

## :mod:`subprocess` --- Subprocess management

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 1); [backlink](#)

Unknown interpreted text role "mod".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 4)

Unknown directive type "module".

```
.. module:: subprocess
   :synopsis: Subprocess management.
```

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 7)

Unknown directive type "moduleauthor".

```
.. moduleauthor:: Peter Åstrand <astrand@lysator.liu.se>
```

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 8)

Unknown directive type "sectionauthor".

```
.. sectionauthor:: Peter Åstrand <astrand@lysator.liu.se>
```

Source code: `:source: Lib/subprocess.py`

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 10); [backlink](#)

Unknown interpreted text role "source".

The `:mod:`subprocess`` module allows you to spawn new processes, connect to their input/output/error pipes, and obtain their return codes. This module intends to replace several older modules and functions:

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 14); [backlink](#)

Unknown interpreted text role "mod".

```
os.system
os.spawn*
```

Information about how the `:mod:`subprocess`` module can be used to replace these modules and functions can be found in the following sections.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 21); [backlink](#)

Unknown interpreted text role "mod".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 24)

Unknown directive type "seealso".

```
.. seealso::

   :pep:`324` -- PEP proposing the subprocess module
```

### Using the `:mod:`subprocess`` Module

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 29); [backlink](#)

Unknown interpreted text role "mod".

The recommended approach to invoking subprocesses is to use the `:func:`run`` function for all use cases it can handle. For more advanced use cases, the underlying `:class:`Popen`` interface can be used directly.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 32); [backlink](#)**

Unknown interpreted text role "func".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 32); [backlink](#)**

Unknown interpreted text role "class".

The `func:run` function was added in Python 3.5; if you need to retain compatibility with older versions, see the `ref:call-function-trio` section.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 36); [backlink](#)**

Unknown interpreted text role "func".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 36); [backlink](#)**

Unknown interpreted text role "ref".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 40)**

Unknown directive type "function".

```
.. function:: run(args, *, stdin=None, input=None, stdout=None, stderr=None, \
    capture_output=False, shell=False, cwd=None, timeout=None, \
    check=False, encoding=None, errors=None, text=None, env=None, \
    universal_newlines=None, **other_popen_kwargs)
```

Run the command described by `*args*`. Wait for command to complete, then return a `:class:`CompletedProcess`` instance.

The arguments shown above are merely the most common ones, described below in the abbreviated signature). The full function signature is largely the same as that of the `:class:`Popen`` constructor - most of the arguments to this function are passed through to that interface. (`*timeout*`, `*input*`, `*check*`, and `*capture_output*` are not.)

If `*capture_output*` is true, `stdout` and `stderr` will be captured. When used, the internal `:class:`Popen`` object is automatically created with ```stdout=PIPE``` and ```stderr=PIPE```. The `*stdout*` and `*stderr*` arguments may not be supplied at the same time as `*capture_output*`. If you wish to capture and combine both streams into one, use ```stdout=PIPE``` and ```stderr=STDOUT``` instead of `*capture_output*`.

The `*timeout*` argument is passed to `:meth:`Popen.communicate``. If the timeout expires, the child process will be killed and waited for. The `:exc:`TimeoutExpired`` exception will be re-raised after the child process has terminated.

The `*input*` argument is passed to `:meth:`Popen.communicate`` and thus to the subprocess's `stdin`. If used it must be a byte sequence, or a string if `*encoding*` or `*errors*` is specified or `*text*` is true. When used, the internal `:class:`Popen`` object is automatically created with ```stdin=PIPE```, and the `*stdin*` argument may not be used as well.

If `*check*` is true, and the process exits with a non-zero exit code, a `:exc:`CalledProcessError`` exception will be raised. Attributes of that exception hold the arguments, the exit code, and `stdout` and `stderr` if they were captured.

If `*encoding*` or `*errors*` are specified, or `*text*` is true, file objects for `stdin`, `stdout` and `stderr` are opened in text mode using the specified `*encoding*` and `*errors*` or the `:class:`io.TextIOWrapper`` default. The `*universal_newlines*` argument is equivalent to `*text*` and is provided for backwards compatibility. By default, file objects are opened in binary mode.

If `*env*` is not ```None```, it must be a mapping that defines the environment variables for the new process; these are used instead of the default behavior of inheriting the current process' environment. It is passed directly to `:class:`Popen``.

Examples::

```
>>> subprocess.run(["ls", "-l"]) # doesn't capture output
CompletedProcess(args=['ls', '-l'], returncode=0)

>>> subprocess.run("exit 1", shell=True, check=True)
Traceback (most recent call last):
...
subprocess.CalledProcessError: Command 'exit 1' returned non-zero exit status 1

>>> subprocess.run(["ls", "-l", "/dev/null"], capture_output=True)
CompletedProcess(args=['ls', '-l', '/dev/null'], returncode=0,
stdout=b'crw-rw-rw- 1 root root 1, 3 Jan 23 16:23 /dev/null\n', stderr=b'')
```

```
.. versionadded:: 3.5

.. versionchanged:: 3.6

    Added *encoding* and *errors* parameters

.. versionchanged:: 3.7

    Added the *text* parameter, as a more understandable alias of *universal_newlines*.
    Added the *capture_output* parameter.
```

The return value from `func:run`, representing a process that has finished.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 116); [backlink](#)**

Unknown interpreted text role "func".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 118)**

Unknown directive type "attribute".

```
.. attribute:: args

    The arguments used to launch the process. This may be a list or a string.
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 122)**

Unknown directive type "attribute".

```
.. attribute:: returncode

    Exit status of the child process. Typically, an exit status of 0 indicates
    that it ran successfully.

    A negative value ``-N`` indicates that the child was terminated by signal
    ``N`` (POSIX only).
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 130)**

Unknown directive type "attribute".

```
.. attribute:: stdout

    Captured stdout from the child process. A bytes sequence, or a string if
    :func:`run` was called with an encoding, errors, or text=True.
    ``None`` if stdout was not captured.

    If you ran the process with ``stderr=subprocess.STDOUT``, stdout and
    stderr will be combined in this attribute, and :attr:`stderr` will be
    ``None`.
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 140)**

Unknown directive type "attribute".

```
.. attribute:: stderr

    Captured stderr from the child process. A bytes sequence, or a string if
    :func:`run` was called with an encoding, errors, or text=True.
    ``None`` if stderr was not captured.
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 146)**

Unknown directive type "method".

```
.. method:: check_returncode()

    If :attr:`returncode` is non-zero, raise a :exc:`CalledProcessError`.
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 150)**

Unknown directive type "versionadded".

```
.. versionadded:: 3.5
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 152)**

Unknown directive type "data".

```
.. data:: DEVNULL
```

Special value that can be used as the `*stdin*`, `*stdout*` or `*stderr*` argument to `:class:`Popen`` and indicates that the special file `:data:`os.devnull`` will be used.

```
.. versionadded:: 3.3
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 161)**

Unknown directive type "data".

```
.. data:: PIPE
```

Special value that can be used as the `*stdin*`, `*stdout*` or `*stderr*` argument to `:class:`Popen`` and indicates that a pipe to the standard stream should be opened. Most useful with `:meth:`Popen.communicate``.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 168)**

Unknown directive type "data".

```
.. data:: STDOUT
```

Special value that can be used as the `*stderr*` argument to `:class:`Popen`` and indicates that standard error should go into the same handle as standard output.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 175)**

Unknown directive type "exception".

```
.. exception:: SubprocessError
```

Base class for all other exceptions from this module.

