

LOAD BALANCE TRAFFIC

Aggregate Load Balance with BGP and MPLS

MUM ID 2018 | 19 – 20 Oktober 2018

Yogyakarta, Indonesia



SPEAKER PROFILE

■ Firdhyan Adhie Lesmana

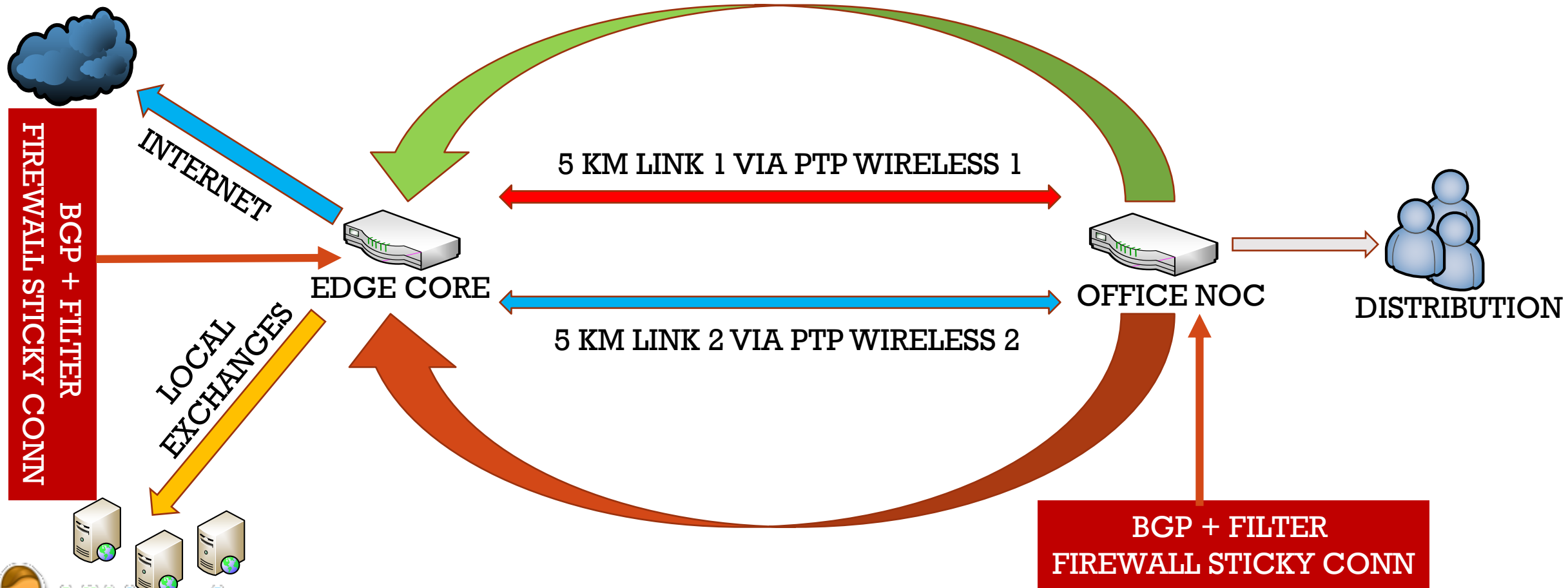
- Adhielesmana.com
- LepakWifi.com
- DNS Premium
 - (www.facebook.com/dnspremium)
- Forum MikroTik Indonesia
- ISP Operations Manager
 - PowerNet Liberia, West Africa.
- MikroTik Certified Trainer & Consultant
 - PowerNet Training Center, Liberia
- Facebook:
 - www.facebook.com/adhielesmana
- Whatsapp :
 - +6289660206541 (ID) / +231777306097 (LR)



