MSTP (802.1s) is supported beginning with these software versions.

9300m:	08.0.01c
9408sl:	02.2.01h
4200vl:	L.10.01

MSTP Benefits

Load Balancing

- minimize CPU effort by allowing many VLANs to use same spanning tree root

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MSTP Benefits:

- load-balancing
- industry-standard
- minimize CPU utilization versus proprietary "per-VLAN" spanning tree (with per-VLAN, 200 VLANs means 200 spanning trees)
- backward-compatible (interoperable) with original 802.1D Spanning Tree Protocol (STP) and newer 802.1w Rapid Spanning Tree Protocol (RSTP)

MSTP Design: Regions

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What is an MST Region?

- a set of switches that all have the same spanning tree setup

How do switches know they're in the same region?

- physical neighbors communicate, and they're in the same region if these three items match their own configuration:
  1) region name ("mstp config name")
  2) revision number ("mstp config revision")
  3) VLAN-to-instance mapping ("mstp config instance <1-16> vlan <VID>")

So to create a region, configure several switches with the same MST parameters

- then the switches will run the same sets of spanning tree instances

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9300m syntax:

mstp config name <region-name>
mstp config revision <region-revision-number>
mstp config instance <1-16> vlan <VID or VID range>

9408sl syntax:

mstp name <region-name>
mstp revision <region-revision-number>
mstp instance <1-16> vlan <VID or VID range>

4200vl syntax:

span config-name <region-name>
span config-revision <region-revision-number>
span instance <1-16> vlan <VID or VID range>

MSTP Example Topology

9300m
MSTP Configuration

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MSTP configuration for the 9300m

9300m: MSTP Config Steps

Starting Point: config has nothing about spanning tree

Steps:

1) Configure VLANs, add ports
   - vlans 100-105, 200-205 for this example
   - all vlans on all links
2) Define the MST Region name
3) Define the MST Region revision number
   - (steps 2 and 3 can be performed as a single command)
4) Define the MST Region VLAN-to-instance mapping
5) Define instance priority
   - 9300m is instance 2 root, instance 1 backup root for this example
6) Define point-to-point links
7) Start MSTP operation
8) Define instance path-cost as desired
   - use path cost to force instance 1 blocking at 9300m, for this example

   NOTE: this step cannot be performed before "mstp start" (08.0.01c bug)

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NOTE: The 9300m will not allow you to add VLANs to an MST instance unless those VLANs already exist (with or without ports). You can issue the command and receive an error message for each non-existent VLAN, and the resulting config will correctly have only the VLANs that exist.

Also, the command "mstp inst 1 e 3/3 path-cost 30000" cannot be performed before "mstp start" - this is a bug in 08.0.01c software.

9300m: MSTP Config

VLANS 100-105
and 200-205
exist on all links

```
...
vlan 1 name DEFAULT-VLAN by port
!
vlan 100 name vlan100 by port
 tagged ethe 3/1 to 3/3
!
vlan 101 name vlan101 by port
 tagged ethe 3/1 to 3/3
!
...
vlan 204 name vlan204 by port
 tagged ethe 3/1 to 3/3
!
vlan 205 name vlan205 by port
 tagged ethe 3/1 to 3/3
!
!
mstp config name 100-and-200-vlans
  revision 8001
mstp config instance 1 vlan 100 to 105
mstp config instance 2 vlan 200 to 205
mstp instance 1 ethe 3/3 path-cost 30000
mstp instance 1 priority 4096
mstp instance 2 priority 0
mstp admin-pt2pt-mac ethe 3/1 to 3/3
mstp start
hostname 9300m
!
```

instance 1 parameters

instance 2 parameters

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All the MSTP config parameters appear in one section of the 9300m config file, but the parameters are grouped by parameter instead of by instance.

9300m: "show mstp"

```
9300m#sho mstp ?
  DECIMAL            MSTP instance number (0-4094, 0 represents CIST)
  debug              Debug
  ethernet           Ethernet port
  pending-changes    display pending MSTP configuration identifier changes
  |                  Output modifiers
  <cr>

9300m#sho mstp <cr>
Multiple Spanning Tree Protocol (IEEE 802.1s) is OPERATIONAL
 Configuration name: [100-and-200-vlans], revision level: 8001
 Total 3 MST instance(s):
  CIST 0 mapped vlans:  1 to 99 106 to 199 206 to 4094
  MSTI 1 mapped vlans:  100 to 105
  MSTI 2 mapped vlans:  200 to 205
 Disabled ports:
 Force version: 3
 Configured  hello time 2 forward delay 15 max age 20 max hops 20
 Operational hello time 2 forward delay 15 max age 20 max hops 20
9300m#
```

Instance 0 (zero) is the Internal Spanning Tree (IST). When MSTP is enabled on a switch, the IST is automatically created, and the IST holds all VLANs that are not defined to be in other instances. This display shows that all such VLANs, configured or not, are members of the "CIST".

