802.1ad Provider Bridge

- An S-VLAN (Service VLAN) is a subset of active topology of a Provider Bridged Network.
- An S-VLAN is uniquely identified by S-VID (Service VLAN ID) in the S-TAG (Service Tag).

<table>
<thead>
<tr>
<th>802.1ad Frame Properties</th>
<th>S-TAG</th>
<th>C-TAG</th>
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<tr>
<td>802.1ad Frame</td>
<td>DA</td>
<td>SA</td>
</tr>
<tr>
<td></td>
<td>TPID</td>
<td>S-VID</td>
</tr>
<tr>
<td></td>
<td>TPID</td>
<td>C-VID</td>
</tr>
<tr>
<td></td>
<td>L/T</td>
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<tr>
<td>User Data</td>
<td></td>
<td>FCS</td>
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</tbody>
</table>
Backbone Provider Bridged Network
Service VLAN Identification

- Backbone Provider Bridged Network interconnects 802.1ad Provider Bridged Networks (802.1ad islands)
  - S-VLAN ID space is extended to 20-28 bit
- An S-VLAN in Backbone Provider Bridged Network is uniquely identified by ES-VID (Extended Service VLAN ID) in the B-TAG (Backbone Tag)
  - An S-VLAN in 802.1ad island is uniquely identified by S-VID
  - However, the S-VID is not globally unique and therefore is not significant in the Backbone Provider Bridge Network
- Thus, Backbone Provider Bridge interchanges S-VID and ES-VID
  - Ingress: S-VID -> ES-VID
  - Egress: ES-VID -> S-VID
- There is no need to transport S-VID across the Backbone Provider Bridge as S-VID only has significance and uniqueness within a particular 802.1ad island
Hierarchical VLANs Architecture in Backbone Provider Bridged Network
Backbone VLAN

- Frame format in Backbone Provider Bridged Network should be compatible with 802.1Q format for:
  - seamless deployment
  - scalability
- Thus, interior 802.1Q Bridges in Backbone Provider Bridged Network should not directly refer ES-VID value
- B-VLAN (Backbone VLAN) is introduced for backward compatibility
  - B-VLAN hierarchically bundles S-VLANs
  - A B-VLAN is a subset of active topology of a Backbone Provider Bridged Network
  - A B-VLAN is uniquely identified by B-VID (Backbone VLAN ID) in the B-TAG (Backbone Tag)
  - B-VID value for incoming frame into the Backbone Provider Bridged Network is based on ES-VID value in the frame
Example of Frame Format and B-TAG Issues

- At least, the above fields and encapsulation scheme are required for Backbone Provider Bridge Frame (BPB Frame)

- B-TAG issues
  - Bit length of ES-VID (20-28 bit)
  - TPID value for B-TAG
    - C-TAG value (0x8100) for 802.1Q compatibility; in this case, 2nd TPID is required to identify ES-VID and BPB Frame
    - A new value that identify B-TAG; in this case, 2nd TPID may not be required
S-TAG Issues

- S-VID value is not globally unique and typically requires translation between 802.1ad islands.
- Thus, there is no need to transport S-TAG across the Backbone Provider Bridge in typical case.
- Option 1: Remove S-TAG and FCS from 802.1ad frame
  - In the case of needing S-VID translation between 802.1ad islands
    - Both the S-TAG and FCS in the 802.1ad frame will need to be regenerated anyways.
    - Thus, there is no need to transport the S-TAG and FCS within Backbone Provider Bridge domain.
    - Note: Ingress can re-calculate FCS value in 802.1ad frame, but it does not make sense if egress does not verify it, and this scheme requires extra hardware.
  - In the case of no S-VID translation between 802.1ad islands
    - FCS in the 802.1ad frame cannot be maintained using this option.
Option 2: Retain S-TAG in 802.1ad frame

- In the case of needing S-VID translation between 802.1ad islands
  - S-TAG in 802.1ad frame is unchanged at ingress, then updated at egress
  - FCS in 802.1ad frame may or may not be removed
  - In this option, BPB frame contains unnecessary 4 octets S-TAG fields, so it is not efficient
  - If FCS is not removed, it wastes further 4 octets

- In the case of no S-VID translation between 802.1ad islands
  - FCS in the 802.1ad frame is maintained using this option, if FCS is not removed

Which option is desired (or both)?