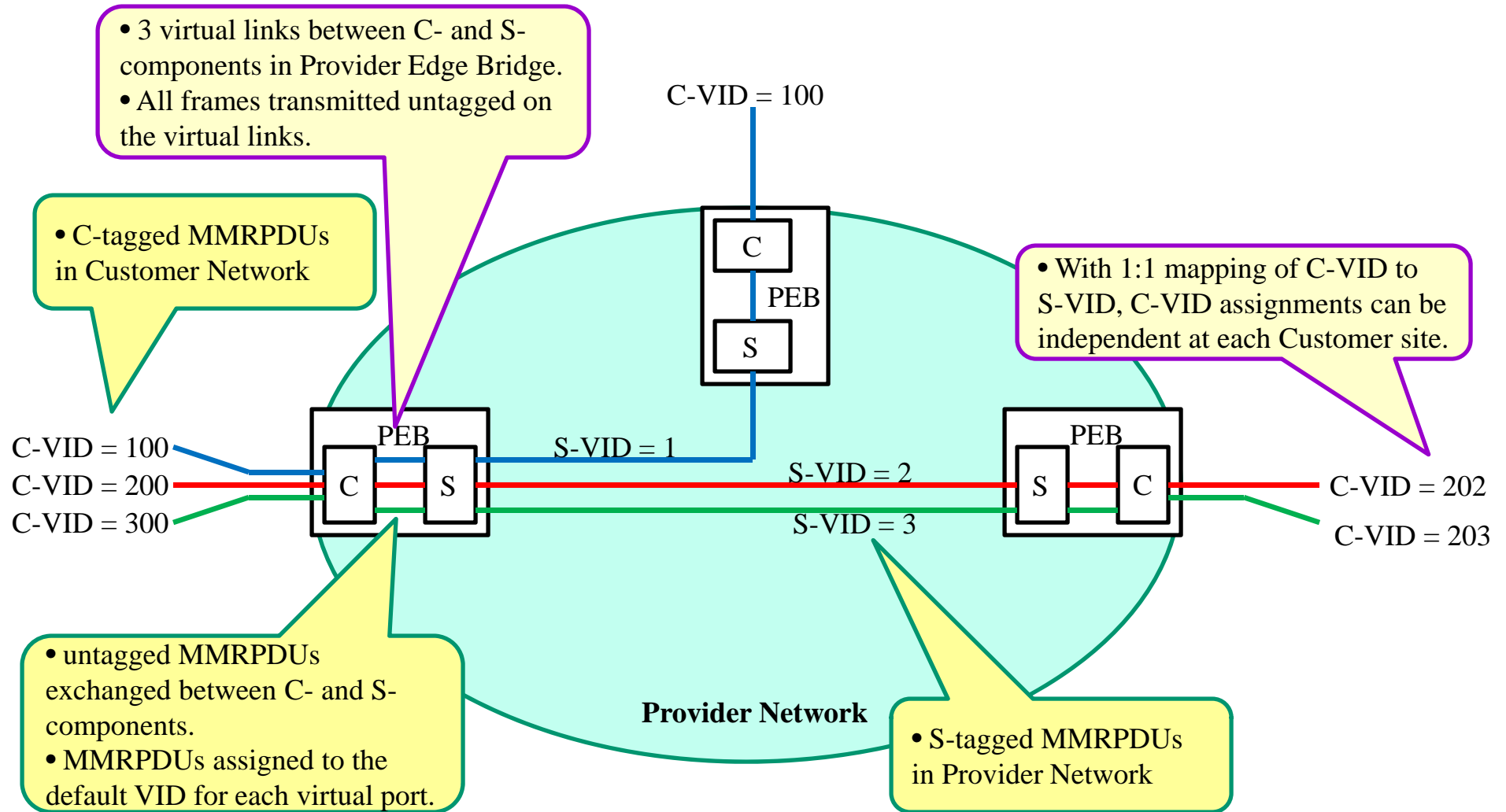# Provider Bridges and MMRP
