University Djillali Liabes of Sidi Bel Abbes

Faculty of exact science, Departement of computer science

Conception and Realization of an Android Mobile Application

On-Demand Printing/Writing Services

Licence degree project report

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Abstract

In universities and school districts, printers, print,paper and pen serve a very central role. Not only are they important to the learning process, they are in use by students, teachers and even the staff. And because of the shortage of printers , the abundance of Documents that need to be printed ,the enormous amount of writing work that awaits for them and the time that they can't afford to wast , Those individuals will seek for an exterior service providers like print shops and writers . For this reason ,we allocated this project for creating an Android Mobile Application with the help of Firebase platform.An online app that willl assist the providers whether print shops ,writers or other individuals to manage the printing and writing requests that comes from Students, teachers and the administrative staff directly from thier devices, which will ease the process and reduce the workload for both of them.

Acknowledgments

We would like to express our sincere gratitude to several individuals for supporting us throughout our Graduate study. First, We wish to express our sincere gratitude to our supervisor, Professor Mahmoud Fahci , for his enthusiasm, patience, insightful comments, helpful information, practical advice and unceasing ideas that have helped us tremendously at all times in our research and writing of this report. We are also grateful to our parents and our freinds for their consistent support and assistance. Finally, last but by no means least; also to everyone in the Departement of computer science it was great sharing premises with all of you during last three years. Thanks for all your encouragement!

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General Introduction

In partial Fulfillment of the Requirement for Licence Degree of Computer science in the university Djillali Liabes of Sidi Bel Abbes , We will be delighted to present our Final year project report.

The project will be devoted to creat an Andriod mobile app for On-Demand Printing and Writing services which it will benefit the print shop owners,writers or any one who has a printer and it will be helpful for the students,teachers,professors or any one who is in the academic field.Therfore the main objective of our project is to creat a "Market" for requesting and providing printing and writing services that will allow clients to request online and help providers to manage those requests.

The project report will be composed of three chapters.In the first chapter, we will introduce the problem that we are trying to solve.we ll analyse it and study it and define and specify the functional and non functional requirements in order to get a clear vision for an effective solution .

For the second chapter,we will give a detailed description and conception for our propposed solution.

The chapter three will be consecrated to Testing our final product with mentioning the work and the test environment.

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Chapter 1

Preliminary study

"Android mobile Application for On demand printing/writing services". This is how our project is titled. But what this app is really for? what we can do with it?what do we need to creat it ?

1.1 State of art and Problem Analysis

In the first part of this chapter,we will be presenting the problem that led us to starting this project.we will also going to see how we are currently dealing with it and what we are supposed to do about it .

1.1.1 Problem Analysis

When you think about learning, typically you envision students at their desks putting pencil to paper, or listening to a teacher in the front of the classroom. However, today there are a variety of tools that support learning and literacy. Around the world at an increasingly rapid pace, new classroom learning methods and tools, including digital technology, are being adopted. Interestingly, current research reports that there are learning and retention limitations to engaging digital technology in the classroom and as a studying tool when compared to pencil and paper.

Two Sides has compiled some eye-opening facts about learning and literacy that

demonstrate why print, paper and pencil remain highly effective learning tools. From handwriting, to reading, to comprehension and retention—print, paper and handwriting deliver proven benefits and continue to play an essential role in education and development[29]. But we cannot close our eyes on the problemes that could face the operators in the education sector therfore we are going to mention them her.

Printing

Paper products have been – and likely always will be – an important component of the education market. Schools of all levels, from elementary to college, go through a lot of paper, making the industry one of the biggest consumers of print materials (and, therefore, one of the best customers for print service providers). As with many sectors, many aspects of the education field have started to transition toward digital platforms. The e-learning industry has gained significant popularity over the past few years ,specially with what happend this year duo the COVID19 panademic, with digital developments in mobile technology and content making it easier than ever for students to access and engage in learning assessments on the go. But just because virtual classrooms are becoming more widely adopted, that does not mean the use of paper in education is diminishing. Printed documents and forms continue to play a powerful role in the industry due to their various applications and uses[23]. Students need to be able to print thier homeworks, papers and reports ... while teachers need to be able to print thier tests, lessons and plans ... and the administrators also need to print legal documents,forms and records. Unfortunately,Universities and school districts dont have the budget that comply with thier needs.Just imagine an university with 300 students ,12 professors , 10 administrators and having just two printing machines,will that cope with thier needs? definitely not.So they ll be obliged to look for outer providers like print shops. but looking for the right provider can be slow and require some efforts and can be totally waste of time if they are not available. Print shops are Brick and Mortar or Offline business,they operate from fixed physical locations , so thier presence will be just locally which it will be hard for them to obtain new customers. The other challenge that they face is the cost

involvement due to infrastructure facilities and human resources. they also usually operate on fixed hours which will be huge drawback for them and for the customers.

Writing

One of the biggest issues that many teachers and educational professionals face is the impact of workload on rising their stress levels.

> "Work should not consume people. Teachers who are exhausted, frazzled and demoralized by their work are not effective or creative in the classroom. And exhaustion further undermines the social bonds in schools. When teachers do not have the energy to interact effectively with each other,with administrators and with students, serious problems emerge. And the workload issue will not go away soon.... If the increased workload remains, I predict that schools will progressively become less healthy places. And everyone will be affected teachers, support staff, students and parents.That cannot be good news". [24]

students also face this problem.The requirements from one class alone can be daunting. Most professors ask students to complete homework assignments, readings and prepare for exams. In addition, some require students to write research papers, journals and participate in out-of-class activities.Combine all those activities and multiply them by four, five or six other classes, then you can recognize how stressful it can be for students.and as an example,a study, led by Mollie Galloway from Lewis and Clark College, shows that although students who spend more time doing homework are sometimes more behaviourally engaged in school, they also tend to be more anxious, and report more physical symptoms due to stress. [31]
Most of thier work is about writing ,and most of it isn't that necessary but it can be helpful and also time consuming ,and for all these reasons, they find themselves looking for writers to ease the work on them like writing some cover reports templates , preliminary researche papers or legal documents templates ... .But is not easy to find good writers.

1.1.2 Study of the existing system

The dealings between the clients and providers still just a traditional commerce that involves face to face interactions . the clients still need to displace to get thier services done and the providers need to have a store to house thier clients which it will be hightly costly and time consuming for both of them.

1.1.3 Proposed System

With the number of smartphone users worldwide today that surpasses three billion and is forecast to further grow by several hundred million in the next few years [26], we see that On demand Application for printing and writing services will be th ideal solution for our problem.

On-demand services apps are everywhere – we can hardly imagine a field unknown to on-demand market. Variety of services, speed, convenience, and quality make these apps popular and widely used around the globe. This brings us to the definition of an entire economy built around this value offering. The on-demand economy is the economic activity created by digital platforms that fulfill consumer demand placed online via immediate access to and convenient provisioning of goods and services offline.

It is revolutionizing the way in which people go about their lives and interact with the labour market, and the explosive growth of the most elegant on-demand ideas has made us realize that we are only just beginning to unlock the potential of this 'on-demand' economy. These new technology driven platforms have the capacity to increase the pool of potential services providers and sellers by leveraging networked technology to change how participants engage in a specific transaction. For instance, service providers are now signing up on platforms to connect directly with consumers, and the consumers now have the convenience of availing services from the comfort of their homes. A dramatic increase in the number of smartphone connected consumers, simple and secure purchase flows, and location-based services are a few of the market conditions making the necessity of having a brick and mortar shop obsolete.

1.2 Specific Requirements

In this part we will introduce the actors that will deal with app and specify the functional and non functional needs of the project.

1.2.1 Identifying the actors

The actor is an extern entity that will interact with our system.Therfore, we need to present them her.There is one primary actor which is the user of this app and a secondary actor which is the backend administrator :

- **User:**

  anyone who will interact directly with our app .There are two types of users and as they share the same requirements ,they also have additional requirements of thier own :

  - Service requester(Client): a person who will make requests of printing or writing services to be done .
  - service provider(Admin): a person or groupe of people or an Business owners who will recieve the requests from the clients and gets them done.

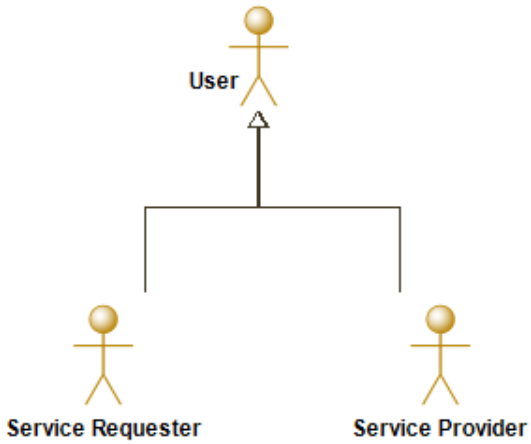

Figure 1-1: Primary Actors(Users)

- **Backend administrator:**

  a person who can access and manage the backend of the system to ensure the function and the security of the system.

Figure 1-2: Secondary Actor(Backend administrator)

1.2.2 Identifying the functional requirements

The users of this system need to be able to register,login,access their profile and edit their profile settings whether they are service providers or service requesters.
In addition to his abilities as a user, the service requester also needs to be able to make requests and manage his own requests.
In addition to his abilities as a user, the service provider also needs to be able to mange the incoming requests from their clients,and access his wallet provided by the app.
The backend administrator of this system needs to be able to manage the users,payments ,the database and the storage , and to set the security rules that permits the app to access the backend side.
All this will be ilustrated in the table 1.1 in detailes.

Actor	Use case	Descreption
User	Register as new user	any new user needs to register to start using the app.
	authentication	any user needs to be able to access his profile and that will be only by login into the app aslo any user needs to be able to edit his login information,personal info,technical info ,payments info and his profile picture as well .
Service requester	make a request	he will need to make a request of a service starting by choosing the type of service whether it s printing or writing and printing ,he will also need to select his service provider ,then he will need to enter some detailes about the request.
	manage own requests	he will need to access his requests to be able to track them , cancel them if he wants to and pay for them after the service provider accepts his request and he also needs to be able to delete them .
Service provider	manage incoming requests	he needs to be able to access all the requests so he can accept them and setting a price for them , refusing them and declaring finishing them as well and he also needs to be able to delete them from his history .
	access wallet	he will need to be able to check his wallet balance,and look back to his tranactions history and also needs to be able to withdraw his money to his actual bank account.
Backend administrator	manage users	he will need to be able to access all the users ,add new users ,update users info or delete existing users .
	manage the database	he will need to access the database as maintaning it and updating it.
	manage the storage	he will need to access all the files in the storage as adding, deleting files in it .
	manage payments	he will need to access the history of all payments and makes sure that the orders are done and payed for.
	set security rules	he will need to set who and how to access the data and the files existed in the database and the storage .

Table 1.1: Different use cases of each actor

Use Case Diagram

A UML use case diagram is the primary form of system/software requirements for a new software program underdeveloped. Use cases specify the expected behavior (what), and not the exact method of making it happen (how)[32]. Use cases once specified can be denoted both textual and it s represented in the table 1.1 and visual representation (i.e. use case diagram) and thats what we are going to do in this section . A key concept of use case modeling is that it helps us design a system from the end user's perspective. It is an effective technique for communicating system behavior in the user's terms by specifying all externally visible system behavior.

the figure 1-3 represents the specified use case diagram for all the users of the application.

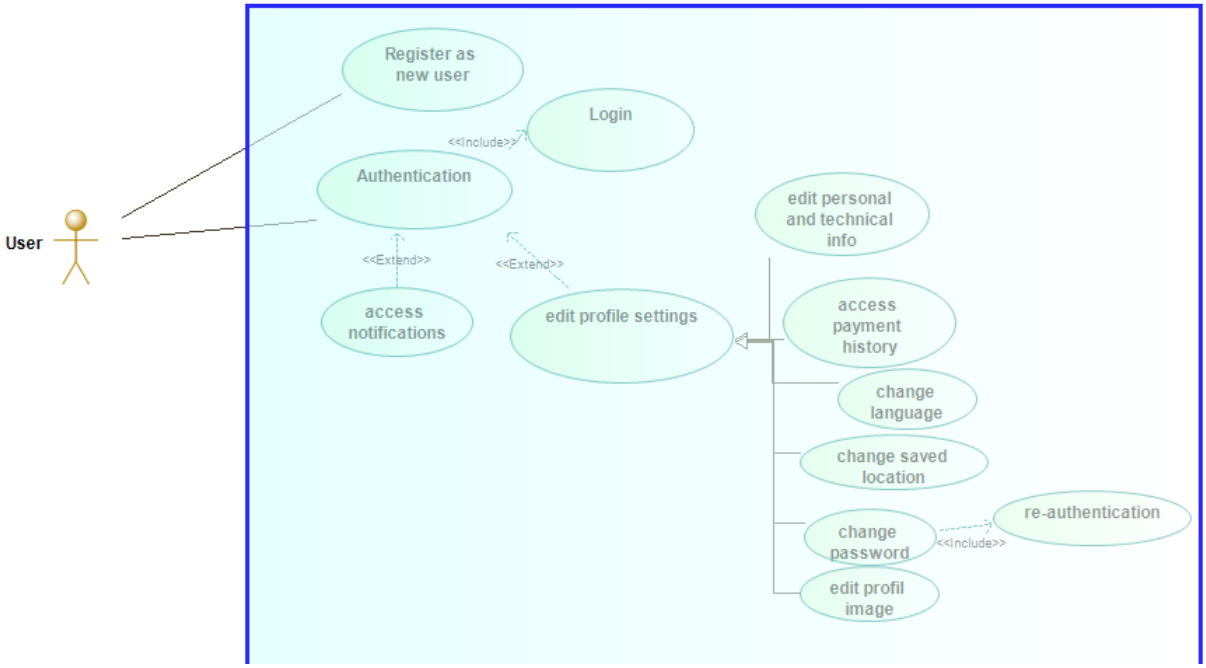

Figure 1-3: Specified User(all users) Use Cas Diagram

the figure 1-4 represents the specified use case diagram for the Service requester.

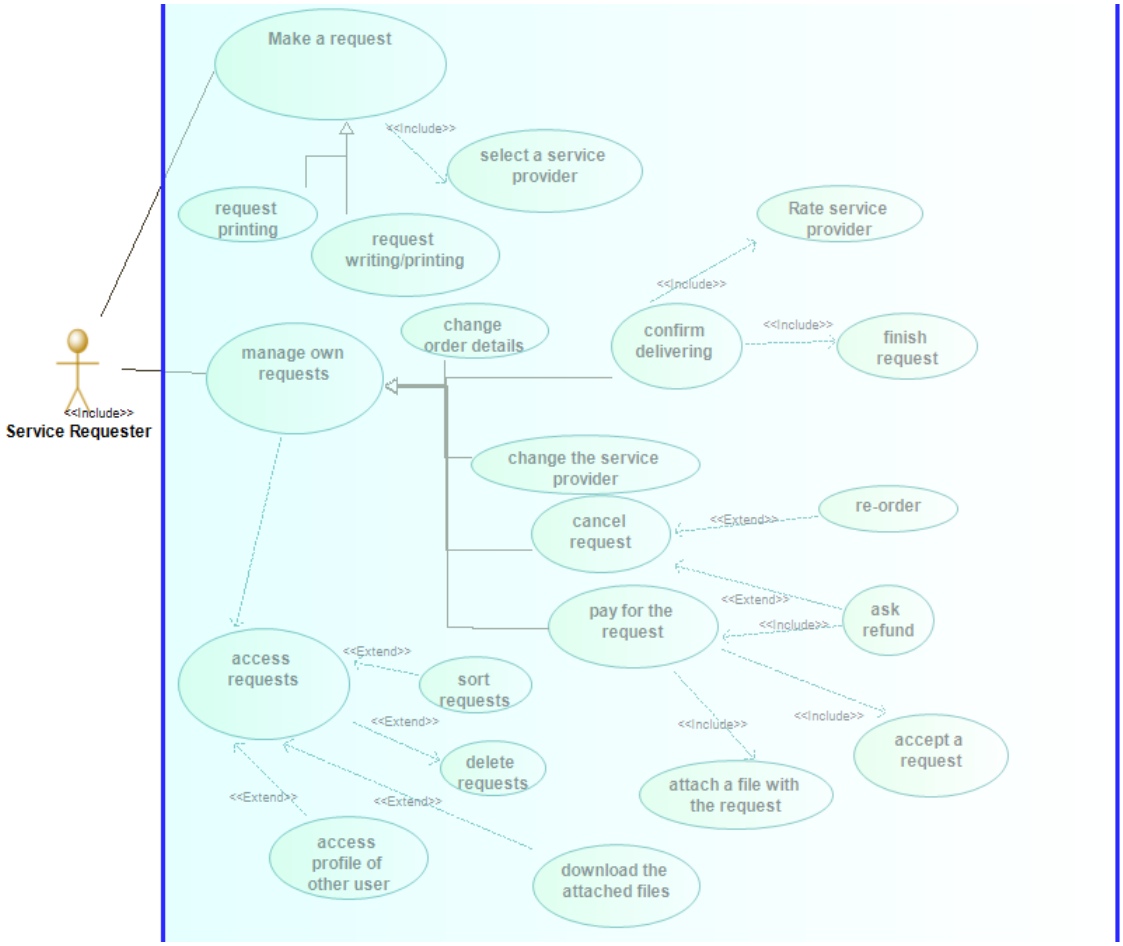

Figure 1-4: Specified User(Service requester) Use Cas Diagram

the figure 1-5 represents the specified use case diagram for the Service provider.

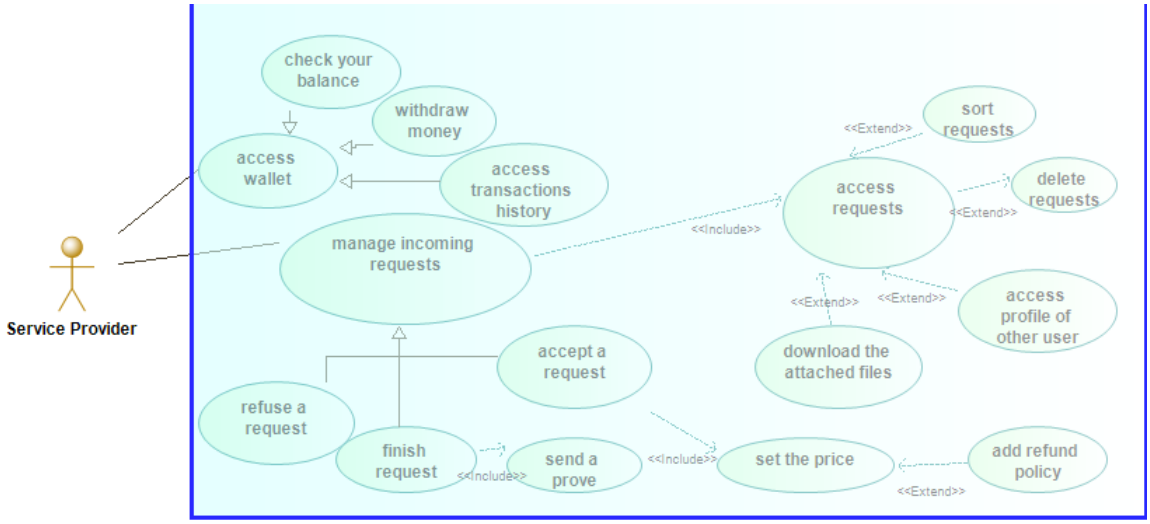

Figure 1-5: Specified User(Service provider) Use Cas Diagram

the figure 1-6 represents the specified use case diagram for Backend administrator.

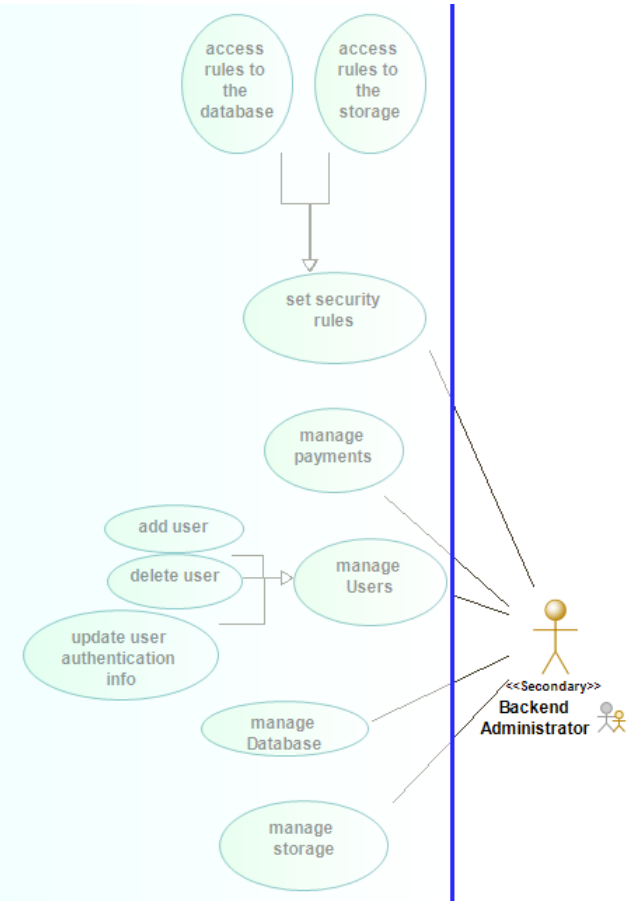

Figure 1-6: Specified Backend administrator Use Cas Diagram

the figure 1-7 represents the global use case diagram for the application wiche gives us a brief summary of the system functionalities and its interactions with the actors.

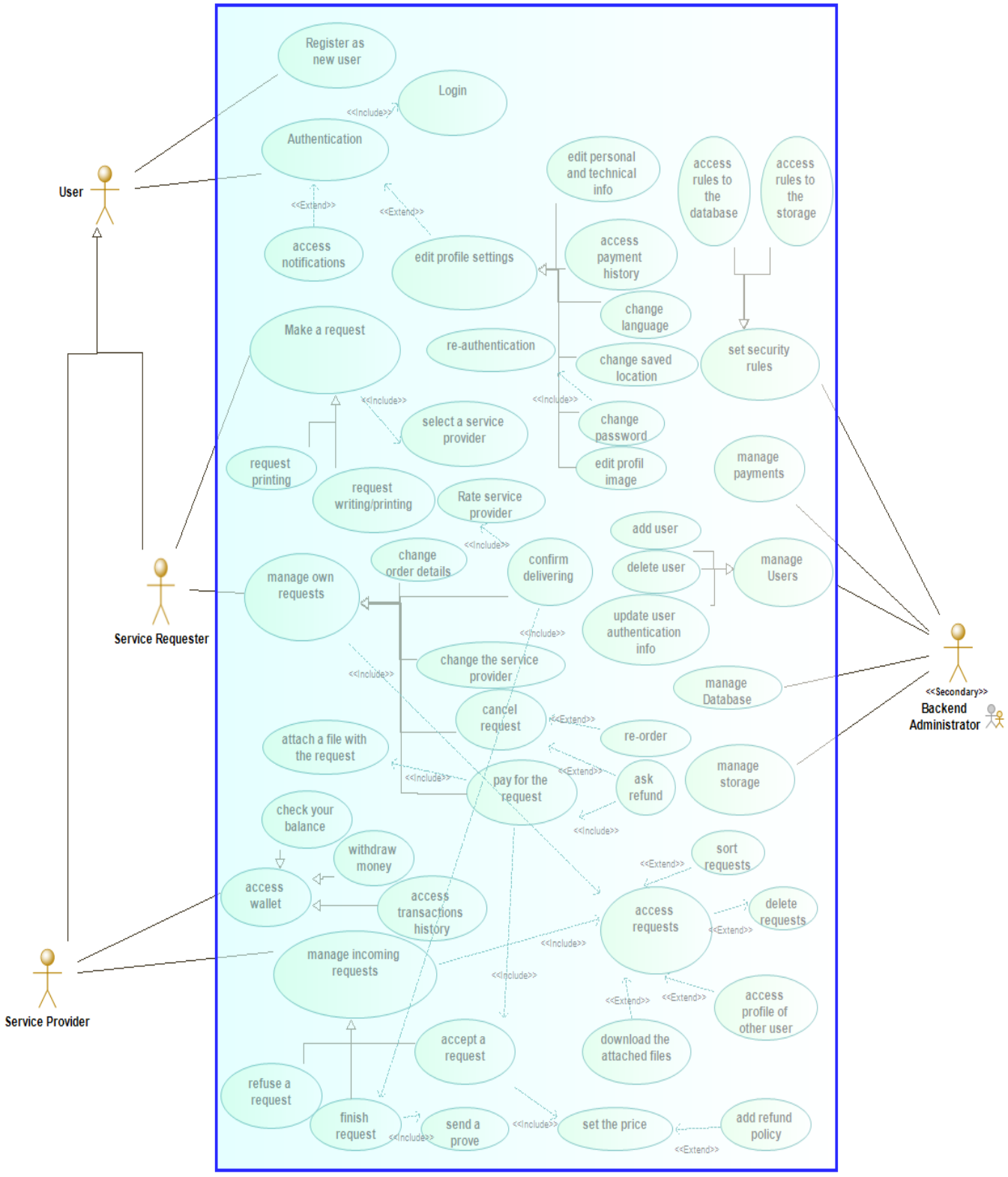

Figure 1-7: General Use Cas Diagram

1.2.3 Identifying Non functional requirements

This application needs to meet some conditions and follow some technical constraints.

Native Android Aplication:

The system needs to be represented by a native Android application but at first,What is Native Application?
Native application is a software or program which has been developed to perform some specific task on particular environment or platform.it built using software development tools (SDK) for a certain software framework, hardware platform or operating system. like Android app built using Java Development Kit on Java platform, iOS app built using iOS SDK, Swift and Objective C. Similarly, .NET required for Windows platform and in our case we will use Android for the development because 96% of mobile users in algeria wich represents our market for the project are Android users[30] therefore we need to focuse in using the Android platform for the development which will be less time and money consuming and bineficial as well.
but why it has to be native?
because its benefits it is what the project needs wich we will list them her:

- they deliver the best performance of all three development approaches (hybrid and web progressive apps).
- they receive complete support from app stores and the overall app marketplace. Distribution in app stores helps with discoverability.
- they are interactive, intuitive, and run more smoothly in terms of user input and output.
- Native development allows developers to access the full feature set of the selected operating system.
- The user experience of native apps is far superior to web apps or hybrid apps. To the user, the flow is more natural because of each mobile operating system's specific UI guidelines and standards.

- A native app must be approved by its respective operating system which assures quality, security, and device compatibility.

the figure 1-8 shows how Android dominates the mobile OS market in Algeria .

