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1.1 Revision History

<table>
<thead>
<tr>
<th>DATE</th>
<th>VERSION</th>
<th>EDITOR</th>
<th>CHANGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 Nov 2019</td>
<td>0.1</td>
<td>Ariya Parsamanesh</td>
<td>Initial creation</td>
</tr>
<tr>
<td>18 Nov 2019</td>
<td>0.2</td>
<td>Ariya Parsamanesh</td>
<td>Added the L2 configuration</td>
</tr>
</tbody>
</table>

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2 CX switch OVA setup

Here in this short technote we’ll go through and setup the virtual environment on Windows 10 laptop so that we can run a number of Aruba CX switch OVA as well as NetEdit OVA to configure them.

We’ll make use of GNS3, VirtualBox and Aruba switch and NetEdit OVAs.

2.1 Things you need

- Windows 10 with min version of 10.0.16299.1387, that has at least 16G of memory
- VirtualBox version 6.0.8-130520
- GNS3 version 2.1.20
3 Win10 Laptop Setup

In this section we’ll create a loopback interface so we can use it to connect our virtual CX switches to the outside networks.

3.1 Loopback Interface Configuration

Open your Device Manager, select “Network Adapters” and add Legacy hardware.
Once you finish the installation you can then assign a valid IP address to that interface.

### 3.2 Loopback Interface IP Address

Open the control panel and select “Network and sharing Centre” and then click on “change adapter setting”, your KM-Test adapter should be listed there, select it and then choose to rename it to “loopback” so that you can identify it easier. Then assign a static IP address to it and save setting.

Here is my setup, I have assigned 192.168.99.254/24 to it.

```
C:\>ipconfig/all

Windows IP Configuration

    Host Name . . . . . . . . . . . . . . . . . . : AriyaP
    Primary Dns Suffix . . . . . . . . . . . . : 
    Node Type . . . . . . . . . . . . . . . . . . : Hybrid
    IP Routing Enabled. . . . . . . . . . . . . : Yes
    WINS Proxy Enabled. . . . . . . . . . . : No
    DNS Suffix Search List. . . . . . . . . . : home

Ethernet adapter Ethernet:

    Connection-specific DNS Suffix . : home
    Description . . . . . . . . . . . . . : Intel(R) 82579LM Gigabit Network Connection
    Physical Address . . . . . . . . . . : F0-DE-F1-64-0A-82
    DHCP Enabled. . . . . . . . . . . . : Yes
    Autoconfiguration Enabled . . . . : Yes
    IPv4 Address . . . . . . . . . . . : 192.168.1.123(Preferred)
    Subnet Mask . . . . . . . . . : 255.255.255.0
    Lease Obtained. . . . . . . . . . : Sunday, November 17, 2019 8:39:39 AM
    Lease Expires . . . . . . . . . . : Monday, November 18, 2019 10:13:51 AM
    Default Gateway . . . . . . . . . : 192.168.1.1
    DHCP Server . . . . . . . . . . . : 192.168.1.1
    DNS Servers . . . . . . . . . . . : 1.1.1.1
    192.168.1.1
    NetBIOS over Tcpip. . . . . . . . : Enabled

Ethernet adapter Ethernet 3:

    Connection-specific DNS Suffix . : 
    Description . . . . . . . . . . . . . : Npcap Loopback Adapter
```
Physical Address: 02-00-4C-4F-4F-50
DHCP Enabled: No
Autoconfiguration Enabled: Yes
IPv4 Address: 172.16.2.10 (Preferred)
Subnet Mask: 255.255.255.0
Default Gateway:
NetBIOS over Tcpip: Enabled

Ethernet adapter Loopback:

Connection-specific DNS Suffix: Microsoft KM-TEST Loopback Adapter
Physical Address: 02-00-4C-4F-4F-50
DHCP Enabled: No
Autoconfiguration Enabled: Yes
IPv4 Address: 192.168.99.254 (Preferred)
Subnet Mask: 255.255.255.0
Default Gateway:
NetBIOS over Tcpip: Enabled

Wireless LAN adapter Wi-Fi:

Media State: Media disconnected
Connection-specific DNS Suffix: home
Description: Intel(R) Centrino(R) Advanced-N 6205
Physical Address: A0-88-B4-50-C0-84
DHCP Enabled: Yes
Autoconfiguration Enabled: Yes

C:\>
4 VirtualBox

Here we’ll cover the installation and setup of VirtualBox. Try to get this specific version as it works nicely with most of the windows and MAC laptops, however you can also use other version and spend time getting it to work.

The installation is straight forward so we won’t be covering it here. We’ll start with importing the OVA images.

4.1 Importing Aruba OVA Images

Here we’ll have 2x OVA images that we want to import

1. ArubaOS-CX_10_04_0001.ova
2. Aruba_NetEdit-2.0.0.ova

We’ll start with the CX ova file.
Do the same for the NetEdit ova as well. Next we’ll edit the setting for the ArubaOS-CX machine.

Check to see that CPU is set to 2 and memory is set to 4G and set the checkbox for “Hardware clock in UTC Time”

Then go to the Network section and select these setting only for the Adapter1, leave the rest of the Adapters 2-4 as their default settings.

Here we are ensuring that first adapter will be on the same network as the loopback interface. It will be clearer as we dot the GNS3 configuration.

Save all the changes you have made and don’t power up the host from VirtualBox, we’ll do all that from GNS3.
Here we’ll install GNS3 and since we are using windows platform, you get many options that needs to be covered here.

I choose the above extra bits, VPCS, Cpulimit and SolarPutty. None of them are mandatory but with these you can get added benefits, for example with solar putty, it gives you a tabbed putty session which can be very handy.
5.1 GNS3 Configuration

When GNS3 is started, you get this window.

Then you get that the connection is successful but you get this error, click ok and the cancel out of it.

Then this is our final windows before we can start.
Now we want to create a new virtual appliance to represent Aruba CX switches.
Then once you click on finish button, you are presented with the ArubaOS-CX template that needs to be edited.

Note the changes we have made to the template, now apply and save it.

We can also change the symbol to an Aruba 8400 icon, this is what I have done.
Next we’ll drag and drop the Aruba 8400 switch to our new project as shown below.

Now we’ll powered them on.

