

Practical: 15

AIM: To study Bluetooth and Zigbee.

Bluetooth:



Bluetooth

figure 15.1 bluetooth logo

Bluetooth is a short-range wireless technology standard that is used for exchanging data between fixed and mobile devices over short distances and building personal area networks. In the most widely used mode, transmission power is limited to 2.5 milliwatts, giving it a very short range of up to 10 meters.

How bluetooth works :

Devices connected in a Bluetooth network **communicate with each other using ultra-high frequency (UHF) radio waves**. These are electromagnetic waves with frequencies around 2.4 gigahertz (2.4 billion waves per second). UHF waves of different frequencies are used in microwave ovens, GPS systems and many other devices.

Bluetooth Architecture:

The architecture of Bluetooth defines two types of networks:

1. Piconet
2. Scatternet

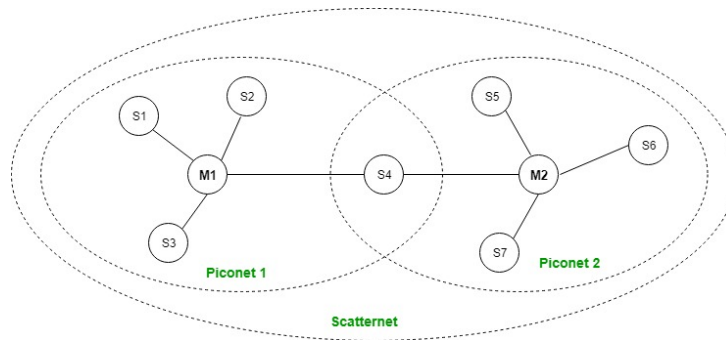


figure 15.2

Piconet:

Piconet is a type of Bluetooth network that contains **one primary node** called the master node and **seven active secondary nodes** called slave nodes. Thus, we can say that there is a total of 8 active nodes which are present at a distance of 10 meters. The communication between the primary and secondary nodes can be one-to-one or one-to-many. Possible communication is only between the master and slave; Slave-slave communication is not possible. It also has **255 parked nodes**, these are secondary nodes and cannot take part in communication unless it gets converted to the active state.

Scatternet:

It is formed by using **various piconets**. A slave that is present in one piconet can act as master or we can say primary in another piconet. This kind of node can receive a message from a master in one piconet and deliver the message to its slave in the other piconet where it is acting as a slave. This type of node is referred to as a bridge node. A station cannot be mastered in two piconets.

Advantage:

- Low cost.
- Easy to use.
- It can also penetrate through walls.
- It creates an Ad-hoc connection immediately without any wires.
- It is used for voice and data transfer.

Disadvantages:

- It can be hacked and hence, less secure.
- It has a slow data transfer rate: of 3 Mbps.
- It has a small range: 10 meters.
- Bluetooth communication does not support routing.
- The issues of handoffs have not been addressed.

Applications:

- Used in laptops, and in wireless PCs.
- In printers.
- In wireless headsets.
- Connecting digital cameras wirelessly to a mobile phone.
- Data transfer from one cell phone to other cell phone or computer.
- Medical health care
- sports and fitness
- military ,security
- Consumer ,game ,professional
- Services ,industry

ZigBee:

Figure 15.3 zigbee logo

ZigBee is a Personal Area Network task group with low rate task group 4. It is a technology of home networking. ZigBee is a technological standard created for controlling and sensing the network. As we know that ZigBee is the Personal Area network of task group 4 so it is based on IEEE 802.15.4 and is created by the Zigbee Alliance.

ZigBee is a standard that addresses the need for very low-cost implementation of Low power devices with Low data rates for short-range wireless communications.

Types of ZigBee Devices:

- **ZigBee Coordinator Device:** It communicates with routers. This device is used for connecting the devices.
- **ZigBee Router:** It is used for passing the data between devices.
- **ZigBee End Device:** It is the device that is going to be controlled.

