THE BLUETOOTH TECHNOLOGY

Abstract:

Living in a wireless world is not a distant dream anymore. The Blue tooth technology is the current killer technical application with promising future ,which brings us closer to that end.Bluetooth technology is a wireless, automatic art of connection that is aimed at simplifying and communicating in the Internet and data synchronization facilitating cable replacement technology. It works on a universal medium to bridge the complex data networks, peripheral interfaces to form a short range digital radio frequency og 2.4GHz in a wide range of 10mts.The blue tooth technology has proven to be the elixir to industrial specifications for wireless Personal Area Network(PAN), requiring little bandwidth with significant features of robustness, low power and low cost efficiency. It supports the personal bubble, which transmits both voice and data for multiple devices connected in a Piconet or Scatter net. Blue tooth wireless technology is designed to secure with unto 128bit public or private key authentication and stream lining chipher upto64 bit ,proving 5 thick layers of security.

Keywords: *Pan, Cipher, piconet devices, wireless, Internet*

Conclusion:

The typical architectures for wireless technology say that blue tooth has produced a strong undercurrent in technical space, and suggested this will continue to rise rapidly.Bluetooth technology is barely tapped. If things pan-out for bluetooth,may be Bill Gate's vision of every device talking to each other will become a_solution for low-medium speed device connectivity. It uses the ad-hoc technology for audio transmissions which make them cost effective, thus making then very practical. It has punched in great momentum in the industrial sector. Its a omni-directional technology not requiring any line-of-sight and providing high levels of security. its a Cable Replacing technology is finding its applications in Smart Home, Internet Bridging. thus it is a international technology having global standards. and it has etched golden pages in the history of the "Art Of Connectivity.

INTRODUCTION:

Living in a wireless world is not a distant dream anymore. Bluetooth is the current killer application with promising future which brings us to that end. Bluetooth is a wireless, automatic connection that is aimed at simplifying and communicating in the internet and data synchronization facilitating cable replacement technology. It works on a universal medium to bridge the data networks, peripheral interfaces to form a short range digital unlicensed radio frequency of 2.4GHz in a wide range of 10mts. Due to their independence on short range radio link, Bluetooth devices do not require a line of site connection in order to communicate. Bluetooth technology has proven to be elixir to industrial specification for wireless, personal area network (PAN) requiring little bandwidth with significant features of robustness, low power and low cost efficiency. It has created a strong under current in the technical space since it is so economic, practical and reliable. The peer-to-peer Connections help in worldwide applications having global standards.

HISTORY: Bluetooth has a very fascinating history, which started in the tenth century. The Viking of Denmark, Harald Gormsen Blatand established a rune stone to connect people. In 1994; IT-Company ERICSSON initiated a multi-communication link. Jaap Haartsen and Sven Mattisson gave birth to Bluetooth. The project became successful in spring 1998, the companies-ERICSSON, TOSHIBA, INTEL, IBM and NOKIA founded the Bluetooth consortium with the goal of development of a single-chip, low cost, radio-based wireless network technology. In 1999, ERICSSON erected a rune stone in LUND (SWEDEN) in memory of the great king who had an epithet of multi-communicating. Thus keeping with its namesake, Bluetooth also connects different wide variety of devices with each other

 BASIC PRINCIPLES OF WORKING: The technology of Bluetooth centers around a 9mm x 9mm microchip, which functions as a low cost and short range radio link. Bluetooth Technology provide a 10 meter personal bubble that support simultaneous transmission of both voice and data for multiple devices. Up to 8 devices can be connected in a piconet, and up to 10 piconets can exist within the 10 meter bubble. Each piconet support up to 3 simultaneous full duplex voice devices.The gross data rate is 1 Mb/s, but the actual data rate are 432 kbps for full duplex transmission,721/56kbps for asymmetric transmission, and 384 kbps for tms2000 transmission. Bluetooth wireless technology is designed to be as secure as a wire with up to 128-bit public/private key authentication, and streaming cipher up to 64 bit based on a5 security.

