

MPLS Test Case

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Profile singkat

- 1998 Lulus S1, Sarjana Teknik Industri Univ. Kristen Maranatha
- 1999 – 2004, Staff Pengajar STMIK CIC Cirebon dan STIKOMPOLTEK Cirebon
- 2004 – 2006, GM Operasional PT. Indo Pratama CyberNet (ISP)
- 2006 Lulus S2, Magister Management Information System Univ. Bina Nusantara
- 2006 – sekarang, Direktur Operasional PT. Data Utama Dinamika (ISP & NAP)
- 2009 – 2012, Kabid. Security APJII
- Belum pernah ikut training mikrotik apalagi ujiannya ☺
- Pencetus ide daftar IP NICE untuk memisahkan bandwidth local dan international di mikrotik
- Penulis buku "Firewall melindungi jaringan dari DDoS menggunakan Linux dan Mikrotik"

MPLS secara singkat

- MPLS singkatan dari Multiprotocol Label Switching. MPLS semacam menggantikan IP routing dimana keputusan forwarding paket tidak lagi didasarkan pada field di IP header dan tabel routing, tetapi pada label yang melekat pada paket.
- Pendekatan ini mempercepat proses forwarding karena lookup hop berikutnya menjadi sangat sederhana dibandingkan dengan routing lookup
- Efisiensi proses forwarding adalah manfaat utama MPLS
- Fitur MPLS RouterOS lebih lengkapnya bisa dibaca:
http://wiki.mikrotik.com/wiki/MPLS_Overview

Mengapa MPLS

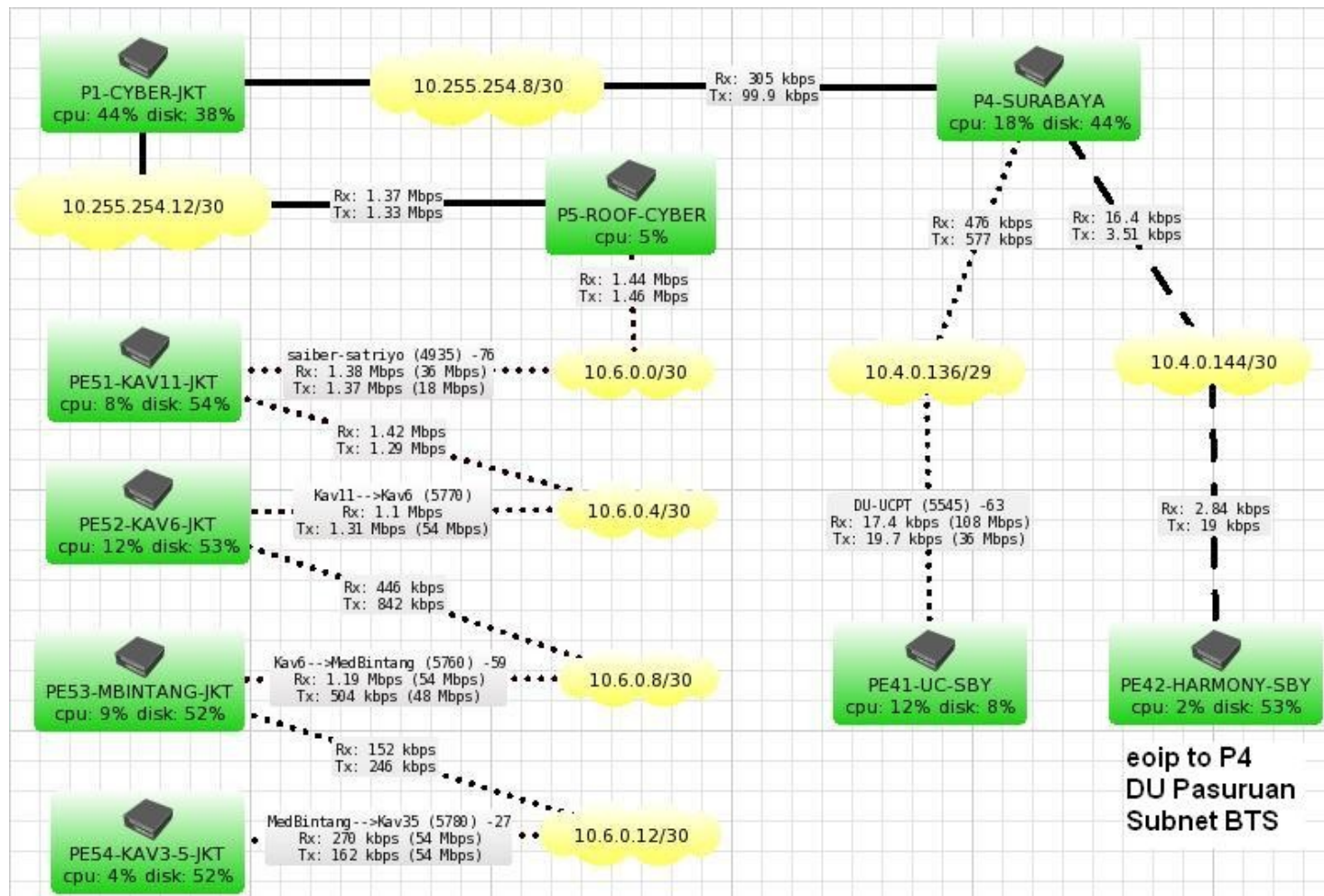
- Lebih efisien dibanding menggunakan EoIP, overhead EoIP relatif lebih besar (cpu usage dan header, berdasarkan pengalaman untuk mendeliver 7Mbps, real traffic pada WLAN adalah 8Mbps artinya 1Mbps hanya untuk header EoIP)
- MPLS bisa membuat interface VPLS secara mess melalui ospf routing sehingga bisa menciptakan layer 2,5 yang full protection / fail over
- Lebih lengkap bisa dibaca:
<http://mum.mikrotik.com/presentations/CZ09/MPLS.pdf>



MPLS Test Case by Datautama

- Menghubungkan 25 PE (Provider Edge) pada 15 Kota
- Untuk beberapa PE yang berada di luar jangkauan POP (Jakarta, Semarang, Surabaya), Datautama bekerja sama dengan ISP rekanan.

