



SmartE SMART ENERGY FOR YOUR HOME REQUIREMENTS DEFINITION DOCUMENT

Version 1.7

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Requirements Description Document	Date: 2015-11-13

Revision History

Date	Version	Description	Author
2015-11-05	1.0	Initial Draft	Marius Schlinke
2015-11-05	1.1	All sections are added	Marius Schlinke
2015-11-07	1.2	Added Use Case Diagram	Marius Schlinke
2015-11-12	1.3	Non-functional requirements added	Elena Kyorova
2015-11-12	1.4	High-level description added	Elena Kyorova
2015-11-12	1.5	Introduction, Background, User stories added.	Nathan Chape
2015-12-09	1.6	Revision: high level overview	Nathan Chape
2015-12-23	1.6.1	Non-functional requirements review, check for spelling	Elena Kyorova
2016-01-13	1.7	Added new US (12) Edit rule. Use case diagram, Document revision.	Elena Kyorova, Nathan Chape, Marius Schlinke

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1 Introduction

1.1 Purpose of this document

The purpose of this document is to specify the requirements of the project both functional and non-functional in detail.

1.2 Document organization

The document is organized as follows:

- Section 1, *Introduction*, describes contents of this guide, used documentation during developing process etc.
- Section 2, *Background and Objectives*, describes the background (i.e. the problem of which the project will address) as well as the goals of the project.
- Section 3, *Requirements*, describes the requirements for the project, functional and non-functional.
- Section 4, *User Stories*, contains the user stories used to describe functionality of the system.

1.3 Intended Audience

- Team
- Supervisors
- Sponsor

The purpose of this document is both clarifying and providing consensus of the projects requirements between the team members, supervisors as well as the sponsor. During development this document serves as a guide for the development team, providing a clear and detailed description of the requirements. It should be noted, however, that the requirements themselves are prone to change during development. If and when this occurs this document will be updated to reflect the new requirements. This document can also be used for verification that the project meets the requirements.

1.4 Scope

This document provides the following information:

- Background information of the project including a high level definition.
- Functional and non-functional requirements including a UML and uses cases for the functional requirements
- User stories that examine each use case in greater detail.

1.5 Definitions and acronyms

1.5.1 Definitions

Keyword	Definitions
SmartE User	The user who will use the SmartE application.
openHab	Framework for working smart devices.

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1.5.2 Acronyms and abbreviations

Acronym or abbreviation	Definitions
SmartE	Smart Energy for Your Home application
FER	Faculty of Electrical Engineering and Computing, University of Zagreb
MDH	Mälardalen Högskola, Sweden
UML	Unified Modeling Language

2 Background and objectives

2.1 Background

Over recent years, smart devices have become more and more prevalent in our homes. Smart devices, once solely the domain of media/communication devices such as TVs and smart phones, have diversified to include other household appliances. Appliances such as, washing machines and refrigerators as well as lighting and climate control. All of which can be monitored/controlled via a local wireless connection. For example, a smart washing machine can be given commands to restrict washing times to the evening thereby taking advantage of cheaper energy rates. Another example could be a dishwasher that you can remotely start from your phone while sitting at the office or turning off the lights that you forgot before leaving to work.

2.2 High Level Description of the Project

The goal of the SmartE project is to create a mobile application that allows a user to:

1. Monitor smart devices in their homes e.g. see whether a light is on or off, the current cycle of the washing machine, current consumption of electricity etc.,
2. Manage smart devices in their homes e.g. turning lights on or off, starting the dishwasher, setting the temperature for climate control etc.
3. Create and apply rules that govern the way in which smart devices within a home should operate. An example of how these rules could look:
 - i. *I am on holiday rule:*
 Alarm system: on 24/7
 Exterior lights on: 1800 - 0600 (To discourage thieves)
 Climate control: off until *day before I return*. (No need to waste energy on climate control when nobody is home)
 - ii. *Everyday rule:*
 Alarm system: on 0900-1700 (when I am at work)
 Exterior lights on: 1800. 0600
 Climate control on: 20 degrees
 - iii. *Energy saving rule:*
 Major household appliances (washing machine, dish washer) are only allowed to run during at low energy rate times. E.g. after 1800 and they must not consume more than a certain wattage. (Appliances can stagger their cycles so that can run co-currently and still save power).

In general, the user interface should be intuitive and user friendly, this is especially important when the user wishes to create their own rules.

