

Hybrid Virtual Private LAN

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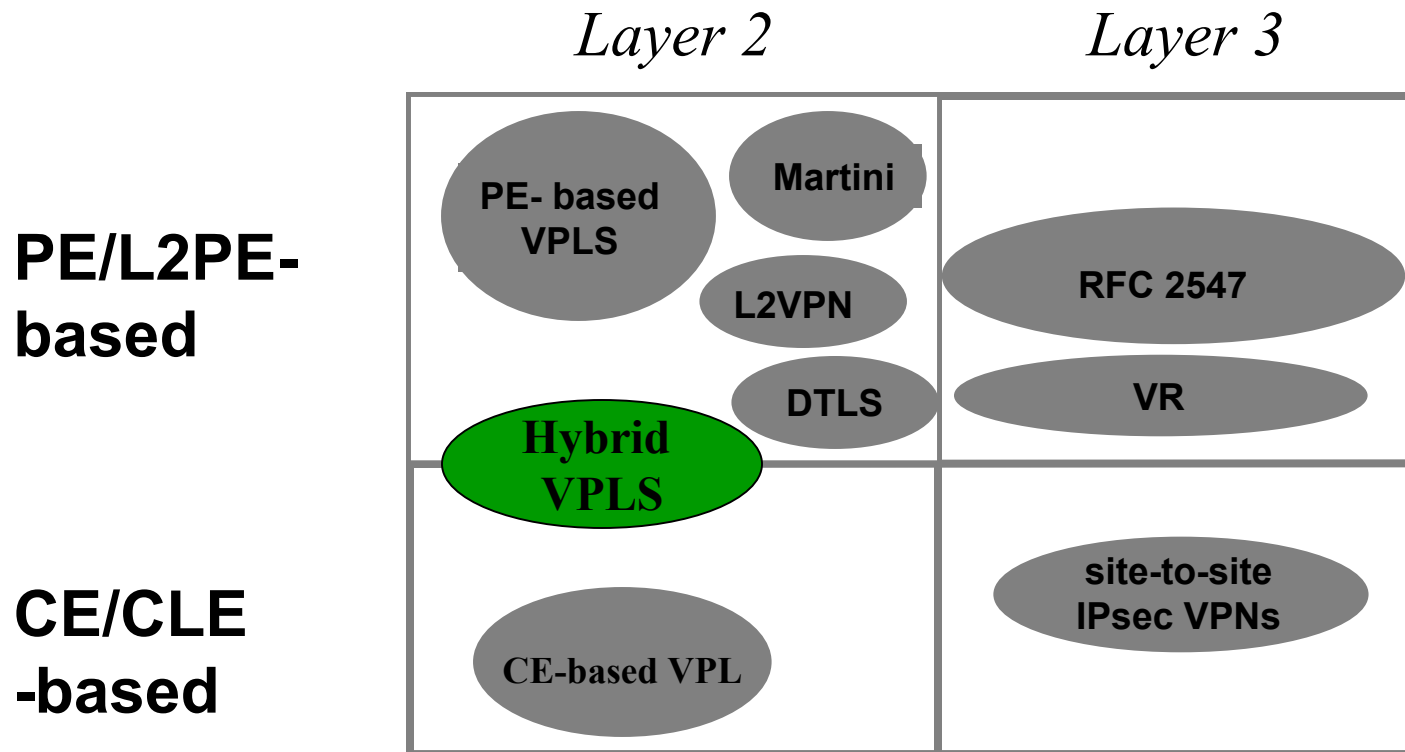
Motivation

- minimal impact on existing provider's network infrastructure (PEs, Ps, L2PE) and CEs
- Bridging of customer's traffic shall be performed in a scalable manner for many customers and sites spanning LAN/MAN/WAN
- A customer's L2VPN control and forwarding shall not impact other customers
- Does not make it difficult to offer service with SLAs
- Shall meet majority of end customers requirements now, while PE-based VPLS, would take time to be standardized, experimented with, and more challenging to scale for many emulated LANs and sites spanning WAN