Topology MPLS JKT – SBY





Tahapan Konfigurasi MPLS

- Menggunakan Mikrotik v 3.20 + paket mpls-test.npk dan routing-test.npk yang sesuai dengan versi Mikrotik yang digunakan, sebelumnya disable paket mpls dan routing standar Mikrotik.
- Konfigurasikan semua Mikrotik Router yang terlibat dalam jaringan MPLS menggunakan OSPF
- Konfigurasikan MPLS LDP
- Konfigurasikan Interface VPLS
- Bridging interface VPLS yang terbentuk dengan Vlan atau Ethernet sesuai kebutuhan

Catatan

- Jaringan MPLS VPLS adalah jaringan yang dibangun pada backbone berbasis “routing” oleh karena itu masing-masing router harus terhubung satu dengan lainnya secara langsung / layer2 dan menjalankan MPLS LDP untuk proses forwarding label.
- Jika diperlukan antar router tersebut bisa juga dikoneksikan menggunakan eoip, misalnya jika dengan sangat terpaksa harus menghubungkan dua router yang terpisah melalui jaringan lainnya yang tidak mendukung MPLS, walaupun cara ini sebenarnya tidak efisien.

Contoh konfigurasi

- Buat interface “lobridge” sebagai loopback interface untuk OSPF dan LDP, lebih lengkapnya bisa dibaca:
http://wiki.mikrotik.com/wiki/MPLS_Lab_Se



Buat interface lobridge di P1

- `/interface bridge add name=lobridge`

Set IP address di P1

■ Set IP address untuk ptp ke masing-masing router MPLS

- /ip address
- add address=10.255.254.1/30 broadcast=10.255.254.3 comment="P2 Presisi" \
disabled=no interface=vlan2-jakarta network=10.255.254.0
- add address=10.255.254.9/30 broadcast=10.255.254.11 comment="P4 Surabaya" \
disabled=no interface=vlan311-surabaya network=10.255.254.8
- add address=10.255.254.5/30 broadcast=10.255.254.7 comment="P3 Semarang" \
disabled=no interface=vlan19-semarang network=10.255.254.4
- add address=10.255.255.1/32 broadcast=10.255.255.1 comment="loopback mpls" \
disabled=no interface=lobridge network=10.255.255.1
- add address=10.255.254.13/30 broadcast=10.255.254.15 comment="P5 Roof Cyber" \
disabled=no interface=vlan2-jakarta network=10.255.254.12
- add address=10.255.254.17/30 broadcast=10.255.254.19 comment="P6 Cibubur" \
disabled=yes interface=vlan2-jakarta network=10.255.254.16

Konfigurasi OSPF di P1

- /routing ospf instance
- set default comment="" disabled=no distribute-default=never metric-bgp=20 \
- metric-connected=20 metric-default=1 metric-other-ospf=20 metric-rip=20 \
- metric-static=20 name=default redistribute-bgp=no \
- redistribute-connected=as-type-1 redistribute-other-ospf=no \
- redistribute-rip=no redistribute-static=no router-id=10.255.255.1
- /routing ospf area
- set backbone area-id=0.0.0.0 disabled=no instance=default name=backbone \
- type=default
- /routing ospf network
- add area=backbone disabled=no network=10.255.254.0/30
- add area=backbone disabled=no network=10.255.254.12/30
- add area=backbone disabled=no network=10.255.254.8/30
- add area=backbone disabled=no network=10.255.254.4/30

Konfigurasi Routing Filter di P1

- add action=accept chain=ospf-out comment="" disabled=no \
■ invert-match=no prefix=10.255.254.0/30 prefix-length=30-32 \
■ protocol=connect,ospf
- add action=accept chain=ospf-out comment="" disabled=no \
■ invert-match=no prefix=10.255.254.4/30 prefix-length=30-32 \
■ protocol=connect,ospf
- add action=accept chain=ospf-out comment="" disabled=no \
■ invert-match=no prefix=10.255.254.8/30 prefix-length=30-32 \
■ protocol=connect,ospf
- add action=accept chain=ospf-out comment="" disabled=no \
■ invert-match=no prefix=10.255.254.12/30 prefix-length=30-32 \
■ protocol=connect,ospf
- add action=accept chain=ospf-out comment="" disabled=no \
■ invert-match=no prefix=10.255.254.20/30 prefix-length=30-32 \
■ protocol=connect,ospf
- add action=accept chain=ospf-out comment="" disabled=no \
■ invert-match=no prefix=10.255.254.24/30 prefix-length=30-32 \
■ protocol=connect,ospf
- add action=accept chain=ospf-out comment="" disabled=no \
■ invert-match=no prefix=10.255.254.28/30 prefix-length=30-32 \
■ protocol=connect,ospf
- add action=accept chain=ospf-out comment="" disabled=no \
■ invert-match=no prefix=10.255.254.32/30 prefix-length=30-32 \
■ protocol=connect,ospf

Konfig Routing Filter di P1 (lanjut)

- add action=accept chain=ospf-out comment="" disabled=no \
- invert-match=no prefix=10.255.254.36/30 prefix-length=30-32 \
- protocol=connect,ospf
- add action=accept chain=ospf-out comment="" disabled=no \
- invert-match=no prefix=10.255.254.40/30 prefix-length=30-32 \
- protocol=connect,ospf
- add action=accept chain=ospf-out comment="" disabled=no \
- invert-match=no prefix=10.255.254.44/30 prefix-length=30-32 \
- protocol=connect,ospf
- add action=accept chain=ospf-out comment="" disabled=no \
- invert-match=no prefix=10.255.254.52/30 prefix-length=30-32 \
- protocol=connect,ospf
- add action=accept chain=ospf-out comment="" disabled=no \
- invert-match=no prefix=10.255.254.56/30 prefix-length=30-32 \
- protocol=connect,ospf
- add action=accept chain=ospf-out comment="" disabled=no \
- invert-match=no prefix=10.255.255.1 prefix-length=32 protocol=\
- connect,ospf
- add action=accept chain=ospf-out comment="" disabled=no \
- invert-match=no prefix=203.89.27.192/26 prefix-length=26-32 \
- protocol=connect,ospf
- add action=accept chain=ospf-out comment="" disabled=no \
- invert-match=no prefix=10.7.0.0/29 prefix-length=29-32 \
- protocol=connect,ospf
- add action=reject chain=ospf-out comment="" disabled=no \
- invert-match=no prefix=0.0.0.0/0 prefix-length=0-32 protocol=\
- connect

