



**ILOCOS SUR POLYTECHNIC STATE COLLEGE**  
**Sta. Maria Campus, Sta. Maria, Ilocos Sur**

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**IT NETWORK INFRASTRUCTURE PLAN OF NARVACAN NATIONAL  
CENTRAL HIGH SCHOOL SENIOR HIGH SCHOOL**

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## Chapter 1

### INTRODUCTION

#### Background of the Study

Planning a Network Infrastructure satisfies the needs of the school for its security. Many confidential files and records shouldn't be altered and kept from the public. This project is developed to avoid security breaches and maintain a powerful network infrastructure. Narvacan National Central High School particularly in Senior High Department consists of (4) buildings included the Gymnasium used by the teacher's and teachers to be their temporary classroom, and a total of around (54) users which includes the teaching staff, and non-teaching staff.

As most of the researchers have been a student of the said school deemed significance to contribute through their humble capabilities towards the betterment of Narvacan National Central High School Senior High School, with their strategic goal "IT Network Infrastructure plan of Narvacan National Central High School Senior High School" thus, the aim of the study is to find out and improve the current network infrastructure of the school through this plan. This will not only result to a fully scalable, manageable and secured network but will also achieve a safe and efficient network infrastructure plan for the school.

Therefore, as presented from the above scenarios, there is a felt need which prompted the researchers to find out and improve the current network infrastructure specifically dealt with the problems and needs of Narvacan National Central High School particularly in Senior High School.

The project is to design LAN (Local Area Network) model for Narvacan National Central High School Senior High. The design includes to set up devices that are connected to the workstation, multifunctional devices, server's routers, and other



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state of the facility systems. The Client should like to use the proposed network design model to supports the senior high department, and have flexibly to add or downgrade the resources for the proposed design. According to a study about network infrastructure for community and training centers, a campus must have their own network infrastructure plan proposed by IT experts of the school. In that way, campus admins will have an access from school profiles to the system's resources such as course content, students' and teachers' information, and etc. (November 2018)

We are specialized in mobile development, web development, network design and engineering, and cybersecurity. Smart Link Networking Agencies have built our reputation from quality products and services in the last decade. Computer networks facilitate communication between different digital devices through messaging, mail services, file and resources sharing, education, commerce, voice calls, video, teleconferencing, and databases. Network design is the planning phase of computer networks. Professionals carry it out with respect to company (client) needs. This phase carried out before the actual network is implemented. In this phase, the professional assesses the client's needs and determines what networking equipment, hardware, operating systems, and application software are best suited for that particular network. (Radosavovic, I., et.al. 2020)

Due to its reliance on the theoretical and applied aspects of the allied fields of computer science, computer engineering, and telecommunications, computer networking may be viewed as a subset of these fields. The evolution of computer networking was impacted by a variety of technological advances and historical events. The bell 101 modem was used in the 1950s to connect a network of



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computers for the U.S. military's Semi-Automatic Ground Environment (SAGE) radar system. The AT&T Corporation released the first commercial computer modem in 1958. 110 bits per second (bit/s) of digital data may be sent with the modem over ordinary unconditioned telephone lines. (Thomas, H., et.al. 2021)

Planning for the layout of a data network used in an office or other enterprise starts with the Local Area Network (LAN). A LAN is the interconnection of networking devices local to the enterprise. Usually, a LAN is specific to a building, or even to one department. Internetworking devices such as switches or routers can facilitate communication between multiple LANs. Primarily focused on the cabling and how the cables interconnect network devices, network topology of the LAN can follow one of four types. A bus topology uses a common cable primarily coaxial of the type 10Base2 or 10Base5. This topology has been largely superseded by other topologies. However, it may still be used in manufacturing environments where shielded cables are required. A ring topology has computers connected in a physical ring or a logical ring. A mesh topology has computers setup to be directly connected to all other computers. Finally, and by far the most common topology is the star. Most LANs today are based on the use of a hub or more commonly, a switch using 1000Base-T (gigabit Ethernet) and/or wireless Ethernet, more commonly referred to as Wi-Fi.

