



**IEEE Standard for
Local and Metropolitan Area Networks—
Bridges and Bridged Networks
Amendment 37:
Automatic Attachment to Provider
Backbone Bridging (PBB) Services**

IEEE Computer Society

Developed by the
LAN/MAN Standards Committee

IEEE Std 802.1Qcj™-2023
(Amendment to IEEE Std 802.1Q™-2022
as amended by IEEE Std 802.1Qcz™-2023
and IEEE Std 802.1Qcw™-2023)

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IEEE Standard for Local and Metropolitan Area Networks— Bridges and Bridged Networks Amendment 37: Automatic Attachment to Provider Backbone Bridging (PBB) Services

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Approved 21 September 2023
IEEE SA Standards Board

Abstract: This amendment to IEEE Std 802.1Q-2022 as amended by IEEE Std 802.1Qcz-2023 and IEEE Std 802.1Qcw-2023 specifies protocols, procedures, and management objects for auto attachment of network devices to Provider Backbone service instances using Type, Length, Value (TLVs) within the Link Layer Discovery Protocol (LLDP).

Keywords: AAB, AAD, AAP, amendment, Auto Attach, Auto Attach Backbone Edge Bridge, Auto Attach Device, Auto Attach Protocol, Bridged Network, IEEE 802.1Q™, IEEE 802.1Qcj™, LAN, local area network, MAC Bridge, metropolitan area network, MSTP, Multiple Spanning Tree Protocol, PBBN, PBN, Provider Backbone Bridged Network, Provider Bridged Network, Rapid Spanning Tree Protocol, RSTP, Shortest Path Bridging Protocol, SPB Protocol, Time-Sensitive Networking, TSN, Virtual Bridged Network, virtual LAN, VLAN Bridge

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Introduction

This introduction is not part of IEEE Std 802.1Qcj™-2023, IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks—Amendment 37: Automatic Attachment to Provider Backbone Bridging (PBB) Services.

IEEE Std 802.1Qcj™-2023: Automatic Attachment to Provider Backbone Bridging (PBB) Services specifies protocols, procedures, and management objects for auto attachment of network devices to Provider Backbone service instances using Type, Length, Value (TLVs) within the Link Layer Discovery Protocol (LLDP).

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—

Bridges and Bridged Networks

Amendment 37: Automatic Attachment to Provider Backbone Bridging (PBB) Services

(This amendment is based on IEEE Std 802.1Q™-2022 as amended by IEEE Std 802.1Qcz™-2023 and IEEE Std 802.1Qcw™-2023.)

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.

The editing instructions are shown in ***bold italics***. Four editing instructions are used: change, delete, insert, and replace. ***Change*** is used to make corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed by using ~~strike~~ (to remove old material) and under (to add new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material. Deletions and insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. ***Replace*** is used to make changes in figures or equations by removing the existing figure or equation and replacing it with a new one. Editing instructions, change markings, and this note will not be carried over into future editions because the changes will be incorporated into the base standard.⁶

⁶ Notes 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 text at the end of 1.3:

This standard specifies the protocols, procedures, and management objects for auto attachment of network devices to backbone service instances (BSIs) by adding an Auto Attach Protocol (AAP) over the Link Layer Discovery Protocol (LLDP). The AAP simplifies the deployment and administration of PBB networks by automatically coupling end stations or Bridges to BSIs.

To this end, it:

- cz) Introduces the concepts of Auto Attach Protocol (AAP), Auto Attach System (AAS) on devices supporting Auto Attach; ⁷ non-PBB-based Auto Attach Devices (AADs) and PBB-based Auto Attach BEBs (AABs).
- da) Describes the process of discovery and advertising of capabilities for AADs and AABs supporting the AAP acting as an AAS.
- db) Describes the bindings between Backbone Service Instance Identifiers (I-SIDs) and VLAN Identifiers.
- dc) Specifies IEEE 802.1 Organizationally Specific LLDP TLVs for discovery and capabilities advertising, and attachment of C-VLANs to backbone service instances.
- dd) Specifies SNMP MIB support for PBBN Auto Attach.
- de) Specifies YANG extensions to the LLDP YANG modules for the PBBN Auto Attach LLDP TLVs.
- df) Specifies SNMP MIB extensions to the LLDP EVB extension MIB module for the PBBN Auto Attach LLDP TLVs.

⁷ The term “Auto Attach” is used interchangeably with “PBBN Auto Attach” where it is clear from the context that “PBBN Auto Attach” is discussed.

3. Definitions

Insert the following definitions in the appropriate collating sequence, renumbering accordingly:

3.1 Auto Attach BEB (AAB) Bridge component: A Backbone Edge Bridge having at least one I-component that uses the AAP to respond to requests from AADs to couple LANs or VLANs to backbone service instances within a PBBN.

3.2 Auto Attach Device (AAD): An end station, MAC Bridge, C-VLAN Bridge, or S-VLAN Bridge that uses the AAP to request attachment to a backbone service instance within a PBBN.

3.3 Auto Attach Protocol (AAP): A protocol operating over LLDP used by an Auto Attach System (AAS) which provides auto attachment to a PBBN.

