Assignment8

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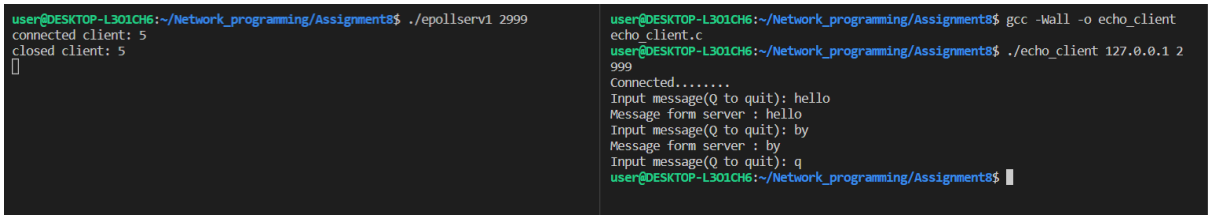
Example 1

`echo_epollserv.c`

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


#define BUF_SIZE 100
#define EPOLL_SIZE 50
void error_handling(char *message);

int main(int argc, char *argv[]){
    int serv_sock;
    int clnt_sock;
    struct sockaddr_in serv_addr;
    struct sockaddr_in clnt_addr;

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

    struct epoll_event *ep_events;
    struct epoll_event event;
    int epfd, event_cnt;

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

    serv_sock = socket(PF_INET, SOCK_STREAM, 0);
    if(serv_sock==-1)
        error_handling("socket() error");

    memset(&serv_addr, 0, sizeof(serv_addr));
    serv_addr.sin_family = AF_INET;
    serv_addr.sin_addr.s_addr=htonl(INADDR_ANY);
    serv_addr.sin_port=htons(atoi(argv[1]));

    if(bind(serv_sock, (struct sockaddr*)&serv_addr, sizeof(serv_addr))==-1)
```

```
        error_handling("bind() error");
    if(listen(serv_sock,5)==-1)
        error_handling("listen() error");

    epfd=epoll_create(EPOLL_SIZE);
    ep_events=malloc(sizeof(struct epoll_event)*EPOLL_SIZE);

    event.events=EPOLLIN;
    event.data.fd=serv_sock;
    epoll_ctl(epfd, EPOLL_CTL_ADD, serv_sock, &event);

    while(1){
        event_cnt=epoll_wait(epfd, ep_events, EPOLL_SIZE, -1);
        if(event_cnt==-1){
            puts("epoll_wait() error");
            break;
        }
        for(i=0;i<event_cnt;i++){
            if(ep_events[i].data.fd==serv_sock){
                adr_sz=sizeof(clnt_addr);
                clnt_sock=accept(serv_sock, (struct sockaddr*)&clnt_addr, &adr_sz);
                event.events=EPOLLIN;
                event.data.fd=clnt_sock;
                epoll_ctl(epfd, EPOLL_CTL_ADD, clnt_sock, &event);
                printf("connected client: %d \n", clnt_sock);
            }
            else{
                str_len=read(ep_events[i].data.fd, buf, BUF_SIZE);
                if(str_len==0){
                    epoll_ctl(epfd, EPOLL_CTL_DEL, ep_events[i].data.fd, NULL);
                    close(ep_events[i].data.fd);
                    printf("closed client: %d \n",ep_events[i].data.fd);
                }
                else{
                        write(ep_events[i].data.fd, buf, str_len);
                }
            }
        }
    }
    close(serv_sock);
    close(epfd);
    return 0;
}

