STRUCTURED CABLING NETWORK CONNECTION OF ISPSC

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INTRODUCTION

Project Context

The 20th Century is the year of the digital age. Business practices are driving changes in enterprise networks. The transition from an industrial to an information economy has changed employee's way of doing their jobs, and the emergence of a global economy of unprecedented competitiveness has accelerated the speed in which companies must adapt to technological changes.

Alcpan and Basar (2010) stated that communications, commerce and entertainment are all based on the network systems in one way or another. Computer networks became a necessity in every business. From large global corporations to small businesses, even homes already had their own personal networks. Personal computers, workstations, servers, tablets, laptops and cell phones all require network to communicate with one another.

Information and Communication Technology (ICT), which is the merger of telecommunication and computing, is the major enabling factor. However, rich communication is unlimited to human interaction. Technology is increasingly used to automate many tasks. In addition, Stansberry (2009) stated that most data centers today are interested in automation which help them automate menial processes. However, with the advancement of technology particularly in network, there are threats like data theft, eavesdropping, DoS attacks etc. Secured and proper network infrastructure

is a must for enterprise networks. Securing your servers and workstations with end point protections are not enough especially if your network is exposed to the internet. Network security is a complicated subject, historically only tackled by well-trained and experienced experts. However as more and more people become "wired", an increasing number of people need to understand the basics of security in a networked world. Today, layer 3 network security, Unified Treat Management (UTM), Network Address Translation (NAT) etc must be observed for a proper and secure network.

Last April 2011, Sony Corporation was attacked through their online service Playstation Network. The service has 77 million registered users which the network holds personal records of every user registered. According to Sony, the estimated range of $20 million in lost revenues for closing its network to $24 billion for the full costs of dealing with the consequences of losing control of customer data. But according to Ponemon Institute, the estimated cost per person for data breach is $318. That means the potential costs of the Playstation Network breach could be more than $24 billion.

Same thing also happened to Zappos Corporation. Customers' names, e-mail addresses, billing and shipping addresses, phone numbers, last four digits of credit card numbers and scrambled passwords may have been illegally accessed. In this regard, the company was forced to reset all passwords for all 24 million customers of Zappos. However, according to Zappos CEO Tony Hsieh, critical credit card data and other payment data was not affected or accessed.

Network breaches are also observed in the Philippines. Philippine government websites had been the primary suspects of web attacks. Last May 2011, the website of the Bureau of Customs was hacked. Another hacking happened last June 2011. This time it is the website of the Vice President of the Philippines by a group called PrivateX at the same month, it also happened with the website of WWF Philippines. Philippine Nuclear Research Institute, Food and Drug Administration were also hacked by a group called Philker. All sites listed were all Government websites. According to the article posted at charmainespeaksup.blogspot.com (2012), PrivateX attack websites particularly government sites due weakness in terms of network security. Network security is critical not only on corporations but also on local government units. Many confidential files and records shouldn't be altered and kept from the public. Proper infrastructure should be implemented to avoid security breaches and to maintain the network easily.

The intention of this study is to organize the computer network of Internet Center, eClassroom Laboratory, Radyo Kailian and the President's Building by maximizing the tools of technology such as structured networking cabling. There is a saying that "Prevention is Better than Cure". This structured network solves unstructured network in the aforementioned areas and as this study, the proponents deemed significance to contribute though their humble capabilities towards the betterment of the goal of ICS and ISPSC Innovation and Public Service through Information Technology.

Purpose and Description

The purpose of this study is to design and establish a structured computer network for the eClassroom, Internet Center, Radyo Kailian and President's Office of ISPSC. The following will be benefitted from this study:

Institution. This study serves as a reference to enhance the current network connectivity of the concerned areas of establishment.

Faculty, Staff, and Students. It helps them to manage a successful and convenient network that do not interlude in the areas of establishment, it is very useful to the entire students and the others to have a faster and consistent connectivity.

