

**NAME**

**stat, lstat, fstat, fstatat** - get file status

**LIBRARY**

Standard C Library (libc, -lc)

**SYNOPSIS**

```
#include <sys/stat.h>
```

*int*

```
stat(const char * restrict path, struct stat * restrict sb);
```

*int*

```
lstat(const char * restrict path, struct stat * restrict sb);
```

*int*

```
fstat(int fd, struct stat *sb);
```

*int*

```
fstatat(int fd, const char *path, struct stat *sb, int flag);
```

**DESCRIPTION**

The **stat()** system call obtains information about the file pointed to by *path*. Read, write or execute permission of the named file is not required, but all directories listed in the path name leading to the file must be searchable.

The **lstat()** system call is like **stat()** except when the named file is a symbolic link, in which case **lstat()** returns information about the link, while **stat()** returns information about the file the link references.

The **fstat()** system call obtains the same information about an open file known by the file descriptor *fd*.

The **fstatat()** system call is equivalent to **stat()** and **lstat()** except when the *path* specifies a relative path. For **fstatat()** and relative *path*, the status is retrieved from a file relative to the directory associated with the file descriptor *fd* instead of the current working directory.

The values for the *flag* are constructed by a bitwise-inclusive OR of flags from this list, defined in *<fcntl.h>*:

AT\_SYMLINK\_NOFOLLOW

If *path* names a symbolic link, the status of the symbolic link is returned.

**AT\_RESOLVE\_BENEATH**

Only walk paths below the starting directory. See the description of the **O\_RESOLVE\_BENEATH** flag in the `open(2)` manual page.

**AT\_EMPTY\_PATH**

If the *path* argument is an empty string, operate on the file or directory referenced by the descriptor *fd*. If *fd* is equal to **AT\_FDCWD**, operate on the current working directory.

If **fstatat()** is passed the special value **AT\_FDCWD** in the *fd* parameter, the current working directory is used and the behavior is identical to a call to **stat()** or **lstat()** respectively, depending on whether or not the **AT\_SYMLINK\_NOFOLLOW** bit is set in *flag*.

When **fstatat()** is called with an absolute *path*, it ignores the *fd* argument.

The *sb* argument is a pointer to a *stat* structure as defined by `<sys/stat.h>` and into which information is placed concerning the file.

The fields of *struct stat* related to the file system are:

*st\_dev* Numeric ID of the device containing the file.

*st\_ino* The file's inode number.

*st\_nlink* Number of hard links to the file.

*st\_flags* Flags enabled for the file. See `chflags(2)` for the list of flags and their description.

The *st\_dev* and *st\_ino* fields together identify the file uniquely within the system.

The time-related fields of *struct stat* are:

*st\_atim* Time when file data was last accessed. Changed implicitly by syscalls such as `read(2)` and `readv(2)`, and explicitly by `utimes(2)`.

*st\_mtim* Time when file data was last modified. Changed implicitly by syscalls such as `truncate(2)`, `write(2)`, and `writv(2)`, and explicitly by `utimes(2)`. Also, any syscall which modifies directory content changes the *st\_mtim* for the affected directory. For instance, `creat(2)`, `mkdir(2)`, `rename(2)`, `link(2)`, and `unlink(2)`.

*st\_ctim* Time when file status was last changed (inode data modification). Changed implicitly by

any syscall that affects file metadata, including *st\_mtim*, such as *chflags(2)*, *chmod(2)*, *chown(2)*, *truncate(2)*, *utimes(2)*, and *write(2)*. Also, any syscall which modifies directory content changes the *st\_ctim* for the affected directory. For instance, *creat(2)*, *mkdir(2)*, *rename(2)*, *link(2)*, and *unlink(2)*.

*st\_birthtim* Time when the inode was created.

These time-related macros are defined for compatibility:

```
#define st_atime          st_atim.tv_sec
#define st_mtime         st_mtim.tv_sec
#define st_ctime         st_ctim.tv_sec
#ifndef _POSIX_SOURCE
#define st_birthtime     st_birthtim.tv_sec
#endif

#ifndef _POSIX_SOURCE
#define st_atimespec     st_atim
#define st_mtimespec     st_mtim
#define st_ctimespec     st_ctim
#define st_birthtimespec st_birthtim
#endif
```

Size-related fields of the *struct stat* are:

*st\_size* File size in bytes.

*st\_blksize* Optimal I/O block size for the file.

*st\_blocks* Actual number of blocks allocated for the file in 512-byte units. As short symbolic links are stored in the inode, this number may be zero.

The access-related fields of *struct stat* are:

*st\_uid* User ID of the file's owner.

*st\_gid* Group ID of the file.

*st\_mode* Status of the file (see below).