Next we’ll open a console connection to both to configure their OOBM ports. You can double click on both the switches and that will open a solarwinds putty tabbed session.
We are going to assign 192.168.99.1/24 and 192.168.99.2/24 to the switches.

```
hostname 8400-1
interface mgmt
   no shutdown
      ip static 192.168.99.1/24
      default-gateway 192.168.99.254
    https-server rest access-mode read-write
    https-server vrf mgmt
    ssh server vrf mgmt

hostname 8400-2
interface mgmt
   no shutdown
      ip static 192.168.99.2/24
      default-gateway 192.168.99.254
    https-server rest access-mode read-write
    https-server vrf mgmt
    ssh server vrf mgmt
```

Note that the IP addressing is on the same IP subnet as that of our laptop loopback interface.
Default gateway IPv4          : 192.168.99.254
IPv6 address/prefix           : 
IPv6 link local address/prefix: fe80::a00:27ff:fe81:f81b/64
Default gateway IPv6          : 
Primary Nameserver            : 
Secondary Nameserver          : 
8400-2#

Now we should have full connectivity to the switches and should be able to ping them from our laptop.

C:\>ping 192.168.99.1
Pinging 192.168.99.1 with 32 bytes of data:
Reply from 192.168.99.1: bytes=32 time<1ms TTL=64
Reply from 192.168.99.1: bytes=32 time<1ms TTL=64
Reply from 192.168.99.1: bytes=32 time<1ms TTL=64
Reply from 192.168.99.1: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.99.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.99.2
Pinging 192.168.99.2 with 32 bytes of data:
Reply from 192.168.99.2: bytes=32 time<1ms TTL=64
Reply from 192.168.99.2: bytes=32 time<1ms TTL=64
Reply from 192.168.99.2: bytes=32 time<1ms TTL=64
Reply from 192.168.99.2: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.99.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>

And the same from the virtual switches.

8400-1# ping 192.168.99.254 vrf mgmt
108 bytes from 192.168.99.254: icmp_seq=1 ttl=128 time=1.49 ms
108 bytes from 192.168.99.254: icmp_seq=2 ttl=128 time=0.325 ms
108 bytes from 192.168.99.254: icmp_seq=3 ttl=128 time=0.408 ms
108 bytes from 192.168.99.254: icmp_seq=4 ttl=128 time=0.254 ms
108 bytes from 192.168.99.254: icmp_seq=5 ttl=128 time=0.463 ms

--- 192.168.99.254 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4006ms
rtt min/avg/max/mdev = 0.254/0.589/1.495/0.458 ms

8400-1# ping 192.168.99.2 vrf mgmt
PING 192.168.99.2 (192.168.99.2) 100(128) bytes of data.
108 bytes from 192.168.99.2: icmp_seq=1 ttl=64 time=0.558 ms
108 bytes from 192.168.99.2: icmp_seq=2 ttl=64 time=0.596 ms
108 bytes from 192.168.99.2: icmp_seq=3 ttl=64 time=0.563 ms
108 bytes from 192.168.99.2: icmp_seq=4 ttl=64 time=0.481 ms
108 bytes from 192.168.99.2: icmp_seq=5 ttl=64 time=0.447 ms

--- 192.168.99.2 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4004ms
rtt min/avg/max/mdev = 0.447/0.529/0.596/0.055 ms
8400-1#

8400-2# ping 192.168.99.1 vrf mgmt
PING 192.168.99.1 (192.168.99.1) 100(128) bytes of data.
108 bytes from 192.168.99.1: icmp_seq=1 ttl=64 time=1.05 ms
108 bytes from 192.168.99.1: icmp_seq=2 ttl=64 time=0.783 ms
108 bytes from 192.168.99.1: icmp_seq=3 ttl=64 time=0.443 ms
108 bytes from 192.168.99.1: icmp_seq=4 ttl=64 time=0.544 ms
108 bytes from 192.168.99.1: icmp_seq=5 ttl=64 time=0.629 ms

--- 192.168.99.1 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4100ms
rtt min/avg/max/mdev = 0.443/0.689/1.050/0.214 ms
8400-2#

5.2 CX Switch WebUI Access

Now that we have the management interface up and running on the CX switches, we should also have full webUI access.

![CX Switch WebUI Access](image)

Note that because we were using bridged Adapter in VirtualBox VM setting for Adapter1, the Interface 1/1/0 of all CX switches will be connected to that loopback interface.
Now we use the connector icon to connect the switches. Note that every virtual CX switch will only have 8x interfaces, out of which 1/1/0 is the out of band mgmt. interface. So here we start with 1/1/1-2 interfaces.

Now we can use to toggle “show/hide interface label” under GNS3 view menu.

Adding the third CX switch and connecting it up. Note that I have changed the icons to reflect 8320s.
6.1 Switch Configuration

Here we'll go through some basic configuration. First thing is that the CX OVA will have only 6x interfaces. Interface 1/1/0 is the mgmt. interface and 1/1/7 is used internally.

```
8320-1# show interface brief
-------------------------------------------------------------------------------------
 Port  Native  Mode      Type      Enabled Status  Reason                  Speed
       VLAN    --       --      --      no     down   Administratively down  --
-------------------------------------------------------------------------------------
 1/1/1  --       routed  --      no     down   Administratively down  --
 1/1/2  --       routed  --      no     down   Administratively down  --
 1/1/3  --       routed  --      no     down   Administratively down  --
 1/1/4  --       routed  --      no     down   Administratively down  --
 1/1/5  --       routed  --      no     down   Administratively down  --
 1/1/6  --       routed  --      no     down   Administratively down  --
8320-1#
```

6.1.1 Link Aggregation Configuration

We'll be configuring LACP for 1/1/1 and 1/1/2 for both 8320-1 and 8320-2 switches.

```
8320-1# conf t
8320-1(config)# int 1/1/1
8320-1(config-if)# no shut
8320-1(config-if)# int 1/1/2
8320-1(config-if)# no shut
8320-1(config-if)# ^Z

8320-2# conf t
8320-2(config)# int 1/1/1
8320-2(config-if)# no shut
8320-2(config-if)# int 1/1/2
8320-2(config-if)# no shut
8320-2(config-if)# ^Z
8320-2#

8320-1# sh lldp neighbor-info
LLDP Neighbor Information
===================================
Total Neighbor Entries : 0
Total Neighbor Entries Deleted : 0
Total Neighbor Entries Dropped : 0
Total Neighbor Entries Aged-Out : 0
LOCAL-PORT CHASSIS-ID PORT-ID PORT-DESC TTL SYS-NAME
--------------------------------------------------------------------------------------------------
8320-1# sh lldp neighbor-info
LLDP Neighbor Information
===================================
Total Neighbor Entries : 2
Total Neighbor Entries Deleted : 0
Total Neighbor Entries Dropped : 0
Total Neighbor Entries Aged-Out : 0
LOCAL-PORT CHASSIS-ID PORT-ID PORT-DESC TTL SYS-NAME
--------------------------------------------------------------------------------------------------
Next is the LACP configuration that you need on both the switches.

