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Red Hat Enterprise Linux Release 9.2 Manual Pages on 'ftw.3' command

\$ man ftw.3

FTW(3) Linux Programmer's Manual FTW(3)

NAME

ftw, nftw - file tree walk

SYNOPSIS

```
#include <ftw.h>

int nftw(const char *dirpath,
         int (*fn) (const char *fpath, const struct stat *sb,
                  int typeflag, struct FTW *ftwbuf),
         int nopenfd, int flags);

#include <ftw.h>

int ftw(const char *dirpath,
        int (*fn) (const char *fpath, const struct stat *sb,
                  int typeflag),
        int nopenfd);
```

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

```
nftw(): _XOPEN_SOURCE >= 500
```

DESCRIPTION

nftw() walks through the directory tree that is located under the directory dirpath, and calls fn() once for each entry in the tree. By default, directories are handled before the files and subdirectories they contain (preorder traversal).

To avoid using up all of the calling process's file descriptors, nopenfd specifies the maximum number of directories that nftw() will

hold open simultaneously. When the search depth exceeds this, `nftw()` will become slower because directories have to be closed and reopened. `nftw()` uses at most one file descriptor for each level in the directory tree.

For each entry found in the tree, `nftw()` calls `fn()` with four arguments: `fpath`, `sb`, `typeflag`, and `ftwbuf`. `fpath` is the pathname of the entry, and is expressed either as a pathname relative to the calling process's current working directory at the time of the call to `nftw()`, if `dirpath` was expressed as a relative pathname, or as an absolute pathname, if `dirpath` was expressed as an absolute pathname. `sb` is a pointer to the `stat` structure returned by a call to `stat(2)` for `fpath`.

The `typeflag` argument passed to `fn()` is an integer that has one of the following values:

`FTW_F` `fpath` is a regular file.

`FTW_D` `fpath` is a directory.

`FTW_DNR`

`fpath` is a directory which can't be read.

`FTW_DP` `fpath` is a directory, and `FTW_DEPTH` was specified in flags. (If `FTW_DEPTH` was not specified in flags, then directories will always be visited with `typeflag` set to `FTW_D`.) All of the files and subdirectories within `fpath` have been processed.

`FTW_NS` The `stat(2)` call failed on `fpath`, which is not a symbolic link.

The probable cause for this is that the caller had read permission on the parent directory, so that the filename `fpath` could be seen, but did not have execute permission, so that the file could not be reached for `stat(2)`. The contents of the buffer pointed to by `sb` are undefined.

`FTW_SL` `fpath` is a symbolic link, and `FTW_PHYS` was set in flags.

`FTW_SLN`

`fpath` is a symbolic link pointing to a nonexistent file. (This occurs only if `FTW_PHYS` is not set.) In this case the `sb` argument passed to `fn()` contains information returned by performing `lstat(2)` on the "dangling" symbolic link. (But see `BUGS`.)

The fourth argument (`ftwbuf`) that `nftw()` supplies when calling `fn()` is a pointer to a structure of type `FTW`:

```
struct FTW {
    int base;
    int level;
};
```

`base` is the offset of the filename (i.e., `basename` component) in the `pathname` given in `fpath`. `level` is the depth of `fpath` in the directory tree, relative to the root of the tree (`dirpath`, which has depth 0).

To stop the tree walk, `fn()` returns a nonzero value; this value will become the return value of `nftw()`. As long as `fn()` returns 0, `nftw()` will continue either until it has traversed the entire tree, in which case it will return zero, or until it encounters an error (such as a `malloc(3)` failure), in which case it will return -1.

Because `nftw()` uses dynamic data structures, the only safe way to exit out of a tree walk is to return a nonzero value from `fn()`. To allow a signal to terminate the walk without causing a memory leak, have the handler set a global flag that is checked by `fn()`. Don't use `longjmp(3)` unless the program is going to terminate.

The `flags` argument of `nftw()` is formed by ORing zero or more of the following flags:

`FTW_ACTIONRETVAL` (since `glibc 2.3.3`)

If this `glibc`-specific flag is set, then `nftw()` handles the return value from `fn()` differently. `fn()` should return one of the following values:

`FTW_CONTINUE`

Instructs `nftw()` to continue normally.

`FTW_SKIP_SIBLINGS`

If `fn()` returns this value, then siblings of the current entry will be skipped, and processing continues in the parent.

`FTW_SKIP_SUBTREE`

If `fn()` is called with an entry that is a directory

(typeflag is FTW_D), this return value will prevent objects within that directory from being passed as arguments to fn(). nftw() continues processing with the next sibling of the directory.

FTW_STOP

Causes nftw() to return immediately with the return value FTW_STOP.

Other return values could be associated with new actions in the future; fn() should not return values other than those listed above.

The feature test macro `_GNU_SOURCE` must be defined (before including any header files) in order to obtain the definition of `FTW_ACTIONRETVAL` from `<ftw.h>`.

FTW_CHDIR

If set, do a `chdir(2)` to each directory before handling its contents. This is useful if the program needs to perform some action in the directory in which `fpath` resides. (Specifying this flag has no effect on the pathname that is passed in the `fpath` argument of `fn()`.)

