المعهد الأعلى للدراسات التكنولوجية في المواصلات بتونس
Institut Supérieur des Etudes Technologiques en Communications de Tunis

Department:

Reference:

« Worker » Internship Report

Internship Realized by: Ilyes Ben Moussa

Class : STIC L2 E

Home Business : Tunisia Telecom Djerba

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School Year : 2018-2019

Acknowledgement

The internship opportunity I had with **Tunisia Telecom Djerba** was a great chance for learning and professional development. Therefore, I consider myself as a very lucky individual as I was provided with an opportunity to be a part of it. I am also grateful for having a chance to meet so many wonderful people and professionals who led me though this internship period.

I express my deepest thanks to **YASSINE TOMZINI**, **chief of the Service Management Unit** for taking part in useful decision & giving necessary advices and guidance helping me to learn both the theoretic and practical part of the work. I choose this moment to acknowledge his contribution gratefully.

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General Introduction

My internship in Tunisia Telecom Djerba was a great opportunity to discover new technologies used in the telecommunication domain, more specifically my internship was with the service management unit. I am going to start first with the PSTN and its components , after that I will move on to the “Next Generation Network” that came is a modern technology that will replace the PSTN. I am also going to talk about the different services that the service management unit offers which are X-DSL and Optic Fibers .Finally I am going to talk about the different tasks that I saw during my internship including the different applications that they use but mainly the most important task was the SWAP operation which changes the architecture of the telecommunication network.

Chapter 1 : **Company Presentation**

Leader in the Tunisian telecommunications market, Tunisia Telecom is among the pioneers of major operators in the region. It is the global operator (more than 150 years) global and integrated offering a full range of products and services in the segments of fixed, mobile, Internet and data transmission (DATA services) .Tunisia Telecom is aimed at both the general public and third-party companies and operators with tailored offers.

Since its creation, Tunisia Telecom has always ensured its role as a corporate citizen to contribute to the sustainable development of the country, it has constantly been close to its customers by providing sustained support to culture, sport, activities related to the environment, student scientific competitions.

[1]

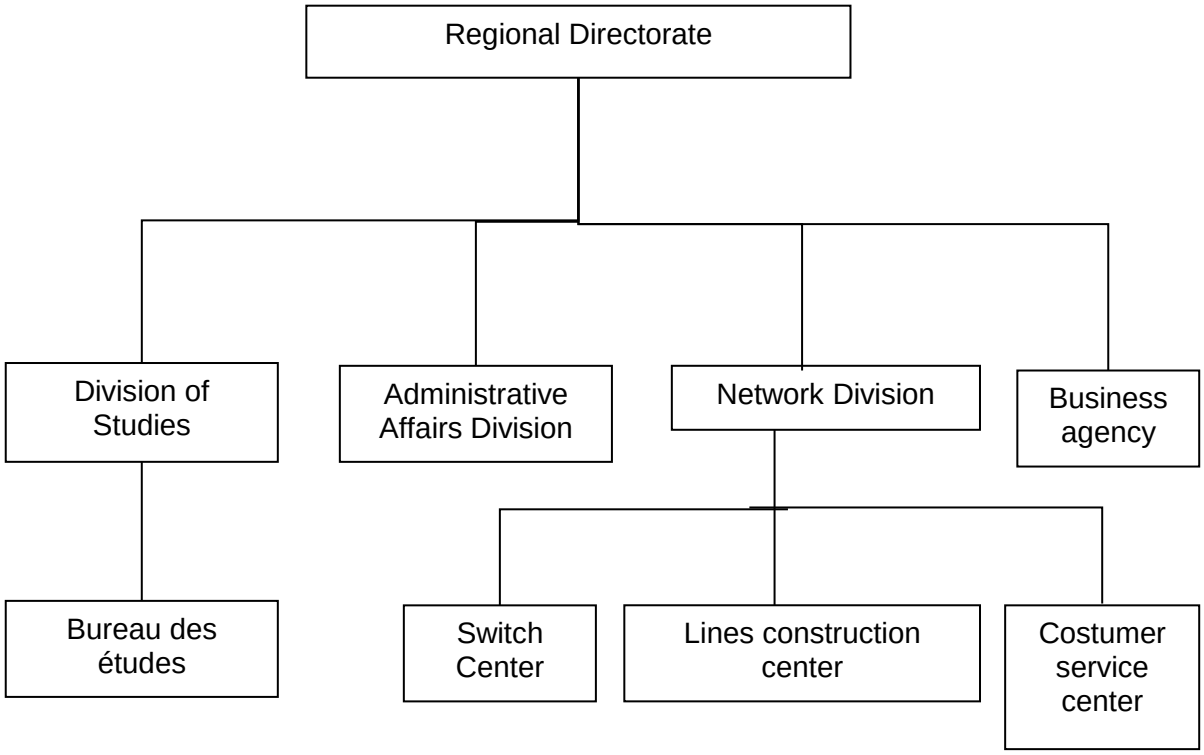

Figure 1 : Regional Directorate organogram

Chapter 2 : The Customer Service Center

1. Presentation of CSC

The Djerba Customer Service Center is a specialized center for technical subscriber service. Indeed, it is responsible for connecting subscribers, relieving trouble, maintaining telephone lines and extending the general network while monitoring the work of contractors.

This center is essentially composed of:

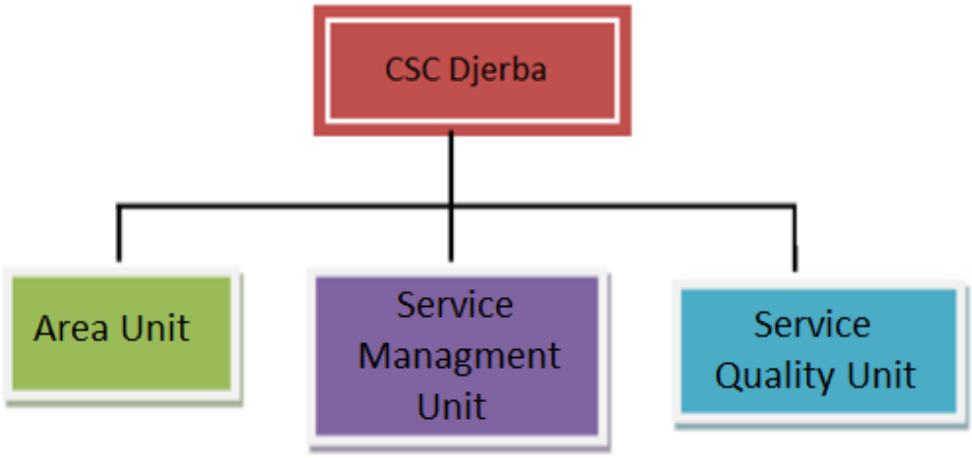

Figure 2 : CSC Organogram

2. Presentation of the Services Management Unit (UGS)

It is a unit that is attached to the Customer Service Center (CSC). This is the unit to which trouble claims and work orders are primarily directed. This unit includes the business unit and the subscriber management unit. This unit offers several types of services including:

DATA service: served mainly for B2B customers, in this service we find optic fiber (FTTX, GPON), VDSL, SDSL and X-DSL Backup

Landline Services: Usually served for B2C customers, the general public clients, using classic either the HC3 or EWSD switches, or by the POTS of IP MSAN technology.

