

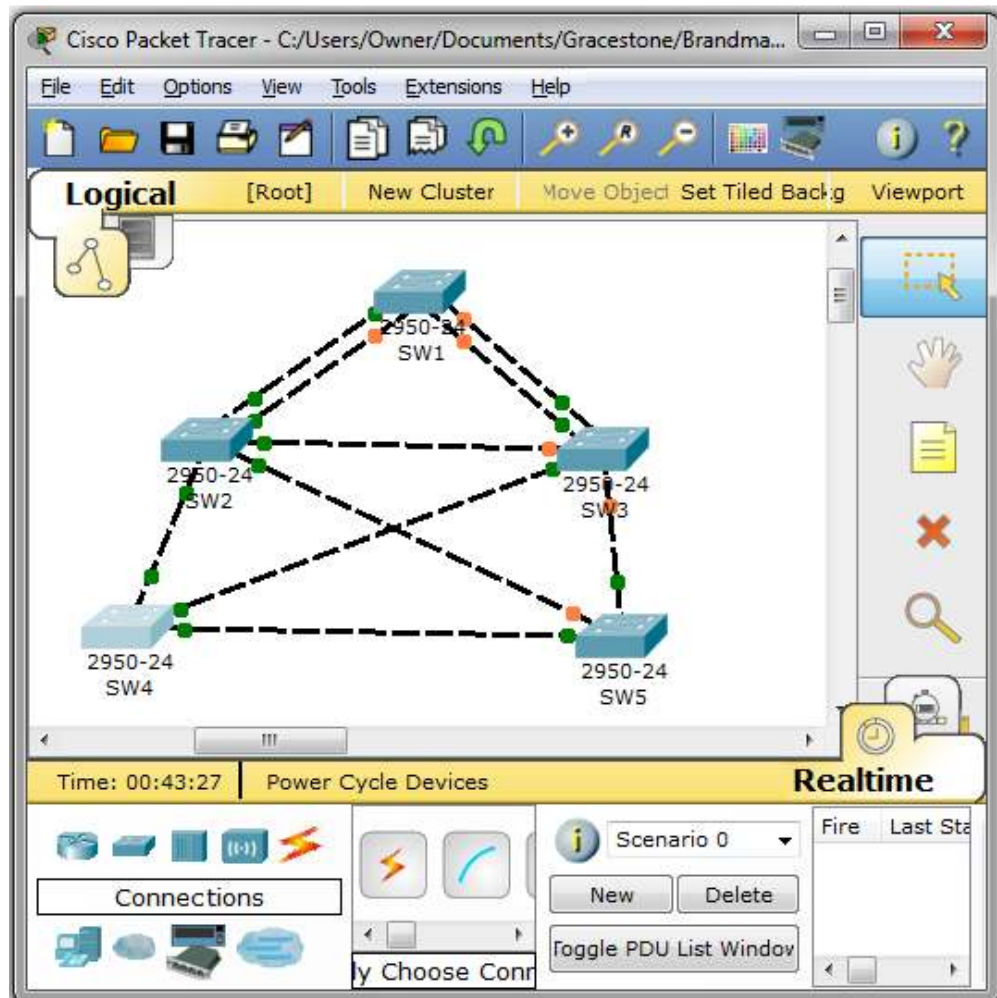
ICND2

Spanning-Tree Protocol

TOPOLOGY

- 5x2950 (Layer 2 Switches)

All basic settings have been prepopulated into the configuration file for use in these exercises.



Lab Exercise 1: Spanning-Tree Exploration

Equipment Involved: SW1 & SW3

STEP 1: Explore 802.1d STP Settings on SW1

- Double click on SW1 to open the command line interface window
- Press **<enter>** to get to user exec mode
- Type **en** and press **<enter>** to go into privileged mode (no password required)

```

[OK]
SW1#sh sp
SW1#sh spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
            Address     0000.0CB5.9E36
            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     0090.0C50.D436
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time  20

Interface                Role Sts Cost      Prio.Nbr Type
-----
Fa0/1                    Root FWD 19        128.1   P2p
Fa0/2                    Altn BLK 19        128.2   P2p
Fa0/3                    Altn BLK 19        128.3   P2p
Fa0/4                    Altn BLK 19        128.4   P2p

SW1#
  
```

- Type the word **show spanning-tree** to display the 802.1d settings for SW1
 - Note the fact that STP is enabled and running (**spanning tree enabled protocol ieee**)
 - The switch bridge-id:
 - **MAC address:** 0000.0CB5.9E36
 - **Priority:** 32769
 - Ports participating in STP (**root** and **designated** ports):
 - Timers:
 - **Hello:** 2 seconds
 - **MaxAge:** 20 seconds
 - **Forward Delay:** 15 seconds
- Is this switch the root of the spanning tree for VLAN 1? How can you tell? If not, which one is?

