```java
import ithakimodem.*;

import java.io.BufferedWriter;
import java.io.File;
import java.io.FileOutputStream;
import java.io.FileWriter;
import java.io.IOException;
import java.util.ArrayList;


public class UserApplication {
    public static void main(String[] param) {
        (new UserApplication()).Receiver();
    }

    public void Receiver() {

        Modem modem;
        modem=new Modem();
        modem.setSpeed(80000);
        modem.setTimeout(4000);
        modem.open("ithaki");

        int k=0;
        String welcomeMessage="";

        for (;;) {
            try {
                k=modem.read();

                if (k==-1){
                    System.out.print("We lost Ithaki!\n");
                    break;
                }

                System.out.print((char)k);
                welcomeMessage+=(char)k;

                if(welcomeMessage.contains("\r\n\n\n")){
                    System.out.print("\n---Rx Over---\n");
                    break;
                }

            } catch (Exception x) {
                System.out.print("Modem Exception!\n");
                break;
            }
        }
```

```
        // ******************
        // ****Echo requst****
        // ******************

        String echoStr="E7091\r";
        ArrayList<Long> times=new ArrayList<>();
        long durationStart=System.currentTimeMillis();

        do{

            long startTime = System.currentTimeMillis();
            String echoMessage="";
            modem.write(echoStr.getBytes());

            for (;;) {
                try {
                    k=modem.read();

                    if (k==-1){
                        System.out.print("We lost Ithaki!\n");
                        break;
                    }

                    System.out.print((char)k);
                    echoMessage+=(char)k;

                    if( echoMessage.contains("PSTART") &&
echoMessage.contains("PSTOP") ){
                        System.out.print("\t---Rx Over---\n");
                        break;
                    }

                }catch (Exception x) {
                    System.out.print("Modem Exception!\n");
                    break;
                }
            }

            long stopTime = System.currentTimeMillis();
            times.add(stopTime-startTime);

        }while(System.currentTimeMillis()-durationStart<240000);


        String timesTxt="C:\\Users\\Thanasis\\OneDrive - Αριστοτέλειο
Πανεπιστήμιο Θεσσαλονίκης\\6ο εξάμηνο\\Δίκτυα Ι\\Networks_Ithaki\\times.txt";
        try {
```

```
            BufferedWriter timesWriter = new BufferedWriter(new
FileWriter(timesTxt));
            for (int i = 0; i < times.size(); i++) {
                timesWriter.write(times.get(i)+"\n");
            }
            timesWriter.flush();
            timesWriter.close();
        } catch (IOException e) {

        }


        // ******************
        // ****Image requst***
        // ******************

        ArrayList<Integer> image=new ArrayList<Integer>();

        String imageStr = "M1207CAM=PTZ\r";
        modem.write(imageStr.getBytes());

        for (;;) {
            try {
                k = modem.read();

                if (k == -1) {
                    System.out.print("We lost Ithaki!\n");
                    break;
                }

                image.add(k);

                if((image.lastIndexOf(0xFF)==image.size()-2) &&
(image.lastIndexOf(0xD9)==image.size()-1)){
                    System.out.print("\n---Image Received!---\n");
                    break;
                }

            }catch (Exception x) {
                System.out.print("\nModem Exception!\n");
                break;
            }
        }

        byte[] imageBytes=new byte[image.size()-image.indexOf(0xFF)];

        for (int a = image.indexOf(0xFF) ; a < image.size(); a++) {
            imageBytes[a-image.indexOf(0xFF)] = image.get(a).byteValue();
        }
```

```
        File imageJpg=new File("C:\\Users\\Thanasis\\OneDrive - Αριστοτέλειο
Πανεπιστήμιο Θεσσαλονίκης\\6ο εξάμηνο\\Δίκτυα
I\\Networks_Ithaki\\egnatia_wide.jpg");
        try {
            FileOutputStream im_stream=new FileOutputStream(imageJpg);
            im_stream.write(imageBytes);
            im_stream.flush();
            im_stream.close();
        } catch (Exception e) {

        }


        // ******************
