MPLS Multipoint Ethernet Services

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Point-to-Point vs Multipoint

- Virtual Private Wire Service (VPWS) a.k.a. Virtual Leased Line (VLL)
  - Emulation of a p-t-p link
- Virtual Private LAN Service (VPLS) a.k.a. Transparent LAN Service (TLS)
  - Emulation of a LAN

Point-to-Point Internet Drafts

- Point-to-Point Solutions
  - Martini
    - **draft-martini-ethernet-encap-mpls-01**
    - **draft-martini-l2circuit-trans-mpls-10**
      - Use of LDP for signaling
  - Kompella
    - **draft-kompella-ppvpn-l2vpn-02**
      - Use of Martini encapsulation
      - Use of BGP for signaling
- Both drafts define a pseudo-wire

Multipoint Internet Drafts

- Multipoint Solutions
  - VPLS/HVPLS
    - **draft-lasserre-vkompella-ppvpn-vpls-02**
      - VPLS: Mesh topology
      - HVPLS: Tree topology
  - **Distributed VPLS**
    - **GVPLS/LPE**
      - draft-radoaca-ppvpn-gvpls-00
      - draft-ouldbrahim-l2vpn-lpe-02
    - Distribution of MAC learning and forwarding engines

Other Multipoint Internet Drafts

- Multipoint Solutions
  - DTLS
  - IPLS
    - **Subset of VPLS case to interconnect IP hosts/routers**
      - MAC Addresses learned via signaling
      - Proxy ARP
  - HVLS
    - MAC-in-MAC

Underlying Tunnels

- All VPLS models rely on Ethernet Martini encapsulation
  - Underlying tunnels can be
    - L2TP
    - MPLS
    - Q in Q

High Interest Level

- Standards Bodies
  - IETF (PPVPN)
  - MEF
  - IEEE (802.1)
  - ITU (SG 15)
- Service Providers
- Vendors

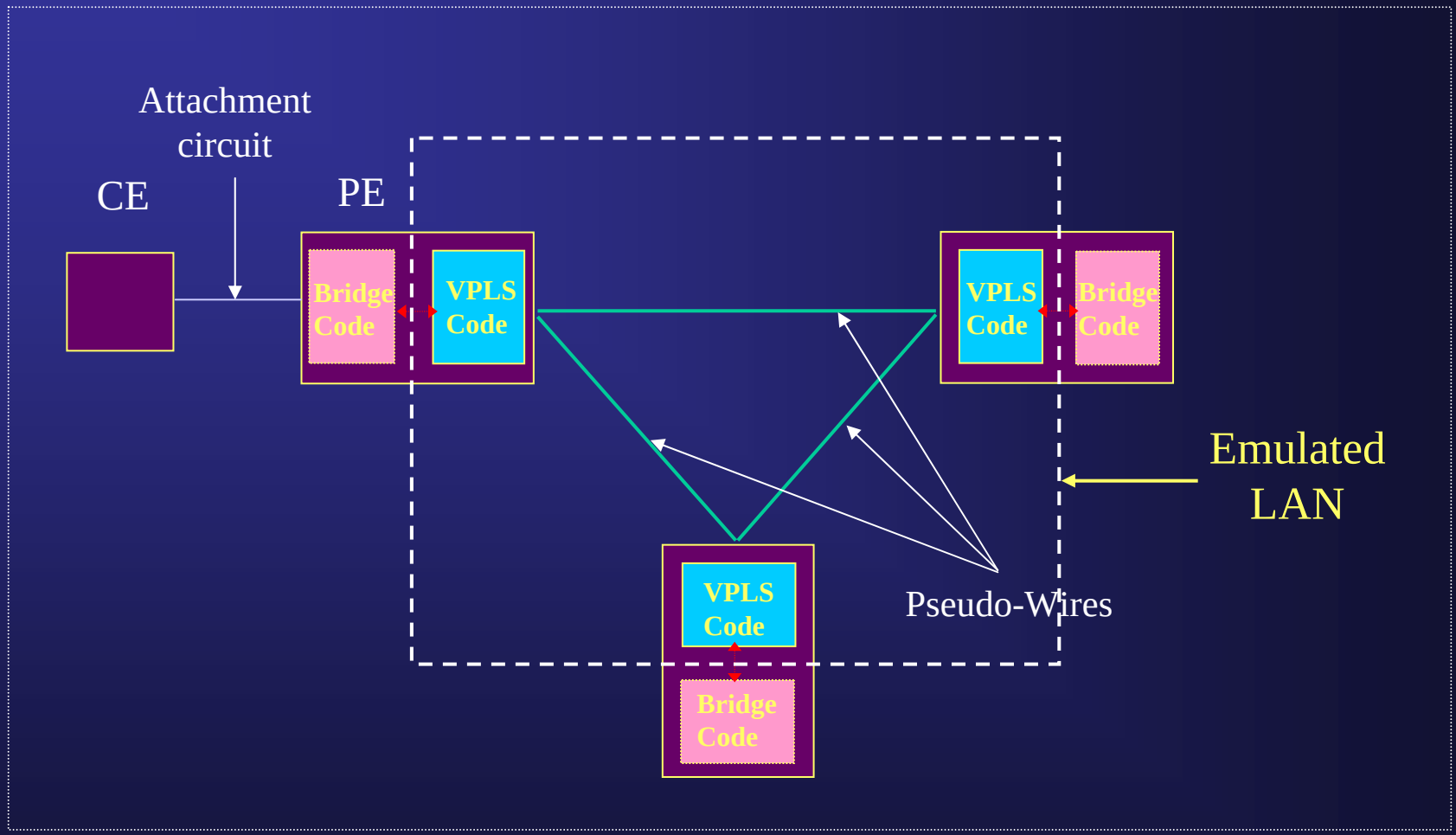
Is it LAN Emulation again ?

