental_completions`
Set this flag to False to deactivate the use of experimental IPython completion APIs.

Trait type Bool

Default `True`

`InteractiveShell.ast_node_interactivity`

'all', 'last', 'last_expr' or 'none', 'last_expr_or_assign' specifying which nodes should be run interactively (displaying output from expressions).

Options `'all'`, `'last'`, `'last_expr'`, `'none'`, `'last_expr_or_assign'`

Default `'last_expr'`

`InteractiveShell.ast_transformers`

A list of ast.NodeTransformer subclass instances, which will be applied to user input before code is run.

Trait type List

`InteractiveShell.autoawait`

Automatically run await statement in the top level repl.

Trait type Bool

Default `True`

`InteractiveShell.autocall`

Make IPython automatically call any callable object even if you didn't type explicit parentheses. For example, 'str 43' becomes 'str(43)' automatically. The value can be '0' to disable the feature, '1' for 'smart' autocall, where it is not applied if there are no more arguments on the line, and '2' for 'full' autocall, where all callable objects are automatically called (even if no arguments are present).

Options `0`, `1`, `2`

Default `0`

CLI option `--autocall`

`InteractiveShell.autoindent`

Autoindent IPython code entered interactively.

Trait type Bool

Default `True`

CLI option `--autoindent`

`InteractiveShell.automagic`

Enable magic commands to be called without the leading %.

Trait type Bool

Default `True`

CLI option `--automagic`

`InteractiveShell.banner1`

The part of the banner to be printed before the profile

Trait type Unicode

Default `"Python 3.6.7 | packaged by conda-forge | (default, Nov 21 20...`

`InteractiveShell.banner2`

The part of the banner to be printed after the profile

Trait type Unicode

InteractiveShell.cache_size
Set the size of the output cache. The default is 1000, you can change it permanently in your config file. Setting it to 0 completely disables the caching system, and the minimum value accepted is 3 (if you provide a value less than 3, it is reset to 0 and a warning is issued). This limit is defined because otherwise you'll spend more time re-flushing a too small cache than working

Trait type Int

Default `1000`

CLI option `--cache-size`

InteractiveShell.color_info
Use colors for displaying information about objects. Because this information is passed through a pager (like 'less'), and some pagers get confused with color codes, this capability can be turned off.

Trait type Bool

Default `True`

CLI option `--color-info`

InteractiveShell.colors
Set the color scheme (NoColor, Neutral, Linux, or LightBG).

Options `'Neutral'`, `'NoColor'`, `'LightBG'`, `'Linux'`

Default `'Neutral'`

CLI option `--colors`

InteractiveShell.debug
No description

Trait type Bool

Default `False`

InteractiveShell.disable_failing_post_execute
Don't call post-execute functions that have failed in the past.

Trait type Bool

Default `False`

InteractiveShell.display_page
If True, anything that would be passed to the pager will be displayed as regular output instead.

Trait type Bool

Default `False`

InteractiveShell.enable_html_pager
(Provisional API) enables html representation in mime bundles sent to pagers.

Trait type Bool

Default `False`

InteractiveShell.history_length
Total length of command history

Trait type Int

Default `10000`

InteractiveShell.history_load_length

The number of saved history entries to be loaded into the history buffer at startup.

Trait type Int

Default `1000`

InteractiveShell.ipython_dir

No description

Trait type Unicode

InteractiveShell.logappend

Start logging to the given file in append mode. Use `logfile` to specify a log file to **overwrite** logs to.

Trait type Unicode

CLI option `--logappend`

InteractiveShell.logfile

The name of the logfile to use.

Trait type Unicode

CLI option `--logfile`

InteractiveShell.logstart

Start logging to the default log file in overwrite mode. Use `logappend` to specify a log file to **append** logs to.

Trait type Bool

Default `False`

InteractiveShell.loop_runner

Select the loop runner that will be used to execute top-level asynchronous code

Trait type Any

Default `'IPython.core.interactiveshell._asyncio_runner'`

InteractiveShell.object_info_string_level

No description

Options `0`, `1`, `2`

Default `0`

InteractiveShell.pdb

Automatically call the pdb debugger after every exception.

Trait type Bool

Default `False`

CLI option `--pdb`

InteractiveShell.prompt_in1

Deprecated since IPython 4.0 and ignored since 5.0, set TerminalInteractiveShell.prompts object directly.

Trait type Unicode

Default `'In [\\#]:  '`

InteractiveShell.prompt_in2

Deprecated since IPython 4.0 and ignored since 5.0, set TerminalInteractiveShell.prompts object directly.

Trait type Unicode

Default `' .\\D.: '`

`InteractiveShell.prompt_out`
Deprecated since IPython 4.0 and ignored since 5.0, set TerminalInteractiveShell.prompts object directly.

Trait type Unicode

Default `'Out[\\#]: '`

`InteractiveShell.prompts_pad_left`
Deprecated since IPython 4.0 and ignored since 5.0, set TerminalInteractiveShell.prompts object directly.

Trait type Bool

Default `True`

`InteractiveShell.quiet`
No description

Trait type Bool

Default `False`

`InteractiveShell.separate_in`
No description

Trait type SeparateUnicode

Default `'\\n'`

`InteractiveShell.separate_out`
No description

Trait type SeparateUnicode

`InteractiveShell.separate_out2`
No description

Trait type SeparateUnicode

`InteractiveShell.show_rewritten_input`
Show rewritten input, e.g. for autocall.

Trait type Bool

Default `True`

`InteractiveShell.sphinxify_docstring`
Enables rich html representation of docstrings. (This requires the docrepr module).

Trait type Bool

Default `False`

`InteractiveShell.wildcards_case_sensitive`
No description

Trait type Bool

Default `True`

`InteractiveShell.xmode`
Switch modes for the IPython exception handlers.

Options `'Context'`, `'Plain'`, `'Verbose'`, `'Minimal'`

Default `'Context'`

ZMQInteractiveShell.ast_node_interactivity
'all', 'last', 'last_expr' or 'none', 'last_expr_or_assign' specifying which nodes should be run interactively (displaying output from expressions).

Options `'all'`, `'last'`, `'last_expr'`, `'none'`, `'last_expr_or_assign'`

Default `'last_expr'`

ZMQInteractiveShell.ast_transformers
A list of ast.NodeTransformer subclass instances, which will be applied to user input before code is run.

Trait type List

ZMQInteractiveShell.autoawait
Automatically run await statement in the top level repl.

Trait type Bool

Default `True`

ZMQInteractiveShell.autocall
Make IPython automatically call any callable object even if you didn't type explicit parentheses. For example, 'str 43' becomes 'str(43)' automatically. The value can be '0' to disable the feature, '1' for 'smart' autocall, where it is not applied if there are no more arguments on the line, and '2' for 'full' autocall, where all callable objects are automatically called (even if no arguments are present).

Options `0`, `1`, `2`

Default `0`

ZMQInteractiveShell.automagic
Enable magic commands to be called without the leading %.

Trait type Bool

Default `True`

ZMQInteractiveShell.banner1
The part of the banner to be printed before the profile

Trait type Unicode

Default `"Python 3.6.7 | packaged by conda-forge | (default, Nov 21 20...`

ZMQInteractiveShell.banner2
The part of the banner to be printed after the profile

Trait type Unicode

ZMQInteractiveShell.cache_size
Set the size of the output cache. The default is 1000, you can change it permanently in your config file. Setting it to 0 completely disables the caching system, and the minimum value accepted is 3 (if you provide a value less than 3, it is reset to 0 and a warning is issued). This limit is defined because otherwise you'll spend more time re-flushing a too small cache than working

Trait type Int

Default `1000`

ZMQInteractiveShell.color_info
Use colors for displaying information about objects. Because this information is passed through a pager (like 'less'), and some pagers get confused with color codes, this capability can be turned off.

Trait type Bool

Default `True`

`ZMQInteractiveShell.colors`
Set the color scheme (NoColor, Neutral, Linux, or LightBG).

Options `'Neutral'`, `'NoColor'`, `'LightBG'`, `'Linux'`

Default `'Neutral'`

`ZMQInteractiveShell.debug`
No description

Trait type Bool

Default `False`

`ZMQInteractiveShell.disable_failing_post_execute`
Don't call post-execute functions that have failed in the past.

Trait type Bool

Default `False`

`ZMQInteractiveShell.display_page`
If True, anything that would be passed to the pager will be displayed as regular output instead.

Trait type Bool

Default `False`

`ZMQInteractiveShell.enable_html_pager`
(Provisional API) enables html representation in mime bundles sent to pagers.

Trait type Bool

Default `False`

`ZMQInteractiveShell.history_length`
Total length of command history

Trait type Int

Default `10000`

`ZMQInteractiveShell.history_load_length`
The number of saved history entries to be loaded into the history buffer at startup.

Trait type Int

Default `1000`

`ZMQInteractiveShell.ipython_dir`
No description

Trait type Unicode

`ZMQInteractiveShell.logappend`
Start logging to the given file in append mode. Use `logfile` to specify a log file to **overwrite** logs to.

Trait type Unicode

`ZMQInteractiveShell.logfile`
The name of the logfile to use.

Trait type Unicode

`ZMQInteractiveShell.logstart`
Start logging to the default log file in overwrite mode. Use `logappend` to specify a log file to **append** logs to.

Trait type Bool

Default `False`

`ZMQInteractiveShell.loop_runner`
Select the loop runner that will be used to execute top-level asynchronous code

Trait type Any

Default `'IPython.core.interactiveshell._asyncio_runner'`

`ZMQInteractiveShell.object_info_string_level`
No description

Options `0, 1, 2`

Default `0`

`ZMQInteractiveShell.pdb`
Automatically call the pdb debugger after every exception.

Trait type Bool

Default `False`

`ZMQInteractiveShell.prompt_in1`
Deprecated since IPython 4.0 and ignored since 5.0, set TerminalInteractiveShell.prompts object directly.

Trait type Unicode

Default `'In [\\#]: '`

`ZMQInteractiveShell.prompt_in2`
Deprecated since IPython 4.0 and ignored since 5.0, set TerminalInteractiveShell.prompts object directly.

Trait type Unicode

Default `' .\\D.: '`

`ZMQInteractiveShell.prompt_out`
Deprecated since IPython 4.0 and ignored since 5.0, set TerminalInteractiveShell.prompts object directly.

Trait type Unicode

Default `'Out[\\#]: '`

`ZMQInteractiveShell.prompts_pad_left`
Deprecated since IPython 4.0 and ignored since 5.0, set TerminalInteractiveShell.prompts object directly.

Trait type Bool

Default `True`

`ZMQInteractiveShell.quiet`
No description

Trait type Bool

Default `False`

`ZMQInteractiveShell.separate_in`
No description

Trait type SeparateUnicode

Default `'\\n'`

ZMQInteractiveShell.separate_out
No description

Trait type SeparateUnicode

ZMQInteractiveShell.separate_out2
No description

Trait type SeparateUnicode

ZMQInteractiveShell.show_rewritten_input
Show rewritten input, e.g. for autocall.

Trait type Bool

Default `True`

ZMQInteractiveShell.sphinxify_docstring
Enables rich html representation of docstrings. (This requires the docrepr module).

Trait type Bool

Default `False`

ZMQInteractiveShell.wildcards_case_sensitive
No description

Trait type Bool

Default `True`

ZMQInteractiveShell.xmode
Switch modes for the IPython exception handlers.

Options `'Context'`, `'Plain'`, `'Verbose'`, `'Minimal'`

Default `'Context'`

ProfileDir.location
Set the profile location directly. This overrides the logic used by the `profile` option.

Trait type Unicode

CLI option `--profile-dir`

Session.buffer_threshold
Threshold (in bytes) beyond which an object's buffer should be extracted to avoid pickling.

Trait type Int

Default `1024`

Session.check_pid
Whether to check PID to protect against calls after fork.

This check can be disabled if fork-safety is handled elsewhere.

Trait type Bool

Default `True`

Session.copy_threshold
Threshold (in bytes) beyond which a buffer should be sent without copying.

Trait type Int

Default `65536`

`Session.debug`
Debug output in the Session

Trait type Bool

Default `False`

`Session.digest_history_size`
The maximum number of digests to remember.

The digest history will be culled when it exceeds this value.

Trait type Int

Default `65536`

`Session.item_threshold`
The maximum number of items for a container to be introspected for custom serialization. Containers larger than this are pickled outright.

Trait type Int

Default `64`

`Session.key`
execution key, for signing messages.

Trait type CBytes

Default `b''`

`Session.keyfile`
path to file containing execution key.

Trait type Unicode

CLI option `--keyfile`

`Session.metadata`
Metadata dictionary, which serves as the default top-level metadata dict for each message.

Trait type Dict

`Session.packer`
The name of the packer for serializing messages. Should be one of 'json', 'pickle', or an import name for a custom callable serializer.

Trait type DottedObjectName

Default `'json'`

`Session.session`
The UUID identifying this session.

Trait type CUnicode

CLI option `--ident`

`Session.signature_scheme`
The digest scheme used to construct the message signatures. Must have the form 'hmac-HASH'.

Trait type Unicode

Default `'hmac-sha256'`

`Session.unpacker`
The name of the unpacker for unserializing messages. Only used with custom functions for `packer`.

Trait type DottedObjectName

Default `'json'`

`Session.username`

Username for the Session. Default is your system username.

Trait type Unicode

Default `'username'`

CLI option `--user`

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5.1.3 IPython shortcuts

Available shortcuts in an IPython terminal.

Warning: This list is automatically generated, and may not hold all available shortcuts. In particular, it may depend on the version of `prompt_toolkit` installed during the generation of this page.

Single Filtered shortcuts

Shortcut	Filter	Description
`c-\`	Always	Force exit (with a non-zero return value)

Multi Filtered shortcuts

Shortcut	Filter	Description
`c-m`	(And: Condition, (Not: Condition), (Or: Condition, Condition))	When the user presses return, insert a newline or execute the code
`c-n`	(And: Condition, Condition)	Control-N in vi edit mode on readline is history previous, unlike default prompt toolkit
`c-o`	(And: Condition, Condition)	insert a newline after the cursor indented appropriately
`c-p`	(And: Condition, Condition)	Control-P in vi edit mode on readline is history next, unlike default prompt toolkit

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5.1.4 Specific config details

Custom Prompts

Changed in version 5.0.

From IPython 5, prompts are produced as a list of Pygments tokens, which are tuples of (token_type, text). You can customise prompts by writing a method which generates a list of tokens.

There are four kinds of prompt:

- The **in** prompt is shown before the first line of input (default like `In [1]:`).
- The **continuation** prompt is shown before further lines of input (default like `...:`).
- The **rewrite** prompt is shown to highlight how special syntax has been interpreted (default like `----->`).
- The **out** prompt is shown before the result from evaluating the input (default like `Out[1]:`).

Custom prompts are supplied together as a class. If you want to customise only some of the prompts, inherit from *`IPython.terminal.prompts.Prompts`*, which defines the defaults. The required interface is like this:

`class MyPrompts`(*shell*)
Prompt style definition. *shell* is a reference to the *`TerminalInteractiveShell`* instance.

`in_prompt_tokens`(*cli=None*)
`continuation_prompt_tokens`(*self*, *cli=None*, *width=None*)
`rewrite_prompt_tokens`()
`out_prompt_tokens`()
Return the respective prompts as lists of `(token_type, text)` tuples.

For continuation prompts, *width* is an integer representing the width of the prompt area in terminal columns.

cli, where used, is the prompt_toolkit `CommandLineInterface` instance. This is mainly for compatibility with the API prompt_toolkit expects.

Here is an example Prompt class that will show the current working directory in the input prompt:

```
from IPython.terminal.prompts import Prompts, Token
import os

class MyPrompt(Prompts):
     def in_prompt_tokens(self, cli=None):
         return [(Token, os.getcwd()),
                 (Token.Prompt, ' >>>')]
```

To set the new prompt, assign it to the `prompts` attribute of the IPython shell:

```
In [2]: ip = get_ipython()
   ...: ip.prompts = MyPrompt(ip)

/home/bob >>> # it works
```

See `IPython/example/utils/cwd_prompt.py` for an example of how to write an extensions to customise prompts.

Inside IPython or in a startup script, you can use a custom prompts class by setting `get_ipython().prompts` to an *instance* of the class. In configuration, `TerminalInteractiveShell.prompts_class` may be set to either the class object, or a string of its full importable name.

To include invisible terminal control sequences in a prompt, use `Token.ZeroWidthEscape` as the token type. Tokens with this type are ignored when calculating the width.

Colours in the prompt are determined by the token types and the highlighting style; see below for more details. The tokens used in the default prompts are `Prompt`, `PromptNum`, `OutPrompt` and `OutPromptNum`.

Terminal Colors

Changed in version 5.0.

There are two main configuration options controlling colours.

`InteractiveShell.colors` sets the colour of tracebacks and object info (the output from e.g. `zip?`). It may also affect other things if the option below is set to `'legacy'`. It has four case-insensitive values: `'nocolor'`, `'neutral'`, `'linux'`, `'lightbg'`. The default is *neutral*, which should be legible on either dark or light terminal backgrounds. *linux* is optimised for dark backgrounds and *lightbg* for light ones.

`TerminalInteractiveShell.highlighting_style` determines prompt colours and syntax highlighting. It takes the name (as a string) or class (as a subclass of `pygments.style.Style`) of a Pygments style, or the special value `'legacy'` to pick a style in accordance with `InteractiveShell.colors`.

You can see the Pygments styles available on your system by running:

```
import pygments
list(pygments.styles.get_all_styles())
```

Additionally, `TerminalInteractiveShell.highlighting_style_overrides` can override specific styles in the highlighting. It should be a dictionary mapping Pygments token types to strings defining the style. See Pygments' documentation for the language used to define styles.

Colors in the pager

On some systems, the default pager has problems with ANSI colour codes. To configure your default pager to allow these:

1. Set the environment PAGER variable to `less`.
2. Set the environment LESS variable to `-r` (plus any other options you always want to pass to less by default). This tells less to properly interpret control sequences, which is how color information is given to your terminal.

Editor configuration

IPython can integrate with text editors in a number of different ways:

- Editors (such as (X)Emacs, vim and TextMate) can send code to IPython for execution.

- IPython's `%edit` magic command can open an editor of choice to edit a code block.

The %edit command (and its alias %ed) will invoke the editor set in your environment as `EDITOR`. If this variable is not set, it will default to vi under Linux/Unix and to notepad under Windows. You may want to set this variable properly and to a lightweight editor which doesn't take too long to start (that is, something other than a new instance of Emacs). This way you can edit multi-line code quickly and with the power of a real editor right inside IPython.

You can also control the editor by setting `TerminalInteractiveShell.editor` in `ipython_config.py`.

Vim

Paul Ivanov's vim-ipython provides powerful IPython integration for vim.

(X)Emacs

If you are a dedicated Emacs user, and want to use Emacs when IPython's `%edit` magic command is called you should set up the Emacs server so that new requests are handled by the original process. This means that almost no time is spent in handling the request (assuming an Emacs process is already running). For this to work, you need to set your EDITOR environment variable to 'emacsclient'. The code below, supplied by Francois Pinard, can then be used in your `.emacs` file to enable the server:

```
(defvar server-buffer-clients)
(when (and (fboundp 'server-start) (string-equal (getenv "TERM") 'xterm))
  (server-start)
  (defun fp-kill-server-with-buffer-routine ()
    (and server-buffer-clients (server-done)))
  (add-hook 'kill-buffer-hook 'fp-kill-server-with-buffer-routine))
```

Thanks to the work of Alexander Schmolck and Prabhu Ramachandran, currently (X)Emacs and IPython get along very well in other ways.

With (X)EMacs >= 24, You can enable IPython in python-mode with:

```
(require 'python)
(setq python-shell-interpreter "ipython")
```

Keyboard Shortcuts

Changed in version 5.0.

You can customise keyboard shortcuts for terminal IPython. Put code like this in a *startup file*:

```
from IPython import get_ipython
from prompt_toolkit.enums import DEFAULT_BUFFER
from prompt_toolkit.keys import Keys
from prompt_toolkit.filters import HasFocus, HasSelection, ViInsertMode,␣
↪EmacsInsertMode

ip = get_ipython()
insert_mode = ViInsertMode() | EmacsInsertMode()

def insert_unexpected(event):
    buf = event.current_buffer
    buf.insert_text('The Spanish Inquisition')
```

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```
# Register the shortcut if IPython is using prompt_toolkit
if getattr(ip, 'pt_app', None):
    registry = ip.pt_app.key_bindings
    registry.add_binding(Keys.ControlN,
                     filter=(HasFocus(DEFAULT_BUFFER)
                             & ~HasSelection()
                             & insert_mode))(insert_unexpected)
```

Here is a second example that bind the key sequence `j`, `k` to switch to VI input mode to `Normal` when in insert mode:

```
from IPython import get_ipython
from prompt_toolkit.enums import DEFAULT_BUFFER
from prompt_toolkit.filters import HasFocus, ViInsertMode
from prompt_toolkit.key_binding.vi_state import InputMode

ip = get_ipython()

def switch_to_navigation_mode(event):
   vi_state = event.cli.vi_state
   vi_state.input_mode = InputMode.NAVIGATION

if getattr(ip, 'pt_app', None):
   registry = ip.pt_app.key_bindings
   registry.add_binding(u'j',u'k',
                        filter=(HasFocus(DEFAULT_BUFFER)
                                 & ViInsertMode()))(switch_to_navigation_mode)
```

For more information on filters and what you can do with the `event` object, see the prompt_toolkit docs.

Enter to execute

In the Terminal IPython shell – which by default uses the `prompt_toolkit` interface, the semantic meaning of pressing the `Enter` key can be ambiguous. In some case `Enter` should execute code, and in others it should add a new line. IPython uses heuristics to decide whether to execute or insert a new line at cursor position. For example, if we detect that the current code is not valid Python, then the user is likely editing code and the right behavior is to likely to insert a new line. If the current code is a simple statement like `ord('*')`, then the right behavior is likely to execute. Though the exact desired semantics often varies from users to users.

As the exact behavior of `Enter` is ambiguous, it has been special cased to allow users to completely configure the behavior they like. Hence you can have enter always execute code. If you prefer fancier behavior, you need to get your hands dirty and read the `prompt_toolkit` and IPython documentation though. See PR #10500, set the `c.TerminalInteractiveShell.handle_return` option and get inspiration from the following example that only auto-executes the input if it begins with a bang or a modulo character (`!` or `%`). To use the following code, add it to your IPython configuration:

```
def custom_return(shell):

    """This function is required by the API. It takes a reference to
    the shell, which is the same thing `get_ipython()` evaluates to.
    This function must return a function that handles each keypress
    event. That function, named `handle` here, references `shell`
    by closure."""

    def handle(event):
```

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```
        """This function is called each time `Enter` is pressed,
        and takes a reference to a Prompt Toolkit event object.
        If the current input starts with a bang or modulo, then
        the input is executed, otherwise a newline is entered,
        followed by any spaces needed to auto-indent."""

        # set up a few handy references to nested items...

        buffer = event.current_buffer
        document = buffer.document
        text = document.text

        if text.startswith('!') or text.startswith('%'): # execute the input...

            buffer.accept_action.validate_and_handle(event.cli, buffer)

        else: # insert a newline with auto-indentation...

            if document.line_count > 1: text = text[:document.cursor_position]
            indent = shell.check_complete(text)[1]
            buffer.insert_text('\n' + indent)

            # if you just wanted a plain newline without any indentation, you
            # could use `buffer.insert_text('\n')` instead of the lines above

    return handle

c.TerminalInteractiveShell.handle_return = custom_return
```

See also:

Overview of the IPython configuration system Technical details of the config system.

5.2 Extending and integrating with IPython

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

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5.2.1 IPython extensions

A level above configuration are IPython extensions, Python modules which modify the behaviour of the shell. They are referred to by an importable module name, and can be placed anywhere you'd normally import from, or in `.ipython/extensions/`.

Getting extensions

A few important extensions are *bundled with IPython*. Others can be found on the extensions index on the wiki, and the Framework :: IPython tag on PyPI.

Extensions on PyPI can be installed using `pip`, like any other Python package.

Using extensions

To load an extension while IPython is running, use the `%load_ext` magic:

```
In [1]: %load_ext myextension
```

To load it each time IPython starts, list it in your configuration file:

```
c.InteractiveShellApp.extensions = [
    'myextension'
]
```

Writing extensions

An IPython extension is an importable Python module that has a couple of special functions to load and unload it. Here is a template:

```
# myextension.py

def load_ipython_extension(ipython):
    # The `ipython` argument is the currently active `InteractiveShell`
    # instance, which can be used in any way. This allows you to register
    # new magics or aliases, for example.

def unload_ipython_extension(ipython):
    # If you want your extension to be unloadable, put that logic here.
```

This `load_ipython_extension()` function is called after your extension is imported, and the currently active *`InteractiveShell`* instance is passed as the only argument. You can do anything you want with IPython at that point.

`load_ipython_extension()` will not be called again if the user use `%load_extension`. The user have to explicitly ask the extension to be reloaded (with `%reload_extension`). In case where the use ask the extension to be reloaded, , the extension will be unloaded (with `unload_ipython_extension`), and loaded again.

Useful `InteractiveShell` methods include *`register_magic_function()`*, *`push()`* (to add variables to the user namespace) and *`drop_by_id()`* (to remove variables on unloading).

See also:

Defining custom magics

You can put your extension modules anywhere you want, as long as they can be imported by Python's standard import mechanism. However, to make it easy to write extensions, you can also put your extensions in `extensions/` within the *IPython directory*. This directory is added to `sys.path` automatically.

When your extension is ready for general use, please add it to the extensions index. We also encourage you to upload it to PyPI and use the `Framework :: IPython` classifier, so that users can install it with standard packaging tools.

Extensions bundled with IPython

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autoreload

%autoreload

IPython extension to reload modules before executing user code.

`autoreload` reloads modules automatically before entering the execution of code typed at the IPython prompt.

This makes for example the following workflow possible:

```
In [1]: %load_ext autoreload

In [2]: %autoreload 2

In [3]: from foo import some_function

In [4]: some_function()
Out[4]: 42

In [5]: # open foo.py in an editor and change some_function to return 43

In [6]: some_function()
Out[6]: 43
```

The module was reloaded without reloading it explicitly, and the object imported with `from foo import ...` was also updated.

Usage

The following magic commands are provided:

`%autoreload`

Reload all modules (except those excluded by `%aimport`) automatically now.

`%autoreload 0`

Disable automatic reloading.

`%autoreload 1`

Reload all modules imported with `%aimport` every time before executing the Python code typed.

`%autoreload 2`

Reload all modules (except those excluded by `%aimport`) every time before executing the Python code typed.

`%aimport`

List modules which are to be automatically imported or not to be imported.

`%aimport foo`

Import module 'foo' and mark it to be autoreloaded for `%autoreload 1`

`%aimport foo, bar`

Import modules 'foo', 'bar' and mark them to be autoreloaded for `%autoreload 1`

`%aimport -foo`

Mark module 'foo' to not be autoreloaded.

Caveats

Reloading Python modules in a reliable way is in general difficult, and unexpected things may occur. `%autoreload` tries to work around common pitfalls by replacing function code objects and parts of classes previously in the module with new versions. This makes the following things to work:

- Functions and classes imported via 'from xxx import foo' are upgraded to new versions when 'xxx' is reloaded.
- Methods and properties of classes are upgraded on reload, so that calling 'c.foo()' on an object 'c' created before the reload causes the new code for 'foo' to be executed.

Some of the known remaining caveats are:

- Replacing code objects does not always succeed: changing a @property in a class to an ordinary method or a method to a member variable can cause problems (but in old objects only).
- Functions that are removed (eg. via monkey-patching) from a module before it is reloaded are not upgraded.
- C extension modules cannot be reloaded, and so cannot be autoreloaded.

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storemagic

%store magic for lightweight persistence.

Stores variables, aliases and macros in IPython's database.

To automatically restore stored variables at startup, add this to your `ipython_config.py` file:

```
c.StoreMagics.autorestore = True
```

`StoreMagics.`**`store`**`(`*parameter_s=''*`)`

Lightweight persistence for python variables.

Example:

```
In [1]: l = ['hello',10,'world']
In [2]: %store l
In [3]: exit

(IPython session is closed and started again...)

ville@badger:~$ ipython
In [1]: l
NameError: name 'l' is not defined
In [2]: %store -r
In [3]: l
Out[3]: ['hello', 10, 'world']
```

Usage:

- **`%store` - Show list of all variables and their current** values
- **`%store spam` - Store the *current* value of the variable spam** to disk
- `%store -d spam` - Remove the variable and its value from storage
- `%store -z` - Remove all variables from storage
- **`%store -r` - Refresh all variables from store (overwrite** current vals)
- **`%store -r spam bar` - Refresh specified variables from store** (delete current val)
- `%store foo >a.txt` - Store value of foo to new file a.txt
- `%store foo >>a.txt` - Append value of foo to file a.txt

It should be noted that if you change the value of a variable, you need to %store it again if you want to persist the new value.

Note also that the variables will need to be pickleable; most basic python types can be safely %store'd.

Also aliases can be %store'd across sessions.

- `octavemagic` used to be bundled, but is now part of oct2py. Use `%load_ext oct2py.ipython` to load it.
- `rmagic` is now part of rpy2. Use `%load_ext rpy2.ipython` to load it, and see `rpy2.ipython.rmagic` for details of how to use it.
- `cythonmagic` used to be bundled, but is now part of cython Use `%load_ext Cython` to load it.
- `sympyprinting` used to be a bundled extension, but you should now use `sympy.init_printing()` instead.

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5.2.2 Integrating your objects with IPython

Tab completion

To change the attributes displayed by tab-completing your object, define a `__dir__(self)` method for it. For more details, see the documentation of the built-in dir() function.

You can also customise key completions for your objects, e.g. pressing tab after `obj["a`. To do so, define a method `_ipython_key_completions_()`, which returns a list of objects which are possible keys in a subscript expression `obj[key]`.

New in version 5.0: Custom key completions

Rich display

The notebook and the Qt console can display richer representations of objects. To use this, you can define any of a number of `_repr_*_()` methods. Note that these are surrounded by single, not double underscores.

Both the notebook and the Qt console can display `svg`, `png` and `jpeg` representations. The notebook can also display `html`, `javascript`, `markdown` and `latex`. If the methods don't exist, or return `None`, it falls back to a standard `repr()`.

For example:

```
class Shout(object):
    def __init__(self, text):
        self.text = text

    def _repr_html_(self):
        return "<h1>" + self.text + "</h1>"
```

We often want to provide frontends with guidance on how to display the data. To support this, `_repr_*_()` methods can also return a `(data, metadata)` tuple where `metadata` is a dictionary containing arbitrary key-value pairs for the frontend to interpret. An example use case is `_repr_jpeg_()`, which can be set to return a jpeg image and a `{'height': 400, 'width': 600}` dictionary to inform the frontend how to size the image.

There are also two more powerful display methods:

class MyObject

_repr_mimebundle_(*include=None*, *exclude=None*)
Should return a dictionary of multiple formats, keyed by mimetype, or a tuple of two dictionaries: *data, metadata*. If this returns something, other `_repr_*_` methods are ignored. The method should take keyword arguments `include` and `exclude`, though it is not required to respect them.

_ipython_display_()
Displays the object as a side effect; the return value is ignored. If this is defined, all other display methods are ignored.

To customize how the REPL pretty-prints your object, add a `_repr_pretty_` method to the class. The method should accept a pretty printer, and a boolean that indicates whether the printer detected a cycle. The method should act on the printer to produce your customized pretty output. Here is an example:

```
class MyObject(object):

    def _repr_pretty_(self, p, cycle):
        if cycle:
            p.text('MyObject(...)')
        else:
            p.text('MyObject[...]')
```

For details, see *`IPython.lib.pretty`*.

Formatters for third-party types

The user can also register formatters for types without modifying the class:

```
from bar import Foo

def foo_html(obj):
    return '<marquee>Foo object %s</marquee>' % obj.name

html_formatter = get_ipython().display_formatter.formatters['text/html']
html_formatter.for_type(Foo, foo_html)

# Or register a type without importing it - this does the same as above:
html_formatter.for_type_by_name('bar.Foo', foo_html)
```

Custom exception tracebacks

Rarely, you might want to display a custom traceback when reporting an exception. To do this, define the custom traceback using `_render_traceback_(self)` method which returns a list of strings, one string for each line of the traceback. For example, the ipyparallel a parallel computing framework for IPython, does this to display errors from multiple engines.

Please be conservative in using this feature; by replacing the default traceback you may hide important information from the user.

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5.2.3 Defining custom magics

There are two main ways to define your own magic functions: from standalone functions and by inheriting from a base class provided by IPython: *IPython.core.magic.Magics*. Below we show code you can place in a file that you load from your configuration, such as any file in the `startup` subdirectory of your default IPython profile.

First, let us see the simplest case. The following shows how to create a line magic, a cell one and one that works in both modes, using just plain functions:

```
from IPython.core.magic import (register_line_magic, register_cell_magic,
                                register_line_cell_magic)

@register_line_magic
def lmagic(line):
    "my line magic"
    return line

@register_cell_magic
def cmagic(line, cell):
    "my cell magic"
    return line, cell

@register_line_cell_magic
def lcmagic(line, cell=None):
    "Magic that works both as %lcmagic and as %%lcmagic"
    if cell is None:
        print("Called as line magic")
        return line
    else:
        print("Called as cell magic")
        return line, cell

# In an interactive session, we need to delete these to avoid
# name conflicts for automagic to work on line magics.
del lmagic, lcmagic
```

You can also create magics of all three kinds by inheriting from the *IPython.core.magic.Magics* class. This lets you create magics that can potentially hold state in between calls, and that have full access to the main IPython object:

```
# This code can be put in any Python module, it does not require IPython
# itself to be running already.  It only creates the magics subclass but
# doesn't instantiate it yet.
from __future__ import print_function
from IPython.core.magic import (Magics, magics_class, line_magic,
                                cell_magic, line_cell_magic)

# The class MUST call this class decorator at creation time
@magics_class
class MyMagics(Magics):

    @line_magic
    def lmagic(self, line):
        "my line magic"
        print("Full access to the main IPython object:", self.shell)
        print("Variables in the user namespace:", list(self.shell.user_ns.keys()))
        return line
```

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```
    @cell_magic
    def cmagic(self, line, cell):
        "my cell magic"
        return line, cell

    @line_cell_magic
    def lcmagic(self, line, cell=None):
        "Magic that works both as %lcmagic and as %%lcmagic"
        if cell is None:
            print("Called as line magic")
            return line
        else:
            print("Called as cell magic")
            return line, cell


# In order to actually use these magics, you must register them with a
# running IPython.

def load_ipython_extension(ipython):
    """
    Any module file that define a function named `load_ipython_extension`
    can be loaded via `%load_ext module.path` or be configured to be
    autoloaded by IPython at startup time.
    """
    # You can register the class itself without instantiating it.  IPython will
    # call the default constructor on it.
    ipython.register_magics(MyMagics)
```

If you want to create a class with a different constructor that holds additional state, then you should always call the parent constructor and instantiate the class yourself before registration:

```
@magics_class
class StatefulMagics(Magics):
    "Magics that hold additional state"

    def __init__(self, shell, data):
        # You must call the parent constructor
        super(StatefulMagics, self).__init__(shell)
        self.data = data

    # etc...

def load_ipython_extension(ipython):
    """
    Any module file that define a function named `load_ipython_extension`
    can be loaded via `%load_ext module.path` or be configured to be
    autoloaded by IPython at startup time.
    """
    # This class must then be registered with a manually created instance,
    # since its constructor has different arguments from the default:
    magics = StatefulMagics(ipython, some_data)
    ipython.register_magics(magics)
```

Note: In early IPython versions 0.12 and before the line magics were created using a `define_magic()` API function. This API has been replaced with the above in IPython 0.13 and then completely removed in IPython 5.

Maintainers of IPython extensions that still use the `define_magic()` function are advised to adjust their code for the current API.

5.2.4 Complete Example

Here is a full example of a magic package. You can distribute magics using setuptools, distutils, or any other distribution tools like flit for pure Python packages.

```
.
├── example_magic
│   ├── __init__.py
│   └── abracadabra.py
└── setup.py
```

```
$ cat example_magic/__init__.py
"""An example magic"""
__version__ = '0.0.1'

from .abracadabra import Abracadabra

def load_ipython_extension(ipython):
    ipython.register_magics(Abracadabra)
```

```
$ cat example_magic/abracadabra.py
from IPython.core.magic import (Magics, magics_class, line_magic, cell_magic)

@magics_class
class Abracadabra(Magics):

    @line_magic
    def abra(self, line):
        return line

    @cell_magic
    def cadabra(self, line, cell):
        return line, cell
```

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5.2.5 Custom input transformation

IPython extends Python syntax to allow things like magic commands, and help with the `?` syntax. There are several ways to customise how the user's input is processed into Python code to be executed.

These hooks are mainly for other projects using IPython as the core of their interactive interface. Using them carelessly can easily break IPython!

String based transformations

When the user enters code, it is first processed as a string. By the end of this stage, it must be valid Python syntax.

Changed in version 7.0: The API for string and token-based transformations has been completely redesigned. Any third party code extending input transformation will need to be rewritten. The new API is, hopefully, simpler.

String based transformations are functions which accept a list of strings: each string is a single line of the input cell, including its line ending. The transformation function should return output in the same structure.

These transformations are in two groups, accessible as attributes of the *InteractiveShell* instance. Each group is a list of transformation functions.

- `input_transformers_cleanup` run first on input, to do things like stripping prompts and leading indents from copied code. It may not be possible at this stage to parse the input as valid Python code.
- Then IPython runs its own transformations to handle its special syntax, like `%magics` and `!system` commands. This part does not expose extension points.
- `input_transformers_post` run as the last step, to do things like converting float literals into decimal objects. These may attempt to parse the input as Python code.

These transformers may raise `SyntaxError` if the input code is invalid, but in most cases it is clearer to pass unrecognised code through unmodified and let Python's own parser decide whether it is valid.

For example, imagine we want to obfuscate our code by reversing each line, so we'd write `)5(f =+ a` instead of `a += f(5)`. Here's how we could swap it back the right way before IPython tries to run it:

```python
def reverse_line_chars(lines):
    new_lines = []
    for line in lines:
        chars = line[:-1]  # the newline needs to stay at the end
        new_lines.append(chars[::-1] + '\n')
    return new_lines
```

To start using this:

```python
ip = get_ipython()
ip.input_transformers_cleanup.append(reverse_line_chars)
```

AST transformations

After the code has been parsed as Python syntax, you can use Python's powerful *Abstract Syntax Tree* tools to modify it. Subclass `ast.NodeTransformer`, and add an instance to `shell.ast_transformers`.

This example wraps integer literals in an `Integer` class, which is useful for mathematical frameworks that want to handle e.g. `1/3` as a precise fraction:

```python
class IntegerWrapper(ast.NodeTransformer):
    """Wraps all integers in a call to Integer()"""
    def visit_Num(self, node):
        if isinstance(node.n, int):
            return ast.Call(func=ast.Name(id='Integer', ctx=ast.Load()),
                            args=[node], keywords=[])
        return node
```

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5.2.6 IPython Events

Extension code can register callbacks functions which will be called on specific events within the IPython code. You can see the current list of available callbacks, and the parameters that will be passed with each, in the callback prototype functions defined in `IPython.core.events`.

To register callbacks, use `IPython.core.events.EventManager.register()`. For example:

```python
class VarWatcher(object):
    def __init__(self, ip):
        self.shell = ip
        self.last_x = None

    def pre_execute(self):
        self.last_x = self.shell.user_ns.get('x', None)

    def pre_run_cell(self, info):
        print('Cell code: "%s"' % info.raw_cell)

    def post_execute(self):
        if self.shell.user_ns.get('x', None) != self.last_x:
            print("x changed!")

    def post_run_cell(self, result):
        print('Cell code: "%s"' % result.info.raw_cell)
        if result.error_before_exec:
            print('Error before execution: %s' % result.error_before_exec)

def load_ipython_extension(ip):
    vw = VarWatcher(ip)
    ip.events.register('pre_execute', vw.pre_execute)
    ip.events.register('pre_run_cell', vw.pre_run_cell)
    ip.events.register('post_execute', vw.post_execute)
    ip.events.register('post_run_cell', vw.post_run_cell)
```

Events

These are the events IPython will emit. Callbacks will be passed no arguments, unless otherwise specified.

shell_initialized

```
def shell_initialized(ipython):
    ...
```

This event is triggered only once, at the end of setting up IPython. Extensions registered to load by default as part of configuration can use this to execute code to finalize setup. Callbacks will be passed the InteractiveShell instance.

pre_run_cell

`pre_run_cell` fires prior to interactive execution (e.g. a cell in a notebook). It can be used to note the state prior to execution, and keep track of changes. An object containing information used for the code execution is provided as an argument.

pre_execute

`pre_execute` is like `pre_run_cell`, but is triggered prior to *any* execution. Sometimes code can be executed by libraries, etc. which skipping the history/display mechanisms, in which cases `pre_run_cell` will not fire.

post_run_cell

`post_run_cell` runs after interactive execution (e.g. a cell in a notebook). It can be used to cleanup or notify or perform operations on any side effects produced during execution. For instance, the inline matplotlib backend uses this event to display any figures created but not explicitly displayed during the course of the cell. The object which will be returned as the execution result is provided as an argument.

post_execute

The same as `pre_execute`, `post_execute` is like `post_run_cell`, but fires for *all* executions, not just interactive ones.

See also:

Module `IPython.core.hooks` The older 'hooks' system allows end users to customise some parts of IPython's behaviour.

Custom input transformation By registering input transformers that don't change code, you can monitor what is being executed.

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5.2.7 Integrating with GUI event loops

When the user types `%gui qt`, IPython integrates itself with the Qt event loop, so you can use both a GUI and an interactive prompt together. IPython supports a number of common GUI toolkits, but from IPython 3.0, it is possible to integrate other event loops without modifying IPython itself.

Supported event loops include `qt4`, `qt5`, `gtk2`, `gtk3`, `wx`, `osx` and `tk`. Make sure the event loop you specify matches the GUI toolkit used by your own code.

To make IPython GUI event loop integration occur automatically at every startup, set the `c.InteractiveShellApp.gui` configuration key in your IPython profile (see *Setting configurable options*).

If the event loop you use is supported by IPython, turning on event loop integration follows the steps just described whether you use Terminal IPython or an IPython kernel.

However, the way Terminal IPython handles event loops is very different from the way IPython kernel does, so if you need to integrate with a new kind of event loop, different steps are needed to integrate with each.

Integrating with a new event loop in the terminal

Changed in version 5.0: There is a new API for event loop integration using prompt_toolkit.

In the terminal, IPython uses prompt_toolkit to prompt the user for input. prompt_toolkit provides hooks to integrate with an external event loop.

To integrate an event loop, define a function which runs the GUI event loop until there is input waiting for prompt_toolkit to process. There are two ways to detect this condition:

```python
# Polling for input.
def inputhook(context):
    while not context.input_is_ready():
        # Replace this with the appropriate call for the event loop:
        iterate_loop_once()

# Using a file descriptor to notify the event loop to stop.
def inputhook2(context):
    fd = context.fileno()
    # Replace the functions below with those for the event loop.
    add_file_reader(fd, callback=stop_the_loop)
    run_the_loop()
```

Once you have defined this function, register it with IPython:

`IPython.terminal.pt_inputhooks.`**`register`**`(`*name*, *inputhook*`)`

Register the function *inputhook* as the event loop integration for the GUI *name*. If `name='foo'`, then the user can enable this integration by running `%gui foo`.

Integrating with a new event loop in the kernel

The kernel runs its own event loop, so it's simpler to integrate with others. IPython allows the other event loop to take control, but it must call `IPython.kernel.zmq.kernelbase.Kernel.do_one_iteration()` periodically.

To integrate with this, write a function that takes a single argument, the IPython kernel instance, arranges for your event loop to call `kernel.do_one_iteration()` at least every `kernel._poll_interval` seconds, and starts the event loop.

Decorate this function with `IPython.kernel.zmq.eventloops.register_integration()`, passing in the names you wish to register it for. Here is a slightly simplified version of the Tkinter integration already included in IPython:

```
@register_integration('tk')
def loop_tk(kernel):
    """Start a kernel with the Tk event loop."""
    from tkinter import Tk

    # Tk uses milliseconds
    poll_interval = int(1000*kernel._poll_interval)
    # For Tkinter, we create a Tk object and call its withdraw method.
    class Timer(object):
        def __init__(self, func):
            self.app = Tk()
            self.app.withdraw()
            self.func = func

        def on_timer(self):
            self.func()
            self.app.after(poll_interval, self.on_timer)

        def start(self):
            self.on_timer()  # Call it once to get things going.
            self.app.mainloop()

    kernel.timer = Timer(kernel.do_one_iteration)
    kernel.timer.start()
```

Some event loops can go one better, and integrate checking for messages on the kernel's ZMQ sockets, making the kernel more responsive than plain polling. How to do this is outside the scope of this document; if you are interested, look at the integration with Qt in `IPython.kernel.zmq.eventloops`.

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CHAPTER 6

Developer's guide for third party tools and libraries

Important: This guide contains information for developers of third party tools and libraries that use IPython. Alternatively, documentation for core **IPython** development can be found in the *Guide for IPython core Developers*.

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6.1 How IPython works

6.1.1 Terminal IPython

When you type `ipython`, you get the original IPython interface, running in the terminal. It does something like this:

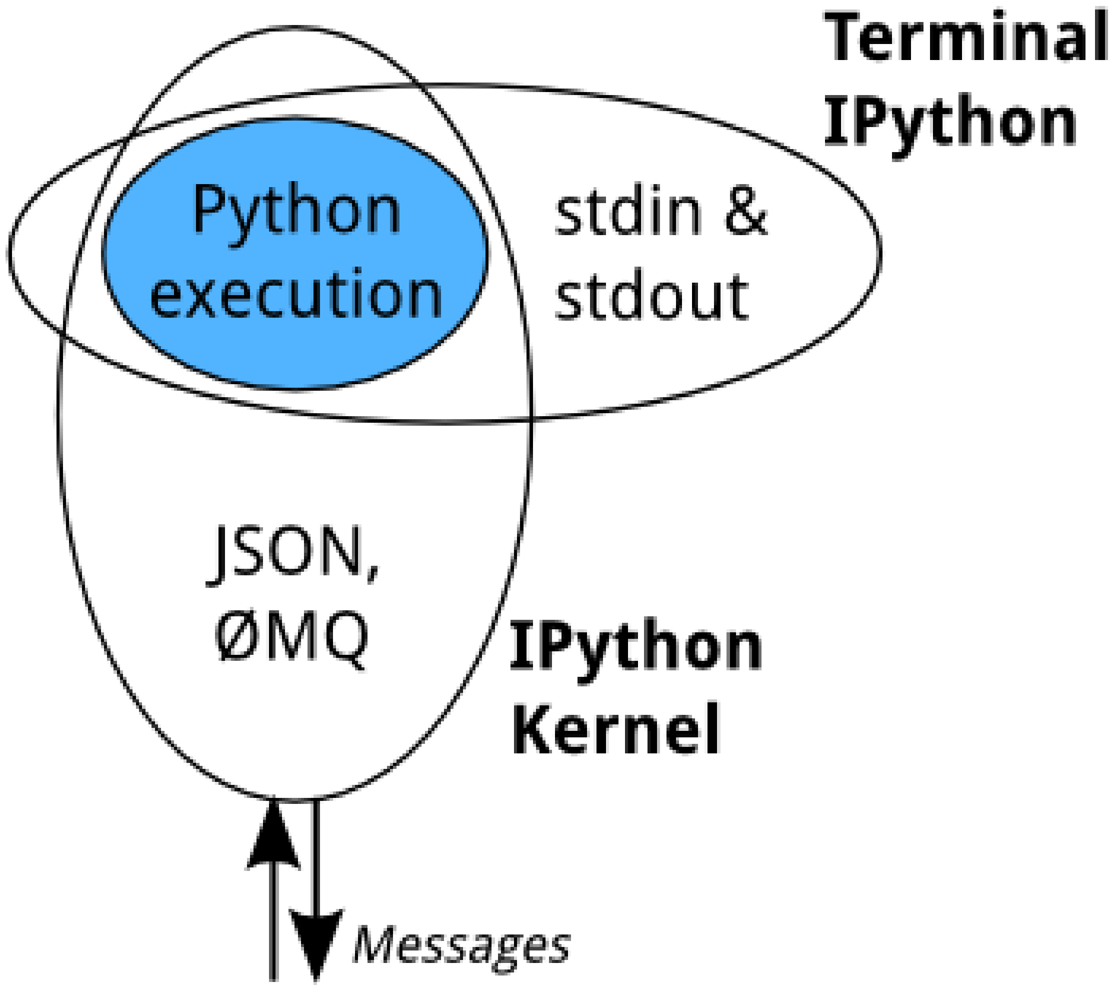
```
while True:
    code = input(">>> ")
    exec(code)
```

Of course, it's much more complex, because it has to deal with multi-line code, tab completion using `readline`, magic commands, and so on. But the model is like that: prompt the user for some code, and when they've entered it, exec it in the same process. This model is often called a REPL, or Read-Eval-Print-Loop.

6.1.2 The IPython Kernel

All the other interfaces—the Notebook, the Qt console, `ipython console` in the terminal, and third party interfaces—use the IPython Kernel. This is a separate process which is responsible for running user code, and things like computing possible completions. Frontends communicate with it using JSON messages sent over ZeroMQ sockets; the protocol they use is described in Messaging in Jupyter.

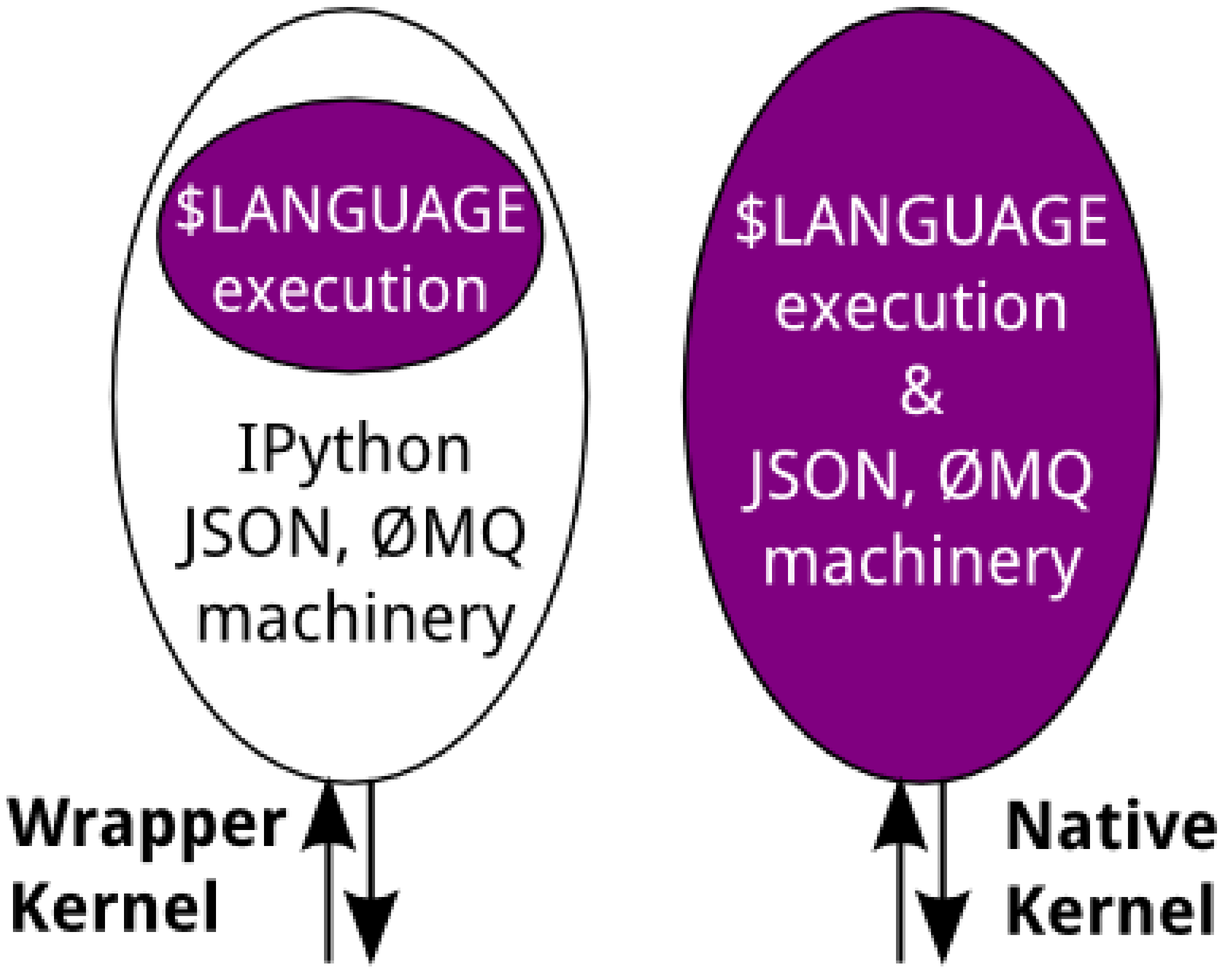
The core execution machinery for the kernel is shared with terminal IPython:



A kernel process can be connected to more than one frontend simultaneously. In this case, the different frontends will have access to the same variables.

This design was intended to allow easy development of different frontends based on the same kernel, but it also made it possible to support new languages in the same frontends, by developing kernels in those languages, and we are refining IPython to make that more practical.

Today, there are two ways to develop a kernel for another language. Wrapper kernels reuse the communications machinery from IPython, and implement only the core execution part. Native kernels implement execution and communications in the target language:



Wrapper kernels are easier to write quickly for languages that have good Python wrappers, like octave_kernel, or languages where it's impractical to implement the communications machinery, like bash_kernel. Native kernels are likely to be better maintained by the community using them, like IJulia or IHaskell.

See also:

Making kernels for Jupyter

Making simple Python wrapper kernels

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6.2 Making simple Python wrapper kernels

New in version 3.0.

You can now re-use the kernel machinery in IPython to easily make new kernels. This is useful for languages that have Python bindings, such as Octave (via Oct2Py), or languages where the REPL can be controlled in a tty using pexpect, such as bash.

See also:

bash_kernel A simple kernel for bash, written using this machinery

6.2.1 Required steps

Subclass `ipykernel.kernelbase.Kernel`, and implement the following methods and attributes:

`class MyKernel`

`implementation`
`implementation_version`
`language`
`language_version`
`banner`

Information for Kernel info replies. 'Implementation' refers to the kernel (e.g. IPython), and 'language' refers to the language it interprets (e.g. Python). The 'banner' is displayed to the user in console UIs before the first prompt. All of these values are strings.

`language_info`

Language information for Kernel info replies, in a dictionary. This should contain the key `mimetype` with the mimetype of code in the target language (e.g. `'text/x-python'`), and `file_extension` (e.g. `'py'`). It may also contain keys `codemirror_mode` and `pygments_lexer` if they need to differ from *`language`*.

Other keys may be added to this later.

`do_execute`(*code*, *silent*, *store_history=True*, *user_expressions=None*, *allow_stdin=False*)

Execute user code.

Parameters

- **`code`** (*`str`*) – The code to be executed.
- **`silent`** (*`bool`*) – Whether to display output.
- **`store_history`** (*`bool`*) – Whether to record this code in history and increase the execution count. If silent is True, this is implicitly False.
- **`user_expressions`** (*`dict`*) – Mapping of names to expressions to evaluate after the code has run. You can ignore this if you need to.
- **`allow_stdin`** (*`bool`*) – Whether the frontend can provide input on request (e.g. for Python's `raw_input()`).

Your method should return a dict containing the fields described in Execution results. To display output, it can send messages using `send_response()`. See messaging for details of the different message types.

To launch your kernel, add this at the end of your module:

