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TEAM 2

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# Software Requirements Specification

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# 1 Reference Documents

No reference document in this version.

## 2 Introduction

This document describes the requirements created for an application to control a MVD according to the instructions provided in the course *Software development for large systems*, ETSN05, at LTH fall 2015. The application controls sensor devices and a multi-color light bulb.

## 3 Background and Goals

### 3.1 Main Goals

The main goal of this application is to provide a user-interface to remotely control and read data from a number of sensor devices and light bulbs. The user should through the application be able to control a MVD device which in turn communicates with the sensors and the light bulb.

### 3.2 Actors and their objectives

**User** refers to the end user of the system. The user is able to interact with devices through the application.

## 4 Terminology

**Application** is short for Lamp Controller Android Application which is used as a controller for light bulbs and sensor devices. The application can be used to scan for devices, communicate with a specific sensor or light bulb.

**Back-End** is the endpoint which the app talks to, to control the light bulbs and to get sensor data. The back-end is accessed through a REST API.

**REST API**, representational state transfer application program interface. An HTTP endpoint to which the application talks in HTTP packages in order to communicate with the back-end.

**MVD**, minimal viable device, is used to scan for Bluetooth Low Energy (BLE) devices, collect and pass the data to the remote server using the MQTT protocol.

**Sensor Device** is the device that contains the sensors for temperature value, pressure value, humidity value, magnetic field data, gyroscopic data and acceleration data.

**MAC-address**, media access control address, is a unique identifier used to communicate and identify the different devices.

**R/G/B/W-values** are values for colors in the light bulb. R is for red, G for green, B for blue and W for white.

## 5 Functional Requirements

The application is comprised of three views called MyDevices View, Sensor Device View and Light Bulb View.

### 5.1 Use cases

#### Scenario 5.1.1 Detecting devices

**Precondition:** The user is in the MyDevices View. There is a light bulb and a sensor device within scan range for the MVD.

**Postcondition:** The light bulb and the sensor device are displayed in the MyDevices view.

**Use Case:**

1. The user presses the "Get Devices"-button.

**Exceptions:**

- 1: One or more devices not found.
  - The user is notified by the pop-up message: "Device(s) not found."

#### Scenario 5.1.2 Connecting to the light bulb.

**Precondition:** The user is in the MyDevices View and a light bulb is detected.

**Postcondition:** The user is in the Light Bulb View.

**Use Case:**

1. The user selects the light bulb from the Devices list and presses the "Control Device"-button.

**Exceptions:**

1. No device selected.
  - The user is notified by the pop-up message: "Please select a device."
2. Device disconnected.
  - The user is notified by the pop-up message: "Device not found".

#### Scenario 5.1.3 Connecting to the sensor device.

**Precondition:** The user is in the MyDevicesView and a sensor device is detected.

**Postcondition:** The user is in the Sensor Device View.

**Use Case:**

1. The user selects the sensor device from the device list and presses the "Control Device"-button.

**Exceptions:**

1. No device selected.
  - The user is notified by the pop-up message: "Please select a device."
2. Device disconnected.
  - The user is notified by the pop-up message: "Device not found".

**Scenario 5.1.4** Turning off the light bulb.

**Precondition:** The user is in the Light Bulb View. The light bulb is turned on.

**Postcondition:** The light bulb is turned off.

**Use Case:**

1. The user sets the on/off-switch to off.

**Exceptions:**

1. An error during the process occurred.
  - The user is notified by the pop-up message: "Error "HTTP Status-Code" occurred".

**Scenario 5.1.5** Turning on the light bulb.

**Precondition:** The user is in the Light Bulb View. The light bulb is turned off.

**Postcondition:** The light bulb is turned on.

**Use Case:**

1. The user sets the on/off-switch to on.

**Exceptions:**

1. An error during the process occurred.
  - The user is notified by the pop-up message: "Error "HTTP Status-Code" occurred".

