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**Introduction**

Newton Ad Agency is planning to expand their company in a new location. The headquarters of our firm are located in Austin, Texas. This is where the company stores its major corporate data. It is also where the company stores and manage the LAN and WAN networks. The mission of Newton Ad Agency’s is to allow its employees to be able to manage work from a variety of locations. Services this agency offer include, “antivirus software, a laptop with full disk prevention, and data loss prevention”. The Fayetteville new location must be able to provide access to the corporate network via VPN to Headquarter located in Austin TX as other locations like New York and Minneapolis. Granting access to the VPN client live video teleconferencing calls will be supported and will have the ability of print work to be send out. “VPN’s are less costly compared to the traditional dial-in access. According to (Engelking, 2000)”, Employees can work from home they only need to connect to the internet service provider (ISP) using VPN they can secure the tunnel to the office network. VPN’s will allow networks connect securely to the headquarter network located in Austin TX. VPN’s server, IP Address and Internet connection is the only way to verify and these are must require in the new locations.

**LAN Topology**

Then a company should decide which LAN topology they should implement. There are two LAN topologies which most commonly used one is Star and the other is Mesh topology. These both topologies have their strength and weakness, but both are very great for implementation. The Mesh topology use point to point connections which provide fault tolerance to the network suppose if one network fails it will switch to another one it gives different path to be operate if one fails. Mesh topology is called Wide area network (WAN). Mesh topology has some weaknesses as mesh topology is very expensive to reconfigure and replace, Mesh topology is good when the network is not used a lot. The Star topology connects many networks by using Hub/Switch, it has strength to connect all networks to one location. Star topology is very easy to troubleshoot and easy to replace. The nodes can easily be removed and added. As similar like mesh topology if one device fails in Star topology the other device is ready for back up. Star topology is a great option, but it also can be very expensive. “Star Topology is the most common type of topology used in many businesses today, with more than one location since funds can be applied towards purchasing a hub and using the same hub as a backup for failed networks. Off-site hubs can also be bought and used for disaster recovery. The down side with these hubs is that, should they fail, everything fails automatically fails too”. (Tech Differences, 2018).

The best option for New Ad newton will be to use Star topology as it will be their best choice. Its better to invest in hubs which will be used as a back up for recovery disaster if any fault or error occurred. Although, Star topology is more expensive compare to Mesh topology but risks which are associated with hub failing are more threatening. Most of the work this company will be doing and to have the ability of connecting and working from home. I suggest that the best choice for Newton Ad would be star topology.

**Local Internet Service Providers**

The right ISP must be chosen for the new office in Fayetteville, NC. as it is the foundation of everything for Newton Ad Agency. It is imperious to recognize the business needs and the network design depending on the needs of Newton Ad Agency. Selecting the correct internet provider would be the starting point of establishing the systems framework. It will also undertake an important role in the balance and accomplishment of daily tasks for Newton Ad Agency. Considering this, I have selected to examine a percentage of the important Internet Service Providers and the several kinds of wiring that is used for their service. For the new office in NC, I have selected to take a look at the system suppliers with “Verizon Fios, Level 3, and Time Warner Spectrum, which are the main suppliers in the territory”.

**Internet Service Provider: Speed, Security, and Reliability**

For the investigation of the three suppliers, I used three variables to create what might be best suitable for the new office. The variables that are important for this business are connection quality, speed, and security. “There is a great deal of data that is shared among the different office locations and on various projects all throughout the organization, and we would not want there to be any risk to that data, particularly when it includes across the nation correspondence”. The speed viewpoint is important as Newton's system framework has many clients, and it is important to have great communication, so it is important to have a system that can deal with high speed data which can help have a more efficient video conferencing and less connection issues. Reliability is “equally as important as the speed variable to deliver performance and stability to the network to the level that the new office should strive to accomplish”. Performance is a high administrative characteristic at Newton Ad agency.

For the speed variable, “Verizon has many plans that range from 25 Mbps right to 500 Mbps dependent on the necessities of the organization, and their download and transfer rates are coordinating”. When comparing both plants level 2 offers 1000 Mbps of download and transfer speeds while Time Warner only “has a maximum of 100 Mbps for download times”. Level 3 speeds are almost equal to Verizon, “their coverage and dependability quality appear to not be as aggressive, as they only cover about 4.3% on average of the territory in Fayetteville, NC”. Time Warner covers about 97.7% and Verizon covers 100%, which makes them a better choice than Level 3 for consistency and reliability. The key components for Newton Ad Agency are reliability and quality, so Time Warner as Verizon Fios are the only two options that can be considered.

When comparing the security aspect, “Verizon Fios keeps a significant lead over Time Warner as a result of the adaptability of service plans that Verizon offers as far as possible up to the 500 Mbps with coordinating download and transfer times”. On the other hands Time Warner does not have transfer speeds as Verizon, therefore, Verizon is considered in this aspect. “Verizon’s security has outstanding service and it has received high customer ratings from clients and ISP rating scales” (Gottsman,2019). The client reviews of Time warner show low service evaluations as well as clients concerns about their level of security. With this aspect known, The best option for Newton Ad Agency would be to go with Verizon Fios for the company’s new office. “Verizon's 500 Mbps bundle” will empower the office to have all the service it needs and support its clients. It would also provide the business with feelings of safety comprehending that Verizon is backed by the best Internet service provider in the country.

