20BDS0146
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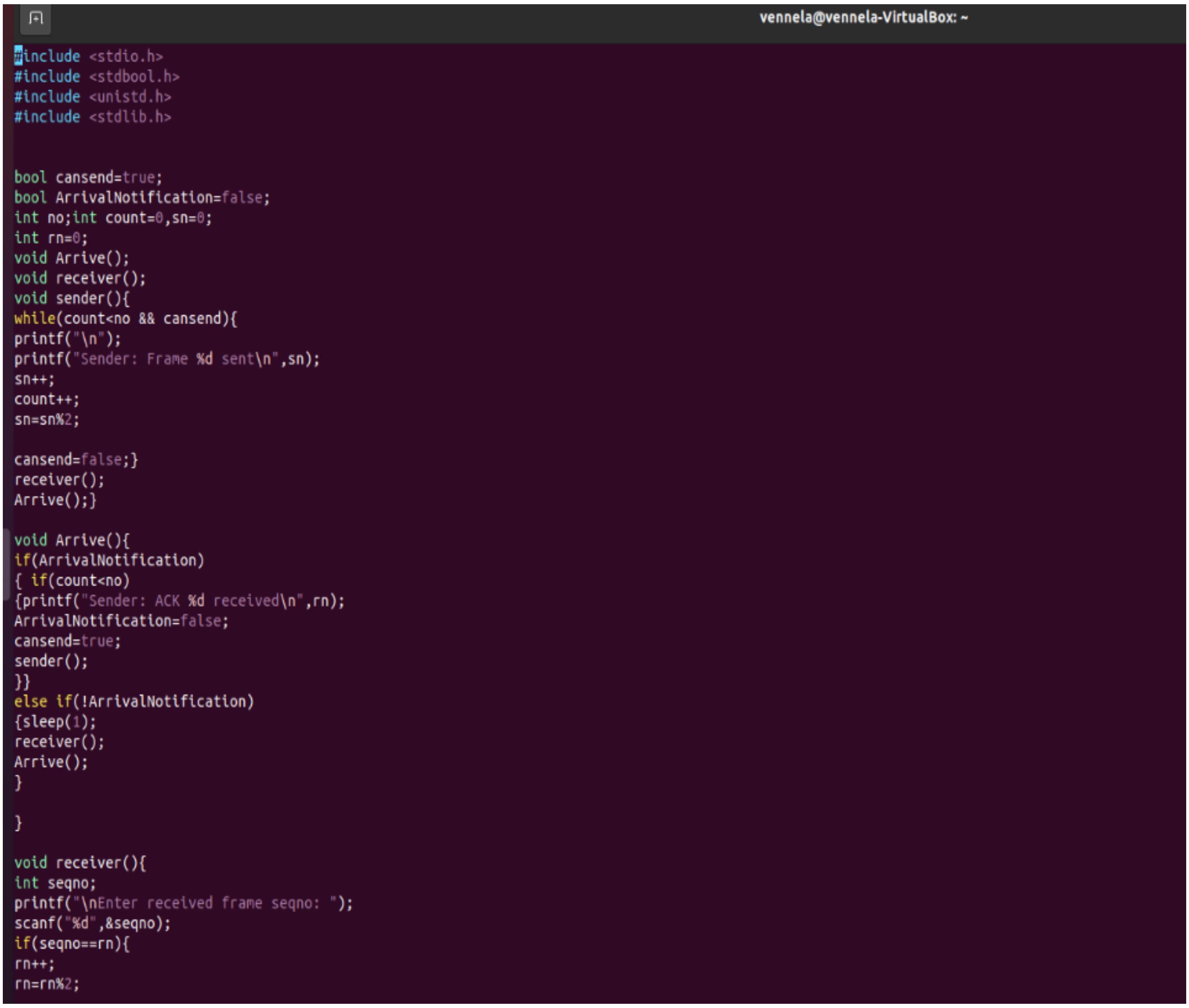
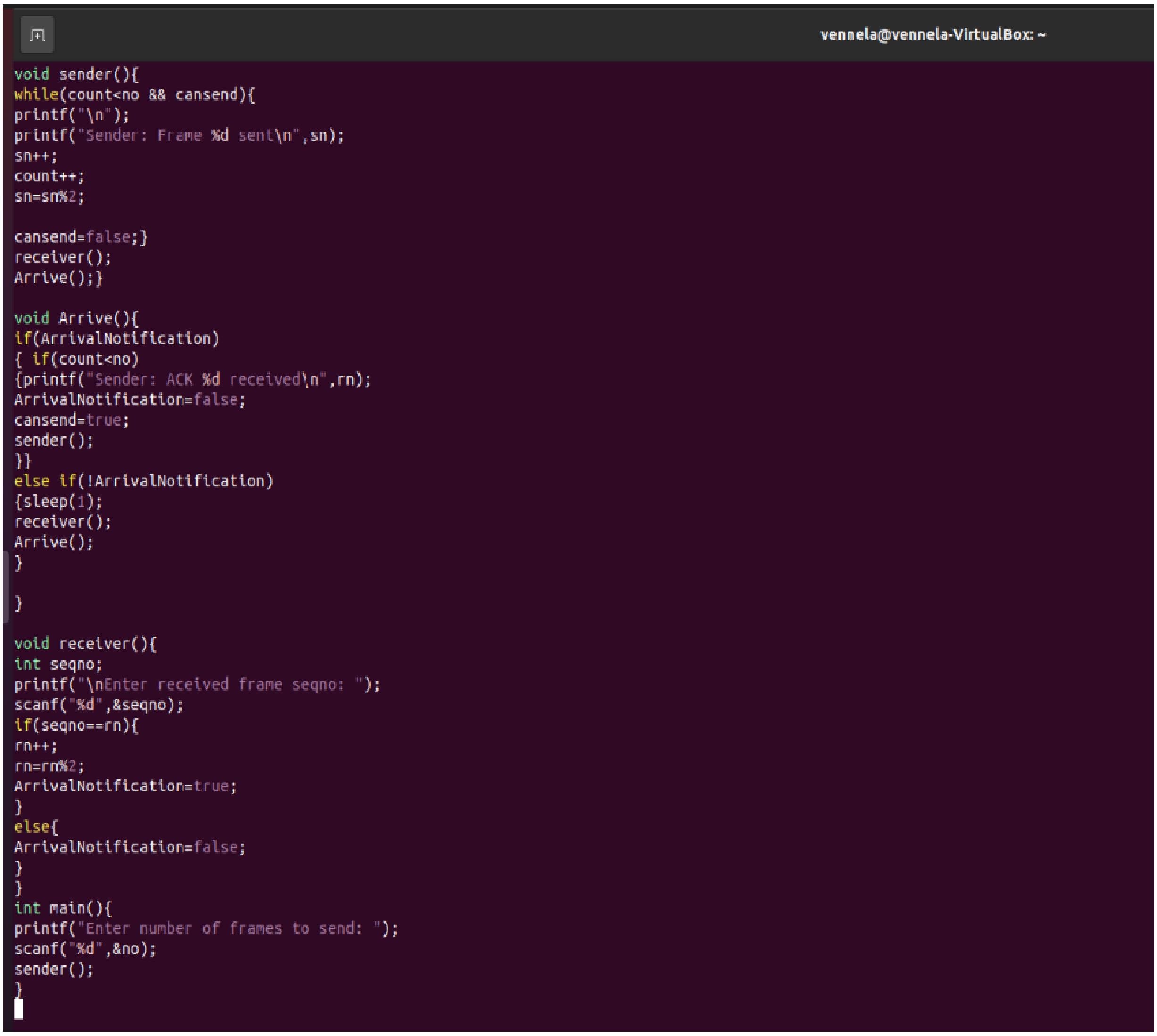
FLOW CONTROL MECHANISMS

1. C program to implement Stop n Wait ARQ

SOURCE CODE:

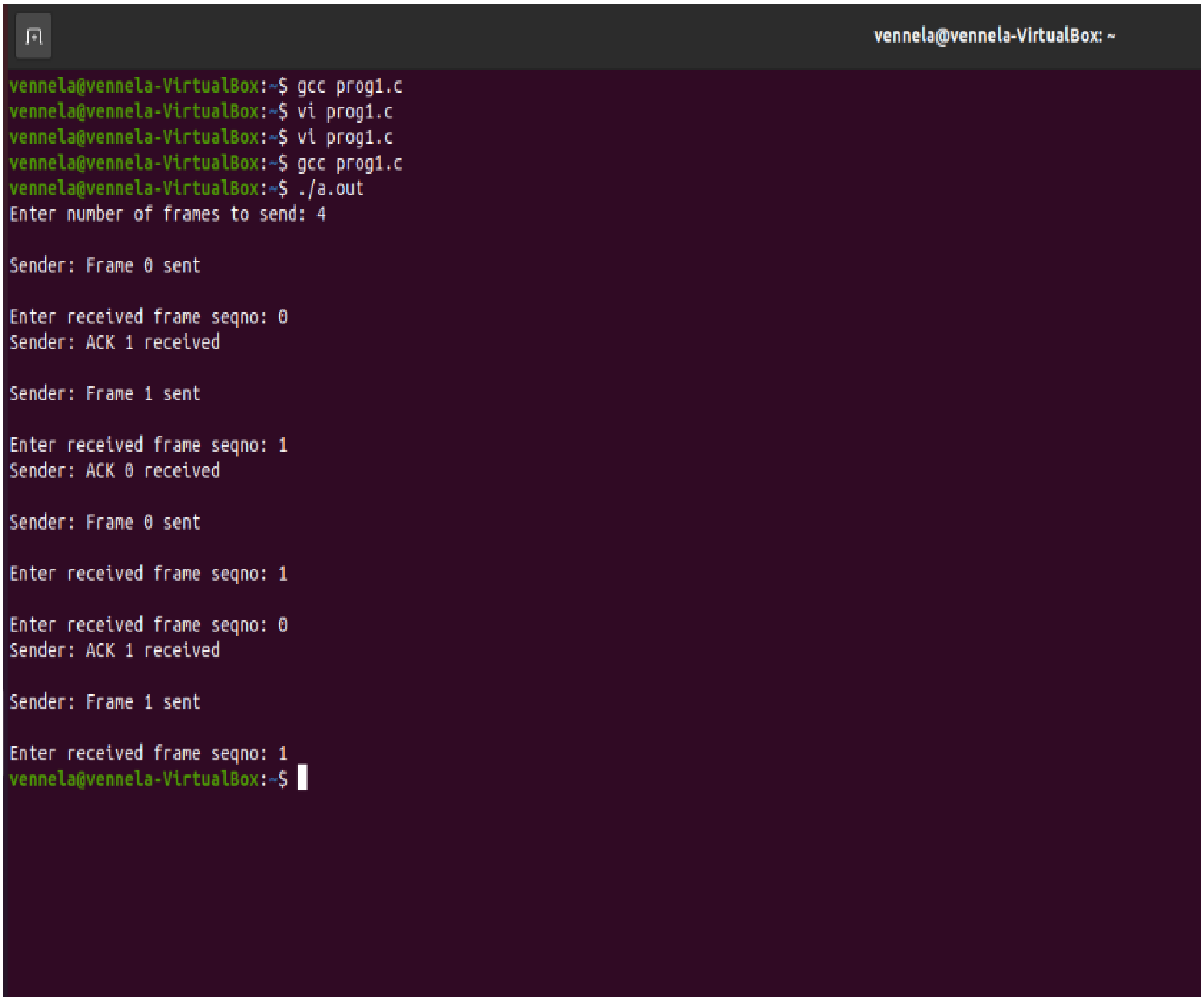


```
#include <stdio.h>
#include <stdbool.h>
#include <unistd.h>
#include <stdlib.h>


bool cansend=true;
bool ArrivalNotification=false;
int no;int count=0,sn=0;
int rn=0;
void Arrive();
void receiver();
void sender(){
while(count<no && cansend){
printf("\n");
printf("Sender: Frame %d sent\n",sn);
sn++;
count++;
sn=sn%2;

cansend=false;}
receiver();
Arrive();}

void Arrive(){
if(ArrivalNotification)
{ if(count<no)
{printf("Sender: ACK %d received\n",rn);
ArrivalNotification=false;
cansend=true;
sender();
}}
else if(!ArrivalNotification)
{sleep(1);
receiver();
Arrive();
}

}

void receiver(){
int seqno;
printf("\nEnter received frame seqno: ");
scanf("%d",&seqno);
if(seqno==rn){
rn++;
rn=rn%2;
```



```
