

IEEE Standard for
Local and metropolitan area networks—

Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks—

Amendment 19: PBB-TE Infrastructure Segment Protection

IEEE Computer Society

Sponsored by the
LAN/MAN Standards Committee

IEEE
3 Park Avenue
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Approved 7 December 2011

IEEE-SA Standards Board

Abstract: This amendment to IEEE Std 802.1Q-2011 specifies localized protection of selected Traffic Engineered Service Instances traversing a common sequence of Provider Network Ports.

Keywords: Bridged Local Area Networks, IEEE 802.1Qbf, Infrastructure Segment Protection, LANs, local area networks, MAC Bridges, MANs, metropolitan area networks, Provider Backbone Bridge, Traffic Engineering

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Introduction

This introduction is not part of IEEE Std 802.1Qbf-2011, IEEE Standard for Local and metropolitan area networks—Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks—Amendment 19: PBB-TE Infrastructure Segment Protection.

This amendment to IEEE Std 802.1Q-2011 specifies localized protection of selected Traffic Engineered Service Instances traversing a common sequence of Provider Network Ports.

This standard contains state-of-the-art material. The area covered by this standard is undergoing evolution. Revisions are anticipated within the next few years to clarify existing material, to correct possible errors, and to incorporate new related material. Information on the current revision state of this and other IEEE 802® standards may be obtained from

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IEEE Standard for Local and metropolitan area networks—

Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks—

Amendment 19: PBB-TE Infrastructure Segment Protection

This amendment to IEEE Std 802.1Q™-2011 specifies localized protection of selected Traffic Engineered Service Instances traversing a common sequence of Provider Network Ports. Changes are applied to the base text of IEEE Std 802.1Q-2011 as amended by IEEE Std 802.1Qbe™-2011, IEEE Std 802.1Qbc™-2011, IEEE Std 802.1Qbb™-2011, and IEEE Std 802.1Qaz™-2011.

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NOTE—The editing instructions contained in this amendment define how to merge the material contained therein into the existing base standard and its amendments to form the comprehensive standard. Text shown in bold italics in this amendment defines the editing instructions necessary to changes to this base text. Three editing instructions are used: ***change***, ***delete***, and ***insert***. ***Change*** is used to make a change to existing material. The editing instruction specifies the location of the change and describes what is being changed. Changes to existing text may be clarified using ~~strikeout~~ markings to indicate removal of old material and underscore markings to indicate addition of new material. ***Delete*** removes existing material. ***Insert*** adds new material without changing the existing material. Insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. Editorial notes will not be carried over into future editions of IEEE Std 802.1Q.¹

¹Notes in text, tables, and figures are given for information only and do not contain requirements needed to implement the standard.

1. Overview

1.3 Introduction

Insert the following list item after item ag) in 1.3, and reletter the subsequent list items in 1.3 accordingly:

- ah) Supports protection of a group of Traffic Engineered service instances that traverses a sequence of LANs and intervening Bridges using a method that does not require the modification of data or control frames.

3. Definitions

Insert the following definitions into Clause 3 in alphabetical order, number them appropriately, and renumber the subsequent definitions accordingly:

3.x Active Segment: The Infrastructure Segment, either the Working Segment or the Protection Segment, that is currently carrying traffic of TESIIs associated with the IPG.

3.x candidate Protection Segment: In the case of M:1 IPS, an Infrastructure Segment that can assume the role of Protection Segment.

3.x current Protection Segment: In the case of M:1 IPS, the candidate Protection Segment that is currently assuming the role of Protection Segment;

3.x Infrastructure Protection Group (IPG): In the case of 1:1 IPS, a set comprising a Working Segment and a Protection Segment or, in the case of M:1 IPS, a set comprising a Working Segment and one or more Protection Segments.

3.x Infrastructure Protection Switching (IPS): The switching of a selected group of TESIIs from a Working Segment to a Protection Segment or from a Protection Segment to a Working Segment due to failure of connectivity, restoration of connectivity, or administrative command.

