AN OVERVIEW ON INTERNET OF THINGS (IOT)

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Abstract

Nowadays, the main communication form on the Internet is human-human. But it is foreseeable that in a near soon that any object will have a unique way of identification and can be addressed so that every object can be connected. The Internet will become to the Internet of Things. The communicate forms will expand from human-human to human-human, human-thing and thing-thing (also called M2M).This will bring a new ubiquitous computing and communication era and change people's life extremely. Radio Frequency Identification techniques (RFID) and related identification technologies will be the cornerstones of the upcoming Internet of Things (IOT). The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

Key words : IoT, Data, Applications,

Introduction

Kevin Ashton, co-founder of the Auto-ID Center at the Massachusetts Institute of Technology (MIT), first mentioned the internet of things in a presentation he made to Procter & Gamble (P&G) in 1999. Wanting to bring radio frequency ID (RFID) to the attention of P&G's senior management, Ashton called his presentation "Internet of Things" to incorporate the cool new trend of 1999: the internet. MIT professor Neil Gershenfeld's book, *When Things Start to Think*, also appeared in 1999. It didn't use the exact term but provided a clear vision of where IoT was headed.

The first internet appliance, for example, was a Coke machine at Carnegie Mellon University in the early 1980s. Using the web, programmers could check the status of the machine and determine whether there would be a cold drink awaiting them, should they decide to make the trip to the machine. IoT evolved from M2M communication, i.e., machines connecting to each other via a network without human interaction. M2M refers to connecting a device to the cloud, managing it and collecting data.

Taking M2M to the next level, IoT is a sensor network of billions of smart devices that connect people, systems and other applications to collect and share data. As its foundation, M2M offers the connectivity that enables IoT.

The internet of things is also a natural extension of supervisory control and data acquisition (SCADA), a category of software application programs for process control, the gathering of data in real time from remote locations to control equipment and conditions. SCADA systems include hardware and software components. The hardware gathers and feeds data into a computer that has SCADA software installed, where it is then processed and presented in a timely manner. The evolution of SCADA is such that late-generation SCADA systems developed into first-generation IoT systems (Farooq *et al*., 2015).

What is IoT

We are witnessing the dawn of a new era of Internet of Things (IoT; also known as Internet of Objects). Generally speaking, IoT refers to the networked interconnection of everyday objects, which are often equipped with ubiquitous intelligence. IoT will increase the ubiquity of the Internet by integrating every object for interaction via embedded systems, which leads to a highly distributed network of devices communicating with human beings as well as other devices.

IoT-based scientific research has recently become an imperative component in monitoring human daily lives and leveraging the enabling technologies including smart objects, smart sensing, cloud and edge computing, and big data analytics. The IoT has created an explosion of sensor data due to the increased number of smart devices with embedded smart sensors. This ranges from smart watches and smartphones to healthcare wearable and head-mounted devices. The recent increase in availability and use of smart wearable devices and the ubiquity of smartphones allows the ability of caregivers to monitor health conditions on a continuous basis. Many of the smart-wearable devices are part of human-in-the-loop Cyber Physical Systems (CPS).

The Internet has changed drastically the way we live, moving interactions between people at a virtual level in several contexts spanning from the professional life to social relationships. The IoT has the potential to add a new dimension to this process by enabling communications with and among mobile phones and smart devices, thus leading to the vision of obtrusiveness or in other words ‘‘anytime, anywhere” computing and communications. Additionally, the IoT is a key enabler for the realization of future embedded smart world as it allows for the interaction with/between the tiny smart things leading to an effective integration of information into the digital world (Luigi Atzori *et al*., 2012).

The Internet of Things, or IoT, refers to the billions of physical devices around the world that are now connected to the internet, all collecting and sharing data. Connecting up all these different objects and adding sensors to them adds a level of digital intelligence to devices that would be otherwise dumb, enabling them to communicate real-time data without involving a human being.

The Internet of Things is making the fabric of the world around us more smarter and more responsive, merging the digital and physical universes. Pretty much any physical object can be transformed into an IoT device if it can be connected to the internet to be controlled or communicate information. A lightbulb that can be switched on using a smartphone app is an IoT device, as is a motion sensor or a smart thermostat in your office or a connected streetlight. Some larger objects may themselves be filled with many smaller IoT components, such as a jet engine that's now filled with thousands of sensors collecting and transmitting data back to make sure it is operating efficiently. At an even bigger scale, smart cities projects are filling entire regions with sensors to help us understand and control the environment.

A thing in the internet of things can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an Internet Protocol (IP) address and is able to transfer data over a network (Feng Xia *et al*., 2102).

How IoT works

The devices use Internet protocol (IP), the same protocol that identifies computers over the world wide web and allows them to communicate with one another. The goal behind the Internet of things is to have devices that self report in real-time, improving efficiency and bringing important information to the surface more quickly than a system depending on human intervention (Shancang Li *et al*.,2015).

An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another. The devices do most of the work without human intervention, although people can interact with the devices -- for instance, to set them up, give them instructions or access the data (Akshay Deelip Shewale,2019).

The connectivity, networking and communication protocols used with these web-enabled devices largely depend on the specific IoT applications deployed.IoT can also make use of artificial intelligence (AI) and machine learning to aid in making data collecting processes easier and more dynamic.

Why IoT is important

The internet of things helps people live and work smarter, as well as gain complete control over their lives. In addition to offering smart devices to automate homes, IoT is essential to business. IoT provides businesses with a real-time look into how their systems really work, delivering insights into everything from the performance of machines to supply chain and logistics operations.

