Jupyter Qt Console Documentation

Release 5.4.3

Jupyter Development Team

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CONTENTS

Release
5.4.3

Date
May 05, 2023

To start the Qt console:

```
$ jupyter qtconsole
```

CHAPTER

ONE

INSTALLATION

The Qt console requires Qt, such as PyQt5, PyQt4, or PySide.

Although pip and conda may be used to install the Qt console, conda is simpler to use since it automatically installs PyQt. Alternatively, qtconsole installation with pip needs additional steps since pip cannot install the Qt requirement.

1.1 Install using conda

To install:

```
conda install qtconsole
```

Note: If the Qt console is installed using conda, it will **automatically** install the Qt requirement as well.

1.2 Install using pip

To install:

```
pip install qtconsole
```

Important: Make sure that Qt is installed. Unfortunately, Qt cannot be installed using pip. The next section gives instructions on installing Qt.

1.3 Installing Qt (if needed)

We recommend installing PyQt with conda:

```
conda install pyqt
```

or with a system package manager. For Windows, PyQt binary packages may be used.

For example with Linux Debian's system package manager, use:

```
sudo apt-get install python3-pyqt5 # PyQt5 on Python 3
sudo apt-get install python3-pyqt4 # PyQt4 on Python 3
sudo apt-get install python-qt4    # PyQt4 on Python 2
```

See also:

Installing Jupyter The Qt console is part of the Jupyter ecosystem.

CHAPTER

TWO

CONFIGURATION OPTIONS

These options can be set in the configuration file, `~/.jupyter/jupyter_qtconsole_config.py`, or at the command line when you start Qt console.

You may enter `jupyter qtconsole --help-all` to get information about all available configuration options.

2.1 Options

ConnectionFileMixin.connection_file
[Unicode] Default: `''`

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.

ConnectionFileMixin.control_port
[Int] Default: `0`

set the control (ROUTER) port [default: random]

ConnectionFileMixin.hb_port
[Int] Default: `0`

set the heartbeat port [default: random]

ConnectionFileMixin.iopub_port
[Int] Default: `0`

set the iopub (PUB) port [default: random]

ConnectionFileMixin.ip
[Unicode] Default: `''`

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!

ConnectionFileMixin.shell_port
[Int] Default: `0`

set the shell (ROUTER) port [default: random]

ConnectionFileMixin.stdin_port
[Int] Default: `0`

set the stdin (ROUTER) port [default: random]

ConnectionFileMixin.transport
[any of `'tcp'``|'ipc'``` (case-insensitive)] Default: `'tcp'`

No description

JupyterConsoleApp.confirm_exit
[CBool] Default: `True`

Set to display confirmation dialog on exit. You can always use 'exit' or 'quit', to force a direct exit without any confirmation.

JupyterConsoleApp.connection_file
[Unicode] Default: `''`

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.

JupyterConsoleApp.control_port
[Int] Default: `0`

set the control (ROUTER) port [default: random]

JupyterConsoleApp.existing
[CUnicode] Default: `''`

Connect to an already running kernel

JupyterConsoleApp.hb_port
[Int] Default: `0`

set the heartbeat port [default: random]

JupyterConsoleApp.iopub_port
[Int] Default: `0`

set the iopub (PUB) port [default: random]

JupyterConsoleApp.ip
[Unicode] Default: `''`

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!

JupyterConsoleApp.kernel_manager_class
[Type] Default: `'jupyter_client.manager.KernelManager'`

The kernel manager class to use.

JupyterConsoleApp.kernel_name
[Unicode] Default: `'python'`

The name of the default kernel to start.

JupyterConsoleApp.shell_port
[Int] Default: `0`

set the shell (ROUTER) port [default: random]

JupyterConsoleApp.sshkey
[Unicode] Default: `''`

Path to the ssh key to use for logging in to the ssh server.

JupyterConsoleApp.sshserver
[Unicode] Default: `''`

The SSH server to use to connect to the kernel.

JupyterConsoleApp.stdin_port
[Int] Default: `0`

set the stdin (ROUTER) port [default: random]

JupyterConsoleApp.transport
[any of `'tcp'``|'ipc'`` (case-insensitive)] Default: `'tcp'`

No description

Application.log_datefmt
[Unicode] Default: `'%Y-%m-%d %H:%M:%S'`

The date format used by logging formatters for %(asctime)s

Application.log_format
[Unicode] Default: `'[%(name)s]%(highlevel)s %(message)s'`

The Logging format template

Application.log_level
[any of `0``|``10``|``20``|``30``|``40``|``50``|'DEBUG'|'INFO'|'WARN'|'ERROR'|'CRITICAL'``] Default: `30`

Set the log level by value or name.

Application.logging_config
[Dict] Default: `{}`

Configure additional log handlers.

The default stderr logs handler is configured by the log_level, log_datefmt and log_format settings.

This configuration can be used to configure additional handlers (e.g. to output the log to a file) or for finer control over the default handlers.

If provided this should be a logging configuration dictionary, for more information see: https://docs.python.org/3/library/logging.config.html#logging-config-dictschema

This dictionary is merged with the base logging configuration which defines the following:

- A logging formatter intended for interactive use called `console`.
- A logging handler that writes to stderr called `console` which uses the formatter `console`.
- A logger with the name of this application set to `DEBUG` level.

This example adds a new handler that writes to a file:

```
c.Application.logging_config = {
    'handlers': {
        'file': {
            'class': 'logging.FileHandler',
            'level': 'DEBUG',
            'filename': '<path/to/file>',
        }
    },
    'loggers': {
        '<application-name>': {
```

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```
            'level': 'DEBUG',
            # NOTE: if you don't list the default "console"
            # handler here then it will be disabled
            'handlers': ['console', 'file'],
        },
    }
}
```

Application.show_config
[Bool] Default: `False`

Instead of starting the Application, dump configuration to stdout

Application.show_config_json
[Bool] Default: `False`

Instead of starting the Application, dump configuration to stdout (as JSON)

JupyterApp.answer_yes
[Bool] Default: `False`

Answer yes to any prompts.

JupyterApp.config_file
[Unicode] Default: `''`

Full path of a config file.

JupyterApp.config_file_name
[Unicode] Default: `''`

Specify a config file to load.

JupyterApp.generate_config
[Bool] Default: `False`

Generate default config file.

JupyterApp.log_datefmt
[Unicode] Default: `'%Y-%m-%d %H:%M:%S'`

The date format used by logging formatters for %(asctime)s

JupyterApp.log_format
[Unicode] Default: `'[%(name)s]%(highlevel)s %(message)s'`

The Logging format template

JupyterApp.log_level
[any of `0``|``10``|``20``|``30``|``40``|``50``|'DEBUG'|'INFO'|'WARN'|'ERROR'|'CRITICAL'``] Default: `30`

Set the log level by value or name.

JupyterApp.logging_config
[Dict] Default: `{}`

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The default stderr logs handler is configured by the log_level, log_datefmt and log_format settings.

This configuration can be used to configure additional handlers (e.g. to output the log to a file) or for finer control over the default handlers.

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- A logging formatter intended for interactive use called `console`.
- A logging handler that writes to stderr called `console` which uses the formatter `console`.
- A logger with the name of this application set to `DEBUG` level.

This example adds a new handler that writes to a file:

```
c.Application.logging_config = {
    'handlers': {
        'file': {
            'class': 'logging.FileHandler',
            'level': 'DEBUG',
            'filename': '<path/to/file>',
        }
    },
    'loggers': {
        '<application-name>': {
            'level': 'DEBUG',
            # NOTE: if you don't list the default "console"
            # handler here then it will be disabled
            'handlers': ['console', 'file'],
        },
    }
}
```

JupyterApp.show_config
[Bool] Default: `False`

Instead of starting the Application, dump configuration to stdout

JupyterApp.show_config_json
[Bool] Default: `False`

Instead of starting the Application, dump configuration to stdout (as JSON)

JupyterQtConsoleApp.answer_yes
[Bool] Default: `False`

Answer yes to any prompts.

JupyterQtConsoleApp.config_file
[Unicode] Default: `''`

Full path of a config file.

JupyterQtConsoleApp.config_file_name
[Unicode] Default: `''`

Specify a config file to load.

JupyterQtConsoleApp.confirm_exit
[CBool] Default: `True`

Set to display confirmation dialog on exit. You can always use 'exit' or 'quit', to force a direct exit without any confirmation.

JupyterQtConsoleApp.connection_file
[Unicode] Default: `''`

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.

JupyterQtConsoleApp.control_port
[Int] Default: `0`

set the control (ROUTER) port [default: random]

JupyterQtConsoleApp.display_banner
[CBool] Default: `True`

Whether to display a banner upon starting the QtConsole.

JupyterQtConsoleApp.existing
[CUnicode] Default: `''`

Connect to an already running kernel

JupyterQtConsoleApp.generate_config
[Bool] Default: `False`

Generate default config file.

JupyterQtConsoleApp.hb_port
[Int] Default: `0`

set the heartbeat port [default: random]

JupyterQtConsoleApp.hide_menubar
[CBool] Default: `False`

Start the console window with the menu bar hidden.

JupyterQtConsoleApp.iopub_port
[Int] Default: `0`

set the iopub (PUB) port [default: random]

JupyterQtConsoleApp.ip
[Unicode] Default: `''`

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!

JupyterQtConsoleApp.kernel_name
[Unicode] Default: `'python'`

The name of the default kernel to start.

JupyterQtConsoleApp.log_datefmt
[Unicode] Default: `'%Y-%m-%d %H:%M:%S'`

The date format used by logging formatters for %(asctime)s

JupyterQtConsoleApp.log_format
[Unicode] Default: `'[%(name)s]%(highlevel)s %(message)s'`

The Logging format template

JupyterQtConsoleApp.log_level
[any of ``0``|``10``|``20``|``30``|``40``|``50``|'DEBUG'|'INFO'|'WARN'|'ERROR'|'CRITICAL'``]
Default: `30`

Set the log level by value or name.

JupyterQtConsoleApp.logging_config
[Dict] Default: `{}`

Configure additional log handlers.

The default stderr logs handler is configured by the log_level, log_datefmt and log_format settings.

This configuration can be used to configure additional handlers (e.g. to output the log to a file) or for finer control over the default handlers.

If provided this should be a logging configuration dictionary, for more information see: https://docs.python.org/3/library/logging.config.html#logging-config-dictschema

This dictionary is merged with the base logging configuration which defines the following:

- A logging formatter intended for interactive use called `console`.
- A logging handler that writes to stderr called `console` which uses the formatter `console`.
- A logger with the name of this application set to `DEBUG` level.

This example adds a new handler that writes to a file:

```
c.Application.logging_config = {
    'handlers': {
        'file': {
            'class': 'logging.FileHandler',
            'level': 'DEBUG',
            'filename': '<path/to/file>',
        }
    },
    'loggers': {
        '<application-name>': {
            'level': 'DEBUG',
            # NOTE: if you don't list the default "console"
            # handler here then it will be disabled
            'handlers': ['console', 'file'],
        },
    }
}
```

JupyterQtConsoleApp.maximize
[CBool] Default: `False`

Start the console window maximized.

JupyterQtConsoleApp.plain
[CBool] Default: `False`

Use a plaintext widget instead of rich text (plain can't print/save).

JupyterQtConsoleApp.shell_port
[Int] Default: `0`

set the shell (ROUTER) port [default: random]

JupyterQtConsoleApp.show_config
[Bool] Default: `False`

Instead of starting the Application, dump configuration to stdout

JupyterQtConsoleApp.show_config_json
[Bool] Default: `False`

Instead of starting the Application, dump configuration to stdout (as JSON)

JupyterQtConsoleApp.sshkey
[Unicode] Default: `''`

Path to the ssh key to use for logging in to the ssh server.

JupyterQtConsoleApp.sshserver
[Unicode] Default: `''`

The SSH server to use to connect to the kernel.

JupyterQtConsoleApp.stdin_port
[Int] Default: `0`

set the stdin (ROUTER) port [default: random]

JupyterQtConsoleApp.stylesheet
[Unicode] Default: `''`

path to a custom CSS stylesheet

JupyterQtConsoleApp.transport
[any of `'tcp'``|'ipc'``` (case-insensitive)] Default: `'tcp'`

No description

ConsoleWidget.ansi_codes
[Bool] Default: `True`

Whether to process ANSI escape codes.

ConsoleWidget.buffer_size
[Int] Default: `500`

The maximum number of lines of text before truncation. Specifying a non-positive number disables text truncation (not recommended).

ConsoleWidget.console_height
[Int] Default: `25`

The height of the console at start time in number
of characters (will double with `vsplit` paging)

ConsoleWidget.console_width
[Int] Default: `81`

The width of the console at start time in number
of characters (will double with `hsplit` paging)

ConsoleWidget.execute_on_complete_input
[Bool] Default: `True`

Whether to automatically execute on syntactically complete input.

If False, Shift-Enter is required to submit each execution. Disabling this is mainly useful for non-Python kernels, where the completion check would be wrong.

ConsoleWidget.font_family
[Unicode] Default: `''`

The font family to use for the console.
On OSX this defaults to Monaco, on Windows the default is Consolas with fallback of Courier, and on other platforms the default is Monospace.

ConsoleWidget.font_size
[Int] Default: `0`

The font size. If unconfigured, Qt will be entrusted
with the size of the font.

ConsoleWidget.gui_completion
[any of `'plain'``|'droplist'|'ncurses'``] Default: `'ncurses'`

The type of completer to use. Valid values are:

'plain'
[Show the available completion as a text list] Below the editing area.

'droplist': Show the completion in a drop down list navigable
by the arrow keys, and from which you can select completion by pressing Return.

'ncurses'
[Show the completion as a text list which is navigable by] `tab` and arrow keys.

ConsoleWidget.gui_completion_height
[Int] Default: `0`

Set Height for completion.

'droplist'
Height in pixels.

'ncurses'
Maximum number of rows.

ConsoleWidget.include_other_output
[Bool] Default: `False`

Whether to include output from clients
other than this one sharing the same kernel.

Outputs are not displayed until enter is pressed.

ConsoleWidget.kind
[any of `'plain'``|'rich'``] Default: `'plain'`

The type of underlying text widget to use. Valid values are 'plain', which specifies a QPlainTextEdit, and 'rich', which specifies a QTextEdit.

ConsoleWidget.other_output_prefix
[Unicode] Default: `'[remote] '`

Prefix to add to outputs coming from clients other than this one.

Only relevant if include_other_output is True.

ConsoleWidget.paging
[any of `'inside'``|'hsplit'|'vsplit'|'custom'|'none'``] Default: `'inside'`

The type of paging to use. Valid values are:

'inside'
The widget pages like a traditional terminal.

'hsplit'
When paging is requested, the widget is split horizontally. The top pane contains the console, and the bottom pane contains the paged text.

'vsplit'
Similar to 'hsplit', except that a vertical splitter is used.

'custom'
No action is taken by the widget beyond emitting a 'custom_page_requested(str)' signal.

'none'
The text is written directly to the console.

ConsoleWidget.scrollbar_visibility
[Bool] Default: `True`

The visibility of the scrollar. If False then the scrollbar will be
invisible.

HistoryConsoleWidget.ansi_codes
[Bool] Default: `True`

Whether to process ANSI escape codes.

HistoryConsoleWidget.buffer_size
[Int] Default: `500`

The maximum number of lines of text before truncation. Specifying a non-positive number disables text truncation (not recommended).

HistoryConsoleWidget.console_height
[Int] Default: `25`

The height of the console at start time in number
of characters (will double with `vsplit` paging)

HistoryConsoleWidget.console_width
[Int] Default: `81`

The width of the console at start time in number
of characters (will double with `hsplit` paging)

HistoryConsoleWidget.execute_on_complete_input
[Bool] Default: `True`

Whether to automatically execute on syntactically complete input.

If False, Shift-Enter is required to submit each execution. Disabling this is mainly useful for non-Python kernels, where the completion check would be wrong.

HistoryConsoleWidget.font_family
[Unicode] Default: `''`

The font family to use for the console.
On OSX this defaults to Monaco, on Windows the default is Consolas with fallback of Courier, and on other platforms the default is Monospace.

HistoryConsoleWidget.font_size
[Int] Default: `0`

The font size. If unconfigured, Qt will be entrusted
with the size of the font.

HistoryConsoleWidget.gui_completion
[any of `'plain'``|'droplist'|'ncurses'``] Default: `'ncurses'`

The type of completer to use. Valid values are:

'plain'
[Show the available completion as a text list] Below the editing area.

'droplist': Show the completion in a drop down list navigable
by the arrow keys, and from which you can select completion by pressing Return.

'ncurses'
[Show the completion as a text list which is navigable by] `tab` and arrow keys.

HistoryConsoleWidget.gui_completion_height
[Int] Default: `0`

Set Height for completion.

'droplist'
Height in pixels.

'ncurses'
Maximum number of rows.

HistoryConsoleWidget.history_lock
[Bool] Default: `False`

No description

HistoryConsoleWidget.include_other_output
[Bool] Default: `False`

Whether to include output from clients
other than this one sharing the same kernel.

Outputs are not displayed until enter is pressed.

HistoryConsoleWidget.kind
[any of `'plain'``|'rich'``] Default: `'plain'`

The type of underlying text widget to use. Valid values are 'plain', which specifies a QPlainTextEdit, and 'rich', which specifies a QTextEdit.

HistoryConsoleWidget.other_output_prefix
[Unicode] Default: `'[remote] '`

Prefix to add to outputs coming from clients other than this one.

Only relevant if include_other_output is True.

HistoryConsoleWidget.paging
[any of `'inside'``|'hsplit'|'vsplit'|'custom'|'none'``] Default: `'inside'`

The type of paging to use. Valid values are:

'inside'
The widget pages like a traditional terminal.

'hsplit'
When paging is requested, the widget is split horizontally. The top pane contains the console, and the bottom pane contains the paged text.

'vsplit'
Similar to 'hsplit', except that a vertical splitter is used.

'custom'
No action is taken by the widget beyond emitting a 'custom_page_requested(str)' signal.

'none'
The text is written directly to the console.

HistoryConsoleWidget.scrollbar_visibility
[Bool] Default: `True`

The visibility of the scrollar. If False then the scrollbar will be
invisible.

FrontendWidget.ansi_codes
[Bool] Default: `True`

Whether to process ANSI escape codes.

FrontendWidget.banner
[Unicode] Default: `''`

No description

FrontendWidget.buffer_size
[Int] Default: `500`

The maximum number of lines of text before truncation. Specifying a non-positive number disables text truncation (not recommended).

FrontendWidget.clear_on_kernel_restart
[Bool] Default: `True`

Whether to clear the console when the kernel is restarted

FrontendWidget.confirm_restart
[Bool] Default: `True`

Whether to ask for user confirmation when restarting kernel

FrontendWidget.console_height
[Int] Default: `25`

The height of the console at start time in number
of characters (will double with `vsplit` paging)

FrontendWidget.console_width
[Int] Default: `81`

The width of the console at start time in number
of characters (will double with `hsplit` paging)

FrontendWidget.enable_calltips
[Bool] Default: `True`

Whether to draw information calltips on open-parentheses.

FrontendWidget.execute_on_complete_input
[Bool] Default: `True`

Whether to automatically execute on syntactically complete input.

If False, Shift-Enter is required to submit each execution. Disabling this is mainly useful for non-Python kernels, where the completion check would be wrong.

FrontendWidget.font_family
[Unicode] Default: `''`

The font family to use for the console.
On OSX this defaults to Monaco, on Windows the default is Consolas with fallback of Courier, and on other platforms the default is Monospace.

FrontendWidget.font_size
[Int] Default: `0`

The font size. If unconfigured, Qt will be entrusted
with the size of the font.

FrontendWidget.gui_completion
[any of `'plain'``|'droplist'|'ncurses'``] Default: `'ncurses'`

The type of completer to use. Valid values are:

'plain'
[Show the available completion as a text list] Below the editing area.

'droplist': Show the completion in a drop down list navigable
by the arrow keys, and from which you can select completion by pressing Return.

'ncurses'
[Show the completion as a text list which is navigable by] `tab` and arrow keys.

FrontendWidget.gui_completion_height
[Int] Default: `0`

Set Height for completion.

'droplist'
Height in pixels.

'ncurses'
Maximum number of rows.

FrontendWidget.history_lock
[Bool] Default: `False`

No description

FrontendWidget.include_other_output
[Bool] Default: `False`

Whether to include output from clients
other than this one sharing the same kernel.

Outputs are not displayed until enter is pressed.

FrontendWidget.kind
[any of `'plain'``|'rich'``] Default: `'plain'`

The type of underlying text widget to use. Valid values are 'plain', which specifies a QPlainTextEdit, and 'rich', which specifies a QTextEdit.

FrontendWidget.lexer_class
[DottedObjectName] Default: `traitlets.Undefined`

The pygments lexer class to use.

FrontendWidget.other_output_prefix
[Unicode] Default: `'[remote] '`

Prefix to add to outputs coming from clients other than this one.

Only relevant if include_other_output is True.

FrontendWidget.paging
[any of `'inside'``|'hsplit'|'vsplit'|'custom'|'none'``] Default: `'inside'`

The type of paging to use. Valid values are:

'inside'
The widget pages like a traditional terminal.

'hsplit'
When paging is requested, the widget is split horizontally. The top pane contains the console, and the bottom pane contains the paged text.

