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Development of Computer Network Security Management at North Tabukan 1 State Vocational School

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ABSTRACT

The development of the internet at this time makes all companies, especially SMKN 1 Tabukan Utara, able to utilize internet technology in supporting computer-based information systems. For this place to run its business properly, it must be supported by an information system and supported by a good computer network infrastructure. Computer network infrastructure in the SMKN 1 Tabukan Utara still has several disadvantages such as the absence of website blocking, login authentication, and regular bandwidth distribution. To overcome these problems, it is necessary to design the network properly, as for the methods used in designing this network using the Network Development Life Cycle (NDLC). This method can develop existing competition through several stages of the process, namely analysis, design, prototype simulation, implementation, monitoring, and management. The results of this study are in the form of a home computer network SMKN 1 Tabukan Utara that implements Captive Portal, Virtual Lan, Firewall Filtering, L7 protocol, and Bandwidth Management.

Keywords: Bandwith, Firewall, Network development life cycle, Virtual Lan

INTRODUCTION

The increasingly advanced development of the internet has made information technology an important aspect of human life, especially in managing data into information, thereby making work done faster. North Tabukan 1 Vocational School, which is a vocational high school, has also used the internet as a learning medium for students and teachers there and can be used to help with assignments or seek more knowledge.

The computer network infrastructure in this place has been well designed, but the design is not optimal because it has several shortcomings that must be corrected, such as the absence of a firewall that regulates user access rights such as internet access times, and what websites users can visit. Current computer networks do not have login authentication such as captive portals, no bandwidth management regulates limits per user which aims to ensure that all users can use the internet smoothly even though all users use it simultaneously and no user management regulates internet usage time. Therefore, SMKN 1 Tabukan Utara needs to design a computer network using the network development life cycle (NDLC) method to optimize the existing computer network.

A computer network is a group of computers that are connected and form a network that can communicate with each other. Not only are they connected, but they can be used to share resources (printer, CPU), communicate (instant messaging, email), and be able to access information (web browsing) (Purbo, 2016). VLA (Virtual Lan) is a technology used to divide the broadcast area in a switch device. All switch ports will be combined in the same broadcast area. So if one of the computers sends data broadcastly, then the data will be forwarded to all ports other than the port used by the sending computer to send the broadcast data (Nugroho, 2017). Mikrotik is a brand of network device, initially, Mikrotik was just a piece of software that was installed on a computer that was used to control the network, but in its development, it has now become a device or network device that is reliable and at an affordable price, as well as widely used at the internet service provider (ISP) company level (Athailah, 2013).

According to Greek, the term Internet comes from the word "inter" which means "between". Internet is an abbreviation of interconnection networking which is a network system that connects each computer globally. Transmission Control Protocol / Internet Protocol Suite (TCP/IP) as a packet exchange protocol. (packet-switching communication protocol) to serve billions of users throughout the world (Iskandar, 2018). A technique for authenticating and securing data passing from an internal network to an external network is the definition of a captive portal. A captive portal is a router or gateway machine that can protect or not allow access to traffic so that users can register which can be used in wireless infrastructure such as hotspots (Zam, 2015).

METHODS

This research uses a pre-experimental design using the one-group pre-test-post-test The following are research methods used in designing computer network infrastructure including

Data Collection Techniques

Data Collection Techniques, in the discussion of this research methodology several data collection techniques will be discussed in this writing, namely:

Observation

Observation is a method or technique for collecting data by making direct observations of an object that you want to investigate. Observations are carried out by direct observation at SMKN 1 Tabukan Utara.

Literature study

Literature study is a technique carried out by studying and collecting information from reference sources such as literature books, magazines, the internet, and sources that are directly related to the research topic.

Interview

The interview is the process of obtaining a description of the research objectives which is carried out through face-to-face questions and answers between the interviewer and the respondent or person being interviewed. Interviews were conducted with staff who manage networks at this school.

System Development Model

System Development Model, in carrying out system development, the author will use the Network Development Life Cycle (NDLC) method for designing computer networks at SMKN 1 Tabukan Utara. This method consists of analysis, design, simulation prototype, implementation, and monitoring. The following are stages of the NDLC method as follows (Kosasi, 2011), see Figure 1.