void sender(){
while(count<no && cansend){
printf("\n");
printf("Sender: Frame %d sent\n",sn);
sn++;
count++;
sn=sn%2;

cansend=false;}
receiver();
Arrive();}

void Arrive(){
if(ArrivalNotification)
{ if(count<no)
{printf("Sender: ACK %d received\n",rn);
ArrivalNotification=false;
cansend=true;
sender();
}}
else if(!ArrivalNotification)
{sleep(1);
receiver();
Arrive();
}

}

void receiver(){
int seqno;
printf("\nEnter received frame seqno: ");
scanf("%d",&seqno);
if(seqno==rn){
rn++;
rn=rn%2;
ArrivalNotification=true;
}
else{
ArrivalNotification=false;
}
}
int main(){
printf("Enter number of frames to send: ");
scanf("%d",&no);
sender();
}
```

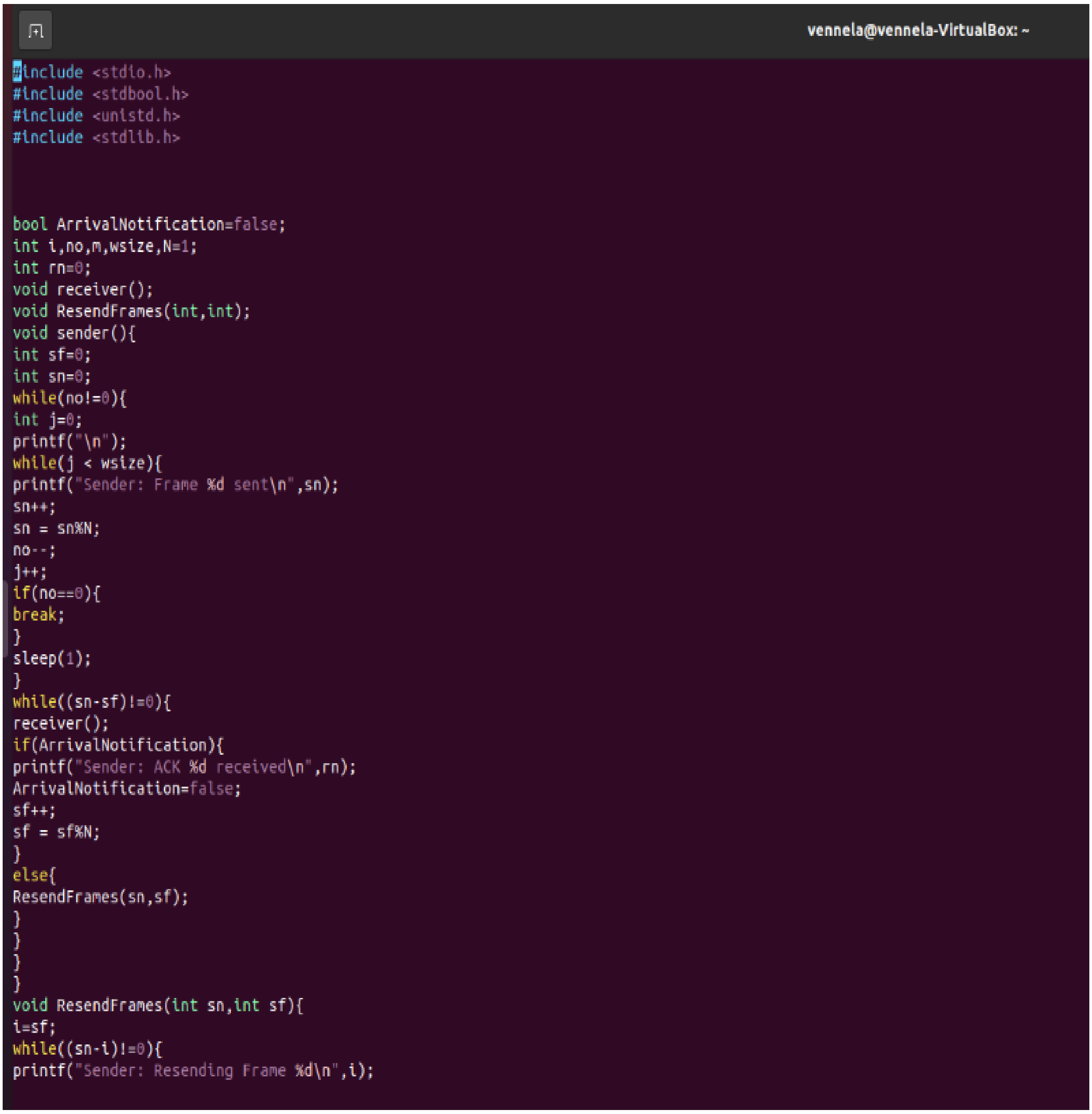
OUTPUT:



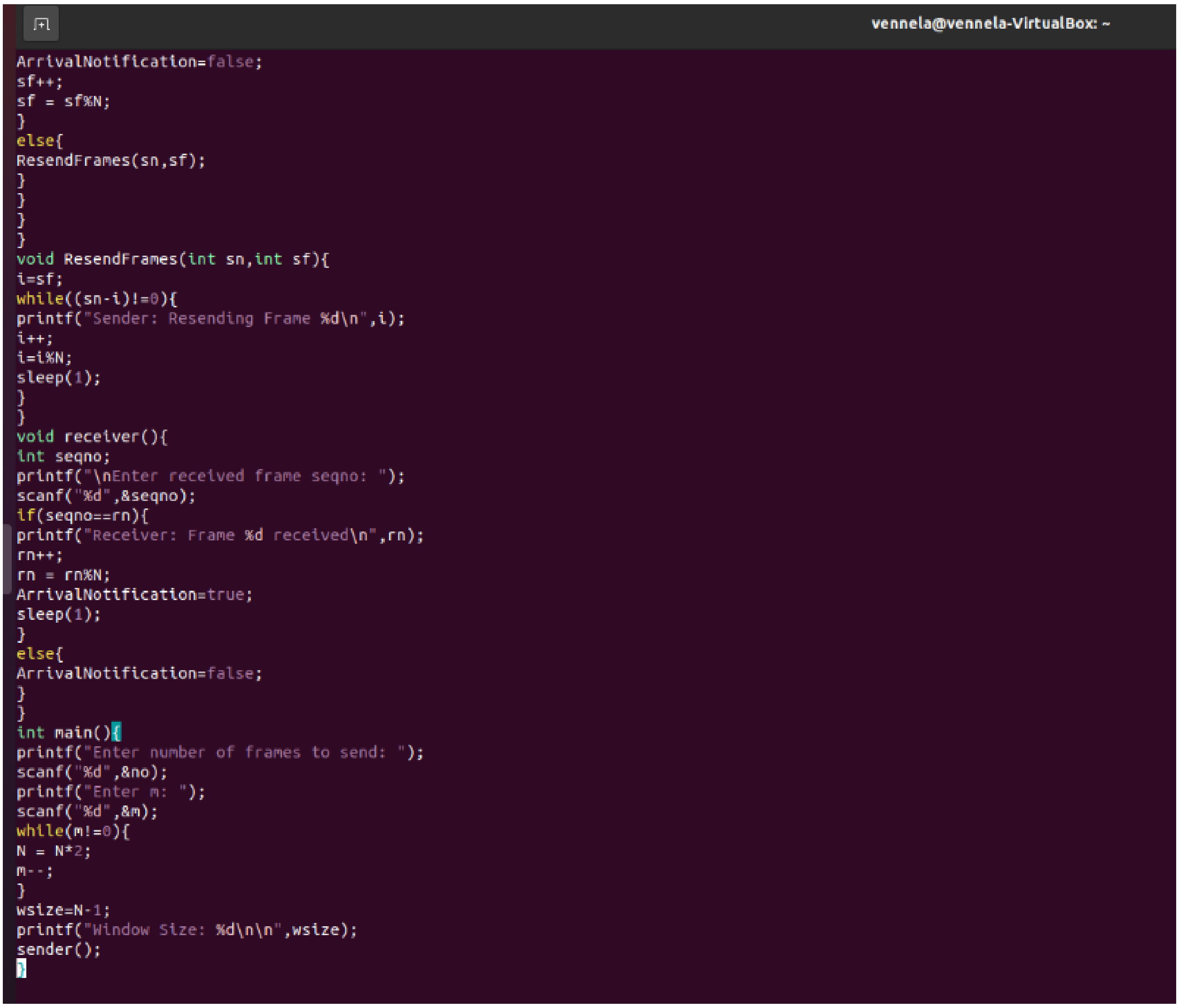
```
vennela@vennela-VirtualBox:~$ gcc prog1.c
vennela@vennela-VirtualBox:~$ vi prog1.c
vennela@vennela-VirtualBox:~$ vi prog1.c
vennela@vennela-VirtualBox:~$ gcc prog1.c
vennela@vennela-VirtualBox:~$ ./a.out
Enter number of frames to send: 4

