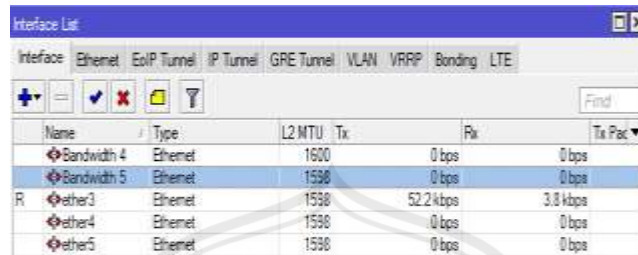


LAMPIRAN

Inisialisasi Mikrotik

Mikrotik RB951-2n ke 2

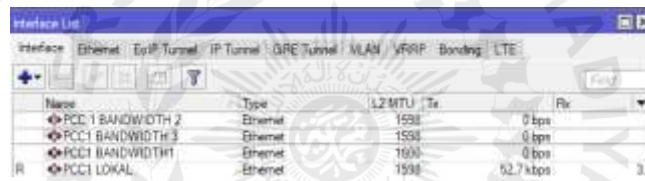


The screenshot shows the Mikrotik Interface List window. The 'Ethernet' tab is selected. The table below lists the interfaces and their status.

Name	Type	L2 MTU	Tx	Rx	Tx Pac
Bandwidth 4	Ethernet	1600	0 bps	0 bps	
Bandwidth 5	Ethernet	1598	0 bps	0 bps	
R ether3	Ethernet	1598	52.2 kbps	3.8 kbps	
ether4	Ethernet	1598	0 bps	0 bps	
ether5	Ethernet	1598	0 bps	0 bps	

Gambar 4.3 *Interface* Mikrotik RB951-2n ke 2

Mikrotik RB951-2n ke 3 PCC 1

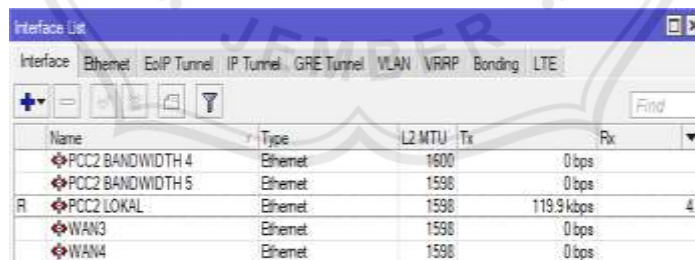


The screenshot shows the Mikrotik Interface List window. The 'Ethernet' tab is selected. The table below lists the interfaces and their status.

Name	Type	L2 MTU	Tx	Rx	Tx Pac
PCC1 BANDWIDTH 2	Ethernet	1598	0 bps	0 bps	
PCC1 BANDWIDTH 3	Ethernet	1598	0 bps	0 bps	
PCC1 BANDWIDTH 1	Ethernet	1600	0 bps	0 bps	
R PCC1 LOKAL	Ethernet	1598	62.7 kbps	3.1	

Gambar 4.4 *Interface* Mikrotik RB951-2n ke 3

Mikrotik RB951-2n ke 4 PCC 2

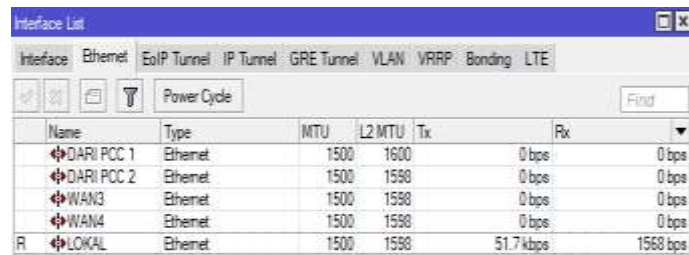


The screenshot shows the Mikrotik Interface List window. The 'Ethernet' tab is selected. The table below lists the interfaces and their status.

Name	Type	L2 MTU	Tx	Rx	Tx Pac
PCC2 BANDWIDTH 4	Ethernet	1600	0 bps	0 bps	
PCC2 BANDWIDTH 5	Ethernet	1598	0 bps	0 bps	
R PCC2 LOKAL	Ethernet	1598	119.9 kbps	4.7	
WAN3	Ethernet	1598	0 bps	0 bps	
WAN4	Ethernet	1598	0 bps	0 bps	

Gambar 4.5 *Interface* Mikrotik RB951-2n ke 4

Mikrotik RB951-2n ke 5 PCC 3



Name	Type	MTU	L2 MTU	Tx	Rx
DARI PCC 1	Ethernet	1500	1600	0 bps	0 bps
DARI PCC 2	Ethernet	1500	1598	0 bps	0 bps
WAN3	Ethernet	1500	1598	0 bps	0 bps
WAN4	Ethernet	1500	1598	0 bps	0 bps
LOKAL	Ethernet	1500	1598	51.7 kbps	1568 bps

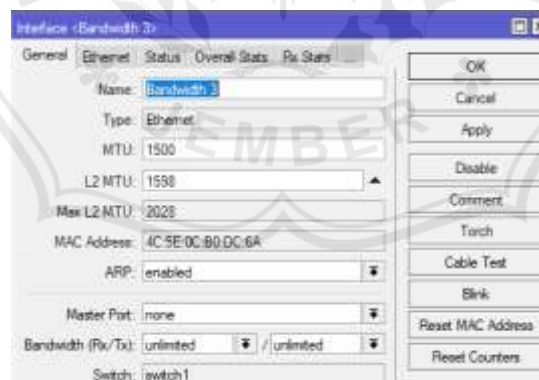
Gambar 4.6 *Interface* Mikrotik RB951-2n ke 5

Pemberian nama pada *interface bandwidth 2*

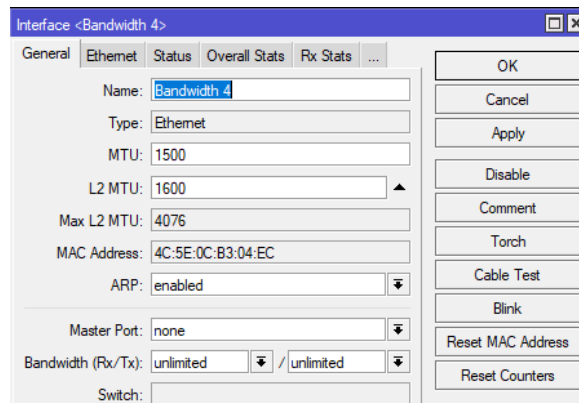


Interface Bandwidth 2

Pemberian nama pada *interface bandwidth 3*



Interface Bandwidth 3 Pemberian nama pada *interface bandwidth 4*



Interface Bandwidth 4

Pemberian nama pada *interface bandwidth 5*



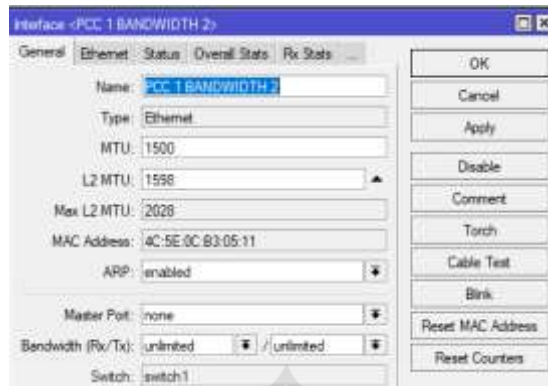
Interface Bandwidth 5

Pemberian nama pada *interface Load Balancing PCC 1 Bandwidth 1.*



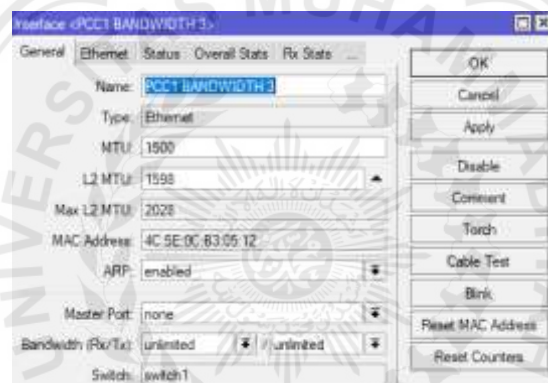
Interface Load Balancing PCC 1 Bandwidth 1

Pemberian nama pada *interface Load Balancing PCC 1 Bandwidth 2*.



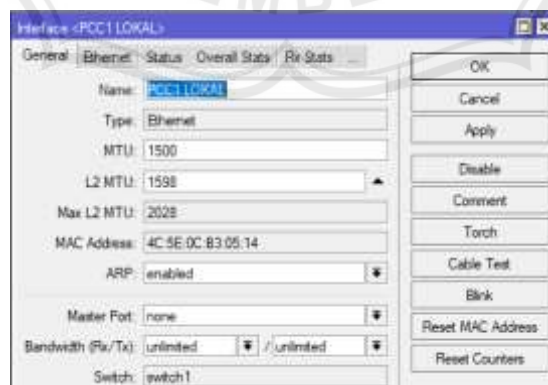
Interface Load Balancing PCC 1 Bandwidth 2

Pemberian nama pada *interface Load Balancing PCC 1 Bandwidth 3*.



Interface Load Balancing PCC 1 Bandwidth 3

Pemberian nama pada *interface Load Balancing PCC 1 Lokal*.



Interface Load Balancing PCC 1 Lokal.

Pemberian nama pada *interface Load Balancing PCC 2 Bandwidth 4.*



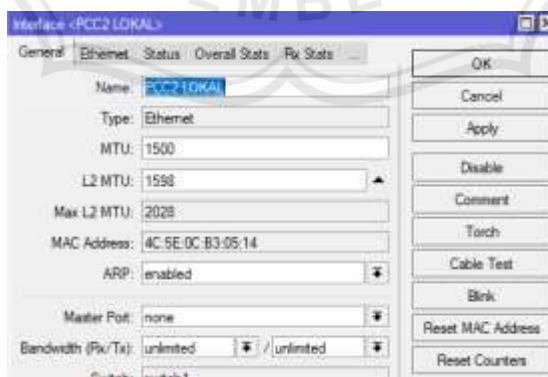
Interface Load Balancing PCC 2 Bandwidth 4.

Pemberian nama pada *interface Load Balancing PCC 2 Bandwidth 5.*



Interface Load Balancing PCC 2 Bandwidth 5.

Pemberian nama pada *interface Load Balancing PCC 2 Lokal.*



Interface Load Balancing PCC 2 Lokal.

Pemberian nama pada *interface Load Balancing PCC 3* dari PCC 1 Lokal.



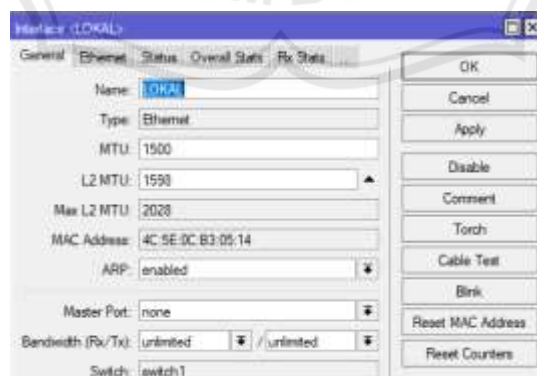
Interface Load Balancing PCC 3 dari PCC 1 Lokal.

Pemberian nama pada *interface Load Balancing PCC 3* dari PCC 2 Lokal.



Gambar 4.14 *Interface Load Balancing PCC 3* dari PCC 2 Lokal

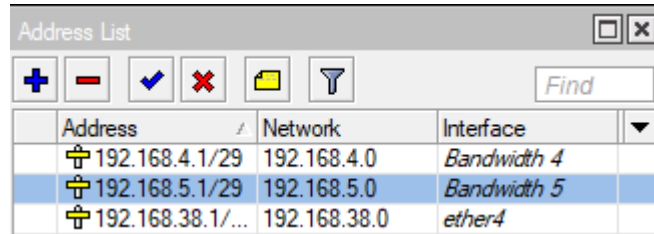
Pemberian nama pada *interface Load Balancing PCC 3* Lokal.



Interface Load Balancing PCC 3 Lokal.

Insialisasi IP Address

Mikrotik RB951-2n ke 2



Address	Network	Interface
192.168.4.1/29	192.168.4.0	Bandwidth 4
192.168.5.1/29	192.168.5.0	Bandwidth 5
192.168.38.1/...	192.168.38.0	ether4

Gambar 4.8 IP Address Mikrotik RB951-2n ke 2

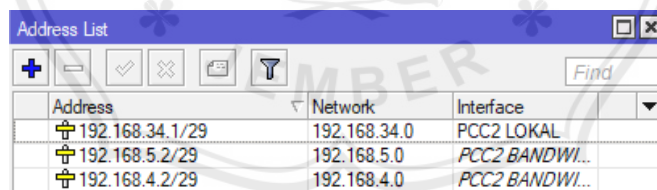
Mikrotik RB951-2n ke 3 PCC 1



Address	Network	Interface
192.168.1.2/29	192.168.1.0	PCC1 BANDWI...
192.168.2.2/29	192.168.2.0	PCC1 BANDWI...
192.168.3.2/29	192.168.3.0	PCC1 BANDWI...
192.168.4.2/29	192.168.4.0	PCC1 BANDWI...
192.168.39.1/28	192.168.39.0	PCC1 LOKAL

Gambar 4.9 IP Address Mikrotik RB951-2n ke 3.

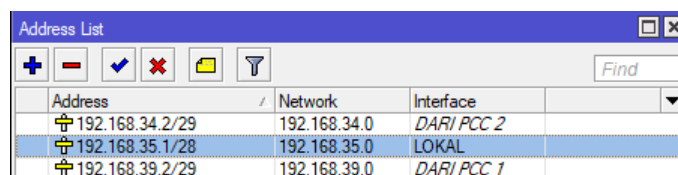
Mikrotik RB951-2n ke 4 PCC 1



Address	Network	Interface
192.168.34.1/29	192.168.34.0	PCC2 LOKAL
192.168.5.2/29	192.168.5.0	PCC2 BANDWI...
192.168.4.2/29	192.168.4.0	PCC2 BANDWI...

Gambar 4.10 IP Address Mikrotik RB951-2n ke 4.

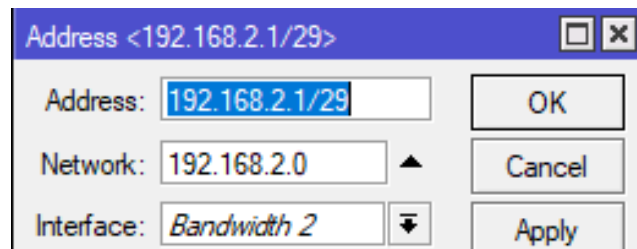
Mikrotik RB951-2n ke 5 PCC 3.



Address	Network	Interface
192.168.34.2/29	192.168.34.0	DARI PCC 2
192.168.35.1/28	192.168.35.0	LOKAL
192.168.39.2/29	192.168.39.0	DARI PCC 1

Gambar 4.11 IP Address Mikrotik RB951-2n ke 5.

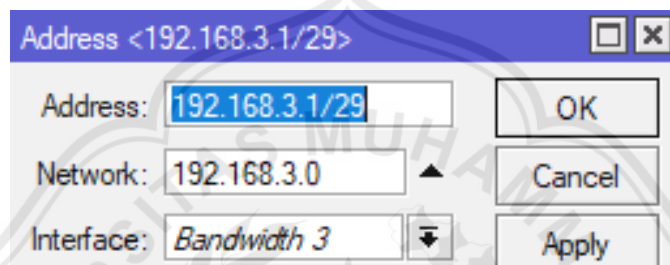
Pemberian IP Address *Bandwidth 2*.



A screenshot of a network configuration dialog box titled "Address <192.168.2.1/29>". The dialog has a blue header bar with window control buttons. It contains three input fields: "Address" with the value "192.168.2.1/29", "Network" with the value "192.168.2.0" and an up arrow, and "Interface" with a dropdown menu showing "Bandwidth 2". To the right of these fields are three buttons: "OK", "Cancel", and "Apply".

IP Address *Bandwidth 2*.

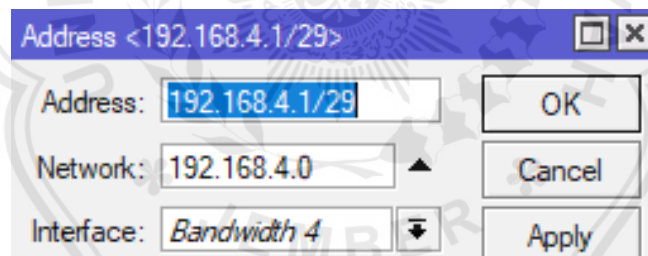
Pemberian IP Address *Bandwidth 3*.



A screenshot of a network configuration dialog box titled "Address <192.168.3.1/29>". The dialog has a blue header bar with window control buttons. It contains three input fields: "Address" with the value "192.168.3.1/29", "Network" with the value "192.168.3.0" and an up arrow, and "Interface" with a dropdown menu showing "Bandwidth 3". To the right of these fields are three buttons: "OK", "Cancel", and "Apply".

IP Address *Bandwidth 3*.

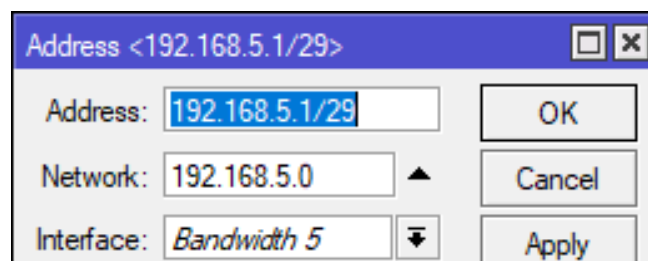
Pemberian IP Address *Bandwidth 4*.



A screenshot of a network configuration dialog box titled "Address <192.168.4.1/29>". The dialog has a blue header bar with window control buttons. It contains three input fields: "Address" with the value "192.168.4.1/29", "Network" with the value "192.168.4.0" and an up arrow, and "Interface" with a dropdown menu showing "Bandwidth 4". To the right of these fields are three buttons: "OK", "Cancel", and "Apply".

