VPLS Interoperability with Provider Backbone Bridges

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Current Limitations w/ H-VPLS (either MPLS or Ethernet Access)

- MAC address scalability at n-PE (since all customer MACs are aggregated at n-PE for its set of VPLS instances)

- PW scalability since they need to be maintained per VSI per customer (e.g., proportional to # of customers ^2)

- In addition with Ethernet Access we have:

 - 4K service instances because of 4K S-VLANs

Proposal

- Use 802.1ah (Provider Backbone Bridges – PBB) with H-VPLS to

  - o   scale # of MACs at n-PE

  - o   scale # of PWs

  - o   scale # of service instances in Ethernet Access

- Two scnearios

  - a) H-VPLS w/ 802.1ah access network

  - b) H-VPLS w/ MPLS access network (.1ah function at u-PE)

Definition: Admin Domain in this context

- Same admin domain: Same I-SID space

- Different admin domains: Different I-SID spaces (therefore I-SID translation is required)

H-VPLS with MPLS Access Network:

Core Network
(MPLS)

Access Network
(MPLS)

Access Network
(MPLS)

CE — U-PE — N-PE — P — P — N-PE — U-PE — CE — U-PE
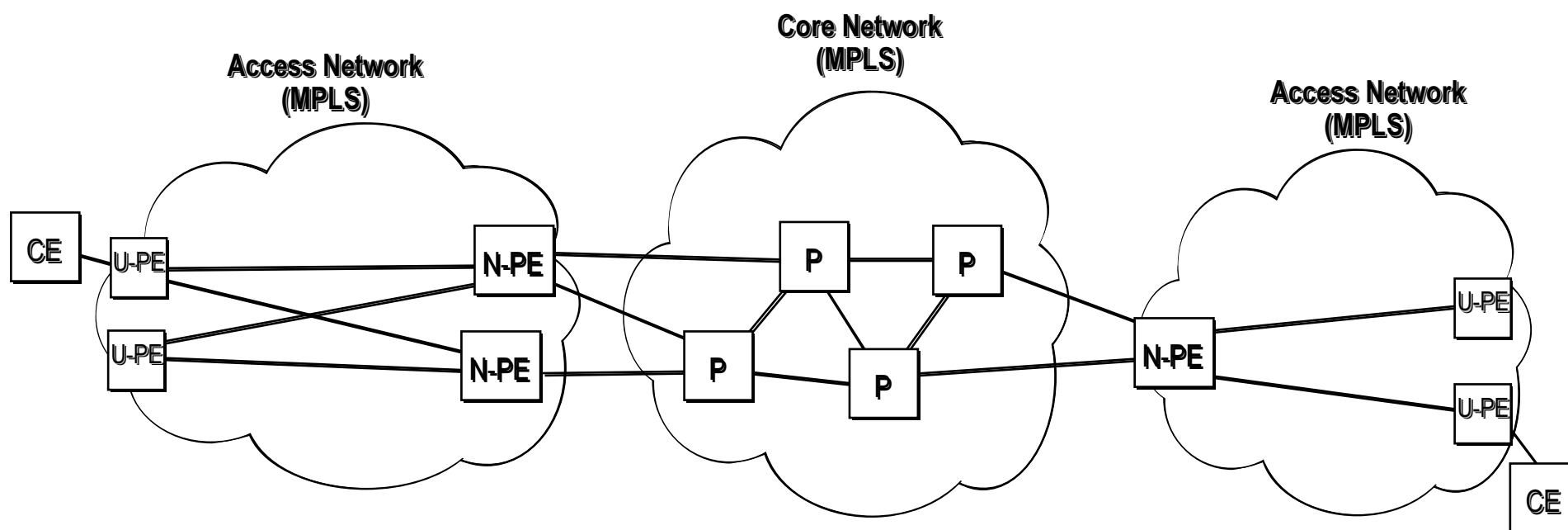
Two cases to Consider:

- MPLS access/agg networks are part of different admin domains

- MPLS access/agg networks are part of the same admin domain

u-PE Requirements & Assumptions

- u-PE is connected to either .1Q or .1ad networks

- u-PE provides 802.1ah encapsulation

- u-PE provides the following three services

  i. Port-mode

  ii. S-VLAN mode

  iii. S-VLAN-bundling mode

- Each of the above services map into a single I-SID
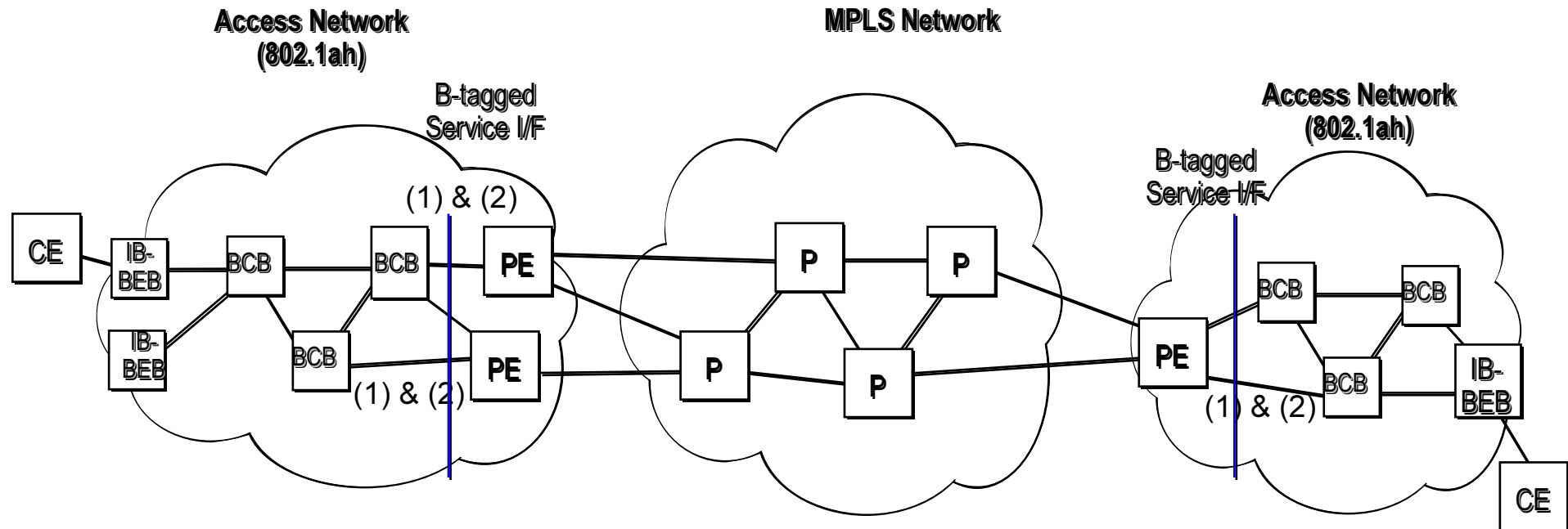
- I-SIDs can be grouped using B-tag

From VPLS perspective

- With respect to VPLS operation, two things need to be considered
    - VPLS instance per B-VID
    - VPLS instance per I-SID

- If a VPLS instance is setup per B-VID, then it can operate exactly the same as done currently. This scenario assumes a single admin domain.

- If a VPLS instance is setup per I-SID, then there are two scenarios to consider:
    - Single admin domain
    - multiple admin domains

Single v.s. Multiple admin domains

- U-PE operation for single admin domain

  - No need for I-SID translation

  - A VPLS instance is setup per I-SID (I-SID is used as service delimiter)

  - Current PW types (either raw mode or tagged mode) can be used

- U-PE operation for multiple admin domains

  - I-SID translation is needed

  - A new PW type is used to carry I-tagged frame. I-SID is translated at the egress PE.

H-VPLS with 802.1ah Access Network:
w/ PEs part of the same admin domain as Access Net

Access Network (802.1ah)

MPLS Network

Access Network (802.1ah)

B-tagged Service I/F

B-tagged Service I/F

(1) & (2)

CE — IB-BEB — BCB — BCB — PE — P — P — PE — BCB — BCB

IB-BEB — BCB — PE — P — P — PE — BCB — IB-BEB — CE

(1) & (2)

(1) & (2)

1) B-tagged service interface w/ B-VID as service delimiter

2) B-tagged service interface w/ I-SID as service delimiter

- PE devices are connected via B-tagged service I/F to 802.1ad BCB

1) B-tagged Service Interface w/ B-VID as service delimiter

- This interface operates exactly as current 802.1Q interface into a VPLS-capable PE and the following services can be supported

  i) Port-mode: where all Ethernet traffic over such interface is mapped onto a single VPLS instance. This is also referred to as unqualified mode

  ii) VLAN-mode: where a given VLAN over such interface is mapped onto a single VPLS instance. This is also referred to as qualified mode

  iii) VLAN-bundling: where a group of VLANs over such interface is mapped onto a single VPLS instance.

- PW requirement is as before and there is no need for new PW type

2) B-tagged Service Interface w/ I-SID as service delimiter – cont.

- **I-SID mode:**

    - Each I-SID is mapped onto a single VPLS instance

    - Forwarding & learning are performed based on B-MAC addresses; however, the scope of broadcast domain is determined by the I-SID – e.g., there is a full mesh of PWs per I-SID

    - If both Access/Agg and Core networks are part of a single Admin domain, then there is no need to do I-SID translation and therefore existing PW can be used (either raw or tagged mode).

