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determine accessibility of a file descriptor

Prolog

This manual page is part of the POSIX Programmer's Manual. The Linux implementation of this interface may differ (consult the corresponding Linux manual page for details of Linux behavior), or the interface may not be implemented on Linux.

Synopsis

```
#include <unistd.h>
```

```
int access(const char *path, int amode);
```

```
#include <fcntl.h>
```

```
int faccessat(int fd, const char *path, int amode, int flag);
```

Description

The `access()` function shall check the file named by the pathname pointed to by the `path` argument for accessibility according to the bit pattern contained in `amode`. The checks for accessibility (including directory permissions checked during pathname resolution) shall be performed using the real user ID in place of the effective user ID and the real group ID in place of the effective group ID.

The value of `amode` is either the bitwise-inclusive OR of the access permissions to be checked (`R_OK`, `W_OK`, `X_OK`) or the existence test (`F_OK`).

If any access permissions are checked, each shall be checked individually, as described in the Base Definitions volume of POSIX.1-2017, *Section 4.5, File Access Permissions*, except that where that description refers to execute permission for a process with appropriate privileges, an implementation may indicate success for `X_OK` even if execute permission is not granted to any user.

The `faccessat()` function, when called with a `flag` value of zero, shall be equivalent to the `access()` function, except in the case where `path` specifies a relative path. In this case the file whose accessibility is to be determined shall be located relative to the directory associated with the file descriptor `fd` instead of the current working directory. If the access mode of the open file description associated with the file descriptor is not `O_SEARCH`, the function shall check whether directory searches are permitted using the current permissions of the directory

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If *faccessat()* is passed the special value `AT_FDCWD` in the *fd* parameter, the current working directory shall be used and, if *flag* is zero, the behavior shall be identical to a call to *access()*.

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

AT_EACCESS

The checks for accessibility (including directory permissions checked during pathname resolution) shall be performed using the effective user ID and group ID instead of the real user ID and group ID as required in a call to *access()*.

Return Value

Upon successful completion, these functions shall return 0. Otherwise, these functions shall return -1 and set *errno* to indicate the error.

Errors

These functions shall fail if:

EACCES

Permission bits of the file mode do not permit the requested access, or search permission is denied on a component of the path prefix.

ELOOP

A loop exists in symbolic links encountered during resolution of the *path* argument.

ENAMETOOLONG

The length of a component of a pathname is longer than `{NAME_MAX}`.

ENOENT

A component of *path* does not name an existing file or *path* is an empty string.

ENOTDIR

A component of the path prefix names an existing file that is neither a directory nor a symbolic link to a directory, or the *path* argument contains at least one non-`<slash>` character and ends with one or more trailing `<slash>` characters and the last pathname component names an existing file that is neither a directory nor a symbolic link to a directory.

EROFS

Write access is requested for a file on a read-only file system.

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The access mode of the open file description associated with *fd* is not `O_SEARCH` and the permissions of the directory underlying *fd* do not permit directory searches.

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 reading or searching.

ENOTDIR

The *path* argument is not an absolute path and *fd* is a file descriptor associated with a non-directory file.

These functions may fail if:

EINVAL

The value of the *amode* argument is invalid.

ELOOP

More than `{SYMLLOOP_MAX}` symbolic links were encountered during resolution of the *path* argument.

ENAMETOOLONG

The length of a pathname exceeds `{PATH_MAX}`, or pathname resolution of a symbolic link produced an intermediate result with a length that exceeds `{PATH_MAX}`.

ETXTBSY

Write access is requested for a pure procedure (shared text) file that is being executed.

The *faccessat()* function may fail if:

EINVAL

The value of the *flag* argument is not valid.

The following sections are informative.

Examples

Testing for the Existence of a File

The following example tests whether a file named **myfile** exists in the **/tmp** directory.

```
#include <unistd.h>
...
```

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```
result = access (pathname, F_OK);
```

Application Usage

Use of these functions is discouraged since by the time the returned information is acted upon, it is out-of-date. (That is, acting upon the information always leads to a time-of-check-to-time-of-use race condition.) An application should instead attempt the action itself and handle the **[EACCES]** error that occurs if the file is not accessible (with a change of effective user and group IDs beforehand, and perhaps a change back afterwards, in the case where *access()* or *faccessat()* without *AT_EACCESS* would have been used.)

Historically, one of the uses of *access()* was in set-user-ID root programs to check whether the user running the program had access to a file. This relied on “super-user” privileges which were granted based on the effective user ID being zero, so that when *access()* used the real user ID to check accessibility those privileges were not taken into account. On newer systems where privileges can be assigned which have no association with user or group IDs, if a program with such privileges calls *access()*, the change of IDs has no effect on the privileges and therefore they are taken into account in the accessibility checks. Thus, *access()* (and *faccessat()* with flag zero) cannot be used for this historical purpose in such programs. Likewise, if a system provides any additional or alternate file access control mechanisms that are not user ID-based, they will still be taken into account.

If a relative pathname is used, no account is taken of whether the current directory (or the directory associated with the file descriptor *fd*) is accessible via any absolute pathname. Applications using *access()*, or *faccessat()* without *AT_EACCESS*, may consequently act as if the file would be accessible to a user with the real user ID and group ID of the process when such a user would not in practice be able to access the file because access would be denied at some point above the current directory (or the directory associated with the file descriptor *fd*) in the file hierarchy.

If *access()* or *faccessat()* is used with *W_OK* to check for write access to a directory which has the *S_ISVTX* bit set, a return value indicating the directory is writable can be misleading since some operations on files in the directory would not be permitted based on the ownership of those files (see the Base Definitions volume of POSIX.1-2017, *Section 4.3, Directory Protection*).

Additional values of *amode* other than the set defined in the description may be valid; for example, if a system has extended access controls.

The use of the *AT_EACCESS* value for *flag* enables functionality not available in *access()*.

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In early proposals, some inadequacies in the `access()` function led to the creation of an `eaccess()` function because:

1. Historical implementations of `access()` do not test file access correctly when the process' real user ID is superuser. In particular, they always return zero when testing execute permissions without regard to whether the file is executable.
2. The superuser has complete access to all files on a system. As a consequence, programs started by the superuser and switched to the effective user ID with lesser privileges cannot use `access()` to test their file access permissions.

However, the historical model of `eaccess()` does not resolve problem (1), so this volume of POSIX.1-2017 now allows `access()` to behave in the desired way because several implementations have corrected the problem. It was also argued that problem (2) is more easily solved by using `open()`, `chdir()`, or one of the `exec` functions as appropriate and responding to the error, rather than creating a new function that would not be as reliable. Therefore, `eaccess()` is not included in this volume of POSIX.1-2017.

The sentence concerning appropriate privileges and execute permission bits reflects the two possibilities implemented by historical implementations when checking superuser access for `X_OK`.

New implementations are discouraged from returning `X_OK` unless at least one execution permission bit is set.

The purpose of the `faccessat()` function is to enable the checking of the accessibility of files in directories other than the current working directory without exposure to race conditions. Any part of the path of a file could be changed in parallel to a call to `access()`, resulting in unspecified behavior. By opening a file descriptor for the target directory and using the `faccessat()` function it can be guaranteed that the file tested for accessibility is located relative to the desired directory.

Future Directions

These functions may be formally deprecated (for example, by shading them 0B) in a future version of this standard.

See Also

`chmod()`, `fstatat()`

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Referenced By

[chmod\(3p\)](#), [ex\(1p\)](#), [fstatat\(3p\)](#), [unistd.h\(0p\)](#).

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