Republic of Tunisia

Ministry of Higher Education and Scientific Research

Private Engineering and Technology College

esprit
Ecole Supérieure Privée
d'Ingénierie et de Technologies

Internship report

Android application development

First year of the engineering cycle

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Supervised by : Mr Abd El Waheb BEN SAAD

Academic Year 2022-2023

Thanks

It is with the greatest honor that I have reserved this page as a sign of gratitude and recognition to all those who helped me, from near or far, in the realization of this valuable internship report within the Tunisian telecommunications company.

I would like to thank my supervisor at Tunisie Telecom, Monastir branch, Mr Abdl Wahab Ben Saad, for his warm welcome. You have done me a great honor by agreeing to direct this work and to give me the benefit of your knowledge and skills. I respect you for your merit and your human as well as professional qualities. I would like to thank you for all the help and advice you have given me throughout the completion of this work. You will find in this work the testimony of my sincere gratitude and deep admiration.

I would also like to extend my warmest thanks to the members of the jury who honored me by agreeing to judge my work.

Finally, I'd like to thank my parents for their encouragement, support and love, and for all their efforts on my behalf.
I hope I have been worthy of their trust. I dedicate this work to them as a token of my great gratitude and eternal love.

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General introduction

Ds part of my studies, at the end of the first year of the engineering cycle I'm required to carry out an internship, designed to ensure the student's professional integration into working life, and to apply the knowledge I've acquired during my studies.
this year. I chose to do my internship at Tunisie Telecom, Monastir regional office.

The main objective of this internship is to develop a mobile application on the Android platform that will enable TT customers to view and pay their bills, as well as consult a range of mobile, fixed-line and Internet offers.

Throughout my report, I'll try to introduce a few theoretical notions about the architecture and the development environment used, then I'll detail the 3 development phases of our application: the analysis phase, the design phase and the implementation phase, ending with a short user guide to facilitate the use of the application.

This work is organized as follows:

The first chapter presents the framework of the internship. The second chapter focuses on the theoretical framework for application development. Finally, the last three chapters are devoted to the three development phases mentioned above.

Chapter I: Introduction to the general framework of the internship

Introduction

In this first chapter, I'll start by giving a brief overview of Tunisie Telecom's Monastir branch. Then, I'll describe the existing procedure for paying bills, as well as marketing offers within the company, in order to highlight its shortcomings and then propose an alternative solution.

Section 1: Presentation of TUNISIE TELECOM, Monastir regional office

The Office National des Télécommunications (created in 1995) changed its legal status on April 5, 2004 to become a limited company called **Tunisie Telecom**.

Tunisie Telecom has evolved from its birth to the present day, with 6 million fixed and mobile telephony subscribers, 140 Espaces TT and sales outlets and over 13,000 private sales outlets.

Let's take a look at the Tunisie Telecom company data sheet:

- **Name**: Société Nationale des Télécommunications
- **Abbreviation**: Tunisie Télécom (TT)
- **Date of incorporation**: April 17, 1995 (Office national des télécommunications)
- **Legal form**: Société Anonyme
- **Capital**: TND 1,400,000,000
- **Headquarters**: Tunisie Telecom, Jardins du Lac II, 1053, Tunis, Tunisia
- **Business sector**: telecommunications
- **Network**: 140 branches
- **Telephone**: 71 901 717 / 71 139 700
- **Fax**: 71 900 777 / 71 860 635
- **Website:** https://www.tunisietelecom.tn

Some information about Tunisie Télécom Monastir office:

- **Address**: Boulevard de la Terre 5000 Monastir Tunisia
- **Telephone**: 73 501 405 / 73501717
- **Fax**: 73 501 203

Section 2: Survey of existing facilities

1. Description and criticism of existing systems

To pay their bills, TT customers go to their nearest Espace TT. This is no longer a practical way of paying bills, due to..:

- Low agency availability
- The waste of time ...

In fact, a customer is notified of his invoices by SMS. When he pays his bills, he receives a paper receipt. As a result, the customer is unable to keep track of all his invoices in an orderly and autonomous way.

On the other hand, Tunisie Telecom's marketing strategy focuses mainly on marketing its offers through TV commercials and billboards, during major sporting or cultural events or during the month of Ramadan, with the aim of reaching the maximum number of consumers. Undoubtedly, this is very expensive.

Fortunately, with the explosion in smartphone sales, the cell phone has become the most widely used device of all time, making it the marketing tool of choice for marketing TT offers to huge numbers of users, so easily and at no cost.

2. Proposed solution

Based on the above, the proposed solution consists of developing a mobile application that enables TT customers to view and pay their bills, as well as consult a variety of internet, fixed and mobile offers.

Conclusion

In this chapter, I have presented Tunisie Telecom, the Monastir branch. In addition, to better appreciate the framework of my work, I have carried out an analysis of the existing situation. We can now move on to the theoretical framework of the application's development, the subject of the next chapter.