```
if __name__ == '__main__':
    from ipykernel.kernelapp import IPKernelApp
    IPKernelApp.launch_instance(kernel_class=MyKernel)
```

6.2.2 Example

`echokernel.py` will simply echo any input it's given to stdout:

```
from ipykernel.kernelbase import Kernel

class EchoKernel(Kernel):
    implementation = 'Echo'
    implementation_version = '1.0'
    language = 'no-op'
    language_version = '0.1'
    language_info = {'mimetype': 'text/plain'}
    banner = "Echo kernel - as useful as a parrot"

    def do_execute(self, code, silent, store_history=True, user_expressions=None,
                   allow_stdin=False):
        if not silent:
            stream_content = {'name': 'stdout', 'text': code}
            self.send_response(self.iopub_socket, 'stream', stream_content)

        return {'status': 'ok',
                # The base class increments the execution count
                'execution_count': self.execution_count,
                'payload': [],
                'user_expressions': {},
               }

if __name__ == '__main__':
    from ipykernel.kernelapp import IPKernelApp
    IPKernelApp.launch_instance(kernel_class=EchoKernel)
```

Here's the Kernel spec `kernel.json` file for this:

```
{"argv":["python","-m","echokernel", "-f", "{connection_file}"],
 "display_name":"Echo"
}
```

6.2.3 Optional steps

You can override a number of other methods to improve the functionality of your kernel. All of these methods should return a dictionary as described in the relevant section of the messaging spec.

class MyKernel

do_complete(*code*, *cusor_pos*)
Code completion

Parameters

- **code** (*str*) – The code already present

- **cursor_pos** (*int*) – The position in the code where completion is requested

See also:

Completion messages

do_inspect (*code*, *cusor_pos*, *detail_level=0*)
Object introspection

Parameters

- **code** (*str*) – The code
- **cursor_pos** (*int*) – The position in the code where introspection is requested
- **detail_level** (*int*) – 0 or 1 for more or less detail. In IPython, 1 gets the source code.

See also:

Introspection messages

do_history (*hist_access_type*, *output*, *raw*, *session=None*, *start=None*, *stop=None*, *n=None*, *pattern=None*, *unique=False*)
History access. Only the relevant parameters for the type of history request concerned will be passed, so your method definition must have defaults for all the arguments shown with defaults here.

See also:

History messages

do_is_complete (*code*)
Is code entered in a console-like interface complete and ready to execute, or should a continuation prompt be shown?

Parameters **code** (*str*) – The code entered so far - possibly multiple lines

See also:

Code completeness messages

do_shutdown (*restart*)
Shutdown the kernel. You only need to handle your own clean up - the kernel machinery will take care of cleaning up its own things before stopping.

Parameters **restart** (*bool*) – Whether the kernel will be started again afterwards

See also:

Kernel shutdown messages

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6.3 Execution semantics in the IPython kernel

The execution of user code consists of the following phases:

1. Fire the `pre_execute` event.
2. Fire the `pre_run_cell` event unless silent is `True`.
3. Execute the `code` field, see below for details.
4. If execution succeeds, expressions in `user_expressions` are computed. This ensures that any error in the expressions don't affect the main code execution.
5. Fire the `post_execute` event.
6. Fire the `post_run_cell` event unless silent is `True`.

See also:

IPython Events

To understand how the `code` field is executed, one must know that Python code can be compiled in one of three modes (controlled by the `mode` argument to the `compile()` builtin):

single Valid for a single interactive statement (though the source can contain multiple lines, such as a for loop). When compiled in this mode, the generated bytecode contains special instructions that trigger the calling of `sys.displayhook()` for any expression in the block that returns a value. This means that a single statement can actually produce multiple calls to `sys.displayhook()`, if for example it contains a loop where each iteration computes an unassigned expression would generate 10 calls:

```
for i in range(10):
    i**2
```

exec An arbitrary amount of source code, this is how modules are compiled. `sys.displayhook()` is *never* implicitly called.

eval A single expression that returns a value. `sys.displayhook()` is *never* implicitly called.

The `code` field is split into individual blocks each of which is valid for execution in 'single' mode, and then:

- If there is only a single block: it is executed in 'single' mode.
- If there is more than one block:
  - if the last one is a single line long, run all but the last in 'exec' mode and the very last one in 'single' mode. This makes it easy to type simple expressions at the end to see computed values.
  - if the last one is no more than two lines long, run all but the last in 'exec' mode and the very last one in 'single' mode. This makes it easy to type simple expressions at the end to see computed values. - otherwise (last one is also multiline), run all in 'exec' mode
  - otherwise (last one is also multiline), run all in 'exec' mode as a single unit.

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6.4 New IPython Console Lexer

New in version 2.0.0.

The IPython console lexer has been rewritten and now supports tracebacks and customized input/output prompts. An entire suite of lexers is now available at *IPython.lib.lexers*. These include:

IPythonLexer & IPython3Lexer Lexers for pure IPython (python + magic/shell commands)

IPythonPartialTracebackLexer & IPythonTracebackLexer Supports 2.x and 3.x via the keyword `python3`. The partial traceback lexer reads everything but the Python code appearing in a traceback. The full lexer combines the partial lexer with an IPython lexer.

IPythonConsoleLexer A lexer for IPython console sessions, with support for tracebacks. Supports 2.x and 3.x via the keyword `python3`.

IPyLexer A friendly lexer which examines the first line of text and from it, decides whether to use an IPython lexer or an IPython console lexer. Supports 2.x and 3.x via the keyword `python3`.

Previously, the `IPythonConsoleLexer` class was available at `IPython.sphinxext.ipython_console_hightlight`. It was inserted into Pygments' list of available lexers under the name `ipython`. It should be mentioned that this name is inaccurate, since an IPython console session is not the same as IPython code (which itself is a superset of the Python language).

Now, the Sphinx extension inserts two console lexers into Pygments' list of available lexers. Both are IPyLexer instances under the names: `ipython` and `ipython3`. Although the names can be confusing (as mentioned above), their continued use is, in part, to maintain backwards compatibility and to aid typical usage. If a project needs to make Pygments aware of more than just the IPyLexer class, then one should not make the IPyLexer class available under the name `ipython` and use `ipy` or some other non-conflicting value.

Code blocks such as:

```
.. code-block:: ipython

    In [1]: 2**2
    Out[1]: 4
```

will continue to work as before, but now, they will also properly highlight tracebacks. For pure IPython code, the same lexer will also work:

```
.. code-block:: ipython

    x = ''.join(map(str, range(10)))
    !echo $x
```

Since the first line of the block did not begin with a standard IPython console prompt, the entire block is assumed to consist of IPython code instead.

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6.5 Overview of the IPython configuration system

This section describes the IPython configuration system. This is based on `traitlets.config`; see that documentation for more information about the overall architecture.

6.5.1 Configuration file location

So where should you put your configuration files? IPython uses "profiles" for configuration, and by default, all profiles will be stored in the so called "IPython directory". The location of this directory is determined by the following algorithm:

- If the `ipython-dir` command line flag is given, its value is used.
- If not, the value returned by *`IPython.paths.get_ipython_dir()`* is used. This function will first look at the *`IPYTHONDIR`* environment variable and then default to `~/.ipython`. Historical support for the `IPYTHON_DIR` environment variable will be removed in a future release.

For most users, the configuration directory will be `~/.ipython`.

Previous versions of IPython on Linux would use the XDG config directory, creating `~/.config/ipython` by default. We have decided to go back to `~/.ipython` for consistency among systems. IPython will issue a warning if it finds the XDG location, and will move it to the new location if there isn't already a directory there.

Once the location of the IPython directory has been determined, you need to know which profile you are using. For users with a single configuration, this will simply be 'default', and will be located in `<IPYTHONDIR>/profile_default`.

The next thing you need to know is what to call your configuration file. The basic idea is that each application has its own default configuration filename. The default named used by the **`ipython`** command line program is `ipython_config.py`, and *all* IPython applications will use this file. The IPython kernel will load its own config file *after* `ipython_config.py`. To load a particular configuration file instead of the default, the name can be overridden by the `config_file` command line flag.

To generate the default configuration files, do:

```
$ ipython profile create
```

and you will have a default `ipython_config.py` in your IPython directory under `profile_default`.

Note: IPython configuration options are case sensitive, and IPython cannot catch misnamed keys or invalid values.

By default IPython will also ignore any invalid configuration files.

New in version 5.0: IPython can be configured to abort in case of invalid configuration file. To do so set the environment variable `IPYTHON_SUPPRESS_CONFIG_ERRORS` to `'1'` or `'true'`

Locating these files

From the command-line, you can quickly locate the IPYTHONDIR or a specific profile with:

```
$ ipython locate
/home/you/.ipython

$ ipython locate profile foo
/home/you/.ipython/profile_foo
```

These map to the utility functions: `IPython.utils.path.get_ipython_dir()` and `IPython.utils.path.locate_profile()` respectively.

6.5.2 Profiles

A profile is a directory containing configuration and runtime files, such as logs, connection info for the parallel apps, and your IPython command history.

The idea is that users often want to maintain a set of configuration files for different purposes: one for doing numerical computing with NumPy and SciPy and another for doing symbolic computing with SymPy. Profiles make it easy to keep a separate configuration files, logs, and histories for each of these purposes.

Let's start by showing how a profile is used:

```
$ ipython --profile=sympy
```

This tells the **`ipython`** command line program to get its configuration from the "sympy" profile. The file names for various profiles do not change. The only difference is that profiles are named in a special way. In the case above, the "sympy" profile means looking for `ipython_config.py` in `<IPYTHONDIR>/profile_sympy`.

The general pattern is this: simply create a new profile with:

```
$ ipython profile create <name>
```

which adds a directory called `profile_<name>` to your IPython directory. Then you can load this profile by adding `--profile=<name>` to your command line options. Profiles are supported by all IPython applications.

IPython ships with some sample profiles in `IPython/config/profile`. If you create profiles with the name of one of our shipped profiles, these config files will be copied over instead of starting with the automatically generated config files.

IPython extends the config loader for Python files so that you can inherit config from another profile. To do this, use a line like this in your Python config file:

```
load_subconfig('ipython_config.py', profile='default')
```

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6.6 IPython GUI Support Notes

IPython allows GUI event loops to be run in an interactive IPython session. This is done using Python's PyOS_InputHook hook which Python calls when the `raw_input()` function is called and waiting for user input. IPython has versions of this hook for wx, pyqt4 and pygtk.

When a GUI program is used interactively within IPython, the event loop of the GUI should *not* be started. This is because, the PyOS_Inputhook itself is responsible for iterating the GUI event loop.

IPython has facilities for installing the needed input hook for each GUI toolkit and for creating the needed main GUI application object. Usually, these main application objects should be created only once and for some GUI toolkits, special options have to be passed to the application object to enable it to function properly in IPython.

We need to answer the following questions:

- Who is responsible for creating the main GUI application object, IPython or third parties (matplotlib, enthought.traits, etc.)?
- What is the proper way for third party code to detect if a GUI application object has already been created? If one has been created, how should the existing instance be retrieved?
- In a GUI application object has been created, how should third party code detect if the GUI event loop is running. It is not sufficient to call the relevant function methods in the GUI toolkits (like `IsMainLoopRunning`) because those don't know if the GUI event loop is running through the input hook.
- We might need a way for third party code to determine if it is running in IPython or not. Currently, the only way of running GUI code in IPython is by using the input hook, but eventually, GUI based versions of IPython will allow the GUI event loop in the more traditional manner. We will need a way for third party code to distinguish between these two cases.

Here is some sample code I have been using to debug this issue:

```python
from matplotlib import pyplot as plt

from enthought.traits import api as traits

class Foo(traits.HasTraits):
    a = traits.Float()

f = Foo()
f.configure_traits()

plt.plot(range(10))
```

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CHAPTER 7

Guide for IPython core Developers

This guide documents the development of IPython itself. Alternatively, developers of third party tools and libraries that use IPython should see the *Developer's guide for third party tools and libraries*.

For instructions on how to make a developer install see *Installing the development version*.

7.1 Backporting Pull requests

All pull requests should usually be made against `master`, if a Pull Request need to be backported to an earlier release; then it should be tagged with the correct `milestone`.

If you tag a pull request with a milestone **before** merging the pull request, and the base ref is `master`, then our backport bot should automatically create a corresponding pull-request that backport on the correct branch.

If you have write access to the IPython repository you can also just mention the **backport bot** to do the work for you. The bot is evolving so instructions may be different. At the time of this writing you can use:

```
@meeseeksdev[bot] backport [to] <branchname>
```

The bot will attempt to backport the current pull-request and issue a PR if possible.

Note: The `@` and `[bot]` when mentioning the bot should be optional and can be omitted.

If the pull request cannot be automatically backported, the bot should tell you so on the PR and apply a "Need manual backport" tag to the origin PR.

7.1.1 Backport with ghpro

We can also use ghpro to automatically list and apply the PR on other branches. For example:

```
$ backport-pr todo --milestone 5.2
[...snip..]
The following PRs have been backported
9848
9851
9953
9955
The following PRs should be backported:
9417
9863
9925
9947

$ backport-pr apply 5.x 9947
[...snip...]
```

7.2 IPython release process

This document contains the process that is used to create an IPython release.

Conveniently, the `release` script in the `tools` directory of the `IPython` repository automates most of the release process. This document serves as a handy reminder and checklist for the release manager.

During the release process, you might need the extra following dependencies:

- `keyring` to access your GitHub authentication tokens
- `graphviz` to generate some graphs in the documentation
- `ghpro` to generate the stats

Make sure you have all the required dependencies to run the tests as well.

7.2.1 1. Set Environment variables

Set environment variables to document previous release tag, current release milestone, current release version, and git tag.

These variables may be used later to copy/paste as answers to the script questions instead of typing the appropriate command when the time comes. These variables are not used by the scripts directly; therefore, there is no need to `export` them. The format for bash is as follows, but note that these values are just an example valid only for the 5.0 release; you'll need to update them for the release you are actually making:

```
PREV_RELEASE=4.2.1
MILESTONE=5.0
VERSION=5.0.0
BRANCH=master
```

7.2.2 2. Create GitHub stats and finish release note

Note: This step is optional if making a Beta or RC release.

Note: Before generating the GitHub stats, verify that all closed issues and pull requests have appropriate milestones. This search should return no results before creating the GitHub stats.

If a major release:

- merge any pull request notes into what's new:

  ```
  python tools/update_whatsnew.py
  ```

- update `docs/source/whatsnew/development.rst`, to ensure it covers the major release features
- move the contents of `development.rst` to `versionX.rst` where `X` is the numerical release version
- generate summary of GitHub contributions, which can be done with:

  ```
  python tools/github_stats.py --milestone $MILESTONE > stats.rst
  ```

  which may need some manual cleanup of `stats.rst`. Add the cleaned `stats.rst` results to `docs/source/whatsnew/github-stats-X.rst` where `X` is the numerical release version (don't forget to add it to the git repository as well). If creating a major release, make a new `github-stats-X.rst` file; if creating a minor release, the content from `stats.rst` may simply be added to the top of an existing `github-stats-X.rst` file.

- Edit `docs/source/whatsnew/index.rst` to list the new `github-stats-X` file you just created.
- You do not need to temporarily remove the first entry called `development`, nor re-add it after the release, it will automatically be hidden when releasing a stable version of IPython (if `_version_extra` in `release.py` is an empty string.

  Make sure that the stats file has a header or it won't be rendered in the final documentation.

To find duplicates and update `.mailmap`, use:

```
git log --format="%aN <%aE>" $PREV_RELEASE... | sort -u -f
```

If a minor release you might need to do some of the above points manually, and forward port the changes.

7.2.3 3. Make sure the repository is clean

of any file that could be problematic. Remove all non-tracked files with:

```
git clean -xfdi
```

This will ask for confirmation before removing all untracked files. Make sure the `dist/` folder is clean to avoid any stale builds from previous build attempts.

7.2.4 4. Update the release version number

Edit `IPython/core/release.py` to have the current version.

in particular, update version number and `_version_extra` content in `IPython/core/release.py`.

Step 5 will validate your changes automatically, but you might still want to make sure the version number matches pep440.

In particular, `rc` and `beta` are not separated by `.` or the `sdist` and `bdist` will appear as different releases. For example, a valid version number for a release candidate (rc) release is: `1.3rc1`. Notice that there is no separator between the '3' and the 'r'. Check the environment variable `$VERSION` as well.

You will likely just have to modify/comment/uncomment one of the lines setting `_version_extra`

7.2.5 5. Run the `tools/build_release` script

Running `tools/build_release` does all the file checking and building that the real release script will do. This makes test installations, checks that the build procedure runs OK, and tests other steps in the release process.

The `build_release` script will in particular verify that the version number match PEP 440, in order to avoid surprise at the time of build upload.

We encourage creating a test build of the docs as well.

7.2.6 6. Create and push the new tag

Commit the changes to release.py:

```
git commit -am "release $VERSION" -S
git push origin $BRANCH
```

(omit the `-S` if you are no signing the package)

Create and push the tag:

```
git tag -am "release $VERSION" "$VERSION" -S
git push origin $VERSION
```

(omit the `-S` if you are no signing the package)

Update release.py back to `x.y-dev` or `x.y-maint`, and re-add the `development` entry in `docs/source/whatsnew/index.rst` and push:

```
git commit -am "back to development" -S
git push origin $BRANCH
```

(omit the `-S` if you are no signing the package)

Now checkout the tag we just made:

```
git checkout $VERSION
```

7.2.7 7. Run the release script

Run the `release` script, this step requires having a current wheel, Python >=3.4 and Python 2.7.:

```
./tools/release
```

This makes the tarballs and wheels, and puts them under the `dist/` folder. Be sure to test the `wheels` and the `sdist` locally before uploading them to PyPI. We do not use an universal wheel as each wheel installs an `ipython2` or `ipython3` script, depending on the version of Python it is built for. Using an universal wheel would prevent this.

Use the following to actually upload the result of the build:

```
./tools/release upload
```

It should posts them to `archive.ipython.org` and to PyPI.

PyPI/Warehouse will automatically hide previous releases. If you are uploading a non-stable version, make sure to log-in to PyPI and un-hide previous version.

7.2.8 8. Draft a short release announcement

The announcement should include:

- release highlights
- a link to the html version of the *What's new* section of the documentation
- a link to upgrade or installation tips (if necessary)

Post the announcement to the mailing list and or blog, and link from Twitter.

Note: If you are doing a RC or Beta, you can likely skip the next steps.

7.2.9 9. Update milestones on GitHub

These steps will bring milestones up to date:

- close the just released milestone
- open a new milestone for the next release (x, y+1), if the milestone doesn't exist already

7.2.10 10. Update the IPython website

The IPython website should document the new release:

- add release announcement (news, announcements)
- update current version and download links
- update links on the documentation page (especially if a major release)

7.2.11 11. Update readthedocs

Make sure to update readthedocs and set the latest tag as stable, as well as checking that previous release is still building under its own tag.

7.2.12 12. Update the Conda-Forge feedstock

Follow the instructions on the repository

7.2.13 13. Celebrate!

Celebrate the release and please thank the contributors for their work. Great job!

7.3 Old Documentation

Out of date documentation is still available and have been kept for archival purposes.

Note: Developers documentation used to be on the IPython wiki, but are now out of date. The wiki is though still available for historical reasons: Old IPython GitHub Wiki.

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CHAPTER 8

The IPython API

IPython	IPython: tools for interactive and parallel computing in Python.
IPython.core.alias	System command aliases.
IPython.core.application	An application for IPython.
IPython.core.autocall	Autocall capabilities for IPython.core.
IPython.core.builtin_trap	A context manager for managing things injected into `builtins`.
IPython.core.compilerop	Compiler tools with improved interactive support.
IPython.core.completer	Completion for IPython.
IPython.core.completerlib	Implementations for various useful completers.
IPython.core.crashhandler	sys.excepthook for IPython itself, leaves a detailed report on disk.
IPython.core.debugger	Pdb debugger class.
IPython.core.error	Global exception classes for IPython.core.
IPython.core.events	Infrastructure for registering and firing callbacks on application events.
IPython.core.excolors	Color schemes for exception handling code in IPython.
IPython.core.extensions	A class for managing IPython extensions.
IPython.core.formatters	Display formatters.
IPython.core.getipython	Simple function to call to get the current InteractiveShell instance
IPython.core.history	History related magics and functionality
IPython.core.historyapp	An application for managing IPython history.
IPython.core.hooks	Hooks for IPython.
IPython.core.inputsplitter	DEPRECATED: Input handling and transformation machinery.
IPython.core.inputtransformer	DEPRECATED: Input transformer classes to support IPython special syntax.
IPython.core.inputtransformer2	Input transformer machinery to support IPython special syntax.

Continued on next page

Table 1 – continued from previous page

IPython.core.interactiveshell	Main IPython class.
IPython.core.logger	Logger class for IPython's logging facilities.
IPython.core.macro	Support for interactive macros in IPython
IPython.core.magic	Magic functions for InteractiveShell.
IPython.core.magic_arguments	A decorator-based method of constructing IPython magics with `argparse` option handling.
IPython.core.oinspect	Tools for inspecting Python objects.
IPython.core.page	Paging capabilities for IPython.core
IPython.core.payload	Payload system for IPython.
IPython.core.payloadpage	A payload based version of page.
IPython.core.prefilter	Prefiltering components.
IPython.core.profileapp	An application for managing IPython profiles.
IPython.core.profiledir	An object for managing IPython profile directories.
IPython.core.prompts	Being removed
IPython.core.pylabtools	Pylab (matplotlib) support utilities.
IPython.core.shellapp	A mixin for `Application` classes that launch InteractiveShell instances, load extensions, etc.
IPython.core.splitinput	Simple utility for splitting user input.
IPython.core.ultratb	Verbose and colourful traceback formatting.
IPython.display	Public API for display tools in IPython.
IPython.lib.backgroundjobs	Manage background (threaded) jobs conveniently from an interactive shell.
IPython.lib.clipboard	Utilities for accessing the platform's clipboard.
IPython.lib.deepreload	Provides a reload() function that acts recursively.
IPython.lib.demo	Module for interactive demos using IPython.
IPython.lib.editorhooks	'editor' hooks for common editors that work well with ipython
IPython.lib.guisupport	Support for creating GUI apps and starting event loops.
IPython.lib.inputhook	Deprecated since IPython 5.0
IPython.lib.latextools	Tools for handling LaTeX.
IPython.lib.lexers	Defines a variety of Pygments lexers for highlighting IPython code.
IPython.lib.pretty	Python advanced pretty printer.
IPython.lib.security	Password generation for the IPython notebook.
IPython.paths	Find files and directories which IPython uses.
IPython.terminal.debugger	
IPython.terminal.embed	An embedded IPython shell.
IPython.terminal.interactiveshell	IPython terminal interface using prompt_toolkit
IPython.terminal.ipapp	The `Application` object for the command line **`ipython`** program.
IPython.terminal.magics	Extra magics for terminal use.
IPython.terminal.prompts	Terminal input and output prompts.
IPython.terminal.shortcuts	Module to define and register Terminal IPython shortcuts with `prompt_toolkit`
IPython.testing	Testing support (tools to test IPython itself).
IPython.testing.decorators	Decorators for labeling test objects.
IPython.testing.globalipapp	Global IPython app to support test running.
IPython.testing.iptest	IPython Test Suite Runner.
IPython.testing.iptestcontroller	IPython Test Process Controller
IPython.testing.ipunittest	Experimental code for cleaner support of IPython syntax with unittest.

Continued on next page

Table 1 – continued from previous page

IPython.testing.skipdoctest	Decorators marks that a doctest should be skipped.
IPython.testing.tools	Generic testing tools.
IPython.utils.PyColorize	Class and program to colorize python source code for ANSI terminals.
IPython.utils.capture	IO capturing utilities.
IPython.utils.colorable	Color managing related utilities
IPython.utils.coloransi	Tools for coloring text in ANSI terminals.
IPython.utils.contexts	Miscellaneous context managers.
IPython.utils.data	Utilities for working with data structures like lists, dicts and tuples.
IPython.utils.decorators	Decorators that don't go anywhere else.
IPython.utils.dir2	A fancy version of Python's builtin `dir()` function.
IPython.utils.encoding	Utilities for dealing with text encodings
IPython.utils.frame	Utilities for working with stack frames.
IPython.utils.generics	Generic functions for extending IPython.
IPython.utils.importstring	A simple utility to import something by its string name.
IPython.utils.io	IO related utilities.
IPython.utils.ipstruct	A dict subclass that supports attribute style access.
IPython.utils.module_paths	Utility functions for finding modules
IPython.utils.openpy	Tools to open .py files as Unicode, using the encoding specified within the file, as per PEP 263.
IPython.utils.path	Utilities for path handling.
IPython.utils.process	Utilities for working with external processes.
IPython.utils.sentinel	Sentinel class for constants with useful reprs
IPython.utils.shimmodule	A shim module for deprecated imports
IPython.utils.strdispatch	String dispatch class to match regexps and dispatch commands.
IPython.utils.sysinfo	Utilities for getting information about IPython and the system it's running in.
IPython.utils.syspathcontext	Context managers for adding things to sys.path temporarily.
IPython.utils.tempdir	This module contains classes - NamedFileInTemporaryDirectory, TemporaryWorkingDirectory.
IPython.utils.terminal	Utilities for working with terminals.
IPython.utils.text	Utilities for working with strings and text.
IPython.utils.timing	Utilities for timing code execution.
IPython.utils.tokenutil	Token-related utilities
IPython.utils.tz	Timezone utilities
IPython.utils.ulinecache	This module has been deprecated since IPython 6.0.
IPython.utils.version	Utilities for version comparison
IPython.utils.wildcard	Support for wildcard pattern matching in object inspection.

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

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If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

8.1 `IPython`

IPython: tools for interactive and parallel computing in Python.

https://ipython.org

8.1.1 3 Functions

`IPython.`**`embed_kernel`**(*module=None*, *local_ns=None*, ***kwargs*)

Embed and start an IPython kernel in a given scope.

If you don't want the kernel to initialize the namespace from the scope of the surrounding function, and/or you want to load full IPython configuration, you probably want `IPython.start_kernel()` instead.

Parameters

- **`module`** (*`types.ModuleType, optional`*) – The module to load into IPython globals (default: caller)
- **`local_ns`** (*`dict, optional`*) – The namespace to load into IPython user namespace (default: caller)
- **`kwargs`** (*`various, optional`*) – Further keyword args are relayed to the IPKernelApp constructor, allowing configuration of the Kernel. Will only have an effect on the first embed_kernel call for a given process.

`IPython.`**`start_ipython`**(*argv=None*, ***kwargs*)

Launch a normal IPython instance (as opposed to embedded)

`IPython.embed()` puts a shell in a particular calling scope, such as a function or method for debugging purposes, which is often not desirable.

`start_ipython()` does full, regular IPython initialization, including loading startup files, configuration, etc. much of which is skipped by `embed()`.

This is a public API method, and will survive implementation changes.

Parameters

- **`argv`** (*`list or None, optional`*) – If unspecified or None, IPython will parse command-line options from sys.argv. To prevent any command-line parsing, pass an empty list: `argv=[]`.
- **`user_ns`** (*`dict, optional`*) – specify this dictionary to initialize the IPython user namespace with particular values.
- **`kwargs`** (*`various, optional`*) – Any other kwargs will be passed to the Application constructor, such as `config`.

`IPython.`**`start_kernel`**(*argv=None*, ***kwargs*)

Launch a normal IPython kernel instance (as opposed to embedded)

`IPython.embed_kernel()` puts a shell in a particular calling scope, such as a function or method for debugging purposes, which is often not desirable.

`start_kernel()` does full, regular IPython initialization, including loading startup files, configuration, etc. much of which is skipped by `embed()`.

Parameters

- **argv** (*list or None, optional*) – If unspecified or None, IPython will parse command-line options from sys.argv. To prevent any command-line parsing, pass an empty list: `argv=[]`.
- **user_ns** (*dict, optional*) – specify this dictionary to initialize the IPython user namespace with particular values.
- **kwargs** (*various, optional*) – Any other kwargs will be passed to the Application constructor, such as `config`.

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

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8.2 Module: `core.alias`

System command aliases.

Authors:

- Fernando Perez
- Brian Granger

8.2.1 4 Classes

class `IPython.core.alias.`**`AliasError`**

Bases: `Exception`

class `IPython.core.alias.`**`InvalidAliasError`**

Bases: *`IPython.core.alias.AliasError`*

class `IPython.core.alias.`**`Alias`**(*shell*, *name*, *cmd*)

Bases: `object`

Callable object storing the details of one alias.

Instances are registered as magic functions to allow use of aliases.

`__init__`(*shell*, *name*, *cmd*)

Initialize self. See help(type(self)) for accurate signature.

`validate`()

Validate the alias, and return the number of arguments.

class IPython.core.alias.**AliasManager**(*shell=None*, ***kwargs*)

Bases: `traitlets.config.configurable.Configurable`

__init__(*shell=None*, ***kwargs*)

Create a configurable given a config config.

Parameters

- **config** (*Config*) – If this is empty, default values are used. If config is a `Config` instance, it will be used to configure the instance.
- **parent** (*Configurable instance, optional*) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the `__init__()` method of `Configurable` *before* doing anything else and using `super()`:

```
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

define_alias(*name*, *cmd*)

Define a new alias after validating it.

This will raise an `AliasError` if there are validation problems.

get_alias(*name*)

Return an alias, or None if no alias by that name exists.

is_alias(*name*)

Return whether or not a given name has been defined as an alias

retrieve_alias(*name*)

Retrieve the command to which an alias expands.

soft_define_alias(*name*, *cmd*)

Define an alias, but don't raise on an AliasError.

8.2.2 1 Function

IPython.core.alias.**default_aliases**()

Return list of shell aliases to auto-define.

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8.3 Module: `core.application`

An application for IPython.

All top-level applications should use the classes in this module for handling configuration and creating configurables.

The job of an `Application` is to create the master configuration object and then create the configurable objects, passing the config to them.

8.3.1 2 Classes

class `IPython.core.application.`**`ProfileAwareConfigLoader`**(*filename*, *path=None*, ***kw*)

Bases: `traitlets.config.loader.PyFileConfigLoader`

A Python file config loader that is aware of IPython profiles.

`load_subconfig`(*fname*, *path=None*, *profile=None*)

Injected into config file namespace as load_subconfig

class `IPython.core.application.`**`BaseIPythonApplication`**(***kwargs*)

Bases: `traitlets.config.application.Application`

`__init__`(***kwargs*)

Create a configurable given a config config.

Parameters

- **config** (*`Config`*) – If this is empty, default values are used. If config is a `Config` instance, it will be used to configure the instance.
- **parent** (*`Configurable instance, optional`*) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the *`__init__()`* method of `Configurable` *before* doing anything else and using `super()`:

```python
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

`excepthook`(*etype*, *evalue*, *tb*)

this is sys.excepthook after init_crashhandler

set self.verbose_crash=True to use our full crashhandler, instead of a regular traceback with a short message (crash_handler_lite)

`init_config_files`()

[optionally] copy default config files into profile dir.

init_crash_handler()
Create a crash handler, typically setting sys.excepthook to it.

init_profile_dir()
initialize the profile dir

initialize(*argv=None*)
Do the basic steps to configure me.

Override in subclasses.

initialize_subcommand(*subc*, *argv=None*)
Initialize a subcommand with argv.

load_config_file(*suppress_errors=None*)
Load the config file.

By default, errors in loading config are handled, and a warning printed on screen. For testing, the suppress_errors option is set to False, so errors will make tests fail.

`supress_errors` default value is to be `None` in which case the behavior default to the one of `traitlets.Application`.

The default value can be set :

- to `False` by setting 'IPYTHON_SUPPRESS_CONFIG_ERRORS' environment variable to '0', or 'false' (case insensitive).
- to `True` by setting 'IPYTHON_SUPPRESS_CONFIG_ERRORS' environment variable to '1' or 'true' (case insensitive).
- to `None` by setting 'IPYTHON_SUPPRESS_CONFIG_ERRORS' environment variable to '' (empty string) or leaving it unset.

Any other value are invalid, and will make IPython exit with a non-zero return code.

python_config_loader_class
alias of *ProfileAwareConfigLoader*

stage_default_config_file()
auto generate default config file, and stage it into the profile.

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8.4 Module: `core.autocall`

Autocall capabilities for IPython.core.

Authors:

- Brian Granger
- Fernando Perez
- Thomas Kluyver

Notes

8.4.1 3 Classes

class IPython.core.autocall.**IPyAutocall**(*ip=None*)
Bases: `object`

Instances of this class are always autocalled

This happens regardless of 'autocall' variable state. Use this to develop macro-like mechanisms.

__init__(*ip=None*)
Initialize self. See help(type(self)) for accurate signature.

set_ip(*ip*)
Will be used to set _ip point to current ipython instance b/f call

Override this method if you don't want this to happen.

class IPython.core.autocall.**ExitAutocall**(*ip=None*)
Bases: *IPython.core.autocall.IPyAutocall*

An autocallable object which will be added to the user namespace so that exit, exit(), quit or quit() are all valid ways to close the shell.

class IPython.core.autocall.**ZMQExitAutocall**(*ip=None*)
Bases: *IPython.core.autocall.ExitAutocall*

Exit IPython. Autocallable, so it needn't be explicitly called.

Parameters **keep_kernel** (*bool*) – If True, leave the kernel alive. Otherwise, tell the kernel to exit too (default).

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Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

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8.5 Module: `core.builtin_trap`

A context manager for managing things injected into `builtins`.

8.5.1 1 Class

class IPython.core.builtin_trap.**BuiltinTrap**(*shell=None*)

Bases: traitlets.config.configurable.Configurable

__init__(*shell=None*)

Create a configurable given a config config.

Parameters

- **config** (*Config*) – If this is empty, default values are used. If config is a Config instance, it will be used to configure the instance.
- **parent** (*Configurable instance, optional*) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the *__init__()* method of Configurable *before* doing anything else and using super():

```
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

activate()

Store ipython references in the __builtin__ namespace.

add_builtin(*key, value*)

Add a builtin and save the original.

deactivate()

Remove any builtins which might have been added by add_builtins, or restore overwritten ones to their previous values.

remove_builtin(*key, orig*)

Remove an added builtin and re-set the original.

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Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

8.6 Module: core.compilerop

Compiler tools with improved interactive support.

Provides compilation machinery similar to codeop, but with caching support so we can provide interactive tracebacks.

8.6.1 Authors

- Robert Kern
- Fernando Perez
- Thomas Kluyver

8.6.2 1 Class

class `IPython.core.compilerop.`**`CachingCompiler`**

Bases: `codeop.Compile`

A compiler that caches code compiled from interactive statements.

`__init__`()

Initialize self. See help(type(self)) for accurate signature.

`ast_parse`(*source*, *filename='<unknown>'*, *symbol='exec'*)

Parse code to an AST with the current compiler flags active.

Arguments are exactly the same as ast.parse (in the standard library), and are passed to the built-in compile function.

`cache`(*code*, *number=0*)

Make a name for a block of code, and cache the code.

Parameters

- **code** (`str`) – The Python source code to cache.
- **number** (`int`) – A number which forms part of the code's name. Used for the execution counter.

Returns

- *The name of the cached code (as a string). Pass this as the filename*
- *argument to compilation, so that tracebacks are correctly hooked up.*

`compiler_flags`

Flags currently active in the compilation process.

`reset_compiler_flags`()

Reset compiler flags to default state.

8.6.3 2 Functions

`IPython.core.compilerop.`**`code_name`**(*code*, *number=0*)

Compute a (probably) unique name for code for caching.

This now expects code to be unicode.

`IPython.core.compilerop.`**`check_linecache_ipython`**(**args*)

Call linecache.checkcache() safely protecting our cached values.

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If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

8.7 Module: `core.completer`

Completion for IPython.

This module started as fork of the rlcompleter module in the Python standard library. The original enhancements made to rlcompleter have been sent upstream and were accepted as of Python 2.3,

This module now support a wide variety of completion mechanism both available for normal classic Python code, as well as completer for IPython specific Syntax like magics.

8.7.1 Latex and Unicode completion

IPython and compatible frontends not only can complete your code, but can help you to input a wide range of characters. In particular we allow you to insert a unicode character using the tab completion mechanism.

Forward latex/unicode completion

Forward completion allows you to easily type a unicode character using its latex name, or unicode long description. To do so type a backslash follow by the relevant name and press tab:

Using latex completion:

```
\alpha<tab>
α
```

or using unicode completion:

```
\greek small letter alpha<tab>
α
```

Only valid Python identifiers will complete. Combining characters (like arrow or dots) are also available, unlike latex they need to be put after the their counterpart that is to say, `F\vec<tab>` is correct, not `\vec<tab>F`.

Some browsers are known to display combining characters incorrectly.

Backward latex completion

It is sometime challenging to know how to type a character, if you are using IPython, or any compatible frontend you can prepend backslash to the character and press `<tab>` to expand it to its latex form.

```
\α<tab>
\alpha
```

Both forward and backward completions can be deactivated by setting the `Completer.backslash_combining_completions` option to `False`.

8.7.2 Experimental

Starting with IPython 6.0, this module can make use of the Jedi library to generate completions both using static analysis of the code, and dynamically inspecting multiple namespaces. The APIs attached to this new mechanism is unstable and will raise unless use in an *`provisionalcompleter`* context manager.

You will find that the following are experimental:

- *`provisionalcompleter`*
- *`IPCompleter.completions`*
- *`Completion`*
- *`rectify_completions`*

Note: better name for *`rectify_completions`* ?

We welcome any feedback on these new API, and we also encourage you to try this module in debug mode (start IPython with `--Completer.debug=True`) in order to have extra logging information is `jedi` is crashing, or if current IPython completer pending deprecations are returning results not yet handled by `jedi`

Using Jedi for tab completion allow snippets like the following to work without having to execute any code:

```
>>> myvar = ['hello', 42]
... myvar[1].bi<tab>
```

Tab completion will be able to infer that `myvar[1]` is a real number without executing any code unlike the previously available `IPCompleter.greedy` option.

Be sure to update `jedi` to the latest stable version or to try the current development version to get better completions.

8.7.3 5 Classes

class `IPython.core.completer.`**`ProvisionalCompleterWarning`**

Bases: `FutureWarning`

Exception raise by an experimental feature in this module.

Wrap code in *`provisionalcompleter`* context manager if you are certain you want to use an unstable feature.

class `IPython.core.completer.`**`Completion`**(*start: int*, *end: int*, *text: str*, ***, *type: str = None*, *_origin=”*, *signature=”*)

Bases: `object`

Completion object used and return by IPython completers.

> **Warning:** Unstable
>
> This function is unstable, API may change without warning. It will also raise unless use in proper context manager.

This act as a middle ground *Completion* object between the `jedi.api.classes.Completion` object and the Prompt Toolkit completion object. While Jedi need a lot of information about evaluator and how the code should be ran/inspected, PromptToolkit (and other frontend) mostly need user facing information.

- Which range should be replaced replaced by what.
- Some metadata (like completion type), or meta information to displayed to the use user.

For debugging purpose we can also store the origin of the completion (`jedi`, `IPython.python_matches`, `IPython.magics_matches...`).

`__init__`(*start: int*, *end: int*, *text: str*, ***, *type: str = None*, *_origin=”*, *signature=”*) → None
Initialize self. See help(type(self)) for accurate signature.

class `IPython.core.completer.`**`CompletionSplitter`**(*delims=None*)
Bases: `object`

An object to split an input line in a manner similar to readline.

By having our own implementation, we can expose readline-like completion in a uniform manner to all frontends. This object only needs to be given the line of text to be split and the cursor position on said line, and it returns the ‘word’ to be completed on at the cursor after splitting the entire line.

What characters are used as splitting delimiters can be controlled by setting the `delims` attribute (this is a property that internally automatically builds the necessary regular expression)

`__init__`(*delims=None*)
Initialize self. See help(type(self)) for accurate signature.

`delims`
Return the string of delimiter characters.

`split_line`(*line*, *cursor_pos=None*)
Split a line of text with a cursor at the given position.

class `IPython.core.completer.`**`Completer`**(*namespace=None*, *global_namespace=None*, ***kwargs*)
Bases: `traitlets.config.configurable.Configurable`

`__init__`(*namespace=None*, *global_namespace=None*, ***kwargs*)
Create a new completer for the command line.

Completer(namespace=ns, global_namespace=ns2) -> completer instance.

If unspecified, the default namespace where completions are performed is __main__ (technically, __main__.__dict__). Namespaces should be given as dictionaries.

An optional second namespace can be given. This allows the completer to handle cases where both the local and global scopes need to be distinguished.

`attr_matches`(*text*)
Compute matches when text contains a dot.

Assuming the text is of the form NAME.NAME....[NAME], and is evaluatable in self.namespace or self.global_namespace, it will be evaluated and its attributes (as revealed by dir()) are used as possible completions. (For class instances, class members are also considered.)

WARNING: this can still invoke arbitrary C code, if an object with a __getattr__ hook is evaluated.

complete(*text*, *state*)

Return the next possible completion for 'text'.

This is called successively with state == 0, 1, 2, … until it returns None. The completion should begin with 'text'.

global_matches(*text*)

Compute matches when text is a simple name.

Return a list of all keywords, built-in functions and names currently defined in self.namespace or self.global_namespace that match.

class IPython.core.completer.**IPCompleter**(*shell=None*, *namespace=None*, *global_namespace=None*, *use_readline=<object object>*, *config=None*, ***kwargs*)

Bases: `IPython.core.completer.Completer`

Extension of the completer class with IPython-specific features

__init__(*shell=None*, *namespace=None*, *global_namespace=None*, *use_readline=<object object>*, *config=None*, ***kwargs*)

IPCompleter() -> completer

Return a completer object.

Parameters

- **shell** – a pointer to the ipython shell itself. This is needed because this completer knows about magic functions, and those can only be accessed via the ipython instance.
- **namespace** (*dict, optional*) – an optional dict where completions are performed.
- **global_namespace** (*dict, optional*) – secondary optional dict for completions, to handle cases (such as IPython embedded inside functions) where both Python scopes are visible.
- **use_readline** (*bool, optional*) – DEPRECATED, ignored since IPython 6.0, will have no effects

all_completions(*text*)

Wrapper around the complete method for the benefit of emacs.

complete(*text=None*, *line_buffer=None*, *cursor_pos=None*)

Find completions for the given text and line context.

Note that both the text and the line_buffer are optional, but at least one of them must be given.

Parameters

- **text** (*string, optional*) – Text to perform the completion on. If not given, the line buffer is split using the instance's CompletionSplitter object.
- **line_buffer** (*string, optional*) – If not given, the completer attempts to obtain the current line buffer via readline. This keyword allows clients which are requesting for text completions in non-readline contexts to inform the completer of the entire text.
- **cursor_pos** (*int, optional*) – Index of the cursor in the full line buffer. Should be provided by remote frontends where kernel has no access to frontend state.

Returns

- **text** (*str*) – Text that was actually used in the completion.
- **matches** (*list*) – A list of completion matches.

Note: This API is likely to be deprecated and replaced by *`IPCompleter.completions`* in the future.

`completions` (*text: str*, *offset: int*) → Iterator[IPython.core.completer.Completion]
Returns an iterator over the possible completions

Warning: Unstable

This function is unstable, API may change without warning. It will also raise unless use in proper context manager.

Parameters

- **`text`** (*`str`*) – Full text of the current input, multi line string.
- **`offset`** (*`int`*) – Integer representing the position of the cursor in `text`. Offset is 0-based indexed.

Yields *`Completion`* object

The cursor on a text can either be seen as being "in between" characters or "On" a character depending on the interface visible to the user. For consistency the cursor being on "in between" characters X and Y is equivalent to the cursor being "on" character Y, that is to say the character the cursor is on is considered as being after the cursor.

Combining characters may span more that one position in the text.

Note: If `IPCompleter.debug` is `True` will yield a `--jedi/ipython--` fake Completion token to distinguish completion returned by Jedi and usual IPython completion.

Note: Completions are not completely deduplicated yet. If identical completions are coming from different sources this function does not ensure that each completion object will only be present once.

`dict_key_matches` (*text*)
Match string keys in a dictionary, after e.g. 'foo['

`file_matches` (*text*)
Match filenames, expanding ~USER type strings.

Most of the seemingly convoluted logic in this completer is an attempt to handle filenames with spaces in them. And yet it's not quite perfect, because Python's readline doesn't expose all of the GNU readline details needed for this to be done correctly.

For a filename with a space in it, the printed completions will be only the parts after what's already been typed (instead of the full completions, as is normally done). I don't think with the current (as of Python 2.3) Python readline it's possible to do better.

`latex_matches` (*text*)
Match Latex syntax for unicode characters.

This does both `\alp` -> `\alpha` and `\alpha` -> α

Used on Python 3 only.

magic_color_matches(*text: str*) → List[str]
Match color schemes for %colors magic

magic_config_matches(*text: str*) → List[str]
Match class names and attributes for %config magic

magic_matches(*text*)
Match magics

matchers
All active matcher routines for completion

python_func_kw_matches(*text*)
Match named parameters (kwargs) of the last open function

python_matches(*text*)
Match attributes or global python names

unicode_name_matches(*text*)
Match Latex-like syntax for unicode characters base on the name of the character.

This does `\GREEK SMALL LETTER ETA` -> η

Works only on valid python 3 identifier, or on combining characters that will combine to form a valid identifier.

Used on Python 3 only.

8.7.4 13 Functions

`IPython.core.completer.`**provisionalcompleter**(*action='ignore'*)
This contest manager has to be used in any place where unstable completer behavior and API may be called.

```
>>> with provisionalcompleter():
...     completer.do_experimetal_things() # works
```

```
>>> completer.do_experimental_things() # raises.
```

Note: Unstable

By using this context manager you agree that the API in use may change without warning, and that you won't complain if they do so.

You also understand that if the API is not to you liking you should report a bug to explain your use case upstream and improve the API and will loose credibility if you complain after the API is make stable.

We'll be happy to get your feedback , feature request and improvement on any of the unstable APIs !

`IPython.core.completer.`**has_open_quotes**(*s*)
Return whether a string has open quotes.

This simply counts whether the number of quote characters of either type in the string is odd.

Returns

- *If there is an open quote, the quote character is returned. Else, return*
- *False.*

`IPython.core.completer.`**`protect_filename`**(*s*, *protectables=' ()[]{}?=\\|;:\'#*"^&'*)

Escape a string to protect certain characters.

`IPython.core.completer.`**`expand_user`**(*path: str*) → Tuple[str, bool, str]

Expand ~-style usernames in strings.

This is similar to `os.path.expanduser()`, but it computes and returns extra information that will be useful if the input was being used in computing completions, and you wish to return the completions with the original '~' instead of its expanded value.

Parameters **`path`** (*`str`*) – String to be expanded. If no ~ is present, the output is the same as the input.

Returns

- **newpath** (*str*) – Result of ~ expansion in the input path.
- **tilde_expand** (*bool*) – Whether any expansion was performed or not.
- **tilde_val** (*str*) – The value that ~ was replaced with.

`IPython.core.completer.`**`compress_user`**(*path: str*, *tilde_expand: bool*, *tilde_val: str*) → str

Does the opposite of expand_user, with its outputs.

`IPython.core.completer.`**`completions_sorting_key`**(*word*)

key for sorting completions

This does several things:

- Demote any completions starting with underscores to the end
- Insert any %magic and %%cellmagic completions in the alphabetical order by their name

`IPython.core.completer.`**`rectify_completions`**(*text: str*, *completions: Iterable[IPython.core.completer.Completion]*, ***, *_debug=False*) → Iterable[IPython.core.completer.Completion]

Rectify a set of completions to all have the same `start` and `end`

> **Warning:** Unstable
>
> This function is unstable, API may change without warning. It will also raise unless use in proper context manager.

Parameters

- **`text`** (*`str`*) – text that should be completed.
- **`completions`** (*`Iterator[Completion]`*) – iterator over the completions to rectify

`jedi.api.classes.Completion` s returned by Jedi may not have the same start and end, though the Jupyter Protocol requires them to behave like so. This will readjust the completion to have the same `start` and `end` by padding both extremities with surrounding text.

During stabilisation should support a `_debug` option to log which completion are return by the IPython completer and not found in Jedi in order to make upstream bug report.

`IPython.core.completer.`**`get__all__entries`**(*obj*)

returns the strings in the __all__ attribute

`IPython.core.completer.`**`match_dict_keys`**(*keys: List[str], prefix: str, delims: str*)

Used by dict_key_matches, matching the prefix to a list of keys

Parameters

- **`keys`** – list of keys in dictionary currently being completed.
- **`prefix`** – Part of the text already typed by the user. e.g. `mydict[b'fo`
- **`delims`** – String of delimiters to consider when finding the current key.

Returns

- **A tuple of three elements** (`quote`, `token_start`, `matched`, with)
- `quote` being the quote that need to be used to close current string.
- `token_start` the position where the replacement should start occurring,
- `matches` a list of replacement/completion

`IPython.core.completer.`**`cursor_to_position`**(*text: str*, *line: int*, *column: int*) → int

Convert the (line,column) position of the cursor in text to an offset in a string.

Parameters

- **`text`** (*`str`*) – The text in which to calculate the cursor offset
- **`line`** (*`int`*) – Line of the cursor; 0-indexed
- **`column`** (*`int`*) – Column of the cursor 0-indexed

Returns

Return type Position of the cursor in `text`, 0-indexed.

See also:

`position_to_cursor()` reciprocal of this function

`IPython.core.completer.`**`position_to_cursor`**(*text: str*, *offset: int*) → Tuple[int, int]

Convert the position of the cursor in text (0 indexed) to a line number(0-indexed) and a column number (0-indexed) pair

Position should be a valid position in `text`.

Parameters

- **`text`** (*`str`*) – The text in which to calculate the cursor offset
- **`offset`** (*`int`*) – Position of the cursor in `text`, 0-indexed.

Returns **(line, column)** – Line of the cursor; 0-indexed, column of the cursor 0-indexed

Return type (int, int)

See also:

`cursor_to_position()` reciprocal of this function

`IPython.core.completer.`**`back_unicode_name_matches`**(*text*)

Match unicode characters back to unicode name

This does -> `\snowman`

Note that snowman is not a valid python3 combining character but will be expanded. Though it will not recombine back to the snowman character by the completion machinery.

This will not either back-complete standard sequences like n, b …

Used on Python 3 only.

`IPython.core.completer.`**`back_latex_name_matches`**(*text: str*)

Match latex characters back to unicode name

This does \ -> `\aleph`

Used on Python 3 only.

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8.8 Module: `core.completerlib`

Implementations for various useful completers.

These are all loaded by default by IPython.

8.8.1 10 Functions

`IPython.core.completerlib.`**`module_list`**(*path*)

Return the list containing the names of the modules available in the given folder.

`IPython.core.completerlib.`**`get_root_modules`**()

Returns a list containing the names of all the modules available in the folders of the pythonpath.

ip.db['rootmodules_cache'] maps sys.path entries to list of modules.

`IPython.core.completerlib.`**`is_importable`**(*module*, *attr*, *only_modules*)

`IPython.core.completerlib.`**`try_import`**(*mod: str*, *only_modules=False*) → List[str]

Try to import given module and return list of potential completions.

`IPython.core.completerlib.`**`quick_completer`**(*cmd*, *completions*)

Easily create a trivial completer for a command.

Takes either a list of completions, or all completions in string (that will be split on whitespace).

Example:

```
[d:\ipython]|1> import ipy_completers
[d:\ipython]|2> ipy_completers.quick_completer('foo', ['bar','baz'])
[d:\ipython]|3> foo b<TAB>
bar baz
[d:\ipython]|3> foo ba
```

`IPython.core.completerlib.`**`module_completion`**(*line*)

Returns a list containing the completion possibilities for an import line.

The line looks like this : 'import xml.d' 'from xml.dom import'

`IPython.core.completerlib.`**`module_completer`**(*self*, *event*)
Give completions after user has typed 'import ...' or 'from ...'

`IPython.core.completerlib.`**`magic_run_completer`**(*self*, *event*)
Complete files that end in .py or .ipy or .ipynb for the %run command.

`IPython.core.completerlib.`**`cd_completer`**(*self*, *event*)
Completer function for cd, which only returns directories.

`IPython.core.completerlib.`**`reset_completer`**(*self*, *event*)
A completer for %reset magic

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8.9 Module: `core.crashhandler`

sys.excepthook for IPython itself, leaves a detailed report on disk.

Authors:

- Fernando Perez
- Brian E. Granger

8.9.1 1 Class

class `IPython.core.crashhandler.`**`CrashHandler`**(*app*, *contact_name=None*, *contact_email=None*, *bug_tracker=None*, *show_crash_traceback=True*, *call_pdb=False*)

Bases: `object`

Customizable crash handlers for IPython applications.

Instances of this class provide a `__call__()` method which can be used as a `sys.excepthook`. The `__call__()` signature is:

```
def __call__(self, etype, evalue, etb)
```

`__init__`(*app*, *contact_name=None*, *contact_email=None*, *bug_tracker=None*, *show_crash_traceback=True*, *call_pdb=False*)
Create a new crash handler

Parameters

- **app** (*Application*) – A running Application instance, which will be queried at crash time for internal information.
- **contact_name** (*str*) – A string with the name of the person to contact.
- **contact_email** (*str*) – A string with the email address of the contact.
- **bug_tracker** (*str*) – A string with the URL for your project's bug tracker.
- **show_crash_traceback** (*bool*) – If false, don't print the crash traceback on stderr, only generate the on-disk report
- **instance attributes** (*Non-argument*) –
- **instances contain some non-argument attributes which allow for** (*These*) –
- **customization of the crash handler's behavior. Please see the** (*further*) –
- **for further details.** (*source*) –

make_report(*traceback*)
Return a string containing a crash report.

8.9.2 1 Function

IPython.core.crashhandler.**crash_handler_lite**(*etype*, *evalue*, *tb*)
a light excepthook, adding a small message to the usual traceback

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8.10 Module: `core.debugger`

Pdb debugger class.

Modified from the standard pdb.Pdb class to avoid including readline, so that the command line completion of other programs which include this isn't damaged.

In the future, this class will be expanded with improvements over the standard pdb.

The code in this file is mainly lifted out of cmd.py in Python 2.2, with minor changes. Licensing should therefore be under the standard Python terms. For details on the PSF (Python Software Foundation) standard license, see:

https://docs.python.org/2/license.html

8.10.1 2 Classes

class IPython.core.debugger.**Tracer**(*colors=None*)

Bases: `object`

DEPRECATED

Class for local debugging, similar to pdb.set_trace.

Instances of this class, when called, behave like pdb.set_trace, but providing IPython's enhanced capabilities.

This is implemented as a class which must be initialized in your own code and not as a standalone function because we need to detect at runtime whether IPython is already active or not. That detection is done in the constructor, ensuring that this code plays nicely with a running IPython, while functioning acceptably (though with limitations) if outside of it.

__init__(*colors=None*)

DEPRECATED

Create a local debugger instance.

