

Echo Client-Server program using UDP Protocol

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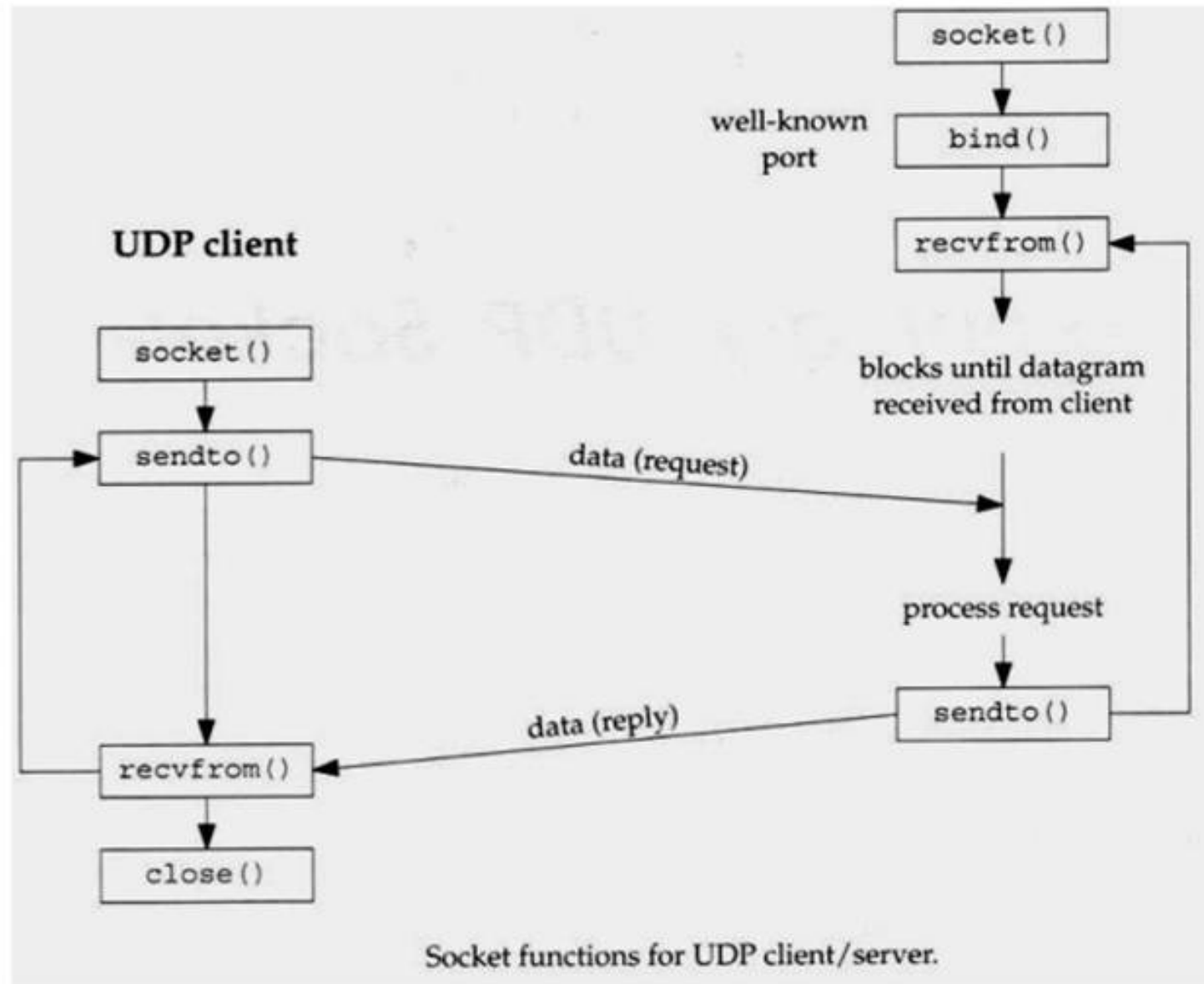
Client-Server Using UDP Socket

- UDP is
 - Connectionless
 - Unreliable
 - datagram protocol
- Some popular applications are built using UDP
 - DNS(the Domain Name System)
 - NFS(the Network File System)
 - SNMP(Simple Network Management Protocol)

Structure of UDP client-server program

- Client does not establish a connection to the server
 - client just sends a datagram to the server using `sendto()` function.
- similarly, server does not accept a connection from client.
 - It instead simply calls `recvfrom()` function which waits for data to arrive.

