



# Fiber Optic

Stock Management System

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TUNISIE TELECOM

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*Everything not saved will be lost.*

*–Nintendo 'Quit Screen' message*



## Acknowledgements

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Thank you all, I appreciate it, I'd also like to thank **ENIT** and all the **Teachers** and **Staff** for their efforts and insights: True Learning comes from you, it's YOU who must spend time in trial and error to truly learn.





## Abstract

There are a few reasons why we use **Stock Management Apps** that are based on **Databases**, lowering the **time** it takes to find what we're looking for and minimizing the risk for **data inconsistencies** and **redundancy** that are found among many alternatives like .xml files, also it can guarantee a **separation of concerns** through different **levels of permissions**, and that in turn lowers the risk of users tinkering with things they are not allowed to - or even limiting their access.

In this report we talk about the **conception**, **design** and **realisation** of a Stock Management Application for Tunisie Telecom's Stock of fiber optics, with a separation of Permissions between what different User types can do.

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# Introduction

In this section I will explain and summarize what was my internship all about and give a brief outline for the chapters to come.

## 1.1 | Motivation

As part of my Computer Science Curriculum in the National Engineering School of Tunis, I wanted to complete my internship in a company that is in line with my professional orientation. I did not choose a Telecommunications Company because I wanted to switch to the field of Telecommunications afterwards, but because the mission that was proposed to me was consistent with my professional goals.

Indeed, my primary mission was to observe the environment and interaction of Tunisie Telecom's employees and their discipline and hard work, I also discovered several new tools and techniques that proved very helpful, I also learned the roles of several devices and also many techniques employed by Tunisie Telecom to guarantee their Networks are top notch, it was a great opportunity for me to actually be in such an environment, which gave me more courage as a student to see myself becoming a Software Engineer.

In a second time, I had to design a Web Platform, which is accessible locally. Its role is to enable Tunisie Telecom staff of Creating, Storing, Updating and Deleting different entries of a Fiber Optics stock management program according to their permissions, putting as a priority the simplicity and efficiency of the Web Platform.

Finally, I'm very satisfied of this internship because it introduced me to a lot of new concepts like HTML, CSS, Bootstrap, PHP, MySQL, LAMP stack, Linux and even Git Version Control Systems in a domain that I love. And also allowed me to highlight my skills acquired during my Software Engineering year of studies.

The place where I did the Internship is shown in Figure 2.1.



Figure 1.1: Tunisie Telecom

This is an Image taken from Google Maps of the Digital Transmission Center (Centre de Transmission Numérique - CTN) of Tunisie Telecom based in Place Pasteur, Belvedere, hereafter noted DTC. Where I did my Internship.

## 1.2 | Aims and Objectives - Outline

Besides this Chapter chapter 1 and the Conclusion ???. There are two main chapters:

- In Chapter chapter 2, I will Introduce Tunisie Telecom DTC Belvedere, the company's history and its field of Telecommunications and the things I saw there, as well as the Data Unit (Unité Data) branch, that is responsible for dealing with big companies and clients in which I worked.
- In Chapter chapter 3, I will Introduce the Problem that we faced in Tunisie Telecom alongside the Solution I came up with, It's analysis, conception and realisation alongside the tools I learned throughout the way.

## Organization Overview

In this section we'll review Tunisie Telecom's History, Notable Leaders, Its' business sector and the wide range of clients it offers its services to, as well as its' organizational hierarchy and its work environment.

### 2.1 | Introduction to Tunisie Telecom & History

#### 2.1.1 | Introduction to TT

Tunisie Telecom is the brand name of the historical provider of telecommunication services in Tunisia. Its capital is 875 million euros and its transaction number, in 2004, amounted to 750 million euros.

Tunisie Telecom is the fully integrated telecom services operator in Tunisia, with leading market positions across all segments with over 7 million customers and an employee base of c.7,500. Tunisie Telecom offers the largest mobile coverage in the country, owns and operates a nationwide fixed and fiber network infrastructure. This is complemented by an extensive submarine cable network allowing for direct and fully redundant connectivity with Europe, Africa and Asia. Tunisie Telecom's service offering ranges from 4G mobile broadband to Fiber-To-The-Home and Fiber-To-The-Building as well as cloud and IP-MPLS solutions for enterprises.

#### 2.1.2 | History

The law establishing the National Telecommunications Office, whose commercial name is Tunisie Télécom, was promulgated on 17 April 1995 and came into force on 1 January 1996.

