

Experiment 2

Aim: Implementation of Bluetooth using J2ME.

Theory:

Bluetooth is a very simple type of wireless networking that can allow up to eight devices to be connected together in a mini-network.

It is very short range in operation, and so is considered to be for 'personal' networking. With a range typically under 30ft, this allows enough distance to perhaps communicate across your office, but not any further. This short range is also its major security feature - anyone wishing to eavesdrop on your Bluetooth communications would not only need special equipment but would also need to be quite close to you.

It is a moderately slow type of networking, but it can transfer data sufficiently fast enough for most typical applications.

Bluetooth is hoped to be a very low cost type of networking, and, as it becomes more widespread, the cost of adding Bluetooth to devices should drop down to perhaps no more than an extra \$5-10 on the selling price.

Bluetooth is designed to be compatible across a range of very different operating systems and devices, including things that you would not normally think of as being 'computer' type items - for example, some types of headset. Bluetooth networking can enable the headset to connect with other devices such as your phone, your MP3 player, your computer, or your PDA.

A Bluetooth enabled headset would mean that you can leave your cellphone in your pocket or briefcase, but still receive incoming phone calls. If your cellphone supports voice recognition for dialing out, you can even place calls as well as receive them, while never needing to reach for your phone. The safety benefits of this, if you're driving, are obvious.

Bluetooth can also help different devices to communicate with each other. For example, you might have a phone, a PDA, and a computer. If all three devices have Bluetooth capabilities, then (with the appropriate software on each device) you can probably share contact information between all three devices quickly and conveniently. And you can look up a phone number on your PDA (or laptop) and then place a call directly from the laptop or PDA, without needing to touch your cellphone.

Bluetooth is not a magical solution giving universal connectivity between devices. Each device also needs to have the appropriate software as well as the basic Bluetooth communication

capability, and so sometimes the promise and theory of what could be possible is not fully matched by the reality.

For best compatibility, devices should support the Bluetooth 1.1 standard

Bluetooth Range

Most Bluetooth devices are described as 'Class 2'. These are very low power (typically 1 milliwatt - 1/1000th of a watt) and have a range of about 10 m (33 ft).

Some devices - for example, some plug in 'dongles' that can be added to laptop computers - are Class 1. These have a range comparable to that of Wi-Fi, ie, 100 m or 330 ft.

With Bluetooth, short range is actually a benefit, because it reduces the chance of interference between your Bluetooth devices and those belonging to other people nearby.

Devices that Use Bluetooth

A limited, but growing number of devices use Bluetooth at present. Devices that are starting to have Bluetooth connectivity built in include:

- Digital cameras and camcorders
- Printers

- Scanners
- Cell Phones
- PDAs
- Laptops
- Keyboards and Mice
- Headsets
- In-car handsfree kits
- GPS navigation receivers
- Home appliances (microwaves, washers, driers, refrigerators)

In addition, add-on Bluetooth adapters are available for computers (e.g. with a USB interface) and for PDAs (e.g. SD cards).

Code:

Client:

```
import javax.microedition.midlet.*;
import javax.microedition.lcdui.*;
import javax.microedition.io.*;
import javax.bluetooth.*;
import java.util.*;

public class BluetoothClientMIDlet extends javax.microedition.midlet.MIDlet
implements CommandListener, DiscoveryListener {
    private Display display;
    private Form form;
    private Command connect;
    private Command send;
    private Command exit;
    private boolean init;
    private LocalDevice localDevice;
    private DiscoveryAgent dAgent;
    private L2CAPConnection conn;
    private static final UUID MY_UUID = new
UUID("F0E0D0C0B0A000908070605040302010",
false);
    private ServiceRecord record;
    private String serverAdd;
    public BluetoothClientMIDlet() {}
    public void startApp() {
        if (init == false) {
            this.display = Display.getDisplay(this);
            connect = new Command("Connect", Command.SCREEN, 1);
            send = new Command("Send", Command.SCREEN, 1);
            exit = new Command("Exit", Command.EXIT, 1);
            form = new Form("Bluetooth Client");
            form.addCommand(connect);
            form.addCommand(send);
            form.addCommand(exit);
            form.setCommandListener(this);
            try {
                localDevice = LocalDevice.getLocalDevice();
                localDevice.setDiscoverable(DiscoveryAgent.GIAC);
                dAgent = localDevice.getDiscoveryAgent();
            } catch (BluetoothStateException bse) {
                bse.printStackTrace();
            }
            init = true;
        }
    }
}
```

```

}
display.setCurrent(form);
}
public void pauseApp() {}
public void destroyApp(boolean unconditional) {
try {
conn.close();
} catch (Exception e) {
e.printStackTrace();
}
}
public void setDisplayable(Displayable d) {
this.display.setCurrent(d);
}
public void commandAction(Command c, Displayable d) {
if (c == connect) {
try {
dAgent.startInquiry(DiscoveryAgent.GIAC, this);
} catch (BluetoothStateException bse) {
bse.printStackTrace();
}
} else if (c == send) {
Thread thread = new Thread() {
public void run() {
send();
}
};
thread.start();
} else {
notifyDestroyed();
}
}
private void send() {
try {
conn.send("Message from Client".getBytes());
} catch (Exception e) {
e.printStackTrace();
}
}
public void deviceDiscovered(RemoteDevice btDevice, DeviceClass cod) {
UUID[] UUIDS = {
MY_UUID
};
try {