```
8320-1# conf t
8320-1(config)# interface lag 101
8320-1(config-lag-if)# no shutdown
8320-1(config-lag-if)# lacp mode active
8320-1(config-lag-if)# interface 1/1/1
8320-1(config-if)# mtu 2048
8320-1(config-if)# lag 101
8320-1(config-if)# interface 1/1/2
8320-1(config-if)# mtu 2048
8320-1(config-if)# lag 101
8320-1# sh lacp agg
Aggregate name   : lag101
Interfaces       : 1/1/1 1/1/2
Heartbeat rate   : Slow
Hash             : l3-src-dst
Aggregate mode   : Active
8320-1# sh lacp interfaces
State abbreviations :
A - Active        P - Passive        F - Aggregable I - Individual
S - Short-timeout L - Long-timeout N - InSync      O - OutofSync
C - Collecting    D - Distributing
X - State m/c expired                      E - Default neighbor state
Actor details of all interfaces:
-------------------------------------------------------------------
<table>
<thead>
<tr>
<th>Intf</th>
<th>Aggr</th>
<th>Port</th>
<th>Port State</th>
<th>System-ID</th>
<th>System Aggr</th>
<th>Forwarding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lag101</td>
<td>2</td>
<td>1</td>
<td>ALFOE</td>
<td>08:00:09:c8:5a:12 65534 101</td>
<td>lACP-block</td>
</tr>
<tr>
<td></td>
<td>lag101</td>
<td>3</td>
<td>1</td>
<td>ALFOE</td>
<td>08:00:09:c8:5a:12 65534 101</td>
<td>lACP-block</td>
</tr>
</tbody>
</table>
```

Partner details of all interfaces:
-------------------------------------------------------------------
<table>
<thead>
<tr>
<th>Intf</th>
<th>Aggr</th>
<th>Port</th>
<th>Port State</th>
<th>System-ID</th>
<th>System Aggr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lag101</td>
<td>0</td>
<td>65534</td>
<td>PLFOEX</td>
<td>00:00:00:00:00:00:00 65534 0</td>
</tr>
<tr>
<td></td>
<td>lag101</td>
<td>0</td>
<td>65534</td>
<td>PLFOEX</td>
<td>00:00:00:00:00:00:00 65534 0</td>
</tr>
</tbody>
</table>
8320-1#  
8320-1# sh interface brief

```
<table>
<thead>
<tr>
<th>Port</th>
<th>Native VLAN</th>
<th>Mode</th>
<th>Type</th>
<th>Enabled</th>
<th>Status</th>
<th>Reason</th>
<th>Speed (Mb/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/1</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>1/1/2</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>1/1/3</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td>Administratively down</td>
<td>--</td>
</tr>
<tr>
<td>1/1/4</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td>Administratively down</td>
<td>--</td>
</tr>
<tr>
<td>1/1/5</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td>Administratively down</td>
<td>--</td>
</tr>
<tr>
<td>1/1/6</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td>Administratively down</td>
<td>--</td>
</tr>
<tr>
<td>lag100</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>yes</td>
<td>blocked</td>
<td>--</td>
<td>auto</td>
</tr>
</tbody>
</table>
```
Now when we configure LACP on the second switch, the link will come up.

```
interface lag 102
    no shutdown
    lacp mode active
interface 1/1/1
    no shutdown
    mtu 2048
    lag 102
interface 1/1/2
    no shutdown
    mtu 2048
    lag 102
```

8320-2# sh lacp aggregates

```
Aggregate name : lag102
Interfaces     : 1/1/1 1/1/2
Heartbeat rate : Slow
Hash           : l3-src-dst
Aggregate mode : Active
```

8320-2# sh lacp inter

State abbreviations:

A - Active        F - Passive   F - Aggregable I - Individual
S - Short-timeout L - Long-timeout N - InSync   O - OutofSync
C - Collecting    D - Distributing
X - State m/c expired   E - Default neighbor state

Actor details of all interfaces:

<table>
<thead>
<tr>
<th>Intf</th>
<th>Aggr</th>
<th>Port</th>
<th>Port</th>
<th>State</th>
<th>System-ID</th>
<th>System Aggr</th>
<th>Forwarding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Name</td>
<td>Id</td>
<td>Pri</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/1/1</td>
<td>lag102</td>
<td>2</td>
<td>1</td>
<td>ALFNCD 08:00:09:72:d0:20 65534 102 up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/1/2</td>
<td>lag102</td>
<td>3</td>
<td>1</td>
<td>ALFNCD 08:00:09:72:d0:20 65534 102 up</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Partner details of all interfaces:

<table>
<thead>
<tr>
<th>Intf</th>
<th>Aggr</th>
<th>Port</th>
<th>Port</th>
<th>State</th>
<th>System-ID</th>
<th>System Aggr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Name</td>
<td>Id</td>
<td>Pri</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/1/1</td>
<td>lag102</td>
<td>2</td>
<td>1</td>
<td>ALFNCD 08:00:09:c8:5a:12 65534 101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/1/2</td>
<td>lag102</td>
<td>3</td>
<td>1</td>
<td>ALFNCD 08:00:09:c8:5a:12 65534 101</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8320-2# sh int b

