EXPERIMENT NO. 1

AIM:

Prepare a case study on Bluetooth architecture and protocol stack. Search for any two research papers where Bluetooth is used for file transfer. Summarize both the research papers.

THEORY:

Bluetooth: -

● Bluetooth is, with the infrared, one of the major wireless technologies developed to achieve WPAN. Bluetooth is a wireless LAN technology used to connect devices of different functions such as telephones, computers (laptop or desktop), notebooks, cameras, printers and so on.

● Bluetooth is managed by the Bluetooth Special Interest Group (SIG), which has more than 30,000 member companies in the areas of telecommunication, computing, networking, and consumer electronics. The IEEE standardized Bluetooth as IEEE 802.15.1, but no longer maintains the standard. The Bluetooth SIG oversees development of the specification, manages the qualification program, and protects the trademarks. A manufacturer must meet Bluetooth SIG standards to market it as a Bluetooth device. A network of patents applies to the technology, which are licensed to individual qualifying devices.

● Nowadays, Bluetooth technology is used for several computer and non-computer application:

1. It is used for providing communication between peripheral devices like wireless mouse or keyboard with the computer.

2. It is used by modern healthcare devices to send signals to monitors.

3. It is used by modern communicating devices like mobile phone, PDAs, palmtops etc to transfer data rapidly.

4. It is used for dial up networking. Thus, allowing a notebook computer to call via a mobile phone.

5. It is used for cordless telephoning to connect a handset and its local base station.

6. It also allows hands-free voice comml1nication with headset.

7. It also enables a mobile computer to connect to a fixed LAN.

8. It can also be used for file transfer operations from one mobile phone to another.

9. Bluetooth uses omni directional radio waves that can through walls or other non- metal barriers.

● Bluetooth devices have a built-in short-range radio transmitter. The rate provided is 1Mbps and uses 2.4 GHz bandwidth.

● Bluetooth is that when the device is within the scope of a other devices automatically start the transfer information without the user noticing. a small network between the devices is created and the user can have accessed as if there were cables.

Bluetooth Architecture : -

Bluetooth architecture defines two types of networks:

1. Piconet

2. Scattemet

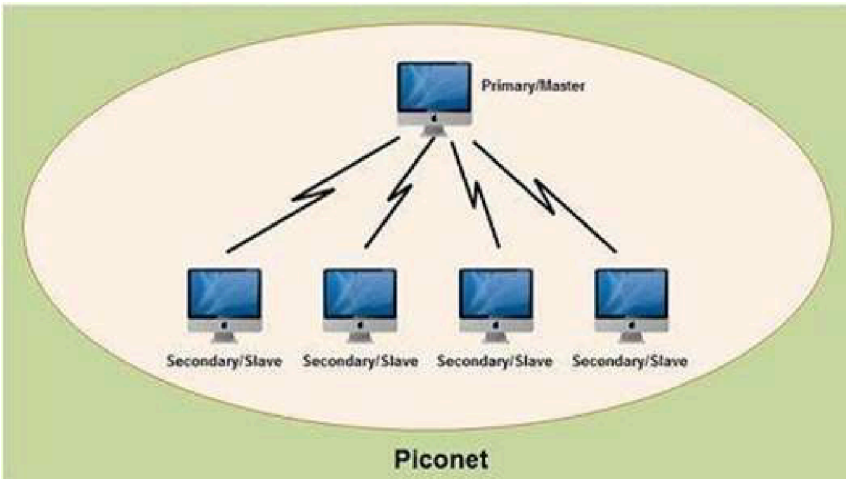
1. Piconet:

● Piconet is a Bluetooth network that consists of one primary (master) node and seven active secondary (slave) nodes.

● Thus, piconet can have up to eight active nodes (1 master and 7 slaves) or stations within the distance of 10 meters.

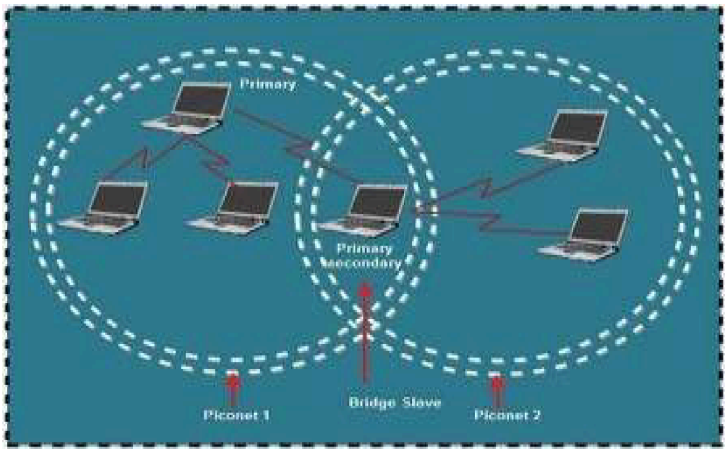
● There can be only one primary or master station in each piconet.

