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Ethernet VPLS Services

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Agenda

Introduction

Internet Drafts

LDP vs BGP Approaches

VPLS Deployment Models

Common Questions

Conclusion



Introduction



Key Trends

✍ **IP becoming dominant**

✍ **Ethernet**

- Dominant in LANs
- As a new access technology
- As a new backbone technology replacing SDH/Sonet in MANs & WANs

✍ **MPLS as a necessary tool for**

- Traffic Engineering
- VPNs



IP & Ethernet

- ✍ **IP and Ethernet have limited CoS/QoS mechanisms**
 - IP ToS/DSCP (DiffServ)
 - 802.1P (CoS)
- ✍ **Ethernet alone lacks OAM, traceability, resiliency facilities**



Ethernet & 802.1 Protocols

Native L2 protocols insufficient for MANs & WANs

- STP/RSTP/MSTP
- GARP/GVRP
- IEEE VLANs
- LLC Echo

New 802.1 efforts

- Provider bridge
- Q-in-Q



IP & MPLS

- ✍ **IP has proven to be a very scalable and flexible connectionless-oriented technology**
- ✍ **MPLS complements IP with a connection-oriented approach to offer:**
 - Traffic Engineering
 - VPNs
 - QoS



Traditional VPNs

✍ **Leased lines**

✍ **Frame Relay**

✍ **ATM**

✍ **IP VPNs**

- L2TP

- IP-IP




- IPSec

- GRE

✍ **VLAN based VPNs**

VPN Types

L2 VPN





- Virtual Leased Line (VLL)
 -  Emulation of a PTP link
- Virtual Private LAN Service (VPLS) a.k.a. Transparent LAN Service (TLS)
 -  Emulation of a LAN
 -  Forwarding based on L2 reachability information

L3 VPN

- Emulation of multi-site routed network
- Forwarding based on L3 reachability information

MPLS VPNs

L2 and L3 MPLS VPNs

- Have a lot in common
 -  Use of underlying routed infrastructure
 -  P routers do not maintain any VPN state
 -  PEs establish a mesh of LSPs
- Main difference
 -  CE-PE interface
 - Routed (Static IP, RIP, OSPF, BGP)
 - Bridged



L2-VPN vs L3-VPNs

L2 VPN

- ✍ **Protocol Agnostic**
- ✍ **Overlay Model**
 - CE-CE Route Exchange
- ✍ **Reachability**
 - Established via address learning in data plane
- ✍ **Pseudo-wire/Pseudo LAN Segment**

L3 VPN

- ✍ **IP only**
- ✍ **Peering Model**
 - CE-PE Route exchange
- ✍ **Reachability**
 - Established via BGP routing plane



Internet Drafts

Point-to-Point Internet Drafts

Point-to-Point Solutions

- Former Martini drafts

- ✍ draft-ietf-pwe3-ethernet-encap-01.txt

- ✍ draft-ietf-pwe3-control-protocol-03.txt

- Use of LDP for signaling

MPLS Point-to-Point Service

Virtual Leased Line



Pseudo-wire

- pair of LSP's of opposite directions forming a single virtual pipe
- Size of pipe based on traffic characteristics
- Can be explicitly routed L2 tunnel for guaranteed service
- Can offer a self-healing point-to-point connection

