

SOURCE CODE:**SENDER:**

```
#include<stdio.h>
#include<string.h>
#include<malloc.h>
#include<sys/types.h>
#include<sys/stat.h>
#include<sys/socket.h>
#include<netinet/in.h>
#include<fcntl.h>
#include<unistd.h>
typedef struct frame_struct
{
int seqnum;
char data[10];
char header[10];
char trailer[10];
char sequence[2];
}frame;
frame insert (char var[10],int seq)
{
frame f;
int i,c=0;
for(i=0;i<7;i++)
{
if(var[i]=='1')
c++;
}
if((c%2)!=0)
var[7]='1';
else
var[7]='0';
var[8]='\0';
strcpy(f.data,var);
f.seqnum=seq;
switch(f.seqnum)
{
case 0: strcpy(f.sequence,"00");break;
case 1: strcpy(f.sequence,"01");break;
case 2: strcpy(f.sequence,"10");break;
case 3: strcpy(f.sequence,"11");break;
}
strcpy(f.header,"01111110");
strcpy(f.trailer,"01111110");
return f;
}
void print(frame head)
{
printf("\n%s-%s-%s-%s",head.header,head.sequence,head.data,head.trailer);
}
```

```

int main()
{
int laf=-1,lfs=-1,sws=3,ch1,ch2,pos,ack,k,fc,ind;
int fd,sd,i,count,j=0,snum=0,n,r,l;
char buf[50],fr[200][10],c;
frame f[20],temp;
struct sockaddr_in sa;
sd=socket(AF_INET,SOCK_DGRAM,0);
if(sd<0)
perror("\n Socket error");
bzero(&sa,sizeof(sa));
sa.sin_family=AF_INET;
sa.sin_addr.s_addr=INADDR_ANY;
sa.sin_port=htons(61125);
l=sizeof(sa);
fd=open("frame.txt",0,"O_RDWR");
if(fd==-1)
printf("\nERROR");
count=0;
i=0;
while((r=read(fd,&c,sizeof(char)))>0)
{
if(count<6)
{
fr[i][count++]=c;
}
else
{
fr[i][count++]=c;
fr[i][count]='\0';
count=0;
i++;
}
}
n=i;
for(j=0;j<n;j++)
{
f[j]=insert(fr[j],snum);
snum++;
if(snum>3)
snum=0;
}
for(j=0;j<n;j++)
print(f[j]);
j=0;
while(laf<n-1)
{
if(((lfs-laf)<sws)&&(j<n))
{
{
printf("\nWINDOW\n");
for(ind=laf+1;ind<laf+4;ind++)

```

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if(ind<n)
printf("\t%d",f[ind].seqnum);
}
print(f[j]);
printf("\nDo u want to introduce error ");
scanf("%d",&ch2);
if(ch2==1)
{
printf("\nEnter the position ");
scanf("%d",&pos);
temp=f[j];
if(f[j].data[pos]=='0')
f[j].data[pos]='1';
else
f[j].data[pos]='0';
printf("Error frame:");
print(f[j]);
}
printf("\nDo the frame get lost ");
scanf("%d",&ch1);
if(ch1==1)
{
if(ch2==1)
{
if(f[j].data[pos]=='0')
f[j].data[pos]='1';
else
f[j].data[pos]='0';
}
lfs++;
j++;
continue;
}
else
{
sendto(sd,&f[j],sizeof(f[j]),0,(struct sockaddr*)&sa,sizeof(sa));
if(ch2==1)
{
if(f[j].data[pos]=='0')
f[j].data[pos]='1';
else
f[j].data[pos]='0';
}
recvfrom(sd,&buf,sizeof(buf),0,(struct sockaddr *)&sa,&l);
if(strcmp(buf,"")!=0)
{
int array=0;
ack=(int)buf[3];
array*=10;
array+=(int)buf[3];
array-=48;
ack=array;

```

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ack--;
if(ack<0)
ack=sws;
k=laf+1;
fc=0;
while(fc<sws)
{
if(f[k].seqnum==ack)
break;
fc++;
k++;
}
laf=k;
}
lfs++;
j++;
}
}
else
{
j=laf+1;
lfs=laf;
printf("\nend of window %d",j);
}
}
printf("\nAll frames sent and acknowledged");
}

