

IEEE Standard for
Local and metropolitan area networks—

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

Amendment 16: Provider Bridging— Remote Customer Service Interfaces

IEEE Computer Society

Sponsored by the
LAN/MAN Standards Committee

IEEE
3 Park Avenue
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IEEE Std 802.1Qbc™-2011
(Amendment to
IEEE Std 802.1Q™-2011
as amended by IEEE 802.1Qbe™-2011)

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Approved 16 June 2011

IEEE-SA Standards Board

Abstract: This amendment to IEEE Std 802.1Q-2011 specifies the use of service virtual local area networks (S-VLANs) to provide customer service interfaces in one Provider Bridged Network for customer interface local area networks (LANs) attached to another Provider Bridged Network.

Keywords: Bridged Local Area Networks, LANs, local area networks, MAC Bridges, MANs, metropolitan area networks, Provider Bridge, Provider Bridged Local Area Networks, Provider Edge Bridge, RCSI, Remote Customer Service Interface, Virtual Bridged Local Area Networks

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Introduction

This introduction is not part of IEEE Std 802.1Qbc-2011, IEEE Standard for Local and metropolitan area networks—Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks—Amendment 16: Provider Bridging—Remote Customer Service Interfaces.

This amendment to IEEE Std 802.1Q-2011 specifies the use of service virtual local area networks (S-VLANs) to provide customer service interfaces in one Provider Bridged Network for customer interface local area networks (LANs) attached to another Provider Bridged Network.

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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Stephen Haddock, *Chair, Interworking Task Group*

Zehavit Alon
Yafan An
Ting Ao
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Zhemin Ding
Donald Eastlake
Janos Farkas
Donald Fedyk
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Ilango Ganga
Geoffrey Garner

Anoop Ghanwani
Eric Gray
Yingjie Gu
Craig Gunther
Hitoshi Hayakawa
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Rene Raeber
Karen Randall
Dan Romascanu
Jessy Rouyer
Panagiotis Saltsidis
Michael Seaman
Rakesh Sharma
Kevin B. Stanton
Robert Sultan
Michael Teener
Patricia Thaler
Chait Tumuluri
Maarten Vissers

The following members of the individual balloting committee voted on this amendment. Balloters may have voted for approval, disapproval, or abstention.

Thomas Alexander	Akio Iso	Jessy Rouyer
Richard Alfvén	Atsushi Ito	Randall Safier
Zehavit Alon	Raj Jain	John Sauer
Hugh Barrass	Anthony Jeffree	Bartien Sayogo
Tomo Bogataj	Shinkyō Kaku	Michael Seaman
Nancy Bravin	Piotr Karocki	Gil Shultz
William Byrd	Stuart J. Kerry	Kapil Sood
Juan Carreon	Max Kicherer	Nurit Sprecher
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Charles Cook	Michael Lerer	Thomas Starai
Claudio DeSanti	Greg Luri	Walter Struppler
Frank Effenberger	Thomas Mack-Crane	Robert Sultan
Prince Francis	Elvis Maculuba	Joseph Tardo
Yukihiro Fujimoto	Jonathon McLendon	Michael Teener
Devon Gayle	Jose Morales	Patricia Thaler
Reinhard Gloer	Joseph Moran	David Thompson
Randall Groves	Michael S. Newman	Thomas Tullia
Stephen Haddock	Paul Nikolich	Mark-Rene Uchida
Marek Hajduczenia	Satoshi Obara	Ludwig Winkel
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Michelle Turner
IEEE Standards Program Manager, Document Development

Kathryn Bennett
IEEE Standards Program Manager, Technical Program Development

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IEEE Standard for Local and metropolitan area networks—

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Amendment 16: Provider Bridging— Remote Customer Service Interfaces

This amendment to IEEE Std 802.1Q™-2011 supports the use of service virtual local area networks (S-VLANs) to attach remote customer service interfaces to a Provider Bridged Network. Changes are applied to the base text of IEEE Std 802.1Q-2011 as amended by IEEE Std 802.1Qbe™-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 for 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 text at the end of 1.3:

This standard allows an S-tagged service interface connecting two independently administered PBNs to be used to handle traffic (identified by a single S-VID) for a given customer attached to one PBN as if the customer were directly attached to the other PBN using a Port-based or C-tagged service interface. To this end it

- bf) Specifies the use of a Port-mapping S-VLAN component to associate selected S-VIDs registered on an external port with distinct internal ports each of which supports a separate service interface.

3. Definitions

Change the definition of Provider Edge Bridge as follows:

3.140 Provider Edge Bridge: A system comprising ~~a single~~ one or more S-VLAN components and one or more C-VLAN components implemented in accordance with Clause 5 of IEEE Std 802.1Q.

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

3.x Port-mapping S-VLAN component: An S-VLAN component with one externally accessible port and one or more additional ports, each connected to another bridge component via an internal LAN (6.14), and for which each registered S-VID's member set includes the externally accessible port and exactly one other port.

3.x Provider Access Port: A Port-mapping S-VLAN component port within a Provider Edge Bridge that receives and transmits frames for a single customer (single S-VID).

3.x Remote Customer Access Port: A Port-mapping S-VLAN component port on a Provider Edge Bridge that is intended to be directly connected to another PBN under a different administration, and receives and transmits frames for one or more customers.

