ECMP CFM Drafting Discussion Summary
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ACCEPT IN PRINCIPLE. Presentation of proposal (bp-saltsidis-CFM-for-ECMP-1112-v01.pdf) and discussion in the TG meeting. Discussion covered the understanding that both VLAN MAs and PBB-TE MAs will be used in SPBM VLANs although this is not clear from reading 802.1aq. Functionality similar to PBB-TE MAs (i.e., MEPs that use specific I-SID group addresses for CCM DA) is thought to be useful (by some) in SPBM and ECMP applications. The next draft will include an ECMP VID MA with MEP CCM behavior that cycles through a configured set of group addresses (in a manner similar to the flow hash cycle currently specified for ECMP path MAs). The LTM and LBM behaviors will be the same across all MAs/MEPs/MIPs for ECMP.

Add text to 27.18 covering the use of PBB-TE MAs in SPBM VLANs.
ECMP VID MAs

- The MA *may* be associated with all I-SIDs with a particular set of endpoints (assuming “association” means that the MA tests the multicast trees assigned to those I-SIDs).
- The association is *explicit* for I-SIDs configured to be used by a MEP (i.e., the I-SID’s group address is used in CCMs).
- The association is *implicit* for I-SIDs that are not configured to be used by a MEP, but who share the same trees as some I-SID that is configured to be used by a MEP.
- There is no association for I-SIDs that are not configured to be used by a MEP and that have a tree assignment that is not used by any I-SID configured to be used by a MEP.

*Note: It would be possible to configure a MEP to use an I-SID for which the MA’s endpoints are a subset of the I-SID’s endpoints without a fault being declared. In this case the MA is in some way associated with an I-SID that does not share the exact same set of endpoints.*
The MA identifier would change if MEPs are added to or deleted from the MA. Is this a desirable behavior?

If more than one of these MAs has a MEP at a given CBP, how are these MEPs distinguished?

Would MEP configuration be based on a list of I-SIDs, implying the use of the group addresses for those I-SIDs at that CBP?

What behavior should be specified when an I-SID providing an address used in the MA is deleted from a CBP hosting a MEP belonging to the MA?

What behavior should be specified when an I-SID is configured at a MEP but that I-SID is not configured at the CBP hosting another MEP in the MA?
MA Identifier

- MA to test group address connectivity between a specified set of CBPs
  - In the remaining slides called “ECMP group MA”
- The CBP set could be used as the MA identifier (list of CBP MAC addresses?)
  - If a MEP is added or removed the identifier changes
  - Delete old MA and create new MA, or
  - Change identifier on the fly.
- An I-SID could be used as the MA identifier
  - One of the I-SIDs used for monitoring, or
  - A “dummy” I-SID used only to identify the CBP set.
MEP Location

- More than one MA (MEP) may reside on a CBP
- How are frames directed to the correct MEP?
  - TESI Mux
  - BSI Mux
- In both cases, the MEP is configured to send CCMs using set of I-SID group addresses
- In the **TESI Mux** case, the group addresses associated with remote MEP’s I-SIDs must be used to select the MEP
- In the **BSI Mux** case, the set of **remote MEP’s I-SID**s must be used to select the MEP
MEP Location – TESI Mux

- TESI Mux is used for ECMP path MEPs
- Can mix group MEPs and path MEPs
- Difference in DA between MAs
- A group MEP is associated with a set of group addresses

Note: Only the SPBM MA can reach MIPs (i.e., perform LB and LT) since it is at the lowest MD level on the CPB.

*Note: Figure does not show proper Mux nesting
### MEP Location – BSI Mux

- BSI Mux is used for ECMP path MEPs
- A group MEP is associated with a set of I-SIDs

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<th>TESI Mux</th>
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- **SPBM MAs, VID MAs**
- **ECMP path MAs**
- **ECMP group MAs**
- **BSI MAs**

**Notes:** Only single I-SID per MEP w/BSI Mux; No CPB address translation – so this may not work, but this may.
Each MEP in an ECMP group MA is configured with a list of I-SIDs it will use for CCM DAs.

In a TESI Mux, the MEP must be associated with specific 3-tuples \(<\text{DA}, \text{SA}, \text{VID}>\).

Therefore, an ECMP group MEP must be configured with the 3-tuples from all the remote MEPs in the MA.

