



Linux Ubuntu 26.04 Manual Pages on command 'stat.2'

\$ man stat.2

stat(2) System Calls Manual stat(2)

NAME

stat, fstat, lstat, fstatat - get file status

LIBRARY

Standard C library (libc, -lc)

SYNOPSIS

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

int stat(const char *restrict path,
        struct stat *restrict statbuf);

int fstat(int fd, struct stat *statbuf);

int lstat(const char *restrict path,
         struct stat *restrict statbuf);

#include <fcntl.h>            /* Definition of AT_* constants */

#include <sys/stat.h>

int fstatat(int dirfd, const char *restrict path,
           struct stat *restrict statbuf, int flags);
```

Feature Test Macro Requirements for glibc (see feature_test_macros(7)):

lstat():

```
/* Since glibc 2.20 */ _DEFAULT_SOURCE

|| _XOPEN_SOURCE >= 500

|| /* Since glibc 2.10: */ _POSIX_C_SOURCE >= 200112L

|| /* glibc 2.19 and earlier */ _BSD_SOURCE
```

fstatat():

Since glibc 2.10:

`_POSIX_C_SOURCE >= 200809L`

Before glibc 2.10:

`_ATFILE_SOURCE`

DESCRIPTION

These functions return information about a file, in the buffer pointed to by `statbuf`. No permissions are required on the file itself, but in the case of `stat()`, `fstatat()`, and `lstat()` execute (search) permission is required on all of the directories in path that lead to the file.

`stat()` and `fstatat()` retrieve information about the file pointed to by `path`; the differences for `fstatat()` are described below.

`lstat()` is identical to `stat()`, except that if `path` is a symbolic link, then it returns information about the link itself, not the file that the link refers to.

`fstat()` is identical to `stat()`, except that the file about which information is to be retrieved is specified by the file descriptor `fd`.

The stat structure

All of these system calls return a `stat` structure (see `stat(3type)`).

Note: for performance and simplicity reasons, different fields in the `stat` structure may contain state information from different moments during the execution of the system call.

For example, if `st_mode` or `st_uid` is changed by another process by calling `chmod(2)` or `chown(2)`, `stat()` might return the old `st_mode` together with the new `st_uid`, or the old `st_uid` together with the new `st_mode`.

fstatat()

The `fstatat()` system call is a more general interface for accessing file information which can still provide exactly the behavior of each of `stat()`, `lstat()`, and `fstat()`.

If `path` is relative, then it is interpreted relative to the directory referred to by the file descriptor `dirfd` (rather than relative to the current working directory of the calling process, as is done by `stat()` and `lstat()` for a relative pathname).

If `path` is relative and `dirfd` is the special value `AT_FDCWD`, then `path` is interpreted relative to the current working directory of the calling process (like `stat()` and `lstat()`).

If `path` is absolute, then `dirfd` is ignored.

`flags` can either be 0, or include one or more of the following flags ORed:

`AT_EMPTY_PATH` (since Linux 2.6.39)

If path is an empty string (or NULL, since Linux 6.11) operate on the file referred to by dirfd (which may have been obtained using the open(2) O_PATH flag). In this case, dirfd can refer to any type of file, not just a directory, and the behavior of fstatat() is similar to that of fstat(). If dirfd is AT_FDCWD, the call operates on the current working directory. This flag is Linux-specific; define _GNU_SOURCE to obtain its definition.

AT_NO_AUTOMOUNT (since Linux 2.6.38)

Don't automount the terminal ("basename") component of path. Since Linux 3.1 this flag is ignored. Since Linux 4.11 this flag is implied.

AT_SYMLINK_NOFOLLOW

If path is a symbolic link, do not dereference it: instead return information about the link itself, like lstat(). (By default, fstatat() dereferences symbolic links, like stat().)

See openat(2) for an explanation of the need for fstatat().

RETURN VALUE

On success, zero is returned. On error, -1 is returned, and errno is set to indicate the error.

ERRORS

EACCES Search permission is denied for one of the directories in the path prefix of path.

(See also path_resolution(7).)

EBADF fd is not a valid open file descriptor.

EBADF (fstatat()) path is relative but dirfd is neither AT_FDCWD nor a valid file descriptor.

EFAULT Bad address.

EINVAL (fstatat()) Invalid flag specified in flags.

ELOOP Too many symbolic links encountered while traversing the path.

ENAMETOOLONG

path is too long.

ENOENT A component of path does not exist or is a dangling symbolic link.

ENOENT path is an empty string and AT_EMPTY_PATH was not specified in flags.

ENOMEM Out of memory (i.e., kernel memory).

ENOTDIR

A component of the path prefix of path is not a directory.

ENOTDIR

(fstatat()) path is relative and dirfd is a file descriptor referring to a file other than a directory.

EOVERFLOW

path or fd refers to a file whose size, inode number, or number of blocks cannot be represented in, respectively, the types off_t, ino_t, or blkcnt_t. This error can occur when, for example, an application compiled on a 32-bit platform without -D_FILE_OFFSET_BITS=64 calls stat() on a file whose size exceeds $(1 \ll 31) - 1$ bytes.

STANDARDS

POSIX.1-2024.

HISTORY

stat()

fstat()

lstat()

SVr4, 4.3BSD, POSIX.1-2001.

fstatat()

POSIX.1-2008. Linux 2.6.16, glibc 2.4.

According to POSIX.1-2001, lstat() on a symbolic link need return valid information only in the st_size field and the file type of the st_mode field of the stat structure.

POSIX.1-2008 tightens the specification, requiring lstat() to return valid information in all fields except the mode bits in st_mode.

Use of the st_blocks and st_blksize fields may be less portable. (They were introduced in BSD. The interpretation differs between systems, and possibly on a single system when NFS mounts are involved.)

C library/kernel differences

Over time, increases in the size of the stat structure have led to three successive versions of stat(): sys_stat() (slot __NR_oldstat), sys_newstat() (slot __NR_stat), and sys_stat64() (slot __NR_stat64) on 32-bit platforms such as i386. The first two versions were already present in Linux 1.0 (albeit with different names); the last was added in Linux 2.4. Similar remarks apply for fstat() and lstat().

The kernel-internal versions of the stat structure dealt with by the different versions are, respectively:

__old_kernel_stat

The original structure, with rather narrow fields, and no padding.

stat Larger st_ino field and padding added to various parts of the structure to allow for future expansion.

stat64 Even larger st_ino field, larger st_uid and st_gid fields to accommodate the Linux-2.4 expansion of UIDs and GIDs to 32 bits, and various other enlarged fields and further padding in the structure. (Various padding bytes were eventually consumed in Linux 2.6, with the advent of 32-bit device IDs and nanosecond components for the timestamp fields.)

The glibc stat() wrapper function hides these details from applications, invoking the most recent version of the system call provided by the kernel, and repacking the returned information if required for old binaries.

On modern 64-bit systems, life is simpler: there is a single stat() system call and the kernel deals with a stat structure that contains fields of a sufficient size.

The underlying system call employed by the glibc fstatat() wrapper function is actually called fstatat64() or, on some architectures, newfstatat().

EXAMPLES

The following program calls lstat() and displays selected fields in the returned stat structure.

