

Installing Python

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1 Abstract

This document is about installing Python from source.

1.1 History

Version	Date	Notes
0.1.3	2024-01-29	Fix line breaks
0.1.2	2024-01-25	Python 3.12.1 on Debian 12 Bookworm
0.1.1	2023-08-02	Typos
0.1.0	2022-03-11	Initial release (Python 3.10.2, Debian Stretch)

2 Python v3.12.1 on Debian 12 Bookworm from Source

2.1 Dependencies

```
aptitude install make build-essential libssl-dev zlib1g-dev \  
libbz2-dev libreadline-dev libsqlite3-dev wget curl llvm \  
libncurses5-dev libncursesw5-dev xz-utils tk-dev
```

2.2 Deciding the Version

Look at <https://www.python.org/ftp/python/> to chose the version of Python you would like to compile.

2.3 Getting the Source

```
export VER=3.12.1  
export DIR=Python-$VER  
export TAR=$DIR.tar.xz  
export URL=https://www.python.org/ftp/python/$VER/$TAR  
mkdir -p src  
mkdir -p build  
cd src  
wget $URL  
cd ../build  
tar xvJf ../src/$TAR  
cd $DIR
```

2.4 Configure

The `--enable-optimizations` flag will enable some optimizations within Python to make it run about 10 percent faster. Doing this may add twenty or thirty minutes to the

compilation time. The `--with-ensurepip=install` flag will install pip bundled with this installation.

This might take 10-20 seconds:

```
1 cd /srv/build/$DIR
2 ./configure --enable-optimizations --with-ensurepip=install
```

2.5 Build

This might take 2-3 hours (2:37h for a 2014 PC)

```
1 make -j 4
```

This takes about 15 minutes on a “AMD FX(tm)-4300” Quad-Core Processor and 17 minutes on an AMD Athlon(tm) X2 Dual Core Processor BE-2400.

2.6 Build Tests

Test the build with `make test` that executes 427 tests. This might need an internet connection. The tests are more demanding to the system as the compilation.

```
make test
```

The output with `time` might look like on an AMD dual core BE-2400:

```
1 == Tests result: SUCCESS ==
2
3 20 tests skipped:
4     test.test_asyncio.test_windows_events
5     test.test_asyncio.test_windows_utils test.test_gdb.test_backtrace
6     test.test_gdb.test_cfunction test.test_gdb.test_cfunction_full
7     test.test_gdb.test_misc test.test_gdb.test_pretty_print
8     test_dbm_gnu test_dbm_ndbm test_devpoll test_ioctl test_kqueue
9     test_launcher test_lzma test_msilib test_startfile
10    test_winconsoleio test_winreg test_wmi test_zoneinfo
11
12 6 tests skipped (resource denied):
13     test_ossaudiodev test_tix test_tkinter test_ttk test_winsound
14     test_zipfile64
15
16 463 tests OK.
```

```
17
18 Total duration: 15 min 11 sec
19 Total tests: run=40,432 skipped=1,270
20 Total test files: run=483/489 skipped=20 resource_denied=6
21 Result: SUCCESS
22 make test 1452.83s user 171.06s system 177% cpu 15:12.57 total
```

See ‘Python v3.10.2 on Debian Stretch from Source’ for different test invocations and alternative installation.

3 Python v3.10.2 on Debian Stretch from Source

This guide will probably also be valid for more recent versions of Debian.

3.1 Dependencies

```
aptitude install make build-essential libssl-dev zlib1g-dev \
libbz2-dev libreadline-dev libsqlite3-dev wget curl llvm \
libncurses5-dev libncursesw5-dev xz-utils tk-dev
```

3.2 Getting the Source

Look at <https://www.python.org/ftp/python/> for the desired or latest version.

```
export VER=3.10.2
export DIR=Python-$VER
export TAR=$DIR.tar.xz
export URL=https://www.python.org/ftp/python/$VER/$TAR
mkdir src build
cd src
wget $URL
cd ../build
tar xvjf ../src/$TAR
cd $DIR
```

3.3 Configure

The `--enable-optimizations` flag will enable some optimizations within Python to make it run about 10 percent faster. Doing this may add twenty or thirty minutes to the compilation time. The `--with-ensurepip=install` flag will install pip bundled with this installation.

