Assignment5

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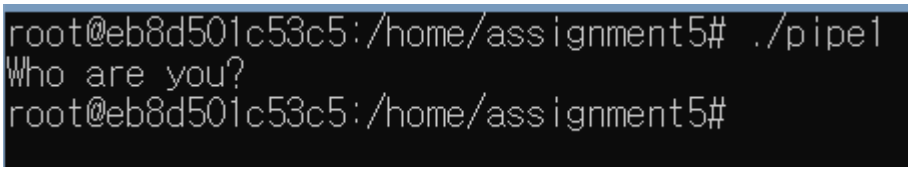
Example1

`pipe1.c`

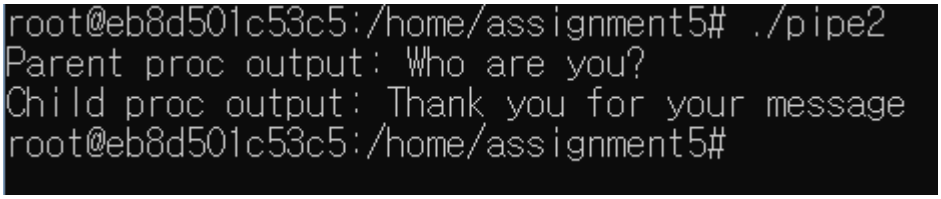
```
#include <stdio.h>
#include <unistd.h>
#define BUF_SIZE 30

int main(int argc, char *argv[]){
    int fds[2];
    char str[] = "Who are you?";
    char buf[BUF_SIZE];
    pid_t pid;

    pipe(fds);
    pid = fork();
    if(pid==0){
        write(fds[1], str, sizeof(str));
    }
    else{
        read(fds[0], buf, BUF_SIZE);
        puts(buf);
    }
    return 0;
}
```



Example2

`pipe2`

```
#include <stdio.h>
#include <unistd.h>
#define BUF_SIZE 30

int main(int argc, char *argv[]){
    int fds[2];
    char str1[] = "Who are you?";
    char str2[] = "Thank you for your message";
    char buf[BUF_SIZE];
    pid_t pid;

    pipe(fds);
    pid = fork();
    if(pid==0){
        write(fds[1], str1, sizeof(str1));
        sleep(2);
        read(fds[0], buf, BUF_SIZE);
        printf("Child proc output: %s\n",buf);
    }
    else{
        read(fds[0], buf, BUF_SIZE);
        printf("Parent proc output: %s\n",buf);
        write(fds[1], str2, sizeof(str2));
        sleep(3);
    }
    return 0;
}
```

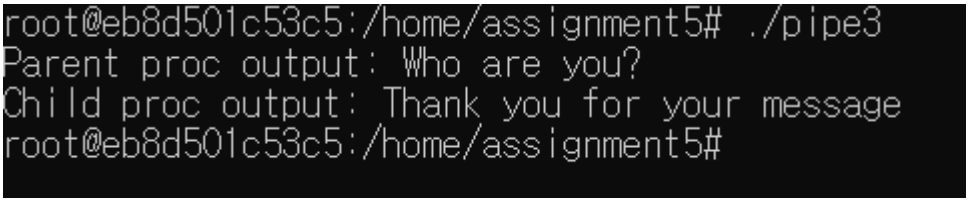


Example3

`pipe3`

```
#include <stdio.h>
#include <unistd.h>
#define BUF_SIZE 30

int main(int argc, char *argv[]){
    int fds1[2], fds2[2];
```

```
    char str1[] = "Who are you?";
    char str2[] = "Thank you for your message";
    char buf[BUF_SIZE];
    pid_t pid;

    pipe(fds1), pipe(fds2);
    pid = fork();
    if(pid==0){
        write(fds1[1], str1, sizeof(str1));
        read(fds2[0], buf, BUF_SIZE);
        printf("Child proc output: %s\n",buf);
    }
    else{
        read(fds1[0], buf, BUF_SIZE);
        printf("Parent proc output: %s\n",buf);
        write(fds2[1], str2, sizeof(str2));
        sleep(3);
    }
    return 0;
}
```



