Final project: executive summary for network design project

Cacophonic Inc. ‘ s Network Designator 25, executives Comprehension INC is a small organization that specializes in aircraft maintenance. The company’s headquarters are based in Illinois; and they have facilities located in four other states as well. Each facility or office then consist primarily of four departments; maintenance, accounting, receiving, and shipping. Due to the breakdown of each department, and the multiple facilities, constant sharing of data, programs and various applications will need to be accessible over a Local Area Network (LANA); as well as over a Wide Area Network (WAN), and via remote access.

The goals of the network, both LANA and WAN, are to allow for a secure yet easily expandable network, that allows real-time data transfer. When planning the LANA for Cacophonic ‘ NC, there were multiple considerations to take into account; the main concerns being the integrity and accessibility of the data over the network; as well as the ease of expanding the network. Along with these concerns, it has also been decided that each department needs to be able to share peripherals devices; such as scanners, copiers and printers.

For this reasoning, the LANA in each of the facilities will use a star topology for its setup. Cacophonic Inc. S star topology LANA will consist of Cat 5 e and abases-T cables. These cables will provide the necessary support for the network design allowing for speed and integrity. As well, this network layout will also allow for network expansion and management; and help support the future goals of the company. As for the WAN that is to be used to connect the facilities to one another, there are a few key factors that need to be considered; the requirements of the WAN.

These requirements include: being able to allow each facility to be able to connect, or rather be connected to the WAN to allow the accountants at headquarters access to al financial data. The WAN must allow for approximately 40 users at any given time on the WAN; that use the WAN for approximately an hour at a time. And due to constant accessing of the data, a synchronous connection needs to be established between each facility's LANA. So based on factors such as these, it has been decided that a SODS connection would be optimal for Cacophonic Inc. S WAN. Like with any company, Cacophonic Inc. ' s data is sensitive, and needs to stay secured. So when accessing the data off site, security measures need to be put into place to allow for the viewing of this sensitive data. For this reasoning, a VPN will be used to access the network remotely. VPN remote access connections use authenticated links to ensure that only authorized clients are able to connect to the organization's LANA. These authenticated links provided by VPN will allow Cacophonic Inc. He ability to connect to its branch offices over a public network while maintaining secure communications. In conclusion, it is believed that by implementing the following network specifications, Cacophonic Inc. Will be able to continue its network's growth, and continue to allow the accessibility required to allow production to continue under arioso circumstances. However, the growth and security of the network is, and will continue to be constrained by the financial backing that the network is allotted. Cabling Specification's building the Cacophonic Inc. S network physically, the cabling contractor will need to comply to the checklist provided below:; Category E Cable used to connect all devices to central hub porterhouses RAJA conversationally E cable segments do not exceed 100 meter in length; abases- T cable used to connect all hubs to the Embodies

RAJA contradictoriness-T cable segments do not exceed 100 meter in lengthening Area Network (LANA) Topographically INC is an organization that specializes in aircraft maintenance. The company’s headquarters are based in Illinois; and they have facilities located in four other states as well.

Each facility or office then consist primarily of four departments; maintenance, accounting, receiving, and shipping. Each department is then broken down in to specialty groups to allow for a more thorough work production. Due to the breakdown of each department, constant sharing of data, programs and various applications will be needed over a Local Area Network (LANA). When planning the LANA for Cacophonic ‘ NC, there are multiple considerations to take he network as well as the ease of expanding the network.

With each department broken into specialty groups, data needs to not only be shared, but more importantly saved in accessible locations for each department that needs access to the data. For instance, certain accounting positions will require access to all data concerning shipping and receiving to maintain up-to-date financial records. However, the shipping and receiving departments do not require access to the accounting department’s data. One such way to accomplish this is through the use of a central storage unit, or server that is specifically for data and file sharing amongst all four departments.

Along with specified data accessibility over the network, Cacophonic INC also requires daily backups of all data pertaining to each department, and that all finical data is to be saved indefinitely to a secure location. Other

specifications for Cacophonic Inch’s LANA include that each department is able to share peripherals devices; including scanners, copiers and printers. As well, Cacophonic INC would also like to be able to provide external access to the LANA for employees who are on the road, or simply away from the facility of any given reason.

However, for security purposes, an internal and external authentication, or verification process will need to be established for each employee. And finely, Cacophonic ‘ No’s LANA will need to consider expansion capabilities to allow for any additional devices that may be required in the future. Data sharing between each department is the most important concern for Cacophonic ‘ NC, so company will need a network topology that will allow network access to a majority of their employees even in the event of a failed network segment.

Network topology refers to the layout or design of a computer network’s interconnections used o connect all its microcomputers and other computer devices (Walton, 1990). When it comes to network topologies, there are three most commonly used (Halberd, 2005); these topologies are: bus, ring, and star. However, based off of the specifications mentioned above, the most effective topology to be used in each of the Cacophonic INC offices would be the star topology.

