PPPoE Authentication over MPLS on WISP

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Agenda

- About Me
- WISP Backbone/Backhaul
- MPLS VPLS
- PPPOE over MPLS
- MTU Consideration
- VPLS MTU Best Practice
- Conclusion

About Me

- Mikrotik user since 2006
- Direktur, PT. Hawk Teknologi Solusi, Internet Service Provider, http://www.hts.net.id
- Kepala Bidang Indonesia Internet eXchange, Asosiasi Penyelenggara Jasa Internet Indonesia 2012-2015, http://www.apjii.or.id

WISP Backbone between BTS

- Conventional Wireless ISP (WISP) backbone design between BTS implement this scenario :
  - Bridging , easy to deploy , but vulnerable to MAC Flooding and ARP Spoofing or looping at layer2, to secure it using VLAN for each customer and may be use Spanning Tree Protection.
  - Routing , more setting , more resource, more secure then Bridging. Static or dynamic routing like BGP or OSPF

MPLS VPLS

- MPLS stands for MultiProtocol Label Switching
- Virtual Private Lan Service (VPLS) interface can be considered tunnel interface just like EoIP interface. To achieve transparent ethernet segment forwarding between customer sites.

MPLS VPLS Backbone

- The MPLS/VPLS approach for Backbone between BTS has some advantages:
  - VPLS tunnel is about 60% faster and less overhead than EoIP tunnel
  - MPLS forwarding is around 45% faster then Routing at similar CPU usage
  - 802.11n speed is limited over WDS bridges, this method doesn't have such limitations
- MPLS can deploy based on OSPF or BGP and then VPLS interface work like EoIP interface so

MPLS Lab Net Diagram
Imagine P1,P2,P3 are our BTS router

Why PPPOE over MPLS?

- The PPPoE (Point to Point Protocol over Ethernet) protocol provides extensive user management, network management and accounting benefits to ISPs and network administrators. Currently PPPoE is used mainly by ISPs **to control client connections** for xDSL and cable modems as well as plain Ethernet networks work with Authentication, Athorization and Accounting (AAA) on RADIUS.
  - RADIUS short for Remote Authentication Dial-In

Why PPPOE over MPLS

- With MPLS VPLS backbone between BTS can do failover using OSPF or BGP VPLS , so backbone between BTS deploy as layer2,5
- MPLS VPLS Backbone has some advantage:
  - VPLS interface can create between Provider Edge, so its like bridge backbone but create at layer2,5 and very flexible
  - Using VPLS interface can eliminate VLAN per customer

MPLS as a Layer 2,5 protocol

VPLS MTU Problem

- If you dealing with many brand of network device : switch, access-point, router and CPE before you deploy MPLS VPLS make sure you check max MTU can pass-through your network infrastructure , why?
  - Because VPLS MTU will not running at 1500byte if one of network device L2 MTU not running at least 1508byte or 1526byte if you need to inject VLAN inside VPLS .
  - For RouterBoard product MTU specification can read at URL =

MTU Consideration

VPLS MTU Best Practice

- We must test our infrastructure what max MTU can pass-through between MPLS router, the simple test is like this:

```
[MPLS-R13] > ping 192.168.240.4 src-address=192.168.240.13 size=1500 do-not-fragment count=3
HOST                    SIZE TTL TIME  STATUS
192.168.240.13           576  64 0ms   fragmentation needed and DF set
192.168.240.13           576  64 0ms   fragmentation needed and DF set
192.168.240.13           576  64 0ms   fragmentation needed and DF set
   sent=3 received=0 packet-loss=100%
HOST                    SIZE TTL TIME  STATUS

[MPLS-R13] > ping 192.168.240.4 src-address=192.168.240.13 size=1496 do-not-fragment count=3
HOST                    SIZE TTL TIME  STATUS
```

VPLS MTU Best Practise

- Test-ping between MPLS IP Loopback on Router MPLS-R13 and MPLS-R4 result :
  - Max MTU between MPLS Router = 1496byte , because 1500byte – 4byte MPLS Header.
  - Max VPLS MTU 1500byte – 8byte MPLS + VPLS Header = 1492byte , but right now I just use 1472byte for VPLS MTU (1500byte – 20byte IP – 8byte MPLS VPLS)