The type of cabling used depends on the topology. In the most common, star topology unshielded twisted pair (UTP) cable is used. For gigabit Ethernet this is cabling is referred to as Cat5e, or Cat6 by American National Standards Institute (ANSI) who have set performance standards for network cabling. Cabling falls under



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the physical layer of the OSI reference model which addresses the physical medium (eg. UTP) and connectors (eg. RJ-45).

In network design is allowing for connectivity between distant LANs, to the Internet and from remotely located devices. Connecting networks that are physically separated (eg. different buildings or different cities) is dependent on routing. Routers are referred to as intelligent network devices. Like a computer or a server, they run their own operating system and require complex configurations. Their primary purpose is to route traffic, hence their name. Every IP network in the world is configured with at least one unique IP address and every router in the world theoretically knows how to get data sent from one of these networks to another. This is only theoretical, as most routers are also used as security devices set to purposely block traffic flowing between networks. When an organization requires interconnection of physically separated networks, the connectivity between them is known as a Wide Area Network (WAN). WAN technologies include Frame Relay, SDSL, ADSL, local carriers etc. In almost all network design scenarios these WAN technologies will be provided by a third party, usually a telecoms company.

When routers are used to interconnect different networks on an enterprise's internetwork, they are typically under the control of that organization. Another connectivity commonly required in the design of a network is Internet connectivity. Most networks in the world today are connected to the Internet. For all but the largest enterprise networks the only Internet connectivity device owned by the institution is the customer premise equipment. For most that would be a broadband router. In most small businesses and even medium enterprises, that router will be provided with one or two routable IP addresses. These will most likely have been supplied by the



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Internet Service Provider (ISP) used by the institution. These days, it is unlikely that anyone would be using dialup modems anymore. Today, remote connectivity is achieved by using the Internet. Most commonly a person requiring remote access to a LAN would be connecting through a Virtual Private Network (VPN). This person would likely be a home worker with a broadband Internet connection. A secure VPN connection is a virtual circuit between a network device such as a computer and a corresponding network device in a LAN.

A good network design must take into account Security at all levels. Perhaps the lowest technical level is physical security. Network devices must be secured in offices and within buildings. Servers, switches and routers should be locked in climate-controlled server rooms or wiring closets. Not only does physical security protect the equipment from theft or damage, it protects your network from unauthorized access. One of the easiest ways to gain access is through plugging a network device into a switch or hub. Data security must focus primarily in the network design on encryption. One of the potentially most unsecure points of entry into a network is through Wi-Fi connectivity. Technologies exist such as Wi-Fi Protected Access (WPA), which will encrypt data on a wireless network.

Whether on a computer, Smartphone, server, switch, or router the operating system of the device offers the best security to protect data and access in a network design. All of these systems offer password protection. Any network design should include the use and appropriate configuration and settings for password protection.

(WowEssays. 2019, December, 04)



## Conceptual Framework of the Study

A conceptual framework illustrates the expected relationship between your variables. It defines the relevant objectives for your research process and maps out how they come together to draw coherent conclusions. (Swaen, B. & George, T.

2022, November 15)

This section explains the connection 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.