Chapter 3 : The Public Switched Telephone Network

Introduction

This chapter is about the classic network that was used for telecommunication which is the PSTN , this chapter will define what it is and what components it has.

1. Définition

The public switched telephone network (PSTN) is the aggregate of the world's circuit-switched telephone networks that are operated by national, regional, or local telephone operators, providing infrastructure and services for public telecommunication. The PSTN consists of telephone lines, fiber optic cables, microwave transmission links, cellular networks, communications satellites, and undersea telephone cables, all interconnected by switching centers, thus allowing most telephones to communicate with each other. Originally a network of fixed-line analog telephone systems, the PSTN is now almost entirely digital in its core network and includes mobile and other networks, as well as fixed telephones.

[2]

2. Structure of local network of subscribers

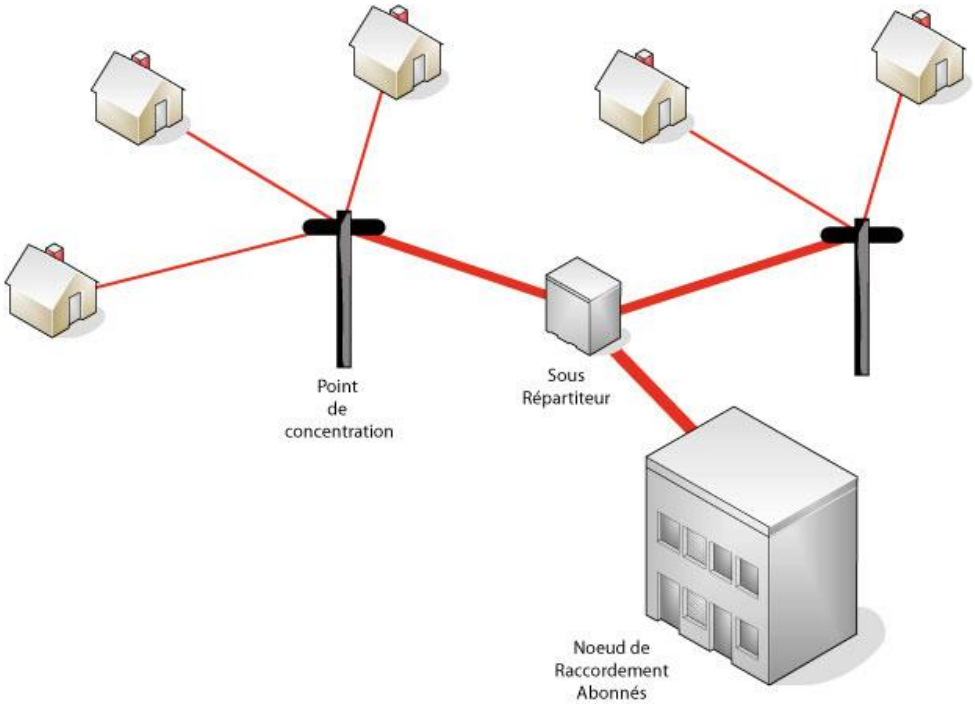

Figure 3 : Structure of local network of subscribers

3. Components of a local network of subscribers

3.1.Main distributor

The distributor is a permanently accessible device acting as a connector between the switches and the telephone network. It is composed mainly of vertical and other horizontal strips connected by means of garters.

Figure 4 : Horizontal strips

Figure 5 : Vertical strips

3.2.Sub distributor

The sub-distributor is a cabinet located on public roads, located between distribution cables and transport cables or between two distribution cables.

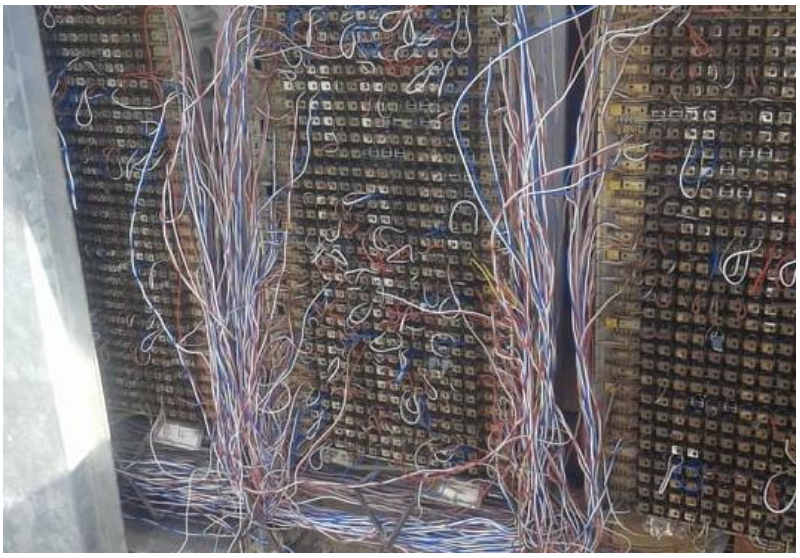

Figure 6 : Sub distributer

4. Concentration point

The concentration points are boxes installed on the poles or on facade or as strips inside the room. This is also where subscriber connection cables are connected.

Conclusion

The PSTN is currently being replaced and included into a new network called Next Generation Network which is better in terms of quality, the variety of services it offers and so on.

Chapter 4 : Next Generation Network

Introduction

In this chapter I am going to define The NGN and its different layers, then I am going to talk about the MSAN which are a key part in the NGN architecture, then I'll be mentioning the different services that the service management unit offers.

1. Definition

A Next Generation Network (NGN) is a packet-based network able to provide services including Telecommunication Services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies. It offers unrestricted access by users to different service providers. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users.

