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# Plumbum Shell Combinators Documentation

*Release 0.1.dev50+g696b3e6*

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Apr 29, 2024



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Ever wished the compactness of shell scripts be put into a **real** programming language? Say hello to *Plumbum Shell Combinators*. Plumbum (Latin for *lead*, which was used to create pipes back in the day) is a small yet feature-rich library for shell script-like programs in Python. The motto of the library is “**Never write shell scripts again**”, and thus it attempts to mimic the **shell syntax** (*shell combinators*) where it makes sense, while keeping it all **Pythonic and cross-platform**.

Apart from *shell-like syntax* and *handy shortcuts*, the library provides local and *remote* command execution (over SSH), local and remote file-system *paths*, easy working-directory and environment *manipulation*, quick access to ANSI *colors*, and a programmatic *Command-Line Interface (CLI)* application toolkit. Now let’s see some code!



## NEWS

- **2023.05.30:** Version 1.8.2 released with a PyPI metadata fix, Python 3.12b1 testing, and a bit more typing.
- **2023.01.01:** Version 1.8.1 released with hatchling replacing setuptools for the build system, and support for Path objects in local.
- **2022.10.05:** Version 1.8.0 released with NO\_COLOR/FORCE\_COLOR, all\_markers & future annotations for the CLI, some command enhancements, & Python 3.11 testing.
- **2021.12.23:** Version 1.7.2 released with very minor fixes, final version to support Python 2.7 and 3.5.
- **2021.11.23:** Version 1.7.1 released with a few features like reverse tunnels, color group titles, and a glob path fix. Better Python 3.10 support.
- **2021.02.08:** Version 1.7.0 released with a few new features like `.with_cwd`, some useful bugfixes, and lots of cleanup.
- **2020.03.23:** Version 1.6.9 released with several Path fixes, final version to support Python 2.6.
- **2019.10.30:** Version 1.6.8 released with `local.cmd`, a few command updates, Set improvements, and TypedEnv.
- **2018.08.10:** Version 1.6.7 released with several minor additions, mostly to CLI apps, and `run_*` modifiers added.
- **2018.02.12:** Version 1.6.6 released with one more critical bugfix for a error message regression in 1.6.5.
- **2017.12.29:** Version 1.6.5 released with mostly bugfixes, including a critical one that could break pip installs on some platforms. English cli apps now load as fast as before the localization update.
- **2017.11.27:** Version 1.6.4 released with new CLI localization support. Several bugfixes and better pathlib compatibility, along with better separation between Plumbum's internal packages.
- **2016.12.31:** Version 1.6.3 released to provide Python 3.6 compatibility. Mostly bugfixes, several smaller improvements to paths, and a provisional config parser added.
- **2016.12.3:** Version 1.6.2 is now available through [conda-forge](#), as well.
- **2016.6.25:** Version 1.6.2 released. This is mostly a bug fix release, but a few new features are included. Modifiers allow some new arguments, and Progress is improved. Better support for SunOS and other OS's.
- **2015.12.18:** Version 1.6.1 released. The release mostly contains smaller fixes for CLI, 2.6/3.5 support, and colors. PyTest is now used for tests, and Conda is supported.
- **2015.10.16:** Version 1.6.0 released. Highlights include Python 3.5 compatibility, the `plumbum.colors` package, Path becoming a subclass of `str` and a host of bugfixes. Special thanks go to Henry for his efforts.
- **2015.07.17:** Version 1.5.0 released. This release brings a host of bug fixes, code cleanups and some experimental new features (be sure to check the changelog). Also, say hi to [Henry Schreiner](#), who has joined as a member of the project.
- *[Change Log](#)*

- *Quick reference guide*



## CHEAT SHEET

### 2.1 Basics

```
>>> from plumbum import local
>>> ls = local["ls"]
>>> ls
LocalCommand(<LocalPath /bin/ls>)
>>> ls()
'build.py\ndist\ndocs\nLICENSE\nplumbum\nREADME.rst\nsetup.py\ntests\ntodo.txt\n'
>>> notepad = local["c:\\windows\\notepad.exe"]
>>> notepad()                                     # Notepad window pops up
''                                                # Notepad window is closed by user, ↵
↵command returns
```

Instead of writing `xxx = local["xxx"]` for every program you wish to use, you can also *import commands*:

```
>>> from plumbum.cmd import grep, wc, cat, head
>>> grep
LocalCommand(<LocalPath /bin/grep>)
```

Or, use the `local.cmd` syntactic-sugar:

```
>>> local.cmd.ls
LocalCommand(<LocalPath /bin/ls>)
>>> local.cmd.ls()
'build.py\ndist\ndocs\nLICENSE\nplumbum\nREADME.rst\nsetup.py\ntests\ntodo.txt\n'
```

See *Local Commands*.

### 2.2 Piping

```
>>> chain = ls["-a"] | grep["-v", "\\\\.py"] | wc["-l"]
>>> print(chain)
/bin/ls -a | /bin/grep -v '\\.py' | /usr/bin/wc -l
>>> chain()
'13\n'
```

See *Pipelining*.

## 2.3 Redirection

```
>>> ((cat < "setup.py" | head["-n", 4]))()
'#!/usr/bin/env python3\nimport os\ntry:\n'
>>> (ls["-a"] > "file.list")()
''
>>> (cat["file.list"] | wc["-l"))()
'17\n'
```

See *Input/Output Redirection*.

## 2.4 Working-directory manipulation

```
>>> local.cwd
<Workdir /home/tomer/workspace/plumbum>
>>> with local.cwd(local.cwd / "docs"):
...     chain()
...
'15\n'
```

A more explicit, and thread-safe way of running a command in a different directory is using the `.with_cwd()` method:

```
.. code-block:: python
```

```
>>> ls_in_docs = local.cmd.ls.with_cwd("docs")
>>> ls_in_docs()
'api\nchangelog.rst\ncheatsheet.rst\ncli.rst\ncolorlib.rst\n_color_list.html\ncolors.
↪rst\nconf.py\nindex.rst\nlocal_commands.rst\nlocal_machine.rst\nmake.bat\nMakefile\n_
↪news.rst\npaths.rst\nquickref.rst\nremote.rst\n_static\n_templates\ntyped_env.rst\
↪nutils.rst\n'
```

See *Paths* and *The Local Object*.

## 2.5 Foreground and background execution

```
>>> from plumbum import FG, BG
>>> (ls["-a"] | grep["\\.py"]) & FG           # The output is printed to stdout directly
build.py
.pydevproject
setup.py
>>> (ls["-a"] | grep["\\.py"]) & BG           # The process runs "in the background"
<Future ['/bin/grep', '\\.py'] (running)>
```

See *Background and Foreground*.

## 2.6 Command nesting

```
>>> from plumbum.cmd import sudo
>>> print(sudo[ifconfig["-a"]])
/usr/bin/sudo /sbin/ifconfig -a
>>> (sudo[ifconfig["-a"]] | grep["-i", "loop"]) & FG
lo          Link encap:Local Loopback
            UP LOOPBACK RUNNING  MTU:16436  Metric:1
```

See *Command Nesting*.

## 2.7 Remote commands (over SSH)

Supports [openSSH](#)-compatible clients, [PuTTY](#) (on Windows) and [Paramiko](#) (a pure-Python implementation of SSH2):

```
>>> from plumbum import SshMachine
>>> remote = SshMachine("somehost", user = "john", keyfile = "/path/to/idrsa")
>>> r_ls = remote["ls"]
>>> with remote.cwd("/lib"):
...     (r_ls | grep["0.so.0"])(C)
...
'libusb-1.0.so.0\nlibusb-1.0.so.0.0.0\n'
```

See *Remote*.

## 2.8 CLI applications

```
import logging
from plumbum import cli

class MyCompiler(cli.Application):
    verbose = cli.Flag(["-v", "--verbose"], help = "Enable verbose mode")
    include_dirs = cli.SwitchAttr("-I", list = True, help = "Specify include directories")

    @cli.switch("-loglevel", int)
    def set_log_level(self, level):
        """Sets the log-level of the logger"""
        logging.root.setLevel(level)

    def main(self, *srcfiles):
        print("Verbose:", self.verbose)
        print("Include dirs:", self.include_dirs)
        print("Compiling:", srcfiles)

if __name__ == "__main__":
    MyCompiler.run()
```

### 2.8.1 Sample output

```
$ python3 simple_cli.py -v -I foo/bar -Ispam/eggs x.cpp y.cpp z.cpp
Verbose: True
Include dirs: ['foo/bar', 'spam/eggs']
Compiling: ('x.cpp', 'y.cpp', 'z.cpp')
```

See *Command-Line Interface (CLI)*.

## 2.9 Colors and Styles

```
from plumbum import colors
with colors.red:
    print("This library provides safe, flexible color access.")
    print(colors.bold | "(and styles in general)", "are easy!")
print("The simple 16 colors or",
      colors.orchid & colors.underline | '256 named colors,',
      colors.rgb(18, 146, 64) | "or full rgb colors" ,
      'can be used.')
print("Unsafe " + colors.bg.dark_khaki + "color access" + colors.bg.reset + " is
↪available too.")
```

### 2.9.1 Sample output

See *Colors*.

## DEVELOPMENT AND INSTALLATION

The library is developed on [GitHub](#), and will happily accept [patches](#) from users. Please use the GitHub's built-in [issue tracker](#) to report any problem you encounter or to request features. The library is released under the permissive [MIT license](#).

### 3.1 Requirements

Plumbum supports **Python 3.6-3.10** and **PyPy** and is continually tested on **Linux**, **Mac**, and **Windows** machines through [GitHub Actions](#). Any Unix-like machine should work fine out of the box, but on Windows, you'll probably want to install a decent [coreutils](#) environment and add it to your `PATH`, or use `WSL(2)`. I can recommend [mingw](#) (which comes bundled with [Git for Windows](#)), but [cygwin](#) should work too. If you only wish to use Plumbum as a Popen-replacement to run Windows programs, then there's no need for the Unix tools.

Note that for remote command execution, an **openSSH-compatible** client is required (also bundled with *Git for Windows*), and a `bash`-compatible shell and a `coreutils` environment is also expected on the host machine.

This project uses `setuptools` to build wheels; and `setuptools_scm` is required for building SDists. These dependencies will be handled for you by PEP 518 compatible builders, like [build](#) and `pip 10+`.

### 3.2 Download

You can **download** the library from the [Python Package Index](#) (in a variety of formats), or run `pip install plumbum` directly. If you use Anaconda, you can also get it from the `conda-forge` channel with `conda install -c conda-forge plumbum`.



## USER GUIDE

The user guide covers most of the features of Plumbum, with lots of code-snippets to get you swimming in no time. It introduces the concepts and “syntax” gradually, so it’s recommended you read it in order. A quick [reference guide is available](#).

### 4.1 Local Commands

Plumbum exposes a special singleton object named `local`, which represents your local machine and serves as a factory for command objects:

```
>>> from plumbum import local
>>>
>>> ls = local["ls"]
>>> ls
<LocalCommand C:\Program Files\Git\bin\ls.exe>
>>> notepad = local["c:\\windows\\notepad.exe"]
>>> notepad
<LocalCommand c:\windows\notepad.exe>
```

If you don’t specify a full path, the program is searched for in your system’s `PATH` (and if no match is found, a `CommandNotFound` exception is raised). Otherwise, the full path is used as given. Once you have a `Command` object, you can execute it like a normal function:

```
>>> ls()
'README.rst\nplumbum\nsetup.py\ntests\ntodo.txt\n'
>>> ls("-a")
'.\n..\n.git\n.gitignore\n.project\n.pydevproject\nREADME.rst\n[...]'
```

For convenience with the common case, you can use the `.cmd` magic property instead of the subscription syntax:

```
>>> ls = local.cmd.ls
>>> ls
<LocalCommand C:\Program Files\Git\bin\ls.exe>
```

New in version 1.7: The `.cmd` commands provider object. If you use the `.get()` method instead of `[]`, you can include fallbacks to try if the first command does not exist on the machine. This can be used to get one of several equivalent commands, or it can be used to check for common locations of a command if not in the path. For example:

```
pandoc = local.get('pandoc',
                   '~/AppData/Local/Pandoc/pandoc.exe',
```

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```

'/Program Files/Pandoc/pandoc.exe',
'/Program Files (x86)/Pandoc/pandoc.exe')

```

An exception is still raised if none of the commands are found. Unlike `[]` access, an exception will be raised if the executable does not exist.

New in version 1.6: The `.get` method With just a touch of magic, you can *import* commands from the mock module `cmd`, like so:

```

>>> from plumbum.cmd import grep, cat
>>> cat
<LocalCommand C:\Program Files\Git\bin\cat.exe>

```

**Note:** There’s no real module named `plumbum.cmd`; it’s a dynamically-created “module”, injected into `sys.modules` to enable the use of `from plumbum.cmd import foo`. As of version 1.1, you can actually `import plumbum.cmd`, for consistency, but it’s not recommended.

It is important to stress that `from plumbum.cmd import foo` translates to `local["foo"]` behind the scenes.

If underscores (`_`) appear in the name, and the name cannot be found in the path as-is, the underscores will be replaced by hyphens (`-`) and the name will be looked up again. This allows you to import `apt_get` for `apt-get`.

### 4.1.1 Pipelining

In order to form pipelines and other chains, we must first learn to *bind arguments* to commands. As you’ve seen, *invoking* a command runs the program; by using square brackets (`__getitem__`), we can create bound commands:

```

>>> ls["-l"]
BoundCommand(<LocalCommand C:\Program Files\Git\bin\ls.exe>, ('-l',))
>>> grep["-v", ".py"]
BoundCommand(<LocalCommand C:\Program Files\Git\bin\grep.exe>, ('-v', '.py'))

```

You can think of bound commands as commands that “remember” their arguments. Creating a bound command does not run the program; in order to run it, you’ll need to call (invoke) it, like so: `ls["-l"]()` (in fact, `ls["-l"]()` is equivalent to `ls("-l")`).

Now that we can bind arguments to commands, forming pipelines is easy and straight-forwards, using `|` (bitwise-or):

```

>>> chain = ls["-l"] | grep[".py"]
>>> print(chain)
C:\Program Files\Git\bin\ls.exe -l | C:\Program Files\Git\bin\grep.exe .py
>>>
>>> chain()
'-rw-r--r--    1 sebulba  Administ      0 Apr 27 11:54 setup.py\n'

```

**Note:** Unlike common posix shells, plumbum only captures `stderr` of the last command in a pipeline. If any of the other commands writes a large amount of text to the `stderr`, the whole pipeline will stall (large amount equals to >64k on posix systems). This can happen with bioinformatics tools that write progress information to `stderr`. To avoid this issue, you can discard `stderr` of the first commands or redirect it to a file.

```

>>> chain = (bwa["mem", ...] >= "/dev/null") | samtools["view", ...]

```



## 4.1.2 Input/Output Redirection

We can also use redirection into files (or any object that exposes a real `fileno()`). If a string is given, it is assumed to be a file name, and a file with that name is opened for you. In this example, we're reading from `stdin` into `grep world`, and redirecting the output to a file named `tmp.txt`:

```
>>> import sys
>>> ((grep["world"] < sys.stdin) > "tmp.txt")()
hello
hello world
what has the world become?
foo                                     # Ctrl+D pressed
''
```

---

**Note:** Parentheses are required here! `grep["world"] < sys.stdin > "tmp.txt"` would be evaluated according to the [rules for chained comparison operators](#) and result an exception.

---

Right after `foo`, `Ctrl+D` was pressed, which caused `grep` to finish. The empty string at the end is the command's `stdout` (and it's empty because it actually went to a file). Lo and behold, the file was created:

```
>>> cat("tmp.txt")
'hello world\nwhat has the world become?\n'
```

If you need to send input into a program (through its `stdin`), instead of writing the data to a file and redirecting this file into `stdin`, you can use the shortcut `<<` (shift-left):

```
>>> (cat << "hello world\nfoo\nbar\nspam" | grep["oo"]) ()
'foo\n'
```

## 4.1.3 Exit Codes

If the command we're running fails (returns a non-zero exit code), we'll get an exception:

```
>>> cat("non/existing.file")
Traceback (most recent call last):
[...]
ProcessExecutionError: Unexpected exit code: 1
Command line: | /bin/cat non/existing.file
Stderr:       | /bin/cat: non/existing.file: No such file or directory
```

In order to avoid such exceptions, or when a different exit code is expected, just pass `retcode = xxx` as a keyword argument. If `retcode` is `None`, no exception checking is performed (any exit code is accepted); otherwise, the exit code is expected to match the one you passed:

```
>>> cat("non/existing.file", retcode = None)
''
>>> cat("non/existing.file", retcode = 17)
Traceback (most recent call last):
```

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```
[...]
ProcessExecutionError: Unexpected exit code: 1
Command line: | /bin/cat non/existing.file
Stderr:      | /bin/cat: non/existing.file: No such file or directory
```

---

**Note:** If you wish to accept several valid exit codes, `retcode` may be a tuple or a list. For instance, `grep("foo", "myfile.txt", retcode = (0, 2))`

If you need to have both the output/error and the exit code (using exceptions would provide either but not both), you can use the `run` method, which will provide all of them

```
>>> cat["non/existing.file"].run(retcode=None)
(1, '', '/bin/cat: non/existing.file: No such file or directory\n')
```

---

If you need the value of the exit code, there are two ways to do it. You can call `.run(retcode=None)` (or any other valid `retcode` value) on a command, you will get a tuple (`retcode`, `stdout`, `stderr`) (see [Run and Popen](#)). If you just need the `retcode`, or want to check the `retcode`, there are two special objects that can be applied to your command to run it and get or test the `retcode`. For example:

```
>>> cat["non/existing.file"] & RETCODE
1
>>> cat["non/existing.file"] & TF
False
>>> cat["non/existing.file"] & TF(1)
True
```

---

**Note:** If you want to run these commands in the foreground (see [Background and Foreground](#)), you can give `FG=True` to `TF` or `RETCODE`. For instance, `cat["non/existing.file"] & TF(1,FG=True)`

---

New in version 1.5: The `TF` and `RETCODE` modifiers

## 4.1.4 Run and Popen

Notice that calling commands (or chained-commands) only returns their `stdout`. In order to get hold of the exit code or `stderr`, you'll need to use the [run](#) method, which returns a 3-tuple of the exit code, `stdout`, and `stderr`:

```
>>> ls.run("-a")
(0, '.\n..\n.git\n.gitignore\n.project\n.pydevproject\nREADME.rst\nplumbum\ [...]', '')
```

You can also pass `retcode` as a keyword argument to `run` in the same way discussed above.

And, if you want to want to execute commands “in the background” (i.e., not wait for them to finish), you can use the [popen](#) method, which returns a normal `subprocess.Popen` object:

```
>>> p = ls.popen("-a")
>>> p.communicate()
('.\n..\n.git\n.gitignore\n.project\n.pydevproject\nREADME.rst\nplumbum\n [...]', '')
```

You can read from its `stdout`, `wait()` for it, `terminate()` it, etc.

### 4.1.5 Background and Foreground

In order to make programming easier, there are two special objects called FG and BG, which are there to help you. FG runs programs in the foreground (they receive the parent's `stdin`, `stdout` and `stderr`), and BG runs programs in the background (much like `popen` above, but it returns a [Future](#) object, instead of a `subprocess.Popen` one). FG is especially useful for interactive programs like editors, etc., that require a TTY or input from the user.

```
>>> from plumbum import FG, BG
>>> ls["-l"] & FG
total 5
-rw-r--r--  1 sebulba  Administ  4478 Apr 29 15:02 README.rst
drwxr-xr-x  2 sebulba  Administ  4096 Apr 27 12:18 plumbum
-rw-r--r--  1 sebulba  Administ    0 Apr 27 11:54 setup.py
drwxr-xr-x  2 sebulba  Administ    0 Apr 27 11:54 tests
-rw-r--r--  1 sebulba  Administ   18 Apr 27 11:54 todo.txt
```

**Note:** The output of `ls` went straight to the screen

```
>>> ls["-a"] & BG
<Future ['C:\\Program Files\\Git\\bin\\ls.exe', '-a'] (running)>
>>> f = _
>>> f.ready()
False
>>> f.wait()
>>> f.stdout
'.\\n..\\n.git\\n.gitignore\\n.project\\n.pydevproject\\nREADME.rst\\nplumbum\\n[...]'
```

If you want to redirect the output, you can pass those arguments to the BG modifier. So the command `ls & BG(stdout=sys.stdout, stderr=sys.stderr)` has exactly the same effect as `ls &` in a terminal.

You can also start a long running process and detach it in `nohup` mode using the `NOHUP` modifier:

```
>>> ls["-a"] & NOHUP
```

If you want to redirect the input or output to something other than `nohup.out`, you can add parameters to the modifier:

```
>>> ls["-a"] & NOHUP(stdout='/dev/null') # Or None
```

New in version 1.6: The `NOHUP` modifier

You can also use the `TEE` modifier, which causes output to be redirected to the screen (like FG), but also provides access to the output (like BG).

### 4.1.6 Command Nesting

The arguments of commands can be strings (or any object that can meaningfully-convert to a string), as we've seen above, but they can also be other **commands**! This allows nesting commands into one another, forming complex command objects. The classic example is `sudo`:

```
>>> from plumbum.cmd import sudo
>>> print(sudo[ls["-l", "-a"]])
/usr/bin/sudo /bin/ls -l -a
```

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```
>>> sudo[ls["-l", "-a"]]()
'total 22\ndrwxr-xr-x    8 sebulba  Administ    4096 May  9 20:46 .\n[...]'
```

In fact, you can nest even command-chains (i.e., pipes and redirections), e.g., `sudo[ls | grep["\\.py"]]`; however, that would require that the top-level program be able to handle these shell operators, and this is not the case for `sudo`. `sudo` expects its argument to be an executable program, and it would complain about `|` not being one. So, there's an inherent difference between `sudo[ls | grep["\\.py"]]` and `sudo[ls] | grep["\\.py"]` (where the pipe is unnested) – the first would fail, the latter would work as expected.

Some programs (mostly shells) will be able to handle pipes and redirections – an example of such a program is `ssh`. For instance, you could run `ssh["somehost", ls | grep["\\.py"]]()`; here, both `ls` and `grep` would run on `somehost`, and only the filtered output would be sent (over SSH) to our machine. On the other hand, an invocation such as `(ssh["somehost", ls] | grep["\\.py"])()` would run `ls` on `somehost`, send its entire output to our machine, and `grep` would filter it locally.

We'll learn more about remote command execution *later*. In the meanwhile, we should learn that command nesting works by *shell-quoting* (or *shell-escaping*) the nested command. Quoting normally takes place from the second level of nesting:

```
>>> print(ssh["somehost", ssh["anotherhost", ls | grep["\\.py"]]])
/bin/ssh somehost /bin/ssh anotherhost /bin/ls '|' /bin/grep '\\\\.py'
```

In this example, we first `ssh` to `somehost`, from it we `ssh` to `anotherhost`, and on that host we run the command chain. As you can see, `|` and the backslashes have been quoted, to prevent them from executing on the first-level shell; this way, they would safely get to the second-level shell.

For further information, see the [api docs](#).

## 4.2 Paths

Apart from commands, Plumbum provides an easy to use path class that represents file system paths. Paths are returned from several plumbum commands, and local paths can be directly created by `local.path()`. Paths are always absolute and are immutable, may refer to a remote machine, and can be used like a `str`. In many respects, paths provide a similar API to `pathlib` in the Python 3.4+ standard library, with a few improvements and extra features.

New in version 1.6: Paths now support more `pathlib` like syntax, several old names have been depreciated, like `.basename`

The primary ways to create paths are from `.cwd`, `.env.home`, or `.path(...)` on a local or remote machine, with `/`, `//` or `[]` for composition.

---

**Note:** The path returned from `.cwd` can also be used in a context manager and has a `.chdir(path)` function. See [The Local Object](#) for an example.

---

Paths provide a variety of functions that allow you to check the status of a file:

```
>>> p = local.path("c:\\windows")
>>> p.exists()
True
>>> p.is_dir()
True
```

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```
>>> p.is_file()
False
```

Besides checking to see if a file exists, you can check the type of file using `.is_dir()`, `.is_file()`, or `.is_symlink()`. You can access details about the file using the properties `.dirname`, `.drive`, `.root`, `.name`, `.suffix`, and `.stem` (all suffixes). General stats can be obtained with `.stat()`.

You can use `.with_suffix(suffix, depth=1)` to replace the last `depth` suffixes with a new suffix. If you specify `None` for the `depth`, it will replace all suffixes (for example, `.tar.gz` is two suffixes). Note that a name like `file.name.10.15.tar.gz` will have “5” suffixes. Also available is `.with_name(name)`, which will replace the entire name. `preferred_suffix(suffix)` will add a suffix if one does not exist (for default suffix situations).

Paths can be composed using `/` or `[]`:

```
>>> p / "notepad.exe"
<LocalPath c:\windows\notepad.exe>
>>> (p / "notepad.exe").is_file()
True
>>> (p / "notepad.exe").with_suffix(".dll")
<LocalPath c:\windows\notepad.dll>
>>> p["notepad.exe"].is_file()
True
>>> p["../some/path"]["notepad.exe"].with_suffix(".dll")
<LocalPath c:\windows\notepad.dll>
```

You can also iterate over directories to get the contents:

```
>>> for p2 in p:
...     print(p2)
...
c:\windows\addins
c:\windows\appcompat
c:\windows\apppatch
...
```

Paths also supply `.iterdir()`, which may be faster on Python 3.5.

**Globing can be easily performed using `//` (floor division)::**

```
>>> p // "*.dll"
[<LocalPath c:\windows\masetupcaller.dll>, ...]
>>> p // "*/*.dll"
[<LocalPath c:\windows\apppatch\acgenral.dll>, ...]
>>> local.cwd / "docs" // "*.rst"
[<LocalPath d:\workspace\plumbum\docs\cli.rst>, ...]
```

New in version 1.6: Globing a tuple will glob for each of the items in the tuple, and return the aggregated result.

**Files can be opened and read directly::**

```
>>> with(open(local.cwd / "docs" / "index.rst")) as f:
...     print(read(f))
<...output...>
```

New in version 1.6: Support for treating a path exactly like a `str`, so they can be used directly in `open()`.

Paths also supply `.delete()`, `.copy(destination, override=False)`, and `.move(destination)`. On systems that support it, you can also use `.symlink(destination)`, `.link(destination)`, and `.unlink()`. You can change permissions with `.chmod(mode)`, and change owners with `.chown(owner=None, group=None, recursive=None)`. If `recursive` is `None`, this will be recursive only if the path is a directory.

For **copy**, **move**, or **delete** in a more general helper function form, see the [utils modules](#).

Relative paths can be computed using `.relative_to(source)` or `mypath - basepath`, though it should be noted that relative paths are not as powerful as absolute paths, and are primarily for recording a path or printing.

For further information, see the [api docs](#).

## 4.3 The Local Object

So far we've only seen running local commands, but there's more to the local object than this; it aims to “fully represent” the *local machine*.