Parameters colors (`str, optional`) – The name of the color scheme to use, it must be one of IPython's valid color schemes. If not given, the function will default to the current IPython scheme when running inside IPython, and to 'NoColor' otherwise.

Examples

```
from IPython.core.debugger import Tracer; debug_here = Tracer()
```

Later in your code:

```
debug_here()  # -> will open up the debugger at that point.
```

Once the debugger activates, you can use all of its regular commands to step through code, set breakpoints, etc. See the pdb documentation from the Python standard library for usage details.

class IPython.core.debugger.**Pdb**(*color_scheme=None*, *completekey=None*, *stdin=None*, *stdout=None*, *context=5*)

Bases: `pdb.Pdb`

Modified Pdb class, does not load readline.

for a standalone version that uses prompt_toolkit, see `IPython.terminal.debugger.TerminalPdb` and `IPython.terminal.debugger.set_trace()`

__init__(*color_scheme=None*, *completekey=None*, *stdin=None*, *stdout=None*, *context=5*)

Instantiate a line-oriented interpreter framework.

The optional argument 'completekey' is the readline name of a completion key; it defaults to the Tab key. If completekey is not None and the readline module is available, command completion is done automatically. The optional arguments stdin and stdout specify alternate input and output file objects; if not specified, sys.stdin and sys.stdout are used.

do_d(***kw*)

d(own) [count] Move the current frame count (default one) levels down in the stack trace (to a newer frame).

do_debug(*arg*)

debug code Enter a recursive debugger that steps through the code argument (which is an arbitrary expression or statement to be executed in the current environment).

do_down(***kw*)
d(own) [count] Move the current frame count (default one) levels down in the stack trace (to a newer frame).

do_l(*arg*)
Print lines of code from the current stack frame

do_list(*arg*)
Print lines of code from the current stack frame

do_ll(*arg*)
Print lines of code from the current stack frame.

Shows more lines than 'list' does.

do_longlist(*arg*)
Print lines of code from the current stack frame.

Shows more lines than 'list' does.

do_pdef(*arg*)
Print the call signature for any callable object.

The debugger interface to %pdef

do_pdoc(*arg*)
Print the docstring for an object.

The debugger interface to %pdoc.

do_pfile(*arg*)
Print (or run through pager) the file where an object is defined.

The debugger interface to %pfile.

do_pinfo(*arg*)
Provide detailed information about an object.

The debugger interface to %pinfo, i.e., obj?.

do_pinfo2(*arg*)
Provide extra detailed information about an object.

The debugger interface to %pinfo2, i.e., obj??.

do_psource(*arg*)
Print (or run through pager) the source code for an object.

do_q(***kw*)
q(uit) exit Quit from the debugger. The program being executed is aborted.

do_quit(***kw*)
q(uit) exit Quit from the debugger. The program being executed is aborted.

do_u(***kw*)
u(p) [count] Move the current frame count (default one) levels up in the stack trace (to an older frame).

do_up(***kw*)
u(p) [count] Move the current frame count (default one) levels up in the stack trace (to an older frame).

do_w(*arg*)
w(here) Print a stack trace, with the most recent frame at the bottom. An arrow indicates the "current frame", which determines the context of most commands. 'bt' is an alias for this command.

Take a number as argument as an (optional) number of context line to print

do_where (*arg*)
w(here) Print a stack trace, with the most recent frame at the bottom. An arrow indicates the "current frame", which determines the context of most commands. 'bt' is an alias for this command.

Take a number as argument as an (optional) number of context line to print

new_do_restart (*arg*)
Restart command. In the context of ipython this is exactly the same thing as 'quit'.

print_list_lines (*filename*, *first*, *last*)
The printing (as opposed to the parsing part of a 'list' command.

set_colors (*scheme*)
Shorthand access to the color table scheme selector method.

8.10.2 6 Functions

`IPython.core.debugger.`**make_arrow** (*pad*)
generate the leading arrow in front of traceback or debugger

`IPython.core.debugger.`**BdbQuit_excepthook** (*et*, *ev*, *tb*, *excepthook=None*)
Exception hook which handles `BdbQuit` exceptions.

All other exceptions are processed using the `excepthook` parameter.

`IPython.core.debugger.`**BdbQuit_IPython_excepthook** (*self*, *et*, *ev*, *tb*, *tb_offset=None*)

`IPython.core.debugger.`**strip_indentation** (*multiline_string*)

`IPython.core.debugger.`**decorate_fn_with_doc** (*new_fn*, *old_fn*, *additional_text="*)
Make new_fn have old_fn's doc string. This is particularly useful for the `do_...` commands that hook into the help system. Adapted from from a comp.lang.python posting by Duncan Booth.

`IPython.core.debugger.`**set_trace** (*frame=None*)
Start debugging from `frame`.

If frame is not specified, debugging starts from caller's frame.

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8.11 Module: `core.error`

Global exception classes for IPython.core.

Authors:

- Brian Granger
- Fernando Perez

- Min Ragan-Kelley

Notes

8.11.1 5 Classes

class `IPython.core.error.`**`IPythonCoreError`**

Bases: `Exception`

class `IPython.core.error.`**`TryNext`**

Bases: *`IPython.core.error.IPythonCoreError`*

Try next hook exception.

Raise this in your hook function to indicate that the next hook handler should be used to handle the operation.

class `IPython.core.error.`**`UsageError`**

Bases: *`IPython.core.error.IPythonCoreError`*

Error in magic function arguments, etc.

Something that probably won't warrant a full traceback, but should nevertheless interrupt a macro / batch file.

class `IPython.core.error.`**`StdinNotImplementedError`**

Bases: *`IPython.core.error.IPythonCoreError`*, `NotImplementedError`

raw_input was requested in a context where it is not supported

For use in IPython kernels, where only some frontends may support stdin requests.

class `IPython.core.error.`**`InputRejected`**

Bases: `Exception`

Input rejected by ast transformer.

Raise this in your NodeTransformer to indicate that InteractiveShell should not execute the supplied input.

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8.12 Module: `core.events`

Infrastructure for registering and firing callbacks on application events.

Unlike *`IPython.core.hooks`*, which lets end users set single functions to be called at specific times, or a collection of alternative methods to try, callbacks are designed to be used by extension authors. A number of callbacks can be registered for the same event without needing to be aware of one another.

The functions defined in this module are no-ops indicating the names of available events and the arguments which will be passed to them.

Note: This API is experimental in IPython 2.0, and may be revised in future versions.

8.12.1 1 Class

class `IPython.core.events.`**`EventManager`**(*shell*, *available_events*)

Bases: `object`

Manage a collection of events and a sequence of callbacks for each.

This is attached to *`InteractiveShell`* instances as an `events` attribute.

Note: This API is experimental in IPython 2.0, and may be revised in future versions.

`__init__`(*shell*, *available_events*)

Initialise the `CallbackManager`.

Parameters

- **`shell`** – The *`InteractiveShell`* instance
- **`available_callbacks`** – An iterable of names for callback events.

`register`(*event*, *function*)

Register a new event callback.

Parameters

- **`event`** (*`str`*) – The event for which to register this callback.
- **`function`** (*`callable`*) – A function to be called on the given event. It should take the same parameters as the appropriate callback prototype.

Raises

- `TypeError` – If `function` is not callable.
- `KeyError` – If `event` is not one of the known events.

`trigger`(*event*, **args*, ***kwargs*)

Call callbacks for `event`.

Any additional arguments are passed to all callbacks registered for this event. Exceptions raised by callbacks are caught, and a message printed.

`unregister`(*event*, *function*)

Remove a callback from the given event.

8.12.2 5 Functions

`IPython.core.events.`**`pre_execute`**()

Fires before code is executed in response to user/frontend action.

This includes comm and widget messages and silent execution, as well as user code cells.

`IPython.core.events.`**`pre_run_cell`**(*info*)

Fires before user-entered code runs.

Parameters **info** (*ExecutionInfo*) – An object containing information used for the code execution.

`IPython.core.events.`**`post_execute`**`()`

Fires after code is executed in response to user/frontend action.

This includes comm and widget messages and silent execution, as well as user code cells.

`IPython.core.events.`**`post_run_cell`**`(`*result*`)`

Fires after user-entered code runs.

Parameters **result** (*ExecutionResult*) – The object which will be returned as the execution result.

`IPython.core.events.`**`shell_initialized`**`(`*ip*`)`

Fires after initialisation of *InteractiveShell*.

This is before extensions and startup scripts are loaded, so it can only be set by subclassing.

Parameters **ip** (*InteractiveShell*) – The newly initialised shell.

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8.13 Module: `core.excolors`

Color schemes for exception handling code in IPython.

8.13.1 1 Class

class `IPython.core.excolors.`**`Deprec`**`(`*wrapped_obj*`)`

Bases: `object`

`__init__``(`*wrapped_obj*`)`

Initialize self. See help(type(self)) for accurate signature.

8.13.2 1 Function

`IPython.core.excolors.`**`exception_colors`**`()`

Return a color table with fields for exception reporting.

The table is an instance of ColorSchemeTable with schemes added for 'Neutral', 'Linux', 'LightBG' and 'NoColor' and fields for exception handling filled in.

Examples:

```
>>> ec = exception_colors()
>>> ec.active_scheme_name
''
>>> print(ec.active_colors)
None
```

Now we activate a color scheme: >>> ec.set_active_scheme('NoColor') >>> ec.active_scheme_name 'NoColor' >>> sorted(ec.active_colors.keys()) ['Normal', 'caret', 'em', 'excName', 'filename', 'filenameEm', 'line', 'lineno', 'linenoEm', 'name', 'nameEm', 'normalEm', 'topline', 'vName', 'val', 'valEm']

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8.14 Module: `core.extensions`

A class for managing IPython extensions.

8.14.1 1 Class

class `IPython.core.extensions.`**`ExtensionManager`**(*shell=None*, ***kwargs*)

Bases: `traitlets.config.configurable.Configurable`

A class to manage IPython extensions.

An IPython extension is an importable Python module that has a function with the signature:

```
def load_ipython_extension(ipython):
    # Do things with ipython
```

This function is called after your extension is imported and the currently active `InteractiveShell` instance is passed as the only argument. You can do anything you want with IPython at that point, including defining new magic and aliases, adding new components, etc.

You can also optionally define an `unload_ipython_extension(ipython)()` function, which will be called if the user unloads or reloads the extension. The extension manager will only call `load_ipython_extension()` again if the extension is reloaded.

You can put your extension modules anywhere you want, as long as they can be imported by Python's standard import mechanism. However, to make it easy to write extensions, you can also put your extensions in `os.path.join(self.ipython_dir, 'extensions')`. This directory is added to `sys.path` automatically.

`__init__`(*shell=None*, ***kwargs*)

Create a configurable given a config config.

Parameters

- **config** (*Config*) – If this is empty, default values are used. If config is a `Config` instance, it will be used to configure the instance.
- **parent** (*Configurable instance, optional*) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the `__init__()` method of `Configurable` *before* doing anything else and using `super()`:

```
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

install_extension(*url*, *filename=None*)
Deprecated.

load_extension(*module_str*)
Load an IPython extension by its module name.

Returns the string "already loaded" if the extension is already loaded, "no load function" if the module doesn't have a load_ipython_extension function, or None if it succeeded.

reload_extension(*module_str*)
Reload an IPython extension by calling reload.

If the module has not been loaded before, `InteractiveShell.load_extension()` is called. Otherwise `reload()` is called and then the `load_ipython_extension()` function of the module, if it exists is called.

unload_extension(*module_str*)
Unload an IPython extension by its module name.

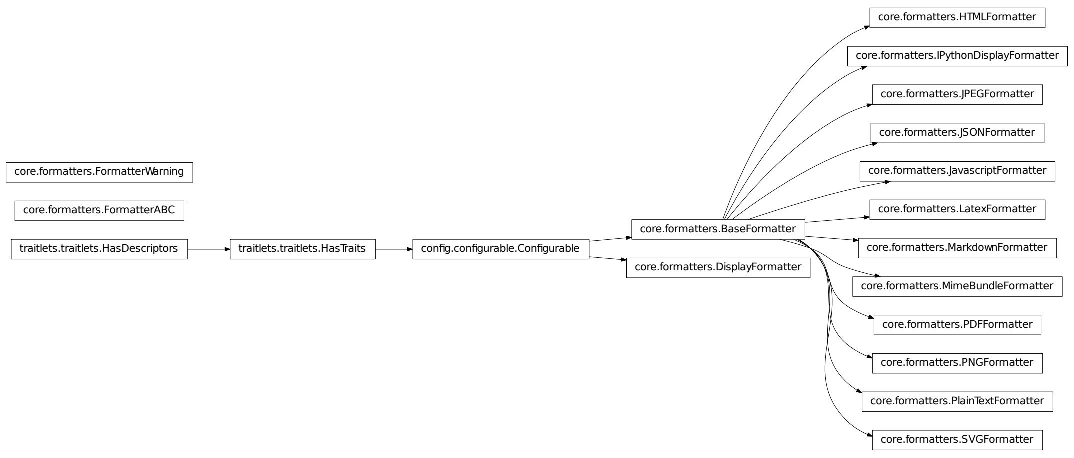
This function looks up the extension's name in `sys.modules` and simply calls `mod.unload_ipython_extension(self)`.

Returns the string "no unload function" if the extension doesn't define a function to unload itself, "not loaded" if the extension isn't loaded, otherwise None.

8.15 Module: `core.formatters`

Display formatters.

Inheritance diagram:


core.formatters.HTMLFormatter
core.formatters.IPythonDisplayFormatter
core.formatters.JPEGFormatter
core.formatters.JSONFormatter
core.formatters.JavascriptFormatter
core.formatters.LatexFormatter
core.formatters.FormatterWarning
core.formatters.FormatterABC
core.formatters.BaseFormatter
traitlets.traitlets.HasDescriptors
traitlets.traitlets.HasTraits
config.configurable.Configurable
core.formatters.MarkdownFormatter
core.formatters.DisplayFormatter
core.formatters.MimeBundleFormatter
core.formatters.PDFFormatter
core.formatters.PNGFormatter
core.formatters.PlainTextFormatter
core.formatters.SVGFormatter

8.15.1 16 Classes

class `IPython.core.formatters.`**`DisplayFormatter`**(***kwargs*)

Bases: `traitlets.config.configurable.Configurable`

`format`(*obj*, *include=None*, *exclude=None*)

Return a format data dict for an object.

By default all format types will be computed.

The following MIME types are usually implemented:

- text/plain
- text/html
- text/markdown
- text/latex
- application/json
- application/javascript
- application/pdf
- image/png
- image/jpeg
- image/svg+xml

Parameters

- **obj** (*object*) – The Python object whose format data will be computed.
- **include** (*list, tuple or set; optional*) – A list of format type strings (MIME types) to include in the format data dict. If this is set *only* the format types included in this list will be computed.
- **exclude** (*list, tuple or set; optional*) – A list of format type string (MIME types) to exclude in the format data dict. If this is set all format types will be computed, except for those included in this argument. Mimetypes present in exclude will take precedence over the ones in include

Returns

(format_dict, metadata_dict) – format_dict is a dictionary of key/value pairs, one of each format that was generated for the object. The keys are the format types, which will usually be MIME type strings and the values and JSON'able data structure containing the raw data for the representation in that format.

metadata_dict is a dictionary of metadata about each mime-type output. Its keys will be a strict subset of the keys in format_dict.

Return type tuple of two dicts

Notes

If an object implement `_repr_mimebundle_` as well as various `_repr_*_`, the data returned by `_repr_mimebundle_` will take precedence and the corresponding `_repr_*_` for this mimetype will not be called.

`format_types`
Return the format types (MIME types) of the active formatters.

class `IPython.core.formatters.`**`FormatterWarning`**
Bases: `UserWarning`

Warning class for errors in formatters

class `IPython.core.formatters.`**`FormatterABC`**
Bases: `object`

Abstract base class for Formatters.

A formatter is a callable class that is responsible for computing the raw format data for a particular format type (MIME type). For example, an HTML formatter would have a format type of `text/html` and would return the HTML representation of the object when called.

class `IPython.core.formatters.`**`BaseFormatter`**`(`*`**kwargs`*`)`
Bases: `traitlets.config.configurable.Configurable`

A base formatter class that is configurable.

This formatter should usually be used as the base class of all formatters. It is a traited `Configurable` class and includes an extensible API for users to determine how their objects are formatted. The following logic is used to find a function to format an given object.

1. The object is introspected to see if it has a method with the name `print_method`. If is does, that object is passed to that method for formatting.
2. If no print method is found, three internal dictionaries are consulted to find print method: `singleton_printers`, `type_printers` and `deferred_printers`.

Users should use these dictionaries to register functions that will be used to compute the format data for their objects (if those objects don't have the special print methods). The easiest way of using these dictionaries is through the `for_type()` and `for_type_by_name()` methods.

If no function/callable is found to compute the format data, `None` is returned and this format type is not used.

`for_type`(*typ*, *func=None*)
Add a format function for a given type.

Parameters

- **`typ`** (*`type or '__module__.__name__' string for a type`*) – The class of the object that will be formatted using `func`.
- **`func`** (*`callable`*) – A callable for computing the format data. `func` will be called with the object to be formatted, and will return the raw data in this formatter's format. Subclasses may use a different call signature for the `func` argument.

  If `func` is None or not specified, there will be no change, only returning the current value.

Returns **oldfunc** – The currently registered callable. If you are registering a new formatter, this will be the previous value (to enable restoring later).

Return type callable

`for_type_by_name`(*type_module*, *type_name*, *func=None*)
Add a format function for a type specified by the full dotted module and name of the type, rather than the type of the object.

Parameters

- **`type_module`** (*`str`*) – The full dotted name of the module the type is defined in, like `numpy`.
- **`type_name`** (*`str`*) – The name of the type (the class name), like `dtype`
- **`func`** (*`callable`*) – A callable for computing the format data. `func` will be called with the object to be formatted, and will return the raw data in this formatter's format. Subclasses may use a different call signature for the `func` argument.

  If `func` is None or unspecified, there will be no change, only returning the current value.

Returns **oldfunc** – The currently registered callable. If you are registering a new formatter, this will be the previous value (to enable restoring later).

Return type callable

`lookup`(*obj*)
Look up the formatter for a given instance.

Parameters **`obj`** (*`object instance`*) –

Returns **f** – The registered formatting callable for the type.

Return type callable

Raises KeyError if the type has not been registered.

`lookup_by_type`(*typ*)
Look up the registered formatter for a type.

Parameters **`typ`** (*`type or '__module__.__name__' string for a type`*) –

Returns **f** – The registered formatting callable for the type.

Return type callable

Raises KeyError if the type has not been registered.

pop (*typ*, *default=IPython.core.formatters._raise_key_error*)
Pop a formatter for the given type.

Parameters

- **typ** (*type or '__module__.__name__' string for a type*) –
- **default** (*object*) – value to be returned if no formatter is registered for typ.

Returns **obj** – The last registered object for the type.

Return type object

Raises KeyError if the type is not registered and default is not specified.

class IPython.core.formatters.**PlainTextFormatter**(***kwargs*)
Bases: *IPython.core.formatters.BaseFormatter*

The default pretty-printer.

This uses `IPython.lib.pretty` to compute the format data of the object. If the object cannot be pretty printed, `repr()` is used. See the documentation of `IPython.lib.pretty` for details on how to write pretty printers. Here is a simple example:

```
def dtype_pprinter(obj, p, cycle):
    if cycle:
        return p.text('dtype(...)')
    if hasattr(obj, 'fields'):
        if obj.fields is None:
            p.text(repr(obj))
        else:
            p.begin_group(7, 'dtype([')
            for i, field in enumerate(obj.descr):
                if i > 0:
                    p.text(',')
                    p.breakable()
                p.pretty(field)
            p.end_group(7, '])')
```

class IPython.core.formatters.**HTMLFormatter**(***kwargs*)
Bases: *IPython.core.formatters.BaseFormatter*

An HTML formatter.

To define the callables that compute the HTML representation of your objects, define a `_repr_html_()` method or use the `for_type()` or `for_type_by_name()` methods to register functions that handle this.

The return value of this formatter should be a valid HTML snippet that could be injected into an existing DOM. It should *not* include the ``<html>` or ``<body>` tags.

class IPython.core.formatters.**MarkdownFormatter**(***kwargs*)
Bases: *IPython.core.formatters.BaseFormatter*

A Markdown formatter.

To define the callables that compute the Markdown representation of your objects, define a `_repr_markdown_()` method or use the `for_type()` or `for_type_by_name()` methods to register functions that handle this.

The return value of this formatter should be a valid Markdown.

class `IPython.core.formatters.`**`SVGFormatter`**`(**kwargs)`

Bases: *`IPython.core.formatters.BaseFormatter`*

An SVG formatter.

To define the callables that compute the SVG representation of your objects, define a `_repr_svg_()` method or use the `for_type()` or `for_type_by_name()` methods to register functions that handle this.

The return value of this formatter should be valid SVG enclosed in ``` `<svg>` ``` tags, that could be injected into an existing DOM. It should *not* include the ``` `<html> ``` or ``` `<body> ``` tags.

class `IPython.core.formatters.`**`PNGFormatter`**`(**kwargs)`

Bases: *`IPython.core.formatters.BaseFormatter`*

A PNG formatter.

To define the callables that compute the PNG representation of your objects, define a `_repr_png_()` method or use the `for_type()` or `for_type_by_name()` methods to register functions that handle this.

The return value of this formatter should be raw PNG data, *not* base64 encoded.

class `IPython.core.formatters.`**`JPEGFormatter`**`(**kwargs)`

Bases: *`IPython.core.formatters.BaseFormatter`*

A JPEG formatter.

To define the callables that compute the JPEG representation of your objects, define a `_repr_jpeg_()` method or use the `for_type()` or `for_type_by_name()` methods to register functions that handle this.

The return value of this formatter should be raw JPEG data, *not* base64 encoded.

class `IPython.core.formatters.`**`LatexFormatter`**`(**kwargs)`

Bases: *`IPython.core.formatters.BaseFormatter`*

A LaTeX formatter.

To define the callables that compute the LaTeX representation of your objects, define a `_repr_latex_()` method or use the `for_type()` or `for_type_by_name()` methods to register functions that handle this.

The return value of this formatter should be a valid LaTeX equation, enclosed in either ``` `$` ```, ``` `$$` ``` or another LaTeX equation environment.

class `IPython.core.formatters.`**`JSONFormatter`**`(**kwargs)`

Bases: *`IPython.core.formatters.BaseFormatter`*

A JSON string formatter.

To define the callables that compute the JSONable representation of your objects, define a `_repr_json_()` method or use the `for_type()` or `for_type_by_name()` methods to register functions that handle this.

The return value of this formatter should be a JSONable list or dict. JSON scalars (None, number, string) are not allowed, only dict or list containers.

class `IPython.core.formatters.`**`JavascriptFormatter`**`(**kwargs)`

Bases: *`IPython.core.formatters.BaseFormatter`*

A Javascript formatter.

To define the callables that compute the Javascript representation of your objects, define a `_repr_javascript_()` method or use the `for_type()` or `for_type_by_name()` methods to register functions that handle this.

The return value of this formatter should be valid Javascript code and should *not* be enclosed in ``` `<script>` ``` tags.

class IPython.core.formatters.**PDFFormatter**(***kwargs*)
Bases: *IPython.core.formatters.BaseFormatter*

A PDF formatter.

To define the callables that compute the PDF representation of your objects, define a `_repr_pdf_()` method or use the `for_type()` or `for_type_by_name()` methods to register functions that handle this.

The return value of this formatter should be raw PDF data, *not* base64 encoded.

class IPython.core.formatters.**IPythonDisplayFormatter**(***kwargs*)
Bases: *IPython.core.formatters.BaseFormatter*

An escape-hatch Formatter for objects that know how to display themselves.

To define the callables that compute the representation of your objects, define a `_ipython_display_()` method or use the `for_type()` or `for_type_by_name()` methods to register functions that handle this. Unlike mime-type displays, this method should not return anything, instead calling any appropriate display methods itself.

This display formatter has highest priority. If it fires, no other display formatter will be called.

Prior to IPython 6.1, `_ipython_display_` was the only way to display custom mime-types without registering a new Formatter.

IPython 6.1 introduces `_repr_mimebundle_` for displaying custom mime-types, so `_ipython_display_` should only be used for objects that require unusual display patterns, such as multiple display calls.

class IPython.core.formatters.**MimeBundleFormatter**(***kwargs*)
Bases: *IPython.core.formatters.BaseFormatter*

A Formatter for arbitrary mime-types.

Unlike other `_repr_<mimetype>_` methods, `_repr_mimebundle_` should return mime-bundle data, either the mime-keyed `data` dictionary or the tuple `(data, metadata)`. Any mime-type is valid.

To define the callables that compute the mime-bundle representation of your objects, define a `_repr_mimebundle_()` method or use the `for_type()` or `for_type_by_name()` methods to register functions that handle this.

New in version 6.1.

8.15.2 2 Functions

IPython.core.formatters.**catch_format_error**(*method*, *self*, **args*, ***kwargs*)
show traceback on failed format call

IPython.core.formatters.**format_display_data**(*obj*, *include=None*, *exclude=None*)
Return a format data dict for an object.

By default all format types will be computed.

Parameters **obj** (*object*) – The Python object whose format data will be computed.

Returns

- **format_dict** (*dict*) – A dictionary of key/value pairs, one or each format that was generated for the object. The keys are the format types, which will usually be MIME type strings and the values and JSON'able data structure containing the raw data for the representation in that format.

- **include** (*list or tuple, optional*) – A list of format type strings (MIME types) to include in the format data dict. If this is set *only* the format types included in this list will be computed.
- **exclude** (*list or tuple, optional*) – A list of format type string (MIME types) to exclue in the format data dict. If this is set all format types will be computed, except for those included in this argument.

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

8.16 Module: `core.getipython`

Simple function to call to get the current InteractiveShell instance

8.16.1 1 Function

`IPython.core.getipython.`**`get_ipython`**`()`

Get the global InteractiveShell instance.

Returns None if no InteractiveShell instance is registered.

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8.17 Module: `core.history`

History related magics and functionality

8.17.1 4 Classes

`class` `IPython.core.history.`**`HistoryAccessorBase`**`(`*`**kwargs`*`)`

Bases: `traitlets.config.configurable.LoggingConfigurable`

An abstract class for History Accessors

class `IPython.core.history.`**`HistoryAccessor`**(*profile='default'*, *hist_file=''*, ***traits*)
Bases: `IPython.core.history.HistoryAccessorBase`

Access the history database without adding to it.

This is intended for use by standalone history tools. IPython shells use HistoryManager, below, which is a subclass of this.

`__init__`(*profile='default'*, *hist_file=''*, ***traits*)
Create a new history accessor.

Parameters

- **profile** (`str`) – The name of the profile from which to open history.
- **hist_file** (`str`) – Path to an SQLite history database stored by IPython. If specified, hist_file overrides profile.
- **config** (`Config`) – Config object. hist_file can also be set through this.

`get_last_session_id`()
Get the last session ID currently in the database.

Within IPython, this should be the same as the value stored in `HistoryManager.session_number`.

`get_range`(*session*, *start=1*, *stop=None*, *raw=True*, *output=False*)
Retrieve input by session.

Parameters

- **session** (`int`) – Session number to retrieve.
- **start** (`int`) – First line to retrieve.
- **stop** (`int`) – End of line range (excluded from output itself). If None, retrieve to the end of the session.
- **raw** (`bool`) – If True, return untranslated input
- **output** (`bool`) – If True, attempt to include output. This will be 'real' Python objects for the current session, or text reprs from previous sessions if db_log_output was enabled at the time. Where no output is found, None is used.

Returns An iterator over the desired lines. Each line is a 3-tuple, either (session, line, input) if output is False, or (session, line, (input, output)) if output is True.

Return type entries

`get_range_by_str`(*rangestr*, *raw=True*, *output=False*)
Get lines of history from a string of ranges, as used by magic commands %hist, %save, %macro, etc.

Parameters

- **rangestr** (`str`) – A string specifying ranges, e.g. "5 ~2/1-4". See `magic_history()` for full details.
- **output** (`raw,`) – As `get_range()`

Returns

Return type Tuples as `get_range()`

`get_session_info`(*session*)
Get info about a session.

Parameters **session** (*int*) – Session number to retrieve.

Returns

- **session_id** (*int*) – Session ID number
- **start** (*datetime*) – Timestamp for the start of the session.
- **end** (*datetime*) – Timestamp for the end of the session, or None if IPython crashed.
- **num_cmds** (*int*) – Number of commands run, or None if IPython crashed.
- **remark** (*unicode*) – A manually set description.

get_tail(*n=10*, *raw=True*, *output=False*, *include_latest=False*)
Get the last n lines from the history database.

Parameters

- **n** (*int*) – The number of lines to get
- **output** (*raw,*) – See *get_range()*
- **include_latest** (*bool*) – If False (default), n+1 lines are fetched, and the latest one is discarded. This is intended to be used where the function is called by a user command, which it should not return.

Returns

Return type Tuples as *get_range()*

init_db()
Connect to the database, and create tables if necessary.

search(*pattern='*'*, *raw=True*, *search_raw=True*, *output=False*, *n=None*, *unique=False*)
Search the database using unix glob-style matching (wildcards * and ?).

Parameters

- **pattern** (*str*) – The wildcarded pattern to match when searching
- **search_raw** (*bool*) – If True, search the raw input, otherwise, the parsed input
- **output** (*raw,*) – See *get_range()*
- **n** (*None or int*) – If an integer is given, it defines the limit of returned entries.
- **unique** (*bool*) – When it is true, return only unique entries.

Returns

Return type Tuples as *get_range()*

writeout_cache()
Overridden by HistoryManager to dump the cache before certain database lookups.

class IPython.core.history.**HistoryManager**(*shell=None*, *config=None*, ***traits*)
Bases: *IPython.core.history.HistoryAccessor*

A class to organize all history-related functionality in one place.

__init__(*shell=None*, *config=None*, ***traits*)
Create a new history manager associated with a shell instance.

end_session()
Close the database session, filling in the end time and line count.

get_range(*session=0*, *start=1*, *stop=None*, *raw=True*, *output=False*)
Retrieve input by session.

Parameters

- **session** (*int*) – Session number to retrieve. The current session is 0, and negative numbers count back from current session, so -1 is previous session.
- **start** (*int*) – First line to retrieve.
- **stop** (*int*) – End of line range (excluded from output itself). If None, retrieve to the end of the session.
- **raw** (*bool*) – If True, return untranslated input
- **output** (*bool*) – If True, attempt to include output. This will be 'real' Python objects for the current session, or text reprs from previous sessions if db_log_output was enabled at the time. Where no output is found, None is used.

Returns An iterator over the desired lines. Each line is a 3-tuple, either (session, line, input) if output is False, or (session, line, (input, output)) if output is True.

Return type entries

get_session_info(*session=0*)
Get info about a session.

Parameters **session** (*int*) – Session number to retrieve. The current session is 0, and negative numbers count back from current session, so -1 is the previous session.

Returns

- **session_id** (*int*) – Session ID number
- **start** (*datetime*) – Timestamp for the start of the session.
- **end** (*datetime*) – Timestamp for the end of the session, or None if IPython crashed.
- **num_cmds** (*int*) – Number of commands run, or None if IPython crashed.
- **remark** (*unicode*) – A manually set description.

name_session(*name*)
Give the current session a name in the history database.

new_session(*conn=None*)
Get a new session number.

reset(*new_session=True*)
Clear the session history, releasing all object references, and optionally open a new session.

store_inputs(*line_num*, *source*, *source_raw=None*)
Store source and raw input in history and create input cache variables `_i*`.

Parameters

- **line_num** (*int*) – The prompt number of this input.
- **source** (*str*) – Python input.
- **source_raw** (*str, optional*) – If given, this is the raw input without any IPython transformations applied to it. If not given, `source` is used.

store_output(*line_num*)
If database output logging is enabled, this saves all the outputs from the indicated prompt number to the database. It's called by run_cell after code has been executed.

Parameters **`line_num`** (*`int`*) – The line number from which to save outputs

`writeout_cache`(*conn=None*)
Write any entries in the cache to the database.

class `IPython.core.history.`**`HistorySavingThread`**(*history_manager*)
Bases: `threading.Thread`

This thread takes care of writing history to the database, so that the UI isn't held up while that happens.

It waits for the HistoryManager's save_flag to be set, then writes out the history cache. The main thread is responsible for setting the flag when the cache size reaches a defined threshold.

`__init__`(*history_manager*)
This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is the argument tuple for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

`run`()
Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

`stop`()
This can be called from the main thread to safely stop this thread.

Note that it does not attempt to write out remaining history before exiting. That should be done by calling the HistoryManager's end_session method.

8.17.2 3 Functions

`IPython.core.history.`**`needs_sqlite`**(*f*, *self*, **a*, ***kw*)
Decorator: return an empty list in the absence of sqlite.

`IPython.core.history.`**`catch_corrupt_db`**(*f*, *self*, **a*, ***kw*)
A decorator which wraps HistoryAccessor method calls to catch errors from a corrupt SQLite database, move the old database out of the way, and create a new one.

We avoid clobbering larger databases because this may be triggered due to filesystem issues, not just a corrupt file.

`IPython.core.history.`**`extract_hist_ranges`**(*ranges_str*)
Turn a string of history ranges into 3-tuples of (session, start, stop).

Examples

```
>>> list(extract_hist_ranges("~8/5-~7/4 2"))
[(-8, 5, None), (-7, 1, 5), (0, 2, 3)]
```

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8.18 Module: `core.historyapp`

An application for managing IPython history.

To be invoked as the `ipython history` subcommand.

8.18.1 3 Classes

class `IPython.core.historyapp.`**`HistoryTrim`**`(`*`**kwargs`*`)`
    Bases: *`IPython.core.application.BaseIPythonApplication`*

  `start``()`
    Start the app mainloop.

    Override in subclasses.

class `IPython.core.historyapp.`**`HistoryClear`**`(`*`**kwargs`*`)`
    Bases: *`IPython.core.historyapp.HistoryTrim`*

  `start``()`
    Start the app mainloop.

    Override in subclasses.

class `IPython.core.historyapp.`**`HistoryApp`**`(`*`**kwargs`*`)`
    Bases: `traitlets.config.application.Application`

  `start``()`
    Start the app mainloop.

    Override in subclasses.

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8.19 Module: `core.hooks`

Hooks for IPython.

In Python, it is possible to overwrite any method of any object if you really want to. But IPython exposes a few 'hooks', methods which are *designed* to be overwritten by users for customization purposes. This module defines the default versions of all such hooks, which get used by IPython if not overridden by the user.

Hooks are simple functions, but they should be declared with `self` as their first argument, because when activated they are registered into IPython as instance methods. The self argument will be the IPython running instance itself, so hooks have full access to the entire IPython object.

If you wish to define a new hook and activate it, you can make an *extension* or a *startup script*. For example, you could use a startup file like this:

```
import os

def calljed(self,filename, linenum):
    "My editor hook calls the jed editor directly."
    print "Calling my own editor, jed ..."
    if os.system('jed +%d %s' % (linenum,filename)) != 0:
        raise TryNext()

def load_ipython_extension(ip):
    ip.set_hook('editor', calljed)
```

8.19.1 1 Class

class `IPython.core.hooks.`**`CommandChainDispatcher`**(*commands=None*)

Bases: `object`

Dispatch calls to a chain of commands until some func can handle it

Usage: instantiate, execute "add" to add commands (with optional priority), execute normally via f() calling mechanism.

`__init__`(*commands=None*)

Initialize self. See help(type(self)) for accurate signature.

`add`(*func*, *priority=0*)

Add a func to the cmd chain with given priority

8.19.2 8 Functions

`IPython.core.hooks.`**`editor`**(*self*, *filename*, *linenum=None*, *wait=True*)

Open the default editor at the given filename and linenumber.

This is IPython's default editor hook, you can use it as an example to write your own modified one. To set your own editor function as the new editor hook, call ip.set_hook('editor',yourfunc).

`IPython.core.hooks.`**`synchronize_with_editor`**(*self*, *filename*, *linenum*, *column*)

`IPython.core.hooks.`**`shutdown_hook`**(*self*)
default shutdown hook

Typically, shutdown hooks should raise TryNext so all shutdown ops are done

`IPython.core.hooks.`**`late_startup_hook`**(*self*)
Executed after ipython has been constructed and configured

`IPython.core.hooks.`**`show_in_pager`**(*self*, *data*, *start*, *screen_lines*)
Run a string through pager

`IPython.core.hooks.`**`pre_prompt_hook`**(*self*)
Run before displaying the next prompt

Use this e.g. to display output from asynchronous operations (in order to not mess up text entry)

`IPython.core.hooks.`**`pre_run_code_hook`**(*self*)
Executed before running the (prefiltered) code in IPython

`IPython.core.hooks.`**`clipboard_get`**(*self*)
Get text from the clipboard.

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8.20 Module: `core.inputsplitter`

DEPRECATED: Input handling and transformation machinery.

This module was deprecated in IPython 7.0, in favour of inputtransformer2.

The first class in this module, *`InputSplitter`*, is designed to tell when input from a line-oriented frontend is complete and should be executed, and when the user should be prompted for another line of code instead. The name 'input splitter' is largely for historical reasons.

A companion, *`IPythonInputSplitter`*, provides the same functionality but with full support for the extended IPython syntax (magics, system calls, etc). The code to actually do these transformations is in *`IPython.core.inputtransformer`*. *`IPythonInputSplitter`* feeds the raw code to the transformers in order and stores the results.

For more details, see the class docstrings below.

8.20.1 4 Classes

class `IPython.core.inputsplitter.`**`IncompleteString`**(*s*, *start*, *end*, *line*)

Bases: `object`

`__init__`(*s*, *start*, *end*, *line*)

Initialize self. See help(type(self)) for accurate signature.

class `IPython.core.inputsplitter.`**`InMultilineStatement`**(*pos*, *line*)

Bases: `object`

`__init__`(*pos*, *line*)

Initialize self. See help(type(self)) for accurate signature.

class `IPython.core.inputsplitter.`**`InputSplitter`**

Bases: `object`

An object that can accumulate lines of Python source before execution.

This object is designed to be fed python source line-by-line, using *`push()`*. It will return on each push whether the currently pushed code could be executed already. In addition, it provides a method called *`push_accepts_more()`* that can be used to query whether more input can be pushed into a single interactive block.

This is a simple example of how an interactive terminal-based client can use this tool:

```
isp = InputSplitter()
while isp.push_accepts_more():
    indent = ' '*isp.indent_spaces
    prompt = '>>> ' + indent
    line = indent + raw_input(prompt)
    isp.push(line)
print 'Input source was:\n', isp.source_reset(),
```

`__init__`()

Create a new InputSplitter instance.

`check_complete`(*source*)

Return whether a block of code is ready to execute, or should be continued

This is a non-stateful API, and will reset the state of this InputSplitter.

Parameters **`source`** (*`string`*) – Python input code, which can be multiline.

Returns

- **status** (*str*) – One of 'complete', 'incomplete', or 'invalid' if source is not a prefix of valid code.
- **indent_spaces** (*int or None*) – The number of spaces by which to indent the next line of code. If status is not 'incomplete', this is None.

`push`(*lines*)

Push one or more lines of input.

This stores the given lines and returns a status code indicating whether the code forms a complete Python block or not.

Any exceptions generated in compilation are swallowed, but if an exception was produced, the method returns True.

Parameters **`lines`** (*`string`*) – One or more lines of Python input.

Returns **is_complete** – True if the current input source (the result of the current input plus prior inputs) forms a complete Python execution block. Note that this value is also stored as a private attribute (`_is_complete`), so it can be queried at any time.

Return type boolean

`push_accepts_more`()

Return whether a block of interactive input can accept more input.

This method is meant to be used by line-oriented frontends, who need to guess whether a block is complete or not based solely on prior and current input lines. The InputSplitter considers it has a complete interactive block and will not accept more input when either:

- A SyntaxError is raised
- The code is complete and consists of a single line or a single non-compound statement
- The code is complete and has a blank line at the end

If the current input produces a syntax error, this method immediately returns False but does *not* raise the syntax error exception, as typically clients will want to send invalid syntax to an execution backend which might convert the invalid syntax into valid Python via one of the dynamic IPython mechanisms.

`reset`()

Reset the input buffer and associated state.

`source_reset`()

Return the input source and perform a full reset.

class `IPython.core.inputsplitter.`**`IPythonInputSplitter`**(*line_input_checker=True*, *physical_line_transforms=None*, *logical_line_transforms=None*, *python_line_transforms=None*)

Bases: *`IPython.core.inputsplitter.InputSplitter`*

An input splitter that recognizes all of IPython's special syntax.

`__init__`(*line_input_checker=True*, *physical_line_transforms=None*, *logical_line_transforms=None*, *python_line_transforms=None*)

Create a new InputSplitter instance.

`push`(*lines*)

Push one or more lines of IPython input.

This stores the given lines and returns a status code indicating whether the code forms a complete Python block or not, after processing all input lines for special IPython syntax.

Any exceptions generated in compilation are swallowed, but if an exception was produced, the method returns True.

Parameters **`lines`** (*`string`*) – One or more lines of Python input.

Returns **is_complete** – True if the current input source (the result of the current input plus prior inputs) forms a complete Python execution block. Note that this value is also stored as a private attribute (_is_complete), so it can be queried at any time.

Return type boolean

`push_accepts_more`()

Return whether a block of interactive input can accept more input.

This method is meant to be used by line-oriented frontends, who need to guess whether a block is complete or not based solely on prior and current input lines. The InputSplitter considers it has a complete interactive block and will not accept more input when either:

- A SyntaxError is raised
- The code is complete and consists of a single line or a single non-compound statement
- The code is complete and has a blank line at the end

If the current input produces a syntax error, this method immediately returns False but does *not* raise the syntax error exception, as typically clients will want to send invalid syntax to an execution backend which might convert the invalid syntax into valid Python via one of the dynamic IPython mechanisms.

`raw_reset`()
Return raw input only and perform a full reset.

`reset`()
Reset the input buffer and associated state.

`source_reset`()
Return the input source and perform a full reset.

`transform_cell`(*cell*)
Process and translate a cell of input.

`transforms`
Quick access to all transformers.

`transforms_in_use`
Transformers, excluding logical line transformers if we're in a Python line.

8.20.2 7 Functions

`IPython.core.inputsplitter.`**`num_ini_spaces`**(*s*)
Return the number of initial spaces in a string.

Note that tabs are counted as a single space. For now, we do *not* support mixing of tabs and spaces in the user's input.

Parameters **s** (*string*) –

Returns **n**

Return type int

`IPython.core.inputsplitter.`**`partial_tokens`**(*s*)
Iterate over tokens from a possibly-incomplete string of code.

This adds two special token types: INCOMPLETE_STRING and IN_MULTILINE_STATEMENT. These can only occur as the last token yielded, and represent the two main ways for code to be incomplete.

`IPython.core.inputsplitter.`**`find_next_indent`**(*code*)
Find the number of spaces for the next line of indentation

`IPython.core.inputsplitter.`**`last_blank`**(*src*)
Determine if the input source ends in a blank.

A blank is either a newline or a line consisting of whitespace.

Parameters **src** (*string*) – A single or multiline string.

`IPython.core.inputsplitter.`**`last_two_blanks`**`(`*src*`)`

Determine if the input source ends in two blanks.

A blank is either a newline or a line consisting of whitespace.

Parameters **`src`** (*`string`*) – A single or multiline string.

`IPython.core.inputsplitter.`**`remove_comments`**`(`*src*`)`

Remove all comments from input source.

Note: comments are NOT recognized inside of strings!

Parameters **`src`** (*`string`*) – A single or multiline input string.

Returns

Return type String with all Python comments removed.

`IPython.core.inputsplitter.`**`get_input_encoding`**`()`

Return the default standard input encoding.

If sys.stdin has no encoding, 'ascii' is returned.

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8.21 Module: `core.inputtransformer`

DEPRECATED: Input transformer classes to support IPython special syntax.

This module was deprecated in IPython 7.0, in favour of inputtransformer2.

This includes the machinery to recognise and transform `%magic` commands, `!system` commands, `help?` querying, prompt stripping, and so forth.

8.21.1 5 Classes

`class` `IPython.core.inputtransformer.`**`InputTransformer`**

Bases: `object`

Abstract base class for line-based input transformers.

`push``(`*line*`)`

Send a line of input to the transformer, returning the transformed input or None if the transformer is waiting for more input.

Must be overridden by subclasses.

Implementations may raise `SyntaxError` if the input is invalid. No other exceptions may be raised.

reset()
Return, transformed any lines that the transformer has accumulated, and reset its internal state.

Must be overridden by subclasses.

classmethod wrap(*func*)
Can be used by subclasses as a decorator, to return a factory that will allow instantiation with the decorated object.

class `IPython.core.inputtransformer.`**StatelessInputTransformer**(*func*)
Bases: *IPython.core.inputtransformer.InputTransformer*

Wrapper for a stateless input transformer implemented as a function.

__init__(*func*)
Initialize self. See help(type(self)) for accurate signature.

push(*line*)
Send a line of input to the transformer, returning the transformed input.

reset()
No-op - exists for compatibility.

class `IPython.core.inputtransformer.`**CoroutineInputTransformer**(*coro*, ***kwargs*)
Bases: *IPython.core.inputtransformer.InputTransformer*

Wrapper for an input transformer implemented as a coroutine.

__init__(*coro*, ***kwargs*)
Initialize self. See help(type(self)) for accurate signature.

push(*line*)
Send a line of input to the transformer, returning the transformed input or None if the transformer is waiting for more input.

reset()
Return, transformed any lines that the transformer has accumulated, and reset its internal state.

class `IPython.core.inputtransformer.`**TokenInputTransformer**(*func*)
Bases: *IPython.core.inputtransformer.InputTransformer*

Wrapper for a token-based input transformer.

func should accept a list of tokens (5-tuples, see tokenize docs), and return an iterable which can be passed to tokenize.untokenize().

__init__(*func*)
Initialize self. See help(type(self)) for accurate signature.

push(*line*)
Send a line of input to the transformer, returning the transformed input or None if the transformer is waiting for more input.

Must be overridden by subclasses.

Implementations may raise `SyntaxError` if the input is invalid. No other exceptions may be raised.

reset()
Return, transformed any lines that the transformer has accumulated, and reset its internal state.

Must be overridden by subclasses.

class `IPython.core.inputtransformer.`**assemble_python_lines**
Bases: *IPython.core.inputtransformer.TokenInputTransformer*

`__init__``()`
Initialize self. See help(type(self)) for accurate signature.

8.21.2 11 Functions

`IPython.core.inputtransformer.`**`assemble_logical_lines`**`()`
Join lines following explicit line continuations ()

`IPython.core.inputtransformer.`**`escaped_commands`**`(`*line*`)`
Transform escaped commands - %magic, !system, ?help + various autocalls.

`IPython.core.inputtransformer.`**`has_comment`**`(`*src*`)`
Indicate whether an input line has (i.e. ends in, or is) a comment.

This uses tokenize, so it can distinguish comments from # inside strings.

Parameters **`src`** (*`string`*) – A single line input string.

Returns **comment** – True if source has a comment.

Return type bool

`IPython.core.inputtransformer.`**`ends_in_comment_or_string`**`(`*src*`)`
Indicates whether or not an input line ends in a comment or within a multiline string.

Parameters **`src`** (*`string`*) – A single line input string.

Returns **comment** – True if source ends in a comment or multiline string.

Return type bool

`IPython.core.inputtransformer.`**`help_end`**`(`*line*`)`
Translate lines with ?/?? at the end

`IPython.core.inputtransformer.`**`cellmagic`**`(`*end_on_blank_line=False*`)`
Captures & transforms cell magics.

After a cell magic is started, this stores up any lines it gets until it is reset (sent None).

`IPython.core.inputtransformer.`**`classic_prompt`**`()`
Strip the >>>/... prompts of the Python interactive shell.

`IPython.core.inputtransformer.`**`ipy_prompt`**`()`
Strip IPython's In [1]:/...: prompts.

`IPython.core.inputtransformer.`**`leading_indent`**`()`
Remove leading indentation.

If the first line starts with a spaces or tabs, the same whitespace will be removed from each following line until it is reset.

`IPython.core.inputtransformer.`**`assign_from_system`**`(`*line*`)`
Transform assignment from system commands (e.g. files = !ls)

`IPython.core.inputtransformer.`**`assign_from_magic`**`(`*line*`)`
Transform assignment from magic commands (e.g. a = %who_ls)

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8.22 Module: `core.inputtransformer2`

Input transformer machinery to support IPython special syntax.

This includes the machinery to recognise and transform `%magic` commands, `!system` commands, `help?` querying, prompt stripping, and so forth.

Added: IPython 7.0. Replaces inputsplitter and inputtransformer which were deprecated in 7.0.

8.22.1 7 Classes

class `IPython.core.inputtransformer2.`**`PromptStripper`**(*prompt_re*, *initial_re=None*)

Bases: `object`

Remove matching input prompts from a block of input.

Parameters

- **`prompt_re`** (*`regular expression`*) – A regular expression matching any input prompt (including continuation, e.g. `...`)
- **`initial_re`** (*`regular expression, optional`*) – A regular expression matching only the initial prompt, but not continuation. If no initial expression is given, prompt_re will be used everywhere. Used mainly for plain Python prompts (>>>), where the continuation prompt `...` is a valid Python expression in Python 3, so shouldn't be stripped.
- **`initial_re and prompt_re differ,`** (*`If`*) –
- **`initial_re will be tested against the first line.`** (*`only`*) –
- **`any prompt is found on the first two lines,`** (*`If`*) –
- **`will be stripped from the rest of the block.`** (*`prompts`*) –

`__init__`(*prompt_re*, *initial_re=None*)

Initialize self. See help(type(self)) for accurate signature.

class `IPython.core.inputtransformer2.`**`TokenTransformBase`**(*start*)

Bases: `object`

Base class for transformations which examine tokens.

Special syntax should not be transformed when it occurs inside strings or comments. This is hard to reliably avoid with regexes. The solution is to tokenise the code as Python, and recognise the special syntax in the tokens.

IPython's special syntax is not valid Python syntax, so tokenising may go wrong after the special syntax starts. These classes therefore find and transform *one* instance of special syntax at a time into regular Python syntax. After each transformation, tokens are regenerated to find the next piece of special syntax.

Subclasses need to implement one class method (find) and one regular method (transform).

The priority attribute can select which transformation to apply if multiple transformers match in the same place. Lower numbers have higher priority. This allows "%magic?" to be turned into a help call rather than a magic call.

`__init__`(*start*)
Initialize self. See help(type(self)) for accurate signature.

`classmethod find`(*tokens_by_line*)
Find one instance of special syntax in the provided tokens.

Tokens are grouped into logical lines for convenience, so it is easy to e.g. look at the first token of each line. *tokens_by_line* is a list of lists of tokenize.TokenInfo objects.

This should return an instance of its class, pointing to the start position it has found, or None if it found no match.

`transform`(*lines: List[str]*)
Transform one instance of special syntax found by `find()`

Takes a list of strings representing physical lines, returns a similar list of transformed lines.

`class` `IPython.core.inputtransformer2.`**`MagicAssign`**(*start*)
Bases: *`IPython.core.inputtransformer2.TokenTransformBase`*

Transformer for assignments from magics (a = %foo)

`classmethod find`(*tokens_by_line*)
Find the first magic assignment (a = %foo) in the cell.

`transform`(*lines: List[str]*)
Transform a magic assignment found by the `find()` classmethod.

`class` `IPython.core.inputtransformer2.`**`SystemAssign`**(*start*)
Bases: *`IPython.core.inputtransformer2.TokenTransformBase`*

Transformer for assignments from system commands (a = !foo)

`classmethod find`(*tokens_by_line*)
Find the first system assignment (a = !foo) in the cell.

`transform`(*lines: List[str]*)
Transform a system assignment found by the `find()` classmethod.

`class` `IPython.core.inputtransformer2.`**`EscapedCommand`**(*start*)
Bases: *`IPython.core.inputtransformer2.TokenTransformBase`*

Transformer for escaped commands like %foo, !foo, or /foo

`classmethod find`(*tokens_by_line*)
Find the first escaped command (%foo, !foo, etc.) in the cell.

`transform`(*lines*)
Transform an escaped line found by the `find()` classmethod.

`class` `IPython.core.inputtransformer2.`**`HelpEnd`**(*start*, *q_locn*)
Bases: *`IPython.core.inputtransformer2.TokenTransformBase`*

Transformer for help syntax: obj? and obj??

`__init__`(*start*, *q_locn*)
Initialize self. See help(type(self)) for accurate signature.

`classmethod find`(*tokens_by_line*)
Find the first help command (foo?) in the cell.

transform(*lines*)
Transform a help command found by the `find()` classmethod.

class IPython.core.inputtransformer2.**TransformerManager**
Bases: `object`

Applies various transformations to a cell or code block.

The key methods for external use are `transform_cell()` and `check_complete()`.

__init__()
Initialize self. See help(type(self)) for accurate signature.

check_complete(*cell: str*)
Return whether a block of code is ready to execute, or should be continued

Parameters **source** (*string*) – Python input code, which can be multiline.

Returns

- **status** (*str*) – One of 'complete', 'incomplete', or 'invalid' if source is not a prefix of valid code.
- **indent_spaces** (*int or None*) – The number of spaces by which to indent the next line of code. If status is not 'incomplete', this is None.

do_one_token_transform(*lines*)
Find and run the transform earliest in the code.

Returns (changed, lines).

This method is called repeatedly until changed is False, indicating that all available transformations are complete.

The tokens following IPython special syntax might not be valid, so the transformed code is retokenised every time to identify the next piece of special syntax. Hopefully long code cells are mostly valid Python, not using lots of IPython special syntax, so this shouldn't be a performance issue.

transform_cell(*cell: str*) → str
Transforms a cell of input code

8.22.2 7 Functions

IPython.core.inputtransformer2.**leading_indent**(*lines*)
Remove leading indentation.

If the first line starts with a spaces or tabs, the same whitespace will be removed from each following line in the cell.

IPython.core.inputtransformer2.**cell_magic**(*lines*)

IPython.core.inputtransformer2.**find_end_of_continued_line**(*lines*, *start_line: int*)
Find the last line of a line explicitly extended using backslashes.

Uses 0-indexed line numbers.

IPython.core.inputtransformer2.**assemble_continued_line**(*lines, start: Tuple[int, int], end_line: int*)
Assemble a single line from multiple continued line pieces

Continued lines are lines ending in `\`, and the line following the last `\` in the block.

For example, this code continues over multiple lines:

```
if (assign_ix is not None) \
     and (len(line) >= assign_ix + 2) \
     and (line[assign_ix+1].string == '%') \
     and (line[assign_ix+2].type == tokenize.NAME):
```

This statement contains four continued line pieces. Assembling these pieces into a single line would give:

```
if (assign_ix is not None) and (len(line) >= assign_ix + 2) and (line[...
```

This uses 0-indexed line numbers. *start* is (lineno, colno).

Used to allow `%magic` and `!system` commands to be continued over multiple lines.

`IPython.core.inputtransformer2.`**`make_tokens_by_line`**(*lines: List[str]*)
Tokenize a series of lines and group tokens by line.

The tokens for a multiline Python string or expression are grouped as one line. All lines except the last lines should keep their line ending ('n', 'rn') for this to properly work. Use `.splitlines(keeplineending=True)` for example when passing block of text to this function.

`IPython.core.inputtransformer2.`**`show_linewise_tokens`**(*s: str*)
For investigation and debugging

`IPython.core.inputtransformer2.`**`find_last_indent`**(*lines*)

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8.23 Module: `core.interactiveshell`

Main IPython class.

8.23.1 7 Classes

class `IPython.core.interactiveshell.`**`ProvisionalWarning`**
Bases: `DeprecationWarning`

Warning class for unstable features

class `IPython.core.interactiveshell.`**`SpaceInInput`**
Bases: `Exception`

class `IPython.core.interactiveshell.`**`SeparateUnicode`**(*default_value=traitlets.Undefined, allow_none=False, read_only=None, help=None, config=None, **kwargs*)
Bases: `traitlets.traitlets.Unicode`

A Unicode subclass to validate separate_in, separate_out, etc.

This is a Unicode based trait that converts '0'->" and `'\\n'->'\n'`.

class `IPython.core.interactiveshell.`**`ExecutionInfo`**(*raw_cell*, *store_history*, *silent*, *shell_futures*)

Bases: `object`

The arguments used for a call to `InteractiveShell.run_cell()`

Stores information about what is going to happen.

`__init__`(*raw_cell*, *store_history*, *silent*, *shell_futures*)
Initialize self. See help(type(self)) for accurate signature.

class `IPython.core.interactiveshell.`**`ExecutionResult`**(*info*)

Bases: `object`

The result of a call to `InteractiveShell.run_cell()`

Stores information about what took place.

`__init__`(*info*)
Initialize self. See help(type(self)) for accurate signature.

`raise_error`()
Reraises error if `success` is `False`, otherwise does nothing

class `IPython.core.interactiveshell.`**`InteractiveShell`**(*ipython_dir=None*, *profile_dir=None*, *user_module=None*, *user_ns=None*, *custom_exceptions=((), None)*, ***kwargs*)

Bases: `traitlets.config.configurable.SingletonConfigurable`

An enhanced, interactive shell for Python.

`__init__`(*ipython_dir=None*, *profile_dir=None*, *user_module=None*, *user_ns=None*, *custom_exceptions=((), None)*, ***kwargs*)
Create a configurable given a config config.

Parameters

- **config** (*Config*) – If this is empty, default values are used. If config is a `Config` instance, it will be used to configure the instance.
- **parent** (*Configurable instance, optional*) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the `__init__()` method of `Configurable` *before* doing anything else and using `super()`:

```
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

all_ns_refs
Get a list of references to all the namespace dictionaries in which IPython might store a user-created object.