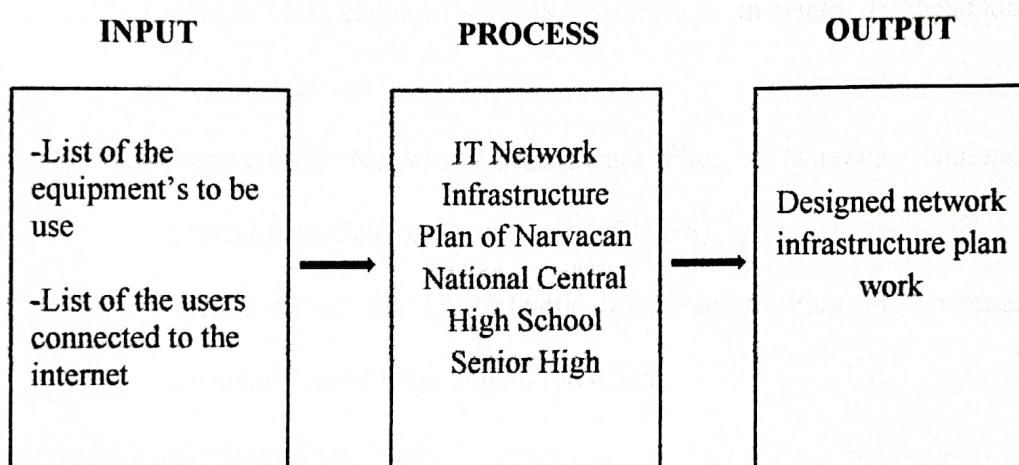


Figure 1. Conceptual Framework

The figure 1 illustrates the study's application of the input-process-output framework. As presented in the framework, the list of the equipment's to be used, the list of the users that will connect to the internet which will be utilized as variables for input. The process of the designed IT Network Infrastructure Plan of Narvacan National Central High School Senior High will provide an internet connection not only to the teachers but also to the students. The output of the designed network infrastructure will increase productivity and more users can connect to the network.



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The IT network infrastructure could be adopted by Narvacan National Central High School Senior High.

### **Objectives of the Project**

The study's goal was to evaluate Narvacan National Central High School's (NNCHS) current IT network infrastructure plan, with a focus on the senior high school department, in order to develop a design for the school's IT network infrastructure plan.

Specifically, the study had achieved the following objectives:

1. Assess the existing network infrastructure of Narvacan National Central High School (NNCHS) particularly in Senior High School department.
2. Proposed IT Network Infrastructure Plan of Narvacan National Central High School Senior High (NNCHS).
3. Evaluation of the IT Network Infrastructure Plan of Narvacan National Central High School (NNCHS).

### **Scope and Limitation of the Study**

The study was conducted at Narvacan National Central High School (NNCHS) Senior High School located in Paratong, Narvacan, Ilocos Sur. The project was studied during the academic year 2022-2023.

The study aimed to propose an IT Network Infrastructure for Narvacan National Central High School (NNCHS) senior high to improve the existing network infrastructure of the campus. The researchers establish a network infrastructure plan to achieve a well-designed and structured network layout through a concrete network diagram. The existing infrastructure and equipment are distributed only for offices



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and teachers are limited only. The researchers propose a plan to use a server and patch panel to be distributed and used by the student, teachers and offices, the security is also provided to protect the cable and also the data.

### **Importance of the Study**

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

**To Narvacan National Central High School Senior High School.** The campus will be benefited to this study as it will serve as a guide in improving their established IT network infrastructure. The IT network infrastructure plan not only solve current networks issues but also will eliminate the problems encountered and most especially it will give them the best future plans for their network infrastructure.

**To the NNCHS Employees.** This study will help them easily access all data stored in their network infrastructure and ensure them that all system resources are secured with integrity.

**To the IT Administrators and Engineers of other schools.** This study will serve as their basis for the creation of a better network infrastructure for their school.

**Finally, To the Future Researchers,** helps them enhance their capabilities and understand what is a network infrastructure, how to make a plan and how to design their own network infrastructure for their own good.



## **Chapter 2**

### **METHODOLOGY**

This chapter presents the methodologies employed by the researchers during the conduct of the study.

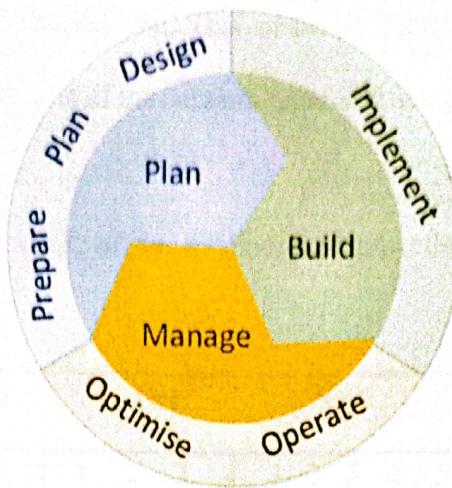
#### **Research Design**

The network infrastructure of their customer was evaluated by the researchers using a descriptive research design. An objective of a descriptive research design is to methodically gather data to describe a phenomena, circumstance, or population. More particular, it assists in providing answers to the research problem's what, when, where, and how inquiries as opposed to its why. (Voxco, 2021)

