

# PBB-TE (802.1Qay) CFM

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# Agenda

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- **CFM scope in PBB-TE**
- **CFM enhancements needed in 802.1Qay**
- **Proposed Solution(s)**



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# PBB-TE CFM Scope

# PBB-TE Overview

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- PBB-TE supports active topology via provisioned Ethernet Switched Paths (ESPs) in a PBBN
- For B-VIDs allocated to PBB-TE, the MAC learning is turned off and frames with unknown destination address are discarded and not flooded
- ESPs can be identified by  $\langle B\text{-DA}, B\text{-SA}, B\text{-VID1}, B\text{-VID2} \rangle$  where B-VID1 and B-VID2 may be same or different in either direction and belong to VID set reserved for PBB-TE



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# PBB-TE CFM Requirements

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- **802.1Qay/D0.0 Scope (c1.1) implies requirements to support Continuity Check and Loopback protocols of CFM**
- **Support for CCM and LBM/LBR does not necessarily imply the need for MIPs for PBB-TE ESPs**
- **Question: Are MIPs for PBB-TE ESPs required?**



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# PBB-TE CFM Requirements (cont'd)

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- If PBB-TE ESP MIPs are required, support for Linktrace protocol can also be considered
  - Linktrace protocol support is not precluded but not explicitly stated in D0.0
- **Question: Assuming that MIPs in PBB-TE ESPs are required, is Linktrace protocol support a requirement?**

# PBB-TE CFM Requirements (cont'd)

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- If support for Linktrace protocol is considered to be a requirement, LTM/LTR support does mandate that paths for an ESP are co-routed in either direction
- Co-routing of paths for an ESP in either direction is implied even otherwise in Annex M; seems to be intended choice
- **Question: Assuming that Linktrace protocol support is a requirement, is there any issue with requirement that paths of ESP are co-routed in either direction?**

# PBB-TE CFM Enhancements

# PBB-TE CFM Enhancements – Set 1

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- The first set of enhancements are identified for CFM support between PBB-TE MEPs
- CFM protocols between PBB-TE ESP MEPs
  - Continuity Check
  - Loopback
  - Linktrace not really needed between PBB-TE MEPs

# Continuity Check Enhancements

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- **Continuity Check across PBB-TE ESP requires Unicast CCMs where the Unicast address is same as B-DA in the direction of ESP**
  - This is such that forwarding along the path is based on same <B-DA, B-VID> tuple as any data path frame as required by PBB-TE ESP
- **Unicast CCMs are already supported in Y.1731 and is not precluded in 802.1ag**
- **For explicit support, update will be needed to text from .1ag/D8.1 c3.2, c8.13.11, c18 etc.**
- **Enhancement#1: Support Unicast CCMs**

# Loopback Enhancements

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- Loopback across PBB-TE ESP MEPs works fine without any issues if same B-VID is used in either direction of ESP path
- However, when different B-VIDs are used in either direction, a more general case, enhancement is needed to additionally change VID value in LBR
- **Enhancement#2: Support change in VID value in LBR at the loopback point**



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# PBB-TE CFM Enhancements – Set 2

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- The second set of enhancements are identified assuming need to support PBB-TE MIPs
- CFM protocols between PBB-TE ESP MEPs and MIPs
  - Loopback
  - Linktrace

# Loopback MIP Enhancements

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➤ **Loopback to a PBB-TE ESP MIP requires enhancement since:**

- If DA in LBM identifies MIP's MAC, MIP MAC may not be provisioned in filtering databases associated with PBB-TE ESP VIDs, meaning that LBM frame may be discarded since flooding is not allowed
- If DA in LBM is same as B-DA, MIP may not selectively intercept LBMs intended for it

➤ **Enhancement#3:**

- PBB-TE ESP MIPs should be able to intercept LBMs intended for it
- PBB-TE ESP MIPs should be able to ignore LBMs not intended for it



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# Linktrace MIP Enhancements

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- **Linktrace in a PBB-TE requires enhancement since:**
  - If DA in LTM is a multicast MAC as per Table 8-10/802.1ag/D8.1:
    - a static entry for this group MAC address will need to be added in all devices apriori
    - since VID can be reused across different PBB-TE ESPs, LTM would not be bounded to only PBB-TE ESP path
    - Since target MAC may not be provisioned in filtering databases associated with PBB-TE ESP VIDs, MIP would have no means to determine whether or not they are in the path of ESP for that VID
  - If DA in LTM is same as B-DA, MIP may not intercept LTMs
- **Enhancement#4:**
  - **PBB-TE ESP MIPs should be able to intercept LTMs for specific ESP**