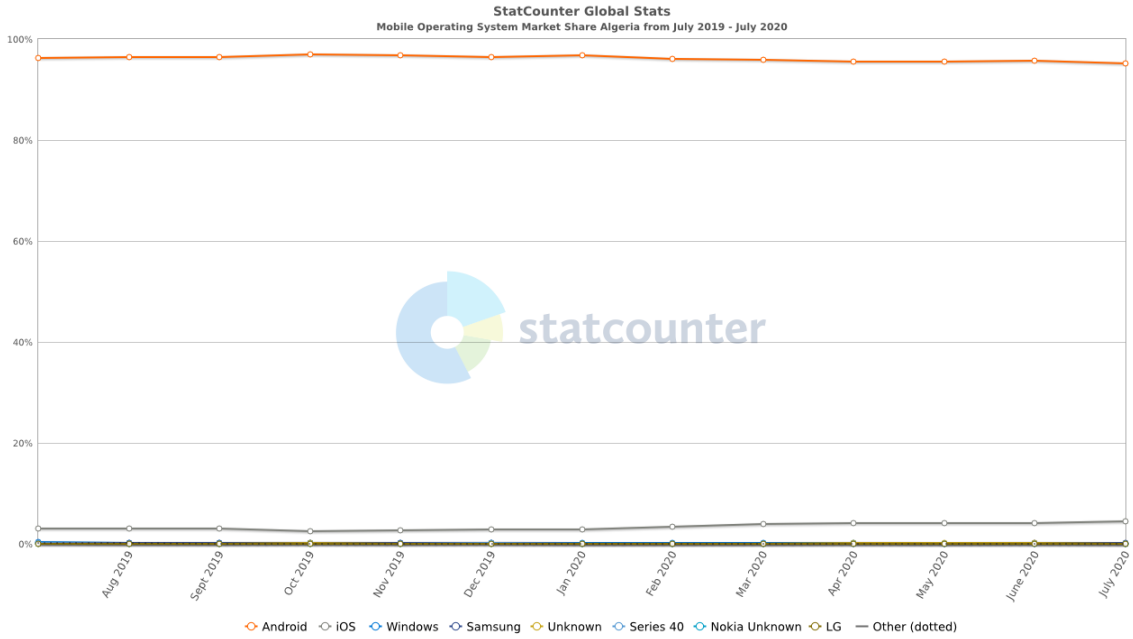

Figure 1-8: Mobile OS market in Algeria

Realtime Database:

The service provider and requester like we metioned above , they will need to access the list of orders to manage them .for this reason, the application needs to constantly offer them new updates for this list without their interfering therefore we obliged to use a realtime database.What is realtime database then?

A real-time database is a database system which uses real-time processing to handle workloads whose state is constantly changing. This differs from traditional databases containing persistent data, mostly unaffected by time[13].

Traditional databases are persistent but are incapable of dealing with dynamic data that constantly changes. Therefore, another system is needed. Real-time databases may be modified to improve accuracy and efficiency and to avoid conflict, by providing deadlines and wait periods to insure temporal consistency. Real-time database sys-

tems offer a way of monitoring a physical system and representing it in data streams to a database. A data stream, like memory, fades over time. In order to guarantee that the freshest and most accurate information is recorded there are a number of ways of checking transactions to make sure they are executed in the proper order.

Authentication service:

The user needs to login to the App using his email and password to access his data, therfore we need a better security to ensure the integrity and the confidentiality of his credentials .And that will be achieved by using a well trusted authentication service wich refers to the identity verification process from the service provider to the user.

Storage server

Since the service requesters or the clients are going to send files to the service providers, we have to provide a server to store these files and make it easy to reach by the service providers with consideration of a better security.And because of a scarcity of our resources we need a storage service provider (SSP) wich is any company that provides computer storage space and related management services.

Payment gateway

And because there is payments transactions needs to be done online in our app, we will need a payment gateway.Payment gateway[21] is a technology used by merchants to accept debit or credit card purchases from customers. Payment gateways are the consumer-facing interfaces used to collect payments.In other words, payment gateways are the "checkout" portals used to enter credit card information or credentials for services such as PayPal which will link our app with card bank providers. It is a key component of the electronic payment processing system, as it is the front-end technology responsible for sending customer information to the merchant acquiring bank, where the transaction is then processed.Why do we need it? well before answering this question,we'll take a step back and highlight that online payment is

processed as a card-not-present transaction. The customer's card cannot be physically swiped on a POS terminal, as we would normally do if we processed the payment in a brick-and-mortar shop. Therefore, we can only rely on the card information that the customer is entering on the payment page. But, how can we be sure that the card the customer is using is their card? In card-not-present transactions, the fraud risk is significantly higher, and this is where a payment gateway does its magic.it is the gatekeeper of our users payment data. For online merchants, a payment gateway relays the information from us, the merchants, to the acquirer and the issuing bank using data encryption to keep unwanted threats away from the sensitive card data. Aside from fraud management, a payment gateway also protects merchants from expired cards, insufficient funds, closed accounts or exceeding credit limits.

1.3 Conclusion

In this chapter, we did state our problem and made it clear, we also went through what we need to solve the problem and that by making a mobile application, we also did focused on indicating the principal functional and non functional that this application requires to have to fulfil the needs of this app users.

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Chapter 2

Technical conceptual design

Conceptual design is the very first phase of design, in which drawings or solid models are the dominant tools and products. ... These models allow us to provide more pointed feedback at an early stage in the design process and ensure that we deliver an outstanding end product out of this project. it also help to create a clear user interface which is easy to understand and interpret and it helps to describe the roles of different users and their requirements in detail so that the project is better understood from the offset.So this chapter will be dedicated to the concept design using one of the important modeling languages that is generally used in in the field of software engineering ;The UML.

2.1 Graphic conception

Conceptual graphic designing involves visual designing. It is all about creating an identity of the design by determining a specific image of how a design will look. It involves the choice of colors ,shape and typography and thats what we are about to present here in this part.

2.1.1 Synopsis

Synopsis is the gist of our planned project. It gives a panoramic view of our project for quick analysis.

- **Topic:** On-demand Android mobile application fro writing and printing services.
- **Type and support:**Android Mobile phones.
- **Aim and objective:**offer a space for the individuals in the education and the academic field to help each other in printing and writing services and for othere individuals or businesses that provides those services and make it easy for them to request and provide and manage those services.
- **Target market:**Algerian market.
- **Target audience:**Print shops,Cybercafes,academics,students,pupil...
- **Use context:** Via application.

2.1.2 graphical charter

A graphic charter explains how and under which conditions the app visual elements can be used. It contains all the rules and explains the creative choices behind them. It also includes the visual documentation and templates to consistently apply our app identity[18].

visual identity

Our application is Native Android application,So our app UI elements such as the shape,colors and typography, they all follows Android UI components which all depends on the Android version of the device.

UI Flow Diagram

User interface-flow diagrams are typically used for one of two purposes. First, they are used to model the interactions that the actors have with our software.Second, they enable us to gain a high-level overview of the user interface for our application. This overview is effectively the combination of all the behavioral views derived from our use cases[19].

the figure 2-1 shows the login and registration process UI Flow diagram .

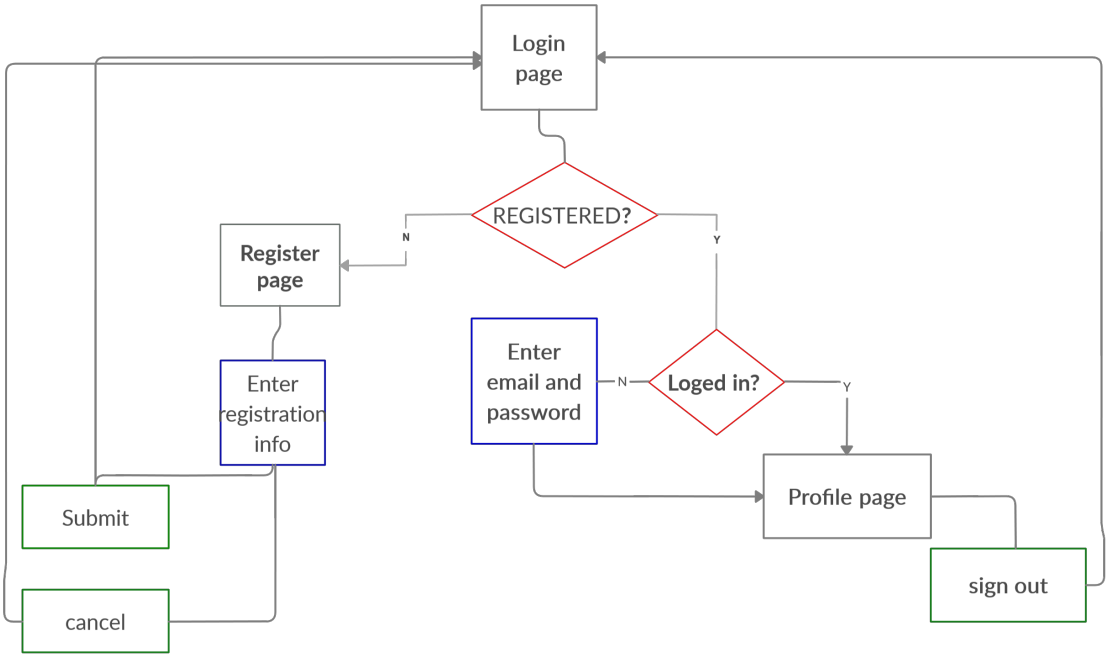

Figure 2-1: Login/Register UI Flow Diagram

the figure 2-2 shows the profile elements UI Flow diagram .

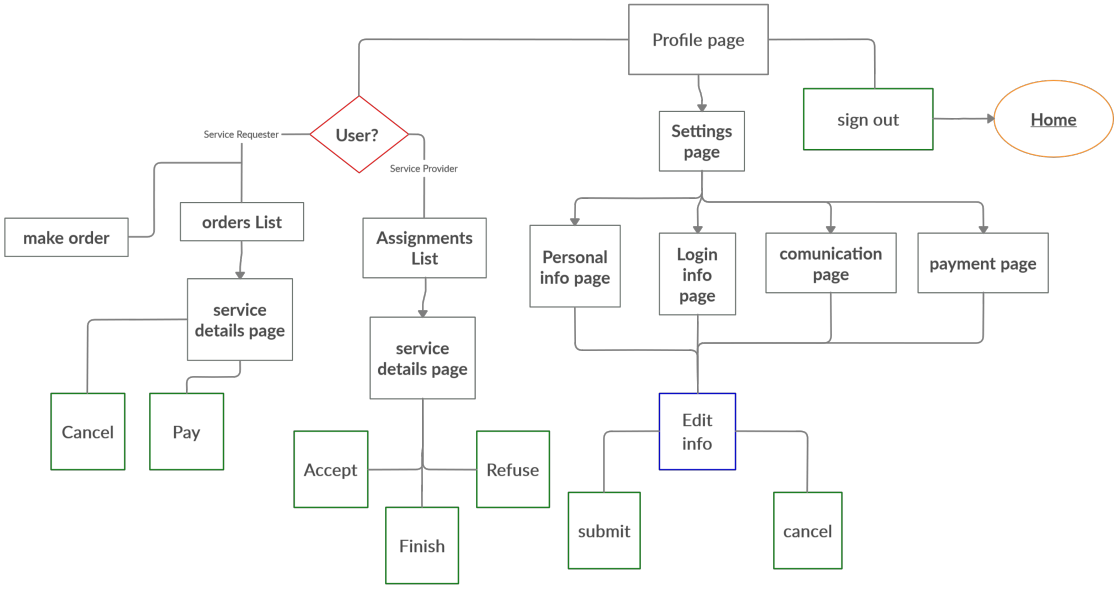

Figure 2-2: Profile UI Flow Diagram

the figure 2-3 shows the request process UI Flow diagram .

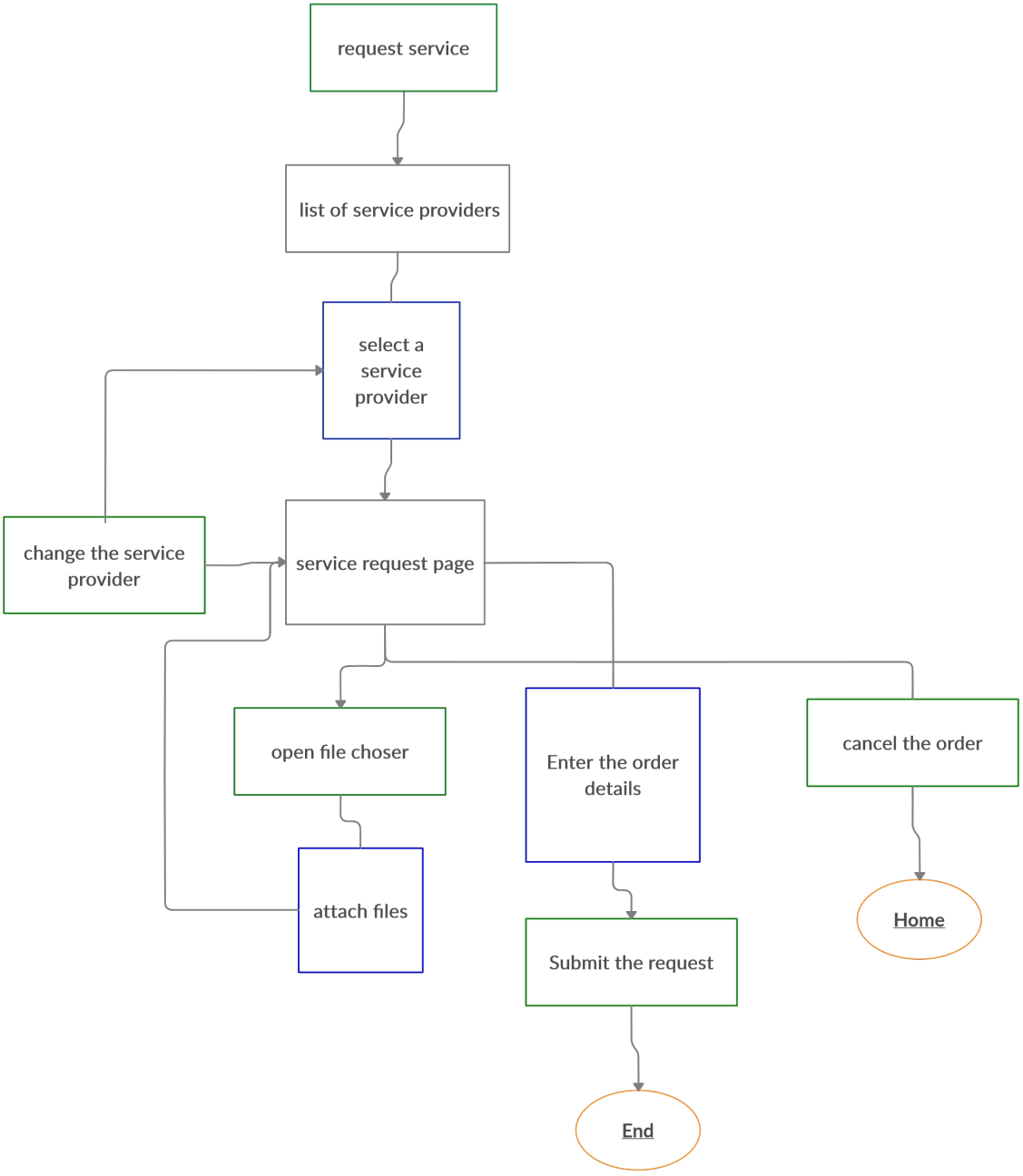

Figure 2-3: Request UI Flow Diagram

the figure 2-4 shows the globale UI Flow diagram of this app.

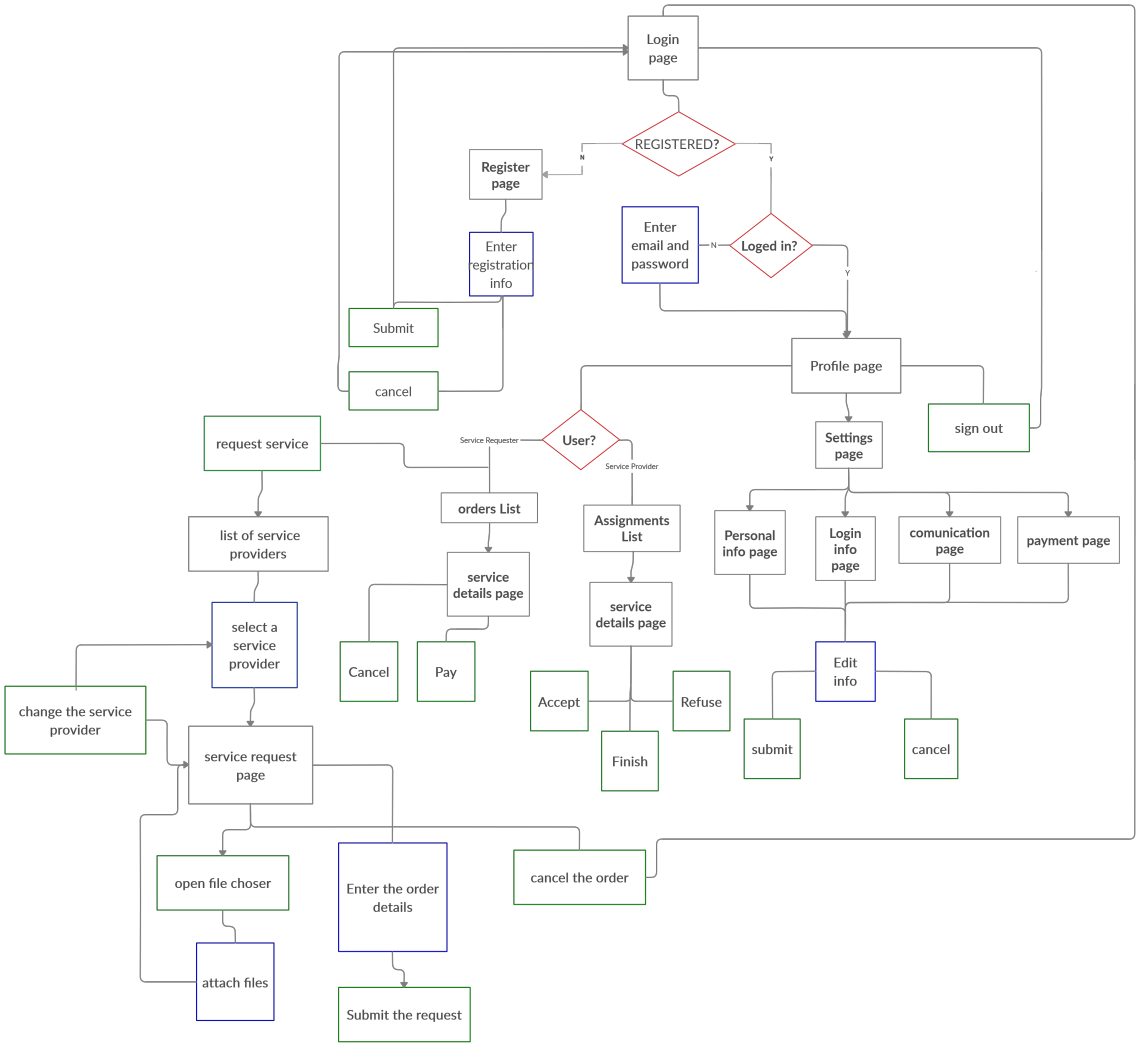

Figure 2-4: Globale UI Flow Diagram

Wireframe

A wireframe is a sketch of the system to be built. It's simple, clear and allows everyone to read and understand easily. Wireframe shows "just enough" information of the screen instead of the full details. The actual screen design will be produced at a later stage by referencing the wireframe.They serve as a blueprint that defines each screen design, content and functionality. Wireframes are created before any design work is started so that the focus is on layout without the distraction of color and

visual elements. And for this matter , we are going to present here all the wireframes that concerns the important functionalities that the app has to offer.