3.4 Auto Attach System (AAS): An Auto Attach Device (AAD) or Auto Attach BEB (AAB).

4. Abbreviations

Insert the following abbreviations into Clause 4, in the appropriate collating sequence:

AAB	Auto Attach BEB
AAD	Auto Attach Device
AAP	Auto Attach Protocol
AAS	Auto Attach System

5. Conformance

5.9 C-VLAN Bridge conformance

Insert 5.9.2 after 5.9.1 as follows:

5.9.2 C-VLAN Bridge requirements for PBBN Auto Attach (optional)

A C-VLAN Bridge that conforms to the provisions for PBBN Auto Attach (Clause 50) shall:

- a) Support Link Layer Discovery Protocol (LLDP) transmit and receive mode (IEEE Std 802.1AB™).
- b) Support the PBBN Auto Attach System TLV (D.2.17).
- c) Support the PBBN Auto Attach Assignment TLV (D.2.18).
- d) Support the AAD state machine (50.6).
- e) Support management entities for PBBN Auto Attach as specified in 12.34.

A C-VLAN Bridge that conforms to the provisions for PBBN Auto Attach may:

- f) Support SNMP MIB extensions for AAP (17.7.26).
- g) Support SNMP MIB extensions for AAP LLDP TLVs (D.5.6).
- h) Support YANG for AAP LLDP TLVs (D.6.6.7).

5.10 Provider Bridge conformance

Insert 5.10.3 after 5.10.2 as follows:

5.10.3 S-VLAN Bridge requirements for PBBN Auto Attach (optional)

An S-VLAN Bridge that conforms to the provisions for PBBN Auto Attach (Clause 50) shall:

- a) Support Link Layer Discovery Protocol (LLDP) transmit and receive mode (IEEE Std 802.1AB).
- b) Support the PBBN Auto Attach System TLV (D.2.17).
- c) Support the PBBN Auto Attach Assignment TLV (D.2.18).
- d) Support the AAD state machine (50.6).
- e) Support management entities for PBBN Auto Attach as specified in 12.34.

An S-VLAN Bridge that conforms to the provisions for PBBN Auto Attach may:

- f) Support SNMP MIB extensions for AAP (17.7.26).
- g) Support SNMP MIB extensions for AAP LLDP TLVs (D.5.6).
- h) Support YANG for AAP LLDP TLVs (D.6.6.7).

5.12 Backbone Edge Bridge (BEB) conformance

Insert 5.12.2 after 5.12.1 as follows:

5.12.2 Backbone Edge Bridge requirements for PBBN Auto Attach (optional)

An Auto Attach BEB (AAB) shall be a conformant Backbone Edge Bridge (BEB, 5.12) with at least one I-component (5.7) and shall have one or more C-VLAN components providing externally visible Customer Edge Ports (CEP) as specified in 50.2.

Each externally accessible AAB port that supports PBBN Auto Attach shall:

- a) Support Link Layer Discovery Protocol (LLDP) transmit and receive mode (IEEE Std 802.1AB).
- b) Support the PBBN Auto Attach System TLV (D.2.17).
- c) Support the PBBN Auto Attach Assignment TLV (D.2.18).
- d) Support the C-tagging service interface (50.2.2) and S-tagging service interface (50.2.1).
- e) Support the AAB state machine (50.7).
- f) Support the management entities for PBBN Auto Attach as specified in 12.34.

Each externally accessible AAB port that supports PBBN Auto Attach may:

- g) Support the IEEE Std 802.1Q Organizationally Specific Management VID TLV (D.2.6)
- h) Support SNMP MIB extensions for AAP (17.7.26).
- i) Support SNMP MIB extensions for AAP LLDP TLVs (D.5.6).
- j) Support YANG for AAP LLDP TLVs (D.6.6.7).

5.14 MAC Bridge conformance

Insert 5.14.2 after 5.14.1 as follows:

5.14.2 MAC Bridge requirements for PBBN Auto Attach (optional)

A MAC Bridge that conforms to the provisions for PBBN Auto Attach (Clause 50) shall:

- a) Support Link Layer Discovery Protocol (LLDP) transmit and receive mode (IEEE Std 802.1AB).
- b) Support the PBBN Auto Attach System TLV (D.2.17).
- c) Support the PBBN Auto Attach Assignment TLV (D.2.18).
- d) Support the AAD state machine (50.6).
- e) Support the management entities for PBBN Auto Attach as specified in 12.34.

A MAC Bridge that conforms to the provisions for PBBN Auto Attach may:

- f) Support SNMP MIB extensions for AAP (17.7.26).
- g) Support SNMP MIB extensions for AAP LLDP TLVs (D.5.6).
- h) Support YANG for AAP LLDP TLVs (D.6.6.7).

Insert 5.33 after 5.32 as follows:

5.33 End station requirements for PBBN Auto Attach (optional)

An end station that conforms to the provisions for PBBN Auto Attach (Clause 50) shall:

- a) Support Link Layer Discovery Protocol (LLDP) transmit and receive mode (IEEE Std 802.1AB).
- b) Support the PBBN Auto Attach System TLV (D.2.17).
- c) Support the PBBN Auto Attach Assignment TLV (D.2.18).
- d) Support the AAD state machine (50.6).
- e) Support the management entities for PBBN Auto Attach as specified in 12.34.

