



IEEE 802.1s on Bridge Domains

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The IEEE 802.1s on Bridge Domains feature enables Multiple Spanning Tree (MST) on Ethernet Virtual Circuits (EVCs).

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Prerequisites for IEEE 802.1s on Bridge Domains

- MST must be configured.

Restrictions for IEEE 802.1s on Bridge Domains

- Service instances on a port-channel are not supported on Cisco 7600 series routers.



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- Service instances with “encapsulation default” are not supported.
- Service instances with “encapsulation untagged” without the dot1q option are not supported.
- Service instances with “encapsulation priority-tagged” are not supported.

Information About IEEE 802.1s on Bridge Domains

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EVC

An EVC as defined by the Metro Ethernet Forum is a port-level point-to-point or multipoint-to-multipoint Layer 2 circuit. It is an end-to-end representation of a single instance of a Layer 2 service being offered by a provider to a customer. An EVC embodies the different parameters on which the service is being offered. A service instance is the instantiation of an EVC on a specified port.

Service instances are configured under a port channel. The traffic, carried by the service instance is load balanced across member links. Service instances under a port channel are grouped and each group is associated with one member link. Ingress traffic for a single EVC can arrive on any member of the bundle. All egress traffic for a service instance uses only one of the member links. Load balancing is achieved by grouping service instances and assigning them to a member link.

Ethernet virtual connection services (EVCS) uses the concepts of EVCs and service instances to provide Layer 2 switched Ethernet services. EVC status can be used by a Customer Edge (CE) device either to find an alternative path in to the service provider network or in some cases, to fall back to a backup path over Ethernet or over another alternative service such as Frame Relay or ATM.

For information about the Metro Ethernet Forum standards, see the Standards table in the Additional References section.

MST and STP

Spanning Tree Protocol (STP) is a Layer 2 link-management protocol that provides path redundancy while preventing undesirable loops in the network. For a Layer 2 Ethernet network to function properly, only one active path can exist between any two stations. STP operation is transparent to end stations, which cannot detect whether they are connected to a single VLAN segment or to a switched LAN of multiple segments.

Cisco 7600 series routers use STP (the IEEE 802.1D bridge protocol) on all VLANs. By default, a single instance of STP runs on each configured VLAN (provided you do not manually disable STP). You can enable and disable STP on a per-VLAN basis.

MST maps multiple VLANs into a spanning tree instance, with each instance having a spanning tree topology independent of other spanning tree instances. This architecture provides multiple forwarding paths for data traffic, enables load balancing, and reduces the number of spanning tree instances required to support many VLANs. MST improves the fault tolerance of the network because a failure in one instance (a forwarding path) does not affect other instances.

To participate in MST instances, routers must be consistently configured with the same MST configurations. A collection of interconnected routers that have the same MST configuration forms an MST region. For two or more routers to be in the same MST region, they must have the same VLAN-to-instance mapping, the same configuration revision number, and the same MST name.

The MST configuration controls the MST region to which each router belongs. The configuration includes the name of the region, the revision number, and the MST VLAN-to-instance assignment map.

A region can have one or multiple members with the same MST configuration; each member must be capable of processing Rapid Spanning Tree Protocol (RSTP) bridge protocol data units (BPDUs). There is no limit to the number of MST regions in a network, but each region can support up to 65 spanning tree instances. Instances can be identified by any number in the range from 0 to 4094. You can assign a VLAN to only one spanning tree instance at a time.

MST on Service Instances with Bridge Domains

The IEEE 802.1s on Bridge Domains feature uses VLAN IDs for service-instance-to-MST-instance mapping. EVC service instances with the same VLAN ID (the outer VLAN IDs in the QinQ case) as the one in a particular MST instance will be mapped to that MST instance.

EVC service instances can have encapsulations with a single tag as well as double tags. In the case of double tag encapsulations, the outer VLAN ID is used for the MST instance mapping, and the inner VLAN ID is ignored.

Because MST requires bridge ports, you must configure a bridge domain for service instances to participate in the MST instances. Additionally, because MST runs by sending untagged BPDUs on the wire, independently of any VLAN, a native VLAN is required on the interface with EVC service instances. By default, switch ports have a native VLAN. However, if the port is not a switch port, you must specify a native VLAN using an EVC service instance.