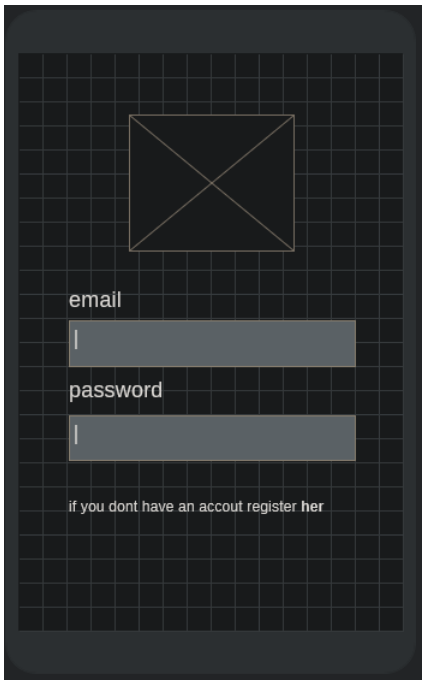

Figure 2-5: Home(Login) wireframe

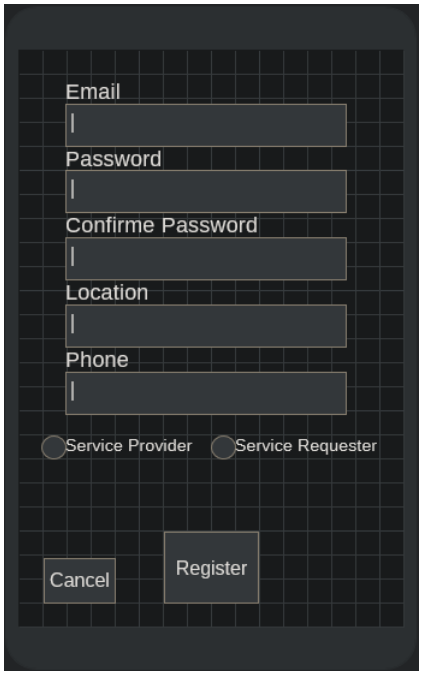

Figure 2-6: Register wireframe

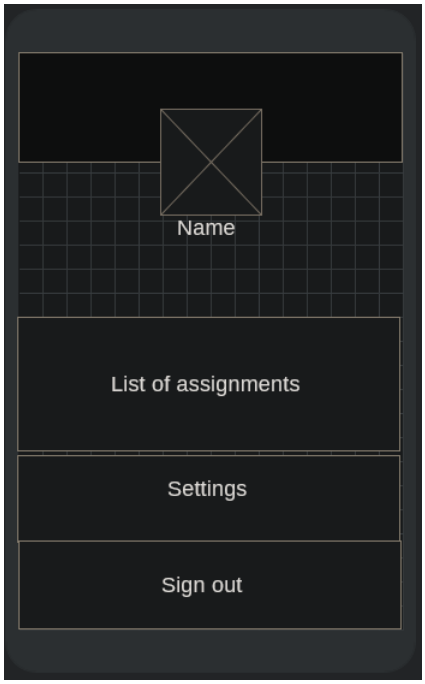

Figure 2-7: Service provider profile wireframe

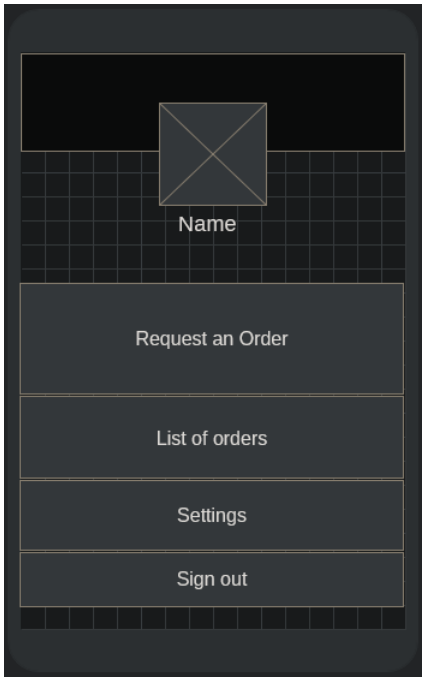

Figure 2-8: Service requester profile wireframe

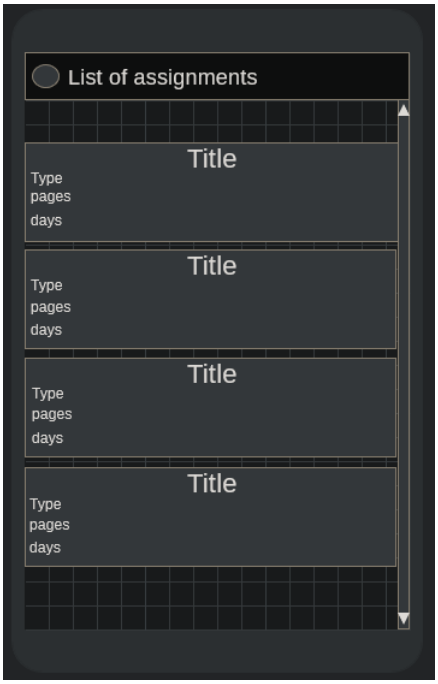

Figure 2-9: List of services wireframe

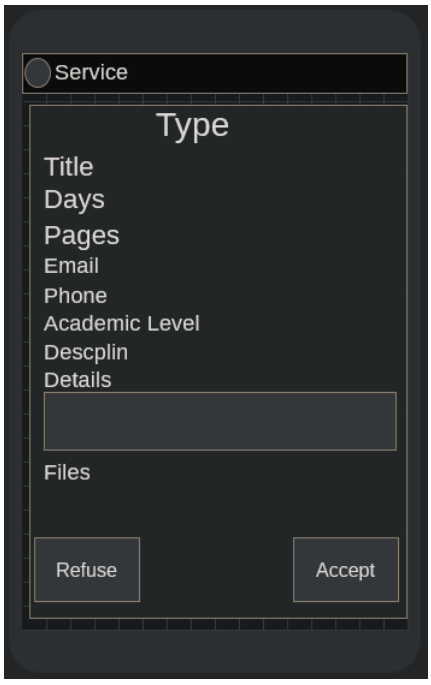

Figure 2-10: Service wireframe

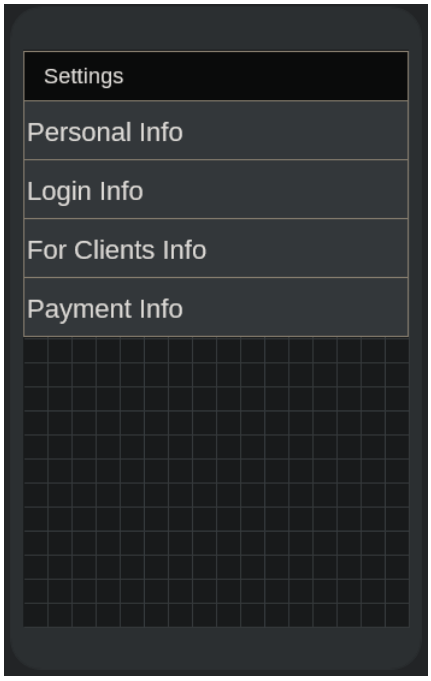

Figure 2-11: Settings wireframe

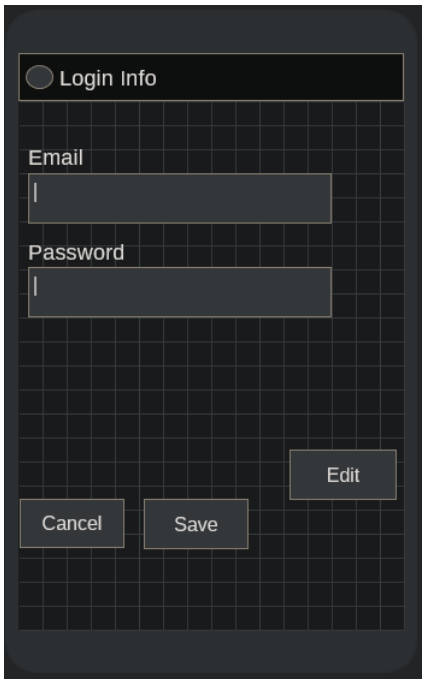

Figure 2-12: Login info settings wireframe

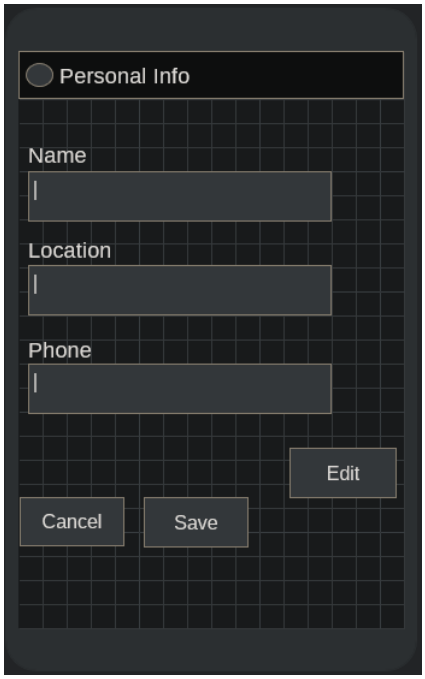

Figure 2-13: Personal info settings wireframe

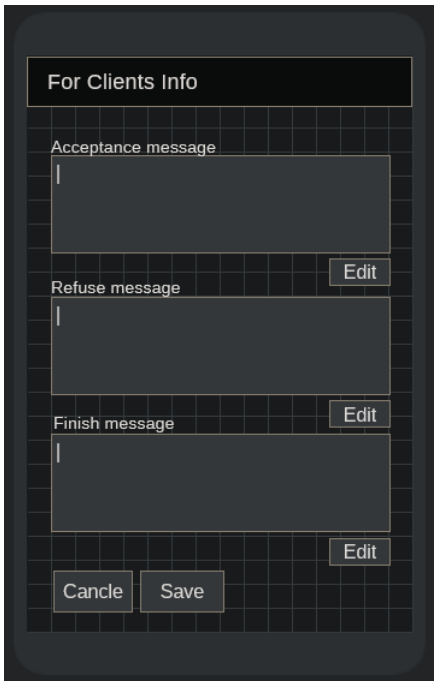

Figure 2-14: For client info settings wireframe

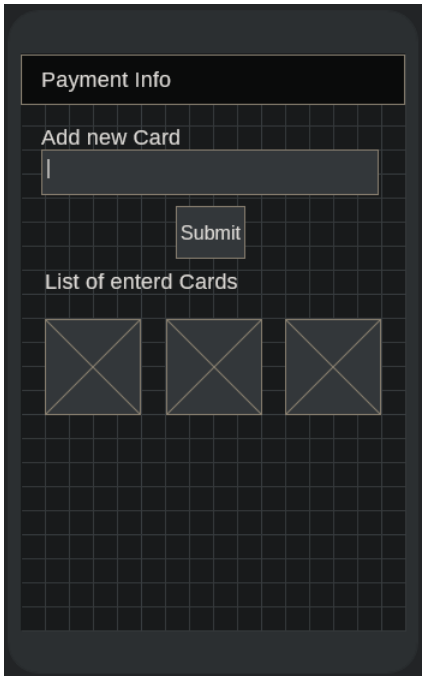

Figure 2-15: Payment info settings wireframe

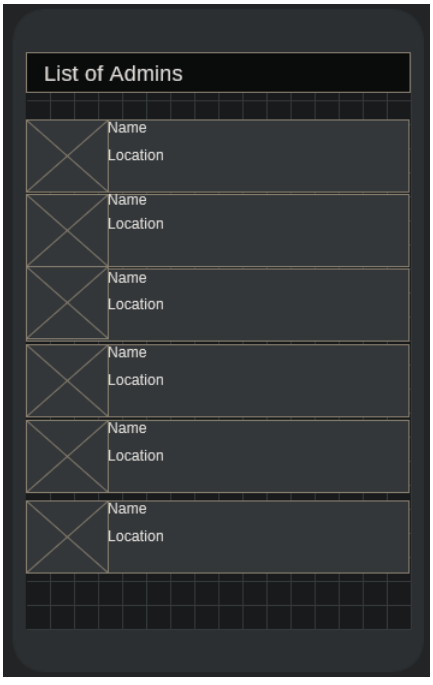

Figure 2-16: List of service providers wireframe

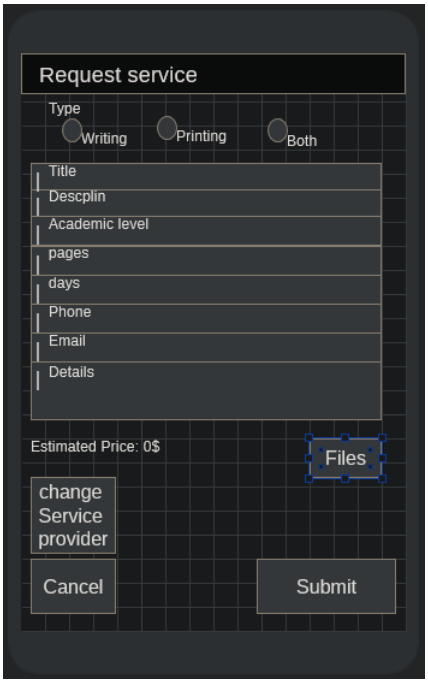

Figure 2-17: Request service wireframe

2.2 Detailed conception

In this part , we will have to look at two different views of the concept,the static view and the dynamic view without of course forgeting about the database structure. Therefore we are going to use the Unified Modeling Language known as UML.

UML [27] is a standardized modeling language consisting of an integrated set of diagrams, developed to help system and software developers for specifying, visualizing, constructing, and documenting the artifacts of software systems. Its diagrams consist of two diffrent set of diagrams,structure diagrams and behaviour diagrams. The structure diagrams show the static structure of the system and its parts on different abstraction and implementation levels and how they are related to each othere. The elements in a structure diagram represent the meaningful concepts of a system, and may include abstract, real world and implementation concepts, mean while the behavior diagrams show the dynamic behavior of the objects in a system, which can be described as a series of changes to the system over time. the figure 2-18 shows the UML diagrams types[25].

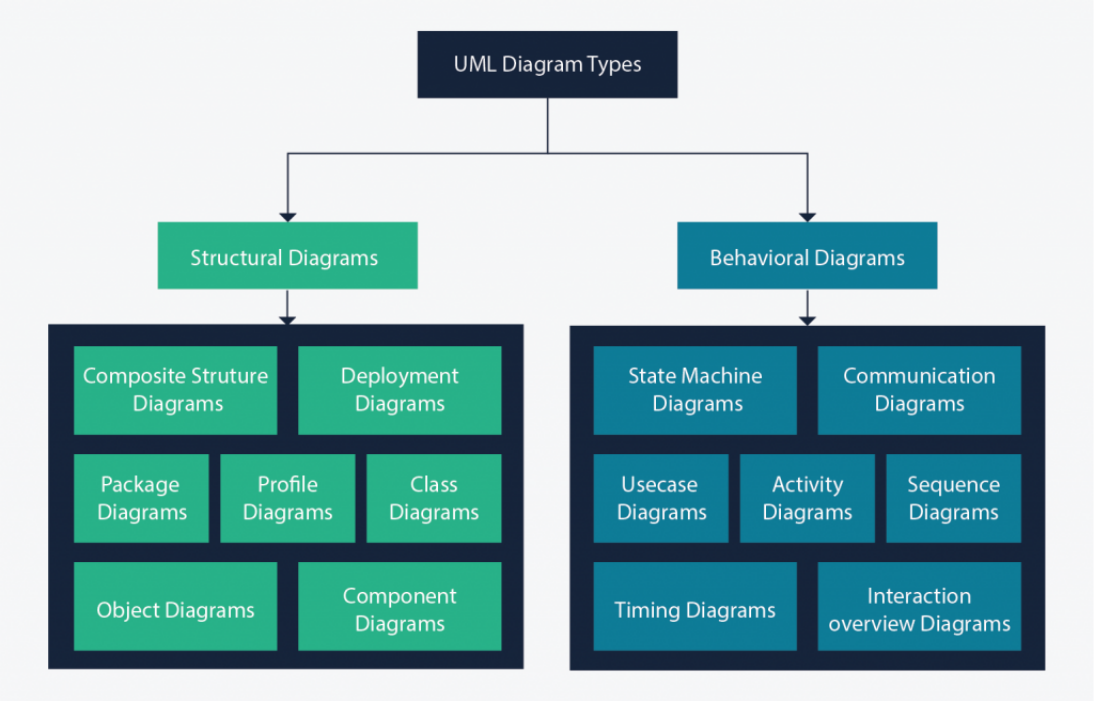

Figure 2-18: UML Diagram types

For this project we are going to use only one structure diagram which is the class diagram and a behaviour digram which is the sequence diagram and we did all ready presented use case daigram which is shown in the figure 1-3.

2.2.1 Static conception

Class Diagram

Class diagrams are the main building block of any object-oriented solution. It shows the classes in a our system, attributes, and operations of each class and the relationship between each class. the figure 2-19 shows the Class diagram of our system .

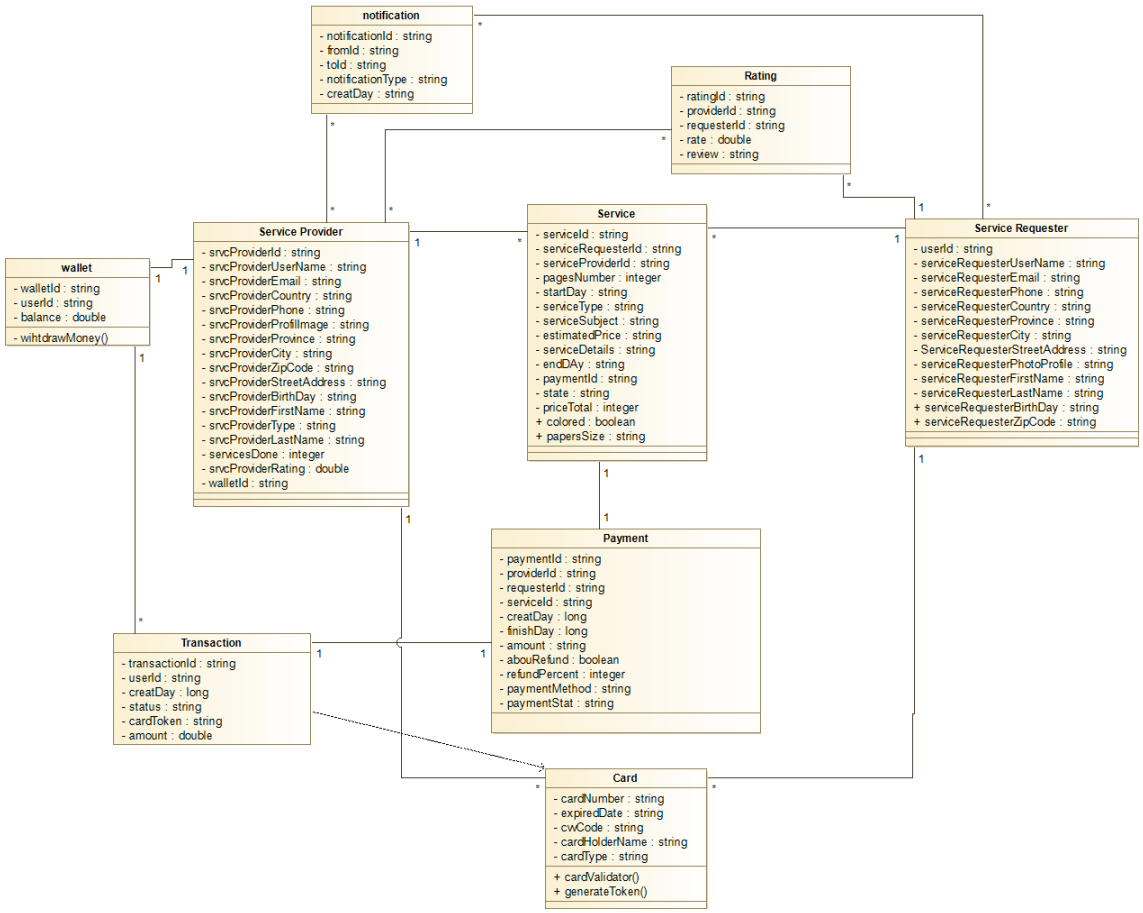

Figure 2-19: Class digram for our on demand writing/printing services app

2.2.2 Dynamic conception

Sequence Diagram

Sequence Diagrams are interaction diagrams that detail how operations are carried out. They capture the interaction between objects in the context of a collaboration. Sequence Diagrams are time focus and they show the order of the interaction visually by using the vertical axis of the diagram to represent time what messages are sent and when. here we will show how the objects interact with each other in a particular scenario of a use case.

the figure 2-22 shows the Sequence Diagram of requesting a service by service requesters .

the figure 2-20 shows the Sequence Diagram of login by users .

the figure 2-21 shows the Sequence Diagram of registering by users .

the figures 2-25, 2-26 shows the Sequence Diagram of managing incoming requests by service providers .

the figures 2-23, 2-24 shows the Sequence Diagram of editing the settings by users .

the figures 2-27, 2-28 2-29 shows the Sequence Diagram of managing the own requestes by service requesters . the figure 2-30 shows the Sequence Diagram of accessingthe wallet by service providers.

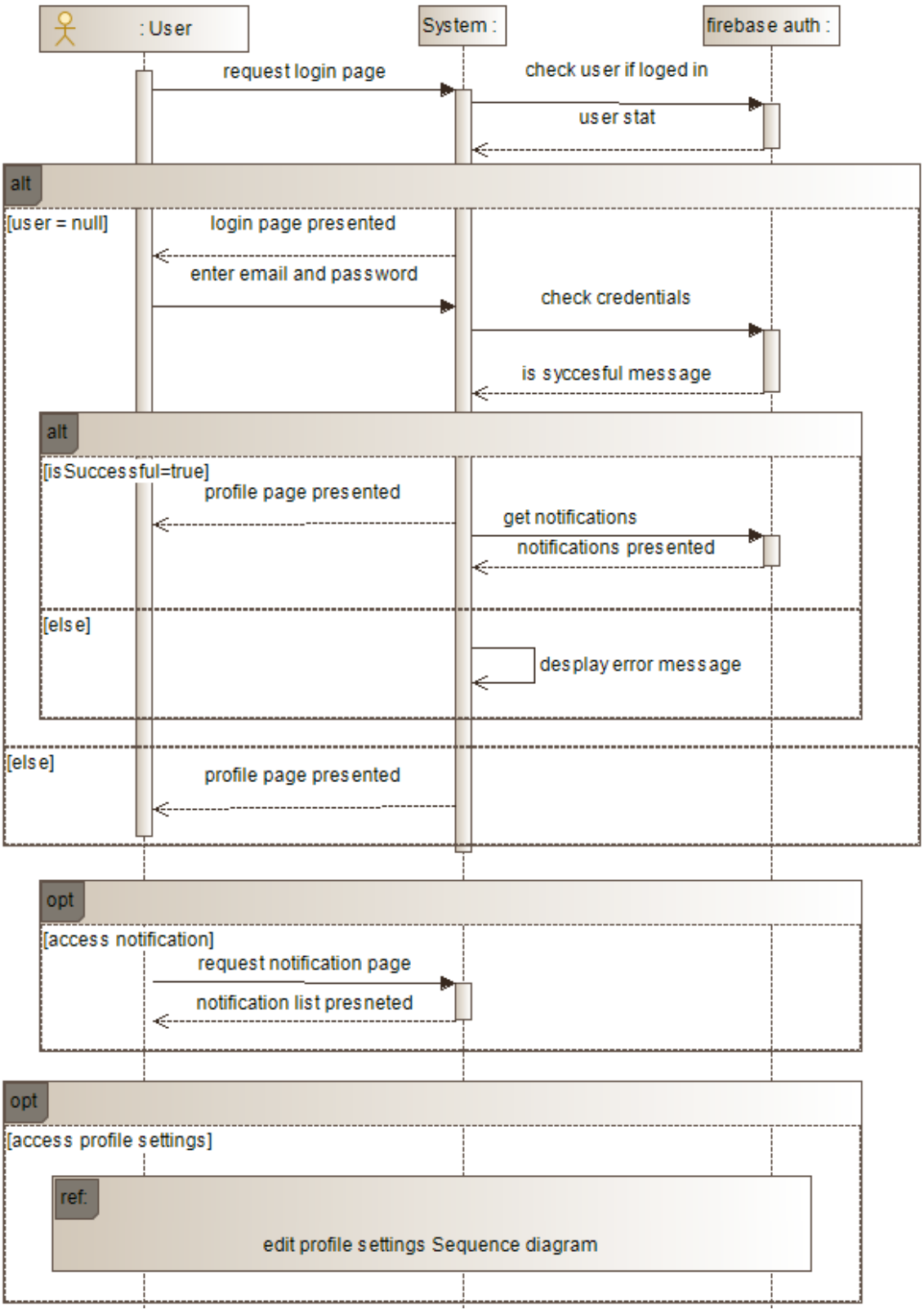

Figure 2-20: Login Sequence diagram

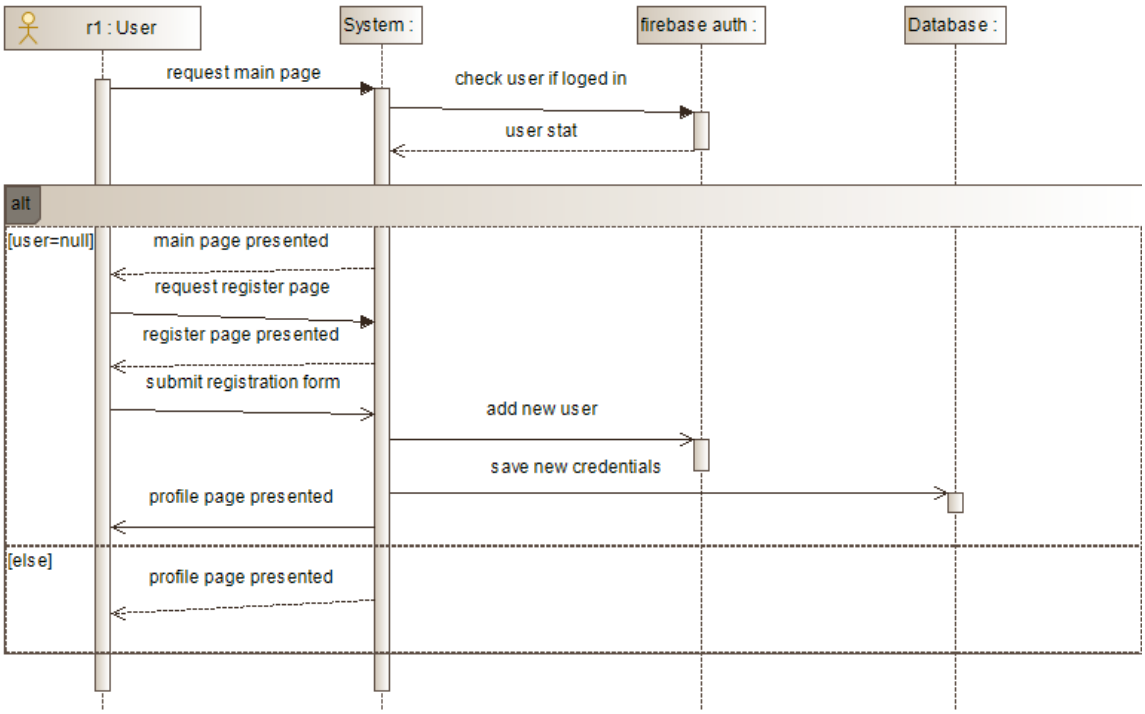

Figure 2-21: Register Sequence diagram

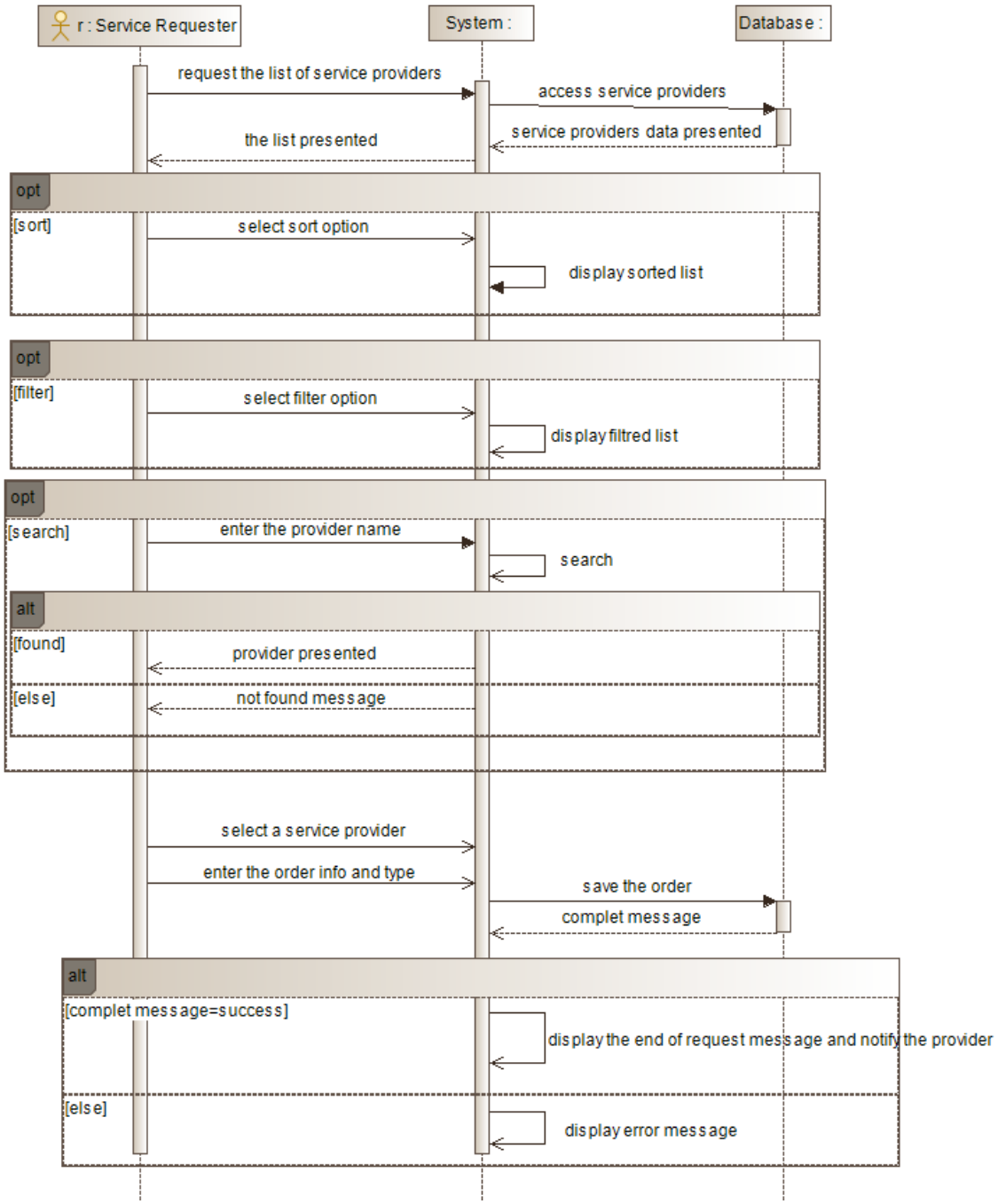

Figure 2-22: Request a service Sequence diagram

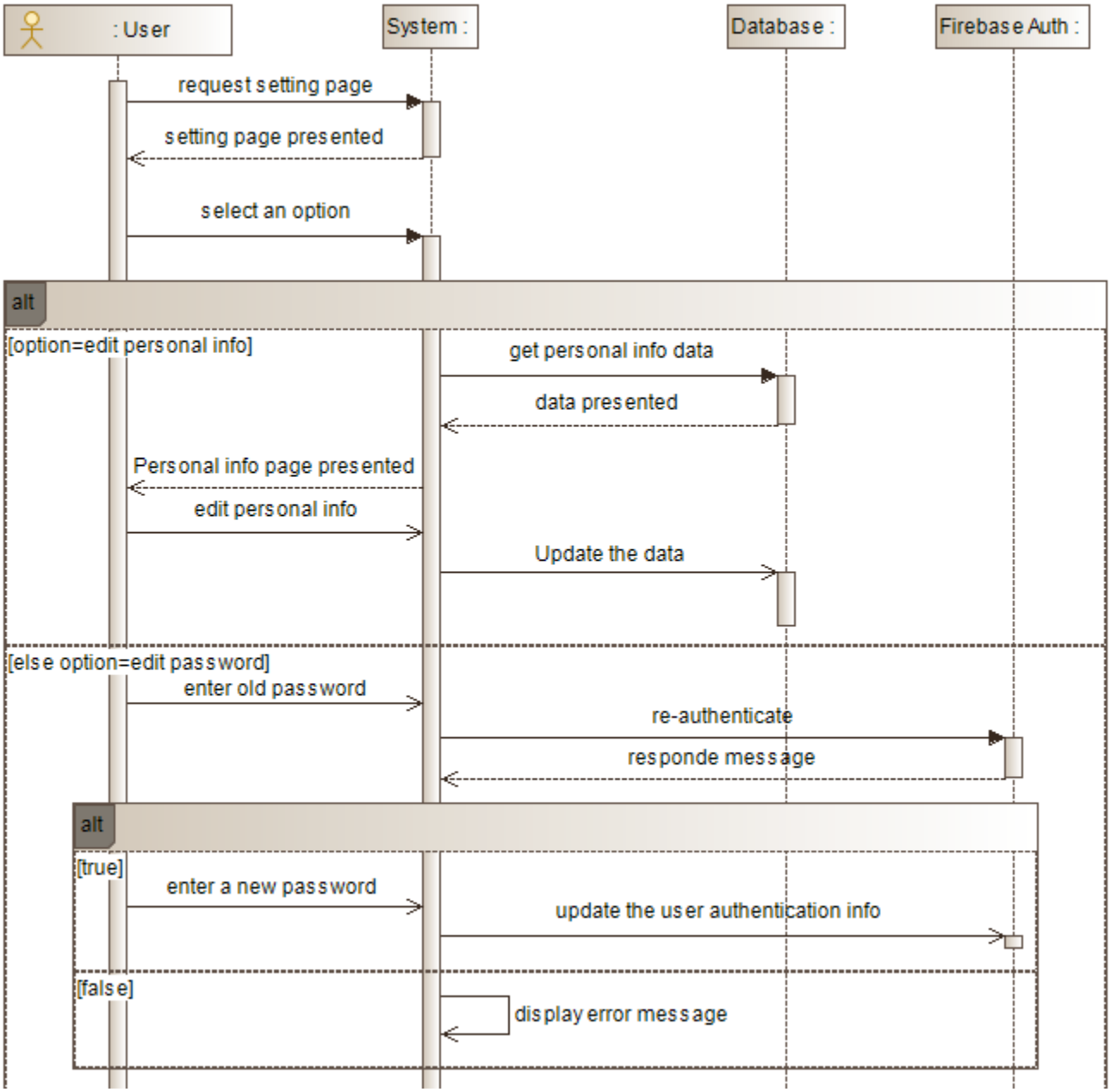

Figure 2-23: Edit settings Sequence diagram(Personal info,Change password)

