

# 시스템프로그래밍실습

#Assignment 3-2

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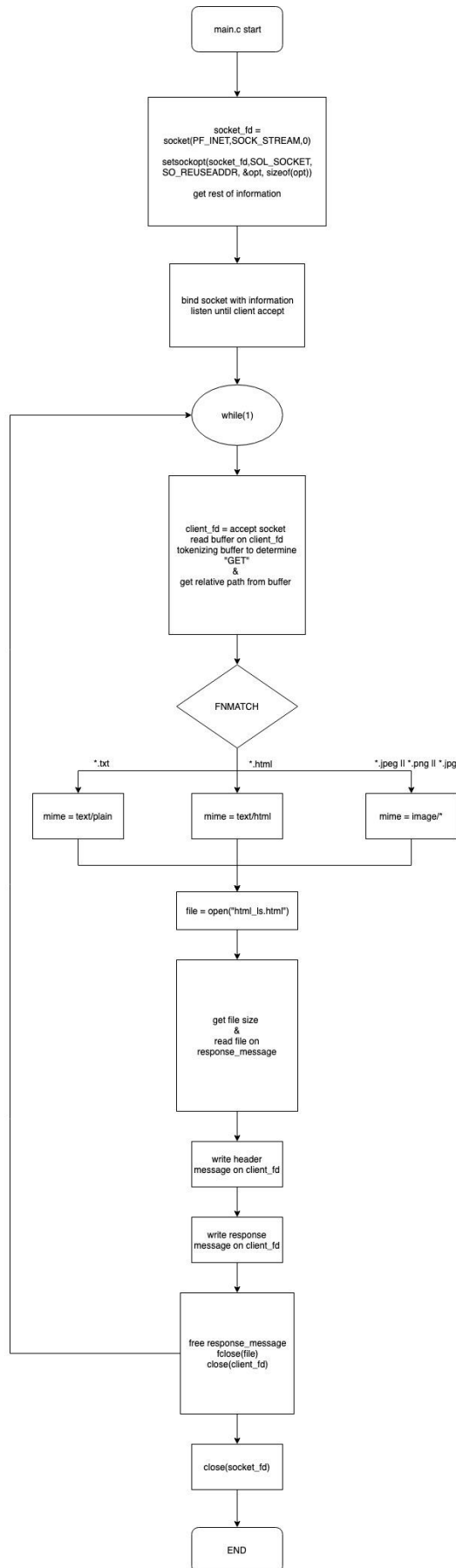
신영주 교수님