3.x Infrastructure Segment: A sequence of PNPs and the intervening LANs and Bridge relay entities.

3.x Protection Segment: An Infrastructure Segment associated with an IPG that can carry TESI traffic when the Working Segment associated with that IPG has failed or when directed by administrative command.

3.x Segment Endpoint Bridge (SEB): A PBB at the endpoint of an Infrastructure Segment.

3.x Segment Endpoint Port (SEP): A PNP at the endpoint of an Infrastructure Segment.

3.x Segment Identifier (SEG-ID): A pair of SMP-IDs specifying the identity of an Infrastructure Segment.

3.x Segment Intermediate Bridge (SIB): A PBB having an intermediate position within an Infrastructure Segment.

3.x Segment Intermediate Port (SIP): A PNP having an intermediate position within an Infrastructure Segment.

3.x Segment Monitoring Path (SMP): A unidirectional path carrying CFM traffic associated with the monitoring of an Infrastructure Segment.

3.x Segment Monitoring Path Identifier (SMP-ID): A 3-tuple <SMP-DA, SMP-SA, SMP-VID> where the SMP-DA is the MAC address of the destination PNP of the SMP, the SMP-SA is the MAC address of the origin PNP of the SMP, and SMP-VID is a VID allocated to the TE-MSTID (8.9) and associated with the SMP.

3.x Working Segment: The Infrastructure Segment, among the Infrastructure Segments associated with an IPG, on which TESI traffic is carried when no connectivity failure of that segment has been detected and no administrative command is active.

4. Abbreviations

Insert the following abbreviations into Clause 4 in alphabetical order:

IPG	Infrastructure Protection Group
IPS	Infrastructure Protection Switching
SEB	Segment Endpoint Bridge
SEG-ID	Segment Identifier
SEP	Segment Endpoint Port
SIB	Segment Intermediate Bridge
SIP	Segment Intermediate Port
SMP	Segment Monitoring Path
SMP-ID	Segment Monitoring Path Identifier

5. Conformance

5.6 S-VLAN component conformance

5.6.2 S-VLAN component requirements for PBB-TE

Change the following list items in 5.6.2 as shown:

- c) Allow ...; ~~and/or~~
- d) Support ...; ~~and/or~~
- e) Support Infrastructure Protection Switching as specified in 26.11.

Insert the following subclause, 5.6.3, after 5.6.2:

5.6.3 S-VLAN component requirements for PBB-TE IPS

An S-VLAN component implementation that conforms to the provisions of this standard for PBB-TE IPS (26.11) shall

- a) Support 1:1 IPS as specified in 26.11.2

An S-VLAN component implementation that conforms to the provisions of this standard for PBB-TE IPS (26.11) may

- b) Support M:1 IPS as specified in 26.11.5

5.8 B-component conformance

5.8.2 B-component requirements for PBB-TE

Insert the following list item at the end of 5.8.2:

- n) Support Infrastructure Protection Switching as specified in 26.11

Insert the following subclause, 5.8.3, after 5.8.2:

5.8.3 B-component requirements for PBB-TE IPS

A B-component implementation that conforms to the provisions of this standard for PBB-TE IPS (26.11) shall

- a) Support 1:1 IPS as specified in 26.11.2

A B-component implementation that conforms to the provisions of this standard for PBB-TE IPS (26.11) may

- b) Support M:1 IPS as specified in 26.11.5

6. Support of the MAC Service

6.20 Support of the ISS with signaled priority

Insert the following subclause, 6.21 (including Figure 6-13), after 6.20.2:

6.21 Infrastructure Segment Multiplex Entity

The Infrastructure Segment Multiplex Entity allows shims defined for SEPs and SIPs to be instantiated per Infrastructure Segment at a Service Access Point that supports multiple Infrastructure Segments. Figure 6-13 illustrates two Infrastructure Segment Multiplex Entities, placed back-to-back. A set of back-to-back Infrastructure Segment Multiplex Entities may be used at the multiplexed (E)ISS SAPs that are associated with SMP-VIDs on a Provider Network Port to provide per Infrastructure Segment SAPs that support Connectivity Fault Management (CFM) shims for Infrastructure Segment MAs as shown in Figure 26-10.

