VLANs

CCNA2v7 Module 3 VLANs + CCNA3v6 Chapter 2 Scaling VLANs

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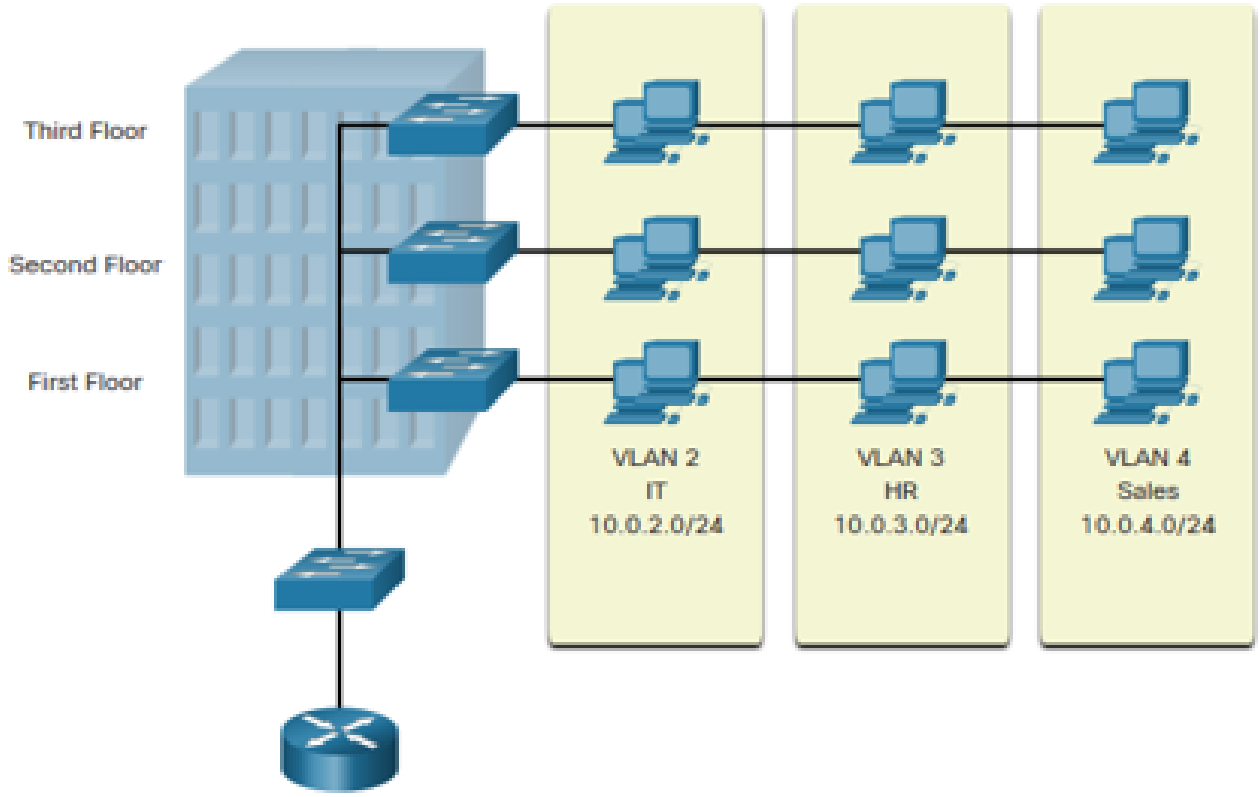
VLAN

- **Logical connections** with other similar devices
- **Benefits:**
  - Smaller Broadcast Domains
  - Improved Security
  - Improved IT Efficiency
  - Reduced Cost
  - Better Performance
  - Simpler Management

