Implementing IEEE 802.1ah Provider Backbone Bridge

This module provides conceptual and configuration information for IEEE 802.1ah Provider Backbone Bridge on Cisco ASR 9000 Series Routers. The IEEE 802.1ah standard (Ref [4]) provides a means for interconnecting multiple provider bridged networks to build a large scale end-to-end Layer 2 provider bridged network.

Feature History for Implementing IEEE 802.1ah Provider Backbone Bridge

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Release 3.9.1</td>
<td>This feature was introduced on Cisco ASR 9000 Series Routers.</td>
</tr>
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- Information About Implementing 802.1ah Provider Backbone Bridge, page 278
- How to Implement 802.1ah Provider Backbone Bridge, page 283
- Configuration Examples for Implementing 802.1ah Provider Backbone Bridge, page 297
- Additional References, page 299
Prerequisites for Implementing 802.1ah Provider Backbone Bridge

This prerequisite applies to implementing 802.1ah Provider Backbone Bridge:

- You must be in a user group associated with a task group that includes the proper task IDs. The command reference guides include the task IDs required for each command.

  If you suspect user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

- You must be familiar with the multipoint bridging concepts. Refer to the Implementing Multipoint Layer 2 Services module.

Information About Implementing 802.1ah Provider Backbone Bridge

To implement 802.1ah, you must understand these concepts:

- Benefits of IEEE 802.1ah standard, page 278
- IEEE 802.1ah Standard for Provider Backbone Bridging Overview, page 279
- Backbone Edge Bridges, page 281
- IB-BEB, page 282

Benefits of IEEE 802.1ah standard

The benefits of IEEE 802.1ah provider backbone bridges are as follows:

- Increased service instance scalability
- MAC address scalability
IEEE 802.1ah Standard for Provider Backbone Bridging Overview

The IEEE 802.1ah Provider Backbone Bridge feature encapsulates or decapsulates end-user traffic on a Backbone Edge Bridge (BEB) at the edge of the Provider Backbone Bridged Network (PBBN). A Backbone Core Bridge (BCB) based network provides internal transport of the IEEE 802.1ah encapsulated frames within the PBBN. **Figure 22** shows a typical 802.1ah PBB network.

**Figure 22**  
IEEE 802.1ah Provider Backbone Bridge

PB - provider bridge
Figure 23 shows a typical provider backbone network topology.

**Figure 23  Provider Back Bone Network Topology**
Backbone Edge Bridges

Backbone edge bridges (BEBs) can contain either an I-Component or a B-Component. The I-Component maps service VLAN identifiers (S-VIDs) to service instance identifiers (I-SIDs) and adds a provider backbone bridge (PBB) header without a backbone VLAN tag (B-Tag). The B-Component maps I-SIDs to backbone VIDs (B-VIDs) and adds a PBB header with a B-Tag.

The IEEE 802.1ah standard specifies these three types of BEBs:

- The B-BEB contains the B-Component of the MAC-in-MAC bridge. It validates the I-SIDs and maps the frames onto the backbone VLAN (B-VLAN). It also switches traffic based on the B-VLANS within the core bridge.
- The I-BEB contains the I-Component of the MAC-in-MAC bridge. It performs B-MAC encapsulation and inserts the I-SIDs based on the provider VLAN tags (S-tags), customer VLAN tags (C-tags), or S-tag/C-tag pairs.
- The IB-BEB contains one or more I-Components and a single B-Component interconnected through a LAN segment.

Note

Only IB-BEBs are supported on Cisco ASR 9000 Series Routers. Cisco IOS XR supports IB-BEB bridge type at the Edge node.

Figure 24 shows the PBB bridge component topology on the Cisco ASR 9000 Series Routers.

Figure 24  PBB Bridge Component Topology on Cisco ASR 9000 Series Routers
IB-BEB

The IB-BEB contains both the I-Component and the B-Component. The bridge selects the B-MAC and inserts the I-SID based on the provider VLAN tag (S-tag), the customer VLAN tag (C-tag), or both the S-tag and the C-tag. It validates the I-SIDs and it transmits and receives frames on the B-VLAN.

The IEEE 802.1ah on Provider Backbone Bridges feature supports all services mandated by the IEEE 802.1ah standard and extends the services to provide these additional functionalities:

- **S-Tagged Service:**
  - In multiplexed environments each S-tag maps to an I-SID and may be retained or removed.
  - In bundled environments multiple S-tags map to the same I-SID and the S-tags must be retained.

