NAME

opendir − open a directory / readdir − read a directory

SYNOPSIS

#include <sys/types.h>

#include <dirent.h>

DIR *opendir(const char ****name*);**

struct dirent *readdir(DIR ****dir*);**
int readdir_r(DIR ****dirp*, struct dirent ****entry***, struct dirent ****result***);**

DESCRIPTION opendir

The **opendir()** function opens a directory stream corresponding to the directory *name*, and returns a pointer to the directory stream. The stream is positioned at the first entry in the directory.

RETURN VALUE

The **opendir()** function returns a pointer to the directory stream or NULL if an error occurred.

DESCRIPTION readdir

The **readdir()** function returns a pointer to a dirent structure representing the next directory entry in the directory stream pointed to by *dir*. It returns NULL on reaching the end-of-file or if an error occurred.

DESCRIPTION readdir_r

The **readdir_r()** function initializes the structure referenced by *entry* and stores a pointer to this structure in *result*. On successful return, the pointer returned at **result* will have the same value as the argument *entry*. Upon reaching the end of the directory stream, this pointer will have the value NULL.

The data returned by **readdir()** is overwritten by subsequent calls to **readdir()** for the **same** directory stream.

The *dirent* structure is defined as follows:

```
struct dirent {
    long          d_ino;          /* inode number */
    off_t         d_off;          /* offset to the next dirent */
    unsigned short  d_reclen;     /* length of this record */
    unsigned char   d_type;       /* type of file */
    char          d_name[256];    /* filename */
};
```

RETURN VALUE

The **readdir()** function returns a pointer to a dirent structure, or NULL if an error occurs or end-of-file is reached.

readdir_r() returns 0 if successful or an error number to indicate failure.

ERRORS

EACCES
Permission denied.

ENOENT
Directory does not exist, or *name* is an empty string.

ENOTDIR
name is not a directory.

NAME

fopen, fdopen, fileno − stream open functions

SYNOPSIS

#include <stdio.h>

FILE *fopen(const char * *path*, **const char *** *mode*);
FILE *fdopen(int *fildes*, **const char *** *mode*);
int fileno(FILE * *stream*);

DESCRIPTION

The **fopen** function opens the file whose name is the string pointed to by *path* and associates a stream with it.

The argument *mode* points to a string beginning with one of the following sequences (Additional characters may follow these sequences.):

r Open text file for reading. The stream is positioned at the beginning of the file.

r+ Open for reading and writing. The stream is positioned at the beginning of the file.

w Truncate file to zero length or create text file for writing. The stream is positioned at the beginning of the file.

w+ Open for reading and writing. The file is created if it does not exist, otherwise it is truncated. The stream is positioned at the beginning of the file.

a Open for appending (writing at end of file). The file is created if it does not exist. The stream is positioned at the end of the file.

a+ Open for reading and appending (writing at end of file). The file is created if it does not exist. The stream is positioned at the end of the file.

The **fdopen** function associates a stream with the existing file descriptor, *fildes*. The *mode* of the stream (one of the values "r", "r+", "w", "w+", "a", "a+") must be compatible with the mode of the file descriptor. The file position indicator of the new stream is set to that belonging to *fildes*, and the error and end-of-file indicators are cleared. Modes "w" or "w+" do not cause truncation of the file. The file descriptor is not dup'ed, and will be closed when the stream created by **fdopen** is closed. The result of applying **fdopen** to a shared memory object is undefined.

The function **fileno**() examines the argument *stream* and returns its integer descriptor.

RETURN VALUE

Upon successful completion **fopen**, **fdopen** and **freopen** return a **FILE** pointer. Otherwise, **NULL** is returned and the global variable *errno* is set to indicate the error.

ERRORS

EINVAL
The *mode* provided to **fopen**, **fdopen**, or **freopen** was invalid.

The **fopen**, **fdopen** and **freopen** functions may also fail and set *errno* for any of the errors specified for the routine **malloc**(3).

The **fopen** function may also fail and set *errno* for any of the errors specified for the routine **open**(2).

The **fdopen** function may also fail and set *errno* for any of the errors specified for the routine **fcntl**(2).

SEE ALSO

open(2), **fclose**(3), **fileno**(3)

NAME

fread, fwrite − binary stream input/output

SYNOPSIS

#include <stdio.h>

size_t fread(void ****ptr*, size_t** *size***, size_t** *nmemb***, FILE ****stream***);**

size_t fwrite(const void ****ptr*, size_t** *size***, size_t** *nmemb***,**
FILE ****stream*);**

DESCRIPTION

The function **fread**() reads *nmemb* elements of data, each *size* bytes long, from the stream pointed to by *stream*, storing them at the location given by *ptr*.

