



**AALBORG UNIVERSITY**

---

**STUDENT REPORT**

GROUP SW604F12

BACHELOR PROJECT

---

**Oasis: Part of the GIRAF System**

---

*Authors:*

Henrik KLARUP  
Jens Mohr MORTENSEN  
Dan Stenholt MØLLER

*Supervisor:*

Ulrik NYMAN

Spring Semester 2012



**Title:** Oasis: Part of the GIRAF System

**Subject:** Application Development

**Semester:** Spring Semester 2012

**Project group:** sw604f12

**Participants:**

---

Henrik Klarup

---

Jens Mohr Mortensen

---

Dan Stenholt Møller

**Supervisor:**

Ulrik Nyman

**Number of copies:** X

**Number of pages:** X

**Number of appendices:** X Pages

**Completed:** June 3, 2012

**Department of Computer Science**

**Aalborg University**

Selma Lagerlöfs Vej 300

DK-9220 Aalborg Øst

Telephone +45 9940 9940

Telefax +45 9940 9798

<http://cs.aau.dk>

**Synopsis:**

Oasis is an administration module for the GIRAF system. The GIRAF system is designed to ease the daily routine for guardians of children with ASD.

Oasis will provide tools for the development of applications for the GIRAF platform. Oasis consists of three parts; a database used to store information, a library that supplies an API, and an administration application. We tested the functionality of Oasis, using unit testing and a usability test.

The Oasis tools are used in the development of various applications for the GIRAF platform. Even though we released a working version of Oasis, the tools are still open for further development.

*The content of this report is freely accessible. Publication (with source reference) can only happen with the acknowledgment from the authors of this report.*



---

## Resume

---

Oasis is an administration module for the GIRA system. The GIRA system is developed as part of a multi project. The multi project is a continuation of a previous multi project by a group of 6th semester Software students at Aalborg University.

Besides Oasis, other groups have developed modules for the GIRA system. These includes; Launcher, WOMBAT, PARROT, and Savannah. Oasis have received requirements from different multi project groups. These requirements specifies how the Oasis module is structured.

Oasis consists of three parts; a database, a library, and a Oasis administration app. The database part of Oasis is called Oasis Local Db. The Oasis Local Db is used for storing the data, which is used by GIRA applications. The library of Oasis is called Oasis Lib. The Oasis Lib is the library, which works as a connection between the Oasis Local Db and GIRA applications. The administration application is called Oasis App. The Oasis App demonstrates some of the utilities the Oasis Lib offers.

To ensure the correctness of the Oasis Lib we enforced dynamic white box testing through unit tests. The unit tests are created in order to test the Oasis Lib and the Oasis Local Db. It is only the normal operation of the Oasis Lib and Oasis Local Db that has been tested. The usability of the Oasis App has been tested and the result of the test have been documented.

The Oasis tools are used in the development of various applications for the GIRA platform. Although we released a fully functional version of Oasis, there still exists some requirements Oasis does not fulfill. These requirements gives the opportunity for further development.



---

## Preface

---

This report was written as a 6th semester bachelor project by Software group sw604f12 from the Department of Computer Science at Aalborg University (AAU) in the spring of 2012. The report will document the process of developing an administration module for the GIRAF system. The GIRAF system is designed to support guardians of children with autism spectrum disorder.

When references are used in the report they will be referred to in the format [abc] with a corresponding entry in the bibliography (located in the back of the report). For larger works a range of relevant pages will also be specified in the format [pp. 10]. Figures, tables and equations will be referred to in the format [2.1], where the first number refers to the chapter in which it is placed and the second number is the actual number of the figure, table or equation.

The reader is expected to have an understanding of basic programming concepts.

Throughout this report the following abbreviations will be used:

- GIRAF - Name of the entire system, a title was never agreed upon, but “**G**raphical **I**nterface **R**esources for **A**ssistive **F**unctionality” was suggested.
- WOMBAT - Name of the timer application, **W**ay **O**f **M**easuring **B**asic **T**ime.
- PARROT - Name of the pictogram application, **P**ictogram **A**sisting with **R**hetoric **R**easoning **O**r **T**alking.
- MVC - **M**odel **V**iew **C**ontroller [Mic12].
- ASD - **A**utistic **S**pectrum **D**isorder.

- Guardians - Parents, teachers, caretakers, and educators of children with ASD.
- Children - Children refers to “Children with ASD”.
- We - In the introduction, it refers to the entire multi project group. After the common report, it refers to the individual project group.
- Eclipse - An intelligent development environment for Java.
- Metadata - Data about data.
- API - Application Programming Interface.
- GUI - Graphical User Interface

The CD-ROM included with this report contains the source code for the system developed during this project, as well as a copy of this report.

The Oasis administration project group would like to thank the educators whom helped developing and designing the GIRAF system, as well as our supervisor for the interest and cooperation in the project.

---

## Contents

---

<b>I GIRA Introduction</b>	<b>1</b>
<b>1 Introduction</b>	<b>3</b>
1.1 Motivation . . . . .	3
1.2 Target Group . . . . .	4
1.3 Target Platform . . . . .	5
1.4 Development Method . . . . .	5
1.5 Problem Definition . . . . .	5
1.6 System Description . . . . .	6
1.7 Architecture . . . . .	7
1.8 Usability Test . . . . .	7
<b>II Oasis Introduction</b>	<b>11</b>
<b>2 Initial Process</b>	<b>13</b>
2.1 Problem Definition . . . . .	13
2.2 Requirements . . . . .	13
2.3 System architecture . . . . .	14
<b>3 The Process</b>	<b>17</b>
3.1 Sprints . . . . .	17
<b>III Design and Implementation</b>	<b>21</b>
<b>4 Oasis Local Db</b>	<b>23</b>

4.1	Database Schema . . . . .	23
4.2	Structure . . . . .	26
4.3	Implementation . . . . .	26
<b>5</b>	<b>Oasis Lib</b>	<b>31</b>
5.1	Structure . . . . .	31
5.2	Implementation . . . . .	33
<b>6</b>	<b>Oasis App</b>	<b>37</b>
6.1	Design . . . . .	37
6.2	Implementation . . . . .	37
<b>7</b>	<b>Testing</b>	<b>45</b>
7.1	Dynamic White Box Testing . . . . .	45
7.2	Usability Test . . . . .	52
<b>IV</b>	<b>Epilogue</b>	<b>55</b>
<b>8</b>	<b>Discussion</b>	<b>57</b>
8.1	Development Method . . . . .	57
8.2	System architecture . . . . .	58
<b>9</b>	<b>Conclusion</b>	<b>62</b>
9.1	GIRAF Problem Definition . . . . .	62
9.2	Oasis Problem Definition . . . . .	62
9.3	Oasis . . . . .	63
9.4	Testing . . . . .	63
<b>10</b>	<b>Future Work</b>	<b>64</b>
10.1	Server Synchronization . . . . .	64
10.2	Unit Tests . . . . .	64
10.3	Certificates . . . . .	65
10.4	Media Table . . . . .	65
10.5	Oasis App . . . . .	65
<b>V</b>	<b>Appendix</b>	<b>67</b>
<b>11</b>	<b>Requirements from Wombat</b>	<b>69</b>
11.1	Project Backlog . . . . .	70
11.2	Burndown Charts and Sprint Backlogs . . . . .	72
11.3	Change Log . . . . .	81

11.4 Mail correspondence with Customer . . . . .	84
11.5 Notes from Interview . . . . .	86
11.6 Usability Documents . . . . .	88
11.7 Unit Test Results . . . . .	100
<b>Bibliography</b>	<b>103</b>
*	



# **Part I**

## **GIRAF Introduction**



# CHAPTER 1

---

## Introduction

---

In order to describe the context of the system, we – as a multi project group – will in the following state the motivation of the project, the group of people we are aiming at helping, the technological platform chosen, the used development method, followed by a problem definition, a system description and architecture, and the conducted usability test.

### 1.1 Motivation

As this is a student report written as part of a learning project, we are required to comply with the study regulation. The main areas of focus, according to the study regulation, are: multi-project management and quality assurance in the form of requirements analysis, requirements management, and testing. The goal is to create a comprehensive software system, across multiple project groups, in order to enhance our competences in analysis, design, implementation, and evaluation of software applications in regards to the system requirements [Uni].

This project builds on top of a previous project, and is further developed, with the aim of having other students continue the development. The goal of the project, we are building on top of, is to create a touch based tablet system to support children and their guardians in everyday scenarios.

## 1.2 Target Group

Our target group is both children and their guardians. These guardians have certain needs for special tools and gadgets that help to ease the communication between them and the children.

Five teachers and educators, who work with children, act as customers. They will provide requirements and information about the institutions' way of working to give us an insight into their daily struggles.

### 1.2.1 Working with Children with ASD

This section is based upon the statements of a woman with ASD [Gra02], explaining what it is like to live with ASD, and an interview with an educator at Birken, a special kindergarten for children (see section 11.5 for interview notes).

People with ASD are often more visual in their way of thinking. Rather than visualizing thoughts in language and text, they do it in pictures or visual demonstrations. Pictures and symbols are therefore an essential part of the daily tools used by children and the people interacting with them. Also, children can have difficulties expressing themselves by writing or talking, and can often more easily use electronic devices to either type a sentence or show pictures, to communicate with people around them. Another characteristic of children is their perception of time. Some of them simply do not understand phrases like "in a moment" or "soon", they will need some kind of visual indicator that shows how long time they will have to wait.

Different communication tools for children with autism already exist, but many of them rely on a static database of pictures, and often these has to be printed on paper in order to use them as intended. Other tools, such as hour-glasses of different sizes and colors, are also essential when working with children, and these tools are either brought around with the child, or a set is kept every place the child might go, e.g. being at an institution or at home.

There exists tools today which helps the guardians in their daily life, although – as stated in Drazenko's quote – none of them are cost-effective enough to be used throughout the institutions. From the quote, it is clear that there is a need for a more cost-effective solution.

*"The price of the existing solutions are not sufficiently low such that we can afford to buy and use them throughout the institution."*

- Drazenko Banjak, educator at Egebakken.

## 1.3 Target Platform

Since we build upon last year's project, we are bound to use the platform they used, which is tablets running the Android operating system.

In this project we have been provided with five Samsung Galaxy Tab 10.1 devices [Sam]. The firmware on the tablets is version 3.2. This version, as of project start, is the latest stable version available for these specific tablets. [Tea12a]

## 1.4 Development Method

As a part of the study regulation we have been required to use the same development method in each individual group. Two methods have been considered, XP (eXtreme Programming) [Wel09], and Scrum [All11b].

With the knowledge of both XP and Scrum, we decided in the multi project to use Scrum of Scrums, which is the use of Scrum nested in a larger Scrum project [All11a].

The reason for choosing Scrum of Scrums is that everyone, at all times, will be able to know what the vision of the project is, and how close every group is to achieving their individual goals of the vision.

Another element of the Scrum method is that a close contact with the customers is maintained. This helps keep the product backlog up to date and correctly prioritized. The customers are presented with the vision of the project, as well as showing the latest release when we have meetings with our customers.

We customized Scrum to fit our project. The changes are as follows:

- The sprint length have been shortened to approximately 7 - 14 half days.
- Some degree of pair programming have been introduced.
- There is no project owner because this is a learning project.
- Everyone is attending the Scrum of Scrums meetings.
- The Scrum of Scrums meetings are only held once at sprint planning.

## 1.5 Problem Definition

The problem statement is as follows:

*How can we ease the daily life for children with ASD and their guardians, while complying with the study regulation?*

This problem statement is necessarily vague to allow the individual groups some freedom in their projects, while we maintain the overall structure of the multi project, however there are limiting factors. We are limited by resources and time available, as we are only working on this project for a single semester. However, all work done in this multi project will be passed on to the next line of students, which means we can make a full system design and pass on anything we do not have the time or resources for. This also requires that our work need to be of such quality that it is understandable by students of the same educational level as ourselves.

## 1.6 System Description

GIRAF is a collection of applications, either fully or partially interdependent, for the Android platform, designed to be used by guardians and children. GIRAF consists of five projects with various degree of interaction. These projects are named Launcher, PARROT, WOMBAT, Oasis, and Savannah. Each of the groups have produced individual products, which are parts of a greater project, GIRAF.

**Launcher** handles execution of GIRAF apps, and at the same time it provides safety features to ensure that a user that is not authorized to interact with the rest of the system will not be able to do so. When the launcher executes an app, it will provide it with profile information, specifying which child is currently using the app, as well as which guardian is signed in.

**PARROT** is an app which provides access to pictograms – pictures with associated information such as sound and text – which can be used for communication. PARROT also gives guardians functionality for adding additional pictograms, as well as organizing the pictograms into categories for ease of access, based on the needs of the individual child.

**WOMBAT** is an app which purpose is to help the children to understand the aspect of time, by visualizing it. WOMBAT provides different ways of displaying time, as well as the possibility to configure the app for the needs of individual children.

**Oasis** locally stores the data and configuration of the GIRAF platform, and provides an API to access it. The stored data and configurations are synchronized to the Savannah server, if available. In addition, an app is provided for the guardian to access the stored data and configurations.

**Savannah** provides Oasis with a way to synchronize tablets running GIRAF. Furthermore, a website is provided to ease administration of the synchronized data.

## 1.7 Architecture

Our System architecture – shown in Figure 1.1 has been designed with simplicity in mind and was greatly inspired by the MVC pattern. This means that the architecture is divided into three layers. The lowest layer is the database where the information is stored. Above this layer is the controller layer which, in the GIRAF platform, is known as Oasis. The controller is responsible for querying the database for information needed in an app and the controller is also responsible for storing information in the database. The last layer is the apps. This division of layers give the GIRAF platform a low cohesion which makes it easier to work with individual parts of the platform independently.

We have chosen to redesign last year's architecture [JB11] to make it easier to work with. We have simplified the architecture because we feel it is unnecessarily complex.

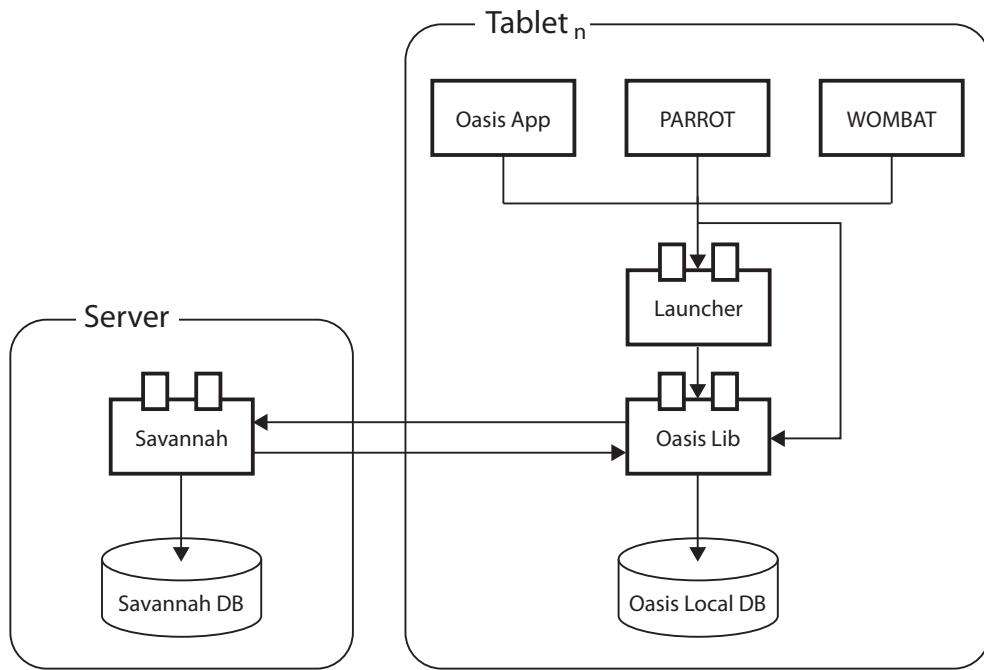


Figure 1.1: The GIRAF architecture

## 1.8 Usability Test

As stated in the motivation, quality assurance through testing of the system is required. Therefore a usability test was conducted in order to measure the cur-

rent usability of the GIRAF platform as a whole, as well as of the individual parts of the platform. Furthermore, the next wave of developers will immediately be able to start correcting the found usability issues.

### **1.8.1 Approach**

The test group consists of the five contact persons. We assess that they, as a test group, are representative. We base this on them being a mix of educators and teachers, with varying computer skills.

They have prior knowledge about the overall idea of the GIRAF platform, and although some of the contact persons had previously informally used some aspects or parts of the system, they had not been exposed to the platform as a whole, and therefore still are of value.

The invitation sent to the test persons can be found in Figure 11.11.

The Instant Data Analysis (IDA) method for usability is chosen. A traditional video analysis method could be used, but since IDA is designed for small test groups, this approach is used. [JK]

### **Setup**

The usability test is divided into two tests: A test of three user applications, and a test of two administrative applications. The user applications are: The launcher, PARROT, and WOMBAT. The administrative applications are: The Oasis app and the Savannah web application. Each test is assigned a team to accommodate the need to run two tests simultaneously. The teams are made with respect to the criteria of the Instant Data Analysis process.

Each team consisted of:

- 1 x Test Coordinator
- 1 x Test Monitor
- 1 x Data Logger
- 2 x Observers

The usability lab at Aalborg University is designed with two rooms for usability testing and a control room to observe and record the tests. The two test chambers are assigned a test each and the control room is used to observe both tests as seen in figure 1.2.

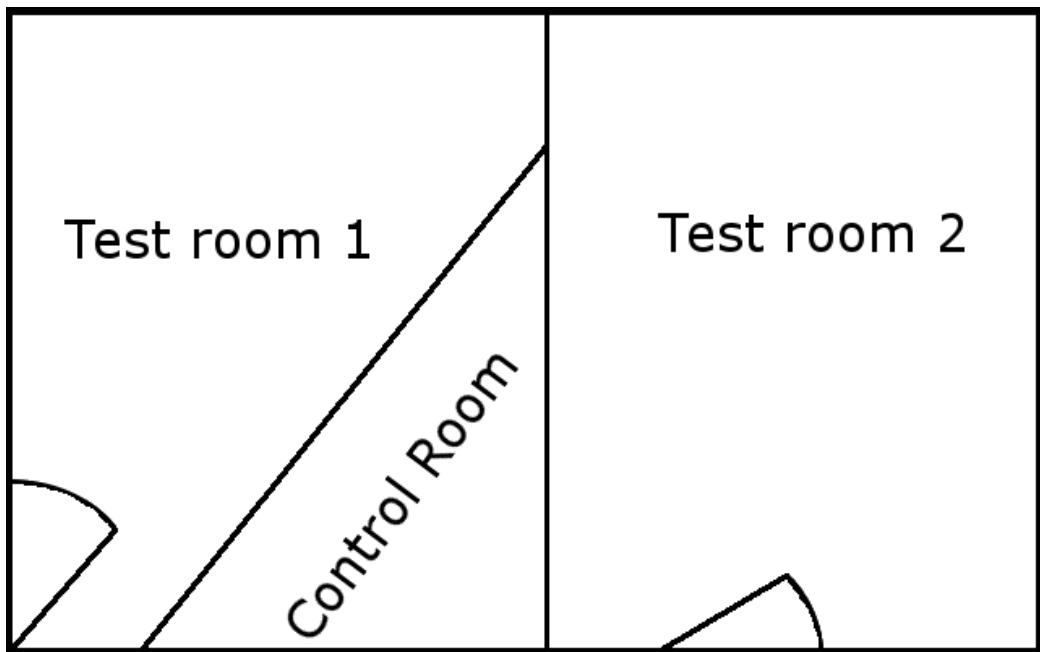


Figure 1.2: An overview of the usability lab at Cassiopeia, Department of Computer Science, Aalborg University.