Sender: Frame 0 sent

Enter received frame seqno: 0
Sender: ACK 1 received

Sender: Frame 1 sent

Enter received frame seqno: 1
Sender: ACK 0 received

Sender: Frame 0 sent

Enter received frame seqno: 1

Enter received frame seqno: 0
Sender: ACK 1 received

Sender: Frame 1 sent

Enter received frame seqno: 1
vennela@vennela-VirtualBox:~$
```

2. C program to implement Goback n ARQ

SOURCE CODE:

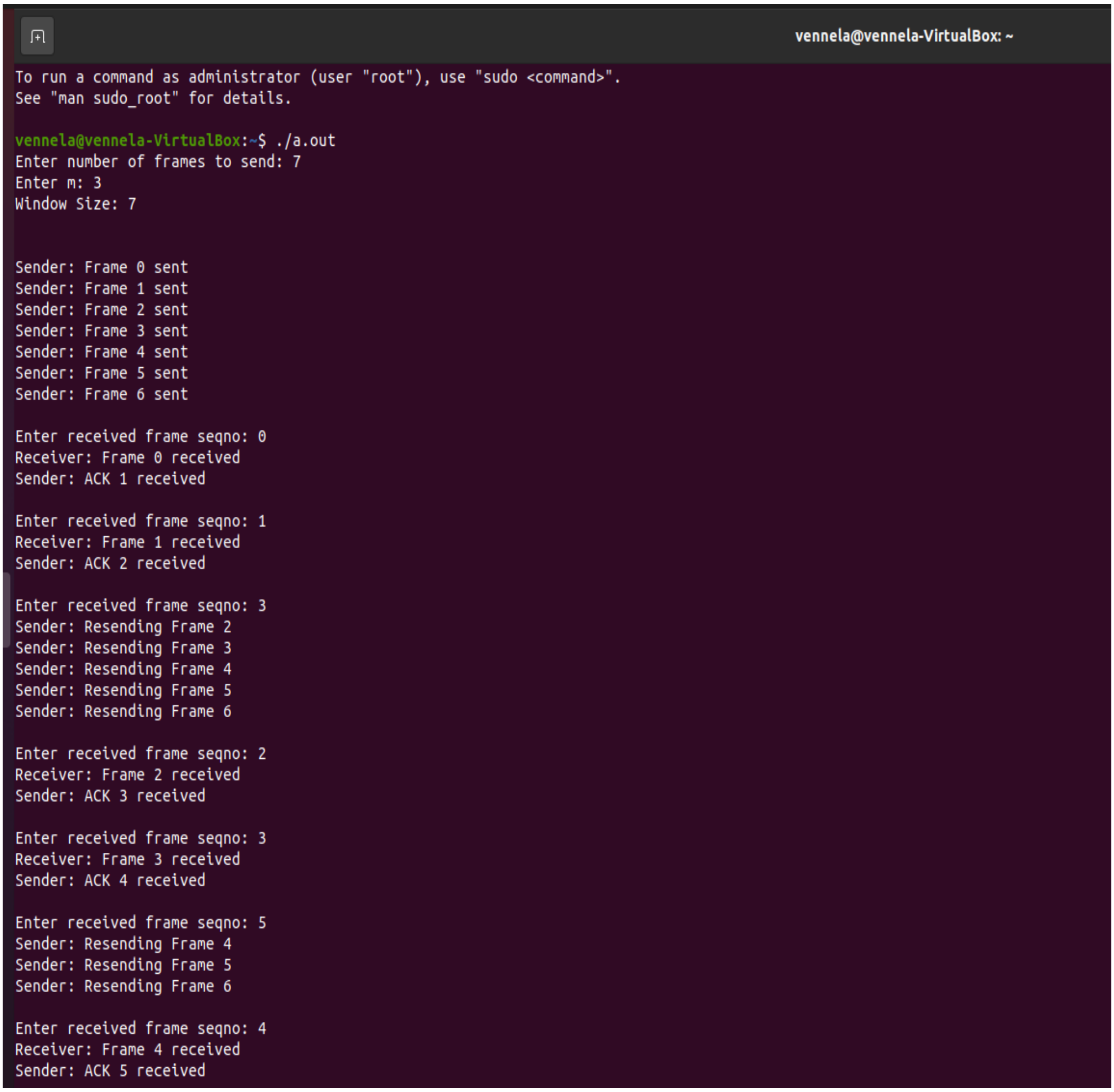


```
#include <stdio.h>
#include <stdbool.h>
#include <unistd.h>
#include <stdlib.h>



bool ArrivalNotification=false;
int i,no,m,wsize,N=1;
int rn=0;
void receiver();
void ResendFrames(int,int);
void sender(){
int sf=0;
int sn=0;
while(no!=0){
int j=0;
printf("\n");
while(j < wsize){
printf("Sender: Frame %d sent\n",sn);
sn++;
sn = sn%N;
no--;
j++;
if(no==0){
break;
}
sleep(1);
}
while((sn-sf)!=0){
receiver();
if(ArrivalNotification){
printf("Sender: ACK %d received\n",rn);
ArrivalNotification=false;
sf++;
sf = sf%N;
}
else{
