

INTERNET OF THINGS (IOT) AND ITS APPLICATIONS

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ABSTRACT

Internet of Things (IoT) is the concept of connecting different devices to each other and to the internet to transmit thousands of bits of data and information. IoT is changing a lot from the manner in which we drive to how we make buys and even how we get vitality to our homes. Complex and varieties of sensors and chips are embedded around us. These devices share data and information and we make use of them. The common platform of IoT is mainly Agriculture. In this paper, an overview of different platforms, architecture, applications and challenges are described.

1. INTRODUCTION

IOT is the collective network of connected devices and the technology that facilitates communication between devices and the cloud, as well as between the devices themselves. The expression "Internet of Things" was formally presented in 1998–1999 by Kevin Ashton of Automatic Identification center (Auto-Id) at Massachusetts Institute of Technology (MIT). Kevin recommended widely Web-associated RFID advancements can be utilized in supply chains to monitor things without human contribution. Internet of Things (IoT) is the concept of connecting different devices to each other and to the internet to transmit thousands of bits of data and information. IoT is changing a great part of the world significantly; from the manner in which we drive to how we make buys, what is more, even how we get vitality to our homes. Complex sensors and chips are implanted around us. How these devices share data and information and how we make use of them. The common platform of IoT is personal health.

2. IOT PLATFORM ARCHITECTURE

IoT is implemented in different platforms for a wide range of applications; thus, the architecture differs according to the platform. To work with all the various operators affecting IoT architecture, it's easier and progressively compelling to locate

a dependable supplier of IoT arrangements. This choice will altogether lessen the quantity of assets spent in transit.

Architecture of IoT

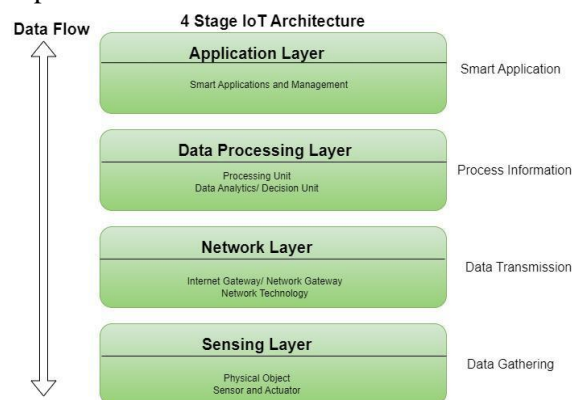
The architecture of IoT is divided into 4 different layers i.e. Sensing Layer, Network Layer, Data processing Layer, and Application Layer.

Sensing Layer: The sensing layer is the first layer of the Internet of Things architecture and is responsible for collecting data from different sources. This layer includes sensors and actuators that are placed in the environment to gather information about temperature, humidity, light, sound, and other physical parameters. Wired or wireless communication protocols connect these devices to the network layer.

Network Layer: The network layer of an IoT architecture is responsible for providing communication and connectivity between devices in the IoT system. It includes protocols and technologies that enable devices to connect and communicate with each other and with the wider internet. Examples of network technologies that are commonly used in IoT include WiFi, Bluetooth, Zigbee, and cellular networks such as 4G and 5G technology. Additionally, the network layer may include gateways and routers that act as intermediaries between devices and the wider internet, and may also include security features such as encryption and authentication to protect against unauthorized access.

Data processing Layer: The data processing layer of IoT architecture refers to the software and hardware components that are responsible for collecting, analyzing, and interpreting data from IoT devices. This layer is responsible for receiving raw data from the devices, processing it, and making it available for further analysis or action. The data processing layer includes a variety of technologies and tools, such as data management systems, analytics platforms, and machine learning algorithms. These tools are used to extract meaningful insights from the data and make decisions based on that data. Example of a technology used in the data processing layer is a data lake, which is a centralized repository for storing raw data from IoT devices.

Application Layer: The application layer of IoT architecture is the topmost layer that interacts directly with the end-user. It is responsible for providing user-friendly interfaces and functionalities that enable users to access and control IoT devices. This layer includes various software and applications such as mobile apps, web portals, and other user interfaces that are designed to interact with the underlying IoT infrastructure. It also includes middleware services that allow different IoT devices and systems to communicate and share data seamlessly. The application layer also includes analytics and processing capabilities that allow data to be analyzed and transformed into meaningful insights. This can include machine learning algorithms, data visualization tools, and other advanced analytics capabilities.



Data center and cloud (Analysis, management, and

In fact, there is an alternative to expand the way toward building a maintainable IoT design by presenting an additional phase in it. It alludes to starting a client's power over the structure — if just your outcome does exclude full computerization, obviously. The fundamental errands here are perception and the board. In the wake of including Stage 5, the framework

transforms into a circle where a client sends directions to sensors/actuators (Stage 1) to play out certain activities. Furthermore, the procedure starts from the very beginning once more.

An IoT stage is a multi-layer innovation that empowers direct provisioning, the executives, and robotization of associated gadgets inside the IoT universe. It essentially interfaces your equipment to the cloud by utilizing adaptable network

alternatives, endeavor level security instruments, and expansive information preparing powers. Generally, IoT steps can vary according to needs. It is usually alluded to as middleware when explaining how it associates remote gadgets

to client applications (or different gadgets) and deals each of the collaborations among the equipment and with application layers.

3. APPLICATIONS

Remote Asset Monitoring and Control

One usage of IoT solutions is remote monitoring and control. The information from IoT sensors in systems and machines is used to deliver precise and immediate insights into the performance of the equipment.

IoT systems give consistent and real-time visibility into the operations leading to well-informed decisions. This boosts overall productivity and saves costs in the long-time. One of the most notable advantages of remote asset monitoring and control is that decisions and adjustments can be made safely and quickly from any location thanks to data transmission from IoT devices.