Network arrangement:

Bluetooth network arrangements (topology) can   be either point-to-point or point-to-multipoint. Any unit in a piconet can establish a connection to another piconet to form a scatter net. See the figure, which diagrams a scatter net in which piconet A, which consists of four units, is connected to piconet B, network

Radio frequency and spectrum hopping: What if there's a lot of radio noise? Won't that interfere with Bluetooth connections? As a rule, the answer is no. It is designed to use fast acknowledgement and frequency hopping, which will make connections robust. It is packet-based, and will jump to a new frequency after each packet is received, which not only helps limit interference problems, but also adds to security. Data rates are on mega byte/second, including

headers. Full duplex transmissions (both directions at once) are accomplished via time division multiplexing.The Bluetooth radio chip functions at 2.4 gigahertz, which is in the unlicensed ISM (Industrial Scientific Medical) band. It separates the 2.4 gigahertz frequency band into 79 hops one megahertz apart, starting with 2.402 and ending with 2.480 (though this bandwidth is narrower in Japan, France, and Spain). This spread spectrum is used to hop from one channel to another, pseudo-randomly, which adds a strong layer of security. Up to 1600 hops per second can be made. The standard frequency range is 10 centimeters to 10 meters, and can be extended to at least 100 meters by increasing transmission power.

Data transmission: Data can be transmitted both synchronously and asynchronously. The Synchronous Connection Oriented (SCO) method is used primarily for voice, and Asynchronous Connectionless (ACL) is primarily for data. Within a piconet, each master-slave pair can use a different transmission mode, and modes can be changed at any time. Time Division Duplex (TDD) is used by both SCO and ACL, and both support 16 types of packets, four of which are control packets that are the same in each type. Because of the need for smoothness in data transmission, SCO packets are generally delivered via reserved intervals, that is, the packets are sent in groups without allowing other transmissions to interrupt. SCO packets can be transmitted without polling by the sending unit. ACL links support both symmetric and asymmetric transmissions.Bandwidth is controlled by the master unit, which determines how much of the total each slave unit can use. Slaves cannot transmit data until they have been polled by the master, and the master can broadcast messages to the slave uPPP Protocols and Usage Models RFCOMM TCP/IP Baseband L2CAP OBEX IrMC TCS-BIN Audio Sync Dial-up net. Usage Models File Transfer AT-commands Fax Headset LAN Access Cordless Phone SDP LMPnits via ACL link.

Protocols and Usage Models
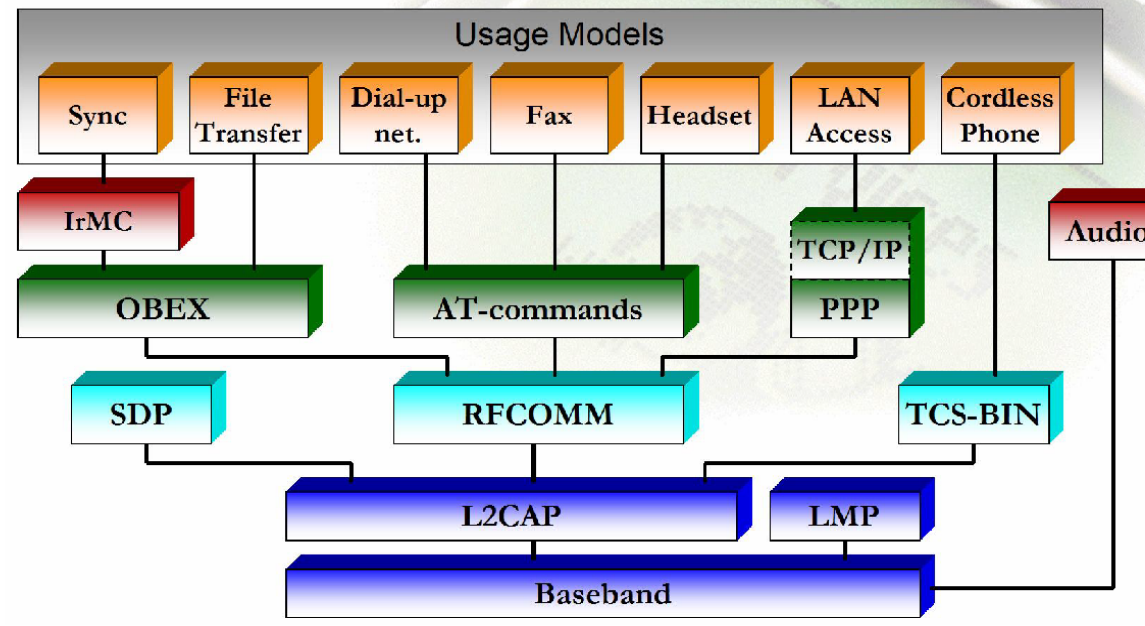
BLUETOOTH CORE PROTOCOLS: Baseband: The Baseband and Link Control Layer enables the RF link Bluetooth units in a piconet. This layer uses inquiry and paging procedures to synchronize the transmission between different Bluetooth devices.