```
```

<table>
<thead>
<tr>
<th>Port</th>
<th>Native VLAN</th>
<th>Mode</th>
<th>Type</th>
<th>Enabled</th>
<th>Status</th>
<th>Reason</th>
<th>Speed (Mb/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/1</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>1/1/2</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>1/1/3</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/1/4</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/1/5</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/1/6</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lag102</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td>--</td>
<td>2000</td>
</tr>
</tbody>
</table>

8320-2#
6.1.2 VLAN Configuration

Now we’ll configure couple of VLANs that will use the LACP link.

8320-1# sh vlan

<table>
<thead>
<tr>
<th>VLAN</th>
<th>Name</th>
<th>Status</th>
<th>Reason</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DEFAULT_VLAN_1</td>
<td>down</td>
<td>no_member_port</td>
<td>default</td>
</tr>
</tbody>
</table>

8320-1# conf t
8320-1(config)# vlan 10,20
8320-1(config-vlan-<10,20>)# interface lag 101
8320-1(config-lag-if)# no routing
8320-1(config-lag-if)# vlan trunk allow 10,20
8320-1(config-lag-if)# end
8320-1#

8320-1# sh vlan

<table>
<thead>
<tr>
<th>VLAN</th>
<th>Name</th>
<th>Status</th>
<th>Reason</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DEFAULT_VLAN_1</td>
<td>down</td>
<td>no_member_port</td>
<td>default</td>
</tr>
<tr>
<td>10</td>
<td>VLAN10</td>
<td>up</td>
<td>ok</td>
<td>static</td>
</tr>
<tr>
<td>20</td>
<td>VLAN20</td>
<td>up</td>
<td>ok</td>
<td>static</td>
</tr>
</tbody>
</table>

8320-2# conf t
8320-2(config)# vlan 10,20
8320-2(config-vlan-<10,20>)# interface lag 102
8320-2(config-lag-if)# no routing
8320-2(config-lag-if)# vlan trunk allow 10,20
8320-2(config-lag-if)# end
8320-2#

8320-2# sh vlan

<table>
<thead>
<tr>
<th>VLAN</th>
<th>Name</th>
<th>Status</th>
<th>Reason</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DEFAULT_VLAN_1</td>
<td>down</td>
<td>no_member_port</td>
<td>default</td>
</tr>
<tr>
<td>10</td>
<td>VLAN10</td>
<td>up</td>
<td>ok</td>
<td>static</td>
</tr>
<tr>
<td>20</td>
<td>VLAN20</td>
<td>up</td>
<td>ok</td>
<td>static</td>
</tr>
</tbody>
</table>

Adding VLAN interface IP address.

8320-1# conf t
8320-1(config)# interface vlan 10
8320-1(config-if-vlan)# ip address 10.0.10.1/24
8320-1(config-if-vlan)# interface vlan 20
8320-1(config-if-vlan)# ip address 10.0.20.1/24
8320-1(config-if-vlan)# end
8320-1#
## 8320-1

```bash
sh ip interface brief
```

<table>
<thead>
<tr>
<th>Interface</th>
<th>IP Address</th>
<th>Interface Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/3</td>
<td>No Address</td>
<td>down/down</td>
</tr>
<tr>
<td>1/1/4</td>
<td>No Address</td>
<td>down/down</td>
</tr>
<tr>
<td>1/1/5</td>
<td>No Address</td>
<td>down/down</td>
</tr>
<tr>
<td>1/1/6</td>
<td>No Address</td>
<td>down/down</td>
</tr>
<tr>
<td>vlan10</td>
<td>10.0.10.1/24</td>
<td>up/up</td>
</tr>
<tr>
<td>vlan20</td>
<td>10.0.20.1/24</td>
<td>up/up</td>
</tr>
</tbody>
</table>

8320-1# conf t
8320-2(config)# configure t
8320-2(config)# interface vlan 10
8320-2(config-if-vlan)# ip address 10.0.10.2/24
8320-2(config-if-vlan)# interface vlan 20
8320-2(config-if-vlan)# ip address 10.0.20.2/24
8320-2(config-if-vlan)# end
8320-2# sh ip interface brief

<table>
<thead>
<tr>
<th>Interface</th>
<th>IP Address</th>
<th>Interface Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/3</td>
<td>No Address</td>
<td>down/down</td>
</tr>
<tr>
<td>1/1/4</td>
<td>No Address</td>
<td>down/down</td>
</tr>
<tr>
<td>1/1/5</td>
<td>No Address</td>
<td>down/down</td>
</tr>
<tr>
<td>1/1/6</td>
<td>No Address</td>
<td>down/down</td>
</tr>
<tr>
<td>vlan10</td>
<td>10.0.10.2/24</td>
<td>up/up</td>
</tr>
<tr>
<td>vlan20</td>
<td>10.0.20.2/24</td>
<td>up/up</td>
</tr>
</tbody>
</table>

8320-2#

--- Finally doing the ping test ---

8320-1# sh ip route

Displaying ipv4 routes selected for forwarding

'\[x/y\]' denotes \[distance/metric\]

10.0.10.0/24, vrf default
  via vlan10, [0/0], connected
10.0.10.1/32, vrf default
  via vlan10, [0/0], local
10.0.20.0/24, vrf default
  via vlan20, [0/0], connected
10.0.20.1/32, vrf default
  via vlan20, [0/0], local

8320-1# ping 10.0.10.2
PING 10.0.10.2 (10.0.10.2) 100(128) bytes of data.
108 bytes from 10.0.10.2: icmp_seq=1 ttl=64 time=26.5 ms
108 bytes from 10.0.10.2: icmp_seq=2 ttl=64 time=3.41 ms
108 bytes from 10.0.10.2: icmp_seq=3 ttl=64 time=3.68 ms
108 bytes from 10.0.10.2: icmp_seq=4 ttl=64 time=3.60 ms
108 bytes from 10.0.10.2: icmp_seq=5 ttl=64 time=3.83 ms

--- 10.0.10.2 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms

8320-1#
6.1.3 Configuring the third Switch

Now we’ll configure couple of VLANs

8320-1# conf t
8320-1(config)# interface 1/1/3
8320-1(config-if)# no routing
8320-1(config-if)# no shut
8320-1(config-if)# vlan trunk allow 10,20
8320-1(config-if)# exit
8320-1(config)# exit
8320-1#

8320-2# conf t
8320-2(config)# interface 1/1/3
8320-2(config-if)# no routing
8320-2(config-if)# no shut
8320-2(config-if)# vlan trunk allow 10,20
8320-2(config-if)# exit
8320-2(config)# exit
8320-2#

8320-3# conf t
8320-3(config)# interface 1/1/1
8320-3(config-if)# no shutdown
8320-3(config-if)# interface 1/1/2
8320-3(config-if)# no shutdown
8320-3(config-if)# end
8320-3#

8320-3# sh lldp neighbor-info
LLDP Neighbor Information
=================================
Total Neighbor Entries : 2
Total Neighbor Entries Deleted : 0
Total Neighbor Entries Dropped : 0
Total Neighbor Entries Aged-Out : 0

<table>
<thead>
<tr>
<th>LOCAL-PORT</th>
<th>CHASSIS-ID</th>
<th>PORT-ID</th>
<th>PORT-DESC</th>
<th>TTL</th>
<th>SYS-NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/1</td>
<td>08:00:09:c8:5a:12</td>
<td>1/1/3</td>
<td>1/1/3</td>
<td>120</td>
<td>8320-1</td>
</tr>
<tr>
<td>1/1/2</td>
<td>08:00:09:72:d0:20</td>
<td>1/1/3</td>
<td>1/1/3</td>
<td>120</td>
<td>8320-2</td>
</tr>
</tbody>
</table>

8320-3# sh int b

<table>
<thead>
<tr>
<th>Port</th>
<th>Native VLAN</th>
<th>Mode</th>
<th>Type</th>
<th>Enabled</th>
<th>Status</th>
<th>Reason</th>
<th>Speed (Mb/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/1</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>1000</td>
</tr>
</tbody>
</table>
Checking the interface status on 8320-1 and -2

