

# OVERVIEW THE INTERNET OF THINGS (IOT) SYSTEM ARCHITECTURE, APPLICATION AND RELATED FUTURE TECHNOLOGIES

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## Abstract

Internet of things can be categorized into two circumstances. Here the internet comes first. Then things fall next. Internet of Things plays vital roles that are used to develop the technologies through the network or internet. IoT deals with monitoring and controlling the environment. IoT requires new technologies or functions and methods for processing. IoT is also used for wireless communication. The goal of IoT architecture is designing and developing the IoT devices. By using IoT the technologies are developed. This paper focuses on IoT architecture, different technologies of IoT and various applications of IoT.

**Keywords:** IoT, Wireless Communication, RFID, NFC, M2M, Telecommunication.

## I. INTRODUCTION

The networking of real objects that have a part of electronics fixed firmly within their architecture is done by the Internet of Things (IoT). In the upcoming years, IoT based scientific knowledge will offer highly developed levels of services, especially changing the way people lead their daily lives. Development of internet application nowadays is very high and IoT is the main technology which can create various useful internet applications. This intelligent technique [1] makes the human effort less and easier to access the physical devices. In this paper we discussed about the internet of things, application, architecture of IoT and related future technologies that are RFID, NFC, M2M and Vehicle to vehicle communication.

## II. HISTORY OF IOT

A way of looking at an IoT [2] is said as “embedded Internet” or “pervasive computing”. Kevin Ashton is the father of IoT. In 1999, particularly “Internet of Things” to become famous, because of Kevin Ashton and elaborated through the MIT’s Auto-ID Center. The first international conference was done by Internet of Things in 2008. It was handled by Zurich. Depending on Cisco’s Business solutions, IoT was declared in 2009. IoT plays [3] an important role in each industry. For example, smart homes, smart cities, smart cars. IoT planned for communications also, such as smart phones, tablets and so on. Next stage of IoT describes the communication between the devices. IoT involves software, hardware and telecommunications. They are able to work well without making mistakes or wasting time and energy to service.

## III. ARCHITECTURE OF IOT

The architecture of IoT [4] determines the implementation of the IoT concepts. The perception, network and application are the three layers designed and research constructed for the first time.

### 1. PERCEPTION LAYER

The first and the lowest layer in the architecture of IoT is perception layer. The main task of it is to collect the data/information from the environment such as temperature and humidity and so on. It depends on the data that is gathered by the heterogeneous object sensors.

### 2. NETWORK LAYER

It is the second and the middle layer in the architecture of IoT. It creates the link between the application layer and the perception layer. Processing of data, broadcasting of data and

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the connecting devices are the main work of Network Layer.

**3. APPLICATION LAYER**

The third and the upper layer of the architecture of IoT. This layer implements the working process of IoT. The software in this application layer works on or for the sensors and some other related virtually intelligent devices.

Nowadays, architecture of three layers in the Internet of Things is not much satisfying in today’s environment and the technology. A new level of architecture of five layers was constructed to define the total concepts of its implementation and working and development of the IoT devices.

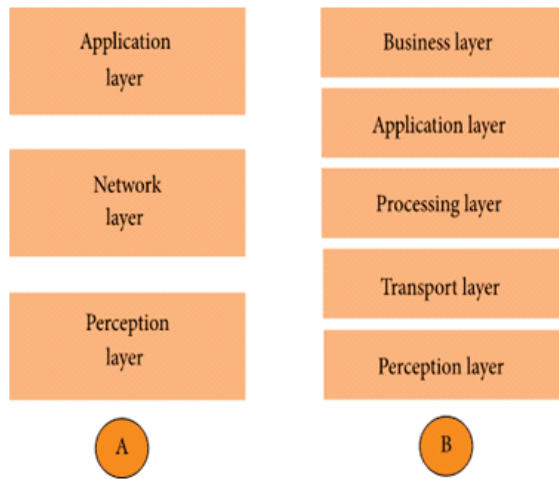


Figure 1: Three Layer and Five Layer Architecture

**1. PERCEPTION LAYER**

The lowest level of architecture and works as explained in the three-layer architecture.

**2. TRANSPORT LAYER**

The second layer transports the information from the perception layer to the transport layer. It will be achieved using networks such as LAN, 3G, 4G, and LTE etc.

**3. PROCESSING LAYER**

The middle layer of the architecture of IoT. It has to perform the main work and process all the data that is collected by the perception layer. It contains a large volume

of data which will be stored using the recent techniques like cloud computing.

**4. APPLICATION LAYER**

This layer implements the process of working in IoT.

**5. BUSINESS LAYER**

The final layer of the architecture of IoT, which controls and manages the working of the whole system along with its structures.

