

Performance analysis and development of OPD interconnection network using NDLC method in Boven Digoel Diskominfo Papua Province

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ABSTRACT

Computer network analysis is very important to help improving network performance. Many companies, including Digoel Boven Diskominfo designed their network, but it is not according to their business goals. Thus, their current performance is not what they expected. Boven Digoel Diskominfo uses internet interconnection between Local Government Organizations (OPD) to manage the system. Network analysis at the Boven Digoel Diskominfo is carried out using the Network Development Life Cycle (NDLC) method relying on the previous infrastructure development process which has several stages namely analysis, design, prototype simulation, implementation, monitoring, and management. The results of this network analysis are the optimization of the core router and the optimization of the Wireless Access Point.



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1. INTRODUCTION

In this globalization era, digital technology is developing very rapidly. Almost all levels of society cannot be separated from technology. The use of computers and cellphones is not only limited to work and communication, but it is used for various benefits. By just sitting in front of the device, we can explore the world and find all the information by just tapping our fingers.

The world of government is no exception. This digital trend is also developing. Many agencies are competing to provide public services to the community by utilizing the sophistication of information and communication technology. It is hoped that public services can be more transparent, and the public will be more easily connected to government services.

In accordance with the Presidential Regulation of the Republic of Indonesia Number 95 in 2018 related to the Electronic-Based Government System (SPBE), SPBE is needed to realize clean, effective, transparent, accountable, quality, and reliable governance. Therefore, several factors are needed to achieve the SPBE's goals.

One of the government offices that implement the use of technology is Boven Digoel Diskominfo. It is one of the agencies that must ensure the availability of a good internet network to support public services in one city. Boven Digoel Diskominfo implements Information Technology to support office service operations through the development of service applications. This serviced office applies OPD interconnection to manage the network between service offices. The demand for accelerated information in public services is one of the problems experienced by Boven Digoel Diskominfo due to less-than-optimal network development. Computer networks play a very important role in supporting operational activities at Boven Digoel Diskominfo. So, network analysis and infrastructure development are needed in accordance with Boven Digoel Diskominfo's

business objectives. Infrastructure development has been carried out at Boven Digoel Diskominfo but it has not been used with the right method. As a result, infrastructure development has not been maximized.

Infrastructure development at this time is done by analyzing the existing network. Network testing through a proxy is used in this study to obtain information about network deficiencies which was then developed in accordance with the business objectives of Boven Digel Diskominfo. Based on the existing network analysis, network development is carried out using the Network Development Life Cycle (NDLC) method. This method is based on the previous development process [4].

NDLC has been used in a previous study by Mulyanto to design a computer network using an omada control management system at the Sumbawa district inspectorate which resulted in an improvement in the computer network system in the Sumbawa district with connections throughout the inspectorate room. So the inspectorate was able to carry out digitalization activities and network technology for all existing employees. [1]The second research was carried out by Tony by designing a computer network at the shalom mahanaim house. The result showed that shalom mahanaim house had a computer network that implemented a capartive portal, virtual lan, firewall filtering, L7 protocol, and bandwidth management [2]. The third research was conducted by Fariz by designing a computer architecture based on the Togaf Adm framework using the NDLC method. The result was by using load balance technology and support for MikroTik devices and sending and receiving data packets are now faster and more stable because communication lines have been segmented and data collisions in the network are resolved [3].

From the previous research which states that NDLC can be used to develop a computer network system so that the computer network built can function according to its purpose, this study will use NDLC to analyze and build an OPD interconnection network in accordance with business objectives on the Diskominfo network in Boven Digoel, Papua Province.

2. RESEARCH METHOD

2.1 Network Development Life Cycle

Network Development Life Cycle (NDLC) is a method that relies on previous development processes such as business strategy planning, application development life cycle, and data distribution analysis [4].

