Multi-WAN
w/ auto notification
for
WAN's status updates

by Mar Aeschyllus Flordeliza

Profile:

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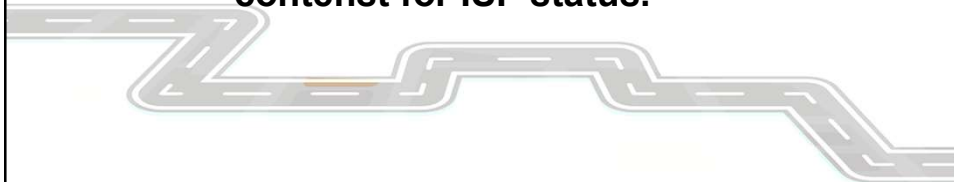**MTCRE - 1403RE066**
MTCWE - 1403WE045
MTCTCE- 1504TCE023
MTCINE - 1504INE021
MTCUME-1511UME014

What do we have for today?

- **Basic MultiWAN using ECMP.**
- **Force destination address to route out of a specific ISP.**
- **Ensure dst.address will go out of specific route.**
- **Setup routers email settings.**
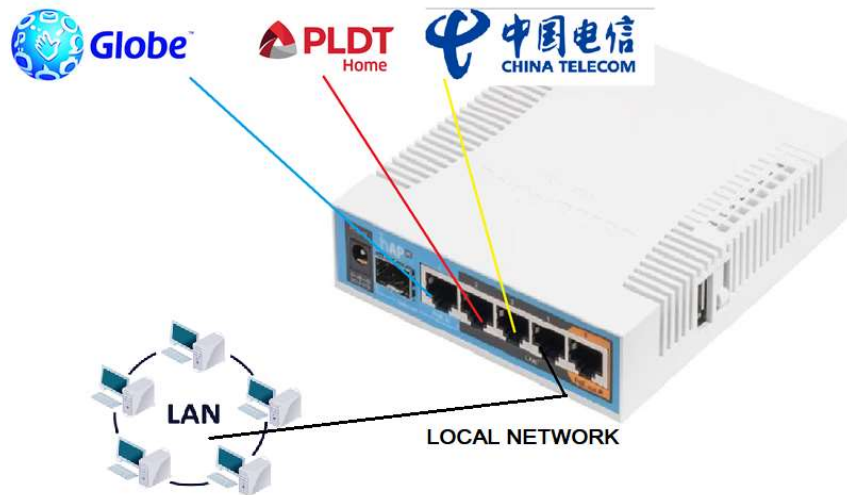- **Setup Trigger and email contenst for ISP status.**

Which way to start?

Multi-WAN Setup

Multi-WAN is a practical setup to maximize multiple ISP's And be able to avoid downtime if you have alternate ISP.

➢ We will use Tripple WAN for better sample

Tripple WAN Source

LAN

LOCAL NETWORK

IP configurations for simulation

- ISP1: 192.168.50.0/24
  GW: 192.168.50.1

- ISP2: 192.168.60.0/24
  GW: 192.168.60.1

- ISP3: 192.168.70.0/24
  GW: 192.168.70.1

- Local Network: 192.168.10.0/24
  GW: 192.168.10.1

Tripple WAN setup

1. **IP>Addresses**
2. **IP>DNS**
3. **Firewall>NAT>masquerade**
4. **Firewall>Mangle**
5. **IP>Routes**
6. **Local DHCP**

Tripple WAN

IP>Addresses

Address		Network	Interface
::: LOCAL Network			
192.168.10.254/24		192.168.10.0	ether4
192.168.50.254/24		192.168.50.0	ether1-WAN1
192.168.60.254/24		192.168.60.0	ether2-WAN2
192.168.70.254/24		192.168.70.0	ether3-WAN3

IP>DNS

DNS Settings

Servers: 208.78.222.222
208.67.220.220

Tripple WAN

Firewall>NAT>masquerade

#	Action	Chain	:||:|| Out. Interface
0	⇄∥ masquerade	srcnat	ether1-WAN1
1	⇄∥ masquerade	srcnat	ether2-WAN2
2	⇄∥ masquerade	srcnat	ether3-WAN3

