

1740213 - *Madhav Shroff*
1740224 - *Anushka Gupta*
1740246 - *Parth Takkar*
1740255 - *Gautam Malhotra*
1740256 - *Jeevan Koshy*

IOT Questions

1. What is IEEE 802.15.4?

IEEE 802.15.4 is a technical standard which defines the operation of low-rate wireless personal area networks (LR-WPANs).

It specifies the physical layer and media access control for LR-WPANs, and is maintained by the IEEE 802.15 working group, which defined the standard in 2003.

It is the basis for the Zigbee, ISA100.11a WirelessHART, MiWi, 6LoWPAN, Thread and SNAP specifications, each of which further extends the standard by developing the upper layers which are not defined in IEEE 802.15.4.

2. For short range wireless application which standards can be used?

IEEE 802.15.1 - Bluetooth

IEEE 802.15.3a - UWB

IEEE 802.15.4 - ZigBee

3. Which standard can be used for high speed internet access in laptop and mobile phones?

All the 802.11 specifications use the Ethernet protocol and Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) for path sharing. The newer modulation methods provide higher data speed and reduced vulnerability to interference.

IEEE 802.11b provides a higher data rate than the previous generations.

IEEE 802.11n provides a higher speed standards, top speeds claimed of 108, 240, and 350+ MHz

4. IEEE 802.3 is used for what purpose?

IEEE 802.3 defines the physical layer and the medium access control (MAC) sub-layer of the data link layer for wired Ethernet networks. This is generally a local area network (LAN) technology with some wide area network (WAN) applications. Physical connections are made between nodes and/or infrastructure devices (hubs, switches, routers) by various types of copper or fiber cable.

5. IEEE 802.11 is used for what purpose?

802.11 is an evolving family of specifications for wireless local area networks developed by a working group of the Institute of Electrical and Electronics Engineers. All the 802.11 specifications use the Ethernet protocol and Carrier Sense Multiple Access with Collision Avoidance for path sharing. The original modulation used in 802.11 was phase-shift keying.

6. IEEE 802.15 is used for what purpose?

IEEE 802.15 is a working group of the Institute of Electrical and Electronics Engineers IEEE 802 standards committee which specifies wireless personal area network standards. The number of Task Groups in IEEE 802.15 varies based on the number of active projects. 802.15 is a communications specification that was approved in early 2002 by the Institute of Electrical and Electronics Engineers Standards Association for wireless personal area networks. The initial version, 802.15.1, was adapted from the bluetooth specification and is fully compatible with Bluetooth 1.1.

7. IEEE 802.15.1 is used for what purpose?

The new IEEE Std 802.15.1™-2002 standard is an additional resource for those who implement Bluetooth devices. The lower transport layers (L2CAP, LMP, Baseband, and radio) of the Bluetooth™ wireless technology are defined. Bluetooth is an industry specification for short-range RF-based connectivity for portable personal devices. The IEEE has reviewed and provided a standard adaptation of the Bluetooth Specification v1.1 Foundation MAC (L2CAP, LMP, and Baseband) and PHY (Radio).

8. The 802.15.4 category is for what purpose?

IEEE 802.15.4 is a standard that was developed to provide a framework and the lower layers in the OSI model for low cost, low power wireless connectivity networks. It provides provides the MAC and PHY layers, leaving the upper layers to be developed for specific higher later standards like Thread, Zigbee, 6LoWPAN and many others. IEEE 802.15.4 does not take the limelight in the way that other standards might, but nevertheless it forms the basis for a large number of standards and accordingly it is far more widely deployed than may be apparent at first sight.

9. ZigBee is an advanced enhancement of which standard?

ZigBee communication is specially built for control and sensor networks on IEEE 802.15.4 standard for wireless personal area networks (WPANs), and it is the product from ZigBee alliance. This communication standard defines physical and Media Access Control (MAC) layers to handle many devices at low-data rates.

10. What is the most popular use of ZigBee standard?

ZigBee is mostly used because numerous data rate communication standards do not these meet the sensors' and control devices' communication standards. These high-data rate communication standards require low-latency and low-energy consumption even at lower bandwidths. The

available proprietary wireless systems' ZigBee technology is low-cost and low-power consumption and its excellent and superb characteristics makes this communication best suited for several embedded applications, industrial control, and home automation, and so on.

