

Two clients have joined server

```
oleg@makaront-virtualbox:~/Documents$ ./lpk24chat-client -t tcp -s 127.0.0.1
/auth 1 2 4
Success: AUTH SUCCESS
Server: 4 has joined default
hello
Server: wow has joined default

oleg@makaront-virtualbox:~/Documents$ ./lpk24chat-client -t tcp -s 127.0.0.1
/auth wow 22 wow
Success: AUTH SUCCESS
Server: wow has joined default
hello
Server: wow has joined default

void set_cc_handler(struct sigaction *sigIntHandler)
// Initialize struct for C++ signal handling
sigIntHandler->sa_handler = cc_handler;
sigemptyset(&sigIntHandler->sa_mask);
sigIntHandler->sa_flags = 0;
sigaction(SIGINT, sigIntHandler, NULL);
```

Terminal Local

```
==4802== All heap blocks were freed -- no leaks are possible
==4802==
==4802== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
oleg@makaront-virtualbox:~/IPK/IPKServer00P$ make
make: Nothing to be done for 'all'.
oleg@makaront-virtualbox:~/IPK/IPKServer00P$ ./lpk24chat-server
RECV 127.0.0.1:39338 | AUTH
SENT 127.0.0.1:39338 | REPLY
RECV 127.0.0.1:39338 | MSG
RECV 127.0.0.1:43032 | AUTH
SENT 127.0.0.1:43032 | REPLY
```

They are communicating with each other.

```
oleg@makaront-virtualbox:~/Documents$ ./lpk24chat-client -t tcp -s 127.0.0.1
/auth 1 2 4
Success: AUTH SUCCESS
Server: 4 has joined default
hello
Server: wow has joined default
wow: hello
akar: hello

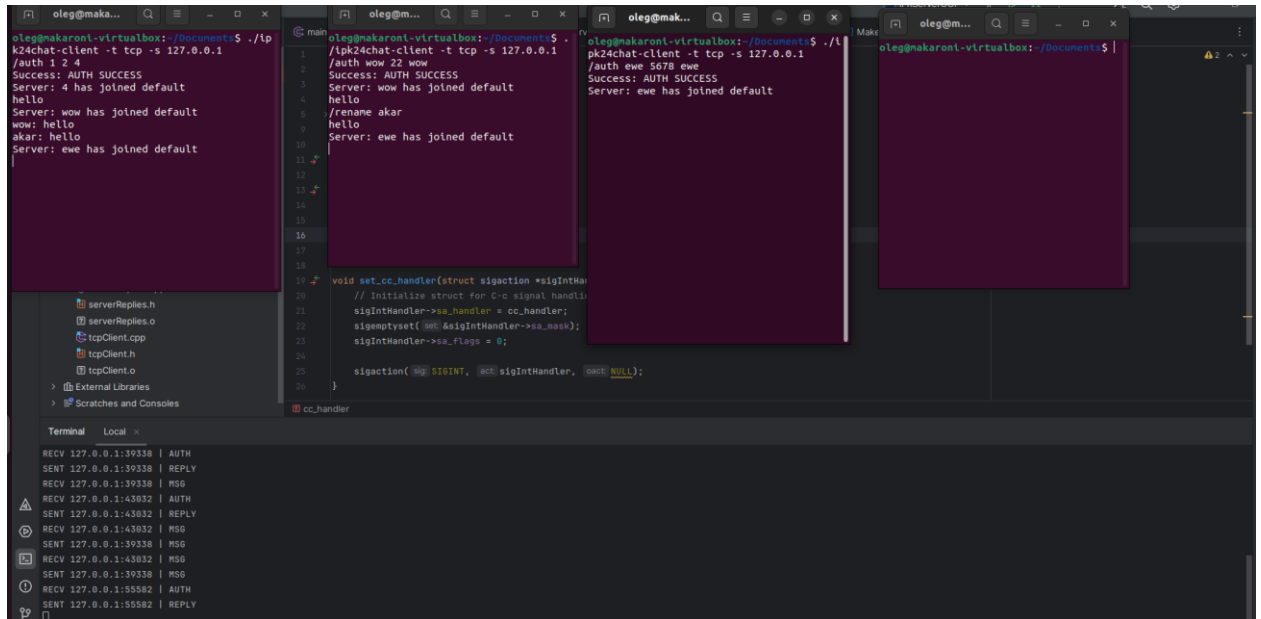
oleg@makaront-virtualbox:~/Documents$ ./lpk24chat-client -t tcp -s 127.0.0.1
/auth wow 22 wow
Success: AUTH SUCCESS
Server: wow has joined default
hello
/renam akar
hello

void set_cc_handler(struct sigaction *sigIntHandler)
// Initialize struct for C++ signal handling
sigIntHandler->sa_handler = cc_handler;
sigemptyset(&sigIntHandler->sa_mask);
sigIntHandler->sa_flags = 0;
sigaction(SIGINT, sigIntHandler, NULL);
```

