

Internold Networks CCNA Live Webclass (INCLW)

Week 7 of 8

Agenda

- » CDP and LLDP
- » STP
- » EtherChannel
- » Switch Stacking
- » IPv6
- » OSPF and EIGRP

CDP and LLDP

CDP and LLDP

» Cisco Discovery Protocol (CDP)

- Cisco proprietary
- Layer 2 service use to discover basic info about directly connected neighbors.
- Default: enabled

» Link Layer Discovery Protocol (LLDP)

- IEEE version of CDP
- IEEE 802.1AB
- Default: disabled

CDP and LLDP

```
R1#show cdp neighbors
```

```
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge  
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone,  
                  D - Remote, C - CVTA, M - Two-port Mac Relay
```

Device ID	Local Intrfce	Holdtme	Capability	Platform	Port ID
SW1	Eth 0/0	174	R S I	Linux Uni	Eth 0/0
SW3	Eth 1/0	129	R S I	Linux Uni	Eth 0/0
R2	Ser 2/0	173	R B	Linux Uni	Ser 2/1

```
Total cdp entries displayed : 3
```

```
SW2#show cdp neighbors detail
```

```
-----
```

```
Device ID: SW1
```

```
Entry address(es):
```

```
  IP address: 1.2.3.2
```

```
Platform: Linux Unix, Capabilities: Router Switch IGMP
```

```
Interface: Ethernet0/0, Port ID (outgoing port): Ethernet0/3
```

```
Holdtime : 152 sec
```

```
<some output omitted>
```

```
R5#show cdp
```

```
Global CDP information:
```

```
  Sending CDP packets every 60 seconds
```

```
  Sending a holdtime value of 180 seconds
```

```
  Sending CDPv2 advertisements is enabled
```

```
R1(config)#cdp run
```

```
R1(config)#int e0/0
```

```
R1(config-if)#no cdp enable
```

```
R1(config-if)#
```

CDP and LLDP

```
SW6#config t
SW6(config)#lldp run
SW6(config)#^Z
SW6#show lldp neighbors
```

Capability codes:

(R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device
(W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other

Device ID	Local Intf	Hold-time	Capability	Port ID
SW7	Et1/1	120	R	Et1/1
SW7	Et1/0	120	R	Et1/0

Total entries displayed: 2

```
SW7#config t
SW7(config)#lldp run
SW7(config)#^Z
SW7#show lldp neighbors
```

Capability codes:

(R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device
(W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other

Device ID	Local Intf	Hold-time	Capability	Port ID
SW6	Et1/0	120	R	Et1/0
SW6	Et1/1	120	R	Et1/1

Total entries displayed: 2

```
SW6#config t
SW6(config)#int e1/0
SW6(config-if)#lldp transmit
SW6(config-if)#lldp receive
SW6(config-if)#end
SW6#
```

CDP and LLDP

» Lab Activity:

- Configure all our devices with CDP and LLDP
- Test and verify if each device can see their directory connected neighbors.

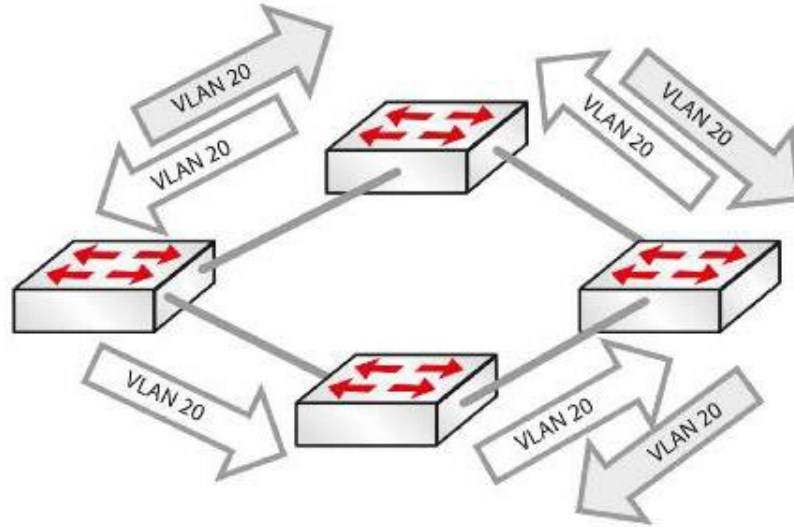
» Use LabTop v2.0 with full configurations