IP Address *Bandwidth 4*.

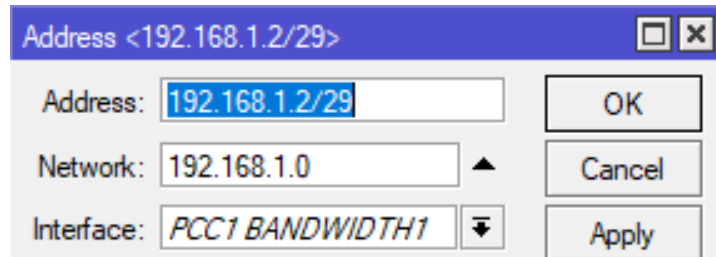
Pemberian IP Address *Bandwidth 5*.



A screenshot of a network configuration dialog box titled "Address <192.168.5.1/29>". The dialog has a blue header bar with window control buttons. It contains three input fields: "Address" with the value "192.168.5.1/29", "Network" with the value "192.168.5.0" and an up arrow, and "Interface" with a dropdown menu showing "Bandwidth 5". To the right of these fields are three buttons: "OK", "Cancel", and "Apply".

IP Address *Bandwidth 5*.

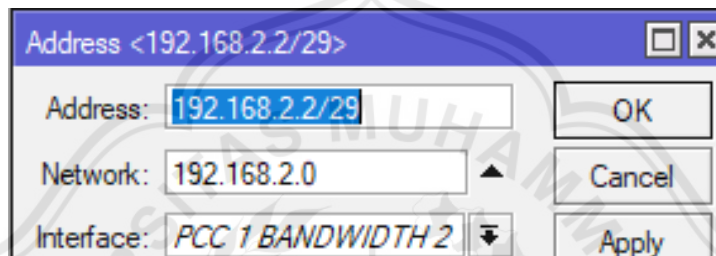
Pemberian IP Address Load Balancing PCC 1 Bandwidth 1.



A screenshot of a network configuration dialog box titled "Address <192.168.1.2/29>". The dialog has three input fields: "Address" with the value "192.168.1.2/29", "Network" with the value "192.168.1.0", and "Interface" with the value "PCC1 BANDWIDTH1". To the right of each field is a small upward-pointing triangle icon. On the right side of the dialog, there are three buttons: "OK", "Cancel", and "Apply".

IP Address Load Balancing PCC 1 Bandwidth 1.

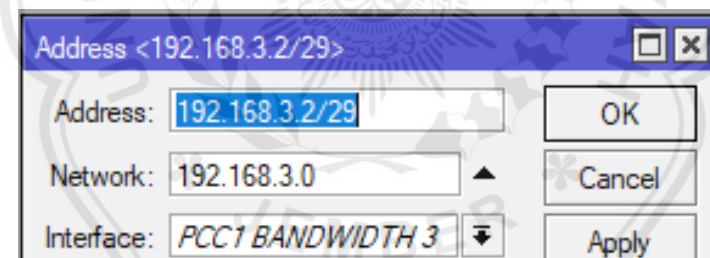
Pemberian IP Address Load Balancing PCC 1 Bandwidth 2.



A screenshot of a network configuration dialog box titled "Address <192.168.2.2/29>". The dialog has three input fields: "Address" with the value "192.168.2.2/29", "Network" with the value "192.168.2.0", and "Interface" with the value "PCC 1 BANDWIDTH 2". To the right of each field is a small upward-pointing triangle icon. On the right side of the dialog, there are three buttons: "OK", "Cancel", and "Apply".

IP Address Load Balancing PCC 1 Bandwidth 2.

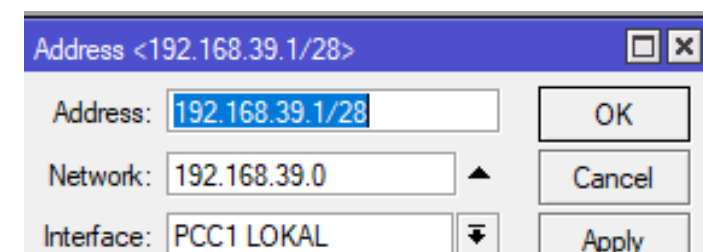
Pemberian IP Address Load Balancing PCC 1 Bandwidth 3.



A screenshot of a network configuration dialog box titled "Address <192.168.3.2/29>". The dialog has three input fields: "Address" with the value "192.168.3.2/29", "Network" with the value "192.168.3.0", and "Interface" with the value "PCC1 BANDWIDTH 3". To the right of each field is a small upward-pointing triangle icon. On the right side of the dialog, there are three buttons: "OK", "Cancel", and "Apply".

IP Address Load Balancing PCC 1 Bandwidth 3.

Pemberian IP Address Load Balancing PCC 1 Lokal.



A screenshot of a network configuration dialog box titled "Address <192.168.39.1/28>". The dialog has three input fields: "Address" with the value "192.168.39.1/28", "Network" with the value "192.168.39.0", and "Interface" with the value "PCC1 LOKAL". To the right of each field is a small upward-pointing triangle icon. On the right side of the dialog, there are three buttons: "OK", "Cancel", and "Apply".

IP Address Load Balancing PCC 1 Lokal.

Pemberian IP Address Load Balancing PCC 2 Bandwidth 4.

IP Address Load Balancing PCC 2 Bandwidth 4

Pemberian IP Address Load Balancing PCC 2 Bandwidth 5.

IP Address Load Balancing PCC 2 Bandwidth 5.

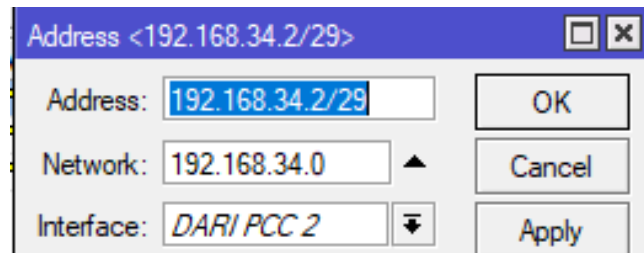
Pemberian IP Address Load Balancing PCC 2 Lokal.

IP Address Load Balancing PCC 2 Lokal.

Pemberian IP Address Load Balancing PCC 3 dari PCC 1 Lokal.

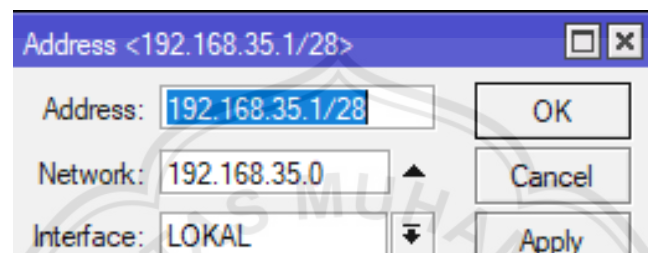
IP Address Load Balancing PCC 3 Dari PCC 1 Lokal.

Pemberian IP Address Load Balancing PCC 3 dari PCC 2 Lokal.



IP Address Load Balancing PCC 3 Dari PCC 2 Lokal.

Pemberian IP Address Load Balancing PCC 3 Lokal.



IP Address Load Balancing PCC 3 Lokal.

Konfigurasi NAT

NAT PCC 1 Bandwidth 1

Mikrotik RB951-2n ke 4 PCC 2

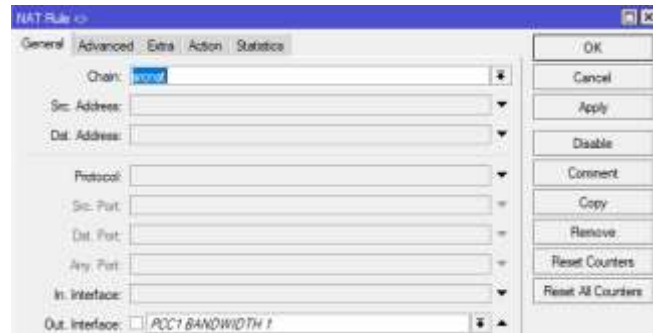
#	Action	Chain	Src. Address	Dst. Address	Proto.	Src. Port	Dst. Port	In. Interface	Out. Interface	In. Interface	Out. Interface	Src. Address	Dst. Address	Action	Priority
1	nat	srcnat						PCC2BANDWIDTH4							0
1	nat	srcnat						PCC2BANDWIDTH5							0

Konfigurasi NAT Mikrotik RB951-2n ke 4.

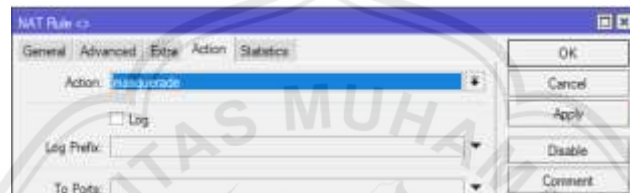
Mikrotik RB951-2n ke 5 PCC 3

#	Action	Chain	Src. Address	Dst. Address	Proto.	Src. Port	Dst. Port	In. Interface	Out. Interface	In. Interface	Out. Interface	Src. Address	Dst. Address	Action	Priority
1	nat	srcnat						DARI PCC 1							0
1	nat	srcnat						DARI PCC 2							0

Konfigurasi NAT Mikrotik RB951-2n ke 5.



NAT PCC1 Bandwidth 1.

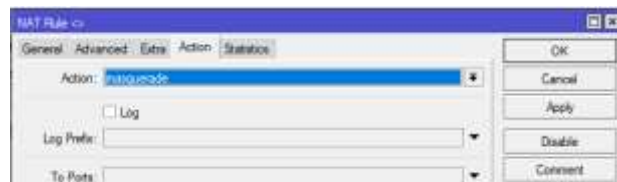


Action NAT PCC 1 Bandwidth 1.

NAT PCC 1 Bandwidth 2

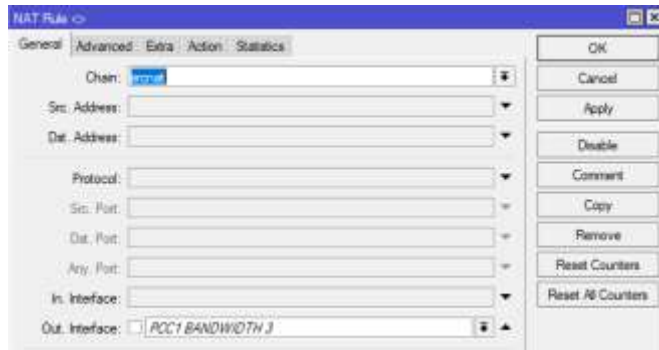


NAT PCC 1 Bandwidth 2.



Action NAT PCC 1 Bandwidth 1.

NAT PCC 1 Bandwidth 3

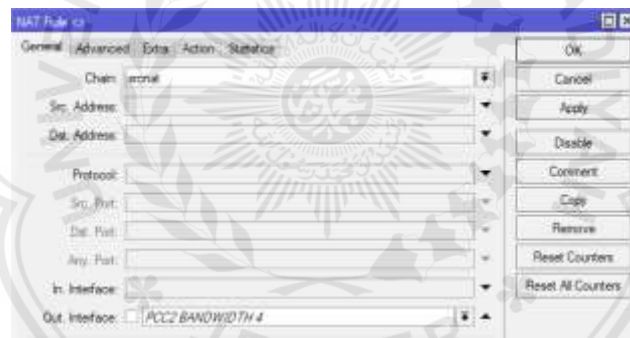


NAT PCC 1 Bandwidth 3.

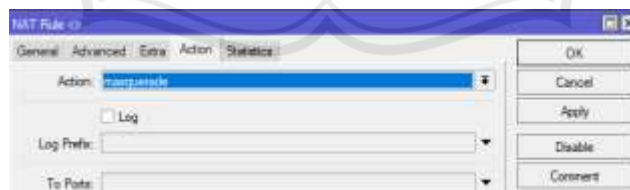


Action NAT PCC 1 Bandwidth 3.

NAT PCC 2 Bandwidth 4

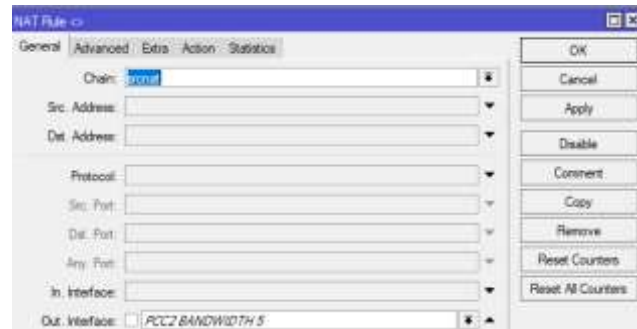


NAT PCC 2 Bandwidth 4.

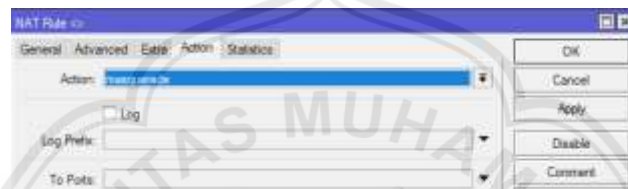


Action NAT PCC 2 Bandwidth 4.

NAT PCC 2 Bandwidth 5

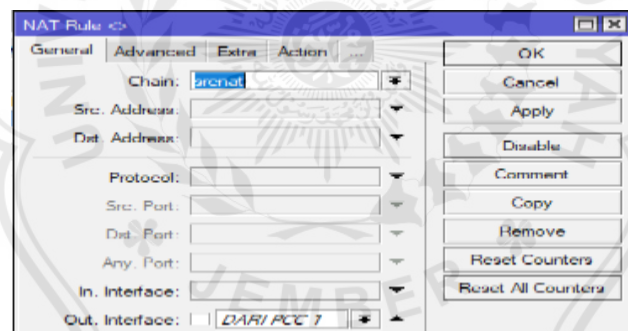


NAT PCC 2 Bandwidth 5.

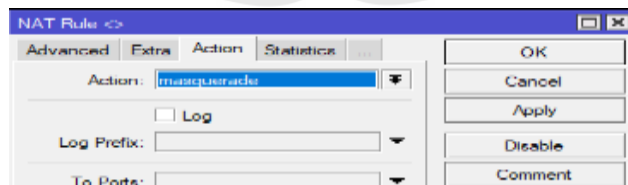


Action NAT PCC 2 Bandwidth 5.

NAT PCC 3 dari Lokal 1

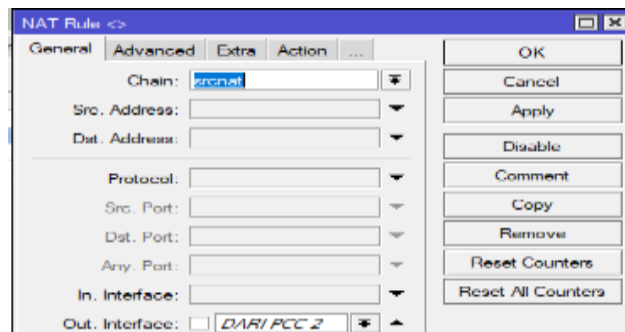


NAT PCC 3 Lokal 1.

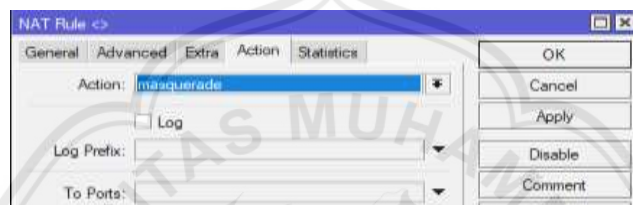


Action NAT PCC 3 Lokal 1.

NAT PCC 3 dari Lokal 2



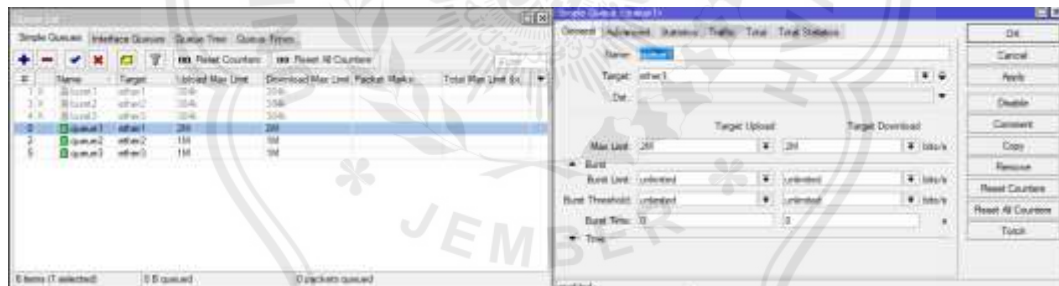
NAT PCC 3 Lokal 2.



Action NAT PCC 3 Lokal 2.

Konfigurasi Queue

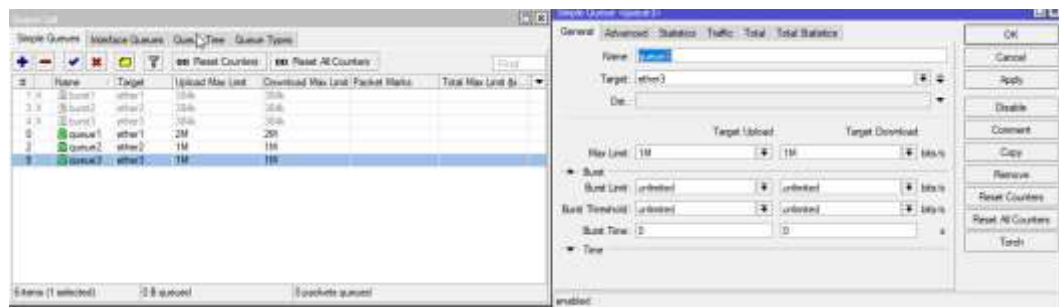
Skema Bandwidth 1:2



Konfigurasi Queue Skema Bandwidth 1:2 Bandwidth 1.

