



Bluetooth for Windows Bluetooth Neighborhood User's Guide

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BTW Neighborhood User's Guide

LICENSED SOFTWARE

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1 Introduction

Bluetooth technology provides short-range wireless communications between enabled devices. Bluetooth for Windows (BTW) is the WIDCOMM, Inc. (WIDCOMM), solution for the seamless integration of Bluetooth technology into personal computers.

Most Bluetooth-enabled devices have the capability to act as:

- A Bluetooth server—these devices provide one or more services, such as access to the Internet, to other Bluetooth devices.

and

- A Bluetooth client—these devices use the service(s) provided by Bluetooth servers.

Bluetooth for Windows provides:

- Clients with the means:
 - To locate other Bluetooth devices in the immediate vicinity (inquiry).
 - Discover the services that those devices offer (discovery).
 - Connect to, use, and disconnect from those services.
- Servers with the means:
 - To include/exclude individual services in the list of services it provides to clients.
- Extensive security, including:
 - Authorization
 - Authentication
 - Encryption.

BTW supports:

- Windows 2000.
- Windows 98SE (Second Edition).
- Windows Me (Millennium Edition).

BTW functions the same, regardless of the supported version of Windows it is running on.

2 Icons Used for Devices and Services

Bluetooth for Windows icons provide at-a-glance feedback about a device or service's status by changing color or color and form.

Device icons turn green when a connection is active.

The device icons also indicate if devices are paired ("trusted"). If a device is trusted, the icon form changes to include a white check mark in a black circle.

The service icons also turn green when a connection is active.

To view an illustration of the device and service icon types in Bluetooth Neighborhood, open the Help menu and select Help Topics. On the Contents tab, double-click the General topic and then the Icons Used for Devices and Services topic.

3 Search for Devices (Device Inquiry)



“Search for Devices” looks for Bluetooth devices in the vicinity and displays the devices it finds in Bluetooth Neighborhood.

Bluetooth for Windows automatically searches for devices when Bluetooth Neighborhood is opened.

To start the Search for Devices when Bluetooth Neighborhood is open:

- In Bluetooth Neighborhood, double-click the Search for Devices icon
- or
- Open the Bluetooth menu and select Search for Devices.

NOTE: The Bluetooth menu is only visible in Windows Explorer when Exploring the Bluetooth Neighborhood.

BTW can be configured to automatically search for devices on a regular basis (Bluetooth Configuration window >Discovery tab).

One of the advantages of Bluetooth is the mobility the wireless connections allow. However, mobility means that devices may move in or out of connection range during the time between the automatic updates performed by BTW.

To be certain that the displayed list of devices in the neighborhood is current, or if automatic periodic inquiry is not enabled, force an up-to-date view by clicking Search for Devices.

Some devices within connection range may not show up in the list of devices found because:

- Your device is configured to report only specific types or classes of devices (Bluetooth Configuration window >Discovery tab, on your device).
- The un-listed device is configured to be non-discoverable (Bluetooth Configuration window > Accessibility tab, on the un-listed device).

For information about how to configure BTW, see the [BTW Configuration Guide](#), WIDCOMM document BTW-DOCS-010620-1220.

4 Find a Service (Service Discovery)

After BTW has identified the available Bluetooth servers within connection range the client can make use of the services provided by those servers. The process of determining the services that are available is called Service Discovery.

The services supported by BTW are:



Bluetooth Serial Port—establishes a Bluetooth wireless connection between two devices. The connection may be used by applications as though a physical serial cable connected the devices.



Dial-up Networking—allows a Bluetooth client to use a modem that is physically attached to the Bluetooth server.



Fax—allows a Bluetooth client to wirelessly send a fax using a device that is physically attached to the Bluetooth server.



File Transfer—establishes a Bluetooth wireless connection that allows your computer to perform file system operations on another Bluetooth-enabled device—browse, drag/drop, open, print, cut/copy, paste, delete, rename, etc.



