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Mikrotik Hotspot Network Implementation Using Simple Queue As Bandwidth Management

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ABSTRACT

Internet network is one of the most important needs in a company to access online in uploading or downloading a file. Where almost all companies already use computers and use the network as a tool to facilitate work. The problem that often occurs in the use of internet networks is that the speed is unstable, because users or users of the same network are more than one person, causing internet splits to split and not focus on one user. Mikrotik is a company that stands and makes products such as Routers, Switches, Antennas. By using a proxy router, the author found a solution to solve the problem by doing a bandweed mechanism with the aim of preventing the monopoly of bandwidth usage, so that all users or users in one network can get their bandwidth in a fair manner. Bandwidth management is a method used to meet these needs. And to do the settings, the author uses the Winbox application and also the queue function to do the implementation of the proxy router. The author uses the ip address of each computer that is connected in one network, to be used as data and then processed in the Winbox application, for bandwidth management.

1. Introduction

A computer network is a system that consists of several computer systems that are related to one another. The relationship formed can take the form of communication such as sending instant messages, sharing data, and access to information such as the web. Computer networks have more benefits compared to stand-alone computers. For example connections between computers, so computers can exchange information with each other. The form of connection can be in the form of optical fiber, copper wire, microwaves, and communication satellites. Each network has different management according to the needs needed [1].

In computer networks, proxy is an operating system that is at the same time software that can be used to make a computer a reliable network router, including various features made for IP networks and wireless networks. Mikrotik is a name of a small company headquartered in Latvia. The formation was first done by John Trully and Arnis Riekstins. John and Arnis began routing the world in 1996 (Mikrotik's mission was to route the whole world). Starting with the Linux system to MS-DOS combined with Aeronet Wireless LAN (WLAN) technology with 2 Mbps speed in Moldova, a neighboring country of Latvia, and then serving five customers in Latvia [2].

On a computer network that has many clients, a bandwidth management mechanism is needed in order to prevent the monopoly on the use of bandwidth, so that all clients can be equally divided into their respective bandwidth rations. QOS (Quality of Services) or commonly called Bandwidth Management, is a method used to meet those needs, and in its application the writer uses the Queue function. Simple Queue is one of the methods found in the Mikrotik OS and is the easiest way to limit the speed of data access from the specified IP address or subnet [3].

In this case, the authors found a similar problem experienced by an agency that is "the Department of Public Housing and Settlement Areas" where the internet network that is used with 10Mbps access

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speeds has not been managed in bandwidth, so that the use of the network is still a tug of war between users one with other. Which results in unstable internet speed due to the absence of bandwidth management on the network.

2. Literature Review

2.1. Computer Network

"Computer networks according to Lowe (2007) are two or more computers connected to each other through cable media (or radio connection media) that can exchange information". "According to Lammle (2000) when a computer network was first created, computers could only be connected to other computers from the same factory". For example DECnet computers can only be connected to DECnet, IBM computers can only be connected with IBM. Then in the late 1970s the International Organization for Standardization (ISO) created the Open System Interconnection (OSI) model. "The OSI model is an important architecture that can connect various types of computers without seeing the manufacturer or the vendor of the manufacturer"

2.2. Hotspot

According to Iwan Sofana (2008) Understanding Hotspot is a hotspot or area is a special place provided to access the internet using Wi-fi equipment. Generally hotspot services are free. Armed with a laptop or PDA, an internet connection can be done free of charge. Usually the user must first register to the hotspot service provider to get a login and password. Then users can search for hotspot areas, such as shopping centers, cafes, hotels, campuses, schools, airports, and other public places. The authentication process is carried out when the browser is activated [4].

2.3. Router

Router is a device on a network that can connect several different networks [5]. By using information on each data packet, the router can do routing from one network to another, determine the best among the networks.

Advantages of Using a Router:

1. We can use the router on any network topology.
2. Routers are not sensitive to time delays as experienced by bridges.
3. The router can be easily configured compared to a bridge.

Disadvantages of Using a Router:

1. Routers at the OSI layer can forward traffic according to the protocol that will be applied to the router itself.
2. The use of static routing tables can result in several systems that are affordable by other systems.
3. Routers are generally more complex and processes on routers are usually larger than bridges.

2.4. Mikrotik

"Mikrotik router OS is an operating system that is used specifically to make a router by implementing it to a computer" [4]. Mikrotik OS is a OS that is very familiar among network administrators or internet network technicians. Mikrotik OS is supported by the GUI (graphic user interface) feature that makes it easy for users to access or configure using the Winbox application. With the GUI feature, the Operating System becomes easier to use because most other Operating System routers are still based on CLI (command line interface).

2.5. Winbox

"Winbox is a utility used to remotely access proxy servers in GUI mode. If to configure the proxy in text mode via the PC itself, for GUI mode using Winbox you must configure the proxy through the client computer " [6]. The function of Winbox is to configure Mikrotik in a GUI or with a desktop display, using this winbox helps to perform Mikrotik settings because it does not use syntax or command codes in a relatively complex console.

