

# COMPUTER NETWORK

## PROJECT 1 –STANDALONE IRC SERVER

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### INTRODUCTION

#### 1. ABSTRACT

I develop a developing concurrent network application in this project 1. The standalone IRC server assumes that there is only one server and all the clients connect to this one, and it merely support a subset commands of the real IRC server. It is implemented in C language include 'csapp.h' provided by CSAPP on Ubuntu.

#### 2. STRUCTURE

This concurrent event-driven server based on I/O multiplexing with three structures and two global arrays.

Consider the memory alignment, I set the MAX\_NAME\_LEN to 64, the multiple of word size.

```
user* user_list[FD_SETSIZE];
```

```
channel* channel_list[FD_SETSIZE];
```

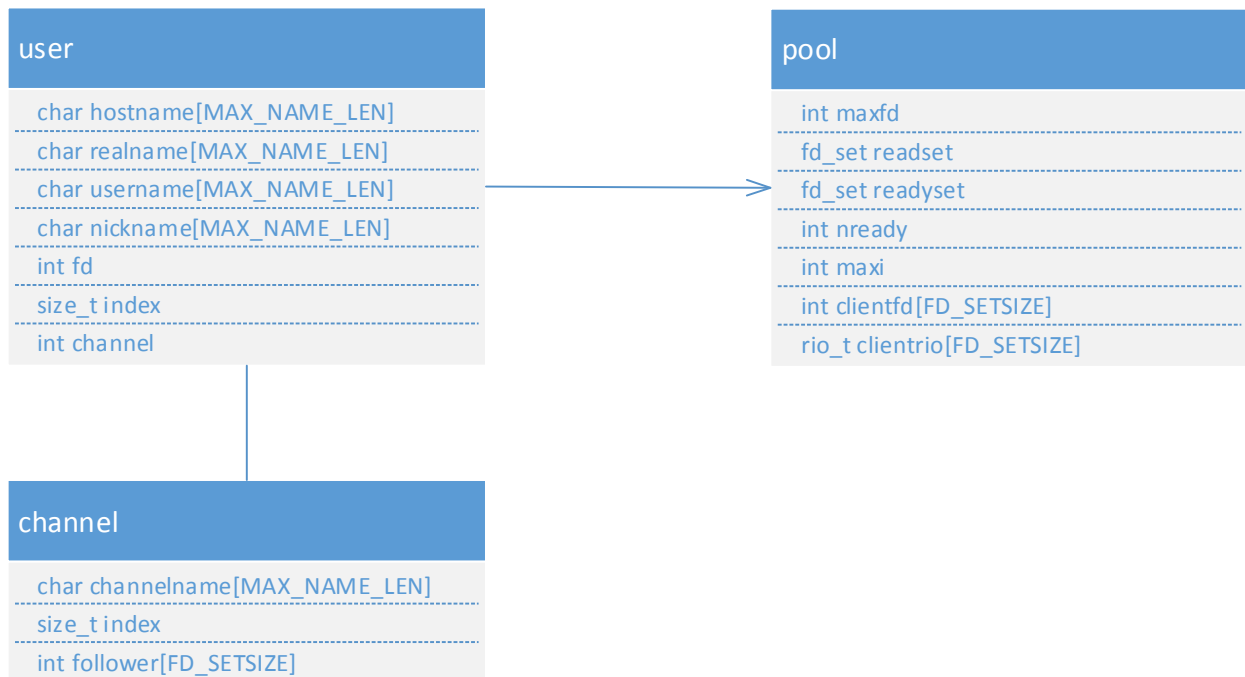


Figure 1 structure

## a) Pool

```
typedef struct { /* represents a pool of connected descriptors */
    int maxfd; /* largest descriptor in read_set */
    fd_set read_set; /* set of all active descriptors */
    fd_set ready_set; /* subset of descriptors ready for reading */
    int nready; /* number of ready descriptors from select */
    int maxi; /* highwater index into client array */
    int clientfd[FD_SETSIZE]; /* set of active descriptors */
    rio_t clientrio[FD_SETSIZE]; /* set of active read buffers */
} pool;
```

**Figure 2 pool structure**

## b) User

For a better memory management, I dynamically allocate memory for a user. When a new client connect to the server, it allocates a user for this client and initializes its all name to ANONYMOUS, the certainly fd and channel to -1. Then it sets the index and add the user to user\_list, where the index is same to the index to the certainly fd in clientfd array of pool structure. When a client disconnect to the server, the server set the fd in clientfd of pool structure to -1, and free the memory of user by invoking Free method.

```
typedef struct {
    char hostname[MAX_NAME_LEN];
    char realname[MAX_NAME_LEN];
    char username[MAX_NAME_LEN];
    char nickname[MAX_NAME_LEN];
    int fd; /* the fd of the user */
    size_t index; /* index in the user_list */
    int channel; /* the user's following channel, -1 if null */
} user;
```

**Figure 3 user structure**

## c) Channel

When a user ask to follow a channel, if the channel is not exist, the server will allocates a channel and initiates the new channel. When the last user parts the channel, the channel will be free.

```
typedef struct {
    char channelname[MAX_NAME_LEN];
    size_t index; /* index in the channel_list */
    int follower[FD_SETSIZE]; /* a list of the follower's index */
} channel;
```