Note that this does not include the displayhook, which also caches objects from the output.

atexit_operations()
This will be executed at the time of exit.

Cleanup operations and saving of persistent data that is done unconditionally by IPython should be performed here.

For things that may depend on startup flags or platform specifics (such as having readline or not), register a separate atexit function in the code that has the appropriate information, rather than trying to clutter

auto_rewrite_input(*cmd*)
Print to the screen the rewritten form of the user's command.

This shows visual feedback by rewriting input lines that cause automatic calling to kick in, like:

```
/f x
```

into:

```
------> f(x)
```

after the user's input prompt. This helps the user understand that the input line was transformed automatically by IPython.

call_pdb
Control auto-activation of pdb at exceptions

check_complete(*code: str*) → Tuple[str, str]
Return whether a block of code is ready to execute, or should be continued

Parameters **source** (*string*) – Python input code, which can be multiline.

Returns

- **status** (*str*) – One of 'complete', 'incomplete', or 'invalid' if source is not a prefix of valid code.
- **indent** (*str*) – When status is 'incomplete', this is some whitespace to insert on the next line of the prompt.

clear_main_mod_cache()
Clear the cache of main modules.

Mainly for use by utilities like %reset.

Examples

In [15]: import IPython

In [16]: m = _ip.new_main_mod(IPython.__file__, 'IPython')

In [17]: len(_ip._main_mod_cache) > 0 Out[17]: True

In [18]: _ip.clear_main_mod_cache()

In [19]: len(_ip._main_mod_cache) == 0 Out[19]: True

complete(*text*, *line=None*, *cursor_pos=None*)
Return the completed text and a list of completions.

Parameters

- **text** (*string*) – A string of text to be completed on. It can be given as empty and instead a line/position pair are given. In this case, the completer itself will split the line like readline does.
- **line** (*string, optional*) – The complete line that text is part of.
- **cursor_pos** (*int, optional*) – The position of the cursor on the input line.

Returns

- **text** (*string*) – The actual text that was completed.
- **matches** (*list*) – A sorted list with all possible completions.

The optional arguments allow the completion to take more context into account, and are part of the low-level completion API.

This is a wrapper around the completion mechanism, similar to what readline does at the command line when the TAB key is hit. By exposing it as a method, it can be used by other non-readline environments (such as GUIs) for text completion.

Simple usage example:

In [1]: x = 'hello'

In [2]: _ip.complete('x.l') Out[2]: ('x.l', ['x.ljust', 'x.lower', 'x.lstrip'])

debugger(*force=False*)

Call the pdb debugger.

Keywords:

- force(False): by default, this routine checks the instance call_pdb flag and does not actually invoke the debugger if the flag is false. The 'force' option forces the debugger to activate even if the flag is false.

debugger_cls

alias of *IPython.core.debugger.Pdb*

define_macro(*name, themacro*)

Define a new macro

Parameters

- **name** (*str*) – The name of the macro.
- **themacro** (*str or Macro*) – The action to do upon invoking the macro. If a string, a new Macro object is created by passing the string to it.

del_var(*varname, by_name=False*)

Delete a variable from the various namespaces, so that, as far as possible, we're not keeping any hidden references to it.

Parameters

- **varname** (*str*) – The name of the variable to delete.
- **by_name** (*bool*) – If True, delete variables with the given name in each namespace. If False (default), find the variable in the user namespace, and delete references to it.

drop_by_id(*variables*)

Remove a dict of variables from the user namespace, if they are the same as the values in the dictionary.

This is intended for use by extensions: variables that they've added can be taken back out if they are unloaded, without removing any that the user has overwritten.

Parameters **variables** (*dict*) – A dictionary mapping object names (as strings) to the objects.

enable_matplotlib(*gui=None*)

Enable interactive matplotlib and inline figure support.

This takes the following steps:

1. select the appropriate eventloop and matplotlib backend
2. set up matplotlib for interactive use with that backend
3. configure formatters for inline figure display
4. enable the selected gui eventloop

Parameters **gui** (*optional, string*) – If given, dictates the choice of matplotlib GUI backend to use (should be one of IPython's supported backends, 'qt', 'osx', 'tk', 'gtk', 'wx' or 'inline'), otherwise we use the default chosen by matplotlib (as dictated by the matplotlib build-time options plus the user's matplotlibrc configuration file). Note that not all backends make sense in all contexts, for example a terminal ipython can't display figures inline.

enable_pylab(*gui=None*, *import_all=True*, *welcome_message=False*)

Activate pylab support at runtime.

This turns on support for matplotlib, preloads into the interactive namespace all of numpy and pylab, and configures IPython to correctly interact with the GUI event loop. The GUI backend to be used can be optionally selected with the optional `gui` argument.

This method only adds preloading the namespace to InteractiveShell.enable_matplotlib.

Parameters

- **gui** (*optional, string*) – If given, dictates the choice of matplotlib GUI backend to use (should be one of IPython's supported backends, 'qt', 'osx', 'tk', 'gtk', 'wx' or 'inline'), otherwise we use the default chosen by matplotlib (as dictated by the matplotlib build-time options plus the user's matplotlibrc configuration file). Note that not all backends make sense in all contexts, for example a terminal ipython can't display figures inline.
- **import_all** (*optional, bool, default: True*) – Whether to do `from numpy import *` and `from pylab import *` in addition to module imports.
- **welcome_message** (*deprecated*) – This argument is ignored, no welcome message will be displayed.

ev(*expr*)

Evaluate python expression expr in user namespace.

Returns the result of evaluation

ex(*cmd*)

Execute a normal python statement in user namespace.

excepthook(*etype*, *value*, *tb*)

One more defense for GUI apps that call sys.excepthook.

GUI frameworks like wxPython trap exceptions and call sys.excepthook themselves. I guess this is a feature that enables them to keep running after exceptions that would otherwise kill their mainloop. This is a bother for IPython which excepts to catch all of the program exceptions with a try: except: statement.

Normally, IPython sets sys.excepthook to a CrashHandler instance, so if any app directly invokes sys.excepthook, it will look to the user like IPython crashed. In order to work around this, we can disable the CrashHandler and replace it with this excepthook instead, which prints a regular traceback using our InteractiveTB. In this fashion, apps which call sys.excepthook will generate a regular-looking exception from IPython, and the CrashHandler will only be triggered by real IPython crashes.

This hook should be used sparingly, only in places which are not likely to be true IPython errors.

extract_input_lines(*range_str*, *raw=False*)
Return as a string a set of input history slices.

Parameters

- **range_str** (*string*) – The set of slices is given as a string, like "~5/6-~4/2 4:8 9", since this function is for use by magic functions which get their arguments as strings. The number before the / is the session number: ~n goes n back from the current session.
- **raw** (*bool, optional*) – By default, the processed input is used. If this is true, the raw input history is used instead.

Notes

Slices can be described with two notations:

- `N:M` -> standard python form, means including items N. . . (M-1).
- `N-M` -> include items N..M (closed endpoint).

find_cell_magic(*magic_name*)
Find and return a cell magic by name.

Returns None if the magic isn't found.

find_line_magic(*magic_name*)
Find and return a line magic by name.

Returns None if the magic isn't found.

find_magic(*magic_name*, *magic_kind='line'*)
Find and return a magic of the given type by name.

Returns None if the magic isn't found.

find_user_code(*target*, *raw=True*, *py_only=False*, *skip_encoding_cookie=True*, *search_ns=False*)
Get a code string from history, file, url, or a string or macro.

This is mainly used by magic functions.

Parameters

- **target** (*str*) – A string specifying code to retrieve. This will be tried respectively as: ranges of input history (see %history for syntax), url, corresponding .py file, filename, or an expression evaluating to a string or Macro in the user namespace.
- **raw** (*bool*) – If true (default), retrieve raw history. Has no effect on the other retrieval mechanisms.
- **py_only** (*bool (default False)*) – Only try to fetch python code, do not try alternative methods to decode file if unicode fails.

Returns

- *A string of code.*

- *ValueError is raised if nothing is found, and TypeError if it evaluates*
- *to an object of another type. In each case, .args[0] is a printable*
- *message.*

get_exception_only(*exc_tuple=None*)
Return as a string (ending with a newline) the exception that just occurred, without any traceback.

get_ipython()
Return the currently running IPython instance.

getoutput(*cmd*, *split=True*, *depth=0*)
Get output (possibly including stderr) from a subprocess.

Parameters

- **cmd** (*str*) – Command to execute (can not end in '&', as background processes are not supported.
- **split** (*bool, optional*) – If True, split the output into an IPython SList. Otherwise, an IPython LSString is returned. These are objects similar to normal lists and strings, with a few convenience attributes for easier manipulation of line-based output. You can use '?' on them for details.
- **depth** (*int, optional*) – How many frames above the caller are the local variables which should be expanded in the command string? The default (0) assumes that the expansion variables are in the stack frame calling this function.

init_completer()
Initialize the completion machinery.

This creates completion machinery that can be used by client code, either interactively in-process (typically triggered by the readline library), programmatically (such as in test suites) or out-of-process (typically over the network by remote frontends).

init_deprecation_warnings()
register default filter for deprecation warning.

This will allow deprecation warning of function used interactively to show warning to users, and still hide deprecation warning from libraries import.

init_environment()
Any changes we need to make to the user's environment.

init_history()
Sets up the command history, and starts regular autosaves.

init_logstart()
Initialize logging in case it was requested at the command line.

init_readline()
DEPRECATED

Moved to terminal subclass, here only to simplify the init logic.

init_user_ns()
Initialize all user-visible namespaces to their minimum defaults.

Certain history lists are also initialized here, as they effectively act as user namespaces.

Notes

All data structures here are only filled in, they are NOT reset by this method. If they were not empty before, data will simply be added to them.

init_virtualenv()

Add a virtualenv to sys.path so the user can import modules from it. This isn't perfect: it doesn't use the Python interpreter with which the virtualenv was built, and it ignores the –no-site-packages option. A warning will appear suggesting the user installs IPython in the virtualenv, but for many cases, it probably works well enough.

Adapted from code snippets online.

http://blog.ufsoft.org/2009/1/29/ipython-and-virtualenv

input_splitter

Make this available for backward compatibility (pre-7.0 release) with existing code.

For example, ipykernel ipykernel currently uses `shell.input_splitter.check_complete`

magic(*arg_s*)

DEPRECATED. Use run_line_magic() instead.

Call a magic function by name.

Input: a string containing the name of the magic function to call and any additional arguments to be passed to the magic.

magic('name -opt foo bar') is equivalent to typing at the ipython prompt:

In[1]: %name -opt foo bar

To call a magic without arguments, simply use magic('name').

This provides a proper Python function to call IPython's magics in any valid Python code you can type at the interpreter, including loops and compound statements.

mktempfile(*data=None*, *prefix='ipython_edit_'*)

Make a new tempfile and return its filename.

This makes a call to tempfile.mkstemp (created in a tempfile.mkdtemp), but it registers the created filename internally so ipython cleans it up at exit time.

Optional inputs:

- data(None): if data is given, it gets written out to the temp file immediately, and the file is closed again.

new_main_mod(*filename*, *modname*)

Return a new 'main' module object for user code execution.

`filename` should be the path of the script which will be run in the module. Requests with the same filename will get the same module, with its namespace cleared.

`modname` should be the module name - normally either '__main__' or the basename of the file without the extension.

When scripts are executed via %run, we must keep a reference to their __main__ module around so that Python doesn't clear it, rendering references to module globals useless.

This method keeps said reference in a private dict, keyed by the absolute path of the script. This way, for multiple executions of the same script we only keep one copy of the namespace (the last one), thus preventing memory leaks from old references while allowing the objects from the last execution to be accessible.

object_inspect(*oname*, *detail_level=0*)
Get object info about oname

object_inspect_mime(*oname*, *detail_level=0*)
Get object info as a mimebundle of formatted representations.

A mimebundle is a dictionary, keyed by mime-type. It must always have the key `'text/plain'`.

object_inspect_text(*oname*, *detail_level=0*)
Get object info as formatted text

prepare_user_module(*user_module=None*, *user_ns=None*)
Prepare the module and namespace in which user code will be run.

When IPython is started normally, both parameters are None: a new module is created automatically, and its __dict__ used as the namespace.

If only user_module is provided, its __dict__ is used as the namespace. If only user_ns is provided, a dummy module is created, and user_ns becomes the global namespace. If both are provided (as they may be when embedding), user_ns is the local namespace, and user_module provides the global namespace.

Parameters

- **user_module** (*module, optional*) – The current user module in which IPython is being run. If None, a clean module will be created.
- **user_ns** (*dict, optional*) – A namespace in which to run interactive commands.

Returns

Return type A tuple of user_module and user_ns, each properly initialised.

push(*variables*, *interactive=True*)
Inject a group of variables into the IPython user namespace.

Parameters

- **variables** (*dict, str or list/tuple of str*) – The variables to inject into the user's namespace. If a dict, a simple update is done. If a str, the string is assumed to have variable names separated by spaces. A list/tuple of str can also be used to give the variable names. If just the variable names are give (list/tuple/str) then the variable values looked up in the callers frame.
- **interactive** (*bool*) – If True (default), the variables will be listed with the `who` magic.

register_magic_function(*func*, *magic_kind='line'*, *magic_name=None*)
Expose a standalone function as magic function for IPython.

This will create an IPython magic (line, cell or both) from a standalone function. The functions should have the following signatures:

- For line magics: `def f(line)`
- For cell magics: `def f(line, cell)`
- For a function that does both: `def f(line, cell=None)`

In the latter case, the function will be called with `cell==None` when invoked as `%f`, and with cell as a string when invoked as `%%f`.

Parameters

- **func** (*callable*) – Function to be registered as a magic.
- **magic_kind** (*str*) – Kind of magic, one of 'line', 'cell' or 'line_cell'

- **magic_name** (*optional str*) – If given, the name the magic will have in the IPython namespace. By default, the name of the function itself is used.

register_post_execute(*func*)

DEPRECATED: Use ip.events.register('post_run_cell', func)

Register a function for calling after code execution.

reset(*new_session=True*)

Clear all internal namespaces, and attempt to release references to user objects.

If new_session is True, a new history session will be opened.

reset_selective(*regex=None*)

Clear selective variables from internal namespaces based on a specified regular expression.

Parameters **regex** (*string or compiled pattern, optional*) – A regular expression pattern that will be used in searching variable names in the users namespaces.

restore_sys_module_state()

Restore the state of the sys module.

run_ast_nodes(*nodelist: List[_ast.AST], cell_name: str, interactivity='last_expr', compiler=<built-in function compile>, result=None*)

Run a sequence of AST nodes. The execution mode depends on the interactivity parameter.

Parameters

- **nodelist** (*list*) – A sequence of AST nodes to run.
- **cell_name** (*str*) – Will be passed to the compiler as the filename of the cell. Typically the value returned by ip.compile.cache(cell).
- **interactivity** (*str*) – 'all', 'last', 'last_expr' , 'last_expr_or_assign' or 'none', specifying which nodes should be run interactively (displaying output from expressions). 'last_expr' will run the last node interactively only if it is an expression (i.e. expressions in loops or other blocks are not displayed) 'last_expr_or_assign' will run the last expression or the last assignment. Other values for this parameter will raise a ValueError.

  Experimental value: 'async' Will try to run top level interactive async/await code in default runner, this will not respect the interactivty setting and will only run the last node if it is an expression.
- **compiler** (*callable*) – A function with the same interface as the built-in compile(), to turn the AST nodes into code objects. Default is the built-in compile().
- **result** (*ExecutionResult, optional*) – An object to store exceptions that occur during execution.

Returns

- *True if an exception occurred while running code, False if it finished*
- *running.*

run_cell(*raw_cell, store_history=False, silent=False, shell_futures=True*)

Run a complete IPython cell.

Parameters

- **raw_cell** (*str*) – The code (including IPython code such as %magic functions) to run.
- **store_history** (*bool*) – If True, the raw and translated cell will be stored in IPython's history. For user code calling back into IPython's machinery, this should be set to False.

- **silent** (*bool*) – If True, avoid side-effects, such as implicit displayhooks and and logging. silent=True forces store_history=False.
- **shell_futures** (*bool*) – If True, the code will share future statements with the interactive shell. It will both be affected by previous __future__ imports, and any __future__ imports in the code will affect the shell. If False, __future__ imports are not shared in either direction.

Returns result

Return type *ExecutionResult*

run_cell_async(*raw_cell: str*, *store_history=False*, *silent=False*, *shell_futures=True*) → IPython.core.interactiveshell.ExecutionResult

Run a complete IPython cell asynchronously.

Parameters

- **raw_cell** (*str*) – The code (including IPython code such as %magic functions) to run.
- **store_history** (*bool*) – If True, the raw and translated cell will be stored in IPython's history. For user code calling back into IPython's machinery, this should be set to False.
- **silent** (*bool*) – If True, avoid side-effects, such as implicit displayhooks and and logging. silent=True forces store_history=False.
- **shell_futures** (*bool*) – If True, the code will share future statements with the interactive shell. It will both be affected by previous __future__ imports, and any __future__ imports in the code will affect the shell. If False, __future__ imports are not shared in either direction.

Returns

- **result** (*ExecutionResult*)
- **.. versionadded** (*7.0*)

run_cell_magic(*magic_name*, *line*, *cell*)

Execute the given cell magic.

Parameters

- **magic_name** (*str*) – Name of the desired magic function, without '%' prefix.
- **line** (*str*) – The rest of the first input line as a single string.
- **cell** (*str*) – The body of the cell as a (possibly multiline) string.

run_code(*code_obj*, *result=None*, *, *async_=False*)

Execute a code object.

When an exception occurs, self.showtraceback() is called to display a traceback.

Parameters

- **code_obj** (*code object*) – A compiled code object, to be executed
- **result** (*ExecutionResult, optional*) – An object to store exceptions that occur during execution.
- **async** (*Bool (Experimental)*) – Attempt to run top-level asynchronous code in a default loop.

Returns

- **False** (*successful execution.*)

- **True** (*an error occurred.*)

run_line_magic(*magic_name*, *line*, *_stack_depth=1*)
Execute the given line magic.

Parameters

- **magic_name** (*str*) – Name of the desired magic function, without '%' prefix.
- **line** (*str*) – The rest of the input line as a single string.
- **_stack_depth** (*int*) – If run_line_magic() is called from magic() then _stack_depth=2. This is added to ensure backward compatibility for use of 'get_ipython().magic()'

runcode(*code_obj*, *result=None*, ***, *async_=False*)
Execute a code object.

When an exception occurs, self.showtraceback() is called to display a traceback.

Parameters

- **code_obj** (*code object*) – A compiled code object, to be executed
- **result** (*ExecutionResult, optional*) – An object to store exceptions that occur during execution.
- **async** (*Bool (Experimental)*) – Attempt to run top-level asynchronous code in a default loop.

Returns

- **False** (*successful execution.*)
- **True** (*an error occurred.*)

safe_execfile(*fname*, **where*, *exit_ignore=False*, *raise_exceptions=False*, *shell_futures=False*)
A safe version of the builtin execfile().

This version will never throw an exception, but instead print helpful error messages to the screen. This only works on pure Python files with the .py extension.

Parameters

- **fname** (*string*) – The name of the file to be executed.
- **where** (*tuple*) – One or two namespaces, passed to execfile() as (globals,locals). If only one is given, it is passed as both.
- **exit_ignore** (*bool (False)*) – If True, then silence SystemExit for non-zero status (it is always silenced for zero status, as it is so common).
- **raise_exceptions** (*bool (False)*) – If True raise exceptions everywhere. Meant for testing.
- **shell_futures** (*bool (False)*) – If True, the code will share future statements with the interactive shell. It will both be affected by previous __future__ imports, and any __future__ imports in the code will affect the shell. If False, __future__ imports are not shared in either direction.

safe_execfile_ipy(*fname*, *shell_futures=False*, *raise_exceptions=False*)
Like safe_execfile, but for .ipy or .ipynb files with IPython syntax.

Parameters

- **fname** (*str*) – The name of the file to execute. The filename must have a .ipy or .ipynb extension.
- **shell_futures** (*bool (False)*) – If True, the code will share future statements with the interactive shell. It will both be affected by previous __future__ imports, and any __future__ imports in the code will affect the shell. If False, __future__ imports are not shared in either direction.
- **raise_exceptions** (*bool (False)*) – If True raise exceptions everywhere. Meant for testing.

safe_run_module(*mod_name*, *where*)
A safe version of runpy.run_module().

This version will never throw an exception, but instead print helpful error messages to the screen.

`SystemExit` exceptions with status code 0 or None are ignored.

Parameters

- **mod_name** (*string*) – The name of the module to be executed.
- **where** (*dict*) – The globals namespace.

save_sys_module_state()
Save the state of hooks in the sys module.

This has to be called after self.user_module is created.

set_autoindent(*value=None*)
Set the autoindent flag.

If called with no arguments, it acts as a toggle.

set_completer_frame(*frame=None*)
Set the frame of the completer.

set_custom_completer(*completer*, *pos=0*)
Adds a new custom completer function.

The position argument (defaults to 0) is the index in the completers list where you want the completer to be inserted.

set_custom_exc(*exc_tuple*, *handler*)
Set a custom exception handler, which will be called if any of the exceptions in exc_tuple occur in the mainloop (specifically, in the run_code() method).

Parameters

- **exc_tuple** (*tuple of exception classes*) – A *tuple* of exception classes, for which to call the defined handler. It is very important that you use a tuple, and NOT A LIST here, because of the way Python's except statement works. If you only want to trap a single exception, use a singleton tuple:

```
exc_tuple == (MyCustomException,)
```

- **handler** (*callable*) – handler must have the following signature:

```
def my_handler(self, etype, value, tb, tb_offset=None):
    ...
    return structured_traceback
```

Your handler must return a structured traceback (a list of strings), or None.

This will be made into an instance method (via types.MethodType) of IPython itself, and it will be called if any of the exceptions listed in the exc_tuple are caught. If the handler is None, an internal basic one is used, which just prints basic info.

To protect IPython from crashes, if your handler ever raises an exception or returns an invalid result, it will be immediately disabled.

- **WARNING** (*by putting in your own exception handler into IPython's main*) –
- **loop, you run a very good chance of nasty crashes. This** (*execution*) –
- **should only be used if you really know what you are doing.** (*facility*) –

set_hook(*name*, *hook*) → sets an internal IPython hook.
IPython exposes some of its internal API as user-modifiable hooks. By adding your function to one of these hooks, you can modify IPython's behavior to call at runtime your own routines.

set_next_input(*s*, *replace=False*)
Sets the 'default' input string for the next command line.

Example:

```
In [1]: _ip.set_next_input("Hello Word")
In [2]: Hello Word_  # cursor is here
```

should_run_async(*raw_cell: str*) → bool
Return whether a cell should be run asynchronously via a coroutine runner

Parameters **raw_cell** (*str*) – The code to be executed

Returns

- **result** (*bool*) – Whether the code needs to be run with a coroutine runner or not
- **.. versionadded** (*7.0*)

show_usage()
Show a usage message

show_usage_error(*exc*)
Show a short message for UsageErrors

These are special exceptions that shouldn't show a traceback.

showindentationerror()
Called by _run_cell when there's an IndentationError in code entered at the prompt.

This is overridden in TerminalInteractiveShell to show a message about the %paste magic.

showsyntaxerror(*filename=None*, *running_compiled_code=False*)
Display the syntax error that just occurred.

This doesn't display a stack trace because there isn't one.

If a filename is given, it is stuffed in the exception instead of what was there before (because Python's parser always uses "<string>" when reading from a string).

If the syntax error occurred when running a compiled code (i.e. running_compile_code=True), longer stack trace will be displayed.

showtraceback(*exc_tuple=None*, *filename=None*, *tb_offset=None*, *exception_only=False*, *running_compiled_code=False*)
Display the exception that just occurred.

If nothing is known about the exception, this is the method which should be used throughout the code for presenting user tracebacks, rather than directly invoking the InteractiveTB object.

A specific showsyntaxerror() also exists, but this method can take care of calling it if needed, so unless you are explicitly catching a SyntaxError exception, don't try to analyze the stack manually and simply call this method.

system(*cmd*)
Call the given cmd in a subprocess, piping stdout/err

Parameters **cmd** (`str`) – Command to execute (can not end in '&', as background processes are not supported. Should not be a command that expects input other than simple text.

system_piped(*cmd*)
Call the given cmd in a subprocess, piping stdout/err

Parameters **cmd** (`str`) – Command to execute (can not end in '&', as background processes are not supported. Should not be a command that expects input other than simple text.

system_raw(*cmd*)
Call the given cmd in a subprocess using os.system on Windows or subprocess.call using the system shell on other platforms.

Parameters **cmd** (`str`) – Command to execute.

transform_ast(*node*)
Apply the AST transformations from self.ast_transformers

Parameters **node** (`ast.Node`) – The root node to be transformed. Typically called with the ast.Module produced by parsing user input.

Returns

- *An ast.Node corresponding to the node it was called with. Note that it*
- *may also modify the passed object, so don't rely on references to the*
- *original AST.*

transform_cell(*raw_cell*)
Transform an input cell before parsing it.

Static transformations, implemented in IPython.core.inputtransformer2, deal with things like `%magic` and `!system` commands. These run on all input. Dynamic transformations, for things like unescaped magics and the exit autocall, depend on the state of the interpreter. These only apply to single line inputs.

These string-based transformations are followed by AST transformations; see `transform_ast()`.

user_expressions(*expressions*)
Evaluate a dict of expressions in the user's namespace.

Parameters **expressions** (`dict`) – A dict with string keys and string values. The expression values should be valid Python expressions, each of which will be evaluated in the user namespace.

Returns

- *A dict, keyed like the input expressions dict, with the rich mime-typed*
- *display_data of each value.*

var_expand(*cmd*, *depth=0*, *formatter=<IPython.utils.text.DollarFormatter object>*)
Expand python variables in a string.

The depth argument indicates how many frames above the caller should be walked to look for the local namespace where to expand variables.

The global namespace for expansion is always the user's interactive namespace.

write(*data*)
DEPRECATED: Write a string to the default output

write_err(*data*)
DEPRECATED: Write a string to the default error output

class IPython.core.interactiveshell.**InteractiveShellABC**
Bases: object

An abstract base class for InteractiveShell.

8.23.2 3 Functions

IPython.core.interactiveshell.**sphinxify**(*doc*)

IPython.core.interactiveshell.**removed_co_newlocals**(*function: function*) → function
Return a function that do not create a new local scope.

Given a function, create a clone of this function where the co_newlocal flag has been removed, making this function code actually run in the sourounding scope.

We need this in order to run asynchronous code in user level namespace.

IPython.core.interactiveshell.**get_default_colors**()
DEPRECATED

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If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

8.24 Module: `core.logger`

Logger class for IPython's logging facilities.

8.24.1 1 Class

class IPython.core.logger.**Logger**(*home_dir*, *logfname='Logger.log'*, *loghead=''*, *logmode='over'*)
Bases: object

A Logfile class with different policies for file creation

__init__(*home_dir*, *logfname='Logger.log'*, *loghead="*, *logmode='over'*)
Initialize self. See help(type(self)) for accurate signature.

close_log()
Fully stop logging and close log file.

In order to start logging again, a new logstart() call needs to be made, possibly (though not necessarily) with a new filename, mode and other options.

log(*line_mod*, *line_ori*)
Write the sources to a log.

Inputs:

- line_mod: possibly modified input, such as the transformations made by input prefilters or input handlers of various kinds. This should always be valid Python.
- line_ori: unmodified input line from the user. This is not necessarily valid Python.

log_write(*data*, *kind='input'*)
Write data to the log file, if active

logstart(*logfname=None*, *loghead=None*, *logmode=None*, *log_output=False*, *timestamp=False*, *log_raw_input=False*)
Generate a new log-file with a default header.

Raises RuntimeError if the log has already been started

logstate()
Print a status message about the logger.

logstop()
Fully stop logging and close log file.

In order to start logging again, a new logstart() call needs to be made, possibly (though not necessarily) with a new filename, mode and other options.

switch_log(*val*)
Switch logging on/off. val should be ONLY a boolean.

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8.25 Module: `core.macro`

Support for interactive macros in IPython

8.25.1 1 Class

class `IPython.core.macro.`**`Macro`**(*code*)

Bases: `object`

Simple class to store the value of macros as strings.

Macro is just a callable that executes a string of IPython input when called.

`__init__`(*code*)

store the macro value, as a single string which can be executed

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8.26 Module: `core.magic`

Magic functions for InteractiveShell.

8.26.1 4 Classes

class `IPython.core.magic.`**`Bunch`**

Bases: `object`

class `IPython.core.magic.`**`MagicsManager`**(*shell=None*, *config=None*, *user_magics=None*, ***traits*)

Bases: `traitlets.config.configurable.Configurable`

Object that handles all magic-related functionality for IPython.

`__init__`(*shell=None*, *config=None*, *user_magics=None*, ***traits*)

Create a configurable given a config config.

Parameters

- **`config`** (*`Config`*) – If this is empty, default values are used. If config is a `Config` instance, it will be used to configure the instance.
- **`parent`** (*`Configurable instance, optional`*) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the *`__init__()`* method of `Configurable` *before* doing anything else and using `super()`:

```
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

auto_status()
Return descriptive string with automagic status.

lsmagic()
Return a dict of currently available magic functions.

The return dict has the keys 'line' and 'cell', corresponding to the two types of magics we support. Each value is a list of names.

lsmagic_docs(*brief=False, missing="*)
Return dict of documentation of magic functions.

The return dict has the keys 'line' and 'cell', corresponding to the two types of magics we support. Each value is a dict keyed by magic name whose value is the function docstring. If a docstring is unavailable, the value of `missing` is used instead.

If brief is True, only the first line of each docstring will be returned.

register(**magic_objects*)
Register one or more instances of Magics.

Take one or more classes or instances of classes that subclass the main `core.Magic` class, and register them with IPython to use the magic functions they provide. The registration process will then ensure that any methods that have decorated to provide line and/or cell magics will be recognized with the `%x`/`%%x` syntax as a line/cell magic respectively.

If classes are given, they will be instantiated with the default constructor. If your classes need a custom constructor, you should instanitate them first and pass the instance.

The provided arguments can be an arbitrary mix of classes and instances.

Parameters **magic_objects** (*one or more classes or instances*) –

register_alias(*alias_name, magic_name, magic_kind='line', magic_params=None*)
Register an alias to a magic function.

The alias is an instance of *MagicAlias*, which holds the name and kind of the magic it should call. Binding is done at call time, so if the underlying magic function is changed the alias will call the new function.

Parameters

- **alias_name** (*str*) – The name of the magic to be registered.
- **magic_name** (*str*) – The name of an existing magic.
- **magic_kind** (*str*) – Kind of magic, one of 'line' or 'cell'

register_function(*func, magic_kind='line', magic_name=None*)
Expose a standalone function as magic function for IPython.

This will create an IPython magic (line, cell or both) from a standalone function. The functions should have the following signatures:

- For line magics: `def f(line)`
- For cell magics: `def f(line, cell)`

- For a function that does both: `def f(line, cell=None)`

In the latter case, the function will be called with `cell==None` when invoked as `%f`, and with cell as a string when invoked as `%%f`.

Parameters

- **func** (*callable*) – Function to be registered as a magic.
- **magic_kind** (*str*) – Kind of magic, one of 'line', 'cell' or 'line_cell'
- **magic_name** (*optional str*) – If given, the name the magic will have in the IPython namespace. By default, the name of the function itself is used.

class IPython.core.magic.**Magics**(*shell=None*, ***kwargs*)
Bases: `traitlets.config.configurable.Configurable`

Base class for implementing magic functions.

Shell functions which can be reached as %function_name. All magic functions should accept a string, which they can parse for their own needs. This can make some functions easier to type, eg `%cd ../` vs. `%cd("../")`

Classes providing magic functions need to subclass this class, and they MUST:

- Use the method decorators `@line_magic` and `@cell_magic` to decorate individual methods as magic functions, AND
- Use the class decorator `@magics_class` to ensure that the magic methods are properly registered at the instance level upon instance initialization.

See `magic_functions` for examples of actual implementation classes.

__init__(*shell=None*, ***kwargs*)
Create a configurable given a config config.

Parameters

- **config** (*Config*) – If this is empty, default values are used. If config is a `Config` instance, it will be used to configure the instance.
- **parent** (*Configurable instance, optional*) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the `__init__()` method of `Configurable` *before* doing anything else and using `super()`:

```
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

arg_err(*func*)
Print docstring if incorrect arguments were passed

default_option(*fn*, *optstr*)
Make an entry in the options_table for fn, with value optstr

format_latex(*strng*)
Format a string for latex inclusion.

parse_options(*arg_str*, *opt_str*, **long_opts*, ***kw*)
Parse options passed to an argument string.

The interface is similar to that of `getopt.getopt()`, but it returns a `Struct` with the options as keys and the stripped argument string still as a string.

arg_str is quoted as a true sys.argv vector by using shlex.split. This allows us to easily expand variables, glob files, quote arguments, etc.

Parameters

- **arg_str** (*str*) – The arguments to parse.
- **opt_str** (*str*) – The options specification.
- **mode** (*str, default 'string'*) – If given as 'list', the argument string is returned as a list (split on whitespace) instead of a string.
- **list_all** (*bool, default False*) – Put all option values in lists. Normally only options appearing more than once are put in a list.
- **posix** (*bool, default True*) – Whether to split the input line in POSIX mode or not, as per the conventions outlined in the `shlex` module from the standard library.

class `IPython.core.magic.`**MagicAlias**(*shell*, *magic_name*, *magic_kind*, *magic_params=None*)
Bases: `object`

An alias to another magic function.

An alias is determined by its magic name and magic kind. Lookup is done at call time, so if the underlying magic changes the alias will call the new function.

Use the *MagicsManager.register_alias()* method or the `%alias_magic` magic function to create and register a new alias.

__init__(*shell*, *magic_name*, *magic_kind*, *magic_params=None*)
Initialize self. See help(type(self)) for accurate signature.

8.26.2 6 Functions

`IPython.core.magic.`**on_off**(*tag*)
Return an ON/OFF string for a 1/0 input. Simple utility function.

`IPython.core.magic.`**compress_dhist**(*dh*)
Compress a directory history into a new one with at most 20 entries.

Return a new list made from the first and last 10 elements of dhist after removal of duplicates.

`IPython.core.magic.`**needs_local_scope**(*func*)
Decorator to mark magic functions which need to local scope to run.

`IPython.core.magic.`**magics_class**(*cls*)
Class decorator for all subclasses of the main Magics class.

Any class that subclasses Magics *must* also apply this decorator, to ensure that all the methods that have been decorated as line/cell magics get correctly registered in the class instance. This is necessary because when method decorators run, the class does not exist yet, so they temporarily store their information into a module global. Application of this class decorator copies that global data to the class instance and clears the global.

Obviously, this mechanism is not thread-safe, which means that the *creation* of subclasses of Magic should only be done in a single-thread context. Instantiation of the classes has no restrictions. Given that these classes are typically created at IPython startup time and before user application code becomes active, in practice this should not pose any problems.

`IPython.core.magic.`**`record_magic`**(*dct*, *magic_kind*, *magic_name*, *func*)

Utility function to store a function as a magic of a specific kind.

Parameters

- **`dct`** (*`dict`*) – A dictionary with 'line' and 'cell' subdicts.
- **`magic_kind`** (*`str`*) – Kind of magic to be stored.
- **`magic_name`** (*`str`*) – Key to store the magic as.
- **`func`** (*`function`*) – Callable object to store.

`IPython.core.magic.`**`validate_type`**(*magic_kind*)

Ensure that the given magic_kind is valid.

Check that the given magic_kind is one of the accepted spec types (stored in the global `magic_spec`), raise ValueError otherwise.

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8.27 Module: `core.magic_arguments`

A decorator-based method of constructing IPython magics with `argparse` option handling.

New magic functions can be defined like so:

```
from IPython.core.magic_arguments import (argument, magic_arguments,
    parse_argstring)

@magic_arguments()
@argument('-o', '--option', help='An optional argument.')
@argument('arg', type=int, help='An integer positional argument.')
def magic_cool(self, arg):
    """ A really cool magic command.

"""
    args = parse_argstring(magic_cool, arg)
    ...
```

The `@magic_arguments` decorator marks the function as having argparse arguments. The `@argument` decorator adds an argument using the same syntax as argparse's `add_argument()` method. More sophisticated uses may also require the `@argument_group` or `@kwds` decorator to customize the formatting and the parsing.

Help text for the magic is automatically generated from the docstring and the arguments:

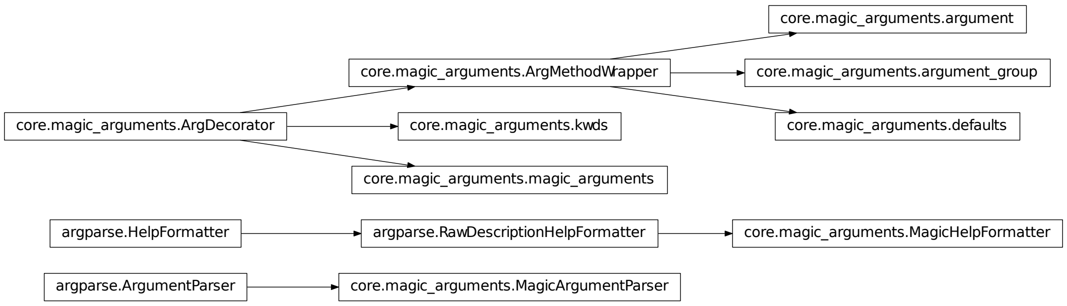
```
In[1]: %cool?
    %cool [-o OPTION] arg

    A really cool magic command.

    positional arguments:
      arg                   An integer positional argument.

    optional arguments:
      -o OPTION, --option OPTION
                            An optional argument.
```

Inheritance diagram:


core.magic_arguments.argument
core.magic_arguments.ArgMethodWrapper
core.magic_arguments.argument_group
core.magic_arguments.ArgDecorator
core.magic_arguments.kwds
core.magic_arguments.defaults
core.magic_arguments.magic_arguments
argparse.HelpFormatter
argparse.RawDescriptionHelpFormatter
core.magic_arguments.MagicHelpFormatter
argparse.ArgumentParser
core.magic_arguments.MagicArgumentParser

8.27.1 8 Classes

class IPython.core.magic_arguments.**MagicArgumentParser**(*prog=None*, *usage=None*, *description=None*, *epilog=None*, *parents=None*, *formatter_class=<class 'IPython.core.magic_arguments.MagicHelpFormatte*
prefix_chars='-', *argument_default=None*, *conflict_handler='error'*, *add_help=False*)

Bases: argparse.ArgumentParser

An ArgumentParser tweaked for use by IPython magics.

__init__(*prog=None*, *usage=None*, *description=None*, *epilog=None*, *parents=None*, *formatter_class=<class 'IPython.core.magic_arguments.MagicHelpFormatter'>*, *prefix_chars='-'*, *argument_default=None*, *conflict_handler='error'*, *add_help=False*)
Initialize self. See help(type(self)) for accurate signature.

error(*message*)
Raise a catchable error instead of exiting.

parse_argstring(*argstring*)
Split a string into an argument list and parse that argument list.

class IPython.core.magic_arguments.**ArgDecorator**
Bases: object

Base class for decorators to add ArgumentParser information to a method.

add_to_parser(*parser*, *group*)
Add this object's information to the parser, if necessary.

class IPython.core.magic_arguments.**magic_arguments**(*name=None*)
Bases: *IPython.core.magic_arguments.ArgDecorator*

Mark the magic as having argparse arguments and possibly adjust the name.

__init__(*name=None*)
Initialize self. See help(type(self)) for accurate signature.

class IPython.core.magic_arguments.**ArgMethodWrapper**(**args*, ***kwds*)
Bases: *IPython.core.magic_arguments.ArgDecorator*

Base class to define a wrapper for ArgumentParser method.

Child class must define either _method_name or add_to_parser.

__init__(**args*, ***kwds*)
Initialize self. See help(type(self)) for accurate signature.

add_to_parser(*parser*, *group*)
Add this object's information to the parser.

class IPython.core.magic_arguments.**argument**(**args*, ***kwds*)
Bases: *IPython.core.magic_arguments.ArgMethodWrapper*

Store arguments and keywords to pass to add_argument().

Instances also serve to decorate command methods.

class IPython.core.magic_arguments.**defaults**(**args*, ***kwds*)
Bases: *IPython.core.magic_arguments.ArgMethodWrapper*

Store arguments and keywords to pass to set_defaults().

Instances also serve to decorate command methods.

class IPython.core.magic_arguments.**argument_group**(**args*, ***kwds*)
Bases: *IPython.core.magic_arguments.ArgMethodWrapper*

Store arguments and keywords to pass to add_argument_group().

Instances also serve to decorate command methods.

add_to_parser(*parser*, *group*)
Add this object's information to the parser.

class IPython.core.magic_arguments.**kwds**(***kwds*)
Bases: *IPython.core.magic_arguments.ArgDecorator*

Provide other keywords to the sub-parser constructor.

__init__(***kwds*)
Initialize self. See help(type(self)) for accurate signature.

8.27.2 3 Functions

IPython.core.magic_arguments.**construct_parser**(*magic_func*)
Construct an argument parser using the function decorations.

`IPython.core.magic_arguments.`**`parse_argstring`**(*magic_func*, *argstring*)
Parse the string of arguments for the given magic function.

`IPython.core.magic_arguments.`**`real_name`**(*magic_func*)
Find the real name of the magic.

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8.28 Module: `core.oinspect`

Tools for inspecting Python objects.

Uses syntax highlighting for presenting the various information elements.

Similar in spirit to the inspect module, but all calls take a name argument to reference the name under which an object is being read.

8.28.1 1 Class

`class` `IPython.core.oinspect.`**`Inspector`**(*color_table={": <IPython.utils.coloransi.ColorScheme object>, 'LightBG': <IPython.utils.coloransi.ColorScheme object>, 'Linux': <IPython.utils.coloransi.ColorScheme object>, 'Neutral': <IPython.utils.coloransi.ColorScheme object>, 'NoColor': <IPython.utils.coloransi.ColorScheme object>}, code_color_table={": <IPython.utils.coloransi.ColorScheme object>, 'LightBG': <IPython.utils.coloransi.ColorScheme object>, 'Linux': <IPython.utils.coloransi.ColorScheme object>, 'Neutral': <IPython.utils.coloransi.ColorScheme object>, 'NoColor': <IPython.utils.coloransi.ColorScheme object>}, scheme=None, str_detail_level=0, parent=None, config=None*)
Bases: `IPython.utils.colorable.Colorable`

`__init__`(*color_table={'': <IPython.utils.coloransi.ColorScheme object>, 'LightBG': <IPython.utils.coloransi.ColorScheme object>, 'Linux': <IPython.utils.coloransi.ColorScheme object>, 'Neutral': <IPython.utils.coloransi.ColorScheme object>, 'NoColor': <IPython.utils.coloransi.ColorScheme object>}, code_color_table={'': <IPython.utils.coloransi.ColorScheme object>, 'LightBG': <IPython.utils.coloransi.ColorScheme object>, 'Linux': <IPython.utils.coloransi.ColorScheme object>, 'Neutral': <IPython.utils.coloransi.ColorScheme object>, 'NoColor': <IPython.utils.coloransi.ColorScheme object>}, scheme=None, str_detail_level=0, parent=None, config=None*)

Create a configurable given a config config.

Parameters

- **`config`** (`Config`) – If this is empty, default values are used. If config is a `Config` instance, it will be used to configure the instance.
- **`parent`** (`Configurable instance, optional`) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the `__init__()` method of `Configurable` *before* doing anything else and using `super()`:

```
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

`info`(*obj, oname='', formatter=None, info=None, detail_level=0*)

DEPRECATED. Compute a dict with detailed information about an object.

`noinfo`(*msg, oname*)

Generic message when no information is found.

`pdef`(*obj, oname=''*)

Print the call signature for any callable object.

If the object is a class, print the constructor information.

`pdoc`(*obj, oname='', formatter=None*)

Print the docstring for any object.

Optional: -formatter: a function to run the docstring through for specially formatted docstrings.

Examples

In [1]: class NoInit: ...: pass

In [2]: class NoDoc: ...: def __init__(self): ...: pass

In [3]: %pdoc NoDoc No documentation found for NoDoc

In [4]: %pdoc NoInit No documentation found for NoInit

In [5]: obj = NoInit()

In [6]: %pdoc obj No documentation found for obj

In [5]: obj2 = NoDoc()

In [6]: %pdoc obj2 No documentation found for obj2

pfile(*obj*, *oname="*)
Show the whole file where an object was defined.

pinfo(*obj*, *oname="*, *formatter=None*, *info=None*, *detail_level=0*, *enable_html_pager=True*)
Show detailed information about an object.

Optional arguments:

- oname: name of the variable pointing to the object.
- **formatter: callable (optional)** A special formatter for docstrings.

  The formatter is a callable that takes a string as an input and returns either a formatted string or a mime type bundle in the form of a dictionary.

  Although the support of custom formatter returning a string instead of a mime type bundle is deprecated.
- info: a structure with some information fields which may have been precomputed already.
- detail_level: if set to 1, more information is given.

psearch(*pattern*, *ns_table*, *ns_search=[]*, *ignore_case=False*, *show_all=False*)
Search namespaces with wildcards for objects.

Arguments:

- pattern: string containing shell-like wildcards to use in namespace searches and optionally a type specification to narrow the search to objects of that type.
- ns_table: dict of name->namespaces for search.

Optional arguments:

- ns_search: list of namespace names to include in search.
- ignore_case(False): make the search case-insensitive.
- show_all(False): show all names, including those starting with underscores.

psource(*obj*, *oname="*)
Print the source code for an object.

8.28.2 10 Functions

IPython.core.oinspect.**pylight**(*code*)

IPython.core.oinspect.**object_info**(***kw*)
Make an object info dict with all fields present.

IPython.core.oinspect.**get_encoding**(*obj*)
Get encoding for python source file defining obj

Returns None if obj is not defined in a sourcefile.

`IPython.core.oinspect.`**`getdoc`**`(`*obj*`)`

Stable wrapper around inspect.getdoc.

This can't crash because of attribute problems.

It also attempts to call a getdoc() method on the given object. This allows objects which provide their docstrings via non-standard mechanisms (like Pyro proxies) to still be inspected by ipython's ? system.

`IPython.core.oinspect.`**`getsource`**`(`*obj*, *oname=''*`)`

Wrapper around inspect.getsource.

This can be modified by other projects to provide customized source extraction.

Parameters

- **obj** (*object*) – an object whose source code we will attempt to extract
- **oname** (*str*) – (optional) a name under which the object is known

Returns src

Return type unicode or None

`IPython.core.oinspect.`**`is_simple_callable`**`(`*obj*`)`

True if obj is a function ()

`IPython.core.oinspect.`**`getargspec`**`(`*obj*`)`

Wrapper around `inspect.getfullargspec()` on Python 3, and :func:inspect.getargspec‘ on Python 2.

In addition to functions and methods, this can also handle objects with a `__call__` attribute.

`IPython.core.oinspect.`**`format_argspec`**`(`*argspec*`)`

Format argspect, convenience wrapper around inspect's.

This takes a dict instead of ordered arguments and calls inspect.format_argspec with the arguments in the necessary order.

`IPython.core.oinspect.`**`find_file`**`(`*obj*`)`

Find the absolute path to the file where an object was defined.

This is essentially a robust wrapper around `inspect.getabsfile`.

Returns None if no file can be found.

Parameters **obj** (*any Python object*) –

Returns **fname** – The absolute path to the file where the object was defined.

Return type str

`IPython.core.oinspect.`**`find_source_lines`**`(`*obj*`)`

Find the line number in a file where an object was defined.

This is essentially a robust wrapper around `inspect.getsourcelines`.

Returns None if no file can be found.

Parameters **obj** (*any Python object*) –

Returns **lineno** – The line number where the object definition starts.

Return type int

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8.29 Module: `core.page`

Paging capabilities for IPython.core

Notes

For now this uses IPython hooks, so it can't be in IPython.utils. If we can get rid of that dependency, we could move it there. —–

8.29.1 10 Functions

`IPython.core.page.`**`display_page`**(*strng*, *start=0*, *screen_lines=25*)
Just display, no paging. screen_lines is ignored.

`IPython.core.page.`**`as_hook`**(*page_func*)
Wrap a pager func to strip the `self` arg

so it can be called as a hook.

`IPython.core.page.`**`page_dumb`**(*strng*, *start=0*, *screen_lines=25*)
Very dumb 'pager' in Python, for when nothing else works.

Only moves forward, same interface as page(), except for pager_cmd and mode.

`IPython.core.page.`**`pager_page`**(*strng*, *start=0*, *screen_lines=0*, *pager_cmd=None*)
Display a string, piping through a pager after a certain length.

strng can be a mime-bundle dict, supplying multiple representations, keyed by mime-type.

The screen_lines parameter specifies the number of *usable* lines of your terminal screen (total lines minus lines you need to reserve to show other information).

If you set screen_lines to a number <=0, page() will try to auto-determine your screen size and will only use up to (screen_size+screen_lines) for printing, paging after that. That is, if you want auto-detection but need to reserve the bottom 3 lines of the screen, use screen_lines = -3, and for auto-detection without any lines reserved simply use screen_lines = 0.

If a string won't fit in the allowed lines, it is sent through the specified pager command. If none given, look for PAGER in the environment, and ultimately default to less.

If no system pager works, the string is sent through a 'dumb pager' written in python, very simplistic.

`IPython.core.page.`**`page`**(*data*, *start=0*, *screen_lines=0*, *pager_cmd=None*)
Display content in a pager, piping through a pager after a certain length.

data can be a mime-bundle dict, supplying multiple representations, keyed by mime-type, or text.

Pager is dispatched via the `show_in_pager` IPython hook. If no hook is registered, `pager_page` will be used.

`IPython.core.page.`**`page_file`**`(`*fname*, *start=0*, *pager_cmd=None*`)`
Page a file, using an optional pager command and starting line.

`IPython.core.page.`**`get_pager_cmd`**`(`*pager_cmd=None*`)`
Return a pager command.

Makes some attempts at finding an OS-correct one.

`IPython.core.page.`**`get_pager_start`**`(`*pager*, *start*`)`
Return the string for paging files with an offset.

This is the '+N' argument which less and more (under Unix) accept.

`IPython.core.page.`**`page_more`**`()`

`IPython.core.page.`**`snip_print`**`(`*str*, *width=75*, *print_full=0*, *header="*`)`
Print a string snipping the midsection to fit in width.

print_full: mode control:

- 0: only snip long strings
- 1: send to page() directly.
- 2: snip long strings and ask for full length viewing with page()

Return 1 if snipping was necessary, 0 otherwise.

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8.30 Module: `core.payload`

Payload system for IPython.

Authors:

- Fernando Perez
- Brian Granger

8.30.1 1 Class

`class` `IPython.core.payload.`**`PayloadManager`**`(`***kwargs*`)`
Bases: `traitlets.config.configurable.Configurable`

`write_payload``(`*data*, *single=True*`)`
Include or update the specified `data` payload in the PayloadManager.

If a previous payload with the same source exists and `single` is True, it will be overwritten with the new one.

8.31 Module: `core.payloadpage`

A payload based version of page.

8.31.1 2 Functions

`IPython.core.payloadpage.`**`page`**(*strng*, *start=0*, *screen_lines=0*, *pager_cmd=None*)

Print a string, piping through a pager.

This version ignores the screen_lines and pager_cmd arguments and uses IPython's payload system instead.

Parameters

- **`strng`** (*`str or mime-dict`*) – Text to page, or a mime-type keyed dict of already formatted data.
- **`start`** (*`int`*) – Starting line at which to place the display.

`IPython.core.payloadpage.`**`install_payload_page`**()

DEPRECATED, use show_in_pager hook

Install this version of page as IPython.core.page.page.

8.32 Module: `core.prefilter`

Prefiltering components.

Prefilters transform user input before it is exec'd by Python. These transforms are used to implement additional syntax such as !ls and %magic.

8.32.1 16 Classes

class IPython.core.prefilter.**PrefilterError**

Bases: Exception

class IPython.core.prefilter.**PrefilterManager**(*shell=None*, ***kwargs*)

Bases: traitlets.config.configurable.Configurable

Main prefilter component.

The IPython prefilter is run on all user input before it is run. The prefilter consumes lines of input and produces transformed lines of input.

The implementation consists of two phases:

1. Transformers
2. Checkers and handlers

Over time, we plan on deprecating the checkers and handlers and doing everything in the transformers.

The transformers are instances of *PrefilterTransformer* and have a single method transform() that takes a line and returns a transformed line. The transformation can be accomplished using any tool, but our current ones use regular expressions for speed.

After all the transformers have been run, the line is fed to the checkers, which are instances of *PrefilterChecker*. The line is passed to the check() method, which either returns None or a *PrefilterHandler* instance. If None is returned, the other checkers are tried. If an *PrefilterHandler* instance is returned, the line is passed to the handle() method of the returned handler and no further checkers are tried.

Both transformers and checkers have a priority attribute, that determines the order in which they are called. Smaller priorities are tried first.

Both transformers and checkers also have enabled attribute, which is a boolean that determines if the instance is used.

Users or developers can change the priority or enabled attribute of transformers or checkers, but they must call the *sort_checkers()* or *sort_transformers()* method after changing the priority.

__init__(*shell=None*, ***kwargs*)

Create a configurable given a config config.

Parameters

- **config** (*Config*) – If this is empty, default values are used. If config is a Config instance, it will be used to configure the instance.
- **parent** (*Configurable instance, optional*) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the *__init__()* method of Configurable *before* doing anything else and using super():

```
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

checkers
Return a list of checkers, sorted by priority.

find_handler(*line_info*)
Find a handler for the line_info by trying checkers.

get_handler_by_esc(*esc_str*)
Get a handler by its escape string.

get_handler_by_name(*name*)
Get a handler by its name.

handlers
Return a dict of all the handlers.

init_checkers()
Create the default checkers.

init_handlers()
Create the default handlers.

init_transformers()
Create the default transformers.

prefilter_line(*line*, *continue_prompt=False*)
Prefilter a single input line as text.