Tunisie Télécom sets up, operates and markets the first GSM network in Mauritania (Mattel) from May 2000. It also enters into a technical cooperation agreement with Djibouti Telecom for the development of its telecommunications networks.

It became a public limited company at the end of 2002, it changes its legal status, by a decree of April 5, 2004, to become a limited company called "Tunisie Telecom". It is experiencing partial privatization in July 2006 with the entry into its capital, up to 35%, of the Emirati consortium EIT (Emirates International Telecommunications).

From 2008, Tunisie Telecom offers the possibility to national bank card holders to feed the balance of their prepaid lines via ATMs of the Arab Tunisian Bank (Mobilink service).

On March 21, 2009, Tunisie Telecom launched a new brand, Elissa, with offers specifically designed for young people under 25; it becomes accessible to all without age limit as of March 10, 2012.

In the spring of 2011, following the Tunisian revolution, the company is shaken by a major social conflict between the representatives of the Tunisian General Labor Union (UGTT) and those of its UAE shareholder over the fate of some 60 contracts representing 3.5% of the payroll; it is marked by strikes and sit-ins affecting the proper functioning of the operator. It ends with the end of these employment contracts, with the exception of ten contract holders retaining their positions.

In September 2012, Chief Executive Officer (CEO) Ali Ghodhbani retires and is replaced by Mokhtar Mnakri, former CEO of Alcatel's subsidiary.

In 2014, Salah Jarraya was appointed CEO to replace Mnakri, whose term was coming to an end.

In June of the same year, the employees started a social movement to obtain a salary increase and to claim the application of the agreements signed in February 2011. They gather around the UGTT and carry out many work stoppages until May they succeed in May 2015. Following these social movements and strikes, Jarraya resigns on July 2nd.

On August 12, Nizar Bouguila is appointed CEO.

On March 15, 2016, Tunisie Telecom launched its new visual identity called "Life is Emotions", with a new logo. In August, Tunisie Telecom finalizes the purchase of 65.4% of the entire capital of GO.

Bouguila is replaced on September 19, 2017 by Mohamed Fadhel Kraiem. On November 7, Tunisie Telecom signed a five-year contract with the Ministry of Information Technologies and the Digital Economy to cover white areas with broadband telecommunications services.

On December 13, 2017, UAE investment fund Abraaj announced that it had signed an agreement the day before for the definitive purchase of EIT's 35% stake. However,



the bankruptcy of the fund cancels the operation.

## 2.2 | Activities of Tunisie Telecom & Customers

Tunisie Telecom offers services in the field of fixed and mobile telecommunications. In June 2006, it has 1,259,000 fixed-line subscribers (PSTN), of which it has a monopoly, and 3,265,000 subscribers to the GSM network, the first line having been inaugurated on March 20, 1998.

With a share of market of 35.4% in December 2014) in the mobile phone market, Tunisie Telecom is the second largest mobile operator in the country, behind Ooredoo, leader with a 45.7% market share. In 2014, the incumbent operator posted an average monthly growth rate of 4.2%, which enabled it to surpass five million subscriptions.

Tunisie Telecom is also an Internet access provider (Frame Relay, ADSL, X.25, LS, ISDN and WLL for rural telephony).

In 2010, Tunisie Telecom launched, in collaboration with the Tunisian Post, the Mo-biDinar mobile remote payment service.

In November 2014, Tunisie Telecom signs a partnership with the Khechine group, which consists in offering the telecom company advantages over the services of the tourism group, in exchange for an advantageous telecommunication offer for hotels and tourism establishments in the country.

In 2016, Tunisie Telecom signs a partnership agreement with the Tunisian Order of Engineers, which allows its members to benefit from a wide range of telecommunication services.

On April 17, 2017, the CEO Nizar Bouguila and the CEO of the CARTE group (Tunisian-European Insurance and Reinsurance Company), Hassine Doghri, announced that they are signing a partnership to optimize the fixed communications of the insurer.

At the end of August 2017, Bouguila and Néji Baghourri, president of the National Union of Tunisian Journalists (SNJT), signed a new partnership agreement stipulating the provision of telecommunications services by Tunisie Telecom to SNJT. The convention also plans to equip the training room at the union's headquarters with new technologies and, thanks to the awarding of a special annual prize, to reward "journalism of excellence".

On November 16, 2017, Tunisie Telecom and the Almadanya Foundation renew their partnership and sponsorship agreement, already three years old, and announce their willingness to launch a new challenge to transport students from remote areas.

