Chapter 5

Secure Routing Protocols Using Trust-Based Mechanisms in the Internet of Things for Smart City Environment Challenges and Future Trends

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ABSTRACT

The internet of things (IoT) is expected to influence both architecture and infrastructure of current and future smart cities vision. Thus, the requirement and effectiveness of making cities smarter demands suitable provision of secure and efficient communication networks between IoT networking devices. Trust-based routing protocols play an important role in IoT for secure information exchange and communications between IoT networking elements. Thus, this chapter presents the foundation of trust-based protocols from social science to IoT for secure smart city environments. The chapter outlines and discusses the key ideas, notions, and theories that may help the reader to understand the current status and the possible future trends of trust-based protocols in IoT networks for smart cities. The chapter also discusses the implications, requirements, and future research challenges of trust-based protocols in IoT for smart cities.

DOI: 10.4018/978-1-5225-7189-6.ch005
INTRODUCTION

Smart City is an innovative new technological paradigm that uses Information and Communication Technologies (ICTs), and different types of electronic data collection sensors to supply information, which can be used to manage assets and resources efficiently, provide digital connectivity and improve quality of lives. Recently, significant technological, economic and ecological changes have generated interest in smart cities, including financial restructuring, climate change, environmental monitoring, smart social housing, and many more. Subsequently, in the intricate architecture of the smart city, the application of the Internet of Things is of interest, as it responds to the efficiency, security, and the provision of low-risk technology choices in building smart city environment and solutions, thus realising the so-called Smart environment. For example, some building managers across the world are more frequently looking to incorporate IoT devices and solutions into their infrastructures to reduce costs and improve the quality of their buildings.

The Internet of things (IoT) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data (Gubbi, Buyya, Marusic, & Palaniswami, 2013). The Internet of Things (IoT) system connects the physical world into cyberspace via sensors, Radio Frequency Identification (RFID) tags, to provide environmental information, body conditions, etc., in smart cities. Subsequently, the potential applications of IoT in building smart cities is limitless, and the growth of IoT technologies will profoundly accelerate the adoption and the efficient design of smart cities in the coming years.

There are several application areas of IoT for smart cities in the areas of commercial, military and domestic purposes: for example, Smart Appliances, Smart Cars, Wearable Devices, Connected Cars, Sensor Actuator Networks (SANETs), etc. A high-level illustration of an IoT-based smart city can be seen Fig. 1 (Mehmood et al., 2017). From the figure, the applications of IoT in smart cities were grouped into personal and home utilities, smart transportation, etc.. The personal and home applications of IoT include e-healthcare pervasive computing devices and services, which help doctors monitor patients remotely; utilities applications such as smart grid, smart metering/monitoring, water network monitoring, and video-based surveillance. Given the different application domains, efficient routing and secure data forwarding between devices in IoT networks are essential. (Bello, Liu, Bai, & Narayanan, 2015b). The IoT devices and systems are not complicated but designing and building communication between them can be a complex task. Subsequently, building secure and effective communication among the IoT wide variety of devices
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