This method prefilters a single line of text by calling the transformers and then the checkers/handlers.

prefilter_line_info(*line_info*)
Prefilter a line that has been converted to a LineInfo object.

This implements the checker/handler part of the prefilter pipe.

prefilter_lines(*lines*, *continue_prompt=False*)
Prefilter multiple input lines of text.

This is the main entry point for prefiltering multiple lines of input. This simply calls `prefilter_line()` for each line of input.

This covers cases where there are multiple lines in the user entry, which is the case when the user goes back to a multiline history entry and presses enter.

register_checker(*checker*)
Register a checker instance.

register_handler(*name*, *handler*, *esc_strings*)
Register a handler instance by name with esc_strings.

register_transformer(*transformer*)
Register a transformer instance.

sort_checkers()
Sort the checkers by priority.

This must be called after the priority of a checker is changed. The `register_checker()` method calls this automatically.

sort_transformers()
Sort the transformers by priority.

This must be called after the priority of a transformer is changed. The `register_transformer()` method calls this automatically.

transform_line(*line*, *continue_prompt*)
Calls the enabled transformers in order of increasing priority.

transformers
Return a list of checkers, sorted by priority.

unregister_checker(*checker*)
Unregister a checker instance.

unregister_handler(*name*, *handler*, *esc_strings*)
Unregister a handler instance by name with esc_strings.

unregister_transformer(*transformer*)
Unregister a transformer instance.

class `IPython.core.prefilter.`**PrefilterTransformer**(*shell=None*, *prefilter_manager=None*, ***kwargs*)
Bases: `traitlets.config.configurable.Configurable`

Transform a line of user input.

__init__(*shell=None*, *prefilter_manager=None*, ***kwargs*)
Create a configurable given a config config.

Parameters

- **config** (*Config*) – If this is empty, default values are used. If config is a `Config` instance, it will be used to configure the instance.
- **parent** (*Configurable instance, optional*) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the `__init__()` method of `Configurable` *before* doing anything else and using `super()`:

```
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

transform(*line*, *continue_prompt*)
Transform a line, returning the new one.

class `IPython.core.prefilter.`**PrefilterChecker**(*shell=None*, *prefilter_manager=None*, ***kwargs*)
Bases: `traitlets.config.configurable.Configurable`

Inspect an input line and return a handler for that line.

__init__(*shell=None*, *prefilter_manager=None*, ***kwargs*)
Create a configurable given a config config.

Parameters

- **config** (*Config*) – If this is empty, default values are used. If config is a `Config` instance, it will be used to configure the instance.
- **parent** (*Configurable instance, optional*) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the `__init__()` method of `Configurable` *before* doing anything else and using `super()`:

```
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

check (*line_info*)
Inspect line_info and return a handler instance or None.

class IPython.core.prefilter.**EmacsChecker** (*shell=None*, *prefilter_manager=None*, ***kwargs*)
Bases: *IPython.core.prefilter.PrefilterChecker*

check (*line_info*)
Emacs ipython-mode tags certain input lines.

class IPython.core.prefilter.**MacroChecker** (*shell=None*, *prefilter_manager=None*, ***kwargs*)
Bases: *IPython.core.prefilter.PrefilterChecker*

check (*line_info*)
Inspect line_info and return a handler instance or None.

class IPython.core.prefilter.**IPyAutocallChecker** (*shell=None*, *prefilter_manager=None*, ***kwargs*)
Bases: *IPython.core.prefilter.PrefilterChecker*

check (*line_info*)
Instances of IPyAutocall in user_ns get autocalled immediately

class IPython.core.prefilter.**AssignmentChecker** (*shell=None*, *prefilter_manager=None*, ***kwargs*)
Bases: *IPython.core.prefilter.PrefilterChecker*

check (*line_info*)
Check to see if user is assigning to a var for the first time, in which case we want to avoid any sort of automagic / autocall games.

This allows users to assign to either alias or magic names true python variables (the magic/alias systems always take second seat to true python code). E.g. ls='hi', or ls,that=1,2

class IPython.core.prefilter.**AutoMagicChecker** (*shell=None*, *prefilter_manager=None*, ***kwargs*)
Bases: *IPython.core.prefilter.PrefilterChecker*

check (*line_info*)
If the ifun is magic, and automagic is on, run it. Note: normal, non-auto magic would already have been triggered via '%' in check_esc_chars. This just checks for automagic. Also, before triggering the magic handler, make sure that there is nothing in the user namespace which could shadow it.

class IPython.core.prefilter.**PythonOpsChecker** (*shell=None*, *prefilter_manager=None*, ***kwargs*)
Bases: *IPython.core.prefilter.PrefilterChecker*

check (*line_info*)
If the 'rest' of the line begins with a function call or pretty much any python operator, we should simply

execute the line (regardless of whether or not there's a possible autocall expansion). This avoids spurious (and very confusing) geattr() accesses.

class IPython.core.prefilter.**AutocallChecker**(*shell=None*, *prefilter_manager=None*, ***kwargs*)

Bases: *IPython.core.prefilter.PrefilterChecker*

check(*line_info*)

Check if the initial word/function is callable and autocall is on.

class IPython.core.prefilter.**PrefilterHandler**(*shell=None*, *prefilter_manager=None*, ***kwargs*)

Bases: traitlets.config.configurable.Configurable

__init__(*shell=None*, *prefilter_manager=None*, ***kwargs*)

Create a configurable given a config config.

Parameters

- **config** (*Config*) – If this is empty, default values are used. If config is a Config instance, it will be used to configure the instance.
- **parent** (*Configurable instance, optional*) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the *__init__()* method of Configurable *before* doing anything else and using super():

```
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

handle(*line_info*)

Handle normal input lines. Use as a template for handlers.

class IPython.core.prefilter.**MacroHandler**(*shell=None*, *prefilter_manager=None*, ***kwargs*)

Bases: *IPython.core.prefilter.PrefilterHandler*

handle(*line_info*)

Handle normal input lines. Use as a template for handlers.

class IPython.core.prefilter.**MagicHandler**(*shell=None*, *prefilter_manager=None*, ***kwargs*)

Bases: *IPython.core.prefilter.PrefilterHandler*

handle(*line_info*)

Execute magic functions.

class IPython.core.prefilter.**AutoHandler**(*shell=None*, *prefilter_manager=None*, ***kwargs*)

Bases: *IPython.core.prefilter.PrefilterHandler*

handle(*line_info*)

Handle lines which can be auto-executed, quoting if requested.

class `IPython.core.prefilter.`**`EmacsHandler`**(*shell=None*, *prefilter_manager=None*, ***kwargs*)

Bases: *`IPython.core.prefilter.PrefilterHandler`*

`handle`(*line_info*)

Handle input lines marked by python-mode.

8.32.2 1 Function

`IPython.core.prefilter.`**`is_shadowed`**(*identifier*, *ip*)

Is the given identifier defined in one of the namespaces which shadow the alias and magic namespaces? Note that an identifier is different than ifun, because it can not contain a '.' character.

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8.33 Module: `core.profileapp`

An application for managing IPython profiles.

To be invoked as the `ipython profile` subcommand.

Authors:

- Min RK

8.33.1 4 Classes

class `IPython.core.profileapp.`**`ProfileLocate`**(***kwargs*)

Bases: *`IPython.core.application.BaseIPythonApplication`*

`parse_command_line`(*argv=None*)

Parse the command line arguments.

`start`()

Start the app mainloop.

Override in subclasses.

class `IPython.core.profileapp.`**`ProfileList`**(***kwargs*)

Bases: `traitlets.config.application.Application`

`start`()

Start the app mainloop.

Override in subclasses.

class IPython.core.profileapp.**ProfileCreate**(***kwargs*)
Bases: *IPython.core.application.BaseIPythonApplication*

init_config_files()
[optionally] copy default config files into profile dir.

parse_command_line(*argv*)
Parse the command line arguments.

stage_default_config_file()
auto generate default config file, and stage it into the profile.

class IPython.core.profileapp.**ProfileApp**(***kwargs*)
Bases: traitlets.config.application.Application

start()
Start the app mainloop.

Override in subclasses.

8.33.2 2 Functions

IPython.core.profileapp.**list_profiles_in**(*path*)
list profiles in a given root directory

IPython.core.profileapp.**list_bundled_profiles**()
list profiles that are bundled with IPython.

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8.34 Module: core.profiledir

An object for managing IPython profile directories.

8.34.1 2 Classes

class IPython.core.profiledir.**ProfileDirError**
Bases: Exception

class IPython.core.profiledir.**ProfileDir**(***kwargs*)
Bases: traitlets.config.configurable.LoggingConfigurable

An object to manage the profile directory and its resources.

The profile directory is used by all IPython applications, to manage configuration, logging and security.

This object knows how to find, create and manage these directories. This should be used by any code that wants to handle profiles.

`copy_config_file`(*config_file*, *path=None*, *overwrite=False*)
Copy a default config file into the active profile directory.

Default configuration files are kept in `IPython.core.profile`. This function moves these from that location to the working profile directory.

`classmethod create_profile_dir`(*profile_dir*, *config=None*)
Create a new profile directory given a full path.

Parameters **`profile_dir`** (*`str`*) – The full path to the profile directory. If it does exist, it will be used. If not, it will be created.

`classmethod create_profile_dir_by_name`(*path*, *name='default'*, *config=None*)
Create a profile dir by profile name and path.

Parameters

- **`path`** (*`unicode`*) – The path (directory) to put the profile directory in.
- **`name`** (*`unicode`*) – The name of the profile. The name of the profile directory will be "profile_<profile>".

`classmethod find_profile_dir`(*profile_dir*, *config=None*)
Find/create a profile dir and return its ProfileDir.

This will create the profile directory if it doesn't exist.

Parameters **`profile_dir`** (*`unicode or str`*) – The path of the profile directory.

`classmethod find_profile_dir_by_name`(*ipython_dir*, *name='default'*, *config=None*)
Find an existing profile dir by profile name, return its ProfileDir.

This searches through a sequence of paths for a profile dir. If it is not found, a *`ProfileDirError`* exception will be raised.

The search path algorithm is: 1. `os.getcwd()` 2. `ipython_dir`

Parameters

- **`ipython_dir`** (*`unicode or str`*) – The IPython directory to use.
- **`name`** (*`unicode or str`*) – The name of the profile. The name of the profile directory will be "profile_<profile>".

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8.35 Module: `core.prompts`

Being removed

8.35.1 1 Class

class `IPython.core.prompts.`**`LazyEvaluate`**(*func*, **args*, ***kwargs*)

Bases: `object`

This is used for formatting strings with values that need to be updated at that time, such as the current time or working directory.

`__init__`(*func*, **args*, ***kwargs*)

Initialize self. See help(type(self)) for accurate signature.

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8.36 Module: `core.pylabtools`

Pylab (matplotlib) support utilities.

8.36.1 10 Functions

`IPython.core.pylabtools.`**`getfigs`**(**fig_nums*)

Get a list of matplotlib figures by figure numbers.

If no arguments are given, all available figures are returned. If the argument list contains references to invalid figures, a warning is printed but the function continues pasting further figures.

Parameters **`figs`** (`tuple`) – A tuple of ints giving the figure numbers of the figures to return.

`IPython.core.pylabtools.`**`figsize`**(*sizex*, *sizey*)

Set the default figure size to be [sizex, sizey].

This is just an easy to remember, convenience wrapper that sets:

```
matplotlib.rcParams['figure.figsize'] = [sizex, sizey]
```

`IPython.core.pylabtools.`**`print_figure`**(*fig*, *fmt='png'*, *bbox_inches='tight'*, ***kwargs*)

Print a figure to an image, and return the resulting file data

Returned data will be bytes unless `fmt='svg'`, in which case it will be unicode.

Any keyword args are passed to fig.canvas.print_figure, such as `quality` or `bbox_inches`.

`IPython.core.pylabtools.`**`retina_figure`**(*fig*, ***kwargs*)
format a figure as a pixel-doubled (retina) PNG

`IPython.core.pylabtools.`**`mpl_runner`**(*safe_execfile*)
Factory to return a matplotlib-enabled runner for %run.

Parameters **`safe_execfile`** (*`function`*) – This must be a function with the same interface as the `safe_execfile()` method of IPython.

Returns

- A function suitable for use as the `runner` argument of the %run magic
- *function.*

`IPython.core.pylabtools.`**`select_figure_formats`**(*shell*, *formats*, ***kwargs*)
Select figure formats for the inline backend.

Parameters

- **`shell`** (`InteractiveShell`) – The main IPython instance.
- **`formats`** (*`str or set`*) – One or a set of figure formats to enable: 'png', 'retina', 'jpeg', 'svg', 'pdf'.
- **`**kwargs`** (*`any`*) – Extra keyword arguments to be passed to fig.canvas.print_figure.

`IPython.core.pylabtools.`**`find_gui_and_backend`**(*gui=None*, *gui_select=None*)
Given a gui string return the gui and mpl backend.

Parameters

- **`gui`** (*`str`*) – Can be one of ('tk','gtk','wx','qt','qt4','inline','agg').
- **`gui_select`** (*`str`*) – Can be one of ('tk','gtk','wx','qt','qt4','inline'). This is any gui already selected by the shell.

Returns

- *A tuple of (gui, backend) where backend is one of ('TkAgg','GTKAgg',*
- **'WXAgg','Qt4Agg','module** (*//ipykernel.pylab.backend_inline','agg').*)

`IPython.core.pylabtools.`**`activate_matplotlib`**(*backend*)
Activate the given backend and set interactive to True.

`IPython.core.pylabtools.`**`import_pylab`**(*user_ns*, *import_all=True*)
Populate the namespace with pylab-related values.

Imports matplotlib, pylab, numpy, and everything from pylab and numpy.

Also imports a few names from IPython (figsize, display, getfigs)

`IPython.core.pylabtools.`**`configure_inline_support`**(*shell*, *backend*)
Configure an IPython shell object for matplotlib use.

Parameters

- **`shell`** (*`InteractiveShell instance`*) –
- **`backend`** (*`matplotlib backend`*) –

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8.37 Module: `core.shellapp`

A mixin for `Application` classes that launch InteractiveShell instances, load extensions, etc.

8.37.1 1 Class

class `IPython.core.shellapp.`**`InteractiveShellApp`**(***kwargs*)

Bases: `traitlets.config.configurable.Configurable`

A Mixin for applications that start InteractiveShell instances.

Provides configurables for loading extensions and executing files as part of configuring a Shell environment.

The following methods should be called by the `initialize()` method of the subclass:

- *`init_path()`*
- `init_shell()` (to be implemented by the subclass)
- *`init_gui_pylab()`*
- *`init_extensions()`*
- *`init_code()`*

`init_code`()

run the pre-flight code, specified via exec_lines

`init_extensions`()

Load all IPython extensions in IPythonApp.extensions.

This uses the `ExtensionManager.load_extensions()` to load all the extensions listed in `self.extensions`.

`init_gui_pylab`()

Enable GUI event loop integration, taking pylab into account.

`init_path`()

Add current working directory, '', to sys.path

Unlike Python's default, we insert before the first `site-packages` or `dist-packages` directory, so that it is after the standard library.

Changed in version 7.2: Try to insert after the standard library, instead of first.

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If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

8.38 Module: `core.splitinput`

Simple utility for splitting user input. This is used by both inputsplitter and prefilter.

Authors:

- Brian Granger
- Fernando Perez

8.38.1 1 Class

class `IPython.core.splitinput.`**`LineInfo`**(*line*, *continue_prompt=False*)

Bases: `object`

A single line of input and associated info.

Includes the following as properties:

line The original, raw line

continue_prompt Is this line a continuation in a sequence of multiline input?

pre Any leading whitespace.

esc The escape character(s) in pre or the empty string if there isn't one. Note that '!!' and '??' are possible values for esc. Otherwise it will always be a single character.

ifun The 'function part', which is basically the maximal initial sequence of valid python identifiers and the '.' character. This is what is checked for alias and magic transformations, used for auto-calling, etc. In contrast to Python identifiers, it may start with "%" and contain "*".

the_rest Everything else on the line.

`__init__`(*line*, *continue_prompt=False*)

Initialize self. See help(type(self)) for accurate signature.

`ofind`(*ip*)

Do a full, attribute-walking lookup of the ifun in the various namespaces for the given IPython InteractiveShell instance.

Return a dict with keys: {found, obj, ospace, ismagic}

Note: can cause state changes because of calling getattr, but should only be run if autocall is on and if the line hasn't matched any other, less dangerous handlers.

Does cache the results of the call, so can be called multiple times without worrying about *further* damaging state.

8.38.2 1 Function

`IPython.core.splitinput.split_user_input(line, pattern=None)`
Split user input into initial whitespace, escape character, function part and the rest.

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

8.39 Module: `core.ultratb`

Verbose and colourful traceback formatting.

ColorTB

I've always found it a bit hard to visually parse tracebacks in Python. The ColorTB class is a solution to that problem. It colors the different parts of a traceback in a manner similar to what you would expect from a syntax-highlighting text editor.

Installation instructions for ColorTB:

```
import sys,ultratb
sys.excepthook = ultratb.ColorTB()
```

VerboseTB

I've also included a port of Ka-Ping Yee's "cgitb.py" that produces all kinds of useful info when a traceback occurs. Ping originally had it spit out HTML and intended it for CGI programmers, but why should they have all the fun? I altered it to spit out colored text to the terminal. It's a bit overwhelming, but kind of neat, and maybe useful for long-running programs that you believe are bug-free. If a crash *does* occur in that type of program you want details. Give it a shot–you'll love it or you'll hate it.

Note: The Verbose mode prints the variables currently visible where the exception happened (shortening their strings if too long). This can potentially be very slow, if you happen to have a huge data structure whose string representation is complex to compute. Your computer may appear to freeze for a while with cpu usage at 100%. If this occurs, you can cancel the traceback with Ctrl-C (maybe hitting it more than once).

If you encounter this kind of situation often, you may want to use the Verbose_novars mode instead of the regular Verbose, which avoids formatting variables (but otherwise includes the information and context given by Verbose).

Note: The verbose mode print all variables in the stack, which means it can potentially leak sensitive information like access keys, or unencryted password.

Installation instructions for VerboseTB:

```
import sys,ultratb
sys.excepthook = ultratb.VerboseTB()
```

Note: Much of the code in this module was lifted verbatim from the standard library module 'traceback.py' and Ka-Ping Yee's 'cgitb.py'.

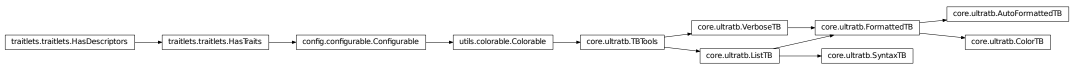
8.39.1 Color schemes

The colors are defined in the class TBTools through the use of the ColorSchemeTable class. Currently the following exist:

- NoColor: allows all of this module to be used in any terminal (the color escapes are just dummy blank strings).
- Linux: is meant to look good in a terminal like the Linux console (black or very dark background).
- LightBG: similar to Linux but swaps dark/light colors to be more readable in light background terminals.
- Neutral: a neutral color scheme that should be readable on both light and dark background

You can implement other color schemes easily, the syntax is fairly self-explanatory. Please send back new schemes you develop to the author for possible inclusion in future releases.

Inheritance diagram:


traitlets.traitlets.HasDescriptors
traitlets.traitlets.HasTraits
config.configurable.Configurable
utils.colorable.Colorable
core.ultratb.TBTools
core.ultratb.VerboseTB
core.ultratb.ListTB
core.ultratb.FormattedTB
core.ultratb.SyntaxTB
core.ultratb.AutoFormattedTB
core.ultratb.ColorTB

8.39.2 7 Classes

class IPython.core.ultratb.**TBTools**(*color_scheme='NoColor'*, *call_pdb=False*, *ostream=None*, *parent=None*, *config=None*)

Bases: *IPython.utils.colorable.Colorable*

Basic tools used by all traceback printer classes.

__init__(*color_scheme='NoColor'*, *call_pdb=False*, *ostream=None*, *parent=None*, *config=None*)

Create a configurable given a config config.

Parameters

- **config** (*Config*) – If this is empty, default values are used. If config is a Config instance, it will be used to configure the instance.
- **parent** (*Configurable instance, optional*) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the *__init__()* method of Configurable *before* doing anything else and using super():

```
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

color_toggle()
Toggle between the currently active color scheme and NoColor.

ostream
Output stream that exceptions are written to.

Valid values are:

- None: the default, which means that IPython will dynamically resolve to sys.stdout. This ensures compatibility with most tools, including Windows (where plain stdout doesn't recognize ANSI escapes).
- Any object with 'write' and 'flush' attributes.

set_colors(**args*, ***kw*)
Shorthand access to the color table scheme selector method.

stb2text(*stb*)
Convert a structured traceback (a list) to a string.

structured_traceback(*etype*, *evalue*, *tb*, *tb_offset=None*, *context=5*, *mode=None*)
Return a list of traceback frames.

Must be implemented by each class.

text(*etype*, *value*, *tb*, *tb_offset=None*, *context=5*)
Return formatted traceback.

Subclasses may override this if they add extra arguments.

class IPython.core.ultratb.**ListTB**(*color_scheme='NoColor'*, *call_pdb=False*, *ostream=None*, *parent=None*, *config=None*)
Bases: *IPython.core.ultratb.TBTools*

Print traceback information from a traceback list, with optional color.

Calling requires 3 arguments: (etype, evalue, elist) as would be obtained by:

```
etype, evalue, tb = sys.exc_info()
if tb:
  elist = traceback.extract_tb(tb)
else:
  elist = None
```

It can thus be used by programs which need to process the traceback before printing (such as console replacements based on the code module from the standard library).

Because they are meant to be called without a full traceback (only a list), instances of this class can't call the interactive pdb debugger.

__init__(*color_scheme='NoColor'*, *call_pdb=False*, *ostream=None*, *parent=None*, *config=None*)
Create a configurable given a config config.

Parameters

- **config** (*Config*) – If this is empty, default values are used. If config is a `Config` instance, it will be used to configure the instance.

- **parent** (*Configurable instance, optional*) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the `__init__()` method of `Configurable` *before* doing anything else and using `super()`:

```
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

get_exception_only(*etype*, *value*)
Only print the exception type and message, without a traceback.

Parameters

- **etype** (*exception type*) –
- **value** (*exception value*) –

show_exception_only(*etype*, *evalue*)
Only print the exception type and message, without a traceback.

Parameters

- **etype** (*exception type*) –
- **value** (*exception value*) –

structured_traceback(*etype*, *value*, *elist*, *tb_offset=None*, *context=5*)
Return a color formatted string with the traceback info.

Parameters

- **etype** (*exception type*) – Type of the exception raised.
- **value** (*object*) – Data stored in the exception
- **elist** (*list*) – List of frames, see class docstring for details.
- **tb_offset** (*int, optional*) – Number of frames in the traceback to skip. If not given, the instance value is used (set in constructor).
- **context** (*int, optional*) – Number of lines of context information to print.

Returns

Return type String with formatted exception.

class IPython.core.ultratb.**VerboseTB**(*color_scheme='Linux'*, *call_pdb=False*, *ostream=None*, *tb_offset=0*, *long_header=False*, *include_vars=True*, *check_cache=None*, *debugger_cls=None*, *parent=None*, *config=None*)
Bases: *IPython.core.ultratb.TBTools*

A port of Ka-Ping Yee's cgitb.py module that outputs color text instead of HTML. Requires inspect and pydoc. Crazy, man.

Modified version which optionally strips the topmost entries from the traceback, to be used with alternate interpreters (because their own code would appear in the traceback).

__init__(*color_scheme='Linux'*, *call_pdb=False*, *ostream=None*, *tb_offset=0*, *long_header=False*, *include_vars=True*, *check_cache=None*, *debugger_cls=None*, *parent=None*, *config=None*)

Specify traceback offset, headers and color scheme.

Define how many frames to drop from the tracebacks. Calling it with tb_offset=1 allows use of this handler in interpreters which will have their own code at the top of the traceback (VerboseTB will first remove that frame before printing the traceback info).

debugger(*force=False*)

Call up the pdb debugger if desired, always clean up the tb reference.

Keywords:

- force(False): by default, this routine checks the instance call_pdb flag and does not actually invoke the debugger if the flag is false. The 'force' option forces the debugger to activate even if the flag is false.

If the call_pdb flag is set, the pdb interactive debugger is invoked. In all cases, the self.tb reference to the current traceback is deleted to prevent lingering references which hamper memory management.

Note that each call to pdb() does an 'import readline', so if your app requires a special setup for the readline completers, you'll have to fix that by hand after invoking the exception handler.

format_exception_as_a_whole(*etype*, *evalue*, *etb*, *number_of_lines_of_context*, *tb_offset*)

Formats the header, traceback and exception message for a single exception.

This may be called multiple times by Python 3 exception chaining (PEP 3134).

format_record(*frame*, *file*, *lnum*, *func*, *lines*, *index*)

Format a single stack frame

format_records(*records*, *last_unique*, *recursion_repeat*)

Format the stack frames of the traceback

structured_traceback(*etype*, *evalue*, *etb*, *tb_offset=None*, *number_of_lines_of_context=5*)

Return a nice text document describing the traceback.

class `IPython.core.ultratb.`**FormattedTB**(*mode='Plain'*, *color_scheme='Linux'*, *call_pdb=False*, *ostream=None*, *tb_offset=0*, *long_header=False*, *include_vars=False*, *check_cache=None*, *debugger_cls=None*, *parent=None*, *config=None*)

Bases: *IPython.core.ultratb.VerboseTB*, *IPython.core.ultratb.ListTB*

Subclass ListTB but allow calling with a traceback.

It can thus be used as a sys.excepthook for Python > 2.1.

Also adds 'Context' and 'Verbose' modes, not available in ListTB.

Allows a tb_offset to be specified. This is useful for situations where one needs to remove a number of topmost frames from the traceback (such as occurs with python programs that themselves execute other python code, like Python shells).

__init__(*mode='Plain'*, *color_scheme='Linux'*, *call_pdb=False*, *ostream=None*, *tb_offset=0*, *long_header=False*, *include_vars=False*, *check_cache=None*, *debugger_cls=None*, *parent=None*, *config=None*)

Specify traceback offset, headers and color scheme.

Define how many frames to drop from the tracebacks. Calling it with tb_offset=1 allows use of this handler in interpreters which will have their own code at the top of the traceback (VerboseTB will first remove that frame before printing the traceback info).

set_mode(*mode=None*)
Switch to the desired mode.

If mode is not specified, cycles through the available modes.

stb2text(*stb*)
Convert a structured traceback (a list) to a string.

structured_traceback(*etype, value, tb, tb_offset=None, number_of_lines_of_context=5*)
Return a nice text document describing the traceback.

class IPython.core.ultratb.**AutoFormattedTB**(*mode='Plain', color_scheme='Linux', call_pdb=False, ostream=None, tb_offset=0, long_header=False, include_vars=False, check_cache=None, debugger_cls=None, parent=None, config=None*)

Bases: *IPython.core.ultratb.FormattedTB*

A traceback printer which can be called on the fly.

It will find out about exceptions by itself.

A brief example:

```
AutoTB = AutoFormattedTB(mode = 'Verbose',color_scheme='Linux')
try:
  ...
except:
  AutoTB()  # or AutoTB(out=logfile) where logfile is an open file object
```

structured_traceback(*etype=None, value=None, tb=None, tb_offset=None, number_of_lines_of_context=5*)
Return a nice text document describing the traceback.

class IPython.core.ultratb.**ColorTB**(*color_scheme='Linux', call_pdb=0, **kwargs*)
Bases: *IPython.core.ultratb.FormattedTB*

Shorthand to initialize a FormattedTB in Linux colors mode.

__init__(*color_scheme='Linux', call_pdb=0, **kwargs*)
Specify traceback offset, headers and color scheme.

Define how many frames to drop from the tracebacks. Calling it with tb_offset=1 allows use of this handler in interpreters which will have their own code at the top of the traceback (VerboseTB will first remove that frame before printing the traceback info).

class IPython.core.ultratb.**SyntaxTB**(*color_scheme='NoColor', parent=None, config=None*)
Bases: *IPython.core.ultratb.ListTB*

Extension which holds some state: the last exception value

__init__(*color_scheme='NoColor', parent=None, config=None*)
Create a configurable given a config config.

Parameters

- **config** (`Config`) – If this is empty, default values are used. If config is a `Config` instance, it will be used to configure the instance.
- **parent** (`Configurable instance, optional`) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the `__init__()` method of `Configurable` *before* doing anything else and using `super()`:

```
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

`clear_err_state`()
Return the current error state and clear it

`stb2text`(*stb*)
Convert a structured traceback (a list) to a string.

`structured_traceback`(*etype*, *value*, *elist*, *tb_offset=None*, *context=5*)
Return a color formatted string with the traceback info.

Parameters

- **etype** (*exception type*) – Type of the exception raised.
- **value** (*object*) – Data stored in the exception
- **elist** (*list*) – List of frames, see class docstring for details.
- **tb_offset** (*int, optional*) – Number of frames in the traceback to skip. If not given, the instance value is used (set in constructor).
- **context** (*int, optional*) – Number of lines of context information to print.

Returns

Return type String with formatted exception.

8.39.3 10 Functions

`IPython.core.ultratb.`**`inspect_error`**()
Print a message about internal inspect errors.

These are unfortunately quite common.

`IPython.core.ultratb.`**`findsource`**(*object*)
Return the entire source file and starting line number for an object.

The argument may be a module, class, method, function, traceback, frame, or code object. The source code is returned as a list of all the lines in the file and the line number indexes a line in that list. An IOError is raised if the source code cannot be retrieved.

FIXED version with which we monkeypatch the stdlib to work around a bug.

`IPython.core.ultratb.`**`getargs`**(*co*)
Get information about the arguments accepted by a code object.

Three things are returned: (args, varargs, varkw), where 'args' is a list of argument names (possibly containing nested lists), and 'varargs' and 'varkw' are the names of the * and ** arguments or None.

`IPython.core.ultratb.`**`with_patch_inspect`**(*f*)
Deprecated since IPython 6.0 decorator for monkeypatching inspect.findsource

`IPython.core.ultratb.`**`fix_frame_records_filenames`**`(`*records*`)`

Try to fix the filenames in each record from inspect.getinnerframes().

Particularly, modules loaded from within zip files have useless filenames attached to their code object, and inspect.getinnerframes() just uses it.

`IPython.core.ultratb.`**`is_recursion_error`**`(`*etype*, *value*, *records*`)`

`IPython.core.ultratb.`**`find_recursion`**`(`*etype*, *value*, *records*`)`

Identify the repeating stack frames from a RecursionError traceback

'records' is a list as returned by VerboseTB.get_records()

Returns (last_unique, repeat_length)

`IPython.core.ultratb.`**`text_repr`**`(`*value*`)`

Hopefully pretty robust repr equivalent.

`IPython.core.ultratb.`**`eqrepr`**`(`*value*, *repr=<function text_repr>*`)`

`IPython.core.ultratb.`**`nullrepr`**`(`*value*, *repr=<function text_repr>*`)`

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

8.40 Module: `display`

Public API for display tools in IPython.

8.40.1 23 Classes

`class` `IPython.display.`**`Audio`**`(`*data=None*, *filename=None*, *url=None*, *embed=None*, *rate=None*, *autoplay=False*`)`

Bases: `IPython.core.display.DisplayObject`

Create an audio object.

When this object is returned by an input cell or passed to the display function, it will result in Audio controls being displayed in the frontend (only works in the notebook).

Parameters

- **`data`** (*`numpy array, list, unicode, str or bytes`*) – Can be one of
  - Numpy 1d array containing the desired waveform (mono)
  - Numpy 2d array containing waveforms for each channel. Shape=(NCHAN, NSAMPLES). For the standard channel order, see http://msdn.microsoft.com/en-us/library/windows/hardware/dn653308(v=vs.85).aspx

  – List of float or integer representing the waveform (mono)
  – String containing the filename
  – Bytestring containing raw PCM data or
  – URL pointing to a file on the web.

  If the array option is used the waveform will be normalized.

  If a filename or url is used the format support will be browser dependent.

- **url** (*unicode*) – A URL to download the data from.
- **filename** (*unicode*) – Path to a local file to load the data from.
- **embed** (*boolean*) – Should the audio data be embedded using a data URI (True) or should the original source be referenced. Set this to True if you want the audio to playable later with no internet connection in the notebook.

  Default is `True`, unless the keyword argument `url` is set, then default value is `False`.
- **rate** (*integer*) – The sampling rate of the raw data. Only required when data parameter is being used as an array
- **autoplay** (*bool*) – Set to True if the audio should immediately start playing. Default is `False`.

Examples

```
# Generate a sound
import numpy as np
framerate = 44100
t = np.linspace(0,5,framerate*5)
data = np.sin(2*np.pi*220*t) + np.sin(2*np.pi*224*t))
Audio(data,rate=framerate)

# Can also do stereo or more channels
dataleft = np.sin(2*np.pi*220*t)
dataright = np.sin(2*np.pi*224*t)
Audio([dataleft, dataright],rate=framerate)

Audio("http://www.nch.com.au/acm/8k16bitpcm.wav")  # From URL
Audio(url="http://www.w3schools.com/html/horse.ogg")

Audio('/path/to/sound.wav')  # From file
Audio(filename='/path/to/sound.ogg')

Audio(b'RAW_WAV_DATA..)  # From bytes
Audio(data=b'RAW_WAV_DATA..)
```

__init__(*data=None*, *filename=None*, *url=None*, *embed=None*, *rate=None*, *autoplay=False*)
Create a display object given raw data.

When this object is returned by an expression or passed to the display function, it will result in the data being displayed in the frontend. The MIME type of the data should match the subclasses used, so the Png subclass should be used for 'image/png' data. If the data is a URL, the data will first be downloaded and then displayed. If

Parameters

- **data** (*unicode, str or bytes*) – The raw data or a URL or file to load the data from
- **url** (*unicode*) – A URL to download the data from.
- **filename** (*unicode*) – Path to a local file to load the data from.
- **metadata** (*dict*) – Dict of metadata associated to be the object when displayed

reload()
Reload the raw data from file or URL.

class IPython.display.**Code**(*data=None*, *url=None*, *filename=None*, *language=None*)
Bases: `IPython.core.display.TextDisplayObject`

Display syntax-highlighted source code.

This uses Pygments to highlight the code for HTML and Latex output.

Parameters

- **data** (*str*) – The code as a string
- **url** (*str*) – A URL to fetch the code from
- **filename** (*str*) – A local filename to load the code from
- **language** (*str*) – The short name of a Pygments lexer to use for highlighting. If not specified, it will guess the lexer based on the filename or the code. Available lexers: http://pygments.org/docs/lexers/

__init__(*data=None*, *url=None*, *filename=None*, *language=None*)
Create a display object given raw data.

When this object is returned by an expression or passed to the display function, it will result in the data being displayed in the frontend. The MIME type of the data should match the subclasses used, so the Png subclass should be used for 'image/png' data. If the data is a URL, the data will first be downloaded and then displayed. If

Parameters

- **data** (*unicode, str or bytes*) – The raw data or a URL or file to load the data from
- **url** (*unicode*) – A URL to download the data from.
- **filename** (*unicode*) – Path to a local file to load the data from.
- **metadata** (*dict*) – Dict of metadata associated to be the object when displayed

class IPython.display.**DisplayHandle**(*display_id=None*)
Bases: `object`

A handle on an updatable display

Call `.update(obj)` to display a new object.

Call `.display(obj)` to add a new instance of this display, and update existing instances.

__init__(*display_id=None*)
Initialize self. See help(type(self)) for accurate signature.

display(*obj*, ***kwargs*)
Make a new display with my id, updating existing instances.

Parameters

- **obj** – object to display
- ****kwargs** – additional keyword arguments passed to display

update(*obj*, ***kwargs*)
Update existing displays with my id

Parameters

- **obj** – object to display
- ****kwargs** – additional keyword arguments passed to update_display

class IPython.display.**DisplayObject**(*data=None*, *url=None*, *filename=None*, *metadata=None*)

Bases: `object`

An object that wraps data to be displayed.

__init__(*data=None*, *url=None*, *filename=None*, *metadata=None*)
Create a display object given raw data.

When this object is returned by an expression or passed to the display function, it will result in the data being displayed in the frontend. The MIME type of the data should match the subclasses used, so the Png subclass should be used for 'image/png' data. If the data is a URL, the data will first be downloaded and then displayed. If

Parameters

- **data** (*unicode, str or bytes*) – The raw data or a URL or file to load the data from
- **url** (*unicode*) – A URL to download the data from.
- **filename** (*unicode*) – Path to a local file to load the data from.
- **metadata** (*dict*) – Dict of metadata associated to be the object when displayed

reload()
Reload the raw data from file or URL.

class IPython.display.**FileLink**(*path*, *url_prefix=''*, *result_html_prefix=''*, *result_html_suffix='<br>'*)

Bases: `object`

Class for embedding a local file link in an IPython session, based on path

e.g. to embed a link that was generated in the IPython notebook as my/data.txt

you would do:

```
local_file = FileLink("my/data.txt")
display(local_file)
```

or in the HTML notebook, just:

```
FileLink("my/data.txt")
```

__init__(*path*, *url_prefix=''*, *result_html_prefix=''*, *result_html_suffix='<br>'*)

Parameters

- **path** (*str*) – path to the file or directory that should be formatted
- **url_prefix** (*str*) – prefix to be prepended to all files to form a working link [default: '']

- **result_html_prefix** (*str*) – text to append to beginning to link [default: '']
- **result_html_suffix** (*str*) – text to append at the end of link [default: '<br>']

class IPython.display.**FileLinks**(*path*, *url_prefix=''*, *included_suffixes=None*, *result_html_prefix=''*, *result_html_suffix='<br>'*, *notebook_display_formatter=None*, *terminal_display_formatter=None*, *recursive=True*)

Bases: IPython.lib.display.FileLink

Class for embedding local file links in an IPython session, based on path

e.g. to embed links to files that were generated in the IPython notebook under my/data, you would do:

```
local_files = FileLinks("my/data")
display(local_files)
```

or in the HTML notebook, just:

```
FileLinks("my/data")
```

__init__(*path*, *url_prefix=''*, *included_suffixes=None*, *result_html_prefix=''*, *result_html_suffix='<br>'*, *notebook_display_formatter=None*, *terminal_display_formatter=None*, *recursive=True*)

See *FileLink* for the path, url_prefix, result_html_prefix and result_html_suffix parameters.

included_suffixes [list] Filename suffixes to include when formatting output [default: include all files]

notebook_display_formatter [function] Used to format links for display in the notebook. See discussion of formatter functions below.

terminal_display_formatter [function] Used to format links for display in the terminal. See discussion of formatter functions below.

Formatter functions must be of the form:

```
f(dirname, fnames, included_suffixes)
```

dirname [str] The name of a directory

fnames [list] The files in that directory

included_suffixes [list] The file suffixes that should be included in the output (passing None meansto include all suffixes in the output in the built-in formatters)

recursive [boolean] Whether to recurse into subdirectories. Default is True.

The function should return a list of lines that will be printed in the notebook (if passing notebook_display_formatter) or the terminal (if passing terminal_display_formatter). This function is iterated over for each directory in self.path. Default formatters are in place, can be passed here to support alternative formatting.

class IPython.display.**GeoJSON**(**args*, ***kwargs*)

Bases: IPython.core.display.JSON

GeoJSON expects JSON-able dict

not an already-serialized JSON string.

Scalar types (None, number, string) are not allowed, only dict containers.

__init__(**args*, ***kwargs*)
Create a GeoJSON display object given raw data.

Parameters

- **data** (*dict or list*) – VegaLite data. Not an already-serialized JSON string. Scalar types (None, number, string) are not allowed, only dict or list containers.
- **url_template** (*string*) – Leaflet TileLayer URL template: http://leafletjs.com/reference.html#url-template
- **layer_options** (*dict*) – Leaflet TileLayer options: http://leafletjs.com/reference.html#tilelayer-options
- **url** (*unicode*) – A URL to download the data from.
- **filename** (*unicode*) – Path to a local file to load the data from.
- **metadata** (*dict*) – Specify extra metadata to attach to the json display object.

Examples

The following will display an interactive map of Mars with a point of interest on frontend that do support GeoJSON display.

```
>>> from IPython.display import GeoJSON
```

```
>>> GeoJSON(data={
...     "type": "Feature",
...     "geometry": {
...         "type": "Point",
...         "coordinates": [-81.327, 296.038]
...     }
... },
... url_template="http://s3-eu-west-1.amazonaws.com/whereonmars.cartodb.net/
↪{basemap_id}/{z}/{x}/{y}.png",
... layer_options={
...     "basemap_id": "celestia_mars-shaded-16k_global",
...     "attribution" : "Celestia/praesepe",
...     "minZoom" : 0,
...     "maxZoom" : 18,
... })
<IPython.core.display.GeoJSON object>
```

In the terminal IPython, you will only see the text representation of the GeoJSON object.

class IPython.display.**HTML**(*data=None*, *url=None*, *filename=None*, *metadata=None*)
Bases: IPython.core.display.TextDisplayObject

__init__(*data=None*, *url=None*, *filename=None*, *metadata=None*)
Create a display object given raw data.

When this object is returned by an expression or passed to the display function, it will result in the data being displayed in the frontend. The MIME type of the data should match the subclasses used, so the Png subclass should be used for 'image/png' data. If the data is a URL, the data will first be downloaded and then displayed. If

Parameters

- **data** (*unicode, str or bytes*) – The raw data or a URL or file to load the data from

- **url** (*unicode*) – A URL to download the data from.
- **filename** (*unicode*) – Path to a local file to load the data from.
- **metadata** (*dict*) – Dict of metadata associated to be the object when displayed

class IPython.display.**IFrame**(*src*, *width*, *height*, ***kwargs*)

Bases: object

Generic class to embed an iframe in an IPython notebook

__init__(*src*, *width*, *height*, ***kwargs*)

Initialize self. See help(type(self)) for accurate signature.

class IPython.display.**Image**(*data=None*, *url=None*, *filename=None*, *format=None*, *embed=None*, *width=None*, *height=None*, *retina=False*, *unconfined=False*, *metadata=None*)

Bases: IPython.core.display.DisplayObject

__init__(*data=None*, *url=None*, *filename=None*, *format=None*, *embed=None*, *width=None*, *height=None*, *retina=False*, *unconfined=False*, *metadata=None*)

Create a PNG/JPEG/GIF image object given raw data.

When this object is returned by an input cell or passed to the display function, it will result in the image being displayed in the frontend.

Parameters

- **data** (*unicode, str or bytes*) – The raw image data or a URL or filename to load the data from. This always results in embedded image data.
- **url** (*unicode*) – A URL to download the data from. If you specify `url=`, the image data will not be embedded unless you also specify `embed=True`.
- **filename** (*unicode*) – Path to a local file to load the data from. Images from a file are always embedded.
- **format** (*unicode*) – The format of the image data (png/jpeg/jpg/gif). If a filename or URL is given for format will be inferred from the filename extension.
- **embed** (*bool*) – Should the image data be embedded using a data URI (True) or be loaded using an <img> tag. Set this to True if you want the image to be viewable later with no internet connection in the notebook.

  Default is `True`, unless the keyword argument `url` is set, then default value is `False`.

  Note that QtConsole is not able to display images if `embed` is set to `False`
- **width** (*int*) – Width in pixels to which to constrain the image in html
- **height** (*int*) – Height in pixels to which to constrain the image in html
- **retina** (*bool*) – Automatically set the width and height to half of the measured width and height. This only works for embedded images because it reads the width/height from image data. For non-embedded images, you can just set the desired display width and height directly.
- **unconfined** (*bool*) – Set unconfined=True to disable max-width confinement of the image.
- **metadata** (*dict*) – Specify extra metadata to attach to the image.

Examples

# embedded image data, works in qtconsole and notebook # when passed positionally, the first arg can be any of raw image data, # a URL, or a filename from which to load image data. # The result is always embedding image data for inline images. Image('http://www.google.fr/images/srpr/logo3w.png') Image('/path/to/image.jpg') Image(b'RAW_PNG_DATA…')

# Specifying Image(url=…) does not embed the image data, # it only generates `<img>` tag with a link to the source. # This will not work in the qtconsole or offline. Image(url='http://www.google.fr/images/srpr/logo3w.png')

reload()
Reload the raw data from file or URL.

class IPython.display.**JSON**(*data=None*, *url=None*, *filename=None*, *expanded=False*, *metadata=None*, *root='root'*, ***kwargs*)
Bases: `IPython.core.display.DisplayObject`

JSON expects a JSON-able dict or list

not an already-serialized JSON string.

Scalar types (None, number, string) are not allowed, only dict or list containers.

__init__(*data=None*, *url=None*, *filename=None*, *expanded=False*, *metadata=None*, *root='root'*, ***kwargs*)
Create a JSON display object given raw data.

Parameters

- **data** (*dict or list*) – JSON data to display. Not an already-serialized JSON string. Scalar types (None, number, string) are not allowed, only dict or list containers.
- **url** (*unicode*) – A URL to download the data from.
- **filename** (*unicode*) – Path to a local file to load the data from.
- **expanded** (*boolean*) – Metadata to control whether a JSON display component is expanded.
- **metadata** (*dict*) – Specify extra metadata to attach to the json display object.
- **root** (*str*) – The name of the root element of the JSON tree

class IPython.display.**Javascript**(*data=None*, *url=None*, *filename=None*, *lib=None*, *css=None*)
Bases: `IPython.core.display.TextDisplayObject`

__init__(*data=None*, *url=None*, *filename=None*, *lib=None*, *css=None*)
Create a Javascript display object given raw data.

When this object is returned by an expression or passed to the display function, it will result in the data being displayed in the frontend. If the data is a URL, the data will first be downloaded and then displayed.

In the Notebook, the containing element will be available as `element`, and jQuery will be available. Content appended to `element` will be visible in the output area.

Parameters

- **data** (*unicode, str or bytes*) – The Javascript source code or a URL to download it from.
- **url** (*unicode*) – A URL to download the data from.
- **filename** (*unicode*) – Path to a local file to load the data from.

- **lib** (*list or str*) – A sequence of Javascript library URLs to load asynchronously before running the source code. The full URLs of the libraries should be given. A single Javascript library URL can also be given as a string.
- **css** (*: list or str*) – A sequence of css files to load before running the source code. The full URLs of the css files should be given. A single css URL can also be given as a string.

class IPython.display.**Latex**(*data=None*, *url=None*, *filename=None*, *metadata=None*)
Bases: `IPython.core.display.TextDisplayObject`

class IPython.display.**Markdown**(*data=None*, *url=None*, *filename=None*, *metadata=None*)
Bases: `IPython.core.display.TextDisplayObject`

class IPython.display.**Math**(*data=None*, *url=None*, *filename=None*, *metadata=None*)
Bases: `IPython.core.display.TextDisplayObject`

class IPython.display.**Pretty**(*data=None*, *url=None*, *filename=None*, *metadata=None*)
Bases: `IPython.core.display.TextDisplayObject`

class IPython.display.**ProgressBar**(*total*)
Bases: `IPython.core.display.DisplayObject`

Progressbar supports displaying a progressbar like element

__init__(*total*)
Creates a new progressbar

Parameters total (*int*) – maximum size of the progressbar

class IPython.display.**SVG**(*data=None*, *url=None*, *filename=None*, *metadata=None*)
Bases: `IPython.core.display.DisplayObject`

class IPython.display.**ScribdDocument**(*id*, *width=400*, *height=300*, ***kwargs*)
Bases: `IPython.lib.display.IFrame`

Class for embedding a Scribd document in an IPython session

Use the start_page params to specify a starting point in the document Use the view_mode params to specify display type one off scroll | slideshow | book

e.g to Display Wes' foundational paper about PANDAS in book mode from page 3

ScribdDocument(71048089, width=800, height=400, start_page=3, view_mode="book")

__init__(*id*, *width=400*, *height=300*, ***kwargs*)
Initialize self. See help(type(self)) for accurate signature.

class IPython.display.**TextDisplayObject**(*data=None*, *url=None*, *filename=None*, *metadata=None*)
Bases: `IPython.core.display.DisplayObject`

Validate that display data is text

class IPython.display.**Video**(*data=None*, *url=None*, *filename=None*, *embed=False*, *mimetype=None*, *width=None*, *height=None*)
Bases: `IPython.core.display.DisplayObject`

__init__(*data=None*, *url=None*, *filename=None*, *embed=False*, *mimetype=None*, *width=None*, *height=None*)
Create a video object given raw data or an URL.

When this object is returned by an input cell or passed to the display function, it will result in the video being displayed in the frontend.

Parameters

- **data** (*unicode, str or bytes*) – The raw video data or a URL or filename to load the data from. Raw data will require passing `embed=True`.
- **url** (*unicode*) – A URL for the video. If you specify `url=`, the image data will not be embedded.
- **filename** (*unicode*) – Path to a local file containing the video. Will be interpreted as a local URL unless `embed=True`.
- **embed** (*bool*) – Should the video be embedded using a data URI (True) or be loaded using a <video> tag (False).

  Since videos are large, embedding them should be avoided, if possible. You must confirm embedding as your intention by passing `embed=True`.

  Local files can be displayed with URLs without embedding the content, via:

  ```
  Video('./video.mp4')
  ```

- **mimetype** (*unicode*) – Specify the mimetype for embedded videos. Default will be guessed from file extension, if available.
- **width** (*int*) – Width in pixels to which to constrain the video in HTML. If not supplied, defaults to the width of the video.
- **height** (*int*) – Height in pixels to which to constrain the video in html. If not supplied, defaults to the height of the video.

Examples

Video('https://archive.org/download/Sita_Sings_the_Blues/Sita_Sings_the_Blues_small.mp4') Video('path/to/video.mp4') Video('path/to/video.mp4', embed=True) Video(b'raw-videodata', embed=True)

reload()
Reload the raw data from file or URL.

class `IPython.display.`**VimeoVideo**(*id*, *width=400*, *height=300*, ***kwargs*)
Bases: `IPython.lib.display.IFrame`

Class for embedding a Vimeo video in an IPython session, based on its video id.

__init__(*id*, *width=400*, *height=300*, ***kwargs*)
Initialize self. See help(type(self)) for accurate signature.

class `IPython.display.`**YouTubeVideo**(*id*, *width=400*, *height=300*, ***kwargs*)
Bases: `IPython.lib.display.IFrame`

Class for embedding a YouTube Video in an IPython session, based on its video id.

e.g. to embed the video from https://www.youtube.com/watch?v=foo , you would do:

```
vid = YouTubeVideo("foo")
display(vid)
```

To start from 30 seconds:

```
vid = YouTubeVideo("abc", start=30)
display(vid)
```

To calculate seconds from time as hours, minutes, seconds use `datetime.timedelta`:

```
start=int(timedelta(hours=1, minutes=46, seconds=40).total_seconds())
```

Other parameters can be provided as documented at https://developers.google.com/youtube/player_parameters#Parameters

When converting the notebook using nbconvert, a jpeg representation of the video will be inserted in the document.

`__init__`(*id*, *width=400*, *height=300*, ***kwargs*)
Initialize self. See help(type(self)) for accurate signature.

8.40.2 16 Functions

`IPython.display.`**`clear_output`**(*wait=False*)
Clear the output of the current cell receiving output.

Parameters **`wait`** (*`bool [default: false]`*) – Wait to clear the output until new output is available to replace it.

`IPython.display.`**`display`**(**objs*, *include=None*, *exclude=None*, *metadata=None*, *transient=None*, *display_id=None*, ***kwargs*)
Display a Python object in all frontends.

By default all representations will be computed and sent to the frontends. Frontends can decide which representation is used and how.

In terminal IPython this will be similar to using `print()`, for use in richer frontends see Jupyter notebook examples with rich display logic.

Parameters

- **`objs`** (*`tuple of objects`*) – The Python objects to display.
- **`raw`** (*`bool, optional`*) – Are the objects to be displayed already mimetype-keyed dicts of raw display data, or Python objects that need to be formatted before display? [default: False]
- **`include`** (*`list, tuple or set, optional`*) – A list of format type strings (MIME types) to include in the format data dict. If this is set *only* the format types included in this list will be computed.
- **`exclude`** (*`list, tuple or set, optional`*) – A list of format type strings (MIME types) to exclude in the format data dict. If this is set all format types will be computed, except for those included in this argument.
- **`metadata`** (*`dict, optional`*) – A dictionary of metadata to associate with the output. mime-type keys in this dictionary will be associated with the individual representation formats, if they exist.
- **`transient`** (*`dict, optional`*) – A dictionary of transient data to associate with the output. Data in this dict should not be persisted to files (e.g. notebooks).
- **`display_id`** (*`str, bool optional`*) – Set an id for the display. This id can be used for updating this display area later via update_display. If given as `True`, generate a new `display_id`
- **`kwargs`** (*`additional keyword-args, optional`*) – Additional keyword-arguments are passed through to the display publisher.

Returns **handle** – Returns a handle on updatable displays for use with `update_display()`, if `display_id` is given. Returns `None` if no `display_id` is given (default).

Return type *DisplayHandle*

Examples

```
>>> class Json(object):
...     def __init__(self, json):
...         self.json = json
...     def _repr_pretty_(self, pp, cycle):
...         import json
...         pp.text(json.dumps(self.json, indent=2))
...     def __repr__(self):
...         return str(self.json)
...
```

```
>>> d = Json({1:2, 3: {4:5}})
```

```
>>> print(d)
{1: 2, 3: {4: 5}}
```

```
>>> display(d)
{
  "1": 2,
  "3": {
    "4": 5
  }
}
```

```
>>> def int_formatter(integer, pp, cycle):
...     pp.text('I'*integer)
```

```
>>> plain = get_ipython().display_formatter.formatters['text/plain']
>>> plain.for_type(int, int_formatter)
<function _repr_pprint at 0x...>
>>> display(7-5)
II
```

```
>>> del plain.type_printers[int]
>>> display(7-5)
2
```

See also:

update_display()

Notes

In Python, objects can declare their textual representation using the `__repr__` method. IPython expands on this idea and allows objects to declare other, rich representations including:

- HTML
- JSON
- PNG

- JPEG
- SVG
- LaTeX

A single object can declare some or all of these representations; all are handled by IPython's display system.

