Analysis of Method Tueed Treedan Filtering Layer to Improve the Effectiveness Bandwidth Management on Network 802.3

Aulia Ichsan¹, Suherman², Erna Budhiarti Nababan³

¹Postgraduate Students at Universitas Sumatera Utara, Medan, Indonesia ^{2,3}Postgraduate Lecturer at Universitas Sumatera Utara, Medan, Indonesia

Corresponding Author: Aulia Ichsan

ABSTRACT

Bandwidth management on the network at the Islamic University of North Sumatra needs further exploration in bandwidth management. The queue method is very simple and bandwidth usage is inefficient because it does not use special methods. The impact of bandwidth distribution is no more structured because there is no guaranteed bandwidth ownership in each client. Compilation of users and heavy traffic, then all internet users overlap increases the possibility of requesting more bandwidth to a few clients (not equally), then filtering data patterns such as streaming traffic or certain websites, are easy to access and have the opportunity to use bandwidth. Solutions from cases like this have been done by researchers who have not been effective enough if using a large campus network such as UISU. Thus this research will develop using the Queue Tree combination method by using traffic priority, the Promised Information Level / Maximum Information Level and the Layer 7 Protocol Screening method to define specific data patterns in the url of the text in order to use bandwidth. The effectiveness of the method is analyzed using the parameter average value (average rate) using the OS proxy router and the ICMP parameter packet using throughput, delay, jitter and packet loss.

Keywords: Bandwidth management, *Kombinasi method*, *Effectiveness network*, *Parameter*.

INTRODUCTION

This research was conducted at the Islamic University of North Sumatra. From

the observations that the author has done. is fairly simple there a bandwidth management in the distribution of bandwidth to each client so that when traffic is dense sometimes there is an uneven distribution of bandwidth and overlapping each client. Then the bandwidth quota for each client does not get a definite guarantee other than that streaming traffic and certain websites are still very easy to access by the client so there is a chance of using bandwidth that is not efficient. According to Hendrik Kusbandono & Eva Mirza Syafitri (2019) ^[1] Bandwidth management is allocating a bandwidth that serves to support the needs or requirements of an internet network in order to provide quality assurance services for a Quality of Services (QoS) network.

From indications like this have been done by previous researchers such as Helmiawan, MA (2015)^[2] using a layer 7 web filtering method that produces a healthy internet and saves bandwidth, then Amin, RAA and Indrajit, RE (2016)^[3] using the Simple method Queue and Per Connection Queue (PCQ) which results in allocating bandwidth for each client by getting a bandwidth value that is almost evenly distributed. Then Nababan, EB et al (2019) ^[4] use the Load Balance Algorithm method which results in delay, jitter and packet loss from packets that are shipped is determined as a performance parameter.

Thus from these studies need further analysis regarding bandwidth management. This research will develop using a combination of two methods namely:

Queue Tree method by utilizing traffic priority and Committed Information Rate (CIR) / Maximum Information Rate (MIR) so that there is a guaranteed bandwidth guaranteed, possible acquisition of bandwidth that reaches the maximum limit and categorizing traffic. According to Abdul Malik et al (2017) ^[5] Queues Tree has a better value of throughput, delay, packet loss compared to Simple Queues.

Layer 7 Protocol Filtering Method to define certain data patterns in the url text so that the router automatically executes dropping and traffic limitations that will enter so that it will further save the use of available bandwidth.

The effectiveness of the method is analyzed using the average value parameter (avg rate) using a proxy operating system router and ICMP packet parameters using delay, jitter and packet loss. The study was conducted using 4 laptop units and using the 802.3 protocol.

RESEARCH BACKGROUND

From the identification of the problems that have been described above the authors analyze how to combine the performance of two methods when traffic is dense so that the distribution and use of bandwidth is more structured, complex and economical. Then the results of the combination are made an evidence test based on the avg rate parameter using a proxy operating system and the parameters of throughput, delay, jitter and packet loss. Thus the bandwidth management of the 802.3 protocol at the North Sumatra Islamic University is better and more effective.