Multipoint Internet Drafts

Multipoint Solutions

- Two IETF Approved VPLS drafts

-  draft-ietf-ppvpn-vpls-ldp-00.txt

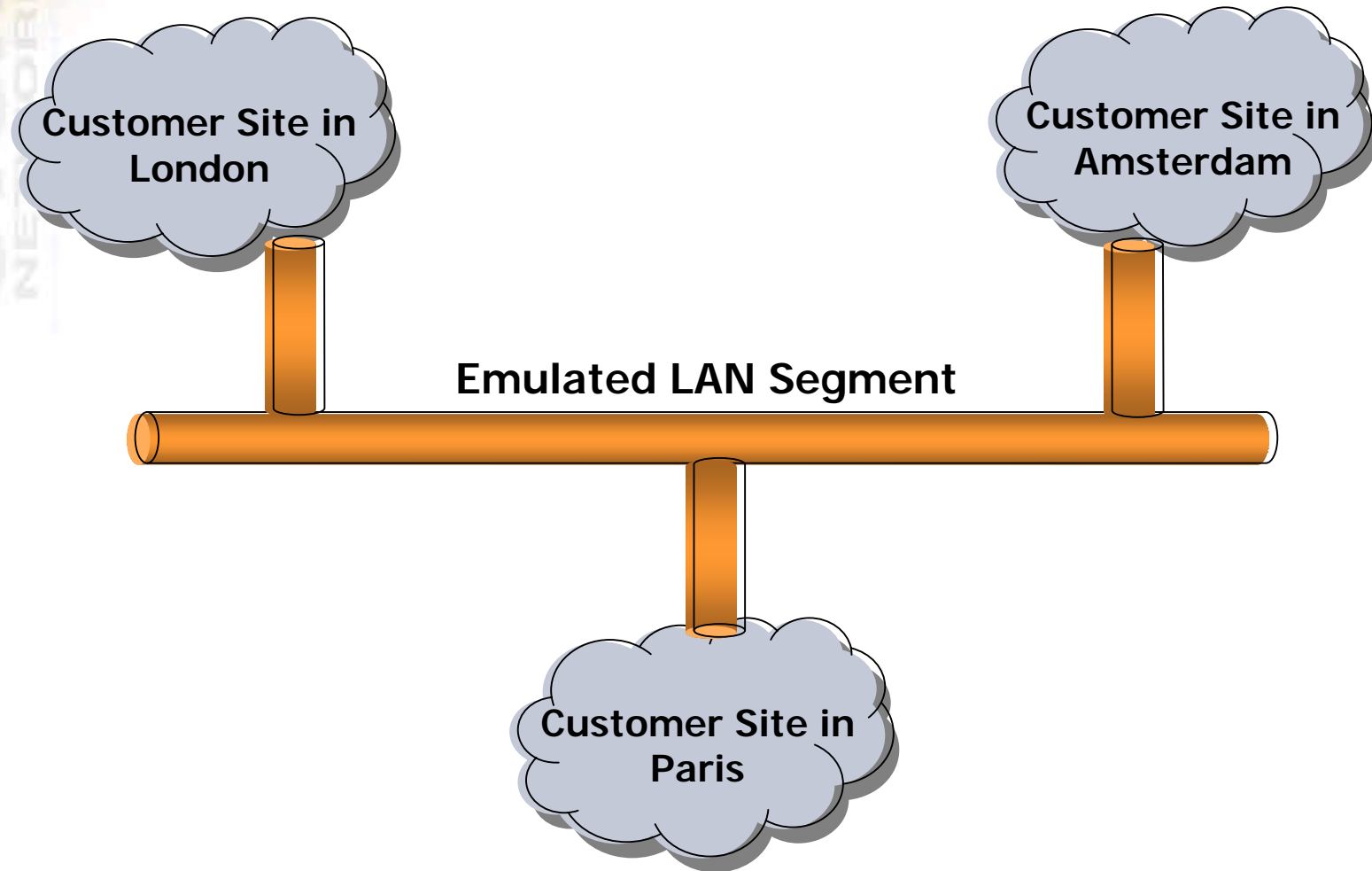
- Former lasserre-vkompella draft
 - LDP Signaling