Terminal Local

```
make: Nothing to be done for 'all'.
oleg@makaront-virtualbox:~/IPK/IPKServer00P$ ./lpk24chat-server
RECV 127.0.0.1:39338 | AUTH
SENT 127.0.0.1:39338 | REPLY
RECV 127.0.0.1:39338 | MSG
RECV 127.0.0.1:43032 | AUTH
SENT 127.0.0.1:43032 | REPLY
RECV 127.0.0.1:43032 | MSG
SENT 127.0.0.1:39338 | MSG
RECV 127.0.0.1:43032 | MSG
SENT 127.0.0.1:39338 | MSG
```

The third client has joined the server.



```
oleg@makaroni-virtualbox: /Documents$ ./ipk24chat-client -t tcp -s 127.0.0.1
/author 1 2 4
Success: AUTH SUCCESS
Server: 4 has joined default
hello
Server: wow has joined default
wow: hello
akar: hello
Server: ewe has joined default

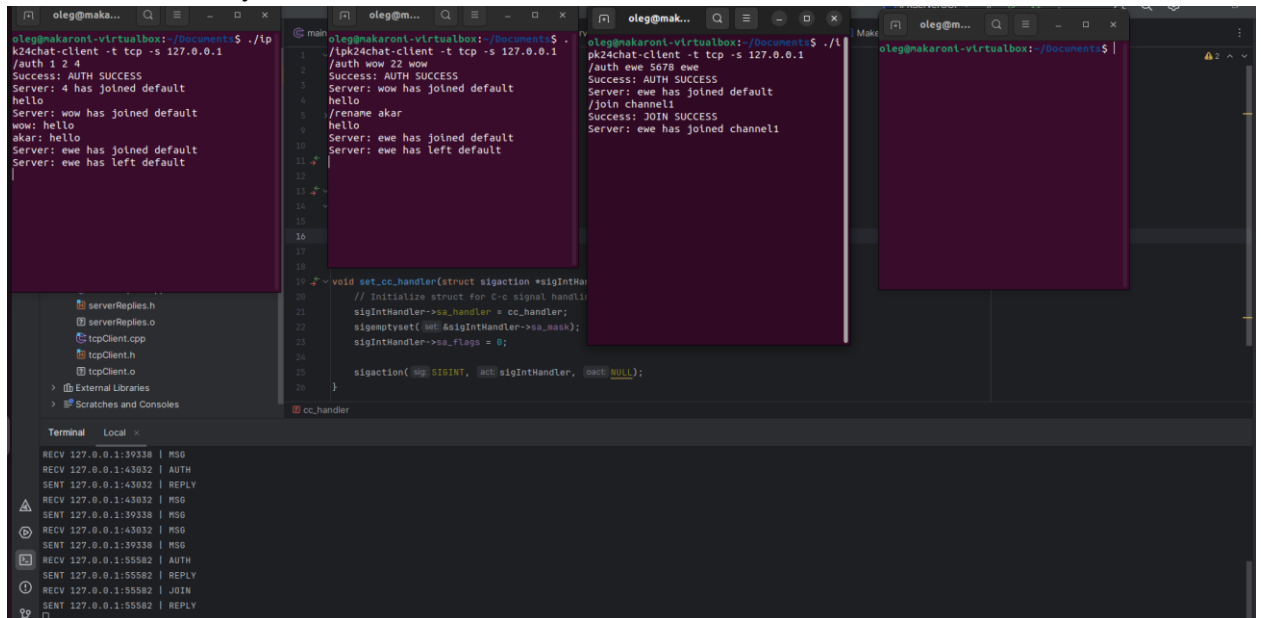
oleg@makaroni-virtualbox: /Documents$ ./ipk24chat-client -t tcp -s 127.0.0.1
/author ewe 5678 ewe
Success: AUTH SUCCESS
Server: ewe has joined default

oleg@makaroni-virtualbox: /Documents$ ./ipk24chat-client -t tcp -s 127.0.0.1
/author ewe 5678 ewe
Success: AUTH SUCCESS
Server: ewe has joined default

void set_cc_handler(struct sigaction *sigIntHandler)
// Initialize struct for C++ signal handling
sigIntHandler->sa_handler = cc_handler;
sigemptyset(&sigIntHandler->sa_mask);
sigIntHandler->sa_flags = 0;

sigaction(SIGINT, sigIntHandler, SIG_DFL);
```