### Execution

The tests are conducted according to the schedule in Figure 1.3.

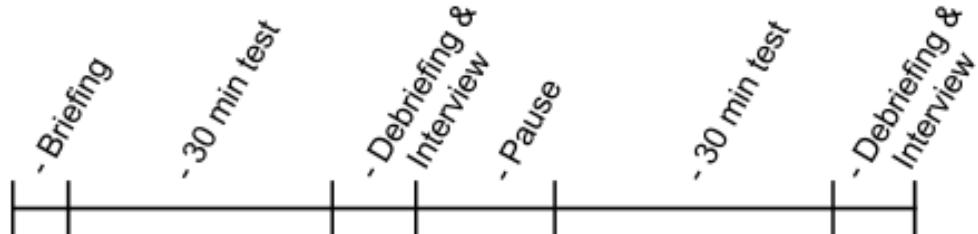


Figure 1.3: The schedule of the usability test.

Briefing, debriefing, and questionnaire documents can be found in section 11.6, and the results of the test can be found in subsection 7.2.1.



## **Part II**

# **Oasis Introduction**



# CHAPTER 2

---

## Initial Process

---

In this chapter the problem definition for Oasis is described. An analysis of the requirements, received from the other groups in the multi project, are performed and from the analysis the Oasis system architecture has been derived.

### 2.1 Problem Definition

In the multi project a common problem definition have been stated, see Section 1.5 on page 5. The common problem definition is – as stated – to vogue for the individual groups. Therefore we have devised a problem definition for Oasis. It is as follows:

*How can we provide a set of tools, which can help develop applications for the GIRA F system?*

### 2.2 Requirements

Before the development can begin the requirements for the software must be analyzed. The requirements stem from the multi project groups and the contact persons. Examples of the requirements received can be seen in Appendix 11 on page 69 and 11.4 on page 84.

The derived informal requirements are:

- Child profile handling
- Guardian profile handling
- Child and guardian relation handling
- Application specific profile setting handling
- Certificate handling
- Media handling
- Media access handling
- Media to media relation handling
- Department handling
- Department to subdepartment handling
- Profile to department relation handling

We have decided to develop a database and a library, which are to be used by GIRAF applications. As an example of a GIRAF application, that uses the library and database, we will develop an administration application.

## 2.3 System architecture

Oasis consists of three parts; The Oasis Local Db, the Oasis Lib, and the Oasis App. This is shown in Figure 2.1 on the next page.

The Oasis Lib handles application interaction with the Oasis Local Db, and every GIRAF application should be utilizing this library. Another feature the Oasis Lib offers is the ability to handle synchronization between the Oasis Local Db and Savannah.

The last part is the Oasis App. This application allows interaction with the Oasis Local Db through the Oasis Lib. Some of the features of the Oasis App are creation and removal of profiles and departments. It also enables the user to handle relations between specific elements.

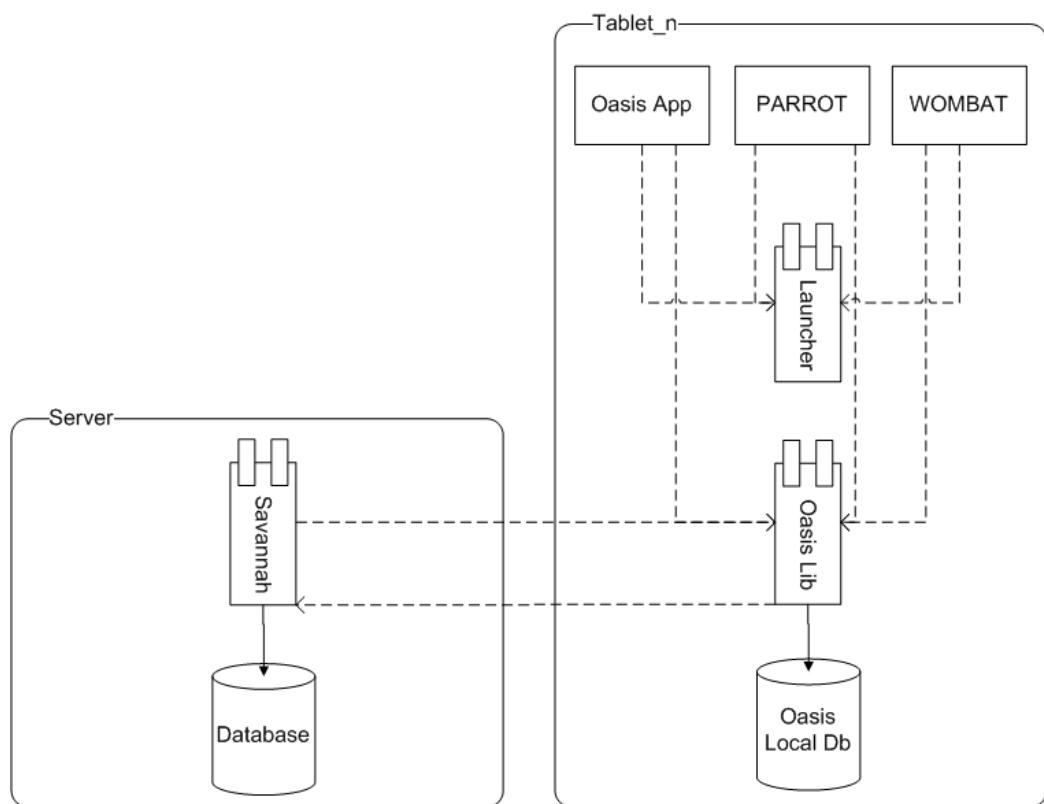


Figure 2.1: The GIRAFT system architecture.



# CHAPTER 3

---

## The Process

---

In this chapter we describe the sprint process of our project, this can be seen in Section 3.1.

### 3.1 Sprints

This project was divided into eight sprints. The length of the sprints was decided at every sprint meeting. At the end of each sprint period, a meeting was held to reflect on what was learned through the sprint. The burn down charts, sprint backlogs and the final change log can be seen in Appendix 11.2 on page 72.

#### 3.1.1 Sprint One

Sprint one started on 19/03-2012 with a work period of seven half days. In this sprint period we started making the design for the Oasis Local Db schema, a prototype database, the model classes, that is supposed to wrap the data from the Oasis Local Db, and some methods to the library, which we got as requirements from the other groups.

#### Sprint Reflection

In this sprint we learned that we should be a bit better at estimating the size of each task and the solution would be combining the small tasks into bigger

tasks, thereby allowing us to work on one big task a day, instead of several small tasks.

### **3.1.2 Sprint Two**

Sprint two started on 26/03-2012 with a work period of eight half days. In this sprint period we improved the design for the Oasis Local Db schema, started implementing the Oasis Local Db, and updated the library with the new requirements we got from the other groups. Besides that we used a little time on setting up a counter-strike server, this gave us a social activity that improved the relation between the multi project groups.

#### **Sprint Reflection**

In this sprint we learned that we still should be a bit better at estimating the size of each task, because there was some tasks we did not start on. Another thing we learned was that a good database design takes some iteration to achieve.

### **3.1.3 Sprint Three**

Sprint three started on 10/04-2012 with a work period of nine half days. In this sprint period we froze the Oasis Local Db schema, continued on the implementation of the Oasis Local Db, and updated the Oasis Lib with the new requirements gathered from the other groups. Besides that we started thinking on the “Oasis App”.

#### **Sprint Reflection**

In this sprint we learned that we should not be adding new tasks to the sprint backlog when the sprint has started, as this will make us less likely to complete all tasks on the sprint backlog. Besides that, we underestimated the size of the tasks, which lead to tasks not being completed before the end of the sprint. Another thing we learned was that some tasks depended on each other and this could result in some tasks not being completed because of such a dependency.

### **3.1.4 Sprint Four**

Sprint four started on 23/04-2012 with a work period of six half days. In this sprint period we completed the implementation of the Oasis Local Db and updated the Oasis Lib with the new requirements gathered from the other groups. Besides that we started writing Java Doc to the Oasis Lib, refactoring of the code

in the Oasis Local Db, started making a method, which created dummy data, and wrote a part of the common report.

#### **Sprint Reflection**

In this sprint we learned that we still need to be better at saying no to other groups, whom came with new tasks in the middle of the sprint.

#### **3.1.5 Sprint Five**

Sprint five started on 07/05-2012 with a work period of six half days. In this sprint we worked on implementing the Oasis App. We also planned to work on synchronizing with Savannah, however this did not happen due to Savannah not being ready. The Oasis Lib was improved with minor bug fixes.

#### **Sprint Reflection**

In this sprint we learned to communicate with the other groups before planning a mutual task.

#### **3.1.6 Sprint Six**

Sprint six started on 14/05-2012 with a work period of eight half days. In this sprint we continued the implementation of the Oasis App, updated the Oasis Lib, and started creating a structure for the rapport.

#### **Sprint Reflection**

In this sprint we learned nothing new.

#### **3.1.7 Sprint Seven**

Sprint seven started on 21/05-2012 with a work period of nine half days. In this sprint we worked on unit tests for the Oasis Lib. We also conducted the usability test, where we tested the Oasis App. Apart from that we also added more content to the rapport.

#### **Sprint Reflection**

In this sprint we learned that not every choice you make as a developer is easy to understand for someone without much technical knowledge.

Examples on this can be seen in the result of the usability test conducted on the Oasis App seen in Section 7.2.1 on page 54.

### **3.1.8 Sprint Eight**

Sprint eight started on 28/05-2012 with a work period of eight half days. In this sprint we finished the report.

#### **Sprint Reflection**

In this sprint we learned that writing some parts of the report earlier might be a good idea.

## **Part III**

# **Design and Implementation**



# CHAPTER 4

---

## Oasis Local Db

---

In this chapter we describe the Oasis Local Db. The Oasis Local Db is used for storing the data, which is used by the GIRAF applications. The database schema, which the Oasis Local Db is based upon, is described in Section 4.1. The structure of SQLite used on the Android Platform is described in Section 4.2 on page 26. Finally the implementation of the Oasis Local Db on the Android system is described in Section 4.3 on page 26.

### 4.1 Database Schema

The Oasis Local Db Schema is developed in cooperation with Savannah. The reason for this is to alleviate the complexities that could occur during a synchronization of the Oasis Local Db and Savannah.

The central point of the Oasis Local Db schema is the AuthUsers table. This table contains all the user id's and their certificates. A user in the Oasis Local Db can be either a profile or a department and therefore a role is stored as well to differentiate the two.

The Oasis Local Db schema for the profiles and departments are a simple model representing a kindergarten like Birken or a school like Egebakken. This means that a profile can either be a child or guardian. The Oasis Local Db supports the possibility to associate profiles to each other in order to allow a child to guardian relation. The profiles can be attached to one or more departments, and a department can be related to one or more sub departments.

An important part of the system for the guardians is the ability to access different kinds of media on the tablets. Therefore media can be stored in the Oasis Local Db along with information about who has access to them. A media can be owned by either a profile or a department, and the owner has the ability to decide who should have access to the media. The Oasis Local Db schema also allows the user to add tags to media, these tags can be used to identify the media.

Another important part of the system is the ability to control applications. From the users viewpoint it consists of deciding which applications should be accessible and from the developers viewpoint it is a way of storing application settings for a profile.

The Oasis Local Db schema can be seen in Figure 4.1 on the facing page.

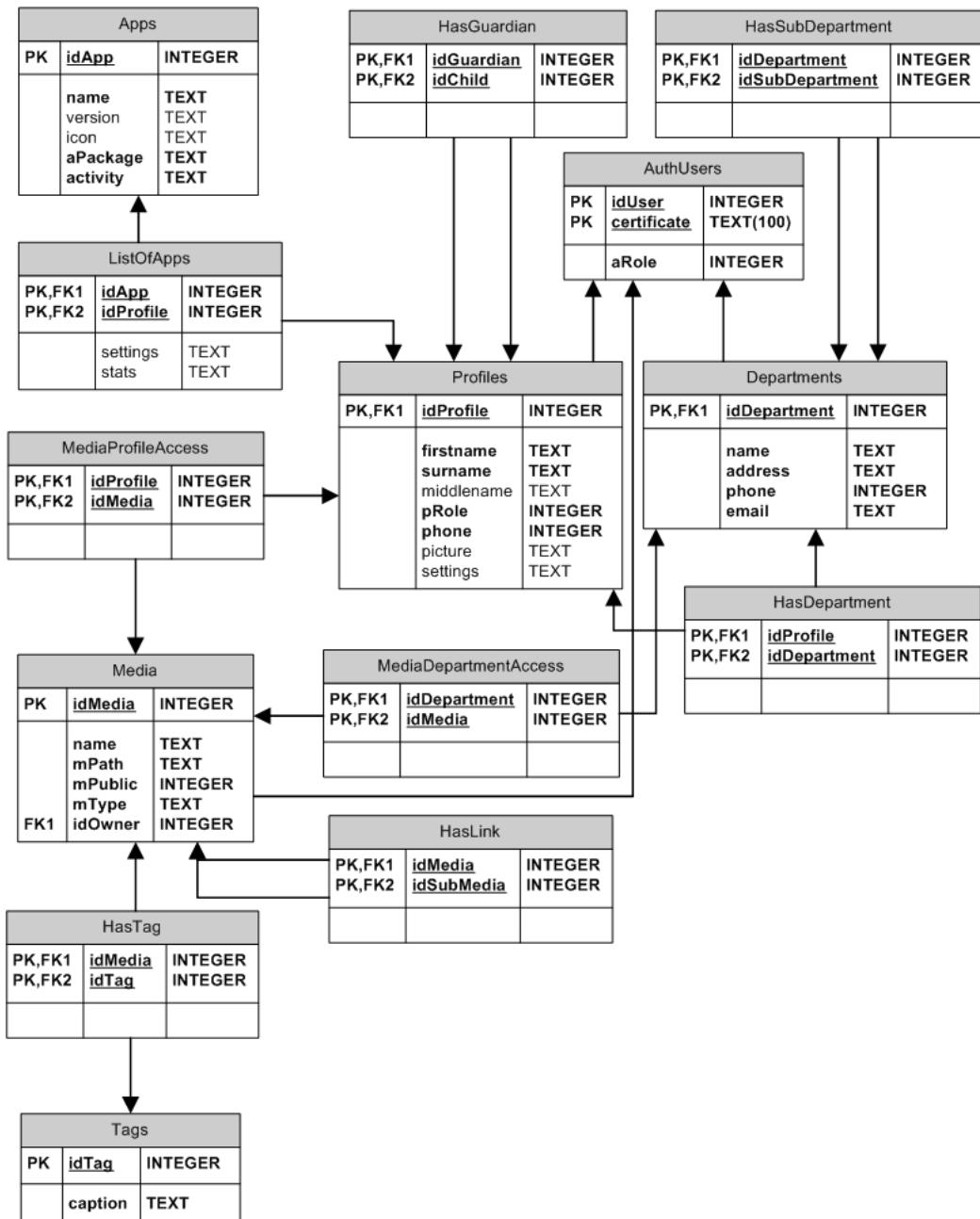


Figure 4.1: The schema for the Oasis Local Db.

## 4.2 Structure

When using the Android system to develop databases the developers are bound to use the open source database SQLite. [SQL12b] The reason for this is that only SQLite is supported on the Android platform. [Teal12b] It supports three kinds of data types; TEXT, which is similar to String type in Java, INTEGER, which is similar to long type in Java, and REAL, which is similar to double type in Java. [SQL12c] SQLite does not validate if the types written to the columns actually are of the defined type. This means that it for instance is possible to write an integer into a TEXT column. On the positive site SQLite only requires a little portion of memory at runtime. [SQL12a]

## 4.3 Implementation

As stated in Section 4.2, we implemented the Oasis Local Db using SQLite. The Oasis Local Db consists of three elements; metadata, tables, and a content provider. These are explained in the following sections.

### 4.3.1 Metadata

First we created metadata files for each table in the Oasis Local Db.

As an example the metadata file for the AuthUsers table can be seen in listing 4.1.

---

```
1 package dk.aau.cs.giraf.oasis.localdb;
2 import android.net.Uri;
3 import android.provider.BaseColumns;
4
5 public class AuthUsersMetaDataAdapter {
6
7     public static final Uri CONTENT_URI =
8         Uri.parse("content://dk.aau.cs.giraf.oasis.localdb.AutismProvider/authusers");
9
10    .
11    .
12
13    public class Table implements BaseColumns {
14        public static final String TABLE_NAME = "tbl_authusers";
15
16        public static final String COLUMN_ID = "_id";
17        public static final String COLUMN_CERTIFICATE = "authusers_certificate";
18        public static final String COLUMN_ROLE = "authusers_role";
19    }
20 }
```

---

Listing 4.1: The AuthUsers MetaData

In the AuthUsers metadata file the uri, CONTENT\_URI, is used to defined which table to alter. The inner class Table defines the strings, which are used as names of the table and the columns.

### 4.3.2 Table

When the metadata file is created we make a table class file, which defines the SQL statements for creating, updating and deleting the table. The table class file for AuthUsers can be seen in listing 4.2.

---

```
1 package dk.aau.cs.giraf.oasis.localdb;
2 import android.database.sqlite.SQLiteDatabase;
3
4 public class AuthUsersTable {
5
6     private static final String TABLE_CREATE = "CREATE TABLE "
7         + AuthUsersMetaDataTable.TABLE_NAME
8         + "("
9         + AuthUsersMetaDataTable.COLUMN_ID + " INTEGER NOT NULL, "
10        + AuthUsersMetaDataTable.COLUMN_CERTIFICATE + " TEXT NOT NULL, "
11        + AuthUsersMetaDataTable.COLUMN_ROLE + " INTEGER NOT NULL, "
12        + "PRIMARY KEY (" + AuthUsersMetaDataTable.COLUMN_ID + ", " +
13            AuthUsersMetaDataTable.COLUMN_ID + ")"
14        + ")";
15
16     private static final String TABLE_DROP = "DROP TABLE IF EXISTS " +
17         AuthUsersMetaDataTable.TABLE_NAME + ";";
18
19     public static void onCreate(SQLiteDatabase db) {
20         db.execSQL(TABLE_CREATE);
21     }
22
23     public static void onUpgrade(SQLiteDatabase db, int oldVersion, int newVersion) {
24         db.execSQL(TABLE_DROP);
25         onCreate(db);
26     }
27 }
```

---

Listing 4.2: The AuthUsers Table

### 4.3.3 Content Provider

After the metadata and the tables for the Oasis Local Db has been created, a content provider is created. The content provider implemented in the Oasis Local Db allow applications to store and retrieve data from the aforementioned tables.

