DTU

02162 Software Engineering 2

Handbook

Smart Home Security

Group C

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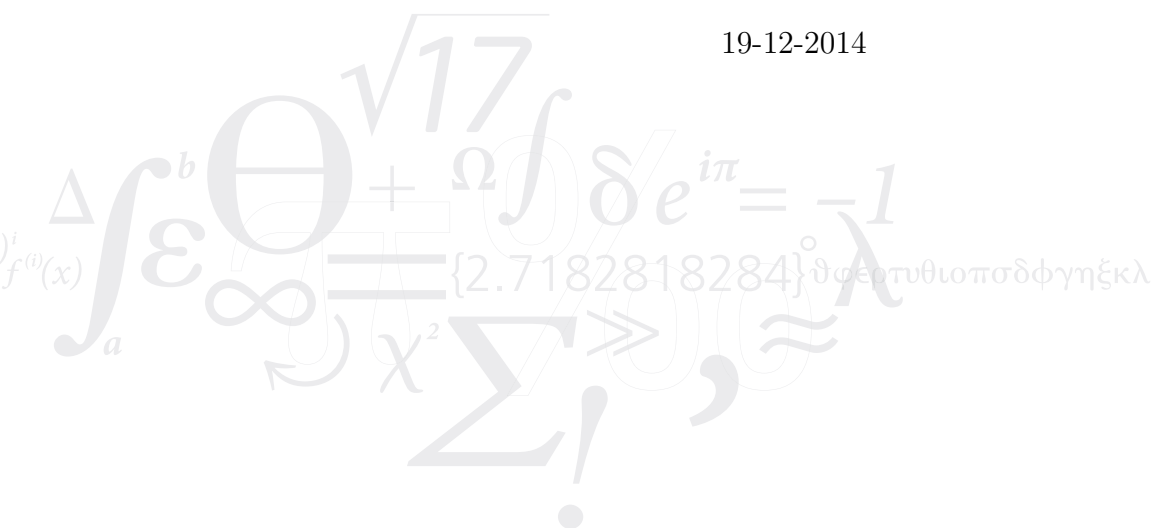Kim Christensen *s084283*
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Contents

1 Introduction (s103459)

The smart home security system described in this handbook, is used to make your home more secure by alerting you when your home is compromised, deterring intruders by using sounds and flashlights, and recording video of any break-ins, making it easier to catch an intruder.

The system uses one or more android smartphones or tablets. These devices act both as sensors and actuators, that detect, record and deter intruders. The system consists of apps installed on the devices as well as a web application, from where the system can be managed. It also includes a Monitor app, used for easy and convenient notification of security events.

The purpose of this handbook is to serve as a guide to your smart home security system. After reading this handbook you will be able to:

- Install the

- Install the different apps on your devices

- Set up your devices in your home

- Register your devices with the system

- Use the Monitor app to:

    - Receive notifications of security events
    - Manually activate actuators
    - Request live video feed

- Use the web application to:

    - Log in to the system
    - Configure the behavior of any actuators, by creating rules used to define when they should be activated
    - Monitor the status of the system
    - Manage new and existing users of the system

Included in this handbook, is first an overview of the system. Following that, is a complete example of the use of the system, where all the available features will be shown. After this, is a user guide, where each feature of the system is explained separately.

If you prefer to get a short step-by-step instruction, this has been included in section 6, located at the end of this handbook. Finally, there is a glossary, where any terms relevant to this system are briefly explained.

Note: It is assumed that the reader of this handbook is familiar with the concept of android apps, and how to install them.

2 System Overview (s103459)

This section gives an overview of which sensor and actuator types are included in the system and how these should be placed in the home. The section also describes which apps are included in the system, what their purpose is and finally outline how the system is managed.

