

# Spanning Tree Protocol Interoperability With Cisco PVST+/PVRST+/MSTP

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## Introduction

The purpose and scope of this white paper is to discuss spanning tree interoperability between Arista and Cisco switches. It is written in a manner that assumes the reader has at least a moderate working knowledge of spanning tree protocol configuration and operation. Detailed explanations of the basic functionality of each spanning tree protocol is outside the scope of this document.

If you are already familiar with the content of this white paper, you may skip to Appendix A - Interoperability Matrix to quickly review the key points.

## List of Acronyms

*BPDU* - Bridge Protocol Data Unit

*CIST* - Common and Internal Spanning Tree

*CST* - Common Spanning Tree

*IEEE* - Institute of Electrical and Electronics Engineers

*ISL* - Inter-Switch Link

*IST* - Internal Spanning Tree

*MAC* - Media Access Control

*MST* - Multiple Spanning Tree

*MSTI* - Multiple Spanning Tree Instance. Ex: *MST0* - Multiple Spanning Tree Instance 0 *MSTP* - Multiple Spanning Tree Protocol (802.1s)

*PVRST+* - Per-VLAN Rapid Spanning Tree Plus

*PVST+* - Per-VLAN Spanning Tree Plus

*RSTP* - Rapid Spanning Tree Protocol (802.1w)

*SSTP* - Shared Spanning Tree Protocol or Secure Socket Tunneling Protocol

*STP* - Spanning Tree Protocol

*VLAN* - Virtual Local Area Network

## Supported Spanning Tree Protocols

Arista switches use Multiple Spanning Tree Protocol (MSTP/802.1s) by default. However, they also support Rapid Spanning Tree Protocol (RSTP/802.1w), as well as Rapid Per-VLAN Spanning Tree (Rapid-PVST) for vendor interoperability.

By nature of the Rapid-PVST protocol being based on RSTP, this also means that Arista switches are backward-compatible with Cisco switches utilizing their proprietary Per-VLAN Spanning Tree Plus (PVST+) protocol.

## What Makes PVST+ Proprietary

Legacy STP called for a single spanning tree instance which the IEEE referred to as the Common Spanning Tree (CST). Rather than sticking to the standard, Cisco developed PVST which supported a single spanning tree instance per VLAN, but required Cisco Inter-switch Link (ISL) be used on trunks - it didn't support 802.1Q.

The "plus" part of PVST+ can be thought of as Cisco's compliance with the IEEE standard while still implementing a spanning tree instance per VLAN. This is achieved by treating VLAN 1 as a CST. To interact properly with the CST, IEEE BPDUs are sent untagged to the reserved multicast MAC address of 0180.C200.0000. For non-native VLANs, BPDU traffic is sent tagged with a special multicast MAC address of 0100.0CCC.CCCD utilizing a separate and proprietary Shared Spanning Tree Protocol1 (SSTP) BPDU.

To aid in understanding, viewing the behavior in a packet capture can be helpful. This packet capture<sup>2</sup> was taken from a VLAN trunk on a Cisco switch where the native VLAN is VLAN 1 (the default), and VLAN 5 is active on it as well. The switch is utilizing PVRST+, but the same behavior applies to PVST+ in regards to utilization of SSTP.

Three different BPDUs are of interest. The first is a standard IEEE BPDU designed to interoperate with the CST. It is untagged and sent to the reserved multicast MAC address of 0180.C200.0000.

```

▶ Frame 4: 60 bytes on wire (480 bits), 60 bytes captured (480 bits)
▼ IEEE 802.3 Ethernet
  ▶ Destination: Spanning-tree-(for-bridges)_00 (01:80:c2:00:00:00) ←
  ▶ Source: Cisco_96:ec:04 (00:1f:6d:96:ec:04)
    Length: 39
    Padding: 0000000000000000
  ▶ Logical-Link Control
  ▼ Spanning Tree Protocol
    Protocol Identifier: Spanning Tree Protocol (0x0000)
    Protocol Version Identifier: Rapid Spanning Tree (2)
    BPDU Type: Rapid/Multiple Spanning Tree (0x02)
    ▶ BPDU flags: 0x0e (Port Role: Designated, Proposal)
    ▶ Root Identifier: 32768 / 1 / 00:1f:6d:96:ec:00
      Root Path Cost: 0
    ▶ Bridge Identifier: 32768 / 1 / 00:1f:6d:96:ec:00 ←
      Port identifier: 0x8004
      Message Age: 0
      Max Age: 20
  
```

The second BPDU is a SSTP BPDU. It is tagged as VLAN 5 and sent to the special multicast MAC address of 0100.0CCC.CCCD.

```

▶ Frame 5: 68 bytes on wire (544 bits), 68 bytes captured (544 bits)
▶ Ethernet II, Src: Cisco_96:ec:04 (00:1f:6d:96:ec:04), Dst: PVST+ (01:00:0c:cc:cc:cd) ←
▶ 802.1Q Virtual LAN, PRI: 7, CFI: 0, ID: 5 ←
▶ Logical-Link Control
▼ Spanning Tree Protocol
  Protocol Identifier: Spanning Tree Protocol (0x0000)
  Protocol Version Identifier: Rapid Spanning Tree (2)
  BPDU Type: Rapid/Multiple Spanning Tree (0x02)
  ▶ BPDU flags: 0x0e (Port Role: Designated, Proposal)
  ▶ Root Identifier: 32768 / 5 / 00:1f:6d:96:ec:00
    Root Path Cost: 0
  ▶ Bridge Identifier: 32768 / 5 / 00:1f:6d:96:ec:00 ←
    Port identifier: 0x8004
    Message Age: 0
    Max Age: 20
    Hello Time: 2
    Forward Delay: 15
    Version 1 Length: 0
  
```

In the third BPDU we see an additional SSTP BPDU for VLAN 1, untagged, and sent to the same

<sup>1</sup> This has also been referred to as Secure Socket Tunneling Protocol.

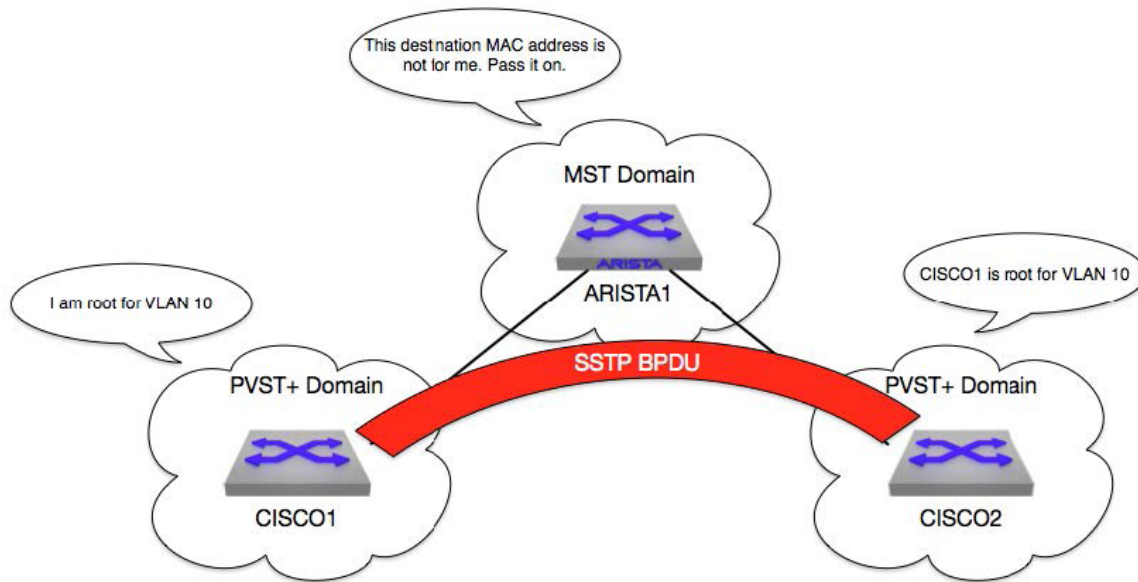
<sup>2</sup> Packet capture provided by PacketLife.net - <http://www.packetlife.net>

special multicast MAC address as the second. This represents the native VLAN to other Cisco switches running PVRST+ or PVST+.

```

    ▸ Frame 7: 64 bytes on wire (512 bits), 64 bytes captured (512 bits)
    ▾ IEEE 802.3 Ethernet
      ▸ Destination: PVST+ (01:00:0c:cc:cc:cd) ←
      ▸ Source: Cisco_96:ec:04 (00:1f:6d:96:ec:04)
        Length: 50
    ▸ Logical-Link Control
    ▾ Spanning Tree Protocol
      Protocol Identifier: Spanning Tree Protocol (0x0000)
      Protocol Version Identifier: Rapid Spanning Tree (2)
      BPDU Type: Rapid/Multiple Spanning Tree (0x02)
      ▸ BPDU flags: 0x0e (Port Role: Designated, Proposal)
      ▸ Root Identifier: 32768 / 1 / 00:1f:6d:96:ec:00
      Root Path Cost: 0
      ▸ Bridge Identifier: 32768 / 1 / 00:1f:6d:96:ec:00 ←
      Port identifier: 0x8004
      Message Age: 0
      Max Age: 20
      Hello Time: 2
  
```

What this accomplishes is a tunneling effect through, for example, an Arista switch environment running MSTP. These SSTP BPDUs would not be understood by the Arista switches, so they would then be flooded as a regular multicast. This allows PVST+ BPDUs to cross through a MST region and be received by another Cisco PVST+ switch on the other side while still maintaining the ability to interact with the CST of a MST environment via IEEE standard BPDUs.



**What Makes MSTP Proprietary For Cisco**

Cisco switches running MSTP do so without being fully compliant with the 802.1s standard when interacting with non-MST domains by utilizing a proprietary feature called PVST Simulation<sup>3</sup>. PVST Simulation was designed for Cisco switches running MST connected to non- MST domains and is automatically enabled on a per-port basis when non-MST BPDUs are received. BPDUs received on VLAN 1 are received and processed normally within MST. BPDUs received on VLANs other than VLAN 1 go through a PVST Simulation check.

This check enforces two rules:

- If the root bridge for CIST is within a non-MST region (a region where MST isn't running), the spanning-tree priority of VLANs 2 and above within that domain must be better (lesser) than that of VLAN 1.
- If the root bridge for CIST is within a MST region, VLANs 2 and above defined in the non-MST domains must have their spanning-tree priorities worse (greater) than that of the CIST root.

A violation of these rules will place the port on the Cisco switch port into a non-forwarding state until the "inconsistency" that triggered the violation is resolved.

PVST Simulation is also responsible for the interoperability mechanism that MSTP cannot provide alone when working with Cisco's PVST+ or PVRST+ implementations. MSTP by itself cannot affect root bridge election outside of the CIST. This can be a problem for attached Cisco switches running their per-VLAN spanning tree implementations because SSTP BPDUs would tunnel through a Cisco MSTP environment as described in the "What makes PVST+ Proprietary" section if it didn't have this added functionality of PVST Simulation.

PVST Simulation addresses this by taking the bridge information received from a boundary port and sends a BPDU for every active VLAN on that link. This allows Cisco switches running MST to affect root bridge election on all VLANs when interacting with switches running per-VLAN spanning tree implementations. This is why Cisco recommends starting MST migration from the Enterprise distribution layer down in a typical 3-tier model with a routed core, and ensuring that the distribution switch is configured to be the root bridge of the CIST in the example provided in their PVST+ to MST migration document - because it conforms with the second rule of the PVST Simulation check.

Arista switches implement MSTP per the 802.1s standard without any additional interoperability mechanisms.