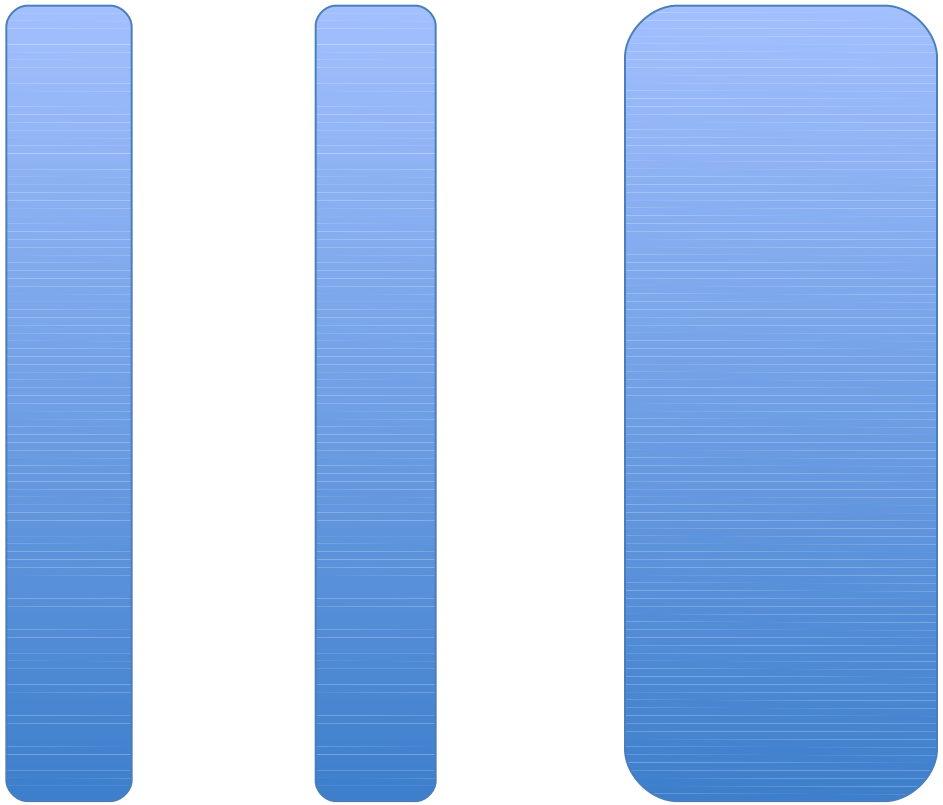
PPPOE over MPLS VPLS

- My idea :
  - Create VPLS interface between MPLS Router at my BTS to PPPOE Server at Datacenter, so I can integrate all BTS to one powerful PPPOE Server via VPLS interface
  - Use Radius Server as AAA and profiling for type of services : bandwidth policy (limit-at,max-limit,burst,threshold,burst-time,ip-pool,etc.
  - When Client Premises Equipment (CPE) dial PPPOE to PPPOE Server and then after authentication get the IP Address from IP-POOL, set the PPPOE client