The content provider must implement several methods. These methods are presented along with a code snippet with AuthUsers as an example in the following bullets:

- `onCreate()` - called at startup to initialize the content provider see Listing 4.3.

---

```
1     public boolean onCreate() {
2         dbHelper = new DBHelper(getApplicationContext());
3         return false;
4     }
```

---

Listing 4.3: The `onCreate()` method.

- `getType()` - called when an application needs to know the type of the data. The `getType()` method can be seen in Listing 4.4. This method is not used in Oasis Local Db.

---

```

1   public String getType(Uri uri) {
2       switch(sUriMatcher.match(uri)) {
3           .
4           .
5           .
6           case AUTHUSERS_TYPE_LIST:
7               return AuthUsersMetaData.CONTENT_TYPE_AUTHUSERS_LIST;
8           case AUTHUSERS_TYPE_ONE:
9               return AuthUsersMetaData.CONTENT_TYPE_AUTHUSER_ONE;
10          .
11          .
12          .
13          default:
14              throw new IllegalArgumentException("Unknown URI: " + uri);
15      }
16  }

```

---

Listing 4.4: The `getType()` method.

- `query()` - called when an application wants to query in the Oasis Local Db. The `query` method can be seen in Listing 4.5.

---

```

1   public Cursor query(Uri uri, String[] projection, String selection, String[]
2                     selectionArgs, String sortOrder) {
3       SQLiteQueryBuilder builder = new SQLiteQueryBuilder();
4       switch(sUriMatcher.match(uri)) {
5           .
6           .
7           case AUTHUSERS_TYPE_LIST:
8               builder.setTables(AuthUsersMetaData.Table.TABLE_NAME);
9               builder.setProjectionMap(authusersProjectionMap);
10              break;
11           case AUTHUSERS_TYPE_ONE:
12               builder.setTables(AuthUsersMetaData.Table.TABLE_NAME);
13               builder.setProjectionMap(authusersProjectionMap);
14               builder.appendWhere(AuthUsersMetaData.Table.COLUMN_ID + " = " +
15                   uri.getPathSegments().get(1));
16               break;
17           .
18           .
19           default:
20               throw new IllegalArgumentException("Unknown URI: " + uri);
21           }
22       SQLiteDatabase db = dbHelper.getReadableDatabase();
23       Cursor queryCursor = builder.query(db, projection, selection, selectionArgs, null,
24                                         null, null);
25       queryCursor.setNotificationUri(getContext().getContentResolver(), uri);
26   }

```

---

Listing 4.5: The `query()` method.

- `insert()` - called when an application wants to insert data into the Oasis Local Db. The `insert()` method can be seen in Listing 4.6.

---

```

1   public Uri insert(Uri uri, ContentValues values) {
2       SQLiteDatabase db = dbHelper.getWritableDatabase();
3       long rowId;
4       Uri _uri;
5

```

---

```

6     switch(sUriMatcher.match(uri)) {
7
8
9
10    case AUTHUSERS_TYPE_LIST:
11        try {
12            rowId = db.insertOrThrow(AuthUsersMetaDataTable.TABLE_NAME, null, values);
13            _uri = ContentUris.withAppendedId(AuthUsersMetaDataTable.CONTENT_URI, rowId);
14            getContext().getContentResolver().notifyChange(_uri, null);
15        } catch (SQLiteConstraintException e) {
16            _uri = ContentUris.withAppendedId(AuthUsersMetaDataTable.CONTENT_URI, -1);
17        }
18        return _uri;
19
20
21    default:
22        throw new IllegalArgumentException("Unknown URI: " + uri);
23    }
24
25}

```

---

Listing 4.6: The insert() method.

- update() - called when an application wants to update existing data in the Oasis Local Db. The update() method can be seen in Listing 4.7.

```

1     public int update(Uri uri, ContentValues values, String where, String[] whereArgs) {
2         SQLiteOpenHelper dbHelper = dbHelper.getWritableDatabase();
3         int rowsUpdated = 0;
4         String rowId;
5
6         switch(sUriMatcher.match(uri)) {
7
8
9
10        case AUTHUSERS_TYPE_LIST:
11            rowsUpdated = db.update(AuthUsersMetaDataTable.TABLE_NAME, values, where,
12                                    whereArgs);
13            break;
14        case AUTHUSERS_TYPE_ONE:
15            rowId = uri.getPathSegments().get(1);
16            rowsUpdated = db.update(AuthUsersMetaDataTable.TABLE_NAME,
17                                   values,
18                                   AuthUsersMetaDataTable.COLUMN_ID + " = " + rowId +
19                                   (!TextUtils.isEmpty(where) ? " AND (" + where + ")" : ""),
20                                   whereArgs);
21            break;
22
23        default:
24            throw new IllegalArgumentException("Unknown URI: " + uri);
25        }
26
27        getContext().getContentResolver().notifyChange(uri, null);
28        return rowsUpdated;
29    }

```

---

Listing 4.7: The update() method.

- delete() - called when an application wants to delete existing data in the Oasis Local Db. The delete() method can be seen in Listing 4.8.

```

1     public int delete(Uri uri, String where, String[] whereArgs) {
2         SQLiteOpenHelper dbHelper = dbHelper.getWritableDatabase();
3         int rowsDeleted = 0;
4         String rowId;
5
6

```

---

```

7
8     .
9     case AUTHUSERS_TYPE_LIST:
10    rowsDeleted = db.delete(AuthUsersMetaData.Table.TABLE_NAME, where, whereArgs);
11    break;
12
13    case AUTHUSERS_TYPE_ONE:
14    rowId = uri.getPathSegments().get(1);
15    rowsDeleted = db.delete(AuthUsersMetaData.Table.TABLE_NAME,
16                           AuthUsersMetaData.Table.COLUMN_ID + " = " + rowId +
17                           (!TextUtils.isEmpty(where) ? " AND (" + where + ")" : ""),
18                           whereArgs);
19    break;
20
21    .
22    .
23
24    default:
25        throw new IllegalArgumentException("Unknown URI: " + uri);
26    }
27
28    getContext().getContentResolver().notifyChange(uri, null);
29    return rowsDeleted;
30}

```

---

Listing 4.8: The delete() method.

The implemented methods in the content provider supply the functionality for the Oasis Local Db. This functionality can be utilized in the implementation of the Oasis Lib.

# CHAPTER 5

---

## Oasis Lib

---

In this chapter we describe the Oasis Lib. The Oasis Lib is the library, which works as a connection between the Oasis Local Db, see Section 4 on page 23, and the GIRAf applications. The Oasis Lib provides an API, which the GIRAf applications can use. The structure of the Oasis Lib is described in Section 5.1. Finally the implementation of the Oasis Lib is described in Section 5.2 on page 33.

### 5.1 Structure

The structure of the Oasis Lib, have been inspired of the MVC pattern, where the system is divided into three parts; Model, View, and Controller.

In Oasis Lib the Model part is a package containing model classes. Each model class represents a table in the Oasis Local Db. The model classes are used to encapsulate the data, which is to be stored and retrieved from the Oasis Local Db. The reason that we use model classes is to ease it for the users of the library and to make a uniform way of storing and retrieving data. The model classes can be seen in Figure 5.1 on the next page.

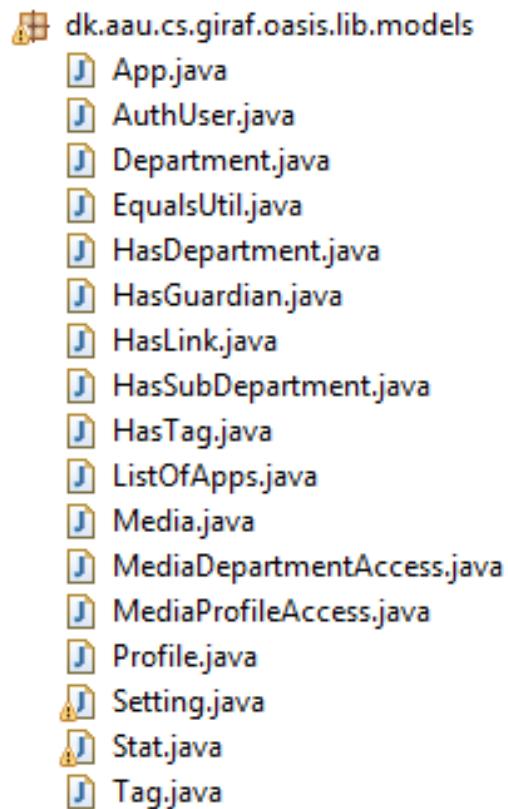


Figure 5.1: The models in the Oasis Lib

The Controller part is the package containing all the methods, which the developers can use to interact with Oasis Local Db. The controller methods have been divided into several classes. The division can be seen in Figure 5.2 on the facing page.

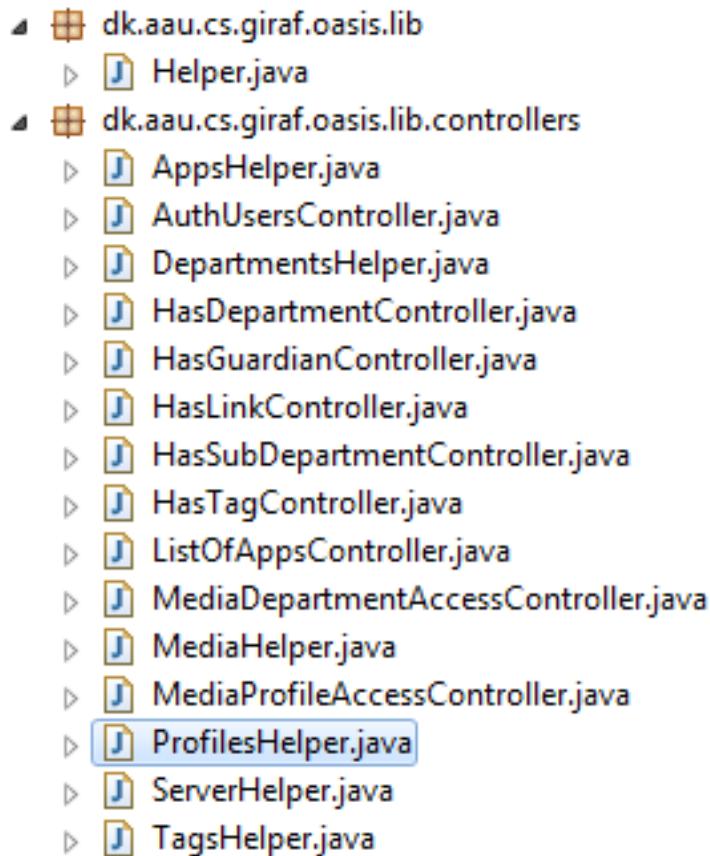


Figure 5.2: The controllers in the Oasis Lib

The controllers are divided by the models they manipulate, this means that for each table in the Oasis Local Db there is a controller.

In the Oasis Lib there is no direct reference to the Views from the MVC pattern. This is because the individual applications in the GIRAF system is seen as a view.

## 5.2 Implementation

The Oasis Lib has been designed with the intention of having as few method calls as possible to gain access to the Oasis Local Db. The code for all the implemented methods will not be shown in this section. Two examples from the Oasis Lib will be presented, these methods are `autenticateProfile` and `getProfileById`.

The method `autenticateProfile` is used to authenticate a profile in order to decide what informations the user should be allowed access to.

First the method verifies that the input is not null and that the certificate conforms to the rules for the certificates, if the certificate is rejected, null is returned to indicate this.

After the certificate has been verified the profile id will be retrieved from the Oasis Local Db, iff a profile exists with that certificate. In case a profile exist with the certificate the id will be returned and the profile model will be retrieved from the Oasis Local Db. If no profile with the certificate exists, -1 will be returned and no profile model will be retrieved.

The code for autenticateProfile can be seen in Listing 5.1.

---

```

1  public Profile authenticateProfile(String certificate) {
2      if (certificate == null || !certificate.matches("[a-z]{200}")) {
3          return null;
4      }
5
6      Profile profile = null;
7      long id = au.getIdByCertificate(certificate);
8
9      if (id != -1) {
10          profile = getProfileById(id);
11      }
12
13      return profile;
14 }
```

---

Listing 5.1: The authenticateProfile method.

The method getProfileById is used the retrieve a profile model from the database. The model is retrived using the profile id as a parameter to get the model by.

First it must be ensured that the id is above zero, as the database can not handle zero or negative values. After this check the database is queried to retrive the profile model. A conversion is needed as the database returns a Cursor object and this object must be converted into a profile model. [Teal2c] This conversion is done in the auxiliary method cursorToProfile, which maps values in the Cursor to values in the profile model. If the Cursor from the database is null or empty, no profile was found in the database.

The code for getProfileById method can be seen in Listing 5.2.

---

```

1  public Profile getProfileById(long id) {
2      Profile profile = null;
3
4      if (id <= 0) {
5          return null;
6      }
7
8      Uri uri = ContentUris.withAppendedId(ProfileMetaData.CONTENT_URI, id);
9      Cursor c = _context.getContentResolver().query(uri, columns, null, null, null);
10
11     if (c != null) {
12         if (c.moveToFirst()) {
13             profile = cursorToProfile(c);
14         }
15         c.close();
16     }
17
18     return profile;
19 }
```

---

---

**Listing 5.2: The getProfileById method.**

For further information on how the Oasis Lib methods work, see the JavaDoc or the source code, which are placed on the attached CD-ROM.



# CHAPTER 6

---

## Oasis App

---

In this chapter we describe the Oasis App. The Oasis App is an application, which demonstrates some of the utilities the Oasis Lib offers. First the design of the Oasis App is described in Section 6.1. After that the implementation of the Oasis Lib in the Oasis App is described in Section 6.2.

### 6.1 Design

The idea behind the Oasis App is that we want to make a tool, for the guardians, to manage the profile data, by giving them CRUD (Create, Read, Update, and Delete) options.

The application design should be revolving around the database structure with the key functionality being profile handling. The application design has been divided into two parts: the home screen of the application and an overview screen showing relevant data.

Paper prototypes of the GUI has been created and evaluated. Several prototypes have been made and the chosen prototype for the app can be seen in Figure 6.1 on the next page and Figure 6.2 on page 39.

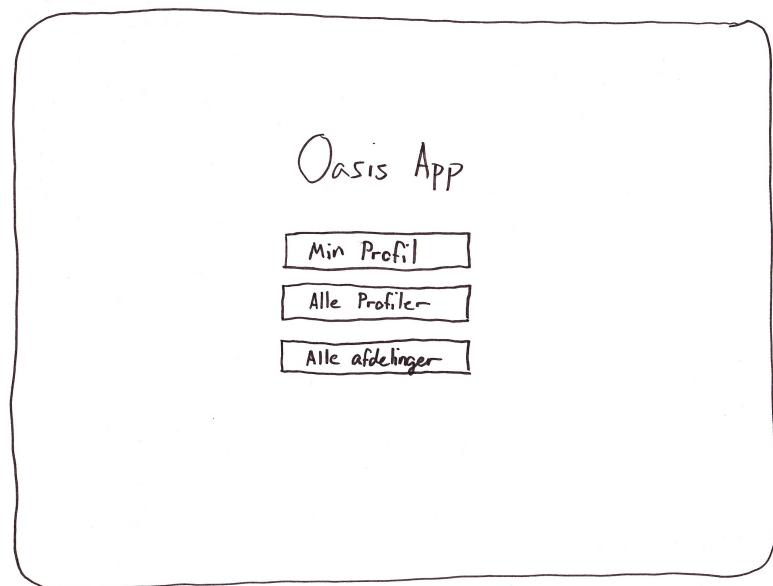


Figure 6.1: The prototype for the home screen.

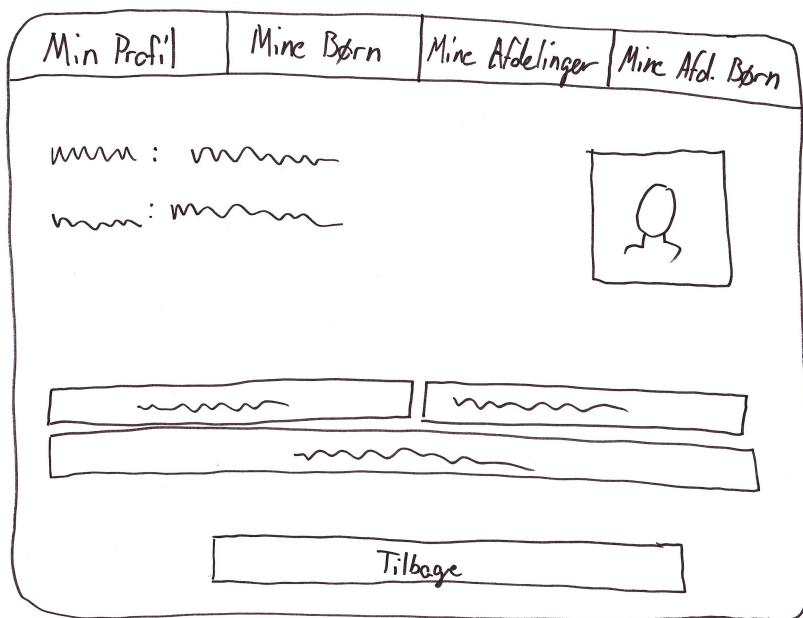


Figure 6.2: The prototype for the overview screen.

The final prototypes have been implemented as the GUI in the Oasis App.

## 6.2 Implementation

The Oasis App is split into two activities; `MainActivity` and `FragParentTab`.

### 6.2.1 MainActivity

The `MainActivity` is the activity that starts at application startup. It uses the `main.xml` as its layout file, which is a layout file containing three buttons, which can be seen on Figure 6.3.

