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Application and Usefulness of Internet of Things in Information Technology

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ABSTRACT

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. It is an ambiguous term, but it is fast becoming a tangible technology that can be applied in data centers to collect information on just about anything that IT wants to control. IoT has evolved from the convergence of wireless technologies, micro-electromechanical systems (MEMS), microservices and the internet. The convergence has helped tear down the silo walls between operational technology (OT) and information technology (IT), allowing unstructured machine-generated data to be analyzed for insights that will drive improvements. The Internet of Things (IoT) is essentially a system of machines or objects outfitted with data-collecting technologies so that those objects can communicate with one another. The machine-to-machine (M2M) data that is generated has a wide range of uses, but is commonly seen as a way to determine the health and status of things -- inanimate or living.

Keywords--- Internet of Things (IoT), Interoperability, Security, Privacy, Network Protocol, Wireless Networks

I. INTRODUCTION

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The 'thing' in IoT could be a person with a heart monitor or an automobile with built-in-sensors, i.e. objects that have been assigned an IP address and have the ability to collect and transfer data over a network without manual assistance or intervention. The embedded technology in the objects helps them to interact with internal states or the external environment, which in turn affects the decisions taken.

Kevin Ashton, cofounder and executive director of the Auto-ID Center at MIT, first mentioned the Internet of Things in a presentation he made to Procter & Gamble in 1999. Here's how Ashton explains the potential of the Internet of Things. Today computers -- and, therefore, the internet -- are almost wholly dependent on human beings for information. Nearly all of the roughly 50 petabytes (a petabyte is 1,024 terabytes) of data available on the internet were first captured and created by human beings by typing, pressing a record button, taking a digital picture or scanning a bar code.

The problem is, people have limited time, attention and accuracy -- all of which means they are not very good at capturing data about things in the real world. 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, Practical applications of IoT technology can be found in many industries today, including precision agriculture, building management, healthcare, energy and transportation. Connectivity options for electronics engineers and application developers working on products and systems for the Internet of Things.

Although the concept wasn't named until 1999, the Internet of Things has been in development for decades. The first internet appliance, for example, was a Coke machine at Carnegie Melon University in the early 1980s. The programmers could connect to the machine over the internet, check the status of the machine and determine whether or not there would be a cold drink awaiting them, should they decide to make the trip down to the machine. The Internet of Things refers to the rapidly growing network of connected objects that are able to collect and exchange data using embedded sensors. Thermostats, cars, lights, refrigerators, and more appliances can all be connected to the IoT.

II. SCOPE OF IOT

When devices or objects can represent themselves digitally, they can be controlled from anywhere. The connectivity then helps us capture more data from more places, ensuring more ways of increasing efficiency and improving safety and IoT security. Internet of Things can connect devices embedded in various systems to the internet. IoT is a transformational force that can help companies improve performance through IoT analytics and IoT Security to deliver better results. Businesses in the utilities, Oil & gas, insurance, manufacturing, transportation, infrastructure and retail sectors can reap the benefits of IoT by making more informed decisions, aided by the torrent of interactional and transactional data at their disposal.

III. HOW BIG IS IOT?

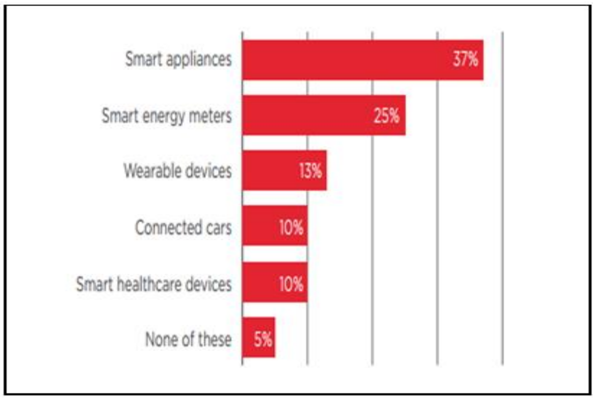
This new wave of connectivity is going beyond laptops and smartphones, it's going towards connected cars, smart homes, connected wearables, smart cities and connected healthcare. Basically a connected life. According to Gartner report, by 2020 connected devices across all technologies will reach to 20.6 billion that's a huge number.

