SENDER:

```
import java.io.*;
import java.net.*;
public class Sender{
Socket sender;
ObjectOutputStream out;
ObjectInputStream in;
String packet,ack,str, msg;
int n,i=0,sequence=0;
Sender(){}
public void run(){
 try{
 BufferedReader br=new BufferedReader(new InputStreamReader(System.in));
System.out.println("Waiting for Connection....");
 sender = new Socket("localhost",2004);
sequence=0;

out=new ObjectOutputStream(sender.getOutputStream());
out.flush();
 in=new ObjectInputStream(sender.getInputStream());
 str=(String)in.readObject();
 System.out.println("receiver     > "+str);
System.out.println("Enter the data to send....");
packet=br.readLine();
n=packet.length();
do{
try{
 if(i<n){
msg=String.valueOf(sequence);
msg=msg.concat(packet.substring(i,i+1));
}
else if(i==n){
 msg="end";out.writeObject(msg);break;
}
out.writeObject(msg);


sequence=(sequence==0)?1:0;
out.flush();
System.out.println("data sent>"+msg);
ack=(String)in.readObject();
System.out.println("waiting for ack.....\n\n");
if(ack.equals(String.valueOf(sequence))){
i++;
```

```
System.out.println("receiver   >  "+" packet recieved\n\n");
}
else{
System.out.println("Time out resending data....\n\n");
sequence=(sequence==0)?1:0;
}
}catch(Exception e){}
}while(i<n+1);
System.out.println("All data sent. exiting.");
}catch(Exception e){}
finally{
try{
in.close();
out.close();
sender.close();
}
catch(Exception e){}
}
}
public static void main(String args[]){
Sender s=new Sender();
s.run();
}
}
```

RECEIVER:

```
import java.io.*;
import java.net.*;

public class Receiver {
   ServerSocket reciever;
   Socket connection = null;
   ObjectOutputStream out;
   ObjectInputStream in;
   String packet, ack, data = "";
   int i = 0, sequence = 0;

   Receiver() {
   }

   public String receiveData() {
      try {
         BufferedReader br = new BufferedReader(new InputStreamReader(System.in));
```

```
        reciever = new ServerSocket(2004, 10);
        System.out.println("waiting for connection...");
        connection = reciever.accept();
        sequence = 0;
        System.out.println("Connection established   :");
        out = new ObjectOutputStream(connection.getOutputStream());
        out.flush();
        in = new ObjectInputStream(connection.getInputStream());
        out.writeObject("connected    .");
        do {
           try {
              packet = (String) in.readObject();
              if (Integer.valueOf(packet.substring(0, 1)) == sequence) {
                 data += packet.substring(1);
                 sequence = (sequence == 0) ? 1 : 0;
                 System.out.println("\n\nreceiver >" + packet);
              } else {
                 System.out.println("\n\nreceiver>" + packet + "   duplicate data");
              }
              if (i < 3) {
                 out.writeObject(String.valueOf(sequence));
                 i++;
              } else {
                 out.writeObject(String.valueOf((sequence + 1) % 2));
                 i = 0;
              }
           } catch (Exception e) {
           }
        } while (!packet.equals("end"));
        System.out.println("Data received=" + data);
        out.writeObject("connection ended    .");
     } catch (Exception e) {
     } finally {
        try {
           in.close();
           out.close();
           reciever.close();
        } catch (Exception e) {
        }
     }
     return data;
  }

  public static void main(String args[]) {
```

```
        Receiver s = new Receiver();
        while (true) {
          String receivedData = s.receiveData();
          // Do something with receivedData if needed
        }
      }
    }
```

```
D:\>javac Receiver.java

D:\>java Receiver
waiting for connection...
Connection established   :


receiver >0h


receiver >1e


receiver >0l


receiver >1l


receiver>1l   duplicate data


receiver >0o
Data received=hello
waiting for connection...
```

```
D:\>java Sender
Waiting for Connection....
receiver     > connected    .
Enter the data to send....
hello
data sent>0h
waiting for ack.....


receiver   >   packet recieved


data sent>1e
waiting for ack.....


receiver   >   packet recieved


data sent>0l
waiting for ack.....


receiver   >   packet recieved


data sent>1l
waiting for ack.....
```

SENDER:

```
import java.net.*;
import java.io.*;

public class SlideSender {
   public static void main(String a[]) throws Exception {
      ServerSocket ser = new ServerSocket(10);
      Socket s = ser.accept();
      BufferedReader in = new BufferedReader(new InputStreamReader(System.in));
      BufferedReader in1 = new BufferedReader(new InputStreamReader(s.getInputStream()));
      PrintWriter p = new PrintWriter(s.getOutputStream(), true);
      String sbuff[] = new String[8];
      int sptr = 0, sws = 8, nf, ano, i;
      String ch;
      do {
         System.out.print("Enter the no. of frames : ");
         nf = Integer.parseInt(in.readLine());
         p.println(nf);
         if (nf <= sws - 1) {
            System.out.println("Enter " + nf + " Messages to be sent\n");
            for (i = 0; i < nf; i++) {
               sbuff[sptr] = in.readLine();
               p.println(sbuff[sptr]);
               sptr = ++sptr % 8;
            }
            sws -= nf;
            System.out.print("Acknowledgment received");
            ano = Integer.parseInt(in1.readLine());
            System.out.println(" for " + ano + " frames");
            sws += nf;
         } else {
            System.out.println("The no. of frames exceeds window size");
            break;
         }
         System.out.print("\nDo you want to send some more frames : ");
         ch = in.readLine();
         p.println(ch);
      } while (ch.equalsIgnoreCase("yes"));
      s.close();
   }
}
```

RECEIVER:

```
import java.net.*;
import java.io.*;

class SlideReceiver {
   public static void main(String a[]) throws Exception {
      Socket s = new Socket(InetAddress.getLocalHost(), 10);
      BufferedReader in = new BufferedReader(new InputStreamReader(s.getInputStream()));
      PrintWriter p = new PrintWriter(s.getOutputStream(), true);
      int i = 0, rptr = -1, nf, rws = 8;
      String rbuf[] = new String[8];
      String ch;
      System.out.println();
      do {
         nf = Integer.parseInt(in.readLine());
         if (nf <= rws - 1) {
            for (i = 0; i < nf; i++) {
               rptr = ++rptr % 8;
               rbuf[rptr] = in.readLine();
               System.out.println("The received Frame " + rptr + " is : " + rbuf[rptr]);
            }
            rws -= nf;
            System.out.println("\nAcknowledgment sent\n");
            p.println(rptr + 1);
            rws += nf;
         } else {
            break;
         }
         ch = in.readLine();
      } while (ch.equalsIgnoreCase("yes"));
      s.close();
   }
}
```

```
D:\>javac SlideReceiver.java

D:\>java SlideReceiver

The received Frame 0 is : Hello
The received Frame 1 is : people
The received Frame 2 is : we
The received Frame 3 is : are
The received Frame 4 is : here

Acknowledgment sent

```

```
D:\>javac SlideSender.java

D:\>java SlideSender
Enter the no. of frames : 5
Enter 5 Messages to be sent

Hello
people
we
are
here
Acknowledgment received for 5 frames

Do you want to send some more frames :
```