



Linux Ubuntu 26.04 Manual Pages on command 'cmsg.3'

\$ man cmsg.3

CMSG(3) Library Functions Manual CMSG(3)

NAME

CMSG_ALIGN, CMSG_SPACE, CMSG_NXTHDR, CMSG_FIRSTHDR - access ancillary data

LIBRARY

Standard C library (libc, -lc)

SYNOPSIS

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

struct cmsghdr *CMSG_FIRSTHDR(struct msghdr *msgh);

struct cmsghdr *CMSG_NXTHDR(struct msghdr *msgh,
                             struct cmsghdr *cmsg);

size_t CMSG_ALIGN(size_t length);

size_t CMSG_SPACE(size_t length);

size_t CMSG_LEN(size_t length);

unsigned char *CMSG_DATA(struct cmsghdr *cmsg);
```

DESCRIPTION

These macros are used to create and access control messages (also called ancillary data) that are not a part of the socket payload. This control information may include the interface the packet was received on, various rarely used header fields, an extended error description, a set of file descriptors, or UNIX credentials. For instance, control messages can be used to send additional header fields such as IP options. Ancillary data is sent by calling `sendmsg(2)` and received by calling `recvmsg(2)`. See their manual pages for more information.

Ancillary data is a sequence of `cmsghdr` structures with appended data. See the specific

protocol man pages for the available control message types. The maximum ancillary buffer size allowed per socket can be set using `/proc/sys/net/core/optmem_max`; see `socket(7)`.

The `cmsghdr` structure is defined as follows:

```
struct cmsghdr {
    size_t cmsg_len; /* Data byte count, including header
                     (type is socklen_t in POSIX) */
    int cmsg_level; /* Originating protocol */
    int cmsg_type; /* Protocol-specific type */
    /* followed by
     unsigned char cmsg_data[]; */
};
```

The sequence of `cmsghdr` structures should never be accessed directly. Instead, use only the following macros:

`CMSG_FIRSTHDR()`

returns a pointer to the first `cmsghdr` in the ancillary data buffer associated with the passed `msghdr`. It returns `NULL` if there isn't enough space for a `cmsghdr` in the buffer.

`CMSG_NXTHDR()`

returns the next valid `cmsghdr` after the passed `cmsghdr`. It returns `NULL` when there isn't enough space left in the buffer.

When initializing a buffer that will contain a series of `cmsghdr` structures (e.g., to be sent with `sendmsg(2)`), that buffer should first be zero-initialized to ensure the correct operation of `CMSG_NXTHDR()`.

`CMSG_ALIGN()`,

given a length, returns it including the required alignment. This is a constant expression.

`CMSG_SPACE()`

returns the number of bytes an ancillary element with payload of the passed data length occupies. This is a constant expression.

`CMSG_DATA()`

returns a pointer to the data portion of a `cmsghdr`. The pointer returned cannot be assumed to be suitably aligned for accessing arbitrary payload data types. Applications should not cast it to a pointer type matching the payload, but should instead

use `memcpy(3)` to copy data to or from a suitably declared object.

CMSG_LEN()

returns the value to store in the `cmsg_len` member of the `cmsg_hdr` structure, taking into account any necessary alignment. It takes the data length as an argument. This is a constant expression.

To create ancillary data, first initialize the `msg_controllen` member of the `msghdr` with the length of the control message buffer. Use `CMSG_FIRSTHDR()` on the `msghdr` to get the first control message and `CMSG_NXTHDR()` to get all subsequent ones. In each control message, initialize `cmsg_len` (with `CMSG_LEN()`), the other `cmsg_hdr` header fields, and the data portion using `CMSG_DATA()`. Finally, the `msg_controllen` field of the `msghdr` should be set to the sum of the `CMSG_SPACE()` of the length of all control messages in the buffer. For more information on the `msghdr`, see `recvmsg(2)`.

VERSIONS

For portability, ancillary data should be accessed using only the macros described here.

In Linux, `CMSG_LEN()`, `CMSG_DATA()`, and `CMSG_ALIGN()` are constant expressions (assuming their argument is constant), meaning that these values can be used to declare the size of global variables. This may not be portable, however.

STANDARDS

`CMSG_FIRSTHDR()`

`CMSG_NXTHDR()`

`CMSG_DATA()`

POSIX.1-2008.

`CMSG_SPACE()`

`CMSG_LEN()`

`CMSG_ALIGN()`

Linux.

HISTORY

This ancillary data model conforms to the POSIX.1g draft, 4.4BSD-Lite, the IPv6 advanced API described in RFC 2292 and SUSv2.

`CMSG_SPACE()` and `CMSG_LEN()` will be included in the next POSIX release (Issue 8).

EXAMPLES

This code looks for the `IP_TTL` option in a received ancillary buffer:

```
struct msghdr msgh;
```

```

struct cmsghdr *cmsg;

int received_ttl;

/* Receive auxiliary data in msgsh */

for (cmsg = CMSG_FIRSTHDR(&msgsh); cmsg != NULL;
     cmsg = CMSG_NXTHDR(&msgsh, cmsg)) {
    if (cmsg->cmsg_level == IPPROTO_IP
        && cmsg->cmsg_type == IP_TTL) {
        memcpy(&received_ttl, CMSG_DATA(cmsg), sizeof(received_ttl));
        break;
    }
}

if (cmsg == NULL) {
    /* Error: IP_TTL not enabled or small buffer or I/O error */
}

```

The code below passes an array of file descriptors over a UNIX domain socket using SCM_RIGHTS:

```

struct msgshdr msg = { 0 };

struct cmsghdr *cmsg;

int myfds[NUM_FD]; /* Contains the file descriptors to pass */

char iobuf[1];

struct iovec io = {
    .iov_base = iobuf,
    .iov_len = sizeof(iobuf)
};

union {
    /* Ancillary data buffer, wrapped in a union
       in order to ensure it is suitably aligned */
    char buf[CMSG_SPACE(sizeof(myfds))];
    struct cmsghdr align;
} u;

msg.msg_iov = &io;

msg.msg_iovlen = 1;

msg.msg_control = u.buf;

msg.msg_controllen = sizeof(u.buf);

```

```
cmmsg = CMSG_FIRSTHDR(&msg);  
cmmsg->cmmsg_level = SOL_SOCKET;  
cmmsg->cmmsg_type = SCM_RIGHTS;  
cmmsg->cmmsg_len = CMSG_LEN(sizeof(myfds));  
memcpy(CMSG_DATA(cmmsg), myfds, sizeof(myfds));
```

For a complete code example that shows passing of file descriptors over a UNIX domain socket, see `seccomp_unotify(2)`.

SEE ALSO

`recvmsg(2)`, `sendmsg(2)`

RFC 2292

Linux man-pages 6.17

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