- <https://www.internold.com/inclw-gdrive>

STP

Spanning Tree Protocol (STP)

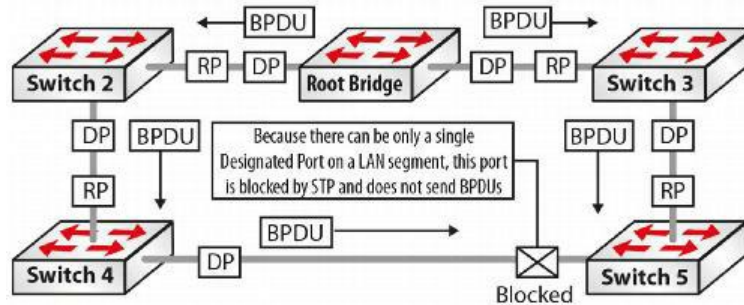
- » Prevents loops from occurring in a network
- » IEEE 802.1D



Bridge Protocol Data Units (BPDUs)

» Message exchange between with each devices to maintain a loop-free topology

- A Root Bridge is elected
- A Root Port is elected on every Non-Root Switch
- A Designated Switch is elected
- A Designated Port is elected
- Loops in the network are eliminated by blocking redundant paths



Bridge ID (BID)

» Switch identity in the STP domain.



```
SW9#show spanning-tree vlan 20
```

```
VLAN0020
```

```
Spanning tree enabled protocol rstp
Root ID    Priority    32788
           Address    aabb.cc00.0100
           Cost       100
           Port       1 (Ethernet0/0)
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
```

```
Bridge ID  Priority    32788 (priority 32768 sys-id-ext 20)
           Address    aabb.cc00.0d00
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec
```

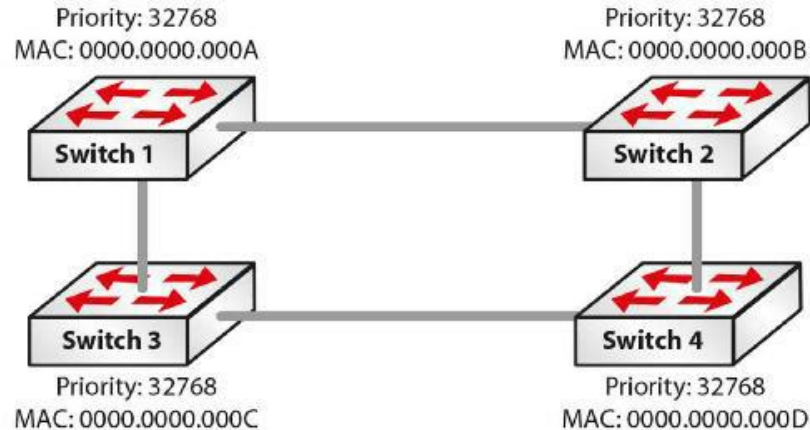
Interface	Role	Sts	Cost	Prio.Nbr	Type
-----	----	---	-----	-----	-----
Et0/0	Root	FWD	100	128.1	Shr
Et0/1	Altn	BLK	100	128.2	Shr
Et0/2	Desg	FWD	100	128.3	Shr

STP Port States

- » Blocking
- » Listening
- » Learning
- » Forwarding
- » Disabled

STP Root Bridge Election

- » Switch with the lowest Bridge ID in the network is elected the STP Root Bridge