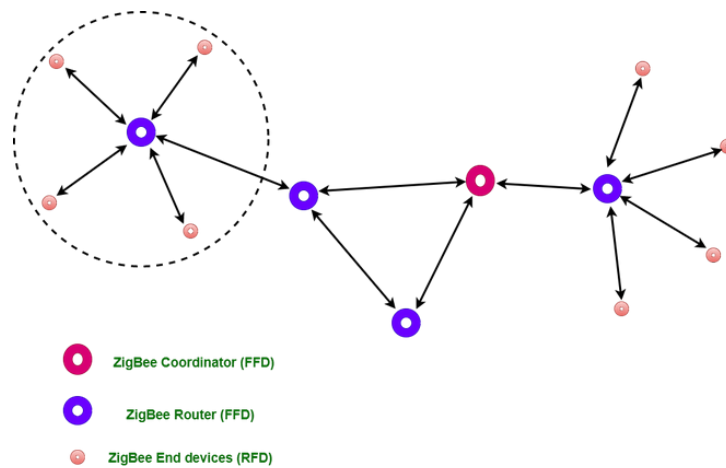


figure 15.4 type of zigbee devices

General Characteristics of Zigbee Standard:

- Low Power Consumption
- Low Data Rate (20- 250 kbps)
- Short-Range (75-100 meters)
- Network Join Time (~ 30 msec)
- Support Small and Large Networks (up to 65000 devices (Theory); 240 devices (Practically))
- Low Cost of Products and Cheap Implementation (Open Source Protocol)
- Extremely low duty cycle.
- 3 frequency bands with 27 channels.

Architecture of Zigbee:

ZigBee architecture is a combination of 6 layers.

1. Application Layer
2. Application Interface Layer
3. Security Layer
4. Network Layer
5. Medium Access Control Layer
6. Physical Layer

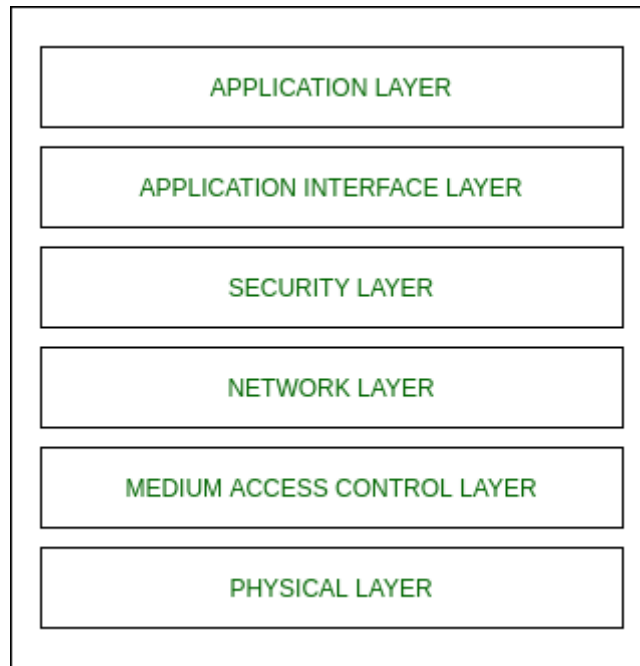


Figure 5.5

Zigbee Applications:

1. Home Automation
2. Medical Data Collection
3. Industrial Control Systems
4. meter reading system
5. light control system

Differences between Bluetooth and Zigbee:

series no.	bluetooth	zigbee
1	The Bluetooth SIG (Special Interest Group) is the organization responsible for managing Bluetooth standards and devices.	The Zigbee Alliance is responsible for managing Zigbee and testing and approving Zigbee-based devices. IEEE standardizes all Zigbee-based protocols.
2	There are seventy nine RF channels in Bluetooth.	There are sixteen RF channels in zigbee.
3	There are a maximum of 8 cell nodes in Bluetooth.	There are more than sixty five thousand (65000) cell nodes in zigbee.
4	The radio signal range of	While the radio signal

	Bluetooth is ten meters.	range of zigbee is ten to hundred meters.
5	Bluetooth batteries may be recharged.	Although ZigBee batteries cannot be recharged, they last longer.
6	A network speed of up to 250 megabits per second.	A network speed of up to 1 megabit per second.
7	Bluetooth uses high data rates and a lot of power on large packet devices.	Zigbee employs low data rates and little power on small packet devices.

