

DESIGN OF A TRAFFIC RATE PRIORITY NETWORK CONNECTION MANAGEMENT SYSTEM ON A COMPUTER NETWORK

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ABSTRACT

The practical laboratory is one of the facilities as a teaching and learning centre for experiments and research. For this reason, adequate facilities are needed in the laboratory to facilitate the teaching and learning process, one of which is the network. However, when many students use the network, the speed will be slow. Based on the above problems, the author wants to conduct research by providing different bandwidth allocations and managing user bandwidth based on priorities. The mangle method is used to mark data packets based on port, protocol, src and dst address, and the simple queue method is used to set the amount of bandwidth and priority for each user. From the results of testing or functional research, it can be concluded that the results of the application of the mangle method are used to provide marking of a packet that will be limited based on the port that has been configured and the Simple Queue method as a determinant for setting the priority given to each user so that when users use zoom access, global, games and others can use the internet network smoothly without any internet interference because traffic rate priority and bandwidth management have been carried out.

Keywords: *Mangle, Simple Queue, Traffic Rate Priority, MikroTik*

1. INTRODUCTION

Despite the fast-growing Internet network, some problems still affect agencies and companies. One of them is an unstable network and the lack of bandwidth management and configuration, greatly influencing the Internet connection. Internet traffic also requires considerable precautions to keep the network between computers free from Internet obstructions. As a result, the network becomes overloaded with access requests, causing the Internet to be slow, with users opening social media such as YouTube or online games.

The function of connection traffic speed priority is to divide the bandwidth according to the speed of use of each computer unit, laptop or those on a network that prioritize connections so that users, when using the Internet, receive bandwidth according to the connections offered in three categories, namely low bandwidth, medium and high bandwidth, so that the rules on prioritization remain relevant.

The laboratory is one of the academic support units of higher education where students can practice understanding learning concepts through tests or practical exercises. In this context, the role of the laboratory is very important because the laboratory is the centre of the teaching and learning process, where experiments, studies or research are carried out in lectures. However, when many students use the network or download files, the speed will be slow.

To deal with the network problem, the authors conducted Quality of Service analysis testing on the internet network in the ITN Malang Database Laboratory. The goal is to keep the Internet stable concerning other connections due to the importance of connection and network traffic demand. The utilization of the Connection Traffic Rate Priority Network feature is expected to overcome the lack of

network stability so that the Internet is not slow when used according to the users' needs.

To maximize the available internet connection so that the network balance between one user and another user does not occur congestion when using the internet network, namely using Mikrotik with the Mangle and Simple Queue methods.

2. LITERATURE REVIEW

2.1. Previous Studies

Cahyana et al in a study entitled "Implementation of Bandwidth Management Using Connection Traffic Rate Priority" stated that the purpose of the connection traffic rate priority research is to allocate bandwidth based on the speed requirements of each computer unit by prioritizing priority connections, so that users who arrive on the Internet can make bandwidth reservations according to the connections offered in three categories: small bandwidth size, medium and high bandwidth. [1].

Rikaro Ramadi et al in a study entitled "The Use of Quality of Service (Qos) Utilization in Managing Network Hotspot Traffic Pti Laboratory Faculty of Education, Muhammadiyah University Jakarta" aims to find computers connected to the network capable of integrating high-quality, reliable, fast, and safe functions and features between its components according to the required system. Along with the trend of using network technology that continues to consider the strategic and economic aspects of users, network computer systems are currently developing into systems that save resources by reducing the use of hardware. Therefore, it is very important to carefully examine network aspects through standard procedures and methods that allow the application of the IQoS concept [2].

Another study by Eka Kusuma Pratama et al in a study entitled "Prioritization of Video Conference Traffic Feature Firewall Port Mangle IP Address List in Mikrotik RouterOS" aims to organize video conferences using Zoom. The highly active network configuration is designed to maximize multi-party video conferencing. Uses traffic speed prioritization with network packets favoring specific networks. The use of the proxy priority function is expected to overcome the unstable video conference screen and become the most efficient solution. Users can register directly to their network anywhere, becoming a powerful solution in using video conferencing applications [3].

Research by Ahmad Ainurridho et al aims to improve the quality of wireless networks and optimize bandwidth or internet speed. Based on the first analysis, the unstable and suboptimal bandwidth quality is caused by the lack of bandwidth management in the network. Based on the literature review, the solution to improve the quality of the wireless network and optimize the bandwidth is to add a bandwidth management configuration with the firewall and bandwidth stretching methods on the Mikrotik router. Simulation is carried out by adding these settings so that the bandwidth received by each user becomes optimal [4].