Structure of UDP client-server program



UDP Socket functions

sendto and recvfrom functions

```
#include <sys/socket.h>
```

```
ssize_t sendto(int sockfd, const void *buff, size_t nbytes, int  
flags, const struct sockaddr *to, socklen_t addrlen);
```

```
ssize_t recvfrom(int sockfd, void *buff, size_t nbytes, int flags,  
struct sockaddr *from, socklen_t *addrlen);
```

- Both return: number of bytes read or written if OK, -1 on error
- First three arguments, sockfd, buff, and nbytes, are identical to the first three arguments for read and write calls.

UDP Socket functions

sendto and recvfrom functions

```
ssize_t sendto(int sockfd, const void *buff, size_t nbytes, int flags, const struct sockaddr *to, socklen_t addrlen);
```

- flags: set this to 0 for simple UDP programs.
- to: socket address structure containing the protocol address (IPaddress and port #) of where data is to be sent.
- addrlen: Size of socket address structure (integer value argument)

UDP Socket functions

```
ssize_t recvfrom(int sockfd, void *buff, size_t nbytes, int flags,  
struct sockaddr *from, socklen_t *addrlen);
```

- flags: set this to 0 for simple UDP programs.
- from: socket address structure that is filled in by recvfrom with the protocol address (IP address and port #) of where data came from
- *addrlen: pointer to integer value. (Value-result argument).
- If the from argument is a null pointer, then the corresponding length argument (addrlen) must also be a null pointer. I.e., we are not interested in knowing who sent us data.
- Final two arguments to sendto are similar to the final two arguments to connect.

UDP Socket functions

sendto and recvfrom functions

- Writing a datagram of length 0 is OK.
 - In the case of UDP
- This results in an **IP datagram** containing an IP header (20 bytes IPv4), an 8 byte **UDP header** and no data.
- This means return value of 0 from recvfrom is OK for a datagram protocol.
 - It does not mean that peer has closed the connection (as happens in case of TCP).
 - UDP is connectionless. No meaning of closing the connection.

UDP Client-Server Program - Echo client-server application: echoUDPServer.c

- ```
#include <sys/types.h>
#include <sys/socket.h>
#include <stdio.h>
#include <netinet/in.h>
#define MAXLINE_SIZE 100
#define SERV_PORT 8000
int main(int argc, char** argv)
{
 int sockfd;
 struct sockaddr_in servaddr, cliaddr;
 int n;
 socklen_t len;
 char mesg [MAXLINE_SIZE];
```

# UDP Client-Server Program - Echo client-server application: echoUDPServer.c

```
/*Create socket*/
```

```
sockfd = socket(AF_INET,SOCK_DGRAM,0);
```

```
/*Initialize socket address structure*/
```

```
bzero(&servaddr,sizeof(servaddr));
servaddr.sin_family = AF_INET;
servaddr.sin_addr.s_addr = htonl(INADDR_ANY);
servaddr.sin_port = htons(SERV_PORT);
```

```
/*bind socket address to the socket*/
```

```
bind(sockfd,(struct sockaddr*)&servaddr,sizeof(servaddr));
```

# UDP Client-Server Program - Echo client-server application: echoUDPServer.c

```
for(;;) {

 len=sizeof(cliaddr);

 /*wait for datagram to arrive, receive a datagram*/

 n=recvfrom(sockfd,mesg,MAXLINE,0,(struct sockaddr*)&cliaddr,&len);

 /*send back the datagram to the client from which it arrived*/

 sendto(sockfd,mesg,n,0,(struct sockaddr*)&cliaddr,len);

 }

}
```

# UDP Client-Server Program - Echo client-server

application: echoUDPClient.c

```
#include <sys/types.h>
#include <sys/socket.h>
#include <stdio.h>
#include <netinet/in.h>
#define MAXLINE 100
#define SERV_PORT 8000
int main(int argc, char** argv)
{
 int sockfd;
 struct sockaddr_in servaddr;
 int n;
 char sendline[MAXLINE],recvline[MAXLINE];
```

