prompt_toolkit Documentation

Release 3.0.38

Jonathan Slenders

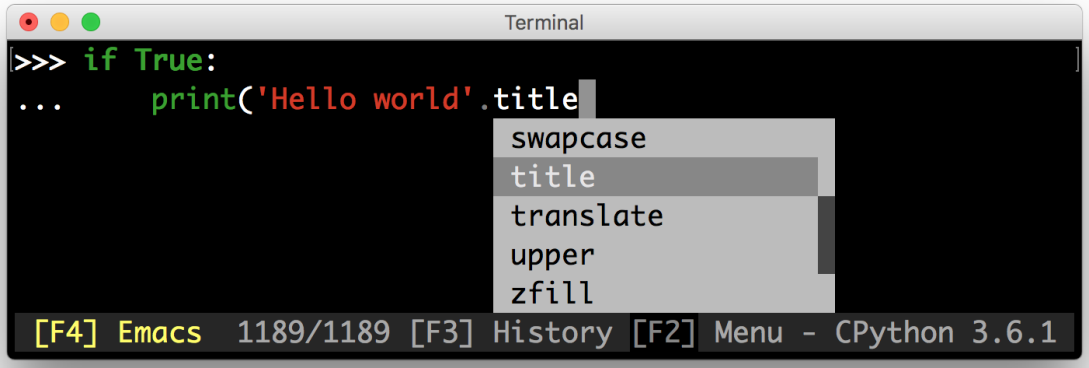
Feb 28, 2023

Contents

Warning: Notice that this is the prompt_toolkit 3.0 documentation. It is mostly compatible with the 2.0 branch. The difference is that prompt_toolkit 3.0 requires at least Python 3.6. On the plus side, it uses asyncio natively (rather than it's own event loop), and we have type annotations everywhere.

prompt_toolkit is a library for building powerful interactive command line and terminal applications in Python.

It can be a very advanced pure Python replacement for GNU readline, but it can also be used for building full screen applications.



Some features:

- Syntax highlighting of the input while typing. (For instance, with a Pygments lexer.)
- Multi-line input editing.
- Advanced code completion.
- Selecting text for copy/paste. (Both Emacs and Vi style.)
- Mouse support for cursor positioning and scrolling.
- Auto suggestions. (Like fish shell.)
- No global state.

Like readline:

- Both Emacs and Vi key bindings.
- Reverse and forward incremental search.
- Works well with Unicode double width characters. (Chinese input.)

Works everywhere:

- Pure Python. Runs on all Python versions starting at Python 3.6. (Python 2.6 - 3.x is supported in prompt_toolkit 2.0; not 3.0).
- Runs on Linux, OS X, OpenBSD and Windows systems.
- Lightweight, the only dependencies are Pygments and wcwidth.
- No assumptions about I/O are made. Every prompt_toolkit application should also run in a telnet/ssh server or an asyncio process.

Have a look at *the gallery* to get an idea of what is possible.

CHAPTER 1

Getting started

Go to *getting started* and build your first prompt. Issues are tracked on the Github project.

CHAPTER 2

Thanks to:

A special thanks to all the contributors for making prompt_toolkit possible.

Also, a special thanks to the Pygments and wcwidth libraries.

CHAPTER 3

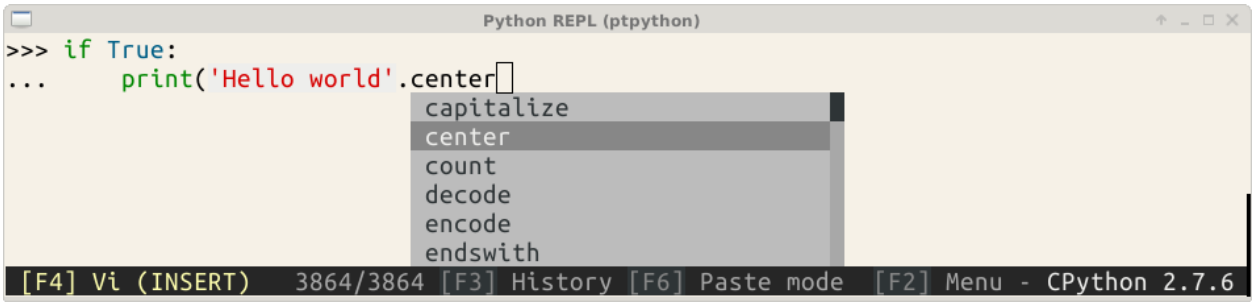
Table of contents

3.1 Gallery

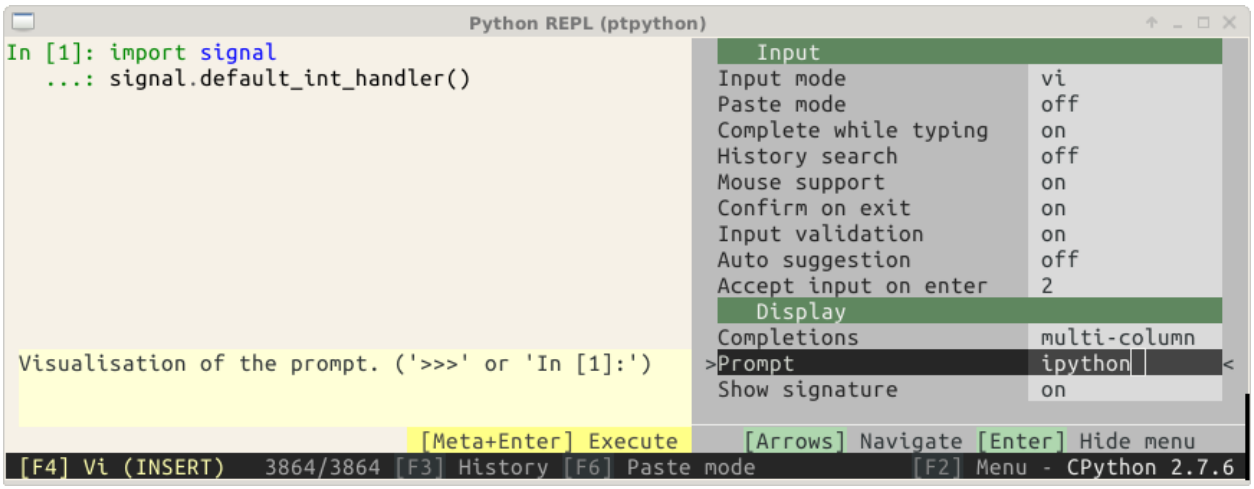
Showcase, demonstrating the possibilities of prompt_toolkit.

3.1.1 Ptpython, a Python REPL

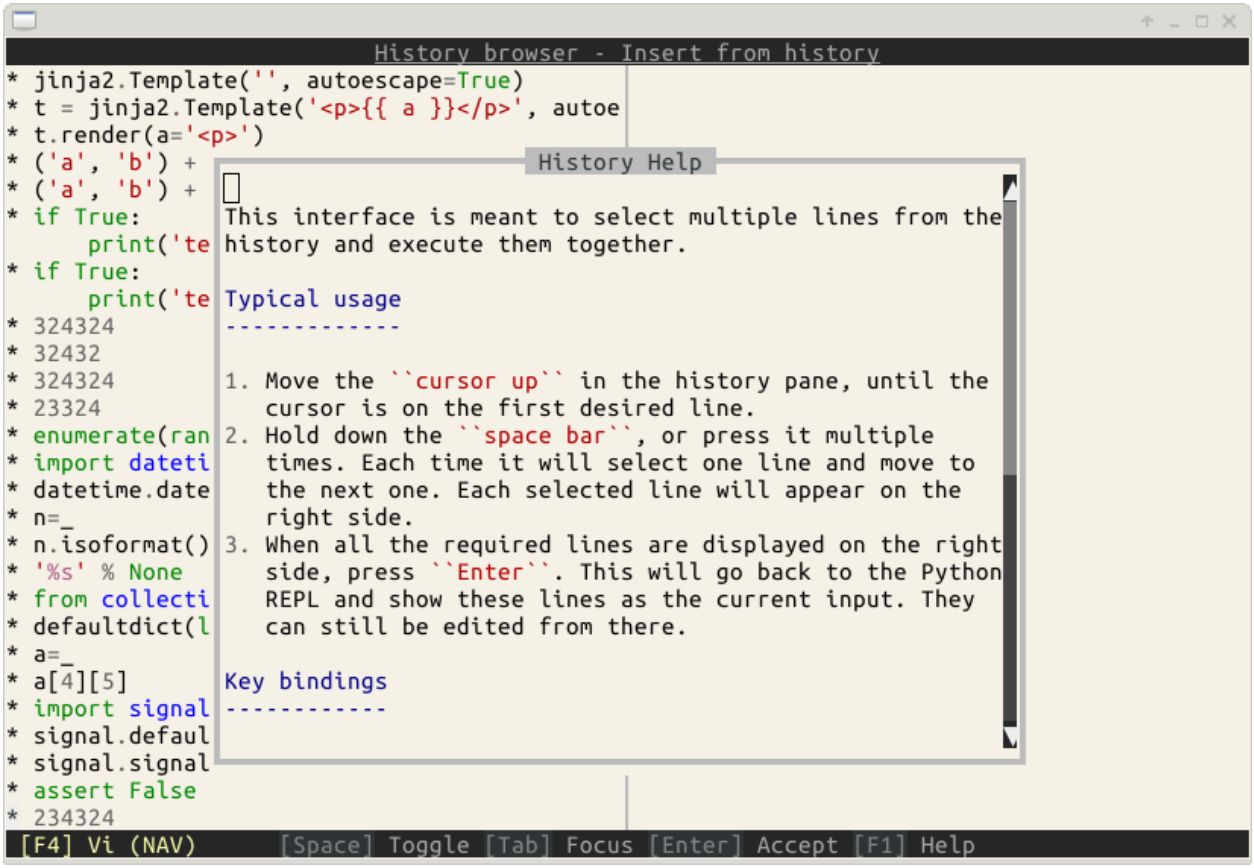
The prompt:



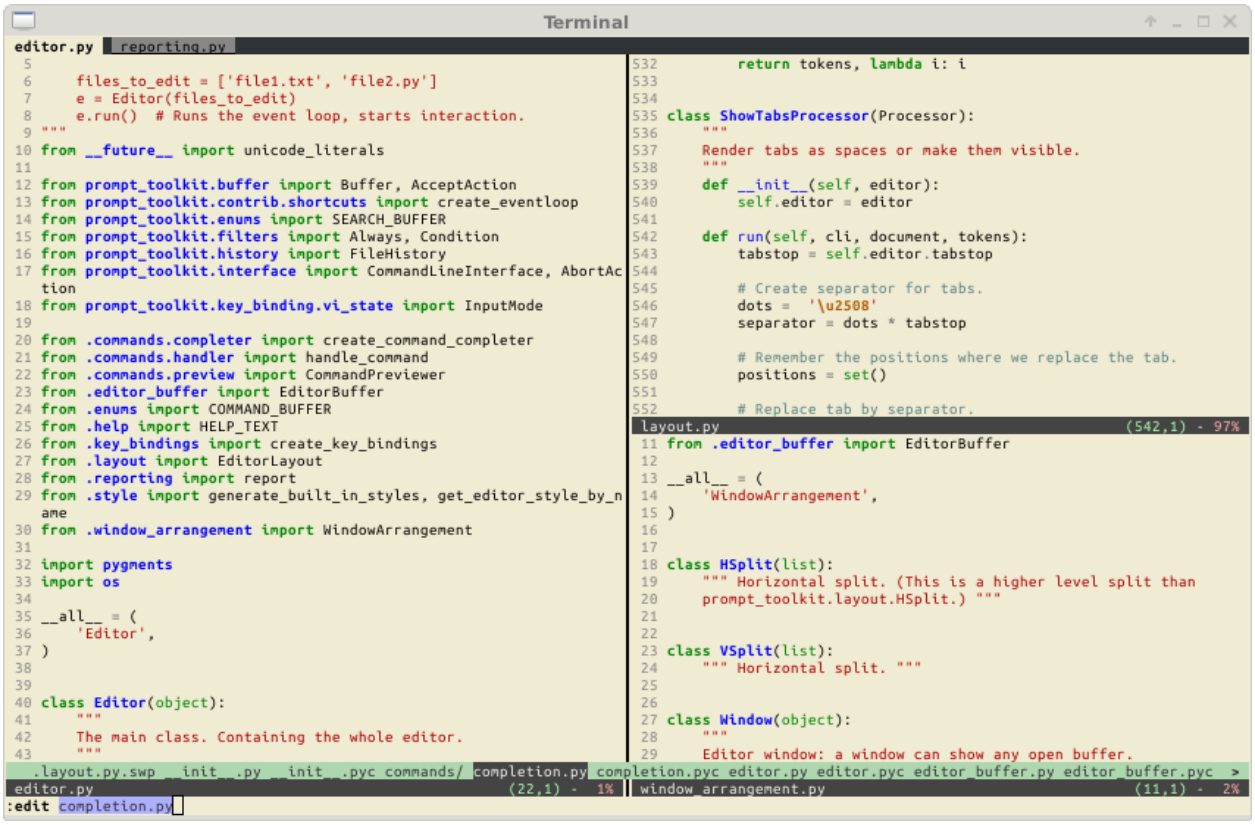
The configuration menu of ptpython.



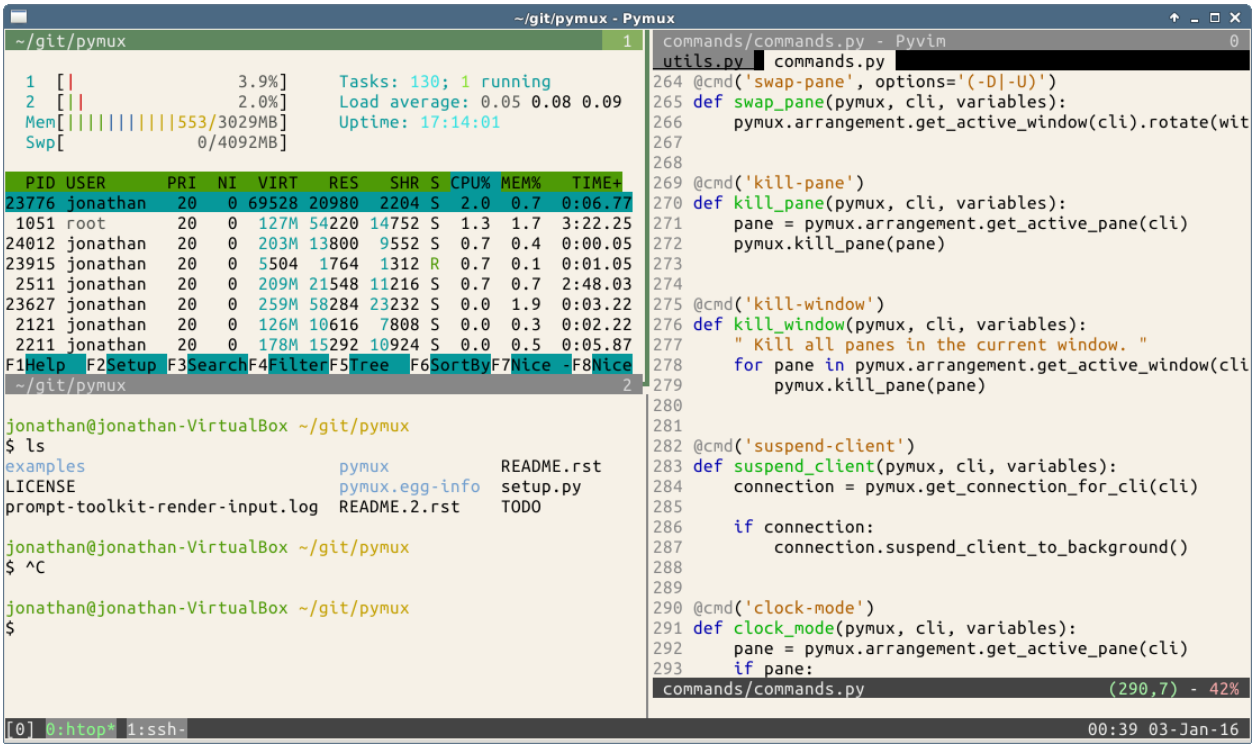
The history page with its help. (This is a full-screen layout.)



3.1.2 Pyvim, a Vim clone



3.1.3 Pymux, a terminal multiplexer (like tmux) in Python



3.2 Getting started

3.2.1 Installation

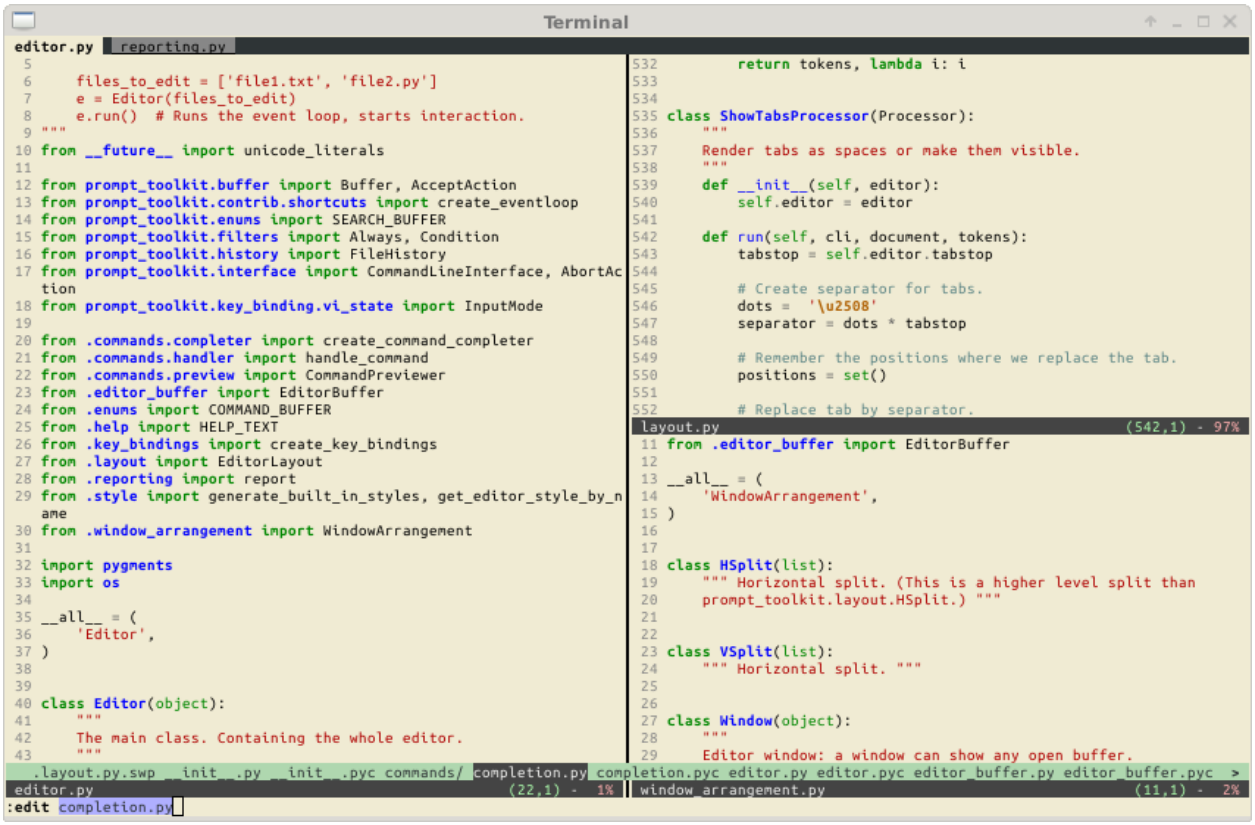
```
pip install prompt_toolkit
```

For Conda, do:

```
conda install -c https://conda.anaconda.org/conda-forge prompt_toolkit
```

3.2.2 Several use cases: prompts versus full screen terminal applications

prompt_toolkit was in the first place meant to be a replacement for readline. However, when it became more mature, we realised that all the components for full screen applications are there and *prompt_toolkit* is very capable of handling many use situations. Pyvim and pymux are examples of full screen applications.



Basically, at the core, *prompt_toolkit* has a layout engine, that supports horizontal and vertical splits as well as floats, where each "window" can display a user control. The API for user controls is simple yet powerful.

When *prompt_toolkit* is used as a readline replacement, (to simply read some input from the user), it uses a rather simple built-in layout. One that displays the default input buffer and the prompt, a float for the autocompletions and a toolbar for input validation which is hidden by default.

For full screen applications, usually we build a custom layout ourselves.

Further, there is a very flexible key binding system that can be programmed for all the needs of full screen applications.

3.2.3 A simple prompt

The following snippet is the most simple example, it uses the `prompt()` function to asks the user for input and returns the text. Just like `(raw_)input`.

```
from prompt_toolkit import prompt

text = prompt('Give me some input: ')
print('You said: %s' % text)
```

3.2.4 Learning *prompt_toolkit*

In order to learn and understand *prompt_toolkit*, it is best to go through the all sections in the order below. Also don't forget to have a look at all the examples in the repository.

- First, *learn how to print text*. This is important, because it covers how to use "formatted text", which is something you'll use whenever you want to use colors anywhere.

- Secondly, go through the *asking for input* section. This is useful for almost any use case, even for full screen applications. It covers autocompletions, syntax highlighting, key bindings, and so on.
- Then, learn about *Dialogs*, which is easy and fun.
- Finally, learn about *full screen applications* and read through *the advanced topics*.

3.3 Upgrading

3.3.1 Upgrading to prompt_toolkit 2.0

Prompt_toolkit 2.0 is not compatible with 1.0, however you probably want to upgrade your applications. This page explains why we have these differences and how to upgrade.

If you experience some difficulties or you feel that some information is missing from this page, don't hesitate to open a GitHub issue for help.

Why all these breaking changes?

After more and more custom prompt_toolkit applications were developed, it became clear that prompt_toolkit 1.0 was not flexible enough for certain use cases. Mostly, the development of full screen applications was not really natural. All the important components, like the rendering, key bindings, input and output handling were present, but the API was in the first place designed for simple command line prompts. This was mostly notably in the following two places:

- First, there was the focus which was always pointing to a `Buffer` (or text input widget), but in full screen applications there are other widgets, like menus and buttons which can be focused.
- And secondly, it was impossible to make reusable UI components. All the key bindings for the entire applications were stored together in one `KeyBindings` object, and similar, all `Buffer` objects were stored together in one dictionary. This didn't work well. You want reusable components to define their own key bindings and everything. It's the idea of encapsulation.

For simple prompts, the changes wouldn't be that invasive, but given that there would be some, I took the opportunity to fix a couple of other things. For instance:

- In prompt_toolkit 1.0, we translated \r into \n during the input processing. This was not a good idea, because some people wanted to handle these keys individually. This makes sense if you keep in mind that they correspond to *Control-M* and *Control-J*. However, we couldn't fix this without breaking everyone's enter key, which happens to be the most important key in prompts.

Given that we were going to break compatibility anyway, we changed a couple of other important things that effect both simple prompt applications and full screen applications. These are the most important:

- We no longer depend on Pygments for styling. While we like Pygments, it was not flexible enough to provide all the styling options that we need, and the Pygments tokens were not ideal for styling anything besides tokenized text.

  Instead we created something similar to CSS. All UI components can attach classnames to themselves, as well as define an inline style. The final style is then computed by combining the inline styles, the classnames and the style sheet.

  There are still adaptors available for using Pygments lexers as well as for Pygments styles.
- The way that key bindings were defined was too complex. `KeyBindingsManager` was too complex and no longer exists. Every set of key bindings is now a `KeyBindings` object and multiple of these can be merged together at any time. The runtime performance remains the same, but it's now easier for users.

- The separation between the `CommandLineInterface` and *`Application`* class was confusing and in the end, didn't really had an advantage. These two are now merged together in one *`Application`* class.
- We no longer pass around the active `CommandLineInterface`. This was one of the most annoying things. Key bindings need it in order to change anything and filters need it in order to evaluate their state. It was pretty annoying, especially because there was usually only one application active at a time. So, *`Application`* became a `TaskLocal`. That is like a global variable, but scoped in the current coroutine or context. The way this works is still not 100% correct, but good enough for the projects that need it (like Pymux), and hopefully Python will get support for this in the future thanks to PEP521, PEP550 or PEP555.

All of these changes have been tested for many months, and I can say with confidence that prompt_toolkit 2.0 is a better prompt_toolkit.

Some new features

Apart from the breaking changes above, there are also some exciting new features.

- We now support vt100 escape codes for Windows consoles on Windows 10. This means much faster rendering, and full color support.
- We have a concept of formatted text. This is an object that evaluates to styled text. Every input that expects some text, like the message in a prompt, or the text in a toolbar, can take any kind of formatted text as input. This means you can pass in a plain string, but also a list of *(style, text)* tuples (similar to a Pygments tokenized string), or an *`HTML`* object. This simplifies many APIs.
- New utilities were added. We now have function for printing formatted text and an experimental module for displaying progress bars.
- Autocompletion, input validation, and auto suggestion can now either be asynchronous or synchronous. By default they are synchronous, but by wrapping them in *`ThreadedCompleter`*, *`ThreadedValidator`* or *`ThreadedAutoSuggest`*, they will become asynchronous by running in a background thread.

  Further, if the autocompletion code runs in a background thread, we will show the completions as soon as they arrive. This means that the autocompletion algorithm could for instance first yield the most trivial completions and then take time to produce the completions that take more time.

Upgrading

More guidelines on how to upgrade will follow.

AbortAction has been removed

Prompt_toolkit 1.0 had an argument `abort_action` for both the `Application` class as well as for the `prompt` function. This has been removed. The recommended way to handle this now is by capturing `KeyboardInterrupt` and `EOFError` manually.

Calling *create_eventloop* usually not required anymore

Prompt_toolkit 2.0 will automatically create the appropriate event loop when it's needed for the first time. There is no need to create one and pass it around. If you want to run an application on top of asyncio (without using an executor), it still needs to be activated by calling `use_asyncio_event_loop()` at the beginning.

Pygments styles and tokens

prompt_toolkit 2.0 no longer depends on Pygments, but that definitely doesn't mean that you can't use any Pygments functionality anymore. The only difference is that Pygments stuff needs to be wrapped in an adaptor to make it compatible with the native prompt_toolkit objects.

- For instance, if you have a list of `(pygments.Token, text)` tuples for formatting, then this needs to be wrapped in a *PygmentsTokens* object. This is an adaptor that turns it into prompt_toolkit "formatted text". Feel free to keep using this.
- Pygments lexers need to be wrapped in a *PygmentsLexer*. This will convert the list of Pygments tokens into prompt_toolkit formatted text.
- If you have a Pygments style, then this needs to be converted as well. A Pygments style class can be converted in a prompt_toolkit *Style* with the `style_from_pygments_cls()` function (which used to be called `style_from_pygments`). A Pygments style dictionary can be converted using `style_from_pygments_dict()`.

  Multiple styles can be merged together using *merge_styles()*.

Wordcompleter

WordCompleter was moved from `prompt_toolkit.contrib.completers.base.WordCompleter` to `prompt_toolkit.completion.word_completer.WordCompleter`.

Asynchronous autocompletion

By default, prompt_toolkit 2.0 completion is now synchronous. If you still want asynchronous auto completion (which is often good thing), then you have to wrap the completer in a *ThreadedCompleter*.

Filters

We don't distiguish anymore between *CLIFilter* and *SimpleFilter*, because the application object is no longer passed around. This means that all filters are a *Filter* from now on.

All filters have been turned into functions. For instance, *IsDone* became *is_done* and *HasCompletions* became *has_completions*.

This was done because almost all classes were called without any arguments in the *__init__* causing additional braces everywhere. This means that *HasCompletions()* has to be replaced by *has_completions* (without parenthesis).

The few filters that took arguments as input, became functions, but still have to be called with the given arguments.

For new filters, it is recommended to use the *@Condition* decorator, rather then inheriting from *Filter*. For instance:

```
from prompt_toolkit.filters import Condition

@Condition
def my_filter();
    return True  # Or False
```

3.3.2 Upgrading to prompt_toolkit 3.0

There are two major changes in 3.0 to be aware of:

- First, prompt_toolkit uses the asyncio event loop natively, rather then using its own implementations of event loops. This means that all coroutines are now asyncio coroutines, and all Futures are asyncio futures. Asynchronous generators became real asynchronous generators as well.
- Prompt_toolkit uses type annotations (almost) everywhere. This should not break any code, but its very helpful in many ways.

There are some minor breaking changes:

- The dialogs API had to change (see below).

Detecting the prompt_toolkit version

Detecting whether version 3 is being used can be done as follows:

```
from prompt_toolkit import __version__ as ptk_version

PTK3 = ptk_version.startswith('3.')
```

Fixing calls to *get_event_loop*

Every usage of `get_event_loop` has to be fixed. An easy way to do this is by changing the imports like this:

```
if PTK3:
    from asyncio import get_event_loop
else:
    from prompt_toolkit.eventloop import get_event_loop
```

Notice that for prompt_toolkit 2.0, `get_event_loop` returns a prompt_toolkit `EventLoop` object. This is not an asyncio eventloop, but the API is similar.

There are some changes to the eventloop API:

version 2.0	version 3.0 (asyncio)
loop.run_in_executor(callback)	loop.run_in_executor(None, callback)
loop.call_from_executor(callback)	loop.call_soon_threadsafe(callback)

Running on top of asyncio

For 2.0, you had tell prompt_toolkit to run on top of the asyncio event loop. Now it's the default. So, you can simply remove the following two lines:

```
from prompt_toolkit.eventloop.defaults import use_asyncio_event_loop
use_asyncio_event_loop()
```

There is a few little breaking changes though. The following:

```
# For 2.0
result = await PromptSession().prompt('Say something: ', async_=True)
```

has to be changed into:

```
# For 3.0
result = await PromptSession().prompt_async('Say something: ')
```

Further, it's impossible to call the *prompt()* function within an asyncio application (within a coroutine), because it will try to run the event loop again. In that case, always use *prompt_async()*.

Changes to the dialog functions

The original way of using dialog boxes looked like this:

```
from prompt_toolkit.shortcuts import input_dialog

result = input_dialog(title='...', text='...')
```

Now, the dialog functions return a prompt_toolkit Application object. You have to call either its `run` or `run_async` method to display the dialog. The `async_` parameter has been removed everywhere.

```
if PTK3:
    result = input_dialog(title='...', text='...').run()
else:
    result = input_dialog(title='...', text='...')

# Or

if PTK3:
    result = await input_dialog(title='...', text='...').run_async()
else:
    result = await input_dialog(title='...', text='...', async_=True)
```

3.4 Printing (and using) formatted text

Prompt_toolkit ships with a *print_formatted_text()* function that's meant to be (as much as possible) compatible with the built-in print function, but on top of that, also supports colors and formatting.

On Linux systems, this will output VT100 escape sequences, while on Windows it will use Win32 API calls or VT100 sequences, depending on what is available.

Note: This page is also useful if you'd like to learn how to use formatting in other places, like in a prompt or a toolbar. Just like *print_formatted_text()* takes any kind of "formatted text" as input, prompts and toolbars also accept "formatted text".

3.4.1 Printing plain text

The print function can be imported as follows:

```
from prompt_toolkit import print_formatted_text

print_formatted_text('Hello world')
```

You can replace the built in `print` function as follows, if you want to.

```
from prompt_toolkit import print_formatted_text as print

print('Hello world')
```

Note: If you're using Python 2, make sure to add `from __future__ import print_function`. Otherwise, it will not be possible to import a function named `print`.

3.4.2 Formatted text

There are several ways to display colors:

- By creating an *HTML* object.
- By creating an *ANSI* object that contains ANSI escape sequences.
- By creating a list of `(style, text)` tuples.
- By creating a list of `(pygments.Token, text)` tuples, and wrapping it in *PygmentsTokens*.

An instance of any of these four kinds of objects is called "formatted text". There are various places in prompt toolkit, where we accept not just plain text (as a string), but also formatted text.

HTML

HTML can be used to indicate that a string contains HTML-like formatting. It recognizes the basic tags for bold, italic and underline: `<b>`, `<i>` and `<u>`.

```
from prompt_toolkit import print_formatted_text, HTML

print_formatted_text(HTML('<b>This is bold</b>'))
print_formatted_text(HTML('<i>This is italic</i>'))
print_formatted_text(HTML('<u>This is underlined</u>'))
```

Further, it's possible to use tags for foreground colors:

```
# Colors from the ANSI palette.
print_formatted_text(HTML('<ansired>This is red</ansired>'))
print_formatted_text(HTML('<ansigreen>This is green</ansigreen>'))

# Named colors (256 color palette, or true color, depending on the output).
print_formatted_text(HTML('<skyblue>This is sky blue</skyblue>'))
print_formatted_text(HTML('<seagreen>This is sea green</seagreen>'))
print_formatted_text(HTML('<violet>This is violet</violet>'))
```

Both foreground and background colors can also be specified setting the *fg* and *bg* attributes of any HTML tag:

```
# Colors from the ANSI palette.
print_formatted_text(HTML('<aaa fg="ansiwhite" bg="ansigreen">White on green</aaa>'))
```

Underneath, all HTML tags are mapped to classes from a stylesheet, so you can assign a style for a custom tag.

```
from prompt_toolkit import print_formatted_text, HTML
from prompt_toolkit.styles import Style

style = Style.from_dict({
    'aaa': '#ff0066',
    'bbb': '#44ff00 italic',
})
```

(continues on next page)

(continued from previous page)

```
print_formatted_text(HTML('<aaa>Hello</aaa> <bbb>world</bbb>!'), style=style)
```

ANSI

Some people like to use the VT100 ANSI escape sequences to generate output. Natively, this is however only supported on VT100 terminals, but prompt_toolkit can parse these, and map them to formatted text instances. This means that they will work on Windows as well. The *ANSI* class takes care of that.

```
from prompt_toolkit import print_formatted_text, ANSI

print_formatted_text(ANSI('\x1b[31mhello \x1b[32mworld'))
```

Keep in mind that even on a Linux VT100 terminal, the final output produced by prompt_toolkit, is not necessarily exactly the same. Depending on the color depth, it is possible that colors are mapped to different colors, and unknown tags will be removed.

(style, text) tuples

Internally, both *HTML* and *ANSI* objects are mapped to a list of `(style, text)` tuples. It is however also possible to create such a list manually with *FormattedText* class. This is a little more verbose, but it's probably the most powerful way of expressing formatted text.

```
from prompt_toolkit import print_formatted_text
from prompt_toolkit.formatted_text import FormattedText

text = FormattedText([
    ('#ff0066', 'Hello'),
    ('', ' '),
    ('#44ff00 italic', 'World'),
])

print_formatted_text(text)
```

Similar to the *HTML* example, it is also possible to use class names, and separate the styling in a style sheet.

```
from prompt_toolkit import print_formatted_text
from prompt_toolkit.formatted_text import FormattedText
from prompt_toolkit.styles import Style

# The text.
text = FormattedText([
    ('class:aaa', 'Hello'),
    ('', ' '),
    ('class:bbb', 'World'),
])

# The style sheet.
style = Style.from_dict({
    'aaa': '#ff0066',
    'bbb': '#44ff00 italic',
})

print_formatted_text(text, style=style)
```

Pygments (Token, text) tuples

When you have a list of Pygments (Token, text) tuples, then these can be printed by wrapping them in a *PygmentsTokens* object.

```
from pygments.token import Token
from prompt_toolkit import print_formatted_text
from prompt_toolkit.formatted_text import PygmentsTokens

text = [
    (Token.Keyword, 'print'),
    (Token.Punctuation, '('),
    (Token.Literal.String.Double, '"'),
    (Token.Literal.String.Double, 'hello'),
    (Token.Literal.String.Double, '"'),
    (Token.Punctuation, ')'),
    (Token.Text, '\n'),
]

print_formatted_text(PygmentsTokens(text))
```

Similarly, it is also possible to print the output of a Pygments lexer:

```
import pygments
from pygments.token import Token
from pygments.lexers.python import PythonLexer

from prompt_toolkit.formatted_text import PygmentsTokens
from prompt_toolkit import print_formatted_text

# Printing the output of a pygments lexer.
tokens = list(pygments.lex('print("Hello")', lexer=PythonLexer()))
print_formatted_text(PygmentsTokens(tokens))
```

Prompt_toolkit ships with a default colorscheme which styles it just like Pygments would do, but if you'd like to change the colors, keep in mind that Pygments tokens map to classnames like this:

pygments.Token	prompt_toolkit classname
• Token.Keyword • Token.Punctuation • Token.Literal.String.Double • Token.Text • Token	• "class:pygments.keyword" • "class:pygments.punctuation" • "class:pygments.literal.string.double" • "class:pygments.text" • "class:pygments"

A classname like pygments.literal.string.double is actually decomposed in the following four classnames: pygments, pygments.literal, pygments.literal.string and pygments.literal.string.double. The final style is computed by combining the style for these four classnames. So, changing the style from these Pygments tokens can be done as follows:

```
from prompt_toolkit.styles import Style

style = Style.from_dict({
    'pygments.keyword': 'underline',
```

(continues on next page)

(continued from previous page)

```
    'pygments.literal.string': 'bg:#00ff00 #ffffff',
})
print_formatted_text(PygmentsTokens(tokens), style=style)
```

to_formatted_text

A useful function to know about is *to_formatted_text()*. This ensures that the given input is valid formatted text. While doing so, an additional style can be applied as well.

```
from prompt_toolkit.formatted_text import to_formatted_text, HTML
from prompt_toolkit import print_formatted_text

html = HTML('<aaa>Hello</aaa> <bbb>world</bbb>!')
text = to_formatted_text(html, style='class:my_html bg:#00ff00 italic')

print_formatted_text(text)
```

3.5 Asking for input (prompts)

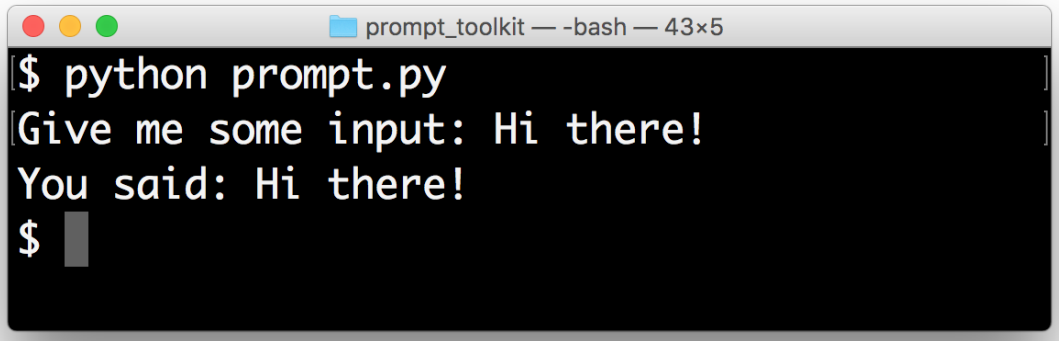
This page is about building prompts. Pieces of code that we can embed in a program for asking the user for input. Even if you want to use *prompt_toolkit* for building full screen terminal applications, it is probably still a good idea to read this first, before heading to the *building full screen applications* page.

In this page, we will cover autocompletion, syntax highlighting, key bindings, and so on.

3.5.1 Hello world

The following snippet is the most simple example, it uses the *prompt()* function to ask the user for input and returns the text. Just like `(raw_)input`.

```
from prompt_toolkit import prompt

text = prompt('Give me some input: ')
print('You said: %s' % text)
```



What we get here is a simple prompt that supports the Emacs key bindings like readline, but further nothing special. However, `prompt()` has a lot of configuration options. In the following sections, we will discover all these parameters.

3.5.2 The *PromptSession* object

Instead of calling the `prompt()` function, it's also possible to create a `PromptSession` instance followed by calling its `prompt()` method for every input call. This creates a kind of an input session.

```
from prompt_toolkit import PromptSession

# Create prompt object.
session = PromptSession()

# Do multiple input calls.
text1 = session.prompt()
text2 = session.prompt()
```

This has mainly two advantages:

- The input history will be kept between consecutive `prompt()` calls.
- The `PromptSession()` instance and its `prompt()` method take about the same arguments, like all the options described below (highlighting, completion, etc...). So if you want to ask for multiple inputs, but each input call needs about the same arguments, they can be passed to the `PromptSession()` instance as well, and they can be overridden by passing values to the `prompt()` method.

3.5.3 Syntax highlighting

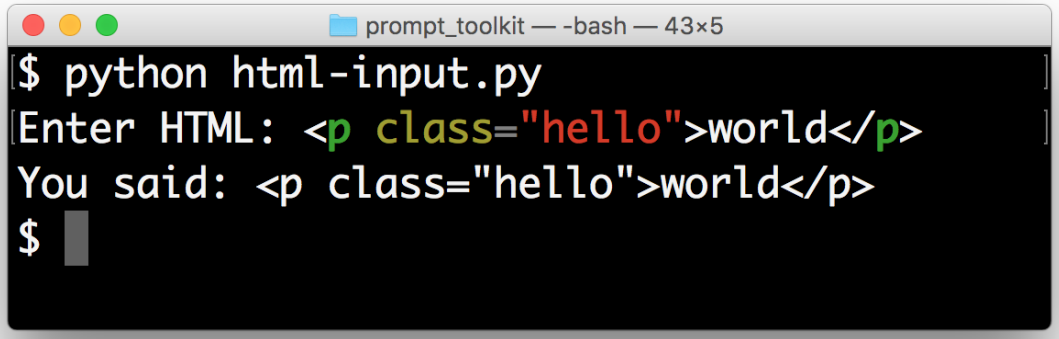
Adding syntax highlighting is as simple as adding a lexer. All of the Pygments lexers can be used after wrapping them in a `PygmentsLexer`. It is also possible to create a custom lexer by implementing the `Lexer` abstract base class.

```
from pygments.lexers.html import HtmlLexer
from prompt_toolkit.shortcuts import prompt
from prompt_toolkit.lexers import PygmentsLexer
```

(continues on next page)

(continued from previous page)

```
text = prompt('Enter HTML: ', lexer=PygmentsLexer(HtmlLexer))
print('You said: %s' % text)
```



The default Pygments colorscheme is included as part of the default style in prompt_toolkit. If you want to use another Pygments style along with the lexer, you can do the following:

```
from pygments.lexers.html import HtmlLexer
from pygments.styles import get_style_by_name
from prompt_toolkit.shortcuts import prompt
from prompt_toolkit.lexers import PygmentsLexer
from prompt_toolkit.styles.pygments import style_from_pygments_cls

style = style_from_pygments_cls(get_style_by_name('monokai'))
text = prompt('Enter HTML: ', lexer=PygmentsLexer(HtmlLexer), style=style,
              include_default_pygments_style=False)
print('You said: %s' % text)
```

We pass `include_default_pygments_style=False`, because otherwise, both styles will be merged, possibly giving slightly different colors in the outcome for cases where where our custom Pygments style doesn't specify a color.