## 1. Introduction

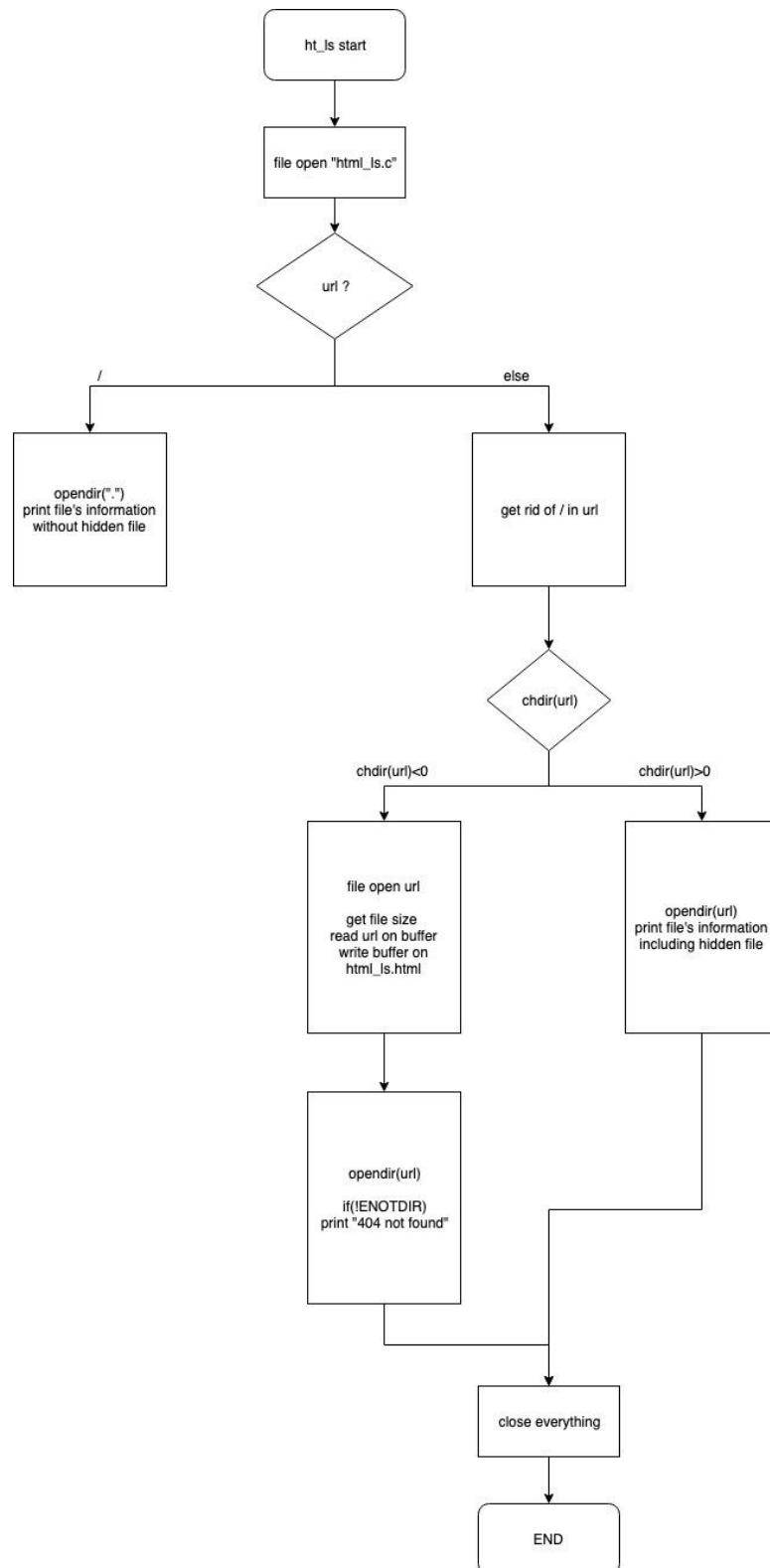
이번 과제는 저번에 구현했던 html 파일을 다른 서버에서도 접속 하여 브라우저 창에 띄우는 과제이다. 이전 과제와 대부분 흡사하지만 이번에는 실행 파일이 존재하는 디렉토리가 root가 된다. Root 디렉토리 경우에는 l option 으로 파일들을 보여 주고, 하위 디렉토리 들은 al option으로 보여준다. 디렉토리 간의 이동은 가능해야 하고 text 파일은 브라우저에서 보여줘야 하고, 다른 파일들은 다운로드 받을 수 있게 구현해야 한다.

## 2. Flow chart

- Srv.c (main.c)



- ht\_ls.c



### 3. Pseudo code

- Srv.c pseudo code

```
int main(){
    socket_fd = socket(PF_INET, SOCK_STREAM,0);
    setsockopt(socket_fd,SOL_SOCKET, SO_REUSEADDR, &opt, sizeof(opt));

    server_addr.sin_family = AF_INET;
    server_addr.sin_addr.s_addr = htonl(INADDR_ANY);
    server_addr.sin_port = htons(PORTNO);

    bind(socket_fd, (struct sockaddr *)&server_addr, sizeof(server_addr));

    listen(socket_fd, 5);

    while(1){
        client_fd= accept(socket_fd, (struct sockaddr*)&client_addr, &len);
        inet_client_address.s_addr = client_addr.sin_addr.s_addr;

        read buf on client_fd;

        toknizng tmp{
            get url
        }

        func = 1;

        if(fnmatch("*.txt",url,0)==0||fnmatch("*.c",url,0)==0||fnmatch("*.h",url,0)
        ==0){
            mime = text/plain;
        }
        else if(fnmatch("*.html", url, 0)==0){
            mime = text/html;
            func = 0;
        }
        else if(fnmatch("*.jpg",url,FNM_CASEFOLD)==0||fnmatch("*.png",url,FNM_CASEF
        OLD)==0||fnmatch("*.jpeg",url,FNM_CASEFOLD)==0){
            mime= image/*;
            func = 2;
        }

        ht_ls(url);
        fopen("html_ls.html");
        filesize= get file size;

        if(func == 1){
            fread(response_message , file)
            write(client_fd, response_header);
            write(client_fd, response_message);
        }
        else if(func==0){
            fread(response_message , file)
            write(client_fd, response_header);
            write(client_fd, response_message);
        }
        else if(func == 2){
            fread(response_message , file)
            write(client_fd, response_header);
        }
    }
}
```

```

        write(client_fd, response_message);
    }

    free(response_message);
    fclose(file);
    close(client_fd);
}
close(socket_fd);
}