DESKRIPSI

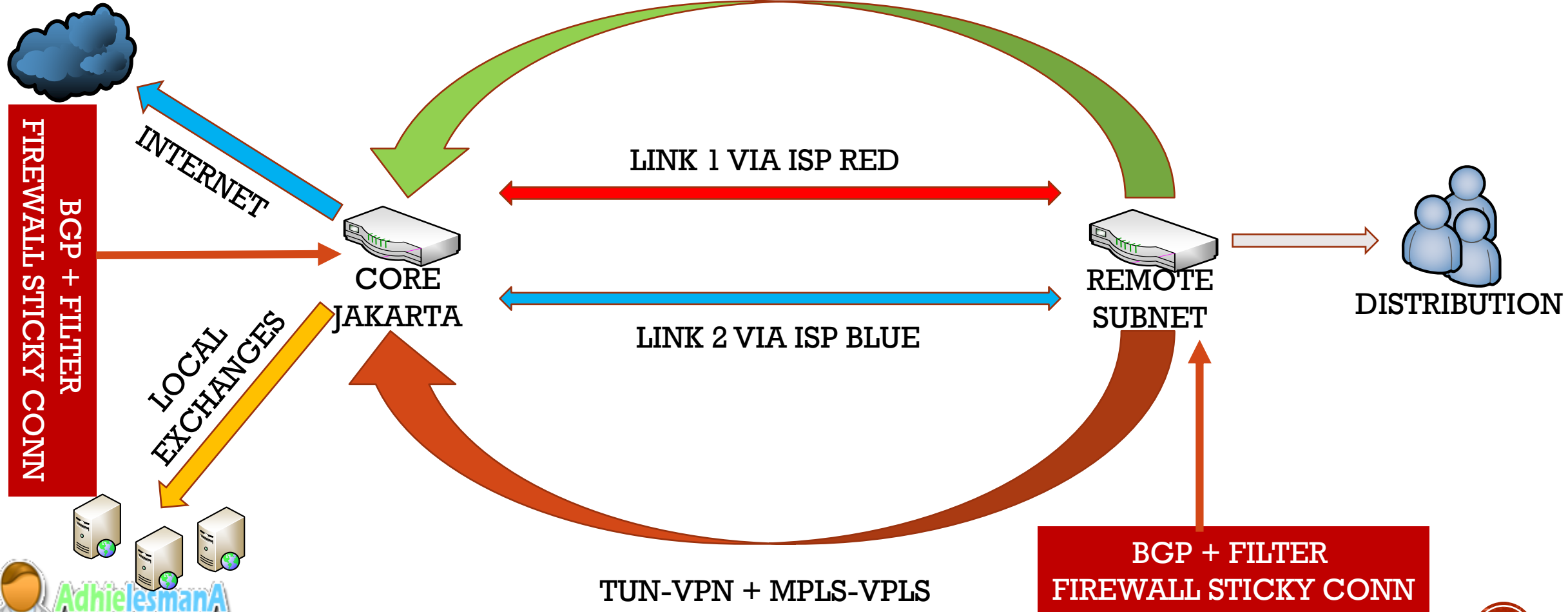
- Aggregating traffic for two or more backbone link.
 - Increase Total Backbone capacity.
 - Traffic Aggregate Solution
 - Not “Internet” Load Balance

