802.1 AVB Priority Encapsulation

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rev. 1

Problem statement

- IEEE 802.1 Audio Video (AV) Bridges form a closed, defended AVB cloud.
  - They recognize each other.
  - They prefer to forward data to each other, rather than to non-AV Bridges.
- AV Bridges reserve priorities 4 and 5 for video and audio traffic, respectively.
  - Only flows that have been established using the AVB stream reservation protocol (802.1AT) are allowed to use priorities 4 and 5.
- Windows Vista feels free to use any priorities it wants.
  - It also demands that its chosen priorities pass unchanged through a bridged network.

Problem statement

- There is a conflict, therefore, between AV Bridges and Windows Vista.
- If a Vista station transmits a priority 4 frame, but has not made a stream reservation, the AV Bridge has a difficult choice to make. It can:

  Drop the offending frame. (bad)

  Change the priority of the offending frame. (bad)

  Allow the frame to disrupt the latency and jitter of the reserved streams in priority 4. (bad)

  Change the way QoS is handled by bridges by confining all AVB streams to a range of MAC addresses, and using that MAC address to identify QoS. (bad)

Why not depend on the destination address?

- In the 802 service definitions, MAC Addresses determine the subset of all stations to which a frame should be delivered.
  - They do not select QoS.
- What would happen if some other feature, e.g., congestion management, decided to use the same trick of using special destination MAC addresses?
  - How could you use both features in a network?
  - Do you add a third range of addresses for the combined features?
- Stick to the architecture – it is the best insurance for long-term viability for a standard.

Priority Saver Shim

- A new “Priority Saver Shim” (PSS) goes in the middle of 802.1Q-2005 subclause 6.7 “Support of the EISS.

  Both interfaces are EISS.

  The lower half of the 6.7 function deals with removing/adding the Q-tag and supplying default values for vlan_identifier and priority.

  The upper half deals with priority regeneration.

  An EISS is placed between the two halves.

- The PSS is present only if:

  1. The PSS is in a Bridge Port of an AV Bridge; and
  2. The Bridge Port is not attached to another AV Bridge.

Priority Saver shim

- On ingress, the PSS inserts a PSS tag at the front of the mac_service_data_unit containing the vlan_identifier, priority, and CFI information from the parameters received with the input frame.

