Network Traffic Analysis for Bandwidth Optimization Internet at STIK Bina Husada Palembang

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Abstract

Traffic Analysis bandwidth is how to organize or analyze ongoing bandwidth, as well as problems related to the bandwidth that will be had right solutions to overcome the bandwidth problem. Therefore, the analysis of network traffic, especially for Internet bandwidth optimization is needed, so adjusted with corporate policies/ institutions to use the network so that there is access to the Internet network will be more efficient, stable, and fast. Referring to the importance of quality Internet bandwidth and have not done that exact measurements can be used to measure how well the bandwidth management is running, then the central issue in this study is "Network Traffic Analysis for Bandwidth Optimization Internet At Bina Husada Palembang sticks". Software used in this study RouterOS, Biznet Speed Meter, Axence NetTools and Iperf. While the methods used are A ction Research with models of QoS monitoring system. From the measurement results, the QoS parameters which consist of bandwidth, throughput, delay, jitter and packet loss to affect the measurement of network QoS. While the factors that could affect the QoS of the network itself is the attenuation, distortion, noise and bandwidth capacity.

Keywords : *Traffic Network, Bandwidth Management, QoS (Quality of Service), Throughput, Delay, Jitter and Packet Loss*

1 INTRODUCTION

Now a days everyone needs information in a quick, concise and accurate, better to find the article, the latest knowledge, or even just to chat. Therefore, we needed a tool that can support it. One is a computer network that is connected to the Internet with fast and stable. Bandwidth is the maximum bin in delivering the data calculated by the amount of bps (bits per second), while the speed is the time spent in taking a distance, for example, takes about 1 meter per second. Internet bandwidth provided by the internet service provider with a certain amount depending on the rental customer. The availability of network bandwidth is an important factor in selecting a web service [1].

STIK Bina Husada Palembang currently has a network of computers connected to the Internet. Connection ISP (Internet Service Provider) using Astinet PT. Telkom. Currently

available bandwidth capacity of 4 Mbps who have used the path FO (Fiber Optic) and develop a computer network expansion into sub-sections in the respective local and courses with media UTP (Unshielded Twisted Pair). STIK Bina Husada have local servers include DHCP server so no need to give the client an IP address manually and other servers to support the academic and financial information systems (SIPMAYA, SIMBHA and SIMKEU). The Routers used is DLX-1000 with Mikrotik RB series in 1100 [6].

Existing bandwidth capacity in use is divided into 2 (two), are: 3 Mbps for office used(Rector, Prodi, BAAK, Administration, Library and Computer Laboratory) while the remaining 1 Mbps for Public Wifi. The number of computers that have as many as 35 PCs in the computer lab and as many as 65 PCs, so the total existing computer of approximately 100 PCs to support day-to- day activities. While the number of students 3419 people spread across 5 study program. With a bandwidth of 4 Mbps if all of the computers used to access the internet will be a delay with internet access. And from the observations, bandwidth management is running it more higher than the quota limit assigned by the Internet Service Provider (ISP) [6].

2   ANALYSIS OF NETWORK TRAFFIC FOR HIGH BANDWIDTH OPTIMIZATION

Analysis of the system can be defined as the decomposition of a complete information system into component parts with a view to identify and evaluate the problems, opportunities, constraints occur and needs to be expected that the amendments can be proposed. Analysis of network traffic can provide a snapshot of a network of relationships that affect QoS (Quality of Service), traffic load and bandwidth capacity [3].

2.1   Review of Literature

Network Traffic: Traffic Management Concept is how to manage all network equipment (switch, routers, firewalls, etc.) can recognize the passing traffic so that it can be made a rule of its own. Therefore, the analysis of traffic on the network is necessary so that we can make a profile of customs in the access network and then we adjust the policy of the company/institution to use the network to access the existing network will be more stable, fast, convenient and secure.

