

# TRILL Transparent Transport over MPLS

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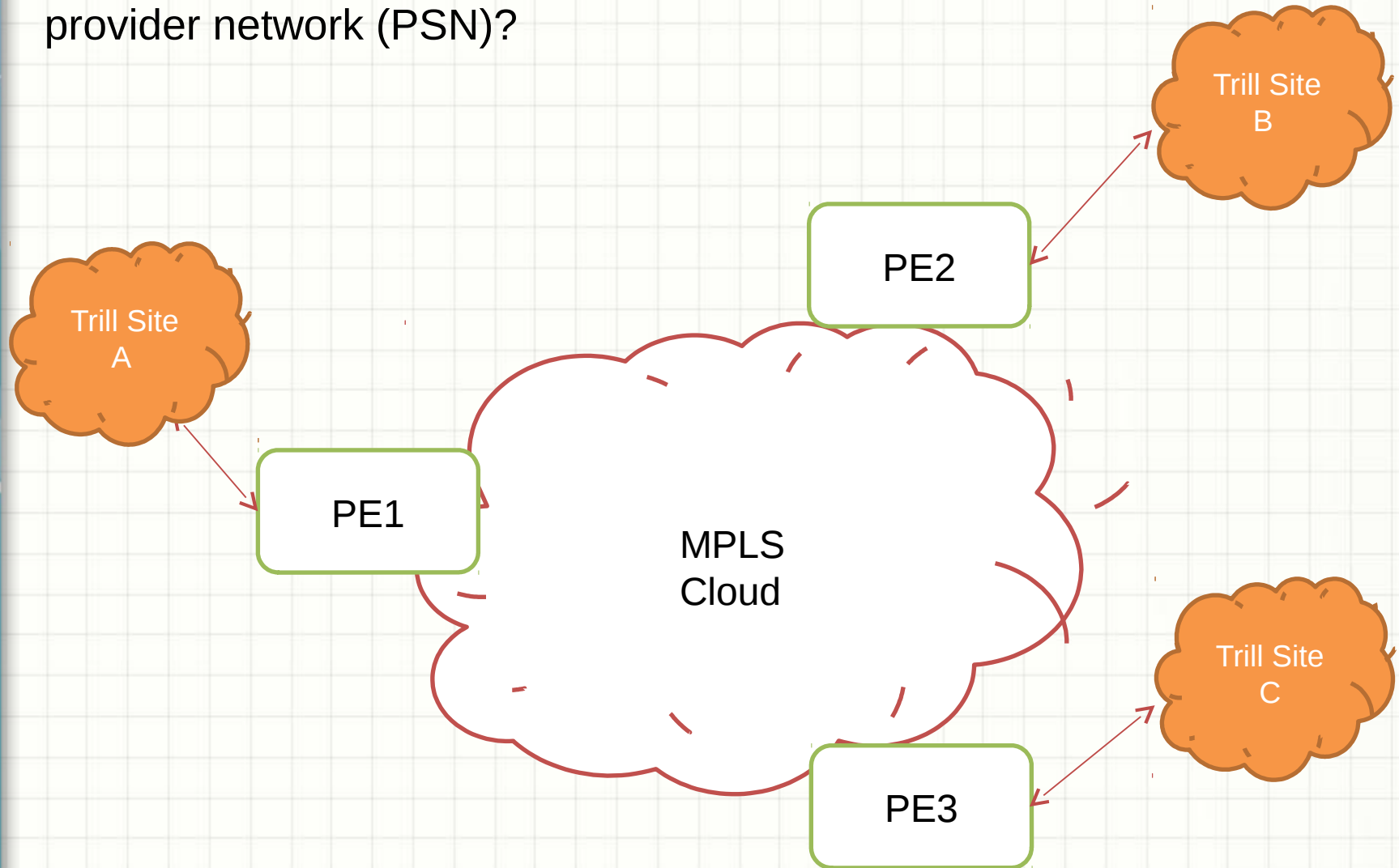
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# Overview

- This draft covers two problems as follows.
  - Providing connection between more than two TRILL sites which are separated by an MPLS provider network using RFC 7173.
  - Providing connection between TRILL sites belonging to a customer/tenant over a MPLS provider network.
    - Here tenants belong to a single administration domain (TRILL campus, not data label) which is capable of serving single / multiple customers.
  - Refer to the next slide for detailed problem statements
- This draft proposes two different models for solving both the above mentioned problems.
  - VPLS model
  - VPTS model