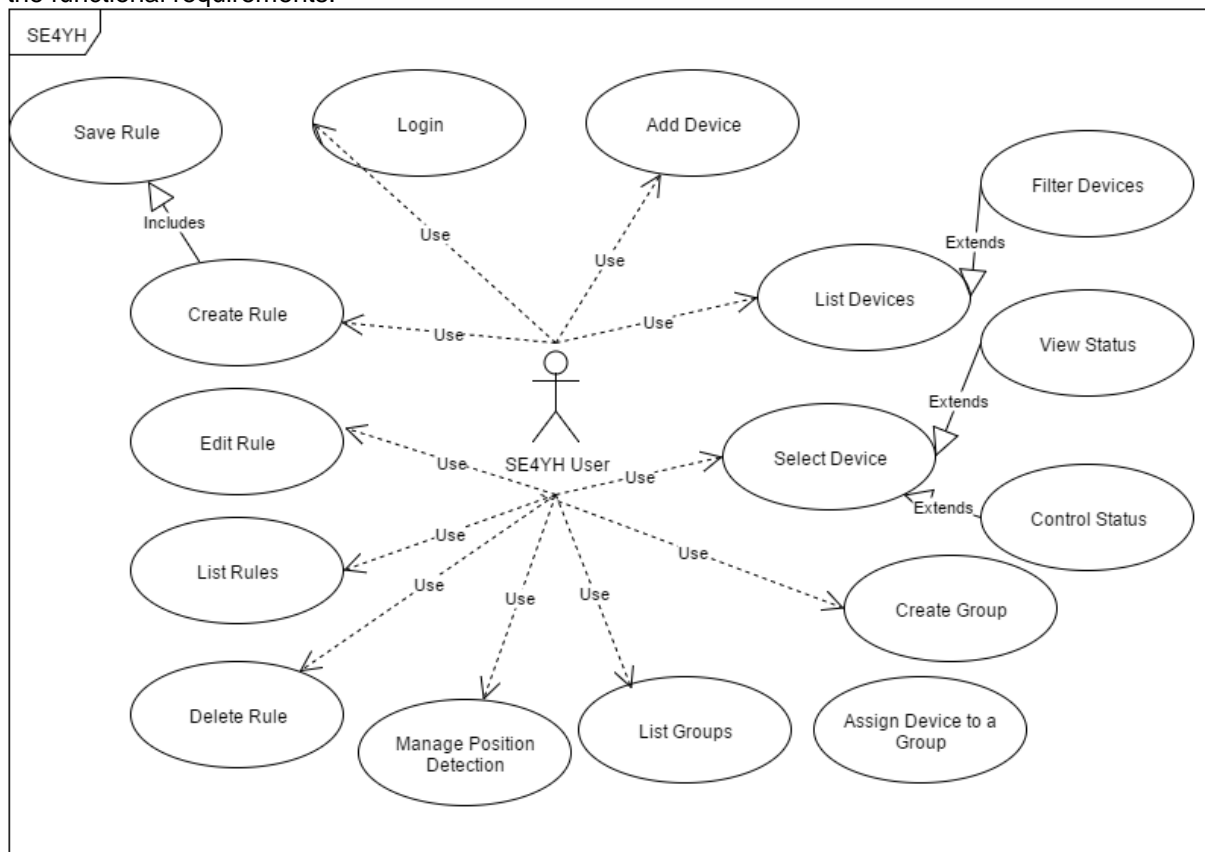
The application must also allow users to add their own smart devices as well as enabling them to group them into logical groups. For example, lights could be grouped into a LIGHTS group but you could also have a group called KITCHEN which contains the smart devices in that area; fridge, dish washer, as well as kitchen specific lighting.

3 Requirements

This section provides the functional and non-functional requirements.

3.1 Functional Requirements

This section provides the functional requirements. A UML Use Case Diagram is used to express the functional requirements.



ID	Use Case Name	Description
UC1	Login	The user can connect to his SmartE System. Either he is at home or remotely.
UC2	Add Device	An added device has to be automatically discovered by the systems.
UC3	List Devices	The user can list all his smart devices. He can than choose if he wants to see its status or if he wants to start some actions see UC5 (e.g. turn on/off light)

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UC4	Filter Devices	The shown devices can be filtered by the user.
UC5	Select Device	The user can select one smart device.
UC6	View Status	The user can see the possible statuses (e.g. remaining time, temperature, energy consumption)
UC7	Control Status	The user can perform possible actions (e.g. start, stop, pause washing machine)
UC8	Create Rule	The user can assign one or multiple rules to a smart device.
UC9	Save Rule	If the user set up a rule, then the rule is saved and activated for the specific device
UC10	Delete Rule	The user can delete a rule.
UC11	Edit Rule	The user can edit a rule.
UC12	Manage Position Detection	The user can decide if his position data is send to the SmartE System or not.
UC13	List Rules	The user can see list of all rules.
UC14	List Groups	The user can see list of all groups.
UC15	Create a group	The use can create a new group
UC16	Assign devices to a group	The user can assign devices to a group
UC17	Delete a group	The user can delete

3.2 Non Functional Requirements

Apart from functional requirements, non-functional requirements should be defined.