### Default Spanning Tree Path Costs

Arista switches use default port path costs as defined in IEEE 802.1D-2004:

**Table 17-3—Port Path Cost values**

Link Speed	Recommended value	Recommended range	Range
<=100 Kb/s	200 000 000 <sup>a</sup>	20 000 000–200 000 000	1–200 000 000
1 Mb/s	20 000 000 <sup>a</sup>	2 000 000–200 000 000	1–200 000 000
10 Mb/s	2 000 000 <sup>a</sup>	200 000–20 000 000	1–200 000 000
100 Mb/s	200 000 <sup>a</sup>	20 000–2 000 000	1–200 000 000
1 Gb/s	20 000	2 000–200 000	1–200 000 000
10 Gb/s	2 000	200–20 000	1–200 000 000
100 Gb/s	200	20–2 000	1–200 000 000
1 Tb/s	20	2–200	1–200 000 000
10 Tb/s	2	1–20	1–200 000 000

<sup>a</sup>Bridges conformant to IEEE Std 802.1D, 1998 Edition, i.e., that support only 16-bit values for Path Cost, should use 65 535 as the Path Cost for these link speeds when used in conjunction with Bridges that support 32-bit Path Cost values.

```
ARISTA.21:27:12#sh span
```

```
VL1
```

```
Spanning tree enabled protocol rapid-pvst
Root ID Priority 4097
Address 001c.730c.25f0
This bridge is the root
Bridge ID Priority 4097 (priority 4096 sys-id-ext 1)
Address 001c.730c.25f0
Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
Interface Role State Cost Prio.Nbr Type
-----
Et1 designated forwarding 20000 128.1 P2p Boundary(STP)
Et2 designated forwarding 20000 128.2 P2p Boundary(STP)
Et4 designated forwarding 20000 128.4 P2p Boundary(STP)
Et6 designated forwarding 20000 128.4 P2p Boundary(STP)
```

Cisco switches utilizing PVST+ or PVRST+ use port path costs defined in the older IEEE 802.1D-1998 standard by default, which does not provide enough granularity for modern networks utilizing 40Gb and 100Gb:

**Table 8-5—Path Cost Parameter Values**

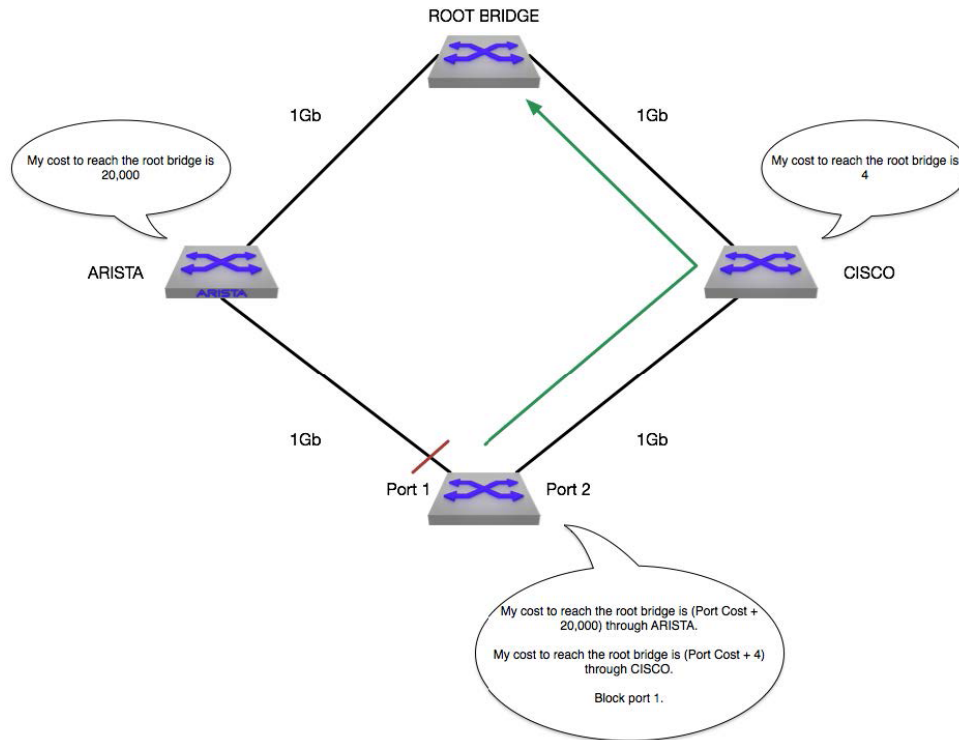
Parameter	Link Speed	Recommended value	Recommended range	Range
Path Cost	4 Mb/s	250	100–1000	1–65 535
Path Cost	10 Mb/s	100	50–600	1–65 535
Path Cost	16 Mb/s	62	40–400	1–65 535
Path Cost	100 Mb/s	19	10–60	1–65 535
Path Cost	1 Gb/s	4	3–10	1–65 535
Path Cost	10 Gb/s	2	1–5	1–65 535

```
CISCO#sh span
```

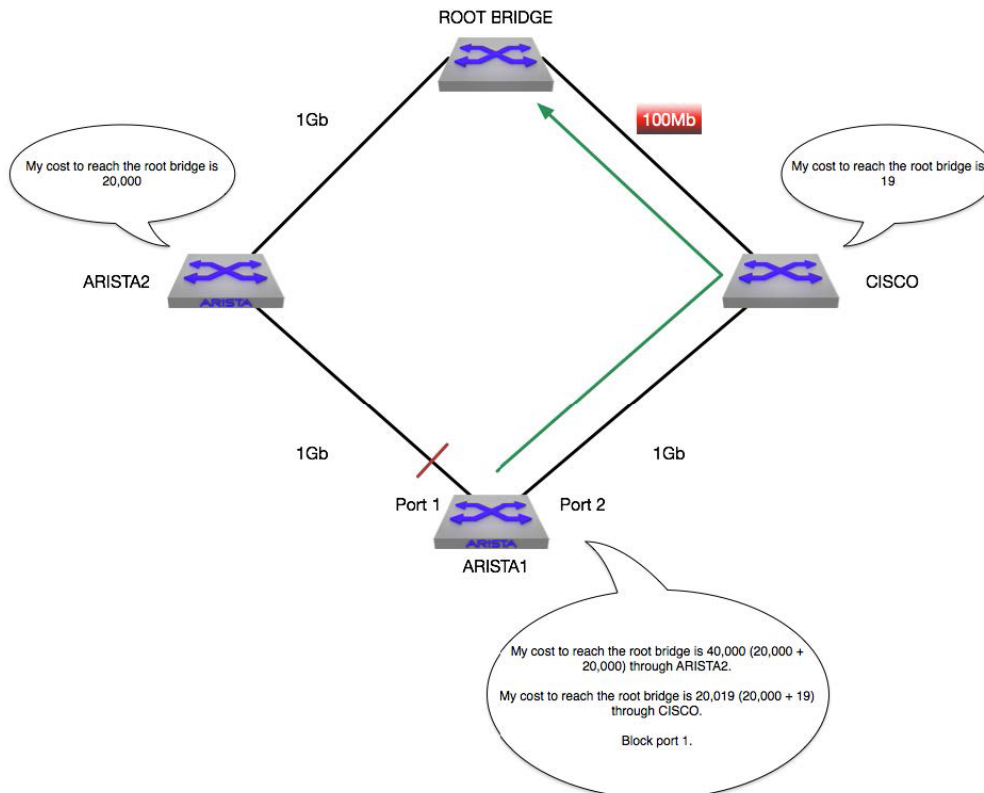
```
VLAN0001
```

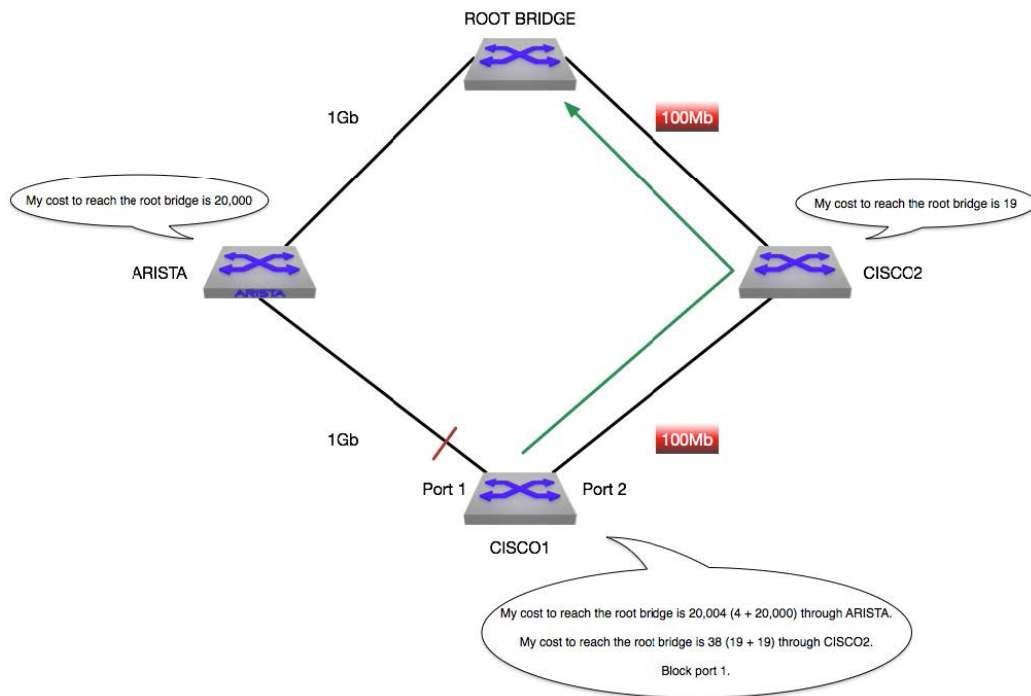
```
Spanning tree enabled protocol rstp
Root ID Priority 4097
Address 001c.730c.25f0
This bridge is the root
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 001d.a143.f900
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300
Interface Role State Cost Prio.Nbr Type
-----
Gi0/1 Root FWD 4 128.1 P2p
Gi0/2 Altn BLK 4 128.2 P2p
Gi0/3 Altn BLK 4 128.3 P2p
Gi0/4 Altn BLK 4 128.4 P2p
```

This is important to know as it can have effects on path choice in spanning tree environments. For example, in the following scenario, the upstream Cisco switch influences path choice due to its lower advertised cost to reach the root bridge:



This can cause suboptimal traffic forwarding in situations where path speeds are not the same, such as in the following two scenarios. In both cases, the upstream Cisco switch influences path selection through a less desirable path: either at the Leaf or Spine layer as appropriate.





This issue can be addressed by utilizing the *spanning-tree pathcost method long* global configuration mode command on a Cisco switch running PVST+ or PVRST+.

```
CISCO(config)#spanning-tree pathcost method long
!
```

!The Gigabit interfaces on this Cisco switch now have costs that are more in line with IEEE 802.1D-2004

```
CISCO#sh span
```

```
VLAN0001
Spanning tree enabled protocol rstp
  Root ID    Priority    4097
            Address    001c.730c.25f0
            Cost      20000
            Port      1 (GigabitEthernet0/1)
            Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
            Address    001d.a143.f900
            Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
            Aging Time 300
```

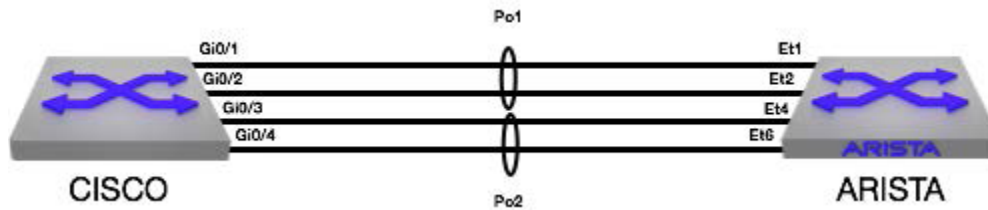
Interface	Role	Sts	Cost	Prio.Nbr	Type
Gi0/1	Root	FWD	20000	128.1	P2p
Gi0/2	Altn	BLK	20000	128.2	P2p
Gi0/3	Altn	BLK	20000	128.3	P2p
Gi0/4	Altn	BLK	20000	128.4	P2p

Lastly, this is not an issue for Cisco switches running MSTP, as the more granular STP path costs are used by default.