Chapter II: Theoretical framework for application development

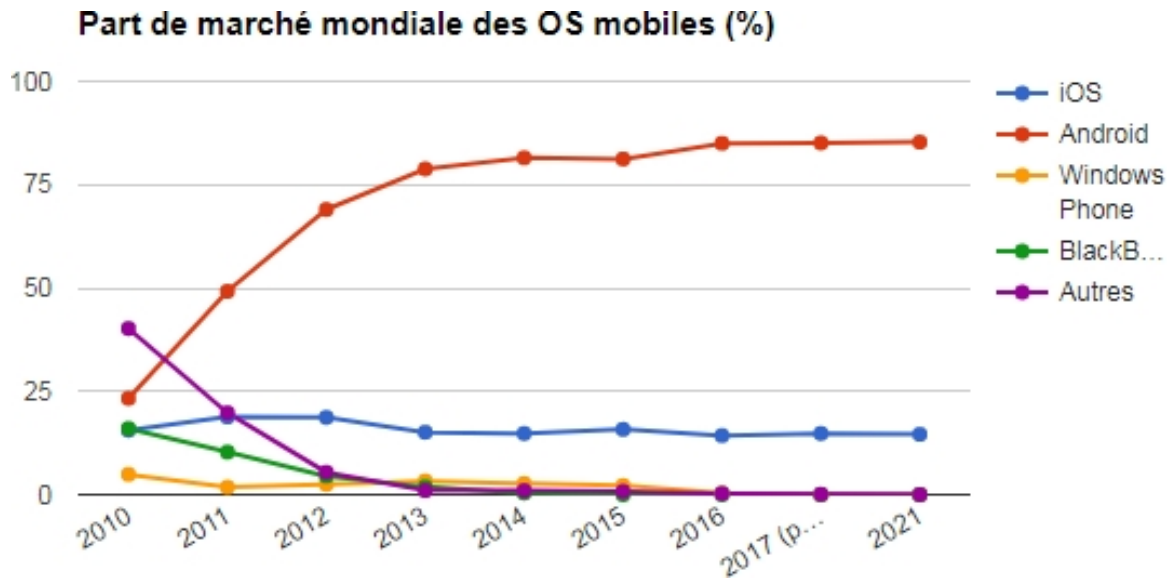
Introduction

In this chapter, we'll take a brief look at the different mobile platforms in section 1, then move on to a second section presenting the market leader. Finally, we'll close the chapter with a third section on three-tier architecture.

Section 1: The different mobile platforms

The smart phone platform development market is dominated by 5 major companies
Google, Apple, Microsoft, Nokia and RIM, which respectively develop the Android, IOS, Windows phone, Symbian OS and BlackBerry OS operating systems.

Here is a diagram illustrating the global market share for each mobile platform:



Section 2: The Android platform

From the graph above, we can see that since 2011, the Android platform has held a monopoly in the field of mobile platform development.

Android is a mobile operating system based on a modified version of the Linux kernel, primarily designed for touchscreen mobile devices such as smartphones and tablets.

Android was developed by a group of developers known as the Open Handset Alliance, sponsored by Giant Google, and was unveiled in November 2007 with the launch of the first commercial Android device, the HTC Dream, in September 2008.

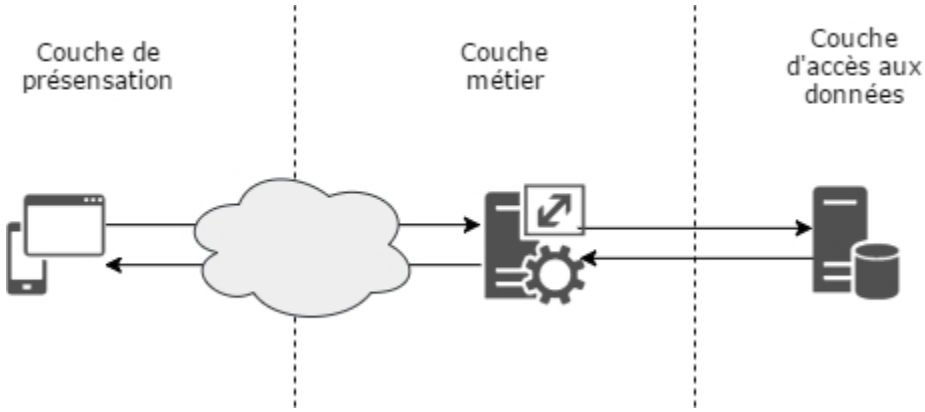
Section 3: Three-tier architecture

1. Notions on three-tier architecture :

Three-tier architecture, also known as three-layer architecture, is a software application architecture that organizes applications into three logical and physical levels:

- **The presentation level**: this is the user interface and communication layer with the application, where the user interacts with the application. The main objective of this level is to display information and collect information from the user.
- **The application level**: The application level, also known as the business layer, is the heart of the application. In this level, the information collected in the presentation level is processed. The application level can also add, delete, modify or query data in the data level.
- **Data level**: The level at which the information processed by the application is stored and managed. This can be in a relational database management system such as PostgreSQL, MySQL, Oracle..., or in a NoSQL database server such as Cassandra, or MongoDB.

Below is a diagram illustrating how the three layers work: the client, the web server and the database server.



It's clear that in a three-tier application, all communications pass through the application level (web server). The presentation level and the data level cannot communicate directly with each other.

2. Advantages of three-tier architecture :

The main advantage of three-tier architecture is its logical and physical separation of functionality. Each level can run on a separate environment, so that services on each level can be customized and optimized without impacting the other levels.

Other advantages of the three-layer architecture over a one- or two-layer architecture include:

- **Faster development**: as each level can be expanded simultaneously by different teams, an organization can get the application to market faster, and programmers can use the latest and best languages and tools for each level.
- **Enhanced scalability**: any level can be scaled independently others, according to market needs.

- **Improved reliability**: a failure in one level is less likely to have an impact on the availability or performance of other levels.
- **Improved security**: since the presentation layer and the data layer cannot communicate directly, a well-designed application l a y e r can act as a kind of internal firewall, preventing SQL injections and other malicious exploits.

Conclusion

To conclude this chapter, we note that among several mobile platforms, the Android platform will be our well-deserved choice. Thus, the three-tier architecture will present our software architecture for the development of our application.

Chapter III: The needs analysis and specification phase

Introduction

The requirements analysis and specification phase is the first step in the application development process. Indeed, in order to design a quality software application that meets users' needs, while respecting the various constraints, it is necessary to detail the customer's requirements and identify the system's major functionalities and limitations.

To do this, I'll start by defining the application's functional and non-functional requirements, then present the use case diagram.

Section 1: Functional requirements

What the application needs to do.

The application will enable TT customers to view and pay their bills (Internet, GSM, fixed-line) as well as consult a wide range of TT offers.

The following functional requirements can be detailed:

- View invoices and invoice details, including invoice number, invoice date and amount due for both paid and unpaid invoices.
- Pay outstanding invoices.
- Consult the list of TT offers and details of each offer.