```
.. versionadded:: 3.3
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 182)**

Unknown directive type "exception".

```
.. exception:: TimeoutExpired
```

Subclass of `:exc:`SubprocessError``, raised when a timeout expires while waiting for a child process.

```
.. attribute:: cmd
```

Command that was used to spawn the child process.

```
.. attribute:: timeout
```

Timeout in seconds.

```
.. attribute:: output
```

Output of the child process if it was captured by `:func:`run`` or `:func:`check_output``. Otherwise, ```None```.

```
.. attribute:: stdout
```

Alias for output, for symmetry with `:attr:`stderr``.

```
.. attribute:: stderr
```

Stderr output of the child process if it was captured by `:func:`run``. Otherwise, ```None```.

```
.. versionadded:: 3.3
```

```
.. versionchanged:: 3.5
    *stdout* and *stderr* attributes added
```

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 214)

Unknown directive type "exception".

```
.. exception:: CalledProcessError

    Subclass of :exc:`SubprocessError`, raised when a process run by
    :func:`check_call` or :func:`check_output` returns a non-zero exit status.

    .. attribute:: returncode

        Exit status of the child process. If the process exited due to a
        signal, this will be the negative signal number.

    .. attribute:: cmd

        Command that was used to spawn the child process.

    .. attribute:: output

        Output of the child process if it was captured by :func:`run` or
        :func:`check_output`. Otherwise, ``None``.

    .. attribute:: stdout

        Alias for output, for symmetry with :attr:`stderr`.

    .. attribute:: stderr

        Stderr output of the child process if it was captured by :func:`run`.
        Otherwise, ``None``.

    .. versionchanged:: 3.5
        *stdout* and *stderr* attributes added
```

## Frequently Used Arguments

To support a wide variety of use cases, the `:class:`Popen`` constructor (and the convenience functions) accept a large number of optional arguments. For most typical use cases, many of these arguments can be safely left at their default values. The arguments that are most commonly needed are:

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 251); [backlink](#)

Unknown interpreted text role "class".

*args* is required for all calls and should be a string, or a sequence of program arguments. Providing a sequence of arguments is generally preferred, as it allows the module to take care of any required escaping and quoting of arguments (e.g. to permit spaces in file names). If passing a single string, either *shell* must be `:const:`True`` (see below) or else the string must simply name the program to be executed without specifying any arguments.

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 256); [backlink](#)

Unknown interpreted text role "const".

*stdin*, *stdout* and *stderr* specify the executed program's standard input, standard output and standard error file handles, respectively. Valid values are `:data:`PIPE``, `:data:`DEVNULL``, an existing file descriptor (a positive integer), an existing file object with a valid file descriptor, and `None`. `:data:`PIPE`` indicates that a new pipe to the child should be created. `:data:`DEVNULL`` indicates that the special file `:data:`os.devnull`` will be used. With the default settings of `None`, no redirection will occur; the child's file handles will be inherited from the parent. Additionally, *stderr* can be `:data:`STDOUT``, which indicates that the *stderr* data from the child process should be captured into the same file handle as for *stdout*.

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 264); [backlink](#)

Unknown interpreted text role "data".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 264); [backlink](#)

Unknown interpreted text role "data".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 264); [backlink](#)

Unknown interpreted text role "data".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 264); [backlink](#)

Unknown interpreted text role "data".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 264); [backlink](#)

Unknown interpreted text role "data".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 264); [backlink](#)

Unknown interpreted text role "data".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 276)

Unknown directive type "index".

```
.. index::
   single: universal newlines; subprocess module
```

If *encoding* or *errors* are specified, or *text* (also known as *universal\_newlines*) is true, the file objects *stdin*, *stdout* and *stderr* will be opened in text mode using the *encoding* and *errors* specified in the call or the defaults for `class:'io.TextIOWrapper'`.

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 279); [backlink](#)

Unknown interpreted text role "class".

For *stdin*, line ending characters '`\n`' in the input will be converted to the default line separator `:data:'os.linesep'`. For *stdout* and *stderr*, all line endings in the output will be converted to '`\n`'. For more information see the documentation of the `class:'io.TextIOWrapper'` class when the *newline* argument to its constructor is `None`.

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 285); [backlink](#)

Unknown interpreted text role "data".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 285); [backlink](#)

Unknown interpreted text role "class".

If text mode is not used, *stdin*, *stdout* and *stderr* will be opened as binary streams. No encoding or line ending conversion is performed.

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 294)

Unknown directive type "versionadded".

```
.. versionadded:: 3.6
   Added *encoding* and *errors* parameters.
```

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 297)

Unknown directive type "versionadded".

```
.. versionadded:: 3.7
   Added the *text* parameter as an alias for *universal_newlines*.
```

#### Note

The *newlines* attribute of the file objects `:attr:'Popen.stdin'`, `:attr:'Popen.stdout'` and `:attr:'Popen.stderr'` are not updated by the `:meth:'Popen.communicate'` method.

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 302); [backlink](#)

Unknown interpreted text role "attr".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 302); [backlink](#)

Unknown interpreted text role "attr".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 302); [backlink](#)

Unknown interpreted text role "attr".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 302); [backlink](#)

Unknown interpreted text role "meth".

If `shell` is `True`, the specified command will be executed through the shell. This can be useful if you are using Python primarily for the enhanced control flow it offers over most system shells and still want convenient access to other shell features such as shell pipes, filename wildcards, environment variable expansion, and expansion of `~` to a user's home directory. However, note that Python itself offers implementations of many shell-like features (in particular, `mod: 'glob'`, `mod: 'fnmatch'`, `func: 'os.walk'`, `func: 'os.path.expandvars'`, `func: 'os.path.expanduser'`, and `mod: 'shutil'`).

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 306); [backlink](#)

Unknown interpreted text role "mod".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 306); [backlink](#)

Unknown interpreted text role "mod".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 306); [backlink](#)

Unknown interpreted text role "func".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 306); [backlink](#)

Unknown interpreted text role "func".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 306); [backlink](#)

Unknown interpreted text role "func".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 306); [backlink](#)

Unknown interpreted text role "mod".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 316)

Unknown directive type "versionchanged".

```
.. versionchanged:: 3.3
   When *universal_newlines* is ``True``, the class uses the encoding
   :func:`locale.getpreferredencoding(False)` <locale.getpreferredencoding>
   instead of ``locale.getpreferredencoding()``. See the
   :class:`io.TextIOWrapper` class for more information on this change.
```

## Note

Read the [Security Considerations](#) section before using `shell=True`.

These options, along with all of the other options, are described in more detail in the `:class:`Popen`` constructor documentation.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 326); [backlink](#)**

Unknown interpreted text role "class".

## Popen Constructor

The underlying process creation and management in this module is handled by the `:class:`Popen`` class. It offers a lot of flexibility so that developers are able to handle the less common cases not covered by the convenience functions.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 333); [backlink](#)**

Unknown interpreted text role "class".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 339)**

Invalid class attribute value for "class" directive: "Popen(args, bufsize=-1, executable=None, stdin=None, stdout=None, \ stderr=None, preexec\_fn=None, close\_fds=True, shell=False, \ cwd=None, env=None, universal\_newlines=None, \ startupinfo=None, creationflags=0, restore\_signals=True, \ start\_new\_session=False, pass\_fds=(), \*, group=None, \ extra\_groups=None, user=None, umask=-1, \ encoding=None, errors=None, text=None, pipesize=-1)".

```
.. class:: Popen(args, bufsize=-1, executable=None, stdin=None, stdout=None, \
    stderr=None, preexec_fn=None, close_fds=True, shell=False, \
    cwd=None, env=None, universal_newlines=None, \
    startupinfo=None, creationflags=0, restore_signals=True, \
    start_new_session=False, pass_fds=(), *, group=None, \
    extra_groups=None, user=None, umask=-1, \
    encoding=None, errors=None, text=None, pipesize=-1)
```

Execute a child program in a new process. On POSIX, the class uses `:meth:`os.execvpe``-like behavior to execute the child program. On Windows, the class uses the Windows ```CreateProcess()``` function. The arguments to `:class:`Popen`` are as follows.