```
8320-1# sh int b

<table>
<thead>
<tr>
<th>Port</th>
<th>Native VLAN</th>
<th>Mode</th>
<th>Type</th>
<th>Enabled</th>
<th>Status</th>
<th>Reason</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/1</td>
<td>1</td>
<td>trunk</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>1/1/2</td>
<td>1</td>
<td>trunk</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>1/1/3</td>
<td>1</td>
<td>trunk</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>1/1/4</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td>Administratively down</td>
<td>--</td>
</tr>
<tr>
<td>1/1/5</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td>Administratively down</td>
<td>--</td>
</tr>
<tr>
<td>1/1/6</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td>Administratively down</td>
<td>--</td>
</tr>
<tr>
<td>vlan10</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td>vlan20</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td>lag101</td>
<td>1</td>
<td>trunk</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>--</td>
</tr>
</tbody>
</table>

8320-1#
```

```
8320-2# sh int b

<table>
<thead>
<tr>
<th>Port</th>
<th>Native VLAN</th>
<th>Mode</th>
<th>Type</th>
<th>Enabled</th>
<th>Status</th>
<th>Reason</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/1</td>
<td>1</td>
<td>trunk</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>1/1/2</td>
<td>1</td>
<td>trunk</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>1/1/3</td>
<td>1</td>
<td>trunk</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>1/1/4</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td>Administratively down</td>
<td>--</td>
</tr>
<tr>
<td>1/1/5</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td>Administratively down</td>
<td>--</td>
</tr>
<tr>
<td>1/1/6</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td>Administratively down</td>
<td>--</td>
</tr>
<tr>
<td>vlan10</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td>vlan20</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td>lag102</td>
<td>1</td>
<td>trunk</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>--</td>
</tr>
</tbody>
</table>

8320-2#
```

Adding the VLANs to the third switch

```
vlan 10,20
interface 1/1/1
no routing
vlan trunk allow 10,20
interface 1/1/2
no routing
vlan trunk allow 10,20
```

