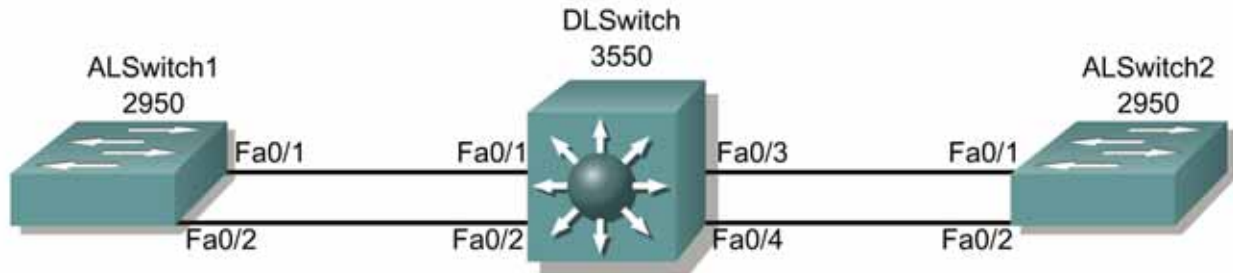


Lab 3.2.5.1 Spanning-Tree Protocol (STP) Default Behavior



Objective

The purpose of this lab is to observe the default behavior of STP.

Scenario

Three switches have just been installed. The distribution layer switch is a Catalyst 3550 and the access layer switches are both Catalyst 2950. There are redundant uplinks between the access layer and distribution layer. Because of the possibility of bridging loops, spanning tree will logically remove any redundant links. In this lab, students will observe what spanning tree does and why.

Step 1

Delete the **vlan.dat** database file, power cycle, and erase the startup configuration on each switch before configuring the switches. Issue the **reload** command. Cable and configure the two switches as shown in the diagram with a hostname, enable password, and console security.

Console into DLSwitch and enter the following commands.

```

Switch>enable
Switch#configure terminal
Switch(config)#hostname DLSwitch
DLSwitch(config)#enable secret class
DLSwitch(config)#line console 0
DLSwitch(config-line)#password cisco
DLSwitch(config-line)#login
  
```

Console into ALSwitch1 and enter the following commands.

```

Switch>enable
Switch#configure terminal
Switch(config)#hostname ALSwitch1
ALSwitch1(config)#enable secret class
ALSwitch1(config)#line console 0
ALSwitch1(config-line)#password cisco
ALSwitch1(config-line)#login
  
```

Console into the ALSwitch2 and enter the following commands.

```

Switch>enable
Switch# configure terminal
Switch(config)#hostname ALSwitch2
  
```

```

ALSwitch2(config)#enable secret class
ALSwitch2(config)#line console 0
ALSwitch2(config-line)#password cisco
ALSwitch2(config-line)#login

```

Step 2

After the cables are connected and the switch detects the redundant links, spanning tree will be initiated.

By default, spanning tree will run on every port. When a new link becomes active, the port will go through the Listening, Learning, and Forwarding states before it becomes active. During this period, the switch will discover if it is connected to another switch or an end-user device.

If another switch is detected, the two switches will begin creating a spanning tree. One of the switches will be elected as the root of the tree. Then an agreement will be established as to which links to keep active and which links to disable if multiple links exist.

1. What type of frame does the Spanning-Tree Protocol use to communicate with other switches?

Note The results in this lab will vary. Spanning-tree operation is based on the MAC address of the switches.

Observe the LEDs on the switch to check the status of the link. A bright green light indicates an active link. An amber light indicates an inactive link.

Step 3

Verify STP with the **show spanning-tree** command on the DLSwitch.

```

DLSwitch#show spanning-tree

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
             Address     0009.430f.a400
             Cost        19
             Port        3 (FastEthernet0/3)
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
             Address     000a.b701.f700
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time   300

Interface    Port ID      Cost Sts     Designated      Port ID
Name         Prio.Nbr    Cost Sts     Cost Bridge ID    Prio.Nbr
-----
Fa0/1        128.1       19 FWD     19 32769 000a.b701.f700 128.1
Fa0/2        128.2       19 FWD     19 32769 000a.b701.f700 128.2
Fa0/3        128.3       19 FWD     0 32769 0009.430f.a400 128.1
Fa0/4        128.4       19 BLK     0 32769 0009.430f.a400 128.2

```

Console into ALSwitch1. Issue the **show spanning-tree** command.

```

ALSwitch1#show spanning-tree

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769