2.1 Sensors and Actuators types

There are three different types of actuators and sensors included in the app. These types are movement sensor, video camera, flashlight and audio player. When setting up the system, you should physically place your devices in a location that corresponds to the purpose the device should fulfill:

- **Movement sensor:**
  Should be placed on the object you want to detect movement of. A common use is to place the sensor on a door. Other uses could be to detect windows, drawers or cabins being opened.

- **Video camera:**
  Should be placed such that the camera of the device overlooks the room you want to view. A common use is to place the device in an elevated corner of a room.

- **Flashlight:**
  Should be placed such that the flashlight of the device faces the spot you want to illuminate. A common use is to place the device facing a door where an intruder might enter.

- **Audio player:**
  Can be placed anywhere within earshot of a possible intruder.

2.2 Sensor and Actuator app

The first app included in the system, is the Sensor and Actuator app. This app contains all the functionality of the movement sensor, the flashlight actuator and the audio player. How this app is used, is described in Section 5.1.

2.3 Camera app

The second app included in the system, is the Camera app. This app contains the functionality of the video camera actuator. How this app is used is described in Section 5.2.

2.4 Monitor app

The third app included in the system, is the Monitor app for your own personal device. Using this app, you will be notified of all security event in a convenient fashion, using the built-in notification system of android devices. You will also be able to manually activate any actuators in the system from this app, as well as request live video feed from available cameras. How the Monitor app is used is described in detail in the section 5.3.

2.5 System Management

Managing the system is done in a web browser by entering the following address:
`http://se-se2-e14-glassfish41-c.compute.dtu.dk:8080/SmartHomeSecurity/`
Here you can log in to the system, configure how your android apps should behave and monitor the status of the system. How these things are done is described in detail in the Section 5.4.

3   Installation Details (s124255)

This part of the handbook is reserved for an advanced user and can be used to deploy the system on a server. It is a requirement that you have at least some knowledge of IDE's and server setup. To use this guide you will need at least one smartphone (Preferably a Samsung Galaxy 5), an available Glassfish Server and the following on your computer:

- A full installation of the Eclipse Luna IDE

- The Glassfish Eclipse Luna Plugin

- The Glassfish Server libraries

- ADT Eclipse plugin

- Connection to the internet

3.1   Initial Preparations

Before you can deploy the server files or manually install the apps on your smartphone, you will need to download and use the zip files containing the project. Import the zip files into your Eclipse workspaces. When all zip files are imported to your project please check that no error occurs, if any try re-installing all the requirements before importing again.

3.2   Glassfish deployment

If you want to use the system on your own Glassfish Server, first you will need to export the eclipse project to a .war file. This can be done by pressing the File tab-¿Export-¿Web-¿WAR file. Save the file to a location on your computer and open your browser. In the browser access your server's admin URL and login. In the panel choose Applications-¿deploy and find the .war file location and press "ok" to deploy. If you want to deploy a new version you will first need to undeploy the currently deployed version. Mark the application and press undeploy.

3.3   App Installation

To install the Apps manually, right click on the App files choose Run As-¿Android Application and the ADT will install the app on your phone.

4 Complete example of system use <small>(s103459)</small>

This section will describe in detail how to set up the system to monitor a door on one device and play a sound and activate flashlight on another, when movement is detected. A third device should also be set up to record video on demand. Also an alert should be sent to a fourth device when the door is moved.

After the system has been set up, an example of how to use this setup will be given. Following the steps in this section will give you a complete tour of all the features of the system.

4.1 Setting up the system

Installing and registering the apps

1. Install the Sensor and Actuator app from
   `http://se-se2-e14-glassfish41-c.compute.dtu.dk:8080/SmartHomeSecurity/android/`
   `SensorActuatorApp.apk`
   on the device that should detect when the door opens.

2. Install the Sensor and Actuator app from
   `http://se-se2-e14-glassfish41-c.compute.dtu.dk:8080/SmartHomeSecurity/android/`
   `SensorActuatorApp.apk`
   on the device that should play a sound and activate flashlight.