Link Manager Protocol (LMP): The link manager protocol is responsible for setting up link channels between Bluetooth devices after performing security methods like authentication and encryption by generating, exchanging and verifying linking and encryption keys and negotiating base band packet size.

Logical Link Control and Adaptation Protocol (L2CAP): L2CAP packets carry payloads which are carried to the upper layer protocols.

Service Discovery Protocol (SDP): Using SDP, device information, services allowed and characteristics of the services are queried between Bluetooth enabled devices.

Cable Replacement Protocol (RFCOMM): RFCOMM is a serial line emulation protocol.

Telephony Control Protocol: The Telephony Control - Binary (TCS Binary) and Telephony Control - AT Commands are used to establish speech and data calls between devices and control mobile phones and modems respectively.

Adopted Protocols: Bluetooth also supports PPP, TCP/UDP/IP, OBEX and WAP protocols to maximize interoperability.

SECURITY: The security base band specification defines a facility for link security between any two Bluetooth devices, consisting of the following elements:
1. Authentication,
2. Encryption,
3. Key management and usage
The security algorithms make use of four parameters:
1. Unit address: the 48-bit devices address, which is publicly known
2. Secret authentication: a secret key128 bit key.
3. Secret privacy: a secret key of length from 4 to 128 bits.
Random number: a 128-bit random number derived from a pseudorandom generation algorithm executed in the Bluetooth unit.
The two secret keys are generated and configured with the unit and not disclosed

USAGE MODEL: While the Bluetooth * usage model is based on connecting devices together, it is focused on three broad categories: *voice/data access points, peripheral interconnects,* and

Voice/Data Access Points: A voice/data access point is one of the key initial usage models and involves connecting a computing device to a communicating device via a secure wireless link

(see Figure 1). For example, a mobile computer equipped with Bluetooth technology could link to a mobile phone that uses Bluetooth technology to connect to the Internet to access e-mail. The mobile phone acts as a personal access point. Even more ideal, the notebook can connect to the Internet while the cell phone is being carried in a briefcase or purse. The Bluetooth usage model also envisions public data access points in the future. Imagine the current data-equipped pay phones in airports being