RESEARCH METHODS

In the research method there is data collection and effectiveness of the research design

1. Data Collection

Table 3.1. Data acquisition from speedtest

РС	Hanya terdapat TX & RX (<u>tidak ada</u> l	Priority, CIR/MIR & filtering pola data)
	TX (Upload)	RX (Download)
PC 1	12 mbps	9097 Kbps
PC 2	545 Kbps	130 Kbps
PC 3	300 Kbps	95 Kbps
PC 4	90 Kbps	43 Kbps

Table 3.2. Data used through ICMP packages

		Internet Control Message Protocol (ICMP)	
Client	Delay (ms)	Jitter	Paket Loss (%)
	Average	Rata-rata delay min-max	Sent/ Received
PC 1	60 ms	Time 1 sampai time akhir variasi nilainya berbeda jauh mulai dari 36 sampai 357 ms	0 %
PC 2	310 ms	Time 1 sampai time akhir variasi nilainya berbeda jauh mulai dari 225 sampai 370 ms	33 %
PC 3	387 ms	Time 1 sampai time akhir variasi nilainya berbeda jauh mulai dari 213 sampai 341 ms	41 %
PC 4	370 ms	Time 1 sampai time akhir variasi nilainya berbeda jauh mulai dari 99 sampai 641 ms	17 %

Table 3.3. Data types are based on traffic that is often accessed by clients

Jenis Tr	rafik atau Konten/Website
Streaming	Sosial Media
^.+(youtube.com googlevideo	
.com cdn.dailymotion.com me	^.+(facebook.com instagram.com twitter.com).*
tacafe.com/mccont.com).*\$	\$



Figure 3.1. Alur keseluruhan sistem.

From tables 3.1 and 3.2 above it can be explained that all clients access the internet at the same time, it appears that bandwidth usage in each client is overlapping (uneven). The tendency of bandwidth values is more

dominating on PC 1. Testing is done using speed test and ICMP. Whereas in table 3.3. is data in the form of traffic types, and websites that are most often accessed by clients.

System Configuration

The system configuration includes the data pattern design on the Regular Expression Script in L7P, the Firewall Mangle design, the Queue Type determination and the Queue Tree design.

Design data patterns on regular expression scripts in L7P.

Firewall L7 Protocol <limit streaming=""></limit>	
Name: Limit Streaming	
L	Regexp:
^.+(youtube.com googlevideo.com cdn.dailymotion.com metacafe.com mccont.com).*\$	^

In designing the Regular Expression L7P Script above, it is a determination of what traffic will be dropped and limited. The script in regex functions to make a tagging in the Filter Rule and Queue Tree so that the router can define certain data patterns in the URL text for auto dropping and later being monitored in Queue so as to save the available bandwidth.

1. The design of the application of Firewall Mangle.

-				1											
100	r Ruleo	NAT	mangle	Baw	Service Ports	Conn	ections Addres	e Liste	Layer? Proto	alook					
٠	-	-	× 🗆	T	og Reset Cou	ten	00 Reset Al	Counters							
2	A	ction	Chain	5	irc. Address	Dst	Address	Proto .	Sec. Port	Dst. Port	in Inter	Out. Int.	Bytes	Packets	
	berdes	serken r	etwork un	tuk up	oad										
0	XU	/ mar	forward	0	0.0.0/0								0	B	
	×э	Pinar	forward										0	B	
	; berdar	sarkan r	netwok unt	tuk dow	micad										
- 2	XU	/ mar	forward			150	168.100.0/24						0	B	
3	XJ	r nar	forward										0	B	
	Lant	atre amin	beold/J gr												
-4	1	nar	forward	0	0.0.0/0								0	B	0
- 5		nar	forward										0	B	0
	; Limit si	treaming	p downloa	đ											
6	3	P mar	forward			150	168.100.0/24						0	B	0
- 7		f mar	forward										0	B	0
	; Uploa	d PC 1													
8		nar	forward	1	92.168.100.254								0	В	0
	; Uploa	d PC 2													
- 3		nar	forward	1	92.168.100.251								0	B	0
	: Uploa	d PC 4													
10		nar	forward	1	92.168.100.253								0	B	0
	; Uplea	d PC 3													
11		* mar	forward	1	92.168.100.252								0	B	0
	; Dawni	load PC	1												
12		na	forward			150	168.100.254						0	B	8
	Downi	load PC	2												
13		 mar 	forward			150	168.100.251						0	B	0
	: Dawni	load PC	3												
14		nar	forward			192	168.100.252						0	B	0
	: Downi	load PC	4												
15		f mar	forward			152	168,100,253						0	B	0
	int se	sned													
16	1	P mar	forward	0	0.0.0/0								0	B	0
17		· mar	forward										0	B	8
18	1	f mar	forward			150	168.100.0/24						0	B	0
19	- -	The	forward										0	8	0