```
8320-3# sh vlan

<table>
<thead>
<tr>
<th>VLAN</th>
<th>Name</th>
<th>Status</th>
<th>Reason</th>
<th>Type</th>
<th>Interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DEFAULT_VLAN_1</td>
<td>down</td>
<td>no_member_port</td>
<td>default</td>
<td>1/1/1-1/1</td>
</tr>
<tr>
<td>10</td>
<td>VLAN10</td>
<td>up</td>
<td>ok</td>
<td>static</td>
<td>1/1/1-1/1</td>
</tr>
<tr>
<td>1/1/2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>VLAN20</td>
<td>up</td>
<td>ok</td>
<td>static</td>
<td>1/1/1-1/1</td>
</tr>
<tr>
<td>1/1/2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8320-3#
```
6.1.4 Configuring MSTP

The 802.1s multiple spanning tree protocol (MSTP) is the default mode for spanning tree on CX switches. Also note that spanning tree is disabled by default.

Run the following commands on the switches.

<table>
<thead>
<tr>
<th>Switch name</th>
<th>Spanning tree command</th>
</tr>
</thead>
</table>
| 8320-1      | spanning-tree config-name STP  
              spanning-tree config-revision 1  
              spanning-tree instance 1 vlan 10  
              spanning-tree instance 2 vlan 20  
              spanning-tree instance 1 priority 1  
              spanning-tree instance 2 priority 1  |
| 8320-2      | spanning-tree config-name STP  
              spanning-tree config-revision 1  
              spanning-tree instance 1 vlan 10  
              spanning-tree instance 2 vlan 20  
              spanning-tree instance 2 priority 1  
              spanning-tree instance 2 priority 1  |
| 8320-3      | spanning-tree config-name STP  
              spanning-tree config-revision 1  
              spanning-tree instance 1 vlan 10  
              spanning-tree instance 2 vlan 20  
              spanning-tree instance 2 priority 1  
              spanning-tree instance 2 priority 1  |

8320-1# sh spanning-tree mst 1

#### MST1
Vlans mapped: 10

<table>
<thead>
<tr>
<th>Bridge Address</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00:09:c8:5a:12</td>
<td>4096</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Root Address</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00:09:c8:5a:12</td>
<td>4096</td>
</tr>
</tbody>
</table>

Port:0, Cost:0, Rem Hops:20

<table>
<thead>
<tr>
<th>Port</th>
<th>Role</th>
<th>State</th>
<th>Cost</th>
<th>Priority</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/3</td>
<td>Designated</td>
<td>Forwarding</td>
<td>20000</td>
<td>128</td>
<td>point_to_point</td>
</tr>
<tr>
<td>lag101</td>
<td>Designated</td>
<td>Forwarding</td>
<td>20000</td>
<td>64</td>
<td>point_to_point</td>
</tr>
</tbody>
</table>

Topology change flag : True
Number of topology changes : 3
Last topology change occurred : 399 seconds ago

8320-1#

8320-1# sh spanning-tree mst 2

#### MST2
Vlans mapped: 20

<table>
<thead>
<tr>
<th>Bridge Address</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00:09:c8:5a:12</td>
<td>32768</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Root Address</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00:09:72:d0:20</td>
<td>4096</td>
</tr>
</tbody>
</table>

Port:lag101, Cost:20000, Rem Hops:19

<table>
<thead>
<tr>
<th>Port</th>
<th>Role</th>
<th>State</th>
<th>Cost</th>
<th>Priority</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/3</td>
<td>Alternate</td>
<td>Blocking</td>
<td>20000</td>
<td>128</td>
<td>point_to_point</td>
</tr>
<tr>
<td>lag101</td>
<td>Root</td>
<td>Forwarding</td>
<td>20000</td>
<td>64</td>
<td>point_to_point</td>
</tr>
</tbody>
</table>

Topology change flag : True
Number of topology changes : 3
Last topology change occurred : 483 seconds ago

8320-1#
This shows that 8320-1 is the root bridge for MST instant 1 which is for VLAN 10 and for instant 2, we have Root bridge with address of 08:00:09:72:d0:20. This happen to be the 8320-2 switch.

8320-2# sh spanning-tree mst 1

#### MST1
Vlans mapped: 10
Bridge Address: 08:00:09:72:d0:20 Priority:32768
Root Address: 08:00:09:c8:5a:12 Priority:4096
Port:lag102, Cost:20000, Rem Hops:19

<table>
<thead>
<tr>
<th>Port</th>
<th>Role</th>
<th>State</th>
<th>Cost</th>
<th>Priority</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/3</td>
<td>Designated</td>
<td>Forwarding</td>
<td>20000</td>
<td>128</td>
<td>point_to_point</td>
</tr>
<tr>
<td>lag102</td>
<td>Root</td>
<td>Forwarding</td>
<td>20000</td>
<td>64</td>
<td>point_to_point</td>
</tr>
</tbody>
</table>

Topology change flag : True
Number of topology changes : 3
Last topology change occurred : 581 seconds ago

8320-2# sh spanning-tree mst 2

#### MST2
Vlans mapped: 20
Bridge Address: 08:00:09:72:d0:20 Priority:4096
Root Address: 08:00:09:72:d0:20 Priority:4096
Port:0, Cost:0, Rem Hops:20

<table>
<thead>
<tr>
<th>Port</th>
<th>Role</th>
<th>State</th>
<th>Cost</th>
<th>Priority</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/3</td>
<td>Designated</td>
<td>Forwarding</td>
<td>20000</td>
<td>128</td>
<td>point_to_point</td>
</tr>
<tr>
<td>lag102</td>
<td>Designated</td>
<td>Forwarding</td>
<td>20000</td>
<td>64</td>
<td>point_to_point</td>
</tr>
</tbody>
</table>

Topology change flag : True
Number of topology changes : 5
Last topology change occurred : 579 seconds ago

8320-2#

And this is what we see on 8320-3

8320-3# sh spanning-tree mst 1

#### MST1
Vlans mapped: 10
Bridge Address: 08:00:09:9d:d1:f7 Priority:32768
Root Address: 08:00:09:c8:5a:12 Priority:4096
Port:1/1/1, Cost:20000, Rem Hops:19

<table>
<thead>
<tr>
<th>Port</th>
<th>Role</th>
<th>State</th>
<th>Cost</th>
<th>Priority</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/1</td>
<td>Root</td>
<td>Forwarding</td>
<td>20000</td>
<td>128</td>
<td>point_to_point</td>
</tr>
<tr>
<td>1/1/2</td>
<td>Alternate</td>
<td>Blocking</td>
<td>20000</td>
<td>128</td>
<td>point_to_point</td>
</tr>
</tbody>
</table>

Topology change flag : True
Number of topology changes : 1
Last topology change occurred : 825 seconds ago

8320-3# sh spanning-tree mst 2

#### MST2
Vlans mapped: 20
### RSTP+

Rapid spanning tree protocol (RSTP) requires less config and the RSTP+ version allows it run on per VLAN basis. We should remove the previous MSTP configs from the switches.

```bash	no spanning-tree	no spanning-tree config-name	no spanning-tree config-revision	no spanning-tree instance 1	no spanning-tree instance 2
```

<table>
<thead>
<tr>
<th>Switch name</th>
<th>Spanning tree command</th>
</tr>
</thead>
</table>
| 8320-1      | `spanning-tree mode rpvst`  
|             | `spanning-tree vlan 10,20`  
|             | `spanning-tree vlan 10 priority 1`  
|             | `spanning-tree` |
| 8320-2      | `spanning-tree mode rpvst`  
|             | `spanning-tree vlan 10,20`  
|             | `spanning-tree vlan 20 priority 1`  
|             | `spanning-tree` |
| 8320-3      | `spanning-tree mode rpvst`  
|             | `spanning-tree vlan 10,20`  
|             | `spanning-tree` |

Checking the spanning tree status for VLAN 10

8320-1

```
8320-1# show spanning-tree vlan 10
VLAN10
Spanning tree status : Enabled Protocol: RPVST
  Root ID  Priority : 4096
  MAC-Address: 08:00:09:c8:5a:12
  This bridge is the root
  Hello time(in seconds):2  Max Age(in seconds):20
  Forward Delay(in seconds):15

Bridge ID  Priority : 4096
  MAC-Address: 08:00:09:c8:5a:12
  Hello time(in seconds):2  Max Age(in seconds):20
  Forward Delay(in seconds):15

Port         Role           State        Cost           Priority   Type
------------- ------------------- -------------- -------------- -------------- -------
1/1/3    Designated     Forwarding   20000   128           point_to_point  
lag101    Designated     Forwarding   20000   64           point_to_point  
```

8320-2