The third client has joined channel1 and left default.



```
oleg@makaroni-virtualbox: /Documents$ ./ipk24chat-client -t tcp -s 127.0.0.1
/author 1 2 4
Success: AUTH SUCCESS
Server: 4 has joined default
hello
Server: wow has joined default
wow: hello
akar: hello
Server: ewe has joined default
Server: ewe has left default

oleg@makaroni-virtualbox: /Documents$ ./ipk24chat-client -t tcp -s 127.0.0.1
/author ewe 5678 ewe
Success: AUTH SUCCESS
Server: ewe has joined default
/author ewe 5678 ewe
Success: JOIN SUCCESS
Server: ewe has joined channel1

oleg@makaroni-virtualbox: /Documents$ ./ipk24chat-client -t tcp -s 127.0.0.1
/author ewe 5678 ewe
Success: AUTH SUCCESS
Server: ewe has joined default
/author ewe 5678 ewe
Success: JOIN SUCCESS
Server: ewe has joined channel1

void set_cc_handler(struct sigaction *sigIntHandler)
// Initialize struct for C++ signal handling
sigIntHandler->sa_handler = cc_handler;
sigemptyset(&sigIntHandler->sa_mask);
sigIntHandler->sa_flags = 0;

sigaction(SIGINT, sigIntHandler, SIG_DFL);
```

[illegible]

The screenshot displays a C++ chat application running in a terminal. The application is divided into three main sections: the server code, the client code, and the network traffic log.

Server Code (oleg@makaroni-virtualbox):

```

1 //pk24chat-client -t tcp -s 127.0.0.1
2 Success: AUTH SUCCESS
3 Server: 4 has joined default
4 hello
5 /rename akar
6 hello
7 Server: ewe has joined default
8 Server: ewe has left default
9 Server: palop has joined default
10 palop: hello everyone
11 Server: palop has left default
12
13
14
15
16
17
18
19 void set_cc_handler(struct sigaction *sigIntHa
20 // Initialize struct for C++ signal handli
21 sigIntHandler->sa_handler = cc_handler;
22 sigemptyset(&sigIntHandler->sa_mask);
23 sigIntHandler->sa_flags = 0;
24
25 sigaction(SIGINT, &sigIntHandler, NULL);
26
27 cc_handler

```

Client Code (oleg@makaroni-virtualbox):

```

1 pk24chat-client -t tcp -s 127.0.0.1
2 /auth ewe 5678 ewe
3 Success: AUTH SUCCESS
4 Server: ewe has joined default
5 /join channel1
6 Success: JOIN SUCCESS
7 Server: ewe has joined channel1
8 hello in new channel
9 Server: palop has joined channel1
10 palop: hello who is in this server
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

```

Network Traffic Log:

```

SENT 127.0.0.1:55582 | REPLY
RCV 127.0.0.1:55582 | MSG
RCV 127.0.0.1:36446 | AUTH
SENT 127.0.0.1:36446 | REPLY
RCV 127.0.0.1:36446 | MSG
SENT 127.0.0.1:39338 | MSG
SENT 127.0.0.1:45032 | MSG
RCV 127.0.0.1:36446 | JOIN
SENT 127.0.0.1:36446 | REPLY
RCV 127.0.0.1:36446 | MSG
SENT 127.0.0.1:55582 | MSG

