

Chapter 4

Requirements and Design Architectures of Sensor Service Portals (SSPs) in Ubiquitous Pervasive Environments

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ABSTRACT

In this chapter, the authors present different sensor portal architectures for pervasive environments. Each of the portal architecture has been designed for a specific set of applications. Some architectures present users' data on the sensor web or over the Internet and make them accessible for different applications, such as building maps, developing car management systems, and providing different entertaining services. Other architectures present the data in a meaningful way so that the context of the data is addressed and access to the real-time information is provided. In this chapter, the authors discuss not only these portal architectures with their deployment scenarios, but also highlight some related issues and provide future promising directions accordingly.

1. INTRODUCTION

The commoditization of cheap, embedded, sensor-equipped devices and the accelerated trend towards ubiquitous Internet connectivity presents the new opportunity for creating a single web portal for a broad spectrum of real-time information about the world around us. Examples of services provided

by such a portal include: a Parking Space Finder service, for directing drivers to available parking spots near their destination; a Bus Alert service, for notifying a user when to head to the bus stop; Waiting Time Monitors, for reporting on the queuing delays at places such as post offices or food courts; a Lost and Found service, for tracking down lost objects; and a Person Finder service,

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for locating your colleagues or monitoring your children playing in the neighborhood. Although each of these services can be built independently, a common portal is more useful. For example, it would allow someone to find parking spots near a post office with little waiting time.

To realize this vision, we have presented different portal architectures that address these common-purpose requirements and act as a common platform where people can share their data in different useful ways. Thus each of the portal architecture should provide better management of sensed data. There are several challenges that need to be addressed before proposing some sensor portal architectures (Fukunaga et al., 2004), such as data ingest, data exploration, data analysis and visualization, managing data uncertainty, data interoperability, and distributed large-scale data processing.

SensorMap is a portal web site for real-time real-world sensor data (Nath, Liu & Zhao, 2007). SensorMap allows data owners to easily make their data available on the map. The platform also transparently provides mechanisms to archive and index data, to process queries, to aggregate and present results on a geocentric web interface based on Windows Live Local. On the other hand, IrisNet (Internet-scale Resource-Intensive Sensor Network Services) aims to design an architecture and building a system that enables easy deployment of such wide-area sensing services. IrisNet envisions a worldwide sensor web, in which users can query, as a single unit, vast quantities of data from thousands or even millions of widely distributed, heterogeneous sensors (Gibbons et al., 2003). In Hull et al. (2006) authors have emphasized the need of separate sensor portal architecture for car management, called CarTel. CarTel is a mobile sensor computing system designed to collect, process, deliver, and visualize data from sensors located on mobile units such as cars and trucks. A CarTel node is a mobile embedded computer

coupled to a set of sensors. Each node gathers and processes sensor readings locally before delivering them to a central portal, where the data is stored in a database for further analysis and visualization. In the automotive context, a variety of on-board and external sensors collect data as users drive.

A framework over web portal for pervasive environment has been proposed in Raza et al. (2009). Authors have described several factors to be considered while designing the sensor service portal:

1. It must provide access to the real time information and, thus, it is desirable to enable one-to-one device communication for providing quick access to the real time information.
2. Users must not be aware of the fact that the application interacts with a specific hardware platform, i.e. the proposed architecture must provide abstraction to the lower layers.
3. Every digital device would be capable of communication, resulting into high traffic generation and, therefore, the proposed architecture must provide a built in network congestion control functionality.

In Raza et al. (2009), the authors further distinguish the traffic types as global and local queries. Local queries are restricted within the local region of interest, and only global queries are sent over the Internet. Moreover, there are two types of queries, i.e. specific and general. Specific queries, such as queries involving nearest gas-stations or current temperature in Seoul, address specific audiences, whereas general queries, which may involve stock exchange indexes, flight schedules, and latest news, address wider audiences.

The rest of the chapter is organized as follows. Section 2 describes the background study. Different SSP Architectures have been in discussed in Section 3. Section 4 concludes the chapter.

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