Selective Repeat

Advantages and Disadvantages of Computer Networking

IEEE 802.11 Mac Frame

TCP Sequence Number | Wrap Around Concept

Berkeley's Algorithm

Cryptography | One Time Password (OTP) algorithm

Computer Network | Introduction To Subnetting

Computer Network | Classless Inter Domain Routing (CIDR)

Computer Network | Finding Network ID of a Subnet (using Subnet Mask)

Ethical Hacking | Phishing

Vishing (Voice Phishing)

Computer Network | Synchronous Optical Network (SONET)

Creating custom domain name instead of localhost in Ubuntu

Computer Networks | Problems with Token Ring

nslookup

command in Linux with Examples

Program to determine Class, Broadcast address and Network address of an IPv4 address

Types of Email Attacks

Differences between POP3 and IMAP

Computer Network | Collision-Free Protocols

Dumpster Diving/Trashing

Computer Network | Network Simulator 3

Malware and its types

Creating an Asynchronous Multithreaded chat Application in Java

Sybil Attack

Private Browsing

Program for IP forwarding table lookup

TCP and UDP server using select

Prerequisites: TCP UDP

In previous articles we have seen a **TCP** server and a **UDP** server. But now we can combine our concurrent TCP echo server and iterative UDP server into a single server that uses `select` to multiplex TCP and UDP scoket.

Select function is used to select between TCP and UDP socket. This function gives instructions to the kernel to wait for any of the multiple events to occur and awakens the process only after one or more events occur or a specified time passes.

Example – kernel will return only when one of these condition occurs

- Any Descriptor from {1, 2, 3} is ready for reading
- Any Descriptor from {4, 5, 6} is ready for writing
- Time 5sec have passed

The entire process can be broken down into following steps :

Server:

1. Create TCP i.e Listening socket
2. Create a UDP socket
3. Bind both socket to server address.
4. Initialize a descriptor set for select and calculate maximum of 2 descriptor for which we will wait
5. Call select and get the ready descriptor(TCP or UDP)
6. Handle new connection if ready descriptor is of TCP OR receive data gram if

ready descriptor is of UDP

UDP Client:

1. Create UDP socket.
2. Send message to server.
3. Wait until response from server is recieved.
4. Close socket descriptor and exit.

TCP Client:

1. Create a TCP scoket.
2. Call connect to establish connection with server
3. When the connection is accepted write message to server
4. Read response of Server
5. Close socket descriptor and exit.

Necessary functions:

```
int select(int maxfd, fd_set *readsset, fd_set *writeset,
fd_set *exceptset, const struct timeval *timeout);
Returns: positive count of descriptors ready, 0 on timeout, -1 erro
```

Arguments:

1. **maxfd:** maximum number of descriptor ready.
2. **timeout:** How long to wait for select to return.
3.
```
struct timeval{
long tv_sec;
long tv_usec;
};
if timeout==NULL then wait forever
if timeout == fixed_amount_time then wait until specified time
if timeout == 0 return immediately.
```
4. **readset:** Descriptor set that we want kernel to test for reading.
5. **writeset:** Descriptor set that we want kernel to test for writing.
6. **exceptset:** Descriptor set that we want kernel to test for exception condition

```
int read(int sockfd, void * buff, size_t nbytes);
```

```
 Returns:  number of bytes read from the descriptor. -1 on error
```

Arguments:

1. **sockfd:** Descriptor which receives data.
2. **buff:** Application buffer socket descriptor data is copied to this buffer.
3. **nbytes:**Number of bytes to be copied to application buffer.