3. Methodology

After the writer made observations and analyzed at the research site and with the existing problems, the writer tried to apply the simple queue method at the office of the office. So that there is no longer a monopoly of bandwidth between users. The author takes the ip address of each user connected to the wifi

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network as a target to determine the speed of access. Here are some of the employees' IP addresses and internet speeds that the authors observe for bandwidth management.

Table 1.
Example of Access Speed Table Before Management Bandwidth

No.	*IP Address*	Kecepatan Akses
1.	192.168.0.182	Download 1 *Mbps* Upload 0,5 *Mbps*
2.	192.168.0.98	Download 3 *Mbps* Upload 0,9 *Mbps*
3.	192.168.0.255	Download 1,5 *Mbps* Upload 1 *Mbps*

In the table above, there are several IP addresses that do not have the same internet speed, because they have not yet managed the bandwidth. It could be that the speed changes to be faster or slower depending on how many users are using the same internet network. So that at any time it can harm one of the users if the internet speed slows down drastically if there are other users who are using it to download files that may reach 1GB in size. By managing the bandwidth of each user using the same network in one institution, each user will get the same upload and download speeds, so that no user experiences delays on the internet network they use. Following are the expected results after managing bandwidth from two users who previously had different internet speeds.

Table 2.
Example of Access Speed Table After Management Bandwidth

No.	*IP Address*	Kecepatan Akses
1.	192.168.0.182	Download 1 *Mbps* Upload 1 *Mbps*
2.	192.168.0.98	Download 1 *Mbps* Upload 1 *Mbps*
3.	192.168.0.255	Download 1 *Mbps* Upload 1 *Mbps*

From the above table, you can clearly see the difference in download and upload speeds after and before bandwidth management. Here is a network topology that I use to perform bandwidth management using a proxy router.

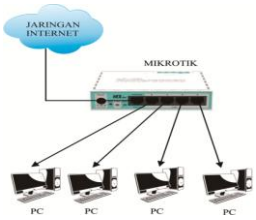

Fig 1. Network Topology Using a Mikrotik Router

From observations made by the author, the writer has a problem at the research site that is upload and download speeds that are not appropriate for every user who uses the internet network. So it slows down the work of using the internet, for example such as sending emails, opening certain websites, uploading files and downloading files. The author uses the Simple Queue method to regulate upload and download speeds with the aim that every employee or user who uses the internet gets the same speed and is equally distributed.

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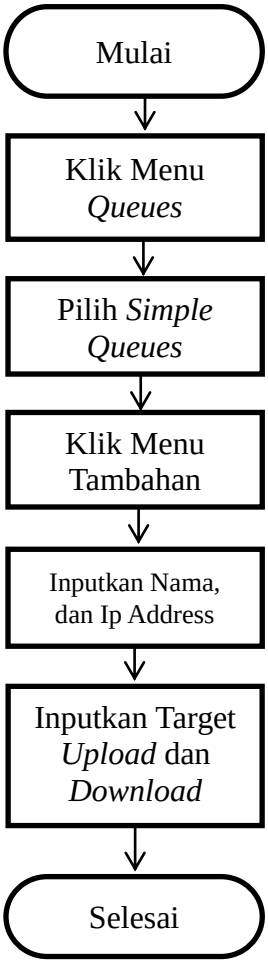

Fig 2. Bandwidth Flowchart Management Using Simple Queue

Information:
1. Open the Winbox application and select the queues menu
2. Choosing a simple queue sub menu
3. Click the additional menu
4. Enter the name and ip address of each user who uses the same network
5. Enter the download and upload target for each IP address entered.

4. Implementation

Implementation is carried out through the Winbox application, which is a special application that can perform remote or remote router settings. The type of proxy router that I use here is RB951Ui-2nD. Following are the steps in managing bandwidth using the winbox application and also the results after managing the bandwidth.

4.1. Connect Mikrotik With Modems And Computers

The first step is to first connect the proxy to the modem to get internet access using a UTP cable, then connect the proxy to the computer. The author uses a laptop as a modem as well as an admin to make settings on the proxy. After connecting the IP Address will appear, then select connect to enter the main menu.

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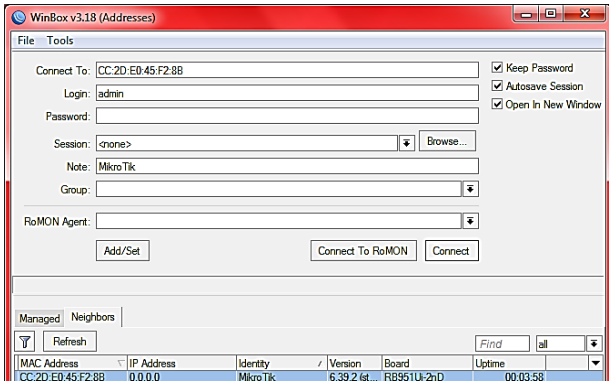

Fig 3. Initial Display of Winbox Application

In fig.3 is the main display of the proxy menu after connect to the device that has been connected to the proxy. There is a sub-menu on the left to do proxy settings.