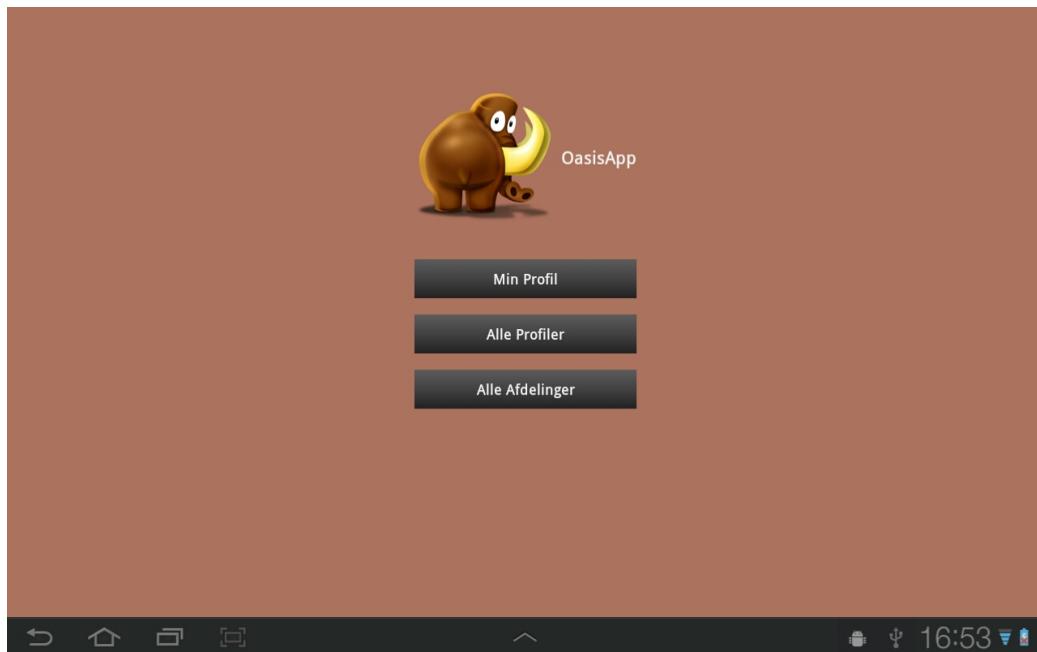


Figure 6.3: An image of the MainActivity layout.

A code snippet of the MainActivity's code can be seen in Listing 6.1.

```
1 .
2 .
3 .
4 public class MainActivity extends Activity implements OnClickListener {
5
6     private Button bMyProfile, bAllProfiles, bAllDepartments, bAddDummyData;
7     private Intent direct;
8     private long guardianId;
9     public Helper helper;
10    public static Profile guardian;
11    public static Profile child;
12    public static int color;
13
14    @Override
15    public void onCreate(Bundle savedInstanceState){
16        super.onCreate(savedInstanceState);
17
18        .
19        .
20        .
21
22        helper = new Helper(this);
23
24        Bundle extras = getIntent().getExtras();
25        if (extras != null) {
26            guardianId = extras.getLong("currentGuardianID");
27            color = extras.getInt("appBackgroundColor");
28            guardian = helper.profilesHelper.getProfileById(guardianId);
29        }
30
31        setContentView(R.layout.main);
32
33        initializeViews();
34    }
35
36    private void initializeViews() {
37        findViewById(R.id.UpperLayout).setBackgroundColor(color);
38
39        bMyProfile = (Button) findViewById(R.id.bMyProfile);
```

```

40     bMyProfile.setOnClickListener(this);
41     bAllProfiles = (Button) findViewById(R.id.bAllProfiles);
42     bAllProfiles.setOnClickListener(this);
43     bAllDepartments = (Button) findViewById(R.id.bAllDepartments);
44     bAllDepartments.setOnClickListener(this);
45     bAddDummyData = (Button) findViewById(R.id.bAddDummyData);
46     if (guardian == null) {
47         bAddDummyData.setOnClickListener(this);
48     } else {
49         bAddDummyData.setVisibility(View.GONE);
50     }
51 }
52
53 @Override
54 public void onClick(View v) {
55     direct = new Intent(this, FragParentTab.class);
56
57     switch (v.getId()) {
58         case R.id.bMyProfile:
59             if (guardian != null) {
60                 direct.putExtra("tabView", FragParentTab.TABPROFILE);
61                 startActivity(direct);
62             } else {
63                 Toast.makeText(this, R.string.noprofile, Toast.LENGTH_SHORT).show();
64             }
65             break;
66         case R.id.bAllProfiles:
67             direct.putExtra("tabView", FragParentTab.TABALLPROFILES);
68             startActivity(direct);
69             break;
70         case R.id.bAllDepartments:
71             direct.putExtra("tabView", FragParentTab.TABALLDEPARTMENTS);
72             startActivity(direct);
73             break;
74         .
75         .
76         .
77     }
78 }
79 }
```

---

Listing 6.1: The MainActivity class

As the activity starts it gets the information of which guardian who is currently logged in to the GIRAF system and what background color the Oasis App is currently set to by the Launcher. When one of the buttons is clicked, the `MainActivity` will start the `FragParentTab` activity and put the corresponding integer in the intent's extra data.

### 6.2.2 FragParentTab

The `FragParentTab` is the activity, which is started by the `MainActivity` activity. The activity has the responsibility of managing what view to show, by using fragments. We chose fragments because we wanted a tab layout. An example of the tab layout view can be seen in Figure 6.4 on the next page.

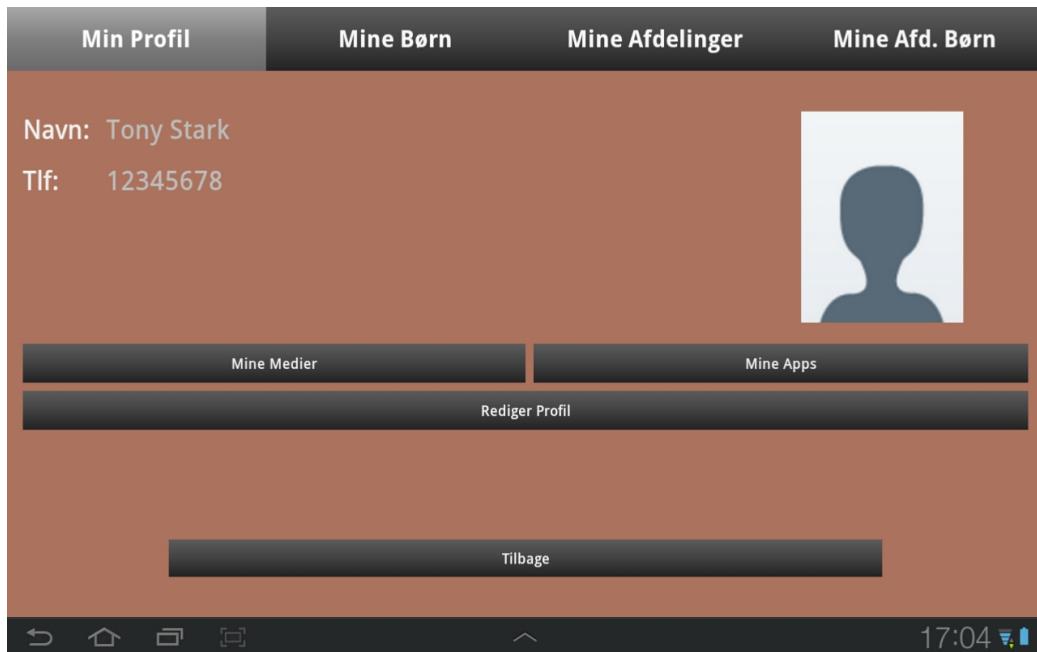


Figure 6.4: An image of the FragParentTab layout.

The FragParentTab activity can be seen in Listing 6.2 on the following page.

```
1 .
2 .
3 .
4 public class FragParentTab extends Activity {
5
6     private int tabView;
7     public final static int TABPROFILE = 0;
8     public final static int TABAPP = 1;
9     public final static int TABMEDIA = 2;
10    public final static int TABALLPROFILES = 3;
11    public final static int TABALLDEPARTMENTS = 4;
12    public final static int TABCHILD = 5;
13    public final static int TABCHILDAPP = 6;
14    public final static int TABCHILDMEDIA = 7;
15    static FragmentManager t;
16
17    @Override
18    protected void onCreate(Bundle savedInstanceState) {
19        super.onCreate(savedInstanceState);
20
21        .
22        .
23        .
24
25        Bundle extras = getIntent().getExtras();
26        if (extras != null) {
27            tabView = extras.getInt("tabView");
28        } else {
29            tabView = -1;
30        }
31
32        setContentView(R.layout.fragments_view);
33
34        findViewById(R.id.fragUpperLayout).setBackgroundColor(MainActivity.color);
35
36        t = getFragmentManager();
37
38        switch(tabView) {
39            case TABPROFILE:
```

```

40         t.beginTransaction().add(R.id.fDetails, new TabManagerProfile()).commit();
41         break;
42     case TABALLPROFILES:
43         t.beginTransaction().add(R.id.fDetails, new TabManagerAllProfiles()).commit();
44         break;
45     case TABALLDEPARTMENTS:
46         t.beginTransaction().add(R.id.fDetails, new TabManagerAllDepartments()).commit();
47         break;
48     case TABCHILD:
49         t.beginTransaction().add(R.id.fDetails, new TabManagerChild()).commit();
50     }
51 }
52
53 public static void switchTab(int tabViewId) {
54
55     switch(tabViewId) {
56         case TABPROFILE:
57             t.beginTransaction().replace(R.id.fDetails, new TabManagerProfile()).commit();
58             break;
59         case TABMEDIA:
60             t.beginTransaction().replace(R.id.fDetails, new TabManagerMedia()).commit();
61             break;
62         case TABAPP:
63             t.beginTransaction().replace(R.id.fDetails, new TabManagerApp()).commit();
64             break;
65         case TABCHILD:
66             t.beginTransaction().replace(R.id.fDetails, new TabManagerChild()).commit();
67             break;
68         case TABCHILDMEDIA:
69             t.beginTransaction().replace(R.id.fDetails, new TabManagerChildMedia()).commit();
70             break;
71         case TABCHILDAPP:
72             t.beginTransaction().replace(R.id.fDetails, new TabManagerChildApp()).commit();
73             break;
74     }
75 }
76
77 @Override
78 protected void onResume() {
79     super.onResume();
80     t = getSupportFragmentManager();
81 }
82 }
```

---

Listing 6.2: The FragParentTab class

The activity controls which fragment it must show and this is done in two ways. The first way is when the activity is created, it decides which fragment to show, by using the integer it gets from the `MainActivity`. This integer represents a fragment class of every tab layout view. This fragment is then added to the fragment stack.

The other way is when a fragment wants to replace itself with another fragment. Here the fragment calls the `switchTab` method, in the `FragParentTab` activity, with the replacing view integer as a parameter.

### 6.2.3 Utilizing the Oasis Lib

Before utilizing the methods within the Oasis Lib, the developer must include the library. It is also necessary to instantiate a helper object before it can be used. When instantiating the object it is necessary to input the current activity's context as a parameter. This is needed to give the Oasis Lib the information about where it is called from. An example of how to instantiate the helper object, can be seen in Listing 6.3.

---

```
1 Helper helper = new Helper(getActivity().getApplicationContext());
```

---

Listing 6.3: Example of Instantiating a helper object.

After the instantiation it is possible to call all the methods within the Oasis Lib. An example of calling a method can be seen in Listing 6.4.

---

```
1 guardian = helper.profilesHelper.getProfileById(guardianId);
```

---

Listing 6.4: Call method from the Oasis Lib.

# CHAPTER 7

---

## Testing

---

In the chapter aspects of dynamic white box testing will be explained in Section 7.1. Furthermore the results of the usability test will be presented in Section 7.2.1 on page 54.

### 7.1 Dynamic White Box Testing

To ensure the correctness of the Oasis Lib we enforced dynamic white box testing through unit tests [Pat, IEE93, pp106]. The Oasis Lib is used by all GIRAF applications this means that if a bug exists in the Oasis Lib there is a potential bug in all GIRAF applications. Therefore the Oasis Lib must be thoroughly tested to make sure that few or no bugs exists.

The Oasis Local Db will be tested along with the Oasis Lib, this is more efficient as more code will be tested in every test, but it has the drawback that if a bug appears more code will have to be investigated in order to locate the bug.

As this project have been developed using the agile development method Scrum we have not devised a full test plan as this is not needed [Pat, pp263]. The focus of the tests will be on test-to-pass [Pat, pp66]. This ensures that the Oasis Lib will function as intended, though there is no guarantee that the Oasis Lib will work if invalid parameters are used.

### 7.1.1 The Test Designs

A test design have been elaborated for each method in the helper classes of the Oasis Lib [Pat, pp281]. Examples of the test designs are presented in the following tables.

The test design in Table 7.1 is for the `authenticateProfile()` method. This test design tests if a profile can be authenticated. This is an essential method for the GIRAF platform, and therefore it is tested both using test-to-pass and test-to-fail tests to ensure that this method is particular robust.

<b>Identifier:</b>	TD00001
<b>Feature to be tested:</b>	Authenticate profile.
<b>Approach:</b>	An automated test will be made to authenticate a profile by its certificate.  1. Enter a profile with a specific certificate in the database.  2. Authenticate the profile by its certificate.
<b>Test case identification:</b>	Check valid certificate Test Case ID# 00001 Check too long certificates Test Case ID# 00002 Check too short certificates Test Case ID# 00003 Check invalid certificates Test Case ID# 00004
<b>Pass/fail criteria:</b>	All valid profile certificates that matches the certificate in the database must be accepted as well as all invalid certificates must be rejected.

Table 7.1: Test Design for `authenticateProfile()`.

The test design in Table 7.2 on the facing page is for the `getProfileById()` method. This is also an important method for the GIRAF system, therefore it is tested with the same mix of test-to-pass and test-to-fail tests. The tests ensures the robustness of the method.

The test design in Table 7.3 on the next page is for the `getChildrenByGuardian()` method. The test ensures the method performs as intended under normal operation. This is done with a single test-to-pass test, which tests if children associated to a guardian can be retrieved from the database.

<b>Identifier:</b>	TD00002
<b>Feature to be tested:</b>	Get profile by id.
<b>Approach:</b>	<p>An automated test will be made in order to ensure that the Oasis Library supports getting a profile by its id from the database.</p> <ol style="list-style-type: none"> <li>1. Add Profiles to the database.</li> <li>2. Get profile by id and verify the output.</li> </ol>
<b>Test case identification:</b>	<p>Check valid id present in the database Test Case ID# 00005</p> <p>Check id not in the database Test Case ID# 00006</p> <p>Check negative id Test Case ID# 00007</p>
<b>Pass/fail criteria:</b>	The profile matching the id should be returned else null should be returned.

Table 7.2: Test Design for getProfileById().

<b>Identifier:</b>	TD00003
<b>Feature to be tested:</b>	Get children by guardian.
<b>Approach:</b>	<p>An automated test will be made to ensure that the Oasis Library supports getting all children associated with one guardian.</p> <ol style="list-style-type: none"> <li>1. Children and guardians should be added to the database.</li> <li>2. Associations between some children and guardians should be made.</li> <li>3. Get children by guardian should be called and the output verified.</li> </ol>
<b>Test case identification:</b>	Check valid guardian with children associated Test Case ID# 00008
<b>Pass/fail criteria:</b>	The list of children should match the children associated with the guardian.

Table 7.3: Test Design for getChildrenByGuardian.

### 7.1.2 The Test Cases

For each test design in Section 7.1.1 on page 46, one or more test cases has been created [Pat, pp283]. Each test case ensures a part of the tested method performs as intended in the test situation. The test cases for the test designs presented in Section 7.1.1 on page 46 will be shown in the following tables: Table 7.4, Table 7.5, Table 7.6 on the facing page, Table 7.7 on the next page, Table 7.8 on the facing page, Table 7.9 on page 50, Table 7.10 on page 50, and Table 7.11 on page 50.

<b>Identifier:</b>	TC00001
<b>Test item:</b>	Valid Certificate handling of the authenticateProfile() method.
<b>Input specification:</b>	A valid certificate.
<b>Output specification:</b>	The model of the authenticated profile.
<b>Environmental needs:</b>	A database is needed and the profile model.
<b>Special procedural requirements:</b>	None.
<b>Intercase dependencies:</b>	None.

Table 7.4: Test Case for valid certificate handling of the authenticateProfile() method.

<b>Identifier:</b>	TC00002
<b>Test item:</b>	Certificate lenght too short handling of the authenticateProfile() method.
<b>Input specification:</b>	A certificate shorther than 200 chars.
<b>Output specification:</b>	Null.
<b>Environmental needs:</b>	A database is needed and the profile model.
<b>Special procedural requirements</b>	None.
<b>Intercase dependencies:</b>	None.

Table 7.5: Test Case for certificate lenght too short handling of the authenticateProfile() method.

### 7.1.3 Unit Test Implementation

All the tests cases have been used to construct the 89 unit tests, which have helped in the development of the Oasis Lib. The tests have been split up into three parts; initialization, execution, and assertion.

<b>Identifier:</b>	TC00003
<b>Test item:</b>	Certificate lenght too long handling of the authenticateProfile() method.
<b>Input specification:</b>	A certificate longer than 200 chars.
<b>Output specification:</b>	Null.
<b>Environmental needs:</b>	A database is needed and the profile model.
<b>Special procedural requirements:</b>	None.
<b>Intercase dependencies:</b>	None.

Table 7.6: Test Case for certificate lenght too long handling of the authenticateProfile() method.

<b>Identifier:</b>	TC00004
<b>Test item:</b>	Invalid Certificate handling of the authenticateProfile() method.
<b>Input specification:</b>	An invalid certificate.
<b>Output specification:</b>	Null.
<b>Environmental needs:</b>	A database is needed and the profile model.
<b>Special procedural requirements:</b>	None.
<b>Intercase dependencies:</b>	None.

Table 7.7: Test Case for invalid certificate handling of the authenticateProfile() method.

<b>Identifier:</b>	TC00005
<b>Test item:</b>	Valid id present in the database handling of the getProfileById() method.
<b>Input specification:</b>	A valid id.
<b>Output specification:</b>	The profile matching the id.
<b>Environmental needs:</b>	A database is needed and the profile model.
<b>Special procedural requirements:</b>	None.
<b>Intercase dependencies:</b>	None.

Table 7.8: Test Case for valid id handling of the getProfileById() method.

<b>Identifier:</b>	TC00006
<b>Test item:</b>	Invalid id not present in the database handling of the getProfileById() method.
<b>Input specification:</b>	An invalid id.
<b>Output specification:</b>	Null.
<b>Environmental needs:</b>	A database is needed and the profile model.
<b>Special procedural requirements:</b>	None.
<b>Intercase dependencies:</b>	None.

Table 7.9: Test Case for invalid id handling of the getProfileById() method.

<b>Identifier:</b>	TC00007
<b>Test item:</b>	Negative id handling of the getProfileById() method.
<b>Input specification:</b>	A negative id.
<b>Output specification:</b>	Null.
<b>Environmental needs:</b>	A database is needed and the profile model.
<b>Special procedural requirements:</b>	None.
<b>Intercase dependencies:</b>	None.

Table 7.10: Test Case for negative id handling of the getProfileById() method.