## Port Channel Behavior

Two LAGs are configured between the Arista and Cisco switches. Only VLAN 1 is present. Rapid-PVST is utilized on the Arista switch with PVRST+ being utilized on the Cisco switch. The Arista switch is configured with a lower priority to become the root bridge.



! Note current spanning tree topology

```
ARISTA.10:04:48(config)#sh span
```

```
VL1
```

```
Spanning tree enabled protocol rapid-pvst
```

```
Root ID    Priority    4097
Address    001c.730c.25f0
This bridge is the root
```

```
Bridge ID  Priority    4097 (priority 4096 sys-id-ext 1)
Address    001c.730c.25f0
Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

```
Interface Role      State      Cost  Prio.Nbr Type
-----
```

```
Po1      designated forwarding 19999 128.100 P2p
Po2      designated forwarding 19999 128.101 P2p
```

```
!
```

! One item of interest is how the spanning tree port costs are presented differently. On the Arista switch, the cost of Po1 and Po2 was 19,999. On the Cisco switch, it is 3

```
CISCO(config)#do sh span
```

```
VLAN0001
```

```
Spanning tree enabled protocol rstp
```

```
Root ID    Priority    4097
Address    001c.730c.25f0
Cost       3
Port       56 (Port-channel1)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
```

```
Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
Address    001d.a143.f900
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300
```

```
Interface Role  Sts  Cost  Prio.Nbr Type
-----
```

```
Po1      Root   FWD   3     128.56  P2p
Po2      Altn   BLK   3     128.64  P2p
```

```
!
```

! Now interface Et1 which is a member of Po1 on the Arista switch will be shut down. Observe the resulting spanning tree topology

```
ARISTA.10:05:48(config)#int et1
```

```
ARISTA.10:38:11(config-if-Et1)#shut
```

```
!
```

! No change is seen on the Arista switch

```

ARISTA.10:39:15(config)#sh span
VL1
  Spanning tree enabled protocol rapid-pvst
  Root ID    Priority    4097
             Address    001c.730c.25f0
             This bridge is the root

  Bridge ID Priority    4097 (priority 4096 sys-id-ext 1)
             Address    001c.730c.25f0
             Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
Interface Role      State      Cost Prio.Nbr Type
-----
Po1        designated forwarding 19999 128.100 P2p
Po2        designated forwarding 19999 128.101 P2p
!
! The Cisco switch on the other hand updates the cost of Po1 to 4. This in turn causes
a change in the spanning tree topology as Po1 is moved into an alternate role, blocking
state. Po2 is moved into a root role, forwarding state
CISCO(config)#do sh span

VLAN0001
  Spanning tree enabled protocol rstp
  Root ID    Priority    4097
             Address    001c.730c.25f0
             Cost        3
             Port        64 (Port-channel2)
             Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
  Bridge ID Priority    32769 (priority 32768 sys-id-ext 1)
             Address    001d.a143.f900
             Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
             Aging Time 300
Interface Role Sts  Cost Prio.Nbr Type
-----
Po1        Altn BLK  4    128.56 P2p
Po2        Root FWD  3    128.64 P2p

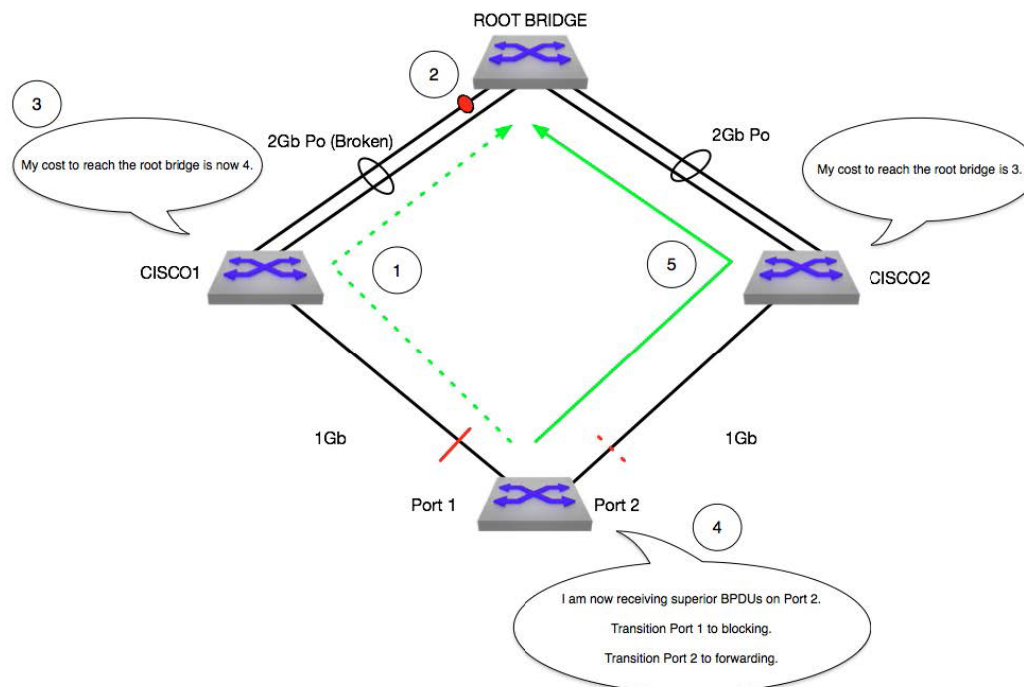
```

It is important to note that Arista switches only update the STP cost for a port channel upon its creation to favor the port channel over a single link that has the same speed as one of the port channel's members. For example, the STP cost for a 1Gb link on an Arista switch is 20,000. A port channel on the same switch made up of 1Gb links has a STP cost of 19,999 making it more desirable over a single 1Gb link.

Arista switches do not update the STP cost as of a port channel in the case of a member link failure. This is done to improve stability by avoiding STP reconvergence events per the IEEE 802.1D-2004 standard:

"Where intermediate link speeds are created as a result of the aggregation of two or more links of the same speed (see IEEE Std 802.3-2002), it can be appropriate to modify the recommended values shown in Table 17-3 to reflect the change in link speed. However, as the primary purpose of the Path Cost is to establish the active topology of the network, it can be inappropriate for the Path Cost to track the effective speed of such links too closely, as the resultant active topology could differ from that intended by the network administrator. For example, if the network administrator had chosen an active topology that makes use of aggregated links for resilience (rather than for increased data rate), it would be inappropriate to cause a Spanning Tree topology change as a result of one of the physical links in an aggregation failing. Similarly, with links that can autonegotiate their data rate, reflecting such changes of data rate in changes to Path Cost is not necessarily appropriate, depending upon the intent of the network administrator. As a default, dynamic changes of data rate shall not automatically cause changes in Port Path Cost."

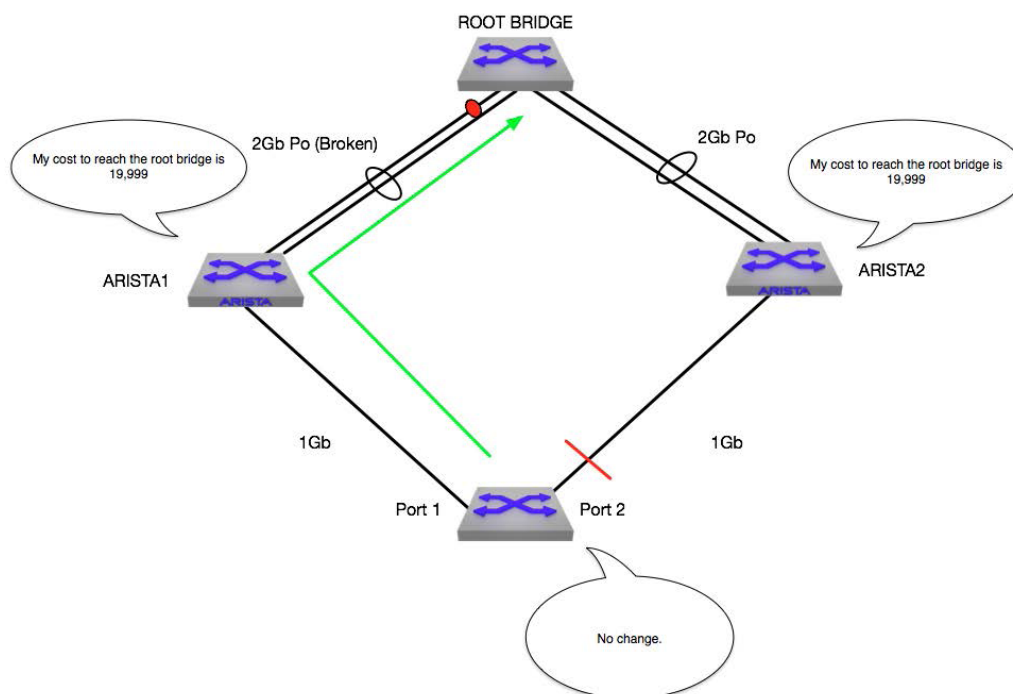
In the following scenario, we see how a change in port channel membership due to a faulty link causes an STP reconvergence event:



1. Traffic is flowing normally through CISCO1 toward the root bridge.
2. A 1Gb member link from the port channel between CISCO1 and the root bridge goes down.
3. CISCO1 updates the STP cost to 4, making that path less desirable than through CISCO2.
4. The switch at the bottom of the diagram begins receiving superior BPDUs on Port 2 due to a lower cost to reach the root bridge. It transitions Port 1 to a blocking state while transitioning Port 2 to a forwarding state. This is a STP reconvergence event.
5. Traffic is now forwarded through CISCO2 and will remain that way until the member link issue is resolved, which will cause another STP reconvergence event as the topology returns back to as it was in Step 1.

This is a standard behavior with all spanning tree protocols on IOS-based Cisco switches. NX-OS-based platforms do not follow this model and instead base the STP cost of a port channel on its configured members - not their operational status (like Arista switches).

Applying the same scenario with Arista switches, it can be observed that the switch at the bottom of the diagram doesn't see a change. This avoids a STP reconvergence event and maintains a stable topology. This also allows the faulty member link to be repaired without causing further STP reconvergence events.



To address this issue on an IOS-based Cisco switch, you may configure the spanning tree cost manually on the port channel with the spanning-tree cost interface command. This will make the STP cost of the port channel static regardless of the state of a member link:

```
CISCO(config-if)#int po1
CISCO(config-if)#spanning-tree cost 19999
!
! The STP cost of Po1 is now 19,999
CISCO(config-if)#do sho span int po1
```

Vlan	Role	Sts	Cost	Prio.Nbr	Type
VLAN0001	Root	FWD	19999	128.56	P2p

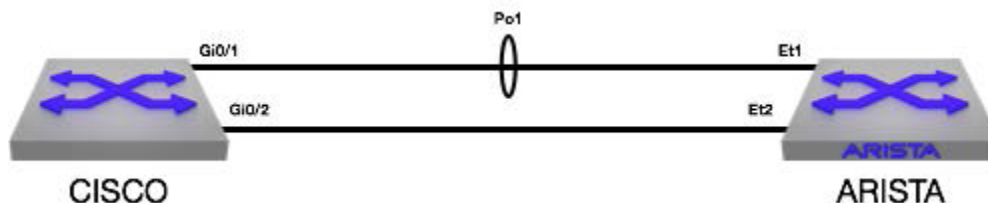
```
!
! One of Po1's member links is shut down
CISCO(config)#int gi0/1
CISCO(config-if)#shut
!
! The STP cost of Po1 is unchanged
CISCO(config-if)#do sh span int po1
```

Vlan	Role	Sts	Cost	Prio.Nbr	Type
VLAN0001	Root	FWD	19999	128.56	P2p

The downside of this is that you will need to ensure you utilize the correct port cost depending on the situation.

Another difference in port channel behavior is the initially-assigned STP cost. On an Arista switch, a port channel made up of two 1Gb interfaces or four 1Gb interfaces has the same cost. For Cisco switches, the cost is a function of the aggregated bandwidth of that particular port channel's configured member links. So in most cases, the port channel on a Cisco switch will have better cost

all things being equal. Take the following scenario for example where the Cisco switch has been configured with the spanning-tree pathcost method long command and initially only one 1Gb link is in the port channel:



```
! The Arista switch shows a cost of 19,999 for Po1
ARISTA.10:12:56(config)#sh span int po1
Instance      Role      State      Cost      Prio.Nbr  Type
-----
VL1           designated forwarding 19999      128.100   P2p
!
! The Cisco switch shows a cost of 20,000 for Po1
CISCO#sh span int po1

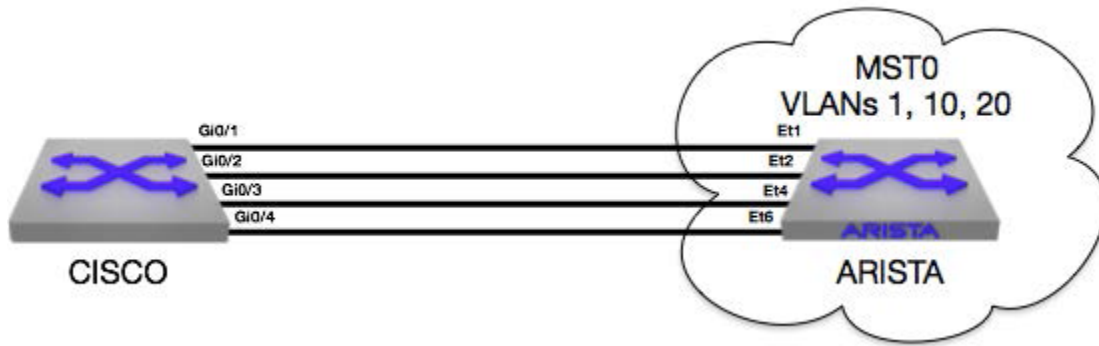
Vlan          Role Sts Cost      Prio.Nbr  Type
-----
VLAN0001      Altn BLK 20000     128.56    P2p
!
! Now the second interface will be added to Po1 on both sides
ARISTA.10:16:29(config)#int et2
ARISTA.10:19:38(config-if-Et2)#channel-group 1 mode active
!
CISCO(config)#int gi0/2
CISCO(config-if)#channel-group 1 mode active
!
! The Arista switch still shows a cost of 19,999 for Po1
ARISTA.10:19:42(config-if-Et2)#sh span int po1
Instance      Role      State      Cost      Prio.Nbr  Type
-----
VL1           designated forwarding 19999      128.100   P2p
!
! The Cisco switch however now shows a cost of 10,000
CISCO(config-if)#do sh span int po1

Vlan          Role Sts Cost      Prio.Nbr  Type
-----
VLAN0001      Root FWD 10000     128.56    P2p
```

This could also be worked around with the spanning-tree cost interface command on Po1 of the Cisco switch - with the same caveats.

### Use Case - Arista MSTP

In these scenarios, an Arista DCS-7048T-4S-F on 4.13.0 is connected to a Cisco C2960 on 12.2(35) SE5, LAN Base via four links configured as trunks initially allowing all VLANs between the two switches. VLANs 1, 10, and 20 are active on both switches. Initially, all configurations are default.

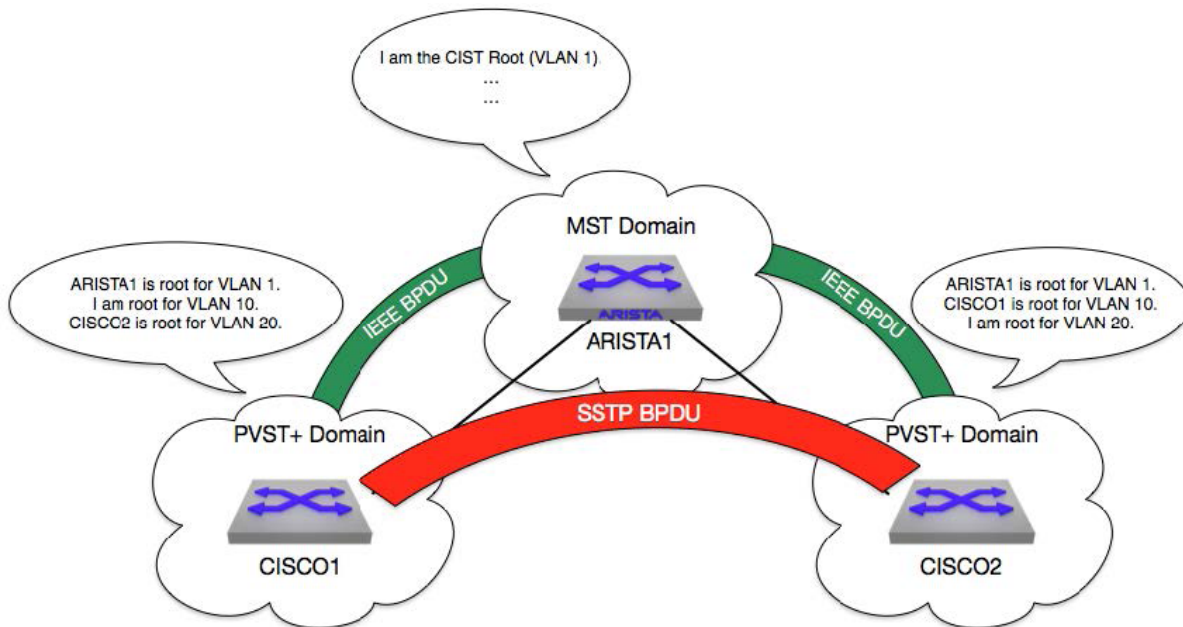


**Interoperability With Cisco PVST+**

Arista switches only send MST0 BPDUs on the default VLAN (VLAN 1 by default). When interoperating with PVST+, it is important to keep this in mind when it comes to root bridge election. For example, consider the following scenario:

- Arista switch is configured with MST, all VLANs are in MST0, and priority is configured for 4,096. VLAN 1, 10, and 20 are active.
- Cisco switch is attached, configured for PVST+, and default priority (32,768). VLAN 1, 10, and 20 are active.
- The links connecting these two switches are configured as trunks and allow all VLANs.

In this case, the Arista switch will be the root bridge for VLAN 1, but the Cisco switch will consider itself the root bridge for VLANs 10 and 20 since it will only receive BPDUs from the Arista switch for VLAN 1. Again, an Arista switch configured for MST will only send BPDUs on the default VLAN.



For the following use case, all VLANs on the Arista switch running MST are mapped to MST0. Note spanning tree topology.

! The Arista switch claims itself to be root of MST0, and places all of its ports into a designated role, forwarding state. Also note that the connected ports between these two switches are seen as boundary ports because the Cisco switch is not running MST

```
ARISTA.14:55:10#sh spanning-tree
```

#### MST0

```
Spanning tree enabled protocol mstp
Root ID    Priority    32768
           Address    001c.730c.25f0
           This bridge is the root
Bridge ID  Priority    32768 (priority 32768 sys-id-ext 0)
           Address    001c.730c.25f0
           Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
Interface  Role        State      Cost      Prio.Nbr  Type
-----
Et1        designated forwarding 20000      128.1     P2p      Boundary(STP)
Et2        designated forwarding 20000      128.2     P2p      Boundary(STP)
Et4        designated forwarding 20000      128.4     P2p      Boundary(STP)
Et6        designated forwarding 20000      128.6     P2p      Boundary(STP)
```

!

! The Cisco switch agrees that the Arista switch is the root bridge for VLAN 1 because the Arista switch has a superior bridge priority of 32768. However, it claims itself to be the root bridge for VLANs 10 and 20. Also note that port Gi0/1 is in a Root port role for VLAN 1, but in a Designated port role for VLANs 10 and 20

```
CISCO#sh spanning-tree
```

#### VLAN0001

```
Spanning tree enabled protocol ieee
Root ID    Priority    32768
           Address    001c.730c.25f0
           Cost        4
           Port        1 (GigabitEthernet0/1)
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
           Address    001d.a143.f900
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
           Aging Time 300
Interface  Role Sts Cost      Prio.Nbr  Type
-----
Gi0/1      Root FWD 4         128.1     P2p
Gi0/2      Altn BLK 4         128.2     P2p
Gi0/3      Altn BLK 4         128.3     P2p
Gi0/4      Altn BLK 4         128.4     P2p
```

#### VLAN0010

```
Spanning tree enabled protocol ieee
Root ID    Priority    32778
           Address    001d.a143.f900
           This bridge is the root
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID  Priority    32778 (priority 32768 sys-id-ext 10)
           Address    001d.a143.f900
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
           Aging Time 300
```

```

Interface      Role Sts Cost      Prio.Nbr Type
-----
Gi0/1          Desg FWD 4         128.1   P2p
Gi0/2          Back BLK 4         128.2   P2p
Gi0/3          Back BLK 4         128.3   P2p
Gi0/4          Back BLK 4         128.4   P2p

```

```

Spanning tree enabled protocol ieee
Root ID        Priority    32788
                Address    001d.a143.f900
                This bridge is the root
                Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID      Priority    32788 (priority 32768 sys-id-ext 20)
                Address    001d.a143.f900
                Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
                Aging Time 300

```

```

Interface      Role Sts Cost      Prio.Nbr Type
-----
Gi0/1          Desg FWD 4         128.1   P2p
Gi0/2          Back BLK 4         128.2   P2p
Gi0/3          Back BLK 4         128.3   P2p
Gi0/4          Back BLK 4         128.4   P2p

```

```

!
! This reflects the per-VLAN behavior of PVST+ versus the fact that Arista switches
running MST only send BPDUs on the default VLAN (VLAN 1 by default) and that MSTP by
itself is not VLAN aware. Even if the Arista switch were to be configured with a
priority of 4096 for MST0 (to which VLANs 1, 10, and 20 are mapped), it would have no
effect outside of VLAN 1 in the Cisco switch's view
ARISTA.15:49:35(config)#spanning-tree mst 0 priority 4096

```

```

!
! Note the updated bridge priority for VLAN 1, but no changes to VLAN 10 or 20
CISCO#sh span

```

```

VLAN0001
Spanning tree enabled protocol ieee
Root ID        Priority    4096
                Address    001c.730c.25f0
                Cost      4
                Port      1 (GigabitEthernet0/1)
                Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID      Priority    32769 (priority 32768 sys-id-ext 1)
                Address    001d.a143.f900
                Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
                Aging Time 300

```