The star topology is a network that uses a central unit, often referred to as a hub or switch, to host a set of cables that radiate out from the hub to each node or workstation on the network (Halberd, 2005, p. 43). According to Cisco Systems, Inc. Intertwining Technology Handbook (n. D.): A hub is a

physical layer device that connects multiple user stations, each via a dedicatedly. Electrical interconnections are established inside the hub. Hubs are used to create physical star network while maintaining the logical bus or ring configuration of the LANA.

Income respects, a hub functions as a multipart repeater. (‘ 1 20)So instead of each station being directly connected to one another, such as in a standard bus or ring topology, a star topology allows for each device on the network to have a point to point connection with the central hub. The primary benefit to using he star topology is that it will reduce the chance of network failure since each device connected to the network is directly connected to the central hub. So “ if any single network connection goes bad (is cut or damaged in some way) only that one connection is affected” (Halberd, 2005, p. 45).

When the star topology is applied to a bus-based network, meaning that it uses an Ethernet based connection, the central hub echoes all transmissions received from any connected node to all other nodes on the network. Therefore, all connected nodes communicate with all others by transmitting to, and receiving from the central pub only. In the event of a failed network segment, the star topology will isolate the node that it links to the central hub; but only that node will be isolated. In such an event, all the other nodes will continue to function properly, except they will be unable to communicate with the node that has been isolated.

If any node connection were to go bad, none of the other nodes will be affected. However, if the central hub were to breakdown, the entire network

will be affected (Technocrat, 2006). As well as the benefit of reducing the chance of network failure, a star topology is the easiest topology to expand upon. With the use of a hub, the star topology simply relies on the number of ports that the hub has. And if more ports are needed, another hub can be connected to the central hub to allow more devices to be added to the network by the use of a patch cable. This additional hub is known as a patch panel.

Then when a new device, such as a printer or a new workstation, needs to be added; the new device simply needs to be connected to the central hub or the patch panel. However, since each node is connected to the hub with its own cable, the star topology does require the use of more cable than a standard bus or ring topology. The LANA topology for Cacophonic INC. Will be relatively simple in terms of set up. Since Cacophonic ‘ No’s departments are within proximity to one another, the best layout for the star topology would be as follows; because it allows the system to be not only expandable, but easily accessible as well.

Each department within the Cacophonic Inc. ‘ s offices will be connected to one another through the use of the star topology LANA; which will terminate to separate network devices located in an intermediate distribution frame closet (DID). Each of the DIF closets on the network will then be linked to a main distribution frame closet (MAD). The MAD closet will hold a switch that is responsible for connecting to the network’s router. The advantage to using such a setup is that it can be used with multiple cabling options. The cabling specifications that will be used in the Cacophonic Inc. ‘ s star topology are as follows. Cacophonic Inc. S star topology LANA will consist of Cat 5 e and

abases-T cables. Category 5 cabling is capable of data transfer rates of 100 megabits per second, which will allow it to employ abases-T Ethernet; which is also known as Fast Ethernet. These cables will provide the necessary support for the network design allowing for speed and integrity. Cat e, and abases-T cables will support this topology mainly since Cacophonic Inc. Has a close network layout; making these cables the best options for the company. As well, this network layout will also allow for network expansion and management; and help support the future goals of the company.

Wide Area Network (WAN) Designs stated previously, Cacophonic Inc. Has a total of five offices; with headquarters based in Illinois, and four other offices branched out in four other states. Each of these locations, are then broken down into four main apartments; which are then broken down further to specialty groups. Then to share and access data throughout each group and department, each of these locations will be equipped with a star topology LANA. However, on a daily basis, headquarters will need to be able to connect to each location to share and access data; mainly this has to do with the accounting system.

To accomplish such a task, a Wide Area Network (WAN) will be used. A WAN is used to connect groups of Lana together over a distance. Wants can be used to connect over a short distance, such as connecting offices in the same city; or o connect local offices to facilities on the other side of the world. According to Cisco (n. D.), A WAN is a data communications network that covers a relatively broad geographic errand that often uses transmission facilities provided by common carriers, such as telecommunications.

WAN technologies generally function at the lower three layers of the Circumference model: the physical layer, the data link layer, and the network layer. (Para. 2)With a WAN set up, the accountants at the headquarter office will be able to connect with any of the other four offices' Lana to monitor financial data. By doing so, his will allow the accountants the ability of exchanging data with one another much more rapidly than using the mail, or any other option out there; even email in some circumstances for that matter.

