High Availability

CCNP SWITCH: Implementing Cisco IP Switched Networks

Cisco | Networking Academy®
Mind Wide Open™

Chapter 9 Objectives

This chapter covers the following Cisco Catalyst switch features:

- The need and basic idea behind switch stacking and VSS
- StackWise
- The benefits of StackWise
- Verifying StackWise
- VSS
- VSS benefits
- Verifying VSS
- Supervisor redundancy
- Supervisor redundancy modes

The Need for Logical Switching Architectures
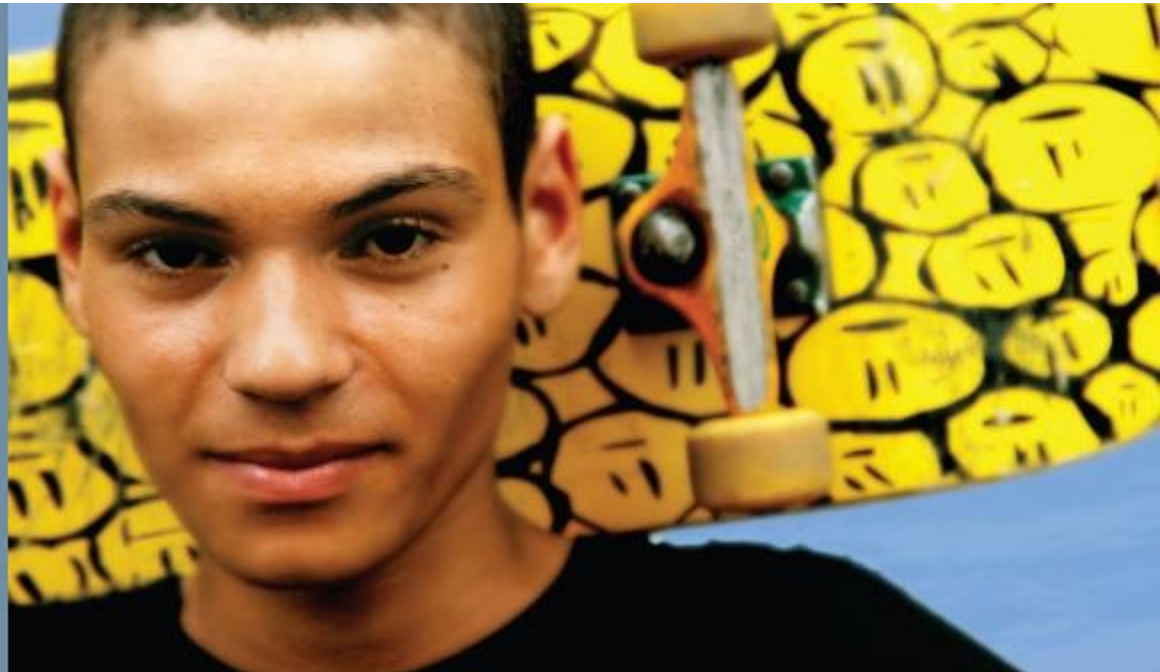
The Need for Logical Switching Architectures

- Access switches needs its own uplink to each of the distribution switches to satisfy the redundancy requirements, but one of the uplinks must be blocked by the Spanning Tree Protocol (STP) to prevent a loop, thus cutting the bandwidth in half.

- To overcome some of these limitations, Cisco proposes the following virtualization solutions.

  - **StackWise:** Focused on the access layer module
  - **VSS:** Focused on the aggregation layer module

