```
printf("[+]Frame Received: %s\n", frame_recv.packet.data);
frame_send.sq_no = 0;
frame_send.frame_kind = 0;
frame_send.ack = frame_recv.sq_no + 1;
sendto(sockfd, &frame_send, sizeof(frame_send), 0, (struct
sockaddr*)&newAddr, addr_size);
printf("[+]Ack Send\n");
}else{
printf("[+]Frame Not Received\n");
}
frame_id++;
}
close(sockfd);
return 0;
}
```

client.c

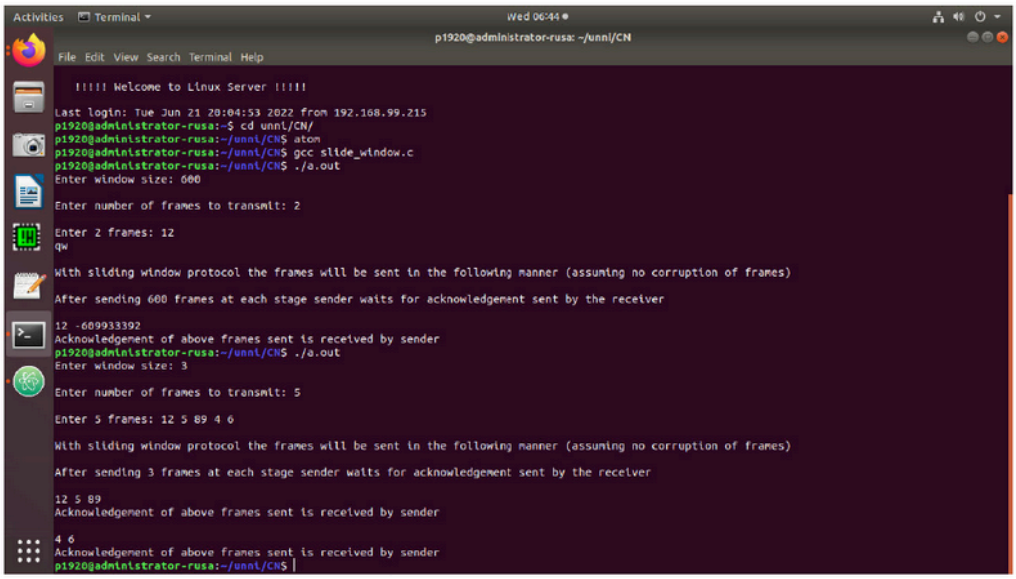
```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <arpa/inet.h>
#include <sys/socket.h>
typedef struct packet{
char data[1024];
}Packet;
typedef struct frame{
int frame_kind; //ACK:0, SEQ:1 FIN:2
int sq_no;
int ack;
Packet packet;

}Frame;
int main(int argc, char **argv[]){
if (argc != 2){
printf("Usage: %s <port>", argv[0]);
exit(0);
}
int port = atoi(argv[1]);
```

```
int sockfd;
struct sockaddr_in serverAddr;
char buffer[1024];
socklen_t addr_size;
int frame_id = 0;
Frame frame_send;
Frame frame_recv;
int ack_recv = 1;
sockfd = socket(AF_INET, SOCK_DGRAM, 0);
memset(&serverAddr, '\0', sizeof(serverAddr));
serverAddr.sin_family = AF_INET;
serverAddr.sin_port = htons(port);
serverAddr.sin_addr.s_addr = inet_addr("127.0.0.1");
while(1){
if(ack_recv == 1){
frame_send.sq_no = frame_id;
frame_send.frame_kind = 1;
frame_send.ack = 0;
printf("Enter Data: ");
scanf("%s", buffer);
strcpy(frame_send.packet.data, buffer);
sendto(sockfd, &frame_send, sizeof(Frame), 0, (struct
sockaddr*)&serverAddr, sizeof(serverAddr));
printf("[+]Frame Send\n");
}
int addr_size = sizeof(serverAddr);
int f_recv_size = recvfrom(sockfd, &frame_recv, sizeof(frame_recv), 0 ,(struct
sockaddr*)&serverAddr, &addr_size);
if( f_recv_size > 0 && frame_recv.sq_no == 0 && frame_recv.ack ==
frame_id+1){
printf("[+]Ack Received\n");
ack_recv = 1;
}else{
printf("[-]Ack Not Received\n");
ack_recv = 0;
}
frame_id++;
}
close(sockfd);
return 0;
```