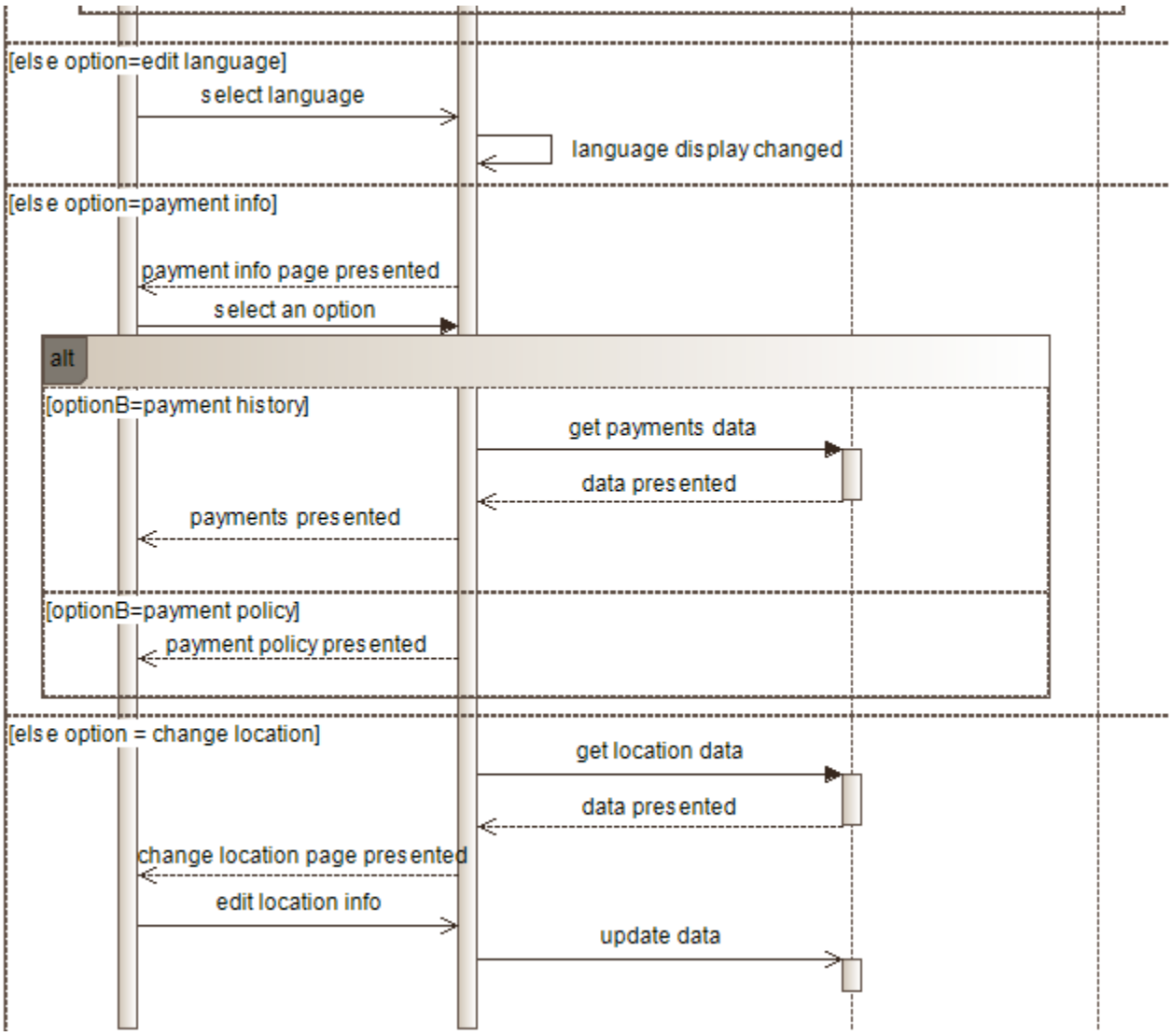

Figure 2-24: Edit settings Sequence diagram Continued(Change language,access Paiment info,Change location)

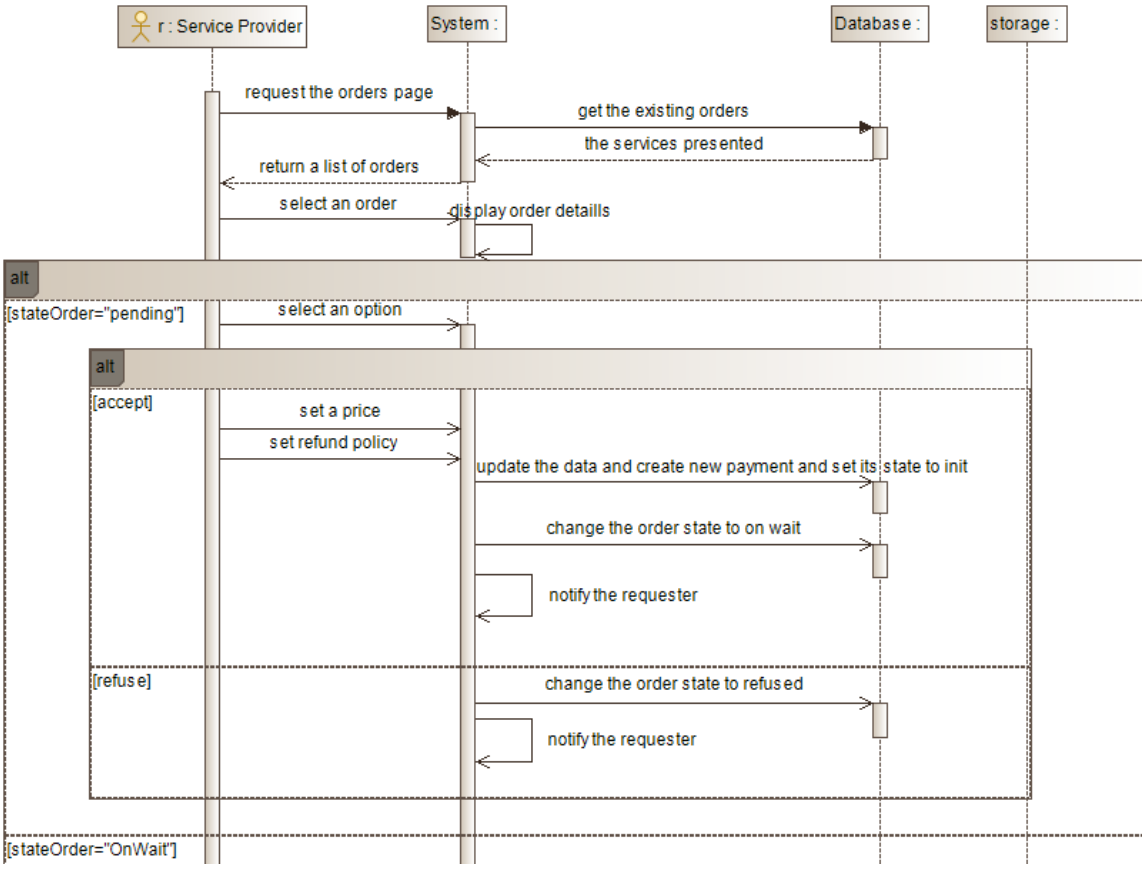

Figure 2-25: Manage requests Sequence diagram(Pending order)

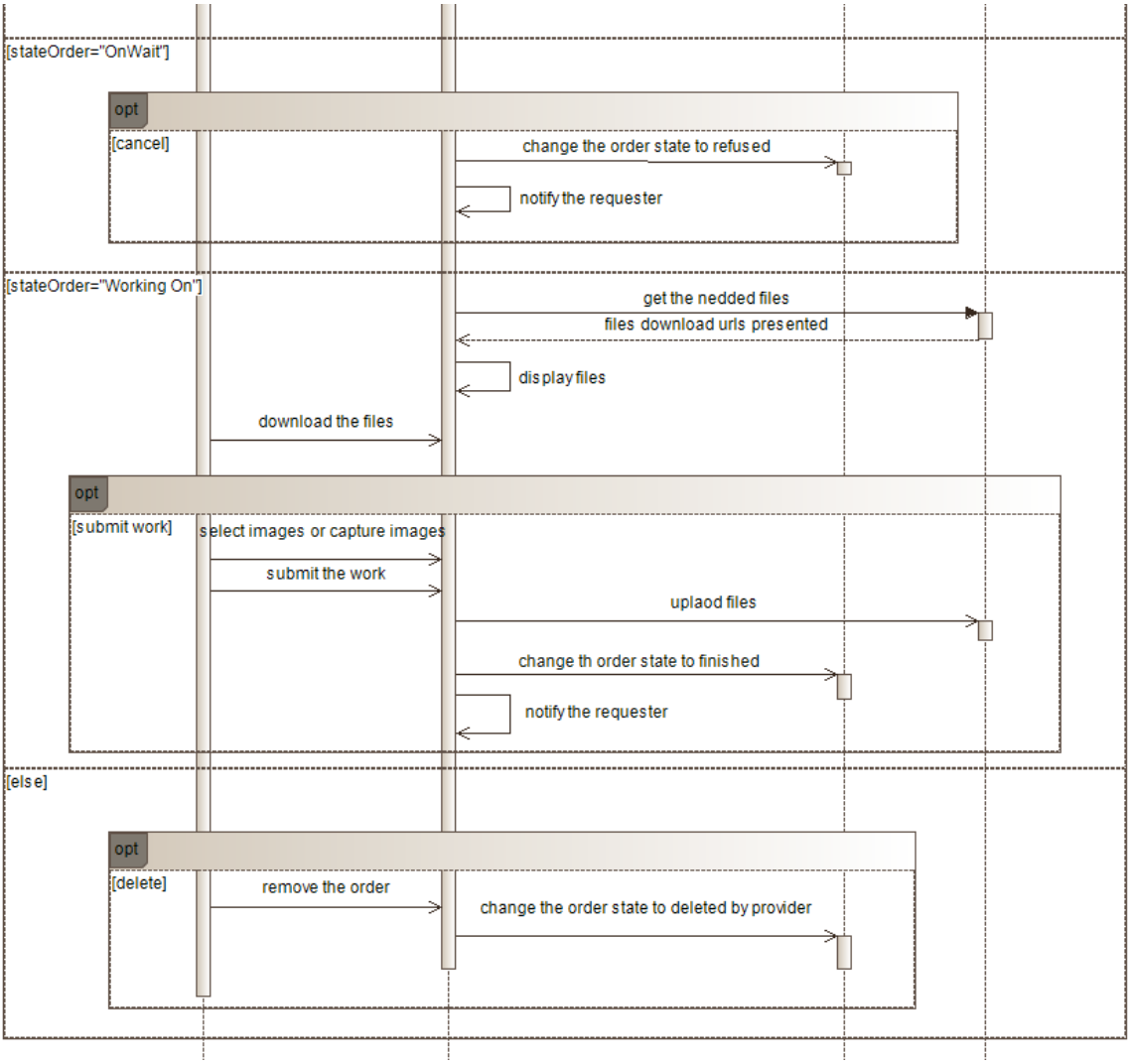

Figure 2-26: Manage requests Sequence diagram (WorkingOn,OnWait,finished,refused state order)

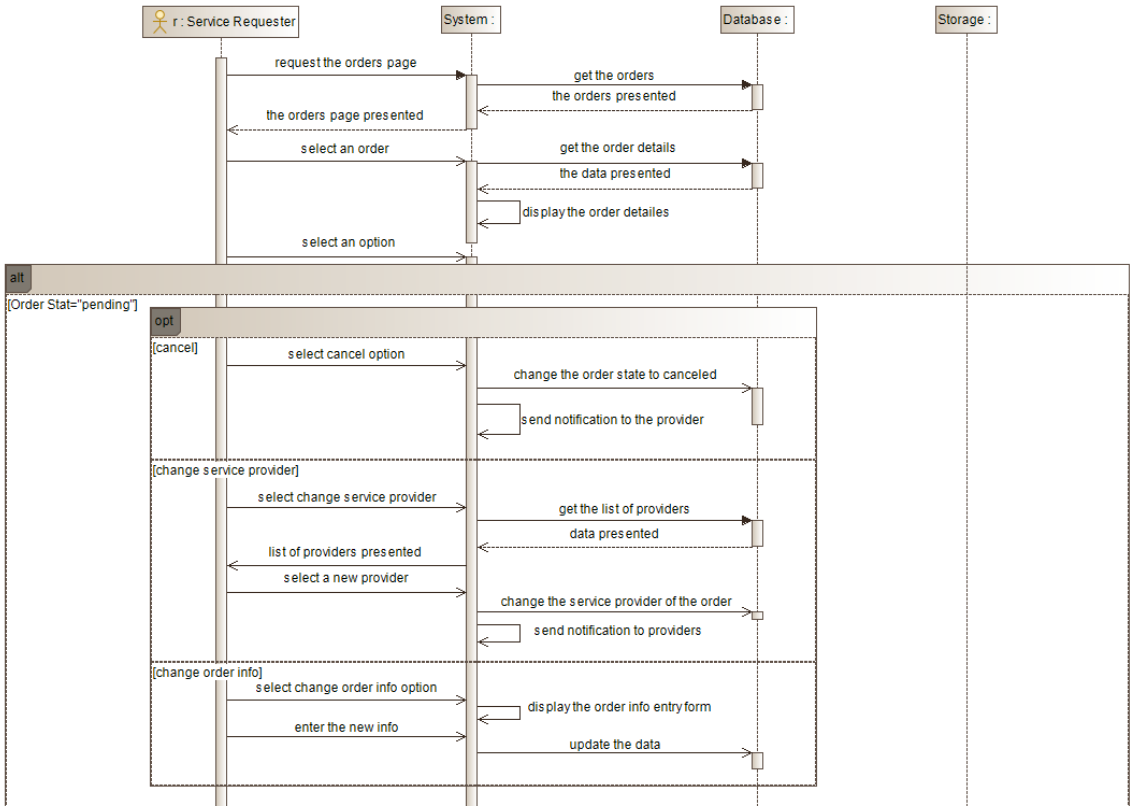

Figure 2-27: Manage orders Sequence diagram (Pending order)

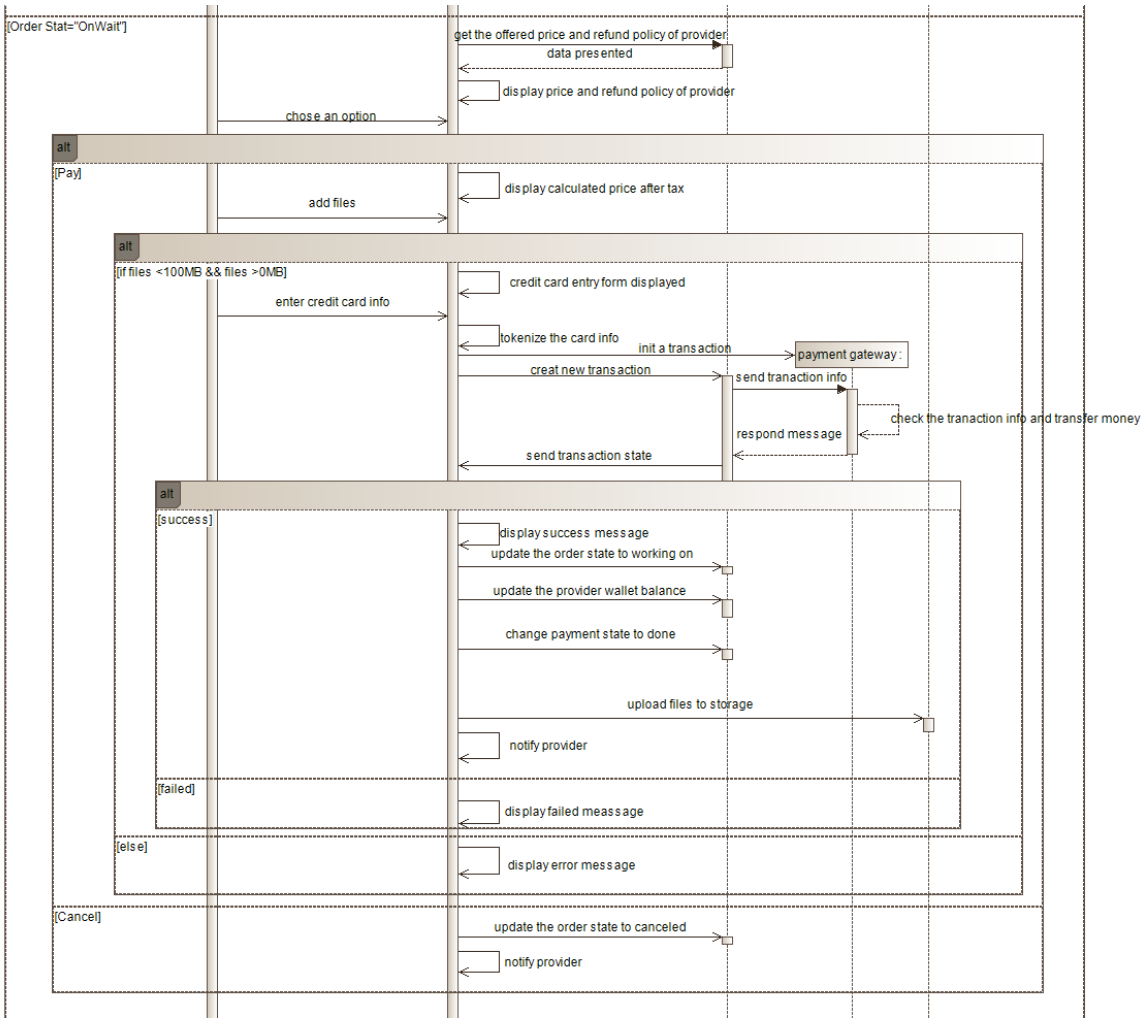

Figure 2-28: Manage orders Sequence diagram (OnWait)

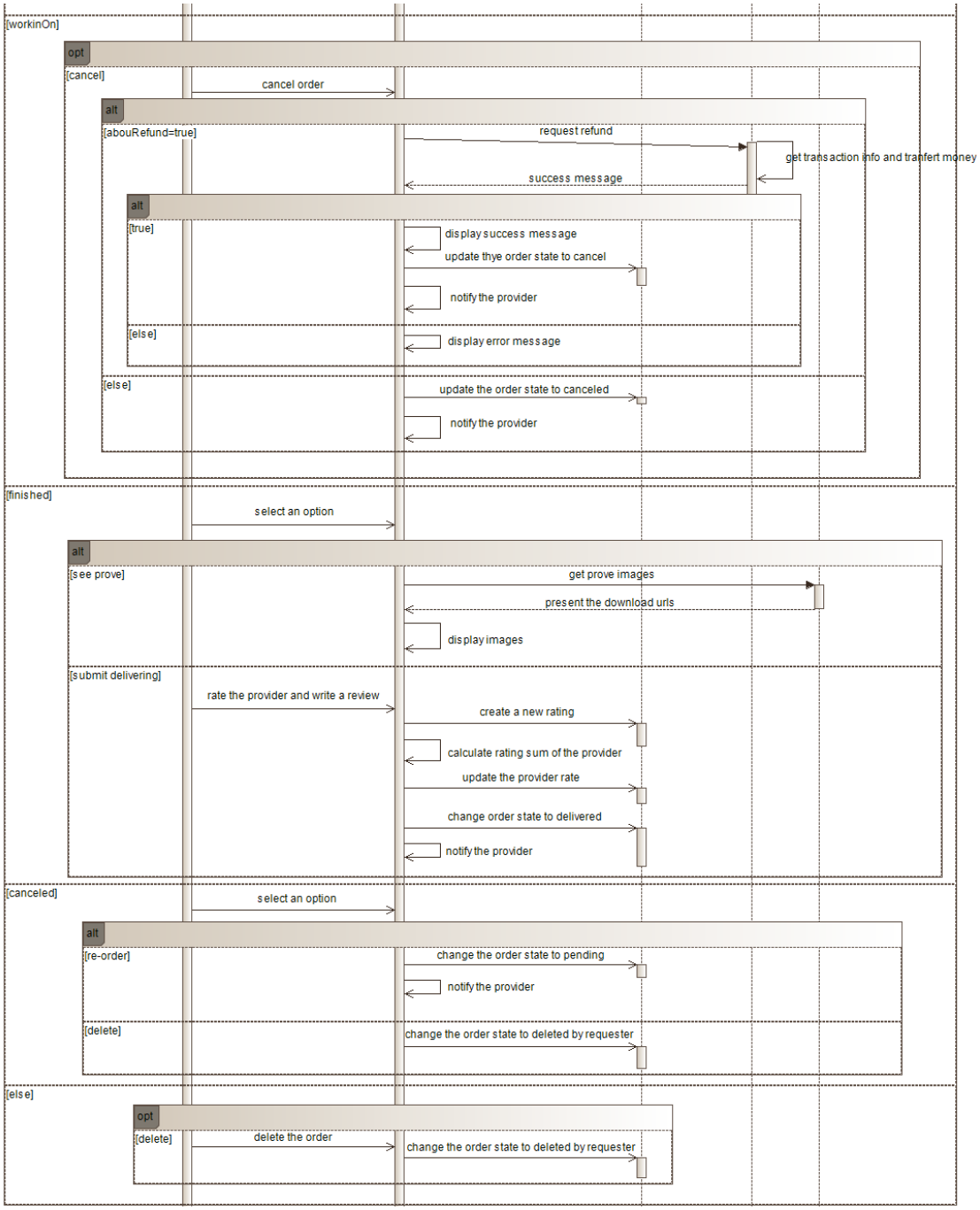

Figure 2-29: Manage orders Sequence diagram (WorkingOn,finished,refused and canceled state order)

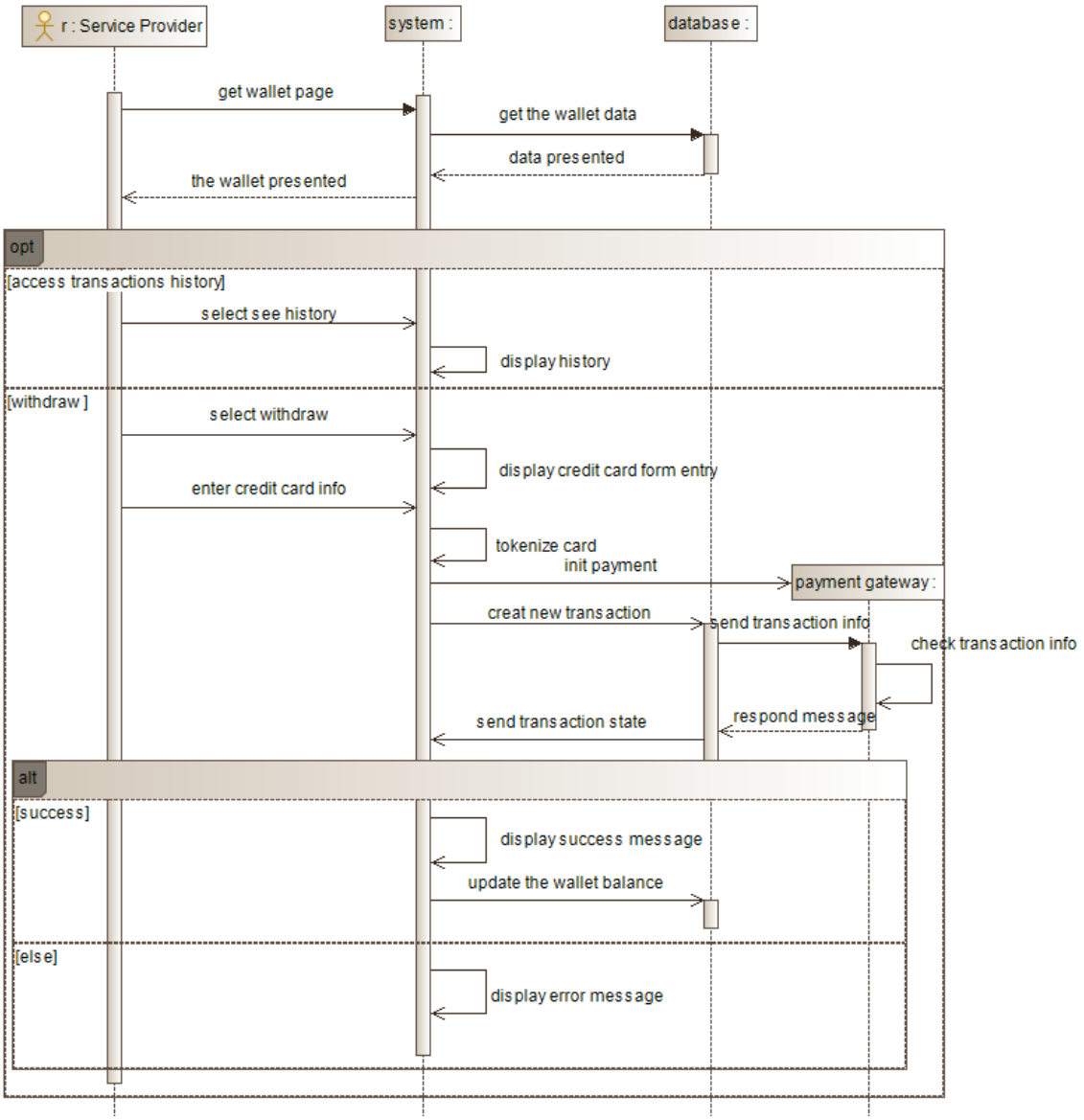

Figure 2-30: Access wallet Sequence diagram

2.2.3 Backend conception

Database

We mentioned in the requirements part in the first chapter that we need a real time database. Of course there is so many databases out there that provide us with this utility , but when it comes to mobile development theree is no better then the Firebase Realtime Database [7]which is a NO-SQL cloud-hosted database. And unlike the

traditional databases that uses RDBMS,the Firebase datbase uses document-oriented database systems which are characterized by their schema so the Data is stored as JSON and synchronized in realtime to every connected user.And here a list of its key capabilities:

- **Realtime:**

  Instead of typical HTTP requests, the Firebase Realtime Database uses data synchronization—every time data changes, any connected device receives that update within milliseconds. Provide collaborative and immersive experiences without thinking about networking code.