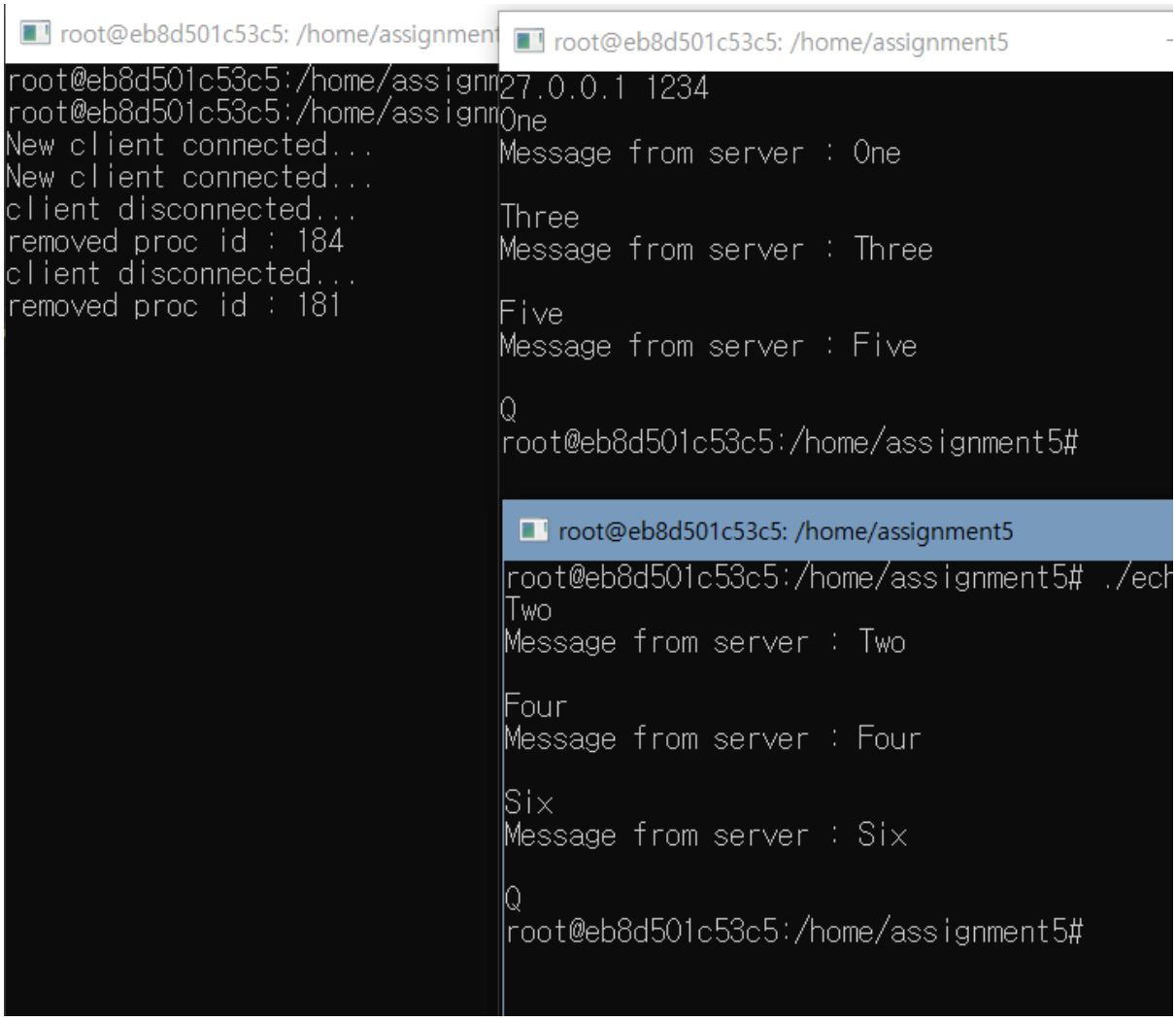
Example4

`eacho_storeserv.c`

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <signal.h>
#include <sys/wait.h>
#include <arpa/inet.h>
#include <sys/socket.h>

