PBB-TE

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Nokia Siemens Networks

PAR Text for Project Scope

This amendment will support provisioning systems that explicitly select traffic engineered paths within Provider Backbone Bridge Networks (P802.1ah) by

- allowing a network operator to disable unknown destination address forwarding and source address learning for administratively selected VLAN Identifiers,
- while allowing other network control protocols to dynamically determine active topologies for other services.
- These interoperable capabilities will be supported
  - by SNMP MIB management of individual bridges,
  - by extensions to the other control protocols specified in this standard,
  - by the use of CFM with the addresses and VLAN Identifiers that specify traffic engineered connections,
  - and by 1:1 path protection switching capable of load sharing.
- This project will not take account of multi-domain networks.

Scope of the Project
Insights

- Provisioned TE P-t-P trunks co-exist with dynamically learnt non-TE paths (conventional PBB).
  The VID space is pre-divided between PBB-TE and conventional PBB
- TE trunks are MP-t-P-based unidirectional paths which share a common <VID, DA-MAC> tuple.
  - PBBs hold only forwarding information.
  - The source MAC address, which is part of the unique trunk identifier, is NOT kept in the FDB.
  - The preservation of the source MAC address in the packet has implications for fault and performance management.

Scope of the Project
Insights (cont'd.)

- TE trunks can be provisioned only in one domain (as inter-domain is out of the scope of the approved PAR).
  PEs are only IB-BEB (no support for I-BEB and B-BEB).
- CFM can be extended to support unicast CCM messages.
  Other CFM extensions are out of the scope of the approved PAR.
- 1:1 trunk protection switching capable of load sharing will be defined
- PBB-TE should be implemented in a closed island.
  Installed PB/PBB nodes do not support PBB-TE, hence they will perform learning, MSTP and unknown flooding on all VIDs.

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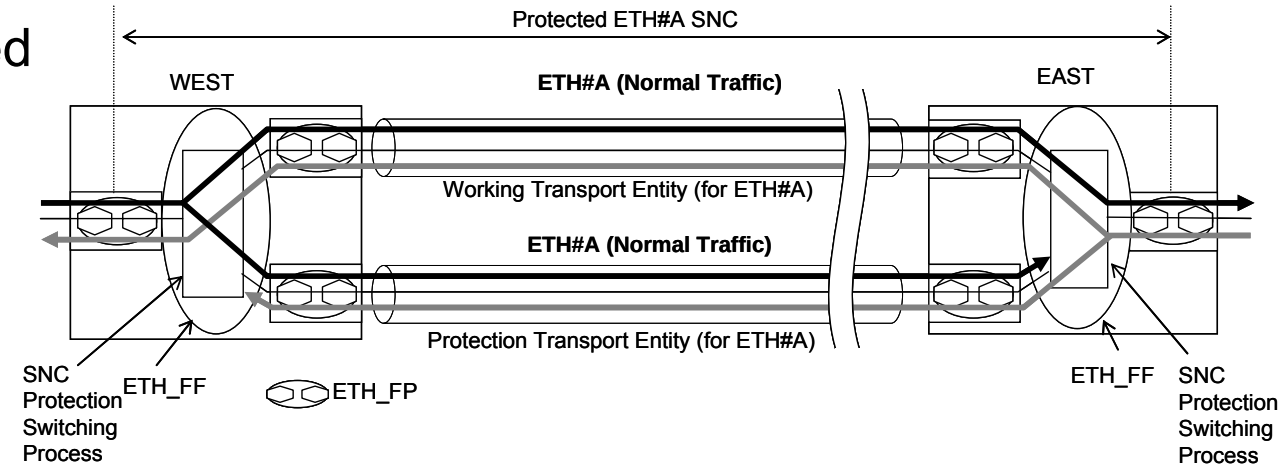
G.8031 as a Reference for Protection Switching