'vsplit'
Similar to 'hsplit', except that a vertical splitter is used.

'custom'
No action is taken by the widget beyond emitting a 'custom_page_requested(str)' signal.

'none'
The text is written directly to the console.

FrontendWidget.scrollbar_visibility
[Bool] Default: `True`

The visibility of the scrollar. If False then the scrollbar will be
invisible.

IPythonWidget.ansi_codes
[Bool] Default: `True`

Whether to process ANSI escape codes.

IPythonWidget.banner
[Unicode] Default: `''`

No description

IPythonWidget.buffer_size
[Int] Default: `500`

The maximum number of lines of text before truncation. Specifying a non-positive number disables text truncation (not recommended).

IPythonWidget.clear_on_kernel_restart
[Bool] Default: `True`

Whether to clear the console when the kernel is restarted

IPythonWidget.confirm_restart
[Bool] Default: `True`

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of characters (will double with `vsplit` paging)

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If False, Shift-Enter is required to submit each execution. Disabling this is mainly useful for non-Python kernels, where the completion check would be wrong.

IPythonWidget.font_family
[Unicode] Default: `''`

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IPythonWidget.font_size
[Int] Default: `0`

The font size. If unconfigured, Qt will be entrusted
with the size of the font.

IPythonWidget.gui_completion
[any of `'plain'``|'droplist'|'ncurses'``] Default: `'ncurses'`

The type of completer to use. Valid values are:

'plain'
[Show the available completion as a text list] Below the editing area.

'droplist': Show the completion in a drop down list navigable
by the arrow keys, and from which you can select completion by pressing Return.

'ncurses'
[Show the completion as a text list which is navigable by] `tab` and arrow keys.

IPythonWidget.gui_completion_height
[Int] Default: `0`

Set Height for completion.

'droplist'
Height in pixels.

'ncurses'
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IPythonWidget.history_lock
[Bool] Default: `False`

No description

IPythonWidget.include_other_output
[Bool] Default: `False`

Whether to include output from clients
other than this one sharing the same kernel.

Outputs are not displayed until enter is pressed.

IPythonWidget.kind
[any of `'plain'``|'rich'``] Default: `'plain'`

The type of underlying text widget to use. Valid values are 'plain', which specifies a QPlainTextEdit, and 'rich', which specifies a QTextEdit.

IPythonWidget.lexer_class
[DottedObjectName] Default: `traitlets.Undefined`

The pygments lexer class to use.

IPythonWidget.other_output_prefix
[Unicode] Default: `'[remote] '`

Prefix to add to outputs coming from clients other than this one.

Only relevant if include_other_output is True.

IPythonWidget.paging
[any of `'inside'``|'hsplit'|'vsplit'|'custom'|'none'``] Default: `'inside'`

The type of paging to use. Valid values are:

'inside'
The widget pages like a traditional terminal.

'hsplit'
When paging is requested, the widget is split horizontally. The top pane contains the console, and the bottom pane contains the paged text.

'vsplit'
Similar to 'hsplit', except that a vertical splitter is used.

'custom'
No action is taken by the widget beyond emitting a 'custom_page_requested(str)' signal.

'none'
The text is written directly to the console.

IPythonWidget.scrollbar_visibility
[Bool] Default: `True`

The visibility of the scrollar. If False then the scrollbar will be
invisible.

JupyterWidget.ansi_codes
[Bool] Default: `True`

Whether to process ANSI escape codes.

JupyterWidget.banner
[Unicode] Default: `''`

No description

JupyterWidget.buffer_size
[Int] Default: `500`

The maximum number of lines of text before truncation. Specifying a non-positive number disables text truncation (not recommended).

JupyterWidget.clear_on_kernel_restart
[Bool] Default: `True`

Whether to clear the console when the kernel is restarted

JupyterWidget.confirm_restart
[Bool] Default: `True`

Whether to ask for user confirmation when restarting kernel

JupyterWidget.console_height
[Int] Default: `25`

The height of the console at start time in number
of characters (will double with `vsplit` paging)

JupyterWidget.console_width
[Int] Default: `81`

The width of the console at start time in number
of characters (will double with `hsplit` paging)

JupyterWidget.editor
[Unicode] Default: `''`

A command for invoking a GUI text editor. If the string contains a {filename} format specifier, it will be used. Otherwise, the filename will be appended to the end the command. To use a terminal text editor, the command should launch a new terminal, e.g. `"gnome-terminal -- vim"`.

JupyterWidget.editor_line
[Unicode] Default: `''`

The editor command to use when a specific line number is requested. The string should contain two format specifiers: {line} and {filename}. If this parameter is not specified, the line number option to the %edit magic will be ignored.

JupyterWidget.enable_calltips
[Bool] Default: `True`

Whether to draw information calltips on open-parentheses.

JupyterWidget.execute_on_complete_input
[Bool] Default: `True`

Whether to automatically execute on syntactically complete input.

If False, Shift-Enter is required to submit each execution. Disabling this is mainly useful for non-Python kernels, where the completion check would be wrong.

JupyterWidget.font_family
[Unicode] Default: `''`

The font family to use for the console.
On OSX this defaults to Monaco, on Windows the default is Consolas with fallback of Courier, and on other platforms the default is Monospace.

JupyterWidget.font_size
[Int] Default: `0`

The font size. If unconfigured, Qt will be entrusted
with the size of the font.

JupyterWidget.gui_completion
[any of `'plain'``|'droplist'|'ncurses'``] Default: `'ncurses'`

The type of completer to use. Valid values are:

'plain'
[Show the available completion as a text list] Below the editing area.

'droplist': Show the completion in a drop down list navigable
by the arrow keys, and from which you can select completion by pressing Return.

'ncurses'
[Show the completion as a text list which is navigable by] `tab` and arrow keys.

JupyterWidget.gui_completion_height
[Int] Default: `0`

Set Height for completion.

'droplist'
Height in pixels.

'ncurses'
Maximum number of rows.

JupyterWidget.history_lock
[Bool] Default: `False`

No description

JupyterWidget.in_prompt
[Unicode] Default: `'In [<span class="in-prompt-number">%i</span>]: '`

No description

JupyterWidget.include_other_output
[Bool] Default: `False`

Whether to include output from clients
other than this one sharing the same kernel.

Outputs are not displayed until enter is pressed.

JupyterWidget.input_sep
[Unicode] Default: `'\\n'`

No description

JupyterWidget.kind
[any of `'plain'``|'rich'``] Default: `'plain'`

The type of underlying text widget to use. Valid values are 'plain', which specifies a QPlainTextEdit, and 'rich', which specifies a QTextEdit.

JupyterWidget.lexer_class
[DottedObjectName] Default: `traitlets.Undefined`

The pygments lexer class to use.

JupyterWidget.other_output_prefix
[Unicode] Default: `'[remote] '`

Prefix to add to outputs coming from clients other than this one.

Only relevant if include_other_output is True.

JupyterWidget.out_prompt
[Unicode] Default: `'Out[<span class="out-prompt-number">%i</span>]: '`

No description

JupyterWidget.output_sep
[Unicode] Default: `''`

No description

JupyterWidget.output_sep2
[Unicode] Default: `''`

No description

JupyterWidget.paging
[any of `'inside'``|'hsplit'|'vsplit'|'custom'|'none'``] Default: `'inside'`

The type of paging to use. Valid values are:

'inside'
The widget pages like a traditional terminal.

'hsplit'
When paging is requested, the widget is split horizontally. The top pane contains the console, and the bottom pane contains the paged text.

'vsplit'
Similar to 'hsplit', except that a vertical splitter is used.

'custom'
No action is taken by the widget beyond emitting a 'custom_page_requested(str)' signal.

'none'
The text is written directly to the console.

JupyterWidget.scrollbar_visibility
[Bool] Default: `True`

The visibility of the scrollar. If False then the scrollbar will be
invisible.

JupyterWidget.style_sheet
[Unicode] Default: `''`

A CSS stylesheet. The stylesheet can contain classes for:

1. Qt: QPlainTextEdit, QFrame, QWidget, etc
2. Pygments: .c, .k, .o, etc. (see PygmentsHighlighter)
3. QtConsole: .error, .in-prompt, .out-prompt, etc

JupyterWidget.syntax_style
[Unicode] Default: `''`

If not empty, use this Pygments style for syntax highlighting. Otherwise, the style sheet is queried for Pygments style information.

KernelManager.autorestart
[Bool] Default: `True`

Should we autorestart the kernel if it dies.

KernelManager.connection_file
[Unicode] Default: `''`

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.

KernelManager.control_port
[Int] Default: `0`

set the control (ROUTER) port [default: random]

KernelManager.hb_port
[Int] Default: `0`

set the heartbeat port [default: random]

KernelManager.iopub_port
[Int] Default: `0`

set the iopub (PUB) port [default: random]

KernelManager.ip
[Unicode] Default: `''`

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!

KernelManager.shell_port
[Int] Default: `0`

set the shell (ROUTER) port [default: random]

KernelManager.shutdown_wait_time
[Float] Default: `5.0`

Time to wait for a kernel to terminate before killing it, in seconds. When a shutdown request is initiated, the kernel will be immediately sent an interrupt (SIGINT), followedby a shutdown_request message, after 1/2 of `shutdown_wait_time`it will be sent a terminate (SIGTERM) request, and finally at the end of `shutdown_wait_time` will be killed (SIGKILL). terminate and kill may be equivalent on windows. Note that this value can beoverridden by the in-use kernel provisioner since shutdown times mayvary by provisioned environment.

KernelManager.stdin_port
[Int] Default: `0`

set the stdin (ROUTER) port [default: random]

KernelManager.transport
[any of `'tcp'``|'ipc'``` (case-insensitive)] Default: `'tcp'`

No description

KernelRestarter.debug
[Bool] Default: `False`

Whether to include every poll event in debugging output.

Has to be set explicitly, because there will be *a lot* of output.

KernelRestarter.random_ports_until_alive
[Bool] Default: `True`

Whether to choose new random ports when restarting before the kernel is alive.

KernelRestarter.restart_limit
[Int] Default: `5`

The number of consecutive autorestarts before the kernel is presumed dead.

KernelRestarter.stable_start_time
[Float] Default: `10.0`

The time in seconds to consider the kernel to have completed a stable start up.

KernelRestarter.time_to_dead
[Float] Default: `3.0`

Kernel heartbeat interval in seconds.

Session.buffer_threshold
[Int] Default: `1024`

Threshold (in bytes) beyond which an object's buffer should be extracted to avoid pickling.

Session.check_pid
[Bool] Default: `True`

Whether to check PID to protect against calls after fork.

This check can be disabled if fork-safety is handled elsewhere.

Session.copy_threshold
[Int] Default: `65536`

Threshold (in bytes) beyond which a buffer should be sent without copying.

Session.debug