MikroTik RouterOS: Mikrotik is independent Linux-based operating system specifically for computers that function as a router, Mikrotik is designed to provide convenience to its users. Administration can be done through the Windows application (Winbox). In addition to the installation can be performed on standard PC computer. PCs which will be used as a router proxy does not require any resource that is large enough to use a standard, for example, only as a gateway. For the purposes of large loads such networks are complex, complicated routing and so it is advisable to consider the selection of adequate resource PC [2].

Bandwidth: Bandwidth is the capacity or the capacity of an ethernet cable in order to be passed a data packet traffic in a certain amount. Bandwidth can also mean the number of data packets consumption per unit time is expressed with units of bits per second (bps). Internet bandwidth provided by the internet service provider with a certain amount depending on the rental customer. Bandwidth management is the process of measuring and controlling the communications (traffic packets) on a network link by allocating channel used for uploading and downloading process. Based Bandwidth Allocation, divided by 2 (two) in the proxy rules,

are: simple queue and queue tree [2].

Winbox: Winbox is a utility that is used to perform remote proxy server in GUI mode through the windows operating system. If to configure proxy in text mode through the PC itself, then for the GUI mode using Winbox we configure the client computer through the proxy.

3 RESEARCH METHODOLOGY

3.1 Analysis and Network Issues

On the computer network at STIK Bina Husada Palembang using a star topology. In a star topology, each workstation is connected directly to the server through the switch. Between the room connected to a switch to a switch that is connected to the transmission media types crossover UTP cable using RJ-45 connectors. For now the gateway server used in STIK Bina Husada Palembang using Mikrotik RouterOS operating system server that functions as a server using the Internet Sharing NAT. The addresses are used on the LAN at STIK Bina Husada is used class C, the network using 192.168.0.0/24 used default subnet mask of 255.255.255.0, and the IP address 192.168.2.2/32 is used to connect a Mikrotik 1100 modem to the router's Internet [6].

The network infrastructure conditions is used Mikrotik Astinet 1100 with a capacity of 4 Mbps bandwidth, 7 pieces DLINK Switch HUB 8 port, 1 unit of computer proxy server and 3 units of computer servers supporting academic and financial information systems, and 4 pieces of the Access Point. The following physical topology that is currently running on the STIK Bina Husada Palembang [6].

Methods: In this study, the research method used was action research. Action research is divided into several stages that constitute the cycle, are: perform diagnosis, make a plan of action, action taking, evaluation and learning.

Analysis Methods: In this final analysis method used is the method of Quality of Service (QoS), QoS is the ability of a service to ensure performance and is a parameter to measure the quality of a service. Institute for Standardization ITU-T defines QoS as a decisive influence overall performance level of user satisfaction. QoS on the network include delay, throughput, jitter, packet loss using Axence NetTools Professional Software and iperf with Windows 7 Professional operating system.

4 RESULTS AND DISCUSSION

4.1 Analysis Bandwidth Utilization Management

In this study, the authors analyze and identify problems Bandwidth Utilization Management Based on RouterOS STIK Bina Husada Palembang by measuring parameters QoS (Quality of Service) such as bandwidth, delay, packet loss and throughput. The data analyzed were analyzing data QoS. QoS is the ability of a service to ensure performance and is a parameter to measure the quality of a service. Institute for Standardization ITU-T defines QoS as the influence that determines the overall performance level of user satisfaction. QoS on the network include bandwidth, delay, packet loss, jitter and throughput.

Table 1: Bandwidth allocation in progress

Bagian	IP Address / Network	Bandwidth
Server SIMKEU	172.16.22.0/30	1 Mbps
Server SIPMAYA	192.168.2.0/24	2 Mbps
Server SIPMAYA_2	172.16.22.4/30	1 Mbps
LAN Office	172.16.20.0/24	3 Mbps
Gedung C	192.168.10.0/24	1 Mbps
Hotspot_1	192.168.201.0/24	128 Kbps
Hotspot_2	192.168.202.0/24	512 Kbps
Hotspot_3	192.168.203.0/24	256 Kbps
Hotspot_4	192.168.204.0/24	512 Kbps
Total Bandwidth		**9.384 Mbps**