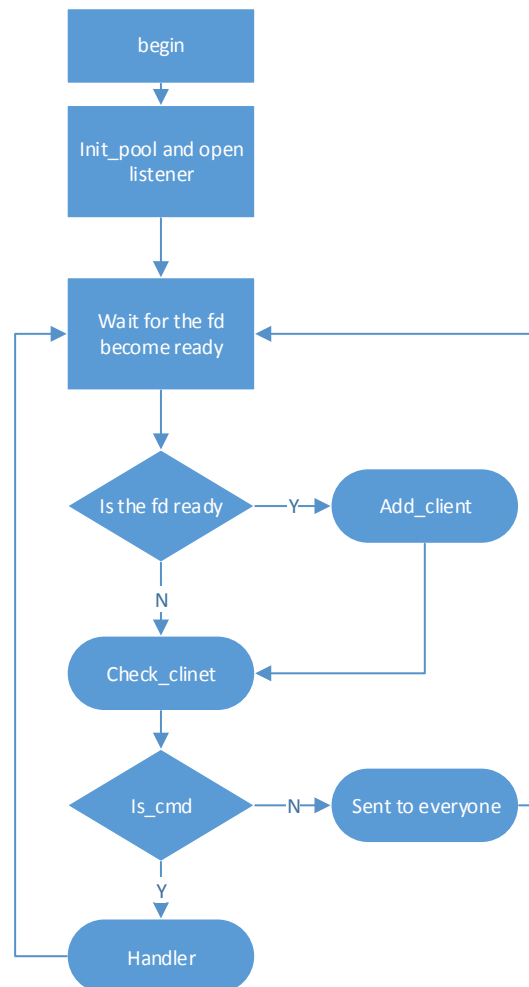
**Figure 4 channel structure**

### 3. PROCEDURE

The set of active clients is maintained in a pool structure. After initializing the pool by calling `init_pool()`, the server enters an infinite loop. During each iteration of this loop, the server calls the `select` function to detect two different kinds of input events:

- A connection request arriving from a new client
- A connected descriptor for an existing client being ready for reading.

When a connection request arrives, the server opens the connection and calls the `add_client` function to add the client to the pool. Finally, the server calls the `check_clients` function to handle the command.



**Figure 5 IRC server procedure**

## TEST AND GRADING

My implementation can pass the ruby script and the python one.

```
zhouyuwei@Ubuntu12: ~/workspace/network/Project_1/code
RPL_LISTEND 323 correct
(+) LIST passed
///// PRIVMSG \\\\\\\
--> NICK gnychis2
--> USER please give me :The MOTD2
--> PRIVMSG gnychis :clown hat curly hair smiley face
    PRIVMSG correct
(+) PRIVMSG passed
///// ECHO ON JOIN \\\\\\\
--> JOIN #linux
    Test if first client got join echo correct
(+) ECHO ON JOIN passed
///// MULTI-TARGET PRIVMSG \\\\\\\
--> PRIVMSG gnychis,#linux :awesome blossom with extra awesome
    PRIVMSG to gnychis and #linux correct
(+) MULTI-TARGET PRIVMSG passed
///// PART \\\\\\\
--> PART #linux
(+) PART echo to self passed
(+) PART echo to other clients passed
Your score: 10 / 10

Good luck with the rest of the project!
zhouyuwei@Ubuntu12:~/workspace/network/Project_1/code$
```

```
zhouyuwei@Ubuntu12: ~/workspace/network/Project_1/code
zhouyuwei@Ubuntu12:~/workspace/network/Project_1/code$ python tester.py --server
=127.0.0.1 --port=26702 p1.multiple.sample.txt
*** Processing file p1.multiple.sample.txt
user1 > 127.0.0.1: <SYN>
user2 > 127.0.0.1: <SYN>
user3 > 127.0.0.1: <SYN>
user1 > 127.0.0.1: "NICK nickname\r\n"
user2 > 127.0.0.1: "USER username hostname servername :Real Name\r\n"
user3 > 127.0.0.1: "USER brokendata :Not enough parameters\r\n"
user1 > 127.0.0.1: "USER username hostname servername :Real Name\r\n"
127.0.0.1 > user1: ":hostname 375 nickname :- hostname Message of the day - \r\n"
"
127.0.0.1 > user1: ":hostname 372 nickname :- Register\r\n"
user1 > 127.0.0.1: "LIST\r\n"
127.0.0.1 > user1: ":hostname 376 nickname :End of /MOTD command\r\n"
127.0.0.1 > user1: ":LIST 321 nickname Channel :Users Name\r\n"
user2 > 127.0.0.1: "NI"
user2 > 127.0.0.1: "CK nickname2\r\n"
127.0.0.1 > user2: ":hostname 375 nickname2 :- hostname Message of the day - \r\n"
n"
127.0.0.1 > user2: ":hostname 372 nickname2 :- Register\r\n"
127.0.0.1 > user2: ":hostname 376 nickname2 :End of /MOTD command\r\n"
user1 > 127.0.0.1: <EOF>
```