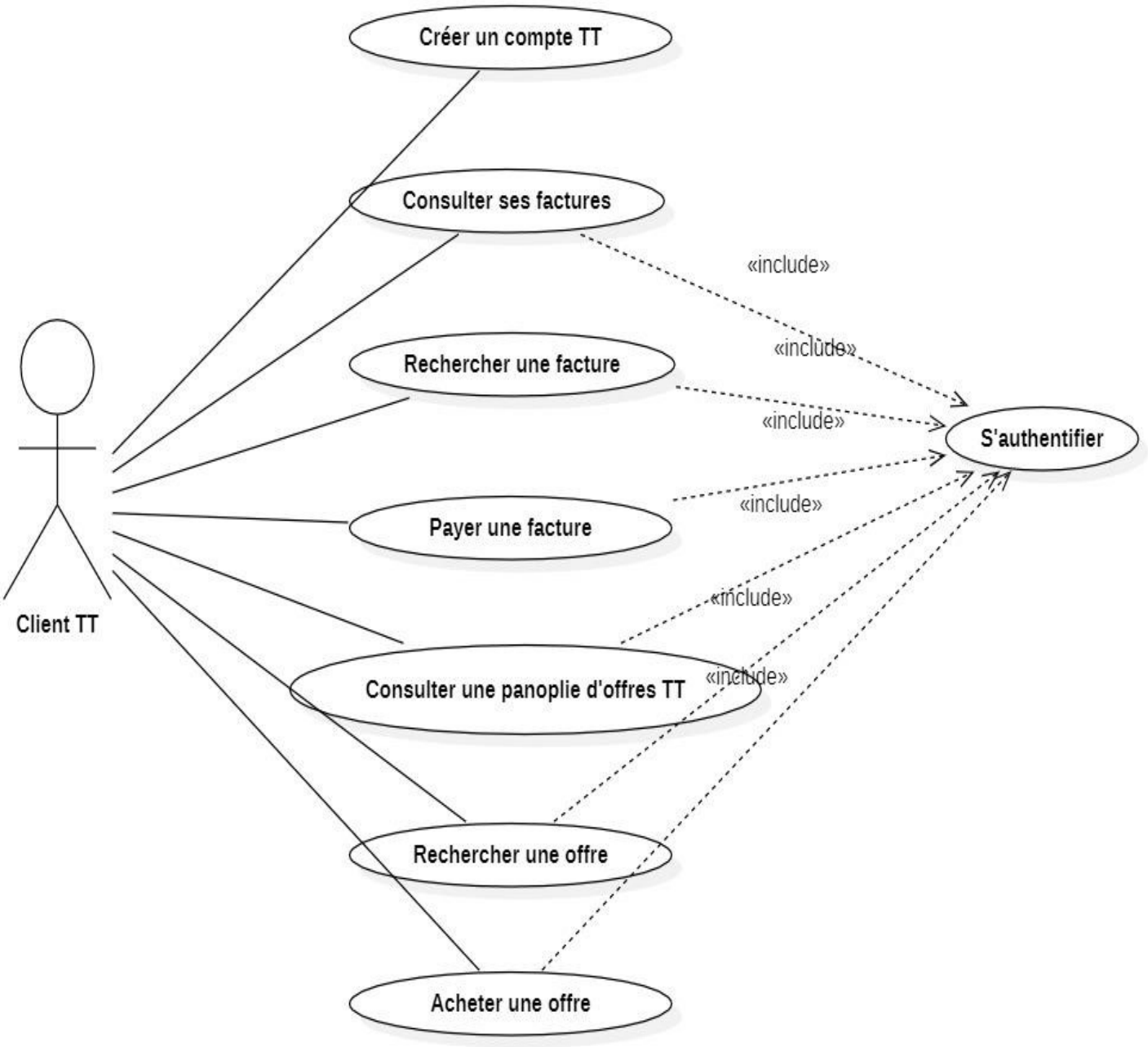
Section 2: Non-functional needs

The performance the application must deliver.

- **Speed**: The application must be optimized for reasonable processing times.
- **Efficiency**: The application must be functional, with as few bugs as possible. In addition, It has to manage a large quantity of data and represent it neatly, without redundancy
- **Security**: the application must meet minimum security requirements to protect itself against malicious attacks.
- **Ergonomics and compatibility**: The application must offer an ergonomic, easy-to-use interface. It must be compatible with all Android terminals. The application must be accessible and activatable by the user from his list of applications.
- **Maintainability and stability**: The application's source code must be descriptive and well-organized to ensure that the application can evolve to meet market needs.

Section 3: Use case diagram :

The use case diagram is a diagram that models the functional requirements of users (the main functionalities of the system from the user's point of view).



Conclusion

To conclude this chapter, we note that the requirements analysis and specification phase has given us a clearer vision of how the system will function, which will help us to begin the second phase of application development, the design phase.