The function **fwrite**() writes *nmemb* elements of data, each *size* bytes long, to the stream pointed to by *stream*, obtaining them from the location given by *ptr*.

For nonlocking counterparts, see **unlocked_stdio**(3).

RETURN VALUE

fread() and **fwrite**() return the number of items successfully read or written (i.e., not the number of characters). If an error occurs, or the end-of-file is reached, the return value is a short item count (or zero).

fread() does not distinguish between end-of-file and error, and callers must use **feof**(3) and **ferror**(3) to determine which occurred.

CONFORMING TO

C89, POSIX.1-2001.

SEE ALSO

read(2), **write**(2), **feof**(3), **ferror**(3), **unlocked_stdio**(3)

NAME

calloc, malloc, free, realloc − Allocate and free dynamic memory

SYNOPSIS

#include <stdlib.h>

void *calloc(size_t *nmemb***, size_t** *size***);**
void *malloc(size_t *size***);**
void free(void **ptr***);*
void *realloc(void **ptr***, size_t** *size***);**

DESCRIPTION

calloc() allocates memory for an array of *nmemb* elements of *size* bytes each and returns a pointer to the allocated memory. The memory is set to zero.

malloc() allocates *size* bytes and returns a pointer to the allocated memory. The memory is not cleared.

free() frees the memory space pointed to by *ptr*, which must have been returned by a previous call to **malloc()**, **calloc()** or **realloc()**. Otherwise, or if **free(***ptr***)** has already been called before, undefined behaviour occurs. If *ptr* is **NULL**, no operation is performed.

realloc() changes the size of the memory block pointed to by *ptr* to *size* bytes. The contents will be unchanged to the minimum of the old and new sizes; newly allocated memory will be uninitialized. If *ptr* is **NULL**, the call is equivalent to **malloc(size)**; if size is equal to zero, the call is equivalent to **free(***ptr***)**. Unless *ptr* is **NULL**, it must have been returned by an earlier call to **malloc()**, **calloc()** or **realloc()**.

RETURN VALUE

For **calloc()** and **malloc()**, the value returned is a pointer to the allocated memory, which is suitably aligned for any kind of variable, or **NULL** if the request fails.

free() returns no value.

realloc() returns a pointer to the newly allocated memory, which is suitably aligned for any kind of variable and may be different from *ptr*, or **NULL** if the request fails. If *size* was equal to 0, either NULL or a pointer suitable to be passed to *free*() is returned. If **realloc()** fails the original block is left untouched - it is not freed or moved.

CONFORMING TO

ANSI-C

SEE ALSO

brk(2), **posix_memalign**(3)

NAME

pthread_create − create a new thread / pthread_exit − terminate the calling thread

SYNOPSIS

#include <pthread.h>

int pthread_create(pthread_t * *thread***, pthread_attr_t *** *attr***, void * (*****start_routine***)(void *), void *** *arg***);**

void pthread_exit(void * *retval***);**

DESCRIPTION

pthread_create creates a new thread of control that executes concurrently with the calling thread. The new thread applies the function *start_routine* passing it *arg* as first argument. The new thread terminates either explicitly, by calling **pthread_exit**(3), or implicitly, by returning from the *start_routine* function. The latter case is equivalent to calling **pthread_exit**(3) with the result returned by *start_routine* as exit code.

The *attr* argument specifies thread attributes to be applied to the new thread. See **pthread_attr_init**(3) for a complete list of thread attributes. The *attr* argument can also be **NULL**, in which case default attributes are used: the created thread is joinable (not detached) and has default (non real-time) scheduling policy.

pthread_exit terminates the execution of the calling thread. All cleanup handlers that have been set for the calling thread with **pthread_cleanup_push**(3) are executed in reverse order (the most recently pushed handler is executed first). Finalization functions for thread-specific data are then called for all keys that have non- **NULL** values associated with them in the calling thread (see **pthread_key_create**(3)). Finally, execution of the calling thread is stopped.

The *retval* argument is the return value of the thread. It can be consulted from another thread using **pthread_join**(3).

RETURN VALUE

On success, the identifier of the newly created thread is stored in the location pointed by the *thread* argument, and a 0 is returned. On error, a non-zero error code is returned.

The **pthread_exit** function never returns.

ERRORS

EAGAIN
not enough system resources to create a process for the new thread.

EAGAIN
more than **PTHREAD_THREADS_MAX** threads are already active.

AUTHOR

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SEE ALSO

pthread_join(3), **pthread_detach**(3), **pthread_attr_init**(3).

NAME

pthread_detach − put a running thread in the detached state

SYNOPSIS

#include <pthread.h>

int pthread_detach(pthread_t th);

DESCRIPTION

pthread_detach put the thread *th* in the detached state. This guarantees that the memory resources consumed by *th* will be freed immediately when *th* terminates. However, this prevents other threads from synchronizing on the termination of *th* using **pthread_join**.