        // ****Image requst***
        // ****with errors****
        // ******************

        ArrayList<Integer> imageError=new ArrayList<Integer>();

        String imageErrorStr = "G8501CAM=PTZ\r";
        modem.write(imageErrorStr.getBytes());

        for (;;) {
            try {
                k = modem.read();

                if (k == -1) {
                    System.out.print("We lost Ithaki!\n");
                    break;
                }

                imageError.add(k);

                if((imageError.lastIndexOf(0xFF)==imageError.size()-2) &&
(imageError.lastIndexOf(0xD9)==imageError.size()-1)){
                    System.out.print("\n---Image with Errors Received!---\n");
                    break;
                }

            }catch (Exception x) {
                System.out.print("\nModem Exception!\n");
                break;
            }
        }
```

```
        byte[] imageErrorBytes=new byte[imageError.size()-
imageError.indexOf(0xFF)];

        for (int a = imageError.indexOf(0xFF) ; a < imageError.size(); a++) {
            imageErrorBytes[a-imageError.indexOf(0xFF)] =
imageError.get(a).byteValue();
        }

        File imageErrorJpg=new File("C:\\Users\\Thanasis\\OneDrive -
Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης\\6ο εξάμηνο\\Δίκτυα
I\\Networks_Ithaki\\egnatiaErrors_wide.jpg");
        try {
            FileOutputStream im_er_stream=new FileOutputStream(imageErrorJpg);
            im_er_stream.write(imageErrorBytes);
            im_er_stream.flush();
            im_er_stream.close();
        } catch (Exception e) {

        }


        // ******************
        // ****GPS requst*****
        // ******************

        String GPSMessage="";

        String GPSStr = "P1196R=1064430\r";
        modem.write(GPSStr.getBytes());

        for (;;) {
            try {
                k = modem.read();

                if (k == -1) {
                    System.out.print("We lost Ithaki!\n");
                    break;
                }

                System.out.print((char)k);

                GPSMessage+=(char)k;

                if((GPSMessage.contains("START ITHAKI GPS TRACKING\r")) &&
(GPSMessage.contains("STOP ITHAKI GPS TRACKING\r"))){
                    System.out.print("\n---GPS Coordinates Received!---\n");
                    break;
                }
```

```
            }catch (Exception x) {
                System.out.print("\nModem Exception!\n");
                break;
            }
        }

        String[] messageLine=GPSMessage.split("\n");
        String[][] messageArr=new String[30][15];
        for(int i=0; i<30;i++){
            messageArr[i]=messageLine[i+1].split(",");
        }

        String TCommands="";
        for(int i=0; i<30; i+=4){
            int
latDeg=(int)Double.parseDouble(messageArr[i][2])/100;               /*DD */
            int
latMin=(int)Double.parseDouble(messageArr[i][2])%100;              /*EE */
            int
latMinMin=(int)(Double.parseDouble(messageArr[i][2])*100)%100;    /*ZZ */
            int latSec=(int)(latMinMin*0.6); //minute to second conversion
            int
longDeg=(int)Double.parseDouble(messageArr[i][4])/100;              /*AA */
            int
longMin=(int)Double.parseDouble(messageArr[i][4])%100;             /*BB */
            int
longMinMin=(int)(Double.parseDouble(messageArr[i][4])*100)%100;   /*CC */
            int longSec=(int)(longMinMin*0.6); //minute to second conversion

            TCommands=TCommands+"T="+Integer.toString(longDeg)+Integer.toStrin
g(longMin)+Integer.toString(longSec)
                +Integer.toString(latDeg)+Integer.toString(latMin)+Integer.toS
tring(latSec);

            System.out.println(TCommands);
        }

        ArrayList<Integer> GPSImage=new ArrayList<Integer>();

        modem.write(("P1196"+TCommands+"\r").getBytes());

        for (;;) {
            try {
                k = modem.read();

                if (k == -1) {
                    System.out.print("We lost Ithaki!\n");
```

```
                    break;
                }

                GPSImage.add(k);

                if((GPSImage.lastIndexOf(0xFF)==GPSImage.size()-2) &&
(GPSImage.lastIndexOf(0xD9)==GPSImage.size()-1)){
                    System.out.print("\n---Google Maps Image Received!---\n");
                    break;
                }

            }catch (Exception x) {
