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RESEARCH ARTICLE

TARGETING A COMPUTER NETWORK IN A UNIVERSITY CENTER

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Abstract

In the modernization of technology and its media, it is observed that the amount of electronic components interconnected to local networks and the worldwide network of computers is numerous and only grows with each passing day. Activities in institutions in general have become fully connected, sectors are reputable and connected to a network of computers generating and receiving data. The project addressed focuses on explaining a situation and informing the reader about the relevance of data traffic control on a local network, ensuring the delivery and receipt of data competently and securely to destinations, without interference from other unauthorized internal connections and thus being external connections. The use of virtual local networks aims at accurately segmenting the network making it independent of physical topology, ensuring cost savings and broadcast traffic control resulting in an easy-to-administer network and increased security. The results obtained in the implementation of segmentation proved to be very effective in terms of monitoring and isolation of some sectors, with this diluted some problems that existed in the issue of information security.

Introduction:-

University centers are updating their internal processes to expand the quality of the result in order to generate productivity profits (DANTAS, 2017). To ensure the delivery of services in an agile and efficient way, interconnected computers are used within a local network, communicating with servers and various devices, which in turn process numerous systems managing the activities and demand of each sector. Over the past 10 years, we have seen many devices connected to computer networks and as a result of increased connections from the local network of organizations. Therefore, it is observed that the exchange of data from systems and services of these devices distributed on the same network has as a consequence the generation of high traffic within the network, which may result in a slow communication between the devices and even the inactivity of these services and systems, bringing difficulty in administration and doubt to the network (DELL CORP, 2014). However, the evolution of network administrator equipment in recent years has provided better network administration making them more agile and secure.

The switches that connect the network in order to keep the devices connected and communicating at all times, handle the receipt and delivery of data packets across the network. Therefore, this research aims to show the benefits of using VLAN to segment the network of a University Center consistently, creating virtual local networks (VLANs) within a physical network environment. To establish specific accesses of devices belonging to different

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sectors and blocks, in order to ensure the fullness and delivery of data, helping for the best functioning and security on the network.

Theoretical Reference

Segmentation is a network architecture method that divides the network into segments or subnets. Organizations use network segmentation to improve performance, optimize monitoring, identify technical issues more easily, and, of course, improve security. This method allows you to create an additional layer of protection so that once inside your network, an attacker cannot access all of your data or your most sensitive data, such as customer data, company financial records, intellectual property, etc. We'll show you the items you need to get a good targeting in this topic.

Information

These days, information has become something very valuable, as it is through it that decisions are made and new business ideas tend to emerge. With technological advances, having access to any information is not so difficult, nowadays you can receive any information on smartphone through chat applications, or through emails, with this the dissemination of information huge proportions and thinking about it comes the challenge of how to protect it.

According to Semola (2014, p. 43), information is a set of data used for the transfer of a message between individuals or machines. Thus, it can be affirmed that these modified data can be only an exchange of information of a communicative nature, or else, are information of great value within the organization, thus leading to the importance of protecting such data.

Information Security

Information security is semantically the preservation of the confidentiality, availability, authenticity, and integrity of all your information and data fundamental to an organization or individual. This protection goes through the physical, technological and people management environment, becoming an area that encourages interest within an organization that cares about the quality and continuity of its business. According to Semolina (2014 p.41), a definition we can establish on information security is that it is an area of knowledge that is dedicated to the protection of information assets against unauthorized access, undesirable change or unavailability.

Scenario

In a study conducted it was observed that the university from which it was studied has old communication, using hubs that has a very basic configuration and that when it receives data from a computer (i.e., a node), which simply relays the information, exchanging the information of systems and services of these devices that share the same network has as great consequence the generation of high traffic within the local network, may in many cases cause slow communication between devices or even unavailability of the services offered by the institution. Because of this problem, ways were studied that could bring improvements, security, reliability and availability in services.

Network Segmentation By Vlans

As seen in the cenaria described above there was the need to use a VLAN, which shares characteristics similar to a LAN, but a VLAN allows different computers and devices to be connected virtually to each other as if they were on a LAN sharing a single broadcast domain (BARROS, 2013). In a way, a VLAN acts as separate mini networks within a LAN. A VLAN is useful for organizational use primarily because it can be used to segment a larger network into smaller segments. Different VLANs can be used for different user groups, departments, roles, etc., without the need to be in the same geographic area.

Manageable Ethernet Switches

For the use of a VLAN it was necessary to exchange the old equipment, such as the HUBS by manageable and intelligent switches. Managed switches allow users to adjust each port on the switch for any configuration, allowing them to manage, configure, and monitor the network in various ways (TANENBAUM, 2011). They also provide greater control over how data travels across the network and who can access that data. Managed switches often offer Simple Network Management Protocol (SNMP), which allows users to monitor the statuses of the switch and individual switch ports and provides statistics such as traffic throughput, network errors, and port status (WOOD, 2016). Network administrators can track this data over time and use it for troubleshooting and network capacity.

Smart Ethernet Switches

Smart switches are designed to offer a more comprehensive set of features, advanced security levels, advanced network control and management, and also offer greater scalability of your network, but are much more expensive than everyone else. Typically these switches are installed as aggregation or access switches on very large networks, or as major switches on relatively smaller networks controlling all network traffic that passes through it.

