Understanding the msghdr structure from sys/socket.h

<div style="text-align:right">Ask Question</div>

▲

6

▼

★

3

I'm trying to understand the following members of the `msghdr` structure of the sys/socket.h lib.

- `struct iovec *msg_iov         scatter/gather array`
- `void        *msg_control    ancillary data, see below`

It states below:

> Ancillary data consists of a sequence of pairs, each consisting of a cmsghdr structure followed by a data array. The data array contains the ancillary data message, and the cmsghdr structure contains descriptive information that allows an application to correctly parse the data.

I'm assuming the `msghdr` struct, contains the protocol-header information? if so... `*msg_iov` is the input/output "vector" of parameters in the request/response? and the `*msg_control` contains the response messages?

`c` `linux` `sockets` `network-programming`

share improve this question

edited Apr 27 '18 at 12:40
Mateusz Piotrowski
3,880 ●6 ●30 ●51

asked Sep 15 '15 at 19:04
Jordan Davis
649 ●11 ●30

add a comment

1 Answer

▲

6

▼

✓

`msg_iov` is an array of input/output buffers with length `msg_iovlen`. Each member of this array contains a pointer to a data buffer and the size of the buffer. This is where the data to read/write lives. It allows you to read/write to an array of buffers which are not necessarily in contiguous memory regions.

`msg_control` points to a buffer of size `msg_controllen` that contains additional information about the packet. To read this field, you first need to declare a `struct cmsghdr *` (let's call it `cmhdr`). You populate this by calling `CMSG_FIRSTHDR()` the first time, passing it the address of the `msghdr` struct, and `CMSG_NXTHDR()` each subsequent time, passing it the address of the `msghdr` struct and the current value of `cmhdr`.

From the `msg_control`, you can find interesting things like the destination IP of the packet (useful for multicast) and the contents of the TOS/DSCP byte in the IP header (useful for custom congestion control protocols), among others. In most cases, you'll need to make a `setsockopt` call to enable receiving this data. In the examples given, the `IP_PKTINFO` and `IP_TOS` options need to be enabled.

See the [cmsg(3) manpage](#) for more details.

The source IP and port, are not in `msg_control`, but are in `msg_name` which expects a pointer to a `struct sockaddr` with length `msg_namelen`.

Here's an example of how to use this:

```c
struct msghdr mhdr;
struct iovec iov[1];
struct cmsghdr *cmhdr;
char control[1000];
struct sockaddr_in sin;
char databuf[1500];
unsigned char tos;

mhdr.msg_name = &sin;
mhdr.msg_namelen = sizeof(sin);
mhdr.msg_iov = iov;
mhdr.msg_iovlen = 1;
mhdr.msg_control = &control;
mhdr.msg_controllen = sizeof(control);
```

```
iov[0].iov_base = databuf;
iov[0].iov_len = sizeof(databuf);
memset(databuf, 0, sizeof(databuf));
if ((*len = recvmsg(sock, &mhdr, 0)) == -1) {
    perror("error on recvmsg");
    exit(1);
} else {
    cmhdr = CMSG_FIRSTHDR(&mhdr);
    while (cmhdr) {
        if (cmhdr->cmsg_level == IPPROTO_IP && cmhdr->cmsg_type == IP_TOS) {
            // read the TOS byte in the IP header
            tos = ((unsigned char *)CMSG_DATA(cmhdr))[0];
        }
        cmhdr = CMSG_NXTHDR(&mhdr, cmhdr);
    }
    printf("data read: %s, tos byte = %02X\n", databuf, tos);
}
```

share improve this answer   edited Sep 15 '15 at 19:35   answered Sep 15 '15 at 19:27

I got it now, thanks again dbush! – Jordan Davis Sep 15 '15 at 19:48

why is `struct sockaddr_in` ? shouldn't it be `struct sockaddr` ? – Jordan Davis Sep 15 '15 at 21:39

1   `struct sockaddr` is a generic type for getting socket info. For an IPv4 socket, the specific type is `struct sockaddr_in`.
For a UNIX domain socket, it's `struct sockaddr_un`, and for an IPv6 socket, it's `struct sockaddr_in6` – dbush Sep
15 '15 at 21:42

Haha okay. Where the hell do you see that though lol? I don't even see in the spec at all. – Jordan Davis Sep 15 '15 at 21:45

1   `man 7 ip`, `man 7 unix`, and `man 7 ipv6`, as well as `man 7 socket`. – dbush Sep 15 '15 at 21:49

show **3** more comments

Your Answer

B *I*   🔗   66   { }   🖼   ☰ ☰ ☰ ☰   ↶ ↷

Sign up or log in

G Sign up using Google

f Sign up using Facebook

Sign up using Email and Password

Post as a guest

Name

Email
Required, but never shown

Post Your Answer

Not the answer you're looking for? Browse other questions tagged c linux sockets network-programming or ask your own question.

asked	3 years, 4 months ago
viewed	5,529 times
active	9 months ago

BLOG

How the 2019 Stack Overflow Developer Survey Came to Be (And Your Last Chance…

Linked

0 sockaddr structure - (sys/socket.h)

Related

6 In C: How to set a pointer to a structure member that is an array?

209 Purpose of Unions in C and C++

5 Locate unused structures and structure-

members

2	How to construct and manage this complex C data structure?
0	Can ancillary data be portably allocated?
2	Linux group and user management
4	Data Type - socklen_t, sa_family_t
0	sockaddr structure - (sys/socket.h)
-1	Socket Programming (sys/socket.h)
3	Using sendmsg/sendmmsg with raw ethernet frames

Hot Network Questions

Russian Dolls - How do they reproduce?

Heisenberg groups, Carnot groups and contact forms

Sigma notation for non-integer steps

Determinantal symmetry: proof requested

What's a mean field variational family?

A 4 x 4 Magic Square with Pairwise Relatively Prime Entries

Novel with science masqueraded as religion; rebels use the occult to fight for freedom

Is there a loss of entropy by hashing an N-bit random key to produce an N-bit hash?

Is it practical to make English the global language?

Is it bad to have no gender variety?

What are the alternatives for Xposed framework on Pie? Preferably without triggering Safety Net?

Why does Python allow out-of-range slice indexes for sequences?

N-movers: How much of the infinite board can I reach?

Can modify memory be used to change a revenant's target?

A man killed my son and married one of the witnesses. Can the witness's statements still be used in court against him?

How to retain a healthy relationship with colleagues after beating them at golf?

Is it inconvenient for the DM if I make a pet to go with my character?

How to deal with a "protest" assignment?

Why is plagiarising words such a big deal?

Is it appropriate to request that the department hire a female faculty member?

Is there an EU law that prevents repair of electrical devices?

find value of trig integral

What was the first games console to support linking consoles together for local multiplayer?

Am I responsible for finding my own replacement?

question feed

STACK OVERFLOW

Questions

PRODUCTS

Teams

COMPANY

About

STACK EXCHANGE NETWORK

Blog   Facebook   Twitter   LinkedIn