Socket programming 2

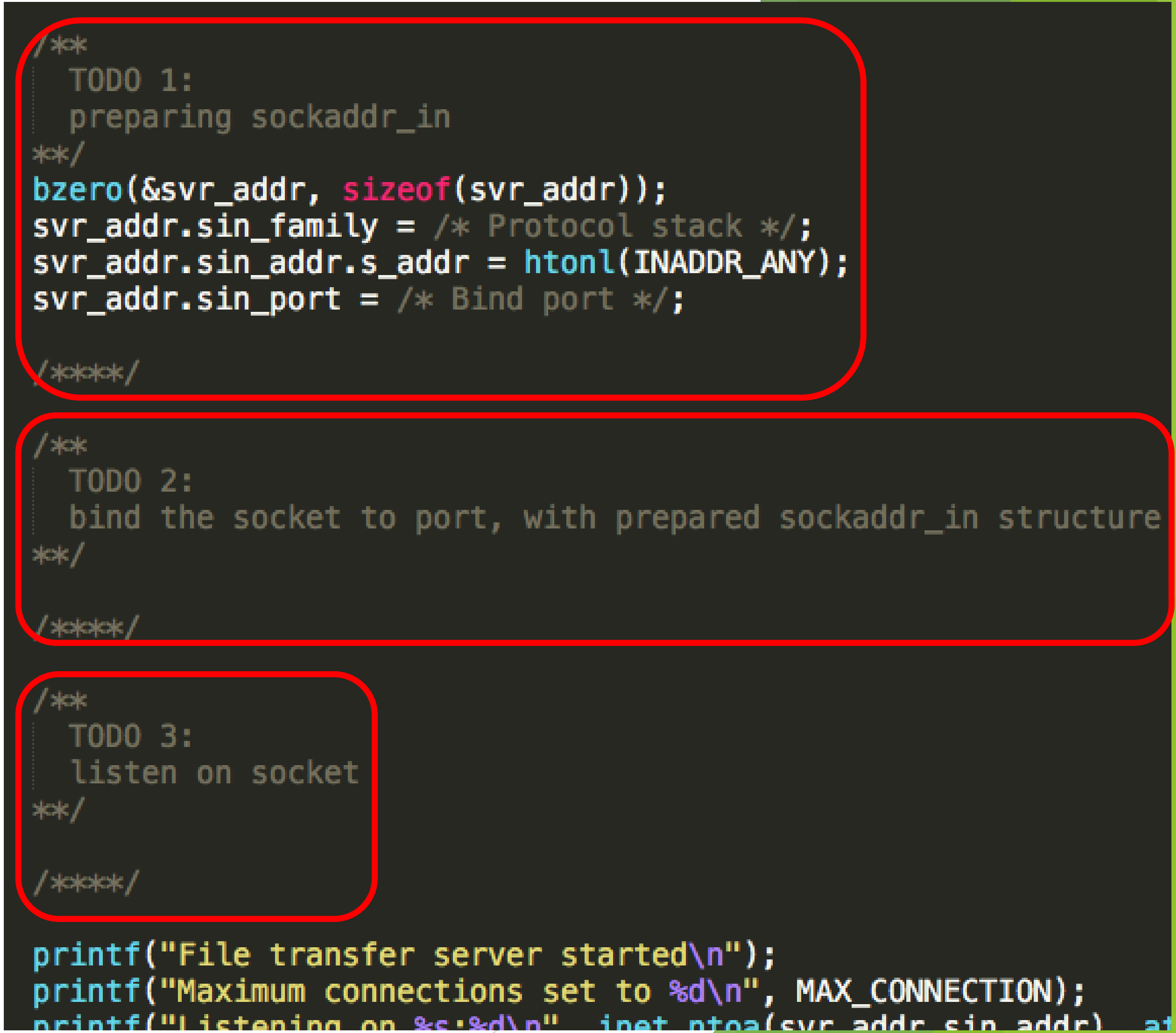
File transfer

File Transfer

- You will need to write file transfer client and server in language C.
- Sample code: https://drive.google.com/open?id=1hZhfi96Dme5XUAZo2pdY1hMjDDTAyJVC
- Please modify the sample code to achieve the goals.

File Transfer

- Follow the hints of “TODO”s



```
/**
  TODO 1:
  preparing sockaddr_in
**/
bzero(&svr_addr, sizeof(svr_addr));
svr_addr.sin_family = /* Protocol stack */;
svr_addr.sin_addr.s_addr = htonl(INADDR_ANY);
svr_addr.sin_port = /* Bind port */;

/****/

/**
  TODO 2:
  bind the socket to port, with prepared sockaddr_in structure
**/

/****/

/**
  TODO 3:
  listen on socket
**/

/****/

printf("File transfer server started\n");
printf("Maximum connections set to %d\n", MAX_CONNECTION);
printf("Listening on %s:%d\n", inet_ntoa(svr_addr.sin_addr), at
```

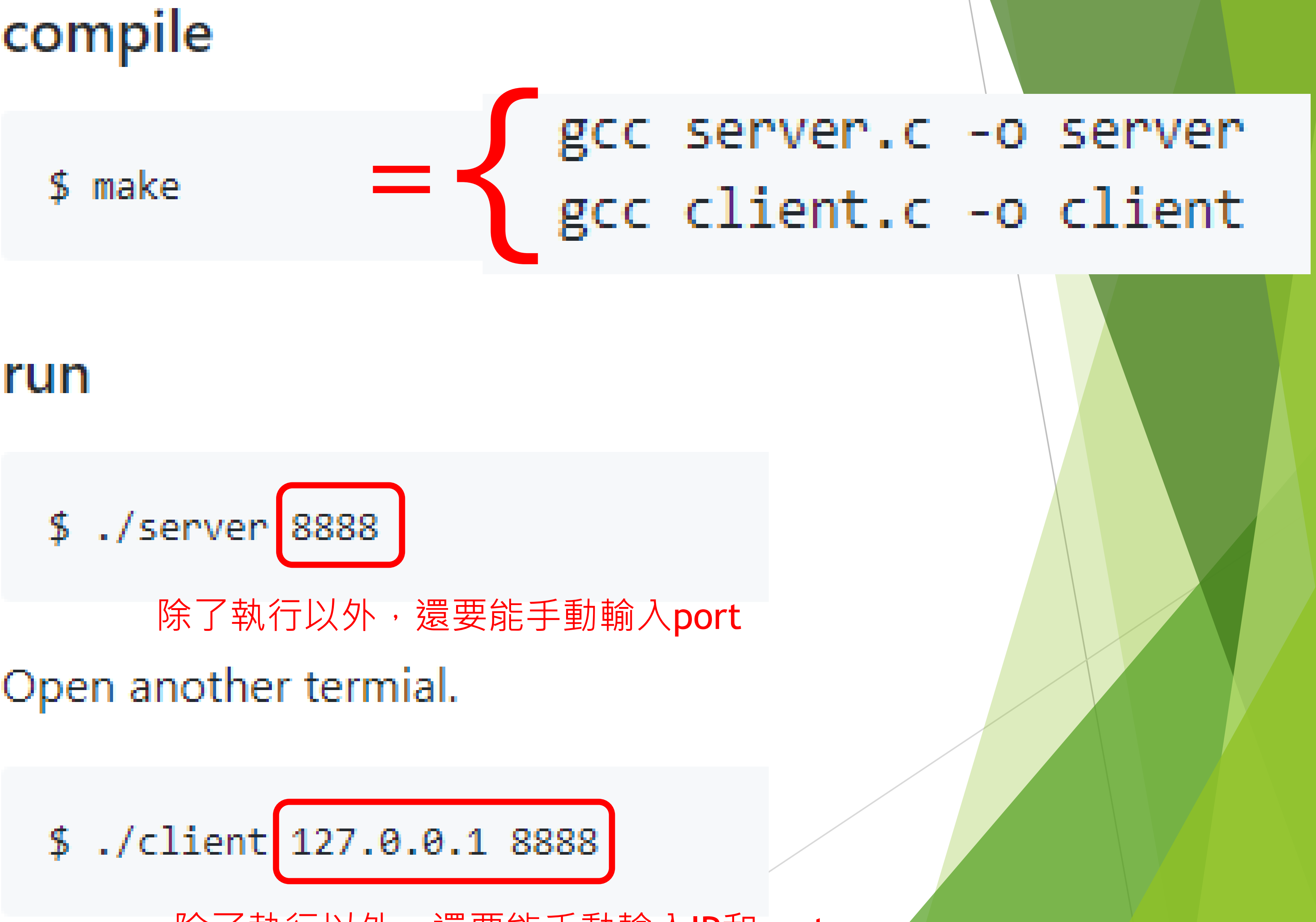
Requirement

- Server
  - User can assign port to server
  - Returns files list to client when the client connects immediately to the server
  - Returns files which client wants to download.

