Implementation of bandwidth management using microtic router

I D M Widia*

Information Technology Department, Vocational School, Diponegoro University, Semarang, Central Java, Indonesia.

Email: idewawidia@gmail.com

Abstract. Computer network is a group of computers that are interconnected between one another and use communication protocols through communication media so that can share and exchange information. In a network technology required a device that can perform management between existing networks. These devices are called routers. The use of internet connection together on Local Area Network requires the existence of gateway and router. Microtic OS is a reliable operating system to operate as a gateway and router. Bandwidth management is required to share the bandwidth capacity available in the network appropriately for each client and application. The clients are expected to get the optimal bandwidth capacity as needed. This makes it easier for network administrators to monitor internet access in each part, because the bandwidth management has been done.

1. Introduction

In the development of information technology today, the internet has become one of the primary needs of both individuals and corporations. Even the internet has become a life style for almost all people. The involvement of the government as a regulator, internet network provider as operator, vendor as a device provider, and the community as consumers are four inseparable pillars and support each other. Various applications also support the growth of internet usage. Online businesses are also getting more and more along with the various facilities offered. Telecommunication network operators or the internet always make new formats in the face of business competition. They compete with each other in terms of innovation, pricing and renewal with the latest technology [1]. Human roles are gradually being taken over by machines. But there is one thing that limits the space for using the internet, namely bandwidth limitations. At the corporate level, each division requires different bandwidth according to its duties and functions [2]. Manage and limit usage Internet bandwidth is indeed an important thing when internet connection is limited. However, these settings must be managed properly to get optimal bandwidth. In this paper will discuss the method of managing bandwidth using a microtic router.

2. Bandwidth Management

2.1. Bandwidth

Bandwidth is a consumption value of data transfer that is calculated in bits / seconds or commonly referred to as bits per second (bps), between the server and the client within a certain time. Or the definition of bandwidth is the width or width of the frequency coverage used by the signal in the transmission medium. So it can be concluded that bandwidth is the maximum capacity of a
communication path used to transfer data in seconds. The bandwidth function is to calculate data transactions. In computer networks, this bandwidth is often used as a synonym for data transfer rates, which is the amount of data that can be carried from one point to another within a certain period of time (usually in seconds)[3].

2.2. Bandwidth Management
The Bandwidth management is the process of measuring and controlling data / internet network communication with the aim of setting bandwidth according to the desired profile. Bandwidth management is needed to precisely divide the bandwidth capacity available in the network for each client and application. Users are expected to get bandwidth proportionally according to needs.

3. Microtic router
Microtic router is a popular name in terms of hardware and software in the internet world. Microtic router is a linux-based operating system that can change the function of a computer into a network router[4]. Besides functioning as a network router, the microtic router can also function to run several applications, namely:

- Application of access capacity or bandwidth; is an application that shows how much data a router can pass to connect to another internet device. Microtic has a function to regulate the access capacity and see the traffic on that bandwidth.
- Running a firewall application: is the ability of the proxy to set up a firewall so that a filter can be made that can enter the network or which harm the computer network.
- Running a wi-fi application: that is the ability to manage anyone who can access the Wi-Fi network in an area.
- Running a hotspot system: almost the same as the wifi function

3.1. Microtic router board
Microtic router board is a computer network device that uses Router OS Microtic based on Linux and is intended for network routers. Microtic router board has several facilities such as bandwidth management, stateful firewall, hotspot for plug and play access, remote Winbox GUI admin, and routing. Microtic router board administration can be done through Windows application (WinBox). At this time, WinBox has been displayed graphically, so that users can easily access and configure the router as needed easily and effectively and efficiently. Reduce errors during setup configuration, easy to understand and customizable as desired.

3.2. Winbox
Winbox is a software or utility used to remotely transfer a proxy server into GUI (Graphical User Interface) mode through the Windows operating system. If to configure the proxy in text mode or CLI (Command Line Interface) through the PC itself, then for GUI mode that uses Winbox we configure the proxy via the client computer. Configuring the proxy via Winbox is more widely used because in addition to its easy and simple usage, we also do not have to memorize console commands.

3.3. Bandwidth monitor
Bandwidth Monitor is an application for monitoring real-time network bandwidth. This application can track all traffic on a network connection and display the amount of download and upload speeds in real time in graphical form. In general, the bandwidth display of the monitor shows the size of the speed in kilobits per second (kbps) to download and upload by color. The maximum speed is also displayed when network traffic is busy. This maximum size is the benchmark for bandwidth size on a network. In its use, Bandwidth Monitor has various facilities, including monitoring network bandwidth, monitoring Internet bandwidth, monitoring multiple network connections at the same time. In addition, there are also additional facilities that are named Speed Stopwatch, which is to monitor the
speed of downloading and uploading on a network adapter with a graphical display option that can be configured according to choose.