[3]

2. Layers of the NGN Network

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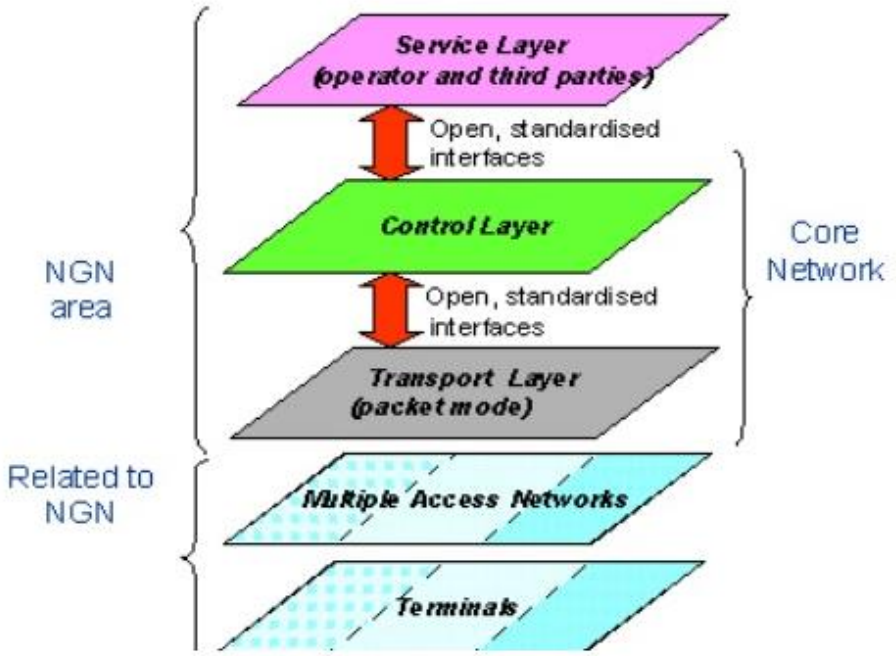

Figure 7 : essential layers of NGN

In the service management unit we only work on the access layer, of which our services are:

3. Optic Fiber Services

3.1.Fiber To The X

Fiber to the x (FTTX) or fiber in the loop is a generic term for any broadband network architecture using optical fiber to provide all or part of the local loop used for last mile telecommunications.

FTTX is a generalization for several configurations of fiber deployment, arranged into two groups: FTTP/FTTH/FTTB (Fiber laid all the way to the premises/home/building) and FTTC/N (fiber laid to the cabinet/node, with copper wires completing the connection).

There are two broad choices for FTTH networking, based on the choice of topology and technology: Active Ethernet (AON) over point-to-point (p2p) networks and Passive Optical Networking (PON) over point-to-multipoint networks.

[4]

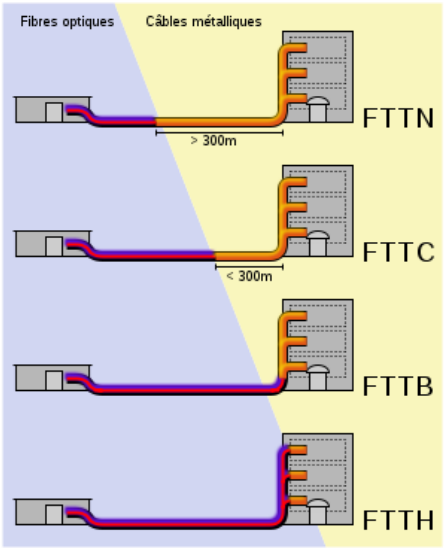

Figure 8 : Different types of Fiber To The X

3.2.Point To Point Architecture

The P2P architecture has its core switch at the central office (or Point of Presence – POP) that connects to aggregation switches in the distribution point. The aggregation switches are connected to Optical Network Terminations (ONT) – located in the customer's

house or business, trough their multiple fiber ports . The advantages of a P2P connection is that it, provides symmetrical bandwidth ,there is no sharing : each aggregation switch port is connected to individual premises and it is able to grow with bandwidth and capacity needs. The only problem is that it is quite pricey, as it requires the involvement of multiple components.

[5]

3.3.Passive Optical Network

A passive optical network (PON) is a telecommunications technology used to provide fiber to the end consumer, both domestic and commercial. A PON's distinguishing feature is that it implements a point-to-multipoint architecture, in which unpowered fiber optic splitters are used to enable a single optical fiber to serve multiple end-points. The end-points are often individual customers, rather than commercial.

[6]

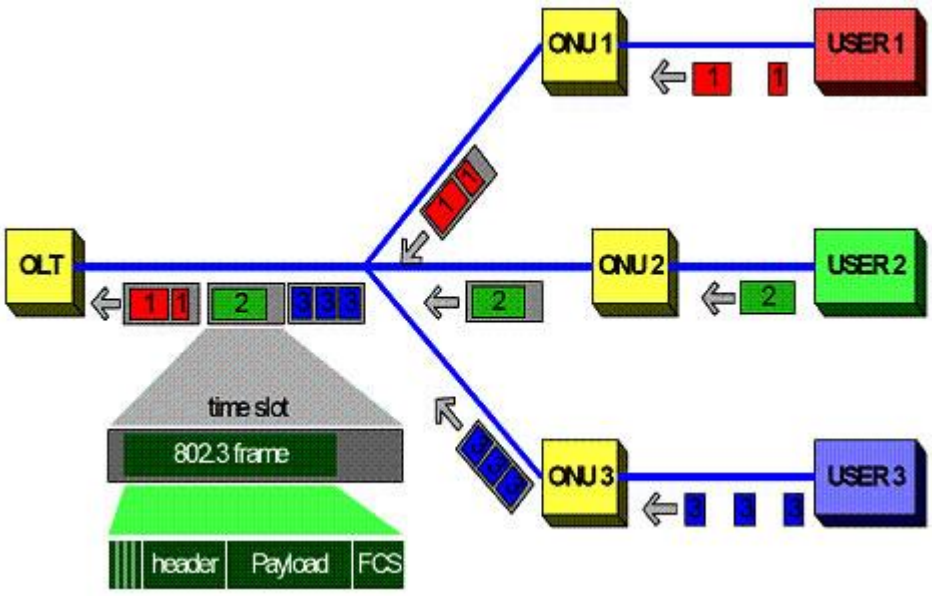

Figure 9: Passive Optical Network

4. X-DSL Technology

Digital subscriber line (DSL; originally digital subscriber loop) is a family of technologies that are used to transmit digital data over telephone lines. In telecommunications

marketing, the term DSL is widely understood to mean asymmetric digital subscriber line (ADSL), the most commonly installed DSL technology, for Internet access.

4.1.ADSL

Asymmetric digital subscriber line (ADSL) is a type of DSL broadband communications technology used for connecting to the Internet. ADSL allows more data to be sent over existing copper telephone lines (POTS), when compared to traditional modem lines. A special filter, called a microfilter, is installed on a subscriber's telephone line to allow both ADSL and regular voice (telephone) services to be used at the same time.