Researchers and future researchers. The study would benefit the researchers through the installation of wired network. This will enhance their skills in calibrating in making structured network connections in the different offices of ISPSC. This serves also as their basis to conduct and enhance the results of this research work.

Objectives of the Project

The study aimed to design and establish a structured computer network for the eClassroom, Internet Center and President's Building of Ilocos Sur Polytechnic State College, Sta. Maria, Ilocos Sur.

Specifically, it sought to address the following:

1. determine the current status of the computer network in the eClassroom, Internet Center and President's Building.
2. design and establish a structured computer network for the eClassroom, Internet Center and President's Building of ISPSC.
3. test the established structured computer network for the eClassroom, Internet Center and President's Building by using latency test.

Scope and Limitation

The project focuses in the design and establishment of a structured computer network for the eClassroom, Internet Center and President's Building of ISPSC. The researchers established a structured wired network for the Internet Center, eClassroom Laboratory and the President's building that will gain internet access from the Server Room or Tech Room.

The project will not cover the configuration of structured network in other offices of ISPSC but can be considered by future researchers for further improvement.

Chapter II

REVIEW OF LITERATURE

As mentioned from the study of Andrea (2015) an infrastructure-based network consists of fixed base stations while communications take place using technique handoff. It connects with new base station and start communication when mobile goes out of range of one base station. Advantages over Ad-hoc networks. (a) Efficiently utilize network resources. (b) single-hop routes, results in: -lower delay and loss and higher data rates Examples: Wireless LANs, paging systems, and cellular phone systems. Base station coordination in infrastructure-based networks provides a centralized control mechanism for transmission scheduling, dynamic resource allocation, power control, and handoff. As such, it can more efficiently utilize network resources to meet the performance requirements of individual users.

Tse *et al.* (2004) most networks with infrastructure are designed so that mobile terminals transmit directly to a base station, with no multihop routing through intermediate wireless nodes. In general, these single-hop routes have lower delay and loss, higher data rates, and more flexibility than multihop routes. For these reasons, the performance of infrastructure-based wireless networks tends to be much better than in networks without infrastructure.

According to Ioan (2002), rapid development in information and communication technology (ICT) over the past few years has made computer networking very important. On the other hand, service providers need to look at architectures that give them better monitoring and control the traffic in the network to ensure the performance is optimal with minimal increase in network resources. One of the many protocols that serve the end users is the Internet Protocol version 4 (IPv4) addressing scheme. However, with the tremendous growth of the internet, the current address provided by IPv4 has proven to be insufficient and inadequate. This has led to the evolution of IPv6. While Carmes (2002) mentioned that the performance of the network and parts of networks can be affected by errors such as jitter, datagram or packet loss, latency, poor transfer rates and bandwidth quality. Data compression, encryption and other means of traffic engineering are some of the approaches that can be done to improve network performance.

According to Figure 1 presented below, Internet usage has increased by 480.4% during the period 2000-2011.The table below was taken from the World internet usage and population statistics website, illustrating the population of internet users and the growth from major world regions.

WORLD INTERNET USAGE AND POPULATION STATISTICS

March 31, 2011

World Regions	Population (2011 Est.)	Internet Users Dec. 31, 2000	Internet Users Latest Data	Penetration (% population)	Growth 2000-2011	Users % of Table
Africa	1,037,524,058	4,514,400	**118,609,620**	11.4 %	2,527.4 %	5.7 %
Asia	3,879,740,877	114,304,000	**922,329,554**	23.8 %	706.9 %	44.0 %
Europe	816,426,346	105,096,093	**476,213,935**	58.3 %	353.1 %	22.7 %
Middle East	216,258,843	3,284,800	**68,553,666**	31.7 %	1,987.0 %	3.3 %
North America	347,394,870	108,096,800	**272,066,000**	78.3 %	151.7 %	13.0 %
Latin America/Caribbean	597,283,165	18,068,919	**215,939,400**	36.2 %	1,037.4 %	10.3 %
Oceania / Australia	35,426,995	7,620,480	**21,293,830**	60.1 %	179.4 %	1.0 %
WORLD TOTAL	**6,930,055,154**	**360,985,492**	**2,095,006,005**	**30.2 %**	**480.4 %**	**100.0 %**

Table 1.1: World Internet Users and Population Statistics (Miniwatts Marketing Group, 2011).