Goal

- Specify interoperable mechanisms (new and as much as possible leverage existing technologies) for Hybrid VPLS
 - Specify interoperation of CLEs and PEs as well as PEs and PEs, including mechanisms to reduce provisioning
 - describe interoperation of CEs and CLEs (to be compliant with existing IEEE specifications)

Context of proposal



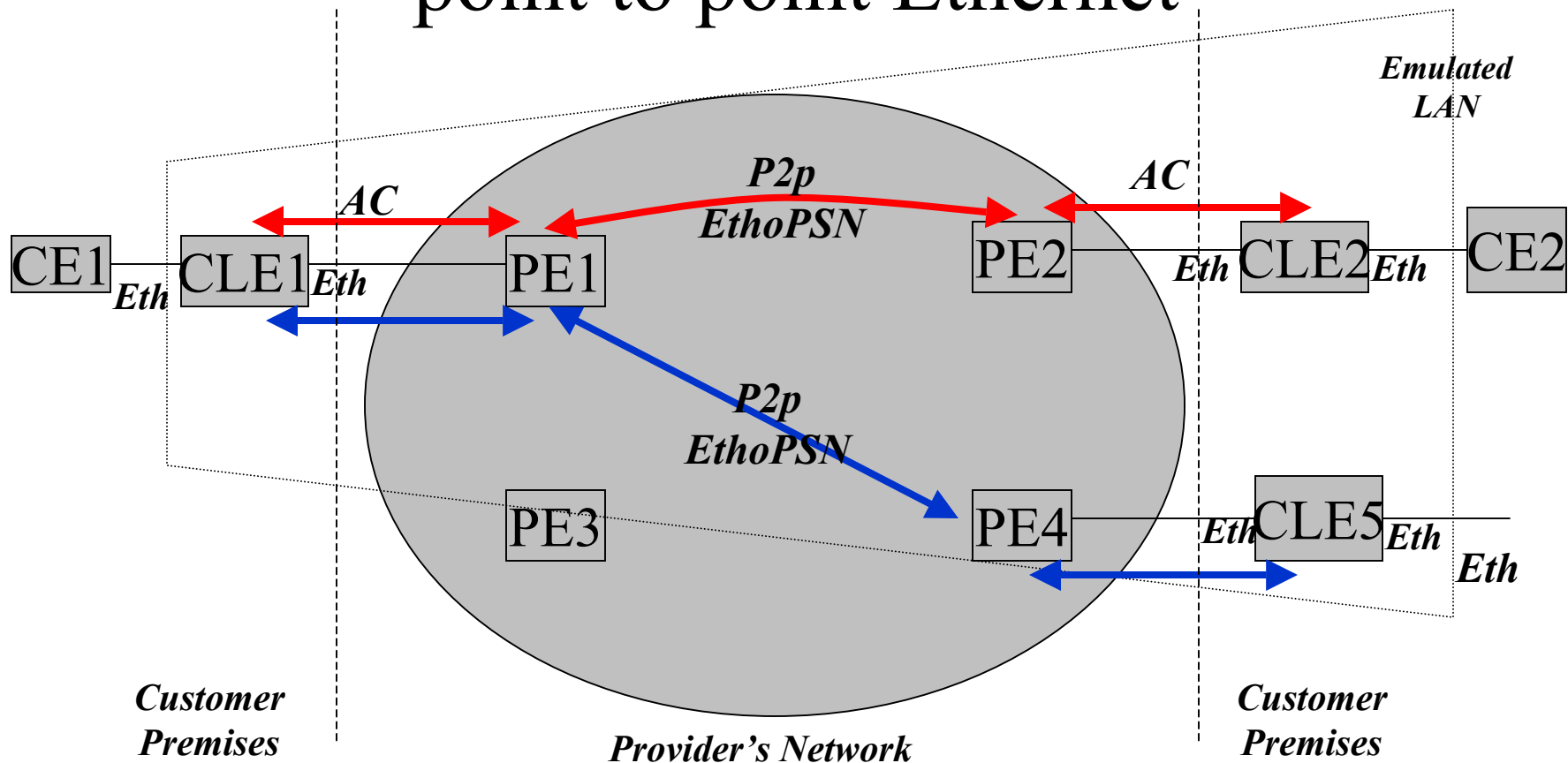
Note: CLE – Customer Located Equipment (Provider owned)