First, you should get acquainted with `which`, which performs program name resolution in the system `PATH` and returns the first match (or raises an exception if no match is found):

```
>>> local.which("ls")
<LocalPath C:\Program Files\Git\bin\ls.exe>
>>> local.which("nonexistent")
Traceback (most recent call last):
  [...]
plumbum.commands.CommandNotFound: ('nonexistent', [...])
```

Another member is `python`, which is a command object that points to the current interpreter (`sys.executable`):

```
>>> local.python
<LocalCommand c:\python310\python.exe>
>>> local.python("-c", "import sys;print(sys.version)")
'3.10.0 (default, Feb 2 2022, 02:22:22) [MSC v.1931 64 bit (Intel)]\r\n'
```

### 4.3.1 Working Directory

The `local.cwd` attribute represents the current working directory. You can change it like so:

```
>>> local.cwd
<Workdir d:\workspace\plumbum>
>>> local.cwd.chdir("d:\\workspace\\plumbum\\docs")
>>> local.cwd
<Workdir d:\workspace\plumbum\docs>
```

You can also use it as a *context manager*, so it behaves like `pushd/popd`:

```
>>> ls_l = ls | wc["-l"]
>>> with local.cwd("c:\\windows"):
...     print(f"{local.cwd}: {ls_l()}")
...     with local.cwd("c:\\windows\\system32"):
...         print(f"{local.cwd}: {ls_l()}")
...
c:\windows: 105
```

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```
c:\windows\system32: 3013
>>> print(f"{local.cwd}:{ls_l()}")
d:\workspace\plumbum: 9
```

Finally, A more explicit and thread-safe way of running a command in a different directory is using the `.with_cwd()` method:

```
>>> ls_in_docs = local.cmd.ls.with_cwd("docs")
>>> ls_in_docs()
'api\nchangelog.rst\ncheatsheet.rst\ncli.rst\ncolorlib.rst\n_color_list.html\ncolors.
↪rst\nconf.py\nindex.rst\nlocal_commands.rst\nlocal_machine.rst\nmake.bat\nMakefile\n
↪news.rst\npaths.rst\nquickref.rst\nremote.rst\n_static\n_templates\ntyped_env.rst\
↪nutils.rst\n'
```

### 4.3.2 Environment

Much like `cwd`, `local.env` represents the *local environment*. It is a dictionary-like object that holds **environment variables**, which you can get/set intuitively:

```
>>> local.env["JAVA_HOME"]
'C:\Program Files\Java\jdk1.6.0_20'
>>> local.env["JAVA_HOME"] = "foo"
```

And similarity to `cwd` is the context-manager nature of `env`; each level would have it's own private copy of the environment:

```
>>> with local.env(FOO="BAR"):
...     local.python("-c", "import os; print(os.environ['FOO'])")
...     with local.env(FOO="SPAM"):
...         local.python("-c", "import os; print(os.environ['FOO'])")
...         local.python("-c", "import os; print(os.environ['FOO'])")
...
'BAR\r\n'
'SPAM\r\n'
'BAR\r\n'
>>> local.python("-c", "import os; print(os.environ['FOO'])")
Traceback (most recent call last):
[...]
ProcessExecutionError: Unexpected exit code: 1
Command line: | /usr/bin/python3 -c "import os; print(os.environ['FOO'])"
Stderr:       | Traceback (most recent call last):
           |   File "<string>", line 1, in <module>
           |   File "/usr/lib/python3.10/os.py", line 725, in __getitem__
           |       raise KeyError(key) from None
           |   KeyError: 'FOO'
```

In order to make cross-platform-ness easier, the `local.env` object provides some convenience properties for getting the username (`.user`), the home path (`.home`), and the executable path (`.path`) as a list. For instance:

```
>>> local.env.user
'sebulba'
```

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```
>>> local.env.home
<Path c:\Users\sebulba>
>>> local.env.path
[<Path c:\python39\lib\site-packages\gtk-2.0\runtime\bin>, <Path c:\Users\sebulba\bin>, .
↪ ..]
>>>
>>> local.which("python")
<Path c:\python39\python.exe>
>>> local.env.path.insert(0, "c:\\python310")
>>> local.which("python")
<Path c:\python310\python.exe>
```

For further information, see the [api docs](#).

## 4.4 Remote

Just like running local commands, Plumbum supports running commands on remote systems, by executing them over SSH.

### 4.4.1 Remote Machines

Forming a connection to a remote machine is very straight forward:

```
>>> from plumbum import SshMachine
>>> rem = SshMachine("hostname", user = "john", keyfile = "/path/to/idrsa")
>>> # ...
>>> rem.close()
```

Or as a context-manager:

```
>>> with SshMachine("hostname", user = "john", keyfile = "/path/to/idrsa") as rem:
...     pass
```

---

**Note:** `SshMachine` requires `ssh` (openSSH or compatible) installed on your system in order to connect to remote machines. The remote machine must have `bash` as the default shell (or any shell that supports the `2>&1` syntax for `stderr` redirection). Alternatively, you can use the pure-Python implementation of [ParamikoMachine](#).

---

Only the `hostname` parameter is required, all other parameters are optional. If the host has your `id-rsa.pub` key in its `authorized_keys` file, or if you've set up your `~/.ssh/config` to login with some user and keyfile, you can simply use `rem = SshMachine("hostname")`.

Much like the [local object](#), remote machines expose `which()`, `path()`, `python`, `cwd` and `env`. You can also run remote commands, create SSH tunnels, upload/download files, etc. You may also refer to the [full API](#), as this guide will only survey the features.

---

**Note:** `PuTTY` users on Windows should use the dedicated `PuttyMachine` instead of `SshMachine`. See also [ParamikoMachine](#).

New in version 1.0.1.

---



## Working Directory and Environment

The `cwd` and `env` attributes represent the remote machine's working directory and environment variables, respectively, and can be used to inspect or manipulate them. Much like their local counterparts, they can be used as context managers, so their effects can be contained.

```
>>> rem.cwd
<Workdir /home/john>
>>> with rem.cwd(rem.cwd / "Desktop"):
...     print(rem.cwd)
/home/john/Desktop
>>> rem.env["PATH"]
/bin:/sbin:/usr/bin:/usr/local/bin
>>> rem.which("ls")
<RemotePath /bin/ls>
```

## Tunneling

SSH tunneling is a very useful feature of the SSH protocol. It allows you to connect from your machine to a remote server process, while having your connection authenticated and encrypted out-of-the-box. Say you run on machine-A, and you wish to connect to a server program running on machine-B. That server program binds to `localhost:8888` (where `localhost` refers naturally to machine-B). Using Plumbum, you can easily set up a tunnel from port 6666 on machine-A to port 8888 on machine-B:

```
>>> tun = rem.tunnel(6666, 8888)
>>> # ...
>>> tun.close()
```

Or as a context manager:

```
>>> with rem.tunnel(6666, 8888):
...     pass
```

You can now connect a socket to machine-A:6666, and it will be securely forwarded over SSH to machine-B:8888. When the tunnel object is closed, all active connections will be dropped.

### 4.4.2 Remote Commands

Like local commands, remote commands are created using indexing (`[]`) on a remote machine object. You can either pass the command's name, in which case it will be resolved by through `which`, or the path to the program.

```
>>> rem["ls"]
<RemoteCommand(<RemoteMachine ssh://hostname>, '/bin/ls')>
>>> rem["/usr/local/bin/python3.2"]
<RemoteCommand(<RemoteMachine ssh://hostname>, '/usr/local/bin/python3.2')>
>>> r_ls = rem["ls"]
>>> r_grep = rem["grep"]
>>> r_ls()
'foo\nbar\spam\n'
```

## Nesting Commands

Remote commands can be nested just like local ones. In fact, that's how the `SshMachine` operates behind the scenes - it nests each command inside `ssh`. Here are some examples:

```
>>> r_sudo = rem["sudo"]
>>> r_ifconfig = rem["ifconfig"]
>>> print(r_sudo[r_ifconfig["-a"]]()
eth0      Link encap:Ethernet HWaddr ...
[...]
```

You can nest multiple commands, one within another. For instance, you can connect to some machine over SSH and use that machine's SSH client to connect to yet another machine. Here's a sketch:

```
>>> from plumbum.cmd import ssh
>>> print(ssh["localhost", ssh["localhost", "ls"]])
/usr/bin/ssh localhost /usr/bin/ssh localhost ls
>>>
>>> ssh["localhost", ssh["localhost", "ls"]]()
'bin\nDesktop\nDocuments\n...'
```

## Piping

Piping works for remote commands as well, but there's a caveat to note here: the plumbing takes place on the local machine! Consider this code for instance

```
>>> r_grep = rem["grep"]
>>> r_ls = rem["ls"]
>>> (r_ls | r_grep["b"]())
'bin\nPublic\n'
```

Although `r_ls` and `r_grep` are remote commands, the data is sent from `r_ls` to the local machine, which then sends it to the remote one for running `grep`. This will be fixed in a future version of Plumbum.

It should be noted, however, that piping remote commands into local ones is perfectly fine. For example, the previous code can be written as

```
>>> from plumbum.cmd import grep
>>> (r_ls | grep["b"]())
'bin\nPublic\n'
```

Which is even more efficient (no need to send data back and forth over SSH).

## Redirection

Redirection to and from remote paths is not currently supported, but you can redirect to and from local paths, with the familiar syntax explained in *the corresponding section for local commands*. Note that if the redirection target/source is given as a string, it is automatically interpreted as a path on the local machine.

### 4.4.3 Paramiko Machine

New in version 1.1.

`SshMachine` relies on the system's `ssh` client to run commands; this means that for each remote command you run, a local process is spawned and an SSH connection is established. While relying on a well-known and trusted SSH client is the most stable option, the incurred overhead of creating a separate SSH connection for each command may be too high. In order to overcome this, Plumbum provides integration for `paramiko`, an open-source, pure-Python implementation of the SSH2 protocol. This is the `ParamikoMachine`, and it works along the lines of the `SshMachine`:

```
>>> from plumbum.machines.paramiko_machine import ParamikoMachine
>>> rem = ParamikoMachine("192.168.1.143")
>>> rem["ls"]
RemoteCommand(<ParamikoMachine paramiko://192.168.1.143>, <RemotePath /bin/ls>)
>>> r_ls = rem["ls"]
>>> r_ls()
'bin\nDesktop\nDocuments\nDownloads\nexamples.desktop\nMusic\nPictures\n...'
>>> r_ls("-a")
'.\n..\n.adobe\n.bash_history\n.bash_logout\n.bashrc\nbin...'
```

**Note:** Using `ParamikoMachine` requires `paramiko` to be installed on your system. Also, you have to explicitly import it (`from plumbum.machines.paramiko_machine import ParamikoMachine`) as `paramiko` is quite heavy.

Refer to the [API docs](#) for more details.

The main advantage of using `ParamikoMachine` is that only a single, persistent SSH connection is created, over which commands execute. Moreover, `paramiko` has a built-in SFTP client, which is used instead of `scp` to copy files (employed by the `.download()/upload()` methods), and tunneling is much more light weight: In the `SshMachine`, a tunnel is created by an external process that lives for as long as the tunnel is to remain active. The `ParamikoMachine`, however, can simply create an extra *channel* on top of the same underlying connection with ease; this is exposed by `connect_sock()`, which creates a tunneled TCP connection and returns a socket-like object

**Warning:** Piping and input/output redirection don't really work with `ParamikoMachine` commands. You'll get all kinds of errors, like `'ChannelFile' object has no attribute 'fileno'` or `I/O operation on closed file` – this is due to the fact that `Paramiko`'s channels are not real, OS-level files, so they can't interact with `subprocess.Popen`.

This will be solved in a future release; in the meanwhile, you can use the machine's `.session()` method, like so

```
>>> s = mach.session()
>>> s.run("ls | grep b")
(0, 'bin\nPublic\n', '')
```

## Tunneling Example

On 192.168.1.143, I ran the following sophisticated server (notice it's bound to localhost):

```
>>> import socket
>>> s=socket.socket()
>>> s.bind(("localhost", 12345))
>>> s.listen(1)
>>> s2,_=s.accept()
>>> while True:
...     data = s2.recv(1000)
...     if not data:
...         break
...     s2.send("I eat " + data)
...
...
```

On my other machine, I connect (over SSH) to this host and then create a tunneled connection to port 12345, getting back a socket-like object:

```
>>> rem = ParamikoMachine("192.168.1.143")
>>> s = rem.connect_sock(12345)
>>> s.send("carrot")
6
>>> s.recv(1000)
'I eat carrot'
>>> s.send("babies")
6
>>> s.recv(1000)
'I eat babies'
>>> s.close()
```

### 4.4.4 Remote Paths

Analogous to local paths, remote paths represent a file-system path of a remote system, and expose a set of utility functions for iterating over subpaths, creating subpaths, moving/copying/ renaming paths, etc.

```
>>> p = rem.path("/bin")
>>> p / "ls"
<RemotePath /bin/ls>
>>> (p / "ls").is_file()
True
>>> rem.path("/dev") // "sd*"
[<RemotePath /dev/sda>, < RemotePath /dev/sdb>, <RemotePath /dev/sdb1>, <RemotePath /dev/
↪sdb2>]
```

---

**Note:** See the [Utilities](#) guide for copying, moving and deleting remote paths

---

For further information, see the [api docs](#).

## 4.5 Utilities

The `utils` module contains a collection of useful utility functions. Note that they are not imported into the namespace of `plumbum` directly, and you have to explicitly import them, e.g. `from plumbum.path.utils import copy`.

- `copy(src, dst)` - Copies `src` to `dst` (recursively, if `src` is a directory). The arguments can be either local or remote paths – the function will sort out all the necessary details.
  - If both paths are local, the files are copied locally
  - If one path is local and the other is remote, the function uploads/downloads the files
  - If both paths refer to the same remote machine, the function copies the files locally on the remote machine
  - If both paths refer to different remote machines, the function downloads the files to a temporary location and then uploads them to the destination
- `move(src, dst)` - Moves `src` onto `dst`. The arguments can be either local or remote – the function will sort out all the necessary details (as in `copy`)
- `delete(*paths)` - Deletes the given sequence of paths; each path may be a string, a local/remote path object, or an iterable of paths. If any of the paths does not exist, the function silently ignores the error and continues. For example

```
from plumbum.path.utils import delete
delete(local.cwd // "*/*.pyc", local.cwd // "*/__pycache__")
```

- `gui_open(path)` - Opens a file in the default editor on Windows, Mac, or Linux. Uses `os.startfile` if available (Windows), `xdg_open` (GNU), or `open` (Mac).

## 4.6 Command-Line Interface (CLI)

The other side of *executing programs* with ease is **writing CLI programs** with ease. Python scripts normally use `optparse` or the more recent `argparse`, and their *derivatives*; but all of these are somewhat limited in their expressive power, and are quite **unintuitive** (and even **unpythonic**). Plumbum’s CLI toolkit offers a **programmatic approach** to building command-line applications; instead of creating a parser object and populating it with a series of “options”, the CLI toolkit translates these primitives into Pythonic constructs and relies on introspection.

From a bird’s eye view, CLI applications are classes that extend `plumbum.cli.Application`. They define a `main()` method and optionally expose methods and attributes as command-line switches. Switches may take arguments, and any remaining positional arguments are given to the `main` method, according to its signature. A simple CLI application might look like this:

```
from plumbum import cli

class MyApp(cli.Application):
    verbose = cli.Flag(["v", "verbose"], help = "If given, I will be very talkative")

    def main(self, filename):
        print(f"I will now read {filename}")
        if self.verbose:
            print("Yadda " * 200)

if __name__ == "__main__":
    MyApp.run()
```

And you can run it:

```
$ python3 example.py foo
I will now read foo

$ python3 example.py --help
example.py v1.0

Usage: example.py [SWITCHES] filename
Meta-switches:
    -h, --help            Prints this help message and quits
    --version             Prints the program's version and quits

Switches:
    -v, --verbose         If given, I will be very talkative
```

So far you've only seen the very basic usage. We'll now start to explore the library.

New in version 1.6.1: You can also directly run the app, as `MyApp()`, without arguments, instead of calling `.main()`.

### 4.6.1 Application

The `Application` class is the “container” of your application. It consists of the `main()` method, which you should implement, and any number of CLI-exposed switch functions or attributes. The entry-point for your application is the classmethod `run`, which instantiates your class, parses the arguments, invokes all switch functions, and then calls `main()` with the given positional arguments. In order to run your application from the command-line, all you have to do is

```
if __name__ == "__main__":
    MyApp.run()
```

Aside from `run()` and `main()`, the `Application` class exposes two built-in switch functions: `help()` and `version()` which take care of displaying the help and program's version, respectively. By default, `--help` and `-h` invoke `help()`, and `--version` and `-v` invoke `version()`; if any of these functions is called, the application will display the message and quit (without processing any other switch).

You can customize the information displayed by `help()` and `version` by defining class-level attributes, such as `PROGNAME`, `VERSION` and `DESCRIPTION`. For instance,

```
class MyApp(cli.Application):
    PROGNAME = "Foobar"
    VERSION = "7.3"
```

### Colors

New in version 1.6.

Colors are supported. You can use a colored string on `PROGNAME`, `VERSION` and `DESCRIPTION` directly. If you set `PROGNAME` to a color, you can get auto-naming and color. The color of the usage string is available as `COLOR_USAGE`. The color of `Usage:` line itself may be specified using `COLOR_USAGE_TITLE`, otherwise it defaults to `COLOR_USAGE`.

Different groups can be colored with a dictionaries `COLOR_GROUPS` and `COLOR_GROUP_TITLES`.

For instance, the following is valid:

```
class MyApp(cli.Application):
    PROGNAME = colors.green
    VERSION = colors.blue | "1.0.2"
    COLOR_GROUPS = {"Switches": colors.blue | "Meta-switches" : colors.yellow}
    COLOR_GROUP_TITLES = {"Switches": colors.bold | colors.blue, "Meta-switches" :
↪ colors.bold & colors.yellow}
    opts = cli.Flag("--ops", help=colors.magenta | "This is help")
```

## 4.6.2 Switch Functions

The decorator `switch` can be seen as the “heart and soul” of the CLI toolkit; it exposes methods of your CLI application as CLI-switches, allowing them to be invoked from the command line. Let’s examine the following toy application:

```
class MyApp(cli.Application):
    _allow_root = False      # provide a default

    @cli.switch("--log-to-file", str)
    def log_to_file(self, filename):
        """Sets the file into which logs will be emitted"""
        logger.addHandler(FileHandle(filename))

    @cli.switch(["-r", "--root"])
    def allow_as_root(self):
        """If given, allow running as root"""
        self._allow_root = True

    def main(self):
        if os.geteuid() == 0 and not self._allow_root:
            raise ValueError("cannot run as root")
```

When the program is run, the switch functions are invoked with their appropriate arguments; for instance, `$ ./myapp.py --log-to-file=/tmp/log` would translate to a call to `app.log_to_file("/tmp/log")`. After all switches were processed, control passes to `main`.

**Note:** Methods’ docstrings and argument names will be used to render the help message, keeping your code as [DRY](#) as possible.

There’s also `autoswitch`, which infers the name of the switch from the function’s name, e.g.:

```
@cli.autoswitch(str)
def log_to_file(self, filename):
    pass
```

Will bind the switch function to `--log-to-file`.

## Arguments

As demonstrated in the example above, switch functions may take no arguments (not counting `self`) or a single argument. If a switch function accepts an argument, it must specify the argument's *type*. If you require no special validation, simply pass `str`; otherwise, you may pass any type (or any callable, in fact) that will take a string and convert it to a meaningful object. If conversion is not possible, the type (or callable) is expected to raise either `TypeError` or `ValueError`.

For instance:

```
class MyApp(cli.Application):
    _port = 8080

    @cli.switch(["-p"], int)
    def server_port(self, port):
        self._port = port

    def main(self):
        print(self._port)
```

```
$ ./example.py -p 17
17
$ ./example.py -p foo
Argument of -p expected to be <type 'int'>, not 'foo':
ValueError("invalid literal for int() with base 10: 'foo'",)
```

The toolkit includes two additional “types” (or rather, *validators*): `Range` and `Set`. `Range` takes a minimal value and a maximal value and expects an integer in that range (inclusive). `Set` takes a set of allowed values, and expects the argument to match one of these values. You can set `case_sensitive=False`, or add `all_markers={"*", "all"}` if you want to have a “trigger all markers” marker. Here’s an example:

```
class MyApp(cli.Application):
    _port = 8080
    _mode = "TCP"

    @cli.switch("-p", cli.Range(1024, 65535))
    def server_port(self, port):
        self._port = port

    @cli.switch("-m", cli.Set("TCP", "UDP", case_sensitive = False))
    def server_mode(self, mode):
        self._mode = mode

    def main(self):
        print(self._port, self._mode)
```

```
$ ./example.py -p 17
Argument of -p expected to be [1024..65535], not '17':
ValueError('Not in range [1024..65535]',)
$ ./example.py -m foo
Argument of -m expected to be Set('udp', 'tcp'), not 'foo':
ValueError("Expected one of ['UDP', 'TCP']",)
```



**Note:** The toolkit also provides some other useful validators: `ExistingFile` (ensures the given argument is an existing file), `ExistingDirectory` (ensures the given argument is an existing directory), and `NonexistentPath` (ensures the given argument is not an existing path). All of these convert the argument to a *local path*.

---

## Repeatable Switches

Many times, you would like to allow a certain switch to be given multiple times. For instance, in `gcc`, you may give several include directories using `-I`. By default, switches may only be given once, unless you allow multiple occurrences by passing `list = True` to the switch decorator:

```
class MyApp(cli.Application):
    _dirs = []

    @cli.switch("-I", str, list = True)
    def include_dirs(self, dirs):
        self._dirs = dirs

    def main(self):
        print(self._dirs)
```

```
$ ./example.py -I/foo/bar -I/usr/include
['/foo/bar', '/usr/include']
```

---

**Note:** The switch function will be called **only once**, and its argument will be a list of items

---

## Mandatory Switches

If a certain switch is required, you can specify this by passing `mandatory = True` to the `switch` decorator. The user will not be able to run the program without specifying a value for this switch.

## Dependencies

Many times, the occurrence of a certain switch depends on the occurrence of another, e.g., it may not be possible to give `-x` without also giving `-y`. This constraint can be achieved by specifying the `requires` keyword argument to the switch decorator; it is a list of switch names that this switch depends on. If the required switches are missing, the user will not be able to run the program.

```
class MyApp(cli.Application):
    @cli.switch("--log-to-file", str)
    def log_to_file(self, filename):
        logger.addHandler(logging.FileHandler(filename))

    @cli.switch("--verbose", requires = ["--log-to-file"])
    def verbose(self):
        logger.setLevel(logging.DEBUG)
```

```
$ ./example --verbose
Given --verbose, the following are missing ['log-to-file']
```

**Warning:** The toolkit invokes the switch functions in the same order in which the switches were given on the command line. It doesn't go as far as computing a topological order on the fly, but this will change in the future.

## Mutual Exclusion

Just as some switches may depend on others, some switches mutually-exclude others. For instance, it does not make sense to allow `--verbose` and `--terse`. For this purpose, you can set the `excludes` list in the `switch` decorator.

```
class MyApp(cli.Application):
    @cli.switch("--log-to-file", str)
    def log_to_file(self, filename):
        logger.addHandler(logging.FileHandler(filename))

    @cli.switch("--verbose", requires = ["--log-to-file"], excludes = ["--terse"])
    def verbose(self):
        logger.setLevel(logging.DEBUG)

    @cli.switch("--terse", requires = ["--log-to-file"], excludes = ["--verbose"])
    def terse(self):
        logger.setLevel(logging.WARNING)
```

```
$ ./example --log-to-file=log.txt --verbose --terse
Given --verbose, the following are invalid ['--terse']
```

## Grouping

If you wish to group certain switches together in the help message, you can specify `group = "Group Name"`, where `Group Name` is any string. When the help message is rendered, all the switches that belong to the same group will be grouped together. Note that grouping has no other effects on the way switches are processed, but it can help improve the readability of the help message.

### 4.6.3 Switch Attributes

Many times it's desired to simply store a switch's argument in an attribute, or set a flag if a certain switch is given. For this purpose, the toolkit provides `SwitchAttr`, which is a [data descriptor](#) that stores the argument in an instance attribute. There are two additional "flavors" of `SwitchAttr`: `Flag` (which toggles its default value if the switch is given) and `CountOf` (which counts the number of occurrences of the switch):

```
class MyApp(cli.Application):
    log_file = cli.SwitchAttr("--log-file", str, default = None)
    enable_logging = cli.Flag("--no-log", default = True)
    verbosity_level = cli.CountOf("-v")

    def main(self):
        print(self.log_file, self.enable_logging, self.verbosity_level)
```

```
$ ./example.py -v --log-file=log.txt -v --no-log -vvv
log.txt False 5
```

## Environment Variables

New in version 1.6.

You can also set a `SwitchAttr` to take an environment variable as an input using the `envname` parameter. For example:

```
class MyApp(cli.Application):
    log_file = cli.SwitchAttr("--log-file", str, envname="MY_LOG_FILE")

    def main(self):
        print(self.log_file)
```

```
$ MY_LOG_FILE=this.log ./example.py
this.log
```

Giving the switch on the command line will override the environment variable value.

### 4.6.4 Main

The `main()` method takes control once all the command-line switches have been processed. It may take any number of *positional argument*; for instance, in `cp -r /foo /bar`, `/foo` and `/bar` are the *positional arguments*. The number of positional arguments that the program would accept depends on the signature of the method: if the method takes 5 arguments, 2 of which have default values, then at least 3 positional arguments must be supplied by the user and at most 5. If the method also takes varargs (`*args`), the number of arguments that may be given is unbound:

```
class MyApp(cli.Application):
    def main(self, src, dst, mode = "normal"):
        print(src, dst, mode)
```

```
$ ./example.py /foo /bar
/foo /bar normal
$ ./example.py /foo /bar spam
/foo /bar spam
$ ./example.py /foo
Expected at least 2 positional arguments, got ['/foo']
$ ./example.py /foo /bar spam bacon
Expected at most 3 positional arguments, got ['/foo', '/bar', 'spam', 'bacon']
```

**Note:** The method's signature is also used to generate the help message, e.g.

```
Usage: [SWITCHES] src dst [mode='normal']
```

With varargs:

```
class MyApp(cli.Application):
    def main(self, src, dst, *eggs):
        print(src, dst, eggs)
```

```
$ ./example.py a b c d
a b ('c', 'd')
$ ./example.py --help
Usage: [SWITCHES] src dst eggs...
Meta-switches:
  -h, --help           Prints this help message and quits
  -v, --version        Prints the program's version and quits
```

## Positional argument validation

New in version 1.6.

You can supply positional argument validators using the `cli.positional` decorator. Simply pass the validators in the decorator matching the names in the main function. For example:

```
class MyApp(cli.Application):
    @cli.positional(cli.ExistingFile, cli.NonexistentPath)
    def main(self, infile, *outfiles):
        "infile is a path, outfiles are a list of paths, proper errors are given"
```

You can also use annotations to specify the validators. For example:

```
class MyApp(cli.Application):
    def main(self, infile : cli.ExistingFile, *outfiles : cli.NonexistentPath):
        "Identical to above MyApp"
```

Annotations are ignored if the positional decorator is present.