```

RECEIVER:

```

#include<stdio.h>
#include<string.h>
#include<malloc.h>
#include<sys/types.h>
#include<sys/stat.h>
#include<sys/socket.h>
#include<netinet/in.h>
#include<fcntl.h>
#include<unistd.h>
typedef struct frame_struct
{
int seqnum;
char data[10];
char header[10];
char trailer[10];
char sequence[2];
}frame;
void print(frame head)
{
printf("\n%s %s %s %s",head.header,head.sequence,head.data,head.trailer);
}
int main()

```

```

{
int r=0,rcv=0;
int fd,sd,i,count,j=0,snum=0,n,l,ch;
char buf[50],fr[200][10],c;
frame f[20],temp;
struct sockaddr_in sa;
sd=socket(AF_INET,SOCK_DGRAM,0);
if(sd<0)
perror("\n Socket error");
bzero(&sa,sizeof(sa));
sa.sin_family=AF_INET;
sa.sin_addr.s_addr=inet_addr("127.0.0.1");
sa.sin_port=htons(61125);
if(bind(sd,(struct sockaddr *)&sa,sizeof(sa)))
perror("bind error");
l=sizeof(sa);
while(1)
{
printf("\nExpected frame %d",r);
recvfrom(sd,&temp,sizeof(temp),0,(struct sockaddr *)&sa,&l);
if(r==temp.seqnum)
{
c=0;
for(i=0;i<8;i++)
{
if(temp.data[i]=='1')
c++;
}
if((c%2)==0)
{
f[rcv++]=temp;
printf("\n%s-%s-%s-%s",temp.header,temp.sequence,temp.data,temp.trailer);
r=(r+1)%4;
printf("\nDo u want to send acknowledgement?");
scanf("%d",&ch);
if(ch==1)
{
strcpy(buf,"ack");
buf[3]=48+r;
buf[4]='\0';
}
else
strcpy(buf," ");
sendto(sd,buf,sizeof(buf),0,(struct sockaddr *)&sa,sizeof(sa));
}
else
{
strcpy(buf," ");
sendto(sd,buf,sizeof(buf),0,(struct sockaddr *)&sa,sizeof(sa));
printf("\nERROR");
printf("\n");
}
}
}

```

```

}
else
{
int fl=0,i;
for(i=0;i<rcv;i++)
{
if(strcmp(f[i].data,temp.data)==0)
{
fl=1;
strcpy(buf,"ack");
buf[3]=48+(f[i].seqnum+1);
printf("\nFrame discarded ack resent");
}
}
if(fl!=1)
{
printf("\nBut received :");
printf("\n%s-%s-%s-%s",temp.header,temp.sequence,temp.data,temp.trailer);
printf("\nReceived out of order hence discarded");
strcpy(buf," ");
}
sendto(sd,buf,sizeof(buf),0,(struct sockaddr *)&sa,sizeof(sa));
}
}
}

```

SAMPLE I/O:

SENDER:

```

saranya@lenovo: ~/Documents
saranya@lenovo:~/Documents$ gcc gobacks.c -o gs
saranya@lenovo:~/Documents$ ./gs

01111110-00-11001010-01111110
01111110-01-01000001-01111110
01111110-10-00111111-01111110
01111110-11-11000101-01111110
01111110-00-10101001-01111110
01111110-01-00001010-01111110
01111110-10-00101011-01111110
WINDOW
    0        1        2
01111110-00-11001010-01111110
Do u want to introduce error 0

Do the frame get lost 0

WINDOW
    0        1        2
01111110-01-01000001-01111110
Do u want to introduce error 0

Do the frame get lost 0

WINDOW
    2        3        0
01111110-10-00111111-01111110
Do u want to introduce error 1

Enter the position 2
Error frame:
01111110-10-00011111-01111110
Do the frame get lost 0

WINDOW
    2        3        0
01111110-11-11000101-01111110