Upgraded with Bluetooth modems. This would allow any mobile device equipped with Bluetooth technology to easily connect to the Internet while located within ten meters of that access point. These access points could, of course, support much higher data rates than today's modems, as public spaces could connect a variety of private Bluetooth access points via a LAN that is routed to the Internet over a DSL line, allowing each access point a private 1Mbps connection to the Internet.
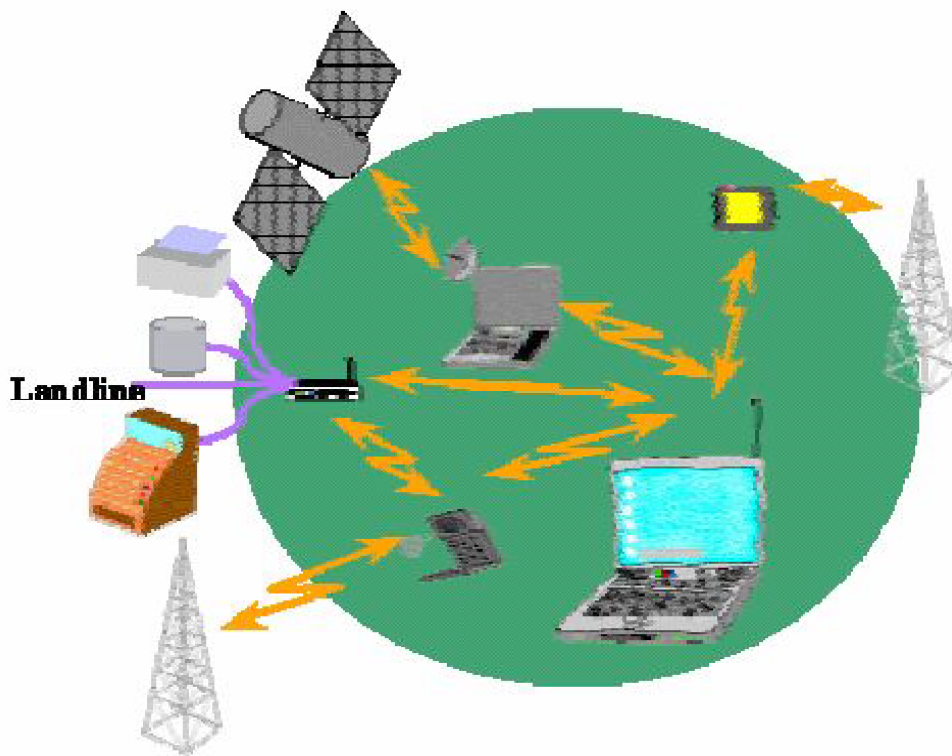

Figure 1: Voice/data access points

Peripheral Interconnects: The second category of uses, *peripheral interconnects*, involves connecting other devices together as shown in Figure 2. Imagine standard keyboards, mice, and joysticks that work over a wireless link. The Bluetooth link is built into the mobile computer; therefore, the cost of the peripheral device is less because an access point is not needed. Additionally, many of these devices can be used in multiple markets. For example, a Bluetooth headset used in the office could be connected to a Bluetooth access point that provides access to the office phone and multi-   media functions of the mobile computer. When mobile, the same headset could be used to interface with the cellular phone (which can now remain in a briefcase or purse).Another aspect of a short-range link like Bluetooth is in the area of proximity security

devices. In this case, if one device is not within range of another device, the first device will go into a high security mode.

Figure 2: Peripheral interconnects
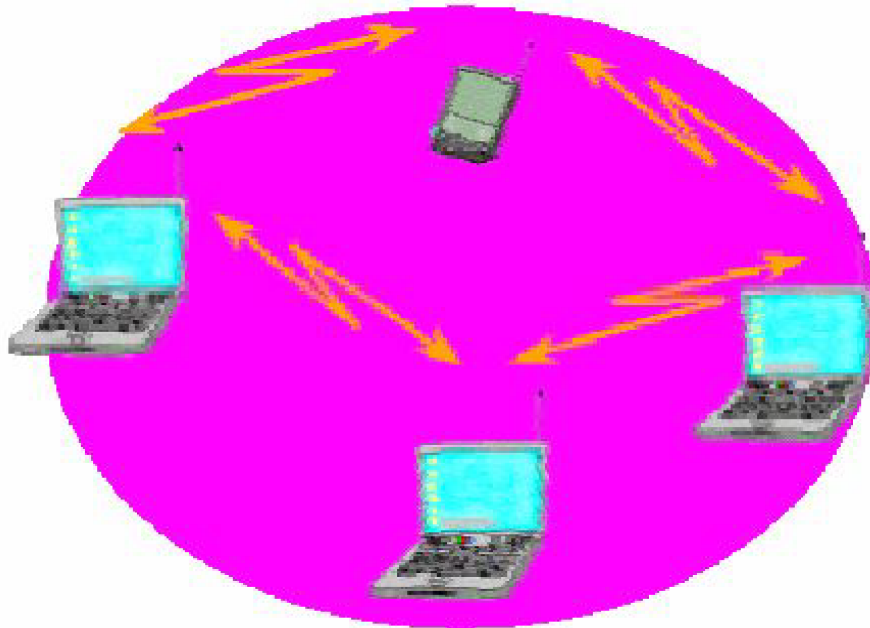
Figure 3: Personal Area Networking (PAN)

Personal Area Networking:

The last usage model, *Personal Area Networking (PAN)*, focuses on the ad-hoc formation and breakdown of personal networks (see Figure 3). Imagine meeting someone in an airport and quickly and securely exchanging documents by establishing a private piconet. In the future, Bluetooth kiosks could provide access to electronic media that could be quickly downloaded for later access on the mobile device.