FTW_DEPTH

If set, do a post-order traversal, that is, call `fn()` for the directory itself after handling the contents of the directory and its subdirectories. (By default, each directory is handled before its contents.)

FTW_MOUNT

If set, stay within the same filesystem (i.e., do not cross mount points).

FTW_PHYS

If set, do not follow symbolic links. (This is what you want.)

If not set, symbolic links are followed, but no file is reported twice.

If `FTW_PHYS` is not set, but `FTW_DEPTH` is set, then the function `fn()` is never called for a directory that would be a descendant

of itself.

ftw()

ftw() is an older function that offers a subset of the functionality of nftw(). The notable differences are as follows:

- * ftw() has no flags argument. It behaves the same as when nftw() is called with flags specified as zero.
- * The callback function, fn(), is not supplied with a fourth argument.
- * The range of values that is passed via the typeflag argument supplied to fn() is smaller: just FTW_F, FTW_D, FTW_DNR, FTW_NS, and (possibly) FTW_SL.

RETURN VALUE

These functions return 0 on success, and -1 if an error occurs.

If fn() returns nonzero, then the tree walk is terminated and the value returned by fn() is returned as the result of ftw() or nftw().

If nftw() is called with the FTW_ACTIONRETVAL flag, then the only nonzero value that should be used by fn() to terminate the tree walk is FTW_STOP, and that value is returned as the result of nftw().

VERSIONS

nftw() is available under glibc since version 2.1.

ATTRIBUTES

For an explanation of the terms used in this section, see attributes(7).

??

?Interface ? Attribute ? Value ?

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?nftw() ? Thread safety ? MT-Safe cwd ?

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?ftw() ? Thread safety ? MT-Safe ?

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CONFORMING TO

POSIX.1-2001, POSIX.1-2008, SVr4, SUSv1. POSIX.1-2008 marks ftw() as obsolete.

NOTES

POSIX.1-2008 notes that the results are unspecified if `fn` does not pre-serve the current working directory.

The function `nftw()` and the use of `FTW_SL` with `ftw()` were introduced in SUSv1.

In some implementations (e.g., glibc), `ftw()` will never use `FTW_SL`, on other systems `FTW_SL` occurs only for symbolic links that do not point to an existing file, and again on other systems `ftw()` will use `FTW_SL` for each symbolic link. If `fpath` is a symbolic link and `stat(2)` failed, POSIX.1-2008 states that it is undefined whether `FTW_NS` or `FTW_SL` is passed in `typeflag`. For predictable results, use `nftw()`.

BUGS

According to POSIX.1-2008, when the `typeflag` argument passed to `fn()` contains `FTW_SLN`, the buffer pointed to by `sb` should contain information about the dangling symbolic link (obtained by calling `lstat(2)` on the link). Early glibc versions correctly followed the POSIX specification on this point. However, as a result of a regression introduced in glibc 2.4, the contents of the buffer pointed to by `sb` were undefined when `FTW_SLN` is passed in `typeflag`. (More precisely, the contents of the buffer were left unchanged in this case.) This regression was eventually fixed in glibc 2.30, so that the glibc implementation (once more) follows the POSIX specification.

EXAMPLES

The following program traverses the directory tree under the path named in its first command-line argument, or under the current directory if no argument is supplied. It displays various information about each file. The second command-line argument can be used to specify characters that control the value assigned to the `flags` argument when calling `nftw()`.

Program source

```
#define _XOPEN_SOURCE 500
#include <ftw.h>
#include <stdio.h>
#include <stdlib.h>
```

```

#include <string.h>
#include <stdint.h>

static int
display_info(const char *fpath, const struct stat *sb,
             int tflag, struct FTW *ftwbuf)
{
    printf("%-3s %2d ",
          (tflag == FTW_D) ? "d" : (tflag == FTW_DNR) ? "dnr" :
          (tflag == FTW_DP) ? "dp" : (tflag == FTW_F) ? "f" :
          (tflag == FTW_NS) ? "ns" : (tflag == FTW_SL) ? "sl" :
          (tflag == FTW_SLN) ? "sln" : "???",
          ftwbuf->level);
    if (tflag == FTW_NS)
        printf("-----");
    else
        printf("%7jd", (intmax_t) sb->st_size);
    printf("  %-40s %d %s\n",
          fpath, ftwbuf->base, fpath + ftwbuf->base);
    return 0;      /* To tell nftw() to continue */
}

int
main(int argc, char *argv[])
{
    int flags = 0;
    if (argc > 2 && strchr(argv[2], 'd') != NULL)
        flags |= FTW_DEPTH;
    if (argc > 2 && strchr(argv[2], 'p') != NULL)
        flags |= FTW_PHYS;
    if (nftw((argc < 2) ? "." : argv[1], display_info, 20, flags)
        == -1) {
        perror("nftw");
        exit(EXIT_FAILURE);
    }
}

```

```
    exit(EXIT_SUCCESS);  
}
```

SEE ALSO

stat(2), fts(3), readdir(3)

COLOPHON

This page is part of release 5.10 of the Linux man-pages project. A description of the project, information about reporting bugs, and the latest version of this page, can be found at <https://www.kernel.org/doc/man-pages/>.

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