NAME

accept – accept a connection on a socket

SYNOPSIS

#include <sys/types.h>
#include <sys/socket.h>

int accept(int *s*, **struct sockaddr** **addr*, **int** **addrlen*);

DESCRIPTION

The argument *s* is a socket that has been created with **socket**(3N) and bound to an address with **bind**(3N), and that is listening for connections after a call to **listen**(3N). The **accept**( ) function extracts the first connection on the queue of pending connections, creates a new socket with the properties of *s*, and allocates a new file descriptor, *ns*, for the socket. If no pending connections are present on the queue and the socket is not marked as non-blocking, **accept**( ) blocks the caller until a connection is present. If the socket is marked as non-blocking and no pending connections are present on the queue, **accept**( ) returns an error as described below. The **accept**( ) function uses the **netconfig**(4) file to determine the STREAMS device file name associated with *s*. This is the device on which the connect indication will be accepted. The accepted socket, *ns*, is used to read and write data to and from the socket that connected to *ns*; it is not used to accept more connections. The original socket (*s*) remains open for accepting further connections.

The argument *addr* is a result parameter that is filled in with the address of the connecting entity as it is known to the communications layer. The exact format of the *addr* parameter is determined by the domain in which the communication occurs.

The argument *addrlen* is a value-result parameter. Initially, it contains the amount of space pointed to by *addr*; on return it contains the length in bytes of the address returned.

The **accept**( ) function is used with connection-based socket types, currently with **SOCK_STREAM**.

It is possible to **select**(3C) or **poll**(2) a socket for the purpose of an **accept**( ) by selecting or polling it for a read. However, this will only indicate when a connect indication is pending; it is still necessary to call **accept**( ).

RETURN VALUE

On success, these system calls return a nonnegative integer that is a file descriptor for the accepted socket. On error, −1 is returned, and *errno* is set appropriately.

ERRORS

accept( ) will fail if:

EBADF	The descriptor is invalid.
EINTR	The accept attempt was interrupted by the delivery of a signal.
EMFILE	The per-process descriptor table is full.
ENODEV	The protocol family and type corresponding to *s* could not be found in the **netconfig** file.
ENOMEM	There was insufficient user memory available to complete the operation.
EPROTO	A protocol error has occurred; for example, the STREAMS protocol stack has not been initialized or the connection has already been released.
EWOULDBLOCK	The socket is marked as non-blocking and no connections are present to be accepted.

SEE ALSO

poll(2), **bind**(3N), **connect**(3N), **listen**(3N), **select**(3C), **socket**(3N), **netconfig**(4), **attributes**(5), **socket**(5)

NAME

bind – bind a name to a socket

SYNOPSIS

#include <sys/types.h>
#include <sys/socket.h>

int bind(int *s*, **const struct sockaddr** **name*, **int** *namelen*);

DESCRIPTION

bind( ) assigns a name to an unnamed socket *s* . When a socket is created with **socket**(3N), it exists in a name space (address family) but has no name assigned. **bind**( ) requests that the name pointed to by *name* be assigned to the socket.

RETURN VALUE

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

ERRORS

The **bind**( ) call will fail if:

EACCES	The requested address is protected and the current user has inadequate permission to access it.
EADDRINUSE	The specified address is already in use.
EADDRNOTAVAIL	The specified address is not available on the local machine.
EBADF	*s* is not a valid descriptor.
EINVAL	*namelen* is not the size of a valid address for the specified address family.
EINVAL	The socket is already bound to an address.
ENOSR	There were insufficient STREAMS resources for the operation to complete.
ENOTSOCK	*s* is a descriptor for a file, not a socket.

The following errors are specific to binding names in the UNIX domain:

EACCES	Search permission is denied for a component of the path prefix of the pathname in *name*.
EIO	An I/O error occurred while making the directory entry or allocating the inode.
EISDIR	A null pathname was specified.
ELOOP	Too many symbolic links were encountered in translating the pathname in *name*.
ENOENT	A component of the path prefix of the pathname in *name* does not exist.
ENOTDIR	A component of the path prefix of the pathname in *name* is not a directory.
EROFS	The inode would reside on a read-only file system.

SEE ALSO

unlink(2), **socket**(3N), **attributes**(5), **socket**(5)

NOTES

Binding a name in the UNIX domain creates a socket in the file system that must be deleted by the caller when it is no longer needed (using **unlink**(2)).

The rules used in name binding vary between communication domains.

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);
int fclose(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.

The **fclose**() function flushes the stream pointed to by *stream* (writing any buffered output data using **fflush**(3)) and closes the underlying file 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. Upon successful completion of **fclose**, 0 is returned. Otherwise, **EOF** is returned and *errno* is set to indicate the error.

ERRORS

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

EBADF
The file descriptor underlying *stream* passed to **fclose** is not valid.

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).