Figure 3.3. The design of the application of Firewall Mangle

The design of the firewall mangle signifies each of the traffic. Namely PC traffic 1,2,3 and 4 for TX and RX, then limit social media traffic and streaming traffic drop. This marking is done for the Queue Tree method later.

1.	Oueue	Type	Deteri	nination.
1.	Quitut	Type	Duun	mnauon.

i2:3D (MikroTik) - WinBox v6.40).9 on hEX (mmips)			
hboard					
Session: B8:69:F4:C8:62:3D					
Simple Queues Interface Queu	es Queue	Tree Queue Types			
•					
• • •		Queue Type cPCQ-Ur	shads		
Type Name	Kind	added Type a early		_	
PCQ Download	pcq	Type Name:	PCQ-Upload		ОК
PCQ-Upload	pcq	Kind:	pcq	Ŧ	Cancel
* default-small	philo		(1-4		Canoci
* ethemet-default	pfifo	Bate:	0	bits/s	Apply
* hotspot-default	sfq		-		
* multi-queue-ethemet-default	mq pfifo	Limit:	50	KIB	Сору
* only-hardware-queue	none	Total Limit:	2000	KiB	Bemove
pcq-download-default	pcq				
pcq-upload-default	pcq	Burst Bate:		hite /e	
* wireless-default	rea sfa	Dense Hate.		010070	-
	urq	Burst Threshold:		-	
		Burst Time:	00-00-10		
		Classifier:	Src. Address Dst. A	ddress	
			Src. Port Dst. F	ort	
		Src. Address Mask:	32		
		Date Address Marily	22		
		Doc. Hudress Mask.	32		
		Src. Address6 Mask:	64		
		Dst. Address6 Mask:	64		
1					

Figure 3.4. Queue Type Determination

In Figure 3.4. above explains that before applying Queue Tree, it determines the Queue Type for the Classifier and its Kind type. It is intended that each client does not overlap and get bandwidth fairly and evenly for both TX and RX and applies to access the traffic that has been made. This type of Queue also marks the Queue Tree

Season: B8-69-E4-C8-62-3D										
Dumum List										
Engle Organization Company	Charles Tree									
ample cueues Piterace cueues		caueue i	Mines .	0						
	OU Heset Co	uncers	OU Preset Au	Counters			10.10.1	100.0	In the last	
Name /	Parent .	Packet	Limit AL (D	Max Lint Av	g. Plat	• 0.hmm	Cluebed Bytes	Uyles 0.6	Packets	
··· Priority 8	CONTRACTOR IN			TOM		0 bps	0.0	01		-
Limit youtube download	Total Download	Packet.	2504	1M		0 bps	08	0.6	0	
::: PC 1-4 Priority 6										
PC 1 Download	Total Download	Packet.		2M		0 605	08	0.0	0	
PC 2 Download	Total Download	Packet	2504	2M		Obps	0.0	0.0	ő	
PC 4 Download	Total Download	Packet	2504	2M		0 bos	0.0	0.0	ŏ	
::: Priority 7				Owner of the		dam damanta	and to			
Imit sosmed download	Total Download	Packet.	2504	Carlette - Cult	a youn	dole downio.	60.2			
Total Upload	ether1-NET			Cieneral	Statistic	C III			ОК	
Limit Soamed Upload	Total Upload	Packet.			lame:	Limit youtu	be download		Cancel	
Priority 8						(T + + 0)		1000		
Limit youtube upload	Total Upload	Packet.	250		arent:	Total Dow	hioad		Apply	
III PC 1-4 Prioritas 6	Total Links ad	Backet	250	Packet N	forten:	Packet stre	raming download	• • •	Disable	
PC 2 Uoload	Total Unload	Packet	250						0.000.0	
PC 3 Upload	Total Upload	Packet	2504	Queue	Type:	PCQ Dowr	Voad		Commen	٤
PC 4 Upload	Total Upload	Packet.		P	riority:	8			Copy	
				Bucket	Size:	0.100			Remove	
				1.00		050		 bits /s 	Reset Coun	ters
									Reset All Cou	inter
				Max	Carriet:	1101		- DKS/S		
				Burst	Limit:			 bits/s 		
				Burst Three	: blorte			 bite/e 		
				Ream	Time:			-		