STEP 2: Set SW1 as the Root of STP on VLAN 1

- Double click on SW1 to open the command line interface window
- Press **<enter>** to get to user exec mode
- Type **en** and press **<enter>** to go into privileged mode (no password required)

```

SW1(Config)#spanning tree vlan 1 root primary
SW1(config)#^Z
%SYS-5-CONFIG_I: Configured from console by console
SW1#sh spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    24577
            Address    0090.0C50.D436
            This bridge is the root
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID Priority    24577 (priority 24576 sys-id-ext 1)
            Address    0090.0C50.D436
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time 20

Interface          Role Sts Cost      Prio.Nbr Type
-----
Fa0/1              Desg FWD 19        128.1   P2p
Fa0/2              Desg LSN 19        128.2   P2p
Fa0/3              Desg LSN 19        128.3   P2p
Fa0/4              Desg LSN 19        128.4   P2p
SW1#

```

- Type **show spanning-tree** and press **<enter>** to display the current settings
- Type **config t** to enter global configuration mode
- Type **spanning-tree vlan 1 root primary** to force SW1 to win the election as the root switch
- Type **show spanning-tree** and press **<enter>** to display the current settings, which shows SW1 now as the root with a priority of 24577 (lower than the default of 32769)
- Also note that the ports are first in learning mode as STP recalculates the topology

```

SW1#sh spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    24577
            Address    0090.0C50.D436
            This bridge is the root
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID Priority    24577 (priority 24576 sys-id-ext 1)
            Address    0090.0C50.D436
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time 20

Interface          Role Sts Cost      Prio.Nbr Type
-----
Fa0/1              Desg FWD 19        128.1   P2p
Fa0/2              Desg FWD 19        128.2   P2p
Fa0/3              Desg FWD 19        128.3   P2p
Fa0/4              Desg FWD 19        128.4   P2p
SW1#

```

- Wait a few moments and issue the **show spanning-tree** command again and then note how the ports are now in forwarding mode
- Type **copy running-config startup-config** (or **wr mem**) to save the configuration to memory
- When finished, select **File > Save** on the main Network Visualizer screen in order to save your changes in the simulator file

STEP 3: Enable Portfast on SW3

- Double click on SW3 to open the command line interface window
- Press **<enter>** to get to user exec mode
- Type **en** and press **<enter>** to go into privileged mode (no password required)

The screenshot shows a window titled 'SW3' with three tabs: 'Physical', 'Config', and 'CLI'. The 'CLI' tab is active, displaying the 'IOS Command Line Interface'. The terminal output is as follows:

```

SW3>en
SW3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SW3(config)#int fa0/8
SW3(config-if)#spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION

%Portfast has been configured on FastEthernet0/8 but will only
have effect when the interface is in a non-trunking mode.
SW3(config-if)#

```

At the bottom of the window, there are 'Copy' and 'Paste' buttons.

- Type **config t** and press **<enter>** to go into global configuration mode (see above)
- Type **interface fa0/8** to enter interface configuration mode on SW3
- Enable the portfast feature by entering the command **spanning-tree portfast** and press **<enter>**
- A warning should appear once you have enable the feature
- Type **exit** to exit configuration mode completely
- Type **copy running-config startup-config** (or **wr mem**) to save the configuration to memory
- When finished, select **File > Save** on the main Network Visualizer screen in order to save your changes in the simulator file

Lab Exercise 2: Etherchannel Configuration

Equipment Involved: SW1, SW2 & SW3

STEP 1: Display Current STP settings on SW2

- Double click on SW2 to open the command line interface window
- Press **<enter>** to get to user exec mode
- Type **en** and press **<enter>** to go into privileged mode (no password required)

