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COE18B066

Computer Networks Practice
Lab exercise-6

QUESTION:

Write a Client and Server program to send a BITMAP image file from client to server in a binary encoded form. It means you have to transform the Image into binary bit-stream and send it through Client socket. At the Server side same bit stream you have to store into a file with same file extension (Bitmap). After completing the program in TCP/UDP, you have to analyse the performance in terms of Latency between the binary encoded text file and bitmap image file.

In this exercise the following were done to send a bitmap file:

- Server-client connection is made initially.
- Client reads the bitmap file and sends it to receiver as a bit stream.
- Server receives the bitstream sent by client and writes them into another bitmap file.
- The latency is then calculated.

TCP CODE:

SERVER SIDE CODE

```
#include<stdio.h>
#include<stdlib.h>
#include<sys/socket.h>
#include<sys/types.h>
#include<netinet/in.h>
#include<string.h>
#include<unistd.h>
int main()
{
int s_sock,c_client;
char buf[100];
char buf2[100];
s_sock=socket(AF_INET,SOCK_STREAM,0);
```

```
struct sockaddr_in server,other;
memset(&server,0,sizeof(server));
memset(&other,0,sizeof(other));
server.sin_family=AF_INET;
server.sin_port=htons(9009);
server.sin_addr.s_addr=INADDR_ANY;
socklen_t addr_size;
bind(s_sock,(struct sockaddr*)&server,sizeof(server));
listen(s_sock,5);
addr_size=sizeof(other);
c_client=accept(s_sock,(struct sockaddr*)&other,&addr_size);

FILE *fp;
fp=fopen("bitmap_copy.bmp","wb");
int ch[1];
read(c_client,ch,sizeof(ch));
while(ch[0]!=EOF)
{
fputc(ch[0],fp);
read(c_client,ch,sizeof(ch));
}
printf("\nfile received successfully\n");
printf("data copied into file bitmap_copy.bmp\n");
fclose(fp);
close(s_sock);
return 0;
}
```

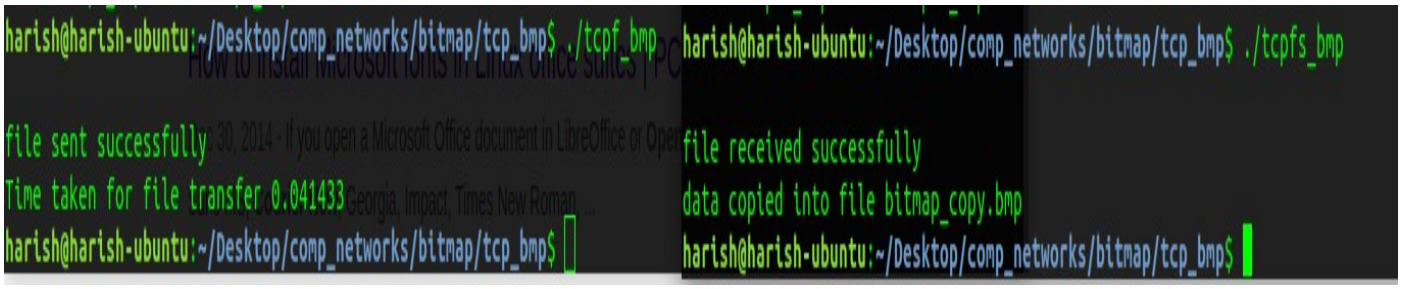
CLIENT SIDE CODE

```
#include<stdio.h>
#include<stdlib.h>
#include<sys/socket.h>
#include<sys/types.h>
#include<netinet/in.h>
#include<string.h>
#include<unistd.h>
```

```
#include<time.h>

int main()
{
int c_sock;
char buf[100];
char bufr[100];
c_sock=socket(AF_INET,SOCK_STREAM,0);
struct sockaddr_in client;
memset(&client,0,sizeof(client));
client.sin_family=AF_INET;
client.sin_port=htons(9009);
client.sin_addr.s_addr=INADDR_ANY;

if(connect(c_sock,(struct sockaddr*)&client,sizeof(client))==-1)
{
printf("server is busy\nconnection failure");
return 0;
}
FILE *fp;
fp=fopen("bitmap_img.bmp","rb");;
if(fp==NULL)
{
printf("\nfile doesnot exist!\n");
exit(1);
}
int ch[1];
clock_t start,end;
double cpu_time_used;
start= clock();
while((ch[0]=fgetc(fp))!=EOF)
{
write(c_sock,ch,sizeof(ch));
}
ch[0]=EOF;
write(c_sock,ch,sizeof(ch));
printf("\nfile sent successfully\n");
```