CONTOH TOPOLOGI 1

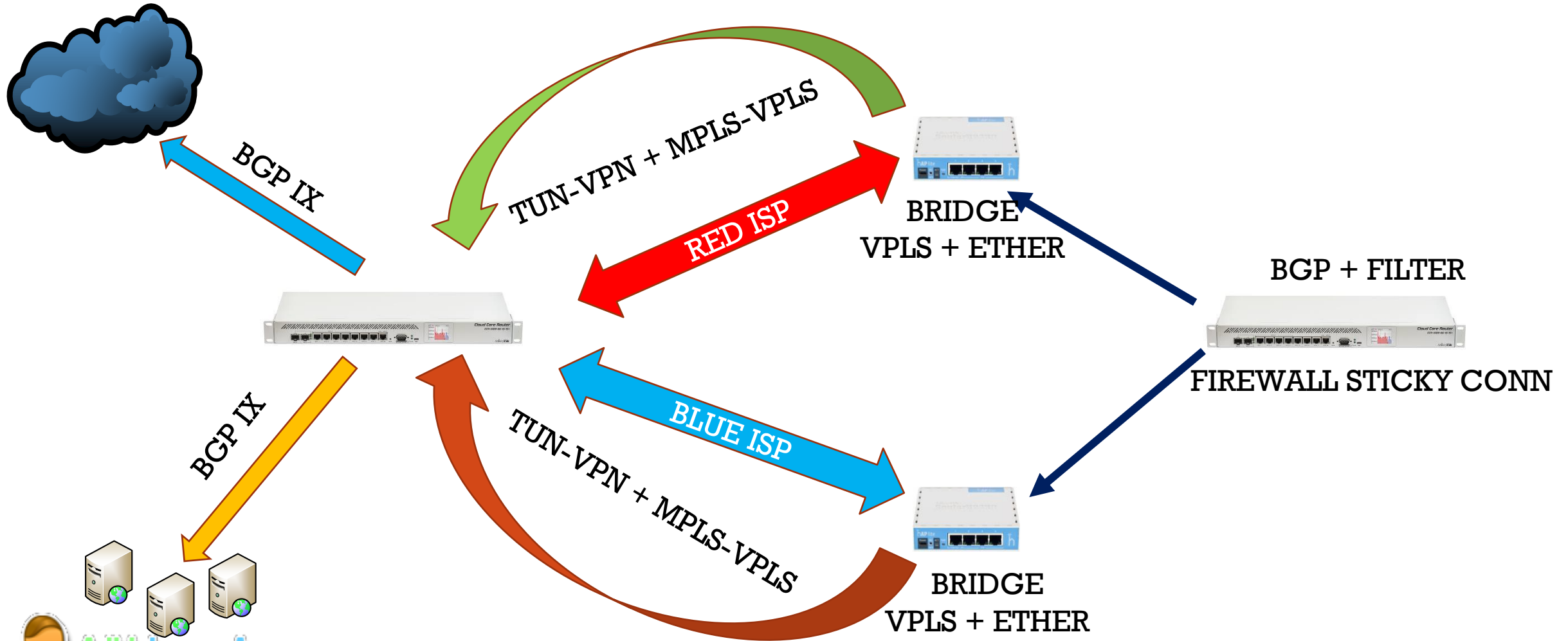


CONTOH TOPOLOGI 2

TUN-VPN + MPLS-VPLS



CONTOH TOPOLOGI 3



BENEFIT

- **Cost Efficient**
- **Support Redundancy / Failover**
- **Load Sharing / Aggregate Traffic**
- **Easy Maintenance & Troubleshoot**
- **MPLS is faster than EoIP, Less CPU and Less protocol overhead**

REQUIREMENT

- MikroTik Router (Both Locations)
 - Support MPLS, VPN, BGP, OSPF etc.
- Backbone Link
 - Wireless Backbone
 - Fiber Broadband (Tunnel)

STEP BY STEP

▪ 1. Prepare Link

- Make sure link established and traffic can passed.
- We can use Wireless Backbone or Tunnel via Fiber Broadband

▪ 2. Create VPLS

- MPLS - VPLS on each router
- Bridge with Ethernet *

▪ 3. Setup BGP

- Setup IP for VPLS interface
- Create BGP peering in VPLS
- Additional Route Filter Rules.

▪ 4. Firewall & Mark Routing

- Rule for Sticky Connections.

OPTION #1 WIRELESS BACKBONE

- Mode AP
 - AP Bridge or Bridge
 - ap + wds if station using wds
 - Bridged with Ethernet

- Mode Station
 - Station Bridge or Station WDS
 - Bridged with Ethernet

OPTION #2 TUNNEL BACKBONE

- **Server PPTP / L2TP**
 - Setup PPP Profile and Secret for Client PPP User Password
 - Use PTP Addressing /32 instead of IP Pool.