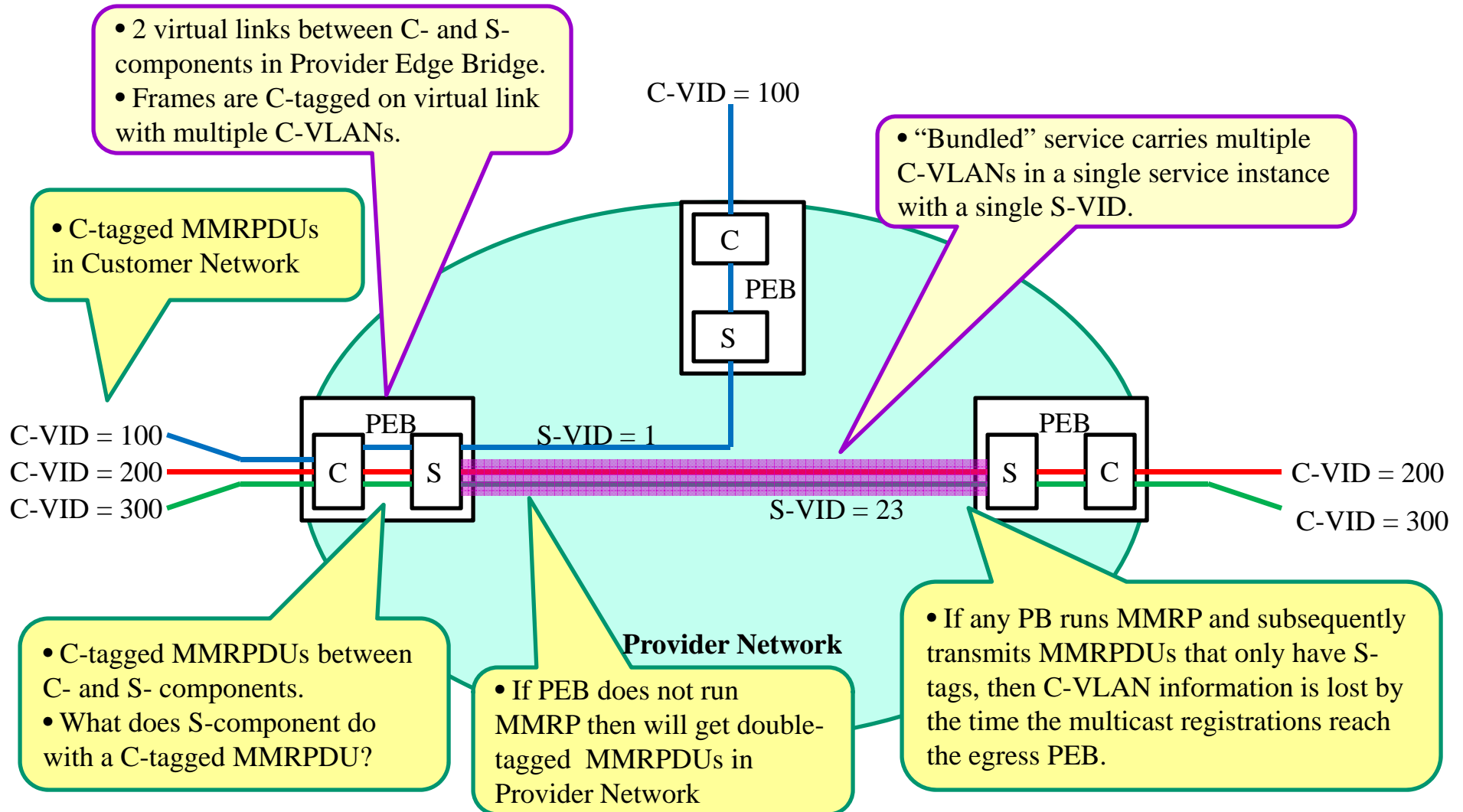## Version 02