NDLC has elements that define the phase, stages, steps, or specific process mechanisms. The word cycle is a descriptive key of the network system development life cycle which describes the whole process and stages of network system development sustainability. NDLC is the method used as a reference (in whole or in outline) on the development process and computer network system design. The design that the author used is The Network Development Life Cycle (NDLC) which is a process approach in data communication that describes the cycle of the beginning and the end of building a computer network. Stages in this method, namely:

a. Analysis

This stage requires problem analysis that appears and analyzes user desires and hardware requirements to be used and analyzed by existing network topologies now.

b. Design

From the previously obtained data, this design stage will create an image interconnect network topology design that is built. It is expected to provide a full picture of the needs. The design can be structural design topology, data access design, layout design wiring, and so on that will provide a clear picture of the project to be built.

c. Simulation (Simulation Prototyping)

This stage is implementing the system at a small scale or trial stage on network systems to be built.

d. Implementation

In the implementation, the author will implement everything that has been planned and in the previous design. Implementation is a very decisive step in the success/failure of the project to be built.

e. Monitoring

The implementation of the monitoring stage is an important step. Thus, the computer networks and communications can go according to your wishes and goals in the early stages of analysis, then monitoring activities need to be carried out. Monitoring can be in the form of doing observations to monitor traffic running on the network. It is in accordance with the active connections on the network and views measurement results bandwidth on the entire network.

f. Management

At this stage of management, it will be carried out several management steps so that the system that has been built can run according to what is expected.

The five stages of NDLC to be carried out are shown in Figure 1.

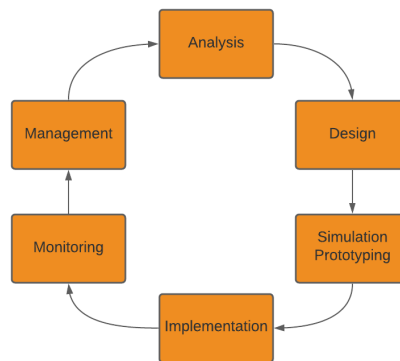


Figure 1 Stage of NDLC

2.2 Computer Network

A network is a combination of hardware, software, and cabling, which together enable multiple devices computing to communicate with each other. While a computer network is a collection of several devices in the form of computers, hubs, switches, routers, or other network devices connected by using media in certain communication [5].

2.3 Router Mikrotik

Mikrotik Router is an operating system that can be used as a router reliable network and includes a full range of features for the network. In addition, Mikrotik can also function as an investigator for intrusions on computer networks and firewalls for other computers and give priority to other computers to access data internet and local data [6].

2.4 Wireless Network

A wireless network is one of the best alternatives in building a computer network that is practical and flexible and has high mobility. A wireless network is a network that does not use wired media but uses radio wave emission for interaction or communication between devices that support wireless connections [7]. Wireless networks are currently one of the standard facilities provided to users that can be accessed via laptops, smartphones, tablets, and other devices that support wireless networks. These facilities help users a lot in the process of finding information [8]

2.5 Cyberindo Speedtest

A Cyberindo is a program that can be run on the Windows 7 operating system. Cyberindo application program will facilitate and speed up the performance of the client computer in running the operating system and applications that run on. It is because they do not need another hard drive to be able to be used on the client's computer [8]. The application program is simply installed on the server computer, then the client computer only runs the application, and all processing activities are carried out by the server computer. Therefore, it requires server computer specifications that exceed the specifications of the client computer because the client computer's processing speed will follow the specifications of the server computer. Besides that, another convenience is obtained in terms of troubleshooting problems and the ease of backing up data because the application program and data are centralized on the server computer. This Cyberindo program can save costs such as computer repair costs and the cost of electricity used [9].

3. RESULTS AND ANALYSIS

The first step in this research is to analyze the result. From the analysis, it describes the problems related to this matter.

Table 1. Analysis Result

Number	Category	Problem
1	RTO in Inter-Service Network	1. Core Router Configuration Failure The router works without any firewall configuration and good traffic management, it causes full data traffic in the network which breakup on the client-side

2	Internet Service Office and OPD	2. Increased data traffic The increase in data traffic has an impact on the need to add devices and rearrange network configuration to optimize available resources, in the form of servers and other network devices.
		1. Wireless Access Point Performance Decrease Types of computers that are widely used by users are Laptops and All-In-One PCs with Wireless connectivity. The addition of the number of users has not been followed by the addition of capacity of the Wireless Access Point so that the performance of Wireless Access Point is overloaded which has an impact on throughput decrease. 2. Lack of Supply Bandwidth To distribute internet data to OPD in Boven Digoel district, the current 100MBPS bandwidth is very limited so there is a need for additional bandwidth in the large quantities that can accommodate the needs of every OPD

From the results of the analysis carried out in the previous stage, a plan is made to improve and optimize the network in Boven Digoel. Table 2 describes the planning that will be carried out from the results of the first stage

Table 2. Solution of the problem

Number	Problem	Solution	Target
1	RTO in Inter-Service Network	Core Router Optimization Doing research on the router firewall, bandwidth management, and optimization of installed Ethernet.	Traffic Back to Normal and No more RTO on the Boven Digoel Diskominfo network
2	Internet Service Office and OPD	Procurement Perform maintenance of wireless access point and its installation	Pointing becomes more accurate with relatively more stable traffic levels.

