**Sender\_Reciever:**

**#include**<stdio.h>

**#include**<string.h>

**#include**<stdlib.h>

char res[100];

void **sender**()

{

    int n,i,len;

    char frame[100],l[100];

**printf**("Enter the number of frames\n");

**scanf**("%d",&n);

**for**(i=0;i**<**n;i++)

    {

**printf**("Enter the frame %d\n",i+1);

**scanf**("%s",&frame);

        len=**strlen**(frame);

**printf**("Number of bytes in the frame %d = %d\n",i+1,len);

**sprintf**(l,"%d",len);

**strcat**(l,frame);

**strcat**(res,l);

    }

}

void **reciever**()

{

    int len,i,j;

**printf**("Received frame \n");

**for**(i=0;i**<strlen**(res);i++)

        {

        len=res[i]-'0';

**for**(j=i+1;j**<=**(i+len);j++)

**printf**("%c",res[j]);

        i=i+len;

**printf**("\n");

        }

}

int **main**()

{

**sender**();

**reciever**();

**return** 0;

}

**Bitstuffing :**

**#include**<stdio.h>

**#include**<stdlib.h>

**#include**<math.h>

void **receiver**(int \*frame, int l2)

{

    int i, j, counter, l3;

    int msg[100];

    l3=l2-8;

    j=0;

**for**(i=8;i**<**l3;i++)

    {

**if**(frame[i]**==**0)

        {

**if**(counter**==**5)

            {

                msg[j]=frame[i];

                j++;

                counter=0;

            }

**else**

            {

                 msg[j]=frame[i];

                 j++;

                 counter++;

            }

        }

**else**

        {

            msg[j]=frame[i];

            j++;

            counter++;

        }

    }

**printf**("Received message is: \n");

**for**(i=0;i**<**j;i++)

**printf**("%d",msg[i]);

**printf**("\n");

}

void **sender**()

{

    int data[100], frame[100], framelen=0, n, i, j=8;

    int count, zeroadded=0, zero;

**printf**("Enter the number of bits\n");

**scanf**("%d",&n);

**printf**("Enter data for bits\n");

**for**(i=0;i**<**n;i++)

**scanf**("%d",&data[i]);

    frame[0]=0;

    frame[1]=1;

    frame[2]=1;

    frame[3]=1;

    frame[4]=1;

    frame[5]=1;

    frame[6]=1;

    frame[7]=0;

**for**(i=0;i**<**n;i++)

    {

**if**(data[i]**==**0)

        {

            frame[j]=data[i];

            j++;

            count=0;

            zero=1;

        }

**else**

        {

**if**((count**==**5)**&&**(zero**==**1))

            {

                frame[j]=0;

                j++;

                zeroadded++;

                frame[j]=data[i];

                j++;

                count=0;

            }

**else**

            {

                frame[j]=data[i];

                j++;

                count++;

            }

        }

     }

    frame[j++]=0;

    frame[j++]=1;

    frame[j++]=1;

    frame[j++]=1;

    frame[j++]=1;

    frame[j++]=1;

    frame[j++]=1;

    frame[j++]=0;

    framelen=n+16+zeroadded;

**printf**("length of frame sent %d \n",framelen);

**printf**("Frame sent: ");

**for**(i=0;i**<**framelen;i++)

**printf**("%d",frame[i]);

**printf**("\n");

**receiver**(frame,framelen);

}

void **main**()

{

**sender**();

}

**CRC:**

**#include**<stdio.h>

**#include**<stdlib.h>

int **main**()

{

    int c[50],b[50];

    int i,j,m,n=3,e,pos,fail=1;

**printf**("Enter no of bits for messages:\n");

**scanf**("%d",&m);

**printf**("Enter the message to be transmitted:\n");

**for**(i=0;i**<**m;i++)

    {

**scanf**("%d",&b[i] );

        c[i]= b[i];

    }

**for**(i=m;i**<**m+n-1;i++) // *append n-1 zeros at the end of message*

        c[i]=b[i]=0;

**if**(m**<**n)

    {

**printf**("Error!!!Enter bits again");

**exit**(0);

    }

**printf** ("Message to be sent is:\n");

**for** (i=0; i**<**m+n-1; i++)

**printf** ("%d", c[i]);

**printf** ("\nIntroduce error?? yes or no[1 or 0]:\n");

**scanf** ("%d", &e);

**if** (e**==**1)

    {

**printf**("Enter the position to be changed:");

**scanf**("%d",&pos);

**if**( pos**>**m)

**printf** ("\nInvalid position!!");

**else**

**if**(c[pos-1]**==**0)

            {

                c[pos-1]=1;

                fail=0;

            }

**else**

            {

                c[pos-1]=0;

                fail=0;

            }

    }

**printf** ("message received at receiver site:\n");

**for** (i=0; i**<**m+n-1; i++)

**printf** ("%d", c[i]);

**if** (fail)

**printf** ("\n successful transfer of message\n");

**else**{

**printf** ("Error in the message");

}

**return** 0;

}

**Distance Vector :**

**#include**<stdio.h>

**struct** node

{

    int dist[20];

    int from[20];

