



Components:- The main components of a sensor node are a microcontroller, transceiver, external memory, power source and one or more sensors.

- > Sensors are classified into three categories: Passive, omnidirectional sensors; Passive, narrower beam sensors; and active sensors.
- > Passive sensors sense the data without actually manipulating the environment by active probing. They are self powered; that is energy is needed only to amplify their analog signal.
- > The controller performs tasks, processes data and controls the functionality of other components in the sensor node. while the most common controller is a microcontroller, other alternatives that can be used as a controller are: a general purpose desktop microprocessor, digital signal processors, FPGAs and ASICs.
- > Sensors are used by wireless sensor nodes to capture data from their environment.

Basic features of the sensor node.

- | | | |
|----|------------------------|---|
| 1. | Microcontroller | ATMega 128L |
| 2. | External memory | 2x64K EEPROM |
| 3. | Clock Frequency | 8MHz |
| 4. | Wireless communication | ZigBee: Jennic: JN61XX
or
Bluetooth: Promi ESD 01 |
| 5. | Power | 3.3V-coin cell |
| 6. | Consumption | ~75-80mA |
| 7. | Additional devices | Clock-calendar |
| 8. | Inputs/outputs | 4 Analogue inputs |

Q: what do you mean by Smart City? Discuss role of IOT in Smart Cities.

A Smart city is a municipality that uses information and communication technologies (ICT) to increase operational efficiency, share information with the public and improve both the quality of government services and citizen well-being.

Several major characteristics are used to determine a city's smartness. These characteristics include:

- a technology-based infrastructure;

- > environmental initiatives;
- > a high functioning public transportation system;
- > a confident sense of urban planning and
- > humans to live and work within the city and utilize its resources.

A smart city's success depends on its ability to form a strong relationship between the government - including its bureaucracy and regulations - and the private sector. This relationship is necessary because most of the work that is done to create and maintain a digital, data-driven environment occurs outside of the government.

Smart city use IoT:- •> Smart cities use IoT devices such as connected sensors,

lights, and meters to collect and analyze data. The cities then use this data to improve infrastructure, public utilities and services, and more.

- > Smart city devices work to make everyday tasks easier and more efficient, while relieving pain points related to public safety, traffic, and environmental issues. Here are some of the most popular smart city technologies:

Use Cases:-

- | | |
|--------------------|----------------------------|
| → Road traffic | → Street lighting |
| → Smart parking | → Waste management |
| → Public transport | → Environment |
| → Utilities | → Public Safety |
| → Street lighting | → Iterative implementation |

9. What do you mean by Industrial Internet of Things? Discuss role of IIOT in Industrial IoT.

The Industrial Internet of Things (IIOT) is the use of smart sensors and actuators to enhance manufacturing and industrial processes. Also known as the Industrial Internet or Industry 4.0, IIOT uses the power of smart machines and real-time analytics to take advantage of the data that "dumb machines" have produced in industrial settings for years.

How does IIOT work?

IIOT is a network of intelligent devices connected to form systems that monitor, collect, exchange and analyze data. Each industrial IoT ecosystem consists of:

- > Connected devices that can sense, communicate and store information about themselves;
- > Public and / or private data communications infrastructure;
- > analytics and applications that generate business information from raw data;
- > storage for the data that is generated by the IIOT devices; and
- > People.

Role of IoT in Industrial IoT.

The Internet of Things (IoT) describes a phenomenon where more and more IoT devices are connected to the Internet, such as smart homes, smart fridges, and industrial manufacturing machines. These interconnected smart devices are significant in enabling automation across industries.

To understand the difference between the growth of IoT from non-IoT devices (non-IoT devices include PC, mobile phone, tablets, laptops, or landlines) in 2010, the total active non-IoT connections was 8 bn devices, compared to only 0.8 bn IoT devices. Estimates predict that by 2025, non-IoT device connections will grow by only 2 bn, reaching approximately 10.3 bn, whereas, in the same time, IoT device connections will exceed 38.6 bn. A dizzying growth rate that has been in tandem with the adoption of automation practices.

It is difficult to separate IoT and automation because automation has been a tremendous driver for IoT devices as it has given applicable purpose to many IoT technologies.

Industrial devices like sensors, connectors, actuators, IoT gateways, interfaces, motion controllers, light bulbs, locks, etc.

10. What do you mean by term Blockchain? Discuss its features, limitation, and application areas.

A blockchain is a type of distributed ledger technology (DLT) that consists of growing lists of records, called blocks, that are securely linked together using cryptography.

Each block contains a cryptographic hash of the previous block, a timestamp, and transaction data (generally represented as a Merkle tree, where data nodes are represented by leaves).

Under the pseudonym of Satoshi Nakamoto, a white paper introduced the concept of blockchain and bitcoin in 2008. Blockchain started as a secured transactional place without including the involvement of third-party sources.

The blockchain stores information electronically. They play a crucial role in the cryptocurrency system and maintain a secure and decentralized record of transactions. Blockchain definition includes a distributed database shared among nodes of a computer network.

Features of Blockchain:-

1. Increased capacity:- This is the first and an important feature of Blockchain. The most remarkable thing about this Blockchain

technology is that it increases the capacity of the whole network.

2. Better Security: Blockchain technology is considered more secure than its contemporaries because of lack of a single point of failure.
3. Immutability: Creating immutable ledgers is one of the main values of Blockchain. Any database that is centralised is destined for hacks and frauds since it requires trust in some third party intermediary to keep the database secure.
4. Faster Settlement: Traditional banking systems are unbelievably slow, probably because they require a lot of settlement time and usually take days to proceed.
5. Decentralised system: Decentralised technology gives you the power to store your assets in a network without the oversight and control of a single person organisation or entity.

uses of decentralization:

- a) Less Failure
- b) user Control
- c) No single point of failure
- d) No Intermediaries
- e) Zero Scams
- f) Transparency
- g) Authentic

Limitation of Blockchain Technology:-

1. Lack of Awareness
2. Limited availability of technical talent
3. Immutable
4. Key management
5. Scalability
6. Consensus mechanism

Application :-

1. Money transfers:- The original concept behind the invention of blockchain technology is still a great application.
2. Financial exchanges:- Many companies have popped up over the past few years offering decentralized Cryptocurrency exchanges.
3. Lending:- Lenders can use blockchain to execute collateralized loans through smart contracts.
4. Insurance:- Using smart contracts on a blockchain can provide greater transparency for customers and insurance providers.
5. Real estate:- Real estate transactions require a ton of paperwork to verify financial information and ownership and then transfer deeds and titles to new owners.

Other application:-

6. Secure personal information
7. Voting
8. Government benefits
9. Securely share medical information
10. Artist royalties
11. Non-fungible tokens
12. Logistics and supply chain tracking
13. Secure Internet of Things networks
14. Data storage
15. Gambling