3. Install the Camera app from
   `http://se-se2-e14-glassfish41-c.compute.dtu.dk:8080/SmartHomeSecurity/android/`
   `CameraApp.apk`
   on the device that should record video.

4. Install the Monitor app from
   `http://se-se2-e14-glassfish41-c.compute.dtu.dk:8080/SmartHomeSecurity/android/`
   `MonitorApp.apk`
   on your personal device, where you want to receive notifications.

5. Start the Sensor and Actuator apps as well as the Camera app on their respective devices, in order to register them with the system.

Placing the devices in your home

1. Fixate the movement sensor device on the door you want to monitor.

2. Place the flashlight and sound device such that the flash of the device faces the door.

3. Place the camera device such that the camera overlooks the room with the door.

Configuring the devices

1. Open your web browser, and go to:
   `http://se-se2-e14-glassfish41-c.compute.dtu.dk:8080/SmartHomeSecurity/`.

2. Login with the username and password included in your purchase of the system.

3. Go to the "Devices" tab in the top left corner.

4. Select the camera device in the "Active Devices" panel (this is the device where it says "Camera is available" in the pop-up window).

5. Press the "Configure" button in the bottom of the pop-up.

6. Give the device a name in the "Configure device" panel, for example "Camera Device", and press the "Submit" button.

7. Select the device that should detect movement in the "Active Devices" (you can identify this device by comparing the MAC address shown on the running app, with the text in the pop-up).

8. Press the "Configure" button in the bottom of the pop-up.

9. Give the device a name in the "Configure device" panel, for example "Door Sensor". Uncheck the "Camera", "Flashlight" and "Sound" boxes to disable these features from the device, and press the "Submit" button.

10. Select the device that should play sound and activate flashlight in the "Active Devices" (you can identify this device by comparing the MAC address shown on the running app, with the text in the pop-up).

11. Press the "Configure" button in the bottom of the pop-up.

12. Give the device a name in the "Configure device" panel, for example "Actuator Device". Uncheck the "Camera" and "Movement sensor" boxes to disable these features from the device, and press the "Submit" button.

13. Select the door sensor and actuator devices and take note of the following AppIDs: The movement sensor and useralert ID's for the sensor device, and the sound and flashlight ID's for the actuator device. These will be refered to as "SensorID", "SensorAlertID", "SoundID" and "FlashlightID" respectively when creating a rule in the following steps.

Creating a rule

1. Go to the "Rules" tab in the top left corner.

2. In the "New Rule" panel, type "1" in the "Policy number" box, indicating that the rule will be added to the existing policy.

3. In the "Rule String" box, enter the following where you substitute "SensorID", "SensorAlertID", "SoundID" and "FlashlightID" with the actual ID's noted earlier:
```
rule1:
when ACCELEROMETER
if event.source == SensorID
then
playSound.play(SoundID), flashlight.play(FlashlightID),
UserAlert.raise("SensorAlertID");
```

4. Press the "Add new rule" button.

The system is now set up and ready to use.

4.2   Example of system use

Using the apps

1. Open the door with the door sensor attached.

2. The actuator device now plays a sound and turns on the flashlight for 5 seconds.

3. On your personal device, the Monitor app now shows an alert, coming from the Door Sensor device. Press the "Clear Alerts" button to remove the alert.

4. If you want the actuator device to reactivate the flashlight or sound, simply click on the actuator device under "Devices" in the Monitor app, and select the action you want. This can be done at any time the Sensor and Actuator app is running on the actuator device.

Using the web application

1. Open your web browser, and go to:
   `http://se-se2-e14-glassfish41-c.compute.dtu.dk:8080/SmartHomeSecurity/`
   In the top right corner of each tab of the web application, there is a "Demo" button, which highlights the available features of the web application.

2. In the Dashboard tab, you now see that 3 devices are registered in the system (assuming none were registered in the system previously).

3. In the right side of the dashboard, the events are shown from when the door was opened, the actuator was activated and the alert was sent. These can also been seen in the Event Log tab.