Konfigurasi MPLS LDP di P1

- /mpls ldp
- set distribute-for-default-route=no enabled=yes hop-limit=255 loop-detect=no \
- lsr-id=10.255.255.1 path-vector-limit=255 transport-address=10.255.255.1 \
- use-explicit-null=no
- /mpls ldp advertise-filter
- add advertise=yes comment="" disabled=no neighbor=all prefix=10.255.254.0/24
- add advertise=yes comment="" disabled=no neighbor=all prefix=10.255.255.0/24
- add advertise=yes comment="" disabled=no neighbor=all prefix=10.6.0.0/28
- add advertise=yes comment="" disabled=no neighbor=all prefix=10.0.2.48/29
- add advertise=yes comment="" disabled=no neighbor=all prefix=10.0.2.56/29
- add advertise=no comment="" disabled=no neighbor=all prefix=0.0.0.0/0
- /mpls ldp interface
- add accept-dynamic-neighbors=yes comment="" disabled=no hello-interval=5s \
- hold-time=15s interface=vlan2-jakarta transport-address=0.0.0.0
- add accept-dynamic-neighbors=yes comment="" disabled=no hello-interval=5s \
- hold-time=15s interface=vlan311-surabaya transport-address=0.0.0.0
- add accept-dynamic-neighbors=yes comment="" disabled=no hello-interval=5s \
- hold-time=15s interface=vlan19-semarang transport-address=0.0.0.0
- /mpls ldp neighbor
- add comment="" disabled=no send-targeted=no transport=10.255.255.3
- add comment="" disabled=no send-targeted=no transport=10.255.255.2
- add comment="" disabled=no send-targeted=no transport=10.255.255.5
- add comment="" disabled=no send-targeted=no transport=10.255.255.4



Cek MPLS sudah aktif belum

- Jika MPLS telah aktif maka bisa dicek dengan cara sbb: (tentunya router MPLS lainnya sudah terkonfigure juga dengan benar)
- `/mpls forwarding-table print`

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```
[noc@Pl-CYBER] > /mpls forwarding-table print
```

```
Flags: L - ldp, V - vpls, T - traffic-eng
```

#	IN-LABEL	OUT-LABELS	DESTINATION	INTERFACE	NEXTHOP
0	expl-null				
1	L 139		10.255.255.7/32	vlan2-jakarta	10.7.0.2
2	L 258		10.255.255.5/32	vlan2-jakarta	10.255.254.14
3	L 657	2328	10.255.255.71/32	vlan2-jakarta	10.7.0.2
4	L 960		10.255.255.6/32	vlan21-fopeninsula	10.255.254.18
5	L 1088	3511	10.255.255.42/32	vlan32-surabaya	10.255.254.10
6	L 1090		10.255.255.4/32	vlan32-surabaya	10.255.254.10
7	L 1094	17	10.255.255.32/32	vlan19-semarang	10.255.254.6
8	L 1095		10.255.255.3/32	vlan19-semarang	10.255.254.6
9	L 1184	1441	10.255.255.51/32	vlan2-jakarta	10.255.254.14
10	V 1240		PltoPE71		
11	L 1261	1506	10.255.255.53/32	vlan2-jakarta	10.255.254.14
12	L 1262	1505	10.255.255.52/32	vlan2-jakarta	10.255.254.14
13	V 1264		PltoPE53		
14	V 1268		PltoPE52		
15	L 1280	4169	10.255.255.41/32	vlan32-surabaya	10.255.254.10
16	L 1293	16	10.255.255.24/32	vlan2-jakarta	10.255.254.2
17	L 1294	39	10.255.255.22/32	vlan2-jakarta	10.255.254.2
18	L 1295	40	10.255.255.21/32	vlan2-jakarta	10.255.254.2
19	L 1296		10.255.255.2/32	vlan2-jakarta	10.255.254.2
20	L 1301	32	10.255.255.25/32	vlan2-jakarta	10.255.254.2
21	L 1311	1748	10.255.255.31/32	vlan19-semarang	10.255.254.6
22	V 1314		PltoPE24		
23	V 1315		PltoPE25		
24	V 1316		PltoPE22		
25	V 1317		PltoPE21		
26	L 1326	4210	10.255.255.44/32	vlan32-surabaya	10.255.254.10
27	V 1353		PltoPE51		
28	L 1385	1504	10.255.255.54/32	vlan2-jakarta	10.255.254.14
29	V 1386		PltoPE54		
30	L 1388	2686	10.255.255.72/32	vlan2-jakarta	10.7.0.2
31	V 1389		PltoPE72		
32	L 1392	4301	10.255.255.43/32	vlan32-surabaya	10.255.254.10
33	L 1394		10.255.255.73/32	eoip-10-Citra-Bukit...	10.255.254.46
34	L 1401		10.255.255.74/32	eoip-12-citraland-m...	10.255.254.54
35	L 1402		10.255.255.45/32	eoip-5-citra-garden...	10.255.254.22
36	L 1410		10.255.255.50/32	eoip-9-Perumahan-Ma...	10.255.254.38