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# PBB-TE CFM Enhancements – Proposed Solutions

# Enhancement#1 – Unicast CCM

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- **Enhancement#1: Support Unicast CCMs**
- **As mentioned earlier, this is already supported in Y.1731 and not precluded from 802.1ag state machines**
- **Updates Required:**
  - **Different clauses in 802.1ag which specifically talk about multicast CCM transmission need update**

# Enhancement#2 – MEP LBM/LBR

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- **Enhancement#2: Support change in VID value in LBR at loopback point**
- **As mentioned earlier, this is needed in general case when VIDs in either direction of PBB-TE ESP are different**
- **Different options:**
  - **Option 1: Carry a TLV with reverse VID in LBM which is used by loopback point for VID value in LBR**
    - **Advantage: Makes processing in LBM sink generic, i.e. if a specific TLV present, use its value for LBR**
  - **Option 2: Since PBB-TE ESP MEP is expected to maintain association between forward and reverse VIDs, have loopback point perform this VID change**
    - **Advantage: Make LBM transmission point generic**
- **Proposed solution: Option 1 since LBM sink becomes stateless**

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# Enhancements – PBB-TE MIPs

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- Discussion applies to Enhancement#3 and #4 which are needed only if PBB-TE MIPs are required
- CFM frames, intended for PBB-TE MIPs should have DA corresponding to PBB-TE ESP i.e. same as B-DA
- PBB-TE MIPs need to identify CFM frames intended for these MIPs, options include:
  - Option 1: New EtherType
  - Option 2: New OpCode
  - Option 3: New TLVs



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# Enhancements – PBB-TE MIPs (cont'd)

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## ➤ Option 1: New EtherType

### ➤ Pros:

- facilitates datapath to differentiate between CFM frames for MEPs & MIPs

### ➤ Cons:

- means duplicate EtherTypes for same functionality – bad!
- not a requirement for PBB-TE MEPs e.g. CCM, LBMs etc.
- Every MIP along ESP path before destination will process frame

## ➤ Option 2: New OpCode

### ➤ Pros:

- facilitates datapath to differentiate between CFM frames for MEPs & MIPs

### ➤ Cons:

- means duplicate OpCodes for same functionality – bad!
- not a requirement for PBB-TE MEPs e.g. CCM, LBMs etc.
- Every MIP along ESP path before destination will process frame



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# Enhancements – PBB-TE MIPs (cont'd)

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## ➤ Option 3: New TLV

### ➤ Pros:

- facilitates datapath to **selectively** differentiate between CFM frames for MEPs & MIPs
- Does not lead to duplication of EtherType or OpCode
- Consistent with current 802.1ag/Y.1731 design

### ➤ Cons:

- Requires packet inspection at MIPs datapath to support efficient usage
- Not a requirement for PBB-TE MEPs CCM

## ➤ Proposed Solution: Use Option 3 (see subsequent slides)



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# Enhancement#3 – MIP LBM

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## ➤ Enhancement#3:

- PBB-TE ESP MIPs should be able to intercept LBMs intended for it
- PBB-TE ESP MIPs should be able to ignore LBMs not intended for it

## ➤ Proposed solution:

- A TLV to be used as first TLV to allow deterministic inspection at intermediate MIPs
  - As per current format, this would imply looking at 10-15 octets following OpCode
- The first field in Value of TLV is MIP identifier i.e. MAC address, which allows MIPs to selectively intercept CFM frames intended for it



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# Enhancement#3 – MIP LBM (cont'd)

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## ➤ Proposed TLV: PBB-TE ESP TLV

	Octets
Type = 9	1
Length	2-3
MIP MAC	4-9
Reverse VID	10-11

### PBB-TE ESP TLV



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# Enhancement#4 – MIP LTM

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## ➤ Enhancement#4:

➤ PBB-TE ESP MIPs should be able to intercept LTMs for specific ESP

## ➤ Proposed solution:

➤ PBB-TE ESP TLV, introduced for Enhancement #3, can be used

➤ It does not need to be the first TLV since all PBB-TE MIP need to intercept all LTM frames on the ESP

➤ The reverse VID value is used to put the correct VID in LTR



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# Enhancement#2 – MEP LBM/LBR

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- **Proposed solution continuation for Option 1 TLV:**
  - **PBB-TE ESP TLV, introduced for Enhancement #3, can be used for proposed Option 1**
  - **The reverse VID value is used to put the correct VID in LBR**



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