4. In dashboard tab, below the floor plan, you can click the red button, which represent a device with the Camera app installed. Clicking this will open a video player, were you can watch all recorded videos from the device. If the camera app is running, you can also view the live video stream.

5. If needed, you can go to the "Users" tab, where you can create new users of the system, as well as view information about existing users.

5 User Guide (s124255, s124259, s103459)

This section describes in detail how to set up the system and use all the available features of the system.

5.1 Setting up and installing a new Sensor or Actuator

The first thing you do is; go to `http://se-se2-e14-glassfish41-c.compute.dtu.dk:8080/` `SmartHomeSecurity/android/SensorActuatorApp.apk`and get the Sensor and Actuator App for your device. After downloading the app, you just open and you are done. The device will register itself in the system and will appear in the Devices tab on the web application. Here you can configure your device and customize which sensors or actuators should be active. See section 5.4.4 for more details.
In Figure 1 below, the interface of the app is shown. Here you can see the MAC address of the device, which is used to identify the device on the web application. It also shows which sensors and actuators are currently active on the device. If the device cannot connect to the server, the status will instead say "Could not connect to server - restart app".
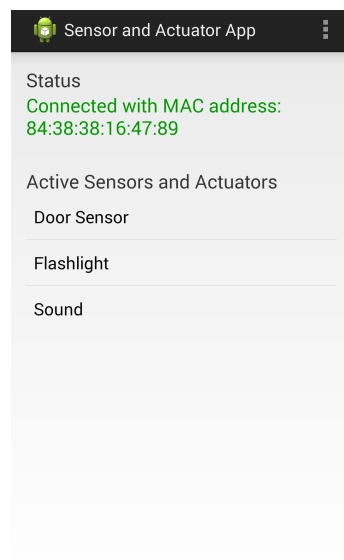

Figure 1: Sensor and Actuator App

The device should be physically placed in your home such that it can fulfill its purpose. See section 2.1 for details on where to place the device.

5.2 Using the Camera App

The camera app is available at
`http://se-se2-e14-glassfish41-c.compute.dtu.dk:8080/SmartHomeSecurity/android/CameraApp.` `apk`. Simply install the app to the device you wish to use for video recording. The app does not have an interface as such; when you want to start video recording, you only have to start the app. The app will then register itself with the system, while displaying the video currently being recorded. When you want to stop recording, simply close the app.

5.3 Setting up and using the Monitor App

The monitor app is available at
`http://se-se2-e14-glassfish41-c.compute.dtu.dk:8080/SmartHomeSecurity/android/MonitorApp.` `apk`. Simply install the app to your personal android device, and start it.

The app will then connect to the server, and retrieve a list of all the devices connected to the system. These devices will be listed under the "Devices" header, and will appear with either a custom name (which can be set in the web application), or with the MAC address of the device if no name has been given. The UI of the app can be seen in Figure 2 below.
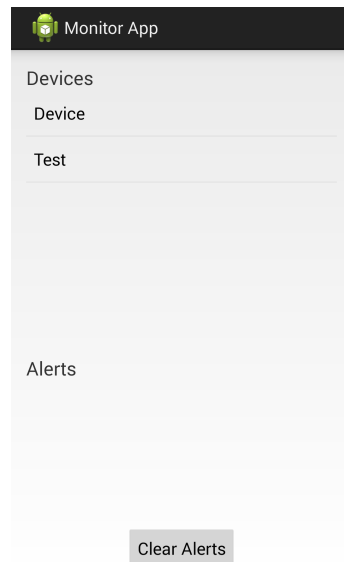

