INTERNET OF THINGS AND ITS APPLICATION

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Abstract:A internet of things is an integrated part of the future and could be define as dynamic global network infrastructure with self-configuring capabilities based on standard and interoperable communication protocol. Where the physical and virtual things are identities. In the IoT things are expected to become active participants in business, information and social processes where they are enabled to interact and communicate among themselves and with the environment by exchanging data information 'sensed '. As per survey in 2008 the number of things connected to the internet was greater than the people living on the earth. Within 2020 the number of things connected to the internet will be about 50 billion. Technologies used in IoT are RFID, WiFi IEEE 802.11, Barcode E QR code, ZigBee IEEE 802.15.4, Sensors and smartphone. It has been widely used in many applications including smart cities such as public water system, power grid, water management, and vehicle traffic control system. In these smart city applications, many IoT devices are deployed that can sense, communicate, compute, and potentially actuate. The aim of this paper is to understand complete idea about the IoT and its major application.

Index Terms **- IoT, Network, WiFi, internet, sensor.**

I. INTRODUCTION

Internet of Things (IoT) conceptualizes the idea of remotely connecting and monitoring real world objects (things) through the Internet [9]. One of the main vision is to make machines smart enough to reduce human labour to almost nil. The idea of inter-connected devices where the devices are smart enough to share information with us, to cloud based applications and to each other (device to device). Smart devices or "Connected devices" as commonly called as, are designed in such a way that they capture and utilize every bit of data which we share or use in everyday life. And these devices will use this data to interact with us on daily basis and complete tasks. This new wave of connectivity is going beyond laptops and smartphones, it's going towards connected cars, smart homes, connected wearables, smart cities and connected healthcare. Basically, a connected life. According to Gartner report, by 2020 connected devices across all technologies will reach to 20.6 billion [1].

YEAR	NUMBER OF CONNECTED DEVICES
1990	0.3 million
1999	90.0 million
2010	5.0 billion
2013	9.0 billion
2025	1.0 trillion

Fig. 1. Year wise number of connected devices by using IoT

II. Architecture of IoT

The Main Stages in the IoT Architecture are

1. Sensors and actuators
2. Internet getaways and Data Acquisition Systems
3. Edge IT
4. Data centre and cloud.

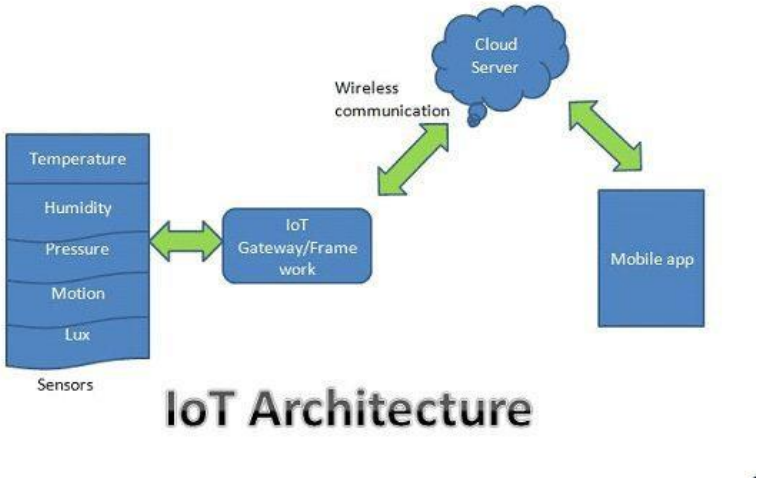

Fig.2 IoT Architecture

Stage 1. Networked things (wireless sensors and actuators)
The outstanding feature about sensors is their ability to convert the information obtained in the outer world into data for analysis. Actuators can intervene the physical reality. For example, they can switch off the light and adjust the temperature in a room.
Because of this, sensing and actuating stage covers and adjusts everything needed in the physical world to gain the necessary insights for further analysis.

Stage 2. Sensor data aggregation systems and analog-to-digital data conversion

Even though this stage of IoT architecture still means working in a proximity with sensors and actuators, Internet gateways and data acquisition systems (DAS) appear here too. Specifically, the later connect to the sensor network and aggregate output, while Internet gateways work through Wi-Fi, wired LANs and perform further processing.
The vital importance of this stage is to process the enormous amount of information collected on the previous stage and squeeze it to the optimal size for further analysis. Besides, the necessary conversion in terms of timing and structure happens here.
In short, Stage 2 makes data both digitalized and aggregated.

Stage 3. The appearance of edge IT systems

During this moment among the stages of IoT architecture, the prepared data is transferred to the IT world. Edge IT systems perform enhanced analytics and pre-processing here. For example, it refers to machine learning and visualization technologies. At the same time, some additional processing may happen here, prior to the stage of entering the data centre.
Likewise, Stage 3 is closely linked to the previous phases in the building of an architecture of IoT. Because of this, the location of edge IT systems is close to the one where sensors and actuators are situated, creating a wiring closet. At the same time, the residing in remote offices is also possible.

