Provider Bridges and MMRP
Version 01

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

- With 1:1 mapping of C-VID to S-VID, C-VID assignments can be independent at each Customer site.
- S-tagged MMRPDUs in Provider Network
- C-VID = 100
- S-VID = 1
- C-VID = 200
- S-VID = 2
- C-VID = 300
- S-VID = 3
- C-VID = 202
- S-VID = 2
- C-VID = 203
- S-VID = 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-tagged MMRPDUs in Customer Network
- "Bundled" service carries multiple C-VLANs in a single service instance with a single S-VID.

- 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.
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 double-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.
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.
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 MMRPDU's
  
  A. If Provider MMRP simply discards C-tagged MMRPDU's:
     - 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 MMRPDU's:
     - 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?
Back-Up Slides
What should an S-VLAN component do with MMRP PDU containing C-tags?

I. S-VLAN Component does not run MMRP
   MMRP PDU is forwarded on the S-VLAN

II. S-VLAN Component runs MMRP
    MMRP PDU 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 MMRP PDU without C-tags.
       4. MMRP forwards and processes the PDU ignoring the C-tag (and generates MMRP PDU without C-tags?)
    B. If MMRP handles state per C-VLAN
       1. MMRP processes the PDU including the C-tag, and generates MMRP PDU with C-tags.
       2. MMEP forwards and processes the PDU including the C-tag (and generates MMRP PDU without C-tags?)

Most likely to work.
• 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.
Thank You