3.5.4 Colors

The colors for syntax highlighting are defined by a *`Style`* instance. By default, a neutral built-in style is used, but any style instance can be passed to the *`prompt()`* function. A simple way to create a style, is by using the *`from_dict()`* function:

```
from pygments.lexers.html import HtmlLexer
from prompt_toolkit.shortcuts import prompt
from prompt_toolkit.styles import Style
from prompt_toolkit.lexers import PygmentsLexer

our_style = Style.from_dict({
    'pygments.comment':   '#888888 bold',
    'pygments.keyword':   '#ff88ff bold',
})
```

(continues on next page)

(continued from previous page)

```
text = prompt('Enter HTML: ', lexer=PygmentsLexer(HtmlLexer),
              style=our_style)
```

The style dictionary is very similar to the Pygments `styles` dictionary, with a few differences:

- The *roman*, *sans*, *mono* and *border* options are ignored.
- The style has a few additions: `blink`, `noblink`, `reverse` and `noreverse`.
- Colors can be in the `#ff0000` format, but they can be one of the built-in ANSI color names as well. In that case, they map directly to the 16 color palette of the terminal.

Read more about styling.

Using a Pygments style

All Pygments style classes can be used as well, when they are wrapped through *`style_from_pygments_cls()`*.

Suppose we'd like to use a Pygments style, for instance `pygments.styles.tango.TangoStyle`, that is possible like this:

```
from prompt_toolkit.shortcuts import prompt
from prompt_toolkit.styles import style_from_pygments_cls
from prompt_toolkit.lexers import PygmentsLexer
from pygments.styles.tango import TangoStyle
from pygments.lexers.html import HtmlLexer

tango_style = style_from_pygments_cls (TangoStyle)

text = prompt ('Enter HTML: ',
  lexer=PygmentsLexer(HtmlLexer),
  style=tango_style)
```

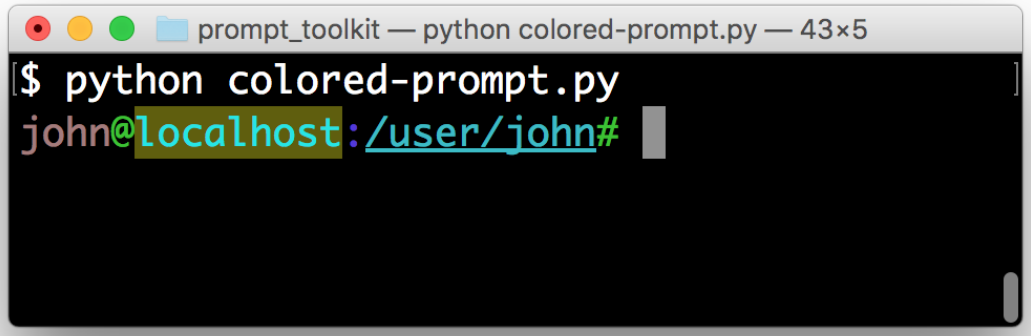
Creating a custom style could be done like this:

```
from prompt_toolkit.shortcuts import prompt
from prompt_toolkit.styles import Style, style_from_pygments_cls, merge_styles
from prompt_toolkit.lexers import PygmentsLexer

from pygments.styles.tango import TangoStyle
from pygments.lexers.html import HtmlLexer

our_style = merge_styles([
    style_from_pygments_cls(TangoStyle),
    Style.from_dict({
        'pygments.comment': '#888888 bold',
        'pygments.keyword': '#ff88ff bold',
    })
])

text = prompt('Enter HTML: ', lexer=PygmentsLexer(HtmlLexer),
              style=our_style)
```

Coloring the prompt itself

It is possible to add some colors to the prompt itself. For this, we need to build some *formatted text*. One way of doing this is by creating a list of style/text tuples. In the following example, we use class names to refer to the style.

```
from prompt_toolkit.shortcuts import prompt
from prompt_toolkit.styles import Style

style = Style.from_dict({
    # User input (default text).
    '':          '#ff0066',

    # Prompt.
    'username': '#884444',
    'at':       '#00aa00',
    'colon':    '#0000aa',
    'pound':    '#00aa00',
    'host':     '#00ffff bg:#444400',
    'path':     'ansicyan underline',
})

message = [
    ('class:username', 'john'),
    ('class:at',       '@'),
    ('class:host',     'localhost'),
    ('class:colon',    ':'),
    ('class:path',     '/user/john'),
    ('class:pound',    '# '),
]

text = prompt(message, style=style)
```



The *message* can be any kind of formatted text, as discussed *here*. It can also be a callable that returns some formatted text.

By default, colors are taken from the 256 color palette. If you want to have 24bit true color, this is possible by adding the `color_depth=ColorDepth.TRUE_COLOR` option to the `prompt()` function.

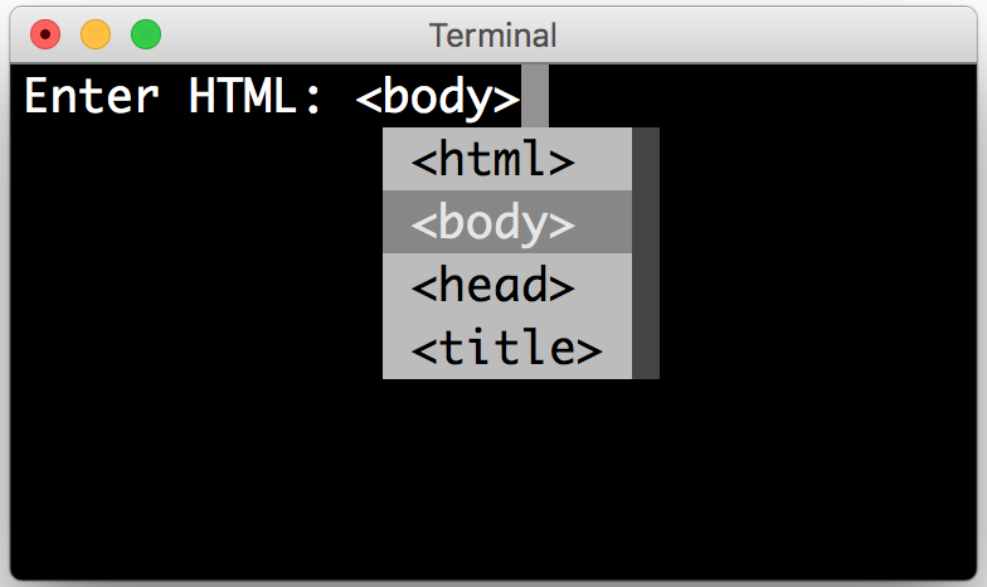
```
from prompt_toolkit.output import ColorDepth

text = prompt(message, style=style, color_depth=ColorDepth.TRUE_COLOR)
```

3.5.5 Autocompletion

Autocompletion can be added by passing a `completer` parameter. This should be an instance of the *Completer* abstract base class. *WordCompleter* is an example of a completer that implements that interface.

```
from prompt_toolkit import prompt
from prompt_toolkit.completion import WordCompleter

html_completer = WordCompleter(['<html>', '<body>', '<head>', '<title>'])
text = prompt('Enter HTML: ', completer=html_completer)
print('You said: %s' % text)
```

WordCompleter is a simple completer that completes the last word before the cursor with any of the given words.



Note: Note that in prompt_toolkit 2.0, the auto completion became synchronous. This means that if it takes a long time to compute the completions, that this will block the event loop and the input processing.

For heavy completion algorithms, it is recommended to wrap the completer in a *ThreadedCompleter* in order to run it in a background thread.

Nested completion

Sometimes you have a command line interface where the completion depends on the previous words from the input. Examples are the CLIs from routers and switches. A simple *WordCompleter* is not enough in that case. We want to to be able to define completions at multiple hierarchical levels. *NestedCompleter* solves this issue:

```
from prompt_toolkit import prompt
from prompt_toolkit.completion import NestedCompleter

completer = NestedCompleter.from_nested_dict({
    'show': {
        'version': None,
        'clock': None,
        'ip': {
            'interface': {'brief'}
        }
    },
    'exit': None,
})

text = prompt('# ', completer=completer)
print('You said: %s' % text)
```

Whenever there is a `None` value in the dictionary, it means that there is no further nested completion at that point. When all values of a dictionary would be `None`, it can also be replaced with a set.

A custom completer

For more complex examples, it makes sense to create a custom completer. For instance:

```
from prompt_toolkit import prompt
from prompt_toolkit.completion import Completer, Completion

class MyCustomCompleter(Completer):
    def get_completions(self, document, complete_event):
        yield Completion('completion', start_position=0)

text = prompt('> ', completer=MyCustomCompleter())
```

A *Completer* class has to implement a generator named *get_completions()* that takes a *Document* and yields the current *Completion* instances. Each completion contains a portion of text, and a position.

The position is used for fixing text before the cursor. Pressing the tab key could for instance turn parts of the input from lowercase to uppercase. This makes sense for a case insensitive completer. Or in case of a fuzzy completion, it could fix typos. When `start_position` is something negative, this amount of characters will be deleted and replaced.

Styling individual completions

Each completion can provide a custom style, which is used when it is rendered in the completion menu or toolbar. This is possible by passing a style to each *Completion* instance.

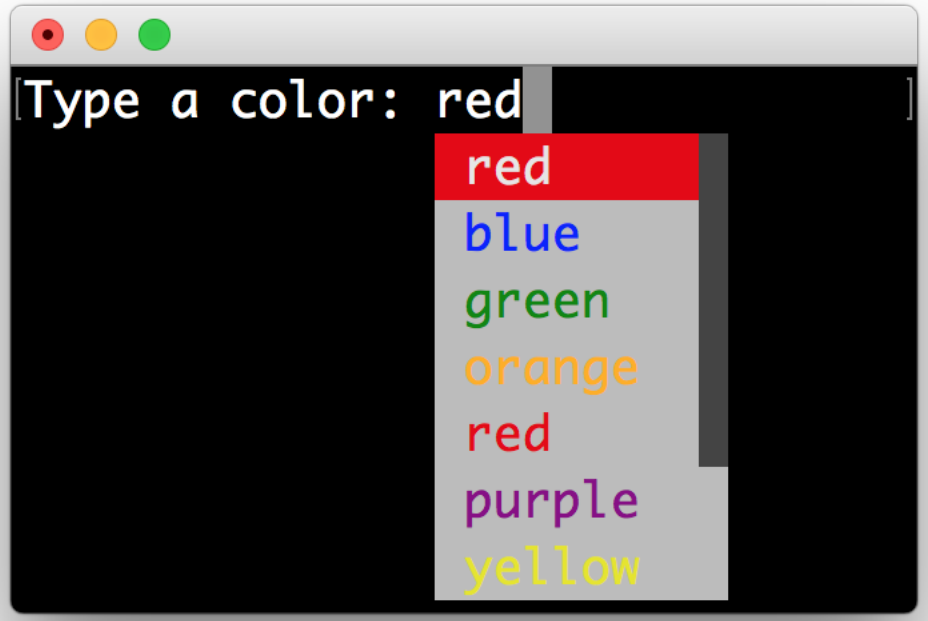
```
from prompt_toolkit.completion import Completer, Completion

class MyCustomCompleter(Completer):
```

(continues on next page)

(continued from previous page)

```
    def get_completions(self, document, complete_event):
        # Display this completion, black on yellow.
        yield Completion('completion1', start_position=0,
                         style='bg:ansiyellow fg:ansiblack')

        # Underline completion.
        yield Completion('completion2', start_position=0,
                         style='underline')

        # Specify class name, which will be looked up in the style sheet.
        yield Completion('completion3', start_position=0,
                         style='class:special-completion')
```

The "colorful-prompts.py" example uses completion styling:



Finally, it is possible to pass *formatted text* for the `display` attribute of a *`Completion`*. This provides all the freedom you need to display the text in any possible way. It can also be combined with the `style` attribute. For instance:

```
from prompt_toolkit.completion import Completer, Completion
from prompt_toolkit.formatted_text import HTML

class MyCustomCompleter(Completer):
    def get_completions(self, document, complete_event):
        yield Completion(
```

(continues on next page)

(continued from previous page)

```
            'completion1', start_position=0,
            display=HTML('<b>completion</b><ansired>1</ansired>'),
            style='bg:ansiyellow')
```

Fuzzy completion

If one possible completions is "django_migrations", a fuzzy completer would allow you to get this by typing "djm" only, a subset of characters for this string.

Prompt_toolkit ships with a *FuzzyCompleter* and *FuzzyWordCompleter* class. These provide the means for doing this kind of "fuzzy completion". The first one can take any completer instance and wrap it so that it becomes a fuzzy completer. The second one behaves like a *WordCompleter* wrapped into a *FuzzyCompleter*.

Complete while typing

Autcompletions can be generated automatically while typing or when the user presses the tab key. This can be configured with the `complete_while_typing` option:

```
text = prompt('Enter HTML: ', completer=my_completer,
              complete_while_typing=True)
```

Notice that this setting is incompatible with the `enable_history_search` option. The reason for this is that the up and down key bindings would conflict otherwise. So, make sure to disable history search for this.

Asynchronous completion

When generating the completions takes a lot of time, it's better to do this in a background thread. This is possible by wrapping the completer in a *ThreadedCompleter*, but also by passing the *complete_in_thread=True* argument.

```
text = prompt('> ', completer=MyCustomCompleter(), complete_in_thread=True)
```

3.5.6 Input validation

A prompt can have a validator attached. This is some code that will check whether the given input is acceptable and it will only return it if that's the case. Otherwise it will show an error message and move the cursor to a given position.

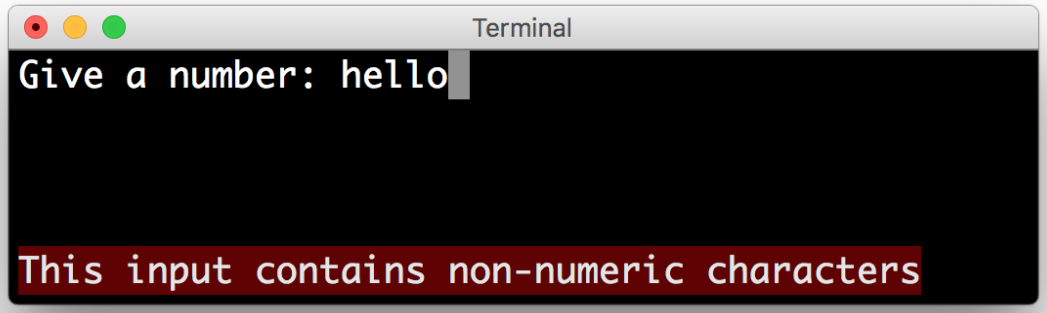
A validator should implements the *Validator* abstract base class. This requires only one method, named `validate` that takes a *Document* as input and raises *ValidationError* when the validation fails.

```
from prompt_toolkit.validation import Validator, ValidationError
from prompt_toolkit import prompt

class NumberValidator(Validator):
    def validate(self, document):
        text = document.text

        if text and not text.isdigit():
            i = 0

            # Get index of first non numeric character.
            # We want to move the cursor here.
```

(continues on next page)

(continued from previous page)

```
            for i, c in enumerate(text):
                if not c.isdigit():
                    break

            raise ValidationError(message='This input contains non-numeric characters
↪',
                                  cursor_position=i)

number = int(prompt('Give a number: ', validator=NumberValidator()))
print('You said: %i' % number)
```



By default, the input is validated in real-time while the user is typing, but prompt_toolkit can also validate after the user presses the enter key:

```
prompt('Give a number: ', validator=NumberValidator(),
       validate_while_typing=False)
```

If the input validation contains some heavy CPU intensive code, but you don't want to block the event loop, then it's recommended to wrap the validator class in a *ThreadedValidator*.

Validator from a callable

Instead of implementing the *Validator* abstract base class, it is also possible to start from a simple function and use the *from_callable()* classmethod. This is easier and sufficient for probably 90% of the validators. It looks as follows:

```
from prompt_toolkit.validation import Validator
from prompt_toolkit import prompt

def is_number(text):
    return text.isdigit()

validator = Validator.from_callable(
    is_number,
    error_message='This input contains non-numeric characters',
    move_cursor_to_end=True)
```

(continues on next page)

(continued from previous page)

```
number = int(prompt('Give a number: ', validator=validator))
print('You said: %i' % number)
```

We define a function that takes a string, and tells whether it's valid input or not by returning a boolean. *from_callable()* turns that into a *Validator* instance. Notice that setting the cursor position is not possible this way.

3.5.7 History

A *History* object keeps track of all the previously entered strings, so that the up-arrow can reveal previously entered items.

The recommended way is to use a *PromptSession*, which uses an *InMemoryHistory* for the entire session by default. The following example has a history out of the box:

```
from prompt_toolkit import PromptSession

session = PromptSession()

while True:
    session.prompt()
```

To persist a history to disk, use a *FileHistory* instead of the default *InMemoryHistory*. This history object can be passed either to a *PromptSession* or to the *prompt()* function. For instance:

```
from prompt_toolkit import PromptSession
from prompt_toolkit.history import FileHistory

session = PromptSession(history=FileHistory('~/.myhistory'))

while True:
    session.prompt()
```

3.5.8 Auto suggestion

Auto suggestion is a way to propose some input completions to the user like the fish shell.

Usually, the input is compared to the history and when there is another entry starting with the given text, the completion will be shown as gray text behind the current input. Pressing the right arrow → or `c-e` will insert this suggestion, `alt-f` will insert the first word of the suggestion.

Note: When suggestions are based on the history, don't forget to share one *History* object between consecutive *prompt()* calls. Using a *PromptSession* does this for you.

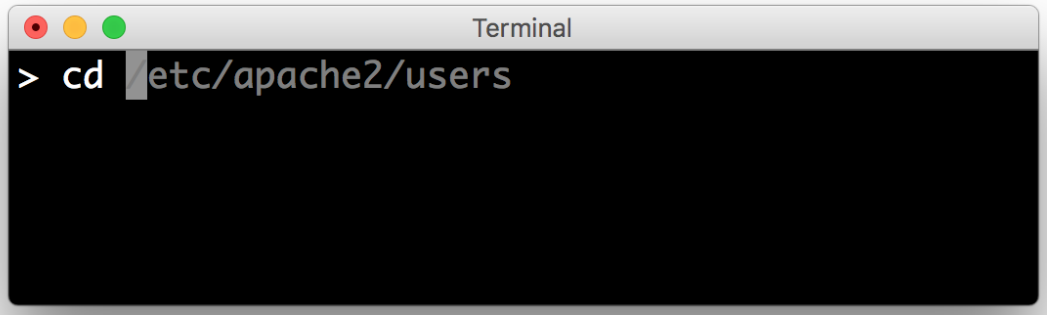
Example:

```
from prompt_toolkit import PromptSession
from prompt_toolkit.history import InMemoryHistory
from prompt_toolkit.auto_suggest import AutoSuggestFromHistory

session = PromptSession()

```

(continues on next page)

(continued from previous page)

```
while True:
    text = session.prompt('> ', auto_suggest=AutoSuggestFromHistory())
    print('You said: %s' % text)
```



A suggestion does not have to come from the history. Any implementation of the *AutoSuggest* abstract base class can be passed as an argument.

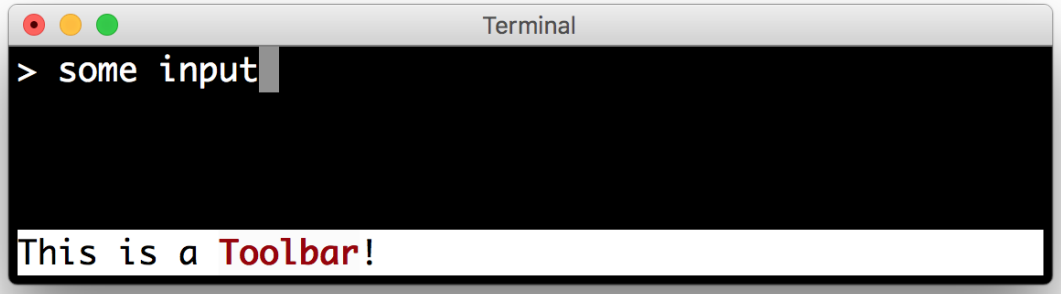
3.5.9 Adding a bottom toolbar

Adding a bottom toolbar is as easy as passing a `bottom_toolbar` argument to *prompt()*. This argument be either plain text, *formatted text* or a callable that returns plain or formatted text.

When a function is given, it will be called every time the prompt is rendered, so the bottom toolbar can be used to display dynamic information.

The toolbar is always erased when the prompt returns. Here we have an example of a callable that returns an *HTML* object. By default, the toolbar has the **reversed style**, which is why we are setting the background instead of the foreground.

```
from prompt_toolkit import prompt
from prompt_toolkit.formatted_text import HTML

def bottom_toolbar():
    return HTML('This is a <b><style bg="ansired">Toolbar</style></b>!')

text = prompt('> ', bottom_toolbar=bottom_toolbar)
print('You said: %s' % text)
```



Similar, we could use a list of style/text tuples.

```
from prompt_toolkit import prompt
from prompt_toolkit.styles import Style

def bottom_toolbar():
    return [('class:bottom-toolbar', ' This is a toolbar. ')]

style = Style.from_dict({
    'bottom-toolbar': '#ffffff bg:#333333',
})

text = prompt('> ', bottom_toolbar=bottom_toolbar, style=style)
print('You said: %s' % text)
```

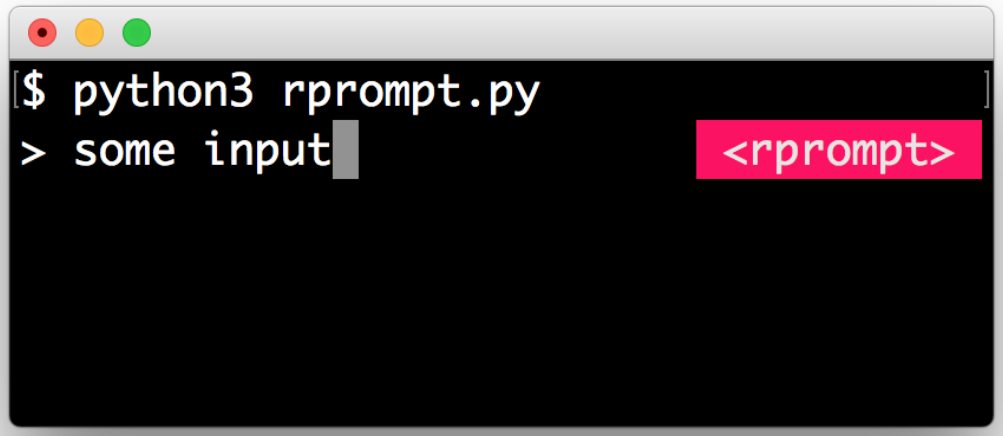
The default class name is `bottom-toolbar` and that will also be used to fill the background of the toolbar.

3.5.10 Adding a right prompt

The *prompt()* function has out of the box support for right prompts as well. People familiar to ZSH could recognise this as the *RPROMPT* option.

So, similar to adding a bottom toolbar, we can pass an `rprompt` argument. This can be either plain text, *formatted text* or a callable which returns either.

```
from prompt_toolkit import prompt
from prompt_toolkit.styles import Style

example_style = Style.from_dict({
    'rprompt': 'bg:#ff0066 #ffffff',
})

def get_rprompt():
    return '<rprompt>'

answer = prompt('> ', rprompt=get_rprompt, style=example_style)
```



The `get_rprompt` function can return any kind of formatted text such as *HTML*. it is also possible to pass text directly to the `rprompt` argument of the *prompt()* function. It does not have to be a callable.

3.5.11 Vi input mode

Prompt-toolkit supports both Emacs and Vi key bindings, similar to Readline. The *prompt()* function will use Emacs bindings by default. This is done because on most operating systems, also the Bash shell uses Emacs bindings by default, and that is more intuitive. If however, Vi binding are required, just pass `vi_mode=True`.

```
from prompt_toolkit import prompt

prompt('> ', vi_mode=True)
```

3.5.12 Adding custom key bindings

By default, every prompt already has a set of key bindings which implements the usual Vi or Emacs behaviour. We can extend this by passing another *KeyBindings* instance to the `key_bindings` argument of the *prompt()* function or the *PromptSession* class.

An example of a prompt that prints `'hello world'` when `Control-T` is pressed.

```
from prompt_toolkit import prompt
from prompt_toolkit.application import run_in_terminal
from prompt_toolkit.key_binding import KeyBindings

bindings = KeyBindings()

@bindings.add('c-t')
def _(event):
    " Say 'hello' when `c-t` is pressed. "
    def print_hello():
```

(continues on next page)

(continued from previous page)

```
        print('hello world')
    run_in_terminal(print_hello)

@bindings.add('c-x')
def _(event):
    " Exit when `c-x` is pressed. "
    event.app.exit()

text = prompt('> ', key_bindings=bindings)
print('You said: %s' % text)
```

Note that we use *`run_in_terminal()`* for the first key binding. This ensures that the output of the print-statement and the prompt don't mix up. If the key bindings doesn't print anything, then it can be handled directly without nesting functions.

Enable key bindings according to a condition

Often, some key bindings can be enabled or disabled according to a certain condition. For instance, the Emacs and Vi bindings will never be active at the same time, but it is possible to switch between Emacs and Vi bindings at run time.

In order to enable a key binding according to a certain condition, we have to pass it a *`Filter`*, usually a *`Condition`* instance. (*Read more about filters*.)

```
from prompt_toolkit import prompt
from prompt_toolkit.filters import Condition
from prompt_toolkit.key_binding import KeyBindings

bindings = KeyBindings()

@Condition
def is_active():
    " Only activate key binding on the second half of each minute. "
    return datetime.datetime.now().second > 30

@bindings.add('c-t', filter=is_active)
def _(event):
    # ...
    pass

prompt('> ', key_bindings=bindings)
```

Dynamically switch between Emacs and Vi mode

The *`Application`* has an `editing_mode` attribute. We can change the key bindings by changing this attribute from `EditingMode.VI` to `EditingMode.EMACS`.

```
from prompt_toolkit import prompt
from prompt_toolkit.application.current import get_app
from prompt_toolkit.enums import EditingMode
from prompt_toolkit.key_binding import KeyBindings

def run():
    # Create a set of key bindings.
    bindings = KeyBindings()
```

(continues on next page)

(continued from previous page)

```
    # Add an additional key binding for toggling this flag.
    @bindings.add('f4')
    def _(event):
        " Toggle between Emacs and Vi mode. "
        app = event.app

        if app.editing_mode == EditingMode.VI:
            app.editing_mode = EditingMode.EMACS
        else:
            app.editing_mode = EditingMode.VI

    # Add a toolbar at the bottom to display the current input mode.
    def bottom_toolbar():
        " Display the current input mode. "
        text = 'Vi' if get_app().editing_mode == EditingMode.VI else 'Emacs'
        return [
            ('class:toolbar', ' [F4] %s ' % text)
        ]

    prompt('> ', key_bindings=bindings, bottom_toolbar=bottom_toolbar)

run()
```

Read more about key bindings . . .

Using control-space for completion

An popular short cut that people sometimes use it to use control-space for opening the autocompletion menu instead of the tab key. This can be done with the following key binding.

```
kb = KeyBindings()

@kb.add('c-space')
def _(event):
    " Initialize autocompletion, or select the next completion. "
    buff = event.app.current_buffer
    if buff.complete_state:
        buff.complete_next()
    else:
        buff.start_completion(select_first=False)
```

3.5.13 Other prompt options

Multiline input

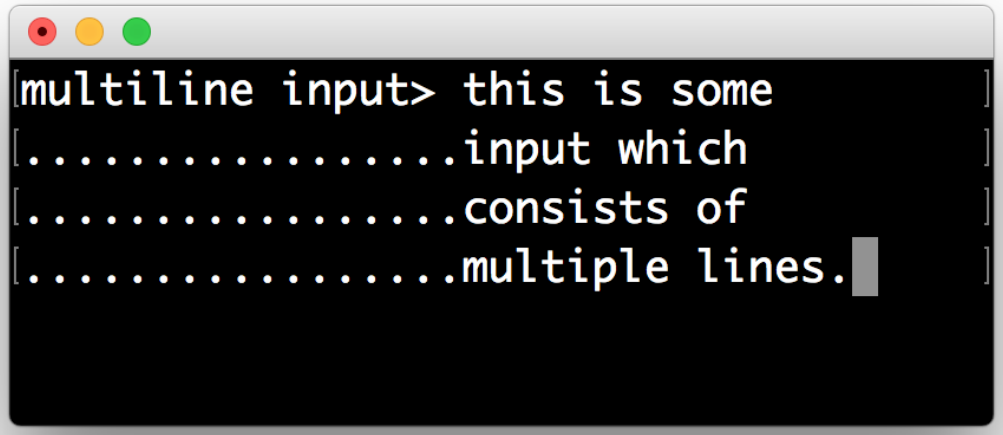
Reading multiline input is as easy as passing the `multiline=True` parameter.

```
from prompt_toolkit import prompt

prompt('> ', multiline=True)
```

A side effect of this is that the enter key will now insert a newline instead of accepting and returning the input. The user will now have to press `Meta+Enter` in order to accept the input. (Or `Escape` followed by `Enter`.)

It is possible to specify a continuation prompt. This works by passing a `prompt_continuation` callable to *`prompt()`*. This function is supposed to return *formatted text*, or a list of `(style, text)` tuples. The width of the returned text should not exceed the given width. (The width of the prompt margin is defined by the prompt.)

```
from prompt_toolkit import prompt

def prompt_continuation(width, line_number, is_soft_wrap):
    return '.' * width
    # Or: return [('', '.' * width)]

prompt('multiline input> ', multiline=True,
       prompt_continuation=prompt_continuation)
```



Passing a default

A default value can be given:

```
from prompt_toolkit import prompt
import getpass

prompt('What is your name: ', default='%s' % getpass.getuser())
```

Mouse support

There is limited mouse support for positioning the cursor, for scrolling (in case of large multiline inputs) and for clicking in the autocompletion menu.

Enabling can be done by passing the `mouse_support=True` option.

```
from prompt_toolkit import prompt

prompt('What is your name: ', mouse_support=True)
```

Line wrapping

Line wrapping is enabled by default. This is what most people are used to and this is what GNU Readline does. When it is disabled, the input string will scroll horizontally.

```
from prompt_toolkit import prompt

prompt('What is your name: ', wrap_lines=False)
```

Password input

When the `is_password=True` flag has been given, the input is replaced by asterisks (`*` characters).

```
from prompt_toolkit import prompt

prompt('Enter password: ', is_password=True)
```

3.5.14 Cursor shapes

Many terminals support displaying different types of cursor shapes. The most common are block, beam or underscore. Either blinking or not. It is possible to decide which cursor to display while asking for input, or in case of Vi input mode, have a modal prompt for which its cursor shape changes according to the input mode.

```
from prompt_toolkit import prompt
from prompt_toolkit.cursor_shapes import CursorShape, ModalCursorShapeConfig

# Several possible values for the `cursor_shape_config` parameter:
prompt('>', cursor=CursorShape.BLOCK)
prompt('>', cursor=CursorShape.UNDERLINE)
prompt('>', cursor=CursorShape.BEAM)
prompt('>', cursor=CursorShape.BLINKING_BLOCK)
prompt('>', cursor=CursorShape.BLINKING_UNDERLINE)
prompt('>', cursor=CursorShape.BLINKING_BEAM)
prompt('>', cursor=ModalCursorShapeConfig())
```

3.5.15 Prompt in an *asyncio* application

Note: New in prompt_toolkit 3.0. (In prompt_toolkit 2.0 this was possible using a work-around).

For asyncio applications, it's very important to never block the eventloop. However, *`prompt()`* is blocking, and calling this would freeze the whole application. Asyncio actually won't even allow us to run that function within a coroutine.

The answer is to call `prompt_async()` instead of *`prompt()`*. The async variation returns a coroutines and is awaitable.

```
from prompt_toolkit import PromptSession
from prompt_toolkit.patch_stdout import patch_stdout

async def my_coroutine():
    session = PromptSession()
```

(continues on next page)

(continued from previous page)

```
    while True:
        with patch_stdout():
            result = await session.prompt_async('Say something: ')
        print('You said: %s' % result)
```

The *patch_stdout()* context manager is optional, but it's recommended, because other coroutines could print to stdout. This ensures that other output won't destroy the prompt.

3.5.16 Reading keys from stdin, one key at a time, but without a prompt

Suppose that you want to use prompt_toolkit to read the keys from stdin, one key at a time, but not render a prompt to the output, that is also possible:

```
import asyncio

from prompt_toolkit.input import create_input
from prompt_toolkit.keys import Keys


async def main() -> None:
    done = asyncio.Event()
    input = create_input()

    def keys_ready():
        for key_press in input.read_keys():
            print(key_press)

            if key_press.key == Keys.ControlC:
                done.set()

    with input.raw_mode():
        with input.attach(keys_ready):
            await done.wait()


if __name__ == "__main__":
    asyncio.run(main())
```

The above snippet will print the *KeyPress* object whenever a key is pressed. This is also cross platform, and should work on Windows.

3.6 Dialogs

Prompt_toolkit ships with a high level API for displaying dialogs, similar to the Whiptail program, but in pure Python.

3.6.1 Message box

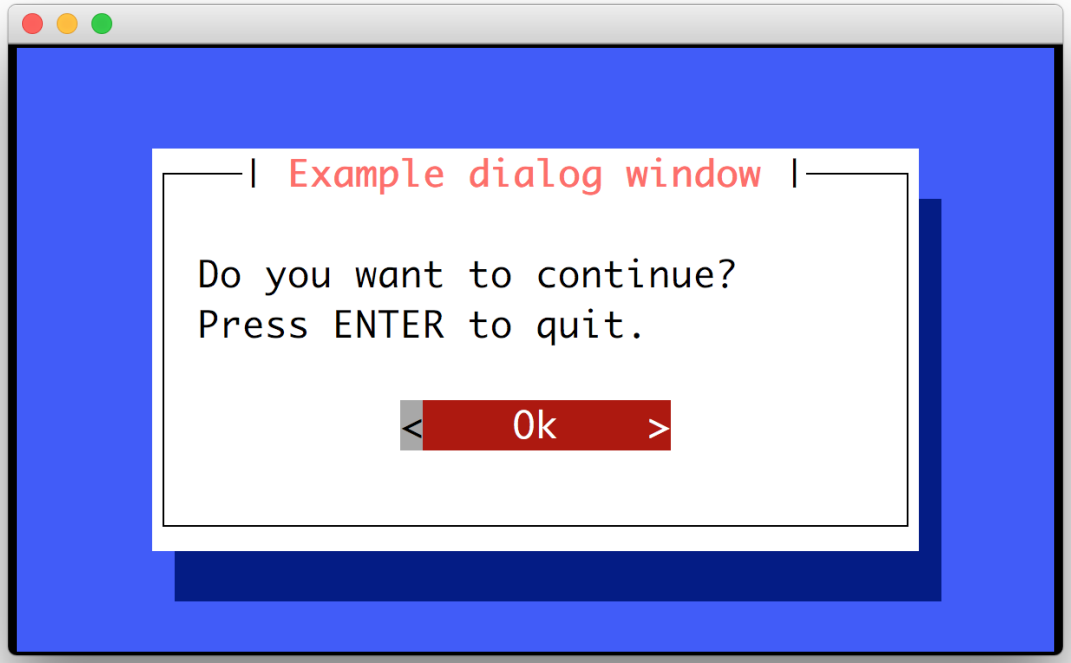
Use the *message_dialog()* function to display a simple message box. For instance:

```
from prompt_toolkit.shortcuts import message_dialog
```

(continues on next page)

(continued from previous page)

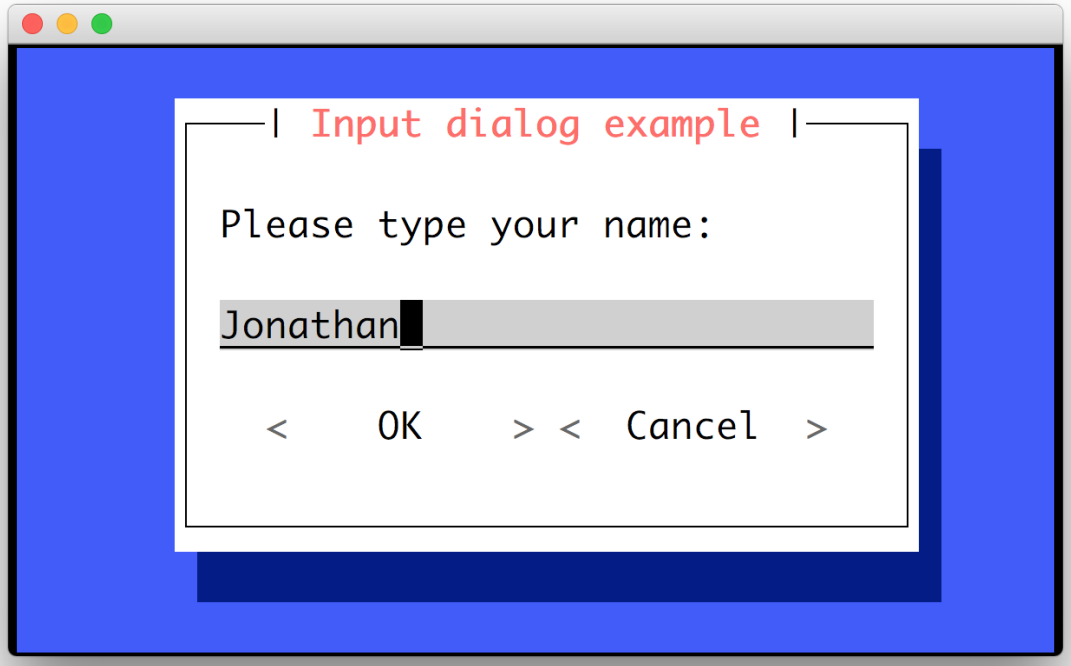
```
message_dialog(
    title='Example dialog window',
    text='Do you want to continue?\nPress ENTER to quit.').run()
```



3.6.2 Input box

The *input_dialog()* function can display an input box. It will return the user input as a string.

```
from prompt_toolkit.shortcuts import input_dialog

text = input_dialog(
    title='Input dialog example',
    text='Please type your name:').run()
```

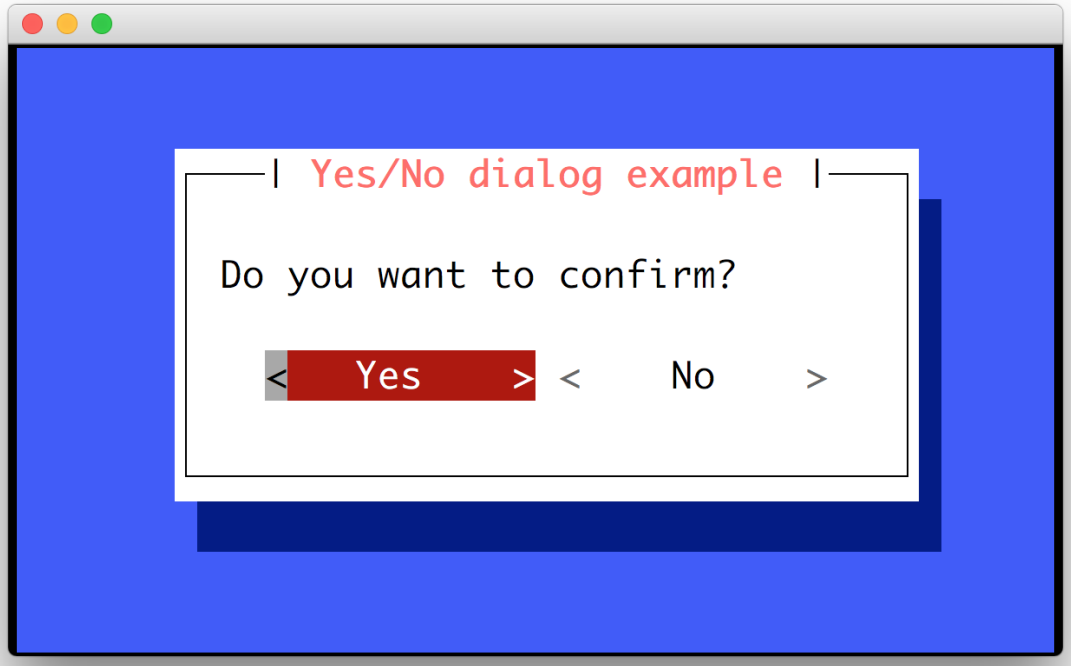


The `password=True` option can be passed to the *`input_dialog()`* function to turn this into a password input box.

3.6.3 Yes/No confirmation dialog

The *`yes_no_dialog()`* function displays a yes/no confirmation dialog. It will return a boolean according to the selection.