PE-based VPLS – PW and bridging at PEs

CE-based VPL – PW and bridging at CEs/CLEs

Hybrid VPLS – PW at PEs, bridging at CLEs (VLAN tags used as mux ID between CLE-PE)

Building an emulated LAN using multiple point to point Ethernet



- CLEs connected by point to point Ethernet (appear as virtual port to CLEs)
- P2p Ethernet provisioned at PEs by provider - trivial provisioning at CLEs, hub CLEs only need to know number of remote sites
- A CLE bridges traffic from one virtual port to another, no bridging on PEs in the provider's network.

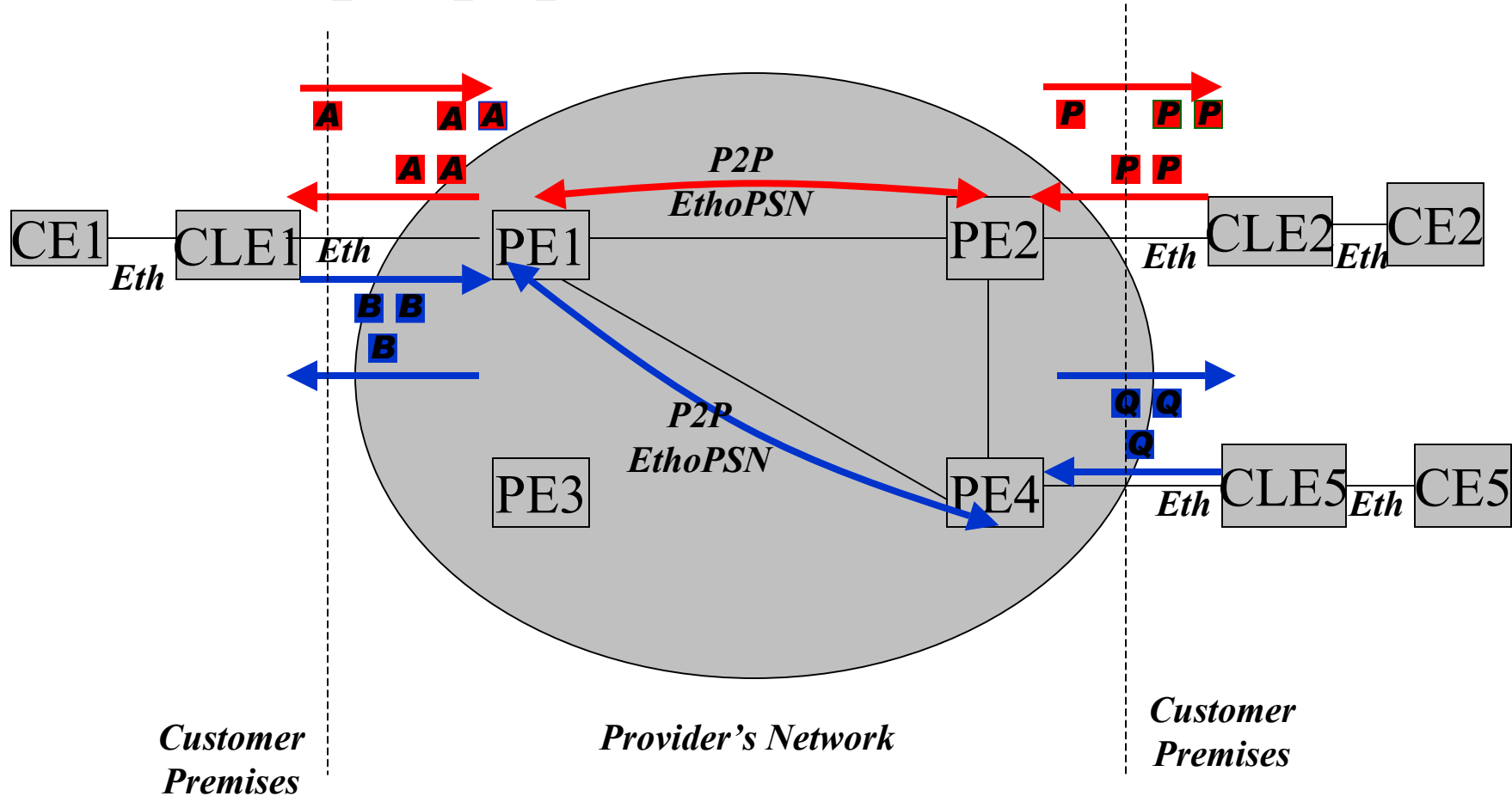
Service Delimiters

- Service delimiter between CE & CLE
 - Ethernet frame (multi-point switching)
- Service delimiter between CLE & PE
 - Multiplexing ID (e.g. VLAN tag, Stacked VLAN tag, MPLS VC) and

Note: In the case of connection to one remote CLE only, Mux ID is not necessary

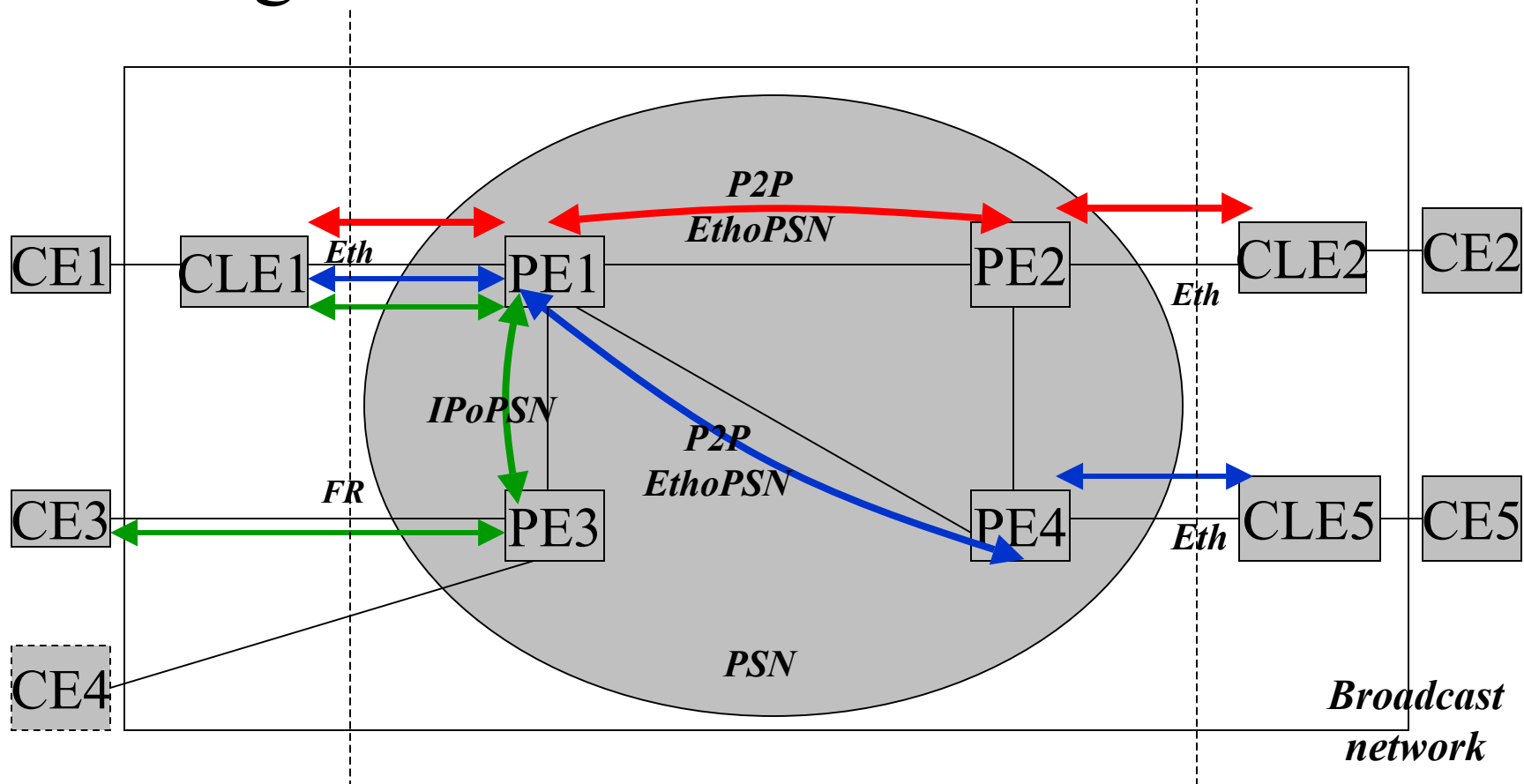
- Ethernet frame (p2p “cross-connect”)

