Responsible for this document:
Oskar Fällström

PUSS154213 v0.1 September 15, 2015

Team 2

Software Verification and Validation Specification

Authors of this document:
Måns Andersson
Hanna Autio
Moa Eklöf
Oskar Fällström
Ulf Hörndahl
Jonathan Lundholm

Version History

Version	Date	Responsible	Description
0.1	150906	OF	First draft
0.2	150911	OF	Edited after informal review

Contents

1 Introduction

The Software Verification and Validation Specification (SVVS) describes all tests and reviews conducted during the development of the project. The document acts as a base for the SVVI (Software Verification and Validation Instruction). In the main document, there are instructions for reviews as well as information about what types of tests should be performed and by whom. In the appendices, test cases are specified.

2 Reference Documents

1. PUSS154212 - System Requirements Specification for the current project
2. Programvaruutveckling för stora system - Projekthandledning (*Institutionen för dataveten-skap*, Lunds Univeritet 2015)

3 Definitions

SDP Software Development Plan

SRS Software Requirements Specification

SVVS Software Verification and Validation Specification

SVVI Software Verification and Validation Instruction

STLDD Software Top Level Design Document

SDDD Software Detailed Design Document

SVVR Software Verification and Validation Report

SSD Software Specification Document

PFR Project Final Report

PG Project Group Leaders

4 Testing

In order to validate and verify that the system fulfills the customers expectations, various tests are conducted during the development phases. Types of test i.e. unit tests, function tests etc. can be divided into two categories: white-box tests and black-box tests, which are described below. Both of these should be performed.

4.1 White-box Testing

In a white-box test the developer tests the internal structure of the system, by means of making sure that all lines/units of code are executed at least once. These are performed by the developer group during development.

4.2 Black-box Testing

A function test or black-box test examines the functionality of a system from an external point of view. Combinations of input data are chosen and the output data from the system is compared to a specification.

5 Reviews

5.1 Formal Reviews

Formal reviews are conducted according to reference 2.

The scheduled formal reviews, and the documents up for review, in this project are:

1. Software Specification Review (SSR)
   - SDP
   - SRS
   - SVVS
2. Preliminary Design Review (PDR)
   - SVVI
   - STLDD
3. Product Review (PR)
   - SVVR
   - SSD
   - PFR

5.2 Informal Reviews

Informal reviews are to be held before the deadline for the formal review, with enough time to correct any problems found during the informal review. The documents up for review should be made available in the project library at least 24 hours before the informal review.

PG are the responsible coordinators for the informal review.

6 Test Environments

All tests specified in this document should be performed on appropriate emulator software. If possible, the tests should also be run on a physical device.

7 Types of Tests

7.1 Unit Tests

The developer group should perform unit tests, both black-box tests and white-box tests. These tests should be performed continuously during development.

7.2 Function Tests

All functions of the system should be tested according to appendix A. The test group is responsible for performing these tests.

7.3 System Tests

The entire system should be tested according to appendix B. The test group is responsible for performing these tests.

7.4 Regression Tests

After any changes, all system tests should be performed again to ensure that previously functional code is still working. The test group is responsible for performing these tests.

7.5 Acceptance Tests

Acceptance tests are performed by the costumer before completion of the project. The costumer is responsible for selecting tests to ensure that the software meets their demands.

A Function Test Specification

This is appendix A where we list all function test specifications.

A.1 MyDevices View Tests

Test A.1.1 The list of available devices is empty on application start up. (Req. 5.2.2)

Test A.1.2 The list on the MyDevices view is scrollable. (Req. 5.2.3)

Test A.1.3 The items on the list are selectable. (Req 5.2.4)

Test A.1.4 Only one device can be selected at a time. (Req. 5.2.5)

Test A.1.5 When no device is selected and the "Control Device" -button is pressed, a pop-up message "Please select device" is displayed. (Req. 5.2.6)

Test A.1.6 Sensors are displayed in the list of available devices with "Sensor" as name, and it's MAC address as address. (Req. 5.2.7)

