Guillaume MONTAVON
Benoît MEILHAC

Study and development with the Android platform

Supervisors :
Mr PIAT
Mr TATIBOUET

IT Department
Université de Franche-Comté
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Abstract

The application development for smartphone is currently increasing due to the amount of new smartphone coming to the market. A lot of these smartphones uses the new Google operating system : Android, launched just 2 years ago. It is promised to a huge future. Therefore, it is very interesting for students to learn about these new technologies.

The purpose of this project is to see what are the possibilities and the future of the smartphone Operating System Andoid. For that, it was necessary to install the tools needed to develop an Android application, learn how to use them and then test some simple examples of applications. Another goal is to compare the differences between an application developed for PCs and one developed for smartphone, and then learn about it in order to develop an application.

A real application, then, was developed during the project, it is a classic task manager that allows a user to better organize. This application has the main advantage, compared to other applications, the possibility of synchronize tasks with a remote server. The achievement of this project is divided in two parts : the development of the Android application and the development of the remote server to synchronize tasks with the smartphone. The application was developed using the *eclipse* software and using the *Java* language. The remote server uses a *PHP/MySQL* server and converts the data transferred in *JSON* format.

This project was very beneficial because it acquired new knowledges about the Android platform and point of view of the programming the Limitations and the possibilities it offers. This application may be published on the android market so that all users in the world can install and use.

Contents

1 Introduction

Mobile phone market currently knows a huge revolution with the emergence of smartphones. This revolution was launched by Apple with its IPhone. Lots of people have been seduced by this one. Google realized the potential of this market and chose to get inside. Therefore it decided to create its own Operating System (OS) for smartphones which could competed with IPhone OS[1] as known as IOS. Its name is Android.

Since Android was created, it knows a very large growth. Indeed, this OS is became the leader in sales of smartphones in the world in just two years after its placing on the market. Due to its free access, lots of manufacturers have adopted it very quickly. Android has a large developer community that contributes to the creation of diverse and varied applications available on Android Market, the online software store developed by Google for Android devices.

The objectives of this project were to begin with study the Android platform, which it is, what it offers to users and developers. And in a second place, the creation of an application using the possibilities of the platform.

A first part will permit to present in details what Android is, the tools used to develop an application and the subject of this project which will present the chosen application. Finally, a second part will describe the implemented application.

[1] IPhone Operating System

2 Context

2.1 What is Android ?

2.1.1 Presentation

Android is an open source operating system for smartphone, PDA[1] and mobile devices. It was conceived by *Android Inc.*, a startup that Google purchased in 2005. This operating system differs mainly of its competitors in that it is open, it is also used by many manufacturers and therefore smartphones on the market. Google's business model very appropriate, the adoption of Android by manufacturers has been very rapid because of the free use.

Its deployment was announced by the Open Handset Alliance (OHA) November 5 2007 and the first phone equipped end of 2008 to the United States and in the beginning of 2009 in France. Since, Android has a significant growth. It became in the beginning of 2011, first in sales of smartphones in the world.

Developer community is very active, indeed it exists more than 200 000 applications available on the Android Market, the online software store. This makes it very interesting.

More than a hundred of mobile devices are equipped of Android. Here are some examples of devices using Android :

[1] Personal Digital Assistant

(a) HTC Desire (b) Google Nexus One (c) Samsung Galaxy S (d) Samsung Galaxy Tab

Figure 2.1: Examples of devices using Android

2.1.2 History

July 2005 : Purchased by Google

A purpose of Google was to enter on market of mobile phone. That is why it purchased the small company *Android Inc.* which developed applications for mobile. From that moment, Google is working on the operating system Android.

November 2007 : Open Handset Alliance (OHA)

Second key point, the creation of OHA by Google. OHA is a business alliance of many firms to develop open standards for mobile devices. There are some big names as *Bouygue Telecom, Samsung or even Intel, Nvidia.* After this alliance, the birth of the Android platform is announced. Now, this alliance has 80 members approximately.

December 2007 : Development kit

Google publishes the first release of its SDK[2].

