Load Balancing and Fail-Over in Router Os

Presented By

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About Simplifinetworks

• Largest Mikrotik Routerboard Distributor in E/A.
• WiFi AP, PTP, PTMP, Security

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About Presenter

- Router Os user since 2015
- Big fan of API..(php)
- First MUM :) 

Affiliation
- Simplifinetworks
- netLabsUG Research project @ Makerere University Kampala
Agenda

- Load Balancing
- SimplifiApp
Load Balancing...

- Hotspot provider
- Hotel /Office/Hostel/Hostel
- Apartments
Why

- Average speeds 2mb/2mb..slow.
- Always on requirement
- High Throughput need
- Cost considerations
Router OS options

- ECMP → Equal Cost Multi path Routing
  Traffic divided up per src-dst-address combination.
  Chances of traffic switching gateways when routing tables are periodically flushed.

- Nth Load Balancing
  Ties user to same source IP address (persistent user sessions)
Router OS options

- PCC → Per Connection Classifier
  Splits traffic into streams according to a set of options (src-address, src-port, dst-address, dst-port) using a hashing algorithm.

For example:

PCC = Hash(dst-address-and-port)/Denominator -> Reminder
- Remainder => 0-4294967295 (integer number)
- Denominator => 1-4294967295 (integer number)
- ValuesToHash ::= both-addresses|both-ports|dst-address-and-port|
- src-address|src-port|both-addresses-and-ports|dst-address|dst-port|src-address-and-port

If reminder equals X label connection 1/stream 1
Router Os Options

Packets In

Ip firewall mangle

HASH Algorithm

Streams out

wan1
wan2
wan3
wan3

Splitting into Streams
What you need!!

- Mikrotik Routerboard -> RouterOs v3.48 & above.
- 2 or more Internet connections.
  - Wan1 192.168.30.2
  - Wan2 192.168.42.2
  - Lan 192.168.88.0/24
Set Up
Set Up

- Add addresses
- Accept traffic in the prerouting chain

```
/ip address
add address=192.168.88.1/24 network=192.168.88.0 interface=bridge
add address=192.168.30.2/24 network=192.168.30.0 interface=Wan1
add address=192.168.42.2/24 network=192.168.42.0 interface=Wan2
/ip firewall mangle
add action=accept chain=prerouting dst-address=192.168.42.0/24 in-interface=bridge
add action=accept chain=prerouting dst-address=192.168.30.0/24 in-interface=bridge
```
Set Up

- Mark traffic from the Internet to avoid replies using wrong gateway.

```
/ip firewall mangle
add action=mark-connection chain=input connection-mark=no-mark in-interface=Wan1 new-connection-mark=Wan1_conn passthrough=yes
add action=mark-connection chain=input connection-mark=no-mark in-interface=Wan2 new-connection-mark=Wan2_conn passthrough=yes
```
Set Up

- Add the PCC rules in Ip mangle menu and mark connections
Set Up

/ip firewall mangle
add action=mark-connection chain=prerouting connection-mark=no-mark dst-address-type=!local in-interface=bridge new-connection-mark=Wan1_conn passthrough=yes per-connection-classifier=both-addresses-and-ports:2/0
add action=mark-connection chain=prerouting connection-mark=no-mark dst-address-type=!local in-interface=bridge new-connection-mark=Wan2_conn passthrough=yes per-connection-classifier=both-addresses-and-ports:2/1

• Add routing mark in prerouting and output chains

/ip firewall mangle
add action=mark-routing chain=prerouting connection-mark=Wan1_conn in-interface=bridge new-routing-mark=to_Wan1 passthrough=no
add action=mark-routing chain=prerouting connection-mark=Wan2_conn in-interface=bridge new-routing-mark=to_Wan2 passthrough=no

add action=mark-routing chain=output connection-mark=Wan1_conn new-routing-mark=to_Wan1
add action=mark-routing chain=output connection-mark=Wan2_conn new-routing-mark=to_Wan2
## Set Up