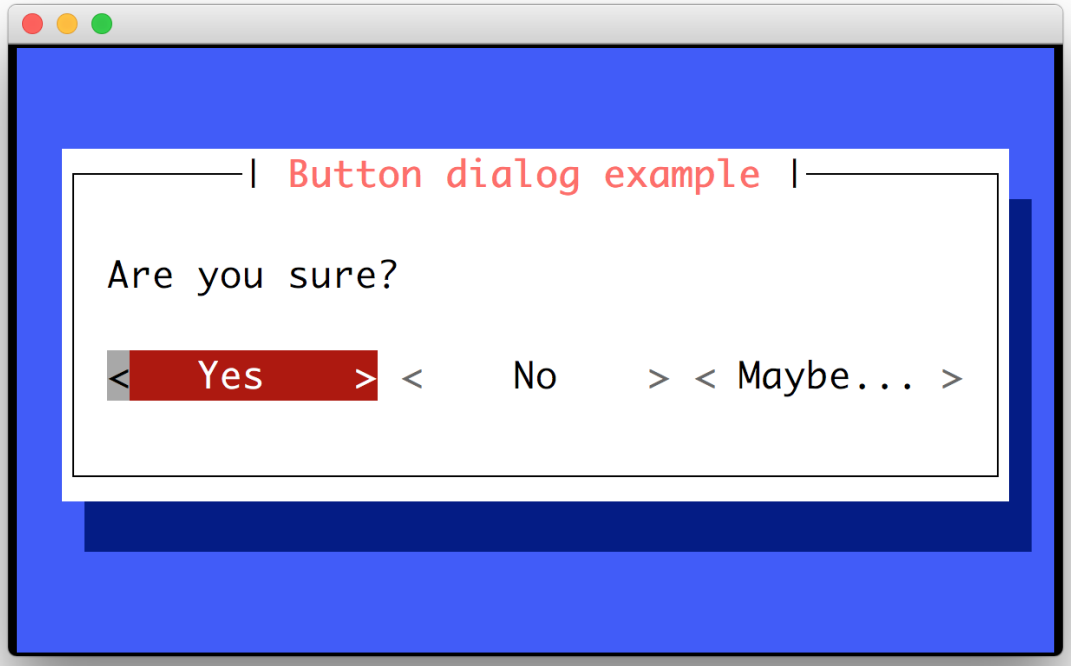
```
from prompt_toolkit.shortcuts import yes_no_dialog

result = yes_no_dialog(
    title='Yes/No dialog example',
    text='Do you want to confirm?').run()
```



3.6.4 Button dialog

The *button_dialog()* function displays a dialog with choices offered as buttons. Buttons are indicated as a list of tuples, each providing the label (first) and return value if clicked (second).

```
from prompt_toolkit.shortcuts import button_dialog

result = button_dialog(
    title='Button dialog example',
    text='Do you want to confirm?',
    buttons=[
        ('Yes', True),
        ('No', False),
        ('Maybe...', None)
    ],
).run()
```



3.6.5 Radio list dialog

The *radiolist_dialog()* function displays a dialog with choices offered as a radio list. The values are provided as a list of tuples, each providing the return value (first element) and the displayed value (second element).

```
from prompt_toolkit.shortcuts import radiolist_dialog

result = radiolist_dialog(
    title="RadioList dialog",
    text="Which breakfast would you like ?",
    values=[
        ("breakfast1", "Eggs and beacon"),
        ("breakfast2", "French breakfast"),
        ("breakfast3", "Equestrian breakfast")
    ]
).run()
```

3.6.6 Checkbox list dialog

The `checkboxlist_dialog()` has the same usage and purpose than the Radiolist dialog, but allows several values to be selected and therefore returned.

```
from prompt_toolkit.shortcuts import checkboxlist_dialog

results_array = checkboxlist_dialog(
```

(continues on next page)

(continued from previous page)

```
    title="CheckboxList dialog",
    text="What would you like in your breakfast ?",
    values=[
        ("eggs", "Eggs"),
        ("bacon", "Bacon"),
        ("croissants", "20 Croissants"),
        ("daily", "The breakfast of the day")
    ]
).run()
```

3.6.7 Styling of dialogs

A custom *Style* instance can be passed to all dialogs to override the default style. Also, text can be styled by passing an *HTML* object.

```
from prompt_toolkit.formatted_text import HTML
from prompt_toolkit.shortcuts import message_dialog
from prompt_toolkit.styles import Style

example_style = Style.from_dict({
    'dialog':             'bg:#88ff88',
    'dialog frame.label': 'bg:#ffffff #000000',
    'dialog.body':        'bg:#000000 #00ff00',
    'dialog shadow':      'bg:#00aa00',
})

message_dialog(
    title=HTML('<style bg="blue" fg="white">Styled</style> '
               '<style fg="ansired">dialog</style> window'),
    text='Do you want to continue?\nPress ENTER to quit.',
    style=example_style).run()
```

3.6.8 Styling reference sheet

In reality, the shortcut commands presented above build a full-screen frame by using a list of components. The two tables below allow you to get the classnames available for each shortcut, therefore you will be able to provide a custom style for every element that is displayed, using the method provided above.

Note: All the shortcuts use the `Dialog` component, therefore it isn't specified explicitly below.

Shortcut	Components used
`yes_no_dialog`	• `Label` • `Button` (x2)
`button_dialog`	• `Label` • `Button`
`input_dialog`	• `TextArea` • `Button` (x2)
`message_dialog`	• `Label` • `Button`
`radiolist_dialog`	• `Label` • `RadioList` • `Button` (x2)
`checkboxlist_dialog`	• `Label` • `CheckboxList` • `Button` (x2)
`progress_dialog`	• `Label` • `TextArea` (locked) • `ProgressBar`

Components	Available classnames
Dialog	• `dialog` • `dialog.body`
TextArea	• `text-area` • `text-area.prompt`
Label	• `label`
Button	• `button` • `button.focused` • `button.arrow` • `button.text`
Frame	• `frame` • `frame.border` • `frame.label`
Shadow	• `shadow`
RadioList	• `radio-list` • `radio` • `radio-checked` • `radio-selected`
CheckboxList	• `checkbox-list` • `checkbox` • `checkbox-checked` • `checkbox-selected`
VerticalLine	• `line` • `vertical-line`
HorizontalLine	• `line` • `horizontal-line`
ProgressBar	• `progress-bar` • `progress-bar.used`

Example

Let's customize the example of the `checkboxlist_dialog`.

It uses 2 `Button`, a `CheckboxList` and a `Label`, packed inside a `Dialog`. Therefore we can customize each of these elements separately, using for instance:

```
from prompt_toolkit.shortcuts import checkboxlist_dialog
from prompt_toolkit.styles import Style

results = checkboxlist_dialog(
    title="CheckboxList dialog",
    text="What would you like in your breakfast ?",
    values=[
        ("eggs", "Eggs"),
        ("bacon", "Bacon"),
        ("croissants", "20 Croissants"),
        ("daily", "The breakfast of the day")
    ],
    style=Style.from_dict({
        'dialog': 'bg:#cdbbb3',
        'button': 'bg:#bf99a4',
        'checkbox': '#e8612c',
        'dialog.body': 'bg:#a9cfd0',
        'dialog shadow': 'bg:#c98982',
        'frame.label': '#fcaca3',
        'dialog.body label': '#fd8bb6',
    })
).run()
```

3.7 Progress bars

Prompt_toolkit ships with a high level API for displaying progress bars, inspired by tqdm

Warning: The API for the prompt_toolkit progress bars is still very new and can possibly change in the future. It is usable and tested, but keep this in mind when upgrading.

Remember that the examples directory of the prompt_toolkit repository ships with many progress bar examples as well.

3.7.1 Simple progress bar

Creating a new progress bar can be done by calling the *ProgressBar* context manager.

The progress can be displayed for any iterable. This works by wrapping the iterable (like `range`) with the *ProgressBar* context manager itself. This way, the progress bar knows when the next item is consumed by the forloop and when progress happens.

```
from prompt_toolkit.shortcuts import ProgressBar
import time


with ProgressBar() as pb:
    for i in pb(range(800)):
        time.sleep(.01)
```

```
$ python simple-progress-bar.py
  39.1% [============>                       ] 313/800 eta [00:05]
```

Keep in mind that not all iterables can report their total length. This happens with a typical generator. In that case, you can still pass the total as follows in order to make displaying the progress possible:

```
def some_iterable():
    yield ...

with ProgressBar() as pb:
    for i in pb(some_iterable, total=1000):
        time.sleep(.01)
```

3.7.2 Multiple parallel tasks

A prompt_toolkit *ProgressBar* can display the progress of multiple tasks running in parallel. Each task can run in a separate thread and the *ProgressBar* user interface runs in its own thread.

Notice that we set the "daemon" flag for both threads that run the tasks. This is because control-c will stop the progress and quit our application. We don't want the application to wait for the background threads to finish. Whether you want this depends on the application.

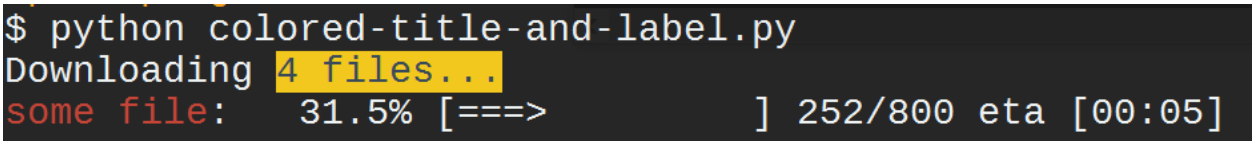
```
from prompt_toolkit.shortcuts import ProgressBar
import time
import threading


with ProgressBar() as pb:
    # Two parallel tasks.
    def task_1():
        for i in pb(range(100)):
            time.sleep(.05)

    def task_2():
        for i in pb(range(150)):
            time.sleep(.08)

    # Start threads.
    t1 = threading.Thread(target=task_1)
    t2 = threading.Thread(target=task_2)
    t1.daemon = True
    t2.daemon = True
    t1.start()
    t2.start()

    # Wait for the threads to finish. We use a timeout for the join() call,
    # because on Windows, join cannot be interrupted by Control-C or any other
    # signal.
    for t in [t1, t2]:
        while t.is_alive():
            t.join(timeout=.5)
```

```
$ python two-tasks.py
 100.0% [============================================================================>] 100/100 eta [00:00]
  51.3% [=======================================>                                    ]  77/150 eta [00:05]
```

3.7.3 Adding a title and label

Each progress bar can have one title, and for each task an individual label. Both the title and the labels can be *formatted text*.

```
from prompt_toolkit.shortcuts import ProgressBar
from prompt_toolkit.formatted_text import HTML
import time

title = HTML('Downloading <style bg="yellow" fg="black">4 files...</style>')
label = HTML('<ansired>some file</ansired>: ')

with ProgressBar(title=title) as pb:
    for i in pb(range(800), label=label):
        time.sleep(.01)
```



3.7.4 Formatting the progress bar

The visualisation of a *ProgressBar* can be customized by using a different sequence of formatters. The default formatting looks something like this:

```
from prompt_toolkit.shortcuts.progress_bar.formatters import *

default_formatting = [
    Label(),
    Text(' '),
    Percentage(),
    Text(' '),
    Bar(),
    Text(' '),
    Progress(),
    Text(' '),
    Text('eta [', style='class:time-left'),
    TimeLeft(),
    Text(']', style='class:time-left'),
    Text(' '),
]
```

That sequence of *Formatter* can be passed to the *formatter* argument of *ProgressBar*. So, we could change this and modify the progress bar to look like an apt-get style progress bar:

```
from prompt_toolkit.shortcuts import ProgressBar
from prompt_toolkit.styles import Style
from prompt_toolkit.shortcuts.progress_bar import formatters
import time

style = Style.from_dict({
    'label': 'bg:#ffff00 #000000',
    'percentage': 'bg:#ffff00 #000000',
    'current': '#448844',
    'bar': '',
})


custom_formatters = [
```

(continues on next page)

(continued from previous page)

```
    formatters.Label(),
    formatters.Text(': [', style='class:percentage'),
    formatters.Percentage(),
    formatters.Text(']', style='class:percentage'),
    formatters.Text(' '),
    formatters.Bar(sym_a='#', sym_b='#', sym_c='.'),
    formatters.Text('  '),
]

with ProgressBar(style=style, formatters=custom_formatters) as pb:
    for i in pb(range(1600), label='Installing'):
        time.sleep(.01)
```

```
$ python styled-apt-get-install.py
Installing: [ 64.4%] [####################.....]
```

3.7.5 Adding key bindings and toolbar

Like other prompt_toolkit applications, we can add custom key bindings, by passing a *KeyBindings* object:

```
from prompt_toolkit import HTML
from prompt_toolkit.key_binding import KeyBindings
from prompt_toolkit.patch_stdout import patch_stdout
from prompt_toolkit.shortcuts import ProgressBar

import os
import time
import signal

bottom_toolbar = HTML(' <b>[f]</b> Print "f" <b>[x]</b> Abort.')

# Create custom key bindings first.
kb = KeyBindings()
cancel = [False]

@kb.add('f')
def _(event):
    print('You pressed `f`.')

@kb.add('x')
def _(event):
    " Send Abort (control-c) signal. "
    cancel[0] = True
    os.kill(os.getpid(), signal.SIGINT)

# Use `patch_stdout`, to make sure that prints go above the
# application.
with patch_stdout():
    with ProgressBar(key_bindings=kb, bottom_toolbar=bottom_toolbar) as pb:
        for i in pb(range(800)):
            time.sleep(.01)

            # Stop when the cancel flag has been set.
            if cancel[0]:
```

(continues on next page)

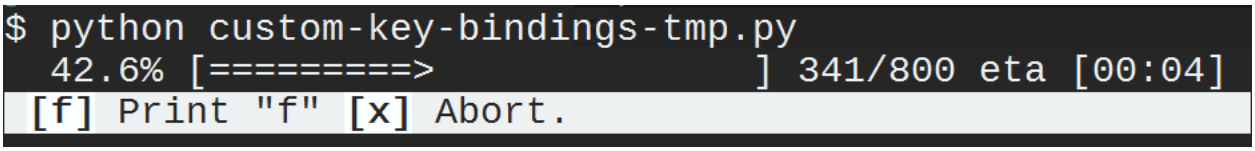
(continued from previous page)

```
                break
```

Notice that we use `patch_stdout()` to make printing text possible while the progress bar is displayed. This ensures that printing happens above the progress bar.

Further, when "x" is pressed, we set a cancel flag, which stops the progress. It would also be possible to send *SIGINT* to the mean thread, but that's not always considered a clean way of cancelling something.

In the example above, we also display a toolbar at the bottom which shows the key bindings.



Read more about key bindings . . .

3.8 Building full screen applications

prompt_toolkit can be used to create complex full screen terminal applications. Typically, an application consists of a layout (to describe the graphical part) and a set of key bindings.

The sections below describe the components required for full screen applications (or custom, non full screen applications), and how to assemble them together.

Before going through this page, it could be helpful to go through *asking for input* (prompts) first. Many things that apply to an input prompt, like styling, key bindings and so on, also apply to full screen applications.

Note: Also remember that the `examples` directory of the prompt_toolkit repository contains plenty of examples. Each example is supposed to explain one idea. So, this as well should help you get started.

Don't hesitate to open a GitHub issue if you feel that a certain example is missing.

3.8.1 A simple application

Every prompt_toolkit application is an instance of an `Application` object. The simplest full screen example would look like this:

```
from prompt_toolkit import Application

app = Application(full_screen=True)
app.run()
```

This will display a dummy application that says "No layout specified. Press ENTER to quit.".

Note: If we wouldn't set the `full_screen` option, the application would not run in the alternate screen buffer, and only consume the least amount of space required for the layout.

An application consists of several components. The most important are:

- I/O objects: the input and output device.

- The layout: this defines the graphical structure of the application. For instance, a text box on the left side, and a button on the right side. You can also think of the layout as a collection of 'widgets'.
- A style: this defines what colors and underline/bold/italic styles are used everywhere.
- A set of key bindings.

We will discuss all of these in more detail below.

3.8.2 I/O objects

Every *Application* instance requires an I/O object for input and output:

- An *Input* instance, which is an abstraction of the input stream (stdin).
- An *Output* instance, which is an abstraction of the output stream, and is called by the renderer.

Both are optional and normally not needed to pass explicitly. Usually, the default works fine.

There is a third I/O object which is also required by the application, but not passed inside. This is the event loop, an *eventloop* instance. This is basically a while-true loop that waits for user input, and when it receives something (like a key press), it will send that to the the appropriate handler, like for instance, a key binding.

When *run()* is called, the event loop will run until the application is done. An application will quit when *exit()* is called.

3.8.3 The layout

A layered layout architecture

There are several ways to create a prompt_toolkit layout, depending on how customizable you want things to be. In fact, there are several layers of abstraction.

- The most low-level way of creating a layout is by combining *Container* and *UIControl* objects.

  Examples of *Container* objects are *VSplit* (vertical split), *HSplit* (horizontal split) and *FloatContainer*. These containers arrange the layout and can split it in multiple regions. Each container can recursively contain multiple other containers. They can be combined in any way to define the "shape" of the layout.

  The *Window* object is a special kind of container that can contain a *UIControl* object. The *UIControl* object is responsible for the generation of the actual content. The *Window* object acts as an adaptor between the *UIControl* and other containers, but it's also responsible for the scrolling and line wrapping of the content.

  Examples of *UIControl* objects are *BufferControl* for showing the content of an editable/scrollable buffer, and *FormattedTextControl* for displaying (*formatted*) text.

  Normally, it is never needed to create new *UIControl* or *Container* classes, but instead you would create the layout by composing instances of the existing built-ins.
- A higher level abstraction of building a layout is by using "widgets". A widget is a reusable layout component that can contain multiple containers and controls. Widgets have a `__pt_container__` function, which returns the root container for this widget. Prompt_toolkit contains a couple of widgets like *TextArea*, *Button*, *Frame*, *VerticalLine* and so on.
- The highest level abstractions can be found in the `shortcuts` module. There we don't have to think about the layout, controls and containers at all. This is the simplest way to use prompt_toolkit, but is only meant for specific use cases, like a prompt or a simple dialog window.

Containers and controls

The biggest difference between containers and controls is that containers arrange the layout by splitting the screen in many regions, while controls are responsible for generating the actual content.

Note: Under the hood, the difference is:

- containers use *absolute coordinates*, and paint on a *Screen* instance.
- user controls create a `UIContent` instance. This is a collection of lines that represent the actual content. A `UIControl` is not aware of the screen.

Abstract base class	Examples
Container	*HSplit VSplit FloatContainer Window ScrollablePane*
UIControl	*BufferControl FormattedTextControl*

The *Window* class itself is particular: it is a *Container* that can contain a *UIControl*. Thus, it's the adaptor between the two. The *Window* class also takes care of scrolling the content and wrapping the lines if needed.

Finally, there is the *Layout* class which wraps the whole layout. This is responsible for keeping track of which window has the focus.

Here is an example of a layout that displays the content of the default buffer on the left, and displays `"Hello world"` on the right. In between it shows a vertical line:

```
from prompt_toolkit import Application
from prompt_toolkit.buffer import Buffer
from prompt_toolkit.layout.containers import VSplit, Window
from prompt_toolkit.layout.controls import BufferControl, FormattedTextControl
from prompt_toolkit.layout.layout import Layout

buffer1 = Buffer()  # Editable buffer.

root_container = VSplit([
    # One window that holds the BufferControl with the default buffer on
    # the left.
    Window(content=BufferControl(buffer=buffer1)),

    # A vertical line in the middle. We explicitly specify the width, to
    # make sure that the layout engine will not try to divide the whole
    # width by three for all these windows. The window will simply fill its
    # content by repeating this character.
    Window(width=1, char='|'),

    # Display the text 'Hello world' on the right.
    Window(content=FormattedTextControl(text='Hello world')),
])

layout = Layout(root_container)

app = Application(layout=layout, full_screen=True)
app.run() # You won't be able to Exit this app
```

Notice that if you execute this right now, there is no way to quit this application yet. This is something we explain in the next section below.

More complex layouts can be achieved by nesting multiple *VSplit*, *HSplit* and *FloatContainer* objects.

If you want to make some part of the layout only visible when a certain condition is satisfied, use a *ConditionalContainer*.

Finally, there is *ScrollablePane*, a container class that can be used to create long forms or nested layouts that are scrollable as a whole.

Focusing windows

Focusing something can be done by calling the *focus()* method. This method is very flexible and accepts a *Window*, a *Buffer*, a `UIControl` and more.

In the following example, we use *get_app()* for getting the active application.

```
from prompt_toolkit.application import get_app

# This window was created earlier.
w = Window()

# ...

# Now focus it.
get_app().layout.focus(w)
```

Changing the focus is something which is typically done in a key binding, so read on to see how to define key bindings.

3.8.4 Key bindings

In order to react to user actions, we need to create a *KeyBindings* object and pass that to our *Application*.

There are two kinds of key bindings:

- Global key bindings, which are always active.
- Key bindings that belong to a certain `UIControl` and are only active when this control is focused. Both *BufferControl* *FormattedTextControl* take a `key_bindings` argument.

Global key bindings

Key bindings can be passed to the application as follows:

```
from prompt_toolkit import Application
from prompt_toolkit.key_binding import KeyBindings

kb = KeyBindings()
app = Application(key_bindings=kb)
app.run()
```

To register a new keyboard shortcut, we can use the *add()* method as a decorator of the key handler:

```
from prompt_toolkit import Application
from prompt_toolkit.key_binding import KeyBindings

kb = KeyBindings()

@kb.add('c-q')
def exit_(event):
```

(continues on next page)

(continued from previous page)

```
    """
    Pressing Ctrl-Q will exit the user interface.

    Setting a return value means: quit the event loop that drives the user
    interface and return this value from the `Application.run()` call.
    """
    event.app.exit()

app = Application(key_bindings=kb, full_screen=True)
app.run()
```

The callback function is named `exit_` for clarity, but it could have been named _ (underscore) as well, because we won't refer to this name.

Read more about key bindings ...

Modal containers

The following container objects take a `modal` argument *VSplit*, *HSplit*, and *FloatContainer*.

Setting `modal=True` makes what is called a **modal** container. Normally, a child container would inherit its parent key bindings. This does not apply to **modal** containers.

Consider a **modal** container (e.g. *VSplit*) is child of another container, its parent. Any key bindings from the parent are not taken into account if the **modal** container (child) has the focus.

This is useful in a complex layout, where many controls have their own key bindings, but you only want to enable the key bindings for a certain region of the layout.

The global key bindings are always active.

3.8.5 More about the Window class

As said earlier, a *Window* is a *Container* that wraps a *UIControl*, like a *BufferControl* or *FormattedTextControl*.

Note: Basically, windows are the leafs in the tree structure that represent the UI.

A *Window* provides a "view" on the *UIControl*, which provides lines of content. The window is in the first place responsible for the line wrapping and scrolling of the content, but there are much more options.

- Adding left or right margins. These are used for displaying scroll bars or line numbers.
- There are the *cursorline* and *cursorcolumn* options. These allow highlighting the line or column of the cursor position.
- Alignment of the content. The content can be left aligned, right aligned or centered.
- Finally, the background can be filled with a default character.

3.8.6 More about buffers and *BufferControl*

Input processors

A *Processor* is used to postprocess the content of a *BufferControl* before it's displayed. It can for instance highlight matching brackets or change the visualisation of tabs and so on.

A *Processor* operates on individual lines. Basically, it takes a (formatted) line and produces a new (formatted) line.

Some build-in processors:

Processor	Usage:
HighlightSearchProcessor	Highlight the current search results.
HighlightSelectionProcessor	Highlight the selection.
PasswordProcessor	Display input as asterisks. (* characters).
BracketsMismatchProcessor	Highlight open/close mismatches for brackets.
BeforeInput	Insert some text before.
AfterInput	Insert some text after.
AppendAutoSuggestion	Append auto suggestion text.
ShowLeadingWhiteSpaceProcessor	Visualise leading whitespace.
ShowTrailingWhiteSpaceProcessor	Visualise trailing whitespace.
TabsProcessor	Visualise tabs as *n* spaces, or some symbols.

A *BufferControl* takes only one processor as input, but it is possible to "merge" multiple processors into one with the *merge_processors()* function.

3.9 Tutorials

3.9.1 Tutorial: Build an SQLite REPL

The aim of this tutorial is to build an interactive command line interface for an SQLite database using prompt_toolkit.

First, install the library using pip, if you haven't done this already.

```
pip install prompt_toolkit
```

Read User Input

Let's start accepting input using the *prompt()* function. This will ask the user for input, and echo back whatever the user typed. We wrap it in a `main()` function as a good practice.

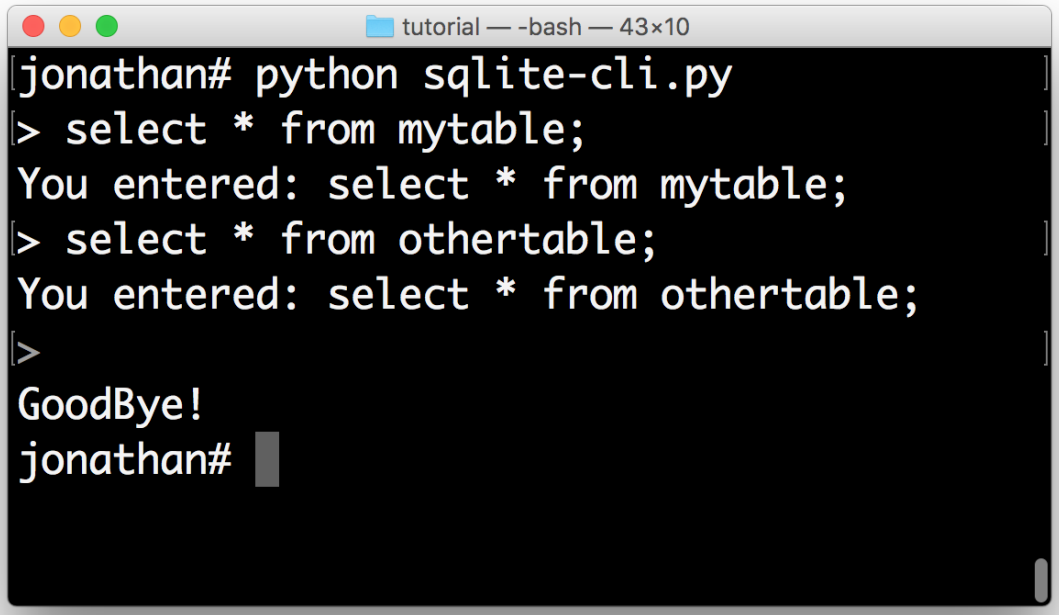
```
from prompt_toolkit import prompt

def main():
    text = prompt('> ')
    print('You entered:', text)

if __name__ == '__main__':
    main()
```

Loop The REPL

Now we want to call the *prompt()* method in a loop. In order to keep the history, the easiest way to do it is to use a *PromptSession*. This uses an *InMemoryHistory* underneath that keeps track of the history, so that if the user presses the up-arrow, they'll see the previous entries.

The *prompt()* method raises `KeyboardInterrupt` when ControlC has been pressed and `EOFError` when ControlD has been pressed. This is what people use for cancelling commands and exiting in a REPL. The try/except below handles these error conditions and make sure that we go to the next iteration of the loop or quit the loop respectively.

```
from prompt_toolkit import PromptSession

def main():
    session = PromptSession()

    while True:
        try:
            text = session.prompt('> ')
        except KeyboardInterrupt:
            continue
        except EOFError:
            break
        else:
            print('You entered:', text)
    print('GoodBye!')

if __name__ == '__main__':
    main()
```



Syntax Highlighting

This is where things get really interesting. Let's step it up a notch by adding syntax highlighting to the user input. We know that users will be entering SQL statements, so we can leverage the Pygments library for coloring the input. The `lexer` parameter allows us to set the syntax lexer. We're going to use the `SqlLexer` from the Pygments library for highlighting.

Notice that in order to pass a Pygments lexer to prompt_toolkit, it needs to be wrapped into a *`PygmentsLexer`*.

```
from prompt_toolkit import PromptSession
from prompt_toolkit.lexers import PygmentsLexer
from pygments.lexers.sql import SqlLexer

def main():
    session = PromptSession(lexer=PygmentsLexer(SqlLexer))

    while True:
        try:
            text = session.prompt('> ')
        except KeyboardInterrupt:
            continue
        except EOFError:
            break
        else:
            print('You entered:', text)
    print('GoodBye!')

if __name__ == '__main__':
    main()
```

Auto-completion

Now we are going to add auto completion. We'd like to display a drop down menu of possible keywords when the user starts typing.

We can do this by creating an *sql_completer* object from the `WordCompleter` class, defining a set of *keywords* for the auto-completion.

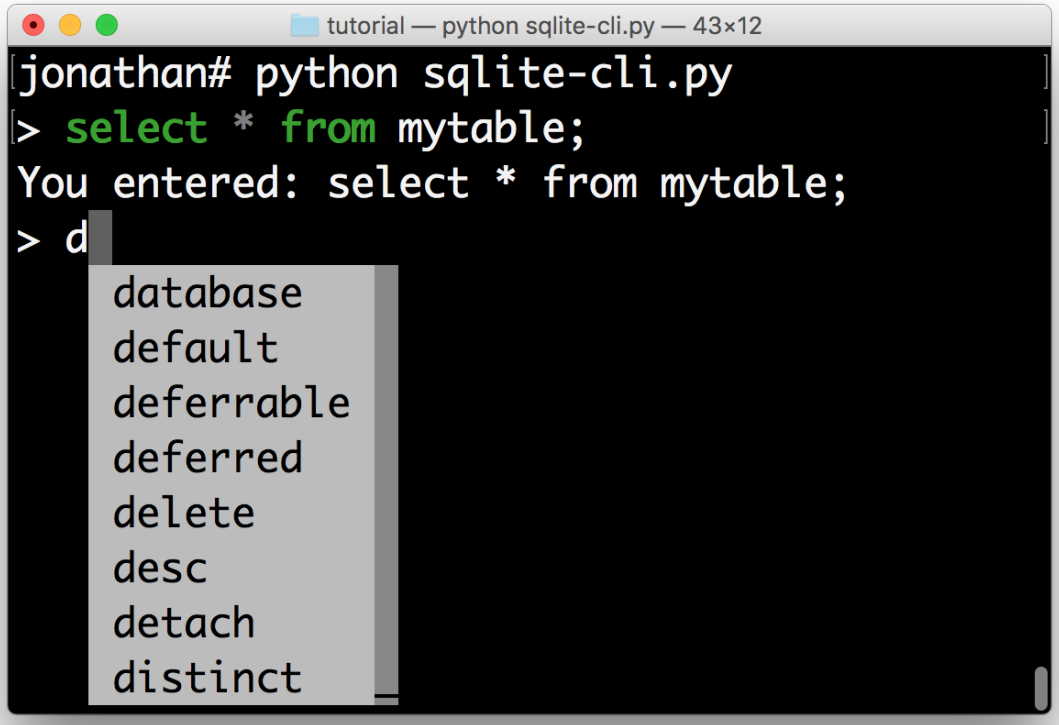
Like the lexer, this `sql_completer` instance can be passed to either the `PromptSession` class or the `prompt()` method.

```
from prompt_toolkit import PromptSession
from prompt_toolkit.completion import WordCompleter
from prompt_toolkit.lexers import PygmentsLexer
from pygments.lexers.sql import SqlLexer

sql_completer = WordCompleter([
    'abort', 'action', 'add', 'after', 'all', 'alter', 'analyze', 'and',
    'as', 'asc', 'attach', 'autoincrement', 'before', 'begin', 'between',
    'by', 'cascade', 'case', 'cast', 'check', 'collate', 'column',
    'commit', 'conflict', 'constraint', 'create', 'cross', 'current_date',
    'current_time', 'current_timestamp', 'database', 'default',
    'deferrable', 'deferred', 'delete', 'desc', 'detach', 'distinct',
    'drop', 'each', 'else', 'end', 'escape', 'except', 'exclusive',
    'exists', 'explain', 'fail', 'for', 'foreign', 'from', 'full', 'glob',
    'group', 'having', 'if', 'ignore', 'immediate', 'in', 'index',
    'indexed', 'initially', 'inner', 'insert', 'instead', 'intersect',
    'into', 'is', 'isnull', 'join', 'key', 'left', 'like', 'limit',
    'match', 'natural', 'no', 'not', 'notnull', 'null', 'of', 'offset',
    'on', 'or', 'order', 'outer', 'plan', 'pragma', 'primary', 'query',
    'raise', 'recursive', 'references', 'regexp', 'reindex', 'release',
    'rename', 'replace', 'restrict', 'right', 'rollback', 'row',
    'savepoint', 'select', 'set', 'table', 'temp', 'temporary', 'then',
    'to', 'transaction', 'trigger', 'union', 'unique', 'update', 'using',
```

(continues on next page)

(continued from previous page)

```
    'vacuum', 'values', 'view', 'virtual', 'when', 'where', 'with',
    'without'], ignore_case=True)

def main():
    session = PromptSession(
        lexer=PygmentsLexer(SqlLexer), completer=sql_completer)

    while True:
        try:
            text = session.prompt('> ')
        except KeyboardInterrupt:
            continue
        except EOFError:
            break
        else:
            print('You entered:', text)
    print('GoodBye!')

if __name__ == '__main__':
    main()
```

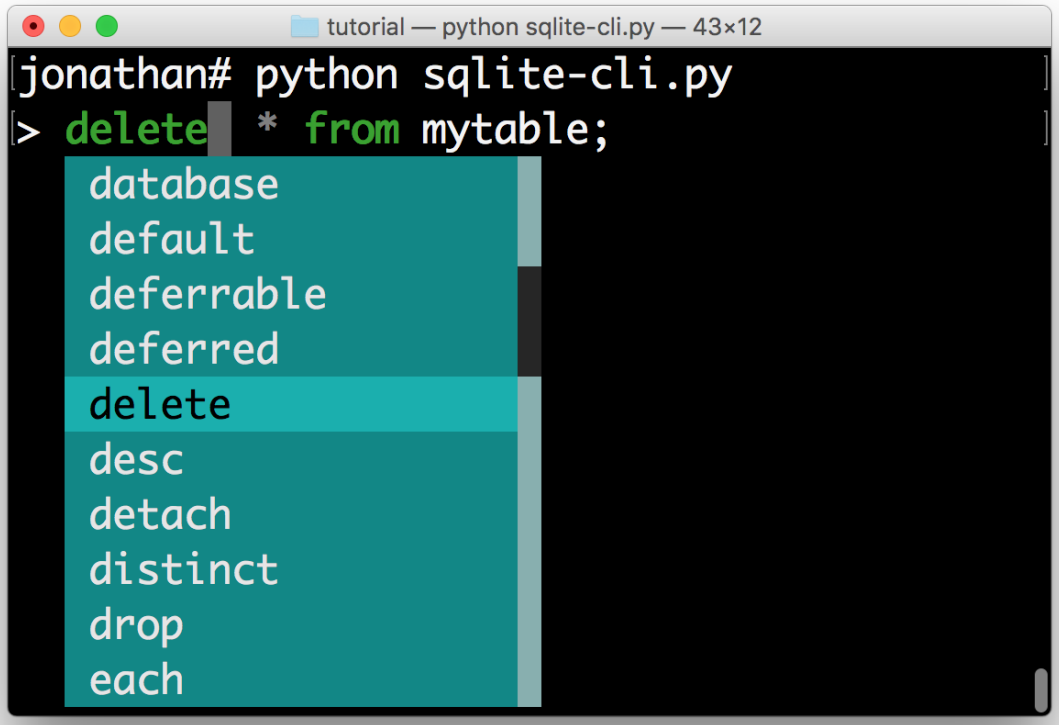


In about 30 lines of code we got ourselves an auto completing, syntax highlighting REPL. Let's make it even better.

Styling the menus

If we want, we can now change the colors of the completion menu. This is possible by creating a `Style` instance and passing it to the `prompt()` function.

```
from prompt_toolkit import PromptSession
from prompt_toolkit.completion import WordCompleter
from prompt_toolkit.lexers import PygmentsLexer
from prompt_toolkit.styles import Style
from pygments.lexers.sql import SqlLexer

sql_completer = WordCompleter([
    'abort', 'action', 'add', 'after', 'all', 'alter', 'analyze', 'and',
    'as', 'asc', 'attach', 'autoincrement', 'before', 'begin', 'between',
    'by', 'cascade', 'case', 'cast', 'check', 'collate', 'column',
    'commit', 'conflict', 'constraint', 'create', 'cross', 'current_date',
    'current_time', 'current_timestamp', 'database', 'default',
    'deferrable', 'deferred', 'delete', 'desc', 'detach', 'distinct',
    'drop', 'each', 'else', 'end', 'escape', 'except', 'exclusive',
    'exists', 'explain', 'fail', 'for', 'foreign', 'from', 'full', 'glob',
    'group', 'having', 'if', 'ignore', 'immediate', 'in', 'index',
    'indexed', 'initially', 'inner', 'insert', 'instead', 'intersect',
    'into', 'is', 'isnull', 'join', 'key', 'left', 'like', 'limit',
    'match', 'natural', 'no', 'not', 'notnull', 'null', 'of', 'offset',
    'on', 'or', 'order', 'outer', 'plan', 'pragma', 'primary', 'query',
    'raise', 'recursive', 'references', 'regexp', 'reindex', 'release',
    'rename', 'replace', 'restrict', 'right', 'rollback', 'row',
    'savepoint', 'select', 'set', 'table', 'temp', 'temporary', 'then',
    'to', 'transaction', 'trigger', 'union', 'unique', 'update', 'using',
    'vacuum', 'values', 'view', 'virtual', 'when', 'where', 'with',
    'without'], ignore_case=True)

style = Style.from_dict({
    'completion-menu.completion': 'bg:#008888 #ffffff',
    'completion-menu.completion.current': 'bg:#00aaaa #000000',
    'scrollbar.background': 'bg:#88aaaa',
    'scrollbar.button': 'bg:#222222',
})

def main():
   session = PromptSession(
       lexer=PygmentsLexer(SqlLexer), completer=sql_completer, style=style)

   while True:
       try:
           text = session.prompt('> ')
       except KeyboardInterrupt:
           continue
       except EOFError:
           break
       else:
           print('You entered:', text)
   print('GoodBye!')

if __name__ == '__main__':
    main()
```



All that's left is hooking up the sqlite backend, which is left as an exercise for the reader. Just kidding... Keep reading.

Hook up Sqlite

This step is the final step to make the SQLite REPL actually work. It's time to relay the input to SQLite.

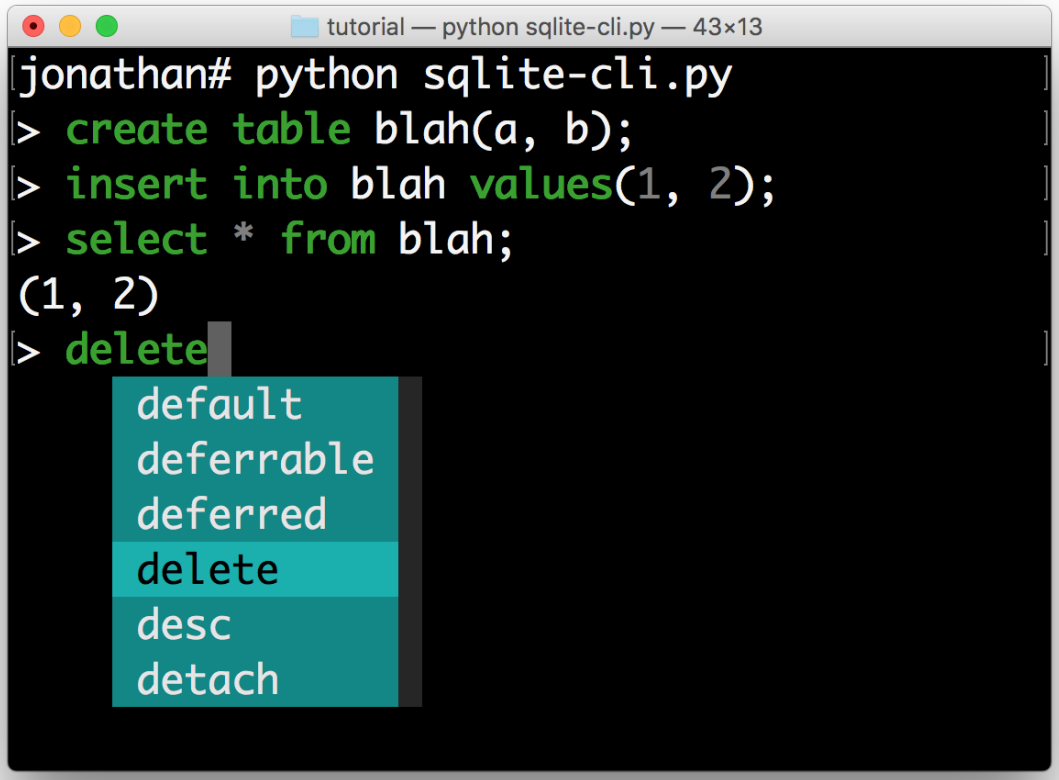
Obviously I haven't done the due diligence to deal with the errors. But it gives a good idea of how to get started.

```
#!/usr/bin/env python
import sys
import sqlite3

from prompt_toolkit import PromptSession
from prompt_toolkit.completion import WordCompleter
from prompt_toolkit.lexers import PygmentsLexer
from prompt_toolkit.styles import Style
from pygments.lexers.sql import SqlLexer

sql_completer = WordCompleter([
    'abort', 'action', 'add', 'after', 'all', 'alter', 'analyze', 'and',
    'as', 'asc', 'attach', 'autoincrement', 'before', 'begin', 'between',
    'by', 'cascade', 'case', 'cast', 'check', 'collate', 'column',
    'commit', 'conflict', 'constraint', 'create', 'cross', 'current_date',
    'current_time', 'current_timestamp', 'database', 'default',
    'deferrable', 'deferred', 'delete', 'desc', 'detach', 'distinct',
```

(continues on next page)

(continued from previous page)

```
    'drop', 'each', 'else', 'end', 'escape', 'except', 'exclusive',
    'exists', 'explain', 'fail', 'for', 'foreign', 'from', 'full', 'glob',
    'group', 'having', 'if', 'ignore', 'immediate', 'in', 'index',
    'indexed', 'initially', 'inner', 'insert', 'instead', 'intersect',
    'into', 'is', 'isnull', 'join', 'key', 'left', 'like', 'limit',
    'match', 'natural', 'no', 'not', 'notnull', 'null', 'of', 'offset',
    'on', 'or', 'order', 'outer', 'plan', 'pragma', 'primary', 'query',
    'raise', 'recursive', 'references', 'regexp', 'reindex', 'release',
    'rename', 'replace', 'restrict', 'right', 'rollback', 'row',
    'savepoint', 'select', 'set', 'table', 'temp', 'temporary', 'then',
    'to', 'transaction', 'trigger', 'union', 'unique', 'update', 'using',
    'vacuum', 'values', 'view', 'virtual', 'when', 'where', 'with',
    'without'], ignore_case=True)

style = Style.from_dict({
    'completion-menu.completion': 'bg:#008888 #ffffff',
    'completion-menu.completion.current': 'bg:#00aaaa #000000',
    'scrollbar.background': 'bg:#88aaaa',
    'scrollbar.button': 'bg:#222222',
})

def main(database):
    connection = sqlite3.connect(database)
    session = PromptSession(
        lexer=PygmentsLexer(SqlLexer), completer=sql_completer, style=style)

    while True:
        try:
            text = session.prompt('> ')
        except KeyboardInterrupt:
            continue  # Control-C pressed. Try again.
        except EOFError:
            break  # Control-D pressed.

        with connection:
            try:
                messages = connection.execute(text)
            except Exception as e:
                print(repr(e))
            else:
                for message in messages:
                    print(message)

    print('GoodBye!')

if __name__ == '__main__':
    if len(sys.argv) < 2:
        db = ':memory:'
    else:
        db = sys.argv[1]

    main(db)
```



I hope that gives an idea of how to get started on building command line interfaces.