```

Interface      Role Sts Cost      Prio.Nbr Type
-----
Gi0/1          Root FWD 4         128.1   P2p
Gi0/2          Altn BLK 4         128.2   P2p
Gi0/3          Altn BLK 4         128.3   P2p
Gi0/4          Altn BLK 4         128.4   P2p

```



VLAN0010

```
Spanning tree enabled protocol ieee
Root ID    Priority    32778
           Address    001d.a143.f900
           This bridge is the root
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID  Priority    32778 (priority 32768 sys-id-ext 10)
           Address    001d.a143.f900
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
           Aging Time 15
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Gi0/1	Desg	FWD	4	128.1	P2p
Gi0/2	Back	BLK	4	128.2	P2p
Gi0/3	Back	BLK	4	128.3	P2p
Gi0/4	Back	BLK	4	128.4	P2p

VLAN0020

```
Spanning tree enabled protocol ieee
Root ID    Priority    32788
           Address    001d.a143.f900
           This bridge is the root
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID  Priority    32788 (priority 32768 sys-id-ext 20)
           Address    001d.a143.f900
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
           Aging Time 15
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Gi0/1	Desg	FWD	4	128.1	P2p
Gi0/2	Back	BLK	4	128.2	P2p
Gi0/3	Back	BLK	4	128.3	P2p
Gi0/4	Back	BLK	4	128.4	P2p

```
!
! Now the Arista switch will be returned to default configuration and the Cisco switch
will be configured for a priority of 4096 for all VLANs. Note the resulting spanning tree
topology
```

```
ARISTA.15:49:40(config)#no spanning-tree mst 0 priority 4096
```

```
!
CISCO(config)#spanning-tree vlan 1,10,20 priority 4096
!
! The results are as expected. The Cisco switch sees itself as the root bridge for all
VLANs
```

```
CISCO#sh span
```

VLAN0001

```
Spanning tree enabled protocol ieee
Root ID    Priority    4097
           Address    001d.a143.f900
           This bridge is the root
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID  Priority    4097 (priority 4096 sys-id-ext 1)
           Address    001d.a143.f900
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
           Aging Time 300
```

```

Interface      Role Sts Cost      Prio.Nbr Type
-----
Gi0/1          Desg FWD 4        128.1   P2p
Gi0/2          Desg FWD 4        128.2   P2p
Gi0/3          Desg FWD 4        128.3   P2p
Gi0/4          Desg FWD 4        128.4   P2p

```

VLAN0010

```

Spanning tree enabled protocol ieee
Root ID      Priority      4106
Address      001d.a143.f900
This bridge is the root
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID    Priority      4106 (priority 4096 sys-id-ext 10)
Address      001d.a143.f900
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300

```

```

Interface      Role Sts Cost      Prio.Nbr Type
-----
Gi0/1          Desg FWD 4        128.1   P2p
Gi0/2          Desg FWD 4        128.2   P2p
Gi0/3          Desg FWD 4        128.3   P2p
Gi0/4          Desg FWD 4        128.4   P2p

```

VLAN0020

```

Spanning tree enabled protocol ieee
Root ID      Priority      4116
Address      001d.a143.f900
This bridge is the root
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID    Priority      4116 (priority 4096 sys-id-ext 20)
Address      001d.a143.f900
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300

```

```

Interface      Role Sts Cost      Prio.Nbr Type
-----
Gi0/1          Desg FWD 4        128.1   P2p
Gi0/2          Desg FWD 4        128.2   P2p
Gi0/3          Desg FWD 4        128.3   P2p
Gi0/4          Desg FWD 4        128.4   P2p

```

!

! The Arista switch sees the Cisco switch as the root bridge for MST0

ARISTA.16:11:50#sh span

MST0

```

Spanning tree enabled protocol mstp
Root ID      Priority      4097
Address      001d.a143.f900
Cost         20000 (Ext) 0 (Int)
Port         1 (Ethernet1)
Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID    Priority      32768 (priority 32768 sys-id-ext 0)
Address      001c.730c.25f0
Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec

```

```

Interface      Role      State      Cost      Prio.Nbr Type
-----
Et1            root      forwarding 20000     128.1   P2p Boundary(STP)
Et2            alternate discarding 20000     128.2   P2p Boundary(STP)
Et4            alternate discarding 20000     128.4   P2p Boundary(STP)
Et6            alternate discarding 20000     128.6   P2p Boundary(STP)

```

**Interoperability With Cisco MSTP**

! All VLANs on the Arista and Cisco switches are mapped to MST0. Note spanning tree topology. The Arista switch sees itself as the root bridge for MST0

```
ARISTA.10:20:19#sh span
```

```
MST0
```

```
Spanning tree enabled protocol mstp
```

```
Root ID    Priority    32768
          Address    001c.730c.25f0
          This bridge is the root
```

```
Bridge ID  Priority    32768 (priority 32768 sys-id-ext 0)
          Address    001c.730c.25f0
```

```
Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p
Et2	designated	forwarding	20000	128.2	P2p
Et4	designated	forwarding	20000	128.4	P2p
Et6	designated	forwarding	20000	128.6	P2p

```
!
```

! As expected, the Cisco switch agrees that the Arista switch is the root bridge for MST0, due to the Arista switch having a lower MAC address

```
CISCO#sh spanning-tree
```

```
MST0
```

```
Spanning tree enabled protocol mstp
```

```
Root ID    Priority    32768
          Address    001c.730c.25f0
          Cost      0
          Port      1 (GigabitEthernet0/1)
          Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
```

```
Bridge ID  Priority    32768 (priority 32768 sys-id-ext 0)
          Address    001d.a143.f900
```

```
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
```

Interface	Role	State	Cost	Prio.Nbr	Type
Gi0/1	Root	FWD	20000	128.1	P2p
Gi0/2	Altn	BLK	20000	128.2	P2p
Gi0/3	Altn	BLK	20000	128.3	P2p
Gi0/4	Altn	BLK	20000	128.4	P2p

```
!
```

! Now the Arista switch will be configured to have VLAN 20 in MST1. Note resulting spanning tree topology

```
ARISTA.10:36:47(config)#spanning-tree mst configuration
```

```
ARISTA.10:36:57(config-mst)#instance 1 vlans 20
```

```
!
```

! The Arista switch sees itself as the root bridge for both MST0 and MST1. Also note the boundary ports due to mismatched MST configuration between the two switches which has resulted in two discrete MST regions being created

```
ARISTA.10:37:39#sh span
```

```
MST0
```

```
Spanning tree enabled protocol mstp
```

```
Root ID    Priority    32768
          Address    001c.730c.25f0
          This bridge is the root
```

```

    Bridge ID  Priority  32768 (priority 32768 sys-id-ext 0)
    Address    001c.730c.25f0
    Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
Interface      Role      State      Cost      Prio.Nbr Type
-----
Et1            designated forwarding 20000      128.1     P2p Boundary
Et2            designated forwarding 20000      128.2     P2p Boundary
Et4            designated forwarding 20000      128.4     P2p Boundary
Et6            designated forwarding 20000      128.6     P2p Boundary

```

MST1

Spanning tree enabled protocol mstp

```

Root ID  Priority  32769
Address  001c.730c.25f0
This bridge is the root

```

```

Bridge ID Priority  32769 (priority 32768 sys-id-ext 1)
Address    001c.730c.25f0

```

```

Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec

```

```

Interface      Role      State      Cost      Prio.Nbr Type
-----
Et1            designated forwarding 20000      128.1     P2p Boundary
Et2            designated forwarding 20000      128.2     P2p Boundary
Et4            designated forwarding 20000      128.4     P2p Boundary
Et6            designated forwarding 20000      128.6     P2p Boundary

```

!

! The Cisco switch agrees that the Arista switch is the root bridge for MST0. Again, we see boundary ports due to mismatched MST configuration

CISCO#sh span

MST0

Spanning tree enabled protocol mstp

```

Root ID  Priority  32768
Address  001c.730c.25f0
Cost     20000
Port     1 (GigabitEthernet0/1)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

```

```

Bridge ID Priority  32768 (priority 32768 sys-id-ext 0)
Address    001d.a143.f900

```

```

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

```

```

Interface      Role      State      Cost      Prio.Nbr Type
-----
Gi0/1          Root      FWD        20000      128.1     P2p Bound(RSTP)
Gi0/2          Altn     BLK        20000      128.2     P2p Bound(RSTP)
Gi0/3          Altn     BLK        20000      128.3     P2p Bound(RSTP)
Gi0/4          Altn     BLK        20000      128.4     P2p Bound(RSTP)

```

! Now the Cisco switch will be configured to have VLAN 20 in MST1, matching the MST config of the Arista switch. Note resulting spanning tree topology

CISCO(config)#spanning-tree mst configuration

CISCO(config-mst)#instance 1 vlan 20

!

! As expected, the Arista switch sees itself as the root bridge, and no boundary ports exist due to both switches having matching MST configuration - thus, both switches believe themselves to be within the same MST region

ARISTA.14:52:31#sh span

MST0

```
Spanning tree enabled protocol mstp
Root ID    Priority    32768
           Address    001c.730c.25f0
           This bridge is the root
Bridge ID  Priority    32768 (priority 32768 sys-id-ext 0)
           Address    001c.730c.25f0
           Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p
Et2	designated	forwarding	20000	128.2	P2p
Et4	designated	forwarding	20000	128.4	P2p
Et6	designated	forwarding	20000	128.6	P2p

MST1

```
Spanning tree enabled protocol mstp
Root ID    Priority    32769
           Address    001c.730c.25f0
           This bridge is the root
Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
           Address    001c.730c.25f0
           Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

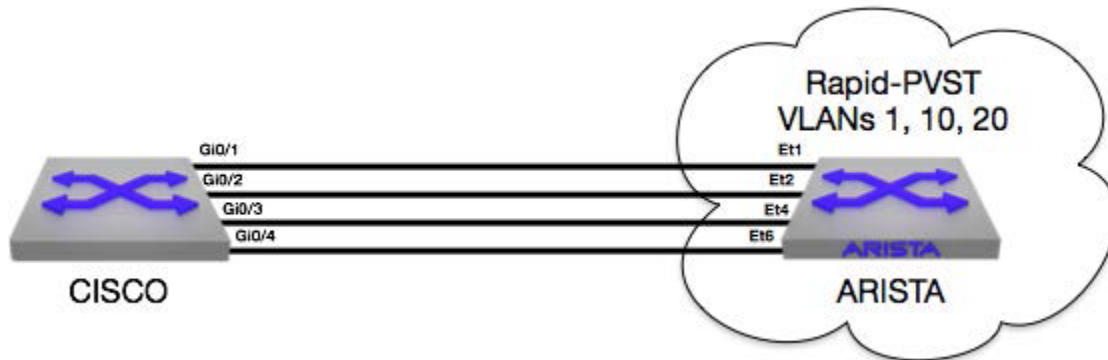
Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p
Et2	designated	forwarding	20000	128.2	P2p
Et4	designated	forwarding	20000	128.4	P2p
Et6	designated	forwarding	20000	128.6	P2p

**Interoperability With Cisco PVRST+**

The same interoperability behavior exhibited in the use case with Cisco PVST+ will apply in this situation as well.

**Use Case - Arista Rapid-PVST**

In these scenarios, an Arista DCS-7048T-4S-F on 4.13.0 is configured with Rapid-PVST and is connected to a Cisco C2960 on 12.2(35) SE5, LAN Base via four links configured as trunks initially allowing all VLANs between the two switches. VLANs 1, 10, and 20 are active on both switches. At the start, all configurations are default.