The status information word *st\_mode* has these bits:

```
#define S_IFMT  0170000 /* type of file mask */
#define S_IFIFO 0010000 /* named pipe (fifo) */
#define S_IFCHR 0020000 /* character special */
#define S_IFDIR 0040000 /* directory */
#define S_IFBLK 0060000 /* block special */
#define S_IFREG 0100000 /* regular */
#define S_IFLNK 0120000 /* symbolic link */
#define S_IFSOCK 0140000 /* socket */
#define S_IFWHT 0160000 /* whiteout */
#define S_ISUID 0004000 /* set user id on execution */
#define S_ISGID 0002000 /* set group id on execution */
#define S_ISVTX 0001000 /* save swapped text even after use */
#define S_IRWXU 0000700 /* RWX mask for owner */
#define S_IRUSR 0000400 /* read permission, owner */
#define S_IWUSR 0000200 /* write permission, owner */
#define S_IXUSR 0000100 /* execute/search permission, owner */
#define S_IRWXG 0000070 /* RWX mask for group */
#define S_IRGRP 0000040 /* read permission, group */
#define S_IWGRP 0000020 /* write permission, group */
#define S_IXGRP 0000010 /* execute/search permission, group */
#define S_IRWXO 0000007 /* RWX mask for other */
#define S_IROTH 0000004 /* read permission, other */
#define S_IWOTH 0000002 /* write permission, other */
#define S_IXOTH 0000001 /* execute/search permission, other */
```

For a list of access modes, see `<sys/stat.h>`, `access(2)` and `chmod(2)`. These macros are available to test whether a *st\_mode* value passed in the *m* argument corresponds to a file of the specified type:

#### **S\_ISBLK(*m*)**

Test for a block special file.

#### **S\_ISCHR(*m*)**

Test for a character special file.

**S\_ISDIR(*m*)** Test for a directory.

#### **S\_ISFIFO(*m*)**

Test for a pipe or FIFO special file.

**S\_ISLNK(*m*)**

Test for a symbolic link.

**S\_ISREG(*m*)**

Test for a regular file.

**S\_ISSOCK(*m*)**

Test for a socket.

**S\_ISWHT(*m*)**

Test for a whiteout.

The macros evaluate to a non-zero value if the test is true or to the value 0 if the test is false.

**RETURN VALUES**

Upon successful completion, the value 0 is returned; otherwise the value -1 is returned and the global variable *errno* is set to indicate the error.

**COMPATIBILITY**

Previous versions of the system used different types for the *st\_dev*, *st\_uid*, *st\_gid*, *st\_rdev*, *st\_size*, *st\_blksize* and *st\_blocks* fields.

**ERRORS**

The **stat()** and **lstat()** system calls will fail if:

- |                |   |
|----------------|---|
| [EACCES]       | Search permission is denied for a component of the path prefix.                                     |
| [EFAULT]       | The <i>sb</i> or <i>path</i> argument points to an invalid address.                                 |
| [EIO]          | An I/O error occurred while reading from or writing to the file system.                             |
| [EINTEGRITY]   | Corrupted data was detected while reading from the file system.                                     |
| [ELOOP]        | Too many symbolic links were encountered in translating the pathname.                               |
| [ENAMETOOLONG] | A component of a pathname exceeded 255 characters, or an entire path name exceeded 1023 characters. |
| [ENOENT]       | The named file does not exist.  |

- [ENOTDIR] A component of the path prefix is not a directory.
- [EOVERFLOW] The file size in bytes cannot be represented correctly in the structure pointed to by *sb*.

The **fstat()** system call will fail if:

- [EBADF] The *fd* argument is not a valid open file descriptor.
- [EFAULT] The *sb* argument points to an invalid address.
- [EIO] An I/O error occurred while reading from or writing to the file system.
- [EINTEGRITY] Corrupted data was detected while reading from the file system.
- [EOVERFLOW] The file size in bytes cannot be represented correctly in the structure pointed to by *sb*.

In addition to the errors returned by the **lstat()**, the **fstatat()** may fail if:

- [EBADF] The *path* argument does not specify an absolute path and the *fd* argument is neither AT\_FDCWD nor a valid file descriptor open for searching.
- [EINVAL] The value of the *flag* argument is not valid.
- [ENOTDIR] The *path* argument is not an absolute path and *fd* is neither AT\_FDCWD nor a file descriptor associated with a directory.
- [ENOTCAPABLE] *path* is an absolute path, or contained a "." component leading to a directory outside of the directory hierarchy specified by *fd*, and the process is in capability mode or the AT\_RESOLVE\_BENEATH flag was specified.

## SEE ALSO

access(2), chmod(2), chown(2), fhstat(2), statfs(2), utimes(2), sticky(7), symlink(7)

## STANDARDS

The **stat()** and **fstat()** system calls are expected to conform to IEEE Std 1003.1-1990 ("POSIX.1"). The **fstatat()** system call follows The Open Group Extended API Set 2 specification.

## HISTORY

The **stat()** and **fstat()** system calls appeared in Version 1 AT&T UNIX. The **lstat()** system call appeared in 4.2BSD. The **fstatat()** system call appeared in FreeBSD 8.0.

## **BUGS**

Applying **fstat()** to a socket returns a zeroed buffer, except for the blocksize field, and a unique device and inode number.