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Bluetooth Wireless Technology & It's Applications

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In Memory of Dr. D S Kushwaha

Abstract

This paper provides an overview of Bluetooth wireless technology and instructs users on an inexpensive, short-range radio technology that eliminates the need for proprietary cabling how to establish Bluetooth connections using IT products. Bluetooth wireless technology is between devices such as notebook PCs, handheld PCs, Personal Digital Assistants (PDAs), cameras, and printers.

Keywords: Wireless Technology, IT Product, PDA, Radio Technology

1. Introduction

Bluetooth wireless technology (BWT) was developed in 1994. With BWT, you can run your presentation on a client's BWT-enabled projector without a cable connection. This paper provides an overview of BWT, describes the requirements for establishing a BWT connection, and provides information about HP products that incorporate BWT.

2. HOW BLUETOOTH WIRELESS TECHNOLOGY WORKS

BWT-enabled devices operate in the unrestricted 2.4-gigahertz (GHz) devices Industrial, Science, Medical (ISM) band. These devices use a technique called ***frequency hopping*** to minimize eavesdropping and interference from other networks that use the ISM band. This gives BWT networks a high immunity to interference from other 2.4-GHz devices.

There are FIVE classes of BWT radio devices, each with a different maximum range:

Class	**Max. permitted power**		**Typ. range (m)**
	(mW)	**(dBm)**	
1	100	20	100
1.5 (BT 5 Vol 6 Part A Sect 3)	10	10	20

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2	2.5	4	10
3	1	0	1
4	0.5	−3	0.5

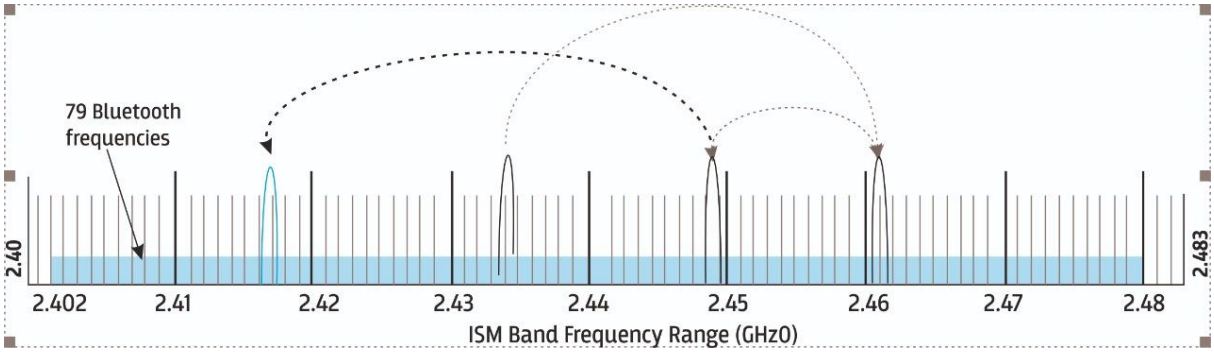

Figure 1. **BWT-enabled devices** *hop* **between frequencies up to 1600 times per second.**

1.1 BWT NETWORK TOPOLOGIES

BWT-enabled devices form network topologies called *piconets* and *scatternets*. A piconet consists of up to eight BWT-enabled devices (Figure 2). The device that sets the frequency-hopping pattern is called the *primary device* and the other devices are called *secondary devices*.

