

Chapter 13

Wireless Sensor Network Protocols Applicable to RFID System

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ABSTRACT

Radio Frequency Identification (RFID) systems and Wireless Sensor Networks (WSNs) are believed to be the two most important technologies in realizing the ubiquitous computing vision of Future Internet. RFID technology provides much cheaper solution for object identification and tracking based on radio wave. On the other hand, data on various parameters about the physical environment can be acquired using WSNs. Integration of the advantages of both RFID systems and WSNs would benefit many application domains. In RFID system, either an active RFID tag itself or an RFID reader (reading passive or semi-passive tags) consisting of an RF transceiver poses communication capability similar to that for nodes in WSNs. Therefore, instead of using single hop RFID protocol, RFID networks can take advantage of WSN-like multihop communication, and in this regard a number of WSN protocols can be useful for such RFID systems. In this chapter we present possible scenario of the integration of RFID system and WSNs and study a number of wireless sensor network protocols suitable to use in RFID system.

INTRODUCTION AND BACKGROUND

Ubiquitous computing is a vision of the next generation computing environment where future computing devices will become invisibly embedded in the world around us and accessed through simple and intelligent interfaces whenever needed

(ITU 2005; Abowd et al. 2005). Imagine a ubiquitous computing world where while snowboarding a person would be notified with the information about the slope ahead, ice thickness and softness, and the location of surrounding skiers for safe running, or a washing machine would automatically read tags embedded in our clothes and adjust

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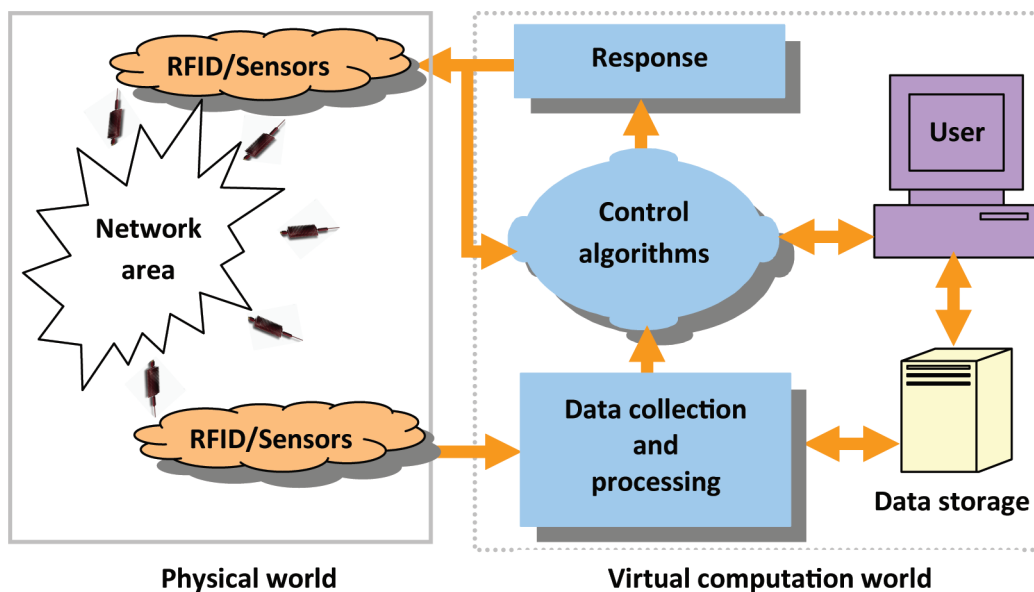
its wash cycle accordingly. Increasingly then, connections are not just people-people or people-computers, but also between people-things, and most strikingly, between things-things. This is what the International Telecommunication Union (ITU) calls the “*internet of things*” (ITU 2005). Such a vision would be transformational and have profound implications on how we live, work, interact and learn, and promises to revolutionize a wide range of application domains (ITU 2005; Abowd et al. 2005). By embedding information storing, processing and communication capabilities, *RFID system* and *Wireless Sensor Networks* (WSNs) can be used as a tool to bridge the real world with the virtual computation world, and such a schematic illustration is shown in Figure 1.

ARFID system is made up of RFID tags, RFID readers and data processing system, where the reader reads the tag information and sent to the data processing system where tag information is decoded and used for object identification and tracking. However, a WSN is made up of many tiny and low cost sensor nodes each having a

sensing module, a processing module and a wireless transceiver module, a central host node (often called sink), and optionally a number of intermediate fusion nodes, namely, the cluster heads. Sensor nodes sense the surrounding environment and send the data generated thereby to the sink, which further process the sensor data to generate a meaningful scenario. RFID technology provides much cheaper solution for object identification and tracking wirelessly based on radio wave. On the other hand, data on various parameters about the physical environment can be acquired using WSNs. Integration of the advantages of both RFID system and WSNs would benefit many application domains.

The rest of the chapter is organized as follows: Section 2.1 and 2.2 introduce the RFID system and wireless sensor networks, respectively, and then their possible integration scenarios are discussed in Section 2.3. Throughout Section 3 a number of WSNs protocols applicable to RFID systems are discussed, and finally, Section 4 concludes the chapter.

Figure 1. Bridging the physical world and virtual world with RFID/sensor networks



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