    - If Access/Agg networks are part of different admin domains, then I-SID translation is required. Therefore, a **new** PW type needs to be used to a) translate I-SID to the local I-SID based on PW service instance and b) to add a B-tag to it based on PW service instance.
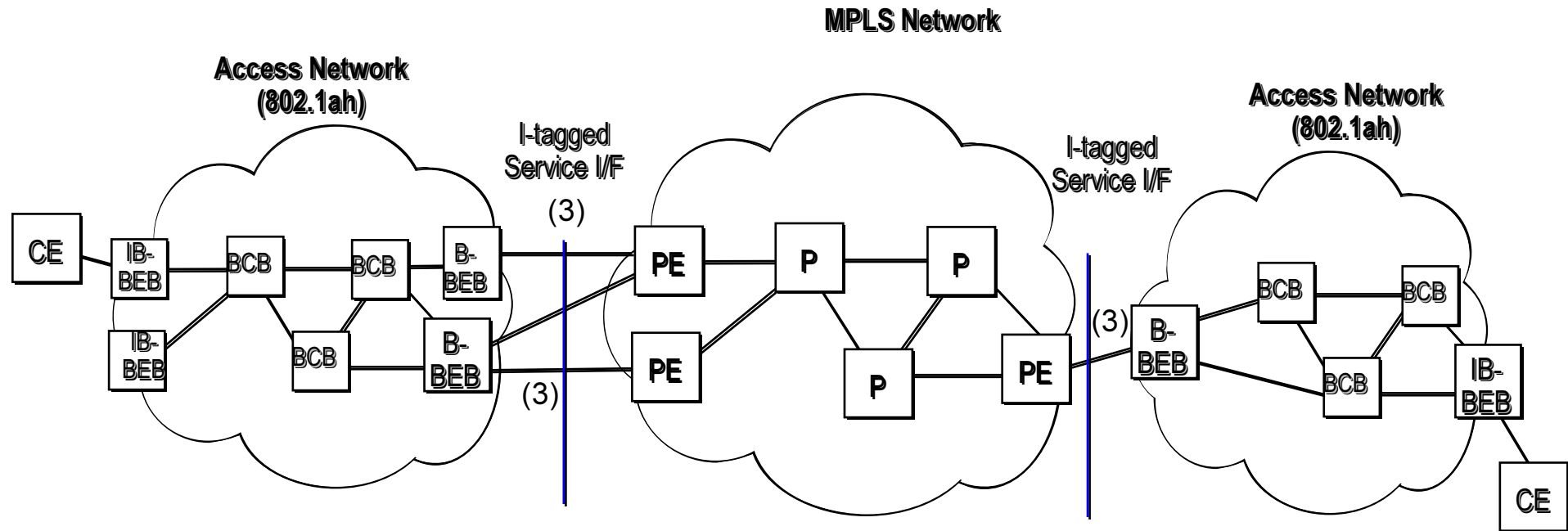
2) B-tagged Service Interface w/ I-SID as service delimiter – cont.

- I-SID-bundling mode:

  - If both Access/Agg and Core networks are part of a single Admin domain, then there is no need to do I-SID translation. Therefore, I-SID bundling can be performed as part of grouping I-SIDs within a B-VLAN and have a full-mesh of PWs for that B-VLAN. The processing of B-VLAN becomes the same as processing a regular VLAN.

  - If access/agg network is part of different admin domain than the core network, then it is not possible to group I-SIDs within a single PW and perform I-SID translation without using I-SID translation table per PW. Since the overhead of this approach is too high, it is not considered here.

H-VPLS with 802.1ah Access Network: w/ PEs part of MPLS admin domains

3) I-tagged service interface w/ I-SID as service delimiter

- PE devices are connected via I-tagged service I/F to 802.1ah B-BEB

- PE devices may include B-component if I-SID processing is needed

3) I-tagged Service Interface w/ I-SID as service delimiter

- This is a new interface as specified in 802.1ah spec. where the frame format is a 802.1ah frame format without any B-tags. I-SIDs are used as service delimiter in this scenario.

  i) Port-mode: where all Ethernet traffic over such interface is mapped onto a single VPLS instance.

  ii) I-SID-mode: where a given I-SID over such interface is mapped onto a single VPLS instance

  iii) I-SID-bundling mode: where a group of I-SIDs over such interface is mapped onto a single VPLS instance.

- If I-SID translation is needed because of different admin domains, then the translation can be performed according to IEEE 802.1ah spec (because of NNI demarcation)

Next Step

- Incorporation of one additional scenario based on the comments received

- Welcoming additional comments/feedback