

Chapter 14

Internet of Things Services, Applications, Issues, and Challenges

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ABSTRACT

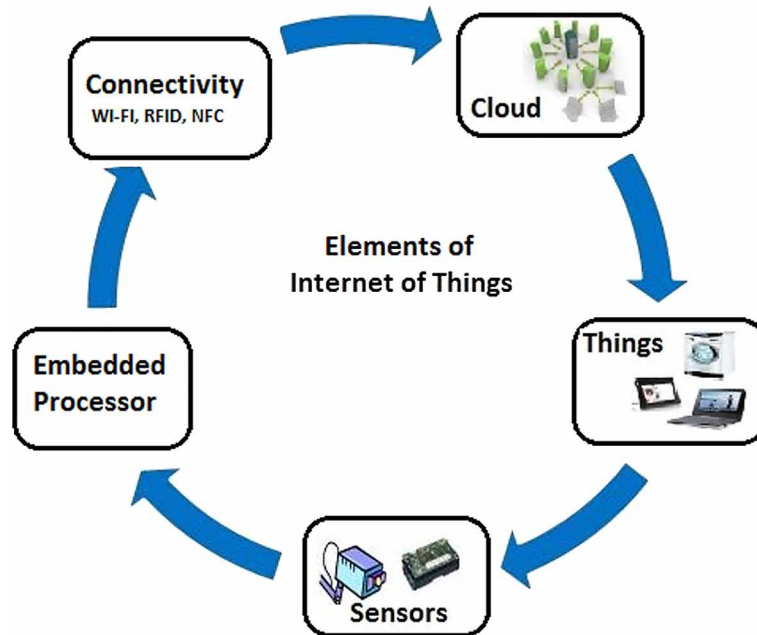
Internet of Things (IoT) is not a futuristic intuition, it is present everywhere. It is with devices, Sensors, Clouds, Big data, and data with business. It is the combination of traditional embedded systems combined with small wireless micro sensors, control systems with automation, and others that makes a huge infrastructure. The integration of wireless communication, micro electro mechanical devices, and Internet has led to the development of new things in the Internet. It is a network of network objects that can be accessed through the Internet and every object can be identified by unique identifier. By replacing IPV4, IPV6 plays a key role and provides a huge increase of address spaces for the development of things in the Internet. The objective of IoT application is to make the things smart without the human intervention. With the increasing number of smart nodes and amount of data that generated by each node is expected to create new concerns about data privacy, data scalability, data security, data manageability and many more issues that have been discussed in this chapter.

1. INTRODUCTION

In early 1990's, the evolution of new technology and new creativity could bring the concept of Internet as "Internet of Computers" as global networks with services provided as "world wide web" built on top of the original platform. Over the years, with the development of Web 2.0, the concept of "Internet of computers" has been changed to "Internet of people" where billions of people are connected through many social web sites. The boundary of Internet is getting expanded day by day with the integration of Micro Electro Mechanical devices (MEMs) and wireless communication technology and the devices are becoming smaller compared to the original PC with increasing processing and storage capacity. These devices are utilized in the form of mobile phones to note books, tablets etc. When these devices

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Figure 1. Elements of IoT



are fitted with sensors along with the actuators, the sensing, computing, and communicating capability can be extended with other devices under the network connectivity.

According to Cisco the definition of “Internet of Everything” which brings together people, process, data and things to make networked connections more relevant and valuable than ever before by turning information into action. Cities globally have the potential to claim \$1.9 Trillion in value from Internet of Things over the next decade. In a 2005 report, the International Telecommunications Union (ITU) suggested that the “Internet of Things will connect the world’s objects in both a sensory and intelligent manner” (ITU report, 2005). By combining various technological developments, the ITU has described four dimensions in IoT: *item identification* (“tagging things”), *sensors and wireless sensor networks* (“feeling things”), *embedded systems* (“thinking things”) and *nano-technology* (“shrinking things”). The definition of IoT is not limited to a particular domain and still it is fuzzy to define the vast concept. As a concluding remark, it can be defined as the combination of smart devices communicating with other devices, objects, environments and producing a huge volume of data. These data can be processed into useful actions that provide command and control to the things to enhance the quality of life. The elements of IoT are given in Figure 1.

1.1 Elements of IoT

The elements of IoT can be grouped in three categories: Hardware, Middleware, and Presentation (Gubbi et. al, 2013).

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