Figure 2: Monitor App

From this list of devices, you can activate any available actuators or get live video feed from available cameras, by pressing the device you want to access. This will prompt a new options dialog, from where you can view and select the option you want, as seen below in Figure 3.
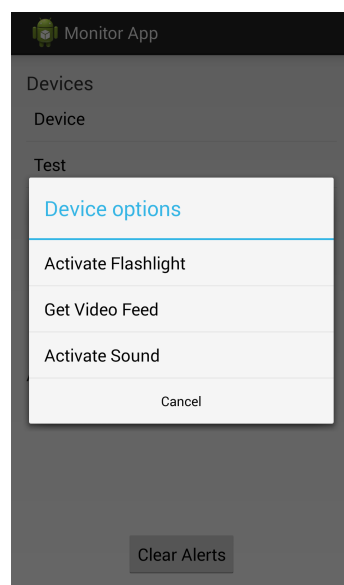
Figure 3: Device Options

Note that any disabled function of a device will not appear as an option in this dialog. To re-activate a disabled function, see section 5.4.4.

In the bottom part of the screen, you will see a header labelled "Alerts". Whenever a security event is registered by the system, the part of the screen below the header will become red, and the

source of the event will be displayed, as seen in Figure 4. The "Clear Alerts" button in the bottom of the screen can then be used to remove all existing alerts, and remove the red background.
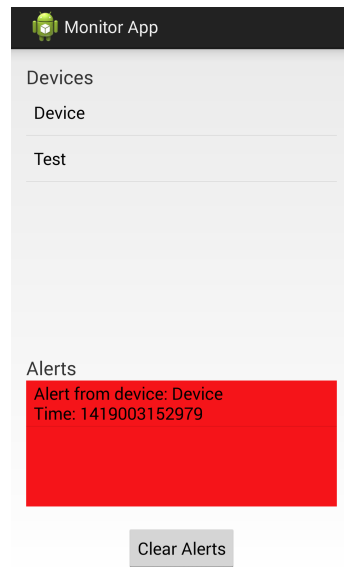

Figure 4: Security Alert

5.4 Managing the System

5.4.1 Log in

When the installation of the sensors is done, the system management can be accessed through the website at:
`http://se-se2-e14-glassfish41-c.compute.dtu.dk:8080/SmartHomeSecurity/`
When you visit the website you will meet a login screen. Username and password for a default manager was provided when you purchased the product. Type in the username and password in the forms and click the *Login* button (Figure 5). In case of wrong username/password combination the system will tell you, and ask you to provide the correct credentials.
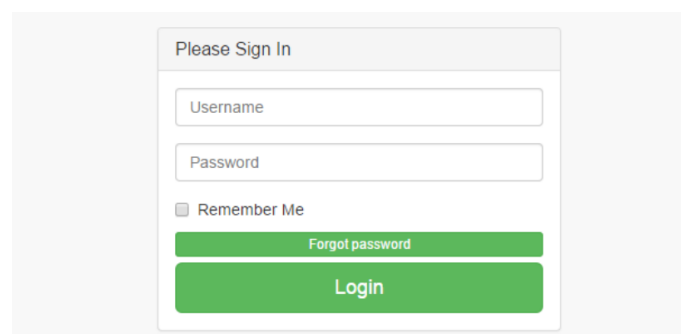

Figure 5: Login screen

5.4.2 Dashboard Tab

The first page you will meet after a successful login is the Dashboard, as seen in Figure 7. In this page you will get a quick overview of the current state of the monitored home.

Devices Running

In the top left corner, the total amount of active devices is monitored. When a device enters or leaves the system, the number will change. The "View Details" button will take you to the device tab.

New Security Events

Next to the right is the amount of security events, that the system has registered within the last 7 days. The "View Details" button will take you down to the list of events on the dashboard.

Last Login

To the right of the New Security Events display, is the Last Login display. This shows how much time has passed since the last time a user logged in to the system. The "View Details" button will show a window with a more precise last login in UTC+01:00 time.

Security Level

In the top right corner is the Security Level display, which shows the current level of the security the system is in. You can use the Activate/Deactivate button under the display to change the security level of the system. The security level can then be used as a condition when making rules, such that certain rules only are active at certain security levels.

