
SmartPlug: Creating Self-Sensing Spaces using Atlas Middleware

Part II. Demonstration Supplement

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Abstract

In this demonstration supplement, we describe the way in which we can execute the SmartPlug and interact with visitors. We also detail an executable scenario in the Ubicomp2009 Demo Session within actual figures.

Introduction

Our initial attempt of self-sensing spaces employed X10 protocols to enable user's control over appliances. A touch screen allows user interactions with a 3D space model of the house. We deployed this application at the Matilda's house, a prototype smart space built inside the Pervasive Computing lab at the University of Florida. We included a video clip in the supplement document demonstrating this application.

The second generation of self-sensing spaces applications were developed and used in a real-world deployment, namely the Gator Tech Smart Home (GTSH) at the University of Florida. One important component of these applications was the prototype SmartPlug, which used a RFID reader to identify properly tagged appliances when connected to the powerline. The work of this smart plug together with

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the self-sensing space application has been published in [1] and demonstrated to a lot of GTSH visitors.

Our proposed demo extends the original smart plug and includes two new features: (1) Current consumption sensor. In addition to identifying objects by using RFID tags, we exploit the power draw characteristic of appliances and use their unique current consumption as their IDs. (2) Self-integration to a SOA platform. Atlas is a service-oriented platform in which each device is represented as a software service, discoverable and interoperable to others. To bring smart plugs and appliances into Atlas, we use the Device Description Language (DDL) to enable automatic integration. The work of DDL [2] has won the Best Paper Award in Saint09.

Actual Devices such as the SmartPlugs are implemented in the GTSH, which is located in Gainesville, Florida USA. Figure 1 shows the wall-mounted SmartPlug

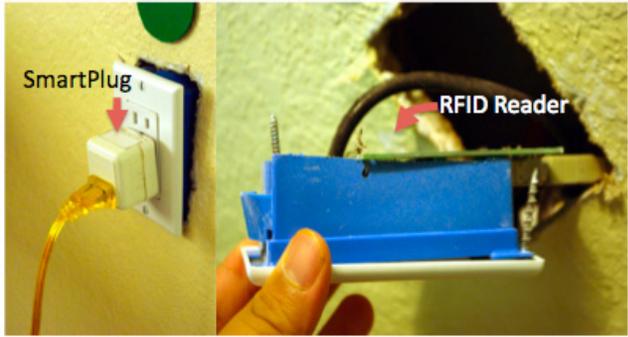


figure 1. The implemented SmartPlug in the GTSH.

For this conference demonstration, we have improved the original SmartPlug and extended the concept of the SmartPlug to include the SmartSwitch. Figure 2 and 3 shows the new version of the SmartPlug and the SmartSwitch

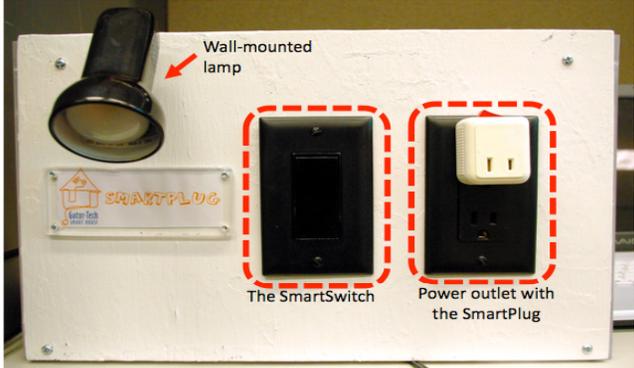


figure 2. Front side of the SmartPlug and SmartSwitch for demonstration.

