

composition in smart home context

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Abstract

The emergence of smart embedded devices in the user's environment creates new opportunities to build applications that better integrate real-time state of physical world and hence, provides user's value added services. To achieve this goal, service orientation is widely used. Service operations are sometimes embedded on hardware equipment. However, a single service satisfies an atomic only user need, so services need to be composed in order to satisfy user's requirements. We present an ontology based framework to facilitate a user driven composition of appropriate application. This framework allow user to specify their needs in a high level specification and the composition to be dynamically adjusted at runtime.

Keywords :

Service Oriented Architecture (SOA), IoT service, Service orchestration, semantic ontology, web services for device.

Introduction

Dynamically assist end-user to manage the composition through intuitive interface

Dynamically adapt the composition to the operational environment.

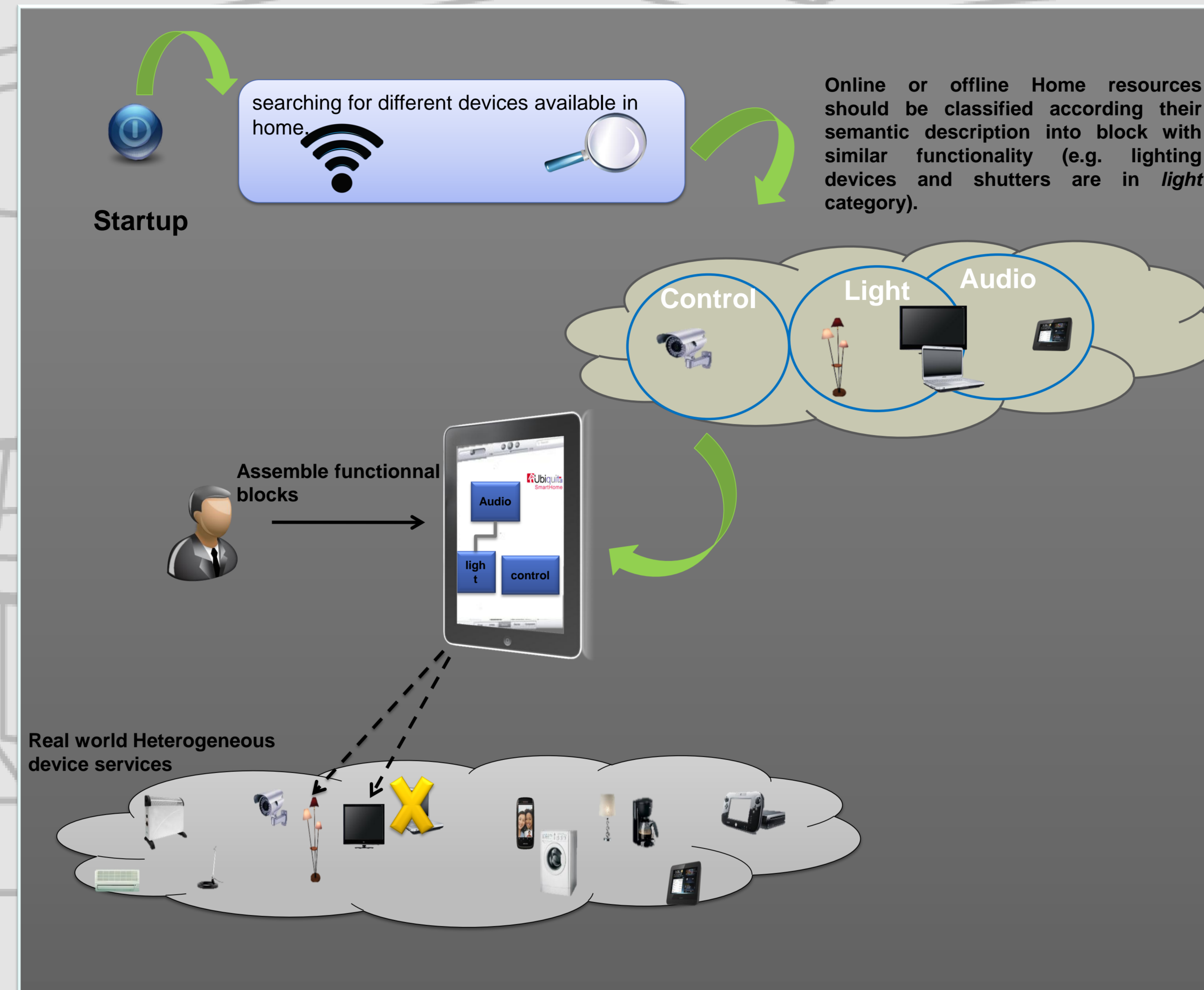
Service composition is a very complex and challenging task. These issues are to be addressed :

Automatically supply a list of abstract functional blocks that can be supported by a set of available devices.

