Users Equal Distribution on Multi-PPPoE Servers

Using RouterBoard and RouterOS

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MuM Dubai – Aug 2012.
Current Scenario – Case Study:

Wisp had the following:

- Approx ~1500+ users (10% monthly growth)
- 4 Different wireless Links
- 4 PPPoe servers
- 4 account types and Service
Case Study: ppp distribution

- 4 Services are offered with different prices

- This is giving unbalanced distribution as pppoe clients per one concentrator

  - ex: gorilla have ~50 clients, turtle have ~850

Current Scenario – Closer Look:

As demand is more on low cost Account Normally pppA(turtle) is congested ~ 900 Users

NO Load Balancing
Current Scenario – Closer Look:

4 PPPoe Servers with 4 different account types

One server per service

Each Server have 4 interfaces serving all 4 Links
one interface for every link

One Server per Service
Case Study: wireless Links

- All 4 links serve different areas (city and suburbs)
  thus it is not possible to have one server per link
  ex: link 1 have total of ~600 clients and link 2 have only ~150
Case Study: old servers

Old Servers are all x86 running routerOS with low resources.

No Organisation – Chaos

the clients are divided into 4 different wireless links then joined with basic switches along with one interface from each concentrator.

Where is pppA ????
True Cable Jungle

Case Study: Requirements

- Chaos needs reorganization and New Topology...

- **Old Servers Systems Needs to be replaced**...

- All 4 links must be joined in one network somehow...

- Need load balance pppoe on all 4 servers.

- Need System scalability
  (as growth is ~150+ users/month)
Chaos needs reorganization and New Topology, how?

Solution: topology

Design New Topology
Solution: Hardware

- Old Servers Needs to be replaced

What To Choose???
Solution: Bridge

- Wireless Links Needs to Be Joined together, How?

Bridge ALL Links and use routerOS Firewall Bridge
Solution: Load Balance

- **Load Balance pppoe Connections**

  Tune the previous bridge to act as load balancer
Solution: Load Balancer

Closer look to configuration:
Solution: Load Balancer

Load balance LAB:

- 4* 1100AHx2 as pppoe servers
- 1 * 1100AH as Bridge/firewall
Solution: Bridge

Bridge ALL Links and pppoes

Create Bridge with ALL links and pppoe servers as ports
Solution: Bridge Firewall

After bridge we will use routerOS Firewall Facility

- Bridge Filter Drop ALL except:
  - pppoe-discovery (8863)
  - pppoe Sessions (8864)
Solution: pppoe servers

after firewall we create all PPPoe servers

4 pppoe servers

4 Service names

4 ip pools
Solution: Simulator

- Using RB433 connected to all 4 link ports we created script to simulate ~500 real clients connections.
Solution: Simulator result

- Non equal Distribution between the pppoes
- pppoe sessions are distributed arbitrary on all 4 servers....
- Pppoe Discovery have 16 service
  (4 Gorilla 4tiger 4Rabbit 4Turtle)
Solution: `#connected`

- In Order to load balance we need to know at anytime how many users are connected to each pppoe server

create and Schedule every 5s script to update the NO’ of connected users

`/ppp active print count-only`
Solution: Load Balancer

-Now that the Number of active ppp is known on each server, how to pass it to Bridge????

Create local BGP between ALL ppps and bridge, where we store the # of ppp in BGP Local pref & pass it to bridge...
Solution: Load Balancer

- Create a local BGP peers and set instance:
Solution: Load Balancer

- Create a Route on all ppps with gateway to the main bridge to pass all the route info
Solution: Load Balancer

- **After BGP creation**
- **BGP peer list in main bridge will look as follows:**
Solution: Load Balancer

Script is running on all ppps every 5 seconds & returning the number of active connections

Modify script to store The # of ppp in BGP pref

Source:
```
:global ppp [ /ppp active print count-only ]
if ($ppp!=$pref) do={
    /ip route set [find dst-address=10.255.255.255/32] bgp-local-pref=$ppp
}```
Solution: Load Balancer

Now after active user # on each ppp is in bgp local pref how to prioritize one ppp over other?

Configure the firewall to be ready to enable/disable discovery to every ppp using MAC Protocols

<table>
<thead>
<tr>
<th>#</th>
<th>Chain</th>
<th>Interfaces...</th>
<th>Interfaces...</th>
<th>Src. MAC Address...</th>
<th>Dst. MAC Address...</th>
<th>MAC Protocol (hex)</th>
<th>Action</th>
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<tr>
<td>0</td>
<td>forward</td>
<td>10.78.9.11 --&gt; pppA</td>
<td>PPPA</td>
<td></td>
<td></td>
<td>8863 (pppoe-discovery)</td>
<td>drop</td>
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<tr>
<td>1</td>
<td>pppoe</td>
<td>10.78.9.12 --&gt; pppB</td>
<td>PPPB</td>
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<td>8863 (pppoe-discovery)</td>
<td>drop</td>
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<td>2</td>
<td>pppoe</td>
<td>10.78.9.13 --&gt; pppC</td>
<td>PPCP</td>
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<td>drop</td>
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<td>3</td>
<td>pppoe</td>
<td>10.78.9.14 --&gt; pppD</td>
<td>PPPD</td>
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<td>default accept session</td>
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<td>7</td>
<td>Drop ALL except one control PC</td>
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<td></td>
<td>100:08:0D:1B:F8:FD 100:08:0D:1B:F8:FD</td>
<td></td>
<td></td>
<td>drop</td>
</tr>
</tbody>
</table>
Solution: Load Balancer

How to give advantage to the lowest occupied PPP and pass connections to it??

create a Scheduled script that discover the lowest occupied ppp & Enable its discovery in firewall, wich make it discoverable to pass sessions to it ....

```plaintext
:global min 10000000
:global clients
:global newActive
:global concentrator
:foreach c=server in=[/ip route find dst-address=10.255.255.255/32] do=

  :set clients [/ip route get $server bgp-local-pref]
  :set concentrator [/ip route get $server gateway]

if ($clients<$min) do=

  :set min $clients
  :set newActive $concentrator

}:foreach

:foreach c=rules in=[/interface bridge filter find] do=

  :if ([/interface bridge filter get $rules comment]=$newActive) do=

    /int br filters disable $rules;
  } else=

    /int bridge filter enable $rules;

}:foreach
```
Solution: Load Balancer TEST

Balancer in Action

- Discoverable & will get session

- pppD less occupied
Solution: Load Balancer TEST

Test with simulator:

35 Clients on each

4 client types from 4 different links
ex: tiger3 is from link3 on third pppoe "pppC"

ppp A - 35 clients
ppp B - 35 clients
ppp C - 35 clients directly connected
ppp D - 35 clients directly connected
Solution: Reorganize

- Bridge / Firewall / Load balancer OK

Time to Reorganize, let's Implement
**Solution:** Load Balancer TEST

Test on real network
After implement

303 Clients on each

<table>
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<tr>
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<th>10.78.11.11</th>
<th>pppA</th>
<th>polaris</th>
<th>Telnet</th>
<th>polaris</th>
<th>Yes</th>
<th>polaris</th>
<th>pppA</th>
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</tbody>
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**Equal Distribution**

Thank You for your Attention

Questions ????

Charbel Matta – Fast2serv, Lebanon.
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