Based on the results of planning in stage two, a prototype was made to make simulations with the packet tracer tool so that the initial performance can be seen before being executed. There are 20 service offices connected to the Boven Digoel Diskominfo network, the network is made using 5 switches, switches 1 to 4 handle 4 offices. Figure 2 is the result of a simulation using a packet tracer.

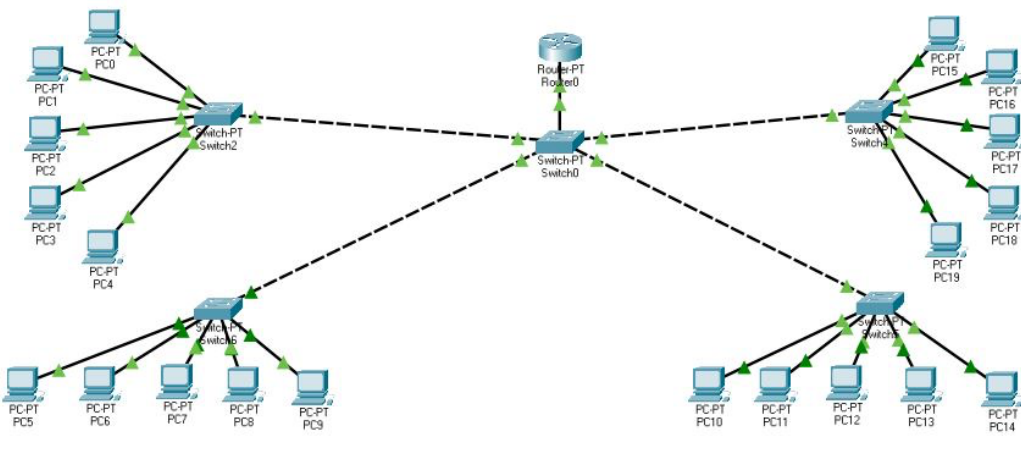


Figure 2. Network simulation

Implementation is carried out after the prototype design is in accordance with the needs. The following are the results of the implementation of research at the Boven Digel Diskominfo

1. Management Bandwidth

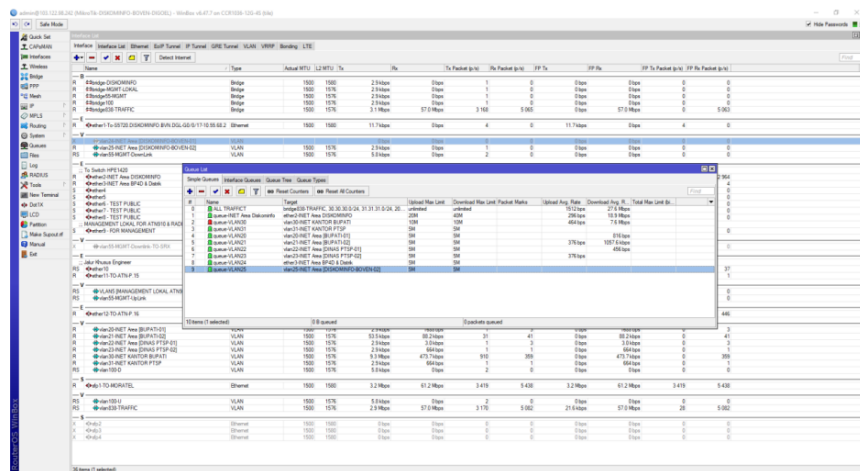


Figure 3. Management Bandwidth

The bandwidth owned by Boven Diegol Diskominfo is 100 mbps. Currently, with the existing bandwidth, each service office gets 5 Mbps service so that it can be fulfilled and evenly distributed.