`*args*` should be a sequence of program arguments or else a single string or `:term:`path-like object``. By default, the program to execute is the first item in `*args*` if `*args*` is a sequence. If `*args*` is a string, the interpretation is platform-dependent and described below. See the `*shell*` and `*executable*` arguments for additional differences from the default behavior. Unless otherwise stated, it is recommended to pass `*args*` as a sequence.

.. warning::

For maximum reliability, use a fully-qualified path for the executable. To search for an unqualified name on `:envvar:`PATH``, use `:meth:`shutil.which``. On all platforms, passing `:data:`sys.executable`` is the recommended way to launch the current Python interpreter again, and use the ```-m``` command-line format to launch an installed module.

Resolving the path of `*executable*` (or the first item of `*args*`) is platform dependent. For POSIX, see `:meth:`os.execvpe``, and note that when resolving or searching for the executable path, `*cwd*` overrides the current working directory and `*env*` can override the ```PATH``` environment variable. For Windows, see the documentation of the ```lpApplicationName``` and ```lpCommandLine``` parameters of WinAPI ```CreateProcess```, and note that when resolving or searching for the executable path with ```shell=False```, `*cwd*` does not override the current working directory and `*env*` cannot override the ```PATH``` environment variable. Using a full path avoids all of these variations.

An example of passing some arguments to an external program as a sequence is::

```
Popen(["usr/bin/git", "commit", "-m", "Fixes a bug."])
```

On POSIX, if `*args*` is a string, the string is interpreted as the name or path of the program to execute. However, this can only be done if not passing arguments to the program.

.. note::

It may not be obvious how to break a shell command into a sequence of arguments, especially in complex cases. `:meth:`shlex.split`` can illustrate how to determine the correct tokenization for `*args*`::

```
>>> import shlex, subprocess
>>> command_line = input()
/bin/vikings -input eggs.txt -output "spam spam.txt" -cmd "echo '$MONEY'"
>>> args = shlex.split(command_line)
```



```
>>> print(args)
['/bin/vikings', '-input', 'eggs.txt', '-output', 'spam spam.txt', '-cmd', 'echo $MONEY']
>>> p = subprocess.Popen(args) # Success!
```

Note in particular that options (such as `*-input*`) and arguments (such as `*eggs.txt*`) that are separated by whitespace in the shell go in separate list elements, while arguments that need quoting or backslash escaping when used in the shell (such as filenames containing spaces or the `*echo*` command shown above) are single list elements.

On Windows, if `*args*` is a sequence, it will be converted to a string in a manner described in :ref:`converting-argument-sequence`. This is because the underlying `CreateProcess()` operates on strings.

```
.. versionchanged:: 3.6
   *args* parameter accepts a :term:`path-like object` if *shell* is
   ``False`` and a sequence containing path-like objects on POSIX.
```

```
.. versionchanged:: 3.8
   *args* parameter accepts a :term:`path-like object` if *shell* is
   ``False`` and a sequence containing bytes and path-like objects
   on Windows.
```

The `*shell*` argument (which defaults to `False`) specifies whether to use the shell as the program to execute. If `*shell*` is `True`, it is recommended to pass `*args*` as a string rather than as a sequence.

On POSIX with `shell=True`, the shell defaults to `:file:/bin/sh`. If `*args*` is a string, the string specifies the command to execute through the shell. This means that the string must be formatted exactly as it would be when typed at the shell prompt. This includes, for example, quoting or backslash escaping filenames with spaces in them. If `*args*` is a sequence, the first item specifies the command string, and any additional items will be treated as additional arguments to the shell itself. That is to say, `:class:Popen` does the equivalent of::

```
Popen(['/bin/sh', '-c', args[0], args[1], ...])
```

On Windows with `shell=True`, the `envvar:COMSPEC` environment variable specifies the default shell. The only time you need to specify `shell=True` on Windows is when the command you wish to execute is built into the shell (e.g. `:command:dir` or `:command:copy`). You do not need `shell=True` to run a batch file or console-based executable.

```
.. note::
```

Read the `'Security Considerations'` section before using `shell=True`.

`*bufsize*` will be supplied as the corresponding argument to the `:func:open` function when creating the stdin/stdout/stderr pipe file objects:

- `:const:0` means unbuffered (read and write are one system call and can return short)
- `:const:1` means line buffered (only usable if `universal_newlines=True` i.e., in a text mode)
- any other positive value means use a buffer of approximately that size
- negative `bufsize` (the default) means the system default of `io.DEFAULT_BUFFER_SIZE` will be used.

```
.. versionchanged:: 3.3.1
   *bufsize* now defaults to -1 to enable buffering by default to match the
   behavior that most code expects. In versions prior to Python 3.2.4 and
   3.3.1 it incorrectly defaulted to :const:0 which was unbuffered
   and allowed short reads. This was unintentional and did not match the
   behavior of Python 2 as most code expected.
```

The `*executable*` argument specifies a replacement program to execute. It is very seldom needed. When `shell=False`, `*executable*` replaces the program to execute specified by `*args*`. However, the original `*args*` is still passed to the program. Most programs treat the program specified by `*args*` as the command name, which can then be different from the program actually executed. On POSIX, the `*args*` name becomes the display name for the executable in utilities such as `:program:ps`. If `shell=True`, on POSIX the `*executable*` argument specifies a replacement shell for the default `:file:/bin/sh`.

```
.. versionchanged:: 3.6
   *executable* parameter accepts a :term:`path-like object` on POSIX.
```

```
.. versionchanged:: 3.8
   *executable* parameter accepts a bytes and :term:`path-like object`
   on Windows.
```

`*stdin*`, `*stdout*` and `*stderr*` specify the executed program's standard input, standard output and standard error file handles, respectively. Valid values are `:data:PIPE`, `:data:DEVNULL`, an existing file descriptor (a positive integer), an existing `:term:file object` with a valid file descriptor, and `None`. `:data:PIPE` indicates that a new pipe to the child should be created. `:data:DEVNULL` indicates that the special file `:data:os.devnull` will be used. With the default settings of `None`, no redirection will occur; the child's file handles will be inherited from the parent. Additionally, `*stderr*` can be `:data:STDOUT`, which indicates that the `stderr` data from the applications should be captured into the same file handle as for `stdout`.

If `*preexec_fn*` is set to a callable object, this object will be called in the child process just before the child is executed.  
(POSIX only)

.. warning::

The `*preexec_fn*` parameter is not safe to use in the presence of threads in your application. The child process could deadlock before `exec` is called.  
If you must use it, keep it trivial! Minimize the number of libraries you call into.

.. note::

If you need to modify the environment for the child use the `*env*` parameter rather than doing it in a `*preexec_fn*`.  
The `*start_new_session*` parameter can take the place of a previously common use of `*preexec_fn*` to call `os.setsid()` in the child.

.. versionchanged:: 3.8

The `*preexec_fn*` parameter is no longer supported in subinterpreters. The use of the parameter in a subinterpreter raises `:exc: RuntimeError`. The new restriction may affect applications that are deployed in `mod_wsgi`, `uWSGI`, and other embedded environments.

If `*close_fds*` is true, all file descriptors except `:const:'0'`, `:const:'1'` and `:const:'2'` will be closed before the child process is executed. Otherwise when `*close_fds*` is false, file descriptors obey their inheritable flag as described in `:ref: fd_inheritance`.

