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Bandwidth Quota Configuration For Internet Access At Pematangsiantar Mayor's Office

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ABSTRACT

Decreasing network performance Along with increasing network users. The way that can be done to reduce network performance degradation is by doing bandwidth management. Bandwidth management is very important in determining the bandwidth allocation that will be given to users to exceed the existing bandwidth allocation in the network. MikroTik Routerboard is one type of proxy that has a special operating system, namely the MikroTik OS Router has QoS which is used for full bandwidth usage licenses. This study provides bandwidth sharing with the Queue Tree method)

1. Introduction

Along with the development of the internet, the industry has now promoted and improved the quality of its services, because there are more and more internet users whose activities use the internet. In this case, it requires an understanding of each client in utilizing data packages so that they are not wasteful in using data packages. Wasteful use of data will certainly be detrimental because data is wasted for things that are not too important for the company, so internet data package management is very necessary for the needs of each employee in the company to have different work needs and functions. Every agency always needs employees who work optimally in it. The level of employee capability is one of the factors to increase the productivity of the performance of each agency. Therefore, each agency must have good internet access to improve employee performance to assist in carrying out their duties. Problems that occur in the Pematangsiantar Mayor's Office are problems in slow internet access due to a large number of employees from each office section using the internet office of the Pematangsiantar Mayor's office, so the Quota Bandwidth distribution is very small in other parts of the office and causes difficulties to communicate between offices. To exchange documents and computer-based data transmission via E-Mail and other electronic media, bandwidth usage on the network is rarely used in totality. The reason is due to the number of client activities that utilize a large amount of bandwidth on the office network to download or to use applications that can reap excessive bandwidth. Internet Network at Pematangsiantar Mayor's Office, bandwidth control between clients often occurs where some clients who want to upload and download news in the form of videos that will be sent to the Pematangsiantar City Government Web will be interrupted by other clients who are watching the news for review on YouTube and plus Smartphones that are always connected, the bandwidth distribution must be shared evenly by all clients for smooth internet access for each client in the Pematangsiantar Mayor's Office which aims to increase the smoothness of internet access to help smooth the performance of each Civil Servants and also to help smooth communication between offices in the regions Mayor's office.

2. Literature Review

2.1 Bandwidth

Bandwidth is the size of a data or information that can flow from one place to another in a network at a certain time [1]. Bandwidth is used to measure each flow of data packets accessed by the client. Now

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it has become commonplace if the word bandwidth is more often used in measuring digital data flow. The units used in bandwidth in units of bps (Bit Per Second).

2.2. Quality Of Service (QoS)

QoS (Quality of Service) is a unit of measurement of the performance of a transmission system that reflects the quality of transmission and availability of services The term QoS usually refers to a collection of technology and network engineering [2]. The purpose of QoS is to provide quality to network performance to provide results that have been determined beforehand. Components of network performance in the scope of QoS often have a need (uptime), bandwidth (throughput), latency (delay), and the error rate.

2.3. Mikrotik RouterOS

MikroTik RouterOS is a Linux based operating system intended as a network router [3]. Mikrotik RouterOS can include many features that are used for IP networks and wireless networks such as hotspots, queues, firewalls, DHCP clients, DHCP servers, web filtering, and handling if an error occurs on a computer network also provides security for the user. Mikrotik RouterOS is a tool designed to facilitate its users in its operation and administration can be done with the Winbox application and can be implemented on Windows-based computers so it is easier to understand.

2.4. Mikrotik Bandwidth Control

Bandwidth Control is a set of transfers that regulates data transfer, late variability, on-time delivery, and delivery of shipments. MikroTik RouterOS supports the following queuing disciplines: PFIFO (First-In-First-Out Package), BFIFO (Bytes First-In-First-Out), SFQ (Stochastic Fairness Queuing), RED (Random Early Detection), PCQ (Per Queue Connection) and HTB (Bucket Token Hierarchy). Currently, research is concentrated on PCQ and HTB2.

a. HTB (Hierarchical Token Bucket)

According to [4] HTB (Hierarchical Token Bucket) is a queue discipline that is useful for applying different treatments to different types of data streams. In general, we can set only one queue for one interface, distribute the amount of data flow and then set the max-limit for workgroups on the parent and then between members of the workgroup. By grouping HTB, it allows us to make Queue more structured, then the client will share the remaining bandwidth of the HTB benefits so that all clients have the same priority.

b. PCQ (Per Connection Queue)