Easily integrate heterogeneous service for device based on standards

This work introduces an ontology driven approach that address the above concerns. Our user oriented framework leverages service orchestration to improve interoperability between heterogonous device's services in a home automation system and provides an intuitive interface for the end-user.

Motivating scenario

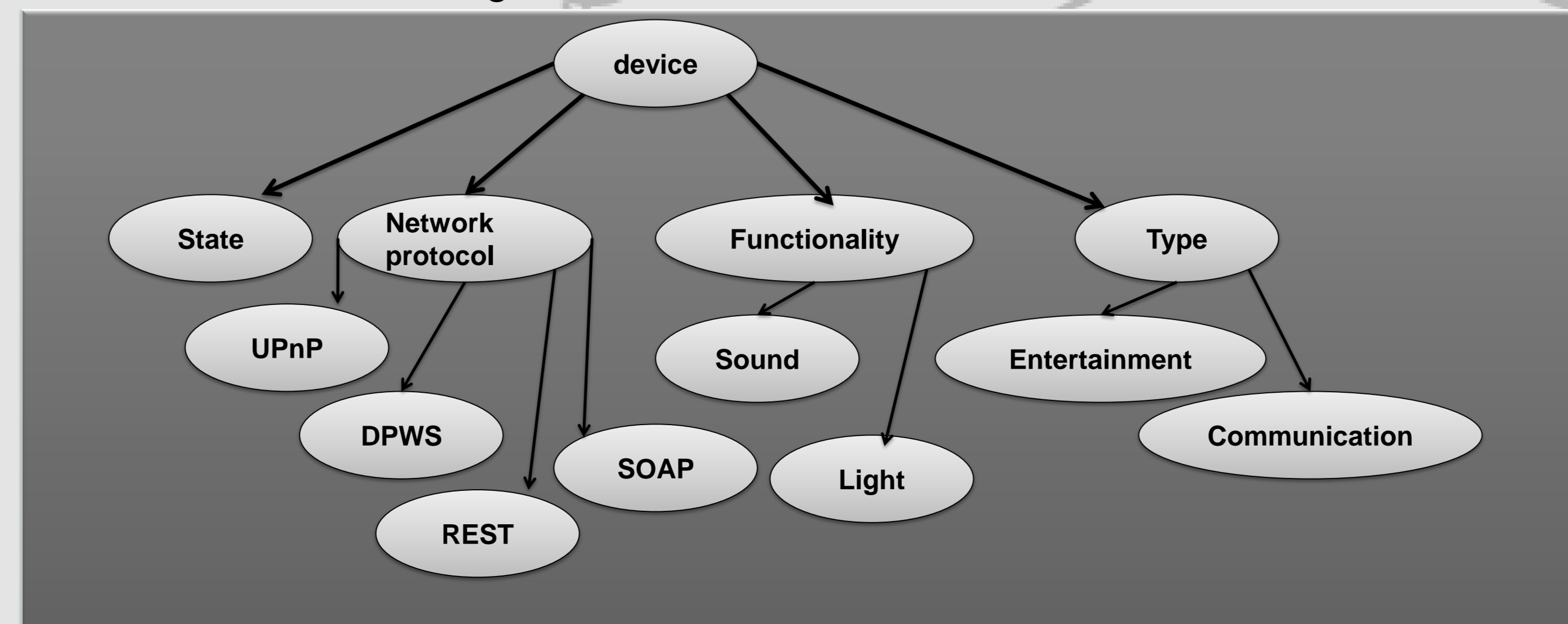


Ontology for smarthome

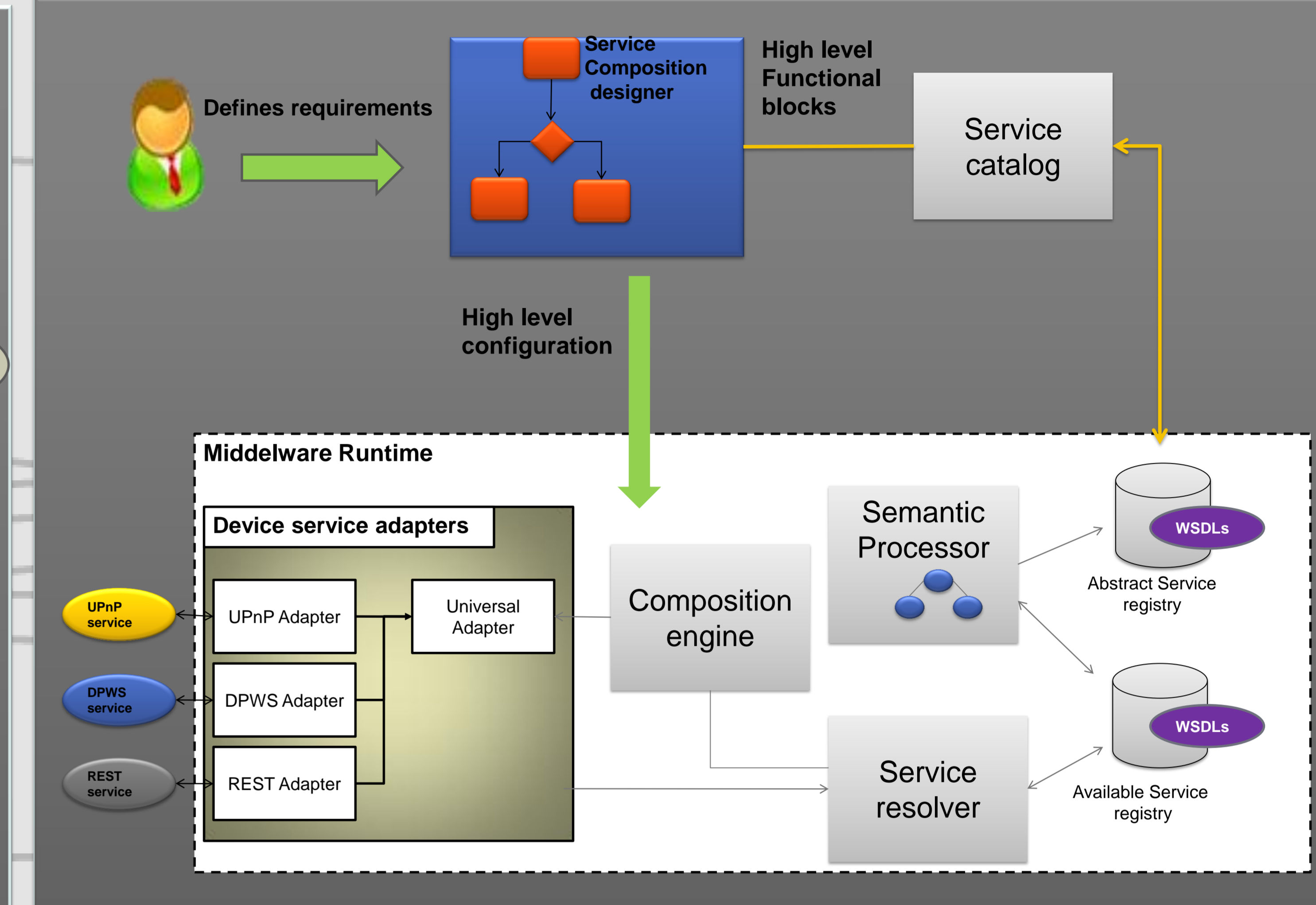
UbiOnt ontology describes the concepts related to devices and their location. *UbiOnt* is deployed along 2 main hierarchy trees . The home location modeling is achieving by concepts derived from *Home*.

The device modeling support a representation of a device, including: several types of functionality, state (controllable, uncontrollable) and four type of network protocol (DPWS, UPnP, SOAP and REST).

Each available service is augmented with a well defined set of keywords. OWL-S annotations are used to provide function semantics and an ontological classification of heterogeneous device's services.



Overview of framework architecture



Implementation of prototype

The different components of our proposed framework are being developed and implemented as part of our *Ubiquita* platform. *Ubiquita* has been implemented in Java as a set of OSGI bundles on the equinox open source framework.

The *Device Service Adapters* module is already implemented which enable invocation and composition of UPnP, DPWS and RESTful services.

Using our ontology, we added some semantic description to a WSDL interface which wrap each device. We also, developed a GUI to lookup for available service instances that match semantic keywords

Conclusion

We proposes a framework for composing heterogeneous services in the context of smart home. We presented an extensible mechanism to integrate different types of device's services. Also, our approach wants to involve the user to manage the service composition rather than the system vendor. Hence, the user can enters a detailed workflow of the desired functionality or a composite service whose atomic constructs have to be selected and instantiated dynamically according predefined device ontology.

As future work, we think of using a DSL (Domain Specific Language) that helps user to create service composition through intuitive GUI. Also, we think of extending our ontology by context modeling information to enhance device access and composition.