[Bool] Default: `False`

Debug output in the Session

Session.digest_history_size
[Int] Default: `65536`

The maximum number of digests to remember.

The digest history will be culled when it exceeds this value.

Session.item_threshold
[Int] Default: `64`

The maximum number of items for a container to be introspected for custom serialization.
Containers larger than this are pickled outright.

Session.key
[CBytes] Default: `b''`

execution key, for signing messages.

Session.keyfile
[Unicode] Default: `''`

path to file containing execution key.

Session.metadata
[Dict] Default: `{}`

Metadata dictionary, which serves as the default top-level metadata dict for each message.

Session.packer
[DottedObjectName] Default: `'json'`

The name of the packer for serializing messages.
Should be one of 'json', 'pickle', or an import name for a custom callable serializer.

Session.session
[CUnicode] Default: `''`

The UUID identifying this session.

Session.signature_scheme
[Unicode] Default: `'hmac-sha256'`

The digest scheme used to construct the message signatures.
Must have the form 'hmac-HASH'.

Session.unpacker
[DottedObjectName] Default: `'json'`

The name of the unpacker for unserializing messages.
Only used with custom functions for `packer`.

Session.username
[Unicode] Default: `'username'`

Username for the Session. Default is your system username.

CHAPTER

THREE

CHANGES IN JUPYTER QT CONSOLE

3.1 5.4

3.1.1 5.4.3

5.4.3 on GitHub

- Add missing closed method to QtInProcessChannel.

3.1.2 5.4.2

5.4.2 on GitHub

- Check if the iopub channel is not closed before flushing it.
- Fix kernel autorestart after it's killed for Jupyter-client 8+.

3.1.3 5.4.1

5.4.1 on GitHub

- Fix crash at startup with PySide6.
- Cast images width and height to int when trying to insert them.

3.1.4 5.4.0

5.4.0 on GitHub

Additions

- Add ConsoleWidget.gui_completion_height option to configure the maximum number of rows or height in pixels of completions when the ConsoleWidget.gui_completion option has values 'ncurses' or 'droplist', respectively.

Changes

- Fix some errors with PySide6 6.4.0.
- Fix mixed input and print statements on macOS.
- Drop usage of disutils.

3.2 5.3

3.2.1 5.3.2

5.3.2 on GitHub

- Fix syntax highlighting with multiline inputs.
- Don't call processEvents when showing input prompts on Mac because it's not necessary.

3.2.2 5.3.1

5.3.1 on GitHub

- Fix segfault when performing code completion on Qt6.
- Fix mixed input and print statements.
- Fix switching syntax highlighting styles on PySide2 and PySide6.

3.2.3 5.3.0

5.3.0 on GitHub

Additions

- Add support for PyQt6.

Changes

- Don't show spurious blank lines when running input statements.
- Fix showing Latex images with dark background colors.
- Drop support for Python 3.6

3.3 5.2

3.3.1 5.2.2

5.2.2 on GitHub

- Fix implicit int to float conversion for Python 3.10 compatibility.
- Fix building documentation in ReadTheDocs.

3.3.2 5.2.1

5.2.1 on GitHub

- Fix error when deleting CallTipWidget.
- Another fix for the 'Erase in Line' ANSI code.

3.3.3 5.2.0

5.2.0 on GitHub

Changes

- Fix hidden execution requests.
- Fix ANSI code for erase line.

3.4 5.1

3.4.1 5.1.1

5.1.1 on GitHub

- Improve handling of different keyboard combinations.
- Move cursor to the beginning of buffer if on the same line.

3.4.2 5.1.0

5.1.0 on GitHub

Additions

- Two new keyboard shortcuts: Ctrl + Up/Down to go to the beginning/end of the buffer.

Changes

- Monkeypatch RegexLexer only while in use by qtconsole.
- Import Empty from queue module.

3.5 5.0

3.5.1 5.0.3

5.0.3 on GitHub

- Emit kernel_restarted signal only after a kernel crash.

3.5.2 5.0.2

5.0.2 on GitHub

- Fix launching issue with Big Sur
- Remove partial prompt on copy

3.5.3 5.0.1

5.0.1 on GitHub

- Add python_requires to setup.py for Python 3.6+ compatibility

3.5.4 5.0.0

5.0.0 on GitHub

Additions

- Add option to set completion type while running.

Changes

- Emit kernel_restarted after restarting kernel.
- Drop support for Python 2.7 and 3.5.

3.6 4.7

3.6.1 4.7.7

4.7.7 on GitHub

- Change font width calculation to use horizontalAdvance

3.6.2 4.7.6

4.7.6 on GitHub

- Replace qApp with QApplication.instance().
- Fix QFontMetrics.width deprecation.

3.6.3 4.7.5

4.7.5 on GitHub

- Print input if there is no prompt.

3.6.4 4.7.4

4.7.4 on GitHub

- Fix completion widget text for paths and files.
- Make Qtconsole work on Python 3.8 and Windows.

3.6.5 4.7.3

4.7.3 on GitHub

- Fix all misuses of QtGui.

3.6.6 4.7.2

4.7.2 on GitHub

- Set updated prompt as previous prompt object in JupyterWidget.
- Fix some Qt incorrect imports.

3.6.7 4.7.1

4.7.1 on GitHub

- Remove common prefix from path completions.
- Use QtWidgets instead of QtGui to create QMenu instances.

3.6.8 4.7.0

4.7.0 on GitHub

Additions

- Use qtpy as the shim layer for Python Qt bindings and remove our own shim.

Changes

- Remove code to expand tabs to spaces.
- Skip history if it is the same as the input buffer.

3.7 4.6

3.7.1 4.6.0

4.6.0 on GitHub

Additions

- Add an option to configure scrollbar visibility.

Changes

- Avoid introducing a new line when executing code.

3.8 4.5

3.8.1 4.5.5

4.5.5 on GitHub

- Set console to read only after input.
- Allow text to be added before the prompt while autocompleting.
- Scroll when adding text even when not executing.

3.8.2 4.5.4

4.5.4 on GitHub

- Fix emoji highlighting.

3.8.3 4.5.3

4.5.3 on GitHub

- Fix error when closing comms.
- Fix prompt automatically scrolling down on execution.

3.8.4 4.5.2

4.5.2 on GitHub

- Remove deprecation warnings in Python 3.8
- Improve positioning and content of completion widget.
- Scroll down for output from remote commands.

3.8.5 4.5.1

4.5.1 on GitHub

- Only use setuptools in setup.py to fix uploading tarballs to PyPI.

3.8.6 4.5.0

4.5.0 on GitHub

Additions

- Add Comms to qtconsole.
- Add kernel language name as an attribute of JupyterWidget.

Changes

- Use new traitlets API with decorators.

3.9 4.4

3.9.1 4.4.4

4.4.4 on GitHub

- Prevent cursor from moving to the end of the line while debugging.

3.9.2 4.4.3

4.4.3 on GitHub

- Fix complete statements check inside indented block for Python after the IPython 7 release.
- Improve auto-scrolling during execution.

3.9.3 4.4.2

4.4.2 on GitHub

- Fix incompatibility with PyQt5 5.11.

3.9.4 4.4.1

4.4.1 on GitHub

- Fix setting width and height when displaying images with IPython's Image.
- Avoid displaying errors when using Matplotlib to generate pngs from Latex.

3.9.5 4.4.0

4.4.0 on GitHub

Additions

- `Control-D` enters an EOT character if kernel is executing and input is empty.
- Implement block indent on multiline selection with `Tab`.
- Change the syntax highlighting style used in the console at any time. It can be done in the menu `View > Syntax Style`.

Changes

- Change `Control-Shift-A` to select cell contents first.
- Change default tab width to 4 spaces.
- Enhance handling of input from other clients.
- Don't block the console when the kernel is asked for completions.

Fixes

- Fix bug that make PySide2 a forbidden binding.
- Fix IndexError when copying prompts.
- Fix behavior of right arrow key.
- Fix behavior of `Control-Backspace` and `Control-Del`

3.10 4.3

3.10.1 4.3.1

4.3.1 on GitHub

- Make %clear to delete previous output on Windows.
- Fix SVG rendering.

3.10.2 4.3.0

4.3 on GitHub

Additions

- Add `Shift-Tab` shortcut to unindent text
- Add `Control-R` shortcut to rename the current tab
- Add `Alt-R` shortcut to set the main window title
- Add `Command-Alt-Left` and `Command-Alt-Right` shortcut to switch tabs on macOS
- Add support for PySide2
- Add support for Python 3.5
- Add support for 24 bit ANSI color codes
- Add option to create new tab connected to the existing kernel

Changes

- Rename `ConsoleWidget.width/height` traits to `console_width/console_height` to avoid a name clash with the `QWidget` properties. Note: the name change could be, in rare cases if a name collision exists, a code-breaking change.
- Change `Tab` key behavior to always indent to the next increment of 4 spaces
- Change `Home` key behavior to alternate cursor between the beginning of text (ignoring leading spaces) and beginning of the line
- Improve documentation of various options and clarified the docs in some places
- Move documentation to ReadTheDocs

Fixes

- Fix automatic indentation of new lines that are inserted in the middle of a cell
- Fix regression where prompt would never be shown for `--existing` consoles
- Fix `python.exe -m qtconsole` on Windows
- Fix showing error messages when running a script using `%run`
- Fix `invalid cursor position` error and subsequent freezing of user input
- Fix syntax coloring when attaching to non-IPython kernels
- Fix printing when using QT5
- Fix `Control-K` shortcut (delete until end of line) on macOS
- Fix history browsing (`Up`/`Down` keys) when lines are longer than the terminal width
- Fix saving HTML with inline PNG for Python 3
- Various internal bugfixes

3.11 4.2

4.2 on GitHub

- various latex display fixes
- improvements for embedding in Qt applications (use existing Qt API if one is already loaded)

3.12 4.1

3.12.1 4.1.1

4.1.1 on GitHub

- Set AppUserModelID for taskbar icon on Windows 7 and later

3.12.2 4.1.0

4.1 on GitHub

- fix regressions in copy/paste, completion
- fix issues with inprocess IPython kernel
- fix `jupyter qtconsole --generate-config`

3.13 4.0

3.13.1 4.0.1

- fix installation issues, including setuptools entrypoints for Windows
- Qt5 fixes

3.13.2 4.0.0

4.0 on GitHub

First release of the Qt console as a standalone package.

CHAPTER

FOUR

OVERVIEW

The Qt console is a very lightweight application that largely feels like a terminal, but provides a number of enhancements only possible in a GUI, such as inline figures, proper multi-line editing with syntax highlighting, graphical calltips, and much more. The Qt console can use any Jupyter kernel.

The Qt console frontend has hand-coded emacs-style bindings for text navigation. This is not yet configurable.

Tip: Since the Qt console tries hard to behave like a terminal, by default it immediately executes single lines of input that are complete. If you want to force multi-line input, hit `Ctrl-Enter` at the end of the first line instead of `Enter`, and it will open a new line for input. At any point in a multi-line block, you can force its execution (without having to go to the bottom) with `Shift-Enter`.

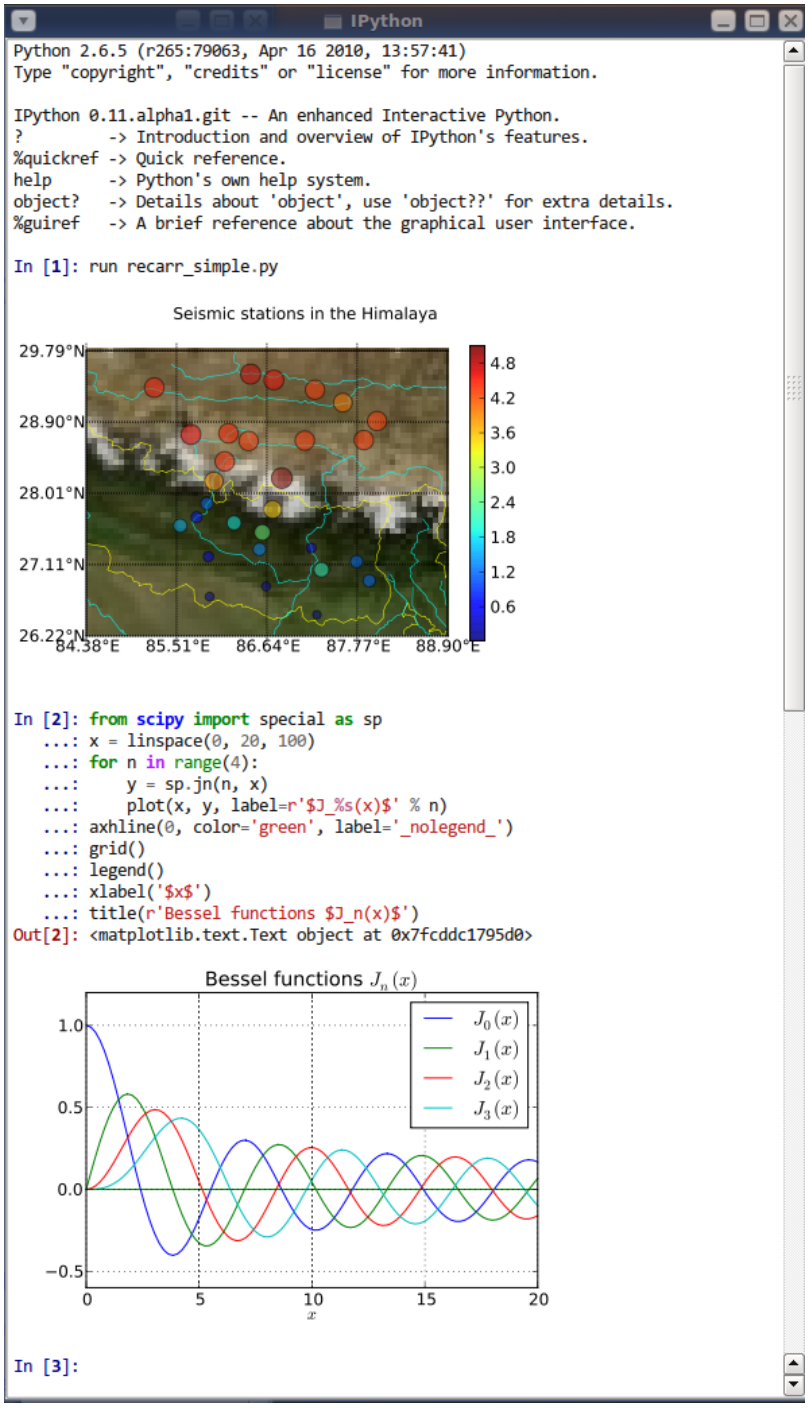


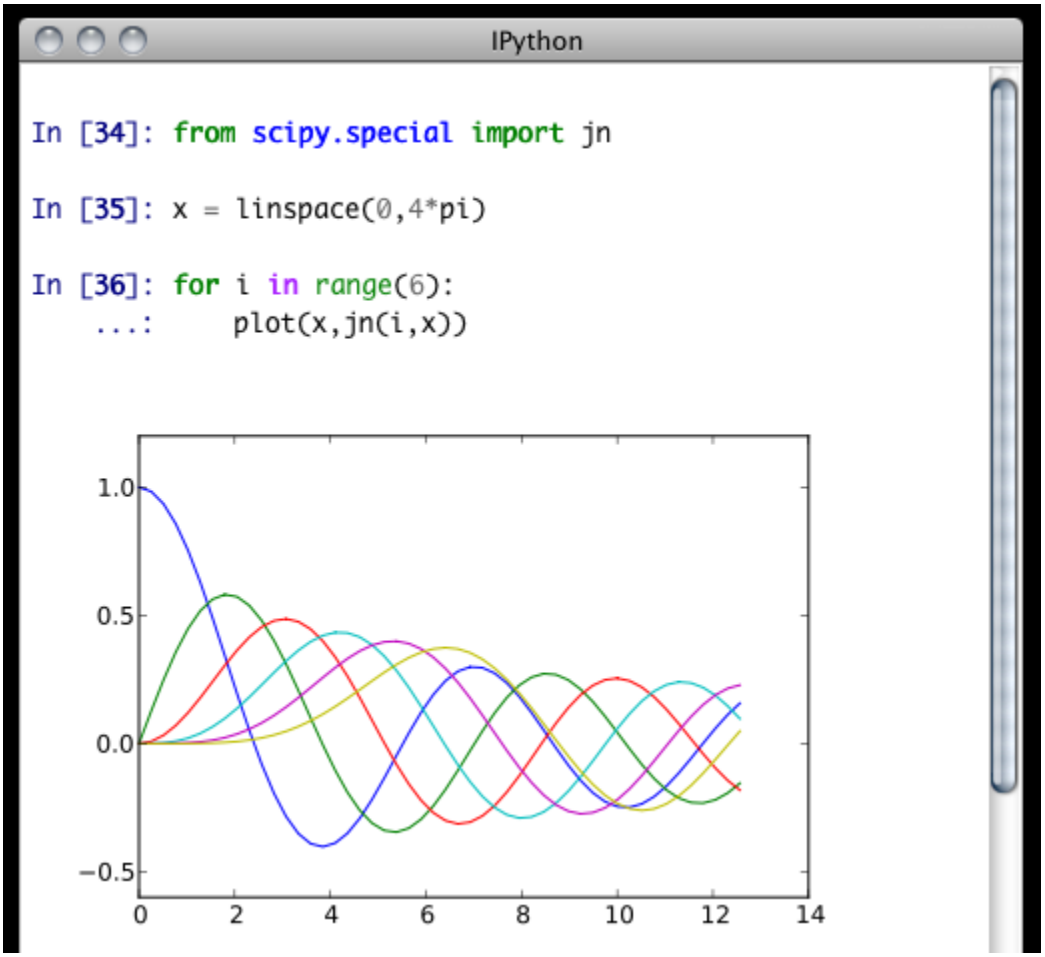
Fig. 1: The Qt console with IPython, using inline matplotlib plots.

CHAPTER

FIVE

INLINE GRAPHICS

One of the most exciting features of the Qt Console is embedded figures. You can plot with matplotlib in IPython, or the plotting library of choice in your kernel.



CHAPTER

SIX

SAVING AND PRINTING

The Qt Console has the ability to save your current session, as either HTML or XHTML. Your inline figures will be PNG in HTML, or inlined as SVG in XHTML. PNG images have the option to be either in an external folder, as in many browsers' "Webpage, Complete" option, or inlined as well, for a larger, but more portable file.

Note: Export to SVG+XHTML requires that you are using SVG figures, which is *not* the default. To switch the inline figure format in IPython to use SVG, do:

```
In [10]: %config InlineBackend.figure_format = 'svg'
```

Or, you can add the same line (c.Inline… instead of %config Inline…) to your config files.

This will only affect figures plotted after making this call

The widget also exposes the ability to print directly, via the default print shortcut or context menu.

See these examples of `png/html` and `svg/xhtml` output. Note that syntax highlighting does not survive export. This is a known issue, and is being investigated.

CHAPTER

SEVEN

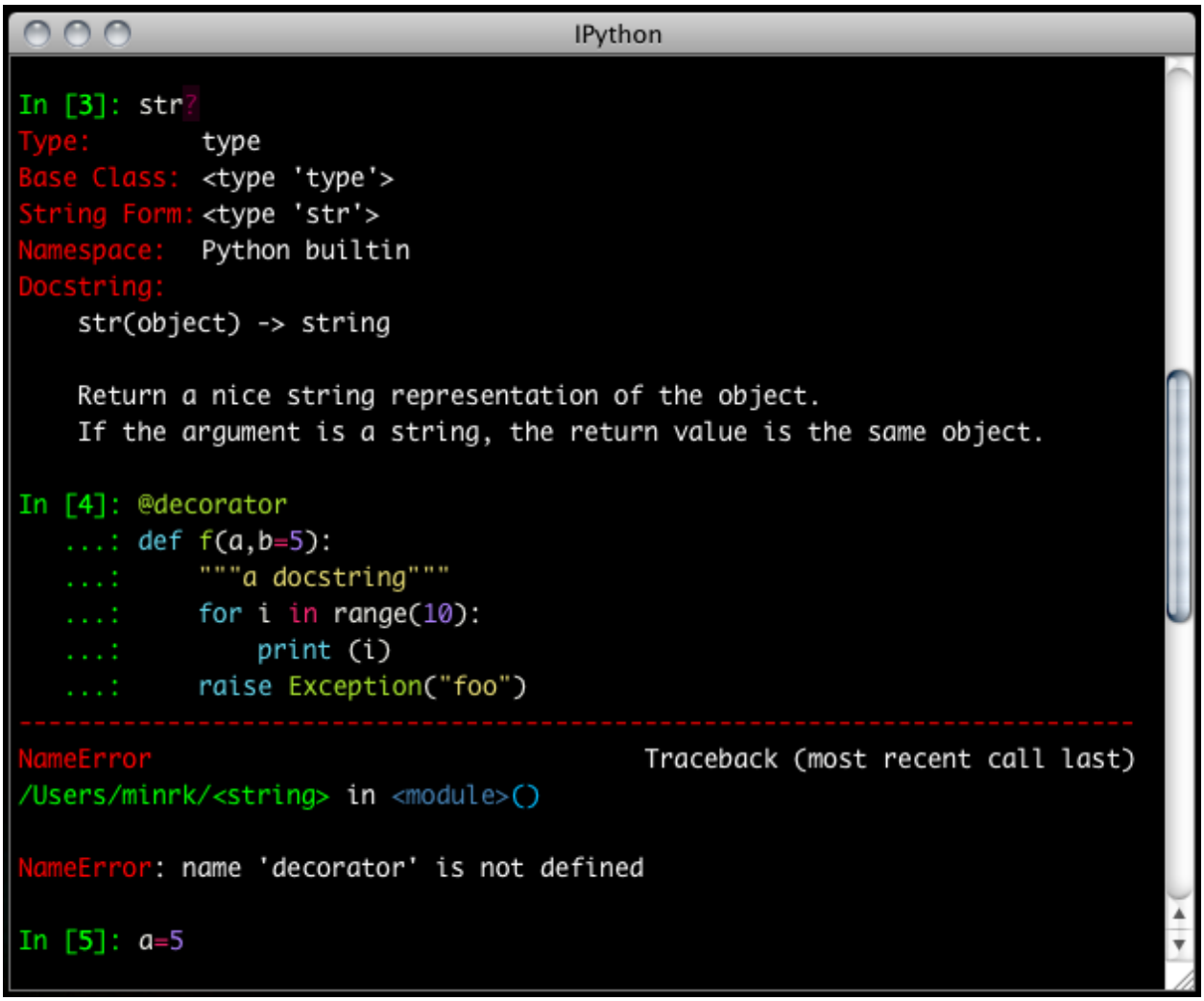
COLORS AND HIGHLIGHTING

Terminal IPython has always had some coloring, but never syntax highlighting. There are a few simple color choices, specified by the `colors` flag or `%colors` magic:

- LightBG for light backgrounds
- Linux for dark backgrounds
- NoColor for a simple colorless terminal

The Qt widget, however, has full syntax highlighting as you type, handled by the pygments library. The `style` argument exposes access to any style by name that can be found by pygments, and there are several already installed.

Screenshot of `jupyter qtconsole --style monokai`, which uses the 'monokai' theme:



Note: Calling `jupyter qtconsole -h` will show all the style names that pygments can find on your system.

You can also pass the filename of a custom CSS stylesheet, if you want to do your own coloring, via the `stylesheet` argument. The default LightBG stylesheet:

```
QPlainTextEdit, QTextEdit { background-color: white;
        color: black ;
        selection-background-color: #ccc}
.error { color: red; }
.in-prompt { color: navy; }
.in-prompt-number { font-weight: bold; }
.out-prompt { color: darkred; }
.out-prompt-number { font-weight: bold; }
/* .inverted is used to highlight selected completion */
.inverted { background-color: black ; color: white; }
```

CHAPTER

EIGHT

FONTS

The Qt console is configurable via the ConsoleWidget. To change these, set the `font_family` or `font_size` traits of the ConsoleWidget. For instance, to use 9pt Anonymous Pro:

```
$> jupyter qtconsole --ConsoleWidget.font_family="Anonymous Pro" --ConsoleWidget.font_
↪size=9
```

CHAPTER

NINE

PROCESS MANAGEMENT

With the two-process ZMQ model, the frontend does not block input during execution. This means that actions can be taken by the frontend while the Kernel is executing, or even after it crashes. The most basic such command is via 'Ctrl-.', which restarts the kernel. This can be done in the middle of a blocking execution. The frontend can also know, via a heartbeat mechanism, that the kernel has died. This means that the frontend can safely restart the kernel.

9.1 Multiple Consoles

Since the Kernel listens on the network, multiple frontends can connect to it. These do not have to all be qt frontends - any Jupyter frontend can connect and run code.

Other frontends can connect to your kernel, and share in the execution. This is great for collaboration. The `--existing` flag means connect to a kernel that already exists. Starting other consoles with that flag will not try to start their own kernel, but rather connect to yours. `kernel-12345.json` is a small JSON file with the ip, port, and authentication information necessary to connect to your kernel. By default, this file will be in your Jupyter runtime directory. If it is somewhere else, you will need to use the full path of the connection file, rather than just its filename.

If you need to find the connection info to send, and don't know where your connection file lives, there are a couple of ways to get it. If you are already running a console connected to an IPython kernel, you can use the `%connect_info` magic to display the information necessary to connect another frontend to the kernel.

