Verifying Spanning Tree operation

Overview:

Spanning Tree Protocol (STP) is an algorithm that provides path redundancy while preventing undesirable loops in a network that are created by multiple active paths between switches. Loops occur when there are alternate routes between two or more switches within the network. To establish path redundancy, STP creates a tree that spans all of the switches in an extended network, forcing redundant paths into a standby, or blocked state. STP allows only one active path at a time between any two switches therefore preventing loops while providing redundant links as a backup in case the initial link should fail. If STP cost changes, or if one network segment becomes unreachable, the spanning tree algorithm will reconfigure the spanning tree topology and reestablishes the link by activating the standby path.

Scenario:

In this CCNA Lab we will use Cisco's Packet Tracer and what we have learned in previous labs to configure VLAN Trunking Protocol and a VLAN on three switches in a fault tolerant configuration. We will then demonstrate Spanning Tree Protocol (STP) operation by shutting down functioning ports and observing the operation of the remaining ports. We will also use the show and ping commands to verify proper operation.

Objectives:

- Practice what we have learned previously by doing basic configuration.
- Practice configuring VTP and VLANs in the VTP domain.
- Learn to verify STP operation on Catalyst switches.

Procedure:

Perform Basic Router Configuration:

1. Configure the hostname on all switched as shown in the network diagram.
2. Configure no ip domain-lookup on all switches.
3. Configure the enable secret password as cisco on all switches.
4. Configure the console and vty password as sanfran on all switches.
5. Configure the exec-timeout command to the console and virtual terminal lines.
6. Save the running configuration to the NVRAM.
7. Configure IP Addressing on the Host PCs:
8. Configure the IP address of the Ethernet interface as shown in the network diagram
9. Configure the interface subnet as shown in the network diagram.
10. Configure the gateway address of the interface to be the 192.168.1.1

Configure Trunks between switches:

1. Configure the interfaces Gig0/1 and 0/2 on DSW1 to have dot1q encapsulation.
2. Configure the interfaces Gig0/1 and 0/2 on DSW1 as trunking.
3. Configure the interfaces Gig1/1 and 1/2 on ASW1 and ASW2 as trunking.

Configure VTP:

1. Configure the VTP domain on all three switches as CCNA.
2. Set the VTP domain password as cisco on all three switches.
3. Configure DSW-1 as a VTP Server switch.
4. Verify VTP Status on DSW1.

```
DSW1#sh vtp status
VTP Version                     : 2
Configuration Revision          : 0
Maximum VLANs supported locally : 1005
Number of existing VLANs        : 5
VTP Operating Mode              : Server
VTP Domain Name                 : CCNA
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Disabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0x8C 0x29 0x40 0xDD 0x7F 0x7A 0x63 0x17
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
Local updater ID is 0.0.0.0 (no valid interface found)
```

5. Configure ASW-1 and ASW-2 as a VTP Client switch
6. Verify VTP Status on ASW1 and 2.

```
ASW1#sh vtp status
VTP Version                     : 2
Configuration Revision          : 0
Maximum VLANs supported locally : 255
Number of existing VLANs        : 5
VTP Operating Mode              : Client
VTP Domain Name                 : CCNA
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Disabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0x8C 0x29 0x40 0xDD 0x7F 0x7A 0x63 0x17
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
```

Create and verify VLANs:

1. Create the VLAN 10 on DSW1
2. Assign the name Sales to VLAN 10
3. Verify VLAN 10 has propagated to ASW1 and ASW2

```
ASW1#sh vlan brief

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                 Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                                 Fa0/9, Fa0/10, Fa0/11, Fa0/12
                                                 Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                                 Fa0/17, Fa0/18, Fa0/19, Fa0/20
                                                 Fa0/21, Fa0/22, Fa0/23, Fa0/24
10   Sales                             active
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
```