Firewall>Mangle

Firewall

Filter Rules NAT Mangle Service Ports Connections Address Lists Layer7 Protocols

#	Action	Chain	In. Interface	(Connection Mark	I New Connection Mark	New Routing Mark
	::: Tripple WAN CONFIG					
	mark connection	input	ether1-WAN1		wan1_conn	
	mark connection	input	ether2-WAN2		wan2_conn	
	mark connection	input	ether3-WAN3		wan3_conn	
	mark routing	output		wan1_conn		to_wan1
	mark routing	output		wan3_conn		to_wan3
	mark routing	output		wan2_conn		to_wan2

Tripple WAN

IP>Routes

Route List

Routes Nexthops Rules VRF

	Dst. Address	Gateway	(Distance	Scope	Target Scope	Routing Mark
AS	▶ 0.0.0.0/0	192.168.50.1 reachable ether1-WAN1	1	30	10	to_wan1
AS	▶ 0.0.0.0/0	192.168.60.1 reachable ether2-WAN2	1	30	10	to_wan2
AS	▶ 0.0.0.0/0	192.168.70.1 reachable ether3-WAN3	1	30	10	to_wan3
	::: Multi-WAN					
AS	▶ 0.0.0.0/0	192.168.70.1 reachable ether3-WAN3, 1...	1	30	10	

Route <0.0.0.0/0>

General Attributes

Dst. Address: 0.0.0.0/0

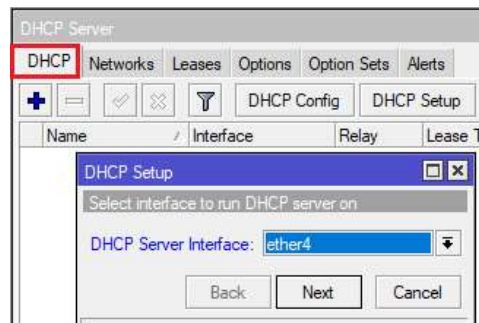Gateway: 192.168.70.1 ▼ reachable ether3-WAN3 ◆
192.168.60.1 ▼ reachable ether2-WAN2 ◆
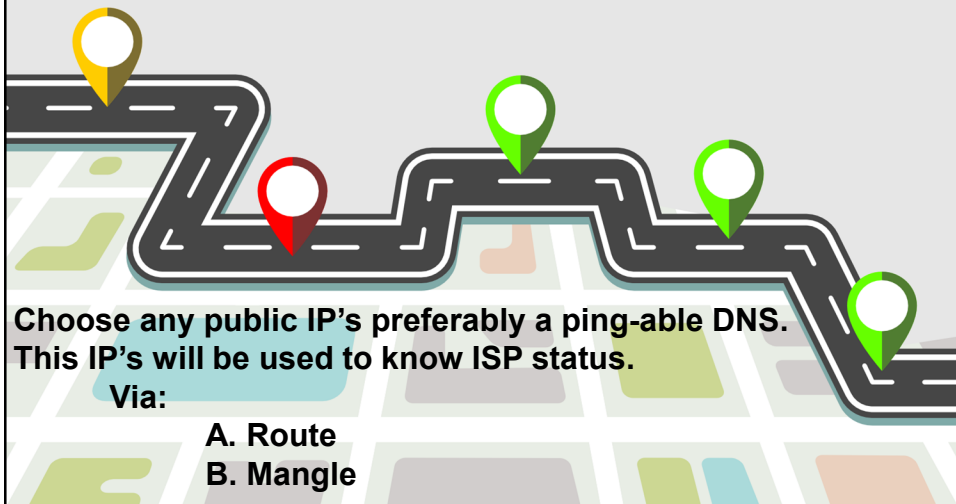192.168.50.1 ▼ reachable ether1-WAN1 ◆

Check Gateway: ▼

Tripple WAN

Local DHCP

Force a dst.address to route out of a specific ISP.

Choose any public IP's preferably a ping-able DNS.
This IP's will be used to know ISP status.
    Via:
        A. Route
        B. Mangle

Choose IP's

Choose 3 ping-able IP that we will be used for monitoring later-on.