Information Exchange—establishes a Bluetooth wireless connection between two devices so that they can exchange personal information manager data such as business cards, calendar items, email messages, and notes.¹



Information Synchronization—establishes a Bluetooth wireless connection between two devices and uses the connection to synchronize Personal Information Manager data between the two devices.



Network Access—establishes a Bluetooth wireless connection between the client and a server that is physically connected to the Local Area Network. If the client has permission (user name and password for the LAN), the wireless connection can be used as if the client were hardwired to the LAN.

All Bluetooth servers do not necessarily provide all of these services. For example:

- Network gateways such as those in WIDCOMM's BlueGate series only provide access to the Local Area Network (the Network Access service).
- A Bluetooth-enabled cellular telephone may provide only:
 - Dial-up Networking (access to the Internet).
 - A Bluetooth Serial Port (used to exchange PIM information with your computer).

To determine which services are provided by a Bluetooth device, right-click the device and select Discover Available Services from the popup menu.

¹ In this release of BTW, Microsoft Outlook is the only Personal Information Manager supported.

4.1 DIAL-UP NETWORKING



The Dial-Up Networking service permits a Bluetooth client to use a modem that is physically connected to a different Bluetooth device (the server).

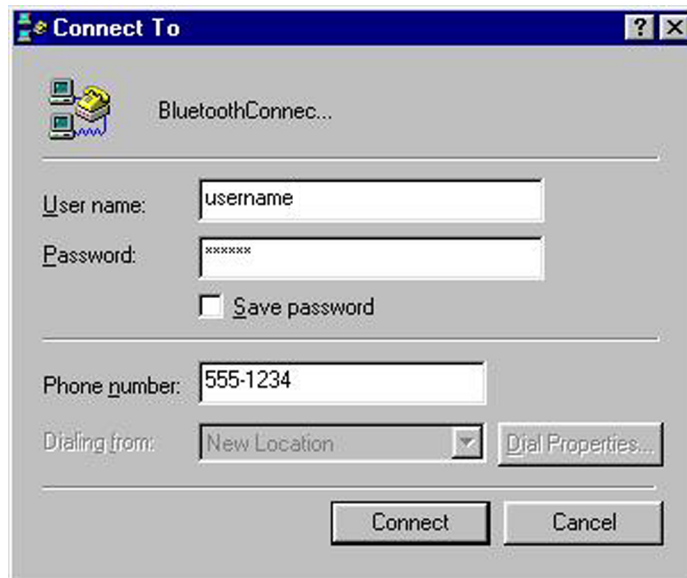
Possible Dial-Up Networking servers include:

- Bluetooth-enabled computers with a modem attached.
- Bluetooth-enabled cellular telephones.
- Stand-alone Bluetooth-enabled modems.

After the Bluetooth wireless connection is established the client can use the server's modem as if it were a local device on the client.

To establish a Dial-Up Networking session, in Bluetooth Neighborhood on the client:

1. Double-click Search for Devices.
2. Right-click a server and select Discover Available Services.
3. Double-click the Dial-up Networking icon.
4. Fill in your user name, password and the phone number to be dialed in the Connect To dialog box and click the Connect button.



You can now open a web browser and connect to the Internet.

To close a Dial-Up Networking connection, in Bluetooth Neighborhood on the client:

1. Click the server that is providing the connection.
2. Double-click the Dial-Up Networking icon.
3. Click OK to close the connection.

Select the Save password check box and the dialog box will not appear for subsequent connections to the same phone number.