Stage 4. Analysis, management, and storage of data

The main processes on the last stage of IoT architecture happen in data centre or cloud. Precisely, it enables in-depth processing, along with a follow-up revision for feedback. Here, the skills of both IT and OT (operational technology) professionals are needed. In other words, the phase already includes the analytical skills of the highest rank, both in digital and human worlds. Therefore, the data from other sources may be included here to ensure an in-depth analysis.
After meeting all the quality standards and requirements, the information is brought back to the physical world—but in a processed and precisely analysed appearance already.

III. Network Connectivity & its type

Key aspects when considering network connectivity are :Range, Data Rate, Power, Frequency, Security [3].
Types of Network connectivity are :

A. High Power Consumption, High Range, High Bandwidth

To wirelessly send a lot of data over a great distance, it takes a lot of power. A great example of this is your smartphone. Your phone can receive and transmit large amounts of data (e.g. video) over great distances, but you need to charge it every 1–2 days. Connectivity options in this group include **cellular** and **satellite**.
Cellular is used when the sensor/device is within coverage of cell towers. For sensors/devices that are, say, on a ship in the middle of the ocean, satellite becomes necessary[4,5].

B. Low Power Consumption, Low Range, High Bandwidth

To decrease power consumption and still send a lot of data, you must decrease the range. Connectivity options in this group include WiFi, Bluetooth, and Ethernet. Ethernet is a hard-wired connection, so the range is short because it's only as far as the length of the cable. WiFi and Bluetooth are both wireless connections with lower power consumption than cellular and satellite and with up to or greater than the bandwidth. However, as I'm sure you've experienced just walking around your home, the range is limited [4,5].

C. Low Power Consumption, High Range, Low Bandwidth

To increase range while maintaining low power consumption, we must decrease theamount of data that you're sending. Connectivity options in this group are called **Low-Power Wide-Area Networks (LPWAN)**.LPWANs send small amounts of data which allows them to operate at very low power with ranges in miles rather than feet. For example, a moisture sensor for agricultural purposes doesn't need to send a lot of data, perhaps just a single number (the moisture level) every few hours. You also don't want this sensor to consume a lot of power because it needs to run on battery (plugging it into an outlet in the middle of a field just isn't realistic). And since agriculture covers a wide area, WiFi and Bluetooth lack the range.
LPWANs are extremely useful for many IoT applications. They allow tons of sensors to collect and send data over broad areas while lasting years on battery life. Although they can't send much data, most sensors don't need to. There are several different kinds of LPWAN, some of them like LoRa operate in unlicensed bands whereas others like NB-IoT use cellular infrastructure[4,5].

IV. Applications of IoT

There are many applications of IoT:

IOT Based Monitoring System in Smart Agriculture

Internet of Things (IoT) plays a crucial role in smart agriculture. Smart farming is an emerging concept, because IoT sensors capable of providing information about their agriculture fields. Monitoring environmental factors is the major factor to improve the yield of the efficient crops. This includes monitoring temperature and humidity in agricultural field through sensors using CC3200 single chip. Camera is interfaced with CC3200 to capture images and send that pictures through MMS to farmers mobile using Wi-Fi[6].

IOT APPLICATION DEVELOPMENT: HOME SECURITY SYSTEM

One of the prominent application segment of Internet of Things framework is in the Security Sector. It is important to arrive at a unique low-cost solution to prevent theft and ensure security to members of the home. The Internet of Things (IoT) Layered Architecture based design approach assists the system designer to conveniently differentiate the system component requirements distinctly at various layers. It remarks the uses of customers end application such as Telegram to securely transmit information through layers of IoT architecture. The proposed solution makes use of USB Webcam as an image capturing unit, Electric Door Strike as an actuator and Telegram which has an amazing feature as Telegram Bot which provide APIs to build solutions which is compatible with Raspberry Pi IoT infrastructure [7].

INDUSTRIAL INTERNET

Industrial Internet is the new buzz in the industrial sector, also termed as Industrial Internet of Things
(IIoT). It is empowering industrial engineering with sensors, software and big data analytics to create brilliant machines.

Conclusion: Internet of Things (IoT) and its services are becoming part of our everyday life, ways of working, and business. There is a great deal of research on developing crucial building blocks and models for the next generation Internet services supported by a plethora of connected things.Some of its major advantages are Communication IoT system increases and encourages machine to machine communication (also known as M2M). Because of this ingenious innovation, **physical**devices stay in touch with one another leading to greater efficiency and higher quality. It also allows full transparency.IoT will potentially be contributing to industries like businesses in the utilities, oil & gas, healthcare, insurance, manufacturing, transportation, infrastructure and retail. internet saves time, cost, increases effectiveness, and help manage economy. IoT is the next superhero in this trail. There are a number of contributing factors as well that drive the adoption of IOT such as improved sensors, device connections, the evolution of lifestyle and mobility [8].

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