2. Interface Configuration

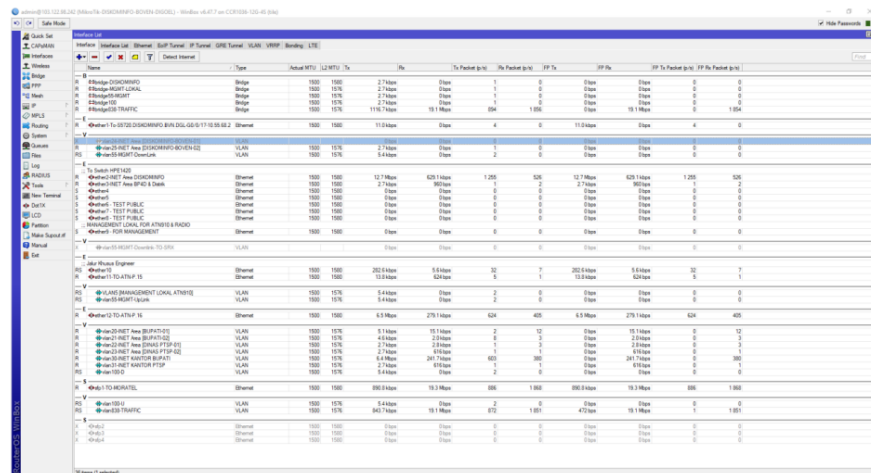


Figure 4. Interface Configuration

3. Bridge Configuration

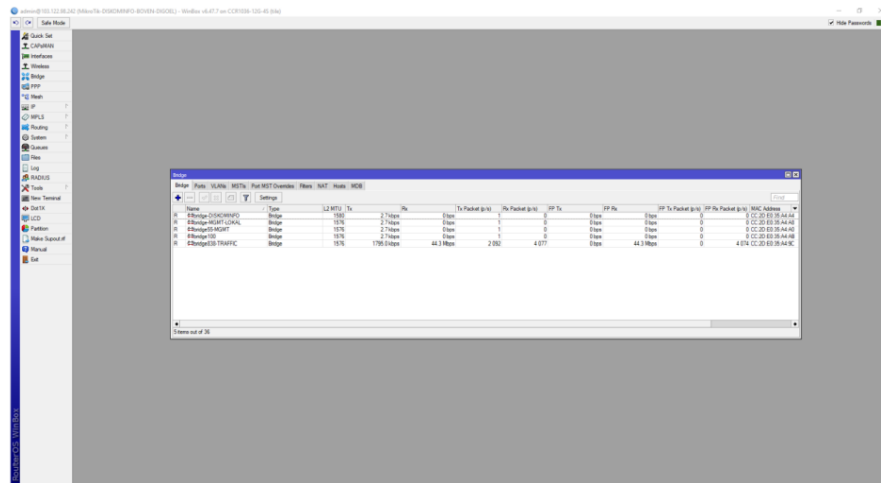


Figure 5. Bridge Configuration

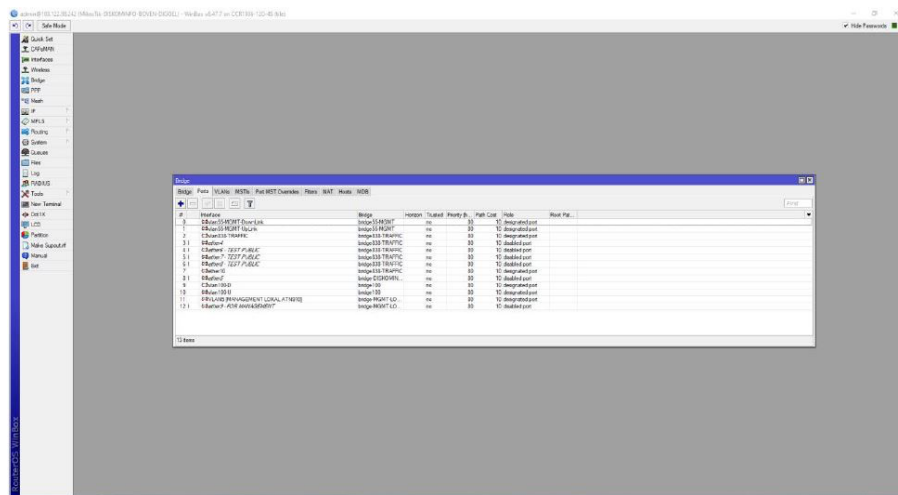


Figure 6. Port Configuration

4. Firewall Optimization

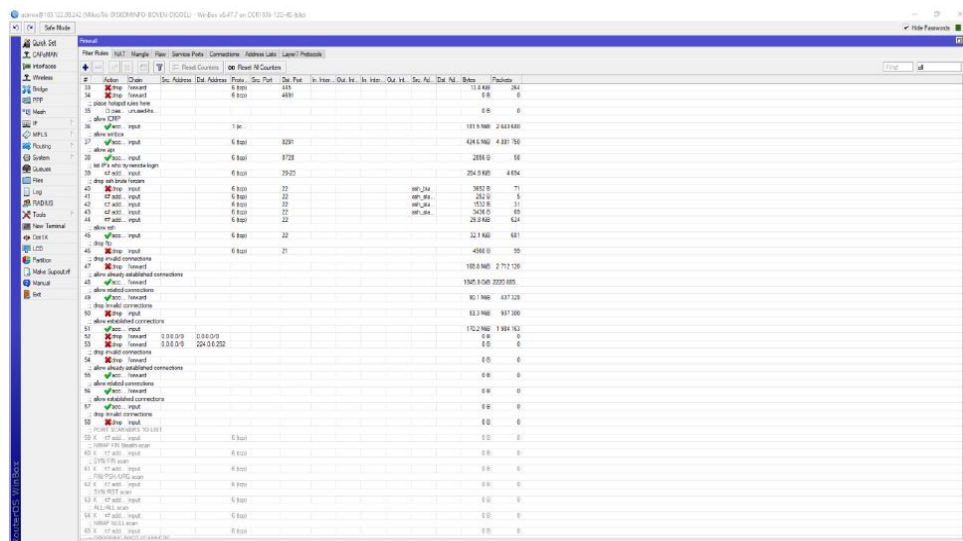


Figure 7. Firewall Optimization

The security side that is not good causes a lot of bandwidth and traffic abuse which affects the performance of the Diskominfo Router in Boven Digoel Regency itself. This matter causes inefficient Bandwidth deployment and frequent Request Time Out. By doing some filters on the firewall side, the Router can now work more maximum.

To improve wireless performance, a wireless installation is carried out with the test results. Testing and monitoring are carried out using the UNIFI OPD wireless access point using Cyberindo Speedtest. One of the results from the MPTSP Office is in figure 8.