#define BUF_SIZE 100
void error_handling(char *message);
void read_childproc(int sig);

int main(int argc, char *argv[]){
    int serv_sock, clnt_sock;
```

```
    struct sockaddr_in serv_adr, clnt_adr;
    int fds[2];

    pid_t pid;
    struct sigaction act;
    socklen_t adr_sz;
    int str_len, state;
    char buf[BUF_SIZE];

    if(argc!=2){
        printf("Usage: %s <port>\n", argv[0]);
        exit(1);
    }

    act.sa_handler = read_childproc;
    sigemptyset(&act.sa_mask);
    act.sa_flags = 0;
    state = sigaction(SIGCHLD, &act, 0);

    serv_sock = socket(PF_INET, SOCK_STREAM, 0);
    memset(&serv_adr, 0, sizeof(serv_adr));
    serv_adr.sin_family = AF_INET;
    serv_adr.sin_addr.s_addr = htonl(INADDR_ANY);
    serv_adr.sin_port = htons(atoi(argv[1]));

    if (bind(serv_sock, (struct sockaddr*) &serv_adr, sizeof(serv_adr))==-1)
        error_handling("bind() error");
    if (listen(serv_sock, 5)==-1)
        error_handling("listen() error");

    pipe(fds);
    pid=fork();
    if(pid==0){
        FILE * fp = fopen("echomsg.txt", "wt");
        char msgbuf[BUF_SIZE];
        int i, len;
        for(i=0; i<10; i++){
            len=read(fds[0], msgbuf, BUF_SIZE);
            fwrite((void*)msgbuf, 1, len, fp);
        }
        fclose(fp);
        return 0;
    }

    while(1){
        adr_sz = sizeof(clnt_adr);
        clnt_sock = accept(serv_sock, (struct sockaddr*)&clnt_adr, &adr_sz);
        if(clnt_sock==-1) continue;
        else puts("New client connected...");
        pid=fork();
        if(pid==0){
            close(serv_sock);
            while((str_len==read(clnt_sock, buf, BUF_SIZE))!=0){
                write(clnt_sock, buf, str_len);
                write(fds[1], buf, str_len);
            }
            close(clnt_sock);
            puts("client disconnected...");
```

```
            return 0;
        }
        else close(clnt_sock);
    }
    close(serv_sock);
    return 0;
}

void read_childproc(int sig){
    pid_t pid;
    int status;
    pid = waitpid(-1, &status, WNOHANG);
    printf("removed proc id : %d\n",pid);
}

void error_handling(char *message){
    fputs(message, stderr);
    fputc('\n',stderr);
    exit(1);
}
```



Example 5

`select.c`

```
#include <stdio.h>
#include <unistd.h>
#include <sys/time.h>
#include <sys/select.h>
#define BUF_SIZE 30
int main(int argc, char *argv[]){
    fd_set reads, temps;
    int result, str_len;
    char buf[BUF_SIZE];
    struct timeval timeout;
    FD_ZERO(&reads);
    FD_SET(0, &reads);

    timeout.tv_sec = 5;
    timeout.tv_usec = 5000;
    while(1){
        temps = reads;
        timeout.tv_sec = 5;
        timeout.tv_usec = 0;
        result = select(1, &temps, 0, 0, &timeout);
        if(result==-1){
            puts("select() error!");
            break;
        }
        else if(result==0){
            puts("time out!");
        }
        else{
            if(FD_ISSET(0, &temps)){
                str_len = read(0, buf, Buf_SIZE);
                buf[str_len] = 0;
                printf("message from console:%s",buf);
            }
        }
    }
```

