Chapter 2

IoT Resource Access and Management

ABSTRACT

In most existing IoT applications, IoT resources are not fully open and shared with “silo” utilization solutions. Although IoT resources are constructed based on semantic models, it is still necessary to establish a resource management platform to support automatic resource access, resource discovery, resource lifecycle management, and resource utilization. This chapter presents an IoT resource management characteristics that can be used to address these issues. Physical systems and devices are connected to the resource accessing utility using a two-layer method, which involves recognizing/installing physical communication drivers and composing communication protocols. A hierarchical mapping method is used to build graphical IoT resource models, helping users to quickly and correctly specify IoT resources and deploy them. A resource platform based on the resource management characteristics is provided to support resource storage, updating, lookup, utilization, and so on.

INTRODUCTION

An IoT application seamlessly integrates the virtual world of information with the real world (Uckelmann et al., 2011). However, most existing applications take the form of vertical “silos” (Zorzi et al., 2010), a closely-coupled application pattern lacking effective mechanisms that can support applications in sharing and reusing resources, and interacting with each other. In a vertical
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silo solution, IoT engineers must bridge the gap between the higher-level application and the underlying technical details manually, and need to be experts in both domains (Bimschas et al., 2011). This is problematic, since application developers are primarily interested in real-world entities (things, places, and people) and their high-level states, rather than in the details of sensors and actuators (Pfisterer et al., 2011). Meanwhile, a large number of existing legacy sensor resources can offer an important contribution to IoT, but are typically locked into closed systems; unlocking these valuable sensor data from closed systems has the potential to revolutionise how we live. To realise this potential, an infrastructure is needed that can connect sensors to the Internet and publish their output in well-understood, machine-readable formats on the Web, thus making them accessible and usable on a large scale (Pfisterer et al., 2011).

Although the concept of IoT was proposed by the MIT Auto-ID Centre in 1999, the relevant theories and IoT applications still take the form of silos. Huge amounts of resources and information are provided by the IoT, and there is a need to build an IoT resource platform that can open and share IoT resources. Several issues are involved in this:

- **Resource Access**: Dynamic resource access, i.e. realising plug-and-play (PnP) functionality of heterogeneous resources, in which the access system can seamlessly recognise a new resource, and automatically interpret and process the information generated by the resources;
- **Resource Management**: Resource management and maintenance are highly complicated, due to the heterogeneity, instability and evolution of the IoT;
- **Resource Discovery**: A very large number of resources provides more capabilities, but also creates issues in terms of resource discovery. The issue of how to find the most appropriate resource across different domains and networks within an acceptable range of time and space is as yet unsolved;
- **Resource Utilisation**: The real world can be reflected in an increasingly realistic way by the digital world, through an expansion of its range and increased sensing capabilities. Meanwhile, the operations and tasks generated in the digital world are becoming more complicated, and ways in which IoT services can be designed to fully utilise IoT resources should be explored.
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Conclusions
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