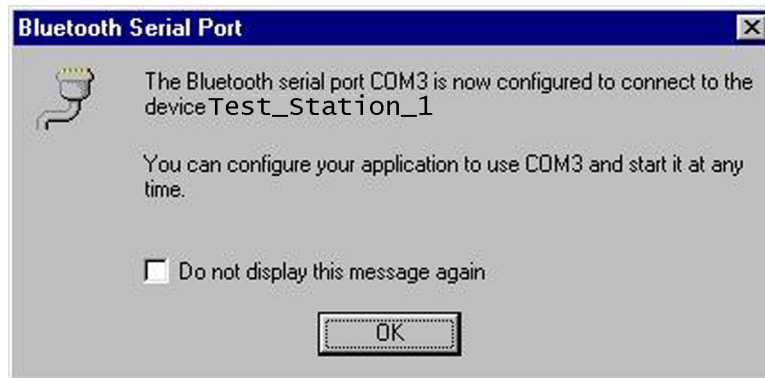
4.2 BLUETOOTH SERIAL PORT



The Bluetooth Serial Port service allows two Bluetooth devices to establish a wireless connection through virtual communications ports and then use that connection as if it were a hardwired serial cable between the devices.

To establish a Bluetooth Serial Port connection with another device, in Bluetooth Neighborhood on the client:

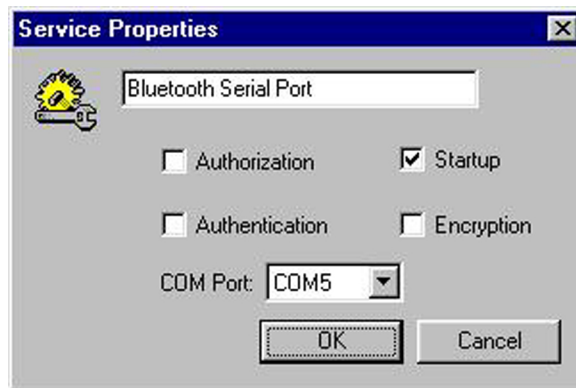
1. Double-click Search for Devices.
2. Right-click the server you want to establish a connection with and select Discover Available Services.
3. Double-click the Bluetooth Serial Port icon.



A dialog box appears that contains the communications port number assigned to this connection by the client (your device). The application on the client must be configured to send data to this port.

The application on the server also needs to be configured to use the correct communications port. To determine the port number being used by the server:

1. Click Local Device
2. Right-click Bluetooth Serial Port and select Properties.



The Service Properties dialog box shows the communications port the connection is using.

To close the Bluetooth Serial Port connection, in Bluetooth Neighborhood on the client:

1. Click the server that is providing the connection.
2. Double-click the Bluetooth Serial Port icon.
3. Click OK to close the connection.

4.3 NETWORK ACCESS



The Network Access service permits a Bluetooth client to use an Ethernet connection that is physically attached to another Bluetooth device (the server).

Only one Network Access connection can be open at a given time. The connection must be closed before the client device can discover services or create another connection.

Possible Network Access servers include:

- Bluetooth-enabled computers that have a hardwired Ethernet connection.
- Stand-alone Bluetooth Network Access Points such as those in WIDCOMM's BlueGate series.

The Bluetooth server must be specifically configured to provide the Network Access service.

After a Bluetooth device is configured as a Network Access server it cannot act as a Network Access client without being re-configured.

4.3.1 Setup—Windows 2000

1. From the Windows Control Panel select Network and Dial-up Connections
2. Right-click the Local Area Connection icon and select Properties.
3. In the Local Area Connection Properties dialog box on the Sharing tab, select Enable Internet Connection Sharing for this connection and click OK.

NOTE: The Sharing tab is added to the Local Area Connection Properties dialog box by BTW.

4. Click YES in the confirmation dialog box to enable Internet connection sharing.

4.3.2 Setup—Windows 98SE & Windows Me

Internet Protocol routing software is required on Windows 98SE and Windows Me servers; a downloadable trial version of WinRoute Lite is available on the Tiny Software, Inc. website—<http://www.tinysoftware.com/>.²

Configure the server:

1. From the Windows Control Panel, double-click the Network icon.
2. On the Configuration tab, select TCP/IP-> Bluetooth LAN Access Server Driver (scroll down if necessary).
3. Click Properties and select the IP Address tab.
4. Select Specify an IP address and:
 - Enter an IP Address (suggested value—192.168.1.1).
 - Enter a Subnet Mask (suggested value—255.255.255.0).
5. Click OK twice to close the dialog boxes.
6. Click YES to restart the computer.