4. Abbreviations

Insert the following abbreviations into Clause 4 in alphabetical order:

RCAP	Remote Customer Access Port
RCSI	Remote Customer Service Interface

5. Conformance

Change 5.10, 5.10.1, and 5.10.2 as shown:

5.10 Provider Bridge conformance

A Provider Bridge shall comprise ~~a single one conformant S-VLAN (5.6) component, and zero or more C-VLAN components (5.5), and zero or more Port-mapping S-VLAN components (5.6).~~

NOTE—The one mandatory S-VLAN component in a Provider Bridge is generally referred to simply as the S-VLAN component; however, when this component needs to be distinguished from other components in a Provider Bridge (particularly Port-mapping S-VLAN components) it is sometimes referred to as the “primary S-VLAN component.”

Each Port shall be capable of being configured as one of, and may be capable of being configured as any of

- a) A Provider Network Port;
- b) A Customer Network Port;
- c) A Customer Edge Port;
- d) A Remote Customer Access Port;

as specified in Clause 15. Each Port configured as a Provider Network Port or Customer Network Port shall be capable of attaching the S-VLAN component of the Provider Bridge directly to an IEEE 802 LAN. Each Port configured as a Customer Edge Port shall be capable of attaching a C-VLAN component within the Provider Bridge directly to an IEEE 802 LAN. Each Port configured as a Remote Customer Access Port shall be capable of attaching a Port-mapping S-VLAN component (15.6) within the Provider Bridge directly to an IEEE 802 LAN.

5.10.1 S-VLAN Bridge conformance

An S-VLAN Bridge shall comprise a single conformant S-VLAN component (5.6). An S-VLAN Bridge does not have any physical interfaces configured as a Customer Edge Port or Remote Customer Access Port, nor does it include any C-VLAN components.

5.10.2 Provider Edge Bridge conformance

A Provider Edge Bridge is a conformant Provider Bridge with a primary S-VLAN component, the capability to include one or more C-VLAN components as specified in 15.4 and the capability to include zero or more Port-mapping S-VLAN components as specified in 15.6.

Each C-VLAN component shall comprise a single Customer Edge Port and a single distinct Provider Edge Port for each service instance that can be provided through that Customer Edge Port. Each Provider Edge Port shall be connected within the Provider Edge Bridge, as specified in 6.14, to a distinct Customer Network Port on the S-VLAN component. Each C-VLAN component shall implement RSTP, with the enhancements to support Customer Edge Ports, as specified in 13.39.

Each Port-mapping S-VLAN component shall comprise a single Remote Customer Access Port and one or more Provider Access Ports each associated with one Remote Customer Service Interface (RCSI) provided through that Remote Customer Access Port. Each Provider Access Port shall be connected within the Provider Edge Bridge, as specified in 6.14, to a distinct Customer Network Port on the primary S-VLAN component or Customer Edge Port on a C-VLAN component. A Provider Network Port shall also be provided, connected internally to a Provider Network Port on the primary S-VLAN component as specified in 15.6.

NOTE—The single Customer Edge Port supported by a C-VLAN component and the single Remote Customer Access Port supported by a Port-mapping S-VLAN component can be supported by two or more independent instances of a MAC, aggregated as specified by Link Aggregation (IEEE Std 802.1AX™).

5.11 Backbone Edge Bridge conformance

Insert the following list item at the end of 5.11:

- f) A Remote Customer Access Port

12. Bridge management

12.13 Provider Bridge management

Change 12.13 as shown:

The conformance requirements of Provider Bridges are specified in 5.10. The S-VLAN component and the externally accessible ports of all Provider Bridges, including Provider Edge Bridges, are managed using the managed objects defined in 12.4 through 12.12. This subclause defines additional managed objects specific to the operation of Provider Bridges.

The internal ports, LANs, ~~and C-VLAN components,~~ and Port-mapping S-VLAN components of a Provider Edge Bridge are not managed directly using the managed objects defined in 12.4 through 12.12. Their operation is controlled and monitored through managed objects defined in this subclause.

Each externally accessible Bridge Port on a Provider Bridge is designated as a Provider Network Port, Customer Network Port, ~~or Customer Edge Port,~~ or Remote Customer Access Port. Designating a port as a Customer Edge Port implies Provider Edge Bridge functionality and, specifically, the existence of a C-VLAN component associated with that port. This C-VLAN component is uniquely identified within the Bridge by the port number of the associated Customer Edge Port. The management of the forwarding process, filtering data base, and C-VLANs of the C-VLAN component and the internal connections are achieved through the Customer Edge Port Configuration managed object defined here (12.13.3).

Designating a port as a Remote Customer Access Port implies the existence of a Port-mapping S-VLAN component associated with that port. The Port-mapping S-VLAN component is uniquely identified within the Bridge by the port number of the associated Remote Customer Access Port. Designating an internal port on the Port-mapping S-VLAN component as a C-Tagged RCSI implies a C-VLAN component with a Customer Edge Port connected via an internal LAN to that internal port (Provider Access Port). This C-VLAN component and internal connection are uniquely identified by the port number of the Remote Customer Access Port and the S-VID associated with the Provider Access Port or by the port number of the internal Customer Edge Port. Designating an internal port on the Port-mapping S-VLAN component as a Port-based RCSI or a Provider Network Port implies an internal LAN connecting this port with a Customer Network Port or Provider Network Port respectively. These ports and internal connections are uniquely identified by the port number of the Remote Customer Access Port and the S-VID associated with the Provider Access Port or by the port number of the Customer Network Port or Provider Network Port. The management of the forwarding process, filtering data base, and S-VLANs of Port-mapping S-VLAN components and their internal connections are achieved through the Remote Customer Access Port Configuration managed object defined here (12.13.4).