Because a VLAN ID is required for EVC service-instance-to-MST-instance mapping, the following EVC service instances without any VLAN IDs in the encapsulation are not supported:

- Untagged (encapsulation untagged)
- Priority-tagged (encapsulation priority-tagged)
- Default (encapsulation default)

How to Configure IEEE 802.1s on Bridge Domains

- [Configuring MST on EVC Bridge Domains, page 3](#)

Configuring MST on EVC Bridge Domains

Perform this task to configure MST on EVC bridge domains:

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface gigabitethernet slot / subslot / port [. subinterface-number] or interface tengigabitethernet slot / subslot / port [. subinterface-number]**
4. **service instance id ethernet [evc-id]**
5. **encapsulation dot1q vlan-id [native]**
6. **bridge-domain bridge-id [split-horizon [group group-id]]**

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 <code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> Enter your password if prompted.
<p>Step 2 <code>configure terminal</code></p> <p>Example:</p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>
<p>Step 3 <code>interface gigabitethernet slot / subslot / port [. subinterface-number] or interface tengigabitethernet slot / subslot / port[. subinterface-number]</code></p> <p>Example:</p> <pre>Router(config)# interface gigabitethernet 4/0/0 or Router(config)# interface tengigabitethernet 4/0/0</pre>	<p>Specifies the Gigabit Ethernet or the Ten Gigabit Ethernet interface to configure,</p>
<p>Step 4 <code>service instance id ethernet [evc-id]</code></p> <p>Example:</p> <pre>Router(config-if)# service instance 101 ethernet</pre>	<p>Creates a service instance (an instance of an EVC) on an interface and enters service instance configuration mode.</p>
<p>Step 5 <code>encapsulation dot1q vlan-id [native]</code></p> <p>Example:</p> <pre>Router(config-if-srv)# encapsulation dot1q 13</pre>	<p>Defines the matching criteria to be used in order to map ingress dot1q frames on an interface to the appropriate service instance.</p>
<p>Step 6 <code>bridge-domain bridge-id [split-horizon [group group-id]]</code></p> <p>Example:</p> <pre>Router(config-if-srv)# bridge-domain 12</pre>	<p>Binds the service instance to a bridge domain instance.</p>

- [Troubleshooting Tips, page 4](#)

Troubleshooting Tips

The following commands can be used to troubleshoot MST configurations on EVC bridge domains.

- debug ethernet l2ctrl
- debug l2ctrl

Configuration Examples for IEEE 802.1s on Bridge Domains

- [Example Configuring MST on EVC Bridge Domains, page 5](#)

Example Configuring MST on EVC Bridge Domains

In the following example, the two interfaces participate in MST instance 0, the default instance to which all VLANs are mapped:

```
Router# enable
Router# configure terminal
Router(config)# interface gigabitethernet 4/0/0
Router(config-if)# service instance 1 ethernet
Router(config-if-srv)# encapsulation dot1q 2
Router(config-if-srv)# bridge-domain 100
Router(config-if-srv)# interface gigabitethernet 4/0/3
Router(config-if)# service instance 1 ethernet
Router(config-if-srv)# encapsulation dot1q 2
Router(config-if-srv)# bridge-domain 100
Router(config-if-srv)# end
```

Issue the following command to verify:

```
Router# show spanning-tree vlan 2
MST0
Spanning tree enabled protocol mstp
Root ID          Priority          32768
Address          0009.e91a.bc40
This bridge is the root
Hello Time       2 sec           Max Age 20 sec   Forward Delay 15 sec
Bridge ID        Priority          32768 (priority 32768 sys-id-ext 0)
Address          0009.e91a.bc40
Hello Time       2 sec           Max Age 20 sec   Forward Delay 15 sec
Interface        Role Sts Cost          Prio.Nbr      Type
-----
Gi4/0/0          Desg FWD 20000          128.1537      P2p
Gi4/0/3          Back BLK 20000          128.1540      P2p
```