}

OUTPUT



2. Go_Back ARQ

Reciver.c

```
#include<stdio.h>
#include<sys/types.h>
#include<sys/socket.h>
#include<netinet/in.h>
#include<string.h>
#include<time.h>
#include<stdlib.h>
#include<ctype.h>
#include<arpa/inet.h>
#define W 5
#define P1 50
#define P2 10
char a[10];
char b[10];
void alpha9(int);
int main()
{
struct sockaddr_in ser,cli;
int s,n,sock,i,j,c=1,f;
```

```
unsigned int s1;
s=socket(AF_INET,SOCK_STREAM,0);
ser.sin_family=AF_INET;
ser.sin_port=6500;
ser.sin_addr.s_addr=inet_addr("127.0.0.1");
bind(s,(struct sockaddr *) &ser, sizeof(ser));
listen(s,1);
n=sizeof(cli);
sock=accept(s,(struct sockaddr *)&cli, &n);
printf("\nTCP Connection Established.\n");
s1=(unsigned int) time(NULL);
srand(s1);
strcpy(b,"Time Out ");
recv(sock,a,sizeof(a),0);
f=atoi(a);
while(1)
{
for(i=0;i<W;i++)
{
recv(sock,a,sizeof(a),0);
if(strcmp(a,b)==0)
{
break;
}
}
i=0;
while(i<W)
{
j=rand()%P1;
if(j<P2)
{
send(sock,b,sizeof(b),0);
break;
}
else
{
alpha9(c);
if(c<=f)
{
printf("\nFrame %s Received ",a);
```

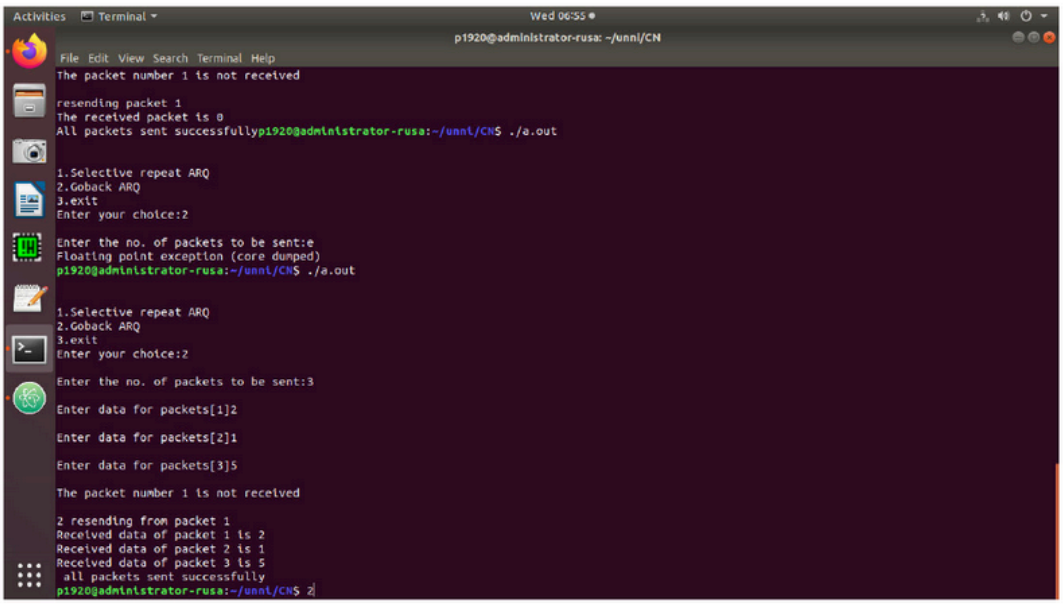
```
send(sock,a,sizeof(a),0);
}
else
{
break;
}
c++;
}
if(c>f)
{
break;
}
i++;
}
}
close(sock);
close(s);
return 0;
}
void alpha9(int z)
{
int k,i=0,j,g;
k=z;
while(k>0)
{
i++;
k=k/10;
}
g=i;
i--;
while(z>0)
{
k=z%10;
a[i]=k+48;
i--;
z=z/10;
}
a[g]='\0';
}
```