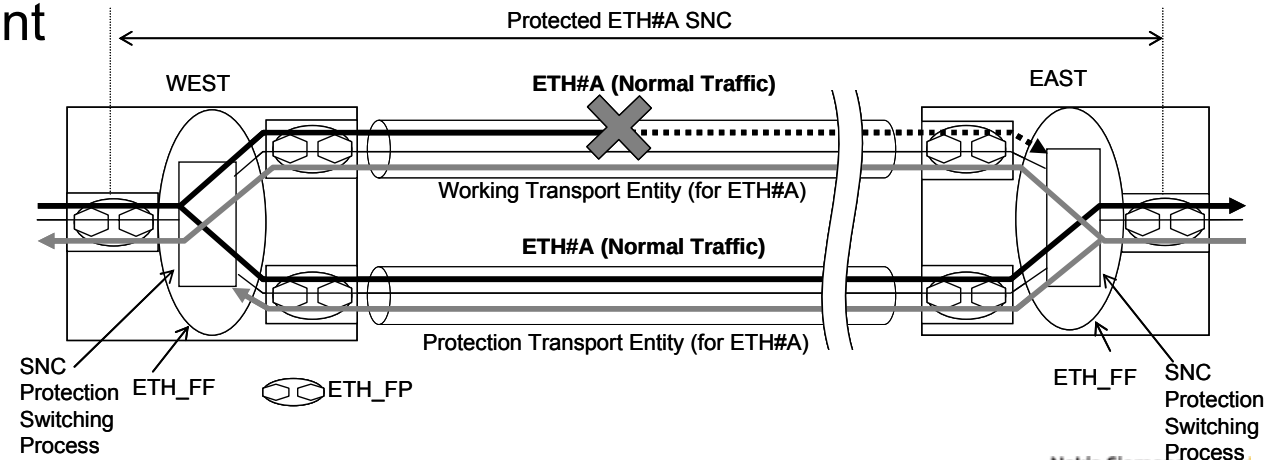
G.8031 as a Reference
Facts

- G.8031 provides the following protection schemes:
  - 1+1
    - for unidirectional trunks
    - for bi-directional trunks
  - 1:1
    - for bidirectional trunks
- G.8031 defines the specific OAM APS for Ethernet linear protection.

G.8031: 1+1 Unidirectional Protection Switching

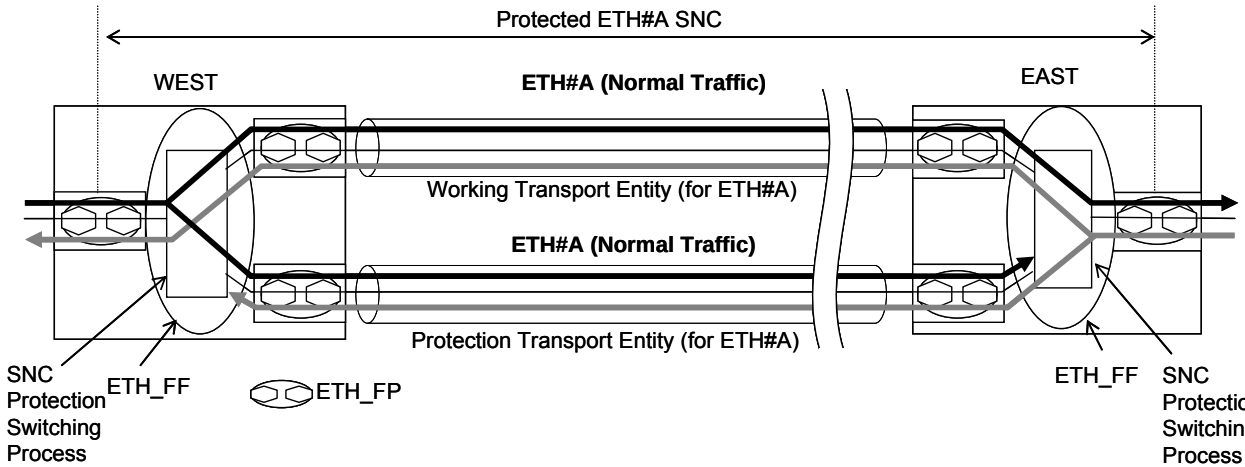
- Traffic is copied and fed to both working and protection trunks.
- The selection is made at the sink based on some predetermined criteria, such as defect indication, management request, etc.
- APS is optional.

