18CSS202J – COMPUTER COMMUNICATIONS

Project Report – Network Design for School

Under the guidance of

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(Under Section 3 of UGC Act, 1956)

BONAFIDE CERTIFICATE

Certified that this project report titled “Network Design for School” is the bonafide work of [“Haripreeth Dwarakanath Avarur”, “Shruthi Kannan”, “Gajullapalli Naga Vyshnavi”, “Aryan Sinha”], who carried out the project work under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form any otherproject report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

SIGNATURE

Professor
Dept. of Computer Science & Engineering

Signature of the Internal

Examiner

SIGNATURE

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ABSTRACT

Designing a network architecture has always been a challenging topic and an active research area. The network has to be analyzed for it to be consistent and reliable. The network design proposal is made to accommodate the requirements for school network design. The project is focused on WLANs andassociated wireless technology. Hence, further to wireless technology, the guide also delves into security issues. The network and devices provided by the management have firewall and security software installed in it. The hardware and tools used for theproject are Router, Switch, Desktop, Broadband MODEM / Wireless Router, Ethernet cable, Cisco Packet Tracer to create a prototype for the proposal.

This project will result in understanding how an organization operates its network architecture, how it administers and maintains the security of the network and what are the challenges faced while architecting the network. A prototype was built whichsimulates the build and function of the network using virtual tools.

This project is to design a suitable network system for schools in developing countries. The aim was to design a network with high security and low cost. This project will help to enhanced education of developing countries. The advantages of networking can be seen clearly in terms of efficiency, security, manageability and cost as it allows collaboration between users in a wide area. To improve college campus network design, the technology used was creating LAN, WLAN and using cheap device to reduce cost of the network. But the network can also become better using routing protocols and other protocol. So, we are going to use such protocols using less number of devices and will also maintain the cost of the network less. To design such network, we are going to use software Cisco-Packet Tracer.

ABBREVIATIONS

WLAN-Wireless Local Area Network

IP- Internet Protocol

PC- Personal Computer

OSI - Open Systems Interconnection

ADSL- asymmetric digital subscriber line

WAP- Wireless Access Point

INTRODUCTION

Networking is referred as connecting computers electronically for the purpose of sharing information. Resources such as a file, applications, printers & software are some common information shared in a networking. The advantages of networking can be seen clearly in terms of security, efficiency, manageability & and cost effectiveness as in allows collaboration between users in a wide range. The Switches and Router this device that play an important role in data transfer from one place to another using different technology such as a radio waves & wire.

LITERATURE SURVEY

WIRELESS NETWORK

Admin telecommunications networks are normally introduced and administered using radio communication. This exercise takes place at the physical level of OSI (layer)

The first technical wireless network was established under the brand ALOHAnet at the University of Hawaii in 1969 and became operational in June 1971. The first commercial wireless network was the WaveLAN family of products developed by NCR in 1986.

ROUTERS

The concept of an Interface computer was first proposed by Donald Davies for the NPL network in 1966. The same idea was conceived by Wesley Clark the following year for use in the ARPANET. Named Interface Message Processors (IMPs), these computers had fundamentally the same functionality as a router does today. The idea for a router (called gateways at the time) initially came about through an international group of computer networking researchers called the International Networking Working Group (INWG). Set up in 1972 as an informal group to consider the technical issues involved in connecting different networks, it became a subcommittee of the International Federation for Information Processing later that year. These gateway devices were different from most previous packet switching schemes in two ways. First, they connected dissimilar kinds of networks, such as serial lines and local area networks. Second, they were connectionless devices, which had no role in assuring that traffic was delivered reliably, leaving that entirely to the hosts. This particular idea, the end-to-end principle, had been previously pioneered in the CYCLADES network.

SWITCH

A network switch is a multiport network bridge that uses MAC addresses to forward data at the data link layer (layer 2) of the OSI model. Some switches can also forward data at the network layer (layer 3) by additionally incorporating routing functionality. Such switches are commonly known as layer-3 switches or multilayer switches.

Switches for Ethernet are the most common form of network switch. The first Ethernet switch was introduced by Kalpana in 1990. Switches also exist for other types of networks including Fibre Channel, Asynchronous Transfer Mode, and InfiniBand.