Client.c

```
#include<stdio.h>
#include<sys/types.h>
#include<sys/socket.h>
#include<netinet/in.h>
#include<string.h>
#include<time.h>
#include<stdlib.h>
#include<ctype.h>
#include<arpa/inet.h>
#define W 5
#define P1 50
#define P2 10
char a[10];
char b[10];
void alpha9(int);
int main()
{
struct sockaddr_in ser,cli;
int s,n,sock,i,j,c=1,f;
unsigned int s1;
s=socket(AF_INET,SOCK_STREAM,0);
ser.sin_family=AF_INET;
ser.sin_port=6500;
ser.sin_addr.s_addr=inet_addr("127.0.0.1");
bind(s,(struct sockaddr *) &ser, sizeof(ser));
listen(s,1);
n=sizeof(cli);
sock=accept(s,(struct sockaddr *)&cli, &n);
printf("\nTCP Connection Established.\n");
s1=(unsigned int) time(NULL);
srand(s1);
strcpy(b,"Time Out ");
recv(sock,a,sizeof(a),0);
f=atoi(a);
while(1)
{
for(i=0;i<W;i++)
{
```

```
recv(sock,a,sizeof(a),0);
if(strcmp(a,b)==0)
{
break;
}
}
i=0;
while(i<W)
{
j=rand()%P1;
if(j<P2)
{
send(sock,b,sizeof(b),0);
break;
}
else
{
alpha9(c);
if(c<=f)
{
printf("\nFrame %s Received ",a);
send(sock,a,sizeof(a),0);
}
else
{
break;
}
c++;
}
if(c>f)
{
break;
}
i++;
}
}
close(sock);
close(s);
return 0;
}
```

```
void alpha9(int z)
{
int k,i=0,j,g;
k=z;
while(k>0)
{
i++;
k=k/10;
}
g=i;
i--;
while(z>0)
{
k=z%10;
a[i]=k+48;
i--;
z=z/10;
}
a[g]='\0';
}
```



3. Selective repeat ARQ

Reciver.c

```
#include<stdio.h>
#include<sys/types.h>
#include<sys/socket.h>
#include<netinet/in.h>
#include<string.h>
#include<time.h>
#include<stdlib.h>
#include<ctype.h>
#include<arpa/inet.h>
#define W 5
#define P1 50
#define P2 10
char a[10];
char b[10];
void alpha9(int);
void alp(int);
int main()
{
struct sockaddr_in ser,cli;
int s,n,sock,i,j,c=1,f;
unsigned int s1;
s=socket(AF_INET,SOCK_STREAM,0);
ser.sin_family=AF_INET;
ser.sin_port=6500;
ser.sin_addr.s_addr=inet_addr("127.0.0.1");
bind(s,(struct sockaddr *) &ser, sizeof(ser));
listen(s,1);
n=sizeof(cli);
sock=accept(s,(struct sockaddr *)&cli, &n);
printf("\nTCP Connection Established.\n");
s1=(unsigned int) time(NULL);
srand(s1);
strcpy(b,"Time Out ");
recv(sock,a,sizeof(a),0);
f=atoi(a);
while(1)
{
for(i=0;i<W;i++)
{
```

```
recv(sock,a,sizeof(a),0);
if(strcmp(a,b)==0)
{
break;
}
}
i=0;
while(i<W)
{
L:
j=rand()%P1;
if(j<P2)
{
alp(c);
send(sock,b,sizeof(b),0);
goto L;
}
else
{
alpha9(c);
if(c<=f)
{
printf("\nFrame %s Received ",a);
send(sock,a,sizeof(a),0);
}
else
{
break;
}
c++;
}
if(c>f)
{
break;
}
i++;
}
}
close(sock);
close(s);
```

```
return 0;
}
void alpha9(int z)
{
int k,i=0,j,g;
k=z;
while(k>0)
{
i++;
k=k/10;
}
g=i;
i--;
while(z>0)
{
k=z%10;
a[i]=k+48;
i--;
z=z/10;
}
a[g]='\0';
}
void alp(int z)
{
int k,i=1,j,g;
k=z;
b[0]='N';
while(k>0)
{
i++;
k=k/10;
}
g=i;
i--;
while(z>0)
{
k=z%10;
b[i]=k+48;
i--;
z=z/10;
```

```
}
b[g]='\0';
}
```