```
[noc@Pl-CYBER] > █
```

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```
[noc@Pl-CYBER] > /tool traceroute 10.255.255.41 src-address=10.255.255.1
ADDRESS STATUS
1 10.255.254.10 17ms 17ms 28ms
    mpls-label=4169
2 10.255.255.41 20ms 17ms 22ms

[noc@Pl-CYBER] > /tool traceroute 10.255.255.51 src-address=10.255.255.1
ADDRESS STATUS
1 10.255.254.14 2ms 1ms 2ms
    mpls-label=1441
2 10.255.255.51 1ms 1ms 1ms

[noc@Pl-CYBER] > /tool traceroute 10.255.255.52 src-address=10.255.255.1
ADDRESS STATUS
1 10.255.254.14 4ms 9ms 15ms
    mpls-label=1505
2 10.6.0.2 18ms 10ms 7ms
    mpls-label=18
3 10.255.255.52 3ms 4ms 3ms

[noc@Pl-CYBER] > /tool traceroute 10.255.255.53 src-address=10.255.255.1
ADDRESS STATUS
1 10.255.254.14 48ms 71ms 102ms
    mpls-label=1506
2 10.6.0.2 191ms 62ms 41ms
    mpls-label=86
3 10.6.0.6 31ms 15ms 26ms
    mpls-label=19
4 10.255.255.53 10ms 9ms 23ms

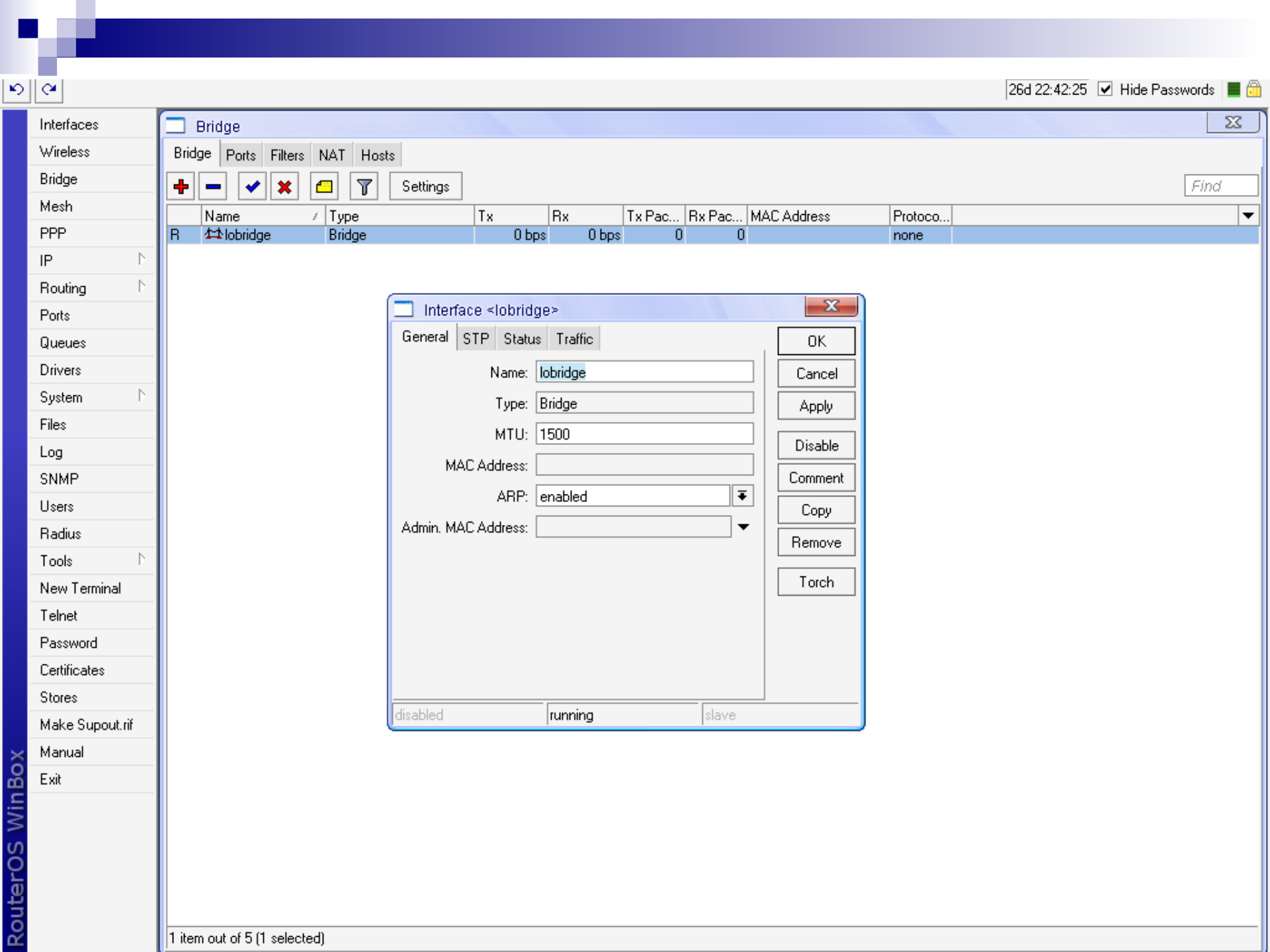
[noc@Pl-CYBER] > /tool traceroute 10.255.255.54 src-address=10.255.255.1
ADDRESS STATUS
1 10.255.254.14 53ms 20ms 5ms
    mpls-label=1504
2 10.6.0.2 13ms 4ms 4ms
    mpls-label=85
3 10.6.0.6 34ms 18ms 10ms
    mpls-label=168
4 10.6.0.10 57ms 20ms 41ms
    mpls-label=1313
5 10.255.255.54 22ms 8ms 27ms

[noc@Pl-CYBER] > /tool traceroute 10.255.255.42 src-address=10.255.255.1
ADDRESS STATUS
1 10.255.254.10 20ms 18ms 19ms
    mpls-label=3511
2 10.255.255.42 19ms 19ms 18ms

[noc@Pl-CYBER] >
```

Konfigurasi P5

- Berikut ini adalah screen capture konfigurasi pada P5 yang merupakan salah satu router MPLS menggunakan RB433 yang menghubungkan P1 dengan PE51,PE52,PE53,PE54



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Bridge

BridgePortsFiltersNATHosts

Settings

Find

	Name	Type	Tx	Rx	Tx Pac...	Rx Pac...	MAC Address	Protoco...
R	lobridge	Bridge	0 bps	0 bps	0	0		none

Interface <lobridge>

GeneralSTPStatusTraffic

Name: lobridge

Type: Bridge

MTU: 1500

MAC Address:

ARP: enabled

Admin. MAC Address:

OK

Cancel

Apply

Disable

Comment

Copy

Remove

Torch

disabled

running

slave

- Interfaces
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Address List

Find

Address	Network	Broadcast	Interface	
::: Ciputra KAV11 / Marketing				
10.6.0.1/30	10.6.0.0	10.6.0.3	wlan1	
::: P1 VPN-DIAL				
10.255.254.14/30	10.255.254.12	10.255.254.15	ether1	
10.255.255.5	10.255.255.5	10.255.255.5	lobridge	

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☐ Terminal

```
[support@P5-R00FCYBER->KAV11] > /routing filter export
# oct/21/2009 14:36:09 by RouterOS 3.20
# software id = 91JG-3TT
#
/routing filter
add action=accept chain=ospf-out comment="" disabled=no invert-match=no prefix=10.6.0.0/30 prefix-length=30-32 protocol=\
connect,ospf
add action=accept chain=ospf-out comment="" disabled=no invert-match=no prefix=10.255.254.12/30 prefix-length=30-32 \
protocol=connect,ospf
add action=accept chain=ospf-out comment="" disabled=no invert-match=no prefix=10.255.255.5 prefix-length=32 protocol=\
connect,ospf
add action=reject chain=ospf-out comment="" disabled=no invert-match=no prefix=0.0.0.0/0 prefix-length=0-32 protocol=\
connect

[support@P5-R00FCYBER->KAV11] > /mpls ldp export
# oct/21/2009 14:36:15 by RouterOS 3.20
# software id = 91JG-3TT
#
/mpls ldp
set distribute-for-default-route=no enabled=yes hop-limit=255 loop-detect=no lsr-id=10.255.255.5 path-vector-limit=255 \
transport-address=10.255.255.5 use-explicit-null=no
/mpls ldp advertise-filter
add advertise=yes comment="" disabled=no neighbor=all prefix=10.255.255.0/24
add advertise=no comment="" disabled=no neighbor=all prefix=0.0.0.0/0
/mpls ldp interface
add accept-dynamic-neighbors=yes comment="" disabled=no hello-interval=5s hold-time=15s interface=ether1 \
transport-address=0.0.0.0
add accept-dynamic-neighbors=yes comment="" disabled=no hello-interval=5s hold-time=15s interface=wlan1 \
transport-address=0.0.0.0
/mpls ldp neighbor
add comment="" disabled=no send-targeted=no transport=10.255.255.2
add comment="" disabled=no send-targeted=no transport=10.255.255.3
add comment="" disabled=no send-targeted=no transport=10.255.250.1
add comment="" disabled=no send-targeted=no transport=10.255.255.1
add comment="" disabled=no send-targeted=no transport=10.255.255.52
add comment="" disabled=no send-targeted=no transport=10.255.255.53
[support@P5-R00FCYBER->KAV11] > /interface wireless print
Flags: X - disabled, R - running
 0 R ;;; Ciputra KAV11 / Marketing 4935
   name="wlan1" mtu=1500 mac-address=00:0B:6B:85:AB:67 arp-enabled interface-type=Atheros AR5213 mode=ap-bridge
   ssid="saiber-satriyo" frequency=4935 band=5ghz scan-list=4900-4950 antenna-mode=ant-a wds-mode=dynamic
   wds-default-bridge=none wds-ignore-ssid=no default-authentication=yes default-forwarding=yes default-ap-tx-limit=0
   default-client-tx-limit=0 hide-ssid=no security-profile=default compression=no
[support@P5-R00FCYBER->KAV11] >
```