-  draft-ietf-ppvpn-vpls-bgp-00.txt

- Former kompella draft
 - BGP Signaling

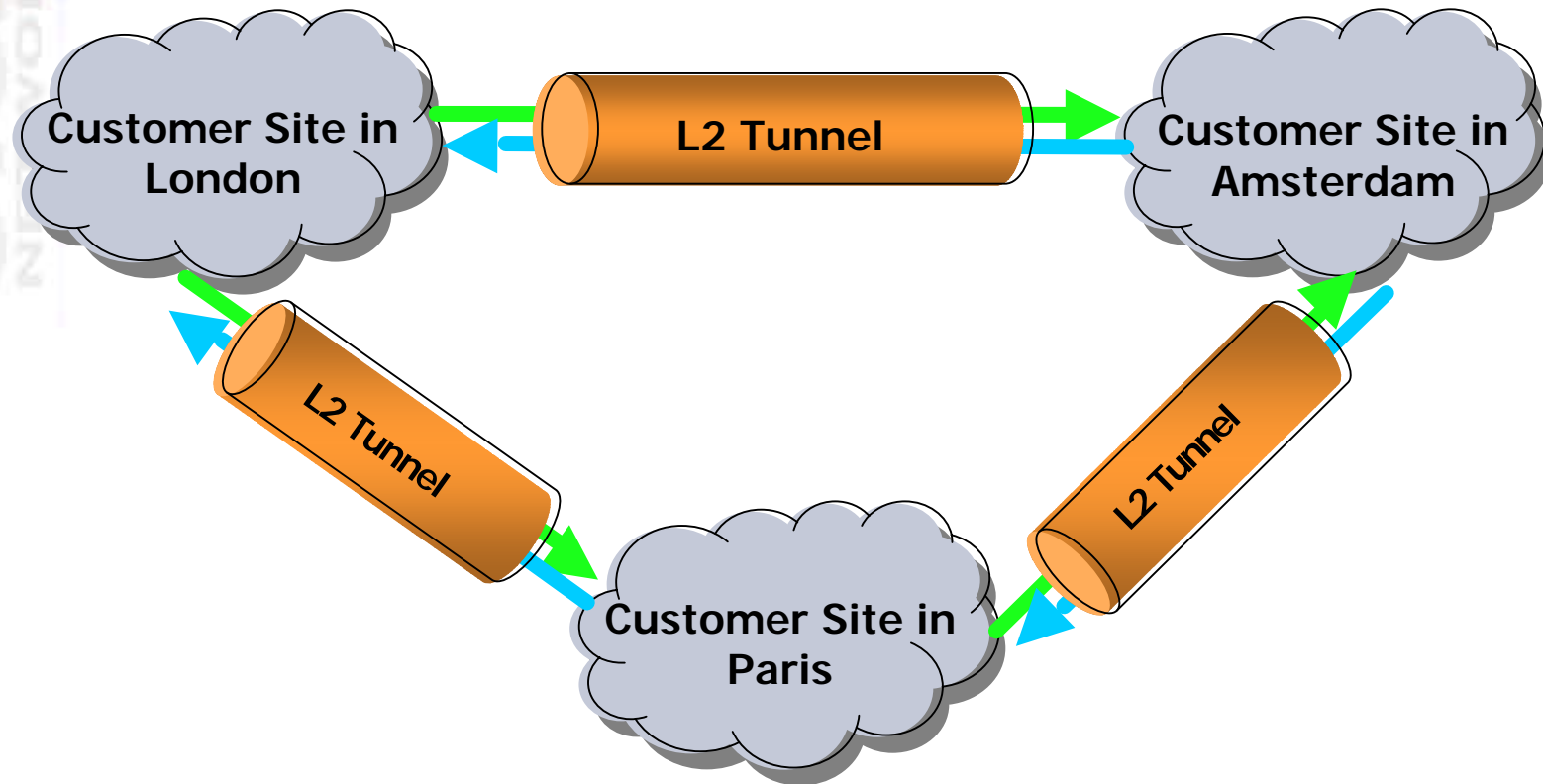
MPLS Multipoint Service

Virtual Private LAN Service



MPLS Multipoint Service

Virtual Private LAN Service



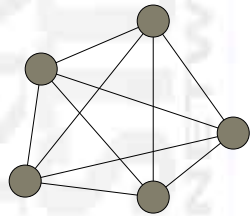


MPLS VPNs

VPLS Deployment Models