# UDP Client-Server Program - Echo client-server application: echoUDPClient.c

```
if(argc!=2){

 fprintf(stderr,"Usage: %s IP-Address\n",argv[0]);
 exit(-1);
}

/*Initialize socket address structure*/

bzero(&servaddr,sizeof(servaddr));
servaddr.sin_family = AF_INET;
if(inet_pton(AF_INET,argv[1], &servaddr.sin_addr)<0)
 fprintf(stderr,"Error in inet_pton");
servaddr.sin_port = htons(SERV_PORT);
```

# UDP Client-Server Program - Echo client-server application: echoUDPClient.c

```
/*Create socket*/
sockfd = socket (AF_INET,SOCK_DGRAM,0);
while(fgets(sendline,MAXLINE,stdin)!=NULL)
{
/*Send the message to the server*/

sendto(sockfd,sendline,strlen(sendline),0,(struct sockaddr*)&servaddr,sizeof(servaddr));

/*wait for response and receive the response*/

n = recvfrom(sockfd,recvline,MAXLINE,0,NULL,NULL);

recvline[n] = 0;

/*Display what the server sent in reply*/

fputs(recvline,stdout);
}
}
```

# UDP Client-Server Program - Echo client-server application: echoUDPClient.c

```
/*Create socket*/
sockfd = socket (AF_INET,SOCK_DGRAM,0);
while(fgets(sendline,MAXLINE,stdin)!=NULL)
{
/*Send the message to the server*/

sendto(sockfd,sendline,strlen(sendline),0,(struct sockaddr*)&servaddr,sizeof(servaddr));

/*wait for response and receive the response*/

n = recvfrom(sockfd,recvline,MAXLINE,0,NULL,NULL);

recvline[n] = 0;

/*Display what the server sent in reply*/

fputs(recvline,stdout);
}
}
```

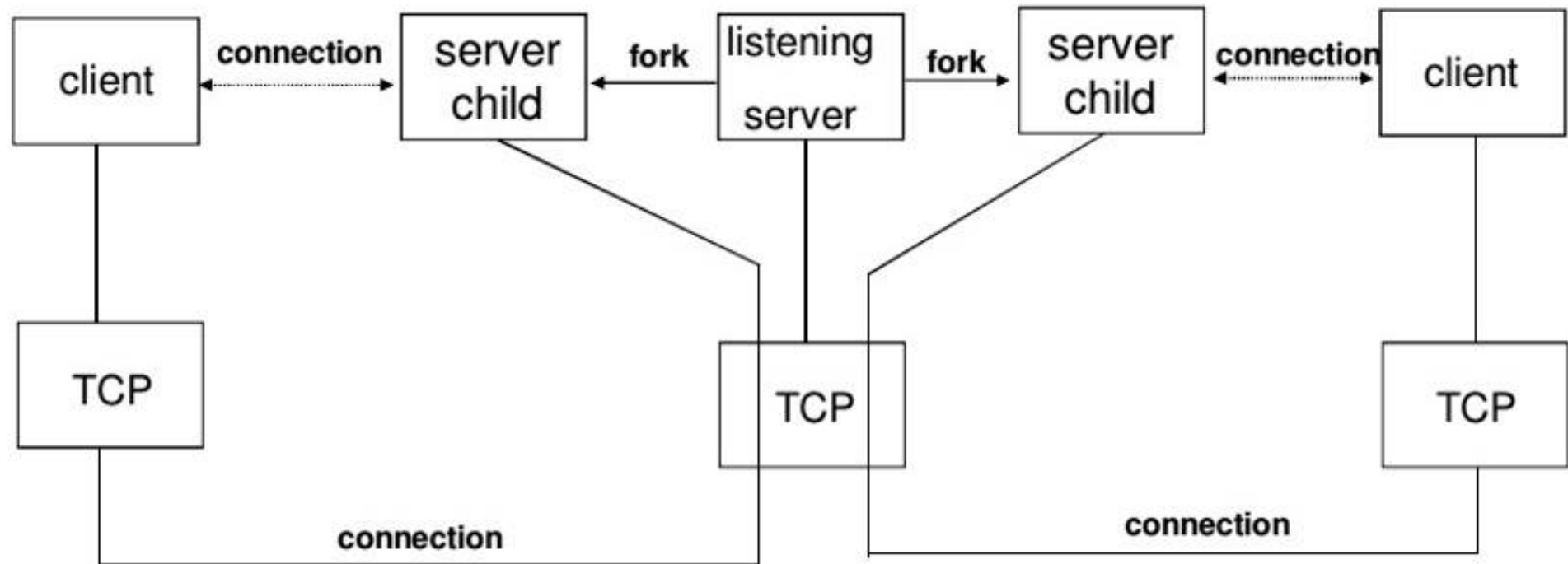
# UDP Client-Server Program - Echo client-server application: echoUDPClient.c

- Compile echoTCPServer.c and echoTCPClient.c using gcc.
- First run the server.
- Run clients and test.