Requirement

- Client
  - User can assign IP address and port to connect the server with command line argument.
  - Support user inputs the file name to download file from server, per file per input.
  - Input “.exit” to disconnect from server.

Commands



compile

```
$ make
```

=

```
gcc server.c -o server
gcc client.c -o client
```

run

```
$ ./server 8888
```

除了執行以外，還要能手動輸入port

Open another termial.

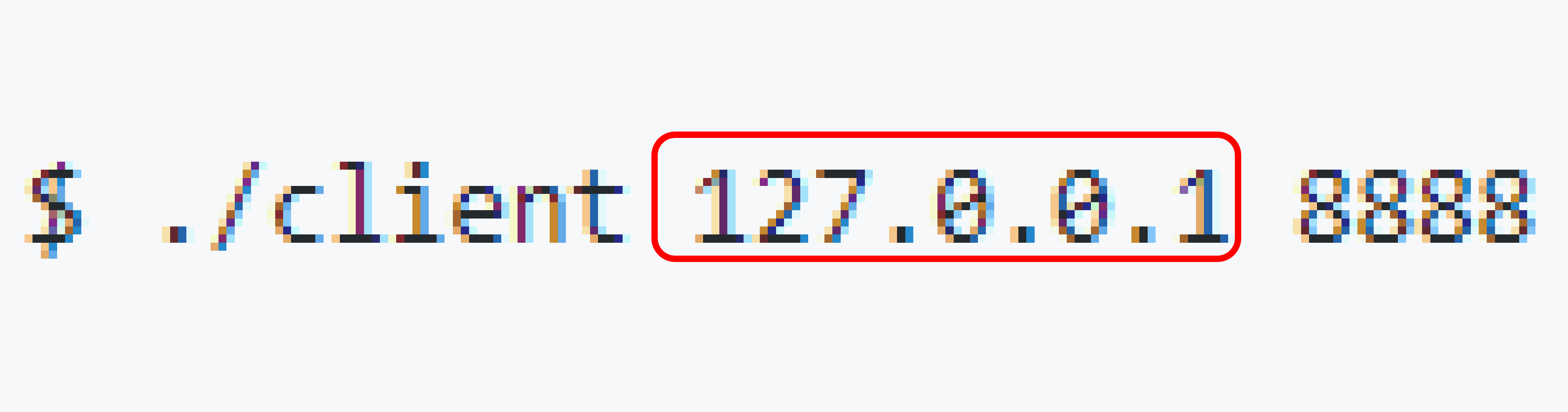
```
$ ./client 127.0.0.1 8888
```

除了執行以外，還要能手動輸入IP和port

Port numbers

- 不要用到特殊保留port number就可以
- List of reserved port numbers:
  - https://www.webopedia.com/quick_ref/portnumbers.asp

Why 127.0.0.1?