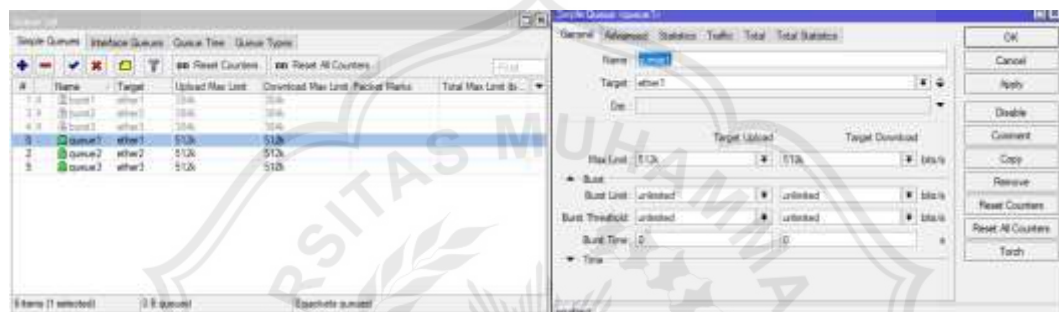


Konfigurasi Queue Skema Bandwidth 1:2 Bandwidth 2.

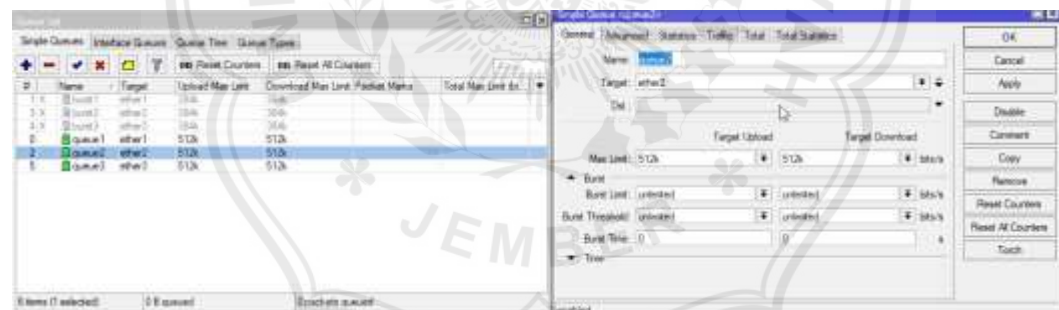


Konfigurasi Queue Skema Bandwidth 1:2 Bandwidth 3.

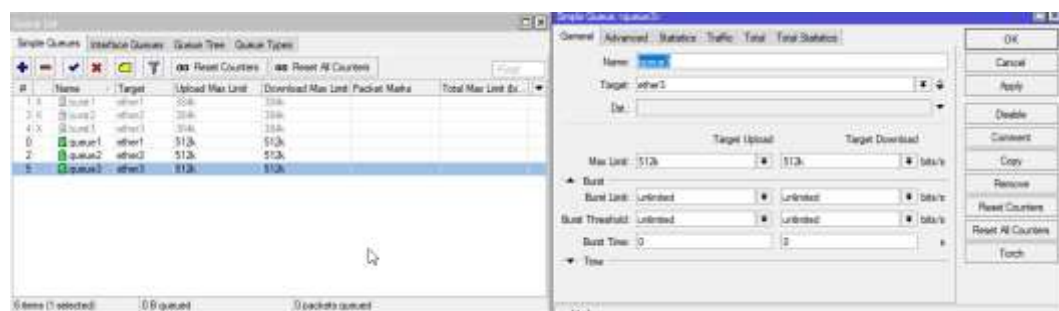
Skema Bandwidth 1:4



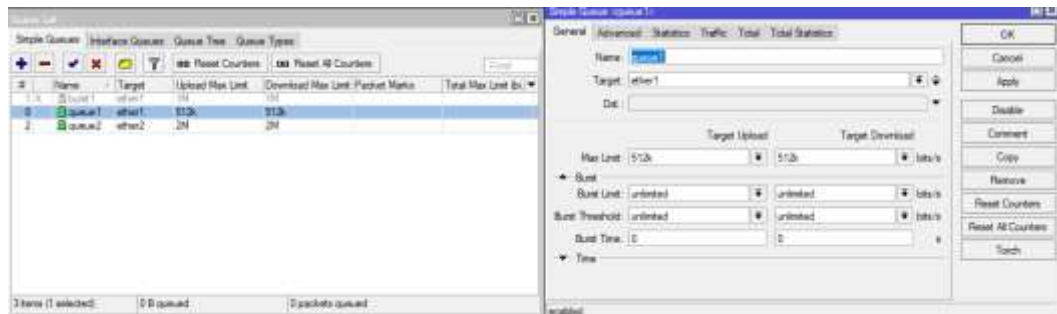
Konfigurasi Queue Skema Bandwidth 1:4 Bandwidth 1.



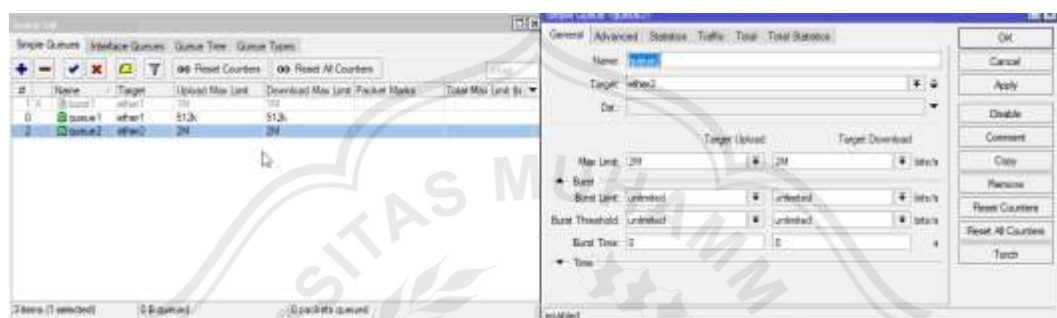
Konfigurasi Queue Skema Bandwidth 1:4 Bandwidth 2.



Konfigurasi Queue Skema Bandwidth 1:4 Bandwidth 3.



Konfigurasi Queue Skema Bandwidth 1:4 Bandwidth 4.



Konfigurasi Queue Skema Bandwidth 1:4 Bandwidth 5.

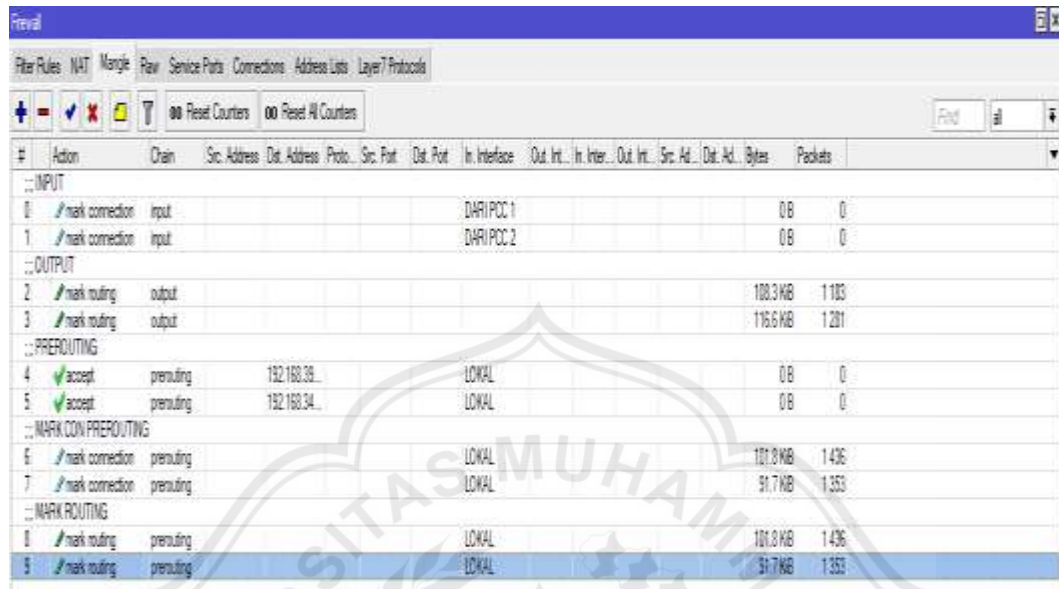
Konfigurasi Mangle

Mikrotik RB951-2n ke 4 PCC 2

#	Action	Chain	Src. Address	Dst. Address	Proto.	Src. Port	Dst. Port	In. Inter.	Out. Int.	In. Inter.	Out. Int.	Src. Ad.	Dst. Ad.	Bytes	Packets
::INPUT															
0	/mak connection	input						PCC2						0B	0
1	/mak connection	input						PCC2						0B	0
::OUTPUT															
2	/mak routing	output												178,5 KB	1.029
3	/mak routing	output												169,9 KB	1.010
::PREROUTING															
4	✓accept	preouting	192.168.4.0/28					PCC2						0B	0
5	✓accept	preouting	192.168.5.0/28					PCC2						0B	0
::MARK CON PREROUTING															
6	/mak connection	preouting						PCC2						250,0 KB	3.105
7	/mak connection	preouting						PCC2						173,4 KB	2.385
::MARK ROUTING															
8	/mak routing	preouting						PCC2						250,0 KB	3.105
9	/mak routing	preouting						PCC2						173,4 KB	2.385

Konfigurasi Mangle Mikrotik RB951-2n ke 4.

Mikrotik RB951-2n ke 5 PCC 3



#	Action	Chain	Src. Address	Dst. Address	Proto.	Src. Port	Dst. Port	In. Interface	Out. Int.	In. Inter...	Out. Int.	Src. Ad.	Dst. Ad.	Bytes	Packets
:: INPUT															
0	mark connection	input						DARI PCC 1						0B	0
1	mark connection	input						DARI PCC 2						0B	0
:: OUTPUT															
2	mark routing	output												108.3 KB	1183
3	mark routing	output												116.6 KB	1201
:: PREROUTING															
4	accept	preouting	192.168.38...					LOKAL						0B	0
5	accept	preouting	192.168.34...					LOKAL						0B	0
:: MARK CON PREROUTING															
6	mark connection	preouting						LOKAL						101.8 KB	1436
7	mark connection	preouting						LOKAL						91.7 KB	1353
:: MARK ROUTING															
8	mark routing	preouting						LOKAL						101.8 KB	1436
9	mark routing	preouting						LOKAL						91.7 KB	1353

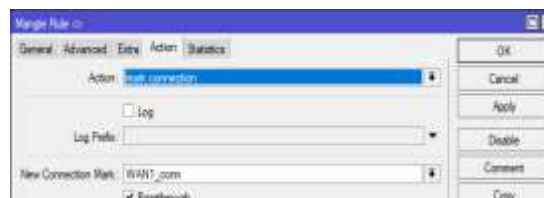
Konfigurasi Mangle Mikrotik RB951-2n ke 5.

Input

Mark Connection Input PCC 1 Bandwidth 1



Mark Connection PCC 1 Bandwidth 1.

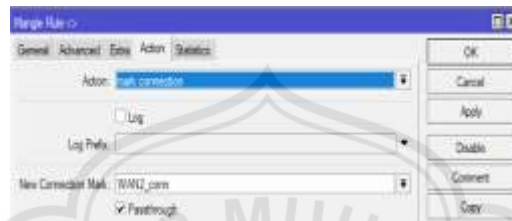


Action Mark Connection PCC 1 Bandwidth 1.

Mark Connection Input PCC 1 Bandwidth 2



Mark Connection PCC 1 Bandwidth 2.



Action Mark Connection PCC 1 Bandwidth 2.

Mark Connection Input PCC 1 Bandwidth 3



Mark Connection PCC 1 Bandwidth 3.

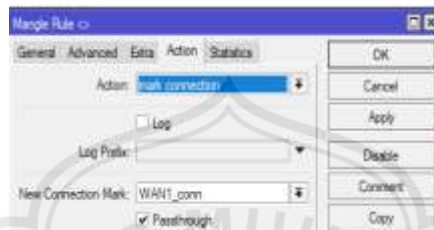


Action Mark Connection PCC 1 Bandwidth 3.

Mark Connection Input PCC 2 Bandwidth 4



Mark Connection PCC 2 Bandwidth 4.



Action Mark Connection PCC 2 Bandwidth 4.

Mark Connection Input PCC 2 Bandwidth 5

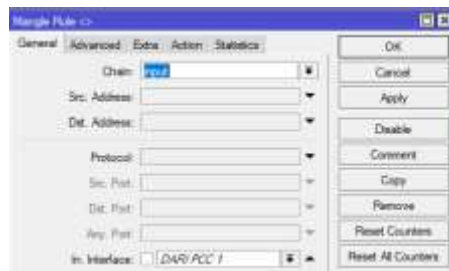


Mark Connection PCC 2 Bandwidth 5.

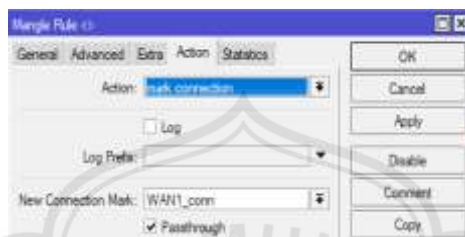


Action Mark Connection PCC 2 Bandwidth 5.

Mark Connection Input PCC 3 dari Lokal 1



Mark Connection PCC 3 dari Lokal 1.



Action Mark Connection PCC 3 dari Lokal 1.

Mark Connection Input PCC 3 dari Lokal 2



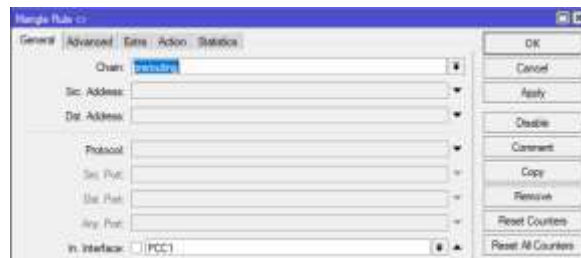
Mark Connection PCC 3 dari Lokal 2.



Action Mark Connection PCC 3 dari Lokal 2.

Mark Connection Prerouting

Mark Connection Prerouting PCC 1 Bandwidth 1



Mark Connection Prerouting PCC 1 Bandwidth 1.



Action Mark Connection Prerouting PCC 1 Bandwidth 1.

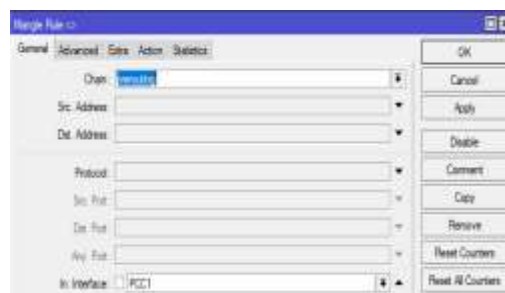


Advanced Mark Connection Prerouting PCC 1 Bandwidth 1.

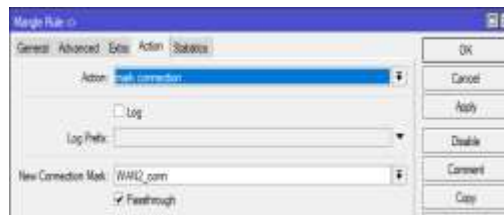


Extra Mark Connection Prerouting PCC 1 Bandwidth 1.

Mark Connection Prerouting PCC 1 Bandwidth 2



Mark Connection Prerouting PCC 1 Bandwidth 2.



Action Mark Connection Prerouting PCC 1 Bandwidth 2.



Advanced Mark Connection Prerouting PCC 1 Bandwidth 2.

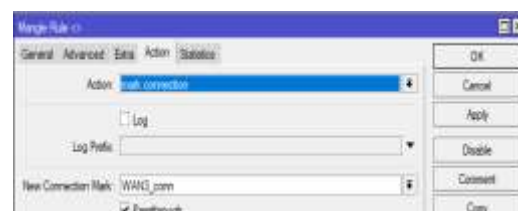


Extra Mark Connection Prerouting PCC 1 Bandwidth 2.

Mark Connection Prerouting PCC 1 Bandwidth 3



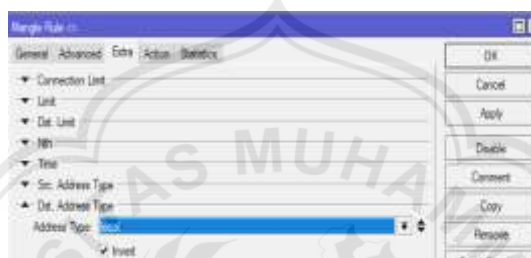
Mark Connection Prerouting PCC 1 Bandwidth 3.



Action Mark Connection Prerouting PCC 1 Bandwidth 3.



Advanced Mark Connection Prerouting PCC 1 Bandwidth 3.

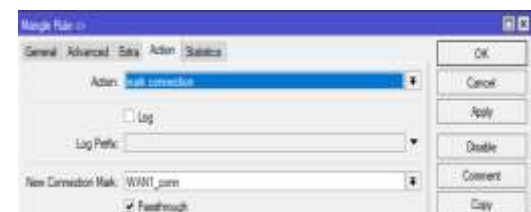


Extra Mark Connection Prerouting PCC 1 Bandwidth 3.

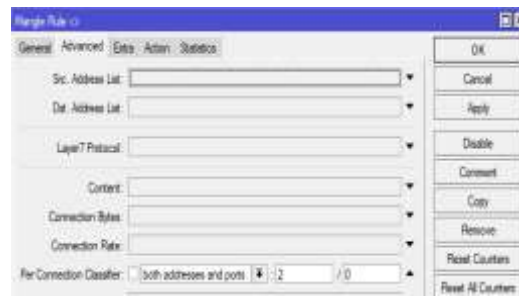
Mark Connection Prerouting PCC 2 Bandwidth 4



Mark Connection Prerouting PCC 2 Bandwidth 4.



Action Mark Connection Prerouting PCC 2 Bandwidth 4.



Advance Mark Connection Prerouting PCC 2 Bandwidth 4.

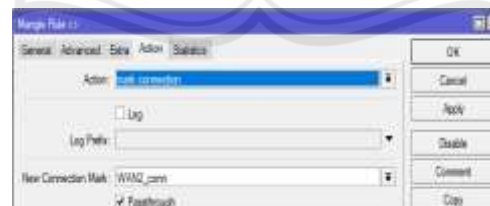


Extra Mark Connection Prerouting PCC 2 Bandwidth 4.