Server.c

```
// Server program
#include <arpa/inet.h>
#include <errno.h>
#include <netinet/in.h>
#include <signal.h>
#include <stdio.h>
#include <stdlib.h>
#include <strings.h>
#include <sys/socket.h>
#include <sys/types.h>
#include <unistd.h>
#define PORT 5000
#define MAXLINE 1024
int max(int x, int y)
{
    if (x > y)
        return x;
    else
        return y;
}
int main()
{
    int listenfd, connfd, udpfd, nready, maxfdp1;
    char buffer[MAXLINE];
    pid_t childpid;
    fd_set rset;
    ssize_t n;
    socklen_t len;
    const int on = 1;
    struct sockaddr_in cliaddr, servaddr;
    char* message = "Hello Client";
    void sig_chld(int);

    /* create listening TCP socket */
    listenfd = socket(AF_INET, SOCK_STREAM, 0);
    bzero(&servaddr, sizeof(servaddr));
    servaddr.sin_family = AF_INET;
    servaddr.sin_addr.s_addr = htonl(INADDR_ANY);
    servaddr.sin_port = htons(PORT);

    // binding server addr structure to listenfd
    bind(listenfd, (struct sockaddr*)&servaddr, sizeof(servadd
    listen(listenfd, 10);

    /* create UDP socket */
    udpfd = socket(AF_INET, SOCK_DGRAM, 0);
    // binding server addr structure to udp sockfd
    bind(udpfd, (struct sockaddr*)&servaddr, sizeof(servaddr));

    // clear the descriptor set
```

TCP_Client.c

```c
// TCP Client program
#include <netinet/in.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <sys/socket.h>
#include <sys/types.h>
#define PORT 5000
#define MAXLINE 1024
int main()
{
    int sockfd;
    char buffer[MAXLINE];
    char* message = "Hello Server";
    struct sockaddr_in servaddr;

    int n, len;
    // Creating socket file descriptor
    if ((sockfd = socket(AF_INET, SOCK_STREAM, 0)) < 0) {
        printf("socket creation failed");
        exit(0);
    }

    memset(&servaddr, 0, sizeof(servaddr));

    // Filling server information
    servaddr.sin_family = AF_INET;
    servaddr.sin_port = htons(PORT);
    servaddr.sin_addr.s_addr = inet_addr("127.0.0.1");

    if (connect(sockfd, (struct sockaddr*)&servaddr,
                            sizeof(servaddr)) < 0) {
        printf("\n Error : Connect Failed \n");
    }

    memset(buffer, 0, sizeof(buffer));
    strcpy(buffer, "Hello Server");
    write(sockfd, buffer, sizeof(buffer));
    printf("Message from server: ");
    read(sockfd, buffer, sizeof(buffer));
    puts(buffer);
    close(sockfd);
}
```

UDP_client.c

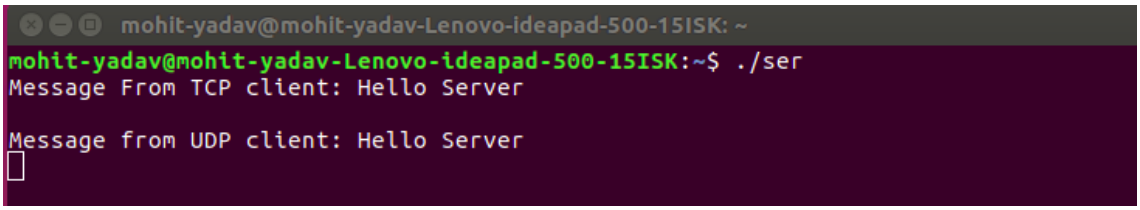
```c
// UDP client program
#include <arpa/inet.h>
#include <netinet/in.h>
#include <stdio.h>
#include <stdlib.h>
#include <strings.h>
#include <sys/socket.h>
#include <sys/types.h>
#define PORT 5000
#define MAXLINE 1024
int main()
{
    int sockfd;
    char buffer[MAXLINE];
    char* message = "Hello Server";
    struct sockaddr_in servaddr;

    int n, len;
    // Creating socket file descriptor
    if ((sockfd = socket(AF_INET, SOCK_DGRAM, 0)) < 0) {
        printf("socket creation failed");
        exit(0);
    }

    memset(&servaddr, 0, sizeof(servaddr));

    // Filling server information
    servaddr.sin_family = AF_INET;
    servaddr.sin_port = htons(PORT);
    servaddr.sin_addr.s_addr = inet_addr("127.0.0.1");
    // send hello message to server
    sendto(sockfd, (const char*)message, strlen(message),
           0, (const struct sockaddr*)&servaddr,
           sizeof(servaddr));

    // receive server's response
    printf("Message from server: ");
    n = recvfrom(sockfd, (char*)buffer, MAXLINE,
                 0, (struct sockaddr*)&servaddr,
                 &len);
    puts(buffer);
    close(sockfd);
    return 0;
}
```