[2]Software Development Kit

September 2008 and March 2009 : First smartphone

The first smartphone equipped of Android operation system is available for sale by *T-Mobile* in September 2008 and is available in France in March 2009.

October 2008 : Licensing

Android is totally under free software/open source license and its entire source code is published. Manufacturers can modify components and customize the system.

2.1.3 Android version

Android has seen a number of updates since its original release. They fix bugs and add new features.
Generally each new version of the Android operating system is developed under a code name based on a dessert item.
Here are a table of Android releases :

Android version	Name of the version
1.5	**C**upcake
1.6	**D**onut
2.0/2.1	**E**clair
2.2	**F**roYo «*Frozen Yogourt*»
2.3 Version currently in used	**G**ingerbread
3.0	**H**oneycomb
Later	**I**ce cream sandwich

Table 2.1: Table of the different versions of Android

This is the version 2.2 which is the most used, the latest being the 2.3.

2.1.4 Features

Android has lot of functionalities, enumerate them is too long so only the most important will be presented.

Extended desktop

The desktop is extended on 3 or more parts, it depends of the manufacturer which can modify the interface. Each part is customizable by the user, it is possible to put shortcuts (to applications, folders, files, contacts, ...) or widgets.

Widgets

Like desktop for newer operating systems, it is possible to put widget on the desktop. They can give various information and provide interaction with the system.

Various sensors

Android take in charge different sensors : accelerometers, gyroscopes, magnetometers, proximity sensors, pressure sensors or even thermometers. Lots of application use sensors, for example, Google Maps uses compass and accelerometer.

Other features

Here are some others features :

- multitasking;
- tethering[3];
- voice based features;
- multi-touch;
- web browser;
- media support;
- new connectivity (WiFi, Bluetooth, GPS, GPRS/EDGE/3G/3G+, ...);
- 3D graphics;
- video calling;
- ...

[3] wireless connection sharing

2.1.5 Android Market

This is an online software stored developed by Google for Android devices. It is very similar to the *App Store*, the online store of Apple for IPhone. This is an application preinstalled on each Android phone which one users can download applications developed by professional and individual.
Applications are free or pay which are sorted by category, news, ... The research of applications is also available.

The application Android Market exists since October 2008, release of the first smartphone. There is also a website for the Android Market since February 2011 at the following address : `https://market.android.com/`.

Here are two screenshots about the Android Market :

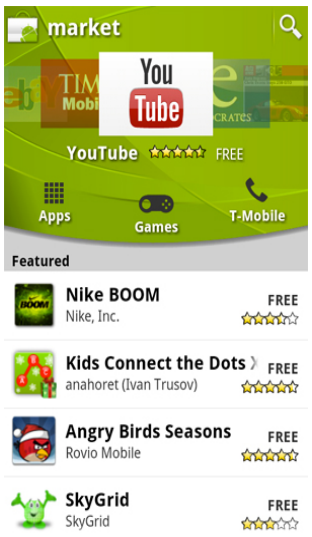

Figure 2.2: Application Android Market

Figure 2.3: Website Android Market

2.1.6 Android in the future

Competition

The competition on smartphones market is hard due to its high growth. There is lot of mobile operation system, here are the four main competitor of Android.

⇒ **IOS (Apple) :** Apple famous operating system for IPhone and IPad. The first on the smartphones market. Main rival of Android.

⇒ **BlackBerry OS (RIM) :** Research In Motion operating system for BlackBerry. It is a system in lower sales.

⇒ **Symbian OS (Nokia) :** Symbian ltd. operating system. It equips lots of mobile phones but not really smartphones, that is why it declines.

⇒ **Windows Phone (Microsoft) :** Microsoft operating system successor to Windows Mobile. It is a young system and not a success or a failure for now.

View on the current market

In only 2 years, Android became the leader in sale of smartphones in the world. Actually, there is approximately 300 000 Android smartphones sold everyday.

For the competition, IOS stagnates, BlackBerry collapses, Symbian is doomed to disappear and Windows Phone tries to find a place between Android and IOS.

Android is promised to a great future because of its exceptional growth and the fact there are more and more smartphones using this system.

