Journal of Computer Science and Information Technology
https://jcsitech-upiyptk.org/ojs
2021 Volume 7 Issue 3 Hal: 54-58 e-ISSN: 2502-1486

Bandwidth Management Analysis Using the HTB (Hierarchichal Token Bucket) Method

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Abstract

Internet in today's era is one of human needs, because it requires a large bandwidth. Bandwidth usage is basically a measure of the performance of an organization. In this study, the problem to be discussed is how the bandwidth management process in PT. Mainstay Partner Achievement. The purpose of this management process is to manage the balance of download or upload access. The method used in solving this problem is the Hierarchical Token Bucket (HTB) method. This method is widely used to solve problems with Internet connections, maximizing bandwidth usage. The Hierarchical Token Bucket (HTB) method is one of the methods designed to be able to perform bandwidth management well, where this algorithm applies queuing discipline which has advantages in limiting traffic at each level and classification, so that bandwidth that is not used by high levels can be used. or divided by lower levels. In the discussion, the HTB method is able to provide maximum results in bandwidth management. Benefits From these results network performance will be more optimal at PT. The mainstay of Achievement Partners can work even better.

Keywords: Bandwidth, Management, HTB, Network, Performance.

1. Introduction

Information technology, especially in computer networks at this time has become one of the basic things in all aspects, this can be seen from the use of computer networks both in general and private, the many needs for access and communication, the network performance must be in good condition. , then network operators and internet service providers (ISPs) must be able to solve the main problem, namely providing good service performance to be able to provide comfortable services to users. Information and communication technology is essential for everyone, Every day people cannot separated from information technology. Without bandwidth management, many computers can use the internet irregularly, causing other computers to not get an equal share of the bandwidth. In addition to equity, bandwidth management also plays a role in determining client priorities. Thus, if there is a client accessing the internet that requires a large bandwidth capacity, then other clients will not be disturbed, because each client already has bandwidth capacity and their respective priority scales that can be used to access the internet.

Bandwidth management is a method that can be used to manage and optimize various types of networks by implementing Quality of Service (QoS) services to determine the types of network traffic, while Quality of Service (QoS) is the ability to describe a level of achievement in a system. data communication[1]. The purpose of Quality of Service (QoS) is to meet the needs of different services, which use the same infrastructure, Quality of Service (QoS) offers the ability to define service attributes provided both qualitatively and quantitatively, Quality of Service (QoS) QoS) plays a very important role in terms of bandwidth sharing, one of which is by using the Hierarchical token bucket (HTB) method, which ensures network users get the bandwidth that has been defined, and there is also a fair bandwidth sharing function among users. network so that network performance can be maintained[2].

Bandwidth management is a network management technique in an effort to provide fair and satisfactory network performance. Bandwidth management is also used to ensure adequate bandwidth to meet the needs of data and information traffic and prevent competition between applications. Bandwidth management is an absolute must for multi-service networks, the more and varied applications that can be served by a network will affect the use of links in the network. Existing links must be able to handle the user's needs for the application even in a state of congestion [3]. Hierarchical Token Bucket (HTB) is a method that serves to regulate the distribution of bandwidth, the division is carried out in a hierarchical manner which is divided into classes so as to facilitate bandwidth management [4]. Some of the obstacles that occur are that many users complain about their internet access speed problems, each bandwidth is not arranged as desired or according to the package chosen by the client, the (HTB) method is chosen as bandwidth management, the router can serve all users evenly and router is optimized [5]. In the analysis journal bandwidth management on PC Routers using the Hierarchical Token Bucket (HTB) Method at PD Medellin: Hierarchical Token Bucket (HTB) is a classful qdisc written by Martin Devara with a set of configurations that are simpler than Class Based Queue

Recived 25 February 2021; Revised 27 March 2021; Accepted 20 June 2021 | doi: 10.35134/jcsitech.v7i2.1

(CBQ)[6]. The application of the Hierarchical Token Bucket (HTB) method to manage the bandwidth distributed to the client, in implementing a method, of course, must first know the architecture of the network itself, such as the number of users or the type of service provided. When all the necessary data has been collected, the application of the method is ready to be carried out on the network [7].