```
    return 0;
}
```

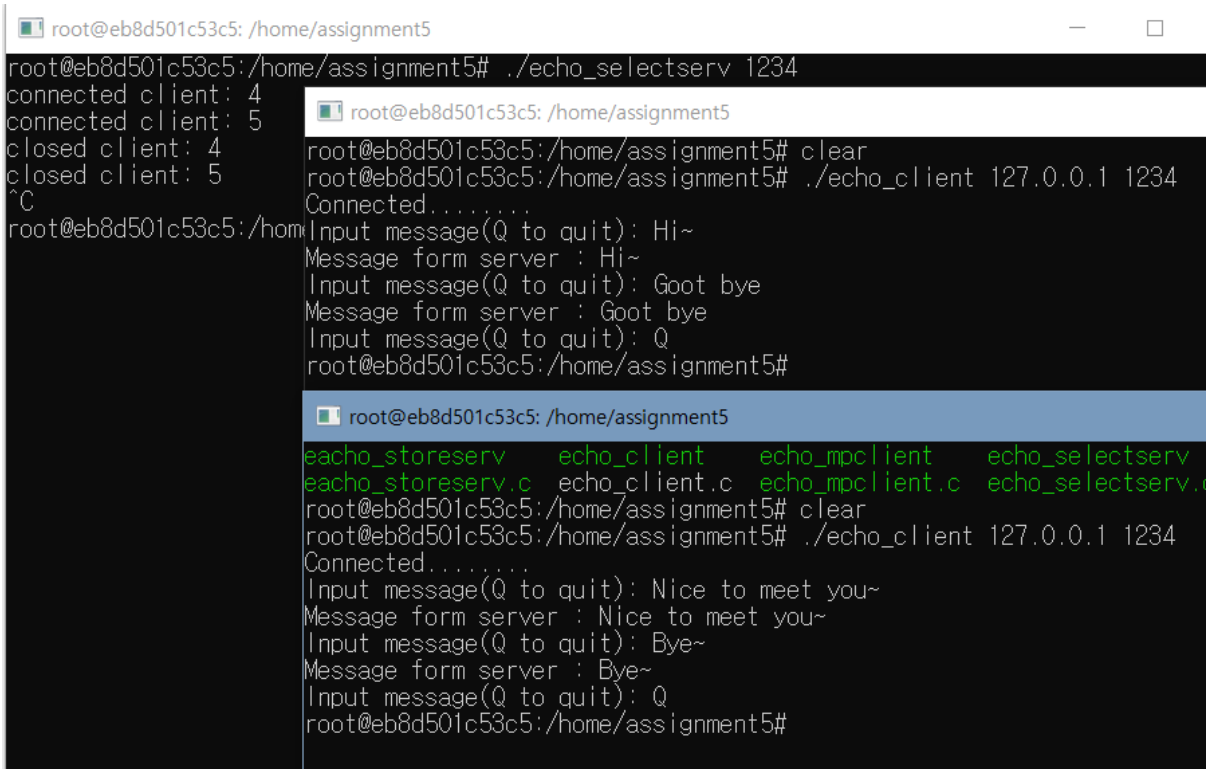
Example 6

`Echo_selectserv.c`

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <arpa/inet.h>
#include <sys/socket.h>
#include <sys/time.h>
#include <sys/select.h>

#define BUF_SIZE 100
void error_handling(char *message);
int main(int argc, char *argv[]){
    int serv_sock, clnt_sock;
    struct sockaddr_in serv_adr, clnt_adr;
    struct timeval timeout;
    fd_set reads, cpy_reads;

    socklen_t adr_sz;
```

```
    int fd_max, str_len, fd_num, i;
    char buf[BUF_SIZE];
    if(argc!=2){
        printf("Usage : %s <port>\n",argv[0]);
        exit(1);
    }

    serv_sock = socket(PF_INET, SOCK_STREAM, 0);
    memset(&serv_adr, 0, sizeof(serv_adr));
    serv_adr.sin_family = AF_INET;
    serv_adr.sin_addr.s_addr = htonl(INADDR_ANY);
    serv_adr.sin_port = htons(atoi(argv[1]));
    if (bind(serv_sock, (struct sockaddr*) &serv_adr, sizeof(serv_adr))==-1)
        error_handling("bind() error");
    if (listen(serv_sock, 5)==-1)
        error_handling("listen() error");

    FD_ZERO(&reads);
    FD_SET(serv_sock, &reads);
    fd_max = serv_sock;
    while(1){
        cpy_reads = reads;
        timeout.tv_sec = 5;
        timeout.tv_usec = 5000;
        if((fd_num = select(fd_max+1, &cpy_reads, 0,0, &timeout))==-1)
            break;
        if(fd_num==0)
            continue;
        for(i=0;i<fd_max+1;i++){
            if(FD_ISSET(i, &cpy_reads)){
                if(i==serv_sock){
                    adr_sz = sizeof(clnt_adr);
                    clnt_sock = accept(serv_sock, (struct sockaddr*)&clnt_adr, &adr_sz);
                    FD_SET(clnt_sock, &reads);
                    if(fd_max<clnt_sock)
                        fd_max = clnt_sock;
                    printf("connected client: %d\n",clnt_sock);
                }
                else{
                    str_len = read(i, buf, BUF_SIZE);
                    if(str_len==0){
                        FD_CLR(i, &reads);
                        close(i);
                        printf("closed client: %d\n",i);
                    }
                    else{
                        write(i, buf, str_len);
                    }
                }
            }
        }
    }
    close(serv_sock);
    return 0;
}
void error_handling(char *buf){
    fputs(buf, stderr);
    fputc('\n',stderr);
```

```
    exit(1);
}
```