- **C-Tagged Service:**
  - In multiplexed environments each C-tag maps to an I-SID and may be retained or removed.
  - In bundled environments multiple C-tags map to the same I-SID and the C-tags must be retained.

- **S/C-Tagged Service:**
  - In multiplexed environments each S-tag/C-tag pair maps to an I-SID. The S-tag or the S-tag/C-tag pair may be retained or removed.
  - In bundled environments multiple S-tag/C-tag pairs map to the same I-SID and the S-tag/C-tag pair must be retained.

- **Port-based Service**
  - A port-based service interface is delivered on a Customer Network Port (CNP). A port-based service interface may attach to a C-VLAN Bridge, 802.1d bridge, router or end-station. The service provided by this interface forwards all frames without an S-Tag over the backbone on a single backbone service instance. A port-based interface discards all frames with an S-Tag that have non-null VLAN IDs.

This example shows how to configure a port-based service:

```
interface GigabitEthernet0/0/0/10.100 l2transport
encapsulation untagged
--> Creates an EFP for untagged frames.
interface GigabitEthernet0/0/0/10.101 l2transport
encapsulation dot1ad priority-tagged
--> Creates an EFP for null S-tagged frames.
interface GigabitEthernet0/0/0/10.102 l2transport
encapsulation dot1q priority-tagged
--> Creates an EFP for null C-tagged frames:
interface GigabitEthernet0/0/0/10.103 l2transport
encapsulation dot1q any
--> Creates an EFP for C-tagged frames:
```

**Note**

To configure a port-based service, all the above EFPs must be added to the same edge bridge domain.
How to Implement 802.1ah Provider Backbone Bridge

This section contains these procedures:

- Restrictions for Implementing 802.1ah Provider Backbone Bridge, page 283
- Configuring Ethernet Flow Points on CNP and PNP Ports, page 283
- Configuring PBB Edge Bridge Domain and Service Instance ID, page 285
- Configuring the PBB Core Bridge Domain, page 287
- Configuring Backbone VLAN Tag under the PBB Core Bridge Domain, page 288
- Configuring Backbone Source MAC Address, page 290 (optional)
- Configuring Unknown Unicast Backbone MAC under PBB Edge Bridge Domain, page 293 (optional)
- Configuring Static MAC addresses under PBB Edge Bridge Domain, page 295 (optional)

Restrictions for Implementing 802.1ah Provider Backbone Bridge

These features are not supported:

- Cross-connect based point to point services over MAC-in-MAC
- One Edge bridge to multiple Core bridge mapping
- I type backbone edge bridge (I-BEB) and B type backbone edge bridge (B-BEB)
- IEEE 802.1ah over VPLS
- Multiple source B-MAC addresses per chassis
- Direct encapsulation of 802.1ah formatted packets natively over an MPLS LSP encapsulation

Configuring Ethernet Flow Points on CNP and PNP Ports

Perform this task to configure an Ethernet flow point (EFP) on the customer network port (CNP) or the provider network port (PNP).

SUMMARY STEPS

1. configure
2. interface type interface-path-id.subinterface l2transport
3. encapsulation dot1q vlan-id
   or
   encapsulation dot1ad vlan-id
   or
   encapsulation dot1ad vlan-id dot1q vlan-id
4. end
   or
   commit
### Detailed Steps

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td><code>configure</code></td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>RP/0/RSP0/CPU0:router# configure</code></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td><code>interface type interface-path-id.subinterface l2transport</code></td>
<td>Configures an interface for L2 switching.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>RP/0/RSP0/CPU0:router(config)# interface GigabitEthernet0/0/0/10.100 l2transport</code></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td><code>encapsulation dot1q vlan-id</code> or <code>encapsulation dot1ad vlan-id</code> or <code>encapsulation dot1ad vlan-id dot1q vlan-id</code></td>
<td>Assigns the matching VLAN ID and Ethertype to the interface.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>RP/0/RSP0/CPU0:router(config-subif)# encapsulation dot1q 100</code> or <code>encapsulation dot1ad 100</code> or <code>encapsulation dot1ad 100 dot1q 101</code></td>
<td></td>
</tr>
<tr>
<td>Step 4</td>
<td><code>end</code> or <code>commit</code></td>
<td>Saves configuration changes.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>RP/0/RSP0/CPU0:router(config-subif)# end</code> or <code>RP/0/RSP0/CPU0:router(config-subif)# commit</code></td>
<td></td>
</tr>
</tbody>
</table>