```

- Ht\_ls.c pseudo code

```

void start{
    initialize node;
}

int insert{
    insert node
}

int status{
    print current node's information
}

int statprint{
    print information form
}

void free_list{
    free every node in list
}

int ht_ls{
    file = fopen("html_ls.html","w");
    getcwd(cur);
    flag =0;

    if(url != '/'){
        furl = get rid of / in url;
        flag = 1;
        if(chdir(furl)<0){

            dirp = opendir(furl);
            if(errno==ENOTDIR){
                nfile = fopen(furl,"r");
                fs = nfile's file size

                fread(buffer, nfile);
                fwrite(buffer, file);
                fclose(nfile);
                closedirp(dirp);
                fclose(file);
            }
            if(errno!=ENOTDIR){
                fprintf(file, "404 not found");
            }
            return -1;
        }
        getcwd(pth);
        dirp = opendir(pth);
        PRINT INFORMATION;
        chdir(cur);
    }
    else {
        dirp= opendir(".");
        PRINT FILE INFORMATION;
    }
}

```

4. Result

← → ↺ 🏠 ⓘ 127.0.0.1:40000 ... 📄 ☆ 📏 📄 ☰

## Welcome to System Programming HTTP

directory path : /home/sp2015722013/work/basicserver  
total : 516

File Name	Permission	Link	Owner	Group	Size	Last Modified
a.out	-rwxrwxr-x	1	sp2015722013	sp2015722013	27144	Wed May 8 10:49:40 2019
bsrv.c	-rw-rw-r--	1	sp2015722013	sp2015722013	29447	Wed May 8 10:50:21 2019
cli	-rwxrwxr-x	1	sp2015722013	sp2015722013	9128	Tue May 7 17:48:21 2019
cli.c	-rw-rw-r--	1	sp2015722013	sp2015722013	1066	Tue May 7 17:46:35 2019
esrv	-rwxrwxr-x	1	sp2015722013	sp2015722013	9280	Tue May 7 17:48:09 2019
esrv.c	-rw-rw-r--	1	sp2015722013	sp2015722013	1470	Tue May 7 17:47:42 2019
ht.js.c	-rw-rw-r--	1	sp2015722013	sp2015722013	11123	Fri May 10 06:03:48 2019
ht.js.h	-rw-rw-r--	1	sp2015722013	sp2015722013	1054	Fri May 10 04:30:22 2019
ht.js.o	-rw-rw-r--	1	sp2015722013	sp2015722013	22048	Wed May 8 15:54:18 2019
itsalright.jpeg	-rw-rw-r--	1	sp2015722013	sp2015722013	199020	Thu May 9 23:46:19 2019
ls.c	-rw-rw-r--	1	sp2015722013	sp2015722013	27930	Fri May 3 04:54:59 2019
ls.o	-rw-rw-r--	1	sp2015722013	sp2015722013	44696	Wed May 8 15:54:11 2019
Makefile	-rw-rw-r--	1	sp2015722013	sp2015722013	39	Fri May 10 04:30:22 2019
mayday	drwxrwxr-x	3	sp2015722013	sp2015722013	4096	Fri May 10 18:23:37 2019
one	drwxrwxr-x	3	sp2015722013	sp2015722013	4096	Fri May 10 20:48:21 2019
simple.js.html	-rw-rw-r--	1	sp2015722013	sp2015722013	23891	Mon May 6 23:52:28 2019
srv	-rwxrwxr-x	1	sp2015722013	sp2015722013	23304	Fri May 10 20:49:53 2019
srv.c	-rw-rw-r--	1	sp2015722013	sp2015722013	6579	Fri May 10 20:49:51 2019
srv.o	-rw-rw-r--	1	sp2015722013	sp2015722013	13288	Wed May 8 15:54:22 2019
test1	-rwxrwxr-x	1	sp2015722013	sp2015722013	31872	Wed May 8 15:54:43 2019

