Wide Area Networking Technologies

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INTRODUCTION

The report is prepared to analyze the use of different WAN technologies and their role in increase the performance of the organization. London College of Education has been taken in the research and recognize the importance of trust systems in WAN. The project provides a detail glimpse about WAN and related evaluation techniques and models to overcome security related issues by using troubleshooting and firewall devices .

TASK 1

<u>1.1Critically evaluate different WAN technologies</u>

Dial-Up connection:

It can be used by organizations to establish connection to the internet. It requires phone line and proper set-up is essential before the communication transaction start. A dial-up connection is the cheapest method of connecting to the Internet and all the usage is charged on the basis of the telephone call and data transfer speed and performance. This method is much safer as compare to other technology because unique IP address provides to every user and every time they can login with a new IP address, so cannot hacking an account (Carol, X. and et.al. 2013). It also provides convenience to user and it can be accessible from anywhere at any time without any interruption. Along with several benefits, some drawbacks of using dial-up connection are lagging behind in speed, unstable dial-u connection, demands a phone line, and many time phone route engaged etc. While many time people who wanted security will always miss it.

Broad band connection:

In this WAN technique, connection speed much faster is up to 100 times than dial-up connection and it does not affect the phone line. Users can use same type of telephone line for both voice/fax and data transmission and they does not have to go through the process of dialling up and logging every time. It does not require to a dial an access number and charged based on the connection duration. Broad band provides high internet access with cheap phone services via VoIP technology (Carol, X. and et.al. 2013). The major drawbacks of using broad band connection are high monthly charges against dial-up connection, higher security connection and lack of availability in rural area.

Frame Relay:

High performance packet switched WAN protocol offers variety of services to user and organizations including reliable more secure connection and higher degree of reliability.

It operates at the physical and data link layer of OSI model and earlier it was designed originally for use across ISDN interfaces but now is using in other network interface also.

ADSL (Asymmetric Digital Subscriber Line:

It has unique features as compare to dial-up or ISDN such as faster downloads no needs for a second phone line, high-speed data transfers digitally and simultaneous transformation of data and voice in a quick manner. In this WAN technique, speed of data transfer depends on various factors including equipment used, cabling quality, and spectrum available and end system configuration can also influence its performance (Sheynblat, L., and Krasner, N. F., 2004). Security is an issue in data transfer process because permanent connection can easily hack by hackers.

ISDN (Integrated Services Digital Network:

It is a set of communication standards and used for instantaneous digital data transfer related to network like audio and video etc. Basic rate of data transfer is 64 Kbps and 128 Kbps available on demand. Generally it is use for network maintenance and video conferencing (with third party equipment). Some drawbacks of ISDN are more expensive, requires specialized digital devices, cannot make resources on network permanently and email delivery would be slightly more irregular etc.

Multiprotocol Layer Switching:

It is a traffic engineering mechanism was defined in the mid-90s to replace IP over ATM in the internet backbone. MPLS provides various advantages to organization regarding to improve quality of service and increase reliability of operations in an appropriate manner. It arranges between layer 2 and layer 3. Major benefits of the MPLS are improves packet forwarding, supports QoS and CoS, integrate IP and ATM in a network and builds interoperable networks in a proper way. An additional layer requires in establishing dedicated networks.
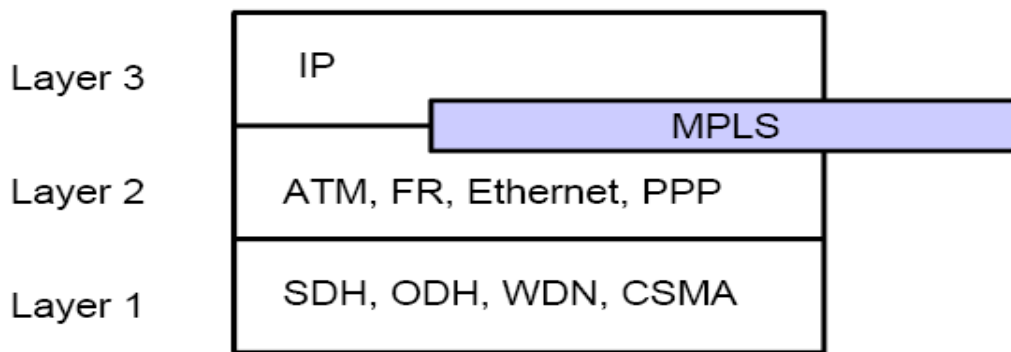
Figure 1: Multilayer switching

(Source: Sheynblat and Krasner, 2004)

Interior and exterior routing protocols

They are easy to configure and widely used. Strengths of protocols are supports IP and IPX require less CPU than OSPF and uses the delay, reliability, bandwidth and load of a link as it's metric to support a long list of optional features in the better manner.

Cable system:

It has several advantages like stability (more consistent service), bundling (save a quite bit of money) and fairly inexpensive etc. Along with the several benefits some issues also associated with it including annoying monopolies, confusing price package and privacy.

Modem:

Modem is most useful in connecting LAN with the Internet and its speed depends on cost. It converts Digital signals into Analog signal. However, its speed is slow as compare to hub and lack of traffic maintenance present in device.

3G, 4G and 5G:

- 3G is the successor of the 1G and 2G and expected speeds of it between 600Kbps to 1.4Mbps. It captures the largest coverage area and handles the majority of all data transfers for cellular service providers in an appropriate manner.
- 4G: It is currently in many major metropolitan areas and companies are trying continuously to expand its service in different area of counties. It provides several benefits to user such as multitasking, streaming video or playing games etc (Jason, B. and Thomas L., 2012).

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- 5G: The fifth generation of mobile communication technology and by using it user can simultaneously send and receive information from cell towers.