49.151.178.157 for ISP1 Monitor

124.106.88.146 for ISP2 Monitor

121.96.219.176 for ISP3 Monitor

A. Force dst. to Route to a specific ISP via Route

IP> Routes:
- **when dst. is 49.151.178.157 gateway is ISP1's GW**
- **when dst. is 124.106.88.146 gateway is ISP2's GW**
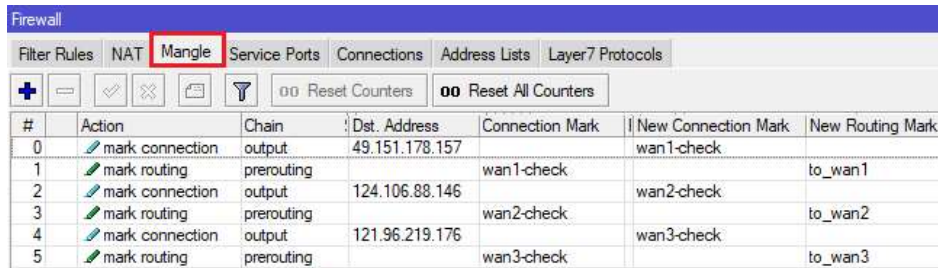- **when dst. is 121.96.219.176 gateway is ISP3's GW**

B. Force dst. to Route to a specific ISP via Mangle

Chain: Output   dst.add: 49.151.178.157 new connection mark: wan1-check
Chain: Prerouting connection mark: wan1-check new-routing-mark: to_wan1

Chain: Output   dst.add: 124.106.88.146 new connection mark: wan2-check
Chain: Prerouting connection mark: wan2-check new-routing-mark: to_wan2

Chain: Output   dst.add: 121.96.219.176 new connection mark: wan3-check
Chain: Prerouting connection mark: wan3-check new-routing-mark: to_wan3

Firewall

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

➕ ➖ ✓ ✗ ▢ ▽ | 00 Reset Counters | 00 Reset All Counters

#	Action	Chain	Dst. Address	Connection Mark	New Connection Mark	New Routing Mark
0	mark connection	output	49.151.178.157		wan1-check	
1	mark routing	prerouting		wan1-check		to_wan1
2	mark connection	output	124.106.88.146		wan2-check	
3	mark routing	prerouting		wan2-check		to_wan2
4	mark connection	output	121.96.219.176		wan3-check	
5	mark routing	prerouting		wan3-check		to_wan3

The Problem

Despite having Route and Mangles that will force packets to go out of a certain ISP.

Routes will be disabled whenever gateway is unreachable.
Giving chance for the router to ping a monitoring IP thru other ISP/Gateway

This will give false report in our monitoring.
As we want to make them triggers

Scenario 1

Forced Route Disabled

Route for mangle disabled

49.151.178.157 is still ping-able despite ISP1 being disconnected

Scenario 2

Forced Route Disabled

Route for mangle disabled

124.106.88.146 is still ping-able despite ISP2 being disconnected

Scenario 3

Route List

Routes | Nexthops | Rules | VRF

	Dst. Address	Gateway	Check Gat...	Distance	Scope	Target Scope	Routing Mark
DC	▶ 192.168.70.0/24	ether3-WAN3 unreachable		255	10	10	
DAC	▶ 192.168.60.0/24	ether2-WAN2 reachable		0	10	10	
DAC	▶ 192.168.50.0/24	ether1-WAN1 reachable		0	10	10	
DAC	▶ 192.168.10.0/24	ether4 reachable		0	10	10	
	;;; ISP2_monitor						
AS	▶ 124.106.88.146	192.168.60.1 reachable ether2-WAN2		1	10	10	
	;;; ISP3_monitor						
S	▶ 121.96.219.176	192.168.70.1 unreachable		1	10	10	
	;;; ISP1_monitor						
AS	▶ 49.151.178.157	192.168.50.1 reachable ether1-WAN1		1	10	10	
AS	▶ 0.0.0.0/0	192.168.50.1 reachable ether1-WAN1		1	30	10	to_wan1
AS	▶ 0.0.0.0/0	192.168.60.1 reachable ether2-WAN2		1	30	10	to_wan2
S	▶ 0.0.0.0/0	192.168.70.1 unreachable		1	30	10	to_wan3
	;;; Multi-WAN						
AS	▶ 0.0.0.0/0	192.168.70.1 unreachable, 192.168.60.1 reachable...		1	30	10	