Test A.1.7 Light bulbs are displayed in the list of available devices with "Light Bulb" as name and it's MAC address as address. (Req. 5.2.8)

Test A.1.8 The "Get Devices" -button performs a scan for available devices when pressed. (Req. 5.2.9)

Test A.1.9 When the back button is pressed the application is closed (Req. 5.2.10)

A.2 Sensor View Tests

Test A.2.1 When the "Control Device"-button in the MyDevices View is pressed and a sensor is selected, the Sensor view is opened. (Req. 5.3.1)

Test A.2.2 The sensor name and mac-address is shown in the top of the view (Req. 5.3.2, 5.3.3)

Test A.2.3 It is possible to change the on/off -status of the selected sensor with a switch. (Req. 5.3.4)

Test A.2.4 There are text fields preceded by "T", "P", "H", "M", "G", "A" that are used to, respectively, display temperature, pressure, humidity, magnetic field, gyroscopic value and acceleration. (Req. 5.3.5, 5.3.6, 5.3.7, 5.3.8, 5.3.9, 5.3.10)

Test A.2.5 By pressing the corresponding "Get"-button, the values of the temperature, pressure, humidity, magnetic field, qyroscopic and acceleration sensors are retrieved if available and displayed. (Req. 5.3.11, 5.3.12, 5.3.13, 5.3.14, 5.3.15, 5.3.16)

Test A.2.6 The "Get all" -button gets the values for all available sensors and displays them.(Req. 5.3.17)

Test A.2.7 The "clear-all" button clears all sensor text fields from data. (Req. 5.3.18)

Test A.2.8 If there is no data to retrieve for any of the physical quantities temperature, pressure, humidity, magnetic field, gyroscopic and acceleration when the corresponding "Get" button is pressed the corresponding text fields display "No data available".(Req. 5.3.19, 5.3.20, 5.3.21, 5.3.22, 5.3.23, 5.3.24)

Test A.2.9 The on/off-switch is set according to the information from the REST API. (5.3.25)

Test A.2.10 When the sensor view is opened the temperature, pressure, humidity, magnetic field, gyroscopic and acceleration text fields are empty. (Req. 5.3.27)

A.3 Lightbulb View

Test A.3.1 The Light Bulb View opens when a light bulb is chosen in the MyDevices View and the "Select device" button is pressed. (Req 5.4.1)

Test A.3.2 The name of the selected light bulb is shown in the top of the View. (Req 5.4.2)

Test A.3.3 The state of the selected light bulb can be changed with a switch. (Req. 5.4.3)

Test A.3.4 The field of R-, G-, B-, W-value is editable and preceded by "R:", "G:", "B:" and "W:" respectively. (Req. 5.4.4, 5.4.5, 5.4.6, 5.4.7)

Test A.3.5 When the Light Bulb View is opened, the fields are empty. (Req. 5.4.8)

Test A.3.6 The "Get"-button receives the R-, G-, B-, W-values and present them in the fields specified in requirement 5.4.4 to 5.4.7. (Req. 5.4.9)

Test A.3.7 The "Set button" sets the color of the light bulb. (Req. 5.4.10)

Test A.3.8 If an input value is left blank the value is interpreted as 00. (Req. 5.4.11)

Test A.3.9 The value representing the color of the fields is of maximum two characters. (Req. 5.4.12)

Test A.3.10 The fields only accepts two characters that represent hexadecimal numbers (e.g. 00 to FF and all combinations inbetween). (Req 5.4.12, Req 5.4.13)

Test A.3.11 A pop-up message saying "Color successfully changed" is displayed when the values of the light bulb were successfully set. (Req 5.4.14)

Test A.3.12 The application checks the input values when the "Set"-button is pressed. If the values are out the specified range, a pop-up message is displayed saying: "Input values out of range" (Req 5.4.13 and Req 5.4.15)

Test A.3.13 When the light bulb is off, the "Set"-button is unavailable. (Req. 5.4.16)

Test A.3.14 When the back button is pressed the system switches to My Devices View. (Req. 5.4.17)

B System Test Specification

This is appendix B where we list all system test specifications.

