IMPLEMENTATION OF MODERN NETWORK PROTOCOL, THE FUTURE OF THE INTERNET IN ISPSC STA. MARIA CAMPUS

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Chapter 1

INTRODUCTION

Background of the Study

The internet world has to go through a transition, but in this process, both protocols, IPv4 and IPv6 (Internet Protocol version 6), have to connect to each other. IPv4 network has grown far more than anyone had ever imagined when the protocol was designed. As technology is developing new services and Internet-enabled devices use more mobile connectivity (2G, 3G, and 4G), IPv4 is challenged with a series of problems, the most demanding one being address exhaustion. There are not enough IPs available from ISPs (Internet Service Provider) to meet the demand. The new IPv6 protocol is needed to satisfy the needs and features of improved scalability and routing, simplified header that makes forwarding packets more efficient, end-to-end connectivity because there is no need for NAT (Network Address Translation), ease-of-configuration because it supports stateful and stateless auto-configuration, and information is stored in the start of the header is useful for a router thus resulting in higher performance routing. The major flaw of IPv6 is that it is not compatible with IPv4, and to use the new protocol changes are required in software and every network device. The majority of network services and applications still use IPv4; therefore, it will not be replaced for a long time. So, the two network protocols will have to coexist (Wu, P., et al., 2012).

In this digital age, the internet has become a powerful tool for connecting people, information, ideas, resources, and services. It has become a driving force of the economy and has provided employment, transformed industries, improved infrastructure, and provided efficient communication among enterprises and individuals across the globe. With a slow Internet connection, citizens are less likely to

be motivated to participate in today's information society. In some countries, the essential role of this tool is well understood, and the right to broadband Internet access as a means of communication is spoken of as a fundamental right. When it comes to providing the nation with Internet access, the Philippines has been steadily catching up with other countries over the past few decades. The country established its first ever online connection on March 29, 1994. Such a milestone opened the doors for progress, allowing Filipinos to access all the information the Internet could offer. The Philippines was named the fastest-growing Internet population in the last five years with a growth of 531%, and its population is predicted to reach the 66 million mark this year. Likewise, the country has been known as the "texting capital of the world" and the "social media capital of the world" at various times over the last few years. The level of consumer engagement with mobile and technology has come to differentiate the country from other fast-growing peers in Asia (A Study on The Internet Connectivity in The Philippines Romeo Agan Salac, 2016).

The internet in the Philippines has been undergoing development since it was first made available in 1994. In that year, the Philippine Network Foundation (PHNet) connected the country and its people to Sprint in the United States via a 64 kbit/s link. More recently, the Philippines was named the fastest-growing Internet population in the last five years with a growth of 531% with regard to fixed (wired) and mobile broadband penetration. The number of Internet users in the country has reached 39.8 million in a population of 100 million populations, signifying Internet penetration of 39.8% by the end of 2014, and it is predicted to reach 66 million by this year. The Internet saw a 10% user growth in 2014. In 2013, the fixed broadband penetration of

the country was 2.6 per 100 inhabitants, ranking 110 out of 190 countries. This figure is almost four times that of the world's fixed broadband penetration of 9.4 per 100 inhabitants. On the other hand, the mobile broadband penetration was posted at 20.3 per 100 inhabitants, placing the country at a rank of 79 out of 138. This figure was closely similar to the world's mobile broadband penetration of 26.7 per 100 inhabitants. In terms of household broadband penetration, the country ranks at 57th among 160 countries surveyed with just 23 out of 100 homes having access to broadband Internet in 2013. In terms of Internet connection speed, the Philippines are among the countries with the slowest. In the 1st quarter of 2015, the average connection speed of South Korea, which ranks No. 1 in the world, was 23.6 Mbps, while the Philippines had an average connection speed of only 2.8 Mbps, 8 times lower than that of South Korea. South Korea's rise to prominence with respect to its Internet broadband is discussed in the literature review.

Conceptual Framework of the Study

This section explains the connections between the particular concepts that could be researched. An illustration of a phenomenon or a diagram, typically provided by a schematic representation using arrows and boxes, could be included with the conceptual framework, for instance.

The Conceptual Framework presents the input used by identifying the current internet protocol utilized in ISPSC. The process presents the Dual stack network address translation of ISPSC interfaces that can originate and understand both IPv4 and IPv6 while the output of the study is the assessed current.