Floor Plan

In the lower left part of the dashboard, is the Floor Plan view. Here you can see the floor plan of a token house. The intention is to allow you to upload a custom floor plan of your own home, in a later version of the system.

Below the floor plan exists a red button for each device with the Camera app registered. These button can then be dragged onto the floor plan to mark where the camera is located in the house. However, in the current version, the location of the camera is reset when the page is reloaded.

Clicking on one of the camera devices will open up a new window as seen in Figure 6. Here you can get live video feed from the camera if it is currently recording, by pressing "Show live video feed". You can also see videos previously recorded by the device, and play these on demand, using the "Show video" buttons.
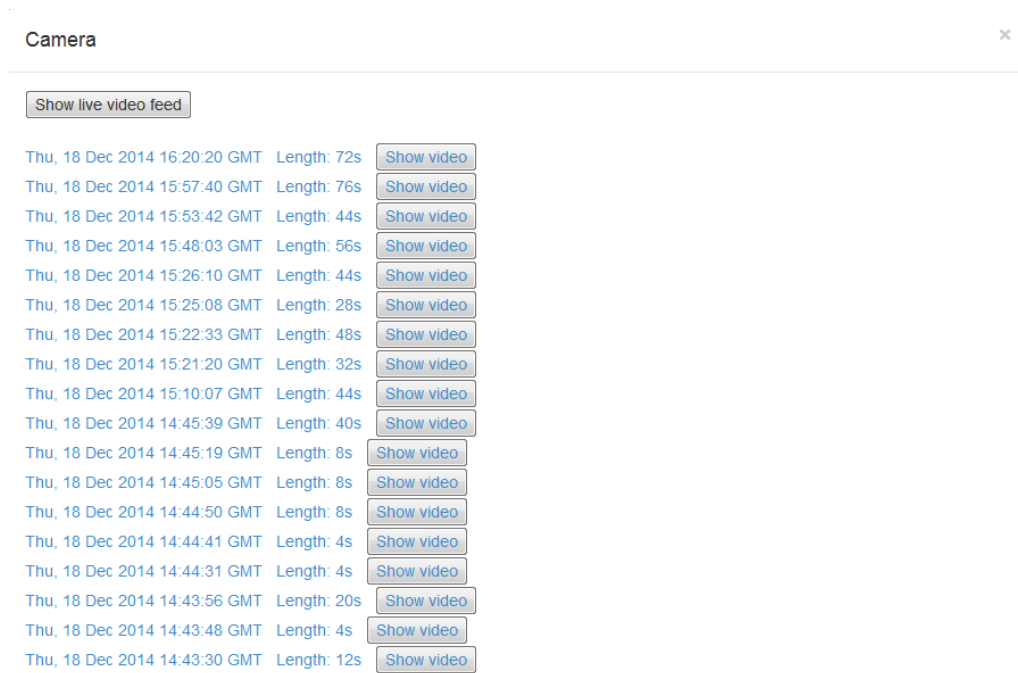
Figure 6: Video Player

Notification Panel

To the right is the Notification Panel. Here you can see a list of events, it will only show the most recent events sorted by the most recent first. But if you press the "Show more" button a full list of events will be shown.
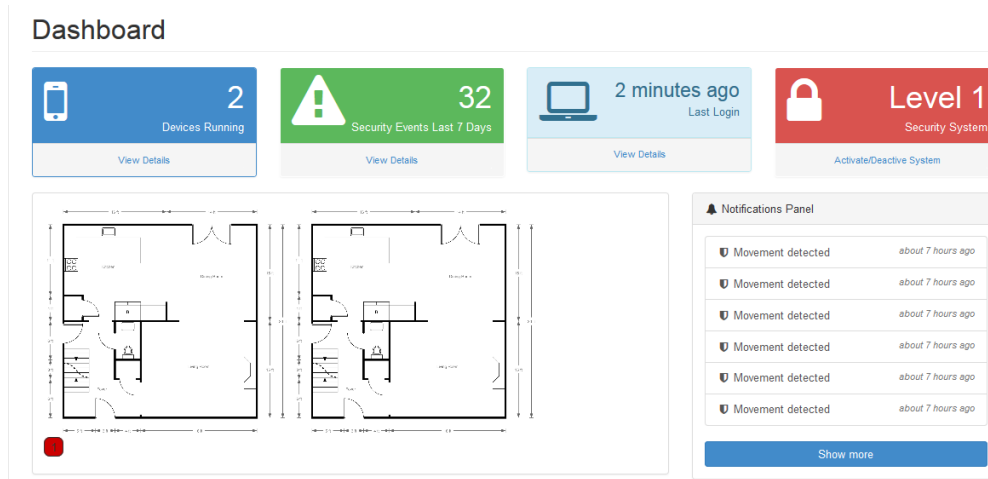