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

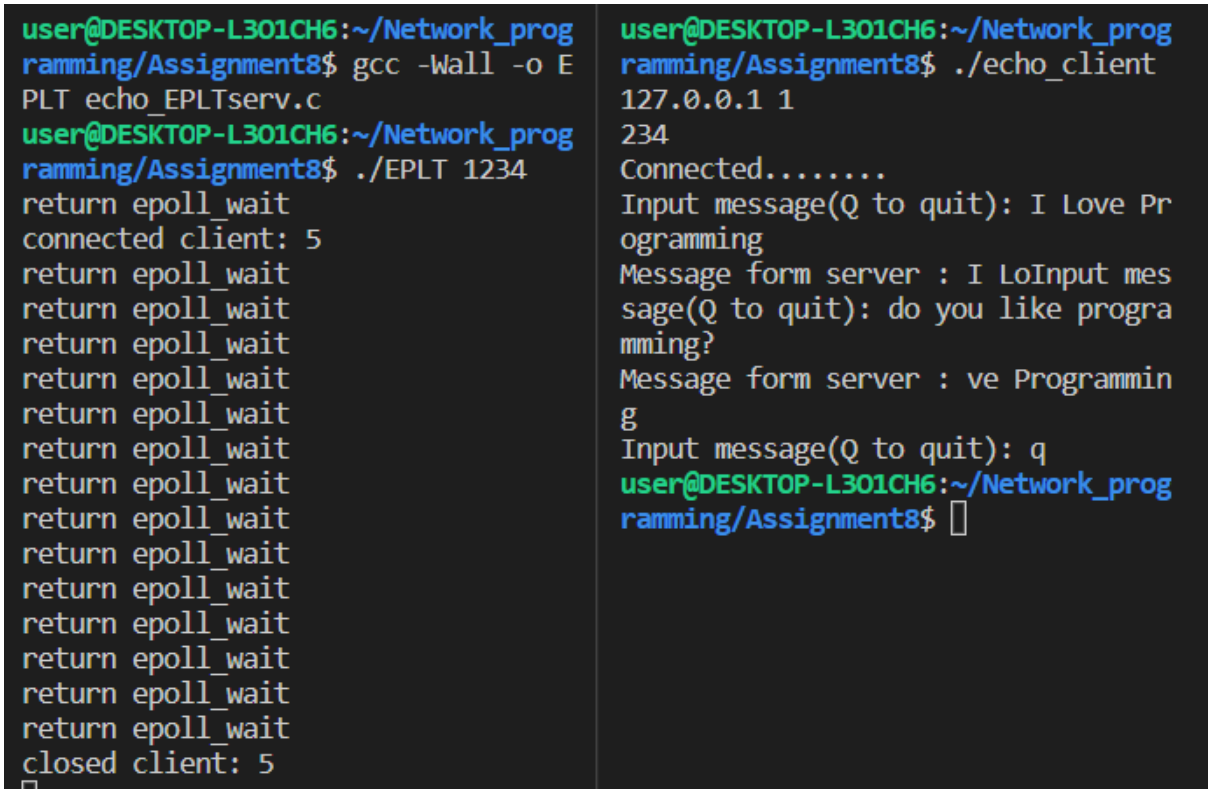


Example 2

`echo_EPLTserv.c`

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


#define BUF_SIZE 4
#define EPOLL_SIZE 50
void error_handling(char *message);

int main(int argc, char *argv[]){
    int serv_sock;
    int clnt_sock;
    struct sockaddr_in serv_addr;
    struct sockaddr_in clnt_addr;

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

    struct epoll_event *ep_events;
    struct epoll_event event;
    int epfd, event_cnt;

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

    serv_sock = socket(PF_INET, SOCK_STREAM, 0);
    if(serv_sock==-1)
        error_handling("socket() error");

    memset(&serv_addr, 0, sizeof(serv_addr));
    serv_addr.sin_family = AF_INET;
    serv_addr.sin_addr.s_addr=htonl(INADDR_ANY);
```

```
    serv_addr.sin_port=htons(atoi(argv[1]));

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

    epfd=epoll_create(EPOLL_SIZE);
    ep_events=malloc(sizeof(struct epoll_event)*EPOLL_SIZE);

    event.events=EPOLLIN;
    event.data.fd=serv_sock;
    epoll_ctl(epfd, EPOLL_CTL_ADD, serv_sock, &event);

    while(1){
        event_cnt=epoll_wait(epfd, ep_events, EPOLL_SIZE, -1);
        if(event_cnt==-1){
            puts("epoll_wait() error");
            break;
        }
        puts("return epoll_wait");
        for(i=0;i<event_cnt;i++){
            if(ep_events[i].data.fd==serv_sock){
                adr_sz=sizeof(clnt_addr);
                clnt_sock=accept(serv_sock, (struct sockaddr*)&clnt_addr, &adr_sz);
                event.events=EPOLLIN;
                event.data.fd=clnt_sock;
                epoll_ctl(epfd, EPOLL_CTL_ADD, clnt_sock, &event);
                printf("connected client: %d \n", clnt_sock);
            }
            else{
                str_len=read(ep_events[i].data.fd, buf, BUF_SIZE);
                if(str_len==0){
                    epoll_ctl(epfd, EPOLL_CTL_DEL, ep_events[i].data.fd, NULL);
                    close(ep_events[i].data.fd);
                    printf("closed client: %d \n",ep_events[i].data.fd);
                }
                else{
                        write(ep_events[i].data.fd, buf, str_len);
                }
            }
        }
    }
    close(serv_sock);
    close(epfd);
    return 0;
}