An internal connection between a CNP on the S-VLAN component and a PEP on the C-VLAN component is instantiated for each service instance. The CNP is identified by the CEP identifier and the S-VID value used for the PVID of the CNP. The PEP is identified by the CEP identifier and the C-VID value used for the PVID of the PEP. These PVID values and the connection between the CNP and PEP are established by reciprocal entries in the C-VID Registration Table (12.13.3.2) and the Provider Edge Port Configuration Table (12.13.3.4) as follows:

- a) An entry in the C-VID Registration Table is created for each C-VLAN supported in the C-VLAN component associated with a CEP. The CEP identifier and C-VID combination identify a PEP. The entry contains (among other parameters) an S-VID value corresponding to the PVID of the CNP, which associates the PEP with a specific CNP. Note that the CEP/C-VID combination identifies a single PEP, however multiple CEP/C-VID combinations can identify the same PEP if the entries for those CEP/C-VID combinations contain the same S-VID value. This many-to-one mapping of CEP/C-VID to PEP permits "bundling", i.e. mapping multiple C-VLANs to the same service instance.

- b) An entry in the Provider Edge Port Configuration Table is created for each S-VID corresponding to a service instance accessed by the C-VLAN component. The CEP identifier and S-VID combination identify a CNP. The entry contains (among other parameters) a C-VID value corresponding to the PVID of the PEP, which associates the CNP with a specific PEP. Note that the CEP/S-VID combination identifies a single CNP, however multiple CEP/S-VID combinations can identify the same CNP if the entries for those CEP/S-VID combinations contain the same C-VID value. This many-to-one mapping of CEP/S-VID to CNP permits configuration of asymmetric VLANs and can be used to establish rooted-multipoint connectivity (F.1.3.2).

Management control of the member sets and untagged sets for C-VIDs in the C-VLAN component is provided in C-VID Registration Table entries rather than through Static VLAN Registration Entries (thus eliminating the need for Filtering Database managed objects for the C-VLAN component). Management control of the member sets and untagged sets for S-VIDs in the S-VLAN component is provided through Static VLAN Registration Entries in the Filtering Database. Creating an entry for an S-VID in the Provider Edge Port Configuration table does not automatically modify the Static VLAN Registration Entries for the corresponding S-VLAN. A CNP is added to the member set and untagged set of an S-VLAN by including the CEP identifier (since the CEP identifier and S-VID combination identifies the CNP) in the Port Map of a Static VLAN Registration Entry for that S-VLAN (12.7.7.1, 8.8.2).

A C-VLAN component with more than one PEP (i.e., supporting more than one service instance) participates in the customer network Spanning Tree Protocol by running an instance of RSTP with the enhancements specified in 13.39. This protocol instance is managed using the managed objects defined in 12.8 and 12.12. All BPDUs generated by this protocol instance use the MAC address of the CEP as a source address and as the bridge address portion of Bridge Identifier. For each PEP, the protocol uses the S-VID value that is the PVID of the associated CNP as the port number. For the CEP, the protocol uses the value 0xFFFF as the port number.

The following managed objects define the semantics of the management operations specific to Provider Bridges:

- c) The Provider Bridge Port Type managed object (12.13.1);
- d) The Network Port Configuration managed object (12.13.2);
- e) The Customer Edge Port Configuration managed object (12.13.3);
- f) The Remote Customer Access Port Configuration managed object (12.13.4).

12.13.1 Provider Bridge Port Type managed object

12.13.1.1 Read Provider Bridge Port Type

12.13.1.1.3 Outputs

Change 12.13.1.1.3 as shown:

- a) Port Type: this takes one of the following values:
 - 1) Provider Network Port;
 - 2) Customer Network Port;
 - 3) Customer Edge Port;
 - 4) Remote Customer Access Port.

12.13.1.2 Configure Provider Bridge Port Type

12.13.1.2.2 Inputs

Change 12.13.1.2.2 as shown:

- a) Port Number: the number of the Bridge Port.
- b) Port Type: this takes one of the following values:
 - 1) Provider Network Port;
 - 2) Customer Network Port;
 - 3) Customer Edge Port;
 - 4) Remote Customer Access Port.

12.13.3 Customer Edge Port Configuration managed object

Insert the following subclauses, 12.13.4 through 12.13.4.2.3, after 12.13.3.6.3:

12.13.4 Remote Customer Access Port Configuration managed object

Designating an external port as a Remote Customer Access Port automatically creates a Port-mapping S-VLAN component associated with that port. This Port-mapping S-VLAN component includes one internal Provider Network Port.