PCQ is a classless queue that can limit bandwidth according to the needs of an agency [5]. PCQ also creates sub-queues, each sub-queue has a data speed limit for PCQ-rate and PCQ-limit packet. The total size of the PCQ queue must be smaller than the PCQ-total-limit packets. With multiple clients can equalize the bandwidth used and divide the bandwidth by PCQ (Per Connection Queue) with the principle of queuing using the PCQ method so that each client will get the same bandwidth quota.

c. Queue Simple

The simple queue is a simple way to determine the bandwidth limit that is commonly used in limiting bandwidth based on certain IP addresses [6]. Simple queue has many criteria and also very many features available on a simple queue even though it looks very simple, can be adjusted to the needs of internet access to be applied. Targets and Max-limits are the basic parameters of a simple queue. Bandwidth is set according to IP address, network address, and the interface can also be limited. Bandwidth can provide maximum limits for targeting used for Max-limit Upload / Download. In one Simple Queue rule, you can close Upload, download at the same time separately (Upload + download) using the Total tab. Each rule in Simple Queue can also be arranged in a hierarchy or stand-alone by directing the Parent to another rule.

d. Queue Tree

Is a bandwidth management feature in Mikrotik that is very flexible and quite complex and is commonly used to limit upload and download quotas to users so there is no struggle for data packets between clients when accessing the internet, although queue tree configuration is quite complicated because it must distinguish upload and download traffic through Magel firewall is quite complicated [7]. Each service on the network can be given a different speed and can be changed at will by the admin. Utilization of Mangle Packet-Mark is very beneficial because it will be easier to determine what traffic to be wrapped, can also be based on IP Address, Protocol, Port and so on.

2.5. Mikrotik Monitoring Tools

a. Graphing Trafic

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MRTG is an internet usage that occurs when an application is made to see the amount of traffic used. It is displayed graph flow character. Graphing traffic is used by entering the Mikrotik IP address in the browser that has the facility owned by Mikrotik.

b. Packet Sniffer
Packet Sniffer is a tool provided in Mikrotik to capture and tap packets that run on the network. This tool is very useful for analyzing network traffic.

c. Torch
Torch displays protocol traffic and speed when received and sent, Torch is a Real-Time Traffic Monitor that is used to analyze traffic flow that passes on an interface based on protocol, source, and destination and port.

3. Methodology

In the research that has been carried out several stages in the form of guidelines in completing the research include :

a. Analysis
In the analysis phase, the researcher analyzes the problem, needs analysis, user analysis, and network topology analysis that already exists.

b. Design
At this stage the researchers made a network topology design drawings that will be built, Design in the form of topological structure designs, topology drawings created using Microsoft Word 2010 tools.

c. Simulation Prototype
The researcher conducted a network simulation with the help of Vmware tools to build an internet network that had been designed and designed beforehand.

d. Implementation
At the implementation stage, the researchers installed the Mikrotik PC Router, basic configuration settings for Mikrotik, modem configuration settings, and bandwidth management in the Queue tree.

e. Monitoring
At the monitoring stage in the Pematangsiantar Mayor's network in the Public Relations and Protocol section, the researcher used the tools found in the Mikrotik. The tools are Graphing traffic, Packet Sniffer and Torch, researchers also conduct bandwidth tests to local servers.

f. Management
Researchers do not fully carry out management stages because at this stage an Admin has full authority in carrying out maintenance and maintenance as well as modification to the structure of the Internet network or to the system.

The research workflow is presented in Figure 1 below .

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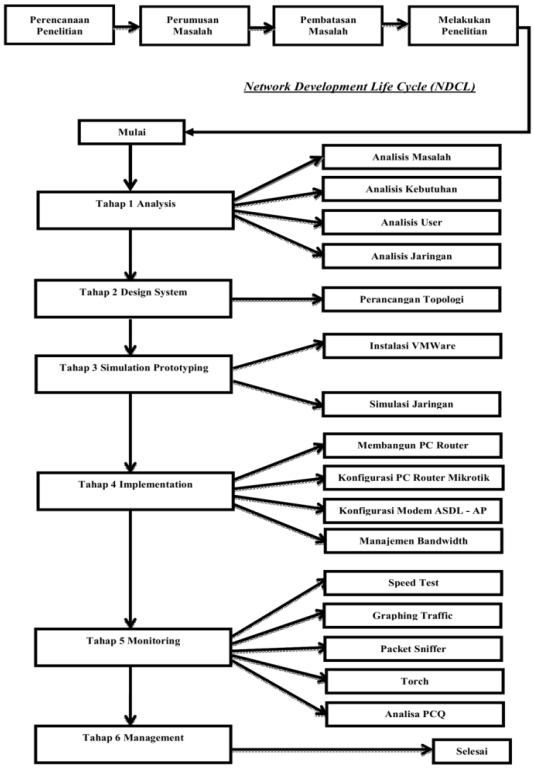

Figure 1. Research workflow

4. Implementation

4.1. Instalation

After completing all the needs that support planning to make it easier to configure the bandwidth quota so that it runs well, the first step that must be done is to install the Winbox application then malfunction the proxy configuration and then perform the initial configuration such as IP configuration, DNS, Hotspot, Mangel Firewall Settings, Bandwidth settings, Bandwidth settings, Speed Test.

