SPBV Does Not Require HW Changes

János Farkas, Norman Finn, Stephen Haddock

June 2012
Background

• SPBV does not require HW change
• MAC pruning maybe sub-optimal in case of SVL
• The sub-optimality issue related to SVL has been brought up by Norman Finn and presented as a forwarding issue appearing in case of SPBV: [http://www.ieee802.org/1/files/public/docs2012/new-AVB-nfinn-more-spb-v-0412-v01.ppt](http://www.ieee802.org/1/files/public/docs2012/new-AVB-nfinn-more-spb-v-0412-v01.ppt)

• This presentation
  – explores the issue and its effects on its own;
  – points on that the sub-optimality was not introduced by SPB, it was there already in 802.1Q-2005
  – gives solution hints if one does not want to live with it
MAC pruning within a VLAN

- MAC pruning allows optimization of forwarding within the scope of a VLAN based on station location.
- In case of Shared VLAN Learning (SVL), there might be cases where MAC pruning cannot provide further optimization.
Shared VLAN Learning (SVL)

• SVL = Multiple VIDs are allocated to the same FID
• Consequence of SVL
  – The different VIDs (assigned to the same FID) are ‘indistinguishable’ from each other when doing the FDB lookup
  – Thus, MAC pruning cannot be implemented within the scope of a single VID in case of SVL
  – Instead, the same MAC pruning rules are applied for all VIDs allocated to the same FID
Case 1: Diverging SVL VID paths

• No issue in case of diverging VID paths (SPB does not change HW)
• VID based pruning cannot be further optimized by MAC based pruning at the divergence point
• An example
  – Bridge A injects frames using VID_A (‘directed’ VID due to single source)
  – Bridge B injects frames using VID_B (‘directed’ VID due to single source)
  – Bridge C has diverging VID paths: C-D link is only involved in VID_B
    • VID based pruning is enough: Bridge D does not receive frames tagged with VID_A from Bridge C
    • MAC based pruning cannot optimize it further, e.g. multicast frames sent by p to x are already pruned based on VID on the C-D link, no need for MAC pruning
Case 2: Coinciding SVL VID paths

- SPBV forwarding is correct with the existing HW
  - To reach C, D passes frames from E
  - C does not receive frames from A through D
- Sub-optimal forwarding may appear due to SVL
  - A unnecessarily sends G frames to B on VID_E
  - G frames could be filtered by MAC pruning in case of IVL
Multicast lookup is based on the same FID as unicast lookup
  – Note that the same lookup is valid both for MSTP and SPBV control
• When forwarding or filtering a frame with a destination group MAC Address, a VLAN-aware Bridge may:
  a) Ignore the allocation of VIDs to FID, and use Table 8-9 directly for the frame’s VID; or
  b) Take the same decision for all VIDs allocated to any given FID, forwarding if Table 8-9 specifies Forward for any VID allocated to the same FID as the frame’s VID, and filtering otherwise.
Multicast lookup is directly based on Table 8-9 of 802.1Q-2011
  - Note that the same lookup is valid both for MSTP and SPBV control

When forwarding or filtering a frame with a destination group MAC Address, a VLAN-aware Bridge may:
  a) Ignore the allocation of VIDs to FID, and use Table 8-9 directly for the frame’s VID

Optimized MAC pruning is possible by using Table 8-9 directly for Group MAC addresses
Summary

• SPBV does not require HW changes
• MAC pruning can be optimized by using Table 8-9 directly for multicast lookups
• MAC pruning may be sub-optimal in case of SVL
  – Pure SVL (Table 8-9 opt. b) for multicast) might not allow MAC pruning based forwarding optimization which could be performed otherwise (e.g. by Table 8-9 opt. a) or by IVL)
  – This sub-optimality does not depend on the control protocol, it is the same for both MSTP and SPB
  – No HW change is needed for SVL implementations if they just can live with this potential sub-optimality
Further Thoughts

The sub-optimality can be also eliminated if SVL is emulated by IVL
IVL emulation of SVL

• SVL can be emulated using IVL HW lookups
  – SVL maps multiple VIDs to one FID, and has a single FDB entry for a D-MAC/FID combination
  – IVL lookups either use the VID directly (or a unique FID for each VID)
  – Emulating SVL using IVL lookups requires creating a separate FDB entry for each VID, thus the FDB entries for each VID have the same D-MAC \( \Rightarrow \) Port Map associations

• ISIS-SPB is able to perform the Group MAC pruning optimization
  – The topology is known to ISIS-SPB
  – ISIS-SPB is able to optimize MAC address registration inside the SPT Region \( \Rightarrow \) optimal pruning is applied if SVL is emulated by IVL (or Table 8-9 is used directly)

• IVL emulation of SVL provides optimized MAC pruning at the price of the number of FDB entries