In the following example, interface gigabitethernet 4/0/0 and interface gigabitethernet 4/0/3 are connected back to back. Each has a service instance attached to it. The service instance on both interfaces has an encapsulation VLAN ID of 2. Changing the VLAN ID from 2 to 8 in the encapsulation directive for the service instance on interface gi4/0/0 stops the MSTP from running in the MST instance to which the old VLAN is mapped and starts the MSTP in the MST instance to which the new VLAN is mapped:

```
Router(config-if)# interface gigabitethernet 4/0/0
Router(config-if)# service instance 1 ethernet
Router(config-if-srv)# encapsulation dot1q 8
Router(config-if-srv)# end
```

Issue the following command to verify:

```
Router# show spanning-tree vlan 2
MST1
Spanning tree enabled protocol mstp
Root ID          Priority          32769
Address          0009.e91a.bc40
This bridge is the root
```

```

      Bridge ID      Hello Time      2 sec      Max Age 20 sec      Forward Delay 15 sec
                    Priority          32769 (priority 32768 sys-id-ext 1)
      Address          0009.e91a.bc40
      Hello Time      2 sec      Max Age 20 sec      Forward Delay 15 sec
Interface          Role Sts Cost          Prio.Nbr      Type
-----
Gi4/0/3          Desg FWD 20000          128.1540      P2p
Router# show spanning-tree vlan 8
MST2
  Spanning tree enabled protocol mstp
  Root ID          Priority          32770
  Address          0009.e91a.bc40
  This bridge is the root
  Hello Time      2 sec      Max Age 20 sec      Forward Delay 15 sec
      Bridge ID      Priority          32770 (priority 32768 sys-id-ext 2)
  Address          0009.e91a.bc40
  Hello Time      2 sec      Max Age 20 sec      Forward Delay 15 sec
Interface          Role Sts Cost          Prio.Nbr      Type
-----
Gi4/0/0          Desg FWD 20000          128.1537      P2p

```

In the following example, interface gigabitethernet 4/0/3 with a service instance that has an outer encapsulation VLAN ID of 2 and a bridge domain of 100 receives a new service:

```

Router# enable
Router# configure terminal
Router(config)# interface gigabitethernet 4/0/3
Router((config-if)# service instance 2 ethernet
Router((config-if-srv)# encap dot1q 2 second-dot1q 100
Router((config-if-srv)# bridge-domain 200

```

Now there are two service instances configured on interface gigabitethernet 4/0/3 and both of them have the same outer VLAN 2.

```

interface GigabitEthernet4/0/3
  no ip address
  service instance 1 ethernet
  encapsulation dot1q 2
  bridge-domain 100
!
service instance 2 ethernet
  encapsulation dot1q 2 second-dot1q 100
  bridge-domain 200

```

The preceding configuration does not affect the MSTP operation on the interface; there is no state change for interface gi4/0/3 in the MST instance it belongs to.

```

Router# show spanning-tree mst 1
##### MST1      vlans mapped:          2
Bridge          address 0009.e91a.bc40          priority
32769 (32768 sysid 1)
Root          this switch for MST1
Interface          Role Sts Cost          Prio.Nbr Type
-----
Gi4/0/3          Desg FWD 20000          128.1540 P2p

```

Additional References

Related Documents

Related Topic	Document Title
Carrier Ethernet commands: complete command syntax, command mode, command history, defaults, usage guidelines, and examples	<i>Cisco IOS Carrier Ethernet Command Reference</i>
Cisco IOS commands: master list of commands with complete command syntax, command mode, command history, defaults, usage guidelines, and examples	Cisco IOS Master Commands List, All Releases

Standards

Standard	Title
MEF 6.1	Metro Ethernet Services Definitions Phase 2 (PDF 6/08)
MEF 10.1	Ethernet Services Attributes Phase 2 (PDF 10/06)

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	--

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for IEEE 802.1s on Bridge Domains

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1 *Feature Information for IEEE 802.1s on Bridge Domains*

Feature Name	Releases	Feature Information
IEEE 802.1s on Bridge Domains	12.2(33)SRD 12.2(50)SY	The IEEE 802.1s on Bridge Domains feature enables MST on EVC interfaces. The following commands were introduced or modified: bridge-domain (service instance), debug ethernet l2ctrl , debug l2ctrl .

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