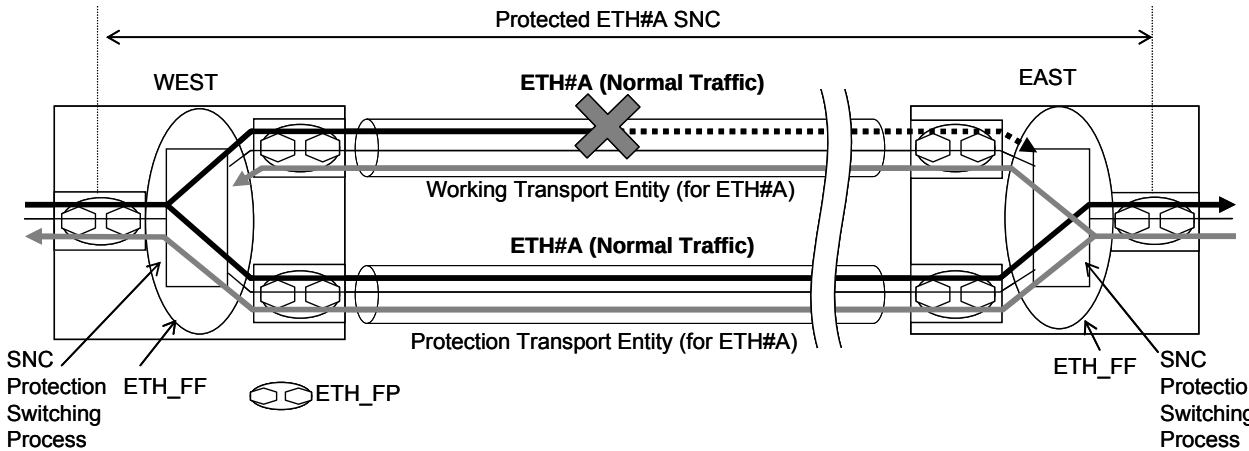




G.8031: 1+1 Bi-Directional Protection Switching

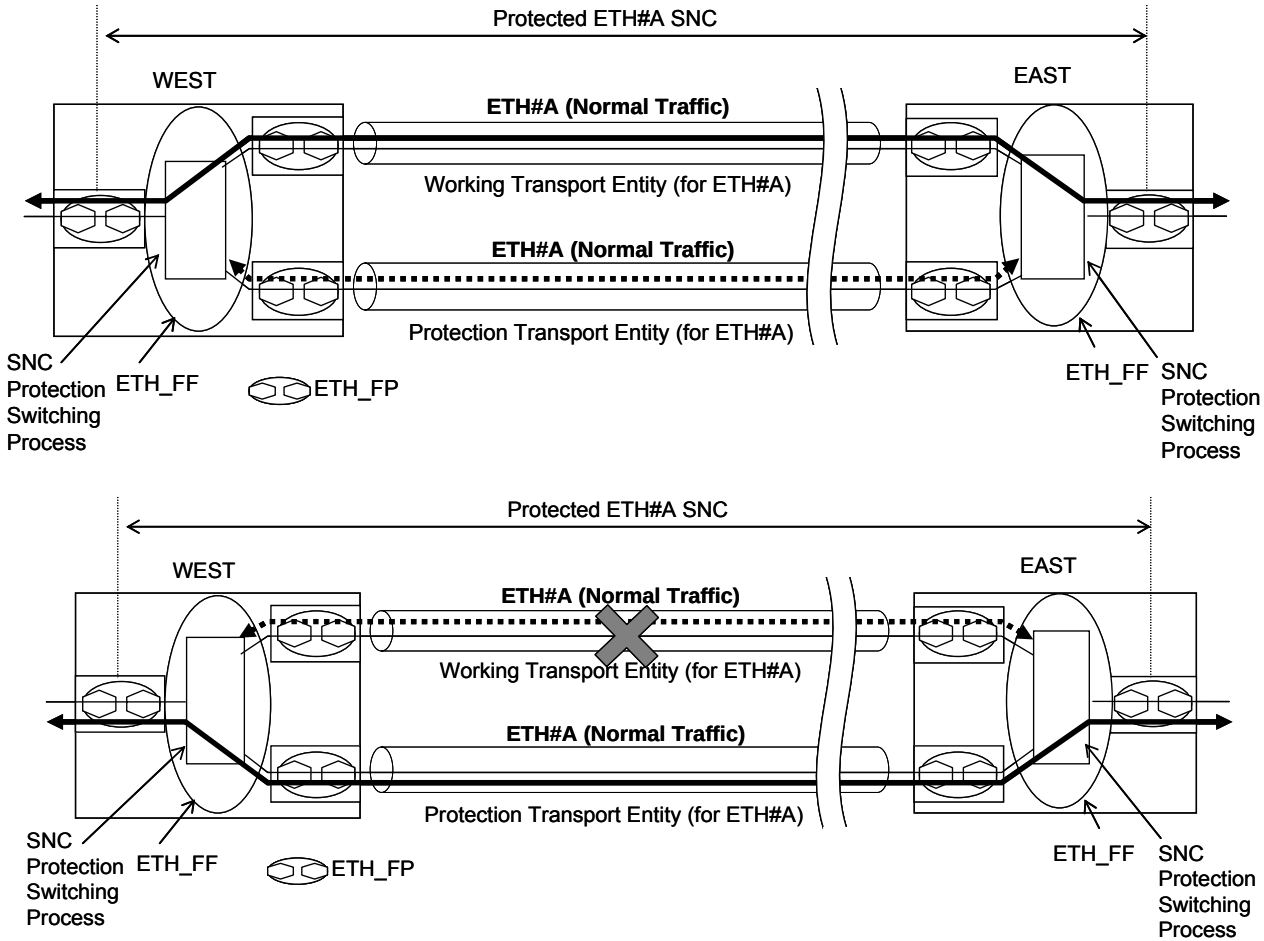
- Traffic is copied and fed to both working and protection trunks.
- The selection is made at the sink based on some predetermined criteria, such as defect indication, management request, etc.
- APS is mandatory in order to force the selectors in both directions to select the same entity