On February 6, 2018, Tunisie Telecom and PROLOGIC Holding, the leader in the IT equipment and services market in Tunisia, announce the signing of a new three-year partnership agreement. Also in February, Tunisie Telecom launches its "Wi-Fi on board" offer, a pilot action conducted in partnership with the National Intercity Transport Company (SNTRI) to offer free Internet access via Wi-Fi in the bus network.

On July 10, in Tunis, the management of Tunisie Telecom and that of Vodafone announce that they have signed a new partnership agreement.

On 28 August, Hermess Group CEO Ali Hermassi and Tunisie Telecom signed a partnership agreement further placing the operator as a leader in business services on the Tunisian telecommunications market.

Note that this section may be based on some articles I read on wikipedia and TT's official website. Here are the references (??).

## 2.3 | Organizational Hierarchy

Since September 2010, the functional organization chart of T.T is as follows: 2.1.

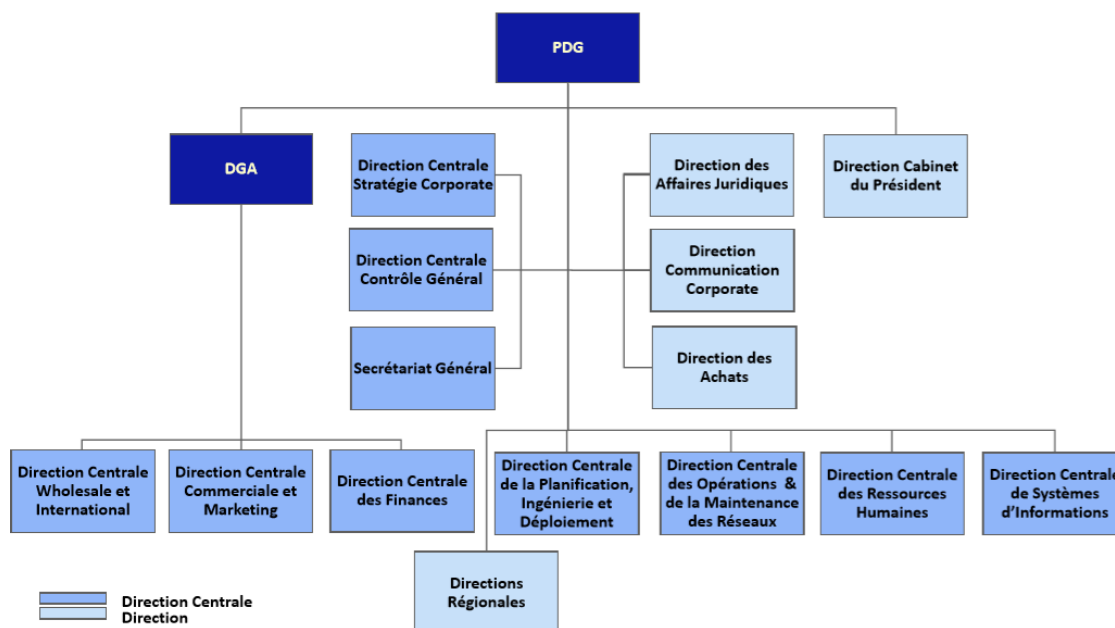


Figure 2.1: Tunisie Telecom

During my internship, I worked for the Data Unit - Business Networks Management Unit that gas the role of ADSL Management, Fiber Optic Management, and manage-

ment of DATA equipment.

## 2.4 | Work Environment

The work environment is exceptionally excellent, Transparent and Open Communication are at the epicenter of what I think is really good about this work environment: We were feeling heard - as interns, we had value and we certainly felt that we belong in the organization. They also gave us the opportunity to Give and Take, that is, we never felt stuck through bureaucracy or even felt that we're doing worthless work, No, our work was at the very center of what Tunisie Telecom employees needed, and we're also allowed to voice our own opinions back, that's a sign of mutual trust in which we're not afraid to suggest ideas to improve the work process! And the thing that I truly appreciated about the whole process was the Recognition of Hard Work: I feel valued by them for the work I had put in.



# The Stock Management Web Application

In this section I will represent what you did in the internship. The project as well as its Conception and design, the Tools Used and its Realisation.

## 3.1 | Introduction

During the last two weeks of the internship, I was given the task to design and implement A stock management Web application for Tunisie Telecom's Stock of Fiber Optics, all for the benefits of a DBMS: Efficiency, Reliability, Convenience, Safety, Multi-User storage of and access to massive amounts of persistent data.