<b>Identifier:</b>	TC00008
<b>Test item:</b>	Valid guardian with children associated handling of the getChildrenByGuardian() method.
<b>Input specification:</b>	A valid guardian.
<b>Output specification:</b>	A list of associated children.
<b>Environmental needs:</b>	A database is needed and the profile model.
<b>Special procedural requirements:</b>	None.
<b>Intercase dependencies:</b>	None.

Table 7.11: Test Case for valid guardian with children associated handling of the getChildrenByGuardian() method.

The unit test for the `testAuthenticateProfileWithValidCertificate()` method can be seen in Listing 7.1. The method starts by initializing the environment. This means that a random valid certificate is created and a profile – the expected profile – is entered in the database and the certificate for the profile is set to the newly created certificate.

After the initialization the method is executed and the retrieved profile is stored as the actual profile in order to have some data for the assertion. At the end an `assertEquals` is called to ensure that the expected profile is the same as the actual profile. If this is the case the test passes, otherwise the test fails and the two profiles are printed in the test log.

---

```

1 public void testAuthenticateProfileWithValidCertificate() {
2     Random rnd = new Random();
3     StringBuilder cert = new StringBuilder();
4     for (int i = 0; i < 200; i++) {
5     {
6         cert.append((char)(rnd.nextInt(26) + 97));
7     }
8     String certificate = cert.toString();
9     Profile expectedProfile = new Profile("Test", "Profile", null,
10        Profile.pRoles.GUARDIAN.ordinal(), 12345678, null, null);
11
12     long id = mActivity.helper.profilesHelper.insertProfile(expectedProfile);
13     expectedProfile.setId(id);
14
15     mActivity.helper.profilesHelper.setCertificate(certificate, expectedProfile);
16
17     Profile actualProfile = mActivity.helper.profilesHelper.authenticateProfile(certificate);
18
19     assertEquals("Should return profile; Test Profile", expectedProfile, actualProfile);
}

```

---

**Listing 7.1:** The `testAuthenticateProfileWithValidCertificate()` method.

The unit test for the `testAuthenticateProfileWithInvalidCertificate()` method can be seen in Listing 7.2. This method also starts by initializing its environment but in this method the created certificate is invalid. The rest of the initialization is the same as in the valid test and the execution is the same as well. In this test `assertNull` is used to confirm that there is not retrieved a profile from the database due to an invalid certificate.

---

```

1 public void testAuthenticateProfileWithInvalidCertificate() {
2     Random rnd = new Random();
3     StringBuilder cert = new StringBuilder();
4     for (int i = 0; i < 200; i++) {
5     {
6         cert.append((char)(rnd.nextInt(26) + 65));
7     }
8     String certificate = cert.toString();
9     Profile expectedProfile = new Profile("Test", "Profile", null,
10        Profile.pRoles.GUARDIAN.ordinal(), 12345678, null, null);
11
12     long id = mActivity.helper.profilesHelper.insertProfile(expectedProfile);
13     expectedProfile.setId(id);
14
15     mActivity.helper.profilesHelper.setCertificate(certificate, expectedProfile);
16
17     Profile actualProfile = mActivity.helper.profilesHelper.authenticateProfile(certificate);
18
19     assertNull("Should return null", actualProfile);
}

```

---

---

**Listing 7.2:** The `testAuthenticateProfileWithInvalidCertificate()` method.

The remaining tests from the test suite have been created using the same structure; an initialization face, an execution face, and one or more assertions. These tests can be seen in the source code of the Oasis App.

### 7.1.4 The Test Results

The result for the unit tests are 88 out of 89 tests passed and this can be seen in Figure 7.1.

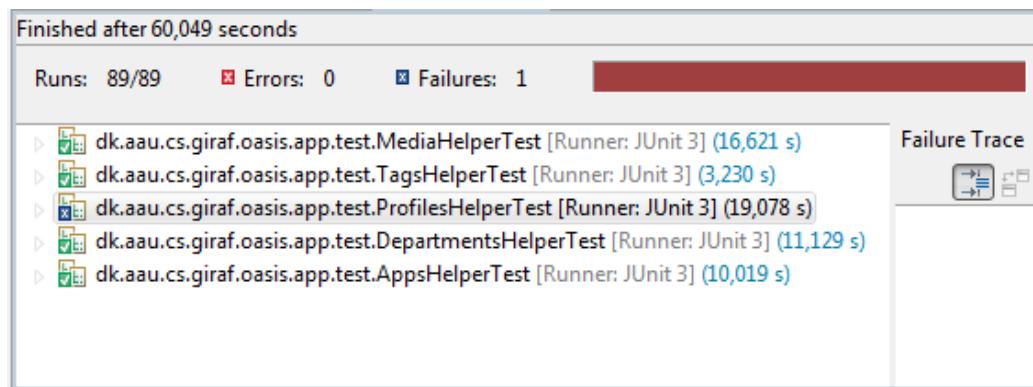


Figure 7.1: The result from all the performed unit tests.

The test that failed is `testGetChildrenByDepartmentAndSubDepartments()` and the result can be seen in Figure 7.2 on the next page.

The individual results for the rest of the test suite can be seen in Appendix 11.7 on page 100.

## 7.2 Usability Test

We decided to have a usability test performed on the Oasis App even though it was not completed. This gives a unique opportunity to modify the application before it is done.

The approach for the usability test can be found in 1.8 on page 7. The questions for the usability test of the Oasis App can be seen in ?? on page ??.

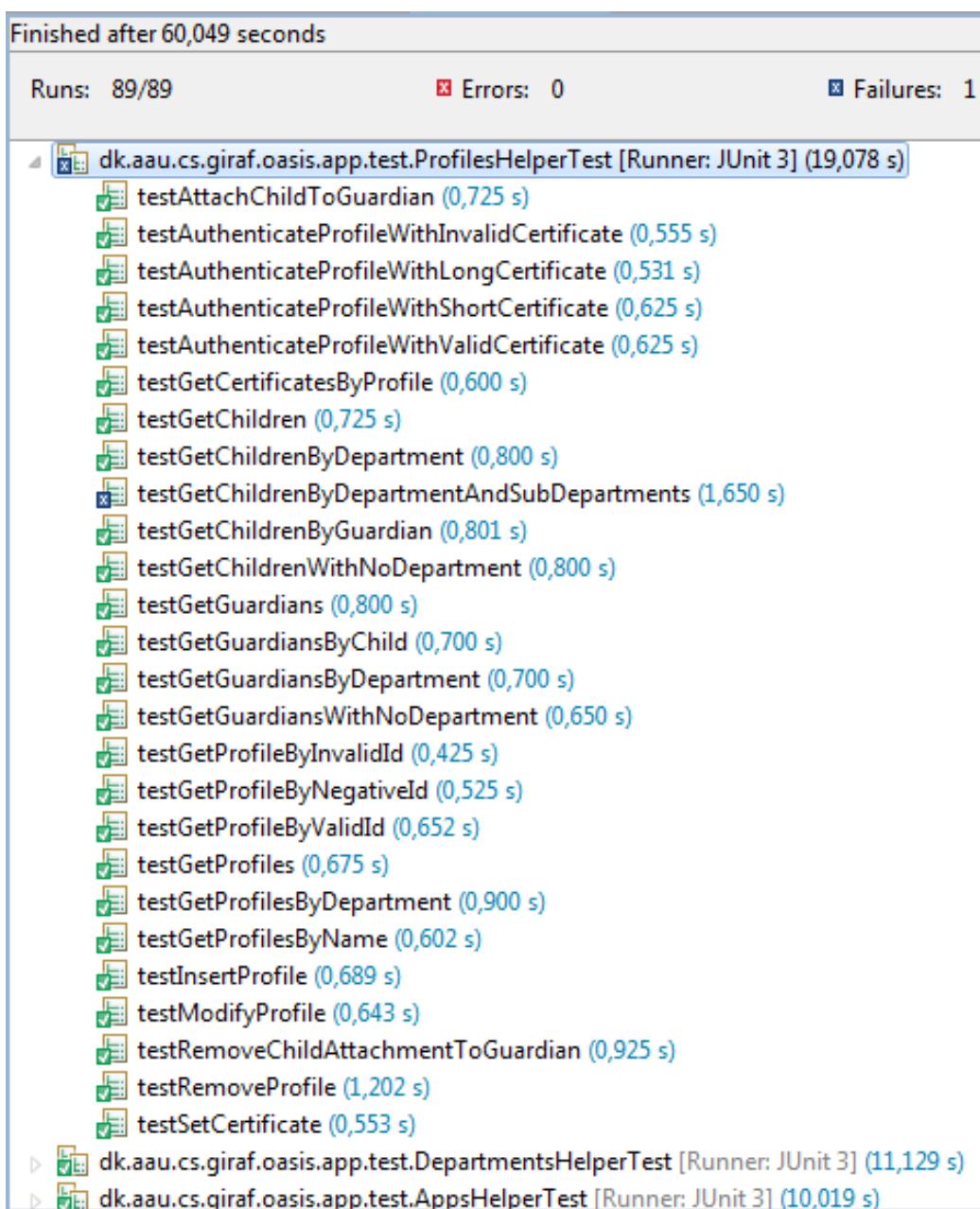


Figure 7.2: The result from the profilesHelper tests.

### 7.2.1 Results and Observations

The result of the usability test can be seen in Table 7.12.

Issues	Description
<b>Cosmetic:</b>	Profile id was showing. "Add child" not clear howto.
<b>Serious:</b>	Too many options, missing the overview. Difficult finding a childs profile.
<b>Critical:</b>	Data availability unclear.

Table 7.12: The issues found in the usability test.

The result shows the following number of issues; two cosmetic issues, two serious issues, and one critical issue.

## **Part IV**

# **Epilogue**



# CHAPTER 8

---

## Discussion

---

In the follow sections we will discuss the used development method and the system architecture.

### **8.1 Development Method**

In the following section we will discuss the development method, as described in Section 1.4 on page 5.

#### **8.1.1 Agile Development**

Using the agile development method, has given us the ability to adjust according to the requirements coming from the other groups. The Oasis Lib has been subject for many requirements, coming during sprints, and the agile development method has made it easy to adjust to requirements as they came.

#### **8.1.2 Meetings**

In the initial planning phase of the project we held several meetings to discuss which product should be made. During the project we have been meeting in the multi project group for the start of each sprint, as well as an evaluation at the end of each sprint. These meetings have given us the ability to follow what the other groups are doing at all times, and therefore plan a bit ahead of the requirements that might come.

### **8.1.3 Sprint Length**

On the meetings at the start of each sprint, we decided how long the sprint should run. Most sprints ended up being around seven half days of work. This sprint length was fitting for our group because we could finish some tasks, while keeping up with what the other groups needed.

### **8.1.4 Project Owner**

In this project we had no project owner, this made it a bit harder to decide things in the multi project meetings, as every person had to agree. However it added the option to influence the project, as an individual, instead of one person deciding it all. In some situations a project owner would have been able to make a decision and we could have avoided a lot of pointless discussion.

## **8.2 System architecture**

In the following section we will discuss the system architecture for Oasis, as described in section 2.3 on page 14.

When designing the architecture, there are multiple ways we could do it. We will list the options we have, their pros and cons, and argue why we choose the one we did.

The pros and cons can be seen in the following tables; Table ?? on page ??, Table ?? on page ??, Table ?? on page ??, Table ?? on page ??.

### **8.2.1 Choosing the architecture**

One of the requirements for the system was accessibility of data in offline mode. This requirement rules out the two options without a local database. The main difference between the two solutions left, is that one requires more development time, and the other forces the tablets to be updated every time the external database changes. Seeing that we could manage the increased development time, from developing two software layers, this solution seems like the more optimal one. Therefore we choose the one described in Table 8.3 on page 60.

<b>Pros:</b>	<b>Cons:</b>
<ul style="list-style-type: none"> <li>• Reduced development time, as you only have to develop one software layer</li> <li>• Access to data in offline mode</li> </ul>	<ul style="list-style-type: none"> <li>• It is not recommended to have direct access to the external database, due to the loss of security and the maintainability will be more complex</li> <li>• If more applications wants to access the external database, then a lot of connections will be made</li> <li>• If a change is made in the external database structure, one has to update the tablet to use it</li> </ul>

Table 8.1: Oasis Lib with direct connection to an external database and with a local database

<b>Pros:</b>	<b>Cons:</b>
<ul style="list-style-type: none"> <li>• Data are always synchronized</li> <li>• Reduced development time, as you only have to develop one software layer</li> </ul>	<ul style="list-style-type: none"> <li>• No access to data, if the external database is offline</li> <li>• If a change is made in the external database structure, one has to update the tablet to use it</li> <li>• It is not recommended to have direct access to the external database, due to the loss of security and the maintainability will be more complex</li> <li>• If more applications wants to access the external database, then a lot of connections will be made</li> </ul>

Table 8.2: Oasis Lib with direct connection to an external database and without a local database

<b>Pros:</b>	<b>Cons:</b>
<ul style="list-style-type: none"> <li>• The external database can be changed without updating the tablet</li> <li>• Access to data, if the external database is offline</li> </ul>	<ul style="list-style-type: none"> <li>• Increased development time, as you have to develop two software layers</li> <li>• Increased development time, as you have to setup two databases</li> <li>• Data is not always synchronized</li> </ul>

Table 8.3: Oasis Lib with connection to software layer on the server and with a local database

<b>Pros:</b>	<b>Cons:</b>
<ul style="list-style-type: none"> <li>• The external database can be changed without updating the tablet</li> <li>• Data is always synchronized</li> </ul>	<ul style="list-style-type: none"> <li>• No access to data if the external database is offline</li> <li>• Increased development time, as you have to develop two software layers</li> <li>• Data is not always synchronized</li> </ul>

Table 8.4: Oasis Lib with connection to software layer on the server and without a local database

# CHAPTER 9

---

## Conclusion

---

In this chapter we described the things we concluded along the project.

### 9.1 GIRAF Problem Definition

In the multi project we made a problem definition. The problem definition is as follows:

*How can we ease the daily life for children with ASD and their guardians, while complying with the study regulation?*

To comply with the study regulations, we (the multi project) have designed and implemented a system called GIRAF. To ensure that every project group has the opportunity to be up to date of the progress of the multi project, we (the multi project) agreed on using the same development method 1.4 on page 5.

### 9.2 Oasis Problem Definition

In Oasis we have specified the multi project problem definition to fit our project. The problem definition is as follows:

*How can we provide a set of tools, which can help develop applications for the GIRAF system?*

We have designed and implemented an administration module for the GI-RAF system. The administration module consists of three parts; a local database, called Oasis Local Db, a library, called Oasis Lib, and an administration application, called Oasis App. The Oasis Local Db ensures that the data is saved correctly. The Oasis Lib ensures that the different applications of the GIRAF system can interact with Oasis Local Db. The Oasis App ensures that the guardians can manage profiles of the GIRAF system, directly on the tablets.

### **9.3 Oasis**

We began by examining the previous student reports, to check if there was any aspects we could reuse in the project. After that we examined the possibilities of how to save data on an Android device, which lead us to start working on the architecture of the local database. Along with that we gathered requirements from the other groups to start working on the architecture of the library. When we finished the Oasis Local Db and the Oasis Lib we started working on the Oasis App. The Oasis App shows some of the capabilities of the Oasis Lib, and by the same time give the guardians a possibility on managing the different profiles of the GIRAF system.

### **9.4 Testing**

To verify the quality of the multi project, we conducted a usability test. The test subjects consisted of the customers of the multi project. The test highlighted some issues in the Oasis App, which could be corrected by the next group of developers, the issues can be seen in Section 7.2.1 on page 54. We created unit tests for the Oasis Lib. The tests were made at the end of the project period. This should be an ongoing process instead of doing them at the end of the semester. The tests ensures indirectly, that the Oasis Local Db works.

# CHAPTER 10

---

## Future Work

---

A number of tasks did not get completed in this semester. As this project is going to be continued by others students, we will provide an overview of some of the changes we did not complete.

### 10.1 Server Synchronization

One of the main things which did not get completed was the synchronization with Savannah. This was due to components not being ready at the time the task was scheduled. In the continuation of the project, this can be implemented by using the components which Savannah provides. Completing this task will make the sync status component in the launcher work properly. Another improvement which can be implemented in a future continuation of the project, is the ability to synchronize images on the device, and update the paths dynamically.

### 10.2 Unit Tests

Unit testing is an essential part of the project. We created unit test for all the helper classes in the Oasis Lib, but for a major part it was only test-to-pass tests. Therefore the Oasis Lib can be made more robust by implementing test-to-fail tests. In the future it can be beneficial to make unit tests for the Oasis Local Db

and the Oasis App. This would make the administration module more robust, because every “part” of the module is tested.

### 10.3 Certificates

Certificates is one of the core elements in the Launcher, and this is reflected in the Oasis Lib.

A feature that can be implemented for the certificates, is the possibility to set a time limit on the certificate, thereby enforcing a renewal of the certificate after the time limit has been exceeded. This would make the system more secure, but would rely on the users printing out new QR-codes, and the Oasis Lib to generate new QR-codes.

### 10.4 Media Table

As seen in the database schema in 4.1 on page 23, a media should be capable of having either a department or a profile as its owner id. The Oasis Lib only supports a profile as the owner of a media. The option for departments to be owners should be added, to make the Oasis Lib fully represent the database schema.

### 10.5 Oasis App

The Oasis App shows how the Oasis Lib can be utilized. A couple of changes and improvements can be done.

One thing which can be done is refactoring of the code. This refactoring would lower the amount of classes, increase the readability, and help with the understanding of the Oasis App source code.

Besides that the Oasis App is still missing some functionality. The functionality that is missing is; view other guardians profiles, create new media, create new applications, and create and manage settings of the applications and profiles.

The usability test showed that the Oasis App can use a better visual design to give a better overview of the application.



# **Part V**

# **Appendix**



# CHAPTER 11

---

## Requirements from Wombat

---

I behøver ikke smide det ind i objekter, da vi har vi allerede lavet objekter til vores data. Hvis vi blot kan få dataen i en eller anden form for array, er det helt fint.

Vi ved ikke helt hvad for noget data der skal gemmes i settings, men vi har forstået på Henrik at man selv kan definere det når man gemmer. Template

Function template Her skriver man funktionen skal kunne Data Her skriver man hvilken data man gerne vil modtage Damer Create

Funktion createAutistSettings Lave multiple Settings der er forbundet til en Autist

Funktion createLastUsedGuardian Lave LastUsed liste der er forbundet til en Guardian Retrieve

Funktion retrieveGuardianAutists Man skal kunne hente Guardian samt alle autister der er linket til denne guardian. Data Guardian Navn på guardian Autister

Funktion retrieveAutistSettings Man skal kunne hente en specifik autist. Data Autist Navn på autist Settings på autist

Funktion retrieveLastUsed Hente LastUsed liste fra en guardian Data Guardian LastUsed Update

Funktion updateAutistSetting Update setting på en bestemt autist

Funktion updateLastUsedGuardian Update en bestemt guardians LastLused Delete

Funktion deleteSettingAutist Slette en setting for en bestemt autist Funktion deleteLastUsedGuardian Slette LastUsed liste på en guardian

## **11.1 Project Backlog**

Here is the full project backlog for the project.