                System.out.print("\nModem Exception!\n");
                break;
            }
        }

        byte[] GPSImageBytes=new byte[GPSImage.size()-GPSImage.indexOf(0xFF)];

        for (int a = GPSImage.indexOf(0xFF) ; a < GPSImage.size(); a++) {
            GPSImageBytes[a-GPSImage.indexOf(0xFF)] =
GPSImage.get(a).byteValue();
        }

        File GPSImageJpg=new File("C:\\Users\\Thanasis\\OneDrive -
Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης\\6ο εξάμηνο\\Δίκτυα
I\\Networks_Ithaki\\gps_coords.jpg");
        try {
            FileOutputStream gps_im_stream=new FileOutputStream(GPSImageJpg);
            gps_im_stream.write(GPSImageBytes);
            gps_im_stream.flush();
            gps_im_stream.close();
        } catch (Exception e) {

        }

        // *************************
        // ****ARQ Implementation****
        // *************************

        String[] arqStr={"Q0267\r","R5043\r"};
        ArrayList<Long> arqTimes=new ArrayList<>();
        ArrayList<Integer> arqResends=new ArrayList<>();
        int packetCount=0;
        int errorCount=0;
        int errorSum=0;
        int errorFlag=0;
        long arqStartTime=0;
```

```
        long arqDurationStart=System.currentTimeMillis();

        do{

            String arqMessage="";
            if(errorFlag==0){
                arqStartTime = System.currentTimeMillis();
            }

            modem.write(arqStr[errorFlag].getBytes());

            for (;;) {
                try {
                    k=modem.read();

                    if (k==-1){
                        System.out.print("We lost Ithaki!\n");
                        break;
                    }

                    System.out.print((char)k);

                    arqMessage+=(char)k;

                    if( arqMessage.contains("PSTART") &&
arqMessage.contains("PSTOP") ){
                        System.out.print("\t---Rx Over---\n");
                        break;
                    }

                }catch (Exception x) {
                    System.out.print("Modem Exception!\n");
                    break;
                }
            }

            String arqData=arqMessage.substring(31, 47);
            String arqFCS=arqMessage.substring(49, 52);

            int xor=arqData.charAt(0);
            for(int i=0; i<arqData.length()-1;i++){
                xor=xor^arqData.charAt(i+1);
            }

            if(xor==Integer.parseInt(arqFCS)){

                long arqStopTime = System.currentTimeMillis();
                arqTimes.add(arqStopTime-arqStartTime);
```

```
                arqResends.add(errorCount);
                errorCount=0;

                System.out.println("No errors in packet!");

                errorFlag=0;
                packetCount++;
            }else{
                System.out.println("Errors in packet,resend requested!");
                errorFlag=1;
                errorCount++;
                packetCount++;
            }

            errorSum+=errorCount;
        }while(System.currentTimeMillis()-arqDurationStart<240000);

        System.out.println("Packet error count:"+errorSum);
        System.out.println("Packet count:"+packetCount);
        System.out.println("PacketLoss:"+((double)errorSum)/packetCount);


        String arqTimesTxt="C:\\Users\\Thanasis\\OneDrive - Αριστοτέλειο
Πανεπιστήμιο Θεσσαλονίκης\\6ο εξάμηνο\\Δίκτυα
I\\Networks_Ithaki\\arq_times.txt";
        try {
            BufferedWriter arqTimesWriter = new BufferedWriter(new
FileWriter(arqTimesTxt));
            for (int i = 0; i < arqTimes.size(); i++) {
                arqTimesWriter.write(arqTimes.get(i)+"\n");
            }
            arqTimesWriter.flush();
            arqTimesWriter.close();
        } catch (IOException e) {

        }

        String arqResendsTxt="C:\\Users\\Thanasis\\OneDrive - Αριστοτέλειο
Πανεπιστήμιο Θεσσαλονίκης\\6ο εξάμηνο\\Δίκτυα
I\\Networks_Ithaki\\arq_resends.txt";
        try {
            BufferedWriter arqResendsWriter = new BufferedWriter(new
FileWriter(arqResendsTxt));
            for (int i = 0; i < arqResends.size(); i++) {
                arqResendsWriter.write(arqResends.get(i)+"\n");
            }
            arqResendsWriter.flush();
            arqResendsWriter.close();
        } catch (IOException e) {
```

```
        }

        modem.close();
        System.out.println("Router Down!");
    }
}
```