## 3.2 | Tools Used

During my internship I used a number of tools including:

- Kali Linux 2019.3 & Elementary OS 5.0 Juno
- LAMP 7.3.9
- Git 2.23.0 & GitHub
- Sublime Text 3.0
- MikTex 2.9.7100 & TexWorks 0.6.3

## 3.3 | Analysis & Conception

In this Section I will Present a detailed analysis of the problem at hand and its proposed Conception.

### 3.3.1 | Analysis

We need to track each Fiber Optic Strand, to which Client it is reserved and on which optical fiber loop between Data Transmission Centers it is located. And give different roles to different Users.

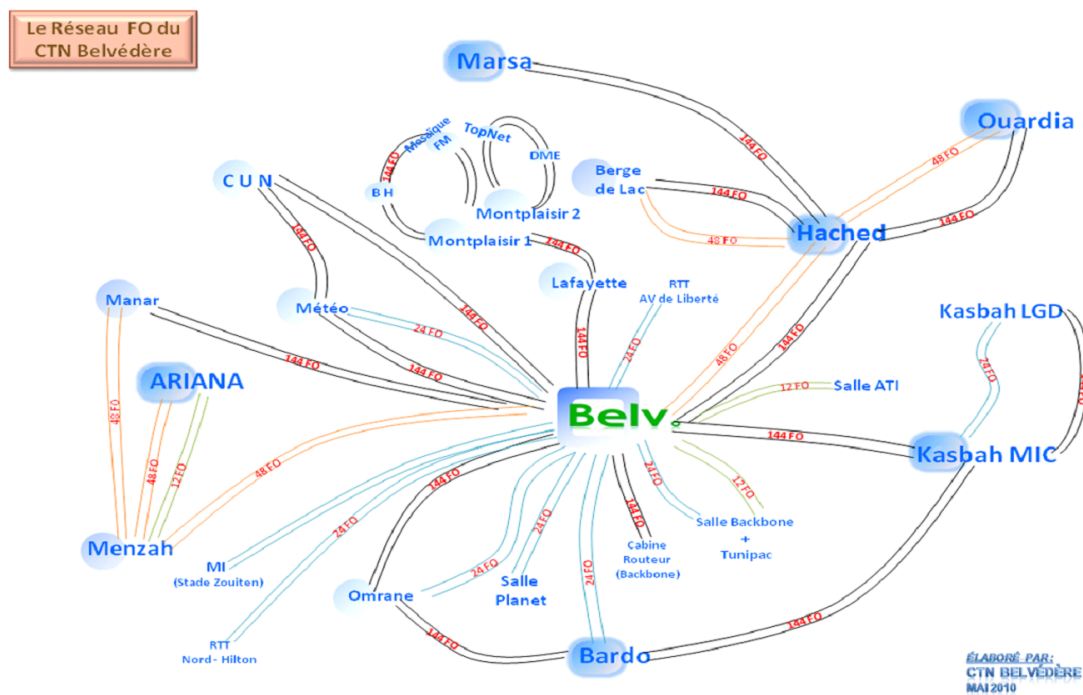


Figure 3.1: Optic Fibers Map

We definitely need this tool implemented as a DBMS because traditional .xls files doesn't provide redundancy control, nor does it give different users different profiles and roles, and we know that DBMS's provide all of that and so much more. The class diagram is shown in 3.3.

[illegible]