- Simple LAN segment emulation model
  - No trying to be a full bridge
- Avoids LANE issues
  - No Servers
    - No bottlenecks
    - No single points of failure
  - No Packet Reordering issues

Is VPLS Re-Inventing Bridging ?

- Isolation between VPLS specific rules and 802.1D bridging rules
  - VPLS dataplane defines specific forwarding rules
    - It is not trying to emulate a full 802.1D bridge (“partial bridge”)
  - Interaction between VPLS and bridging code
    - More clarification required

Where does VPLS fit ?



VPLS Code

- VPLS Forwarding Rules
  - Learns MAC addresses per pseudo-wire (VC LSP)
  - Forwarding based on MAC addresses
  - Replicates multicast & broadcast frames
  - Floods unknown frames
  - Split-horizon for loop prevention
- VPLS Signaling Rules
  - Establishes pseudo-wires per VPLS between relevant PEs
- VPLS Discovery Rules (Manual, LDP, BGP, DNS)

Bridging Code

- Standard IEEE 802.1D code
  - Used to interface with customer facing ports
  - Might run STP with CEs
  - Used to interface with VPLS
  - Might run STP between PEs

Interaction between VPLS and Bridging pieces

- VPLS presents a transparent LAN segment interface (one instance per VPLS) to bridging
  - E.g. STP BPDUs carried transparently
  - Full mesh of pseudo-wires invisible to bridging
- There are cases where tighter interaction leads to faster convergence (e.g. MAC withdrawals)
- Other L2 protocols might also benefit from a closer interaction (e.g. 802.3ad)

Scalability Parameters

- Number of MAC Addresses
- Number of replications
- Number of LSPs
- Number of VPLS instances
- Number of LDP peers
- Number of PEs

Solving Scalability

- Different approaches to solve scalability
  - Hierarchical: HVPLS
    - Smaller mesh
      - Less PEs
      - Less LDP peers
  - Distributed approach
    - DTLS: Bridging (learning/replication/forwarding) at MTU and Signaling/Routing at PE
    - GVPLS: Hybrid model
  - Specialized hardware to handle large number of MAC addresses, replications and LSPs.

Applicability

- VPLS Metrics
  - Number of PEs < 20-30
    - VPLS
  - Number of PEs > 30
    - HVPLS
  - Number of MAC addresses per VPLS < 10K
  - Number of sites per VPLS < 4K

Next Steps

- Align VPLS solutions drafts to common format
  - Topology
  - Control Plane
  - Data Plane
  - Deployment Scenarios
- Clarify VPLS & Bridging interaction

Conclusion

- Emerging L2 VPN technology
- Large support from
  - Service Providers
  - Equipment builders
- Solutions available today