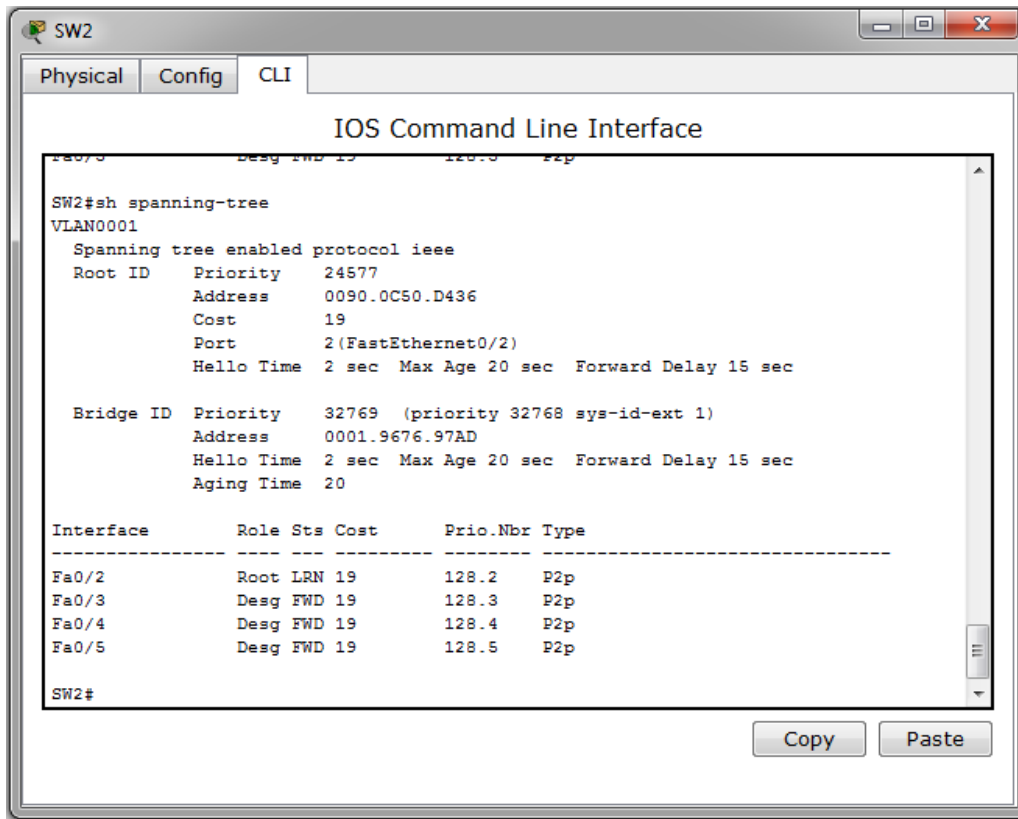
```

SW2#en
SW2#sh spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    24577
            Address    0090.0C50.D436
            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    0001.9676.97AD
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time 20

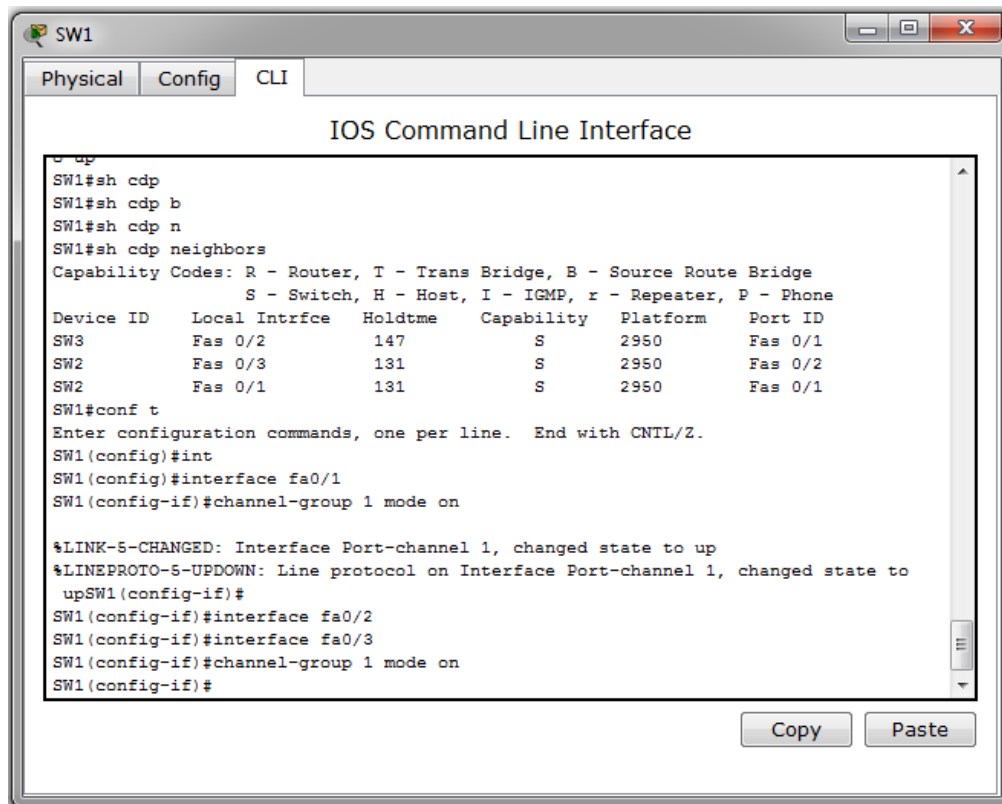
Interface      Role Sts Cost      Prio.Nbr Type
-----
Fa0/1          Root FWD 19        128.1   P2p
Fa0/2          Altn BLK 19        128.2   P2p
Fa0/3          Desg FWD 19        128.3   P2p
Fa0/4          Desg FWD 19        128.4   P2p
Fa0/5          Desg FWD 19        128.5   P2p
  
