SPBV Does Not Require HW Changes

János Farkas, Norman Finn,
Stephen Haddock

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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
- 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

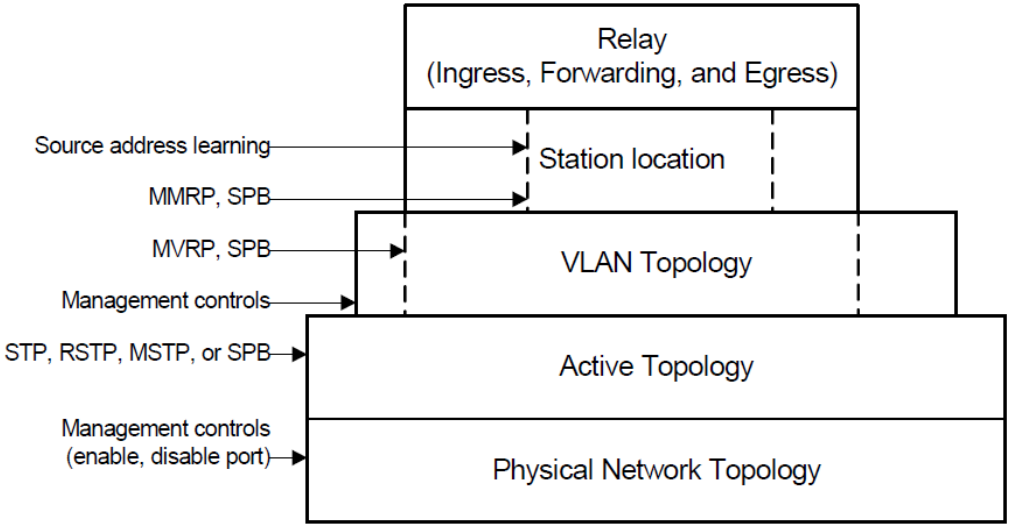


Figure 7-1—VLAN Bridging overview

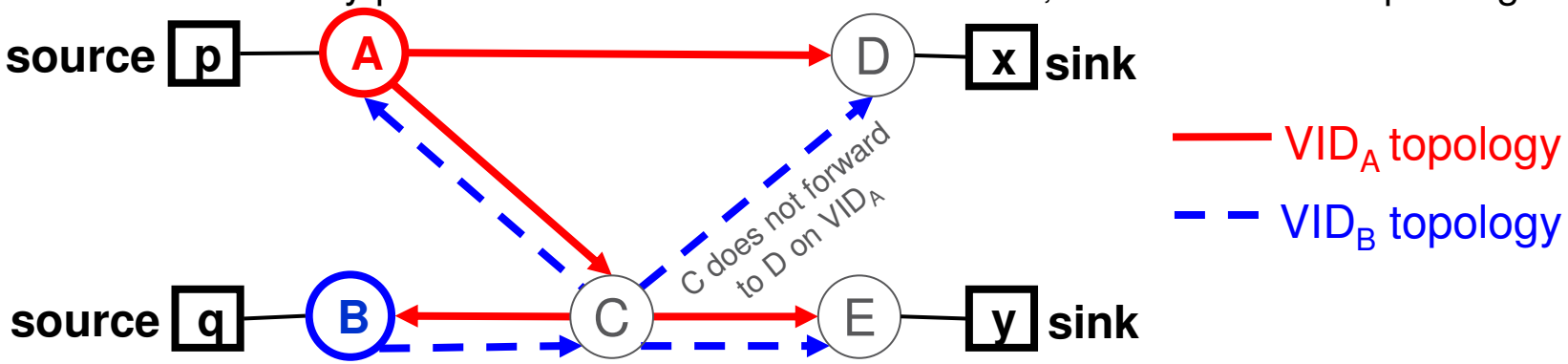
- MAC pruning allows optimization of forwarding within the scope of a VLAN based on station location
- In case of Shared VLAN Learning (SVL), there might be cases where MAC pruning cannot provide further optimization

Shared VLAN Learning (SVL)