- **Offline:**

  Firebase apps remain responsive even when offline because the Firebase Realtime Database SDK persists your data to disk. Once connectivity is reestablished, the client device receives any changes it missed, synchronizing it with the current server state.

- **Accessible from Users Devices:**

  The Firebase Realtime Database can be accessed directly from a mobile device or web browser; thereee's no need for an application server. Security and data validation are available through the Firebase Realtime Database Security Rules, expression-based rules that are executed when data is read or written.

And before we shows how our database is structured we need to mention about these terms .

NO-SQL:

NoSQL[11][28], which stands for "not only SQL," is an approach to database design that can accommodate a wide variety of data models. NoSQL databases are databases that store data in a format othere than relational tables which led to A common misconception is that NoSQL databases or non-relational databases don't store relationship data, well. NoSQL databases can store relationship data—they just store it differently than relational databases do.in NoSQL databases, data stored

differently depending on the type of the dadtabase . the figure 2-31 [22] point at them.

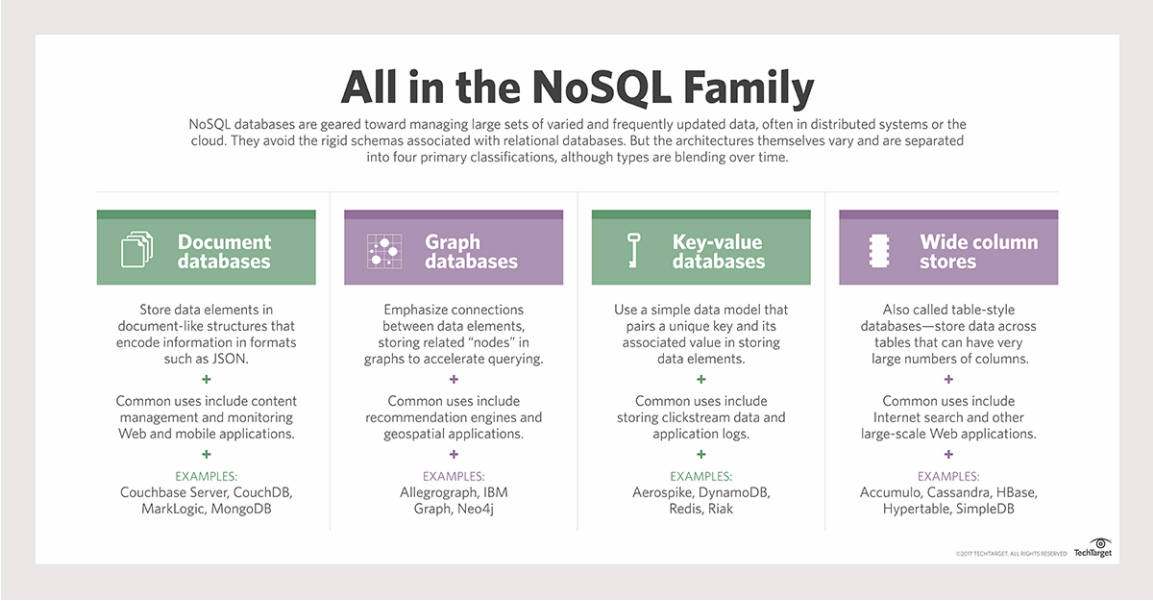

Figure 2-31: Types of NoSQL Databases

The type that we will be concerned with is the Document database.it also called document stores, store semi-structured data and descriptions of that data in document format. They allow us to create and update programs without needing to reference master schema. Use of document databases has increased along with use of JavaScript and the JavaScript Object Notation (JSON).

JSON:

JavaScript Object Notation (JSON)[9] is an open standard file format, and data interchange format, that uses human-readable text to store and transmit data objects consisting of attribute–value pairs and array data types (or any othere serializable value). It is a very common data format, with a diverse range of applications, such as serving as a replacement for XML in AJAX systems. JSON is a language-independent data format. It was derived from JavaScript, but many modern programming languages include code to generate and parse JSON-format data.

All Firebase Realtime Database data is stored as JSON objects. we can think of the database as a cloud-hosted JSON tree. Unlike a SQL database, theree are no tables

or records. When we add data to the JSON tree, it becomes a node in the existing JSON structure with an associated key.

Now we have to take a look at which data is going to be stored,the figure 2-32 will just show us the modeling of our document object oriented database using objectData diagram.

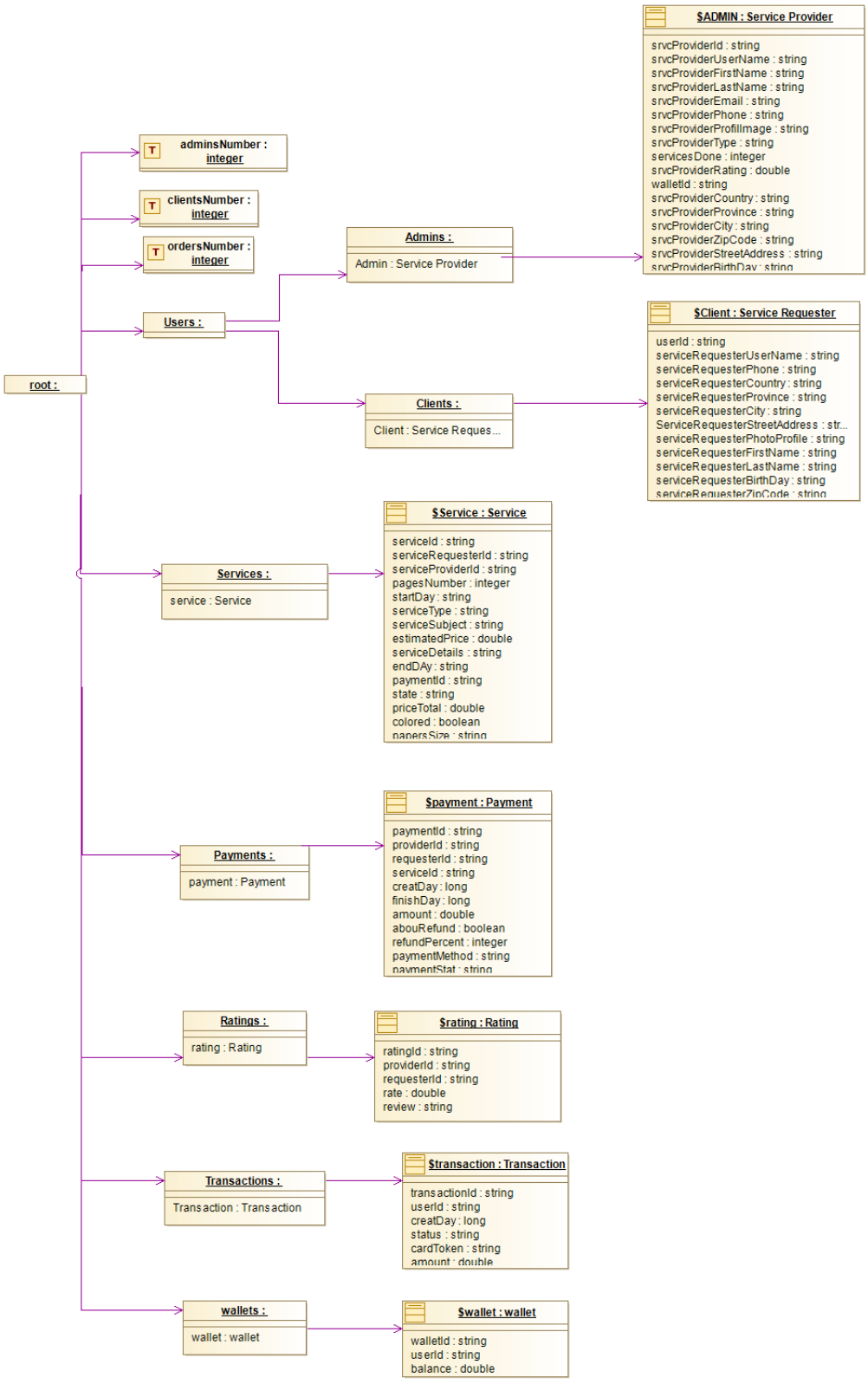

Figure 2-32: Object Data modeling

The elements of our JSON tree here are not related to each othere which will cause us a problem in quering and retreving data frome it . therefore we will introduce Firebase Realtime Database Security Rules[8] .it s important that we mention them here because they determine who has read and write access to our database, how our data is structured, and what indexes exist. These rules live on the Firebase servers and are enforced automatically at all times. Every read and write request will only be completed if our rules allow it. these Security Rules have a JavaScript-like syntax and come in four types:read,write,validate,indexOn.

Authentication

we did refered in the first chapter about an authentication service.for that we used the Firebase authentication[5]. Firebase Authentication provides backend services, easy-to-use SDKs, and ready-made UI libraries to authenticate users to our app. It supports authentication using passwords, phone numbers, popular federated identity providers like Google, Facebook and Twitter, and more. and it integrates tightly with our database . The only one here in our app that can sign in and sign up are the admins.So when the admin register for a new account,Firebase authentication will creat new instance which called Firebase user.it comes with a fixed set of basic properties—a unique ID, a primary email address, a name and a photo URL and they all be stored in the database with additional properties as an new object that totaly independent from Firebase user object.

Storage

For storing the files that the clients will attach with their orders we will use a Cloud Storage from Firebase[2].Cloud Storage stores the files in a Google Cloud Storage bucket, making them accessible through both Firebase and Google Cloud. This allows us the flexibility to upload and download files from mobile clients via the Firebase SDKs. The Firebase SDKs for Cloud Storage integrate seamlessly with Firebase Authentication to identify users, and it provides a declarative security language that lets us set access controls on individual files or groups of files, so we can make files as

public or private as we want.And her a list of its key capabilities:

- **Robust operations:**

  Firebase SDKs for Cloud Storage perform uploads and downloads regardless of network quality. Uploads and downloads are robust, meaning they restart where they stopped, saving your users time and bandwidth.

- **Strong security:**

  Firebase SDKs for Cloud Storage integrate with Firebase Authentication to provide simple and intuitive authentication for developers. You can use our declarative security model to allow access based on filename, size, content type, and other metadata.

Firebase console

Firebase console is a dashboard that comes with Firebase platforme.it allows to the backend administrator to manage all the backend aspects of our app like the database,storage , authenticated users ... . It also allows him to set the security rules that gives the permites for the app to access those Firebase aspects.
The figure 2-33 represents the home interface of the Firebase console.

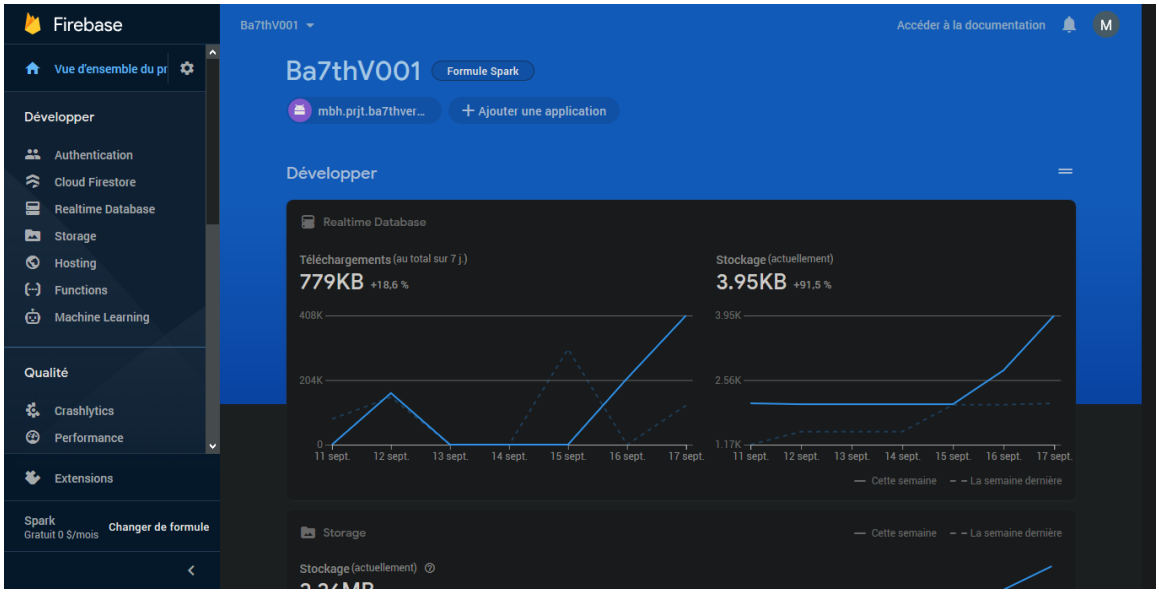

Figure 2-33: Home Firebase console Dashboard

The figure 2-34 represents the storage interface of the Firebase console where the administrator can manage all the stored files.

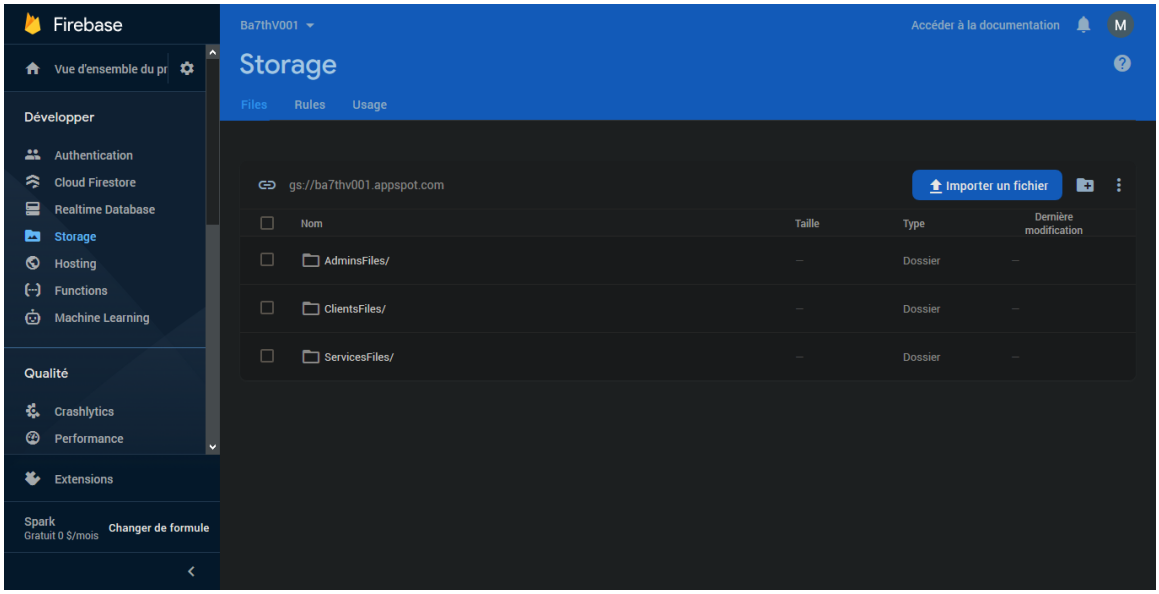

Figure 2-34: Storage Firebase console Dashboard

The figure 2-35 represents the real time database interface of the Firebase console where the administrator can manage all the stored data.

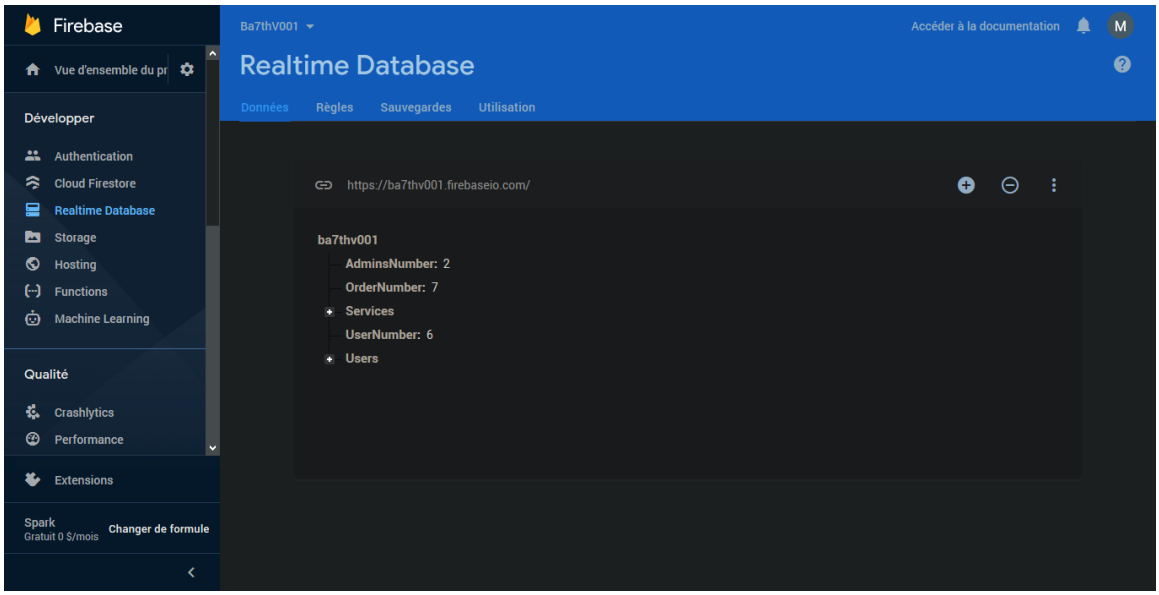

Figure 2-35: Real time database Firebase console Dashboard

The figure 2-36 represents the Authentication interface of the Firebase console

where the administrator can manage all the users.

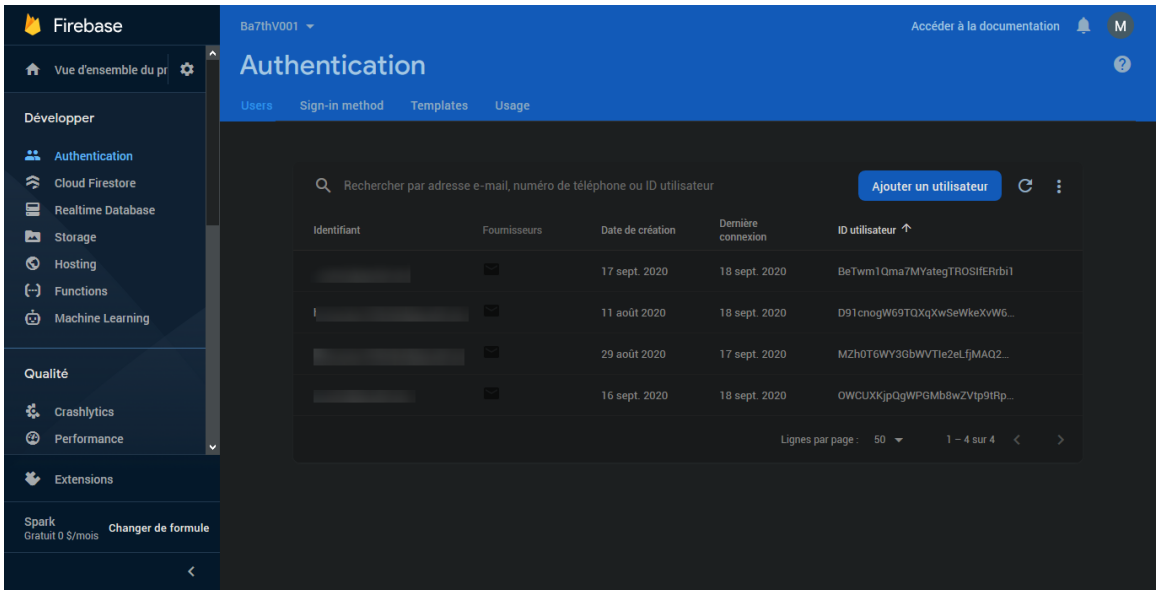

Figure 2-36: Authentication Firebase console Dashboard

Payment gateway

And because there will be payments operations in the application like we mentioned,we will need to implement a payment gateway.The payment gateway may be provided by a bank to its customers, but can be provided by a specialised financial service provider as a separate service, such as a payment service provider like Chekout which is the one that we used in our app.Chekout provides unified payment API thats combine all payments methods into one safe integration and covers a global scale. Depening on Emerchantway [15] website and before we delve deeper into the definition of a payment gateway, we need to identify the key players in online payments.

- **The merchant:**online business operating in any vertical whiche are the service providers and our backend admins that responsible for managing the payments.

- **The customer:r:**the customer, also called a cardholder, who wants to access the products or services that the merchant is providing, and initiates the transaction and in our case he is the requester.

- **The issuing bank:**the issuing bank is the customer's bank that issues the cardholder's credit or debit card on behalf of the card schemes (Visa, Mastercard).

- **The acquirer:** also known as the acquiring bank, the acquirer is the financial institution that maintains the merchant's bank account (known as the merchant's account). The acquiring bank passes the merchant's transactions to the issuing bank to receive payment and in our case there is only one merchant account and the wallet balance represents the share of the service provider in that account .A merchant account is a specific bank account required for card payments / online trading. Not a business bank account .The payment gateway deposits the funds from your customers' payments there.

let's take a step further and analyse how our payment gateway "Checkout" works throughout the payment journey.

- after the service got accepted and the requester observed the offer and clicked on the pay button , he will be proceeded to the payment page.

- The client enters their credit or debit card details on the payment page. These details include the cardholder's name, card expiration date and CVV number (Card Verification Value). This information is securely passed onto "Checkout". Chekout offers deffirent ways of integrations.we used Frames integration which known as client-side encryption or encryption-at-source refers to encrypting sensitive on the client-side device before sending it to the merchant's server. This enables us to simplify our PCI compliance requirements. In a nutshell, it enables you to accept payments on our app while encrypting card data in client device, using the Chekout's encryption library,and we also add verification processes like checking if the card is fake using the luhn algorithm before sending the data.

- The payment gateway tokenises or encrypts the card details and in addition to our verifications it performs fraud checks before they send the card data to the acquiring bank.

- The acquiring bank sends securely the information to the card schemes (Visa, Mastercard).

- The card schemes perform another layer of fraud check and then send the payment data to the issuing bank.

- The issuing bank, after performing fraud screening, authorises the transaction. The approved or declined payment message is transferred back from the card schemes, then to the acquirer

- The acquiring bank sends the approval or decline message back to the payment gateway who then transmits the message to the merchant. If the payment is approved, the acquirer collects the payment amount from the issuing bank and holds the fund into our merchant account.

- Based on the message, our app may either display a payment confirmation page or ask the client to provide another payment method.

- deposits the funds into the merchant's account, a process which is known as the settlement; when the actual settlement will occur.which it will happen depending on our agreement with "Chekout" and when the provider requests his money.

Both merchants and customers benefit from a payment gateway, although most of its activity happens in the background of the transaction. All the steps mentioned above can happen in near real time, or take approximately three seconds. The figure 2-37 represents how the payment flow happens with Checkout gateway.

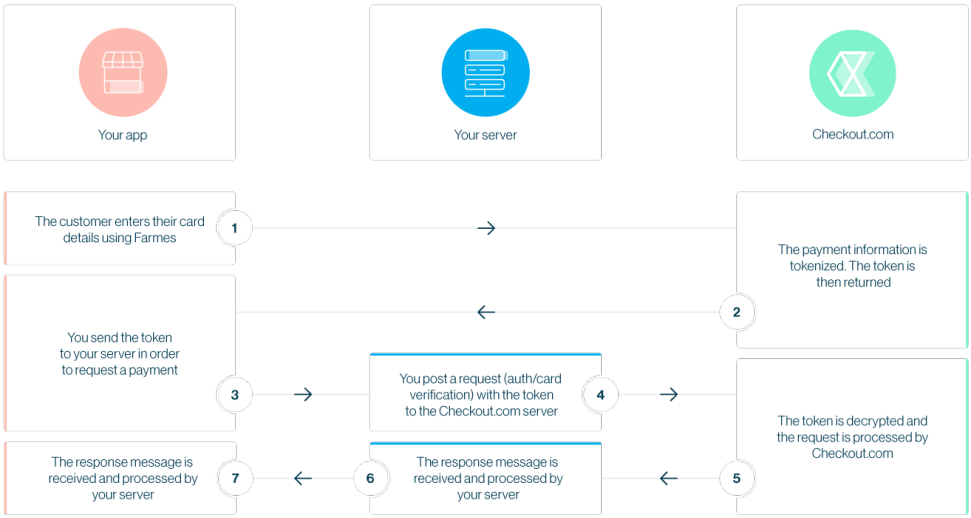

Figure 2-37: Payment proccess

The figure 2-38 shows The Hub or payments dashboard where the admins manage the payments.