The Remote Customer Access Port Configuration managed object applies to each externally accessible Remote Customer Access Port on a Provider Edge Bridge. It includes

- a) The Internal Interface Table, which configures the internal interfaces between the Port-mapping S-VLAN component and the S-VLAN or C-VLAN components. This table provides the equivalent functionality of:
 - 1) for an RCSI supporting a Port-based service interface:
 - i) creating an internal Provider Access Port connected to a Customer Network Port on the S-VLAN component;
 - ii) configuring both the Provider Access Port and Customer Network Port to accept only untagged frames;
 - iii) setting the member set for the external S-VID to include the Provider Access Port and Remote Customer Access Port;
 - iv) setting the Provider Access Port's PVID to the external S-VID and adding that port to that S-VID's untagged set;
 - v) setting the Customer Network Port's PVID to the internal S-VID for the Port-based service instance and adding the port to that S-VID's untagged set;
 - 2) for an RCSI supporting a C-tagged service interface:
 - i) creating a Provider Access Port connected to a Customer Edge Port on a C-VLAN component;
 - ii) setting the member set for the external S-VID to include the Provider Access Port and Remote Customer Access Port;
 - iii) configuring the Provider Access Port's PVID to the external S-VID and adding the port to that S-VID's untagged set;
 - 3) for a Provider Network Port:
 - i) setting the member set for the external S-VID to include the Provider Network Port and Remote Customer Access Port;
 - ii) adding the associated primary S-VLAN component Provider Network Port to the member set of the internal S-VLAN;

- iii) configuring the associated primary S-VLAN component Provider Network Port's VID translation table to translate between the external S-VID and the internal S-VID for the selected service instance.

Note that in the case of an RCSI supporting a C-tagged service interface the C-VLAN component can be further configured using the Customer Edge Port Configuration managed object. This configuration includes:

- The parameters to set the C-VID Registration Table entries (12.13.3.2);
- The Provider Edge Port configuration parameters (12.13.3.4); and
- The Service Priority Regeneration Table entries (12.13.3.6);

all associated with the configuration of the internal Customer Edge Port which is directly connected to the internal Provider Access Port identified by the external S-VID and the Remote Customer Access Port.

The management operations that can be performed on the Remote Customer Access Port Configuration managed object are as follows:

- b) Read Internal Interface Table Entry (12.13.4.1);
- c) Configure Internal Interface Table Entry (12.13.4.2).

Further configuration related to a C-VLAN component associated with an RCSI supporting a C-tagged service interface is accomplished using the Customer Edge Port Configuration managed object (12.13.3).

12.13.4.1 Read Internal Interface Table Entry

12.13.4.1.1 Purpose

To read the Internal Interface Table entry associated with a specific external S-VID in a Port-mapping S-VLAN component of a Remote Customer Access Port.

12.13.4.1.2 Inputs

- a) External Port Number: the number of the Remote Customer Access Port;
- b) External S-VLAN Identifier: a 12-bit S-VID.

12.13.4.1.3 Outputs

- a) Internal Port Number: the port number used to reference the internal interface;
- b) A value indicating the type of internal interface associated with the external S-VID, one of
 - 1) Port-based RCSI
 - 2) C-tagged RCSI
 - 3) PNP
 - 4) Discard (external S-VID is not associated with an internal port);
- c) Internal S-VLAN Identifier: a 12-bit S-VID (not applicable for a C-tagged RCSI).

12.13.4.2 Configure Internal Interface Table Entry

12.13.4.2.1 Purpose

To add or delete an entry in the Internal Interface Table.

12.13.4.2.2 Inputs

- a) External Port Number: the number of the Remote Customer Access Port;
- b) External S-VLAN Identifier: a 12-bit S-VID;
- c) Internal Port Number (optional): the port number used to reference the internal interface;
- d) A value indicating the type of internal interface associated with the external S-VID, one of
 - 1) Port-based RCSI
 - 2) C-tagged RCSI
 - 3) PNP
 - 4) Discard (delete entry for the external S-VID);
- e) Internal S-VLAN Identifier: a 12-bit S-VID (not applicable for a C-tagged RCSI).

12.13.4.2.3 Outputs

None.

15. Support of the MAC Service by Provider Bridged Networks

15.5 S-tagged service interface

Insert the following subclause, 15.6, after 15.5, and renumber the subsequent subclauses in Clause 15 accordingly:

15.6 Remote customer service interfaces

A remote customer service interface (RCSI) provides a C-tagged or Port-based service interface to a customer attached via an access PBN as depicted in Figure 16-2 (16.2). Multiple RCSIs can be provided over a LAN interconnecting two Provider Bridged Networks through the use of a Port-mapping S-VLAN component as shown in Figure 15-9. The Port-mapping S-VLAN component has one external port (Remote Customer Access Port) and one or more internal Ports (Provider Access Ports) that each support one RCSI. The Port-mapping S-VLAN component also can have an internal Provider Network Port for service instances that do not require an RCSI.

The Port-mapping S-VLAN component is configured to associate a unique S-VID with each Provider Access Port. Furthermore, each S-VID configured in the Port-mapping S-VLAN component has the Remote Customer Access Port and exactly one other Port in its member set. This ensures that each external service instance is mapped to only one internal port.