```

The third client has joined default channel again.

```
oleg@makaroni-virtualbox:~/Documents$ ./lpk24chat-client -t tcp -s 127.0.0.1
/auth 1 2 4
Success: AUTH SUCCESS
Server: 4 has joined default
hello
Server: wow has joined default
wow: hello
akar: hello
Server: ewe has joined default
Server: ewe has left default
Server: palop has joined default
palop: hello everyone
Server: palop has left default
Server: ewe has joined default

oleg@makaroni-virtualbox:~/Documents$ ./lpk24chat-client -t tcp -s 127.0.0.1
/auth wow 22 wow
Success: AUTH SUCCESS
Server: wow has joined default
hello
/rename akar
Server: ewe has joined default
Server: ewe has left default
Server: palop has joined default
palop: hello everyone
Server: palop has left default
Server: ewe has joined default

oleg@makaroni-virtualbox:~/Documents$ ./lpk24chat-client -t tcp -s 127.0.0.1
/auth ewe 5678 ewe
Success: AUTH SUCCESS
Server: ewe has joined default
/join channel1
Success: JOIN SUCCESS
Server: ewe has joined channel1
hello in new channel
Server: palop has joined channel1
palop: hello who is in this server
/join default
Success: JOIN SUCCESS
Server: ewe has joined default

oleg@makaroni-virtualbox:~/Documents$ ./lpk24chat-client -t tcp -s 127.0.0.1
/auth palop qwerty palop
Success: AUTH SUCCESS
Server: palop has joined default
hello everyone
/join channel1
Success: JOIN SUCCESS
Server: palop has joined channel1
hello who is in this server
Server: ewe has left channel1
```

```
void set_cc_handler(struct sigaction *sigIntHandler)
// Initialize struct for C++ signal handling
sigIntHandler->sa_handler = cc_handler;
sigemptyset(&sigIntHandler->sa_mask);
sigIntHandler->sa_flags = 0;

sigaction(SIGINT, sigIntHandler, NULL);
```

```
Terminal Local
RECV 127.0.0.1:36446 | AUTH
SENT 127.0.0.1:36446 | REPLY
RECV 127.0.0.1:36446 | MSG
SENT 127.0.0.1:39338 | MSG
SENT 127.0.0.1:43032 | MSG
RECV 127.0.0.1:36446 | JOIN
SENT 127.0.0.1:36446 | REPLY
RECV 127.0.0.1:36446 | MSG
SENT 127.0.0.1:55582 | MSG
RECV 127.0.0.1:55582 | JOIN
SENT 127.0.0.1:55582 | REPLY
```