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Instance 0 (zero) on a given switch is always a member of the "Common and Internal Spanning Tree" (CIST), and contains all VLANs that are not moved into another MST instance. The 9300m display shows it considers every VLAN available on the switch, whether or not it is currently configured, to be in instance 0, except for those that are defined in other instances.

On the 9300m, the "show mstp" command (without parameters) gives a summary. To see details for each instance, use the "show mstp <instance>" command, as shown on the next few slides.

9300m: "show mstp 0"

```
9300m#sho mstp 0
##### MST 0 vlans mapped: 1 to 99 106 to 199 206 to 4094
Member ports:   ethe 1/1 to 1/8 ethe 3/1 to 3/16
Bridge ID:      address 0004.8098.8900 priority 32768 (32768 sysid 0)
Root ID:        self
Reg Root ID:    self
Message age: 0  remaining hops: 20

Interface Role  State Designated ID    Ext-cost Int-cost Prio.Num  Pt2Pt Edge
3/1       Desg  FWD   8000000480988900 20000    20000    128.129   Y     N
3/2       Desg  FWD   8000000480988900 20000    20000    128.130   Y     N
3/3       Desg  FWD   8000000480988900 20000    20000    128.131   Y     N
9300m#
```

9304m is ROOT for IST (lowest MAC address)

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Without configuring instance 0, the normal STP algorithm selects root for instance 0 by lowest MAC address, which in this example is the 9304m.

9300m: "show mstp 1"

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```
9300m#sho mstp 1
##### MST 1 vlans mapped: 100 to 105
Member ports:   ethe 3/1 to 3/3
Bridge ID:      address 0004.8098.8900 priority 4097 (4096 sysid 1)
Reg Root ID:    address 000c.db20.dc80 priority 1 (0 sysid 1)
                port    3/3     int path cost:  30000
Remaining hops: 19

Interface Role  State Designated ID    Ext-cost Int-cost Prio.Num  Pt2Pt Edge
3/1       Altr  BLK   80010014c2d54300 --       20000    128.129   Y     N
3/2       Altr  BLK   8001001321145a00 --       20000    128.130   Y     N
3/3       Root  FWD   0001000cdb20dc80 --       30000    128.131   Y     N
9300m#
```

note the odd-looking priority listings (9304m is configured 4096)

9408sl is ROOT for instance 1

9304m does the blocking for instance 1 loops, due to higher path cost setting toward root

9304m is "blocking" for instance 1 on the paths to the closets, due to the higher path cost setting on int e 3/3 for instance 1.

9300m: "show mstp 2"

```
9300m#sho mstp 2
##### MST 2 vlans mapped: 200 to 205
Member ports:   ethe 3/1 to 3/3
Bridge ID:      address 0004.8098.8900 priority 2 (0 sysid 2)
Reg Root ID:    self
Remaining hops: 20

Interface Role  State Designated ID    Ext-cost Int-cost Prio.Num  Pt2Pt Edge
3/1       Desg  FWD   0002000480988900 --       20000    128.129   Y     N
3/2       Desg  FWD   0002000480988900 --       20000    128.130   Y     N
3/3       Desg  FWD   0002000480988900 --       20000    128.131   Y     N
9300m#
```

note the odd-looking priority for the 9304m (configured as zero)

9304m is ROOT for instance 2

9304m is root for instance 2.

9300m: other "show mstp" output

```
9300m#sho mstp debug
Config name: (100-and-200-vlans), rev=8001, fmt=0,
  digest=0x1ba13ba5931b81ef696eaef78dbd1050
forceVersion=3 migrateTime=3 txHoldCount=3
disabled ports:
9300m#

9300m#sho mstp pending
No pending configuration identifier changes
9300m#
```

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"Show mstp debug" displays the region parameters including the digest.

"Show mstp pending-changes" is used for transitioning the MST config, to see what it will look like after issuing the "mstp commit" command.

9300m: "show span" output

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"span" refers to 802.1D, which is not enabled on the 9304m