Multiple p2p Eth over an access link



- Multiplexing ID has local significance between CLE and PE only
- If the same access link is used to connect to each remote site, need to identify the different p2p Ethernet at access link with multiplexing identifiers e.g. VLAN/Stacked VLAN tags

Peering CE Routers over an emulated LAN



- Peering IP routers with different access links over a broadcast network.
 - All other CEs sees CE3 on a broadcast network and can peer with CE3 over the emulated LAN
- Connect CE3 via a p2p IPoPSN to the emulated LAN
- If a new CE4 router is added, CE4 can peer with other CEs with one AC connected to the emulated LAN

Service Delimiters

- Service delimiter between CE & CLE
 - Ethernet frame (multi-point switching)
- Service delimiter between CLE & PE
 - Homogeneous p2p
 - Multiplexing ID (e.g. VLAN tag, Stacked VLAN tag, MPLS VC)
 - Note: In the case of connection to one remote CLE only, Mux ID is not necessary
 - Ethernet frame (p2p switching)
 - **Heterogeneous p2p**
 - **Multiplexing ID**
 - **IP packet (IP address <-> link layer address mapping)**
 - **Alternative 1: map at CE (mp L3 switching at CE)**
 - **Alternative 2: map at CLE (p2p switching at PE)**
 - **Alternative 3: map at PE (mp L3 switching at PE)**
- **Service delimiter between CE & PE**
 - **IP packet**

Motivation for Peering CE routers over an emulated LAN (with different access links)

