CFM in 802.1aq

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CFM

- **802.1ag**
  - Defines the monitoring of a VLAN service
  - CCM DA: Group MAC address according to Table 8-9
  - LTM DA: Group MAC address according to Table 8-10
  - LBM, LBR, LTR DA: Individual MAC address
- **802.1Qay extensions**
  - Define the monitoring of a TESI
  - CCMs: use the addressing information corresponding to the monitored TESI: (<ESP-DA, ESP-SA, ESP-VID>)
  - LBMs and LTMs: use the same rule as CCMs
  - PBB-TE MIP TLV: LBRs and LTRs use parameters of the reverse direction component ESP. The PBB-TE MIP TLV sent in the corresponding LBMs and LTMs provide MIPs with reverse MAC and VID.
Shortest Path Backbone Bridging (SPBB) Format A

- IS-IS controls the forwarding
  - Managed addresses
  - Individual and Group MAC addresses are configured
  - Non-learning
- SPT ID = \( \text{VID}_\text{SA} \) (SPVID)
- Forwarding is based on: B-DA, \( \text{VID}_\text{SA} \)
- Ingress Checking is based on: \( \text{VID}_\text{SA} \)

CFM

- Both Individual and Group MAC addresses have to be monitored
- CCM DA: BEB B-DA or Group B-DA
- LTM DA: BEB B-DA or Group B-DA
- LBM DA: BEB B-DA
- CCM, LTM, LBM \( \text{VID} = \text{VID}_\text{SA} \)
- LTR and LBR: What is the VID?
  - Reverse VID is carried in PBB-TE MIP TLV of LBM and LTM (SPVID of LTM or LBM DA)
SPBB Format A
Continuity Check protocol

- Format A: Different direction → Different VID
- Monitoring unicast service
  - <Dest MEP, Src MEP, VID<sub>SA</sub>>
- Monitoring multicast service
  - <Group MAC, Src MEP, VID<sub>SA</sub>>

![Diagram](image-url)
SPBB Format A
Loopback protocol

- Format A: Different direction $\rightarrow$ Different VID
- Loopback
  - $<\text{Dest MEP}, \text{Src MEP}, \text{VID}_{\text{Src MEP}}>$
  - Dest MIP: apply PBB-TE MIP TLV
- Loopback Reply
  - PBB-TE MIP TLV carries reverse VID
  - MEPs use their own VID

![Diagram of SPBB Format A Loopback protocol]
SPBB Format A Linktrace protocol

- Format A: Different direction \(\rightarrow\) Different VID
- Linktrace
  - \(<\text{Dest MEP}, \text{Src MEP}, \text{VID}_{\text{Src MEP}}/>\)
  - \(<\text{Group MAC}, \text{Src MEP}, \text{VID}_{\text{Src MEP}}/>\)
- Linktrace Reply
  - PBB-TE MIP TLV carries reverse VID
  - MEPs use their own VID
  - LTR should be sent on the ‘default’ tree assigned to the Base VID if the LTM is sent to a Group MAC address
Shortest Path Backbone Bridging (SPBB) Format B

- IS-IS controls the forwarding
  - Managed addresses
  - Individual and Group MAC addresses are configured
  - Non-learning
- SPT ID = B-SA, Group B-DA<sub>SA</sub>
- Forwarding is based on:
  - Unicast: B-DA, Base VID
  - Multicast: Group B-DA<sub>SA</sub>, Base VID
- Ingress Checking is based on: B-SA

**CFM**

- Both Individual and Group MAC addresses have to be monitored
- CCM DA = BEB B-DA or Group B-DA
- LTM DA = BEB B-DA or Group B-DA
- LBM DA = BEB B-DA
- CCM, LTM, LBM VID = Base VID
- LTR and LBR: What is the SA of the responding BCB?
  - Reverse SA is carried in PBB-TE MIP TLV of LBM and LTM (same as LTM or LBM DA)
SPBB Format B Continuity Check protocol

- Format B: Same VID in both directions
- Multiple MEPs at CBP
- Monitoring unicast service
  - <Dest MEP, Src MEP, Base VID>
- Monitoring multicast service
  - <Group MAC, Src MEP, Base VID>
SPBB Format B
Loopback protocol

- **Format B**: Same VID in both directions
- **Loopback**
  - \(<\text{Dest MEP}, \text{Src MEP}, \text{Base VID}>\)
  - Dest MIP: apply PBB-TE MIP TLV
- **Loopback Reply SA**
  - PBB-TE MIP TLV carries reverse SA, (which is the same as the DA of LBM)
  - MEPs use their own Individual address
SPBB Format B Linktrace protocol

- **Format B**: Same VID in both directions
- **Linktrace**
  - `<Dest MEP, Src MEP, Base VID>`
  - `<Group MAC, Src MEP, Base VID>`
- **Linktrace Reply SA?**
  - PBB-TE MIP TLV carries reverse SA
  - MEPs use their own Individual address
  - LTR should be sent on a ‘default’ tree if the LTM is sent to a Group MAC address
Shortest Path Bridging (SPB)

- Learning
- Shortest Path Tree (SPT) ID: $\text{VID}_{SA}$ (SPVID)
- Forwarding: DA, $\text{VID}_{SA}$

CFM
- CCM DA: Group MAC address
- LTM DA: Group MAC address
- LBM DA: Individual MAC address

Which VID should be applied for LTRs and LBRs?
- Base VID (assigned to MSTI 1 or IST)
- VID of responder bridge
SPB
Continuity Check protocol

- Different direction \(\rightarrow\) Different VID
- Multicast CCM PDUs
  - \(<\text{Group MAC, Src MEP, VID}_{SA}>\)
SPB
Loopback protocol

- Different direction $\rightarrow$ Different VID
- Loopback
  - $<$Dest MEP, Src MEP, VID$\text{Src}$ MEP$>$
- Loopback Reply
  - Reverse VID: Base VID
  - $<$Dest MEP, Src MEP, BaseVID$>$
  - Reply is not on the shortest path but on a ‘default’ tree assigned to the Base VID
  - MEPs may use their own VID
SPB
Linktrace protocol

- Different direction $\rightarrow$ Different VID
- Linktrace
  - $\langle$Group MAC, Src MEP, VID$_{Src\,MEP}$\rangle$
- Linktrace Reply
  - Reverse VID: Base VID
  - $\langle$Dest MEP, Src MEP, BaseVID\rangle$
  - Reply is not on the shortest path but on ‘default’ tree assigned to the Base VID
  - MEPs may use their own VID
Summary

- **SPB**
  - Use CFM as defined in 802.1ag
  - LTR and LBR should be sent on ‘default’ tree (MSTI 1 or IST)

- **SPBB**
  - Use the CFM extensions defined in 802.1Qay
  - PBB-TE MIP TLV carries necessary information for MIPs to construct LTR and LBR
  - If LTM is sent to a Group MAC address, then LTRs sent by MIPs should be transmitted on the ’default’ tree (PBB-TE MIP TLV carried in LTM cannot contain reply information for each individual MIP)