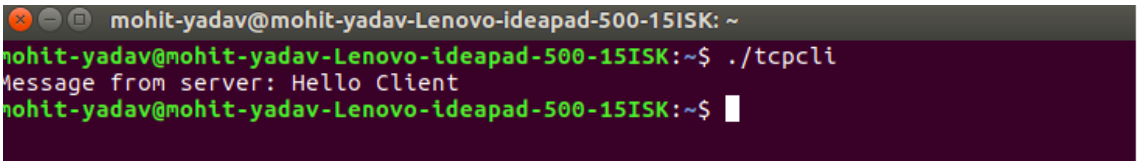
Steps to compile and run the above codes:

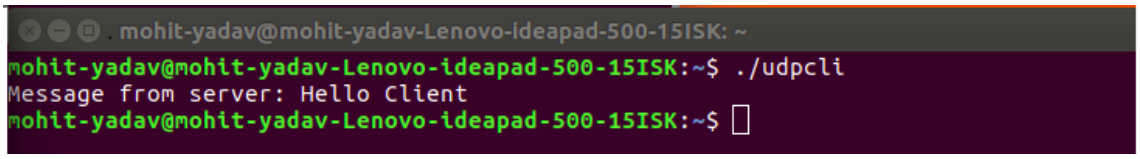
1. Compile the server program (`gcc server.c -o ser`)

2. Run server using (`./ser`)
3. On another terminal, compile tcp client program (`gcc tcp_client.c -o tcpcli`)
4. Run tcp client (`./tcpcli`)
5. On another terminal, compile udp client program (`gcc udp_client.c -o udpcli`)
6. Run udp client (`./udpcli`)

Output of the above codes:







Recommended Posts:

DNS (Domain Name Server) | NetWorking

TCP Server-Client implementation in C

UDP Server-Client implementation in C

Computer Network | Types of Server Virtualization

What are Long-Polling, Websockets, Server-Sent Events (SSE) and Comet?

How DHCP server dynamically assigns IP address to a host?

Java Implementation of Deffi-Hellman Algorithm between Client and Server

Difference Between Go-Back-N and Selective Repeat Protocol

Difference between Serial and Parallel Transmission

Difference between Stop and Wait protocol and Sliding Window protocol

Difference between Ring Topology and Mesh Topology

Difference between LAN and VLAN

Difference between Optical Fibre and Coaxial Cable

Smart Card - Working and Types

Mohityadav

Check out this Author's contributed articles.

If you like GeeksforGeeks and would like to contribute, you can also write an article using contribute.geeksforgeeks.org or mail your article to contribute@geeks-forgeeks.org. See your article appearing on the GeeksforGeeks main page and help other Geeks.

Please Improve this article if you find anything incorrect by clicking on the "Improve Article" button below.

Article Tags : Computer Networks Socket-programming

Practice Tags : Computer Networks

To-do Done

0

No votes yet.

Feedback/ Suggest Improvement Add Notes Improve Article

Please write to us at contribute@geeksforgeeks.org to report any issue with the above content.

Writing code in comment? Please use ide.geeksforgeeks.org, generate link and share the link here.

Load Comments Share this post!

GeeksforGeeks
A computer science portal for geeks

5th Floor, A-118,
Sector-136, Noida, Uttar Pradesh - 201305
feedback@geeksforgeeks.org

COMPANY	LEARN	PRACTICE	CONTRIBUTE
About Us	Algorithms	Company-wise	Write an Article
Careers	Data Structures	Topic-wise	Write Interview Experience
Privacy Policy	Languages	Contests	Internships
Contact Us	CS Subjects	Subjective Questions	Videos
	Video Tutorials		