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



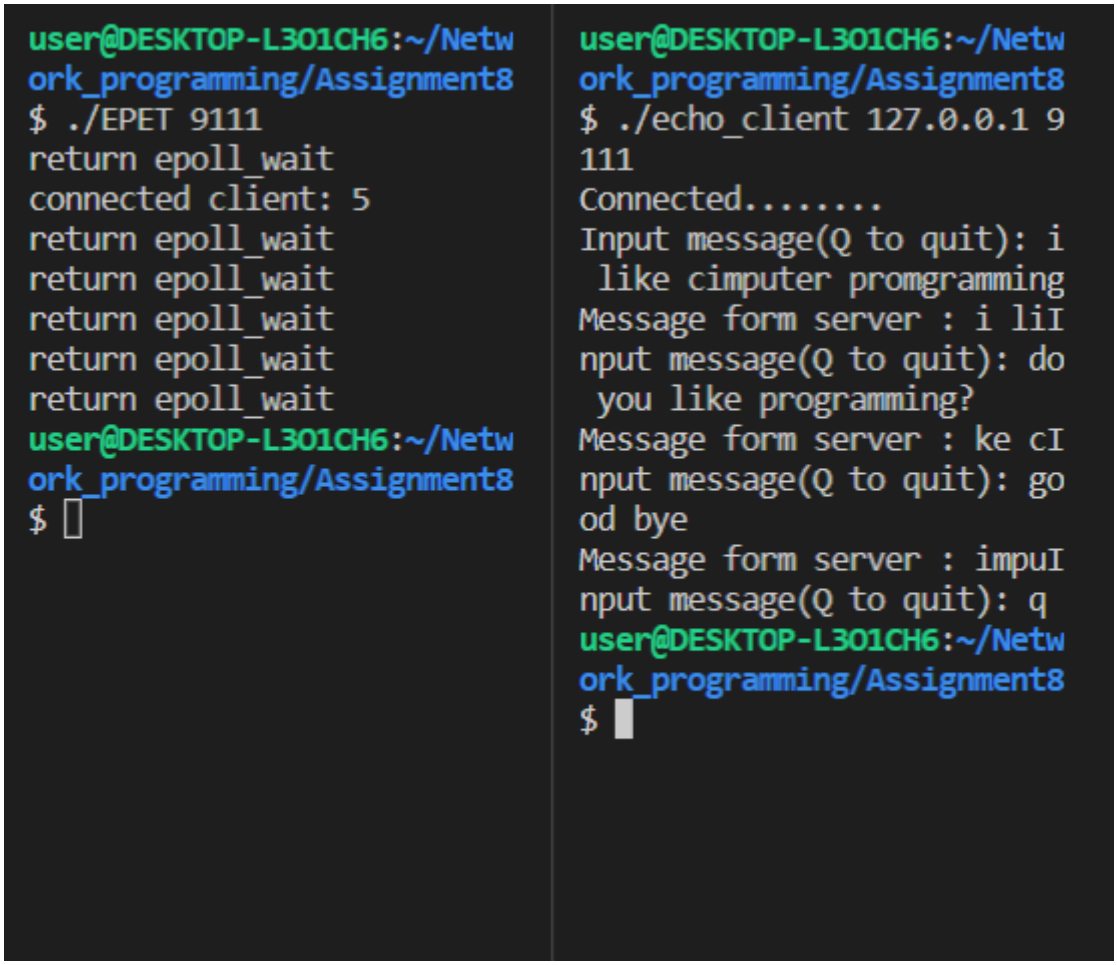
Example 3

`echo_EPETserv.c`

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


#define BUF_SIZE 4
#define EPOLL_SIZE 50
void error_handling(char *message);
void setnonblockingmode(int fd);

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

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

struct epoll_event *ep_events;
struct epoll_event event;
int epfd, event_cnt;

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

serv_sock = socket(PF_INET, SOCK_STREAM, 0);
if(serv_sock==-1)
    error_handling("socket() error");

memset(&serv_addr, 0, sizeof(serv_addr));
serv_addr.sin_family = AF_INET;
serv_addr.sin_addr.s_addr=htonl(INADDR_ANY);
serv_addr.sin_port=htons(atoi(argv[1]));