Configure the routing software:

1. In the Windows system tray, right-click the WinRoute icon (Ⓜ) and select Administration....
2. On the Settings tab, select “2nd network adapter”.
3. From the Network adapter drop-down list choose any adapter other than the WIDCOMM adapter and click the Settings button.
4. On the DHCP tab, in the Adapter drop-down list, select the Widcomm Bluetooth Windows 9x Adapter.
5. Select Enable DHCP Server.
6. Fill in the client IP address range fields:
 - From—210
 - To—240
7. Click OK and then minimize (do not close) the WinRoute Administration configuration panel.

4.3.3 Connect to the LAN

To open a Network Access connection:

1. Double-click Search for Devices.
2. Right-click the server that will provide the hardwired connection and select Discover Available Services.
3. Double-click the Network Access icon.
4. Enter a user name and password, if necessary, and click OK.

It may take 20 to 30 seconds to establish the connection.

To close a Network Access connection:

1. Double-click the Network Access icon.
2. Click OK.

² WIDCOMM makes no endorsements with regards to use of the software.

4.4 FILE TRANSFER



The File Transfer (or *Public Folder*) service allows a Bluetooth client to perform file operations on the default File Transfer directory and the folders and files it contains.

File Transfer operations include:

- Navigate the directory tree on the server.
- Create empty folders in any path displayed on the server.
- Perform file operations on the server.

To perform an operation on a folder or file right-click it and select an option from the popup menu:

- **Open:**
 - Files—are opened in the application associated with them.
 - Folders—are expanded to show their contents.
- **Print**—sends the selected server file to the client's default printer.
- **Send to:**
 - 3.5" Floppy Drive—copies the selected item(s) on the server to the client's 3.5" floppy drive.
 - My Shared Folder—copies the selected item(s) on the server to the default File Transfer folder on the client.
- **Cut**—copies a folder and its contents, or individually selected files in a folder, to the Windows clipboard. When the clipboard contents are pasted to a new location, the originally selected file(s) on the server are deleted.
- **Copy**—copies a folder and its contents, or individually selected files in a folder, to the Windows clipboard.
- **Delete**—deletes selected file(s) and/or folder(s) on the server.
- **Rename**—allows you to change an empty folder's name.
- **Properties**—displays the file or folder's properties dialog box.

Other options that may appear, depending on the context the menu appears in:

- **Update**—updates the contents of a folder.
- **New Folder**—creates a new folder on the server.
- **Abort FTP Operation**—aborts an in-process File Transfer operation.

4.5 INFORMATION EXCHANGE



The Information Exchange (or *Inbox*) service provides a way to send and receive Microsoft Outlook items to and from another Bluetooth device, such as a Personal Digital Assistant or notebook computer.

Supported Outlook items are:

- Business cards (*.vcf and *.vcd)
- Calendar entries (*.vcs)
- Notes (*.vnt)
- Messages (*.vmg)

There are three types of operation:

- Send—send an object to another device.
- Receive—request an object from another device.
- Exchange—send a client object and receive a server object.

The default location of your business card and the location where received items are placed can be configured in the Bluetooth Configuration window (System Tray > BT Icon > Configuration > Information Exchange).

To send, receive, or exchange an object, right-click the Inbox icon of the remote device and select an option from the popup menu.

Business cards are sent, received, or exchanged without further intervention.

To send Calendar Items, Notes, and Messages, navigate to the folder that contains the item you want to send (via a standard Windows dialog box), select the item, and then click Open.

4.6 INFORMATION SYNCHRONIZATION



The Information Synchronization service is used to synchronize information (e.g., a PIM database) between a Bluetooth client and server.

BTW supports synchronization with devices that support IrMC v1.1 and exchange the v2.1 vCard format.

