

Research on Modern Bluetooth Technology

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ABSTRACT: The seemingly endless entanglement of data wires connecting today's electronic devices has become slightly less jumbled with the introduction of Bluetooth technology and the creation of a wireless data link. It also describes the functional overview and applications of Bluetooth. It gives significant advantages of Bluetooth over other data transfer technologies such as IrDA and Home RF. It mainly emphasizes the architecture of Bluetooth. It gives over all Bluetooth packet structure and different communication and data information protocols such as WAP, UDP, IP, TCP, RFCOMM, and L2CAP etc. It also explains Link Security by Data Encryption. Bluetooth is a Radio Frequency (RF) specification for short-range, point-to-point and point-to-multi-point voice and data transfer. Bluetooth will enable users to connect to a wide range of computing and telecommunications devices without the need for proprietary cables that often fall short in terms of ease-of-use. The technology represents an opportunity for the industry to deliver wireless solutions that are ubiquitous across a broad range of underlying Bluetooth standard will ensure that all solutions meet stringent expectations for ease-of-use and interoperability.

I. INTRODUCTION

Bluetooth is a global standard for wireless connectivity. Bluetooth is based on a short-range radio. Designwise three main goals of Bluetooth were small size, low cost and low power consumption. Bluetooth technology facilitates the replacement of the cables normally used to connect one device to another, with one universal short-range radio link. For example, Bluetooth radio technology built into both the mobile telephone and the laptop could replace the traditional (serial) cable used today to connect these devices. Printers, Personal Digital Assistants (PDAs), desktop computers, fax machines, keyboards, joysticks, mice or any other digital device can be part of the Bluetooth system.

About Bluetooth

This Bluetooth technology achieves its goal by embedding small, inexpensive, short-range radio transceivers into the devices that are available today, either directly or through an adapter such as a PC Card. The radio operates on the globally available unlicensed radio band, 2.4 GHz, and supports data speeds of up to 723.2 Kbps. Bluetooth can also support up to three voice channels. The Bluetooth specification targets very low power consumption (less than 100 mW) in the active state. The Bluetooth radio is designed to operate in a noisy radio frequency environment. It uses a fast acknowledgement and frequency hopping scheme to make the link robust. Bluetooth radio modules avoid interference from other signals by hopping to a new frequency after transmitting or receiving a packet.

II. NETWORK TOPOLOGY

The Bluetooth system supports both point-to-point and point-to-multi-point connections. Several Piconets can be established and linked together in an adhoc manner. Each such Piconet is identified by a different frequency hopping sequence. All users participating on the same Piconet are synchronized to this hopping sequence. Bluetooth devices can interact with one or more other Bluetooth devices in several different ways.

Piconet

The simplest scheme is when only two devices are involved. This is referred to as point-to-point. One of the devices acts as the master and the other as a slave. This adhoc network is referred to as a Piconet.

Operations for Piconet

- A Piconet is a collection of devices connected via Bluetooth technology in an adhoc fashion.

- A Piconet starts with two connected devices, such as a portable PC and cellular phone, and may grow to eight connected devices.
- All Bluetooth devices are peer units and have identical implementations.
- By definition, the Bluetooth unit that initiates the connection (to one or more slave units) represents the master.
- The names 'master' and 'slave' only refer to the protocol on the channel: the Bluetooth units themselves are identical; that is, any unit can become a master of a Piconet. Once a Piconet has been established, master-slave roles can be exchanged.

III. PRACTICAL IMPLEMENTATION OF BLUETOOTH TECHNOLOGY

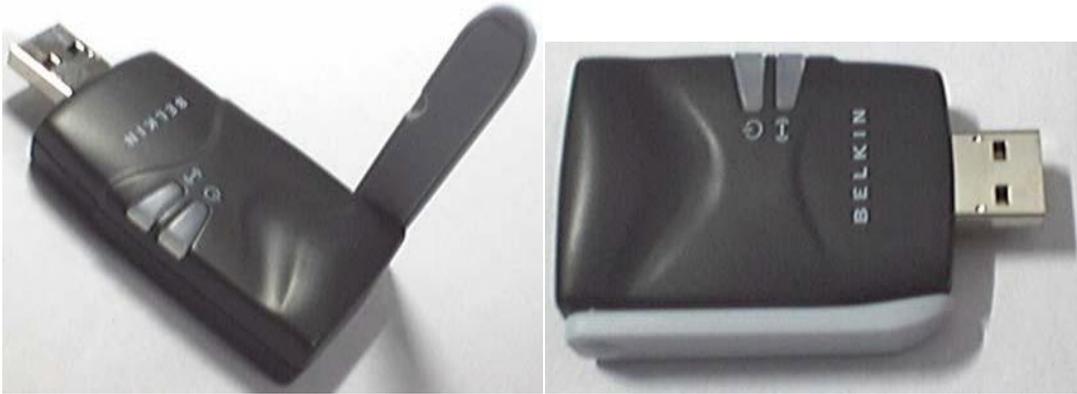
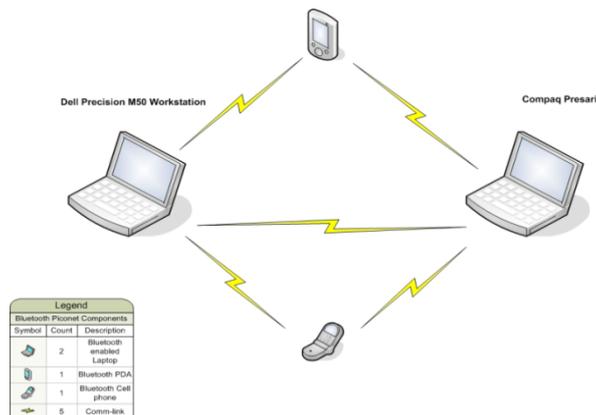


Fig: 1 The Bluetooth piconet was set up as shown below in the diagram

Bluetooth Network



Device Using Bluetooth

- Bluetooth is slowly beginning to reach the hands of consumers.
- Most premium-range mobiles and PDAs support Bluetooth; it has started appearing in the main stream range as well.
- Users buying mobiles phones, or PDAs should look for Bluetooth enable devices .
- Using Bluetooth, you can transfer contacts, ring tones, images etc., between devices easily.