Methodology:-

The PPDIOO cycle was chosen from among other methodologies existing in the market given the familiarity of the project members with this methodology, in addition to its scalability, working for networks of various sizes.

Figure 1:- Cycle Of Methodology.

Source: Cisco Brasil, 2022.

1. Network segmentation has arisen to, among other reasons, limit the spread of broadcast over a local network and consists of inserting devices into the network (routers) that block the passage of broadcast packets when they traverse their interfaces (CISCO, 2020). The steps of the cisco methodological process were applied throughout the network segmentation process performed at the institution, as observed below:
2. In the first phase of preparation was raised the technical and business objectives with the institution, thus determining all its needs, such as servers that must be implemented, levels of performance that the network must support, the lack of Vlanna structure where the network was weak and vulnerable. The limits of the project, such as personnel or resources, were also seen. Finally, this phase is intended to define the scope of the project.
3. In the second planning phase, a detailed study of the current condition of the institution's network was carried out. The purpose of this study was to define exactly how the structure and organization was organized between the units of the current network and how this network would meet or fail to meet the needs of the institution, which were determined in the previous phase. In the planning phase, you define what should be changed and what should be maintained.
4. In the third phase known as drawing it was decided what would be used from the old structure and what was excluded, and the sectors that were segmented (Administrative, Controllership, Secad, Legal, DTI, Nopi, HR and Presidency). Where its security should be higher compared to other sectors, supported by previous phases, may decide that it was more feasible to maintain a part of the old structure of the network, only adding services if segmentation to the sectors already mentioned.
5. In the fourth phase, the implementation should be in a less intrusive way, the design phase, six segmentations were created isolating the sectors individually from the collective, and after that the homologation, in which a small number of customers will approve the operation of the designed network, and the homologation network must have the same structure of the network to be implemented in the next phase. At this stage, all solutions and amendments proposed and approved in the previous phase will be implemented. This phase should be careful when making these changes, as services already provided by the current network should not be interrupted.
6. In the fifth phase of operation, the performance during the operation was verified in the sectors involved, trying to keep it functioning satisfactorily during the day-to-day. Information was collected from the network, and fault detection and performance monitoring were verified, which will be used by the next phase.
7. The sixth phase of the cycle is the improvement phase (optimization). In this phase, with the help of the data collected in the previous phase in the sectors, improvements were proposed for the network in front of the

general direction. This phase has autonomy even to determine that the network did not obtain satisfactory performance. However, an improvement in the level of security and agility of connection was shown that had a significant improvement compared to the old structure in which the previous sectors were.

The service requested by the Institution had a positive result. The optimization phase can lead to a network redesign if many network problems and errors arise, if performance does not meet expectations, or if new applications are identified to support organizational and technical requirements.

Results And Discussion:-

Network segmentation has helped increase security, reliability, and efficiency in your existing network. There are a variety of ways a VLAN can be used to meet an organization's needs. The applied use of vlan was to separate traffic from the tactical sectors of the institution of the network of students through the segmentation of the network. This allowed academics to access the Internet without being in the same institutional network. Where there were undue access to important sectors even invasion of the institution's page. It was also used to limit employeeaccess to certain network segments, which allows only authorized users access to networks with highly sensitive information. The example of academics. But another example would be to separate financial employees from HR employees. This segmentation not only scans user traffic, but also increases security and usability.

The goal of creating segmentation through VLAN was to reduce costs for constant changes in the sectors of its network users. We can also say that there has been an improvement in the ability to manage the institution's network and increase the security of network assets. Security was the most important factor in the implementation of vlan segmentation in the infrastructure by the university center because it ensured the integrity of the data circulating in its network, thus ensuring that the access of teachers, students and administrative environments did not intersect or communicate. The implementation of VLAN is the best segmentation technique that can obtain better quality management in a network infrastructure, provided that, acquiring equipment that has functionalities and protocols for a correct operation for the application of the appropriate configurations.

All equipment was from CISCO, where it took care of the implementation of the project with the DTI team of the institution in question analyzed, where after the last tests took place the training of the team to manage the infrastructure developed, leaving the cisco team as remote support or for some technical intervention to one of the equipment installed and configured by it. The objective of the deployment by cisco company was to homologate and certify the network to maintain the level of excellence of the service.

Conclusion:-

Network segmentation using VLAN is the most effective way to better control the management level of the infrastructure, which contributes to scalability, reliability and availability of network resources, making the network solid. With the combination of equipment that manages networks such as layer 3 switches essential for static routing and quality in service delivery, also as resources that cover energy savings and, finally, power supply to devices connected to your ports (PoE).

Security is the main feature in the application of VLANs within a network structure, not allowing packages that do not have labels to reach uncertain destinations, isolating failures in their segmentation and together with the propagation of broadcasts and access improperly within the server, which directly interferes with the possibility of access failures within the logical segment and prevents the hijacking of users' data, systemsand the servers themselves.

The project to implement the network segmentation of some strategic sectors of the network, has already obtained positive results such as improvement in traffic in the sectors, significant increase in security between the sectors of the company and even external attempt of access without authorization. All objectives conceived in the project have been achieved and future implementations should continue to raise the level of communication of the network.

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