

# Chapter 7

## Middleware Approach to Enhance the Security and Privacy in the Internet of Things

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### **ABSTRACT**

*Internet of things is one of the most rapidly growing research areas. Nowadays, IoT is applicable in various diverse areas because of its basic feature i.e., anything would be available to anyone at anytime. Further, IoT aims to provide service in a pervasive environment, although different problems crop up when the researchers move towards pervasiveness. Security and Privacy are the most intense problems in the field of IoT. There are various approaches available to handle these issues: Architectural security, Database security, Secure communication, and Middleware approaches. This chapter's authors concentrate on middleware approach from the security and privacy perspective. Middleware can provide security by separating the end user from the actual complex system. Middleware also hides the actual complexity of the system from the user. So, the user will get the seamless services with no threats to security or privacy. This chapter provides a brief overview of secure middlewares and suggests the current research gaps as future directions.*

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## INTRODUCTION

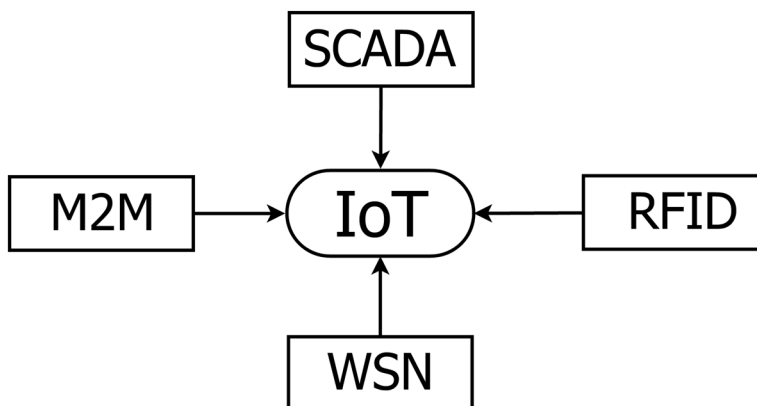
Internet of Things (IoT) is a combination of various technologies including sensors, actuators, embedded systems, cloud computing, next-generation of cheaper and smaller devices, objects, and things. Moreover, the researchers define IoT on the basis of its common characteristics, which involve the objects in the IoT scenario should be instrumented and interconnected to process anything intelligently and should be available to the end users anyhow, anywhere, anytime in anyway. Further, on the basis of IoT characteristics world can be categorize in four fundamental building blocks i.e., Radio Frequency IDentification (RFID), Machine to Machine communication (M2M), Wireless Sensor Networks (WSN), and Supervisory Control and Data Acquisition (SCADA), as shown in Figure 1 along with Internet. Further, these technologies are the building blocks of IoT. So, IoT automatically inherits the features and challenges existing in these technologies. Moreover, IoT evolved with various challenges as we move towards pervasiveness like Heterogeneity, Interoperability, Security, Privacy, Reliability etc., along with the preexisting issues.

IoT is the glue that tightens these four pillars through a common set of characteristics, networking methodology, and an abstract software layer middleware platform. The authors lend an abstracted view of these pillars along with level of applicability chronologically in IoT, which are as follows:

**WSN (Internet of Objects):** RFID is a low-cost, disposable contactless smartcard.

RFID use radio waves for transmission of data from electronic chip attached to object to a dedicated system via a reader for tracking and identification the

*Figure 1. Building blocks of IoT*



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