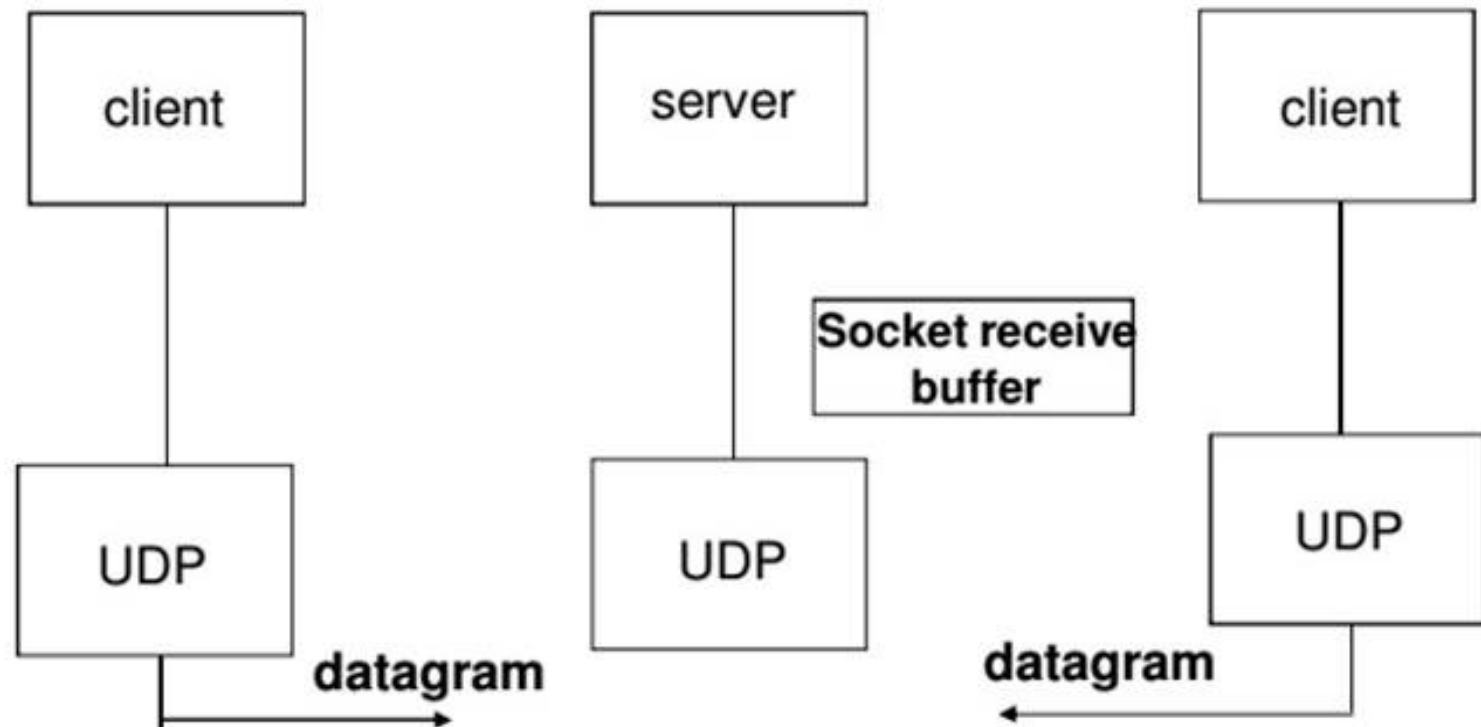
# Comparing TCP and UDP based programs

- TCP client server with two clients



# Comparing TCP and UDP based programs

- UDP client-server with two clients.



# References

- Sources :
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