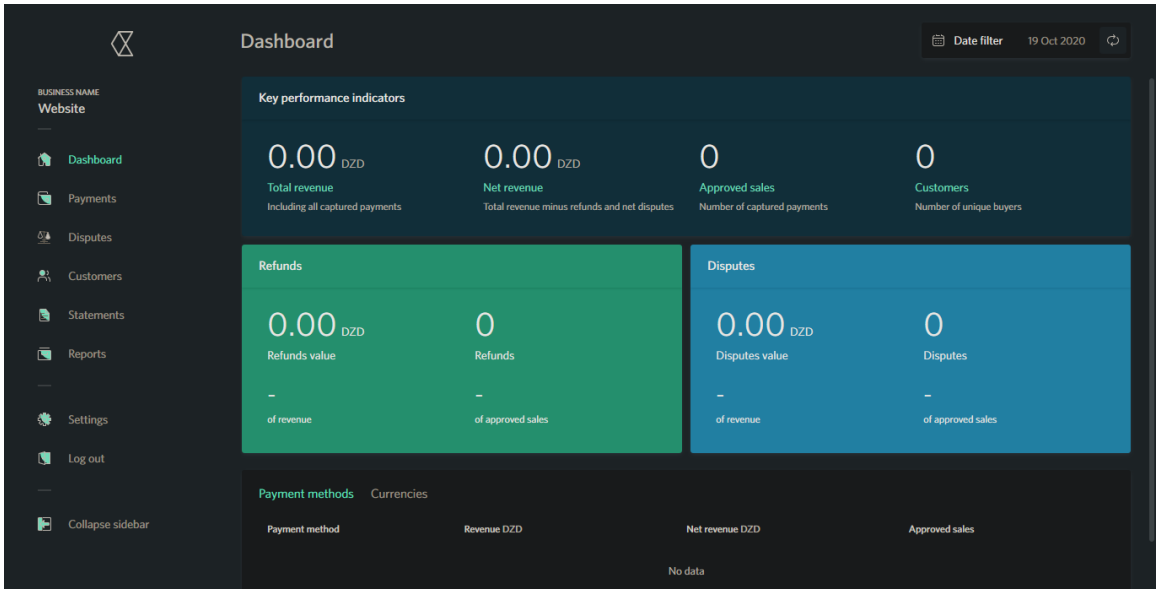

Figure 2-38: The Hub

2.3 Conclusion

In this chapter we did made a concept design of the functionaliteis of our project starting out by how the app tends to look like to what the app can do and what data contains and how it stored in our database.We also did presented the UML that certainly helped us in modeling the concept of our project.

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Chapter 3

Production and realization of test

In this chapter,we will go through the last phase of our project development which is the Testing stage.Testing should ensure that each function works correctly and helps reduce the number of bugs and glitches that users encounter. This leads to a higher user satisfaction, and a better usage rate.

3.1 Software/Hardware Environments

Software/Hardware Environments means all necessary hardware and software environments relating to our app, including, without limitation, separate and distinct hardware and software environments for each of development, testing and production, of our project product, in each case, as applicable, including customer/usage servers and user connectivity.

3.1.1 Hardware Environment

For the development we used a PC with the characteristics that listed in the table 3.1.And for the testing we used virtuel machines that we run inside the development machine which they are also listed in the table 3.1 her.

Device	CPU	RAM	OS	network
PC	Intel(R) Core(TM) i5-4300M	8 GB	Windows 10 64 bit	LAN
Nexus 6	X86	4 GB	Android 7.0	LTE
Pixel 2	X86	2GB	Android 6.0	LTE

Table 3.1: Devices used

3.1.2 Software Environment

Firebase

Figure 3-1: Firebas Logo

Firebase[6] is a Backend-as-a-Service - BaaS - and mobile development cloud platform that's currently owned and developed by Google[20].The platform consists of a great set of development tools that simplified our work which we did used some of them and we will list them her

- Real Time Database
- Authentication
- Storage

Checkout

Figure 3-2: Checkout Logo

Checkout is payment gateway and a merchant account provider that specializes in processing international payments,It provides a full-stack payment service, from accepting transactions, processing them and detecting fraud. It helps with reconciliation thanks to an API and a reporting hub.

Software used

- **Android Studio:**
  Android Studio[1] is the official integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development.We used it to develop our App.

- **Modelio:**
  Modelio[10] is an open-source UML tool developed by Modeliosoft. It supports the UML2 and BPMN standards. We used it to creat UML diagrams.

- **TeXworks:**

  TeXworks[14] is free and open-source application software. It is a Qt-based graphical user interface to the TeX typesetting system and its LaTeX, ConTeXt, and XeTeX extensions. TeXworks is targeted at direct generation of PDF output.we used it to write our project report.

languages used

- **Java:**

  It is class based and object oriented programming language which we used it for developing our APP with the help of Android SDK (Software Development Kit).

- **XML:**

  Extensible Markup Language (XML)[17] is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable.it helped us in creating our APP UI elements.

- **JSON:**

  JSON (JavaScript Object Notation) is a lightweight data-interchange format. It is easy for humans to read and write. It is easy for machines to parse and generate.it helped us in passing the data between the APP and the Database and structuring the Database.

Online Tools used

- **Creatly:**

  It is a chart and diagram maker tool [3] . We did used it for creating UI flow diagram.

- **wireframe.cc:**

  A design tool that we used for wireframing[16].

Libraries used

- **Picasso:**

  It is a powerful image downloading and caching library for Android[12].

- **CreditCardView:**

  It is a library used for displaying and validation of credit card.[4].

3.2 Testing

In this part we will execute our App and go through all the screen interfaces that we will encounter.Of course we 'll started out with the Home screen that is shown in the figure 3-3

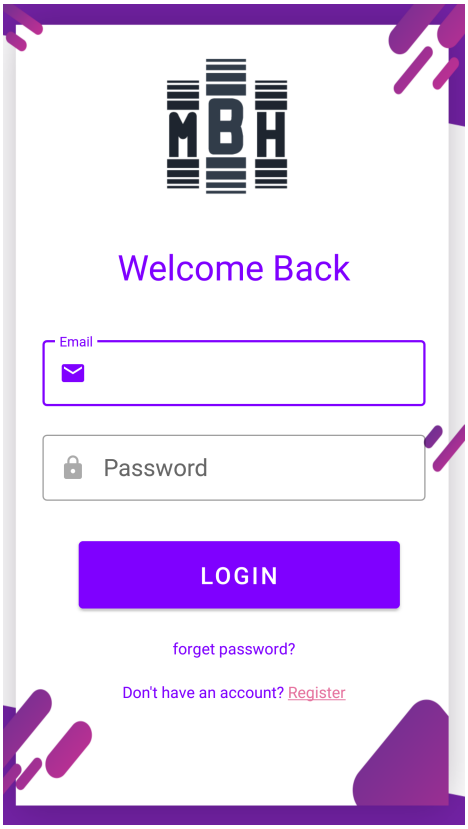
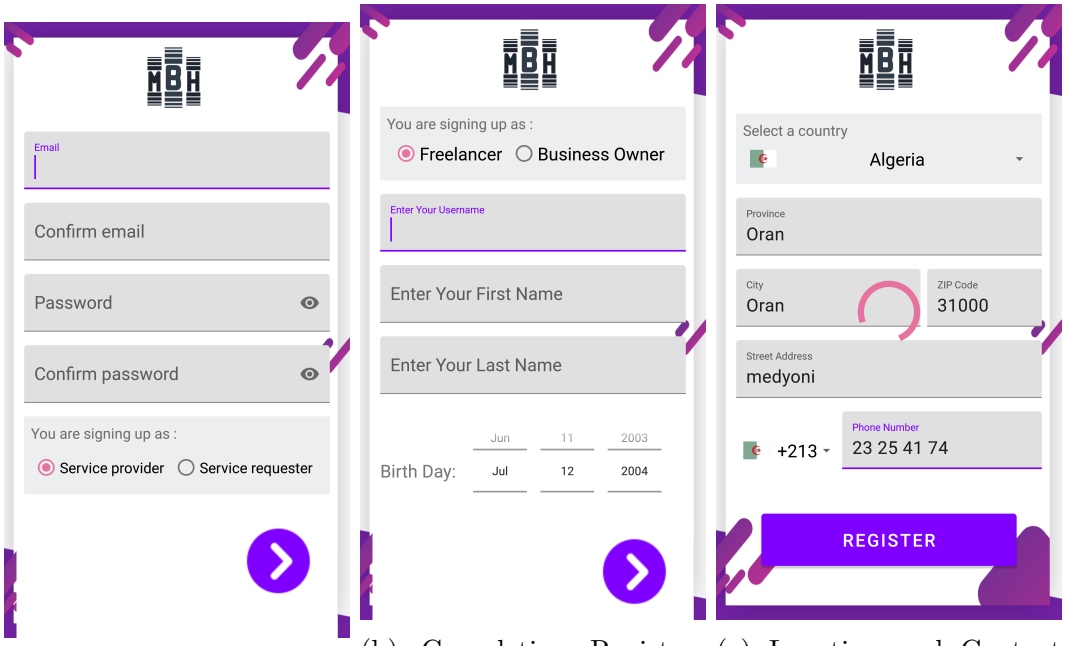


Figure 3-3: Home(Login) screen

Here,if the user does not have an account he will need to click on "register her" and the app will take him to the register screen as it shown in the figure 3-4.



(a) Init Registration

(b) Completing Registration

(c) Location and Contact Registration

Figure 3-4: Registration process

After entering his information and selecting what type of user he is, the app will take him straight to his profile and dashboard screen (he needs to enter a valid email or it won't work) . Let us take an example and consider that Touzala Mohamed wants to register as service provider and Tarek Dhiyaa wants to register as service requester. The figure 3-5 shows the profile and dashboard screen of Touzala (service provider).

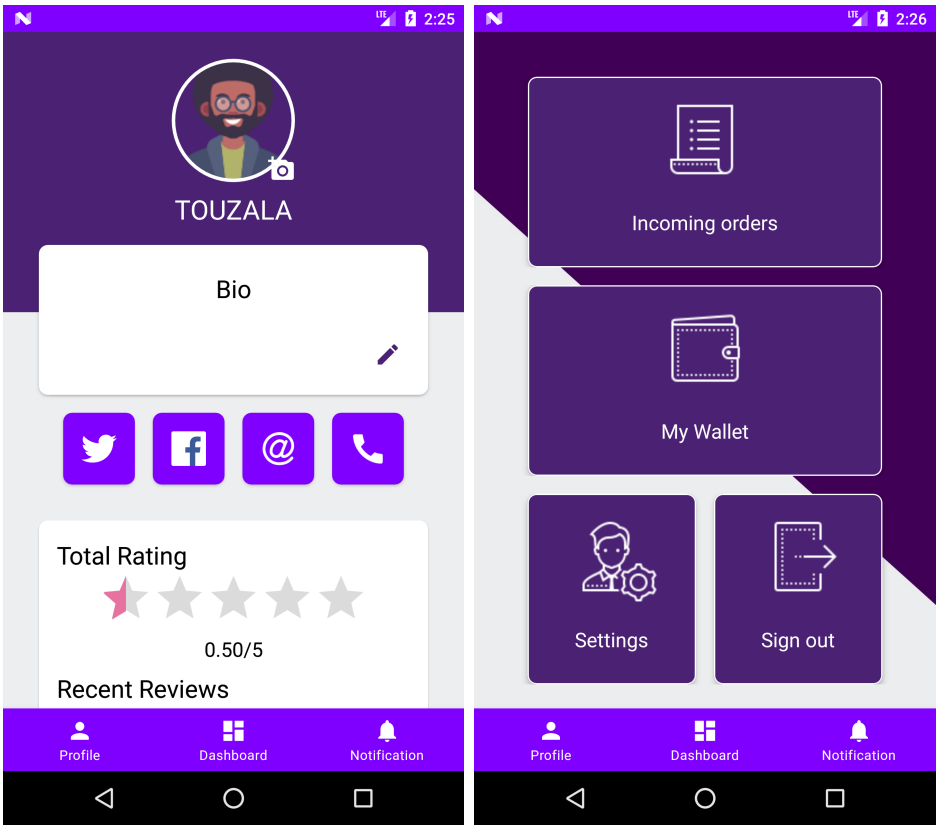


Figure 3-5: Service provider Profile and dashboard screen

And the profile screen of Tarek(service requester) shown in the figure3-6

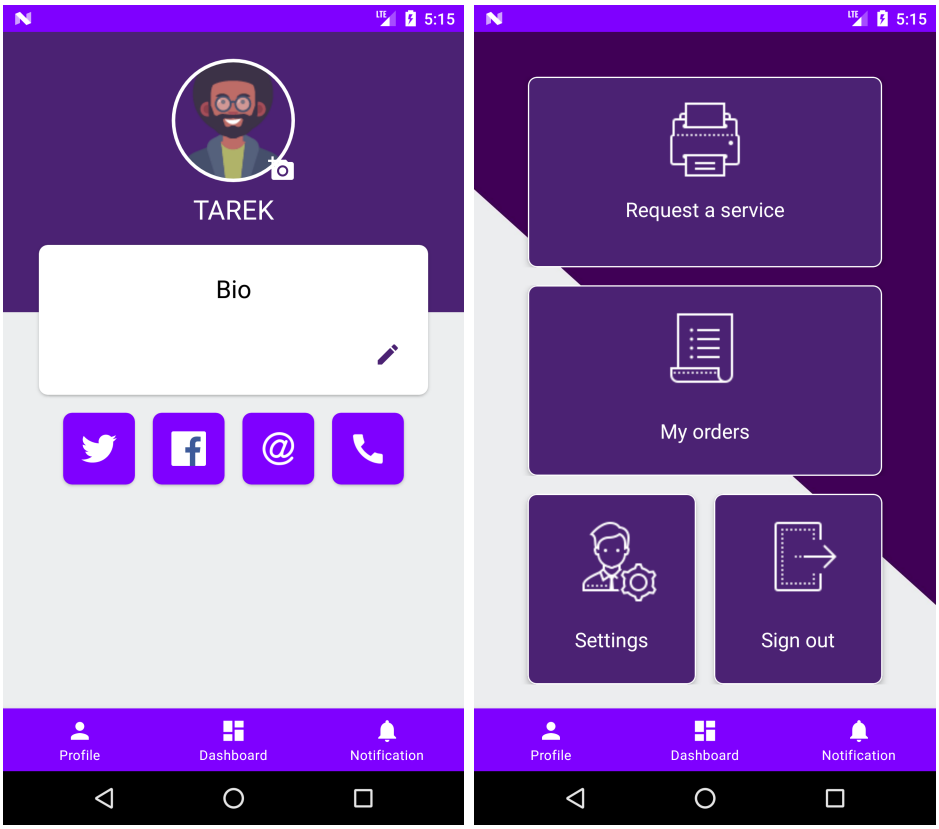


Figure 3-6: Service requester Profile and dashboard screen

And like you see ,as they encounter deferent buttons like "request an order" or "list of assignments" ,they do encounter same options too like "settings" ,"signout" and changing the profile picture as well (by clicking on that green picture which will open the gallery and allows chosing an image from the device storage).

For now let us focus on the service provider side . the figure 3-7 shows the list of assignments screen .And because Touzala is new user it will be empty.

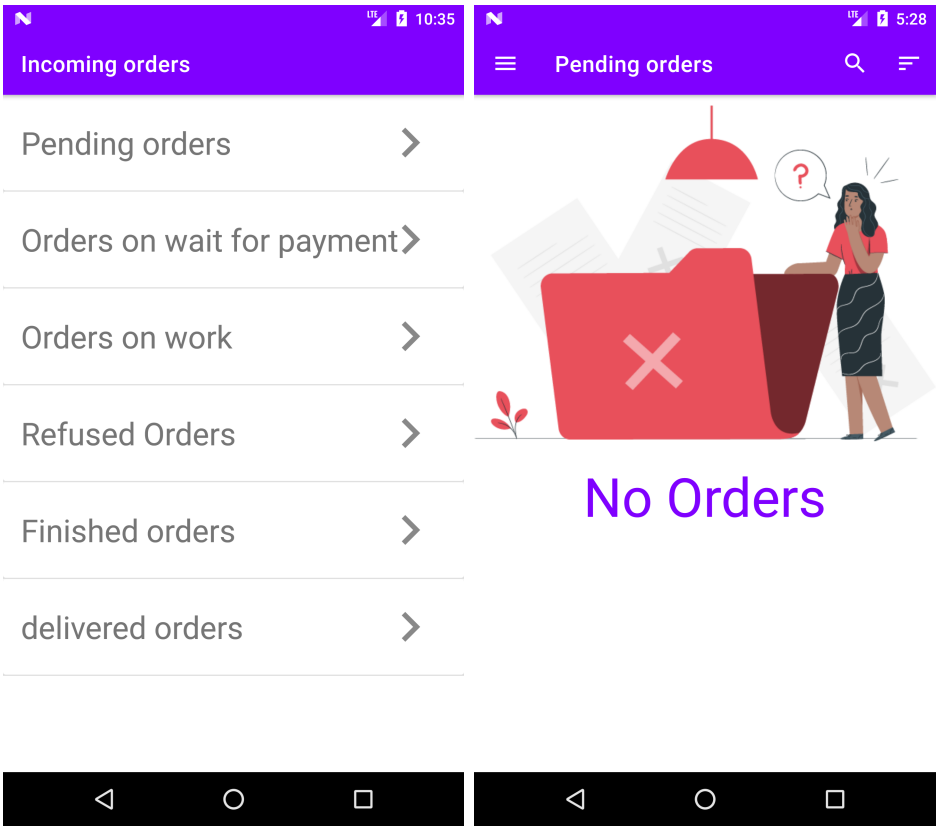


Figure 3-7: List of assignments screen A

But for older user it will be more like what is shown in the figure 3-8, of course he can search by the name of the requester or by subject and he can sort the orders depending on creation time or number of pages.

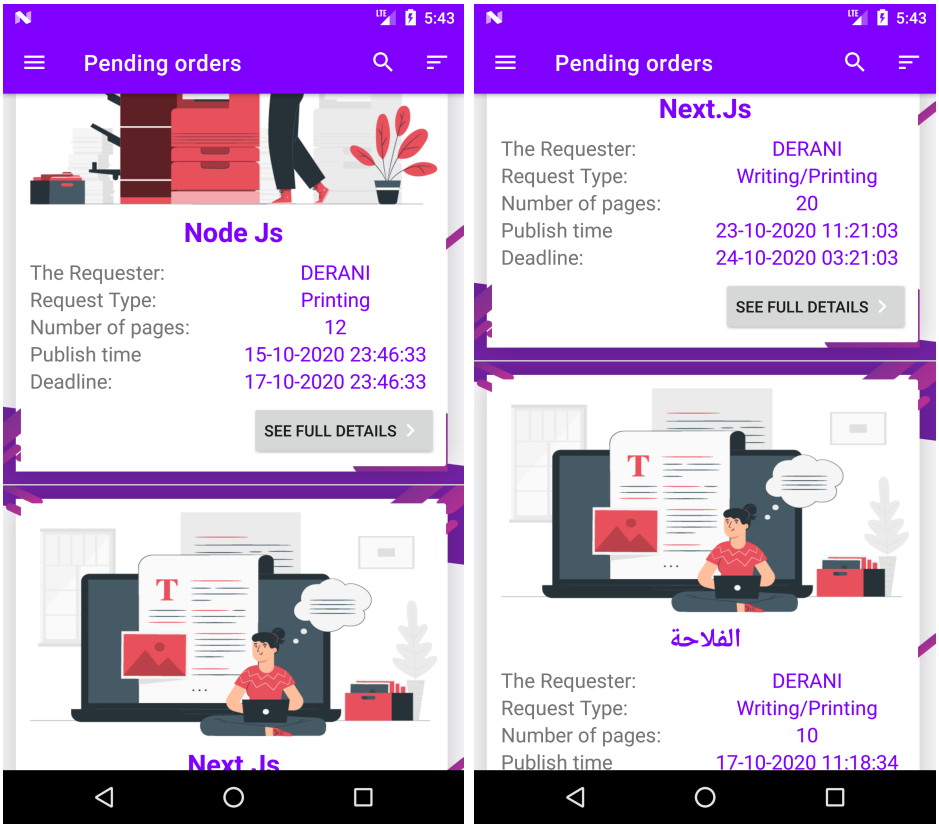


Figure 3-8: List of assignments screen B

Of course , the classification of the incoming orders depends on their state, if still not accepted or refused yet, it will be pending. and the service provider can access to its detailes and decide either to accept it or refuse it like it shown in the figure 3-9.

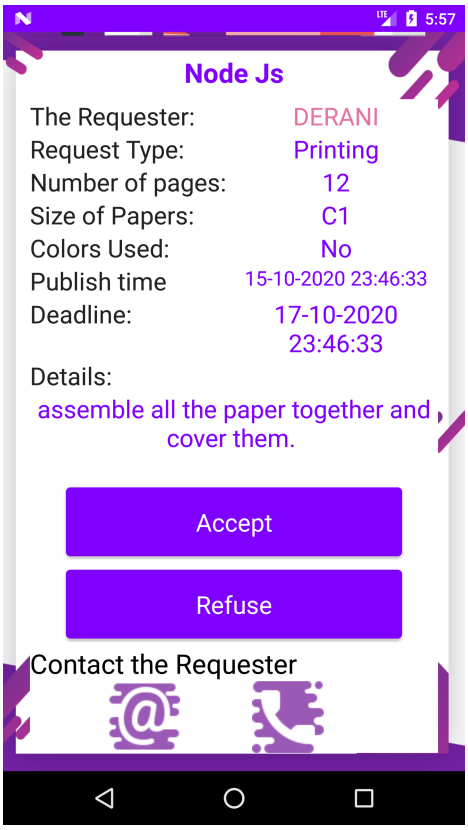
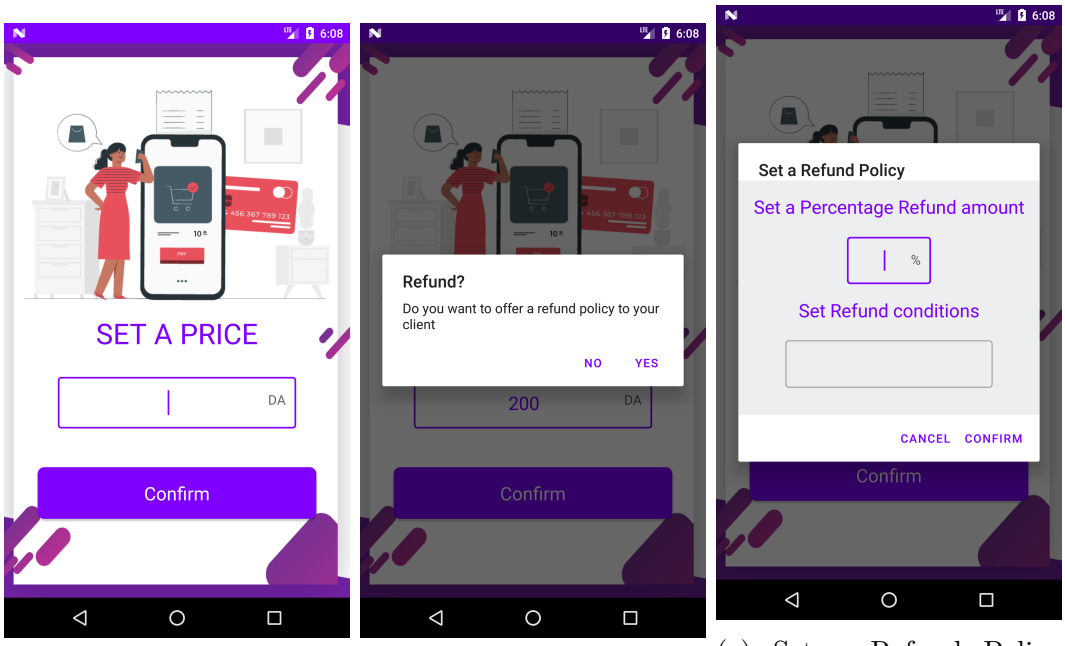


Figure 3-9: Pending Service details screen

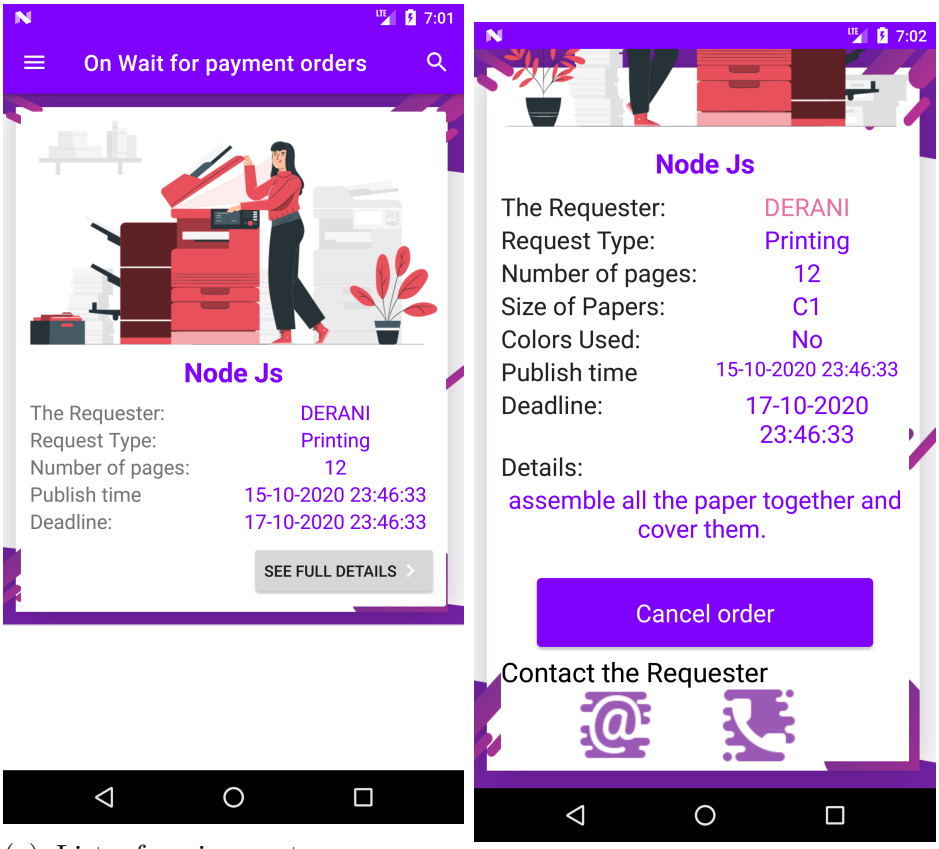
If the service provider decides to accept the order, another screen will pop up for him to enter the service price,after that he will be free to choose to offer a refund to his requester like it shown in the 3-10.