Kosasih conducted research to automatically share bandwidth using the Per Connection Queue (PCQ) method to remain optimal and avoid individual control between users, load restrictions in using available bandwidth, and excessive bandwidth capacity. Bandwidth allocation is divided evenly and based on all user needs and can reduce the company's bandwidth investment costs. to optimize bandwidth allocation by applying a top-down approach model. The results of this study indicate that all users can access the internet stably with the same data transfer speed, thus, they can optimally utilize the bandwidth capacity owned by the company and avoid bandwidth leakage [5].

Novrianda conducted research on the Internet used by STIPER Sriwigama Palembang which has a problem of uneven bandwidth distribution at access points connected to users, so that most users feel that the internet speed is slow. Therefore, bandwidth management is used in this study so that bandwidth distribution can be evenly distributed to each access point connected to the user, with the same internet speed. This research requires Mikrotik and Winbox router software that is capable of configuring bandwidth management using the SimpleQueue method. In this study, a prototype with a bandwidth of 2.5 Mbps was used and bandwidth distribution was carried out at five access points on the STIPER Sriwigama Palembang LAN [6].

2.2. Mangle

Mangle is a Mikrotik router firewall used to mark data packets. Sometimes the marking job is called

mark packets. The purpose of marking is to make packets easier to identify, which in turn makes it easier to use filtering, masking, routing, and bandwidth management to implement or implement Quality of Service (QoS) [7].

2.3. Src. Address List dan Dst. Address List

Src. Address List and Dst.AddressList serves to retrieve or carry IP (Internet Protocol) information contained in the firewall addresslist. This feature allows network administrators to easily classify Internet Protocol (IP) addresses for use as packet marking indicators. Thanks to this feature, network administrators do not have to worry about too many errors due to the large number of IPs (Internet Protocol) used [8].

2.4. Firewall

A firewall is a device whose job is to check and determine the data packets that leave or enter the network. The role of a firewall is to protect the network from attacks from the Internet because it can determine whether data packets can enter and exit the network. Apart from protecting the network, firewalls also function to protect users or host computers (single host, this type of firewall is called a host firewall) [7].

2.5. Bandwidth Management

In a network that has many clients, a bandwidth management mechanism is needed to prevent the use of monopolized bandwidth so that all clients can receive their own bandwidth allocation. QOS (Quality of Services) or better known as Bandwidth Management is a method used to fulfill these needs. [9].

2.6. Simple Queue

Simple Queue is a strict method or to limit bandwidth by dividing bandwidth from small to medium-sized ones. This simple queue is also used to manage bandwidth for each user upload and download, allowing administrators to limit specific destinations based on IP addresses as well as network addresses and interfaces. [10].

2.7. Queue Tree

Queue Tree is a feature for flexible, and efficient bandwidth management. The Queue Tree has very detailed requirements for protocols, services, ports and more. Queue Tree implements the firewall's Mangle function. This feature can determine what traffic we restrict. Queue Tree is commonly used to determine useful traffic for online games and even web browsing [10].

2.8. Star Topology

In a star topology, each node is connected to a central access point, usually called a hub (which can be a hub, switch, or router). Unlike a bus topology, a star topology allows each node on the network to have

a point-to-point connection to the central hub. All traffic sent on the network passes through the hub and acts as a message repeater so that it can be sent to other nodes [11].

2.9. API (Application Programming Interface)

Programming documentation consists of functions, interfaces, classes, structures, etc. to create software. API is a collection of programming code that connects software to other software and allows developers to access system functions. APIs have functions dedicated to application development and carry a request message from the user that says what the system should do, after which it announces a response according to the user's request. [12].

3. ANALYSIS AND DESIGN

3.1. Menu Structure

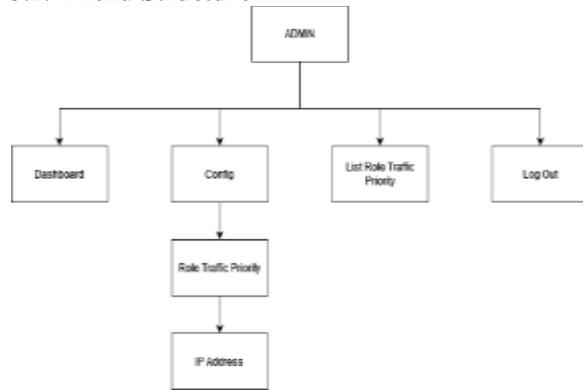


Figure 1. Menu Structure

Figure 1 shows the menu structure of the bandwidth management system on the web which consists of 4 main menus:

1. Dashboard menu, as a menu to display IP Addresses connected in an internet network
2. Config menu to configure Traffic Priority where there is a sub menu to provide role zoom or others through IP Address on the internet network
3. Traffic Priority List menu as a menu to display a list of IP Addresses registered in the Traffic Priority Role menu
4. Logout menu, to exit the system.