The fourth client has also joined default channel again.

```
oleg@makaroni-virtualbox:~/Documents$ ./lpk24chat-client -t tcp -s 127.0.0.1
/auth 1 2 4
Success: AUTH SUCCESS
Server: 4 has joined default
hello
Server: wow has joined default
wow: hello
akar: hello
Server: ewe has joined default
Server: ewe has left default
Server: palop has joined default
palop: hello everyone
Server: palop has left default
Server: ewe has joined default
Server: palop has joined default

oleg@makaroni-virtualbox:~/Documents$ ./lpk24chat-client -t tcp -s 127.0.0.1
/auth wow 22 wow
Success: AUTH SUCCESS
Server: wow has joined default
hello
/rename akar
Server: ewe has joined default
Server: ewe has left default
Server: palop has joined default
palop: hello everyone
Server: palop has left default
Server: ewe has joined default
Server: palop has joined default

oleg@makaroni-virtualbox:~/Documents$ ./lpk24chat-client -t tcp -s 127.0.0.1
/auth ewe 5678 ewe
Success: AUTH SUCCESS
Server: ewe has joined default
/join channel1
Success: JOIN SUCCESS
Server: ewe has joined channel1
hello in new channel
Server: palop has joined channel1
palop: hello who is in this server
/join default
Success: JOIN SUCCESS
Server: ewe has joined default
Server: palop has joined default

oleg@makaroni-virtualbox:~/Documents$ ./lpk24chat-client -t tcp -s 127.0.0.1
/auth palop qwerty palop
Success: AUTH SUCCESS
Server: palop has joined default
hello everyone
/join channel1
Success: JOIN SUCCESS
Server: palop has joined channel1
hello who is in this server
Server: ewe has left channel1
/join default
Success: JOIN SUCCESS
Server: palop has joined default
```

```
void set_cc_handler(struct sigaction *sigIntHandler)
// Initialize struct for C++ signal handling
sigIntHandler->sa_handler = cc_handler;
sigemptyset(&sigIntHandler->sa_mask);
sigIntHandler->sa_flags = 0;

sigaction(SIGINT, sigIntHandler, NULL);
```

```
Terminal Local
RECV 127.0.0.1:36446 | MSG
SENT 127.0.0.1:39338 | MSG
SENT 127.0.0.1:43032 | MSG
RECV 127.0.0.1:36446 | JOIN
SENT 127.0.0.1:36446 | REPLY
RECV 127.0.0.1:36446 | MSG
SENT 127.0.0.1:55582 | MSG
RECV 127.0.0.1:55582 | JOIN
SENT 127.0.0.1:55582 | REPLY
RECV 127.0.0.1:36446 | JOIN
SENT 127.0.0.1:36446 | REPLY
```

The screenshot displays a C++ chat server implementation using epoll. It consists of three terminal windows running the server and two client connections.

Server Terminal (oleg@mak...):

```

oleg@makaroni-virtualbox:~/Documents$ ./tp
k24chat-client -t tcp -s 127.0.0.1
/auth 1 2 4
Success: AUTH SUCCESS
Server: 4 has joined default
hello
Server: wow has joined default
wow: hello
akar: hello
Server: ewe has joined default
Server: ewe has left default
Server: palop has joined default
palop: hello everyone
Server: palop has left default
Server: ewe has joined default
Server: palop has joined default
^C
oleg@makaroni-virtualbox:~/Documents$

// void set_cc_handler(struct sigaction *sigIntHandler)
// Initialize struct for C++ signal handling
sigIntHandler->sa_handler = cc_handler;
sigemptyset(&sigIntHandler->sa_mask);
sigIntHandler->sa_flags = 0;
sigaction(SIGINT, &sigIntHandler, NULL);
cc_handler

```

Client Terminal 1 (oleg@mak...):

```

oleg@makaroni-virtualbox:~/Documents$ ./l
ipk24chat-client -t tcp -s 127.0.0.1
/auth ewe 5678 ewe
Success: AUTH SUCCESS
Server: ewe has joined default
/join channel1
Success: JOIN SUCCESS
Server: ewe has joined channel1
hello in new channel
Server: palop has joined channel1
palop: hello who is in this server
Server: ewe has left channel1
/join default
Success: JOIN SUCCESS
Server: palop has joined default
Server: 4 has left default

```

Client Terminal 2 (oleg@mak...):

```

oleg@makaroni-virtualbox:~/Documents$ ./l
ipk24chat-client -t tcp -s 127.0.0.1
/auth palop qwerty palop
Success: AUTH SUCCESS
Server: palop has joined default
hello everyone
/join channel1
Success: JOIN SUCCESS
Server: palop has joined channel1
hello who is in this server
Server: ewe has left channel1
/join default
Success: JOIN SUCCESS
Server: palop has joined default
Server: 4 has left default