```
9300m#sho span
Spanning-tree is not configured on port-vlan 1.
Spanning-tree is not configured on port-vlan 100.
Spanning-tree is not configured on port-vlan 101.
Spanning-tree is not configured on port-vlan 102.
Spanning-tree is not configured on port-vlan 103.
Spanning-tree is not configured on port-vlan 104.
Spanning-tree is not configured on port-vlan 105.
Spanning-tree is not configured on port-vlan 200.
Spanning-tree is not configured on port-vlan 201.
Spanning-tree is not configured on port-vlan 202.
Spanning-tree is not configured on port-vlan 203.
Spanning-tree is not configured on port-vlan 204.
Spanning-tree is not configured on port-vlan 205.
9300m#
```


"Show span" is not an applicable command for MSTP. Also, "show 802-1w" gives similar output (for example, "IEEE 802-1w is not configured on port-vlan 1"), because 802.1w (RSTP) is not enabled on the 9300m.

9408sl
MSTP Configuration

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MSTP configuration for the 9408sl

9408sl: MSTP Config Steps

Starting Point: config has "no spanning-tree" at global level

- refers to 802.1D STP, which is indeed not running
- this item stays in the config file (looks odd, but it's correct)

Steps:

1) Configure VLANs, add ports
   - vlans 100-105, 200-205 for this example
   - all vlans on all links
2) Define the MST Region name
3) Define the MST Region revision number
4) Define the MST Region VLAN-to-instance mapping
5) Define instance priority
   - 9408sl is instance 1 root, instance 2 backup root for this example
6) Define instance path-cost as desired
   - use path cost to force instance 2 blocking at 9408sl, for this example
7) Define point-to-point links
8) Start MSTP operation

NOTE: The 9408sl will not allow you to add VLANs to an MST instance unless those VLANs already exist (with or without ports).

9408sl: MSTP Config

VLANS 100-105
and 200-205
exist on all links

```
...
no spanning-tree
!
vlan 100 name vlan100
 tagged ethe 4/1 to 4/3
!
vlan 101 name vlan101
 tagged ethe 4/1 to 4/3
!
...
vlan 204 name vlan204
 tagged ethe 4/1 to 4/3
!
vlan 205 name vlan205
 tagged ethe 4/1 to 4/3
!
vlan 1 name DEFAULT-VLAN
!
mstp name 100-and-200-vlans
mstp revision 8001
mstp instance 1 vlan 100 to 105
mstp instance 1 priority 0
mstp instance 2 vlan 200 to 205
mstp instance 2 priority 4096
mstp instance 2 ethe 4/3 path-cost 30000
mstp admin-pt2pt-mac ethe 4/1 to 4/3
mstp start
!
```

instance 1 parameters

instance 2 parameters

All the MSTP config parameters appear in one section of the 9408sl config file, grouped by instance.

9408sl: "show mstp" options

```
9408sl#sho mstp ?
  DECIMAL         displays mstp information for specific mstid
  configuration   displays mstp configuration
  detail          displays detailed mstp information
  |               Output modifiers
  <cr>
9408sl#
```

9408sl: "show mstp config"

```
9408sl#sho mstp config

MSTP CONFIGURATION
------------------
Name     : 100-and-200-vlans
Revision : 8001
Version  : 3 (MSTP mode)
Status   : Started

Instance VLANs
-------- -------------------------------------------------------
0        -
1        100 to 105
2        200 to 205
```

Instance 0 (zero) is the Internal Spanning Tree (IST). When MSTP is enabled on a switch, the IST is automatically created, and the IST holds all VLANs that are not defined to be in other instances. This display has an error - VLAN 1, the "Default_VLAN", exists on the switch, and holds all untagged ports, so VLAN 1 is actually in the IST.

Display error here: instance 0 (zero) is the Internal Spanning Tree (IST), which contains all VLANs that are not moved into another MST instance. VLAN 1 (the Default_VLAN) exists on the switch, so it should be listed here as a member of instance 0.

9408sl: "show mstp 0"

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not true, VLAN 1 is in IST

9304m is ROOT for IST