The End.

3.10 Advanced topics

3.10.1 More about key bindings

This page contains a few additional notes about key bindings.

Key bindings can be defined as follows by creating a *KeyBindings* instance:

```
from prompt_toolkit.key_binding import KeyBindings

bindings = KeyBindings()

@bindings.add('a')
def _(event):
    " Do something if 'a' has been pressed. "
    ...
```

(continues on next page)

(continued from previous page)

```
@bindings.add('c-t')
def _(event):
    " Do something if Control-T has been pressed. "
    ...
```

Note: `c-q` (control-q) and `c-s` (control-s) are often captured by the terminal, because they were used traditionally for software flow control. When this is enabled, the application will automatically freeze when `c-s` is pressed, until `c-q` is pressed. It won't be possible to bind these keys.

In order to disable this, execute the following command in your shell, or even add it to your *.bashrc*.

```
stty -ixon
```

Key bindings can even consist of a sequence of multiple keys. The binding is only triggered when all the keys in this sequence are pressed.

```
@bindings.add('a', 'b')
def _(event):
    " Do something if 'a' is pressed and then 'b' is pressed. "
    ...
```

If the user presses only *a*, then nothing will happen until either a second key (like *b*) has been pressed or until the timeout expires (see later).

List of special keys

Besides literal characters, any of the following keys can be used in a key binding:

Name	Possible keys
Escape Shift + escape	`escape` `s-escape`
Arrows	`left`, `right`, `up`, `down`
Navigation	`home`, `end`, `delete`, `pageup`, `pagedown`, `insert`
Control+letter	`c-a`, `c-b`, `c-c`, `c-d`, `c-e`, `c-f`, `c-g`, `c-h`, `c-i`, `c-j`, `c-k`, `c-l`, `c-m`, `c-n`, `c-o`, `c-p`, `c-q`, `c-r`, `c-s`, `c-t`, `c-u`, `c-v`, `c-w`, `c-x`, `c-y`, `c-z`
Control + number	`c-1`, `c-2`, `c-3`, `c-4`, `c-5`, `c-6`, `c-7`, `c-8`, `c-9`, `c-0`
Control + arrow	`c-left`, `c-right`, `c-up`, `c-down`
Other control keys	`c-@`, `c-\`, `c-]`, `c-^`, `c-_`, `c-delete`
Shift + arrow	`s-left`, `s-right`, `s-up`, `s-down`
Control + Shift + arrow	`c-s-left`, `c-s-right`, `c-s-up`, `c-s-down`
Other shift keys	`s-delete`, `s-tab`
F-keys	`f1`, `f2`, `f3`, `f4`, `f5`, `f6`, `f7`, `f8`, `f9`, `f10`, `f11`, `f12`, `f13`, `f14`, `f15`, `f16`, `f17`, `f18`, `f19`, `f20`, `f21`, `f22`, `f23`, `f24`

There are a couple of useful aliases as well:

c-h	backspace
c-@	c-space
c-m	enter
c-i	tab

Note: Note that the supported keys are limited to what typical VT100 terminals offer. Binding `c-7` (control + number 7) for instance is not supported.

Binding alt+something, option+something or meta+something

Vt100 terminals translate the alt key into a leading `escape` key. For instance, in order to handle `alt-f`, we have to handle `escape` + `f`. Notice that we receive this as two individual keys. This means that it's exactly the same as first typing `escape` and then typing `f`. Something this alt-key is also known as option or meta.

In code that looks as follows:

```
@bindings.add('escape', 'f')
def _(event):
    " Do something if alt-f or meta-f have been pressed. "
```

Wildcards

Sometimes you want to catch any key that follows after a certain key stroke. This is possible by binding the '<any>' key:

```
@bindings.add('a', '<any>')
def _(event):
    ...
```

This will handle *aa*, *ab*, *ac*, etcetera. The key binding can check the *event* object for which keys exactly have been pressed.

Attaching a filter (condition)

In order to enable a key binding according to a certain condition, we have to pass it a *Filter*, usually a *Condition* instance. (*Read more about filters*.)

```
from prompt_toolkit.filters import Condition

@Condition
def is_active():
    " Only activate key binding on the second half of each minute. "
    return datetime.datetime.now().second > 30

@bindings.add('c-t', filter=is_active)
def _(event):
    # ...
    pass
```

The key binding will be ignored when this condition is not satisfied.

ConditionalKeyBindings: Disabling a set of key bindings

Sometimes you want to enable or disable a whole set of key bindings according to a certain condition. This is possible by wrapping it in a *ConditionalKeyBindings* object.

```
from prompt_toolkit.key_binding import ConditionalKeyBindings

@Condition
def is_active():
    " Only activate key binding on the second half of each minute. "
    return datetime.datetime.now().second > 30

 bindings = ConditionalKeyBindings(
     key_bindings=my_bindings,
     filter=is_active)
```

If the condition is not satisfied, all the key bindings in *my_bindings* above will be ignored.

Merging key bindings

Sometimes you have different parts of your application generate a collection of key bindings. It is possible to merge them together through the *merge_key_bindings()* function. This is preferred above passing a *KeyBindings* object around and having everyone populate it.

```
from prompt_toolkit.key_binding import merge_key_bindings

bindings = merge_key_bindings([
    bindings1,
    bindings2,
])
```

Eager

Usually not required, but if ever you have to override an existing key binding, the *eager* flag can be useful.

Suppose that there is already an active binding for *ab* and you'd like to add a second binding that only handles *a*. When the user presses only *a*, prompt_toolkit has to wait for the next key press in order to know which handler to call.

By passing the *eager* flag to this second binding, we are actually saying that prompt_toolkit shouldn't wait for longer matches when all the keys in this key binding are matched. So, if *a* has been pressed, this second binding will be called, even if there's an active *ab* binding.

```
@bindings.add('a', 'b')
def binding_1(event):
    ...

@bindings.add('a', eager=True)
def binding_2(event):
    ...
```

This is mainly useful in order to conditionally override another binding.

Asyncio coroutines

Key binding handlers can be asyncio coroutines.

```
from prompt_toolkit.application import in_terminal

@bindings.add('x')
async def print_hello(event):
    """
    Pressing 'x' will print 5 times "hello" in the background above the
    prompt.
    """
    for i in range(5):
        # Print hello above the current prompt.
        async with in_terminal():
            print('hello')

        # Sleep, but allow further input editing in the meantime.
        await asyncio.sleep(1)
```

If the user accepts the input on the prompt, while this coroutine is not yet finished , an *asyncio.CancelledError* exception will be thrown in this coroutine.

Timeouts

There are two timeout settings that effect the handling of keys.

- `Application.ttimeoutlen`: Like Vim's *ttimeoutlen* option. When to flush the input (For flushing escape keys.) This is important on terminals that use vt100 input. We can't distinguish the escape key from for instance the left-arrow key, if we don't know what follows after "x1b". This little timer will consider "x1b" to be escape if nothing did follow in this time span. This seems to work like the *ttimeoutlen* option in Vim.
- `KeyProcessor.timeoutlen`: like Vim's *timeoutlen* option. This can be *None* or a float. For instance, suppose that we have a key binding AB and a second key binding A. If the uses presses A and then waits, we don't handle this binding yet (unless it was marked 'eager'), because we don't know what will follow. This timeout is the maximum amount of time that we wait until we call the handlers anyway. Pass *None* to disable this timeout.

Recording macros

Both Emacs and Vi mode allow macro recording. By default, all key presses are recorded during a macro, but it is possible to exclude certain keys by setting the *record_in_macro* parameter to *False*:

```
@bindings.add('c-t', record_in_macro=False)
def _(event):
    # ...
    pass
```

Creating new Vi text objects and operators

We tried very hard to ship prompt_toolkit with as many as possible Vi text objects and operators, so that text editing feels as natural as possible to Vi users.

If you wish to create a new text object or key binding, that is actually possible. Check the *custom-vi-operator-and-text-object.py* example for more information.

Handling SIGINT

The SIGINT Unix signal can be handled by binding `<sigint>`. For instance:

```
@bindings.add('<sigint>')
def _(event):
    # ...
    pass
```

This will handle a SIGINT that was sent by an external application into the process. Handling control-c should be done by binding `c-c`. (The terminal input is set to raw mode, which means that a `c-c` won't be translated into a SIGINT.)

For a `PromptSession`, there is a default binding for `<sigint>` that corresponds to `c-c`: it will exit the prompt, raising a `KeyboardInterrupt` exception.

Processing *.inputrc*

GNU readline can be configured using an *.inputrc* configuration file. This file contains key bindings as well as certain settings. Right now, prompt_toolkit doesn't support *.inputrc*, but it should be possible in the future.

3.10.2 More about styling

This page will attempt to explain in more detail how to use styling in prompt_toolkit.

To some extent, it is very similar to how Pygments styling works.

Style strings

Many user interface controls, like *Window* accept a `style` argument which can be used to pass the formatting as a string. For instance, we can select a foreground color:

- `"fg:ansired"` (ANSI color palette)
- `"fg:ansiblue"` (ANSI color palette)
- `"fg:#ffaa33"` (hexadecimal notation)
- `"fg:darkred"` (named color)

Or a background color:

- `"bg:ansired"` (ANSI color palette)
- `"bg:#ffaa33"` (hexadecimal notation)

Or we can add one of the following flags:

- `"bold"`
- `"italic"`
- `"underline"`
- `"blink"`
- `"reverse"` (reverse foreground and background on the terminal.)
- `"hidden"`

Or their negative variants:

- "nobold"
- "noitalic"
- "nounderline"
- "noblink"
- "noreverse"
- "nohidden"

All of these formatting options can be combined as well:

- "fg:ansiyellow bg:black bold underline"

The style string can be given to any user control directly, or to a *Container* object from where it will propagate to all its children. A style defined by a parent user control can be overridden by any of its children. The parent can for instance say style="bold underline" where a child overrides this style partly by specifying style="nobold bg:ansired".

Note: These styles are actually compatible with Pygments styles, with additional support for *reverse* and *blink*. Further, we ignore flags like *roman*, *sans*, *mono* and *border*.

The following ANSI colors are available (both for foreground and background):

```
# Low intensity, dark.  (One or two components 0x80, the other 0x00.)
ansiblack, ansired, ansigreen, ansiyellow, ansiblue
ansimagenta, 'ansicyan, ansigray

# High intensity, bright.
ansibrightblack, ansibrightred, ansibrightgreen, ansibrightyellow
ansibrightblue, ansibrightmagenta, ansibrightcyan, ansiwhite
```

In order to know which styles are actually used in an application, it is possible to call get_used_style_strings(), when the application is done.

Class names

Like we do for web design, it is not a good habit to specify all styling inline. Instead, we can attach class names to UI controls and have a style sheet that refers to these class names. The *Style* can be passed as an argument to the *Application*.

```
from prompt_toolkit.layout import VSplit, Window
from prompt_toolkit.styles import Style

layout = VSplit([
    Window(BufferControl(...), style='class:left'),
    HSplit([
        Window(BufferControl(...), style='class:top'),
        Window(BufferControl(...), style='class:bottom'),
    ], style='class:right')
])

style = Style([
     ('left', 'bg:ansired'),
     ('top', 'fg:#00aaaa'),
```

(continues on next page)

(continued from previous page)

```
    ('bottom', 'underline bold'),
])
```

It is possible to add multiple class names to an element. That way we'll combine the styling for these class names. Multiple classes can be passed by using a comma separated list, or by using the `class:` prefix twice.

```
Window(BufferControl(...), style='class:left,bottom'),
Window(BufferControl(...), style='class:left class:bottom'),
```

It is possible to combine class names and inline styling. The order in which the class names and inline styling is specified determines the order of priority. In the following example for instance, we'll take first the style of the "header" class, and then override that with a red background color.

```
Window(BufferControl(...), style='class:header bg:red'),
```

Dot notation in class names

The dot operator has a special meaning in a class name. If we write: `style="class:a.b.c"`, then this will actually expand to the following: `style="class:a class:a.b class:a.b.c"`.

This is mainly added for Pygments lexers, which specify "Tokens" like this, but it's useful in other situations as well.

Multiple classes in a style sheet

A style sheet can be more complex as well. We can for instance specify two class names. The following will underline the left part within the header, or whatever has both the class "left" and the class "header" (the order doesn't matter).

```
style = Style([
    ('header left', 'underline'),
])
```

If you have a dotted class, then it's required to specify the whole path in the style sheet (just typing `c` or `b.c` doesn't work if the class is `a.b.c`):

```
style = Style([
    ('a.b.c', 'underline'),
])
```

It is possible to combine this:

```
style = Style([
    ('header body left.text', 'underline'),
])
```

Evaluation order of rules in a style sheet

The style is determined as follows:

- First, we concatenate all the style strings from the root control through all the parents to the child in one big string. (Things at the right take precedence anyway.)

  E.g: `class:body bg:#aaaaaa #000000 class:header.focused class:left.text.highlighted underline`

- Then we go through this style from left to right, starting from the default style. Inline styling is applied directly.

  If we come across a class name, then we generate all combinations of the class names that we collected so far (this one and all class names to the left), and for each combination which includes the new class name, we look for matching rules in our style sheet. All these rules are then applied (later rules have higher priority).

  If we find a dotted class name, this will be expanded in the individual names (like `class:left class:left.text class:left.text.highlighted`), and all these are applied like any class names.

- Then this final style is applied to this user interface element.

Using a dictionary as a style sheet

The order of the rules in a style sheet is meaningful, so typically, we use a list of tuples to specify the style. But is also possible to use a dictionary as a style sheet. This makes sense for Python 3.6, where dictionaries remember their ordering. An `OrderedDict` works as well.

```
from prompt_toolkit.styles import Style

style = Style.from_dict({
    'header body left.text': 'underline',
})
```

Loading a style from Pygments

Pygments has a slightly different notation for specifying styles, because it maps styling to Pygments "Tokens". A Pygments style can however be loaded and used as follows:

```
from prompt_toolkit.styles.pygments import style_from_pygments_cls
from pygments.styles import get_style_by_name

style = style_from_pygments_cls(get_style_by_name('monokai'))
```

Merging styles together

Multiple *`Style`* objects can be merged together as follows:

```
from prompt_toolkit.styles import merge_styles

style = merge_styles([
    style1,
    style2,
    style3
])
```

Color depths

There are four different levels of color depths available:

1 bit	Black and white	`ColorDepth.DEPTH_1_BIT`	`ColorDepth.MONOCHROME`
4 bit	ANSI colors	`ColorDepth.DEPTH_4_BIT`	`ColorDepth.ANSI_COLORS_ONLY`
8 bit	256 colors	`ColorDepth.DEPTH_8_BIT`	`ColorDepth.DEFAULT`
24 bit	True colors	`ColorDepth.DEPTH_24_BIT`	`ColorDepth.TRUE_COLOR`

By default, 256 colors are used, because this is what most terminals support these days. If the `TERM` enviroment variable is set to `linux` or `eterm-color`, then only ANSI colors are used, because of these terminals. The 24 bit true color output needs to be enabled explicitely. When 4 bit color output is chosen, all colors will be mapped to the closest ANSI color.

Setting the default color depth for any prompt_toolkit application can be done by setting the `PROMPT_TOOLKIT_COLOR_DEPTH` environment variable. You could for instance copy the following into your *.bashrc* file.

```
# export PROMPT_TOOLKIT_COLOR_DEPTH=DEPTH_1_BIT
export PROMPT_TOOLKIT_COLOR_DEPTH=DEPTH_4_BIT
# export PROMPT_TOOLKIT_COLOR_DEPTH=DEPTH_8_BIT
# export PROMPT_TOOLKIT_COLOR_DEPTH=DEPTH_24_BIT
```

An application can also decide to set the color depth manually by passing a *ColorDepth* value to the *Application* object:

```
from prompt_toolkit.output.color_depth import ColorDepth

app = Application(
    color_depth=ColorDepth.ANSI_COLORS_ONLY,
    # ...
)
```

Style transformations

Prompt_toolkit supports a way to apply certain transformations to the styles near the end of the rendering pipeline. This can be used for instance to change certain colors to improve the rendering in some terminals.

One useful example is the *AdjustBrightnessStyleTransformation* class, which takes *min_brightness* and *max_brightness* as arguments which by default have 0.0 and 1.0 as values. In the following code snippet, we increase the minimum brightness to improve rendering on terminals with a dark background.

```
from prompt_toolkit.styles import AdjustBrightnessStyleTransformation

app = Application(
    style_transformation=AdjustBrightnessStyleTransformation(
        min_brightness=0.5,   # Increase the minimum brightness.
        max_brightness=1.0,
    )
    # ...
)
```

3.10.3 Filters

Many places in *prompt_toolkit* require a boolean value that can change over time. For instance:

- to specify whether a part of the layout needs to be visible or not;
- or to decide whether a certain key binding needs to be active or not;
- or the `wrap_lines` option of *BufferControl*;
- etcetera.

These booleans are often dynamic and can change at runtime. For instance, the search toolbar should only be visible when the user is actually searching (when the search buffer has the focus). The `wrap_lines` option could be changed with a certain key binding. And that key binding could only work when the default buffer got the focus.

In *prompt_toolkit*, we decided to reduce the amount of state in the whole framework, and apply a simple kind of reactive programming to describe the flow of these booleans as expressions. (It's one-way only: if a key binding needs to know whether it's active or not, it can follow this flow by evaluating an expression.)

The (abstract) base class is *Filter*, which wraps an expression that takes no input and evaluates to a boolean. Getting the state of a filter is done by simply calling it.

An example

The most obvious way to create such a *Filter* instance is by creating a *Condition* instance from a function. For instance, the following condition will evaluate to `True` when the user is searching:

```
from prompt_toolkit.application.current import get_app
from prompt_toolkit.filters import Condition

is_searching = Condition(lambda: get_app().is_searching)
```

A different way of writing this, is by using the decorator syntax:

```
from prompt_toolkit.application.current import get_app
from prompt_toolkit.filters import Condition

@Condition
def is_searching():
    return get_app().is_searching
```

This filter can then be used in a key binding, like in the following snippet:

```
from prompt_toolkit.key_binding import KeyBindings

kb = KeyBindings()

@kb.add('c-t', filter=is_searching)
def _(event):
    # Do, something, but only when searching.
    pass
```

If we want to know the boolean value of this filter, we have to call it like a function:

```
print(is_searching())
```

Built-in filters

There are many built-in filters, ready to use. All of them have a lowercase name, because they represent the wrapped function underneath, and can be called as a function.

- `has_arg`
- `has_completions`
- *has_focus*
- `buffer_has_focus`

- has_selection
- has_validation_error
- is_aborting
- is_done
- is_read_only
- is_multiline
- renderer_height_is_known
- *in_editing_mode*
- in_paste_mode
- vi_mode
- vi_navigation_mode
- vi_insert_mode
- vi_insert_multiple_mode
- vi_replace_mode
- vi_selection_mode
- vi_waiting_for_text_object_mode
- vi_digraph_mode
- emacs_mode
- emacs_insert_mode
- emacs_selection_mode
- is_searching
- control_is_searchable
- vi_search_direction_reversed

Combining filters

Filters can be chained with the `&` (AND) and `|` (OR) operators and negated with the `~` (negation) operator.

Some examples:

```
from prompt_toolkit.key_binding import KeyBindings
from prompt_toolkit.filters import has_selection, has_selection

kb = KeyBindings()

@kb.add('c-t', filter=~is_searching)
def _(event):
    " Do something, but not while searching. "
    pass

@kb.add('c-t', filter=has_search | has_selection)
def _(event):
    " Do something, but only when searching or when there is a selection. "
    pass
```

to_filter

Finally, in many situations you want your code to expose an API that is able to deal with both booleans as well as filters. For instance, when for most users a boolean works fine because they don't need to change the value over time, while some advanced users want to be able this value to a certain setting or event that does changes over time.

In order to handle both use cases, there is a utility called *to_filter()*.

This is a function that takes either a boolean or an actual *Filter* instance, and always returns a *Filter*.

```
from prompt_toolkit.filters.utils import to_filter

# In each of the following three examples, 'f' will be a `Filter`
# instance.
f = to_filter(True)
f = to_filter(False)
f = to_filter(Condition(lambda: True))
f = to_filter(has_search | has_selection)
```

3.10.4 The rendering flow

Understanding the rendering flow is important for understanding how *Container* and *UIControl* objects interact. We will demonstrate it by explaining the flow around a *BufferControl*.

Note: A *BufferControl* is a *UIControl* for displaying the content of a *Buffer*. A buffer is the object that holds any editable region of text. Like all controls, it has to be wrapped into a *Window*.

Let's take the following code:

```
from prompt_toolkit.enums import DEFAULT_BUFFER
from prompt_toolkit.layout.containers import Window
from prompt_toolkit.layout.controls import BufferControl
from prompt_toolkit.buffer import Buffer

b = Buffer(name=DEFAULT_BUFFER)
Window(content=BufferControl(buffer=b))
```

What happens when a *Renderer* objects wants a *Container* to be rendered on a certain *Screen*?

The visualisation happens in several steps:

1. The *Renderer* calls the *write_to_screen()* method of a *Container*. This is a request to paint the layout in a rectangle of a certain size.

   The *Window* object then requests the *UIControl* to create a *UIContent* instance (by calling *create_content()*). The user control receives the dimensions of the window, but can still decide to create more or less content.

   Inside the *create_content()* method of *UIControl*, there are several steps:

   2. First, the buffer's text is passed to the *lex_document()* method of a *Lexer*. This returns a function which for a given line number, returns a "formatted text list" for that line (that's a list of `(style_string, text)` tuples).
   3. This list is passed through a list of *Processor* objects. Each processor can do a transformation for each line. (For instance, they can insert or replace some text, highlight the selection or search string, etc...)
   4. The *UIControl* returns a *UIContent* instance which generates such a token lists for each lines.

The *Window* receives the *UIContent* and then:

5. It calculates the horizontal and vertical scrolling, if applicable (if the content would take more space than what is available).
6. The content is copied to the correct absolute position *Screen*, as requested by the *Renderer*. While doing this, the *Window* can possible wrap the lines, if line wrapping was configured.

Note that this process is lazy: if a certain line is not displayed in the *Window*, then it is not requested from the *UIContent*. And from there, the line is not passed through the processors or even asked from the *Lexer*.

3.10.5 Running on top of the *asyncio* event loop

Note: New in prompt_toolkit 3.0. (In prompt_toolkit 2.0 this was possible using a work-around).

Prompt_toolkit 3.0 uses asyncio natively. Calling `Application.run()` will automatically run the asyncio event loop.

If however you want to run a prompt_toolkit `Application` within an asyncio environment, you have to call the `run_async` method, like this:

```
from prompt_toolkit.application import Application

async def main():
    # Define application.
    application = Application(
        ...
    )

    result = await application.run_async()
    print(result)

asyncio.get_event_loop().run_until_complete(main())
```

3.10.6 Unit testing

Testing user interfaces is not always obvious. Here are a few tricks for testing prompt_toolkit applications.

PosixPipeInput and *DummyOutput*

During the creation of a prompt_toolkit *Application*, we can specify what input and output device to be used. By default, these are output objects that correspond with *sys.stdin* and *sys.stdout*. In unit tests however, we want to replace these.

- For the input, we want a "pipe input". This is an input device, in which we can programatically send some input. It can be created with *create_pipe_input()*, and that return either a `PosixPipeInput` or a `Win32PipeInput` depending on the platform.
- For the output, we want a *DummyOutput*. This is an output device that doesn't render anything. We don't want to render anything to *sys.stdout* in the unit tests.

Note: Typically, we don't want to test the bytes that are written to *sys.stdout*, because these can change any time when the rendering algorithm changes, and are not so meaningful anyway. Instead, we want to test the return value from the *Application* or test how data structures (like text buffers) change over time.

So we programmatically feed some input to the input pipe, have the key bindings process the input and then test what comes out of it.

In the following example we use a *PromptSession*, but the same works for any *Application*.

```
from prompt_toolkit.shortcuts import PromptSession
from prompt_toolkit.input import create_pipe_input
from prompt_toolkit.output import DummyOutput

def test_prompt_session():
    with create_pipe_input() as inp:
        inp.send_text("hello\n")
        session = PromptSession(
            input=inp,
            output=DummyOutput(),
        )

        result = session.prompt()

    assert result == "hello"
```

In the above example, don't forget to send the \n character to accept the prompt, otherwise the *Application* will wait forever for some more input to receive.

Using an AppSession

Sometimes it's not convenient to pass input or output objects to the *Application*, and in some situations it's not even possible at all. This happens when these parameters are not passed down the call stack, through all function calls.

An easy way to specify which input/output to use for all applications, is by creating an AppSession with this input/output and running all code in that AppSession. This way, we don't need to inject it into every *Application* or *print_formatted_text()* call.

Here is an example where we use *create_app_session()*:

```
from prompt_toolkit.application import create_app_session
from prompt_toolkit.shortcuts import print_formatted_text
from prompt_toolkit.output import DummyOutput

def test_something():
    with create_app_session(output=DummyOutput()):
        ...
        print_formatted_text('Hello world')
        ...
```

Pytest fixtures

In order to get rid of the boilerplate of creating the input, the *DummyOutput*, and the AppSession, we create a single fixture that does it for every test. Something like this:

```
import pytest
from prompt_toolkit.application import create_app_session
from prompt_toolkit.input import create_pipe_input
from prompt_toolkit.output import DummyOutput

@pytest.fixture(autouse=True, scope="function")
def mock_input():
    with create_pipe_input() as pipe_input:
        with create_app_session(input=pipe_input, output=DummyOutput()):
            yield pipe_input
```

Type checking

Prompt_toolkit 3.0 is fully type annotated. This means that if a prompt_toolkit application is typed too, it can be verified with mypy. This is complementary to unit tests, but also great for testing for correctness.

3.10.7 Input hooks

Input hooks are a tool for inserting an external event loop into the prompt_toolkit event loop, so that the other loop can run as long as prompt_toolkit (actually asyncio) is idle. This is used in applications like IPython, so that GUI toolkits can display their windows while we wait at the prompt for user input.

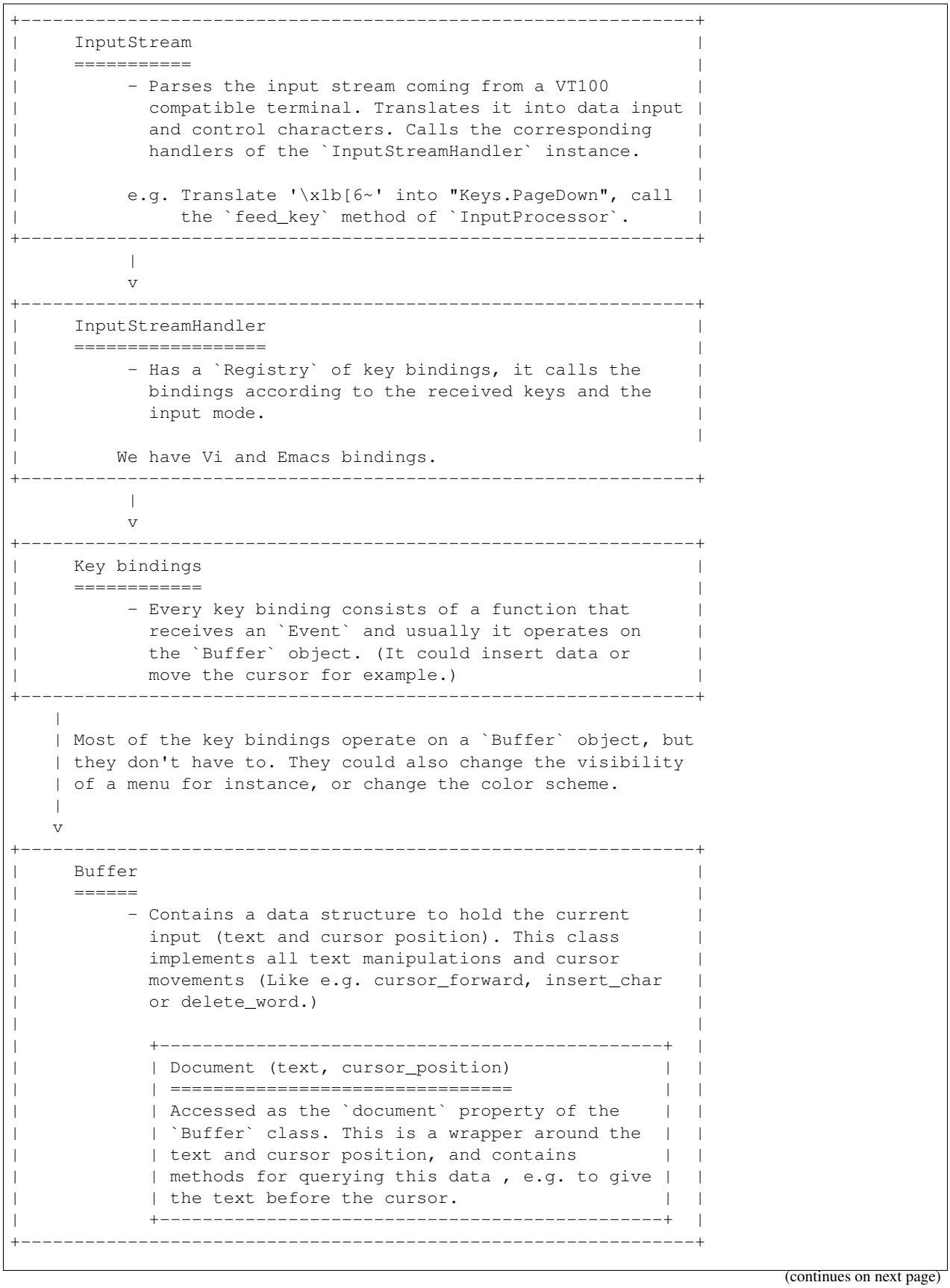
As a consequence, we will "trampoline" back and forth between two event loops.

Note: This will use a `SelectorEventLoop`, not the :class: `ProactorEventLoop` (on Windows) due to the way the implementation works (contributions are welcome to make that work).

```
from prompt_toolkit.eventloop.inputhook import set_eventloop_with_inputhook

def inputhook(inputhook_context):
    # At this point, we run the other loop. This loop is supposed to run
    # until either `inputhook_context.fileno` becomes ready for reading or
    # `inputhook_context.input_is_ready()` returns True.

    # A good way is to register this file descriptor in this other event
    # loop with a callback that stops this loop when this FD becomes ready.
    # There is no need to actually read anything from the FD.

    while True:
        ...

set_eventloop_with_inputhook(inputhook)

# Any asyncio code at this point will now use this new loop, with input
# hook installed.
```

3.10.8 Architecture

TODO: this is a little outdated.



(continues on next page)

(continued from previous page)

```
    |
    |  Normally after every key press, the output will be
    |  rendered again. This happens in the event loop of
    |  the `Application` where `Renderer.render` is called.
    v
+-------------------------------------------------------------+
|     Layout                                                  |
|     ======                                                  |
|          - When the renderer should redraw, the renderer    |
|            asks the layout what the output should look like.|
|          - The layout operates on a `Screen` object that he |
|            received from the `Renderer` and will put the    |
|            toolbars, menus, highlighted content and prompt  |
|            in place.                                        |
|                                                             |
|            +-----------------------------------------------+|
|            | Menus, toolbars, prompt                       ||
|            | ======================                        ||
|            |                                               ||
|            +-----------------------------------------------+|
+-------------------------------------------------------------+
    |
    v
+-------------------------------------------------------------+
|     Renderer                                                |
|     ========                                                |
|          - Calculates the difference between the last output|
|            and the new one and writes it to the terminal    |
|            output.                                         |
+-------------------------------------------------------------+
```

3.10.9 The rendering pipeline

This document is an attempt to describe how prompt_toolkit applications are rendered. It's a complex but logical process that happens more or less after every key stroke. We'll go through all the steps from the point where the user hits a key, until the character appears on the screen.

Waiting for user input

Most of the time when a prompt_toolkit application is running, it is idle. It's sitting in the event loop, waiting for some I/O to happen. The most important kind of I/O we're waiting for is user input. So, within the event loop, we have one file descriptor that represents the input device from where we receive key presses. The details are a little different between operating systems, but it comes down to a selector (like select or epoll) which waits for one or more file descriptor. The event loop is then responsible for calling the appropriate feedback when one of the file descriptors becomes ready.

It is like that when the user presses a key: the input device becomes ready for reading, and the appropriate callback is called. This is the *read_from_input* function somewhere in *application.py*. It will read the input from the `Input` object, by calling `read_keys()`.

Reading the user input

The actual reading is also operating system dependent. For instance, on a Linux machine with a vt100 terminal, we read the input from the pseudo terminal device, by calling *os.read*. This however returns a sequence of bytes. There are two difficulties:

- The input could be UTF-8 encoded, and there is always the possibility that we receive only a portion of a multi-byte character.
- vt100 key presses consist of multiple characters. For instance the "left arrow" would generate something like `\x1b[D`. It could be that when we read this input stream, that at some point we only get the first part of such a key press, and we have to wait for the rest to arrive.

Both problems are implemented using state machines.

- The UTF-8 problem is solved using *codecs.getincrementaldecoder*, which is an object in which we can feed the incoming bytes, and it will only return the complete UTF-8 characters that we have so far. The rest is buffered for the next read operation.
- Vt100 parsing is solved by the `Vt100Parser` state machine. The state machine itself is implemented using a generator. We feed the incoming characters to the generator, and it will call the appropriate callback for key presses once they arrive. One thing here to keep in mind is that the characters for some key presses are a prefix of other key presses, like for instance, escape (`\x1b`) is a prefix of the left arrow key (`\x1b[D`). So for those, we don't know what key is pressed until more data arrives or when the input is flushed because of a timeout.

For Windows systems, it's a little different. Here we use Win32 syscalls for reading the console input.

Processing the key presses

The `Key` objects that we receive are then passed to the `KeyProcessor` for matching against the currently registered and active key bindings.

This is another state machine, because key bindings are linked to a sequence of key presses. We cannot call the handler until all of these key presses arrive and until we're sure that this combination is not a prefix of another combination. For instance, sometimes people bind `jj` (a double `j` key press) to `esc` in Vi mode. This is convenient, but we want to make sure that pressing `j` once only, followed by a different key will still insert the `j` character as usual.

Now, there are hundreds of key bindings in prompt_toolkit (in ptpython, right now we have 585 bindings). This is mainly caused by the way that Vi key bindings are generated. In order to make this efficient, we keep a cache of handlers which match certain sequences of keys.

Of course, key bindings also have filters attached for enabling/disabling them. So, if at some point, we get a list of handlers from that cache, we still have to discard the inactive bindings. Luckily, many bindings share exactly the same filter, and we have to check every filter only once.

Read more about key bindings . . .

The key handlers

Once a key sequence is matched, the handler is called. This can do things like text manipulation, changing the focus or anything else.

After the handler is called, the user interface is invalidated and rendered again.

Rendering the user interface

The rendering is pretty complex for several reasons:

- We have to compute the dimensions of all user interface elements. Sometimes they are given, but sometimes this requires calculating the size of `UIControl` objects.
- It needs to be very efficient, because it's something that happens on every single key stroke.
- We should output as little as possible on stdout in order to reduce latency on slow network connections and older terminals.

Calculating the total UI height

Unless the application is a full screen application, we have to know how much vertical space is going to be consumed. The total available width is given, but the vertical space is more dynamic. We do this by asking the root `Container` object to calculate its preferred height. If this is a `VSplit` or `HSplit` then this involves recursively querying the child objects for their preferred widths and heights and either summing it up, or taking maximum values depending on the actual layout. In the end, we get the preferred height, for which we make sure it's at least the distance from the cursor position to the bottom of the screen.

Painting to the screen

Then we create a `Screen` object. This is like a canvas on which user controls can paint their content. The `write_to_screen()` method of the root *Container* is called with the screen dimensions. This will call recursively `write_to_screen()` methods of nested child containers, each time passing smaller dimensions while we traverse what is a tree of *Container* objects.

The most inner containers are `Window` objects, they will do the actual painting of the `UIControl` to the screen. This involves line wrapping the *UIControl*'s text and maybe scrolling the content horizontally or vertically.

Rendering to stdout

Finally, when we have painted the screen, this needs to be rendered to stdout. This is done by taking the difference of the previously rendered screen and the new one. The algorithm that we have is heavily optimized to compute this difference as quickly as possible, and call the appropriate output functions of the `Output` back-end. At the end, it will position the cursor in the right place.

3.11 Reference

3.11.1 Application

class prompt_toolkit.application.**Application**(*layout: Layout | None = None, style: BaseStyle | None = None, include_default_pygments_style: FilterOrBool = True, style_transformation: StyleTransformation | None = None, key_bindings: KeyBindingsBase | None = None, clipboard: Clipboard | None = None, full_screen: bool = False, color_depth: ColorDepth | Callable[[], ColorDepth | None] | None = None, mouse_support: FilterOrBool = False, enable_page_navigation_bindings: None | FilterOrBool = None, paste_mode: FilterOrBool = False, editing_mode: EditingMode = <EditingMode.EMACS: 'EMACS'>, erase_when_done: bool = False, reverse_vi_search_direction: FilterOrBool = False, min_redraw_interval: float | int | None = None, max_render_postpone_time: float | int | None = 0.01, refresh_interval: float | None = None, terminal_size_polling_interval: float | None = 0.5, cursor: AnyCursorShapeConfig = None, on_reset: ApplicationEventHandler[_AppResult] | None = None, on_invalidate: ApplicationEventHandler[_AppResult] | None = None, before_render: ApplicationEventHandler[_AppResult] | None = None, after_render: ApplicationEventHandler[_AppResult] | None = None, input: Input | None = None, output: Output | None = None*)

The main Application class! This glues everything together.

Parameters

- **layout** – A *Layout* instance.
- **key_bindings** – *KeyBindingsBase* instance for the key bindings.
- **clipboard** – *Clipboard* to use.
- **full_screen** – When True, run the application on the alternate screen buffer.
- **color_depth** – Any *ColorDepth* value, a callable that returns a *ColorDepth* or *None* for default.
- **erase_when_done** – (bool) Clear the application output when it finishes.
- **reverse_vi_search_direction** – Normally, in Vi mode, a '/' searches forward and a '?' searches backward. In Readline mode, this is usually reversed.

- **min_redraw_interval** – Number of seconds to wait between redraws. Use this for applications where *invalidate* is called a lot. This could cause a lot of terminal output, which some terminals are not able to process.

  None means that every *invalidate* will be scheduled right away (which is usually fine).

  When one *invalidate* is called, but a scheduled redraw of a previous *invalidate* call has not been executed yet, nothing will happen in any case.

- **max_render_postpone_time** – When there is high CPU (a lot of other scheduled calls), postpone the rendering max x seconds. '0' means: don't postpone. '.5' means: try to draw at least twice a second.

- **refresh_interval** – Automatically invalidate the UI every so many seconds. When *None* (the default), only invalidate when *invalidate* has been called.

- **terminal_size_polling_interval** – Poll the terminal size every so many seconds. Useful if the applications runs in a thread other then then main thread where SIGWINCH can't be handled, or on Windows.

Filters:

Parameters

- **mouse_support** – (*Filter* or boolean). When True, enable mouse support.
- **paste_mode** – *Filter* or boolean.
- **editing_mode** – *EditingMode*.
- **enable_page_navigation_bindings** – When *True*, enable the page navigation key bindings. These include both Emacs and Vi bindings like page-up, page-down and so on to scroll through pages. Mostly useful for creating an editor or other full screen applications. Probably, you don't want this for the implementation of a REPL. By default, this is enabled if *full_screen* is set.

Callbacks (all of these should accept an *Application* object as input.)

Parameters

- **on_reset** – Called during reset.
- **on_invalidate** – Called when the UI has been invalidated.
- **before_render** – Called right before rendering.
- **after_render** – Called right after rendering.

I/O: (Note that the preferred way to change the input/output is by creating an *AppSession* with the required input/output objects. If you need multiple applications running at the same time, you have to create a separate *AppSession* using a *with create_app_session():* block.

Parameters

- **input** – *Input* instance.
- **output** – *Output* instance. (Probably Vt100_Output or Win32Output.)

Usage:

app = Application(...) app.run()

Or await app.run_async()

cancel_and_wait_for_background_tasks() → None
Cancel all background tasks, and wait for the cancellation to complete. If any of the background tasks raised an exception, this will also propagate the exception.

(If we had nurseries like Trio, this would be the *__aexit__* of a nursery.)

color_depth
The active *ColorDepth*.

The current value is determined as follows:

- If a color depth was given explicitly to this application, use that value.
- Otherwise, fall back to the color depth that is reported by the *Output* implementation. If the *Output* class was created using *output.defaults.create_output*, then this value is coming from the $PROMPT_TOOLKIT_COLOR_DEPTH environment variable.

cpr_not_supported_callback() → None
Called when we don't receive the cursor position response in time.

create_background_task(*coroutine: Coroutine[Any, Any, None]*) → asyncio.Task[None]
Start a background task (coroutine) for the running application. When the *Application* terminates, unfinished background tasks will be cancelled.

Given that we still support Python versions before 3.11, we can't use task groups (and exception groups), because of that, these background tasks are not allowed to raise exceptions. If they do, we'll call the default exception handler from the event loop.

If at some point, we have Python 3.11 as the minimum supported Python version, then we can use a *TaskGroup* (with the lifetime of *Application.run_async()*, and run run the background tasks in there.

This is not threadsafe.

current_buffer
The currently focused *Buffer*.

(This returns a dummy *Buffer* when none of the actual buffers has the focus. In this case, it's really not practical to check for *None* values or catch exceptions every time.)

current_search_state
Return the current `SearchState`. (The one for the focused *BufferControl*.)

exit(*result: _AppResult | None = None*, *exception: BaseException | type[BaseException] | None = None*, *style: str = ''*) → None
Exit application.

Note: If *Application.exit* is called before *Application.run()* is called, then the *Application* won't exit (because the *Application.future* doesn't correspond to the current run). Use a *pre_run* hook and an event to synchronize the closing if there's a chance this can happen.