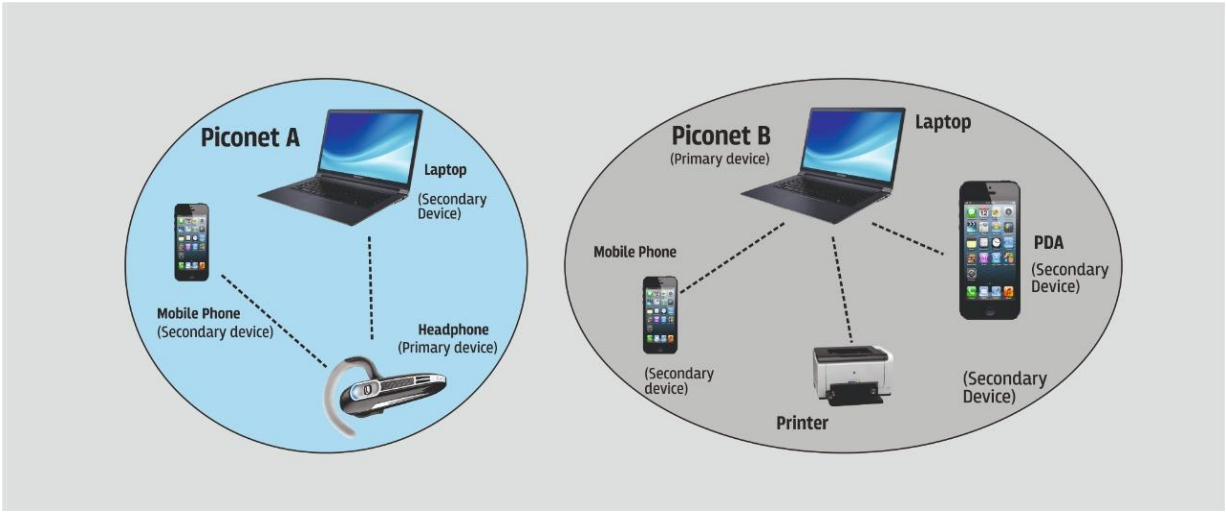

Figure 2. A *piconet* consists of up to eight BWT-enabled devices

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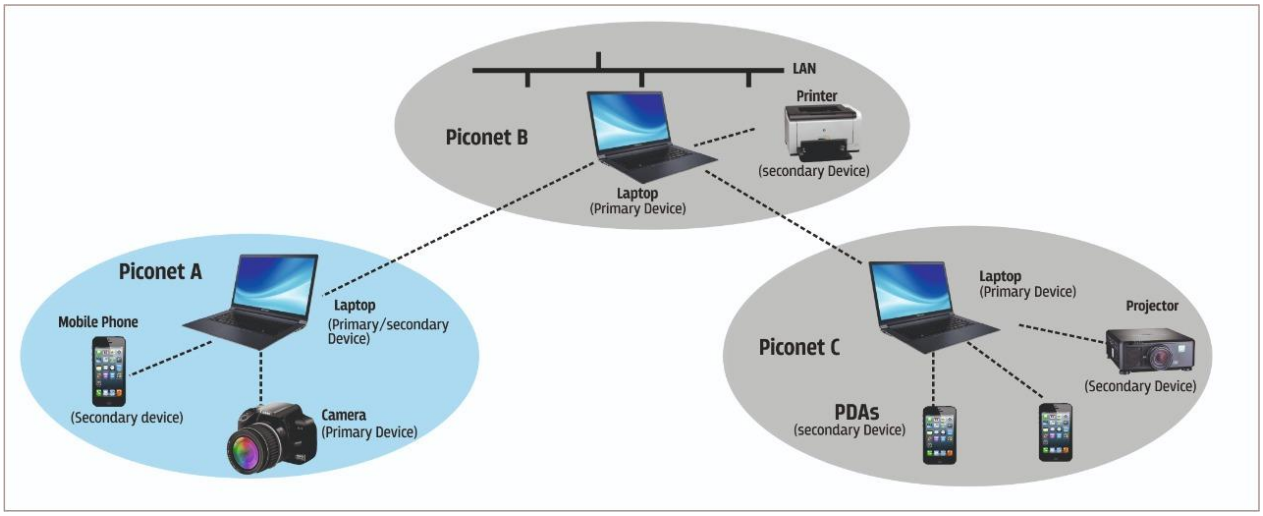


Figure 3. A scatternet is two or more piconets connected by a common device.

1.2 BWT SECURITY

Authentication verifies the identity of the BWT device trying to connect with your device. After authentication, your Bluetooth device grants (authorizes) another Bluetooth device access to a specific service.

