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

$ man cmsg.3

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

NAME

CMSG_ALIGN, CMSG_SPACE, CMSG_NXTHDR, CMSG_FIRSTHDR - access ancillary data

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 op? tions. 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 cmsghdr structure, taking into account any necessary alignment. It takes the data length as an argument. This is a constant expres? sion.

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 cmsghdr 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).

CONFORMING TO

This ancillary data model conforms to the POSIX.1g draft, 4.4BSD-Lite, the IPv6 advanced API described in RFC 2292 and SUSv2. CMSG_FIRSTHDR(), CMSG_NXTHDR(), and CMSG_DATA() are specified in POSIX.1-2008. CMSG_SPACE() and CMSG_LEN() will be included in the next POSIX release (Issue 8).

CMSG_ALIGN() is a Linux extension.

NOTES

For portability, ancillary data should be accessed using only the macros described here. CMSG_ALIGN() is a Linux extension and should not be used in portable programs.

In Linux, CMSG_LEN(), CMSG_DATA(), and CMSG_ALIGN() are constant ex? pressions (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.

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 msgh */
    for (cmsg = CMSG_FIRSTHDR(&msgh); cmsg != NULL;
            cmsg = CMSG_NXTHDR(&msgh, cmsg)) {
        if (cmsg->cmsg_level == IPPROTO_IP
                && cmsg->cmsg_type == IP_TTL) {
            memcpy(&receive_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 msghdr 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);
    cmsg = CMSG_FIRSTHDR(&msg);
```

```
cmsg->cmsg_level = SOL_SOCKET;
cmsg->cmsg_type = SCM_RIGHTS;
cmsg->cmsg_len = CMSG_LEN(sizeof(myfds));
memcpy(CMSG_DATA(cmsg), myfds, sizeof(myfds));
```

SEE ALSO

recvmsg(2), sendmsg(2)

RFC 2292

COLOPHON

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