ARCHITECTURE OF IOT: A Literature Review

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ABSTRACT:

The term Internet of Thing(IoT) is a communication between two or more physical things/devices with the help of internet or it can be defined as a network of physical object or people called "things" that are embedded with software, electronics, network, and sensors which allows these objects to collect and exchange data.The term IoT was firstly proposed by Kevin Ashton in 1999.Internet-of-Things (IoT) are everywhere in our daily life.This research paper focuses on the definition of IoThistory andarchitecture of IoT. The main objective of this paper is to provide an overview of IOT and it's architecture.IoTis an under implementation technology The aim of IOT Technology is, transform the real world object in to smart devices.

Keywords: Internet of Things (IoT), PAN(Personal Area Network),SAP(Service Access Point)

1. INTRODUCTION:

The term IoT was firstly proposed by Kevin Ashton in 1999[1]**.** According to Kevin Ashton**"**If we had computers that knew everything there was to know about things—using data they gathered without any help from us,we would be able to track and count everything, and greatly reduce waste, loss and cost. We would know when things needed replacing, repairing or recalling, and whether they were fresh or past their best."[10]. IOT is nothing it is a communication between two or more devices with the help of internet. Now the question aries in our mind is that how physical thing can communicate each other? So the answer is that, this kind of communication is possible with the help of some IOT Protocol Like MQTT,LO-RA IPV6 etc.this kinds of communication explain with the help of diagram.Below figure 1first device(sensors)effectively communicate another device like gateway.Gateway extract information and passes it server (cloud) by using some networking technologies like LAN and WAN.this server again pass similar kinds of information to various user applications like web based applications, intranet applications etc.

1.1 MQTT Communication Protocol:MQTT stands for message queuing telemetary transport protocol used in internet of things applications[5]. many other protocol are also there used in IOT applications like HTTP,CO-AP,TCP-IP,UDP etc.but MQTT is a base of IOT.it is a light weight protocol and it is also easy to use protocol.one more application apart IoT is facebook Messenger which is based on MQTT services.following companies are there which provide MQTT services like:

Mosquitto

HIVE MQ

Cloud MQTT

Adafruitsio etc.

Mosquitto is a softwareinstall within the server which provide MQTT services.This software service is used to create it's own server in own machine or own cloud. MQTT sever is also called broker. Remaining other services like HIVE MQ, Adafruitsioetc are based on online cloud.We need to empower computers with their own means of gathering information, so they can see, hear and smell the world for themselves, in all its random glory[8].The 'Thing' in IoT can be any device with any kind of built-in-sensors with the ability to collect and transfer data over a network without manual intervention. The embedded technology in the object helps them to interact with internal states and the external environment, which in turn helps in decisions making process.IoT is a concept that connects all the devices to the internet and let them communicate with each other over the internet. IoT is a giant network of connected devices – all of which gather and share data about how they are used and the environments in which they are operated.By doing so, each of your devices will be learning from the experience of other devices, as humans do. IoT is trying to expand the interdependence in human-i.e interact, contribute and collaborate to things. I

know this sounds a bit complicated, for exampleA developer submits the application with a document containing the standards, logic, errors & exceptions handled by him to the tester. Again, if there are any issues Tester communicates it back to the Developer. It takes multiple iterations & in this manner a smart application is created.

1.2 HISTORY OF IOT:

The concept of a network of smart things was discussed as early as 1982, with a Coke machine at Carnegie Mellon University becoming the first internet-connected appliance,able to report its inventory and whether newly loaded drinks were cold[3]. Kevin Ashton is a scientist who is known for inventing the term "the Internet of Things" to describe a system where the Internet is connected to the physical world via sensors.

- 1970- The actual idea of connected devices was proposed
- 1990- John Romkey created a toaster which could be turned on/off over the Internet
- 1995- Siemens introduced the first cellular module built for M2M
- 1999- The term "Internet of Things" was used by Kevin Ashton during his work at P&G which became widely accepted
- 2004 - The term was mentioned in famous publications like the Guardian, Boston Globe, and Scientific American

- 2005-UN's International Telecommunications Union (ITU) published its first report on this topic.
- 2008- The Internet of Things was born
- 2011- Gartner, the market research company, include "The Internet of Things" technology in their research.

