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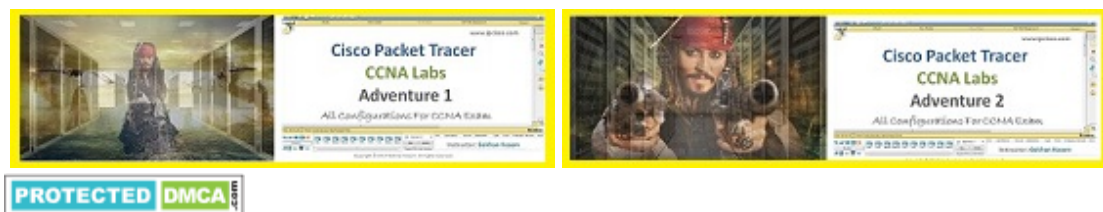
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STP (Spanning Tree Protocol) Example on Packet Tracer

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Author: gokhankosem, on 11 Apr 15 - 1 Comment
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STP (Spanning Tree Protocol)

Example on Packet Tracer

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In this post, instead of detaily talk about **STP (Spanning Tree Protocol)**, we will focus on a basic **Switching Loop** topology and how **STP** mechanism helps to avoid this Switching Loop.

You can **DOWNLOAD** the **Packet Tracer** example with **.pkt** format **HERE.**

Switching Loop is an unwanted problem in a network. Then, what is Switching Loop? **Switching Loop** is the

situation, in which there are two **layer 2** path between two layer 2 endpoint(switch, brigde). Switches creates broadcast storms from every port and switch rebroadcast again and again. Because of teh fact that there is no **TTL(time to live)** mechanism on layer 2, this continues forever.

To avoid this unwanted **Switching Loops**, there are some mechanisms. One of the most common name of this mechanisms is **STP(Spanning Tree Protocol)**.

Acording to this protocol, in the switching topology, a **Root Bridge** is selected. And then the connected port of the switches are classified. The port classification and their meaning are like below:

– **Root Port :** The port to the Root Bridge
– **Designated Port :** The other port thatis not Root Port
– **Non Designated (Blocked) Port :** In a segment, other port than the Designated Port

The selection process is done orderly. First **Root Bridge** is selected, secondly **Root Ports** on all the switches, then **Designated Ports** are selected, and lastly the remainning ports become **Non-Designated Port**, meaning **Blocking Port**.

STP Example on Packet Tracer

For STP example with PAcket Tracer, we will use the below switch topology.
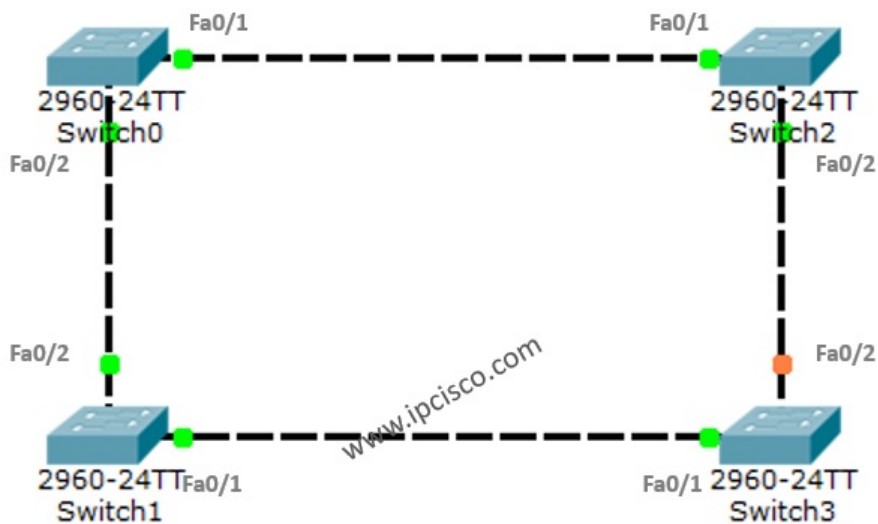
STP Example Topology

As you can see after connecting the switches together in the Loop position, one of the ports become blocking. Because by default STP is enabled and it is avoiding us any Switching Loop.

To understand more detailly let's check the show screenshots.