> ⚠️ Each VLAN will have its own unique range of IP addressing

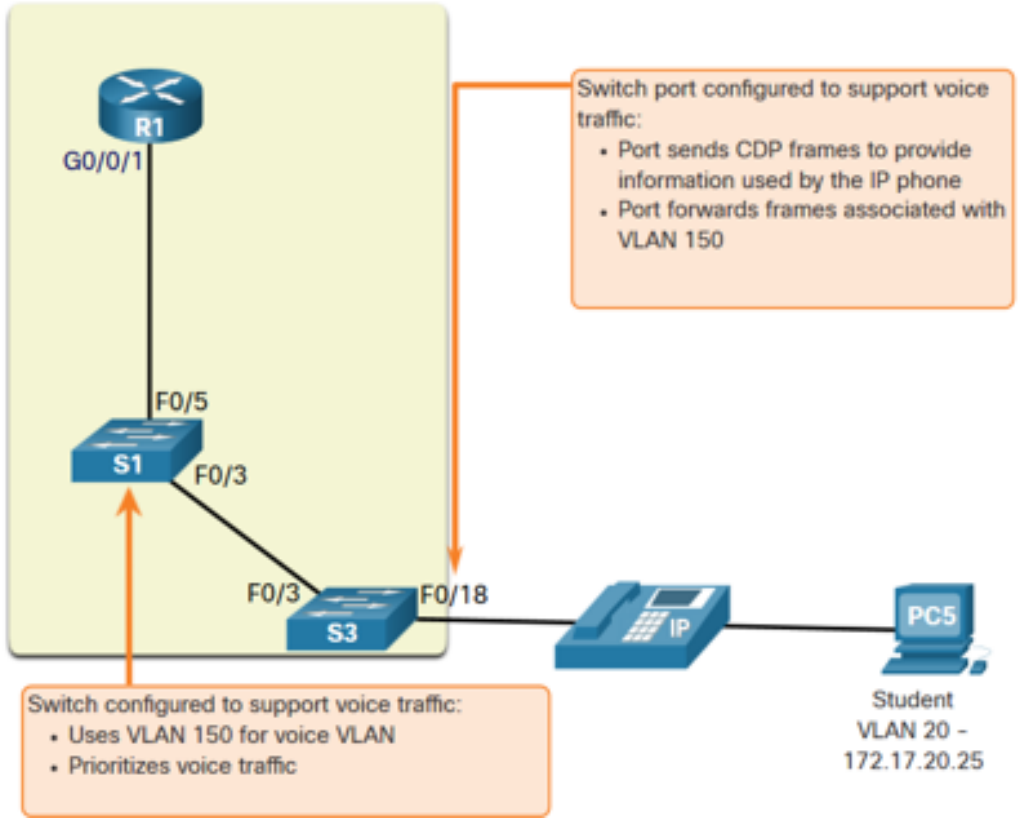


Types of VLANs

- **Default VLAN**
  - **VLAN 1**
    - Default VLAN, native VLAN and management VLAN
    - Assigned to all interfaces by default
    - Cannot be deleted or renamed
- **Data VLAN**: User-generated traffic. Default VLAN 1.
- **Native VLAN**: Used for trunks links only. Default VLAN 1. Designed for legacy use.
- **Management VLAN**: Used for SSH/Telnet VTY traffic. Default VLAN 1.

Types of VLANs

- **Voice VLAN**:
  - Separated VLAN required
    - Assured bandwith
    - High QoS priority
    - Ability to avoid congestion
    - Delay < 150 ms

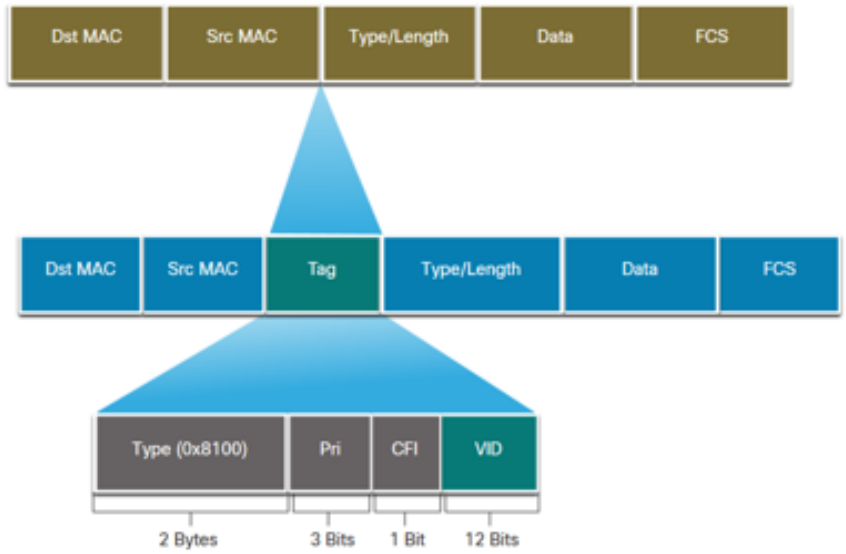


Defining VLAN Trunks

- **Trunk**: point-to-point link between 2 network devices that:
  - Allows more than one VLAN (by default all VLANs)
  - Extend the VLAN across the entire network
  - Support 802.1q trunking
- **Devices connected to the switches receive unicast, multicast and broadcast**:
  - **Without VLAN**: all devices
  - **With VLAN**: ony those confined to the VLAN