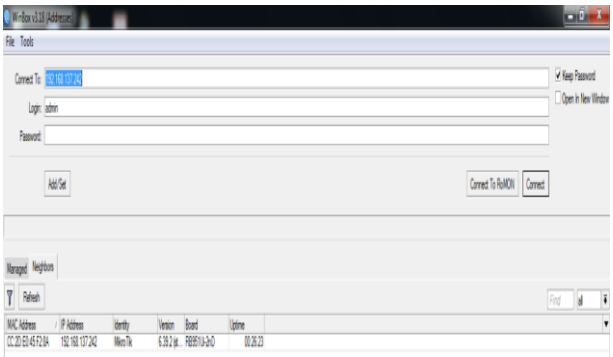

Figure 2. Initial Display Winbox application

4.2. Setting Wlan 1

Configuring Wlan1 is the initial stage, WLAN 1 functions as an internet dealer and will be processed later for Firewalls, Bridges, Bandweds, Hotspots, etc.

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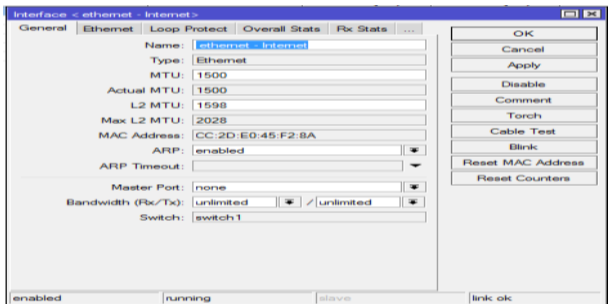
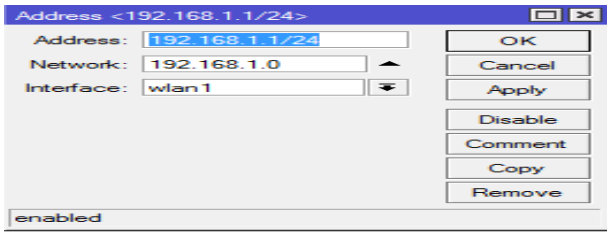


Figure 3. Setting Wlan 1

4.3. Setting IP

Mikrotik IP Address settings can be connected to the internet and proxy as a gateway to computers and other devices.



Fugure 4. Setting IP

4.4. Seting DNS (Domain Name System)

To be able to store hostname and domain information in a distributed database on computer networks that use TCP / IP.

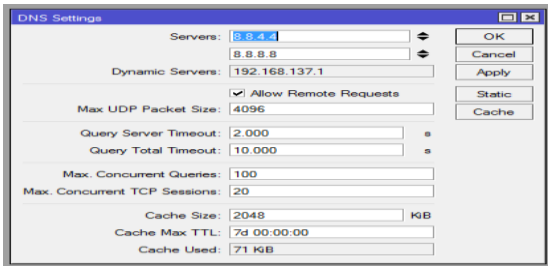


Figure 5. Setting DNS

4.5. Setting Hotspot Mikrotik

Setting up a hotspot so that each client gets wireless internet access.

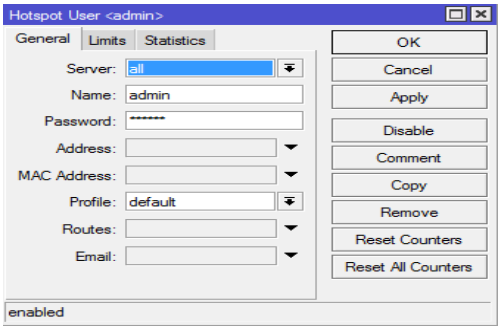


Figure 6. Setting hotspot Mikrotik

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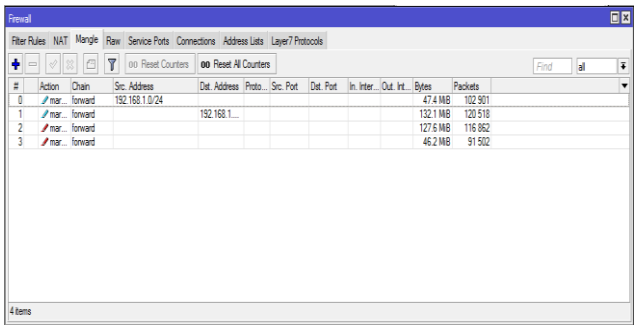
4.6. Tampilan Login Jaringan

Display when the client has received permission to access the internet through an account that has been registered by the admin who can access the login.