Figure 7: Dashboard

5.4.3 Browsing Tabs

After a successful login, you will be able to browse the website through the four tabs in the top of the page as in Figure 8.
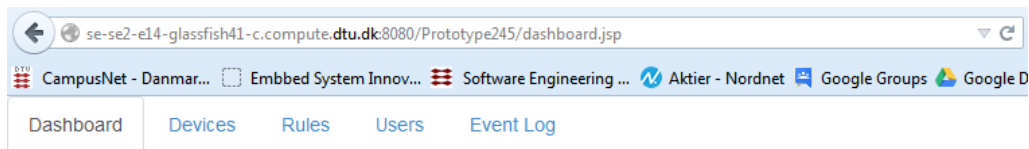
Figure 8: The four website tabs

5.4.4 Devices Tab

When changing to the Devices tab, you will see the Devices Management page (shown in Figure 9). In this page you will have access to advanced information about the individual devices and have the possibility to change the setup of the devices.

Active Devices panel

In the "Active Devices" panel a list of all registered devices will be shown. By clicking on a device, a window with detailed information about the device can be seen. The information includes; the mac address of the device, possibly the name of the device if one has been assigned and the status of the devices sensors and actuators. All devices can have multiple sensors or actuators active. In the window a "Configure" button which if pressed will transfer the chosen devices mac address to the "Configure Device" panel for easier configuration. All devices can have multiple sensors or actuators active.

Configure A Device panel

In the "Configure Device" panel is where the configuration of a device is done. Here you can change the name of a device to a more descriptive name or a name you find more suiting. You can choose which sensors and actuator that should be activated or deactivated. These is if you do not want a device placed in your bedroom to be able to play a sound, it can be deselected for the device(s). If the camera app haven't been registered for a device and you try to activate the camera, you will be notified of the problem.

Figure 9: Device Management page

5.4.5 Rules Tab

When changing to the Rules tab you will see the Rule Management page (shown in Figure 10). Here you will get an overview of the different policies and its rules.

Policies panel

Here you will get the full list of the policies that currently apply to your security system. Clicking on any existing policy til bring up a window where the rules for the chosen policy is listed. The

policies are identified by their number, as an example would a policy shown as "Policy 24" be identified by the number "24", it is this number which is needed to add a rule to an existing policy in the "New Rule" panel.

New Rule panel

In this panel, you as an user can add rules to the system. You will need to enter a number for the policy, as described in the "Policies panel" section, of the policy which you would like to add a new rule to. If the policy currently does not exist, a new one will be created with a number chosen by the system and your rule will be added to this one. Moreover, you need to enter a "Rule String" this is a long sequence of commands which will be verified and added if the syntax is correct. This is only for advanced users and it is advised to study the example rule found on the page.

Figure 10: Rule Management page

5.4.6   Users Tab

When changing to the Users tab you will see the User Management page (Shown in Figure 11). In this page you will see the user information of your system.

Users panel

In the Users panel a full list of all registered users in the system will be shown. By clicking on a user a pop-up window appears with detailed information of the user. The information of the users include username, firstname, lastname, email, role, and password.