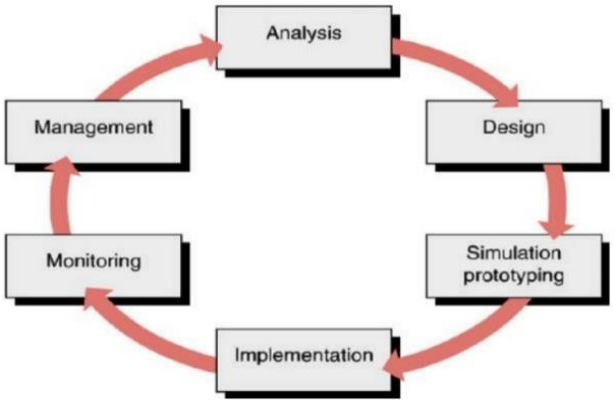

Figure 1. Network Development Life Cycle (NDLC)

The explanation of the stages above is as follows:

Analysis Stage, The initial stages carried out in analyzing are needs analysis, analysis of existing problems, analysis of user desires, and analysis of existing network topology. You could say that this stage is the stage of collecting the data needed for problem formulation in resolving existing obstacles. By identifying the system that is running and then trying to analyze what kind of system development will be applied to the system,

Design Stage, This stage is based on the data obtained previously, in this design stage the author will create a design drawing of the network topology that will be built, data access design, and so on. Everything is done using GNS3 tools,

Simulation Prototype Stage, This stage carries out network development which will be created in the form of a simulation with the help of GNS3 tools. This is intended to see the performance of the

network that will be built and become material for presentations and sharing with network system development,

Implementation Stage, This stage will take a little time. In carrying out the implementation, the author has implemented everything that was previously planned and designed. At this stage, it will be seen how the development that will be built will have an impact on the existing system.

Monitoring Stage. After implementation, the monitoring stage is important so that the network and communication can run following the author's wishes and objectives at the initial stage of analysis. The author will use the tools in Mikrotik which function to monitor network traffic.

Management Stage. One of the stages that is of particular concern is policy issues, namely in terms of activities, maintenance, and management categorized at this stage. Policies need to be created to create and regulate so that systems that have been built and run well can last a long time and the element of reliability is maintained.

Research Flow

Based on the method used, this research uses a framework of thought developed based on NDLC, the description is as follows in Figure 2.