}rt[10];

int **main**()

{

    int dmat[20][20];

    int n, i, j, k, count=1;

**printf** ("\nEnter the number of nodes :\n");

**scanf** ("%d", &n);

**printf** ("\nEnter the cost matrix :\n");

**for** (i=1; i**<=**n; i++)

**for** (j=1; j**<=**n; j++)

        {

**scanf** ("%d", &dmat[i][j]);

            dmat [i][i] = 0;

            rt[i]**.**dist[j] = dmat[i][j];

            rt[i]**.**from[j] = j;

        }

**do**

    {

**for** (i=1; i**<=**n; i++)

**for** (j=1; j**<=**n; j++)

**for** (k=1; k**<=**n; k++)

**if** (rt[i]**.**dist[j] **>** dmat[i][k] + rt[k]**.**dist[j])

        {

            rt[i]**.**dist[j] = rt[i]**.**dist[k] + rt[k]**.**dist[j];

            rt[i]**.**from[j] = k;

        }

        count++;

    }

**while** (count **<** n);

**for** (i=1; i**<=**n; i++)

    {

**printf** ("\nDistance Table for router %c is \n", i+64);

**for** (j=1; j**<=**n; j++)

**printf** ("\tNode %d Via %d, Distance : %d\n", j, rt[i]**.**from[j], rt[i]**.**dist[j]);

    }

**return** 0;

}

**Leaky Bucket :**

**#include**<stdio.h>

**#include**<stdlib.h>

int **main**()

{

    int i,j,qs,ns,t,count,size,a,choice,p[10],cap,rate,delay,flag=1,t1,t2;

**printf**("enter the queue size:");

**scanf**("%d",&size);

    count=size;

**printf**("enter leaky bucket capacity:");

**scanf**("%d",&cap);

    qs=cap;

**printf**("enter the size of the packets in the queue:");

**for**(i=0;i**<**size;i++)

    {

**scanf**("%d",&a);

**if**(a**>**cap)

        {

            i--;

**printf**("packets cannot be entered");

        }

**else**

            p[i]=a;

    }

**printf**("enter the output rate:");

**scanf**("%d",&rate);

    delay=cap/rate;

**printf**("delay=%d\n",delay);

**while**(flag)

    {

        qs=cap;

**while**(qs**>=**p[0]**&&**count**>**0)

        {

**printf**("\npacket of size %d is put into the bucket\n",p[0]);

            qs=qs-p[0];

**printf**("\navailable space %d\n",qs);

            count--;

**for**(i=0;i**<**count;i++)

                p[i]=p[i+1];

        }

        t=delay;

        long int t1=(long)**time**(NULL);

        long int t2=(long)**time**(NULL);

**while**((t2-t1)**<**delay)

        {

            t2=(long)**time**(NULL);

**if**((delay-t)**==**(t2-t1))

            {

**printf**("\ntransmitting packets in the leaky bucket:%d seconds\n",t);

                t--;

            }

        }

**printf**("\npackets in the queue:\n");

**for**(i=0;i**<**count;i++)

**printf**("%d\t",p[i]);

**if**(count**==**0)

        flag=0;

        }

}

**TCP :**

**server.c :**

**#include** <stdio.h>

**#include** <stdlib.h>

**#include** <fcntl.h>

**#include** <sys/types.h>

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

**#include** <netinet/in.h>

**#include** <string.h>

**#define** PORT\_ID 8000

int **main**()

{

    char buf[300];

    int fd1,fd2,size,n;

**struct** sockaddr\_in s;

**system**("clear");

**printf**("Server is getting ready\n");

    s**.**sin\_family=AF\_INET;

    s**.**sin\_port=**htons**(PORT\_ID);

    s**.**sin\_addr**.**s\_addr=**inet\_addr**("127.0.0.1");

    fd1=**socket**(AF\_INET,SOCK\_STREAM,0);

**if**((**bind**(fd1,(**struct** sockaddr \*)&s,**sizeof**(**struct** sockaddr)))**==**-1)

**printf**("Error in socket binding\n");

**if**((**listen**(fd1,5))**==**-1)

**printf**("Error in listening\n");

**printf**("Waiting for client request\n");

    size=**sizeof**(**struct** sockaddr);

    fd2=**accept**(fd1,(**struct** sockaddr \*)&s,&size);

    size=**recv**(fd2,buf,**sizeof**(buf),0);

    buf[size]='\0';

**printf**("Filename received is %s\n",buf);

**if**((fd1=**open**(buf,O\_RDONLY))**!=**-1)

    {

**while**((n=**read**(fd1,buf,**sizeof**(buf)))**>**0)

**send**(fd2,buf,n,0);

    }

**else**

**send**(fd2,"File not found",20,0);

**close**(fd1);

**close**(fd2);

**printf**("Server terminated");

**return** 0;

}

**Client.c:**

**#include**<stdio.h>

**#include**<fcntl.h>

**#include**<sys/types.h>

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

**#include**<netinet/in.h>

**#include**<string.h>

**#define** PORT\_ID 8000

int **main**()