In this process determine the queue structure for both Queue Parrent and Child Queue. Available bandwidths have a total of 20 Mbps, then simplified into 2 categories namely upload and download traffic, each of which is given 10 Mbps. For TX traffic (upload) has a child upload of 8 Mbps for MIR and 1 Mbps for CIR, then child social media limit and child limit streaming 1 Mbps for MIR and 250 Kbps for CIR. Whereas for RX traffic (download) has the

same bandwidth and child values as TX (Upload). The mechanism of queuing bandwidth distribution in the Oueue Tree method is that bandwidth will be allocated to the limit at (Committed Information Rate (CIR)) first then if the bandwidth is still remaining then the remaining bandwidth will be given to the highest priority where the highest priority in this test is child download traffic and child upload with a large bandwidth of 8 Mbps. Then if there are only a few bandwidth users and accessing a small bandwidth value, the router will provide full bandwidth but only limited to the Maximum Information Rate and its priority value.

RESULT

Here will be discussed the results of research evidence based on the speed test that is equipped with a graph diagram and the results of throughput, delay, jitter and packet loss.

Bandwidth achievement based on speedtest from TX (upload) and RX (download).

Table 4.1 Bandwidth results are based on TX in each traffic.

		Ba	indwidth Ters	sedia 20 Mbp	s	
			TX (Upload) 10 Mbps		
	Prior	rity 6	Prior	rity 7	Prior	ity 8
	Trafik Ch	ild Upload	Trafik Cl	nild Limit	Trafik Cl	nild Limit
Client			Sosial	Media	Strea	ming
Chem	Maximum	Commited	Maximum	Commited	Maximum	Commited
	Information	Information	Information	Information	Information	Information
	Rate (MIR)	Rate (CIR) 1	Rate (MIR)	Rate (CIR)	Rate (MIR)	Rate (CIR)
	8 Mbps (2	Mbps (250	1 Mbps	250 Kbps	1 Mbps	250 Kbps
	Mbps x 4)	Kbps x 4)				
	Avg.	Rate	Avg.	Rate	Avg.	Rate
PC 1	2.0 1	Abps				
		-				
PC 2	2.0 M	Abps		-		-
PC 3	1984.	6 kbps				
PC 4	1992.	0 kbps				

Table 4.2 Bandwidth results based on RX in each traffic

			RX (Downl	oad) 10 Mbp	s	
	Prior	ity 6	Prio	rity 7	Prio	rity 8
	Trafik Dowr	Child 1load	Trafik C Sosial	hild Limit Media	Trafik Cl Strea	hild Limit ming
Client	Maximum Information Rate (MIR) 8 Mbps (2 Mbps x 4)	Commited Information Rate (CIR) 1 Mbps (250 Kbps x 4)	Maximum Information Rate (MIR) 1 Mbps	Commited Information Rate (CIR) 250 Kbps	Maximum Information Rate (MIR) 1 Mbps	Commited Information Rate (CIR) 250 Kbps
	Avg.	Rate	Avg	Rate	Avg.	Rate
PC 1	1986.7	7 kbps				
PC 2	1991.6	5 kbps			077.0	
PC 3	1952.2	2 kbps	286,0	5 Kbps	977,8	kbps
PC 4	1980.0) kbps	1			

In tables 4.1 and 4.2 above it can be explained that the acquisition of bandwidth on each client is equal and does not dominate, this applies to every traffic. Each client has been guaranteed to get a Committed Information Rate, even reaching the Maximum Information Rate value of its avg rate. The mechanism of bandwidth distribution is explained in Figure 3.5 above.