VLAN Identication with a Tag

- **IEEE 802.1q: 4 bytes** (in a Frame between Src MAC and Type/Length)
  - **Type**: 2 bytes 0x8100
  - **User priority**: 3 bits
  - **Canonical Format Identifier (CFI)**: 1 bit (token ring frames)
  - **VLAN ID (VID): 12 bits ➡️ 4096 VLANs**
- Tag removed when sent to end devices

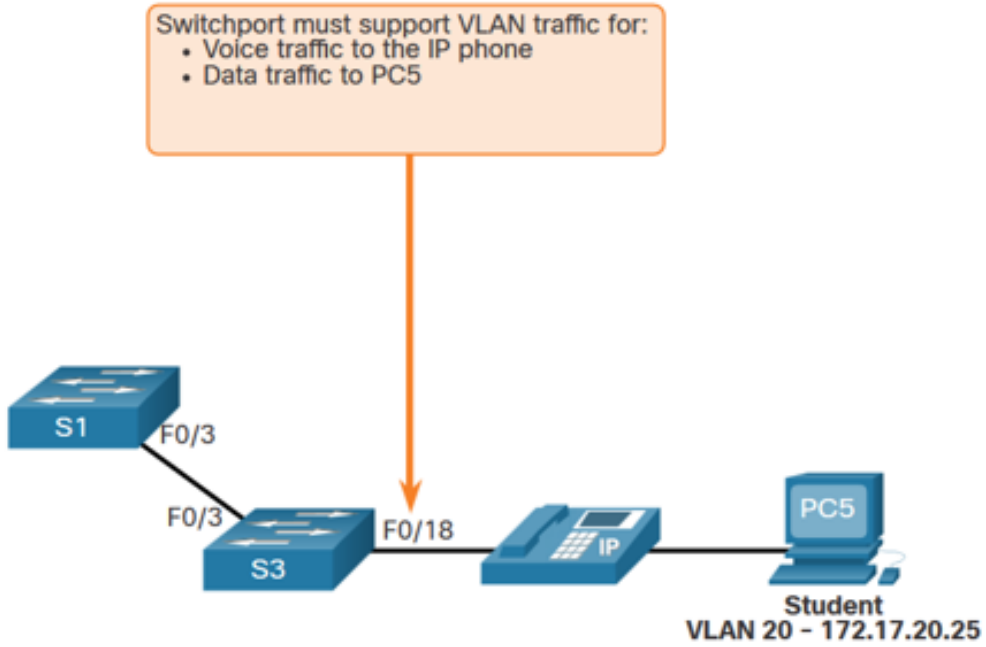


VLAN Ranges on Catalyst Switches

- **Normal Range VLAN 1-1005**:
  - Used in Small to Medium sized businesses
  - **1, 1002-1005** (Reserved for legacy): Autocreated, cannot be deleted
  - Stored in **flash:/vlan.dat**
- **Extended Range VLAN 1006-4095**:
  - Used by Service Providers
  - Stored in **running-config**
  - Fewer VLAN features

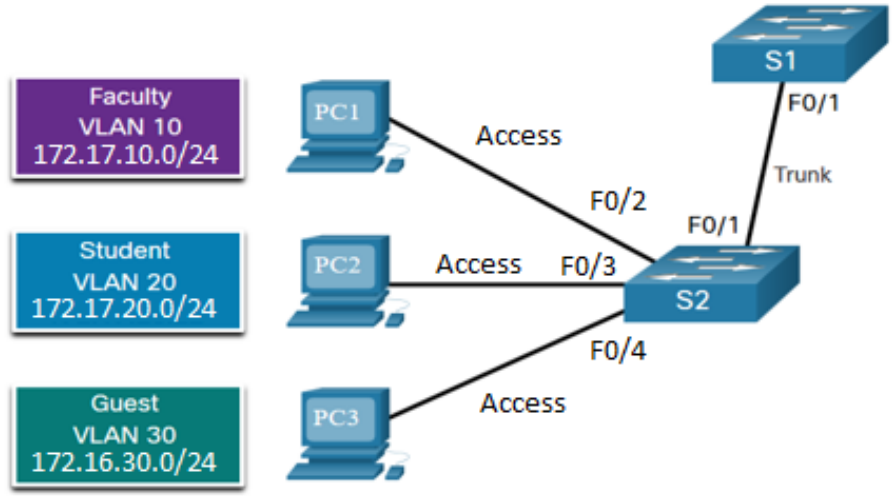
Data and Voice VLAN Example

```
S3# configure terminal
S3(config)# vlan 20
S3(config-vlan)# name STUDENTS
S3(config-vlan)# vlan 150
S3(config-vlan)# name VOICE
S3(config-vlan)# interface f0/18
S3(config-if)# switchport mode access
S3(config-if)# switchport access vlan 20
S3(config-if)# mls qos trust cos
S3(config-if)# switchport voice vlan 150
S3(config-if)# end
S3# show vlan brief
```