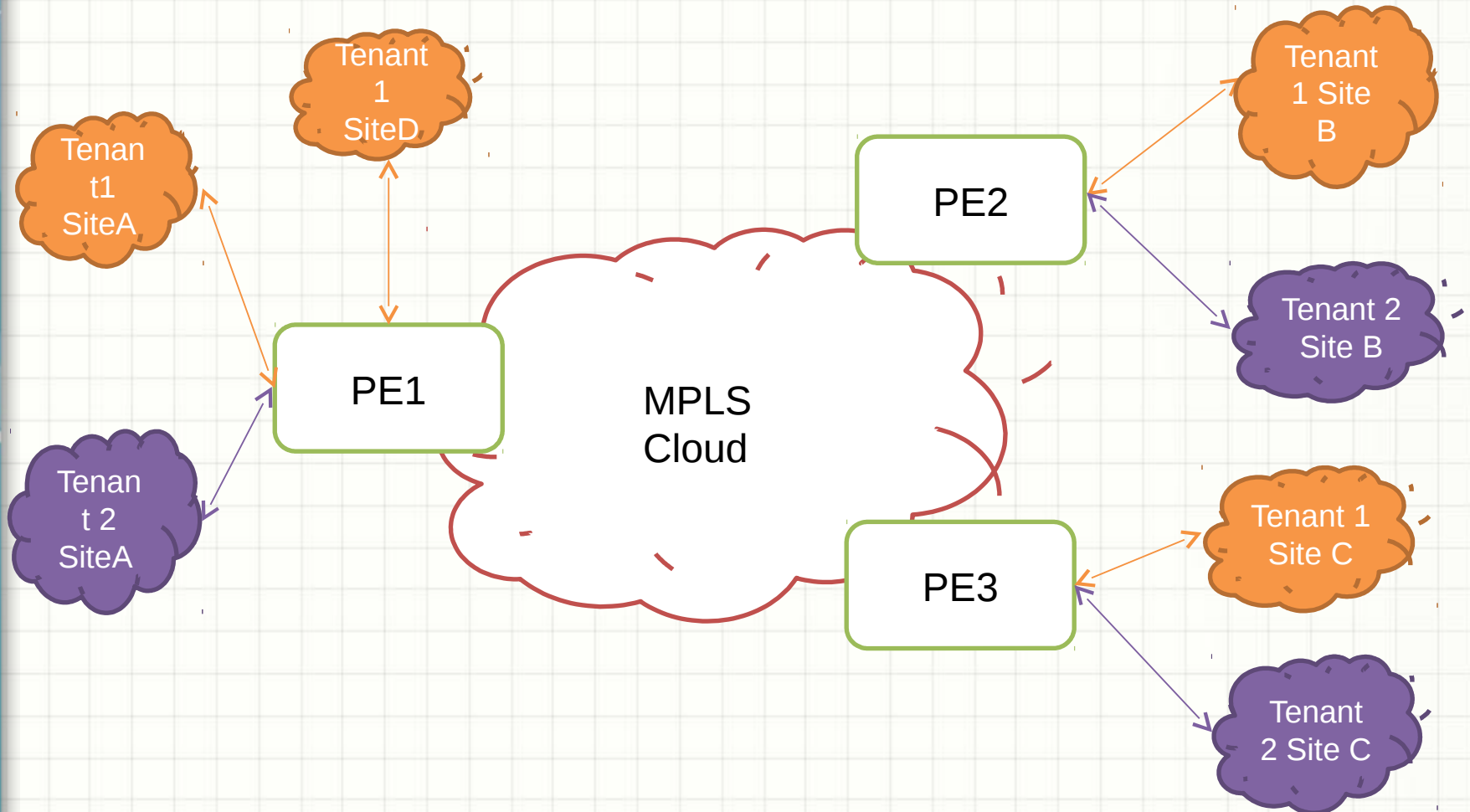
# Problem Statement 1

How to connect multiple (more than 2) TRILL sites using MPLS provider network (PSN)?



# Problem Statement 2

How to connect multiple TRILL sites belonging to a Tenant (Tenant here is campus (not Data label)) using MPLS provider network (PSN)?