IoT enables companies to automate processes and reduce labor costs. It also cuts down on waste and improves service delivery, making it less expensive to manufacture and deliver goods, as well as offering transparency into customer transactions.

As such, IoT is one of the most important technologies of everyday life, and it will continue to pick up steam as more businesses realize the potential of connected devices to keep them competitive (KyoochunLee, 2015).

IoT benefits to organizations

The internet of things offers several benefits to organizations. Some benefits are industry-specific, and some are applicable across multiple industries. Some of the common benefits of IoT enable businesses to:

- monitor their overall business processes;
- improve the customer experience (CX);
- enhance employee productivity;
- integrate and adapt business models;
- make better business decisions; and
- generate more revenue (Dada & Thiesse, 2008).

Generally, IoT is most abundant in manufacturing, transportation and utility organizations, making use of sensors and other IoT devices; however, it has also found use cases for organizations within the agriculture, infrastructure and home automation industries, leading some organizations toward digital transformation.

IoT can benefit farmers in agriculture by making their job easier. Sensors can collect data on rainfall, humidity, temperature and soil content, as well as other factors, that would help automate farming techniques.

The ability to monitor operations surrounding infrastructure is also a factor that IoT can help with. Sensors, for example, could be used to monitor events or changes within structural buildings, bridges and other infrastructure. This brings benefits with it, such as cost saving, saved time, quality-of-life workflow changes and paperless workflow (Alex Mavromatis *et al*., 2020).

A home automation business can utilize IoT to monitor and manipulate mechanical and electrical systems in a building. On a broader scale, smart cities can help citizens reduce waste and energy

Applications of the Internet of Things

In Medicine

The Internet of Things promises to transform a wide range of fields. In medicine, for example, connected devices can help medical professionals monitor patients inside and outside of a hospital setting. Computers can then evaluate the data to help practitioners adjust treatments and improve patient outcomes (Boyi Xu *et al*.,2014).

In Smart Cities Planning

Another field that's also experiencing a transformation is urban planning. When sensors that have an IP address are placed under a busy street, for instance, city officials can alert drivers about upcoming delays or

accidents. Meanwhile, intelligent trash cans are able to notify the city when they become full, thus optimizing waste collection routes.

In Business

The use of smart devices will also likely mean a competitive advantage for businesses that use them strategically. For instance, by tracking data about energy use and inventory levels, a firm can significantly reduce its overall costs. Connectivity may also help companies market to consumers more effectively. By tracking a consumer's behavior inside a store, a retailer could theoretically make tailored product recommendations that increase the overall size of the sale (Daniele Miorandi *et al*., 2012).

In Agriculture

In IoT-based smart farming, a system is built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, etc.) and automating the irrigation system. The farmers can monitor the field conditions from anywhere. IoT-based smart farming is highly efficient when compared with the conventional approach (Andrea Zanella *et al*., 2014).

Advances in IoT

The rise of 5G technology is the first advance we will talk about. 5G networks are at the forefront of development of cellular mobile communications. Recent developments will ensure that their spread will mean much more than just a faster internet connection for your smartphone. Their extremely high speeds will offer an array of new possibilities for the IoT, paving the way for a degree of connectivity that is impossible with current standards. Through 5G, data can be gathered, analyzed and managed in real time, virtually without delays, greatly broadening potential IoT applications and opening up pathways to further technological innovation.

Edge computing is literally the opposite of cloud computing, the technology that has gained so much prominence just in the last five years or so. Edge computing means that data is stored in micro-centers as opposed to the cloud, providing numerous new options for the IoT.

Smart Stores

In 2019, smart lighting devices, video feeds and Wi-Fi enabled food traffic-monitoring software allows store owners to collect info about customer traffic patterns in the shop, how much time they spend in each of its aisles and how they interact with products on display (Guinard *et al*.,2010).

Manufacturing and Healthcare

The IoT has already begun to transform manufacturing. Sensors, RFID tags, and smart beacons have been in place for several years. Advances in these devices are disrupting every part of the production process from product development to supply chain management.

In the world of healthcare, already more than half of organizations have adopted IoT technology. It is an area where there are almost endless possibilities- smart pills, smart home care, electronic health records, and personal healthcare management (Ronghui Cao *et al*., 2020)

Nano Technologies

This technology realizes smaller and improved version of the things that are interconnected. It can decrease the consumption of a system by enabling the development of devices in nano meters scale which can be used as a sensor and an actuator just like a normal device. Such a nano device is made from nano components and the resulting network defines a new networking paradigm which is Internet of Nano-Things.

Optical Technologies

Rapid developments in the field of Optical technologies in the form of technologies like Li-Fi and Cisco's BiDi optical technology could be a major breakthrough in the development of IoT. Li-Fi, an epoch-making Visible Light Communication (VLC) technology, will provide a great connectivity on a higher bandwidth for the objects interconnected on the concept of IoT (Ying Zhang, 2011).

Increased Security Concerns

Despite the promise that the IoT holds for all of us in making our lives easier, at the same time it carries the dual-edged sword of making us more vulnerable to an attack. In the past, a malware infection meant just lost or compromised data. The emergence of the IoT means that a virus or ransomware infection can easily disable vital functions and services.

Conclusion

There are billions of devices in homes, factories, oil wells, hospitals, cars, and thousands of other places. With the proliferation of devices, you increasingly need solutions to connect them, and collect, store, and analyze device data. IoT provides broad and deep functionality, spanning the edge to the cloud, so we can build IoT solutions for virtually any use case across a wide range of devices. The Internet of Things is actually a pretty simple concept, which means taking all the things in the world and connecting them to the internet**.** IoT is changing industries across the board – from agriculture to healthcare to manufacturing and everything.

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