Computer Network Design of the office area of the telecommunications company SERTOD

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Abstract

At present, every industry or company that wishes to improve efficiency in carrying out its social role needs to use the technological tools at its disposal, an example of this is computer networks, which is the set of computers interconnected with each other and that have resources shared. This document describes the implementation of a wired network in the telecommunications company SERTOD. This company had a network with obsolete equipment, it also had areas where the product network did not reach the remodeling and expansion of the company. A new network was designed following a series of steps well defined by the bibliographies for the implementation of wired networks, A market study was carried out to analyze the costs of the equipment to be used and to choose carefully in terms of cost and quality. A proposal was obtained for the new network to be implemented in the SETOD company.

Keywords: infrastructure; LAN network; SETOD; telecommunications; topology

1. Introduction

The development of telecommunications coupled with the advancement of the reception and transmission of signals through a communication channel has acquired great importance in the concept of globalization of society. The company is one of the companies that has benefited the most from this since by making use of telecommunications, the processing of information and knowledge has been improved, erasing barriers such as time and distance limitations. Over time, the elements that have been used for communication have been improved, according to man's own needs and technologies.[1], [2].

Telecommunications itself has components such as hardware and software and the transmission used in a simple network made up of computers, a network operating system, cables to interconnect these devices, network interface cards, switches) and concentrators, but in many companies, these components are installed and with the passage of time they become obsolete, also the expansion of the company's premises or another factor that favors the need to redesign the network[3], [4].

The telecommunications service company SERTOD has structural problems regarding its network. It has an infrastructure made up of several departments in which the main information pertaining to the company's

processes is managed. This company is structured with a cascade network topology where the HUBS interconnection devices are in charge of expanding the network and interconnecting the company's computers, according to their characteristics, these devices produce a large collision domain. when carrying out large operations between the different departments, which generates a lower capacity[5],[6].

In view of its organizational growth, the company decides to opt for a solution and change in the physical infrastructure, which allows them to obtain better results and greater efficiency in work performance, and thus make better use of the work tools. that are assigned to you. This is why it is suggested that they opt for a new network scheme design, which solves the setbacks and disagreements that arise in the development of their work activities, such as:

- Unsafe wiring.
- Bad distribution of equipment.
- Difficulty accessing the internet.
- Loss of time in the execution of activities.
- Slowness in the processes.

The delivered LAN network design will feature a state-of-the-art network model, compatible with current equipment and expectations, and must also be capable of integrating legacy platforms.

For the implementation of the problem, use was made of the design of a local area network that links a system of a series of configurations of minicomputers, microcomputers, terminals, and all kinds of independent peripherals located in the same place.

The following stages were followed for the design of the network:

- Study stage
- Design stage
- Stage of preparation of the request for offer and selection of the seller.
- Installation and commissioning stage.
- Stage of analysis of the benefits and evaluation of the results.

2. Study stage

2.1 Determine the number of workstations and their future location

The unit network is made up of several departments:

- Human Resources Department (HR)
- Sub-Node of offices
- Department of Economics
- Communications Node
- Board
- Head of Section
- Lobby

Table 1 reflects the summary of the resources that will be part of the network from the administration of the LAN:

Table 1: Summary of network resources

Departments	Shared resources
HR department.	4 pcs + 1 printer
Sub-Node of offices	1 server
Department of Economics	3 pcs + 1 printer
Communications Node	3 servers + 1 PC + 1 printer
Board	1 laptop + 1 printer
Head of Section	2 PC + 1 printer
Lobby	1 laptop + 1 printer

2.2 Define what the shared resources will be.

Depending on the information, it was decided to change the flow of information since the company will not have the same infrastructure and will make greater use of the technologies associated with the change of the network and its interconnection, such as traffic from information on that network.

2.3 Assess whether it is necessary to change the flow of information in the organization.

Of the tasks carried out in the company, all of them will remain interconnected between the networks of the offices, allowing the exchange of information between the main offices of the company, taking into account the scope of the network in the presentation of the design.[7], [8].

2.4 Investment and operation study.

This step is the unification of 4 steps in the study of the network, they are:

- Determine which tasks will continue to be performed locally and which ones will go over the network.
- Know if minicomputers or mainframes are going to be connected to the network.
- Make an approximate calculation of the cost of the network from knowledge of market prices.
- Study the benefits that the LAN would bring and based on this justify its cost.

