

INTERNET OF THINGS- THE SMART TECHNOLOGY- AN OVERVIEW

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ABSTRACT:

Many of us have dreamt about a smart life, where our appliances do our work automatically. Lights switch on automatically and switches off as we move out. The coffee maker automatically makes coffee. The heater turns on automatically. Our car drives us to work in the safest and the fastest route. Our cellphones automatically remind us about our appointments and other reminders. Our life will be made automatic, won't it? This is going to be the future of the world. The world is going to become 'Smart world'. All these automations are made possible by implementing Internet of Things. This paper deals with an overview of the introduction, history, working, future potential, advantages, disadvantages and applications of Internet of Things.

KEYWORDS:

Smart, things, network, communication, RFID, sensors, internet, automation.

INTERNET OF THINGS:

Internet of Things is a smart technology that reduces human effort and enables easy access to physical devices. Internet of things is the network of physical objects embedded with electronics, sensors, software and network connectivity that enables these objects to collect and exchange data. IoT enables the sensing and connectivity of objects remotely across the network infrastructure. It creates opportunities for connecting physical world with the computer-based systems, thereby providing improved efficiency, accuracy and wider benefits. 'Things', according to IoT, refers to a wide variety of devices like heart monitoring implants, biochip transponders, electric clams in coastal waters, automobiles with built-in sensors, DNA analysis devices for food and

environmental monitoring or field operation devices that assist fire-fighters in search and rescue operations. These devices collect useful data with the help of various existing technologies and then flow the data between other devices. [1]

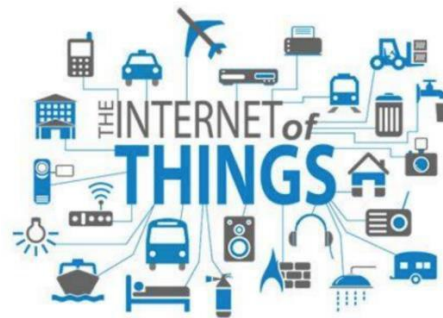


Figure 1: IoT

HISTORY OF IOT:

Internet of things has evolved with multiple technologies like real-time analytics, machine learning, commodity sensors, embedded systems, wireless sensor networks, control systems and automation (including home and building automation). The term 'Internet of Things' was coined by Kevin Ashton of Procter and Gamble in 1999. He considered Radio Frequency Identification (RFID) as an essential element of IoT as it allowed computers to manage all individual things. This concept of network of smart devices began in 1982. The first internet connected device was a coke-vending machine at Carnegie Mellon University. This device could check if the newly loaded drinks were cold or not. This field gained popularity when Bill Joy envisioned Device To Device (D2D) communication as a part of his "Six webs" framework that he presented at the World Economic Forum at Davos in 1999. A research article on IoT

was published in Finnish and another article was submitted at the conference for Nordic Researchers in 2002. With the growth of people between 2003 and 2010, the concept of IoT grew to a greater extent. [2]



Figure 2: Kevin Ashton

WORKING OF IOT:

IoT is the result of several technical developments that help to bridge the gap between the virtual and the physical world. The IoT platform is connected to devices with inbuilt sensors. The IoT platform combines data from different devices and connects and applies analytics to share the information with applications built for address specific needs. These platforms can accurately point out useful information while others can be ignored, while this information can be used to detect patterns, make recommendations and possible problems before they occur. This information collected from various devices can provide smarter decisions which can help save time and resources. The insight provided by advanced analytics enables the processes to become more efficient. Smart objects and systems enable automation of repetitive, mundane, time-consuming or dangerous tasks. [3]

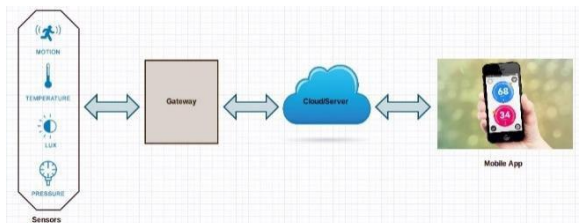


Figure 3: How IoT works

COMPONENTS OF IOT:

There are four main components used in IoT namely:

- RFID
- Sensors

- Smart technology
- Nano technology

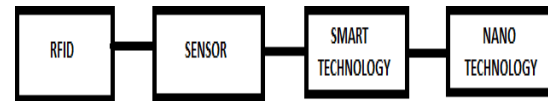


Figure 4: Components of IoT

RFID:

To identify and track the data of things, Radio Frequency Identification (RFID) is used. RFID tag is a physical object, applied to a real world item to identify and track it electronically.

SENSORS:

Sensors are used to collect and process the data to detect the changes in the physical status of things. They give life to the devices and make them sense the environment and it changes.

SMART TECHNOLOGY:

Smart technology improves the power of the network. This is done by transferring processing capabilities to the different parts of the network.