Parameters

- **result** – Set this result for the application.
- **exception** – Set this exception as the result for an application. For a prompt, this is often *EOFError* or *KeyboardInterrupt*.
- **style** – Apply this style on the whole content when quitting, often this is 'class:exiting' for a prompt. (Used when *erase_when_done* is not set.)

get_used_style_strings() → list[str]
Return a list of used style strings. This is helpful for debugging, and for writing a new *Style*.

invalidate() → None
Thread safe way of sending a repaint trigger to the input event loop.

invalidated
True when a redraw operation has been scheduled.

is_running
True when the application is currently active/running.

key_processor = None
The *InputProcessor* instance.

print_text(*text: AnyFormattedText*, *style: BaseStyle | None = None*) → None
Print a list of (style_str, text) tuples to the output. (When the UI is running, this method has to be called through *run_in_terminal*, otherwise it will destroy the UI.)

Parameters

- **text** – List of `(style_str, text)` tuples.
- **style** – Style class to use. Defaults to the active style in the CLI.

quoted_insert = None
Quoted insert. This flag is set if we go into quoted insert mode.

render_counter = None
Render counter. This one is increased every time the UI is rendered. It can be used as a key for caching certain information during one rendering.

reset() → None
Reset everything, for reading the next input.

run(*pre_run: Callable[[], None] | None = None*, *set_exception_handler: bool = True*, *handle_sigint: bool = True*, *in_thread: bool = False*) → _AppResult
A blocking 'run' call that waits until the UI is finished.

This will start the current asyncio event loop. If no loop is set for the current thread, then it will create a new loop. If a new loop was created, this won't close the new loop (if *in_thread=False*).

Parameters

- **pre_run** – Optional callable, which is called right after the "reset" of the application.
- **set_exception_handler** – When set, in case of an exception, go out of the alternate screen and hide the application, display the exception, and wait for the user to press ENTER.
- **in_thread** – When true, run the application in a background thread, and block the current thread until the application terminates. This is useful if we need to be sure the application won't use the current event loop (asyncio does not support nested event loops). A new event loop will be created in this background thread, and that loop will also be closed when the background thread terminates. When this is used, it's especially important to make sure that all asyncio background tasks are managed through *get_appp().create_background_task()*, so that unfinished tasks are properly cancelled before the event loop is closed. This is used for instance in ptpython.
- **handle_sigint** – Handle SIGINT signal. Call the key binding for *Keys.SIGINT*. (This only works in the main thread.)

run_async(*pre_run: Callable[[], None] | None = None*, *set_exception_handler: bool = True*, *handle_sigint: bool = True*, *slow_callback_duration: float = 0.5*) → _AppResult

Run the prompt_toolkit *Application* until *exit()* has been called. Return the value that was passed to *exit()*.

This is the main entry point for a prompt_toolkit *Application* and usually the only place where the event loop is actually running.

Parameters

- **pre_run** – Optional callable, which is called right after the "reset" of the application.
- **set_exception_handler** – When set, in case of an exception, go out of the alternate screen and hide the application, display the exception, and wait for the user to press ENTER.
- **handle_sigint** – Handle SIGINT signal if possible. This will call the <*sigint*> key binding when a SIGINT is received. (This only works in the main thread.)
- **slow_callback_duration** – Display warnings if code scheduled in the asyncio event loop takes more time than this. The asyncio default of *0.1* is sometimes not sufficient on a slow system, because exceptionally, the drawing of the app, which happens in the event loop, can take a bit longer from time to time.

run_system_command(*command: str*, *wait_for_enter: bool = True*, *display_before_text: Union[str, MagicFormattedText, List[Union[Tuple[str, str], Tuple[str, str, Callable[[prompt_toolkit.mouse_events.MouseEvent], NotImplementedOrNone]]]], Callable[[], Any], None] = ''*, *wait_text: str = 'Press ENTER to continue...'*) → None

Run system command (While hiding the prompt. When finished, all the output will scroll above the prompt.)

Parameters

- **command** – Shell command to be executed.
- **wait_for_enter** – FWait for the user to press enter, when the command is finished.
- **display_before_text** – If given, text to be displayed before the command executes.

Returns A *Future* object.

suspend_to_background(*suspend_group: bool = True*) → None

(Not thread safe – to be called from inside the key bindings.) Suspend process.

Parameters **suspend_group** – When true, suspend the whole process group. (This is the default, and probably what you want.)

timeoutlen = None

Like Vim's *timeoutlen* option. This can be *None* or a float. For instance, suppose that we have a key binding AB and a second key binding A. If the uses presses A and then waits, we don't handle this binding yet (unless it was marked 'eager'), because we don't know what will follow. This timeout is the maximum amount of time that we wait until we call the handlers anyway. Pass *None* to disable this timeout.

ttimeoutlen = None

When to flush the input (For flushing escape keys.) This is important on terminals that use vt100 input. We can't distinguish the escape key from for instance the left-arrow key, if we don't know what follows after "x1b". This little timer will consider "x1b" to be escape if nothing did follow in this time span. This seems to work like the *ttimeoutlen* option in Vim.

vi_state = None

Vi state. (For Vi key bindings.)

prompt_toolkit.application.**get_app**() → Application[Any]
Get the current active (running) Application. An *Application* is active during the *Application.run_async()* call.

We assume that there can only be one *Application* active at the same time. There is only one terminal window, with only one stdin and stdout. This makes the code significantly easier than passing around the *Application* everywhere.

If no *Application* is running, then return by default a *DummyApplication*. For practical reasons, we prefer to not raise an exception. This way, we don't have to check all over the place whether an actual *Application* was returned.

(For applications like pymux where we can have more than one *Application*, we'll use a work-around to handle that.)

prompt_toolkit.application.**get_app_or_none**() → Application[Any] | None
Get the current active (running) Application, or return *None* if no application is running.

prompt_toolkit.application.**set_app**(*app: Application[Any]*) → Generator[(None, None, None)]
Context manager that sets the given *Application* active in an *AppSession*.

This should only be called by the *Application* itself. The application will automatically be active while its running. If you want the application to be active in other threads/coroutines, where that's not the case, use *contextvars.copy_context()*, or use *Application.context* to run it in the appropriate context.

prompt_toolkit.application.**create_app_session**(*input: Input | None = None*, *output: Output | None = None*) → Generator[AppSession, None, None]
Create a separate AppSession.

This is useful if there can be multiple individual 'AppSession's going on. Like in the case of an Telnet/SSH server. This functionality uses contextvars and requires at least Python 3.7.

class prompt_toolkit.application.**AppSession**(*input: Input | None = None*, *output: Output | None = None*)
An AppSession is an interactive session, usually connected to one terminal. Within one such session, interaction with many applications can happen, one after the other.

The input/output device is not supposed to change during one session.

Warning: Always use the *create_app_session* function to create an instance, so that it gets activated correctly.

Parameters

- **input** – Use this as a default input for all applications running in this session, unless an input is passed to the *Application* explicitely.
- **output** – Use this as a default output.

class prompt_toolkit.application.**DummyApplication**
When no *Application* is running, *get_app()* will run an instance of this *DummyApplication* instead.

prompt_toolkit.application.**in_terminal**(*render_cli_done: bool = False*) → AsyncGenerator[None, None]
Asynchronous context manager that suspends the current application and runs the body in the terminal.

```
async def f():
    async with in_terminal():
        call_some_function()
        await call_some_async_function()
```

prompt_toolkit.application.**run_in_terminal**(*func: Callable[[], _T], render_cli_done: bool = False, in_executor: bool = False*) → Awaitable[_T]

Run function on the terminal above the current application or prompt.

What this does is first hiding the prompt, then running this callable (which can safely output to the terminal), and then again rendering the prompt which causes the output of this function to scroll above the prompt.

`func` is supposed to be a synchronous function. If you need an asynchronous version of this function, use the `in_terminal` context manager directly.

Parameters

- **func** – The callable to execute.
- **render_cli_done** – When True, render the interface in the 'Done' state first, then execute the function. If False, erase the interface first.
- **in_executor** – When True, run in executor. (Use this for long blocking functions, when you don't want to block the event loop.)

Returns A *Future*.

3.11.2 Formatted text

Many places in prompt_toolkit can take either plain text, or formatted text. For instance the *prompt()* function takes either plain text or formatted text for the prompt. The *FormattedTextControl* can also take either plain text or formatted text.

In any case, there is an input that can either be just plain text (a string), an *HTML* object, an *ANSI* object or a sequence of *(style_string, text)* tuples. The *to_formatted_text()* conversion function takes any of these and turns all of them into such a tuple sequence.

prompt_toolkit.formatted_text.**to_formatted_text**(*value: Union[str, MagicFormattedText, List[Union[Tuple[str, str], Tuple[str, str, Callable[[prompt_toolkit.mouse_events.MouseEvent], NotImplementedOrNone]]]], Callable[[], Any], None], style: str = '', auto_convert: bool = False*) → prompt_toolkit.formatted_text.base.FormattedText

Convert the given value (which can be formatted text) into a list of text fragments. (Which is the canonical form of formatted text.) The outcome is always a *FormattedText* instance, which is a list of (style, text) tuples.

It can take a plain text string, an *HTML* or *ANSI* object, anything that implements *__pt_formatted_text__* or a callable that takes no arguments and returns one of those.

Parameters

- **style** – An additional style string which is applied to all text fragments.
- **auto_convert** – If *True*, also accept other types, and convert them to a string first.

prompt_toolkit.formatted_text.**is_formatted_text**(*value: object*) → TypeGuard[AnyFormattedText]

Check whether the input is valid formatted text (for use in assert statements). In case of a callable, it doesn't check the return type.

class prompt_toolkit.formatted_text.**Template**(*text: str*)

Template for string interpolation with formatted text.

Example:

```
Template(' ... {} ... ').format(HTML(...))
```

Parameters **text** – Plain text.

prompt_toolkit.formatted_text.**merge_formatted_text**(*items: Iterable[Union[str, MagicFormattedText, List[Union[Tuple[str, str], Tuple[str, str, Callable[[prompt_toolkit.mouse_events.MouseEvent], NotImplementedOrNone]]]], Callable[[], Any], None]]*) → Union[str, MagicFormattedText, List[Union[Tuple[str, str], Tuple[str, str, Callable[[prompt_toolkit.mouse_events.MouseEvent], NotImplementedOrNone]]]], Callable[[], Any], None]

Merge (Concatenate) several pieces of formatted text together.

class prompt_toolkit.formatted_text.**FormattedText**

A list of `(style, text)` tuples.

(In some situations, this can also be `(style, text, mouse_handler)` tuples.)

class prompt_toolkit.formatted_text.**HTML**(*value: str*)

HTML formatted text. Take something HTML-like, for use as a formatted string.

```
# Turn something into red.
HTML('<style fg="ansired" bg="#00ff44">...</style>')

# Italic, bold, underline and strike.
HTML('<i>...</i>')
HTML('<b>...</b>')
HTML('<u>...</u>')
HTML('<s>...</s>')
```

All HTML elements become available as a "class" in the style sheet. E.g. `<username>...</username>` can be styled, by setting a style for `username`.

format(**args*, ***kwargs*) → prompt_toolkit.formatted_text.html.HTML

Like *str.format*, but make sure that the arguments are properly escaped.

class prompt_toolkit.formatted_text.**ANSI**(*value: str*)

ANSI formatted text. Take something ANSI escaped text, for use as a formatted string. E.g.

```
ANSI('\x1b[31mhello \x1b[32mworld')
```

Characters between `\001` and `\002` are supposed to have a zero width when printed, but these are literally sent to the terminal output. This can be used for instance, for inserting Final Term prompt commands. They will be translated into a prompt_toolkit '[ZeroWidthEscape]' fragment.

format(**args*, ***kwargs*) → prompt_toolkit.formatted_text.ansi.ANSI

Like *str.format*, but make sure that the arguments are properly escaped. (No ANSI escapes can be injected.)

class prompt_toolkit.formatted_text.**PygmentsTokens**(*token_list: list[tuple[Token, str]]*)

Turn a pygments token list into a list of prompt_toolkit text fragments (`(style_str, text)` tuples).

prompt_toolkit.formatted_text.**fragment_list_len**(*fragments: List[Union[Tuple[str, str], Tuple[str, str, Callable[[prompt_toolkit.mouse_events.MouseEvent], NotImplementedOrNone]]]]*) → int

Return the amount of characters in this text fragment list.

Parameters **fragments** – List of `(style_str, text)` or `(style_str, text, mouse_handler)` tuples.

prompt_toolkit.formatted_text.**fragment_list_width**(*fragments: List[Union[Tuple[str, str], Tuple[str, str, Callable[[prompt_toolkit.mouse_events.MouseEvent], NotImplementedOrNone]]]]*) → int

Return the character width of this text fragment list. (Take double width characters into account.)

Parameters **fragments** – List of `(style_str, text)` or `(style_str, text, mouse_handler)` tuples.

prompt_toolkit.formatted_text.**fragment_list_to_text**(*fragments: List[Union[Tuple[str, str], Tuple[str, str, Callable[[prompt_toolkit.mouse_events.MouseEvent], NotImplementedOrNone]]]]*) → str

Concatenate all the text parts again.

Parameters **fragments** – List of `(style_str, text)` or `(style_str, text, mouse_handler)` tuples.

prompt_toolkit.formatted_text.**split_lines**(*fragments: List[Union[Tuple[str, str], Tuple[str, str, Callable[[prompt_toolkit.mouse_events.MouseEvent], NotImplementedOrNone]]]]*) → Iterable[List[Union[Tuple[str, str], Tuple[str, str, Callable[[prompt_toolkit.mouse_events.MouseEvent], NotImplementedOrNone]]]]]

Take a single list of (style_str, text) tuples and yield one such list for each line. Just like str.split, this will yield at least one item.

Parameters **fragments** – List of (style_str, text) or (style_str, text, mouse_handler) tuples.

prompt_toolkit.formatted_text.**to_plain_text**(*value: Union[str, MagicFormattedText, List[Union[Tuple[str, str], Tuple[str, str, Callable[[prompt_toolkit.mouse_events.MouseEvent], NotImplementedOrNone]]]], Callable[[], Any], None]*) → str

Turn any kind of formatted text back into plain text.

3.11.3 Buffer

Data structures for the Buffer. It holds the text, cursor position, history, etc...

exception prompt_toolkit.buffer.**EditReadOnlyBuffer**

Attempt editing of read-only *Buffer*.

class prompt_toolkit.buffer.**Buffer**(*completer: Completer | None = None*, *auto_suggest: AutoSuggest | None = None*, *history: History | None = None*, *validator: Validator | None = None*, *tempfile_suffix: str | Callable[[], str] = ''*, *tempfile: str | Callable[[], str] = ''*, *name: str = ''*, *complete_while_typing: FilterOrBool = False*, *validate_while_typing: FilterOrBool = False*, *enable_history_search: FilterOrBool = False*, *document: Document | None = None*, *accept_handler: BufferAcceptHandler | None = None*, *read_only: FilterOrBool = False*, *multiline: FilterOrBool = True*, *on_text_changed: BufferEventHandler | None = None*, *on_text_insert: BufferEventHandler | None = None*, *on_cursor_position_changed: BufferEventHandler | None = None*, *on_completions_changed: BufferEventHandler | None = None*, *on_suggestion_set: BufferEventHandler | None = None*)

The core data structure that holds the text and cursor position of the current input line and implements all text manipulations on top of it. It also implements the history, undo stack and the completion state.

Parameters

- **completer** – *Completer* instance.
- **history** – *History* instance.
- **tempfile_suffix** – The tempfile suffix (extension) to be used for the "open in editor" function. For a Python REPL, this would be ".py", so that the editor knows the syntax highlighting to use. This can also be a callable that returns a string.
- **tempfile** – For more advanced tempfile situations where you need control over the subdirectories and filename. For a Git Commit Message, this would be ".git/COMMIT_EDITMSG", so that the editor knows the syntax highlighting to use. This can also be a callable that returns a string.
- **name** – Name for this buffer. E.g. DEFAULT_BUFFER. This is mostly useful for key bindings where we sometimes prefer to refer to a buffer by their name instead of by reference.
- **accept_handler** – Called when the buffer input is accepted. (Usually when the user presses *enter*.) The accept handler receives this *Buffer* as input and should return True when the buffer text should be kept instead of calling reset.

  In case of a *PromptSession* for instance, we want to keep the text, because we will exit the application, and only reset it during the next run.

Events:

Parameters

- **on_text_changed** – When the buffer text changes. (Callable or None.)
- **on_text_insert** – When new text is inserted. (Callable or None.)
- **on_cursor_position_changed** – When the cursor moves. (Callable or None.)
- **on_completions_changed** – When the completions were changed. (Callable or None.)
- **on_suggestion_set** – When an auto-suggestion text has been set. (Callable or None.)

Filters:

Parameters

- **complete_while_typing** – *Filter* or *bool*. Decide whether or not to do asynchronous autocompleting while typing.
- **validate_while_typing** – *Filter* or *bool*. Decide whether or not to do asynchronous validation while typing.
- **enable_history_search** – *Filter* or *bool* to indicate when up-arrow partial string matching is enabled. It is advised to not enable this at the same time as *complete_while_typing*, because when there is an autocompletion found, the up arrows usually browse through the completions, rather than through the history.
- **read_only** – *Filter*. When True, changes will not be allowed.
- **multiline** – *Filter* or *bool*. When not set, pressing *Enter* will call the *accept_handler*. Otherwise, pressing *Esc-Enter* is required.

append_to_history() → None
Append the current input to the history.

apply_completion(*completion: prompt_toolkit.completion.base.Completion*) → None
Insert a given completion.

apply_search(*search_state: prompt_toolkit.search.SearchState*, *include_current_position: bool = True*, *count: int = 1*) → None
Apply search. If something is found, set *working_index* and *cursor_position*.

auto_down(*count: int = 1*, *go_to_start_of_line_if_history_changes: bool = False*) → None
If we're not on the last line (of a multiline input) go a line down, otherwise go forward in history. (If nothing is selected.)

auto_up(*count: int = 1*, *go_to_start_of_line_if_history_changes: bool = False*) → None
If we're not on the first line (of a multiline input) go a line up, otherwise go back in history. (If nothing is selected.)

cancel_completion() → None
Cancel completion, go back to the original text.

complete_next(*count: int = 1*, *disable_wrap_around: bool = False*) → None
Browse to the next completions. (Does nothing if there are no completion.)

complete_previous(*count: int = 1*, *disable_wrap_around: bool = False*) → None
Browse to the previous completions. (Does nothing if there are no completion.)

copy_selection(*_cut: bool = False*) → prompt_toolkit.clipboard.base.ClipboardData
Copy selected text and return *ClipboardData* instance.

Notice that this doesn't store the copied data on the clipboard yet. You can store it like this:

```
data = buffer.copy_selection()
get_app().clipboard.set_data(data)
```

cursor_down(*count: int = 1*) → None
(for multiline edit). Move cursor to the next line.

cursor_up(*count: int = 1*) → None
(for multiline edit). Move cursor to the previous line.

cut_selection() → prompt_toolkit.clipboard.base.ClipboardData
Delete selected text and return *ClipboardData* instance.

delete(*count: int = 1*) → str
Delete specified number of characters and Return the deleted text.

delete_before_cursor(*count: int = 1*) → str
Delete specified number of characters before cursor and return the deleted text.

document
Return *Document* instance from the current text, cursor position and selection state.

document_for_search(*search_state: prompt_toolkit.search.SearchState*) → prompt_toolkit.document.Document
Return a *Document* instance that has the text/cursor position for this search, if we would apply it. This will be used in the *BufferControl* to display feedback while searching.

get_search_position(*search_state: prompt_toolkit.search.SearchState*, *include_current_position: bool = True*, *count: int = 1*) → int
Get the cursor position for this search. (This operation won't change the *working_index*. It's won't go through the history. Vi text objects can't span multiple items.)

go_to_completion(*index: int | None*) → None
Select a completion from the list of current completions.

go_to_history(*index: int*) → None
Go to this item in the history.

history_backward(*count: int = 1*) → None
Move backwards through history.

history_forward(*count: int = 1*) → None
Move forwards through the history.

Parameters **count** – Amount of items to move forward.

insert_line_above(*copy_margin: bool = True*) → None
Insert a new line above the current one.

insert_line_below(*copy_margin: bool = True*) → None
Insert a new line below the current one.

insert_text(*data: str*, *overwrite: bool = False*, *move_cursor: bool = True*, *fire_event: bool = True*) → None
Insert characters at cursor position.

Parameters **fire_event** – Fire *on_text_insert* event. This is mainly used to trigger autocompletion while typing.

is_returnable
True when there is something handling accept.

join_next_line(*separator: str = ' '*) → None
Join the next line to the current one by deleting the line ending after the current line.

join_selected_lines(*separator: str = ' '*) → None
Join the selected lines.

load_history_if_not_yet_loaded() → None
Create task for populating the buffer history (if not yet done).

Note:

```
This needs to be called from within the event loop of the
application, because history loading is async, and we need to be
sure the right event loop is active. Therefor, we call this method
in the `BufferControl.create_content`.

There are situations where prompt_toolkit applications are created
```

(continues on next page)

(continued from previous page)

```
in one thread, but will later run in a different thread (Ptpython
is one example. The REPL runs in a separate thread, in order to
prevent interfering with a potential different event loop in the
main thread. The REPL UI however is still created in the main
thread.) We could decide to not support creating prompt_toolkit
objects in one thread and running the application in a different
thread, but history loading is the only place where it matters, and
this solves it.
```

newline(*copy_margin: bool = True*) → None
Insert a line ending at the current position.

open_in_editor(*validate_and_handle: bool = False*) → asyncio.Task[None]
Open code in editor.

This returns a future, and runs in a thread executor.

paste_clipboard_data(*data: prompt_toolkit.clipboard.base.ClipboardData*, *paste_mode: prompt_toolkit.selection.PasteMode = <PasteMode.EMACS: 'EMACS'>*, *count: int = 1*) → None
Insert the data from the clipboard.

reset(*document: Document | None = None*, *append_to_history: bool = False*) → None

Parameters **append_to_history** – Append current input to history first.

save_to_undo_stack(*clear_redo_stack: bool = True*) → None
Safe current state (input text and cursor position), so that we can restore it by calling undo.

set_document(*value: prompt_toolkit.document.Document*, *bypass_readonly: bool = False*) → None
Set *Document* instance. Like the `document` property, but accept an `bypass_readonly` argument.

Parameters **bypass_readonly** – When True, don't raise an *EditReadOnlyBuffer* exception, even when the buffer is read-only.

> **Warning:** When this buffer is read-only and *bypass_readonly* was not passed, the *EditReadOnlyBuffer* exception will be caught by the *KeyProcessor* and is silently suppressed. This is important to keep in mind when writing key bindings, because it won't do what you expect, and there won't be a stack trace. Use try/finally around this function if you need some cleanup code.

start_completion(*select_first: bool = False*, *select_last: bool = False*, *insert_common_part: bool = False*, *complete_event: CompleteEvent | None = None*) → None
Start asynchronous autocompletion of this buffer. (This will do nothing if a previous completion was still in progress.)

start_history_lines_completion() → None
Start a completion based on all the other lines in the document and the history.

start_selection(*selection_type: prompt_toolkit.selection.SelectionType = <SelectionType.CHARACTERS: 'CHARACTERS'>*) → None
Take the current cursor position as the start of this selection.

swap_characters_before_cursor() → None
Swap the last two characters before the cursor.

transform_current_line(*transform_callback: Callable[[str], str]*) → None
Apply the given transformation function to the current line.

Parameters **transform_callback** – callable that takes a string and return a new string.

transform_lines(*line_index_iterator: Iterable[int], transform_callback: Callable[[str], str]*) → str
Transforms the text on a range of lines. When the iterator yield an index not in the range of lines that the document contains, it skips them silently.

To uppercase some lines:

```
new_text = transform_lines(range(5,10), lambda text: text.upper())
```

Parameters

- **line_index_iterator** – Iterator of line numbers (int)
- **transform_callback** – callable that takes the original text of a line, and return the new text for this line.

Returns The new text.

transform_region(*from_: int, to: int, transform_callback: Callable[[str], str]*) → None
Transform a part of the input string.

Parameters

- **from** – (int) start position.
- **to** – (int) end position.
- **transform_callback** – Callable which accepts a string and returns the transformed string.

validate(*set_cursor: bool = False*) → bool
Returns *True* if valid.

Parameters **set_cursor** – Set the cursor position, if an error was found.

validate_and_handle() → None
Validate buffer and handle the accept action.

yank_last_arg(*n: int | None = None*) → None
Like *yank_nth_arg*, but if no argument has been given, yank the last word by default.

yank_nth_arg(*n: int | None = None*, *_yank_last_arg: bool = False*) → None
Pick nth word from previous history entry (depending on current *yank_nth_arg_state*) and insert it at current position. Rotate through history if called repeatedly. If no *n* has been given, take the first argument. (The second word.)

Parameters **n** – (None or int), The index of the word from the previous line to take.

class prompt_toolkit.buffer.**CompletionState**(*original_document: Document*, *completions: list[Completion] | None = None*, *complete_index: int | None = None*)
Immutable class that contains a completion state.

complete_index = None
Position in the *completions* array. This can be *None* to indicate "no completion", the original text.

completions = None
List of all the current Completion instances which are possible at this point.

current_completion
Return the current completion, or return *None* when no completion is selected.

go_to_index(*index: int | None*) → None
Create a new *CompletionState* object with the new index.

When *index* is *None* deselect the completion.

new_text_and_position() → tuple[str, int]
Return (new_text, new_cursor_position) for this completion.

original_document = None
Document as it was when the completion started.

prompt_toolkit.buffer.**indent**(*buffer: prompt_toolkit.buffer.Buffer*, *from_row: int*, *to_row: int*, *count: int = 1*) → None
Indent text of a *Buffer* object.

prompt_toolkit.buffer.**unindent**(*buffer: prompt_toolkit.buffer.Buffer*, *from_row: int*, *to_row: int*, *count: int = 1*) → None
Unindent text of a *Buffer* object.

prompt_toolkit.buffer.**reshape_text**(*buffer: prompt_toolkit.buffer.Buffer*, *from_row: int*, *to_row: int*) → None
Reformat text, taking the width into account. *to_row* is included. (Vi 'gq' operator.)

3.11.4 Selection

Data structures for the selection.

class prompt_toolkit.selection.**SelectionType**
Type of selection.

BLOCK = 'BLOCK'
A block selection. (Visual-Block in Vi.)

CHARACTERS = 'CHARACTERS'
Characters. (Visual in Vi.)

LINES = 'LINES'
Whole lines. (Visual-Line in Vi.)

class prompt_toolkit.selection.**PasteMode**
An enumeration.

class prompt_toolkit.selection.**SelectionState**(*original_cursor_position: int = 0*, *type: prompt_toolkit.selection.SelectionType = <SelectionType.CHARACTERS: 'CHARACTERS'>*)
State of the current selection.

Parameters

- **original_cursor_position** – int
- **type** – *SelectionType*

3.11.5 Clipboard

class prompt_toolkit.clipboard.**Clipboard**
Abstract baseclass for clipboards. (An implementation can be in memory, it can share the X11 or Windows keyboard, or can be persistent.)

get_data() → prompt_toolkit.clipboard.base.ClipboardData
Return clipboard data.

rotate() → None
For Emacs mode, rotate the kill ring.

set_data(*data: prompt_toolkit.clipboard.base.ClipboardData*) → None
Set data to the clipboard.

Parameters **data** – *ClipboardData* instance.

set_text(*text: str*) → None
Shortcut for setting plain text on clipboard.

class prompt_toolkit.clipboard.**ClipboardData**(*text: str = ''*, *type: prompt_toolkit.selection.SelectionType = <SelectionType.CHARACTERS: 'CHARACTERS'>*)
Text on the clipboard.

Parameters

- **text** – string
- **type** – *SelectionType*

class prompt_toolkit.clipboard.**DummyClipboard**
Clipboard implementation that doesn't remember anything.

class prompt_toolkit.clipboard.**DynamicClipboard**(*get_clipboard: Callable[[], Clipboard | None]*)
Clipboard class that can dynamically returns any Clipboard.

Parameters **get_clipboard** – Callable that returns a *Clipboard* instance.

class prompt_toolkit.clipboard.**InMemoryClipboard**(*data: ClipboardData | None = None*, *max_size: int = 60*)
Default clipboard implementation. Just keep the data in memory.

This implements a kill-ring, for Emacs mode.

class prompt_toolkit.clipboard.pyperclip.**PyperclipClipboard**
Clipboard that synchronizes with the Windows/Mac/Linux system clipboard, using the pyperclip module.

3.11.6 Auto completion

class prompt_toolkit.completion.**Completion**(*text: str*, *start_position: int = 0*, *display: AnyFormattedText | None = None*, *display_meta: AnyFormattedText | None = None*, *style: str = ''*, *selected_style: str = ''*)

Parameters

- **text** – The new string that will be inserted into the document.
- **start_position** – Position relative to the cursor_position where the new text will start. The text will be inserted between the start_position and the original cursor position.
- **display** – (optional string or formatted text) If the completion has to be displayed differently in the completion menu.

- **display_meta** – (Optional string or formatted text) Meta information about the completion, e.g. the path or source where it's coming from. This can also be a callable that returns a string.
- **style** – Style string.
- **selected_style** – Style string, used for a selected completion. This can override the *style* parameter.

display_meta
Return meta-text. (This is lazy when using a callable).

display_meta_text
The 'meta' field as plain text.

display_text
The 'display' field as plain text.

new_completion_from_position(*position: int*) → prompt_toolkit.completion.base.Completion
(Only for internal use!) Get a new completion by splitting this one. Used by *Application* when it needs to have a list of new completions after inserting the common prefix.

class prompt_toolkit.completion.**Completer**
Base class for completer implementations.

get_completions(*document: prompt_toolkit.document.Document*, *complete_event: prompt_toolkit.completion.base.CompleteEvent*) → Iterable[prompt_toolkit.completion.base.Completion]
This should be a generator that yields *Completion* instances.

If the generation of completions is something expensive (that takes a lot of time), consider wrapping this *Completer* class in a *ThreadedCompleter*. In that case, the completer algorithm runs in a background thread and completions will be displayed as soon as they arrive.

Parameters

- **document** – *Document* instance.
- **complete_event** – *CompleteEvent* instance.

get_completions_async(*document: prompt_toolkit.document.Document*, *complete_event: prompt_toolkit.completion.base.CompleteEvent*) → AsyncGenerator[prompt_toolkit.completion.base.Completion, None]
Asynchronous generator for completions. (Probably, you won't have to override this.)

Asynchronous generator of *Completion* objects.

class prompt_toolkit.completion.**ThreadedCompleter**(*completer: prompt_toolkit.completion.base.Completer*)
Wrapper that runs the *get_completions* generator in a thread.

(Use this to prevent the user interface from becoming unresponsive if the generation of completions takes too much time.)

The completions will be displayed as soon as they are produced. The user can already select a completion, even if not all completions are displayed.

get_completions_async(*document: prompt_toolkit.document.Document*, *complete_event: prompt_toolkit.completion.base.CompleteEvent*) → AsyncGenerator[prompt_toolkit.completion.base.Completion, None]
Asynchronous generator of completions.

class prompt_toolkit.completion.**DummyCompleter**
A completer that doesn't return any completion.

class prompt_toolkit.completion.**DynamicCompleter**(*get_completer: Callable[[], Completer | None]*)

Completer class that can dynamically returns any Completer.

Parameters **get_completer** – Callable that returns a *Completer* instance.

class prompt_toolkit.completion.**CompleteEvent**(*text_inserted: bool = False, completion_requested: bool = False*)

Event that called the completer.

Parameters

- **text_inserted** – When True, it means that completions are requested because of a text insert. (*Buffer.complete_while_typing*.)
- **completion_requested** – When True, it means that the user explicitly pressed the *Tab* key in order to view the completions.

These two flags can be used for instance to implement a completer that shows some completions when `Tab` has been pressed, but not automatically when the user presses a space. (Because of *complete_while_typing*.)

completion_requested = None
Used explicitly requested completion by pressing 'tab'.

text_inserted = None
Automatic completion while typing.

class prompt_toolkit.completion.**ConditionalCompleter**(*completer: prompt_toolkit.completion.base.Completer, filter: Union[prompt_toolkit.filters.base.Filter, bool]*)

Wrapper around any other completer that will enable/disable the completions depending on whether the received condition is satisfied.

Parameters

- **completer** – *Completer* instance.
- **filter** – *Filter* instance.

prompt_toolkit.completion.**merge_completers**(*completers: Sequence[prompt_toolkit.completion.base.Completer], deduplicate: bool = False*) → prompt_toolkit.completion.base.Completer

Combine several completers into one.

Parameters **deduplicate** – If *True*, wrap the result in a *DeduplicateCompleter* so that completions that would result in the same text will be deduplicated.

prompt_toolkit.completion.**get_common_complete_suffix**(*document: prompt_toolkit.document.Document, completions: Sequence[prompt_toolkit.completion.base.Completion]*) → str

Return the common prefix for all completions.

class prompt_toolkit.completion.**PathCompleter**(*only_directories: bool = False, get_paths: Callable[[], list[str]] | None = None, file_filter: Callable[[str], bool] | None = None, min_input_len: int = 0, expanduser: bool = False*)

Complete for Path variables.

Parameters

- **get_paths** – Callable which returns a list of directories to look into when the user enters a relative path.
- **file_filter** – Callable which takes a filename and returns whether this file should show up in the completion. `None` when no filtering has to be done.
- **min_input_len** – Don't do autocompletion when the input string is shorter.

class prompt_toolkit.completion.**ExecutableCompleter**

Complete only executable files in the current path.

class prompt_toolkit.completion.**FuzzyCompleter**(*completer: Completer*, *WORD: bool = False*, *pattern: str | None = None*, *enable_fuzzy: FilterOrBool = True*)

Fuzzy completion. This wraps any other completer and turns it into a fuzzy completer.

If the list of words is: ["leopard" , "gorilla", "dinosaur", "cat", "bee"] Then trying to complete "oar" would yield "leopard" and "dinosaur", but not the others, because they match the regular expression 'o.*a.*r'. Similar, in another application "djm" could expand to "django_migrations".

The results are sorted by relevance, which is defined as the start position and the length of the match.

Notice that this is not really a tool to work around spelling mistakes, like what would be possible with difflib. The purpose is rather to have a quicker or more intuitive way to filter the given completions, especially when many completions have a common prefix.

Fuzzy algorithm is based on this post: https://blog.amjith.com/fuzzyfinder-in-10-lines-of-python

Parameters

- **completer** – A *Completer* instance.
- **WORD** – When True, use WORD characters.
- **pattern** – Regex pattern which selects the characters before the cursor that are considered for the fuzzy matching.
- **enable_fuzzy** – (bool or *Filter*) Enabled the fuzzy behavior. For easily turning fuzzyness on or off according to a certain condition.

class prompt_toolkit.completion.**FuzzyWordCompleter**(*words: list[str] | Callable[[], list[str]]*, *meta_dict: dict[str, str] | None = None*, *WORD: bool = False*)

Fuzzy completion on a list of words.

(This is basically a *WordCompleter* wrapped in a *FuzzyCompleter*.)

Parameters

- **words** – List of words or callable that returns a list of words.
- **meta_dict** – Optional dict mapping words to their meta-information.
- **WORD** – When True, use WORD characters.

class prompt_toolkit.completion.**NestedCompleter**(*options: dict[str, Completer | None]*, *ignore_case: bool = True*)

Completer which wraps around several other completers, and calls any the one that corresponds with the first word of the input.

By combining multiple *NestedCompleter* instances, we can achieve multiple hierarchical levels of autocompletion. This is useful when *WordCompleter* is not sufficient.

If you need multiple levels, check out the *from_nested_dict* classmethod.

classmethod from_nested_dict(*data: Mapping[str, Union[Any, Set[str], None, prompt_toolkit.completion.base.Completer]]*) → prompt_toolkit.completion.nested.NestedCompleter

Create a *NestedCompleter*, starting from a nested dictionary data structure, like this:

```
data = {
    'show': {
        'version': None,
        'interfaces': None,
        'clock': None,
        'ip': {'interface': {'brief'}}
    },
    'exit': None
    'enable': None
}
```

The value should be *None* if there is no further completion at some point. If all values in the dictionary are None, it is also possible to use a set instead.

Values in this data structure can be a completers as well.

class prompt_toolkit.completion.**WordCompleter**(*words: list[str] | Callable[[], list[str]], ignore_case: bool = False, display_dict: Mapping[str, AnyFormattedText] | None = None, meta_dict: Mapping[str, AnyFormattedText] | None = None, WORD: bool = False, sentence: bool = False, match_middle: bool = False, pattern: Pattern[str] | None = None*)

Simple autocompletion on a list of words.

Parameters

- **words** – List of words or callable that returns a list of words.
- **ignore_case** – If True, case-insensitive completion.
- **meta_dict** – Optional dict mapping words to their meta-text. (This should map strings to strings or formatted text.)
- **WORD** – When True, use WORD characters.
- **sentence** – When True, don't complete by comparing the word before the cursor, but by comparing all the text before the cursor. In this case, the list of words is just a list of strings, where each string can contain spaces. (Can not be used together with the WORD option.)
- **match_middle** – When True, match not only the start, but also in the middle of the word.
- **pattern** – Optional compiled regex for finding the word before the cursor to complete. When given, use this regex pattern instead of default one (see document._FIND_WORD_RE)

class prompt_toolkit.completion.**DeduplicateCompleter**(*completer: prompt_toolkit.completion.base.Completer*)

Wrapper around a completer that removes duplicates. Only the first unique completions are kept.

Completions are considered to be a duplicate if they result in the same document text when they would be applied.

3.11.7 Document

The *Document* that implements all the text operations/querying.

class prompt_toolkit.document.**Document**(*text: str = ''*, *cursor_position: int | None = None*, *selection: SelectionState | None = None*)

This is a immutable class around the text and cursor position, and contains methods for querying this data, e.g. to give the text before the cursor.

This class is usually instantiated by a *Buffer* object, and accessed as the *document* property of that class.

Parameters

- **text** – string
- **cursor_position** – int
- **selection** – *SelectionState*

char_before_cursor
Return character before the cursor or an empty string.

current_char
Return character under cursor or an empty string.

current_line
Return the text on the line where the cursor is. (when the input consists of just one line, it equals *text*.

current_line_after_cursor
Text from the cursor until the end of the line.

current_line_before_cursor
Text from the start of the line until the cursor.

cursor_position
The document cursor position.

cursor_position_col
Current column. (0-based.)

cursor_position_row
Current row. (0-based.)

cut_selection() → tuple[Document, ClipboardData]
Return a (*Document*, *ClipboardData*) tuple, where the document represents the new document when the selection is cut, and the clipboard data, represents whatever has to be put on the clipboard.

empty_line_count_at_the_end() → int
Return number of empty lines at the end of the document.

end_of_paragraph(*count: int = 1*, *after: bool = False*) → int
Return the end of the current paragraph. (Relative cursor position.)

find(*sub: str*, *in_current_line: bool = False*, *include_current_position: bool = False*, *ignore_case: bool = False*, *count: int = 1*) → int | None
Find *text* after the cursor, return position relative to the cursor position. Return *None* if nothing was found.

Parameters **count** – Find the n-th occurrence.

find_all(*sub: str*, *ignore_case: bool = False*) → list[int]
Find all occurrences of the substring. Return a list of absolute positions in the document.

find_backwards(*sub: str*, *in_current_line: bool = False*, *ignore_case: bool = False*, *count: int = 1*) → int | None

Find *text* before the cursor, return position relative to the cursor position. Return *None* if nothing was found.

Parameters **count** – Find the n-th occurrence.

find_boundaries_of_current_word(*WORD: bool = False*, *include_leading_whitespace: bool = False*, *include_trailing_whitespace: bool = False*) → tuple[int, int]

Return the relative boundaries (startpos, endpos) of the current word under the cursor. (This is at the current line, because line boundaries obviously don't belong to any word.) If not on a word, this returns (0,0)

find_enclosing_bracket_left(*left_ch: str*, *right_ch: str*, *start_pos: int | None = None*) → int | None

Find the left bracket enclosing current position. Return the relative position to the cursor position.

When *start_pos* is given, don't look past the position.

find_enclosing_bracket_right(*left_ch: str*, *right_ch: str*, *end_pos: int | None = None*) → int | None

Find the right bracket enclosing current position. Return the relative position to the cursor position.

When *end_pos* is given, don't look past the position.

find_matching_bracket_position(*start_pos: int | None = None*, *end_pos: int | None = None*) → int

Return relative cursor position of matching [, (, { or < bracket.

When *start_pos* or *end_pos* are given. Don't look past the positions.

find_next_matching_line(*match_func: Callable[[str], bool]*, *count: int = 1*) → int | None

Look downwards for empty lines. Return the line index, relative to the current line.

find_next_word_beginning(*count: int = 1*, *WORD: bool = False*) → int | None

Return an index relative to the cursor position pointing to the start of the next word. Return *None* if nothing was found.

find_next_word_ending(*include_current_position: bool = False*, *count: int = 1*, *WORD: bool = False*) → int | None

Return an index relative to the cursor position pointing to the end of the next word. Return *None* if nothing was found.

find_previous_matching_line(*match_func: Callable[[str], bool]*, *count: int = 1*) → int | None

Look upwards for empty lines. Return the line index, relative to the current line.

find_previous_word_beginning(*count: int = 1*, *WORD: bool = False*) → int | None

Return an index relative to the cursor position pointing to the start of the previous word. Return *None* if nothing was found.

find_previous_word_ending(*count: int = 1*, *WORD: bool = False*) → int | None

Return an index relative to the cursor position pointing to the end of the previous word. Return *None* if nothing was found.

find_start_of_previous_word(*count: int = 1*, *WORD: bool = False*, *pattern: Pattern[str] | None = None*) → int | None

Return an index relative to the cursor position pointing to the start of the previous word. Return *None* if nothing was found.

Parameters **pattern** – (None or compiled regex). When given, use this regex pattern.

get_column_cursor_position(*column: int*) → int
Return the relative cursor position for this column at the current line. (It will stay between the boundaries of the line in case of a larger number.)

get_cursor_down_position(*count: int = 1*, *preferred_column: int | None = None*) → int
Return the relative cursor position (character index) where we would be if the user pressed the arrow-down button.

Parameters **preferred_column** – When given, go to this column instead of staying at the current column.

get_cursor_left_position(*count: int = 1*) → int
Relative position for cursor left.

get_cursor_right_position(*count: int = 1*) → int
Relative position for cursor_right.

get_cursor_up_position(*count: int = 1*, *preferred_column: int | None = None*) → int
Return the relative cursor position (character index) where we would be if the user pressed the arrow-up button.