```
9408sl#sho mstp 0

MSTP Instance 0 (CIST) - VLANs: None
-----------------------------------------------------------------------------
Bridge            Bridge Bridge Bridge Bridge Root   Root   Root   Root
Identifier        MaxAge Hello  FwdDly Hop    MaxAge Hello  FwdDly Hop
hex               sec    sec    sec    cnt    sec    sec    sec    cnt
8000000cdb20dc80  20     2      15     20     20     2      15     19

Root              ExtPath   RegionalRoot      IntPath   Designated        Root
Bridge            Cost      Bridge            Cost      Bridge            Port
hex                         hex                         hex
8000000480988900  0         8000000480988900  20000     8000000480988900  4/3

Port  Pri PortPath  P2P Edge Role       State      Designa-  Designated
Num       Cost      Mac Port                       ted cost  bridge
4/1   128 20000     T   F    DESIGNATED FORWARDING 0         8000000cdb20dc80
4/2   128 20000     T   F    DESIGNATED FORWARDING 0         8000000cdb20dc80
4/3   128 20000     T   F    ROOT       FORWARDING 0         8000000480988900

9408sl#
```


On the 9408sl, "span" refers to 802.1D STP, "rstp" refers to 802.1w RSTP, and "mstp" refers to 802.1s MSTP. Command "show span" gives no response because 802.1D is not running, and "show rstp" and "show 802-1w" also give no response because 802.1w is not running.

Instance zero (0) is the "Internal Spanning Tree", or IST. Whenever MSTP is enabled, the switch has an instance 0, which holds all VLANs that are not placed in other instances. It's easy to forget VLAN 1, the Default_VLAN - but MSTP knows it's there, and the IST takes care of eliminating loops on VLAN 1.

On the 9408sl, the "show mstp" command (without parameters) gives the combined outputs of "show mstp 0", "show mstp 1", etc, for all configured instances.

9408sl: "show mstp 1"

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```
9408sl#sho mstp 1

MSTP Instance 1 - VLANs: 100 to 105
-----------------------------------------------------------------------------
Bridge            Max RegionalRoot     IntPath   Designated        Root  Root
Identifier        Hop Bridge           Cost      Bridge            Port  Hop
hex               cnt hex                        hex                     cnt
0001000cdb20dc80 20  0001000cdb20dc80 0         0001000cdb20dc80 Root  20

Port  Pri PortPath  P2P Edge Role       State      Designa-  Designated
Num       Cost      Mac Port                      ted cost  bridge
4/1   128 20000     T   F    DESIGNATED FORWARDING 0         0001000cdb20dc80
4/2   128 20000     T   F    DESIGNATED FORWARDING 0         0001000cdb20dc80
4/3   128 20000     T   F    DESIGNATED FORWARDING 0         0001000cdb20dc80

9408sl#
```

9408sl is ROOT for instance 1

9408sl is root for instance 1.

9408sl: "show mstp 2"

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```
9408sl#sho mstp 2

MSTP Instance 2 - VLANs: 200 to 205
-----------------------------------------------------------------------------
Bridge            Max RegionalRoot     IntPath   Designated       Root  Root
Identifier        Hop Bridge           Cost      Bridge           Port  Hop
hex               cnt hex                        hex                    cnt
1002000cdb20dc80 20  0002000480988900 30000     0002000480988900 4/3   19

Port  Pri PortPath  P2P Edge Role       State       Designa-  Designated
Num       Cost      Mac Port                       ted cost  bridge
4/1   128 20000     T   F    ALTERNATE  DISCARDING  20000     80020014c2d54300
4/2   128 20000     T   F    ALTERNATE  DISCARDING  20000     8002001321145a00
4/3   128 30000     T   F    ROOT       FORWARDING  0         0002000480988900

9408sl#
```

9408sl is blocking paths for instance 2

9408sl is "blocking" (now called "discarding") for instance 2, on the paths to the closets. This is due to setting the port cost to 30000, to make the preferred path through the closet for instance 2 traffic, not through the 9408sl.

9408sl: "show mstp detail" - 1

```
9408sl#sho mstp detail
MSTP Instance 0 (CIST) - VLANs: None
-----------------------------------------------------------------------------
  Bridge: 8000000cdb20dc80 [Priority 32768, SysId 0, Mac 000cdb20dc80]
  FwdDelay 15, HelloTime 2, MaxHops 20, TxHoldCount 6

