35.9. `fcntl` — The `fcntl` and `ioctl` system calls

This module performs file control and I/O control on file descriptors. It is an interface to the `fcntl()` and `ioctl()` Unix routines. For a complete description of these calls, see *fcntl(2)* and *ioctl(2)* Unix manual pages.

All functions in this module take a file descriptor *fd* as their first argument. This can be an integer file descriptor, such as returned by `sys.stdin.fileno()`, or an `io.IOBase` object, such as `sys.stdin` itself, which provides a `fileno()` that returns a genuine file descriptor.

Changed in version 3.3: Operations in this module used to raise an `IOError` where they now raise an `OSError`.

The module defines the following functions:

`fcntl.`**`fcntl`**(*fd*, *cmd*, *arg=0*)

Perform the operation *cmd* on file descriptor *fd* (file objects providing a `fileno()` method are accepted as well). The values used for *cmd* are operating system dependent, and are available as constants in the `fcntl` module, using the same names as used in the relevant C header files. The argument *arg* can either be an integer value, or a `bytes` object. With an integer value, the return value of this function is the integer return value of the C `fcntl()` call. When the argument is bytes it represents a binary structure, e.g. created by `struct.pack()`. The binary data is copied to a buffer whose address is passed to the C `fcntl()` call. The return value after a successful call is the contents of the buffer, converted to a `bytes` object. The length of the returned object will be the same as the length of the *arg* argument. This is limited to 1024 bytes. If the information returned in the buffer by the operating system is larger than 1024 bytes, this is most likely to result in a segmentation violation or a more subtle data corruption.

If the `fcntl()` fails, an `OSError` is raised.

`fcntl.`**`ioctl`**(*fd*, *request*, *arg=0*, *mutate_flag=True*)

This function is identical to the `fcntl()` function, except that the argument handling is even more complicated.

The *request* parameter is limited to values that can fit in 32-bits. Additional constants of interest for use as the *request* argument can be found in the `termios` module, under the same names as used in the relevant C header files.

The parameter *arg* can be one of an integer, an object supporting the read-only buffer interface (like `bytes`) or an object supporting the read-write buffer interface (like `bytearray`).

In all but the last case, behaviour is as for the `fcntl()` function.

If a mutable buffer is passed, then the behaviour is determined by the value of the *mutate_flag* parameter.

If it is false, the buffer's mutability is ignored and behaviour is as for a read-only buffer, except that the 1024 byte limit mentioned above is avoided – so long as the buffer you pass is at least as long as what the operating system wants to put there, things should work.

If *mutate_flag* is true (the default), then the buffer is (in effect) passed to the underlying `ioctl()` system call, the latter's return code is passed back to the calling Python, and the buffer's new contents reflect the action of the `ioctl()`. This is a slight simplification, because if the supplied buffer is less than 1024 bytes long it is first copied into a static buffer 1024 bytes long which is then passed to `ioctl()` and copied back into the supplied buffer.

If the `ioctl()` fails, an `OSError` exception is raised.

An example:

```
>>> import array, fcntl, struct, termios, os
>>> os.getpgrp()
13341
>>> struct.unpack('h', fcntl.ioctl(0, termios.TIOCGPGRP, "  "))[0]
13341
>>> buf = array.array('h', [0])
>>> fcntl.ioctl(0, termios.TIOCGPGRP, buf, 1)
0
>>> buf
array('h', [13341])
```

`fcntl.`**`flock`**(*fd*, *operation*)

Perform the lock operation *operation* on file descriptor *fd* (file objects providing a `fileno()` method are accepted as well). See the Unix manual *flock(2)* for details. (On some systems, this function is emulated using `fcntl()`.)

If the `flock()` fails, an `OSError` exception is raised.

`fcntl.`**`lockf`**(*fd*, *cmd*, *len=0*, *start=0*, *whence=0*)

This is essentially a wrapper around the `fcntl()` locking calls. *fd* is the file descriptor of the file to lock or unlock, and *cmd* is one of the following values:

- `LOCK_UN` – unlock
- `LOCK_SH` – acquire a shared lock
- `LOCK_EX` – acquire an exclusive lock

When *cmd* is `LOCK_SH` or `LOCK_EX`, it can also be bitwise ORed with `LOCK_NB` to avoid blocking on lock acquisition. If `LOCK_NB` is used and the lock cannot be acquired, an `OSError` will be raised and the exception will have an *errno* attribute set to `EACCES` or `EAGAIN` (depending on the operating system; for portability, check for both values). On at least some systems, `LOCK_EX` can only be used if the file descriptor refers to a file opened for writing.

len is the number of bytes to lock, *start* is the byte offset at which the lock starts, relative to *whence*, and *whence* is as with `io.IOBase.seek()`, specifically:

- `0` – relative to the start of the file (`os.SEEK_SET`)
- `1` – relative to the current buffer position (`os.SEEK_CUR`)
- `2` – relative to the end of the file (`os.SEEK_END`)

The default for *start* is 0, which means to start at the beginning of the file. The default for *len* is 0 which means to lock to the end of the file. The default for *whence* is also 0.

Examples (all on a SVR4 compliant system):

```
import struct, fcntl, os

f = open(...)
rv = fcntl.fcntl(f, fcntl.F_SETFL, os.O_NDELAY)

lockdata = struct.pack('hhllhh', fcntl.F_WRLCK, 0, 0, 0, 0, 0)
rv = fcntl.fcntl(f, fcntl.F_SETLKW, lockdata)
```

Note that in the first example the return value variable *rv* will hold an integer value; in the second example it will hold a `bytes` object. The structure lay-out for the *lockdata* variable is system dependent — therefore using the `flock()` call may be better.

See also:

Module `os`

If the locking flags `O_SHLOCK` and `O_EXLOCK` are present in the `os` module (on BSD only), the `os.open()` function provides an alternative to the `lockf()` and `flock()` functions.