Mark Connection Prerouting PCC 2 Bandwidth 5



Mark Connection Prerouting PCC 2 Bandwidth 5.



Action Mark Connection Prerouting PCC 2 Bandwidth 5.

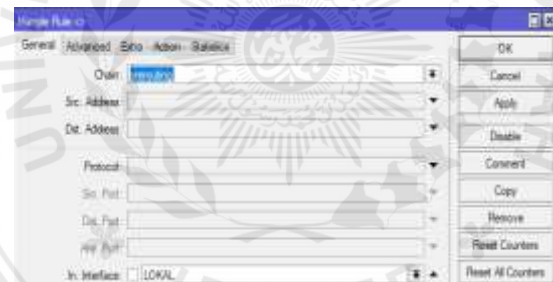


Advanced Mark Connection Prerouting PCC 2 Bandwidth 5.



Extra Mark Connection Prerouting PCC 2 Bandwidth 5.

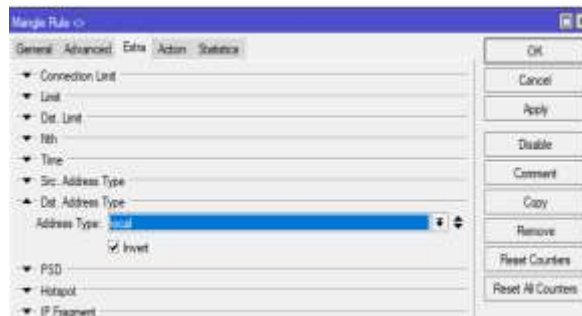
Mark Connection Prerouting PCC 3 dari Lokal 1



Mark Connection Prerouting PCC 3 dari Lokal 1.



Advanced Mark Connection Prerouting PCC 3 dari Lokal 1.



Extra Mark Connection Prerouting PCC 3 dari Lokal 1.



Action Mark Connection Prerouting PCC 3 dari Lokal 1.

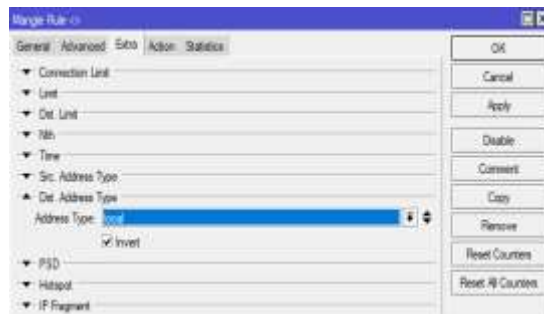
Mark Connection Prerouting PCC 3 dari Lokal 2



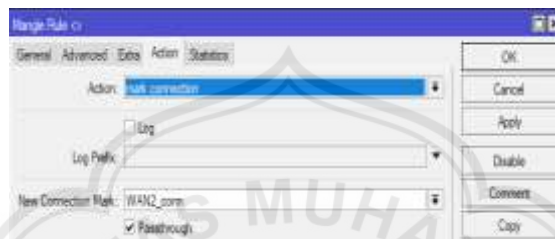
Mark Connection Prerouting PCC 3 dari Lokal 2.



Advanced Mark Connection Prerouting PCC 3 dari Lokal 2.



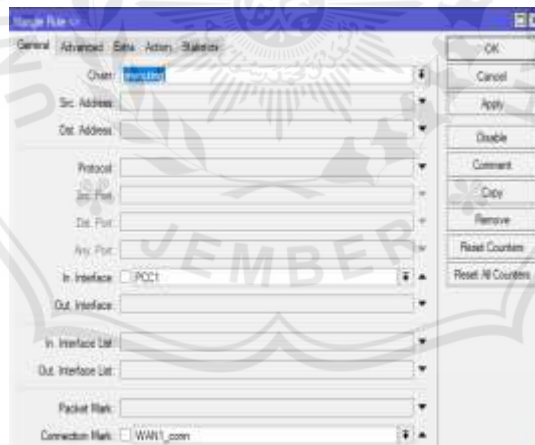
Extra Mark Connection Prerouting PCC 3 dari Lokal 2.



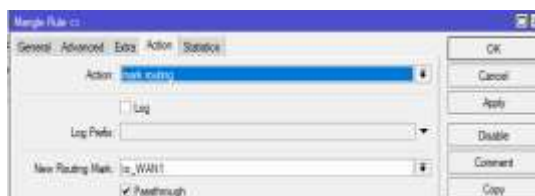
Action Mark Connection Prerouting PCC 3 dari Lokal 2.

Mark Routing

Mark Routing PCC 1 Bandwidth 1



Mark Routing PCC 1 Bandwidth 1.



Action Mark Routing PCC 1 Bandwidth 1.

Mark Routing PCC 1 Bandwidth 2

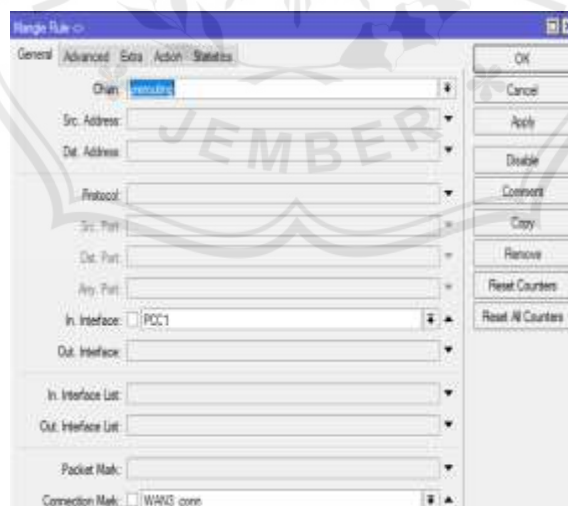


Mark Routing PCC 1 Bandwidth 2.

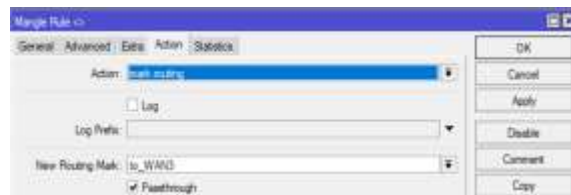


Action Mark Routing PCC 1 Bandwidth 2.

Mark Routing PCC 1 Bandwidth 3

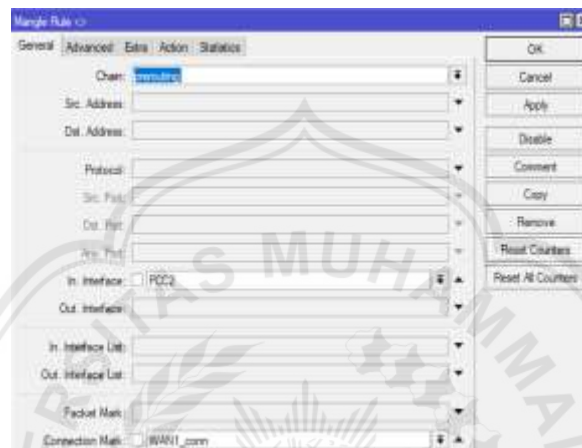


Mark Routing PCC 1 Bandwidth 3.

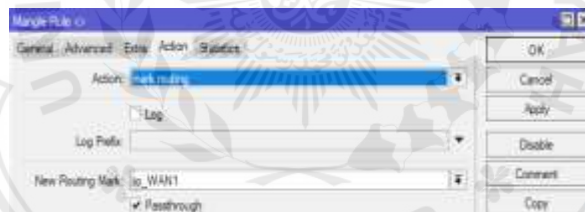


Mark Routing PCC 1 Bandwidth 3.

Mark Routing PCC 2 Bandwidth 4

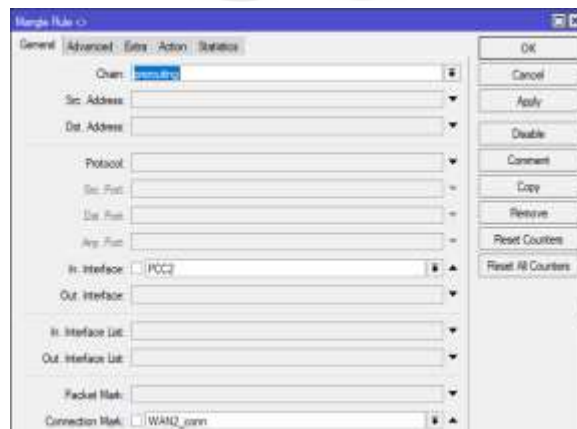


Mark Routing PCC 2 Bandwidth 4.

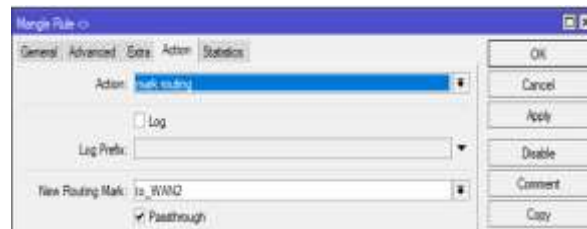


Action Mark Routing PCC 2 Bandwidth 4.

Mark Routing PCC 2 Bandwidth 5

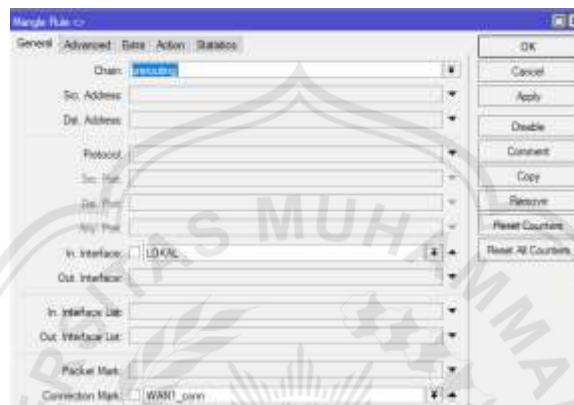


Mark Routing PCC 2 Bandwidth 5.



Action Mark Routing PCC 2 Bandwidth 5.

Mark Routing PCC 3 dari Lokal 1

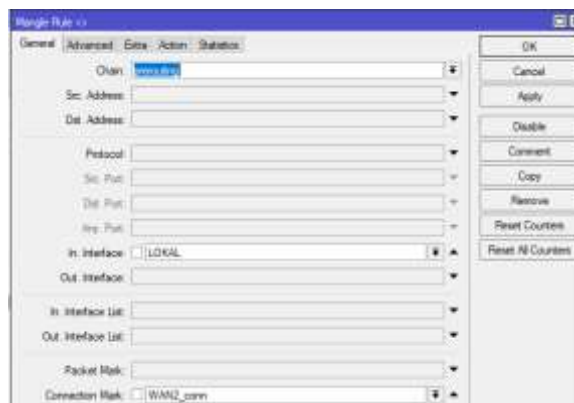


Mark Routing PCC 3 dari Lokal 1.

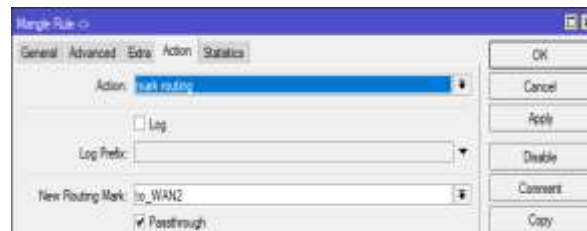


Action Mark Routing PCC 3 dari Lokal 1.

Mark Routing PCC 3 dari local 2



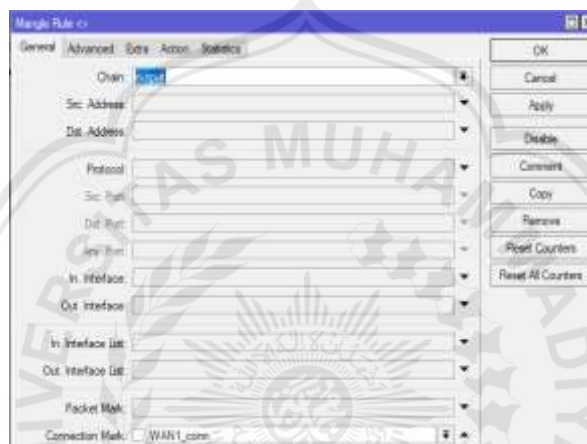
Mark Routing PCC 3 dari Lokal 2.



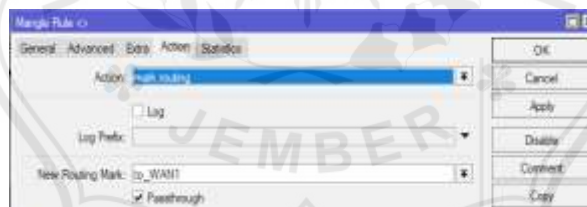
Action Mark Routing PCC 3 dari Lokal 2.

Output

Mark Routing Output PCC 1 Bandwidth 1

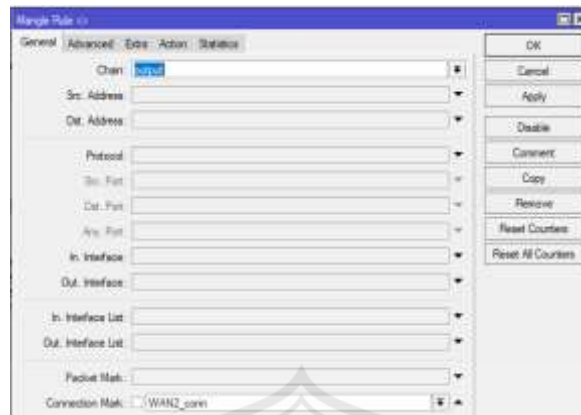


Mark Routing Output PCC 1 Bandwidth 1.

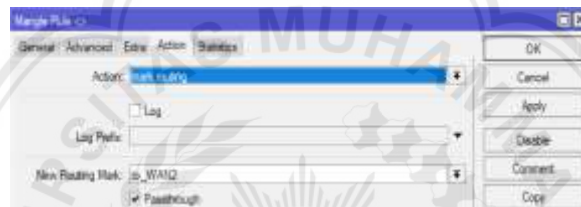


Action Mark Routing Output PCC 1 Bandwidth 1.

Mark Routing Output PCC 1 Bandwidth 2

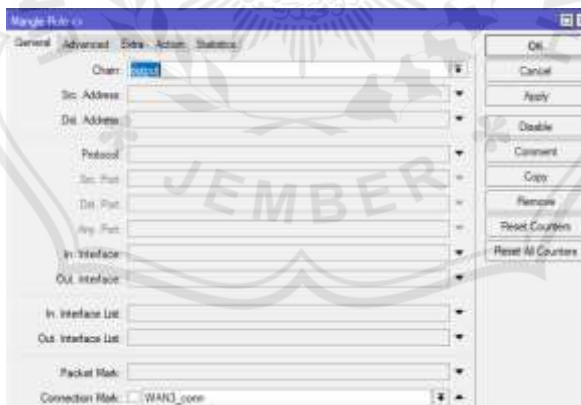


Mark Routing Output PCC 1 Bandwidth 2.

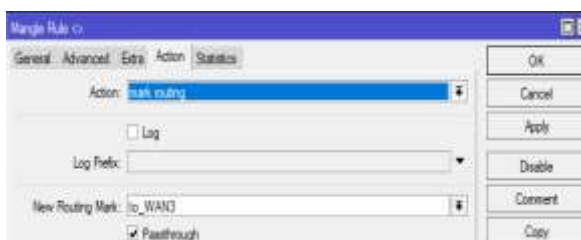


Mark Routing Output PCC 1 Bandwidth 2.

Mark Routing Output PCC 1 Bandwidth 3

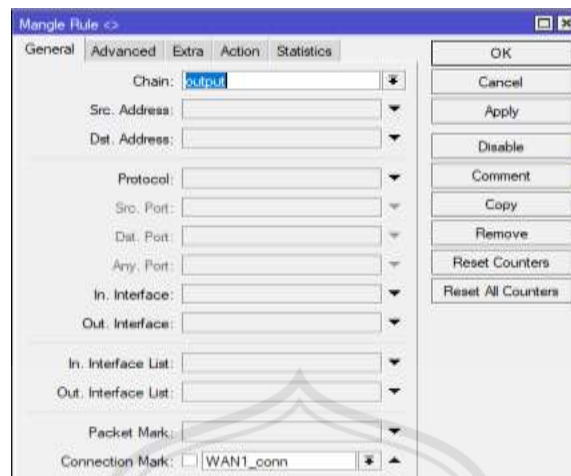


Mark Routing Output PCC 1 Bandwidth 3.

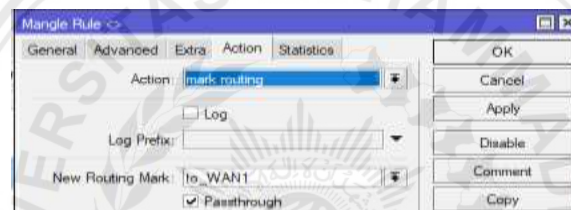


Action Mark Routing Output PCC 1 Bandwidth 3.

Mark Routing Output PCC 2 Bandwidth 4

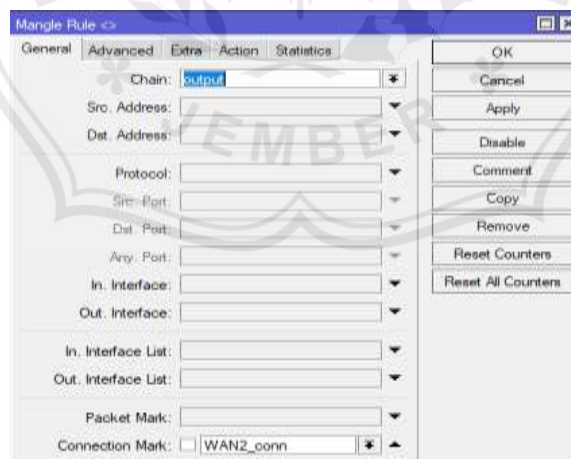


Mark Routing Output PCC 2 Bandwidth 4.