Since the goal of the study is to evaluate and enhance the current network infrastructure plan of the senior high division of Narvacan National Central High School (NNCHS), the research design uses both qualitative and quantitative research methods to gather information that helps to precisely describe a research problem. Additionally, a descriptive research approach just identifies, observes, and measures variables without than controlling or manipulating any variables. The two methods most frequently employed to carry out this study design are surveys and observation.

#### **Network Model**

The figure 1 presents the Network Lifecycle Model used by the researchers as means of the methodology or procedures implied in this study. Cisco Services Method Approach (Cisco, 2008) describes the function of each phase involved in the life cycle of PPDIOO.



**Figure 2. The PPDIOO Network Lifecycle Model**

The researchers adopted the PPDIOO network development lifecycle model for the necessary methods to be applied in this capstone project. The phases and activities are as follows:

**Preparation:** The researchers made a questionnaire and a survey form for the preparation of gathering the data of Narvacan National Central High School for them to know the deficiencies and needs in their network infrastructure.

**Planning:** After gathering information's they decided to visit those rooms without internet connection for them to have an idea on how to give them an internet connection.

**Design:** The researchers proposed an infrastructure design to improve the existing network infrastructure of Narvacan National Central High School senior high.

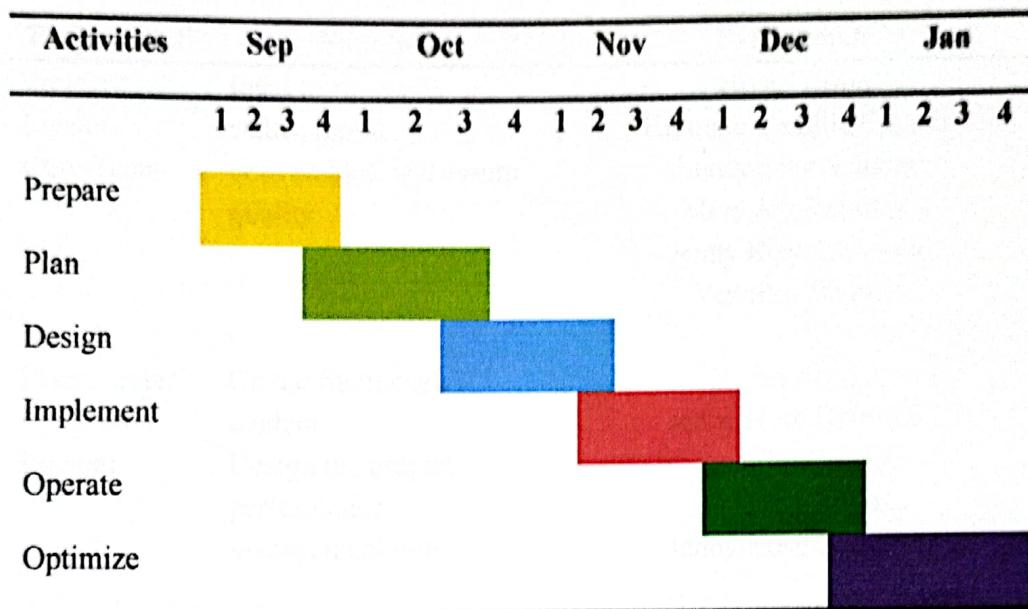
**Implementation:** the implementation or the network itself, is developed based on the composition of the devices according to the design, this should provide services without hindering the current network, without altering its availability or performance of it.



**Operation and Optimization:** This phase is related to the IT budget of companies and the operation of the network regarding availability and functionality.