**Interoperability With Cisco PVST+**

! Note current spanning tree topology with default settings. The Arista switch considers itself the root bridge for all VLANs due to having a lower MAC address since there is a tie on bridge priority

ARISTA.23:39:56#sh span

VL1

Spanning tree enabled protocol rapid-pvst

Root ID Priority 32769  
Address 001c.730c.25f0  
This bridge is the root

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)  
Address 001c.730c.25f0

Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec

Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p Boundary(STP)
Et2	designated	forwarding	20000	128.2	P2p Boundary(STP)
Et4	designated	forwarding	20000	128.4	P2p Boundary(STP)
Et6	designated	forwarding	20000	128.6	P2p Boundary(STP)

VL10

Spanning tree enabled protocol rapid-pvst

Root ID Priority 32778  
Address 001c.730c.25f0  
This bridge is the root

Bridge ID Priority 32778 (priority 32768 sys-id-ext 10)  
Address 001c.730c.25f0

Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec

Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p Boundary(STP)
Et2	designated	forwarding	20000	128.2	P2p Boundary(STP)
Et4	designated	forwarding	20000	128.4	P2p Boundary(STP)
Et6	designated	forwarding	20000	128.6	P2p Boundary(STP)

VL20

Spanning tree enabled protocol rapid-pvst

Root ID Priority 32788  
Address 001c.730c.25f0  
This bridge is the root

Bridge ID Priority 32788 (priority 32768 sys-id-ext 20)  
Address 001c.730c.25f0

Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec

Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p Boundary(STP)
Et2	designated	forwarding	20000	128.2	P2p Boundary(STP)
Et4	designated	forwarding	20000	128.4	P2p Boundary(STP)
Et6	designated	forwarding	20000	128.6	P2p Boundary(STP)

!

! The Cisco switch agrees that the Arista switch is the root bridge for all VLANs

CISCO#sh span

## VLAN0001

```
Spanning tree enabled protocol ieee
Root ID    Priority    32769
           Address    001c.730c.25f0
           Cost      4
           Port      1 (GigabitEthernet0/1)
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
           Address    001d.a143.f900
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300
```

Interface	Role	State	Cost	Prio.Nbr	Type
Gi0/1	Root	FWD	4	128.1	P2p
Gi0/2	Altn	BLK	4	128.2	P2p
Gi0/3	Altn	BLK	4	128.3	P2p
Gi0/4	Altn	BLK	4	128.4	P2p

## VLAN0010

```
Spanning tree enabled protocol ieee
Root ID    Priority    32778
           Address    001c.730c.25f0
           Cost      4
           Port      1 (GigabitEthernet0/1)
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID  Priority    32778 (priority 32768 sys-id-ext 10)
           Address    001d.a143.f900
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300
```

Interface	Role	State	Cost	Prio.Nbr	Type
Gi0/1	Root	FWD	4	128.1	P2p
Gi0/2	Altn	BLK	4	128.2	P2p
Gi0/3	Altn	BLK	4	128.3	P2p
Gi0/4	Altn	BLK	4	128.4	P2p

## VLAN0020

```
Spanning tree enabled protocol ieee
Root ID    Priority    32788
           Address    001c.730c.25f0
           Cost      4
           Port      1 (GigabitEthernet0/1)
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID  Priority    32788 (priority 32768 sys-id-ext 20)
           Address    001d.a143.f900
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300
```

Interface	Role	State	Cost	Prio.Nbr	Type
Gi0/1	Root	FWD	4	128.1	P2p
Gi0/2	Altn	BLK	4	128.2	P2p
Gi0/3	Altn	BLK	4	128.3	P2p
Gi0/4	Altn	BLK	4	128.4	P2p

```
!
! Now the Arista switch will be configured to be the root bridge for VLANs 1 and 10, and
the Cisco switch to be the root bridge for VLAN 20. Note resulting spanning tree topology
ARISTA.23:47:46(config)#spanning-tree vlan 1,10 priority 4096
```

```
!
CISCO(config)#spanning-tree vlan 20 priority 4096
```

```
! Results were as expected for both the Arista and Cisco switches. They both agree that
the Arista switch is the root bridge for VLANs 1 and 10, and that the Cisco switch is the
root bridge for VLAN 20
```

```
ARISTA.23:50:33(config)#sh span
```

```
VL1
```

```
Spanning tree enabled protocol rapid-pvst
```

```
Root ID    Priority    4097
Address    001c.730c.25f0
This bridge is the root
```

```
Bridge ID  Priority    4097 (priority 4096 sys-id-ext 1)
Address    001c.730c.25f0
```

```
Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p Boundary(STP)
Et2	designated	forwarding	20000	128.2	P2p Boundary(STP)
Et4	designated	forwarding	20000	128.4	P2p Boundary(STP)
Et6	designated	forwarding	20000	128.6	P2p Boundary(STP)

```
VL10
```

```
Spanning tree enabled protocol rapid-pvst
```

```
Root ID    Priority    4106
Address    001c.730c.25f0
This bridge is the root
```

```
Bridge ID  Priority    4106 (priority 4096 sys-id-ext 10)
Address    001c.730c.25f0
```

```
Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p Boundary(STP)
Et2	designated	forwarding	20000	128.2	P2p Boundary(STP)
Et4	designated	forwarding	20000	128.4	P2p Boundary(STP)
Et6	designated	forwarding	20000	128.6	P2p Boundary(STP)

```
VL20
```

```
Spanning tree enabled protocol rapid-pvst
```

```
Root ID    Priority    4116
Address    001d.a143.f900
Cost       20000 (Ext) 0 (Int)
Port       1 (Ethernet1)
```

```
Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

```
Bridge ID  Priority    32788 (priority 32768 sys-id-ext 20)
Address    001c.730c.25f0
```

```
Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p Boundary(STP)
Et2	designated	forwarding	20000	128.2	P2p Boundary(STP)
Et4	designated	forwarding	20000	128.4	P2p Boundary(STP)
Et6	designated	forwarding	20000	128.6	P2p Boundary(STP)



```
CISCO#sh span
```

```
VLAN0001
```

```
Spanning tree enabled protocol ieee
Root ID    Priority    4097
           Address    001c.730c.25f0
           Cost      4
           Port      1 (GigabitEthernet0/1)
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
           Address    001d.a143.f900
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
           Aging Time 300
```

Interface	Role	State	Cost	Prio.Nbr	Type
Gi0/1	Root	FWD	4	128.1	P2p
Gi0/2	Altn	BLK	4	128.2	P2p
Gi0/3	Altn	BLK	4	128.3	P2p
Gi0/4	Altn	BLK	4	128.4	P2p

```
VLAN0010
```

```
Spanning tree enabled protocol ieee
Root ID    Priority    4106
           Address    001c.730c.25f0
           Cost      4
           Port      1 (GigabitEthernet0/1)
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID  Priority    32778 (priority 32768 sys-id-ext 10)
           Address    001d.a143.f900
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
           Aging Time 300
```

Interface	Role	State	Cost	Prio.Nbr	Type
Gi0/1	Root	FWD	4	128.1	P2p
Gi0/2	Altn	BLK	4	128.2	P2p
Gi0/3	Altn	BLK	4	128.3	P2p
Gi0/4	Altn	BLK	4	128.4	P2p

```
VLAN0020
```

```
Spanning tree enabled protocol ieee
Root ID    Priority    4116
           Address    001d.a143.f900
           This bridge is the root
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID  Priority    4116 (priority 4096 sys-id-ext 20)
           Address    001d.a143.f900
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
           Aging Time 300
```

Interface	Role	State	Cost	Prio.Nbr	Type
Gi0/1	Root	FWD	4	128.1	P2p
Gi0/2	Altn	BLK	4	128.2	P2p
Gi0/3	Altn	BLK	4	128.3	P2p
Gi0/4	Altn	BLK	4	128.4	P2p

## Interoperability With Cisco MSTP

! Note current spanning tree topology with default settings. The Arista switch sees the Cisco switch as the root bridge for all VLANs due to superior bridge priority. If you didn't already notice, this is different behavior than what was seen in the use case where the Arista switch was utilizing MST and the Cisco switch was using PVRST+. This output reflects the fact that a Cisco switch running MST sends a BPDU for every VLAN via PVST Simulation

```
ARISTA.14:57:59#sh span
```

```
VL1
```

```
Spanning tree enabled protocol rapid-pvst
```

```
Root ID    Priority    32768
           Address    001d.a143.f900
           Cost      20000 (Ext) 0 (Int)
           Port      1 (Ethernet1)
           Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
           Address    001c.730c.25f0
           Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p Boundary(STP)
Et2	designated	forwarding	20000	128.2	P2p Boundary(STP)
Et4	designated	forwarding	20000	128.4	P2p Boundary(STP)
Et6	designated	forwarding	20000	128.6	P2p Boundary(STP)

```
VL10
```

```
Spanning tree enabled protocol rapid-pvst
```

```
Root ID    Priority    32768
           Address    001d.a143.f900
           Cost      20000 (Ext) 0 (Int)
           Port      1 (Ethernet1)
           Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID  Priority    32778 (priority 32768 sys-id-ext 10)
           Address    001c.730c.25f0
           Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p Boundary(STP)
Et2	designated	forwarding	20000	128.2	P2p Boundary(STP)
Et4	designated	forwarding	20000	128.4	P2p Boundary(STP)
Et6	designated	forwarding	20000	128.6	P2p Boundary(STP)

```
VL20
```

```
Spanning tree enabled protocol rapid-pvst
```

```
Root ID    Priority    32768
           Address    001d.a143.f900
           Cost      20000 (Ext) 0 (Int)
           Port      1 (Ethernet1)
           Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID  Priority    32788 (priority 32768 sys-id-ext 20)
           Address    001c.730c.25f0
           Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p Boundary(STP)
Et2	designated	forwarding	20000	128.2	P2p Boundary(STP)
Et4	designated	forwarding	20000	128.4	P2p Boundary(STP)
Et6	designated	forwarding	20000	128.6	P2p Boundary(STP)

```

!
! The Cisco switch sees itself as the root bridge for MST0, as expected
CISCO#sh span
MST0
  Spanning tree enabled protocol mstp
  Root ID    Priority    32768
            Address     001d.a143.f900
            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     001d.a143.f900
            Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Interface   Role        State      Cost      Prio.Nbr Type
-----
Gi0/1       Root        FWD        20000     128.1    P2p Bound(PVST)
Gi0/2       Altn        BLK        20000     128.2    P2p Bound(PVST)
Gi0/3       Altn        BLK        20000     128.3    P2p Bound(PVST)
Gi0/4       Altn        BLK        20000     128.4    P2p Bound(PVST)
!
! Now the Arista switch will be configured to be the root bridge for VLAN 10. Note
resulting spanning tree topology
ARISTA.15:26:20(config)#spanning-tree vlan 10 priority 4096
!
! The Arista switch sees itself as the root bridge for VLAN 10, as expected
ARISTA.15:27:25#sh span
VL1
  Spanning tree enabled protocol rapid-pvst
  Root ID    Priority    32768
            Address     001d.a143.f900
            Cost      20000 (Ext) 0 (Int)
            Port      1 (Ethernet1)
            Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
  Bridge ID Priority    32769 (priority 32768 sys-id-ext 1)
            Address     001c.730c.25f0
            Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
Interface   Role        State      Cost      Prio.Nbr Type
-----
Et1         designated forwarding 20000     128.1    P2p Boundary(STP)
Et2         designated forwarding 20000     128.2    P2p Boundary(STP)
Et4         designated forwarding 20000     128.4    P2p Boundary(STP)
Et6         designated forwarding 20000     128.6    P2p Boundary(STP)
VL10
  Spanning tree enabled protocol rapid-pvst
  Root ID    Priority    4106
            Address     001c.730c.25f0
            This bridge is the root
  Bridge ID Priority    4106 (priority 4096 sys-id-ext 10)
            Address     001c.730c.25f0
            Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
Interface   Role        State      Cost      Prio.Nbr Type
-----
Et1         designated forwarding 20000     128.1    P2p Boundary(STP)
Et2         designated forwarding 20000     128.2    P2p Boundary(STP)
Et4         designated forwarding 20000     128.4    P2p Boundary(STP)
Et6         designated forwarding 20000     128.6    P2p Boundary(STP)

```

VL20

```
Spanning tree enabled protocol rapid-pvst
```

```
Root ID    Priority    32768
          Address    001d.a143.f900
          Cost      20000 (Ext) 0 (Int)
          Port      1 (Ethernet1)
          Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID  Priority    32788 (priority 32768 sys-id-ext 20)
          Address    001c.730c.25f0
          Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p Boundary(STP)
Et2	designated	forwarding	20000	128.2	P2p Boundary(STP)
Et4	designated	forwarding	20000	128.4	P2p Boundary(STP)
Et6	designated	forwarding	20000	128.6	P2p Boundary(STP)

!