Figure 3.2: Optic Fibers Map

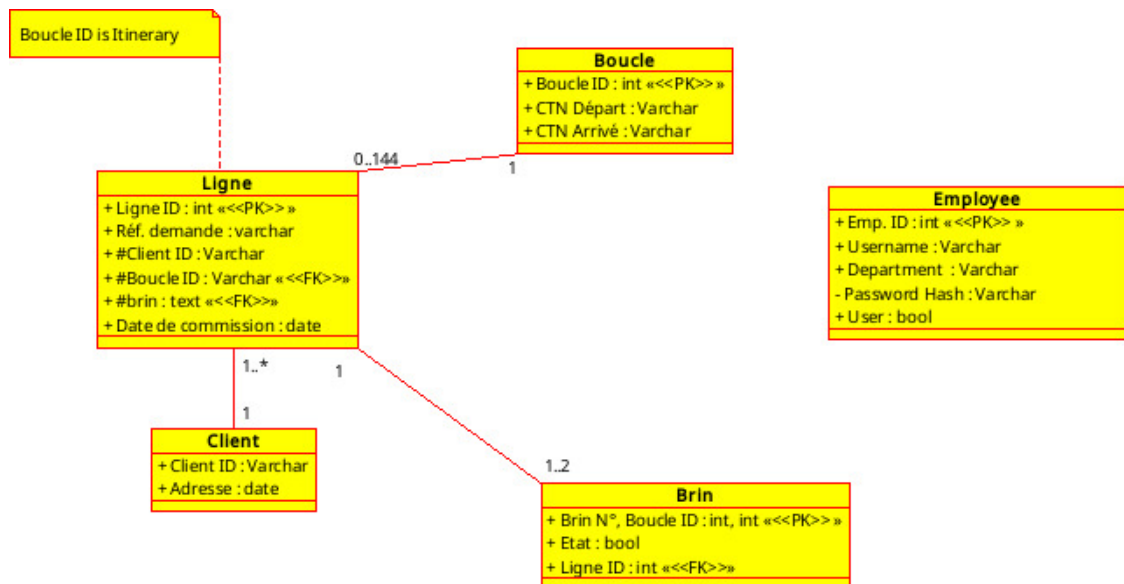


Figure 3.3: Conception

### 3.3.2 | Conception

In the Class Diagram and in our project, all revolves around the FiberOptic Ligne, which belongs to a certain Client (company or individual and further details are out of the

scope of this work), and is situated on a certain Circuit or 'Boucle' between DTC's, and also which Brin - Boucle pair are attributed to that Ligne along with the status. And then separately, there's an Employee with a status of Admin who has all the permissions on adding, modifying or even deleting Ligne, Client, Boucle, Brin and also other Employees. On the other hand a simple User can only create new Lignes for already existing Clients, on boucles that already exist. There are 144 Brins per Boucle, and they can have either the status used or unused or under maintenance.

## 3.4 | Realisation

Here is a look at the Login screen, the DBMS will automatically recognize which role to grant the Employee. The password is a SHA-256 encrypted and saved in the DBMS. A

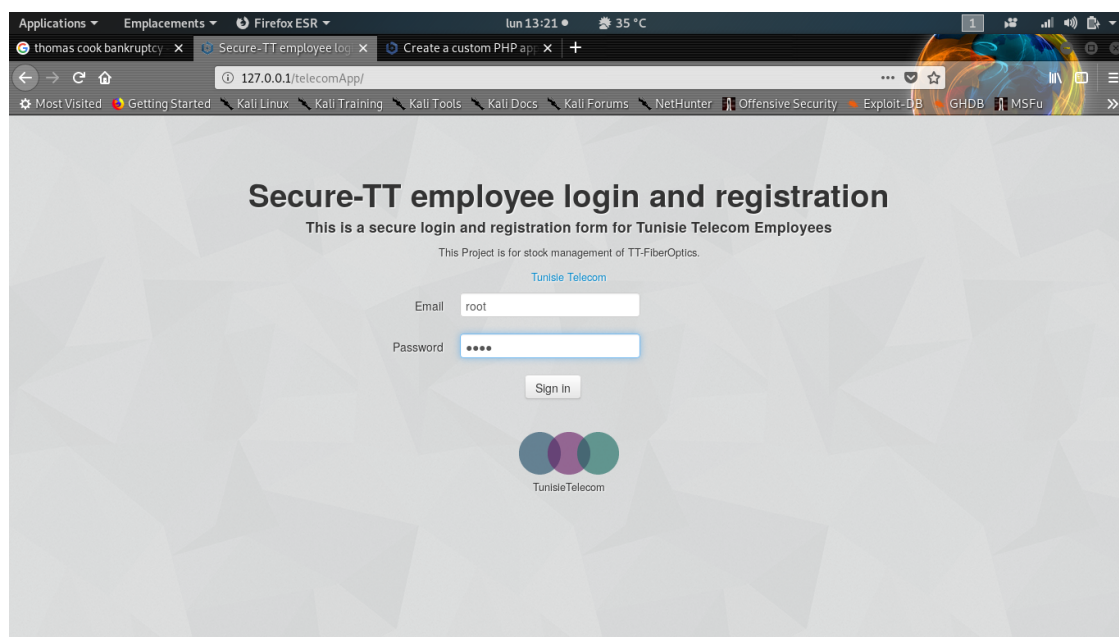


Figure 3.4: Login Screen

User - Employees Dashboard screen is shown below in Figure 3.5. As you can see, a User can only see things he's allowed to see, and can only modify these things exclusively. If the Login process recognizes the Employee as being the Admin, the Dashboard will be something like this, He have total control over everything, as is shown on the left, He can manage Clients, or what I presented in the Conception phase above as Ligne (I made the Implementation before the Conception, big mistake, I know), Employees, Boucles and Brins.