The main idea of the first approach is that you have to implement special display methods when you define your class, one for each representation you want to use. Here is a list of the names of the special methods and the values they must return:

- `_repr_html_`: return raw HTML as a string, or a tuple (see below).
- `_repr_json_`: return a JSONable dict, or a tuple (see below).
- `_repr_jpeg_`: return raw JPEG data, or a tuple (see below).
- `_repr_png_`: return raw PNG data, or a tuple (see below).
- `_repr_svg_`: return raw SVG data as a string, or a tuple (see below).
- **`_repr_latex_`: return LaTeX commands in a string surrounded by "$",** or a tuple (see below).
- **`_repr_mimebundle_`: return a full mimebundle containing the mapping** from all mimetypes to data. Use this for any mime-type not listed above.

The above functions may also return the object's metadata alonside the data. If the metadata is available, the functions will return a tuple containing the data and metadata, in that order. If there is no metadata available, then the functions will return the data only.

When you are directly writing your own classes, you can adapt them for display in IPython by following the above approach. But in practice, you often need to work with existing classes that you can't easily modify.

You can refer to the documentation on integrating with the display system in order to register custom formatters for already existing types (*Rich display*).

New in version 5.4: display available without import

New in version 6.1: display available without import

Since IPython 5.4 and 6.1 `display()` is automatically made available to the user without import. If you are using display in a document that might be used in a pure python context or with older version of IPython, use the following import at the top of your file:

```
from IPython.display import display
```

`IPython.display.`**`display_html`**`(`**objs*, ***kwargs*`)`

Display the HTML representation of an object.

Note: If raw=False and the object does not have a HTML representation, no HTML will be shown.

Parameters

- **`objs`** (*`tuple of objects`*) – The Python objects to display, or if raw=True raw HTML data to display.
- **`raw`** (*`bool`*) – Are the data objects raw data or Python objects that need to be formatted before display? [default: False]
- **`metadata`** (*`dict (optional)`*) – Metadata to be associated with the specific mimetype output.

`IPython.display.`**`display_javascript`**`(`**objs*, ***kwargs*`)`

Display the Javascript representation of an object.

Parameters

- **objs** (*tuple of objects*) – The Python objects to display, or if raw=True raw javascript data to display.
- **raw** (*bool*) – Are the data objects raw data or Python objects that need to be formatted before display? [default: False]
- **metadata** (*dict (optional)*) – Metadata to be associated with the specific mimetype output.

`IPython.display.`**`display_jpeg`**`(`**objs*, ***kwargs*`)`

Display the JPEG representation of an object.

Parameters

- **objs** (*tuple of objects*) – The Python objects to display, or if raw=True raw JPEG data to display.
- **raw** (*bool*) – Are the data objects raw data or Python objects that need to be formatted before display? [default: False]
- **metadata** (*dict (optional)*) – Metadata to be associated with the specific mimetype output.

`IPython.display.`**`display_json`**`(`**objs*, ***kwargs*`)`

Display the JSON representation of an object.

Note that not many frontends support displaying JSON.

Parameters

- **objs** (*tuple of objects*) – The Python objects to display, or if raw=True raw json data to display.
- **raw** (*bool*) – Are the data objects raw data or Python objects that need to be formatted before display? [default: False]
- **metadata** (*dict (optional)*) – Metadata to be associated with the specific mimetype output.

`IPython.display.`**`display_latex`**`(`**objs*, ***kwargs*`)`

Display the LaTeX representation of an object.

Parameters

- **objs** (*tuple of objects*) – The Python objects to display, or if raw=True raw latex data to display.
- **raw** (*bool*) – Are the data objects raw data or Python objects that need to be formatted before display? [default: False]
- **metadata** (*dict (optional)*) – Metadata to be associated with the specific mimetype output.

`IPython.display.`**`display_markdown`**`(`**objs*, ***kwargs*`)`

Displays the Markdown representation of an object.

Parameters

- **objs** (*tuple of objects*) – The Python objects to display, or if raw=True raw markdown data to display.
- **raw** (*bool*) – Are the data objects raw data or Python objects that need to be formatted before display? [default: False]

- **metadata** (*dict (optional)*) – Metadata to be associated with the specific mimetype output.

IPython.display.**display_pdf**(**objs*, ***kwargs*)
Display the PDF representation of an object.

Parameters

- **objs** (*tuple of objects*) – The Python objects to display, or if raw=True raw javascript data to display.
- **raw** (*bool*) – Are the data objects raw data or Python objects that need to be formatted before display? [default: False]
- **metadata** (*dict (optional)*) – Metadata to be associated with the specific mimetype output.

IPython.display.**display_png**(**objs*, ***kwargs*)
Display the PNG representation of an object.

Parameters

- **objs** (*tuple of objects*) – The Python objects to display, or if raw=True raw png data to display.
- **raw** (*bool*) – Are the data objects raw data or Python objects that need to be formatted before display? [default: False]
- **metadata** (*dict (optional)*) – Metadata to be associated with the specific mimetype output.

IPython.display.**display_pretty**(**objs*, ***kwargs*)
Display the pretty (default) representation of an object.

Parameters

- **objs** (*tuple of objects*) – The Python objects to display, or if raw=True raw text data to display.
- **raw** (*bool*) – Are the data objects raw data or Python objects that need to be formatted before display? [default: False]
- **metadata** (*dict (optional)*) – Metadata to be associated with the specific mimetype output.

IPython.display.**display_svg**(**objs*, ***kwargs*)
Display the SVG representation of an object.

Parameters

- **objs** (*tuple of objects*) – The Python objects to display, or if raw=True raw svg data to display.
- **raw** (*bool*) – Are the data objects raw data or Python objects that need to be formatted before display? [default: False]
- **metadata** (*dict (optional)*) – Metadata to be associated with the specific mimetype output.

IPython.display.**publish_display_data**(*data*, *metadata=None*, *source=None*, ***, *transient=None*, ***kwargs*)
Publish data and metadata to all frontends.

See the `display_data` message in the messaging documentation for more details about this message type.

Keys of data and metadata can be any mime-type.

Parameters

- **data** (*dict*) – A dictionary having keys that are valid MIME types (like 'text/plain' or 'image/svg+xml') and values that are the data for that MIME type. The data itself must be a JSON'able data structure. Minimally all data should have the 'text/plain' data, which can be displayed by all frontends. If more than the plain text is given, it is up to the frontend to decide which representation to use.
- **metadata** (*dict*) – A dictionary for metadata related to the data. This can contain arbitrary key, value pairs that frontends can use to interpret the data. mime-type keys matching those in data can be used to specify metadata about particular representations.
- **source** (*str, deprecated*) – Unused.
- **transient** (*dict, keyword-only*) – A dictionary of transient data, such as display_id.

`IPython.display.`**`set_matplotlib_close`**(*close=True*)

Set whether the inline backend closes all figures automatically or not.

By default, the inline backend used in the IPython Notebook will close all matplotlib figures automatically after each cell is run. This means that plots in different cells won't interfere. Sometimes, you may want to make a plot in one cell and then refine it in later cells. This can be accomplished by:

```
In [1]: set_matplotlib_close(False)
```

To set this in your config files use the following:

```
c.InlineBackend.close_figures = False
```

Parameters **close** (*bool*) – Should all matplotlib figures be automatically closed after each cell is run?

`IPython.display.`**`set_matplotlib_formats`**(**formats*, ***kwargs*)

Select figure formats for the inline backend. Optionally pass quality for JPEG.

For example, this enables PNG and JPEG output with a JPEG quality of 90%:

```
In [1]: set_matplotlib_formats('png', 'jpeg', quality=90)
```

To set this in your config files use the following:

```
c.InlineBackend.figure_formats = {'png', 'jpeg'}
c.InlineBackend.print_figure_kwargs.update({'quality' : 90})
```

Parameters

- ***formats** (*strs*) – One or more figure formats to enable: 'png', 'retina', 'jpeg', 'svg', 'pdf'.
- ****kwargs** – Keyword args will be relayed to `figure.canvas.print_figure`.

`IPython.display.`**`update_display`**(*obj*, ***, *display_id*, ***kwargs*)

Update an existing display by id

Parameters

- **obj** – The object with which to update the display
- **display_id** (*keyword-only*) – The id of the display to update

See also:

`display()`

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

8.41 Module: `lib.backgroundjobs`

Manage background (threaded) jobs conveniently from an interactive shell.

This module provides a BackgroundJobManager class. This is the main class meant for public usage, it implements an object which can create and manage new background jobs.

It also provides the actual job classes managed by these BackgroundJobManager objects, see their docstrings below.

This system was inspired by discussions with B. Granger and the BackgroundCommand class described in the book Python Scripting for Computational Science, by H. P. Langtangen:

http://folk.uio.no/hpl/scripting

(although ultimately no code from this text was used, as IPython's system is a separate implementation).

An example notebook is provided in our documentation illustrating interactive use of the system.

8.41.1 4 Classes

class `IPython.lib.backgroundjobs.`**`BackgroundJobManager`**

Bases: `object`

Class to manage a pool of backgrounded threaded jobs.

Below, we assume that 'jobs' is a BackgroundJobManager instance.

Usage summary (see the method docstrings for details):

jobs.new(. . .) -> start a new job

jobs() or jobs.status() -> print status summary of all jobs

jobs[N] -> returns job number N.

foo = jobs[N].result -> assign to variable foo the result of job N

jobs[N].traceback() -> print the traceback of dead job N

jobs.remove(N) -> remove (finished) job N

jobs.flush() -> remove all finished jobs

As a convenience feature, BackgroundJobManager instances provide the utility result and traceback methods which retrieve the corresponding information from the jobs list:

jobs.result(N) <–> jobs[N].result jobs.traceback(N) <–> jobs[N].traceback()

While this appears minor, it allows you to use tab completion interactively on the job manager instance.

`__init__`()

Initialize self. See help(type(self)) for accurate signature.

`flush`()

Flush all finished jobs (completed and dead) from lists.

Running jobs are never flushed.

It first calls _status_new(), to update info. If any jobs have completed since the last _status_new() call, the flush operation aborts.

`new`(*func_or_exp*, **args*, ***kwargs*)

Add a new background job and start it in a separate thread.

There are two types of jobs which can be created:

1. Jobs based on expressions which can be passed to an eval() call. The expression must be given as a string. For example:

job_manager.new('myfunc(x,y,z=1)'[,glob[,loc]])

The given expression is passed to eval(), along with the optional global/local dicts provided. If no dicts are given, they are extracted automatically from the caller's frame.

A Python statement is NOT a valid eval() expression. Basically, you can only use as an eval() argument something which can go on the right of an '=' sign and be assigned to a variable.

For example,"print 'hello'" is not valid, but '2+3' is.

2. Jobs given a function object, optionally passing additional positional arguments:

job_manager.new(myfunc, x, y)

The function is called with the given arguments.

If you need to pass keyword arguments to your function, you must supply them as a dict named kw:

job_manager.new(myfunc, x, y, kw=dict(z=1))

The reason for this assymmetry is that the new() method needs to maintain access to its own keywords, and this prevents name collisions between arguments to new() and arguments to your own functions.

In both cases, the result is stored in the job.result field of the background job object.

You can set `daemon` attribute of the thread by giving the keyword argument `daemon`.

Notes and caveats:

1. All threads running share the same standard output. Thus, if your background jobs generate output, it will come out on top of whatever you are currently writing. For this reason, background jobs are best used with silent functions which simply return their output.

2. Threads also all work within the same global namespace, and this system does not lock interactive variables. So if you send job to the background which operates on a mutable object for a long time, and start modifying that same mutable object interactively (or in another backgrounded job), all sorts of bizarre behaviour will occur.

3. If a background job is spending a lot of time inside a C extension module which does not release the Python Global Interpreter Lock (GIL), this will block the IPython prompt. This is simply because the Python interpreter can only switch between threads at Python bytecodes. While the execution is inside C code, the interpreter must simply wait unless the extension module releases the GIL.

4. There is no way, due to limitations in the Python threads library, to kill a thread once it has started.

remove(*num*)
Remove a finished (completed or dead) job.

result(*N*) → return the result of job N.

status(*verbose=0*)
Print a status of all jobs currently being managed.

class `IPython.lib.backgroundjobs.`**BackgroundJobBase**
Bases: `threading.Thread`

Base class to build BackgroundJob classes.

The derived classes must implement:

- Their own __init__, since the one here raises NotImplementedError. The derived constructor must call self._init() at the end, to provide common initialization.
- A strform attribute used in calls to __str__.
- A call() method, which will make the actual execution call and must return a value to be held in the 'result' field of the job object.

__init__()
Must be implemented in subclasses.

Subclasses must call `_init()` for standard initialisation.

run()
Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

class `IPython.lib.backgroundjobs.`**BackgroundJobExpr**(*expression*, *glob=None*, *loc=None*)
Bases: `IPython.lib.backgroundjobs.BackgroundJobBase`

Evaluate an expression as a background job (uses a separate thread).

__init__(*expression*, *glob=None*, *loc=None*)
Create a new job from a string which can be fed to eval().

global/locals dicts can be provided, which will be passed to the eval call.

class `IPython.lib.backgroundjobs.`**BackgroundJobFunc**(*func*, **args*, ***kwargs*)
Bases: `IPython.lib.backgroundjobs.BackgroundJobBase`

Run a function call as a background job (uses a separate thread).

__init__(*func*, **args*, ***kwargs*)
Create a new job from a callable object.

Any positional arguments and keyword args given to this constructor after the initial callable are passed directly to it.

8.42 Module: `lib.clipboard`

Utilities for accessing the platform's clipboard.

8.42.1 1 Class

class `IPython.lib.clipboard.`**`ClipboardEmpty`**

Bases: `ValueError`

8.42.2 3 Functions

`IPython.lib.clipboard.`**`win32_clipboard_get`**`()`

Get the current clipboard's text on Windows.

Requires Mark Hammond's pywin32 extensions.

`IPython.lib.clipboard.`**`osx_clipboard_get`**`()`

Get the clipboard's text on OS X.

`IPython.lib.clipboard.`**`tkinter_clipboard_get`**`()`

Get the clipboard's text using Tkinter.

This is the default on systems that are not Windows or OS X. It may interfere with other UI toolkits and should be replaced with an implementation that uses that toolkit.

8.43 Module: `lib.deepreload`

Provides a reload() function that acts recursively.

Python's normal `reload` function only reloads the module that it's passed. The *`reload()`* function in this module also reloads everything imported from that module, which is useful when you're changing files deep inside a package.

To use this as your default reload function, type this for Python 2:

```
import __builtin__
from IPython.lib import deepreload
__builtin__.reload = deepreload.reload
```

Or this for Python 3:

```
import builtins
from IPython.lib import deepreload
builtins.reload = deepreload.reload
```

A reference to the original `reload` is stored in this module as `original_reload`, so you can restore it later.

This code is almost entirely based on knee.py, which is a Python re-implementation of hierarchical module import.

8.43.1 9 Functions

`IPython.lib.deepreload.`**`replace_import_hook`**(*new_import*)

`IPython.lib.deepreload.`**`get_parent`**(*globals*, *level*)
parent, name = get_parent(globals, level)

Return the package that an import is being performed in. If globals comes from the module foo.bar.bat (not itself a package), this returns the sys.modules entry for foo.bar. If globals is from a package's __init__.py, the package's entry in sys.modules is returned.

If globals doesn't come from a package or a module in a package, or a corresponding entry is not found in sys.modules, None is returned.

`IPython.lib.deepreload.`**`load_next`**(*mod*, *altmod*, *name*, *buf*)
mod, name, buf = load_next(mod, altmod, name, buf)

altmod is either None or same as mod

`IPython.lib.deepreload.`**`import_submodule`**(*mod*, *subname*, *fullname*)
m = import_submodule(mod, subname, fullname)

`IPython.lib.deepreload.`**`add_submodule`**(*mod*, *submod*, *fullname*, *subname*)
mod.{subname} = submod

`IPython.lib.deepreload.`**`ensure_fromlist`**(*mod*, *fromlist*, *buf*, *recursive*)
Handle 'from module import a, b, c' imports.

`IPython.lib.deepreload.`**`deep_import_hook`**(*name*, *globals=None*, *locals=None*, *fromlist=None*, *level=-1*)
Replacement for __import__()

`IPython.lib.deepreload.`**`deep_reload_hook`**(*m*)
Replacement for reload().

`IPython.lib.deepreload.`**`reload`**(*module*, *exclude=('sys', 'os.path', 'builtins', '__main__', 'numpy', 'numpy._globals')*)
Recursively reload all modules used in the given module. Optionally takes a list of modules to exclude from reloading. The default exclude list contains sys, __main__, and __builtin__, to prevent, e.g., resetting display, exception, and io hooks.

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8.44 Module: `lib.demo`

Module for interactive demos using IPython.

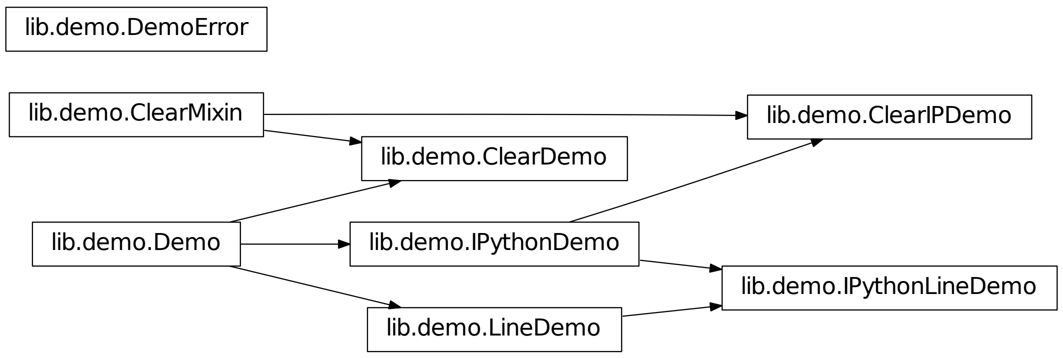
This module implements a few classes for running Python scripts interactively in IPython for demonstrations. With very simple markup (a few tags in comments), you can control points where the script stops executing and returns control to IPython.

8.44.1 Provided classes

The classes are (see their docstrings for further details):

- Demo: pure python demos
- IPythonDemo: demos with input to be processed by IPython as if it had been typed interactively (so magics work, as well as any other special syntax you may have added via input prefilters).
- LineDemo: single-line version of the Demo class. These demos are executed one line at a time, and require no markup.
- IPythonLineDemo: IPython version of the LineDemo class (the demo is executed a line at a time, but processed via IPython).
- ClearMixin: mixin to make Demo classes with less visual clutter. It declares an empty marquee and a pre_cmd that clears the screen before each block (see Subclassing below).
- ClearDemo, ClearIPDemo: mixin-enabled versions of the Demo and IPythonDemo classes.

Inheritance diagram:



8.44.2 Subclassing

The classes here all include a few methods meant to make customization by subclassing more convenient. Their docstrings below have some more details:

- highlight(): format every block and optionally highlight comments and docstring content.
- marquee(): generates a marquee to provide visible on-screen markers at each block start and end.
- pre_cmd(): run right before the execution of each block.
- post_cmd(): run right after the execution of each block. If the block raises an exception, this is NOT called.

8.44.3 Operation

The file is run in its own empty namespace (though you can pass it a string of arguments as if in a command line environment, and it will see those as sys.argv). But at each stop, the global IPython namespace is updated with the current internal demo namespace, so you can work interactively with the data accumulated so far.

By default, each block of code is printed (with syntax highlighting) before executing it and you have to confirm execution. This is intended to show the code to an audience first so you can discuss it, and only proceed with execution once you agree. There are a few tags which allow you to modify this behavior.

The supported tags are:

# <demo> stop

> Defines block boundaries, the points where IPython stops execution of the file and returns to the interactive prompt.
>
> You can optionally mark the stop tag with extra dashes before and after the word 'stop', to help visually distinguish the blocks in a text editor:
>
> # <demo> — stop —

# <demo> silent

> Make a block execute silently (and hence automatically). Typically used in cases where you have some boilerplate or initialization code which you need executed but do not want to be seen in the demo.

# <demo> auto

> Make a block execute automatically, but still being printed. Useful for simple code which does not warrant discussion, since it avoids the extra manual confirmation.

# <demo> auto_all

> This tag can _only_ be in the first block, and if given it overrides the individual auto tags to make the whole demo fully automatic (no block asks for confirmation). It can also be given at creation time (or the attribute set later) to override what's in the file.

While _any_ python file can be run as a Demo instance, if there are no stop tags the whole file will run in a single block (no different that calling first %pycat and then %run). The minimal markup to make this useful is to place a set of stop tags; the other tags are only there to let you fine-tune the execution.

This is probably best explained with the simple example file below. You can copy this into a file named ex_demo.py, and try running it via:

```python
from IPython.lib.demo import Demo
d = Demo('ex_demo.py')
d()
```

Each time you call the demo object, it runs the next block. The demo object has a few useful methods for navigation, like again(), edit(), jump(), seek() and back(). It can be reset for a new run via reset() or reloaded from disk (in case you've edited the source) via reload(). See their docstrings below.

Note: To make this simpler to explore, a file called "demo-exercizer.py" has been added to the "docs/examples/core" directory. Just cd to this directory in an IPython session, and type:

```
%run demo-exercizer.py
```

and then follow the directions.

Example

The following is a very simple example of a valid demo file.

```
#################### EXAMPLE DEMO <ex_demo.py> ###############################
'''A simple interactive demo to illustrate the use of IPython's Demo class.'''

print 'Hello, welcome to an interactive IPython demo.'

# The mark below defines a block boundary, which is a point where IPython will
# stop execution and return to the interactive prompt. The dashes are actually
# optional and used only as a visual aid to clearly separate blocks while
# editing the demo code.
# <demo> stop

x = 1
y = 2

# <demo> stop

# the mark below makes this block as silent
# <demo> silent

print 'This is a silent block, which gets executed but not printed.'

# <demo> stop
# <demo> auto
print 'This is an automatic block.'
print 'It is executed without asking for confirmation, but printed.'
z = x+y

print 'z=',x

# <demo> stop
# This is just another normal block.
print 'z is now:', z

print 'bye!'
################### END EXAMPLE DEMO <ex_demo.py> ############################
```

8.44.4 8 Classes

class IPython.lib.demo.**DemoError**

Bases: Exception

class `IPython.lib.demo.`**`Demo`**(*src*, *title=”*, *arg_str=”*, *auto_all=None*, *format_rst=False*, *formatter='terminal'*, *style='default'*)

Bases: `object`

`__init__`(*src*, *title=”*, *arg_str=”*, *auto_all=None*, *format_rst=False*, *formatter='terminal'*, *style='default'*)

Make a new demo object. To run the demo, simply call the object.

See the module docstring for full details and an example (you can use IPython.Demo? in IPython to see it).

Inputs:

- **src is either a file, or file-like object, or a** string that can be resolved to a filename.

Optional inputs:

- title: a string to use as the demo name. Of most use when the demo you are making comes from an object that has no filename, or if you want an alternate denotation distinct from the filename.
- arg_str(‘’): a string of arguments, internally converted to a list just like sys.argv, so the demo script can see a similar environment.
- auto_all(None): global flag to run all blocks automatically without confirmation. This attribute overrides the block-level tags and applies to the whole demo. It is an attribute of the object, and can be changed at runtime simply by reassigning it to a boolean value.
- format_rst(False): a bool to enable comments and doc strings formatting with pygments rst lexer
- formatter(‘terminal’): a string of pygments formatter name to be used. Useful values for terminals: terminal, terminal256, terminal16m
- style(‘default’): a string of pygments style name to be used.

`again`()

Move the seek pointer back one block and re-execute.

`back`(*num=1*)

Move the seek pointer back num blocks (default is 1).

`edit`(*index=None*)

Edit a block.

If no number is given, use the last block executed.

This edits the in-memory copy of the demo, it does NOT modify the original source file. If you want to do that, simply open the file in an editor and use reload() when you make changes to the file. This method is meant to let you change a block during a demonstration for explanatory purposes, without damaging your original script.

`fload`()

Load file object.

`highlight`(*block*)

Method called on each block to highlight it content

`jump`(*num=1*)

Jump a given number of blocks relative to the current one.

The offset can be positive or negative, defaults to 1.

`marquee`(*txt=”*, *width=78*, *mark='*'*)

Return the input string centered in a ‘marquee’.

post_cmd()
Method called after executing each block.

pre_cmd()
Method called before executing each block.

reload()
Reload source from disk and initialize state.

reset()
Reset the namespace and seek pointer to restart the demo

run_cell(*source*)
Execute a string with one or more lines of code

seek(*index*)
Move the current seek pointer to the given block.

You can use negative indices to seek from the end, with identical semantics to those of Python lists.

show(*index=None*)
Show a single block on screen

show_all()
Show entire demo on screen, block by block

class IPython.lib.demo.**IPythonDemo**(*src*, *title=''*, *arg_str=''*, *auto_all=None*, *format_rst=False*, *formatter='terminal'*, *style='default'*)
Bases: *IPython.lib.demo.Demo*

Class for interactive demos with IPython's input processing applied.

This subclasses Demo, but instead of executing each block by the Python interpreter (via exec), it actually calls IPython on it, so that any input filters which may be in place are applied to the input block.

If you have an interactive environment which exposes special input processing, you can use this class instead to write demo scripts which operate exactly as if you had typed them interactively. The default Demo class requires the input to be valid, pure Python code.

run_cell(*source*)
Execute a string with one or more lines of code

class IPython.lib.demo.**LineDemo**(*src*, *title=''*, *arg_str=''*, *auto_all=None*, *format_rst=False*, *formatter='terminal'*, *style='default'*)
Bases: *IPython.lib.demo.Demo*

Demo where each line is executed as a separate block.

The input script should be valid Python code.

This class doesn't require any markup at all, and it's meant for simple scripts (with no nesting or any kind of indentation) which consist of multiple lines of input to be executed, one at a time, as if they had been typed in the interactive prompt.

Note: the input can not have *any* indentation, which means that only single-lines of input are accepted, not even function definitions are valid.

reload()
Reload source from disk and initialize state.

class IPython.lib.demo.**IPythonLineDemo**(*src*, *title=''*, *arg_str=''*, *auto_all=None*, *format_rst=False*, *formatter='terminal'*, *style='default'*)
Bases: *IPython.lib.demo.IPythonDemo*, *IPython.lib.demo.LineDemo*

Variant of the LineDemo class whose input is processed by IPython.

class IPython.lib.demo.**ClearMixin**

Bases: object

Use this mixin to make Demo classes with less visual clutter.

Demos using this mixin will clear the screen before every block and use blank marquees.

Note that in order for the methods defined here to actually override those of the classes it's mixed with, it must go /first/ in the inheritance tree. For example:

> class ClearIPDemo(ClearMixin,IPythonDemo): pass

will provide an IPythonDemo class with the mixin's features.

marquee(*txt=", width=78, mark='*'*)

Blank marquee that returns '' no matter what the input.

pre_cmd()

Method called before executing each block.

This one simply clears the screen.

class IPython.lib.demo.**ClearDemo**(*src, title=", arg_str=", auto_all=None, format_rst=False, formatter='terminal', style='default'*)

Bases: *IPython.lib.demo.ClearMixin*, *IPython.lib.demo.Demo*

class IPython.lib.demo.**ClearIPDemo**(*src, title=", arg_str=", auto_all=None, format_rst=False, formatter='terminal', style='default'*)

Bases: *IPython.lib.demo.ClearMixin*, *IPython.lib.demo.IPythonDemo*

8.44.5 2 Functions

IPython.lib.demo.**re_mark**(*mark*)

IPython.lib.demo.**slide**(*file_path, noclear=False, format_rst=True, formatter='terminal', style='native', auto_all=False, delimiter='...'*)

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8.45 Module: lib.editorhooks

'editor' hooks for common editors that work well with ipython

They should honor the line number argument, at least.

Contributions are *very* welcome.

8.45.1 11 Functions

`IPython.lib.editorhooks.`**`install_editor`**(*template*, *wait=False*)

Installs the editor that is called by IPython for the %edit magic.

This overrides the default editor, which is generally set by your EDITOR environment variable or is notepad (windows) or vi (linux). By supplying a template string `run_template`, you can control how the editor is invoked by IPython – (e.g. the format in which it accepts command line options)

Parameters

- **`template`** (*`basestring`*) – run_template acts as a template for how your editor is invoked by the shell. It should contain '{filename}', which will be replaced on invocation with the file name, and '{line}', $line by line number (or 0) to invoke the file with.
- **`wait`** (*`bool`*) – If `wait` is true, wait until the user presses enter before returning, to facilitate non-blocking editors that exit immediately after the call.

`IPython.lib.editorhooks.`**`komodo`**(*exe='komodo'*)

Activestate Komodo [Edit]

`IPython.lib.editorhooks.`**`scite`**(*exe='scite'*)

SciTE or Sc1

`IPython.lib.editorhooks.`**`notepadplusplus`**(*exe='notepad++'*)

Notepad++ http://notepad-plus.sourceforge.net

`IPython.lib.editorhooks.`**`jed`**(*exe='jed'*)

JED, the lightweight emacsish editor

`IPython.lib.editorhooks.`**`idle`**(*exe='idle'*)

Idle, the editor bundled with python

Parameters **`exe`** (*`str, None`*) – If none, should be pretty smart about finding the executable.

`IPython.lib.editorhooks.`**`mate`**(*exe='mate'*)

TextMate, the missing editor

`IPython.lib.editorhooks.`**`emacs`**(*exe='emacs'*)

`IPython.lib.editorhooks.`**`gnuclient`**(*exe='gnuclient'*)

`IPython.lib.editorhooks.`**`crimson_editor`**(*exe='cedt.exe'*)

`IPython.lib.editorhooks.`**`kate`**(*exe='kate'*)

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8.46 Module: `lib.guisupport`

Support for creating GUI apps and starting event loops.

IPython's GUI integration allows interactive plotting and GUI usage in IPython session. IPython has two different types of GUI integration:

1. The terminal based IPython supports GUI event loops through Python's PyOS_InputHook. PyOS_InputHook is a hook that Python calls periodically whenever raw_input is waiting for a user to type code. We implement GUI support in the terminal by setting PyOS_InputHook to a function that iterates the event loop for a short while. It is important to note that in this situation, the real GUI event loop is NOT run in the normal manner, so you can't use the normal means to detect that it is running.
2. In the two process IPython kernel/frontend, the GUI event loop is run in the kernel. In this case, the event loop is run in the normal manner by calling the function or method of the GUI toolkit that starts the event loop.

In addition to starting the GUI event loops in one of these two ways, IPython will *always* create an appropriate GUI application object when GUi integration is enabled.

If you want your GUI apps to run in IPython you need to do two things:

1. Test to see if there is already an existing main application object. If there is, you should use it. If there is not an existing application object you should create one.
2. Test to see if the GUI event loop is running. If it is, you should not start it. If the event loop is not running you may start it.

This module contains functions for each toolkit that perform these things in a consistent manner. Because of how PyOS_InputHook runs the event loop you cannot detect if the event loop is running using the traditional calls (such as `wx.GetApp.IsMainLoopRunning()` in wxPython). If PyOS_InputHook is set These methods will return a false negative. That is, they will say the event loop is not running, when is actually is. To work around this limitation we proposed the following informal protocol:

- Whenever someone starts the event loop, they *must* set the `_in_event_loop` attribute of the main application object to `True`. This should be done regardless of how the event loop is actually run.
- Whenever someone stops the event loop, they *must* set the `_in_event_loop` attribute of the main application object to `False`.
- If you want to see if the event loop is running, you *must* use `hasattr` to see if `_in_event_loop` attribute has been set. If it is set, you *must* use its value. If it has not been set, you can query the toolkit in the normal manner.
- If you want GUI support and no one else has created an application or started the event loop you *must* do this. We don't want projects to attempt to defer these things to someone else if they themselves need it.

The functions below implement this logic for each GUI toolkit. If you need to create custom application subclasses, you will likely have to modify this code for your own purposes. This code can be copied into your own project so you don't have to depend on IPython.

8.46.1 6 Functions

`IPython.lib.guisupport.`**`get_app_wx`**`(`**args*, ***kwargs*`)`
    Create a new wx app or return an exiting one.

`IPython.lib.guisupport.`**`is_event_loop_running_wx`**`(`*app=None*`)`
    Is the wx event loop running.

`IPython.lib.guisupport.`**`start_event_loop_wx`**`(`*app=None*`)`
    Start the wx event loop in a consistent manner.

`IPython.lib.guisupport.`**`get_app_qt4`**`(`**args*, ***kwargs*`)`
Create a new qt4 app or return an existing one.

`IPython.lib.guisupport.`**`is_event_loop_running_qt4`**`(`*app=None*`)`
Is the qt4 event loop running.

`IPython.lib.guisupport.`**`start_event_loop_qt4`**`(`*app=None*`)`
Start the qt4 event loop in a consistent manner.

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8.47 Module: `lib.inputhook`

Deprecated since IPython 5.0

Inputhook management for GUI event loop integration.

8.47.1 11 Classes

`class` `IPython.lib.inputhook.`**`InputHookManager`**
Bases: `object`

DEPRECATED since IPython 5.0

Manage PyOS_InputHook for different GUI toolkits.

This class installs various hooks under `PyOSInputHook` to handle GUI event loop integration.

`__init__``()`
Initialize self. See help(type(self)) for accurate signature.

`clear_app_refs``(`*gui=None*`)`
DEPRECATED since IPython 5.0

Clear IPython's internal reference to an application instance.

Whenever we create an app for a user on qt4 or wx, we hold a reference to the app. This is needed because in some cases bad things can happen if a user doesn't hold a reference themselves. This method is provided to clear the references we are holding.

Parameters **`gui`** (`None or str`) – If None, clear all app references. If ('wx', 'qt4') clear the app for that toolkit. References are not held for gtk or tk as those toolkits don't have the notion of an app.

`clear_inputhook``(`*app=None*`)`
DEPRECATED since IPython 5.0

Set PyOS_InputHook to NULL and return the previous one.

Parameters **app** (*optional, ignored*) – This parameter is allowed only so that clear_inputhook() can be called with a similar interface as all the `enable_*` methods. But the actual value of the parameter is ignored. This uniform interface makes it easier to have user-level entry points in the main IPython app like `enable_gui()`.

current_gui()
DEPRECATED since IPython 5.0

Return a string indicating the currently active GUI or None.

disable_gui()
DEPRECATED since IPython 5.0

Disable GUI event loop integration.

If an application was registered, this sets its `_in_event_loop` attribute to False. It then calls `clear_inputhook()`.

enable_gui(*gui=None*, *app=None*)
DEPRECATED since IPython 5.0

Switch amongst GUI input hooks by name.

This is a higher level method than `set_inputhook()` - it uses the GUI name to look up a registered object which enables the input hook for that GUI.

Parameters

- **gui** (*optional, string or None*) – If None (or 'none'), clears input hook, otherwise it must be one of the recognized GUI names (see `GUI_*` constants in module).
- **app** (*optional, existing application object.*) – For toolkits that have the concept of a global app, you can supply an existing one. If not given, the toolkit will be probed for one, and if none is found, a new one will be created. Note that GTK does not have this concept, and passing an app if `gui=="GTK"` will raise an error.

Returns

- *The output of the underlying gui switch routine, typically the actual*
- *PyOS_InputHook wrapper object or the GUI toolkit app created, if there was*
- *one.*

get_pyos_inputhook()
DEPRECATED since IPython 5.0

Return the current PyOS_InputHook as a ctypes.c_void_p.

get_pyos_inputhook_as_func()
DEPRECATED since IPython 5.0

Return the current PyOS_InputHook as a ctypes.PYFUNCYPE.

register(*toolkitname*, **aliases*)
DEPRECATED since IPython 5.0

Register a class to provide the event loop for a given GUI.

This is intended to be used as a class decorator. It should be passed the names with which to register this GUI integration. The classes themselves should subclass `InputHookBase`.

```
@inputhook_manager.register('qt')
class QtInputHook(InputHookBase):
    def enable(self, app=None):
        ...
```

set_inputhook(*callback*)
DEPRECATED since IPython 5.0

Set PyOS_InputHook to callback and return the previous one.

class IPython.lib.inputhook.**InputHookBase**(*manager*)
Bases: `object`

DEPRECATED since IPython 5.0

Base class for input hooks for specific toolkits.

Subclasses should define an `enable()` method with one argument, `app`, which will either be an instance of the toolkit's application class, or None. They may also define a `disable()` method with no arguments.

__init__(*manager*)
Initialize self. See help(type(self)) for accurate signature.

class IPython.lib.inputhook.**NullInputHook**(*manager*)
Bases: *IPython.lib.inputhook.InputHookBase*

DEPRECATED since IPython 5.0

A null inputhook that doesn't need to do anything

class IPython.lib.inputhook.**WxInputHook**(*manager*)
Bases: *IPython.lib.inputhook.InputHookBase*

disable()
DEPRECATED since IPython 5.0

Disable event loop integration with wxPython.

This restores appnapp on OS X

enable(*app=None*)
DEPRECATED since IPython 5.0

Enable event loop integration with wxPython.

Parameters app (*WX Application, optional.*) – Running application to use. If not given, we probe WX for an existing application object, and create a new one if none is found.

Notes

This methods sets the `PyOS_InputHook` for wxPython, which allows the wxPython to integrate with terminal based applications like IPython.

If `app` is not given we probe for an existing one, and return it if found. If no existing app is found, we create an `wx.App` as follows:

```
import wx
app = wx.App(redirect=False, clearSigInt=False)
```

class IPython.lib.inputhook.**Qt4InputHook**(*manager*)
Bases: *IPython.lib.inputhook.InputHookBase*

disable_qt4()
DEPRECATED since IPython 5.0

Disable event loop integration with PyQt4.

This restores appnapp on OS X

enable(*app=None*)
DEPRECATED since IPython 5.0

Enable event loop integration with PyQt4.

Parameters **app** (*Qt Application, optional.*) – Running application to use. If not given, we probe Qt for an existing application object, and create a new one if none is found.

Notes

This methods sets the PyOS_InputHook for PyQt4, which allows the PyQt4 to integrate with terminal based applications like IPython.

If `app` is not given we probe for an existing one, and return it if found. If no existing app is found, we create an `QApplication` as follows:

```
from PyQt4 import QtCore
app = QtGui.QApplication(sys.argv)
```

class IPython.lib.inputhook.**Qt5InputHook**(*manager*)
Bases: *IPython.lib.inputhook.Qt4InputHook*

enable(*app=None*)
DEPRECATED since IPython 5.0

Enable event loop integration with PyQt4.

Parameters **app** (*Qt Application, optional.*) – Running application to use. If not given, we probe Qt for an existing application object, and create a new one if none is found.

Notes

This methods sets the PyOS_InputHook for PyQt4, which allows the PyQt4 to integrate with terminal based applications like IPython.

If `app` is not given we probe for an existing one, and return it if found. If no existing app is found, we create an `QApplication` as follows:

```
from PyQt4 import QtCore
app = QtGui.QApplication(sys.argv)
```

class IPython.lib.inputhook.**GtkInputHook**(*manager*)
Bases: *IPython.lib.inputhook.InputHookBase*

enable(*app=None*)
DEPRECATED since IPython 5.0

Enable event loop integration with PyGTK.

Parameters **app** (*ignored*) – Ignored, it's only a placeholder to keep the call signature of all gui activation methods consistent, which simplifies the logic of supporting magics.

Notes

This methods sets the PyOS_InputHook for PyGTK, which allows the PyGTK to integrate with terminal based applications like IPython.

class `IPython.lib.inputhook.`**`TkInputHook`**(*manager*)

Bases: *`IPython.lib.inputhook.InputHookBase`*

`enable`(*app=None*)

DEPRECATED since IPython 5.0

Enable event loop integration with Tk.

Parameters **`app`** (toplevel `Tkinter.Tk` widget, optional.) – Running toplevel widget to use. If not given, we probe Tk for an existing one, and create a new one if none is found.

Notes

If you have already created a `Tkinter.Tk` object, the only thing done by this method is to register with the *`InputHookManager`*, since creating that object automatically sets `PyOS_InputHook`.

class `IPython.lib.inputhook.`**`GlutInputHook`**(*manager*)

Bases: *`IPython.lib.inputhook.InputHookBase`*

`disable`()

DEPRECATED since IPython 5.0

Disable event loop integration with glut.

This sets PyOS_InputHook to NULL and set the display function to a dummy one and set the timer to a dummy timer that will be triggered very far in the future.

`enable`(*app=None*)

DEPRECATED since IPython 5.0

Enable event loop integration with GLUT.

Parameters **`app`** (*`ignored`*) – Ignored, it's only a placeholder to keep the call signature of all gui activation methods consistent, which simplifies the logic of supporting magics.

Notes

This methods sets the PyOS_InputHook for GLUT, which allows the GLUT to integrate with terminal based applications like IPython. Due to GLUT limitations, it is currently not possible to start the event loop without first creating a window. You should thus not create another window but use instead the created one. See 'gui-glut.py' in the docs/examples/lib directory.

The default screen mode is set to: glut.GLUT_DOUBLE | glut.GLUT_RGBA | glut.GLUT_DEPTH

class `IPython.lib.inputhook.`**`PygletInputHook`**(*manager*)

Bases: *`IPython.lib.inputhook.InputHookBase`*

`enable`(*app=None*)

DEPRECATED since IPython 5.0

Enable event loop integration with pyglet.

Parameters **`app`** (*`ignored`*) – Ignored, it's only a placeholder to keep the call signature of all gui activation methods consistent, which simplifies the logic of supporting magics.

Notes

This methods sets the `PyOS_InputHook` for pyglet, which allows pyglet to integrate with terminal based applications like IPython.

class `IPython.lib.inputhook.`**`Gtk3InputHook`**(*manager*)

Bases: *`IPython.lib.inputhook.InputHookBase`*

`enable`(*app=None*)

DEPRECATED since IPython 5.0

Enable event loop integration with Gtk3 (gir bindings).

Parameters **`app`** (*`ignored`*) – Ignored, it's only a placeholder to keep the call signature of all gui activation methods consistent, which simplifies the logic of supporting magics.

Notes

This methods sets the PyOS_InputHook for Gtk3, which allows the Gtk3 to integrate with terminal based applications like IPython.

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8.48 Module: `lib.latextools`

Tools for handling LaTeX.

8.48.1 1 Class

class `IPython.lib.latextools.`**`LaTeXTool`**(***kwargs*)

Bases: `traitlets.config.configurable.SingletonConfigurable`

An object to store configuration of the LaTeX tool.

8.48.2 6 Functions

`IPython.lib.latextools.`**`latex_to_png`**(*s*, *encode=False*, *backend=None*, *wrap=False*)

Render a LaTeX string to PNG.

Parameters

- **`s`** (*`str`*) – The raw string containing valid inline LaTeX.

- **encode** (*bool, optional*) – Should the PNG data base64 encoded to make it JSON'able.
- **backend** (*{matplotlib, dvipng}*) – Backend for producing PNG data.
- **wrap** (*bool*) – If true, Automatically wrap `s` as a LaTeX equation.
- **is returned when the backend cannot be used.** (*None*) –

`IPython.lib.latextools.`**`latex_to_png_mpl`**(*s, wrap*)

`IPython.lib.latextools.`**`latex_to_png_dvipng`**(*s, wrap*)

`IPython.lib.latextools.`**`kpsewhich`**(*filename*)
Invoke kpsewhich command with an argument `filename`.

`IPython.lib.latextools.`**`genelatex`**(*body, wrap*)
Generate LaTeX document for dvipng backend.

`IPython.lib.latextools.`**`latex_to_html`**(*s, alt='image'*)
Render LaTeX to HTML with embedded PNG data using data URIs.

Parameters

- **s** (*str*) – The raw string containing valid inline LateX.
- **alt** (*str*) – The alt text to use for the HTML.

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8.49 Module: `lib.lexers`

Defines a variety of Pygments lexers for highlighting IPython code.

This includes:

IPythonLexer, IPython3Lexer Lexers for pure IPython (python + magic/shell commands)

IPythonPartialTracebackLexer, IPythonTracebackLexer Supports 2.x and 3.x via keyword `python3`. The partial traceback lexer reads everything but the Python code appearing in a traceback. The full lexer combines the partial lexer with an IPython lexer.

IPythonConsoleLexer A lexer for IPython console sessions, with support for tracebacks.

IPyLexer A friendly lexer which examines the first line of text and from it, decides whether to use an IPython lexer or an IPython console lexer. This is probably the only lexer that needs to be explicitly added to Pygments.

8.49.1 4 Classes

class IPython.lib.lexers.**IPythonPartialTracebackLexer**(***options*)
Bases: `pygments.lexer.RegexLexer`

Partial lexer for IPython tracebacks.

Handles all the non-python output. This works for both Python 2.x and 3.x.

class IPython.lib.lexers.**IPythonTracebackLexer**(***options*)
Bases: `pygments.lexer.DelegatingLexer`

IPython traceback lexer.

For doctests, the tracebacks can be snipped as much as desired with the exception to the lines that designate a traceback. For non-syntax error tracebacks, this is the line of hyphens. For syntax error tracebacks, this is the line which lists the File and line number.

__init__(***options*)
Initialize self. See help(type(self)) for accurate signature.

class IPython.lib.lexers.**IPythonConsoleLexer**(***options*)
Bases: `pygments.lexer.Lexer`

An IPython console lexer for IPython code-blocks and doctests, such as:

```
.. code-block:: ipythonconsole

    In [1]: a = 'foo'

In [2]:      a
Out[2]: 'foo'

In [3]: p    rint a
foo

In [4]: 1 /      0
```

Support is also provided for IPython exceptions:

```
.. code-block:: ipythonconsole

    In [1]: raise Exception

--------    -------------------------------------------------------------------
Exceptio    n                                        Traceback (most recent call last)
<ipython    -input-1-fca2ab0ca76b> in <module>
----> 1     raise Exception

Exceptio    n:
```

__init__(***options*)
Initialize the IPython console lexer.

Parameters

- **python3** (*bool*) – If `True`, then the console inputs are parsed using a Python 3 lexer. Otherwise, they are parsed using a Python 2 lexer.
- **in1_regex** (*RegexObject*) – The compiled regular expression used to detect the start of inputs. Although the IPython configuration setting may have a trailing whitespace, do not include it in the regex. If `None`, then the default input prompt is assumed.

- **in2_regex** (*RegexObject*) – The compiled regular expression used to detect the continuation of inputs. Although the IPython configuration setting may have a trailing whitespace, do not include it in the regex. If `None`, then the default input prompt is assumed.
- **out_regex** (*RegexObject*) – The compiled regular expression used to detect outputs. If `None`, then the default output prompt is assumed.

buffered_tokens()
Generator of unprocessed tokens after doing insertions and before changing to a new state.

get_mci(*line*)
Parses the line and returns a 3-tuple: (mode, code, insertion).

`mode` is the next mode (or state) of the lexer, and is always equal to 'input', 'output', or 'tb'.

`code` is a portion of the line that should be added to the buffer corresponding to the next mode and eventually lexed by another lexer. For example, `code` could be Python code if `mode` were 'input'.

`insertion` is a 3-tuple (index, token, text) representing an unprocessed "token" that will be inserted into the stream of tokens that are created from the buffer once we change modes. This is usually the input or output prompt.

In general, the next mode depends on current mode and on the contents of `line`.

get_tokens_unprocessed(*text*)
Return an iterable of (index, tokentype, value) pairs where "index" is the starting position of the token within the input text.

In subclasses, implement this method as a generator to maximize effectiveness.

ipytb_start = re.compile('^(\\^C)?(-+\\n)|^(File)(.*)(, line)(\\d+\\n)')
The regex to determine when a traceback starts.

class `IPython.lib.lexers.`**IPyLexer**(***options*)
Bases: `pygments.lexer.Lexer`

Primary lexer for all IPython-like code.

This is a simple helper lexer. If the first line of the text begins with "In [[0-9]+]:", then the entire text is parsed with an IPython console lexer. If not, then the entire text is parsed with an IPython lexer.

The goal is to reduce the number of lexers that are registered with Pygments.

__init__(***options*)
Initialize self. See help(type(self)) for accurate signature.

get_tokens_unprocessed(*text*)
Return an iterable of (index, tokentype, value) pairs where "index" is the starting position of the token within the input text.

In subclasses, implement this method as a generator to maximize effectiveness.

8.49.2 1 Function

`IPython.lib.lexers.`**build_ipy_lexer**(*python3*)
Builds IPython lexers depending on the value of `python3`.

The lexer inherits from an appropriate Python lexer and then adds information about IPython specific keywords (i.e. magic commands, shell commands, etc.)

Parameters **python3** (*bool*) – If `True`, then build an IPython lexer from a Python 3 lexer.

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8.50 Module: `lib.pretty`

Python advanced pretty printer. This pretty printer is intended to replace the old `pprint` python module which does not allow developers to provide their own pretty print callbacks.

This module is based on ruby's `prettyprint.rb` library by `Tanaka Akira`.

8.50.1 Example Usage

To directly print the representation of an object use `pprint`:

```
from pretty import pprint
pprint(complex_object)
```

To get a string of the output use `pretty`:

```
from pretty import pretty
string = pretty(complex_object)
```

8.50.2 Extending

The pretty library allows developers to add pretty printing rules for their own objects. This process is straightforward. All you have to do is to add a `_repr_pretty_` method to your object and call the methods on the pretty printer passed:

```
class MyObject(object):

    def _repr_pretty_(self, p, cycle):
        ...
```

Here is an example implementation of a `_repr_pretty_` method for a list subclass:

```
class MyList(list):

    def _repr_pretty_(self, p, cycle):
        if cycle:
            p.text('MyList(...)')
        else:
            with p.group(8, 'MyList([', '])'):
                for idx, item in enumerate(self):
```

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(continued from previous page)

```
                    if idx:
                        p.text(',')
                        p.breakable()
                    p.pretty(item)
```

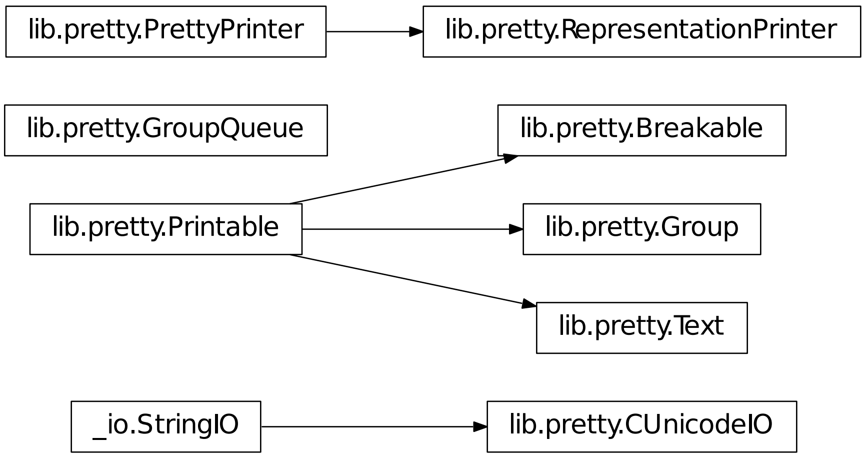
The `cycle` parameter is `True` if pretty detected a cycle. You *have* to react to that or the result is an infinite loop. `p.text()` just adds non breaking text to the output, `p.breakable()` either adds a whitespace or breaks here. If you pass it an argument it's used instead of the default space. `p.pretty` prettyprints another object using the pretty print method.

The first parameter to the `group` function specifies the extra indentation of the next line. In this example the next item will either be on the same line (if the items are short enough) or aligned with the right edge of the opening bracket of `MyList`.

If you just want to indent something you can use the group function without open / close parameters. You can also use this code:

```
with p.indent(2):
    ...
```

Inheritance diagram:



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8.50.3 7 Classes

class IPython.lib.pretty.**PrettyPrinter**(*output*, *max_width=79*, *newline='n'*, *max_seq_length=1000*)

Bases: `IPython.lib.pretty._PrettyPrinterBase`

Baseclass for the `RepresentationPrinter` prettyprinter that is used to generate pretty reprs of objects. Contrary to the `RepresentationPrinter` this printer knows nothing about the default pprinters or the `_repr_pretty_` callback method.

`__init__`(*output*, *max_width=79*, *newline='\n'*, *max_seq_length=1000*)
Initialize self. See help(type(self)) for accurate signature.

`begin_group`(*indent=0*, *open="*)
Begin a group. If you want support for python < 2.5 which doesn't has the with statement this is the preferred way:

p.begin_group(1, '{') … p.end_group(1, '}')

The python 2.5 expression would be this:

with p.group(1, '{', '}'): …

The first parameter specifies the indentation for the next line (usually the width of the opening text), the second the opening text. All parameters are optional.

`break_`()
Explicitly insert a newline into the output, maintaining correct indentation.

`breakable`(*sep=' '*)
Add a breakable separator to the output. This does not mean that it will automatically break here. If no breaking on this position takes place the `sep` is inserted which default to one space.

`end_group`(*dedent=0*, *close="*)
End a group. See `begin_group` for more details.

`flush`()
Flush data that is left in the buffer.

`text`(*obj*)
Add literal text to the output.

class `IPython.lib.pretty.`**`RepresentationPrinter`**(*output*, *verbose=False*, *max_width=79*, *newline='n'*, *singleton_pprinters=None*, *type_pprinters=None*, *deferred_pprinters=None*, *max_seq_length=1000*)
Bases: *`IPython.lib.pretty.PrettyPrinter`*

Special pretty printer that has a `pretty` method that calls the pretty printer for a python object.

This class stores processing data on `self` so you must *never* use this class in a threaded environment. Always lock it or reinstanciate it.

Instances also have a verbose flag callbacks can access to control their output. For example the default instance repr prints all attributes and methods that are not prefixed by an underscore if the printer is in verbose mode.

`__init__`(*output*, *verbose=False*, *max_width=79*, *newline='\n'*, *singleton_pprinters=None*, *type_pprinters=None*, *deferred_pprinters=None*, *max_seq_length=1000*)
Initialize self. See help(type(self)) for accurate signature.

`pretty`(*obj*)
Pretty print the given object.

class `IPython.lib.pretty.`**`Printable`**
Bases: `object`

class `IPython.lib.pretty.`**`Text`**
Bases: *`IPython.lib.pretty.Printable`*

`__init__`()
Initialize self. See help(type(self)) for accurate signature.

class `IPython.lib.pretty.`**`Breakable`**(*seq*, *width*, *pretty*)
Bases: *`IPython.lib.pretty.Printable`*

`__init__`(*seq*, *width*, *pretty*)
Initialize self. See help(type(self)) for accurate signature.

class `IPython.lib.pretty.`**`Group`**(*depth*)
Bases: *`IPython.lib.pretty.Printable`*

`__init__`(*depth*)
Initialize self. See help(type(self)) for accurate signature.

class `IPython.lib.pretty.`**`GroupQueue`**(**groups*)
Bases: `object`

`__init__`(**groups*)
Initialize self. See help(type(self)) for accurate signature.

8.50.4 4 Functions

`IPython.lib.pretty.`**`pretty`**(*obj*, *verbose=False*, *max_width=79*, *newline='\n'*, *max_seq_length=1000*)
Pretty print the object's representation.

`IPython.lib.pretty.`**`pprint`**(*obj*, *verbose=False*, *max_width=79*, *newline='\n'*, *max_seq_length=1000*)
Like `pretty` but print to stdout.

`IPython.lib.pretty.`**`for_type`**(*typ*, *func*)
Add a pretty printer for a given type.

`IPython.lib.pretty.`**`for_type_by_name`**(*type_module*, *type_name*, *func*)
Add a pretty printer for a type specified by the module and name of a type rather than the type object itself.

