# Lesson 10

- **Forwarding Data Between VLANs**
- **VTP**
- **Data & Voice VLAN together on interface**
- **Troubleshooting VLAN and VLAN trunks**

Forwarding data between VLAN

We know that VLAN is the Layer 2 technology. Creating VLANs we divide broadcast domain into small parts or subnets. Let's analyze the following image. We see there are two VLANs and two subnets relatively Subnet 10 and Subnet 20. In this case there is no route between hosts in separate subnets.

Routing between VLANs we need any device thar operate at Network Layer.

This may be multi-layer switch or Router, because switch does not route between VLANs.
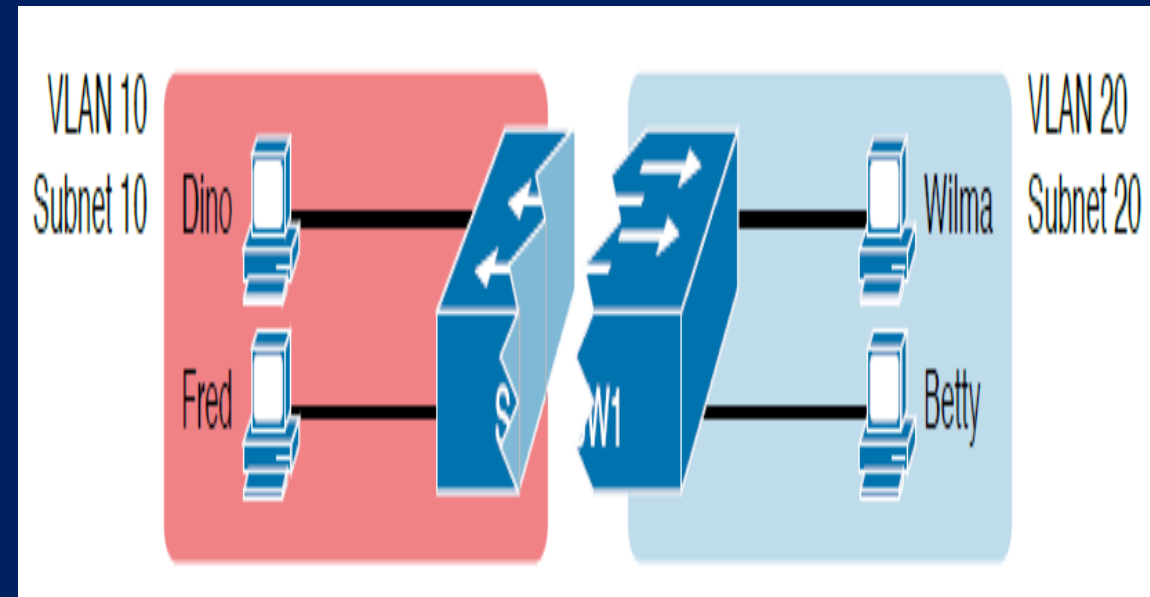
Forwarding data between VLAN cont.

In the topology, we see router that has ethernet interface connected to subnets. In this case, router use two physical interfaces. In IP Routing in the LAN section, we will learn sub-interface concepts.
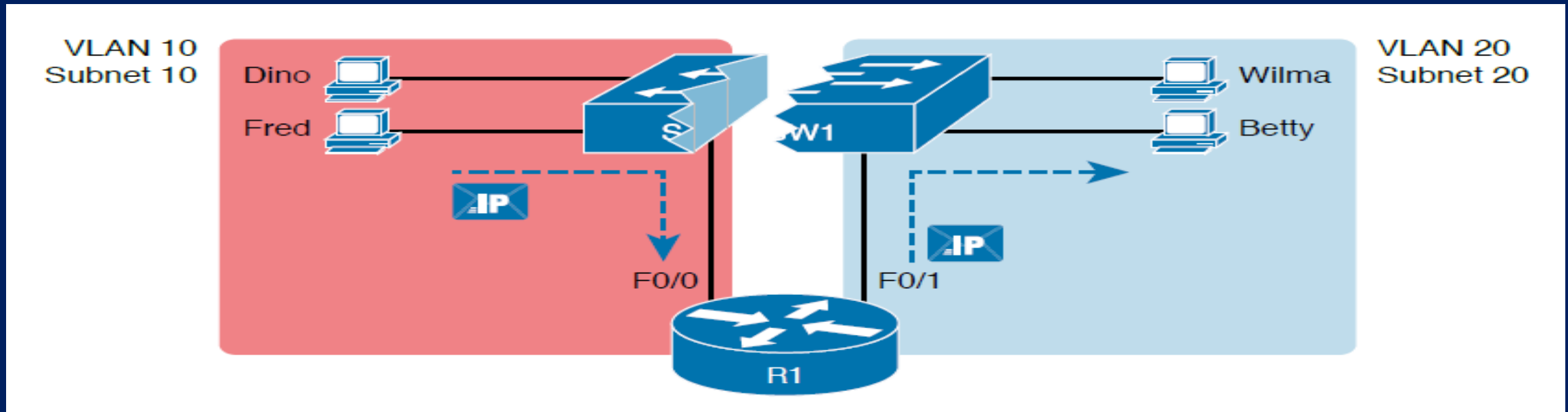
The Layer 2 switch can keep doing its job—forwarding frames inside a VLAN, while the router can do its job— routing IP packets between the subnets.