The first time Information Synchronization is used with a new application it may take a few minutes to synchronize the database; the data from both devices must be merged, duplicate entries deleted, and then the updated database copied back to both devices.

Subsequent uses of Information Synchronization, for the same application, are much faster—only the changes that have been made since the databases were last synchronized must be exchanged.

Microsoft Outlook is the only Personal Information Manager supported in this release of BTW. Outlook permits duplicate entries, so all duplicates may not be exchanged in the synchronization process.

Only Outlook's default contacts folder is synchronized. Items in sub-folders are not synchronized. Items that are moved from the default folder to a sub-folder will appear to have been deleted the next synchronization takes place.

To use Information Synchronization:

1. Double-click Search for Devices.
2. Right-click the server you want to synchronize with and select Discover Available Services.
3. Double-click the Information Synchronization icon.

A dialog box displays progress and, when the process is complete, indicates that synchronization successfully completed.

The connection closes automatically when synchronization is complete.

4.7 FAX SERVICE



The Fax service allows a Bluetooth client to wirelessly send a fax using a device that is physically attached to a Bluetooth server.

To send a Fax:

1. Double-click Search for Devices.
2. Right-click the server you want to establish a connection with and select Discover Available Services.
3. Double-click the Fax icon.
4. After the Fax connection is established, open or create the document to be faxed and use the “Print” or “Send to Fax Recipient” option available in most applications.

The Fax connection closes automatically when the transmission is complete.

5 Local Services

Local Services are those services that a Bluetooth server is capable of providing.

The services provided by BTW are:

- Bluetooth Serial Port³.
- Dial-Up Networking.
- Fax.
- File Transfer.
- Information Exchange.
- Information Synchronization.
- Network Access.

The names of all the services are displayed even though the server may not be capable of supporting all services. For example, when a server provides a service that is hardware-dependant that server must be capable of local action, for example, a Dial-Up Networking server must have a working modem, a Fax server must have a functional fax modem, and a Network Access server must be physically connected to the Local Area Network.

All services start automatically by default when BTW is initialized.

Automatic start-up can be turned off for individual services (Bluetooth Configuration window > Local Services tab > double-click the service name). If a service is not configured to start automatically it can still be started manually; right-click the service and select Start from the popup menu.

To stop a service that is running, right-click the service and select Stop from the popup menu. Stopped services are not available for clients to use.

With Local Device selected, the Details view of Explorer provides basic information about each local service:

- Service—the name of the service
- Startup—Automatic or Manual
- Status:
 - Started (COM#)—the service is running and ready to use COM#
 - Not Started—the service is not running (not available to clients)
 - Connected (COM#)—the service is in use, the local port is COM#
- Device name if connected:
 - Empty field—the service is not connected
 - A device name and/or Bluetooth Device Address—identifies the device that is using the service.

Connections are usually established and shut down by the client. If it is necessary to interrupt a connection from the server side:

1. Right-click the local service and select Stop from the popup menu.
2. Right-click the local service and select Start from the popup menu to re-start the service.

³ Additional Bluetooth Serial Ports may be added to the services provided. See the [BTW Configuration Guide](#), WIDCOMM document BTW-DOCS-010620-1220, for additional information.

6 Security



Each service on the server can be configured to require:

- Authorization—the server operator must acknowledge all connection attempts before a connection is established.
- Authentication—the server requires a Personal Identification Number (PIN) code or a Link Key before a connection is established.
- Encryption—all data sent between the client and server is encrypted.

The default security setting for Authorization, Authentication and Encryption is disabled.

Devices can also be paired, a process that eliminates the need to enter a PIN code every time access is attempted.

See the [BTW Configuration Guide](#), WIDCOMM document BTW-DOCS-010620-1220, for detailed information on configuring the security settings of BTW.

Appendix A—Troubleshooting

CANNOT CONNECT TO A PAIRED DEVICE

Paired devices are always displayed in Bluetooth Neighborhood, even if the remote device is out of range or not powered on:

- Verify that the paired device is within radio range and powered on then attempt the connection again.