4
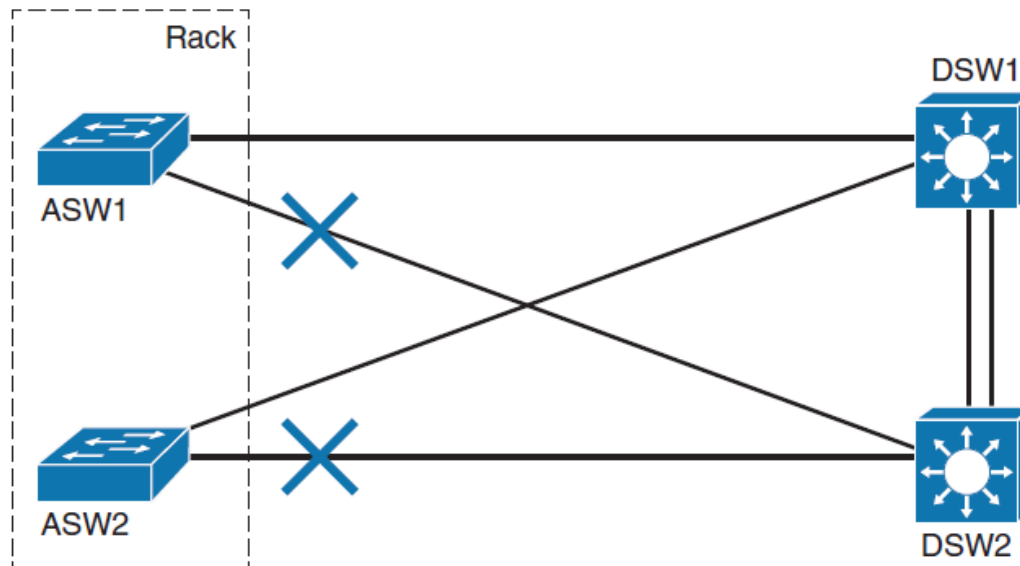
What Is StackWise?

What Is StackWise?

- Cisco StackWise technology provides a method for collectively utilizing the capabilities of a stack of switches.
- Configuration and routing information is shared by every switch in the stack, creating a single switching unit.
- Switches can be added to and deleted from a working stack without affecting performance.

- The stack is managed as a single unit by a master switch, which is elected from one of the stack member switches.

StackWise Details

- Each stack of switches has a single IP address and is managed as a single object.

- This allows each switch in the stack to share the same network topology, MAC address, and routing information.

- Catalyst 3750-E, 3750-X, and 3850 series switches support StackWise and StackWise Plus.

- StackWise Plus is an evolution of StackWise. StackWise Plus supports local switching, so locally destined packets need not traverse the stack ring.

- Catalyst 3850 series supports StackWise-480 with improved 480-Gbps stacking.

- Catalyst 2960-S series supports FlexStack, aStackWise-based feature tailored for Layer 2 switches. FlexStack is limited to four stacked switches.