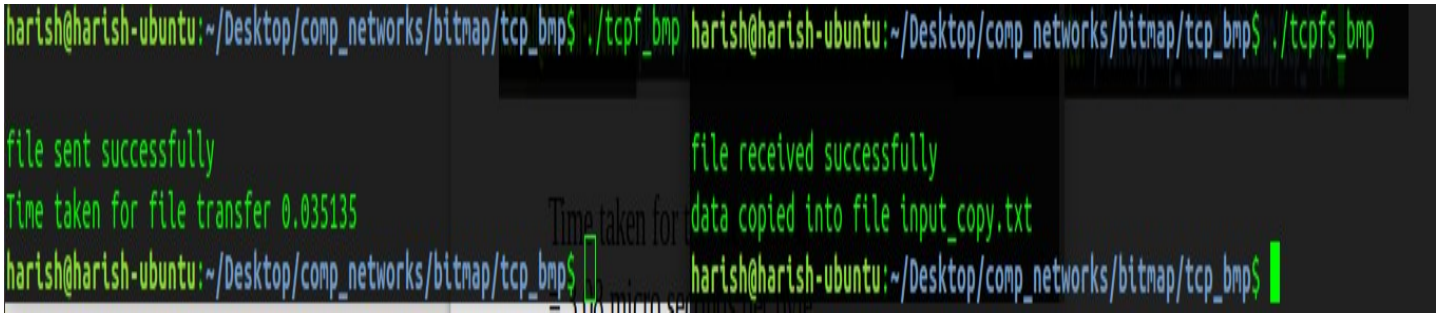
```
end=clock();
cpu_time_used=((double)(end-start))/CLOCKS_PER_SEC;
printf("Time taken for file transfer %f\n",cpu_time_used);
fclose(fp);
close(c_sock);
return 0;
}
```

OUTPUT:



Time taken for bmp file: 0.041433
=1.524 micro seconds per byte

For text file,



Time taken for txt file: 0.035135
= 1.289 micro seconds per byte

LATENCY:

```
harish@harish-ubuntu:~/Desktop/comp_networks/bitmap/tcp_bmp$ sudo nmap --packet-trace -p 9009 localhost
[sudo] password for harish:

Starting Nmap 7.60 ( https://nmap.org ) at 2020-09-23 12:22 IST
SENT (0.1356s) TCP 127.0.0.1:60991 > 127.0.0.1:9009 S ttl=46 id=18056 iplen=44  seq=1437323938 win=1024 <mss 1
460>
RCVD (0.1355s) TCP 127.0.0.1:60991 > 127.0.0.1:9009 S ttl=46 id=18056 iplen=44  seq=1437323938 win=1024 <mss 1
460>
RCVD (0.1356s) TCP 127.0.0.1:9009 > 127.0.0.1:60991 RA ttl=64 id=0 iplen=40  seq=0 win=0
Nmap scan report for localhost (127.0.0.1)
Host is up (0.000049s latency).

PORT     STATE  SERVICE
9009/tcp closed pichat

Nmap done: 1 IP address (1 host up) scanned in 0.38 seconds
```

0.000049 seconds latency

Using ping,

```
harish@harish-ubuntu:~/Desktop/comp_networks/bitmap/tcp_bmp$ ping localhost
PING localhost (127.0.0.1) 56(84) bytes of data.
64 bytes from localhost (127.0.0.1): icmp_seq=1 ttl=64 time=0.043 ms
64 bytes from localhost (127.0.0.1): icmp_seq=2 ttl=64 time=0.084 ms
64 bytes from localhost (127.0.0.1): icmp_seq=3 ttl=64 time=0.069 ms
64 bytes from localhost (127.0.0.1): icmp_seq=4 ttl=64 time=0.031 ms
64 bytes from localhost (127.0.0.1): icmp_seq=5 ttl=64 time=0.052 ms
64 bytes from localhost (127.0.0.1): icmp_seq=6 ttl=64 time=0.069 ms
64 bytes from localhost (127.0.0.1): icmp_seq=7 ttl=64 time=0.078 ms
64 bytes from localhost (127.0.0.1): icmp_seq=8 ttl=64 time=0.042 ms
64 bytes from localhost (127.0.0.1): icmp_seq=9 ttl=64 time=0.025 ms
64 bytes from localhost (127.0.0.1): icmp_seq=10 ttl=64 time=0.051 ms
64 bytes from localhost (127.0.0.1): icmp_seq=11 ttl=64 time=0.069 ms
^C
--- localhost ping statistics ---
11 packets transmitted, 11 received, 0% packet loss, time 10225ms
rtt min/avg/max/mdev = 0.025/0.055/0.084/0.020 ms
harish@harish-ubuntu:~/Desktop/comp_networks/bitmap/tcp_bmp$
```