Parameters **preferred_column** – When given, go to this column instead of staying at the current column.

get_end_of_document_position() → int
Relative position for the end of the document.

get_end_of_line_position() → int
Relative position for the end of this line.

get_start_of_document_position() → int
Relative position for the start of the document.

get_start_of_line_position(*after_whitespace: bool = False*) → int
Relative position for the start of this line.

get_word_before_cursor(*WORD: bool = False*, *pattern: Pattern[str] | None = None*) → str
Give the word before the cursor. If we have whitespace before the cursor this returns an empty string.

Parameters **pattern** – (None or compiled regex). When given, use this regex pattern.

get_word_under_cursor(*WORD: bool = False*) → str
Return the word, currently below the cursor. This returns an empty string when the cursor is on a whitespace region.

has_match_at_current_position(*sub: str*) → bool
True when this substring is found at the cursor position.

insert_after(*text: str*) → prompt_toolkit.document.Document
Create a new document, with this text inserted after the buffer. It keeps selection ranges and cursor position in sync.

insert_before(*text: str*) → prompt_toolkit.document.Document
Create a new document, with this text inserted before the buffer. It keeps selection ranges and cursor position in sync.

is_cursor_at_the_end
True when the cursor is at the end of the text.

is_cursor_at_the_end_of_line
True when the cursor is at the end of this line.

last_non_blank_of_current_line_position() → int
Relative position for the last non blank character of this line.

leading_whitespace_in_current_line
The leading whitespace in the left margin of the current line.

line_count
Return the number of lines in this document. If the document ends with a trailing n, that counts as the beginning of a new line.

lines
Array of all the lines.

lines_from_current
Array of the lines starting from the current line, until the last line.

on_first_line
True when we are at the first line.

on_last_line
True when we are at the last line.

paste_clipboard_data(*data: prompt_toolkit.clipboard.base.ClipboardData*, *paste_mode: prompt_toolkit.selection.PasteMode = <PasteMode.EMACS: 'EMACS'>*, *count: int = 1*) → prompt_toolkit.document.Document
Return a new *Document* instance which contains the result if we would paste this data at the current cursor position.

Parameters

- **paste_mode** – Where to paste. (Before/after/emacs.)
- **count** – When >1, Paste multiple times.

selection
SelectionState object.

selection_range() → tuple[int, int]
Return (from, to) tuple of the selection. start and end position are included.

This doesn't take the selection type into account. Use *selection_ranges* instead.

selection_range_at_line(*row: int*) → tuple[int, int] | None
If the selection spans a portion of the given line, return a (from, to) tuple.

The returned upper boundary is not included in the selection, so *(0, 0)* is an empty selection. *(0, 1)*, is a one character selection.

Returns None if the selection doesn't cover this line at all.

selection_ranges() → Iterable[tuple[int, int]]
Return a list of *(from, to)* tuples for the selection or none if nothing was selected. The upper boundary is not included.

This will yield several (from, to) tuples in case of a BLOCK selection. This will return zero ranges, like (8,8) for empty lines in a block selection.

start_of_paragraph(*count: int = 1*, *before: bool = False*) → int
Return the start of the current paragraph. (Relative cursor position.)

text
The document text.

translate_index_to_position(*index: int*) → tuple[int, int]
Given an index for the text, return the corresponding (row, col) tuple. (0-based. Returns (0, 0) for index=0.)

translate_row_col_to_index(*row: int*, *col: int*) → int
Given a (row, col) tuple, return the corresponding index. (Row and col params are 0-based.)

Negative row/col values are turned into zero.

3.11.8 Enums

prompt_toolkit.enums.**DEFAULT_BUFFER = 'DEFAULT_BUFFER'**
Name of the default buffer.

class prompt_toolkit.enums.**EditingMode**
An enumeration.

prompt_toolkit.enums.**SEARCH_BUFFER = 'SEARCH_BUFFER'**
Name of the search buffer.

prompt_toolkit.enums.**SYSTEM_BUFFER = 'SYSTEM_BUFFER'**
Name of the system buffer.

3.11.9 History

Implementations for the history of a *Buffer*.

NOTE: There is no *DynamicHistory*: This doesn't work well, because the *Buffer* needs to be able to attach an event handler to the event when a history entry is loaded. This loading can be done asynchronously and making the history swappable would probably break this.

class prompt_toolkit.history.**History**
Base `History` class.

This also includes abstract methods for loading/storing history.

append_string(*string: str*) → None
Add string to the history.

get_strings() → list[str]
Get the strings from the history that are loaded so far. (In order. Oldest item first.)

load() → AsyncGenerator[str, None]
Load the history and yield all the entries in reverse order (latest, most recent history entry first).

This method can be called multiple times from the *Buffer* to repopulate the history when prompting for a new input. So we are responsible here for both caching, and making sure that strings that were were appended to the history will be incorporated next time this method is called.

load_history_strings() → Iterable[str]
This should be a generator that yields *str* instances.

It should yield the most recent items first, because they are the most important. (The history can already be used, even when it's only partially loaded.)

store_string(*string: str*) → None
Store the string in persistent storage.

class prompt_toolkit.history.**ThreadedHistory**(*history: prompt_toolkit.history.History*)
Wrapper around *History* implementations that run the *load()* generator in a thread.

Use this to increase the start-up time of prompt_toolkit applications. History entries are available as soon as they are loaded. We don't have to wait for everything to be loaded.

load() → AsyncGenerator[str, None]
Like *History.load(), but call 'self.load_history_strings()* in a background thread.

class prompt_toolkit.history.**DummyHistory**
History object that doesn't remember anything.

class prompt_toolkit.history.**FileHistory**(*filename: str*)
History class that stores all strings in a file.

class prompt_toolkit.history.**InMemoryHistory**(*history_strings: Sequence[str] | None = None*)
History class that keeps a list of all strings in memory.

In order to prepopulate the history, it's possible to call either *append_string* for all items or pass a list of strings to *__init__* here.

3.11.10 Keys

class prompt_toolkit.keys.**Keys**
List of keys for use in key bindings.

Note that this is an "StrEnum", all values can be compared against strings.

3.11.11 Style

Styling for prompt_toolkit applications.

class prompt_toolkit.styles.**Attrs**(*color*, *bgcolor*, *bold*, *underline*, *strike*, *italic*, *blink*, *reverse*, *hidden*)

bgcolor
Alias for field number 1

blink
Alias for field number 6

bold
Alias for field number 2

color
Alias for field number 0

hidden
Alias for field number 8

italic
Alias for field number 5

reverse
Alias for field number 7

strike
Alias for field number 4

underline
Alias for field number 3

class prompt_toolkit.styles.**BaseStyle**
Abstract base class for prompt_toolkit styles.

get_attrs_for_style_str(*style_str: str*, *default: prompt_toolkit.styles.base.Attrs = Attrs(color='', bgcolor='', bold=False, underline=False, strike=False, italic=False, blink=False, reverse=False, hidden=False)*) → prompt_toolkit.styles.base.Attrs

Return *Attrs* for the given style string.

Parameters

- **style_str** – The style string. This can contain inline styling as well as classnames (e.g. "class:title").
- **default** – *Attrs* to be used if no styling was defined.

invalidation_hash() → Hashable

Invalidation hash for the style. When this changes over time, the renderer knows that something in the style changed, and that everything has to be redrawn.

style_rules

The list of style rules, used to create this style. (Required for *DynamicStyle* and *_MergedStyle* to work.)

class prompt_toolkit.styles.**DummyStyle**

A style that doesn't style anything.

class prompt_toolkit.styles.**DynamicStyle**(*get_style: Callable[[], BaseStyle | None]*)

Style class that can dynamically returns an other Style.

Parameters **get_style** – Callable that returns a *Style* instance.

class prompt_toolkit.styles.**Style**(*style_rules: list[tuple[str, str]]*)

Create a `Style` instance from a list of style rules.

The *style_rules* is supposed to be a list of ('classnames', 'style') tuples. The classnames are a whitespace separated string of class names and the style string is just like a Pygments style definition, but with a few additions: it supports 'reverse' and 'blink'.

Later rules always override previous rules.

Usage:

```
Style([
    ('title', '#ff0000 bold underline'),
    ('something-else', 'reverse'),
    ('class1 class2', 'reverse'),
])
```

The `from_dict` classmethod is similar, but takes a dictionary as input.

classmethod from_dict(*style_dict: dict[str, str]*, *priority: Priority = <Priority.DICT_KEY_ORDER: 'KEY_ORDER'>*) → Style

Parameters

- **style_dict** – Style dictionary.
- **priority** – *Priority* value.

get_attrs_for_style_str(*style_str: str*, *default: prompt_toolkit.styles.base.Attrs = Attrs(color='', bgcolor='', bold=False, underline=False, strike=False, italic=False, blink=False, reverse=False, hidden=False)*) → prompt_toolkit.styles.base.Attrs

Get *Attrs* for the given style string.

class prompt_toolkit.styles.**Priority**

The priority of the rules, when a style is created from a dictionary.

In a *Style*, rules that are defined later will always override previous defined rules, however in a dictionary, the key order was arbitrary before Python 3.6. This means that the style could change at random between rules.

We have two options:

- ***DICT_KEY_ORDER*: This means, iterate through the dictionary, and take** the key/value pairs in order as they come. This is a good option if you have Python >3.6. Rules at the end will override rules at the beginning.
- *MOST_PRECISE*: keys that are defined with most precision will get higher priority. (More precise means: more elements.)

prompt_toolkit.styles.**merge_styles**(*styles: list[BaseStyle]*) → _MergedStyle
Merge multiple *Style* objects.

prompt_toolkit.styles.**style_from_pygments_cls**(*pygments_style_cls: type[PygmentsStyle]*) → Style
Shortcut to create a *Style* instance from a Pygments style class and a style dictionary.

Example:

```
from prompt_toolkit.styles.from_pygments import style_from_pygments_cls
from pygments.styles import get_style_by_name
style = style_from_pygments_cls(get_style_by_name('monokai'))
```

Parameters **pygments_style_cls** – Pygments style class to start from.

prompt_toolkit.styles.**style_from_pygments_dict**(*pygments_dict: dict[Token, str]*) → Style
Create a *Style* instance from a Pygments style dictionary. (One that maps Token objects to style strings.)

prompt_toolkit.styles.**pygments_token_to_classname**(*token: Token*) → str
Turn e.g. *Token.Name.Exception* into *'pygments.name.exception'*.

(Our Pygments lexer will also turn the tokens that pygments produces in a prompt_toolkit list of fragments that match these styling rules.)

class prompt_toolkit.styles.**StyleTransformation**
Base class for any style transformation.

invalidation_hash() → Hashable
When this changes, the cache should be invalidated.

transform_attrs(*attrs: prompt_toolkit.styles.base.Attrs*) → prompt_toolkit.styles.base.Attrs
Take an *Attrs* object and return a new *Attrs* object.

Remember that the color formats can be either "ansi..." or a 6 digit lowercase hexadecimal color (without '#' prefix).

class prompt_toolkit.styles.**SwapLightAndDarkStyleTransformation**
Turn dark colors into light colors and the other way around.

This is meant to make color schemes that work on a dark background usable on a light background (and the other way around).

Notice that this doesn't swap foreground and background like "reverse" does. It turns light green into dark green and the other way around. Foreground and background colors are considered individually.

Also notice that when <reverse> is used somewhere and no colors are given in particular (like what is the default for the bottom toolbar), then this doesn't change anything. This is what makes sense, because when the 'default' color is chosen, it's what works best for the terminal, and reverse works good with that.

transform_attrs(*attrs: prompt_toolkit.styles.base.Attrs*) → prompt_toolkit.styles.base.Attrs
Return the *Attrs* used when opposite luminosity should be used.

class prompt_toolkit.styles.**AdjustBrightnessStyleTransformation**(*min_brightness: Union[Callable[[], float], float] = 0.0, max_brightness: Union[Callable[[], float], float] = 1.0*)
Adjust the brightness to improve the rendering on either dark or light backgrounds.

For dark backgrounds, it's best to increase *min_brightness*. For light backgrounds it's best to decrease *max_brightness*. Usually, only one setting is adjusted.

This will only change the brightness for text that has a foreground color defined, but no background color. It works best for 256 or true color output.

Note: Notice that there is no universal way to detect whether the application is running in a light or dark terminal. As a developer of an command line application, you'll have to make this configurable for the user.

Parameters

- **min_brightness** – Float between 0.0 and 1.0 or a callable that returns a float.
- **max_brightness** – Float between 0.0 and 1.0 or a callable that returns a float.

prompt_toolkit.styles.**merge_style_transformations**(*style_transformations: Sequence[prompt_toolkit.styles.style_transformation.StyleTran*) → prompt_toolkit.styles.style_transformation.StyleTransfor
Merge multiple transformations together.

class prompt_toolkit.styles.**DummyStyleTransformation**
Don't transform anything at all.

class prompt_toolkit.styles.**ConditionalStyleTransformation**(*style_transformation: prompt_toolkit.styles.style_transformation.Styl filter: Union[prompt_toolkit.filters.base.Filter, bool]*)
Apply the style transformation depending on a condition.

class prompt_toolkit.styles.**DynamicStyleTransformation**(*get_style_transformation: Callable[[], StyleTransformation | None]*)
StyleTransformation class that can dynamically returns any *StyleTransformation*.

Parameters **get_style_transformation** – Callable that returns a *StyleTransformation* instance.

3.11.12 Shortcuts

prompt_toolkit.shortcuts.**prompt**(*message: AnyFormattedText | None = None*, ***, *history: History | None = None*, *editing_mode: EditingMode | None = None*, *refresh_interval: float | None = None*, *vi_mode: bool | None = None*, *lexer: Lexer | None = None*, *completer: Completer | None = None*, *complete_in_thread: bool | None = None*, *is_password: bool | None = None*, *key_bindings: KeyBindingsBase | None = None*, *bottom_toolbar: AnyFormattedText | None = None*, *style: BaseStyle | None = None*, *color_depth: ColorDepth | None = None*, *cursor: AnyCursorShapeConfig = None*, *include_default_pygments_style: FilterOrBool | None = None*, *style_transformation: StyleTransformation | None = None*, *swap_light_and_dark_colors: FilterOrBool | None = None*, *rprompt: AnyFormattedText | None = None*, *multiline: FilterOrBool | None = None*, *prompt_continuation: PromptContinuationText | None = None*, *wrap_lines: FilterOrBool | None = None*, *enable_history_search: FilterOrBool | None = None*, *search_ignore_case: FilterOrBool | None = None*, *complete_while_typing: FilterOrBool | None = None*, *validate_while_typing: FilterOrBool | None = None*, *complete_style: CompleteStyle | None = None*, *auto_suggest: AutoSuggest | None = None*, *validator: Validator | None = None*, *clipboard: Clipboard | None = None*, *mouse_support: FilterOrBool | None = None*, *input_processors: list[Processor] | None = None*, *placeholder: AnyFormattedText | None = None*, *reserve_space_for_menu: int | None = None*, *enable_system_prompt: FilterOrBool | None = None*, *enable_suspend: FilterOrBool | None = None*, *enable_open_in_editor: FilterOrBool | None = None*, *tempfile_suffix: str | Callable[[], str] | None = None*, *tempfile: str | Callable[[], str] | None = None*, *default: str = ''*, *accept_default: bool = False*, *pre_run: Callable[[], None] | None = None*) → str

Display the prompt.

The first set of arguments is a subset of the *PromptSession* class itself. For these, passing in `None` will keep the current values that are active in the session. Passing in a value will set the attribute for the session, which means that it applies to the current, but also to the next prompts.

Note that in order to erase a `Completer`, `Validator` or `AutoSuggest`, you can't use `None`. Instead pass in a `DummyCompleter`, `DummyValidator` or `DummyAutoSuggest` instance respectively. For a `Lexer` you can pass in an empty `SimpleLexer`.

Additional arguments, specific for this prompt:

Parameters

- **default** – The default input text to be shown. (This can be edited by the user).
- **accept_default** – When *True*, automatically accept the default value without allowing the user to edit the input.
- **pre_run** – Callable, called at the start of *Application.run*.
- **in_thread** – Run the prompt in a background thread; block the current thread. This avoids interference with an event loop in the current thread. Like *Application.run(in_thread=True)*.

This method will raise `KeyboardInterrupt` when control-c has been pressed (for abort) and `EOFError` when control-d has been pressed (for exit).

class prompt_toolkit.shortcuts.**PromptSession**(*message: AnyFormattedText = ''*, ***, *multiline: FilterOrBool = False*, *wrap_lines: FilterOrBool = True*, *is_password: FilterOrBool = False*, *vi_mode: bool = False*, *editing_mode: EditingMode = <EditingMode.EMACS: 'EMACS'>*, *complete_while_typing: FilterOrBool = True*, *validate_while_typing: FilterOrBool = True*, *enable_history_search: FilterOrBool = False*, *search_ignore_case: FilterOrBool = False*, *lexer: Lexer | None = None*, *enable_system_prompt: FilterOrBool = False*, *enable_suspend: FilterOrBool = False*, *enable_open_in_editor: FilterOrBool = False*, *validator: Validator | None = None*, *completer: Completer | None = None*, *complete_in_thread: bool = False*, *reserve_space_for_menu: int = 8*, *complete_style: CompleteStyle = <CompleteStyle.COLUMN: 'COLUMN'>*, *auto_suggest: AutoSuggest | None = None*, *style: BaseStyle | None = None*, *style_transformation: StyleTransformation | None = None*, *swap_light_and_dark_colors: FilterOrBool = False*, *color_depth: ColorDepth | None = None*, *cursor: AnyCursorShapeConfig = None*, *include_default_pygments_style: FilterOrBool = True*, *history: History | None = None*, *clipboard: Clipboard | None = None*, *prompt_continuation: PromptContinuationText | None = None*, *rprompt: AnyFormattedText = None*, *bottom_toolbar: AnyFormattedText = None*, *mouse_support: FilterOrBool = False*, *input_processors: list[Processor] | None = None*, *placeholder: AnyFormattedText | None = None*, *key_bindings: KeyBindingsBase | None = None*, *erase_when_done: bool = False*, *tempfile_suffix: str | Callable[[], str] | None = '.txt'*, *tempfile: str | Callable[[], str] | None = None*, *refresh_interval: float = 0*, *input: Input | None = None*, *output: Output | None = None*)

PromptSession for a prompt application, which can be used as a GNU Readline replacement.

This is a wrapper around a lot of `prompt_toolkit` functionality and can be a replacement for *raw_input*.

All parameters that expect "formatted text" can take either just plain text (a unicode object), a list of `(style_str, text)` tuples or an HTML object.

Example usage:

```
s = PromptSession(message='>')
text = s.prompt()
```

Parameters

- **message** – Plain text or formatted text to be shown before the prompt. This can also be a callable that returns formatted text.
- **multiline** – *bool* or *Filter*. When True, prefer a layout that is more adapted for multiline input. Text after newlines is automatically indented, and search/arg input is shown below the input, instead of replacing the prompt.
- **wrap_lines** – *bool* or *Filter*. When True (the default), automatically wrap long lines instead of scrolling horizontally.
- **is_password** – Show asterisks instead of the actual typed characters.
- **editing_mode** – `EditingMode.VI` or `EditingMode.EMACS`.
- **vi_mode** – *bool*, if True, Identical to `editing_mode=EditingMode.VI`.
- **complete_while_typing** – *bool* or *Filter*. Enable autocompletion while typing.
- **validate_while_typing** – *bool* or *Filter*. Enable input validation while typing.
- **enable_history_search** – *bool* or *Filter*. Enable up-arrow parting string matching.
- **search_ignore_case** – *Filter*. Search case insensitive.
- **lexer** – *Lexer* to be used for the syntax highlighting.
- **validator** – *Validator* instance for input validation.
- **completer** – *Completer* instance for input completion.
- **complete_in_thread** – *bool* or *Filter*. Run the completer code in a background thread in order to avoid blocking the user interface. For `CompleteStyle.READLINE_LIKE`, this setting has no effect. There we always run the completions in the main thread.
- **reserve_space_for_menu** – Space to be reserved for displaying the menu. (0 means that no space needs to be reserved.)
- **auto_suggest** – *AutoSuggest* instance for input suggestions.
- **style** – *Style* instance for the color scheme.
- **include_default_pygments_style** – *bool* or *Filter*. Tell whether the default styling for Pygments lexers has to be included. By default, this is true, but it is recommended to be disabled if another Pygments style is passed as the *style* argument, otherwise, two Pygments styles will be merged.
- **style_transformation** – `StyleTransformation` instance.
- **swap_light_and_dark_colors** – *bool* or *Filter*. When enabled, apply `SwapLightAndDarkStyleTransformation`. This is useful for switching between dark and light terminal backgrounds.
- **enable_system_prompt** – *bool* or *Filter*. Pressing Meta+'!' will show a system prompt.
- **enable_suspend** – *bool* or *Filter*. Enable Control-Z style suspension.

- **enable_open_in_editor** – *bool* or *Filter*. Pressing 'v' in Vi mode or C-X C-E in emacs mode will open an external editor.
- **history** – *History* instance.
- **clipboard** – *Clipboard* instance. (e.g. *InMemoryClipboard*)
- **rprompt** – Text or formatted text to be displayed on the right side. This can also be a callable that returns (formatted) text.
- **bottom_toolbar** – Formatted text or callable which is supposed to return formatted text.
- **prompt_continuation** – Text that needs to be displayed for a multiline prompt continuation. This can either be formatted text or a callable that takes a *prompt_width*, *line_number* and *wrap_count* as input and returns formatted text. When this is *None* (the default), then *prompt_width* spaces will be used.
- **complete_style** – `CompleteStyle.COLUMN`, `CompleteStyle.MULTI_COLUMN` or `CompleteStyle.READLINE_LIKE`.
- **mouse_support** – *bool* or *Filter* to enable mouse support.
- **placeholder** – Text to be displayed when no input has been given yet. Unlike the *default* parameter, this won't be returned as part of the output ever. This can be formatted text or a callable that returns formatted text.
- **refresh_interval** – (number; in seconds) When given, refresh the UI every so many seconds.
- **input** – *Input* object. (Note that the preferred way to change the input/output is by creating an *AppSession*.)
- **output** – *Output* object.

prompt (*message: AnyFormattedText | None = None*, ***, *editing_mode: EditingMode | None = None*, *refresh_interval: float | None = None*, *vi_mode: bool | None = None*, *lexer: Lexer | None = None*, *completer: Completer | None = None*, *complete_in_thread: bool | None = None*, *is_password: bool | None = None*, *key_bindings: KeyBindingsBase | None = None*, *bottom_toolbar: AnyFormattedText | None = None*, *style: BaseStyle | None = None*, *color_depth: ColorDepth | None = None*, *cursor: AnyCursorShapeConfig | None = None*, *include_default_pygments_style: FilterOrBool | None = None*, *style_transformation: StyleTransformation | None = None*, *swap_light_and_dark_colors: FilterOrBool | None = None*, *rprompt: AnyFormattedText | None = None*, *multiline: FilterOrBool | None = None*, *prompt_continuation: PromptContinuationText | None = None*, *wrap_lines: FilterOrBool | None = None*, *enable_history_search: FilterOrBool | None = None*, *search_ignore_case: FilterOrBool | None = None*, *complete_while_typing: FilterOrBool | None = None*, *validate_while_typing: FilterOrBool | None = None*, *complete_style: CompleteStyle | None = None*, *auto_suggest: AutoSuggest | None = None*, *validator: Validator | None = None*, *clipboard: Clipboard | None = None*, *mouse_support: FilterOrBool | None = None*, *input_processors: list[Processor] | None = None*, *placeholder: AnyFormattedText | None = None*, *reserve_space_for_menu: int | None = None*, *enable_system_prompt: FilterOrBool | None = None*, *enable_suspend: FilterOrBool | None = None*, *enable_open_in_editor: FilterOrBool | None = None*, *tempfile_suffix: str | Callable[[], str] | None = None*, *tempfile: str | Callable[[], str] | None = None*, *default: str | Document = ''*, *accept_default: bool = False*, *pre_run: Callable[[], None] | None = None*, *set_exception_handler: bool = True*, *handle_sigint: bool = True*, *in_thread: bool = False*) → _T

Display the prompt.

The first set of arguments is a subset of the *PromptSession* class itself. For these, passing in `None` will keep the current values that are active in the session. Passing in a value will set the attribute for the session, which means that it applies to the current, but also to the next prompts.

Note that in order to erase a `Completer`, `Validator` or `AutoSuggest`, you can't use `None`. Instead pass in a `DummyCompleter`, `DummyValidator` or `DummyAutoSuggest` instance respectively. For a `Lexer` you can pass in an empty `SimpleLexer`.

Additional arguments, specific for this prompt:

Parameters

- **default** – The default input text to be shown. (This can be edited by the user).
- **accept_default** – When *True*, automatically accept the default value without allowing the user to edit the input.
- **pre_run** – Callable, called at the start of *Application.run*.
- **in_thread** – Run the prompt in a background thread; block the current thread. This avoids interference with an event loop in the current thread. Like *Application.run(in_thread=True)*.

This method will raise `KeyboardInterrupt` when control-c has been pressed (for abort) and `EOFError` when control-d has been pressed (for exit).

prompt_toolkit.shortcuts.**confirm**(*message: str = 'Confirm?'*, *suffix: str = ' (y/n) '*) → bool
Display a confirmation prompt that returns True/False.

class prompt_toolkit.shortcuts.**CompleteStyle**
How to display autocompletions for the prompt.

prompt_toolkit.shortcuts.**create_confirm_session**(*message: str*, *suffix: str = ' (y/n) '*) → prompt_toolkit.shortcuts.prompt.PromptSession[bool][bool]
Create a *PromptSession* object for the 'confirm' function.

prompt_toolkit.shortcuts.**clear**() → None
Clear the screen.

prompt_toolkit.shortcuts.**clear_title**() → None
Erase the current title.

prompt_toolkit.shortcuts.**print_formatted_text**(**values*, *sep: str = ' '*, *end: str = '\n'*, *file: TextIO | None = None*, *flush: bool = False*, *style: BaseStyle | None = None*, *output: Output | None = None*, *color_depth: ColorDepth | None = None*, *style_transformation: StyleTransformation | None = None*, *include_default_pygments_style: bool = True*) → None

```
print_formatted_text(*values, sep=' ', end='\n', file=None, flush=False,␣
↪style=None, output=None)
```

Print text to stdout. This is supposed to be compatible with Python's print function, but supports printing of formatted text. You can pass a *FormattedText*, *HTML* or *ANSI* object to print formatted text.

- Print HTML as follows:

```
print_formatted_text(HTML('<i>Some italic text</i> <ansired>This is red!</
↪ansired>'))

style = Style.from_dict({
    'hello': '#ff0066',
```

(continues on next page)

(continued from previous page)

```
    'world': '#884444 italic',
})
print_formatted_text(HTML('<hello>Hello</hello> <world>world</world>!'),␣
↪style=style)
```

- Print a list of (style_str, text) tuples in the given style to the output. E.g.:

```
style = Style.from_dict({
    'hello': '#ff0066',
    'world': '#884444 italic',
})
fragments = FormattedText([
    ('class:hello', 'Hello'),
    ('class:world', 'World'),
])
print_formatted_text(fragments, style=style)
```

If you want to print a list of Pygments tokens, wrap it in *PygmentsTokens* to do the conversion.

If a prompt_toolkit *Application* is currently running, this will always print above the application or prompt (similar to *patch_stdout*). So, *print_formatted_text* will erase the current application, print the text, and render the application again.

Parameters

- **values** – Any kind of printable object, or formatted string.
- **sep** – String inserted between values, default a space.
- **end** – String appended after the last value, default a newline.
- **style** – *Style* instance for the color scheme.
- **include_default_pygments_style** – *bool*. Include the default Pygments style when set to *True* (the default).

prompt_toolkit.shortcuts.**set_title**(*text: str*) → None

Set the terminal title.

class prompt_toolkit.shortcuts.**ProgressBar**(*title: AnyFormattedText = None*, *formatters: Sequence[Formatter] | None = None*, *bottom_toolbar: AnyFormattedText = None*, *style: BaseStyle | None = None*, *key_bindings: KeyBindings | None = None*, *cancel_callback: Callable[[], None] | None = None*, *file: TextIO | None = None*, *color_depth: ColorDepth | None = None*, *output: Output | None = None*, *input: Input | None = None*)

Progress bar context manager.

Usage

```
with ProgressBar(...) as pb:
    for item in pb(data):
        ...
```

Parameters

- **title** – Text to be displayed above the progress bars. This can be a callable or formatted text as well.

- **formatters** – List of *Formatter* instances.
- **bottom_toolbar** – Text to be displayed in the bottom toolbar. This can be a callable or formatted text.
- **style** – *prompt_toolkit.styles.BaseStyle* instance.
- **key_bindings** – *KeyBindings* instance.
- **cancel_callback** – Callback function that's called when control-c is pressed by the user. This can be used for instance to start "proper" cancellation if the wrapped code supports it.
- **file** – The file object used for rendering, by default *sys.stderr* is used.
- **color_depth** – *prompt_toolkit ColorDepth* instance.
- **output** – *Output* instance.
- **input** – *Input* instance.

prompt_toolkit.shortcuts.**input_dialog**(*title: AnyFormattedText = ''*, *text: AnyFormattedText = ''*, *ok_text: str = 'OK'*, *cancel_text: str = 'Cancel'*, *completer: Completer | None = None*, *validator: Validator | None = None*, *password: FilterOrBool = False*, *style: BaseStyle | None = None*, *default: str = ''*) → Application[str]

Display a text input box. Return the given text, or None when cancelled.

prompt_toolkit.shortcuts.**message_dialog**(*title: AnyFormattedText = ''*, *text: AnyFormattedText = ''*, *ok_text: str = 'Ok'*, *style: BaseStyle | None = None*) → Application[None]

Display a simple message box and wait until the user presses enter.

prompt_toolkit.shortcuts.**progress_dialog**(*title: AnyFormattedText = ''*, *text: AnyFormattedText = ''*, *run_callback: Callable[[Callable[[int], None], Callable[[str], None]], None] = <function <lambda>>*, *style: BaseStyle | None = None*) → Application[None]

Parameters **run_callback** – A function that receives as input a *set_percentage* function and it does the work.

prompt_toolkit.shortcuts.**radiolist_dialog**(*title: AnyFormattedText = ''*, *text: AnyFormattedText = ''*, *ok_text: str = 'Ok'*, *cancel_text: str = 'Cancel'*, *values: Sequence[tuple[_T, AnyFormattedText]] | None = None*, *default: _T | None = None*, *style: BaseStyle | None = None*) → Application[_T]

Display a simple list of element the user can choose amongst.

Only one element can be selected at a time using Arrow keys and Enter. The focus can be moved between the list and the Ok/Cancel button with tab.

prompt_toolkit.shortcuts.**yes_no_dialog**(*title: AnyFormattedText = ''*, *text: AnyFormattedText = ''*, *yes_text: str = 'Yes'*, *no_text: str = 'No'*, *style: BaseStyle | None = None*) → Application[bool]

Display a Yes/No dialog. Return a boolean.

prompt_toolkit.shortcuts.**button_dialog**(*title: AnyFormattedText = ''*, *text: AnyFormattedText = ''*, *buttons: list[tuple[str, _T]] = []*, *style: BaseStyle | None = None*) → Application[_T]

Display a dialog with button choices (given as a list of tuples). Return the value associated with button.

Formatter classes for the progress bar. Each progress bar consists of a list of these formatters.

class prompt_toolkit.shortcuts.progress_bar.formatters.**Formatter**

Base class for any formatter.

class prompt_toolkit.shortcuts.progress_bar.formatters.**Text**(*text: Union[str, MagicFormattedText, List[Union[Tuple[str, str], Tuple[str, str, Callable[[prompt_toolkit.mouse_events.Mous NotImplementedOrNone]]]], Callable[[], Any], None], style: str = ''*)

Display plain text.

class prompt_toolkit.shortcuts.progress_bar.formatters.**Label**(*width: Union[None, int, prompt_toolkit.layout.dimension.Dimension Callable[[], Any]] = None*, *suffix: str = ''*)

Display the name of the current task.

Parameters

- **width** – If a *width* is given, use this width. Scroll the text if it doesn't fit in this width.
- **suffix** – String suffix to be added after the task name, e.g. ': '. If no task name was given, no suffix will be added.

class prompt_toolkit.shortcuts.progress_bar.formatters.**Percentage**

Display the progress as a percentage.

class prompt_toolkit.shortcuts.progress_bar.formatters.**Bar**(*start: str = '['*, *end: str = ']'*, *sym_a: str = '='*, *sym_b: str = '>'*, *sym_c: str = ' '*, *unknown: str = '#'*)

Display the progress bar itself.

class prompt_toolkit.shortcuts.progress_bar.formatters.**Progress**

Display the progress as text. E.g. "8/20"

class prompt_toolkit.shortcuts.progress_bar.formatters.**TimeElapsed**

Display the elapsed time.

class prompt_toolkit.shortcuts.progress_bar.formatters.**TimeLeft**

Display the time left.

class prompt_toolkit.shortcuts.progress_bar.formatters.**IterationsPerSecond**

Display the iterations per second.

class prompt_toolkit.shortcuts.progress_bar.formatters.**SpinningWheel**

Display a spinning wheel.

class prompt_toolkit.shortcuts.progress_bar.formatters.**Rainbow**(*formatter: prompt_toolkit.shortcuts.progress_bar.fo*

For the fun. Add rainbow colors to any of the other formatters.

prompt_toolkit.shortcuts.progress_bar.formatters.**create_default_formatters**() → list[Formatter]

Return the list of default formatters.

3.11.13 Validation

Input validation for a *Buffer*. (Validators will be called before accepting input.)

class prompt_toolkit.validation.**ConditionalValidator**(*validator: prompt_toolkit.validation.Validator, filter: Union[prompt_toolkit.filters.base.Filter, bool]*)

Validator that can be switched on/off according to a filter. (This wraps around another validator.)

exception prompt_toolkit.validation.**ValidationError**(*cursor_position: int = 0, message: str = ''*)

Error raised by *Validator.validate()*.

Parameters

- **cursor_position** – The cursor position where the error occurred.
- **message** – Text.

class prompt_toolkit.validation.**Validator**

Abstract base class for an input validator.

A validator is typically created in one of the following two ways:

- Either by overriding this class and implementing the *validate* method.
- Or by passing a callable to *Validator.from_callable*.

If the validation takes some time and needs to happen in a background thread, this can be wrapped in a *ThreadedValidator*.

classmethod from_callable(*validate_func: Callable[[str], bool], error_message: str = 'Invalid input', move_cursor_to_end: bool = False*) → prompt_toolkit.validation.Validator

Create a validator from a simple validate callable. E.g.:

```
def is_valid(text):
    return text in ['hello', 'world']
Validator.from_callable(is_valid, error_message='Invalid input')
```

Parameters

- **validate_func** – Callable that takes the input string, and returns *True* if the input is valid input.
- **error_message** – Message to be displayed if the input is invalid.
- **move_cursor_to_end** – Move the cursor to the end of the input, if the input is invalid.

validate (*document: prompt_toolkit.document.Document*) → None
Validate the input. If invalid, this should raise a `ValidationError`.

Parameters **document** – `Document` instance.

validate_async (*document: prompt_toolkit.document.Document*) → None
Return a *Future* which is set when the validation is ready. This function can be overloaded in order to provide an asynchronous implementation.

class prompt_toolkit.validation.**ThreadedValidator** (*validator: prompt_toolkit.validation.Validator*)
Wrapper that runs input validation in a thread. (Use this to prevent the user interface from becoming unresponsive if the input validation takes too much time.)

validate_async (*document: prompt_toolkit.document.Document*) → None
Run the *validate* function in a thread.

class prompt_toolkit.validation.**DummyValidator**
Validator class that accepts any input.

class prompt_toolkit.validation.**DynamicValidator** (*get_validator: Callable[[], Validator | None]*)
Validator class that can dynamically returns any Validator.

Parameters **get_validator** – Callable that returns a `Validator` instance.

3.11.14 Auto suggestion

Fish-style like auto-suggestion.

While a user types input in a certain buffer, suggestions are generated (asynchronously.) Usually, they are displayed after the input. When the cursor presses the right arrow and the cursor is at the end of the input, the suggestion will be inserted.

If you want the auto suggestions to be asynchronous (in a background thread), because they take too much time, and could potentially block the event loop, then wrap the `AutoSuggest` instance into a `ThreadedAutoSuggest`.

class prompt_toolkit.auto_suggest.**Suggestion** (*text: str*)
Suggestion returned by an auto-suggest algorithm.

Parameters **text** – The suggestion text.

class prompt_toolkit.auto_suggest.**AutoSuggest**
Base class for auto suggestion implementations.

get_suggestion (*buffer: Buffer*, *document: Document*) → Suggestion | None
Return *None* or a `Suggestion` instance.

We receive both `Buffer` and `Document`. The reason is that auto suggestions are retrieved asynchronously. (Like completions.) The buffer text could be changed in the meantime, but `document` contains the buffer document like it was at the start of the auto suggestion call. So, from here, don't access `buffer.text`, but use `document.text` instead.

Parameters

- **buffer** – The `Buffer` instance.
- **document** – The `Document` instance.

get_suggestion_async (*buff: 'Buffer'*, *document: Document*) → Suggestion | None
Return a `Future` which is set when the suggestions are ready. This function can be overloaded in order to provide an asynchronous implementation.

class prompt_toolkit.auto_suggest.**ThreadedAutoSuggest**(*auto_suggest: prompt_toolkit.auto_suggest.AutoSuggest*)

Wrapper that runs auto suggestions in a thread. (Use this to prevent the user interface from becoming unresponsive if the generation of suggestions takes too much time.)

get_suggestion_async(*buff: 'Buffer'*, *document: Document*) → Suggestion | None

Run the *get_suggestion* function in a thread.

class prompt_toolkit.auto_suggest.**DummyAutoSuggest**

AutoSuggest class that doesn't return any suggestion.

class prompt_toolkit.auto_suggest.**AutoSuggestFromHistory**

Give suggestions based on the lines in the history.

class prompt_toolkit.auto_suggest.**ConditionalAutoSuggest**(*auto_suggest: AutoSuggest*, *filter: bool | Filter*)

Auto suggest that can be turned on and of according to a certain condition.

class prompt_toolkit.auto_suggest.**DynamicAutoSuggest**(*get_auto_suggest: Callable[[], AutoSuggest | None]*)

Validator class that can dynamically returns any Validator.

Parameters **get_validator** – Callable that returns a *Validator* instance.

3.11.15 Renderer

Renders the command line on the console. (Redraws parts of the input line that were changed.)

class prompt_toolkit.renderer.**Renderer**(*style: BaseStyle*, *output: Output*, *full_screen: bool = False*, *mouse_support: FilterOrBool = False*, *cpr_not_supported_callback: Callable[[], None] | None = None*)

Typical usage:

```
output = Vt100_Output.from_pty(sys.stdout)
r = Renderer(style, output)
r.render(app, layout=...)
```

clear() → None

Clear screen and go to 0,0

erase(*leave_alternate_screen: bool = True*) → None

Hide all output and put the cursor back at the first line. This is for instance used for running a system command (while hiding the CLI) and later resuming the same CLI.)

Parameters **leave_alternate_screen** – When True, and when inside an alternate screen buffer, quit the alternate screen.

height_is_known

True when the height from the cursor until the bottom of the terminal is known. (It's often nicer to draw bottom toolbars only if the height is known, in order to avoid flickering when the CPR response arrives.)

last_rendered_screen

The *Screen* class that was generated during the last rendering. This can be *None*.

render(*app: Application[Any], layout: Layout, is_done: bool = False*) → None

Render the current interface to the output.

Parameters **is_done** – When True, put the cursor at the end of the interface. We won't print any changes to this part.

report_absolute_cursor_row(*row: int*) → None
To be called when we know the absolute cursor position. (As an answer of a "Cursor Position Request" response.)

request_absolute_cursor_position() → None
Get current cursor position.

We do this to calculate the minimum available height that we can consume for rendering the prompt. This is the available space below te cursor.

For vt100: Do CPR request. (answer will arrive later.) For win32: Do API call. (Answer comes immediately.)

rows_above_layout
Return the number of rows visible in the terminal above the layout.

wait_for_cpr_responses(*timeout: int = 1*) → None
Wait for a CPR response.

waiting_for_cpr
Waiting for CPR flag. True when we send the request, but didn't got a response.

prompt_toolkit.renderer.**print_formatted_text**(*output: Output*, *formatted_text: AnyFormattedText*, *style: BaseStyle*, *style_transformation: StyleTransformation | None = None*, *color_depth: ColorDepth | None = None*) → None
Print a list of (style_str, text) tuples in the given style to the output.

3.11.16 Lexers

Lexer interface and implementations. Used for syntax highlighting.

class prompt_toolkit.lexers.**Lexer**
Base class for all lexers.

invalidation_hash() → Hashable
When this changes, *lex_document* could give a different output. (Only used for *DynamicLexer*.)

lex_document(*document: prompt_toolkit.document.Document*) → Callable[[int], List[Union[Tuple[str, str], Tuple[str, str, Callable[[prompt_toolkit.mouse_events.MouseEvent], NotImplementedOrNone]]]]]
Takes a *Document* and returns a callable that takes a line number and returns a list of `(style_str, text)` tuples for that line.

XXX: Note that in the past, this was supposed to return a list of `(Token, text)` tuples, just like a Pygments lexer.

class prompt_toolkit.lexers.**SimpleLexer**(*style: str = ''*)
Lexer that doesn't do any tokenizing and returns the whole input as one token.

Parameters **style** – The style string for this lexer.

class prompt_toolkit.lexers.**DynamicLexer**(*get_lexer: Callable[[], Lexer | None]*)
Lexer class that can dynamically returns any Lexer.

Parameters **get_lexer** – Callable that returns a *Lexer* instance.

class prompt_toolkit.lexers.**PygmentsLexer**(*pygments_lexer_cls: type[PygmentsLexerCls]*, *sync_from_start: FilterOrBool = True*, *syntax_sync: SyntaxSync | None = None*)
Lexer that calls a pygments lexer.