An end station implementation that conforms to the provisions for PBBN Auto Attach may:

- f) Support SNMP MIB extensions for AAP (17.7.26).
- g) Support SNMP MIB extensions for AAP LLDP TLVs (D.5.6).
- h) Support YANG for AAP LLDP TLVs (D.6.6.7).

12. Bridge Management

Insert 12.34 after 12.33, as follows:

12.34 Managed objects for PBBN Auto Attach

The conformance requirements for PBBN Auto Attach support are specified in 5.9.2, 5.10.3, 5.12.2, 5.14.2, and 5.33. PBBN Auto Attach is specified in Clause 50.

The PBBN Auto Attach specific managed objects defined here:

- a) Provide managed objects for identifying and configuring an Auto Attach System (12.34.1).
- b) Provide managed objects for configuring Bridge Ports, LAGs, and DRNIs for Auto Attach (12.34.2).
- c) Provide managed objects to catalog discovered remote ports supporting Auto Attach (12.34.3).
- d) Provide managed objects that indicate the desired VID to I-SID assignments for AADs and the operating assignments for AABs for each Bridge Port, LAG, or DRNI (12.34.4).
- e) Provide per port PBBN Auto Attach statistics (12.34.5).

12.34.1 PBBN Auto Attach System objects

The PBBN Auto Attach System objects (Table 12-46) identify the AAS within the administrative domain, indicate the type of AAS, either AAB or one of the AAD types, and enable Auto Attach within the AAS. The aaSystemMAC uniquely identifies the system including all associated components.

Table 12-46—PBBN Auto Attach System objects

Name	Data type	Operations supported ^a	Conformance ^b	References
aaSystemEnable	Boolean	RW	B, D	50.4.2.1
aaSystemMAC	macAddress	R	B, D	50.4.2.4
aaSystemType	enumerated {AAB, CVLAN-AWARE-AAD, VLAN-UNWARE-AAD, SVLAN-AWARE-AAD}	R	B, D	50.4.2.5
aaSystemResetTime	unsigned (1...1200)	RW	B, D	50.4.2.6

^a R = Read only access; RW = Read/Write access.

^b B = required for AAB; D= required for AAD.

In the case of an AAB a single aaSystemMAC identifies all I-components and T-components as well as all embedded S-components and C-components used to support external C-VLAN and S-VLAN interfaces. In the case where a pair of BEBs form a DRNI, the single aaSystemMAC identifies all components of both BEBs coupled to form a DRNI.

For an AAD the single aaSystemMAC identifies all end station and Bridge components within the AAD.

The object aaSystemEnable defaults to FALSE allowing configuration of the system before Auto Attach operation. Changing aaSystemEnable from FALSE to TRUE starts Auto Attach on all configured and enabled ports. Setting aaSystemEnable to FALSE breaks all attachments and disables the Auto Attach feature on all ports of the AAS.

12.34.2 PBBN Auto Attach port table

Each AAS has a port table that lists the ports that can be advertised by this system using the AAP. Each entry in the PBBN Auto Attach port table (Table 12-47) can be created, deleted, and updated by the system administrator to configure ports for Auto Attach.

Table 12-47—PBBN Auto Attach port table

Name	Data type	Operations supported ^a	Conformance ^b	References
aaPortId	If-ref	R	B, D	50.4.3.13
aaPortNetId	String	R	B, D	50.4.3.9, 50.4.1.3 portNetId ^c
aaPortEnable	Boolean	RW	B, D	50.4.3.1

^a R = Read only access; RW = Read/Write access.

^b B = required for AAB; D= required for AAD.

^c This is the object within the referenced structure.

Each local port is uniquely identified within the AAS by its aaPortId and uniquely identified over the administrative domain by aaPortNetId. The aaPortNetId is composed of the aaSystemMAC and the aaPortID. The management object aaPortNetId reflects the content of the state machine variable aaOperLocSysTlv.portNetId.

The object aaPortEnable controls the state machine variable aaAdminPortEnable that enables/disables Auto Attach operation on this port. Setting aaPortEnable = FALSE forces the AAP state machines for this port to restart, detaching all active associations and clearing the current statistics.

12.34.3 PBBN Discovered Auto Attach Systems table

The PBBN Discovered Auto Attach Systems table (Table 12-48) object provides information about active remote Auto Attach ports identified by the Auto Attach Protocol (AAP) through the Auto Attach LLDP database system objects. The Discovered Auto Attach Systems table is read only.