Figure 7. Network Login Display

4.7. Setting Mangel

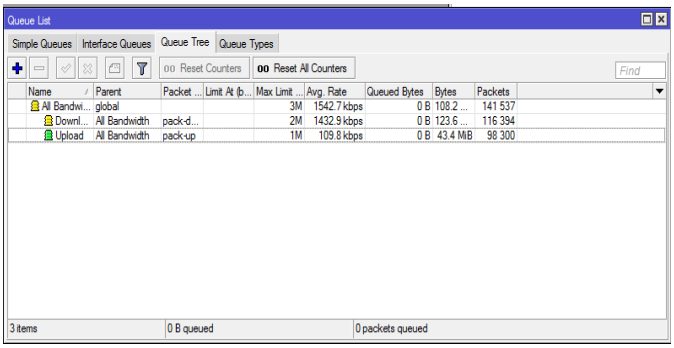
Configure mangel to mark upload, download, and packet data connection traffic by marking connections based on the protocol and the destination port that is available in the Mangel Mikrotik feature to separate the bandwidth of the queue.



Figur 8. Setting mangel

4.8. Setting Bandwidth

Bandwidth settings to limit the maximum of each client can access the internet so that it consumes data packets only at a specified maximum limit.



Figur 9. Setting Hotspot Mikrotik

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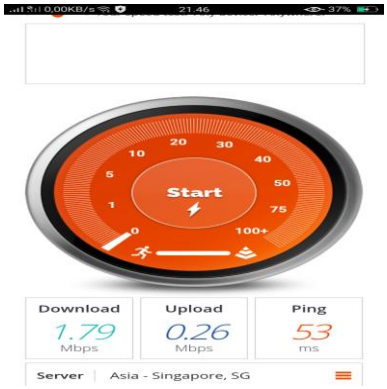
4.9. Speedtest

After completing the client access quota limit, then perform an accuracy test of the settings that have been done.



Figur 10. Display Speedtest Results

4.10. System Requirements Specifications

The system specifications used in the implementation of the Mikrotik Router-based network at the Pematangsiantar Mayor's Office use hardware and software as mentioned in the sub-chapter below:

1. Software specifications

   The following is a Hardware specification that will be used in the implementation of a router-based network in the Pematangsiantar Mayor's Office.

   a. Mikrotik router specifications

   The router that will be used at the Pematangsiantar Mayor's Office is the output of the proxy with the type of RB91UI-2ND proxy. The complete specifications of the router can be seen in the table below:

TABEL 1.
Specification *mikrotik RB91UI-2ND*

Product Code	RB951Ui-2nD
Architecture	MIPS-BE
CPU	QCA9531-BL3A-R 650MHz
Main Storage/NAND	16MB
RAM	64MB
LAN Ports	5
Gigabit	No
Switch Chip	1
Integrated Wireless	1
Wireless Standarts	802.11 b/g/n
Wireless Tx Power	22dbm
Integrated Antenna	Yes
Antenna Gain	2 x 1,5dBi
USB	1
Power on USB	Yes
Power Jack	8-30V
POE Input	Yes
POE Output	Yes, Port 5
Dimentions	113x89x28mm.
Operating System	RouterOS
Temperature Range	-20C .. +50C
RouterOS License	Level4

   b. Software Requirements Analysis

   In implementing and evaluating a Mikrotik Router-based network in the Pematangsiantar Mayor's Office, Winbox software is used. The Winbox application that is used to configure

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the router version 5.13, with Winbox is easier to configure than using the CLI (Command Line Interface)

5. Conclusion

a. Mikrotik Routers can manage bandwidth according to the needs of the Pematangsiantar Mayor's Office.
b. After managing the bandwidth of the internet connection to be smooth and stable in each office and Bub-di section in the Mayor's Office Pematangsiantar.
c. Mikrotik Router can facilitate the admin in monitoring internet access in each part of the Office because bandwidth management has been done.
d. Managing with Queue Tree and PCQ Method features the network quality becomes more optimal, this is because bandwidth is divided by the rules applied and does not cause clients to grab bandwidth from each other.

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