On Switch0

```
Switch0#show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
             Address     0001.C90E.EDC0
             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     0001.C90E.EDC0
             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


Switch0#show spanning-tree active
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
             Address     0001.C90E.EDC0
             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     0001.C90E.EDC0
             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
```

As we can see above, the addresses are for the Root and the Bridge part. So, Switch0 is selected as **Root Bridge**. The Root Bridge is selected according to the Bridge ID, The Bridge ID is the MAC address of the

Switch. So, the lower one is selected as Root Bridge. This is Switch0.

The two port of Switch0 are normally Designated Port. Because all the ports on Root Bridge is always choosen as **Designated Port**.

Both of these ports are in Forwarding State, this means that they are ready to send the traffic. As a recall, as you know there are four states of an STP port. These are:

– **Blocking** (20 seconds)
– **Listening** (15 second)
– **Learning** (15 second)
– **Forwarding**

You can also use the following commands to check the spanning-tree information.

```
Switch0#show spanning-tree interface fa0/1
Vlan            Role Sts Cost      Prio.Nbr Type
--------------- ---- --- --------- -------- --------------------------------
VLAN0001        Desg FWD 19        128.1    P2p


Switch0#show spanning-tree interface fa0/2
Vlan            Role Sts Cost      Prio.Nbr Type
--------------- ---- --- --------- -------- --------------------------------
VLAN0001        Desg FWD 19        128.2    P2p
```

```
Switch0#show spanning-tree vlan 1
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
             Address     0001.C90E.EDC0
             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     0001.C90E.EDC0
             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
```

You can also use the below command for summary information:

```
Switch0#show spanning-tree summary
Switch is in pvst mode
Root bridge for: default
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


-------------------- -------- --------- -------- ---------- ----------
1 vlans                     0         0        0          2          2
```

For detailed information, use the below command:

```
Switch0#show spanning-tree detail

VLAN0001 is executing the ieee compatible Spanning Tree Protocol
  Bridge Identifier has priority of 32768, sysid 1, 0001.C90E.EDC0
  Configured hello time 2, max age 20, forward delay 15
  Current root has priority 32769
  Topology change flag not set, detected flag not set
  Number of topology changes 0 last change occurred 00:00:00 ago
            from FastEthernet0/1
  Times:  hold 1, topology change 35, notification 2
            hello 2, max age 20, forward delay 15
  Timers: hello 0, topology change 0, notification 0, aging 300

Port 1 (FastEthernet0/1) of VLAN0001 is designated forwarding
  Port path cost 19, Port priority 128, Port Identifier 128.1
  Designated bridge has priority 32769, address 0001.C90E.EDC0
  Designated port id is 128.1, designated path cost 19
  Timers: message age 16, forward delay 0, hold 0
  Number of transitions to forwarding state: 1
  Link type is point-to-point by default

Port 2 (FastEthernet0/2) of VLAN0001 is designated forwarding
  Port path cost 19, Port priority 128, Port Identifier 128.2
  Designated bridge has priority 32769, address 0001.C90E.EDC0
  Designated port id is 128.2, designated path cost 19
  Timers: message age 16, forward delay 0, hold 0
  Number of transitions to forwarding state: 1
  Link type is point-to-point by default
```

We checked the states on Root Bridge, Switch0. Now let's check the other swicthes port states.

On Switch1

```
Switch1#show spanning-tree active
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
             Address     0001.C90E.EDC0
             Cost        19
             Port        2(FastEthernet0/2)
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769  (priority 32768 sys-id-ext 1)
             Address     0090.0CB7.18E5
             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            Root FWD 19         128.2    P2p
```

As you can see above, the root face of the switch, is the Root Port. Because all the cost are same, and it has a lower hop to the root. The other port is Designated Root.

On Switch2

```
Switch2#show spanning-tree active
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
             Address     0001.C90E.EDC0
             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     00D0.FF2E.5B1B
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  20

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Fa0/2            Desg FWD 19         128.2    P2p
Fa0/1            Root FWD 19         128.1    P2p
```

On Switch3

```
Switch3#show spanning-tree active
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
             Address     0001.C90E.EDC0
             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     00D0.58E3.0126
             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
```

AS you can see above, the STP blocks one of the port of Switch3. This election is done according to the cost to the root. The Designated Ports are selected and the remainning Non-Designated Port on a segment is blocked. Remember, only one Designated Port can exist in a segment.