CANNOT DISCOVER SERVICES ON A REMOTE DEVICE (NOT PAIRED)

The remote device might not be powered on or may be out of range:

- Verify that the remote device is powered on.
- Verify that the remote device is in Connectable mode (Configuration >Accessibility tab).
- Perform a Search for Devices to verify that the device is within range.

DIAL-UP NETWORKING SERVICE DOES NOT START

The Dial-Up Networking service will not start unless a properly configured modem is attached to the server.:

1. Verify that the modem is usable as a local device from the server.
2. In the Bluetooth Configuration window, Local Services tab, double-click the Dial-Up Networking service:
 - a) Click the down arrow in the Modem field and select the modem that should be used to dial out.
 - b) Click OK.
 - c) Click OK to close the Bluetooth Configuration window.

HOW DO I DETERMINE THE BLUETOOTH DEVICE ADDRESS (BDA) OF MY HARDWARE DEVICE?

- In the Windows System Tray, right click the Bluetooth icon and select Configuration from the popup menu.
- In the Bluetooth Configuration window, on the Hardware tab, in the Device Properties section, the fourth entry is Device Address. This is the BDA of the Bluetooth device attached to this computer.

HOW DO I DETERMINE THE VERSION NUMBER OF THE BLUETOOTH SPECIFICATION THAT THE HOST CONTROLLER INTERFACE (HCI) COMPLIES WITH?

- In the Windows System Tray, right click the Bluetooth icon and select Configuration from the popup menu.
- In the Bluetooth Configuration window, on the Hardware tab, in the Device Properties section, the fifth entry provides Bluetooth Specification compliance information.
- The sixth entry contains the Specification revision information, if appropriate.

HOW DO I DETERMINE THE VERSION NUMBER OF THE LINK MANAGER PROTOCOL (LMP)?

- In the Windows System Tray, right click the Bluetooth icon and select Configuration from the popup menu.
- In the Bluetooth Configuration window, on the Hardware tab, in the Device Properties section, the seventh entry provides LMP version number information.
- The eighth entry contains the LMP sub version number information, if appropriate.

HOW DO I FIND INFORMATION ABOUT THE BLUETOOTH HARDWARE ATTACHED TO MY COMPUTER?

- In the Windows System Tray, right click the Bluetooth icon and select Configuration from the popup menu.
- In the Bluetooth Configuration window, on the Hardware tab, in the Devices section:
 - Column one—contains the hardware name.
 - Column two—contains the hardware type (USB, Serial, etc.)
- In the Devices Properties section:
 - The first entry is the hardware manufacturer.
 - The second entry contains the firmware version of the hardware.
 - The third entry, Device Status, indicates that the device is operating properly or that there is a problem/conflict.

HOW DO I TEST A NETWORK ACCESS CONNECTION?

If the client is hardwired to the LAN, unplug the connection to ensure that the test checks the wireless connection rather than the hardwired connection.

If the server has access to the Internet, open a browser on the client and connect to the World Wide Web.

You may also Ping the server from the DOS prompt.

WHY DO I GET AN UNKNOWN PORT MESSAGE WHEN I ATTEMPT TO USE A BLUETOOTH SERIAL PORT?

The “Unknown Port” error message usually means an attempt was made to connect a port that was in use.

Additional Bluetooth Serial Ports can be added if you need more than one at a time. See the [BTW Configuration Guide](#), WIDCOMM document BTW-DOCS-011100-1700, for information on adding additional ports.

TECHNICAL SUPPORT

Before contacting WIDCOMM technical support:

WIDCOMM customers are issued a user name and password so they may use on-line tech support. If you do not have a customer support user name and password by e-mail contact customerservice@widcomm.com.

