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IMPLEMENTATION OF OPEN-SOURCE SOFTWARE IN THE COLLEGE OF COMPUTING STUDIES COMPUTER NETWORK LAB OF ISPSC STA. MARIA CAMPUS

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Chapter 1

INTRODUCTION

Background of the Study

The constant evolution of technology has necessitated the integration of open-source software in various domains, including educational institutions. The College of Computing Studies recognizes the importance of equipping students with hands-on skills and knowledge in computer networking. Traditional proprietary software can often present limitations, such as restricted access, high costs, and limited customization options. Open-source software, on the other hand, offers an alternative approach that aligns with collaboration, innovation, and accessibility.Implementing open-source software within the Computer Network Lab opens up a wide range of opportunities for students. They can explore cutting-edge technologies, experiment with different tools, and gain a deeper understanding of network configurations and protocols. Additionally, open-source software encourages active participation, allowing students to contribute to the` development of these tools and collaborate with the larger tech community.

Synopsys (n.d.) defines open source software (OSS) as software that is distributed with its source code, allowing it to be used, updated, and distributed with its original rights. Kushwaha (2023) used the term open source to refer to source code that is made available to the public to see, use, change, and distribute. It is typically created and maintained cooperatively by a user community. The paper by Wen (2017) presents a systematic literature review focused on software security in open source development. Despite the emphasis on building secure open-source software, the number of vulnerabilities found in such software is increasing. The author highlights

the importance of understanding existing security practices and weaknesses in order to address these issues. The study applies a sociotechnical analysis approach to identify and analyze security studies conducted in the context of open source development. The findings reveal that system verification is the most frequently researched security area in open source software. However, the sociotechnical perspective has not received much attention in this research area. Furthermore, no research has been conducted specifically focusing on security knowledge management in open source development.

Network performance is a common issue that may be encountered from time to time. There are several tools available for testing the performance of a network, and one such tool is iPerf3. This tool is compatible with Windows, Linux, and Unix operating systems (Jangid, n.d.).

In the classroom, the implementation of open-source software in the College of Computing Studies Computer Network Lab offers an opportunity to enhance the learning experience and provide students with a comprehensive understanding of computer networking. By embracing open-source solutions, the college can empower students to gain proficiency in industry-relevant tools, foster collaboration, and encourage innovation within the field of computer networks.

In the process of setting up the OSS Network Lab, the department had specific requirements, including a Desktop server, a desktop client, a cable cutter, an RJ45 Modem, a router with a high-speed internet connection, and one or more switches to facilitate internal networking. To begin the installation, iPerf3 was prioritized. The process involved using the sudo apt update command to replace the apt package deal administrator's desk with programs that could be installed or upgraded, followed by

sudo apt-get install iPerf3 to install iPerf3. Thus, this study aimed to implement open-source software (OSS) at the Ilocos Sur Polytechnic State College, Sta. Maria Campus, College of Computing Studies. The focus was on enabling users to operate the software, Transfer File, for efficient management of network clients on the client server. Sharing files with others, whether they are friends, family members, collaborators, or clients, is a common need in various situations.

The implementation of Transfer File aimed to make the work of CCS students faster, more consistent, and not reliant on proprietary software, thus emphasizing the value and defense of freedom in software usage. The implementation of open-source software in ISPSC Sta. Maria was developed to simplify and enhance the daily use of computers, high-speed internet connections, and network management.Ilocos Sur Polytechnic State College has hoped to benefit from this study by gaining guidance on improving the utilization and implementation of software specifically for computer networks.