G.8031: 1:1 Bi-Directional Protection Switching

- Traffic is transmitted on the working trunk only (using a selector bridge at the source).
- The selector at the sink selects the trunk which carries the traffic.
- APS is mandatory in order to force the selectors in both directions to select the same entity



G.8031: Insights

- 1+1 is not is the scope of the PBB-TE PAR

  Requires additional functionality, such as traffic replication at the source, a traffic selector in the sink, defect indication regarding the protection switching process, etc.

- 1:1 is possible only for bi-directional trunks
  - A bi-directional PBB-TE trunk can be provisioned by two unidirectional trunks which would constitute one logical bi-directional trunk.
    The correct behavior depends exclusively on the provisioning of the network and the right connectivity.
  - APS is not in the scope of the PBB-TE PAR.
    Still, OAM CCM may be considered as an interim alternative to APS for coordination between the source and the sink.

Protection Switching in PBB-TE

Protection Switching in PBB-TE

- Quote From PBB-TE PAR: 1:1 Path Protection Switching Capable of Load Sharing
- 1:1 protection switching requires that the protection state be coordinated between the source and the sink.
  802.1ag OAM CCM with RDI can be used as an interim solution.

Possible Solutions for 1:1 Protection Switching
1:1 Unidirectional Protection

- Reminder: not supported by G.8031
- Applied to unidirectional trunks
- Functional behavior:
  - In-band unicast OAM CCM messages are sent from the source to the sink. Unicast OAM CCM is needed since VLAN is local to a specific destination; multicast will be sent on all trunks with the same VLAN.
  - Defects are detected by the sink and are indicated to the source using CCM with RDI:
    - Via native bridged multicast OAM CCM (on a PBB VLAN space)
      Issue: Can MA support multiple VLANs?
    - Via another trunk from the sink to the source (must be protected)
  - Protection switching is performed by the source when a CCM with RDI is received from the sink.

Possible Solutions for 1:1 Protection Switching
Bi-directional Protection

- Two unidirectional trunks (between the same two bridge ports) can constitute a logical Ethernet bi-directional trunk.
  Again, the correct behavior depends on the provisioning of the network and the right connectivity.
- Functional behavior:
  - In-band unicast OAM CCMs are sent on each unidirectional trunk.
  - Defects are detected by the sink, and are indicated to the source using CCM messages with RDI.
  - Protection switching is performed by the source if it does not receive three consecutive CCM messages, or when it gets a CCM message with RDI.

Conclusions

1:1 bi-directional protection is the most appropriate.

- Further analysis is needed to determine the relationship between the paths of both unidirectional trunks:
  - Should they share the same path?
    If so, which mechanism would ensure that the same route would be used for both directions?
  - Or , should the source of one unidirectional trunk be the sink of the other unidirectional trunk?
  - Or, should there be no restrictions on the unidirectional trunks?
- Should protection switching support revertvie/non-revertive modes?
- Should protection switching support manual switchover?

Conclusions (cont'd.)

- Is the protection switching mechanism based on CCM satisfactory, or should we consider OAM APS for the long term?
- 802.1ag defines MA to verify the integrity of a single service instance.
  Should we enhance the definition of the MA so that it will verify the integrity of a trunk? A bi-directional trunk?

Thank You

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