To contact WIDCOMM technical support:

- Go to the WIDCOMM home page (www.widcomm.com) and click Support.
- On the Support page click Bluetooth for Windows (BTW)
- On the Technical Support page under BTW click “Enter Password Protected Area.”
- Enter your technical support user name and password and click Submit.
- Select from the options on the support page.
- If filling out a bug report or requesting technical assistance, please provide all information requested on the form.

Appendix B—An Introduction to Bluetooth

This appendix provides a brief non-technical overview of Bluetooth.

For information on a specific topic, click the appropriate link below:

1. [Overview](#).
2. [Device Identity](#).
3. [Security Introduction](#).
 - a) [Service Level](#).
 - b) [Encryption](#).
 - c) [Authorization](#).
 - d) [Authentication](#).
4. [Device Inquiry and Service Discovery](#).
 - a) [Device Inquiry](#).
 - b) [Service Discovery](#).
 - c) [Security](#).
5. [A Typical Connection Scenario](#).

OVERVIEW

The term “Bluetooth” refers to a worldwide standard for the wireless exchange of data between two devices.

In order to exchange data, two Bluetooth devices must establish a connection.

Before a connection is established, one device must request a connection with another. The second device accepts (or rejects) the connection.

The originator of the request is known as the *client*.

The device that accepts (or rejects) the request is known as the *server*.

Most Bluetooth devices can act as both client and server.

A client Bluetooth device runs a software program that requests a connection to another device as part of its normal operation. For example, the program may request a connection to a remote computer, a printer, or a modem.

Becoming a Bluetooth client normally requires an action by the device operator, such as an attempt to browse a remote computer, print a file, or dial out on a modem.

Every Bluetooth device that provides a service must be prepared to respond to a connection request. Bluetooth software is always running in the background on the server, ready to respond to connection requests. [<back>](#)

DEVICE IDENTITY

Each Bluetooth device has a unique forty-eight-bit binary Bluetooth Device Address (BDA) burned into its Read Only Memory (ROM) during the manufacturing process. This address cannot be changed by the end-user.

A device's BDA is usually displayed in hexadecimal format, e.g., 00:D0:B7:03:2E:9F is a valid BDA.

Each Bluetooth device also has an operator-configurable user-friendly name to help distinguish it from other Bluetooth devices in the vicinity. Valid user-friendly names include:

- Bob's PC.
- Randy's Laptop.
- John Q. Public's PDA.

User-friendly names make it easier to recognize the devices in the Bluetooth Neighborhood. However, because individuals other than the user can change the name, it is not reliable for security purposes. [<back>](#)

SECURITY INTRODUCTION

Bluetooth offers three primary levels of security:

- None—all Bluetooth devices are allowed to connect.
- Service Level—individual local services may be disabled. Disabled services are not available to any remote device. Service Level security is only available on some types of devices.
 - Encryption—connections with remote devices can be encrypted for additional security.
 - Authorization—the local device operator must authorize a remote device connection, usually by physically clicking an on-screen button.
 - Authentication—remote devices must provide a link key. The link key is generated through the passkey process the first time the local and remote devices connect.
- Link Level
 - Authentication—remote devices must provide a link key. The link key is generated through the passkey process the first time the local and remote devices connect. [<back>](#)

SERVICE LEVEL

Each Bluetooth service can be selectively disabled. If all Bluetooth services are disabled, the local computer is unable to accept connections from a remote computer.

The local computer can still initiate outgoing connections to other Bluetooth units, but incoming connections will not be allowed.

Advantages: Extremely strong security.

Disadvantages: It is non-selective; it shuts out all incoming Bluetooth connections for a particular service. [<back>](#)

ENCRYPTION

The Bluetooth specification allows for encrypted transactions using a key size of up to 128 bits.

Some Bluetooth devices do not support encryption. If a device or service is configured to use encryption and attempts a connection with a device that does not support encryption, the connection may fail unexpectedly.

Advantages: Protects against radio frequency snooping.

Disadvantages: The receiving unit must also support encryption. [<back>](#)

AUTHORIZATION

Authorization provides name-level security.

A visual warning notifies the local operator that a remote device is attempting to access the system.