For each remote MEP \(x\), and each I-SID \(i\) configured in MEP \(x\) one must determine the group address used by the I-SID at that CBP and record a 3-tuple \(<\text{DA}_i, \text{SA}_x, \text{VID}>\) in the TESI Mux for the local MEP.

Note: If an I-SID is configured not to send multicast frames at a CBP, then that I-SID cannot be used by the MEP.
An I-SID used in an ECMP group MA MUST be configured on (at least) the CBPs in the MA.

It was noted that automation could ensure consistent configuration of MEPs in case of changes in I-SID connectivity.

Specifying automation is a significant task.

As noted in San Antonio, automation of MEP configuration is not in scope for Qbp.

Qbp will only address the MEP configuration required and any consistency rules that must be maintained by an operator or controller.
If an I-SID is deleted from a CBP the forwarding state for that I-SID’s group address at that CBP will be deleted.

If that I-SID is configured in an ECMP group MEP, the path for CCM using the deleted address may be broken.

Therefore, **before deleting an I-SID from a CBP, one should remove the I-SID from any ECMP group MA.**
If an I-SID is added to a CBP, forwarding for that I-SID’s group addresses to that CBP will be created.

If that I-SID is configured in an ECMP group MEP, CCMs will arrive at the new CBP and be discarded.

No defect will be detected, however this situation does not conform to the strict consistency rule originally proposed.
Changing an I-SID Tree

- If an I-SID is assigned a new multicast tree type, the forwarding state for that I-SID’s old group address will be deleted and a new address added.
- If that I-SID is configured in an ECMP group MEP, the expected address at receiving MEPs will be wrong.
- Therefore, **before changing an I-SID’s tree type at a CBP, one must add the new expected address to the other MEPs in the MA.**
ECMP group MA Maintenance

- To maintain the correspondence between I-SID endpoints and ECMP group MA endpoints
  - If an I-SID endpoint is added
    - the I-SID should be removed from any ECMP group MA, and
      - A new ECMP group MA created for that I-SID, or
      - Add the I-SID to an* ECMP group MA with matching endpoints, or
      - No longer use the I-SID in an ECMP group MA.
  - If an I-SID endpoint is to be deleted
    - The I-SID should first be deleted from any ECMP group MA
    - Delete the I-SID from the CBP, and
      - Create a new ECMP group MA for that I-SID, or
      - Add the I-SID to an ECMP group MA with matching endpoints, or
      - No longer use the I-SID in an ECMP group MA.
  - If an I-SID’s multicast tree type changes
    - Add the new expected address before changing
    - Remove the old expected address after changing

*Can more than one ECMP group MA have the same set of endpoints?
ECMP group MA Maintenance

- Adding an ECMP group MA MEP
  - For each I-SID used in the MA
    - Add an I-SID endpoint at the new CBP, or
    - Remove the I-SID from the MA

- Deleting an ECMP group MA MEP
  - For each I-SID used in the MA
    - Delete the I-SID at the CBP where the MEP is deleted, or
    - Tolerate the looser consistency rule.
BSI MAs

- BSI CFM is already defined
- One I-SID per MA
- Capable of monitoring the same group address trees as ECMP group MAs
- **No coordination required** with backbone MAs when making changes to BSI endpoints
- Select a set of BSIs to monitor the desired multicast trees and enable BSI CCMs
- If a selected BSI’s endpoints change, reevaluate the selection, if necessary
Choices

- Do we add ECMP group MAs to Qbp?
  - Will add SPBM group MA which can be used (unchanged) in ECMP VIDs
  - How are SPBM Group MAs identified?
    - Use I-SID as MA identifier
    - MEPs inherit MA I-SID and use that I-SID’s local group address as DA in CCM
  - Single I-SID per MA* or multiple I-SIDs per MA?
    - Single I-SID per MA

- Do we describe how BSI MAs can be used to monitor ECMP multicast trees? No

*Reduces complexity of MA maintenance by removing constraints related to I-SID grouping.
Use of PBB-TE MAs with SPBM

- From Janos:
  - aq-farkas-CFM-in-802.1aq-0908.pdf
  - aq-farkas-proposal-for-CFM-in-SPB.pdf

- For SPBM MAs the SA in LBR and LTR frames should be set according to the same logic used for PBB-TE
  - not currently specified in the 802.1Qbp draft

- Does not describe how MAs are configured

- Is anyone convinced that we need to specify PBB-TE MAs to be used with SPBM VLANs? Yes, but this is covered by stating that SPBM path MA is functionally identical to the PBB-TE P-P MA.