[7]

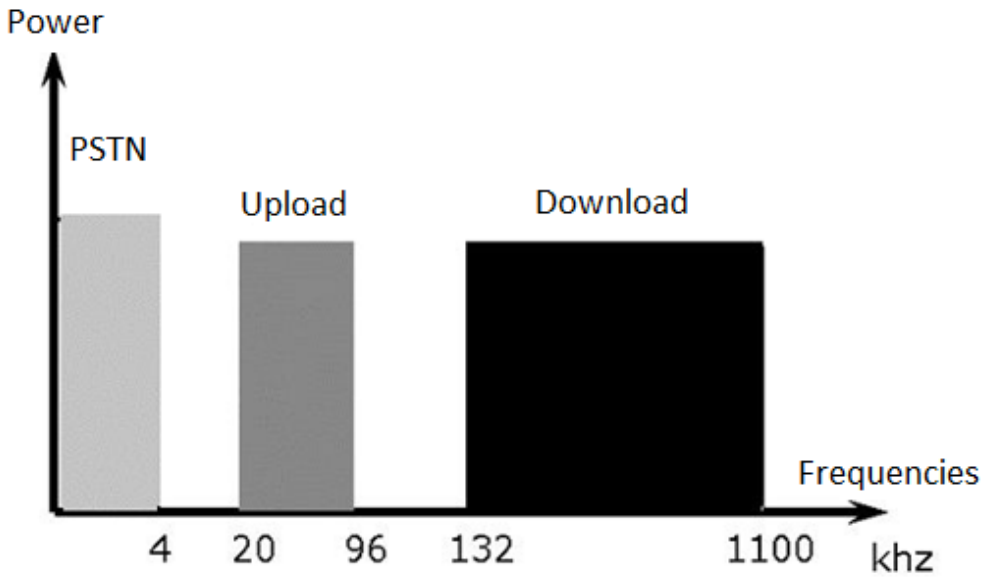

Figure 10 : ADSL Bandwidth

4.2.SDSL

A symmetric digital subscriber line (SDSL) is a digital subscriber line (DSL) that transmits digital data over the copper wires of the telephone network, where the bandwidth in the downstream direction, from the network to the subscriber, is identical to the bandwidth in the upstream direction, from the subscriber to the network. This symmetric bandwidth can be considered to be the opposite of the asymmetric bandwidth offered by asymmetric digital subscriber line (ADSL) technologies, where the upstream bandwidth is lower than the downstream bandwidth

[8]

4.3.VDSL

Very high speed digital subscriber line (VDSL) is a DSL technology that provides a faster data transfer rate than asymmetric digital subscriber line (ADSL) and ADSL2+ technologies. It sends out data in the 13 to 55 Mbps range over small distances, which are typically between 330 to 1650 yards of twisted pair copper wire. The shorter the distance, the higher the data transfer rate. VDSL enables users to upload, download and process data more rapidly.

[9]

4.4.DSLAM

A digital subscriber line access multiplexer (DSLAM) is a network device, often located in telephone exchanges, that connects multiple customer digital subscriber line (DSL) interfaces to a high-speed digital communications channel using multiplexing techniques.

5. The IP MSAN technology

5.1.Definition

A multi-service access node (MSAN), also known as a multi-service access gateway (MSAG), is a device typically installed in a telephone exchange (although sometimes in a roadside serving area interface cabinet) which connects customers' telephone lines to the core network, to provide telephone, ISDN, and broadband such as DSL all from a single platform.

5.2. IP-MSAN advantages

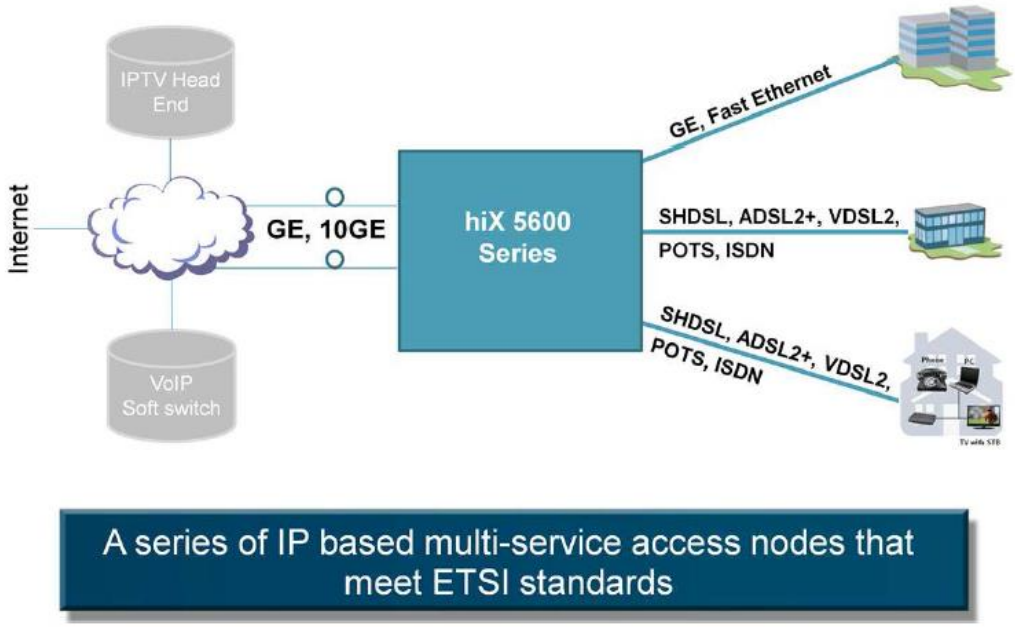

Figure 11 : Architecture IP MSAN

This new technology offers:

▪A single platform that integrates all services (VoIP, IPTV and internet).

▪ High data transfer rate.

▪ Reduce the complexity of central offices.

▪Minimize energy consumption .

5.3.Conclusion

After we got familiar with the theoretic part of the work and we got to know the different parts that we work on in the service management unit, I am now going to talk about the practical part of the work.

Chapter 5 : Accomplished tasks

Introduction

In this chapter am going to talk about the different applications that I learned to use during my internship and also a big operation called the SWAP.

1. Claims handling

Using the HPSM application, we process complaints received by the ISP, the agency, or the client itself. Our role in the service management unit is to test the quality of the line, see where the problem is and redirect it to the right unit to intervene.