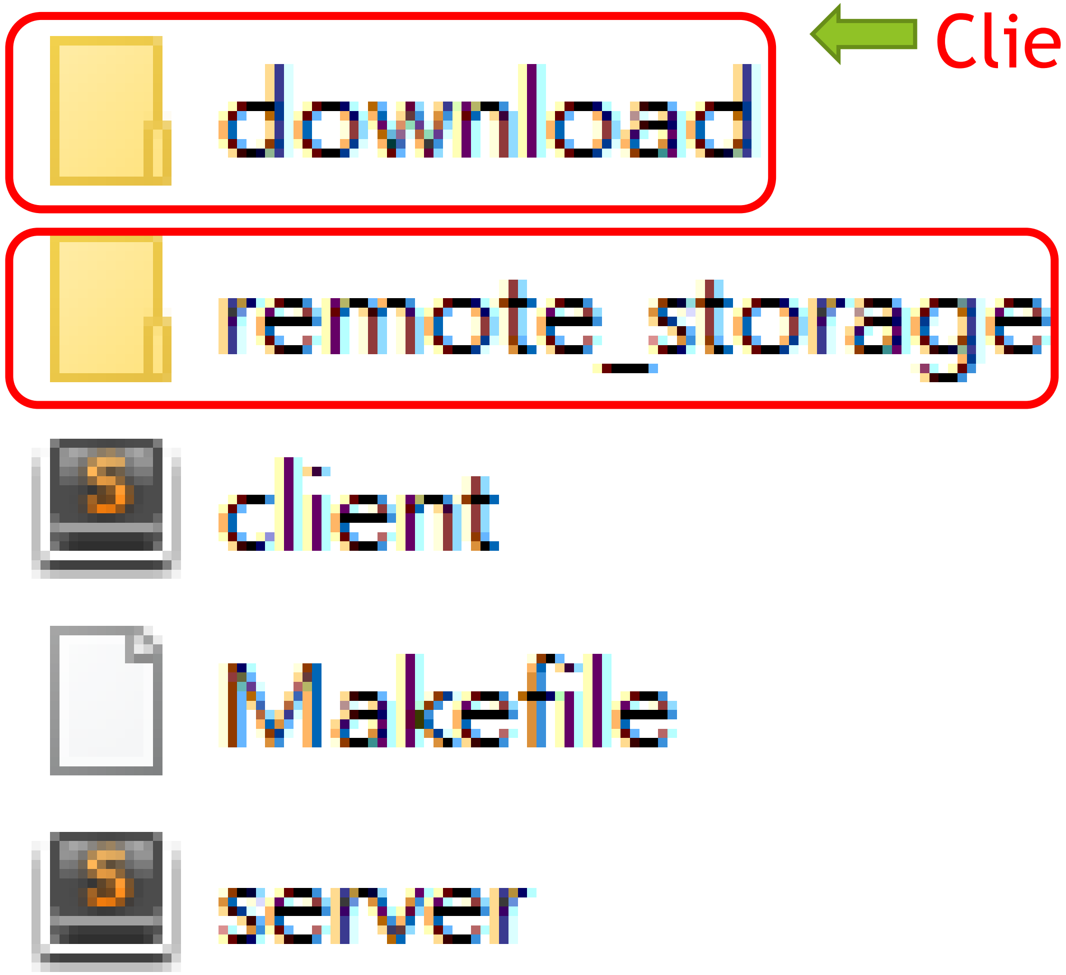


```
$ ./client 127.0.0.1 8888
```

File directories

File transfer

空資料夾



download

remote_storage

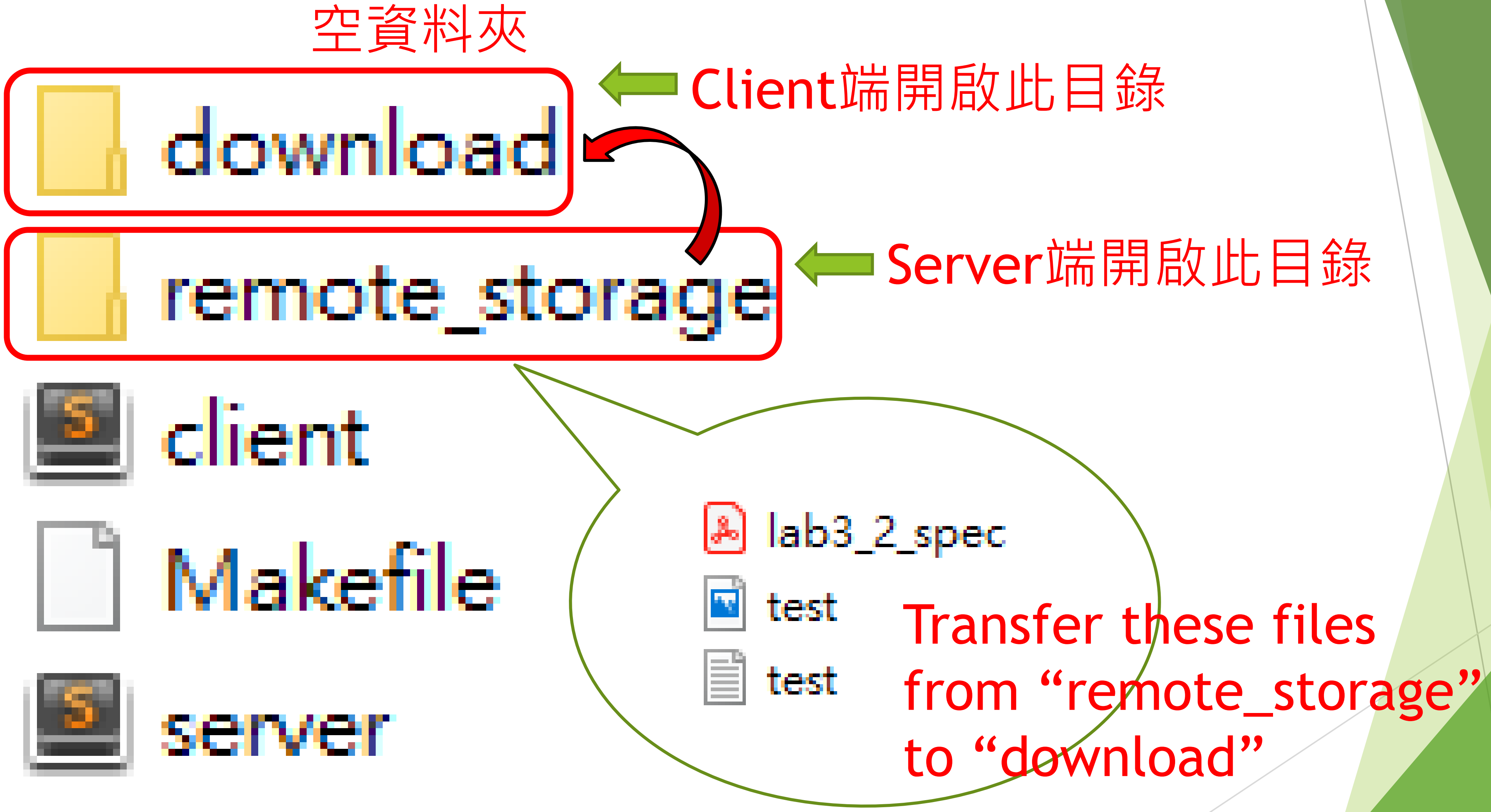
client

Makefile

server

Client端開啟此目錄

Server端開啟此目錄



空資料夾

download

Client端開啟此目錄

remote_storage

Server端開啟此目錄

client

Makefile

server

lab3_2_spec

test

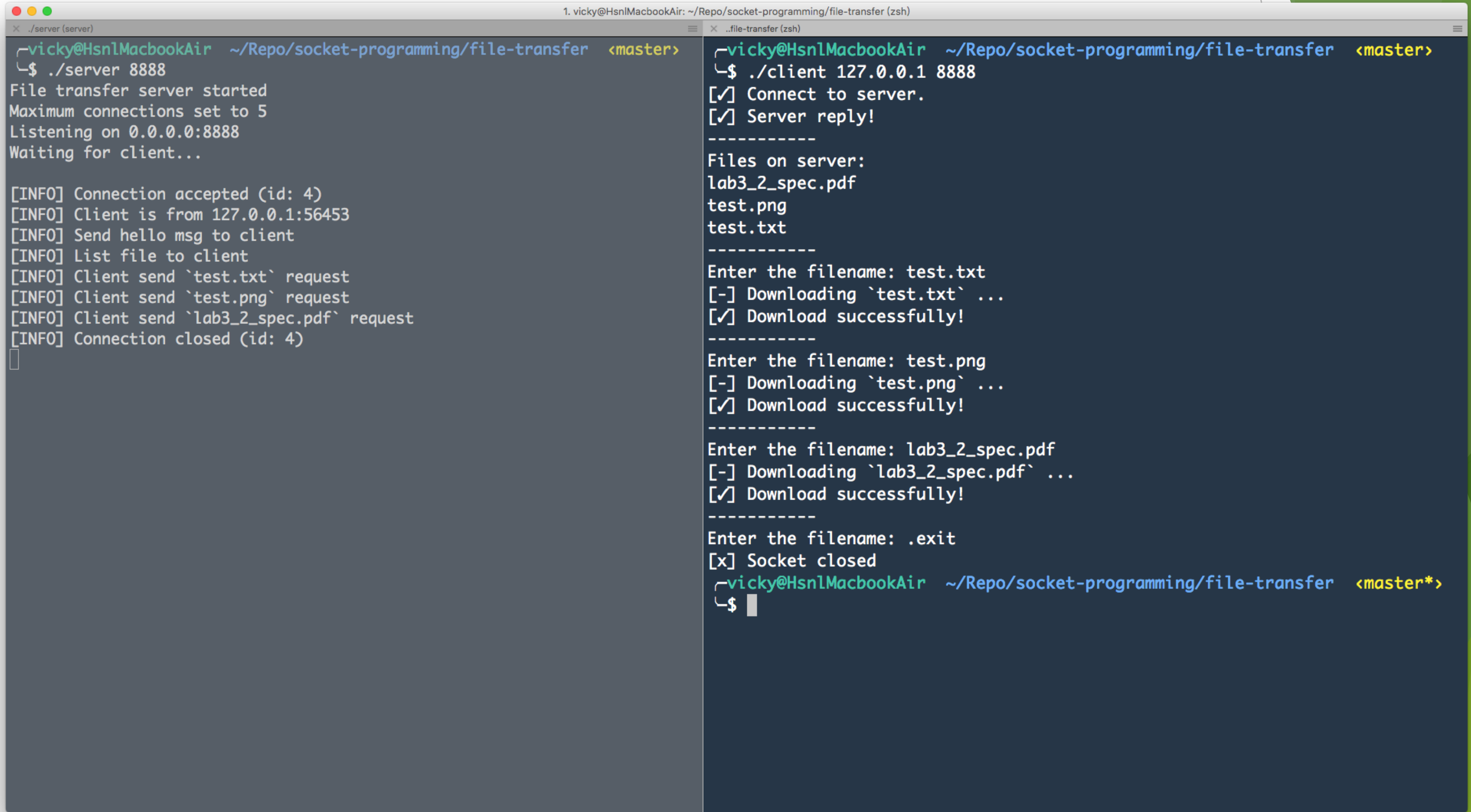
test

Transfer these files from “remote_storage” to “download”

Deadline

- Please also upload your code and a screenshot of your result to iLMS system.
  - Deadline: 100%, before 2018/11/11 23:59 (Sun.)
  - Deadline: 80%, before 2018/11/18 23:59 (Sun.)
  - Deadline: 60%, before 2018/11/25 23:59 (Sun.)
- After *2018/11/26*, your submission is **NOT** accepted.