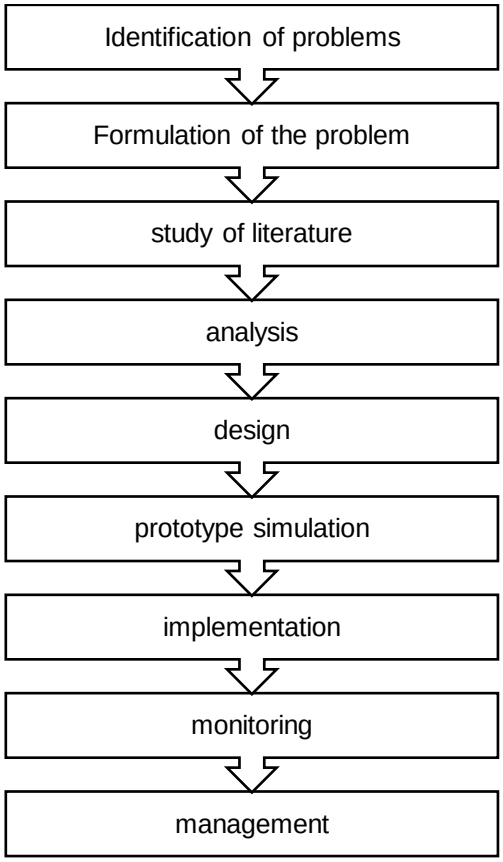

Figure 2. Research Thinking Framework

Following the research flow diagram above regarding the research to be carried out, it will be carried out in several stages including: a. Problem Identification, at this stage, the main problem related to the research is identified which has been outlined in the background of the problem which is then followed up to find the right solution. b. Problem Formulation, at this stage existing problems related to the research object are studied so that they can be formulated so that research can be carried out. c. Literature Study, at this stage, data and information are collected in the form of theories through books, journals, and electronic reading sources, utilizing various kinds of literature that are relevant to the research being studied to obtain supporting data. d. Analysis is the stage of analyzing data related to the running network. d. Design, at this stage a design is carried out regarding the network topology and security which will later be applied to the network. e. Prototype simulation, carrying out simulations according to the results of the analysis and designs that have been designed and then tested before being implemented. f. Implementation is the stage of implementing everything that has been planned and has gone through the prototype simulation stage. g. Monitoring is the stage of monitoring a network that has been successfully implemented and h. Management is the maintenance and maintenance stage of a system that is already running well.

RESULTS AND DISCUSSION

Running Network Scheme

The current network scheme contains network topology and network architecture which are the stages of the NDLC method.

Running Network Topology

The network topology at North Tabukan 1 Vocational School already has a running network topology. The network topology used by this school is Star Topology. The following is the topology that exists at this school. See Figure 3.

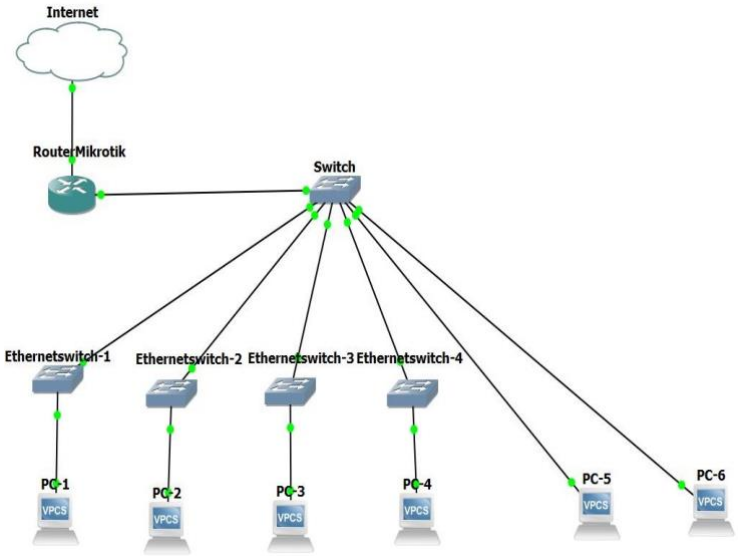

Figure 3. The state network topology

Network Architecture

This architecture describes a blueprint that contains a more detailed network topology that will later be designed. See Figure 4.

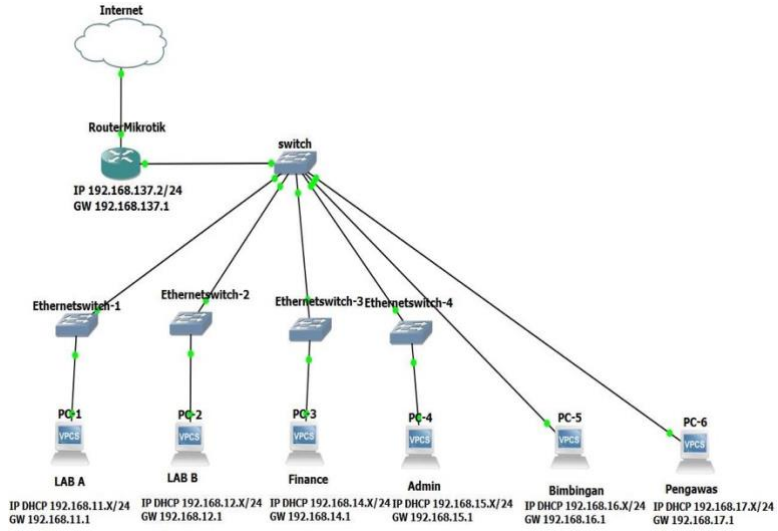

Figure 4. The state Network architecture

Based on the concept of the image above, SMKN 1 Tabukan Utara uses a Mikrotik router as its main router and then an unmanageable switch that distributes internet access to clients with DHCP settings so that each client gets an IP automatically.