VTP (VLAN Trunking Protocol)

VTP is a Cisco proprietary tool (protocol) on Cisco switches that advertises each VLAN configured in one switch (with the **vlan** *number* command) so that all the other switches in the campus learn about that VLAN.

Without VTP we need to configure each switch separately for service VLANs. It is time consuming and error-prone.

However, in VTP concept, there is one master switch (Server) that will advertise all configured VLANs to other switch.

VTP has three modes:

1. Server
2. Client
3. Transparent
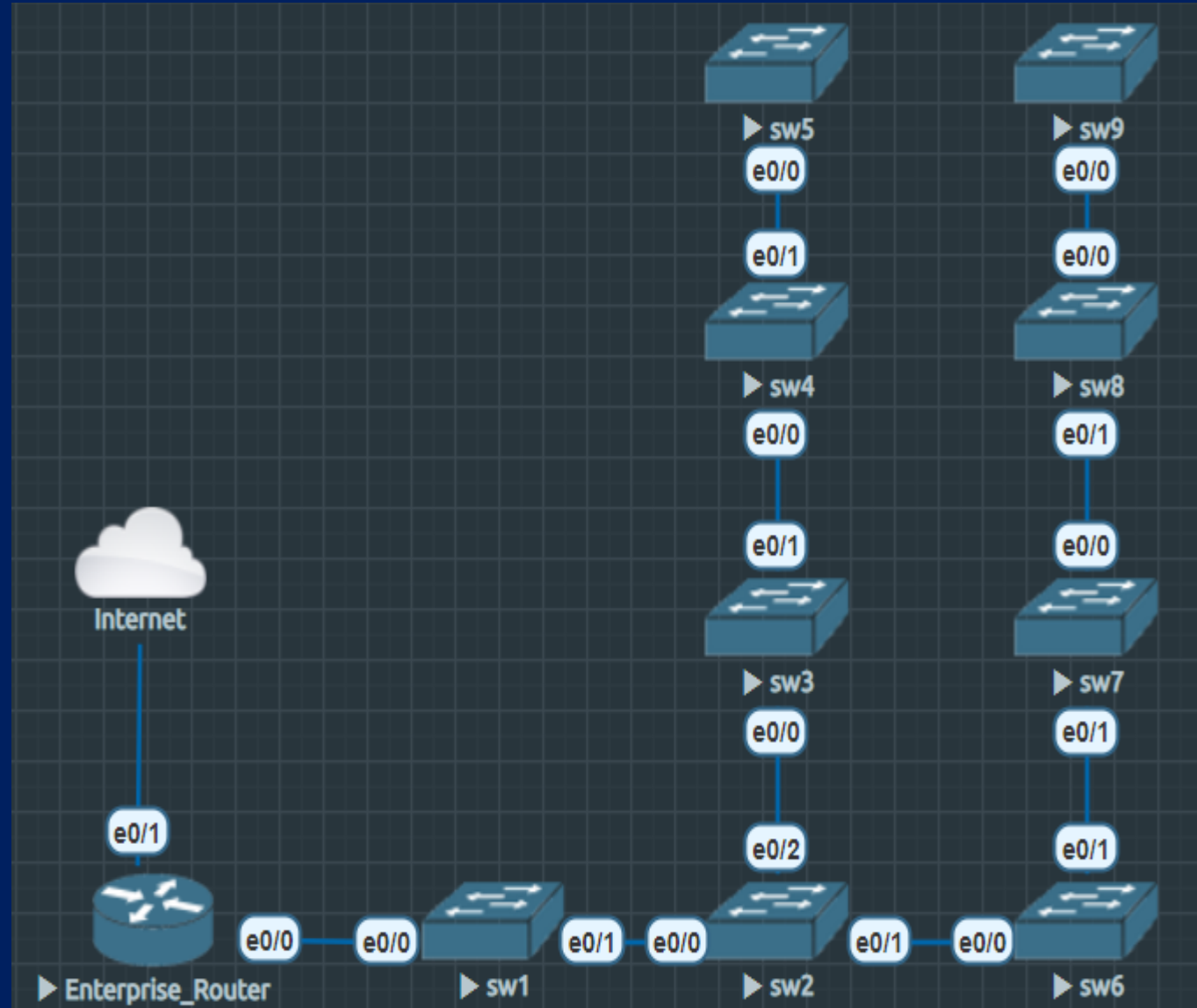
VTP cont.

To take VTP advantages all switches will be in the same VTP domain. By default, Cisco Catalyst switches' mode is VTP server mode. VTP uses advertisement messages to share VLAN database information among switch that are in the same VTP domain.

Three VTP modes:

- In server mode: we can create, delete, or modify VLANs.

- In clients mode: we can do nothing related to VLANS. Client switches form their VLAN database based on Servers.