```
#include <stdint.h>

#include <stdio.h>

#include <stdlib.h>

#include <sys/stat.h>

#include <sys/sysmacros.h>

#include <time.h>

int

main(int argc, char *argv[])

{

    struct stat sb;

    if (argc != 2) {

        fprintf(stderr, "Usage: %s <path>\n", argv[0]);

        exit(EXIT_FAILURE);

    }

    if (lstat(argv[1], &sb) == -1) {
```

```

    perror("lstat");

    exit(EXIT_FAILURE);
}

printf("ID of containing device: [%x,%x]\n",
       major(sb.st_dev),
       minor(sb.st_dev));

printf("File type:          ");
switch (sb.st_mode & S_IFMT) {
case S_IFBLK: printf("block device\n");      break;
case S_IFCHR: printf("character device\n");  break;
case S_IFDIR: printf("directory\n");         break;
case S_IFIFO: printf("FIFO/pipe\n");         break;
case S_IFLNK: printf("symlink\n");           break;
case S_IFREG: printf("regular file\n");       break;
case S_IFSOCK: printf("socket\n");           break;
default:      printf("unknown?\n");          break;
}

printf("I-node number:      %ju\n", (uintmax_t) sb.st_ino);
printf("Mode:              %jo (octal)\n",
       (uintmax_t) sb.st_mode);
printf("Link count:        %ju\n", (uintmax_t) sb.st_nlink);
printf("Ownership:         UID=%ju  GID=%ju\n",
       (uintmax_t) sb.st_uid, (uintmax_t) sb.st_gid);
printf("Preferred I/O block size: %jd bytes\n",
       (intmax_t) sb.st_blksize);
printf("File size:         %jd bytes\n",
       (intmax_t) sb.st_size);
printf("Blocks allocated:   %jd\n",
       (intmax_t) sb.st_blocks);
printf("Last status change:  %s", ctime(&sb.st_ctime));
printf("Last file access:    %s", ctime(&sb.st_atime));
printf("Last file modification: %s", ctime(&sb.st_mtime));
exit(EXIT_SUCCESS);

```

}

SEE ALSO

ls(1), stat(1), access(2), chmod(2), chown(2), readlink(2), statx(2), utime(2), stat(3type),
capabilities(7), inode(7), symlink(7)

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