Conceptual Framework of the Study

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

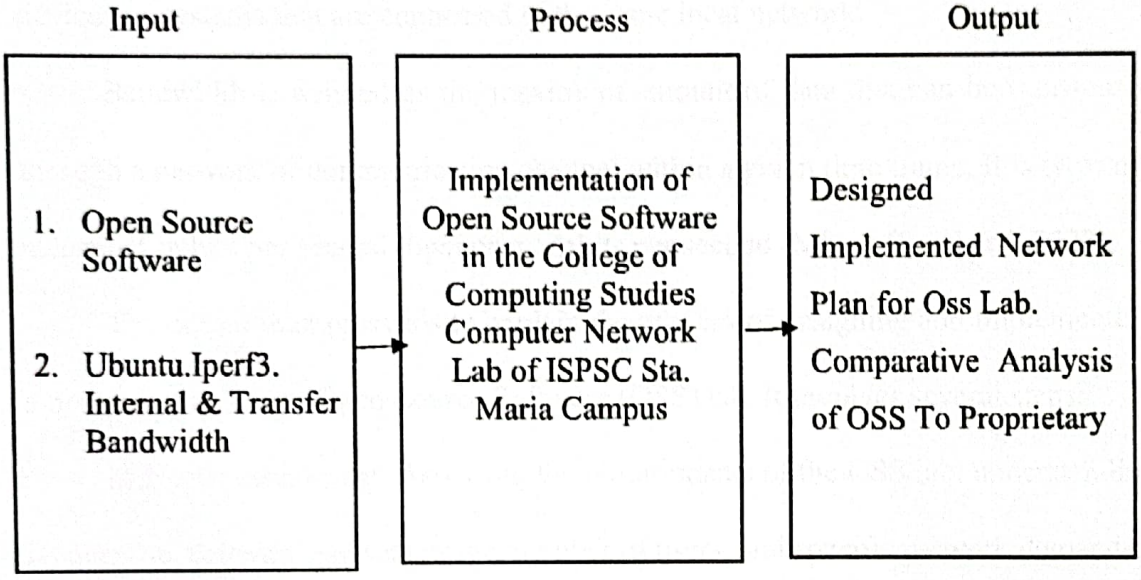

Figure 1. The Conceptual Framework of the study

The Figure 1 illustrates the conceptual framework of the study. Open-source software refers to computer software that is released with its source code, allowing users to freely view, modify, and distribute the code. This accessibility enables anyone to access, study, and modify the software according to their needs.

In the context, Ubuntu, a popular Linux-based operating system, is mentioned. It is an open-source software distribution that is designed to be user-friendly and accessible to a wide range of users. Ubuntu offers an alternative to proprietary operating systems like Windows and macOS (Rouse, 2017).

Another tool mentioned is iPerf3, which is a command-line tool used for network performance measurement. It enables users to analyze network bandwidth,

throughput, and latency by generating network traffic between two endpoints. iPerf3 is commonly used for testing network performance, identifying bottlenecks, troubleshooting network issues, and optimizing network configurations.

Hulen et al. (2002) state that the term "internal transfer" refers to the transfer of data within the same network or system. It involves moving data between different devices or systems that are connected to the same local network.

Bandwidth is defined as the maximum amount of data that can be transmitted through a network or communication channel within a given time frame. It is typically measured in bits per second (bps) or megabits per second (Mbps) (Lamberti, 2023).

The output then proceeds to explain the process of designing and implementing a network plan for an Open Source Software (OSS) lab. It involves several steps:

a) Needs assessment: Assessing the requirements of the OSS lab, understanding its purpose, software and tool usage, number of users, and specific network demands.

b) Network topology: Designing the network topology based on the needs assessment, including the layout of devices like servers, switches, routers, and firewalls, and planning the connections between them.

c) IP addressing and subnetting: Planning IP addressing and subnetting by assigning unique IP addresses to devices and dividing the network into subnets for efficient management and security.

d) Security measures: Implementing security measures such as firewalls, intrusion detection systems, and access controls to protect the lab's resources and data.

e) Network protocols and services: Selecting appropriate network protocols and services, including TCP/IP, DHCP for dynamic IP address assignment, DNS for domain name resolution, and others, to facilitate efficient communication within the lab.

f) Network equipment selection: Choosing suitable network equipment, considering factors like scalability, performance, compatibility with OSS, and budget.

g) Implementation and configuration: Connecting and configuring the network devices according to the design, which may involve tasks like setting up VLANs, configuring routing protocols, and securing network access.

h) Testing and optimization: Conducting thorough testing to ensure the network functions as intended, addressing any issues or performance bottlenecks, and applying optimization techniques to enhance network performance.

i) Documentation and maintenance: Compiling the network plan, including diagrams, configurations, and relevant documentation. Performing ongoing maintenance and periodic updates to ensure network security and keep it up to date.

The output also mentions the comparative analysis of open-source software and proprietary software. Key points to consider in such an analysis include licensing models, costs, customization and flexibility options, and security and reliability approaches.

To ensure that the content is not plagiarized, it is important to properly cite the sources of information used in the study and follow appropriate referencing guidelines.

Objectives of the Study

The main objective of this capstone project is to provide a working laboratory using Open-Source Software. The objective specifics of the study are to with:

1. Identify the key requirements in setting up CCS Network lab.
2. Conduct a comparative analysis of Open-source Software and Proprietary Software.

Scope and Limitations of the Study

The study was conducted at Ilocos Sur Polytechnic State College, Sta. Maria Campus, during the school year 2022-2023. The objective of the study was to implement open-source software (OSS) that could be utilized by CCS students. The system allows users to change their profiles and respond to survey questions after logging in. On the administrative side, the administrator can review the survey responses and provide responses to the user. The administrator also has the ability to add, modify, and delete questions from the questionnaire, as well as generate reports based on the user-provided data. Users who complete the survey questionnaire can choose to receive emails from the system, which may include notifications or reminders about system updates from the administrator.