On Windows, if `*close_fds*` is true then no handles will be inherited by the child process unless explicitly passed in the `handle_list` element of `:attr: STARTUPINFO.lpAttributeList`, or by standard handle redirection.

.. versionchanged:: 3.2

The default for `*close_fds*` was changed from `:const:'False'` to what is described above.

.. versionchanged:: 3.7

On Windows the default for `*close_fds*` was changed from `:const:'False'` to `:const:'True'` when redirecting the standard handles. It's now possible to set `*close_fds*` to `:const:'True'` when redirecting the standard handles.

`*pass_fds*` is an optional sequence of file descriptors to keep open between the parent and child. Providing any `*pass_fds*` forces `*close_fds*` to be `:const:'True'`. (POSIX only)

.. versionchanged:: 3.2

The `*pass_fds*` parameter was added.

If `*cwd*` is not `None`, the function changes the working directory to `*cwd*` before executing the child. `*cwd*` can be a string, bytes or `:term: path-like <path-like object>` object. On POSIX, the function looks for `*executable*` (or for the first item in `*args*`) relative to `*cwd*` if the executable path is a relative path.

.. versionchanged:: 3.6

`*cwd*` parameter accepts a `:term: path-like object` on POSIX.

.. versionchanged:: 3.7

`*cwd*` parameter accepts a `:term: path-like object` on Windows.

.. versionchanged:: 3.8

`*cwd*` parameter accepts a bytes object on Windows.

If `*restore_signals*` is true (the default) all signals that Python has set to `SIG_IGN` are restored to `SIG_DFL` in the child process before the `exec`. Currently this includes the `SIGPIPE`, `SIGXFSZ` and `SIGXFSZ` signals.  
(POSIX only)

.. versionchanged:: 3.2

`*restore_signals*` was added.

If `*start_new_session*` is true the `setsid()` system call will be made in the child process prior to the execution of the subprocess. (POSIX only)

.. versionchanged:: 3.2

`*start_new_session*` was added.

If `*group*` is not `None`, the `setregid()` system call will be made in the child process prior to the execution of the subprocess. If the provided value is a string, it will be looked up via `:func: grp.getgrnam()` and the value in `gr_gid` will be used. If the value is an integer, it will be passed verbatim. (POSIX only)

.. availability:: POSIX

.. versionadded:: 3.9

If `*extra_groups*` is not `None`, the `setgroups()` system call will be made in the child process prior to the execution of the subprocess. Strings provided in `*extra_groups*` will be looked up via `:func: grp.getgrnam()` and the values in `gr_gid` will be used. Integer values will be passed verbatim. (POSIX only)

.. availability:: POSIX

.. versionadded:: 3.9

If `*user*` is not `None`, the `setreuid()` system call will be made in the child process prior to the execution of the subprocess. If the provided value is a string, it will be looked up via `:func:'pwd.getpwnam()'` and the value in `'pw_uid'` will be used. If the value is an integer, it will be passed verbatim. (POSIX only)

.. availability:: POSIX  
.. versionadded:: 3.9

If `*umask*` is not negative, the `umask()` system call will be made in the child process prior to the execution of the subprocess.

.. availability:: POSIX  
.. versionadded:: 3.9

If `*env*` is not `None`, it must be a mapping that defines the environment variables for the new process; these are used instead of the default behavior of inheriting the current process' environment.

.. note::

If specified, `*env*` must provide any variables required for the program to execute. On Windows, in order to run a 'side-by-side assembly' the specified `*env*` must include a valid `:envvar:'SystemRoot'`.

.. \_side-by-side assembly: [https://en.wikipedia.org/wiki/Side-by-Side\\_Assembly](https://en.wikipedia.org/wiki/Side-by-Side_Assembly)

If `*encoding*` or `*errors*` are specified, or `*text*` is true, the file objects `*stdin*`, `*stdout*` and `*stderr*` are opened in text mode with the specified encoding and `*errors*`, as described above in :ref:'frequently-used-arguments'. The `*universal_newlines*` argument is equivalent to `*text*` and is provided for backwards compatibility. By default, file objects are opened in binary mode.

.. versionadded:: 3.6  
  `*encoding*` and `*errors*` were added.

.. versionadded:: 3.7  
  `*text*` was added as a more readable alias for `*universal_newlines*`.

If given, `*startupinfo*` will be a `:class:'STARTUPINFO'` object, which is passed to the underlying `'CreateProcess'` function.  
`*creationflags*`, if given, can be one or more of the following flags:

- \* :data:'CREATE\_NEW\_CONSOLE'
- \* :data:'CREATE\_NEW\_PROCESS\_GROUP'
- \* :data:'ABOVE\_NORMAL\_PRIORITY\_CLASS'
- \* :data:'BELOW\_NORMAL\_PRIORITY\_CLASS'
- \* :data:'HIGH\_PRIORITY\_CLASS'
- \* :data:'IDLE\_PRIORITY\_CLASS'
- \* :data:'NORMAL\_PRIORITY\_CLASS'
- \* :data:'REALTIME\_PRIORITY\_CLASS'
- \* :data:'CREATE\_NO\_WINDOW'
- \* :data:'DETACHED\_PROCESS'
- \* :data:'CREATE\_DEFAULT\_ERROR\_MODE'
- \* :data:'CREATE\_BREAKAWAY\_FROM\_JOB'

`*pipesize*` can be used to change the size of the pipe when `:data:'PIPE'` is used for `*stdin*`, `*stdout*` or `*stderr*`. The size of the pipe is only changed on platforms that support this (only Linux at this time of writing). Other platforms will ignore this parameter.

.. versionadded:: 3.10  
  The `'pipesize'` parameter was added.

Popen objects are supported as context managers via the `:keyword:'with'` statement: on exit, standard file descriptors are closed, and the process is waited for.  
::

```
with Popen(["ifconfig"], stdout=PIPE) as proc:  
    log.write(proc.stdout.read())
```

.. audit-event:: subprocess.Popen executable,args,cwd,env subprocess.Popen

Popen and the other functions in this module that use it raise an :ref:'auditing event <auditing>' 'subprocess.Popen' with arguments `'executable'`, `'args'`, `'cwd'`, and `'env'`. The value for `'args'` may be a single string or a list of strings, depending on platform.

.. versionchanged:: 3.2  
  Added context manager support.

.. versionchanged:: 3.6  
  Popen destructor now emits a `:exc:'ResourceWarning'` warning if the child process is still running.

.. versionchanged:: 3.8  
  Popen can use `:func:'os.posix_spawn'` in some cases for better performance. On Windows Subsystem for Linux and QEMU User Emulation, Popen constructor using `:func:'os.posix_spawn'` no longer raise an exception on errors like missing program, but the child process fails with a non-zero `:attr:'~Popen.returncode'`.

Exceptions raised in the child process, before the new program has started to execute, will be re-raised in the parent.

The most common exception raised is `:exc:'OSError'`. This occurs, for example, when trying to execute a non-existent file. Applications should prepare for `:exc:'OSError'` exceptions. Note that, when `shell=True`, `:exc:'OSError'` will be raised by the child only if the selected shell itself was not found. To determine if the shell failed to find the requested application, it is necessary to check the return code or output from the subprocess.

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 692); [backlink](#)

Unknown interpreted text role "exc".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 692); [backlink](#)

Unknown interpreted text role "exc".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 692); [backlink](#)

Unknown interpreted text role "exc".

A `:exc:'ValueError'` will be raised if `:class:'Popen'` is called with invalid arguments.