4.2   Internet Bandwidth

The results obtained in the analysis bandwidth speed internet access while using internet bandwidth pegukuran site http://bm.speed.net.id obtained results where the value of the total Internet bandwidth which means it will acquire 2,28 Mbps download speed at 291.55 kB/s where the formulation speed downloading (kB/s) is the ratio of the speed of internet access per 8 bits.

$$Download\ Speed\ (Kbps) = \frac{Kecepatan\ Akses\ Internet\ (kbps)}{8\ Bit} - \frac{2.28\ Mbps}{8\ Bit} = 291.55\ kB/s$$

4.3   QoS (Quality of Service)

Quality of Service (QoS) is the ability of a service to ensure performance and is a parameter to measure the quality of a service. Institute for Standardization ITU-T defines QoS as the influence that determines the overall performance level of user satisfaction. By using software or tools Axence NetTools.

4.3.1   Delay and Packet Loss

The researchers trying to see the connection status on the youtube.com site, the facebook.com site, and the binahusada.ac.id site. The results display Delay and Packet Loss are as follows Table 2, Table 3, Table 4.
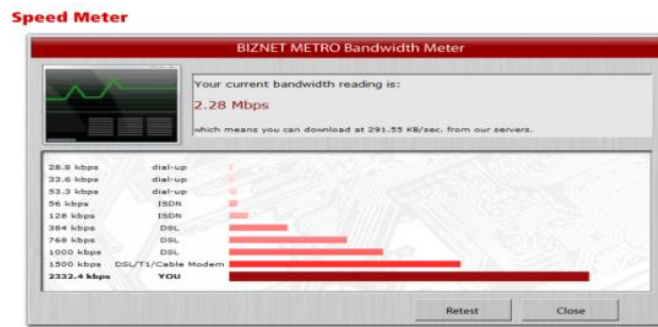
Figure 1: Results of the First Test Internet Bandwidth

Table 2: Results of Delay and Packet Loss youtube.com

Situs	Min (ms)	Max (ms)	Rata-rata Delay (ms)	Packet Loss (%)
	163	250	211	16
	163	250	210	15
	156	250	208	15
www.youtube.com	156	298	208	17
	156	298	208	17
	156	298	210	17

Table 3: Results of Delay and Packet Loss facebook.com

Situs	Min (ms)	Max (ms)	Rata-rata Delay (ms)	Packet Loss (%)
	32	331	113	1
	32	331	109	1
	32	331	100	3
www.facebook.com	32	331	99	3
	32	331	96	3
	32	331	101	2

Table 4: Results of Delay and Packet Loss binahusada.ac.id

Situs	Min (ms)	Max (ms)	Rata-rata Delay (ms)	*Packet Loss* (%)
	18	224	167	15
	18	276	168	16
	18	276	168	16
www.binahusada.ac.id	113	198	171	11
	113	198	171	16
	113	204	173	15

Table 5: Throughput results facebook.com

Situs	Min(kBps)	Max(kBps)	Rata-rata(kBps)
	2	20.7	9.29
	2.2	60.3	11.04
	2	9.86	5.75
www.facebook.com	3.4	6.05	5
	3.28	7.12	5.04
	3.28	7.12	5.03

4.3.2 Throughput

Throughput is the ability of a network to perform the actual data transmission. Usually throughput is always associated with bandwidth. Because throughput can indeed also called bandwidth in actual conditions.

The researchers tried to observe the traffic throughput on the youtube.com site, the facebook.com site, and the binahusada.ac.id site. The throughput results display are as follows Table 5, Table 6, Table 7.