### Oasis Project Backlog

ID	Name	Area	Prioritet	Estimat	Dependency	How to demo	Note	Status
19	Sync with the online database	Server	1	10	Server	Enter data to the local db and sync with the online db. Open the online db and validate that the data is entered	Not started	
27	Create table 1 scheme for profiles	App	5	30	OasisLib	Show the app	Done	
28	Create table 2 scheme for media	Database	5	2	None	CRUD via demo app	Done	
29	Create table 3 scheme for departments	Database	5	2	None	CRUD via demo app	Done	
30	Create table 4 scheme for certificates	Database	5	2	None	CRUD via demo app	Done	
31	Create table 5 scheme for a list of apps	Database	5	2	None	CRUD via demo app	Done	
32	Create table 6 scheme for apps	Database	5	2	None	CRUD via demo app	Done	
33	Create view model 7 for a profile	Model	3	1	Profile table	CRUD via demo app	Done	
34	Create view model 8 for a media	Model	3	1	Media table	CRUD via demo app	Done	
35	Create view model 9 for a department	Model	3	1	Department table	CRUD via demo app	Done	
36	Create view model 10 for a certificate	Model	3	1	Certificate table	CRUD via demo app	Done	
37	Create view model 11 for a list of apps	Model	3	1	List of apps table	CRUD via demo app	Done	
38	Create view model 12 for an app	Model	3	1	Apps table	CRUD via demo app	Done	
39	Create a profile 13 controller	Controller	4	3	Profile table	CRUD via demo app	Done	
40	Create a media 14 controller	Controller	4	3	Media table	CRUD via demo app	Done	
41	Create a department 15 controller	Controller	4	3	Department table	CRUD via demo app	Done	
42	Create a certificate 16 controller	Controller	4	3	Certificate table	CRUD via demo app	Done	
43	Create a list of 17 apps controller	Controller	4	3	List of apps table	CRUD via demo app	Done	
44	Create an app 18 controller	Controller	4	3	Apps table	CRUD via demo app	Done	
45	Elaborate on the 19 database design	Database	7	10	None	New database scheme	Done	
46	Update the 20 database tables	Database	10	5	None	CRUD via demo app	Done	
47	Update the 21 data models	Model	10	5	Database tables	CRUD via demo app	Done	
48	Update the 22 controller	Controller	10	5	Database tables, Data	CRUD via demo app	Done	
49	Update the 23 controller	Controller	10	5	models	CRUD via demo app	Done	
50	Update the 24 database schema	Database	10	5	models	CRUD via demo app	Done	
51	Settings model 25	Model	8	20	Database tables	CRUD via demo app	Done	
52	Stats model 26	Model	8	20	Database tables	CRUD via demo app	Done	
53	GunGame Server 30	Social	100	100	Savannah	Open CS and play	Done	
54	Common report 31	Report	15	5	Earlier sections	Report pdf	Done	
55	Update the 32 database tables v0.3	Database	10	5	None	CRUD via demo app	Done	
56	Update the 33 data models v0.3	Model	10	5	Database tables	CRUD via demo app	Done	
57	Update the 34 controller v0.3	Controller	10	5	Database tables, Data models	CRUD via demo app	Done	
58	Update and implement the 35 hasControllers in tag helpers	HasControllers	10	10			Done	
59	insertTag should return tagId	TaqHelper	15	2			Done	
60	attachTagsToMedia remove1 TagMediaHelper insertTag should return medId	MediaHelper	12	12			Done	
61	profilesHelper should handle setting all make pRole enum	ProfilesHelper	5	5			Done	
62	Ioac should handle settings and stats	Ioac	5	5			Done	
63	Add new fields to app model record Update generator	AppModel	20	4			Done	
64	Add new columns to appHelper columns insertApp should return	AppHelper	20	5			Done	
65	Add columns icon, packageName, activityName to database	App DB	20	5			Done	
66	set user and cert should be primary key make aRole enum	AuthUsersDB	10	4			Done	
67	Reactor local db code	Database	12	2			Done	
68	Java doc	All	3	3			Done	
69	Dummy data	All	20	5			Done	
70	Correct comment	Report	25	10			Done	
71	Report error correction in the library	Library	4	5			Done	
72	Add extra functionality to the library	Library	4	5			Done	
73	Create report structure	Report	2	10		Read the report See the result of the test suite	Done	
74	Unit tests	Library	15	20		See the result of the test suite	Done	
75	Usability	Oasis app	10	10		See the result of the usability test	Done	
76	Report content	Report	5	200		Read the report	Done	
77	Improve Oasis App	Oasis app	5	10	Oasis lib	Show app	Not started	

Figure 11.1: An overview of the Oasis project backlog.

## **11.2 Burndown Charts and Sprint Backlogs**

Here are an overview of all the sprints in this project.

Oasis Burndown Chart/Sprint1 Backlog

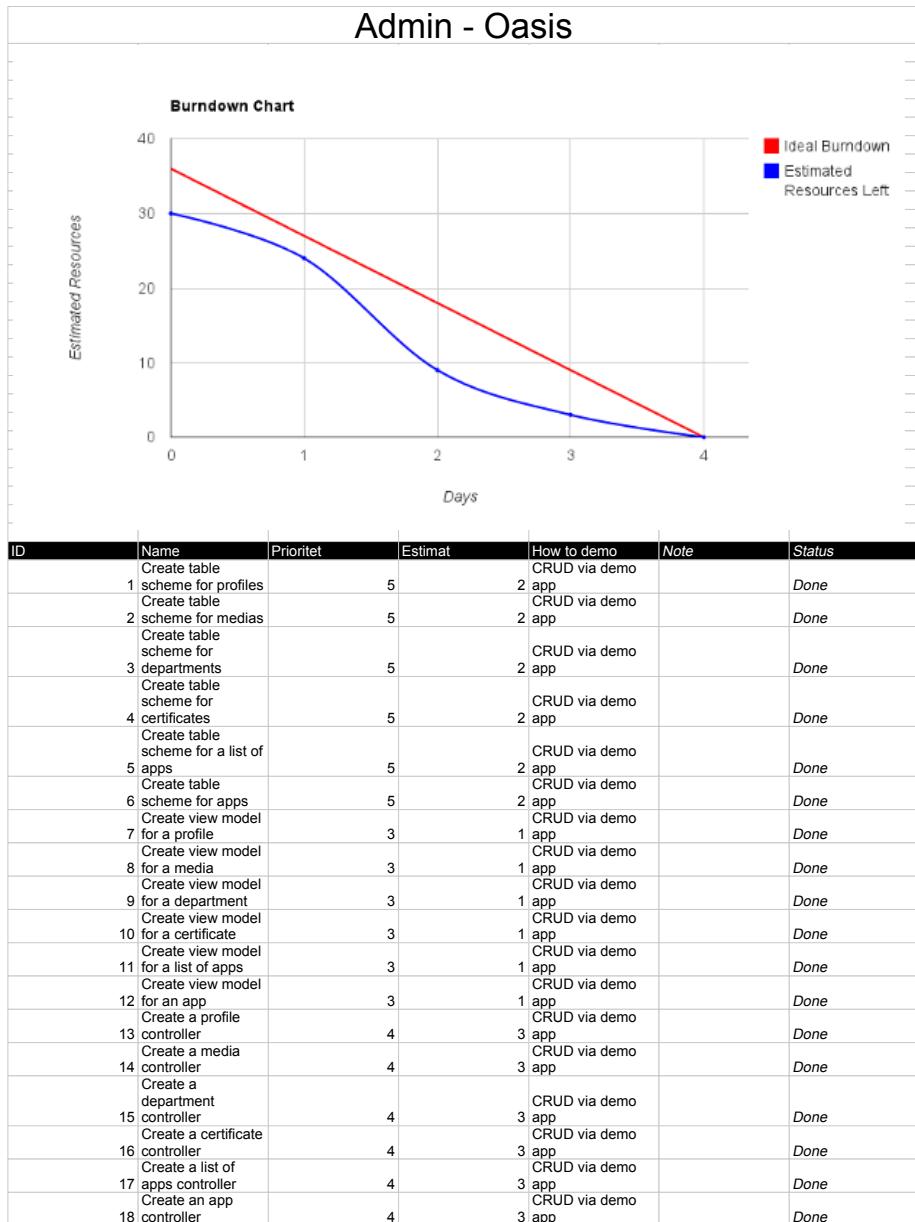


Figure 11.2: The burndown chart and sprint backlog from sprint 1.

Oasis Burndown Chart/Sprint2 Backlog

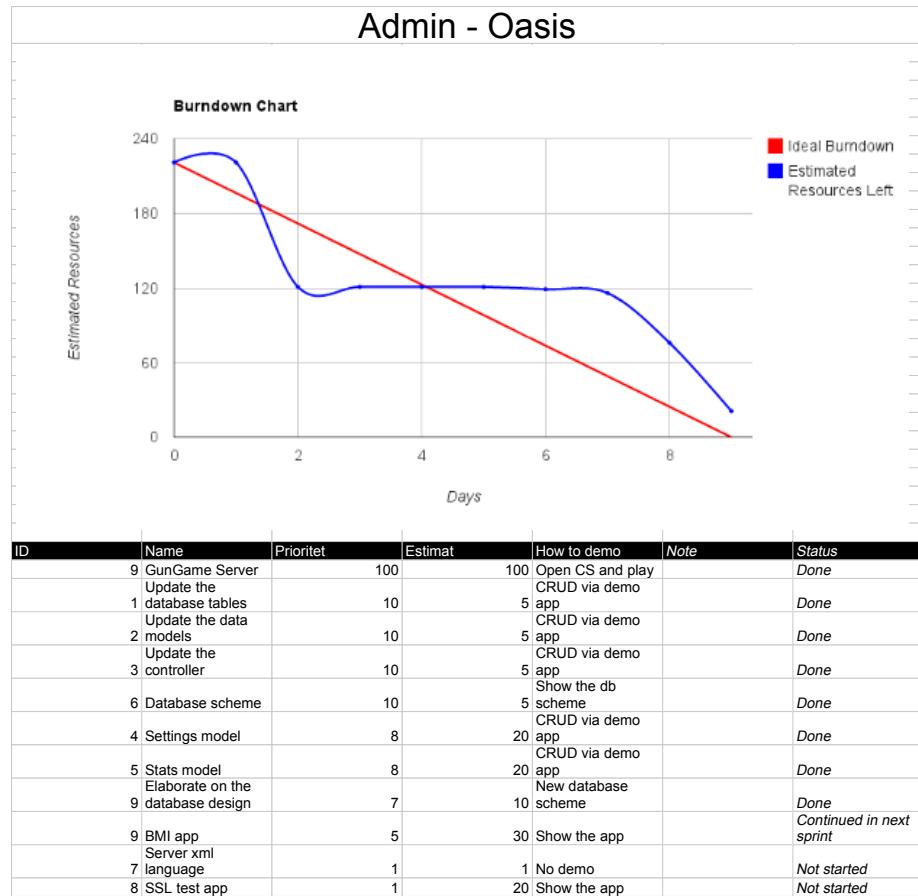


Figure 11.3: The burndown chart and sprint backlog from sprint 2.

Oasis Burndown Chart/Sprint3 Backlog

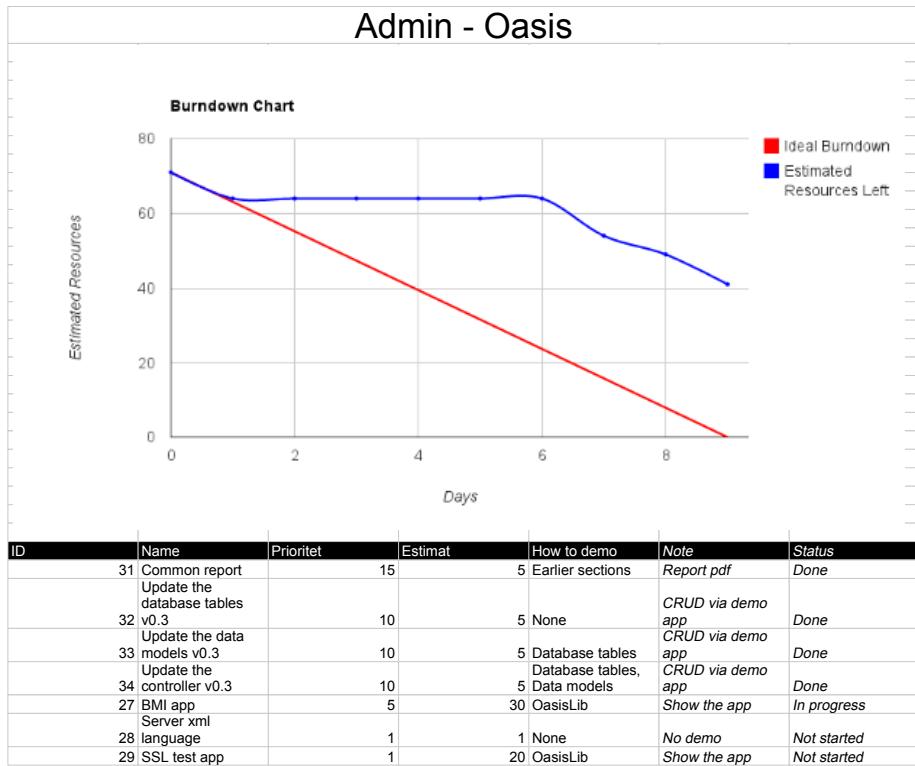


Figure 11.4: The burndown chart and sprint backlog from sprint 3.

Oasis Burndown Chart/Sprint4 Backlog

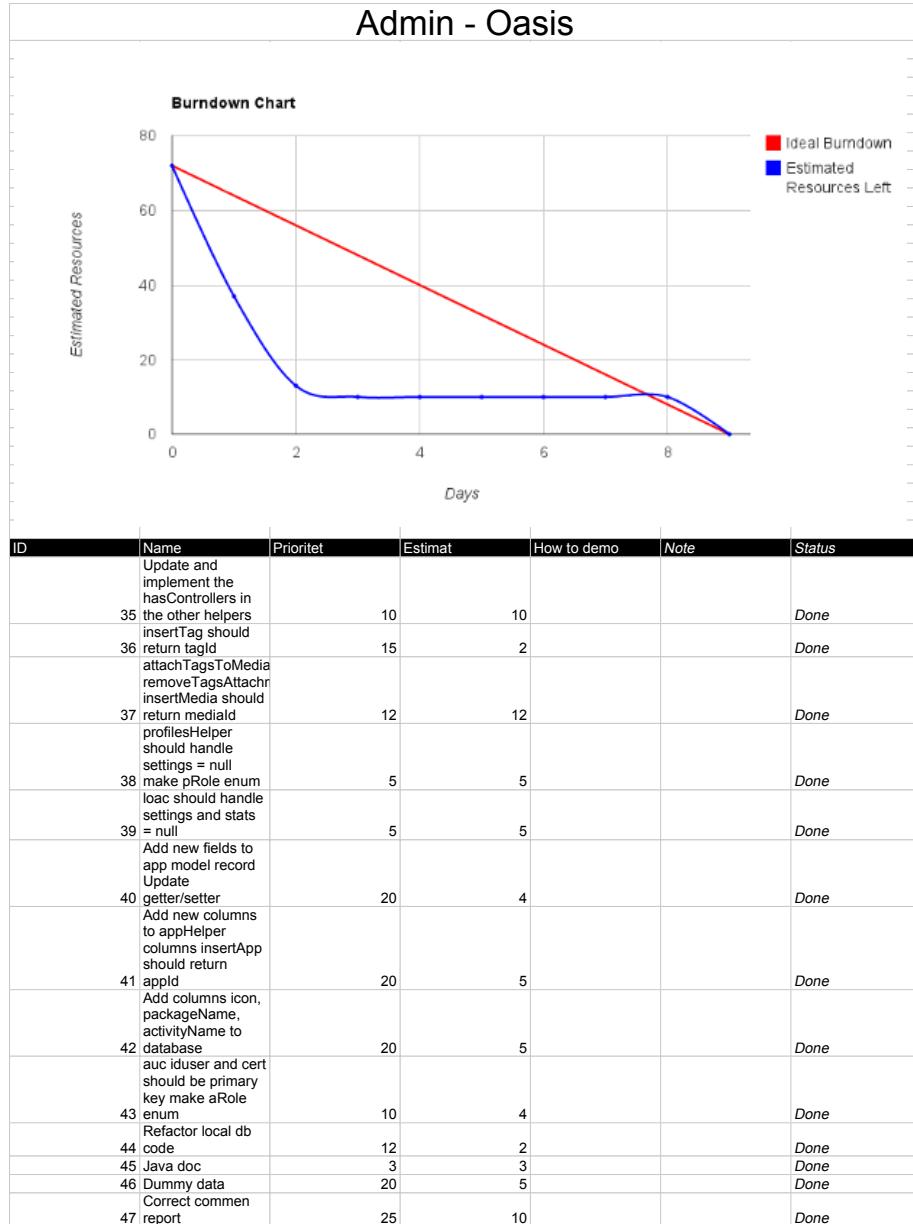


Figure 11.5: The burndown chart and sprint backlog from sprint 4.

Oasis Burndown Chart/Sprint5 Backlog

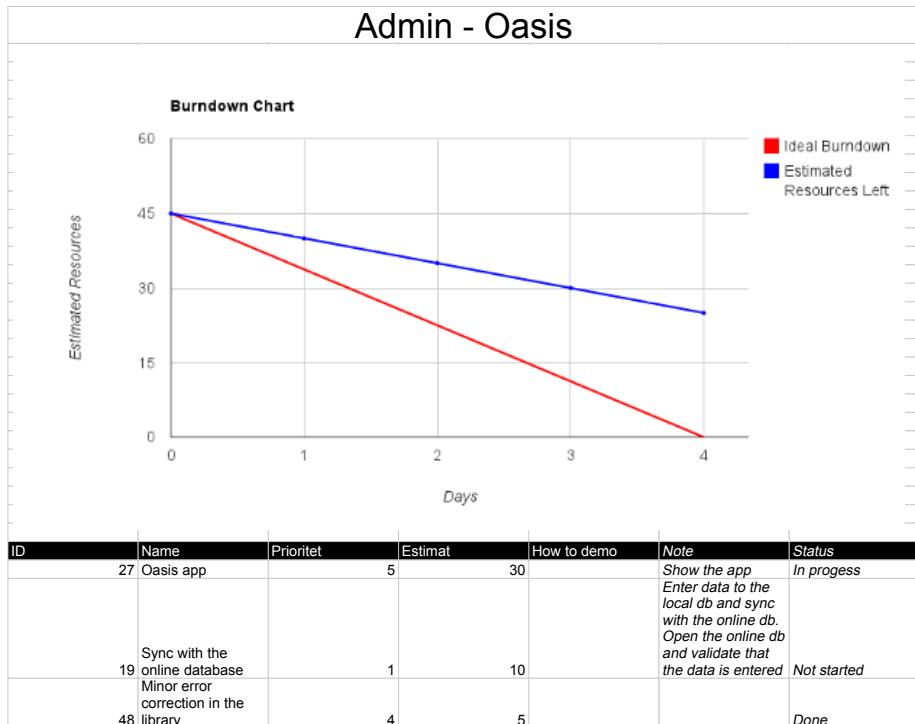


Figure 11.6: The burndown chart and sprint backlog from sprint 5.