Example:

```
from pygments.lexers.html import HtmlLexer
lexer = PygmentsLexer(HtmlLexer)
```

Note: Don't forget to also load a Pygments compatible style. E.g.:

```
from prompt_toolkit.styles.from_pygments import style_from_pygments_cls
from pygments.styles import get_style_by_name
style = style_from_pygments_cls(get_style_by_name('monokai'))
```

Parameters

- **pygments_lexer_cls** – A *Lexer* from Pygments.
- **sync_from_start** – Start lexing at the start of the document. This will always give the best results, but it will be slow for bigger documents. (When the last part of the document is display, then the whole document will be lexed by Pygments on every key stroke.) It is recommended to disable this for inputs that are expected to be more than 1,000 lines.
- **syntax_sync** – *SyntaxSync* object.

classmethod from_filename(*filename: str*, *sync_from_start: Union[prompt_toolkit.filters.base.Filter, bool] = True*) → prompt_toolkit.lexers.base.Lexer

Create a *Lexer* from a filename.

lex_document(*document: prompt_toolkit.document.Document*) → Callable[[int], List[Union[Tuple[str, str], Tuple[str, str, Callable[[prompt_toolkit.mouse_events.MouseEvent], NotImplementedOrNone]]]]]

Create a lexer function that takes a line number and returns the list of (style_str, text) tuples as the Pygments lexer returns for that line.

class prompt_toolkit.lexers.**RegexSync**(*pattern: str*)

Synchronize by starting at a line that matches the given regex pattern.

classmethod from_pygments_lexer_cls(*lexer_cls: PygmentsLexerCls*) → RegexSync

Create a *RegexSync* instance for this Pygments lexer class.

get_sync_start_position(*document: Document*, *lineno: int*) → tuple[int, int]

Scan backwards, and find a possible position to start.

class prompt_toolkit.lexers.**SyncFromStart**

Always start the syntax highlighting from the beginning.

class prompt_toolkit.lexers.**SyntaxSync**

Syntax synchroniser. This is a tool that finds a start position for the lexer. This is especially important when editing big documents; we don't want to start the highlighting by running the lexer from the beginning of the file. That is very slow when editing.

get_sync_start_position(*document: Document*, *lineno: int*) → tuple[int, int]

Return the position from where we can start lexing as a (row, column) tuple.

Parameters

- **document** – *Document* instance that contains all the lines.
- **lineno** – The line that we want to highlight. (We need to return this line, or an earlier position.)

3.11.17 Layout

Command line layout definitions

The layout of a command line interface is defined by a Container instance. There are two main groups of classes here. Containers and controls:

- A container can contain other containers or controls, it can have multiple children and it decides about the dimensions.
- A control is responsible for rendering the actual content to a screen. A control can propose some dimensions, but it's the container who decides about the dimensions – or when the control consumes more space – which part of the control will be visible.

Container classes:

```
- Container (Abstract base class)
   |- HSplit (Horizontal split)
   |- VSplit (Vertical split)
   |- FloatContainer (Container which can also contain menus and other floats)
   `- Window (Container which contains one actual control
```

Control classes:

```
- UIControl (Abstract base class)
   |- FormattedTextControl (Renders formatted text, or a simple list of text␣
↪fragments)
   `- BufferControl (Renders an input buffer.)
```

Usually, you end up wrapping every control inside a *Window* object, because that's the only way to render it in a layout.

There are some prepared toolbars which are ready to use:

```
- SystemToolbar (Shows the 'system' input buffer, for entering system commands.)
- ArgToolbar (Shows the input 'arg', for repetition of input commands.)
- SearchToolbar (Shows the 'search' input buffer, for incremental search.)
- CompletionsToolbar (Shows the completions of the current buffer.)
- ValidationToolbar (Shows validation errors of the current buffer.)
```

And one prepared menu:

- CompletionsMenu

The layout class itself

class prompt_toolkit.layout.**Layout**(*container: AnyContainer*, *focused_element: FocusableElement | None = None*)

The layout for a prompt_toolkit *Application*. This also keeps track of which user control is focused.

Parameters

- **container** – The "root" container for the layout.
- **focused_element** – element to be focused initially. (Can be anything the *focus* function accepts.)

buffer_has_focus

Return *True* if the currently focused control is a *BufferControl*. (For instance, used to determine whether the default key bindings should be active or not.)

current_buffer
The currently focused *Buffer* or *None*.

current_control
Get the *UIControl* to currently has the focus.

current_window
Return the *Window* object that is currently focused.

find_all_windows() → Generator[prompt_toolkit.layout.containers.Window, None, None]
Find all the *UIControl* objects in this layout.

focus(*value: Union[str, prompt_toolkit.buffer.Buffer, prompt_toolkit.layout.controls.UIControl, prompt_toolkit.layout.containers.Container, MagicContainer]*) → None
Focus the given UI element.

value can be either:

- a *UIControl*
- a *Buffer* instance or the name of a *Buffer*
- a *Window*
- Any container object. In this case we will focus the *Window* from this container that was focused most recent, or the very first focusable *Window* of the container.

focus_last() → None
Give the focus to the last focused control.

focus_next() → None
Focus the next visible/focusable Window.

focus_previous() → None
Focus the previous visible/focusable Window.

get_buffer_by_name(*buffer_name: str*) → Buffer | None
Look in the layout for a buffer with the given name. Return *None* when nothing was found.

get_focusable_windows() → Iterable[prompt_toolkit.layout.containers.Window]
Return all the *Window* objects which are focusable (in the 'modal' area).

get_parent(*container: Container*) → Container | None
Return the parent container for the given container, or `None`, if it wasn't found.

get_visible_focusable_windows() → list[Window]
Return a list of *Window* objects that are focusable.

has_focus(*value: Union[str, prompt_toolkit.buffer.Buffer, prompt_toolkit.layout.controls.UIControl, prompt_toolkit.layout.containers.Container, MagicContainer]*) → bool
Check whether the given control has the focus. :param value: *UIControl* or *Window* instance.

is_searching
True if we are searching right now.

previous_control
Get the *UIControl* to previously had the focus.

search_target_buffer_control
Return the *BufferControl* in which we are searching or *None*.

update_parents_relations() → None
Update child->parent relationships mapping.

walk() → Iterable[prompt_toolkit.layout.containers.Container]
Walk through all the layout nodes (and their children) and yield them.

walk_through_modal_area() → Iterable[prompt_toolkit.layout.containers.Container]
Walk through all the containers which are in the current 'modal' part of the layout.

class prompt_toolkit.layout.**InvalidLayoutError**

class prompt_toolkit.layout.**walk**
Walk through layout, starting at this container.

Containers

class prompt_toolkit.layout.**Container**
Base class for user interface layout.

get_children() → list[Container]
Return the list of child *Container* objects.

get_key_bindings() → KeyBindingsBase | None
Returns a *KeyBindings* object. These bindings become active when any user control in this container has the focus, except if any containers between this container and the focused user control is modal.

is_modal() → bool
When this container is modal, key bindings from parent containers are not taken into account if a user control in this container is focused.

preferred_height(*width: int*, *max_available_height: int*) → prompt_toolkit.layout.dimension.Dimension
Return a *Dimension* that represents the desired height for this container.

preferred_width(*max_available_width: int*) → prompt_toolkit.layout.dimension.Dimension
Return a *Dimension* that represents the desired width for this container.

reset() → None
Reset the state of this container and all the children. (E.g. reset scroll offsets, etc...)

write_to_screen(*screen: Screen*, *mouse_handlers: MouseHandlers*, *write_position: WritePosition*, *parent_style: str*, *erase_bg: bool*, *z_index: int | None*) → None
Write the actual content to the screen.

Parameters

- **screen** – *Screen*
- **mouse_handlers** – MouseHandlers.
- **parent_style** – Style string to pass to the *Window* object. This will be applied to all content of the windows. *VSplit* and *HSplit* can use it to pass their style down to the windows that they contain.
- **z_index** – Used for propagating z_index from parent to child.

class prompt_toolkit.layout.**HSplit**(*children: Sequence[AnyContainer], window_too_small: Container | None = None, align: VerticalAlign = <VerticalAlign.JUSTIFY: 'JUSTIFY'>, padding: AnyDimension = 0, padding_char: str | None = None, padding_style: str = '', width: AnyDimension = None, height: AnyDimension = None, z_index: int | None = None, modal: bool = False, key_bindings: KeyBindingsBase | None = None, style: str | Callable[[], str] = ''*)
Several layouts, one stacked above/under the other.

```
+--------------------+
|                    |
+--------------------+
|                    |
+--------------------+
```

By default, this doesn't display a horizontal line between the children, but if this is something you need, then create a HSplit as follows:

```
HSplit(children=[ ... ], padding_char='-',
       padding=1, padding_style='#ffff00')
```

Parameters

- **children** – List of child *Container* objects.
- **window_too_small** – A *Container* object that is displayed if there is not enough space for all the children. By default, this is a "Window too small" message.
- **align** – *VerticalAlign* value.
- **width** – When given, use this width instead of looking at the children.
- **height** – When given, use this height instead of looking at the children.
- **z_index** – (int or None) When specified, this can be used to bring element in front of floating elements. *None* means: inherit from parent.
- **style** – A style string.
- **modal** – `True` or `False`.
- **key_bindings** – `None` or a *KeyBindings* object.
- **padding** – (*Dimension* or int), size to be used for the padding.
- **padding_char** – Character to be used for filling in the padding.
- **padding_style** – Style to applied to the padding.

write_to_screen(*screen: Screen*, *mouse_handlers: MouseHandlers*, *write_position: WritePosition*, *parent_style: str*, *erase_bg: bool*, *z_index: int | None*) → None

Render the prompt to a *Screen* instance.

Parameters **screen** – The *Screen* class to which the output has to be written.

class prompt_toolkit.layout.**VSplit**(*children: Sequence[AnyContainer]*, *window_too_small: Container | None = None*, *align: HorizontalAlign = <HorizontalAlign.JUSTIFY: 'JUSTIFY'>*, *padding: AnyDimension = 0*, *padding_char: str | None = None*, *padding_style: str = ''*, *width: AnyDimension = None*, *height: AnyDimension = None*, *z_index: int | None = None*, *modal: bool = False*, *key_bindings: KeyBindingsBase | None = None*, *style: str | Callable[[], str] = ''*)

Several layouts, one stacked left/right of the other.

```
+---------+----------+
|         |          |
|         |          |
+---------+----------+
```

By default, this doesn't display a vertical line between the children, but if this is something you need, then create a HSplit as follows:

```
VSplit(children=[ ... ], padding_char='|',
       padding=1, padding_style='#ffff00')
```

Parameters

- **children** – List of child *Container* objects.
- **window_too_small** – A *Container* object that is displayed if there is not enough space for all the children. By default, this is a "Window too small" message.
- **align** – *HorizontalAlign* value.
- **width** – When given, use this width instead of looking at the children.
- **height** – When given, use this height instead of looking at the children.
- **z_index** – (int or None) When specified, this can be used to bring element in front of floating elements. *None* means: inherit from parent.
- **style** – A style string.
- **modal** – `True` or `False`.
- **key_bindings** – `None` or a *KeyBindings* object.
- **padding** – (*Dimension* or int), size to be used for the padding.
- **padding_char** – Character to be used for filling in the padding.
- **padding_style** – Style to applied to the padding.

write_to_screen(*screen: Screen*, *mouse_handlers: MouseHandlers*, *write_position: WritePosition*, *parent_style: str*, *erase_bg: bool*, *z_index: int | None*) → None

Render the prompt to a *Screen* instance.

Parameters **screen** – The *Screen* class to which the output has to be written.

class prompt_toolkit.layout.**FloatContainer**(*content: AnyContainer*, *floats: list[Float]*, *modal: bool = False*, *key_bindings: KeyBindingsBase | None = None*, *style: str | Callable[[], str] = ''*, *z_index: int | None = None*)

Container which can contain another container for the background, as well as a list of floating containers on top of it.

Example Usage:

```
FloatContainer(content=Window(...),
               floats=[
                   Float(xcursor=True,
                         ycursor=True,
                         content=CompletionsMenu(...))
               ])
```

Parameters **z_index** – (int or None) When specified, this can be used to bring element in front of floating elements. *None* means: inherit from parent. This is the z_index for the whole *Float* container as a whole.

preferred_height(*width: int*, *max_available_height: int*) → prompt_toolkit.layout.dimension.Dimension

Return the preferred height of the float container. (We don't care about the height of the floats, they should always fit into the dimensions provided by the container.)

class prompt_toolkit.layout.**Float**(*content: AnyContainer*, *top: int | None = None*, *right: int | None = None*, *bottom: int | None = None*, *left: int | None = None*, *width: int | Callable[[], int] | None = None*, *height: int | Callable[[], int] | None = None*, *xcursor: bool = False*, *ycursor: bool = False*, *attach_to_window: AnyContainer | None = None*, *hide_when_covering_content: bool = False*, *allow_cover_cursor: bool = False*, *z_index: int = 1*, *transparent: bool = False*)

Float for use in a *FloatContainer*. Except for the *content* parameter, all other options are optional.

Parameters

- **content** – *Container* instance.
- **width** – *Dimension* or callable which returns a *Dimension*.
- **height** – *Dimension* or callable which returns a *Dimension*.
- **left** – Distance to the left edge of the *FloatContainer*.
- **right** – Distance to the right edge of the *FloatContainer*.
- **top** – Distance to the top of the *FloatContainer*.
- **bottom** – Distance to the bottom of the *FloatContainer*.
- **attach_to_window** – Attach to the cursor from this window, instead of the current window.
- **hide_when_covering_content** – Hide the float when it covers content underneath.
- **allow_cover_cursor** – When *False*, make sure to display the float below the cursor. Not on top of the indicated position.
- **z_index** – Z-index position. For a Float, this needs to be at least one. It is relative to the z_index of the parent container.
- **transparent** – *Filter* indicating whether this float needs to be drawn transparently.

class prompt_toolkit.layout.**Window**(*content: UIControl | None = None, width: AnyDimension = None, height: AnyDimension = None, z_index: int | None = None, dont_extend_width: FilterOrBool = False, dont_extend_height: FilterOrBool = False, ignore_content_width: FilterOrBool = False, ignore_content_height: FilterOrBool = False, left_margins: Sequence[Margin] | None = None, right_margins: Sequence[Margin] | None = None, scroll_offsets: ScrollOffsets | None = None, allow_scroll_beyond_bottom: FilterOrBool = False, wrap_lines: FilterOrBool = False, get_vertical_scroll: Callable[[Window], int] | None = None, get_horizontal_scroll: Callable[[Window], int] | None = None, always_hide_cursor: FilterOrBool = False, cursorline: FilterOrBool = False, cursorcolumn: FilterOrBool = False, colorcolumns: None | list[ColorColumn] | Callable[[], list[ColorColumn]] = None, align: WindowAlign | Callable[[], WindowAlign] = <WindowAlign.LEFT: 'LEFT'>, style: str | Callable[[], str] = '', char: None | str | Callable[[], str] = None, get_line_prefix: GetLinePrefixCallable | None = None*)

Container that holds a control.

Parameters

- **content** – *UIControl* instance.
- **width** – *Dimension* instance or callable.
- **height** – *Dimension* instance or callable.
- **z_index** – When specified, this can be used to bring element in front of floating elements.
- **dont_extend_width** – When *True*, don't take up more width then the preferred width reported by the control.
- **dont_extend_height** – When *True*, don't take up more width then the preferred height reported by the control.
- **ignore_content_width** – A *bool* or *Filter* instance. Ignore the *UIContent* width when calculating the dimensions.
- **ignore_content_height** – A *bool* or *Filter* instance. Ignore the *UIContent* height when calculating the dimensions.
- **left_margins** – A list of *Margin* instance to be displayed on the left. For instance: *NumberedMargin* can be one of them in order to show line numbers.
- **right_margins** – Like *left_margins*, but on the other side.
- **scroll_offsets** – *ScrollOffsets* instance, representing the preferred amount of lines/columns to be always visible before/after the cursor. When both top and bottom are a very high number, the cursor will be centered vertically most of the time.
- **allow_scroll_beyond_bottom** – A *bool* or *Filter* instance. When True, allow scrolling so far, that the top part of the content is not visible anymore, while there is still empty space available at the bottom of the window. In the Vi editor for instance, this is possible. You will see tildes while the top part of the body is hidden.
- **wrap_lines** – A *bool* or *Filter* instance. When True, don't scroll horizontally, but wrap lines instead.

- **get_vertical_scroll** – Callable that takes this window instance as input and returns a preferred vertical scroll. (When this is *None*, the scroll is only determined by the last and current cursor position.)
- **get_horizontal_scroll** – Callable that takes this window instance as input and returns a preferred vertical scroll.
- **always_hide_cursor** – A *bool* or *Filter* instance. When True, never display the cursor, even when the user control specifies a cursor position.
- **cursorline** – A *bool* or *Filter* instance. When True, display a cursorline.
- **cursorcolumn** – A *bool* or *Filter* instance. When True, display a cursorcolumn.
- **colorcolumns** – A list of *ColorColumn* instances that describe the columns to be highlighted, or a callable that returns such a list.
- **align** – *WindowAlign* value or callable that returns an *WindowAlign* value. alignment of content.
- **style** – A style string. Style to be applied to all the cells in this window. (This can be a callable that returns a string.)
- **char** – (string) Character to be used for filling the background. This can also be a callable that returns a character.
- **get_line_prefix** – None or a callable that returns formatted text to be inserted before a line. It takes a line number (int) and a wrap_count and returns formatted text. This can be used for implementation of line continuations, things like Vim "breakindent" and so on.

preferred_height(*width: int*, *max_available_height: int*) → prompt_toolkit.layout.dimension.Dimension

Calculate the preferred height for this window.

preferred_width(*max_available_width: int*) → prompt_toolkit.layout.dimension.Dimension

Calculate the preferred width for this window.

write_to_screen(*screen: Screen*, *mouse_handlers: MouseHandlers*, *write_position: WritePosition*, *parent_style: str*, *erase_bg: bool*, *z_index: int | None*) → None

Write window to screen. This renders the user control, the margins and copies everything over to the absolute position at the given screen.

class prompt_toolkit.layout.**WindowAlign**

Alignment of the Window content.

Note that this is different from *HorizontalAlign* and *VerticalAlign*, which are used for the alignment of the child containers in respectively *VSplit* and *HSplit*.

class prompt_toolkit.layout.**ConditionalContainer**(*content: Union[prompt_toolkit.layout.containers.Container, MagicContainer]*, *filter: Union[prompt_toolkit.filters.base.Filter, bool]*)

Wrapper around any other container that can change the visibility. The received *filter* determines whether the given container should be displayed or not.

Parameters

- **content** – *Container* instance.
- **filter** – *Filter* instance.

class prompt_toolkit.layout.**DynamicContainer**(*get_container: Callable[[], Union[prompt_toolkit.layout.containers.Container, MagicContainer]]*)

Container class that dynamically returns any Container.

Parameters **get_container** – Callable that returns a *Container* instance or any widget with a __pt_container__ method.

class prompt_toolkit.layout.**ScrollablePane**(*content: Container*, *scroll_offsets: ScrollOffsets | None = None*, *keep_cursor_visible: FilterOrBool = True*, *keep_focused_window_visible: FilterOrBool = True*, *max_available_height: int = 10000*, *width: AnyDimension = None*, *height: AnyDimension = None*, *show_scrollbar: FilterOrBool = True*, *display_arrows: FilterOrBool = True*, *up_arrow_symbol: str = '^'*, *down_arrow_symbol: str = 'v'*)

Container widget that exposes a larger virtual screen to its content and displays it in a vertical scrollbale region.

Typically this is wrapped in a large *HSplit* container. Make sure in that case to not specify a *height* dimension of the *HSplit*, so that it will scale according to the content.

Note: If you want to display a completion menu for widgets in this *ScrollablePane*, then it's still a good practice to use a *FloatContainer* with a *CompletionsMenu* in a *Float* at the top-level of the layout hierarchy, rather then nesting a *FloatContainer* in this *ScrollablePane*. (Otherwise, it's possible that the completion menu is clipped.)

Parameters

- **content** – The content container.
- **scrolloffset** – Try to keep the cursor within this distance from the top/bottom (left/right offset is not used).
- **keep_cursor_visible** – When *True*, automatically scroll the pane so that the cursor (of the focused window) is always visible.
- **keep_focused_window_visible** – When *True*, automatically scroll th e pane so that the focused window is visible, or as much visible as possible if it doen't completely fit the screen.
- **max_available_height** – Always constraint the height to this amount for performance reasons.
- **width** – When given, use this width instead of looking at the children.
- **height** – When given, use this height instead of looking at the children.
- **show_scrollbar** – When *True* display a scrollbar on the right.

write_to_screen(*screen: Screen*, *mouse_handlers: MouseHandlers*, *write_position: WritePosition*, *parent_style: str*, *erase_bg: bool*, *z_index: int | None*) → None

Render scrollable pane content.

This works by rendering on an off-screen canvas, and copying over the visible region.

class prompt_toolkit.layout.**ScrollOffsets**(*top: int | Callable[[], int] = 0*, *bottom: int | Callable[[], int] = 0*, *left: int | Callable[[], int] = 0*, *right: int | Callable[[], int] = 0*)

Scroll offsets for the *Window* class.

Note that left/right offsets only make sense if line wrapping is disabled.

class prompt_toolkit.layout.**ColorColumn**(*position: int*, *style: str = 'class:color-column'*)
Column for a *Window* to be colored.

class prompt_toolkit.layout.**to_container**
Make sure that the given object is a *Container*.

class prompt_toolkit.layout.**to_window**
Make sure that the given argument is a *Window*.

class prompt_toolkit.layout.**is_container**
Checks whether the given value is a container object (for use in assert statements).

class prompt_toolkit.layout.**HorizontalAlign**
Alignment for *VSplit*.

class prompt_toolkit.layout.**VerticalAlign**
Alignment for *HSplit*.

Controls

class prompt_toolkit.layout.**BufferControl**(*buffer: Buffer | None = None*, *input_processors: list[Processor] | None = None*, *include_default_input_processors: bool = True*, *lexer: Lexer | None = None*, *preview_search: FilterOrBool = False*, *focusable: FilterOrBool = True*, *search_buffer_control: None | SearchBufferControl | Callable[[], SearchBufferControl] = None*, *menu_position: Callable[[], int | None] | None = None*, *focus_on_click: FilterOrBool = False*, *key_bindings: KeyBindingsBase | None = None*)
Control for visualising the content of a *Buffer*.

Parameters

- **buffer** – The *Buffer* object to be displayed.
- **input_processors** – A list of *Processor* objects.
- **include_default_input_processors** – When True, include the default processors for highlighting of selection, search and displaying of multiple cursors.
- **lexer** – *Lexer* instance for syntax highlighting.
- **preview_search** – *bool* or *Filter*: Show search while typing. When this is *True*, probably you want to add a `HighlightIncrementalSearchProcessor` as well. Otherwise only the cursor position will move, but the text won't be highlighted.
- **focusable** – *bool* or *Filter*: Tell whether this control is focusable.
- **focus_on_click** – Focus this buffer when it's click, but not yet focused.
- **key_bindings** – a *KeyBindings* object.

create_content(*width: int*, *height: int*, *preview_search: bool = False*) → prompt_toolkit.layout.controls.UIContent
Create a UIContent.

get_invalidate_events() → Iterable[Event[object]]
Return the Window invalidate events.

get_key_bindings() → KeyBindingsBase | None
When additional key bindings are given. Return these.

mouse_handler(*mouse_event: MouseEvent*) → NotImplementedOrNone
Mouse handler for this control.

preferred_width(*max_available_width: int*) → int | None
This should return the preferred width.

Note: We don't specify a preferred width according to the content, because it would be too expensive. Calculating the preferred width can be done by calculating the longest line, but this would require applying all the processors to each line. This is unfeasible for a larger document, and doing it for small documents only would result in inconsistent behaviour.

search_state
Return the *SearchState* for searching this *BufferControl*. This is always associated with the search control. If one search bar is used for searching multiple *BufferControls*, then they share the same *SearchState*.

class prompt_toolkit.layout.**SearchBufferControl**(*buffer: Buffer | None = None*, *input_processors: list[Processor] | None = None*, *lexer: Lexer | None = None*, *focus_on_click: FilterOrBool = False*, *key_bindings: KeyBindingsBase | None = None*, *ignore_case: FilterOrBool = False*)
BufferControl which is used for searching another *BufferControl*.

Parameters **ignore_case** – Search case insensitive.

class prompt_toolkit.layout.**DummyControl**
A dummy control object that doesn't paint any content.

Useful for filling a *Window*. (The *fragment* and *char* attributes of the *Window* class can be used to define the filling.)

class prompt_toolkit.layout.**FormattedTextControl**(*text: AnyFormattedText = ''*, *style: str = ''*, *focusable: FilterOrBool = False*, *key_bindings: KeyBindingsBase | None = None*, *show_cursor: bool = True*, *modal: bool = False*, *get_cursor_position: Callable[[], Point | None] | None = None*)
Control that displays formatted text. This can be either plain text, an *HTML* object an *ANSI* object, a list of `(style_str, text)` tuples or a callable that takes no argument and returns one of those, depending on how you prefer to do the formatting. See `prompt_toolkit.layout.formatted_text` for more information.

(It's mostly optimized for rather small widgets, like toolbars, menus, etc...)

When this UI control has the focus, the cursor will be shown in the upper left corner of this control by default. There are two ways for specifying the cursor position:

- Pass a *get_cursor_position* function which returns a *Point* instance with the current cursor position.
- If the (formatted) text is passed as a list of `(style, text)` tuples and there is one that looks like `('[SetCursorPosition]', '')`, then this will specify the cursor position.

Mouse support:

The list of fragments can also contain tuples of three items, looking like: (style_str, text, handler). When mouse support is enabled and the user clicks on this fragment, then the given handler is called.

That handler should accept two inputs: (Application, MouseEvent) and it should either handle the event or return *NotImplemented* in case we want the containing Window to handle this event.

Parameters

- **focusable** – *bool* or *Filter*: Tell whether this control is focusable.
- **text** – Text or formatted text to be displayed.
- **style** – Style string applied to the content. (If you want to style the whole *Window*, pass the style to the *Window* instead.)
- **key_bindings** – a *KeyBindings* object.
- **get_cursor_position** – A callable that returns the cursor position as a *Point* instance.

mouse_handler(*mouse_event: MouseEvent*) → NotImplementedOrNone
Handle mouse events.

(When the fragment list contained mouse handlers and the user clicked on on any of these, the matching handler is called. This handler can still return *NotImplemented* in case we want the *Window* to handle this particular event.)

preferred_height(*width: int*, *max_available_height: int*, *wrap_lines: bool*, *get_line_prefix: GetLinePrefixCallable | None*) → int | None
Return the preferred height for this control.

preferred_width(*max_available_width: int*) → int
Return the preferred width for this control. That is the width of the longest line.

class prompt_toolkit.layout.**UIControl**
Base class for all user interface controls.

create_content(*width: int*, *height: int*) → prompt_toolkit.layout.controls.UIContent
Generate the content for this user control.

Returns a *UIContent* instance.

get_invalidate_events() → Iterable[Event[object]]
Return a list of *Event* objects. This can be a generator. (The application collects all these events, in order to bind redraw handlers to these events.)

get_key_bindings() → KeyBindingsBase | None
The key bindings that are specific for this user control.

Return a *KeyBindings* object if some key bindings are specified, or *None* otherwise.

is_focusable() → bool
Tell whether this user control is focusable.

mouse_handler(*mouse_event: MouseEvent*) → NotImplementedOrNone
Handle mouse events.

When *NotImplemented* is returned, it means that the given event is not handled by the *UIControl* itself. The *Window* or key bindings can decide to handle this event as scrolling or changing focus.

Parameters **mouse_event** – *MouseEvent* instance.

move_cursor_down() → None
Request to move the cursor down. This happens when scrolling down and the cursor is completely at the top.

move_cursor_up() → None
Request to move the cursor up.

class prompt_toolkit.layout.**UIContent**(*get_line: Callable[[int], StyleAndTextTuples] = <function UIContent.<lambda>>, line_count: int = 0, cursor_position: Point | None = None, menu_position: Point | None = None, show_cursor: bool = True*)

Content generated by a user control. This content consists of a list of lines.

Parameters

- **get_line** – Callable that takes a line number and returns the current line. This is a list of (style_str, text) tuples.
- **line_count** – The number of lines.
- **cursor_position** – a *Point* for the cursor position.
- **menu_position** – a *Point* for the menu position.
- **show_cursor** – Make the cursor visible.

get_height_for_line(*lineno: int, width: int, get_line_prefix: GetLinePrefixCallable | None, slice_stop: int | None = None*) → int

Return the height that a given line would need if it is rendered in a space with the given width (using line wrapping).

Parameters

- **get_line_prefix** – None or a *Window.get_line_prefix* callable that returns the prefix to be inserted before this line.
- **slice_stop** – Wrap only "line[:slice_stop]" and return that partial result. This is needed for scrolling the window correctly when line wrapping.

Returns The computed height.

Other

Sizing

class prompt_toolkit.layout.**Dimension**(*min: int | None = None, max: int | None = None, weight: int | None = None, preferred: int | None = None*)

Specified dimension (width/height) of a user control or window.

The layout engine tries to honor the preferred size. If that is not possible, because the terminal is larger or smaller, it tries to keep in between min and max.

Parameters

- **min** – Minimum size.
- **max** – Maximum size.
- **weight** – For a VSplit/HSplit, the actual size will be determined by taking the proportion of weights from all the children. E.g. When there are two children, one with a weight of 1, and the other with a weight of 2, the second will always be twice as big as the first, if the min/max values allow it.
- **preferred** – Preferred size.

classmethod exact(*amount: int*) → prompt_toolkit.layout.dimension.Dimension

Return a *Dimension* with an exact size. (min, max and preferred set to `amount`).

is_zero() → bool
True if this *Dimension* represents a zero size.

classmethod zero() → prompt_toolkit.layout.dimension.Dimension
Create a dimension that represents a zero size. (Used for 'invisible' controls.)

Margins

class prompt_toolkit.layout.**Margin**
Base interface for a margin.

create_margin(*window_render_info: WindowRenderInfo*, *width: int*, *height: int*) → StyleAndTextTuples
Creates a margin. This should return a list of (style_str, text) tuples.

Parameters

- **window_render_info** – `WindowRenderInfo` instance, generated after rendering and copying the visible part of the `UIControl` into the `Window`.
- **width** – The width that's available for this margin. (As reported by *get_width()*.)
- **height** – The height that's available for this margin. (The height of the `Window`.)

get_width(*get_ui_content: Callable[[], prompt_toolkit.layout.controls.UIContent]*) → int
Return the width that this margin is going to consume.

Parameters **get_ui_content** – Callable that asks the user control to create a *UIContent* instance. This can be used for instance to obtain the number of lines.

class prompt_toolkit.layout.**NumberedMargin**(*relative: Union[prompt_toolkit.filters.base.Filter, bool] = False*, *display_tildes: Union[prompt_toolkit.filters.base.Filter, bool] = False*)
Margin that displays the line numbers.

Parameters

- **relative** – Number relative to the cursor position. Similar to the Vi 'relativenumber' option.
- **display_tildes** – Display tildes after the end of the document, just like Vi does.

class prompt_toolkit.layout.**ScrollbarMargin**(*display_arrows: Union[prompt_toolkit.filters.base.Filter, bool] = False*, *up_arrow_symbol: str = '^'*, *down_arrow_symbol: str = 'v'*)
Margin displaying a scrollbar.

Parameters **display_arrows** – Display scroll up/down arrows.

class prompt_toolkit.layout.**ConditionalMargin**(*margin: prompt_toolkit.layout.margins.Margin*, *filter: Union[prompt_toolkit.filters.base.Filter, bool]*)
Wrapper around other *Margin* classes to show/hide them.

class prompt_toolkit.layout.**PromptMargin**(*get_prompt: Callable[[], StyleAndTextTuples]*, *get_continuation: None | Callable[[int, int, bool], StyleAndTextTuples] = None*)
[Deprecated]

Create margin that displays a prompt. This can display one prompt at the first line, and a continuation prompt (e.g, just dots) on all the following lines.

This *PromptMargin* implementation has been largely superseded in favor of the *get_line_prefix* attribute of *Window*. The reason is that a margin is always a fixed width, while *get_line_prefix* can return a variable width prefix in front of every line, making it more powerful, especially for line continuations.

Parameters

- **get_prompt** – Callable returns formatted text or a list of *(style_str, type)* tuples to be shown as the prompt at the first line.
- **get_continuation** – Callable that takes three inputs. The width (int), line_number (int), and is_soft_wrap (bool). It should return formatted text or a list of *(style_str, type)* tuples for the next lines of the input.

get_width(*get_ui_content: Callable[[], prompt_toolkit.layout.controls.UIContent]*) → int
Width to report to the *Window*.

Completion Menus

class prompt_toolkit.layout.**CompletionsMenu**(*max_height: int | None = None*, *scroll_offset: int | Callable[[], int] = 0*, *extra_filter: FilterOrBool = True*, *display_arrows: FilterOrBool = False*, *z_index: int = 100000000*)

class prompt_toolkit.layout.**MultiColumnCompletionsMenu**(*min_rows: int = 3*, *suggested_max_column_width: int = 30*, *show_meta: Union[prompt_toolkit.filters.base.Filter, bool] = True*, *extra_filter: Union[prompt_toolkit.filters.base.Filter, bool] = True*, *z_index: int = 100000000*)
Container that displays the completions in several columns. When *show_meta* (a `Filter`) evaluates to True, it shows the meta information at the bottom.

Processors

Processors are little transformation blocks that transform the fragments list from a buffer before the BufferControl will render it to the screen.

They can insert fragments before or after, or highlight fragments by replacing the fragment types.

class prompt_toolkit.layout.processors.**Processor**
Manipulate the fragments for a given line in a `BufferControl`.

apply_transformation(*transformation_input: prompt_toolkit.layout.processors.TransformationInput*) → prompt_toolkit.layout.processors.Transformation
Apply transformation. Returns a `Transformation` instance.

Parameters **transformation_input** – `TransformationInput` object.

class prompt_toolkit.layout.processors.**TransformationInput**(*buffer_control: BufferControl*, *document: Document*, *lineno: int*, *source_to_display: SourceToDisplay*, *fragments: StyleAndTextTuples*, *width: int*, *height: int*)

Parameters

- **buffer_control** – *BufferControl* instance.
- **lineno** – The number of the line to which we apply the processor.
- **source_to_display** – A function that returns the position in the *fragments* for any position in the source string. (This takes previous processors into account.)
- **fragments** – List of fragments that we can transform. (Received from the previous processor.)

class prompt_toolkit.layout.processors.**Transformation**(*fragments: StyleAndTextTuples*, *source_to_display: SourceToDisplay | None = None*, *display_to_source: DisplayToSource | None = None*)

Transformation result, as returned by *Processor.apply_transformation()*.

Important: Always make sure that the length of *document.text* is equal to the length of all the text in *fragments*!

Parameters

- **fragments** – The transformed fragments. To be displayed, or to pass to the next processor.
- **source_to_display** – Cursor position transformation from original string to transformed string.
- **display_to_source** – Cursor position transformed from source string to original string.

class prompt_toolkit.layout.processors.**DummyProcessor**

A *Processor* that doesn't do anything.

class prompt_toolkit.layout.processors.**HighlightSearchProcessor**

Processor that highlights search matches in the document. Note that this doesn't support multiline search matches yet.

The style classes 'search' and 'search.current' will be applied to the content.

class prompt_toolkit.layout.processors.**HighlightIncrementalSearchProcessor**

Highlight the search terms that are used for highlighting the incremental search. The style class 'incsearch' will be applied to the content.

Important: this requires the *preview_search=True* flag to be set for the *BufferControl*. Otherwise, the cursor position won't be set to the search match while searching, and nothing happens.

class prompt_toolkit.layout.processors.**HighlightSelectionProcessor**

Processor that highlights the selection in the document.

class prompt_toolkit.layout.processors.**PasswordProcessor**(*char: str = '*'*)
Processor that masks the input. (For passwords.)

Parameters **char** – (string) Character to be used. "*" by default.

class prompt_toolkit.layout.processors.**HighlightMatchingBracketProcessor**(*chars: str = '[](){}<>'*, *max_cursor_distance: int = 1000*)
When the cursor is on or right after a bracket, it highlights the matching bracket.

Parameters **max_cursor_distance** – Only highlight matching brackets when the cursor is within this distance. (From inside a *Processor*, we can't know which lines will be visible on the screen. But we also don't want to scan the whole document for matching brackets on each key press, so we limit to this value.)

class prompt_toolkit.layout.processors.**DisplayMultipleCursors**
When we're in Vi block insert mode, display all the cursors.

class prompt_toolkit.layout.processors.**BeforeInput**(*text: Union[str, MagicFormattedText, List[Union[Tuple[str, str], Tuple[str, str, Callable[[prompt_toolkit.mouse_events.MouseEvent], NotImplementedOrNone]]]], Callable[[], Any], None], style: str = ''*)
Insert text before the input.

Parameters

- **text** – This can be either plain text or formatted text (or a callable that returns any of those).
- **style** – style to be applied to this prompt/prefix.

class prompt_toolkit.layout.processors.**ShowArg**
Display the 'arg' in front of the input.

This was used by the *PromptSession*, but now it uses the *Window.get_line_prefix* function instead.

class prompt_toolkit.layout.processors.**AfterInput**(*text: Union[str, MagicFormattedText, List[Union[Tuple[str, str], Tuple[str, str, Callable[[prompt_toolkit.mouse_events.MouseEvent], NotImplementedOrNone]]]], Callable[[], Any], None], style: str = ''*)
Insert text after the input.

Parameters

- **text** – This can be either plain text or formatted text (or a callable that returns any of those).
- **style** – style to be applied to this prompt/prefix.

class prompt_toolkit.layout.processors.**AppendAutoSuggestion**(*style: str = 'class:auto-suggestion'*)

Append the auto suggestion to the input. (The user can then press the right arrow the insert the suggestion.)

class prompt_toolkit.layout.processors.**ConditionalProcessor**(*processor: prompt_toolkit.layout.processors.Processor, filter: Union[prompt_toolkit.filters.base.Filter, bool]*)

Processor that applies another processor, according to a certain condition. Example:

```
# Create a function that returns whether or not the processor should
# currently be applied.
def highlight_enabled():
    return true_or_false

# Wrapped it in a `ConditionalProcessor` for usage in a `BufferControl`.
BufferControl(input_processors=[
    ConditionalProcessor(HighlightSearchProcessor(),
                         Condition(highlight_enabled))])
```

Parameters

- **processor** – *Processor* instance.
- **filter** – *Filter* instance.

class prompt_toolkit.layout.processors.**ShowLeadingWhiteSpaceProcessor**(*get_char: Callable[[], str] | None = None, style: str = 'class:leading-whitespace'*)

Make leading whitespace visible.

Parameters **get_char** – Callable that returns one character.

class prompt_toolkit.layout.processors.**ShowTrailingWhiteSpaceProcessor**(*get_char: Callable[[], str] | None = None, style: str = 'class:training-whitespace'*)

Make trailing whitespace visible.

Parameters **get_char** – Callable that returns one character.

class prompt_toolkit.layout.processors.**TabsProcessor**(*tabstop: int | Callable[[], int] = 4*, *char1: str | Callable[[], str] = '|'*, *char2: str | Callable[[], str] = ''*, *style: str = 'class:tab'*)

Render tabs as spaces (instead of ^I) or make them visible (for instance, by replacing them with dots.)

Parameters

- **tabstop** – Horizontal space taken by a tab. (*int* or callable that returns an *int*).
- **char1** – Character or callable that returns a character (text of length one). This one is used for the first space taken by the tab.
- **char2** – Like *char1*, but for the rest of the space.

class prompt_toolkit.layout.processors.**ReverseSearchProcessor**

Process to display the "(reverse-i-search)'...': ..." stuff around the search buffer.

Note: This processor is meant to be applied to the BufferControl that contains the search buffer, it's not meant for the original input.

class prompt_toolkit.layout.processors.**DynamicProcessor**(*get_processor: Callable[[], Processor | None]*)

Processor class that dynamically returns any Processor.

Parameters **get_processor** – Callable that returns a `Processor` instance.

prompt_toolkit.layout.processors.**merge_processors**(*processors: list[Processor]*) → Processor

Merge multiple *Processor* objects into one.

Utils

prompt_toolkit.layout.utils.**explode_text_fragments**(*fragments: Iterable[_T]*) → prompt_toolkit.layout.utils._ExplodedList[~_T][_T]

Turn a list of (style_str, text) tuples into another list where each string is exactly one character.

It should be fine to call this function several times. Calling this on a list that is already exploded, is a null operation.

Parameters **fragments** – List of (style, text) tuples.

Screen

class prompt_toolkit.layout.screen.**Screen**(*default_char: Char | None = None*, *initial_width: int = 0*, *initial_height: int = 0*)

Two dimensional buffer of `Char` instances.

append_style_to_content(*style_str: str*) → None

For all the characters in the screen. Set the style string to the given *style_str*.

cursor_positions = None

Position of the cursor.

draw_all_floats() → None

Draw all float functions in order of z-index.

draw_with_z_index(*z_index: int, draw_func: Callable[[], None]*) → None
Add a draw-function for a *Window* which has a >= 0 z_index. This will be postponed until *draw_all_floats* is called.

fill_area(*write_position: prompt_toolkit.layout.screen.WritePosition*, *style: str = ''*, *after: bool = False*) → None
Fill the content of this area, using the given *style*. The style is prepended before whatever was here before.

get_cursor_position(*window: Window*) → Point
Get the cursor position for a given window. Returns a *Point*.

get_menu_position(*window: Window*) → Point
Get the menu position for a given window. (This falls back to the cursor position if no menu position was set.)

menu_positions = None
(Optional) Where to position the menu. E.g. at the start of a completion. (We can't use the cursor position, because we don't want the completion menu to change its position when we browse through all the completions.)

set_cursor_position(*window: Window*, *position: Point*) → None
Set the cursor position for a given window.

set_menu_position(*window: Window*, *position: Point*) → None
Set the cursor position for a given window.

show_cursor = None
Visibility of the cursor.

width = None
Currently used width/height of the screen. This will increase when data is written to the screen.

zero_width_escapes = None
Escape sequences to be injected.

class prompt_toolkit.layout.screen.**Char**(*char: str = ' '*, *style: str = ''*)
Represent a single character in a *Screen*.

This should be considered immutable.

Parameters

- **char** – A single character (can be a double-width character).
- **style** – A style string. (Can contain classnames.)

3.11.18 Widgets

Collection of reusable components for building full screen applications. These are higher level abstractions on top of the *prompt_toolkit.layout* module.