Avg Round trip time=0.025ms

UDP CODE:

SERVER SIDE CODE

```
#include<stdio.h>
#include<stdlib.h>
#include<sys/socket.h>
#include<sys/types.h>
#include<netinet/in.h>
#include<string.h>
```

```
int main()
{
int s_sock,c_client;
char buf[20];
char buf2[20];
s_sock=socket(AF_INET,SOCK_DGRAM,0);
struct sockaddr_in server,other;
server.sin_family=AF_INET;
server.sin_port=htons(9009);
server.sin_addr.s_addr=INADDR_ANY;
int k=bind(s_sock,(struct sockaddr*)&server,sizeof(server));
if(k==-1)
{
printf("connection failed!\n");
exit(0);
}
socklen_t add;
add=sizeof(other);
int n=recvfrom(s_sock,buf,sizeof(buf),0,(struct sockaddr*)&other,&add);
printf("msg from client: %s\n",buf);

FILE *fp;
fp=fopen("bitmap_copy.bmp","wb");
int ch[1];

n=recvfrom(s_sock,ch,sizeof(ch),0,(struct sockaddr*)&other,&add);
while(ch[0]!=EOF)
{
fputc(ch[0],fp);
n=recvfrom(s_sock,ch,sizeof(ch),0,(struct sockaddr*)&other,&add);
}
printf("\nfile received successfully\n");
printf("data copied into file bitmap_copy.bmp\n");

fclose(fp);
```

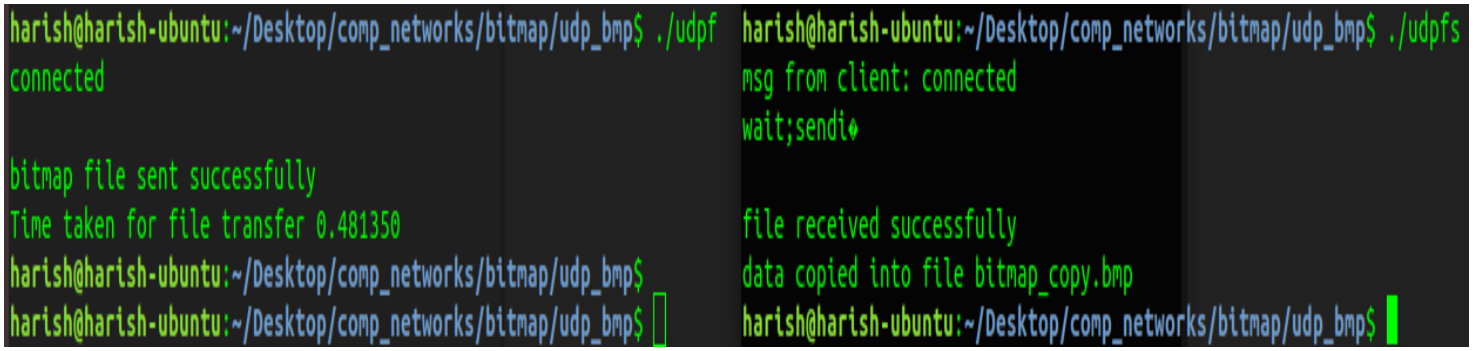
```
return 0;
}
```

CLIENT SIDE CODE

```
#include<stdio.h>
#include<stdlib.h>
#include<sys/socket.h>
#include<sys/types.h>
#include<netinet/in.h>
#include<string.h>
#include<unistd.h>
#include<time.h>
int main()
{
int c_sock;
char buf[50];
char bufr[20];
c_sock=socket(AF_INET,SOCK_DGRAM,0);
struct sockaddr_in client;
client.sin_family=AF_INET;
client.sin_port=htons(9009);
client.sin_addr.s_addr=INADDR_ANY;

FILE *fp;
fp=fopen("bitmap_img.bmp","rb");;
if(fp==NULL)
{
printf("\nfile doesnot exist!\n");
exit(1);
}
strcpy(buf,"connected\nwait;sending in process\n");
printf("connected\n");
sendto(c_sock,buf,sizeof(buf),0,(struct sockaddr*)&client,sizeof(client));

int ch[1];
clock_t start,end;
double cpu_time_used;
```

