



## ***Red Hat Enterprise Linux Release 9.2 Manual Pages on 'renameat2.2' command***

**\$ man renameat2.2**

RENAME(2)                      Linux Programmer's Manual                      RENAME(2)

NAME

rename, renameat, renameat2 - change the name or location of a file

SYNOPSIS

```
#include <stdio.h>

int rename(const char *oldpath, const char *newpath);

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

#include <stdio.h>

int renameat(int olddirfd, const char *oldpath,
             int newdirfd, const char *newpath);

int renameat2(int olddirfd, const char *oldpath,
             int newdirfd, const char *newpath, unsigned int flags);
```

Feature Test Macro Requirements for glibc (see feature\_test\_macros(7)):

renameat():

Since glibc 2.10:

    \_POSIX\_C\_SOURCE >= 200809L

Before glibc 2.10:

    \_ATFILE\_SOURCE

renameat2():

    \_GNU\_SOURCE

DESCRIPTION

rename() renames a file, moving it between directories if required.

Any other hard links to the file (as created using link(2)) are unaf?

ected. Open file descriptors for oldpath are also unaffected.

Various restrictions determine whether or not the rename operation succeeds: see ERRORS below.

If newpath already exists, it will be atomically replaced, so that there is no point at which another process attempting to access newpath will find it missing. However, there will probably be a window in which both oldpath and newpath refer to the file being renamed.

If oldpath and newpath are existing hard links referring to the same file, then rename() does nothing, and returns a success status.

If newpath exists but the operation fails for some reason, rename() guarantees to leave an instance of newpath in place.

oldpath can specify a directory. In this case, newpath must either not exist, or it must specify an empty directory.

If oldpath refers to a symbolic link, the link is renamed; if newpath refers to a symbolic link, the link will be overwritten.

#### renameat()

The renameat() system call operates in exactly the same way as rename(), except for the differences described here.

If the pathname given in oldpath is relative, then it is interpreted relative to the directory referred to by the file descriptor olddirfd (rather than relative to the current working directory of the calling process, as is done by rename() for a relative pathname).

If oldpath is relative and olddirfd is the special value AT\_FDCWD, then oldpath is interpreted relative to the current working directory of the calling process (like rename()).

If oldpath is absolute, then olddirfd is ignored.

The interpretation of newpath is as for oldpath, except that a relative pathname is interpreted relative to the directory referred to by the file descriptor newdirfd.

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

#### renameat2()

renameat2() has an additional flags argument. A renameat2() call with a zero flags argument is equivalent to renameat().

The flags argument is a bit mask consisting of zero or more of the fol-

lowing flags:

#### RENAME\_EXCHANGE

Atomically exchange oldpath and newpath. Both pathnames must exist but may be of different types (e.g., one could be a non-empty directory and the other a symbolic link).

#### RENAME\_NOREPLACE

Don't overwrite newpath of the rename. Return an error if newpath already exists.

RENAME\_NOREPLACE can't be employed together with RENAME\_EXCHANGE.

RENAME\_NOREPLACE requires support from the underlying filesystem. Support for various filesystems was added as follows:

- \* ext4 (Linux 3.15);
- \* btrfs, shmem, and cifs (Linux 3.17);
- \* xfs (Linux 4.0);
- \* Support for many other filesystems was added in Linux 4.9, including ext2, minix, reiserfs, jfs, vfat, and bpf.

#### RENAME\_WHITEOUT (since Linux 3.18)

This operation makes sense only for overlay/union filesystem implementations.

Specifying RENAME\_WHITEOUT creates a "whiteout" object at the source of the rename at the same time as performing the rename.

The whole operation is atomic, so that if the rename succeeds then the whiteout will also have been created.

A "whiteout" is an object that has special meaning in union/overlay filesystem constructs. In these constructs, multiple layers exist and only the top one is ever modified. A whiteout on an upper layer will effectively hide a matching file in the lower layer, making it appear as if the file didn't exist.

When a file that exists on the lower layer is renamed, the file is first copied up (if not already on the upper layer) and then

renamed on the upper, read-write layer. At the same time, the source file needs to be "whiteouted" (so that the version of the source file in the lower layer is rendered invisible). The whole operation needs to be done atomically.

When not part of a union/overlay, the whiteout appears as a character device with a {0,0} device number. (Note that other union/overlay implementations may employ different methods for storing whiteout entries; specifically, BSD union mount employs a separate inode type, DT\_WHT, which, while supported by some filesystems available in Linux, such as CODA and XFS, is ignored by the kernel's whiteout support code, as of Linux 4.19, at least.)

RENAME\_WHITEOUT requires the same privileges as creating a device node (i.e., the CAP\_MKNOD capability).

RENAME\_WHITEOUT can't be employed together with RENAME\_EXCHANGE.

RENAME\_WHITEOUT requires support from the underlying filesystem.