Rather, it would be as if the accountants were in the same office; or as if the offices were all in the same location. To build Cacophonic Inc. ' s WAN, there are a few key factors that need to be considered; the requirements of the WAN. By understanding the requirements of the WAN, the technology to achieve them can then be more easily determined. Requirements:; All five locations need to be able to connect, or rather be connected to he WAN to allow the accountants at headquarters access to all financial data. ; Must allow for approximately 40 users at any given time on the WAN; that use the WAN for approximately an hour at a time. The amount of data being transferred and shared does not usually exceed that of 1 JOB. ; The accounting application software that Cacophonic Inc. Uses requires an encoding rate of 40 Kbps. ; Due to constant accessing of the data, a synchronous connection will need to be established between each of Cacophonic Inc. ' s Lana. Bandwidth Calcareousness the requirements listed, it states that the data counting application software that is used requires an encoding rate of 40 Kbps. So to calculate the total data transfer, the following calculation is used:; First calculate the data transfer per minute. 40

Kbps multiplied by 60 seconds per minute = 2, 400 kilobits per minute; Next the kilobits per minute need to be multiplied by the average time on the WAN. 02, 400 kilobits per minute multiplied by 60 minutes = 144, 000 kilobits; Convert the total kilobits to kilobytes. 0144000 kilobits divided by 8 bits per byte = 18, 000 kilobytes; Convert the total kilobytes to megabytes. 09, 000 kilobytes divided by 1 , 024 = 17. 8 Mambo, to calculate the required WAN connection bandwidth, the following calculations are used. First multiply the maximum concurrent users by the encoding rate. 040 users multiplied by 40 Kbps = 1, 600 Kbps; Now convert the maximum kilobits per second to megabits per second. 0 1, 600 Kbps divided by 1, 024 = 1. 563 Mbps Connection Typesetter designing a WAN, one must consider what type of connection can be used with the available services. A WAN connection refers not only to the components being used, such as cables, switches, and routers on the physical level; but also the way in which the data s transmitted on the data link layer, and the network layer.

According to Warren Wheaton (2000) there are three general types of WAN connections offered by most carriers; these are:; Circuit switched connections; Dedicated connections; packet switched or cell switched conventioneer’s, along with theses three connection types, Halberd (2005) mentions Digital Subscriber Line (DSL). Circuit Switched Connection” Circuit switching transmits data streams and datagram’s across dedicated physical circuits. To provide asynchronous dial-in and” Integrated Services Digital Network (KIDS) “ services, the telephone companies use circuit witching” (Wheaton, 2000, Para. 3).

However, due to the low bandwidths that circuit- switched connections offer, theses would not be recommended for Cacophonic Inc. ‘ s WAN. Dedicated Connections unlike circuit switched connections, dedicated connections use point-to-point serial connections that provide a fixed or permanent connection to a remote network. The awesome thing about dedicated connections is the fact that they offer speeds up to TO, or 44. 736 Mbps, over a public carrier’s network. With fixed or permanent connections, dedicated connections allow for less overhead to be required in order to establish communication between two locations.

Now since dedicated connections offer such low overhead, as well high bandwidths, they are excellent choices for companies that require WAN connections with a high bandwidth. However, of the three connections, the dedicated connections are on the usually the highest. Packet Switched or Cell Switched Compassionately-switched or cell-switched connections, on the other hand, are point-to-point connections that allow the data to travel over a public carrier’s network. Now even though packet-switched and cell-witched connections are more costly than KIDS connections and asynchronous dial- in.

Packet switched and cell switched connections are able to provide much higher bandwidths than either circuit-switching connection; and at a much lower cost than dedicated connections. Some examples of packet-switched and cell-switched networks are: Frame Relay, which is packet switched; X. 25, which is also packet switched; and Asynchronous Transfer Mode (ATM), which is cell switched. DSSSL is a connection type that can deliver reliable, high data transfer speeds for office-to-office connectivity. Along with DSSSL

high speed capabilities, the fact that it runs over traditional twisted pair copper wire makes it available in most areas.

DSL is more expensive than standard dialup; but, it is affordable for most small businesses. However, according to Halberd (2005), there are at least six different choices to choose from when choosing a DSL connection. These include:; Asymmetric DSL (ADDS), which allows for up to 8 Mbps of data to be received and up to 1 Mbps of data to be sent. ; High-speed DSL (HEADS), this allows between 768 Kbps and 2. 048 Mbps connections between two sites. Rate-adaptive DSL (RAIDS) allows for 600 Kbps to Mbps of data to be received and 128 Kbps to 1 Mbps of data to be sent. Symmetric DSL (SODS) allows bidirectional rates varying from 160 Kbps to 2. 048 Mbps. ; Very-high-speed DSL (BEDS) allows up to 26 Mbps of bandwidth. ; KIDS-based DSL (SOIL) speed is about the same as KIDS, but SOIL is used for data almost exclusively, because it is an always-on connection to a single destination, as opposed to KIDS, which can be used to place calls to other KIDS connections. (p. 86)Connection to be Pseudo the six DSL choices, the SODS would be an excellent inactivity choice for Cacophonic Inc. ‘ s WAN.