1.3 COMPONENTS OF IOT:

IOT as a technology consists of four main componentsthrough which an architecture is framed.

1) Sensors/Actuators:Sensors sense the things from it's environment.it is a key component that helps you to collect live data from the surrounding environment. It could be a simple Moisture monitoring sensor.

2)Devices: The devices consist of the hardware through which the data send from one place to another. foreg- A mobile phone is a device which has multiple sensors like GPS, camera but your smartphone is not able to sense these things.

3)Gateway:gateway is the bridge through which a data is being transferred[4]. Once that data is collected, and it gets to the cloud, the software performs processing on the gathered data.All the collected data is sent to a cloud infrastructure.

4)Cloud: A cloud is basically a data analytics or whatever function with this want to perform with do that.The sensors should be connected to the cloud

using various mediums of communication[7]s. These communication mediums include mobile or satellite networks, Bluetooth, WI-FI, WAN, etc.

2. ARCHITECTURE:

The Architecture of IOT consists four stages:

Stage 1:**Sensors:**Sensors collect data from the environment under measurement and turn it into useful data.for example PIR sensors at home. This sensors detect all living object present it's environment for example human body, animal etcThis stage covers everything.

Stage 2:**Internet Gateways:**The data from the sensors starts in analog form .That data need to be converted into digital stream for further processing. the Data Acquision System(DAS) perform these data and conversion functions.it performs the analog to digital conversion. The internet gateways receive the digitized data and route it over Wi-Fi ,LAN or the internet to stage 3 system for further processing.

Stage 3:Edge IT: Once IOT data has been digitized,it's ready to cross into the realm of IT.However,data may require for further processing before it's enter the data center. this is where edge IT Systems,which perform more analysis,come into play.Edge IT processing system may be located in remote offices or other edge locations. Generally it reside closer to the sensors.

Stage4:**Analysis,Management and Storage of Data:** Thedata from stage 3 is forwarded to physical data center or cloud based Systems,where more powerful IT systems can analyze, manage and securely store the data. stage 4 processing mat take place on premises ,In the cloud,or in a hybrid cloud system,but the type of processing executing in this stage remains the same, regardless of the platform.

2.1 Layered Architecture of IOT: On the basis of the various stages of an IOT system.It's architecture is classified in to four different layers.

1)Sensors Connectivity Layer: It has wide range of sensors and has multiple functions to do using sensors. for example Humidity, walking, pressure/temperature ,speed, blood pressure etc. these are all physical parameter sense by the sensors connectivity layer[6]. this layer is also responsible to pass this information to next layer(Gateway Network) of IoT architecture with the help of LAN and PAN .In local area network use WI-FI, Ethernet cable and in case of personal area network uses Bluetooth and ipv6 Protocol.in this layer consist of smart devices.A device which program intelligently called smart device for egZigbee,RFID etc, These devices talk with the physical world and pass this information to the Digital world.

2)GatewayNetwork Layer: This layer extract information to smart device and passes it to cloud or internet Using LAN and WAN Networking. Here in case of LAN similarly used Wi-Fi ,Ethernet cable and

WAN uses GSM and 4G/upcoming 5G Technologies[2].Gateway is divided in to two parts

Simple Gateway

Embedded Contolled Gateway

Simple Gateway: This gateway extract information to smart device and passes it to cloud without any changes and transformation.

Embedded Contolled Gateway: Embedded gateway are smart enough device or small in size. Generally it is programmed in c language,Phython etc.it is programmed to shoot out requirements in our business purpose.

Gateway passes the information to internet Router. Router is a device which sense information from similar kinds of devices or machine and passes to internet[9].Apart from router gateway sense the information from different kinds of sensors and pass in to gateway.Gateway convert this information to digital form and passes to cloud.

3)Cloud/Internet Layer: This layer is also called management service layer.it is the most important layer in IOT system. We can say that it is the heart of IOT system.this layer consist of two type os services

Business Services

Operational Services

Business Services: It is a kind of virtual database which store all information in a cloud and passes it to Application layer of IOT Architecture.

Operational Services: Various cloud platforms areavailiable like:

Amazon Web Services

Microsoft Azure

IBM Watson

Google Cloud etc.