Problem 1

항상 개행(\n)을 잘 살피자

source.c

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <arpa/inet.h>
#include <sys/socket.h>
#include <sys/time.h>
#include <sys/select.h>

#define BUF_SIZE 100

void error_handling(char *message);
int main(int argc, char *argv[]){
```

```
    int serv_sock, clnt_sock;
    struct sockaddr_in serv_adr, clnt_adr;
    struct timeval timeout;
    fd_set reads, cpy_reads;

    int fd[10];
    int fd_size=0;

    socklen_t adr_sz;
    int fd_max, str_len, fd_num, i;
    char buf[BUF_SIZE];

    char welcome[10] = "Welcome~\n";
    char client_num[60];
    char CLIENT_HELLO = '0';
    char CLIENT_CHAT = '1';
    char CLIENT_BYE = '2';
    char client_id[3];
    char temp[BUF_SIZE];


    if(argc!=2){
        printf("Usage : %s <port>\n",argv[0]);
        exit(1);
    }

    serv_sock = socket(PF_INET, SOCK_STREAM, 0);
    memset(&serv_adr, 0, sizeof(serv_adr));
    serv_adr.sin_family = AF_INET;
    serv_adr.sin_addr.s_addr = htonl(INADDR_ANY);
    serv_adr.sin_port = htons(atoi(argv[1]));
    if (bind(serv_sock, (struct sockaddr*) &serv_adr, sizeof(serv_adr))==-1)
        error_handling("bind() error");
    if (listen(serv_sock, 5)==-1)
        error_handling("listen() error");

    FD_ZERO(&reads);
    FD_SET(serv_sock, &reads);
    fd_max = serv_sock;
    while(1){
        cpy_reads = reads;
        timeout.tv_sec = 5;
        timeout.tv_usec = 5000;
        if((fd_num = select(fd_max+1, &cpy_reads, 0,0, &timeout))==-1)
            break;
        if(fd_num==0)
            continue;
        for(i=0;i<fd_max+1;i++){
            if(FD_ISSET(i, &cpy_reads)){
                if(i==serv_sock){
                    adr_sz = sizeof(clnt_adr);
                    clnt_sock = accept(serv_sock, (struct sockaddr*)&clnt_adr, &adr_sz);
                    FD_SET(clnt_sock, &reads);
                    if(fd_max<clnt_sock)
                        fd_max = clnt_sock;
                    fd[fd_size++]=clnt_sock;
                    printf("connected client: %d\n",clnt_sock);
```

```
                    // send welcome message
                    write(clnt_sock, welcome, strlen(welcome));
                    sleep(1);

                    // send the number  of clients
                    sprintf(buf, "The number of Clients is %d now.\n",fd_size);
                    write(clnt_sock, buf,strlen(buf));

                    sprintf(client_id, "%02d",clnt_sock);
                    buf[0] = CLIENT_HELLO;
                    strcpy(buf+1,client_id);
                    strcpy(buf+3,welcome);

                    for(int j=0 ;j<fd_size-1;j++){
                        write(fd[j], buf, strlen(buf));
                    }
                }
                else{
                    str_len = read(i, buf, BUF_SIZE);
                    buf[str_len]='\0';
                    if(str_len==0){