Screenshot Example


1. vicky@HsnlMacbookAir: ~/Repo/socket-programming/file-transfer (zsh)
./server (server)
..file-transfer (zsh)

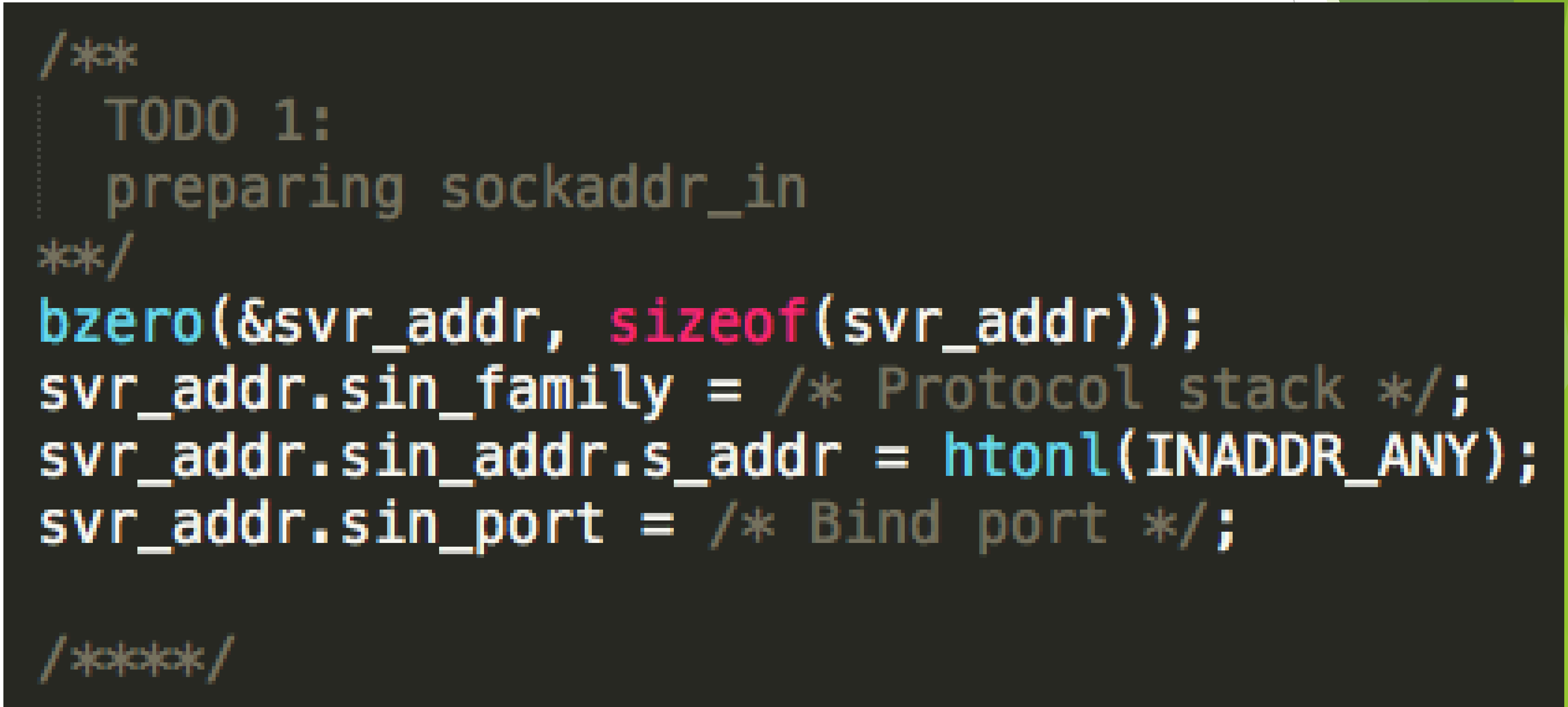
```
┌vicky@HsnlMacbookAir  ~/Repo/socket-programming/file-transfer  <master>
└$ ./server 8888
File transfer server started
Maximum connections set to 5
Listening on 0.0.0.0:8888
Waiting for client...

[INFO] Connection accepted (id: 4)
[INFO] Client is from 127.0.0.1:56453
[INFO] Send hello msg to client
[INFO] List file to client
[INFO] Client send `test.txt` request
[INFO] Client send `test.png` request
[INFO] Client send `lab3_2_spec.pdf` request
[INFO] Connection closed (id: 4)
```

```
┌vicky@HsnlMacbookAir  ~/Repo/socket-programming/file-transfer  <master>
└$ ./client 127.0.0.1 8888
[✓] Connect to server.
[✓] Server reply!
-----------
Files on server:
lab3_2_spec.pdf
test.png
test.txt
-----------
Enter the filename: test.txt
[-] Downloading `test.txt` ...
[✓] Download successfully!
-----------
Enter the filename: test.png
[-] Downloading `test.png` ...
[✓] Download successfully!
-----------
Enter the filename: lab3_2_spec.pdf
[-] Downloading `lab3_2_spec.pdf` ...
[✓] Download successfully!
-----------
Enter the filename: .exit
[x] Socket closed
┌vicky@HsnlMacbookAir  ~/Repo/socket-programming/file-transfer  <master*>
└$
```