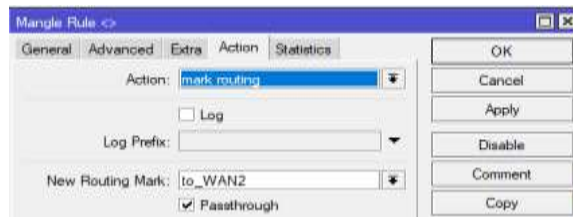


Action Mark Routing Output PCC 2 Bandwidth 4.

Mark Routing Output PCC 2 Bandwidth 5

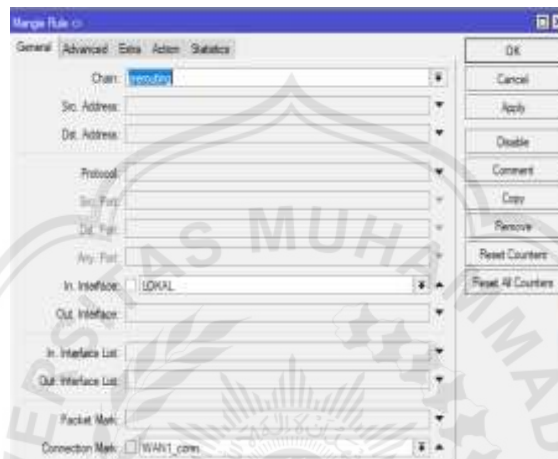


Mark Routing Output PCC 2 Bandwidth 4.

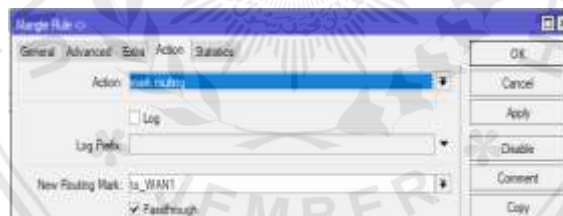


Action Mark Routing Output PCC 2 Bandwidth 5.

Mark Routing Output PCC 3 dari Lokal 1

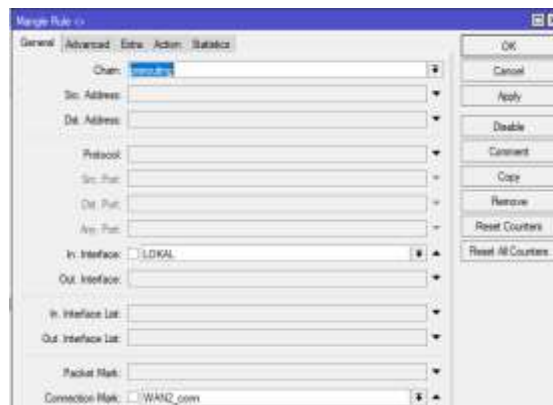


Mark Routing Output PCC 3 dari Lokal 1.

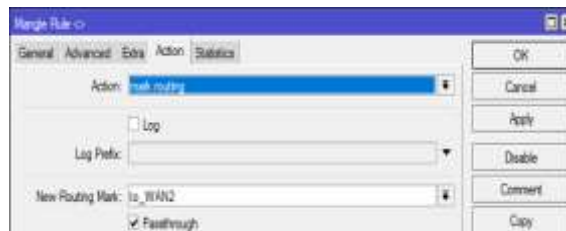


Action Mark Routing Output PCC 3 dari Lokal 1.

Mark Routing Output PCC 3 dari Lokal 2



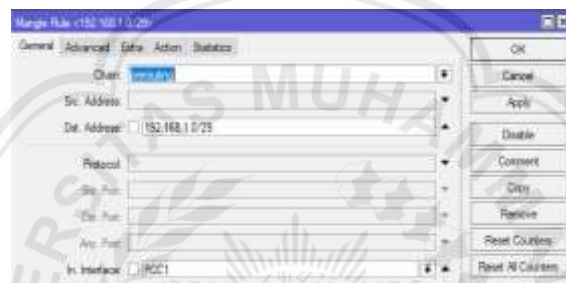
Mark Routing Output PCC 3 dari Lokal 2.



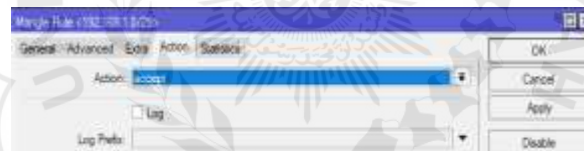
Action Mark Routing Output PCC 3 dari Lokal 2.

Prerouting

Prerouting PCC 1 Bandwidth 1



Prerouting PCC 1 Bandwidth 1.

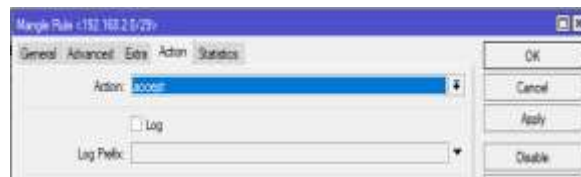


Prerouting PCC 1 Bandwidth 1.

Prerouting PCC 1 Bandwidth 2



Prerouting PCC 1 Bandwidth 2.



Action Prerouting PCC 1 Bandwidth 2.

Prerouting PCC 1 Bandwidth 3



Action Prerouting PCC 1 Bandwidth 3.

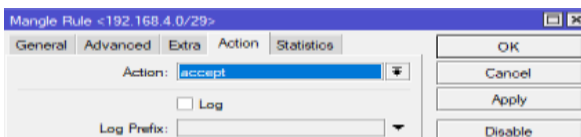


Action Prerouting PCC 1 Bandwidth 3.

Prerouting PCC 2 Bandwidth 4

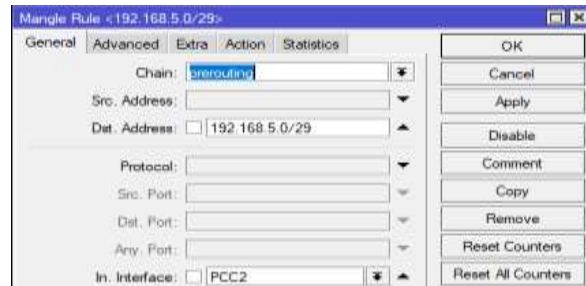


Prerouting PCC 1 Bandwidth 2.

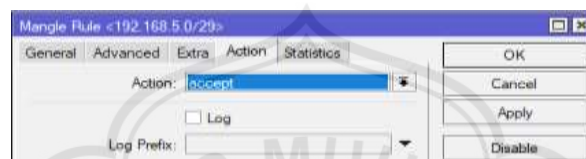


Action Prerouting PCC 1 Bandwidth 2.

Prerouting PCC 2 Bandwidth 5

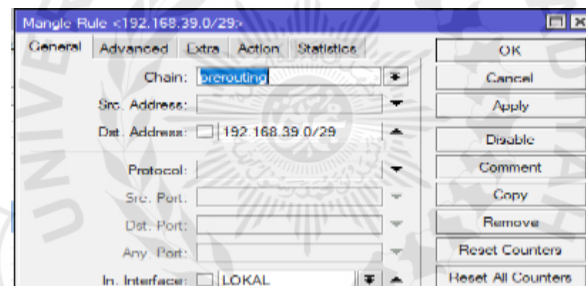


Prerouting PCC 2 Bandwidth 5.

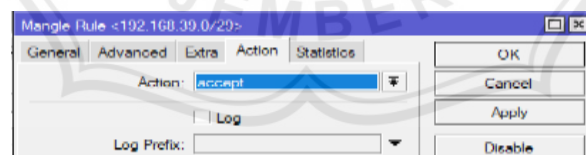


Action Prerouting PCC 2 Bandwidth 5.

Prerouting PCC 3 dari Lokal 1

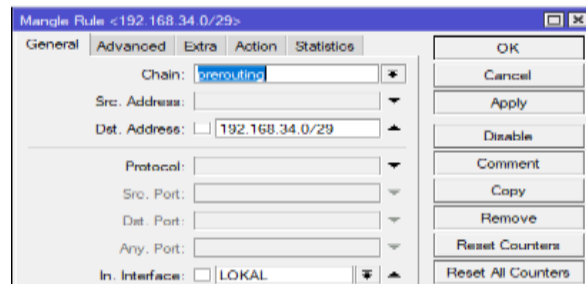


Prerouting PCC 2 dari Lokal 1.

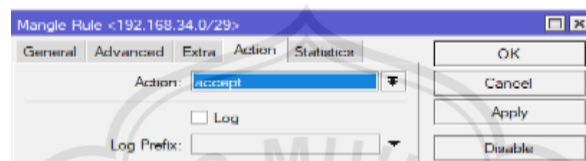


Action Prerouting PCC 3 dari Lokal 1.

Prerouting PCC 3 dari Lokal 2



Prerouting PCC 3 dari Lokal 2.



Action Prerouting PCC 3 dari Lokal 2.

PERHITUNGAN

Skema Bandwidth 1:1 Client 1:2

Pengujian Skema Bandwidth 1:1 Client 1:2

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.23.254	74.125.96.10	TCP	70	80981514481:14899441->74.125.96.10:80
2	0.000752	74.125.96.10	192.168.23.254	TCP	1392	225->80981514481:14899441
3	0.000440	192.168.23.254	74.125.96.10	TCP	70	80981514481:14899441->74.125.96.10:80
4	0.000400	74.125.96.10	192.168.23.254	TCP	1391	443->80981514481:14899441
5	0.001800	192.168.23.254	74.125.96.10	TCP	80	80981514481:14899441->74.125.96.10:80
6	0.001761	74.125.96.10	192.168.23.254	TCP	1392	443->80981514481:14899441
7	0.000070	192.168.23.254	74.125.96.10	TCP	80	80981514481:14899441->74.125.96.10:80
8	0.001252	74.125.96.10	192.168.23.254	TCP	1392	443->80981514481:14899441
9	0.001800	192.168.23.254	74.125.96.10	TCP	80	80981514481:14899441->74.125.96.10:80
10	0.000000	74.125.96.10	192.168.23.254	TCP	1392	443->80981514481:14899441
11	0.002747	192.168.23.254	74.125.96.10	TCP	80	80981514481:14899441->74.125.96.10:80
12	0.002501	74.125.96.10	192.168.23.254	TCP	1392	443->80981514481:14899441
13	0.003749	74.125.96.10	192.168.23.254	TCP	1392	443->80981514481:14899441
14	0.000000	192.168.23.254	74.125.96.10	TCP	80	80981514481:14899441->74.125.96.10:80
15	0.000070	74.125.96.10	192.168.23.254	TCP	1392	443->80981514481:14899441
16	0.000771	74.125.96.10	192.168.23.254	TCP	1392	443->80981514481:14899441
17	0.001623	192.168.23.254	74.125.96.10	TCP	80	80981514481:14899441->74.125.96.10:80
18	0.000070	74.125.96.10	192.168.23.254	TCP	1392	443->80981514481:14899441
19	0.000000	192.168.23.254	74.125.96.10	TCP	80	80981514481:14899441->74.125.96.10:80
20	0.000000	192.168.23.254	74.125.96.10	TCP	80	80981514481:14899441->74.125.96.10:80
21	0.000000	192.168.23.254	74.125.96.10	TCP	80	80981514481:14899441->74.125.96.10:80
22	0.000000	192.168.23.254	74.125.96.10	TCP	80	80981514481:14899441->74.125.96.10:80
23	0.000000	192.168.23.254	74.125.96.10	TCP	80	80981514481:14899441->74.125.96.10:80
24	0.000000	192.168.23.254	74.125.96.10	TCP	80	80981514481:14899441->74.125.96.10:80

Pengujian Bandwidth 1:1 Client 1:2.

Details				
File				
Name:	E:\GROUPTASK\PRAKTIK\CAPTUR BANDWIDTH 1-1\2\PERCOBAAN 1			
Length:	38 KB			
Hash (SHA-256):	752e888a2d10e223088110f3c4d127512772f0c3d030c7b241118a4f0ca4			
Hash (SHA-1):	5985c394d997bfb1d4069971689200b0de790be			
Hash (SHA-3):	649bc7c0504e01508467b78e4886e956c3881ff			
Format:	Wireshark/NetworkMiner/... - pcap			
Encapsulation:	Ethernet			
Snapshot length:	65535			
Time				
First packet:	1970-01-02 08:47:28			
Last packet:	1970-01-02 09:50:28			
Elapsed:	00:02:59			
Capture				
Hardware:	Unknown			
OS:	Unknown			
Application:	Unknown			
Interfaces				
Interface:	Discard packets	Capture filter	Link type	Packet size limit
	Unknown	Unknown	Ethernet	65535 bytes
Statistics				
Measurements:	Captured	Discarded	Packets	
Packets:	50213	45743 (91.1%)	---	
Time spent, s:	179.603	179.602	---	
Average size:	279.8	254.7	---	
Average packet size, B:	762	374	---	
Bytes:	38262230	28383290 (92.5%)	0	
Average bytes/s:	213 k	167 k	---	

Hasil Pengujian Bandwidth 1:1 Client 1:2.

Delay

$$\text{Delay} = \frac{\text{Waktu Pengiriman}}{\text{Total Paket Yang Diterima}}$$

$$\text{Delay} = \left(\frac{179,602}{45743} \right) * 1000$$

$$\text{Delay} = 3,926327526 \text{ ms}$$

Jitter

$$\text{Jitter} = \frac{\text{Total Variasi Delay}}{(\text{Total Paket Yang Diterima}-1)}$$

$$\text{Jitter} = \left(\frac{-0,003960}{45743-1} \right) * 1000$$

$$\text{Jitter} = -0,0000866 \text{ ms}$$

Throughput

$$\text{Throughput} = \frac{\text{Paket Data Diterima}}{\text{Lama Pengamatan}}$$

$$\text{Throughput} = \left(\frac{35383290}{179,602} \right) * 8 / 1000$$

$$\text{Throughput} = 1576,08 \text{ kbps}$$

Packet Loss

$$\text{Packet Loss} = \frac{(\text{Paket Data Yang Dikirim} - \text{Paket Data Dierima})}{\text{Paket Data Dikirim}} \times 100\%$$

$$\text{Packet Loss} = \frac{(50213 - 45743)}{50213} * 100\%$$

Packet Loss = 9%

RATIO BANDWIDTH 1:1 TOPOLOGI 1:2									
NO	PACKETS SEND	PACKETS RECEIVED	BYTES	TIMESPAN	TOTAL VARIASI DELAY	DELAY RATA-RATA(ms)	JITTER(ms)	THROUGHPUT(kbps)	PACKET LOSS
1	50213	45743	35383290	179,602	-0,003960	3,926327526	-0,0000866	1576,08	9%
2	28468	27620	22068282	185,288	-0,045618	6,708472122	-0,0016515	952,82	3%
3	44729	41877	36611816	179,861	-0,491718	4,294982926	-0,0117422	1628,45	6%
4	63773	60747	46162119	180,294	0,009906	2,967949035	0,0001631	2048,30	5%
5	51878	50235	38786822	178,552	-0,000171	3,554334627	-0,0000034	1737,84	3%
6	36928	35869	28984149	180,186	-0,557242	5,02344643	-0,0155359	1286,85	3%
7	29910	28897	26483985	180,051	-0,000374	6,230785203	-0,0000129	1176,73	3%
8	47583	44289	36069542	180,552	0,005088	4,076678182	0,0001149	1598,19	7%
9	51350	29192	23073320	180,552	0,010268	6,184982187	0,0003518	1022,35	43%
10	56082	48183	38135887	180,956	0,00309	3,755598448	0,0000641	1685,97	14%

Perhitungan Hasil Pengujian Bandwidth 1:1 Client 1:2.

Skema Bandwidth 1:1 Client 1:3
Pengujian Skema Bandwidth 1:1 Client 1:3

The screenshot shows a Wireshark interface with a list of network packets. The 'Packet List' pane displays various TCP segments, including segments that were ignored because they were out of order or duplicate. The 'Packet Bytes' pane shows the raw data of the selected packets. The interface includes standard menu options like File, Edit, View, Go, Capture, Analyze, Statistics, Telephony, Stream, Tools, Help, and a toolbar with icons for file operations and network analysis.

Pengujian Bandwidth 1:1 Client 1:3.

Statistics	Captured	Displayed	Filtered	Matched
Packets	49529	46308	46308 (92.51%)	---
Time spent, s	177.143	177.143	---	---
Average packet size, B	279.8	381.4	---	---
Bytes	28277813	28027777 (99.1%)	---	---
Average system	2.62 s	2.62 s	---	---

Hasil Pengujian Bandwidth 1:1 Client 1:3.

