

OpenHAB Extension

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Project OpenHAB extension

THANKS	3
GENERAL PRESENTATION	4
CONTEXT AND DESCRIPTION	4
PRODUCT FONCTIONS	4
PRODUCT EVOLUTION	4
UPNP PART	5
DEFINITION	5
FELIX	5
<i>Definitions</i>	5
<i>Work done</i>	5
UPNP TESTER	6
<i>Definition</i>	6
<i>Work done</i>	6
UPNP COMMANDE	7
INTERFACE ADMINISTRATION PART	8
INTERACTION WITH THE CAMERA	9
PROBLEMS ENCOUNTERED	10
NEW TECHNOLOGIES	10
OPENHAB	10
FEELINGS ON THE PROJECT	10

Thanks

Before starting our report, we would like to thank the whole pedagogic staff responsible for the training course RICM at Polytech Grenoble.

We would like to especially thank and express our gratitude to the following people for this rewarding and interesting experience they provided us during these months. Also we thank them for their help and guidance regarding the different missions mentioned in this report.

Thanks to Professor Didier DONSEZ, teacher of software engineering and our project manager, for sharing his knowledge and skills with us.

Thanks to Engineer Amr ALZOUHRI-ALYAFI for sharing his experience in the IoT.

General Presentation

Context and Description

Till today the home automation does not expand in full expansion as predicted, due to the complexity of the equipment and protocols variation from one manufacturer to another.

That is the reason why we believe that it is interesting to provide an interface allowing to easily handle a home. This interface will allow the user to describe his home in hierarchical form, and also the capacity to create groups such as security, media, etc.

In order to facilitate this interface, we have to implement an automatic detection of the devices on the network with the help of UPnP Protocol. This will be more convenient for the user who no longer won't have to configure a new device.

This application is designed for anyone who wants to easily manage their house "smart".

Product fonctions

- User interface (HTML5 for more flexibility)
- Automatic detection of new devices
- Possibility of adding a device to a category (kitchen, ...)
- Manage a device (ex. start/stop)

Product evolution

Regarding the evolution that can be suggested, we can imagine that the user can create the rules (like in IFTTT) by himself. Another evolution will be to offer more functionality to the user.

UPnP Part

Definition

Universal Plug and Play (UPnP) is a set of networking protocols that permits to networked devices, such as personal computers, printers, Internet gateways, Wi-Fi access points and mobile devices to seamlessly discover each other's presence on the network and establish functional network services for data sharing, communications and entertainment. UPnP is intended primarily for residential networks without enterprise-class devices.

The UPnP technology is promoted by the UPnP Forum, a computer industry initiative to enable simple and robust connectivity to stand-alone devices and personal computers from many different vendors.

Félix

Definitions

Apache Felix is a community effort to implement the OSGi Framework and Service platform and other interesting OSGi-related technologies under the Apache license. The OSGi specifications originally targeted embedded devices and home services gateways, but they are ideally suited for any project interested in the principles of modularity, component-orientation, and/or service-orientation. OSGi technology combines aspects of these aforementioned principles to define a dynamic service deployment framework that is amenable to remote management.

The OSGi specification describes a modular system and a service platform for the Java programming language that implements a complete and dynamic component model, something that does not exist in standalone Java/VM environments.

Work done

We choosed to use this framework because it is mostly integrate into the heart of OpenHab.

During the project this aspect trick us sometimes. Indeed this some library does not exist in OpenHab but exist in the Felix.

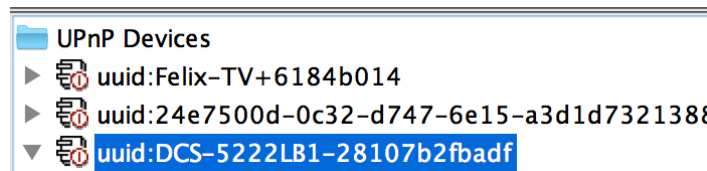
UPnP Tester

Definition

The UPnP Tester, is a Bundle allowing the exploration of a LAN. This Bundle is going to locate various UPnP devices in the LAN.

Work done

This component allow you to retrieve different information about the detected UPnP devices. Like shown in the picture below, we can see the different detected UPnP devices (we can see our security camera):



For every device detected, we have the ability to display various information related to the device. In the Picture below we can see various information about our camera such as: name, serial number, IP address ...

property key	value
UPnP.device.UDN	uuid:DCS-5222LB1-28107b2fbadf
UPnP.device.imported	http://felix.apache.org
UPnP.device.modelURL	http://www.dlink.com/
UPnP.device.manufacturerURL	http://www.dlink.com/
UPnP.device.modelName	DCS-5222LB1
UPnP.device.manufacturer	D-Link Corporation
UPnP.device.UPC	
UPnP.service.id	urn:upnp-org:serviceId:ConnectionManager; urn:upnp-org:serviceId:ContentDirectory; urn:microsoft.com:serviceId:MediaServer:1
UPnP.device.friendlyName	DCS-5222LB1 (192.168.1.56)
UPnP.device.modelDescription	Full HD Wireless N Cube Network Camera
UPnP.presentationURL	http://192.168.1.56/
UPnP.device.modelNumber	DCS-5222LB1
UPnP.service.type	urn:schemas-upnp-org:service:ConnectionManager:1; urn:schemas-upnp-org:service:ContentDirectory:1; urn:microsoft.com:serviceId:MediaServer:1
UPnP.device.type	urn:schemas-upnp-org:device:MediaServer:1
DEVICE_CATEGORY	UPnP;
UPnP.device.serialNumber	28107B2FBADF

We deployed this bundle into the Felix Framework.