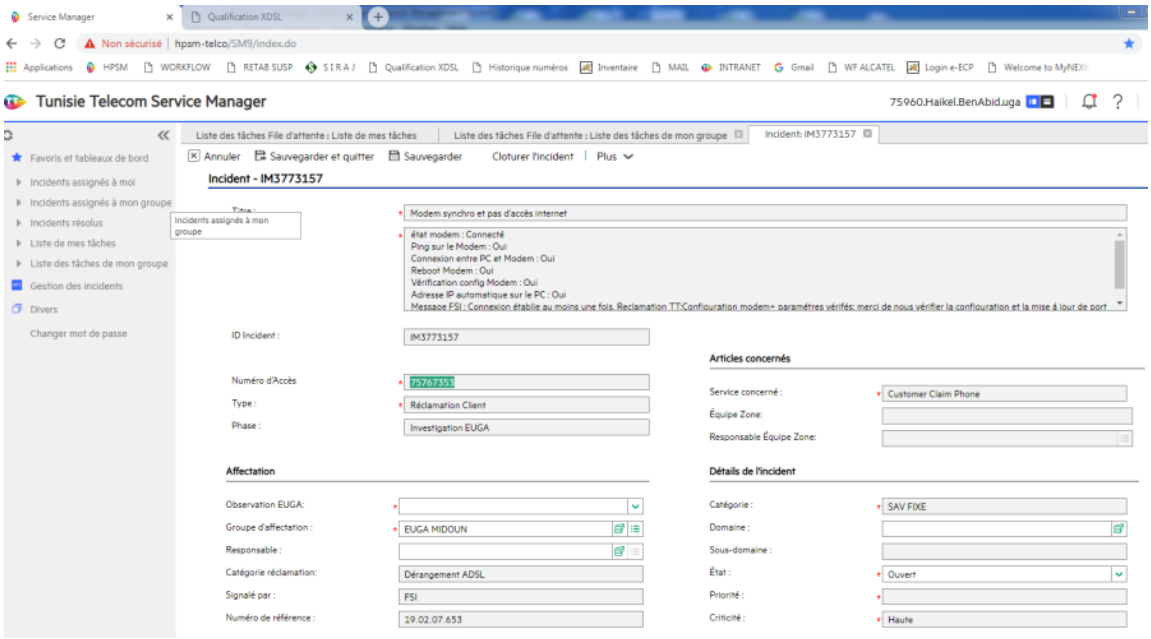

Figure 12 : Claims handling on HPSM

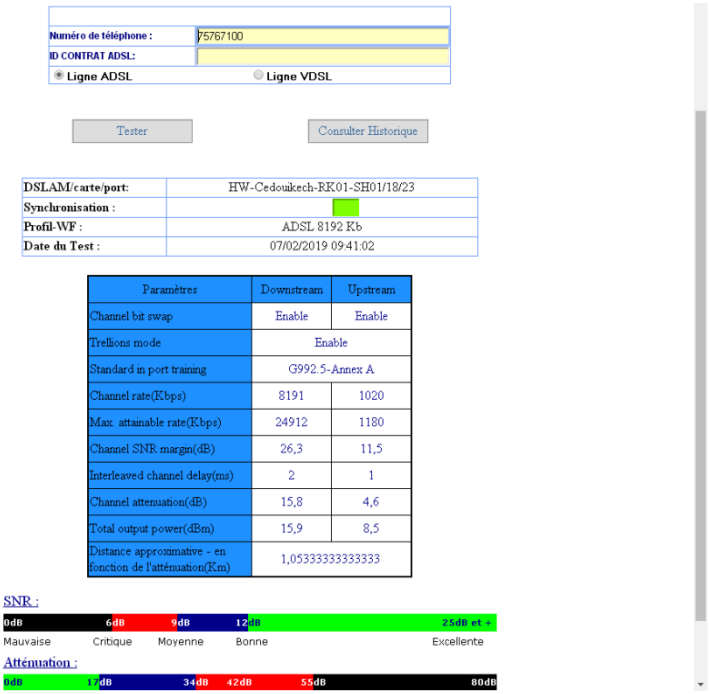

Figure 13 : Qualification of a line using NETSCAN

There are different types of disturbances that can arise:

1.1.Isolation

It is a discontinuity of the subscriber line due to an accidental cut of a cable, so the current does not reach the device.

1.2.Loop

It is a short circuit of the subscriber line due to a defect of the installation at the subscriber or the contact between two wires. He then can have neither emission nor reception.

1.3.Ground

Un contact avec la terre alors on a une fuite du courant et une infiltration d'eau et d'humidité au niveau d'une épissure.

1.4.Noise

The sound at the handset is not clear due to poor contact producing spurious signals.

1.5. Inversion

When connecting the cables, two pairs of subscribers can be reversed so the call to the first is received by the second and vice versa.

2. Creating new subscribers

2.1.Creating new ADSL subscribers

ADSL creation requests are found on the WorkFlow BackBones application, a Slot / Port is reserved according to the location and equipment available and close to the subscriber..

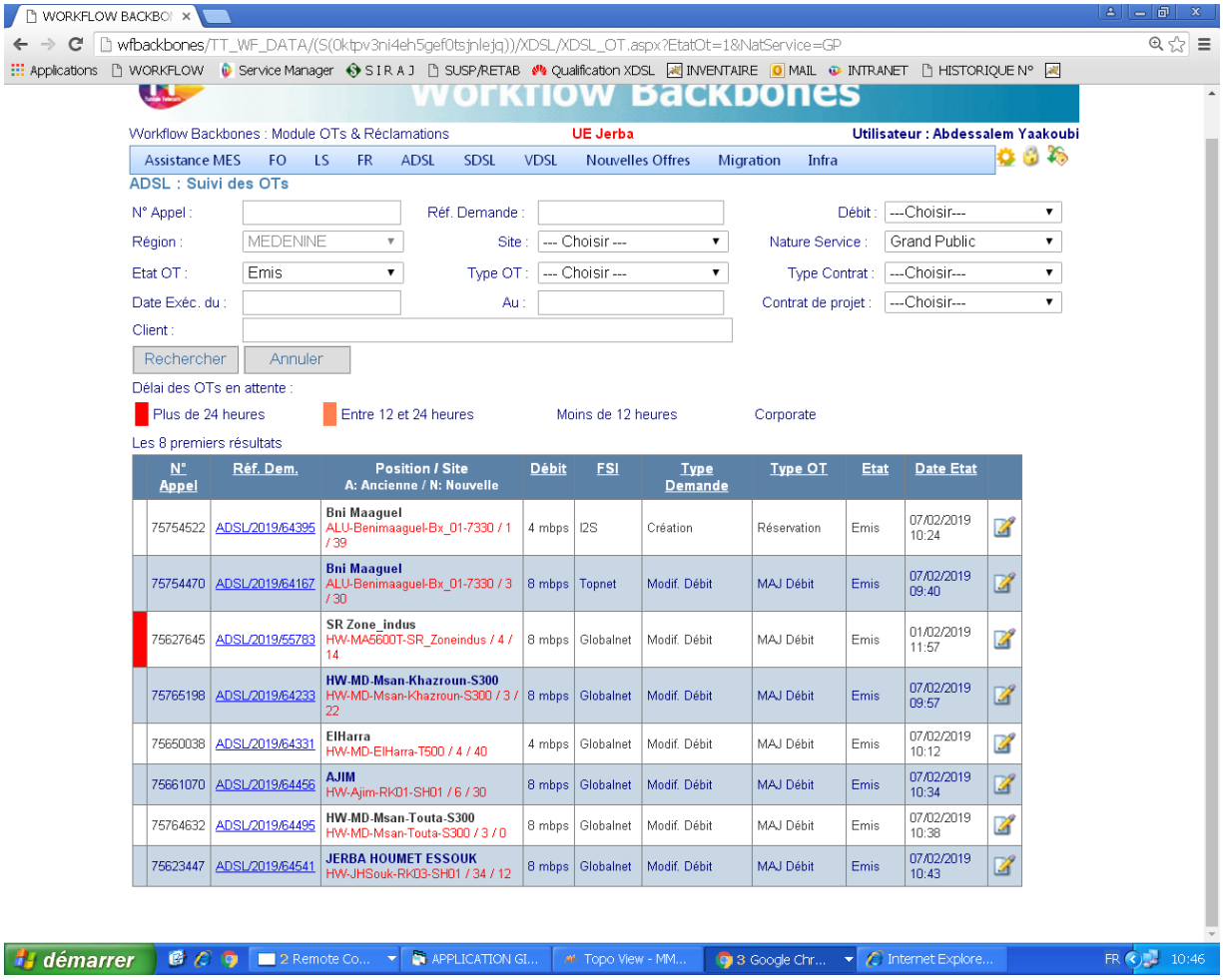

Figure 14 : Order Of Work on WorkFlow

On the U2000 application, the new port must be configured according to the work order, then configure the Vlan corresponding to the ISP, and then set the requested bit rate, then the port must be activated.