- When you issue the **end** command, the system prompts you to commit changes:

  Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:

  - Entering **yes** saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.
  - Entering **no** exits the configuration session and returns the router to EXEC mode without committing the configuration changes.
  - Entering **cancel** leaves the router in the current configuration session without exiting or committing the configuration changes.

- Use the **commit** command to save the configuration changes to the running configuration file and remain within the configuration session.
Configuring PBB Edge Bridge Domain and Service Instance ID

Perform this task to configure a PBB edge domain and the service ID.

Note
To configure the PBB feature, login with admin user privileges and issue the `hw-module profile feature l2` command to select an ASR 9000 Ethernet line card ucode version that supports the PBB feature. The PBB feature will not be supported on the ASR 9000 Ethernet line card unless you make this configuration. For more information on configuring the feature profile, refer to the *Cisco ASR 9000 Series Aggregation Services Router System Management Configuration Guide*.

### SUMMARY STEPS

1. `configure`
2. `l2vpn`
3. `bridge group group-name`
4. `bridge-domain domain-name`
5. `interface type interface-path-id.subinterface`
6. `pbb edge i-sid service-id core-bridge core-bridge-name`
7. `end`
   - or
   - `commit`

### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> configure</td>
<td>Enters global configuration mode.</td>
</tr>
</tbody>
</table>
| **Example:**  
RP/0/RSP0/CPU0:router# configure |  |
| **Step 2** `l2vpn` | Enters L2VPN configuration mode. |
| **Example:**  
RP/0/RSP0/CPU0:router(config)# l2vpn |  |
| **Step 3** `bridge group bridge-group-name` | Enters configuration mode for the named bridge group. This command creates a new bridge group or modifies the existing bridge group if it already exists. A bridge group organizes bridge domains. |
| **Example:**  
RP/0/RSP0/CPU0:router(config-12vpn)# bridge group pbb |  |
| **Step 4** `bridge-domain domain-name` | Enters configuration mode for the named bridge domain. This command creates a new bridge domain or modifies the existing bridge domain, if it already exists. |
| **Example:**  
RP/0/RSP0/CPU0:router(config-12vpn-bg)# bridge-domain pbb-edge |  |
**Step 5**

**interface** type interface-path-id.subinterface

**Example:**

RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd)#interface GigabitEthernet0/5/0/0.20

Assigns the matching VLAN ID and Ethertype to the interface. This EFP is considered as the CNP for the Edge bridge.

**Step 6**

**pbb edge i-sid service-id core-bridge core-bridge-name**

**Example:**

RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd)#pbb edge i-sid 1000 core-bridge pbb-core

Configures the bridge domain as PBB edge with the service identifier and the assigned core bridge domain, and enters the PBB edge configuration submode.

This command also creates the Virtual instance port (VIP) that associates the PBB Edge bridge domain to the specified Core bridge domain.

All the interfaces (bridge ports) under this bridge domain are treated as the customer network ports (CNP).

**Step 7**

**end**

or

**commit**

**Example:**

RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd-pbb-edge)# end

or

RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd-pbb-edge)# commit

Saves configuration changes.

- When you issue the **end** command, the system prompts you to commit changes:

  Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:

  - Entering **yes** saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.
  - Entering **no** exits the configuration session and returns the router to EXEC mode without committing the configuration changes.
  - Entering **cancel** leaves the router in the current configuration session without exiting or committing the configuration changes.

- Use the **commit** command to save the configuration changes to the running configuration file and remain within the configuration session.
Configuring the PBB Core Bridge Domain

Perform this task to configure the PBB core bridge domain.