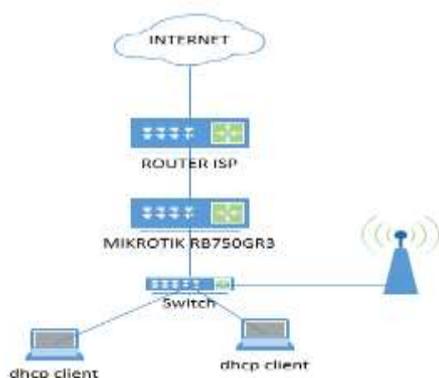


Figure 2. Block diagram

Figure 2 shows the topology used to design the Traffic Rate Priority Network Management System. This topology uses Mikrotik which is connected to a router connected to the internet from an ISP (Internet Service Provider) There is 1 laptop connected to the network using a UTP cable used to access the win box and configure Traffic Rate Priority and bandwidth management on the network, while the second laptop is used as a user.

3.3 Flowchart System

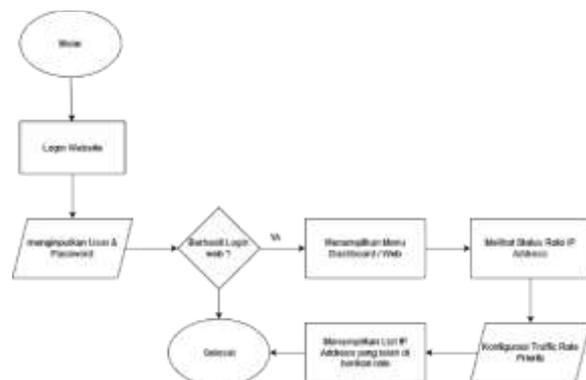


Figure 3. Flowchart system

Figure 3 is the Connection Traffic Rate Priority Network flowchart. Starting from the web login if the web login is successful then Next, the web will display the web dashboard display if the login has been successful, if it is not successful it will display a login error message. Then see the status of the IP Address role on Traffic. The next step is to configure Role Traffic Rate Priority which is to manage IPs that are diverted into role games or streaming and also manage bandwidth. Then in the next step, see the list that is registered in the traffic rate priority role, then finish.

3.4 Source Code DHCP Server

```

:local queueName "Client-
$leaseActMAC";
:if ($leaseBound = "1") do={
/queue simple add name=
$queueName target=($leaseActIP
. "/32")
limit-at=512k/769k max-
limit=512k/1024k comment=[/ip
dhcp-server lease get [find
where active-mac-
address=$leaseActMAC && active-
address=$leaseActIP] host-
name];} else={ /queue simple
remove $queueName}
    
```

4. RESULT AND DISCUSSION

4.1. Tampilan pada menu dashboard



Figure 4. Dashboard display

This guest traffic rate priority network dashboard page displays information about the user's name, ip address, max download, max upload, download, upload, packet marks, priority and options to perform or change the user's status such as packet marks and others.

4.2. Display on the Zoom dashboard menu



Figure 5. Zoom dashboard display

This network priority traffic rate Zoom dashboard page displays information about user name, ip address, max download, max upload, download, upload, packet marks, priority and options. Then on this zoom dashboard page only displays users who have zoom status on packet marks.

4.3. Display on the game dashboard menu



Figure 6. Game dashboard display

This network priority traffic rate game dashboard page displays information about user name, ip address, max download, max upload, download, upload, packet marks, priority and options. Then on the game dashboard page, it only displays users who have game status on packet marks.

4.4. Display on the global dashboard menu



Figure 7. Global dashboard display

This global traffic rate priority network dashboard page displays information about user name, ip address, max download, max upload, download, upload, packet marks, priority and options. Then on the game dashboard page, it only displays users who have game status on packet marks.