```

```
saranya@lenovo: ~/Documents
saranya@lenovo: ~/Documents
01111110-10-00111111-01111110
Do u want to introduce error 1

Enter the position 2
Error frame:
01111110-10-00011111-01111110
Do the frame get lost 0

WINDOW
      2      3      0
01111110-11-11000101-01111110
Do u want to introduce error 0

Do the frame get lost 0

WINDOW
      2      3      0
01111110-00-10101001-01111110
Do u want to introduce error 0

Do the frame get lost 0

end of window 2
WINDOW
      2      3      0
01111110-10-00111111-01111110
Do u want to introduce error 0

Do the frame get lost 0

WINDOW
      3      0      1
01111110-11-11000101-01111110
Do u want to introduce error 0

Do the frame get lost 1

saranya@lenovo: ~/Documents
saranya@lenovo: ~/Documents
Do the frame get lost 1

WINDOW
      3      0      1
01111110-00-10101001-01111110
Do u want to introduce error 0

Do the frame get lost 0

WINDOW
      3      0      1
01111110-01-00001010-01111110
Do u want to introduce error 0

Do the frame get lost 0

end of window 3
WINDOW
      3      0      1
01111110-11-11000101-01111110
Do u want to introduce error 0

Do the frame get lost 0

WINDOW
      0      1      2
01111110-00-10101001-01111110
Do u want to introduce error 0

Do the frame get lost 0

WINDOW
      0      1      2
01111110-01-00001010-01111110
Do u want to introduce error 0

Do the frame get lost 0
```

```
saranya@lenovo: ~/Documents
saranya@lenovo: ~/Documents
WINDOW
      3      0      1
01111110-01-00001010-01111110
Do u want to introduce error 0

Do the frame get lost 0

end of window 3
WINDOW
      3      0      1
01111110-11-11000101-01111110
Do u want to introduce error 0

Do the frame get lost 0

WINDOW
      0      1      2
01111110-00-10101001-01111110
Do u want to introduce error 0

Do the frame get lost 0

WINDOW
      0      1      2
01111110-01-00001010-01111110
Do u want to introduce error 0

Do the frame get lost 0

WINDOW
      0      1      2
01111110-10-00101011-01111110
Do u want to introduce error 0

Do the frame get lost 0

saranya@lenovo:~/Documents$ |
```

RECEIVER:

```
saranya@lenovo: ~/Documents
saranya@lenovo: ~/Documents
saranya@lenovo:~/Documents$ gcc gobackr.c -o gr
saranya@lenovo:~/Documents$ ./gr

Expected frame 0
01111110-00-11001010-01111110
Do u want to send acknowledgement?0

Expected frame 1
01111110-01-01000001-01111110
Do u want to send acknowledgement?1

Expected frame 2
ERROR

Expected frame 2
But received :
01111110-11-11000101-01111110
Received out of order hence discarded
Expected frame 2
But received :
01111110-00-10101001-01111110
Received out of order hence discarded
Expected frame 2
01111110-10-00111111-01111110
Do u want to send acknowledgement?1

Expected frame 3
But received :
01111110-00-10101001-01111110
Received out of order hence discarded
Expected frame 3
But received :
01111110-01-00001010-01111110
Received out of order hence discarded
Expected frame 3
01111110-11-11000101-01111110
Do u want to send acknowledgement?1
```



```
saranya@lenovo: ~/Documents
saranya@lenovo: ~/Documents
saranya@lenovo: ~/Documents

But received :
01111110-11-11000101-01111110
Received out of order hence discarded
Expected frame 2
But received :
01111110-00-10101001-01111110
Received out of order hence discarded
Expected frame 2
01111110-10-00111111-01111110
Do u want to send acknowledgement?1

Expected frame 3
But received :
01111110-00-10101001-01111110
Received out of order hence discarded
Expected frame 3
But received :
01111110-01-00001010-01111110
Received out of order hence discarded
Expected frame 3
01111110-11-11000101-01111110
Do u want to send acknowledgement?1

Expected frame 0
01111110-00-10101001-01111110
Do u want to send acknowledgement?0

Expected frame 1
01111110-01-00001010-01111110
Do u want to send acknowledgement?0

Expected frame 2
01111110-10-00101011-01111110
Do u want to send acknowledgement?1

saranya@lenovo:~/Documents$
saranya@lenovo:~/Documents$ |
```