Terminal

```
    sent=934 received=881 packet-loss=5% min-rtt=71ms avg-rtt=167ms

echo: dhcp,critical,error dhcp-client on ether2-WAN2 lost IP address
[admin@Multi-WAN auto change Gateway] > ping 124.106.88.146
  SEQ HOST                        SIZE TTL TIME  STATUS
    0 124.106.88.146               56  45 177ms
    1 124.106.88.146               56  45  72ms
    2 124.106.88.146               56  45 177ms
```

Forced Route Disabled

Route for mangle disabled

121.96.219.176 is still ping-able despite ISP2 being disconnected

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Ensuring dst.address will go out of assigned specific route

To avoid monitoring IP's being pinged thru other ISP's

The Solution

To avoid monitoring IP's being pinged thru other ISP's we will use Firewall Filter.

Chain: Output   dst.add: 49.151.178.157   out.interface:Ether2_Wan2 action: drop
Chain: Output   dst.add: 49.151.178.157   out.interface:Ether3_Wan3 action: drop

Chain: Output   dst.add: 124.106.88.146   out.interface:Ether1_Wan1 action: drop
Chain: Output   dst.add: 124.106.88.146   out.interface:Ether3_Wan3 action: drop

Chain: Output   dst.add: 121.96.219.176   out.interface:Ether1_Wan1 action: drop
Chain: Output   dst.add: 121.96.219.176   out.interface:Ether2_Wan2 action: drop

---

The Solution

Drops monitoring IP for ISP1 from going out of ISP2 & ISP3
Chain: Output   dst.add: 49.151.178.157   out.interface:Ether2_Wan2 action: drop
Chain: Output   dst.add: 49.151.178.157   out.interface:Ether3_Wan3 action: drop

#	Action	Chain	S	Dst. Address	I	I	In. Inter...	Out. Interface
0	✖ drop	output		49.151.178.157				ether2-WAN2
1	✖ drop	output		49.151.178.157				ether3-WAN3
2	✖ drop	output		124.106.88.146				ether1-WAN1
3	✖ drop	output		124.106.88.146				ether3-WAN3
4	✖ drop	output		121.96.219.176				ether1-WAN1
5	✖ drop	output		121.96.219.176				ether2-WAN2

Firewall

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

00 Reset Counters   00 Reset All Counters

The Solution

Drops monitoring IP for ISP2 from going out of ISP1 & ISP3
Chain: Output   dst.add: 124.106.88.146 out.interface:Ether1_Wan1 action: drop
Chain: Output   dst.add: 124.106.88.146 out.interface:Ether3_Wan3 action: drop

The Solution

Drops monitoring IP for ISP3 from going out of ISP1 & ISP2
Chain: Output   dst.add: 121.96.219.176 out.interface:Ether1_Wan1 action: drop
Chain: Output   dst.add: 121.96.219.176 out.interface:Ether2_Wan2 action: drop

Results

Firewall Drops Traffic for 49.151.178.157 going out of ether2_WAN2 and ether3_WAN3.

Cannot Ping 49.151.178.157 when ISP1 is down.

Results

Firewall Drops Traffic for 124.106.88.146 going out of ether1_WAN1 and ether3_WAN3.

Cannot Ping 124.106.88.146 when ISP2 is down.