2. ESTABLISHING BWT DEVICES (CONNECTIONS)

The first step is to activate BWT functionality on each device. Services or profiles that your device will make available to other BWT-enabled devices.

If you decide to operate your device in secure mode, you must pair the device with another BWT-enabled device before they can interoperate.

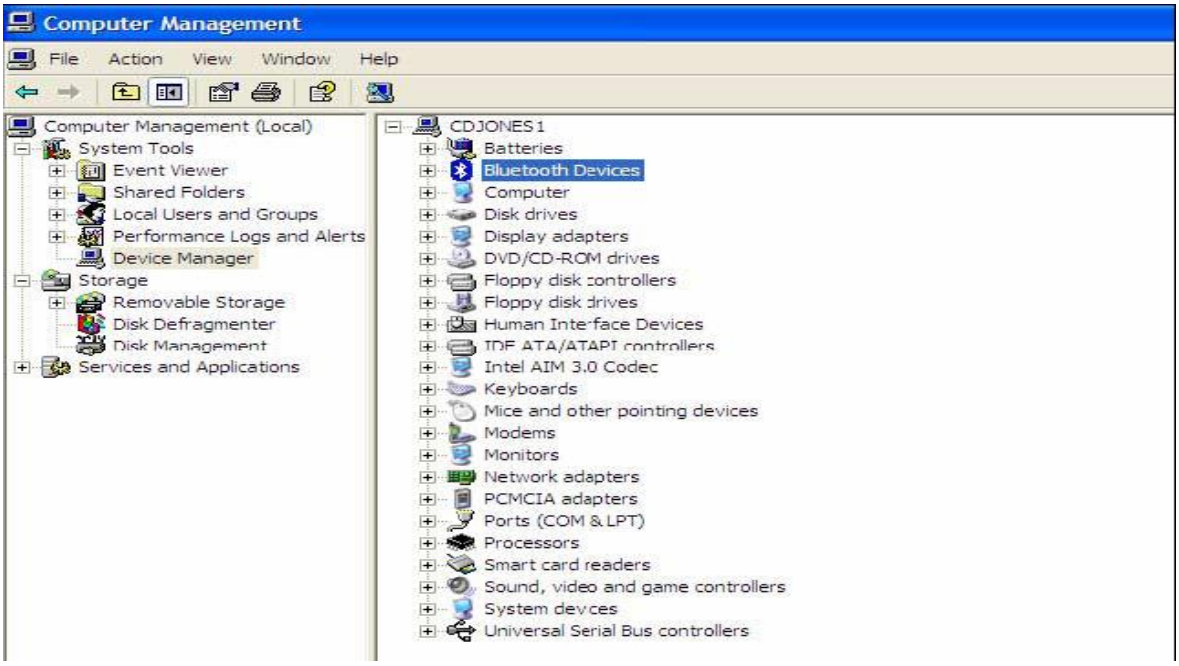
3. ACTIVATING BWT DEVICES

3.1 Notebook PCs

If you are not sure whether your notebook supports BWT, check for the presence of Bluetooth Devices in Device Manager as follows:

- Select the **Device Manager** button.
- If your notebook supports BWT, you will see Bluetooth Devices in the Device Manager window (Figure 4).

Figure 4. Confirming Bluetooth capability via Device Manager



The following steps activate your BWT-enabled notebook PC:

- Install the BWT software.
- Enable BWT functionality.

Table: Bluetooth Status

Disabled	**Enabled**	**Connected**
Blue with red logo	Blue with white logo	Blue with green logo

If BWT is disabled (red logo), enable it by right clicking the **Bluetooth** icon and selecting **Start the Bluetooth Device.** Right-click the **Bluetooth** icon and then select **Explore My Bluetooth Places.**

3.2 iPAQ Pocket PCs

Select the **BWT** icon in the lower right corner of the Today screen to activate BWT functionality, to create BWT connections, or to manage and change the BWT settings.

3.3 Printers

Some models of Deskjet printers are integrated with BWT capability. After you installing the printer software on notebook, select **Start > My Programs > My Bluetooth Places** to manage the BWT printer connection.