4.3.3 Jitter

Jitter is defined as the variation of delay or variation in packet arrival time. Many things affect jitter, such as an increase in traffic suddenly so narrowing the bandwidth and cause queues. Which is tested iperf server 222 124 142 162, iperf client attempts to connect to port 5001 (the port iperf server) in a 10-second intervals, the data sent by 1.25 Mbyte transfer

Table 6: Throughput Results youtube.com

Situs	Min(kBps)	Max(kBps)	Rata-rata(kBps)
	2.73	50.94	13.25
	2.73	50.94	12.1
	2.73	50.94	11.77
www.youtube.com	2.73	50.94	11.19
	2.73	50.94	10.64
	2.17	50.44	12.06

Table 7: Throughput Results binahusada.ac.id

Situs	Min(kBps)	Max(kBps)	Rata-rata(kBps)
	7.6	22.1	11.58
	7.6	22	11.5
	8.2	16.9	11.38
www.binahusada.ac.id	8.2	16.98	11.4
	8.2	25.2	11.31
	8.2	25.2	11.28

Table 8: Resuts of Testing for Jitter at 1 with interval 5s

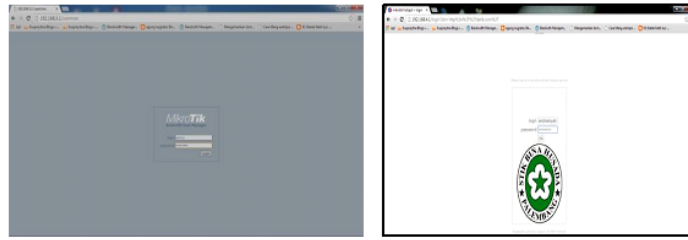| Interval (s)	Transfer (KBytes)	Bandwidth (Kbps)	Jitter (ms)
0-1	25.8	423	6.7
2-Jan	48.8	800	4.7
3-Feb	44.5	729	3.8
4-Mar	37.3	612	3.5
5-Apr	35.9	588	3.5

Figure 2: Initialization key length 12-byte array

Table 9: Results of Testing for Jitter at 5 with interval 5s

Interval (s)	Transfer (KBytes)	Bandwidth (Kbps)	Jitter (ms)
0-1	31.6	517	8.4
2-Jan	45.9	753	8.4
3-Feb	43.1	753	6.8
4-Mar	45.9	753	6.8
5-Apr	41.6	588	7.5

speeds 1,05 mbit / sec. Show in Table 8, Table 9, Table 10.

From the above table jitter values obtained varied with an average value of 5.2 ms jitter, resulting in a degradation categories are included in the category is good (Peak Jitter 75 ms), if the jitter value is more smaller then the result is better but if more higer than the value the result is poor for the internet network QoS.

5 ANALYSIS QOS INTERNET NETWORK

5.1 Bandwidth

Methods of QoS in the LAN network STIK Bina Husaha Palembang to the parameters Bandwidth is the traffic control network bandwidth of the Internet by doing a simple queue management method based mikrotik router. The method is very easy to configure simple queue to setting the network bandwidth allocated to each part either LAN or wireless internet network (hotspot).

From the results display bandwidth from Figure 4.2 can be obtained through the Software Winbox total amount of the bandwidth results obtained at 9 Mbps with QoS details are : Simkeu allocated 1 Mbps, Sipmaya allocated 2 Mbps, Sipmaya2 allocated 1 Mbps, LAN Office received an allocation of 3 Mbps, building C allocated bandwidth of 1 Mbps, and last hotspot or access point as many as 4 pieces with a total bandwidth of 1 Mbps. The total of which exceeds the maximum limit of the bandwidth is given ISP (Internet Service Provider) is 4

Table 10: Results of Testing for Jitter at 10 with Interval 5s

Interval (s)	Transfer (KBytes)	Bandwidth (Kbps)	Jitter (ms)
0-1	50.2	823	3.8
2-Jan	50.2	823	3.9
3-Feb	40.2	659	5.5
4-Mar	37.3	612	6.1
5-Apr	28.7	470	6.2

Mbps this is one reason for the instability internet connection at STIK Bina Husada.