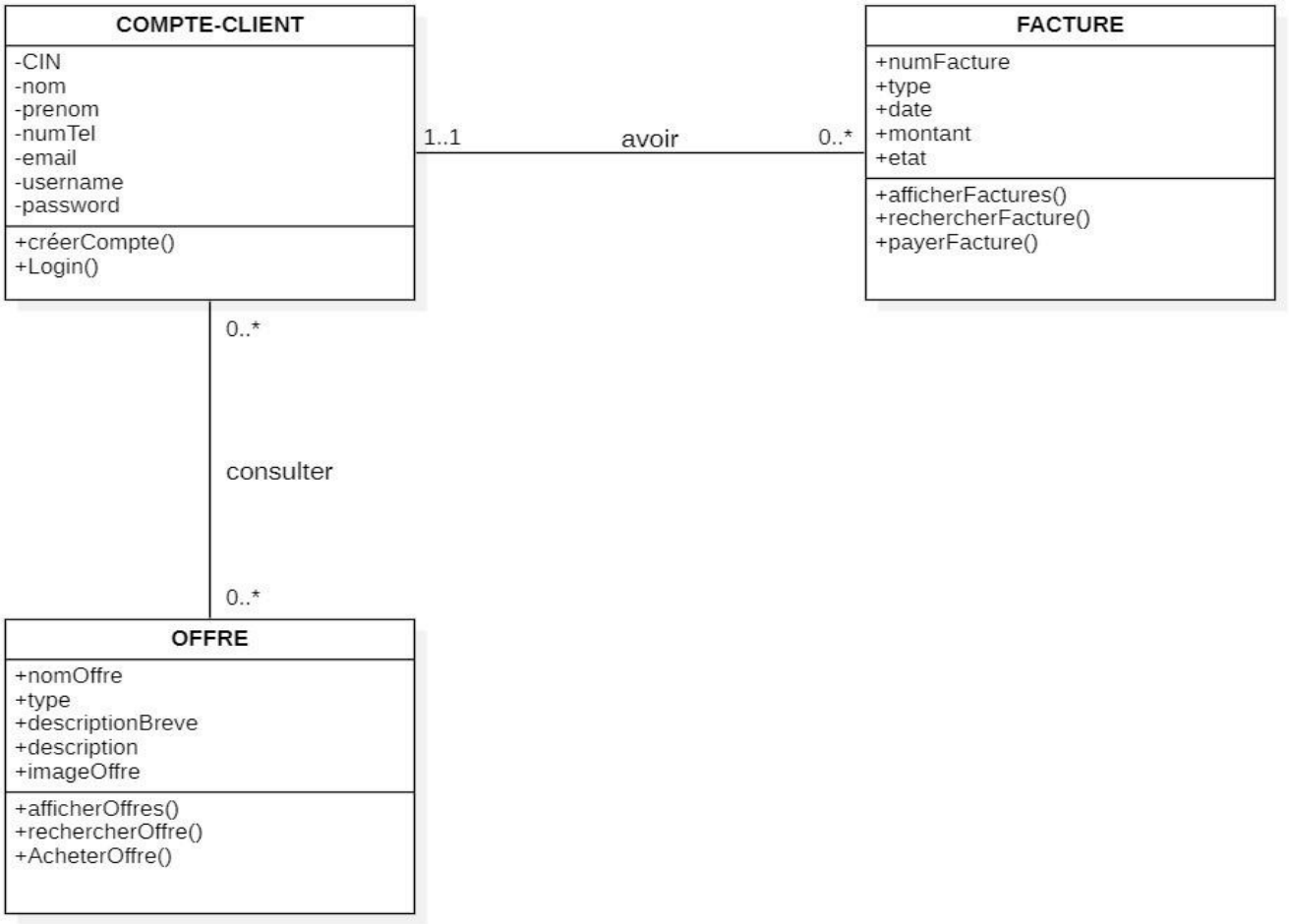
Chapter IV: The design phase

Introduction

Design is a preliminary and essential step that must precede the implementation stage of any application. In this chapter, we present a few diagrams to illustrate this phase.

Section 1: class diagram

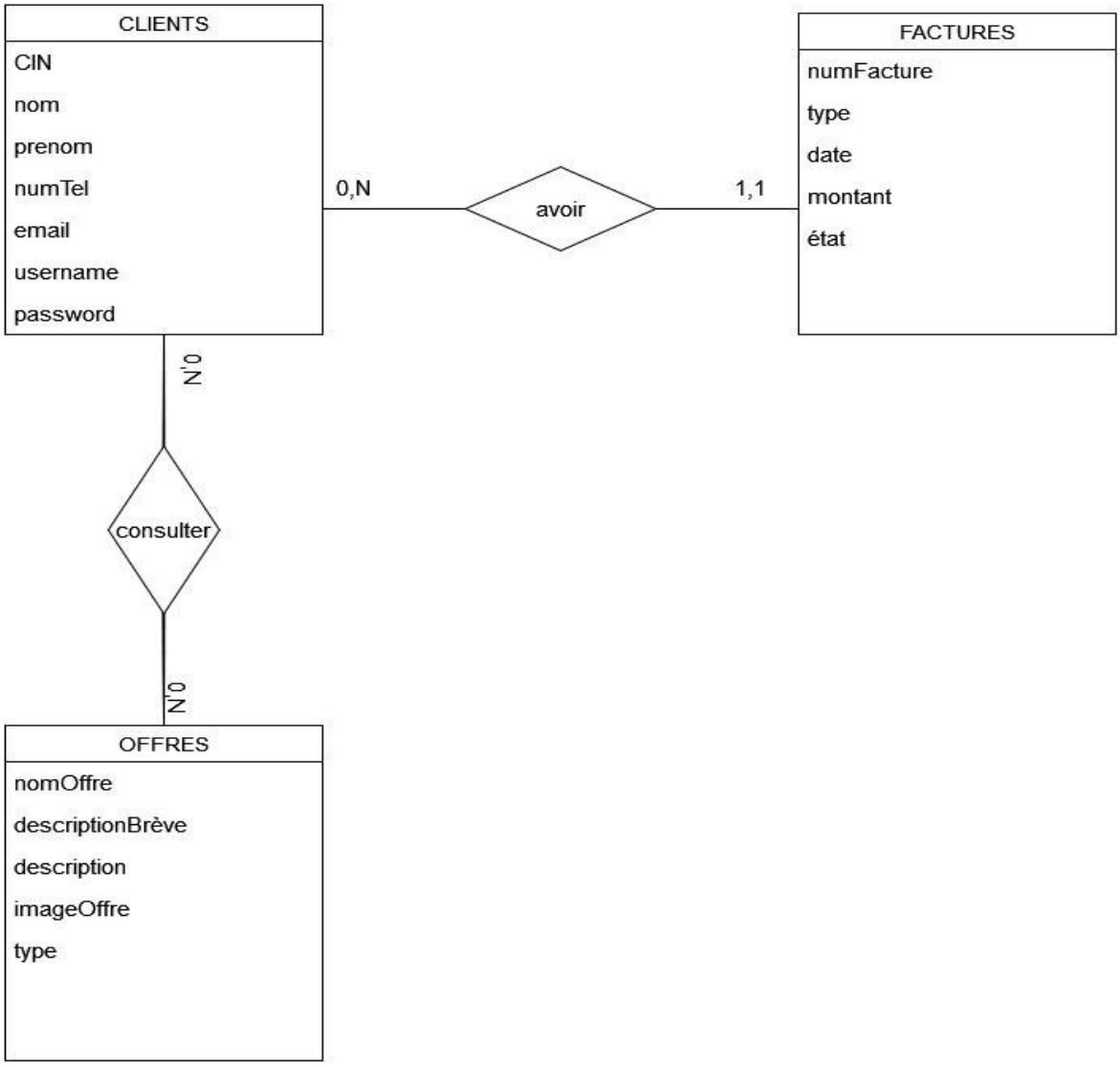
A class diagram is a static representation of the system's internal structure, in particular the set of classes (entities), including their attributes and methods, in order to realize the various use cases.