Results

Firewall Drops Traffic for 121.96.219.176 **going out of ether1_WAN1 and ether2_WAN2.**

Firewall

Filter Rules	NAT	Mangle	Service Ports	Connections	Address Lists	Layer7 Protocols

| ✚ | ➖ | ✔ | ✖ | 🗁 | ▽ | 00 Reset Counters | 00 Reset All Counters |

#	Action	Chain	Dst. Address	I	I	I	Out. Interface	Bytes	Packets
	✖ drop	output	121.96.219.176				ether1-WAN1	504 B	9
	✖ drop	output	121.96.219.176				ether2-WAN2	0 B	0

Cannot Ping 121.96.219.176 **when** ISP3 **is down.**

Terminal

```
/              Move up to base level
..             Move up one level
/command       Use command at the base level
[admin@Multi-WAN auto change Gateway] > ping 121.96.219.176
SEQ HOST                                        SIZE TTL TIME  STATUS
  0                                                             packet r...
  1                                                             packet r...
  2                                                             packet r...
```

Route List

Routes	Nexthops	Rules	VRF

| ✚ | ➖ | ✔ | ✖ | 🗁 | ▽ |

	Dst. Address	Gateway	Check Gat...	Distance	Scope	Target Scope	Routing Mark
DC	192.168.70.0/24	ether3-WAN3 unreachable		255	10	10	
DAC	192.168.60.0/24	ether2-WAN2 reachable		0	10	10	
DAC	192.168.50.0/24	ether1-WAN1 reachable		0	10	10	
DAC	192.168.10.0/24	ether4 reachable		0	10	10	
;;; ISP2_monitor							
AS	124.106.88.146	192.168.60.1 reachable ether2-WAN2		1	10	10	
;;; ISP3_monitor							
S	121.96.219.176	192.168.70.1 unreachable		1	10	10	
;;; ISP1_monitor							
AS	49.151.178.157	192.168.50.1 reachable ether1-WAN1		1	10	10	
AS	0.0.0.0/0	192.168.50.1 reachable ether1-WAN1		1	30	10	to_wan1
AS	0.0.0.0/0	192.168.60.1 reachable ether2-WAN2		1	30	10	to_wan2
S	0.0.0.0/0	192.168.70.1 unreachable		1	30	10	to_wan3
;;; Multi-WAN							
AS	0.0.0.0/0	192.168.70.1 unreachable, 192.168.50.1 reachable...		1	30	10	

Setup routers email settings.

Router's Email setup

Email Settings

Server:	mikrotikphilippines.com
Port:	26
Start TLS:	no

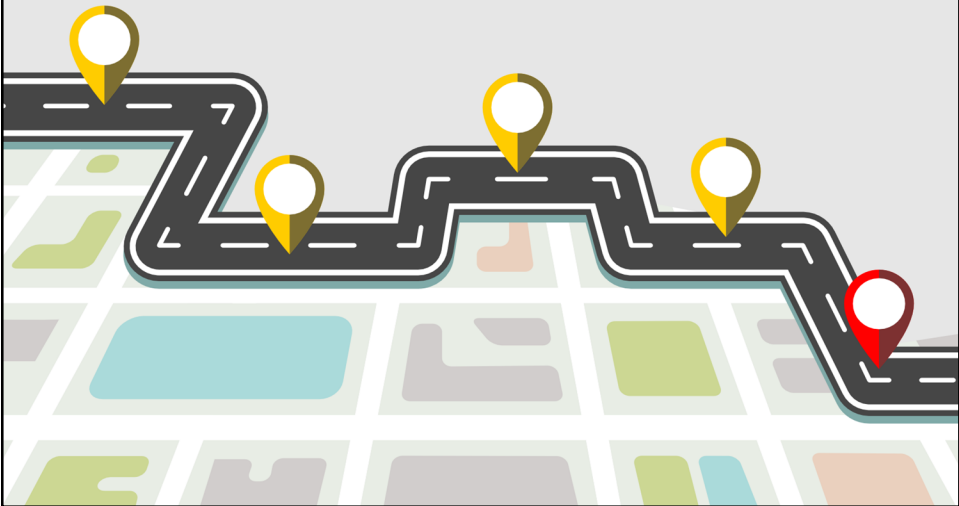mail server setting

From:	mar.flordeliza
User:	mar.flordeliza@mikrotikphilippines.com
Password:	*********

OK
Cancel
Apply
Send Email

account to be used by the router to send mails

Triggers for Email Router

Auto Email setup

Now that we are assured that when ISP1 is down you cannot ping 49.151.178.157

Now that we are assured that when ISP2 is down you cannot ping 124.106.88.146

Now that we are assured that when ISP3 is down you cannot ping 121.96.219.176

We could now use them as triggers.