SUMMARY STEPS

1. configure
2. l2vpn
3. bridge group group-name
4. bridge-domain domain-name
5. interface type interface-path-id.subinterface
6. pbb core
7. end
   or
   commit

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> configure</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>Example:</td>
<td><strong>RP/0/RSP0/CPU0:router# configure</strong></td>
</tr>
<tr>
<td><strong>Step 2</strong> l2vpn</td>
<td>Enters L2VPN configuration mode.</td>
</tr>
<tr>
<td>Example:</td>
<td><strong>RP/0/RSP0/CPU0:router(config)# l2vpn</strong></td>
</tr>
<tr>
<td><strong>Step 3</strong> bridge group bridge-group-name</td>
<td>Enters configuration mode for the named bridge group. This command creates a new bridge group or modifies the existing bridge group, if it already exists. A bridge group organizes bridge domains.</td>
</tr>
<tr>
<td>Example:</td>
<td><strong>RP/0/RSP0/CPU0:router(config-l2vpn)#bridge group pbb</strong></td>
</tr>
<tr>
<td><strong>Step 4</strong> bridge-domain domain-name</td>
<td>Enters configuration mode for the named bridge domain. This command creates a new bridge domain or modifies the existing bridge domain if it already exists.</td>
</tr>
<tr>
<td>Example:</td>
<td><strong>RP/0/RSP0/CPU0:router(config-l2vpn-bg)#bridge-domain pbb-core</strong></td>
</tr>
<tr>
<td><strong>Step 5</strong> interface type interface-path-id.subinterface</td>
<td>Assigns the matching VLAN ID and Ethertype to the interface.</td>
</tr>
<tr>
<td>Example:</td>
<td><strong>RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd)#interface GigabitEthernet0/5/0/0.20</strong></td>
</tr>
</tbody>
</table>
## Configuring Backbone VLAN Tag under the PBB Core Bridge Domain

Perform this task to configure the backbone VLAN tag under the PBB core bridge domain.

### SUMMARY STEPS

1. configure
2. l2vpn
3. bridge group group-name
4. bridge-domain domain-name
5. interface type interface-path-id.subinterface
6. interface type interface-path-id.subinterface
7. pbb core
8. rewrite ingress tag push dot1ad vlan-id symmetric
9. end
   or
   commit

### Step 6

**Command or Action**

```
conf
```

**Purpose**

Configures the bridge domain as PBB core and enters the PBB core configuration submode.

This command also creates an internal port known as Customer bridge port (CBP).

All the interfaces (bridge ports) under this bridge domain are treated as the provider network ports (PNP).

**Example:**

```
RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd)# pbb core
```

### Step 7

**Command or Action**

```
end
```

**Purpose**

Saves configuration changes.

- When you issue the *end* command, the system prompts you to commit changes:

  Uncommitted changes found, commit them before exiting(yes/no/cancel)?
  [cancel]:

  - Entering *yes* saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.
  - Entering *no* exits the configuration session and returns the router to EXEC mode without committing the configuration changes.
  - Entering *cancel* leaves the router in the current configuration session without exiting or committing the configuration changes.

- Use the *commit* command to save the configuration changes to the running configuration file and remain within the configuration session.