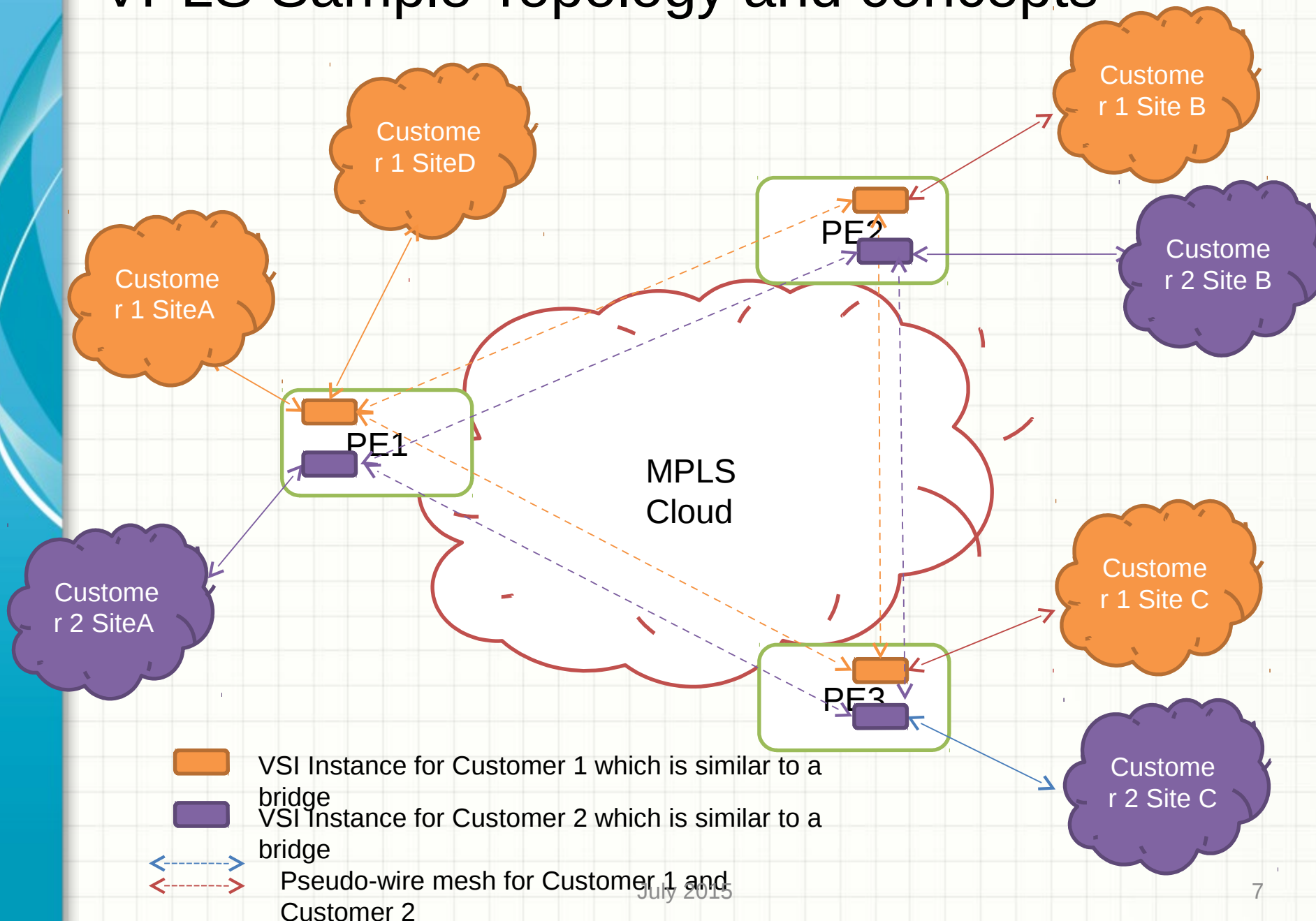


# VPLS Introduction

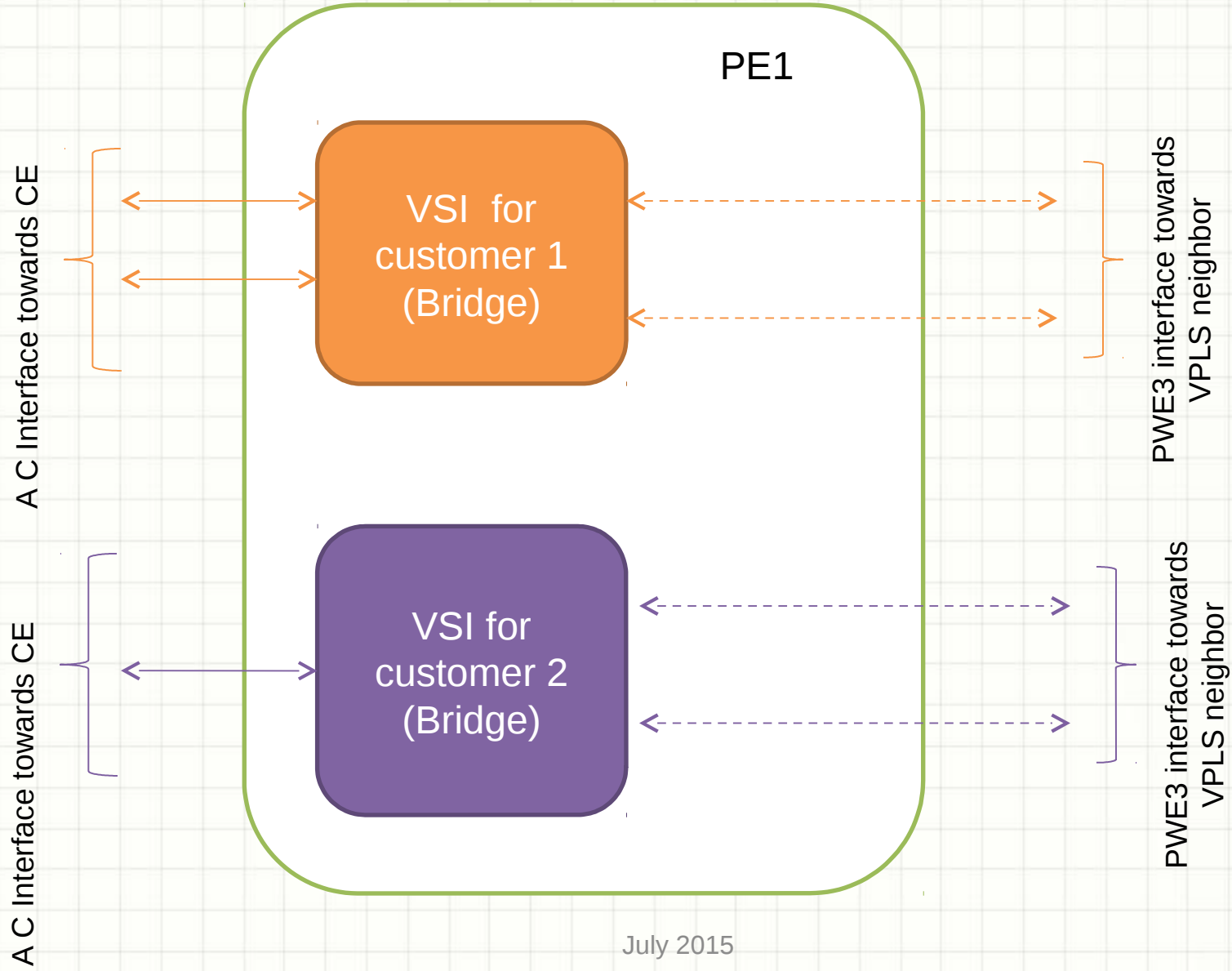
# Introduction to VPLS

- VPLS provides multipoint layer2 VPN service over an MPLS network
- Attachment Circuit:
  - Is a layer2 virtual interface which is connected to the CE device.
  - Can be a switch port or combination of switch port + VLAN
- PWEs (pseudowires)
  - Provides a simulated wire service over MPLS network.
  - Operates over MPLS PSN (Packet Switched Network) tunnel.
- VSI Instance
  - For each customer one VPLS instance / VSI (Virtual Switch Instance) will be created.
  - The VSI acts similar to IEEE layer2 bridge with some exceptions.
  - Two types of ports will be part of this VSI. Attachment Circuit port and PWE3 (pseudowire). Both of these ports are logical ports.