Auto Email setup

With the use of Netwatch monitoring 49.151.178.157 for ISP1

Interval period could be shorten for a more accurate status check.

Auto Email setup

With the use of Netwatch monitoring 124.106.88.146 for ISP2

Netwatch Host <124.106.88.146>

Host | Up | Down

Host: 124.106.88.146
Interval: 00:00:30
Timeout: 1000 ms
Status: up
Since: Dec/13/2017 11:27:22

Interval period could be shorten for a more accurate status check.

Netwatch Host <124.106.88.146>

Host | **Up** | Down

On Up:

/tool e-mail send to=aesflordeliza@gmail.com
subject="ISP2 is now up"
body="ISP2 on Ether2 is now restored"
from="mar.flordeliza@mikrotikphilippines.com"

Netwatch Host <124.106.88.146>

Host | Up | **Down**

On Down:

/tool e-mail send to=aesflordeliza@gmail.com
subject="ISP2 is down"
body="ISP2 on Ether2 is Down"
from="mar.flordeliza@mikrotikphilippines.com"

Auto Email setup

With the use of Netwatch monitoring 121.96.219.176 for ISP3

Netwatch Host <121.96.219.176>

Host | Up | Down

Host: 121.96.219.176
Interval: 00:00:30
Timeout: 1000 ms
Status: up
Since: Dec/13/2017 11:27:21

Interval period could be shorten for a more accurate status check.

Netwatch Host <121.96.219.176>

Host | **Up** | Down

On Up:

/tool e-mail send to=aesflordeliza@gmail.com
subject="ISP3 is now up"
body="ISP3 on Ether3 is now restored"
from="mar.flordeliza@mikrotikphilippines.com"

Netwatch Host <121.96.219.176>

Host | Up | **Down**

On Down:

/tool e-mail send to=aesflordeliza@gmail.com
subject="ISP3 is down" body="ISP3 on
Ether3 is Down"
from="mar.flordeliza@mikrotikphilippines.com"

Configuration benefits?

- **Knows when your ISP goes down and the time it was restored.**
- **Router reports via email means you could also received it while on vacation/away from work.**
- **Ease of mind that you don't need to manually check each ISP manually, specially for multiple ISP deployment.**
- **Ensuring configuration will work even on modem-router down time, ISP link disconnection or any other forms of internet source problem.**

Thank You
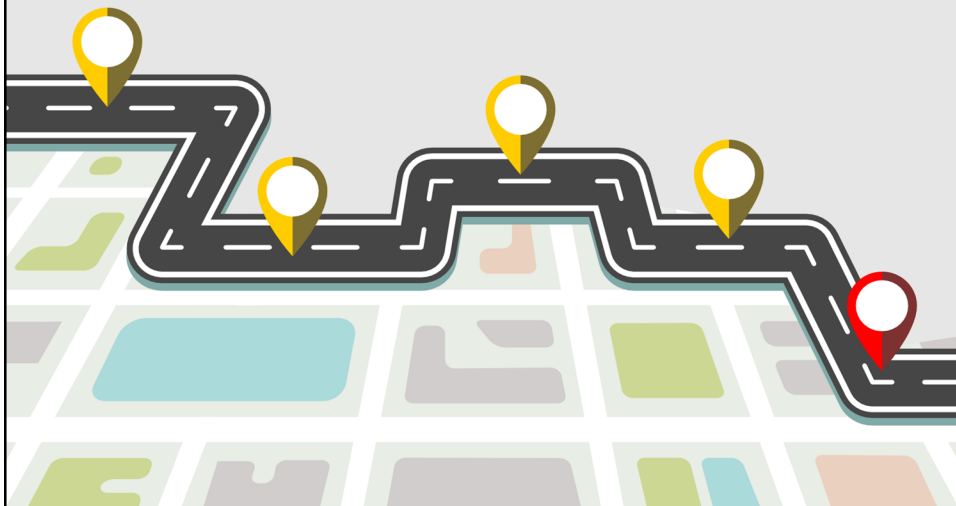
The End

- **Questions and Answers**

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