**Example:**

```
RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd-pbb-core)# end
```

**Example:**

```
RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd-pbb-core)# commit
```
### DETAILED STEPS

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<tr>
<th>Command or Action</th>
<th>Purpose</th>
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</thead>
<tbody>
<tr>
<td><strong>Step 1</strong>&lt;br&gt;configure</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong>&lt;br&gt;RP/0/RSP0/CPU0:router# configure</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong>&lt;br&gt;l2vpn</td>
<td>Enters L2VPN configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong>&lt;br&gt;RP/0/RSP0/CPU0:router(config)# l2vpn</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong>&lt;br&gt;bridge group bridge-group-name</td>
<td>Enters configuration mode for the named bridge group. This command creates a new bridge group or modifies the existing bridge group if it already exists. A bridge group organizes bridge domains.</td>
</tr>
<tr>
<td><strong>Example:</strong>&lt;br&gt;RP/0/RSP0/CPU0:router(config-l2vpn)#bridge group pbb</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong>&lt;br&gt;bridge-domain domain-name</td>
<td>Enters configuration mode for the named bridge domain. This command creates a new bridge domain or modifies the existing bridge domain if it already exists.</td>
</tr>
<tr>
<td><strong>Example:</strong>&lt;br&gt;RP/0/RSP0/CPU0:router(config-l2vpn-bd)#bridge-domain pbb-core</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong>&lt;br&gt;interface type interface-path-id.subinterface</td>
<td>Assigns the matching VLAN ID and Ethertype to the interface.</td>
</tr>
<tr>
<td><strong>Example:</strong>&lt;br&gt;RP/0/RSP0/CPU0:router(config-l2vpn-bd-bd)#interface GigabitEthernet0/5/0/0.20</td>
<td></td>
</tr>
<tr>
<td><strong>Step 6</strong>&lt;br&gt;interface type interface-path-id.subinterface</td>
<td>Adds an interface to a bridge domain that allows packets to be forwarded and received from other interfaces that are part of the same bridge domain. The interface now becomes an attachment circuit on this bridge domain.</td>
</tr>
<tr>
<td><strong>Example:</strong>&lt;br&gt;RP/0/RSP0/CPU0:router(config-l2vpn-bd-bd-ac)#interface GigabitEthernet0/5/0/1.15</td>
<td></td>
</tr>
<tr>
<td><strong>Step 7</strong>&lt;br&gt;pbb core</td>
<td>Configures the bridge domain as PBB core and enters the PBB core configuration submode. This command also creates an internal port known as Customer bridge port (CBP). All the interfaces (bridge ports) under this bridge domain are treated as the provider network ports (PNP).</td>
</tr>
<tr>
<td><strong>Example:</strong>&lt;br&gt;RP/0/RSP0/CPU0:router(config-l2vpn-bd-bd)#pbb core</td>
<td></td>
</tr>
</tbody>
</table>
Configuring Backbone Source MAC Address

The backbone source MAC address (B-SA) is a unique address for a backbone network. Each Cisco ASR 9000 Series Router has one backbone source MAC address. If B-SA is not configured, then the largest MAC in the EEPROM is used as the PBB B-SA.

Note

The backbone source MAC address configuration is optional. If you do not configure the backbone source MAC address, the Cisco ASR 9000 Series Routers allocate a default backbone source MAC address from the chassis backplane MAC pool.
Perform this task to configure the backbone source MAC address.

**SUMMARY STEPS**

1. `configure`
2. `l2vpn`
3. `pbb`
4. `backbone-source-mac mac-address`
5. `end`
   or
   `commit`

**DETAILED STEPS**

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<tbody>
<tr>
<td><strong>Step 1</strong> <code>configure</code></td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> RP/0/RSP0/CPU0:router# configure</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> <code>l2vpn</code></td>
<td>Enters L2VPN configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> RP/0/RSP0/CPU0:router(config)# l2vpn</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> <code>pbb</code></td>
<td>Enters PBB configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> RP/0/RSP0/CPU0:router(config-l2vpn)# pbb</td>
<td></td>
</tr>
</tbody>
</table>
# Implementing IEEE 802.1ah Provider Backbone Bridge

## How to Implement 802.1ah Provider Backbone Bridge

### Cisco ASR 9000 Series Aggregation Services Router L2VPN and Ethernet Services Configuration Guide

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<tr>
<td><strong>Step 4</strong></td>
<td></td>
</tr>
<tr>
<td><code>backbone-source-address mac-address</code></td>
<td>Configures the backbone source MAC address.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>RP/0/RSP0/CPU0:router(config-l2vpn-pbb)# backbone-source-address 0045.1200.04</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td></td>
</tr>
<tr>
<td><code>end</code> or <code>commit</code></td>
<td>Saves configuration changes.</td>
</tr>
</tbody>
</table>

**Example:**

RP/0/RSP0/CPU0:router(config-l2vpn-pbb)# end

or

RP/0/RSP0/CPU0:router(config-l2vpn-pbb)# commit

- When you issue the `end` command, the system prompts you to commit changes:
  
  Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:
  
  - Entering `yes` saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.
  
  - Entering `no` exits the configuration session and returns the router to EXEC mode without committing the configuration changes.
  
  - Entering `cancel` leaves the router in the current configuration session without exiting or committing the configuration changes.
  
- Use the `commit` command to save the configuration changes to the running configuration file and remain within the configuration session.
Configuring Unknown Unicast Backbone MAC under PBB Edge Bridge Domain

Perform this task to configure the unknown unicast backbone MAC under the PBB edge bridge domain.