**Scenario 5.1.6** Turning off the sensor device.

**Precondition:** The user is in the Sensor Device View. The sensor device is turned on.

**Postcondition:** The sensor device is turned off.

**Use Case:**

1. The user sets the on/off-switch to off.

**Exceptions:**

1. An error during the process occurred.
  - The user is notified by the pop-up message: "Error "HTTP Status-Code" occurred".

**Scenario 5.1.7** Turning on the sensor device.

**Precondition:** The user is in the Sensor Device View. The sensor device is turned off.

**Postcondition:** The sensor device is turned on.

**Use Case:**

1. The user sets the on/off-switch to on.

**Exceptions:**

1. An error during the process occurred.
  - The user is notified by the pop-up message: "Error "HTTP Status-Code" occurred".

**Scenario 5.1.8** Set the color of light bulb

**Precondition:** The user is in the Light Bulb View. The light bulb is turned on with color yellow.

**Postcondition:** The light bulb has color red.

**Use Case:**

1. The user sets the R-field to FF, the G-field to 00 and the B-field to 00 and the W-field to 00.
2. The user presses the "Set"-button.

**Exceptions:**

1. An error during the process occurred.
  - The user is notified by the pop-up message: "Error "HTTP Status-Code" occurred".

**Scenario 5.1.9** Get the color of light bulb

**Precondition:** The user is in the Light Bulb View. The light bulb is turned on with color yellow.

**Postcondition:** All the color values are displayed in their respective field.

**Use Case:**

1. The user presses the "Get"-button.

**Exceptions:**

- 1: One or more fields are empty.
  - The text field is updated to: "No data available."

**Scenario 5.1.10** Get sensor data

**Precondition:** The user is in the Sensor Device View. The sensor is turned on.

**Postcondition:** The sensor temperature is displayed in the temperature field.

**Use Case:**

1. The user presses the "Get"-button next to the temperature field.

**Exceptions:**

- 1: No data available.
  - The text field is updated to: "No data available."

**Scenario 5.1.11** Get all sensor data

**Precondition:** The user is in the Sensor Device View. The sensor is turned on.

**Postcondition:** All the sensor values is displayed in their respective field.

**Use Case:**

1. The user presses the "Get All"-button.

**Exceptions:**

- 1: No data available.
  - The text field is updated to: "No data available."

**Scenario 5.1.12** Clear all sensor data

**Precondition:** The user is in the Sensor Device View.

**Postcondition:** The sensor values is cleared in their respective field.

**Use Case:**

1. The user presses the "Clear All"-button.

**Requirement 5.1.1:** Scenario 5.1.1 should be supported.

**Requirement 5.1.2:** Scenario 5.1.2 should be supported.

**Requirement 5.1.3:** Scenario 5.1.3 should be supported.

**Requirement 5.1.4:** Scenario 5.1.4 should be supported.

**Requirement 5.1.5:** Scenario 5.1.5 should be supported.

**Requirement 5.1.6:** Scenario 5.1.6 should be supported.

**Requirement 5.1.7:** Scenario 5.1.7 should be supported.

**Requirement 5.1.8:** Scenario 5.1.8 should be supported.

**Requirement 5.1.9:** Scenario 5.1.9 should be supported.

**Requirement 5.1.10:** Scenario 5.1.10 should be supported.

**Requirement 5.1.11:** Scenario 5.1.11 should be supported.

**Requirement 5.1.12:** Scenario 5.1.12 should be supported.

## **5.2 The MyDevices View**

**Requirement 5.2.1:** When the application is started, the MyDevices View should be displayed.

**Requirement 5.2.2:** When the application is started the list of available devices is empty.

**Requirement 5.2.3:** Available devices should be presented in a scrollable list.

**Requirement 5.2.4:** Devices in the list should be selectable.

**Requirement 5.2.5:** Only one device can be selected at a time.

**Requirement 5.2.6:** When no device is selected and the "Control device"-button is pressed, a pop-up message "Please select a device." is displayed.