Delay

$$\text{Delay} = \frac{\text{Waktu Pengiriman}}{\text{Total Paket Yang Diterima}}$$

$$\text{Delay} = \left(\frac{177,143}{46308} \right) * 1000$$

$$\text{Delay} = 3,825321759 \text{ ms}$$

Jitter

$$\text{Jitter} = \frac{\text{Total Variasi Delay}}{(\text{Total Paket Yang Diterima}-1)}$$

$$\text{Jitter} = \left(\frac{0,004183}{46308-1} \right) * 1000$$

$$\text{Jitter} = 0,0000903 \text{ ms}$$

Throughput

$$\text{Throughput} = \frac{\text{Paket Data Diterima}}{\text{Lama Pengamatan}}$$

$$\text{Throughput} = \left(\frac{39032737}{177,143} \right) * 8 / 1000$$

$$\text{Throughput} = 1762,77 \text{ kbps}$$

Packet Loss

$$\text{Packet Loss} = \frac{(\text{Paket Data Yang Dikirim} - \text{Paket Data Dierima})}{\text{Paket Data Dikirim}} * 100\%$$

$$\text{Packet Loss} = \frac{(49529 - 46308)}{49529} * 100\%$$

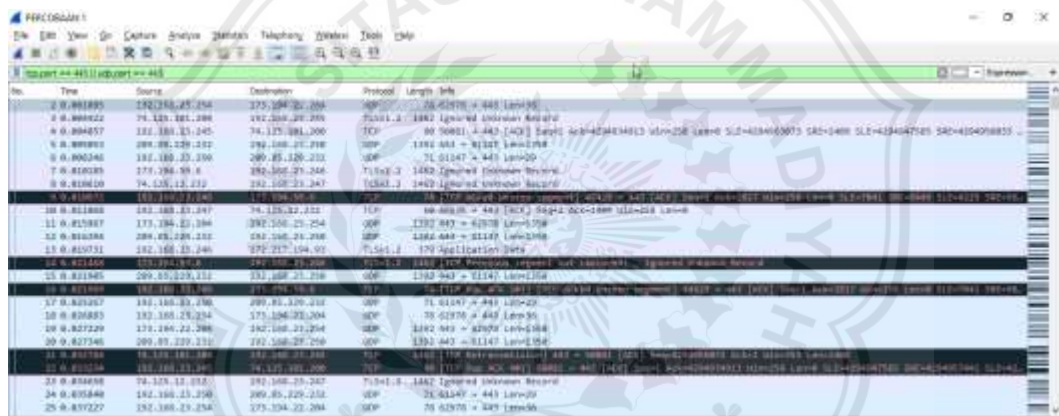
Packet Loss = 7%

RATIO BANDWIDTH 1:1 TOPOLOGI 1:3									
NO	PACKETS SEND	PACKETS RECEIVED	BYTES	TIMESPAN	TOTAL VARIASI DELAY	DELAY RATA-RATA(ms)	JITTER(ms)	THROUGHPUT(kbps)	PACKET LOSS
1	49529	46308	39032737	177,143	0,004183	3,825321759	0,0000903	1762,77	7%
2	59481	55518	46443167	179,737	-4E-06	3,237454519	-0,0000001	2067,16	7%
3	49230	46131	39200259	179,079	0,00016	3,881966573	0,0000035	1751,19	6%
4	62105	58057	48437266	188,187	-0,000445	3,241417917	-0,0000077	2059,11	7%
5	51889	48814	40982867	184,185	0,000488	3,773200311	0,0000100	1780,07	6%
6	58440	54644	44873300	182,15	0,000421	3,333394334	0,0000077	1970,83	6%
7	52859	47004	38527006	183,002	0,000127	3,893328227	0,0000027	1684,22	11%
8	58193	53490	43310183	182,216	0,000301	3,406543279	0,0000056	1901,49	8%
9	78403	69579	58918262	184,551	-0,003544	2,652395119	-0,0000509	2554,02	11%
10	61264	42844	35938720	177,861	-0,00128	4,151363085	-0,0000299	1616,49	30%

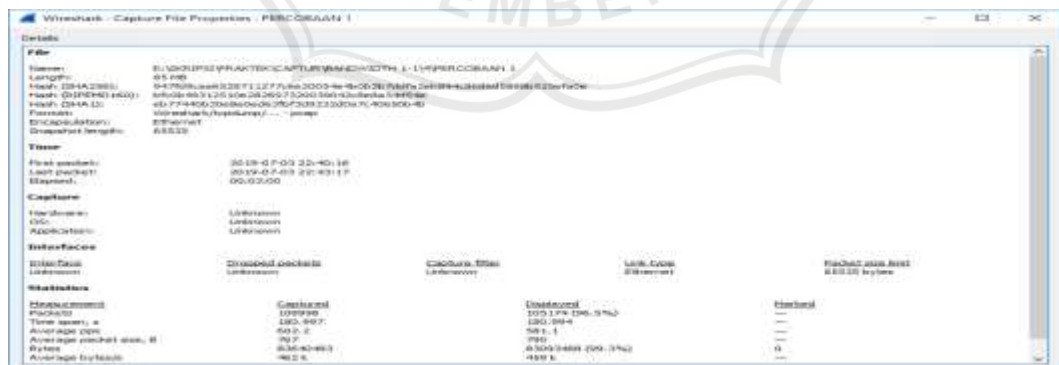
Perhitungan Hasil Pengujian Bandwidth 1:1 Client 1:3.

Skema Bandwidth 1:1 Client 1:4

Pengujian Skema Bandwidth 1:1 Client 1:4



Pengujian Bandwidth 1:1 Client 1:4.



Hasil Pengujian Bandwidth 1:1 Client 1:4

Delay

$$\text{Delay} = \frac{\text{Waktu Pengiriman}}{\text{Total Paket Yang Diterima}}$$

$$\text{Delay} = \left(\frac{181,489}{92743} \right) * 1000$$

$$\text{Delay} = 1,956902408\text{ms}$$

Jitter

$$\text{Jitter} = \frac{\text{Total Variasi Delay}}{(\text{Total Paket Yang Diterima}-1)}$$

$$\text{Jitter} = \left(\frac{-0,000024}{92743-1} \right) * 1000$$

$$\text{Jitter} = -0,0000003\text{ms}$$

Throughput

$$\text{Throughput} = \frac{\text{Paket Data Diterima}}{\text{Lama Pengamatan}}$$

$$\text{Throughput} = \left(\frac{73719551}{181,489} \right) * 8 / 1000$$

$$\text{Throughput} = 3249,54\text{kbps}$$

Packet Loss

$$\text{Packet Loss} = \frac{(\text{Paket Data Yang Dikirim} - \text{Paket Data Dierima})}{\text{Paket Data Dikirim}} * 100\%$$

$$\text{Packet Loss} = \frac{(96015 - 92743)}{96015} * 100\%$$

$$\text{Packet Loss} = 3\%$$

RATIO BANDWIDTH 1:1 TOPOLOGI 1:4									
NO	PACKETS SEND	PACKETS RECEIVED	BYTES	TIMESPAN	TOTAL VARIASI DELAY	DELAY RATA-RATA(ms)	JITTER(ms)	THROUGHPUT(kbps)	PACKET LOSS
1	108998	105174	83093488	180,994	-0,002118	1,720900603	-0,0000201	3672,76	4%
2	90953	87669	71267803	180,809	0,005093	2,062405183	0,0000581	3153,29	4%
3	88869	85659	68129677	181,603	-0,005153	2,120069111	-0,0000602	3001,26	4%
4	90274	86951	69601376	180,561	0,003537	2,076583363	0,0000407	3083,78	4%
5	31869	30511	24626124	182,98	-0,00013	5,997181344	-0,0000043	1076,67	4%
6	86541	82255	66873432	183,848	-0,001173	2,23509817	-0,0000143	2909,94	5%
7	95906	92213	74771936	182,229	-0,044695	1,976174726	-0,0004847	3282,55	4%
8	96027	92806	73852958	183,227	-0,002765	1,974301231	-0,0000298	3224,54	3%
9	90245	86662	70610311	183,99	-7,1E-05	2,123075858	-0,0000008	3070,18	4%
10	81828	78234	64426077	181,001	0,001768	2,313584886	0,0000226	2847,55	4%

Perhitungan Hasil Pengujian Bandwidth 1:1 Client 1:4

Skema Bandwidth 1:1 Client 2:3

Pengujian Skema Bandwidth 1:1 Client 2:3

Throughput

$$\text{Throughput} = \frac{\text{Paket Data Diterima}}{\text{Lama Pengamatan}}$$

$$\text{Throughput} = \left(\frac{73719551}{181,489}\right) * 8/1000$$

$$\text{Throughput} = 3249,54 \text{ kbps}$$

Packet Loss

$$\text{Packet Loss} = \frac{(\text{Paket Data Yang Dikirim} - \text{Paket Data Dierima})}{\text{Paket Data Dikirim}} * 100\%$$

$$\text{Packet Loss} = \frac{(96015 - 92743)}{96015} * 100\%$$

$$\text{Packet Loss} = 3\%$$

RATIO BANDWIDTH 1:1 TOPOLOGI 2:3									
NO	PACKETS SEND	PACKETS RECEIVED	BYTES	TIMESPAN	TOTAL VARIASI DELAY	DELAY RATA-RATA(ms)	JITTER(ms)	THROUGHPUT(kbps)	PACKET LOSS
1	96015	92743	73719551	181,489	-0,000024	1,956902408	-0,0000003	3249,54	3%
2	94562	90115	73841756	182,47	-0,002121	2,024857127	-0,0000245	3237,43	5%
3	93741	90089	74131342	182,52	-0,000151	2,025996515	-0,0000017	3249,24	4%
4	95636	92728	74161168	183,029	0,003891	1,973826676	0,0000420	3241,50	3%
5	96966	93916	75819347	184,277	0,003728	1,962147025	0,0000397	3291,54	3%
6	86274	82569	67931140	181,057	-6,1E-05	2,192796328	-0,0000007	3001,54	4%
7	93693	90966	74340959	180,807	0,005650	1,987632742	0,0000621	3289,30	3%
8	85121	82374	67687380	181,021	5,1E-05	2,197550198	0,0000006	2991,36	3%
9	95688	93240	77688641	180,525	7,1E-05	1,936132561	0,0000008	3442,79	3%
10	84318	74457	61456733	180,717	0,005162	2,427132439	0,0000693	2720,57	12%

Perhitungan Hasil Pengujian Bandwidth 1:1 Client 2:3.

Skema Bandwidth 1:2 Client 1:1

Pengujian Skema Bandwidth 1:2 Client 1:1

The screenshot shows a network traffic capture in Wireshark. The main pane displays a list of network packets. The selected packet (No. 11) is a TCP Reset (RST) with sequence number 182,100,23,46 and window size 0. The packet details pane shows the following information:

- IP: 192.168.23.46 → 192.168.23.84
- Protocol: TCP
- Length: 40
- Info: RST (Seq=182,100,23,46) Win=0 Len=0
- Flags: RST
- Sequence Number: 182,100,23,46
- Window Size: 0
- Length: 0
- Checksum: 0
- Urgent Pointer: 0
- Options: None

Pengujian Bandwidth 1:2 Client 1:1.

Section	Field	Value
File	Name	C:\Users\PC\MyApp\PC\CAPTURE\BANDWIDTH 1:2\PERCOBAAN 1
	Length	114 KB
	Hash (SHA256)	773905d4f96370b1f97949914622610a90078223463b28333333333333333333
	Hash (MD5)	05f40a9b7e0d020a0f0b13e490184129c099f
	Hash (SHA-1)	844124a774b58f76773382a6174404a82aef3
Time	First packet	2019-07-09 19:23:27
	Last packet	2019-07-09 19:23:40
Capture	File name	Unknown
	OS	Unknown
	Application	Unknown
Statistics	Captured packets	Unknown
	Captured time	Unknown
Statistics	Packets	146362
	Time spent	346.362 (26.34%)
	Average size	791.8
	Average packet size	791.8
Statistics	Packets	111334986
	Time spent	264
	Average size	311234888 (28.61%)
	Average packet size	280.1

Hasil Pengujian Bandwidth 1:2 Client 1:1.

Delay

$$\text{Delay} = \frac{\text{Waktu Pengiriman}}{\text{Total Paket Yang Diterima}}$$

$$\text{Delay} = \left(\frac{184,955}{146362} \right) * 1000$$

$$\text{Delay} = 1,26368183 \text{ms}$$

Jitter

$$\text{Jitter} = \frac{\text{Total Variasi Delay}}{(\text{Total Paket Yang Diterima}-1)}$$

$$\text{Jitter} = \left(\frac{-0,000060}{146362-1} \right) * 1000$$

$$\text{Jitter} = -0,0000004 \text{ ms}$$

Throughput

$$\text{Throughput} = \frac{\text{Paket Data Diterima}}{\text{Lama Pengamatan}}$$

$$\text{Throughput} = \left(\frac{111334986}{184,955} \right) * 8 / 1000$$

$$\text{Throughput} = 4815,66 \text{ kbps}$$

Packet Loss

$$\text{Packet Loss} = \frac{(\text{Paket Data Yang Dikirim} - \text{Paket Data Dierima})}{\text{Paket Data Dikirim}} * 100\%$$

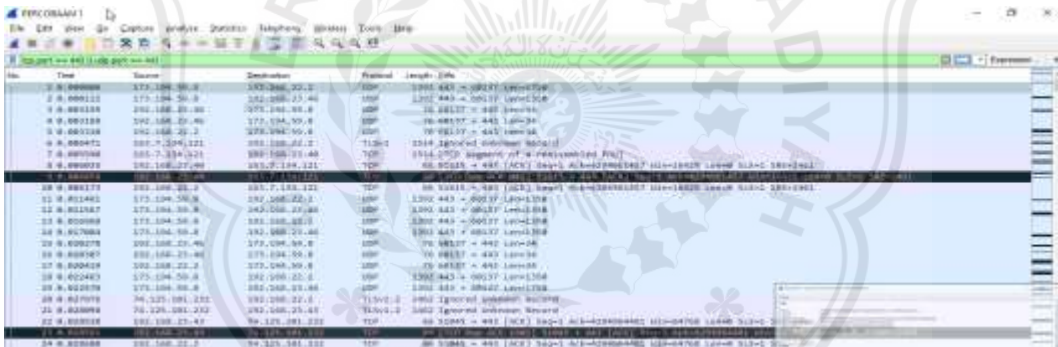
$$\text{Packet Loss} = \frac{(148926-146362)}{148926} * 100\%$$

$$\text{Packet Loss} = 2\%$$

RATIO BANDWIDTH 2:1 TOPOLOGI 1:1									
NO	PACKETS SEND	PACKETS RECEIVED	BYTES	TIMESPAN	TOTAL VARIASI DELAY	DELAY RATA-RATA(ms)	JITTER(ms)	THROUGHPUT(kbps)	PACKET LOSS
1	148926	146362	1,11E+08	184,955	-0,000060	1,26368183	-0,0000004	4815,66	2%
2	92573	89908	65312924	183,766	9,6E-05	2,043933799	0,0000011	2843,31	3%
3	157049	154133	1,1E+08	184,612	-8E-05	1,197744805	-0,0000005	4760,22	2%
4	129127	126356	91509288	181,311	3,9E-05	1,434921967	0,0000003	4037,67	2%
5	90206	87345	61675074	180,877	-9E-06	2,070834049	-0,0000001	2727,82	3%
6	130333	127185	96556238	182,332	8,5E-05	1,433596729	0,0000007	4236,50	2%
7	85165	82047	58239458	180,373	0,000107	2,198410667	0,0000013	2583,07	4%
8	125754	122317	91560651	182,665	8,7E-05	1,493373775	0,0000007	4009,99	3%
9	117157	114204	87317973	183,482	-5E-06	1,606616231	0,0000000	3807,15	3%
10	99830	96971	68498333	180,999	9E-05	1,866527106	0,0000009	3027,57	3%

Perhitungan Hasil Pengujian Bandwidth 1:2 Client 1:1.

Skema Bandwidth 1:2 Client 1:2
Pengujian Skema Bandwidth 1:2 Client 1:2



Pengujian Bandwidth 1:2 Client 1:2.



Hasil Pengujian Bandwidth 1:2 Client 1:2.

Delay

$$\text{Delay} = \frac{\text{Waktu Pengiriman}}{\text{Total Paket Yang Diterima}}$$

$$\text{Delay} = \left(\frac{187,568}{100398}\right) * 1000$$

$$\text{Delay} = 1,868244387\text{ms}$$

Jitter

$$\text{Jitter} = \frac{\text{Total Variasi Delay}}{(\text{Total Paket Yang Diterima}-1)}$$

$$\text{Jitter} = \left(\frac{-0,000007}{100398-1}\right) * 1000$$

$$\text{Jitter} = -0,0000001\text{ ms}$$

Throughput

$$\text{Throughput} = \frac{\text{Paket Data Diterima}}{\text{Lama Pengamatan}}$$

$$\text{Throughput} = \left(\frac{449336754040426}{187,568}\right) * 8/1000$$

$$\text{Throughput} = 3216,07\text{ kbps}$$

Packet Loss

$$\text{Packet Loss} = \frac{(\text{Paket Data Yang Dikirim}-\text{Paket Data Dierima})}{\text{Paket Data Dikirim}} * 100\%$$

$$\text{Packet Loss} = \frac{(110919-100398)}{110919} * 100\%$$

$$\text{Packet Loss} = 9\%$$

RATIO BANDWIDTH 1:1 TOPOLOGI 1:2									
NO	PACKETS SEND	PACKETS RECEIVED	BYTES	TIMESPAN	TOTAL VARIASI DELAY	DELAY RATA-RATA(ms)	JITTER(ms)	THROUGHPUT(kbps)	PACKET LOSS
1	110919	100398	75404042	187,568	-0,000007	1,868244387	-0,0000001	3216,07	9%
2	122017	120509	80277657	181,032	-0,000106	1,502228049	-0,0000009	3547,56	1%
3	117414	62359	43767395	183,798	-6,2E-05	2,947417374	-0,0000010	1905,02	47%
4	119474	118448	80825057	183,043	-1,6E-05	1,545344793	-0,0000001	3532,51	1%
5	120197	61093	42600535	187,121	-0,00012	3,062887729	-0,0000020	1821,30	49%
6	124889	66609	43563566	181,785	-5,2E-05	2,729135702	-0,0000008	1917,15	47%
7	123412	53723	35214730	186,971	-0,000011	3,480278465	-0,0000002	1506,75	56%
8	108927	100787	71578256	182,511	-5E-06	1,810858543	0,0000000	3137,49	7%
9	118826	117755	82257524	183,858	-2,1E-05	1,561360452	-0,0000002	3579,18	1%
10	126035	68824	43527017	180,586	-5,4E-05	2,623881204	-0,0000008	1928,26	45%

$$\text{Jitter} = \left(\frac{-0,000064}{131859-1} \right) * 1000$$

$$\text{Jitter} = -0,0000005 \text{ ms}$$

Throughput

$$\text{Throughput} = \frac{\text{Paket Data Diterima}}{\text{Lama Pengamatan}}$$

$$\text{Throughput} = \left(\frac{88183039}{180,593} \right) * 8 / 1000$$

$$\text{Throughput} = 3906,38 \text{ kbps}$$

Packet Loss

$$\text{Packet Loss} = \frac{(\text{Paket Data Yang Dikirim} - \text{Paket Data Dierima})}{\text{Paket Data Dikirim}} * 100\%$$

$$\text{Packet Loss} = \frac{(133165 - 131859)}{133165} * 100\%$$

$$\text{Packet Loss} = 1\%$$

RATIO BANDWIDTH 1:1 TOPOLOGI 1:3									
NO	PACKETS SEND	PACKETS RECEIVED	BYTES	TIMESPAN	TOTAL VARIASI DELAY	DELAY RATA-RATA(ms)	JITTER(ms)	THROUGHPUT(kbps)	PACKET LOSS
1	133165	131859	88183039	180,593	-0,000064	1,369591761	-0,0000005	3906,38	1%
2	109000	105821	1,08E+08	184,86	-8,1E-05	1,746912239	-0,0000008	4657,01	3%
3	109019	107889	1,09E+08	186,868	5E-06	1,732039411	0,0000000	4673,50	1%
4	107016	97401	1E+08	185,219	-3,9E-05	1,90161292	-0,0000004	4326,67	9%
5	114004	94500	95618376	186,919	-8,6E-05	1,977978836	-0,0000009	4092,40	17%
6	111017	100738	1,02E+08	185,95	-2,4E-05	1,845877425	-0,0000002	4378,53	9%
7	108000	98437	1,01E+08	186,093	0,0000330	1,890478174	0,0000034	4355,61	9%
8	116516	114183	1,08E+08	186,032	-7,3E-05	1,629244283	-0,0000006	4625,46	2%
9	114021	107002	1,04E+08	184,753	-6,1E-05	1,726631278	-0,0000006	4517,86	6%
10	116348	113639	1,07E+08	182,39	-4E-05	1,604994764	-0,0000004	4703,02	2%

Perhitungan Hasil Pengujian Bandwidth 1:2 Client 1:3.