- In transparent mode: we are free to make change VLAN database. Transparent switches gets and forward VTP advertisement without affecting their own VLAN database.

VTP configurations

Using **show vtp status** command we see switch VTP status.

```
Sw#show vtp status
VTP Version capable          : 1 to 3
VTP version running          : 1
VTP Domain Name              :
VTP Pruning Mode             : Disabled
VTP Traps Generation         : Disabled
Device ID                    : aabb.cc80.2000
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
Local updater ID is 0.0.0.0 (no valid interface found)

Feature VLAN:
--------------
VTP Operating Mode           : Server
Maximum VLANs supported locally : 1005
Number of existing VLANs     : 5
Configuration Revision       : 0
MD5 digest                   : 0x57 0xCD 0x40 0x65 0x63 0x59 0x47 0xBD
                               0x56 0x9D 0x4A 0x3E 0xA5 0x69 0x35 0xBC

Sw#
```

Using **vtp mode server | client | transparent** command we change switch VTP mode. the interfaces between switches have to be trunk mode.

Practical view …
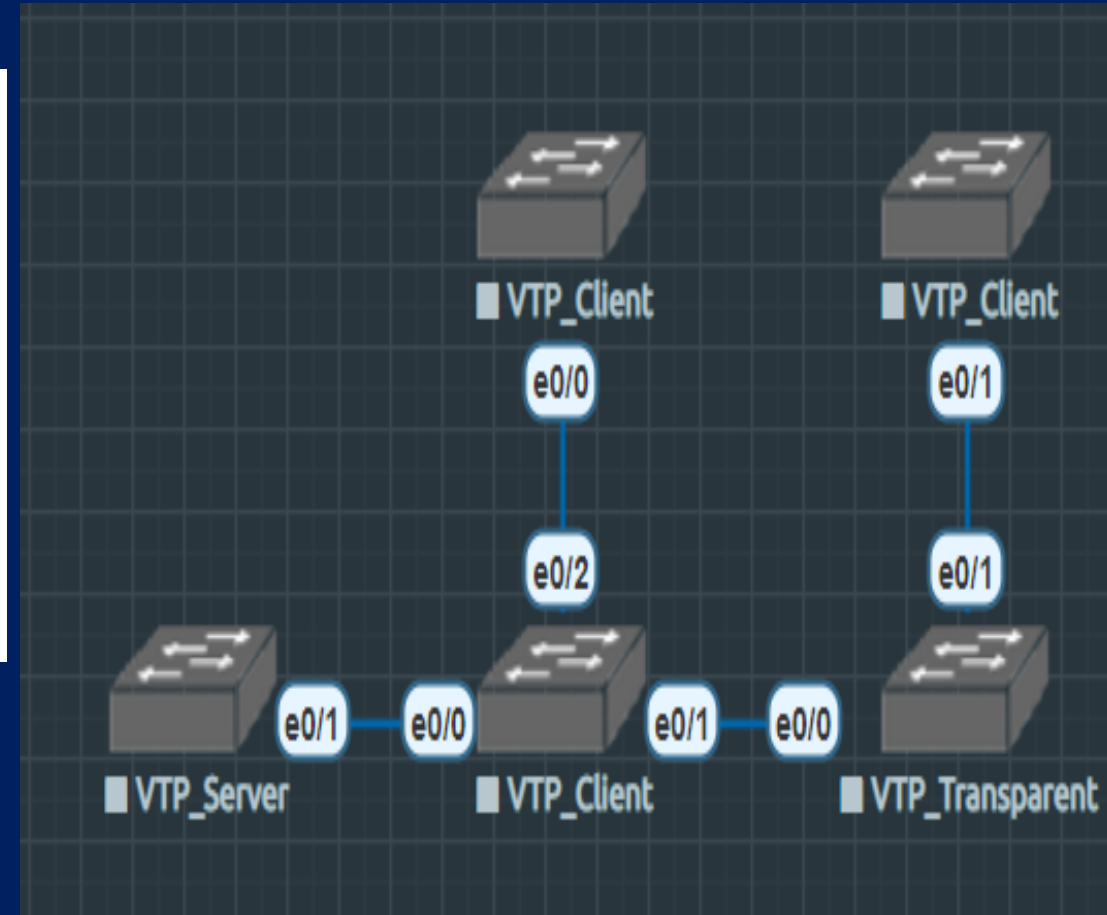
Data & Voice VLAN together on interface