```

```

      Address      0009.430f.a400
      Cost         38
      Port         1 (FastEthernet0/1)
      Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID Priority    32769 (priority 32768 sys-id-ext 1)
Address      000a.8afc.dd80
Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
Aging Time   300

Interface      Port ID      Designated      Port ID
Name           Prio.Nbr      Cost Sts      Cost Bridge ID      Prio.Nbr
-----
Fa0/1          128.1          19 FWD          19 32769 000a.b701.f700 128.1
Fa0/2          128.2          19 BLK          19 32769 000a.b701.f700 128.2

```

Console into ALSwitch2. Issue the **show spanning-tree** command.

```

ALSwitch2#show spanning-tree

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
             Address      0009.430f.a400
             This bridge is the root
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID Priority    32769 (priority 32768 sys-id-ext 1)
Address      0009.430f.a400
Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
Aging Time   300

Interface      Port ID      Designated      Port ID
Name           Prio.Nbr      Cost Sts      Cost Bridge ID      Prio.Nbr
-----
Fa0/1          128.1          19 FWD          0 32769 0009.430f.a400 128.1
Fa0/2          128.2          19 FWD          0 32769 0009.430f.a400 128.2

```

Notice that between two switches, one of the two ports will be set to blocking. Blocking could occur on the access layer switch or the distribution layer switch. If all ports have their default setting, then the higher MAC address of the two ports is set to blocking.

The switch port is in blocking state because it detected two links between the same switches. This would result in a bridge loop if the switch logically disables one link.

Note Student output may differ since all switches have the default Bridge Priority of 32769 and selection of the Root Bridge is based upon the lowest switch MAC address. The sample output below also differs from those in the lab since they were generated with a different set of switches.

```

DLSwitch#show spanning-tree

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
             Address      000b.be4f.e780
             This bridge is the root
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID Priority    32769 (priority 32768 sys-id-ext 1)
Address      000b.be4f.e780
Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
Aging Time   300

```

Interface Name	Port ID Prio.Nbr	Cost Sts	Designated Cost Bridge ID	Port ID Prio.Nbr
Fa0/1	128.1	19 FWD	0 32769 000b.be4f.e780	128.1
Fa0/2	128.2	19 FWD	0 32769 000b.be4f.e780	128.2
Fa0/3	128.3	19 FWD	0 32769 000b.be4f.e780	128.3
Fa0/4	128.4	19 FWD	0 32769 000b.be4f.e780	128.4

ALSwitch1#**show spanning-tree**

```

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
             Address    000b.be4f.e780
             Cost        19
             Port        1 (FastEthernet0/1)
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
             Address    000b.bec6.ac00
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  300

```

Interface Name	Port ID Prio.Nbr	Cost Sts	Designated Cost Bridge ID	Port ID Prio.Nbr
Fa0/1	128.1	19 FWD	0 32769 000b.be4f.e780	128.1
Fa0/2	128.2	19 BLK	0 32769 000b.be4f.e780	128.2

ALSwitch2#**show spanning-tree**

```

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
             Address    000b.be4f.e780
             Cost        19
             Port        1 (FastEthernet0/1)
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
             Address    000b.bec6.e080
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  300

```

Interface Name	Port ID Prio.Nbr	Cost Sts	Designated Cost Bridge ID	Port ID Prio.Nbr
Fa0/1	128.1	19 FWD	0 32769 000b.be4f.e780	128.3
Fa0/2	128.2	19 BLK	0 32769 000b.be4f.e780	128.4

After reviewing the spanning-tree output, answer the following questions:

DLSwitch1#**show vtp counters**
<Output omitted>

VTP pruning statistics:

Trunk	Join Transmitted	Join Received	Summary advts received from non-pruning-capable device
Fa0/1	0	0	0
Fa0/3	0	0	0
Fa0/7	0	0	0

DLSwitch2#**show vtp counters**
<Output omitted>
VTP pruning statistics:

Trunk	Join Transmitted	Join Received	Summary advts received from non-pruning-capable device
-----	-----	-----	-----
Fa0/1	0	0	0
Fa0/3	0	0	0
Fa0/7	0	0	0

ALSwitch1#**show vtp counters**
<Output omitted>

VTP pruning statistics:

Trunk	Join Transmitted	Join Received	Summary advts received from non-pruning-capable device
-----	-----	-----	-----
Fa0/1	0	0	0
Fa0/3	0	0	0

ALSwitch2#**show vtp counters**
<Output omitted>

VTP pruning statistics:

Trunk	Join Transmitted	Join Received	Summary advts received from non-pruning-capable device
-----	-----	-----	-----
Fa0/1	0	0	0
Fa0/3	0	0	0