Table 12-48—PBBN Discovered Auto Attach Systems table

Name	Data type	Operations supported ^a	Conformance ^b	References
aaDiscLocPortId	If-ref	R	B, D	50.4.3.13
aaDiscRemPortNetId	String	R	B, D	50.4.3.11, 50.4.1.3, D.2.17.10 portNetId ^c
aaDiscRemSystemType	Enumeration {AAB, CVLAN-AWARE-AAD, VLAN-UNAWARE-AAD, SVLAN-AWARE-AAD}	R	B, D	50.4.3.11, 50.4.1.3, D.2.17.7 sysType ^c
aaDiscRemPortTagging	Enumeration {TAG-ALL, TAG-OR-UNTAG, UNTAG-ONLY}	R	B, D	50.4.3.11, 50.4.1.3, D.2.17.8 portTagging ^c
aaDiscRemPortAssocState	Enumeration {NOT_READY, READY_TO_ASSOC, READY_TO_ATTACH, ASSOC_FAILED_TYPES, ASSOC_FAILED_TAGS, ASSOC_FAILED_TOPO, ASSOC_FAILED_OTHER, ASSOC_ATTACHED, ASSOC_STANDBY, ASSOC_INVALID}	R	B, D	50.4.3.11, 50.4.1.3, D.2.17.5 state ^c
aaDiscLocPortAssocState	Enumeration {NOT_READY, READY_TO_ASSOC, READY_TO_ATTACH, ASSOC_FAILED_TYPES, ASSOC_FAILED_TAGS, ASSOC_FAILED_TOPO, ASSOC_FAILED_OTHER, ASSOC_ATTACHED, ASSOC_STANDBY, ASSOC_INVALID}	R	B, D	50.4.3.9, 50.4.1.3, D.2.17.5 state ^c

^a Operations Supported: R = Read only access; RW = Read/Write access.

^b B = required for AAB; D= required for AAD.

^c This is the object within the referenced structure.

The aaDiscLocPortId provides a reference to the local port, LAG, or DRNI where the remote attach port was discovered. The aaDiscRemPortNetId uniquely identifies the remote port, LAG, or DRNI discovered at the local port.

12.34.4 PBBN Auto Attach assignment table

There is one PBBN Auto Attach assignment table for each port configured in the Auto Attach port table (12.34.2). The Auto Attach assignment table is used by management to set the VLAN ID/I-SID assignments desired by the AAD and to monitor the current Auto Attach assignment requests received at the AAB. Entries in the Auto Attach assignment table can be created, updated, and deleted for the AAD, but are read only for the AAB.

Each entry of the Auto Attach assignment table (Table 12-49) contains three variables specifying the VID, I-SID, and status of each assignment. In an AAD the desired assignments are stored and read from the per port state machine variable aaAdminVidIsidAsgns[] (50.4.3.2). One aaAdminVidIsidAsgns[] exists for each local port identified by the Auto Attach port table.

Table 12-49—PBBN Auto Attach assignment table

Name	Data type	Operations supported ^a	Conformance ^b	References
aaVidIsidAsgnsVid	unsigned[1...4094]	R for AAB, RW for AAD	B, D	50.4.3.2 vid ^c
aaVidIsidAsgnsIsid	unsigned [1, 256...16777214]	R for AAB, RW for AAD	B, D	50.4.3.2 isid ^c
aaVidIsidAsgnsStatus	Enumerated { PENDING, ACCEPTED, REJECTED, REJ-RES-UNAVAIL, REJ-INVALID-VID, REJ-VLAN-UNAVAIL, REJ-INVALID-I-SID, REJ-I-SID-UNAVAIL, REJ-APP-ISSUE, REJ-NOT-ALLOWED	R	B, D	AAD 50.4.3.10, AAB 50.4.3.8, 50.4.1.1 asgnsArray[] status ^c

^a R = Read only access; RW = Read/Write access.

^b B = required for AAB; D= required for AAD.

^c This is the object within the referenced structure.

The status indicated in the Auto Attach assignment table for each VID to I-SID assignment is determined from the state machine variable aaOperRemAsgnsTlv.asgnsArray.status (50.4.3.10) in AADs or from the state machine variable aaOperLocAsgnsTlv.asgns.status (50.4.3.8) in AABs. The status at the AAD is the status from the VID/I-SID assignments reported in the remote LLDP assignment objects received from the AAB. The status at the AAB is the status determined by the AAB for the VID/I-SID assignment requests received from the AAD. At the AAD, if no remote LLDP assignment objects exist in the LLDP database or if the VID/I-SID assignment is not listed in the remote AAB LLDP database objects, then the status is set to PENDING in the Auto Attach assignment table.

The AAD administrator can create new entries, delete entries, and update entries in the Auto Attach assignment table. When the administrator deletes, adds, or updates an entry in the Auto Attach assignment table the AAP state machine variable aaAdminVidIsidAsgns[] associated with the affected port is updated to match the Auto Attach assignment table. When a new entry is created or updated, the new VID and I-SID is provided by management and the status begins as PENDING and then transitions to reflect the current status indicated in the remote AAB LLDP objects.

In an AAB the Auto Attach assignment table is read only and reflects the current assignments within the local LLDP assignment database. The Auto Attach assignment table contains the status, VID, and I-SID (D.2.18.6, D.2.18.7, D.2.18.8) from the local LLDP assignment database objects.

12.34.5 PBBN Auto Attach statistics table

There is one PBBN Auto Attach statistics table for each port configured in the Auto Attach port table (Table 12-47). Each Auto Attach statistics table (Table 12-50) provides per port statistics. All objects of the Auto Attach statistics table are read only. The contents of the table is maintained by the Auto Attach state machines (50.6, 50.7). All statistic counters on all ports are cleared on system reset.