Server.c

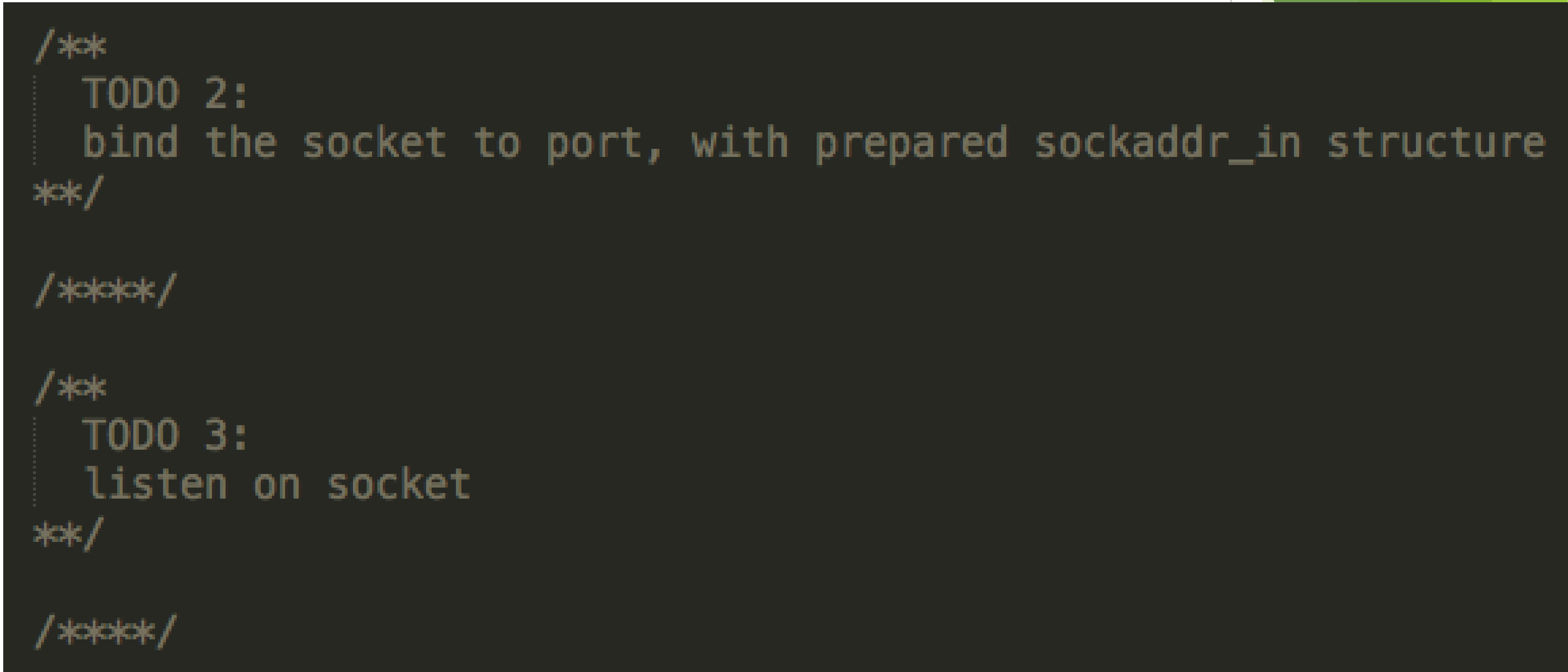
Code guide through

建立Socket連線
TODO 1~TODO 4



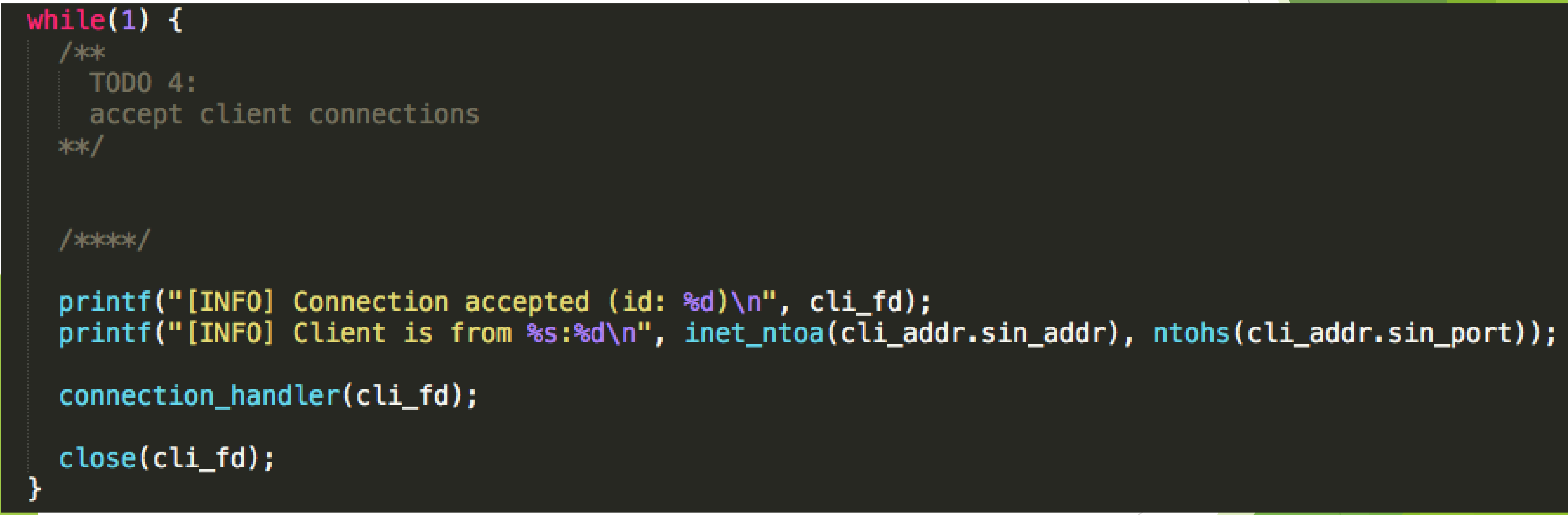
```
/**
  TODO 1:
  preparing sockaddr_in
**/
bzero(&svr_addr, sizeof(svr_addr));
svr_addr.sin_family = /* Protocol stack */;
svr_addr.sin_addr.s_addr = htonl(INADDR_ANY);
svr_addr.sin_port = /* Bind port */;

/****/
```

建立Socket連線
TODO 1~TODO 4



```
/**
  TODO 2:
  bind the socket to port, with prepared sockaddr_in structure
**/

/****/

/**
  TODO 3:
  listen on socket
**/

/****/
```

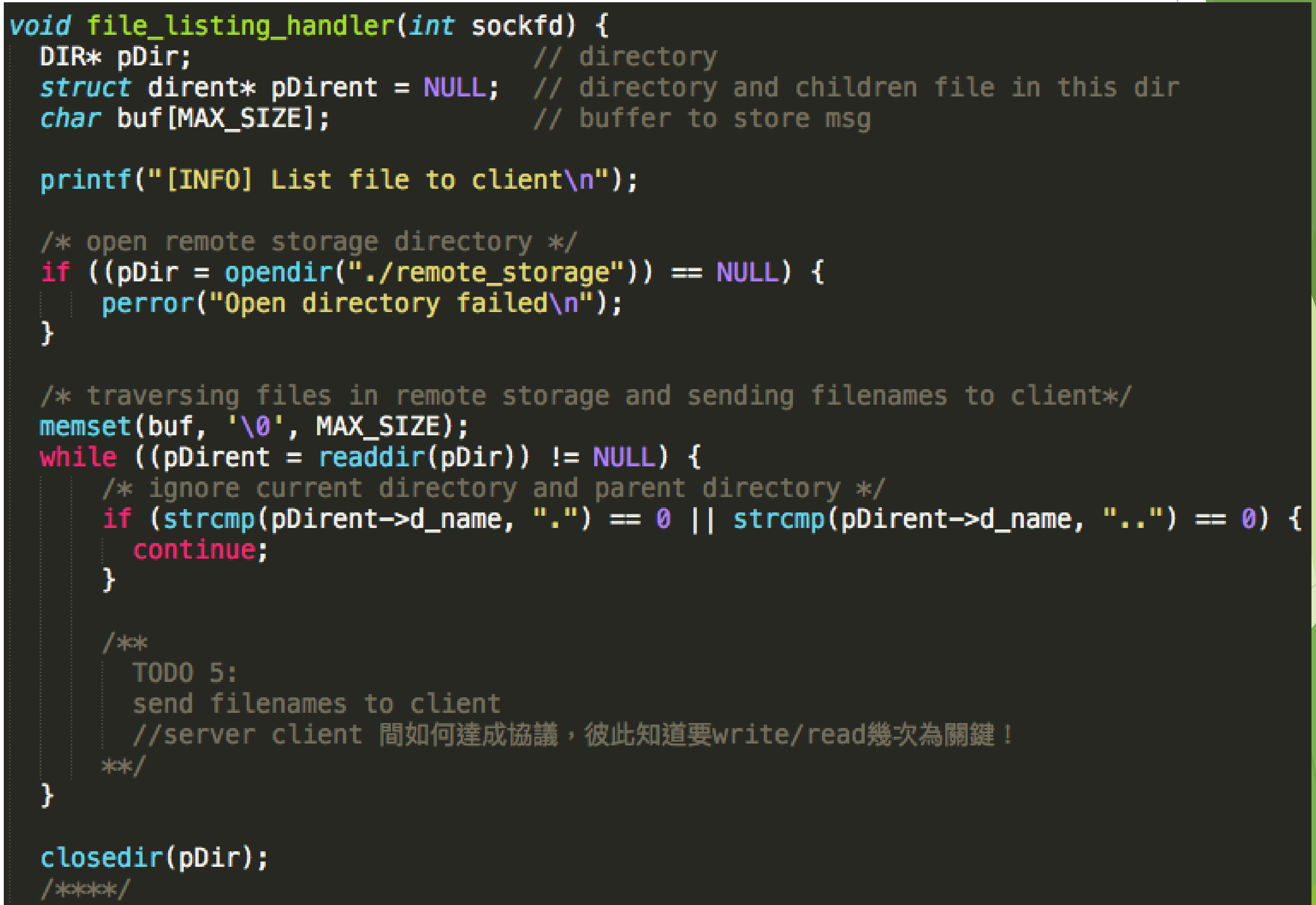
建立Socket連線
TODO 1~TODO 4



```
while(1) {
  /**
    TODO 4:
    accept client connections
  **/


  /*****/

  printf("[INFO] Connection accepted (id: %d)\n", cli_fd);
  printf("[INFO] Client is from %s:%d\n", inet_ntoa(cli_addr.sin_addr), ntohs(cli_addr.sin_port));

  connection_handler(cli_fd);

  close(cli_fd);
}
```