Smart Cities

A smart city is a city that uses cutting-edge technology, such as a sizable network of sensors and linked devices, to collect real-time data and increase the effectiveness of public services while conserving resources. Some of the top smart cities in the world are Singapore, Zurich (Switzerland), New York (United States), etc. Technologies that enable a smart city's sophisticated services are the Internet of Things, edge computing, big data, cloud computing, artificial intelligence (AI), machine learning (ML), and the list goes on.

Smart cities create a sustainable and inclusive urban environment. It is achieved by a range of smart city initiatives.

Smart Waste Management System

With the help of IoT technology, authorities can make waste-related informed decisions: how to handle it, what is the best way to clean it, and what future planning should look like.

Smart Buildings

Facility managers use IoT sensors to remotely monitor people in the building and resource usage, minimizing waste and operational costs.

Smart Parking Solutions

Smart parking is all about helping the driver to find parking, paying for it, or figuring out how long it'll take to get there.

Smart Traffic Management

Applications like Google Maps or Waze collect and exchange data from cars utilizing mobile devices as sensors. Other than contributing to traffic monitoring, users can use the information provided to avoid peak hours and take alternative fast and fuel-efficient routes or estimate arrival times.

Smart Grids

Another IoT remote asset monitor and control application is the smart grid. A smart grid is a type of electricity network that utilizes digital and other cutting-edge technologies to monitor and control the flow of electricity from all sources to meet the changing electricity requirements of end users.

It coordinates the requirements and capabilities of all operators, generators, end users, and electricity market participants to optimize the functioning of all components while reducing costs and environmental effects.

Smart Homes

The Internet of Things (IoT) use in a smart home makes it possible to link up all your home devices, like ACs, lights, doors, thermostats, theft alarms, and more, into one system. You have all the control you need with just a tap on your phone.

Vehicle Fleet Management

The supply chain is made up of many levels of complexity, and managing them efficiently often necessitates the use of tools and technologies like the Internet of Things.

The advantages of IoT technology sensors incorporation into fleet vehicles include geolocation optimization, fuel reduction, pollution mitigation, and performance monitoring. Additionally, IoT creates a comprehensive network between operators, vehicles, and drivers.

Real-time maintenance alarms clear up head space for drivers, helping them keep track of any necessary data. The implementation of real-time maintenance alarms eliminates the need for drivers to manually detect maintenance issues. It is extremely helpful when it comes to maintenance management.

In one way or another, such a smart device plays a role in improving your health, entertainment, and network connectivity.

Agriculture

The continuous disruptions over the past few years have made food security an increasing concern for all nations. This is where technology can step in to help - especially the Internet of Things. IoT systems help farmers boost their profit margins. IoT sensors and devices do so, for example, by utilizing a smart greenhouse: Monitoring soil moisture, nutrients, and CO2 levels, and by using the data, farmers can modify the temperature and humidity in the greenhouse to promote the optimum growth of their crops.

This data, along with suitable adjustments to the weather, leads to energy saving and water and more efficient fertilizer systems and irrigations.

Smart Medical

The healthcare industry relies a lot on the data provided by caretakers and patients to make diagnoses and other important medical decisions. With the implementation of IoT equipment, healthcare professionals can remotely monitor their patient's vital data like heart rate, blood pressure, and ECG and be alerted when the patients' are in danger. Sometimes, the difference between life and death is only one fast response.

4.IOT CHALLENGES

Security challenges in IoT :

Lack of encryption –

Although encryption is a great way to prevent hackers from accessing data, it is also one of the leading IoT security challenges.

These drives like the storage and processing capabilities that would be found on a traditional computer.

The result is an increase in attacks where hackers can easily manipulate the algorithms that were designed for protection.

Insufficient testing and updating –

With the increase in the number of IoT(internet of things) devices, IoT manufacturers are more eager to produce and deliver their device as fast as they can without giving security too much of although. Most of these devices and IoT products do not get enough testing and updates and are prone to hackers and other security issues.

Design challenge in IoT :

Design challenges in IoT (Internet of Things) refer to the technical difficulties and trade-offs involved in creating connected devices that are both functional and secure. Some of the key design challenges in IoT include:

Interoperability: Interoperability refers to the ability of different systems, devices, or components to work together seamlessly and exchange data effectively. In the context of the Internet of Things (IoT), interoperability is a critical challenge, as a large number of diverse devices are being connected to the internet. The lack of standardization in the IoT can lead to difficulties in communication and data exchange between devices, resulting in an fragmented and inefficient system. To overcome this challenge, organizations and industry groups are working to establish standards and protocols to ensure interoperability between IoT devices. This includes the development of common communication protocols, data formats, and security standards. Interoperability is important for enabling the full potential of the IoT and allowing connected devices to work together effectively and efficiently. Ensuring that different IoT devices can work together seamlessly and exchange data effectively.

Security: Security is a critical concern in the Internet of Things (IoT) as it involves the protection of sensitive data and systems from unauthorized access, theft, or damage. IoT devices are often vulnerable to cyber attacks due to their increased exposure to the internet and their limited computing resources.

5.DISCUSSION

The developing thought of the Internet of Things (IoT), where the Internet meets the physical world, is quickly discovering its way all through our cutting-edge life, meaning to improve the personal satisfaction by associating many shrewd gadgets, advancements, and applications. By and large, the IoT would take into consideration the computerization of everything around us. This paper recorded and studied various stages and applications. This, thus, ought to give a decent establishment to scientists and specialists who are intrigued to increase a knowledge into the IoT advances and conventions to comprehend the general engineering and job of the various segments and conventions that comprise the IoT. Besides, different challenges related to different IoT platforms and environments have been discussed.

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