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March 21, 2013

Overview

- MMRP creates a common, flat control plane for pruning multicast trees across Customer Networks and Provider Networks.
    - This is unlike xSTP and MVRP that use different Reserved DAs to create separate, hierarchical control planes for Customer Networks and Provider Networks.
- This works when there is a one-to-one map between a C-VID in the Customer Network and an S-VID in the Provider Network.
- It only sort-of works when there is a many-to-one map of C-VIDs to S-VID.
    - It can be made to work with actions that are local to each individual bridge (don't require changes to the PDUs exchanged), but
        - The standard is silent on how to do this so it must be discovered by each implementer independently.
        - It requires saving Customer state in the core of the Provider Network.
    - There may be better solutions if we are willing to make changes to the standard.

2

1:1 mapping of C-VID to S-VID works

• 3 virtual links between C- and S-components in Provider Edge Bridge.
• All frames transmitted untagged on the virtual links.

• C-tagged MMRPDUs in Customer Network

C-VID = 100

C

PEB

S

• With 1:1 mapping of C-VID to S-VID, C-VID assignments can be independent at each Customer site.

PEB

C-VID = 100
C-VID = 200
C-VID = 300

C   S

S-VID = 1
S-VID = 2
S-VID = 3

PEB

S   C

C-VID = 202
C-VID = 203

Provider Network

• untagged MMRPDUs exchanged between C- and S-components.
• MMRPDUs assigned to the default VID for each virtual port.

• S-tagged MMRPDUs in Provider Network

3

"Bundled" Services Are Problematic:

• 2 virtual links between C- and S-components in Provider Edge Bridge.
• Frames are C-tagged on virtual link with multiple C-VLANs.

C-VID = 100

• "Bundled" service carries multiple C-VLANs in a single service instance with a single S-VID.

• C-tagged MMRPDUs in Customer Network

C

PEB

S

PEB

C-VID = 100
C-VID = 200
C-VID = 300

C   S

S-VID = 1

S-VID = 23

PEB

S   C

C-VID = 200

C-VID = 300

Provider Network

• C-tagged MMRPDUs between C- and S- components.
• What does S-component do with a C-tagged MMRPDU?

• If PEB does not run MMRP then will get double-tagged MMRPDUs in Provider Network

• If any PB runs MMRP and subsequently transmits MMRPDUs that only have S-tags, then C-VLAN information is lost by the time the multicast registrations reach the egress PEB.

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Three promising approaches

1. Provider MMRP processes double-tagged MMRPDUs, keeps attribute state per S-VID and C-VID, transmits double-tagged MMRPDUs.

    – I think this works, but keeping state per C-VID in Provider Core is ugly.

2. Provider MMPR forwards double-tagged MMRPDUs and also processes them ignoring the C-tag, keeps state per S-VID only, transmits S-tagged MMRPDUs.

    – This might work. Seems ok for join operations, but there are (solvable?) issues with leave operations.

3. MMRP at CNPs forwards and processes C-tagged MMRPDUs, keeps state per S-VID and C-VID, transmits C-tagged MMRPDU to Customer Network and S-tagged MMRPDU toward Provider Network. MMRP in Provider Core simply forward double-tagged MMRPDUs.

    – Seems promising. Keeps Customer state isolated to edge of Provider Network at the expense of special processing at CNPs.

•   None of these require changes to the PDUs, protocol operations or state machines, although number 3 may work better if Provider and Customer MMRP used different reserved DAs. 5

1. C-VLAN state in Provider Core

- Virtually no change to standard; just an "interpretation" of the MAP context.
  - A Provider Bridge supports a MAP context of "per S-VLAN" using S-tagged MMRPDUs **and** a MAP context of "per S-VLAN per C-VLAN" using double-tagged MMRPDUs.

- Advantages and Disadvantages:
  - Maintaining Customer specific state in the core of a Provider Network is a significant disadvantage.
  - When the Customer state is present, it allows a Provider Bridge to filter data frames based on both S-VID and C-VID.
    - Filtering multicast using both S-VID and C-VID was requested in ballot comments during 802.1ad. The comments were rejected because there was a strong desire not to require Provider Bridges to process both tags. Having the Customer MMRP (and MVRP?) state would allow this level of filtering without requiring it.