A thread can be created initially in the detached state, using the **detachstate** attribute to **pthread_create**(3). In contrast, **pthread_detach** applies to threads created in the joinable state, and which need to be put in the detached state later.

After **pthread_detach** completes, subsequent attempts to perform **pthread_join** on *th* will fail. If another thread is already joining the thread *th* at the time **pthread_detach** is called, **pthread_detach** does nothing and leaves *th* in the joinable state.

RETURN VALUE

On success, 0 is returned. On error, a non-zero error code is returned.

ERRORS

ESRCH
No thread could be found corresponding to that specified by *th*

EINVAL
the thread *th* is already in the detached state

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SEE ALSO

pthread_create(3), **pthread_join**(3), **pthread_attr_setdetachstate**(3).

NAME

stat, fstat, lstat − get file status

SYNOPSIS

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

int stat(const char *path, struct stat *buf);
int fstat(int fd, struct stat *buf);
int lstat(const char *path, struct stat *buf);
```

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

lstat(): _BSD_SOURCE || _XOPEN_SOURCE >= 500

DESCRIPTION

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

stat() stats the file pointed to by *path* and fills in *buf* .

lstat() is identical to **stat**(), except that if *path* is a symbolic link, then the link itself is stat-ed, not the file that it refers to.

fstat() is identical to **stat**(), except that the file to be stat-ed is specified by the file descriptor *fd*.

All of these system calls return a *stat* structure, which contains the following fields:

```
struct stat {
    dev_t     st_dev;     /* ID of device containing file */
    ino_t     st_ino;     /* inode number */
    mode_t    st_mode;    /* protection */
    nlink_t   st_nlink;   /* number of hard links */
    uid_t     st_uid;     /* user ID of owner */
    gid_t     st_gid;     /* group ID of owner */
    dev_t     st_rdev;    /* device ID (if special file) */
    off_t     st_size;    /* total size, in bytes */
    blksize_t st_blksize; /* blocksize for file system I/O */
    blkcnt_t  st_blocks;  /* number of blocks allocated */
    time_t    st_atime;   /* time of last access */
    time_t    st_mtime;   /* time of last modification */
    time_t    st_ctime;   /* time of last status change */
};
```

The *st_dev* field describes the device on which this file resides.

The *st_rdev* field describes the device that this file (inode) represents.

The *st_size* field gives the size of the file (if it is a regular file or a symbolic link) in bytes. The size of a symlink is the length of the pathname it contains, without a trailing null byte.

The *st_blocks* field indicates the number of blocks allocated to the file, 512-byte units. (This may be smaller than *st_size*/512 when the file has holes.)

The *st_blksize* field gives the "preferred" blocksize for efficient file system I/O. (Writing to a file in smaller chunks may cause an inefficient read-modify-rewrite.)

Not all of the Linux file systems implement all of the time fields. Some file system types allow mounting in such a way that file accesses do not cause an update of the *st_atime* field. (See "noatime" in **mount**(8).)

The field *st_atime* is changed by file accesses, for example, by **execve**(2), **mknod**(2), **pipe**(2), **utime**(2) and **read**(2) (of more than zero bytes). Other routines, like **mmap**(2), may or may not update *st_atime*.

The field *st_mtime* is changed by file modifications, for example, by **mknod**(2), **truncate**(2), **utime**(2) and **write**(2) (of more than zero bytes). Moreover, *st_mtime* of a directory is changed by the creation or deletion of files in that directory. The *st_mtime* field is *not* changed for changes in owner, group, hard link count, or mode.

The field *st_ctime* is changed by writing or by setting inode information (i.e., owner, group, link count, mode, etc.).

The following POSIX macros are defined to check the file type using the *st_mode* field:

S_ISREG(m)	is it a regular file?
S_ISDIR(m)	directory?
S_ISCHR(m)	character device?
S_ISBLK(m)	block device?
S_ISFIFO(m)	FIFO (named pipe)?
S_ISLNK(m)	symbolic link? (Not in POSIX.1-1996.)
S_ISSOCK(m)	socket? (Not in POSIX.1-1996.)

RETURN VALUE

On success, zero is returned. On error, −1 is returned, and *errno* is set appropriately.

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 bad.

EFAULT
Bad address.

ELOOP
Too many symbolic links encountered while traversing the path.

ENAMETOOLONG
File name too long.

ENOENT
A component of the path *path* does not exist, or the path is an empty string.

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

ENOTDIR
A component of the path is not a directory.

SEE ALSO

access(2), **chmod**(2), **chown**(2), **fstatat**(2), **readlink**(2), **utime**(2), **capabilities**(7), **symlink**(7)