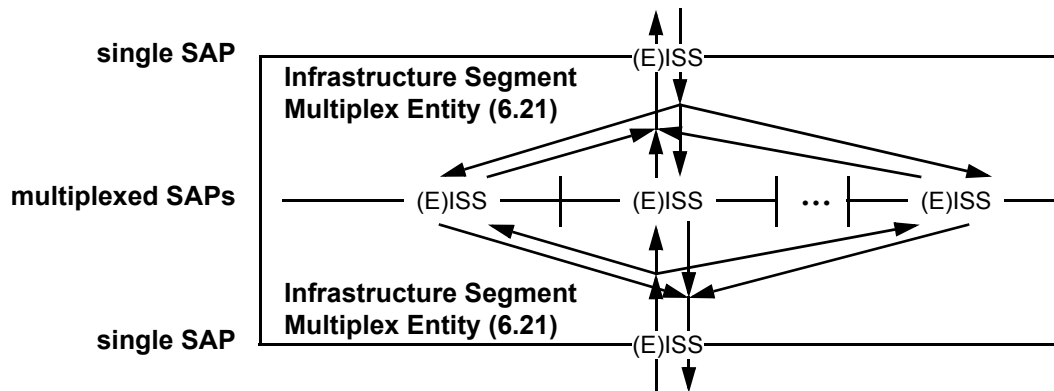


Figure 6-13—Two back-to-back Up and Down Infrastructure Segment Multiplex Entities

An Infrastructure Segment Multiplex Entity has one (E)ISS SAP that supports multiple Infrastructure Segment instances, and a number of multiplexed (E)ISS SAPs each supporting a single Infrastructure Segment instance. Each multiplexed SAP has destination_address, source_address, and vlan_identifier combinations assigned by the Infrastructure Segment Multiplex Entity. Every destination_address, source_address, and vlan_identifier combination can be assigned to a multiplexed SAP, and no destination_address, source_address, and vlan_identifier combination is assigned to more than one multiplexed SAP.

Upon receiving a Request or Indication from its single (E)ISS SAP, the Infrastructure Segment Multiplex Entity uses the destination_address, source_address, and vlan_identifier to select the corresponding one of its multiplexed SAPs to present the Request or Indication. The Request or Indication presented at the multiplexed SAPs has the same parameters as the original Request or Indication at the Single SAP. Similarly, any Request or Indication received from a multiplexed SAP is transparently presented to the single (E)ISS SAP.

The MAC_Operational status parameter (6.6.2) presented to the uppermost single (E)ISS SAP in Figure 6-13 is TRUE if and only if:

- The uppermost single (E) ISS SAP's MAC_Enabled parameter is TRUE; and
- At least one of its multiplexed SAPs' MAC_Operational status parameters is TRUE.

The MAC_Operational status parameter of each of the multiplexed SAPs in Figure 6-13 is computed separately, and is TRUE if and only if:

- c) The lowermost single (E)ISS SAP's MAC_Operational parameter is TRUE; and
- d) That multiplexed SAP's MAC_Enabled parameter is TRUE.

The MAC_Operational parameter of the passive SAP on an Infrastructure Segment MEP is set to FALSE when the Infrastructure Segment MEP declares an errorCCMdefect (20.21.3) or an xconCCMdefect (20.23.3), setting the MAC_Operational parameter of the associated multiplexed SAP on the Infrastructure Segment Multiplex Entity to FALSE. The MAC_Operational parameter of the passive SAP on an Infrastructure Segment MEP is set back to TRUE when both defects are cleared, setting back to TRUE the MAC_Operational parameter of the associated multiplexed SAP.