Table 12-50—PBBN Auto Attach statistics table

Name	Data type	Operations supported ^a	Conformance ^b	References
aaStatsAssocAttached	Counter32	R	B, D	50.4.3.18
aaStatsAssocFailed	Counter32	R	B, D	50.4.3.19
aaStatsAssocReset	Counter32	R	B, D	50.4.3.20
aaStatsAssocStandby	Counter32	R	B, D	50.4.3.21
aaStatsVidIsidAsgnsAccepted	Counter32	R	B, D	50.4.3.22
aaStatsVidIsidAsgnsRejected	Counter32	R	B, D	50.4.3.23
aaStatsVidIsidAsgnsRequested	Counter32	R	B, D	50.4.3.24
aaStatsVidIsidAsgnsWithdrawn	Counter32	R	B, D	50.4.3.25

^a R = Read only access; RW = Read/Write access.

^b B = required for AAB; D= required for AAD.

The counters provided are as follows:

- a) aaStatsAssocAttached: Counts the number of associations that were attached.
- b) aaStatsAssocFailed: Counts the number of associations that failed.
- c) aaStatsAssocReset: Counts the number of association resets.
- d) aaStatsAssocStandby: Counts the number of associations that were standby.
- e) aaStatsVidIsidAsgnsRequested: Counts the number of new VID to I-SID assignments requested.
- f) aaStatsVidIsidAsgnsAccepted: Counts the number of VID to I-SID assignment requests accepted.
- g) aaStatsVidIsidAsgnsRejected: Counts the number of VID to I-SID assignment requests rejected.
- h) aaStatsVidIsidAsgnsWithdrawn: Counts the number of VID to I-SID assignment requests withdrawn.

17. Management Information Base (MIB)

17.2 Structure of the MIB

Insert a new row at the end of Table 17-1 as follows (unchanged rows not shown):

Table 17-1—IEEE 802.1Q MIB modules

Module	Structure, relationships, security considerations, module definition	Managed functionality	Initial functionality and MIB specification
IEEE8021-PBBN-AA-MIB	17.2.26, 17.3.26, 17.4.26, 17.7.26	Clause 50	IEEE Std 802.1Qcj

Insert 17.2.26 after 17.2.25 as follows:

17.2.26 Structure of the IEEE8021-PBBN-AA-MIB

The IEEE8021-PBBN-AA-MIB module provides objects to configure and manage the Auto Attach Protocol (AAP, Clause 50).

Table 17-32—IEEE8021-PBBN-AA-MIB Structure

IEEE8021-PBBN-AA-MIB table/objects	Reference
<i>ieee8021AaConfig</i>	
ieee8021AaSystemEnable	aaSystemEnable, 12.34.1, 50.4.2.1
ieee8021AaSystemType	aaSystemType, 12.34.1, 50.4.2.5
ieee8021AaSystemMAC	aaSystemMAC, 12.34.1, 50.4.2.4
ieee8021AaSystemResetTime	aaSystemResetTime, 12.34.1, 50.4.2.6
ieee8021AaPortTable	PBBN Auto Attach port table, 12.34.2
ieee8021AaPortEntry	12.34.2
ieee8021AaPortIfIndex*	aaPortId, 12.34.2, 50.4.3.13
ieee8021AaPortNetId*	aaPortNetId, 12.34.2, 50.4.3.9, 50.4.1.3
ieee8021AaPortEnable	aaPortEnable, 12.34.2, 50.4.3.1
ieee8021AaPortRowStatus	—
ieee8021AaDiscSystemsTable	PBBN Discovered Auto Attach Systems table, 12.34.3
ieee8021AaDiscSystemsEntry	12.34.3
ieee8021AaDiscLocPortIfIndex*	aaDiscLocPortId, 12.34.2, 50.4.3.13
ieee8021AaDiscRemSystemType	aaDiscRemSystemType, 12.34.3, 50.4.3.11, 50.4.1.3
ieee8021AaDiscRemPortNetId*	aaDiscRemPortNetId, 12.34.3, 50.4.3.11, 50.4.1.3
ieee8021AaDiscRemPortTagging	aaDiscRemPortTagging, 12.34.3, 50.4.3.11, 50.4.1.3
ieee8021AaDiscRemPortAssocState	aaDiscRemPortAssocState, 12.34.3, 50.4.3.11, 50.4.1.3
ieee8021AaDiscLocPortAssocState	aaDiscLocPortAssocState, 12.34.3, 50.4.3.9, 50.4.1.3

Table 17-32—IEEE8021-PBBN-AA-MIB Structure (continued)