We integrate and modify the tester in order to be integrate in OpenHab.

We observe the same result in Felix as in Eclipse and OpenHab.

UPnP commande

After understanding the operation of the UPnP Tester, we have tried to add additional commands to Felix Framework and thereafter to openHab.

Those commands will allow the user to see every device in the LAN, and in a second time display the devices in the OpenHab interface.

The first implementation that we tried was not successful. So we looked at it more closely with the help of Prof. Donsez. In fact, this implementation could not have worked due to some tricky Apache problems. Prof. Donsez tried to implement it also and came to the same conclusion.

So this time, we started a second implementation with the help of Prof. Donsez. But despite the importation of various bundles (IPOJO, ...) , the implantation does not work. Either on Felix or on Openhab.

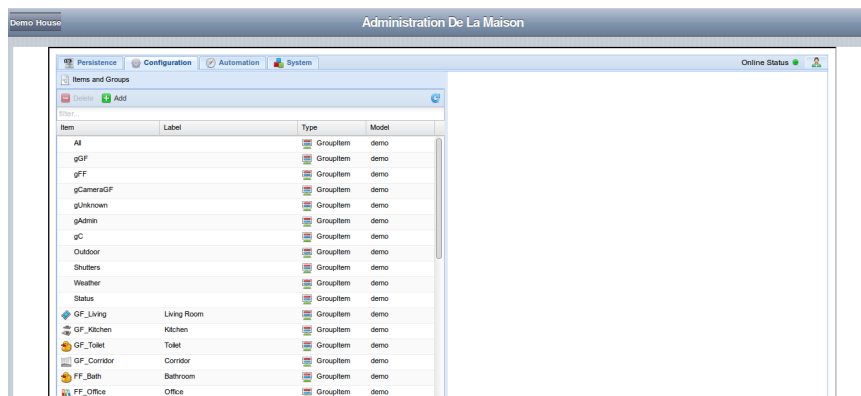
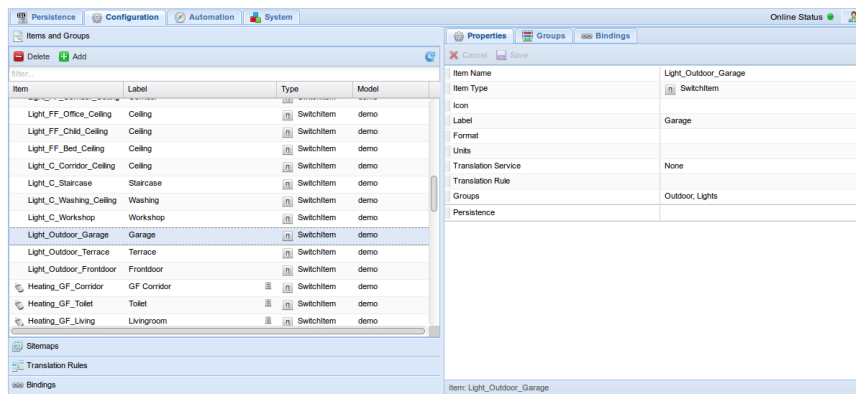
Interface Administration part

Secondly, it was asked that a user can be able to manage his home with a graphical interface. The user will be able to add devices, manage them and so on ...

Firstly, we created an interface capable of reading .item file. Then we display devices that the user already have. We also offer him the possibility of adding a new devices. For that we write directly the information given by the user into the .item form.

After this laborious work, we decided to use HABmin. Because it offers much more interesting components for the interaction.

We can see in the picture below some interaction that are possible with HABmin.



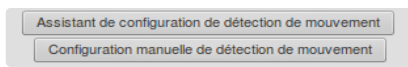
Interaction with the camera

For the purpose of the third part of the project a security camera was handle to us.

We installed the camera on our network. It therefore uses DHCP protocol so it automatically configure itself on the network when it connects.

We can execute several operation with the camera such as:

- Make it turn
- Watch direct display
- Add notifications
- Change the IP address



Problems encountered

New technologies

This project have various interesting technologies. Those technologies are completely new to us. So it was difficult for us to understand the structures. This took a lot of time, which heavily impacted project's progress.

OpenHAB

We have seen here the limits of the openHab community. Indeed, when we had specific problems, the community could not help us. We sent many posts in order to get more information but nobody answered.

Feelings on the project

For this project we have two major feelings that emerged. First of all the feeling of unfinished leaves a bad taste. In fact, we could not realize all the features required for the project. Our time management was not good, because we were never confronted to such complex problem as the OSGi. So the documentation part was longer than expected.

However, we have a feeling of satisfaction, because we now have some major knowledge of openHab, and we understand the function and value of the OSGi et UPnP protocol.

We can say that this project will allow us to take a step back on our future projects. It also made us see the importance of documentation on a technology before starting coding.