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## Basic Study of Bluetooth Networking Topologies

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### Abstract

In this paper I review about Bluetooth network. A Bluetooth network is a local area network which has built spontaneously as device connected also referred as an ad hoc network which is Personal Area network (PAN). A Bluetooth network is much better to connect different devices individually. It covers broad swaths of circumstances. Many people carry various movable devices such as cell phones, laptops, tablets and mp3 player for use in their daily lives. Bluetooth network is wireless communication between devices might be loosely explained as structure, frequently referred as an ad hoc networking that permits devices to established communication without help of any substructure. The various type of Bluetooth ad hoc system and there functionality is discussed in this paper such as piconet and scatternet. In conclusion there are some fresh studies about scatternet and piconet routine used in routing problems in an ad hoc network.

**Keywords:** ad hoc network, Bluetooth, wireless, piconet, scatternet.

### Introduction:

In today's life communication has become a primary aspect of computing. Now a days in order to stay online through mobile devices it is very important to create such kind of network which should be fast and cost effective when moving among the different infrastructures. When ad hoc network has created, it might be possible the nodes which are associated to the network should be able to move freely and information should be move through the new path when old path has broken. The network should be handled by clustering. Mobile nodes which are in the (Bluetooth) range can communicates directly with each other, while that are far apart rely on other nodes to relay message as routers.

Bluetooth is a technology that can be used for ad hoc networking. Bluetooth has a vast industry in computing and telecommunication which specifies the specification of communication and describes how laptops, mobiles, computers and personal digital assistant can connect with each other and communicate with one another using wireless transmission in short range. The goal of this system is to remove or eliminate any cable connectivity and promote these technology users of different portable devices e.g. Mobiles, PDA's, computer systems and Other handheld devices can quickly and easily share information with each other, for example in classroom student can share information using ad hoc networking.

In bluetooth a connection between two devices is called 'Pairing' which is formed by exchanging shared secrets referred to as a PINs. A 'master' device has the option of pairing with seven 'slaves' devices called piconet. A 3 bit address space limits the number of devices in any piconet to eight [6]. Two or more piconet when communicate with each other form a scatter net which can be used to eliminate bluetooth range restriction. A scattered is formed when the device act as master and slave in the different piconet at the same time. A summary of other Bluetooth technology key features has presented in Table 1.

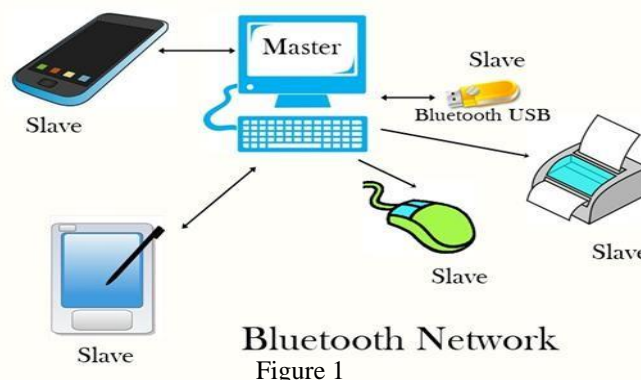
**Table 1. Bluetooth Technical Specification**

Connection	Spread Spectrum(Frequency
Frequency band	2.4 GHZ ISM
Modulation Technique	Gaussian Frequency Shift
MAC Scheduling scheme	FH-CDMA
Transmission Power	>20 dBm
Aggregate Data Rate	0.721-1 Mbps
Range	10m-100m
Supported Stations	8 devices (per Piconet)
Voice Channels	3
Data Security-	128 bit key
Data Security-Encryption	8-128 bits(configurable)

With each new release of Bluetooth the manufactures recover multiple aspect of security to make it more secure and user-friendly to cover wide range of devices, a list of Bluetooth versions with comparison is stated in [1]. Although Bluetooth technology is consider as a very popular technology. In this paper those topics which are reviewed are as follows, Bluetooth- network, Bluetooth topologies and Bluetooth hardware.

**The Bluetooth Network:**

Usually a Bluetooth connection network refers to as piconet use a master slave control when and where different devices want to send data. In this model seven slave devices can connect with a single master device. The master device coordinates communication throughout the piconet. It can send data to the slave and request data as well. Slaves are only allowed to transmit to and receive from their master device. If master is connected to one slave it is called Point to Point piconet and if master is connected to multiple slaves then it is called Point to Multipoint piconet in piconet all slaves follows frequency hopping sequence from the master [3]. In the piconet slave devices have only direct connection with master device no direct connection between slaves. When two or more piconets communicate with each other it forms a scatternet. The structure of Bluetooth network is in Figure 1.