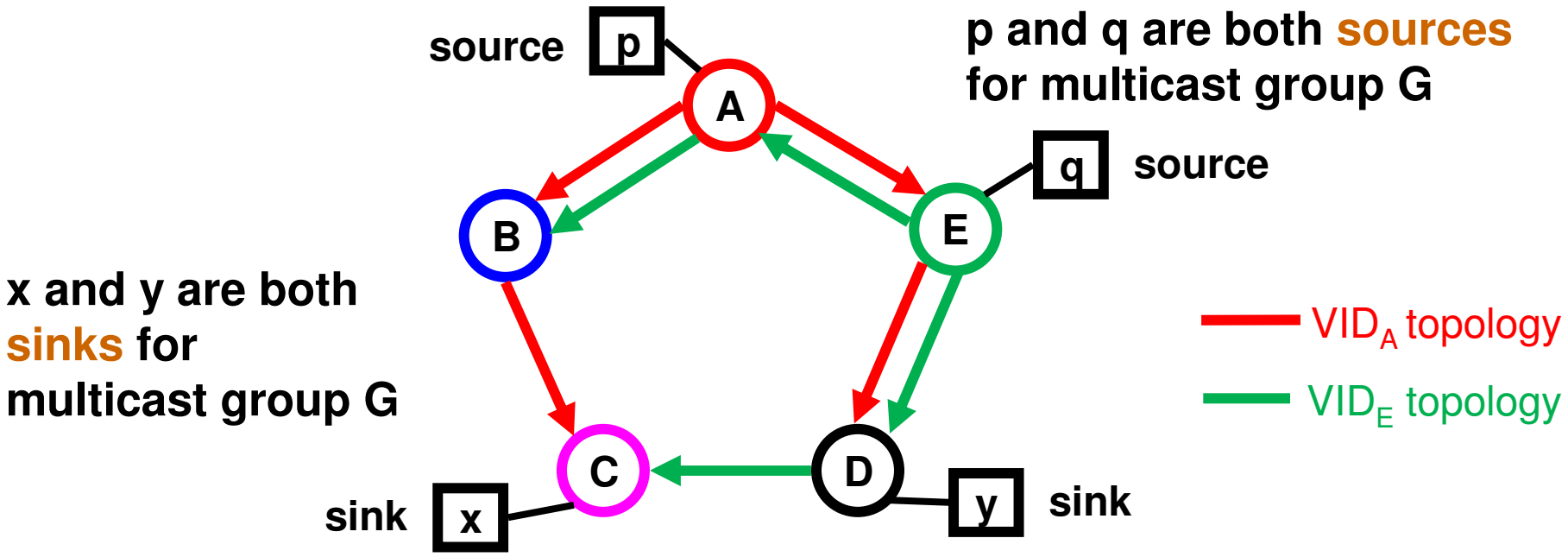
- SVL = Multiple VIDs are allocated to the same FID
- Consequence of SVL
  - The different VIDs (assigned to the same FID) are ‘indistinguishable’ from each other when doing the FDB lookup
  - Thus, MAC pruning cannot be implemented within the scope of a single VID in case of SVL
  - Instead, the same 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