Section 2: database design

1. Entity-Association Model

The Entity/Association Model (also known as the Entity-Relationship Model) is a type of conceptual schema widely used for databases, particularly relational databases. It's a tool for describing how a database works.



2. The relational model

The relational model is made up of relationships (tables). These relationships are described by attributes (column names).

The relational schema of our database will be :

CUSTOMERS (CIN, last name, first name, phone number, email, username, password)

INVOICES (invoice number, type, date, amount, status, #CIN)

OFFERS (nameOffer, description Brief, description, image Offer, type)

3. Standardization

Standardizing a database means imposing construction rules on its structure to ensure data consistency and avoid redundant information.

- 1st FN: Check that all attributes are elementary and monovalent.
- 2nd FN: A relationship is in 2FN if it is in 1FN and, in addition, if the non-key attributes do not functionally depend on part of the primary key. If the primary key is simple (a single attribute), you're automatically in 2nd normal form.
- 3rd FN: A relationship is in 3FN if it is in 2FN and, in addition, any non-key attribute is not functionally dependent on any other non-key attribute.

Conclusion

This chapter describes the design phase of our application. In addition, to better appreciate this design, I have illustrated the framework of my work with design diagrams. We can now move on to the implementation phase.

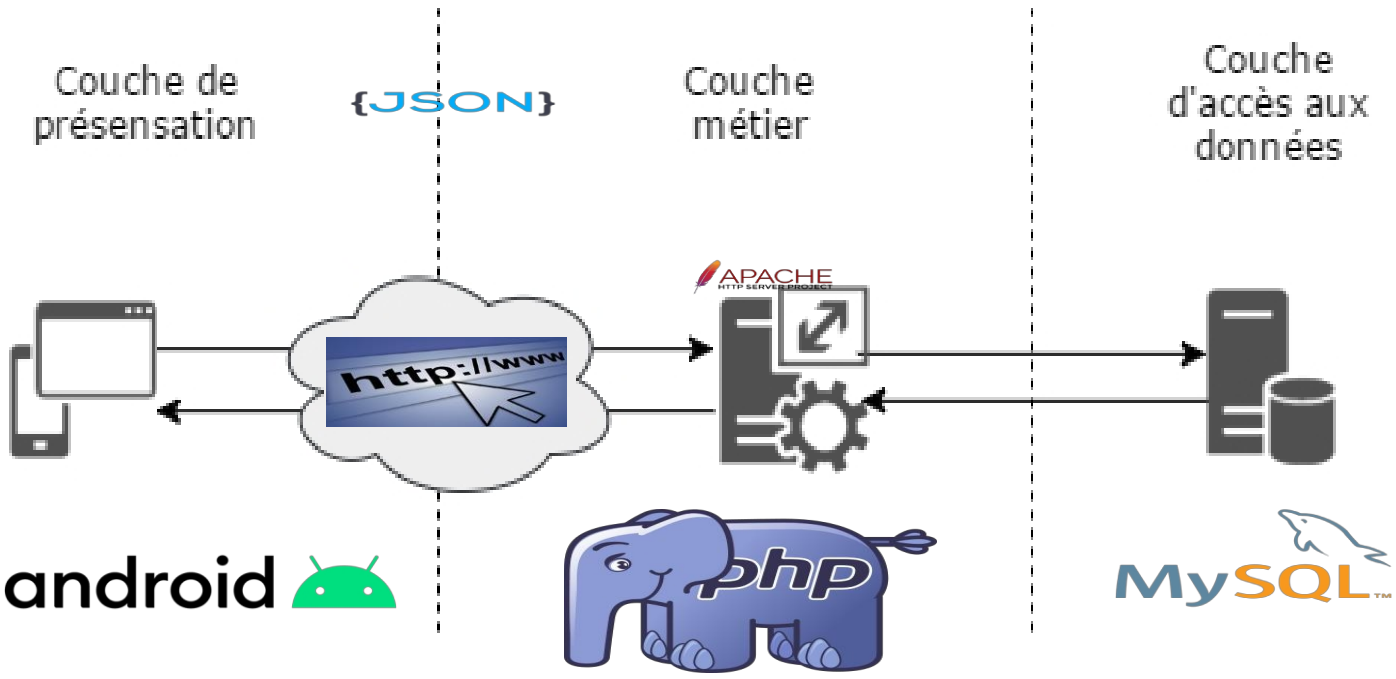
Chapter V: The implementation phase

Introduction

In order to succeed in the implementation phase, we need to approach the development of our application in a practical development environment with the right development tools.