ResendFrames(sn,sf);
}
}
}
}
void ResendFrames(int sn,int sf){
i=sf;
while((sn-i)!=0){
printf("Sender: Resending Frame %d\n",i);
```



```
ArrivalNotification=false;
sf++;
sf = sf%N;
}
else{
ResendFrames(sn,sf);
}
}
}
}
void ResendFrames(int sn,int sf){
i=sf;
while((sn-i)!=0){
printf("Sender: Resending Frame %d\n",i);
i++;
i=i%N;
sleep(1);
}
}
void receiver(){
int seqno;
printf("\nEnter received frame seqno: ");
scanf("%d",&seqno);
if(seqno==rn){
printf("Receiver: Frame %d received\n",rn);
rn++;
rn = rn%N;
ArrivalNotification=true;
sleep(1);
}
else{
ArrivalNotification=false;
}
}
int main(){
printf("Enter number of frames to send: ");
scanf("%d",&no);
printf("Enter m: ");
scanf("%d",&m);
while(m!=0){
N = N*2;
m--;
}
wsize=N-1;
printf("Window Size: %d\n\n",wsize);
sender();
}
```

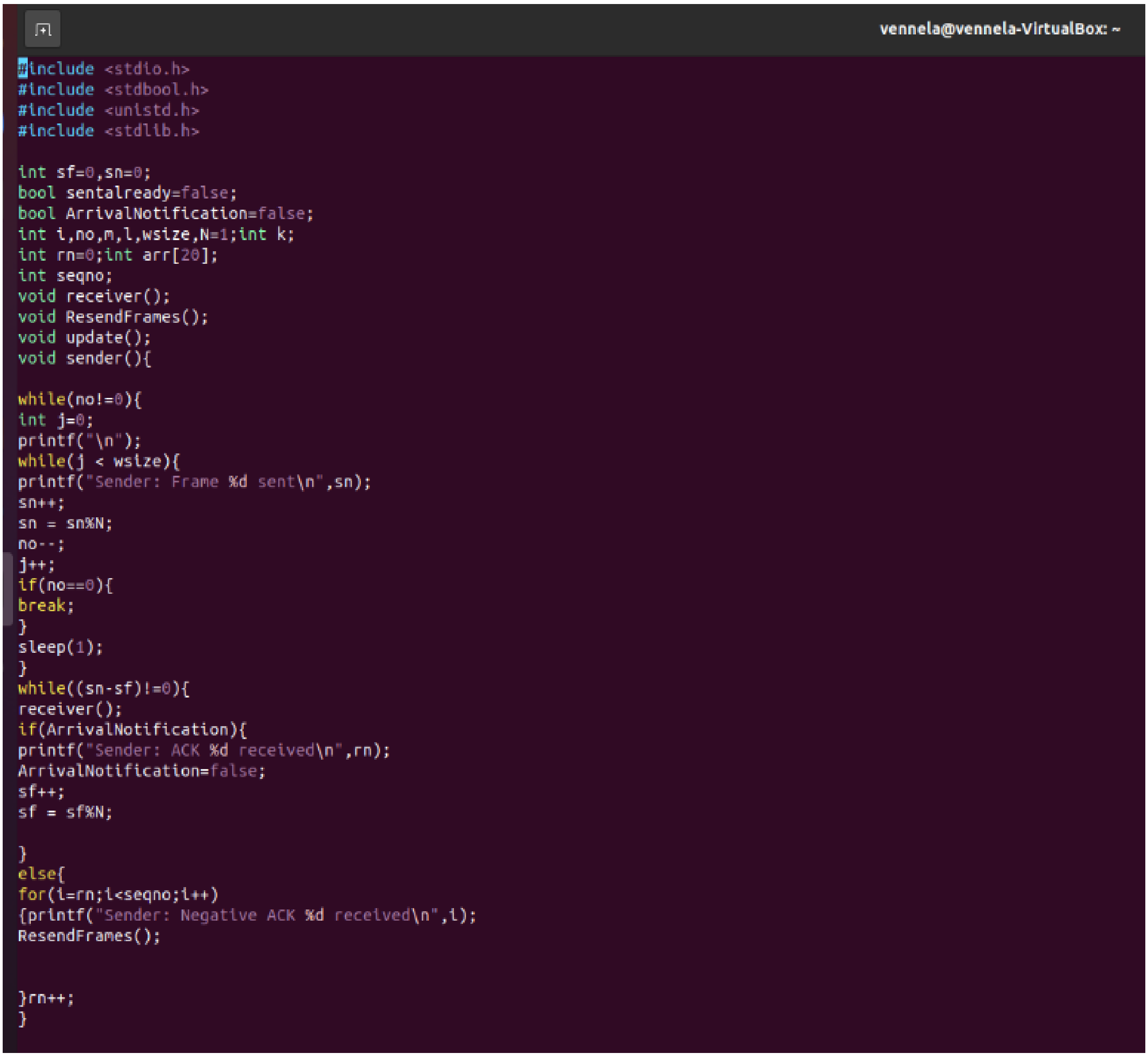
OUTPUT:



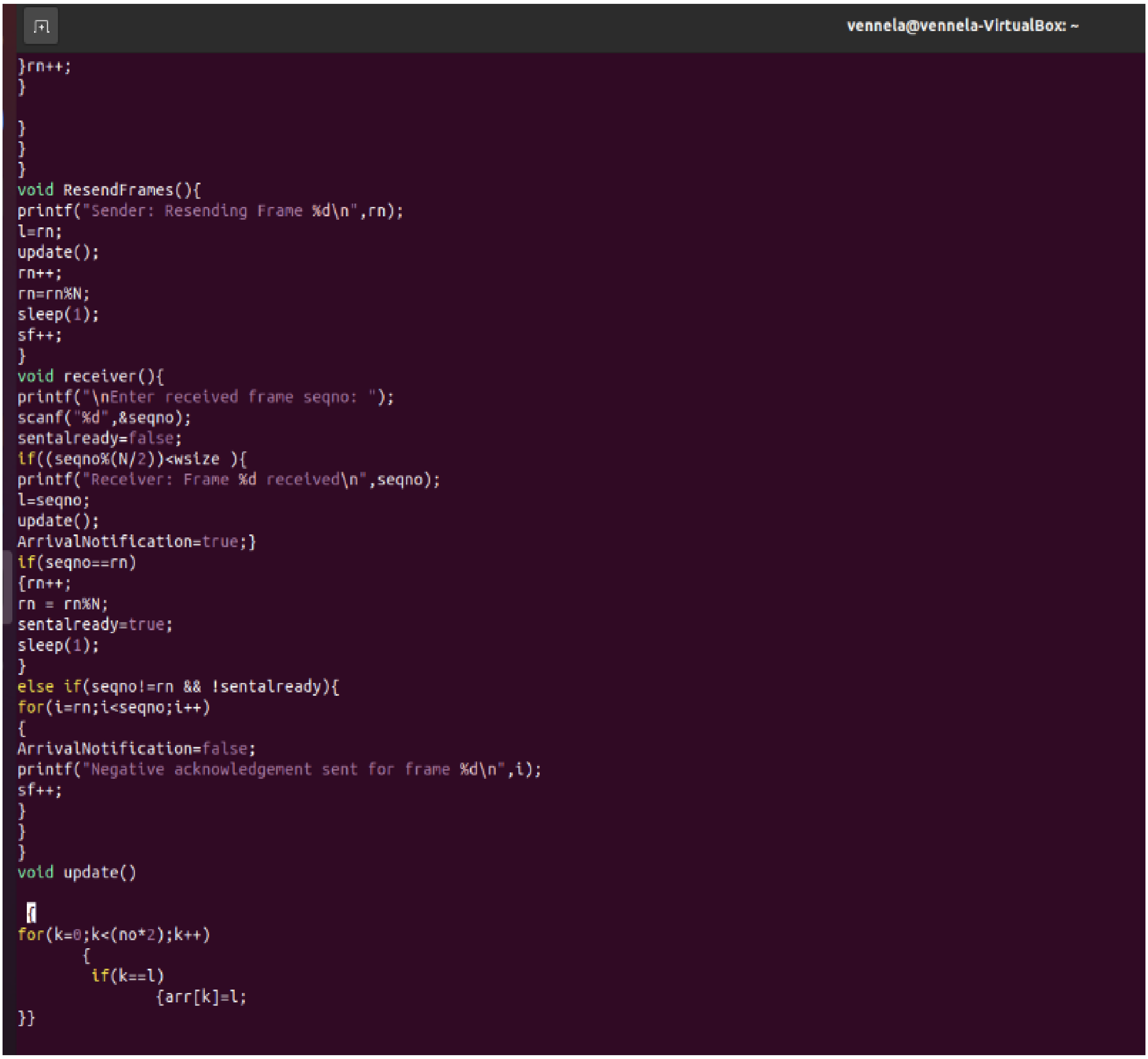
```
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

vennela@vennela-VirtualBox:~$ ./a.out