2.2 Presentation of the subject

With the Android platform, the developer can have many possibilities in the creation of applications. Therefore there are so many applications available on the Android Market.

The final purpose of the project is to use more functionalities as possible in an application to get a view of what is feasible. To save development time, the software (a task manager), realized in the first semester as part of the unit value *Modélisation, Interface utilisateur, Conception Avancée (MICA)*, was chosen.

So that, the project consists to :

— adapt the existing application to an Android smartphone;

— add correctly several useful functionalities to the smartphone;

— have a functional application.

2.3 The task manager

2.3.1 Presentation of existing

The task manager realized as part of the unit part MICA[4] is a software for managing daily tasks that everyone should make. It is a memory aid used by everyone.

Existing functionalities

This software can realize the following actions :

— manage tags;

— manage tasks;

— sort tasks according to specific criteria;

— assign sub-tasks to tasks;

— change language via a software internationalization in English;

— save the tasks list.

[4]Modélisation, Interface utilisateur, Conception Avancée

View of the existing

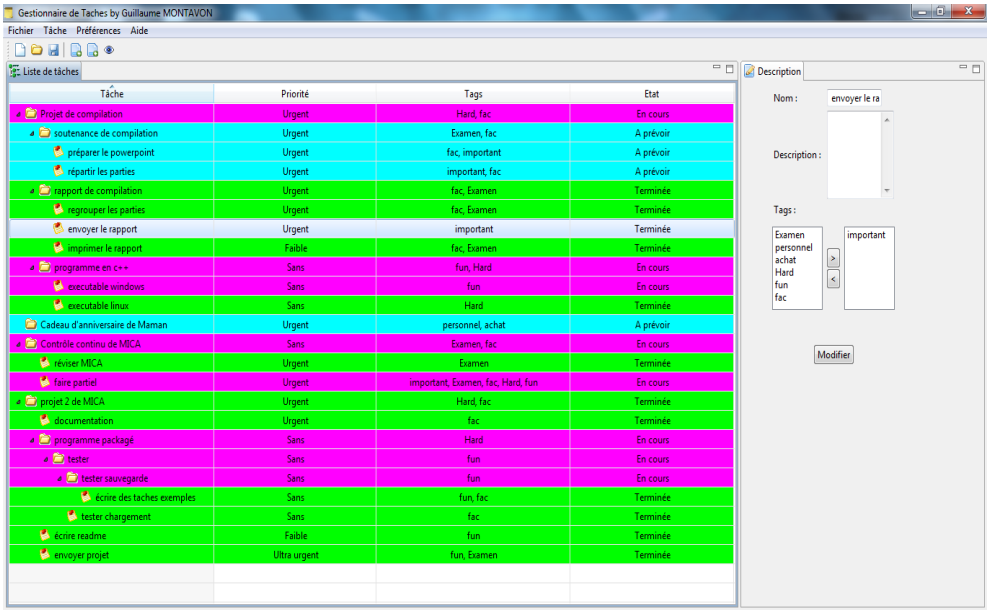

Figure 2.4: Example of screenshot of the existing task manager

2.3.2 Presentation of the software for smartphones

The software must be able to adapt to a smartphone while containing the functionalities listed above. That is to say, he must be able to adapt to screen size, have a simple interface and not over-elaborate, but still full. It must also include new possibilities available with Android.

Omitting the functionalities already listed in the presentation of the existing, the task manager for smartphone must be able to :

— use the SQLite database available on Android smartphones;

— synchronize with a remote server;

— use the various functionalities included with Android;

— manage user accounts on the server.

2.4 Specifications

2.4.1 Application design

The application can be divided into different main parts. One general part that reflects the objectives of the first software task manager. One part concerning the storage of information on the smartphone. And a last part to manage the remote server.

The general objectives of the application are :

— manage the application with tasks and tags (added, remove, modification, sorting);

— a graphical interface fluid and pleasant to use while still powerful and complete;

— internationalization of the application in English;

— manage the application preferences.

Concerning the database :

— creation of a coherent basis to manage all the data of the application;

— storing, modifying and deleting data.