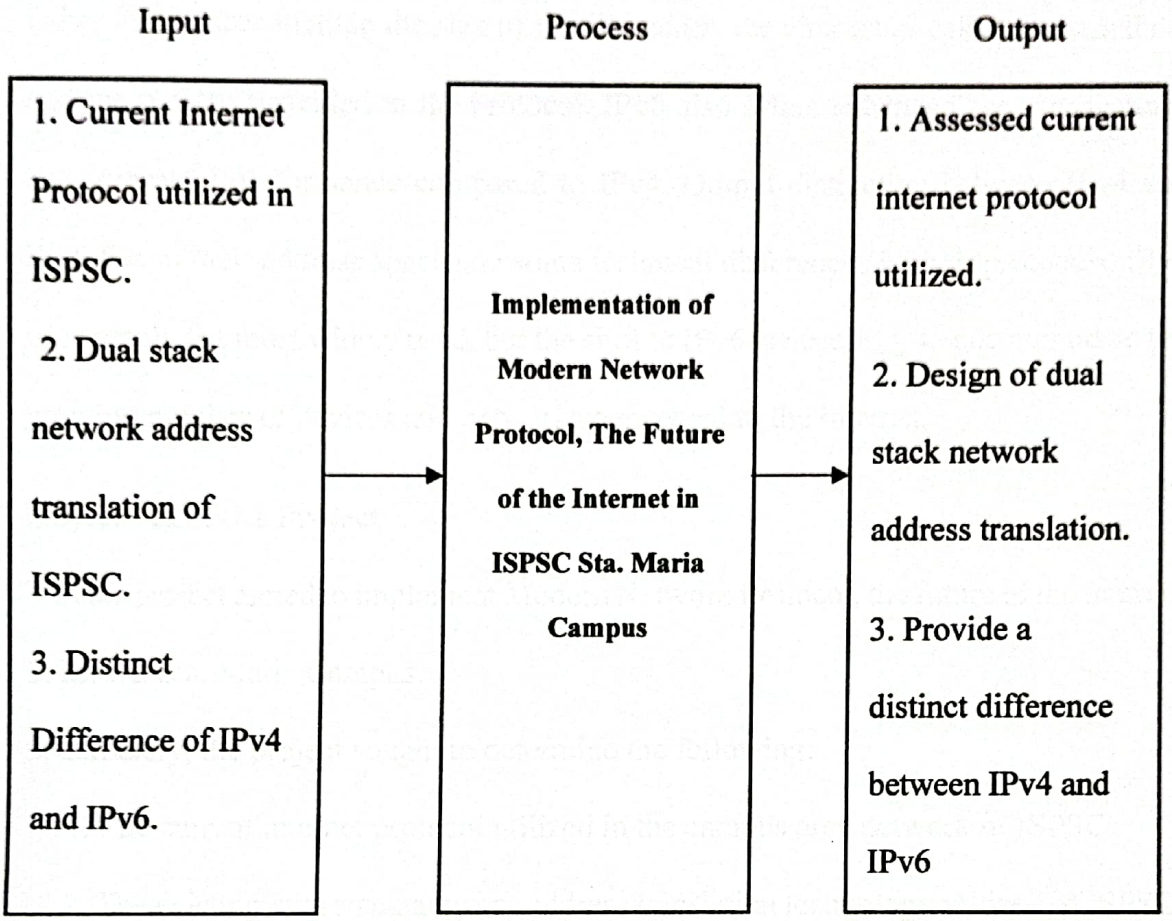

Figure 1. Conceptual Framework of the Study

The conceptual framework present the input The Internet Service Providers' Consortium (ISPSC) dual stack network address translation (NAT) refers to the deployment of both IPv4 and IPv6 in an ISP network. Dual stack refers to a network's simultaneous support for IPv4 and IPv6 addresses. A method for converting private IPv4 addresses to public addresses is network address translation (NAT). In the process of this modern Network Protocol, the future of the internet in ISPSC Santa Maria Campus, this IPv4 and IPv6 are two distinct versions of the Internet Protocol. While IPv4 is the older version, IPv6 is the newer and more advanced version. The main difference between the two is the addressing system. IPv4 uses 32-bit addresses, which can support roughly 4.3 billion unique addresses. On the other hand, IPv6 uses 128-bit addresses, providing an almost unlimited number of unique addresses (3.4 x 10^38).

Other differences include the size of the IP header, the checksum calculation method, and the options provided in the protocol. IPv6 also offers enhanced security features and improved performance compared to IPv4. Output distinction between IPv4 and IPv6 lies in their address space and some technical differences in their protocols. IPv4 is currently the most widely used, but the shift to IPv6 is necessary to accommodate the growing number of devices and networks connected to the internet.

Objectives of the Project

This project aimed to implement Modern Network Protocol, the future of the internet in ISPSC Sta. Maria Campus.

Specifically, the project sought to determine the following:

1. The current internet protocol utilized in the campus area network of ISPSC.
2. The existing dual stack network address translation technology utilized of ISPSC.
3. Distinct difference between both IPv4 and IPv6 transition mechanisms for the campus area network ISPSC

Scope and Limitations

The study was conducted at Ilocos Sur Polytechnic State College, Santa Maria Campus from the school year 2021-2022.