Catatan tambahan

- Untuk RB yang akan digunakan untuk MPLS sebaiknya tidak menggunakan wds-slave maupun station-wds tapi cukup ap-bridge > station karena MPLS ini metodenya routing, pengalaman dibuat bridge MPLS VPLS bermasalah

Konfigurasi PE51

- Berikut ini adalah screen capture konfigurasi pada PE51
- Pada PE51 interface VPLS yang terbentuk di bridge ke ether2, tujuannya agar dari ether2 jaringan di KAV11 Jakarta bisa terhubung ke PE41 Surabaya Vlan 201, jadi terbentuk layer 2,5 dari KAV11 Jakarta ke Vlan 201 Surabaya

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```
[harijanto@PE51-KAV11-MARKETING] > /interface bridge export
# oct/21/2009 14:50:17 by RouterOS 3.20
# software id = VWPP-LTT
#
/interface bridge
add admin-mac=00:00:00:00:00:00 ageing-time=5m arp-enabled auto-mac=yes comment="" disabled=no forward-delay=15s \
max-message-age=20s mtu=1500 name=lobridge priority=0x8000 protocol-mode=none transmit-hold-count=6
add admin-mac=00:00:00:00:00:00 ageing-time=5m arp-enabled auto-mac=yes comment="" disabled=no forward-delay=15s \
max-message-age=20s mtu=1500 name=bridgePE51toPE41 priority=0x8000 protocol-mode=none transmit-hold-count=6
/interface bridge port
add bridge=bridgePE51toPE41 comment="" disabled=no edge=auto external-fdb=auto horizon=none interface=PE51toPE41 \
path-cost=10 point-to-point=auto priority=0x80
add bridge=bridgePE51toPE41 comment="" disabled=no edge=auto external-fdb=auto horizon=none interface=ether2 path-cost=10 \
point-to-point=auto priority=0x80
/interface bridge settings
set use-ip-firewall=yes use-ip-firewall-for-pppoe=yes use-ip-firewall-for-vlan=yes
[harijanto@PE51-KAV11-MARKETING] > /ip address export
# oct/21/2009 14:50:28 by RouterOS 3.20
# software id = VWPP-LTT
#
/ip address
add address=10.6.0.2/30 broadcast=10.6.0.3 comment="Roof Cyber" disabled=no interface=wlan2 network=10.6.0.0
add address=10.255.255.51/32 broadcast=10.255.255.51 comment="" disabled=no interface=lobridge network=10.255.255.51
add address=10.6.0.5/30 broadcast=10.6.0.7 comment="Ciputra KAV6 / Kantor Pusat" disabled=no interface=wlan1 network=\
10.6.0.4
add address=123.255.207.162/30 broadcast=123.255.207.163 comment="" disabled=no interface=PE51toP1 network=\
123.255.207.160
add address=123.255.207.1/29 broadcast=123.255.207.7 comment="Gateway Internet KAV11" disabled=no interface=ether1 \
network=123.255.207.0
[harijanto@PE51-KAV11-MARKETING] > /routing ospf export
# oct/21/2009 14:51:19 by RouterOS 3.20
# software id = VWPP-LTT
#
/routing ospf instance
set default comment="" disabled=no distribute-default=never metric-bgp=20 metric-connected=20 metric-default=1 \
metric-other-ospf=20 metric-rip=20 metric-static=20 name=default redistribute-bgp=no redistribute-connected=as-type-1 \
redistribute-other-ospf=no redistribute-rip=no redistribute-static=no router-id=10.255.255.51
/routing ospf area
set backbone area-id=0.0.0.0 disabled=no instance=default name=backbone type=default
/routing ospf network
add area=backbone disabled=no network=10.6.0.0/30
add area=backbone disabled=no network=10.6.0.4/30
[harijanto@PE51-KAV11-MARKETING] >
```

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Terminal