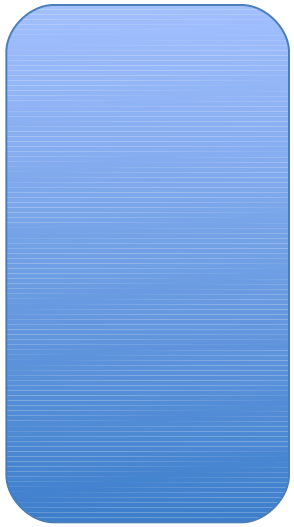
VPLS Interface attach to PPPOE Service

RADIUS Server for PPP

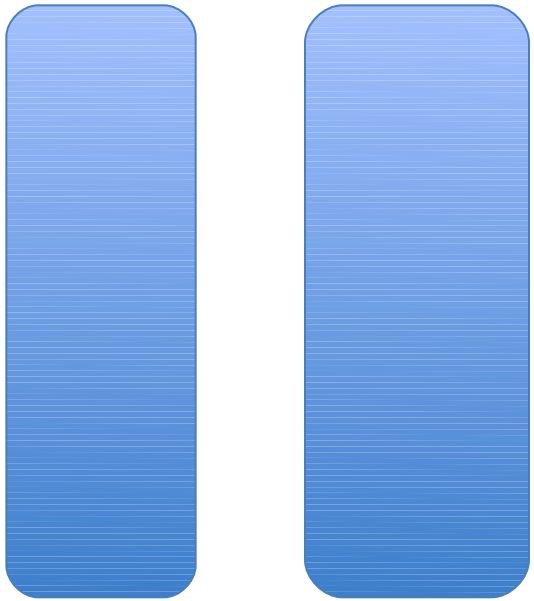
IP Address to PPPOE Interface /32 per connection