```

```
oleg@makaroni-virtualbox:~/Documents$ ./pk24chat-client -t tcp -s 127.0.0.1
Success: AUTH SUCCESS
Server: 4 has joined default
hello
Server: wow has joined default
wow: hello
akar: hello
Server: ewe has joined default
Server: ewe has left default
Server: palop has joined default
palop: hello everyone
Server: palop has left default
Server: ewe has joined default
Server: palop has joined default
Server: 4 has left default
^C
oleg@makaroni-virtualbox:~/Documents$

oleg@makaroni-virtualbox:~/Documents$ ./pk24chat-client -t tcp -s 127.0.0.1
Success: AUTH SUCCESS
Server: wow has joined default
hello
/renome akar
hello
Server: ewe has joined default
Server: ewe has left default
Server: palop has joined default
palop: hello everyone
Server: palop has left default
Server: ewe has joined default
Server: palop has joined default
Server: 4 has left default
oleg@makaroni-virtualbox:~/Documents$

oleg@makaroni-virtualbox:~/Documents$ ./pk24chat-client -t tcp -s 127.0.0.1
Success: AUTH SUCCESS
Server: ewe has joined default
/join channel1
Success: JOIN SUCCESS
Server: ewe has joined channel1
hello in new channel
Server: palop has joined channel1
palop: hello who is in this server
/join default
Success: JOIN SUCCESS
Server: ewe has joined default
Server: palop has joined default
Server: 4 has left default
oleg@makaroni-virtualbox:~/Documents$

oleg@makaroni-virtualbox:~/Documents$ ./pk24chat-client -t tcp -s 127.0.0.1
Success: AUTH SUCCESS
Server: palop has joined default
hello everyone
/join channel1
Success: JOIN SUCCESS
Server: palop has joined channel1
hello who is in this server
Server: ewe has left channel1
/join default
Success: JOIN SUCCESS
Server: palop has joined default
Server: 4 has left default
oleg@makaroni-virtualbox:~/Documents$
```

This is how previous communication is looking in WireShark.