● The communication between the primary and the secondary can be one-to-one or one- to-many.



All communication is between master and a slave. Salve-slave communication is not possible.
● In addition to seven active slave station, a piconet can have up to 255 parked nodes. These parked nodes are secondary or slave stations and cannot take part in communication until it is moved from parked state to active state.

2. Scatternet
● Scattemet is formed by combining various piconets.
● A slave in one piconet can act as a master or primary in other piconet.
● Such a station or node can receive messages from the master in the first piconet and deliver the message to its slaves in other piconet where it is acting as master. This node is also called bridge slave.
● Thus a station can be a member of two piconets.
● A station cannot be a master in two piconets.



Bluetooth pairing:

In order that devices can connect easily and quickly, a scheme known as Bluetooth pairing may be used. Once Bluetooth pairing has occurred two devices may communicate with each other.

Bluetooth pairing is generally initiated manually by a device user. The Bluetooth link for the device is made visible to other devices. They may then be paired.

The Bluetooth pairing process is typically triggered automatically the first time a device receives a connection request from a device with which it is not yet paired. In order that Bluetooth pairing may occur, a password has to be exchanged between the two devices. This password or "Passkey" as it is more correctly termed is a code shared by both Bluetooth devices. It is used to ensure that both users have agreed to pair with each other. The process of Bluetooth pairing is summarised below:

● Bluetooth device looks for other Bluetooth devices in range: To be found by other Bluetooth devices, the first device, Device 1 must be set to discoverable mode - this will allow other Bluetooth devices in the vicinity to detect its presence and attempt to establish a connection.

● Two Bluetooth devices find each other: When the two devices: Device 1 and device 2 find each other it is possible to detect what they are. Normally the discoverable device will indicate what type of device it is - cellphone, headset, etc., along with its Bluetooth device name. The Bluetooth device name is the can be allocated by the user, or it will be the one allocated during manufacture.

● Prompt for Passkey: Often the default passkey is set to "0000", but it is advisable to use something else as hackers will assume most people will not change this. However many more sophisticated devices - smartphones and computers - both users must agree on a code which must obviously be the same for both.

● Device 1 sends passkey: The initiating device, Device 1 sends the passkey that has been entered to Device 2.

● Device 2 sends passkey: The passkeys are compared and if they are both the same, a trusted pair is formed, Bluetooth pairing is established.

● Communication is established: Once the Bluetooth pairing has occurred, data can be exchanged between the devices.

Applications of Bluetooth:

First Case Study:

Title: 25 Years of Bluetooth Technology [1]

Authors: Sherali Zeadally, Farhan Siddiqui, Zubair Baig

Abstract:

Bluetooth technology started off as a wireless, short-range cable replacement technology but it has undergone significant developments over the last two decades. Bluetooth radios are currently embedded in almost all computing devices including personal computers, smart phones, smart watches, and even micro-controllers. For many of us, Bluetooth is an essential technology that we use every day. We provide an insight into the history of Bluetooth and its significant design developments over the last 25 years. We also discuss related issues (including security) and Bluetooth as a driving technology for the Internet of Things (IoT). Finally, we also present recent research results obtained with Bluetooth technology in various application areas.

Second Case Study:

Title: Seamless file sharing for Android devices [2]

Authors: MinSeok Jeon, Sun-Kyum Kim, Ji-Hyeun Yoon, Jinhee Jo, Sung-Bong Yang

Abstract:

The performance of mobile devices, especially smart phones, has been quickly improved for the last few years. Most users take advantage of highly efficient smart phones, and consume the contents in the smart phones longer time than other devices usage time. As a result, users frequently share the contents and the needs of file sharing via smart phones have been increased considerably. Existing peer-to-peer sharing frequently incurs disconnections and retransmissions. A Web hard-based sharing needs to pay expensive cost for using high-volume file servers as well. In order to overcome such problems, we propose an application for seamless file sharing for the Android devices. The seamless service manager and the file manager in the proposed application share files seamlessly by choosing faster and more stable network automatically - one of the Bluetooth and the WI-FI. We expect that the proposed application could be a cost effective and reliable solution for file sharing among mobile devices.

References:

[1] https://doi.org/10.3390/fi11090194

[2] DOI:10.1109/WF-IoT.2014.6803153