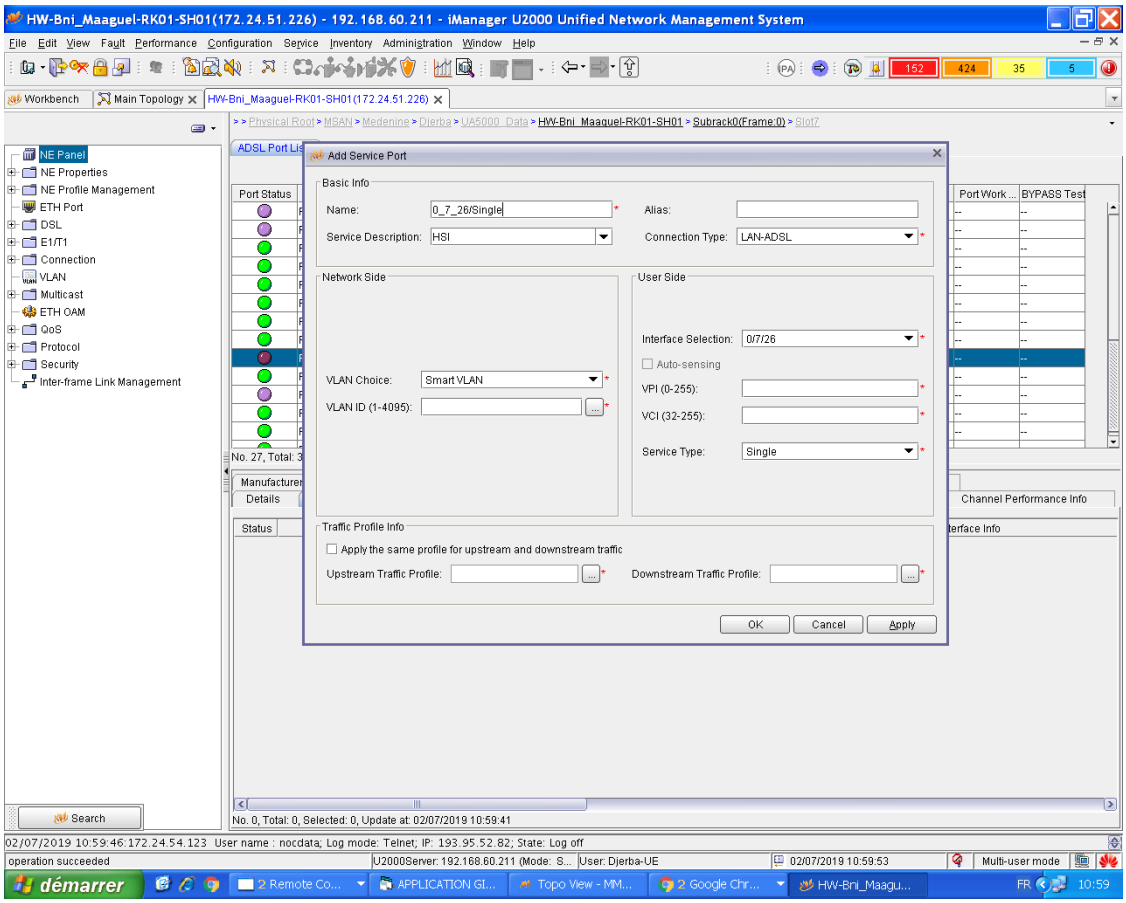

Figure 15 : Port Configuration on U2000

Finally we validate the work order on WorkFlow so that the request passes to the team that will make the garter draw.

2.2.Creating New Landlines

New landline requests are found on the GIS app. In the first place we choose a number for the subscriber and we check the availability of this number.