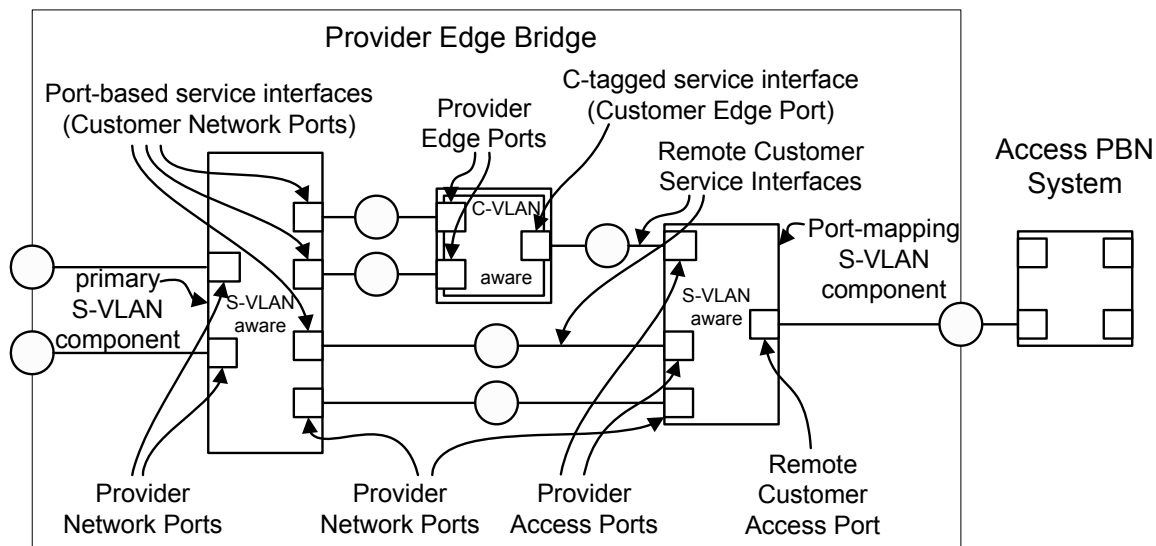


Figure 15-9—RCSIs to a Provider Bridged Network

Each RCSI supported by a Remote Customer Access Port is associated with a Provider Access Port connected via an internal LAN to either a Customer Network Port, providing a Port-based service interface (15.3), or a Customer Edge Port, providing a C-tagged service interface (15.4). The external S-VID mapped to an RCSI identifies a service instance originating at a remote customer interface LAN attached to an access PBN (16.2). To provide separation between the external S-VID space used by the access PBN and the internal S-VID space for this PBN, frames on an RCSI do not carry an S-VLAN tag. When frames transit an RCSI the internal S-VID is set by the PVID of the Customer Network Port and the external S-VID by the PVID of the Provider Access Port.

NOTE—If two Customer Network Ports associated with different RCSIs on the same Remote Customer Access Port belong to the same internal S-VLAN, frames received on the Remote Customer Access Port with one S-VID can be transmitted on that same external port with a different S-VID. This is sometimes referred to as “Hairpin Switching” and is described in 16.2.

In addition to the RCSIs, a Provider Network Port on the Port-mapping S-VLAN component is connected via an internal LAN to a Provider Network Port on the primary S-VLAN component. External service instances that are not associated with an RCSI can be mapped to this Port. This allows multiple service instances to be passed between the PBNs without requiring a separate Port for each service instance. On this interface service frames carry S-VLAN tags and the VID translation table of the Provider Network Port on the S-VLAN component is used to provide independence between internal and external S-VID spaces.

A Provider Edge Bridge can support multiple Remote Customer Access Ports connected to other PBNs. Each Remote Customer Access Port can support multiple RCSIs for one or more customers. Each Remote Customer Access Port is supported by a Port-mapping S-VLAN component as illustrated in Figure 15-10. As shown in the figure, each Port-mapping S-VLAN component with a Remote Customer Access Port can have one Provider Network Port and multiple Provider Access Ports providing either Port-based or C-tagged RCSIs.