```
[harijanto@PE51-KAV11-MARKETING] > /routing filter export
# oct/21/2009 14:52:07 by RouterOS 3.20
# software id = VWPP-LTT
#
/routing filter
add action=accept chain=ospf-out comment="" disabled=no invert-match=no prefix=10.6.0.0/30 prefix-length=30-32 protocol=\
connect,ospf
add action=accept chain=ospf-out comment="" disabled=no invert-match=no prefix=10.6.0.4/30 prefix-length=30-32 protocol=\
connect,ospf
add action=accept chain=ospf-out comment="" disabled=no invert-match=no prefix=10.255.255.51 prefix-length=32 protocol=\
connect,ospf
add action=reject chain=ospf-out comment="" disabled=no invert-match=no prefix=0.0.0.0/0 prefix-length=0-32 protocol=\
connect
[harijanto@PE51-KAV11-MARKETING] > /mpls ldp export
# oct/21/2009 14:52:22 by RouterOS 3.20
# software id = VWPP-LTT
#
/mpls ldp
set distribute-for-default-route=no enabled=yes hop-limit=255 loop-detect=no lsr-id=10.255.255.51 path-vector-limit=255 \
transport-address=10.255.255.51 use-explicit-null=no
/mpls ldp advertise-filter
add advertise=yes comment="" disabled=no neighbor=all prefix=10.255.255.0/24
add advertise=no comment="" disabled=no neighbor=all prefix=0.0.0.0/0
/mpls ldp interface
add accept-dynamic-neighbors=yes comment="" disabled=no hello-interval=5s hold-time=15s interface=wlan2 \
transport-address=0.0.0.0
add accept-dynamic-neighbors=yes comment="" disabled=no hello-interval=5s hold-time=15s interface=wlan1 \
transport-address=0.0.0.0
/mpls ldp neighbor
add comment="" disabled=no send-targeted=no transport=10.255.255.5
add comment="" disabled=no send-targeted=yes transport=10.255.255.4
add comment="" disabled=no send-targeted=yes transport=10.255.255.4
[harijanto@PE51-KAV11-MARKETING] > /interface vpls export
# oct/21/2009 14:52:31 by RouterOS 3.20
# software id = VWPP-LTT
#
/interface vpls
add arp=enabled cisco-style=no cisco-style-id=0 comment="" disable-running-check=no disabled=no mac-address=\
00:00:00:00:51:41 mtu=1460 name=PE51toPE41 remote-peer=10.255.255.41 vpls-id=41:51
add arp=enabled cisco-style=no cisco-style-id=0 comment="" disable-running-check=no disabled=no mac-address=\
00:00:00:00:51:01 mtu=1460 name=PE51toP1 remote-peer=10.255.255.1 vpls-id=1:51
[harijanto@PE51-KAV11-MARKETING] >
```



Konfigurasi VPLS di PE41

- Pada slide sebelumnya telah di tunjukkan konfigurasi VPLS pada PE51, berikut ini adalah screen capture VPLS pada PE41 yang berada di Surabaya
- Pastikan di kedua sisi interface VPLS dalam keadaan “R”

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Make Supout.rif

Manual

Exit

☐ Terminal