<root directory>

← → ↺ 🏠 ⓘ 127.0.0.1:40000/one ... 📄 ☆ 📏 📄 ☰

## System Programming HTTP

directory path : /home/sp2015722013/work/basicserver/one  
total : 104

File Name	Permission	Link	Owner	Group	Size	Last Modified
..	drwxrwxr-x	3	sp2015722013	sp2015722013	4096	Fri May 10 20:48:21 2019
...	drwxrwxr-x	4	sp2015722013	sp2015722013	4096	Fri May 10 20:49:53 2019
l.c	-rw-rw-r--	1	sp2015722013	sp2015722013	19	Wed May 8 19:30:20 2019
l.txt	-rw-rw-r--	1	sp2015722013	sp2015722013	2	Tue May 7 20:19:56 2019
ht.js.c	-rw-rw-r--	1	sp2015722013	sp2015722013	11215	Fri May 10 04:29:03 2019
ht.js.h	-rw-rw-r--	1	sp2015722013	sp2015722013	1054	Thu May 9 03:35:14 2019
inone	drwxrwxr-x	2	sp2015722013	sp2015722013	4096	Fri May 10 20:48:21 2019
test	-rwxrwxr-x	1	sp2015722013	sp2015722013	27880	Fri May 10 05:22:47 2019
test.c	-rw-rw-r--	1	sp2015722013	sp2015722013	5571	Fri May 10 05:24:12 2019
web_serv.c	-rw-rw-r--	1	sp2015722013	sp2015722013	23694	Fri May 10 00:43:49 2019
web_serv.h	-rw-rw-r--	1	sp2015722013	sp2015722013	1175	Fri May 10 00:43:14 2019

<child directory>

Welcome to System Programming HTTP

directory path : /home/sp2015722013/work/basicserver  
total : 516

File Name	Permission	Link	Owner	Group	Size	Last Modified
a.out	-rwxrwxr-x	1	sp2015722013	sp2015722013	27144	Wed May 8 10:49:40 2019
bsrv.c	-rw-rw-r--	1	sp2015722013	sp2015722013	29447	Wed May 8 10:50:21 2019
cli	-rwxrwxr-x	1	sp2015722013	sp2015722013		
cli.c	-rw-rw-r--	1	sp2015722013	sp2015722013		
esrv	-rwxrwxr-x	1	sp2015722013	sp2015722013		
esrv.c	-rw-rw-r--	1	sp2015722013	sp2015722013		
ht_ls.c	-rw-rw-r--	1	sp2015722013	sp2015722013		
ht_ls.h	-rw-rw-r--	1	sp2015722013	sp2015722013		
ht_ls.o	-rw-rw-r--	1	sp2015722013	sp2015722013		
itsalright.jpeg	-rw-rw-r--	1	sp2015722013	sp2015722013		
ls.c	-rw-rw-r--	1	sp2015722013	sp2015722013		
ls.o	-rw-rw-r--	1	sp2015722013	sp2015722013		
Makefile	-rw-rw-r--	1	sp2015722013	sp2015722013		
mayday	drwxrwxr-x	3	sp2015722013	sp2015722013		
one	drwxrwxr-x	3	sp2015722013	sp2015722013		
simple_ls.html	-rw-rw-r--	1	sp2015722013	sp2015722013		
srv	-rwxrwxr-x	1	sp2015722013	sp2015722013	23304	Fri May 10 20:49:53 2019
srv.c	-rw-rw-r--	1	sp2015722013	sp2015722013	6579	Fri May 10 20:49:51 2019
srv.o	-rw-rw-r--	1	sp2015722013	sp2015722013	13288	Wed May 8 15:54:22 2019
test1	-rwxrwxr-x	1	sp2015722013	sp2015722013	31872	Wed May 8 15:54:43 2019

Opening itsalright.jpeg

You have chosen to open:  
itsalright.jpeg  
which is: JPEG image (194 KB)  
from: http://127.0.0.1:40000

What should Firefox do with this file?

☒ Open with Image Viewer (default)

☐ Save File

☐ Do this automatically for files like this from now on.

Cancel OK

itsalright.jpeg

Well

directo  
total :

File

a.out  
bsrv.c  
cli  
cli.c  
esrv  
esrv.c  
ht\_ls.c  
ht\_ls.h  
ht\_ls.o  
itsalright  
ls.c  
ls.o  
Makefile  
mayday  
one  
simple  
srv  
srv.c  
srv.o  
test1

LEGIT GOONS

LIQUOR

어쩔려고 그래?

괜찮아, 우린 이미 쫓겼으니까

<image file download>



```

#include <stdio.h>
#include <string.h>
#include <unistd.h>
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>

#define BUFFSIZE 1024
#define PORTNO 40000

int main(){
    int socket_fd, len;
    struct sockaddr_in server_addr;
    char haddr[] = "127.0.0.1";
    char buf[BUFFSIZE];

    if((socket_fd=socket(PF_INET, SOCK_STREAM, 0))<0){
        printf("Can't create socket.\n");
        return -1;
    }

    memset(buf,0,sizeof(buf));
    memset(&server_addr, 0, sizeof(server_addr));
    server_addr.sin_family = AF_INET;
    server_addr.sin_addr.s_addr = inet_addr(haddr);
    server_addr.sin_port=htons(PORTNO);

    if(connect(socket_fd, (struct sockaddr*)&server_addr, sizeof(server_addr))<0){
        printf("can't connect.\n");
        return -1;
    }

    write(STDOUT_FILENO, ">", 2);
    while((len=read(STDIN_FILENO, buf, sizeof(buf)))>0){
        if(write(socket_fd, buf, strlen(buf))>0){
            if((len = read(socket_fd, buf, sizeof(buf)))>0){
                write(STDOUT_FILENO,buf, len);
                memset(buf,0,sizeof(buf));
            }
        }
        write(STDOUT_FILENO,">",2);
    }

    close(socket_fd);
    return 0;
}