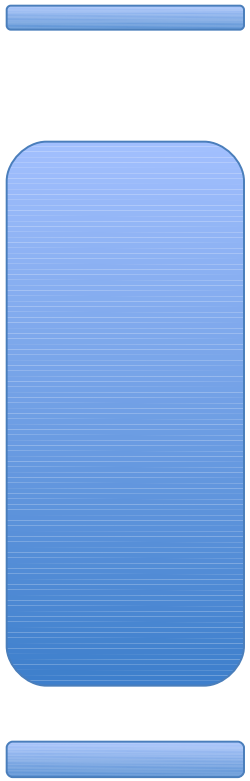
Dynamic Simple Queue for PPPOE



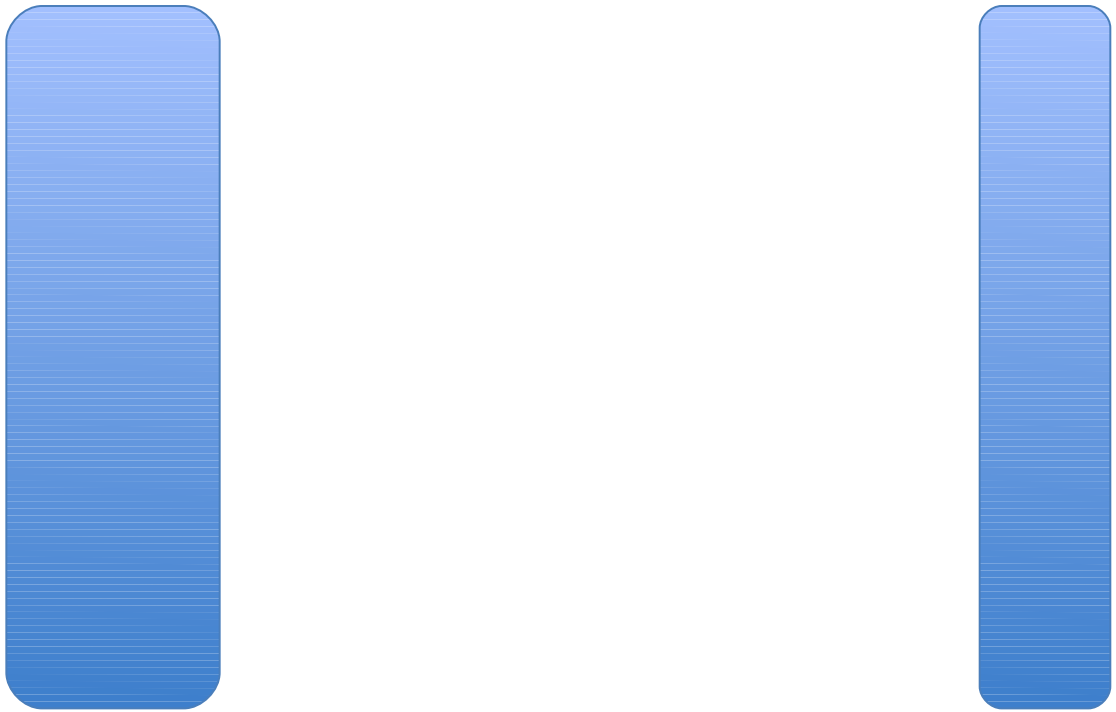
Dynamic Change MSS



PPPOE over VPLS Interface



Radius Online Users



PPPOE over MPLS VPLS

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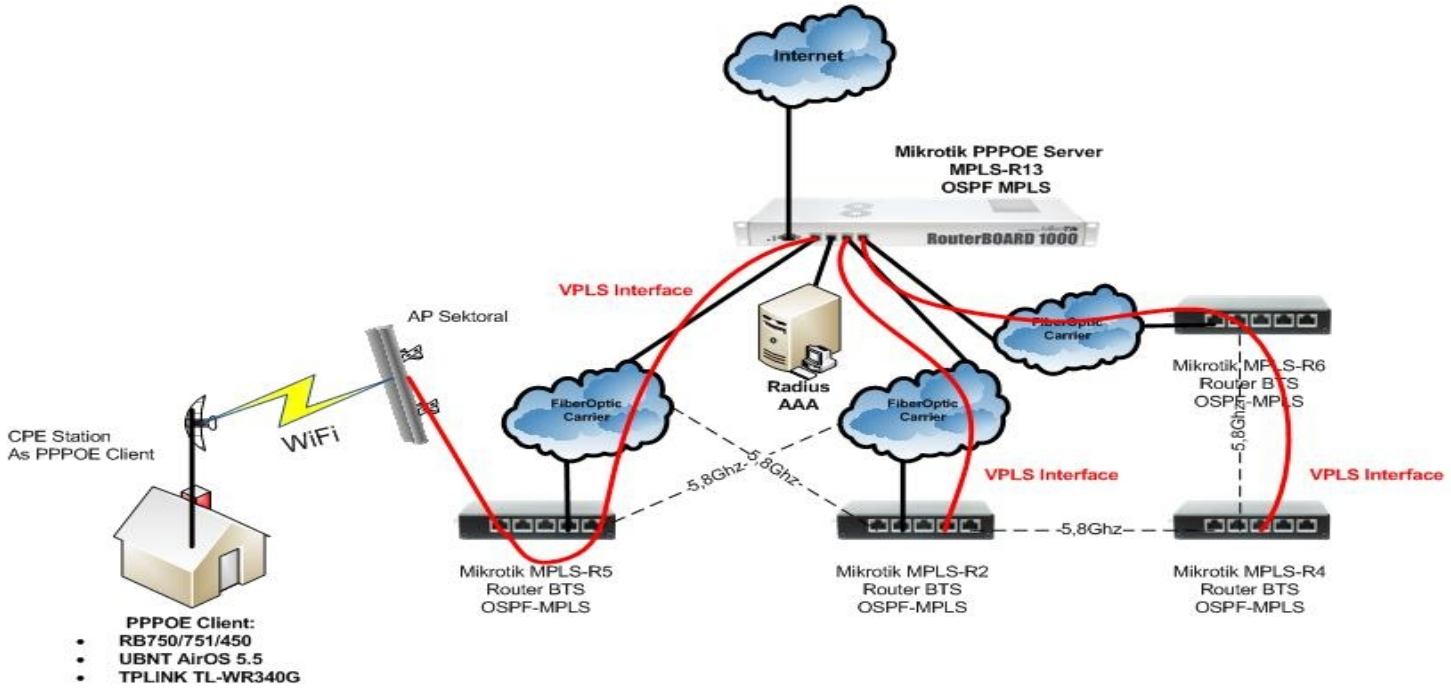

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Custom Solution For: Customer: HTSNET

Conclusions

- PPPOE over MPLS VPLS still can implement on network with L2MTU max 1500byte but customer must dial PPPOE through VPLS as PPPOE Interface at PPPOE Server
- If you need to create VLAN over VPLS, the network L2MTU must be at least 1526byte
- With PPPOE ISP reduce utilization of Public IPv4
- Imagine if between the WISP can established integration BGP MPLS VPLS and PPPOE +