## Switch Abbreviations

The cli supports switches which have been abbreviated by the user, for example, “-h”, “-he”, or “-hel” would all match an actual switch name of “-help”, as long as no ambiguity arises from multiple switches that might match the same abbreviation. This behavior is disabled by default but can be enabled by defining the class-level attribute `ALLOW_ABBREV` to `True`. For example:

```
class MyApp(cli.Application):
    ALLOW_ABBREV = True
    cheese = cli.Flag(["cheese"], help = "cheese, please")
    chives = cli.Flag(["chives"], help = "chives, instead")
```

With the above definition, running the following will raise an error due to ambiguity:

```
$ python3 example.py --ch # error! matches --cheese and --chives
```

However, the following two lines are equivalent:

```
$ python3 example.py --che
$ python3 example.py --cheese
```

### 4.6.5 Sub-commands

New in version 1.1.

A common practice of CLI applications, as they span out and get larger, is to split their logic into multiple, pluggable *sub-applications* (or *sub-commands*). A classic example is version control systems, such as `git`, where `git` is the *root* command, under which sub-commands such as `commit` or `push` are nested. Git even supports alias-ing, which creates allows users to create custom sub-commands. Plumbum makes writing such applications really easy.

Before we get to the code, it is important to stress out two things:

- Under Plumbum, each sub-command is a full-fledged `cli.Application` on its own; if you wish, you can execute it separately, detached from its so-called root application. When an application is run independently, its `parent` attribute is `None`; when it is run as a sub-command, its `parent` attribute points to its parent application. Likewise, when an parent application is executed with a sub-command, its `nested_command` is set to the nested application; otherwise it's `None`.
- Each sub-command is responsible of **all** arguments that follow it (up to the next sub-command). This allows applications to process their own switches and positional arguments before the nested application is invoked. Take, for instance, `git --foo=bar spam push origin --tags`: the root application, `git`, is in charge of the switch `--foo` and the positional argument `spam`, and the nested application `push` is in charge of the arguments that follow it. In theory, you can nest several sub-applications one into the other; in practice, only a single level is normally used.

Here is an example of a mock version control system, called `geet`. We're going to have a root application `Geet`, which has two sub-commands – `GeetCommit` and `GeetPush`: these are attached to the root application using the `subcommand` decorator

```
class Geet(cli.Application):
    """The 133t version control"""
    VERSION = "1.7.2"

    def main(self, *args):
        if args:
            print(f"Unknown command {args[0]}")
            return 1 # error exit code
        if not self.nested_command: # will be `None` if no sub-command follows
            print("No command given")
            return 1 # error exit code

@Geet.subcommand("commit") # attach 'geet commit'
class GeetCommit(cli.Application):
    """creates a new commit in the current branch"""

    auto_add = cli.Flag("-a", help = "automatically add changed files")
    message = cli.SwitchAttr("-m", str, mandatory = True, help = "sets the commit message")

    def main(self):
        print("doing the commit...")

@Geet.subcommand("push") # attach 'geet push'
class GeetPush(cli.Application):
    """pushes the current local branch to the remote one"""
    def main(self, remote, branch = None):
        print("doing the push...")
```

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```
if __name__ == "__main__":  
    Geet.run()
```

---

**Note:**

- Since `GeetCommit` is a `cli.Application` on its own right, you may invoke `GeetCommit.run()` directly (should that make sense in the context of your application)
  - You can also attach sub-commands “imperatively”, using `subcommand` as a method instead of a decorator: `Geet.subcommand("push", GeetPush)`
- 

Here’s an example of running this application:

```
$ python3 geet.py --help  
geet v1.7.2  
The l33t version control  
  
Usage: geet.py [SWITCHES] [SUBCOMMAND [SWITCHES]] args...  
Meta-switches:  
  -h, --help           Prints this help message and quits  
  -v, --version        Prints the program's version and quits  
  
Subcommands:  
  commit              creates a new commit in the current branch; see  
                      'geet commit --help' for more info  
  push                pushes the current local branch to the remote  
                      one; see 'geet push --help' for more info  
  
$ python3 geet.py commit --help  
geet commit v1.7.2  
creates a new commit in the current branch  
  
Usage: geet commit [SWITCHES]  
Meta-switches:  
  -h, --help           Prints this help message and quits  
  -v, --version        Prints the program's version and quits  
  
Switches:  
  -a                  automatically add changed files  
  -m VALUE:str        sets the commit message; required  
  
$ python3 geet.py commit -m "foo"  
committing...
```

### 4.6.6 Configuration parser

Another common task of a cli application is provided by a configuration parser, with an INI backend: `Config` (or `ConfigINI` to explicitly request the INI backend). An example of it's use:

```
from plumbum import cli

with cli.Config('~/.myapp_rc') as conf:
    one = conf.get('one', '1')
    two = conf.get('two', '2')
```

If no configuration file is present, this will create one and each call to `.get` will set the value with the given default. The file is created when the context manager exits. If the file is present, it is read and the values from the file are selected, and nothing is changed. You can also use `[]` syntax to forcibly set a value, or to get a value with a standard `ValueError` if not present. If you want to avoid the context manager, you can use `.read` and `.write` as well.

The ini parser will default to using the `[DEFAULT]` section for values, just like Python's `ConfigParser` on which it is based. If you want to use a different section, simply separate section and heading with a `.` in the key. `conf['section.item']` would place `item` under `[section]`. All items stored in an `ConfigINI` are converted to `str`, and `str` is always returned.

### 4.6.7 Terminal Utilities

Several terminal utilities are available in `plumbum.cli.terminal` to assist in making terminal applications.

`get_terminal_size(default=(80,25))` allows cross platform access to the terminal size as a tuple (width, height). Several methods to ask the user for input, such as `readline`, `ask`, `choose`, and `prompt` are available.

`Progress(iterator)` allows you to quickly create a progress bar from an iterator. Simply wrap a slow iterator with this and iterate over it, and it will produce a nice text progress bar based on the user's screen width, with estimated time remaining displayed. If you need to create a progress bar for a fast iterator but with a loop containing code, use `Progress.wrap` or `Progress.range`. For example:

```
for i in Progress.range(10):
    time.sleep(1)
```

If you have something that produces output, but still needs a progress bar, pass `has_output=True` to force the bar not to try to erase the old one each time.

A command line image plotter (`Image`) is provided in `plumbum.cli.image`. It can plot a PIL-like image `im` using:

```
Image().show_pil(im)
```

The `Image` constructor can take an optional size (defaults to the current terminal size if `None`), and a `char_ratio`, a height to width measure for your current font. It defaults to a common value of 2.45. If set to `None`, the ratio is ignored and the image will no longer be constrained to scale proportionately. To directly plot an image, the `show` method takes a filename and a double parameter, which doubles the vertical resolution on some fonts. The `show_pil` and `show_pil_double` methods directly take a PIL-like object. To plot an image from the command line, the module can be run directly: `python3 -m plumbum.cli.image myimage.png`.

For the full list of helpers or more information, see the [api docs](#).

### 4.6.8 See Also

- [filecopy.py](#) example
- [geet.py](#) – a runnable example of using sub-commands
- [RPyC](#) has changed its bash-based build script to Plumbum CLI. Notice [how short and readable](#) it is.
- A [blog post](#) describing the philosophy of the CLI module

## 4.7 TypedEnv

Plumbum provides this utility class to facilitate working with environment variables. Similar to how `plumbum.cli.Application` parses command line arguments into pythonic data types, `plumbum.typed_env.TypedEnv` parses environment variables:

```
class MyEnv(TypedEnv):
    username = TypedEnv.Str("USER", default='anonymous') path = TypedEnv.CSV("PATH", separator=":",
    type=local.path) tmp = TypedEnv.Str(["TMP", "TEMP"]) # support 'fallback' var-names is_travis = Type-
    dEnv.Bool("TRAVIS", default=False) # True is 'yes/true/1' (case-insensitive)
```

We can now instantiate this class to access its attributes:

```
>>> env = MyEnv()
>>> env.username
'ofer'

>>> env.path
[<LocalPath /home/ofer/bin>,
 <LocalPath /usr/local/bin>,
 <LocalPath /usr/local/sbin>,
 <LocalPath /usr/sbin>,
 <LocalPath /usr/bin>,
 <LocalPath /sbin>,
 <LocalPath /bin>]

>>> env.tmp
Traceback (most recent call last):
  [...]
KeyError: 'TMP'

>>> env.is_travis
False
```

Finally, our `TypedEnv` object allows us ad-hoc access to the rest of the environment variables, using dot-notation:

```
>>> env.HOME
'/home/ofer'
```

We can also update the environment via our `TypedEnv` object:

```
>>> env.tmp = "/tmp"
>>> env.tmp
'/tmp'
```



```
>>> from os import environ
>>> env.TMP
'/tmp'
```

```
>>> env.is_travis = True
>>> env.TRAVIS
'yes'
```

```
>>> env.path = [local.path("/a"), local.path("/b")]
>>> env.PATH
'/a:/b'
```

### 4.7.1 TypedEnv as an Abstraction Layer

The TypedEnv class is very useful for separating your application from the actual environment variables. It provides a layer where parsing and normalizing can take place in a centralized fashion.

For example, you might start with this simple implementation:

```
class CiBuildEnv(TypedEnv):
    job_id = TypedEnv.Str("BUILD_ID")
```

Later, as the application gets more complicated, you may expand your implementation like so:

```
class CiBuildEnv(TypedEnv):
    is_travis = TypedEnv.Bool("TRAVIS", default=False)
    _travis_job_id = TypedEnv.Str("TRAVIS_JOB_ID")
    _jenkins_job_id = TypedEnv.Str("BUILD_ID")

    @property
    def job_id(self):
        return self._travis_job_id if self.is_travis else self._jenkins_job_id
```

### 4.7.2 TypedEnv vs. local.env

It is important to note that TypedEnv is separate and unrelated to the LocalEnv object that is provided via `local.env`.

While TypedEnv reads and writes directly to `os.environ`, `local.env` is a frozen copy taken at the start of the python session.

While TypedEnv is focused on parsing environment variables to be used by the current process, `local.env`'s primary purpose is to manipulate the environment for child processes that are spawned via plumbum's *local commands*.

## 4.8 Colors

New in version 1.6.

The purpose of the `plumbum.colors` library is to make adding text styles (such as color) to Python easy and safe. Color is often a great addition to shell scripts, but not a necessity, and implementing it properly is tricky. It is easy to end up with an unreadable color stuck on your terminal or with random unreadable symbols around your text. With the color module, you get quick, safe access to ANSI colors and attributes for your scripts. The module also provides an API for creating other color schemes for other systems using escapes.

---

**Note:** Enabling color

`ANSIStyle` assumes that only a terminal can display color, and looks at the value of the environment variable `TERM`. You can force the use of color globally by setting `colors.use_color=4` (The levels 0-4 are available, with 0 being off). See this [note](#) for more options.

---

### 4.8.1 Quick start

Colors (red, green, etc.), attributes (bold, underline, etc.) and general styles (`warn`, `info`, etc.) are in `plumbum.colors`. Combine styles with `&`, apply to a string with `|`. So, to output a warning you would do

```
from plumbum.colors import warn
print(warn | "This is a warning.")
```

To create a custom style you would do

```
from plumbum import colors
print(colors.green & colors.bold | "This is green and bold.")
```

You can use rgb colors, too:

```
print(colors.rgb(0,255,0) | "This is also green.")
```

### 4.8.2 Generating Styles

Styles are accessed through the `plumbum.colors` object. This has the following available objects:

**fg and bg**

The foreground and background colors, reset to default with `colors.fg.reset` or `~colors.fg` and likewise for `bg`.

**bold, dim, underline, italics, reverse, strikeouts, and hidden**

All the *ANSI* modifiers are available, as well as their negations, such as `~colors.bold` or `colors.bold.reset`, etc.

**reset**

The global reset will restore all properties at once.

**do\_nothing**

Does nothing at all, but otherwise acts like any `Style` object. It is its own inverse. Useful for `cli` properties.

**Styles loaded from a stylesheet dictionary, such as `warn` and `info`.**

These allow you to set standard styles based on behavior rather than colors, and you can load a new stylesheet with `colors.load_stylesheet(...)`.

Recreating and loading the default stylesheet would look like this:

```
>>> default_styles = dict(
...     warn="fg red",
...     title="fg cyan underline bold",
...     fatal="fg red bold",
...     highlight="bg yellow",
...     info="fg blue",
...     success="fg green")
>>> colors.load_stylesheet(default_styles)
```

The `colors.from_ansi(code)` method allows you to create a `Style` from any ansi sequence, even complex or combined ones.

## Colors

The `colors.fg` and `colors.bg` allow you to access and generate colors. Named foreground colors are available directly as methods. The first 16 primary colors, `black`, `red`, `green`, `yellow`, `blue`, `magenta`, `cyan`, etc, as well as `reset`, are available. All 256 color names are available, but do not populate directly, so that auto-completion gives reasonable results. You can also access colors using strings and do `colors.fg[string]`. Capitalization, underscores, and spaces (for strings) will be ignored.

You can also access colors numerically with `colors.fg[n]` for the extended 256 color codes. `colors.fg.rgb(r, g, b)` will create a color from an input red, green, and blue values (integers from 0-255). `colors.fg.rgb(code)` will allow you to input an html style hex sequence.

Anything you can access from `colors.fg` can also be accessed directly from `colors`.

### 4.8.3 256 Color Support

While this library supports full 24 bit colors through escape sequences, the library has special support for the “full” 256 colorset through numbers, names or HEX html codes. Even if you use 24 bit color, the closest name is displayed in the repr. You can access the colors as `colors.fg.Light_Blue`, `colors.fg.lightblue`, `colors.fg[12]`, `colors.fg('Light_Blue')`, `colors.fg('LightBlue')`, or `colors.fg('#0000FF')`. You can also iterate or slice the colors, `colors.fg`, or `colors.bg` objects. Slicing even intelligently downgrades to the simple version of the codes if it is within the first 16 elements. The supported colors are:

If you want to enforce a specific representation, you can use `.basic` (8 color), `.simple` (16 color), `.full` (256 color), or `.true` (24 bit color) on a style, and the colors in that `Style` will conform to the output representation and name of the best match color. The internal RGB colors are remembered, so this is a non-destructive operation.

---

**Note:** Some terminals only support a subset of colors, so keep this in mind when using a larger color set. The standard Ubuntu terminal handles 24 bit color, the Mac terminal only handles 256 colors, and Colorama on Windows only handles 8. See [this gist](#) for information about support in terminals. If you need to limit the output color, you can set `colors.use_color` to 0 (no colors), 1 (8 colors), 2 (16 colors), or 3 (256 colors), or 4 (24-bit colors). This option will be automatically guessed for you on initialization.

---

### 4.8.4 Style manipulations

Safe color manipulations refer to changes that reset themselves at some point. Unsafe manipulations must be manually reset, and can leave your terminal color in an unreadable state if you forget to reset the color or encounter an exception. The library is smart and will try to restore the color when Python exits.

---

**Note:** If you do get the color unset on a terminal, the following, typed into the command line, will restore it:

```
$ python3 -m plumbum.colors
```

This also supports command line access to unsafe color manipulations, such as

```
$ python3 -m plumbum.colors blue
$ python3 -m plumbum.colors bg red
$ python3 -m plumbum.colors fg 123
$ python3 -m plumbum.colors bg reset
$ python3 -m plumbum.colors underline
```

You can use any path or number available as a style.

### Unsafe Manipulation

Styles have two unsafe operations: Concatenation (with + and a string) and calling `.now()` without arguments (directly calling a style without arguments is also a shortcut for `.now()`). These two operations do not restore normal color to the terminal by themselves. To protect their use, you can use a context manager around any unsafe operation.

An example of the usage of unsafe colors manipulations inside a context manager:

```
from plumbum import colors

with colors:
    colors.fg.red.now()
    print('This is in red') .. raw:: html

<p><font color="#800000">This is in red</font><br/>
<font color="#008000">This is in green <span style="text-decoration: underline;">and now
↪also underlined!</span></font><br/>
<font color="#008000"><span style="text-decoration: underline;">Underlined</span> and
↪not underlined but still green.</font><br/>
This is completely restored, even if an exception is thrown! </p>

    colors.green.now()
    print('This is green ' + colors.underline + 'and now also underlined!')
    print('Underlined' + colors.underline.reset + ' and not underlined but still red')
print('This is completely restored, even if an exception is thrown!')
```

Output:

We can use `colors` instead of `colors.fg` for foreground colors. If we had used `colors.fg` as the context manager, then non-foreground properties, such as `colors.underline` or `colors.bg.yellow`, would not have been reset. Each attribute, as well as `fg`, `bg`, and `colors` all have inverses in the ANSI standard. They are accessed with `~` or `.reset`, and can be used to manually make these operations safer, but there is a better way.

## Safe Manipulation

All other operations are safe; they restore the color automatically. The first, and hopefully already obvious one, is using a specific style rather than a `colors` or `colors.fg` object in a `with` statement. This will set the color (using `sys.stdout` by default) to that color, and restore color on leaving.

The second method is to manually wrap a string. This can be done with `color | "string"` or `color["string"]`. These produce strings that can be further manipulated or printed.

Finally, you can also print a color to stdout directly using `color.print("string")`. This has the same syntax as the `print` function.

An example of safe manipulations:

```
colors.fg.yellow('This is yellow', end='')
print(' And this is normal again.')
with colors.red:
    print('Red color!')
    with colors.bold:
        print("This is red and bold.")
    print("Not bold, but still red.")
print("Not red color or bold.")
print(colors.magenta & colors.bold | "This is bold and colorful!", "And this is not.")
```

Output:

## Style Combinations

You can combine styles with `&` and they will create a new combined style. Colors will not be “summed” or otherwise combined; the rightmost color will be used (this matches the expected effect of applying the styles individually to the strings). However, combined styles are intelligent and know how to reset just the properties that they contain. As you have seen in the example above, the combined style (`colors.magenta & colors.bold`) can be used in any way a normal style can.

### 4.8.5 New color systems

The library was written primarily for ANSI color sequences, but can also easily be subclassed to create new color systems. See *Colorlib design* for information on how the system works. An HTML version is available as `plumbum.colorlib.htmlcolors`.

### 4.8.6 See Also

- `colored` Another library with 256 color support
- `colorful` A fairly new library with a similar feature set
- **colorama** A library that supports colored text on Windows, can be combined with `Plumbum.colors` (if you force `use_color`, doesn't support all extended colors)
- `rich` A very powerful modern library for all sorts of styling.

## 4.9 Change Log

### 4.9.1 1.8.3

- Fix StdinDataRedirection's formulate() method by @nebbish in <https://github.com/tomerfiliba/plumbum/pull/629>
- Missing non-zero return code from TEE'd pipe by @vient in <https://github.com/tomerfiliba/plumbum/pull/661>
- Fix stalling in Pipeline command by @astaric in <https://github.com/tomerfiliba/plumbum/pull/632>
- Use high-speed method for C locale too by @henryiii in <https://github.com/tomerfiliba/plumbum/pull/681>
- Update index.rst - fix broken link for sh project by @mcint in <https://github.com/tomerfiliba/plumbum/pull/658>

### 4.9.2 1.8.2

- Fix author metadata on PyPI package and add static check (#648)
- Add testing for Python 3.12 beta 1 (#650)
- Use Ruff for linting (#643)
- Paths: Add type hinting for Path (#646)

### 4.9.3 1.8.1

- Accept path-like objects (#627)
- Move the build backend to hatchling and hatch-vcs. Users should be unaffected. Third-party packaging may need to adapt to the new build system. (#607)

### 4.9.4 1.8.0

- Drop Python 2.7 and 3.5 support, add 3.11 support (#573)
- Lots of extended checks and fixes for problems exposed.
- Color: support NO\_COLOR/FORCE\_COLOR (#575)
- Commands: New iter\_lines buffer\_size parameter (#582)
- Commands: cache remote commands (#583)
- SSH: Support reverse tunnels and dynamically allocated ports (#608)
- CLI: add Set(..., all\_markers={"\*", "all"}) and fix support for other separators (#619)
- CLI: support future annotations (#621)
- Color: fix the ABC (#617)
- Exceptions: fix for exception pickling (#586)
- Fix for StdinDataRedirection and modifiers (#605)

#### 4.9.5 1.7.2

- Commands: avoid issue mktemp issue on some BSD variants (#571)
- Better specification of dependency on pywin32 (#568)
- Some DeprecationWarnings changed to FutureWarnings (#567)

#### 4.9.6 1.7.1

- Paths: glob with local paths no longer expands the existing path too (#552)
- Paramiko: support reverse tunnels (#562)
- SSHMachine: support forwarding Unix sockets in `.tunnel()` (#550)
- CLI: Support `COLOR_GROUP_TITLES` (#553)
- Fix a deprecated in Python 3.10 warning (#563)
- Extended testing and checking on Python 3.10 and various PyPy versions. Nox is supported for easier new-user development.

#### 4.9.7 1.7.0

- Commands: support `.with_cwd()` (#513)
- Commands: make `iter_lines` deal with decoding errors during iteration (#525)
- Commands: fix handling of env-vars passed to plumbum `BoundEnvCommands` (#513)
- Commands: fix support for win32 in `iter_lines` (#500)
- Paths: fix incorrect `__getitem__` method in `Path` (#506)
- Paths: Remote path stat had odd `OSError` (#505)
- Paths: Fix `RemotePath.copy()` (#527)
- Paths: missing `__fspath__` added (#498)
- SSH: better error reporting on `SshSession` error (#515)
- Internal: redesigned CI, major cleanup to setuptools distribution, Black formatting, style checking throughout.

#### 4.9.8 1.6.9

- Last version to support Python 2.6; added `python_requires` for future versions (#507)
- Paths: Fix bug with subscription operations (#498), (#506)
- Paths: Fix resolve (#492)
- Commands: Fix resolve (#491)
- Commands: Add context manager on `popen` (#495)
- Several smaller fixes (#500), (#505)

#### 4.9.9 1.6.8

- Exceptions: Changed `ProcessExecutionError`'s formatting to be more user-friendly (#456)
- Commands: support for per-line timeout with `iter_lines` (#454)
- Commands: support for piping stdout/stderr to a logger (#454)
- Paths: support composing paths using subscription operations (#455)
- CLI: Improved 'Set' validator to allow non-string types, and CSV params (#452)
- TypedEnv: Facility for modeling environment-variables into python data types (#451)
- Commands: execute local/remote commands via a magic `.cmd` attribute (#450)

#### 4.9.10 1.6.7

- Commands: Added `run_*` methods as an alternative to modifiers (#386)
- CLI: Added support for `ALLOW_ABREV` (#401)
- CLI: Added `DESCRIPTION_MORE`, preserves spacing (#378)
- Color: Avoid throwing error in `atexit` in special cases (like `pytest`) (#393)
- Including Python 3.7 in testing matrix.
- Smaller bugfixes and other testing improvements.

#### 4.9.11 1.6.6

- Critical Bugfix: High-speed (English) translations could break the CLI module (#371)
- Small improvement to wheels packaging

#### 4.9.12 1.6.5

- Critical Bugfix: Syntax error in image script could break pip installs (#366)
- CLI: Regression fix: English apps now load as fast as in 1.6.3 (#364)
- CLI: Missing colon restored in group names
- Regression fix: Restored non-setuptools installs (but really, why would you not have setuptools?) (#367)

#### 4.9.13 1.6.4

- CLI: Support for localization (#339), with:
  - Russian by Pavel Pletenev (#339)
  - Dutch by Roel Aaij (#351)
  - French by Joel Closier (#352)
  - German by Christoph Hasse (#353)
  - Pulls with more languages welcome!
- CLI: Support for `MakeDirectory` (#339)



- Commands: Fixed unicode input/output on Python 2 (#341)
- Paths: More updates for pathlib compatibility (#325)
- Terminal: Changed `prompt()`'s default value for `type` parameter from `int` to `str` to match existing docs (#327)
- Remote: Support `~` in `PATH` for a remote (#293)
- Remote: Fixes for globbing with spaces in filename on a remote server (#322)
- Color: Fixes to image plots, better separation (#324)
- Python 3.3 has been removed from Travis and Appveyor.
- Several bugs fixed

#### 4.9.14 1.6.3

- Python 3.6 is now supported, critical bug fixed (#302)
- Commands: Better handling of return codes for pipelines (#288)
- Paths: Return split support (regression) (#286) - also supports dummy args for better `str` compatibility
- Paths: Added support for Python 3.6 path protocol
- Paths: Support Python's `in` syntax
- CLI: Added Config parser (provisional) (#304)
- Color: image plots with `python -m plumbum.cli.image` (#304)
- SSH: No longer hangs for `timeout` seconds on failure (#306)
- Test improvements, especially on non-linux systems

#### 4.9.15 1.6.2

- CLI: `Progress` now has a clear keyword that hides the bar on completion
- CLI: `Progress` without clear now starts on next line without having to manually add `\n`.
- Commands: modifiers now accept a `timeout` parameter (#281)
- Commands: BG modifier now allows `stdout/stderr` redirection (to screen, for example) (#258)
- Commands: Modifiers no longer crash on repr (see #262)
- Remote: `nohup` works again, typo fixed (#261)
- Added better support for SunOS and other OS's. (#260)
- Colors: Context manager flushes stream now, provides more consistent results
- Other smaller bugfixes, better support for Python 3.6+

#### 4.9.16 1.6.1

- CLI: `Application` subclasses can now be run directly, instead of calling `.run()`, to facilitate using as entry points (#237)
- CLI: `gui_open` added to allow easy opening of paths in default gui editor (#239)
- CLI: More control over help message (#233)
- Remote: `cwd` is now stashed to reduce network usage (similar to Plumbum <1.6 behavior), and absolute paths are faster, (#238)
- Bugfix: Pipelined return codes now give correct attribution (#243)
- Bugfix: `Progress` works on Python 2.6 (#230)
- Bugfix: Colors now work with more terminals (#231)
- Bugfix: Getting an executable no longer returns a directory (#234)
- Bugfix: `Iterdir` now works on Python <3.5
- Testing is now expanded and fully written in Pytest, with coverage reporting.
- Added support for Conda ( as of 1.6.2, use the `-c conda-forge` channel)

#### 4.9.17 1.6.0

- Added support for Python 3.5, PyPy, and better Windows and Mac support, with CI testing (#218, #217, #226)
- Colors: Added colors module, support for colors added to cli (#213)
- Machines: Added `.get()` method for checking several commands. (#205)
- Machines: `local.cwd` now is the current directory even if you change the directory with non-Plumbum methods (fixes unexpected behavior). (#207)
- SSHMachine: Better error message for SSH (#211)
- SSHMachine: Support for FreeBSD remote (#220)
- Paths: Now a subclass of `str`, can be opened directly (#228)
- Paths: Improved pathlib compatibility with several additions and renames (#223)
- Paths: Added globbing multiple patterns at once (#221)
- Commands: added `NOHUP` modifier (#221)
- CLI: added positional argument validation (#225)
- CLI: added `envname`, which allows you specify an environment variable for a `SwitchAttr` (#216)
- CLI terminal: added `Progress`, a command line progress bar for iterators and ranges (#214)
- Continued to clean out Python 2.5 hacks

#### 4.9.18 1.5.0

- Removed support for Python 2.5. (Travis CI does not support it anymore)
- CLI: add `invoke`, which allows you to programmatically run applications (#149)
- CLI: add `--help-all` and various cosmetic fixes: (#125), (#126), (#127)
- CLI: add `root_app` property (#141)
- Machines: `getattr` now raises `AttributeError` instead of `CommandNotFound` (#135)
- Paramiko: `keep_alive` support (#186)
- Paramiko: does not support piping explicitly now (#160)
- Paramiko: Added pure SFTP backend, gives SFTP v4+ support (#188)
- Paths: bugfix to `cwd` interaction with `Path` (#142)
- Paths: `read/write` now accept an optional encoding parameter (#148)
- Paths: Suffix support similar to the Python 3.4 standard library `pathlib` (#198)
- Commands: renamed `setenv` to `with_env` (#143)
- Commands: pipelines will now fail with `ProcessExecutionError` if the source process fails (#145)
- Commands: added `TF` and `RETCODE` modifiers (#202)
- Experimental concurrent machine support in `experimental/parallel.py`
- Several minor bug fixes, including Windows and Python 3 fixes (#199, #195)

#### 4.9.19 1.4.2

- Paramiko now supports Python 3, enabled support in Plumbum
- Terminal: added `prompt()`, bugfix to `get_terminal_size()` (#113)
- CLI: added `cleanup()`, which is called after `main()` returns
- CLI: bugfix to `CountOf` (#118)
- Commands: Add a `TEE` modifier (#117)
- Remote machines: bugfix to `which`, bugfix to remote environment variables (#122)
- Path: `read()/write()` now operate on bytes

#### 4.9.20 1.4.1

- Force `/bin/sh` to be the shell in `SshMachine.session()` (#111)
- Added `islink()` and `unlink()` to path objects (#100, #103)
- Added access to path objects
- Faster `which` implementation (#98)
- Several minor bug fixes

#### 4.9.21 1.4

- Moved `atomic` and `unixutils` into the new `fs` package (file-system related utilities)
- Dropped `plumbum.utils` legacy shortcut in favor of `plumbum.path.utils`
- Bugfix: the left-hand-side process of a pipe wasn't waited on, leading to zombies (#89)
- Added `RelativePath` (the result of `Path.relative_to`)
- Fixed more text alignment issues in `cli.Application.help()`
- Introduced `ask()` and `choose` to `cli.terminal`
- Bugfix: Path comparison operators were wrong
- Added connection timeout to `RemoteMachine`

#### 4.9.22 1.3

- `Command.popen`: a new argument, `new_session` may be passed to `Command.popen`, which runs the given in a new session (`setsid` on POSIX, `CREATE_NEW_PROCESS_GROUP` on Windows)
- `Command.Popen`: args can now also be a list (previously, it was required to be a tuple). See
- `local.daemonize`: run commands as full daemons (double-fork and `setsid`) on POSIX systems, or detached from their controlling console and parent (on Windows).
- `list_processes`: return a list of running process (local/remote machines)
- `SshMachine.nohup`: “daemonize” remote commands via `nohup` (not really a daemon, but good enough)
- `atomic`: Atomic file operations (`AtomicFile`, `AtomicCounterFile` and `PidFile`)
- `copy` and `move`: the `src` argument can now be a list of files to move, e.g., `copy(["foo", "bar"], "/usr/bin")`
- `list local and remote processes`
- `cli`: better handling of text wrapping in the generated help message
- `cli`: add a default `main()` method that checks for unknown subcommands
- `terminal`: initial commit (`get_terminal_size`)
- packaging: the package was split into subpackages; it grew too big for a flat namespace. imports are not expected to be broken by this change
- `SshMachine`: added `password` parameter, which relies on `sshpass` to feed the password to `ssh`. This is a security risk, but it's occasionally necessary. Use this with caution!
- Commands now have a `machine` attribute that points to the machine they run on
- Commands gained `setenv`, which creates a command with a bound environment
- Remote path: several fixes to `stat` (`StatRes`)
- `cli`: add lazily-loaded subcommands (e.g., `MainApp.subcommand("foo", "my.package.foo.FooApp")`), which are imported on demand
- Paths: added `relative_to` and `split`, which (respectively) computes the difference between two paths and splits paths into lists of nodes
- `cli`: `Predicate` became a class decorator (it exists solely for pretty-printing anyway)
- `PuttyMachine`: [bugfix](#)

### 4.9.23 1.2

- Path: added `chmod`
- Path: added `link` and `symlink`
- Path: `walk()` now applies filter recursively (#64)
- Commands: added `Append redirect`
- Commands: fix `_subprocess` issue (#59)
- Commands: add `__file__` to module hack (#66)
- Paramiko: add `'username'` and `'password'`
- Paramiko: add `'timeout'` and `'look_for_keys'`
- Python 3: fix #56 and #55

### 4.9.24 1.1

- `Paramiko` integration (#10)
- CLI: now with built-in support for `sub-commands`. See also: #43
- The “import hack” has moved to the package’s `__init__.py`, to make it importable directly (#45)
- Paths now support `chmod` (on POSIX platform) (#49)
- The argument name of a `SwitchAttr` can now be given to it (defaults to `VALUE`) (#46)

### 4.9.25 1.0.1

- Windows: path are no longer converted to lower-case, but `__eq__` and `__hash__` operate on the lower-cased result (#38)
- Properly handle empty strings in the argument list (#41)
- Relaxed type-checking of `LocalPath` and `RemotePath` (#35)
- Added `PuttyMachine` for Windows users that relies on `plink` and `pscp` (instead of `ssh` and `scp`) (#37)

### 4.9.26 1.0.0

- Rename `cli.CountingAttr` to `cli.CountOf`
- Moved to `Travis` continuous integration
- Added `unixutils`
- Added `chown` and `uid/gid`
- Lots of fixes and updates to the doc
- Full list of `issues`

## 4.9.27 0.9.0

Initial release

## 4.10 Quick reference guide

This is a cheatsheet for common tasks in Plumbum.

### 4.10.1 CLI

#### Optional arguments

Utility	Usage
Flag	True or False descriptor
SwitchAttr	A value as a descriptor
CountOf	Counting version of Flag
@switch	A function that runs when passed
@autoswitch	A switch that gets its name from the function decorated
@validator	A positional argument validator on main (or use Py3 attributes)

#### Validators

Anything that produces a `ValueError` or `TypeError`, is applied to argument. Some special ones included:

Validator	Usage
Range	A number in some range
Set	A choice in a set
ExistingFile	A file (converts to Path)
ExistingDirectory	A directory
NonexistentPath	Not a file or directory

#### Common options

Option	Used in	Usage
First argument	Non-auto	The name, or list of names, includes dash(es)
Second argument	All	The validator
docstring	switch, Application	The help message
help=	All	The help message
list=True	switch	Allow multiple times (passed as list)
requires=	All	A list of optional arguments to require
excludes=	All	A list of optional arguments to exclude
group=	All	The name of a group
default=	All	The default if not given
envname=	SwitchAttr	The name of an environment variable to check
mandatory=True	Switches	Require this argument to be passed

## Special member variables

### 4.10.2 Paths

Idiom	Description
<code>local.cwd</code>	Common way to make paths
<code>/ Construct</code>	Composition of parts
<code>// Construct</code>	Grep for files
<code>Sorting</code>	Alphabetical
<code>Iteration</code>	By parts
<code>To str</code>	Canonical full path
<code>Subtraction</code>	Relative path
<code>in</code>	Check for file in folder

Property	Description	Compare to Pathlib
<code>.name</code>	The file name	✓
<code>.basename</code>	DEPRECATED	
<code>.stem</code>	Name without extension	✓
<code>.dirname</code>	Directory name	
<code>.root</code>	The file tree root	✓
<code>.drive</code>	Drive letter (Windows)	✓
<code>.suffix</code>	The suffix	✓
<code>.suffixes</code>	A list of suffixes	✓
<code>.uid</code>	User ID	
<code>.gid</code>	Group ID	
<code>.parts</code>	Tuple of <code>split</code>	✓
<code>.parents</code>	The ancestors of the path	✓
<code>.parent</code>	The ancestor of the path	✓

Method	Description	Compare to Pathlib
<code>.up(count = 1)</code>	Go up count directories	
<code>.walk(filter=*, dir_filter=*)</code>	Traverse directories	
<code>.as_uri(scheme=None)</code>	Universal Resource ID	✓
<code>.join(part, ...)</code>	Put together paths (/)	<code>.joinpath</code>
<code>.list()</code>	Files in directory	(shortcut)
<code>.iterdir()</code>	Fast iterator over dir	✓
<code>.is_dir()</code>	If path is dir	✓
<code>.isdir()</code>	DEPRECATED	
<code>.is_file()</code>	If is file	✓
<code>.isfile()</code>	DEPRECATED	
<code>.is_symlink()</code>	If is symlink	✓
<code>.islink()</code>	DEPRECATED	
<code>.exists()</code>	If file exists	✓
<code>.stat()</code>	Return OS stats	✓
<code>.with_name(name)</code>	Replace filename	✓
<code>.with_suffix(suffix, depth=1)</code>	Replace suffix	✓ (no depth)
<code>.preferred_suffix(suffix)</code>	Replace suffix if no suffix	
<code>.glob(pattern)</code>	Search for pattern	✓
<code>.split()</code>	Split into directories	<code>.parts</code>
<code>.relative_to(source)</code>	Relative path (-)	✓
<code>.resolve(strict=False)</code>	Does nothing	✓
<code>.access(mode = 0)</code>	Check access permissions	

Method (changes files)	Description	Compare to Pathlib
<code>.link(dst)</code>	Make a hard link	
<code>.symlink(dst)</code>	Make a symlink	<code>.symlink_to</code>
<code>.unlink()</code>	Unlink a file (delete)	✓
<code>.delete()</code>	Delete file	<code>.unlink</code>
<code>.move(dst)</code>	Move file	
<code>.rename(newname)</code>	Change the file name	✓
<code>.copy(dst, override=False)</code>	Copy a file	
<code>.mkdir()</code>	Make a directory	✓ (+ more args)
<code>.open(mode="r")</code>	Open a file for reading	✓ (+ more args)
<code>.read(encoding=None)</code>	Read a file to text	<code>.read_text</code>
<code>.write(data, encoding=None)</code>	Write to a file	<code>.write_text</code>
<code>.touch()</code>	Touch a file	✓ (+ more args)
<code>.chown(owner=None, group=None, recursive=None)</code>	Change owner	
<code>.chmod(mode)</code>	Change permissions	✓



### 4.10.3 Colors

You pick colors from fg or bg, also can reset

Main colors: black red green yellow blue magenta cyan white

Default styles: warn title fatal highlight info success

Attrs: bold dim underline italics reverse strikeout hidden



## API REFERENCE

The API reference (generated from the *docstrings* within the library) covers all of the exposed APIs of the library. Note that some “advanced” features and some function parameters are missing from the guide, so you might want to consult with the API reference in these cases.

### 5.1 Package `plumbum.cli`

**exception** `plumbum.cli.application.ShowHelp`

**exception** `plumbum.cli.application.ShowHelpAll`

**exception** `plumbum.cli.application.ShowVersion`

**class** `plumbum.cli.application.Application(executable=None)`

The base class for CLI applications; your “entry point” class should derive from it, define the relevant switch functions and attributes, and the `main()` function. The class defines two overridable “meta switches” for version (`-v`, `--version`) help (`-h`, `--help`), and help-all (`--help-all`).

The signature of the main function matters: any positional arguments (e.g., non-switch arguments) given on the command line are passed to the `main()` function; if you wish to allow unlimited number of positional arguments, use varargs (`*args`). The names of the arguments will be shown in the help message.

The classmethod `run` serves as the entry point of the class. It parses the command-line arguments, invokes switch functions and enters `main`. You should **not override** this method.

Usage:

```
class FileCopier(Application):
    stat = Flag("p", "copy stat info as well")

    def main(self, src, dst):
        if self.stat:
            shutil.copy2(src, dst)
        else:
            shutil.copy(src, dst)

if __name__ == "__main__":
    FileCopier.run()
```

There are several class-level attributes you may set:

- `PROGNAME` - the name of the program; if `None` (the default), it is set to the name of the executable (`argv[0]`); can be in color. If only a color, will be applied to the name.

- **VERSION** - the program's version (defaults to 1.0, can be in color)
- **DESCRIPTION** - a short description of your program (shown in help). If not set, the class' `__doc__` will be used. Can be in color.
- **DESCRIPTION\_MORE** - a detailed description of your program (shown in help). The text will be printed by paragraphs (specified by empty lines between them). The indentation of each paragraph will be the indentation of its first line. List items are identified by their first non-whitespace character being one of '-', '\*', and '/'; so that they are not combined with preceding paragraphs. Bullet '/' is "invisible", meaning that the bullet itself will not be printed to the output.
- **USAGE** - the usage line (shown in help).
- **COLOR\_USAGE\_TITLE** - The color of the usage line's header.
- **COLOR\_USAGE** - The color of the usage line.
- **COLOR\_GROUPS** - A dictionary that sets colors for the groups, like Meta-switches, Switches, and Subcommands.
- **COLOR\_GROUP\_TITLES** - A dictionary that sets colors for the group titles. If the dictionary is empty, it defaults to **COLOR\_GROUPS**.
- **SUBCOMMAND\_HELPMSG** - Controls the printing of extra "see subcommand -h" help message. Default is a message, set to False to remove.
- **ALLOW\_ABBREV** - Controls whether partial switch names are supported, for example '-ver' will match '-verbose'. Default is False for backward consistency with previous plumbum releases. Note that ambiguous abbreviations will not match, for example if -foothis and -foothat are defined, then -foo will not match.

A note on sub-commands: when an application is the root, its `parent` attribute is set to `None`. When it is used as a nested-command, `parent` will point to its direct ancestor. Likewise, when an application is invoked with a sub-command, its `nested_command` attribute will hold the chosen sub-application and its command-line arguments (a tuple); otherwise, it will be set to `None`

**classmethod** `unbind_switches(*switch_names)`

Unbinds the given switch names from this application. For example

```
class MyApp(cli.Application):
    pass
MyApp.unbind_switches("--version")
```

**classmethod** `subcommand(name, subapp=None)`

Registers the given sub-application as a sub-command of this one. This method can be used both as a decorator and as a normal classmethod:

```
@MyApp.subcommand("foo")
class FooApp(cli.Application):
    pass
```

Or

```
MyApp.subcommand("foo", FooApp)
```

New in version 1.1.

New in version 1.3: The sub-command can also be a string, in which case it is treated as a fully-qualified class name and is imported on demand. For example,

```
MyApp.subcommand("foo", "fully.qualified.package.FooApp")
```

**classmethod** `autocomplete(argv)`

This is supplied to make subclassing and testing argument completion methods easier

**classmethod** `run(argv=None, exit=True)`

Runs the application, taking the arguments from `sys.argv` by default if nothing is passed. If `exit` is `True` (the default), the function will exit with the appropriate return code; otherwise it will return a tuple of (`inst`, `retcode`), where `inst` is the application instance created internally by this function and `retcode` is the exit code of the application.

---

**Note:** Setting `exit` to `False` is intended for testing/debugging purposes only – do not override it in other situations.

---

**classmethod** `invoke(*args, **switches)`

Invoke this application programmatically (as a function), in the same way `run()` would. There are two key differences: the return value of `main()` is not converted to an integer (returned as-is), and exceptions are not swallowed either.

**Parameters**

- **args** – any positional arguments for `main()`
- **switches** – command-line switches are passed as keyword arguments, e.g., `foo=5` for `--foo=5`

**main(\*args)**

Implement me (no need to call super)

**cleanup(retcode)**

Called after `main()` and all sub-applications have executed, to perform any necessary cleanup.

**Parameters**

**retcode** – the return code of `main()`

**helpall()**

Prints help messages of all sub-commands and quits

**help()**

Prints this help message and quits

**version()**

Prints the program's version and quits

**exception** `plumbum.cli.switches.SwitchError`

A general switch related-error (base class of all other switch errors)

**exception** `plumbum.cli.switches.PositionalArgumentsError`

Raised when an invalid number of positional arguments has been given

**exception** `plumbum.cli.switches.SwitchCombinationError`

Raised when an invalid combination of switches has been given

**exception** `plumbum.cli.switches.UnknownSwitch`

Raised when an unrecognized switch has been given

**exception** `plumbum.cli.switches.MissingArgument`

Raised when a switch requires an argument, but one was not provided

**exception** `plumbum.cli.switches.MissingMandatorySwitch`

Raised when a mandatory switch has not been given

**exception** `plumbum.cli.switches.WrongArgumentType`

Raised when a switch expected an argument of some type, but an argument of a wrong type has been given

**exception** `plumbum.cli.switches.SubcommandError`

Raised when there's something wrong with sub-commands

`plumbum.cli.switches.switch`(*names*, *argtype=None*, *argname=None*, *list=False*, *mandatory=False*, *requires=()*, *excludes=()*, *help=None*, *overridable=False*, *group='Switches'*, *envname=None*)

A decorator that exposes functions as command-line switches. Usage:

```
class MyApp(Application):
    @switch(["-l", "--log-to-file"], argtype = str)
    def log_to_file(self, filename):
        handler = logging.FileHandler(filename)
        logger.addHandler(handler)

    @switch(["--verbose"], excludes=["--terse"], requires=["--log-to-file"])
    def set_debug(self):
        logger.setLevel(logging.DEBUG)

    @switch(["--terse"], excludes=["--verbose"], requires=["--log-to-file"])
    def set_terse(self):
        logger.setLevel(logging.WARNING)
```

### Parameters

- **names** – The name(s) under which the function is reachable; it can be a string or a list of string, but at least one name is required. There's no need to prefix the name with - or -- (this is added automatically), but it can be used for clarity. Single-letter names are prefixed by -, while longer names are prefixed by --
- **envname** – Name of environment variable to extract value from, as alternative to `argv`
- **argtype** – If this function takes an argument, you need to specify its type. The default is `None`, which means the function takes no argument. The type is more of a “validator” than a real type; it can be any callable object that raises a `TypeError` if the argument is invalid, or returns an appropriate value on success. If the user provides an invalid value, `plumbum.cli.WrongArgumentType()`
- **argname** – The name of the argument; if `None`, the name will be inferred from the function's signature
- **list** – Whether or not this switch can be repeated (e.g. `gcc -I/lib -I/usr/lib`). If `False`, only a single occurrence of the switch is allowed; if `True`, it may be repeated indefinitely. The occurrences are collected into a list, so the function is only called once with the collections. For instance, for `gcc -I/lib -I/usr/lib`, the function will be called with `["/lib", "/usr/lib"]`.
- **mandatory** – Whether or not this switch is mandatory; if a mandatory switch is not given, `MissingMandatorySwitch` is raised. The default is `False`.
- **requires** – A list of switches that this switch depends on (“requires”). This means that it's invalid to invoke this switch without also invoking the required ones. In the example above, it's illegal to pass `--verbose` or `--terse` without also passing `--log-to-file`.

By default, this list is empty, which means the switch has no prerequisites. If an invalid combination is given, `SwitchCombinationError` is raised.

Note that this list is made of the switch *names*; if a switch has more than a single name, any of its names will do.

---

**Note:** There is no guarantee on the (topological) order in which the actual switch functions will be invoked, as the dependency graph might contain cycles.

---

- **excludes** – A list of switches that this switch forbids (“excludes”). This means that it’s invalid to invoke this switch if any of the excluded ones are given. In the example above, it’s illegal to pass `--verbose` along with `--terse`, as it will result in a contradiction. By default, this list is empty, which means the switch has no prerequisites. If an invalid combination is given, `SwitchCombinationError` is raised.

Note that this list is made of the switch *names*; if a switch has more than a single name, any of its names will do.

- **help** – The help message (description) for this switch; this description is used when `--help` is given. If `None`, the function’s docstring will be used.
- **overridable** – Whether or not the names of this switch are overridable by other switches. If `False` (the default), having another switch function with the same name(s) will cause an exception. If `True`, this is silently ignored.
- **group** – The switch’s *group*; this is a string that is used to group related switches together when `--help` is given. The default group is `Switches`.

### Returns

The decorated function (with a `_switch_info` attribute)

`plumbum.cli.switches.autoswitch(*args, **kwargs)`

A decorator that exposes a function as a switch, “inferring” the name of the switch from the function’s name (converting to lower-case, and replacing underscores with hyphens). The arguments are the same as for `switch`.

`class plumbum.cli.switches.SwitchAttr(names, argtype=<class 'str'>, default=None, list=False, argname='VALUE', **kwargs)`

A switch that stores its result in an attribute (descriptor). Usage:

```
class MyApp(Application):
    logfile = SwitchAttr(["-f", "--log-file"], str)

    def main(self):
        if self.logfile:
            open(self.logfile, "w")
```

### Parameters

- **names** – The switch names
- **argtype** – The switch argument’s (and attribute’s) type
- **default** – The attribute’s default value (`None`)
- **argname** – The switch argument’s name (default is `"VALUE"`)
- **kwargs** – Any of the keyword arguments accepted by `switch`

**class** plumbum.cli.switches.**Flag**(names, default=False, \*\*kwargs)

A specialized SwitchAttr for boolean flags. If the flag is not given, the value of this attribute is default; if it is given, the value changes to not default. Usage:

```
class MyApp(Application):
    verbose = Flag(["-v", "--verbose"], help = "If given, I'll be very talkative")
```

#### Parameters

- **names** – The switch names
- **default** – The attribute's initial value (False by default)
- **kwargs** – Any of the keyword arguments accepted by switch, except for list and argtype.

**class** plumbum.cli.switches.**CountOf**(names, default=0, \*\*kwargs)

A specialized SwitchAttr that counts the number of occurrences of the switch in the command line. Usage:

```
class MyApp(Application):
    verbosity = CountOf(["-v", "--verbose"], help = "The more, the merrier")
```

If `-v -v -vv` is given in the command-line, it will result in `verbosity = 4`.

#### Parameters

- **names** – The switch names
- **default** – The default value (0)
- **kwargs** – Any of the keyword arguments accepted by switch, except for list and argtype.

**class** plumbum.cli.switches.**positional**(\*args, \*\*kwargs)

Runs a validator on the main function for a class. This should be used like this:

```
class MyApp(cli.Application):
    @cli.positional(cli.Range(1,10), cli.ExistingFile)
    def main(self, x, *f):
        # x is a range, f's are all ExistingFile's
```

Or, Python 3 only:

```
class MyApp(cli.Application):
    def main(self, x : cli.Range(1,10), *f : cli.ExistingFile):
        # x is a range, f's are all ExistingFile's
```

If you do not want to validate on the annotations, use this decorator ( even if empty) to override annotation validation.

Validators should be callable, and should have a `.choices()` function with possible choices. (For future argument completion, for example)

Default arguments do not go through the validator.

#TODO: Check with MyPy

**class** plumbum.cli.switches.**Validator**

**choices**(partial="")

Should return set of valid choices, can be given optional partial info



`class plumbum.cli.switches.Range(start, end)`

A switch-type validator that checks for the inclusion of a value in a certain range. Usage:

```
class MyApp(Application):
    age = SwitchAttr(["--age"], Range(18, 120))
```

#### Parameters

- **start** – The minimal value
- **end** – The maximal value

`choices(partial=)`

Should return set of valid choices, can be given optional partial info

`class plumbum.cli.switches.Set(*values: str | Callable[[str], str], case_sensitive: bool = False, csv: bool | str = False, all_markers: collections.abc.Set[str] = frozenset({}))`

A switch-type validator that checks that the value is contained in a defined set of values. Usage:

```
class MyApp(Application):
    mode = SwitchAttr(["--mode"], Set("TCP", "UDP", case_sensitive = False))
    num = SwitchAttr(["--num"], Set("MIN", "MAX", int, csv = True))
```

#### Parameters

- **values** – The set of values (strings), or other callable validators, or types, or any other object that can be compared to a string.
- **case\_sensitive** – A keyword argument that indicates whether to use case-sensitive comparison or not. The default is `False`
- **csv** – splits the input as a comma-separated-value before validating and returning a list. Accepts `True`, `False`, or a string for the separator
- **all\_markers** – When a user inputs any value from this set, all values are iterated over. Something like {"\*", "all"} would be a potential setting for this option.

`choices(partial=)`

Should return set of valid choices, can be given optional partial info

`class plumbum.cli.switches.Predicate(func)`

A wrapper for a single-argument function with pretty printing

## 5.1.1 Terminal-related utilities

`plumbum.cli.terminal.readline(message: str = "") → str`

Gets a line of input from the user (stdin)

`plumbum.cli.terminal.ask(question: str, default: bool | None = None) → bool`

Presents the user with a yes/no question.

#### Parameters

- **question** – The question to ask
- **default** – If `None`, the user must answer. If `True` or `False`, lack of response is interpreted as the default option

**Returns**

the user's choice

`plumbum.cli.terminal.choose(question, options, default=None)`

Prompts the user with a question and a set of options, from which the user needs to choose.

**Parameters**

- **question** – The question to ask
- **options** – A set of options. It can be a list (of strings or two-tuples, mapping text to returned-object) or a dict (mapping text to returned-object).``
- **default** – If None, the user must answer. Otherwise, lack of response is interpreted as this answer

**Returns**

The user's choice

Example:

```
ans = choose("What is your favorite color?", ["blue", "yellow", "green"], default =
↳ "yellow")
# `ans` will be one of "blue", "yellow" or "green"

ans = choose("What is your favorite color?",
    {"blue" : 0x0000ff, "yellow" : 0xffff00 , "green" : 0x00ff00}, default =
↳ 0x00ff00)
# this will display "blue", "yellow" and "green" but return a numerical value
```

`plumbum.cli.terminal.prompt(question, type=<class 'str'>, default=NotImplemented, validator=<function <lambda>>>)`

Presents the user with a validated question, keeps asking if validation does not pass.

**Parameters**

- **question** – The question to ask
- **type** – The type of the answer, defaults to str
- **default** – The default choice
- **validator** – An extra validator called after type conversion, can raise ValueError or return False to trigger a retry.

**Returns**

the user's choice

`plumbum.cli.terminal.get_terminal_size(default: Tuple[int, int] = (80, 25)) → Tuple[int, int]`

Get width and height of console; works on linux, os x, windows and cygwin

Adapted from <https://gist.github.com/jtriley/1108174> Originally from: <http://stackoverflow.com/questions/566746/how-to-get-console-window-width-in-python>

`class plumbum.cli.terminal.Progress(iterator=None, length=None, timer=True, body=False, has_output=False, clear=True)`

**start()**

This should initialize the progress bar and the iterator

**done()**

Is called when the iterator is done.

**display()**

Called to update the progress bar

### 5.1.2 Terminal size utility

`plumbum.cli.termsize.get_terminal_size(default: Tuple[int, int] = (80, 25)) → Tuple[int, int]`

Get width and height of console; works on linux, os x, windows and cygwin

Adapted from <https://gist.github.com/jtriley/1108174> Originally from: <http://stackoverflow.com/questions/566746/how-to-get-console-window-width-in-python>

### 5.1.3 Progress bar

**class** `plumbum.cli.progress.ProgressBase(iterator=None, length=None, timer=True, body=False, has_output=False, clear=True)`

Base class for progress bars. Customize for types of progress bars.

#### Parameters

- **iterator** – The iterator to wrap with a progress bar
- **length** – The length of the iterator (will use `__len__` if None)
- **timer** – Try to time the completion status of the iterator
- **body** – True if the slow portion occurs outside the iterator (in a loop, for example)
- **has\_output** – True if the iteration body produces output to the screen (forces rewrite off)
- **clear** – Clear the progress bar afterwards, if applicable.

**abstract start()**

This should initialize the progress bar and the iterator

**property value**

This is the current value, as a property so setting it can be customized

**abstract display()**

Called to update the progress bar

**increment()**

Sets next value and displays the bar

**time\_remaining()**

Get the time remaining for the progress bar, guesses

**str\_time\_remaining()**

Returns a string version of time remaining

**abstract done()**

Is called when the iterator is done.

**classmethod range(\*value, \*\*kargs)**

Fast shortcut to create a range based progress bar, assumes work done in body

**classmethod** **wrap**(*iterator*, *length=None*, *\*\*kargs*)

Shortcut to wrap an iterator that does not do all the work internally

**class** `plumbum.cli.progress.Progress`(*iterator=None*, *length=None*, *timer=True*, *body=False*,  
*has\_output=False*, *clear=True*)

**start**()

This should initialize the progress bar and the iterator

**done**()

Is called when the iterator is done.

**display**()

Called to update the progress bar

**class** `plumbum.cli.progress.ProgressIPy`(\*args, \*\*kargs)

**start**()

This should initialize the progress bar and the iterator

**property value**

This is the current value, -1 allowed (automatically fixed for display)

**display**()

Called to update the progress bar

**done**()

Is called when the iterator is done.

**class** `plumbum.cli.progress.ProgressAuto`(\*args, \*\*kargs)

Automatically selects the best progress bar (IPython HTML or text). Does not work with qtconsole (as that is correctly identified as identical to notebook, since the kernel is the same); it will still iterate, but no graphical indication will be displayed.

#### Parameters

- **iterator** – The iterator to wrap with a progress bar
- **length** – The length of the iterator (will use `__len__` if None)
- **timer** – Try to time the completion status of the iterator
- **body** – True if the slow portion occurs outside the iterator (in a loop, for example)

## 5.2 Package `plumbum.commands`

`plumbum.commands.base.iter_lines`(*proc*, *retcode=0*, *timeout=None*, *linesize=-1*, *line\_timeout=None*,  
*buffer\_size=None*, *mode=None*, *\_iter\_lines=<function*  
*\_iter\_lines\_posix>*)

Runs the given process (equivalent to `run_proc()`) and yields a tuples of (out, err) line pairs. If the exit code of the process does not match the expected one, `ProcessExecutionError` is raised.

#### Parameters

- **retcode** – The expected return code of this process (defaults to 0). In order to disable exit-code validation, pass `None`. It may also be a tuple (or any iterable) of expected exit codes.

- **timeout** – The maximal amount of time (in seconds) to allow the process to run. `None` means no timeout is imposed; otherwise, if the process hasn't terminated after that many seconds, the process will be forcefully terminated an exception will be raised
- **linesize** – Maximum number of characters to read from stdout/stderr at each iteration. `-1` (default) reads until a b'n' is encountered.
- **line\_timeout** – The maximal amount of time (in seconds) to allow between consecutive lines in either stream. Raise an `ProcessLineTimedOut` if the timeout has been reached. `None` means no timeout is imposed.
- **buffer\_size** – Maximum number of lines to keep in the stdout/stderr buffers, in case of a `ProcessExecutionError`. Default is `None`, which defaults to `DEFAULT_BUFFER_SIZE` (which is infinite by default). `0` will disable buffering completely.
- **mode** – Controls what the generator yields. Defaults to `DEFAULT_ITER_LINES_MODE` (which is `BY_POSITION` by default) - `BY_POSITION` (default): yields `(out, err)` line tuples, where either item may be `None` - `BY_TYPE`: yields `(fd, line)` tuples, where `fd` is 1 (stdout) or 2 (stderr)

**Returns**

An iterator of (out, err) line tuples.

`plumbum.commands.base.run_proc(proc, retcode, timeout=None)`

Waits for the given process to terminate, with the expected exit code

**Parameters**

- **proc** – a running Popen-like object, with all the expected methods.
- **retcode** – the expected return (exit) code of the process. It defaults to 0 (the convention for success). If `None`, the return code is ignored. It may also be a tuple (or any object that supports `__contains__`) of expected return codes.
- **timeout** – the number of seconds (a float) to allow the process to run, before forcefully terminating it. If `None`, not timeout is imposed; otherwise the process is expected to terminate within that timeout value, or it will be killed and `ProcessTimedOut` will be raised

**Returns**

A tuple of (return code, stdout, stderr)

`plumbum.commands.base.shquote(text)`

Quotes the given text with shell escaping (assumes as syntax similar to sh)

**exception** `plumbum.commands.base.RedirectionError`

Raised when an attempt is made to redirect an process' standard handle, which was already redirected to/from a file

**\_\_weakref\_\_**

list of weak references to the object (if defined)

**class** `plumbum.commands.base.BaseCommand`

Base of all command objects

**\_\_str\_\_()**

Return `str(self)`.

**\_\_or\_\_(other)**

Creates a pipe with the other command

**\_\_gt\_\_**(*file*)

Redirects the process' stdout to the given file

**\_\_rshift\_\_**(*file*)

Redirects the process' stdout to the given file (appending)

**\_\_ge\_\_**(*file*)

Redirects the process' stderr to the given file

**\_\_lt\_\_**(*file*)

Redirects the given file into the process' stdin

**\_\_lshift\_\_**(*data*)

Redirects the given data into the process' stdin

**\_\_getitem\_\_**(*args*)

Creates a bound-command with the given arguments. Shortcut for `bound_command`.

**bound\_command**(*\*args*)

Creates a bound-command with the given arguments

**\_\_call\_\_**(*\*args, \*\*kwargs*)

A shortcut for `run(args)`, returning only the process' stdout

**with\_env**(*\*\*env*)

Returns a `BoundEnvCommand` with the given environment variables

**with\_cwd**(*path*)

Returns a `BoundEnvCommand` with the specified working directory. This overrides a `cwd` specified in a wrapping `machine.cwd()` context manager.

**setenv**(*\*\*env*)

Returns a `BoundEnvCommand` with the given environment variables

**formulate**(*level=0, args=()*)

Formulates the command into a command-line, i.e., a list of shell-quoted strings that can be executed by Popen or shells.

#### Parameters

- **level** – The nesting level of the formulation; it dictates how much shell-quoting (if any) should be performed
- **args** – The arguments passed to this command (a tuple)

#### Returns

A list of strings

**popen**(*args=(), \*\*kwargs*)

Spawns the given command, returning a Popen-like object.

---

**Note:** When processes run in the **background** (either via `popen` or `& BG`), their stdout/stderr pipes might fill up, causing them to hang. If you know a process produces output, be sure to consume it every once in a while, using a monitoring thread/reactor in the background. For more info, see [#48](#)

---

#### Parameters

- **args** – Any arguments to be passed to the process (a tuple)

- **kwargs** – Any keyword-arguments to be passed to the Popen constructor

**Returns**

A Popen-like object

**nohup**(*cwd='.', stdout='nohup.out', stderr=None, append=True*)

Runs a command detached.

**bgrun**(*args=(), \*\*kwargs*)

Runs the given command as a context manager, allowing you to create a [pipeline](#) (not in the UNIX sense) of programs, parallelizing their work. In other words, instead of running programs one after the other, you can start all of them at the same time and wait for them to finish. For a more thorough review, see [Lightweight Asynchronism](#).

Example:

```
from plumbum.cmd import mkfs

with mkfs["-t", "ext3", "/dev/sda1"] as p1:
    with mkfs["-t", "ext3", "/dev/sdb1"] as p2:
        pass
```

---

**Note:** When processes run in the **background** (either via `popen` or `& BG`), their `stdout/stderr` pipes might fill up, causing them to hang. If you know a process produces output, be sure to consume it every once in a while, using a monitoring thread/reactor in the background. For more info, see [#48](#)

---

For the arguments, see [run](#).

**Returns**

A Popen object, augmented with a `.run()` method, which returns a tuple of (return code, `stdout`, `stderr`)

**run**(*args=(), \*\*kwargs*)

Runs the given command (equivalent to `popen()` followed by `run_proc`). If the exit code of the process does not match the expected one, `ProcessExecutionError` is raised.

**Parameters**

- **args** – Any arguments to be passed to the process (a tuple)
- **retcode** – The expected return code of this process (defaults to 0). In order to disable exit-code validation, pass `None`. It may also be a tuple (or any iterable) of expected exit codes.

---

**Note:** this argument must be passed as a keyword argument.

---

- **timeout** – The maximal amount of time (in seconds) to allow the process to run. `None` means no timeout is imposed; otherwise, if the process hasn't terminated after that many seconds, the process will be forcefully terminated an exception will be raised

---

**Note:** this argument must be passed as a keyword argument.

---

- **kwargs** – Any keyword-arguments to be passed to the Popen constructor

**Returns**

A tuple of (return code, stdout, stderr)

**run\_bg**(\*\*kwargs)

Run this command in the background. Uses all arguments from the BG construct :py:class: *plumbum.commands.modifiers.BG*

**run\_fg**(\*\*kwargs)

Run this command in the foreground. Uses all arguments from the FG construct :py:class: *plumbum.commands.modifiers.FG*

**run\_tee**(\*\*kwargs)

Run this command using the TEE construct. Inherits all arguments from TEE :py:class: *plumbum.commands.modifiers.TEE*

**run\_tf**(\*\*kwargs)

Run this command using the TF construct. Inherits all arguments from TF :py:class: *plumbum.commands.modifiers.TF*

**run\_retcode**(\*\*kwargs)

Run this command using the RETCODE construct. Inherits all arguments from RETCODE :py:class: *plumbum.commands.modifiers.RETCODE*

**run\_nohup**(\*\*kwargs)

Run this command using the NOHUP construct. Inherits all arguments from NOHUP :py:class: *plumbum.commands.modifiers.NOHUP*

**class** *plumbum.commands.base.Pipeline*(srccmd, dstcmd)

**\_\_init\_\_**(srccmd, dstcmd)

**\_\_repr\_\_**()

Return repr(self).

**formulate**(level=0, args=())

Formulates the command into a command-line, i.e., a list of shell-quoted strings that can be executed by Popen or shells.

**Parameters**

- **level** – The nesting level of the formulation; it dictates how much shell-quoting (if any) should be performed
- **args** – The arguments passed to this command (a tuple)

**Returns**

A list of strings

**popen**(args=(), \*\*kwargs)

Spawns the given command, returning a Popen-like object.

---

**Note:** When processes run in the **background** (either via **popen** or **& BG**), their stdout/stderr pipes might fill up, causing them to hang. If you know a process produces output, be sure to consume it every once in a while, using a monitoring thread/reactor in the background. For more info, see [#48](#)

---

**Parameters**

- **args** – Any arguments to be passed to the process (a tuple)



- **kwargs** – Any keyword-arguments to be passed to the Popen constructor

**Returns**

A Popen-like object

```
class plumbum.commands.base.BaseRedirection(cmd, file)
```

```
__init__(cmd, file)
```

```
__repr__()
```

Return repr(self).

```
formulate(level=0, args=())
```

Formulates the command into a command-line, i.e., a list of shell-quoted strings that can be executed by Popen or shells.

**Parameters**

- **level** – The nesting level of the formulation; it dictates how much shell-quoting (if any) should be performed
- **args** – The arguments passed to this command (a tuple)

**Returns**

A list of strings

```
popen(args=(), **kwargs)
```

Spawns the given command, returning a Popen-like object.

---

**Note:** When processes run in the **background** (either via popen or & BG), their stdout/stderr pipes might fill up, causing them to hang. If you know a process produces output, be sure to consume it every once in a while, using a monitoring thread/reactor in the background. For more info, see [#48](#)

---

**Parameters**

- **args** – Any arguments to be passed to the process (a tuple)
- **kwargs** – Any keyword-arguments to be passed to the Popen constructor

**Returns**

A Popen-like object

```
class plumbum.commands.base.Command(cmd, args)
```

```
__init__(cmd, args)
```

```
__repr__()
```

Return repr(self).

```
formulate(level=0, args=())
```

Formulates the command into a command-line, i.e., a list of shell-quoted strings that can be executed by Popen or shells.

**Parameters**

- **level** – The nesting level of the formulation; it dictates how much shell-quoting (if any) should be performed
- **args** – The arguments passed to this command (a tuple)

**Returns**

A list of strings

**popen**(*args*=(), *\*\*kwargs*)

Spawns the given command, returning a Popen-like object.

---

**Note:** When processes run in the **background** (either via **popen** or **& BG**), their stdout/stderr pipes might fill up, causing them to hang. If you know a process produces output, be sure to consume it every once in a while, using a monitoring thread/reactor in the background. For more info, see [#48](#)

---

**Parameters**

- **args** – Any arguments to be passed to the process (a tuple)
- **kwargs** – Any keyword-arguments to be passed to the Popen constructor

**Returns**

A Popen-like object

**class** `plumbum.commands.base.BoundEnvCommand`(*cmd*, *env*=None, *cwd*=None)

**\_\_init\_\_**(*cmd*, *env*=None, *cwd*=None)

**\_\_repr\_\_**()

Return repr(self).

**formulate**(*level*=0, *args*=())

Formulates the command into a command-line, i.e., a list of shell-quoted strings that can be executed by Popen or shells.

**Parameters**

- **level** – The nesting level of the formulation; it dictates how much shell-quoting (if any) should be performed
- **args** – The arguments passed to this command (a tuple)

**Returns**

A list of strings

**popen**(*args*=(), *cwd*=None, *env*=None, *\*\*kwargs*)

Spawns the given command, returning a Popen-like object.

---

**Note:** When processes run in the **background** (either via **popen** or **& BG**), their stdout/stderr pipes might fill up, causing them to hang. If you know a process produces output, be sure to consume it every once in a while, using a monitoring thread/reactor in the background. For more info, see [#48](#)

---

**Parameters**

- **args** – Any arguments to be passed to the process (a tuple)
- **kwargs** – Any keyword-arguments to be passed to the Popen constructor

**Returns**

A Popen-like object

```
class plumbum.commands.base.ConcreteCommand(executable, encoding)
```

```
    __init__(executable, encoding)
```

```
    __str__()
```

Return str(self).

```
    __repr__()
```

Return repr(self).

```
    formulate(level=0, args=())
```

Formulates the command into a command-line, i.e., a list of shell-quoted strings that can be executed by Popen or shells.

#### Parameters

- **level** – The nesting level of the formulation; it dictates how much shell-quoting (if any) should be performed
- **args** – The arguments passed to this command (a tuple)

#### Returns

A list of strings

```
    popen(args=(), **kwargs)
```

Spawns the given command, returning a Popen-like object.

---

**Note:** When processes run in the **background** (either via `popen` or `& BG`), their stdout/stderr pipes might fill up, causing them to hang. If you know a process produces output, be sure to consume it every once in a while, using a monitoring thread/reactor in the background. For more info, see [#48](#)

---

#### Parameters

- **args** – Any arguments to be passed to the process (a tuple)
- **kwargs** – Any keyword-arguments to be passed to the Popen constructor

#### Returns

A Popen-like object

```
class plumbum.commands.base.StdinRedirection(cmd, file)
```

```
class plumbum.commands.base.StdoutRedirection(cmd, file)
```

```
class plumbum.commands.base.StderrRedirection(cmd, file)
```

```
class plumbum.commands.base.AppendingStdoutRedirection(cmd, file)
```

```
class plumbum.commands.base.StdinDataRedirection(cmd, data)
```

```
    __init__(cmd, data)
```

```
    formulate(level=0, args=())
```

Formulates the command into a command-line, i.e., a list of shell-quoted strings that can be executed by Popen or shells.

#### Parameters

- **level** – The nesting level of the formulation; it dictates how much shell-quoting (if any) should be performed

- **args** – The arguments passed to this command (a tuple)

**Returns**

A list of strings

**popen**(*args=()*, *\*\*kwargs*)

Spawns the given command, returning a Popen-like object.

---

**Note:** When processes run in the **background** (either via **popen** or **& BG**), their stdout/stderr pipes might fill up, causing them to hang. If you know a process produces output, be sure to consume it every once in a while, using a monitoring thread/reactor in the background. For more info, see [#48](#)

---

**Parameters**

- **args** – Any arguments to be passed to the process (a tuple)
- **kwargs** – Any keyword-arguments to be passed to the Popen constructor

**Returns**

A Popen-like object

**class** `plumbum.commands.modifiers.Future`(*proc*, *expected\_retcode*, *timeout=None*)

Represents a “future result” of a running process. It basically wraps a Popen object and the expected exit code, and provides `poll()`, `wait()`, `returncode`, `stdout`, and `stderr`.

**\_\_init\_\_**(*proc*, *expected\_retcode*, *timeout=None*)

**\_\_repr\_\_**()

Return `repr(self)`.

**poll**()

Polls the underlying process for termination; returns `False` if still running, or `True` if terminated

**ready**()

Polls the underlying process for termination; returns `False` if still running, or `True` if terminated

**wait**()

Waits for the process to terminate; will raise a `plumbum.commands.ProcessExecutionError` in case of failure

**property stdout**

The process’ stdout; accessing this property will wait for the process to finish

**property stderr**

The process’ stderr; accessing this property will wait for the process to finish

**property returncode**

The process’ returncode; accessing this property will wait for the process to finish

**\_\_weakref\_\_**

list of weak references to the object (if defined)

**class** `plumbum.commands.modifiers.PipeToLoggerMixin`

This mixin allows piping plumbum commands’ output into a logger. The logger must implement a `log(level, msg)` method, as in `logging.Logger`

Example:

```
class MyLogger(logging.Logger, PipeToLoggerMixin):
    pass

logger = MyLogger("example.app")
```

Here we send the output of an `install.sh` script into our log:

```
local['./install.sh'] & logger
```

We can choose the log-level for each stream:

```
local['./install.sh'] & logger.pipe(out_level=logging.DEBUG, err_level=logging.
↪DEBUG)
```

Or use a convenience method for it:

```
local['./install.sh'] & logger.pipe_debug()
```

A prefix can be added to each line:

```
local['./install.sh'] & logger.pipe(prefix="install.sh: ")
```

If the command fails, an exception is raised as usual. This can be modified:

```
local['install.sh'] & logger.pipe_debug(retcode=None)
```

An exception is also raised if too much time (`DEFAULT_LINE_TIMEOUT`) passed between lines in the stream, This can also be modified:

```
local['install.sh'] & logger.pipe(line_timeout=10)
```

If we happen to use `logbook`:

```
class MyLogger(logbook.Logger, PipeToLoggerMixin):
    from logbook import DEBUG, INFO # hook up with logbook's levels
```

**pipe**(*out\_level=None, err\_level=None, prefix=None, line\_timeout=None, \*\*kw*)

Pipe a command's stdout and stderr lines into this logger.

#### Parameters

- **out\_level** – the log level for lines coming from stdout
- **err\_level** – the log level for lines coming from stderr

Optionally use *prefix* for each line.

**pipe\_info**(*prefix=None, \*\*kw*)

Pipe a command's stdout and stderr lines into this logger (both at level INFO)

**pipe\_debug**(*prefix=None, \*\*kw*)

Pipe a command's stdout and stderr lines into this logger (both at level DEBUG)

**\_\_rand\_\_**(*cmd*)

Pipe a command's stdout and stderr lines into this logger. Log levels for each stream are determined by `DEFAULT_STDOUT` and `DEFAULT_STDERR`.

**\_\_weakref\_\_**

list of weak references to the object (if defined)

**exception** `plumbum.commands.processes.ProcessExecutionError`(*argv, retcode, stdout, stderr, message=None, \*, host=None*)

Represents the failure of a process. When the exit code of a terminated process does not match the expected result, this exception is raised by `run_proc`. It contains the process' return code, stdout, and stderr, as well as the command line used to create the process (*argv*)

**\_\_init\_\_**(*argv, retcode, stdout, stderr, message=None, \*, host=None*)

**\_\_str\_\_**()

Return `str(self)`.

**\_\_weakref\_\_**

list of weak references to the object (if defined)

**exception** `plumbum.commands.processes.ProcessTimedOut`(*msg, argv*)

Raises by `run_proc` when a timeout has been specified and it has elapsed before the process terminated

**\_\_init\_\_**(*msg, argv*)

**\_\_weakref\_\_**

list of weak references to the object (if defined)

**exception** `plumbum.commands.processes.ProcessLineTimedOut`(*msg, argv, machine*)

Raises by `iter_lines` when a `line_timeout` has been specified and it has elapsed before the process yielded another line

**\_\_init\_\_**(*msg, argv, machine*)

**\_\_weakref\_\_**

list of weak references to the object (if defined)

**exception** `plumbum.commands.processes.CommandNotFound`(*program, path*)

Raised by `local.which` and `RemoteMachine.which` when a command was not found in the system's PATH

**\_\_init\_\_**(*program, path*)

**\_\_weakref\_\_**

list of weak references to the object (if defined)

`plumbum.commands.processes.run_proc`(*proc, retcode, timeout=None*)

Waits for the given process to terminate, with the expected exit code

#### Parameters

- **proc** – a running Popen-like object, with all the expected methods.
- **retcode** – the expected return (exit) code of the process. It defaults to 0 (the convention for success). If `None`, the return code is ignored. It may also be a tuple (or any object that supports `__contains__`) of expected return codes.
- **timeout** – the number of seconds (a float) to allow the process to run, before forcefully terminating it. If `None`, not timeout is imposed; otherwise the process is expected to terminate within that timeout value, or it will be killed and `ProcessTimedOut` will be raised

#### Returns

A tuple of (return code, stdout, stderr)

```
plumbum.commands.processes.iter_lines(proc, retcode=0, timeout=None, linesize=-1, line_timeout=None,
                                     buffer_size=None, mode=None, _iter_lines=<function
                                     _iter_lines_posix>)
```

Runs the given process (equivalent to `run_proc()`) and yields a tuples of (out, err) line pairs. If the exit code of the process does not match the expected one, `ProcessExecutionError` is raised.

#### Parameters

- **retcode** – The expected return code of this process (defaults to 0). In order to disable exit-code validation, pass `None`. It may also be a tuple (or any iterable) of expected exit codes.
- **timeout** – The maximal amount of time (in seconds) to allow the process to run. `None` means no timeout is imposed; otherwise, if the process hasn't terminated after that many seconds, the process will be forcefully terminated an exception will be raised
- **linesize** – Maximum number of characters to read from stdout/stderr at each iteration. -1 (default) reads until a b'n' is encountered.
- **line\_timeout** – The maximal amount of time (in seconds) to allow between consecutive lines in either stream. Raise an `ProcessLineTimedOut` if the timeout has been reached. `None` means no timeout is imposed.
- **buffer\_size** – Maximum number of lines to keep in the stdout/stderr buffers, in case of a `ProcessExecutionError`. Default is `None`, which defaults to `DEFAULT_BUFFER_SIZE` (which is infinite by default). 0 will disable buffering completely.
- **mode** – Controls what the generator yields. Defaults to `DEFAULT_ITER_LINES_MODE` (which is `BY_POSITION` by default) - `BY_POSITION` (default): yields (out, err) line tuples, where either item may be `None` - `BY_TYPE`: yields (fd, line) tuples, where fd is 1 (stdout) or 2 (stderr)

#### Returns

An iterator of (out, err) line tuples.

## 5.3 Package plumbum.machines

```
class plumbum.machines.env.EnvPathList(path_factory, pathsep)
```

```
    __init__(path_factory, pathsep)
```

```
    append(path)
```

Append object to the end of the list.

```
    extend(paths)
```

Extend list by appending elements from the iterable.

```
    insert(index, path)
```

Insert object before index.

```
    index(path)
```

Return first index of value.

Raises `ValueError` if the value is not present.