StackWise Benefits

8
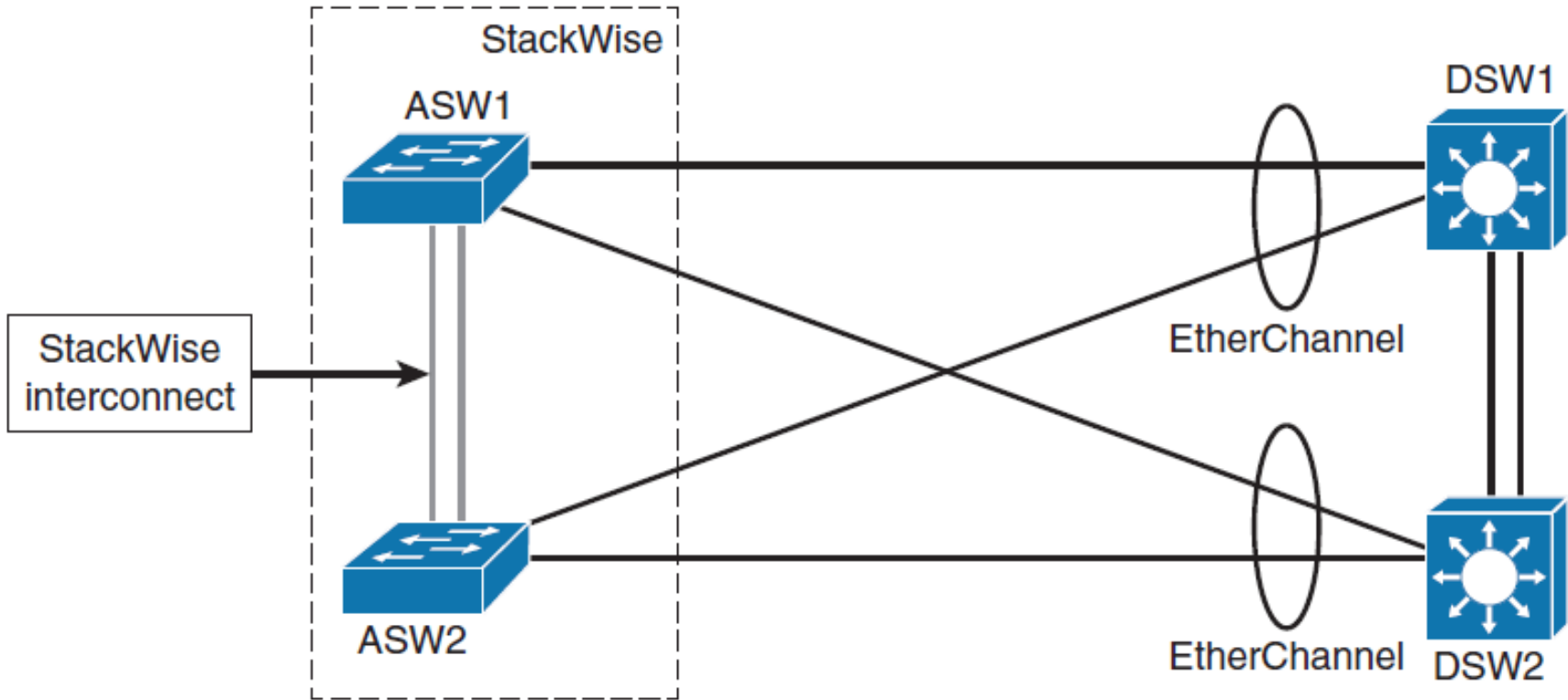
Verifying StackWise

```
Switch1# show switch
Switch/Stack Mac Address: 0013.6075.7280

Switch#   Role      Mac Address      Priority H/W    Version   Current State
*1        Master    0013.6075.7280       1              0       Ready
2         Member    0013.60e1.1800       1              0       Ready
```

```
Switch1# show switch stack-ports
Switch #        Port 1              Port 2
---------       ------              ------
1                 Ok                  Ok
2                 Ok                  Ok
```

What Is VSS?

What Is VSS?

- Virtual Switching System (VSS) is a network system virtualization technology that combines a pair of Catalyst 4500 or 6500 series switches into one virtual switch, increasing the operational efficiency, boosting nonstop communications, and scaling the system bandwidth capacity.

- The VSS simplifies network configuration and operation by reducing the number of Layer 3 routing neighbors and by providing a loop-free Layer 2 topology.

What Is VSS?

- The VSL is made of up to eight 10 Gigabit Ethernet connections bundled into an EtherChannel.

- VSL carries the control plane communication between the two VSS members, in addition to regular data traffic.

- Once the VSS is formed, only the control plane of one of the members is active. The data plane and switch fabric of both members are active.

- Both chassis are kept in sync with the interchassis SSO mechanism, along with NSF to provide nonstop communication even in the event of failure of one of the member supervisor engines or chassis.


Cisco Catalyst 6500 Virtual Switching System Member
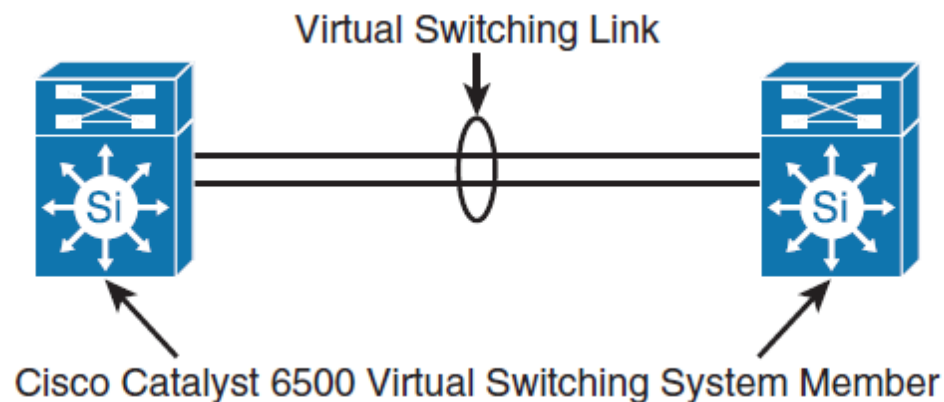
VSS Benefits