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

Source: HP

HP did a small survey in which they estimated the rise of connected devices over the years and the results are surprising. These devices will bridge the gap between physical and digital world to improve the quality and productivity of life, society and industries. With IoT catching up Smart homes is the most awaited feature, with brands already getting into the competition with smart appliances. Wearable's are another feature trending second on the internet. With launch of Apple Watch and more devices to flow in, these connected devices are going to keep us hooked with the inter-connected world.

A survey conducted by KRC Research in UK, US, Japan and Germany the early adopters of IOT has revealed which devices are the customers more likely to use in the coming years. Smart Appliances like thermostat, smart refrigerator to name a few are most liked by the customers and are seem to change the way we operate.



Source: Global System for Mobile Communications Associations (GSMA)Report

If we are wondering what impact will IoT have on the economy then for information as per the Cisco report IoT will generate $14.4 trillion in value across all industries in the next decade. Now, to give a glimpse of how applications of IoT will transform our lives and listed down few areas where IoT is much awaited and companies are preparing to surprise with smart devices.

IV. ARCHITECTURE OF IOT

There is no single consensus on architecture for IoT, which is agreed universally. Different architectures have been proposed by different researchers.

V. THREE- AND FIVE-LAYER ARCHITECTURES

The most basic architecture is a three-layer architecture [3–5] as shown in Figure 1. It was introduced in the early stages of research in this area. It has three layers, namely, the perception, network, and application layers.

(i) The perception layer is the physical layer, which has sensors for sensing and gathering information about the environment. It senses some physical parameters or identifies other smart objects in the environment.

(ii) The network layer is responsible for connecting to other smart things, network devices, and servers. Its features are also used for transmitting and processing sensor data.

(iii) The application layer is responsible for delivering application specific services to the user. It defines various applications in which the Internet of Things can be deployed, for example, smart homes, smart cities, and smart health.

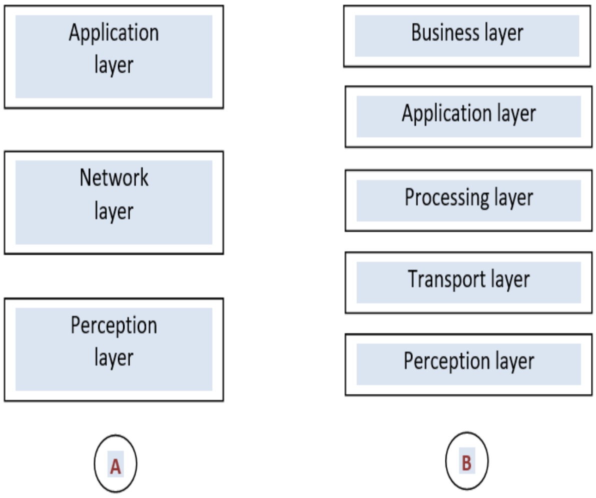


Figure1: Architecture of IoT (A: three layers) (B: five layers)