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

epfd=epoll_create(EPOLL_SIZE);
ep_events=malloc(sizeof(struct epoll_event)*EPOLL_SIZE);

setnonblockingmode(serv_sock);
event.events=EPOLLIN;
event.data.fd=serv_sock;
epoll_ctl(epfd, EPOLL_CTL_ADD, serv_sock, &event);

while(1){
    event_cnt=epoll_wait(epfd, ep_events, EPOLL_SIZE, -1);
    if(event_cnt==-1){
        puts("epoll_wait() error");
        break;
    }
    puts("return epoll_wait");
    for(i=0;i<event_cnt;i++){
        if(ep_events[i].data.fd==serv_sock){
            adr_sz=sizeof(clnt_addr);
            clnt_sock=accept(serv_sock, (struct sockaddr*)&clnt_addr, &adr_sz);
            event.events=EPOLLIN|EPOLLET;
            event.data.fd=clnt_sock;
            epoll_ctl(epfd, EPOLL_CTL_ADD, clnt_sock, &event);
            printf("connected client: %d \n", clnt_sock);
        }
        else{
            str_len=read(ep_events[i].data.fd, buf, BUF_SIZE);
            if(str_len==0){
                epoll_ctl(epfd, EPOLL_CTL_DEL, ep_events[i].data.fd, NULL);
                close(ep_events[i].data.fd);
                printf("closed client: %d \n",ep_events[i].data.fd);
```

```
                }
                else if(str_len<0){
                    if(errno==EAGAIN)
                        break;
                }
                else{
                        write(ep_events[i].data.fd, buf, str_len);
                }
            }
        }
    }
    close(serv_sock);
    close(epfd);
    return 0;
}

void setnonblockingmode(int fd){
    int flag=fcntl(fd, F_GETFL, 0);
    fcntl(fd, F_SETFL, flag|O_NONBLOCK);
}

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



Problem

Design a program by yourself which uses epoll concepts

objective

Let’s make message queue program that accumulate logs from client program.

motivation

Trying to find service fit with epoll, finally find message queue using edge trigger epoll. I think it perfectly good for message queue service to save the logs

solution

using edge trigger epoll, when edge trigger event occur, server get message from client and send the message to host that connected with server first. except first client(host), all of client’s message will be transmitted to host client (first one).

server.c

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


#define BUF_SIZE 4
#define EPOLL_SIZE 50
void error_handling(char *message);

int main(int argc, char *argv[]){
    int serv_sock;
    int clnt_sock;
    struct sockaddr_in serv_addr;
    struct sockaddr_in clnt_addr;

    socklen_t adr_sz;
    char buf[BUF_SIZE];
    char *host = "host\n";
    char *client = "client\n";
    int str_len, i;

    struct epoll_event *ep_events;
    struct epoll_event event;
    int epfd, event_cnt;

    int host_sock;
    int active_count;

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

    serv_sock = socket(PF_INET, SOCK_STREAM, 0);
    if(serv_sock==-1)
        error_handling("socket() error");

    memset(&serv_addr, 0, sizeof(serv_addr));
    serv_addr.sin_family = AF_INET;
    serv_addr.sin_addr.s_addr=htonl(INADDR_ANY);
    serv_addr.sin_port=htons(atoi(argv[1]));