Port 4/1 - Role: DESIGNATED - State: FORWARDING
  PathCost 20000, Priority 128, OperEdge F, OperPt2PtMac T, Boundary F
  Designated   - Root 8000000480988900, RegionalRoot 8000000480988900,
                 Bridge 8000000cdb20dc80, ExtCost 0, IntCost 20000
  ActiveTimers - helloWhen 2
  MachineState - PRX-RECEIVE, PTX-IDLE, PPM-SENDING_RSTP, PIM-CURRENT
                 PRT-ACTIVE_PORT, PST-FORWARDING, TCM-ACTIVE
  BPDUs        - Rcvd MST 403, RST 0, Config 0, TCN 0
                 Sent MST 436, RST 0, Config 0, TCN 0

Port 4/2 - Role: DESIGNATED - State: FORWARDING
  PathCost 20000, Priority 128, OperEdge F, OperPt2PtMac T, Boundary F
  Designated   - Root 8000000480988900, RegionalRoot 8000000480988900,
                 Bridge 8000000cdb20dc80, ExtCost 0, IntCost 20000
  ActiveTimers - helloWhen 2
  MachineState - PRX-RECEIVE, PTX-IDLE, PPM-SENDING_RSTP, PIM-CURRENT
                 PRT-ACTIVE_PORT, PST-FORWARDING, TCM-ACTIVE
  BPDUs        - Rcvd MST 45, RST 0, Config 0, TCN 0
                 Sent MST 436, RST 0, Config 0, TCN 0
... (cont'd)
```


On the 9408sl, "show mstp detail" gives more specific port information for each instance.

9408sl: "show mstp detail" - 2

```
...
Port 4/3 - Role: ROOT - State: FORWARDING
  PathCost 20000, Priority 128, OperEdge F, OperPt2PtMac T, Boundary F
  Designated   - Root 8000000480988900, RegionalRoot 8000000480988900,
                 Bridge 8000000480988900, ExtCost 0, IntCost 0
  ActiveTimers - helloWhen 2 rrWhile 15 rcvdInfoWhile 4
  MachineState - PRX-RECEIVE, PTX-IDLE, PPM-SENDING_RSTP, PIM-CURRENT
                 PRT-ACTIVE_PORT, PST-FORWARDING, TCM-ACTIVE
  BPDUs        - Rcvd MST 396, RST 0, Config 0, TCN 0
                 Sent MST 436, RST 0, Config 0, TCN 0
...(cont'd)
```

9408sl: "show mstp detail" - 3

```
...
MSTP Instance 1 - VLANs: 100 to 105
-----------------------------------------------------------------------------
  Bridge: 0001000cdb20dc80 [Priority 0, SysId 1, Mac 000cdb20dc80]

Port 4/1 - Role: DESIGNATED - State: FORWARDING
  PathCost 20000, Priority 128
  Designated   - RegionalRoot 0001000cdb20dc80, IntCost 0
                 Bridge 0001000cdb20dc80
  ActiveTimers -
  MachineState - PIM-CURRENT, PRT-ACTIVE_PORT, PST-FORWARDING, TCM-ACTIVE

Port 4/2 - Role: DESIGNATED - State: FORWARDING
  PathCost 20000, Priority 128
  Designated   - RegionalRoot 0001000cdb20dc80, IntCost 0
                 Bridge 0001000cdb20dc80
  ActiveTimers -
  MachineState - PIM-CURRENT, PRT-ACTIVE_PORT, PST-FORWARDING, TCM-ACTIVE

Port 4/3 - Role: DESIGNATED - State: FORWARDING
  PathCost 20000, Priority 128
  Designated   - RegionalRoot 0001000cdb20dc80, IntCost 0
                 Bridge 0001000cdb20dc80
  ActiveTimers -
  MachineState - PIM-CURRENT, PRT-ACTIVE_PORT, PST-FORWARDING, TCM-ACTIVE
...(cont'd)
```

9408sl: "show mstp detail" - 4

```
...
MSTP Instance 2 - VLANs: 200 to 205
-------------------------------------------------------------------------------
  Bridge: 1002000cdb20dc80 [Priority 4096, SysId 2, Mac 000cdb20dc80]

Port 4/1 - Role: ALTERNATE - State: DISCARDING
  PathCost 20000, Priority 128
  Designated   - RegionalRoot 0002000480988900, IntCost 20000
                 Bridge 80020014c2d54300
  ActiveTimers - fdWhile 15 rcvdInfoWhile 4
  MachineState - PIM-CURRENT, PRT-BLOCKED_PORT, PST-DISCARDING, TCM-INACTIVE