SUMMARY STEPS

1. configure
2. l2vpn
3. bridge group group-name
4. bridge-domain domain-name
5. interface type interface-path-id.subinterface
6. pbb edge i-sid service-id core-bridge core-bridge-name
7. unknown-unicast-bmac mac-address
8. end
   or
   commit

DETAILED STEPS

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<tr>
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</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>configure</td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td>RP/0/RSP0/CPU0:router# configure</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Enters L2VPN configuration mode.</td>
</tr>
<tr>
<td>l2vpn</td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td>RP/0/RSP0/CPU0:router(config)# l2vpn</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Enters configuration mode for the named bridge group. This command creates a new bridge group or modifies the existing bridge group if it already exists. A bridge group organizes bridge domains.</td>
</tr>
<tr>
<td>bridge group bridge-group-name</td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td>RP/0/RSP0/CPU0:router(config-l2vpn)#bridge group pbb</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>Enters configuration mode for the named bridge domain. This command creates a new bridge domain or modifies the existing bridge domain if it already exists.</td>
</tr>
<tr>
<td>bridge-domain domain-name</td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td>RP/0/RSP0/CPU0:router(config-l2vpn-bg)#bridge-domain pbb-edge</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>Assigns the matching VLAN ID and Ethertype to the interface.</td>
</tr>
<tr>
<td>interface type interface-path-id.subinterface</td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td>RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd)#interface GigabitEthernet0/5/0/0.20</td>
</tr>
</tbody>
</table>
### Command or Action

<table>
<thead>
<tr>
<th>Step 6</th>
<th><code>pbb edge i-sid service-id core-bridge core-bridge-name</code></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Purpose</strong></td>
</tr>
<tr>
<td></td>
<td>Configures the bridge domain as PBB edge with the service</td>
</tr>
<tr>
<td></td>
<td>identifier and the assigned core bridge domain and</td>
</tr>
<tr>
<td></td>
<td>enters the PBB edge configuration submode.</td>
</tr>
<tr>
<td></td>
<td>This command also creates the Virtual instance port (VIP)</td>
</tr>
<tr>
<td></td>
<td>that associates the PBB Edge bridge domain to the</td>
</tr>
<tr>
<td></td>
<td>specified Core bridge domain.</td>
</tr>
<tr>
<td></td>
<td>All the interfaces (bridge ports) under this bridge</td>
</tr>
<tr>
<td></td>
<td>domain are treated as the customer network ports (CNP).</td>
</tr>
</tbody>
</table>

#### Example:

```
RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd)#
pbb edge i-sid 1000 core-bridge pbb-core
```

<table>
<thead>
<tr>
<th>Step 7</th>
<th><code>unknown-unicast-bmac mac-address</code></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Purpose</strong></td>
</tr>
<tr>
<td></td>
<td>Configures unknown unicast backbone MAC address.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong> On Trident line cards, once you configure the</td>
</tr>
<tr>
<td></td>
<td>unknown unicast BMAC, the BMAC is used to forward</td>
</tr>
<tr>
<td></td>
<td>customer traffic with multicast, broadcast and unknown</td>
</tr>
<tr>
<td></td>
<td>unicast destination MAC address.</td>
</tr>
</tbody>
</table>

#### Example:

```
RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd-pbb-edge)#
unknown-unicast-bmac 1.1.1
```

<table>
<thead>
<tr>
<th>Step 8</th>
<th><code>end</code> or <code>commit</code></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Purpose</strong></td>
</tr>
<tr>
<td></td>
<td>Saves configuration changes.</td>
</tr>
<tr>
<td></td>
<td>- When you issue the <code>end</code> command, the system</td>
</tr>
<tr>
<td></td>
<td>prompts you to commit changes:</td>
</tr>
<tr>
<td></td>
<td>Uncommitted changes found, commit them before</td>
</tr>
<tr>
<td></td>
<td>exiting(yes/no/cancel)? [cancel]:</td>
</tr>
<tr>
<td></td>
<td>- Entering yes saves configuration changes to the</td>
</tr>
<tr>
<td></td>
<td>running configuration file, exits the configuration</td>
</tr>
<tr>
<td></td>
<td>session, and returns the router to EXEC mode.</td>
</tr>
<tr>
<td></td>
<td>- Entering no exits the configuration session and</td>
</tr>
<tr>
<td></td>
<td>returns the router to EXEC mode without committing</td>
</tr>
<tr>
<td></td>
<td>the configuration changes.</td>
</tr>
<tr>
<td></td>
<td>- Entering cancel leaves the router in the current</td>
</tr>
<tr>
<td></td>
<td>configuration session without exiting or</td>
</tr>
<tr>
<td></td>
<td>committing the configuration changes.</td>
</tr>
<tr>
<td></td>
<td>- Use the <code>commit</code> command to save the configuration</td>
</tr>
<tr>
<td></td>
<td>changes to the running configuration file and</td>
</tr>
<tr>
<td></td>
<td>remain within the configuration session.</td>
</tr>
</tbody>
</table>