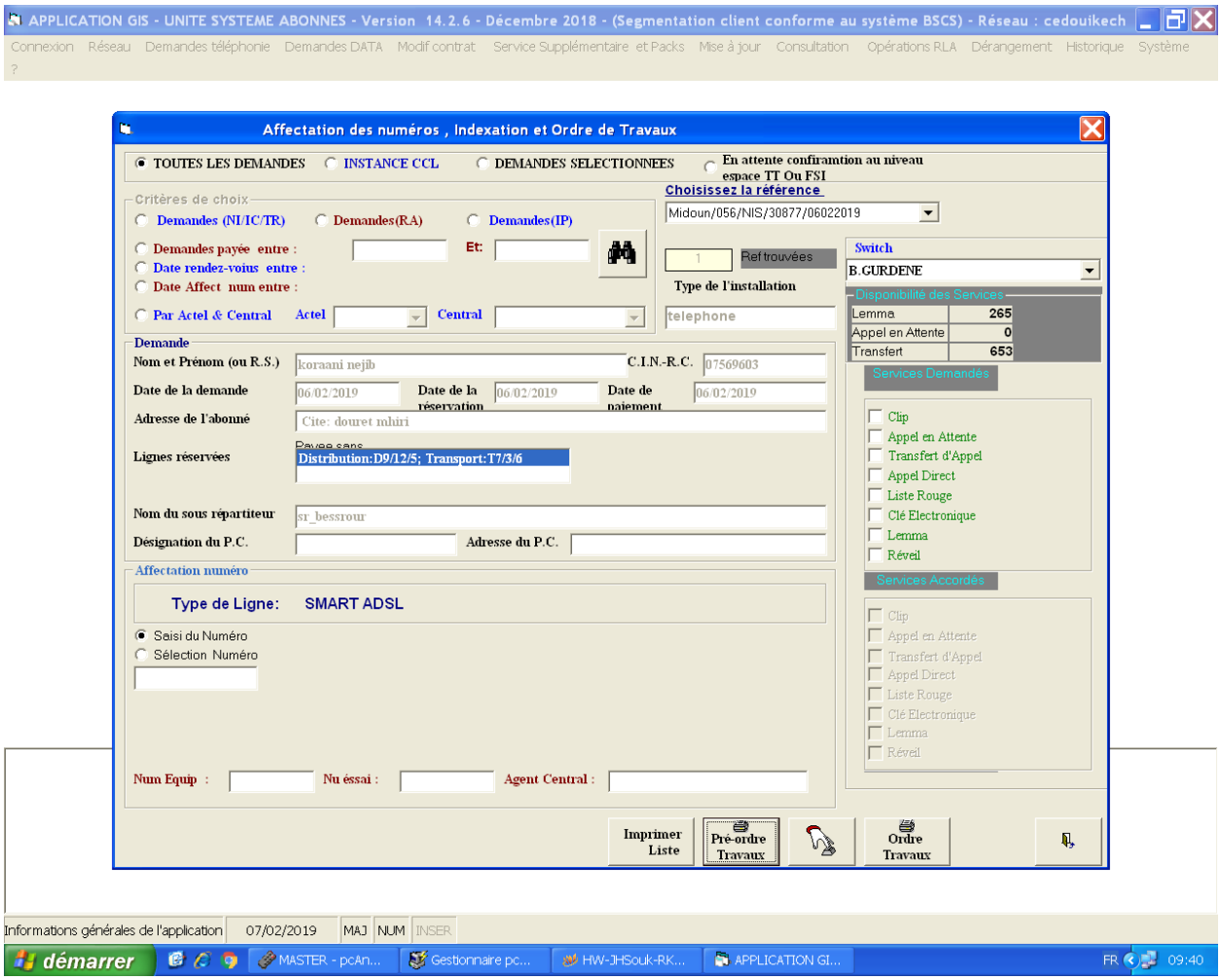

Figure 16 : Creating subscribers on GIS

The next step differs depending on the available equipment that we will create our new subscriber:

- **On the classic switch:**

We list the equipment available in the switch, and then we assign the number of the subscriber on the chosen equipment

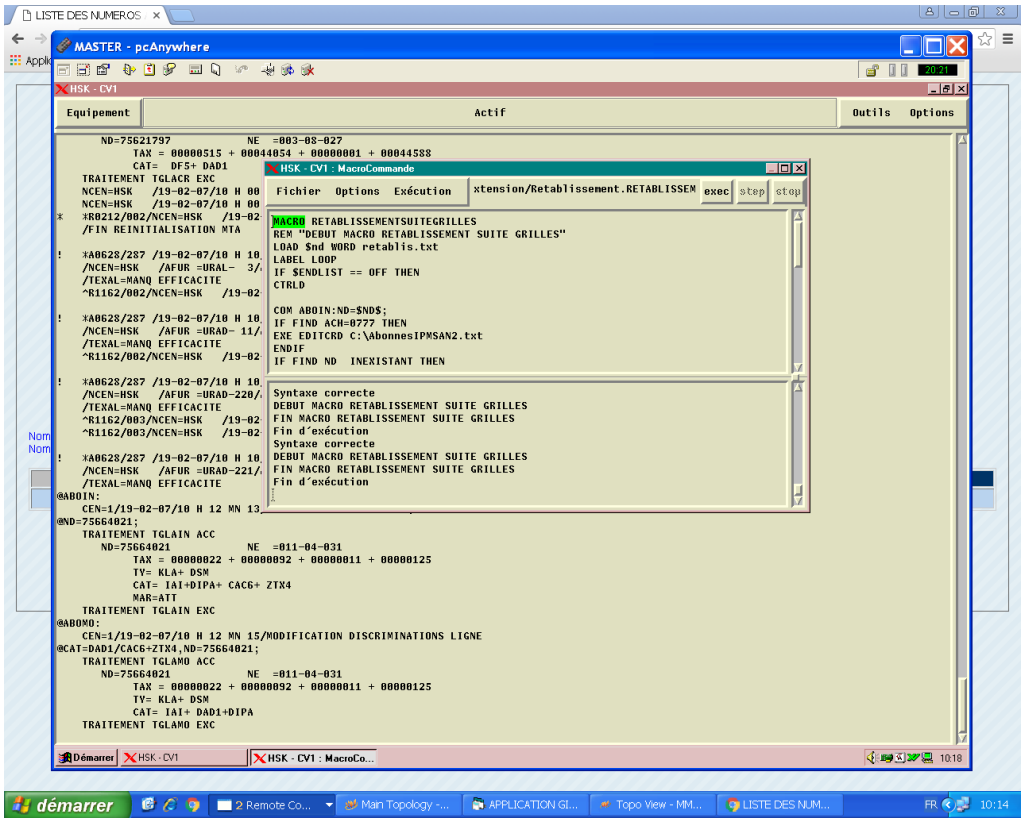

Figure 17 : HC3 Interface (classic switch)

➢ Sur l'IP MSAN :

Find the IP address of the MSAN on which we will add the subscriber, We look for a free Terminal ID on POTS and we assign the number of the subscriber to the slot and corresponding port

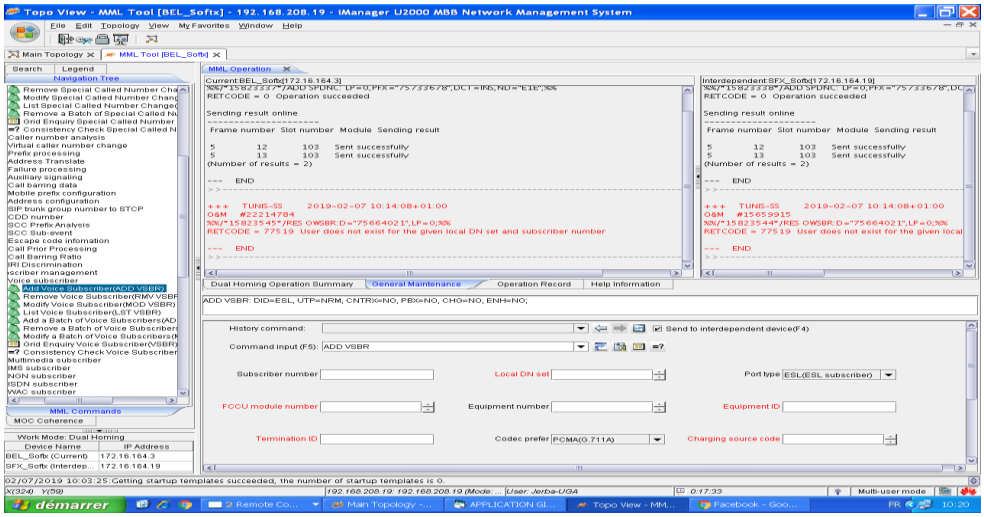

Figure 18 : Creating subscribers on POTS

Finally we return to GIS, we give the equipment / TID and we validate the work order to pass to garter drawing.

3. Configuring Cisco Routers

Our role in the service management unit is to configure the router just that it can route data and then the softswitch can complete their part of the configuration. Here are some commands that can be used during configuration :

Table 1 : Cisco Router Commands

Description	Cisco Command
Set a console password to cisco	Router(config)#line con 0 Router(config-line)#login Router(config-line)#password cisco
Set a telnet password	Router(config)#line vty 0 4 Router(config-line)#login Router(config-line)#password cisco
Stop console timing out	Router(config)#line con 0 Router(config-line)#exec-timeout 0 0
Set the enable password to cisco	Router(config)#enable password cisco
Set the enable secret password to peter. This password overrides the enable password and is encypted within the config file	Router(config)#enable secret peter
Enable an interface	Router(config-if)#no shutdown
To disable an interface	Router(config-if)#shutdown
Set the clock rate for a router with a DCE cable to 64K	Router(config-if)clock rate 64000
Set a logical bandwidth assignment of 64K to the serial interface	Router(config-if)bandwidth 64 Note that the zeroes are not missing
To add an IP address to a interface	Router(config-if)#ip addr 10.1.1.1 255.255.255.0
Static route the remote network is 172.16.1.0, with a mask of 255.255.255.0, the next hop is 172.16.2.1, at a cost of 5 hops	Router(config)#ip route 172.16.1.0 255.255.255.0 172.16.2.1 5

4. Switching telephone subscribers on IPMSAN (SWAP)

The SWAP operation is a migration of PSTN telephone subscribers and ADSL subscribers to the Msan network (Multi-Service Access Node or Multi-Service Access Node).