{

    char buf[30000];

    int fd1,n;

**struct** sockaddr\_in s;

**system**("clear");

**printf**("Enter the filename to be sent to the server\n");

**scanf**("%s",buf);

    s**.**sin\_family=AF\_INET;

    s**.**sin\_port=**htons**(PORT\_ID);

    s**.**sin\_addr**.**s\_addr=**inet\_addr**("127.0.0.1");

    fd1=**socket**(AF\_INET,SOCK\_STREAM,0);

**if**((**connect**(fd1,(**struct** socketaddr \*)&s,**sizeof**(**struct** sockaddr)))**==**-1)

**printf**("Error in socket binding\n");

**send**(fd1,buf,**strlen**(buf),0);

**printf**("\*\*\*\*Contents of the requested file is \*\*\*\* \n");

**while**((n=**recv**(fd1,buf,**sizeof**(buf),0))**>**0)

    {

        buf[n]='\0';

**printf**("%s",buf);

    }

**printf**("\n");

**close**(fd1);

**return** 0;

}

**UDP:**

**server.c:**

**#include** <stdio.h>

**#include** <stdlib.h>

**#include**<fcntl.h>

**#include**<sys/types.h>

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

**#include**<netinet/in.h>

**#include**<string.h>

**#define** PORT\_ID 8000

void **clearBuf**(char\* b){

**for** (int i = 0; i **<** 300; i++)

        b[i] = '\0';

}

int **main**(){

    char buf[300];

    int fd1,n,size;

    FILE \*fp;

**struct** sockaddr\_in s1, s2;

    int s\_length = **sizeof**(s2);

**system**("clear");

**printf**("Server is getting ready.... \n");

    s1**.**sin\_family = AF\_INET;

    s1**.**sin\_port = **htons**(PORT\_ID);

    s1**.**sin\_addr**.**s\_addr = **inet\_addr**("127.0.0.1");

    fd1 = **socket**(AF\_INET, SOCK\_DGRAM, 0);

**if**((**bind**(fd1,(**struct** sockaddr \*)&s1, **sizeof**(**struct** sockaddr)))**==**-1)

**printf**("Error in socket binding!!!!\n");

**printf**("Waiting for client request....\n");

    size = **recvfrom**(fd1,buf,**sizeof**(buf), 0,(**struct** sockaddr \*)&s2, &s\_length);

    buf[size] = '\0';

    fp = **fopen**(buf, "r");

**printf**("File Name recieved is : %s\n",buf);

**if** (fp **==** NULL){

**sendto**(fd1,"File not found .... ", 20, 0,(**struct** sockaddr \*)&s2, s\_length);

    }

**else**{

**printf**("\nFile Successfully opened!\n");

**clearBuf**(buf);

**while**(**fscanf**(fp, "%s", buf)**!=**EOF){

**sendto**(fd1,buf,**sizeof**(buf),0,(**struct** sockaddr \*)&s2, s\_length);

**clearBuf**(buf);

        }

**sendto**(fd1,NULL,0,0,(**struct** sockaddr \*)&s2, s\_length);

**fclose**(fp);

    }

**close**(fd1);

**printf**("Server terminated....\n");

**return** 0;

}

**client.c:**

**#include**<stdio.h>

**#include**<stdlib.h>

**#include**<fcntl.h>

**#include**<sys/types.h>

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

**#include**<netinet/in.h>

**#include**<string.h>

**#define** PORT\_ID 8000

void **clearBuf**(char\* b){

**for** (int i = 0; i **<** 300; i++)

        b[i] = '\0';

}

int **main**(){

    char buf[30000];

    int fd1,n;

**struct** sockaddr\_in s;

    int s\_length = **sizeof**(s);

**system**("clear");

**printf**("Enter the filename to be sent to the server \n");

**scanf**("%s",buf);

    s**.**sin\_family = AF\_INET;

    s**.**sin\_port = **htons**(PORT\_ID);

    s**.**sin\_addr**.**s\_addr = **inet\_addr**("127.0.0.1");

    fd1 = **socket**(AF\_INET, SOCK\_DGRAM, 0);

**if**((**connect**(fd1,(**struct** sockaddr \*)&s, **sizeof**(**struct** sockaddr)))**==**-1)

**printf**("Error in socket connecting!!!!\n");

**sendto**(fd1, buf, **strlen**(buf),0,(**struct** sockaddr \*)&s,**sizeof**(s));

**clearBuf**(buf);

**printf**("\*\*\*\* contents of the requested file is \*\*\*\*\n");

**while**(**recvfrom**(fd1,buf,**sizeof**(buf),0,(**struct** sockaddr \*)&s,&s\_length)){

**puts**(buf);

**clearBuf**(buf);

    }

**printf**("\n");

**close**(fd1);

**printf**("Client terminated....\n");

**return** 0;

}