```
    __contains__(path)
```

Return key in self.

**remove**(*path*)

Remove first occurrence of value.

Raises ValueError if the value is not present.

**class** plumbum.machines.env.**BaseEnv**(*path\_factory*, *pathsep*, \*, *\_curr*)

The base class of LocalEnv and RemoteEnv

**\_\_init\_\_**(*path\_factory*, *pathsep*, \*, *\_curr*)

**\_\_call\_\_**(*\*args*, *\*\*kwargs*)

A context manager that can be used for temporal modifications of the environment. Any time you enter the context, a copy of the old environment is stored, and then restored, when the context exits.

#### Parameters

- **args** – Any positional arguments for `update()`
- **kwargs** – Any keyword arguments for `update()`

**\_\_iter\_\_**()

Returns an iterator over the items (**key**, **value**) of current environment (like `dict.items`)

**\_\_hash\_\_**()

Return `hash(self)`.

**\_\_len\_\_**()

Returns the number of elements of the current environment

**\_\_contains\_\_**(*name*)

Tests whether an environment variable exists in the current environment

**\_\_getitem\_\_**(*name*)

Returns the value of the given environment variable from current environment, raising a `KeyError` if it does not exist

**keys**()

Returns the keys of the current environment (like `dict.keys`)

**items**()

Returns the items of the current environment (like `dict.items`)

**values**()

Returns the values of the current environment (like `dict.values`)

**get**(*name*, *\*default*)

Returns the keys of the current environment (like `dict.keys`)

**\_\_delitem\_\_**(*name*)

Deletes an environment variable from the current environment

**\_\_setitem\_\_**(*name*, *value*)

Sets/replaces an environment variable's value in the current environment

**pop**(*name*, *\*default*)

Pops an element from the current environment (like `dict.pop`)

**clear**()

Clears the current environment (like `dict.clear`)



**update**(\*args, \*\*kwargs)

Updates the current environment (like dict.update)

**getdict**()

Returns the environment as a real dictionary

**property path**

The system's PATH (as an easy-to-manipulate list)

**property home**

Get or set the home path

**property user**

Return the user name, or None if it is not set

**class** plumbum.machines.local.PlumbumLocalPopen(\*args, \*\*kwargs)

**iter\_lines**(retcode=0, timeout=None, linesize=-1, line\_timeout=None, buffer\_size=None, mode=None, \_iter\_lines=<function \_iter\_lines\_posix>)

Runs the given process (equivalent to run\_proc()) and yields a tuples of (out, err) line pairs. If the exit code of the process does not match the expected one, `ProcessExecutionError` is raised.

#### Parameters

- **retcode** – The expected return code of this process (defaults to 0). In order to disable exit-code validation, pass `None`. It may also be a tuple (or any iterable) of expected exit codes.
- **timeout** – The maximal amount of time (in seconds) to allow the process to run. `None` means no timeout is imposed; otherwise, if the process hasn't terminated after that many seconds, the process will be forcefully terminated an exception will be raised
- **linesize** – Maximum number of characters to read from stdout/stderr at each iteration. -1 (default) reads until a b'n' is encountered.
- **line\_timeout** – The maximal amount of time (in seconds) to allow between consecutive lines in either stream. Raise an `ProcessLineTimedOut` if the timeout has been reached. `None` means no timeout is imposed.
- **buffer\_size** – Maximum number of lines to keep in the stdout/stderr buffers, in case of a `ProcessExecutionError`. Default is `None`, which defaults to `DEFAULT_BUFFER_SIZE` (which is infinite by default). 0 will disable buffering completely.
- **mode** – Controls what the generator yields. Defaults to `DEFAULT_ITER_LINES_MODE` (which is `BY_POSITION` by default) - `BY_POSITION` (default): yields (out, err) line tuples, where either item may be `None` - `BY_TYPE`: yields (fd, line) tuples, where fd is 1 (stdout) or 2 (stderr)

#### Returns

An iterator of (out, err) line tuples.

**\_\_init\_\_**(\*args, \*\*kwargs)

**class** plumbum.machines.local.LocalEnv

The local machine's environment; exposes a dict-like interface

**\_\_init\_\_**()

**expand**(*expr*)

Expands any environment variables and home shortcuts found in *expr* (like `os.path.expanduser` combined with `os.path.expandvars`)

**Parameters**

**expr** – An expression containing environment variables (as `$FOO`) or home shortcuts (as `~/` `.bashrc`)

**Returns**

The expanded string

**expanduser**(*expr*)

Expand home shortcuts (e.g., `~/foo/bar` or `~john/foo/bar`)

**Parameters**

**expr** – An expression containing home shortcuts

**Returns**

The expanded string

**class** `plumbum.machines.local.LocalCommand`(*executable*, *encoding*='auto')

**\_\_init\_\_**(*executable*, *encoding*='auto')

**popen**(*args*=(), *cwd*=None, *env*=None, *\*\*kwargs*)

Spawns the given command, returning a Popen-like object.

---

**Note:** When processes run in the **background** (either via `popen` or `& BG`), their `stdout`/`stderr` pipes might fill up, causing them to hang. If you know a process produces output, be sure to consume it every once in a while, using a monitoring thread/reactor in the background. For more info, see [#48](#)

---

**Parameters**

- **args** – Any arguments to be passed to the process (a tuple)
- **kwargs** – Any keyword-arguments to be passed to the Popen constructor

**Returns**

A Popen-like object

**class** `plumbum.machines.local.LocalMachine`

The *local machine* (a singleton object). It serves as an entry point to everything related to the local machine, such as working directory and environment manipulation, command creation, etc.

Attributes:

- `cwd` - the local working directory
- `env` - the local environment
- `custom_encoding` - the local machine's default encoding (`sys.getfilesystemencoding()`)

**\_\_init\_\_**()

**classmethod** `which`(*programe*)

Looks up a program in the `PATH`. If the program is not found, raises `CommandNotFound`

**Parameters**

**progname** – The program’s name. Note that if underscores (`_`) are present in the name, and the exact name is not found, they will be replaced in turn by hyphens (`-`) then periods (`.`), and the name will be looked up again for each alternative

**Returns**

A `LocalPath`

**path(\*parts)**

A factory for `LocalPaths`. Usage: `p = local.path("/usr", "lib", "python2.7")`

**\_\_contains\_\_(cmd)**

Tests for the existence of the command, e.g., `"ls"` in `plumbum.local`. `cmd` can be anything acceptable by `__getitem__`.

**\_\_getitem\_\_(cmd)**

Returns a `Command` object representing the given program. `cmd` can be a string or a `LocalPath`; if it is a path, a command representing this path will be returned; otherwise, the program name will be looked up in the system’s PATH (using `which`). Usage:

```
ls = local["ls"]
```

**daemonic\_popen(command, cwd='/', stdout=None, stderr=None, append=True)**

On POSIX systems:

Run `command` as a UNIX daemon: fork a child process to `setpid`, redirect std handles to `/dev/null`, `umask`, close all fds, `chdir` to `cwd`, then fork and exec `command`. Returns a `Popen` process that can be used to poll/wait for the executed command (but keep in mind that you cannot access std handles)

On Windows:

Run `command` as a “Windows daemon”: detach from controlling console and create a new process group. This means that the command will not receive console events and would survive its parent’s termination. Returns a `Popen` object.

---

**Note:** this does not run `command` as a system service, only detaches it from its parent.

---

New in version 1.3.

**list\_processes()**

Returns information about all running processes (on POSIX systems: using `ps`)

New in version 1.3.

**pgrep(pattern)**

Process grep: return information about all processes whose command-line args match the given regex pattern

**session(new\_session=False)**

Creates a new `ShellSession` object; this invokes `/bin/sh` and executes commands on it over `stdin/stdout/stderr`

**tempdir()**

A context manager that creates a temporary directory, which is removed when the context exits

**as\_user(username=None)**

Run nested commands as the given user. For example:

```
head = local["head"]
head("-n1", "/dev/sda1")    # this will fail...
with local.as_user():
    head("-n1", "/dev/sda1")
```

### Parameters

**username** – The user to run commands as. If not given, root (or Administrator) is assumed

### `as_root()`

A shorthand for `as_user("root")`

**python** = `LocalCommand(/home/docs/checkouts/readthedocs.org/user_builds/plumbum/envs/stable/bin/python)`

A command that represents the current python interpreter (`sys.executable`)

`plumbum.machines.local.local` = `<plumbum.machines.local.LocalMachine object>`

The *local machine* (a singleton object). It serves as an entry point to everything related to the local machine, such as working directory and environment manipulation, command creation, etc.

Attributes:

- `cwd` - the local working directory
- `env` - the local environment
- `custom_encoding` - the local machine's default encoding (`sys.getfilesystemencoding()`)

**exception** `plumbum.machines.session.ShellSessionError`

Raises when something goes wrong when calling `ShellSession.popen`

**`__weakref__`**

list of weak references to the object (if defined)

**exception** `plumbum.machines.session.SSHCommsError`(*argv*, *retcode*, *stdout*, *stderr*, *message=None*, \*, *host=None*)

Raises when the communication channel can't be created on the remote host or it times out.

**exception** `plumbum.machines.session.SSHCommsChannel2Error`(*argv*, *retcode*, *stdout*, *stderr*, *message=None*, \*, *host=None*)

Raises when channel 2 (`stderr`) is not available

**exception** `plumbum.machines.session.IncorrectLogin`(*argv*, *retcode*, *stdout*, *stderr*, *message=None*, \*, *host=None*)

Raises when incorrect login credentials are provided

**exception** `plumbum.machines.session.HostPublicKeyUnknown`(*argv*, *retcode*, *stdout*, *stderr*, *message=None*, \*, *host=None*)

Raises when the host public key isn't known

**class** `plumbum.machines.session.MarkedPipe`(*pipe*, *marker*)

A pipe-like object from which you can read lines; the pipe will return report EOF (the empty string) when a special marker is detected

**`__init__`**(*pipe*, *marker*)

**`close`**()

'Closes' the marked pipe; following calls to `readline` will return ""

**readline()**

Reads the next line from the pipe; returns "" when the special marker is reached. Raises EOFError if the underlying pipe has closed

**class** plumbum.machines.session.**SessionPopen**(*proc, argv, isatty, stdin, stdout, stderr, encoding, \*, host*)

A shell-session-based Popen-like object (has the following attributes: `stdin`, `stdout`, `stderr`, `returncode`)

**\_\_init\_\_**(*proc, argv, isatty, stdin, stdout, stderr, encoding, \*, host*)

**poll()**

Returns the process' exit code or `None` if it's still running

**wait()**

Waits for the process to terminate and returns its exit code

**communicate**(*input=None*)

Consumes the process' stdout and stderr until the it terminates.

**Parameters**

**input** – An optional bytes/buffer object to send to the process over stdin

**Returns**

A tuple of (stdout, stderr)

**class** plumbum.machines.session.**ShellSession**(*proc, encoding='auto', isatty=False, connect\_timeout=5, \*, host=None*)

An abstraction layer over *shell sessions*. A shell session is the execution of an interactive shell (`/bin/sh` or something compatible), over which you may run commands (sent over stdin). The output of is then read from stdout and stderr. Shell sessions are less “robust” than executing a process on its own, and they are susceptible to all sorts of malformed-strings attacks, and there is little benefit from using them locally. However, they can greatly speed up remote connections, and are required for the implementation of `SshMachine`, as they allow us to send multiple commands over a single SSH connection (setting up separate SSH connections incurs a high overhead). Try to avoid using shell sessions, unless you know what you're doing.

Instances of this class may be used as *context-managers*.

**Parameters**

- **proc** – The underlying shell process (with open stdin, stdout and stderr)
- **encoding** – The encoding to use for the shell session. If "auto", the underlying process' encoding is used.
- **isatty** – If true, assume the shell has a TTY and that stdout and stderr are unified
- **connect\_timeout** – The timeout to connect to the shell, after which, if no prompt is seen, the shell process is killed

**\_\_init\_\_**(*proc, encoding='auto', isatty=False, connect\_timeout=5, \*, host=None*)

**alive()**

Returns `True` if the underlying shell process is alive, `False` otherwise

**close()**

Closes (terminates) the shell session

**\_\_weakref\_\_**

list of weak references to the object (if defined)

**popen**(*cmd*)

Runs the given command in the shell, adding some decoration around it. Only a single command can be executed at any given time.

**Parameters**

**cmd** – The command (string or Command object) to run

**Returns**

A SessionPopen instance

**run**(*cmd*, *retcode=0*)

Runs the given command

**Parameters**

- **cmd** – The command (string or Command object) to run
- **retcode** – The expected return code (0 by default). Set to None in order to ignore erroneous return codes

**Returns**

A tuple of (return code, stdout, stderr)

### 5.3.1 Remote Machines

**class** plumbum.machines.remote.**RemoteEnv**(*remote*)

The remote machine's environment; exposes a dict-like interface

**\_\_init\_\_**(*remote*)

**\_\_delitem\_\_**(*name*)

Deletes an environment variable from the current environment

**\_\_setitem\_\_**(*name*, *value*)

Sets/replaces an environment variable's value in the current environment

**pop**(*name*, *\*default*)

Pops an element from the current environment (like dict.pop)

**update**(*\*args*, *\*\*kwargs*)

Updates the current environment (like dict.update)

**expand**(*expr*)

Expands any environment variables and home shortcuts found in *expr* (like `os.path.expanduser` combined with `os.path.expandvars`)

**Parameters**

**expr** – An expression containing environment variables (as `$F00`) or home shortcuts (as `~/` or `~/.bashrc`)

**Returns**

The expanded string

**expanduser**(*expr*)

Expand home shortcuts (e.g., `~/foo/bar` or `~john/foo/bar`)

**Parameters**

**expr** – An expression containing home shortcuts

**Returns**

The expanded string

**getdelta()**

Returns the difference between the this environment and the original environment of the remote machine

```
class plumbum.machines.remote.RemoteCommand(remote, executable, encoding='auto')
```

```
__init__(remote, executable, encoding='auto')
```

```
__repr__()
```

Return repr(self).

```
popen(args=(), **kwargs)
```

Spawns the given command, returning a Popen-like object.

---

**Note:** When processes run in the **background** (either via `popen` or `& BG`), their stdout/stderr pipes might fill up, causing them to hang. If you know a process produces output, be sure to consume it every once in a while, using a monitoring thread/reactor in the background. For more info, see [#48](#)

---

**Parameters**

- **args** – Any arguments to be passed to the process (a tuple)
- **kwargs** – Any keyword-arguments to be passed to the Popen constructor

**Returns**

A Popen-like object

```
nohup(cwd='.', stdout='nohup.out', stderr=None, append=True)
```

Runs a command detached.

```
exception plumbum.machines.remote.ClosedRemoteMachine
```

```
__weakref__
```

list of weak references to the object (if defined)

```
class plumbum.machines.remote.BaseRemoteMachine(encoding='utf8', connect_timeout=10,
                                                new_session=False)
```

Represents a *remote machine*; serves as an entry point to everything related to that remote machine, such as working directory and environment manipulation, command creation, etc.

Attributes:

- `cwd` - the remote working directory
- `env` - the remote environment
- `custom_encoding` - the remote machine's default encoding (assumed to be UTF8)
- `connect_timeout` - the connection timeout

There also is a `_cwd` attribute that exists if the `cwd` is not current (del if `cwd` is changed).

```
class RemoteCommand(remote, executable, encoding='auto')
```

```
__init__(remote, executable, encoding='auto')
```

**\_\_repr\_\_()**

Return repr(self).

**nohup**(*cwd='.', stdout='nohup.out', stderr=None, append=True*)

Runs a command detached.

**popen**(*args=(), \*\*kwargs*)

Spawns the given command, returning a Popen-like object.

---

**Note:** When processes run in the **background** (either via **popen** or **& BG**), their stdout/stderr pipes might fill up, causing them to hang. If you know a process produces output, be sure to consume it every once in a while, using a monitoring thread/reactor in the background. For more info, see [#48](#)

---

**Parameters**

- **args** – Any arguments to be passed to the process (a tuple)
- **kwargs** – Any keyword-arguments to be passed to the Popen constructor

**Returns**

A Popen-like object

**\_\_init\_\_**(*encoding='utf8', connect\_timeout=10, new\_session=False*)

**\_\_repr\_\_()**

Return repr(self).

**close()**

closes the connection to the remote machine; all paths and programs will become defunct

**path**(*\*parts*)

A factory for [RemotePaths](#). Usage: `p = rem.path("/usr", "lib", "python2.7")`

**which**(*progrname*)

Looks up a program in the PATH. If the program is not found, raises `CommandNotFound`

**Parameters**

**progrname** – The program's name. Note that if underscores (`_`) are present in the name, and the exact name is not found, they will be replaced in turn by hyphens (`-`) then periods (`.`), and the name will be looked up again for each alternative

**Returns**

A `RemotePath`

**\_\_getitem\_\_**(*cmd*)

Returns a `Command` object representing the given program. `cmd` can be a string or a [RemotePath](#); if it is a path, a command representing this path will be returned; otherwise, the program name will be looked up in the system's PATH (using `which`). Usage:

```
r_ls = rem["ls"]
```

**property python**

A command that represents the default remote python interpreter

**session**(*isatty=False, \*, new\_session=False*)

Creates a new `ShellSession` object; this invokes the user's shell on the remote machine and executes commands on it over stdin/stdout/stderr



**download**(*src*, *dst*)

Downloads a remote file/directory (*src*) to a local destination (*dst*). *src* must be a string or a [RemotePath](#) pointing to this remote machine, and *dst* must be a string or a [LocalPath](#)

**upload**(*src*, *dst*)

Uploads a local file/directory (*src*) to a remote destination (*dst*). *src* must be a string or a [LocalPath](#), and *dst* must be a string or a [RemotePath](#) pointing to this remote machine

**popen**(*args*, *\*\*kwargs*)

Spawns the given command on the remote machine, returning a Popen-like object; do not use this method directly, unless you need “low-level” control on the remote process

**list\_processes**()

Returns information about all running processes (on POSIX systems: using `ps`)

New in version 1.3.

**pgrep**(*pattern*)

Process grep: return information about all processes whose command-line args match the given regex pattern

**tempdir**()

A context manager that creates a remote temporary directory, which is removed when the context exits

**class** `plumbum.machines.ssh_machine.SshTunnel`(*session*, *lport*, *dport*, *reverse*)

An object representing an SSH tunnel (created by `SshMachine.tunnel`)

**\_\_init\_\_**(*session*, *lport*, *dport*, *reverse*)

**\_\_repr\_\_**()

Return repr(self).

**close**()

Closes(terminates) the tunnel

**property lport**

Tunneled port or socket on the local machine.

**property dport**

Tunneled port or socket on the remote machine.

**property reverse**

Represents if the tunnel is a reverse tunnel.

**class** `plumbum.machines.ssh_machine.SshMachine`(*host*, *user=None*, *port=None*, *keyfile=None*,  
*ssh\_command=None*, *scp\_command=None*,  
*ssh\_opts=()*, *scp\_opts=()*, *password=None*,  
*encoding='utf8'*, *connect\_timeout=10*,  
*new\_session=False*)

An implementation of [remote machine](#) over SSH. Invoking a remote command translates to invoking it over SSH

```
with SshMachine("yourhostname") as rem:
    r_ls = rem["ls"]
    # r_ls is the remote `ls`
    # executing r_ls() translates to `ssh yourhostname ls`
```

### Parameters

- **host** – the host name to connect to (SSH server)
- **user** – the user to connect as (if `None`, the default will be used)
- **port** – the server’s port (if `None`, the default will be used)
- **keyfile** – the path to the identity file (if `None`, the default will be used)
- **ssh\_command** – the ssh command to use; this has to be a `Command` object; if `None`, the default ssh client will be used.
- **scp\_command** – the scp command to use; this has to be a `Command` object; if `None`, the default scp program will be used.
- **ssh\_opts** – any additional options for ssh (a list of strings)
- **scp\_opts** – any additional options for scp (a list of strings)
- **password** – the password to use; requires `sshpass` be installed. Cannot be used in conjunction with `ssh_command` or `scp_command` (will be ignored). NOTE: THIS IS A SECURITY RISK!
- **encoding** – the remote machine’s encoding (defaults to UTF8)
- **connect\_timeout** – specify a connection timeout (the time until shell prompt is seen). The default is 10 seconds. Set to `None` to disable
- **new\_session** – whether or not to start the background session as a new session leader (set-sid). This will prevent it from being killed on Ctrl+C (SIGINT)

```
__init__(host, user=None, port=None, keyfile=None, ssh_command=None, scp_command=None,
          ssh_opts=(), scp_opts=(), password=None, encoding='utf8', connect_timeout=10,
          new_session=False)
```

```
__str__()
```

Return `str(self)`.

```
popen(args, ssh_opts=(), env=None, cwd=None, **kwargs)
```

Spawns the given command on the remote machine, returning a `Popen`-like object; do not use this method directly, unless you need “low-level” control on the remote process

```
nohup(command)
```

Runs the given command using `nohup` and redirects std handles, allowing the command to run “detached” from its controlling TTY or parent. Does not return anything. Depreciated (use `command.nohup` or `daemonic_popen`).

```
daemonic_popen(command, cwd='.', stdout=None, stderr=None, append=True)
```

Runs the given command using `nohup` and redirects std handles, allowing the command to run “detached” from its controlling TTY or parent. Does not return anything.

New in version 1.6.0.

```
session(isatty=False, new_session=False)
```

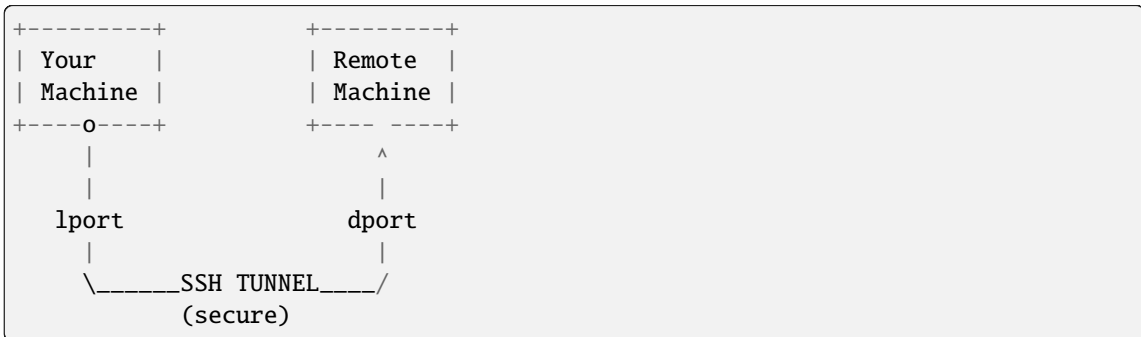
Creates a new `ShellSession` object; this invokes the user’s shell on the remote machine and executes commands on it over stdin/stdout/stderr

```
tunnel(lport, dport, lhost='localhost', dhost='localhost', connect_timeout=5, reverse=False)
```

Creates an SSH tunnel from the TCP port (`lport`) of the local machine (`lhost`, defaults to “localhost”, but it can be any IP you can `bind()`) to the remote TCP port (`dport`) of the destination machine (`dhost`, defaults to “localhost”, which means *this remote machine*). This function also supports Unix sockets, in

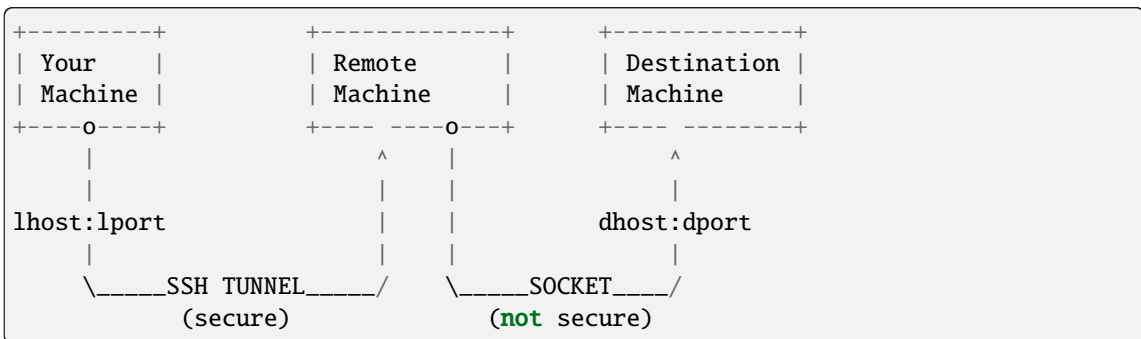
which case the local socket should be passed in as `lport` and the local bind address should be `None`. The same can be done for a remote socket, by following the same pattern with `dport` and `dhost`. The returned `SshTunnel` object can be used as a *context-manager*.

The more conventional use case is the following:



Here, you wish to communicate safely between port `lport` of your machine and port `dport` of the remote machine. Communication is tunneled over SSH, so the connection is authenticated and encrypted.

The more general case is shown below (where `dport != "localhost"`):



Usage:

```

rem = SshMachine("megazord")

with rem.tunnel(1234, "/var/lib/mysql/mysql.sock", dhost=None):
    sock = socket.socket()
    sock.connect(("localhost", 1234))
    # sock is now tunneled to the MySQL socket on megazord

```

**download**(*src*, *dst*)

Downloads a remote file/directory (*src*) to a local destination (*dst*). *src* must be a string or a [RemotePath](#) pointing to this remote machine, and *dst* must be a string or a [LocalPath](#)

**upload**(*src*, *dst*)

Uploads a local file/directory (*src*) to a remote destination (*dst*). *src* must be a string or a [LocalPath](#), and *dst* must be a string or a [RemotePath](#) pointing to this remote machine

```

class plumbum.machines.ssh_machine.PuTTYMachine(host, user=None, port=None, keyfile=None,
                                                  ssh_command=None, scp_command=None,
                                                  ssh_opts=(), scp_opts=(), encoding='utf8',
                                                  connect_timeout=10, new_session=False)

```

PuTTY-flavored SSH connection. The programs `plink` and `pscp` are expected to be in the path (or you may provide your own `ssh_command` and `scp_command`)

Arguments are the same as for `plumbum.machines.remote.SshMachine`

```
__init__(host, user=None, port=None, keyfile=None, ssh_command=None, scp_command=None,
          ssh_opts=(), scp_opts=(), encoding='utf8', connect_timeout=10, new_session=False)
```

```
__str__()
```

Return `str(self)`.

```
session(isatty=False, new_session=False)
```

Creates a new `ShellSession` object; this invokes the user's shell on the remote machine and executes commands on it over `stdin/stdout/stderr`

```
class plumbum.machines.paramiko_machine.ParamikoPopen(argv, stdin, stdout, stderr, encoding,
                                                       stdin_file=None, stdout_file=None,
                                                       stderr_file=None)
```

```
__init__(argv, stdin, stdout, stderr, encoding, stdin_file=None, stdout_file=None, stderr_file=None)
```

```
class plumbum.machines.paramiko_machine.ParamikoMachine(host, user=None, port=None,
                                                         password=None, keyfile=None,
                                                         load_system_host_keys=True,
                                                         missing_host_policy=None,
                                                         encoding='utf8', look_for_keys=None,
                                                         connect_timeout=None, keep_alive=0,
                                                         gss_auth=False, gss_kex=None,
                                                         gss_deleg_creds=None, gss_host=None,
                                                         get_pty=False,
                                                         load_system_ssh_config=False)
```

An implementation of *remote machine* over Paramiko (a Python implementation of openSSH2 client/server). Invoking a remote command translates to invoking it over SSH

```
with ParamikoMachine("yourhostname") as rem:
    r_ls = rem["ls"]
    # r_ls is the remote `ls`
    # executing r_ls() is equivalent to `ssh yourhostname ls`, only without
    # spawning a new ssh client
```

### Parameters

- **host** – the host name to connect to (SSH server)
- **user** – the user to connect as (if `None`, the default will be used)
- **port** – the server's port (if `None`, the default will be used)
- **password** – the user's password (if a password-based authentication is to be performed) (if `None`, key-based authentication will be used)
- **keyfile** – the path to the identity file (if `None`, the default will be used)
- **load\_system\_host\_keys** – whether or not to load the system's host keys (from `/etc/ssh` and `~/.ssh`). The default is `True`, which means Paramiko behaves much like the `ssh` command-line client
- **missing\_host\_policy** – the value passed to the underlying `set_missing_host_key_policy` of the client. The default is `None`, which means `set_missing_host_key_policy` is not invoked and paramiko's default behavior (reject) is employed

- **encoding** – the remote machine’s encoding (defaults to UTF8)
- **look\_for\_keys** – set to False to disable searching for discoverable private key files in ~/.ssh
- **connect\_timeout** – timeout for TCP connection

---

**Note:** If Paramiko 1.15 or above is installed, can use GSS\_API authentication

---

#### Parameters

- **gss\_auth** (*bool*) – True if you want to use GSS-API authentication
- **gss\_kex** (*bool*) – Perform GSS-API Key Exchange and user authentication
- **gss\_deleg\_creds** (*bool*) – Delegate GSS-API client credentials or not
- **gss\_host** (*str*) – The targets name in the kerberos database. default: hostname
- **get\_pty** (*bool*) – Execute remote commands with allocated pseudo-tty. default: False
- **load\_system\_ssh\_config** (*bool*) – read system SSH config for ProxyCommand configuration. default: False

**class RemoteCommand**(*remote, executable, encoding='auto'*)

**\_\_or\_\_**(\*\_)

Creates a pipe with the other command

**\_\_gt\_\_**(\*\_)

Redirects the process’ stdout to the given file

**\_\_rshift\_\_**(\*\_)

Redirects the process’ stdout to the given file (appending)

**\_\_ge\_\_**(\*\_)

Redirects the process’ stderr to the given file

**\_\_lt\_\_**(\*\_)

Redirects the given file into the process’ stdin

**\_\_lshift\_\_**(\*\_)

Redirects the given data into the process’ stdin

**\_\_init\_\_**(*host, user=None, port=None, password=None, keyfile=None, load\_system\_host\_keys=True, missing\_host\_policy=None, encoding='utf8', look\_for\_keys=None, connect\_timeout=None, keep\_alive=0, gss\_auth=False, gss\_kex=None, gss\_deleg\_creds=None, gss\_host=None, get\_pty=False, load\_system\_ssh\_config=False*)

**\_\_str\_\_**()

Return str(self).

**close**()

closes the connection to the remote machine; all paths and programs will become defunct

**property sftp**

Returns an SFTP client on top of the current SSH connection; it can be used to manipulate files directly, much like an interactive FTP/SFTP session

**session**(*isatty=False, term='vt100', width=80, height=24, \*, new\_session=False*)

Creates a new `ShellSession` object; this invokes the user's shell on the remote machine and executes commands on it over `stdin/stdout/stderr`

**popen**(*args, stdin=None, stdout=None, stderr=None, new\_session=False, env=None, cwd=None*)

Spawns the given command on the remote machine, returning a `Popen`-like object; do not use this method directly, unless you need “low-level” control on the remote process

**download**(*src, dst*)

Downloads a remote file/directory (*src*) to a local destination (*dst*). *src* must be a string or a [RemotePath](#) pointing to this remote machine, and *dst* must be a string or a `LocalPath`

**upload**(*src, dst*)

Uploads a local file/directory (*src*) to a remote destination (*dst*). *src* must be a string or a `LocalPath`, and *dst* must be a string or a [RemotePath](#) pointing to this remote machine

**connect\_sock**(*dport, dhost='localhost', ipv6=False*)

Returns a `Paramiko Channel`, connected to *dhost:dport* on the remote machine. The `Channel` behaves like a regular socket; you can `send` and `recv` on it and the data will pass encrypted over SSH. Usage:

```
mach = ParamikoMachine("myhost")
sock = mach.connect_sock(12345)
data = sock.recv(100)
sock.send("foobar")
sock.close()
```

## 5.4 Package `plumbum.path`

**class** `plumbum.path.base.FSUser`(*val, name=None*)

A special object that represents a file-system user. It derives from `int`, so it behaves just like a number (`uid/gid`), but also have a `.name` attribute that holds the string-name of the user, if given (otherwise `None`)

**static** `__new__`(*cls, val, name=None*)

**class** `plumbum.path.base.Path`

An abstraction over file system paths. This class is abstract, and the two implementations are `LocalPath` and [RemotePath](#).

`__repr__`()

Return `repr(self)`.

`__truediv__`(*other: Any*) → `_PathImpl`

Joins two paths

`__getitem__`(*key*)

Return `self[key]`.

`__floordiv__`(*expr*)

Returns a (possibly empty) list of paths that matched the glob-pattern under this path

`__iter__`()

Iterate over the files in this directory

**\_\_eq\_\_**(*other: object*) → bool

Return self==value.

**\_\_ne\_\_**(*other*)

Return self!=value.

**\_\_gt\_\_**(*other*)

Return self>value.

**\_\_ge\_\_**(*other*)

Return self>=value.

**\_\_lt\_\_**(*other*)

Return self<value.

**\_\_le\_\_**(*other*)

Return self<=value.

**\_\_hash\_\_**()

Return hash(self).

**\_\_fspath\_\_**()

Added for Python 3.6 support

**\_\_contains\_\_**(*item*)

Paths should support checking to see if an file or folder is in them.

**up**(*count=1*)

Go up in count directories (the default is 1)

**walk**(*filter=<function Path.<lambda>>, dir\_filter=<function Path.<lambda>>>*)

traverse all (recursive) sub-elements under this directory, that match the given filter. By default, the filter accepts everything; you can provide a custom filter function that takes a path as an argument and returns a boolean

#### Parameters

- **filter** – the filter (predicate function) for matching results. Only paths matching this predicate are returned. Defaults to everything.
- **dir\_filter** – the filter (predicate function) for matching directories. Only directories matching this predicate are recursed into. Defaults to everything.

**abstract property name: str**

The basename component of this path

**property basename**

Included for compatibility with older Plumbum code

**abstract property stem: str**

The name without an extension, or the last component of the path

**abstract property dirname: \_PathImpl**

The dirname component of this path

**abstract property root: str**

The root of the file tree (/ on Unix)

**abstract property drive:** `str`

The drive letter (on Windows)

**abstract property suffix:** `str`

The suffix of this file

**abstract property suffixes:** `List[str]`

This is a list of all suffixes

**abstract property uid:** `FSUser`

The user that owns this path. The returned value is a `FSUser` object which behaves like an `int` (as expected from `uid`), but it also has a `.name` attribute that holds the string-name of the user

**abstract property gid:** `FSUser`

The group that owns this path. The returned value is a `FSUser` object which behaves like an `int` (as expected from `gid`), but it also has a `.name` attribute that holds the string-name of the group

**abstract as\_uri**(*scheme: str | None = None*)  $\rightarrow$  `str`

Returns a universal resource identifier. Use `scheme` to force a scheme.

**abstract join**(\**parts: Any*)  $\rightarrow$  `_PathImpl`

Joins this path with any number of paths

**abstract list**()  $\rightarrow$  `List[_PathImpl]`

Returns the files in this directory

**abstract iterdir**()  $\rightarrow$  `Iterable[_PathImpl]`

Returns an iterator over the directory. Might be slightly faster on Python 3.5 than `.list()`

**abstract is\_dir**()  $\rightarrow$  `bool`

Returns `True` if this path is a directory, `False` otherwise

**isdir**()

Included for compatibility with older Plumbum code

**abstract is\_file**()  $\rightarrow$  `bool`

Returns `True` if this path is a regular file, `False` otherwise

**isfile**()  $\rightarrow$  `bool`

Included for compatibility with older Plumbum code

**islink**()

Included for compatibility with older Plumbum code

**abstract is\_symlink**()  $\rightarrow$  `bool`

Returns `True` if this path is a symbolic link, `False` otherwise

**abstract exists**()  $\rightarrow$  `bool`

Returns `True` if this path exists, `False` otherwise

**abstract stat**()  $\rightarrow$  `stat_result`

Returns the `os.stats` for a file

**abstract with\_name**(*name: Any*)  $\rightarrow$  `_PathImpl`

Returns a path with the name replaced



**abstract with\_suffix**(*suffix: str, depth: int | None = 1*) → *\_PathImpl*

Returns a path with the suffix replaced. Up to last *depth* suffixes will be replaced. *None* will replace all suffixes. If there are less than *depth* suffixes, this will replace all suffixes. `.tar.gz` is an example where *depth*=2 or *depth*=*None* is useful

**preferred\_suffix**(*suffix*)

Adds a suffix if one does not currently exist (otherwise, no change). Useful for loading files with a default suffix

**abstract glob**(*pattern: str | Iterable[str]*) → *List[\_PathImpl]*

Returns a (possibly empty) list of paths that matched the glob-pattern under this path

**abstract delete**()

Deletes this path (recursively, if a directory)

**abstract move**(*dst*)

Moves this path to a different location

**rename**(*newname*)

Renames this path to the new *name* (only the basename is changed)

**abstract copy**(*dst, override=None*)

Copies this path (recursively, if a directory) to the destination path “*dst*”. Raises *TypeError* if *dst* exists and *override* is *False*. Will overwrite if *override* is *True*. Will silently fail to copy if *override* is *None* (the default).

**abstract mkdir**(*mode=511, parents=True, exist\_ok=True*)

Creates a directory at this path.

#### Parameters

- **mode** – **Currently only implemented for local paths!** Numeric mode to use for directory creation, which may be ignored on some systems. The current implementation reproduces the behavior of `os.mkdir` (i.e., the current umask is first masked out), but this may change for remote paths. As with `os.mkdir`, it is recommended to call `chmod()` explicitly if you need to be sure.
- **parents** – If this is true (the default), the directory’s parents will also be created if necessary.
- **exist\_ok** – If this is true (the default), no exception will be raised if the directory already exists (otherwise *OSError*).

Note that the defaults for *parents* and *exist\_ok* are the opposite of what they are in Python’s own `pathlib` - this is to maintain backwards-compatibility with Plumbum’s behaviour from before they were implemented.

**abstract open**(*mode: str = 'r', \*, encoding: str | None = None*) → *IOBase*

opens this path as a file

**abstract read**(*encoding: str | None = None*) → *str*

returns the contents of this file as a *str*. By default the data is read as text, but you can specify the encoding, e.g., `'latin1'` or `'utf8'`

**abstract write**(*data: AnyStr, encoding: str | None = None*) → *None*

writes the given data to this file. By default the data is written as-is (either text or binary), but you can specify the encoding, e.g., `'latin1'` or `'utf8'`

**abstract touch()**

Update the access time. Creates an empty file if none exists.

**abstract chown**(*owner=None, group=None, recursive=None*)

Change ownership of this path.

**Parameters**

- **owner** – The owner to set (either uid or username), optional
- **group** – The group to set (either gid or groupname), optional
- **recursive** – whether to change ownership of all contained files and subdirectories. Only meaningful when **self** is a directory. If **None**, the value will default to **True** if **self** is a directory, **False** otherwise.

**abstract chmod**(*mode*)

Change the mode of path to the numeric mode.

**Parameters**

**mode** – file mode as for `os.chmod`

**abstract access**(*mode: int | str = 0*) → bool

Test file existence or permission bits

**Parameters**

**mode** – a bitwise-or of access bits, or a string-representation thereof: 'f', 'x', 'r', 'w' for `os.F_OK`, `os.X_OK`, `os.R_OK`, `os.W_OK`

**abstract link**(*dst*)

Creates a hard link from **self** to **dst**

**Parameters**

**dst** – the destination path

**abstract symlink**(*dst*)

Creates a symbolic link from **self** to **dst**

**Parameters**

**dst** – the destination path

**abstract unlink**()

Deletes a symbolic link

**split**(\*\_args, \*\*\_kwargs)

Splits the path on directory separators, yielding a list of directories, e.g. `"/var/log/messages"` will yield `['var', 'log', 'messages']`.

**property parts**

Splits the directory into parts, including the base directory, returns a tuple

**relative\_to**(*source*)

Computes the “relative path” require to get from **source** to **self**. They satisfy the invariant `source_path + (target_path - source_path) == target_path`. For example:

```
/var/log/messages - /var/log/messages = []  
/var/log/messages - /var              = [log, messages]  
/var/log/messages - /                  = [var, log, messages]  
/var/log/messages - /var/tmp           = [.., log, messages]
```

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```

/var/log/messages - /opt          = [..., var, log, messages]
/var/log/messages - /opt/lib      = [..., .., var, log, messages]

```

**\_\_sub\_\_**(*other*)Same as `self.relative_to(other)`**resolve**(*strict=False*)

Added to allow pathlib like syntax. Does nothing since Plumbum paths are always absolute. Does not (currently) resolve symlinks.

**property parents**

Pathlib like sequence of ancestors

**property parent**

Pathlib like parent of the path.

**\_\_weakref\_\_**

list of weak references to the object (if defined)

**class** `plumbum.path.base.RelativePath(parts)`

Relative paths are the “delta” required to get from one path to another. Note that relative path do not point at anything, and thus are not paths. Therefore they are system agnostic (but closed under addition) Paths are always absolute and point at “something”, whether existent or not.

Relative paths are created by subtracting paths (`Path.relative_to`)**\_\_init\_\_**(*parts*)**\_\_str\_\_**()Return `str(self)`.**\_\_repr\_\_**()Return `repr(self)`.**\_\_eq\_\_**(*other*)Return `self==value`.**\_\_ne\_\_**(*other*)Return `self!=value`.**\_\_gt\_\_**(*other*)Return `self>value`.**\_\_ge\_\_**(*other*)Return `self>=value`.**\_\_lt\_\_**(*other*)Return `self<value`.**\_\_le\_\_**(*other*)Return `self<=value`.**\_\_hash\_\_**()Return `hash(self)`.**\_\_weakref\_\_**

list of weak references to the object (if defined)

**class** plumbum.path.local.LocalPath(\*parts)

The class implementing local-machine paths

**static** \_\_new\_\_(cls, \*parts)

**property** name

The basename component of this path

**property** dirname

The dirname component of this path

**property** suffix

The suffix of this file

**property** suffixes

This is a list of all suffixes

**property** uid

The user that owns this path. The returned value is a FSUser object which behaves like an `int` (as expected from `uid`), but it also has a `.name` attribute that holds the string-name of the user

**property** gid

The group that owns this path. The returned value is a FSUser object which behaves like an `int` (as expected from `gid`), but it also has a `.name` attribute that holds the string-name of the group

**join**(\*others)

Joins this path with any number of paths

**list**()

Returns the files in this directory

**iterdir**()

Returns an iterator over the directory. Might be slightly faster on Python 3.5 than `.list()`

**is\_dir**()

Returns `True` if this path is a directory, `False` otherwise

**is\_file**()

Returns `True` if this path is a regular file, `False` otherwise

**is\_symlink**()

Returns `True` if this path is a symbolic link, `False` otherwise

**exists**()

Returns `True` if this path exists, `False` otherwise

**stat**()

Returns the `os.stats` for a file

**with\_name**(name)

Returns a path with the name replaced

**property** stem

The name without an extension, or the last component of the path

**with\_suffix**(suffix, depth=1)

Returns a path with the suffix replaced. Up to last `depth` suffixes will be replaced. `None` will replace all suffixes. If there are less than `depth` suffixes, this will replace all suffixes. `.tar.gz` is an example where `depth=2` or `depth=None` is useful

**glob**(*pattern*)

Returns a (possibly empty) list of paths that matched the glob-pattern under this path

**delete**()

Deletes this path (recursively, if a directory)

**move**(*dst*)

Moves this path to a different location

**copy**(*dst*, *override=None*)

Copies this path (recursively, if a directory) to the destination path “dst”. Raises `TypeError` if *dst* exists and *override* is `False`. Will overwrite if *override* is `True`. Will silently fail to copy if *override* is `None` (the default).

**makedirs**(*mode=511*, *parents=True*, *exist\_ok=True*)

Creates a directory at this path.

#### Parameters

- **mode** – **Currently only implemented for local paths!** Numeric mode to use for directory creation, which may be ignored on some systems. The current implementation reproduces the behavior of `os.makedirs` (i.e., the current umask is first masked out), but this may change for remote paths. As with `os.makedirs`, it is recommended to call `chmod()` explicitly if you need to be sure.
- **parents** – If this is true (the default), the directory’s parents will also be created if necessary.
- **exist\_ok** – If this is true (the default), no exception will be raised if the directory already exists (otherwise `OSError`).

Note that the defaults for `parents` and `exist_ok` are the opposite of what they are in Python’s own `pathlib` - this is to maintain backwards-compatibility with Plumbum’s behaviour from before they were implemented.

**open**(*mode='r'*, *encoding=None*)

opens this path as a file

**read**(*encoding=None*, *mode='r'*)

returns the contents of this file as a `str`. By default the data is read as text, but you can specify the encoding, e.g., `'latin1'` or `'utf8'`

**write**(*data*, *encoding=None*, *mode=None*)

writes the given data to this file. By default the data is written as-is (either text or binary), but you can specify the encoding, e.g., `'latin1'` or `'utf8'`

**touch**()

Update the access time. Creates an empty file if none exists.

**chown**(*owner=None*, *group=None*, *recursive=None*)

Change ownership of this path.

#### Parameters

- **owner** – The owner to set (either `uid` or `username`), optional
- **group** – The group to set (either `gid` or `groupname`), optional
- **recursive** – whether to change ownership of all contained files and subdirectories. Only meaningful when `self` is a directory. If `None`, the value will default to `True` if `self` is a directory, `False` otherwise.

**chmod**(*mode*)

Change the mode of path to the numeric mode.

**Parameters**

**mode** – file mode as for `os.chmod`

**access**(*mode=0*)

Test file existence or permission bits

**Parameters**

**mode** – a bitwise-or of access bits, or a string-representation thereof: 'f', 'x', 'r', 'w' for `os.F_OK`, `os.X_OK`, `os.R_OK`, `os.W_OK`

**link**(*dst*)

Creates a hard link from `self` to `dst`

**Parameters**

**dst** – the destination path

**symlink**(*dst*)

Creates a symbolic link from `self` to `dst`

**Parameters**

**dst** – the destination path

**unlink**()

Deletes a symbolic link

**as\_uri**(*scheme='file'*)

Returns a universal resource identifier. Use `scheme` to force a scheme.

**property drive**

The drive letter (on Windows)

**property root**

The root of the file tree (/ on Unix)

**class** `plumbum.path.local.LocalWorkdir`

Working directory manipulator

**\_\_hash\_\_**()

Return `hash(self)`.

**static** **\_\_new\_\_**(*cls*)

**chdir**(*newdir*)

Changes the current working directory to the given one

**Parameters**

**newdir** – The destination director (a string or a `LocalPath`)

**getpath**()

Returns the current working directory as a `LocalPath` object

**\_\_call\_\_**(*newdir*)

A context manager used to `chdir` into a directory and then `chdir` back to the previous location; much like `pushd/popd`.

**Parameters**

**newdir** – The destination directory (a string or a `LocalPath`)

**class** `plumbum.path.remote.StatRes(tup)`

POSIX-like stat result

**\_\_init\_\_**(*tup*)

**\_\_weakref\_\_**

list of weak references to the object (if defined)

**class** `plumbum.path.remote.RemotePath(remote, *parts)`

The class implementing remote-machine paths

**static** **\_\_new\_\_**(*cls*, *remote*, \**parts*)

**property** **name**

The basename component of this path

**property** **dirname**

The dirname component of this path

**property** **suffix**

The suffix of this file

**property** **suffixes**

This is a list of all suffixes

**property** **uid**

The user that owns this path. The returned value is a `FSUser` object which behaves like an `int` (as expected from `uid`), but it also has a `.name` attribute that holds the string-name of the user

**property** **gid**

The group that owns this path. The returned value is a `FSUser` object which behaves like an `int` (as expected from `gid`), but it also has a `.name` attribute that holds the string-name of the group

**join**(\**parts*)

Joins this path with any number of paths

**list**()

Returns the files in this directory

**iterdir**()

Returns an iterator over the directory. Might be slightly faster on Python 3.5 than `.list()`

**is\_dir**()

Returns `True` if this path is a directory, `False` otherwise

**is\_file**()

Returns `True` if this path is a regular file, `False` otherwise

**is\_symlink**()

Returns `True` if this path is a symbolic link, `False` otherwise

**exists**()

Returns `True` if this path exists, `False` otherwise

**stat**()

Returns the `os.stat`s for a file

**with\_name**(*name*)

Returns a path with the name replaced

**with\_suffix**(*suffix*, *depth=1*)

Returns a path with the suffix replaced. Up to last *depth* suffixes will be replaced. None will replace all suffixes. If there are less than *depth* suffixes, this will replace all suffixes. `.tar.gz` is an example where *depth=2* or *depth=None* is useful

**glob**(*pattern*)

Returns a (possibly empty) list of paths that matched the glob-pattern under this path

**delete**()

Deletes this path (recursively, if a directory)

**unlink**()

Deletes a symbolic link

**move**(*dst*)

Moves this path to a different location

**copy**(*dst*, *override=False*)

Copies this path (recursively, if a directory) to the destination path “dst”. Raises `TypeError` if *dst* exists and *override* is `False`. Will overwrite if *override* is `True`. Will silently fail to copy if *override* is `None` (the default).

**makedirs**(*mode=None*, *parents=True*, *exist\_ok=True*)

Creates a directory at this path.

#### Parameters

- **mode** – **Currently only implemented for local paths!** Numeric mode to use for directory creation, which may be ignored on some systems. The current implementation reproduces the behavior of `os.makedirs` (i.e., the current umask is first masked out), but this may change for remote paths. As with `os.makedirs`, it is recommended to call `chmod()` explicitly if you need to be sure.
- **parents** – If this is true (the default), the directory’s parents will also be created if necessary.
- **exist\_ok** – If this is true (the default), no exception will be raised if the directory already exists (otherwise `OSError`).

Note that the defaults for *parents* and *exist\_ok* are the opposite of what they are in Python’s own `pathlib` - this is to maintain backwards-compatibility with Plumbum’s behaviour from before they were implemented.

**read**(*encoding=None*)

returns the contents of this file as a `str`. By default the data is read as text, but you can specify the encoding, e.g., `'latin1'` or `'utf8'`

**write**(*data*, *encoding=None*)

writes the given data to this file. By default the data is written as-is (either text or binary), but you can specify the encoding, e.g., `'latin1'` or `'utf8'`

**touch**()

Update the access time. Creates an empty file if none exists.



**chown**(*owner=None, group=None, recursive=None*)

Change ownership of this path.

**Parameters**

- **owner** – The owner to set (either uid or username), optional
- **group** – The group to set (either gid or groupname), optional
- **recursive** – whether to change ownership of all contained files and subdirectories. Only meaningful when *self* is a directory. If *None*, the value will default to *True* if *self* is a directory, *False* otherwise.

**chmod**(*mode*)

Change the mode of path to the numeric mode.

**Parameters**

**mode** – file mode as for `os.chmod`

**access**(*mode=0*)

Test file existence or permission bits

**Parameters**

**mode** – a bitwise-or of access bits, or a string-representation thereof: 'f', 'x', 'r', 'w' for `os.F_OK`, `os.X_OK`, `os.R_OK`, `os.W_OK`

**link**(*dst*)

Creates a hard link from *self* to *dst*

**Parameters**

**dst** – the destination path

**symlink**(*dst*)

Creates a symbolic link from *self* to *dst*

**Parameters**

**dst** – the destination path

**open**(*mode='r', bufsize=-1, \*, encoding=None*)

Opens this path as a file.

Only works for ParamikoMachine-associated paths for now.

**as\_uri**(*scheme='ssh'*)

Returns a universal resource identifier. Use *scheme* to force a scheme.

**property stem**

The name without an extension, or the last component of the path

**property root**

The root of the file tree (/ on Unix)

**property drive**

The drive letter (on Windows)

**class** `plumbum.path.remote.RemoteWorkdir`(*remote*)

Remote working directory manipulator

**static** `__new__`(*cls, remote*)

**\_\_hash\_\_()**

Return hash(self).

**chdir(newdir)**

Changes the current working directory to the given one

**getpath()**

Returns the current working directory as a *remote path* <plumbum.path.remote.RemotePath> object

**\_\_call\_\_(newdir)**

A context manager used to `chdir` into a directory and then `chdir` back to the previous location; much like `pushd/popd`.

**Parameters**

**newdir** – The destination director (a string or a [RemotePath](#))

## 5.4.1 Utils

`plumbum.path.utils.delete(*paths)`

Deletes the given paths. The arguments can be either strings, [local paths](#), [remote paths](#), or iterables of such. No error is raised if any of the paths does not exist (it is silently ignored)

`plumbum.path.utils.move(src, dst)`

Moves the source path onto the destination path; `src` and `dst` can be either strings, [LocalPaths](#) or [RemotePath](#); any combination of the three will work.

New in version 1.3: `src` can also be a list of strings/paths, in which case `dst` must not exist or be a directory.

`plumbum.path.utils.copy(src, dst)`

Copy (recursively) the source path onto the destination path; `src` and `dst` can be either strings, [LocalPaths](#) or [RemotePath](#); any combination of the three will work.

New in version 1.3: `src` can also be a list of strings/paths, in which case `dst` must not exist or be a directory.

`plumbum.path.utils.gui_open(filename)`

This selects the proper gui open function. This can also be achieved with `webbrowser`, but that is not supported.

## 5.5 Package plumbum.fs

File system utilities

Atomic file operations

**class** `plumbum.fs.atomic.AtomicFile(filename, ignore_deletion=False)`

Atomic file operations implemented using file-system advisory locks (`flock` on POSIX, `LockFile` on Windows).

---

**Note:** On Linux, the manpage says `flock` might have issues with NFS mounts. You should take this into account.

---

New in version 1.3.

**reopen()**

Close and reopen the file; useful when the file was deleted from the file system by a different process

**locked**(*blocking=True*)

A context manager that locks the file; this function is reentrant by the thread currently holding the lock.

**Parameters**

**blocking** – if True, the call will block until we can grab the file system lock. if False, the call may fail immediately with the underlying exception (IOError or WindowsError)

**delete**()

Atomically delete the file (holds the lock while doing it)

**read\_atomic**()

Atomically read the entire file

**read\_shared**()

Read the file **without** holding the lock

**write\_atomic**(*data*)

Writes the given data atomically to the file. Note that it overwrites the entire file; `write_atomic("foo")` followed by `write_atomic("bar")` will result in only "bar".

**class** `plumbum.fs.atomic.AtomicCounterFile`(*atomicfile, initial=0*)

An atomic counter based on AtomicFile. Each time you call `next()`, it will atomically read and increment the counter's value, returning its previous value

Example:

```
acf = AtomicCounterFile.open("/some/file")
print(acf.next()) # e.g., 7
print(acf.next()) # 8
print(acf.next()) # 9
```

New in version 1.3.

**classmethod** `open`(*filename*)

Shortcut for `AtomicCounterFile(AtomicFile(filename))`

**reset**(*value=None*)

Reset the counter's value to the one given. If None, it will default to the initial value provided to the constructor

**next**()

Read and increment the counter, returning its previous value

**exception** `plumbum.fs.atomic.PidFileTaken`(*msg, pid*)

This exception is raised when `PidFile.acquire` fails to lock the pid file. Note that it derives from `SystemExit`, so unless explicitly handled, it will terminate the process cleanly

**class** `plumbum.fs.atomic.PidFile`(*filename*)

A PID file is a file that's locked by some process from the moment it starts until it dies (the OS will clear the lock when the process exits). It is used to prevent two instances of the same process (normally a daemon) from running concurrently. The PID file holds its process' PID, so you know who's holding it.

New in version 1.3.

**acquire**()

Attempt to acquire the PID file. If it's already locked, raises `PidFileTaken`. You should normally acquire the file as early as possible when the program starts

**release()**

Release the PID file (should only happen when the program terminates)

**class** `plumbum.fs.mounts.MountEntry`(*dev, point, fstype, options*)

Represents a mount entry (device file, mount point and file system type)

`plumbum.fs.mounts.mount_table()`

returns the system's current mount table (a list of `MountEntry` objects)

`plumbum.fs.mounts.mounted(fs)`

Indicates if a the given filesystem (device file or mount point) is currently mounted

## 5.6 Package `plumbum.colors`

Factory for styles. Holds font styles, FG and BG objects representing colors, and imitates the FG `ColorFactory` to a large degree.

`plumbum.colors.__dir__()`

Default `dir()` implementation.

`plumbum.colors.__format__(format_spec, /)`

Default object formatter.

`plumbum.colors.__init_subclass__()`

This method is called when a class is subclassed.

The default implementation does nothing. It may be overridden to extend subclasses.

`plumbum.colors.__new__(*args, **kwargs)`

Create and return a new object. See `help(type)` for accurate signature.

`plumbum.colors.__reduce__()`

Helper for pickle.

`plumbum.colors.__reduce_ex__(protocol, /)`

Helper for pickle.

`plumbum.colors.__sizeof__()`

Size of object in memory, in bytes.

`plumbum.colors.__subclasshook__()`

Abstract classes can override this to customize `issubclass()`.

This is invoked early on by `abc.ABCMeta.__subclasscheck__()`. It should return `True`, `False` or `NotImplemented`. If it returns `NotImplemented`, the normal algorithm is used. Otherwise, it overrides the normal algorithm (and the outcome is cached).

### 5.6.1 plumbum.colorlib

The `ansicolor` object provides `bg` and `fg` to access colors, and attributes like `bold` and `underlined` text. It also provides `reset` to recover the normal font.

**class** `plumbum.colorlib.ANSIStyle`(*attributes=None, fgcolor=None, bgcolor=None, reset=False*)

This is a subclass for ANSI styles. Use it to get color on `sys.stdout` tty terminals on posix systems.

Set `use_color = True/False` if you want to control color for anything using this `Style`.

`__str__`()

Base `Style` does not implement a `__str__` representation. This is the one required method of a subclass.

**exception** `plumbum.colorlib.ColorNotFound`

Thrown when a color is not valid for a particular method.

`__weakref__`

list of weak references to the object (if defined)

**class** `plumbum.colorlib.HTMLStyle`(*attributes=None, fgcolor=None, bgcolor=None, reset=False*)

This was meant to be a demo of subclassing `Style`, but actually can be a handy way to quickly color html text.

`end = '<br/>\n'`

The endline character. Override if needed in subclasses.

`__str__`()

Base `Style` does not implement a `__str__` representation. This is the one required method of a subclass.