To more clearly see the results of the acquisition of bandwidth achieved can be seen in



Figure 4.1. Acquired upload and download bandwidth



Figure 4.2. Acquiring social media limit bandwidth and drop streaming traffic.

Achievement of value based on ICMP packet (throughput, delay, jitter and packet loss).

 Table 4.3. The results are obtained through the Internet

 Control Message Protocol package

	Int	ernet Control Mes	sage Protocol (ICMI)
Client	Troughput	Delay (<u>ms</u>)	Jitter (ms)	Paket Loss (%)
	(bps)	Average	Rata-rata delay min-max	Sent/ Received
PC 1	188 kbps	-7917478 ms	20 ms	0%
PC 2	198 kbps	-7917478 ms	20 ms	0%
PC 3	16 kbps	-7917478 ms	20 ms	0%
PC 4	25 kbps	$-7917478~\mathrm{ms}$	20 ms	0%

Following the process of achieving the value of throughput, delay, jitter and packet loss;

Troughput

The throughput value is obtained from the formula (Throughput = Amount of data sent / Time of sending data x 8) where the result is:PC 1 = 1209421 Bytes : 51.238 Time Span, S = 23 kbps x 8 = 188 kbps.

PC 2 = 1685285 Bytes : 68.004 Time Span, S = 24 kbps x 8 = 198 kbps.

PC 3 = 123838 Bytes : 59.841 Time Span, S = 2069 kbps x 8 = 16 kbps.

PC 4 = 236479 Bytes : 75.026 Time Span, S = 3151 kbps X 8 25 kbps.

Here's an example of the screenshot;

Last packet: 2019-11-17 16:2 Elapsed: 00:00:51 Capture Untel(R) Core(TM Hardware: Intel(R) Core(TM Application: Dumpcap (Wiresh Interface Dropoed packets Ethernet 0 (0 %) Statistics Measurement Packets 2474 Time span, s 51.238	3:02) i3-6100U CPU @ 0 (1803), build 11 aark) 3.0.6 (v3.0. Capture filter	2.30GHz (with 7134 6-0-g908c8e35 Link type	SSE4.2) 7d0f) Packet size limit	
Elapsed: 00:00:51 Capture Intel(R) Core(TM OS): Hardware: Intel(R) Core(TM OS): OS: 64-bit Windows 1 Application: Dumpcap (Wiresh Interfaces Dropped packets Ethernet 0 (0 %) Statistics Measurement Packets 2474 Tme span, s 51.238) i3-6100U CPU @ 0 (1803), build 17 ark) 3.0.6 (v3.0.	2.30GHz (with 7134 6-0-g908c8e35 <u>Link type</u>	SSE4.2) 7dof) Packet size limit	
Capture Intel(R) Core(ITM 64-bit Windows 1 54-bit Windows 1 Dumpcap (Wiresh Interfaces Interfaces Dropped packets 0 (0 %) Statistics Measurement Packets Captured 2474 Time span, s 51.238) i3-6100U CPU @ 0 (1803), build 17 ark) 3.0.6 (v3.0.	2.30GHz (with 7134 6-0-g908c8e35 <u>Link type</u>	SSE4.2) 7d0f) Packet size limit	
Hardware: Intel(R) Core(TM 64-bit Windows 1 Dumpcap (Wires) Interface Dropped packets Ethernet 0 (0 %) Statistics Measurement Captured Packets 2474 Time span, s 51.238) i3-6100U CPU @ 0 (1803), build 17 ark) 3.0.6 (v3.0.	2.30GHz (with 7134 6-0-g908c8e35 Link type	SSE4.2) 7d0f) Packet size limit	
OS: 64-bit Windows 1 Dumpcap (Wiresh Interfaces Ethernet 0 (0 %) Statistics Measurement Captured Packets 2474 Time span, s 51.238	0 (1803), build 17 ark) 3.0.6 (v3.0. <u>Capture filter</u>	7134 6-0-g908c8e35 <u>Link type</u>	7d0f) Packet size limit	Ì
Application: Dumpcap (Wiresh Interface Dropped packets Ethernet 0 (0 %) Statistics Measurement Captured Packets 2474 Time span, s 51.238	Capture filter	6-0-g908c8e35 Link type	7d0f) Packet size limit	
Interface Dropped packets Ethernet 0 (0 %) Statistics Measurement Captured Packets 2474 Time span, s 51.238	Capture filter	Link type	Packet size limit	
Interface Dropped packets Ethernet 0 (0 %) Statistics Captured Packets 2474 Time span, s 51.238	Capture filter	Link type	Packet size limit	
Ethernet 0 (0 %) Statistics Measurement Captured Packets 2474 Time span, s 51.238	0000			
Statistics Measurement Captured Packets 2474 Time span, s 51.238	HUHE	Ethernet	262144 bytes	
Measurement Captured Packets 2474 Time span, s 51.238				
Packets 2474 Time span, s 51.238	Display	red	Marked	
Time span, s 51.238	2474 (100.0%)		
	51.238	1		
Average pps 48.3	48.3			
Average packet size, B 489	489			
Bytes 1209421	12094	21 (100.0%)	0	
Average bytes/s 23 k	23 k		<u></u>	
Average bits/s 188 k			<u>1999</u>	