This might take 10-20 seconds:

```
1 cd /srv/build/$DIR
2 ./configure --enable-optimizations --with-ensurepip=install
```

This might take 2-3 hours (2:37h for a 2014 PC)

```
1 make -j 4
```

Test the build with 427 tests. This might need an internet connection.

```
make test
```

The output might look like:

```
1 == Tests result: SUCCESS ==
2
3 407 tests OK.
4
5 20 tests skipped:
6     test_dbm_gnu test_dbm_ndbm test_devpoll test_gdb test_ioctl
7     test_kqueue test_lzma test_msilib test_ossaudiodev test_smtplib
8     test_ssl test_startfile test_tix test_tk test_ttk_guionly
9     test_winconsoleio test_winreg test_winsound test_zipfile64
10    test_zoneinfo
11
12 Total duration: 4 min 23 sec
13 Tests result: SUCCESS
```

The build binary is located at `build/$DIR/python` and a test can be executed with the `-m` option. This is basically the same as `make test`.

```
1 ./python -m test
```

```
1 == Tests result: SUCCESS ==
2
3 403 tests OK.
4
5 24 tests skipped:
6     test_curses test_dbm_gnu test_dbm_ndbm test_devpoll test_gdb
```

```
7     test_queue test_lzma test_msilib test_ossaudiodev test_smtpnet
8     test_socketserver test_ssl test_startfile test_tix test_tk
9     test_ttk_guionly test_urllib2net test_urllibnet test_winconsoleio
10    test_winreg test_winsound test_xmlrpc_net test_zipfile64
11    test_zoneinfo
12
13 Total duration: 24 min 17 sec
14 Tests result: SUCCESS
```

Interestingly `./python -m test` runs less tests than `make test`.

If you just want to use Python in a limited way, you are done. Maybe write an environment to source and put the new python version in your path.

If you need all functionality you might use the `altinstall` target here to avoid overwriting the system Python. Since you are installing into `/usr/local`, you will need to run as root (alternatively use `--prefix` with `./configure`):

```
1 make altinstall
```

This will result in a bunch of warnings

```
1 WARNING: Value for scheme.headers does not match. Please report this to \
2 <https://github.com/pypa/pip/issues/10151>
3 distutils: /usr/local/include/python3.10/UNKNOWN
4 sysconfig: /srv/build/Python-3.10.2/Include/UNKNOWN
5 WARNING: Additional context:
6 user = False
7 home = None
8 root = '/'
9 prefix = None
10 Looking in links: /tmp/tmpw4wp92
11 Processing /tmp/tmpw4wp92/setuptools-58.1.0-py3-none-any.whl
12 Processing /tmp/tmpw4wp92/pip-21.2.4-py3-none-any.whl
13 Installing collected packages: setuptools, pip
14 WARNING: Value for scheme.headers does not match. Please report this to \
15 <https://github.com/pypa/pip/issues/10151>
16 distutils: /usr/local/include/python3.10/setuptools
17 sysconfig: /srv/build/Python-3.10.2/Include/setuptools
18 WARNING: Value for scheme.headers does not match. Please report this to \
19 <https://github.com/pypa/pip/issues/10151>
20 distutils: /usr/local/include/python3.10/pip
21 sysconfig: /srv/build/Python-3.10.2/Include/pip
22 Successfully installed pip-21.2.4 setuptools-58.1.0
23 WARNING: Running pip as the 'root' user can result in broken permissions and
```

```
24     \
    conflicting behaviour with the system package manager. It is recommended
    to \
25     use a virtual environment instead: https://pip.pypa.io/warnings/venv
```

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