8. Principles of bridge operation

8.3 Model of operation

Insert the following text (including Figure 8-8) at the end of 8.3, and renumber the subsequent figures in Clause 8 accordingly:

Figure 8-8 illustrates the operation of the IPS Control entity. The IPS Control entity functions as an intermediary between the Bridge Management entity and the FDB for operations related to TESIs associated with an IPG. Infrastructure Segment MEPs associated with an IPG communicate the operational state of the associated Infrastructure Segment to the IPS control entity (26.11.3).

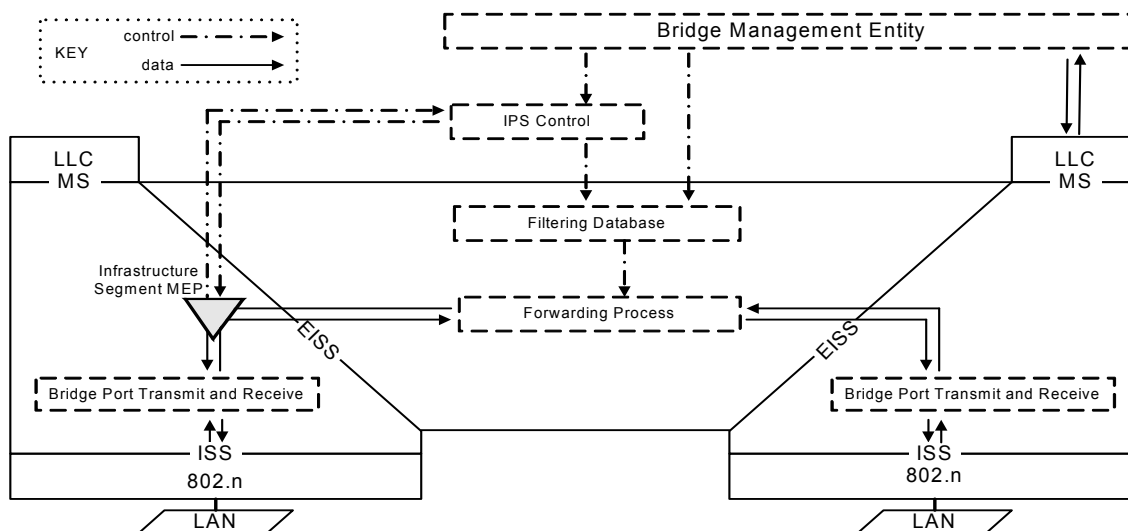


Figure 8-8—Infrastructure Segment MEP placement in a PNP

8.8 The Filtering Database

Change the sixth paragraph in 8.8 as follows:

Static filtering information is added to, modified, and removed from the Filtering Database only under explicit management control except when PBB-TE IPS is deployed, in which case the static filtering information for traffic associated with IPGs configured on the Bridge is added to, modified, and removed from the Filtering Database only under the direction of IPS Control (26.11.3). It shall not be automatically removed by any ageing mechanism. Management of static filtering information may be carried out by use of the remote management capability provided by Bridge Management (8.12) using the operations specified in Clause 12.

12. Bridge management

12.7 Filtering Database

12.7.7 General Filtering Database operations

12.7.7.1 Create Filtering Entry

12.7.7.1.3 Outputs

Insert the following list item after item a) in 12.7.7.1.3, and reletter the remaining list item in 12.7.7.1.3 accordingly:

- b) Operation rejected because the specified Static Filtering Entry is associated with an Infrastructure Protection Group and is administered by IPS Control;

12.14 CFM entities

12.14.2 CFM Stack managed object

12.14.2.1 Read CFM Stack managed object

12.14.2.1.2 Inputs

Change list item d) in 12.14.2.1.2 as indicated:

- d) A specific VID, ~~I-SID, TE-SID, or SEG-ID associated with an MP, or 0, in the case that the MP is associated with no VID, I-SID, TE-SID, or SEG-ID, or I-SID for I-components or B-components or the TE-SID to which the MEPs and MHFs are attached, or 0, for those attached to no VID or I-SID or TE-SID.~~

Change 12.14.4 through 12.14.4.1.2 as indicated:

12.14.4 Configuration Error List managed object

The Configuration Error List managed object is a list of ~~{service instance identifier, port}~~ pairs configured in error together with the identity of the configuration error. The ~~service instance identifier~~ is a VID, I-SID, ~~or TE-SID, or SEG-ID~~, and the port is a simple bridge port or aggregated bridge port.