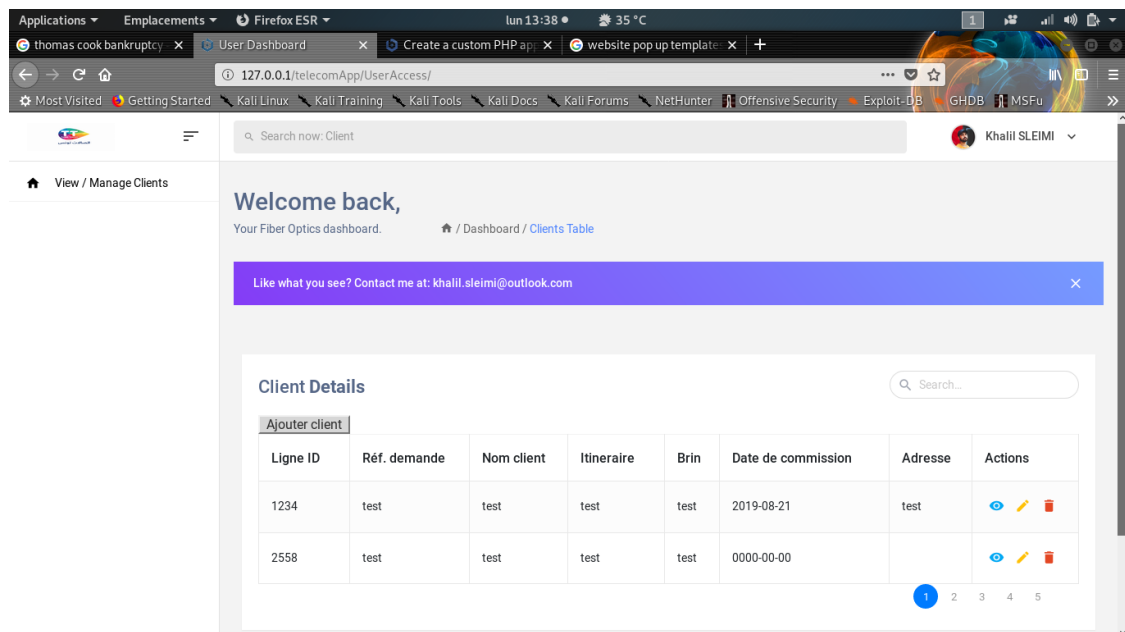


Figure 3.5: User Ligne

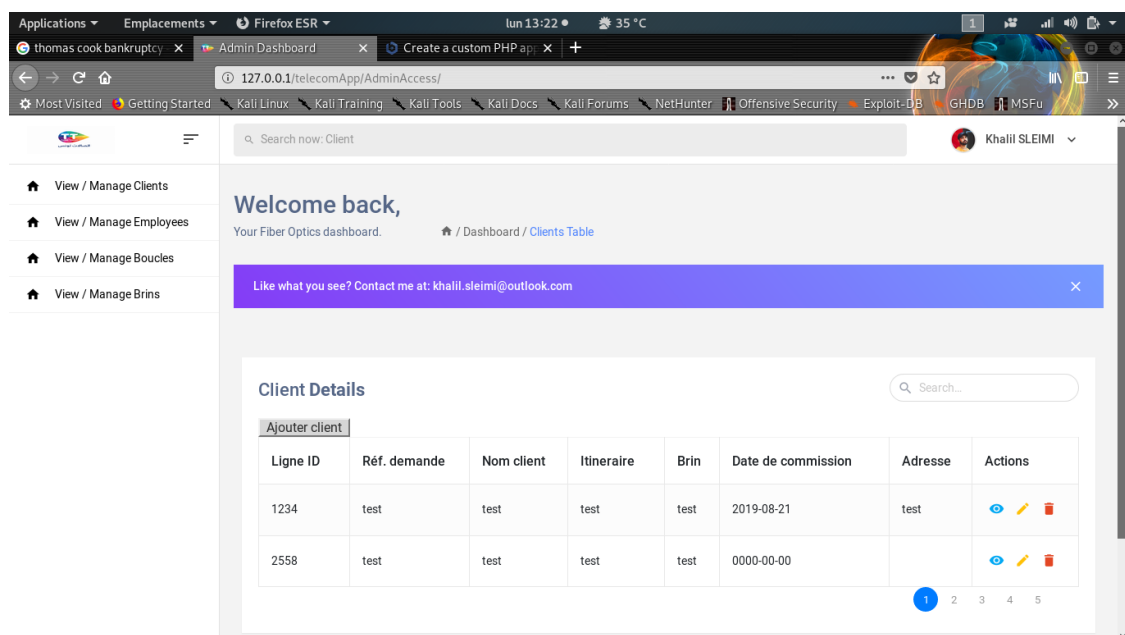


Figure 3.6: Admin Ligne

In this Figure 3.7, the Admin is allowed to Add, remove or even modify any other Employee, If we'd want it to be some more professional, the Department field will be