This capstone plans to show the significance of IPv4 and IPv6 key features and will only be limited to the implementation of the transition mechanism to ISPSC only.

The upgraded network internet protocol featured that the staff and students will be benefited from the connectivity of a network.

The Dual stack protocol could allow the staff to create a comparison between IPv4 and IPv6, the administrator can do speed testing through Iperf and experience fast network connectivity.

Importance of the Study

This study as perceived by the proponents is meaningful and significant for the following:

To **ISPSC and Internet Service Providers (ISP),** they will benefit from this study in a way that will guide them to improve their network infrastructure by utilizing the technologies which are relevant to the use of the latest network protocols.

To **ISP Network Administrators,** the plan helps them to have a better way of network communication in the implementation of their respective internet services.

The **Researchers,** this study will help them clearly understand in depth the value of adopting the new technologies relevant to the future of the internet such as network protocols like IPv6.

To **Future Researchers,** that will use this study as their reference for the conduct of similar studies and serves as a reference for their review of the literature.

Chapter 2

METHODOLOGY

Research Design

The researchers used a descriptive and experimental design to provide distinct required data in conducting the study. The data gathered in the study aimed to utilize the institution to provide a dual-stack network protocol. The developmental study design could provide a collate and contrast of two separated but randomized experiments and repeated observations of the same occurrences. Along with the use of an experimental study approach, the researchers also used a purposive sample technique where the staff of the MIS office can allow to operate and test the upgraded dual stack network to ensure stable network speed performance. The data were specifically collected from the respondents that simply express their experience and recommendation throughout the acceptability of implementing modern network protocol for ISPSC for having an analytical observation in terms of the smooth network connectivity of the staff and students.

Network Model

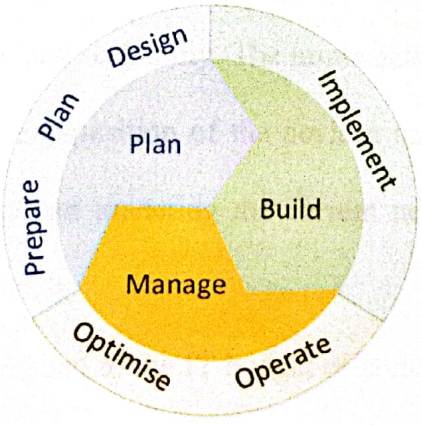

Figure 2. The PPDIOO Network Lifecycle Model

The figure above presents the Network Lifecycle Model used by the researchers as means of the methodology or procedures used in this study. Cisco Services Method Approach (Cisco, 2011) describes the function of each phase involved in the life cycle of PPDIOO. This research adopted the PPDIOO network development lifecycle model and the Cisco Top-Down Approach for the Design and Development of an IT Infrastructure which is necessary for the necessary methods to be applied in this capstone project.

The phases and activities are as follows:

Plan. This phase is mainly based on the study of a business that implements or modifies a network architecture design to consider network and development techniques as well as a new trend of technologies to ensure better network management and support. In addition, this phase takes the plan to be implemented for the development of the network; this plan includes the resources used, activities, time, and budget estimates concerning the project.

Build. The creation of a specific and complete design is important for reducing costs, delays, and conflicts in the implementation of the network. Such a design must be based on technical requirements and business goals, certifying a reliable, secure network, high performance, and scalability. The implementation or the network itself, is developed based on the composition of the devices according to the design, this should provide services without hindering the current network, without altering its availability or performance of it.

Manage. This phase is related to the IT budget of companies and the operation of the network regarding availability and functionality.

Project Plan

This table shows the time frame of the study and the process of doing the Implementation of Modern Network Protocol, the Future of the Internet in ISPSC Sta. Maria Campus.