Enter number of frames to send: 7
Enter m: 3
Window Size: 7


Sender: Frame 0 sent
Sender: Frame 1 sent
Sender: Frame 2 sent
Sender: Frame 3 sent
Sender: Frame 4 sent
Sender: Frame 5 sent
Sender: Frame 6 sent

Enter received frame seqno: 0
Receiver: Frame 0 received
Sender: ACK 1 received

Enter received frame seqno: 1
Receiver: Frame 1 received
Sender: ACK 2 received

Enter received frame seqno: 3
Sender: Resending Frame 2
Sender: Resending Frame 3
Sender: Resending Frame 4
Sender: Resending Frame 5
Sender: Resending Frame 6

Enter received frame seqno: 2
Receiver: Frame 2 received
Sender: ACK 3 received

Enter received frame seqno: 3
Receiver: Frame 3 received
Sender: ACK 4 received

Enter received frame seqno: 5
Sender: Resending Frame 4
Sender: Resending Frame 5
Sender: Resending Frame 6

Enter received frame seqno: 4
Receiver: Frame 4 received
Sender: ACK 5 received
```

3. C program to implement Selective Repeat ARQ

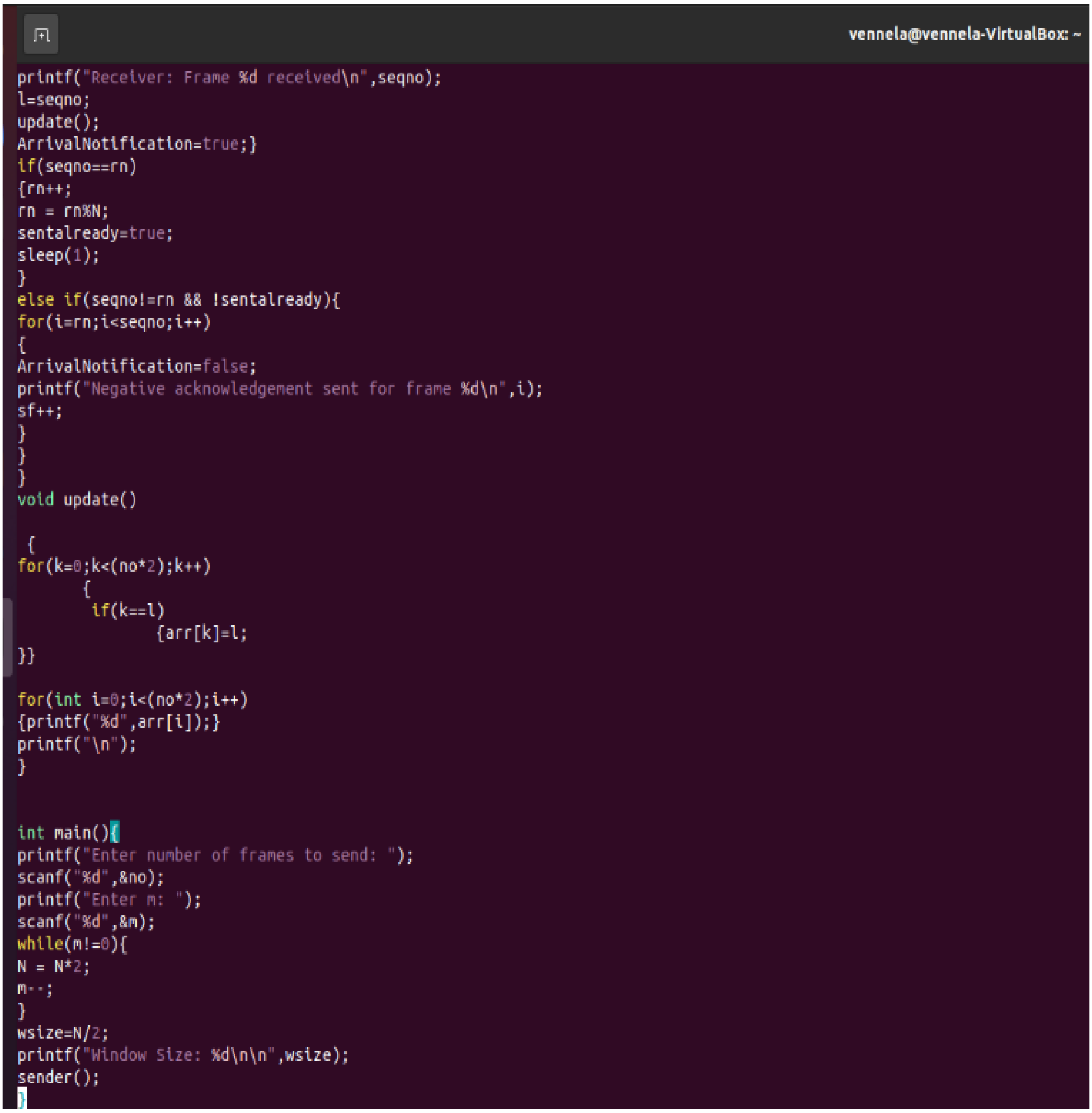