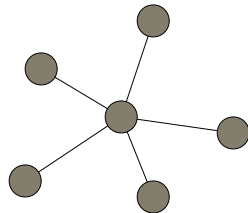
VPN Topologies

Building VPNs



— Fully meshed topology

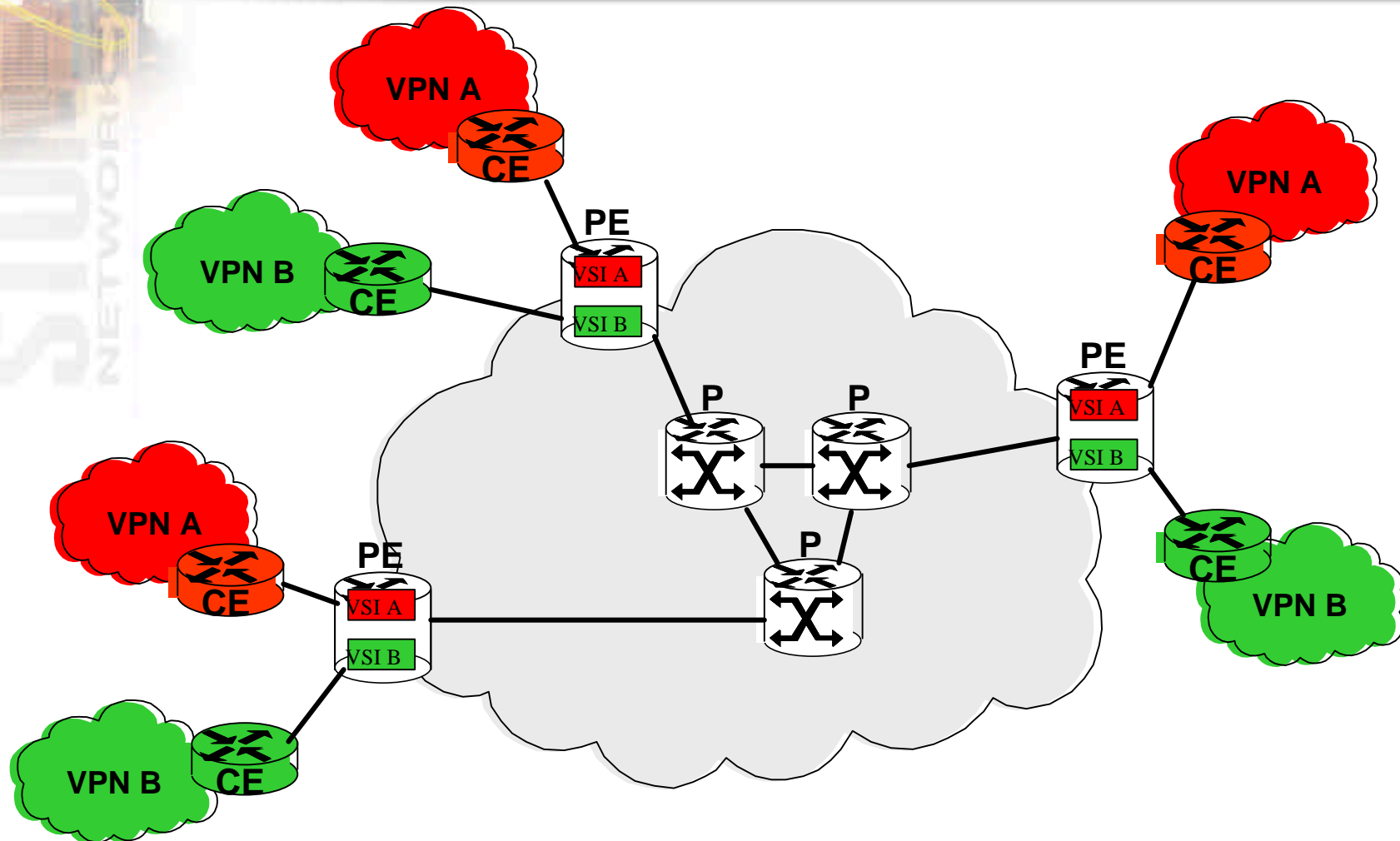
 VPLS



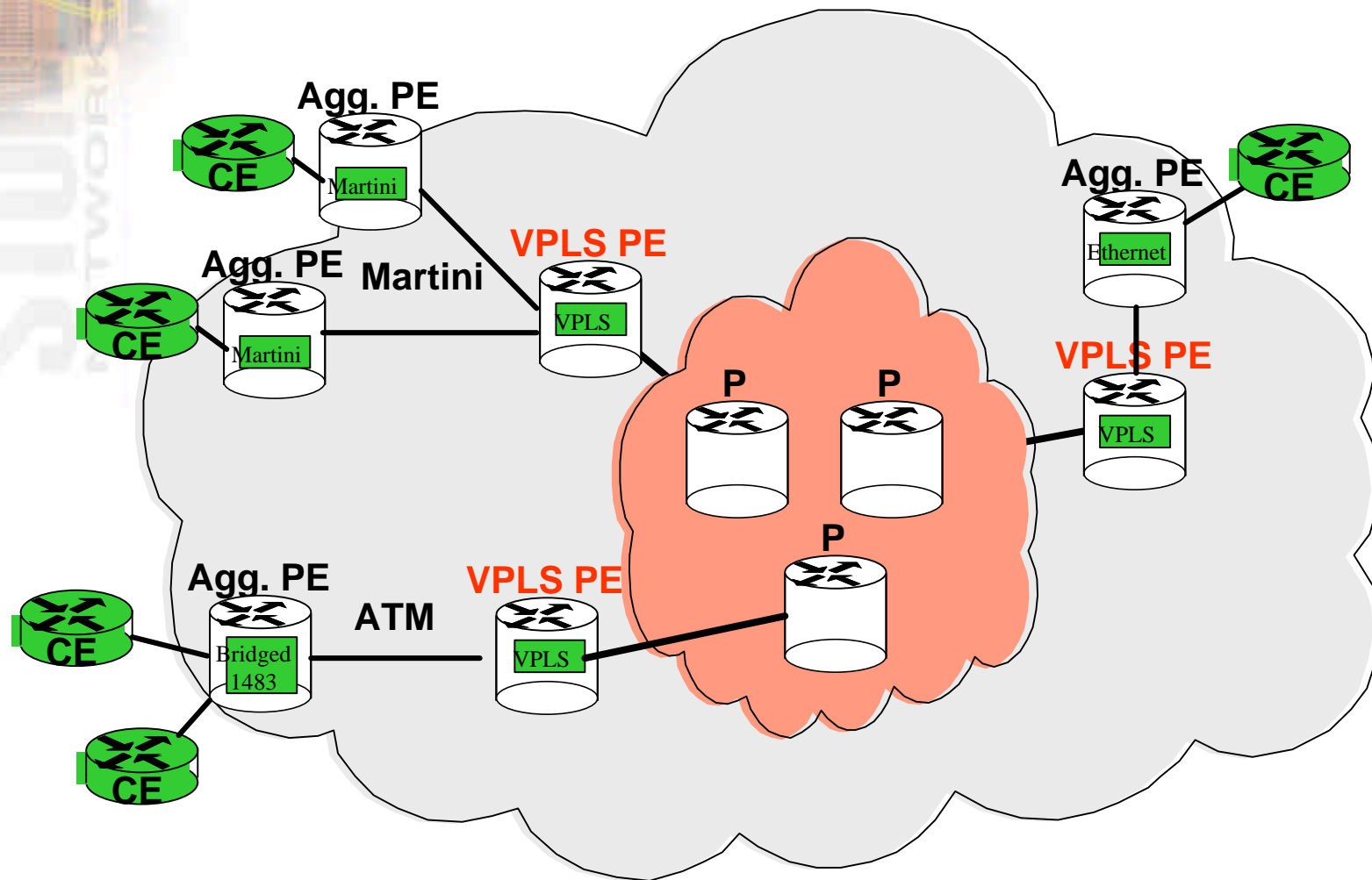
— “Hub and spoke” topology

 HVPLS

VPLS Edge-to-Edge Model



Hierarchical VPLS: HVPLS





Common Questions