- VSS increases operational efficiency by reducing switch management overhead and simplifying the network.
- It provides a single point of management, IP address, and routing instance.
- Neighbors see the VSS as a single Layer 2 switching or Layer 3 routing node, thus reducing the control protocol traffic.
- VSS provides a single VLAN gateway IP address, removing the need for the first-hop redundancy protocol (HSRP, VRRP, GLBP),
- Multichannel EtherChannel (MEC) allows you to bundle links to two physical switches in VSS, creating a loop-free redundant topology without the need for STP.
- Interchassis stateful failover results in no disruption to applications that rely on network state information.
- VSS eliminates Layer 2 / Layer 3 protocol reconvergence if a virtual switch member fails, resulting in deterministic subsecond virtual switch recovery.

VSS Benefits
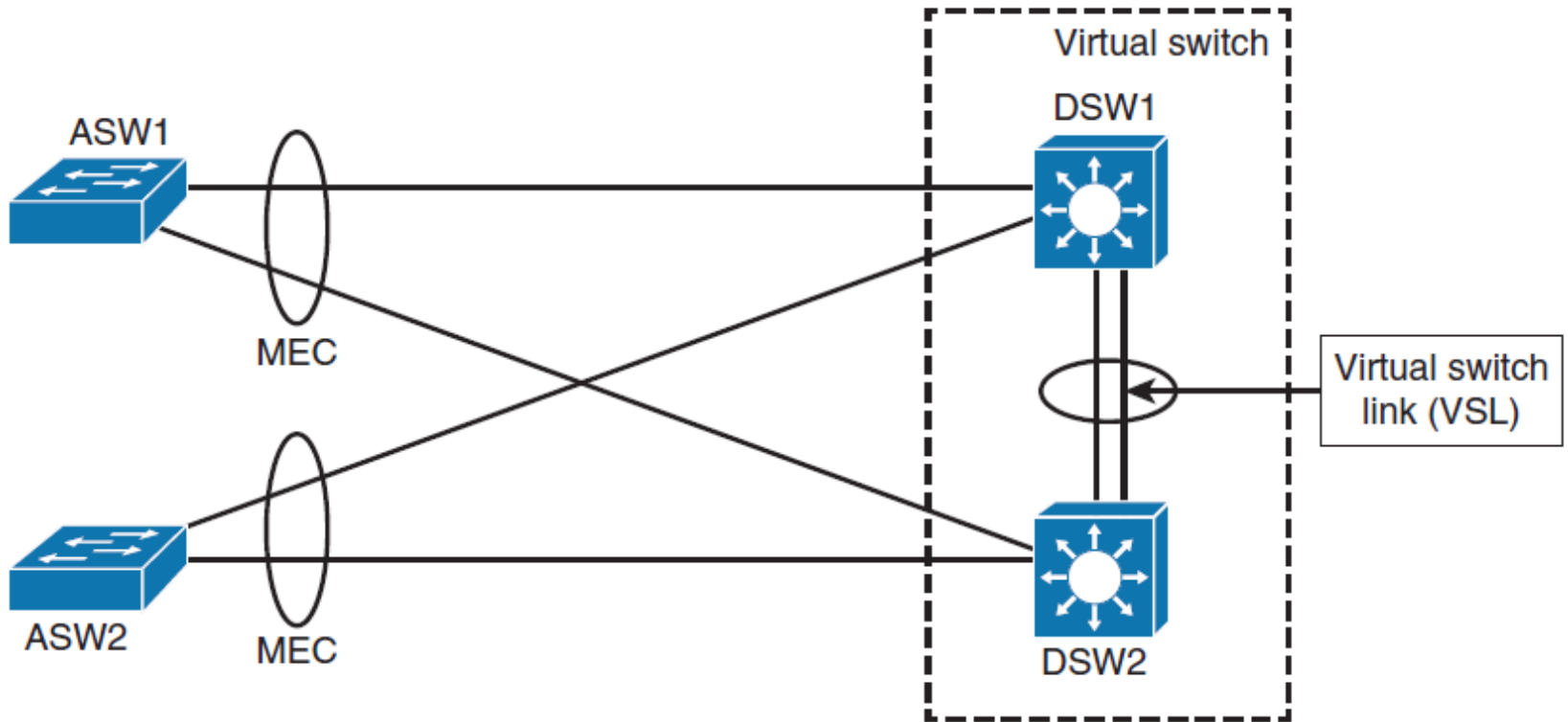
Verifying VSS

To verify the status of VSS configuration, use the following commands:

- **`show switch virtual`**
- **`show switch virtual link`**
- **`show switch virtual role`**
- **`show switch virtual link port-channel`**

```
Switch1# show switch virtual

Switch mode                    : Virtual Switch
Virtual switch domain number   : 1
Local switch number            : 1
Local switch operational role : Virtual Switch Active
Peer switch number             : 2
Peer switch operational role  : Virtual Switch Standby
```

Verifying VSL

```
Switch1# show switch virtual link

VSL Status : UP

VLS Uptime : 7 weeks, 4 days, 31 minutes

VSL SCP Ping : Pass

VSL ICC Ping : Pass

VSL Control Link : Te1/5/5

VSL Encryption : Configured Mode - Off, Operational Mode - Off
```

```
Switch1# show switch virtual link port-channel

Flags:  D - down          P - bundled in port-channel
        I - stand-alone s - suspended
        H - Hot-standby (LACP only)
        R - Layer3        S - Layer2
        U - in use        N - not in use, no aggregation
        f - failed to allocate aggregator

        M - not in use, no aggregation due to minimum links not met
        m - not in use, port not aggregated due to minimum links not met
        u - unsuitable for bundling
        d - default port

        w - waiting to be aggregated

Group  Port-channel  Protocol    Ports
------+-------------+-----------+-------------------
2      Po2(RU)         -          Te1/5/4(P)     Te1/5/5(P)
3      Po3(RU)         -          Te2/5/4(P)     Te2/5/5(P)
```
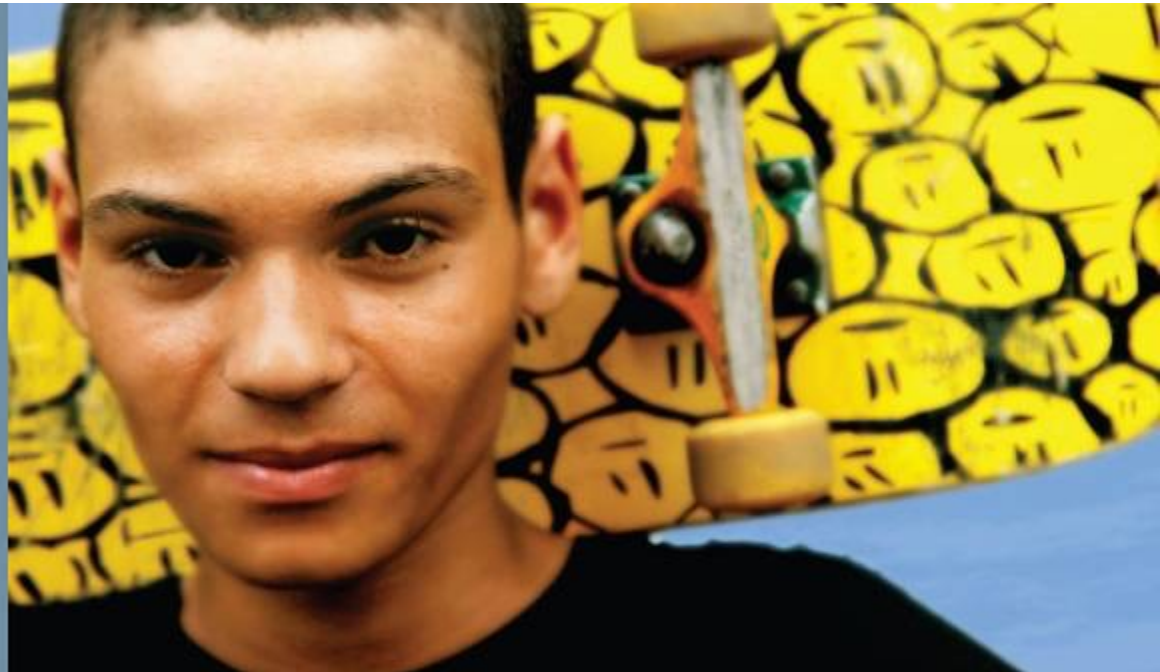
Redundant Switch Supervisors

Redundant Switch Supervisors

- The Cisco supervisor engine module is the heart of the Cisco modular switch platforms.

