Service Provider CCIE Advanced Technologies Class

Layer 2 VPNs

Layer 3 VPN Problems

- Layer 3 MPLS VPNs require PE participating in CE routing
- CE devices may not be IP aware
  - Layer 2 Ethernet switches
- CE may not support PE routing protocols offerings
  - SPs typically don't run every possible PE-CE protocol
- Customer may not want to reconfigure to migrate to MPLS
  - Frame Relay PVCs
  - ATM PVCs

Layer 2 VPN Solutions

- Layer 2 protocols can be tunneled over IP/MPLS network
- CE1 looks directly connected to CE2
- No CE-PE routing
- Broadcast domain is end-to-end

L2TPv3

- L2TPv3 - Layer 2 Tunneling Protocol
- Tunnels over IP network
  - Ethernet
  - Frame Relay
  - ATM
  - HDLC
  - PPP
- Does not require MPLS core

L2TPv3 Configuration

```
R3:
pseudowire-class L2TPv3
 encapsulation l2tpv3
 ip local interface Loopback0
!
interface Ethernet0/0
 description TO CE
 xconnect 150.1.6.6 1 pw-class L2TPv3

R6:
pseudowire-class L2TPv3
 encapsulation l2tpv3
 ip local interface Loopback0
!
interface GigabitEthernet0/1
 description to CE
 xconnect 150.1.3.3 1 pw-class L2TPv3
```

AToM

- AToM – Any Transport over MPLS
- Tunnels over MPLS network
  - Ethernet
  - Frame Relay
  - ATM
  - HDLC
  - PPP
- Requires MPLS core
- Very limited support on 12.2S
- Mostly supported on 12.0S on 7200s and GSR

AToM Configuration

```
R3:
interface Ethernet0/0
 description TO CE
 xconnect 150.1.6.6 1 encapsulation mpls

R6:
interface GigabitEthernet0/1
 description to CE
 xconnect 150.1.3.3 1 encapsulation mpls
```

L2VPN Interworking

- AToM "interworking" allows any to any layer 2 tunneling
  - Ethernet to ATM
  - Ethernet to Frame Relay
  - Ethernet to PPP
  - ATM to Frame Relay
  - ATM to PPP
  - PPP to Frame Relay
- Mostly supported in 12.0S on 7200s and GSR (again)

Interworking Configuration

```
R3:
pseudowire-class AToM
 encapsulation mpls
 interworking ip
!
interface Ethernet0/0
 description TO CE
 xconnect 150.1.6.6 1 pw-class AToM

R6:
pseudowire-class AToM
 encapsulation mpls
 interworking ip
!
interface Serial0/0/0
 description TO CE
 xconnect 150.1.3.3 1 pw-class AToM
```

VPLS

- VPLS – Virtual Private Lan Service
- Allows multipoint Ethernet network tunneled over MPLS
  - AToM is point-to-point only
- Mostly supported in 12.0S on GSR (yet again)

Layer 2 VPN Conclusion

- Possible on SP CCIE Lab but unlikely
  - Very limited version support
  - Burns up PE and CE routers for simple functionality
- Straightforward configuration
  - DocCD "configuration task list" is your friend