Figure 1. World Internet Usage

The increased use of social networking sites on the Internet, and the growing services of the internet, including the demands and requirements for the use of multimedia applications, needs higher communication speed. To address this issue, hardware developers have increased the speed of hardware such as processors, switches and routers. Developers have also increased the speed of infrastructure backbones such as the capacity of the cables used, however the maximum amount of data that can be transferred via these media remain untouched and unchanged. Hsiao *et al.* (2009) stated that, "the CPU workload is heavy and the processing of network protocol task is the bottleneck". There is an issue with the existing Internet Protocol version, IPv4, which is running out of IP addresses; this issue has been

addressed by the development and the introduction of the Next Generation Internet Protocol (NGIP) also known as Internet Protocol version 6. In the computer networking arena, the maximum number of data that can be transferred over the network can be defined, this is known as MTU. This can be done via the network interface 3card (NIC). However, the MTU that can be transferred from source to destination remains unchanged.

Almost everything is now available over internet. In this age of advancement of technologies, you can pay your bills online and purchase various items by going through various websites and choosing among a variety of options. People use the internet for social networking websites which is very common nowadays and etc. That is why internet connection is very important, but setting up a computer network in a business, home or school often required running many cables through walls and ceilings in order to deliver network access to all of the network-enabled devices in the building so the internet access range is very limited.

Network Planning is concerned with the cost-effective deployment of a communication infrastructure to provide adequate coverage, throughput, and quality for end user services. In this project, Wireless networking can prove to be very useful in public places- libraries, guest houses, hotels, cafeterias, and schools are all places where one might find wireless access to the internet. From a financial point of view, this is beneficial to both the provider and the client. The provider would offer the service for a charge- probably on a pay per use system, and the client would be able to take

advantage of this service in a convenient location; away from the office or home.

Networks (Wired and Wireless) have grown like weed over the past few decades providing a pace to the means of accessing network resources. Therefore, it is vital to have an accurate and a reliable generic platform to enable network. The wired Networks provide a secure and faster means of connectivity. The performance of the wired Ethernet is very sensitive to the number of users, offered load, transmission links while wireless is also very sensitive to the number of users, offered load as well as physical characteristics, data rate, packet size and so on. We can compare wired and wireless networks in the area of installation, cost, reliability, performance, security, mobility. As networks are being upgraded from scratch all over the word, network planning is becoming most important. Computing the viability and performance of networks in real can be very expensive and painstaking task. To ease and comfort the process of estimating and predicting a network technique is widely used and put into practice. A variety of simulation tools like Qualnet, NS2, Netsim and OPNET are available for the purpose of modelling and simulation but the choice of a simulator depends upon the features available and requirements of network application. Among the various network simulators OPNET provides the industry's leading environment for network modelling and simulation. It allows to design and study communication networks, devices, protocols, and applications with flexibility and scalability. It provides object-oriented modelling approach and

graphical editors that mirror the structure of actual networks and network components. The analysis helped to estimate and optimize the performance of wired and wireless networks using proposed optimization techniques Bansal *et al.* (2010).

Wired local area networks include several technologies like Ethernet, token ring, token bus, Fibre distributed data interface and asynchronous transfer mode local area networks (Din, 2009). Standardized in IEEE 802.3, Ethernet has largely replaced competing wired LAN technologies. The Ethernet is a working example of the more general Carrier Sense, Multiple Access with Collision Detect (CSMA/CD) local area network technology. The Ethernet is a multiple-access network, meaning that a set of nodes sends and receives frames over a shared link. When the two devices transmit at the same time the collision can occur. This collision generates a jam signal that causes all nodes on the segment to stop sending data, which informs all the devices that a collision has occurred. The –carrier sensel in CSMA/CD means that all the nodes can distinguish between an idle and a busy link. The –collision detectl means that a node listens as it transmits and can therefore detect when a frame it is transmitting has interfered (collided) with a frame transmitted by another node. The Ethernet is said to be a 1 - persistent protocol because an adaptor with a frame to send transmits with probability 1 whenever a busy line goes idle.

