



## Multiple Spanning Tree (MST) Traffic Engineering

« Rapid Spanning Tree (RSTP) Traffic Engineering | STP Bridge Assurance »

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#### Note:

Configure the tasks "VLANs & Trunking" and "Port Channels" prior to beginning this lab.

### Objective

- Influence layer 2 traffic flows by modifying the MST Root Bridge and Root Port elections.

### Task

- Per the previous task the network should be configured as follows:
  - The first server's link to the first 5K is in VLAN 10 with address 10.0.0.1X/24, where X is the server number.
  - The first server's link to the second 5K is in VLAN 20 with address 20.0.0.1X/24, where X is the server number.
  - The second server's link to the first 5K is in VLAN 20 with address 20.0.0.1X/24, where X is the server number.
  - The second server's link to the second 5K is in VLAN 10 with address 10.0.0.1X/24, where X is the server number.
  - 5Ks and 7Ks have SVIs for VLANs 10 & 20 with IP addressing 10.0.0.X/24 and 20.0.0.X/24 respectively, where X is the device number.
  - 5Ks have access ports to the servers and trunk ports to the 7Ks, and the 7Ks have trunks to the 5Ks.
  - Port-Channel5 is configured between the 5Ks, Port-Channel7 is configured between the 7Ks, and both are trunks.
- Modify your previous configuration as follows:
  - Re-enable the diagonal links between the 5Ks and 7Ks, and configure them as trunks.
  - Allow all VLANs on all trunks on both the 5Ks and 7Ks.
- Configure Multiple Spanning-Tree between the switches as follows:
  - Configure the switches in MST region 100 named MST100.
  - VLANs 10, 30, and 50 should be in MST instance 1.
  - VLANs 20, 40, and 60 should be in MST instance 2.
- Once complete you should have IP reachability between the servers in both VLANs 10 & 20.
- Modify path selection for MST as follows:
  - Set your first 7K to be the MST Root Bridge for instance 1, with the other 7K being the backup Root Bridge.
  - Your first 5K should switch traffic through the second 5K to reach the Root Bridge for instance 1.
  - Set your second 7K to be the MST Root Bridge for instance 2, with the other 7K being the backup Root Bridge.
  - Your second 5K should switch traffic through the first 5K to reach the Root Bridge for instance 2.
  - Set your first 5K to be the Root Bridge for the CIST.
- Verify the new Root Bridge elections for both MST instances 1 & 2 and that layer 2 traffic is flowing between the servers as specified.

### Configuration [Click to collapse](#)

```
N5K1:
vlan 10,20,30,40,50,60
!
spanning-tree mode mst
spanning-tree mst 0 priority 0
spanning-tree mst configuration
  name MST100
  revision 100
  instance 1 vlan 10,30,50
  instance 2 vlan 20,40,60
!
interface Ethernet1/1
  switchport
  switchport mode access
  switchport access vlan 10
  no shutdown
!
interface Ethernet1/2
  switchport
  switchport mode access
  switchport access vlan 20
  no shutdown
!
interface Ethernet1/3 - 4
  switchport
  switchport mode trunk
  channel-group 5
  no shutdown
!
interface port-channel5
  switchport mode trunk
  speed 10000
!
interface Ethernet1/5 - 6
  switchport
  switchport mode trunk
  spanning-tree mst 1 cost 99999
  no shutdown
```

```
N5K2:
vlan 10,20,30,40,50,60
!
spanning-tree mode mst
spanning-tree mst configuration
  name MST100
  revision 100
  instance 1 vlan 10,30,50
  instance 2 vlan 20,40,60
!
```

```

interface Ethernet1/1
  switchport
  switchport mode access
  switchport access vlan 20
  no shutdown
!
interface Ethernet1/2
  switchport
  switchport mode access
  switchport access vlan 10
  no shutdown
!
interface Ethernet1/3 - 4
  switchport
  switchport mode trunk
  channel-group 5
  no shutdown
!
interface port-channel5
  switchport mode trunk
  speed 10000
!
interface Ethernet1/5 - 6
  switchport
  switchport mode trunk
  spanning-tree mst 2 cost 99999
  no shutdown