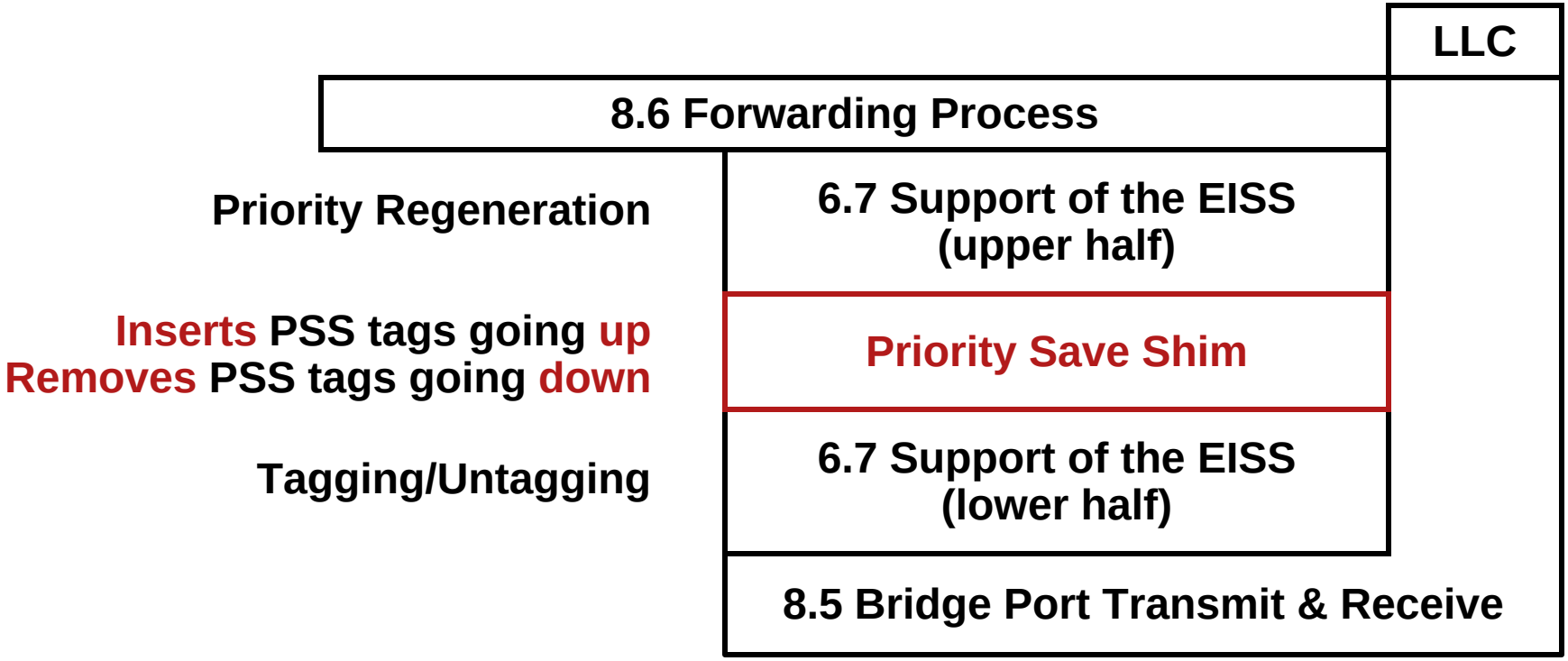
  Those parameters are also passed up to the upper half of the 6.7 Support of the EISS shim (or whatever is above it).

- On egress, the mac_service_data_unit is examined for a PSS tag.

  If the PSS tag is not present, the PSS is a no-op.

  If the PSS tag is present, then the tag is extracted, and its contents substituted for the vlan_identifier, priority, and CFI information received from the upper layer.