SOURCE CODE:



```
#include <stdio.h>
#include <stdbool.h>
#include <unistd.h>
#include <stdlib.h>

int sf=0,sn=0;
bool sentalready=false;
bool ArrivalNotification=false;
int i,no,m,l,wsize,N=1;int k;
int rn=0;int arr[20];
int seqno;
void receiver();
void ResendFrames();
void update();
void sender(){

while(no!=0){
int j=0;
printf("\n");
while(j < wsize){
printf("Sender: Frame %d sent\n",sn);
sn++;
sn = sn%N;
no--;
j++;
if(no==0){
break;
}
sleep(1);
}
while((sn-sf)!=0){
receiver();
if(ArrivalNotification){
printf("Sender: ACK %d received\n",rn);
ArrivalNotification=false;
sf++;
sf = sf%N;

}
else{
for(i=rn;i<seqno;i++)
{printf("Sender: Negative ACK %d received\n",i);
ResendFrames();


}rn++;
}
```

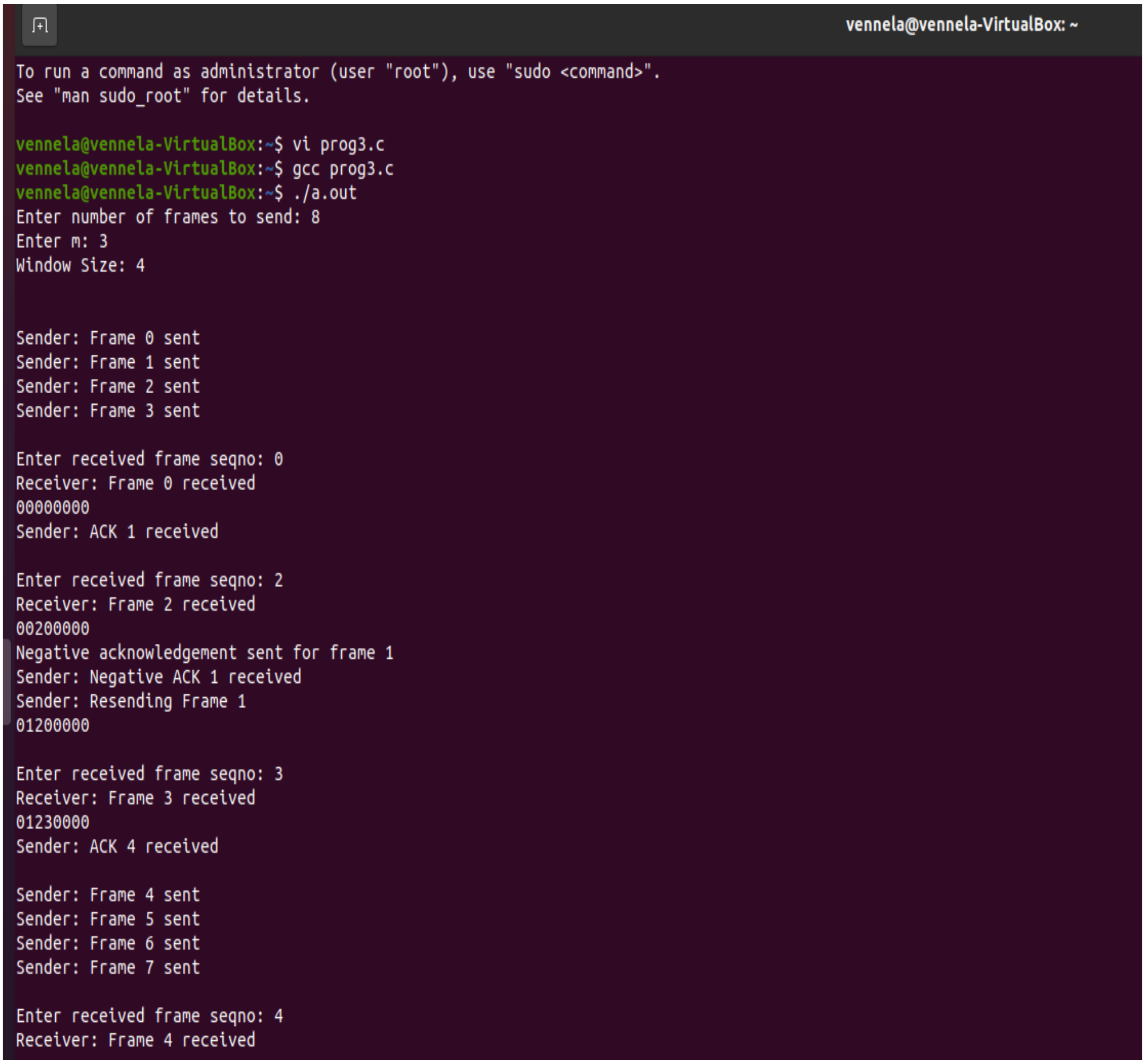


```
}rn++;
}

}
}
}
void ResendFrames(){
printf("Sender: Resending Frame %d\n",rn);
l=rn;
update();
rn++;
rn=rn%N;
sleep(1);
sf++;
}
void receiver(){
printf("\nEnter received frame seqno: ");
scanf("%d",&seqno);
sentalready=false;