5.2 QoS

Throughput: From the calculation of throughput of the server www.binahusada.ac.id through the Office LAN monitoring by figure 4.8 binahusada.ac.id throughput on the site, where parts of information in the form of throughput values obtained average value (average) at 11.37 Kbyte/sec, the value of throughput minimum sebesar 8 Kbyte/sec dan maximum sebesar 21.6 Kbyte/sec, although total packet sent is variaty. Server throughput calculation www.facebook.com monitoring via LAN Office by figure 4.6 throughput on the site www.facebook.com, where part information throughput values obtained in the form of the mean value (average) of 6.85 Kbyte/sec, the value of the minimum throughput of 2.76 Kbyte/sec and a maximum of 18.1 Kbyte/sec, and the number of packets sent (sent) varies. While the results of the calculation server throughput www.youtube.com monitoring via LAN throughput Office by figure 4.7 on the site www.youtube.com, where part information throughput values obtained in the form of the mean value (average) of 12.67 Kbyte/sec, the value of the minimum throughput of 2.61 kbytes/sec and a maximum of 50.8 Kbyte/sec, and the number of packets sent variates. Factors such as attenuation, interference and signal bandwidth management configuration affect the measurement results.

Packet Loss and Delay: According TIPHON version as used in the standardization of measurement delay value, the amount of delay can be classified as a category of Excellent latency if ¡150 ms, if 150 ms - 300 ms is good, if 300 ms- 450 ms is poor, and if ¿ 450 ms is unacceptable.

Based on the results of the measurement values Packet Delay and Loss in the server youtube.com with an average value of 211 ms delay with the average percentage of 16,26% packet loss, it can be concluded from these results the value of the delay in the category good and the category packet loss is poor. The results of measurements of Delay and Packet Loss value on the server www.binahusada.ac.id with an average value of 169 ms delay with the average percentage of packet loss amounted to 15.2%, from these results we can conclude the delay value in the category is good and category packet loss is poor, and the value of Delay and Packet Loss on www.facebook.com servers with an average value of 117 ms delay with

Table 11: Proposed Bandwidth Allocation

Section	IP Address / Network	The proposed bandwidth
Web server	172.16.22.8/30	1 Mbps
Lan office	172.16.20.0/24	1 Mbps
Gedung C	172.16.21.0/24	1 Mbps
Hotspot1	192.168.201.0/24	256 Kbps
Hotspot2	192.168.202.0/24	256 Kbps
Hotspot3	192.168.203.0/24	256 Kbps
Hotspot4	192.168.204.0/24	256 Kbps
Total Bandwidth		**4 Mbps**

the average percentage of packet loss of 2%, it can be concluded from the results of the delay values in the category is excellent and the category of Packet Loss is very good .

Jitter: Based on the peak jitter value in accordance with the table version TIPHON as standardization for peak jiiter value. If categories the peak jitter is 0 ms then the category is very good, if categories the peak jitter is 75 ms then the category is nice, if categories the peak jitter is 125 ms then the category is medium and if categories the peak jitter is 225 ms then the category is poor.

The results from measurements of peak jitter value for the LAN network devices with the smallest value of 0.5 ms, while the largest value of 8.4 ms with an average value of 5.2 ms jitter. From the calculation of the value of jitter degradation categories according TIPHON version is nice.

Factors Influencing QoS:
a. Damping
b. Distortion and Noise

Troubleshooting: The proposed bandwidth allocation table follows Table 11.

6 CONCLUSION

1. The quality of service parameter consisting bandwidth, throughput, delay, jitter and packet loss are very influenced for bandwidth optimation.

2. The factors that can influenced QoS of bandwidth usage are attenutation, distortion and noise

3. The Capacity of bandwidth provided that influaced to QoS in a busy times can increase internet access significantly, therefore to get good QoS needed bandwidth management Queue Simple wheareas suitable with Internet Service Provider and blocked some internet access that can used much bandwidth.

4. For hostpot network need build a user manager

There is a suggestion that wont to extend is for a better QoS techniques is needed to utilize caching proxy server that serves to store the object that was opened by the client after the stored object, then the object will be taken by another client where data or object captured not through internet but directly taken from the proxy cache server commonly referred to as HIT is very helpful in optimizing internet bandwidth.

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