# VPLS Sample Topology and concepts



# Provider Edge (PE) Device





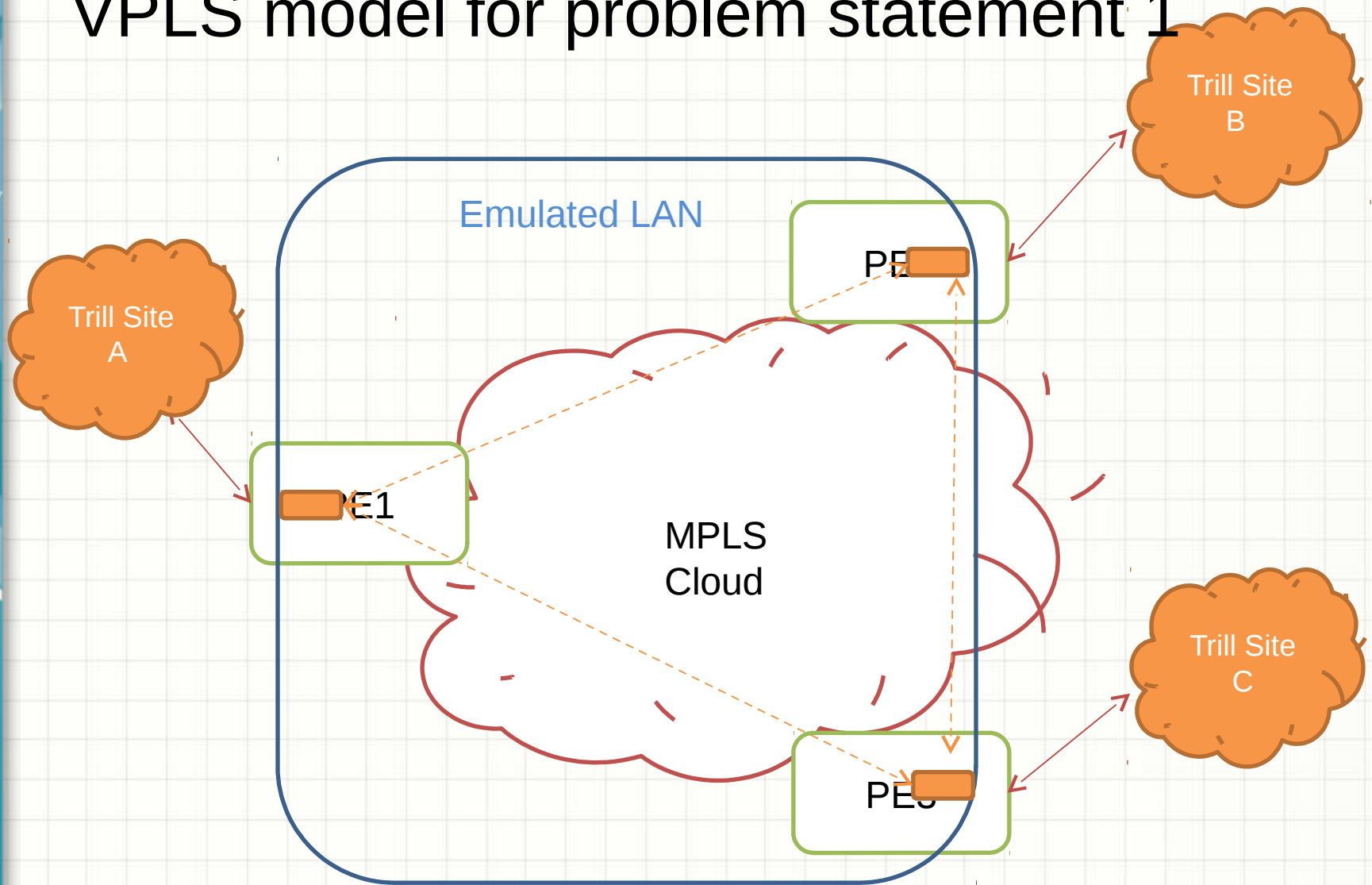



# VPLS Model for TRILL


# VPLS Model Solution Overview

- This model uses the existing VPLS service / VSI to transparently carry the TRILL packets.
- In this model, one VSI instance will be created for each tenant similar to VPLS.
- There is no changes / enhancements to be made in the VSI or PE router.
- The VSI in PE router transparently forwards L2 packets from TRILL site over MPLS domain that encapsulate TRILL payload.
- Split Horizon in the provider PSN network takes care of loop-free topology in the PSN.
- So this looks very similar to RBridges interconnected through a Layer 2 Broadcast Domain. In Broadcast Domain or LAN, STP takes care of loop-free topology, whereas in this model, split horizon takes care of loop free topology.
- This model is useful when PE devices are not capable of running TRILL Protocol