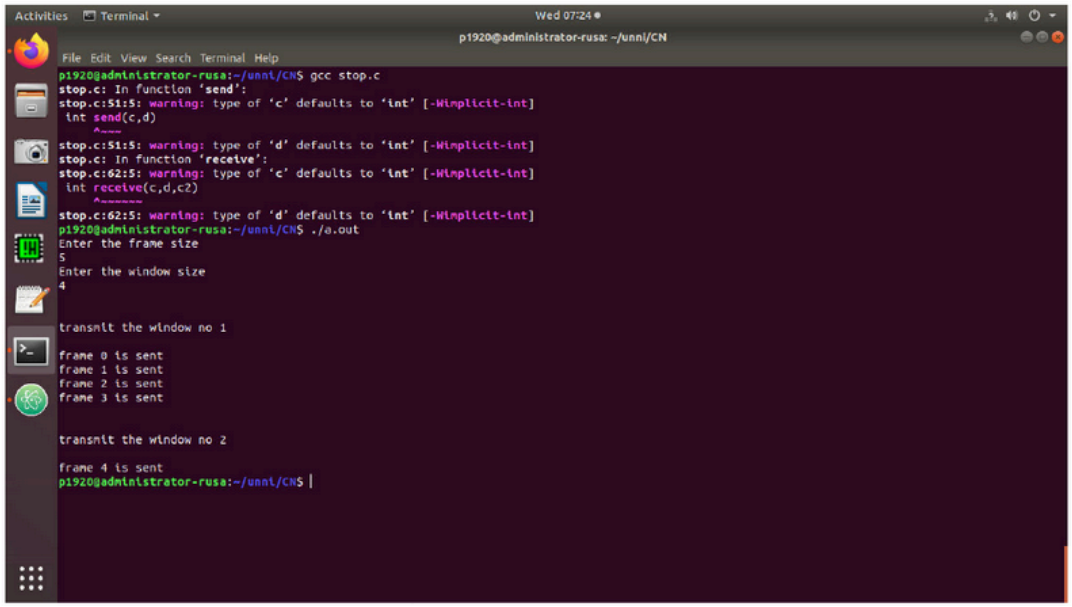
Client.c

```
#include<stdio.h>
#include<sys/types.h>
#include<sys/socket.h>
#include<netinet/in.h>
#include<string.h>
#include<time.h>
#include<stdlib.h>
#include<ctype.h>
#define W 5
char a[10];
char b[10];
void alpha9(int);
int con();
int main()
{
int s,f,wl,c=1,x,i=0,j,n,p=0,e=0;
struct sockaddr_in ser;
s=socket(AF_INET,SOCK_STREAM,0);
ser.sin_family=AF_INET;
ser.sin_port=6500;
ser.sin_addr.s_addr=inet_addr("127.0.0.1");
connect(s,(struct sockaddr *) &ser, sizeof(ser));
printf("\nTCP Connection Established.\n");
printf("\nEnter the number of Frames: ");
scanf("%d",&f);
alpha9(f);
send(s,a,sizeof(a),0);
strcpy(b,"Time Out ");
while(1)
{
for(i=0;i<W;i++)
{
alpha9(c);
send(s,a,sizeof(a),0);
```

```
if(c<=f)
{
printf("\nFrame %d Sent",c);
c++;
}
}
i=0;
wl=W;
while(i<W)
{
recv(s,a,sizeof(a),0);
p=atoi(a);
if(a[0]=='N')
{
e=con();
if(e<f)
{
printf("\nNAK %d",e);
printf("\nFrame %d sent",e);
i--;
}
}
else
{
if(p<=f)
{
printf("\nFrame %s Acknowledged",a);
wl--;
}
else
{
break;
}
}
if(p>f)
{
break;
}
i++;
}
```

```
if(wl==0 && c>f)
{
send(s,b,sizeof(b),0);
break;
}
else
{
c=c-wl;
wl=W;
}
}
close(s);
return 0;
}
void alpha9(int z)
{
int k,i=0,j,g;
k=z;
while(k>0)
{
i++;
k=k/10;
}
g=i;
i--;
while(z>0)
{
k=z%10;
a[i]=k+48;
i--;
z=z/10;
}
a[g]='\0';
}
int con()
{
char k[9];
int i=1;
while(a[i]!='\0')
{
```

```
k[i-1]=a[i];
i++;
}
k[i-1]='\0';
i=atoi(k);
return i;
}
```



Experiment 6

Implement and simulate algorithm for Distance Vector Routing protocol

Aim: To implement and simulate algorithm for Distance vector routing protocol

Description:

This algorithm is iterative, and distributed. Each node receives information from its directly attached neighbors, performs some calculations and results to its neighboring nodes. This process of updating the information goes on until there is no exchange of information between neighbors.

Algorithm:

(adapted from Computer Networking – A top down approach by Kurose and Rose)

Bellman Ford algoithm is applied.

Let dx(y) be the cost of the least cost path from node x to node y. Then Bellman Ford equation states that
dx(y) = min{ c(x,v) + dv(y) }

v

where v is a neighbour of node x. dv(y) is the cost of the least cost path from v to y. c(x,v) is the cost
from x to neighbour v. The least cost path has a value equal to minimum of c(x,v) + dv(y) over all its
neighbours v. The solution of Bellman Ford equation provides entries in node x's forwarding table.
Distance vector (DV) algorithm
At each node x
Initialization:
for all destinations y in N:

Dx(y) = c(x,y) /* if y is not a neighbour of x, then c(x,y) = ∞ */

for each neighbour w,
send distance vector Dx = { Dx(y): y in N} to w
loop:
for each y in N:
Dx(y) = min { c(x,v) + Dv(y) }