Proposed Network Design

The proposed network design contains network topology and network architecture which is the design stage of the Network Development Life Cycle method.

Proposed Network Topology

At this stage, the network design process is carried out as shown in Figure 5.

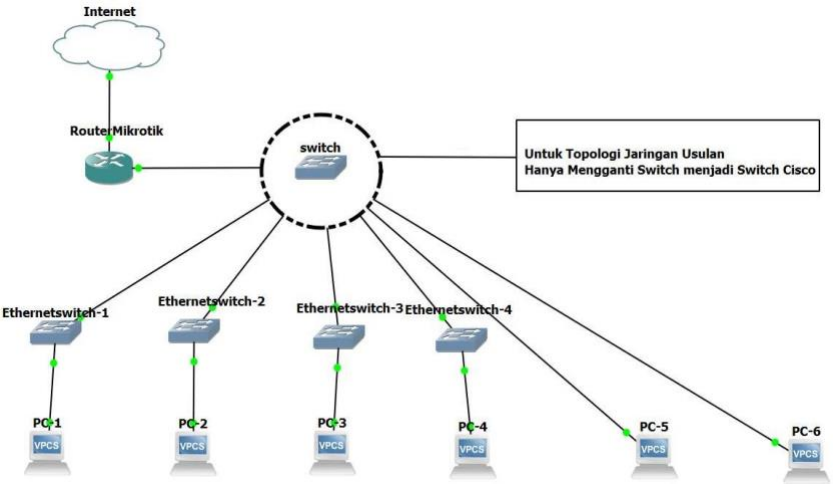

Figure 5. Proposed Network Topology

After analyzing the network at SMKN 1 Tabukan Utara, it can be concluded that the proposed topology only needs to replace unmanageable switches with manageable switches to suit the network concept that has been designed.

Proposed network architecture

At this stage, the network architecture is designed, which is part of the design in the Network Development Life Cycle process, which is carried out more clearly and in detail. see figure 6.

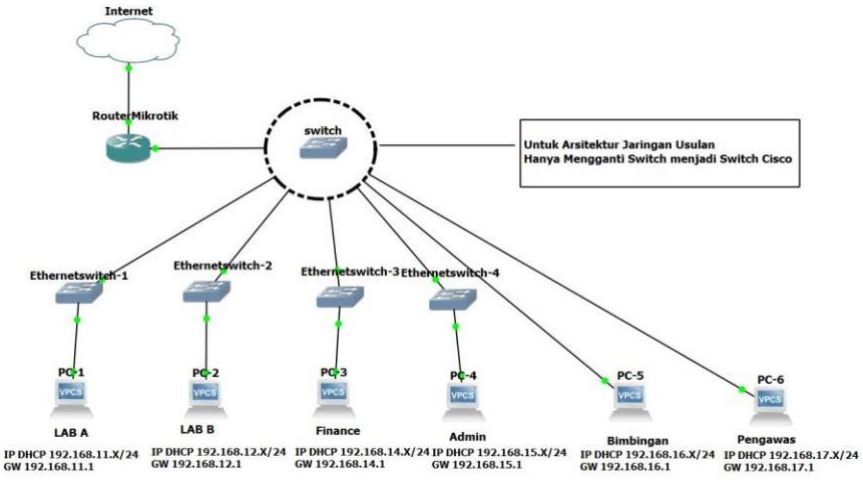

Figure 6. Proposed network architecture

The difference between the previous network and the proposal is the use of VLAN which makes network settings more flexible and easier. And with VLAN users can save on the devices they will use. Data security is more guaranteed because it can be separated and created separately. Better performance because broadcasts are divided into smaller ones.

Network Implementation

At this stage, the configuration results and network development design using the NDLC method will be explained using the GNS3 simulation tool and Winbox software. The implementation process will be carried out following the determined network design. See Figure 7.