Figure 4.3. The process of obtaining the value of throughput

Microsoft Windows [Version 10.0.17134.885] (c) 2018 Microsoft Corporation. All rights reserved.			
C:\Users\Aulia Ichsan≻ping 8.8.8.8			
Pinging 8.8.8.8 with 32 bytes of data:			
Reply from 8.8.8.8: bytes=32 time=16ms TTL=52			
Reply from 8.8.8.8: bytes=32 time=20ms TTL=52			
Reply from 8.8.8.8: bytes=32 time=18ms TTL=52			
Reply from 8.8.8.8: bytes=32 time=20ms TTL=52			
······································			
Ping statistics for 8.8.8.8:			
Packets: Sent = 4. Received = 4. Lost = θ (θ % loss).			
Approximate round trip times in milli-seconds:			
Minimum = 16ms. Maximum = 20ms. Average = 18ms			
C:\Users\Aulia Ichsan>			

Delay

To obtain the average value of delay using the formula (Average delay = Total Delay / Total packets received)

The following is an example of a calculation screenshot:

Time 2	Time 1	Delay
1,127,478	1,087,464	0.040.014
11,087,181	1,127,478	9,959,703
11,088,928	11,087,181	0.001747
11,116,248	11,088,928	0.02732
11,116,327	11,116,248	0.000079
11,166,476	11,116,327	0.050149
11,193,929	11,166,476	0.027453
11,194,013	11,193,929	0.000084
11,194,392	11,194,013	0.000379
11,222,592	11,194,392	0.0279
11,225,042	11,222,592	0.00245
11,227,600	11,225,042	0.002558
11,227,639	11,227,600	0.000039
11,228,858	11,227,639	0.001219
11,233,723	11,228,858	0.004865
11,264,712	11,233,723	0.030989
11,266,536	11,264,712	0.001824
11,297,410	11,266,536	0.030874
11,877,618	11,297,410	0.580208
11,918,487	11,877,618	0.040869
41,877,183	11,918,487	29,958,696
41,918,664	41,877,183	-41,877,183
	Total Delay	-1,958,784
	Rata-rata Delay	-7917478

Figure 4.4. proses perolehan mencari nilai rata-rata delay.

Jitter dan Packet Loss

The variation in the value of jitter from time 1 to the end time is almost equal and stable in each client. Each client also has no packet loss with a gain of 0%. packet loss obtained from the formula (Packet loss = (Data sent - data received) x 100%).

The following screenshots of the results of the acquisition of jitter and packet loss.