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8.51 Module: `lib.security`

Password generation for the IPython notebook.

8.51.1 2 Functions

`IPython.lib.security.`**`passwd`**(*passphrase=None*, *algorithm='sha1'*)
Generate hashed password and salt for use in notebook configuration.

In the notebook configuration, set `c.NotebookApp.password` to the generated string.

Parameters

- **passphrase** (*str*) – Password to hash. If unspecified, the user is asked to input and verify a password.
- **algorithm** (*str*) – Hashing algorithm to use (e.g, 'sha1' or any argument supported by `hashlib.new()`).

Returns **hashed_passphrase** – Hashed password, in the format 'hash_algorithm:salt:passphrase_hash'.

Return type str

Examples

```
>>> passwd('mypassword')
'sha1:7cf3:b7d6da294ea9592a9480c8f52e63cd42cfb9dd12'
```

`IPython.lib.security.`**`passwd_check`**(*hashed_passphrase*, *passphrase*)

Verify that a given passphrase matches its hashed version.

Parameters

- **hashed_passphrase** (*str*) – Hashed password, in the format returned by `passwd`.
- **passphrase** (*str*) – Passphrase to validate.

Returns **valid** – True if the passphrase matches the hash.

Return type bool

Examples

```
>>> from IPython.lib.security import passwd_check
>>> passwd_check('sha1:0e112c3ddfce:a68df677475c2b47b6e86d0467eec97ac5f4b85a',
...              'mypassword')
True
```

```
>>> passwd_check('sha1:0e112c3ddfce:a68df677475c2b47b6e86d0467eec97ac5f4b85a',
...              'anotherpassword')
False
```

8.52 Module: `paths`

Find files and directories which IPython uses.

8.52.1 5 Functions

`IPython.paths.`**`get_ipython_dir`**`()`

Get the IPython directory for this platform and user.

This uses the logic in `get_home_dir` to find the home directory and then adds .ipython to the end of the path.

`IPython.paths.`**`get_ipython_cache_dir`**`()`

Get the cache directory it is created if it does not exist.

`IPython.paths.`**`get_ipython_package_dir`**`()`

Get the base directory where IPython itself is installed.

`IPython.paths.`**`get_ipython_module_path`**`(`*module_str*`)`

Find the path to an IPython module in this version of IPython.

This will always find the version of the module that is in this importable IPython package. This will always return the path to the `.py` version of the module.

`IPython.paths.`**`locate_profile`**`(`*profile='default'*`)`

Find the path to the folder associated with a given profile.

I.e. find $IPYTHONDIR/profile_whatever.

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8.53 Module: `terminal.debugger`

8.53.1 1 Class

`class` `IPython.terminal.debugger.`**`TerminalPdb`**`(`**args*, ***kwargs*`)`

Bases: *`IPython.core.debugger.Pdb`*

`__init__``(`**args*, ***kwargs*`)`

Instantiate a line-oriented interpreter framework.

The optional argument 'completekey' is the readline name of a completion key; it defaults to the Tab key. If completekey is not None and the readline module is available, command completion is done automatically. The optional arguments stdin and stdout specify alternate input and output file objects; if not specified, sys.stdin and sys.stdout are used.

cmdloop (*intro=None*)
Repeatedly issue a prompt, accept input, parse an initial prefix off the received input, and dispatch to action methods, passing them the remainder of the line as argument.

override the same methods from cmd.Cmd to provide prompt toolkit replacement.

8.53.2 1 Function

`IPython.terminal.debugger.`**`set_trace`**(*frame=None*)
Start debugging from `frame`.

If frame is not specified, debugging starts from caller's frame.

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8.54 Module: `terminal.embed`

An embedded IPython shell.

8.54.1 3 Classes

class `IPython.terminal.embed.`**`KillEmbedded`**
Bases: `Exception`

class `IPython.terminal.embed.`**`EmbeddedMagics`**(*shell=None*, ***kwargs*)
Bases: *`IPython.core.magic.Magics`*

exit_raise (*parameter_s=''*)
%exit_raise Make the current embedded kernel exit and raise and exception.

This function sets an internal flag so that an embedded IPython will raise a `IPython.terminal.embed.KillEmbedded` Exception on exit, and then exit the current I. This is useful to permanently exit a loop that create IPython embed instance.

kill_embedded (*parameter_s=''*)

```
%kill_embedded [-i] [-x] [-y]
```

%kill_embedded : deactivate for good the current embedded IPython

This function (after asking for confirmation) sets an internal flag so that an embedded IPython will never activate again for the given call location. This is useful to permanently disable a shell that is being called inside a loop: once you've figured out what you needed from it, you may then kill it and the program will then continue to run without the interactive shell interfering again.

Kill Instance Option:

> If for some reasons you need to kill the location where the instance is created and not called, for example if you create a single instance in one place and debug in many locations, you can use the `--instance` option to kill this specific instance. Like for the `call location` killing an "instance" should work even if it is recreated within a loop.

Note: This was the default behavior before IPython 5.2

---

optional arguments:

-i, --instance	Kill instance instead of call location
-x, --exit	Also exit the current session
-y, --yes	Do not ask confirmation

class `IPython.terminal.embed.`**`InteractiveShellEmbed`**`(`*`**kw`*`)`

Bases: *`IPython.terminal.interactiveshell.TerminalInteractiveShell`*

`__init__``(`*`**kw`*`)`

Create a configurable given a config config.

Parameters

- **config** (*Config*) – If this is empty, default values are used. If config is a `Config` instance, it will be used to configure the instance.
- **parent** (*Configurable instance, optional*) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the *`__init__()`* method of `Configurable` *before* doing anything else and using `super()`:

```
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

`init_sys_modules``()`

Explicitly overwrite *`IPython.core.interactiveshell`* to do nothing.

`mainloop``(`*local_ns=None*, *module=None*, *stack_depth=0*, *display_banner=None*, *global_ns=None*, *compile_flags=None*`)`

Embeds IPython into a running python program.

Parameters

- **module** (*local_ns,*) – Working local namespace (a dict) and module (a module or similar object). If given as None, they are automatically taken from the scope where the shell was called, so that program variables become visible.

- **stack_depth** (*int*) – How many levels in the stack to go to looking for namespaces (when local_ns or module is None). This allows an intermediate caller to make sure that this function gets the namespace from the intended level in the stack. By default (0) it will get its locals and globals from the immediate caller.
- **compile_flags** – A bit field identifying the __future__ features that are enabled, as passed to the builtin `compile()` function. If given as None, they are automatically taken from the scope where the shell was called.

8.54.2 1 Function

`IPython.terminal.embed.`**`embed`**`(`***kwargs*`)`

Call this to embed IPython at the current point in your program.

The first invocation of this will create an *`InteractiveShellEmbed`* instance and then call it. Consecutive calls just call the already created instance.

If you don't want the kernel to initialize the namespace from the scope of the surrounding function, and/or you want to load full IPython configuration, you probably want `IPython.start_ipython()` instead.

Here is a simple example:

```
from IPython import embed
a = 10
b = 20
embed(header='First time')
c = 30
d = 40
embed()
```

Full customization can be done by passing a `Config` in as the config argument.

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8.55 Module: `terminal.interactiveshell`

IPython terminal interface using prompt_toolkit

8.55.1 1 Class

`class` `IPython.terminal.interactiveshell.`**`TerminalInteractiveShell`**`(`**args*, ***kwargs*`)`

Bases: *`IPython.core.interactiveshell.InteractiveShell`*

`__init__`(**args*, ***kwargs*)
Create a configurable given a config config.

Parameters

- **`config`** (*`Config`*) – If this is empty, default values are used. If config is a `Config` instance, it will be used to configure the instance.
- **`parent`** (*`Configurable instance, optional`*) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the `__init__()` method of `Configurable` *before* doing anything else and using `super()`:

```python
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

`auto_rewrite_input`(*cmd*)
Overridden from the parent class to use fancy rewriting prompt

`debugger_cls`
Modified Pdb class, does not load readline.

for a standalone version that uses prompt_toolkit, see `IPython.terminal.debugger.TerminalPdb` and `IPython.terminal.debugger.set_trace()`

`switch_doctest_mode`(*mode*)
Switch prompts to classic for %doctest_mode

`system`(*cmd*)
Call the given cmd in a subprocess using os.system on Windows or subprocess.call using the system shell on other platforms.

Parameters **`cmd`** (*`str`*) – Command to execute.

8.55.2 1 Function

`IPython.terminal.interactiveshell.`**`get_default_editor`**`()`

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8.56 Module: `terminal.ipapp`

The `Application` object for the command line **`ipython`** program.

8.56.1 3 Classes

class `IPython.terminal.ipapp.`**`IPAppCrashHandler`**(*app*)

Bases: *`IPython.core.crashhandler.CrashHandler`*

sys.excepthook for IPython itself, leaves a detailed report on disk.

`__init__`(*app*)

Create a new crash handler

Parameters

- **app** (*Application*) – A running `Application` instance, which will be queried at crash time for internal information.
- **contact_name** (*str*) – A string with the name of the person to contact.
- **contact_email** (*str*) – A string with the email address of the contact.
- **bug_tracker** (*str*) – A string with the URL for your project's bug tracker.
- **show_crash_traceback** (*bool*) – If false, don't print the crash traceback on stderr, only generate the on-disk report
- **instance attributes** (*Non-argument*) –
- **instances contain some non-argument attributes which allow for** (*These*) –
- **customization of the crash handler's behavior. Please see the** (*further*) –
- **for further details.** (*source*) –

`make_report`(*traceback*)

Return a string containing a crash report.

class `IPython.terminal.ipapp.`**`LocateIPythonApp`**(***kwargs*)

Bases: *`IPython.core.application.BaseIPythonApplication`*

`start`()

Start the app mainloop.

Override in subclasses.

class `IPython.terminal.ipapp.`**`TerminalIPythonApp`**(***kwargs*)

Bases: *`IPython.core.application.BaseIPythonApplication`*, *`IPython.core.shellapp.InteractiveShellApp`*

`crash_handler_class`

alias of *`IPAppCrashHandler`*

`init_banner`()

optionally display the banner

`init_shell`()

initialize the InteractiveShell instance

initialize(*argv=None*)
Do actions after construct, but before starting the app.

parse_command_line(*argv=None*)
override to allow old '-pylab' flag with deprecation warning

start()
Start the app mainloop.

Override in subclasses.

8.56.2 1 Function

`IPython.terminal.ipapp.`**load_default_config**(*ipython_dir=None*)
Load the default config file from the default ipython_dir.

This is useful for embedded shells.

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8.57 Module: `terminal.magics`

Extra magics for terminal use.

8.57.1 1 Class

class `IPython.terminal.magics.`**TerminalMagics**(*shell*)
Bases: *IPython.core.magic.Magics*

__init__(*shell*)
Create a configurable given a config config.

Parameters

- **config** (*Config*) – If this is empty, default values are used. If config is a `Config` instance, it will be used to configure the instance.
- **parent** (*Configurable instance, optional*) – The parent Configurable instance of this object.

Notes

Subclasses of Configurable must call the *__init__()* method of `Configurable` *before* doing anything else and using `super()`:

```
class MyConfigurable(Configurable):
    def __init__(self, config=None):
        super(MyConfigurable, self).__init__(config=config)
        # Then any other code you need to finish initialization.
```

This ensures that instances will be configured properly.

autoindent (*parameter_s=''*)
Toggle autoindent on/off (deprecated)

cpaste (*parameter_s=''*)
Paste & execute a pre-formatted code block from clipboard.

You must terminate the block with '–' (two minus-signs) or Ctrl-D alone on the line. You can also provide your own sentinel with '%paste -s %%' ('%%' is the new sentinel for this operation).

The block is dedented prior to execution to enable execution of method definitions. '>' and '+' characters at the beginning of a line are ignored, to allow pasting directly from e-mails, diff files and doctests (the '...' continuation prompt is also stripped). The executed block is also assigned to variable named 'pasted_block' for later editing with '%edit pasted_block'.

You can also pass a variable name as an argument, e.g. '%cpaste foo'. This assigns the pasted block to variable 'foo' as string, without dedenting or executing it (preceding >>> and + is still stripped)

'%cpaste -r' re-executes the block previously entered by cpaste. '%cpaste -q' suppresses any additional output messages.

Do not be alarmed by garbled output on Windows (it's a readline bug). Just press enter and type – (and press enter again) and the block will be what was just pasted.

IPython statements (magics, shell escapes) are not supported (yet).

See also:

paste() automatically pull code from clipboard.

Examples

```
In [8]: %cpaste
Pasting code; enter '--' alone on the line to stop.
:>>> a = ["world!", "Hello"]
:>>> print " ".join(sorted(a))
:--
Hello world!
```

paste (*parameter_s=''*)
Paste & execute a pre-formatted code block from clipboard.

The text is pulled directly from the clipboard without user intervention and printed back on the screen before execution (unless the -q flag is given to force quiet mode).

The block is dedented prior to execution to enable execution of method definitions. '>' and '+' characters at the beginning of a line are ignored, to allow pasting directly from e-mails, diff files and doctests (the '...' continuation prompt is also stripped). The executed block is also assigned to variable named 'pasted_block' for later editing with '%edit pasted_block'.

You can also pass a variable name as an argument, e.g. '%paste foo'. This assigns the pasted block to variable 'foo' as string, without executing it (preceding >>> and + is still stripped).

Options:

-r: re-executes the block previously entered by cpaste.

-q: quiet mode: do not echo the pasted text back to the terminal.

IPython statements (magics, shell escapes) are not supported (yet).

See also:

`cpaste()` manually paste code into terminal until you mark its end.

`rerun_pasted`(*name='pasted_block'*)
Rerun a previously pasted command.

`store_or_execute`(*block*, *name*)
Execute a block, or store it in a variable, per the user's request.

8.57.2 1 Function

`IPython.terminal.magics.`**`get_pasted_lines`**(*sentinel*, *l_input=<function input>*, *quiet=False*)
Yield pasted lines until the user enters the given sentinel value.

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8.58 Module: `terminal.prompts`

Terminal input and output prompts.

8.58.1 3 Classes

class `IPython.terminal.prompts.`**`Prompts`**(*shell*)
Bases: `object`

`__init__`(*shell*)
Initialize self. See help(type(self)) for accurate signature.

class `IPython.terminal.prompts.`**`ClassicPrompts`**(*shell*)
Bases: `IPython.terminal.prompts.Prompts`

class `IPython.terminal.prompts.`**`RichPromptDisplayHook`**(*shell=None*, *cache_size=1000*, ***kwargs*)
Bases: `IPython.core.displayhook.DisplayHook`

Subclass of base display hook using coloured prompt

write_output_prompt()
Write the output prompt.

The default implementation simply writes the prompt to `sys.stdout`.

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8.59 Module: `terminal.shortcuts`

Module to define and register Terminal IPython shortcuts with `prompt_toolkit`

8.59.1 12 Functions

`IPython.terminal.shortcuts.`**create_ipython_shortcuts**(*shell*)
Set up the prompt_toolkit keyboard shortcuts for IPython

`IPython.terminal.shortcuts.`**newline_or_execute_outer**(*shell*)

`IPython.terminal.shortcuts.`**previous_history_or_previous_completion**(*event*)
Control-P in vi edit mode on readline is history next, unlike default prompt toolkit.

If completer is open this still select previous completion.

`IPython.terminal.shortcuts.`**next_history_or_next_completion**(*event*)
Control-N in vi edit mode on readline is history previous, unlike default prompt toolkit.

If completer is open this still select next completion.

`IPython.terminal.shortcuts.`**dismiss_completion**(*event*)

`IPython.terminal.shortcuts.`**reset_buffer**(*event*)

`IPython.terminal.shortcuts.`**reset_search_buffer**(*event*)

`IPython.terminal.shortcuts.`**suspend_to_bg**(*event*)

`IPython.terminal.shortcuts.`**force_exit**(*event*)
Force exit (with a non-zero return value)

`IPython.terminal.shortcuts.`**indent_buffer**(*event*)

`IPython.terminal.shortcuts.`**newline_autoindent_outer**(*inputsplitter*) → Callable[..., None]
Return a function suitable for inserting a indented newline after the cursor.

Fancier version of deprecated `newline_with_copy_margin` which should compute the correct indentation of the inserted line. That is to say, indent by 4 extra space after a function definition, class definition, context manager... And dedent by 4 space after `pass`, `return`, `raise ...`.

`IPython.terminal.shortcuts.`**`open_input_in_editor`**`(`*event*`)`

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8.60 Module: `testing`

Testing support (tools to test IPython itself).

8.60.1 1 Function

`IPython.testing.`**`test`**`(`***kwargs*`)`

Run the entire IPython test suite.

Any of the options for run_iptestall() may be passed as keyword arguments.

For example:

```
IPython.test(testgroups=['lib', 'config', 'utils'], fast=2)
```

will run those three sections of the test suite, using two processes.

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8.61 Module: `testing.decorators`

Decorators for labeling test objects.

Decorators that merely return a modified version of the original function object are straightforward. Decorators that return a new function object need to use nose.tools.make_decorator(original_function)(decorator) in returning the decorator, in order to preserve metadata such as function name, setup and teardown functions and so on - see nose.tools for more information.

This module provides a set of useful decorators meant to be ready to use in your own tests. See the bottom of the file for the ready-made ones, and if you find yourself writing a new one that may be of generic use, add it here.

Included decorators:

Lightweight testing that remains unittest-compatible.

- An @as_unittest decorator can be used to tag any normal parameter-less function as a unittest TestCase. Then, both nose and normal unittest will recognize it as such. This will make it easier to migrate away from Nose if we ever need/want to while maintaining very lightweight tests.

NOTE: This file contains IPython-specific decorators. Using the machinery in IPython.external.decorators, we import either numpy.testing.decorators if numpy is available, OR use equivalent code in IPython.external._decorators, which we've copied verbatim from numpy.

8.61.1 11 Functions

`IPython.testing.decorators.`**`as_unittest`**(*func*)

Decorator to make a simple function into a normal test via unittest.

`IPython.testing.decorators.`**`apply_wrapper`**(*wrapper*, *func*)

Apply a wrapper to a function for decoration.

This mixes Michele Simionato's decorator tool with nose's make_decorator, to apply a wrapper in a decorator so that all nose attributes, as well as function signature and other properties, survive the decoration cleanly. This will ensure that wrapped functions can still be well introspected via IPython, for example.

`IPython.testing.decorators.`**`make_label_dec`**(*label*, *ds=None*)

Factory function to create a decorator that applies one or more labels.

Parameters

- **`label`** (*`string or sequence`*) –
- **`or more labels that will be applied by the decorator to the functions`** (*`One`*) –

it decorates. Labels are attributes of the decorated function with their value set to True.

ds : string An optional docstring for the resulting decorator. If not given, a default docstring is auto-generated.

Returns

Return type A decorator.

Examples

A simple labeling decorator:

```
>>> slow = make_label_dec('slow')
>>> slow.__doc__
"Labels a test as 'slow'."
```

And one that uses multiple labels and a custom docstring:

```
>>> rare = make_label_dec(['slow','hard'],
... "Mix labels 'slow' and 'hard' for rare tests.")
>>> rare.__doc__
"Mix labels 'slow' and 'hard' for rare tests."
```

Now, let's test using this one: >>> @rare … def f(): pass … >>> >>> f.slow True >>> f.hard True

`IPython.testing.decorators.`**`skipif`**(*skip_condition*, *msg=None*)
Make function raise SkipTest exception if skip_condition is true

Parameters

- **`skip_condition`** (`bool or callable`) – Flag to determine whether to skip test. If the condition is a callable, it is used at runtime to dynamically make the decision. This is useful for tests that may require costly imports, to delay the cost until the test suite is actually executed.
- **`msg`** (`string`) – Message to give on raising a SkipTest exception.

Returns **decorator** – Decorator, which, when applied to a function, causes SkipTest to be raised when the skip_condition was True, and the function to be called normally otherwise.

Return type function

Notes

You will see from the code that we had to further decorate the decorator with the nose.tools.make_decorator function in order to transmit function name, and various other metadata.

`IPython.testing.decorators.`**`skip`**(*msg=None*)
Decorator factory - mark a test function for skipping from test suite.

Parameters **`msg`** (`string`) – Optional message to be added.

Returns **decorator** – Decorator, which, when applied to a function, causes SkipTest to be raised, with the optional message added.

Return type function

`IPython.testing.decorators.`**`onlyif`**(*condition*, *msg*)
The reverse from skipif, see skipif for details.

`IPython.testing.decorators.`**`module_not_available`**(*module*)
Can module be imported? Returns true if module does NOT import.

This is used to make a decorator to skip tests that require module to be available, but delay the 'import numpy' to test execution time.

`IPython.testing.decorators.`**`decorated_dummy`**(*dec*, *name*)
Return a dummy function decorated with dec, with the given name.

Examples

import IPython.testing.decorators as dec setup = dec.decorated_dummy(dec.skip_if_no_x11, __name__)

`IPython.testing.decorators.`**`skip_file_no_x11`**(*name*)

`IPython.testing.decorators.`**`onlyif_cmds_exist`**(**commands*)
Decorator to skip test when at least one of `commands` is not found.

`IPython.testing.decorators.`**`onlyif_any_cmd_exists`**`(`**commands*`)`
Decorator to skip test unless at least one of `commands` is found.

8.62 Module: `testing.globalipapp`

Global IPython app to support test running.

We must start our own ipython object and heavily muck with it so that all the modifications IPython makes to system behavior don't send the doctest machinery into a fit. This code should be considered a gross hack, but it gets the job done.

8.62.1 1 Class

`class` `IPython.testing.globalipapp.`**`StreamProxy`**`(`*name*`)`
Bases: `IPython.utils.io.IOStream`

Proxy for sys.stdout/err. This will request the stream *at call time* allowing for nose's Capture plugin's redirection of sys.stdout/err.

Parameters **`name`** (`str`) – The name of the stream. This will be requested anew at every call

`__init__``(`*name*`)`
Initialize self. See help(type(self)) for accurate signature.

8.62.2 3 Functions

`IPython.testing.globalipapp.`**`get_ipython`**`()`

`IPython.testing.globalipapp.`**`xsys`**`(`*self*, *cmd*`)`
Replace the default system call with a capturing one for doctest.

`IPython.testing.globalipapp.`**`start_ipython`**`()`
Start a global IPython shell, which we need for IPython-specific syntax.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

8.63 Module: `testing.iptest`

IPython Test Suite Runner.

This module provides a main entry point to a user script to test IPython itself from the command line. There are two ways of running this script:

1. With the syntax `iptest all`. This runs our entire test suite by calling this script (with different arguments) recursively. This causes modules and package to be tested in different processes, using nose or trial where appropriate.
2. With the regular nose syntax, like `iptest -vvs IPython`. In this form the script simply calls nose, but with special command line flags and plugins loaded.

8.63.1 4 Classes

class `IPython.testing.iptest.`**`TestSection`**(*name*, *includes*)
Bases: `object`

`__init__`(*name*, *includes*)
Initialize self. See help(type(self)) for accurate signature.

class `IPython.testing.iptest.`**`ExclusionPlugin`**(*exclude_patterns=None*)
Bases: `nose.plugins.base.Plugin`

A nose plugin to effect our exclusions of files and directories.

`__init__`(*exclude_patterns=None*)

Parameters **`exclude_patterns`** (*`sequence of strings, optional`*) – Filenames containing these patterns (as raw strings, not as regular expressions) are excluded from the tests.

`configure`(*options*, *config*)
Configure the plugin and system, based on selected options.

The base plugin class sets the plugin to enabled if the enable option for the plugin (self.enableOpt) is true.

`options`(*parser, env=environ({'HOSTNAME': 'build-8253302-project-24836-scipy-ipython', 'APPDIR': '/app', 'HOME': '/home/docs', 'OLDPWD': '/home/docs', 'READTHEDOCS': 'True', 'CONDA_ENVS_PATH': '/home/docs/checkouts/readthedocs.org/user_builds/scipy-ipython/conda', 'READTHEDOCS_PROJECT': 'scipy-ipython', 'PATH': '/home/docs/checkouts/readthedocs.org/user_builds/scipy-ipython/conda/latest/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/home/docs/.conda/bin', 'LANG': 'C.UTF-8', 'DEBIAN_FRONTEND': 'noninteractive', 'CONDA_DEFAULT_ENV': 'latest', 'BIN_PATH': '/home/docs/checkouts/readthedocs.org/user_builds/scipy-ipython/conda/latest/bin', 'READTHEDOCS_VERSION': 'latest', 'PWD': '/home/docs/checkouts/readthedocs.org/user_builds/scipy-ipython/checkouts/latest/docs/source', 'DOCUTILSCONFIG': '/home/docs/checkouts/readthedocs.org/user_builds/scipy-ipython/checkouts/latest/docs/source/docutils.conf'})*)
Register commandline options.

Implement this method for normal options behavior with protection from OptionConflictErrors. If you override this method and want the default –with-$name option to be registered, be sure to call super().

wantDirectory(*directory*)
Return whether the given directory should be scanned for tests.

wantFile(*filename*)
Return whether the given filename should be scanned for tests.

class `IPython.testing.iptest.`**StreamCapturer**(*echo=False*)
Bases: `threading.Thread`

__init__(*echo=False*)
This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is the argument tuple for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

halt()
Safely stop the thread.

run()
Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

class `IPython.testing.iptest.`**SubprocessStreamCapturePlugin**
Bases: `nose.plugins.base.Plugin`

__init__()
Initialize self. See help(type(self)) for accurate signature.

configure(*options*, *config*)
Configure the plugin and system, based on selected options.

The base plugin class sets the plugin to enabled if the enable option for the plugin (self.enableOpt) is true.

8.63.2 5 Functions

`IPython.testing.iptest.`**monkeypatch_xunit**()

`IPython.testing.iptest.`**extract_version**(*mod*)

`IPython.testing.iptest.`**test_for**(*item*, *min_version=None*, *callback=<function extract_version>*)
Test to see if item is importable, and optionally check against a minimum version.

If min_version is given, the default behavior is to check against the `__version__` attribute of the item, but specifying `callback` allows you to extract the value you are interested in. e.g:

```
In [1]: import sys

In [2]: from IPython.testing.iptest import test_for

In [3]: test_for('sys', (2,6), callback=lambda sys: sys.version_info)
Out[3]: True
```

`IPython.testing.iptest.`**`check_exclusions_exist`**`()`

`IPython.testing.iptest.`**`run_iptest`**`()`

Run the IPython test suite using nose.

This function is called when this script is **not** called with the form `iptest all`. It simply calls nose with appropriate command line flags and accepts all of the standard nose arguments.

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8.64 Module: `testing.iptestcontroller`

IPython Test Process Controller

This module runs one or more subprocesses which will actually run the IPython test suite.

8.64.1 2 Classes

class `IPython.testing.iptestcontroller.`**`TestController`**

Bases: `object`

Run tests in a subprocess

`__init__``()`

Initialize self. See help(type(self)) for accurate signature.

`cleanup``()`

Kill process if it's still alive, and clean up temporary directories

`cleanup_process``()`

Cleanup on exit by killing any leftover processes.

`cmd = None`

list, command line arguments to be executed

`dirs = None`

list, TemporaryDirectory instances to clear up when the process finishes

env = None
dict, extra environment variables to set for the subprocess

print_extra_info()
Print extra information about this test run.

If we're running in parallel and showing the concise view, this is only called if the test group fails. Otherwise, it's called before the test group is started.

The base implementation does nothing, but it can be overridden by subclasses.

process = None
subprocess.Popen instance

section = None
str, IPython test suite to be executed.

setup()
Create temporary directories etc.

This is only called when we know the test group will be run. Things created here may be cleaned up by self.cleanup().

stdout = None
str, process stdout+stderr

class IPython.testing.iptestcontroller.**PyTestController**(*section*, *options*)
Bases: *IPython.testing.iptestcontroller.TestController*

Run Python tests using IPython.testing.iptest

__init__(*section*, *options*)
Create new test runner.

cleanup()
Make the non-accessible directory created in setup() accessible again, otherwise deleting the workingdir will fail.

pycmd = None
str, Python command to execute in subprocess

setup()
Create temporary directories etc.

This is only called when we know the test group will be run. Things created here may be cleaned up by self.cleanup().

8.64.2 7 Functions

IPython.testing.iptestcontroller.**popen_wait**(*p*, *timeout*)

IPython.testing.iptestcontroller.**prepare_controllers**(*options*)
Returns two lists of TestController instances, those to run, and those not to run.

IPython.testing.iptestcontroller.**do_run**(*controller*, *buffer_output=True*)
Setup and run a test controller.

If buffer_output is True, no output is displayed, to avoid it appearing interleaved. In this case, the caller is responsible for displaying test output on failure.

Returns

- **controller** (*TestController*) – The same controller as passed in, as a convenience for using map() type APIs.
- **exitcode** (*int*) – The exit code of the test subprocess. Non-zero indicates failure.

`IPython.testing.iptestcontroller.`**`report`**`()`

Return a string with a summary report of test-related variables.

`IPython.testing.iptestcontroller.`**`run_iptestall`**`(`*options*`)`

Run the entire IPython test suite by calling nose and trial.

This function constructs `IPTester` instances for all IPython modules and package and then runs each of them. This causes the modules and packages of IPython to be tested each in their own subprocess using nose.

Parameters

- **`parameters are passed as attributes of the options object.`** (*`All`*) –
- **`testgroups`** (*`list of str`*) – Run only these sections of the test suite. If empty, run all the available sections.
- **`fast`** (*`int or None`*) – Run the test suite in parallel, using n simultaneous processes. If None is passed, one process is used per CPU core. Default 1 (i.e. sequential)
- **`inc_slow`** (*`bool`*) – Include slow tests. By default, these tests aren't run.
- **`url`** (*`unicode`*) – Address:port to use when running the JS tests.
- **`xunit`** (*`bool`*) – Produce Xunit XML output. This is written to multiple foo.xunit.xml files.
- **`coverage`** (*`bool or str`*) – Measure code coverage from tests. True will store the raw coverage data, or pass 'html' or 'xml' to get reports.
- **`extra_args`** (*`list`*) – Extra arguments to pass to the test subprocesses, e.g. '-v'

`IPython.testing.iptestcontroller.`**`default_options`**`()`

Get an argparse Namespace object with the default arguments, to pass to *`run_iptestall()`*.

`IPython.testing.iptestcontroller.`**`main`**`()`

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8.65 Module: `testing.ipunittest`

Experimental code for cleaner support of IPython syntax with unittest.

In IPython up until 0.10, we've used very hacked up nose machinery for running tests with IPython special syntax, and this has proved to be extremely slow. This module provides decorators to try a different approach, stemming from a conversation Brian and I (FP) had about this problem Sept/09.

The goal is to be able to easily write simple functions that can be seen by unittest as tests, and ultimately for these to support doctests with full IPython syntax. Nose already offers this based on naming conventions and our hackish plugins, but we are seeking to move away from nose dependencies if possible.

This module follows a different approach, based on decorators.

- A decorator called @ipdoctest can mark any function as having a docstring that should be viewed as a doctest, but after syntax conversion.

8.65.1 Authors

- Fernando Perez <Fernando.Perez@berkeley.edu>

8.65.2 2 Classes

class `IPython.testing.ipunittest.`**`IPython2PythonConverter`**

Bases: `object`

Convert IPython 'syntax' to valid Python.

Eventually this code may grow to be the full IPython syntax conversion implementation, but for now it only does prompt conversion.

`__init__`()

Initialize self. See help(type(self)) for accurate signature.

class `IPython.testing.ipunittest.`**`Doc2UnitTester`**(*verbose=False*)

Bases: `object`

Class whose instances act as a decorator for docstring testing.

In practice we're only likely to need one instance ever, made below (though no attempt is made at turning it into a singleton, there is no need for that).

`__init__`(*verbose=False*)

New decorator.

Parameters **verbose** (*boolean, optional (False)*) – Passed to the doctest finder and runner to control verbosity.

8.65.3 2 Functions

`IPython.testing.ipunittest.`**`count_failures`**(*runner*)

Count number of failures in a doctest runner.

Code modeled after the summarize() method in doctest.

`IPython.testing.ipunittest.`**`ipdocstring`**(*func*)

Change the function docstring via ip2py.

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

8.66 Module: `testing.skipdoctest`

Decorators marks that a doctest should be skipped.

The IPython.testing.decorators module triggers various extra imports, including numpy and sympy if they're present. Since this decorator is used in core parts of IPython, it's in a separate module so that running IPython doesn't trigger those imports.

8.66.1 1 Function

`IPython.testing.skipdoctest.`**`skip_doctest`**(*f*)

Decorator - mark a function or method for skipping its doctest.

This decorator allows you to mark a function whose docstring you wish to omit from testing, while preserving the docstring for introspection, help, etc.

8.67 Module: `testing.tools`

Generic testing tools.

8.67.1 Authors

- Fernando Perez <Fernando.Perez@berkeley.edu>

8.67.2 3 Classes

`class` `IPython.testing.tools.`**`TempFileMixin`**

Bases: `object`

Utility class to create temporary Python/IPython files.

Meant as a mixin class for test cases.

mktmp(*src, ext='.py'*)
Make a valid python temp file.

class IPython.testing.tools.**AssertPrints**(*s, channel='stdout', suppress=True*)
Bases: object

Context manager for testing that code prints certain text.

Examples

```
>>> with AssertPrints("abc", suppress=False):
...     print("abcd")
...     print("def")
...
abcd
def
```

__init__(*s, channel='stdout', suppress=True*)
Initialize self. See help(type(self)) for accurate signature.

class IPython.testing.tools.**AssertNotPrints**(*s, channel='stdout', suppress=True*)
Bases: *IPython.testing.tools.AssertPrints*

Context manager for checking that certain output *isn't* produced.

Counterpart of AssertPrints

8.67.3 13 Functions

IPython.testing.tools.**full_path**(*startPath, files*)
Make full paths for all the listed files, based on startPath.

Only the base part of startPath is kept, since this routine is typically used with a script's `__file__` variable as startPath. The base of startPath is then prepended to all the listed files, forming the output list.

Parameters

- **startPath** (*string*) – Initial path to use as the base for the results. This path is split using os.path.split() and only its first component is kept.
- **files** (*string or list*) – One or more files.

Examples

```
>>> full_path('/foo/bar.py',['a.txt','b.txt'])
['/foo/a.txt', '/foo/b.txt']
```

```
>>> full_path('/foo',['a.txt','b.txt'])
['/a.txt', '/b.txt']
```

If a single file is given, the output is still a list:

```
>>> full_path('/foo','a.txt')
['/a.txt']
```

`IPython.testing.tools.`**`parse_test_output`**(*txt*)

Parse the output of a test run and return errors, failures.

Parameters **`txt`** (*`str`*) – Text output of a test run, assumed to contain a line of one of the following forms:

```
'FAILED (errors=1)'
'FAILED (failures=1)'
'FAILED (errors=1, failures=1)'
```

Returns number of errors and failures.

Return type nerr, nfail

`IPython.testing.tools.`**`default_argv`**()

Return a valid default argv for creating testing instances of ipython

`IPython.testing.tools.`**`default_config`**()

Return a config object with good defaults for testing.

`IPython.testing.tools.`**`get_ipython_cmd`**(*as_string=False*)

Return appropriate IPython command line name. By default, this will return a list that can be used with subprocess.Popen, for example, but passing `as_string=True` allows for returning the IPython command as a string.

Parameters **`as_string`** (*`bool`*) – Flag to allow to return the command as a string.

`IPython.testing.tools.`**`ipexec`**(*fname*, *options=None*, *commands=()*)

Utility to call 'ipython filename'.

Starts IPython with a minimal and safe configuration to make startup as fast as possible.

Note that this starts IPython in a subprocess!

Parameters

- **`fname`** (*`str`*) – Name of file to be executed (should have .py or .ipy extension).
- **`options`** (*`optional, list`*) – Extra command-line flags to be passed to IPython.
- **`commands`** (*`optional, list`*) – Commands to send in on stdin

Returns

Return type `(stdout, stderr)` of ipython subprocess.

`IPython.testing.tools.`**`ipexec_validate`**(*fname*, *expected_out*, *expected_err=''*, *options=None*, *commands=()*)

Utility to call 'ipython filename' and validate output/error.

This function raises an AssertionError if the validation fails.

Note that this starts IPython in a subprocess!

Parameters

- **`fname`** (*`str`*) – Name of the file to be executed (should have .py or .ipy extension).
- **`expected_out`** (*`str`*) – Expected stdout of the process.
- **`expected_err`** (*`optional, str`*) – Expected stderr of the process.
- **`options`** (*`optional, list`*) – Extra command-line flags to be passed to IPython.

Returns

Return type None

`IPython.testing.tools.`**`check_pairs`**`(`*func*, *pairs*`)`

Utility function for the common case of checking a function with a sequence of input/output pairs.

Parameters

- **`func`** (*`callable`*) – The function to be tested. Should accept a single argument.
- **`pairs`** (*`iterable`*) – A list of (input, expected_output) tuples.

Returns

- *None. Raises an AssertionError if any output does not match the expected*
- *value.*

`IPython.testing.tools.`**`mute_warn`**`()`

`IPython.testing.tools.`**`make_tempfile`**`(`*name*`)`

Create an empty, named, temporary file for the duration of the context.

`IPython.testing.tools.`**`fake_input`**`(`*inputs*`)`

Temporarily replace the input() function to return the given values

Use as a context manager:

with fake_input([‘result1’, ‘result2’]): …

Values are returned in order. If input() is called again after the last value was used, EOFError is raised.

`IPython.testing.tools.`**`help_output_test`**`(`*subcommand=”*`)`

test that `ipython [subcommand] -h` works

`IPython.testing.tools.`**`help_all_output_test`**`(`*subcommand=”*`)`

test that `ipython [subcommand] --help-all` works

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8.68 Module: `utils.PyColorize`

Class and program to colorize python source code for ANSI terminals.

Based on an HTML code highlighter by Jurgen Hermann found at: http://aspn.activestate.com/ASPN/Cookbook/Python/Recipe/52298

Modifications by Fernando Perez (fperez@colorado.edu).

Information on the original HTML highlighter follows:

MoinMoin - Python Source Parser

Title: Colorize Python source using the built-in tokenizer

Submitter: Jurgen Hermann Last Updated:2001/04/06

Version no:1.2

Description:

This code is part of MoinMoin (http://moin.sourceforge.net/) and converts Python source code to HTML markup, rendering comments, keywords, operators, numeric and string literals in different colors.

It shows how to use the built-in keyword, token and tokenize modules to scan Python source code and re-emit it with no changes to its original formatting (which is the hard part).

8.68.1 1 Class

class `IPython.utils.PyColorize.`**Parser**(*color_table=None*, *out=<_io.TextIOWrapper name='<stdout>' mode='w' encoding='UTF-8'>*, *parent=None*, *style=None*)

Bases: `IPython.utils.colorable.Colorable`

Format colored Python source.

__init__(*color_table=None*, *out=<_io.TextIOWrapper name='<stdout>' mode='w' encoding='UTF-8'>*, *parent=None*, *style=None*)

Create a parser with a specified color table and output channel.

Call format() to process code.

format2(*raw*, *out=None*)

Parse and send the colored source.

If out and scheme are not specified, the defaults (given to constructor) are used.

out should be a file-type object. Optionally, out can be given as the string 'str' and the parser will automatically return the output in a string.

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8.69 Module: `utils.capture`

IO capturing utilities.

8.69.1 3 Classes

class `IPython.utils.capture.`**RichOutput**(*data=None*, *metadata=None*, *transient=None*, *update=False*)

Bases: `object`

`__init__`(*data=None*, *metadata=None*, *transient=None*, *update=False*)
Initialize self. See help(type(self)) for accurate signature.

class `IPython.utils.capture.`**`CapturedIO`**(*stdout*, *stderr*, *outputs=None*)
Bases: `object`

Simple object for containing captured stdout/err and rich display StringIO objects

Each instance `c` has three attributes:

- `c.stdout` : standard output as a string
- `c.stderr` : standard error as a string
- `c.outputs`: a list of rich display outputs

Additionally, there's a `c.show()` method which will print all of the above in the same order, and can be invoked simply via `c()`.

`__init__`(*stdout*, *stderr*, *outputs=None*)
Initialize self. See help(type(self)) for accurate signature.

`outputs`
A list of the captured rich display outputs, if any.

If you have a CapturedIO object `c`, these can be displayed in IPython using:

```
from IPython.display import display
for o in c.outputs:
    display(o)
```

`show`()
write my output to sys.stdout/err as appropriate

`stderr`
Captured standard error

`stdout`
Captured standard output

class `IPython.utils.capture.`**`capture_output`**(*stdout=True*, *stderr=True*, *display=True*)
Bases: `object`

context manager for capturing stdout/err

`__init__`(*stdout=True*, *stderr=True*, *display=True*)
Initialize self. See help(type(self)) for accurate signature.

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8.70 Module: `utils.colorable`

Color managing related utilities

8.70.1 1 Class

class `IPython.utils.colorable.`**`Colorable`**(***kwargs*)

Bases: `traitlets.config.configurable.Configurable`

A subclass of configurable for all the classes that have a `default_scheme`

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8.71 Module: `utils.coloransi`

Tools for coloring text in ANSI terminals.

8.71.1 5 Classes

class `IPython.utils.coloransi.`**`TermColors`**

Bases: `object`

Color escape sequences.

This class defines the escape sequences for all the standard (ANSI?) colors in terminals. Also defines a NoColor escape which is just the null string, suitable for defining 'dummy' color schemes in terminals which get confused by color escapes.

This class should be used as a mixin for building color schemes.

class `IPython.utils.coloransi.`**`InputTermColors`**

Bases: `object`

Color escape sequences for input prompts.

This class is similar to TermColors, but the escapes are wrapped in and so that readline can properly know the length of each line and can wrap lines accordingly. Use this class for any colored text which needs to be used in input prompts, such as in calls to raw_input().

This class defines the escape sequences for all the standard (ANSI?) colors in terminals. Also defines a NoColor escape which is just the null string, suitable for defining 'dummy' color schemes in terminals which get confused by color escapes.

This class should be used as a mixin for building color schemes.

class `IPython.utils.coloransi.`**`NoColors`**

Bases: `object`

This defines all the same names as the colour classes, but maps them to empty strings, so it can easily be substituted to turn off colours.

class `IPython.utils.coloransi.`**`ColorScheme`**(*_ColorScheme__scheme_name_*, *colordict=None*, ***colormap*)

Bases: `object`

Generic color scheme class. Just a name and a Struct.

`__init__`(*_ColorScheme__scheme_name_*, *colordict=None*, ***colormap*)

Initialize self. See help(type(self)) for accurate signature.

`copy`(*name=None*)

Return a full copy of the object, optionally renaming it.

class `IPython.utils.coloransi.`**`ColorSchemeTable`**(*scheme_list=None*, *default_scheme=''*)

Bases: `dict`

General class to handle tables of color schemes.

It's basically a dict of color schemes with a couple of shorthand attributes and some convenient methods.

active_scheme_name -> obvious active_colors -> actual color table of the active scheme

`__init__`(*scheme_list=None*, *default_scheme=''*)

Create a table of color schemes.

The table can be created empty and manually filled or it can be created with a list of valid color schemes AND the specification for the default active scheme.

`add_scheme`(*new_scheme*)

Add a new color scheme to the table.

`copy`()

Return full copy of object

`set_active_scheme`(*scheme*, *case_sensitive=0*)

Set the currently active scheme.

Names are by default compared in a case-insensitive way, but this can be changed by setting the parameter case_sensitive to true.

8.71.2 1 Function

`IPython.utils.coloransi.`**`make_color_table`**(*in_class*)

Build a set of color attributes in a class.

Helper function for building the `TermColors` and :class'InputTermColors'.

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8.72 Module: `utils.contexts`

Miscellaneous context managers.

8.72.1 2 Classes

class `IPython.utils.contexts.`**`preserve_keys`**(*dictionary*, **keys*)

Bases: `object`

Preserve a set of keys in a dictionary.

Upon entering the context manager the current values of the keys will be saved. Upon exiting, the dictionary will be updated to restore the original value of the preserved keys. Preserved keys which did not exist when entering the context manager will be deleted.

Examples

```
>>> d = {'a': 1, 'b': 2, 'c': 3}
>>> with preserve_keys(d, 'b', 'c', 'd'):
...     del d['a']
...     del d['b']      # will be reset to 2
...     d['c'] = None   # will be reset to 3
...     d['d'] = 4      # will be deleted
...     d['e'] = 5
...     print(sorted(d.items()))
...
[('c', None), ('d', 4), ('e', 5)]
>>> print(sorted(d.items()))
[('b', 2), ('c', 3), ('e', 5)]
```

`__init__`(*dictionary*, **keys*)

Initialize self. See help(type(self)) for accurate signature.

class `IPython.utils.contexts.`**`NoOpContext`**

Bases: `object`

Deprecated

Context manager that does nothing.

`__init__`()

Initialize self. See help(type(self)) for accurate signature.

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8.73 Module: `utils.data`

Utilities for working with data structures like lists, dicts and tuples.

8.73.1 2 Functions

`IPython.utils.data.`**`uniq_stable`**`(`*elems*`)` → list

Return from an iterable, a list of all the unique elements in the input, but maintaining the order in which they first appear.

Note: All elements in the input must be hashable for this routine to work, as it internally uses a set for efficiency reasons.

`IPython.utils.data.`**`chop`**`(`*seq*, *size*`)`

Chop a sequence into chunks of the given size.

8.74 Module: `utils.decorators`

Decorators that don't go anywhere else.

This module contains misc. decorators that don't really go with another module in `IPython.utils`. Beore putting something here please see if it should go into another topical module in `IPython.utils`.

8.74.1 2 Functions

`IPython.utils.decorators.`**`flag_calls`**`(`*func*`)`

Wrap a function to detect and flag when it gets called.

This is a decorator which takes a function and wraps it in a function with a 'called' attribute. wrapper.called is initialized to False.

The wrapper.called attribute is set to False right before each call to the wrapped function, so if the call fails it remains False. After the call completes, wrapper.called is set to True and the output is returned.

Testing for truth in wrapper.called allows you to determine if a call to func() was attempted and succeeded.

`IPython.utils.decorators.`**`undoc`**(*func*)

Mark a function or class as undocumented.

This is found by inspecting the AST, so for now it must be used directly as @undoc, not as e.g. @decorators.undoc

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8.75 Module: `utils.dir2`

A fancy version of Python's builtin `dir()` function.

8.75.1 3 Functions

`IPython.utils.dir2.`**`safe_hasattr`**(*obj*, *attr*)

In recent versions of Python, hasattr() only catches AttributeError. This catches all errors.

`IPython.utils.dir2.`**`dir2`**(*obj*) → list of strings

Extended version of the Python builtin dir(), which does a few extra checks.

This version is guaranteed to return only a list of true strings, whereas dir() returns anything that objects inject into themselves, even if they are later not really valid for attribute access (many extension libraries have such bugs).

`IPython.utils.dir2.`**`get_real_method`**(*obj*, *name*)

Like getattr, but with a few extra sanity checks:

- If obj is a class, ignore everything except class methods
- Check if obj is a proxy that claims to have all attributes
- Catch attribute access failing with any exception
- Check that the attribute is a callable object

Returns the method or None.

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8.76 Module: `utils.encoding`

Utilities for dealing with text encodings

8.76.1 2 Functions

`IPython.utils.encoding.`**`get_stream_enc`**(*stream*, *default=None*)

Return the given stream's encoding or a default.

There are cases where `sys.std*` might not actually be a stream, so check for the encoding attribute prior to returning it, and return a default if it doesn't exist or evaluates as False. `default` is None if not provided.

`IPython.utils.encoding.`**`getdefaultencoding`**(*prefer_stream=True*)

Return IPython's guess for the default encoding for bytes as text.

If prefer_stream is True (default), asks for stdin.encoding first, to match the calling Terminal, but that is often None for subprocesses.

Then fall back on locale.getpreferredencoding(), which should be a sensible platform default (that respects LANG environment), and finally to sys.getdefaultencoding() which is the most conservative option, and usually ASCII on Python 2 or UTF8 on Python 3.

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8.77 Module: `utils.frame`

Utilities for working with stack frames.

8.77.1 4 Functions

`IPython.utils.frame.`**`extract_vars`**(**names*, ***kw*)

Extract a set of variables by name from another frame.

Parameters

- **`*names`** (*`str`*) – One or more variable names which will be extracted from the caller's frame.

- **depth** (*integer, optional*) – How many frames in the stack to walk when looking for your variables. The default is 0, which will use the frame where the call was made.

Examples

```
In [2]: def func(x):
   ...:     y = 1
   ...:     print(sorted(extract_vars('x','y').items()))
   ...:

In [3]: func('hello')
[('x', 'hello'), ('y', 1)]
```

`IPython.utils.frame.`**`extract_vars_above`**(**names*)

Extract a set of variables by name from another frame.

Similar to extractVars(), but with a specified depth of 1, so that names are extracted exactly from above the caller.

This is simply a convenience function so that the very common case (for us) of skipping exactly 1 frame doesn't have to construct a special dict for keyword passing.

`IPython.utils.frame.`**`debugx`**(*expr, pre_msg=''*)

Print the value of an expression from the caller's frame.

Takes an expression, evaluates it in the caller's frame and prints both the given expression and the resulting value (as well as a debug mark indicating the name of the calling function. The input must be of a form suitable for eval().

An optional message can be passed, which will be prepended to the printed expr->value pair.

`IPython.utils.frame.`**`extract_module_locals`**(*depth=0*)

Returns (module, locals) of the function `depth` frames away from the caller

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8.78 Module: `utils.generics`

Generic functions for extending IPython.

8.78.1 2 Functions

`IPython.utils.generics.`**`inspect_object`**(*obj*)

Called when you do obj?

`IPython.utils.generics.`**`complete_object`**(*obj*, *prev_completions*)

Custom completer dispatching for python objects.

Parameters

- **`obj`** (`object`) – The object to complete.
- **`prev_completions`** (`list`) – List of attributes discovered so far.
- **`should return the list of attributes in obj. If you only wish to`** (*This*) –
- **`to the attributes already discovered normally, return`** (*add*) –
- **`+ prev_completions.`** (*own_attrs*) –

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8.79 Module: `utils.importstring`

A simple utility to import something by its string name.

8.79.1 1 Function

`IPython.utils.importstring.`**`import_item`**(*name*)

Import and return `bar` given the string `foo.bar`.

Calling `bar = import_item("foo.bar")` is the functional equivalent of executing the code `from foo import bar`.

Parameters **name** (*string*) – The fully qualified name of the module/package being imported.

Returns **mod** – The module that was imported.

Return type module object

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8.80 Module: `utils.io`

IO related utilities.

8.80.1 1 Class

class `IPython.utils.io.`**`Tee`**(*file_or_name*, *mode='w'*, *channel='stdout'*)

Bases: `object`

A class to duplicate an output stream to stdout/err.

This works in a manner very similar to the Unix 'tee' command.

When the object is closed or deleted, it closes the original file given to it for duplication.

`__init__`(*file_or_name*, *mode='w'*, *channel='stdout'*)

Construct a new Tee object.

Parameters

- **`file_or_name`** (*`filename or open filehandle (writable)`*) – File that will be duplicated
- **`mode`** (*`optional, valid mode for open()`*) – If a filename was give, open with this mode.
- **`channel`** (*`str, one of ['stdout', 'stderr']`*) –

`close`()

Close the file and restore the channel.

`flush`()

Flush both channels.

`write`(*data*)

Write data to both channels.

8.80.2 2 Functions

`IPython.utils.io.`**`ask_yes_no`**(*prompt*, *default=None*, *interrupt=None*)

Asks a question and returns a boolean (y/n) answer.

If default is given (one of 'y','n'), it is used if the user input is empty. If interrupt is given (one of 'y','n'), it is used if the user presses Ctrl-C. Otherwise the question is repeated until an answer is given.

An EOF is treated as the default answer. If there is no default, an exception is raised to prevent infinite loops.

Valid answers are: y/yes/n/no (match is not case sensitive).

`IPython.utils.io.`**`temp_pyfile`**(*src*, *ext='.py'*)

Make a temporary python file, return filename and filehandle.

Parameters

- **`src`** (*`string or list of strings (no need for ending newlines if list)`*) – Source code to be written to the file.
- **`ext`** (*`optional, string`*) – Extension for the generated file.

Returns It is the caller's responsibility to close the open file and unlink it.

Return type (filename, open filehandle)

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8.81 Module: `utils.ipstruct`

A dict subclass that supports attribute style access.

Authors:

- Fernando Perez (original)
- Brian Granger (refactoring to a dict subclass)

8.81.1 1 Class

class `IPython.utils.ipstruct.`**`Struct`**(**args*, ***kw*)

Bases: `dict`

A dict subclass with attribute style access.

This dict subclass has a a few extra features:

- Attribute style access.
- Protection of class members (like keys, items) when using attribute style access.
- The ability to restrict assignment to only existing keys.
- Intelligent merging.
- Overloaded operators.

`__init__`(**args*, ***kw*)

Initialize with a dictionary, another Struct, or data.

Parameters

- **args** (*dict, Struct*) – Initialize with one dict or Struct
- **kw** (*dict*) – Initialize with key, value pairs.