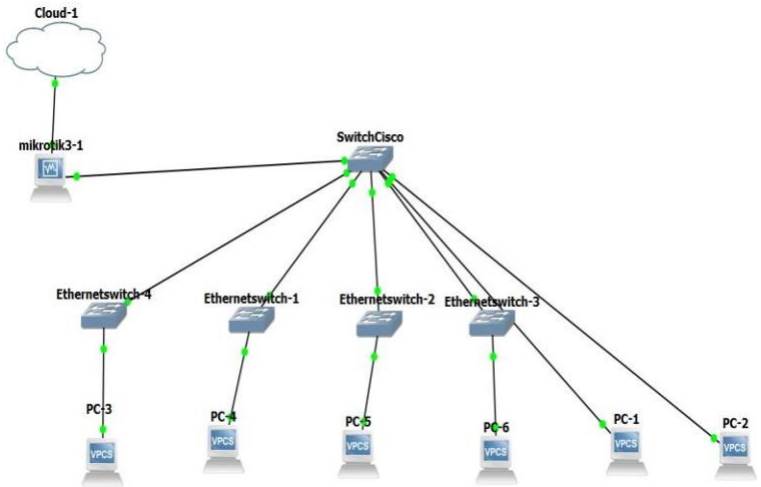

Figure 7. Network implementation results

Monitoring

The next stage is to carry out the monitoring stage on this network using the tools found on the Mikrotik router to find out if the network is running. The initial step taken in monitoring is the Interface List then click on the ether1 interface for monitoring. see figure 8.

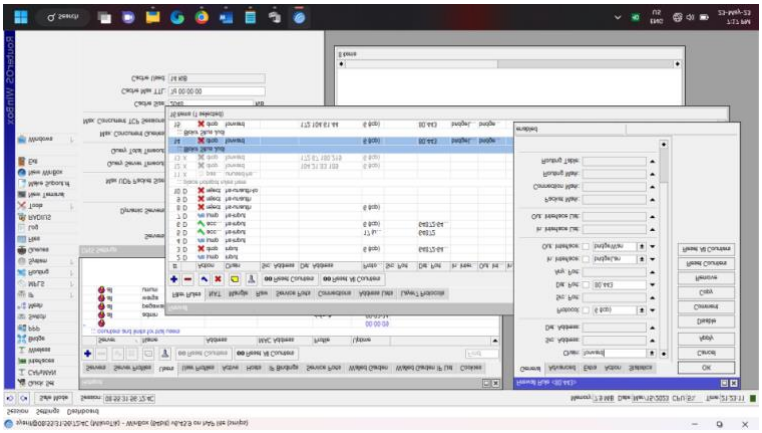

Figure 8. *Interface List*

The following are the monitoring results. see Figure 9.

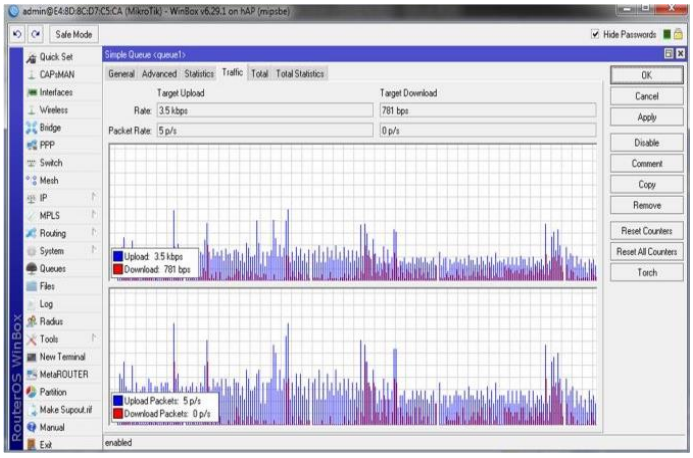

Figure 9. Monitoring results

Management

The next stage of the NDLC development method is management. Management needs to be created to organize and ensure that the system that has been created can be well maintained so that configuration backups and monitoring logs are provided.

a. Configuration backups are carried out to prevent damage to the hardware or undesirable things. see Figure 10.