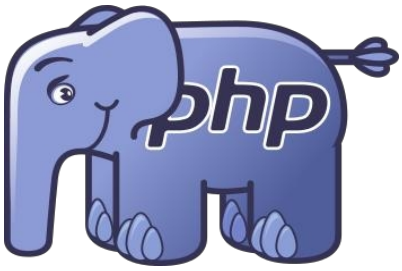
We'll start by presenting the development environment we're using, then move on to the main graphical interfaces of our application.

Section 1: Presentation of the development environment



Android, the market leader for smartphones, is an operating system dedicated to mobile devices with a screen. such as smartphones and tablets.

The Apache HTTP Server is free, open source, cross-platform web server software released under the terms of the Apache 2.0 license. Apache is developed and maintained by an open community of developers under the Apache Software Foundation.



PHP (synonymous with HyperText Preprocessor) is a server-side scripting language for Web development. It was originally created by Danish-Canadian programmer Rasmus Lerdorf in 1994.

In our project, PHP is used to facilitate database connectivity.

MySQL is an open source relational database management system (RDBMS).

The Hypertext Transfer Protocol (HTTP) is an application-layer protocol in the TCP/IP protocol stack.

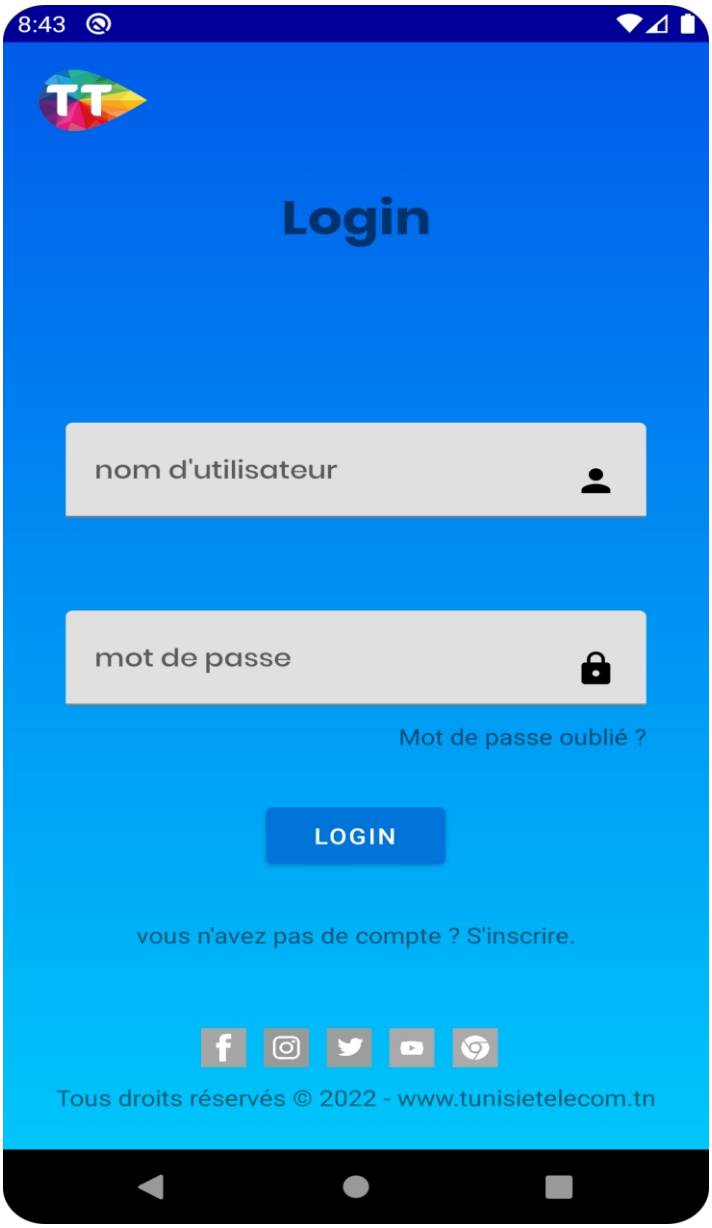
HTTP is the basis for data communication on the World Wide Web (WWW).

{JSON}

Json (synonymous with JavaScript Object Notation) is a lightweight data exchange format. It's easy for humans to read and write. So it's easy for machines to analyze and generate.