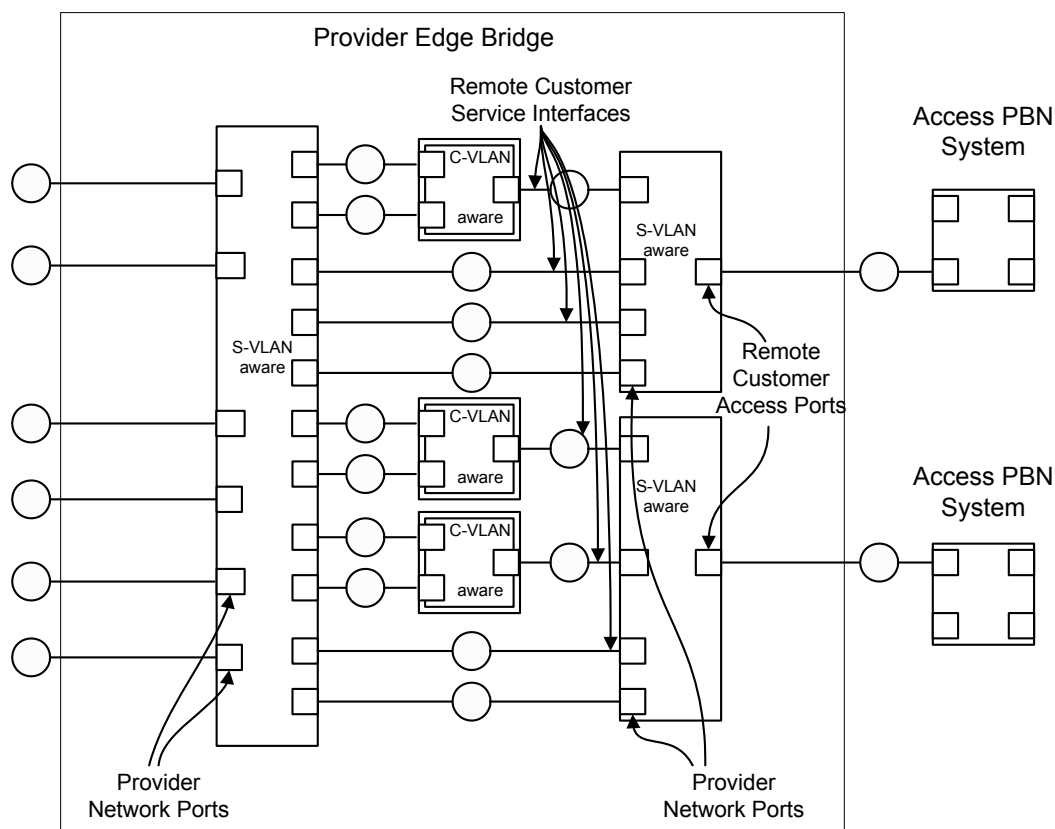
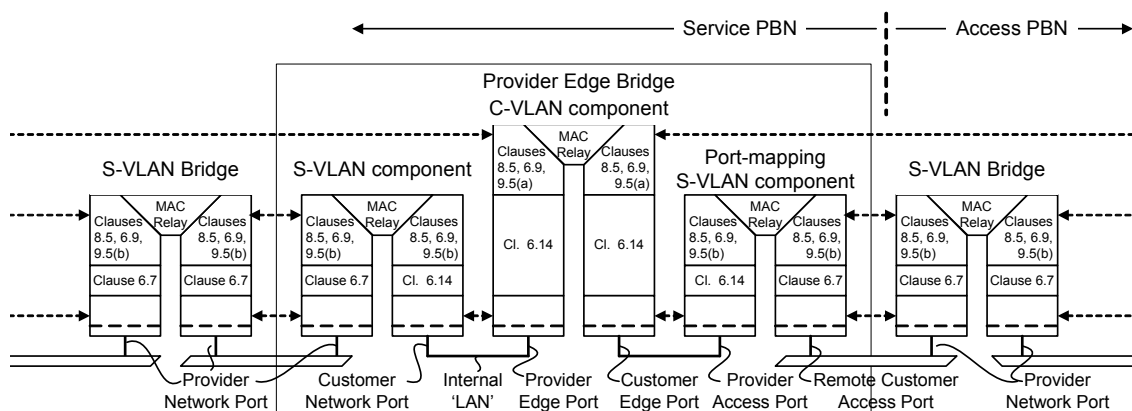


Figure 15-10—Remote Customer Access Ports

Figure 15-11 shows a C-tagged RCSI. Since S-VLAN components are transparent to C-VLAN control PDUs, i.e., PDUs using addresses in Table 8.1 but not in Table 8.2, these control PDUs exchanged via the Customer Edge Port reach the next (e.g., customer controlled) C-VLAN component across the access PBN. S-VLAN control PDUs, using addresses in Table 8.2, exchanged on the Remote Customer Access Port will normally reach the neighboring Provider Bridge in the adjacent PBN.



Frames traversing the internal LAN between the Port-mapping S-VLAN component and the C-VLAN component do not contain an S-VLAN tag. The S-VID for frames received on this interface by the Port-mapping S-VLAN component is provided by the Provider Access Port's PVID.

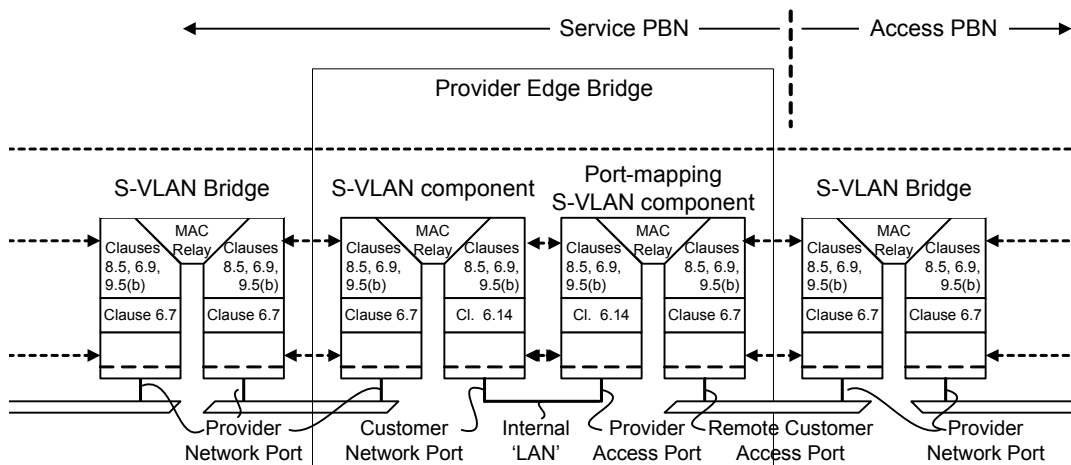


Figure 15-13 shows the Provider Network Port on the Port-mapping S-VLAN component connected to a Provider Network Port on the S-VLAN component. Service frames carried over this interface have S-VLAN tags and S-VID translation can be performed.