Port 4/2 - Role: ALTERNATE - State: DISCARDING
  PathCost 20000, Priority 128
  Designated   - RegionalRoot 0002000480988900, IntCost 20000
                 Bridge 8002001321145a00
  ActiveTimers - fdWhile 15 rcvdInfoWhile 4
  MachineState - PIM-CURRENT, PRT-BLOCKED_PORT, PST-DISCARDING, TCM-INACTIVE

Port 4/3 - Role: ROOT - State: FORWARDING
  PathCost 30000, Priority 128
  Designated   - RegionalRoot 0002000480988900, IntCost 0
                 Bridge 0002000480988900
  ActiveTimers - rrWhile 15 rcvdInfoWhile 6
  MachineState - PIM-CURRENT, PRT-ACTIVE_PORT, PST-FORWARDING, TCM-ACTIVE
```

4200vl
MSTP Configuration

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MSTP configuration for the 4200vl

4200vl: MSTP Config Steps

Starting Point: default spanning-tree protocol is MSTP, nothing to change

Steps:

1) Configure VLANs, add ports
   - vlans 100-105, 200-205 for this example
   - all vlans on all links
2) Define the MST Region name
3) Define the MST Region revision number
4) Define the MST Region VLAN-to-instance mapping
5) Define instance priority
   - 4200vl "closet" switches use default priority for this example
6) Define instance path-cost as desired
   - 4200vl "closet" switches use default path-costs for this example
7) Define endnode ports ("edge ports") for the closet switches
   - 4200vl ports are all "edge" "no" by default, change to "yes" as appropriate
8) Enable spanning tree

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NOTE: The 4200vl allows you to configure VLANs in an MST instance even if those VLANs do not already exist on the switch. However, only the existing VLANs show up in the config file. If you add VLANs to the switch later, they must be moved into the desired MST instance.

4200vl: MSTP Config - Closet 1

VLANS 100-105
and 200-205
exist on all links

```
...
vlan 1
   name "DEFAULT_VLAN"
   untagged 1-48
   ip address 10.10.10.142 255.255.255.0
   exit
vlan 100
   name "vlan100"
   no ip address
   tagged 3-4
   exit
vlan 101
   name "vlan101"
   no ip address
   tagged 3-4
   exit
...
```

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On the 4200vl "closet" switches, bridge priority setting is the default value of 8, but the actual priority is that setting multiplied by 4096 (to give bridge priority of 32768).

4200vl: MSTP Config - Closet 1 cont'd

VLANS 100-105
and 200-205
exist on all links

```
...
vlan 205
   name "vlan205"
   no ip address
   tagged 3-4
   exit
spanning-tree
spanning-tree 1 edge-port
spanning-tree 2 edge-port
spanning-tree 5 edge-port
spanning-tree 6 edge-port
spanning-tree 7 edge-port
...
spanning-tree 47 edge-port
spanning-tree 48 edge-port
spanning-tree config-name "100-and-200-vlans"
spanning-tree config-revision 8001
spanning-tree instance 1 vlan 100-105
spanning-tree instance 2 vlan 200-205
```

ports 3 and 4 stay at default, no edge-port

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On the 4200vl "closet" switches, default MSTP "edge-port" setting is "no". Because the closet has only 2 switch-to-switch links, simplest way to get all endnode ports to be edge-ports is with these commands (for closet 1):

span all edge-port
no span 3,4 edge-port
wri mem

4200vl: "show span config" - Closet 1

```
closet_1# sho span config

 Multiple Spanning Tree (MST) Configuration Information

  STP Enabled [No] : Yes
  Force Version [MSTP-operation] : MSTP-operation
  Default Path Costs [802.1t] : 802.1t
  MST Configuration Name : 100-and-200-vlans
  MST Configuration Revision : 8001     Switch Priority : 32768
  Forward Delay [15] : 15               Hello Time [2] : 2
  Max Age [20] : 20                     Max Hops [20] : 20