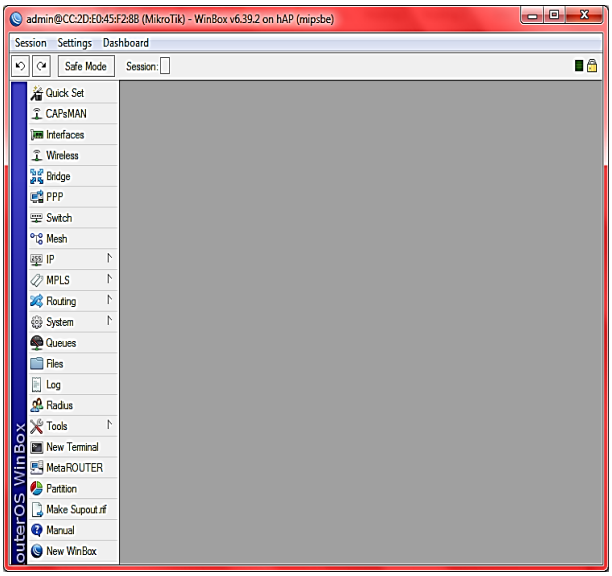

Fig 4. Display Main Menu From Winbox Application

4.2. Use of Hotspots on Winbox

In the Winbox application there is a hotspot feature, where the authors use it as a liaison between the network user's computer with the network used. The role of the third person is carried out to set or remote proxy in managing the proxy. In this hotspot menu the author can create and manage user names and passwords when they will be connected to the network. The process will be transferred to the login screen after connecting to the network.

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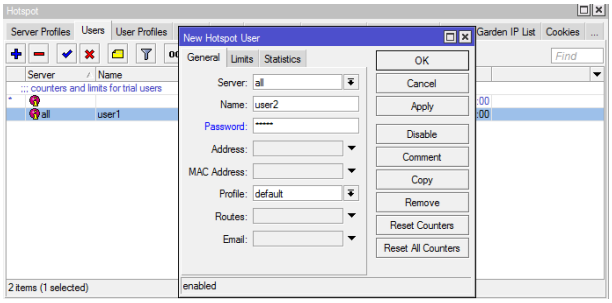

Fig 5. Display User Hotspot

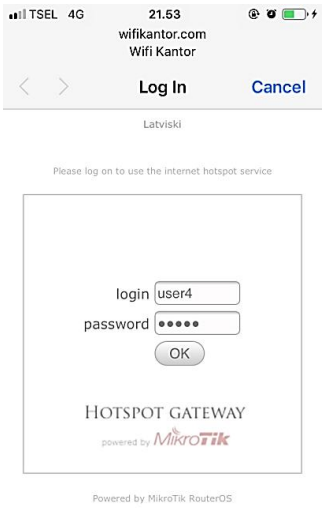

Fig 6. Display User Login

Fig 7. Display Login Success

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4.3. Image of Test Speed Test Results with Smartphone

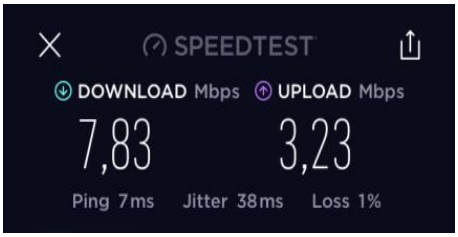

Fig 8. Display Test Results Speed test with Smartphone on user Before the Bandwidth Management

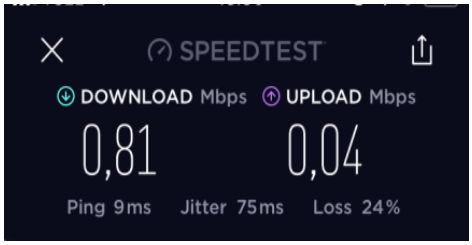

Fig 9. Display Test Results Speed test with Smartphone on user After the Bandwidth Management

From the results of the speed test in the picture above, it can be seen the difference before and after the bandwidth management is performed on the user, with a max download of 1Mbps and a max upload of 64k.

4.4. System requirements specifications

The system requirements in managing bandwidth include software and hardware requirements, as follows.

1. Software Requirements
   For Software that is needed in managing bandwidth is a winbox and speedtest application to do a speed test to make the difference before and after performing bandwidth management.
2. Hardware Requirements
   a. Mikrotik Router,
   b. UTP cable,
   c. Modem.

5. Conclusion

From the case that the writer examined and observed, the writer drew some conclusions:

1. By managing bandwidth, the internet network used will be stable. Although used together, it will not affect each other because the bandwidth has been shared by every user who is connected to the same internet network.
2. Simple Queue is a simple way to limit Bandwidth based on Client's IP Address, either Bandwidth Download or Upload.
3. Mikrotik RouterBoard has a Hotspot feature that can facilitate network connection with users without using a cable, and can set the wireless network configuration that can be used with a specific username or password.
4. With this bandwidth management system, the employees of the Office of Housing and Settlement Areas will be helped in using the internet network.

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