Manually Selecting the Root Bridge

» Change the Bridge Priority

```
SW9#show spanning-tree vlan 20
```

```
VLAN0020
Spanning tree enabled protocol rstp
Root ID    Priority    32788
           Address    aabb.cc00.0100
           Cost       100
           Port       1 (Ethernet0/0)
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID  Priority    32788 (priority 32768 sys-id-ext 20)
           Address    aabb.cc00.0d00
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Et0/0	Root	FWD	100	128.1	Shr
Et0/1	Altn	BLK	100	128.2	Shr
Et0/2	Desg	FWD	100	128.3	Shr

```
SW9#config t
SW9(config)#spanning-tree vlan 20 priority ?
<0-61440> bridge priority in increments of 4096
```

```
SW9(config)#spanning-tree vlan 20 priority 4096
SW9(config)#^Z
SW9#show spanning-tree vlan 20
```

```
VLAN0020
Spanning tree enabled protocol rstp
Root ID    Priority    4116
           Address    aabb.cc00.0d00
This bridge is the root
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
```

```
Bridge ID  Priority    4116 (priority 4096 sys-id-ext 20)
           Address    aabb.cc00.0d00
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Et0/0	Desg	FWD	100	128.1	Shr
Et0/1	Desg	BLK	100	128.2	Shr
Et0/2	Desg	FWD	100	128.3	Shr

STP Port Path Cost

» IEEE 802.1D specification

Link Speed(Bandwidth)	Port Cost
10 mbps	100
100 bmps	19
1 gbps	4
10 gbps	2

```
SW10#show spanning-tree interface e0/0
```

Vlan	Role	Sts	Cost	Prio.Nbr	Type
VLAN0001	Desg	FWD	100	128.1	Shr
VLAN0010	Desg	FWD	100	128.1	Shr
VLAN0020	Desg	FWD	100	128.1	Shr
VLAN0030	Desg	FWD	100	128.1	Shr

SW10#

Cisco Spanning Tree Enhancements

- » Port Fast
- » BPDU Guard
- » BPDU Filter
- » Loop Guard
- » Root Guard
- » Uplink Fast
- » Backbone Fast

Newer Versions of STP

» Rapid Spanning Tree Protocol (RSTP)

- 802.1W

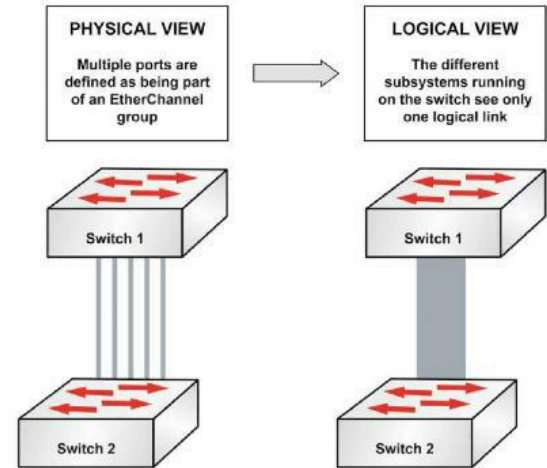
» Multiple Spanning Tree Protocol

- IEEE 802.1S

EtherChannels

EtherChannels and Link Aggregations

- » An EtherChannel is comprised of physical, individual links that are bundled together into a single logical link
- » Can consist of up to 8 ports
- » Static
- » Dynamic
 - Port Aggregation Protocol (PAgP)
 - Link Aggregation Control Protocol (LACP)