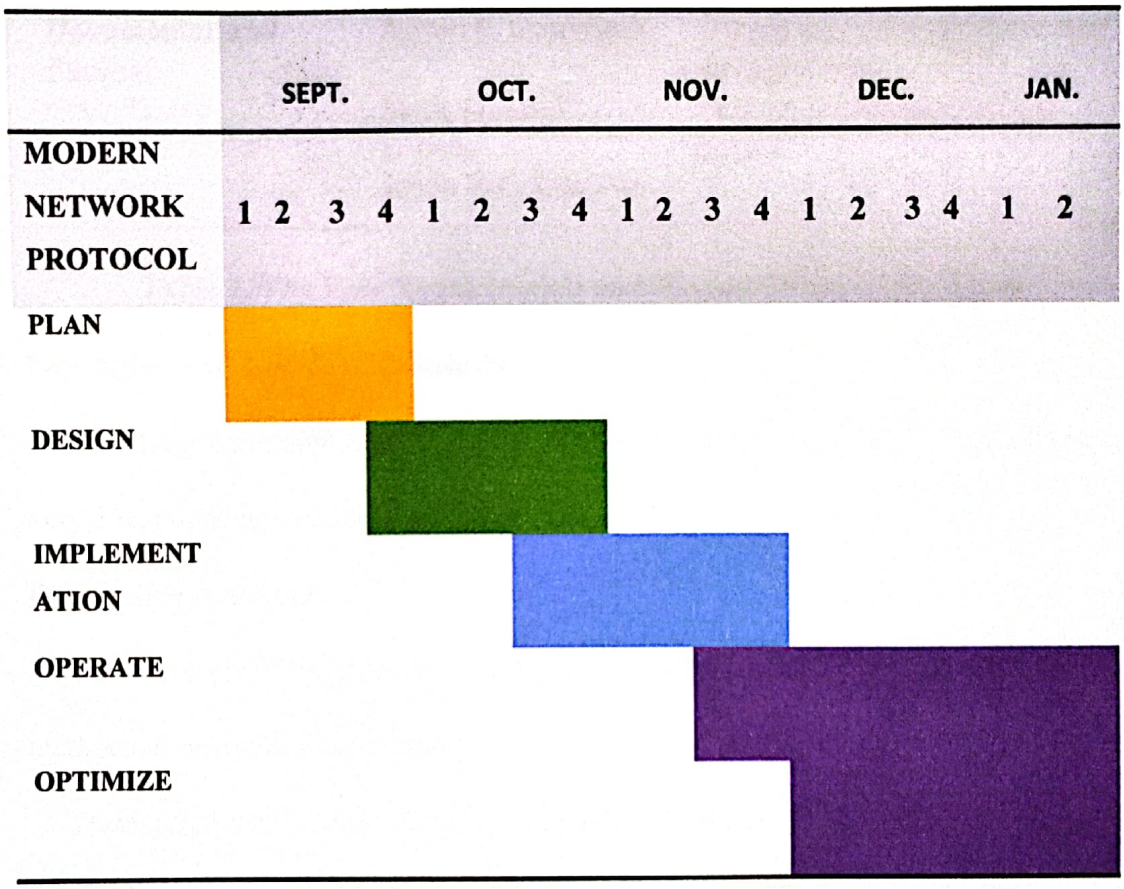

Table 1. The Project Schedule Gantt chart

Table 1 above shows the cycle of the methods and procedures that the researchers applied in this study.

Project Assignments

This table shows the roles and responsibilities in the proposed project. Showing the functions of each member.

Roles	Name	Functions
Project Manager	Jennifer J. Villalba	Lead Team, report status review of deliverables, and assure quality
Network Architect/ DevOps Architect	Mary Rose C. Viloria Alison S. Gorromeo	Framework Content
Documenter and Planner	Alison S. Gorromeo	Design the project performance management
QA / Tester	Mark Jayson C. Cabang Jonah fe C. Cachola	Test the performance of the project.

Table 2. The Role Requirements and Responsibility of the Team

Population and Locale of the Study

The study was conducted in ISPSC for the Academic Year 2022-2023. There are only 5 respondents of MIS Staff in this study.

Research Instruments

The researchers adopted the PPDIOO network lifecycle model for the essential methods to be applied in this study.

Throughout the first survey of the study which is the proposal of Dual Stack Internet Protocol in Ilocos Sur Polytechnic State College Sta. Maria Campus was used to determined the existing internet network protocol of the client. The final survey was conducted for the network profile of the client in September 2022 to January 2023.

Data Analysis

Table shown below is the result of collected data through questionnaires and interviews serve as a tool to provide accurate data. Data Analysis and interpretation was applied in objective number 3, and a test was used to compare the two internet protocol since this statistical method show the critical area of distribution in the two sided test

where a sample is greater than or less than a certain value provided from the results of the iperf experimental network test for the IPv4 and IPv6 protocols.

Point Value	Mean Range	Descriptive Rating	Descriptive Interpretation
5	5.21-4.00	Strongly Agree	Very Highly Acceptable
4	3.20-4.00	Agree	Highly Acceptable
3	2.1-4.00	Neither Agree	Moderately Acceptable
2	4.00	Disagree	Slightly Acceptable
1	4.00	Strongly Disagree	Not Acceptable

Table 3. Descriptive Interpretation on the Level of Acceptability

A scale from Not Acceptable to Very Highly Acceptable was used to rate the information that was gathered. In terms of interpretation, a mean score of 4.00 indicates a Strong Disagreement and is interpreted as Not Acceptable, 4.00 indicates a Disagreement and is interpreted as Slightly Acceptable, 2.1-4.00 indicates a lack of Agreement and is interpreted as Moderately Acceptable, 3.20-4.00 indicates Agreement and is interpreted as Highly Acceptable, and 5.21-4.00 indicates a Strong Agreement and is interpreted as Very Highly Acceptable.