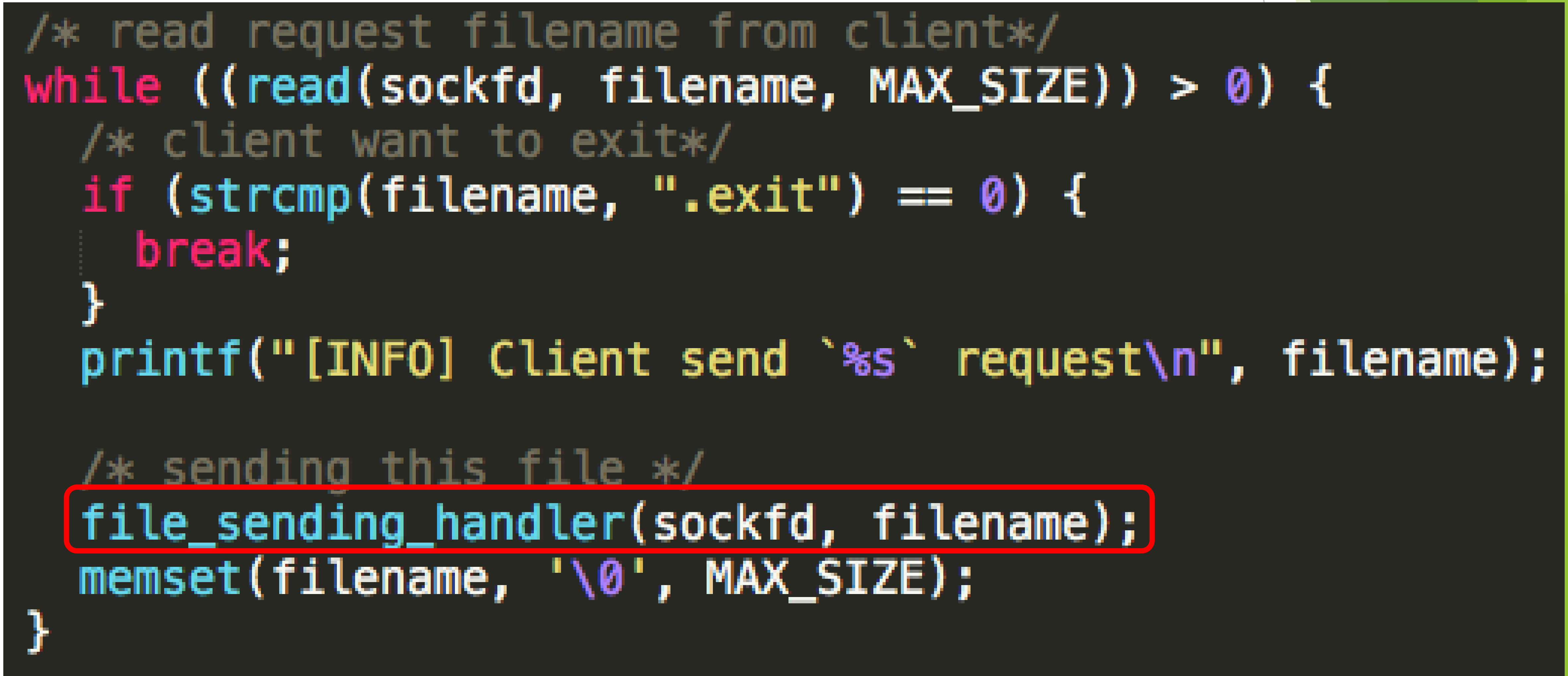
取得remote_storage目錄下檔名後write給client

TODO 5



```c
void file_listing_handler(int sockfd) {
  DIR* pDir;                        // directory
  struct dirent* pDirent = NULL;  // directory and children file in this dir
  char buf[MAX_SIZE];               // buffer to store msg

  printf("[INFO] List file to client\n");

  /* open remote storage directory */
  if ((pDir = opendir("./remote_storage")) == NULL) {
      perror("Open directory failed\n");
  }

  /* traversing files in remote storage and sending filenames to client*/
  memset(buf, '\0', MAX_SIZE);
  while ((pDirent = readdir(pDir)) != NULL) {
      /* ignore current directory and parent directory */
      if (strcmp(pDirent->d_name, ".") == 0 || strcmp(pDirent->d_name, "..") == 0) {
        continue;
      }

      /**
        TODO 5:
        send filenames to client
        //server client 間如何達成協議，彼此知道要write/read幾次為關鍵！
      **/
  }

  closedir(pDir);
  /****/
```

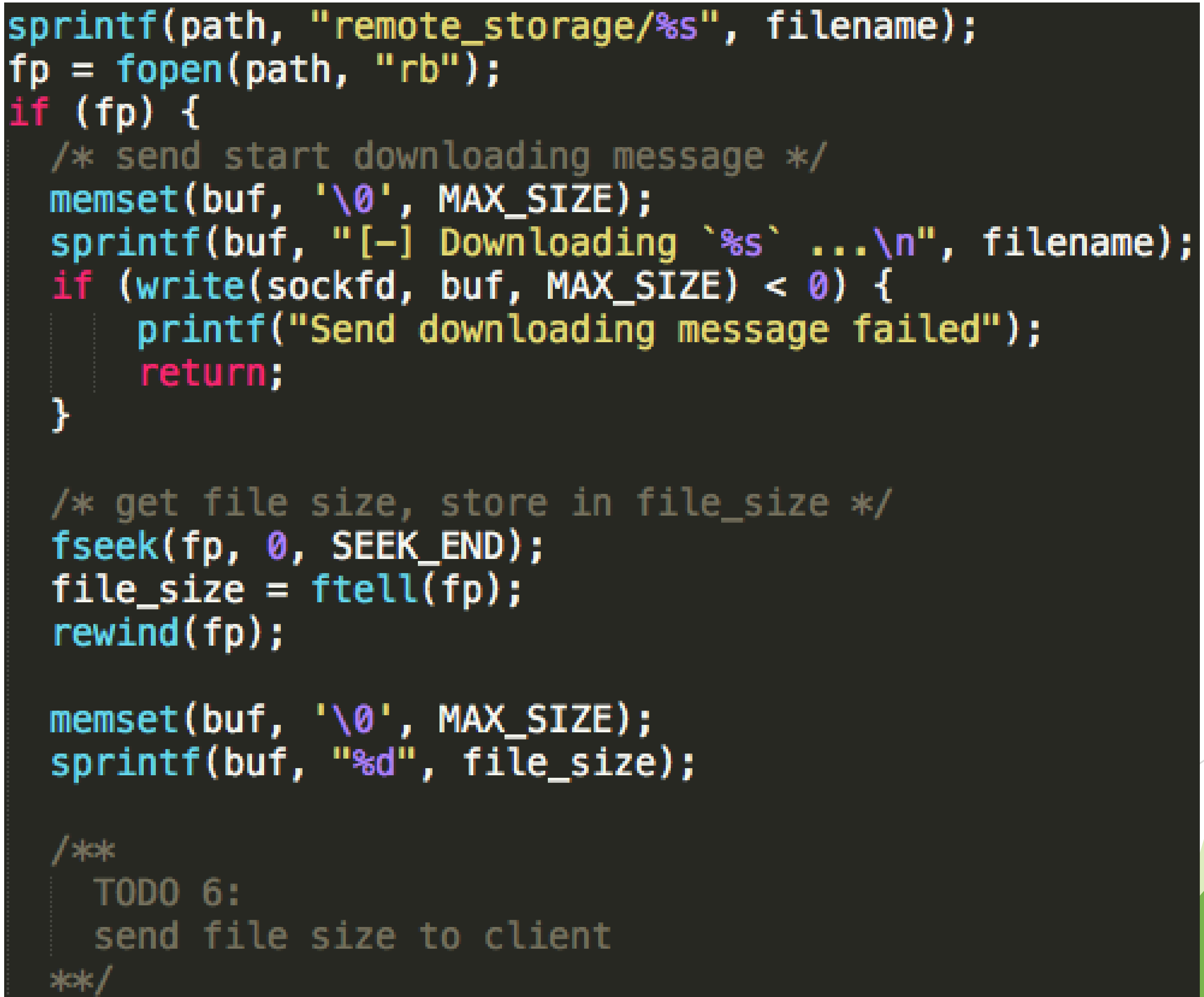
開始持續read來自client端的訊息（Client會輸入欲下載的檔名字串）



```
/* read request filename from client*/
while ((read(sockfd, filename, MAX_SIZE)) > 0) {
  /* client want to exit*/
  if (strcmp(filename, ".exit") == 0) {
    break;
  }
  printf("[INFO] Client send `%s` request\n", filename);

  /* sending this file */
  file_sending_handler(sockfd, filename);
  memset(filename, '\0', MAX_SIZE);
}
```