IEEE8021-PBBN-AA-MIB table/objects	Reference
ieee8021AaIsidVidAsgnsTable	PBBN Auto Attach assignment table, 12.34.4
ieee8021AaIsidVidAsgnsEntry	12.34.4
ieee8021AaIsidVidAsgnsIfIndex*	aaPortId, 12.34.2, 50.4.3.13
ieee8021AaIsidVidAsgnsIsid*	aaVidIsidAsgnsIsid, 12.34.4, 50.4.3.2, 50.4.1.4
ieee8021AaIsidVidAsgnsVlan*	aaVidIsidAsgnsVid, 12.34.4, 50.4.3.2, 50.4.1.4
ieee8021AaIsidVidAsgnsStatus	aaVidIsidAsgnsStatus, 12.34.4, 50.4.3.10, 50.4.3.8
ieee8021AaIsidVidAsgnsRowStatus	—
<i>ieee8021AaStats</i>	
ieee8021AaStatsTable	PBBN Auto Attach statistics table, 12.34.5
ieee8021AaStatsEntry	12.34.5
ieee8021AaStatsPortIfIndex*	aaPortId, 12.34.2, 50.4.3.13
ieee8021AaStatsAssocAttached	aaStatsAssocAttached, 12.34.5, 50.4.3.18
ieee8021AaStatsAssocFailed	aaStatsAssocFailed, 12.34.5, 50.4.3.19
ieee8021AaStatsAssocReset	aaStatsAssocReset, 12.34.5, 50.4.3.20
ieee8021AaStatsAssocStandby	aaStatsAssocStandby, 12.34.5, 50.4.3.21
ieee8021AaStatsAsgnsRequested	aaStatsVidIsidAsgnsRequested, 12.34.5, 50.4.3.24
ieee8021AaStatsAsgnsAccepted	aaStatsVidIsidAsgnsAccepted, 12.34.5, 50.4.3.22
ieee8021AaStatsAsgnsRejected	aaStatsVidIsidAsgnsRejected, 12.34.5, 50.4.3.23
ieee8021AaStatsAsgnsWithdrawn	aaStatsVidIsidAsgnsWithdrawn, 12.34.5, 50.4.3.25
<i>ieee8021AaNotifyObjects</i>	
ieee8021AaNotifications	—
ieee8021AaDiscoveredSystem	—
ieee8021AaDiscRemSystemType	aaDiscRemSystemType, 12.34.3, 50.4.3.11, 50.4.1.3
ieee8021AaDiscRemPortNetId	aaDiscRemPortNetId, 12.34.3, 50.4.3.11, 50.4.1.3
ieee8021AaDiscSystemsDescr	IEEE Std 802.1AB-2016, 8.5.7.2
ieee8021AaDiscSystemsMgmtOid	IEEE Std 802.1AB-2016, 8.5.9.8
ieee8021AaNotifyObjects	—
ieee8021AaDiscSystemsDescr	IEEE Std 802.1AB-2016, 8.5.7.2
ieee8021AaDiscSystemsMgmtOid	IEEE Std 802.1AB-2016, 8.5.9.8

*This object is an INDEX of the table in which it resides.

17.3 MIB module relationships

Insert 17.3.26 after 17.3.25, as follows:

17.3.26 Relationship of the IEEE8021-PBBN-AA-MIB to other MIB modules

The IEEE8021-PBBN-AA-MIB provides objects that extend the functionality of IEEE802.1AB LLDP.

17.4 Security considerations

Insert 17.4.26 after 17.4.25, as follows:

17.4.26 Security considerations of the IEEE8021-PBBN-AA-MIB

There are a number of management objects defined in the IEEE8021-PBBN-AA-MIB module that have a MAX-ACCESS clause of read-write. Such objects can be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

The following tables and objects in the IEEE8021-PBBN-AA-MIB can be misconfigured to interfere with the operation of the forwarding and queuing mechanisms in a manner that would be detrimental to the transmission of scheduled traffic:

- ieee8021AaSystemEnable
- ieee8021AaPortRowStatus
- ieee8021AaPortEnable
- ieee8021AaIsidVidAsgnsRowStatus
- ieee8021AaIsidVidAsgnsIsid
- ieee8021AaIsidVidAsgnsVlan

Some of the readable objects in this MIB module (i.e., objects with a MAX-ACCESS other than not accessible) can be considered sensitive or vulnerable in some network environments. It is thus important to control all types of access (including GET and/or NOTIFY) to these objects and possibly to encrypt the values of these objects when sending them over the network via SNMP.

17.7 MIB modules^{8 9}

Insert 17.7.26 after 17.7.25 as follows:

17.7.26 Definitions for the IEEE8021-PBBN-AA-MIB module

```
IEEE8021-PBBN-AA-MIB DEFINITIONS ::= BEGIN

-- =====
-- MIB for support of PBBN Auto Attach to Provider Backbone
-- Bridging (PBB) services.
-- =====

IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE, Integer32, Gauge32, Unsigned32, Counter32,
    NOTIFICATION-TYPE
        FROM SNMPv2-SMI
    SnmpAdminString
        FROM SNMP-FRAMEWORK-MIB
    RowStatus, TruthValue, MacAddress
        FROM SNMPv2-TC
    MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
        FROM SNMPv2-CONF;

ieee8021PbbnAutoAttachMib MODULE-IDENTITY
    LAST-UPDATED "202309210000Z" -- September 21, 2023
    ORGANIZATION "IEEE 802.1 Working Group"
    CONTACT-INFO
        " WG-URL: http://www.ieee802.org/1/
          WG-EMail: stds-802-1-1@ieee.org
          Contact: IEEE 802.1 Working Group Chair
          Postal: C/O IEEE 802.1 Working Group
                IEEE Standards Association
                445 Hoes Lane
                Piscataway, NJ 08854
                USA
          E-mail: stds-802-1-chairs@ieee.org"
    DESCRIPTION
        "The PBBN Auto Attach MIB module for configuration and statistics support.

        Unless otherwise indicated, the references in this MIB module are to
        IEEE Std 802.1Q Bridges and Bridged Networks:
        IEEE Std 802.1Q-2022 as amended by IEEE Std 802.1Qcz, IEEE Std 802.1Qcw,
        and IEEE Std 802.1Qcj.

        Copyright (C) IEEE (2023).
        This version of this MIB module is part of IEEE Std 802.1Q;
        see that standard for full legal notices."

    REVISION      "202309210000Z" -- September 21, 2023
    DESCRIPTION    "Initial version published as part of IEEE Std 802.1Qcj."

    ::= { iso (1) iso-identified-organization (3) ieee (111)
          standards-association-numbered-series-standard1s (2)
          lan-man-stds (802) ieee802dot1 (1)
          ieee802dot1mibs (1) ieee8021PbbnAutoAttachMib (37) }

    ieee8021AaNotifications OBJECT IDENTIFIER ::= { ieee8021PbbnAutoAttachMib 0 }
    ieee8021AaObjects       OBJECT IDENTIFIER ::= { ieee8021PbbnAutoAttachMib 1 }
    ieee8021AaNotifyObjects OBJECT IDENTIFIER ::= { ieee8021PbbnAutoAttachMib 2 }

    ieee8021AaConfig        OBJECT IDENTIFIER ::= { ieee8021AaObjects 1 }
    ieee8021AaStats         OBJECT IDENTIFIER ::= { ieee8021AaObjects 2 }
```

⁸ Copyright release for MIBs: Users of this standard may freely reproduce the MIB modules in this standard so that they can be used for their intended purpose.

⁹ An ASCII version of this MIB module is attached to the PDF version of this standard, and can be obtained by Web browser from the IEEE 802.1 Website at <https://1.ieee802.org/mib-modules/>.

```
-- =====
-- Auto Attach scalar attributes
-- =====

ieee8021AaSystemEnable OBJECT-TYPE
    SYNTAX          INTEGER {
                        enabled(1),
                        disabled(2)
                    }
    MAX-ACCESS      read-write
    STATUS          current
    DESCRIPTION
        "Exports the status of the Auto Attach service on this system."
    ::= { ieee8021AaConfig 1 }

ieee8021AaSystemType OBJECT-TYPE
    SYNTAX          INTEGER {
                        aaBeb(1),
                        aaDeviceVlanAware(2),
                        aaDeviceVlanUnaware(3)
                    }
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "Defines the AAS type indicating the services supported by the system.
         May be read-only on platforms that only support a single system type."
    ::= { ieee8021AaConfig 2 }

ieee8021AaSystemMAC OBJECT-TYPE
    SYNTAX          MacAddress
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "Defines the Auto Attach System MAC Address used to uniquely identify
         this system."
    ::= { ieee8021AaConfig 3 }

ieee8021AaSystemResetTime OBJECT-TYPE
    SYNTAX          Integer32 (1..1200)
    MAX-ACCESS      read-write
    STATUS          current
    DESCRIPTION
        "AAP reset time delay used to re-synchronize the associated AASs"
    ::= { ieee8021AaConfig 4 }

-- =====
-- Auto Attach VID/I-SID assignment table support
-- =====

ieee8021AaVidIsidAsgnsTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF Ieee8021AaVidIsidAsgnsEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "This table contains the VID <-> I-SID assignments for the
         Auto Attach application."
    ::= { ieee8021AaConfig 5 }

ieee8021AaVidIsidAsgnsEntry OBJECT-TYPE
    SYNTAX          Ieee8021AaVidIsidAsgnsEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "Information about the I-SID <-> VID assignments for the
         Auto Attach application."
    INDEX { ieee8021AaVidIsidAsgnsIfIndex,
            ieee8021AaVidIsidAsgnsIsid,
            ieee8021AaVidIsidAsgnsVid }
    ::= { ieee8021AaVidIsidAsgnsTable 1 }
```