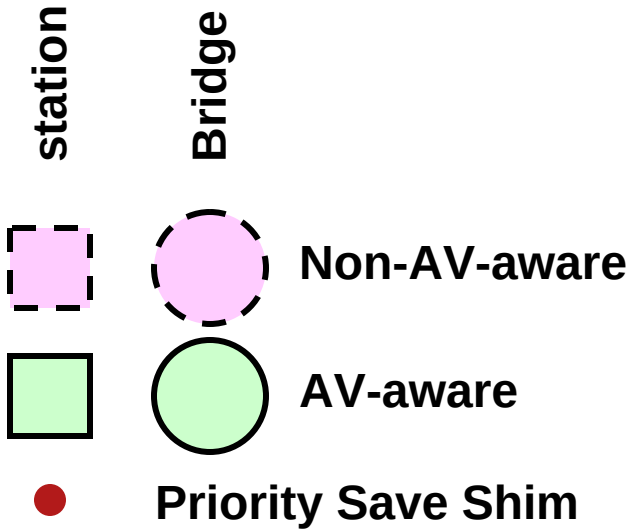
Priority Saver shim

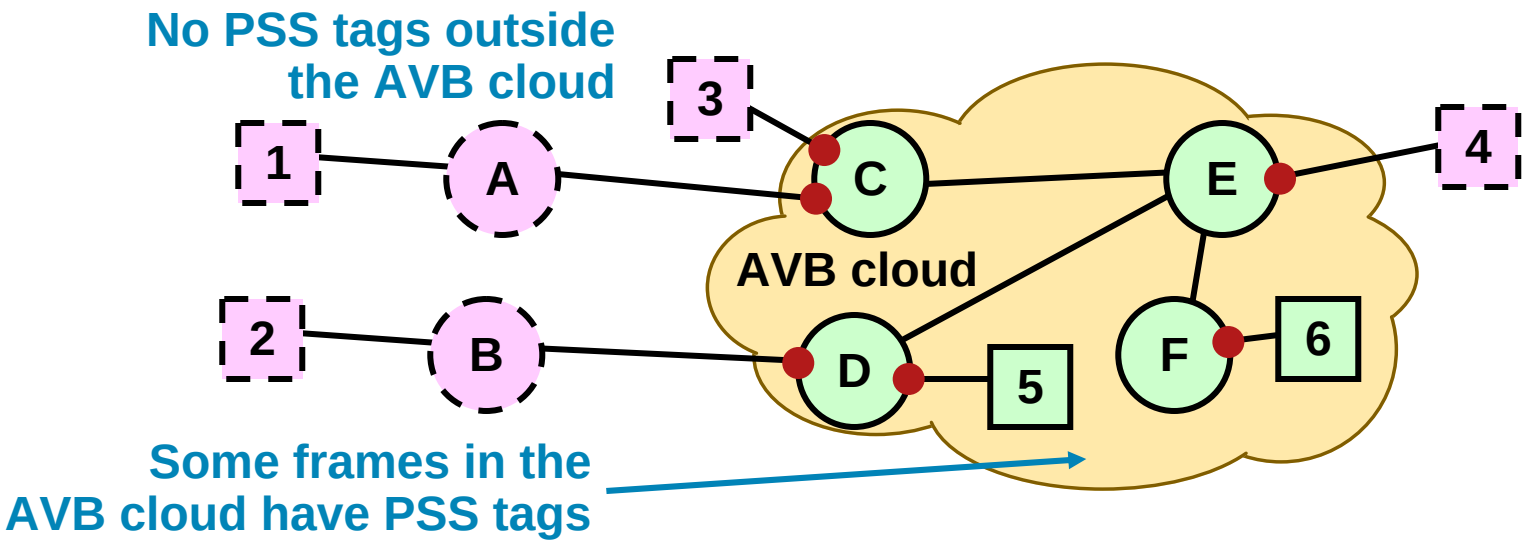


- Note that the PSS inserts and removes its tag in the opposite directions than other tags, e.g. 6.7. The PSS tags are present only within the AVB cloud.

Four cases for end stations or connections to non-AV Bridges

- AV to AV (5 to 6)
- AV to non-AV (5 to 4, 5 to 1)
- Non-AV to AV (3 to 6, 2 to 5)
- Non-AV to non-AV (1 to 3, 4 to 2)





AV to AV

- Ingress PSS.
  - The Q-tag, if any, is broken open and parameterized by the lower half of 6.7.
  - The PSS Shim does not add a PSS tag, because the source is AV-aware. (Although it could add one.*)
  - The upper half of 6.7 needn't translate priorities, because the source is AV-aware.
- AV Bridges use the priority of the frame to pick output queues through the cloud; the priority can change.
- Egress PSS.
  - No PSS tag is present, so PSS Shim does nothing.
  - Frame output with (or without) Q-tag, priority may have been changed.

* Just so that all frames inside the AVB cloud have a PSS tag. It's not needed, in this case.

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Non-AV to AV

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  The PSS Shim adds a PSS tag with the end station's priority.

  The upper half of 6.7 can translate the priority to protect AVB.

- AV Bridges use the priority of the frame to pick output queues through the cloud; the priority can change.

- Egress PSS.

  The PSS shim removes the PSS tag, and the source end station's priority replaces the final priority of the frame.

  Frame output with (or without) Q-tag with original priority.

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Summary

- Non-AV end stations see no change to the priority, if present.
- AV end stations can see a priority change, but don't care.
- AV Bridges can operate on priorities, and change them, if needed.
- Because AV Bridges are a self-defending cloud, with enforced boundaries, the required PSS tags can be confined to the cloud, and the whole idea can work.
- It still remains that stations that require no priority change are a problem for the future of bridges.


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