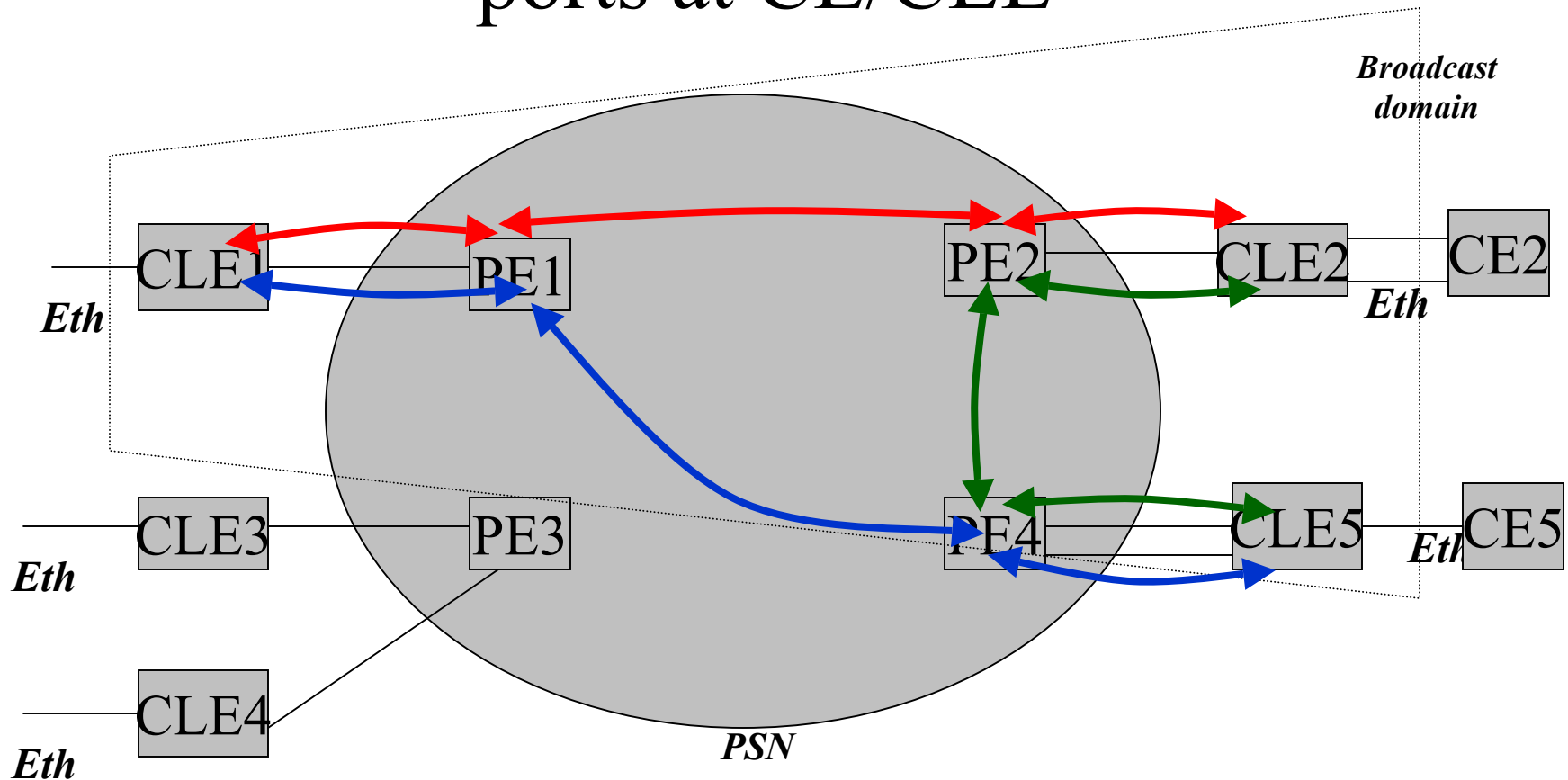
- Reduce error prone provisioning at CE routers
- If a new CE4 router is added, CE4 can peer with other CEs with one AC connected to the emulated LAN
- Reduces link state database (cf peering CEs over many p2p links or over different subnets)
- Reduces routing control messages
- Forwarding optimality no worse than connecting CEs in different subnets

Next steps

- Select mechanism(s) to automate trivial provisioning at CLEs, reduce provisioning of PEs for Hybrid VPLS
- Separate draft for heterogeneous PW, PW and router peering mechanisms?
- Evaluate need and issues of split horizon forwarding vs spanning tree