- **Client PPTP / L2TP**
 - Dial VPN Tunnel
 - Check IP
 - Test Connection, Ping to neighbor PTP IP address

MPLS - VPLS

- Create VPLS links between point to point router.
- Follow this information about VPLS
 - <https://wiki.mikrotik.com/wiki/Manual:MPLSVPLS>
 - Require OSPF
 - Require Loopback IP and Interfaces
- Join to MTCINE Training to learn BGP and MPLS Topic

BRIDGE VPLS AND ETHERNET

- Create Interface Bridge (For Topology 3)
 - add VPLS and Ethernet on Bridge.
 - For topology 1 and 2 we don't need bridge

SETUP BGP PEERING

- Once the link is established and both router is reachable.
- Create BGP peering between both locations and each link.
- Create new Routing Filter with custom action parameter.
- Assign the routing filter on BGP Instance

ROUTING FILTER EXAMPLE

- Make Incoming BGP Route Filter.
- Make ICMP to Each Opposite routers IP
- Apply Route filter on Core and Remote Router

The screenshot shows the Mikrotik WinBox interface. On the left sidebar, the 'Routing' menu item is highlighted with a red box. In the main window, the 'Route Filters' toolbar has a '+' icon highlighted with a red box. An orange arrow points from this '+' icon to the configuration window for a 'Route Filter <0.0.0.0/0>'. The configuration window has tabs for 'Matchers', 'BGP', 'Actions', and 'BGP Actions'. The 'BGP' tab is active, showing the 'Action' dropdown set to 'accept'. Below, the 'Set In Nexthop' field is populated with three entries, each containing '111.92.'.

ESTABLISHING THE BGP PEERS

- Assign the Route filter to BGP Peers configuration
- Establishing the BGP Peers

	Instance	Remote Address	Remote AS	M...	R...	TTL	Remote ID	Uptime	Prefix Co...	State
-Cyber	default	111.92.	65253	no	no	d...	172.16.253.1	00:00:55	2	established
-Cyber-2	default	111.92.	65253	no	no	d...	172.16.253.1	00:02:00	2	established
-Cyber-3	default	111.92.	65253	no	no	d...	172.16.253.1	00:02:53	2	established

ROUTING BY BGP - FILTER

- Routing Result from BGP + Routing Filter
- Result on Remote Router

	Dst. Address	Gateway	Distance	Routing Mark	Pref. Source
DAb	▶ 111.92.	111.92. reachable eth7-gate2, 111.92. reachabl...	200		
Db	▶ 111.92.	111.92. reachable eth7-gate2, 111.92. reachabl...	200		
Db	▶ 111.92.				
Db	▶ 111.92.				

Route

General Attributes

Dst. Address: 111.92.0/24

Gateway: 111.92. reachable eth7-gate2

111.92. reachable eth6-gate3

111.92. reachable eth8-gate1

OK

Copy

Remove

4 items out of 121 (1 selected)

ROUTING BY BGP - FILTER

- Result on Core Router

	Dst. Address	△	Gateway		Distance	P
DAb	▶ 111.92.0/30		111.92.0	reachable VPLS-MD-1, 111.92.0	200	
DAb	▶ 111.92.1/30		111.92.1	reachable VPLS-MD-1, 111.92.1	200	
DAb	▶ 111.92.2/30		111.92.2	reachable VPLS-MD-1, 111.92.2	200	
DAb	▶ 111.92.3/30		111.92.3	reachable VPLS-MD-1, 111.92.3	200	

FIREWALL AND ROUTING MARK

- Add new firewall mangle and mark route all incoming traffic from each WAN interfaces.
- Create new routing mark for each Gateway following the routing mark from ip firewall mangle.
- Do this on both end.

FIREWALL AND ROUTING MARK

Firewall

Filter Rules NAT Mangle Raw Service Ports Connections Address Lists Layer7 Protocols