Furthermore, the system has the capability to generate and analyze reports based on the user-inputted information. The results are visually displayed through graphs and charts. The system will undergo testing with the participation of BSIT students in the 2022-2023 academic year, and its goal is to serve as a laboratory for Open-Source Software (OSS) that can be utilized by CCS students.

Importance of the Study

This study aimed to implement open-source software (OSS) at the College of Computing Studies, Ilocos Sur Polytechnic State College, Sta. Maria Campus. The specific software implemented in this study was called Transfer File, which allowed users to manage network servers and clients. The purpose of implementing this software was to enhance the efficiency and consistency of work for the students of CCS. By utilizing Transfer File, students were able to perform their tasks more quickly and effectively.

The Ilocos Sur Polytechnic State College. In a way, this study would guide to improve its utilization and implementation of software specifically for computer networks.

Network Administrators and Engineers. This serves as a basis for understanding the value of appropriate software and its purpose in networking.

Future Researchers. This study serves as a reference for the conduct of similar studies and as a reference for their review of the literature.

Finally, for the **Researchers**, this study would help them enhance their capabilities and skills in considering the most appropriate software for networking for ISPSC.

Chapter 2

METHODOLOGY

In this chapter, the researcher presents the research methodology, which encompasses the research design, software model, sources of data, instrumentation and data collection, and tools for data analysis.

Research Design

The researchers employed a combination of developmental and experimental research designs for this study. The descriptive-developmental research design was utilized to organize the presentation, prescription, and interpretation of data. The results obtained served as the foundation for the developed system, specifically the implementation of open-source software in the College of Computing Studies Computer Network Lab of ISPSC Sta. Maria Campus.

According to Radcliffe (2022), the developmental research design focuses on collecting data to understand what changes and remains constant with age. It specifies the information to be collected and the methods of data collection.

Knight (2010) states that a well-designed experimental design serves as a roadmap for study procedures, enabling readers to better understand how the data was collected and allowing them to accurately evaluate the results.

The study was conducted at Ilocos Sur Polytechnic State College and can be utilized by the institution to establish a clear distinction between proprietary software and open-source software.

Network Life Cycle Model

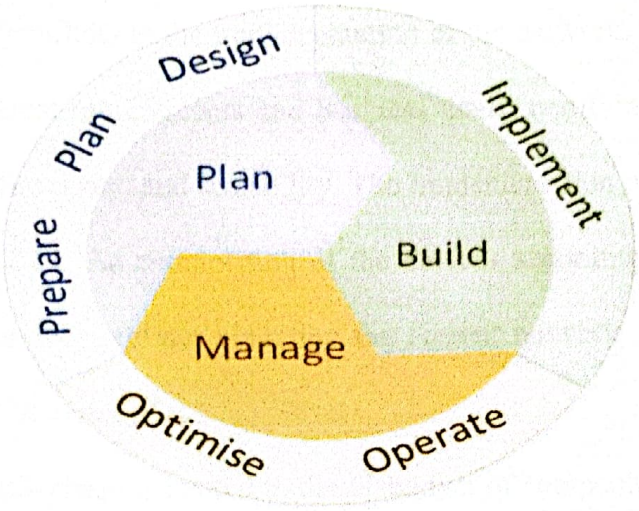

Figure 2. The PPDIOO Network Life Cycle Model

Figure 2 depicts the Network Life Cycle Model, specifically the PPDIOO (Prepare, Plan, Design, Implement, Operate, and Optimize) model, utilized by the researchers as the methodology or procedural framework for this study. The Cisco Services Method Approach (Cisco, 2011) describes the purpose and activities associated with each phase within the PPDIOO life cycle. The present research project adopted the PPDIOO network development lifecycle model and the Cisco Top-Down Approach for the Design and Development of an IT Infrastructure. These frameworks provide 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 estimate 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