取得檔名後告知client檔案大小

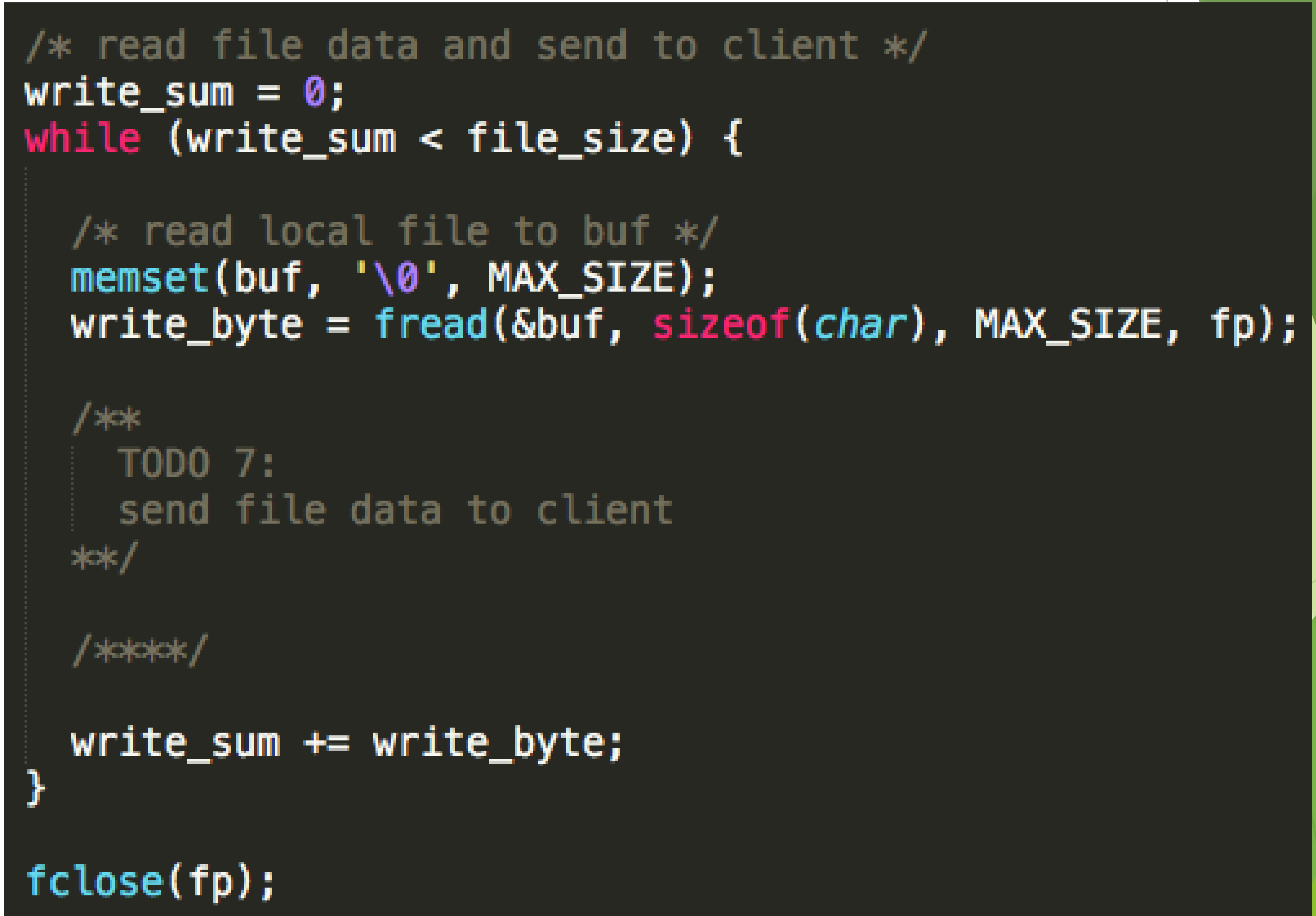
TODO 6



```c
sprintf(path, "remote_storage/%s", filename);
fp = fopen(path, "rb");
if (fp) {
  /* send start downloading message */
  memset(buf, '\0', MAX_SIZE);
  sprintf(buf, "[-] Downloading `%s` ...\n", filename);
  if (write(sockfd, buf, MAX_SIZE) < 0) {
      printf("Send downloading message failed");
      return;
  }

  /* get file size, store in file_size */
  fseek(fp, 0, SEEK_END);
  file_size = ftell(fp);
  rewind(fp);

  memset(buf, '\0', MAX_SIZE);
  sprintf(buf, "%d", file_size);

  /**
    TODO 6:
    send file size to client
  **/
```

使用buf分次write檔案給client

TODO 7

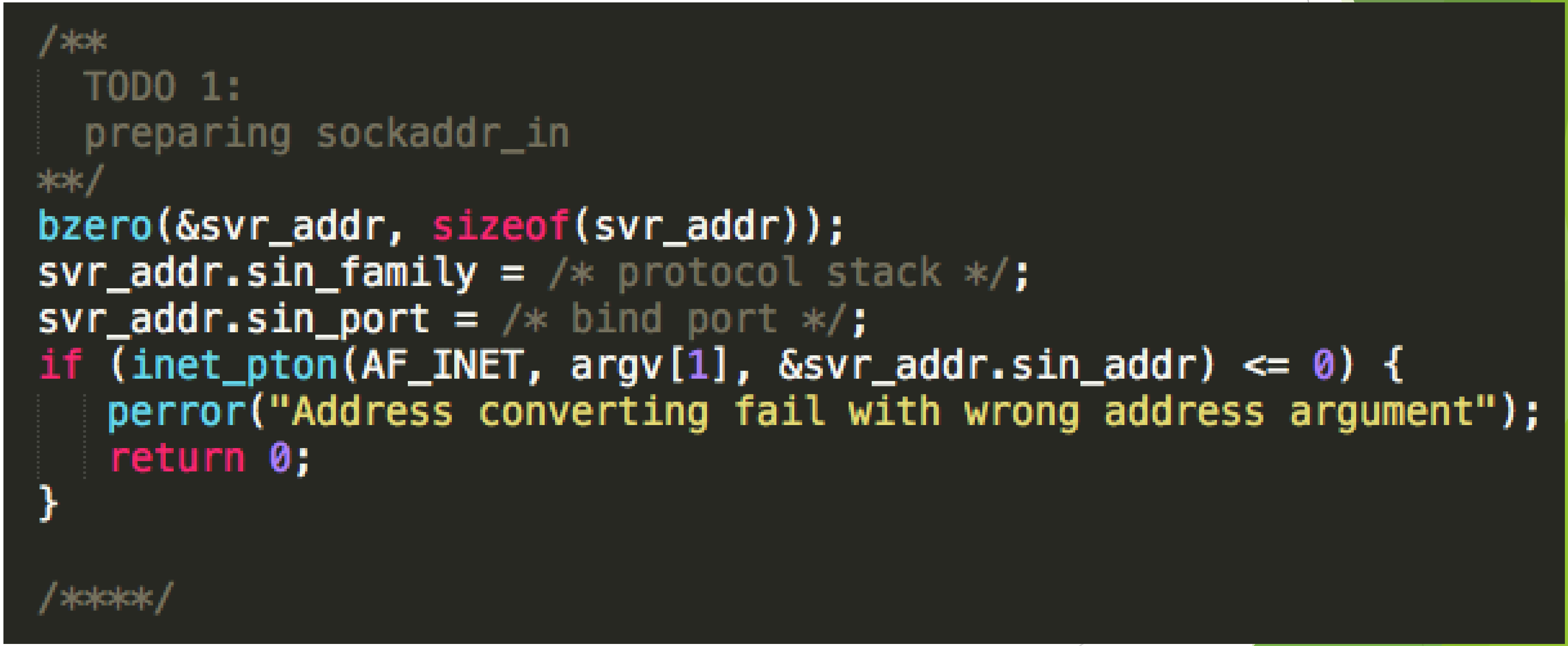


```
/* read file data and send to client */
write_sum = 0;
while (write_sum < file_size) {

  /* read local file to buf */
  memset(buf, '\0', MAX_SIZE);
  write_byte = fread(&buf, sizeof(char), MAX_SIZE, fp);

  /**
    TODO 7:
    send file data to client
  **/

  /****/

  write_sum += write_byte;
}

fclose(fp);
```