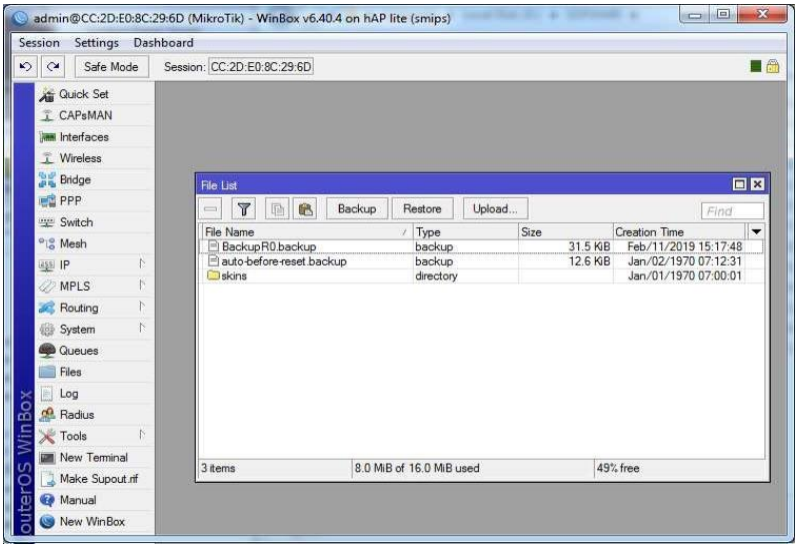

Figure 10. Configuration backup results

b. Log monitoring is carried out to find out what processes have been carried out by the Mikrotik router and analyzing the monitoring log makes it easier for us to find problems and apply solutions. See Figure 11.

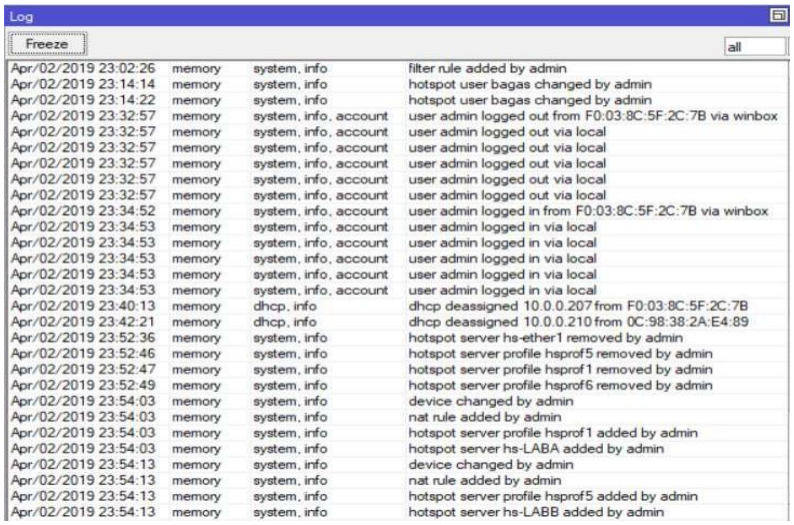

Figure 11. Monitoring log results

CONCLUSION

Based on the computer network design using the Network Development Life Cycle method with several stages that it goes through, it can be concluded that the network of SMKN 1 Tabukan Utara has

become better than before. Many configurations and implementations have been carried out so that the network can be used more optimally, such as setting bandwidth management, implementing firewall filters and up time limits to limit internet usage time for students and teachers, L7 Protocol configuration, implementing Virtual LAN, using network login authentication and monitoring.

The suggestions given are solutions for the future that can be even better which include three aspects, namely managerial aspects, system aspects, and further research aspects. a. Managerial aspect, advice that can be given based on the managerial aspect is to prepare more budget to buy better equipment so that the network can run more optimally and prepare a budget if one day you want to develop the network more widely. b. System Aspect, the advice that can be given is to the IT staff there to back up the configuration on each hardware used when adding or changing the configuration and carry out regular maintenance. c. Aspects of further research, the current network design is carried out using the Network Development Life Cycle method, for further research I suggest carrying out a wider network design by combining networks between Mahanaim Foundation buildings to make it easier to exchange information.

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