(a) Set a Price screen (b) Refund option screen (c) Set a Refund Policy screen

Figure 3-10: Accepting Pending Service details screen

After accepting the order, it will becom on wait for payment state like it shown in the figure 3-11

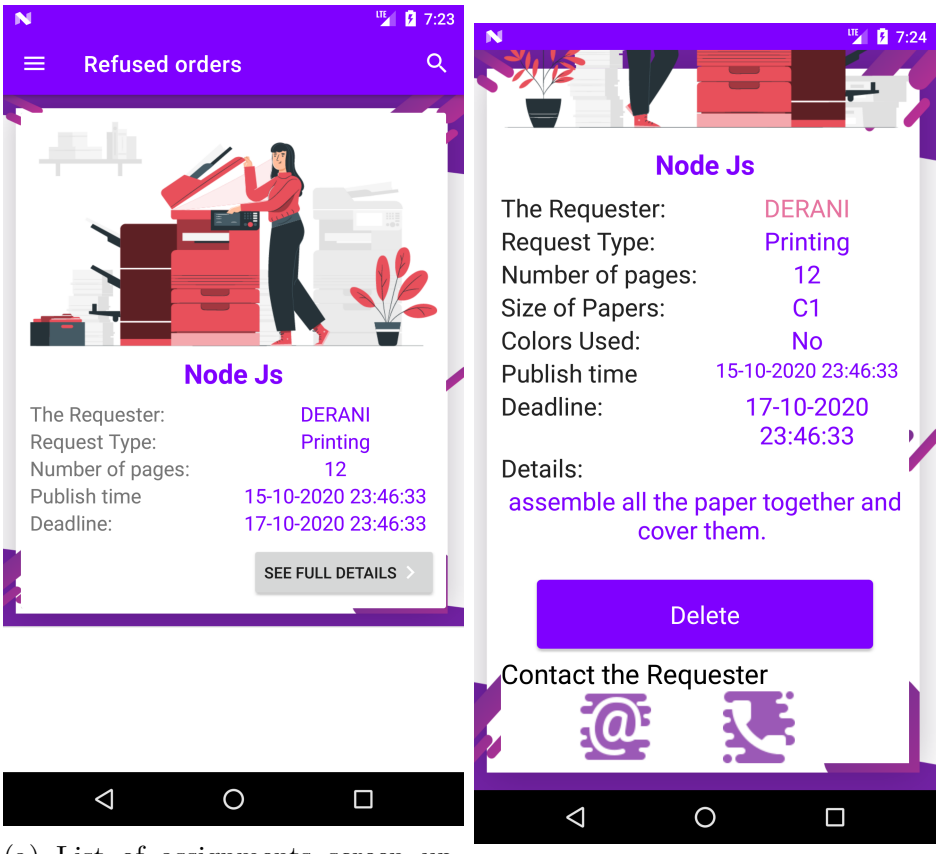


(a) List of assignments screen updated

(b) OnWait Service details screen

Figure 3-11: Acceptance updates

Then he just simply need to wait for the service requester to pay,but if the service requester didn't , he will be able to refuse the order and the client will be informed .And if he wanted, he can delete the order from his history but not from the database (same thing will happen if he refuse it in the first place) like it shown in the figure 3-12.

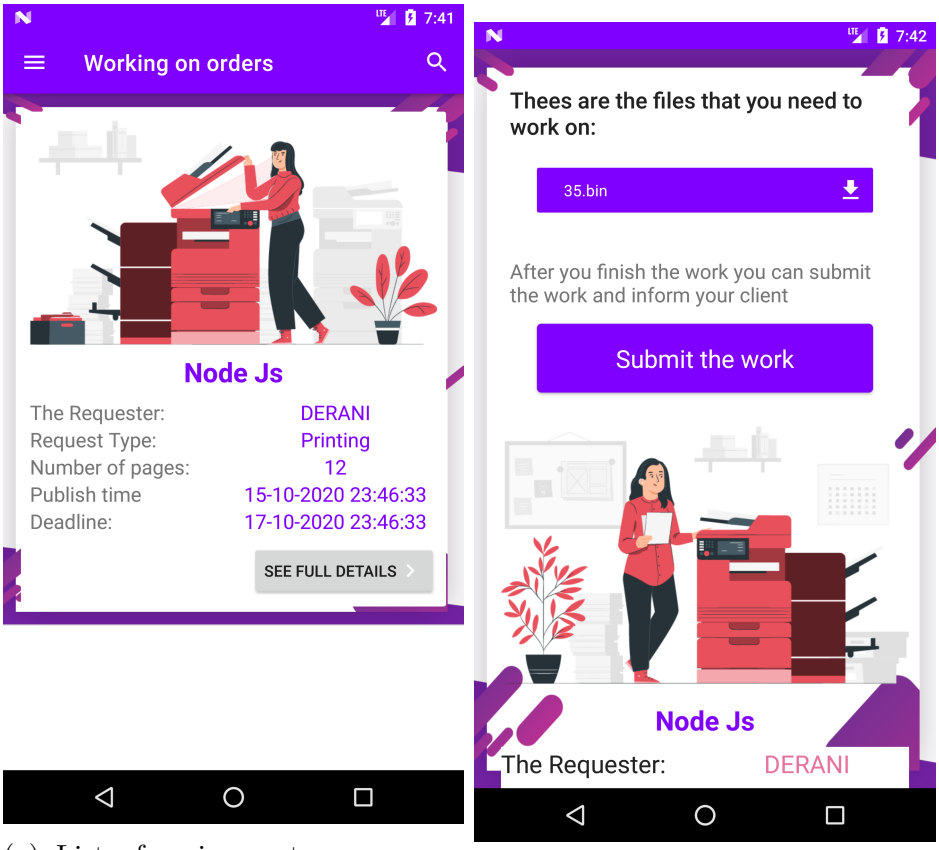


(a) List of assignments screen updated

(b) Refused Service details screen

Figure 3-12: Refuse updates

But if one of the orders have been paid , an notification will reach to the service provider to informe him about the payment so he can start working on the order which will be on the "workingOn" state like it shown in the figure 3-13.



(a) List of assignments screen updated

(b) WorkinOn Service details screen

Figure 3-13: Initiating the work updates

once he finishes the job, he can hit the submit the work button which will open another screen so he will be able to submit a prove or files to send to the service requester.The figure 3-14 shows the screen of that.

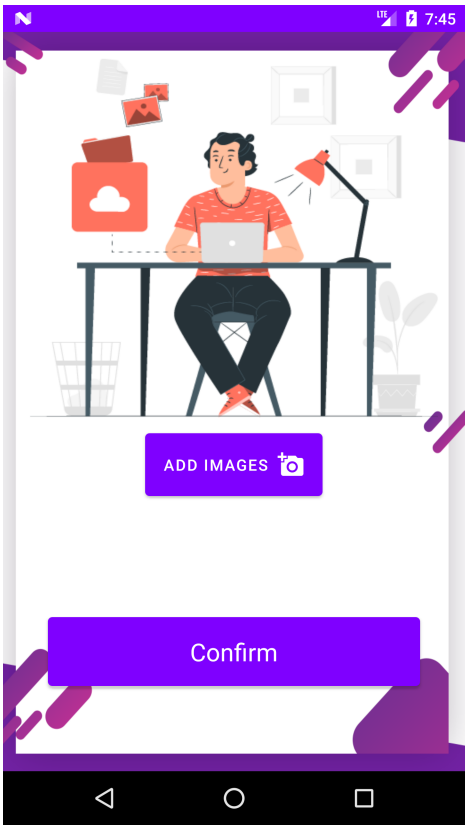
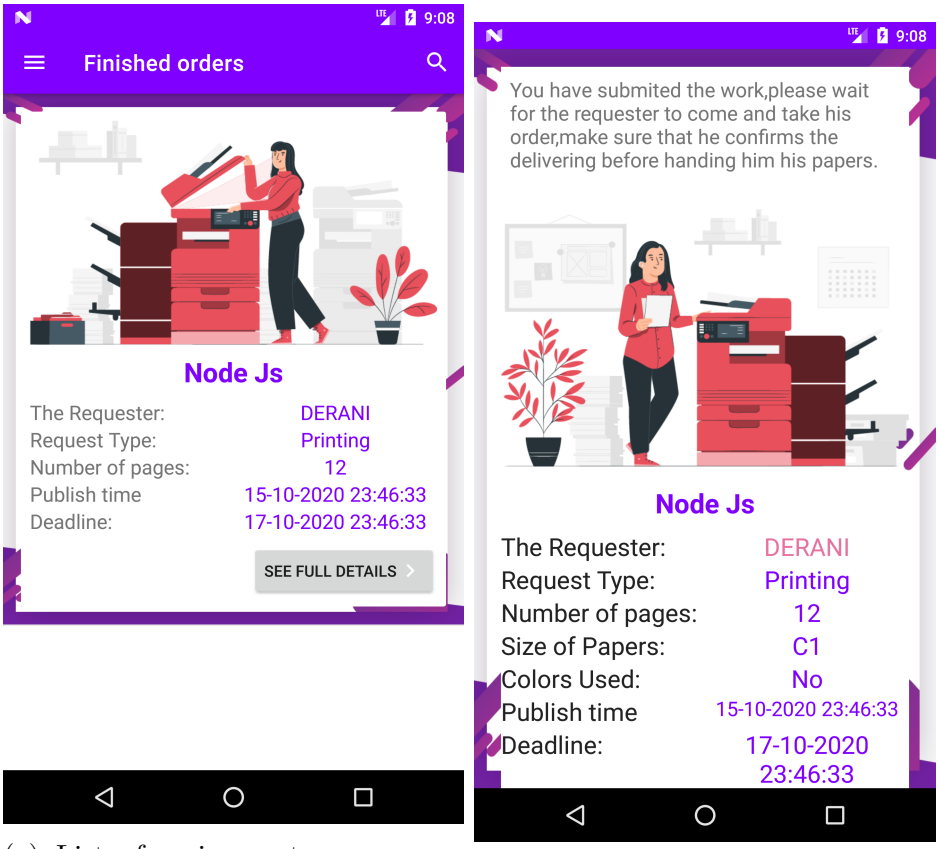


Figure 3-14: Submit work screen

now the service is on "finished" stat we can see that in the figure 3-15 and all that he have to do is to wait for the requester to take his order.

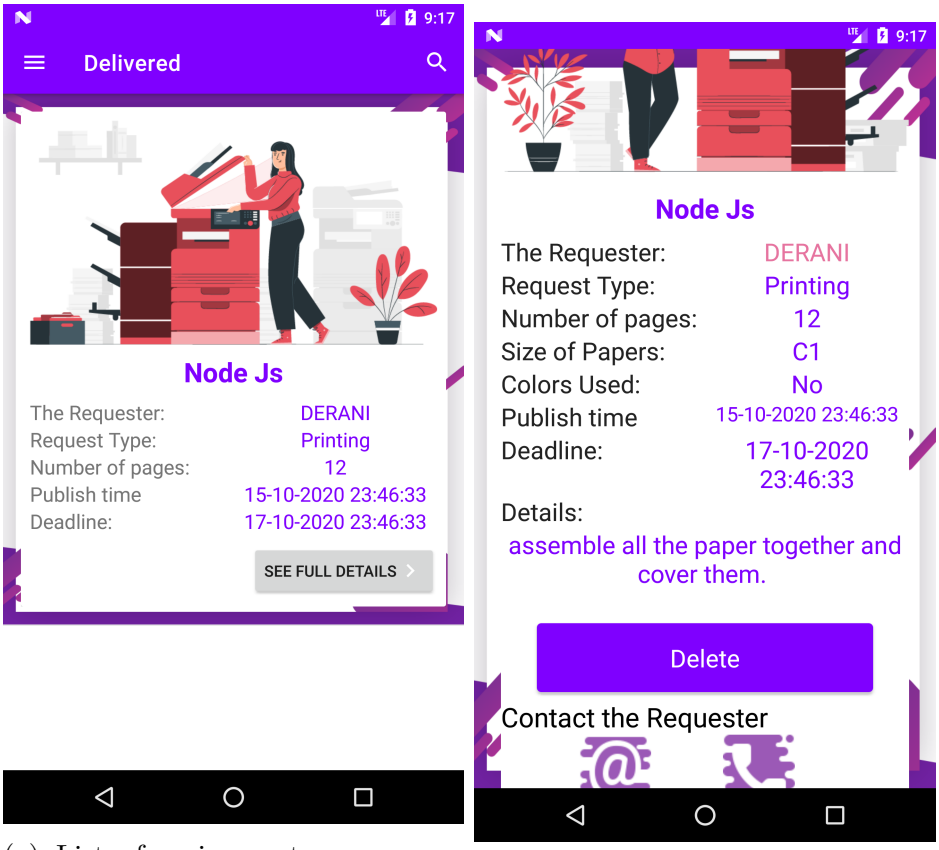


(a) List of assignments screen updated

(b) Finished Service details screen

Figure 3-15: Finishing updates

After th requester submits the delivering the order willl be on the "delivered" stat and he will be able to delete it from his history like it shown in the figure .The figure 3-16

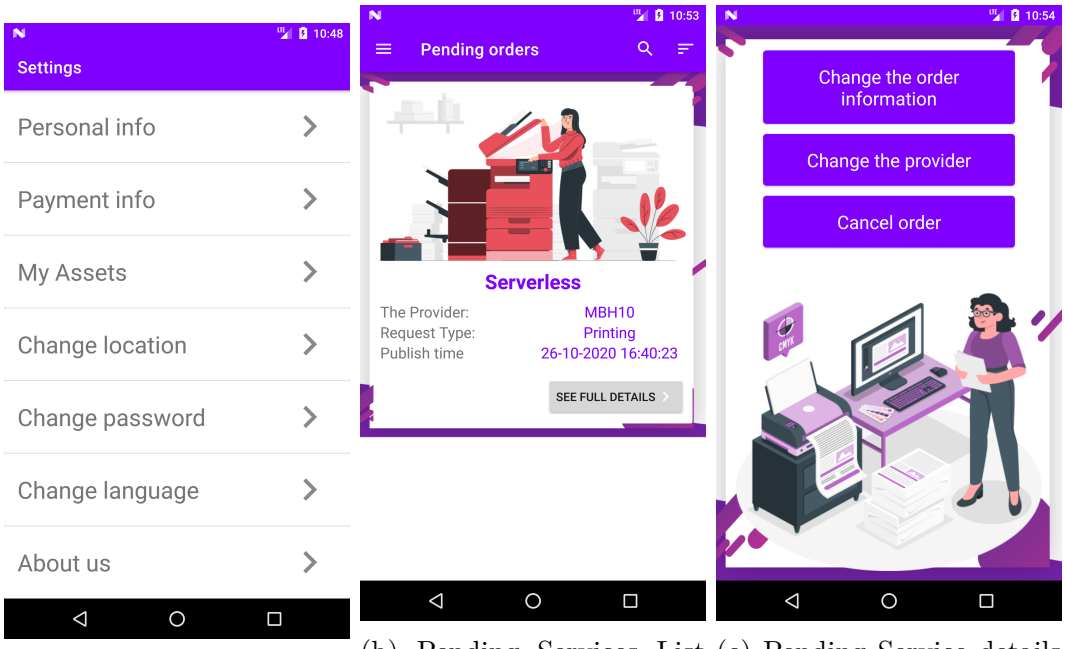


(a) List of assignments screen updated

(b) Delivered Service details screen

Figure 3-16: Delivering updates

Now let us focus on the service requester side.And like the figure 3-17 shows the list of its own orders,it does not differ from the list of orders that encounters the service provider, only the canceled state is added,but the order detailes will be diferent.Let us take an example of the printing order titled Serverless that have just been orderd.So it will be pending waiting for service provider responde but he will be able to change the provider or change his order details or cancel it.



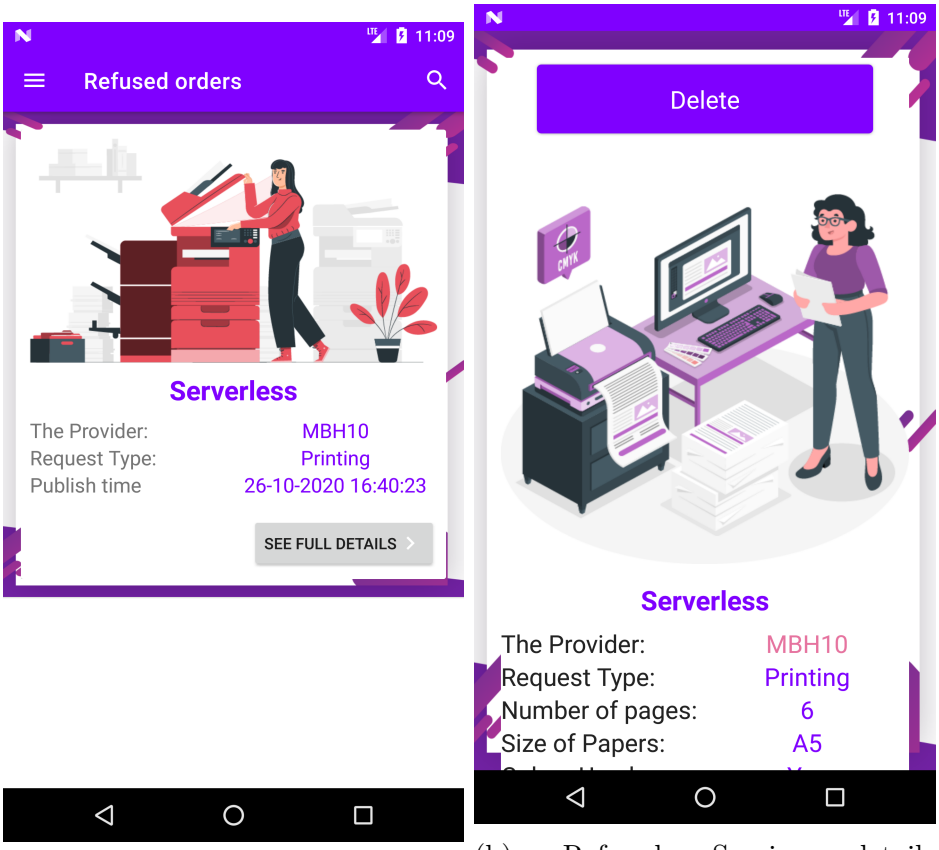
(a) List of orders screen

(b) Pending Services List screen(Client)

(c) Pending Service details screen(Client)

Figure 3-17: Service reqeuster orders

if service provider refuses his order, an notification will reach him to informe him about that and his order will be in the "refuse" state and he will be able to delete it after. Like it shown in the figure 3-18.

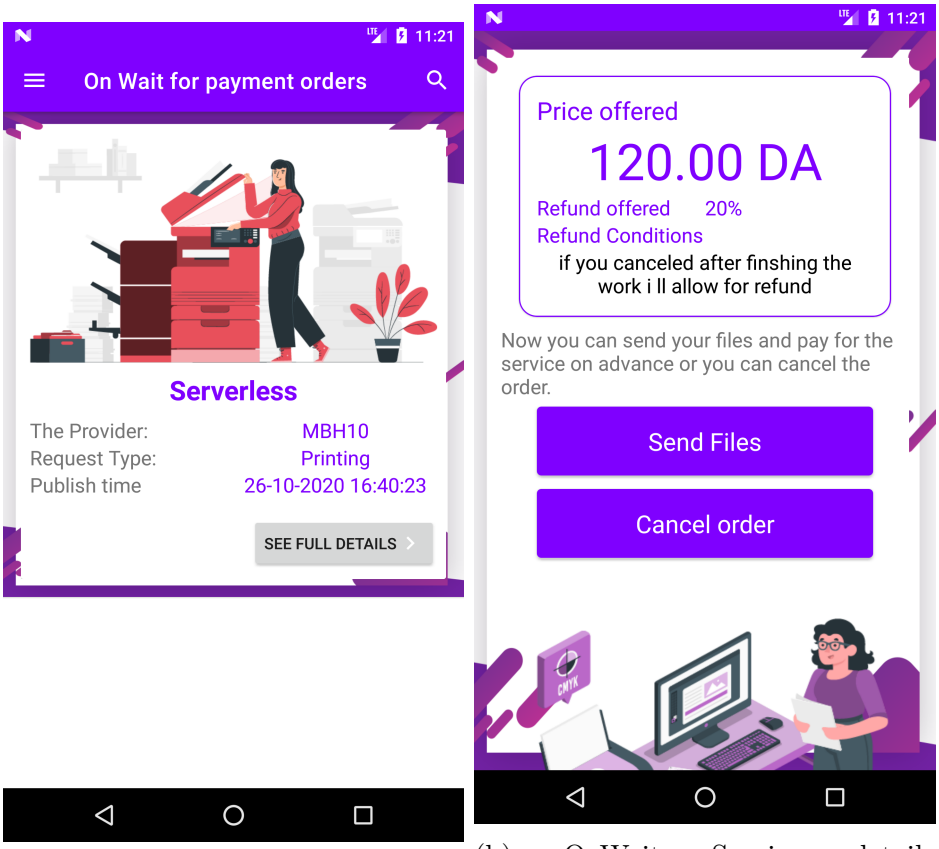


(a) List of orders screen updated

(b) Refused Service details screen(Client)

Figure 3-18: Refuse Updates(Client)

But if the order got accepted,an notification will reach him to informe him about that and his order will be in the "on wait for payment " state and he will be able to see the price offered and the refund offered and to pay for it by sending his file along or cancel it if he wanted. Like it shown in the figure 3-19.

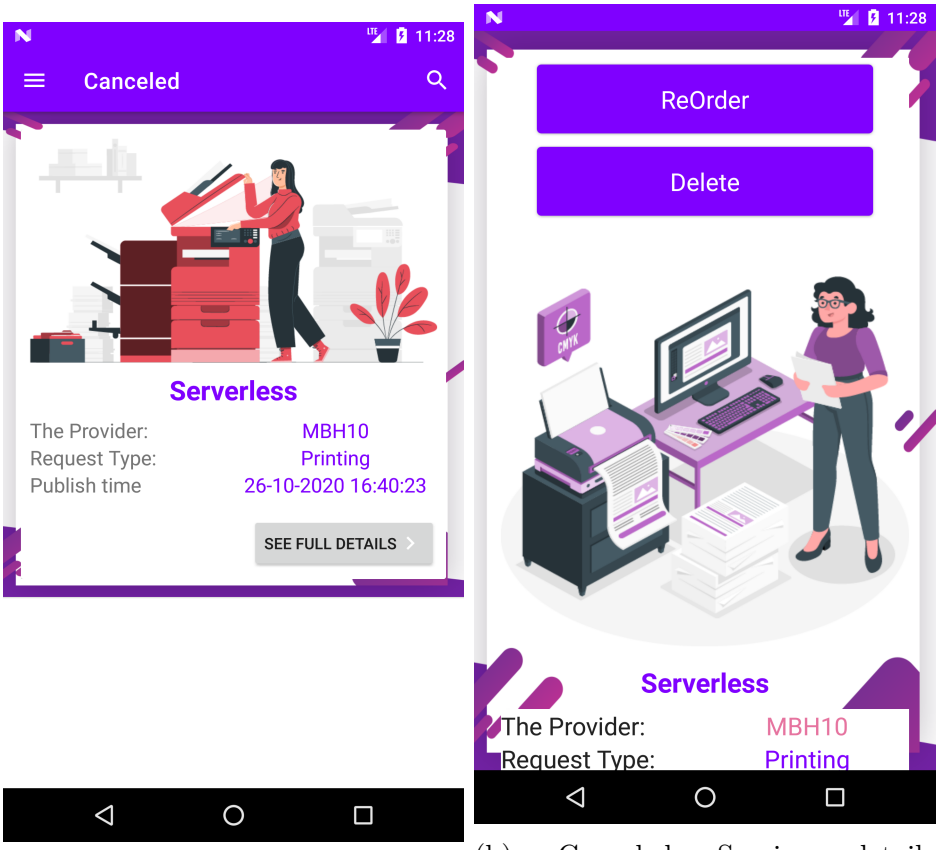


(a) List of orders screen updated

(b) OnWait Service details screen(Client)

Figure 3-19: Accept Updates(Client)

If he choose to cancel,the system will send the service provider an notification to inform him.And the order will be in the "canceled" state .And he can delete it if he wants or reorder it to another provider.Like it shwon in the figure 3-20.

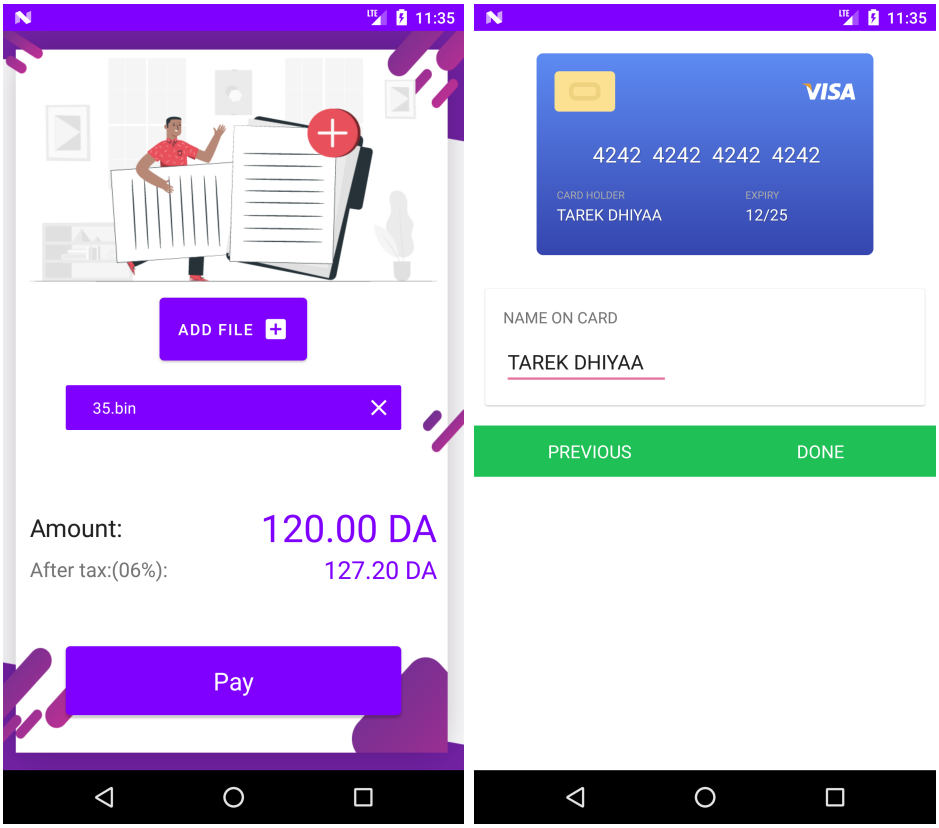


(a) List of orders screen updated

(b) Canceled Service details screen(Client)

Figure 3-20: Cancel Updates(Client)

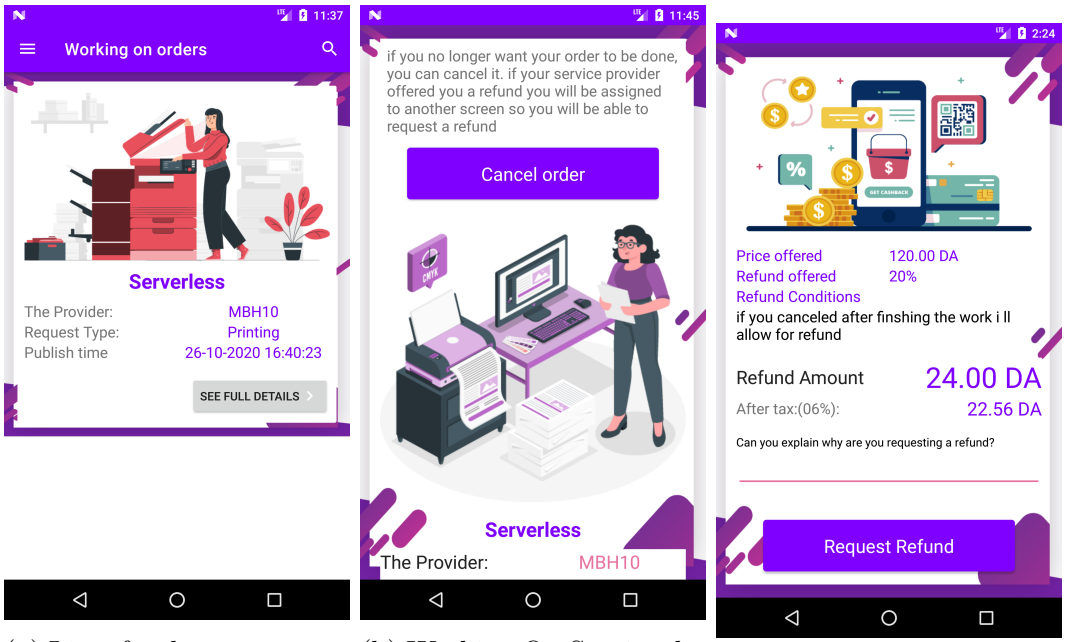
But if he wanted to get his order done , he will send his files and pay the service provider(he must enter his credit card info and the card must be a valid one).the system will send an notification to the service provider to informe him to start working.like it shown in the figure 3-21.