! The Cisco switch sees itself as the root bridge for MST0 as before, but also reports an inconsistency caused by the receipt of a superior BPDU on VLAN 10 across all its the links and triggers a PVST Simulation check failure.

CISCO#

```
3w3d: %SPANTREE-2-PVSTSIM_FAIL: Blocking designated port Gi0/3: Inconsistent superior
PVST BPDU received on VLAN 10, claiming root 4106:001c.730c.25f0
```

```
3w3d: %SPANTREE-2-PVSTSIM_FAIL: Blocking designated port Gi0/4: Inconsistent superior
PVST BPDU received on VLAN 10, claiming root 4106:001c.730c.25f0
```

```
3w3d: %SPANTREE-2-PVSTSIM_FAIL: Blocking designated port Gi0/1: Inconsistent superior
PVST BPDU received on VLAN 10, claiming root 4106:001c.730c.25f0
```

```
3w3d: %SPANTREE-2-PVSTSIM_FAIL: Blocking designated p
```

```
CISCO#ort Gi0/2: Inconsistent superior PVST BPDU received on VLAN 10, claiming root
4106:001c.730c.25f0
```

In this case, the CIST root bridge (the root bridge on VLAN 1) is the Cisco switch, which is running MST, and therefore is within a MST region. The BPDU received on VLAN 10 came from a non-MST region, and was superior, thus violating the second rule of the PVST Simulation check which again states:

“If the root bridge for CIST is within a MST region, VLANs 2 and above defined in the non-MST domains must have their spanning-tree priorities worse (greater) than that of the CIST root.”

The end result is all connected links transporting these superior BPDUs from the non-MST region (boundary ports) on VLAN 10 are placed into a BKN\* status, which do not forward traffic. Once the “inconsistency” is cleared, the port will be returned back to an operational state.

CISCO#sh span

MST0

```
Spanning tree enabled protocol mstp
```

```
Root ID    Priority    32768
          Address    001d.a143.f900
          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    001d.a143.f900
          Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
```

```

Interface      Role      State      Cost      Prio.Nbr  Type
-----
Gi0/1          Desg     BKN        20000     128.1     P2p Bound(PVST) *PVST_Inc
Gi0/2          Desg     BKN        20000     128.2     P2p Bound(PVST) *PVST_Inc
Gi0/3          Desg     BKN        20000     128.3     P2p Bound(PVST) *PVST_Inc
Gi0/4          Desg     BKN        20000     128.4     P2p Bound(PVST) *PVST_Inc

```

!

```
CISCO#sh spanning-tree mst 0
```

```
##### MST0 vlans mapped: 1-4094
```

```
Bridge address 001d.a143.f900 priority 32768 (32768 sysid 0)
```

```
Root this switch for the CIST
```

```
Operational hello time 2 , forward delay 15, max age 20, txholdcount 6
```

```
Configured hello time 2 , forward delay 15, max age 20, max hops 20
```

```
Interface      Role      State      Cost      Prio.Nbr  Type
-----
```

```

Gi0/1          Desg     BKN        20000     128.1     P2p Bound(PVST) *PVST_Inc
Gi0/2          Desg     BKN        20000     128.2     P2p Bound(PVST) *PVST_Inc
Gi0/3          Desg     BKN        20000     128.3     P2p Bound(PVST) *PVST_Inc
Gi0/4          Desg     BKN        20000     128.4     P2p Bound(PVST) *PVST_Inc

```

!

! Now the Arista switch will be configured as the CIST root bridge by assigning VLAN 1 a priority of 4096. Note resulting spanning tree topology

```
ARISTA.17:07:22(config)#spanning-tree vlan 1 priority 4096
```

!

! The Arista switch sees itself as root bridge for VLAN 1 and 10, as expected. Also note that it believes itself to be the root for VLAN 20 as well despite no change in priority. The reason for this may not be clear right now, but it will be in a moment

```
ARISTA.17:08:55(config)#sh span
```

```
VL1
```

```
Spanning tree enabled protocol rapid-pvst
```

```
Root ID Priority 4097
```

```
Address 001c.730c.25f0
```

```
This bridge is the root
```

```
Bridge ID Priority 4097 (priority 4096 sys-id-ext 1)
```

```
Address 001c.730c.25f0
```

```
Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

```
Interface      Role      State      Cost      Prio.Nbr  Type
-----
```

```

Et1            designated forwarding 20000     128.1     P2p Boundary(STP)
Et2            designated forwarding 20000     128.2     P2p
Et4            designated forwarding 20000     128.4     P2p
Et6            designated forwarding 20000     128.6     P2p

```

```
VL10
```

```
Spanning tree enabled protocol rapid-pvst
```

```
Root ID Priority 4106
```

```
Address 001c.730c.25f0
```

```
This bridge is the root
```

```
Bridge ID Priority 4106 (priority 4096 sys-id-ext 10)
```

```
Address 001c.730c.25f0
```

```
Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

```

Interface      Role      State      Cost      Prio.Nbr  Type
-----
Et1            designated forwarding 20000      128.1     P2p Boundary(STP)
Et2            designated forwarding 20000      128.2     P2p Boundary(STP)
Et4            designated forwarding 20000      128.4     P2p Boundary(STP)
Et6            designated forwarding 20000      128.6     P2p Boundary(STP)

```

VL20

Spanning tree enabled protocol rapid-pvst

Root ID Priority 32788

Address 001c.730c.25f0

This bridge is the root

Bridge ID Priority 32788 (priority 32768 sys-id-ext 20)

Address 001c.730c.25f0

Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec

```

Interface      Role      State      Cost      Prio.Nbr  Type
-----
Et1            designated forwarding 20000      128.1     P2p Boundary(STP)
Et2            designated forwarding 20000      128.2     P2p Boundary(STP)
Et4            designated forwarding 20000      128.4     P2p Boundary(STP)
Et6            designated forwarding 20000      128.6     P2p Boundary(STP)

```

!

! The reason why the Arista switch believes itself to be root for VLAN 20 despite no change in configured priority is because, as we can see below, the Cisco switch has no forwarding ports

CISCO#

```
3w4d: %SPANTREE-2-PVSTSIM_FAIL: Blocking root port Gi0/1: Inconsistent inferior PVST BPDU
received on VLAN 20, claiming root 32788:001c.730c.25f0
```

!

CISCO#sh span

MST0

Spanning tree enabled protocol mstp

Root ID Priority 4097

Address 001c.730c.25f0

Cost 20000

Port 1 (GigabitEthernet0/1)

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32768 (priority 32768 sys-id-ext 0)

Address 001d.a143.f900

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

```

Interface      Role      State      Cost      Prio.Nbr  Type
-----
Gi0/1          Desg     BKN        20000      128.1     P2p Bound(PVST) *PVST_Inc
Gi0/2          Desg     BKN        20000      128.2     P2p Bound(PVST)
Gi0/3          Desg     BKN        20000      128.3     P2p Bound(PVST)
Gi0/4          Desg     BKN        20000      128.4     P2p Bound(PVST)

```

The only port that could have forwarded BPDUs is in a BKN\* state because in this circumstance the first rule of the PVST Simulation check is being violated, which again states:

"If the root bridge for CIST is within a non-MST region, the spanning-tree priority of VLANs 2 and above within that domain must be better (lesser) than that of VLAN 1."

This rule applies because the Arista switch is not running MST, and is therefore within a non- MST region, and is now the CIST root due to the priority for VLAN 1 being configured at 4096, which is the same or less (better) than the configured priority for VLAN 10, and of course the unmodified priority of VLAN 20.

! In order to clear this "inconsistency", VLAN 1 will be configured with a priority of 8192, and VLAN 20 will be configured with a priority of 4096. Note the resulting spanning tree topology

```
ARISTA.17:25:08(config)#spanning-tree vlan 1 priority 8192
```

```
ARISTA.17:25:08(config)#spanning-tree vlan 20 priority 4096
```

```
!
```

! The spanning tree output from the Arista switch is as expected

```
ARISTA.17:25:31(config)#sh span
```

```
VL1
```

```
Spanning tree enabled protocol rapid-pvst
```

```
Root ID    Priority    8193
Address    001c.730c.25f0
```

```
This bridge is the root
```

```
Bridge ID  Priority    8193 (priority 8192 sys-id-ext 1)
```

```
Address    001c.730c.25f0
```

```
Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

```
Interface    Role        State        Cost        Prio.Nbr Type
```

```
-----
```

Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p
Et2	designated	forwarding	20000	128.2	P2p
Et4	designated	forwarding	20000	128.4	P2p
Et6	designated	forwarding	20000	128.6	P2p

```
VL10
```

```
Spanning tree enabled protocol rapid-pvst
```

```
Root ID    Priority    4106
Address    001c.730c.25f0
```

```
This bridge is the root
```

```
Bridge ID  Priority    4106 (priority 4096 sys-id-ext 10)
```

```
Address    001c.730c.25f0
```

```
Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

```
Interface    Role        State        Cost        Prio.Nbr Type
```

```
-----
```

Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p Boundary(STP)
Et2	designated	forwarding	20000	128.2	P2p Boundary(STP)
Et4	designated	forwarding	20000	128.4	P2p Boundary(STP)
Et6	designated	forwarding	20000	128.6	P2p Boundary(STP)

```
VL20
```

```
Spanning tree enabled protocol rapid-pvst
```

```
Root ID    Priority    4116
Address    001c.730c.25f0
```

```
This bridge is the root
```

```
Bridge ID  Priority    4116 (priority 4096 sys-id-ext 20)
```

```
Address    001c.730c.25f0
```

```
Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

```
Interface    Role        State        Cost        Prio.Nbr Type
```

```
-----
```

Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p Boundary(STP)
Et2	designated	forwarding	20000	128.2	P2p Boundary(STP)
Et4	designated	forwarding	20000	128.4	P2p Boundary(STP)
Et6	designated	forwarding	20000	128.6	P2p Boundary(STP)

```
!
```

! The Cisco switch clears the PVST Simulation inconsistency and restores the port to normal operation. The switchport is now forwarding and the Cisco switch agrees that the Arista switch is the CIST root bridge