```

#### **N7K1:**

```

feature lacp
!
vlan 10,20,30,40,50,60
!
spanning-tree mode mst
spanning-tree mst 1 priority 4096
spanning-tree mst 2 priority 8192
spanning-tree mst configuration
  name MST100
  revision 100
  instance 1 vlan 10,30,50
  instance 2 vlan 20,40,60
!
interface Ethernet1/1 - 2
  lacp rate fast
  switchport
  switchport mode trunk
  channel-group 7 mode active
  no shutdown
!
interface port-channel7
  switchport
  switchport mode trunk
  lacp min-links 2
!
interface Ethernet1/3
  switchport
  switchport mode trunk
  spanning-tree vlan 20 cost 1
  no shutdown
!
interface Ethernet1/4
  switchport
  switchport mode trunk
  no shutdown

```

#### **N7K2:**

```

feature lacp
!
vlan 10,20,30,40,50,60
!
spanning-tree mode mst
spanning-tree mst 1 priority 8192
spanning-tree mst 2 priority 4096
spanning-tree mst configuration
  name MST100
  revision 100
  instance 1 vlan 10,30,50
  instance 2 vlan 20,40,60
!
interface Ethernet1/1 - 2
  lacp rate fast
  switchport
  switchport mode trunk
  channel-group 7 mode active
  no shutdown
!
interface port-channel7
  switchport
  switchport mode trunk
  lacp min-links 2
!
interface Ethernet1/3 - 4
  switchport
  switchport mode trunk
  no shutdown

```

## Verification

To be in the same MST Region, all switches must have an identical configuration of the MST Region Name, Revision Number, and VLAN to Instance mappings.

<https://t.me/learningnets>

```

N5K1# show spanning-tree mst configuration
Name      [MST100]
Revision  100   Instances configured 3
Instance  Vlans mapped
-----
0         1-9,11-19,21-29,31-39,41-49,51-59,61-4094
1         10,30,50
2         20,40,60
-----

```

The Common Internal Spanning-Tree (CIST) is the default fallback instance (instance zero) for all VLANs that are not explicitly assigned to another region. Root Bridge election rules in MST are the same as Rapid PVST, where the device with the lowest priority number and MAC address wins the election.

```

N5K1# show spanning-tree mst 0

#### MST0 vlans mapped: 1-9,11-19,21-29,31-39,41-49,51-59,61-4094
Bridge address 00de.fb12.1a7c priority 0 (0 sysid 0)
Root this switch for the CIST
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 Sts Cost      Prio.Nbr Type
-----
Po5             Desg FWD 1000    128.4100 P2p
Eth1/1          Desg FWD 2000    128.129  P2p
Eth1/2          Desg FWD 2000    128.130  P2p
Eth1/5          Desg FWD 2000    128.133  P2p
Eth1/6          Desg FWD 2000    128.134  P2p
Eth1/15         Desg BKN*2000    128.143  P2p *TYPE_Inc
Eth1/21         Desg FWD 2000    128.149  P2p
Eth1/22         Desg FWD 2000    128.150  P2p
Eth1/23         Desg FWD 2000    128.151  P2p
Eth1/24         Desg FWD 2000    128.152  P2p

```

Other MST instances, such as the below outputs of instances 1 & 2, only run on ports that are forwarding a VLAN of the instance either via an access VLAN or trunk port configuration.

```

N7K1# show spanning-tree mst 1

#### MST1 vlans mapped: 10,30,50
Bridge address 68bd.abd7.6042 priority 4097 (4096 sysid 1)
Root this switch for MST1

Interface      Role Sts Cost      Prio.Nbr Type
-----
Po7             Desg FWD 1000    128.4102 P2p
Eth1/3          Desg FWD 2000    128.131  P2p
Eth1/4          Desg FWD 2000    128.132  P2p

N7K2# show spanning-tree mst 2

#### MST2 vlans mapped: 20,40,60
Bridge address 0026.980c.2142 priority 4098 (4096 sysid 2)
Root this switch for MST2

Interface      Role Sts Cost      Prio.Nbr Type
-----
Po7             Desg FWD 1000    128.4102 P2p
Eth1/3          Desg FWD 2000    128.131  P2p
Eth1/4          Desg FWD 2000    128.132  P2p