4.5. DHCP Server Display

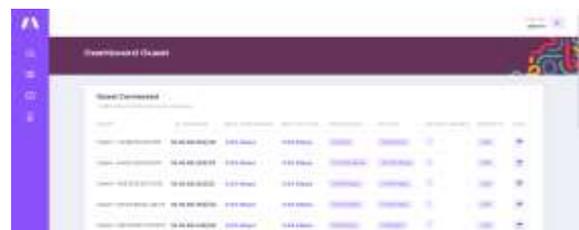


Figure 8. DHCP display

This test is done to display users or clients who are connected to the local network. There are several features, namely displaying the client's name, IP address, max download, max upload, download, upload, packet marks, priority and packet marks options and options to change the status of the currently connected client.

4.6. User Management Display



Figure 9. User Management Display

Option testing to change client status is done to meet the needs of each client. On clients with IP Address 18.18.48.252 / 32 change the max limit where the max limit has 2 types, namely max download and max upload. In packet marks there are 3 types of choices, namely zoom, game and global.

4.7. User option result display



Figure 10. User option result display

Client results after changing the status based on client IP address 18.18.48.252 and 18.18.48.250.

4.8. Bandwidth Testing Results Display

At this test stage, a download and upload of data in the form of a file that has been prepared on a google drive and laptop. Each user / client will get the appropriate download bandwidth speed and upload bandwidth.

Table 1. Bandwidth Limit Testing Results

No	Client	Bandwidth Limit			Within Bandwidth Limit
		Upload / Download	Upload (avg)	Download (avg)	
1	Client 1	5M / 5M	4.95	4.96	YES
2	Client 2	4M / 4M	3.94	3.84	YES
3	Client 3	3M / 3M	2.80	2.95	YES
4	Client 4	2M / 2M	1.90	1.88	YES
5	Client 5	1M / 1M	0.82	0.80	YES
TOTAL BANDWIDTH 15Mbps (ISP)					

4.9. Mangle Firewall Testing Without Priority

In testing, it can be concluded that Clients 3 and 4 perform file download activities and Client 5 performs streaming activities which cause the bandwidth provided by the internet service provider to be used up and make browsing, Zoom and game activities slow because the priority (8) is the lowest or the same as other clients which results in internet network traffic becoming jammed and irregular.

Table 2. Test Results without priority

No	Client	Bandwidth Limit			Priority	Packet Marks
		Upload / Download	Upload (avg)	Download (avg)		
1	Client 1	2M / 2M	87.3 kbps	860 kbps	8	-
2	Client 2	1M / 1M	1 kbps	7 kbps	8	-
3	Client 3	7M / 7M	55.2 kbps	2.7 Mbps	8	-
4	Client 4	7M / 7M	95.7 kbps	4.5 Mbps	8	-
5	Client 5	1M/1M	81.9 kbps	1 Mbps	8	-
TOTAL BANDWIDTH 10Mbps (ISP)						

4.10. Mangle Firewall Testing with Priority

When the client is connected or connected to the internet where Clients 1 to 5 perform internet activities such as browsing, zooming and gaming. In packet marks zoom gets priority 1 where the priority will maximize the zoom bandwidth on Client 1. In the game packet marks get priority 2 where the priority will maximize the game bandwidth on Client 2 without

disturbing or taking bandwidth at priority 1. In the global packet marks get priority 3 where the priority will maximize the global bandwidth on Clients 3 and 4 without disturbing or taking bandwidth at priority 1 and 2. On Client 5 using priority 8 where priority is the lowest priority and does not get bandwidth priority.

Table 3. Test Results with priority

No	Client	Bandwidth Limit			Priority	Packet Marks
		Upload / Download	Upload (avg)	Download (avg)		
1	Client 1	2M / 2M	95.1kbps	1.3 Mbps	1	Zoom
2	Client 2	1M / 1M	1 kbps	3.4 kbps	2	Game
3	Client 3	7M / 7M	68.6kbps	3.7 Mbps	3	Global
4	Client 4	7M / 7M	73.8kbps	3.9 Mbps	3	Global
5	Client 5	10M/10M	53.3kbps	1.1 Mbps	8	-
TOTAL BANDWIDTH 10Mbps (ISP)						

5. CONCLUSION

Based on the tests, it can be concluded that the connection traffic rate priority network is used to request bandwidth as needed by providing different bandwidth allocations. User bandwidth management based on priority using the Mangle method is used to mark a packet that will be limited based on the dst port that has been configured. The application of the Simple Queue method is as a determinant for setting priority, bandwidth and the type of packet marks that have been configured on the Mangle Firewall, which are given and used by each user or client.

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