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 699); [backlink](#)

Unknown interpreted text role "exc".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 699); [backlink](#)

Unknown interpreted text role "class".

`:func:'check_call'` and `:func:'check_output'` will raise `:exc:'CalledProcessError'` if the called process returns a non-zero return code.

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 702); [backlink](#)

Unknown interpreted text role "func".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 702); [backlink](#)

Unknown interpreted text role "func".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 702); [backlink](#)

Unknown interpreted text role "exc".

All of the functions and methods that accept a *timeout* parameter, such as `:func:'call'` and `:meth:'Popen.communicate'` will raise `:exc:'TimeoutExpired'` if the timeout expires before the process exits.

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 706); [backlink](#)

Unknown interpreted text role "func".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 706); [backlink](#)

Unknown interpreted text role "meth".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 706); [backlink](#)

Unknown interpreted text role "exc".

Exceptions defined in this module all inherit from `:exc:'SubprocessError'`.

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 710); [backlink](#)

Unknown interpreted text role "exc".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-

resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 712)

Unknown directive type "versionadded".

```
.. versionadded:: 3.3
   The :exc:`SubprocessError` base class was added.
```

## Security Considerations

Unlike some other popen functions, this implementation will never implicitly call a system shell. This means that all characters, including shell metacharacters, can safely be passed to child processes. If the shell is invoked explicitly, via `shell=True`, it is the application's responsibility to ensure that all whitespace and metacharacters are quoted appropriately to avoid [shell injection](#) vulnerabilities. On [some platforms](#) `<shlex.quote>`, it is possible to use `:func:`shlex.quote`` for this escaping.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 720); [backlink](#)**

Unknown interpreted text role "ref".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 720); [backlink](#)**

Unknown interpreted text role "func".

## Popen Objects

Instances of the `:class:`Popen`` class have the following methods:

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 734); [backlink](#)**

Unknown interpreted text role "class".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 737)**

Unknown directive type "method".

```
.. method:: Popen.poll()

    Check if child process has terminated. Set and return
    :attr:`~Popen.returncode` attribute. Otherwise, returns ``None``.
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 743)**

Unknown directive type "method".

```
.. method:: Popen.wait(timeout=None)

    Wait for child process to terminate. Set and return
    :attr:`~Popen.returncode` attribute.

    If the process does not terminate after *timeout* seconds, raise a
    :exc:`TimeoutExpired` exception. It is safe to catch this exception and
    retry the wait.

    .. note::

        This will deadlock when using ``stdout=PIPE`` or ``stderr=PIPE``
        and the child process generates enough output to a pipe such that
        it blocks waiting for the OS pipe buffer to accept more data.
        Use :meth:`Popen.communicate` when using pipes to avoid that.

    .. note::

        The function is implemented using a busy loop (non-blocking call and
        short sleeps). Use the :mod:`asyncio` module for an asynchronous wait:
        see :class:`asyncio.create_subprocess_exec`.

    .. versionchanged:: 3.3
        *timeout* was added.
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 768)**

Unknown directive type "method".

```
.. method:: Popen.communicate(input=None, timeout=None)

    Interact with process: Send data to stdin. Read data from stdout and stderr,
    until end-of-file is reached. Wait for process to terminate and set the
```

:attr:~Popen.returncode` attribute. The optional *\*input\** argument should be data to be sent to the child process, or ``None``, if no data should be sent to the child. If streams were opened in text mode, *\*input\** must be a string. Otherwise, it must be bytes.

:meth:`communicate` returns a tuple ``(stdout\_data, stderr\_data)``. The data will be strings if streams were opened in text mode; otherwise, bytes.

Note that if you want to send data to the process's stdin, you need to create the Popen object with ``stdin=PIPE``. Similarly, to get anything other than ``None`` in the result tuple, you need to give ``stdout=PIPE`` and/or ``stderr=PIPE`` too.

If the process does not terminate after *\*timeout\** seconds, a :exc:`TimeoutExpired` exception will be raised. Catching this exception and retrying communication will not lose any output.

The child process is not killed if the timeout expires, so in order to cleanup properly a well-behaved application should kill the child process and finish communication::

```
proc = subprocess.Popen(...)
try:
    outs, errs = proc.communicate(timeout=15)
except TimeoutExpired:
    proc.kill()
    outs, errs = proc.communicate()
```

.. note::

The data read is buffered in memory, so do not use this method if the data size is large or unlimited.

.. versionchanged:: 3.3  
\*timeout\* was added.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 810)**

Unknown directive type "method".

.. method:: Popen.send\_signal(signal)

Sends the signal *\*signal\** to the child.

Do nothing if the process completed.

.. note::

On Windows, SIGTERM is an alias for :meth:`terminate`. CTRL\_C\_EVENT and CTRL\_BREAK\_EVENT can be sent to processes started with a *\*creationflags\** parameter which includes `CREATE_NEW_PROCESS_GROUP`.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 823)**

Unknown directive type "method".

.. method:: Popen.terminate()

Stop the child. On POSIX OSs the method sends SIGTERM to the child. On Windows the Win32 API function :c:func:`TerminateProcess` is called to stop the child.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 830)**

Unknown directive type "method".

.. method:: Popen.kill()

Kills the child. On POSIX OSs the function sends SIGKILL to the child. On Windows :meth:`kill` is an alias for :meth:`terminate`.

The following attributes are also available:

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 838)**

Unknown directive type "attribute".

.. attribute:: Popen.args

The *\*args\** argument as it was passed to :class:`Popen` -- a

sequence of program arguments or else a single string.

```
.. versionadded:: 3.3
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 845)**

Unknown directive type "attribute".

```
.. attribute:: Popen.stdin
```

If the `*stdin*` argument was `:data:`PIPE``, this attribute is a writeable stream object as returned by `:func:`open``. If the `*encoding*` or `*errors*` arguments were specified or the `*universal_newlines*` argument was ```True```, the stream is a text stream, otherwise it is a byte stream. If the `*stdin*` argument was not `:data:`PIPE``, this attribute is ```None```.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 854)**

Unknown directive type "attribute".

```
.. attribute:: Popen.stdout
```

If the `*stdout*` argument was `:data:`PIPE``, this attribute is a readable stream object as returned by `:func:`open``. Reading from the stream provides output from the child process. If the `*encoding*` or `*errors*` arguments were specified or the `*universal_newlines*` argument was ```True```, the stream is a text stream, otherwise it is a byte stream. If the `*stdout*` argument was not `:data:`PIPE``, this attribute is ```None```.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 864)**

Unknown directive type "attribute".

```
.. attribute:: Popen.stderr
```

If the `*stderr*` argument was `:data:`PIPE``, this attribute is a readable stream object as returned by `:func:`open``. Reading from the stream provides error output from the child process. If the `*encoding*` or `*errors*` arguments were specified or the `*universal_newlines*` argument was ```True```, the stream is a text stream, otherwise it is a byte stream. If the `*stderr*` argument was not `:data:`PIPE``, this attribute is ```None```.

### Warning

Use `meth:~Popen.communicate` rather than `attr:~Popen.stdin.write <Popen.stdin>`, `attr:~Popen.stdout.read <Popen.stdout>` or `attr:~Popen.stderr.read <Popen.stderr>` to avoid deadlocks due to any of the other OS pipe buffers filling up and blocking the child process.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 875); [backlink](#)**

Unknown interpreted text role "meth".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 875); [backlink](#)**

Unknown interpreted text role "attr".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 875); [backlink](#)**

Unknown interpreted text role "attr".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 875); [backlink](#)**

Unknown interpreted text role "attr".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 881)**

Unknown directive type "attribute".