The Scatternet

When two Piconets are close to each other, they have overlapping coverage areas. This scenario is provided for in the Bluetooth specification and is referred to as a scatter net. Slaves in one Piconet can participate in another Piconet as

either a master or slave. This is accomplished through time division multiplexing. In a scatter net, the two (or more) Piconets are not synchronized in either time or frequency. Each of the Piconets operates in its own frequency-hopping channel while any devices in multiple Piconets participate at the appropriate time via time division multiplexing.

Frequency Hopping

Bluetooth technology uses a frequency hopping technique, which means that every packet is transmitted on a different frequency. In most countries, 79 channels can be used. With a fast hop rate (1600 hops per second), good interference protection is achieved. Note that this case only refers to situations where there are two or more simultaneous active piconets or a non-Bluetooth device using the same frequency in range. The error correction algorithms are used to correct the fault caused by jammed transmissions.

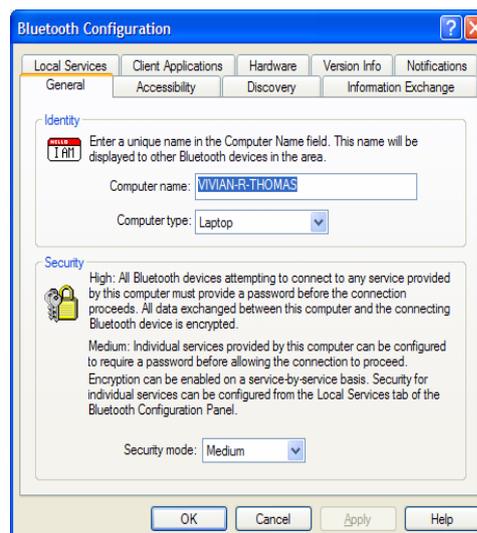
The Bluetooth Clock

Every Bluetooth unit has an internal system clock, which determines the timing and hopping of the transceiver. The Bluetooth clock is derived from a free running native clock, which is never adjusted and is never turned off. For synchronization with other units, only offsets are used. These offsets, when added to the native clock, provide temporary Bluetooth clocks, which are mutually synchronized. The Bluetooth clock has no relation to the time of day and can therefore be initialized to any value.

Bluetooth Settings and Configuration

To customize the configuration settings of *Bluetooth software for Windows operating system*, follow the instructions described below:

- Right click on the *Bluetooth icon on the right-hand side* of the task bar of your screen. The "Bluetooth Configuration" window appears to allow you to customize the configuration settings of "Explore", "Setup", or "Services".
- In the "Setup" menu, there are two extended items, "Security" and "Configuration".
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IV. HOW BLUETOOTH WORKS

SYSTEM SUPPORT

The easiest way to enable Bluetooth support in a system is to attach Bluetooth USB sticks. Some motherboards, such as MSI KT3Ultra2-BR, come with inbuilt Bluetooth support. Once plugged into the system, you'll have to install the drivers for the device to start using it. The system will then periodically scan the surroundings for Bluetooth devices.

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Advantages

- It attempts to provide advantages over IrDA (Infrared Data Association) and Home RF (RaIt eliminates the feasibility of using IrDA for hidden computing. Due to its RF nature Bluetooth is not subject to such limitations.
- In addition to wireless device connections up to 10m (and up to 100m if transmitter power is increased), devices need not be within line of sight and may connect through walls or other non-metal objects.
- Bluetooth could also be used in home networking applications. There is a need for networks that are simple to install and maintain.
- Wireless connections circumvent the hassle of adding wiring to existing residences. Other technologies cost more than \$100 per node. (dioFrequency).

Disadvantages

- Bluetooth devices are expected to be omnipresent and at some places access to this devices by public users many have to be restricted.
- Personal privacy is at risk.
- The range can't be increased without compromising on power.

Applications

- Home-The Three-in-one Phone
- The Internet Bridge
- Smart Home
- Office-The Automatic Synchronizer
- The Interactive Conference
- Travelers-Automatic Check-in
- Home RF

Features

- It is wireless
- It is inexpensive.
- You don't have to think about it i.e., does not require you to do anything special to make it work.
- Operates in the 2.56 GHz ISM band, which is globally available.
- Uses FHSS (Frequency Hopping Spread Spectrum)
- Can support up to 8 devices in the Piconet.
- Omni-directional, non line of sight transmissions through walls.
- 10m to 100m range.
- 1mW power.
- Extended range with external power amplifier (100m).
- Its main strength is its ability to simultaneously handle both data and voice transmissions.

V. CONCLUSIONS

Bluetooth, on the other hand, is a generic access technology meant for wirelessly connecting devices of all types, shapes and sizes. It's intended to be ubiquitous, allowing the formation of ad hoc networks between devices wherever they may be located, with or without the user's intervention. It's designed to enable portable devices such as notebook computers to easily move about an office or campus environment, while maintaining connectivity to the corporate LAN. It can also be used to rapidly set up a LAN among desktop computers without pulling CAT-5 cable

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