Oasis Burndown Chart/Sprint6 Backlog

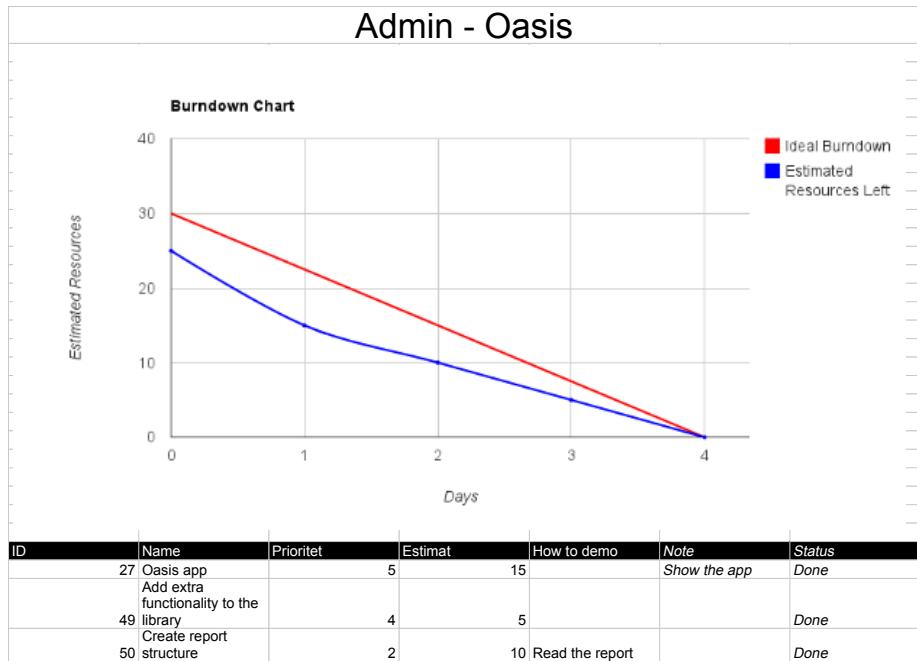


Figure 11.7: The burndown chart and sprint backlog from sprint 6.

Oasis Burndown Chart/Sprint7 Backlog

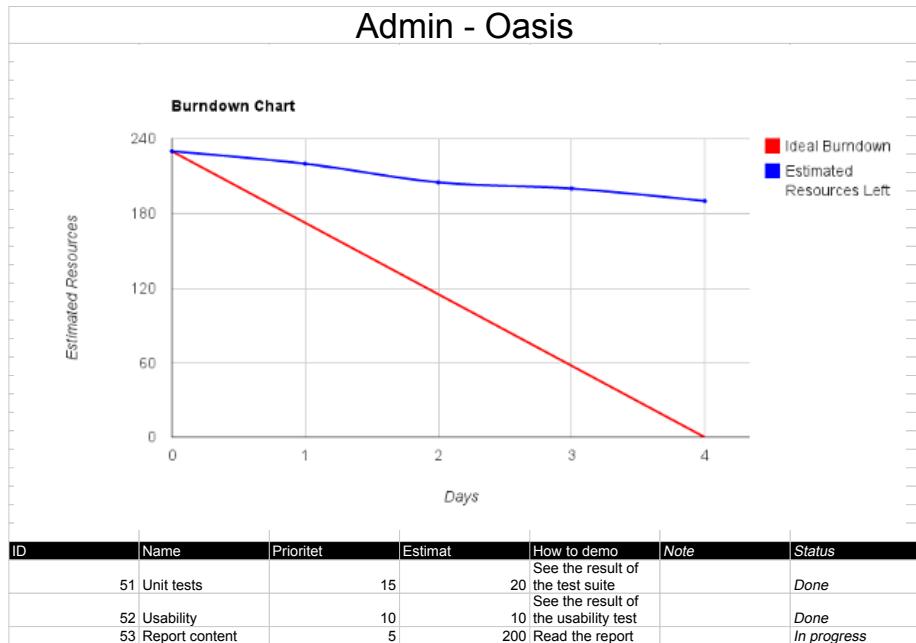


Figure 11.8: The burndown chart and sprint backlog from sprint 7.

Oasis Burndown Chart/Sprint8 Backlog

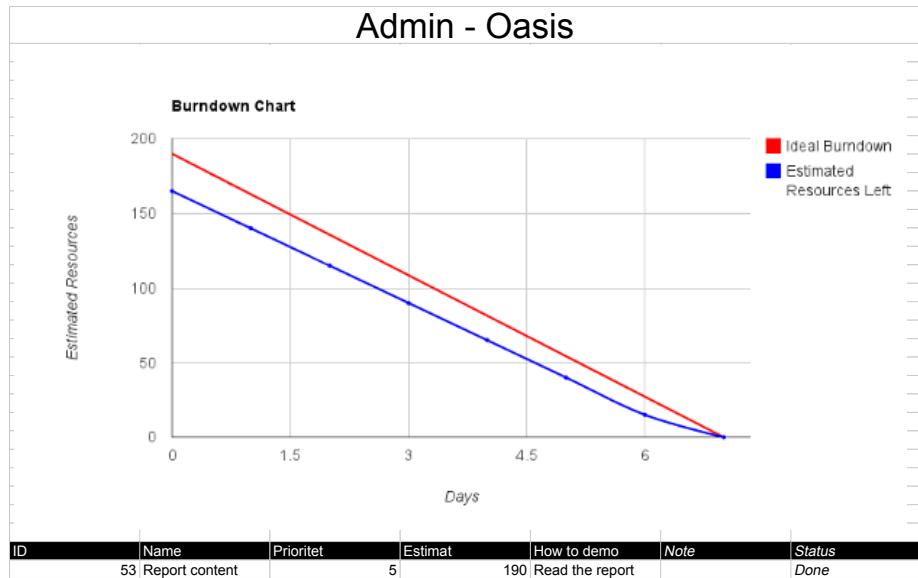


Figure 11.9: The burndown chart and sprint backlog from sprint 8.

## **11.3 Change Log**

Here is the full change log for the Oasis Library – along with the models used in it – and the Oasis Local Database.

# Oasis Changelog

## OasisLib version 0.8

- Minor bug fixed to the controllers

## OasisLib version 0.7

- Minor bug fixed to the controllers

## OasisLib version 0.6

- Controllers
  - Added AppsHelper.removeApp
  - Renamed AppsHelper.modifyAppSettingsByProfile to AppsHelper.modifyAppByProfile
  - Added AuthUsersController.removeAuthUser
  - Added DepartmentsHelper.removeDepartment
  - Added HasDepartmentController.removeHasDepartmentByDepartmentId
  - Added HasDepartmentController.removeHasDepartmentByProfileId
  - Added HasGuardianController.removeHasGuardianByProfile
  - Added HasGuardianController.removeHasGuardian
  - Added HasLinkController.removeHasLinkByMediaId
  - Added HasLinkController.removeHasLinkBySubMediaId
  - Added HasSubDepartmentController.removeHasSubDepartmentBySubDepartmentId
  - Added HasSubDepartmentController.removeHasSubDepartmentByDepartmentId
  - Added HasTagController.removeHasTagByTagId
  - Added HasTagController.removeHasTagByMediaId
  - Added ListOfAppsController.removeListOfAppsByProfileId
  - Added ListOfAppsController.removeListOfAppsByAppId
  - Added MediaDepartmentAccessController.removeMediaDepartmentAccessByMediaId
  - Added MediaDepartmentAccessController.removeMediaDepartmentAccessByDepartmentId
  - Added MediaHelper.removeMedia
  - Added MediaHelper.getMyPictures
  - Added MediaHelper.getMySounds
  - Added MediaHelper.getMyWords
  - Added MediaProfileAccessController.removeMediaProfileAccessByProfileId
  - Added MediaProfileAccessController.removeMediaProfileAccessByMediaId
  - Added ProfilesHelper.removeProfile
  - Added ProfilesHelper.getGuardians
  - Added ProfilesHelper.getChildren
  - Added ProfilesHelper.getChildrenWithNoDepartment
  - Added ProfilesHelper.getGuardiansWithNoDepartment
  - Added ProfilesHelper.getGuardiansByChild
  - Added TagsHelper.removeTag

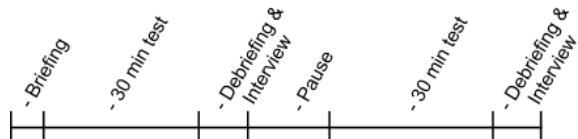
Figure 11.10: The change log for the library and database.



Bemærk venligst at vi er ikke tester din kendskab til applikationen eller evner med en tablet, men derimod om GIRAF applikationen er nem at bruge, vi har kun interesse i at kende til de svagheder der ville være i applikationen. Dette betyder også at du ikke kan give nogle forkerte svar, da du er eksperten.

Derfor vil vi gerne invitere dig ud i vores brugervenligheds laboratorie, hvor vi kan studere din brug af applikationen. Under brugervenligheds testen vil du blive givet en række opgaver, som skal udføres. Yderligere vil du blive bedt om at tænke højt og fortælle alle tanker, indtryk og valg du tager ved brug af applikationen under testen. Under testen af applikationen vil der blive optaget både video og lyd, til at studere testen senere.

Dagen kommer til at bestå af:



Vi vil meget gerne høre fra dig hvis du har lyst og tid til at deltage i denne brugervenligheds test, den 22/5 - 2012, på Aalborg Universitet.  
For at vide hvornår på dagen du kan komme vil vi gerne, at du går ind på denne side (<http://www.doodle.com/d2h6swgbtsdf6z2b>) skriver dit navn og vælger det tidspunkt på dagen du helst vil komme, dette er svar nok for at vi ved du gerne vil komme.

Kommentarer og spørgsmål kan sendes retur til den mail invitationen kom fra.

På forhånd tak,  
Android projektet  
Software 6. semester  
Aalborg Universitet  
Selma Lagerlöfs vej 300, 9220 Aalborg



Figure 11.11: Invitation sent to the test persons of the usability test.

## **11.4 Mail correspondence with Customer**

### **11.4.1 Mail To Customer**

Hej Kristine

Vi er blevet tildelt dig som kontakt person i forbindelse med vores projekt. Som nævnt sidst så arbejder vi på at udvikle applikationer til android, som kan bruges enten af jer som pædagoger og måske af autisterne på sigt. Vi vil udvikle flere forskellige applikationer, og vi vil gerne løbende aftale møder med dig, hvor vi kan vise det samlede produkt som er lavet. På den måde kan vi få feedback på hvad der går godt og hvad der er knap så godt.

Vores udviklings gruppe består af tre personer og vi skal lave en applikation der kan hjælpe med at lave profiler der passer til børnene.

Da vi stadig kun er i gang med at planlægge mener vi ikke at det er nødvendigt at holde et møde endnu. Men vi har nogen spørgsmål som vi gerne vil have dig til at svare på:

#### **Hvilke informationer gemmer i omkring det enkelte barn?**

- Journal nummer?
- Person nummer?
- Navn?
- Alder?
- Særlige behov?

#### **a - Ur**

a1. Vil barnet kunne forstå at en hel cirkel kan have forskelligt tidsinterval? a1.1 Eller er det bedst hvis cirklen har et fast tidsrum fx 1 time?

a2. Hvis man skal måle et tidsinterval på uret, er det så bedst at lade uret efterligne et almindeligt ur med 12 timer eller et stop-ur med kun 1 time?

#### **b - Timeglas**

b1. Vil barnet kunne forstå at det samme timeglas med den samme mængde sand kan varierer i tid?

b2. Er det bedst at man varierer i mængden af sand i timeglasset eller at man varierer i timeglassets størrelse?

#### **c - Aktivitetstid**

c1. Vil barnet kunne forstå at en linje der går hele vejen hen over skærmen kan varierer i tidsinterval? c1.1 Eller er det bedre hvis linjen har et fast tidsinterval og fx en halv linje derfor svarer til en halv time og en hel linje til en hel time?

#### **d - Dagsplan**

d1. Hvis man laver en visuel dagsplan er det så bedst at man laver et interval som viser tiden imellem to aktiviteter, eller at man viser alle aktiviter i løbet af dagen kombineret med en tidslinje?

### **11.4.2 Mail From Customer**

Hej. Tak for jeres mail. Jeg skal besvare jeres mail så godt som muligt, og så må i give lys hvis i har brug for at jeg uddyber.

Vedr. informationer vedr. barnet: Vi benytter et elektronisksystem som hedder, EKJ, hvor alle oplysninger på børnene er gemt. Det vil sige, pers. nr., adresse oplysninger, indbydelser, handleplaner og referater fra diverse møder.

UR: Hvis det er tydeligt vist at "tiden går" /skiven bliver mindre/forsvinder, som tiden går, vil barnet forstå meningen med uret. For at indikere forskellig tid, kan man benytte forskellige farvet baggrunde. Lilla:5 min. Grøn:10 min osv. Vi benytter kun kortere tidsintervaller,(1. min. 3. min. 5 min. -op til ca. 10-15. min) da 1 time er for abstrakt.

Timeglas: Hvis der er en tydelig markering af tidsintervallet, som beskrevet ovenfor, er det muligt at bruge samme timeglas. Tror det vil give bedst forståelse for barnet, hvis mængden af sand varieres efter tid.

Aktivitetstid og dagsplan: (Tror J) Aktivitetstid kan bruges ved, at tiden bliver indikeret af mængden af aktiviteter. - Altså 3-5 viste aktiviteter af gangen, og ikke så meget om det er en time eller 15 min. Tiden kunne være en mulighed at tilføre, om nødvendigt. Mange af vores børn har manglende fornemmelse for tid, og ofte har de brug for at se små konkrete sekvenser/beskeder frem for mange over længere tid. Derfor vil jeg tror de bedst kan overskue  $\frac{1}{2}$  dag af gangen, men stadig have mulighed for at have dagen på skemaet, hvor det kan vises i sekvenser.

Jeg har samlet de to ovenstående punkter, da de nemt kommer til at gibe ind i hinanden. Vores ugeskemaer i børnehaven er vist med internationale farver, dem vil i ligeledes kunne benytte til at tydeliggøre ugedagene. Mandag: Grøn, Tirs.: Lilla, Ons.: orange, tors.: blå, Fre.: gul, lør.: rød og søndag: hvid.

Håber dette er uddybende nok, ellers må i gerne skrive eller ringe til mig hvis

det er nemmere.  
Ser frem til at hører fra jer igen.

## 11.5 Notes from Interview

*This is notes from an interview with Mette Als Andreasen, an educator at Birken in Langholt, Denmark.*

Når tiden løber ud (kristian har tage et billede):  
Færdig - symbol  
Gå til skema - symbol  
Taget fra boardmaker

Kunne være godt hvis man kunne sætte egne billeder ind som start/stop symboler.

Rød farve = nej, stop, aflyst.

De har sådan et ur på 60 minutter hvor tid tilbage er markeret med rød, og så bipper den lige kort når den er færdig.  
Det ville være fint hvis de kunne bruge sort/hvid til dem der ikke kan håndtere farver, men også kan vælge farver.

Stop-ur:  
en fast timer på 60 minutter + en customizable som ikke ser helt magen til ud, som f.eks, kan være på 5, 10 eller 15 minutter for en hel cirkel.

timeglas:  
skift farve på timeglassene, men ikke nødvendigvis gøre dem større. Kombinere med mere/mindre sand. Eventuelt kombinere med et lille digitalt ur, til dem der har brug for det, skal kunne slåes til og fra.

Dags-plan:  
ikke særlig relevant til de helt små og ikke særligt velfungerende børn. Men kunne være rigtig godt til de lidt ældre.  
En plan går oppefra og ned, og hvis der så skal specificeres noget ud til aktiviteterne, så er det fra venstre mod højre ud fra det nedadgående skema.

Til parrot:  
Godt med rigtige billeder af tingene, som pædagogerne selv kan tage, eventuelt også af aktiviteter, så pedagogerne kan have billeder af aktiviter som de kan liste

efter skeamet.

Der var mange skemaer rundt omkring, og der henviser det sidste billede i rækken til næste skema, som hænger f.eks. på badeværelset eller i garderoben.

## 11.6 Usability Documents

### Briefing

Goddag og velkommen til denne brugervenlighedsundersøgelse.

Vi vil gerne starte med at takke dig for, at du vil hjælpe os med at gennemføre denne brugervenlighedsundersøgelse. Vi læser op fra dette dokument for at sikre os, at alle personer som deltager i vores studie for samme introduktion. Hvis du har spørgsmål undervejs, er du naturligvis meget velkommen til at stille disse spørgsmål.

Vi har i dette semester bygget et system til Android til at hjælpe børn med autisme og deres pædagoger og forældre, og det er nu næst til et sted hvor vi gerne vil teste systemet. Denne test handler udelukkende om at finde problemer og mangler i systemet, og ikke om at teste jeres viden af systemet, så alle tanker I må have om produktet vil vi meget gerne høre.

Før vi starter første del af testen, vil jeg bede dig om at underskrive denne samtykkeerklæring for at sikre, at du er indforstået med rammerne for studiet. Derudover skal du også svare på et demografisk spørgeskema inden testen går i gang.

Testen består af fire dele:

- Test af applikationer (20 min)
- De-briefing og spørgeskema (5 min)
- Test af Administrations applikation og web applikation (20 min)
- De-briefing og spørgeskema (5 min)

Undervejs vil der være en pause.

I de to tests vil du blive stillet en række opgaver som du skal løse. Læs opgaveformuleringen grundigt og fortæl så test hjælperen hvad du mener opgaven går ud på. Derefter skal du forsøge at løse opgaven så godt som muligt. Opgaverne skal løses i den rækkefølge de står således at du starter med opgave 1 og arbejder dig ned af.

Det er meningen at du skal tænke højt mens du løser opgaverne. Dvs. at du siger hvad du har tænkt dig at gøre for at løse opgaven, hvilke ting du synes virker uklare eller komplicerede og hvordan du tror systemet virker. For eksempel vil det være godt hvis du nævner hvad du forventer en knap gør inden du trykker på den.

Når testen er færdig vil der være nogle afsluttende spørgsmål som du skal besvare omkring hvordan du synes testen er forløbet og hvad din opfattelse af systemet er.