In the next topology, we see user desk with telephone and PC on it. Before IP telephony each of these were connected suitable network devices. PC to Switch, Telephone to Voice switch (called PBX –Private Branch Exchange).
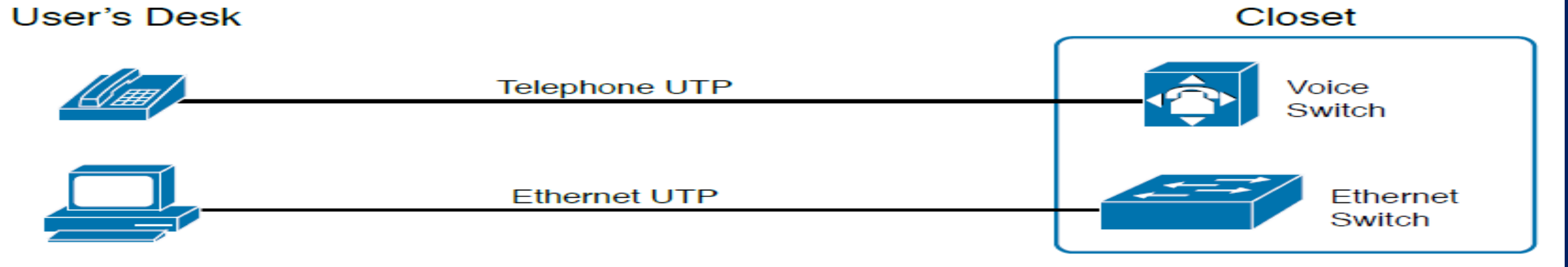
The term IP telephone change this, Phones also use IP packets to exchange voice information. Phones use UTP cable to connect switch. IP telephones have included a small LAN switch (that is called embedded switch), on the underside of the phone. Using the small patch cable we connect our PC to IP phone.
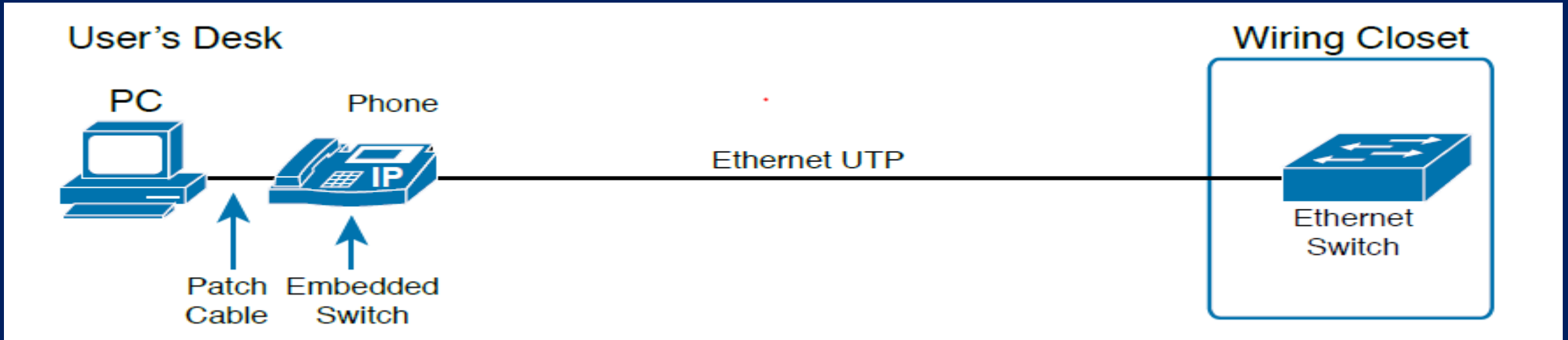
Data & Voice VLAN cont.

Cisco best practices for IP telephony design tell us to put the phones in one VLAN and the PCs in a different VLAN.

Let's look at the next topology. Data VLAN 10, Voice VLAN 11.