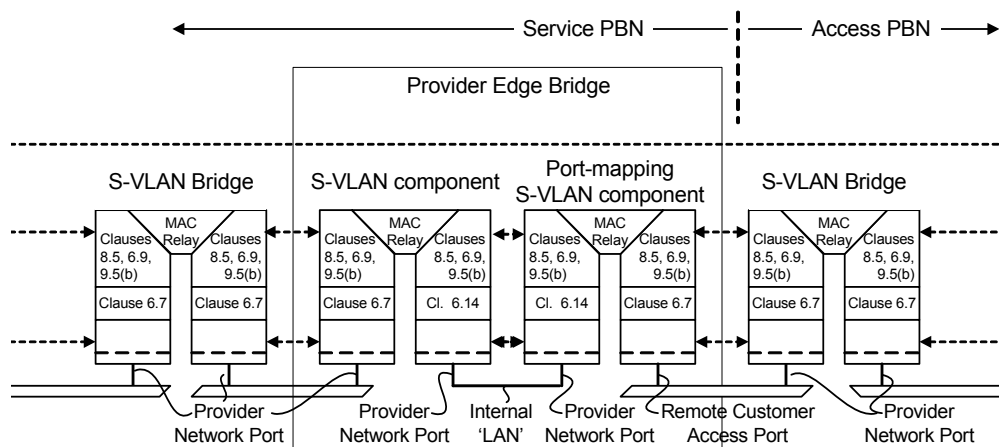


Figure 15-13—Provider Network Port interface

16. Principles of Provider Bridged Network operation

16.2 Provider Bridged Network

Insert the following text, including Figure 16-2 and Figure 16-3, at the end of 16.2:

In some cases a service provider needs to reach a customer interface LAN that is not directly attached to the service provider's network but is attached instead to another PBN. Figure 16-2 shows some examples in which a customer interface LAN is connected to an access PBN that is not the PBN providing service to the customer.

NOTE—The PBN providing access to the customer interface LANs in these examples can provide other services to its own customers as well.

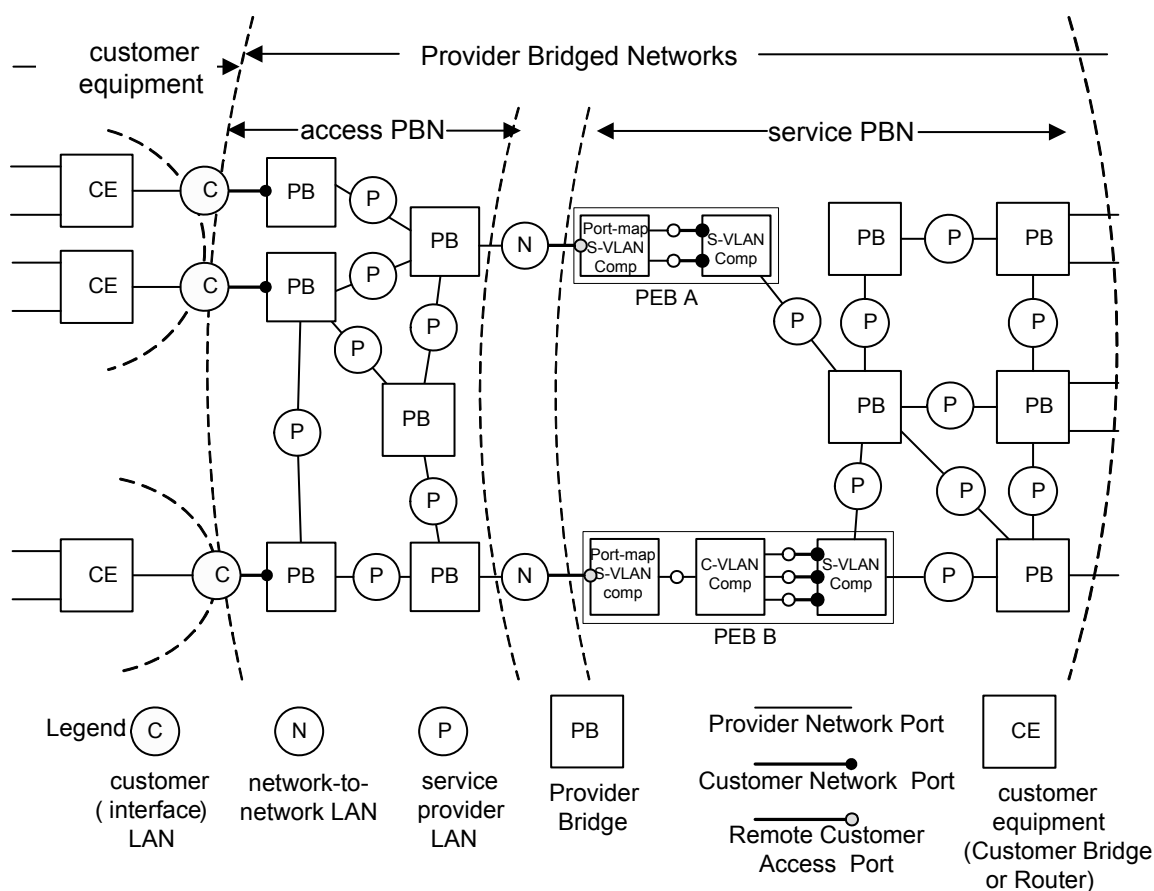


Figure 16-2—Examples of remote customer service access via a second PBN

In these examples the service provider uses a Port-based service provided by the access PBN to reach the customer interface LANs. Each such access service is identified by a distinct S-VID at the network-to-network interface LAN. The service PBN uses this S-VID to select an RCSI that provides either a Port-based or C-Tagged service interface as specified in Clause 15. An RCSI provides service instance selection and identification (15.7) and service management for each customer interface LAN. Each RCSI carries frames to/from a single customer interface LAN.