IEEE Std 802.1Qcj™-2023
IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks
Amendment 37: Automatic Attachment to Provider Backbone Bridging (PBB) Services

```
Ieee8021AaVidIsidAsgnsEntry ::= SEQUENCE {
    ieee8021AaVidIsidAsgnsIfIndex      Integer32,
    ieee8021AaVidIsidAsgnsIsid        Integer32,
    ieee8021AaVidIsidAsgnsVid         Integer32,
    ieee8021AaVidIsidAsgnsStatus      INTEGER,
    ieee8021AaVidIsidAsgnsRowStatus   RowStatus }

ieee8021AaVidIsidAsgnsIfIndex OBJECT-TYPE
    SYNTAX      Integer32 (0..65535)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Interface identifier component of the I-SID <-> VID assignment."
    ::= { ieee8021AaVidIsidAsgnsEntry 1 }

ieee8021AaVidIsidAsgnsIsid OBJECT-TYPE
    SYNTAX      Integer32 (1256..16777214)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "I-SID component of the I-SID <-> VID assignment."
    ::= { ieee8021AaVidIsidAsgnsEntry 2 }

ieee8021AaVidIsidAsgnsVid OBJECT-TYPE
    SYNTAX      Integer32 (1..4094)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "VLAN ID component of the I-SID <-> VID assignment."
    ::= { ieee8021AaVidIsidAsgnsEntry 3 }

ieee8021AaVidIsidAsgnsStatus OBJECT-TYPE
    SYNTAX      INTEGER {
        pending(1),
        accepted(2),
        rejected(3),
        rejectedAutoAttachResourcesUnavailable(4),
        rejectedInvalidVLANID(5),
        rejectedVLANResourcesUnavailable(6),
        rejectedInvalidISID(7),
        rejectedISIDResourcesUnavailable(8),
        rejectedApplicationInteractionIssue(9),
        rejectedAssignmentNotAllowed(10)
    }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The current state of the Auto Attach I-SID <-> VID assignment.
        Rejections can be from multiple causes including resources
        unavailable, duplicate, application interaction, etc."
    ::= { ieee8021AaVidIsidAsgnsEntry 4 }

ieee8021AaVidIsidAsgnsRowStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "This object allows entries to be created and deleted in the
        ieee8021AaVidIsidAsgnsTable."
    ::= { ieee8021AaVidIsidAsgnsEntry 5 }
```

```
-- =====
-- Auto Attach port table support
-- =====

ieee8021AaPortTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF Ieee8021AaPortEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This table contains port-specific data for the
        Auto Attach application."
    ::= { ieee8021AaConfig 6 }

ieee8021AaPortEntry OBJECT-TYPE
    SYNTAX      Ieee8021AaPortEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Port-specific data related to the Auto Attach application."
    INDEX { ieee8021AaPortIfIndex,
            ieee8021AaPortNetId }
    ::= { ieee8021AaPortTable 1 }

Ieee8021AaPortEntry ::= SEQUENCE {
    ieee8021AaPortIfIndex      Integer32,
    ieee8021AaPortNetId       OCTET STRING,
    ieee8021AaPortEnable      INTEGER,
    ieee8021AaPortRowStatus   RowStatus }

ieee8021AaPortIfIndex OBJECT-TYPE
    SYNTAX      Integer32 (0..65535)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "IfIndex on the interface (port) identifier attribute."
    ::= { ieee8021AaPortEntry 1 }

ieee8021AaPortNetId OBJECT-TYPE
    SYNTAX      OCTET STRING (SIZE (0..12))
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Identifies an AAS port uniquely within the administrative domain.
        The object is the concatenation of the ieee8021AaSystemMAC and
        ieee8021AaPortIfIndex. The identified port can be simple, a LAG,
        or a DRNI."
    ::= { ieee8021AaPortEntry 2 }

ieee8021AaPortEnable OBJECT-TYPE
    SYNTAX      INTEGER {
        enabled(1),
        disabled(2)
    }
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The current port Auto Attach Protocol enable. Indicates whether
        Auto Attach TLVs will be included in LLDPDUs generated on
        the port (enabled) or not (disabled)."
    ::= { ieee8021AaPortEntry 3 }

ieee8021AaPortRowStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "This object allows entries to be created, deleted, and modified in the
        ieee8021AaPortTable, if the operation is supported by the agent."
    ::= { ieee8021AaPortEntry 4 }
```

```
-- =====
-- Discovered Auto Attach Systems table support
-- =====

ieee8021AaDiscSystemsTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF Ieee8021AaDiscSystemsEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "This table contains details about locally connected AASs that have
        been discovered."
    ::= { ieee8021AaConfig 7 }

ieee8021AaDiscSystemsEntry OBJECT-TYPE
    SYNTAX      Ieee8021AaDiscSystemsEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "Contains details about a locally connected AAS."
    INDEX { ieee8021AaDiscLocPortIfIndex,
            ieee8021AaDiscRemPortNetId }
    ::= { ieee8021AaDiscSystemsTable 1 }

Ieee8021AaDiscSystemsEntry ::= SEQUENCE {
    ieee8021AaDiscLocPortIfIndex      Integer32,
    ieee8021AaDiscRemSystemType       INTEGER,
    ieee8021AaDiscRemPortNetId        OCTET STRING,
    ieee8021AaDiscRemPortTagging      BITS,
    ieee8021AaDiscRemPortAssocState   INTEGER,
    ieee8021AaDiscLocPortAssocState   INTEGER }

ieee8021AaDiscLocPortIfIndex OBJECT-TYPE
    SYNTAX      Integer32 (0..65535)
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "Identifies the interface through which the AAS
        represented by this entry was discovered."
    ::= { ieee8021AaDiscSystemsEntry 1 }

ieee8021AaDiscRemSystemType OBJECT-TYPE
    SYNTAX      INTEGER {
        aaBeb(1),
        aaDeviceCVlanAware(2),
        aaDeviceVlanUnaware(3),
        aaDeviceSVlanAware(4)
    }
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "Identifies the AAS type as advertised through LLDP."
    ::= { ieee8021AaDiscSystemsEntry 2 }

ieee8021AaDiscRemPortNetId OBJECT-TYPE
    SYNTAX      OCTET STRING (SIZE (0..12))
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "Identifies an AAS port uniquely within the administrative domain.
        The object is the concatenation of the ieee8021AaSystemMAC and
        port IfIndex. The identified port can be simple, a LAG, or a DRNI."
    ::= { ieee8021AaDiscSystemsEntry 3 }
```