```
8320-2# show spanning-tree vlan 10
VLAN10
Spanning tree status : Enabled Protocol: RPVST
```
<table>
<thead>
<tr>
<th>Port</th>
<th>Role</th>
<th>State</th>
<th>Cost</th>
<th>Priority</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/3</td>
<td>Designated</td>
<td>Forwarding</td>
<td>20000</td>
<td>128</td>
<td>point_to_point</td>
</tr>
<tr>
<td>lagI02</td>
<td>Root</td>
<td>Forwarding</td>
<td>20000</td>
<td>64</td>
<td>point_to_point</td>
</tr>
</tbody>
</table>

8320-2#

8320-3#

8320-3# show spanning-tree vlan 10

VLAN10
Spanning tree status : Enabled Protocol: RPVST
Root ID       Priority : 4096
MAC-Address: 08:00:09:68:5a:12
Hello time(in seconds):2  Max Age(in seconds):20
Forward Delay(in seconds):15

Bridge ID Priority : 32768
MAC-Address: 08:00:09:72:1d:68
Hello time(in seconds):2  Max Age(in seconds):20
Forward Delay(in seconds):15

Port        Role    State       Cost  Priority | Type       |
--------------------------------------------------|------------|
--------------------------------------------------|------------|
1/1/1       Root     Forwarding  20000  128      | point_to_point |
1/1/2       Alternate Blocking | 20000  128      | point_to_point |

8320-3#

Checking the spanning tree status for VLAN 20

8320-1#

8320-1# show spanning-tree vlan 20

VLAN20
Spanning tree status : Enabled Protocol: RPVST
Root ID       Priority : 4096
MAC-Address: 08:00:09:68:5a:12
Hello time(in seconds):2  Max Age(in seconds):20
Forward Delay(in seconds):15

Bridge ID Priority : 32768
MAC-Address: 08:00:09:72:1d:68
Hello time(in seconds):2  Max Age(in seconds):20
Forward Delay(in seconds):15

Port        Role    State       Cost  Priority | Type       |
--------------------------------------------------|------------|
--------------------------------------------------|------------|
1/1/3       Alternate Blocking | 20000  128      | point_to_point |
lagI01      Root     Forwarding  20000  64       | point_to_point |

8320-1#

8320-2#

8320-2# show spanning-tree vlan 20

VLAN20
Spanning tree status : Enabled Protocol: RPVST
Root ID       Priority : 4096
MAC-Address: 08:00:09:72:1d:68
This bridge is the root
Hello time(in seconds):2  Max Age(in seconds):20
Forward Delay(in seconds):15

Bridge ID Priority : 4096
MAC-Address: 08:00:09:72:1d:68
Hello time(in seconds):2  Max Age(in seconds):20
Forward Delay (in seconds): 15

<table>
<thead>
<tr>
<th>Port</th>
<th>Role</th>
<th>State</th>
<th>Cost</th>
<th>Priority</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/3</td>
<td>Designated</td>
<td>Forwarding</td>
<td>20000</td>
<td>128</td>
<td>point_to_point</td>
</tr>
<tr>
<td>lag102</td>
<td>Designated</td>
<td>Forwarding</td>
<td>20000</td>
<td>64</td>
<td>point_to_point</td>
</tr>
</tbody>
</table>

8320-2#

8320-3#

show spanning-tree vlan 20

VLAN20
Spanning tree status: Enabled Protocol: RPVST
Root ID Priority: 4096
MAC-Address: 08:00:09:72:d0:20
Hello time (in seconds): 2
Max Age (in seconds): 20
Forward Delay (in seconds): 15

Bridge ID Priority: 32768
MAC-Address: 08:00:09:9d:d1:f7
Hello time (in seconds): 2
Max Age (in seconds): 20
Forward Delay (in seconds): 15

Port Role State Cost Priority Type
--------- ----------- ------- ------ -------- -------
1/1/1 Designated Forwarding 20000 128 point_to_point
1/1/2 Root Forwarding 20000 128 point_to_point

8320-3#

And here is an easy way to find out who is the root bridge for various VLANs

8320-1#

show spanning-tree summary root

Spanning tree status: Enabled Protocol: RPVST
Root bridge for VLAN : 10

<table>
<thead>
<tr>
<th>VLAN</th>
<th>Priority</th>
<th>Root ID</th>
<th>Root cost</th>
<th>Hello</th>
<th>Max</th>
<th>Fwd</th>
</tr>
</thead>
<tbody>
<tr>
<td>VLAN10</td>
<td>4096</td>
<td>08:00:09:8c:5a:12</td>
<td>0</td>
<td>2</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>VLAN20</td>
<td>4096</td>
<td>08:00:09:72:d0:20</td>
<td>20000</td>
<td>2</td>
<td>20</td>
<td>15</td>
</tr>
</tbody>
</table>

8320-1#

8320-2#

show spanning-tree summary root

Spanning tree status: Enabled Protocol: RPVST
Root bridge for VLAN : 20

<table>
<thead>
<tr>
<th>VLAN</th>
<th>Priority</th>
<th>Root ID</th>
<th>Root cost</th>
<th>Hello</th>
<th>Max</th>
<th>Fwd</th>
</tr>
</thead>
<tbody>
<tr>
<td>VLAN10</td>
<td>4096</td>
<td>08:00:09:8c:5a:12</td>
<td>20000</td>
<td>2</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>VLAN20</td>
<td>4096</td>
<td>08:00:09:72:d0:20</td>
<td>20000</td>
<td>2</td>
<td>20</td>
<td>15</td>
</tr>
</tbody>
</table>

8320-2#

8320-3#

show spanning-tree summary root

Spanning tree status: Enabled Protocol: RPVST
Root bridge for VLAN : 20

<table>
<thead>
<tr>
<th>VLAN</th>
<th>Priority</th>
<th>Root ID</th>
<th>Root cost</th>
<th>Hello</th>
<th>Max</th>
<th>Fwd</th>
</tr>
</thead>
<tbody>
<tr>
<td>VLAN10</td>
<td>4096</td>
<td>08:00:09:8c:5a:12</td>
<td>20000</td>
<td>2</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>VLAN20</td>
<td>4096</td>
<td>08:00:09:72:d0:20</td>
<td>20000</td>
<td>2</td>
<td>20</td>
<td>15</td>
</tr>
</tbody>
</table>

8320-3#
Here I have added a VPCS as PC-3 to GNS3 that is connected to 8320-3 switch on 1/1/3 interface.

You need to edit the VPCS to assign it an IP address.

Now we’ll configure the interface 1/1/3 on 8320-3 to be on VLAN 10.