Section 2: User guide and main graphic interfaces

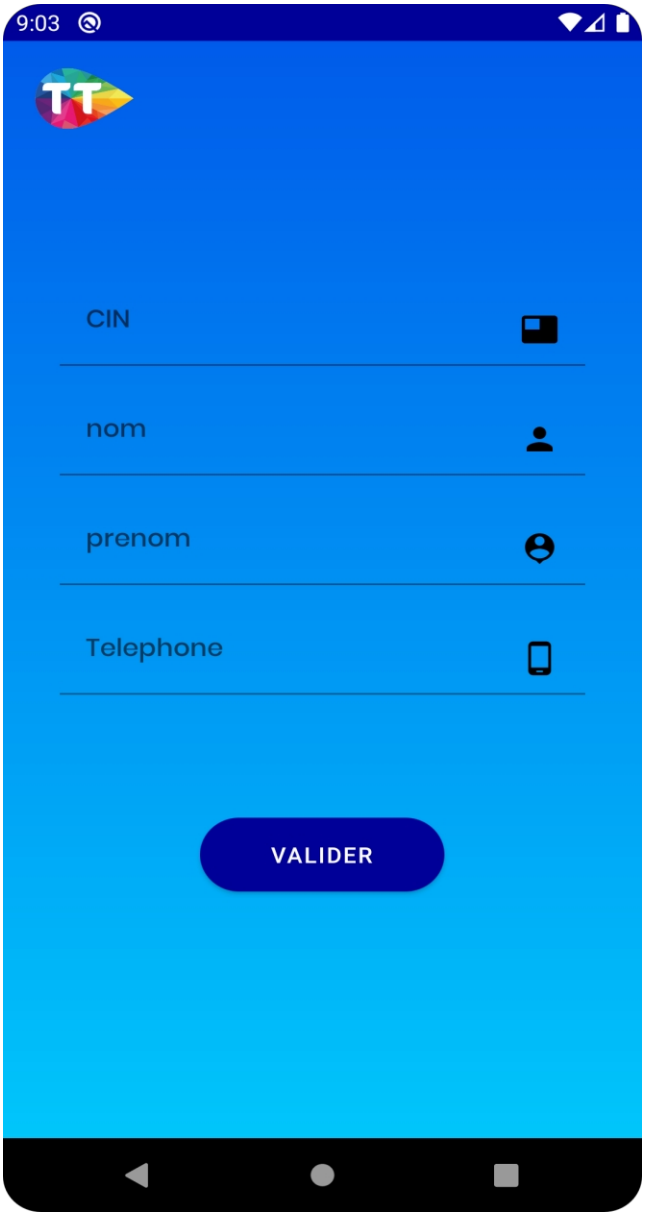
1. Connection interface



- TT customers enter their **user name** and **password**, then press the **Login** button to authenticate.
- If the customer does not have an account, he can create one by clicking on **register**.

- If you wish to reset your password, click on **Forgotten password**.
- He can also visit all TT social networks to keep abreast of all the latest news.

2. Registration interfaces



- To register, the TT customer must carefully enter **all the fields** in the interface, then **validate** your registration.

3. Home menu

- Once authenticated, the TT client can :

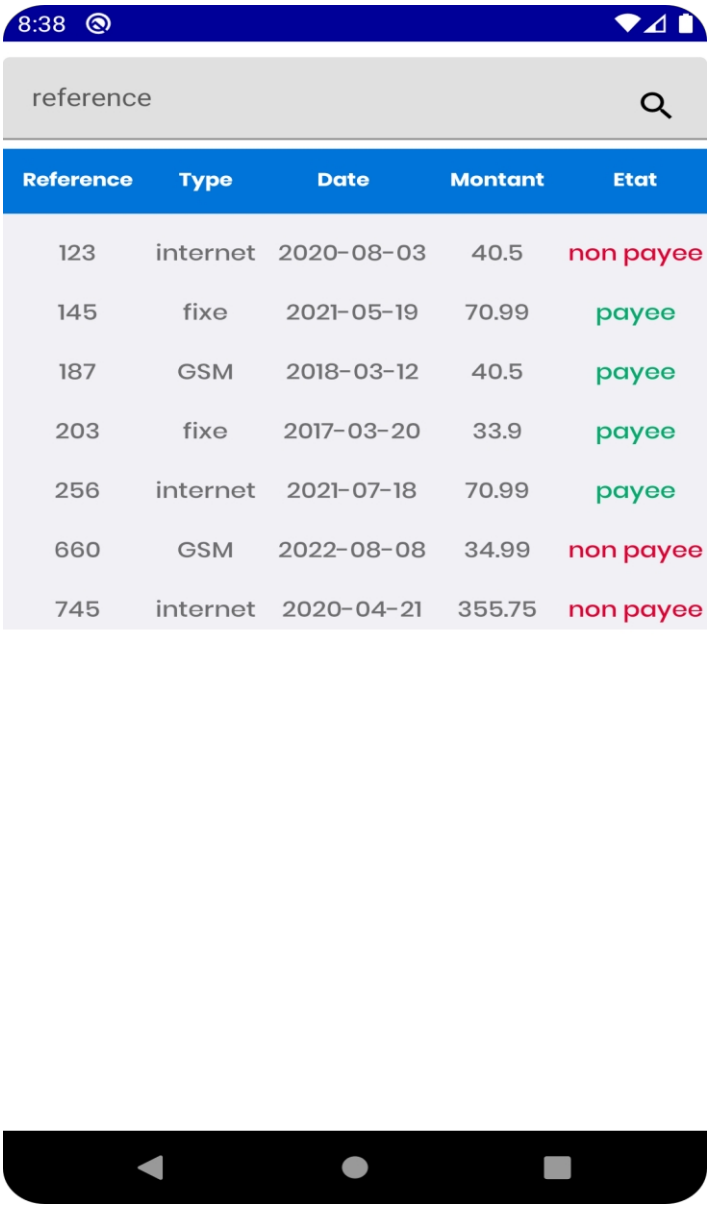
❖ Press the **MY INVOICES** button to view all your invoices.

❖ Press the **OUR OFFERS** button to consult the list of TT offers.

❖ Press the **E-BILL** button to pay an invoice.

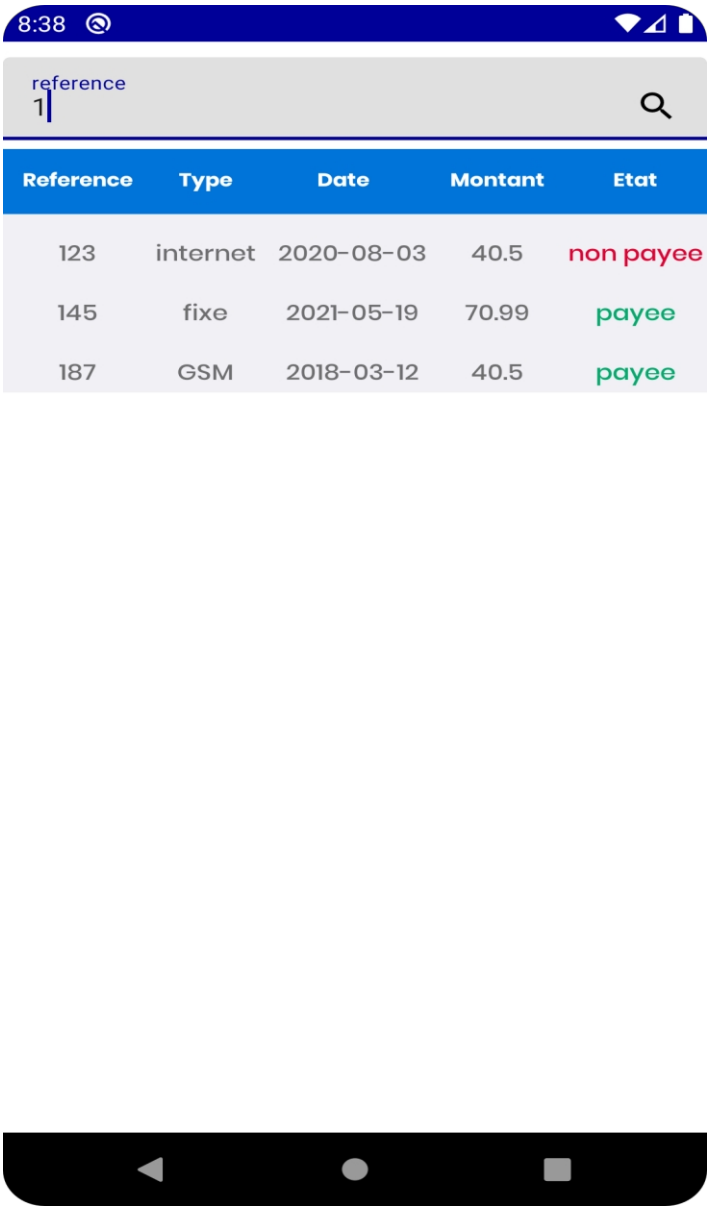
❖ Press the **LOGOUT** button to log out of your account.