The main reasoning behind this is that SODS offers the efficient data transfer speeds that meet the requirements. Now since DSL run over existing telephone-lines, a SODS connection will also be the most cost- effective way for Cacophonic Inc to build their WAN. As well, the SODS also allows the WAN to be an on, or open connection always. DSL Hardware use of a DSL connection over a LANA will require the installation of a DSL router provided by the ISP at each Cacophonic Inc. Location. However, in order to connect multiple Lana, access routers are used.

The access router is connected to each Élan’s hub or switch, to serve as a gateway to the WAN. Along with an access router at each location, Cacophonic Inc will also need to establish an enterprise-wide account with an ISP. In turn, the Stall’s constant connection will then also allow for the accountants at headquarters to be able to monitor the daily financial data at each location. Conclusion conclusion, the connection that will be used for Cacophonic Inc. ‘ s WAN will be a SODS connection. The reasoning for this choice is simply because it not only is the most cost-effective for Cacophonic Inc. UT the SODS also offers the desired bandwidths to meet the network requirements. Network Remote Access” Remote access is a set of technologies that transparently connects a computer, typically located in an off-site or remote location, to a network” (Microsoft, 2002, ‘ 1 2). Simply put, remote access refers to methods used to connect one device to another that are usually on different networks. One way to view it would be that remote access is a computer program installed on a computer that allows one the ability to access his or her computer from another computer over the Internet, LANA, or phone connection.

This access would then allow him or her to access the organization’s network on the computer as if it were the one he or she was at the location. However, to accomplish such a task, there are two different methods to choose from: Dial-Up; and Virtual Private Networks, or VPN. “ With dial-up remote access, a remote access client uses the telecommunications infrastructure to create a temporary physical or virtual circuit to a port on a remote access server, which is typically attached to a corporate network” (Microsoft, 2003, Para. 2).

However, to make this connection the dial-up method requires the use of wow modems.

The client uses one modem, which is connected to his or her computer, to connect to a telephone-line to dial into an Sip's node. Once connected, he or she can then establish a modem-to-modem link with the remote server's modem in the other location. This modem-to-modem link then allows for a secure connection through an authentication or authorization process involving LANA and operating system protocols. VPN, on the other hand, " provide a more active form of security by either encrypting or encapsulating data for transmission through an unsecured network" (Cisco, n. . , Para.) through the use of protocols installed on both the remote access client's device, and the organization's remote access server. So when using the VPN method, a VPN client would be able to use any IP network to create a virtual point-to-point connection with a remote access server at the other location (Microsoft, 2002). One way to look at it would be that a VPN is an encrypted communications network tunneled through another network that is assigned to a specific network through protocols that are put into place.

Now, while even though both methods provide a secure connection over an unsecured outwork; the manner in that this security is reached is completely different. A VPN does not require explicit security features such as authentication or authorization; as with a dial-up remote access. Instead VPN use a set of tunneling protocols to establish a secured tunneled network that is encrypted. Because of this, it has been decided that Cacophonic Inc. Will implement a VPN to allow for private connections over the Internet to its network.

VPN Remote Accession as stated previously, the Cacophonic Inc. Network will use a VPN to establish remote access to the network. However, a closer look at the VPN remote access it needed. VPN connections can be used in two different manners. The first is to use VPN technology to form WAN connections between two networks that have access to the Internet; this is known as a WAN VPN connection. As well, VPN can be used to form remote access connections that enable remote access clients the ability to access an organization’s LANA via the Internet.

The main difference between a WAN VPN connection and a VPN remote access connection is that a WAN VPN connects two networks together, rather than a remote client and a LANA. A remote access connection is usually formed when needed and uses less expensive hardware on the remote side (Halberd, 2006), such as Cacophonic Inc. ‘ s SODS modem. The makeup of a VPN remote access connection consists of the remote access client, the organization’s remote access server, and a shared or public network; which is typically the Internet.

However, the manner in which the VPN is established can be varied by the choices of hardware and software that will be used. As such, the following factors were considered when deciding on the remote access solution to be used:; Cost actors; Network hardware and connections; performance factories Factories plays one of the most important roles in determining anything on a company’s network. As such, this is no different with the network remote access; and according to Halberd (2006), “ VPN connections cost much less than dedicated connections” (p. 135).

As well, the protocols that are used to establish the security offered by VPN come standard on Windows based servers; which also make it more cost efficient than other options. Network Hardware and Connectional Cacophonic Inc. ‘ s offices use Windows 2000 and Geiger based operating systems (SO) on their servers and work station computers. So because of this, the use of the use of the VPN remote access is that much more appealing since all Windows 2000 and higher based JOSS can be used to establish this remote connection through the use of various protocols.