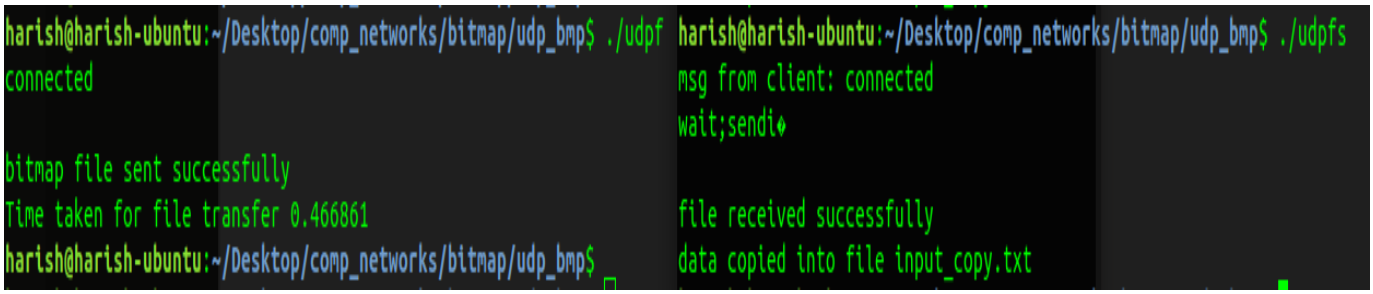
```
start= clock();
while((ch[0]=fgetc(fp))!=EOF)
{
sendto(c_sock,ch,sizeof(ch),0,(struct sockaddr*)&client,sizeof(client));
sleep(0.01);
}
ch[0]=EOF;

sendto(c_sock,ch,sizeof(ch),0,(struct sockaddr*)&client,sizeof(client));
printf("\nbitmap file sent successfully\n");
end=clock();
cpu_time_used=((double)(end-start))/CLOCKS_PER_SEC;
printf("Time taken for file transfer %f\n",cpu_time_used);
fclose(fp);

return 0;
}
```

OUTPUT:



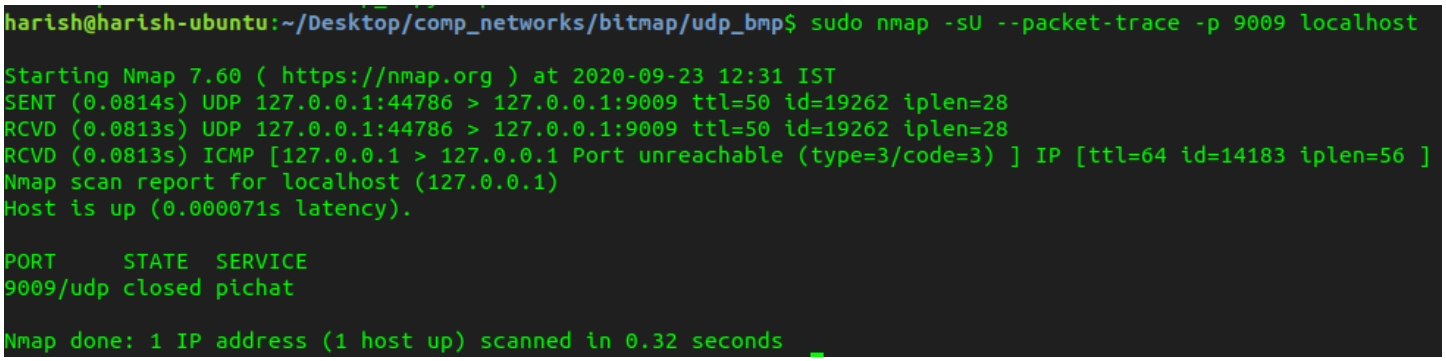
Time taken for bmp file: 0.481350
=1.7704 micro seconds per byte

for text file,



Time taken for txt file: 0.466861
=1.7201 micro seconds per byte

LATENCY:



0.000071 seconds latency.