```

```

dAgent.searchServices(null, UUIDS, btDevice, this);
System.out.println("Device : " +
btDevice.getBluetoothAddress());
} catch (Exception e) {
e.printStackTrace();
}
}
public void inquiryCompleted(int discType) {}
public void servicesDiscovered(int transID, ServiceRecord[] servRecord) {
try {
serverAdd =

servRecord[0].getConnectionURL(ServiceRecord.AUTHENTICATE_ENCRYPT, false);
conn = (L2CAPConnection) Connector.open(serverAdd +
";ReceiveMTU=512;TransmitMTU=512");
System.out.println("Server Connection URL - " + serverAdd);
} catch (Exception e) {
e.printStackTrace();
}
}
public void serviceSearchCompleted(int transID, int respCode) {}
}

```

Server:

```

import javax.microedition.midlet.*;
import javax.microedition.lcdui.*;
import javax.microedition.io.*;
import javax.bluetooth.*;
import java.util.*;

public class BluetoothServerMIDlet extends javax.microedition.midlet.MIDlet implements
CommandListener
{
    // LCDUI variables
    private Display display ;
    private Form form ;
    private Command search ;
    private Command server ;
    private Command send ;
    private Command receive ;
    private Command stop ;
    private Command exit ;

    private boolean init ;

```

```

// Bluetooth variables
private LocalDevice localDevice ;
private DiscoveryAgent dAgent ;
private L2CAPConnectionNotifier serverConnNotifier ;
private L2CAPConnection serverConn ;

/** Describes this server */
private static final UUID MY_UUID = new UUID("F0E0D0C0B0A000908070605040302010",
false);

/** Keeps the information about this server. */
private ServiceRecord record;

private Thread thread ;
public void startApp()
{

    if(init == false)
    {
        this.display = Display.getDisplay(this) ;

        receive = new Command("Receive",Command.SCREEN,1) ;
        exit = new Command("Exit",Command.EXIT,1) ;
        form = new Form("Bluetooth Server") ;
        form.addCommand(receive) ;
        form.addCommand(exit) ;
        form.setCommandListener(this) ;
        display.setCurrent(form) ;

        try
        {
            // Getting the local device
            localDevice = LocalDevice.getLocalDevice() ;
            localDevice.setDiscoverable(DiscoveryAgent.GIAC) ; //
Setting status to General/Unlimited Inquiry Access Code (GIAC) mode

            thread = new Thread()
            {
                public void run()
                {
                    startServer() ;
                }
            };

```

```

        thread.run() ;
    }
    catch(BluetoothStateException bse)
    {
        bse.printStackTrace() ;
    }

    init = true ;
}

}

public void pauseApp()
{

}

public void destroyApp(boolean unconditional)
{

}

public void commandAction(Command c, Displayable d)
{
    if(c == receive)
    {
        try
        {
            Thread thread1 = new Thread()
            {
                public void run()
                {
                    receive() ;
                }
            };

            thread1.start() ;
        }
        catch (Exception e)
        {
            e.printStackTrace() ;
        }
    }
}

```

```

        }
        else
        {
            notifyDestroyed() ;
        }
    }

    private void startServer()
    {
        try
        {
            serverConnNotifier
(L2CAPConnectionNotifier)Connector.open("btl2cap://localhost:" + MY_UUID.toString() +
";ReceiveMTU=512;TransmitMTU=512");
            serverConn = serverConnNotifier.acceptAndOpen() ;
            record = localDevice.getRecord(serverConnNotifier);
        }
        catch(Exception e)
        {
            e.printStackTrace() ;
        }
    }

    private void receive()
    {
        byte [] data ;
        data = new byte[100] ;

        try
        {
            if (serverConn.ready() == true)
            {
                serverConn.receive(data) ;
            }

            form.deleteAll() ;
            form.append(new String(data)) ;
        }
        catch(Exception e)
        {
            e.printStackTrace() ;
        }
    }
}

```


Output:



Conclusion:

Bluetooth specifications allow for developing interactive services and applications over interoperable radio modules and data communication protocols. Even though Bluetooth technology is making tremendous progress, it has some security issues. Hence Bluetooth wireless technology has not been able to introduce itself in fields of banking, security checks and identification.