PEB A in Figure 16-2 receives traffic from two customer interface LANs attached to the access PBN. The traffic from each customer interface LAN is carried over a separate RCSI. In the example shown each RCSI is connected to a Port-based service interface (Customer Network Port). If the two customer interface LANs participate in the same service instance (i.e., their RCSI CNPs belong to the same S-VLAN) a frame received from one RCSI CNP can be transmitted on the other RCSI CNP. Thus a frame received on the network-to-network LAN with one S-VID can be subsequently transmitted on that same external LAN with a different S-VID. This behavior is sometimes called “Hairpin Switching”.²

The structure allowing a frame to be received and subsequently transmitted on the same external interface while avoiding loops and misdelivery of multicast frames is illustrated in Figure 16-3. Frames from/to CE₁ have S-VID A and frames from/to CE₂ have S-VID B. Thus the two customer interface LANs cannot exchange traffic within the access PBN. In PEB A external S-VIDs A and B select or identify different RCSI Provider Access Ports.

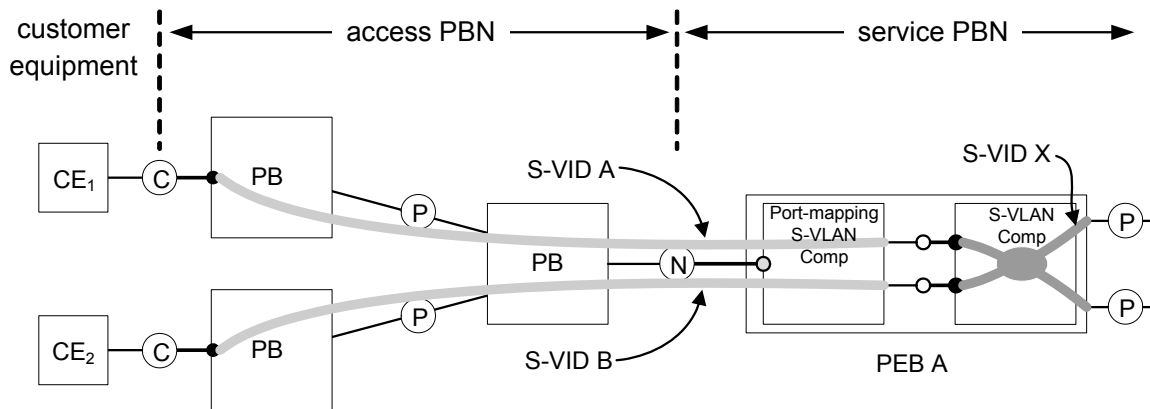


Figure 16-3—Access service separation and “Hairpin Switching”

In this example, both RCSI Customer Network Ports belong to the same internal S-VLAN in the service provider's network identified by S-VID X. Frames can be relayed between all Ports belonging to S-VID X, including between the two RCSIs. When a frame is received on one RCSI and subsequently transmitted on the other RCSI the frame is received and transmitted on the same external Remote Customer Access Port. However, in this case the external S-VIDs in the received and transmitted frames are different. If the sets of endpoints in the access PBN associated with each external S-VID are disjoint there is no possibility of looping or misdelivery of multicast frames.

PEB B in Figure 16-2 receives traffic from a customer interface LAN and provides a C-tagged RCSI (Customer Edge Port). The capabilities of a C-Tagged RCSI are the same as those provided by an external Customer Edge Port as described above.

²For example, this behavior is called “Hairpin Switching” in MEF 26 [B6].

17. Management Information Base (MIB)

17.2 Structure of the MIB

17.2.5 Structure of the IEEE8021-PB MIB

Insert the following rows at the end of Table 17-9:

Table 17-9—IEEE8021-PB MIB structure and relationship to this standard

IEEE MIB table	IEEE MIB object	Reference
ieee8021PbRcapTable		12.13.4
	ieee8021BridgeBasePortComponentId*	—
	ieee8021BridgeBasePort*	—
	ieee8021PbRcapSComponentId	—
	ieee8021PbRcapRcapPortNumber	—
	ieee8021PbRcapRowStatus	—
ieee8021PbInternalInterfaceTable		12.13.4
	ieee8021BridgeBasePortComponentId*	—
	ieee8021BridgeBasePort*	—
	ieee8021PbIiExternalSVid*	—
	ieee8021PbIiInternalPortNumber	—
	ieee8021PbIiInternalPortType	—
	ieee8021PbIiInternalSVid	—
	ieee8021PbIiRowStatus	—

17.4 Security considerations

17.4.5 Security considerations of the IEEE8021-PB MIB

Change 17.4.5 as shown:

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write and/or read-create. Such objects may 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. These tables and objects and their sensitivity/vulnerability are described below.