replaced by a Type field which is either "Admin" or "User". But this was done in less than a month from scratch, and also due to a HDD failure, I don't think I could've done any better - only if I had designed it from the get go and actively used github to back it up - and not forget "git add \*" everytime I add some new file.

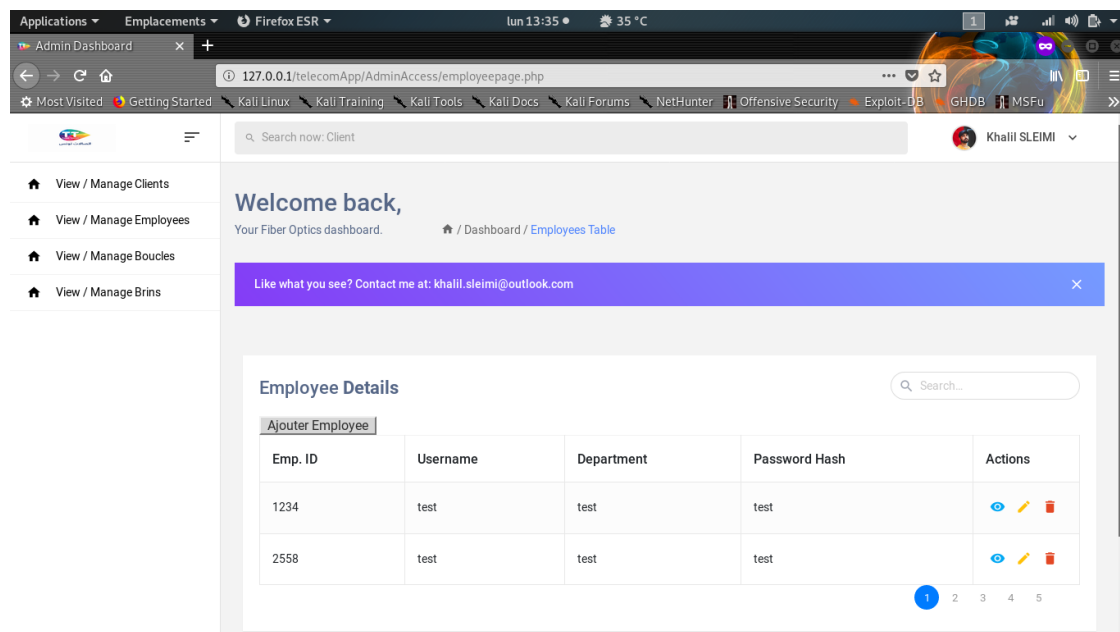


Figure 3.7: Admin Employee

Now, every Ligne is based on a certain Fiber Optic Boucle. This Menu allows the Admin to Manage these Boucles.

And in this figure is a view of how the pop up for adding and modifying Lignes - Clients is like