  Port Type      | Cost      Priority Edge Point-to-Point MCheck Hello Time
  ---- --------- + --------- -------- ---- -------------- ------ ----------
  1    100/1000T | Auto      128      Yes  Force-True     Yes    Use Global
  2    100/1000T | Auto      128      Yes  Force-True     Yes    Use Global
  3    100/1000T | Auto      128      No   Force-True     Yes    Use Global
  4    100/1000T | Auto      128      No   Force-True     Yes    Use Global
  5    100/1000T | Auto      128      Yes  Force-True     Yes    Use Global
  6    100/1000T | Auto      128      Yes  Force-True     Yes    Use Global
  7    100/1000T | Auto      128      Yes  Force-True     Yes    Use Global
```

4200vl: "show span mst-config"

```
closet_1# sho span mst-conf

 MST Configuration Identifier Information

  MST Configuration Name : 100-and-200-vlans
  MST Configuration Revision : 8001
  MST Configuration Digest : 0x1BA13BA5931B81EF696EAEF78DBD1050

  IST Mapped VLANs : 1

  Instance ID Mapped VLANs
  ----------- ------------------------------------------------------------
  1           100-105
  2           200-205
```

IST (instance 0) has the Default_VLAN (VLAN 1)

4200vl: "show span instance ist"

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```
closet_1# sho span inst ist

 IST Instance Information

  Instance ID : 0
  Mapped VLANs : 1
  Switch Priority          : 32768
  Topology Change Count    : 1
  Time Since Last Change   : 5 mins

  Regional Root MAC Address : 000480-988900
  Regional Root Priority    : 32768
  Regional Root Path Cost   : 20000
  Regional Root Port        : 3
  Remaining Hops            : 19

                                                   Designated
  Port Type      Cost      Priority Role       State      Bridge
  ---- --------- --------- -------- ---------- ---------- -------------
  1    100/1000T Auto      128      Disabled   Disabled
  2    100/1000T Auto      128      Disabled   Disabled
  3    100/1000T 20000     128      Root       Forwarding 000480-988900
  4    100/1000T 20000     128      Alternate  Blocking   000cdb-20dc80
  5    100/1000T Auto      128      Disabled   Disabled
  6    100/1000T Auto      128      Disabled   Disabled
  7    100/1000T Auto      128      Disabled   Disabled
...
```

9304m is ROOT for instance 0 (IST)

On the 4200vl switches, you cannot use the number 0 (zero) for instance 0, you have to use the keyword "ist".

4200vl: "show span instance 1"

```
closet_1# sho span inst 1

 MST Instance Information

  Instance ID : 1
  Mapped VLANs : 100-105
  Switch Priority          : 32768
  Topology Change Count    : 4
  Time Since Last Change   : 5 mins

  Regional Root MAC Address : 000cdb-20dc80
  Regional Root Priority    : 0
  Regional Root Path Cost   : 20000
  Regional Root Port        : 4
  Remaining Hops            : 19

                                                        Designated
  Port Type      Cost      Priority Role       State      Bridge
  ---- --------- --------- -------- ---------- ---------- -------------
  1    100/1000T Auto      128      Disabled   Disabled
  2    100/1000T Auto      128      Disabled   Disabled
  3    100/1000T 20000     128      Designated Forwarding 0014c2-d54300
  4    100/1000T 20000     128      Root       Forwarding 000cdb-20dc80
  5    100/1000T Auto      128      Disabled   Disabled
  6    100/1000T Auto      128      Disabled   Disabled
  7    100/1000T Auto      128      Disabled   Disabled
...
```

9408sl is ROOT for instance 1

4200vl: "show span instance 2"

```
closet_1# sho span inst 2

 MST Instance Information

  Instance ID : 2
  Mapped VLANs : 200-205
  Switch Priority          : 32768
  Topology Change Count    : 4
  Time Since Last Change   : 5 mins

  Regional Root MAC Address : 000480-988900
  Regional Root Priority    : 0
  Regional Root Path Cost   : 20000
  Regional Root Port        : 3
  Remaining Hops            : 19

                                                   Designated
  Port Type      Cost      Priority Role       State      Bridge
  ---- --------- --------- -------- ---------- ---------- -------------
  1    100/1000T Auto      128      Disabled   Disabled
  2    100/1000T Auto      128      Disabled   Disabled
  3    100/1000T 20000     128      Root       Forwarding 000480-988900
  4    100/1000T 20000     128      Designated Forwarding 0014c2-d54300
  5    100/1000T Auto      128      Disabled   Disabled
  6    100/1000T Auto      128      Disabled   Disabled
  7    100/1000T Auto      128      Disabled   Disabled
...
```

9304m is ROOT for instance 2

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