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3. C-VLAN state at Provider Edge

- Customer specific state contained to the edge of PBN by having CNPs "snoop" ingress Customer MMRPDUs.
    - "Snoop" means the original frame is forwarded, but the MMRP application also processes it and keeps C-VLAN specific state. CNPs do not generate MMRPDUs(?)
    - Applies to all Customer Network Ports at Port-Based Service Interfaces and C-tagged Service Interfaces. Other ports in Provider Network (PNPs) keep only S-VLAN specific state, and generate only S-tagged MMRPDUs
- Advantages and Disadvantages
    - No Customer specific state in the core of the Provider Network.
    - If MMRP is supported anywhere in Provider Network then must be supported at all CNPs(?)

Interoperability with current implementations

- Depends upon what current implementations do with double-tagged MMRPDUs

  A. If Provider MMRP simply discards C-tagged MMRPDUs:

     - Customer and Provider MMRP is defeated: Registration information is not propagated within Provider Network or between the Customer Network sites.

  B. If Provider MMRP simply forwards C-tagged MMRPDUs:

     - Customer MMRP works but Provider MMRP is defeated: Registration information is propagated between Customer Network sites, but not within the Provider Network.

       – Will data frames with the group address get through the Provider Network?

  C. If Provider MMRP processes MMRPDU ignoring C-tag:

     - Customer MMRP is defeated, but Provider MMRP might work.

       – Provider MMRP "registration" operations will work, but will "leave" operations?

Feedback from March 18 presentation to the Interworking Task Group

- Nobody wants Customer (i.e. per C-VLAN) state in the core of the Provider Network!!!

- Approach number 2 has issues with leave operations because it only keeps per-S-VLAN state. Can resolve by keeping per C-VLAN state but then want it only at Provider Edge so it becomes very close to approach 3.

- Approach number 3 hopefully does not need to transmit C-tagged MMRPDU toward the Customer Network (only snoops Customer MMRPDU but does not participate).

- Focus on approach #3.

- Also need to resolve the MAP Context change that occurs when have a D-bridge in a VLAN network.

Proposal (based on approach #3)

- The basic idea:

  1. C-tagged MMRPDUs forwarded through Provider Network.

  2. CNPs (at edge of Provider Network) can snoop C-tagged
     MMRPDUs, keep per-C-VLAN state, summarize the customer
     address registrations into provider address registrations that get
     propagated with S-tagged (not double-tagged) MMRPDUs.

- Effectively separates the MMRP control planes in the
  Customer and Provider Networks

  – Much like the separation of Provider and Customer xSTP and MVRP.

Back-Up Slides

What should an S-VLAN component do with MMRPDUs containing C-tags?