No.	Time	Source	Destination	Protocol	Length	Info
4	5.908225107	127.0.0.1	127.0.0.1	IPK24	87	C -> Server AUTH 1 aS 4 uSing 2
6	5.908406776	127.0.0.1	127.0.0.1	IPK24	92	Server -> C REPLY OK IS AUTH SUCCESS
8	5.908428224	127.0.0.1	127.0.0.1	IPK24	107	Server -> C MSG FROM Server IS 4 has joined default
11	132.572584451	127.0.0.1	127.0.0.1	IPK24	87	C -> Server msg FROM 4 is hello
16	166.044489871	127.0.0.1	127.0.0.1	IPK24	92	C -> Server AUTH wow aS wow uSing 22
18	166.044658342	127.0.0.1	127.0.0.1	IPK24	92	Server -> C REPLY OK IS AUTH SUCCESS
20	166.044665463	127.0.0.1	127.0.0.1	IPK24	109	Server -> C MSG FROM Server IS wow has joined default
22	166.044706906	127.0.0.1	127.0.0.1	IPK24	109	Server -> C MSG FROM Server IS wow has joined default
28	198.587819025	127.0.0.1	127.0.0.1	IPK24	89	C -> Server msg FROM wow is hello
29	198.587932530	127.0.0.1	127.0.0.1	IPK24	89	Server -> C msg FROM wow is hello
32	221.272389932	127.0.0.1	127.0.0.1	IPK24	90	C -> Server msg FROM akar is hello
34	221.272582339	127.0.0.1	127.0.0.1	IPK24	90	Server -> C msg FROM akar is hello
39	246.268112346	127.0.0.1	127.0.0.1	IPK24	94	C -> Server AUTH ewe aS ewe uSing 5678
41	246.268184736	127.0.0.1	127.0.0.1	IPK24	92	Server -> C REPLY OK IS AUTH SUCCESS
43	246.268213688	127.0.0.1	127.0.0.1	IPK24	109	Server -> C MSG FROM Server IS ewe has joined default
45	246.268227439	127.0.0.1	127.0.0.1	IPK24	109	Server -> C MSG FROM Server IS ewe has joined default
47	246.268238961	127.0.0.1	127.0.0.1	IPK24	109	Server -> C MSG FROM Server IS ewe has joined default
49	262.620212970	127.0.0.1	127.0.0.1	IPK24	88	C -> Server JOIN channel1 aS ewe
50	262.620271912	127.0.0.1	127.0.0.1	IPK24	92	Server -> C REPLY OK IS JOIN SUCCESS
52	262.620287103	127.0.0.1	127.0.0.1	IPK24	107	Server -> C MSG FROM Server IS ewe has left default
54	262.620296798	127.0.0.1	127.0.0.1	IPK24	107	Server -> C MSG FROM Server IS ewe has left default
56	262.620310529	127.0.0.1	127.0.0.1	IPK24	110	Server -> C MSG FROM Server IS ewe has joined channel1
58	286.431931533	127.0.0.1	127.0.0.1	IPK24	104	C -> Server msg FROM ewe is hello in new channel
63	317.143848066	127.0.0.1	127.0.0.1	IPK24	100	C -> Server AUTH palop aS palop uSing qwerty
65	317.144001729	127.0.0.1	127.0.0.1	IPK24	92	Server -> C REPLY OK IS AUTH SUCCESS
67	317.144036255	127.0.0.1	127.0.0.1	IPK24	111	Server -> C MSG FROM Server IS palop has joined default
69	317.144065965	127.0.0.1	127.0.0.1	IPK24	111	Server -> C MSG FROM Server IS palop has joined default
71	317.144086179	127.0.0.1	127.0.0.1	IPK24	111	Server -> C MSG FROM Server IS palop has joined default
73	327.381049954	127.0.0.1	127.0.0.1	IPK24	100	C -> Server msg FROM palop is hello everyone
74	327.381114309	127.0.0.1	127.0.0.1	IPK24	100	Server -> C msg FROM palop is hello everyone
76	327.381179727	127.0.0.1	127.0.0.1	IPK24	100	Server -> C msg FROM palop is hello everyone
79	348.791005843	127.0.0.1	127.0.0.1	IPK24	90	C -> Server JOIN channel1 aS palop
81	348.791069724	127.0.0.1	127.0.0.1	IPK24	92	Server -> C REPLY OK IS JOIN SUCCESS
83	348.791083708	127.0.0.1	127.0.0.1	IPK24	109	Server -> C MSG FROM Server IS palop has left default
85	348.791096480	127.0.0.1	127.0.0.1	IPK24	109	Server -> C MSG FROM Server IS palop has left default
87	348.791139769	127.0.0.1	127.0.0.1	IPK24	112	Server -> C MSG FROM Server IS palop has joined channel1
89	348.791150457	127.0.0.1	127.0.0.1	IPK24	112	Server -> C MSG FROM Server IS palop has joined channel1
91	365.224353949	127.0.0.1	127.0.0.1	IPK24	113	C -> Server msg FROM palop is hello who is in this server
92	365.224453594	127.0.0.1	127.0.0.1	IPK24	113	Server -> C msg FROM palop is hello who is in this server
95	388.221067258	127.0.0.1	127.0.0.1	IPK24	87	C -> Server JOIN default aS ewe
97	388.221132667	127.0.0.1	127.0.0.1	IPK24	92	Server -> C REPLY OK IS JOIN SUCCESS
111	408.300775632	127.0.0.1	127.0.0.1	IPK24	111	Server -> C MSG FROM Server IS palop has joined default
113	408.300790201	127.0.0.1	127.0.0.1	IPK24	111	Server -> C MSG FROM Server IS palop has joined default
115	408.300802099	127.0.0.1	127.0.0.1	IPK24	111	Server -> C MSG FROM Server IS palop has joined default
117	408.300812566	127.0.0.1	127.0.0.1	IPK24	111	Server -> C MSG FROM Server IS palop has joined default
119	417.521192228	127.0.0.1	127.0.0.1	IPK24	71	C -> Server bye
122	417.521346917	127.0.0.1	127.0.0.1	IPK24	105	Server -> C MSG FROM Server IS 4 has left default
124	417.521366431	127.0.0.1	127.0.0.1	IPK24	105	Server -> C MSG FROM Server IS 4 has left default
126	417.521374491	127.0.0.1	127.0.0.1	IPK24	105	Server -> C MSG FROM Server IS 4 has left default
130	429.894504641	127.0.0.1	127.0.0.1	IPK24	71	Server -> C BYE
132	429.894558813	127.0.0.1	127.0.0.1	IPK24	71	Server -> C BYE
134	429.894579982	127.0.0.1	127.0.0.1	IPK24	71	Server -> C BYE