### Project Plan

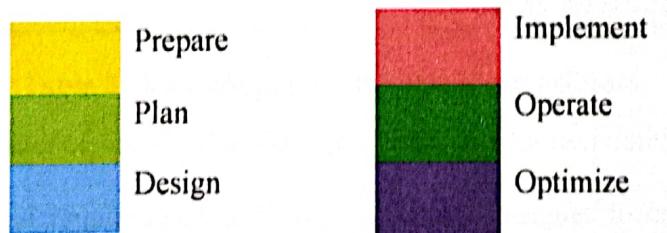
Table 1 shows the cycle of the methods and procedures that the researchers applied in this study.



**Table 1. Project Plan for Planning and Designing Network Infrastructure**

### Plan for Narvacan National Central High School senior high

#### Legend:



### Project Assignments

The role expectations and duties of the team members are listed in Table 2. The project manager plans and develops the project's concept, supervises the team, monitors the project's progress, sets deadlines, deals with unforeseen issues,



manages finances, ensures stakeholder satisfaction, and evaluates the project's success, including that of their team members. The core team members have a secondary responsibility to ensure the project's success in addition to the project leader's primary responsibility to ensure the project complies with the standards and best practices unique to their function.

Project Staff	Functions	Participants
Project Leader	Lead team, review status, report deliverables, and assure quality	Bryan Abrigo Kristelle Camille Callejo Lency May Villano Mary Joy Ramirez Jenny Rose Gaburno Venaflor Bosque
Documenter	Create framework content	Bryan Abrigo Jenny Rose Gaburno
Planner	Design the project performance management tool	Venaflor Bosque Bryan Abrigo Jenny Rose Gaburno
Plan Developer	Build the project performance, evaluate deliverables and promote of use	Kristelle Camille Callejo Lency May Villano Mary Joy Ramirez Venaflor Bosque Bryan Abrigo Jenny Rose Gaburno
Review Team		

Table 2. Role Requirements and Responsibility

The documenter organizes, classifies, and labels data for user convenience, while adhering to legal requirements and working with colleagues to ensure standard documentation practices across the organization. Plans and designers in charge of drafters utilize a network to create a draft of an engineer's or architect's design. They are accountable for gathering knowledge about necessary tools and supplies,



ensuring that drafts follow the specifications of the construction technique, and collaborating with other team members.

#### **Population and Locale of the Study**

The researchers used the purposive sampling that helped the researchers to find out the distribution of the respondents, which involves the Assistant Principal of NNCHS Senior High, 4 IT experts.

Respondents	N
Assistant Principal of NNCHS Senior High	1
IT experts	4
<b>TOTAL</b>	<b>5</b>

**Table 3. Distribution of Respondents**

#### **Research Instruments**

During the first survey which is the Propose Network Infrastructure Plan of Narvacan National Central High School Senior High was used to determine the existing IT network infrastructure of the client. The second and last survey was conducted for the network profile of the client in September 2022 to February 2023.

The researchers adopted the PPDIOO network development lifecycle model for the necessary methods to be applied in this capstone project.

#### **Data Analysis**

A conceptual network design network diagram was made in order to gain a better understanding of the data obtained from the survey tool used to evaluate the network infrastructure of Narvacan National Central High School Senior High School.

According to Table 4, a 5-point Likert scale was employed.



Point Value	Statistical Range	Descriptive Equivalent	Descriptive Interpretation
5	4.20- 5.00	Excellent	Valid
4	3.40- 4.19	Very Good	Valid
3	2.60- 3.39	Good	Valid
2	1.80- 2.59	Poor	Not Valid
1	1.00-1.79	Not Evident	Not Valid

**Table 4. The Likert Scale used in the Orchestrated Control Survey**

#### Instrument

The collected information was ranked from Not Evident to Excellent. The mean falls within the following categories: 1.80-2.59, described as poor and interpreted as not valid; 2.60-3.39; 3.40-4.19; and 4.20-5.00, described as excellent and interpreted as valid. The mean ranges from 1.00 to 1.79, described as not evident and interpreted as not valid; 2.60 to 3.39; 3.40-4.19; and 4.20 to 5.00.