4. Bandwidth management using microtic router

The availability of internet in company activities has become a necessity. Each department or division requires an internet connection. For this reason, the bandwidth that can be used is maximum and stable in every department connected to the internet, but the bandwidth that will be given to each part varies depending on the internet needs in each department. Tasks or jobs in each department are not the same, especially jobs that require an internet connection. To maximize internet connection according to the needs in each department, there is a need for bandwidth management to divide the amount of bandwidth needed. To divide the bandwidth needed, each department uses Winbox by configuring the microtic via the client computer. Configuring the microtic via Winbox is more widely used because in addition to its easy and simple usage, we also do not have to memorize console commands. In this paper, there are 3 methods for making bandwidth management, namely identification of needs, design and configuration and implementation.

4.1 Identification of needs

At this stage what is done is setting and identifying technological needs and other needs. Next is assessing a network to determine whether the existing system infrastructure and operational environment are able to support the proposed system, and ensure that the available resources are sufficient to build the bandwidth management. In the design phase, it was designed to design a system for bandwidth management, in accordance with the available technology. In this stage also design IP addresses that will be used on the network.

In carrying out bandwidth management, the supporting equipment needed are:
- Hardware (Hardware): Laptop
- Software (Software):
  - Windows 10 Enterprise Operating System.
  - Google Chrome is used to search references from the internet
  - Microsoft Office to manage report writing
  - Winbox software as a tool for managing bandwidth and rules
  - bandwidth monitor software monitors bandwidth in real time

4.2 Network design

In this design phase, the design of the bandwidth distribution configuration for client computers in each department is carried out. If the existing conditions of bandwidth are not in accordance with the internet needs in each department, namely directly from the server to the client computer without any bandwidth distribution. As a result of the absence of bandwidth distribution from the router, every part that downloads is large enough, the other part that will upload or browse becomes difficult or even impossible because the internet connection is slow.

**Table 1.** IP address design example.

| No. | PC  | IP Address         | Dept.   |
|-----|-----|--------------------|---------|
| 1   | Client | 192.168.100.0/24 | HR and GA |
| 2   | Client | 192.168.101.0/24 | Purchasing |
| 3   | Client | 192.168.102.0/24 | Engineering |
For example, the Purchasing department downloads a large amount of data. Finance and Accounting that will upload e-invoices is difficult because the internet connection is slow and can't connect.

As seen on Table 1, IP Address divided by segments that represent department, which will be easier and more effective than divided by users.

Table 2. Bandwidth sharing.

| No. | PC    | Department  | Bandwidth |
|-----|-------|-------------|-----------|
| 1   | Client| HR and GA   | 512 Kbps  |
| 2   | Client| Purchasing  | 1 Mbps    |
| 3   | Client| Engineering | 512 Kbps  |
| 4   | Client| QC and Whse | 512 Kbps  |
| 5   | Client| Fin and Acct| 1 Mbps    |
| 6   | Client| IT Manager  | 1 Mbps    |
| 7   | Client| Marketing   | 512 Kbps  |

Before doing bandwidth management, it is necessary to determine in advance how much bandwidth is allocated for each client. Suppose the overall bandwidth is 5 Mbps. Bandwidth sharing for each client is based on the analysis of internet usage in each section. The Table 2 is a bandwidth sharing table for each department.

5. Implementation

Topology design after the implementation of the Mikrotic router as shown in Figure 1.
5.1 Microtic configuration
At this stage, the stages of bandwidth management implementation will be presented using the Microtic router.

1. Open Winbox Application

Figure 1. Design implementation.

Figure 2. Winbox application.
2. Click the Mac address that appears and click connect to connect to Microtic. Winbox will connect to Microtic.

![Figure 3. Mac address.](image)

3. DNS Configuration
DNS settings function so that all client computers that are on the network can access the domain of a site or browse the internet.

![Figure 4. DNS configuration.](image)
4. Bandwidth Management Configuration

![Image of Bandwidth Management Configuration]

**Figure 5.** Bandwidth management configuration.

6. System testing

This test is done to find out the connection between the client computer to the internet using a web browser.

![Image of Test Result]

**Figure 6.** Test result on IT department.

The speed test results show that the bandwidth of the IT & Manager computer client is 912.6 kbps according to its bandwidth management which is a maximum of 1 Mb.

7. Conclusion

After going through the stages in the design and the implementation stage of the Microtic router to manage bandwidth with the Microtic operating system then get a conclusion:
1. The bandwidth management design that has been implemented is in accordance with the internet requirements in each department.
2. After bandwidth management is done, internet connection becomes maximum, smooth and stable in each department.

References
[1] Handriyanto E D 2009 *Router usage study as router on a computer network.*
[2] Satya and Ika A 2006 *Know and Use Microtic Winbox Router Modem Based on PC (Windows and Linux).* DATAKOM, Jakarta.
[3] Soemarwanto and Dwi. 2013. *Computer Networks and their Utilization.*
[4] Taufan R 2001. *TCP / IP Network Management,* PT. Elek Media Komputindo, Jakarta.