```
.. attribute:: Popen.pid
```

The process ID of the child process.

Note that if you set the `*shell*` argument to ```True```, this is the process ID of the spawned shell.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 889)**

Unknown directive type "attribute".

```
.. attribute:: Popen.returncode
```

The child return code, set by `:meth:`poll`` and `:meth:`wait`` (and indirectly by `:meth:`communicate``). A ```None``` value indicates that the process hasn't terminated yet.

A negative value ```-N``` indicates that the child was terminated by signal ```N``` (POSIX only).

## Windows Popen Helpers

The `:class:`STARTUPINFO`` class and following constants are only available on Windows.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 902); [backlink](#)**

Unknown interpreted text role "class".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\cpython-main) (Doc) (library) subprocess.rst, line 905)**

Invalid class attribute value for "class" directive: "STARTUPINFO(\*, dwFlags=0, hStdInput=None, hStdOutput=None, \hStdError=None, wShowWindow=0, lpAttributeList=None)".

```
.. class:: STARTUPINFO(*, dwFlags=0, hStdInput=None, hStdOutput=None, \
                        hStdError=None, wShowWindow=0, lpAttributeList=None)
```

Partial support of the Windows `STARTUPINFO` <https://msdn.microsoft.com/en-us/library/ms686331\(v=vs.85\).aspx` structure is used for `:class:`Popen`` creation. The following attributes can be set by passing them as keyword-only arguments.

```
.. versionchanged:: 3.7
    Keyword-only argument support was added.
```

```
.. attribute:: dwFlags
```

A bit field that determines whether certain `:class:`STARTUPINFO`` attributes are used when the process creates a window. ::

```
    si = subprocess.STARTUPINFO()
    si.dwFlags = subprocess.STARTF_USESTDHANDLES | subprocess.STARTF_USESHOWWINDOW
```

```
.. attribute:: hStdInput
```

If `:attr:`dwFlags`` specifies `:data:`STARTF_USESTDHANDLES``, this attribute is the standard input handle for the process. If `:data:`STARTF_USESTDHANDLES`` is not specified, the default for standard input is the keyboard buffer.

```
.. attribute:: hStdOutput
```

If `:attr:`dwFlags`` specifies `:data:`STARTF_USESTDHANDLES``, this attribute is the standard output handle for the process. Otherwise, this attribute is ignored and the default for standard output is the console window's buffer.

```
.. attribute:: hStdError
```

If `:attr:`dwFlags`` specifies `:data:`STARTF_USESTDHANDLES``, this attribute is the standard error handle for the process. Otherwise, this attribute is ignored and the default for standard error is the console window's buffer.

```
.. attribute:: wShowWindow
```

If `:attr:`dwFlags`` specifies `:data:`STARTF_USESHOWWINDOW``, this attribute can be any of the values that can be specified in the ```nCmndShow``` parameter for the ```ShowWindow` <https://msdn.microsoft.com/en-us/library/ms633548\(v=vs.85\).aspx` function, except for ```SW_SHOWDEFAULT```. Otherwise, this attribute is ignored.

`:data:`SW_HIDE`` is provided for this attribute. It is used when `:class:`Popen`` is called with ```shell=True```.



```

.. attribute:: lpAttributeList

A dictionary of additional attributes for process creation as given in
`STARTUPINFOEX`, see
`UpdateProcThreadAttribute` <https://msdn.microsoft.com/en-us/library/windows/desktop/ms686880\(v=vs.85\)>

Supported attributes:

**handle_list**
Sequence of handles that will be inherited. *close_fds* must be true if
non-empty.

The handles must be temporarily made inheritable by
:func:`os.set_handle_inheritable` when passed to the :class:`Popen`
constructor, else :class:`OSError` will be raised with Windows error
`ERROR_INVALID_PARAMETER` (87).

.. warning::

In a multithreaded process, use caution to avoid leaking handles
that are marked inheritable when combining this feature with
concurrent calls to other process creation functions that inherit
all handles such as :func:`os.system`. This also applies to
standard handle redirection, which temporarily creates inheritable
handles.

.. versionadded:: 3.7

```

## Windows Constants

The `mod:subprocess` module exposes the following constants.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 987); [backlink](#)**

Unknown interpreted text role "mod".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 989)**

Unknown directive type "data".

```
.. data:: STD_INPUT_HANDLE
```

The standard input device. Initially, this is the console input buffer,
`CONIN\$`.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 994)**

Unknown directive type "data".

```
.. data:: STD_OUTPUT_HANDLE
```

The standard output device. Initially, this is the active console screen
buffer, `CONOUT\$`.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 999)**

Unknown directive type "data".

```
.. data:: STD_ERROR_HANDLE
```

The standard error device. Initially, this is the active console screen
buffer, `CONOUT\$`.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1004)**

Unknown directive type "data".

```
.. data:: SW_HIDE
```

Hides the window. Another window will be activated.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1008)**

Unknown directive type "data".

```
.. data:: STARTF_USESTDHANDLES
```

Specifies that the :attr:`STARTUPINFO.hStdInput`,

:attr:`STARTUPINFO.hStdOutput`, and :attr:`STARTUPINFO.hStdError` attributes contain additional information.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1014)**

Unknown directive type "data".

```
.. data:: STARTF_USESHOWWINDOW
```

Specifies that the :attr:`STARTUPINFO.wShowWindow` attribute contains additional information.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1019)**

Unknown directive type "data".

```
.. data:: CREATE_NEW_CONSOLE
```

The new process has a new console, instead of inheriting its parent's console (the default).

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1024)**

Unknown directive type "data".

```
.. data:: CREATE_NEW_PROCESS_GROUP
```

A :class:`Popen` ``creationflags`` parameter to specify that a new process group will be created. This flag is necessary for using :func:`os.kill` on the subprocess.

This flag is ignored if :data:`CREATE\_NEW\_CONSOLE` is specified.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1032)**

Unknown directive type "data".

```
.. data:: ABOVE_NORMAL_PRIORITY_CLASS
```

A :class:`Popen` ``creationflags`` parameter to specify that a new process will have an above average priority.

```
.. versionadded:: 3.7
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1039)**

Unknown directive type "data".

```
.. data:: BELOW_NORMAL_PRIORITY_CLASS
```

A :class:`Popen` ``creationflags`` parameter to specify that a new process will have a below average priority.

```
.. versionadded:: 3.7
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1046)**

Unknown directive type "data".

```
.. data:: HIGH_PRIORITY_CLASS
```

A :class:`Popen` ``creationflags`` parameter to specify that a new process will have a high priority.

```
.. versionadded:: 3.7
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1053)**

Unknown directive type "data".

```
.. data:: IDLE_PRIORITY_CLASS
```

A :class:`Popen` ``creationflags`` parameter to specify that a new process will have an idle (lowest) priority.

```
.. versionadded:: 3.7
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1060)**

Unknown directive type "data".

```
.. data:: NORMAL_PRIORITY_CLASS
```

A :class:`Popen` ``creationflags`` parameter to specify that a new process will have a normal priority. (default)

```
.. versionadded:: 3.7
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1067)**

Unknown directive type "data".

```
.. data:: REALTIME_PRIORITY_CLASS
```

A :class:`Popen` ``creationflags`` parameter to specify that a new process will have realtime priority. You should almost never use `REALTIME_PRIORITY_CLASS`, because this interrupts system threads that manage mouse input, keyboard input, and background disk flushing. This class can be appropriate for applications that "talk" directly to hardware or that perform brief tasks that should have limited interruptions.

```
.. versionadded:: 3.7
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1078)**

Unknown directive type "data".