                        // remove i from fd[]
                        for(int k=0;k<fd_size;k++){
                            if(fd[k]==i){
                                for(int m=k;m<fd_size-1;m++)
                                    fd[m]=fd[m+1];
                                }
                            break;
                        }

                        FD_CLR(i, &reads);
                        close(i);
                        printf("closed client: %d\n",i);

                        fd_size--;
                        fd[fd_size]=-1;

                        sprintf(client_id, "%02d",i);
                        buf[0] = CLIENT_BYE;
                        strcpy(buf+1,client_id);
                        strcpy(buf+3,welcome);

                        for(int j=0 ;j<fd_size;j++){
                            write(fd[j], buf, strlen(buf));
                        }
                    }
                    else{
                        strcpy(temp,buf);
                        sprintf(client_id, "%02d",i);
                        buf[0] = CLIENT_CHAT;
                        strcpy(buf+1,client_id);
                        strcpy(buf+3,temp);

                        for(int j=0 ;j<fd_size;j++){
                            if (fd[j]!=i){
                                write(fd[j], buf, strlen(buf));
                            }
```

```
                        }
                    }
                }
            }
        }
    }
    close(serv_sock);
    return 0;
}
void error_handling(char *buf){
    fputs(buf, stderr);
    fputc('\n',stderr);
    exit(1);
}
```

client.c

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <arpa/inet.h>
#include <sys/socket.h>

#define BUF_SIZE 100
#define CLIENT_HELLO 0
#define CLIENT_CHAT 1
#define CLIENT_BYE 2


void error_handling(char *message);
void read_routine(int sock, char *buf);
void write_routine(int sock, char *buf);

int main(int argc, char *argv[]){
    int sock;
    pid_t pid;
    char buf[BUF_SIZE];
    char buf2[BUF_SIZE];
    struct sockaddr_in serv_adr;

    if(argc!=3){
        printf("Usage : %s <IP> <port>\n", argv[0]);
        exit(1);
    }

    sock = socket(PF_INET, SOCK_STREAM, 0);
    memset(&serv_adr, 0, sizeof(serv_adr));
    serv_adr.sin_family = AF_INET;
    serv_adr.sin_addr.s_addr = inet_addr(argv[1]);
    serv_adr.sin_port = htons(atoi(argv[2]));
```

```
    if(connect(sock, (struct sockaddr*)&serv_adr, sizeof(serv_adr))==-1)
        error_handling("connect() error!");

    // read socket form : [message] # Welcome~
    int str_len;

    str_len = read(sock, buf, BUF_SIZE-1);
    buf[str_len]=0;
    printf("Server : %s", buf);

    // read socket form : [message] # The number of Clients is 00 now.
    str_len = read(sock, buf, BUF_SIZE-1);
    buf[str_len]=0;
    printf("Server : %s", buf);

    pid = fork();
    if(pid==0)
        write_routine(sock, buf);
    else
        read_routine(sock, buf);
    close(sock);
    return 0;
}

void read_routine(int sock, char *buf){
    while(1){
        // read socket form : [state, clientID, message]
        int str_len = read(sock, buf, BUF_SIZE-1);
        if(str_len==0)
            return ;
        buf[str_len]=0;

        int state = buf[0]-'0';
        int clientID = (buf[1]-'0')*10+(buf[2]-'0');
        char *message = buf+3;

        if(state==CLIENT_HELLO){
            printf("Client %d has joined this chatting room\n", clientID);
        }
        else if(state==CLIENT_CHAT){
            printf("Client %d : %s", clientID, message);
        }
        else if(state==CLIENT_BYE){
            printf("Client %d has left this chatting room\n", clientID);
        }
    }
}

void write_routine(int sock, char *buf){
    while(1){
        fgets(buf, BUF_SIZE, stdin);
        if(!strcmp(buf, "q\n") || !strcmp(buf, "Q\n")){
            shutdown(sock, SHUT_WR);
            return ;
        }
        write(sock, buf, strlen(buf));
    }
}
```

```
void error_handling(char *message){
    fputs(message, stderr);
    fputc('\n', stderr);
    exit(1);
}
```