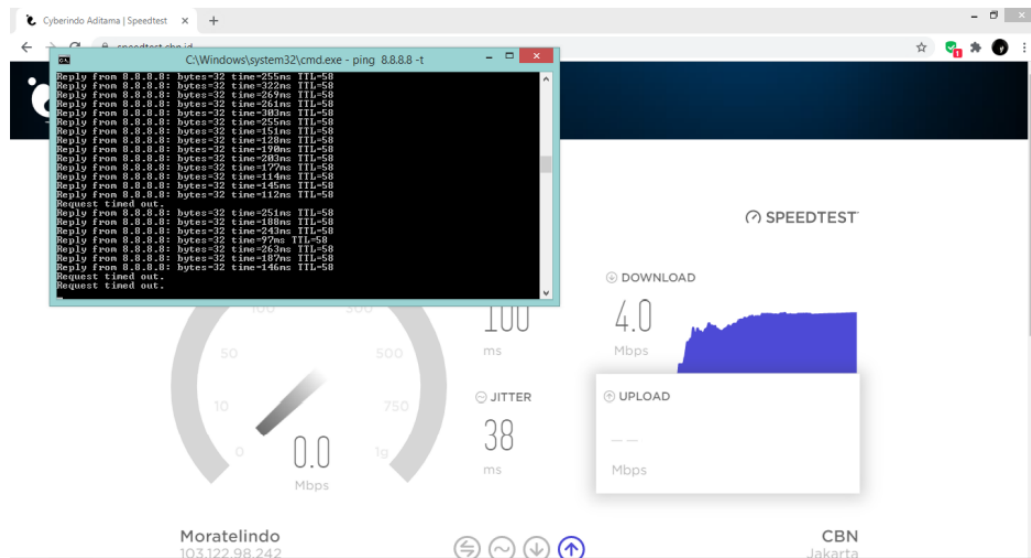


Figure 8. Checking the UNIFI OPD wireless MPTSP office

4. CONCLUSION

The result of optimizing the core router in this study is there is no RTO for inter-departmental networks. We expect that in the future the availability of Bandwidth can be increased to 10 to 20 Mbps for each OPD. Wireless optimization to improve wireless performance adds some filters on the firewall, so the router can work more optimally

The limitations of this system are traffic and data transfer in the network still running on layer two switch devices, the backbone between OPDs still using wireless and depending on weather, and the lack of network security systems (firewall devices).

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