CHARACTERISTICS: Signals can be transmitted through walls and briefcases, thus eliminating the need for line-of-sight.

- Devices do not need to be pointed at each other, as signals are omni-directional.

- It separates the frequency band into hops. This spread spectrum is used to hop from one channel to another, which adds a strong layer of security.

- Both synchronous and asynchronous applications are supported, making it easy to implement on a variety of devices and for a variety of services, such as voice and Internet.

- Up to eight devices can be networked in a Pico net.

Governments worldwide regulate it, so it is possible to utilize the same standard wherever one travels as it uses the unlicensed radio frequency of 2.4GHZ

ADVANTAGES OF BLUETOOTH TECHNOLOGY:

1. No line of site restrictions as with IrDA.

2. Low power consumption makes integrated in battery powered devices very practical.

3. 2.4 GHz radio frequency ensures worldwide operability.

4. Tremendous momentum not only within the computer industry but other industries like cellular telephones and transportation.

APPLICATIONS:
Smart Home

Homes equipped with Bluetooth devices may be able to recognize the arrival of its bonafide residents and unlock the door on their arrival. The device will also adjust heat to a preset temperature. While this is happening, the data from the individual's PDA may be exchanged with the home electronic board, and the family calendar is updated
To reflect the scheduled activities in the office.

The Internet Bridge

An extension of this model could be a mobile computer that allows surfing the Internet irrespective of the location of the user, and regardless of whether the user is cordlessly connected through a mobile phone (cellular) or through a wire line connection (e.g. PSTN, ISDN, LAN, xDSL).

Automatic Check-in:
➢
Hotels are testing, or plan to test, services that allow guests to check   in, unlock room doors and even control room temperature with handheld devices equipped with Bluetooth Technology.
➢
The Bluetooth enabled mobile phone or the PDA can present the electronic ticket to the airline system without one having to go through the queue at the check-in counters. The airline's on-line system performs the identification via the ID-tag feature built into the mobile phone or the PDA and confirms the reserved seat.

The Three-in-one Phone

With Bluetooth support, one handset will be able to provide multiple functionality. When at home, the phone functions as a cordless phone, connected to the fixed line. When on the move, it functions as a mobile phone connected to the mobile network. Additionally, when the phone comes within range of another mobile phone with built-in Bluetooth technology, it functions as a walkie-talkie.

AUTOMATIC SYNCHRONIZATION: Bluetooth provides the facility of automatically synchronizing our desktop for portable computers, mobiles, notebook, and electronic gadgets.

Bluetooth applications in day-to-day life:

1. It can be used in refrigerators so as to intimate when the food supply is low.
2. Bluetooth chips in freight containers to identify cargo when a lorry drives into the depot.

FUTURE SCOPE: *Bluetooth* is a continually expanding technology. There are plans to add many new application profiles. With over 1800 companies working on *Bluetooth*, the future could further be brighter. And with any further developments of the technology we can create miracles in the field of "COMMUNICATIONS" With a strong special interest group behind *Bluetooth*; the standardization of the application profiles is almost assured.

According to market researchers, Canners In-Stat Group, it is anticipated that as many as 670 million products will have *Bluetooth* built-in by the year 2005.

At this time, we anticipate the *Bluetooth* SIG to evolve the *Bluetooth* technology to provide greater bandwidth & distances, thus increasing the potential platforms & applications used in the emerging personal area-networking marketplace

Some members of the *Bluetooth* SIG such as Sony & Eastman Kodak are interested in seeing the speed of *Bluetooth* increasing for applications such as streaming video.

Bluetooth technology already plays a part in the rising Voice over IP (VOIP) scene, with Bluetooth headsets being used as wireless extensions to the PC audio system. As VOIP becomes more popular, and more suitable for general home or office users than wired phone lines, Bluetooth may be used in cordless handsets, with a base station connected to the Internet link