11. What is the advantage of ZigBee?

Some advantages of ZigBee:

- Setting up the network is very simple and easy.
- It does not have central controller and loads are distributed evenly across the network.
- It is easy to monitor and control home appliances from remote.
- It will take the place of existing Infrared technology based devices. This will save cost of battery replacement as ZigBee uses lithium battery which lasts long.
- The network is scalable and it is easy to add/remote ZigBee end device to the network

12. Write at least 10 applications of ZigBee.

1. Industrial Automation
2. Home Automation
3. Smart Metering
4. Smart grid monitoring
5. Medical data Collection
6. Wireless Sensor Network
7. Set top boxes and remote control
8. Computer peripheral
9. Fire alarms
10. Learning games and interactive toys.

13. What is Bluetooth?

Bluetooth is a wireless technology utilized for transfer of data between different electronic devices. The distance of data transmission is less as compared to other modes of wireless communication. The bluetooth technology is robust and helps to eliminate the use of cords, cables, adapters and permits the electronic devices to communicate wirelessly among one other. It allows the use of hands-free headset for calls, printing and fax services. This technology is advantageous as it is less complicated, consumes less power and is available at cheaper rates.

14. For what purpose was Bluetooth developed?

Bluetooth was invented by a group of engineers at Ericsson in the year 1994 with Jaap Haartsen and Sven Mattisson being the major contributors. It is known to have been developed as a device which did not consume much energy and could exchange data over short distances but turned out to be a very useful wireless technology.

The name 'bluetooth' comes from a Danish viking called Harald Bluetood who shipped runes that are pieces of small stones, bones or pebbles around the world just the way technology ships data. The symbol is therefore the initial in Scandinavian runes.

15. Name some of the machine to machine and IOT uses for Bluetooth.

Some of the machine to machine and IOT uses of Bluetooth are as follows:

- Wireless headsets and Speakers
- Transfer of files between devices
- Wireless keyboards and printers

16. What is Bluetooth low energy?

Bluetooth Low Energy is a power-conserving variant of the wireless Bluetooth technology, designed for use by Internet-connected machines and appliances. It is extremely useful in machine to machine communication. This technology can help applications run on a small battery for nearly four to five years. It operates on 2.4 GHz ISM band and remains in sleep mode constantly unless a connection is initiated.

17. Name some of the BLE's M2M/ IoT Applications.

a. BLE using Smartphone as a gateway in IoT

- b. Smart Locks
- c. Blood glucose monitor in Healthcare
- d. Sports and fitness bands
- e. Public transportation apps
- f. Geography-based target promotions

18. What is the difference between bluetooth and bluetooth low energy in IOT applications?

Bluetooth and Bluetooth Low Energy are used for very different purposes. Bluetooth can handle a lot of data, but consumes battery life quickly and costs a lot more. BLE is used for applications that do not need to exchange large amounts of data, and can therefore run on battery power for years at a cheaper cost

19. What is Z wave?

Z-Wave was born from an idea by Danish company Zensys for a simpler, and less expensive, alternative to ZigBee. ZigBee and Z-Wave are wireless protocols that essentially focus on connectivity within the smart home

20. Where is Z wave used?

As the smart home trend explodes, more and more connected devices are being added into one's life. A lot of these devices – sensors, lightbulbs, heating controls, locks, plugs etc. pack in

Z-Wave to talk to each other or rather communicate with one another. A big advantage is that all Z-Wave devices are interoperable. Over 70% of the smart home devices have Z-Wave inside

21. What is the difference between ZigBee and Z wave?

a. Frequency:

ZigBee and Z-Wave each use different frequencies, it's almost equivalent to them using different languages for communication.

b. Code and products:

Z-wave has proprietary code which means that all Z-Wave smart devices will work with all other past, present, and future Z-Wave devices, so you'll never have to worry about incompatibility if you want to add on to your smart home system in the future.

Zigbee is designed with open source code meaning any one can access and make the code. This has led to different protocols for different types of Zigbee smart home devices, and not all of them worked together

c. Speed and Interference:

Zigbee uses either a powerful 2.4 GHz frequency or a lower power 915 MHz frequency which might interfere with your microwave or Wi-Fi but Z-wave uses a frequency of 908.42 MHz, which won't interfere with your Wi-Fi but can interfere with your cordless landline.

d. Number of supported devices

Z-Wave can support up to 232 smart devices while Zigbee can support over 62,000