```

Path selection rules are the same as Rapid PVST, with the lowest end-to-end path cost being preferred to reach the Root Bridge. In the below case N5K1 has been modified to prefer Port-Channel5 as opposed to Eth1/5 or Eth1/6 to reach the Root Bridge for all VLANs in MST instance 1.

```

N5K1# show spanning-tree vlan 10

MST0001
Spanning tree enabled protocol mstp
Root ID Priority 4097
Address 68bd.abd7.6042
Cost 3000
Port 4100 (port-channel5)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 00de.fb12.1a7c
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Interface      Role Sts Cost      Prio.Nbr Type
-----
Po5             Root FWD 1000    128.4100 P2p
Eth1/1          Desg FWD 2000    128.129  P2p
Eth1/5          Altn BLK 99999    128.133  P2p
Eth1/6          Altn BLK 99999    128.134  P2p

N5K1# show mac address-table vlan 10
Legend:
* - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
age - seconds since last seen,+ - primary entry using vPC Peer-Link
VLAN  MAC Address      Type      age      Secure NTFY  Ports/SWID.SSID.LID
-----
* 10   0000.0000.0010      dynamic  0         F    F    Eth1/1
* 10   0000.0000.0021      dynamic  0         F    F    Po5

```

**MST0001**

```
Spanning tree enabled protocol mstp
Root ID    Priority    4097
          Address    68bd.abd7.6042
          Cost      2000
          Port      133 (Ethernet1/5)
          Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
          Address    00de.fb12.1a01
          Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
```

Interface	Role	Sts	Cost	Prio.	Nbr	Type
Po5	Desg	FWD	1000	128.4100	P2p	
Eth1/2	Desg	FWD	2000	128.130	P2p	
Eth1/5	Root	FWD	2000	128.133	P2p	
Eth1/6	Altn	BLK	2000	128.134	P2p	

N5K2# show mac address-table vlan 10

Legend:

\* - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC  
age - seconds since last seen,+ - primary entry using vPC Peer-Link

VLAN	MAC Address	Type	age	Secure	NTFY	Ports/SWID.SSID.LID
* 10	0000.0000.0010	dynamic	0	F	F	Po5
* 10	0000.0000.0021	dynamic	0	F	F	Eth1/2

Path selection for MST instance 2 is essentially identical, but configured in the reverse direction per the instructions.

N5K2# show spanning-tree vlan 20

**MST0002**

```
Spanning tree enabled protocol mstp
Root ID    Priority    4098
          Address    0026.980c.2142
          Cost      3000
          Port      4100 (port-channel5)
          Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID  Priority    32770 (priority 32768 sys-id-ext 2)
          Address    00de.fb12.1a01
          Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
```

Interface	Role	Sts	Cost	Prio.	Nbr	Type
Po5	Root	FWD	1000	128.4100	P2p	
Eth1/1	Desg	FWD	2000	128.129	P2p	
Eth1/5	Altn	BLK	99999	128.133	P2p	
Eth1/6	Altn	BLK	99999	128.134	P2p	

N5K2# show mac address-table vlan 20

Legend:

\* - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC  
age - seconds since last seen,+ - primary entry using vPC Peer-Link

VLAN	MAC Address	Type	age	Secure	NTFY	Ports/SWID.SSID.LID
* 20	0000.0000.0011	dynamic	10	F	F	Eth1/1
* 20	0000.0000.0020	dynamic	10	F	F	Po5

N5K1# show spanning-tree vlan 20

**MST0002**

```
Spanning tree enabled protocol mstp
Root ID    Priority    4098
          Address    0026.980c.2142
          Cost      2000
          Port      134 (Ethernet1/6)
          Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID  Priority    32770 (priority 32768 sys-id-ext 2)
          Address    00de.fb12.1a7c
          Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
```

Interface	Role	Sts	Cost	Prio.	Nbr	Type
Po5	Desg	FWD	1000	128.4100	P2p	
Eth1/2	Desg	FWD	2000	128.130	P2p	
Eth1/5	Altn	BLK	2000	128.133	P2p	
Eth1/6	Root	FWD	2000	128.134	P2p	

N5K1# show mac address-table vlan 20

Legend:

\* - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC  
age - seconds since last seen,+ - primary entry using vPC Peer-Link

VLAN	MAC Address	Type	age	Secure	NTFY	Ports/SWID.SSID.LID
* 20	0000.0000.0011	dynamic	0	F	F	Po5
* 20	0000.0000.0020	dynamic	0	F	F	Eth1/2