**Requirement 5.2.7:** Sensors are displayed in the list of available devices as "Sensor", their MAC-addresses as address and their identifier as id.

**Requirement 5.2.8:** Light Bulbs are displayed in the list of available devices as "Light Bulb", their MAC-addresses as address and their identifier as id.

**Requirement 5.2.9:** The "Get devices"-button instructs the MVD to perform a scan for available devices when pressed.

**Requirement 5.2.10:** When the back button is pressed the application is closed.

**Requirement 5.2.11:** The layout of the MyDevices View should resemble figure 1 in Appendix.

**Requirement 5.2.12** The system scans for the MAC-address: 90:59:AF:2A:BD:19 (light bulb)

**Requirement 5.2.13** The system scans for the MAC-address: 00:10:18:01:23:3A (sensor device)



### 5.3 The Sensor View

**Requirement 5.3.1:** When the "Control Device"-button in the MyDevices View is pressed and a sensor is selected, the Sensor View is opened.

**Requirement 5.3.2:** The name of the selected sensor is shown in the top of the View.

**Requirement 5.3.3:** The MAC-address of the selected sensor is shown in the top of the View.

**Requirement 5.3.4:** It is possible to change the on/off-status of the selected sensor with a switch.

**Requirement 5.3.5:** There is a text field used to display temperature value preceded by "T:".

**Requirement 5.3.6:** There is a text field used to display pressure value preceded by "P:".

**Requirement 5.3.7:** There is a text field used to display humidity value preceded by "H:".

**Requirement 5.3.8:** There is a text field used to display magnetic field data preceded by "M:".

**Requirement 5.3.9:** There is a text field used to display gyroscopic data preceded by "G:".

**Requirement 5.3.10:** There is a text field used to display acceleration data preceded by "A:".

**Requirement 5.3.11:** It should be possible to get the value of the temperature sensor by pressing the "Get"-button next to the temperature value field.

**Requirement 5.3.12:** It should be possible to get the value of the pressure sensor by pressing the "Get"-button next to the pressure value field.

**Requirement 5.3.13:** It should be possible to get the value of the humidity sensor by pressing the "Get"-button next to the humidity value field.

**Requirement 5.3.14:** It should be possible to get the value of the magnetic field sensor by pressing the "Get"-button next to the magnetic field data field.

**Requirement 5.3.15:** It should be possible to get the value of the gyroscopic sensor by pressing the "Get"-button next to the gyroscopic data field.

**Requirement 5.3.16:** It should be possible to get the value of the acceleration sensor by pressing the "Get"-button next to the acceleration data field.

**Requirement 5.3.17:** There is a "Get all"-button that gets the value for all available sensor data.

**Requirement 5.3.18:** There is a "Clear all"-button that clears content in the text field for all the sensor data.

**Requirement 5.3.19:** If the "Get"-button for temperature is pressed while the temperature sensor has no available data a message "No data available." is displayed in the temperature value field.

**Requirement 5.3.20:** If the "Get"-button for pressure is pressed while the pressure sensor has no available data a message "No data available." is displayed in the pressure value field.

**Requirement 5.3.21:** If the "Get"-button for humidity is pressed while the humidity sensor has no available data a message "No data available." is displayed in the humidity value field.

**Requirement 5.3.22:** If the "Get"-button for magnetic field is pressed while the magnetic field sensor has no available data a message "No data available." is displayed in the magnetic field data field.

**Requirement 5.3.23:** If the "Get"-button for gyroscope is pressed while the gyroscopic sensor has no available data a message "No data available." is displayed in the gyroscopic data field.

**Requirement 5.3.24:** If the "Get"-button for acceleration is pressed while the acceleration sensor has no available data a message "No data available." is displayed in the acceleration data field.