(a) Send File screen (b) Confirm Payment screen

Figure 3-21: Payment Updates(Client)

And then he willl wait for the order to be done , the order will be on "WorkingOn" state and he can cancel it if he no longer wants his order to be done and ask for his cash back if a refund offered.like it shown in the figure 3-22.



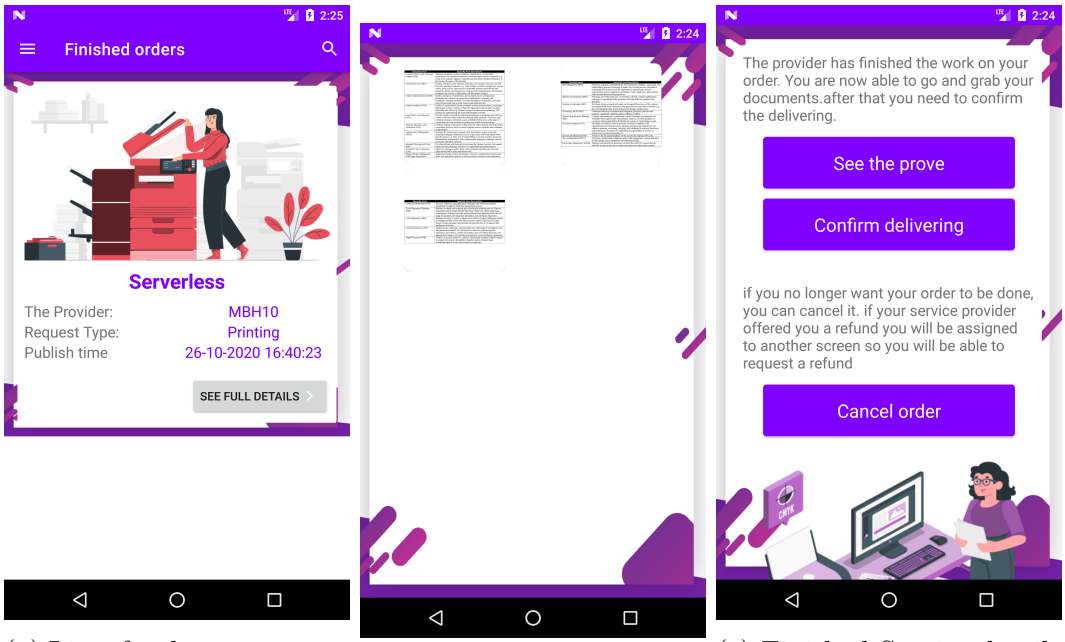
(a) List of orders screen updated

(b) Working On Service details screen(Client)

(c) Refund screen

Figure 3-22: Working on Updates(Client)

the figure 3-23 shows the case where the provider finishes the job,it will be on the "finished" stat,he will be able to see a prove of finishing the jobe so he can go to the provider to take his documents or he can cancel the order and request a refund.



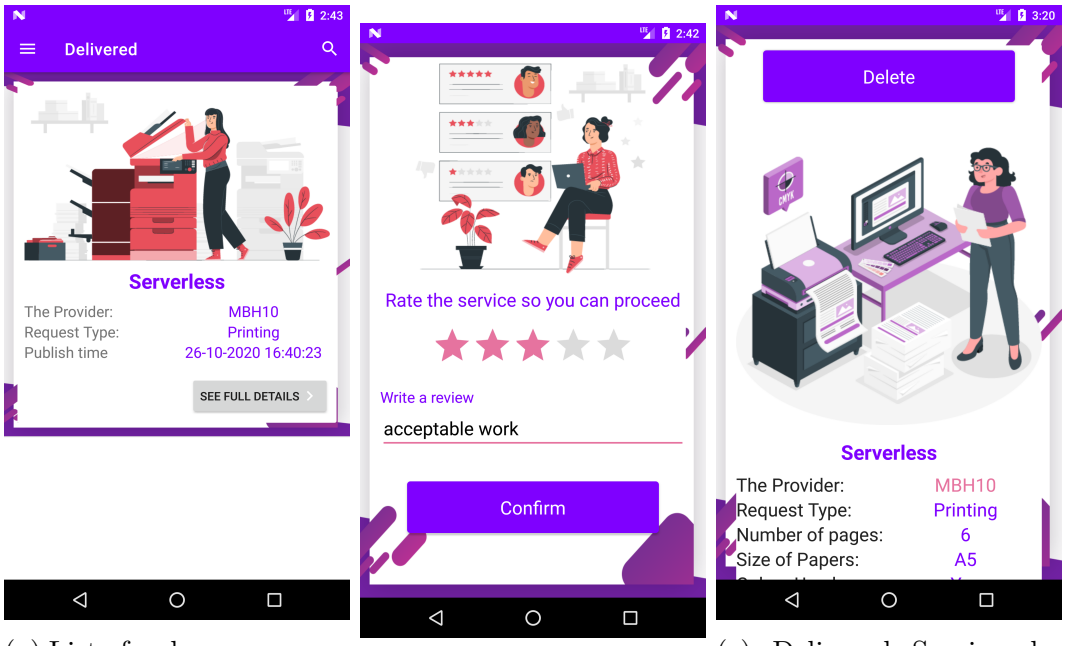
(a) List of orders screen updated

(b) See Prove screen

(c) Finished Service details screen(Client)

Figure 3-23: Finishing Updates(Client)

in case he went to the provider and gets his order , he will be obliged to rate him and confirm the delivering so the order will become on "delivered" state , and after that he willl be able to delete the order from his history.the figure 3-24 shows that.



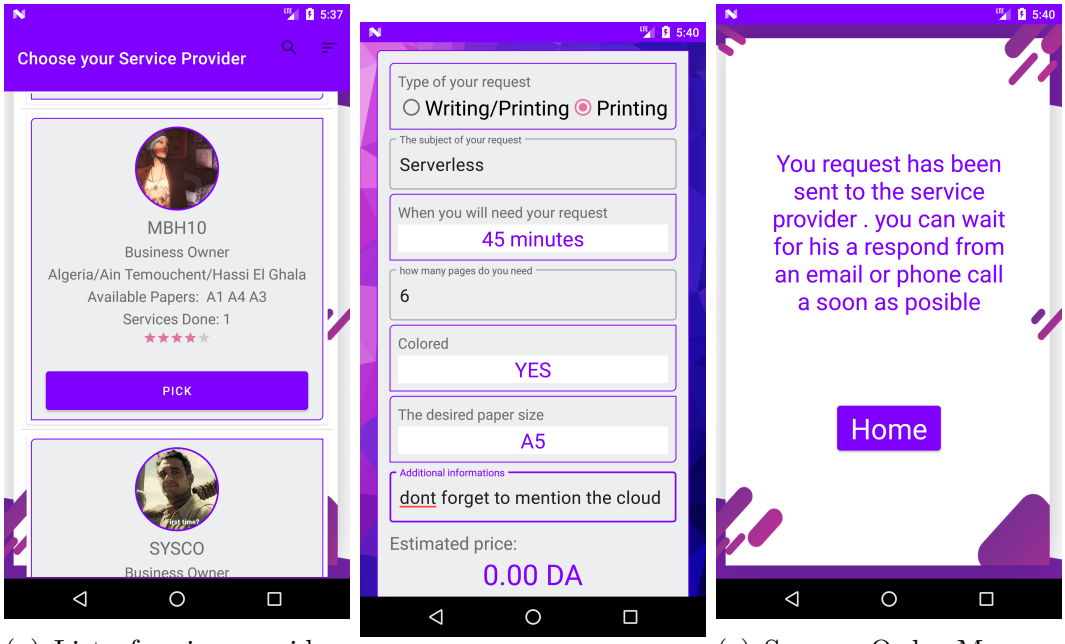
(a) List of orders screen updated

(b) Rate provider screen

(c) Delivered Service details screen(Client)

Figure 3-24: Delivering Updates(Client)

When it comes to ordering new order,the requester needs to hit the "request a service" button in the dashboard screen,and like it shown in the figure3-25 list of service providers will show up , he will need to pick one.Then he will need to enter the order info .Then he submits his order and success message will show up to him .



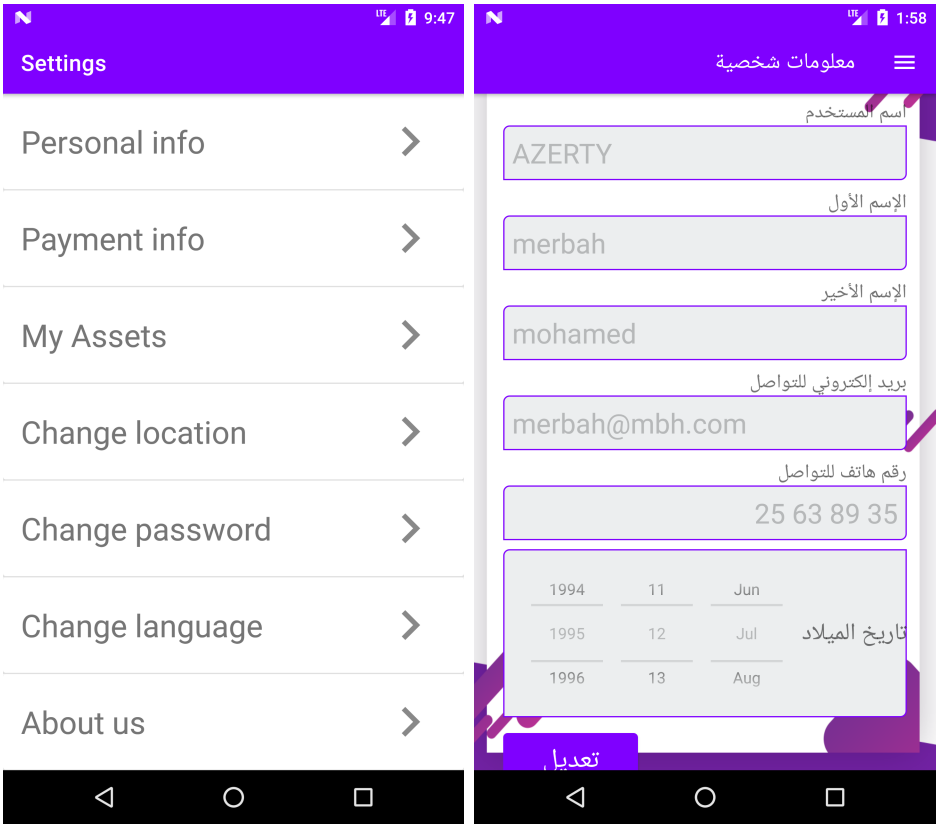
(a) List of serice providers screen

(b) The Order screen

(c) Success Order Message screen

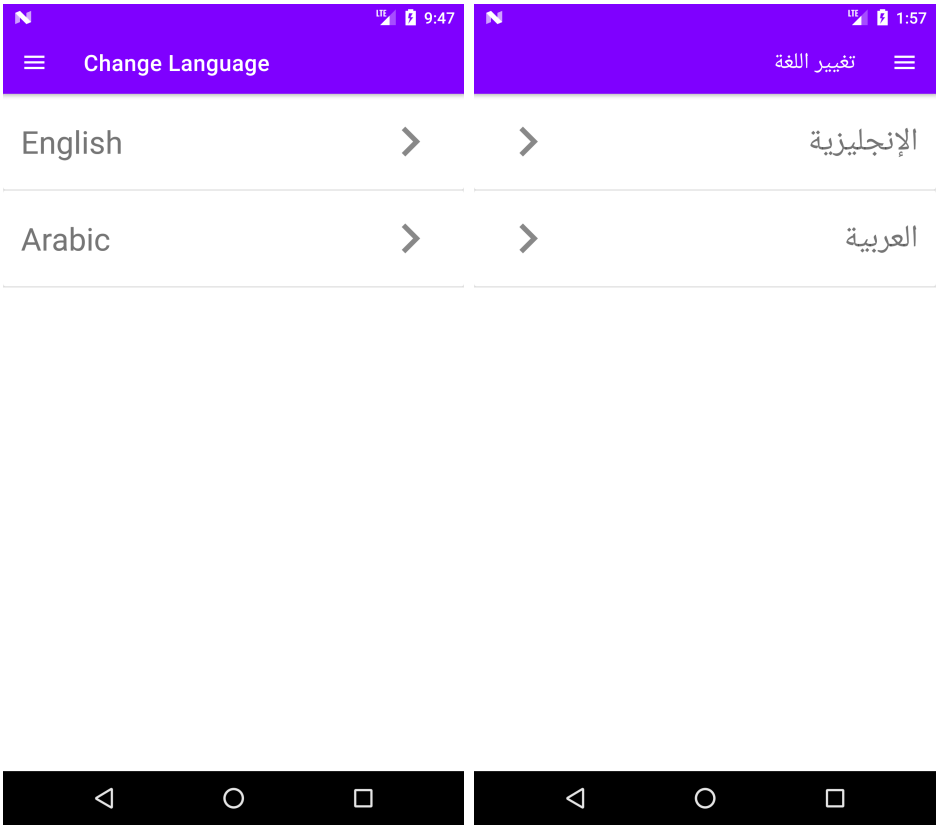
Figure 3-25: Order a service screens

the figures 3-26,3-27,3-28,3-29 shows all the settings that the user can change in this app whether his password ,personal info or the language or the location or he can acces his payment info like payment history.



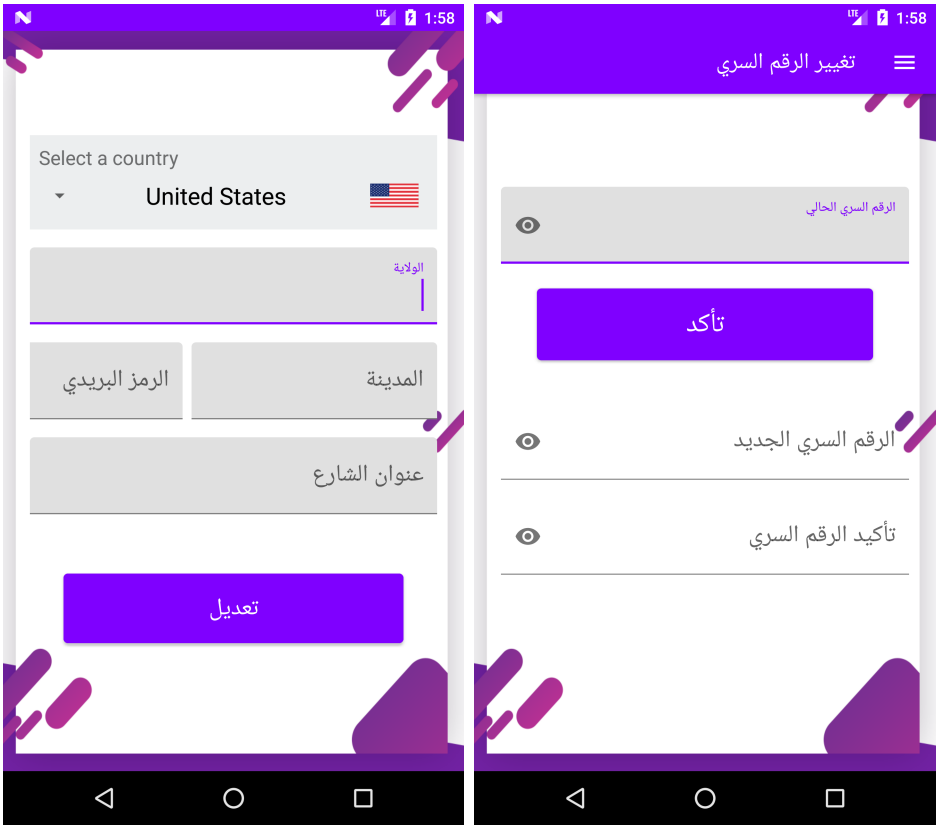
(a) Settings (b) Personal Info

Figure 3-26: Settings screens A



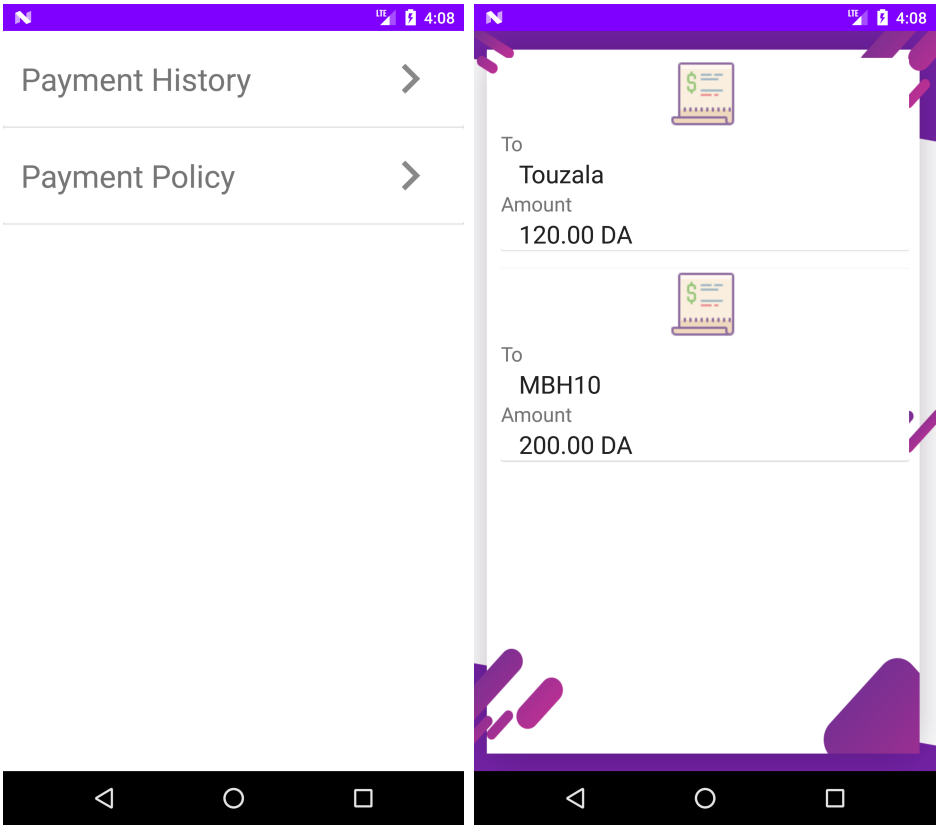
(a) Change Language screen(EN) (b) Change Language screen(AR)

Figure 3-27: Settings screens B



(a) Change location screen (b) Change Password screen

Figure 3-28: Settings screens C



(a) Payment Info screen (b) Settings screens D

Figure 3-29: Payment info

The figure 3-30 shows the wallet of the provider .here the user will access to his transactions history and request his money to be sent to his actual bank account .

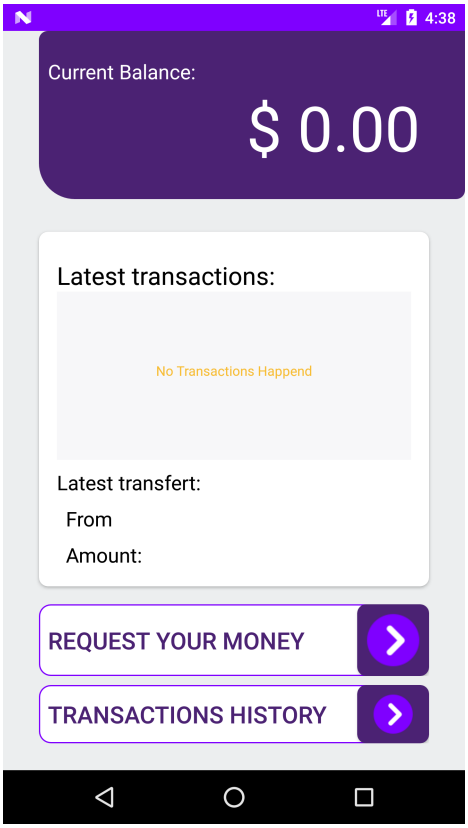


Figure 3-30: Wallet screen

3.3 Conclusion

At the end, we can say that our App secssecfuly passed the test and worked very well.

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General Conclusion

Because of all the problems that face the print shops businesses which affect their customers ,students and teachers specially , we felt the necessity to creat an app to manage this whole procedure that happens between them .And that is exactly what we did successfully implemted her in this project . Now, with the help of this app ,the students and teachers can easly order a service online and thier providers will present them with the service they need which it will reduce the workload on them and thier universities.

Certainly, ther is plenty room for imporovement for this app .Maybe it will be better if we expand the scop of this app to other fields other than the academic field,like Management field or using it for legalization and civil services.Or if we add more controle over how the service provider manage the orders. Or even if we add some IOT finctionalities to it and make the app connected directlly to the printer.

At the end,we can say that this app will be much more of assist and help.

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References

[1] Android studio. https://en.wikipedia.org/wiki/Android_Studio. Accessed on 2020-06.

[2] Cloud storage. https://firebase.google.com/docs/storage. Accessed on 2020-06.

[3] Creatly website. https://creately.com/. Accessed on 2020-06.

[4] Creditcardview. https://github.com/sharish/CreditCardView. Accessed on 2020-09.

[5] Firebase authentication. https://firebase.google.com/docs/auth. Accessed on 2020-06.

[6] Firebase documentation. https://firebase.google.com/docs. Accessed on 2020-06.

[7] Firebase realtime database. https://firebase.google.com/docs/database. Accessed on 2020-06.

[8] Firebase security rules. https://firebase.google.com/docs/rules?authuser=0. Accessed on 2020-06.

[9] Introducing json. https://www.json.org/json-en.html. Accessed on 2020-06.

[10] Modelio. https://en.wikipedia.org/wiki/Modelio. Accessed on 2020-06.

[11] Nosql. https://en.wikipedia.org/wiki/NoSQL. Accessed on 2020-06.

[12] Picasso. https://square.github.io/picasso/. Accessed on 2020-06.

[13] Real-time database. https://en.wikipedia.org/wiki/Real-time_database. Accessed on 2020-06.

[14] Texworks. https://en.wikipedia.org/wiki/TeXworks. Accessed on 2020-06.

[15] What is a payment gateway and how does it work? https://www.emerchantpay.com/insights/what-is-a-payment-gateway-and-how-does-it-work/. Accessed on 2020-10.

[16] wireframe website. https://wireframe.cc/. Accessed on 2020-06.

[17] Xml. https://en.wikipedia.org/wiki/XML. Accessed on 2020-06.

[18] What is a graphic charter? https://www.victoria-agency.be/2013/03/23/what-is-a-graphic-charter/, 2013. Accessed on 2020-06.

[19] Scott W. Ambler. *The Object Primer: Agile Model-Driven Development With Uml 2.0*, chapter User Interface Flow Diagrams (UI Storyboards): An Agile Introduction. Cambridge University Press, third edition, 2004.

[20] caelinsutch. What is firebase? https://dev.to/caelinsutch/what-is-firebase-1acj, 2020. Accessed on 2020-06.

[21] Jason Fernando. Payment gateway. https://www.investopedia.com/terms/p/payment-gateway.asp, 2019. Accessed on 2020-10.

[22] Barney Beal Margaret Rouse, Jack Vaughan. Definition nosql (not only sql database). https://searchdatamanagement.techtarget.com/definition/NoSQL-Not-Only-SQL, 2017. Accessed on 2020-06.

[23] Wise Marketing. Crucial role of paper and print in education industry. https://wbf.com/blog/2016/06/06/crucial-role-of-paper-and-print-in-education-industry/, 2016.

[24] Charlie Naylor. *Teacher Workload and Stress: An International Perspective onHuman Costs and Systemic Failure. BCTF Research Report.* PhD thesis, British Columbia Teachers' Federation, Vancouver., British Columbia Teachers' Federation, 100-550 West 6thAvenue, Vancouver, BC, Canada V5Z 4P2. Tel: 604-871-2283;Tel: 800-663-9163 (Toll Free); Fax: 604-871-2294; Web site:http://www.bctf.ca., 2001.

[25] Nishadha. Uml diagram types guide: Learn about all types of uml diagrams with examples. https://creately.com/blog/diagrams/uml-diagram-types-examples/, 2018. Accessed on 2020-06.

[26] S. O'Dea. Number of smartphone users worldwide from 2016 to 2021. https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/, 2020. Accessed on 2020-06.

[27] Visual Paradigm. What is unified modeling language (uml)? https://www.visual-paradigm.com/guide/uml-unified-modeling-language/what-is-uml/. Accessed on 2020-06.

[28] Lauren Schaefer. What is nosql? https://www.mongodb.com/nosql-explained. Accessed on 2020-06.

[29] Two Sides. Print and paper the facts. https://www.twosides.info/wp-content/uploads/2018/09/Print-and-paper-play-a-key-role-in-learning-and-literacy.pdf, 2015.

[30] StatCounter. Mobile operating system market share in algeria. https://gs.statcounter.com/os-market-share/mobile/algeria, aug 2020. Accessed on 2020-06.

[31] Marianne Stenger. Don't overload students: Assigning too much work discourages learning. https://www.opencolleges.edu.au/informed/features/dont-overload-students-assigning-too-much-work-discourages-learning/, 2018. Accessed on 2020-06.

[32] visual paradigm. What is use case diagram? https://www.visual-paradigm.com/guide/uml-unified-modeling-language/what-is-use-case-diagram/. Accessed on 2020-06.