B.1 Use Cases

Test B.1.1 Use case 5.1.1 in Ref 1 is supported. (Req. 5.1.1)

Test B.1.2 The exception described in use case 5.1.1 can be generated by removing the devices from range while attempting use case 5.1.1. (Req 5.1.1)

Test B.1.3 Use case 5.1.2 in Ref 1 is supported. (Req. 5.1.2)

Test B.1.4 The exception in use case 5.1.2 can be generated by not selecting a device in step 1. (Req. 5.1.2)

Test B.1.5 Use case 5.1.3 in Ref 1 is supported. (Req. 5.1.3)

Test B.1.6 The exception described in use case 5.1.3 can be generated by not selecting a device in step 1. (Req. 5.1.3)

Test B.1.7 Use case 5.1.4 in Ref 1 is supported. (Req. 5.1.4)

Test B.1.8 Use case 5.1.5 in Ref 1 is supported. (Req. 5.1.5)

Test B.1.9 Use case 5.1.6 in Ref 1 is supported. (Req. 5.1.6)

Test B.1.10 Use case 5.1.7 in Ref 1 is supported. (Req. 5.1.7)

Test B.1.11 Use case 5.1.8 in ref 1 is supported. (Req. 5.1.8)

Test B.1.12 A popup message reading "Fill in all fields" can be generated by not entering any data into some of the colour fields when attempting use case 5.1.8. (Req. 5.1.8)

Test B.1.13 Use case 5.1.9 in Ref 1 is supported. (Req. 5.1.9)

Test B.1.14 If some data is unavailable when attempting use case 5.1.9, the text in the corresponding field is set to "No data available." (Req. 5.1.9)

Test B.1.15 Use case 5.1.10 in Ref 1 is supported. (Req. 5.1.10)

Test B.1.16 If some data is unavailable when attempting use case 5.1.10, the text in the corresponding field is set to "No data available." (Req. 5.1.10)

Test B.1.17 Use case 5.1.11 in Ref 1 is supported. (Req. 5.1.11)

Test B.1.18 If some data is unavailable when attempting use case 5.1.11, the text in the corresponding field is set to "No data available." (Req. 5.1.11)

Test B.1.19 Use case 5.1.12 in Ref 1 is supported. (Req. 5.1.12)

B.2 Appearance and Layout

Test B.2.1 The first screen that is shown on startup is the MyDevicesView. (Req. 5.2.1)

Test B.2.2 When the back button is pressed in the MyDevices View, the application is closed. (Req. 5.2.10)

Test B.2.3 When the back button is pressed in the Sensor View, the MyDevices View is opened. (Req. 5.3.26)

Test B.2.4 When the back button is pressed in the Light Bulb View, the MyDevices View is opened. (Req. 5.4.17)

Test B.2.5 The layout of the MyDevices View resembles figure 1 in reference 1 (Req. 6.1).

Test B.2.6 The layout of the Sensor View resembles figure 2 in reference 1 (Req. 6.2).

Test B.2.7 The layout of the Light Bulb View resembles figure 3 in reference 1 (Req. 6.3).

Test B.2.8 Test of usability using persons without prior knowledge of the project or the app. (Req. 6.4)

C Test Matrices

Testcase \ Requirement	5.2.1	5.2.2	5.2.3	5.2.4	5.2.5	5.2.6	5.2.7	5.2.8	5.2.9	5.2.10
A.1.1		x								
A.1.2			x							
A.1.3				x						
A.1.4					x					
A.1.5						x				
A.1.6							x			
A.1.7								x		
A.1.8									x	
A.1.9										x
B.2.1	x									
B.2.2										x

Figure 1: Test matrix for The My Devices View.