Skema Bandwidth 1:2 Client 1:4

Pengujian Skema Bandwidth 1:2 Client 1:4

No.	Time	Source	Destination	Protocol	Length	Info
0	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
1	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
2	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
3	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
4	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
5	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
6	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
7	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
8	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
9	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
10	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
11	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
12	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
13	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
14	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
15	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
16	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
17	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
18	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
19	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
20	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
21	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
22	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
23	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
24	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
25	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
26	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
27	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
28	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
29	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
30	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
31	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
32	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
33	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
34	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
35	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
36	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
37	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
38	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
39	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
40	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
41	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
42	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
43	0.000000	192.168.4.2	74.125.18.44	TCP	60	684924 → 443 [ACK] Seq=1 425449 Win=256 Len=0
44	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	
45	0.000000	74.125.18.44	192.168.4.2	SMC	Continuation Data	

Pengujian Bandwidth 1:2 Client 1:4.

File	Statistics
1: 1 x 1000	1: 1000
2: 192.168.4.2	2: 192.168.4.2
3: 74.125.18.44	3: 74.125.18.44
4: 192.168.4.2	4: 192.168.4.2
5: 74.125.18.44	5: 74.125.18.44
6: 192.168.4.2	6: 192.168.4.2
7: 74.125.18.44	7: 74.125.18.44
8: 192.168.4.2	8: 192.168.4.2
9: 74.125.18.44	9: 74.125.18.44
10: 192.168.4.2	10: 192.168.4.2
11: 74.125.18.44	11: 74.125.18.44
12: 192.168.4.2	12: 192.168.4.2
13: 74.125.18.44	13: 74.125.18.44
14: 192.168.4.2	14: 192.168.4.2
15: 74.125.18.44	15: 74.125.18.44
16: 192.168.4.2	16: 192.168.4.2
17: 74.125.18.44	17: 74.125.18.44
18: 192.168.4.2	18: 192.168.4.2
19: 74.125.18.44	19: 74.125.18.44
20: 192.168.4.2	20: 192.168.4.2
21: 74.125.18.44	21: 74.125.18.44
22: 192.168.4.2	22: 192.168.4.2
23: 74.125.18.44	23: 74.125.18.44
24: 192.168.4.2	24: 192.168.4.2
25: 74.125.18.44	25: 74.125.18.44
26: 192.168.4.2	26: 192.168.4.2
27: 74.125.18.44	27: 74.125.18.44
28: 192.168.4.2	28: 192.168.4.2
29: 74.125.18.44	29: 74.125.18.44
30: 192.168.4.2	30: 192.168.4.2
31: 74.125.18.44	31: 74.125.18.44
32: 192.168.4.2	32: 192.168.4.2
33: 74.125.18.44	33: 74.125.18.44
34: 192.168.4.2	34: 192.168.4.2
35: 74.125.18.44	35: 74.125.18.44
36: 192.168.4.2	36: 192.168.4.2
37: 74.125.18.44	37: 74.125.18.44
38: 192.168.4.2	38: 192.168.4.2
39: 74.125.18.44	39: 74.125.18.44
40: 192.168.4.2	40: 192.168.4.2
41: 74.125.18.44	41: 74.125.18.44
42: 192.168.4.2	42: 192.168.4.2
43: 74.125.18.44	43: 74.125.18.44
44: 192.168.4.2	44: 192.168.4.2
45: 74.125.18.44	45: 74.125.18.44
46: 192.168.4.2	46: 192.168.4.2
47: 74.125.18.44	47: 74.125.18.44
48: 192.168.4.2	48: 192.168.4.2
49: 74.125.18.44	49: 74.125.18.44
50: 192.168.4.2	50: 192.168.4.2

Hasil Pengujian Bandwidth 1:2 Client 1:4.

Delay

$$\text{Delay} = \frac{\text{Waktu Pengiriman}}{\text{Total Paket Yang Diterima}}$$

$$\text{Delay} = \left(\frac{189,194}{38328}\right) * 1000$$

$$\text{Delay} = 4,936182425 \text{ ms}$$

Jitter

$$\text{Jitter} = \frac{\text{Total Variasi Delay}}{(\text{Total Paket Yang Diterima}-1)}$$

$$\text{Jitter} = \left(\frac{0,011300}{38328-1}\right) * 1000$$

$$\text{Jitter} = 0,0002948 \text{ ms}$$

Throughput

$$\text{Throughput} = \frac{\text{Paket Data Diterima}}{\text{Lama Pengamatan}}$$

$$\text{Throughput} = \left(\frac{31343628}{189,194} \right) * 8 / 1000$$

$$\text{Throughput} = 1325,35 \text{ kbps}$$

Packet Loss

$$\text{Packet Loss} = \frac{(\text{Paket Data Yang Dikirim} - \text{Paket Data Dierima})}{\text{Paket Data Dikirim}} * 100\%$$

$$\text{Packet Loss} = \frac{(124148 - 38328)}{124148} * 100\%$$

$$\text{Packet Loss} = 69\%$$

RANG BANDAWIDTH 2:3 TOPOLOGI 1:4									
NO	PACKETS SEND	PACKETS RECEIVED	BYTES	TIMESPAN	TOTAL VARIASI DELAY	DELAY RATA-RATA(ms)	JITTER(ms)	THROUGHPUT(kbps)	PACKET LOSS
1	124148	38328	31343628	189,194	0,011300	4,936182425	0,0002948	1325,35	69%
2	125146	44356	38162930	189,179	0,152076	4,26501488	0,0034286	1613,83	65%
3	122700	46503	34880236	185,794	-1E-05	3,99531213	-0,0000002	1501,89	62%
4	119014	11187	8414577	182,928	1,8E-05	16,35183695	0,0000016	368,00	91%
5	128262	69618	55972752	185,804	0,005143	2,668907466	0,0000739	2409,97	46%
6	129077	34509	28345760	185,592	-3,2E-05	5,378075285	-0,0000009	1221,85	72%
7	104977	24312	20485259	187,545	-0,000027	7,714091807	-0,0000011	873,83	77%
8	105296	38480	29299541	186,185	8E-06	4,838487526	0,0000002	1258,94	63%
9	109300	53558	44577801	185,106	2E-05	3,456178349	0,0000004	1926,58	51%
10	120502	43559	36599982	182,487	-5,3E-05	4,189421245	-0,0000012	1604,50	64%

Perhitungan Hasil Pengujian Bandwidth 1:2 Client 1:4.

Skema Bandwidth 1:2 Client 2:3

Pengujian Skema Bandwidth 1:2 Client 2:3

No	Time	Source	Destination	Protocol	Length	Info
38	0.014810	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
39	0.015795	192.168.19.4	192.168.19.4	UDP	78	59548 → 443 [seq=12]
40	0.015820	192.168.19.4	192.168.19.4	UDP	78	59548 → 443 [seq=12]
41	0.015980	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
42	0.016348	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
43	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
44	0.016380	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
45	0.016380	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
46	0.016380	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
47	0.016380	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
48	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
49	0.016380	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
50	0.016377	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
51	0.016377	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
52	0.016377	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
53	0.016377	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
54	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
55	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
56	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
57	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
58	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
59	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
60	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
61	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
62	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
63	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
64	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
65	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
66	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
67	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
68	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
69	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
70	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
71	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
72	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
73	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
74	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
75	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
76	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
77	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
78	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
79	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
80	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
81	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
82	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
83	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
84	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
85	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
86	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
87	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
88	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
89	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
90	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
91	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
92	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
93	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
94	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
95	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
96	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
97	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
98	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
99	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
100	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
101	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
102	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
103	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
104	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
105	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
106	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
107	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
108	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
109	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
110	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
111	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
112	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
113	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
114	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
115	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
116	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
117	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
118	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
119	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]
120	0.016379	192.168.19.4	192.168.19.4	UDP	1900	1900,443 → 59548 [seq=1390]

Pengujian Bandwidth 1:2 Client 2:3.



Hasil Pengujian Bandwidth 1:2 Client 2:3.

Delay

$$\text{Delay} = \frac{\text{Waktu Pengiriman}}{\text{Total Paket Yang Diterima}}$$

$$\text{Delay} = \left(\frac{181,599}{22384} \right) * 1000$$

$$\text{Delay} = 8,112893138 \text{ ms}$$

Jitter

$$\text{Jitter} = \frac{\text{Total Variasi Delay}}{(\text{Total Paket Yang Diterima}-1)}$$

$$\text{Jitter} = \left(\frac{-0,000033}{22384-1} \right) * 1000$$

$$\text{Jitter} = -0,0000015 \text{ ms}$$

Throughput

$$\text{Throughput} = \frac{\text{Paket Data Diterima}}{\text{Lama Pengamatan}}$$

$$\text{Throughput} = \left(\frac{17990647}{181,599} \right) * 8 / 1000$$

$$\text{Throughput} = 792,54 \text{ kbps}$$

Packet Loss

$$\text{Packet Loss} = \frac{(\text{Paket Data Yang Dikirim} - \text{Paket Data Dierima})}{\text{Paket Data Dikirim}} * 100\%$$

$$\text{Packet Loss} = \frac{(106017-22384)}{106017} * 100\%$$

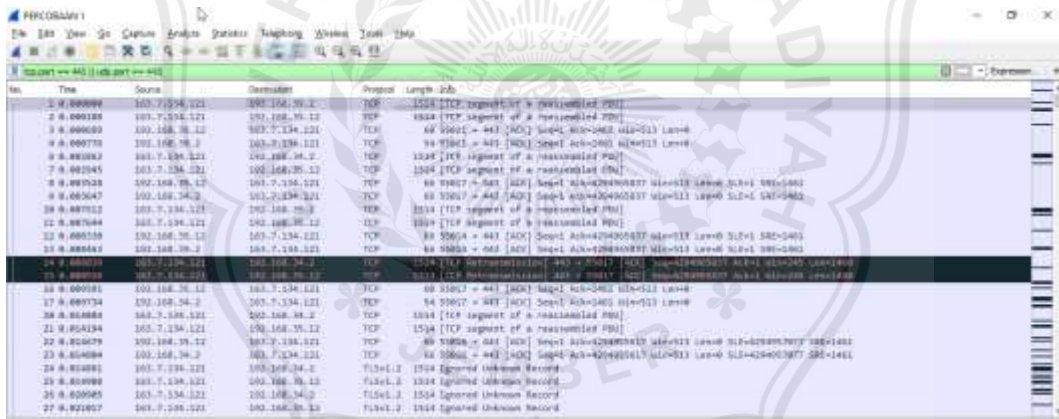
Packet Loss = 79%

RATIO BANDWIDTH 2:1 TOPOLOGI 2:3									
NO	PACKETS SEND	PACKETS RECEIVED	BYTES	TIMESPAN	TOTAL VARIASI DELAY	DELAY RATA-RATA(ms)	JITTER(ms)	THROUGHPUT(kbps)	PACKET LOSS
1	106017	22384	17990647	181,599	-0,000033	8,112893138	-0,0000015	792,54	79%
2	109000	24903	18800846	186,584	-5,5E-05	7,492430631	-0,0000022	806,11	77%
3	112020	23583	19667830	182,693	0,001429	7,746809142	0,0000606	861,24	79%
4	118000	78502	64037426	184,778	-6,8E-05	2,353799903	-0,0000009	2772,51	33%
5	111021	48554	40690903	183,232	-8E-06	3,77377765	-0,0000002	1776,59	56%
6	113025	90232	78241421	183,048	9E-06	2,028637291	0,0000001	3419,49	20%
7	109000	81268	69700015	185,682	0,000064	2,28481075	0,0000008	3002,98	25%
8	122179	86419	72850036	187,649	-6,5E-05	2,171385922	-0,0000008	3105,80	29%
9	86550	74743	68070104	183,967	0,001132	2,461327482	0,0000151	2960,10	14%
10	124353	60589	51559856	180,577	0,747989	2,980359471	0,0123455	2284,23	51%

Perhitungan Hasil Pengujian Bandwidth 1:2 Client 2:3.

Skema Bandwidth 1:4 Client 1:1

Pengujian Skema Bandwidth 1:4 Client 1:1



Pengujian Bandwidth 1:4 Client 1:1.



Hasil Pengujian Bandwidth 1:4 Client 1:1.

Delay

$$\text{Delay} = \frac{\text{Waktu Pengiriman}}{\text{Total Paket Yang Diterima}}$$

$$\text{Delay} = \left(\frac{183,955}{104187}\right) * 1000$$

$$\text{Delay} = 1,76562335 \text{ ms}$$

Jitter

$$\text{Jitter} = \frac{\text{Total Variasi Delay}}{(\text{Total Paket Yang Diterima}-1)}$$

$$\text{Jitter} = \left(\frac{0,005344}{104187-1}\right) * 1000$$

$$\text{Jitter} = 0,0000513 \text{ ms}$$

Throughput

$$\text{Throughput} = \frac{\text{Paket Data Diterima}}{\text{Lama Pengamatan}}$$

$$\text{Throughput} = \left(\frac{94134225}{183,955}\right) * 8/1000$$

$$\text{Throughput} = 4093,79 \text{ kbps}$$

Packet Loss

$$\text{Packet Loss} = \frac{(\text{Paket Data Yang Dikirim} - \text{Paket Data Dierima})}{\text{Paket Data Dikirim}} * 100\%$$

$$\text{Packet Loss} = \frac{(115828 - 104187)}{115828} * 100\%$$

$$\text{Packet Loss} = 10\%$$

RATIO BANDWIDTH 4:1 TOPOLOGI 1:1									
NO	PACKETS SEND	PACKETS RECEIVED	BYTES	TIMESPAN	TOTAL VARIASI DELAY	DELAY RATA-RATA(ms)	JITTER(ms)	THROUGHPUT(kbps)	PACKET LOSS
1	115828	104187	94134225	183,955	0,005344	1,76562335	0,0000513	4093,79	10%
2	114009	105220	95750193	180,766	-6,7E-05	1,717981372	-0,0000006	4237,53	8%
3	115020	105279	95302099	186,027	-5,8E-05	1,766990568	-0,0000006	4098,42	8%
4	115427	105668	95398122	183,311	-4,8E-05	1,734782526	-0,0000005	4163,33	8%
5	113598	106496	96843739	185,959	-4,1E-05	1,74615948	-0,0000004	4166,24	6%
6	113599	106502	96853034	185,955	3E-06	1,746023549	0,0000000	4166,73	6%
7	114678	107054	96434547	188,851	-0,000038	1,764072337	-0,0000004	4085,11	7%
8	115200	105805	95498892	188,3	0,000669	1,779689051	0,0000063	4057,31	8%
9	114633	105340	95439803	180,294	-4,4E-05	1,711543573	-0,0000004	4234,85	8%
10	116680	107073	95340128	189,006	-7,3E-05	1,765206915	-0,0000007	4035,43	8%

Perhitungan Hasil Pengujian Bandwidth 1:4 Client 1:1.

Skema Bandwidth 1:4 Client 1:2

Pengujian Skema Bandwidth 1:4 Client 1:2



Pengujian Bandwidth 1:4 Client 1:2.



Hasil Pengujian Bandwidth 1:4 Client 1:2.

Delay

$$\text{Delay} = \frac{\text{Waktu Pengiriman}}{\text{Total Paket Yang Diterima}}$$

$$\text{Delay} = \left(\frac{182,89}{112178}\right) * 1000$$

$$\text{Delay} = 1,630355328\text{ms}$$

Jitter

$$\text{Jitter} = \frac{\text{Total Variasi Delay}}{(\text{Total Paket Yang Diterima}-1)}$$

$$\text{Jitter} = \left(\frac{0,003662}{112178-1}\right)*1000$$

$$\text{Jitter} = 0,0000326 \text{ ms}$$

Throughput

$$\text{Throughput} = \frac{\text{Paket Data Diterima}}{\text{Lama Pengamatan}}$$

$$\text{Throughput} = \left(\frac{96228912}{182,89}\right)*8/1000$$

$$\text{Throughput} = 4209,26 \text{ kbps}$$

Packet Loss

$$\text{Packet Loss} = \frac{(\text{Paket Data Yang Dikirim}-\text{Paket Data Dierima})}{\text{Paket Data Dikirim}} \times 100\%$$

$$\text{Packet Loss} = \frac{(119239-112178)}{119239} * 100\%$$

$$\text{Packet Loss} = 6\%$$

BANDWIDTH 1:4 1 TOPOLOGI 1:2									
NO	PACKETS SEND	PACKETS RECEIVED	BYTES	TIMESPAN	TOTAL VARIASI DELAY	DELAY RATA-RATA(ms)	JITTER(ms)	THROUGHPUT(kbps)	PACKET LOSS
1	119239	112178	96228912	182,89	0,003662	1,630355328	0,0000326	4209,26	6%
2	115208	108169	96398983	180,286	0,005877	1,666706727	0,0000543	4277,60	6%
3	113769	107724	97070416	188,261	-2,8E-05	1,747623556	-0,0000003	4124,93	5%
4	115134	107895	96213932	183,101	-6,4E-05	1,697029519	-0,0000006	4203,75	6%
5	118246	112607	97072573	180,182	0,005762	1,600095909	0,0000512	4309,98	5%
6	114631	109975	97685583	181,451	0,005096	1,649929529	0,0000463	4306,86	4%
7	117512	112851	97674495	181,627	-0,000007	1,609440767	-0,0000001	4302,20	4%
8	124281	119127	97503424	189,689	0,002494	1,592325837	0,0000209	4112,14	4%
9	119193	113155	97035412	188,77	0,000437	1,668242676	0,0000039	4112,32	5%
10	115663	107870	95709991	187,621	-7,7E-05	1,739325114	-0,0000007	4080,99	7%

Perhitungan Hasil Pengujian Bandwidth 1:4 Client 1:2.