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

```
    epfd=epoll_create(EPOLL_SIZE);
    ep_events=malloc(sizeof(struct epoll_event)*EPOLL_SIZE);

    event.events=EPOLLIN;
    event.data.fd=serv_sock;
    epoll_ctl(epfd, EPOLL_CTL_ADD, serv_sock, &event);

    while(1){
        event_cnt=epoll_wait(epfd, ep_events, EPOLL_SIZE, -1);
        if(event_cnt==-1){
            puts("epoll_wait() error");
            break;
        }
        for(i=0;i<event_cnt;i++){
            if(ep_events[i].data.fd==serv_sock){
                adr_sz=sizeof(clnt_addr);
                clnt_sock=accept(serv_sock, (struct sockaddr*)&clnt_addr, &adr_sz);
                event.events=EPOLLIN;
                event.data.fd=clnt_sock;
                epoll_ctl(epfd, EPOLL_CTL_ADD, clnt_sock, &event);
                printf("connected client: %d \n", clnt_sock);
                if(!active_count){
                    host_sock=clnt_sock;
                    write(clnt_sock, host, strlen(host));
                }
                else{
                    write(clnt_sock, client, strlen(host));
                }
                active_count++;
            }
            else{
                str_len=read(ep_events[i].data.fd, buf, BUF_SIZE);
                if(str_len==0){
                    epoll_ctl(epfd, EPOLL_CTL_DEL, ep_events[i].data.fd, NULL);
                    close(ep_events[i].data.fd);
                    printf("closed client: %d \n",ep_events[i].data.fd);
                    if(active_count==1)
                        host_sock=0;
                    active_count--;
                }
                else{
                    write(host_sock, buf, str_len);
                }
            }
        }
    }
    close(serv_sock);
    close(epfd);
    return 0;
}

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

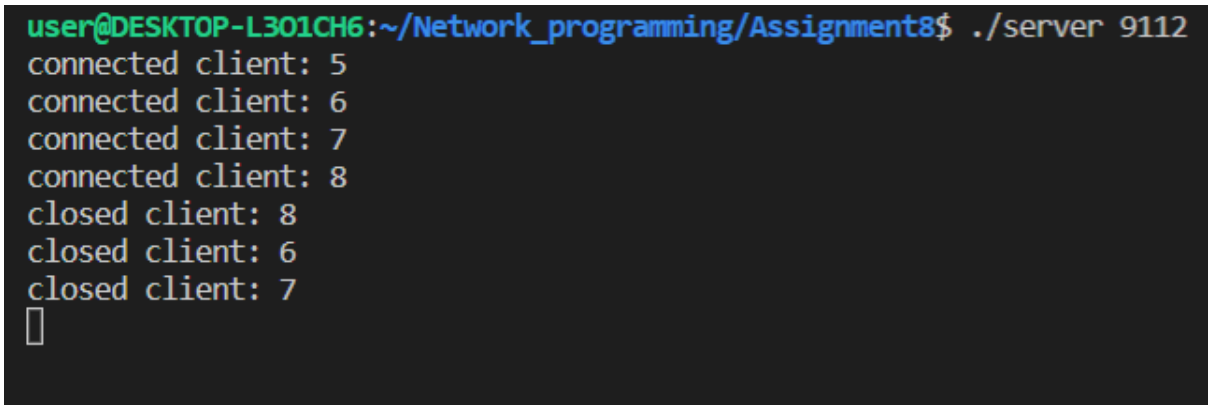
client.c

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

#define BUF_SIZE 1024

void error_handling(char *message);

int main(int argc, char* argv[]){
        int sock;
        struct sockaddr_in serv_addr;
        char message[BUF_SIZE];
        int str_len;
        int host=0;
        if(argc != 3){
                printf("Usage: %s <IP> <port>\n", argv[0]);
        }
        sock = socket(PF_INET, SOCK_STREAM, 0);
        if(sock==-1)
                error_handling("socket() error");

        memset(&serv_addr, 0, sizeof(serv_addr));
        serv_addr.sin_family = AF_INET;
        serv_addr.sin_addr.s_addr = inet_addr(argv[1]);
        serv_addr.sin_port = htons(atoi(argv[2]));

        if(connect(sock, (struct sockaddr*)&serv_addr, sizeof(serv_addr))==-1)
                error_handling("connect() error!");
        else{
            str_len = read(sock, message, BUF_SIZE-1);
            message[str_len] = 0;
            if(!strcmp(message, "host\n")){
                host=1;
                puts("Connected as a host!");
            }
            else
                puts("Connected as a client!");
        }
        while(1){
                if (!host){
                    fputs("Input message(Q to quit): ", stdout);
                    fgets(message, BUF_SIZE, stdin);

                    if(!strcmp(message, "q\n") || !strcmp(message, "Q\n"))
                            break;
                    write(sock, message, strlen(message));
                }
                else{
                    str_len = read(sock, message, BUF_SIZE-1);
                    message[str_len] = 0;
                    printf("%s", message);
```

```
                }
        }
        close(sock);
  return 0;
}



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

result

server



host

```
user@DESKTOP-L3O1CH6:~/Network_programming/Assignment8$ ./client 127.0.0.1 9112
Connected as a host!
[01:43] DB connected!
[01:43] client connected!
[01:44] docker connected!
[01:44] client request quety to DB 192.168.0.5
[01:44] DB get query from client 10.0.0.8
[01:45] DB return result to client 10.0.0.8
[01:45] client get response from DB 192.168.0.5
[01:50] client request entering docker with id:15926816, password:5629019
[01:50] docker get request from client 10.0.0.8 with id:15926816, password:5629019
[01:51] docker face inter error (code:1191)
[01:52] docker fail to restart system. shut down docker...
[01:58] client cannot get data from docker (timeout)
```

client 1,2,3