+ - ✓ ✗ [icon] [icon] 00 Reset Counters 00 Reset All Counters

#	Action	Chain	In. Interface	Connection Mark	New Connection Mark	New Routing Mark	Bytes	Packets
0	✓ mark connection	prerouting	eth8-gate1		JKT-LINK-1		1409.1 GiB	1268 880 8...
1	✓ mark routing	prerouting	leth8-gate1	JKT-LINK-1		JKT-LINK-1	126.1 GiB	881 676 448
2	✓ mark routing	output		JKT-LINK-1		JKT-LINK-1	12.4 MiB	186 477
3	✓ mark connection	prerouting	eth7-gate2		JKT-LINK-2		1393.5 GiB	1255 863 6...
4	✓ mark routing	prerouting	leth7-gate2	JKT-LINK-2		JKT-LINK-2	120.8 GiB	892 627 005
5	✓ mark routing	output		JKT-LINK-2		JKT-LINK-2	203.9 MiB	413 995
6	✓ mark connection	prerouting	eth6-gate3		JKT-LINK-3		1420.2 GiB	1274 032 6...
7	✓ mark routing	prerouting	leth6-gate3	JKT-LINK-3		JKT-LINK-3	118.7 GiB	882 488 493
8	✓ mark routing	output		JKT-LINK-3		JKT-LINK-3	465.4 MiB	604 859

FIREWALL AND ROUTING MARK

Firewall

Filter Rules NAT Mangle Raw Service Ports Connections Address Lists Layer7 Protocols

+ - ✓ ✗ 🗑️ 🏠 00 Reset Counters 00 Reset All Counters

#	Action	Chain	In. Interface	Connection Mark	New Connection Mark	New Routing Mark	Bytes	Packets
0	mark connection	prerouting	eth8-gate1		JKT-LINK-1		1409.1 GiB	1268 880 8...
1	mark routing	prerouting	leth8-gate1	JKT-LINK-1		JKT-LINK-1	126.1 GiB	881 676 448
2	mark routing	output		JKT-LINK-1		JKT-LINK-1	12.4 MiB	186 477
3	mark connection	prerouting	eth7-gate2		JKT-LINK-2		1393.5 GiB	1255 863 6...
4	mark routing	prerouting	leth7-gate2	JKT-LINK-2		JKT-LINK-2	120.8 GiB	892 627 005
5	mark routing	output		JKT-LINK-2		JKT-LINK-2	203.9 MiB	413 995
6	mark connection	prerouting	eth6-gate3		JKT-LINK-3		1420.2 GiB	1274 032 6...
7	mark routing	prerouting	leth6-gate3	JKT-LINK-3		JKT-LINK-3	118.7 GiB	882 488 493
8	mark routing	output		JKT-LINK-3		JKT-LINK-3	465.4 MiB	604 859

STATIC ROUTE – ROUTING MARK

Route List

Routes Nexthops Rules VRF

+ - ✓ ✗ [icon] [icon] Find all [dropdown]

Routing Mark [dropdown] contains [dropdown] JKT [dropdown] + - Filter

	Dst. Address	Gateway	Distance	Routing Mark	Pref. Source
AS	0.0.0.0/0	111.92. reachable eth7-gate2	1	JKT-LINK-2	
AS	0.0.0.0/0	111.92. reachable eth8-gate1	1	JKT-LINK-1	
AS	0.0.0.0/0	111.92. reachable eth6-gate3	1	JKT-LINK-3	

RESULT

- Result on Remote Router
- Load Balance Aggregated Traffic.
- No NAT
 - Packet go and comes with origin IP addresses
 - No src-address changes even when the routing path changes
 - Normally in load-balance our src-address always changes

❖ eth6-gate3	Ethernet	1500	1580	4.5 Mbps	43.7 Mbps
❖ eth7-gate2	Ethernet	1500	1580	2.7 Mbps	36.9 Mbps
❖ eth8-gate1	Ethernet	1500	1580	5.8 Mbps	44.4 Mbps

RESULT

- Result on MAIN CORE Router

❖❖MD-NODE-1	L2TP Server Binding	1480			49.2 Mbps	9.6 Mbps
❖❖MD-NODE-2	L2TP Server Binding	1480			55.8 Mbps	2.9 Mbps
❖❖MD-NODE-3	L2TP Server Binding	1480			45.9 Mbps	5.5 Mbps
↔VPLS-MD-1	VPLS	1500	1600		48.9 Mbps	9.4 Mbps
↔VPLS-MD-2	VPLS	1500	1600		55.5 Mbps	2.7 Mbps
↔VPLS-MD-3	VPLS	1500	1600		45.6 Mbps	5.2 Mbps

THANKS

- Q & A
- Thanks To MikroTik
- ClickMediaNet - Blora