if((seqno%(N/2))<wsize ){
printf("Receiver: Frame %d received\n",seqno);
l=seqno;
update();
ArrivalNotification=true;}
if(seqno==rn)
{rn++;
rn = rn%N;
sentalready=true;
sleep(1);
}
else if(seqno!=rn && !sentalready){
for(i=rn;i<seqno;i++)
{
ArrivalNotification=false;
printf("Negative acknowledgement sent for frame %d\n",i);
sf++;
}
}
}
void update()

 {
for(k=0;k<(no*2);k++)
       {
        if(k==l)
               {arr[k]=l;
}}
```



```
printf("Receiver: Frame %d received\n",seqno);
l=seqno;
update();
ArrivalNotification=true;}
if(seqno==rn)
{rn++;
rn = rn%N;
sentalready=true;
sleep(1);
}
else if(seqno!=rn && !sentalready){
for(i=rn;i<seqno;i++)
{
ArrivalNotification=false;
printf("Negative acknowledgement sent for frame %d\n",i);
sf++;
}
}
}
void update()

 {
for(k=0;k<(no*2);k++)
       {
        if(k==l)
               {arr[k]=l;
}}

for(int i=0;i<(no*2);i++)
{printf("%d",arr[i]);}
printf("\n");
}


int main(){
printf("Enter number of frames to send: ");
scanf("%d",&no);
printf("Enter m: ");
scanf("%d",&m);
while(m!=0){
N = N*2;
m--;
}
wsize=N/2;
printf("Window Size: %d\n\n",wsize);
sender();
}
```

OUTPUT:



```
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

vennela@vennela-VirtualBox:~$ vi prog3.c
vennela@vennela-VirtualBox:~$ gcc prog3.c
vennela@vennela-VirtualBox:~$ ./a.out
Enter number of frames to send: 8
Enter m: 3
Window Size: 4


Sender: Frame 0 sent
Sender: Frame 1 sent
Sender: Frame 2 sent
Sender: Frame 3 sent

Enter received frame seqno: 0
Receiver: Frame 0 received
00000000
Sender: ACK 1 received

Enter received frame seqno: 2
Receiver: Frame 2 received
00200000
Negative acknowledgement sent for frame 1
Sender: Negative ACK 1 received
Sender: Resending Frame 1
01200000

Enter received frame seqno: 3
Receiver: Frame 3 received
01230000
Sender: ACK 4 received

Sender: Frame 4 sent
Sender: Frame 5 sent
Sender: Frame 6 sent
Sender: Frame 7 sent

Enter received frame seqno: 4
Receiver: Frame 4 received
```