```
[support@PE41-UC-DH] > /interface vpls export
```

```
# oct/21/2009 14:54:34 by RouterOS 3.27
```

```
# software id = FY8H-FNE8
```

```
#
```

```
/interface vpls
```

```
add advertised-l2mtu=1500 arp=enabled cisco-style=no cisco-style-id=0 comment="" disable-running-check=no disabled=no \
    l2mtu=1500 mac-address=00:00:00:00:41:51 mtu=1460 name="PE41toPE51 - Marketing Office - JKT" remote-peer=\
    10.255.255.51 vpls-id=41:51
add advertised-l2mtu=1500 arp=enabled cisco-style=no cisco-style-id=0 comment="" disable-running-check=no disabled=no \
    l2mtu=1500 mac-address=00:00:00:00:41:52 mtu=1460 name="PE41toPE52 - Kantor Pusat - JKT" remote-peer=10.255.255.52 \
    vpls-id=41:52
add advertised-l2mtu=1500 arp=enabled cisco-style=no cisco-style-id=0 comment="" disable-running-check=no disabled=no \
    l2mtu=1500 mac-address=00:00:00:00:41:53 mtu=1460 name="PE41toPE53 - Media Bintang - JKT" remote-peer=10.255.255.53 \
    vpls-id=41:53
add advertised-l2mtu=1500 arp=enabled cisco-style=no cisco-style-id=0 comment="" disable-running-check=no disabled=no \
    l2mtu=1500 mac-address=00:00:00:00:41:54 mtu=1460 name="PE41toPE54 - Site Office - JKT" remote-peer=10.255.255.54 \
    vpls-id=41:54
add advertised-l2mtu=1500 arp=enabled cisco-style=no cisco-style-id=0 comment="" disable-running-check=no disabled=no \
    l2mtu=1500 mac-address=00:00:00:00:41:31 mtu=1460 name="PE41toPE31- Ciputra Mall - SMG" remote-peer=10.255.255.31 \
    vpls-id=41:31
add advertised-l2mtu=1500 arp=enabled cisco-style=no cisco-style-id=0 comment="" disable-running-check=no disabled=no \
    l2mtu=1500 mac-address=00:00:00:00:41:32 mtu=1460 name="PE41toPE32 - Ciputra Hotel - SMG" remote-peer=10.255.255.32 \
    vpls-id=41:32
add advertised-l2mtu=1500 arp=enabled cisco-style=no cisco-style-id=0 comment="" disable-running-check=no disabled=no \
    l2mtu=1500 mac-address=00:00:00:00:41:43 mtu=1460 name="PE41toPE43 - Citra Garden - SDA" remote-peer=10.255.255.43 \
    vpls-id=41:43
add advertised-l2mtu=1500 arp=enabled cisco-style=no cisco-style-id=0 comment="" disable-running-check=no disabled=no \
    l2mtu=1500 mac-address=00:00:00:00:41:42 mtu=1460 name="PE41toPE42 - Citra Harmoni - SDA" remote-peer=10.255.255.42 \
    vpls-id=41:42
add advertised-l2mtu=1500 arp=enabled cisco-style=no cisco-style-id=0 comment="" disable-running-check=no disabled=no \
    l2mtu=1500 mac-address=00:00:00:00:41:25 mtu=1460 name="PE41toPE25 - Citra Raya - Tangerang" remote-peer=\
    10.255.255.25 vpls-id=41:25
add advertised-l2mtu=1500 arp=enabled cisco-style=no cisco-style-id=0 comment="" disable-running-check=no disabled=no \
    l2mtu=1500 mac-address=00:00:00:00:41:24 mtu=1460 name="PE41toPE24 - Garden City - JKT" remote-peer=10.255.255.24 \
    vpls-id=41:24
add advertised-l2mtu=1500 arp=enabled cisco-style=no cisco-style-id=0 comment="" disable-running-check=no disabled=no \
    l2mtu=1500 mac-address=00:00:00:00:41:45 mtu=1460 name="PE41toPE45 - Citra garden - Lampung" remote-peer=\
    10.255.255.45 vpls-id=41:45
add advertised-l2mtu=1500 arp=enabled cisco-style=no cisco-style-id=0 comment="" disable-running-check=no disabled=no \
    l2mtu=1500 mac-address=00:00:00:00:41:46 mtu=1460 name="PE41toPE46 - Citra Garden - Medan" remote-peer=10.255.255.46 \
    vpls-id=41:46
add advertised-l2mtu=1500 arp=enabled cisco-style=no cisco-style-id=0 comment="" disable-running-check=no disabled=no \
    l2mtu=1500 mac-address=00:00:00:00:41:47 mtu=1460 name="PE41toPE47 - Garden City - Palembang" remote-peer=\
    10.255.255.47 vpls-id=41:47
```

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Interface List

Interface Ethernet EoIP Tunnel IP Tunnel VLAN VRRP Bonding



Find

	Name	Type	L2 MTU	Tx	Rx	Tx Pac...	Rx Pac...	Tx Drops	Rx Drops	Tx E
R	PE41toPE21 - Hotel Ciputra - JKT	VPLS	1500	0 bps	0 bps	0	0	0	0	
R	PE41toPE22 - Mall Ciputra - JKT	VPLS	1500	0 bps	0 bps	0	0	0	0	
R	PE41toPE23	VPLS	1500	0 bps	0 bps	0	0	0	0	
R	PE41toPE24 - Garden City - JKT	VPLS	1500	0 bps	0 bps	0	0	0	0	
R	PE41toPE25 - Citra Raya - Tangerang	VPLS	1500	0 bps	0 bps	0	0	0	0	
R	PE41toPE31 - Ciputra Mall - SMG	VPLS	1500	0 bps	0 bps	0	0	0	0	
R	PE41toPE32 - Ciputra Hotel - SMG	VPLS	1500	0 bps	0 bps	0	0	0	0	
R	PE41toPE42 - Citra Harmoni - SDA	VPLS	1500	0 bps	475 bps	0	1	0	0	
R	PE41toPE43 - Citra Garden - SDA	VPLS	1500	0 bps	0 bps	0	0	0	0	
R	PE41toPE44 - Ciputra World - SBY	VPLS	1500	0 bps	0 bps	0	0	0	0	
R	PE41toPE45 - Citra garden - Lampung	VPLS	1500	0 bps	0 bps	0	0	0	0	
	PE41toPE46 - Citra Garden - Medan	VPLS	1500	0 bps	0 bps	0	0	0	0	
	PE41toPE47 - Garden City - Palembang	VPLS	1500	0 bps	0 bps	0	0	0	0	
	PE41toPE48 - Mall Ciputra - Pekanbaru	VPLS	1500	0 bps	0 bps	0	0	0	0	
	PE41toPE49 - Taman Dayu Pandaan	VPLS	1500	0 bps	0 bps	0	0	0	0	
R	PE41toPE50 - Perumahan Makasar	VPLS	1500	0 bps	0 bps	0	0	0	0	
R	PE41toPE51 - Marketing Office - JKT	VPLS	1500	0 bps	0 bps	0	0	0	0	
R	PE41toPE52 - Kantor Pusat - JKT	VPLS	1500	0 bps	0 bps	0	0	0	0	
R	PE41toPE53 - Media Bintang - JKT	VPLS	1500	0 bps	475 bps	0	1	0	0	
R	PE41toPE54 - Site Office - JKT	VPLS	1500	0 bps	0 bps	0	0	0	0	
R	PE41toPE71 - Garden Cibubur	VPLS	1500	0 bps	0 bps	0	0	0	0	
R	PE41toPE72 - Jonggol Citra Indah	VPLS	1500	0 bps	0 bps	0	0	0	0	
R	PE41toPE73 - Balikpapan	VPLS	1500	0 bps	0 bps	0	0	0	0	
R	PE41toPE74 - Citraland - Manado	VPLS	1500	0 bps	0 bps	0	0	0	0	
	PE41toPE75 - Citra Garden - Banjarmasin	VPLS	1500	0 bps	0 bps	0	0	0	0	
::: ciputra hotel jakarta										
R	bridgePE41toPE21	Bridge	1500	0 bps	0 bps	0	0	0	0	
::: ciputra mall jakarta										
R	bridgePE41toPE22	Bridge	1500	0 bps	0 bps	0	0	0	0	
::: ciputra century21 jakarta										
R	bridgePE41toPE23	Bridge	1500	0 bps	0 bps	0	0	0	0	
::: cintra garden city jakarta										
R	bridgePE41toPE24	Bridge	1500	0 bps	0 bps	0	0	0	0	
::: citra raya tangerang										
R	bridgePE41toPE25	Bridge	1500	0 bps	0 bps	0	0	0	0	
::: ciputra mall semarang										
R	bridgePE41toPE31	Bridge	1500	0 bps	0 bps	0	0	0	0	

78 items (1 selected)

Tambahkan change-mss

- Pada saat pertama kali mengimplementasikan MPLS VPLS ini sempat ditemui kendala pada saat mengakses http, ftp dll. Ternyata harus di change-mss pada interface out, sebenarnya tindakan ini selalu diperlukan jika kita menggunakan tunnel seperti halnya pada ipip tunnel, sedangkan untuk eoip dan pptp sudah otomatis terbentuk.
- Berikut contohnya pada PE51 dan PE41



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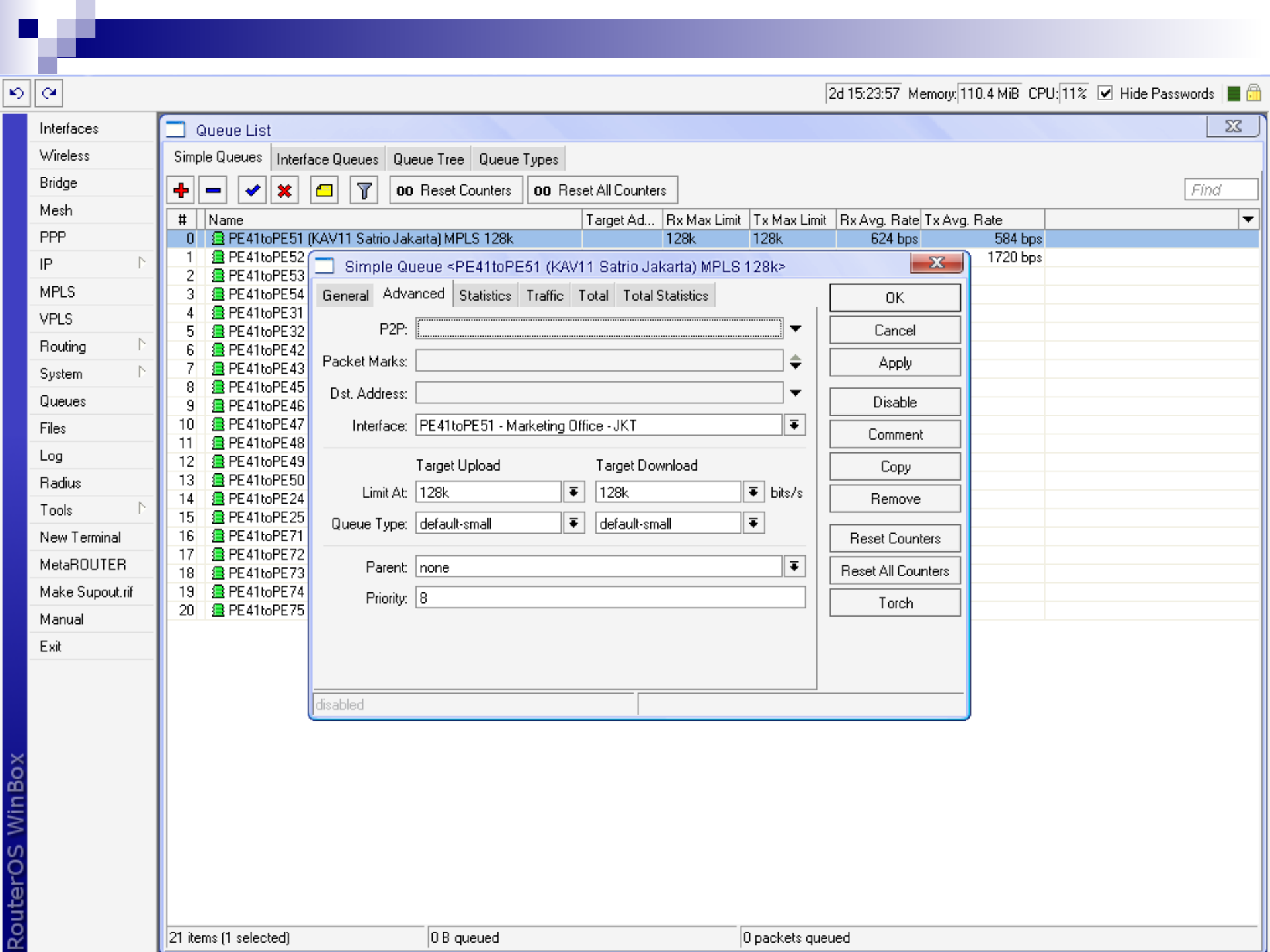
☐ Terminal