New User panel

In the New User panel, a user will be able to create new users accounts, by filling in the form with a first name, last name, email, role, username and password. All fields must me filled, if successful a window with an overview of the new user account will be shown.

Figure 11: User Management

5.4.7 Event Log Tab

In the Event Log tab, you will find a complete log of all event recorded by the system. The events are displayed in a table, as seen in Figure 12.

As default, the table shows the latest 10 events. However this can be changed to 25, 50 or 100 using drop-down menu in the top left corner. You can also change the pages of the table in the bottom right corner, and thereby browse through the complete history of event.

Each event is display with 5 different information types: Source App ID, Event Type, Event ID, Time and Value. The Source App ID can then be compared with the information available about the devices in the Device tab, if you want to know which device the ID corresponds to.

Located in the top right corner is a search function, where you can enter any keyword you want to search for. The table then gives all event where one of the 5 information types matched the keyword.

Figure 12: Event Log page

6   Quick Start (s103470)

Follow these quick steps to get started in a hurry:

1. Login

   - Open a web browser and go to
     `http://se-se2-e14-glassfish41-c.compute.dtu.dk:8080/SmartHomeSecurity/`
   - Use the provided admin user and password for the first login

2. Create a new user

   - Go to the "Users" tab
   - Create your manager user for future logins by filling out the "New user" form and
     selecting "Manager" as the role
   - Optional: Create additional users if needed

3. Set up the sensors and actuators

   - Get the Sensor and Actuator app from `http://se-se2-e14-glassfish41-c.compute.`
     `dtu.dk:8080/SmartHomeSecurity/android/SensorActuatorApp.apk`
     and install it on your android device
   - Start the app. It will now automatically be registered by the system
   - Place the device where you want it in your home
   - Optional: Install and set up additional devices if needed

4. Get monitor app for your personal device

   - Get the Monitor app from `http://se-se2-e14-glassfish41-c.compute.dtu.dk:8080/`
     `SmartHomeSecurity/android/MonitorApp.apk`
     and install it on your android device
   - Start the app. You will now receive alerts in this app when security events occur in the
     system. You will also be able to manually activate actuators and get live video feed in
     this app.

5. Set up rules

   - In your web browser, go to the "Rules" tab
   - Fill out the "Rule string" field with your new rule
   - (Optional) Fill out the "Policy number" with a policy number if you want to add a rule
     to an existing policy
   - Click the "Create new rule" button
   - Optional: Add additional rules if needed

The system is now ready to monitor your home. You can monitor the current condition of the
system on the "Dashboard" tab on the web page, and using the Monitor app.

7 Glossary (s124255, s124259, s103459, s103470, s123673)

Entity	Description
Home	A physical location, where the sensors and actuators of the system is set up
Device	The physical smartphone containing the app with the actuators and sensors
Web Application	The online GUI that is used in order to setup, maintain and use the system
Sensor	The detecting hardware. An example could be detecting that a door is opened
Actuator	Hardware performing output, e.g. playing a sound and activate flashlight
Camera app	The smartphone app that records the videos and sends them to the server
Monitor app	The smartphone app that controls the actuators in the system and allows to check the status of the sensors
Sensor and actuator app	The smartphone app that contains the systems sensors and actuators
User	A person who is logged in to the home security system via the web application
Viewer	A user who can only receive alerts on events and follow events on the web application. He can receive video feed on request and in case of an alert
Manager	A user who oversees the configuration and maintenance of the system's setup. Does also have the same capabilities as a Viewer
Role	The role of a user, giving different permissions to the system, i.e. a Manager or a Viewer
User management	The part of the system dealing with users and their roles
System	A broad term for the home security system as a whole
Event	An action occurring when a sensor detects something
Setup	The actual organization of the sensors/actors in a home
Configuration	A broad term for all the setup options in the system
Rules	Defining when the backend should send an alert based on the sensor's data
Alert	What will be sent to the user when anything suspicious is detected in the setup