Based on the devices used to interconnect the network, a market study was made with the different prices presented by the devices that we needed to interconnect the new network, fundamentally analyzing the quality-price factor in addition to focusing on the hardware to be used. It is going to give the company that it is going to be based mainly on office automation and some applications that are used such as payroll and personnel systems. After conducting this study, the equipment described in Table 2 shown below was purchased:

Table 2: List of equipment and its characteristics.

Devices	Quantity	Providers	Cost per unit	Price
Layer 2 switch	6	Cisco	$ 221.00	$ 1326.00
Servers	4	HP	$ 711.17	$ 2844.55
VoIP equipment	1	Huawei	$ 154.90	$ 154.90
Routers	1	Cisco	$ 430.00	$ 430.00
Total	12	-	$ 1517.07	$ 4755.45

As can be seen from the table described above, carrying out the implementation of a LAN network can be expensive, but for the company, assuming the benefits that this can provide in the short and long term, it is decided to implement the network, bringing as advantages:

- Ease of sharing computing resources
- Data transmission speed.
- High reliability
- Data security, increasing the control and organization of the data.

3. Design stage

3.1 Select the type (s) and network standard (s) to be used

For the realization of this LAN network, the star topology was used in this typology the cable segments of each piece of equipment in the network are connected to a centralized component, or concentrator also known as Hub[9], [10]. The function of the central node is to receive the signal sent by one computer and make it reach the others.

This typology works that when a computer makes a transmission, then the hub forwards the signal to the rest of the computers connected to it, thus speeding up the transmission of information.

The advantages of building a network with this typology are:

- It is very easy to add or remove a new computer on the network.
- Quick reconfiguration. Easy to prevent damage and/or conflict.
- Centralization of the network.
- Easy to find fault.

☐ Most local area networks that have a router, switch, or hub follows this topology. The central node in these would be the router, the switch, or the hub, through which all the packets pass.

3.2 Select the transmission medium to use

Support for transmission in this design carries data in the form of signals between the network, simplifying its installation and speed on the network.

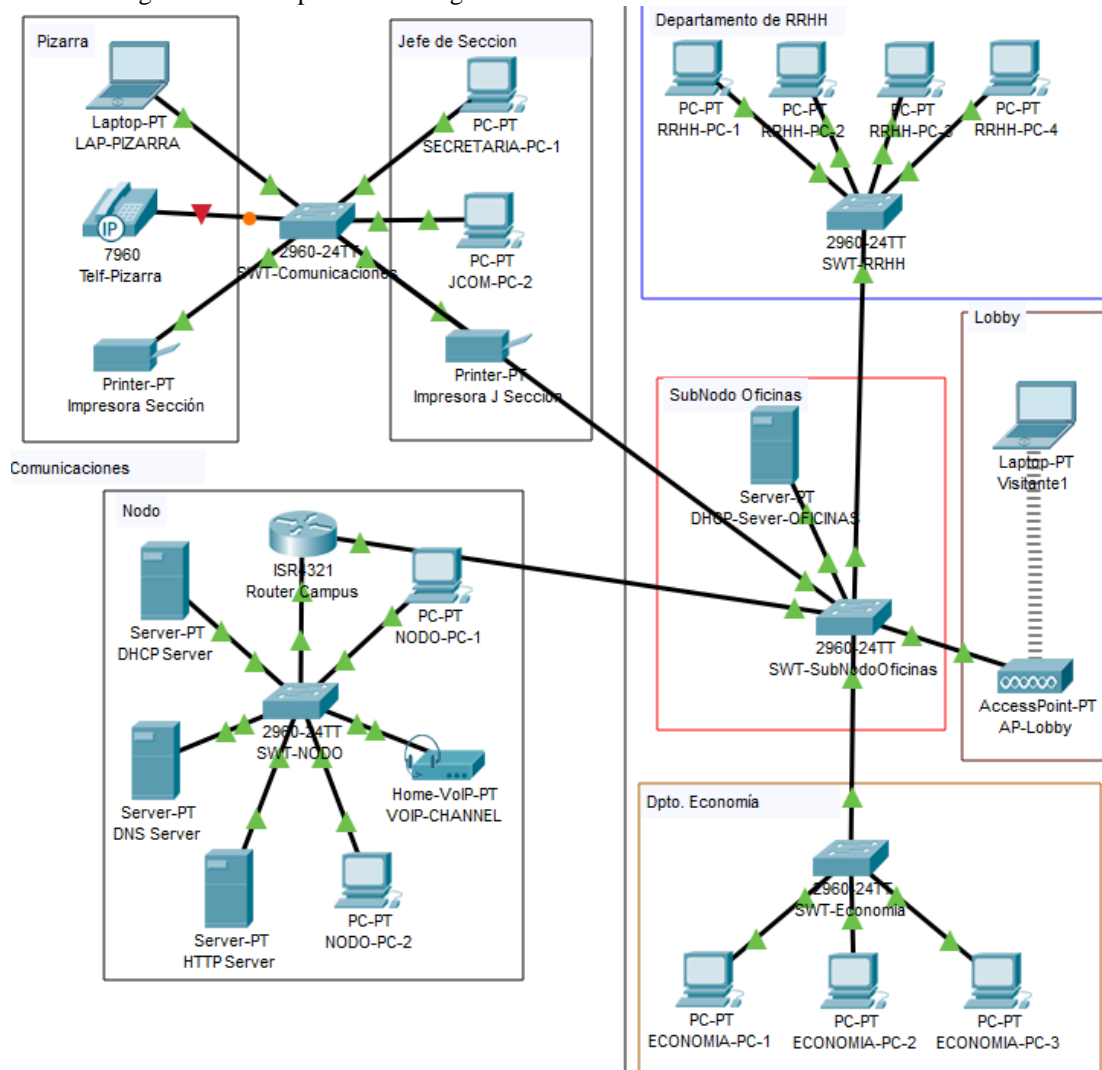The resulting network is represented in figure 1 shown below:

Figure1: Network design

3.3 Select the network operating system to be used.

In order to contribute to the technological sovereignty of the country and to look for a viable and cheap variant of making the network work, the Nova Servers operating system was chosen, a variant of GNU / Linux developed by the Free Software Center of the University of Informatics Sciences.. Its features include easy and intuitive configuration through the nova-manager tool, aimed at managing telematics services and compatibility with obsolete hardware in the business environment.[eleven], [12].

3.4 Analyze the need to use connectivity techniques.

In order to improve the functionality of the network, as well as to provide a security contribution, the application of a captive portal was used as a connectivity technique, it will allow only its users to connect to the network, thus as only authorized equipment.

3.5 Consider future network extensions.

An analysis was carried out for the sake of a possible expansion of the network to other offices that require it. As a result of this analysis, a wireless network Access Point was implemented that will allow users to connect wirelessly with laptops, but the possibility of adding equipment in a wired way is not feasible because the network covers all existing areas. in the company.

3.6 Conduct a primary traffic assessment.

To carry out a primary analysis of network traffic, Wireshark, formerly known as Ethereal, was used, which is a protocol analyzer used to perform analysis and solve problems in communication networks. This software has all the standard features of a protocol analyzer in a unique hollow form. It is developed by The Wireshark team and is licensed under GPLv2. After carrying out the analysis, it was concluded that the data flow is correct for the equipment and the tasks of the network.[13], [14].

3.7 Take into account the needs of the personnel involved in the network.

The personnel involved in the network will be the technicians who work at the node and the office personnel, applying the principle of least privilege, the administrative roles will only be held by the node operators and the other roles will be users.

4. Stage of preparation of the request for offer and selection of the seller

4.1 Execution analysis

In this step, 3 of the steps of the stage are summarized, they are:

- Specify the technical characteristics of the items to be purchased.
- Conduct an economic analysis.
- Analyze the characteristics of the seller.

After analyzing the costs and the quality of the equipment to be acquired, it was decided to buy the equipment directly from the offices, where good discounts were obtained, which after a complete economic analysis of the project concluded that 36.7% was saved. % taking advantage of the discounts offered by this provider, leading to the conclusion that the investment is viable.

5. Conclusions

After the installation and assembly process of all the computer network equipment had been carried out, all the documentation for it was prepared, as well as the section in the computer security plan that contemplates the referred computer network. Once the process is finished, the following conclusions can be reached:

- The study of the destination site allowed choosing the architecture and topology of the computer network.
- The market study made it possible to carefully choose the equipment to be used with a balance between cost and quality.
- The use of free software In the proposal of the network, it allowed to reduce costs in terms of licenses, as well as the development of some customized components of the network.
- A good amount was saved in terms of discounts, finally qualifying the project as viable.

Regarding the gathering of information and its respective analysis, it was allowed to design a connectivity and infrastructure management solution for the company. Being able to diagnose the current state by identifying the shortcomings that the company has and which were corrected, providing security to the company, and which solutions were proposed. The proposed design will bring improvements to the security and administration level of the company throughout its infrastructure.[fifteen], [16].

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