

Chapter 6

Secure Routing Challenges for Opportunistic Internet of Things

Nisha Kandhoul

*Division of Information Technology, Netaji Subhas University of Technology,
New Delhi, India*

Sanjay K. Dhurandher

*Division of Information Technology, Netaji Subhas University of Technology,
New Delhi, India*

ABSTRACT

Internet of Things (IoT) is a technical revolution of the internet where users, computing systems, and daily objects having sensing abilities, collaborate to provide innovative services in several application domains. Opportunistic IoT (OppIoT) is an extension of the opportunistic networks that exploits the interactions between the human-based communities and the IoT devices to increase the network connectivity and reliability. In this context, the security and privacy requirements play a crucial role as the collected information is exposed to a wide unknown audience. An adaptable infrastructure is required to handle the intrinsic vulnerabilities of OppIoT devices, with limited resources and heterogeneous technologies. This chapter elaborates the security requirements, the possible threats, and the current work conducted in the field of security in OppIoT networks.

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INTRODUCTION

Internet of Things (IoT) (Atzori et al., 2010) is a global network of connected objects that can be accessed via internet. IoT network provides a system for collecting, analyzing and processing the data generated by the sensor-based devices. IoT embodies a huge number of technologies and connects a variety of things or devices via unique addressing approach and standard protocols are used for communication. These devices are capable of interaction with one another and cooperate with their neighbors for achieving certain common goals. It is an innovation for the future of communications and computing. The connected objects in IoT vary from a person with a heart monitor to any device with built-in-sensors, i.e. devices having IP address and having the capability of data collection and interchange over a network without any manual intervention. The technology embedded in these objects enable them to interact with the external environment and affects their decision making. The devices can be managed and controlled remotely because of their inherent capability of connecting to the internet. IoT devices interact among themselves by transmitting and gathering information, sensing the environmental parameters like temperature, pressure etc., thereby transmitting the same to other devices in their communication range for further processing and other actions. The future era of internet will support interactions among humans, human based societies and smart objects held by them.

The network connections can be broadly categorized into two types based on its topology: infrastructure-based connection and infrastructure-less connections that is, ad-hoc or opportunistic connection. The infrastructure-based connections use pre- established infrastructure like base stations, routers, access points and manage the data a centralized way. In contrast, infrastructure-less connections do not use any infrastructure and make use of short-range radio techniques like Bluetooth, RFID, Wi-Fi etc for building decentralized networks.

Opportunistic Networks (Pelusi et al., 2006) is a class of Delay Tolerant Networks (Fall, 2003) that perform routing of messages and data sharing by exploiting the human characteristics like mobility patterns, similarities among humans, their daily routines and interests. Opportunistic IoT(OppIoT) extends the concepts of Opportunistic networks by merging human users and their smart devices. OppIoT explores the social side of IoT networks whereby the data is shared among communities, formed on the basis of movement and opportunistic contacts between humans and their personal devices like mobile phones, wearable devices, vehicles etc. Figure 1 shows a basic OppIoT network comprising of some mobile devices, laptops, sensors and human beings.

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