12.14.4.1 Read Configuration Error List managed object

12.14.4.1.1 Purpose

To list the entries in the Configuration Error List where each entry describes the ~~Service Instance Identifier~~ and port pair that identifies the entry, together with a description of the particular configuration error.

12.14.4.1.2 Inputs

- a) A ~~VID, I-SID, or TE-SID, specifying which service instance to check for ports in error or a SEG-ID specifying which Infrastructure Segment to check for ports in error;~~ and
- b) An interface, either a Bridge Port, or an aggregated IEEE 802.3 port within a Bridge Port.

12.14.5 Maintenance Domain managed object

12.14.5.3 Create Maintenance Association managed object

12.14.5.3.2 Inputs

Change 12.14.5.3.2 as indicated:

- a) A reference to a particular Maintenance Domain managed object (12.14.5);
- b) The Short MA Name of an MA within that Maintenance Domain, including the format specifier from Table 21-20 (21.6.5.4). In the case of a PBB-TE, ~~or a VID-based MA, or Infrastructure Segment MA~~, the default value is a 2-octet integer (format 3) containing the primary VID, or 0, if the MA is not attached to a VID; and
- c) The list of VID_s, ~~the I-SID, or the TE-SID, or the SEG-ID~~ monitored by this MA, or 0, if the MA is not attached to any VID_s, ~~or I-SID, or TE-SID, or SEG-ID~~. In the case ~~of that~~ a list of VID_s is specified, the first VID in the list is the MA's Primary VID (default none). The specification of I-SID is allowed only in the case of I- or B- components. The TE-SID is allowed only in the case that PBB-TE is supported. The SEG-ID is allowed only in the case that IPS is supported.

12.14.5.3.3 Outputs

Insert the following list item after item 7) in 12.14.5.3.3 a) ("Operation status..."), and renumber the remaining list item in 12.14.5.3.3 a) accordingly:

- 8) Operation rejected because the SEG-ID value specified does not correspond to a valid Infrastructure Segment;

12.14.6 Maintenance Association managed object

12.14.6.1 Read Maintenance Association managed object

12.14.6.1.3 Outputs

Change list item b) in 12.14.6.1.3 as indicated:

- b) The VID(s), I-SID, ~~or TE-SID, or SEG-ID~~ monitored by this MA, or 0, if the MA is not attached to any VID_s, ~~or I-SID, or TE-SID, or SEG-ID~~. In the case of a list of VID_s, the first VID returned is the MA's Primary VID;

12.14.6.3 Create Maintenance association End Point managed object

12.14.6.3.3 Outputs

Change list item 4) in 12.14.6.3.3 a) ("Operation status...") as indicated:

- 4) Operation rejected due to the existence of a MEP in the same direction (Up or Down) at that same MD Level, for the same VID(s), I-SID, ~~or TE-SID, or SEG-ID~~ as this MEP (or for no VID, I-SID, ~~or TE-SID, or SEG-ID~~, if this MEP's MA has no VID, I-SID, ~~or TE-SID, or SEG-ID~~), on that Bridge Port or aggregated IEEE 802.3 port;

12.14.7 Maintenance association End Point managed object**12.14.7.1 Read Maintenance association End Point managed object****12.14.7.1.3 Outputs**

Change list item d) in 12.14.7.1.3 as indicated:

- d) (writable) An integer indicating the Primary VID of the MEP, always one of the VIDs assigned to the MEP's MA. The value 0 indicates that either the Primary VID is that of the MEP's MA, or that the MEP's MA is associated with no VID. In the case of a PBB-TE associated MEP, the Primary VID is not writable but is always associated with the value of the ESP-VID parameter identifying the MA's ESP that has the MEP's MAC address in its ESP-SA field (MEPprimaryVID, 20.9.7). In the case of an Infrastructure Segment associated MEP, the Primary VID (MEPprimaryVID, 20.9.7) is not writable but is always associated with the value of the SMP-VID parameter identifying the MA's SMP that has the MEP's MAC address in its SMP-SA field;