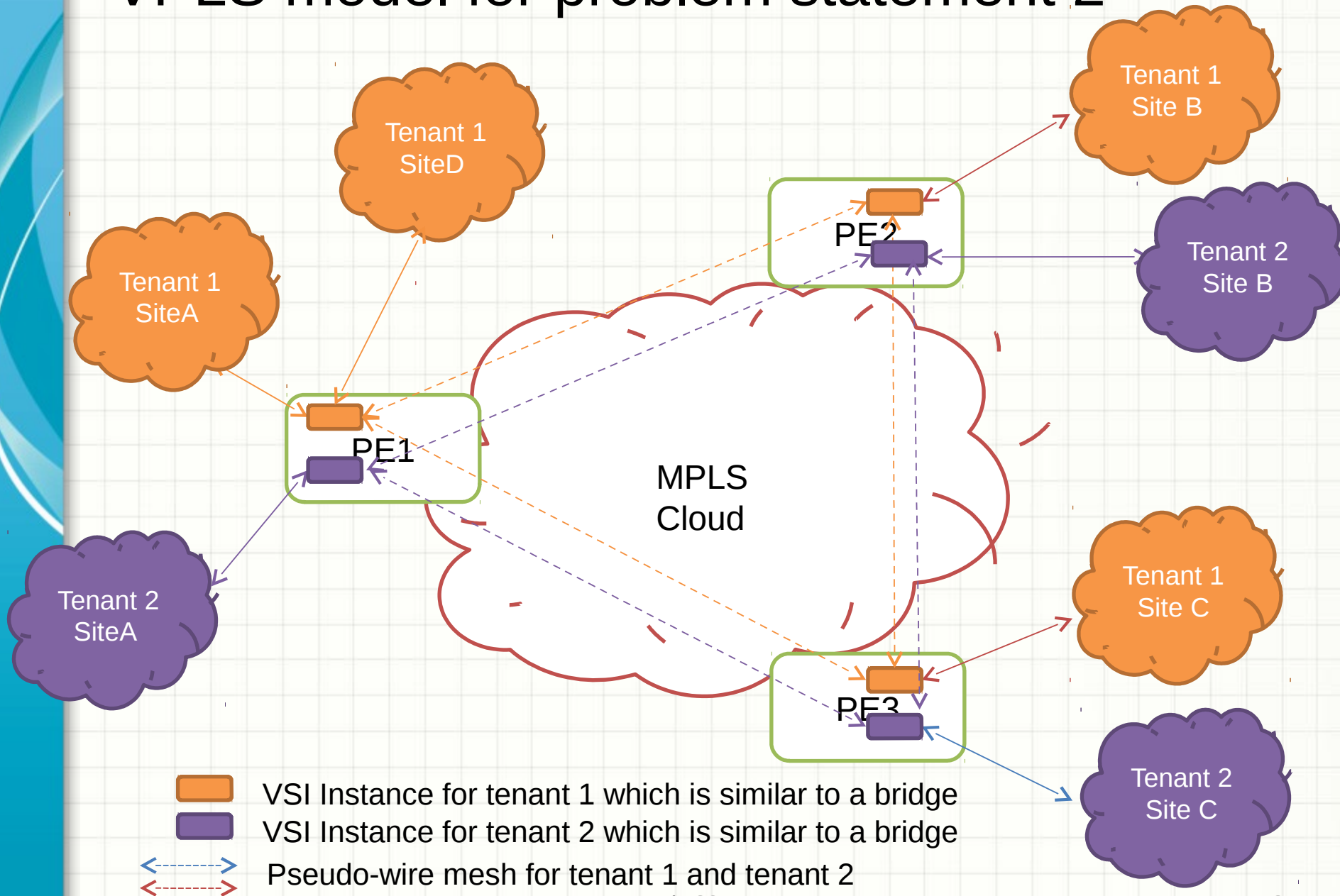
# VPLS model for problem statement 1



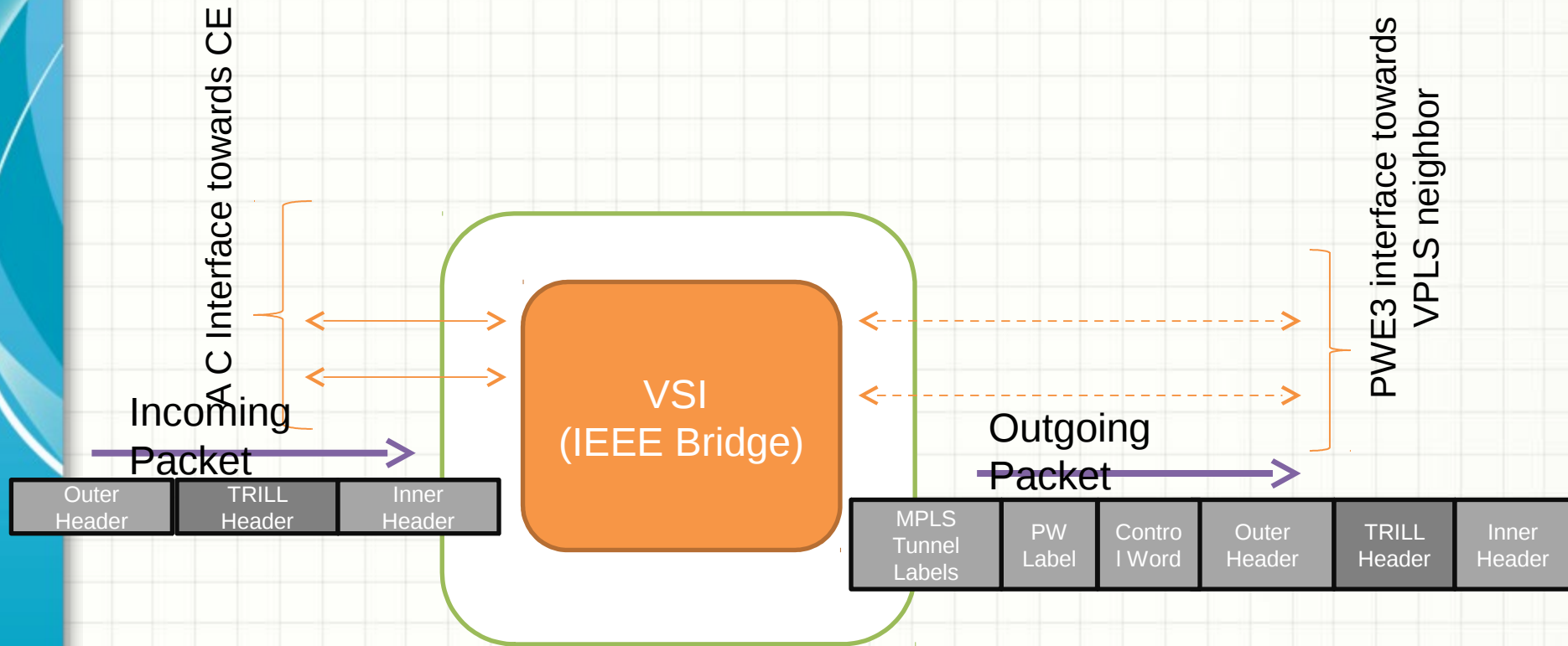
 VSI Instance for connecting different sites.