**Internet Service Provider: Business Goals and Objectives**

The objectives and targets that are upheld for Newton Ad agency would be best done by Verizon as it would quickly contribute to the office rapidly. We must ensure that the hardware needed in the workplace can benefit the system of the ISP supplier. A quantum gateway router would be purchased from Verizon and include some network extenders. Moreover, we will help prepare everybody that is not a developer with laptops such as “Dell” and “Lenovo” so things would be easier. The developers would be equipped with “MacBook pros”. We will also be including “HP Page Wide Pro printers” that would be installed in different locations so the printing could be more efficient and accessible.

Since all the laptops will come with cameras, “Google Hangouts” can be helpful for video conferencing. “Google hangouts” is also very affordable at “$5 per month”. For the meeting rooms, Google’s new Meeting room would be set up that hosts up to 15 individuals at a time for video conferencing. “This will allow to streamline and fundamentally utilize a service with the equipment that is intended to work with one another, giving us more consistency and stability in our everyday tasks”. Moreover, it will not reduce the transfer speeds as the “500 Mbps service plan with Verizon Fios”. The company would also not be concerned about lagging and disruptions during video conferencing. These options would definitely be very helpful and set up the foundation for the new office. It will also help us to adjust the structure as the requirements for the office are expected for Newton Ad Agency.

**Additional Considerations: Hardware and Software**

A wireless mess infrastructure is recommended to support the employees at the new office. The new office would need a WLAN controller with multiple access points. It is also recommended to use the “Cisco equipment and network software”. “The office’s access points will be connected to the WLAN controller which will be connected to the ISPs network via fiber. A WLAN controller will act as a switch for network traffic, a firewall to protect against malicious internet traffic, and will allow network administrators to easily manage all wireless access points in the office from one place”. “With WLAN controllers, you can reduce the overall operational expenses by centralizing and simplifying network deployment, operations and management and monitoring of all of the wireless access points on your network.” (Cisco. N.d.).

“The recommended WLAN controller is the Cisco 1504 Wireless Controller, which will allow for up to 75 access points and 1000 devices” (Cisco. N.d.). “This offers an advantage for scalability. The recommended access points are the Cisco Aironet 1850 Series Access Points, which support mesh deployments and 802.11ac Wave 2 data rates” (Cisco. N.d.). The access points that would be needed would depend on the layout of the office as well as knowing what material the building is made of.

**Printer Configuration**

The new office in Fayetteville, will need to send their print jobs to the printers in the main office. The devices printers must be connected to the main office’s VPN internet. IF the printer is not available at the time the authorized user muss be logged in to the VPN and it should be configured manually. “To do this the user would need the printer’s model, IP address, and the port it is connected to. If the IT department is slow to provide this information, the command prompt and ipconfig can be used to find the IP address of connected devices. This would allow the user to use a printer set up wizard to establish a direct connection to the networked printer(s) via the VPN tunnel”.

**Potential Errors**

Many problems can occur on a network, so Newton is also at a risk of running into a problem. These problems include losing connection to the internet or having problems with the wireless connections, IP addresses and also printing jobs which are linked with the headquarters. To overcome these issues, it is important for the techs at Newton to be able to troubleshoot issues by figuring out the cause and also being able to locate the error messages. The techs must figure the problem to see if it is affecting one or multiple locations. They should also “locate and identify any recent changes to the network or individual stations this will help you create a list of possible causes and make sure to document the entire process for future reference”.

It is important to check the DHCP servers to make sure they are working and configured to the right settings. This would help resolve any issues with the IP address. Wireless connectivity problems can be caused by “interference with the channels or improper security credentials and dead spots”. To overcome connectivity problems the site should conduct a survey which can determine the signal strength across the office. This survey can help the company determine if routers must be moved to a better location or if more routers are needed. Printer configurations need to be assigned properly to the correct settings and to ensure that printers run smoothly correct drivers need to be installed.

**Rapid Resolution**

To ensure the WAN is optimized Newton Ad Agency will take a proactive approach to by identifying “network weaknesses, performing regular maintenance and upgrades on hardware/software, keeping accurate inventory of hardware/software, creating redundancy, clearly defining roles regarding network administrative responsibilities, educating employees on cyber threats, and constantly monitoring HVAC and network activity”. An active network optimization enterprise will help Newton Ad Agency to prepare and resolve any network errors before they occur.

Monitoring network activity and HVAC equipment constantly would give the IT staff help identify issues before they occur. This gives Newton Ad Agency great potential to lessen the errors more quickly.

**Conclusion**

To ensure the new office runs smoothly, I recommend the use of star topology which consists of switches, routers and wireless technology. Internet with high speed will be important as it will warrant that print jobs and conference calls run efficiently. The techs will monitor the network which would help the company identify and solve issues before they can cause major problems. Per study done by “IHS, ICT (information and communication technology) outages cost North American companies $700 billion a year. This includes lost employee productivity (78%), lost revenue (17%), and actual costs to fix the downtime issues (5%)”. (Stanganelli. 2016). Being active decreases the risk of network errors from occurring in the future. It also increases the network efficiency. By doing this the employees will be given a stable LAN which would give less interruptions. A network optimization strategy will also have the IT staff informed, so troubleshooting, and then assigning resources to resolve network errors will be a unified and attentive process.

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