In scatternet a piconet master may work as slave in scatternet. Bandwidth is condensed proportionally if 10 or more piconets are communicating in the 10 meter radius and possibility of interference may enhance. The way in which more the one communicate with each other form an ad hoc network in which each node is free to move. A mobile area network is self-configuring (MANET) which is an example of wireless communication.

**Network Topologies:**

In this section the different types of topologies use in Bluetooth communication and their applications will be discussed. Bluetooth technology must be able to operate in ad hoc networks that can be part of ip-networked world or can be stand alone and can be the combination of both stand alone and ip-networked world. The main purpose of Bluetooth networks is to eliminate the use of wire or cables and transmit data without cables although not every device is supporting Bluetooth except some [5]. Bluetooth technology allows different types of connections in which three main types are given below.

1. Single-slave enabling communication between two devices.
2. Multi-slave allows for 7 slaves to be connected to one master – the seven other individual devices connection is the basis for piconets.
3. Scatternet, connection of multiple piconets allows for the creation of large ad-hoc network.

### **Piconet Network:**

The basic functionality of the Bluetooth technology is point to point connection and it is also said to be piconet. While talking about the Bluetooth point to point communication it is not the application of ad hoc network but we can say it that it is an ad hoc connection. Point to point communication via Bluetooth is definitely an alternative way of communication rather than cables but it cannot replace all types of cables. Connections using over 723 kbps cannot be replaced by Bluetooth technology.

In general, good applications of piconet network is wireless headphones and dialup networking between laptops and mobiles. The connection between two mobile devices is also referred as Piconet or point to point communication. Pictorial representation of point to point communication (piconet) is given in Figure 2.



Figure 2

The IEEE 802.11 standards by IEEE are the most common point to point communication standard by IEEE for Wireless local area network. IEEE 802.11n standard allows point to point connection up to 600 Mbps [2].

### **Scatternet Network:**

Scatternet is the integral part of Bluetooth specifications and it has been under an outstanding research since first familiarize of it. A person who is newly introduced with Bluetooth will be immediately introduced with the concept of scatternet. The topology implemented by the Bluetooth is that a master and slave connected together form a piconet and different piconets linked together to form a scatternet to cover much wider area [2]. A scatternet is the connection of different piconet normally support between more than 8 devices The device participating in both piconets can relay data between members of both ad hoc networks. However, the basic Bluetooth protocol is not going support this relaying - the host software of each device would need to manage it. Using this approach, it is probable to join together numerous piconets into a large scatternet, and to increase the physical area of the network beyond Bluetooth's limited range. In the case where scatternet is use it has the ability of interconnectivity to the internet to the physical world with the use of wireless devices. A number of multiple companies try to develop a social- networking and dating services that force early implementation of scatternet. Scatternet can also use in interconnection of different devices and autonomous robots.

### **Bluetooth Networking:**

Bluetooth technology is designed to make a useful impact in a technology of networking. Bluetooth wireless signals are used to transmit signals in the shorter range normally in the range of 25-30 feet. Bluetooth technology is considered a very important role but Bluetooth must be able to work in ad-hoc network or in the

stand alone system. Bluetooth network is designed to eliminate the factor of cables such that different technology must use wireless technology which is cheap and remove the cables for example a communication between two devices should be wirelessly. Shorter area wireless communication must be fit in to the wider area communication it that can be extend by using IP addressing into the Personal area network. Generally said that a good capacity for booming IP will definitely provide the much wider network and interface, which would most certainly accelerate the development of advanced applications for Bluetooth.

### **Conclusion:**

Ad-hoc Bluetooth network is still a very vast field to study and research about the problems that can exist in these networks and the solutions. In this paper I have tried to take a survey about Ad-hoc networking, piconet and scatternet. I have also tried to verify what is piconet and scatternet actually is and also tried to elaborate Bluetooth networking I have also discussed about different properties of ad hoc network. However instead of looking at large area network I have discussed about small area network or personal area network that is emerging now a days in respect to increase in radio technologies now a days. Thus, current development of IP support in Bluetooth technology is very much crucial but the products that apply the concepts of ad hoc network is applicable is shorter area range. However Bluetooth ad hoc network is only helps the user of personal area networks and also able the interconnection between different users but the best ability of ad hoc network is that it is portable and organized from a dominant device (Central device) from which different devices are connected because of its inherit property Bluetooth network is easy to deploy. Ad hoc network is frequently use in military sector where the communication is done via ad hoc network but the commercial use of ad hoc network is very few so far, The ability of creating a small area network ad hoc system in portable devices represents a totally new area for future ad-hoc based applications.

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### **Notes**

Note 1. This is Review Paper.