 Pseudo-wire mesh

# VPLS model for problem statement 2



# VPLS model packet encapsulations





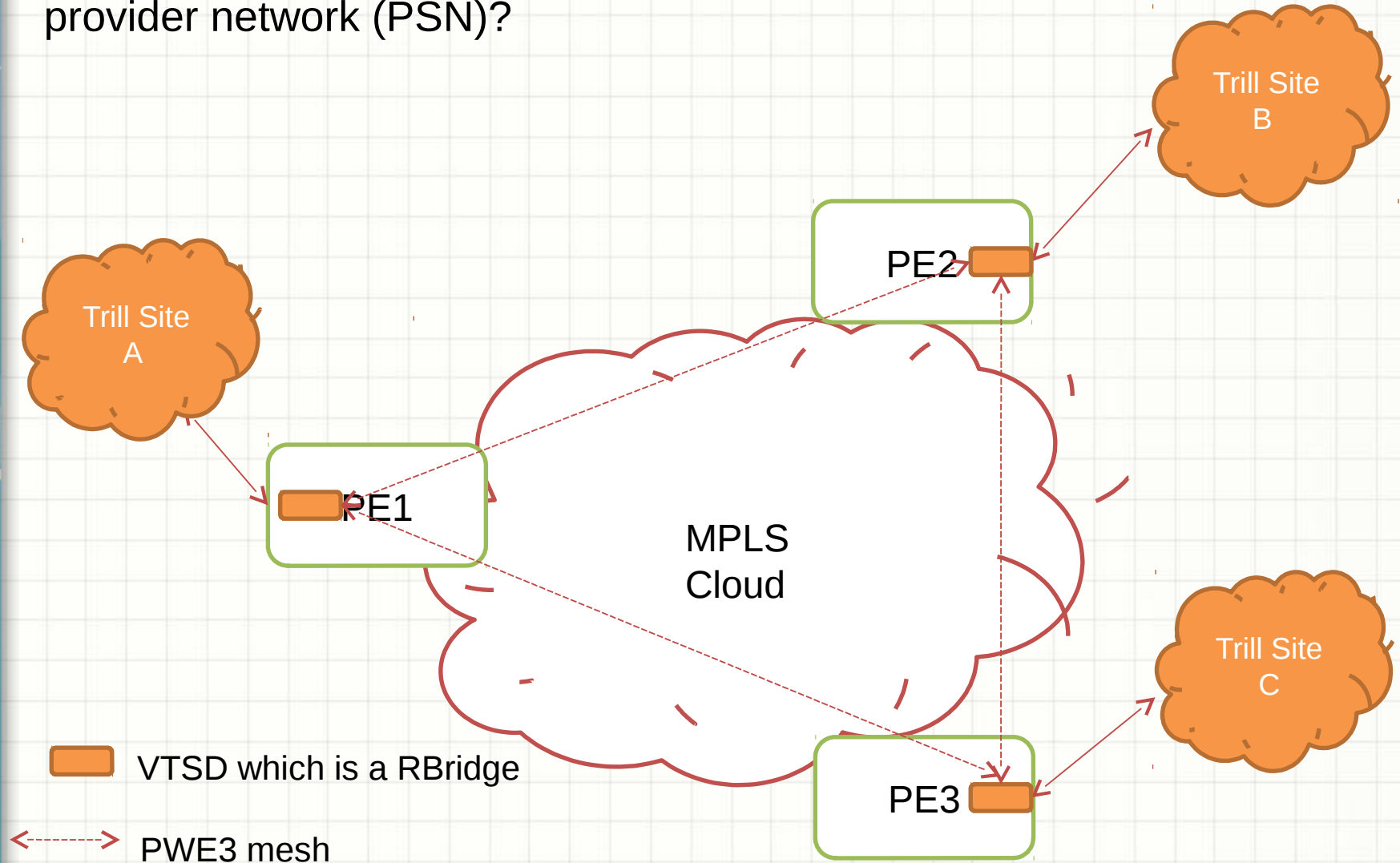
# VPTS Model

# VPTS model (Virtual Private TRILL Service)

- VPTS is similar to what VPLS does for a bridge domain
  - VPLS provides Virtual Private LAN Service for a customer,
  - VPTS provides Virtual Private TRILL Service for a TRILL tenant.
- PE routers are replaced with TIR. A TIR is capable of running both the MPLS and TRILL Protocols, i.e., TIR = MPLS PE + TRILL RBridge.
- A new kind of switch domain, called VTSD (Virtual TRILL Switch Domain), replaces the VSI (bridge) in VPLS.
- The VTSD acts as a Virtual RBridge inside TIR