### Firewall Table

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>passthrough</td>
<td>prerouting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>118.8 M</td>
<td>136 433</td>
</tr>
<tr>
<td>1</td>
<td>passthrough</td>
<td>forward</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>118.8 M</td>
<td>136 433</td>
</tr>
<tr>
<td>2</td>
<td>passthrough</td>
<td>postrouting</td>
<td>192.168.42.0/24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>118.8 M</td>
<td>136 433</td>
</tr>
<tr>
<td>3</td>
<td>accept</td>
<td>prerouting</td>
<td></td>
<td>192.168.30.0/24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 B</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>accept</td>
<td>prerouting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 B</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>mark connection</td>
<td>input</td>
<td></td>
<td>Wan1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20.7 K</td>
</tr>
<tr>
<td>6</td>
<td>mark connection</td>
<td>input</td>
<td></td>
<td>Wan2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>73.5 K</td>
</tr>
<tr>
<td>7</td>
<td>mark connection</td>
<td>prerouting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>21.0 K</td>
<td>339</td>
</tr>
<tr>
<td>8</td>
<td>mark connection</td>
<td>prerouting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>33.3 K</td>
<td>436</td>
</tr>
<tr>
<td>9</td>
<td>mark routing</td>
<td>prerouting</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>436.7 K</td>
<td>3 147</td>
</tr>
<tr>
<td>10</td>
<td>mark routing</td>
<td>prerouting</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>473.1 K</td>
<td>7 536</td>
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<tr>
<td>11</td>
<td>mark routing</td>
<td>output</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>549 B</td>
<td>6</td>
</tr>
<tr>
<td>12</td>
<td>mark routing</td>
<td>output</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2639 B</td>
<td>39</td>
</tr>
</tbody>
</table>
Masquerade Rule

- Add a masquerade rule for each Wan connection in `ip firewall nat;`.

```
/ip firewall nat
add action=masquerade chain=srcnat out-interface=Wan1
add action=masquerade chain=srcnat out-interface=Wan2
```
Set Up

• Routing Table

<table>
<thead>
<tr>
<th>Dist. Address</th>
<th>Gateway</th>
<th>Check Gateway</th>
<th>Distance</th>
<th>Routing Mark</th>
<th>Pref. Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS</td>
<td>0.0.0.0/0</td>
<td>192.168.42.1</td>
<td>reachable Wan2</td>
<td>ping</td>
<td>1 to_Wan2</td>
</tr>
<tr>
<td>AS</td>
<td>0.0.0.0/0</td>
<td>192.168.30.1</td>
<td>reachable Wan1</td>
<td>ping</td>
<td>1 to_Wan1</td>
</tr>
<tr>
<td>S</td>
<td>0.0.0.0/0</td>
<td>192.168.30.1</td>
<td>reachable Wan1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>AS</td>
<td>0.0.0.0/0</td>
<td>192.168.42.1</td>
<td>reachable Wan2</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>DAC</td>
<td>192.168.30.0/24</td>
<td>Wan1 reachable</td>
<td>0</td>
<td>192.168.30.2</td>
<td></td>
</tr>
<tr>
<td>DAC</td>
<td>192.168.42.0/24</td>
<td>Wan2 reachable</td>
<td>0</td>
<td>192.168.42.1</td>
<td></td>
</tr>
<tr>
<td>DAC</td>
<td>192.168.88.0/24</td>
<td>bridge reachable</td>
<td>0</td>
<td>192.168.88.1</td>
<td></td>
</tr>
</tbody>
</table>
Set Up

- Traffic
Speed Test

Speed Results

DOWNLOAD SPEED  |  UPLOAD SPEED

11.12 Mbps  |  5.34 Mbps

Latency 301 ms  |  Protocol IPV4  |  Host Foxboro, MA

Learn about the things that may affect your test results.

Test Again  |  Speed Survey
Considerations

PCC with Hotspot


Third WAN connection

- Just modify PCC rule and corresponding routing mark and default route

```
/ip firewall mangle
add action=mark-connection chain=prerouting connection-mark=no-mark dst-address-type=!local interface=bridge new-connection-mark=Wan1_conn passthrough=yes per-connection-classifier=both-addresses-and-ports:3/0
add action=mark-connection chain=prerouting connection-mark=no-mark dst-address-type=!local interface=bridge new-connection-mark=Wan2_conn passthrough=yes per-connection-classifier=both-addresses-and-ports:3/1
add action=mark-connection chain=prerouting connection-mark=no-mark dst-address-type=!local interface=bridge new-connection-mark=Wan3_conn passthrough=yes per-connection-classifier=both-addresses-and-ports:3/2
```
Resources