Examples

```
>>> s = Struct(a=10,b=30)
>>> s.a
10
>>> s.b
30
```

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```
>>> s2 = Struct(s,c=30)
>>> sorted(s2.keys())
['a', 'b', 'c']
```

allow_new_attr(*allow=True*)
Set whether new attributes can be created in this Struct.

This can be used to catch typos by verifying that the attribute user tries to change already exists in this Struct.

copy()
Return a copy as a Struct.

Examples

```
>>> s = Struct(a=10,b=30)
>>> s2 = s.copy()
>>> type(s2) is Struct
True
```

hasattr(*key*)
hasattr function available as a method.

Implemented like has_key.

Examples

```
>>> s = Struct(a=10)
>>> s.hasattr('a')
True
>>> s.hasattr('b')
False
>>> s.hasattr('get')
False
```

merge(*__loc_data__=None*, *_Struct__conflict_solve=None*, ***kw*)
Merge two Structs with customizable conflict resolution.

This is similar to `update()`, but much more flexible. First, a dict is made from data+key=value pairs. When merging this dict with the Struct S, the optional dictionary 'conflict' is used to decide what to do.

If conflict is not given, the default behavior is to preserve any keys with their current value (the opposite of the `update()` method's behavior).

Parameters

- **__loc_data** (*dict, Struct*) – The data to merge into self
- **__conflict_solve** (*dict*) – The conflict policy dict. The keys are binary functions used to resolve the conflict and the values are lists of strings naming the keys the conflict resolution function applies to. Instead of a list of strings a space separated string can be used, like 'a b c'.
- **kw** (*dict*) – Additional key, value pairs to merge in

Notes

The __conflict_solve dict is a dictionary of binary functions which will be used to solve key conflicts. Here is an example:

```
__conflict_solve = dict(
    func1=['a','b','c'],
    func2=['d','e']
)
```

In this case, the function func1() will be used to resolve keys 'a', 'b' and 'c' and the function func2() will be used for keys 'd' and 'e'. This could also be written as:

```
__conflict_solve = dict(func1='a b c',func2='d e')
```

These functions will be called for each key they apply to with the form:

```
func1(self['a'], other['a'])
```

The return value is used as the final merged value.

As a convenience, merge() provides five (the most commonly needed) pre-defined policies: preserve, update, add, add_flip and add_s. The easiest explanation is their implementation:

```
preserve = lambda old,new: old
update   = lambda old,new: new
add      = lambda old,new: old + new
add_flip = lambda old,new: new + old  # note change of order!
add_s    = lambda old,new: old + ' ' + new  # only for str!
```

You can use those four words (as strings) as keys instead of defining them as functions, and the merge method will substitute the appropriate functions for you.

For more complicated conflict resolution policies, you still need to construct your own functions.

Examples

This show the default policy:

```
>>> s = Struct(a=10,b=30)
>>> s2 = Struct(a=20,c=40)
>>> s.merge(s2)
>>> sorted(s.items())
[('a', 10), ('b', 30), ('c', 40)]
```

Now, show how to specify a conflict dict:

```
>>> s = Struct(a=10,b=30)
>>> s2 = Struct(a=20,b=40)
>>> conflict = {'update':'a','add':'b'}
>>> s.merge(s2,conflict)
>>> sorted(s.items())
[('a', 20), ('b', 70)]
```

8.82 Module: `utils.module_paths`

Utility functions for finding modules

Utility functions for finding modules on sys.path.

`find_module` returns a path to module or None, given certain conditions.

8.82.1 1 Function

`IPython.utils.module_paths.`**`find_mod`**`(`*module_name*`)`

Find module `module_name` on sys.path, and return the path to module `module_name`.

- If `module_name` refers to a module directory, then return path to __init__ file. - If `module_name` is a directory without an __init__file, return None.
- If module is missing or does not have a `.py` or `.pyw` extension, return None. - Note that we are not interested in running bytecode.
- Otherwise, return the fill path of the module.

Parameters **module_name** (*str*) –

Returns **module_path** – Path to module `module_name`, its __init__.py, or None, depending on above conditions.

Return type str

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8.83 Module: `utils.openpy`

Tools to open .py files as Unicode, using the encoding specified within the file, as per PEP 263.

Much of the code is taken from the tokenize module in Python 3.2.

8.83.1 4 Functions

`IPython.utils.openpy.`**`source_to_unicode`**(*txt*, *errors='replace'*, *skip_encoding_cookie=True*)

Converts a bytes string with python source code to unicode.

Unicode strings are passed through unchanged. Byte strings are checked for the python source file encoding cookie to determine encoding. txt can be either a bytes buffer or a string containing the source code.

`IPython.utils.openpy.`**`strip_encoding_cookie`**(*filelike*)

Generator to pull lines from a text-mode file, skipping the encoding cookie if it is found in the first two lines.

`IPython.utils.openpy.`**`read_py_file`**(*filename*, *skip_encoding_cookie=True*)

Read a Python file, using the encoding declared inside the file.

Parameters

- **`filename`** (*`str`*) – The path to the file to read.
- **`skip_encoding_cookie`** (*`bool`*) – If True (the default), and the encoding declaration is found in the first two lines, that line will be excluded from the output - compiling a unicode string with an encoding declaration is a SyntaxError in Python 2.

Returns

Return type A unicode string containing the contents of the file.

`IPython.utils.openpy.`**`read_py_url`**(*url*, *errors='replace'*, *skip_encoding_cookie=True*)

Read a Python file from a URL, using the encoding declared inside the file.

Parameters

- **`url`** (*`str`*) – The URL from which to fetch the file.
- **`errors`** (*`str`*) – How to handle decoding errors in the file. Options are the same as for bytes.decode(), but here 'replace' is the default.
- **`skip_encoding_cookie`** (*`bool`*) – If True (the default), and the encoding declaration is found in the first two lines, that line will be excluded from the output - compiling a unicode string with an encoding declaration is a SyntaxError in Python 2.

Returns

Return type A unicode string containing the contents of the file.

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8.84 Module: `utils.path`

Utilities for path handling.

8.84.1 1 Class

class IPython.utils.path.**HomeDirError**

Bases: Exception

8.84.2 16 Functions

IPython.utils.path.**get_long_path_name**(*path*)

Expand a path into its long form.

On Windows this expands any ~ in the paths. On other platforms, it is a null operation.

IPython.utils.path.**unquote_filename**(*name*, *win32=False*)

On Windows, remove leading and trailing quotes from filenames.

This function has been deprecated and should not be used any more: unquoting is now taken care of by `IPython.utils.process.arg_split()`.

IPython.utils.path.**compress_user**(*path*)

Reverse of `os.path.expanduser()`

IPython.utils.path.**get_py_filename**(*name*, *force_win32=None*)

Return a valid python filename in the current directory.

If the given name is not a file, it adds '.py' and searches again. Raises IOError with an informative message if the file isn't found.

IPython.utils.path.**filefind**(*filename*, *path_dirs=None*)

Find a file by looking through a sequence of paths.

This iterates through a sequence of paths looking for a file and returns the full, absolute path of the first occurrence of the file. If no set of path dirs is given, the filename is tested as is, after running through `expandvars()` and `expanduser()`. Thus a simple call:

```
filefind('myfile.txt')
```

will find the file in the current working dir, but:

```
filefind('~/myfile.txt')
```

Will find the file in the users home directory. This function does not automatically try any paths, such as the cwd or the user's home directory.

Parameters

- **filename** (*str*) – The filename to look for.
- **path_dirs** (*str, None or sequence of str*) – The sequence of paths to look for the file in. If None, the filename need to be absolute or be in the cwd. If a string, the string is put into a sequence and the searched. If a sequence, walk through each element and join with `filename`, calling `expandvars()` and `expanduser()` before testing for existence.

Returns

Return type Raises `IOError` or returns absolute path to file.

IPython.utils.path.**get_home_dir**(*require_writable=False*)

Return the 'home' directory, as a unicode string.

Uses os.path.expanduser('~'), and checks for writability.

See stdlib docs for how this is determined. $HOME is first priority on *ALL* platforms.

Parameters **`require_writable`** (*`bool [default: False]`*) –

if True: guarantees the return value is a writable directory, otherwise raises HomeDirError

if False: The path is resolved, but it is not guaranteed to exist or be writable.

`IPython.utils.path.`**`get_xdg_dir`**`()`
Return the XDG_CONFIG_HOME, if it is defined and exists, else None.

This is only for non-OS X posix (Linux,Unix,etc.) systems.

`IPython.utils.path.`**`get_xdg_cache_dir`**`()`
Return the XDG_CACHE_HOME, if it is defined and exists, else None.

This is only for non-OS X posix (Linux,Unix,etc.) systems.

`IPython.utils.path.`**`expand_path`**`(`*s*`)`
Expand $VARS and ~names in a string, like a shell

Examples In [2]: os.environ['FOO']='test'

In [3]: expand_path('variable FOO is $FOO') Out[3]: 'variable FOO is test'

`IPython.utils.path.`**`unescape_glob`**`(`*string*`)`
Unescape glob pattern in `string`.

`IPython.utils.path.`**`shellglob`**`(`*args*`)`
Do glob expansion for each element in `args` and return a flattened list.

Unmatched glob pattern will remain as-is in the returned list.

`IPython.utils.path.`**`target_outdated`**`(`*target*, *deps*`)`
Determine whether a target is out of date.

target_outdated(target,deps) -> 1/0

deps: list of filenames which MUST exist. target: single filename which may or may not exist.

If target doesn't exist or is older than any file listed in deps, return true, otherwise return false.

`IPython.utils.path.`**`target_update`**`(`*target*, *deps*, *cmd*`)`
Update a target with a given command given a list of dependencies.

target_update(target,deps,cmd) -> runs cmd if target is outdated.

This is just a wrapper around target_outdated() which calls the given command if target is outdated.

`IPython.utils.path.`**`link`**`(`*src*, *dst*`)`
Hard links `src` to `dst`, returning 0 or errno.

Note that the special errno `ENOLINK` will be returned if `os.link` isn't supported by the operating system.

`IPython.utils.path.`**`link_or_copy`**`(`*src*, *dst*`)`
Attempts to hardlink `src` to `dst`, copying if the link fails.

Attempts to maintain the semantics of `shutil.copy`.

Because `os.link` does not overwrite files, a unique temporary file will be used if the target already exists, then that file will be moved into place.

`IPython.utils.path.`**`ensure_dir_exists`**`(`*path*, *mode=493*`)`
ensure that a directory exists

If it doesn't exist, try to create it and protect against a race condition if another process is doing the same.

The default permissions are 755, which differ from os.makedirs default of 777.

8.85 Module: `utils.process`

Utilities for working with external processes.

8.85.1 1 Class

class `IPython.utils.process.`**`FindCmdError`**

Bases: `Exception`

8.85.2 2 Functions

`IPython.utils.process.`**`find_cmd`**(*cmd*)

Find absolute path to executable cmd in a cross platform manner.

This function tries to determine the full path to a command line program using `which` on Unix/Linux/OS X and `win32api` on Windows. Most of the time it will use the version that is first on the users `PATH`.

Warning, don't use this to find IPython command line programs as there is a risk you will find the wrong one. Instead find those using the following code and looking for the application itself:

```
import sys
argv = [sys.executable, '-m', 'IPython']
```

Parameters **cmd** (`str`) – The command line program to look for.

`IPython.utils.process.`**`abbrev_cwd`**()

Return abbreviated version of cwd, e.g. d:mydir

8.86 Module: `utils.sentinel`

Sentinel class for constants with useful reprs

8.86.1 1 Class

class `IPython.utils.sentinel.`**`Sentinel`**(*name*, *module*, *docstring=None*)

Bases: `object`

`__init__`(*name*, *module*, *docstring=None*)

Initialize self. See help(type(self)) for accurate signature.

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8.87 Module: `utils.shimmodule`

A shim module for deprecated imports

8.87.1 3 Classes

class `IPython.utils.shimmodule.`**`ShimWarning`**

Bases: `Warning`

A warning to show when a module has moved, and a shim is in its place.

class `IPython.utils.shimmodule.`**`ShimImporter`**(*src*, *mirror*)

Bases: `object`

Import hook for a shim.

This ensures that submodule imports return the real target module, not a clone that will confuse `is` and `isinstance` checks.

`__init__`(*src*, *mirror*)

Initialize self. See help(type(self)) for accurate signature.

`find_module`(*fullname*, *path=None*)

Return self if we should be used to import the module.

`load_module`(*fullname*)

Import the mirrored module, and insert it into sys.modules

class `IPython.utils.shimmodule.`**`ShimModule`**(**args*, ***kwargs*)

Bases: `module`

`__init__`(**args*, ***kwargs*)
Initialize self. See help(type(self)) for accurate signature.

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8.88 Module: `utils.strdispatch`

String dispatch class to match regexps and dispatch commands.

8.88.1 1 Class

class `IPython.utils.strdispatch.`**`StrDispatch`**
Bases: `object`

Dispatch (lookup) a set of strings / regexps for match.

Example:

```
>>> dis = StrDispatch()
>>> dis.add_s('hei',34, priority = 4)
>>> dis.add_s('hei',123, priority = 2)
>>> dis.add_re('h.i', 686)
>>> print(list(dis.flat_matches('hei')))
[123, 34, 686]
```

`__init__`()
Initialize self. See help(type(self)) for accurate signature.

`add_re`(*regex*, *obj*, *priority=0*)
Adds a target regexp for dispatching

`add_s`(*s*, *obj*, *priority=0*)
Adds a target 'string' for dispatching

`dispatch`(*key*)
Get a seq of Commandchain objects that match key

`flat_matches`(*key*)
Yield all 'value' targets, without priority

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8.89 Module: `utils.sysinfo`

Utilities for getting information about IPython and the system it's running in.

8.89.1 5 Functions

`IPython.utils.sysinfo.`**`pkg_commit_hash`**`(`*pkg_path*`)`

Get short form of commit hash given directory `pkg_path`

We get the commit hash from (in order of preference):

- IPython.utils._sysinfo.commit
- git output, if we are in a git repository

If these fail, we return a not-found placeholder tuple

Parameters **`pkg_path`** (`str`) – directory containing package only used for getting commit from active repo

Returns

- **hash_from** (*str*) – Where we got the hash from - description
- **hash_str** (*str*) – short form of hash

`IPython.utils.sysinfo.`**`pkg_info`**`(`*pkg_path*`)`

Return dict describing the context of this package

Parameters **`pkg_path`** (`str`) – path containing __init__.py for package

Returns **context** – with named parameters of interest

Return type dict

`IPython.utils.sysinfo.`**`get_sys_info`**`()`

Return useful information about IPython and the system, as a dict.

`IPython.utils.sysinfo.`**`sys_info`**`()`

Return useful information about IPython and the system, as a string.

Examples

```
In [2]: print(sys_info())
{'commit_hash': '144fdae',      # random
 'commit_source': 'repository',
 'ipython_path': '/home/fperez/usr/lib/python2.6/site-packages/IPython',
 'ipython_version': '0.11.dev',
 'os_name': 'posix',
 'platform': 'Linux-2.6.35-22-generic-i686-with-Ubuntu-10.10-maverick',
```

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```
'sys_executable': '/usr/bin/python',
'sys_platform': 'linux2',
'sys_version': '2.6.6 (r266:84292, Sep 15 2010, 15:52:39) \n[GCC 4.4.5]'}
```

IPython.utils.sysinfo.**num_cpus**()

Return the effective number of CPUs in the system as an integer.

This cross-platform function makes an attempt at finding the total number of available CPUs in the system, as returned by various underlying system and python calls.

If it can't find a sensible answer, it returns 1 (though an error *may* make it return a large positive number that's actually incorrect).

8.90 Module: `utils.syspathcontext`

Context managers for adding things to sys.path temporarily.

Authors:

- Brian Granger

8.90.1 2 Classes

class IPython.utils.syspathcontext.**appended_to_syspath**(*dir*)

Bases: `object`

A context for appending a directory to sys.path for a second.

__init__(*dir*)

Initialize self. See help(type(self)) for accurate signature.

class IPython.utils.syspathcontext.**prepended_to_syspath**(*dir*)

Bases: `object`

A context for prepending a directory to sys.path for a second.

__init__(*dir*)

Initialize self. See help(type(self)) for accurate signature.

8.91 Module: `utils.tempdir`

This module contains classes - NamedFileInTemporaryDirectory, TemporaryWorkingDirectory.

These classes add extra features such as creating a named file in temporary directory and creating a context manager for the working directory which is also temporary.

8.91.1 2 Classes

class `IPython.utils.tempdir.`**`NamedFileInTemporaryDirectory`**(*filename*, *mode='w+b'*, *bufsize=-1*, ***kwds*)

Bases: `object`

`__init__`(*filename*, *mode='w+b'*, *bufsize=-1*, ***kwds*)

Open a file named `filename` in a temporary directory.

This context manager is preferred over `NamedTemporaryFile` in stdlib `tempfile` when one needs to reopen the file.

Arguments `mode` and `bufsize` are passed to `open`. Rest of the arguments are passed to `TemporaryDirectory`.

class `IPython.utils.tempdir.`**`TemporaryWorkingDirectory`**(*suffix=None*, *prefix=None*, *dir=None*)

Bases: `tempfile.TemporaryDirectory`

Creates a temporary directory and sets the cwd to that directory. Automatically reverts to previous cwd upon cleanup. Usage example:

with TemporaryWorkingDirectory() as tmpdir: . . .

8.92 Module: `utils.terminal`

Utilities for working with terminals.

Authors:

- Brian E. Granger
- Fernando Perez
- Alexander Belchenko (e-mail: bialix AT ukr.net)

8.92.1 4 Functions

`IPython.utils.terminal.`**`toggle_set_term_title`**`(`*val*`)`

Control whether set_term_title is active or not.

set_term_title() allows writing to the console titlebar. In embedded widgets this can cause problems, so this call can be used to toggle it on or off as needed.

The default state of the module is for the function to be disabled.

Parameters **`val`** (*`bool`*) – If True, set_term_title() actually writes to the terminal (using the appropriate platform-specific module). If False, it is a no-op.

`IPython.utils.terminal.`**`set_term_title`**`(`*title*`)`

Set terminal title using the necessary platform-dependent calls.

`IPython.utils.terminal.`**`freeze_term_title`**`()`

`IPython.utils.terminal.`**`get_terminal_size`**`(`*defaultx=80*, *defaulty=25*`)`

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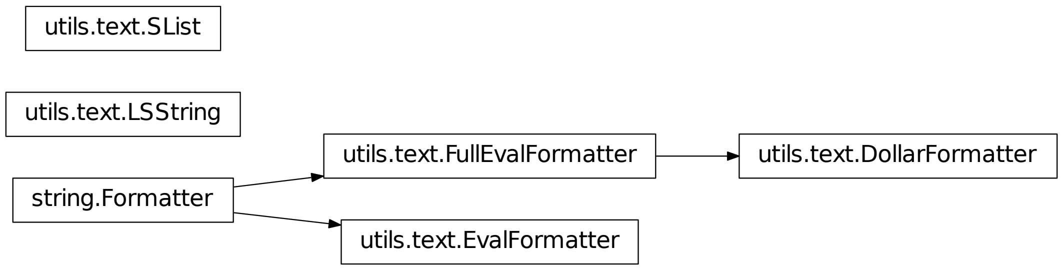
8.93 Module: `utils.text`

Utilities for working with strings and text.

Inheritance diagram:



8.93.1 5 Classes

class IPython.utils.text.**LSString**

Bases: `str`

String derivative with a special access attributes.

These are normal strings, but with the special attributes:

.l (or .list) : value as list (split on newlines). .n (or .nlstr): original value (the string itself). .s (or .spstr): value as whitespace-separated string. .p (or .paths): list of path objects (requires path.py package)

Any values which require transformations are computed only once and cached.

Such strings are very useful to efficiently interact with the shell, which typically only understands whitespace-separated options for commands.

class IPython.utils.text.**SList**

Bases: `list`

List derivative with a special access attributes.

These are normal lists, but with the special attributes:

- .l (or .list) : value as list (the list itself).
- .n (or .nlstr): value as a string, joined on newlines.
- .s (or .spstr): value as a string, joined on spaces.
- .p (or .paths): list of path objects (requires path.py package)

Any values which require transformations are computed only once and cached.

fields(**fields*)

Collect whitespace-separated fields from string list

Allows quick awk-like usage of string lists.

Example data (in var a, created by 'a = !ls -l'):

```
-rwxrwxrwx  1 ville None      18 Dec 14  2006 ChangeLog
drwxrwxrwx+ 6 ville None       0 Oct 24 18:05 IPython
```

- `a.fields(0)` is `['-rwxrwxrwx', 'drwxrwxrwx+']`
- `a.fields(1,0)` is `['1 -rwxrwxrwx', '6 drwxrwxrwx+']` (note the joining by space).
- `a.fields(-1)` is `['ChangeLog', 'IPython']`

IndexErrors are ignored.

Without args, fields() just split()'s the strings.

grep (*pattern*, *prune=False*, *field=None*)
Return all strings matching 'pattern' (a regex or callable)

This is case-insensitive. If prune is true, return all items NOT matching the pattern.

If field is specified, the match must occur in the specified whitespace-separated field.

Examples:

```
a.grep( lambda x: x.startswith('C') )
a.grep('Cha.*log', prune=1)
a.grep('chm', field=-1)
```

sort (*field=None*, *nums=False*)
sort by specified fields (see fields())

Example:

```
a.sort(1, nums = True)
```

Sorts a by second field, in numerical order (so that 21 > 3)

class `IPython.utils.text.`**EvalFormatter**
Bases: `string.Formatter`

A String Formatter that allows evaluation of simple expressions.

Note that this version interprets a : as specifying a format string (as per standard string formatting), so if slicing is required, you must explicitly create a slice.

This is to be used in templating cases, such as the parallel batch script templates, where simple arithmetic on arguments is useful.

Examples

```
In [1]: f = EvalFormatter()
In [2]: f.format('{n//4}', n=8)
Out[2]: '2'

In [3]: f.format("{greeting[slice(2,4)]}", greeting="Hello")
Out[3]: 'll'
```

class `IPython.utils.text.`**FullEvalFormatter**
Bases: `string.Formatter`

A String Formatter that allows evaluation of simple expressions.

Any time a format key is not found in the kwargs, it will be tried as an expression in the kwargs namespace.

Note that this version allows slicing using [1:2], so you cannot specify a format string. Use *`EvalFormatter`* to permit format strings.

Examples

```
In [1]: f = FullEvalFormatter()
In [2]: f.format('{n//4}', n=8)
Out[2]: '2'

In [3]: f.format('{list(range(5))[2:4]}')
Out[3]: '[2, 3]'

In [4]: f.format('{3*2}')
Out[4]: '6'
```

class `IPython.utils.text.`**`DollarFormatter`**

Bases: *`IPython.utils.text.FullEvalFormatter`*

Formatter allowing Itpl style $foo replacement, for names and attribute access only. Standard {foo} replacement also works, and allows full evaluation of its arguments.

Examples

```
In [1]: f = DollarFormatter()
In [2]: f.format('{n//4}', n=8)
Out[2]: '2'

In [3]: f.format('23 * 76 is $result', result=23*76)
Out[3]: '23 * 76 is 1748'

In [4]: f.format('$a or {b}', a=1, b=2)
Out[4]: '1 or 2'
```

8.93.2 13 Functions

`IPython.utils.text.`**`indent`**(*instr*, *nspaces=4*, *ntabs=0*, *flatten=False*)

Indent a string a given number of spaces or tabstops.

indent(str,nspaces=4,ntabs=0) -> indent str by ntabs+nspaces.

Parameters

- **`instr`** (*`basestring`*) – The string to be indented.
- **`nspaces`** (*`int (default: 4)`*) – The number of spaces to be indented.
- **`ntabs`** (*`int (default: 0)`*) – The number of tabs to be indented.
- **`flatten`** (*`bool (default: False)`*) – Whether to scrub existing indentation. If True, all lines will be aligned to the same indentation. If False, existing indentation will be strictly increased.

Returns **str|unicode**

Return type string indented by ntabs and nspaces.

`IPython.utils.text.`**`list_strings`**(*arg*)

Always return a list of strings, given a string or list of strings as input.

Examples

```
In [7]: list_strings('A single string')
Out[7]: ['A single string']

In [8]: list_strings(['A single string in a list'])
Out[8]: ['A single string in a list']

In [9]: list_strings(['A','list','of','strings'])
Out[9]: ['A', 'list', 'of', 'strings']
```

`IPython.utils.text.`**`marquee`**(*txt=”*, *width=78*, *mark=’*’*)
Return the input string centered in a ‘marquee’.

Examples

```
In [16]: marquee('A test',40)
Out[16]: '**************** A test ****************'

In [17]: marquee('A test',40,'-')
Out[17]: '---------------- A test ----------------'

In [18]: marquee('A test',40,' ')
Out[18]: '                 A test                 '
```

`IPython.utils.text.`**`num_ini_spaces`**(*strng*)
Return the number of initial spaces in a string

`IPython.utils.text.`**`format_screen`**(*strng*)
Format a string for screen printing.

This removes some latex-type format codes.

`IPython.utils.text.`**`dedent`**(*text*)
Equivalent of textwrap.dedent that ignores unindented first line.

This means it will still dedent strings like: ‘‘‘foo is a bar ‘’‘

For use in wrap_paragraphs.

`IPython.utils.text.`**`wrap_paragraphs`**(*text*, *ncols=80*)
Wrap multiple paragraphs to fit a specified width.

This is equivalent to textwrap.wrap, but with support for multiple paragraphs, as separated by empty lines.

Returns

Return type list of complete paragraphs, wrapped to fill `ncols` columns.

`IPython.utils.text.`**`long_substr`**(*data*)
Return the longest common substring in a list of strings.

Credit: http://stackoverflow.com/questions/2892931/longest-common-substring-from-more-than-two-strings-python

`IPython.utils.text.`**`strip_email_quotes`**(*text*)
Strip leading email quotation characters (‘>’).

Removes any combination of leading ‘>’ interspersed with whitespace that appears *identically* in all lines of the input text.

Parameters **`text`** (*`str`*) –

Examples

Simple uses:

```
In [2]: strip_email_quotes('> > text')
Out[2]: 'text'

In [3]: strip_email_quotes('> > text\n> > more')
Out[3]: 'text\nmore'
```

Note how only the common prefix that appears in all lines is stripped:

```
In [4]: strip_email_quotes('> > text\n> > more\n> more...')
Out[4]: '> text\n> more\nmore...'
```

So if any line has no quote marks ('>') , then none are stripped from any of them

```
In [5]: strip_email_quotes('> > text\n> > more\nlast different')
Out[5]: '> > text\n> > more\nlast different'
```

`IPython.utils.text.`**`strip_ansi`**(*source*)

Remove ansi escape codes from text.

Parameters **`source`** (*`str`*) – Source to remove the ansi from

`IPython.utils.text.`**`compute_item_matrix`**(*items*, *row_first=False*, *empty=None*, **args*, ***kwargs*)

Returns a nested list, and info to columnize items

Parameters

- **`items`** – list of strings to columize
- **`row_first`** (*`(default False)`*) – Whether to compute columns for a row-first matrix instead of column-first (default).
- **`empty`** (*`(default None)`*) – default value to fill list if needed
- **`separator_size`** (*`int (default=2)`*) – How much characters will be used as a separation between each columns.
- **`displaywidth`** (*`int (default=80)`*) – The width of the area onto which the columns should enter

Returns

- *strings_matrix* – nested list of string, the outer most list contains as many list as rows, the innermost lists have each as many element as columns. If the total number of elements in `items` does not equal the product of rows*columns, the last element of some lists are filled with `None`.
- *dict_info* – some info to make columnize easier:

  num_columns number of columns

  max_rows maximum number of rows (final number may be less)

  column_widths list of with of each columns

  optimal_separator_width best separator width between columns

Examples

```
In [1]: l = ['aaa','b','cc','d','eeeee','f','g','h','i','j','k','l']
In [2]: list, info = compute_item_matrix(l, displaywidth=12)
In [3]: list
Out[3]: [['aaa', 'f', 'k'], ['b', 'g', 'l'], ['cc', 'h', None], ['d', 'i', None],␣
↪['eeeee', 'j', None]]
In [4]: ideal = {'num_columns': 3, 'column_widths': [5, 1, 1], 'optimal_separator_
↪width': 2, 'max_rows': 5}
In [5]: all((info[k] == ideal[k] for k in ideal.keys()))
Out[5]: True
```

`IPython.utils.text.`**`columnize`**`(`*items*, *row_first=False*, *separator=' '*, *displaywidth=80*, *spread=False*`)`

Transform a list of strings into a single string with columns.

Parameters

- **`items`** (*`sequence of strings`*) – The strings to process.
- **`row_first`** (*`(default False)`*) – Whether to compute columns for a row-first matrix instead of column-first (default).
- **`separator`** (*`str, optional [default is two spaces]`*) – The string that separates columns.
- **`displaywidth`** (*`int, optional [default is 80]`*) – Width of the display in number of characters.

Returns

Return type The formatted string.

`IPython.utils.text.`**`get_text_list`**`(`*list_*, *last_sep=' and '*, *sep=', '*, *wrap_item_with=''*`)`

Return a string with a natural enumeration of items

```
>>> get_text_list(['a', 'b', 'c', 'd'])
'a, b, c and d'
>>> get_text_list(['a', 'b', 'c'], ' or ')
'a, b or c'
>>> get_text_list(['a', 'b', 'c'], ', ')
'a, b, c'
>>> get_text_list(['a', 'b'], ' or ')
'a or b'
>>> get_text_list(['a'])
'a'
>>> get_text_list([])
''
>>> get_text_list(['a', 'b'], wrap_item_with="`")
'`a` and `b`'
>>> get_text_list(['a', 'b', 'c', 'd'], " = ", sep=" + ")
'a + b + c = d'
```

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8.94 Module: `utils.timing`

Utilities for timing code execution.

8.94.1 7 Functions

`IPython.utils.timing.`**`clocku`**`()` → floating point number
: Return the *USER* CPU time in seconds since the start of the process. This is done via a call to resource.getrusage, so it avoids the wraparound problems in time.clock().

`IPython.utils.timing.`**`clocks`**`()` → floating point number
: Return the *SYSTEM* CPU time in seconds since the start of the process. This is done via a call to resource.getrusage, so it avoids the wraparound problems in time.clock().

`IPython.utils.timing.`**`clock`**`()` → floating point number
: Return the *TOTAL USER+SYSTEM* CPU time in seconds since the start of the process. This is done via a call to resource.getrusage, so it avoids the wraparound problems in time.clock().

`IPython.utils.timing.`**`clock2`**`(`*) -> (t_user*, *t_system*`)`
: Similar to clock(), but return a tuple of user/system times.

`IPython.utils.timing.`**`timings_out`**`(`*reps*, *func*, **args*, ***kw) -> (t_total*, *t_per_call*, *output*`)`
: Execute a function reps times, return a tuple with the elapsed total CPU time in seconds, the time per call and the function's output.

  Under Unix, the return value is the sum of user+system time consumed by the process, computed via the resource module. This prevents problems related to the wraparound effect which the time.clock() function has.

  Under Windows the return value is in wall clock seconds. See the documentation for the time module for more details.

`IPython.utils.timing.`**`timings`**`(`*reps*, *func*, **args*, ***kw) -> (t_total*, *t_per_call*`)`
: Execute a function reps times, return a tuple with the elapsed total CPU time in seconds and the time per call. These are just the first two values in timings_out().

`IPython.utils.timing.`**`timing`**`(`*func*, **args*, ***kw*`)` → t_total
: Execute a function once, return the elapsed total CPU time in seconds. This is just the first value in timings_out().

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8.95 Module: `utils.tokenutil`

Token-related utilities

8.95.1 3 Functions

`IPython.utils.tokenutil.`**`generate_tokens`**(*readline*)

wrap generate_tokens to catch EOF errors

`IPython.utils.tokenutil.`**`line_at_cursor`**(*cell*, *cursor_pos=0*)

Return the line in a cell at a given cursor position

Used for calling line-based APIs that don't support multi-line input, yet.

Parameters

- **`cell`** (*`str`*) – multiline block of text
- **`cursor_pos`** (*`integer`*) – the cursor position

Returns (line, offset) – The line with the current cursor, and the character offset of the start of the line.

Return type (string, integer)

`IPython.utils.tokenutil.`**`token_at_cursor`**(*cell*, *cursor_pos=0*)

Get the token at a given cursor

Used for introspection.

Function calls are prioritized, so the token for the callable will be returned if the cursor is anywhere inside the call.

Parameters

- **`cell`** (*`unicode`*) – A block of Python code
- **`cursor_pos`** (*`int`*) – The location of the cursor in the block where the token should be found

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8.96 Module: `utils.tz`

Timezone utilities

Just UTC-awareness right now

8.96.1 1 Class

class IPython.utils.tz.**tzUTC**

Bases: datetime.tzinfo

tzinfo object for UTC (zero offset)

dst(*d*)

datetime -> DST offset in minutes east of UTC.

utcoffset(*d*)

datetime -> timedelta showing offset from UTC, negative values indicating West of UTC

8.96.2 1 Function

IPython.utils.tz.**utc_aware**(*unaware*)

decorator for adding UTC tzinfo to datetime's utcfoo methods

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8.97 Module: `utils.ulinecache`

This module has been deprecated since IPython 6.0.

Wrapper around linecache which decodes files to unicode according to PEP 263.

8.97.1 1 Function

IPython.utils.ulinecache.**getlines**(*filename*, *module_globals=None*)

Get the lines for a Python source file from the cache. Update the cache if it doesn't contain an entry for this file already.

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8.98 Module: `utils.version`

Utilities for version comparison

It is a bit ridiculous that we need these.

8.98.1 1 Function

`IPython.utils.version.`**`check_version`**(*v*, *check*)

check version string v >= check

If dev/prerelease tags result in TypeError for string-number comparison, it is assumed that the dependency is satisfied. Users on dev branches are responsible for keeping their own packages up to date.

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8.99 Module: `utils.wildcard`

Support for wildcard pattern matching in object inspection.

8.99.1 Authors

- Jörgen Stenarson <jorgen.stenarson@bostream.nu>
- Thomas Kluyver

8.99.2 6 Functions

`IPython.utils.wildcard.`**`create_typestr2type_dicts`**(*dont_include_in_type2typestr=['lambda']*)

Return dictionaries mapping lower case typename (e.g. 'tuple') to type objects from the types package, and vice versa.

`IPython.utils.wildcard.`**`is_type`**(*obj*, *typestr_or_type*)

is_type(obj, typestr_or_type) verifies if obj is of a certain type. It can take strings or actual python types for the second argument, i.e. 'tuple'<->TupleType. 'all' matches all types.

TODO: Should be extended for choosing more than one type.

`IPython.utils.wildcard.`**`show_hidden`**(*str*, *show_all=False*)

Return true for strings starting with single _ if show_all is true.

`IPython.utils.wildcard.`**`dict_dir`**(*obj*)

Produce a dictionary of an object's attributes. Builds on dir2 by checking that a getattr() call actually succeeds.

`IPython.utils.wildcard.`**`filter_ns`**(*ns*, *name_pattern='*'*, *type_pattern='all'*, *ignore_case=True*, *show_all=True*)

Filter a namespace dictionary by name pattern and item type.

`IPython.utils.wildcard.`**`list_namespace`**(*namespace*, *type_pattern*, *filter*, *ignore_case=False*, *show_all=False*)

Return dictionary of all objects in a namespace dictionary that match type_pattern and filter.

CHAPTER 9

IPython Sphinx Directive

Note: The IPython Sphinx Directive is in 'beta' and currently under active development. Improvements to the code or documentation are welcome!

The ipython directive is a stateful ipython shell for embedding in sphinx documents. It knows about standard ipython prompts, and extracts the input and output lines. These prompts will be renumbered starting at `1`. The inputs will be fed to an embedded ipython interpreter and the outputs from that interpreter will be inserted as well. For example, code blocks like the following:

```
.. ipython::

   In [136]: x = 2

   In [137]: x**3
   Out[137]: 8
```

will be rendered as

```
In [1]: x = 2

In [2]: x**3
Out[2]: 8
```

Note: This tutorial should be read side-by-side with the Sphinx source for this document because otherwise you will see only the rendered output and not the code that generated it. Excepting the example above, we will not in general be showing the literal ReST in this document that generates the rendered output.

9.1 Persisting the Python session across IPython directive blocks

The state from previous sessions is stored, and standard error is trapped. At doc build time, ipython's output and std err will be inserted, and prompts will be renumbered. So the prompt below should be renumbered in the rendered docs, and pick up where the block above left off.

```
In [3]: z = x*3   # x is recalled from previous block

In [4]: z
Out[4]: 6

In [5]: print(z)
6

In [6]: q = z[)   # this is a syntax error -- we trap ipy exceptions
------------------------------------------------------------
   File "<ipython console>", line 1
     q = z[)   # this is a syntax error -- we trap ipy exceptions
           ^
SyntaxError: invalid syntax
```

9.2 Adding documentation tests to your IPython directive

The embedded interpreter supports some limited markup. For example, you can put comments in your ipython sessions, which are reported verbatim. There are some handy "pseudo-decorators" that let you doctest the output. The inputs are fed to an embedded ipython session and the outputs from the ipython session are inserted into your doc. If the output in your doc and in the ipython session don't match on a doctest assertion, an error will occur.

```
In [7]: x = 'hello world'

# this will raise an error if the ipython output is different
In [8]: x.upper()
Out[8]: 'HELLO WORLD'

# some readline features cannot be supported, so we allow
# "verbatim" blocks, which are dumped in verbatim except prompts
# are continuously numbered
In [9]: x.st<TAB>
x.startswith  x.strip
```

For more information on @doctest decorator, please refer to the end of this page in Pseudo-Decorators section.

9.3 Multi-line input

Multi-line input is supported.

```
In [10]: url = 'http://ichart.finance.yahoo.com/table.csv?s=CROX\
   ....: &d=9&e=22&f=2009&g=d&a=1&br=8&c=2006&ignore=.csv'
   ....:

In [11]: print(url.split('&'))
['http://ichart.finance.yahoo.com/table.csv?s=CROX', 'd=9', 'e=22',
```

9.4 Testing directive outputs

The IPython Sphinx Directive makes it possible to test the outputs that you provide with your code. To do this, decorate the contents in your directive block with one of the following:

- list directives here

If an IPython doctest decorator is found, it will take these steps when your documentation is built:

1. Run the *input* lines in your IPython directive block against the current Python kernel (remember that the session persists across IPython directive blocks);

2. Compare the *output* of this with the output text that you've put in the IPython directive block 9what comes after `Out[NN]`);

3. If there is a difference, the directive will raise an error and your documentation build will fial.

You can do doctesting on multi-line output as well. Just be careful when using non-deterministic inputs like random numbers in the ipython directive, because your inputs are run through a live interpreter, so if you are doctesting random output you will get an error. Here we "seed" the random number generator for deterministic output, and we suppress the seed line so it doesn't show up in the rendered output

```
In [12]: import numpy.random

In [13]: numpy.random.rand(10,2)
Out[13]:
array([[0.64524308, 0.59943846],
       [0.47102322, 0.8715456 ],
       [0.29370834, 0.74776844],
       [0.99539577, 0.1313423 ],
       [0.16250302, 0.21103583],
       [0.81626524, 0.1312433 ],
       [0.67338089, 0.72302393],
       [0.7566368 , 0.07033696],
       [0.22591016, 0.77731835],
       [0.0072729 , 0.34273127]])
```

For more information on @supress and @doctest decorators, please refer to the end of this file in Pseudo-Decorators section.

Another demonstration of multi-line input and output

```
In [14]: print(x)
jdh

In [15]: for i in range(10):
   ....:     print(i)
   ....:
   ....:
0
1
2
3
4
5
6
7
8
9
```

Most of the "pseudo-decorators" can be used an options to ipython mode. For example, to setup matplotlib pylab but suppress the output, you can do. When using the matplotlib `use` directive, it should occur before any import of pylab. This will not show up in the rendered docs, but the commands will be executed in the embedded interpreter and subsequent line numbers will be incremented to reflect the inputs:

```
.. ipython::
   :suppress:

   In [144]: from matplotlib.pylab import *

   In [145]: ion()
```

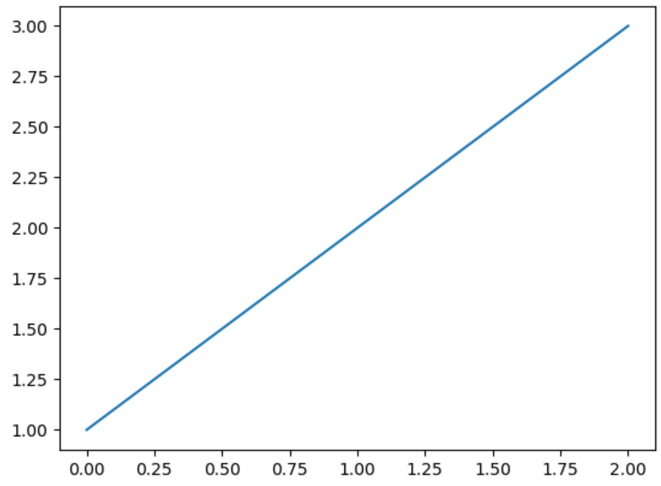
Likewise, you can set `:doctest:` or `:verbatim:` to apply these settings to the entire block. For example,

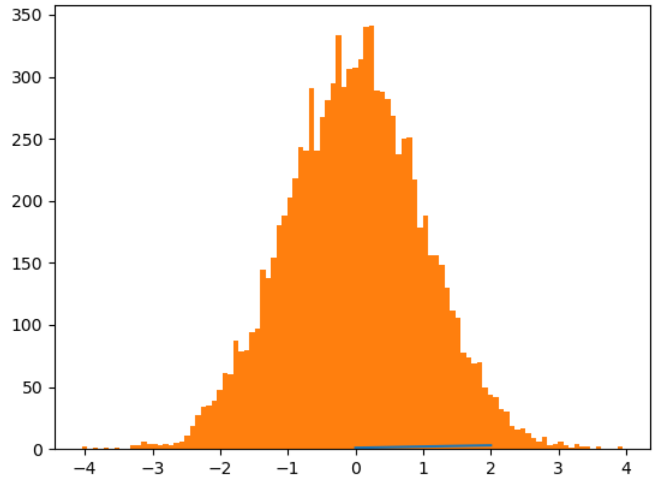
```
In [16]: cd mpl/examples/
/home/jdhunter/mpl/examples

In [17]: pwd
Out[17]: '/home/jdhunter/mpl/examples'

In [18]: cd mpl/examples/<TAB>
mpl/examples/animation/        mpl/examples/misc/
mpl/examples/api/              mpl/examples/mplot3d/
mpl/examples/axes_grid/        mpl/examples/pylab_examples/
mpl/examples/event_handling/   mpl/examples/widgets

In [19]: cd mpl/examples/widgets/
/home/msierig/mpl/examples/widgets

In [20]: !wc *
    2    12    77 README.txt
   40    97   884 buttons.py
   26    90   712 check_buttons.py
   19    52   416 cursor.py
  180   404  4882 menu.py
   16    45   337 multicursor.py
   36   106   916 radio_buttons.py
   48   226  2082 rectangle_selector.py
   43   118  1063 slider_demo.py
   40   124  1088 span_selector.py
  450  1274 12457 total
```

You can create one or more pyplot plots and insert them with the `@savefig` decorator.

For more information on @savefig decorator, please refer to the end of this page in Pseudo-Decorators section.

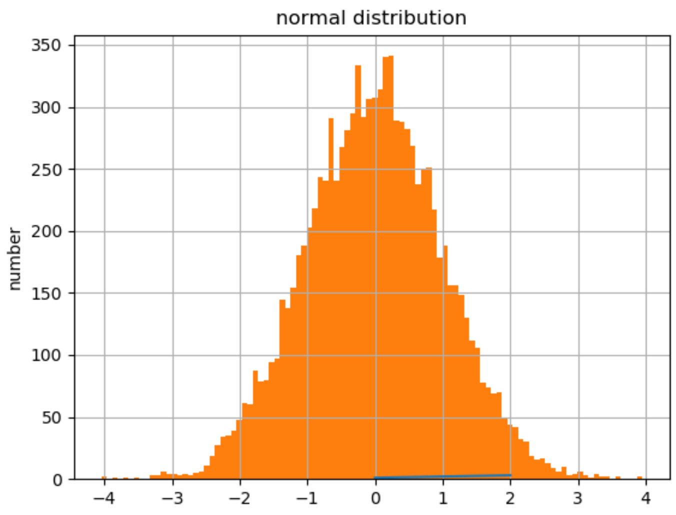
```
In [21]: plot([1,2,3]);

# use a semicolon to suppress the output
In [22]: hist(np.random.randn(10000), 100);
```





In a subsequent session, we can update the current figure with some text, and then resave

```
In [23]: ylabel('number')
Out[23]: Text(38.222222222222214, 0.5, 'number')

In [24]: title('normal distribution')
\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\Out[24]: Text(0.5, 1.0, 'normal␣
↪distribution')

In [25]: grid(True)
```



You can also have function definitions included in the source.

```
In [26]: def square(x):
   ....:     """
   ....:     An overcomplicated square function as an example.
   ....:     """
   ....:     if x < 0:
   ....:         x = abs(x)
   ....:     y = x * x
   ....:     return y
   ....:
```

Then call it from a subsequent section.

```
In [27]: square(3)
Out[27]: 9

In [28]: square(-2)
\\\\\\\\\\\Out[28]: 4
```

9.4.1 Writing Pure Python Code

Pure python code is supported by the optional argument `python`. In this pure python syntax you do not include the output from the python interpreter. The following markup:

```
.. ipython:: python

   foo = 'bar'
   print(foo)
   foo = 2
   foo**2
```

Renders as

```
In [29]: foo = 'bar'
```

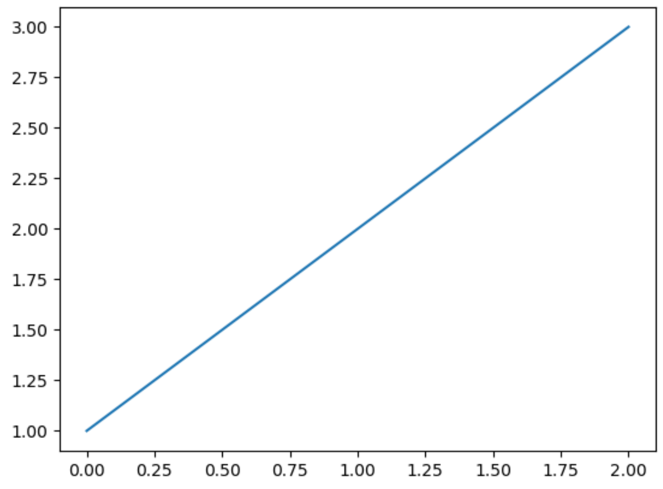
(continues on next page)

(continued from previous page)

```
In [30]: print(foo)
bar

In [31]: foo = 2

In [32]: foo**2
Out[32]: 4
```

We can even plot from python, using the savefig decorator, as well as, suppress output with a semicolon

```
In [33]: plot([1,2,3]);
```



For more information on @savefig decorator, please refer to the end of this page in Pseudo-Decorators section.

Similarly, std err is inserted

```
In [34]: foo = 'bar'

In [35]: foo[)
[0;36m  File [0;32m"<ipython-input-35-edde7a2425af>"[0;36m, line [0;32m1[0m
[0;31m    foo[)[0m
[0m        ^[0m
[0;31mSyntaxError[0m[0;31m:[0m invalid syntax
```

9.5 Handling Comments

Comments are handled and state is preserved

```
# comments are handled
In [36]: print(foo)
bar
```

If you don't see the next code block then the options work.

9.6 Splitting Python statements across lines

Multi-line input is handled.

```
In [37]: line = 'Multi\
   ....:         line &\
   ....:         support &\
   ....:         works'
   ....:

In [38]: print(line.split('&'))
['Multi        line ', '        support ', '        works']
```

Functions definitions are correctly parsed

```
In [39]: def square(x):
   ....:     """
   ....:     An overcomplicated square function as an example.
   ....:     """
   ....:     if x < 0:
   ....:         x = abs(x)
   ....:     y = x * x
   ....:     return y
   ....:
```

And persist across sessions

```
In [40]: print(square(3))
9

In [41]: print(square(-2))
\\4
```

Pretty much anything you can do with the ipython code, you can do with with a simple python script. Obviously, though it doesn't make sense to use the doctest option.

9.7 Pseudo-Decorators

Here are the supported decorators, and any optional arguments they take. Some of the decorators can be used as options to the entire block (eg `verbatim` and `suppress`), and some only apply to the line just below them (eg `savefig`).

@suppress

> execute the ipython input block, but suppress the input and output block from the rendered output. Also, can be applied to the entire `.. ipython` block as a directive option with `:suppress:`.

@verbatim

> insert the input and output block in verbatim, but auto-increment the line numbers. Internally, the interpreter will be fed an empty string, so it is a no-op that keeps line numbering consistent. Also, can be applied to the entire `.. ipython` block as a directive option with `:verbatim:`.

@savefig OUTFILE [IMAGE_OPTIONS]

save the figure to the static directory and insert it into the document, possibly binding it into a minipage and/or putting code/figure label/references to associate the code and the figure. Takes args to pass to the image directive (*scale*, *width*, etc can be kwargs); see image options for details.

@doctest

Compare the pasted in output in the ipython block with the output generated at doc build time, and raise errors if they don't match. Also, can be applied to the entire `.. ipython` block as a directive option with `:doctest:`.

9.8 Configuration Options

ipython_savefig_dir

The directory in which to save the figures. This is relative to the Sphinx source directory. The default is `html_static_path`.

ipython_rgxin

The compiled regular expression to denote the start of IPython input lines. The default is `re.compile('In [(d+)]:s?(.*)s*')`. You shouldn't need to change this.

ipython_rgxout

The compiled regular expression to denote the start of IPython output lines. The default is `re.compile('Out[(d+)]:s?(.*)s*')`. You shouldn't need to change this.

ipython_promptin

The string to represent the IPython input prompt in the generated ReST. The default is `'In [%d]:'`. This expects that the line numbers are used in the prompt.

ipython_promptout

The string to represent the IPython prompt in the generated ReST. The default is `'Out [%d]:'`. This expects that the line numbers are used in the prompt.

9.9 Automatically generated documentation

Sphinx directive to support embedded IPython code.

IPython provides an extension for Sphinx to highlight and run code.

This directive allows pasting of entire interactive IPython sessions, prompts and all, and their code will actually get re-executed at doc build time, with all prompts renumbered sequentially. It also allows you to input code as a pure python input by giving the argument python to the directive. The output looks like an interactive ipython section.

Here is an example of how the IPython directive can **run** python code, at build time.

```
In [1]: 1+1
Out[1]: 2

In [2]: import datetime
   ...: datetime.datetime.now()
   ...:
\\\\\\\\\\Out[2]: datetime.datetime(2018, 12, 10, 23, 28, 32, 262438)
```

It supports IPython construct that plain Python does not understand (like magics):

```
In [3]: import time

In [4]: %timeit time.sleep(0.05)
50.5 ms +- 284 us per loop (mean +- std. dev. of 7 runs, 10 loops each)
```

This will also support top-level async when using IPython 7.0+

```
In [5]: import asyncio
   ...: print('before')
   ...: await asyncio.sleep(1)
   ...: print('after')
   ...:
before
after
```

The namespace will persist across multiple code chucks, Let's define a variable:

```
In [6]: who = "World"
```

And now say hello:

```
In [7]: print('Hello,', who)
Hello, World
```

If the current section raises an exception, you can add the `:okexcept:` flag to the current block, otherwise the build will fail.

```
In [8]: 1/0
[0;31m---------------------------------------------------------------------------[0m
[0;31mZeroDivisionError[0m                         Traceback (most recent call last)
[0;32m<ipython-input-8-9e1622b385b6>[0m in [0;36m<module>[0;34m[0m
[0;32m----> 1[0;31m [0;36m1[0m[0;34m/[0m[0;36m0[0m[0;34m[0m[0;34m[0m[0m
[0m
[0;31mZeroDivisionError[0m: division by zero
```

9.9.1 IPython Sphinx directive module

To enable this directive, simply list it in your Sphinx `conf.py` file (making sure the directory where you placed it is visible to sphinx, as is needed for all Sphinx directives). For example, to enable syntax highlighting and the IPython directive:

```
extensions = ['IPython.sphinxext.ipython_console_highlighting',
              'IPython.sphinxext.ipython_directive']
```

The IPython directive outputs code-blocks with the language 'ipython'. So if you do not have the syntax highlighting extension enabled as well, then all rendered code-blocks will be uncolored. By default this directive assumes that your prompts are unchanged IPython ones, but this can be customized. The configurable options that can be placed in conf.py are:

ipython_savefig_dir: The directory in which to save the figures. This is relative to the Sphinx source directory. The default is `html_static_path`.

ipython_rgxin: The compiled regular expression to denote the start of IPython input lines. The default is `re.compile('In \[(\d+)\]:\s?(.*)\s*')`. You shouldn't need to change this.

ipython_warning_is_error: [default to True] Fail the build if something unexpected happen, for example if a block raise an exception but does not have the `:okexcept:` flag. The exact behavior of what is considered strict, may change between the sphinx directive version.

ipython_rgxout: The compiled regular expression to denote the start of IPython output lines. The default is `re.compile('Out\[(\d+)\]:\s?(.*)\s*')`. You shouldn't need to change this.

ipython_promptin: The string to represent the IPython input prompt in the generated ReST. The default is `'In [%d]:'`. This expects that the line numbers are used in the prompt.

ipython_promptout: The string to represent the IPython prompt in the generated ReST. The default is `'Out [%d]:'`. This expects that the line numbers are used in the prompt.

ipython_mplbackend: The string which specifies if the embedded Sphinx shell should import Matplotlib and set the backend. The value specifies a backend that is passed to `matplotlib.use()` before any lines in `ipython_execlines` are executed. If not specified in conf.py, then the default value of 'agg' is used. To use the IPython directive without matplotlib as a dependency, set the value to `None`. It may end up that matplotlib is still imported if the user specifies so in `ipython_execlines` or makes use of the @savefig pseudo decorator.

ipython_execlines: A list of strings to be exec'd in the embedded Sphinx shell. Typical usage is to make certain packages always available. Set this to an empty list if you wish to have no imports always available. If specified in `conf.py` as `None`, then it has the effect of making no imports available. If omitted from conf.py altogether, then the default value of ['import numpy as np', 'import matplotlib.pyplot as plt'] is used.

ipython_holdcount When the @suppress pseudo-decorator is used, the execution count can be incremented or not. The default behavior is to hold the execution count, corresponding to a value of `True`. Set this to `False` to increment the execution count after each suppressed command.

As an example, to use the IPython directive when `matplotlib` is not available, one sets the backend to `None`:

```
ipython_mplbackend = None
```

An example usage of the directive is:

```
.. ipython::

    In [1]: x = 1

    In [2]: y = x**2

    In [3]: print(y)
```

See http://matplotlib.org/sampledoc/ipython_directive.html for additional documentation.

9.9.2 Pseudo-Decorators

Note: Only one decorator is supported per input. If more than one decorator is specified, then only the last one is used.

In addition to the Pseudo-Decorators/options described at the above link, several enhancements have been made. The directive will emit a message to the console at build-time if code-execution resulted in an exception or warning. You can suppress these on a per-block basis by specifying the :okexcept: or :okwarning: options:

```
.. ipython::
    :okexcept:
    :okwarning:

```

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```
    In [1]: 1/0
    In [2]: # raise warning.
```

9.9.3 To Do

- Turn the ad-hoc test() function into a real test suite.
- Break up ipython-specific functionality from matplotlib stuff into better separated code.

CHAPTER 10

About IPython

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

10.1 History

10.1.1 Origins

IPython was starting in 2001 by Fernando Perez while he was a graduate student at the University of Colorado, Boulder. IPython as we know it today grew out of the following three projects:

- ipython by Fernando Pérez. Fernando began using Python and ipython began as an outgrowth of his desire for things like Mathematica-style prompts, access to previous output (again like Mathematica's % syntax) and a flexible configuration system (something better than `PYTHONSTARTUP`).
- IPP by Janko Hauser. Very well organized, great usability. Had an old help system. IPP was used as the "container" code into which Fernando added the functionality from ipython and LazyPython.
- LazyPython by Nathan Gray. Simple but very powerful. The quick syntax (auto parens, auto quotes) and verbose/colored tracebacks were all taken from here.

Here is how Fernando describes the early history of IPython:

When I found out about IPP and LazyPython I tried to join all three into a unified system. I thought this could provide a very nice working environment, both for regular programming and scientific computing: shell-like features, IDL/Matlab numerics, Mathematica-type prompt history and great object introspection and help facilities. I think it worked reasonably well, though it was a lot more work than I had initially planned.

Warning: This documentation covers a development version of IPython. The development version may differ significantly from the latest stable release.

Important: This documentation covers IPython versions 6.0 and higher. Beginning with version 6.0, IPython stopped supporting compatibility with Python versions lower than 3.3 including all versions of Python 2.7.

If you are looking for an IPython version compatible with Python 2.7, please use the IPython 5.x LTS release and refer to its documentation (LTS is the long term support release).

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10.2.2 About the IPython Development Team

Fernando Perez began IPython in 2001 based on code from Janko Hauser <jhauser-AT-zscout.de> and Nathaniel Gray <n8gray-AT-caltech.edu>. Fernando is still the project lead.

The IPython Development Team is the set of all contributors to the IPython project. This includes all of the IPython subprojects. See the release notes for a list of people who have contributed to each release.

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