  - One VTSD domain per tenant in MPLS network.
  - The VTSD as virtual Rbridge maintains all the information for that tenant.
  - Forms adjacency with
    - Other TIRs in the same VTSD domain.
    - RBridge in the TRILL sites.
- VTSD should take care of segregating tenant traffic.
- No need to run Split Horizon in the provider PSN network, as TRILL takes care of Loop free topology using Distribution Trees.
- VLAN pruning of TRILL protocol take care of pruning the Distribution tree.

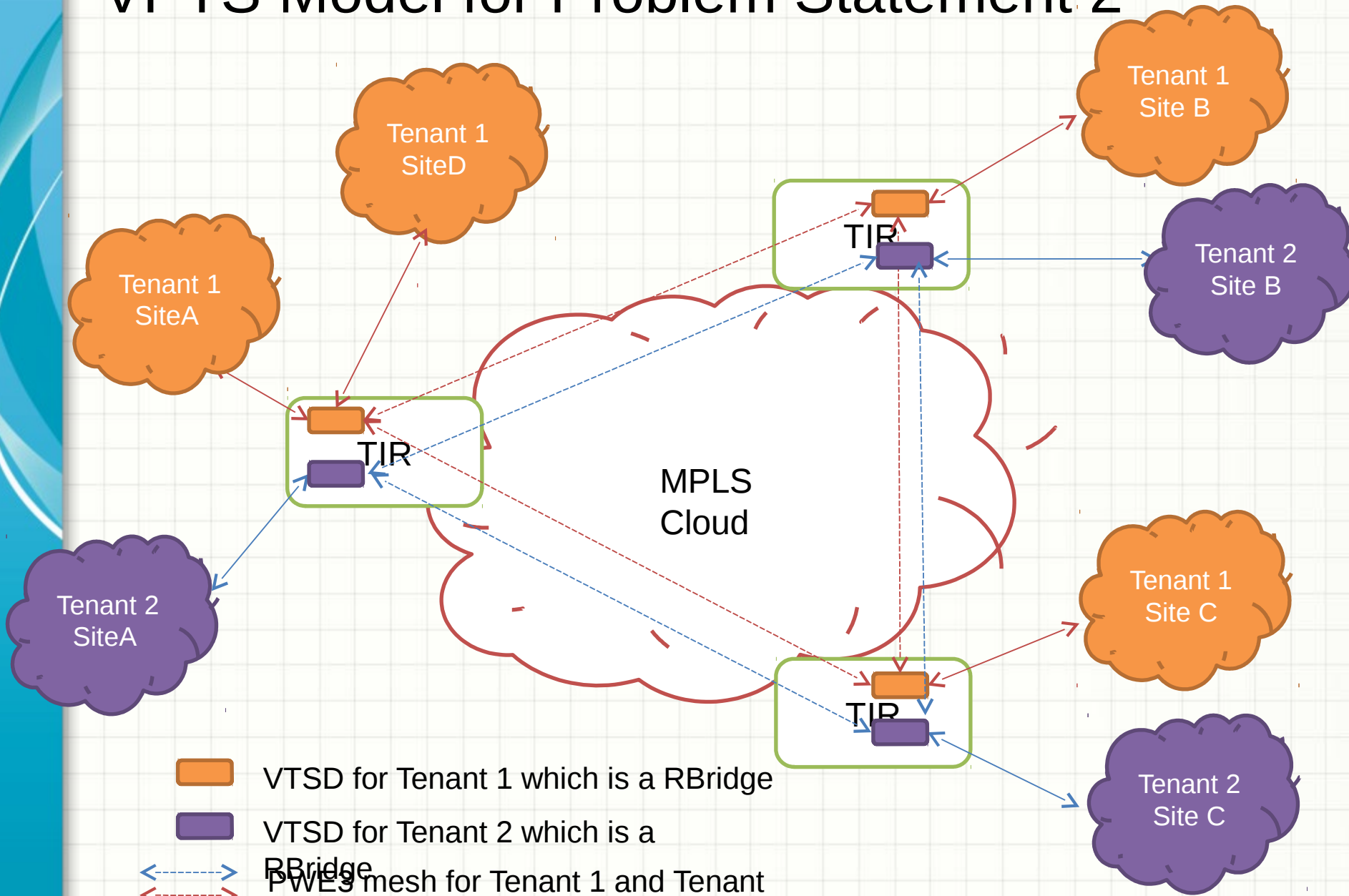
# VPTS Model for Problem Statement 1





How to connect multiple (more than 2) TRILL sites using MPLS provider network (PSN)?



