Chapter 10
Realizing IoE for Smart Service Delivery:
Case of Museum Tour Guide

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ABSTRACT

Widespread use of numerous hand-held smart devices has opened new avenues in computing. Internet of things (IoT) is the next big thing resulting in the 4th industrial revolution. Coupling IoT with data collection, storage, and processing leads to Internet of everything (IoE). This work outlines the concept of smart device and presents an IoE ecosystem. Characteristics of IoE ecosystem with a review of contemporary research is also presented. A comparison table contains the research finding. To realize IoE, an object-oriented context aware model is presented. This model is based on Unified Modelling Language (UML). A case study of a museum guide system is outlined that discusses how IoE can be implemented. The contribution of this chapter includes review of contemporary IoE systems, a detailed comparison, a context aware IoE model, and a case study to review the concepts.

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INTRODUCTION

The advent of fourth industrial revolution introduced seamless connectivity among devices (Serpanos & Wolf, 2017). In IoT each device can provide smart processing for specific application types however in IoE smart processing can increase the power of activity recognition to include various services. The services can range for smart music recommender, smart movie recommender, smart meal recommender, smart location, smart museum tour, smart agriculture, smart healthcare and others. IoT was pioneered by Auto-ID lab located in MIT circa 1999 and is among the popular research and industry focused subjects of the current era (Ashton, 2009). IoT is the evolution of computers staring from networks to the Internet, to the advent of mobile computing and finally to IoT (Perera, Zaslavsky, Christen, & Georgakopoulos, 2013). IoT enables application to use sensors present in the environment and is thus a middle layer of a pervasive architecture.

IoE is a natural evolution of IoT. IoE is the amalgamation of people, data, processing, intelligence and things. IoT when coupled with intelligence and machine learning lead to IoE. This provides situational-awareness to different applications (Jung, 2017). However, situational-awareness is generally specific, and researchers are still exploring generic methodologies. Among the chief methods of ensuring intelligence is through context awareness (Perera, Zaslavsky, Christen, & Georgakopoulos, 2013). Miraz et.al. consider extension of business and industrial processes as a difference between IoT and IoE (Miraz, Ali, Excell, & Picking, 2015). This enriches users’ life and provides better services to suit their needs. However, IoE cannot survive without better intelligence. The seamless integration of business and industrial processes in everyday life open new avenues for revenue generation. Cisco predicts the industry to generate up to $15 trillion revenue by employing IoE by the year 2022 (Bradley, Loucks, Noronha, Macaulay, & Buckalew, 2013).

This chapter is organized starting from introduction to this chapter followed by the anatomy of smart devices. Smart device is the key technology that enables IoE. Numerous devices interact among each other as well as services in the environment which is discussed in the next section followed by characteristics of IoE ecosystem. A discussion on evidences found in literature is presented in the next section that includes a comparison. An object-oriented model of an IoE ecosystem is presented followed by a case study of a museum tour guide system. The chapter concludes with an overview and future roadmap.

Anatomy of Smart Devices

All devices have simple structure and are based on both hardware and software components. These devices are compact and provide mobility (Strang & Linnhoff-Popien, 2004). The inexpensive manufacturing of smart devices coupled with their high demand and integration in the lives of common users demands high connectivity and data sharing. This led to the development of smart devices which could utilize available connectivity means including Wi-Fi, LTE and 5G (Bradley, Loucks, Noronha, Macaulay, & Buckalew, 2013). The devices commonly include smart phones, smart appliances and other electronic equipment that could be connected. The components of a smart devices include On-board Sensors, Connectivity Module, Smart Processing Unit and Actuators. These components are shown in Figure 1.