NAME

ipv6, AF_INET6 – Linux IPv6 protocol implementation

SYNOPSIS

```
#include <sys/socket.h>
#include <netinet/in.h>

tcp6_socket = socket(AF_INET6, SOCK_STREAM, 0);
raw6_socket = socket(AF_INET6, SOCK_RAW, protocol);
udp6_socket = socket(AF_INET6, SOCK_DGRAM, protocol);
```

DESCRIPTION

Linux 2.2 optionally implements the Internet Protocol, version 6. This man page contains a description of the IPv6 basic API as implemented by the Linux kernel and glibc 2.1. The interface is based on the BSD sockets interface; see **socket**(7).

The IPv6 API aims to be mostly compatible with the **ip**(7) v4 API. Only differences are described in this man page.

To bind an **AF_INET6** socket to any process the local address should be copied from the *in6addr_any* variable which has *in6_addr* type. In static initializations **IN6ADDR_ANY_INIT** may also be used, which expands to a constant expression. Both of them are in network order.

IPv4 connections can be handled with the v6 API by using the v4-mapped-on-v6 address type; thus a program only needs only to support this API type to support both protocols. This is handled transparently by the address handling functions in libc.

IPv4 and IPv6 share the local port space. When you get an IPv4 connection or packet to a IPv6 socket its source address will be mapped to v6 and it will be mapped to v6.

Address Format

```
struct sockaddr_in6 {
    uint16_t        sin6_family;    /* AF_INET6 */
    uint16_t        sin6_port;      /* port number */
    uint32_t        sin6_flowinfo;  /* IPv6 flow information */
    struct in6_addr sin6_addr;      /* IPv6 address */
    uint32_t        sin6_scope_id;  /* Scope ID (new in 2.4) */
};

struct in6_addr {
    unsigned char   s6_addr[16];    /* IPv6 address */
};
```

sin6_family is always set to **AF_INET6**; *sin6_port* is the protocol port (see *sin_port* in **ip**(7)); *sin6_flowinfo* is the IPv6 flow identifier; *sin6_addr* is the 128-bit IPv6 address. *sin6_scope_id* is an ID of depending of on the scope of the address. It is new in Linux 2.4. Linux only supports it for link scope addresses, in that case *sin6_scope_id* contains the interface index (see **netdevice**(7))

RETURN VALUES

−1 is returned if an error occurs. Otherwise the return value is a descriptor referencing the socket.

NOTES

The *sockaddr_in6* structure is bigger than the generic *sockaddr*. Programs that assume that all address types can be stored safely in a *struct sockaddr* need to be changed to use *struct sockaddr_storage* for that instead.

SEE ALSO

cmsg(3), **ip**(7)

NAME

listen – listen for connections on a socket

SYNOPSIS

#include <sys/types.h> /* See NOTES */
#include <sys/socket.h>

int listen(int *sockfd*, **int** *backlog*);

DESCRIPTION

listen() marks the socket referred to by *sockfd* as a passive socket, that is, as a socket that will be used to accept incoming connection requests using **accept**(2).

The *sockfd* argument is a file descriptor that refers to a socket of type **SOCK_STREAM** or **SOCK_SEQPACKET**.

The *backlog* argument defines the maximum length to which the queue of pending connections for *sockfd* may grow. If a connection request arrives when the queue is full, the client may receive an error with an indication of **ECONNREFUSED** or, if the underlying protocol supports retransmission, the request may be ignored so that a later reattempt at connection succeeds.

RETURN VALUE

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

ERRORS

EADDRINUSE
Another socket is already listening on the same port.

EBADF
The argument *sockfd* is not a valid descriptor.

ENOTSOCK
The argument *sockfd* is not a socket.

NOTES

To accept connections, the following steps are performed:

1. A socket is created with **socket**(2).
2. The socket is bound to a local address using **bind**(2), so that other sockets may be **connect**(2)ed to it.
3. A willingness to accept incoming connections and a queue limit for incoming connections are specified with **listen**().
4. Connections are accepted with **accept**(2).

If the *backlog* argument is greater than the value in */proc/sys/net/core/somaxconn*, then it is silently truncated to that value; the default value in this file is 128.

EXAMPLE

See **bind**(2).

SEE ALSO

accept(2), **bind**(2), **connect**(2), **socket**(2), **socket**(7)

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

Xavier Leroy <Xavier.Leroy@inria.fr>

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

AUTHOR

Xavier Leroy <Xavier.Leroy@inria.fr>

SEE ALSO

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

NAME

sigaction – POSIX signal handling functions.

SYNOPSIS

#include <signal.h>

int sigaction(int *signum*, **const struct sigaction** **act*, **struct sigaction** **oldact*);

DESCRIPTION

The **sigaction** system call is used to change the action taken by a process on receipt of a specific signal.

signum specifies the signal and can be any valid signal except **SIGKILL** and **SIGSTOP**.

If *act* is non–null, the new action for signal *signum* is installed from *act*. If *oldact* is non–null, the previous action is saved in *oldact*.