- User-friendly** interface

The system provides good-looking and intuitive interface which will allow the user agile navigation through rules and devices, so the user is able to find the device that is wanted quickly no matter if it is included in a specific group or not.

All of the main functionalities (adding device, adding group, assigning device to a group, create rule) can be reachable through navigation drawer, which includes all the usable links to the leading application capabilities.

The user input is validated: if required fields are not filled, a warning message is displayed which states which container/box/dropdown menu should be filled in.

On an error occasion the system responds with suitable informative message about the origin of the fault and what should be the user reaction.
- Secure** connection

Communication between the remote client and the openHab server should be secured in order to prevent malicious attempts to enter in the system. No unidentified user should be able to operate with the system.
- Fault** tolerant system

In case of error in one or more component, the system should be able to proceed working. The display messages in case of error should be informative and notification should be send to the support.

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If server is not responding, communication between the application and the devices is not possible, informative message should be displayed.
In case of smart device failure (which is not connected with the application), the application should recognize the unavailability.

4 User Stories

SID	UID	Story	Priority
US1	UC1	As a user I want to be able to login into the application if I am at home	High
US2	UC1	As a user I want to be able to login into the application if I am not at home	Low
US3	UC2	A new smart device can be added to the client application.	High
US4	UC3	As a user I want to be able to see a list of all smart devices currently connected to my network.	High
US5	UC4	As a user I want to be able to filter my list of smart devices based on certain criteria. e.g. power consumption, device type etc.	Low
US6	UC5	As a user I want be able to select a smart device - from a list of devices.	High
US7	UC6	As a user I want to be able to view the status of a selected smart device.	High
US8	UC7	As a user I want to be able to change the status of a selected smart device. (Perform action/issue command with/to smart device).	High
US9	UC8	As a user I want to be able to define a rule(s) to govern the smart device(s) in my network.	High
US10	UC9	As a user I want to be able to save a rule.	High
US11	UC10	As a user I want to be able to delete a rule.	Med
US12	UC11	As a user I want to be able to edit a rule.	Med
US13	UC13	As a user I want to see the defined rules	High
US14	UC14	As a user I want to see the defined groups.	High
US15	UC15	As a user I want to be able to create a group.	High
US16	UC16	As a user I want to be able to assign a device to a group.	High
US17	UC17	As a user I want to be able to delete a group.	High
US18	UC12	As a user I want to enable/disable position tracking.	Low

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4.1 Detailed User Stories

Story ID	US1
Story	As a user I want to be able to login into the application if I am at home
Source	Development Team
Detailed Description	When the user starts the client, then he can connect to the system. If he is already connected then the client is showing the main screen.
Validation Criteria	<ul style="list-style-type: none"> • If the user opens the application and he is not connected to the system, then a screen is shown where he can type his credentials (E-Mail and password). • If the user types in some wrong credentials, then an error message is shown. • If the user types in correct credentials, then the main screen is shown automatically. • If the user opens the application and he is connected to the system, then the main screen is shown.

Story ID	US2
Story	As a user I want to be able to login into the application if I am not at home
Source	Development Team
Detailed Description	The user connects remotely to his network via a WAN connection.
Validation Criteria	<ul style="list-style-type: none"> • If the user opens the application and he is not connected to the system, then a screen is shown where he can type in his credentials. • If the user types in some wrong credentials, then an error message is shown. • If the user types in correct credentials, then the main screen is shown automatically. • If the user opens the application and he is connected to the system, then the main screen is shown.

Story ID	US3
Story	A new smart device can be added.
Source	Development Team
Detailed	When a new smart device is detected in the network, then the user can

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Description	refresh the list and the device shall be listed.
Validation Criteria	<ul style="list-style-type: none"> • If a new smart device is detected then the user can refresh the device list and the device shall be listed.

Story ID	US4
Story	As a user I want to be able to see a list of all smart devices currently connected to my network.
Source	Development Team
Detailed Description	From the main screen, the user can choose to view a list of all smart devices currently connected to their network.
Validation Criteria	<ul style="list-style-type: none"> • The user is presented a list of all currently connected smart devices in the network. • If there is no connected device(s), then an info message is shown.

Story ID	US5
Story	As a user I want to be able to sort my list of smart devices based on certain criteria. e.g. power consumption, device type etc.
Source	Development Team
Detailed Description	Via the list view screen the user is able to sort the displayed smart devices.
Validation Criteria	<ul style="list-style-type: none"> • If the user is at the main screen, then he can select the view which is showing the devices. • At the list view screen the user can select different criteria by which to sort the list.