```
In [2]: %connect_info
{
  "stdin_port":50255,
  "ip":"127.0.0.1",
  "hb_port":50256,
  "key":"70be6f0f-1564-4218-8cda-31be40a4d6aa",
  "shell_port":50253,
  "iopub_port":50254
}

Paste the above JSON into a file, and connect with:
    $> ipython <app> --existing <file>
or, if you are local, you can connect with just:
    $> ipython <app> --existing kernel-12345.json
or even just:
    $> ipython <app> --existing
if this is the most recent kernel you have started.
```

Otherwise, you can find a connection file by name (and optionally profile) with `jupyter_client.find_connection_file()`:

```
$> python -c "from jupyter_client import find_connection_file;\
print(find_connection_file('kernel-12345.json'))"
/home/you/Library/Jupyter/runtime/kernel-12345.json
```

9.2 Security

Warning: Since the ZMQ code currently has no encryption, listening on an external-facing IP is dangerous. You are giving any computer that can see you on the network the ability to connect to your kernel, and view your traffic. Read the rest of this section before listening on external ports or running a kernel on a shared machine.

By default (for security reasons), the kernel only listens on localhost, so you can only connect multiple frontends to the kernel from your local machine. You can specify to listen on an external interface by specifying the `ip` argument:

```
$> jupyter qtconsole --ip=192.168.1.123
```

If you specify the ip as 0.0.0.0 or '*', that means all interfaces, so any computer that can see yours on the network can connect to the kernel.

Messages are not encrypted, so users with access to the ports your kernel is using will be able to see any output of the kernel. They will **NOT** be able to issue shell commands as you due to message signatures.

Warning: If you disable message signatures, then any user with access to the ports your kernel is listening on can issue arbitrary code as you. **DO NOT** disable message signatures unless you have a lot of trust in your environment.

The one security feature Jupyter does provide is protection from unauthorized execution. Jupyter's messaging system will sign messages with HMAC digests using a shared-key. The key is never sent over the network, it is only used to generate a unique hash for each message, based on its content. When the kernel receives a message, it will check that the digest matches, and discard the message. You can use any file that only you have access to to generate this key, but the default is just to generate a new UUID.

9.3 SSH Tunnels

Sometimes you want to connect to machines across the internet, or just across a LAN that either doesn't permit open ports or you don't trust the other machines on the network. To do this, you can use SSH tunnels. SSH tunnels are a way to securely forward ports on your local machine to ports on another machine, to which you have SSH access.

In simple cases, Jupyter's tools can forward ports over ssh by simply adding the `--ssh=remote` argument to the usual `--existing...` set of flags for connecting to a running kernel, after copying the JSON connection file (or its contents) to the second computer.

Warning: Using SSH tunnels does *not* increase localhost security. In fact, when tunneling from one machine to another *both* machines have open ports on localhost available for connections to the kernel.

There are two primary models for using SSH tunnels with Jupyter. The first is to have the Kernel listen only on localhost, and connect to it from another machine on the same LAN.

First, let's start a kernel on machine **worker**, listening only on loopback:

```
user@worker $> ipython kernel
[IPKernelApp] To connect another client to this kernel, use:
[IPKernelApp] --existing kernel-12345.json
```

In this case, the IP that you would connect to would still be 127.0.0.1, but you want to specify the additional `--ssh` argument with the hostname of the kernel (in this example, it's 'worker'):

```
user@client $> jupyter qtconsole  --ssh=worker --existing /path/to/kernel-12345.json
```

Which will write a new connection file with the forwarded ports, so you can reuse them:

```
[JupyterQtConsoleApp] To connect another client via this tunnel, use:
[JupyterQtConsoleApp] --existing kernel-12345-ssh.json
```

Note again that this opens ports on the *client* machine that point to your kernel.

Note: the ssh argument is simply passed to openssh, so it can be fully specified `user@host:port` but it will also respect your aliases, etc. in `.ssh/config` if you have any.

The second pattern is for connecting to a machine behind a firewall across the internet (or otherwise wide network). This time, we have a machine **login** that you have ssh access to, which can see **kernel**, but **client** is on another network. The important difference now is that **client** can see **login**, but *not* **worker**. So we need to forward ports from client to worker *via* login. This means that the kernel must be started listening on external interfaces, so that its ports are visible to `login`:

```
user@worker $> ipython kernel --ip=0.0.0.0
[IPKernelApp] To connect another client to this kernel, use:
[IPKernelApp] --existing kernel-12345.json
```

Which we can connect to from the client with:

```
user@client $> jupyter qtconsole --ssh=login --ip=192.168.1.123 --existing /path/to/
↪kernel-12345.json
```

Note: The IP here is the address of worker as seen from *login*, and need only be specified if the kernel used the ambiguous 0.0.0.0 (all interfaces) address. If it had used 192.168.1.123 to start with, it would not be needed.

9.4 Manual SSH tunnels

It's possible that Jupyter's ssh helper functions won't work for you, for various reasons. You can still connect to remote machines, as long as you set up the tunnels yourself. The basic format of forwarding a local port to a remote one is:

```
[client] $> ssh <server> <localport>:<remoteip>:<remoteport> -f -N
```

This will forward local connections to **localport** on client to **remoteip:remoteport** *via* **server**. Note that remoteip is interpreted relative to *server*, not the client. So if you have direct ssh access to the machine to which you want to forward connections, then the server *is* the remote machine, and remoteip should be server's IP as seen from the server itself, i.e. 127.0.0.1. Thus, to forward local port 12345 to remote port 54321 on a machine you can see, do:

```
[client] $> ssh machine 12345:127.0.0.1:54321 -f -N
```

But if your target is actually on a LAN at 192.168.1.123, behind another machine called **login**, then you would do:

```
[client] $> ssh login 12345:192.168.1.16:54321 -f -N
```

The `-f -N` on the end are flags that tell ssh to run in the background, and don't actually run any commands beyond creating the tunnel.

See also:

A short discussion of ssh tunnels: http://www.revsys.com/writings/quicktips/ssh-tunnel.html

9.5 Stopping Kernels and Consoles

Since there can be many consoles per kernel, the shutdown mechanism and dialog are probably more complicated than you are used to. Since you don't always want to shutdown a kernel when you close a window, you are given the option to just close the console window or also close the Kernel and *all other windows*. Note that this only refers to all other *local* windows, as remote Consoles are not allowed to shutdown the kernel, and shutdowns do not close Remote consoles (to allow for saving, etc.).

Rules:

- Restarting the kernel automatically clears all *local* Consoles, and prompts remote Consoles about the reset.
- Shutdown closes all *local* Consoles, and notifies remotes that the Kernel has been shutdown.
- Remote Consoles may not restart or shutdown the kernel.

CHAPTER

TEN

QT AND THE REPL

Note: This section is relevant regardless of the frontend you use to write Qt Code. This section is mostly there as it is easy to get confused and assume that writing Qt code in the QtConsole should change from usual Qt code. It should not. If you get confused, take a step back, and try writing your code using the pure terminal based `jupyter console` that does not involve Qt.

An important part of working with the REPL – QtConsole, Jupyter notebook, IPython terminal – when you are writing your own Qt code is to remember that user code (in the kernel) is *not* in the same process as the frontend. This means that there is not necessarily any Qt code running in the kernel, and under most normal circumstances there isn't. This is true even if you are running the QtConsole.

Warning: When executing code from the qtconsole prompt, it is **not possible** to access the QtApplication instance of the QtConsole itself.

A common problem listed in the PyQt4 Gotchas is the fact that Python's garbage collection will destroy Qt objects (Windows, etc.) once there is no longer a Python reference to them, so you have to hold on to them. For instance, in:

```
from PyQt4 import QtGui

def make_window():
    win = QtGui.QMainWindow()

def make_and_return_window():
    win = QtGui.QMainWindow()
    return win
```

`make_window()` will never draw a window, because garbage collection will destroy it before it is drawn, whereas `make_and_return_window()` lets the caller decide when the window object should be destroyed. If, as a developer, you know that you always want your objects to last as long as the process, you can attach them to the `QApplication` instance itself:

```
from PyQt4 import QtGui, QtCore

# do this just once:
app = QtCore.QCoreApplication.instance()
if not app:
    # we are in the kernel in most of the case there is NO qt code running.
    # we need to create a Gui APP.
    app = QtGui.QApplication([])
```

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```
app.references = set()
# then when you create Windows, add them to the set
def make_window():
    win = QtGui.QMainWindow()
    app.references.add(win)
```

Now the `QApplication` itself holds a reference to `win`, so it will never be garbage collected until the application itself is destroyed.

10.1 Embedding the QtConsole in a Qt application

There are a few options to integrate the Jupyter Qt console with your own application:

- Use `qtconsole.rich_jupyter_widget.RichJupyterWidget` in your Qt application. This will embed the console widget in your GUI and start the kernel in a separate process, so code typed into the console cannot access objects in your application. See `examples/embed_qtconsole.py` for an example.
- Start an IPython kernel inside a PyQt application (ipkernel_qtapp.py in the `ipykernel` repository shows how to do this). Then launch the Qt console in a separate process to connect to it. This means that the console will be in a separate window from your application's UI, but the code entered by the user runs in your application.
- Start a special IPython kernel, the `ipykernel.inprocess.ipkernel.InProcessKernel`, which allows a QtConsole in the same process. See `examples/inprocess_qtconsole.py` for an example. This allows both the kernel and the console interface to be part of your application, but it is not well supported. We encourage you to use one of the above options instead if you can.

CHAPTER

ELEVEN

REGRESSIONS

There are some features, where the qt console lags behind the Terminal frontend:

- !cmd input: Due to our use of pexpect, we cannot pass input to subprocesses launched using the '!' escape, so you should never call a command that requires interactive input. For such cases, use the terminal IPython. This will not be fixed, as abandoning pexpect would significantly degrade the console experience.