Change list item h) in 12.14.7.1.3 as indicated:

- h) (writable) The priority parameter for CCMs and LTMs transmitted by the MEP (default value: the highest priority, i.e., that with the highest numerical value, allowed to pass through the Bridge Port for any of this MEP's VIDs, or I-SID, or TE-SID, or SEG-ID);

Change list item i) in 12.14.7.1.3 as indicated:

- i) The MAC address of the MEP (19.4); In the case of a MEP that is associated with a TESI, the MAC address of the CBP upon which the MEP is operating. In the case of a MEP that is associated with an Infrastructure Segment, the MAC address of the PNP upon which the MEP is operating;

Insert the following subclauses, 12.24 through 12.24.2.3.3, after 12.23:

12.24 1:1 PBB-TE Infrastructure Protection Switching (IPS) managed objects

The IPS managed objects model operations that create, modify, delete, or inquire about the configuration and the operation of IPS (26.11). To this end, they describe objects related to an Infrastructure Protection Group (IPG) (26.11.2.1). The following are the IPS managed objects associated with a SEB:

- a) IPG list managed object (12.24.1);
- b) IPG managed object (12.24.2).

12.24.1 IPG list managed object

There is one IPG list managed object per SEB. The IPG list managed object contains a list of the IPGs that have been configured on the SEB.

The management operations that can be performed on the IPG list managed object are as follows:

- a) Read IPG list (12.24.1.1);
- b) Create IPG managed object (12.24.1.2); and
- c) Delete IPG managed object (12.24.1.3).

12.24.1.1 Read IPG list

12.24.1.1.1 Purpose

To obtain information about the set of IPGs associated with a SEB.

12.24.1.1.2 Inputs

None.

12.24.1.1.3 Outputs

A list, perhaps empty, of the IPG managed objects configured on the SEB. For each item in the list, the Read IPG list command returns:

- a) A value identifying the IPG;
- b) A reference to the particular Maintenance Association managed object (12.14.6) identifying the Infrastructure Segment MA that corresponds to the working entity of the IPG;
- c) A reference to the particular Maintenance Association managed object (12.14.6) identifying the Infrastructure Segment MA that corresponds to the protection entity of the IPG; and
- d) In the case of M:1 IPS, a prioritized list of references to Maintenance Association managed object (12.14.6), each of which identifies a candidate Protection Segment associated with the IPG.

12.24.1.2 Create IPG managed object

12.24.1.2.1 Purpose

To create a new IPG managed object in a SEB and add it to the IPG list managed object associated with the SEB.

12.24.1.2.2 Inputs

- a) A reference to a particular Maintenance Association managed object (12.14.6) identifying the Infrastructure Segment MA that corresponds to the working entity of the IPG; and
- b) In the case of 1:1 IPS, a reference to a particular Maintenance Association managed object (12.14.6) identifying the Infrastructure Segment MA that corresponds to the protection entity of the IPG or, in the case of M:1 IPS, a prioritized list of references to Maintenance Association managed object (12.14.6), each of which identifies an Infrastructure Segment MA associated with an Infrastructure Segment that is a candidate Protection Segment for the IPG.

12.24.1.2.3 Outputs

- a) Operation status. This takes one of the following values:
 - 1) Operation rejected due to nonexistent MD;
 - 2) Operation rejected due to a nonexistent MA;
 - 3) Operation rejected because a referenced MA is not associated with an Infrastructure Segment;
 - 4) Operation rejected because the referenced MAs do not belong to the same MD;
 - 5) Operation rejected because two or more managed objects referenced are associated with the same MA;
 - 6) Operation rejected because neither SMP-ID associated with a SEG-ID identifying one of the referenced Infrastructure MAs contains in its SMP-SA field the MAC address of a PNP associated with the SEB; or
 - 7) Operation accepted.