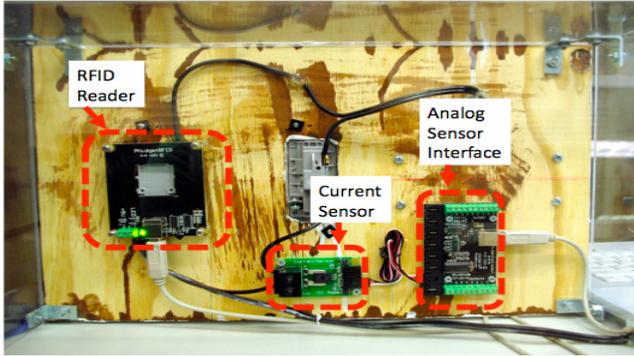


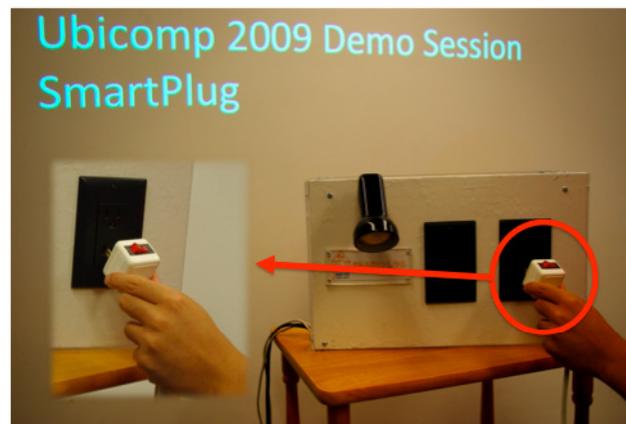
figure 3. Back side of the SmartPlug and SmartSwitch for demonstration.

Scenario

#1 – We will deploy our SmartPlug and SmartSwitch in the conference room as below.



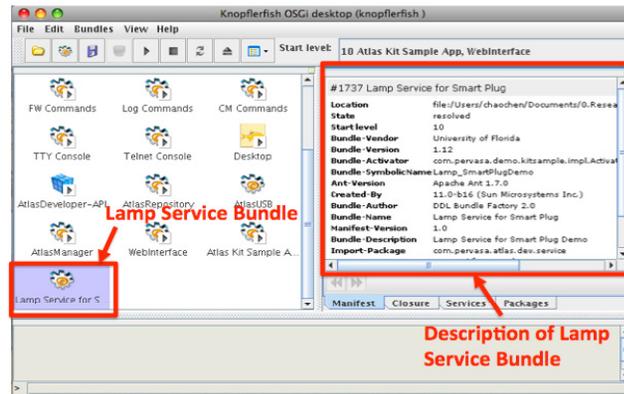
#2 – When a visitor comes to our booth, they can plug in the SmartPlug and turn on the SmartSwitch.



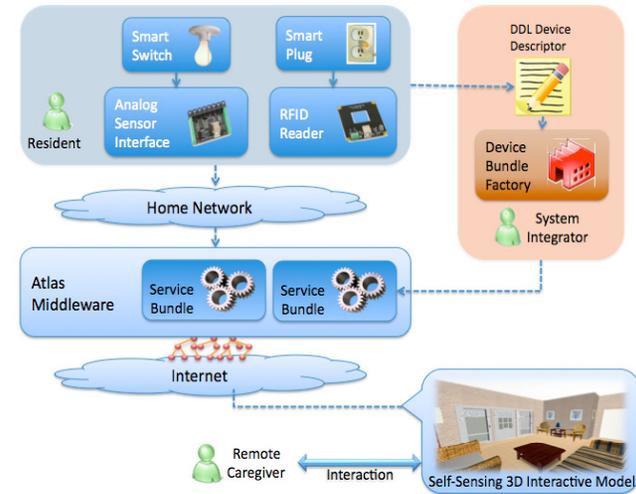
#3 – Our system will show the 3D model based on the visitor's activities. For example, if the visitor plugged in the SmartPlug, the 3D model shows a lamp in virtual living room with more brightness.



#4 – Then we will explain how our system achieve automatic identification and self-integration of the appliances, by showing the Atlas Middleware. We will also show automatic creation of service bundle by using the Device Description Language. Figures below show actual snapshots of our software on a PC that will be placed in our demo booth.



#5 – Finally, we will explain our novel SmartPlug and SmartSwitch through a large printed flowchart as below.



References

[1] H. Elzabadani, A. Helal, B. Abdulrazak and E. Ansen. Self-Sensing Space: Smart Plugs for Smart Environments, Proceedings of the ICOST (2005).

[2] C. Chen & A. Helal. Device Integration in SODA using the Device Description Language. SAINT 2009.