Among the filesystems that provide that support are tmpfs (since Linux 3.18), ext4 (since Linux 3.18), XFS (since Linux 4.1), f2fs (since Linux 4.2), btrfs (since Linux 4.7), and ubifs (since Linux 4.9).

## RETURN VALUE

On success, zero is returned. On error, -1 is returned, and `errno` is set appropriately.

## ERRORS

**EACCES** Write permission is denied for the directory containing `oldpath` or `newpath`, or, search permission is denied for one of the directories in the path prefix of `oldpath` or `newpath`, or `oldpath` is a directory and does not allow write permission (needed to update the `..` entry). (See also `path_resolution(7)`.)

**EBUSY** The rename fails because `oldpath` or `newpath` is a directory that is in use by some process (perhaps as current working directory, or as root directory, or because it was open for reading) or is in use by the system (for example as mount point), while the

system considers this an error. (Note that there is no requirement to return EBUSY in such cases?there is nothing wrong with doing the rename anyway?but it is allowed to return EBUSY if the system cannot otherwise handle such situations.)

EDQUOT The user's quota of disk blocks on the filesystem has been exhausted.

EFAULT oldpath or newpath points outside your accessible address space.

EINVAL The new pathname contained a path prefix of the old, or, more generally, an attempt was made to make a directory a subdirectory of itself.

EISDIR newpath is an existing directory, but oldpath is not a directory.

ELOOP Too many symbolic links were encountered in resolving oldpath or newpath.

EMLINK oldpath already has the maximum number of links to it, or it was a directory and the directory containing newpath has the maximum number of links.

ENAMETOOLONG

oldpath or newpath was too long.

ENOENT The link named by oldpath does not exist; or, a directory component in newpath does not exist; or, oldpath or newpath is an empty string.

ENOMEM Insufficient kernel memory was available.

ENOSPC The device containing the file has no room for the new directory entry.

ENOTDIR

A component used as a directory in oldpath or newpath is not, in fact, a directory. Or, oldpath is a directory, and newpath exists but is not a directory.

ENOTEMPTY or EEXIST

newpath is a nonempty directory, that is, contains entries other than "." and "..".

EPERM or EACCES

The directory containing oldpath has the sticky bit (S\_ISVTX) set and the process's effective user ID is neither the user ID of the file to be deleted nor that of the directory containing it, and the process is not privileged (Linux: does not have the CAP\_FOWNER capability); or newpath is an existing file and the directory containing it has the sticky bit set and the process's effective user ID is neither the user ID of the file to be replaced nor that of the directory containing it, and the process is not privileged (Linux: does not have the CAP\_FOWNER capability); or the filesystem containing pathname does not support re-naming of the type requested.

EROFS The file is on a read-only filesystem.

EXDEV oldpath and newpath are not on the same mounted filesystem.

(Linux permits a filesystem to be mounted at multiple points, but rename() does not work across different mount points, even if the same filesystem is mounted on both.)

The following additional errors can occur for renameat() and renameat2():

EBADF olddirfd or newdirfd is not a valid file descriptor.

ENOTDIR

oldpath is relative and olddirfd is a file descriptor referring to a file other than a directory; or similar for newpath and newdirfd

The following additional errors can occur for renameat2():

EEXIST flags contains RENAME\_NOREPLACE and newpath already exists.

EINVAL An invalid flag was specified in flags.

EINVAL Both RENAME\_NOREPLACE and RENAME\_EXCHANGE were specified in flags.

EINVAL Both RENAME\_WHITEOUT and RENAME\_EXCHANGE were specified in flags.

EINVAL The filesystem does not support one of the flags in flags.

ENOENT flags contains RENAME\_EXCHANGE and newpath does not exist.

EPERM RENAME\_WHITEOUT was specified in flags, but the caller does not

have the CAP\_MKNOD capability.

## VERSIONS

renameat() was added to Linux in kernel 2.6.16; library support was added to glibc in version 2.4.

renameat2() was added to Linux in kernel 3.15; library support was added in glibc 2.28.

## CONFORMING TO

rename(): 4.3BSD, C89, C99, POSIX.1-2001, POSIX.1-2008.

renameat(): POSIX.1-2008.

renameat2() is Linux-specific.

## NOTES

### Glibc notes

On older kernels where renameat() is unavailable, the glibc wrapper function falls back to the use of rename(). When oldpath and newpath are relative pathnames, glibc constructs pathnames based on the symbolic links in /proc/self/fd that correspond to the olddirfd and newdirfd arguments.

## BUGS

On NFS filesystems, you can not assume that if the operation failed, the file was not renamed. If the server does the rename operation and then crashes, the retransmitted RPC which will be processed when the server is up again causes a failure. The application is expected to deal with this. See link(2) for a similar problem.

## SEE ALSO

mv(1), rename(1), chmod(2), link(2), symlink(2), unlink(2), path\_resolution(7), symlink(7)

## COLOPHON

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