Skema Bandwidth 1:4 Client 1:3

Pengujian Skema Bandwidth 1:4 Client 1:3

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	117.180.76.200	102.168.38.2	SSL	1514	SSL: Continuation Data
2	0.000012	117.180.76.200	102.168.38.2	SSL	1514	SSL: Continuation Data
3	0.000019	117.180.76.200	117.180.76.200	TCP	34	48377 → 443 [ACK] Seq=1 4184294997 Win=286 Len=0 S1S=429495257 S2S=4381 S1S=5041 S2S=7586
4	0.000046	117.180.76.200	117.180.76.200	TCP	34	48377 → 443 [ACK] Seq=1 4184294997 Win=286 Len=0 S1S=429495257 S2S=4381 S1S=5041 S2S=7586
16	0.021300	117.180.76.204	102.168.38.2	TLSv1.2	3514	Encrypted Alert, Ignored Unknown Record
17	0.021500	117.180.76.204	102.168.38.3	TLSv1.2	3514	Encrypted Alert, Ignored Unknown Record
20	0.044011	117.180.76.200	117.180.76.204	TCP	60	48377 → 443 [ACK] Seq=1 4184294997 Win=286 Len=0 S1S=429495257 S2S=4381 S1S=5041 S2S=7586
21	0.044028	117.180.76.200	117.180.76.204	TCP	60	48377 → 443 [ACK] Seq=1 4184294997 Win=286 Len=0 S1S=429495257 S2S=4381 S1S=5041 S2S=7586
22	0.044733	117.180.76.200	102.168.38.2	SSL	1514	TCP: Reset (seq=48377) → 443 [RST] Seq=1 4184294997 Win=0 Len=0 S1S=429495257 S2S=4381 S1S=5041 S2S=7586
23	0.044739	117.180.76.200	102.168.38.2	SSL	1514	TCP: Reset (seq=48377) → 443 [RST] Seq=1 4184294997 Win=0 Len=0 S1S=429495257 S2S=4381 S1S=5041 S2S=7586
24	0.045734	117.180.76.200	117.180.76.200	TCP	34	48377 → 443 [ACK] Seq=1 4184294997 Win=286 Len=0 S1S=429495257 S2S=4381 S1S=5041 S2S=7586
25	0.045742	117.180.76.200	117.180.76.200	TCP	34	48377 → 443 [ACK] Seq=1 4184294997 Win=286 Len=0 S1S=429495257 S2S=4381 S1S=5041 S2S=7586
46	0.000810	117.180.76.204	102.168.38.2	TCP	60	443 → 48377 [ACK] Seq=1 4184294997 Win=286 Len=0 S1S=429495257 S2S=4381 S1S=5041 S2S=7586
47	0.000810	117.180.76.204	102.168.38.3	TCP	60	443 → 48377 [ACK] Seq=1 4184294997 Win=286 Len=0 S1S=429495257 S2S=4381 S1S=5041 S2S=7586
99	0.070810	117.180.76.200	102.168.38.2	SSL	1514	SSL: Continuation Data
11	0.070810	117.180.76.200	102.168.38.2	SSL	1514	SSL: Continuation Data
54	0.071300	117.180.76.200	117.180.76.200	TCP	34	48377 → 443 [ACK] Seq=1 4184294997 Win=286 Len=0 S1S=429495257 S2S=4381 S1S=5041 S2S=7586
55	0.071300	117.180.76.200	117.180.76.200	TCP	34	48377 → 443 [ACK] Seq=1 4184294997 Win=286 Len=0 S1S=429495257 S2S=4381 S1S=5041 S2S=7586
88	0.000808	117.180.76.200	102.168.38.2	TCP	60	443 → 48377 [ACK] Seq=1 4184294997 Win=286 Len=0 S1S=429495257 S2S=4381 S1S=5041 S2S=7586
89	0.000817	117.180.76.200	102.168.38.3	TCP	60	443 → 48377 [ACK] Seq=1 4184294997 Win=286 Len=0 S1S=429495257 S2S=4381 S1S=5041 S2S=7586
92	0.000810	117.180.76.200	102.168.38.2	TLSv1.2	3514	Encrypted Alert, Ignored Unknown Record
93	0.000810	117.180.76.200	102.168.38.3	TLSv1.2	3514	Encrypted Alert, Ignored Unknown Record
98	0.000700	117.180.76.200	117.180.76.200	TCP	34	48377 → 443 [ACK] Seq=1 4184294997 Win=286 Len=0 S1S=429495257 S2S=4381 S1S=5041 S2S=7586
99	0.000812	117.180.76.200	117.180.76.200	TCP	34	48377 → 443 [ACK] Seq=1 4184294997 Win=286 Len=0 S1S=429495257 S2S=4381 S1S=5041 S2S=7586

Pengujian Bandwidth 1:4 Client 1:3.

File	Details
File	117.180.76.200-117.180.76.200.pcapng
Length	96.988
Hosts	117.180.76.200, 102.168.38.2, 102.168.38.3
Ports	443, 48377
Protocols	SSL, TCP, TLSv1.2
Time	0.000000 - 0.000810
First packet	0.000000
Last packet	0.000810
Elapsed	0.000810
Columns	Packet List, Packet Bytes, Time
Statistics	Summary, Packets, Bytes, etc.

Hasil Pengujian Bandwidth 1:4 Client 1:3.

Delay

$$\text{Delay} = \frac{\text{Waktu Pengiriman}}{\text{Total Paket Yang Diterima}}$$

$$\text{Delay} = \left(\frac{185,69}{44925}\right) * 1000$$

$$\text{Delay} = 4,133333333 \text{ ms}$$

Jitter

$$\text{Jitter} = \frac{\text{Total Variasi Delay}}{(\text{Total Paket Yang Diterima}-1)}$$

$$\text{Jitter} = \left(\frac{-0,000030}{44925-1}\right) * 1000$$

$$\text{Jitter} = -0,0000007 \text{ ms}$$

Throughput

$$\text{Throughput} = \frac{\text{Paket Data Diterima}}{\text{Lama Pengamatan}}$$

$$\text{Throughput} = \left(\frac{39432579}{185,69}\right) * 8/1000$$

$$\text{Throughput} = 1698,86 \text{ kbps}$$

Packet Loss

$$\text{Packet Loss} = \frac{(\text{Paket Data Yang Dikirim} - \text{Paket Data Dierima})}{\text{Paket Data Dikirim}} * 100\%$$

$$\text{Packet Loss} = \frac{(106230 - 44925)}{106230} * 100\%$$

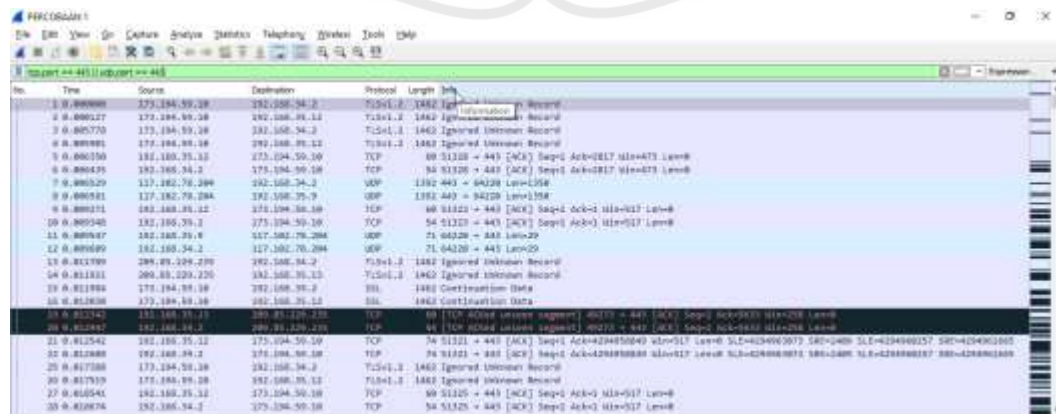
$$\text{Packet Loss} = 58\%$$

NO	PACKETS SEND	PACKETS RECEIVED	BYTES	TIMESPAN	TOTAL VARIASI DELAY	DELAY RATA-RATA(ms)	JITTER(ms)	THROUGHPUT(kbps)	PACKET LOSS
1	106230	44925	39432579	185,69	-0,000030	4,133333333	-0,0000007	1698,86	58%
2	115035	41352	33034273	188,098	-2E-05	4,548703811	-0,0000005	1404,98	64%
3	74073	50201	40263730	185,368	-0,013061	3,692516085	-0,0002602	1737,68	32%
4	97146	84766	67128883	182	6E-06	2,147087276	0,0000001	2950,72	13%
5	134031	123835	1,08E+08	177,329	-7,5E-05	1,431978035	-0,0000006	4879,82	8%
6	143555	136504	1,1E+08	185,187	-5,3E-05	1,356641564	-0,0000004	4772,53	5%
7	79234	70293	59471363	186,590	-0,000011	2,654460615	-0,0000002	2549,82	11%
8	107813	99110	86092949	183,392	-6,4E-05	1,850388457	-0,0000006	3755,58	8%
9	99990	91891	78475483	180,682	-8E-05	1,966264378	-0,0000009	3474,63	8%
10	86157	79178	67639072	182,84	6E-06	2,309227311	0,0000001	2959,49	8%

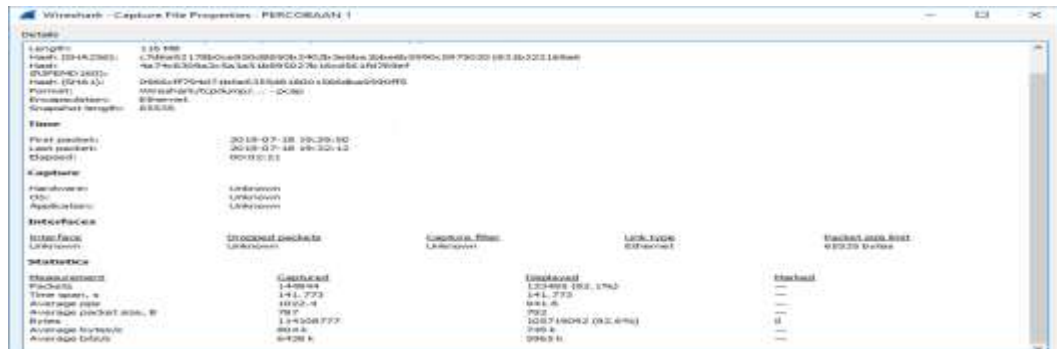
Perhitungan Hasil Pengujian Bandwidth 1:4 Client 1:3.

Skema Bandwidth 1:4 Client 1:4

Pengujian Skema Bandwidth 1:4 Client 1:4



Pengujian Bandwidth 1:4 Client 1:4.



Hasil Pengujian Bandwidth 1:4 Client 1:4.

Delay

$$\text{Delay} = \frac{\text{Waktu Pengiriman}}{\text{Total Paket Yang Diterima}}$$

$$\text{Delay} = \left(\frac{181,773}{133495} \right) * 1000$$

$$\text{Delay} = 1,361646504 \text{ ms}$$

Jitter

$$\text{Jitter} = \frac{\text{Total Variasi Delay}}{(\text{Total Paket Yang Diterima}-1)}$$

$$\text{Jitter} = \left(\frac{-0,000070}{133495-1} \right) * 1000$$

$$\text{Jitter} = -0,0000005 \text{ ms}$$

Throughput

$$\text{Throughput} = \frac{\text{Paket Data Diterima}}{\text{Lama Pengamatan}}$$

$$\text{Throughput} = \left(\frac{105719092}{181,773} \right) * 8/1000$$

$$\text{Throughput} = 4652,80 \text{ kbps}$$

Packet Loss

$$\text{Packet Loss} = \frac{(\text{Paket Data Yang Dikirim} - \text{Paket Data Dierima})}{\text{Paket Data Dikirim}} * 100\%$$

$$\text{Packet Loss} = \frac{(144944-133495)}{144944} * 100\%$$

$$\text{Packet Loss} = 8\%$$

NO	PACKETS SEND	PACKETS RECEIVED	BYTES	TIMESPAN	TOTAL VARIASI DELAY	DELAY RATA-RATA(ms)	JITTER(ms)	THROUGHPUT(kbps)	PACKET LOSS
1	144944	133495	1,06E+08	181,773	-0,000070	1,361646504	-0,0000005	4652,80	8%
2	131856	128568	1,06E+08	184,079	-7E-06	1,431763736	-0,0000001	4599,67	2%
3	119071	115165	96188747	182,218	-7,1E-05	1,582234186	-0,0000006	4223,02	3%
4	81997	77177	67709309	182,295	4,7E-05	2,362037913	0,0000006	2971,42	6%
5	54541	53173	41981621	188,154	3,1E-05	3,538525191	0,0000006	1784,99	3%
6	140719	137008	1,12E+08	182,377	0,005109	1,331141247	0,00000373	4918,99	3%
7	137889	126045	1,05E+08	180,192	-0,000061	1,429584672	-0,0000005	4667,46	9%
8	132761	127986	1,11E+08	181,674	-5,5E-05	1,419483381	-0,0000004	4872,20	4%
9	136308	129417	1,09E+08	187,647	0,739949	1,449940889	0,0057176	4650,46	5%
10	137559	132219	1,1E+08	183,461	0,001698	1,387553982	0,0000128	4816,46	4%

Perhitungan Hasil Pengujian Bandwidth 1:4 Client 1:4.

Skema Bandwidth 1:4 Client 2:3 Pengujian Skema Bandwidth 1:4 Client 2:3



Pengujian Bandwidth 1:4 Client 2:3.



Hasil Pengujian Bandwidth 1:4 Client 2:3.

Delay

$$\text{Delay} = \frac{\text{Waktu Pengiriman}}{\text{Total Paket Yang Diterima}}$$

$$\text{Delay} = \left(\frac{174,604}{135708}\right) * 1000$$

$$\text{Delay} = 1,28661538 \text{ ms}$$

Jitter

$$\text{Jitter} = \frac{\text{Total Variasi Delay}}{(\text{Total Paket Yang Diterima}-1)}$$

$$\text{Jitter} = \left(\frac{-0,000054}{135708-1}\right) * 1000$$

$$\text{Jitter} = -0,0000004 \text{ ms}$$

Throughput

$$\text{Throughput} = \frac{\text{Paket Data Diterima}}{\text{Lama Pengamatan}}$$

$$\text{Throughput} = \left(\frac{112415096}{174,604}\right) * 8/1000$$

$$\text{Throughput} = 5150,63 \text{ kbps}$$

Packet Loss

$$\text{Packet Loss} = \frac{(\text{Paket Data Yang Dikirim} - \text{Paket Data Dierima})}{\text{Paket Data Dikirim}} * 100\%$$

$$\text{Packet Loss} = \frac{(139407 - 135708)}{139407} * 100\%$$

$$\text{Packet Loss} = 3\%$$

RATIO BANDWIDTH H. 4.1 TOPOLOGI 2:3									
NO	PACKETS SEND	PACKETS RECEIVED	BYTES	TIMESPAN	TOTAL VARIASI DELAY	DELAY RATA-RATA(ms)	JITTER(ms)	THROUGHPUT(kbps)	PACKET LOSS
1	139407	135708	1,12E+08	174,604	-0,000054	1,28661538	-0,0000004	5150,63	3%
2	134006	131304	1,13E+08	176,346	0,00489	1,343036008	0,0000372	5113,34	2%
3	137729	135302	1,13E+08	180,285	2,7E-05	1,332463674	0,0000002	5004,84	2%
4	136645	135090	1,13E+08	185,219	-6E-05	1,37107854	-0,0000004	4897,59	1%
5	134233	132536	1,13E+08	189,392	0,00054	1,428985332	0,0000041	4788,49	1%
6	134845	133188	1,13E+08	189,285	0,003597	1,421186593	0,0000270	4792,77	1%
7	136630	135250	1,13E+08	182,577	0,000469	1,349922366	0,0000035	4971,76	1%
8	135789	135789	1,13E+08	181,577	-1,1E-05	1,337199626	-0,0000001	4993,65	0%
9	135690	133958	1,13E+08	182,044	0,003878	1,358963257	0,0000289	4969,22	1%
10	139940	138579	1,13E+08	186,486	-7E-05	1,34570173	-0,0000005	4868,62	1%

Perhitungan Hasil Pengujian Bandwidth 1:4 Client 2:3.





BIODATA PENULIS



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Judul TA : *ANALISA QUALITY OF SERVICE PADA TEKNIK
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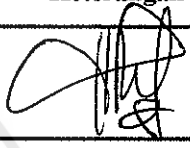


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SIDANG TUGAS AKHIR

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Judul Tugas Akhir : **ANALISA QUALITY OF SERVICE PADA TEKNIK LOAD BALANCING MENGGUNAKAN METODE PCC DENGAN DEDICATED BANDWITH**
Hari / Tanggal : **Kamis / 28 November 2019**
Jam : **09:00 WIB**
Tempat : **cc.lt.2.2**

Bab/Halaman	Uraian	Keterangan
	<i>Analisa yg membuktikan router mengalami overload disertai penjelasan</i>	

Dosen Penguji 1

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Judul Tugas Akhir : ANALISA QUALITY OF SERVICE PADA TEKNIK LOAD BALANCING MENGGUNAKAN METODE PCC DENGAN DEDICATED BANDWITH
Hari / Tanggal : Kamis / 28 November 2019
Jam : 09:00 WIB
Tempat : cc.it.2.2

Bab/Halaman	Uraian	Keterangan
	Bulet dedicated	
	Penjelasan pembagian klien	
	Konsistensi perbandingan	

Dosen Penguji 2

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