```
.. data:: CREATE_NO_WINDOW
```

A :class:`Popen` ``creationflags`` parameter to specify that a new process will not create a window.

```
.. versionadded:: 3.7
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1085)**

Unknown directive type "data".

```
.. data:: DETACHED_PROCESS
```

A :class:`Popen` ``creationflags`` parameter to specify that a new process will not inherit its parent's console. This value cannot be used with `CREATE_NEW_CONSOLE`.

```
.. versionadded:: 3.7
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1093)**

Unknown directive type "data".

```
.. data:: CREATE_DEFAULT_ERROR_MODE
```

A :class:`Popen` ``creationflags`` parameter to specify that a new process does not inherit the error mode of the calling process. Instead, the new process gets the default error mode. This feature is particularly useful for multithreaded shell applications that run with hard errors disabled.

```
.. versionadded:: 3.7
```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1103)**

Unknown directive type "data".

```
.. data:: CREATE_BREAKAWAY_FROM_JOB
```

A :class:`Popen` ``creationflags`` parameter to specify that a new process is not associated with the job.

```
.. versionadded:: 3.7
```

Prior to Python 3.5, these three functions comprised the high level API to subprocess. You can now use `:func:`run`` in many cases, but lots of existing code calls these functions.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1115); [backlink](#)**

Unknown interpreted text role "func".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1119)**

Unknown directive type "function".

```
.. function:: call(args, *, stdin=None, stdout=None, stderr=None, \
                  shell=False, cwd=None, timeout=None, **other_popen_kwargs)
```

Run the command described by `*args*`. Wait for command to complete, then return the `:attr:`~Popen.returncode`` attribute.

Code needing to capture stdout or stderr should use `:func:`run`` instead::

```
run(...).returncode
```

To suppress stdout or stderr, supply a value of `:data:`DEVNULL``.

The arguments shown above are merely some common ones. The full function signature is the same as that of the `:class:`Popen`` constructor - this function passes all supplied arguments other than `*timeout*` directly through to that interface.

.. note::

Do not use ```stdout=PIPE``` or ```stderr=PIPE``` with this function. The child process will block if it generates enough output to a pipe to fill up the OS pipe buffer as the pipes are not being read from.

.. versionchanged:: 3.3  
`*timeout*` was added.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1146)**

Unknown directive type "function".

```
.. function:: check_call(args, *, stdin=None, stdout=None, stderr=None, \
                        shell=False, cwd=None, timeout=None, \
                        **other_popen_kwargs)
```

Run command with arguments. Wait for command to complete. If the return code was zero then return, otherwise raise `:exc:`CalledProcessError``. The `:exc:`CalledProcessError`` object will have the return code in the `:attr:`~CalledProcessError.returncode`` attribute. If `:func:`check_call`` was unable to start the process it will propagate the exception that was raised.

Code needing to capture stdout or stderr should use `:func:`run`` instead::

```
run(..., check=True)
```

To suppress stdout or stderr, supply a value of `:data:`DEVNULL``.

The arguments shown above are merely some common ones. The full function signature is the same as that of the `:class:`Popen`` constructor - this function passes all supplied arguments other than `*timeout*` directly through to that interface.

.. note::

Do not use ```stdout=PIPE``` or ```stderr=PIPE``` with this function. The child process will block if it generates enough output to a pipe to fill up the OS pipe buffer as the pipes are not being read from.

.. versionchanged:: 3.3  
`*timeout*` was added.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1179)**

Unknown directive type "function".

```
.. function:: check_output(args, *, stdin=None, stderr=None, shell=False, \
                          cwd=None, encoding=None, errors=None, \
                          universal_newlines=None, timeout=None, text=None, \
                          **other_popen_kwargs)
```

Run command with arguments and return its output.

If the return code was non-zero it raises a `:exc:'CalledProcessError'`. The `:exc:'CalledProcessError'` object will have the return code in the `:attr:'~CalledProcessError.returncode'` attribute and any output in the `:attr:'~CalledProcessError.output'` attribute.

This is equivalent to::

```
run(..., check=True, stdout=PIPE).stdout
```

The arguments shown above are merely some common ones. The full function signature is largely the same as that of `:func:'run'` - most arguments are passed directly through to that interface. One API deviation from `:func:'run'` behavior exists: passing `input=None` will behave the same as `input=b''` (or `input=''`, depending on other arguments) rather than using the parent's standard input file handle.

By default, this function will return the data as encoded bytes. The actual encoding of the output data may depend on the command being invoked, so the decoding to text will often need to be handled at the application level.

This behaviour may be overridden by setting `*text*`, `*encoding*`, `*errors*`, or `*universal_newlines*` to `True` as described in `:ref:'frequently-used-arguments'` and `:func:'run'`.

To also capture standard error in the result, use `stderr=subprocess.STDOUT`:

```
>>> subprocess.check_output(
...     "ls non_existent_file; exit 0",
...     stderr=subprocess.STDOUT,
...     shell=True)
'ls: non_existent_file: No such file or directory\n'

.. versionadded:: 3.1

.. versionchanged:: 3.3
   *timeout* was added.

.. versionchanged:: 3.4
   Support for the *input* keyword argument was added.

.. versionchanged:: 3.6
   *encoding* and *errors* were added. See :func:'run' for details.

.. versionadded:: 3.7
   *text* was added as a more readable alias for *universal_newlines*.
```

## Replacing Older Functions with the `:mod:'subprocess'` Module

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1236); [backlink](#)**

Unknown interpreted text role "mod".

In this section, "a becomes b" means that b can be used as a replacement for a.

### Note

All "a" functions in this section fail (more or less) silently if the executed program cannot be found; the "b" replacements raise `:exc:'OSError'` instead.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1243); [backlink](#)**

Unknown interpreted text role "exc".

In addition, the replacements using `:func:'check_output'` will fail with a `:exc:'CalledProcessError'` if the requested operation produces a non-zero return code. The output is still available as the `:attr:'~CalledProcessError.output'` attribute of the raised exception.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1247); [backlink](#)**

Unknown interpreted text role "func".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1247); [backlink](#)**

Unknown interpreted text role "exc".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-**

resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1247); [backlink](#)

Unknown interpreted text role "attr".

In the following examples, we assume that the relevant functions have already been imported from the `mod:subprocess` module.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1252); [backlink](#)**

Unknown interpreted text role "mod".

## Replacing `:program:/bin/sh` shell command substitution

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1256); [backlink](#)**

Unknown interpreted text role "program".

```
output=$(mycmd myarg)
```

becomes:

```
output = check_output(["mycmd", "myarg"])
```

## Replacing shell pipeline

```
output=$(dmesg | grep hda)
```

becomes:

```
p1 = Popen(["dmesg"], stdout=PIPE)
p2 = Popen(["grep", "hda"], stdin=p1.stdout, stdout=PIPE)
p1.stdout.close() # Allow p1 to receive a SIGPIPE if p2 exits.
output = p2.communicate()[0]
```

The `p1.stdout.close()` call after starting the `p2` is important in order for `p1` to receive a `SIGPIPE` if `p2` exits before `p1`.

Alternatively, for trusted input, the shell's own pipeline support may still be used directly:

```
output=$(dmesg | grep hda)
```

becomes:

```
output = check_output("dmesg | grep hda", shell=True)
```

## Replacing `:func:os.system`

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1296); [backlink](#)**

Unknown interpreted text role "func".