4. Billing history

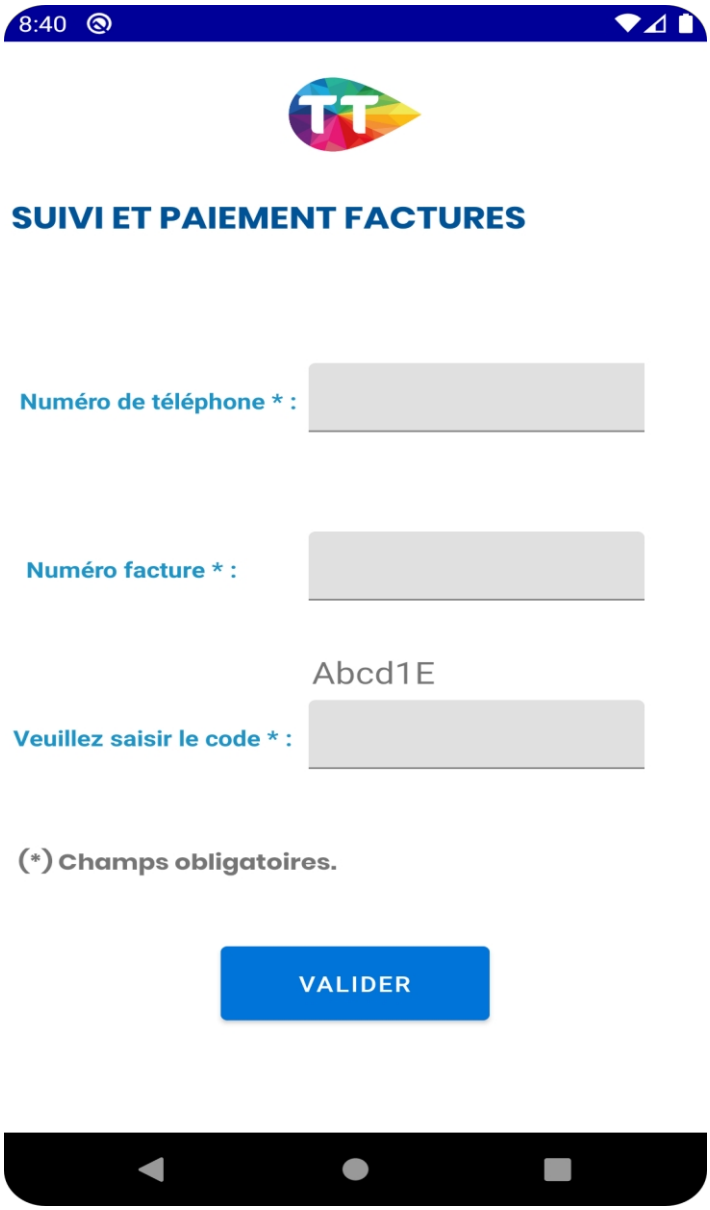


- By clicking on the **MY INVOICES** button, the TT customer can view his or her invoices and the details of each invoice, including its number, type, billing date, amount due and status, for both paid and unpaid invoices.
- The TT customer can press any unpaid invoice to pay it.

- TT customers can search for any invoice by entering its number in the search bar. In fact, it's a dynamic search, so all he has to do is type the first few digits of this reference and he'll see all the invoices starting with this part, as shown in this figure :



5. Payment interface



- TT customers can activate this interface either by clicking on an unpaid invoice in the invoice history, or by pressing the E-BILL button in the home menu.
- The customer must fill in the required fields and press **validate** to make the payment.

6. List of offers

- If the TT customer presses the **OUR OFFERS** button, an array of TT offers will appear on the screen.

- The TT customer can choose a category of offer (Internet, Fixed or Mobile).

- He can select any offer for more details or to buy it:

- They can search for an offer just as easily by entering their name or part of their name in the search bar:

Conclusion

We closed this project with the final phase of our application development process: the implementation phase, which included the development environment used and the main graphical interfaces.

General conclusion

The development of an Android application using a three-tier architecture was no easy task, yet I didn't hesitate to take part.

In this context, I have tried, through this work, to detail the needs of TT customers through a first step of needs analysis and specification, then to address these needs in the design phase and finally, to implement our application within a suitable development environment.

My experience at TUNISIE TELECOM, Monastir branch, gave me the opportunity to understand and pinpoint the parameters involved in analyzing and designing software applications, and to assimilate the means deployed for implementation.

Last but not least, this internship was of great benefit to me, as it enabled me to apply some of the academic knowledge I had acquired during my university studies, and to improve my analytical and communication skills.