#### Example:

```
RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd-pbb-edge)# end
```

```
RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd-pbb-edge)# commit
```
Configuring Static MAC addresses under PBB Edge Bridge Domain

Perform this task to configure the static MAC addresses under the PBB edge bridge domain.

**SUMMARY STEPS**

1. `configure`
2. `l2vpn`
3. `bridge group group-name`
4. `bridge-domain domain-name`
5. `interface type interface-path-id.subinterface`
6. `interface type interface-path-id.subinterface`
7. `pbb edge i-sid service-id core-bridge core-bridge-name`
8. `static-mac-address cda-mac-address bmac bda-mac-address`
9. `end`
   or
   `commit`

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> <code>configure</code></td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> <code>RP/0/RSP0/CPU0:router# configure</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> <code>l2vpn</code></td>
<td>Enters L2VPN configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> <code>RP/0/RSP0/CPU0:router(config)# l2vpn</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> <code>bridge group bridge-group-name</code></td>
<td>Enters configuration mode for the named bridge group. This command creates a new bridge group or modifies the existing bridge group if it already exists. A bridge group organizes bridge domains.</td>
</tr>
<tr>
<td><strong>Example:</strong> <code>RP/0/RSP0/CPU0:router(config-l2vpn)# bridge group pbb</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong> <code>bridge-domain domain-name</code></td>
<td>Enters configuration mode for the named bridge domain. This command creates a new bridge domain or modifies the existing bridge domain if it already exists.</td>
</tr>
<tr>
<td><strong>Example:</strong> <code>RP/0/RSP0/CPU0:router(config-l2vpn-bg)# bridge-domain pbb-edge</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong> <code>interface type interface-path-id.subinterface</code></td>
<td>Assigns the matching VLAN ID and Ethertype to the interface.</td>
</tr>
<tr>
<td><strong>Example:</strong> <code>RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd)# interface GigabitEthernet0/5/0/0.20</code></td>
<td></td>
</tr>
</tbody>
</table>
### Command or Action

<table>
<thead>
<tr>
<th>Step 6</th>
<th>Command: <code>interface type interface-path-id.subinterface</code></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Example: <code>RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd-ac)#interface GigabitEthernet0/5/0/1.15</code></td>
</tr>
</tbody>
</table>

Adds an interface to a bridge domain that allows packets to be forwarded and received from other interfaces that are part of the same bridge domain. The interface now becomes an attachment circuit on this bridge domain.

<table>
<thead>
<tr>
<th>Step 7</th>
<th>Command: <code>pbb edge i-sid service-id core-bridge core-bridge-name</code></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Example: <code>RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd)#pbb edge i-sid 1000 core-bridge pbb-core</code></td>
</tr>
</tbody>
</table>

Configures the bridge domain as PBB edge with the service identifier and the assigned core bridge domain and enters the PBB edge configuration submode.

This command also creates the Virtual instance port (VIP) that associates the PBB Edge bridge domain to the specified Core bridge domain.

All the interfaces (bridge ports) under this bridge domain are treated as the customer network ports (CNP).

<table>
<thead>
<tr>
<th>Step 8</th>
<th>Command: <code>static-mac-address cda-mac-address bmac bda-mac-address</code></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Example: <code>RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd-pbb-edge)#static-mac-address 0033.3333.3333 bmac 0044.4444.4444</code></td>
</tr>
</tbody>
</table>

Configures the static CMAC to BMAC mapping under the PBB Edge submode.

<table>
<thead>
<tr>
<th>Step 9</th>
<th>Command: <code>end</code> or <code>commit</code></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Example: <code>RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd-pbb-edge)# end</code> or <code>RP/0/RSP0/CPU0:router(config-l2vpn-bg-bd-pbb-edge)# commit</code></td>
</tr>
</tbody>
</table>

Saves configuration changes.