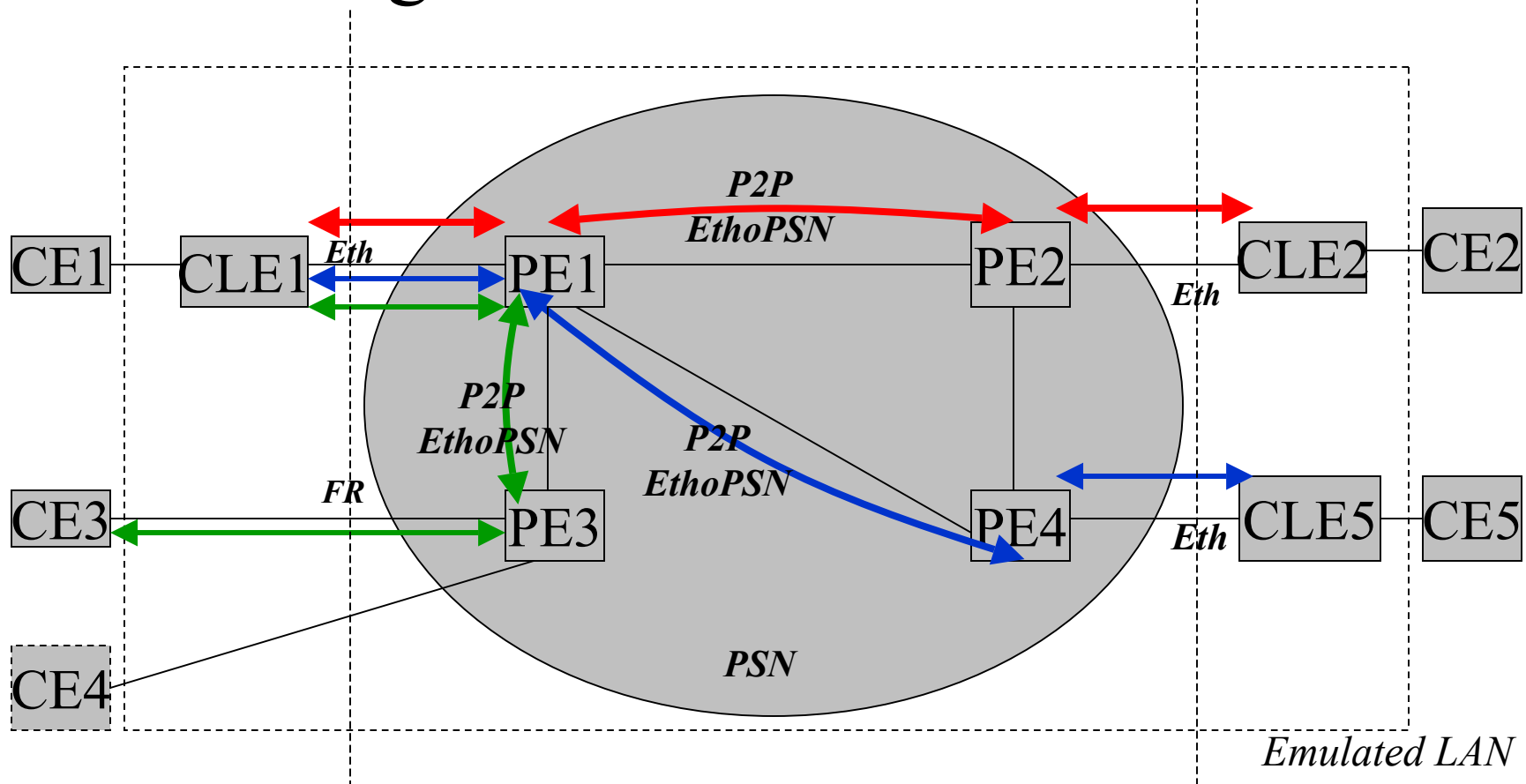
Backup slides

Using multiple access links or additional ports at CE/CLE



- If a different access link is used to connect to each remote site (e.g. at CLE5), or CLE2 tags the traffic from different CE2 ports, no changes required at CLEs, no need for multiplexing identifier at access network
- otherwise if only one physical link is connected to the network, a multiplexing identifier is required

CE Bridges with different Access Links



- CE and CLE Bridges may have different access links (e.g. Eth and FR)
- Connect CE3 via a p2p EthoPSN to the emulated LAN
- CE3 switches/bridges traffic as defined by existing specifications