- The supervisor provides centralized forwarding information and processing.

- All software processes of a modular switch are run on a supervisor.

- Redundant supervisors are highly recommended for the aggregation and core layer so that they might help provide faster convergence in case of the primary supervisor failure. Platforms such as the Catalyst 4500, 6500, and 6800 series can accept two supervisor modules that are installed in a single chassis, thus removing a single point of failure.

- The first supervisor module to successfully boot becomes the active supervisor for the chassis.

- The other supervisor remains in a standby role, waiting for the active supervisor to fail.

- The active supervisor provides all switching functions. The standby supervisor, however, is allowed to boot and initialize only to a certain level.

- When the active module fails, the standby module can proceed to initialize any remaining functions and take over the active role.

Supervisor Redundancy Modes

Redundancy Mode	Behavior When Active Module Fails	Failover Time
RPR	The standby module reloads every other module, initializes all supervisor functions.	> 2 minutes
RPR+	The standby module finishes initializing without reloading other modules.	> 30 seconds
SSO	The standby module is already initialized.	> 1 second

- Redundant supervisor modules can be configured in several modes.

- Redundancy mode limits the standby supervisor's state of readiness.

- SSO allows for NSF.

Supervisor Redundancy Modes

- **Route processor redundancy (RPR)**
  - The redundant supervisor is only partially booted and initialized. When the active module fails, the standby module must reload every other module in the switch and then initialize all the supervisor functions.

- **Route processor redundancy plus (RPR+)**
  - The redundant supervisor is booted, allowing the supervisor and route engine to initialize. No Layer 2 or Layer 3 functions are started. When the active module fails, the standby module finishes initializing without reloading other switch modules. This allows switch ports to retain their state.

- **Stateful switchover (SSO)**
  - The redundant supervisor is fully booted and initialized. Both the startup and running configuration contents are synchronized between the supervisor modules. Layer 2 information is maintained on both supervisors so that hardware switching can continue during a failover. The state of the switch interfaces is also maintained on both supervisors so that links do not flap during a failover.

Stateful Switchover

- The redundant supervisor engine starts up in a fully initialized state and synchronizes with the startup configuration and the running configuration of the active supervisor engine.

- The standby supervisor in SSO mode also keeps in sync with the active supervisor engine for all changes in hardware and software states for features that are supported via SSO.

- Any supported feature interrupted by failure of the active supervisor engine is continued seamlessly on the redundant supervisor engine.

Nonstop Forwarding

- NSF is an interactive method that focuses on quickly rebuilding the Routing Information Base (RIB) table after a supervisor switchover.

- The RIB is used to generate the Forwarding Information Base (FIB) table for CEF, which is downloaded to any switch modules that can perform CEF.

- NSF with SSO redundancy includes the standard SSO for Layer 2 switching; however, it also minimizes the amount of time that a Layer 3 network is unavailable following a supervisor engine switchover by continuing to forward IP packets using CEF entries built from the old active supervisor.

Chapter 9 Summary

- The need and basic idea behind switch stacking and VSS
- StackWise
- The benefits of StackWise
- Verifying StackWise
- VSS
- VSS benefits
- Verifying VSS
- Supervisor redundancy
- Supervisor redundancy modes

Chapter 9 Labs

- **None**

Acknowledgment

- *Some of the images and texts are from Implementing Cisco IP Switched Networks (SWITCH) Foundation Learning Guide: (CCNP SWITCH 300-115)* by Richard Froom and Erum Frahim (1587206641)

- Copyright © 2015 – 2016 Cisco Systems, Inc.

- Special Thanks to *Bruno Silva*