```

<.c file view on browser>

directory path : /home/sp2015722013/work/basicserver  
total : 516

File Name	Permission	Link	Owner	Group	Size	Last Modified
a.out	-rwxrwxr-x	1	sp2015722013	sp2015722013	27144	Wed May 8 10:49:40 2019
bsrv.c	-rw-rw-r--	1	sp2015722013	sp2015722013	29447	Wed May 8 10:50:21 2019
cli	-rwxrwxr-x	1	sp2015722013	sp2015722013	9128	Tue May 7 17:48:21 2019
cli.c	-rw-rw-r--	1	sp2015722013	sp2015722013	1066	Tue May 7 17:46:35 2019
esrv	-rwxrwxr-x	1	sp201572			
esrv.c	-rw-rw-r--	1	sp201572			
ht_ls.c	-rw-rw-r--	1	sp201572			
ht_ls.h	-rw-rw-r--	1	sp201572			
ht_ls.o	-rw-rw-r--	1	sp201572			
itsalright.jpeg	-rw-rw-r--	1	sp201572			
ls.c	-rw-rw-r--	1	sp201572			
ls.o	-rw-rw-r--	1	sp201572			
Makefile	-rw-rw-r--	1	sp201572			
mayday	drwxrwxr-x	3	sp201572			
one	drwxrwxr-x	3	sp201572			
simple_ls.html	-rw-rw-r--	1	sp201572			
srv	-rwxrwxr-x	1	sp201572			
srv.c	-rw-rw-r--	1	sp201572			
srv.o	-rw-rw-r--	1	sp2015722013	sp2015722013	13288	Wed May 8 15:54:22 2019
test1	-rwxrwxr-x	1	sp2015722013	sp2015722013	31872	Wed May 8 15:54:43 2019
two	lrwxrwxrwx	1	sp2015722013	sp2015722013	3	Fri May 10 01:50:53 2019
two	lrwxrwxrwx	1	sp2015722013	sp2015722013	6	Fri May 10 01:52:48 2019

Opening ls.o

You have chosen to open:

ls.o  
which is: O file (43.6 KB)  
from: http://127.0.0.1:40000

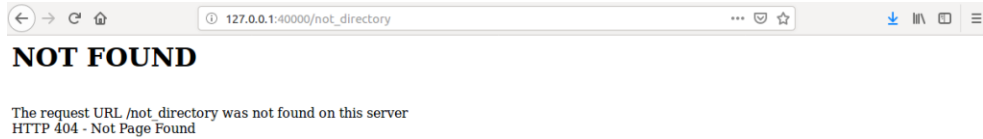
What should Firefox do with this file?

☐ Open with

☒ Save File

☐ Do this automatically for files like this from now on.

<object file download>



< if no such directory or file >

## 5. Conclusion

이번 과제를 통해서 처음으로 socket programming 이라는 것을 해 보았다. 처음에는 socket이라는 것에 대한 이해도가 없었지만 구현을 하면서 이해도가 점점 높아졌다. 구현을 하면서 가장 처음이 제일 힘들었다. 어떤 방향으로 진행 할지에 대한 감이 전혀 잡히질 않았지만 html file을 활용한다는 것을 깨닫고 그다음부터 차츰 나아졌다. 지금까지 경로를 항상 절대 경로로만 생각 했었는데 처음으로 상대 경로로 생각 해주어야 해서 혼란스러웠다. 파일 이름에 하이퍼 링크를 걸어주는 것과 그 링크를 url로 받아서 다시 ht\_ls 파일로 보내서 html 파일을 생성하는 부분에서 자꾸 이상한 path가 나와서 상당한 난항을 거쳤지만 chdir()를 적절히 쓰고 getcwd()를 통해 path를 적절히 받아와서 해결할 수 있었다. 이번 과제를 통해서 socket 시스템에 대한 이해도가 높아졌고 어떤 단계를 거치며 서버에 접속 되는지에 대해서도 알게 되었다.