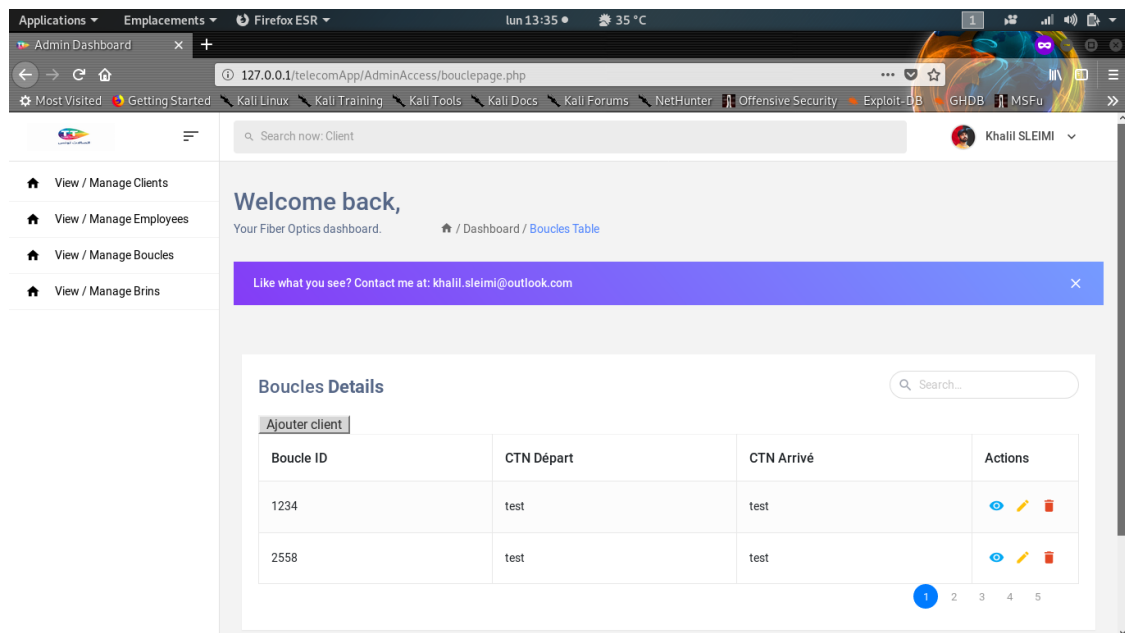


Figure 3.8: Admin Boucles

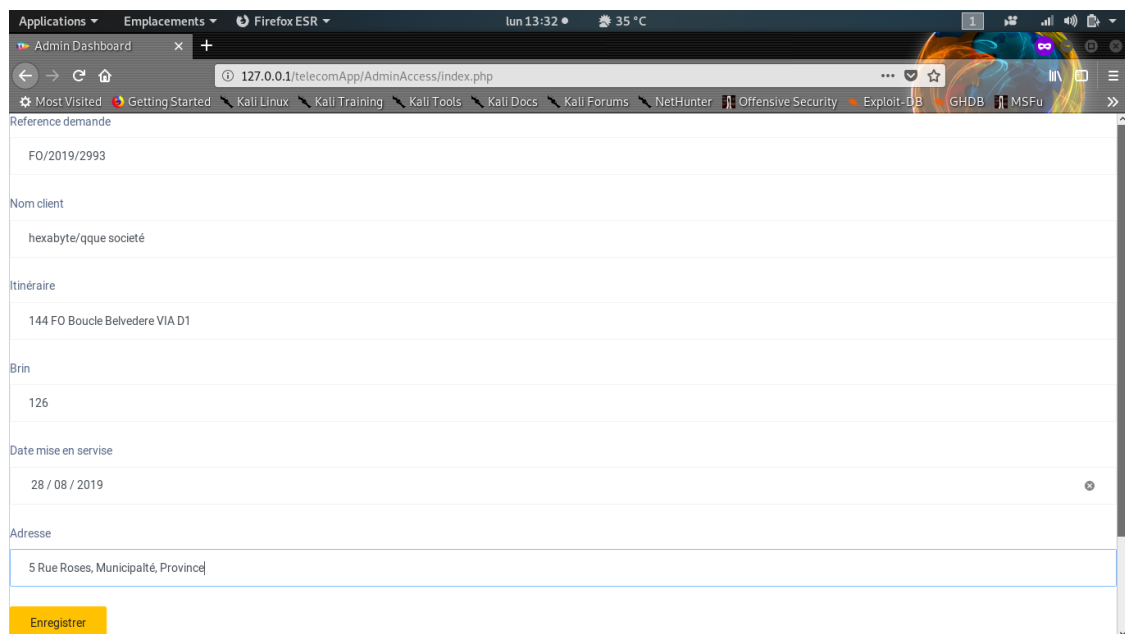


Figure 3.9: Pop Up



## Conclusions

**In tThis section I reflect on my Experience with Tunisie Telecom, and the big lessons I learned there.**

I can honestly say that my time spent interning with Tunisie Telecom resulted in one of the best summers of my life. Not only did I gain practical skills but I also had the opportunity to meet many fantastic people. The atmosphere at the Belvedere Data Transmission Center was always welcoming which made me feel right at home. Additionally, I felt like I was able to contribute to the company by assisting and working on a project throughout the summer.

I learned a lot of skills that will be very helpful for me throughout my career, and the experience taught the importnace to think before you write and also the importance of backing up your work: You never know when your PC might fail!

Overall, my internship at Tunisie Telecom has been a success. I was able to gain practical skills, work in a fantastic environment, and make connections that will last a lifetime. I could not be more thankful.