ALSwitch3#**show vtp counters**
<Output omitted>

VTP pruning statistics:

Trunk	Join Transmitted	Join Received	Summary advts received from non-pruning-capable device
-----	-----	-----	-----
Fa0/1	0	0	0
Fa0/3	0	0	0

DLSwitch1#**show 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             : CORP
VTP Pruning Mode            : Disabled
VTP V2 Mode                 : Disabled
VTP Traps Generation        : Disabled
MD5 digest                  : 0xB7 0x5D 0xB6 0x6D 0xE0 0xC0 0x3E 0x2E
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
Local updater ID is 5.5.5.1 on interface V11 (lowest numbered VLAN interface found)

```

DLSwitch2#**show vtp status**

```

VTP Version                : 2
Configuration Revision      : 0
Maximum VLANs supported locally : 1005
Number of existing VLANs    : 5
VTP Operating Mode          : Client
VTP Domain Name             : CORP
VTP Pruning Mode            : Disabled
VTP V2 Mode                 : Disabled
VTP Traps Generation        : Disabled

```

```
MD5 digest                  : 0xB7 0x5D 0xB6 0x6D 0xE0 0xC0 0x3E 0x2E
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
```

ALSwitch1#show vtp status

```
VTP Version                  : 2
Configuration Revision       : 0
Maximum VLANs supported locally : 250
Number of existing VLANs    : 5
VTP Operating Mode          : Client
VTP Domain Name             : CORP
VTP Pruning Mode            : Disabled
VTP V2 Mode                 : Disabled
VTP Traps Generation        : Disabled
MD5 digest                  : 0xB7 0x5D 0xB6 0x6D 0xE0 0xC0 0x3E 0x2E
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
```

ALSwitch2#show vtp status

```
VTP Version                  : 2
Configuration Revision       : 0
Maximum VLANs supported locally : 250
Number of existing VLANs    : 5
VTP Operating Mode          : Client
VTP Domain Name             : CORP
VTP Pruning Mode            : Disabled
VTP V2 Mode                 : Disabled
VTP Traps Generation        : Disabled
MD5 digest                  : 0xB7 0x5D 0xB6 0x6D 0xE0 0xC0 0x3E 0x2E
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
```

ALSwitch3#show vtp status

```
VTP Version                  : 2
Configuration Revision       : 0
Maximum VLANs supported locally : 250
Number of existing VLANs    : 5
VTP Operating Mode          : Client
VTP Domain Name             : CORP
VTP Pruning Mode            : Disabled
VTP V2 Mode                 : Disabled
VTP Traps Generation        : Disabled
MD5 digest                  : 0xB7 0x5D 0xB6 0x6D 0xE0 0xC0 0x3E 0x2E
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
```

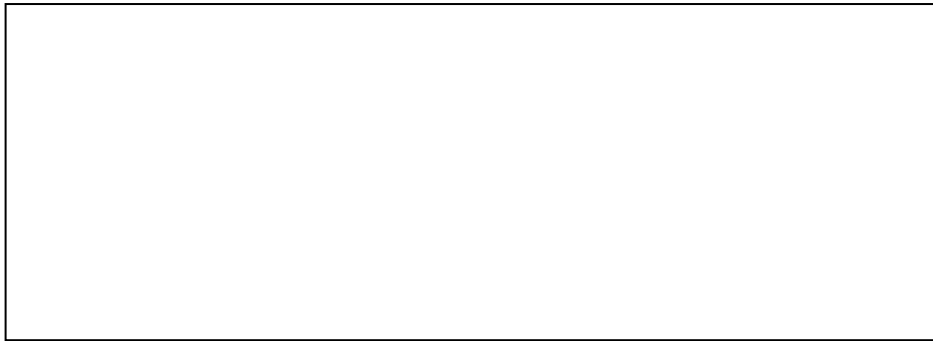
1. Which switch is the root of the spanning-tree?
2. How can the root switch be identified?
3. Why was that switch selected as the root?

4. What caused the one port to be in blocking state over another?

5. What caused one link to be blocked over another?

Step 4

Create a diagram of the spanning-tree topology for VLAN 01. With Cisco Catalyst switches, there is a different spanning spanning-tree state for each VLAN. Identify the root bridge, root ports, and designated ports.



In this lab the default operation of spanning tree was observed. Since no bridge priorities were specified, the switch with the lowest MAC address was elected as the root. Since no link priorities were changed, the link with the lowest cost was chosen as the active link. If costs were equal, then the tie was broken by the lowest port number.

In a later lab the default STP behavior will be modified so that spanning tree will work according to the specifications.