Hicrosoft Windows [Version 6.1.7601] Copyright (c) 2009 Microsoft Corporation. All rights reserved. C:\Users\SitiRafida>ping 8.8.8.8 Pinging 8.8.8.8 with 32 bytes of data: Reply from 8.8.8.8: bytes=32 time=20ms TTL=54 Ping statistics for 8.8.8.8: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 20ms, Maximum = 20ms, Average = 20ms C:\Users\SitiRafida>

Microsoft Windows [Version 10.0.17134.1069] (c) 2018 Microsoft Corporation. All rights reserved.	Pinging 8.8.8.8 with 32 bytes of data:
C:\Users\CBT-07>ping 8.8.8.8	Reply from 8.8.8.8: bytes=32 time=16ms TTL=52
Pinging 8.8.8.8 with 32 bytes of data: Reply from 8.8.8.8: bytes=32 time=20ms TTL=54 Reply from 8.8.8.8: bytes=32 time=20ms TTL=54 Reply from 8.8.8.8: bytes=32 time=20ms TTL=54 Reply from 8.8.8.8: bytes=32 time=21ms TTL=54	Reply from 8.8.8.8: bytes=32 time=20ms TTL=52 Reply from 8.8.8.8: bytes=32 time=18ms TTL=52 Reply from 8.8.8.8: bytes=32 time=20ms TTL=52
<pre>Ping statistics for 8.8.8.8: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 20ms, Maximum = 21ms, Average = 20ms C:\Users\CBT-07></pre>	Ping statistics for 8.8.8.8: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 16ms, Maximum = 20ms, Average = 18ms

Figure 4.5 The results of the acquisition of jitter and packet loss.

CONCLUSION

Routers can allocate bandwidth to all clients to be more structured. Where every cilent is given a limit at first or Committed Information Rate so that all clients get a definite bandwidth ration, after the limit at work then if the bandwidth is still remaining the bandwidth will be allocated to the traffic priority with the highest value first namely priority 6 if it still remains then bandwidth will be allocated to a smaller traffic that is priority 7 and so on until the bandwidth is used up. But if there is a lot of bandwidth left, the client with the highest priority can get a max limit / Maximum Information Rate.\

The result of this Queue Tree method is that traffic can be categorized into 3 parts, namely TX / RX traffic, social media traffic limits, and traffic limit streaming. The acquisition of bandwidth on each client becomes equally even by adding the function Per Connection Queue (PCQ) to the Queue Tree.

With the implementation of the Layer 7 Filtering method on a firewall router it can automatically define certain data patterns in the url text for auto dropping or limitation so that it can result in reduced bandwidth usage.

REFERENCES

 Kusbandono, H & Syafitri, E.M. 2019. Penerapan Quality Of Service (QoS) dengan Metode PCQ untuk Manajemen Bandwidth Internet pada WLAN Politeknik Negeri Madiun. Journal of Computer, information system, & technology management. Vol. 2, No. 1. April 2019. pp : 7-12.

- Helmiawan, M.A. 2015. Internet Positif Dengan Metode Web Filtering Layer 7 Pada Jaringan Wireless (Study Case Hotspot RT4 Cipeuteuy Baru Sumedang), *Researchgate.net*. 8 Mei 2019 (diakses 8 Mei 2019).
- Amin, R.A.A & Indrajit, R.E. 2016. Analysis of Effectiveness of Using Simple Queue With Per Connection Queue (PCQ) In The Bandwidth Management (A Case Study At The Academy Of Information Management And Computer Mataram (Amikom) Mataram. *Journal of Theoretical and Applied Information Technology*. Vol. 83 No.3, 31st January 2016. Pp : 319-326.
- Suherman, S, Aziz, M & Nababan, E.B. 2019. Load Balancing Algorithm for a Local Video network. *The 3rd International Conference on Computing and Applied Informatics 2018.* (diakses 17 April 2020).
- Malik, A, Aksara, L.M.F & Yamin, M. 2017. Perbandingan Metode Simple Queues dan Queues Tree untuk Optimasi Manajemen Bandwidth Menggunakan Mikrotik (Studi Kasus: Pengadilan Tinggi Agama Kendari). *semanTIK*, Vol.3, No.2, Jul-Des 2017,pp. 1-8.

How to cite this article: Ichsan A, Suherman, Nababan EB. Analysis of method tueed treedan filtering layer to improve the effectiveness bandwidth management on network 802.3. International Journal of Research and Review. 2020; 7(4): 536-541.