**Requirement 5.3.25:** The on/off-switch is set according to the information from the back-end data which is accessed through the REST API.

**Requirement 5.3.26:** When the back button is pressed the MyDevices View should be opened.

**Requirement 5.3.27:** When the Sensor View is opened the text fields are empty.

**Requirement 5.3.28:** The layout of the Sensor View should resemble figure 2 in Appendix.

## 5.4 The Light bulb View

**Requirement 5.4.1:** When the "Control Device"-button in the MyDevices View is pressed and a light bulb is selected, the Light bulb View is opened.

**Requirement 5.4.2:** The name of the selected light bulb is shown at the top of the View.

**Requirement 5.4.3:** It is possible to change the on/off-status of the selected light bulb with a switch.

**Requirement 5.4.4:** There is an editable field used to display the R-value preceded by "R:".

**Requirement 5.4.5:** There is an editable field used to display the G-value preceded by "G:".

**Requirement 5.4.6:** There is an editable field used to display the B-value preceded by "B:".

**Requirement 5.4.7:** There is an editable field used to display the W-value preceded by "W:".

**Requirement 5.4.8** When the View is opened the fields are empty.

**Requirement 5.4.9** There is a "Get"-button that retrieves the R,G,B,W values and presents them in their respective fields.

**Requirement 5.4.10** There is a "Set"-button that sets the color of the light bulb.

**Requirement 5.4.11** If any of the fields is empty when pressing the "Set"-button its values are interpreted as 00.

**Requirement 5.4.12** The maximum number of characters allowed in the fields is two.

**Requirement 5.4.13** The fields only accept hexadecimal numbers in the range from 00-FF.

**Requirement 5.4.14** If the values of the light bulb were successfully set a pop-up message "Color successfully changed." is displayed.

**Requirement 5.4.15** If the values of the light bulb were unsuccessfully set a pop-up message "Error: Could not change color." is displayed.

**Requirement 5.4.16** The "Set"-button is disabled when the light bulb is turned off.

**Requirement 5.4.17:** When the back button is pressed the MyDevices View should be opened.

**Requirement 5.4.18:** The layout of the Light Bulb View should resemble figure 3 in Appendix.

## 6 Quality Requirements

**Requirement 6.1** Nine out of ten people should be able to use the application after five minutes of instructions.

**Requirement 6.2** Response time from pressing a button to the system responding happening always be below two seconds.

**Requirement 6.3** The time-out time for the system should be 15 seconds.

## 7 Appendix

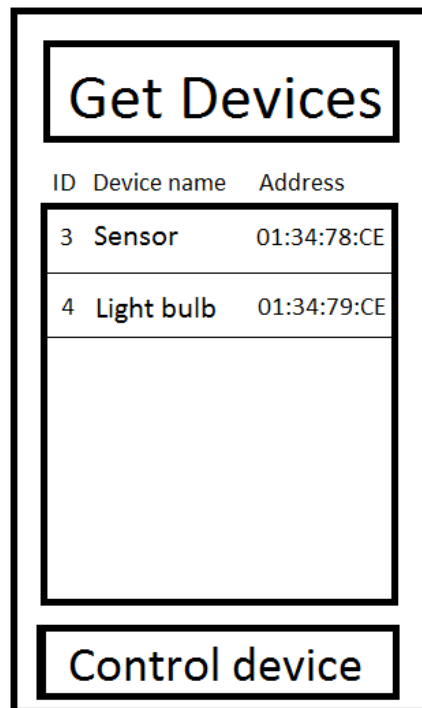


Figure 1: The layout of the My Devices View

Wiced Sense 3  
01:34:78:CE

0

1

T:

Get

P:

Get

H:

Get

M:

Get

G:

Get

A:

Get

Get All

Clear All

Figure 2: The layout of the My Sensor View

Nexturn 4  
01:34:79:CE

0

1

R:

G:

B:

W:

Get

Set

Figure 3: The layout of the Light Bulb View