This layer is responsible to provide useful/related information to application user layer.

4)ApplicationLayer: Following applications come in this layer:

Web based Applications

Intranet Applications

Enterprises Applications

Web based Applications: any web basedapplications that talk with internet and communicate with browser can Mobile Applications

access the information from the cloud come in this categories.

Intranet Applications: Any organization which are having in house cloud can communicate with intranet application.

Enterprises Applications: Any ERP applications like SAP(service access point) use cloud for communications.

Mobile Applications: Any Android /ios/Microsoft operating systemthat can be used to talk with the cloud.

3. FIGURE I :
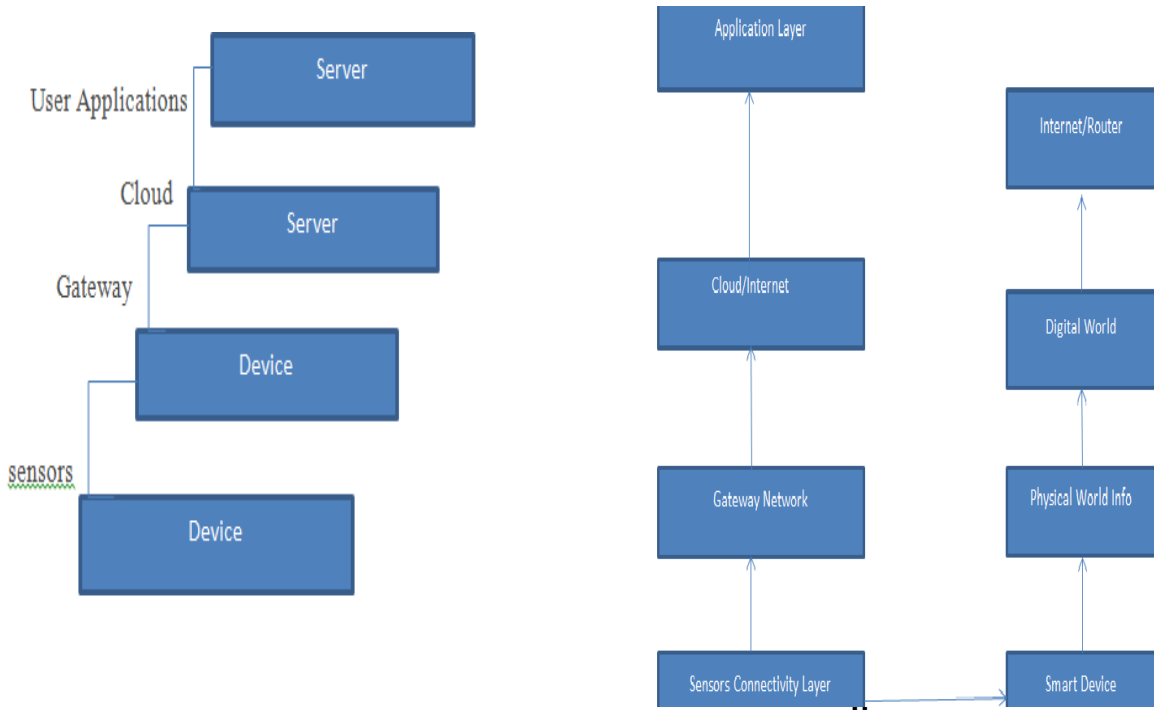
4. CONCLUSION:

IOT is primarily a fully system of all the interconnected computing devices having all the mechanical/electrical /digital machine. In the past few years, IoT has been developed rapidly and a large number of enabling technologies have been proposed. In current year 2019 ,IOT devices increased approx. to 9.8 billion and in the upcoming year many new technologies will also emerge taking us to a whole new level of a smart world.The future of IoT is very bright. our home appliances to vehicles everything would be connected smartly to providing a better lifestyle. IoT has been bringing a huge technological changes in our daily lives, which in turn helps to making our life simpler and more comfortable, though various technologies and applications.Though IoT has huge benefits, there are some drawback in the IoT governance and implementation level. Due to lack of proper Rules /Regulations and IOT standards the IOT and it's applications become quite usual and dangerous .In future people will get addicted to technical connections but increase in internet participants Risk Mitigation and human ability will make IOT safer.

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