Trunk Configuration Example

```
S2# configure terminal
S2(config)# vlan 10
S2(config-vlan)# name Faculty
S2(config-vlan)# vlan 20
S2(config-vlan)# name Student
S2(config-vlan)# vlan 30
S2(config-vlan)# name Guest
S2(config-vlan)# vlan 99
S2(config-vlan)# name Native
S2(config-vlan)# interface f0/2
S2(config-if)# switchport mode access
S2(config-if)# switchport access vlan 10
S2(config-if)# interface f0/3
S2(config-if)# switchport mode access
S2(config-if)# switchport access vlan 20
S2(config-if)# interface f0/4
S2(config-if)# switchport mode access
S2(config-if)# switchport access vlan 30
S2(config-if)# interface f0/1
S2(config-if)# switchport mode trunk
S2(config-if)# switchport trunk native vlan 99
S2(config-if)# switchport trunk allowed vlan 10,20,30,99
S2(config-if)# do show interfaces f0/1 switchport
```



Dynamic Trunking Protocol (DTP)

- 🟢: by default (Dynamic auto mode) on Catalyst switches
- 🔴: turned off with `switchport nonegotiate` command

Negotiated Interface Modes (`switchport mode ...`):

- `access` : Permanent access mode. Negotiates to convert neighbor into access.
- `dynamic auto` : Becomes a trunk only if neighbor is trunk or desirable.
- `dynamic desirable` : Actively seeks becoming trunk.
- `trunk` : Permanent trunk mode. Negotiates to convert neighbor into trunk.

> Verify DTP Mode with `show dtp interface f0/1`
>
> ⚠️ **Best practice: DISABLE DTP!**

Results of a DTP Configuration

Link Device 1 Mode / Link Device 2 Mode	Dynamic Auto	Dynamic Desirable	Trunk	Access
Dynamic Auto	Access	Trunk	Trunk	Access
Dynamic Desirable	Trunk	Trunk	Trunk	Access
Trunk	Trunk	Trunk	Trunk	Limited Connectivity
Access	Access	Access	Limited Connectivity	Access

VLAN Trunking Protocol (VTP)

- Manage VLANs on a **switch** configured as a VTP Server
- VTP server distributes and synchronize VLAN information over trunk links.
- Modes:
  - VTP version 1: Default mode. Supports normal range VLANs only
  - VTP version 2: Supports advanced features.

```
S1# show vtp status
```

VTP Modes

- **VTP Server:**
  - Advertise VTP domain
  - Store VLAN information for the entire domain in NVRAM
  - Operations allowed: create, delete or rename VLANs for the domain
  - Configuration revision number stored in NVRAM.
- **VTP Client:**
  - Cannot create, delete or rename VLANs
  - Only stores VLAN information for the entire domain while is ON (RAM)
- **VTP Transparent:**
  - Forwards VTP advertisements to VTP clients and servers
  - Can create, rename or delete **LOCAL** VLANs (stored in NVRAM)
  - Needed for creating extended VLANs on a VTP enabled switch

VTP Configuration

```
S1(config)# vtp mode server
S1(config)# vtp domain CCNA
S1(config)# vtp password cisco12345
S1(config)# vlan 10
S1(config-vlan)# name SALES
S1(config-vlan)# vlan 20
S1(config-vlan)# name MARKETING
S1(config-vlan)# vlan 30
S1(config-vlan)# name ACCOUNTING
```

```
S2(config)# vtp mode client
S2(config)# vtp domain CCNA
S2(config)# vtp password cisco12345
S2(config)# exit
S2# show vtp status
```