```

- Type **show spanning-tree** and press **<enter>** to display the current settings. Note that the root port (leading back to SW1) is forwarding and that the redundant port (Fa0/2) is blocked.
- Enter configuration mode using the **config t** command
- Enter interface configuration mode by typing the command **interface fa0/1**
- Simulate a link failure by typing the **shutdown** command
- Return to privileged command line mode by entering **exit** twice
- Quickly execute the **show spanning-tree** command to display the new settings.
- Note that the new root port (Fa0/2) is in **Listening** and then **Learning** mode for several seconds before transitioning to **Forwarding** mode. If it seems like a long time, that's because it **IS** (50 seconds at the defaults)



STEP 2: Configure Etherchannel between SW1 & SW2, and SW1 & SW3

- Double click on SW1 to open the command line interface window
- Press **<enter>** to get to user exec mode
- Type **en** and press **<enter>** to go into privileged mode (no password required)



- Type **config t** and press **<enter>** to go into global configuration mode (see above)
- Type **interface fa0/1** to enter interface configuration mode on SW1
- Enable Etherchannel by entering the command **channel-group 1 mode on** and press **<enter>**. This enables the feature without any type of negotiation involved
- Repeat the process on Fa0/3 (attached to SW2)
- Type show **ip interface brief** and press **<enter>**, and press the space bar to scroll to the end of the output. Verify that the last interface is listed as **Port-Channel 1** and that it is up
- Type **exit** to exit configuration mode completely
- Type **interface fa0/2** to enter interface configuration mode on SW1 (Etherchannel for SW3)
- Enable Etherchannel by entering the command **channel-group 2 mode on** and press **<enter>**. This enables the feature without any type of negotiation involved
- Repeat the process on Fa0/4 (attached to SW3)
- Type show **ip interface brief** and press **<enter>**, and press the space bar to scroll to the end of the output. Verify that the last interface is listed as **Port-Channel 2** and that it is up
- Type **exit** to exit configuration mode completely
- Type **copy running-config startup-config** (or **wr mem**) to save the configuration to memory
- When finished, select **File > Save** on the main Network Visualizer screen in order to save your changes in the simulator file
- Repeat this process on SW2, using interfaces Fa0/1 & Fa0/2
- Type **exit** to exit configuration mode completely
- Type **copy running-config startup-config** (or **wr mem**) to save the configuration to memory
- When finished, select **File > Save** on the main Network Visualizer screen in order to save your changes in the simulator file
- Repeat this process on SW3, using the interfaces Fa0/1 & Fa0/2
- Type **exit** to exit configuration mode completely
- Type **copy running-config startup-config** (or **wr mem**) to save the configuration to memory
- When finished, select **File > Save** on the main Network Visualizer screen in order to save your changes in the simulator file

STEP 3: Repeat the Link Failure on SW2 on Fa0/1

- Double click on SW2 to open the command line interface window
- Press **<enter>** to get to user exec mode
- Type **en** and press **<enter>** to go into privileged mode (no password required)

```

SW2#sh spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    24577
            Address    0090.0C50.D436
            Cost      19
            Port      25 (Port-channel 1)
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769  (priority 32768 sys-id-ext 1)
            Address    0001.9676.97AD
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time 20

Interface    Role Sts Cost      Prio.Nbr Type
-----
Po1          Root FWD 19        128.25  Shr
Fa0/3        Desg FWD 19        128.3   P2p
Fa0/4        Desg FWD 19        128.4   P2p
Fa0/5        Desg FWD 19        128.5   P2p

SW2#

```

- Type **show spanning-tree** and press **<enter>** to display the current settings. Note that Port-Channel 1 (bundle of Fa0/1 & Fa0/2) is shown as the root port.
- Enter configuration mode using the **config t** command
- Enter interface configuration mode by typing the command **interface fa0/1**
- Simulate a link failure by typing the **shutdown** command
- Return to privileged command line mode by entering **exit** twice
- Quickly execute the **show spanning-tree** command to display the new settings.
- Note that the Port-Channel 1 is still listed as the root and that Spanning-Tree has not triggered a convergence event. This is the strength of Etherchannel, along with increased trunk bandwidth.
- Re-enable Fa0/1