```
8320-3# sh int b
```

<table>
<thead>
<tr>
<th>Port</th>
<th>Native VLAN</th>
<th>Mode</th>
<th>Type</th>
<th>Enabled</th>
<th>Status</th>
<th>Reason</th>
<th>Speed (Mb/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/3</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td>Administratively down</td>
<td>1000</td>
</tr>
<tr>
<td>1/1/4</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td>Administratively down</td>
<td>--</td>
</tr>
<tr>
<td>1/1/5</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td>Administratively down</td>
<td>--</td>
</tr>
<tr>
<td>1/1/6</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td>Administratively down</td>
<td>--</td>
</tr>
</tbody>
</table>

```
8320-3# conf t
8320-3(config)# int 1/1/3
8320-3(config-if)# no routing
```
8320-3(config-if)# vlan access 10
8320-3(config-if)# no shut
8320-3(config-if)# ^Z
8320-3#
8320-3# sh int b

<table>
<thead>
<tr>
<th>Port</th>
<th>Native VLAN</th>
<th>Mode</th>
<th>Type</th>
<th>Enabled</th>
<th>Status</th>
<th>Reason</th>
<th>Speed (Mb/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/1</td>
<td>1</td>
<td>trunk</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>1/1/2</td>
<td>1</td>
<td>trunk</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>1/1/3</td>
<td>10</td>
<td>access</td>
<td>--</td>
<td>yes</td>
<td>up</td>
<td>Administratively down --</td>
<td>1000</td>
</tr>
<tr>
<td>1/1/4</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td>Administratively down --</td>
<td>--</td>
</tr>
<tr>
<td>1/1/5</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td>Administratively down --</td>
<td>--</td>
</tr>
<tr>
<td>1/1/6</td>
<td>--</td>
<td>routed</td>
<td>--</td>
<td>no</td>
<td>down</td>
<td>Administratively down --</td>
<td>--</td>
</tr>
</tbody>
</table>
8320-3#

Porting VLANs and Status

Here are the successful pings from 8320-1

8320-1# ping 10.0.10.9
PING 10.0.10.9 (10.0.10.9) 100(128) bytes of data.
108 bytes from 10.0.10.9: icmp_seq=1 ttl=64 time=630 ms
108 bytes from 10.0.10.9: icmp_seq=2 ttl=64 time=22.6 ms
108 bytes from 10.0.10.9: icmp_seq=3 ttl=64 time=77.3 ms
108 bytes from 10.0.10.9: icmp_seq=4 ttl=64 time=331 ms
108 bytes from 10.0.10.9: icmp_seq=5 ttl=64 time=101 ms
--- 10.0.10.9 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4007ms
rtt min/avg/max/mdev = 22.618/248.520/630.541/218.004 ms
8320-1#

And from 8320-2

8320-2# ping 10.0.10.9
PING 10.0.10.9 (10.0.10.9) 100(128) bytes of data.
108 bytes from 10.0.10.9: icmp_seq=1 ttl=64 time=1649 ms
108 bytes from 10.0.10.9: icmp_seq=2 ttl=64 time=639 ms
108 bytes from 10.0.10.9: icmp_seq=4 ttl=64 time=436 ms
108 bytes from 10.0.10.9: icmp_seq=5 ttl=64 time=210 ms
--- 10.0.10.9 ping statistics ---
5 packets transmitted, 4 received, 20% packet loss, time 4056ms
rtt min/avg/max/mdev = 210.679/733.937/1649.112/549.674 ms
8320-2#
8 Appendix A – Running Configuration

8.1 Switch 8320-1 Configuration

8320-1# sh run
Current configuration:
!
!Version ArubaOS-CX Virtual.10.04.0001
!export-password: default
hostname 8320-1
user admin group administrators password ciphertext
AQBapdSJvDb18mCzVw141v+U2CPE819nioJBWwMxPn5DR/DVYqAAAEp2TDMjdoehptPcmQgMSycBOezpsBIp9mGC
Tj8krTJwCc1yo64nZbwZVA/9ekvKo7k3wvIAWu3Z3/Kd2Rc24Pjuu9H72TcgWJLMO+1MXVtUVi+vrTfis/n3WZmFA
gVV6S/
led locator on
cli-session
    timeout 0
! ssh server vrf mgmt
!
vlan 1,10,20
spanning-tree mode rpvst
spanning-tree
spanning-tree vlan 10,20
spanning-tree vlan 10 priority 1
interface mgmt
    no shutdown
    ip static 192.168.99.1/24
    default-gateway 192.168.99.254
interface lag 101
    no shutdown
    no routing
    vlan trunk native 1
    vlan trunk allowed 10,20
    lacp mode active
interface 1/1/1
    no shutdown
    mtu 2048
    lag 101
interface 1/1/2
    no shutdown
    mtu 2048
    lag 101
interface 1/1/3
    no shutdown
    no routing
    vlan trunk native 1
    vlan trunk allowed 10,20
interface vlan10
    ip address 10.0.10.1/24
interface vlan20
    ip address 10.0.20.1/24
https-server rest access-mode read-write
https-server vrf mgmt
8320-1#

8.2 Switch 8320-2 Configuration

8320-2# sh run
Current configuration:

8.3 Switch 8320-3 Configuration

8320-3# sh run
Current configuration:

!Version ArubaOS-CX Virtual.10.04.0001
!export-password: default
hostname 8320-3
user admin group administrators password ciphertext
AQBape4cFSNn+KHfqJrC5ygaJUJl4OpfWz5j0lpwqe+KlwNYgAAA4CROYIKzm6MhJD1z1AMVp3OYV1mauMSfKe
8.3 Switch 8320-3 Configuration

8320-3# sh run
Current configuration:

!Version ArubaOS-CX Virtual.10.04.0001
!export-password: default
hostname 8320-3
user admin group administrators password ciphertext
AQBape4cFSNn+KHfqJrC5ygaJUJl4OpfWz5j0lpwqe+KlwNYgAAA4CROYIKzm6MhJD1z1AMVp3OYV1mauMSfKe
8.3 Switch 8320-3 Configuration

8320-3# sh run
Current configuration:

!Version ArubaOS-CX Virtual.10.04.0001
!export-password: default
hostname 8320-3
user admin group administrators password ciphertext
AQBape4cFSNn+KHfqJrC5ygaJUJl4OpfWz5j0lpwqe+KlwNYgAAA4CROYIKzm6MhJD1z1AMVp3OYV1mauMSfKe

! ssh server vrf mgmt
!
vlan 1,10,20
spanning-tree mode rpvst
spanning-tree
spanning-tree vlan 10,20
interface mgmt
  no shutdown
  ip static 192.168.99.3/24
  default-gateway 192.168.99.254
interface 1/1/1
  no shutdown
  no routing
  vlan trunk native 1
  vlan trunk allowed 10,20
interface 1/1/2
  no shutdown
  no routing
  vlan trunk native 1
  vlan trunk allowed 10,20
interface 1/1/3
  no shutdown
  no routing
  vlan access 10
https-server rest access-mode read-write
https-server vrf mgmt
8320-3#