**class** `plumbum.colorlib.Style`(*attributes=None, fgcolor=None, bgcolor=None, reset=False*)

This class allows the color changes to be called directly to write them to `stdout`, `[]` calls to wrap colors (or the `.wrap` method) and can be called in a `with` statement.

**color\_class**

alias of `Color`

`end = '\n'`

The endline character. Override if needed in subclasses.

`ANSI_REG = re.compile('\x1b\[([\\d;]+)m')`

The regular expression that finds ansi codes in a string.

**property** `stdout`

This property will allow custom, class level control of `stdout`. It will use current `sys.stdout` if set to `None` (default). Unfortunately, it only works on an instance..

`__init__`(*attributes=None, fgcolor=None, bgcolor=None, reset=False*)

This is usually initialized from a factory.

`invert`()

This resets current color(s) and flips the value of all attributes present

**property** `reset`

Shortcut to access `reset` as a property.

`__copy__`()

Copy is supported, will make dictionary and colors unique.

`__invert__`()

This allows `~color`.

**\_\_add\_\_**(*other*)

Adding two matching Styles results in a new style with the combination of both. Adding with a string results in the string concatenation of a style.

Addition is non-commutative, with the rightmost Style property being taken if both have the same property. (Not safe)

**\_\_radd\_\_**(*other*)

This only gets called if the string is on the left side. (Not safe)

**wrap**(*wrap\_this*)

Wrap a string in this style and its inverse.

**\_\_and\_\_**(*other*)

This class supports `color & color2` syntax, and `color & "String"` syntax too.

**\_\_rand\_\_**(*other*)

This class supports `"String:" & color` syntax.

**\_\_ror\_\_**(*other*)

Support for `"String" | color` syntax

**\_\_or\_\_**(*other*)

This class supports `color | color2` syntax. It also supports `"color | "String"` syntax too.

**\_\_call\_\_**()

This is a shortcut to print color immediately to the stdout. (Not safe)

**now**()

Immediately writes color to stdout. (Not safe)

**print**(*\*printables*, *\*\*kargs*)

This acts like `print`; will print that argument to stdout wrapped in Style with the same syntax as the `print` function in 3.4.

**print\_**(*\*printables*, *\*\*kargs*)

DEPRECATED: Shortcut from classic Python 2

**\_\_getitem\_\_**(*wrapped*)

The `[]` syntax is supported for wrapping

**\_\_enter\_\_**()

Context manager support

**\_\_exit\_\_**(*\_type*, *\_value*, *\_traceback*)

Runs even if exception occurred, does not catch it.

**property ansi\_codes**

Generates the full ANSI code sequence for a Style

**property ansi\_sequence**

This is the string ANSI sequence.

**\_\_repr\_\_**()

Return `repr(self)`.

**\_\_eq\_\_**(*other*)

Equality is true only if `reset`, or if `attributes`, `fg`, and `bg` match.

**abstract \_\_str\_\_()**

Base Style does not implement a `__str__` representation. This is the one required method of a subclass.

**classmethod from\_ansi(*ansi\_string*, *filter\_resets=False*)**

This generated a style from an ansi string. Will ignore resets if `filter_resets` is `True`.

**add\_ansi(*sequence*, *filter\_resets=False*)**

Adds a sequence of ansi numbers to the class. Will ignore resets if `filter_resets` is `True`.

**classmethod string\_filter\_ansi(*colored\_string*)**

Filters out colors in a string, returning only the name.

**classmethod string\_contains\_colors(*colored\_string*)**

Checks to see if a string contains colors.

**to\_representation(*rep*)**

This converts both colors to a specific representation

**limit\_representation(*rep*)**

This only converts if true representation is higher

**property basic**

The color in the 8 color representation.

**property simple**

The color in the 16 color representation.

**property full**

The color in the 256 color representation.

**property true**

The color in the true color representation.

**\_\_hash\_\_ = None**

**class plumbum.colorlib.StyleFactory(*style*)**

Factory for styles. Holds font styles, FG and BG objects representing colors, and imitates the FG ColorFactory to a large degree.

**\_\_init\_\_(*style*)**

**property use\_color**

Shortcut for setting color usage on Style

**from\_ansi(*ansi\_sequence*)**

Calling this is a shortcut for creating a style from an ANSI sequence.

**property stdout**

This is a shortcut for getting stdout from a class without an instance.

**get\_colors\_from\_string(*color=""*)**

Sets color based on string, use `.` or `space` for separator, and numbers, fg/bg, htmlcodes, etc all accepted (as strings).

**filter(*colored\_string*)**

Filters out colors in a string, returning only the name.

**contains\_colors**(*colored\_string*)

Checks to see if a string contains colors.

**extract**(*colored\_string*)

Gets colors from an ansi string, returns those colors

**plumbum.colorlib.main()**

Color changing script entry. Call using python3 -m plumbum.colors, will reset if no arguments given.

## 5.6.2 plumbum.colorlib.styles

This file provides two classes, *Color* and *Style*.

Color is rarely used directly, but merely provides the workhorse for finding and manipulating colors.

With the Style class, any color can be directly called or given to a with statement.

**class** plumbum.colorlib.styles.**Color**(*r\_or\_color=None, g=None, b=None, fg=True*)

Loaded with (r, g, b, fg) or (color, fg=fg). The second signature is a short cut and will try full and hex loading.

This class stores the idea of a color, rather than a specific implementation. It provides as many different tools for representations as possible, and can be subclassed to add more representations, though that should not be needed for most situations. `.from_` class methods provide quick ways to create colors given different representations. You will not usually interact with this class.

Possible colors:

```
reset = Color() # The reset color by default
background_reset = Color(fg=False) # Can be a background color
blue = Color(0,0,255) # Red, Green, Blue
green = Color.from_full("green") # Case insensitive name, from large colorset
red = Color.from_full(1) # Color number
white = Color.from_html("#FFFFFF") # HTML supported
yellow = Color.from_simple("red") # Simple colorset
```

The attributes are:

**reset**

True if this is a reset color (following attributes don't matter if True)

**rgb**

The red/green/blue tuple for this color

**simple**

If true will stay to 16 color mode.

**number**

The color number given the mode, closest to rgb if not rgb not exact, gives position of closest name.

**fg**

This is a foreground color if True. Background color if False.

**\_\_init\_\_**(*r\_or\_color=None, g=None, b=None, fg=True*)

This works from color values, or tries to load non-simple ones.



**number**

Number of the original color, or closest color

**representation**

0 for off, 1 for 8 colors, 2 for 16 colors, 3 for 256 colors, 4 for true color

**exact**

This is false if the named color does not match the real color

**classmethod from\_simple**(color, fg=True)

Creates a color from simple name or color number

**classmethod from\_full**(color, fg=True)

Creates a color from full name or color number

**classmethod from\_hex**(color, fg=True)

Converts #123456 values to colors.

**property name**

The (closest) name of the current color

**property name\_camelcase**

The camelcase name of the color

**\_\_repr\_\_**()

This class has a smart representation that shows name and color (if not unique).

**\_\_eq\_\_**(other)

Reset colors are equal, otherwise rgb have to match.

**property ansi\_sequence**

This is the ansi sequence as a string, ready to use.

**property ansi\_codes**

This is the full ANSI code, can be reset, simple, 256, or full color.

**property hex\_code**

This is the hex code of the current color, html style notation.

**\_\_str\_\_**()

This just prints it's simple name

**to\_representation**(val)

Converts a color to any representation

**limit\_representation**(val)

Only converts if val is lower than representation

**\_\_hash\_\_** = None**class** plumbum.colorlib.styles.**Style**(attributes=None, fgcolor=None, bgcolor=None, reset=False)

This class allows the color changes to be called directly to write them to stdout, [] calls to wrap colors (or the .wrap method) and can be called in a with statement.

**color\_class**

The class of color to use. Never hardcode Color call when writing a Style method.

alias of `Color`

**end** = '\n'

The endline character. Override if needed in subclasses.

**ANSI\_REG** = `re.compile('\x1b\[([\\d;]+)m')`

The regular expression that finds ansi codes in a string.

**property stdout**

This property will allow custom, class level control of stdout. It will use current sys.stdout if set to None (default). Unfortunately, it only works on an instance..

**\_\_init\_\_**(*attributes=None, fgcolor=None, bgcolor=None, reset=False*)

This is usually initialized from a factory.

**invert**()

This resets current color(s) and flips the value of all attributes present

**property reset**

Shortcut to access reset as a property.

**\_\_copy\_\_**()

Copy is supported, will make dictionary and colors unique.

**\_\_invert\_\_**()

This allows ~color.

**\_\_add\_\_**(*other*)

Adding two matching Styles results in a new style with the combination of both. Adding with a string results in the string concatenation of a style.

Addition is non-commutative, with the rightmost Style property being taken if both have the same property. (Not safe)

**\_\_radd\_\_**(*other*)

This only gets called if the string is on the left side. (Not safe)

**wrap**(*wrap\_this*)

Wrap a string in this style and its inverse.

**\_\_and\_\_**(*other*)

This class supports color & color2 syntax, and color & "String" syntax too.

**\_\_rand\_\_**(*other*)

This class supports "String:" & color syntax.

**\_\_ror\_\_**(*other*)

Support for "String" | color syntax

**\_\_or\_\_**(*other*)

This class supports color | color2 syntax. It also supports "color | "String" syntax too.

**\_\_call\_\_**()

This is a shortcut to print color immediately to the stdout. (Not safe)

**now**()

Immediately writes color to stdout. (Not safe)

**print**(\**printables*, \*\**kargs*)

This acts like print; will print that argument to stdout wrapped in Style with the same syntax as the print function in 3.4.

**print\_**(*\*printables, \*\*kargs*)

DEPRECATED: Shortcut from classic Python 2

**\_\_getitem\_\_**(*wrapped*)

The [] syntax is supported for wrapping

**\_\_enter\_\_**()

Context manager support

**\_\_exit\_\_**(*\_type, \_value, \_traceback*)

Runs even if exception occurred, does not catch it.

**property ansi\_codes**

Generates the full ANSI code sequence for a Style

**property ansi\_sequence**

This is the string ANSI sequence.

**\_\_repr\_\_**()

Return repr(self).

**\_\_eq\_\_**(*other*)

Equality is true only if reset, or if attributes, fg, and bg match.

**abstract \_\_str\_\_**()

Base Style does not implement a \_\_str\_\_ representation. This is the one required method of a subclass.

**classmethod from\_ansi**(*ansi\_string, filter\_resets=False*)

This generated a style from an ansi string. Will ignore resets if filter\_resets is True.

**add\_ansi**(*sequence, filter\_resets=False*)

Adds a sequence of ansi numbers to the class. Will ignore resets if filter\_resets is True.

**classmethod string\_filter\_ansi**(*colored\_string*)

Filters out colors in a string, returning only the name.

**classmethod string\_contains\_colors**(*colored\_string*)

Checks to see if a string contains colors.

**to\_representation**(*rep*)

This converts both colors to a specific representation

**limit\_representation**(*rep*)

This only converts if true representation is higher

**property basic**

The color in the 8 color representation.

**property simple**

The color in the 16 color representation.

**property full**

The color in the 256 color representation.

**property true**

The color in the true color representation.

**\_\_hash\_\_** = None

**class** plumbum.colorlib.styles.**ANSISStyle**(*attributes=None, fgcolor=None, bgcolor=None, reset=False*)

This is a subclass for ANSI styles. Use it to get color on sys.stdout tty terminals on posix systems.

Set `use_color = True/False` if you want to control color for anything using this Style.

**\_\_str\_\_**()

Base Style does not implement a `__str__` representation. This is the one required method of a subclass.

**class** plumbum.colorlib.styles.**HTMLStyle**(*attributes=None, fgcolor=None, bgcolor=None, reset=False*)

This was meant to be a demo of subclassing Style, but actually can be a handy way to quickly color html text.

**end** = '<br/>\n'

The endline character. Override if needed in subclasses.

**\_\_str\_\_**()

Base Style does not implement a `__str__` representation. This is the one required method of a subclass.

**exception** plumbum.colorlib.styles.**ColorNotFound**

Thrown when a color is not valid for a particular method.

**\_\_weakref\_\_**

list of weak references to the object (if defined)

**exception** plumbum.colorlib.styles.**AttributeNotFound**

Similar to color not found, only for attributes.

**\_\_weakref\_\_**

list of weak references to the object (if defined)

## 5.6.3 plumbum.colorlib.factories

Color-related factories. They produce Styles.

**class** plumbum.colorlib.factories.**ColorFactory**(*fg, style*)

This creates color names given `fg = True/False`. It usually will be called as part of a StyleFactory.

**\_\_init\_\_**(*fg, style*)

**\_\_getattr\_\_**(*item*)

Full color names work, but do not populate `__dir__`.

**full**(*name*)

Gets the style for a color, using standard name procedure: either full color name, html code, or number.

**simple**(*name*)

Return the extended color scheme color for a value or name.

**rgb**(*r, g=None, b=None*)

Return the extended color scheme color for a value.

**hex**(*hexcode*)

Return the extended color scheme color for a value.

**ansi**(*ansiseg*)

Make a style from an ansi text sequence

**\_\_getitem\_\_**(*val*)

Shortcut to provide way to access colors numerically or by slice. If end <= 16, will stay to simple ANSI version.

**\_\_call\_\_**(*val\_or\_r=None, g=None, b=None*)

Shortcut to provide way to access colors.

**\_\_iter\_\_**()

Iterates through all colors in extended colorset.

**\_\_invert\_\_**()

Allows clearing a color with ~

**\_\_enter\_\_**()

This will reset the color on leaving the with statement.

**\_\_exit\_\_**(*\_type: Any, \_value: Any, \_traceback: Any*) → None

This resets a FG/BG color or all styles, due to different definition of RESET for the factories.

**\_\_repr\_\_**()

Simple representation of the class by name.

**\_\_weakref\_\_**

list of weak references to the object (if defined)

**class** plumbum.colorlib.factories.**StyleFactory**(*style*)

Factory for styles. Holds font styles, FG and BG objects representing colors, and imitates the FG ColorFactory to a large degree.

**\_\_init\_\_**(*style*)

**property** **use\_color**

Shortcut for setting color usage on Style

**from\_ansi**(*ansi\_sequence*)

Calling this is a shortcut for creating a style from an ANSI sequence.

**property** **stdout**

This is a shortcut for getting stdout from a class without an instance.

**get\_colors\_from\_string**(*color=""*)

Sets color based on string, use . or space for separator, and numbers, fg/bg, htmlcodes, etc all accepted (as strings).

**filter**(*colored\_string*)

Filters out colors in a string, returning only the name.

**contains\_colors**(*colored\_string*)

Checks to see if a string contains colors.

**extract**(*colored\_string*)

Gets colors from an ansi string, returns those colors

### 5.6.4 plumbum.colorlib.names

Names for the standard and extended color set. Extended set is similar to [vim wiki](#), [colored](#), etc. Colors based on [wikipedia](#).

You can access the index of the colors with `names.index(name)`. You can access the rgb values with `r=int(html[n][1:3],16)`, etc.

`plumbum.colorlib.names.color_codes_simple = [0, 1, 2, 3, 4, 5, 6, 7, 60, 61, 62, 63, 64, 65, 66, 67]`

Simple colors, remember that reset is #9, second half is non as common.

**class** `plumbum.colorlib.names.FindNearest(r: int, g: int, b: int)`

This is a class for finding the nearest color given rgb values. Different find methods are available.

`__init__(r: int, g: int, b: int) → None`

`only_basic()`

This will only return the first 8 colors! Breaks the colorspace into cubes, returns color

`all_slow(color_slice: slice = slice(None, None, None)) → int`

This is a slow way to find the nearest color.

`only_colorblock() → int`

This finds the nearest color based on block system, only works for 17-232 color values.

`only_simple() → int`

Finds the simple color-block color.

`only_grey() → int`

Finds the greyscale color.

`all_fast() → int`

Runs roughly 8 times faster than the slow version.

`__weakref__`

list of weak references to the object (if defined)

`plumbum.colorlib.names.from_html(color: str) → Tuple[int, int, int]`

Convert html hex code to rgb.

`plumbum.colorlib.names.to_html(r, g, b)`

Convert rgb to html hex code.

## 5.7 Colorlib design

New in version 1.6.

The purpose of this document is to describe the system that `plumbum.colors` implements. This system was designed to be flexible and to allow implementing new color backends. Hopefully this document will allow future work on `colorlib` to be as simple as possible.

---

**Note:** Enabling color

`plumbum.colors` tries to guess the color output settings of your system. You can force the use of color globally by setting `colors.use_color=True` See [256 Color Support](#) for more options.

---

### 5.7.1 Generating colors

Styles are accessed through the `colors` object, which is an instance of a `StyleFactory`. The `colors` object is actually an imitation module that wraps `plumbum.colorlib.ansicolors` with module-like access. Thus, things like `from plumbum.colors.bg import red` work also. The library actually lives in `plumbum.colorlib`.

#### Style Factory

The `colors` object has the following available objects:

##### **fg and bg**

The foreground and background colors, reset to default with `colors.fg.reset` or `~colors.fg` and likewise for `bg`. These are `ColorFactory` instances.

##### **bold, dim, underline, italics, reverse, strikeout, and hidden**

All the *ANSI* modifiers are available, as well as their negations, such as `~colors.bold` or `colors.bold.reset`, etc. (These are generated automatically based on the `Style` attached to the factory.)

##### **reset**

The global reset will restore all properties at once.

##### **do\_nothing**

Does nothing at all, but otherwise acts like any `Style` object. It is its own inverse. Useful for `cli` properties.

The `colors` object can be used in a `with` statement, which resets all styles on leaving the statement body. Although factories do support some of the same methods as a `Style`, their primary purpose is to generate `Styles`. The `colors` object has a `use_color` property that can be set to force the use of color. A `stdout` property is provided to make changing the output of color statement easier. A `colors.from_ansi(code)` method allows you to create a `Style` from any `ansi` sequence, even complex or combined ones.

#### Color Factories

The `colors.fg` and `colors.bg` are `ColorFactory`'s. In fact, the `colors` object itself acts exactly like the `colors.fg` object, with the exception of the properties listed above.

Named foreground colors are available directly as methods. The first 16 primary colors, `black`, `red`, `green`, `yellow`, `blue`, `magenta`, `cyan`, etc, as well as `reset`, are available. All 256 color names are available, but do not populate factory directly, so that auto-completion gives reasonable results. You can also access colors using strings and do `colors[string]`. Capitalization, underscores, and spaces (for strings) will be ignored.

You can also access colors numerically with `colors(n)` or `colors[n]` with the extended 256 color codes. The former will default to simple versions of colors for the first 16 values. The later notation can also be used to slice. Full hex codes can be used, too. If no match is found, these will be the true 24 bit color value.

The `fg` and `bg` also can be put in with statements, and they will restore the foreground and background color only, respectively.

`colors.rgb(r,g,b)` will create a color from an input red, green, and blue values (integers from 0-255). `colors.rgb(code)` will allow you to input an html style hex sequence. These work on `fg` and `bg` too. The `repr` of styles is smart and will show you the closest color to the one you selected if you didn't exactly select a color through RGB.

### 5.7.2 Style manipulations

Safe color manipulations refer to changes that reset themselves at some point. Unsafe manipulations must be manually reset, and can leave your terminal color in an unreadable state if you forget to reset the color or encounter an exception. If you do get the color unset on a terminal, the following, typed into the command line, will restore it:

```
$ python3 -m plumbum.colors
```

This also supports command line access to unsafe color manipulations, such as

```
$ python3 -m plumbum.colors blue
$ python3 -m plumbum.colors bg red
$ python3 -m plumbum.colors fg 123
$ python3 -m plumbum.colors bg reset
$ python3 -m plumbum.colors underline
```

You can use any path or number available as a style.

#### Unsafe Manipulation

Styles have two unsafe operations: Concatenation (with + and a string) and calling `.now()` without arguments (directly calling a style without arguments is also a shortcut for `.now()`). These two operations do not restore normal color to the terminal by themselves. To protect their use, you should always use a context manager around any unsafe operation.

An example of the usage of unsafe colors manipulations inside a context manager:

```
from plumbum import colors

with colors:
    colors.fg.red.now()
    print('This is in red')
    colors.green.now()
    print('This is green ' + colors.underline + 'and now also underlined!')
    print('Underlined' + colors.underline.reset + ' and not underlined but still red')
print('This is completely restored, even if an exception is thrown!')
```

Output:

We can use `colors` instead of `colors.fg` for foreground colors. If we had used `colors.fg` as the context manager, then non-foreground properties, such as `colors.underline` or `colors.bg.yellow`, would not have reset those properties. Each attribute, as well as `fg`, `bg`, and `colors` all have inverses in the ANSI standard. They are accessed with `~` or `.reset`, and can be used to manually make these operations safer, but there is a better way.



## Safe Manipulation

All other operations are safe; they restore the color automatically. The first, and hopefully already obvious one, is using a Style rather than a `colors` or `colors.fg` object in a `with` statement. This will set the color (using `sys.stdout` by default) to that color, and restore color on leaving.

The second method is to manually wrap a string. This can be done with `color.wrap("string")` or `color["string"]`. These produce strings that can be further manipulated or printed.

Finally, you can also print a color to stdout directly using `color.print("string")`. This has the same syntax as the `print` function.

An example of safe manipulations:

```
colors.fg.yellow('This is yellow', end='')
print(' And this is normal again.')
with colors.red:
    print('Red color!')
    with colors.bold:
        print("This is red and bold.")
        print("Not bold, but still red.")
print("Not red color or bold.")
print((colors.magenta & colors.bold)["This is bold and colorful!"], "And this is not.")
```

Output:

## Style Combinations

You can combine styles with `&` and they will create a new combined Style object. Colors will not be “summed” or otherwise combined; the rightmost color will be used (this matches the expected effect of applying the Styles individually to the strings). However, combined Styles are intelligent and know how to reset just the properties that they contain. As you have seen in the example above, the combined style (`colors.magenta & colors.bold`) can be used in any way a normal Style can. Since wrapping is done with `|`, the Python order of operations causes styles to be combined first, then wrapping is done last.

### 5.7.3 256 Color Support

While this library supports full 24 bit colors through escape sequences, the library has special support for the “full” 256 colorset through numbers, names or HEX html codes. Even if you use 24 bit color, the closest name is displayed in the `repr`. You can access the colors as `colors.fg.Light_Blue`, `colors.fg.lightblue`, `colors.fg[12]`, `colors.fg('Light_Blue')`, `colors.fg('LightBlue')`, or `colors.fg('#0000FF')`. You can also iterate or slice the `colors`, `colors.fg`, or `colors.bg` objects. Slicing even intelligently downgrades to the simple version of the codes if it is within the first 16 elements. The supported colors are:

If you want to enforce a specific representation, you can use `.basic` (8 color), `.simple` (16 color), `.full` (256 color), or `.true` (24 bit color) on a Style, and the colors in that Style will conform to the output representation and name of the best match color. The internal RGB colors are remembered, so this is a non-destructive operation.

To limit the use of color to one of these styles, set `colors.use_color` to 1 for 8 colors, 2 for 16 colors, 3 for 256 colors, or 4 for true color. It will be guessed based on your system on initialisation.

### 5.7.4 The Classes

The library consists of three primary classes, the `Color` class, the `Style` class, and the `StyleFactory` class. The following portion of this document is primarily dealing with the working of the system, and is meant to facilitate extensions or work on the system.

The `Color` class provides meaning to the concept of color, and can provide a variety of representations for any color. It can be initialised from r,g,b values, or hex codes, 256 color names, or the simple color names via classmethods. If initialized without arguments, it is the reset color. It also takes an `fg` `True/False` argument to indicate which color it is. You probably will not be interacting with the `Color` class directly, and you probably will not need to subclass it, though new extensions to the representations it can produce are welcome.

The `Style` class hold two colors and a dictionary of attributes. It is the workhorse of the system and is what is produced by the `colors` factory. It holds `Color` as `.color_class`, which can be overridden by subclasses (again, this usually is not needed). To create a color representation, you need to subclass `Style` and give it a working `__str__` definition. `ANSIStyle` is derived from `Style` in this way.

The factories, `ColorFactory` and `StyleFactory`, are factory classes that are meant to provide simple access to 1 style `Style` classes. To use, you need to initialize an object of `StyleFactory` with your intended `Style`. For example, `colors` is created by:

```
colors = StyleFactory(ANSIStyle)
```

#### Subclassing Style

For example, if you wanted to create an `HTMLStyle` and `HTMLcolors`, you could do:

```
class HTMLStyle(Style):
    attribute_names = dict(bold='b', li='li', code='code')
    end = '<br/>\n'

    def __str__(self):
        result = ''

        if self.bg and not self.bg.reset:
            result += f'<span style="background-color: {self.bg.hex_code}">'
        if self.fg and not self.fg.reset:
            result += f'<font color="{self.fg.hex_code}">'
        for attr in sorted(self.attributes):
            if self.attributes[attr]:
                result += '<' + self.attribute_names[attr] + '>'

        for attr in reversed(sorted(self.attributes)):
            if not self.attributes[attr]:
                result += '</' + self.attribute_names[attr].split()[0] + '>'
        if self.fg and self.fg.reset:
            result += '</font>'
        if self.bg and self.bg.reset:
            result += '</span>'

        return result

htmlcolors = StyleFactory(HTMLStyle)
```

This doesn't support global resets, since that's not how HTML works, but otherwise is a working implementation. This is an example of how easy it is to add support for other output formats.

An example of usage:

```
>>> htmlcolors.bold & htmlcolors.red | "This is colored text"
'<font color="#800000"><b>This is colored text</b></font>'
```

The above color table can be generated with:

```
for color in htmlcolors:
    htmlcolors.li(
        "&#x25a0;" | color,
        color.fg.hex_code | htmlcolors.code,
        color.fg.name_camelcase)
```

---

**Note:** HTMLStyle is implemented in the library, as well, with the htmlcolors object available in plumbum.colorlib. It was used to create the colored output in this document, with small changes because colors.reset cannot be supported with HTML.

---

### 5.7.5 See Also

- **colored** Another library with 256 color support
- **colorama** A library that supports colored text on Windows,  
can be combined with Plumbum.colors (if you force use\_color, doesn't support all extended colors)

---

**Note:** The local object is an instance of a machine.

---



## ABOUT

The original purpose of Plumbum was to enable local and remote program execution with ease, assuming nothing fancier than good-old SSH. On top of this, a file-system abstraction layer was devised, so that working with local and remote files would be seamless.

I've toyed with this idea for some time now, but it wasn't until I had to write build scripts for a project I've been working on that I decided I've had it with shell scripts and it's time to make it happen. Plumbum was born from the scraps of the `Path` class, which I wrote for the aforementioned build system, and the `SshContext` and `SshTunnel` classes that I wrote for [RPyC](#). When I combined the two with *shell combinators* (because shell scripts do have an edge there) the magic happened and here we are.



## CREDITS

The project has been inspired by **PBS** (now called `sh`) of [Andrew Moffat](#), and has borrowed some of his ideas (namely treating programs like functions and the nice trick for importing commands). However, I felt there was too much magic going on in PBS, and that the syntax wasn't what I had in mind when I came to write shell-like programs. I contacted Andrew about these issues, but he wanted to keep PBS this way. Other than that, the two libraries go in different directions, where Plumbum attempts to provide a more wholesome approach.

Plumbum also pays tribute to [Rotem Yaari](#) who suggested a library code-named `pyplatform` for that very purpose, but which had never materialized.





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