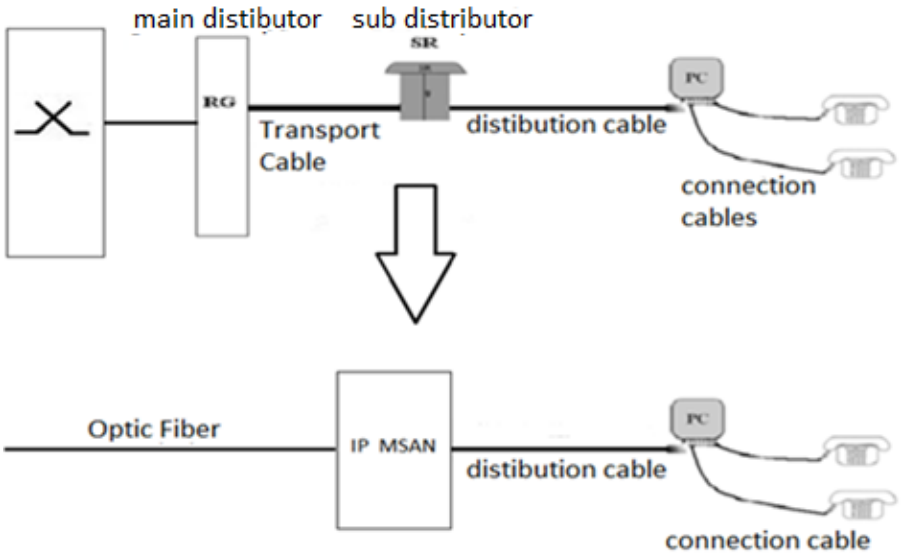

Figure 19 :Principle of SWAP

After retrieving the list of clients that are going to be swapped, we do the bidding at the sub-distributor level to check if all the subscribers are on the correct start and pair to make the final list of SWAP, We connect the distribution part (MDF: main distribution frame) of the MSAN and the other part of the cable is left free until the day of the SWAP. Then we create the subscribers on the U2000, Draw garters from the TIDs to the MDF in the MSAN according to the primer and the pair given in the list and the TIDs

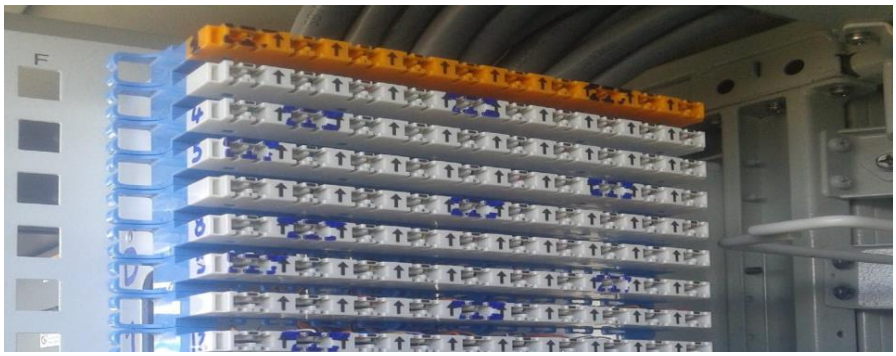

Figure 20 :Main distribution frame

On the day of the SWAP, we cut the distribution cable going to the subscribers and connect it with the MSAN distribution cable, the routing is done at the Soft Switch level in Tunis then it is our task to route the subscribers that were previously on the classic switch,

check if all subscribers return to their initial states before the swap (modem synchronized, tone, suspended ...), if all is done right we release old ports of the subscribers off the classic central and connect the sleeve, Finally we update all subscribers to a new position on SIRAJ

Figure 21 :Distribution cable before sleeve connection

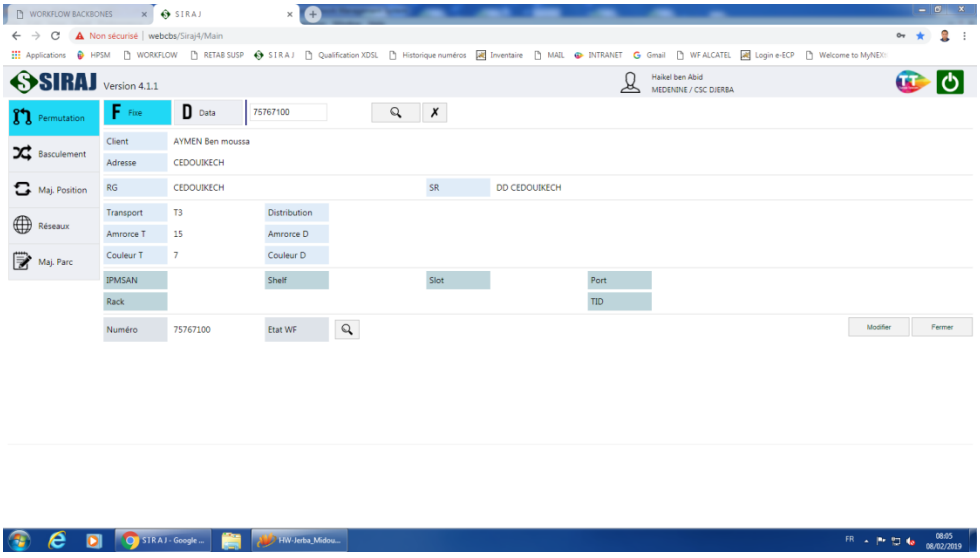

Figure 22 :SIRAJ Application Interface

Conclusion

This chapter was about the different task that I saw and got to do some myself like manipulating the different applications, also the tasks that I observed which mainly is the SWAP.

General Conclusion

Other than getting to see the practical part of what I studied in ISET'Com like The different components of the PSTN network, I got to learn new concepts like the Next Generation Network of which the IP MSAN is a key component. I also got to learn generalities about optic fibers , various X-DSL technologies , and all the different applications like Workflow , SIRAJ , GIS , U2000 and the classic switches which are EWSD and HC, along with configuring some routers.

All this made it easier to explain and link together all the steps of the migration operation named SWAP which mentions almost every technology that I talked previously.

Finally, I hope that my work would be up to standards and wishing that I reach the target aimed by this report.

Webography

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