Client.c

Code guide through

建立Socket連線
TODO 1



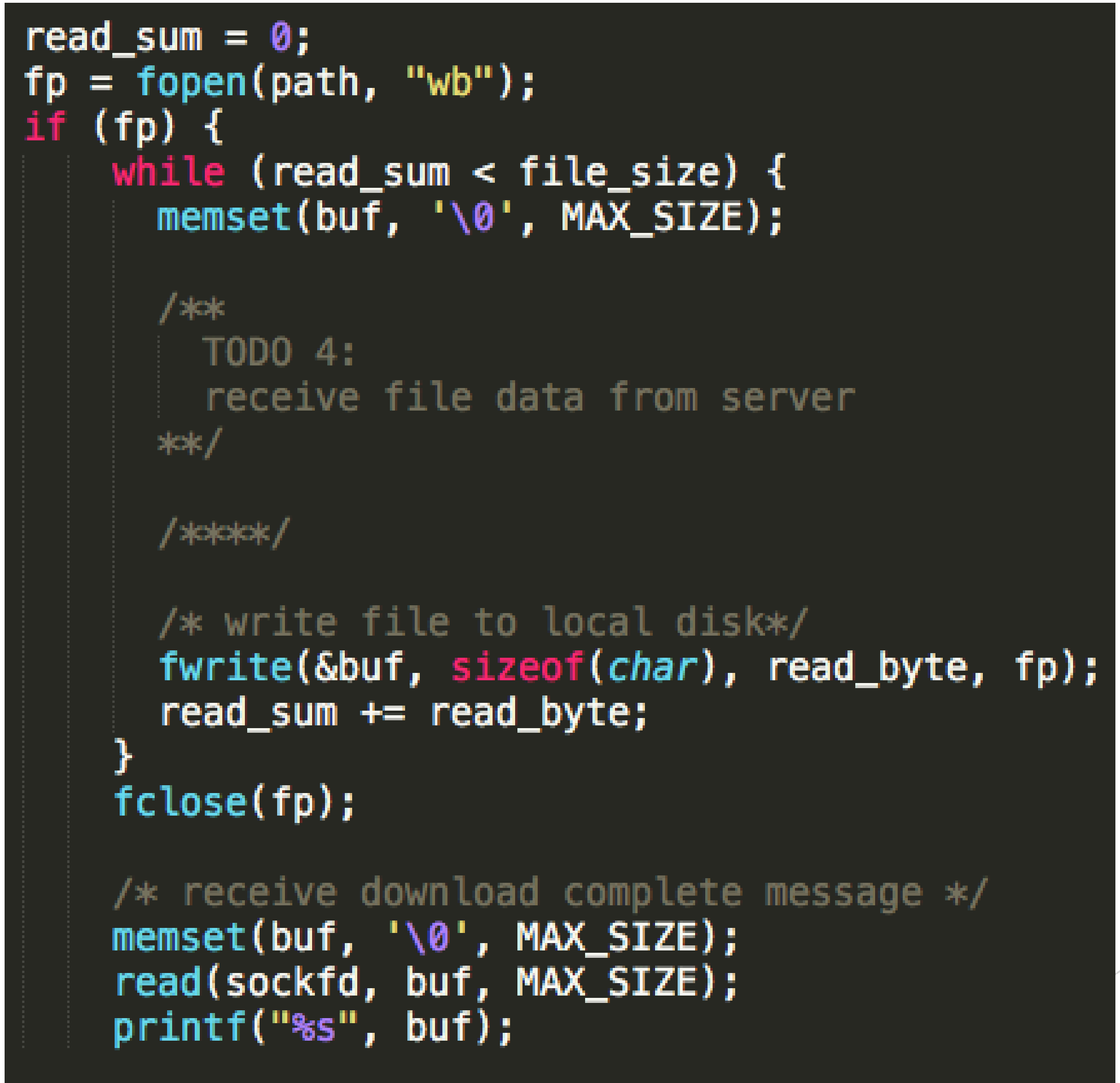
```
/**
  TODO 1:
  preparing sockaddr_in
**/
bzero(&svr_addr, sizeof(svr_addr));
svr_addr.sin_family = /* protocol stack */;
svr_addr.sin_port = /* bind port */;
if (inet_pton(AF_INET, argv[1], &svr_addr.sin_addr) <= 0) {
   perror("Address converting fail with wrong address argument");
   return 0;
}


/****/
```

對應Server端的write/read
TODO 2 ~ TODO 3

- (略)

接收從Server read過來的檔案片段

TODO 4



```
read_sum = 0;
fp = fopen(path, "wb");
if (fp) {
    while (read_sum < file_size) {
      memset(buf, '\0', MAX_SIZE);

      /**
        TODO 4:
        receive file data from server
      **/

      /*****/

      /* write file to local disk*/
      fwrite(&buf, sizeof(char), read_byte, fp);
      read_sum += read_byte;
    }
    fclose(fp);

    /* receive download complete message */
    memset(buf, '\0', MAX_SIZE);
    read(sockfd, buf, MAX_SIZE);
    printf("%s", buf);
```

Extra readings

- https://www.google.com.tw/search?q=Af_inet&oq=Af_inet&aqs=chrome..69i57j0l5.4495j0j7&sourceid=chrome&ie=UTF-8
- https://blog.csdn.net/lxj434368832/article/details/78499937
- https://www.ibm.com/support/knowledgecenter/en/SSLTBW_2.3.0/com.ibm.zos.v2r3.bpxbd00/rtread.htm
- https://stackoverflow.com/questions/2174889/whats-the-differences-between-r-and-rb-in-fopen
- https://www.tutorialspoint.com/c_standard_library/c_function_ftell.htm
- http://tw.gitbook.net/c_standard_library/c_function_fread.html
- https://zhidao.baidu.com/question/237489283.html
- https://cboard.cprogramming.com/c-programming/21472-atoi.html
- http://tw.gitbook.net/c_standard_library/c_function_fread.html
- https://www.google.com.tw/search?q=why+file+transfer+in+c+using+2048&oq=why+file+transfer+in+c+using+2048&aqs=chrome..69i57.12522j0j7&sourceid=chrome&ie=UTF-8
- https://superuser.com/questions/37449/what-are-and-in-a-directory