Story ID	US6
Story	As a user I want be able to select a smart device - from a list of devices.
Source	Development Team
Detailed Description	Via the list view screen the user is able to select a smart device.
Validation Criteria	<ul style="list-style-type: none"> • If the user is at the main screen, then he can select the view which is showing the devices. • The user can select a device by clicking on the name of the device showing in a list representation.

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Story ID	US7
Story	As a user I want to be able to view the status of a selected smart device.
Source	Development Team
Detailed Description	An option to view the status is displayed when a device is selected. The status consists of one or more attributes relevant to that smart device. For example, if a light is selected, then the status would display whether the light is on or off. If climate control is selected it could display whether it is on or off, the current temperature as well as the desired temperature.
Validation Criteria	<ul style="list-style-type: none"> • The user is able to select a smart device from the list. • When the user clicked on one device then, the status of a smart device is displayed.

Story ID	US8
Story	As a user I want to be able to change the status of a selected smart device. (Perform action/issue command with/to smart device).
Source	Development Team
Detailed Description	With a smart device selected, the user is able to issue a command/change the status of selected device e.g. Turn off light, increase temperature, pause dishwasher etc.
Validation Criteria	<ul style="list-style-type: none"> • A user is able to select a smart device • A user can view the status of selected smart device. • Only relevant actions for that particular smart device are displayed i.e. On/Off, Raise/Lower temperature, overload etc.

Story ID	US9
Story	As a user I want to be able to define a rule(s) to govern the smart device(s) in my network.
Source	Development Team
Detailed Description	The user can set rules which determine how and when smart devices in a household are run. An example of these rules could be: <ul style="list-style-type: none"> • lights should be turned on at a defined time • the heater should be turned off when a window is opened
Validation	<ul style="list-style-type: none"> • The user is able to select the <i>rule</i> screen.

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Criteria	<ul style="list-style-type: none"> The user is able to set conditions that define their rules.
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Story ID	US10
Story	As a user I want to be able to save a rule.
Source	Development Team
Detailed Description	Once the user has defined a set of rules the user should be able to name and save them.
Validation Criteria	<ul style="list-style-type: none"> The user is able to define a rule(s) The user can select an option to save the rule

Story ID	US11
Story	As a user I want to be able to delete a rule.
Source	Development Team
Detailed Description	From a list of previously saved rules a user should be able to select one or more and delete them.
Validation Criteria	<ul style="list-style-type: none"> The user is able to select a rule from a list of existing rules The user is able to delete selected rule

Story ID	US12
Story	As a user I want to edit a rule
Source	Development Team
Detailed Description	From the list of current rules a user can: <ul style="list-style-type: none"> select a rule edit the values of the selected rule save the rule
Validation Criteria	<ul style="list-style-type: none"> The old rule is updated with new values

Story ID	US13
Story	As a user I want to see the defined rules

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Source	Development Team
Detailed Description	The user can see all the rules he defined.
Validation Criteria	<ul style="list-style-type: none"> • The user is able to see all rule he created • The user is able to select a rule.

Story ID	US14
Story	As a user I want to see the defined groups
Source	Development Team
Detailed Description	The user can see all the groups he defined.
Validation Criteria	<ul style="list-style-type: none"> • The user can see all his groups he created. • The user is able to select a group.

Story ID	US15
Story	As a user I want to be able to create a group.
Source	Development Team
Detailed Description	The user is able to create a new group. He can define the group name (required), the group description (required) and the type (e.g. kitchen which is optional).
Validation Criteria	<ul style="list-style-type: none"> • The user can create a group by defining the group name. • The user can also specify a group description and a type.

Story ID	US16
Story	As a user I want to assign a device to a group.
Source	Development Team
Detailed Description	To group devices to one collection / container he can assign a device or multiple devices to a group.
Validation Criteria	<ul style="list-style-type: none"> • The user can assign one device to a group. • The user can assign multiple devices to a group.

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Story ID	US17
Story	As a user I want to be able to delete a rule.
Source	Development Team
Detailed Description	The user can delete groups.
Validation Criteria	<ul style="list-style-type: none"> • The user can delete previously defined groups.

Story ID	US18
Story	As a user I want to enable/disable position tracking
Source	Development Team
Detailed Description	<p>The SmartE can enable/disable tracking of user(s) mobile devices, e.g. iPhone. This allows the system to know whether:</p> <ul style="list-style-type: none"> • The user is in his/her home • and if they are, where in the house they currently positioned
Validation Criteria	<ul style="list-style-type: none"> • The user is able to select their mobile device from the list of devices • The user is able to select tracking on/off for selected mobile device.