Testcase \ Requirement	5.4.1	5.4.2	5.4.3	5.4.4	5.4.5	5.4.6	5.4.7	5.4.8	5.4.9	5.4.10	5.4.11	5.4.12	5.4.13	5.4.14	5.4.15	5.4.16	5.4.17
A.3.1	x																
A.3.2		x															
A.3.3			x														
A.3.4				x	x	x	x										
A.3.5								x									
A.3.6									x								
A.3.7										x							
A.3.8											x						
A.3.9												x					
A.3.10												x	x				
A.3.11														x			
A.3.12													x		x		
A.3.13																x	
A.3.14																	x
B.2.4																	

Figure 2: Test matrix for The Lightbulb View.

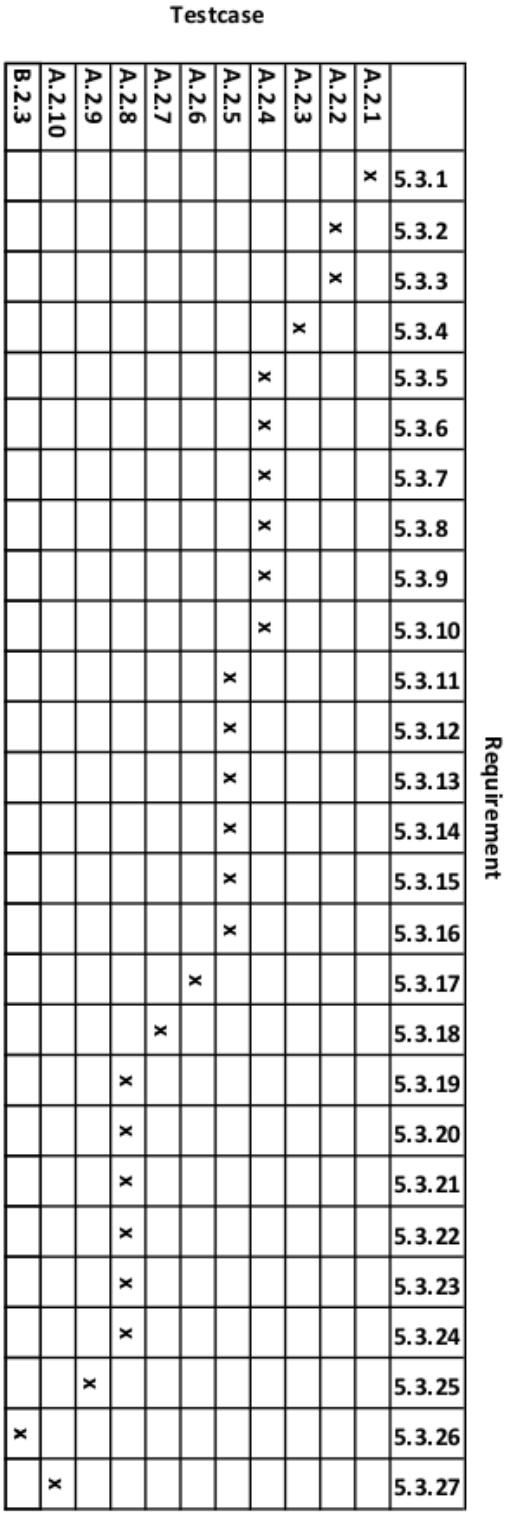

Figure 3: Test matrix for The Sensor View.

Requirement

Testcase	5.1.1	5.1.2	5.1.3	5.1.4	5.1.5	5.1.6	5.1.7	5.1.8	5.1.9	5.1.10	5.1.11	5.1.12
B.1.1	x											
B.1.2	x											
B.1.3		x										
B.1.4			x									
B.1.5				x								
B.1.6					x							
B.1.7						x						
B.1.8							x					
B.1.9								x				
B.1.10								x				
B.1.11									x			
B.1.12									x			
B.1.13										x		
B.1.14										x		
B.1.15											x	
B.1.16											x	
B.1.17												x

Figure 4: Test matrix for the use cases.

Requirement

Testcase	5.2.1	5.2.10	5.3.26	5.4.17	6.1	6.2	6.3	6.4
B.2.1	x							
B.2.2		x						
B.2.3			x					
B.2.4				x				
B.2.5					x			
B.2.6						x		
B.2.7							x	
B.2.8								x

Figure 5: Test matrix for the layout.