- When you issue the `end` command, the system prompts you to commit changes:

  Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:

  - Entering `yes` saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.

  - Entering `no` exits the configuration session and returns the router to EXEC mode without committing the configuration changes.

  - Entering `cancel` leaves the router in the current configuration session without exiting or committing the configuration changes.

- Use the `commit` command to save the configuration changes to the running configuration file and remain within the configuration session.
Configuration Examples for Implementing 802.1ah Provider Backbone Bridge

This section provides these configuration examples:

- Configuring Ethernet Flow Points: Example, page 297
- Configuring PBB Edge Bridge Domain and Service Instance ID: Example, page 297
- Configuring PBB Core Bridge Domain: Example, page 298
- Configuring Backbone VLAN Tag: Example, page 298
- Configuring Backbone Source MAC Address: Example, page 298
- Configuring Static Mapping and Unknown Unicast MAC Address under the PBB Edge Bridge Domain, page 299

Configuring Ethernet Flow Points: Example

This example shows how to configure Ethernet flow points:

config
interface GigabitEthernet0/0/0/10.100 l2transport
encapsulation dot1q 100
or
encapsulation dot1ad 100
or
encapsulation dot1ad 100 dot1q 101

Configuring PBB Edge Bridge Domain and Service Instance ID: Example

This example shows how to configure the PBB edge bridge domain:

config
l2vpn
  bridge group PBB
    bridge-domain PBB-EDGE
    interface GigabitEthernet0/0/0/38.100
    !
    interface GigabitEthernet0/2/0/30.150
    !
    pbb edge i-sid 1000 core-bridge PBB-CORE
    !
    !
Configuring PBB Core Bridge Domain: Example

This example shows how to configure the PBB core bridge domain:

```
config
dlvpn
  bridge group PBB
    bridge-domain PBB-CORE
      interface G0/5/0/10.100
      !
      interface G0/2/0/20.200
      !
      pbb core
      !
```

Configuring Backbone VLAN Tag: Example

This example shows how to configure the backbone VLAN tag:

```
config
dlvpn
  bridge group PBB
    bridge-domain PBB-CORE
      interface G0/5/0/10.100
      !
      interface G0/2/0/20.200
      !
      pbb core
      rewrite ingress tag push dot1ad 100 symmetric
      !
```

Configuring Backbone Source MAC Address: Example

This example shows how to configure the backbone source MAC address:

```
config
dlvpn
  pbb
    backbone-source-mac 0045.1200.04
    !
```


## Configuring Static Mapping and Unknown Unicast MAC Address under the PBB Edge Bridge Domain

This example shows how to configure static mapping and unknown unicast MAC address under the PBB edge bridge domain:

```config
config
l2vpn
  bridge group PBB
  bridge-domain PBB-EDGE
  interface GigabitEthernet0/0/0/38.100
  !
  interface GigabitEthernet0/2/0/30.150
  !
  pbb edge i-sid 1000 core-bridge PBB-CORE
  static-mac-address 0033.3333.3333 bmac 0044.4444.4444
  unknown-unicast-bmac 0123.8888.8888
  !
  !
```

## Additional References

These sections provide references related to implementing 802.1ah on Cisco ASR 9000 Series Routers.

## Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>802.1ah commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples</td>
<td>Provider Backbone Bridge Commands module in Cisco ASR 9000 Series Aggregation Services Router L2VPN and Ethernet Services Command Reference</td>
</tr>
</tbody>
</table>

## Standards

<table>
<thead>
<tr>
<th>Standards</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.</td>
<td>—</td>
</tr>
</tbody>
</table>
MIBs

<table>
<thead>
<tr>
<th>MIBs</th>
<th>MIBs Link</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To locate and download MIBs using Cisco IOS XR software, use the Cisco MIB Locator found at this URL and choose a platform under the Cisco Access Products menu: <a href="http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml">http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml</a></td>
</tr>
</tbody>
</table>

RFCs

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td>No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.</td>
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</table>

Technical Assistance

<table>
<thead>
<tr>
<th>Description</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.</td>
<td><a href="http://www.cisco.com/techsupport">http://www.cisco.com/techsupport</a></td>
</tr>
</tbody>
</table>