ADSL

ADSL was specifically designed to exploit the one-way nature of most multimedia communication in which large amounts of information flow toward the user and only a small amount of interactive control information is returned. Several experiments with ADSL to real users began in 1996. In 1998, wide-scale installations began in several parts of the U.S. In 2000 and beyond, ADSL and other forms of DSL are expected to become generally available in urban areas. With ADSL (and other forms of DSL), telephone companies are competing with cable companies and their cable modem services.

Ethernet

Ethernet was developed at Xerox PARC between 1973 and 1974. It was inspired by ALOHAnet, which Robert Metcalfe had studied as part of his PhD dissertation. The idea was first documented in a memo that Metcalfe wrote on May 22, 1973, where he named it after the luminiferous aether once postulated to exist as an "omnipresent, completely-passive medium for the propagation of electromagnetic waves." In 1975, Xerox filed a patent application listing Metcalfe, David Boggs, Chuck Thacker, and Butler Lampson as inventors. In 1976, after the system was deployed at PARC, Metcalfe and Boggs published a seminal paper. Yogen Dalal, Ron Crane, Bob Garner, and Roy Ogus facilitated the upgrade from the original 2.94 Mbit/s protocol to the 10 Mbit/s protocol, which was released to the market in 1980.

AccessPoint

A wireless access point (WAP), or Access Point (AP), is a networking device that allows other Wi-Fi devices to connect to a wired network. The WAP connects to a router through a wired network\ as a standalone device, but it can also be an integral component of the router itself. A WAP is differentiated from a hotspot which is a physical location where Wi-Fi access is available.

PROJECT SCOPE

Routers at a distance can't be contacted with efficiency. In this problem, we have 3 users one with a laptop and one with a pc at home, and we have to design a wireless network that can remotely be accessed from the office. All users have a high speed internet connection and a serial port printer is available for printing.

OBJECTIVE

The Service Ready Architecture for Schools is a well-designed and validated network architecture that is flexible, adaptive, and cost effective to support a wide range of educational services. This architecture provides the ability to deliver all of the services required of an enhanced learning environment, as well as the ability to collaborate with other schools, district headquarters, and entities beyond the district. At the heart of the architecture is a robust routing and switching network. Operating on top of this network are all the services used within the school district, such as safety and security systems, voice communications, video surveillance, etc. The architecture has been designed around both school operations and technical considerations.

NETWORKING REQUIREMENTS

- The hotel has 15 floors with 10 rooms in each floor
- The hotel has a lobby area.
- The hotel has a swimming pool area.
- ADSL Internet is available for the school.
- All the rooms should have computers installed.
- The computers in all the rooms should have internet connection.
- The swimming pool area and lobby should have wireless internet access.
- The rooms should have free internet access.
- The computers should have appropriate security software installed.
- The school staff and the guests should be on different networks.

REQUIREMENT ANALYSIS

The school support 10 computers in each floor and the hotel has a total of 15 floors. The school has 15 staffs in the school management so 15 desktop computers would be required for management department. So, 165 desktop computers would be required. All the computers should have an antivirus software to secure all the computers. The guest computers will be connected to the Primary Router whereas the staff computers will be connected to Staff Router in order to provide different network for guests and staffs. So, we require a total of 2 routers.

To connect those computers with internet connection will need one switch for each floor. All switches are linked to the primary router so we need 15 Switches in total for the guest computers and we require two more switches, one to connect all the staff computers to Staff Router and one to connect the Wireless Repeater to ADSL. So, 17 switches would be required.

The Lobby area will be supported with wireless internet facility. To have a better bandwidth we'll repeat the signal of the wireless access point from primary router by wireless repeater. All the wireless connection supported with WAP/WAP2PSK protection to be secure.

MODULES

- High availability:

The high availability technologies used in the Service Ready Architecture for Schools allow network equipment to eliminate the effects of any unplanned link or network failures by understanding the typology of the infrastructure and using that information to immediately re-route network traffic without the need to re-learn (reconverge) the network. The use of this technology allows critical services such as voice and video communications to remain unaffected by network outages.