Figure 11.12: The document used to brief and de-brief the test persons.



## 11.6.1 Questionnaires from usability

/05/12

Usabilitytest - Spørgeskema - Google Dokumenter

### Usabilitytest - Spørgeskema

1. Hvilket køn er du?

Kvinde       Mand

2. Hvor erfaren vurderer du at du selv er med computerer? (vælg en)

Meget begrænset erfaring  
 Lettere erfaren  
 Forholdsvis erfaren  
 Meget erfaren

3. Har du brugt en tablet før (f.eks. en iPad)?

Ja       Nej

4. Tror du at en tablet med de rigtige programmer vil kunne forbedre din arbejdsgang?

Ja       Nej

5. Tror du at en tablet med de rigtige programmer vil kunne forbedre børnenes hverdag?

Ja       Nej

Hvor let mener du at applikationerne var at bruge?

GIRAF:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Parrot:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Wombat:

- Meget let
- Let
- Middel
- Svær
- Meget svær



Admin:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Hvor let mener du at Web interfacet var at bruge?

- Meget let
- Let
- Middel
- Svær
- Meget svær

## Usabilitytest - Spørgeskema

1. Hvilket køn er du?

Kvinder       Mand

2. Hvor erfaren vurderer du at du selv er med computerer? (vælg en)

Meget begrænset erfaring  
 Lettere erfaren  
 Forholdsvis erfaren  
 Meget erfaren

3. Har du brugt en tablet før (f.eks. en iPad)?

Ja       Nej

4. Tror du at en tablet med de rigtige programmer vil kunne forbedre din arbejdsgang?

Ja       Nej

5. Tror du at en tablet med de rigtige programmer vil kunne forbedre børnenes hverdag?

Ja       Nej

Hvor let mener du at applikationerne var at bruge?

GIRAF:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Parrot:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Wombat:

- Meget let
- Let
- Middel
- Svær
- Meget svær

\* Admin:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Hvor let mener du at Web interfacet var at bruge?

- Meget let
- Let
- Middel
- Svær
- Meget svær

## Usabilitytest - Spørgeskema

1. Hvilket køn er du?

Kvinde       Mand

2. Hvor erfaren vurderer du at du selv er med computerer? (vælg en)

Meget begrænset erfaring  
 Lettere erfaren  
 Forholdsvis erfaren  
 Meget erfaren

3. Har du brugt en tablet før (f.eks. en iPad)?

Ja       Nej

4. Tror du at en tablet med de rigtige programmer vil kunne forbedre din arbejdsgang?

Ja       Nej

5. Tror du at en tablet med de rigtige programmer vil kunne forbedre børnenes hverdag?

Ja       Nej

Hvor let mener du at applikationerne var at bruge?



GIRAF:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Parrot:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Wombat:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Admin:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Hvor let mener du at Web interfacet var at bruge?

- Meget let
- Let
- Middel
- Svær
- Meget svær

## Usabilitytest - Spørgeskema

1. Hvilket køn er du?

Kvinder       Mand

2. Hvor erfaren vurderer du at du selv er med computerer? (vælg en)

- Meget begrænset erfaring
- Lettere erfaren
- Forholdsvis erfaren
- Meget erfaren

3. Har du brugt en tablet før (f.eks. en iPad)?

Ja       Nej

4. Tror du at en tablet med de rigtige programmer vil kunne forbedre din arbejdsgang?

Ja       Nej

5. Tror du at en tablet med de rigtige programmer vil kunne forbedre børnenes hverdag?

Ja       Nej

Hvor let mener du at applikationerne var at bruge?

GIRAF:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Parrot:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Wombat:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Admin:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Hvor let mener du at Web interfacet var at bruge?

- Meget let
- Let
- Middel
- Svær
- Meget svær

## Usabilitytest - Spørgeskema

1. Hvilket køn er du?

Kvinde       Mand

2. Hvor erfaren vurderer du at du selv er med computerer? (vælg en)

Meget begrænset erfaring  
 Lettere erfaren  
 Forholdsvis erfaren  
 Meget erfaren

3. Har du brugt en tablet før (f.eks. en iPad)?

Ja       Nej

4. Tror du at en tablet med de rigtige programmer vil kunne forbedre din arbejdsgang?

Ja       Nej

5. Tror du at en tablet med de rigtige programmer vil kunne forbedre børnenes hverdag?

Ja       Nej

Hvor let mener du at applikationerne var at bruge?

GIRAF:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Parrot:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Wombat:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Admin:

- Meget let
- Let
- Middel
- Svær
- Meget svær

Hvor let mener du at Web interfacet var at bruge?

- Meget let
- Let
- Middel
- Svær
- Meget svær

## 11.7 Unit Test Results

In this section the results for the remaining unit tests can be found.

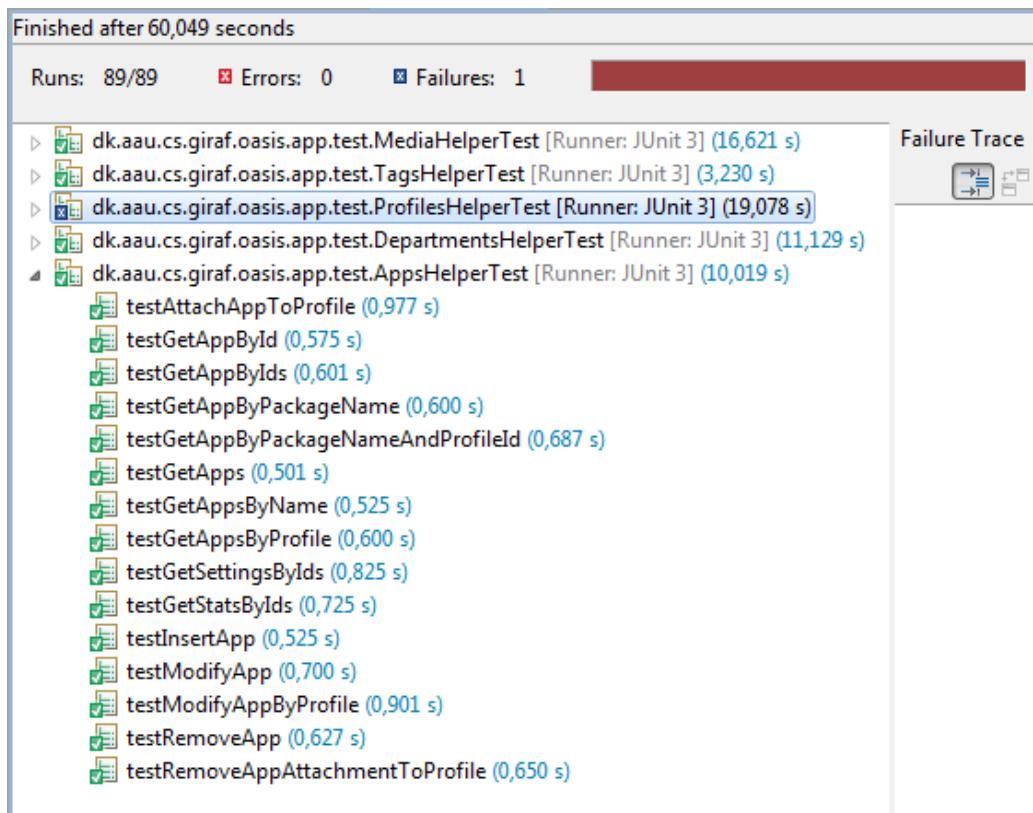


Figure 11.13: The result from the appsHelper tests.

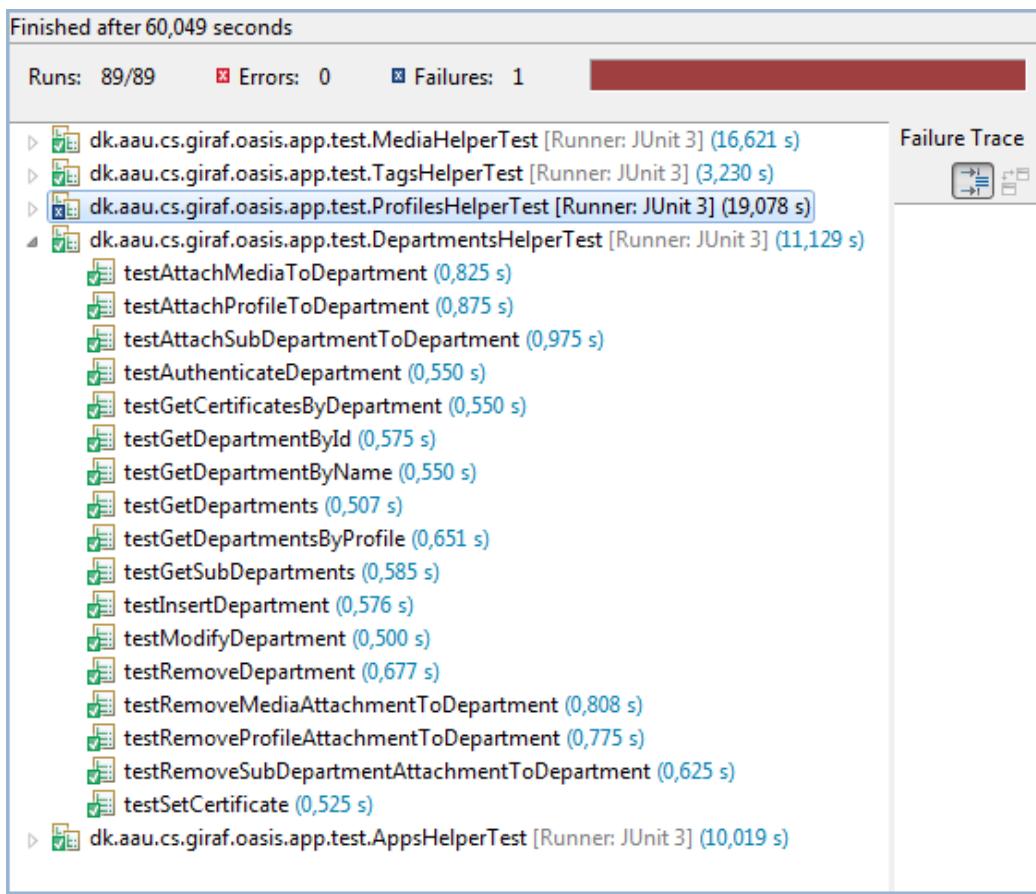


Figure 11.14: The result from the departmentHelper tests.

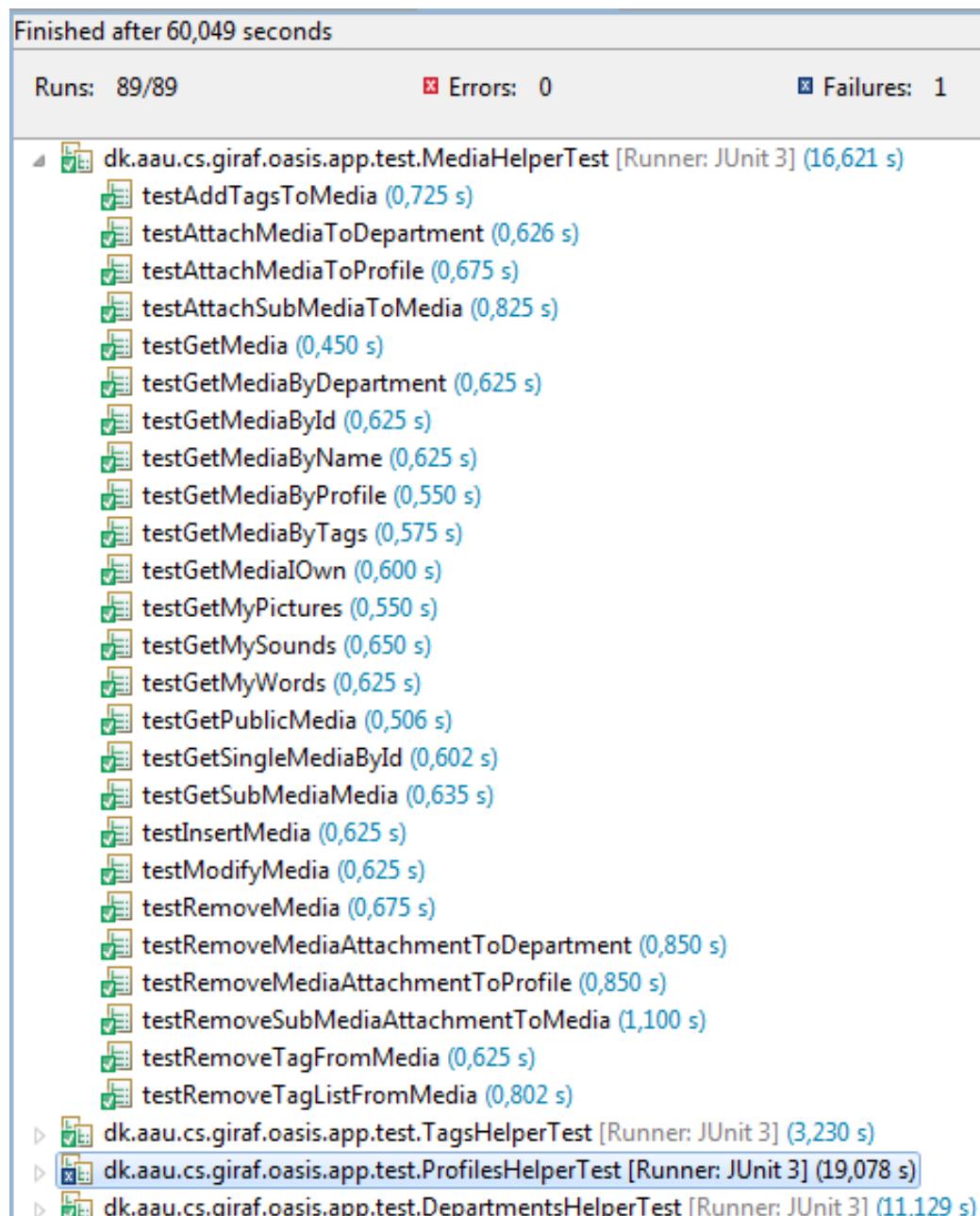


Figure 11.15: The result from the mediaHelper tests.

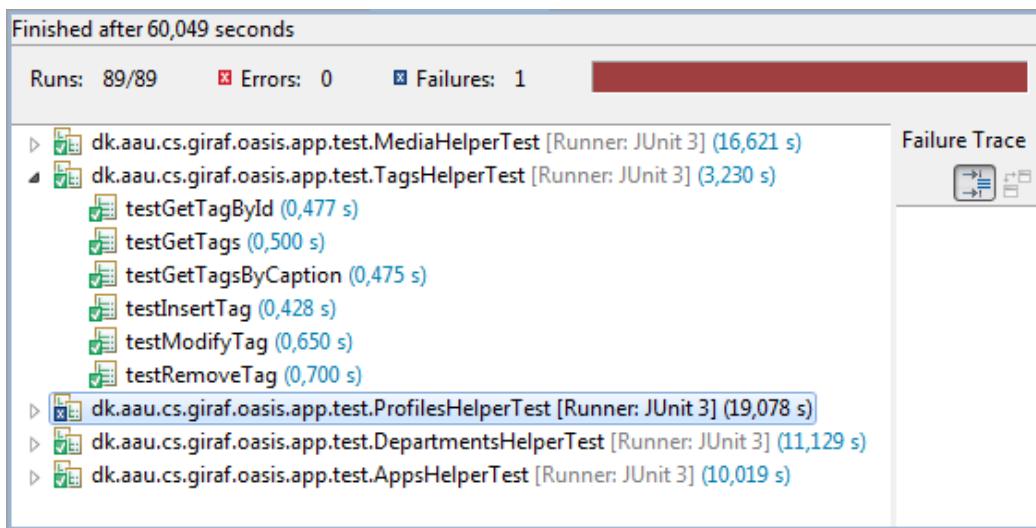


Figure 11.16: The result from the tagsHelper tests.

---

## Bibliography

---

- [All11a] Scrum Alliance. Advice on conducting the scrum of scrums meeting. <http://www.scrumalliance.org/articles/46-advice-on-conducting-the-scrum-of-scrums-meeting>, 2011.
- [All11b] Scrum Alliance. Scrum alliance. <http://www.scrumalliance.org/>, 2011.
- [Gra02] Temple Grandin. Teaching tips for children and adults with autism. [http://www.autism.com/ind\\_teaching\\_tips.asp](http://www.autism.com/ind_teaching_tips.asp), December 2002.
- [IEE93] IEEE. Unit testing. [http://aulas.carloserrao.net/lib/exe/fetch.php?media=0910:10081987\\_ieee\\_standard\\_for\\_software\\_unit\\_testing.pdf](http://aulas.carloserrao.net/lib/exe/fetch.php?media=0910:10081987_ieee_standard_for_software_unit_testing.pdf), December 1993.
- [JB11] Steffan Bo Pallesen Jacob Bang, Lasse Linnerup Christiansen. Administration module for giraf. [http://people.cs.aau.dk/\\_ulrik/Giraf/Admin.pdf](http://people.cs.aau.dk/_ulrik/Giraf/Admin.pdf), May 2011.
- [JK] Jan Stage Jesper Kjeldskov, Mikael B. Skov. *Instant Data Analysis: Conducting Usability Evaluations in a Day*. Last viewed: 2012-05-24.
- [Mic12] Microsoft. Model view controller. <http://msdn.microsoft.com/en-us/library/ff649643.aspx>, May 2012.
- [Pat] Ron Patton. *Software Testing*.
- [Sam] Samsung. Samsung tablet. <http://www.samsung.com/global/microsite/galaxytab/10>
- [SQL12a] SQLite. About sqlite. <http://www.sqlite.org/about.html>, May 2012.

- [SQL12b] SQLite. Sqlite. <http://www.sqlite.org/>, May 2012.
- [SQL12c] SQLite. Sqlite datatypes. <http://www.sqlite.org/datatype3.html>, May 2012.
- [Tea12a] Android Development Team. Android 4.0.3 platform. <http://developer.android.com/sdk/android-4.0.3.html#relnotes>, March 2012.
- [Tea12b] Android Development Team. Android architecture. <http://developer.android.com/guide/basics/what-is-android.html>, March 2012.
- [Tea12c] Android Development Team. Cursor. <http://developer.android.com/reference/android/database/Cursor.html>, March 2012.
- [Uni] Aalborg University. Studieordning for bacheloruddannelsen i software. [http://www.sict.aau.dk/digitalAssets/3/3331\\_softwbach\\_sept2009.pdf](http://www.sict.aau.dk/digitalAssets/3/3331_softwbach_sept2009.pdf). Last viewed: 2012-03-15.
- [Wel09] Don Wells. extreme programming. <http://www.extremeprogramming.org/rules.html>, 2009.



This page is left blank for the purpose of containing the attached CD-ROM.