Chapter 9
Network Support for IoT Ecosystems

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ABSTRACT

IoT is a new paradigm that enables cloud environments to capture, interpret, and analyze data at a real time from some sensors distributed in the environment and able to act on the environment based on decision-making algorithms. Communication between the sensors and the cloud is performed via the network. This chapter presents a bibliographic study that aims to map out which network technologies are more adapted to the IoT environments. In this sense, the many characteristics are presented, such as security, distance range, energy consumption, and versions of each illustrated network technology in order to support the choice of better network technology for new IoT projects.

INTRODUCTION

Internet of Things (IoT) is the definition of the implementation of machine-to-machine communication (M2M) via the Internet (Gubbi, Buyya, Marusic, & Palaniswami, 2013). Currently, it is a significant component in the digital market. Third-party platforms for IoT are relatively new in the market and present a great diversity regarding functionality and the application areas. In general, most IoT platforms fit

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in connectivity management, device management, or enabling applications. Moreover, IoT platforms allow companies and organizations to develop and launch IoT solutions faster and at a lower cost by offering standardized components that can be shared by multiple solutions (Amaral, Tiburski, de Matos, & Hessel, 2015).

These devices can include sensors that can be used to measure and collect data about the environment around them. It can be used to store the large data collected, and coordinators to help manage sets of these components as well. In this sense, the IoT has the potential to significantly extend, enrich and even shift the relationship between people and the world around them (Koreshoff, Robertson, & Leong, 2013). An IoT example is the smart house, where actuators change several variables in the house, such as thermostat, lighting and other functions based on the data collected through the sensors. In order to visualize the potential of such technological movement, it is estimated that the Internet of Things could add from 4 to 11 trillion dollars to the global economy in 2025 of the economic impact (Manyika, 2015). Besides, the Internet of Things tends to enable significant social gains, such as assisting countries to achieve the United Nations' Sustainable Development Goals (Biggs, Garrity, LaSalle, Polomska, & Pepper, 2016).

Technologically, this groundbreaking paradigm is accepted as a dynamic network infrastructure with capabilities of runtime auto-configuration, based on interoperable communication standards where things (physical and virtual) have identities, and attributes integrated within an information network. Such characteristics make IoT an attractive technology for a plethora of areas, which includes: health, safety, and sustainability. Because of the diversity of applicability environments, multiple network technologies can be used to interconnect components and devices. But for the most part, network technologies and connectivity are the legacy of traditional computing environments and are not designed to address the characteristics of ecosystems of IoT. Therefore, due to different costs in each of them (e.g., value, the difficulty of implementation, aiming) choosing the best network technology for each scenario is necessary.

This chapter presents a survey on wireless technologies used nowadays to enable communication among the components that integrate and interact with IoT ecosystems. More specifically, this work shows a comparison among each of these technologies, highlighting the differences of each one, supported by some metrics such as speed, communication range, security, and energy wasted. In this sense, a survey that shows a list of network options that allow connecting different IoT devices, based on the application environment, can be helpful to prescribe the most appropriate network to a specific case of use. Thus, it becomes an interesting proposal of research which includes, for example, the costs involved in such choice. In the end, some future trends and challenges are presented, as well as research possibilities in the area of networks focused on IoT ecosystems.

In this way, this chapter aims to be a guide to future choices related to networks in IoT. The chapter is organized as follows: Section *Internet Of Things* presents the concept and taxonomies of the Internet of Things. Section *Computer Networks for IoT ecosystems* shows network technologies that support IoT ecosystems. In Section *Assessing the Characteristics of Network*, are discussed the impact of choosing the network technology, depending on the IoT scenario. Finally, Section *Trends and Challenges* discusses future directions of research in IoT networking.

INTERNET OF THINGS

IoT means the capacity of connection between several sorts of devices through the Internet (Gubbi, Buyya, Marusic, & Palaniswami, 2013). This innovative technology is growing, and it becomes vital for