NANO TECHNOLOGY:

Nano technology is very essential to make the smallest of the things smarter. Nano technology enables even the smallest device to connect and interact with one another. [4]

FUTURE POTENTIAL OF IOT:

The future internet is responsible for providing new service experience to the users. Three different drivers of IOT namely, people, society and business connect everything. As the technology of IoT develops, devices are improved to 'smart devices'. This eventually eases human life to a very great extent. Imagine if our alarm clock can sense the traffic condition and wake us up earlier so that we reach our workplace on time. Or our coffee maker prepares coffee for us by sensing the time we switched off our alarm. All these are possible using IoT. The European Commission decided to implement its IoT policy for supporting providing better life to its citizens and supporting economic revival, and it has selected several new IoT research projects as part of the 7th Framework Program on European Research (CERP IoT, 2010). According to

IoT Strategic Research Roadmap (2009), this type of networks of networks will be laid out as infrastructures and extended later by 'things' connecting to one another. IoT will improve communication between people and their environment. Terminals will be able to create a local communication network and can act as a link between different communication networks thus extending overall infrastructure capacity. [5]

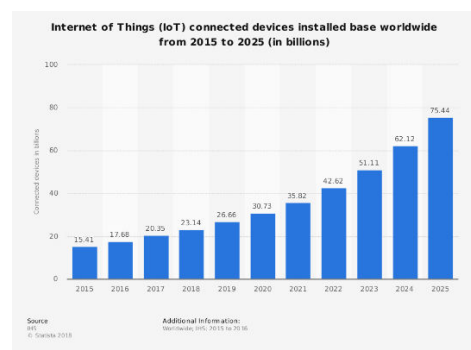


Figure 5: IoT- Statistics

ADVANTAGES OF IOT:

BETTER COMMUNICATION:

IoT increases machine to machine communication. This helps the devices to stay connected to one another, thus providing greater efficiency, better transparency and higher quality.

AUTOMATION OF DEVICES:

As these smart devices use wireless infrastructure, it requires very little human intervention. In most of the cases, human intervention is not at all required. These devices can operate on their own. This allows greater control and automation thereby increasing efficiency.

FLOW OF INFORMATION:

IoT systems have a better flow of information that allows people to make smarter decisions. The systematic use of information saves time and work effectively. They can provide simpler information like the availability of groceries to the more complicated decisions at work.

HELPFUL FOR BUSINESS:

IoT systems would be very advantageous for businesses. It would help monitor consumer trends and respond to the timely demand changes. This would lead to greater sales and profit. [6]

DISADVANTAGES OF IOT:

PRIVACY ISSUES:

Once anything is put on the internet, it will be available until it is deleted. Though there are security measures, there are possibilities for hackers to seize our information. If such things happen, all the information about an individual's personal life to his confidential information can be leaked and can be misused.

OVER-RELIANCE ON TECHNOLOGY:

No system is robust and fault-free. If the system that is being used collapses, then the information supplied to the user will be stopped. This will thus cause his entire work to stop. Hence the more we rely on the internet, we are more prone to make our work a catastrophe in case the system crashes.

UNEMPLOYMENT:

Unemployment is one great impact of IoT. As the technology develops, human labor is less required. In such a case, humans remain jobless. This can affect the society to a very great extent. [7]

APPLICATIONS OF IOT:

IoT can be used in almost all the fields. It helps in improving efficiency and eases human life.



Figure 6: Applications of IoT

SMART HOMES:

This is the mostly used application of Internet of Things. More than 60,000 people are currently using smart home applications. The prominent among them are the Nest, AlertMe and many other multinational corporations like Philips and Haier.

WEARABLES:

Wearables are also a popular application of IoT. Gesture control devices and smart trainers are devices that are most commonly used. Nowadays, these applications are available in the smartphones we use.

AGRICULTURE:

Smart farming can help us monitor the crops. This is done with the help of sensors. Irrigation can be automated. Also, the amount of fertilizers used can be monitored.

SMART CITIES:

Smart city includes various applications like traffic management, water distribution, waste management, urban security and environmental monitoring. Smart city solutions can reduce the real-time difficulties faced by people living in cities. Traffic cameras can be made to monitor traffic, repairs or blocks on roads and send the information to people via google maps or any other application. Applications like these can help reduce noise pollution and make cities safer.

AUTOMATION IN INDUSTRIES:

In industries, quality tests of products can be done and it can automatically take the necessary steps to improve the quality. This is labor efficient and helps in monitoring so that we get better performance.

HEALTH CARE:

A smart health care device that can monitor patient's condition and can send notifications to the doctor or caretaker once the patient's condition changes or becomes unstable. However, this is a bit difficult process as the messages must be sent to smart sensors via gateway to the cloud, which in turn passes that signal to the smart devices of the doctor or caretaker.

DISASTER MANAGEMENT:

It is used to predict, prepare, recover and respond to the weather conditions. Certain sensors are used to

identify the predicted temperature. By monitoring these sensors, people can be alerted and the necessary precautions can be taken.

SMART GRIDS:

Smart grids use the information about the electricity suppliers and consumers in order to improve the efficiency, reliability and economy of electricity. [8]

CONCLUSION:

Internet of things is a very useful technology. It is a concept of great potential. In fact, the future of the world lies in the hands of IoT. The life of human beings on Earth is going to get smarter and automated. Few applications are already in use. By 2025, it is estimated that every device will get smarter using the IoT technology.

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