- Single-fabric multi-service:

This technology gives the network administrator the ability to have many different services or networks share the same infrastructure, yet maintain logically separate networks. As multiple services operate over a single infrastructure, it becomes important to manage traffic based on the service being utilized. In the education environment this is particularly important as schools struggle with allowing student access to the same network used for grading systems, safety and security, and phone conversations.

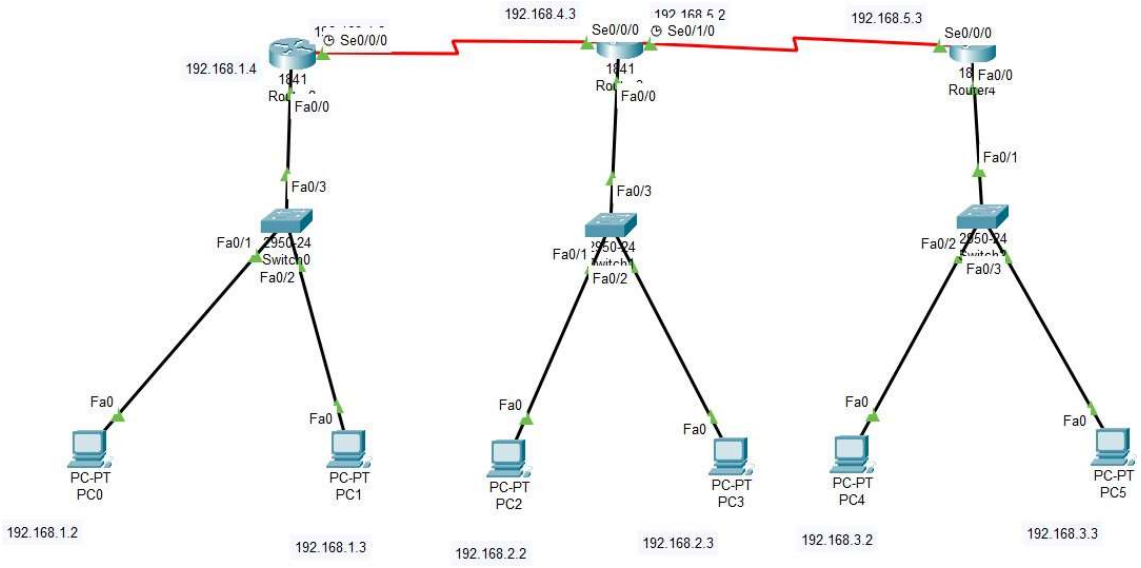
- Differentiated services:

Certain network services demand more from the network than others. For example, voice communications do not work if parts of the conversation drop out. Video conferencing is not useful if the picture keeps freezing. Additionally, a teacher's use of the network to enter grades should take precedence over a student surfing the Web. Finally, if there are more traffic demands than the network can handle, the network should be able decide which traffic is most important. The ability to understand, mark, shape, and limit traffic is embedded into the Service Ready Architecture for Schools.

- Access layer flexibility:

Employing a hybrid access layer design allows the network administrator to leverage an existing Layer 2 network while giving them the flexibility to implement a routed access layer. Moving the Layer 2/Layer 3 demarcation point to the access switch allows the network administrator to prevent loops without requiring multiple complex Layer 2 technologies, such as spanning tree protocol. Additionally, it provides high availability and eases network troubleshooting and management by leveraging well known Layer-3 troubleshooting tools and technologies.

SCREENSHOT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PC5
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INFERENCE

This project has proven that a standard network system can be designed with lower costs. Although we used the cheapest devices in designing the network, the security of this network turned out to be very strong. This is because the firewall and backup devices used in this network are of good quality. All networks need many servers for doing their work. These servers help the network to perform their functions in a smooth way. It can be seen in this research that various costs were minimized in order to maximize the quality of the designed network.

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CONCLUSION

- Star topology provides a central hub from which all other connections are derived
- Faults in the network can be located and fixed easily
- Top-down approach handles user requirements at all levels
- Total Cost is $224.61
- The described network aims to provide an optimal, scalable and maintainable

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