Software Development/Network Model or Paradigm

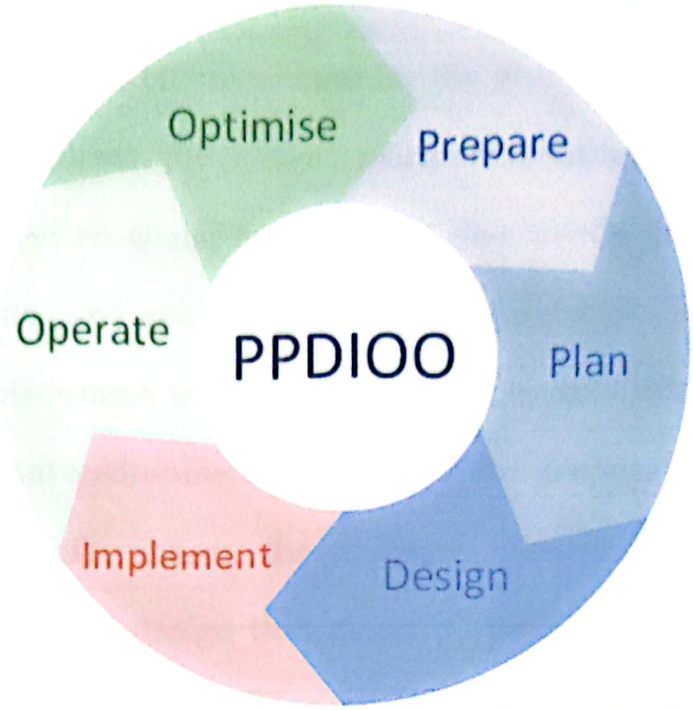

Figure 1. The PPDIOO Network Model

This chapter provides techniques in analyzing a customer's technical goals for a new network design or network upgrade. Analyzing the customer's technical goal can help the proponents confidently recommend the proper technologies that will be used in the computer network.

The study was conducted at Institute of Computing Studies, ISPSC - Santa Maria Campus. This capstone project utilized the PPDIOO Approach. The researchers used the PPDIOO Approach as their network Life Cycle model in order to process and design an appropriate network plan based on requirements that were gathered.

Prepare In this phase, the researchers established an organize requirements, developed a network strategy and proposed a high-level

conceptual architecture identifying technologies that can best support the architecture. They established also a financial justification for network strategy by assisting the technical case for the propose architecture.

Plan. In this phase, the network planners identified the initial network requirements based on goals, facilities and user needs. In here, it involves characterizing sites and assessing any existing networks and performing a gap analysis to determine whether the existing system infrastructure, sites and the operational environment can support the propose refinement.

Design. In this phase, the network designers must specify a comprehensive detailed design that meets current technical requirements, and incorporates specifications to support availability, reliability, security, scalability, and performance.

Implement. In this phase, after the design has been approved, the implementation of the propose design begins. The network is built or additional components are incorporated according to the design specifications, with the goal of integrating devices without disrupting the existing network or creating points of vulnerability.

Operate. Operation is the final test of the appropriateness of the design. The operational phase involves maintaining network health through day-to-day operations, including maintaining high availability and reducing expenses. The fault detection, correction, and performance monitoring that occur in daily operations provide the initial data for the optimization phase.

Optimize. The optimize phase is based on a proactive network management that identifies and resolves problems. In this, it may lead to a network redesign if too many problems may occur cause of design errors or as network performance bust over time of the actual usage and capabilities will turn off. Redesign can also be required when requirements change as expected.

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