```
[support@PE41-UC-DH] > /ip firewall mangle export
# oct/21/2009 15:04:58 by RouterOS 3.27
# software id = FY8H-FNE8
#
/ip firewall mangle
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE51 - Marketing Office - JKT" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE52 - Kantor Pusat - JKT" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE53 - Media Bintang - JKT" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE54 - Site Office - JKT" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE42 - Citra Harmoni - SDA" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE43 - Citra Garden - SDA" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE44 - Ciputra World - SBY" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE31- Ciputra Mall - SMG" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE32 - Ciputra Hotel - SMG" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE25 - Citra Raya - Tangerang" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE24 - Garden City - JKT" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE45 - Citra garden - Lampung" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE46 - Citra Garden - Medan" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE47 - Garden City - Palembang" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE71 - Garden Cibubur" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE72 - Jonggol Citra Indah" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE21 - Hotel Ciputra - JKT" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=\
"PE41toPE22 - Mall Ciputra - JKT" protocol=tcp tcp-flags=syn
add action=change-mss chain=forward comment="" disabled=no new-mss=clamp-to-pmtu out-interface=PE41toPE23 protocol=tcp \
tcp-flags=syn
```




Konfigurasi P dan PE lainnya

- Pada prinsipnya konfigurasi pada router MPLS lainnya hampir sama dengan P1, P5 dan PE51
- Sedangkan untuk limiter dilakukan per interface out yang bisa dilihat pada screen capture berikut





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Queue List

Simple Queues Interface Queues Queue Tree Queue Types

Reset Counters Reset All Counters

Find

#	Name	Target Ad...	Rx Max Limit	Tx Max Limit	Packet Marks	Rx Avg. Rate	Tx Avg. Rate	
0	PE51toPE41 (UC SURABAYA) MPLS 128k		128k	128k			272 bps	
1	PE51toP1-CYBER		512k	512k		111.3 kbps	81.0 kbps	

Simple Queue <PE51toPE41 (UC SURABAYA) MPLS 128k>

General Advanced Statistics Traffic Total Total Statistics

P2P:

Packet Marks:

Dst. Address:

Interface: PE51toPE41

Target Upload

Target Download

Limit At: 128k 128k bits/s

Queue Type: default-small default-small

Parent: none

Priority: 1

OK

Cancel

Apply

Disable

Copy

Remove

Reset Counters

Reset All Counters

Torch

disabled

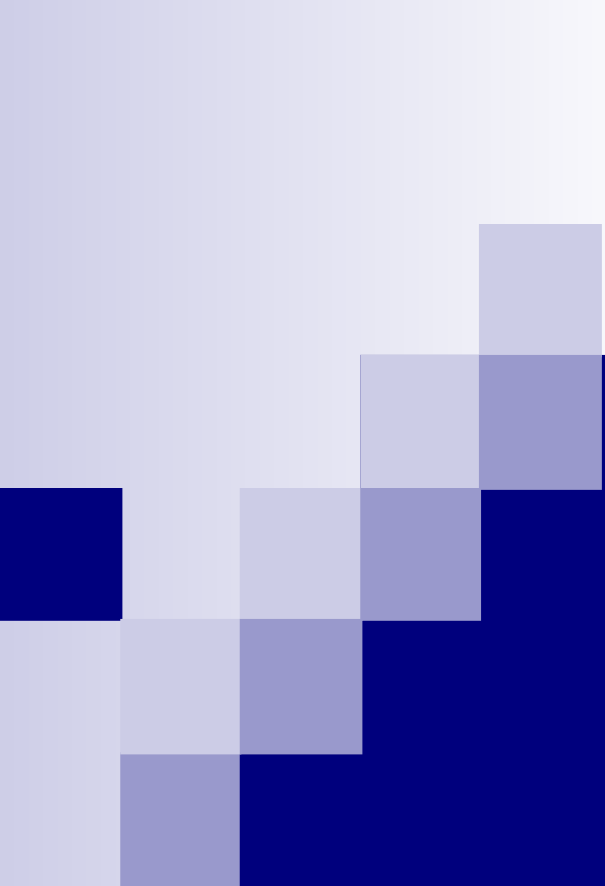
2 items (1 selected)

0 B queued

0 packets queued

Kesimpulan

- Dengan MPLS VPLS, ISP bisa membangun jaringan yang fleksibel, efisien dan reliable jika antar RouterOS tersebut bisa melakukan fail over menggunakan OSPF ataupun BGP.
- Jaringan MPLS VPLS ini bisa dibangun antar ISP jika ada standar pengalamatan bersama dan standar topologi backbone yang berbasis routing.
- Kekurangannya, karena masih bersifat mpls-test.npk dan routing-test.npk maka hati-hati jika melakukan upgrade versi karena bisa terjadi kegagalan koneksi MPLS VPLS secara keseluruhan



Terima Kasih

Q & A