Table 1: Comparison between 3G and 4G

Technology	3G	4G
Design Began	1990	2000
services	Higher capacity data rates up to 2 Mbps	Higher capacity data rates up to 100 megabyte
Standards	WCDMA, CDMA	Single standard
Multiplexing	CDMA	OFDM
Core network	Packet network	Internet

1.2 WAN traffic intensive services

Quality of service can be measure with help of several parameters such as delay, delay variation, bandwidth (max data transfer rate) and packet loss rate etc. DSCP (Differentiated Service Code Point) marks packets entering the network with a certain class and Ingress Nodes can support complex functions and scalability of DiffServ is much better. However it does not keep per flow state information so difficulty raise to support end-to end QoS. IP precedence includes type of services in packet prioritization to create up to 8 priority levels.

Voice over IP is a group of technologies use for delivery of voice communication and multi-media sessions over IP. VoIP telephone calls are similar to traditional digital telephony and include digitization of the Analog voice signals and encoding techniques. The below figure displays the working of VoIP
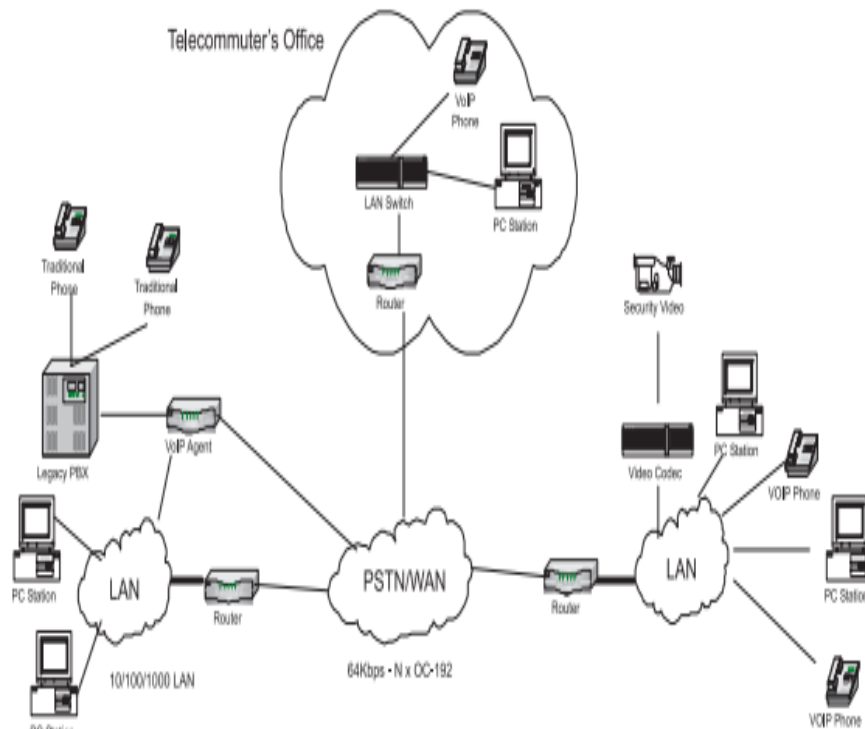
Figure 2: VoIP network

(Source: Morten ,2011)

TASK 2

1.3 and 1.4 WAN concerns and make recommendations to sustain network security issues

   Different WAN technologies can be used to overcome network security and reliability issues that are described as follows:

MD5: It is a widely used cryptographic hash function and it provides some assurance that a transferred file and user can match checksum of downloaded file with already existing files. As well as it also provides error check-sum functionality and assists user to recognize a corrupt or incomplete download more likely when downloading large file. In MD process input message is broken up into chunks of 512-bit block and commonly it used to check the integrity of files. MD5 is widely used to store passwords. In digital signature it is used for providing guarantee consistency on transaction. The algorithm working as describes as follows:
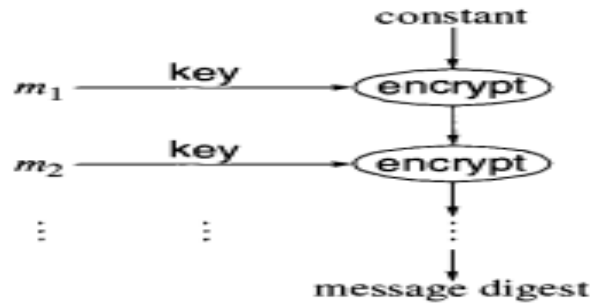
Figure 3: MD5 Algorithm

(Source: Jason and Thomas, 2012)

The transaction process starts when sender creates input message (M) and computes it with message digests (sMD). On the other side receiver gets the message (M-esMD) and extracts encrypted message digest (esMD). Further receiver computes own message digest (rMD) with received message (M). Message was not modified during the data transmission, when both message digests are equal.

Broadcast reduction system is a logical domain of computer network which is use in noise reduction. By using broadcast each node are connecting with each other at data linked layer.

Filters are Analog circuits which perform signal processing functions and commonly it is used in removing unwanted frequency components from the signal. Different types of digital filters can use by organizations such as active, passive, high pass, liner and non-linear etc.

Firewall is a network security system that is monitoring over incoming and outgoing messages. It is working as a software solution and as a hardware appliance. Firewall protects computer or network from unauthorized users by acting as a gate through which all data must pass. System performance can also affect by it because it verify every packets and lot of time is taken in verification process.

Access control lists can be used to assign permission to non-existent nodes and stores permission safely separately from the content in an appropriate manner.

VPN tunnels allow remote clients to tunnel into our network that the underlying network does not support or provide directly. It enables one network to send its data via other network connections. It can be used to carry the packets that actually provide the service not normally provided by the network. Major drawbacks of tunnels are that they are not easily moved (Jason and Thomas, 2012).

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