Switch Stacking

Switch Stacking

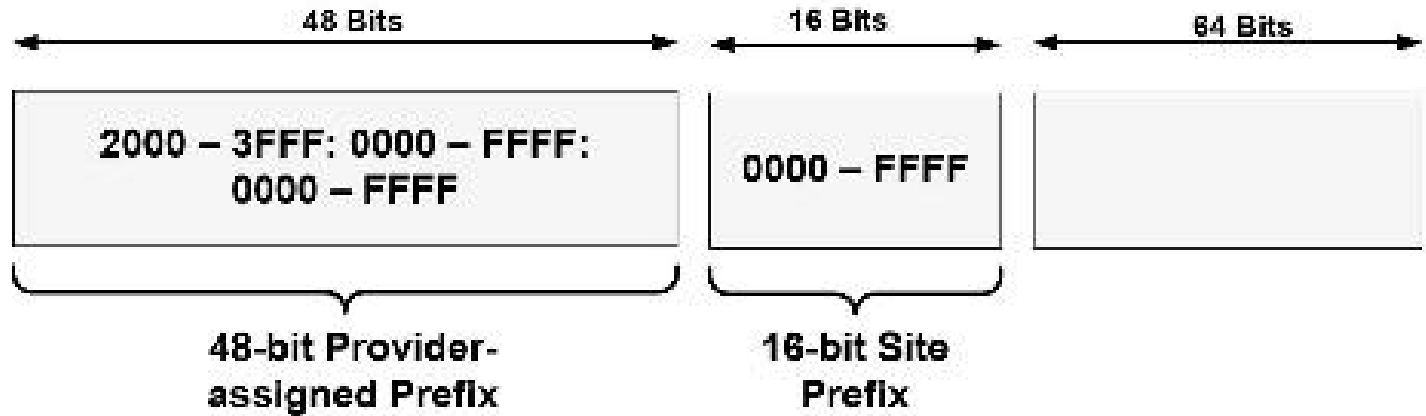
- » Switch stacking enables you to physically connect a number of Cisco switches with special cables so that they logically appear on the network as one switch.
- » Single
 - IP address for management
 - MAC address table
 - Instance of STP



IPv6

IPv6 Concepts and Overview

» Details on separate recording



EIGRP and OSPF

EIGRP

- » Enhanced Interior Gateway Routing Protocol
- » Cisco proprietary

OSPF

- » Open Shortest Path First (OSPF)
- » Open-standard
- » Version 2

EIGRP and OSPF

» Developed to address the following issues:

- Sending full periodic routing updates
- A hop limitation (scalability)
- The lack of VLSM support
- Slow convergence
- The lack of loop prevention mechanisms

EIGRP Configuration

```
R2(config)#router eigrp ?  
  <1-65535> Autonomous System  
R2(config)#router eigrp 100  
R2(config-router)#net 1.2.3.192 255.255.255.252  
R2(config-router)#net 1.2.3.88 255.255.255.248
```

```
R2#show ip eigrp neighbor
```

```
EIGRP-IPv4 Neighbors for AS(100)
```

H	Address	Interface	Hold (sec)	Uptime	SRTT (ms)	RTO	Q Cnt	Seq Num
0	1.2.3.198	Se2/0	11	00:04:10	16	100	0	4

```
R2#show ip route eigrp
```

```
<output clipped>
```

```
Gateway of last resort is not set
```

1.0.0.0/8 is variably subnetted, 26 subnets, 4 masks

```
D      1.2.3.96/28 [90/2195456] via 1.2.3.198, 00:04:16, Serial2/0
```

OSPF Configuration

```
R3(config)#router ospf ?
```

```
<1-65535> Process ID
```

```
R3(config)#router ospf 1
```

```
R3(config-router)#net 1.2.3.196 0.0.0.3 area 0
```

```
R3(config-router)#net 1.2.3.96 0.0.0.15 area 0
```

```
R3(config)#^Z
```

```
R3#show ip ospf neighbors
```

Neighbor ID	Pri	State	Dead Time	Address	Interface
1.2.3.197	0	FULL/ -	00:00:32	1.2.3.197	Serial2/1

```
R3#show ip route ospf
```

```
<output clipped>
```

Gateway of last resort is not set

1.0.0.0/8 is variably subnetted, 11 subnets, 4 masks

0 1.2.3.64/28 [110/74] via 1.2.3.197, 00:00:43, Serial2/1

Lab Activity

- » Configure LabTop v2.0 using OSPF
- » Configure LabTop v2.0 using EIGRP

EIGRP for IPv6 and OSPFv3

» Watch separate recording

5-min break

Demo

Summary

Summary

» Watch per topic videos for details of the technology

» Lab Activity

- CDP and LLDP
- OSPF
- EIGRP

» Practice Quiz

Thank You

... for the opportunity to share