I.   S-VLAN Component does not run MMRP

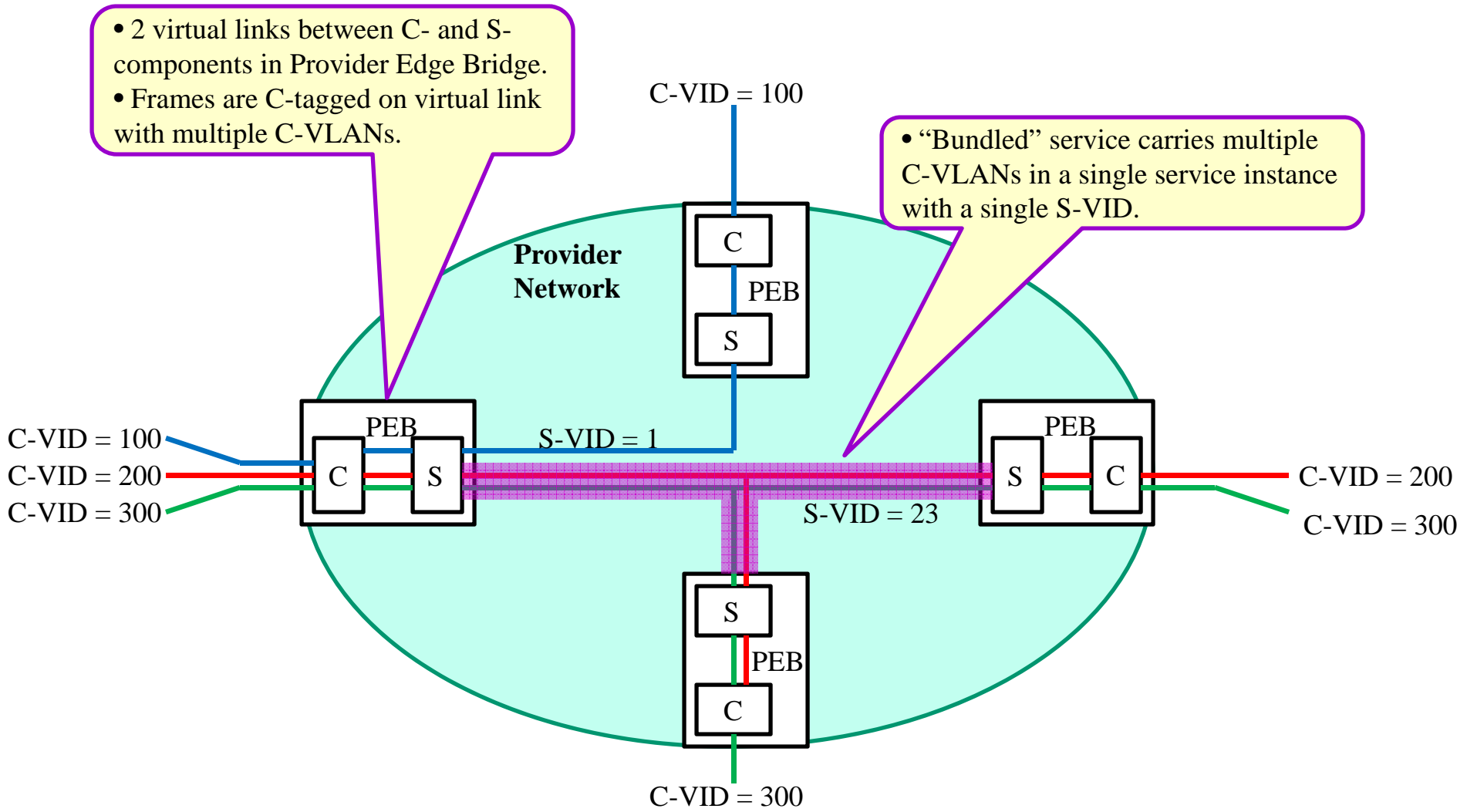MMRPDU is forwarded on the S-VLAN

II. S-VLAN Component runs MMRP

MMRPDU is intercepted (relay filters; MMRP application processes)

A.   If MMRP does not handle state per C-VLAN, options are:

1.   MMRP discards the PDU

2.   MMRP forwards the PDU

3.   MMRP processes the PDU ignoring the C-tag, and generates MMRPDUs without C-tags.

4.   MMRP forwards and processes the PDU ignoring the C-tag (and generates MMRPDUs without C-tags?)

B.   If MMRP handles state per C-VLAN

1.   MMRP processes the PDU including the C-tag, and generates MMRPDUs with C-tags.

2.   MMEP forwards and processes the PDU including the C-tag (and generates MMRPDUs without C-tags?)

- 2 virtual links between C- and S-components in Provider Edge Bridge.
- Frames are C-tagged on virtual link with multiple C-VLANs.

- "Bundled" service carries multiple C-VLANs in a single service instance with a single S-VID.

C-VID = 100

Provider Network

C

PEB

S

C-VID = 100
C-VID = 200
C-VID = 300

PEB

C   S

S-VID = 1

S-VID = 23

PEB

S   C

C-VID = 200
C-VID = 300

S

PEB

C

C-VID = 300

13

Thank You

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