Concerning the synchronization with the remote server :

— creation of a database more evolved than the smartphone;

— sending and receiving data with their storage, modification and deleting;

— manage users;

— implementation of various methods of synchronization :

  ⋆ overwrite data from the smartphone replaced by those of the server;

  ⋆ overwrite data from the server replaced by those of the smartphone;

  ⋆ combine data of the server and the smartphone.

— manage a proxy server.

2.4.2 Technical constraints

Developing an application with Android imposes some constraints to have a result.

Development tools

Several tools are available to easily develop with Android :

— Google Android SDK[5] which contains an emulator of smartphone;

— eclipse IDE[6] to develop in Java;

— Android plugin ADT which one can to use the emulator with eclipse.

Web server

A web server was set up to test remote synchronization. This server is hosted by *OLikeOpen* (web host which offer his services for free) and has a MySQL database and PHP tools for communicating with it.

Miscellaneous

There are lot of version of Android and they evolve everyday, so this is why the development was completed and tested on 2.2 version (*FroYo*). However, an emulator is not sufficient to verify the correct running of the application, a smartphone that has the correct version of Android was necessary to validate the tests.

2.4.3 Temporal constraints

The first part of the project consists to the study of the Android platform, so the development time of the application depends of time to get one's feet wet with the tools proposed by Android. The rest of the time is a full development of the task manager.

[5]Software Development Kit
[6]Integrated Development Environment

3 Achievement

3.1 Presentation

This project consisted firstly to make a detailed study of Android:

⇒ **Its market;**

⇒ **Its potential;**

⇒ **Its future.**

Following this study, a document presenting this study was then performed. Then the second part of the project was to learn application development using the Android Eclipse software and the emulator included in the SDK for Android. Examples of functional applications have been developed to improve and better understand the subject. The third part, the most important, was the development of a functional application : in this case, a task manager. This application was developed using version 2.2 of Android (*Fro Yo*) and was tested under the latest release, currently, 2.3 (Gingerbread). The application is internationalized and can therefore choose the language (English or French).

In the next parts of the report will be presented the different features of the application made during the project.

3.2 Home screen

When launching the application on his smartphone or on the emulator, the home screen below appears.

The top bar displays the application name and the number of tasks it has. At the top of the homepage, is situated 3 buttons. Between them is displayed the name of the current task. The first button takes you back to the display of all root tasks (tasks that have no daughter). The second takes you back to the parent task and the third adds a new sub-task to the current task. At the center of the screen, the list of tasks already created and appears contains the main task: name, description, date, number of subtasks. To the right of each task is a blue button that provides access to sub-tasks of that task. To edit a task, just simply press it, a new window will open. If the user wants to access the various options in the application, he may press the "Menu" of its smartphone. A menu will then appear at the bottom of the screen (see image above) and will sort, sync, add a tag ...

Figure 3.1: Home Screen of the application

When the user changes the screen orientation of his smartphone, it automatically resizes the window with the list of tasks.

Figure 3.2: Change of orientation

3.3 Information of a task

When you click on a task to edit it or when you create a task, a form appears with the different task information (name, description, status, priority, date, tags). This page allows you to modify (or add) the information in a task, when finished, you press the button "back", the task is saved and then you get on the main page with the new list tasks.

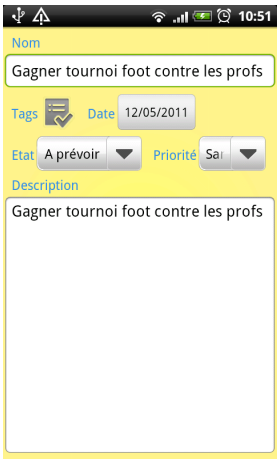

Figure 3.3: Information of a task

3.4 Tag management

A task can have one or more tags. These allow you to group tasks. For this, the user can sort the tasks according to their tag by pressing the "Menu" and selecting "Sort". He can also remove or add tags using the menu.