The local operator can open a dialog box that provides:

- Name-level security information—the user-friendly name of the device attempting access.
- The type of access the requesting device is trying to achieve.

Based on the information provided in the dialog box, the operator may authorize or deny access by physically clicking an on-screen button.

If the initial notification is ignored, access is denied after a preset timeout.

Authorization does not provide foolproof security since Bluetooth device names are configurable by the end-user.

Advantages: Ease of use—requires a simple **YES-or-NO** response.

Disadvantages: Weak security. [<back>](#)

AUTHENTICATION

Authentication requires a passkey from the remote device attempting to access the local device.

A visual warning notifies the local operator that a remote device is attempting to access the system.

The local operator can open a dialog box that provides:

- Name-level security information—the user-friendly name of the device attempting access.
- A place for the local operator to enter a passkey.

The operator of the remote system must enter the identical passkey or access is denied.

If the initial notification is ignored, access is denied after a preset timeout.

Advantages: Stronger security.

Disadvantages: Passkeys must be protected.

LINK KEYS

To avoid entering a passkey time-after-time for a known and trusted remote device, a link key can be created.

A link key is a mathematical construct created from:

- The passkey.
- The Bluetooth Device Address (BDA) of the remote device.
- An internally generated, random number.

There is no limit to the number of link keys that may be created.

Devices that share a link key are “paired.”

Paired devices are authenticated automatically, without operator intervention.

[<back>](#)

DEVICE INQUIRY AND SERVICE DISCOVERY

To connect to a remote Bluetooth device, the remote device must:

- Be within range.
- Provide a service that may be used with a Bluetooth connection (for example, Dial-Up Networking).
- Be accessible, from a security standpoint, by the local device. [<back>](#)

DEVICE INQUIRY

A Bluetooth device must be within radio range of a second Bluetooth device to establish a connection.

Every Bluetooth device keeps a list that contains the user-friendly name and device address of each remote device that is within its radio range.

As Bluetooth devices wander in and out of range (the “Bluetooth Neighborhood”) the list must be updated. This is accomplished in two ways.

- The list is updated automatically when the local device periodically queries all other Bluetooth devices within range.
- The list can also be updated as necessary by selecting an on-screen option. [<back>](#)

SERVICE DISCOVERY

Even though a device is within radio range, the local device will not be able to connect to it if the remote device does not provide the requested service.

Service Discovery is the process of determining which services are available on the devices within range.

Connection requests are made for a specific service. If the desired service is File Transfer and the remote device does not offer that service, the connection will not be allowed. [<back>](#)

SECURITY

The security parameters of the remote device must be set to allow the local device to establish a connection.

Even though there is a remote device in radio range (the “Bluetooth Neighborhood”) that provides the desired service, the remote device security parameters may be set to allow only specific devices to connect. If the requesting device is not on that list, it will not be allowed to connect. [<back>](#)

A TYPICAL CONNECTION SCENARIO

In this simplified scenario Joe's PC is a Bluetooth-enabled computer running an application that needs access to a FAX.

1. Joe's PC performs a search of the Bluetooth Neighborhood (a device inquiry) and determines that there are four Bluetooth devices in radio range.
2. Joe's PC queries (a service discovery) each of the four devices to determine which services each provide. Ann's Computer offers the FAX service.
3. Joe's PC sends a FAX connection request to Ann's Computer.
4. Ann's Computer evaluates the request and determines that Joe's PC is permitted to use the FAX service, PROVIDED THE CORRECT PASSWORD ("passkey") IS SUBMITTED.
5. Ann's Computer queries Joe's PC for the passkey (authentication).
6. Joe's PC returns the correct passkey and the FAX connection is established.
7. Joe's PC uses the FAX on Ann's Computer as if it were a local device on Joe's PC.

After Joe's PC is finished using the FAX service the connection between it and Ann's Computer is disconnected. Some Bluetooth services disconnect automatically; others must be closed manually. [<back>](#)