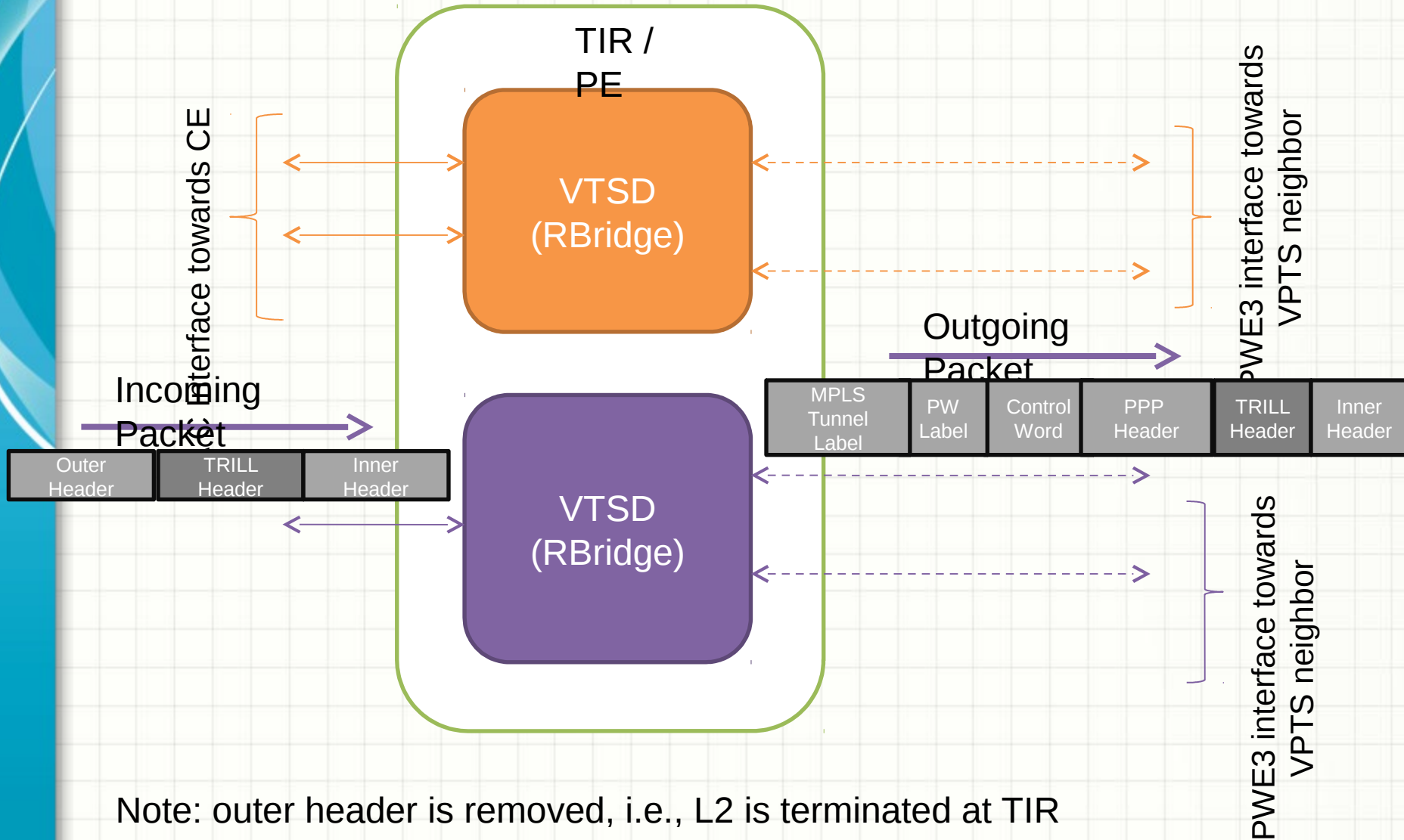


# VPTS Model for Problem Statement 2



-  VTSD for Tenant 1 which is a RBridge
-  VTSD for Tenant 2 which is a RBridge
-  PWES mesh for Tenant 1 and Tenant 2
-  PWES mesh for Tenant 1 and Tenant 2

# VPTS model packet encapsulations



# VPLS and VPTS Model (Similarities)

- Both the models use MPLS Pseudowire encapsulation to send the packet.
- Both the models use MPLS and VPLS control plane to establish the MPLS path.
  - The value of TLV fields may differ, e.g., VPLS uses Ethernet PW; VPTS uses PPP PW
  - VPTS does not rely on VPLS control protocol for MAC withdraw
- Both the models require no control plane protocol enhancements in the PSN network, though the VPTS model requires replacement of the VSI with VTSD.

# VPLS vs. VPTS Model

## VPLS Model

Transparently connect TRILL sites to each other via MPLS domain.

Doesn't require any control plane / data path changes in the existing VPLS control / data plane.

PE device need not be TRILL aware device

TRILL control packets are transparently forwarded to the VPLS neighbor by the PE. This results in PE device not to form TRILL adjacency with RBridges in TRILL sites.

Failure in pseudowire link between any PE devices has to be explicitly handled by any fast re-route mechanisms.

## VPTS Model

Connect TRILL sites with TRILL protocol processing at the MPLS edge device (TIR).

Requires changes in the data plane of existing VPLS processing to avoid split horizon rule.

PE device / TIR needs to be TRILL aware.

TRILL control packets needs to be processed by VTSD at TIR. This results in VTSD of TIR (PE) form adjacency with other TIRs and RBridges in TRILL sites.

Failure in pseudowire links between any PE devices will be handled implicitly by TRILL protocol, as there is a mesh of PW paths.

# Next Steps

- Clarifying VPLS Control Plane Usage for VPTS.
- H-VPLS (Hierarchical VPLS) considerations.
- PW-Redundancy considerations.
- Interoperability between devices supporting VPLS and VPTS models (i.e., TIR and PE devices).
- Defining the behavior of VTSD in all the use case scenarios.
- Discussing this with PALS WG.