2. Research Method

The research framework is a plot contained in the research. The research framework describes the stages and concepts that will be carried out in research. The following stages of the research can be seen in Fig. 1 as follows:

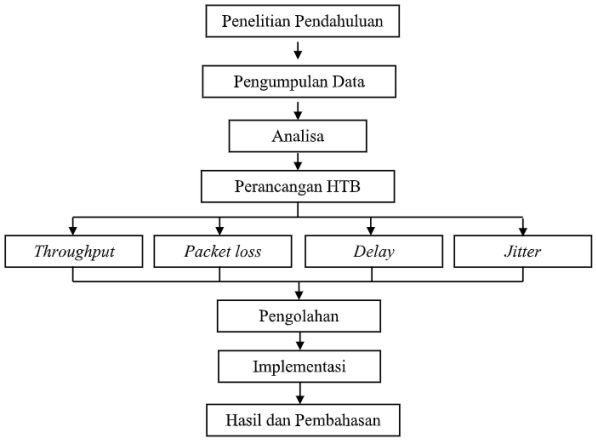

Figure. 1 Stages of the Research

The research stages explain the steps in recording data and collecting several reports that are needed to be used as guidelines in making this research, namely: Preliminary research is carried out by approaching the object of research, The purpose of this stage is to find out the problems that occur appropriately, so that research is expected to provide the most optimal solution to solving these problems. The problem that has been successfully obtained is the large number of internet network usage at PT. Andalan Mitra Prestasi mainstays such as browsing, uploading and downloading have an impact on the decline in network quality performance, because the dense use of internet access makes users, especially staff and customer service PT. Andalan Mitra Prestasi is disturbed in utilizing network facilities for office purposes. Therefore, the author wants to do an analysis to get results and assess how the performance of the network quality at PT. PT. Andalan Mitra Prestasi and whether it is in accordance with the internet network category according to Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON).

3. Result and Discussion

Analysis of network system data that will be run using the HTB (Hierarchical Token Bucket) method which is used for effectiveness in managing the network bandwidth of PT Andalan Mitra Prestasi on Jln. S. Parman No.80-82, Lolong Belanti, Padang City, West Sumatra, where the old system will be compared to the new system that will be implemented. An overview of the system can be obtained after conducting research on some of the weaknesses of the existing system, especially in terms of the activity of the network system used [8]. The design of the data analysis consists of analyzing the download and upload speeds on the network.

3.1 Network System Work Analysis PT. Mainstay of Achievement Partners

After conducting direct research on the spaciousness of the system that is running at PT. The mainstay of Mitra Prestasi, namely the network bandwidth limiting system. The use of subnetting, uploading and downloading restrictions has not been applied to PT. The mainstay of Mitra Prestasi so that it affects the level of Quality of Service (QoS) on the network [9]. The following network system is running [10]:

a. Network system work process

To provide an overview of the current working system on the old computer network system at PT Andalan Mitra Prestasi using a wireless router and internet sources from Biznet and Indihome providers with a tree topology series with a total bandwidth of 100 mb, where all computers are connected to the user using a router. All computers can be connected to the internet, but due to the limited available bandwidth, on certain days and during peak operational hours there are often connection problems.

b. Weaknesses of the existing network

When the researcher tries to access to login with an employee account or as a general user, the obstacles that occur are as follows:

1. It takes a very long time to connect. Even though the researchers conducted a trial during office breaks and there were only a few employees who were actively using the network.
2. There is no proper bandwidth setting so that 51 devices that are directly connected to the available routerboard are active and the internet network becomes slow and has errors. For that we need better bandwidth management.
3. And it often happens that several computers at PT Andalan Mitra Prestasi are often not connected to the internet network suddenly so that the internet connection to the provider (ISP) becomes very slow and even disconnects and can cause crashes or downs.

After analyzing the network system that is running, a new system description needs to be made, where the

purpose of the new system is to improve the existing system. As for the things that need to be designed in this system, namely the distribution and management of network bandwidth in a hierarchy or multilevel limitation on the object of research. From the design of this system, it is hoped that there will be improvements and refinements of the old system.

3.2 Network Topology Design

The picture of the network topology at PT. The mainstay of Achievement Partners can be seen in Fig. 2 below:

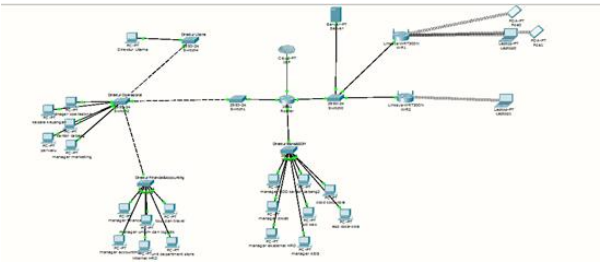

Figure. 2 Network Topology of PT Andalan Mitra Prestasi

3.2 Packets Loss Analysis

In this study, we will compare the Quality of Service in a network using hardware and software [11]. Researchers will compare the value of Quality of Service before optimization and Quality of Service after optimization to identify and evaluate problems in the system [12]. Measurement of throughput parameters using the Wireshark application and speedtest by recording network traffic in a few minutes [13]. The following stages in measuring throughput can be seen in Fig. 3 below:

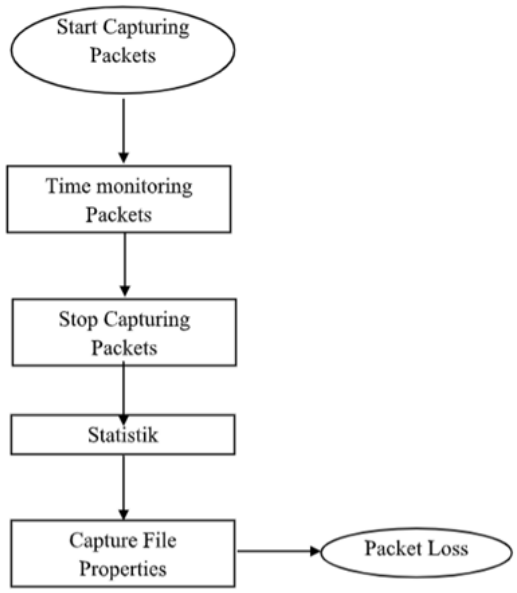

Figure.3 Stages in Measuring Throughput

3.3 Hierarchical Token Bucket (HTB) Analysis

Hierarchical Token Bucket (HTB) is a method that regulates bandwidth distribution, bandwidth distribution is carried out in a hierarchical manner which is divided into classes, making it easier to manage bandwidth, HTB is claimed to offer ease of use with borrowing techniques and implementation of more accurate traffic distribution, HTB queuing techniques provide traffic restriction facilities at each level and classification, unused bandwidth can be used by lower classifications [14]. In the system design, the author designs and implements a network with subnetting and applies a Queue Tree and Hierarchical Token Bucket (HTB), which will be proven when the system is running [15]. Until the final step of this research is to measure the Quality of Service on the network.

The configuration stages carried out are as follows:

1. Installing Winbox and Login

For Mikrotik configuration, the author uses Winbox software. After Winbox.exe is stored on the computer, it can be run directly by entering the Mikrotik MAC Address, for example C4: AD: 34: 88: 9A: E6, also fill in Login with admin while the password is empty.

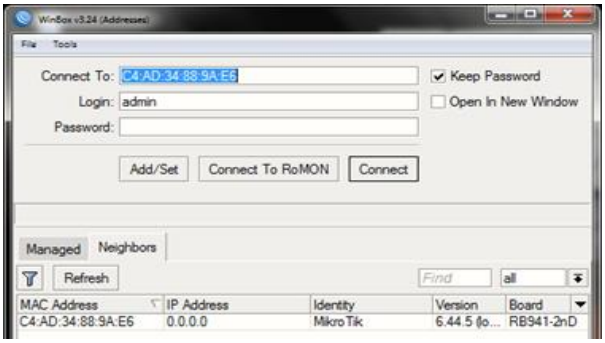

Figure. 4 Install Winbox

2. Setting IP Address

On this router the author uses 3 ether, ether 1 for Public IP and ether 2 as well as ether 3 for Local IP. Steps to provide IP Address on each interface by clicking Menu| IP| Address| on the Address List view click the + blue button.

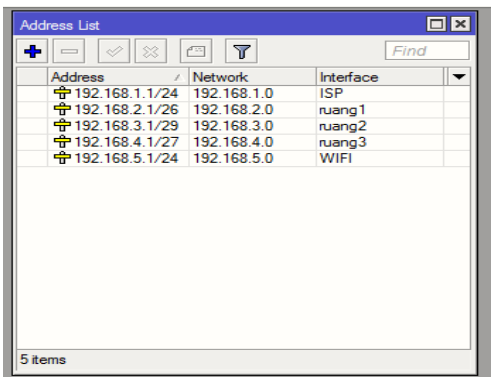

Figure. 5 Setting IP Address

3. Route Table Settings

Set Route on Mikrotik Router aims to determine the gateway path from the local network to an internet-connected network. By clicking Menu IP| Routes| in the Route List view click the blue + button to add a gateway as shown:

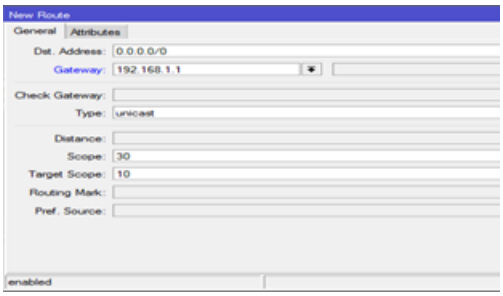

Figure. 6 Route Table Settings

4. NAT Firewall Settings

NAT or also known as Network Address Translation is a method of connecting more than one computer to the internet using one IP address. Click Menu IP| Firewall| NAT. Settings like the picture:

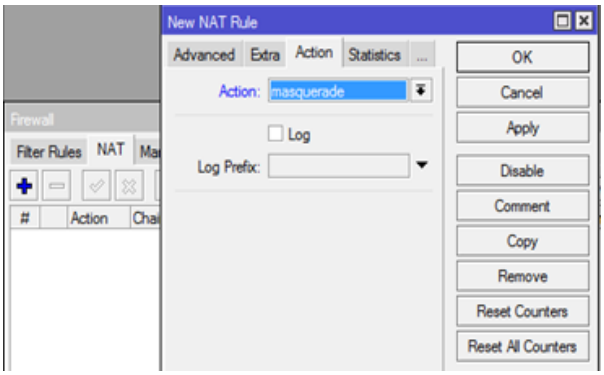

Figure. 7 Firewall Settings

5. DHCP Server Settings

DHCP Server settings aim to create a dynamic IP for the client and get it by the client automatically, by clicking the IP|DHCP Server| menu. DHCP Setup| select the interface for DHCP.

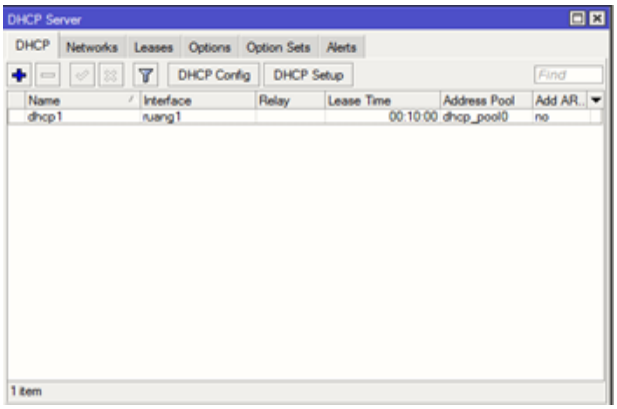

Figure. 8 DHCP Server Settings

In the statistics of the image does not show packet loss means that there are no lost packets, then the packet loss is worth = 0%.

Table. 1 Packet Loss After Optimization

Testing	*Packet Loss*
LAN 1	0%
LAN 2	0%
WIFI	0 %

3.4 Before and After Optimization Comparison

After observing and measuring the value of QoS, it can be concluded that there are differences in QoS values before and after optimizing bandwidth management using the Hierarchical Token Bucket (HTB) method [16],[17].

Table. 2 Before and After Optimization Comparison

Parameter	LAN 1		LAN 2		WIFI	
	Before	After	Before	After	Before	After
Throughput	4.2	980	1.6	158	18.83	3112
Packet Loss	0%	0%	0%	0%	1 %	0%
Delay	232.8 ms	226 ms	221.4 ms	190.6 ms	523.6 ms	390.6 ms
Jitter	394 ms	14.9 ms	14.30 ms	9.94 ms	26.60 ms	15.19 ms

From the results of Table. 2 it is concluded that the throughput value of the client gets an increase in each client that has been captured previously from before and after optimization using a mikrotik routerboard with the Hierarchical Token Bucket (HTB) method, and the packet loss value is almost entirely worth 0% because it is not the presence of lost packets, as well as the overall delay value has increased so that it can assist in the network communication process, and the jitter value has also increased, namely the smaller the jitter value, the smoother the communication process in the network will be[18],[19].

Table.3 Network Speed Comparison

Index	LAN 1		LAN 2		WIFI	
	Before	After	Before	After	Before	After
Ping	83 ms	48 ms	74 ms	37 ms	86 ms	72 ms
Download	0.50 mb	11.67 mb	4.69 mb	12.80 mb	0.96 mb	16.52 mb
Upload	0.46 mb	5.14 mb	4.64 mb	14.97 mb	0.90 mb	12.54 mb

From the results of Table. 3 it can be concluded that the ping value of each client has increased from the process before and after optimization, the smaller the value, the more responsive the internet connection on the network is, as well as the download and upload processes which we can interpret as a one-way relationship which the bigger the number, the better the connection.

4. Conclusion

In this chapter the author will conclude from the overall discussion that the author has conveyed in the previous chapters. Some conclusions that the authors found, namely: The application of the Hierarchical Token Bucket (HTB) method in performing bandwidth management on the PT network. Andalan Mitra Prestasi, can assist network admins in providing solutions to improve network performance quality, resulting in good network quality. Application of Hierarchical Token Bucket (HTB) in terms of designing and implementing bandwidth management on the PT network. Mainstay Mitra Prestasi, can help make it easier for network admins to manage bandwidth, so that the bandwidth management process can be implemented optimally.

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