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

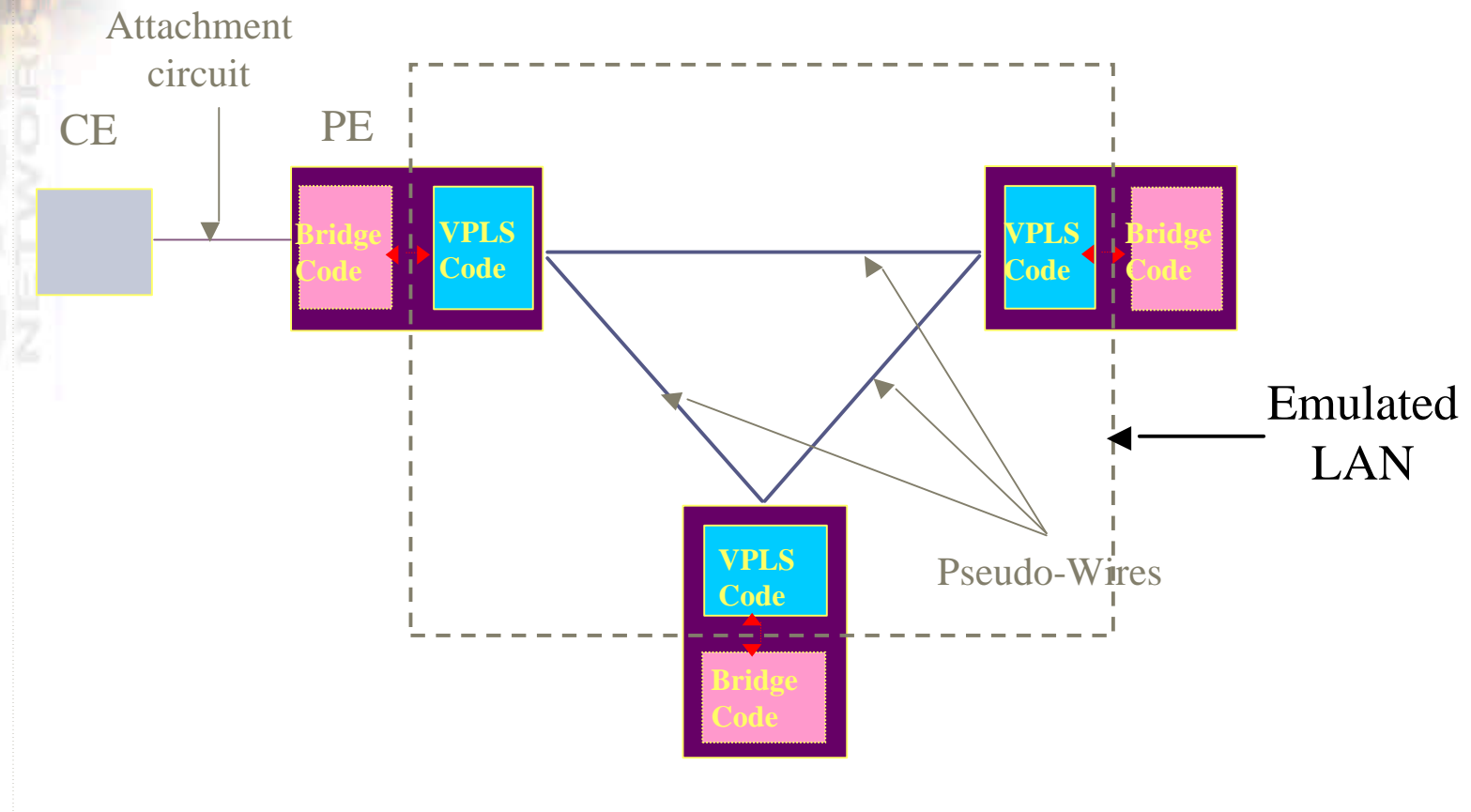
Is VPLS Re-Inventing Bridging ?




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 ?



 IEEE 802.1D bridging code

 IETF VPLS code

 Interaction between VPLS and Bridging

 Emulated LAN instance

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)**



Conclusion

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- ✍ **Next Generation Ethernet Service**
- ✍ **Maturing Standards**
- ✍ **Wide Industry Acceptance**
- ✍ **Wide Market Support**



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Thank you !