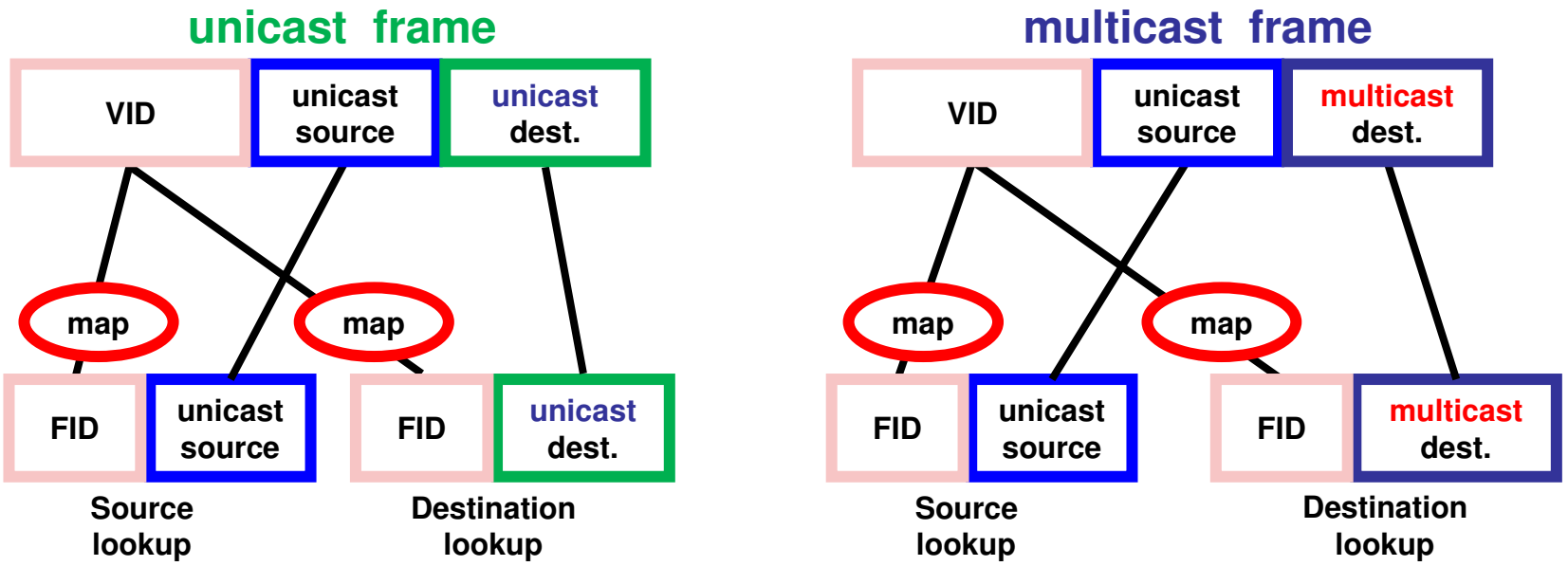


Case 2: Coinciding SVL VID paths



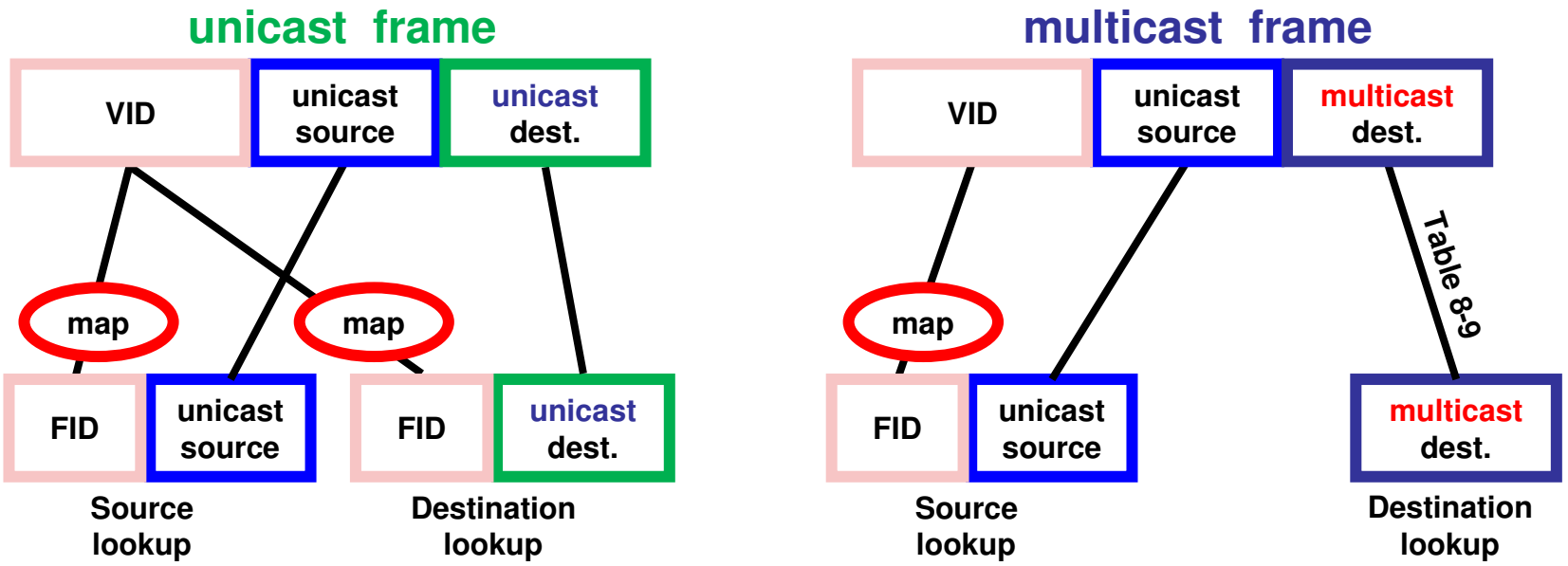
- SPBV forwarding is correct with the existing HW
  - To reach **C**, **D passes** frames **from E**
  - **C does not receive** frames **from A** through **D**
- Sub-optimal forwarding may appear due to SVL
  - A unnecessarily sends G frames to B on VID_E
  - G frames could be filtered by MAC pruning in case of IVL

MAC address lookups: b)



- 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.

MAC address lookups: a)



- 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 ⇔ 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 → 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