```

CISCO#
3w4d: %SPANTREE-2-PVSTSIM_OK: PVST Simulation inconsistency cleared on port
GigabitEthernet0/1.
!
CISCO#sh spanning-tree mst 0
##### MST0 vlans mapped: 1-4094
Bridge address 001d.a143.f900 priority 32768 (32768 sysid 0)
Root address 001c.730c.25f0 priority 8193 (8192 sysid 1)
port Gi0/1 path cost 20000
Regional Root this switch
Operational hello time 2 , forward delay 15, max age 20, txholdcount 6
Configured hello time 2 , forward delay 15, max age 20, max hops 20
Interface          Role          State      Cost      Prio.Nbr  Type
-----
Gi0/1              Root         FWD        20000     128.1     P2p Bound (PVST)
Gi0/2              Altn        BLK        20000     128.2     P2p Bound (PVST)
Gi0/3              Altn        BLK        20000     128.3     P2p Bound (PVST)
Gi0/4              Altn        BLK        20000     128.4     P2p Bound (PVST)
    
```

When taking this behavior into account, it is understandable that migrations from a per-VLAN spanning tree implementation to MST can be challenging - especially in mixed-vendor environments with Cisco and its PVST Simulation feature.

### Interoperability With Cisco PVRST+

The same interoperability behavior exhibited in the use case with Cisco PVST+ will apply in this situation as well.

#### APPENDIX A - INTEROPERABILITY MATRIX

Arista / Cisco Spanning Tree Mode	Arista MST	Arista Rapid-PVST
Cisco MST	No issues.**	Be aware of the implications of Cisco's proprietary PVST Simulation feature.  If the Arista switch is to be the CIST root bridge, VLANs 2 and above on the Arista switch must be configured with a lower (better) priority than VLAN 1. This adheres to the first rule of the PVST Simulation check.  If the Arista switch is NOT to be the CIST root bridge, ALL VLANs on the Arista switch must be configured with a higher (worse) priority than the CIST root bridge in order to adhere to the second rule of the PVST Simulation check (and not to overtake the role of the CIST root bridge).**
Cisco PVRST+	Be aware of the implications of the tunneling effect of Cisco's proprietary SSTP feature.  If the Arista switch is to be root bridge of the CIST, determine which Cisco switches should be the root bridge for their respective VLANs outside of the CIST and utilize spanning tree priority in order to maintain a stable, predictable topology.**	Configure the Cisco switch with the spanningtree pathcost method long command.**
Cisco PVST+	Same as with Cisco PVRST+.**	Configure the Cisco switch with the spanningtree pathcost method long command.**



\*\* With all spanning tree protocols on IOS-based Cisco switches, consider utilizing the spanning-tree cost interface command on appropriate port channels to prevent the STP cost being updated on a port channel when a member link is added or removed, and to address situations where you need to equalize port path costs between Arista and Cisco switches. Be wary of the caveats described in the "Port Channel Behavior" section.

## Appendix B - Other Concerns

### Multiple MSTIs

In a situation where multiple Multiple Spanning Tree Instances (MSTIs) are being leveraged, this has no added effect on interoperability. MSTP does not send a BPDU for every spanning tree instance. MSTIs are communicated via MRecord fields (one for every instance) within the BPDU sent through the Internal Spanning Tree (IST) of a single MST region<sup>4</sup>.

```

▼ MST Extension
  MST Config ID format selector: 0
  MST Config name: Brewery
  MST Config revision: 0
  MST Config digest: 9357ebb7a8d74dd5fef4f2bab50531aa
  CIST Internal Root Path Cost: 200000
  ▸ CIST Bridge Identifier: 32768 / 0 / 00:1e:f7:05:a8:80
  CIST Remaining hops: 20
▼ MSTID 1, Regional Root Identifier 24576 / 00:1e:f7:05:a8:80 ←
  ▸ MSTI flags: 0xfc (Master, Agreement, Forwarding, Learning, Port Role: Designated)
  MSTID 1, priority 24576 Root Identifier 00:1e:f7:05:a8:80
  Internal root path cost: 0
  Bridge Identifier Priority: 6
  Port identifier priority: 8
  Remaining hops: 20
▼ MSTID 2, Regional Root Identifier 32768 / 00:16:46:b5:8c:80 ←
  ▸ MSTI flags: 0xf8 (Master, Agreement, Forwarding, Learning, Port Role: Root)
  MSTID 2, priority 32768 Root Identifier 00:16:46:b5:8c:80
  Internal root path cost: 200000
  Bridge Identifier Priority: 8
  Port identifier priority: 8
  Remaining hops: 20

```

This is a function within MSTP itself and is separate from PVST Simulation functionality. It does not change interoperability. To verify this, the Arista switch will be configured to have three MSTIs. VLAN 1 will be mapped to MST0 (by default), VLAN 10 will be mapped to MST1, and VLAN 20 will be mapped to MST2.

```
ARISTA.14:45:12(config)#spanning-tree mst configuration
```

```
ARISTA.14:46:00(config-mst)#instance 1 vlan 10
```

```
ARISTA.14:46:14(config-mst)#instance 2 vlan 20
```

```
!
```

! The Arista switch will also have a priority of 4096 configured for MST0, with default priorities for MST1 and MST2

```
ARISTA.14:45:12(config)#spanning-tree mst 0 priority 4096
```

```
!
```

! The Cisco switch will be configured to have a priority of 4096 for VLAN 20, with default priorities for VLANs 1 and 10. Note the resulting spanning tree topology

```
CISCO(config)# spanning-tree vlan 20 priority 4096
```

```
!
```

! The Arista switch claims itself to be root for all MSTIs, including MST2 to which VLAN 20 is mapped, despite the Cisco switch being configured with a lower (better) priority for that VLAN. This is again because MSTP by itself is not VLAN aware

```
ARISTA.14:57:16#sh span
```

```
MST0
```

```
Spanning tree enabled protocol mstp
```

```
Root ID    Priority    4096
           Address    001c.730c.25f0
           This bridge is the root
```

```
Bridge ID  Priority    4096 (priority 4096 sys-id-ext 0)
           Address    001c.730c.25f0
           Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec
```

<sup>4</sup>"MSTP Tutorial Part 1: Inside a Region" - INE Blog - <http://blog.ine.com>

Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p Boundary(STP)
Et2	designated	forwarding	20000	128.2	P2p Boundary(STP)
Et4	designated	forwarding	20000	128.4	P2p Boundary(STP)
Et6	designated	forwarding	20000	128.6	P2p Boundary(STP)

MST1

Spanning tree enabled protocol mstp  
 Root ID Priority 32769  
 Address 001c.730c.25f0  
 This bridge is the root  
 Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)  
 Address 001c.730c.25f0  
 Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec

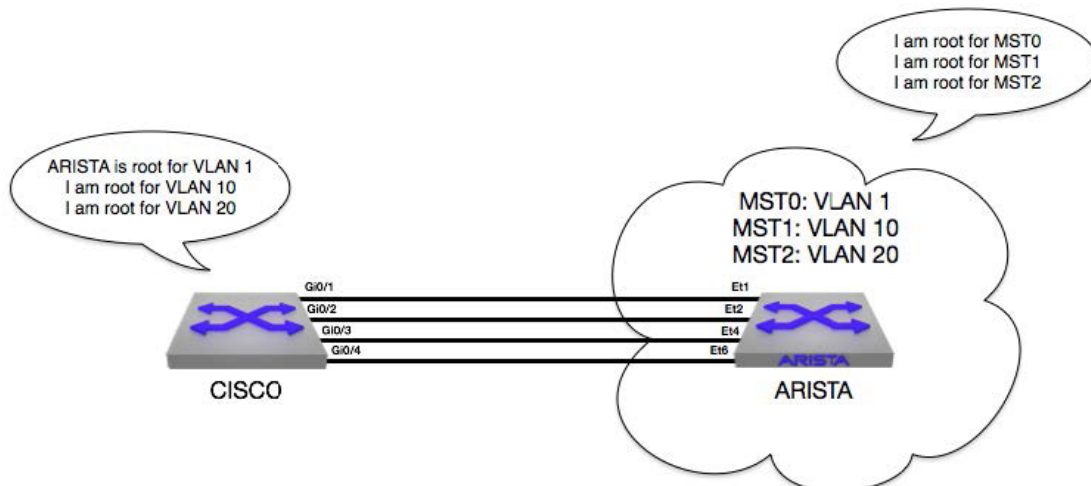
Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p Boundary(STP)
Et2	designated	forwarding	20000	128.2	P2p Boundary(STP)
Et4	designated	forwarding	20000	128.4	P2p Boundary(STP)
Et6	designated	forwarding	20000	128.6	P2p Boundary(STP)

MST2

Spanning tree enabled protocol mstp  
 Root ID Priority 32770  
 Address 001c.730c.25f0  
 This bridge is the root  
 Bridge ID Priority 32770 (priority 32768 sys-id-ext 2)  
 Address 001c.730c.25f0  
 Hello Time 2.000 sec Max Age 20 sec Forward Delay 15 sec

Interface	Role	State	Cost	Prio.Nbr	Type
Et1	designated	forwarding	20000	128.1	P2p Boundary(STP)
Et2	designated	forwarding	20000	128.2	P2p Boundary(STP)
Et4	designated	forwarding	20000	128.4	P2p Boundary(STP)
Et6	designated	forwarding	20000	128.6	P2p Boundary(STP)

While this looks more complicated, in reality it is the same interoperability behavior described in the “Interoperability with Cisco PVST+” section of the use case with Arista MSTP.



### Changing The VLAN-To-Instance Mapping

While removing or adding VLANs to MST instances certainly has effects on the spanning tree topology behavior that are outside the scope of this interoperability white paper, it does not change the actual interoperability behavior described within the various use cases. For example, an Arista switch leveraging MSTP will still have no effect outside of VLAN 1 on a Cisco switch running PVST+. Inversely, a Cisco switch running MSTP will still have an effect on every VLAN on a connected Arista switch running Rapid-PVST due to Cisco's PVST Simulation feature.

### Cisco Bug CSCta

While removing or adding VLANs to MST instances certainly has effects on the spanning tree topology behavior that are outside the scope of this interoperability white paper, it does not change the actual interoperability behavior described within the various use cases. For example, an Arista switch leveraging MSTP will still have no effect outside of VLAN 1 on a Cisco switch running PVST+. Inversely, a Cisco switch running MSTP will still have an effect on every VLAN on a connected Arista switch running Rapid-PVST due to Cisco's PVST Simulation feature.

#### Catalyst 2k and 3k series switches sending MST BPDU's tagged incorrectly CSCta17209

##### ▼ Description

###### Symptoms:

Ports will be put into blocking state due to P2P dispute when "vlan dot1q tag native" is configured. This happens because Catalyst2k and 3k series switches are incorrectly sending MST BPDU's as tagged in the native VLAN. Catalyst 7600 and 6500 series switches no longer accept tagged MST BPDU's due to changes in the code.

###### Conditions:

All of the following must be true:

- The switch is a Catalyst 2960/2970/3560/3750/3750ME or ME2400/ME3400.
- The command "vlan dot1q tag native" appears in the global configuration.

###### Workaround:

Remove the command "vlan dot1q tag native" from the switch's global configuration.

This issue is resolved starting with IOS release 12.2(52)SE.

Was the description about this Bug Helpful? ☆☆☆☆☆ (0)

##### ▼ Details

Last Modified: Mar 31,2013

Status: Fixed

Severity: 3 Moderate

Product: Cisco Catalyst  
3750 Series Switches

Known Affected Releases: (5)

12.2(50)SE3

12.2(50)SE2

12.2(50)SE1

12.2(50)SE

12.2(46)SE

Known Fixed Releases: (3)

12.2(52)SE

12.2(52)EX

12.2(53)SE

[Download software for Cisco Catalyst 3750 Series Switches](#)

<sup>5</sup> "Tagging the Native VLAN" - Network World.

<http://www.networkworld.com/community/node/38732>

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