The **sigaction** structure is defined as something like

```
struct sigaction {
    void     (*sa_handler)(int signal_number);
    sigset_t sa_mask;
    int      sa_flags;
}
```

sa_handler specifies the action to be associated with *signum* and may be **SIG_DFL** for the default action, **SIG_IGN** to ignore this signal, or a pointer to a signal handling function.

sa_mask gives a mask of signals which should be blocked during execution of the signal handler. In addition, the signal which triggered the handler will be blocked, unless the **SA_NODEFER** or **SA_NOMASK** flags are used.

sa_flags specifies a set of flags which modify the behaviour of the signal handling process. It is formed by the bitwise OR of zero or more of the following:

SA_NOCLDSTOP
If *signum* is **SIGCHLD**, do not receive notification when child processes stop (i.e., when child processes receive one of **SIGSTOP**, **SIGTSTP**, **SIGTTIN** or **SIGTTOU**).

SA_RESTART
Provide behaviour compatible with BSD signal semantics by making certain system calls restartable across signals. Without **SA_RESTART** the system calls return an error and set errno to EINTR when interrupted by a signal.

RETURN VALUES

sigaction() returns 0 on success; on error, −1 is returned, and *errno* is set to indicate the error.

ERRORS

EINVAL
An invalid signal was specified. This will also be generated if an attempt is made to change the action for **SIGKILL** or **SIGSTOP**, which cannot be caught.

SEE ALSO

kill(1), **kill**(2), **killpg**(2), **pause**(2), **sigsetops**(3),

NAME

strerror — get error message string

SYNOPSIS

#include <string.h>

char *strerror(int *errnum*);

DESCRIPTION

For *strerror*(): The functionality described on this reference page is aligned with the ISO C standard. Any conflict between the requirements described here and the ISO C standard is unintentional. This volume of POSIX.1-2008 defers to the ISO C standard.

The *strerror*() function shall map the error number in *errnum* to a locale-dependent error message string and shall return a pointer to it. Typically, the values for *errnum* come from *errno*, but *strerror*() shall map any value of type **int** to a message.

The application shall not modify the string returned. The returned string pointer might be invalidated or the string content might be overwritten by a subsequent call to *strerror*() in the same thread. The returned pointer and the string content might also be invalidated if the calling thread is terminated.

The contents of the error message strings returned by *strerror*() should be determined by the setting of the *LC_MESSAGES* category in the current locale.

The implementation shall behave as if no function defined in this volume of POSIX.1-2008 calls *strerror*().

The *strerror*() function shall not change the setting of *errno* if successful.

If the value of *errnum* is a valid error number, the message string shall indicate what error occurred; if the value of *errnum* is zero, the message string shall either be an empty string or indicate that no error occurred; otherwise, if these functions complete successfully, the message string shall indicate that an unknown error occurred.

RETURN VALUE

Upon completion, whether successful or not, *strerror*() shall return a pointer to the generated message string. On error *errno* may be set, but no return value is reserved to indicate an error.

ERRORS

These functions may fail if:

EINVAL

The value of *errnum* is neither a valid error number nor zero.

SEE ALSO

perror(3)

NAME

strcat, strchr, strcmp, strcpy, strdup, strlen, strncat, strncmp, strncpy, strrchr, strstr, strtok – string operations

SYNOPSIS

#include <string.h>

char *strcat(char **dest*, const char **src*);
Append the string *src* to the string *dest*, returning a pointer *dest*.

char *strchr(const char **s*, int *c*);
Return a pointer to the first occurrence of the character *c* in the string *s*.

int strcmp(const char **s1*, const char **s2*);
Compare the strings *s1* with *s2*. It returns an integer less than, equal to, or greater than zero if *s1* is found, respectively, to be less than, to match, or be greater than *s2*.

char *strcpy(char **dest*, const char **src*);
Copy the string *src* to *dest*, returning a pointer to the start of *dest*.

char *strdup(const char **s*);
Return a duplicate of the string *s* in memory allocated using **malloc**(3).

size_t strlen(const char **s*);
Return the length of the string *s*.

char *strncat(char **dest*, const char **src*, size_t *n*);
Append at most *n* characters from the string *src* to the string *dest*, returning a pointer to *dest*.

int strncmp(const char **s1*, const char **s2*, size_t *n*);
Compare at most *n* bytes of the strings *s1* and *s2*. It returns an integer less than, equal to, or greater than zero if *s1* is found, respectively, to be less than, to match, or be greater than *s2*.

char *strncpy(char **dest*, const char **src*, size_t *n*);
Copy at most *n* bytes from string *src* to *dest*, returning a pointer to the start of *dest*.

char *strrchr(const char **s*, int *c*);
Return a pointer to the last occurrence of the character *c* in the string *s*.

char *strstr(const char **haystack*, const char **needle*);
Find the first occurrence of the substring *needle* in the string *haystack*, returning a pointer to the found substring.

char *strtok(char **s*, const char **delim*);
Extract tokens from the string *s* that are delimited by one of the bytes in *delim*.

DESCRIPTION

The string functions perform operations on null-terminated strings.