3.4 Cellular phones

Activating BWT functionality on a cell phone becomes as easy as pressing **Menu > Connect > Bluetooth.**

3.5 Selecting BWT device profiles

Profiles are services that are available for each BWT-enabled device. About the full line of BWT offering, one can consult with the various manufacturers.

3.6 Pairing

Paired devices exchange encrypted data that cannot be deciphered by unauthorized devices. The devices remain paired even when you can manually pair your device with another connected device by right-clicking the device icon in My Bluetooth Places and selecting **Pair Device** from the shortcut menu. To unpair a device, right click the device icon in My Bluetooth Places, and then select **Unpair Device** from the shortcut menu.

4. BLUETOOTH RANGE EXTENDER

Bluetooth range extenders connect to an audio source to improve its range and connectivity. These sources can include televisions, laptops, phones, stereo systems, and even turntables. Bluetooth range extenders are sometimes even able to give an older audio source Bluetooth capability.

Most Bluetooth devices are level 2 Bluetooth, meaning they have a range of between 10-20 meters. But Bluetooth range extenders are level 1, meaning they can multiply that range by 10. That also offers connectivity between rooms that might otherwise not be possible.

Bluetooth range extenders are perfect for those who live in bigger homes and want to enjoy their Bluetooth audio anywhere. If your home isn't open concept and has a lot of walls, Bluetooth range extenders can also eliminate dead zones. They're also ideal if you want to use Bluetooth to listen to music while running or biking outdoors.

A Bluetooth range extender is a device that helps to increase the field of connectivity of Bluetooth devices.Most modern Bluetooth devices are known to have a range of up to 200 feet. The latest Bluetooth 5.0 has been claimed to have ranges up to 800 feet.

However, these numbers are possible if the field does not have any barriers and hurdles. Bluetooth devices have to pass through walls, metallic doors, etc., which lower their field of strength. It even causes these devices to develop areas of no signal reception, commonly known as "dead zones."

For ensuring a better signal, a Bluetooth 5.0 range extender or repeater is used for improving connectivity to devices. Extenders can have many uses, such as receiving or transmitting data for gaming and home theater systems, using a handsfree headset, etc.

4.1 DIFFERENT TYPES OF BLUETOOTH RANGE EXTENDERS

Bluetooth range extenders are available in four distinct class types. These types are differentiated based on their range and power consumption.

- **Class 1 Extenders –** These devices work at a range of 100 meters. Also, class 1 devices have a power consumption of 100 milliwatts.
- **Class 2 Bluetooth Range Extenders –** These extenders possess a working range of about 10 meters. Their widespread power consumption is 2.5 milliwatts.
- **Class 3 Range Extenders –** Thee devices have a range that is less than 10 meters. Their power consumption is one milliwatt.
- **Class 4 Devices –** These Bluetooth range extenders have a field range of ½ meter and power consumption of 0.5 milliwatts. There does not have a limited widespread usage compared to other classes.

The usage of each class of extender can depend upon individual preference. You might need a particular class-based device for your needs than another. Or, you might a device that offers long range for synchronizing. Thus, it is essential to choose the Bluetooth range extender wisely.

4.2 Advantage of Bluetooth Range Extender

- May be used as a Bluetooth transmitter/Receiver
- Connects to any 3.5 mm audio output jack
- Can pair to 2 Bluetooth enabled devices at once
- Exceptionally low literacy
- Allows you full control over the music
- Battery can last for up to 20 hours
- May be used while charging

4.3 Disadvantage of Bluetooth Range Extender

- May experience lagging from time to time

5. Conclusion

BWT-enabled devices operate in the unrestricted 2.4-GHz ISM band. The manufacturers can develop BWT-enabled products to use this frequency band. From PDAs that automatically synchronize contact information with the laptop and cell phone, to a car that automatically adjusts the seat and mirrors as you approach it, Bluetooth wireless technology will eventually unite all the gadgets in IT world and change forever the way you work and play.

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