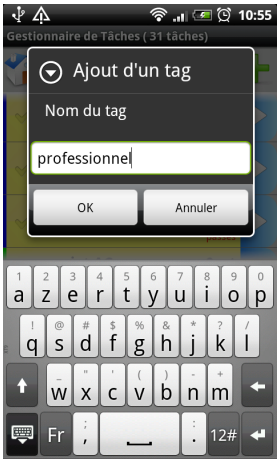

Figure 3.4: Add a tag

3.5 Preferences

The management of preferences lets users modify settings of the application. To get there, the user can press the menu button and select Settings. It allows the

user to choose whether they wish to use a user account (password and login), use a proxy (address and port) or if he wants to display spots cancelled.

Figure 3.5: Preferences of the application

3.6 Add an user account

Management is achieved through synchronization, including user accounts. Indeed, the server can save a list of tasks and tags associated with a user. Therefore, if the application user wants to synchronize its activities on the server, you must first create a user account using the menu "Add User". To do so, he enters the requested information (name, password, mail, ...), a message will indicate if the account has been created and if he wants to connect automatically. Otherwise, he can always connect later in the application preferences.

Figure 3.6: Add an user account

3.7 Synchronization

There are already many task manager on the Android Market, but the main advantage of this application is that users can synchronize their tasks on a remote server. 3 synchronization modes are available:

⇒ **Overwrite** the server with the mobile;

⇒ **Crush** the mobile data server;

⇒ **Combining data** from the server with those of the smartphone.

To synchronize its tasks on the remote server, the user must first create a user account (see previous section), then enter their username and password in the settings of the application (see chapter on preferences). He can, then, synchronize his tasks by going to the menu, then pressing "Synchronization" and then finally by selecting the mode of synchronization which he wishes.

The data sent between the remote server and the smartphone are encoded in JSON[1]. The remote server has been coded in PHP[2] during the project.

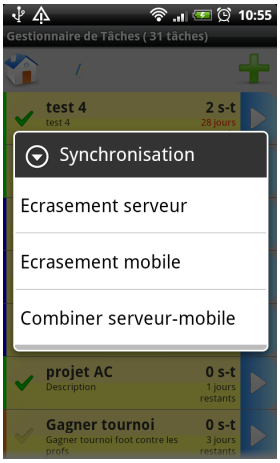

Figure 3.7: Choice of synchronization mode

[1] JavaScript Object Notation
[2] Hypertext Preprocessor

4 Conclusion

The first large part of this project has given an overview on Android platform. It revealed, among other things, how does Android work, possibilities but also limits. What was important for the continuation of the project, concerning the programming, it was the discovery of the tools necessary to develop. The second part could be started serenely.

In this second part, once the choice of the application made, it was necessary to do a short study on the functionalities, improvements and customizations. The task manager is now functional, it enables management of tasks and tags on a remote server to a specific user.

To conclude, the study of the platform has acquired new knowledges, to know more details about Android and what goes around. This study gives an overview of the product. After that, the development of a compatible application for Android smartphones revealed in greater depth Android, its functioning system, the limitations and the possibilities. Finally, work on the Android platform was full of knowledges. This platform, in constant evolution, continue to seduce more and more people by adapting easily on their needs.

Glossary

IDE : (Integrated Development Environment) this is a software application that provides comprehensive facilities to computer programmers for software development. An IDE normally consists of a source code editor, a compiler and/or an interpreter, build automation tools and a debugger.

JSON : (JavaScript Object Notation) this is a lightweight text-based open standard designed for human-readable data interchange.

MySQL : this is a relational database management system that runs as a server providing multi-user access to a number of databases.

PHP : (Hypertext Preprocessor) this is a general-purpose scripting language originally designed for web development to produce dynamic web pages.

Proxy server : this is a server (a computer system or an application) that acts as an intermediary for requests from clients seeking resources from other servers.

SDK : (Software Development Kit) this is typically a set of development tools that allows for the creation of applications for a certain software package, software framework, hardware platform, computer system, video game console, operating system, or similar platform.

Smartphone : this is a mobile phone that offers more advanced computing ability and connectivity than a contemporary feature phone.

SQLite : this is an embedded relational database management system contained in a relatively small programming library.

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