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

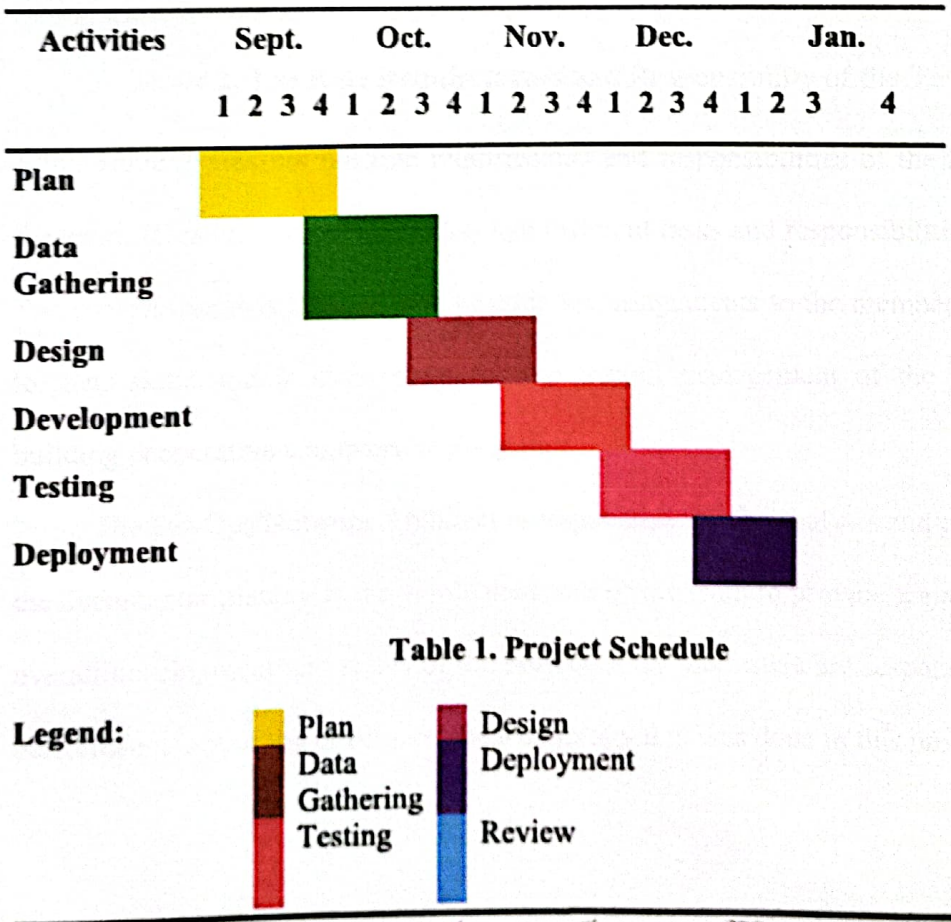

Table 1. Project Schedule

Legend:

Plan
Data Gathering
Testing
Design
Deployment
Review

Project Assignments

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

Roles	Name	Functions
Project Manager	Beverly R. Custodio	Lead Team report status review of deliverables and assurance quality.
Network Architect/ Devops Architect	Sittinor O. Ampaso Beverly R. Custodio	Framework Content
QA / Tester	Jerico E. Asistin Jhon Rey. Bielza Angelo D. Ariota	Test the performance of the project.
Documenter/Technical Writer	Angelo D. Ariota Jerico E. Asistin Jhon Rey T. Bielza Beverly R. Custodio Sittinor O. Ampaso	A status report on the whole project. Publish project plan timeline and project requirement sheets.

Table 2. The Role Requirements and Responsibility of the Team

Table 2 presents the role requirements and responsibilities of the members of the team. It shows that each member had different tasks and responsibilities assigned. The project leader is the one who provide the assignments to the members according to their skills and is responsible for the overall management of the project and building cooperative teamwork in the group.

The DevOps/Network Architect is responsible for the analysis and design while the documenter/planner is the whole members of the team to provide teamwork in the overall development and status of the project lastly the testers are responsible for the performance test of the developed the technology that was done in this project.

Population and Locale of the Study

The study was conducted at ISPSC for the academic year 2022-2023. The respondents Table 1. Project Schedule of the study are the following: For objective number 1, the respondents are the MIS Staff (Cashier, Accounting, registrar, and Admin). For objective number 2, it would be the presentation of the proposed design made by the researchers, and for objective number 3, the assessment of the designed and implemented dual stack mechanism.

Respondents	N
CCS Students	7
IT Experts	3
TOTAL	**10**

Table 3. Distribution of Respondents

Research Instruments

The following are the methods that have been used in gathering the data that was utilized in the conduct of this study:

Survey questionnaires, documentary analysis, internet research, and library research were the tools that were used in the study.

Data Analysis

Questionnaires and interviews served as tools for collecting data. Mean, Data analysis, and interpretation was applied in objective no. 1, and t-test was used to compare the two (2) Operating System which is Ubuntu and Windows since this statistical method shows the critical area of distribution in the two-sided test where a sample is greater than or less than a certain value as provided from the results of the iperf3 experimental network test for the Ubuntu and Windows.

Table 4. Descriptive Interpretation on the Level of Acceptability

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 4. Descriptive Interpretation on the Level of Acceptability