Most of these widgets implement the `__pt_container__` method, which makes it possible to embed these in the layout like any other container.

class prompt_toolkit.widgets.**TextArea**(*text: str = ''*, *multiline: FilterOrBool = True*, *password: FilterOrBool = False*, *lexer: Lexer | None = None*, *auto_suggest: AutoSuggest | None = None*, *completer: Completer | None = None*, *complete_while_typing: FilterOrBool = True*, *validator: Validator | None = None*, *accept_handler: BufferAcceptHandler | None = None*, *history: History | None = None*, *focusable: FilterOrBool = True*, *focus_on_click: FilterOrBool = False*, *wrap_lines: FilterOrBool = True*, *read_only: FilterOrBool = False*, *width: AnyDimension = None*, *height: AnyDimension = None*, *dont_extend_height: FilterOrBool = False*, *dont_extend_width: FilterOrBool = False*, *line_numbers: bool = False*, *get_line_prefix: GetLinePrefixCallable | None = None*, *scrollbar: bool = False*, *style: str = ''*, *search_field: SearchToolbar | None = None*, *preview_search: FilterOrBool = True*, *prompt: AnyFormattedText = ''*, *input_processors: list[Processor] | None = None*, *name: str = ''*)

A simple input field.

This is a higher level abstraction on top of several other classes with sane defaults.

This widget does have the most common options, but it does not intend to cover every single use case. For more configurations options, you can always build a text area manually, using a *Buffer*, *BufferControl* and *Window*.

Buffer attributes:

Parameters

- **text** – The initial text.
- **multiline** – If True, allow multiline input.
- **completer** – *Completer* instance for auto completion.
- **complete_while_typing** – Boolean.
- **accept_handler** – Called when *Enter* is pressed (This should be a callable that takes a buffer as input).
- **history** – *History* instance.
- **auto_suggest** – *AutoSuggest* instance for input suggestions.

BufferControl attributes:

Parameters

- **password** – When *True*, display using asterisks.
- **focusable** – When *True*, allow this widget to receive the focus.
- **focus_on_click** – When *True*, focus after mouse click.
- **input_processors** – *None* or a list of `Processor` objects.
- **validator** – *None* or a *Validator* object.

Window attributes:

Parameters

- **lexer** – *Lexer* instance for syntax highlighting.

- **wrap_lines** – When *True*, don't scroll horizontally, but wrap lines.
- **width** – Window width. (*Dimension* object.)
- **height** – Window height. (*Dimension* object.)
- **scrollbar** – When *True*, display a scroll bar.
- **style** – A style string.
- **dont_extend_width** – When *True*, don't take up more width then the preferred width reported by the control.
- **dont_extend_height** – When *True*, don't take up more width then the preferred height reported by the control.
- **get_line_prefix** – None or a callable that returns formatted text to be inserted before a line. It takes a line number (int) and a wrap_count and returns formatted text. This can be used for implementation of line continuations, things like Vim "breakindent" and so on.

Other attributes:

Parameters **search_field** – An optional *SearchToolbar* object.

accept_handler
The accept handler. Called when the user accepts the input.

document
The *Buffer* document (text + cursor position).

text
The *Buffer* text.

class prompt_toolkit.widgets.**Label**(*text: AnyFormattedText*, *style: str = ''*, *width: AnyDimension = None*, *dont_extend_height: bool = True*, *dont_extend_width: bool = False*, *align: WindowAlign | Callable[[], WindowAlign] = <WindowAlign.LEFT: 'LEFT'>*, *wrap_lines: FilterOrBool = True*)

Widget that displays the given text. It is not editable or focusable.

Parameters

- **text** – Text to display. Can be multiline. All value types accepted by *prompt_toolkit.layout.FormattedTextControl* are allowed, including a callable.
- **style** – A style string.
- **width** – When given, use this width, rather than calculating it from the text size.
- **dont_extend_width** – When *True*, don't take up more width than preferred, i.e. the length of the longest line of the text, or value of *width* parameter, if given. *True* by default
- **dont_extend_height** – When *True*, don't take up more width than the preferred height, i.e. the number of lines of the text. *False* by default.

class prompt_toolkit.widgets.**Button**(*text: str*, *handler: Callable[[], None] | None = None*, *width: int = 12*, *left_symbol: str = '<'*, *right_symbol: str = '>'*)

Clickable button.

Parameters

- **text** – The caption for the button.

- **handler** – *None* or callable. Called when the button is clicked. No parameters are passed to this callable. Use for instance Python's *functools.partial* to pass parameters to this callable if needed.
- **width** – Width of the button.

class prompt_toolkit.widgets.**Frame**(*body: AnyContainer*, *title: AnyFormattedText = ''*, *style: str = ''*, *width: AnyDimension = None*, *height: AnyDimension = None*, *key_bindings: KeyBindings | None = None*, *modal: bool = False*)

Draw a border around any container, optionally with a title text.

Changing the title and body of the frame is possible at runtime by assigning to the *body* and *title* attributes of this class.

Parameters

- **body** – Another container object.
- **title** – Text to be displayed in the top of the frame (can be formatted text).
- **style** – Style string to be applied to this widget.

class prompt_toolkit.widgets.**Shadow**(*body: Union[prompt_toolkit.layout.containers.Container, MagicContainer]*)

Draw a shadow underneath/behind this container. (This applies *class:shadow* the the cells under the shadow. The Style should define the colors for the shadow.)

Parameters **body** – Another container object.

class prompt_toolkit.widgets.**Box**(*body: AnyContainer*, *padding: AnyDimension = None*, *padding_left: AnyDimension = None*, *padding_right: AnyDimension = None*, *padding_top: AnyDimension = None*, *padding_bottom: AnyDimension = None*, *width: AnyDimension = None*, *height: AnyDimension = None*, *style: str = ''*, *char: None | str | Callable[[], str] = None*, *modal: bool = False*, *key_bindings: KeyBindings | None = None*)

Add padding around a container.

This also makes sure that the parent can provide more space than required by the child. This is very useful when wrapping a small element with a fixed size into a `VSplit` or `HSplit` object. The `HSplit` and `VSplit` try to make sure to adapt respectively the width and height, possibly shrinking other elements. Wrapping something in a `Box` makes it flexible.

Parameters

- **body** – Another container object.
- **padding** – The margin to be used around the body. This can be overridden by *padding_left*, padding_right', *padding_top* and *padding_bottom*.
- **style** – A style string.
- **char** – Character to be used for filling the space around the body. (This is supposed to be a character with a terminal width of 1.)

class prompt_toolkit.widgets.**VerticalLine**

A simple vertical line with a width of 1.

class prompt_toolkit.widgets.**HorizontalLine**

A simple horizontal line with a height of 1.

class prompt_toolkit.widgets.**RadioList**(*values: Sequence[tuple[_T, AnyFormattedText]], default: _T | None = None*)

List of radio buttons. Only one can be checked at the same time.

Parameters **values** – List of (value, label) tuples.

class prompt_toolkit.widgets.**Checkbox**(*text: Union[str, MagicFormattedText, List[Union[Tuple[str, str], Tuple[str, str, Callable[[prompt_toolkit.mouse_events.MouseEvent], NotImplementedOrNone]]]], Callable[[], Any], None] = '', checked: bool = False*)

Backward compatibility util: creates a 1-sized CheckboxList

Parameters **text** – the text

class prompt_toolkit.widgets.**SearchToolbar**(*search_buffer: Buffer | None = None, vi_mode: bool = False, text_if_not_searching: AnyFormattedText = '', forward_search_prompt: AnyFormattedText = 'I-search: ', backward_search_prompt: AnyFormattedText = 'I-search backward: ', ignore_case: FilterOrBool = False*)

Parameters

- **vi_mode** – Display '/' and '?' instead of I-search.
- **ignore_case** – Search case insensitive.

class prompt_toolkit.widgets.**SystemToolbar**(*prompt: Union[str, MagicFormattedText, List[Union[Tuple[str, str], Tuple[str, str, Callable[[prompt_toolkit.mouse_events.MouseEvent], NotImplementedOrNone]]]], Callable[[], Any], None] = 'Shell command: ', enable_global_bindings: Union[prompt_toolkit.filters.base.Filter, bool] = True*)

Toolbar for a system prompt.

Parameters **prompt** – Prompt to be displayed to the user.

class prompt_toolkit.widgets.**MenuContainer**(*body: AnyContainer, menu_items: list[MenuItem], floats: list[Float] | None = None, key_bindings: KeyBindingsBase | None = None*)

Parameters

- **floats** – List of extra Float objects to display.
- **menu_items** – List of *MenuItem* objects.

3.11.19 Filters

Filters decide whether something is active or not (they decide about a boolean state). This is used to enable/disable features, like key bindings, parts of the layout and other stuff. For instance, we could have a *HasSearch* filter attached to some part of the layout, in order to show that part of the user interface only while the user is searching.

Filters are made to avoid having to attach callbacks to all event in order to propagate state. However, they are lazy, they don't automatically propagate the state of what they are observing. Only when a filter is called (it's actually a callable), it will calculate its value. So, its not really reactive programming, but it's made to fit for this framework.

Filters can be chained using `&` and `|` operations, and inverted using the `~` operator, for instance:

```
filter = has_focus('default') & ~ has_selection
```

prompt_toolkit.filters.**has_focus**(*value: FocusableElement*) → Condition
Enable when this buffer has the focus.

prompt_toolkit.filters.**in_editing_mode**(*editing_mode: prompt_toolkit.enums.EditingMode*) → prompt_toolkit.filters.base.Condition
Check whether a given editing mode is active. (Vi or Emacs.)

class prompt_toolkit.filters.**Filter**
Base class for any filter to activate/deactivate a feature, depending on a condition.

The return value of `__call__` will tell if the feature should be active.

class prompt_toolkit.filters.**Never**
Never enable feature.

class prompt_toolkit.filters.**Always**
Always enable feature.

class prompt_toolkit.filters.**Condition**(*func: Callable[[], bool]*)
Turn any callable into a Filter. The callable is supposed to not take any arguments.

This can be used as a decorator:

```
@Condition
def feature_is_active():  # `feature_is_active` becomes a Filter.
    return True
```

Parameters **func** – Callable which takes no inputs and returns a boolean.

prompt_toolkit.filters.**is_true**(*value: Union[prompt_toolkit.filters.base.Filter, bool]*) → bool
Test whether *value* is True. In case of a Filter, call it.

Parameters **value** – Boolean or *Filter* instance.

prompt_toolkit.filters.**to_filter**(*bool_or_filter: Union[prompt_toolkit.filters.base.Filter, bool]*) → prompt_toolkit.filters.base.Filter
Accept both booleans and Filters as input and turn it into a Filter.

prompt_toolkit.filters.**HasFocus**(*value: FocusableElement*) → Condition
Enable when this buffer has the focus.

prompt_toolkit.filters.**InEditingMode**(*editing_mode: prompt_toolkit.enums.EditingMode*) → prompt_toolkit.filters.base.Condition
Check whether a given editing mode is active. (Vi or Emacs.)

class prompt_toolkit.filters.**Filter**
Base class for any filter to activate/deactivate a feature, depending on a condition.

The return value of `__call__` will tell if the feature should be active.

class prompt_toolkit.filters.**Condition**(*func: Callable[[], bool]*)
Turn any callable into a Filter. The callable is supposed to not take any arguments.

This can be used as a decorator:

```
@Condition
def feature_is_active():  # `feature_is_active` becomes a Filter.
    return True
```

Parameters **func** – Callable which takes no inputs and returns a boolean.

prompt_toolkit.filters.utils.**to_filter**(*bool_or_filter: Union[prompt_toolkit.filters.base.Filter, bool]*) → prompt_toolkit.filters.base.Filter

Accept both booleans and Filters as input and turn it into a Filter.

prompt_toolkit.filters.utils.**is_true**(*value: Union[prompt_toolkit.filters.base.Filter, bool]*) → bool

Test whether *value* is True. In case of a Filter, call it.

Parameters **value** – Boolean or *Filter* instance.

Filters that accept a *Application* as argument.

prompt_toolkit.filters.app.**has_focus**(*value: FocusableElement*) → Condition

Enable when this buffer has the focus.

prompt_toolkit.filters.app.**in_editing_mode**(*editing_mode: prompt_toolkit.enums.EditingMode*) → prompt_toolkit.filters.base.Condition

Check whether a given editing mode is active. (Vi or Emacs.)

3.11.20 Key binding

class prompt_toolkit.key_binding.**KeyBindingsBase**

Interface for a KeyBindings.

bindings

List of *Binding* objects. (These need to be exposed, so that *KeyBindings* objects can be merged together.)

get_bindings_for_keys(*keys: KeysTuple*) → list[Binding]

Return a list of key bindings that can handle these keys. (This return also inactive bindings, so the *filter* still has to be called, for checking it.)

Parameters **keys** – tuple of keys.

get_bindings_starting_with_keys(*keys: KeysTuple*) → list[Binding]

Return a list of key bindings that handle a key sequence starting with *keys*. (It does only return bindings for which the sequences are longer than *keys*. And like *get_bindings_for_keys*, it also includes inactive bindings.)

Parameters **keys** – tuple of keys.

class prompt_toolkit.key_binding.**KeyBindings**

A container for a set of key bindings.

Example usage:

```
kb = KeyBindings()

@kb.add('c-t')
def _(event):
    print('Control-T pressed')

@kb.add('c-a', 'c-b')
def _(event):
    print('Control-A pressed, followed by Control-B')

@kb.add('c-x', filter=is_searching)
def _(event):
    print('Control-X pressed')  # Works only if we are searching.
```

add(**keys, filter: FilterOrBool = True, eager: FilterOrBool = False, is_global: FilterOrBool = False, save_before: Callable[[KeyPressEvent], bool] = <function KeyBindings.<lambda>>, record_in_macro: FilterOrBool = True*) → Callable[[T], T]
Decorator for adding a key bindings.

Parameters

- **filter** – *Filter* to determine when this key binding is active.
- **eager** – *Filter* or *bool*. When True, ignore potential longer matches when this key binding is hit. E.g. when there is an active eager key binding for Ctrl-X, execute the handler immediately and ignore the key binding for Ctrl-X Ctrl-E of which it is a prefix.
- **is_global** – When this key bindings is added to a *Container* or *Control*, make it a global (always active) binding.
- **save_before** – Callable that takes an *Event* and returns True if we should save the current buffer, before handling the event. (That's the default.)
- **record_in_macro** – Record these key bindings when a macro is being recorded. (True by default.)

add_binding(**keys, filter: FilterOrBool = True, eager: FilterOrBool = False, is_global: FilterOrBool = False, save_before: Callable[[KeyPressEvent], bool] = <function KeyBindings.<lambda>>, record_in_macro: FilterOrBool = True*) → Callable[[T], T]
Decorator for adding a key bindings.

Parameters

- **filter** – *Filter* to determine when this key binding is active.
- **eager** – *Filter* or *bool*. When True, ignore potential longer matches when this key binding is hit. E.g. when there is an active eager key binding for Ctrl-X, execute the handler immediately and ignore the key binding for Ctrl-X Ctrl-E of which it is a prefix.
- **is_global** – When this key bindings is added to a *Container* or *Control*, make it a global (always active) binding.
- **save_before** – Callable that takes an *Event* and returns True if we should save the current buffer, before handling the event. (That's the default.)
- **record_in_macro** – Record these key bindings when a macro is being recorded. (True by default.)

get_bindings_for_keys(*keys: KeysTuple*) → list[Binding]
Return a list of key bindings that can handle this key. (This return also inactive bindings, so the *filter* still has to be called, for checking it.)

Parameters **keys** – tuple of keys.

get_bindings_starting_with_keys(*keys: KeysTuple*) → list[Binding]
Return a list of key bindings that handle a key sequence starting with *keys*. (It does only return bindings for which the sequences are longer than *keys*. And like *get_bindings_for_keys*, it also includes inactive bindings.)

Parameters **keys** – tuple of keys.

remove(**args*) → None
Remove a key binding.

This expects either a function that was given to *add* method as parameter or a sequence of key bindings.

Raises *ValueError* when no bindings was found.

Usage:

```
remove(handler)  # Pass handler.
remove('c-x', 'c-a')  # Or pass the key bindings.
```

remove_binding(**args*) → None
Remove a key binding.

This expects either a function that was given to *add* method as parameter or a sequence of key bindings.

Raises *ValueError* when no bindings was found.

Usage:

```
remove(handler)  # Pass handler.
remove('c-x', 'c-a')  # Or pass the key bindings.
```

class prompt_toolkit.key_binding.**ConditionalKeyBindings**(*key_bindings: prompt_toolkit.key_binding.key_bindings.KeyBindi filter: Union[prompt_toolkit.filters.base.Filter, bool] = True*)
Wraps around a *KeyBindings*. Disable/enable all the key bindings according to the given (additional) filter.:

```
@Condition
def setting_is_true():
    return True  # or False

registry = ConditionalKeyBindings(key_bindings, setting_is_true)
```

When new key bindings are added to this object. They are also enable/disabled according to the given *filter*.

Parameters

- **registries** – List of *KeyBindings* objects.
- **filter** – *Filter* object.

prompt_toolkit.key_binding.**merge_key_bindings**(*bindings: Se- quence[prompt_toolkit.key_binding.key_bindings.KeyBindingsBas* → prompt_toolkit.key_binding.key_bindings._MergedKeyBinding
Merge multiple Keybinding objects together.

Usage:

```
bindings = merge_key_bindings([bindings1, bindings2, ...])
```

class prompt_toolkit.key_binding.**DynamicKeyBindings**(*get_key_bindings: Callable[[], KeyBindingsBase | None]*)
KeyBindings class that can dynamically returns any KeyBindings.

Parameters **get_key_bindings** – Callable that returns a *KeyBindings* instance.

Default key bindings.:

```
key_bindings = load_key_bindings()
app = Application(key_bindings=key_bindings)
```

prompt_toolkit.key_binding.defaults.**load_key_bindings**() → prompt_toolkit.key_binding.key_bindings.KeyBinding
Create a KeyBindings object that contains the default key bindings.

class prompt_toolkit.key_binding.vi_state.**InputMode**
An enumeration.

class prompt_toolkit.key_binding.vi_state.**ViState**
Mutable class to hold the state of the Vi navigation.

input_mode
Get *InputMode*.

last_character_find = None
None or CharacterFind instance. (This is used to repeat the last search in Vi mode, by pressing the 'n' or 'N' in navigation mode.)

named_registers = None
Named registers. Maps register name (e.g. 'a') to `ClipboardData` instances.

reset() → None
Reset state, go back to the given mode. INSERT by default.

tilde_operator = None
When true, make ~ act as an operator.

waiting_for_digraph = None
Waiting for digraph.

An *KeyProcessor* receives callbacks for the keystrokes parsed from the input in the `InputStream` instance.

The *KeyProcessor* will according to the implemented keybindings call the correct callbacks when new key presses are feed through *feed*.

class prompt_toolkit.key_binding.key_processor.**KeyProcessor**(*key_bindings: prompt_toolkit.key_binding.key_bindings.Key*
Statemachine that receives *KeyPress* instances and according to the key bindings in the given `KeyBindings`, calls the matching handlers.

```
p = KeyProcessor(key_bindings)

# Send keys into the processor.
p.feed(KeyPress(Keys.ControlX, ''))
p.feed(KeyPress(Keys.ControlC, '')

# Process all the keys in the queue.
p.process_keys()

# Now the ControlX-ControlC callback will be called if this sequence is
# registered in the key bindings.
```

Parameters **key_bindings** – *KeyBindingsBase* instance.

empty_queue() → list[KeyPress]
Empty the input queue. Return the unprocessed input.

feed(*key_press: prompt_toolkit.key_binding.key_processor.KeyPress*, *first: bool = False*) → None
Add a new *KeyPress* to the input queue. (Don't forget to call *process_keys* in order to process the queue.)

Parameters **first** – If true, insert before everything else.

feed_multiple(*key_presses: list[KeyPress]*, *first: bool = False*) → None

Parameters **first** – If true, insert before everything else.

process_keys() → None
Process all the keys in the *input_queue*. (To be called after *feed*.)

Note: because of the *feed/process_keys* separation, it is possible to call *feed* from inside a key binding. This function keeps looping until the queue is empty.

send_sigint() → None
Send SIGINT. Immediately call the SIGINT key handler.

class prompt_toolkit.key_binding.key_processor.**KeyPress**(*key: Keys | str*, *data: str | None = None*)

Parameters

- **key** – A *Keys* instance or text (one character).
- **data** – The received string on stdin. (Often vt100 escape codes.)

class prompt_toolkit.key_binding.key_processor.**KeyPressEvent**(*key_processor_ref: weakref.ReferenceType[KeyProcessor], arg: str | None, key_sequence: list[KeyPress], previous_key_sequence: list[KeyPress], is_repeat: bool*)

Key press event, delivered to key bindings.

Parameters

- **key_processor_ref** – Weak reference to the *KeyProcessor*.
- **arg** – Repetition argument.
- **key_sequence** – List of *KeyPress* instances.
- **previouskey_sequence** – Previous list of *KeyPress* instances.
- **is_repeat** – True when the previous event was delivered to the same handler.

app
The current *Application* object.

append_to_arg_count(*data: str*) → None
Add digit to the input argument.

Parameters **data** – the typed digit as string

arg
Repetition argument.

arg_present
True if repetition argument was explicitly provided.

cli
For backward-compatibility.

current_buffer
The current buffer.

is_repeat = None
True when the previous key sequence was handled by the same handler.

3.11.21 Eventloop

prompt_toolkit.eventloop.**run_in_executor_with_context**(*func: Callable[..., _T], *args, loop: asyncio.AbstractEventLoop | None = None*) → Awaitable[_T]

Run a function in an executor, but make sure it uses the same contextvars. This is required so that the function will see the right application.

See also: https://bugs.python.org/issue34014

prompt_toolkit.eventloop.**call_soon_threadsafe**(*func: Callable[[], None], max_postpone_time: float | None = None, loop: asyncio.AbstractEventLoop | None = None*) → None

Wrapper around asyncio's *call_soon_threadsafe*.

This takes a *max_postpone_time* which can be used to tune the urgency of the method.

Asyncio runs tasks in first-in-first-out. However, this is not what we want for the render function of the prompt_toolkit UI. Rendering is expensive, but since the UI is invalidated very often, in some situations we render the UI too often, so much that the rendering CPU usage slows down the rest of the processing of the application. (Pymux is an example where we have to balance the CPU time spend on rendering the UI, and parsing process output.) However, we want to set a deadline value, for when the rendering should happen. (The UI should stay responsive).

prompt_toolkit.eventloop.**get_traceback_from_context**(*context: dict[str, Any]*) → TracebackType | None

Get the traceback object from the context.

Similar to *PyOS_InputHook* of the Python API, we can plug in an input hook in the asyncio event loop.

The way this works is by using a custom 'selector' that runs the other event loop until the real selector is ready.

It's the responsibility of this event hook to return when there is input ready. There are two ways to detect when input is ready:

The inputhook itself is a callable that receives an *InputHookContext*. This callable should run the other event loop, and return when the main loop has stuff to do. There are two ways to detect when to return:

- Call the *input_is_ready* method periodically. Quit when this returns *True*.
- Add the *fileno* as a watch to the external eventloop. Quit when file descriptor becomes readable. (But don't read from it.)

  Note that this is not the same as checking for *sys.stdin.fileno()*. The eventloop of prompt-toolkit allows thread-based executors, for example for asynchronous autocompletion. When the completion for instance is ready, we also want prompt-toolkit to gain control again in order to display that.

prompt_toolkit.eventloop.inputhook.**new_eventloop_with_inputhook**(*inputhook: Callable[[prompt_toolkit.eventloop.inp None]*) → asyncio.events.AbstractEventLoop

Create a new event loop with the given inputhook.

prompt_toolkit.eventloop.inputhook.**set_eventloop_with_inputhook**(*inputhook: Callable[[prompt_toolkit.eventloop.inp None]*) → asyncio.events.AbstractEventLoop

Create a new event loop with the given inputhook, and activate it.

class prompt_toolkit.eventloop.inputhook.**InputHookSelector**(*selector: selectors.BaseSelector, inputhook: Callable[[prompt_toolkit.eventloop.inputhook.*, None]*)

Usage:

selector = selectors.SelectSelector() loop = asyncio.SelectorEventLoop(InputHookSelector(selector, inputhook)) asyncio.set_event_loop(loop)

close() → None
Clean up resources.

class prompt_toolkit.eventloop.inputhook.**InputHookContext**(*fileno: int, input_is_ready: Callable[[], bool]*)

Given as a parameter to the inputhook.

prompt_toolkit.eventloop.utils.**run_in_executor_with_context**(*func: Callable[..., _T], *args, loop: asyncio.AbstractEventLoop | None = None*) → Awaitable[_T]

Run a function in an executor, but make sure it uses the same contextvars. This is required so that the function will see the right application.

See also: https://bugs.python.org/issue34014

prompt_toolkit.eventloop.utils.**call_soon_threadsafe**(*func: Callable[[], None], max_postpone_time: float | None = None, loop: asyncio.AbstractEventLoop | None = None*) → None

Wrapper around asyncio's *call_soon_threadsafe*.

This takes a *max_postpone_time* which can be used to tune the urgency of the method.

Asyncio runs tasks in first-in-first-out. However, this is not what we want for the render function of the prompt_toolkit UI. Rendering is expensive, but since the UI is invalidated very often, in some situations we render the UI too often, so much that the rendering CPU usage slows down the rest of the processing of the application. (Pymux is an example where we have to balance the CPU time spend on rendering the UI, and parsing process output.) However, we want to set a deadline value, for when the rendering should happen. (The UI should stay responsive).

prompt_toolkit.eventloop.utils.**get_traceback_from_context**(*context: dict[str, Any]*) → TracebackType | None

Get the traceback object from the context.

3.11.22 Input

class prompt_toolkit.input.**Input**
Abstraction for any input.

An instance of this class can be given to the constructor of a *Application* and will also be passed to the EventLoop.

attach(*input_ready_callback: Callable[[], None]*) → AbstractContextManager[None]
Return a context manager that makes this input active in the current event loop.

close() → None
Close input.

closed
Should be true when the input stream is closed.

cooked_mode() → AbstractContextManager[None]
Context manager that turns the input into cooked mode.

detach() → AbstractContextManager[None]
Return a context manager that makes sure that this input is not active in the current event loop.

fileno() → int
Fileno for putting this in an event loop.

flush() → None
The event loop can call this when the input has to be flushed.

flush_keys() → list[KeyPress]
Flush the underlying parser. and return the pending keys. (Used for vt100 input.)

raw_mode() → AbstractContextManager[None]
Context manager that turns the input into raw mode.

read_keys() → list[KeyPress]
Return a list of Key objects which are read/parsed from the input.

typeahead_hash() → str
Identifier for storing type ahead key presses.

class prompt_toolkit.input.**DummyInput**
Input for use in a *DummyApplication*

If used in an actual application, it will make the application render itself once and exit immediately, due to an *EOFError*.

prompt_toolkit.input.**create_input**(*stdin: TextIO | None = None*, *always_prefer_tty: bool = False*) → Input
Create the appropriate *Input* object for the current os/environment.

Parameters **always_prefer_tty** – When set, if *sys.stdin* is connected to a Unix *pipe*, check whether *sys.stdout* or *sys.stderr* are connected to a pseudo terminal. If so, open the tty for reading instead of reading for *sys.stdin*. (We can open *stdout* or *stderr* for reading, this is how a *$PAGER* works.)

prompt_toolkit.input.**create_pipe_input**() → AbstractContextManager[prompt_toolkit.input.base.PipeInput]
Create an input pipe. This is mostly useful for unit testing.

Usage:

```
with create_pipe_input() as input:
    input.send_text('inputdata')
```

Breaking change: In prompt_toolkit 3.0.28 and earlier, this was returning the *PipeInput* directly, rather than through a context manager.

class prompt_toolkit.input.vt100.**Vt100Input**(*stdin: TextIO*)
Vt100 input for Posix systems. (This uses a posix file descriptor that can be registered in the event loop.)

attach(*input_ready_callback: Callable[[], None]*) → AbstractContextManager[None]
Return a context manager that makes this input active in the current event loop.

detach() → AbstractContextManager[None]
Return a context manager that makes sure that this input is not active in the current event loop.

flush_keys() → list[KeyPress]
Flush pending keys and return them. (Used for flushing the 'escape' key.)

read_keys() → list[KeyPress]
Read list of KeyPress.

class prompt_toolkit.input.vt100.**raw_mode**(*fileno: int*)

```
with raw_mode(stdin):
    ''' the pseudo-terminal stdin is now used in raw mode '''
```

We ignore errors when executing *tcgetattr* fails.

class prompt_toolkit.input.vt100.**cooked_mode**(*fileno: int*)
The opposite of `raw_mode`, used when we need cooked mode inside a *raw_mode* block. Used in *Application.run_in_terminal.*:

```
with cooked_mode(stdin):
    ''' the pseudo-terminal stdin is now used in cooked mode. '''
```

Parser for VT100 input stream.

class prompt_toolkit.input.vt100_parser.**Vt100Parser**(*feed_key_callback: Callable[[prompt_toolkit.key_binding.key_processor.KeyP None]*)
Parser for VT100 input stream. Data can be fed through the *feed* method and the given callback will be called with KeyPress objects.

```
def callback(key):
    pass
i = Vt100Parser(callback)
i.feed('data{...')
```

Attr feed_key_callback Function that will be called when a key is parsed.

feed(*data: str*) → None
Feed the input stream.

Parameters **data** – Input string (unicode).

feed_and_flush(*data: str*) → None
Wrapper around `feed` and `flush`.

flush() → None
Flush the buffer of the input stream.

This will allow us to handle the escape key (or maybe meta) sooner. The input received by the escape key is actually the same as the first characters of e.g. Arrow-Up, so without knowing what follows the escape sequence, we don't know whether escape has been pressed, or whether it's something else. This flush function should be called after a timeout, and processes everything that's still in the buffer as-is, so without assuming any characters will follow.

Mappings from VT100 (ANSI) escape sequences to the corresponding prompt_toolkit keys.

We are not using the terminfo/termcap databases to detect the ANSI escape sequences for the input. Instead, we recognize 99% of the most common sequences. This works well, because in practice, every modern terminal is mostly Xterm compatible.

Some useful docs: - Mintty: https://github.com/mintty/mintty/blob/master/wiki/Keycodes.md

Used by autodoc_mock_imports.

3.11.23 Output

class prompt_toolkit.output.**Output**

Base class defining the output interface for a *Renderer*.

Actual implementations are *Vt100_Output* and Win32Output.

ask_for_cpr() → None
Asks for a cursor position report (CPR). (VT100 only.)

bell() → None
Sound bell.

clear_title() → None
Clear title again. (or restore previous title.)

cursor_backward(*amount: int*) → None
Move cursor *amount* place backward.

cursor_down(*amount: int*) → None
Move cursor *amount* place down.

cursor_forward(*amount: int*) → None
Move cursor *amount* place forward.

cursor_goto(*row: int = 0*, *column: int = 0*) → None
Move cursor position.

cursor_up(*amount: int*) → None
Move cursor *amount* place up.

disable_autowrap() → None
Disable auto line wrapping.

disable_bracketed_paste() → None
For vt100 only.

disable_mouse_support() → None
Disable mouse.

enable_autowrap() → None
Enable auto line wrapping.

enable_bracketed_paste() → None
For vt100 only.

enable_mouse_support() → None
Enable mouse.

encoding() → str
Return the encoding for this output, e.g. 'utf-8'. (This is used mainly to know which characters are supported by the output the data, so that the UI can provide alternatives, when required.)

enter_alternate_screen() → None
Go to the alternate screen buffer. (For full screen applications).

erase_down() → None
Erases the screen from the current line down to the bottom of the screen.

erase_end_of_line() → None
Erases from the current cursor position to the end of the current line.

erase_screen() → None
Erases the screen with the background colour and moves the cursor to home.

fileno() → int
Return the file descriptor to which we can write for the output.

flush() → None
Write to output stream and flush.

get_default_color_depth() → prompt_toolkit.output.color_depth.ColorDepth
Get default color depth for this output.

This value will be used if no color depth was explicitely passed to the *Application*.

Note: If the *$PROMPT_TOOLKIT_COLOR_DEPTH* environment variable has been set, then *outputs.defaults.create_output* will pass this value to the implementation as the default_color_depth, which is returned here. (This is not used when the output corresponds to a prompt_toolkit SSH/Telnet session.)

---

get_rows_below_cursor_position() → int
For Windows only.

get_size() → prompt_toolkit.data_structures.Size
Return the size of the output window.

hide_cursor() → None
Hide cursor.

quit_alternate_screen() → None
Leave the alternate screen buffer.

reset_attributes() → None
Reset color and styling attributes.

reset_cursor_key_mode() → None
For vt100 only. Put the terminal in normal cursor mode (instead of application mode).

See: https://vt100.net/docs/vt100-ug/chapter3.html

reset_cursor_shape() → None
Reset cursor shape.

responds_to_cpr
True if the *Application* can expect to receive a CPR response after calling *ask_for_cpr* (this will come back through the corresponding *Input*).

This is used to determine the amount of available rows we have below the cursor position. In the first place, we have this so that the drop down autocompletion menus are sized according to the available space.

On Windows, we don't need this, there we have *get_rows_below_cursor_position*.

scroll_buffer_to_prompt() → None
For Win32 only.

set_attributes(*attrs: prompt_toolkit.styles.base.Attrs*, *color_depth: prompt_toolkit.output.color_depth.ColorDepth*) → None
Set new color and styling attributes.

set_cursor_shape(*cursor_shape: prompt_toolkit.cursor_shapes.CursorShape*) → None
Set cursor shape to block, beam or underline.

set_title(*title: str*) → None
Set terminal title.

show_cursor() → None
Show cursor.

write(*data: str*) → None
Write text (Terminal escape sequences will be removed/escaped.)

write_raw(*data: str*) → None
Write text.

class prompt_toolkit.output.**DummyOutput**
For testing. An output class that doesn't render anything.

fileno() → int
There is no sensible default for fileno().

class prompt_toolkit.output.**ColorDepth**
Possible color depth values for the output.

DEPTH_1_BIT = 'DEPTH_1_BIT'
One color only.

DEPTH_24_BIT = 'DEPTH_24_BIT'
24 bit True color.

DEPTH_4_BIT = 'DEPTH_4_BIT'
ANSI Colors.

DEPTH_8_BIT = 'DEPTH_8_BIT'
The default.

prompt_toolkit.output.**create_output**(*stdout: TextIO | None = None*, *always_prefer_tty: bool = False*) → Output
Return an *Output* instance for the command line.

Parameters

- **stdout** – The stdout object
- **always_prefer_tty** – When set, look for *sys.stderr* if *sys.stdout* is not a TTY. Useful if *sys.stdout* is redirected to a file, but we still want user input and output on the terminal.

  By default, this is *False*. If *sys.stdout* is not a terminal (maybe it's redirected to a file), then a *PlainTextOutput* will be returned. That way, tools like *print_formatted_text* will write plain text into that file.

Output for vt100 terminals.

A lot of thanks, regarding outputting of colors, goes to the Pygments project: (We don't rely on Pygments anymore, because many things are very custom, and everything has been highly optimized.) http://pygments.org/

class prompt_toolkit.output.vt100.**Vt100_Output**(*stdout: TextIO*, *get_size: Callable[[], Size]*, *term: str | None = None*, *default_color_depth: ColorDepth | None = None*, *enable_bell: bool = True*, *enable_cpr: bool = True*)

Parameters

- **get_size** – A callable which returns the *Size* of the output terminal.
- **stdout** – Any object with has a *write* and *flush* method + an 'encoding' property.

- **term** – The terminal environment variable. (xterm, xterm-256color, linux, ...)
- **enable_cpr** – When *True* (the default), send "cursor position request" escape sequences to the output in order to detect the cursor position. That way, we can properly determine how much space there is available for the UI (especially for drop down menus) to render. The *Renderer* will still try to figure out whether the current terminal does respond to CPR escapes. When *False*, never attempt to send CPR requests.

ask_for_cpr() → None
Asks for a cursor position report (CPR).

bell() → None
Sound bell.

cursor_goto(*row: int = 0*, *column: int = 0*) → None
Move cursor position.

encoding() → str
Return encoding used for stdout.

erase_down() → None
Erases the screen from the current line down to the bottom of the screen.

erase_end_of_line() → None
Erases from the current cursor position to the end of the current line.

erase_screen() → None
Erases the screen with the background colour and moves the cursor to home.

fileno() → int
Return file descriptor.

flush() → None
Write to output stream and flush.

classmethod from_pty(*stdout: TextIO*, *term: str | None = None*, *default_color_depth: ColorDepth | None = None*, *enable_bell: bool = True*) → Vt100_Output
Create an Output class from a pseudo terminal. (This will take the dimensions by reading the pseudo terminal attributes.)

get_default_color_depth() → prompt_toolkit.output.color_depth.ColorDepth
Return the default color depth for a vt100 terminal, according to the our term value.

We prefer 256 colors almost always, because this is what most terminals support these days, and is a good default.

reset_cursor_key_mode() → None
For vt100 only. Put the terminal in cursor mode (instead of application mode).

reset_cursor_shape() → None
Reset cursor shape.

set_attributes(*attrs: prompt_toolkit.styles.base.Attrs*, *color_depth: prompt_toolkit.output.color_depth.ColorDepth*) → None
Create new style and output.

Parameters **attrs** – *Attrs* instance.

set_title(*title: str*) → None
Set terminal title.

write(*data: str*) → None
Write text to output. (Removes vt100 escape codes. – used for safely writing text.)

write_raw(*data: str*) → None
Write raw data to output.

Used by autodoc_mock_imports.

3.11.24 Data structures

class prompt_toolkit.layout.**WindowRenderInfo**(*window: Window, ui_content: UIContent, horizontal_scroll: int, vertical_scroll: int, window_width: int, window_height: int, configured_scroll_offsets: ScrollOffsets, visible_line_to_row_col: dict[int, tuple[int, int]], rowcol_to_yx: dict[tuple[int, int], tuple[int, int]], x_offset: int, y_offset: int, wrap_lines: bool*)
Render information for the last render time of this control. It stores mapping information between the input buffers (in case of a `BufferControl`) and the actual render position on the output screen.

(Could be used for implementation of the Vi 'H' and 'L' key bindings as well as implementing mouse support.)

Parameters

- **ui_content** – The original *UIContent* instance that contains the whole input, without clipping. (ui_content)
- **horizontal_scroll** – The horizontal scroll of the *Window* instance.
- **vertical_scroll** – The vertical scroll of the *Window* instance.
- **window_width** – The width of the window that displays the content, without the margins.
- **window_height** – The height of the window that displays the content.
- **configured_scroll_offsets** – The scroll offsets as configured for the *Window* instance.
- **visible_line_to_row_col** – Mapping that maps the row numbers on the displayed screen (starting from zero for the first visible line) to (row, col) tuples pointing to the row and column of the *UIContent*.
- **rowcol_to_yx** – Mapping that maps (row, column) tuples representing coordinates of the *UIContent* to (y, x) absolute coordinates at the rendered screen.

applied_scroll_offsets
Return a *ScrollOffsets* instance that indicates the actual offset. This can be less than or equal to what's configured. E.g, when the cursor is completely at the top, the top offset will be zero rather than what's configured.

bottom_visible
True when the bottom of the buffer is visible.

center_visible_line(*before_scroll_offset: bool = False*, *after_scroll_offset: bool = False*) → int
Like *first_visible_line*, but for the center visible line.

content_height
The full height of the user control.

cursor_position
Return the cursor position coordinates, relative to the left/top corner of the rendered screen.

displayed_lines
List of all the visible rows. (Line numbers of the input buffer.) The last line may not be entirely visible.

first_visible_line(*after_scroll_offset: bool = False*) → int
Return the line number (0 based) of the input document that corresponds with the first visible line.

full_height_visible
True when the full height is visible (There is no vertical scroll.)

get_height_for_line(*lineno: int*) → int
Return the height of the given line. (The height that it would take, if this line became visible.)

input_line_to_visible_line
Return the dictionary mapping the line numbers of the input buffer to the lines of the screen. When a line spans several rows at the screen, the first row appears in the dictionary.

last_visible_line(*before_scroll_offset: bool = False*) → int
Like *first_visible_line*, but for the last visible line.

top_visible
True when the top of the buffer is visible.

vertical_scroll_percentage
Vertical scroll as a percentage. (0 means: the top is visible, 100 means: the bottom is visible.)

class prompt_toolkit.data_structures.**Point**(*x*, *y*)

x
Alias for field number 0

y
Alias for field number 1

class prompt_toolkit.data_structures.**Size**(*rows*, *columns*)

columns
Alias for field number 1

rows
Alias for field number 0

3.11.25 Patch stdout

patch_stdout

This implements a context manager that ensures that print statements within it won't destroy the user interface. The context manager will replace *sys.stdout* by something that draws the output above the current prompt, rather than overwriting the UI.

Usage:

```
with patch_stdout(application):
    ...
    application.run()
    ...
```

Multiple applications can run in the body of the context manager, one after the other.

prompt_toolkit.patch_stdout.**patch_stdout**(*raw: bool = False*) → Generator[None, None, None]
Replace *sys.stdout* by an _StdoutProxy instance.

Writing to this proxy will make sure that the text appears above the prompt, and that it doesn't destroy the output from the renderer. If no application is curring, the behaviour should be identical to writing to *sys.stdout* directly.

Warning: If a new event loop is installed using *asyncio.set_event_loop()*, then make sure that the context manager is applied after the event loop is changed. Printing to stdout will be scheduled in the event loop that's active when the context manager is created.

Parameters **raw** – (*bool*) When True, vt100 terminal escape sequences are not removed/escaped.

class prompt_toolkit.patch_stdout.**StdoutProxy**(*sleep_between_writes: float = 0.2*, *raw: bool = False*)

File-like object, which prints everything written to it, output above the current application/prompt. This class is compatible with other file objects and can be used as a drop-in replacement for *sys.stdout* or can for instance be passed to *logging.StreamHandler*.

The current application, above which we print, is determined by looking what application currently runs in the *AppSession* that is active during the creation of this instance.

This class can be used as a context manager.

In order to avoid having to repaint the prompt continuously for every little write, a short delay of *sleep_between_writes* seconds will be added between writes in order to bundle many smaller writes in a short timespan.

close() → None
Stop *StdoutProxy* proxy.

This will terminate the write thread, make sure everything is flushed and wait for the write thread to finish.

flush() → None
Flush buffered output.

CHAPTER 4

Indices and tables

- genindex
- modindex
- search

Prompt_toolkit was created by Jonathan Slenders.

Python Module Index

p

Index

A

B

C

D

E

F

G

H

I

J

K

L

Q

R

S

T

U

V

W

X

Y

Z