**IV. TECHNOLOGIES**

There are so many technologies used to describe the IoT. There are four major technologies are RFID, NFC, MACHINE TO MACHINE COMMUNICATION and VEHICLE TO VEHICLE COMMUNICATION.

**1. RFID (Radio Frequency Identification)** - Radio frequency identifications are *broadly used scientific knowledge related to the technology* that includes the wireless data records and the processing of transactions. RFID enables communication by using the radio waves and the radio waves used to enable the data transmission. Nowadays, RFID tags are used widely. These metal tags that are embedded into a metal object. These peculiar tags are energy reflectors that are sent out by the reader. It is used to track the location of the object with which it attached the RFID tags. These are three types of RFID. They are active RFID, passive RFID and Active reader Active tag.

**2. NFC(Near Field Communications)**

The Near Field Communication technology (NFC) very similar to RFID technology. It allows only a very small range of wireless technology. This very short range (a few inches) allows for some unique experience, the users only have to touch two devices, bringing them close to each other to create and start a transaction. These are two different modes in NFC. They are ACTIVE MODE and PASSIVE MODE.

### 3. MACHINE TO MACHINE COMMUNICATION (MTOM)

Without manual assistance of humans it performs exchanging the data between two or more devices. For example, power line connection (PLC), or wireless communication in the industrial IoT.

### 4. VEHICLE TO VEHICLE COMMUNICATION (VTOV)

It is achieved due to the IoT things such as GPS receivers that let vehicles communicate their locations. This system and the road sensors, that sends data about the road condition

## V. APPLICATIONS

IoT applications [5] make human life easier and make them really smart. There are some smart applications including smart cities, smart homes, smart transportations, and smart health and so on.

### A. SMART CITIES

The connected sensors, light and meters are the devices that are used in the smart cities to gather and analyze the data. Then these data that were gathered from the devices used to improve the infrastructures, public utilities, services etc.



Figure 2: Smart City

### B. SMART HOMES

In smart homes, the various electric and electronic devices that are wired up to a centralized control system. So, they can be either switched off or on remotely at particular times. But it has to buy a lot of things such as sensors, smart bulbs, and security cameras and so on.



Figure 3: Smart Homes

### C. SMART TRANSPORTATION

IoT makes transportation smarter. IoT is at the hard center of the force reshaping transportation to give us greater safety. Simply, it is connected transportation to make necessary outfitting vehicles with Wi-Fi or other sensors to make it possible for internet connectivity during travel. For example, Smart cars, Smart buses, etc.



Figure 4: Smart Transportation

### D. SMART HEALTH

IoT is used in a number of different types of devices that improve the quality of the healthcare services that experienced a particular kind of treatment by the patients. Even the devices that are already in use are now being more modern by IoT by simply using firmly fixed chips of a smart device. This chip enhances the support and care that a patient needs.

## VI. RELATED FUTURE TECHNOLOGIES

The advanced technologies related to the internet of things (IoT) have been growing at a very good rate. Some

future technologies that are related to the IoT for the wired as well as the wireless communication that were brought up together.

#### **A. CLOUD COMPUTING**

IoT devices need a lot of storage to share their information for valuable purposes helping to resolve the storage needs of customers. The Internet of Things (IoT) involves the devices that are connected to the internet. The worker depends on cloud computing service to complete their work because the data is to be controlled and in charge remotely by a server.

The performance may differ depending on the big data that may not always be a stream data.

#### **B. BIG DATA**

The performance may differ depending on the big data that may not always be a stream data. The IoT things produce without interrupted flow of data in a scalable manner. Users must be able to handle this data and make it able to be done.

#### **C. SECURITY AND PRIVACY**

IoT privacy is a peculiar consideration that requires the protection of every individual's information from being allowed in the environment of IoT. Most any physical or logical object can be given a unique identifier and can be able to communicate with the freedom to act independently over the similar network.

#### **D. DISTRIBUTED COMPUTING**

To handle ultra-big data, distributed computing is an efficient way to centralize. A very necessary technique for Internet of Things (IoT) is to give away something that does not need for computation from the cloud servers and also it reduces the transmission bandwidth requirements.

#### **E. FOG COMPUTING**

Cloud computing is not successful for many Internet of Things (IoT) applications, at that time fog is often used. The fog computing reduces the need of bandwidth and reduces the back-and-forth communications between the sensors and the cloud.

### **VII. CONCLUSION**

The future of IoT is almost as great due to advances in technology and that the consumers have a strong wish to group the devices such as Smart phones with the household machines. Wi-Fi has made it to be done to connect people and machines in the environment. Our certainty is that Internet of Things changes our lifestyles. The necessary is the input and the practical help of the technologists and the ordinary people to make it better for individuals and the society.

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