4. From PC-1 ping PC-2

```
PC>ping 192.168.1.11

Pinging 192.168.1.11 with 32 bytes of data:

Reply from 192.168.1.11: bytes=32 time=172ms TTL=128
Reply from 192.168.1.11: bytes=32 time=78ms TTL=128
Reply from 192.168.1.11: bytes=32 time=125ms TTL=128
Reply from 192.168.1.11: bytes=32 time=110ms TTL=128
Ping statistics for 192.168.1.11:

    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 78ms, Maximum = 172ms, Average = 121ms
```

Verifying Spanning-Tree:

1. Display Spanning-Tree summary on DSW1

```
DSW1#sh spanning-tree summary
Switch is in pvst mode
Root bridge for:
Extended system ID          is enabled
Portfast Default            is disabled
PortFast BPDU Guard Default  is disabled
Portfast BPDU Filter Default is disabled
Loopguard Default           is disabled
EtherChannel misconfig guard is disabled
UplinkFast                  is disabled
BackboneFast                is disabled
Configured Pathcost method used is short

Name                   Blocking Listening Learning Forwarding STP Active
---------------------- -------- --------- -------- ---------- ----------
VLAN0001                    0        0        0         2          2
VLAN0010                    0        0        0         2          2

---------------------- -------- --------- -------- ---------- ----------
2 vlans                     0        0        0         4          4
```

2. Display Spanning-Tree summary on ASW1

```
ASW1#sh spanning-tree summary
Switch is in pvst mode
Root bridge for:
Extended system ID          is enabled
Portfast Default            is disabled
PortFast BPDU Guard Default  is disabled
Portfast BPDU Filter Default is disabled
Loopguard Default           is disabled
EtherChannel misconfig guard is disabled
UplinkFast                  is disabled
BackboneFast                is disabled
Configured Pathcost method used is short

Name                   Blocking Listening Learning Forwarding STP Active
---------------------- -------- --------- -------- ---------- ----------
VLAN0001                    1        0        0         2          3
VLAN0010                    1        0        0         1          2

---------------------- -------- --------- -------- ---------- ----------
2 vlans                     2        0        0         3          5
```

3. Display Spanning-Tree summary on ASW2

```
ASW2#sh spanning-tree summary
Switch is in pvst mode
Root bridge for: default Sales
Extended system ID          is enabled
Portfast Default            is disabled
PortFast BPDU Guard Default  is disabled
Portfast BPDU Filter Default is disabled
Loopguard Default           is disabled
EtherChannel misconfig guard is disabled
UplinkFast                  is disabled
BackboneFast                is disabled
Configured Pathcost method used is short

Name                 Blocking Listening Learning Forwarding STP Active
-------------------- -------- --------- -------- ---------- ----------
VLAN0001                    0         0        0          3          3
VLAN0010                    0         0        0          2          2

-------------------- -------- --------- -------- ---------- ----------
2 vlans                     0         0        0          5          5
```

4. Shut down the interface Gig1/2 on ASW1 Note the topology change.
5. Display Spanning-Tree summary on ASW1

```
ASW1#sh spanning-trees
Switch is in pvst mode
Root bridge for:
Extended system ID          is enabled
Portfast Default            is disabled
PortFast BPDU Guard Default  is disabled
Portfast BPDU Filter Default is disabled
Loopguard Default           is disabled
EtherChannel misconfig guard is disabled
UplinkFast                  is disabled
BackboneFast                is disabled
Configured Pathcost method used is short

Name                 Blocking Listening Learning Forwarding STP Active
-------------------- -------- --------- -------- ---------- ----------
VLAN0001                    0         0        0          2          2
VLAN0010                    0         0        0          1          1

-------------------- -------- --------- -------- ---------- ----------
2 vlans                     0         0        0          3          3
```

6. From PC1 ping PC2.

PC>ping 192.168.1.11

Pinging 192.168.1.11 with 32 bytes of data:

Reply from 192.168.1.11: bytes=32 time=172ms TTL=128
Reply from 192.168.1.11: bytes=32 time=78ms TTL=128
Reply from 192.168.1.11: bytes=32 time=125ms TTL=128
Reply from 192.168.1.11: bytes=32 time=110ms TTL=128
Ping statistics for 192.168.1.11:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 78ms, Maximum = 172ms, Average = 121ms