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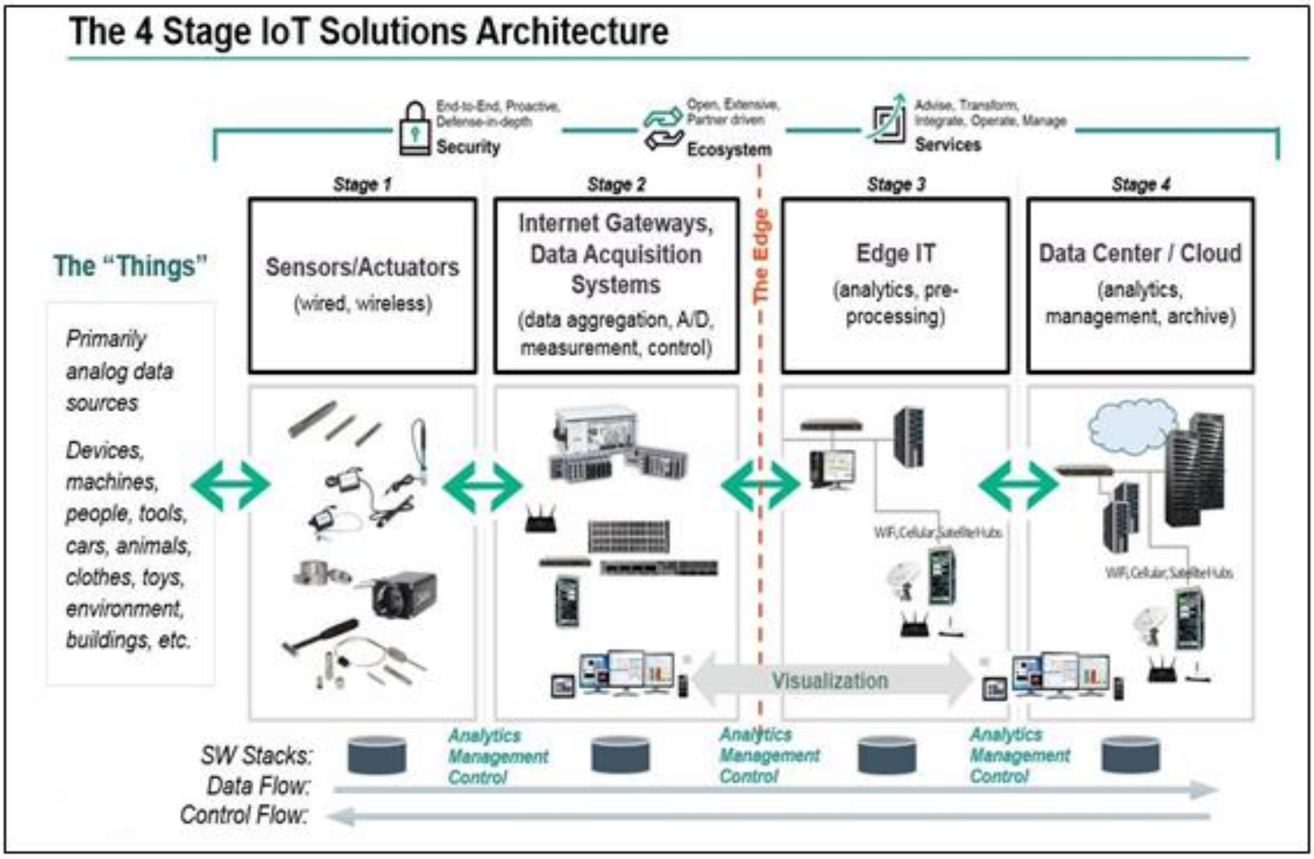

VI. INTERNET OF THINGS EXAMPLES AND APPLICATIONS

The Internet of Things (IoT) promises to bring immense value to our lives continuing to connect all the "things" in our world, we'll achieve feats that will truly seem like magic. IoT is so broad and far-reaching of a concept, some Internet of Things examples and applications to clear things up.

Manufacturing Efficiency

Sensors embedded in manufacturing equipment and placed throughout a factory can help identify bottlenecks in the manufacturing process. By addressing bottlenecks, manufacturing time and waste is reduced. Rather than standard preventative maintenance, which means performing maintenance on machines before they break, "predictive maintenance" means using advanced sensing and analytics to predict exactly when machines will need maintenance. Because predictive maintenance means only servicing machines when they need it, this cuts total costs and the time machines spend idle.

Energy Efficiency

People and organizations can achieve significant decreases in their energy usage with IoT. Sensors monitor things like lighting, temperature, energy usage, etc. and that data is processed by intelligent algorithms to micromanage activities in real-time. Through this process Google cut 15% of it's energy expenditure in it's data centers. On an individual level, things like Smart Thermostats can automatically turn off heating/cooling when no one's home to save energy.

Agricultural efficiency

For outdoor agriculture, an example could be sensing soil moisture and taking weather into account so that smart irrigation systems only water crops when needed, reducing the amount of water usage. For indoor agriculture, IoT allows monitoring and management of micro-climate conditions (humidity, temperature, light, etc.) to maximize production.

Inventory Efficiency

By placing RFID or NFC tags on individual products, the exact location of single items in a large warehouse can be shared, thus saving search time and lowering labor costs.

VII. CONCLUSIONS

Internet play important and revolutionary invention which transforming a hardware and software making it unavoidable for anyone. The form of communication that we see now is either human-human or human-device, but the Internet of Things (IoT) are great future for the internet where the type of communication is machine-machine (M2M). The Internet-of-Things may represent the next big leap ahead in the ICT sector. Through the massive deployment of embedded devices, opens up new exciting directions for both research and business.

This paper aims to provide a comprehensive overview of the IoT scenario and reviews its enabling technologies and the sensor networks. Describes a number of research challenges has been identified, which are expected to become major research trends in the next years. The most relevant application fields have been presented, and a number of use cases identified. An overview of the key issues related to the development of Io T technologies and services.

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