Chapter 4
Basic Concepts of Internet of Things and Game Theory

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ABSTRACT

With the evolution of the Internet and related technologies, there has been an evolution of new paradigm, which is the Internet of Things (IoT). IoT is the network of physical objects, such as devices, embedded with electronics, software, sensors, and network connectivity that enables these objects to collect and exchange data. In the IoT, a large number of objects are connected to one another for information sharing, irrespective of their locations (Corcoran, 2016). Even though the IoT was defined at 1999, the concept of IoT has been in development for decades. As the technology and implementation of the IoT ideas move forward, different views for the concept of the IoT have appeared (Ma, 2011). Based on different views, in this book, the IoT is defined as a kind of modern technology, implicating machine to machine communications and person to computer communications will be extended to everything from everyday household objects to sensors monitoring the movement. Currently, we can see a few key areas of focus for the Internet of Things (IoT) that will require special attention over the course of the next decade on the part of computer science, energy technology, networks, wireless communication, and system platform. There are already a number of implementation case studies emerging from companies across a range of industry sectors.

CLOUD COMPUTING WITH IoT

In 2010s, it seems that we are seeing a new phenomenon; the data are leaving the computer and moving to the network. Using the cloud computing, we can realize that it is quite empowering to have all of our data available in one place and from any device. Once we start using these services, more of our day-to-day data tend to get sucked up into cyberspace. From the practical viewpoint, cloud computing and IoT are two very different technologies that are both already part of our life. Their adoption and use are expected to be more and more pervasive, making them important components of the future Internet. A novel paradigm where cloud and IoT are merged together is foreseen as disruptive and

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as an enabler of a large number of application scenarios. We call this new paradigm as CloudIoT, which is expected to disrupt both current and future Internet (Botta, 2016; Corcoran, 2016). The new applications, arising from this CloudIoT paradigm, open up new exciting directions for business and research; smart cities will enable more efficient public services and promote new business opportunities, ubiquitous healthcare applications will improve the quality of life for many patients (Botta, 2016). In this book, designing cloud oriented IoT mechanisms and the deployment of CloudIoT are considered as one of the main issues.

GREEN IoT

IoT devices will produce a lot of electronic waste and will also consume a significant amount of energy in order to execute different tasks. Besides energy consumption is acute in different heterogeneous IoT devices as it actively relates to cost and availability of the IoT network. However, energy is considered as valuable resource for loT network, because the devices used for loT applications are battery operated low power machines. Therefore, utilizing the energy in efficient way is the main goal of loT network. This will eventually pose a challenge in near future to reduce the energy consumption and will also demand for new ways of developing a green communication across the IoT systems. Nowadays, new challenges for the energy-efficient IoT system design have been addressed. However, despite these efforts to improve the energy efficiency in IoT systems, it is not always practical or feasible under limited ambient energy availability and stringent form-factor constraints. Therefore, additional system-level techniques need to be developed for the IoT systems. For the future IoT, energy consumption has become a core issue and different algorithmic approaches have been initiated for different effective solutions like complementing hardware or different system-based approaches (Abedin, 2015).

QUALITY OF SERVICE IN IoT

The huge number of different links and interactions between IoT objects makes it a scalable complex system. In addition, some services in service-oriented IoT are required to be reconfigurable and composable for Quality of Service (QoS) aware services. Therefore, brings difficulties for satisfying the dynamic QoS requirements of services (Li, 2014). In this perspective, it is necessary to define service models, which can categorize IoT applications and then determine which QoS factors are necessary to satisfy the requirements of those services (Nef, 2012). Nowadays, a number of QoS models have been developed for traditional networks. However, the QoS management in IoT is still poorly studied. The definition of QoS in IoT is still not clear because the definition of service in IoT is not exactly the same, in which a service can be defined as the simple acquisition and processing of information and the decision making process in identification, communication, and so on. The traditional QoS attributes in terms of bandwidth, delay, jitter, and packet loss ratio are evidently inappropriate in IoT. In IoT, more QoS attributes are concerned, such as information accuracy, the network resources needed, required energy consumption, and the coverage of IoT. To solve the difficulties mentioned above, a new QoS model for service-oriented IoT is necessary (Nef, 2012).