We can summarize the last logical network topology like below:
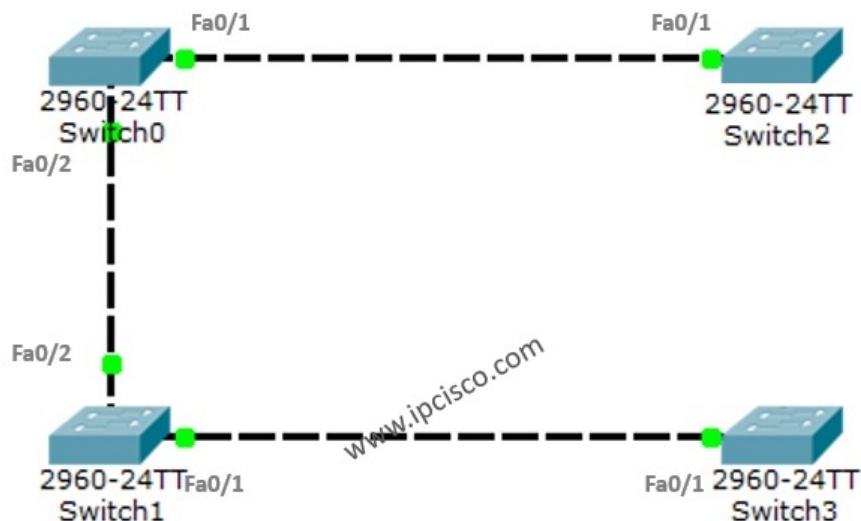
STP Example Topology

I hope this can be useful for you, to understand STP better. **STP(Spanning Tree Protocol)** is the first protocol for this mechanism. Beside STP, there are many protocols used today. **RSTP(Rapid Spanning Tree Protocol), PVRST (Per VLAN Rapid Spanning Tree), PVRST+** and **MST** are these protocol. In the following articles we will discuss these protocols one by one.

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Router DHCP Configuration Example on Packet Tracer
VTP Configuration Example on Packet Tracer
VLAN Configuration Example on Packet Tracer
STP Configuration Example on Packet Tracer
RSTP Configuration with Packet Tracer
STP Portfast Configuration with Packet Tracer
Inter VLAN Routing Configuration on Packet Tracer
Switch Virtual Interface (SVI) Configuration with Packet Tracer
BGP Configuration Example on Packet Tracer
Port Security Configuration Example on Packet Tracer
RIP Configuration Example on Packet Tracer
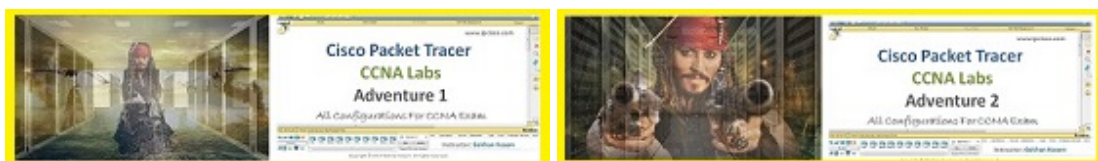**CDP** Configuration Example on Packet Tracer
OSPF Area Types Example on Packet Tracer (Standard and Backbone Areas)

OSPF External Routes Example on Packet Tracer
OSPF Area Types Example on Packet Tracer (Stub, NSSA, Totally Stubby, Totally NSSA Areas)

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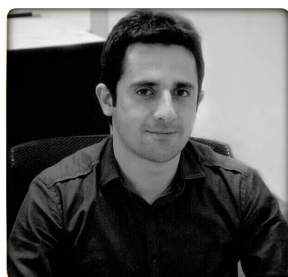
About the Author

Gokhan Kosem is a telecommunation and network engineer. His ambition to IP networks and end-to-end system installation made him to prepare this web-site. By sharing his experiences about various networking protocols beside different system installation experiences and Cisco, Juniper, Alcatel-Lucent devices configurations, he is aimed to be helpful for his collegues in all over the world. He is currently lives in Istanbul, Turkey.

One comment for "STP (Spanning Tree Protocol) Example on Packet Tracer"

1
Rajasekar

Hi,
I am more then interested in spanning tree concept sir . i have read in online but i not able to configure.kindly configure command prompt STP teach me sir.

June 14th, 2017 at 12:52

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