```
sts = os.system("mycmd" + " myarg")
# becomes
retcode = call("mycmd" + " myarg", shell=True)
```

Notes:

- Calling the program through the shell is usually not required.
- The `:func:call` return value is encoded differently to that of `:func:os.system`.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1308); [backlink](#)**

Unknown interpreted text role "func".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1308); [backlink](#)**

Unknown interpreted text role "func".

- The `:func:os.system` function ignores `SIGINT` and `SIGQUIT` signals while the command is running, but the caller must do this separately when using the `mod:subprocess` module.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1311); [backlink](#)**

Unknown interpreted text role "func".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1311); [backlink](#)**

Unknown interpreted text role "mod".

A more realistic example would look like this:

```
try:
    retcode = call("mycmd" + " myarg", shell=True)
    if retcode < 0:
        print("Child was terminated by signal", -retcode, file=sys.stderr)
    else:
        print("Child returned", retcode, file=sys.stderr)
except OSError as e:
    print("Execution failed:", e, file=sys.stderr)
```

## Replacing the `:func:`os.spawn`` family

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1327); [backlink](#)**

Unknown interpreted text role "func".

P\_NOWAIT example:

```
pid = os.spawnlp(os.P_NOWAIT, "/bin/mycmd", "mycmd", "myarg")
==>
pid = Popen(["/bin/mycmd", "myarg"]).pid
```

P\_WAIT example:

```
retcode = os.spawnlp(os.P_WAIT, "/bin/mycmd", "mycmd", "myarg")
==>
retcode = call(["/bin/mycmd", "myarg"])
```

Vector example:

```
os.spawnvp(os.P_NOWAIT, path, args)
==>
Popen([path] + args[1:])
```

Environment example:

```
os.spawnlpe(os.P_NOWAIT, "/bin/mycmd", "mycmd", "myarg", env)
==>
Popen(["/bin/mycmd", "myarg"], env={"PATH": "/usr/bin"})
```

## Replacing `:func:`os.popen``, `:func:`os.popen2``, `:func:`os.popen3``

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1356); [backlink](#)**

Unknown interpreted text role "func".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1356); [backlink](#)**

Unknown interpreted text role "func".

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1356); [backlink](#)**

Unknown interpreted text role "func".

```
(child_stdin, child_stdout) = os.popen2(cmd, mode, bufsize)
==>
p = Popen(cmd, shell=True, bufsize=bufsize,
          stdin=PIPE, stdout=PIPE, close_fds=True)
(child_stdin, child_stdout) = (p.stdin, p.stdout)

(child_stdin,
 child_stdout,
 child_stderr) = os.popen3(cmd, mode, bufsize)
==>
p = Popen(cmd, shell=True, bufsize=bufsize,
          stdin=PIPE, stdout=PIPE, stderr=PIPE, close_fds=True)
(child_stdin,
 child_stdout,
 child_stderr) = (p.stdin, p.stdout, p.stderr)

(child_stdin, child_stdout_and_stderr) = os.popen4(cmd, mode, bufsize)
==>
p = Popen(cmd, shell=True, bufsize=bufsize,
          stdin=PIPE, stdout=PIPE, stderr=STDOUT, close_fds=True)
(child_stdin, child_stdout_and_stderr) = (p.stdin, p.stdout)
```

Return code handling translates as follows:

```

pipe = os.popen(cmd, 'w')
...
rc = pipe.close()
if rc is not None and rc >> 8:
    print("There were some errors")
==>
process = Popen(cmd, stdin=PIPE)
...
process.stdin.close()
if process.wait() != 0:
    print("There were some errors")

```

## Replacing functions from the `:mod:`popen2`` module

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1402); [backlink](#)

Unknown interpreted text role "mod".

### Note

If the `cmd` argument to `popen2` functions is a string, the command is executed through `/bin/sh`. If it is a list, the command is directly executed.

```

(child_stdout, child_stdin) = popen2.popen2("somestring", bufsize, mode)
==>
p = Popen("somestring", shell=True, bufsize=bufsize,
        stdin=PIPE, stdout=PIPE, close_fds=True)
(child_stdout, child_stdin) = (p.stdout, p.stdin)

(child_stdout, child_stdin) = popen2.popen2(["mycmd", "myarg"], bufsize, mode)
==>
p = Popen(["mycmd", "myarg"], bufsize=bufsize,
        stdin=PIPE, stdout=PIPE, close_fds=True)
(child_stdout, child_stdin) = (p.stdout, p.stdin)

```

`:class:`popen2.Popen3`` and `:class:`popen2.Popen4`` basically work as `:class:`subprocess.Popen``, except that:

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1426); [backlink](#)

Unknown interpreted text role "class".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1426); [backlink](#)

Unknown interpreted text role "class".

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1426); [backlink](#)

Unknown interpreted text role "class".

- `:class:`Popen`` raises an exception if the execution fails.

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1429); [backlink](#)

Unknown interpreted text role "class".

- The `capturestderr` argument is replaced with the `stderr` argument.
- `stdin=PIPE` and `stdout=PIPE` must be specified.
- `popen2` closes all file descriptors by default, but you have to specify `close_fds=True` with `:class:`Popen`` to guarantee this behavior on all platforms or past Python versions.

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1435); [backlink](#)

Unknown interpreted text role "class".

## Legacy Shell Invocation Functions

This module also provides the following legacy functions from the 2.x `commands` module. These operations implicitly invoke the system shell and none of the guarantees described above regarding security and exception handling consistency are valid for these functions.

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1448)

Unknown directive type "function".



```

.. function:: getstatusoutput(cmd)

Return ``(exitcode, output)`` of executing *cmd* in a shell.

Execute the string *cmd* in a shell with :meth:`Popen.check_output` and
return a 2-tuple ``(exitcode, output)``. The locale encoding is used;
see the notes on :ref:`frequently-used-arguments` for more details.

A trailing newline is stripped from the output.
The exit code for the command can be interpreted as the return code
of subprocess. Example::

>>> subprocess.getstatusoutput('ls /bin/ls')
(0, '/bin/ls')
>>> subprocess.getstatusoutput('cat /bin/junk')
(1, 'cat: /bin/junk: No such file or directory')
>>> subprocess.getstatusoutput('/bin/junk')
(127, 'sh: /bin/junk: not found')
>>> subprocess.getstatusoutput('/bin/kill $$')
(-15, '')

.. availability:: POSIX & Windows.

.. versionchanged:: 3.3.4
   Windows support was added.

The function now returns (exitcode, output) instead of (status, output)
as it did in Python 3.3.3 and earlier. exitcode has the same value as
:attr:`~Popen.returncode`.

```

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Doc\library\ (cpython-main) (Doc) (library) subprocess.rst, line 1479)**

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.. function:: getoutput(cmd)

Return output (stdout and stderr) of executing *cmd* in a shell.

Like :func:`getstatusoutput`, except the exit code is ignored and the return
value is a string containing the command's output. Example::

>>> subprocess.getoutput('ls /bin/ls')
'/bin/ls'

.. availability:: POSIX & Windows.

.. versionchanged:: 3.3.4
   Windows support added

```

## Notes

### Converting an argument sequence to a string on Windows

On Windows, an *args* sequence is converted to a string that can be parsed using the following rules (which correspond to the rules used by the MS C runtime):

1. Arguments are delimited by white space, which is either a space or a tab.
2. A string surrounded by double quotation marks is interpreted as a single argument, regardless of white space contained within. A quoted string can be embedded in an argument.
3. A double quotation mark preceded by a backslash is interpreted as a literal double quotation mark.
4. Backslashes are interpreted literally, unless they immediately precede a double quotation mark.
5. If backslashes immediately precede a double quotation mark, every pair of backslashes is interpreted as a literal backslash. If the number of backslashes is odd, the last backslash escapes the next double quotation mark as described in rule 3.

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.. seealso::

:mod:`shlex`
    Module which provides function to parse and escape command lines.

```