- **Data VLAN:** Same idea and configuration as the access VLAN on an access port but defined as the VLAN on that link for forwarding the traffic for the device connected to the phone on the desk (typically the user's PC).

- **Voice VLAN:** The VLAN defined on the link for forwarding the phone's traffic. Traffic in this VLAN is typically tagged with an 802.1Q header.

Interface Configuration:

interface Fa0/0

 switchport access vlan 10

 switchport mode access

 switchport voice vlan 20

end

Practical view...
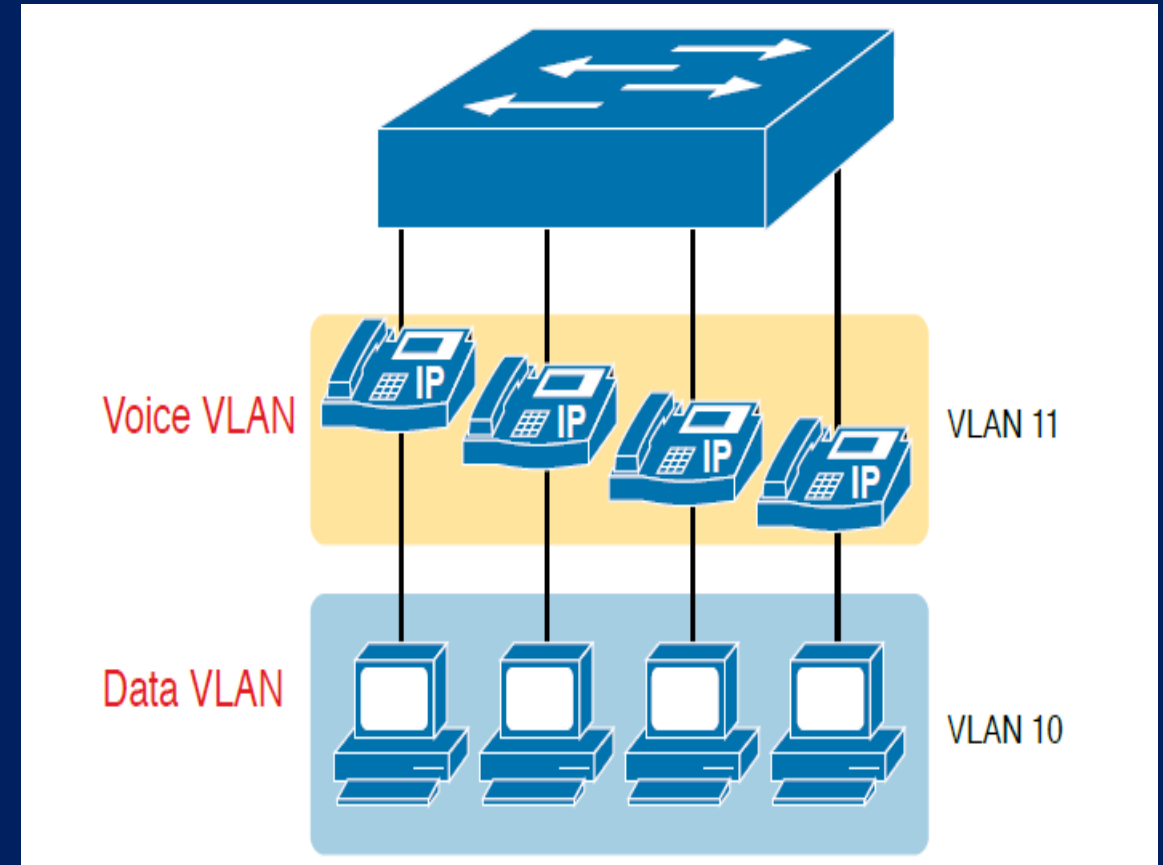
Troubleshooting VLAN and VLAN trunks

- **Step 1.** Confirm that all VLANs are both defined and active.
- **Step 2.** Check the allowed VLAN lists on both ends of each trunk to ensure that all VLANs intended to be used are included.
- **Step 3.** Check for incorrect trunk configuration settings that result in one switch operating as a trunk, with the neighboring switch not operating as a trunk.
- **Step 4.** Check the native VLAN settings on both ends of the trunk to ensure the settings match.

Practical view…

Configuration Task

1. Configure VTP domain, VTP Server, Client and Transparent modes on switches according to topology.

2. Create VLANs.

3. Configure Ports to trunk mode between switches.

4. Configure interfaces for voice VLAN & Data VLAN according to topology.

5. Assign IP addresses to PCs.

6. Verify configurations and check connections between PCs.
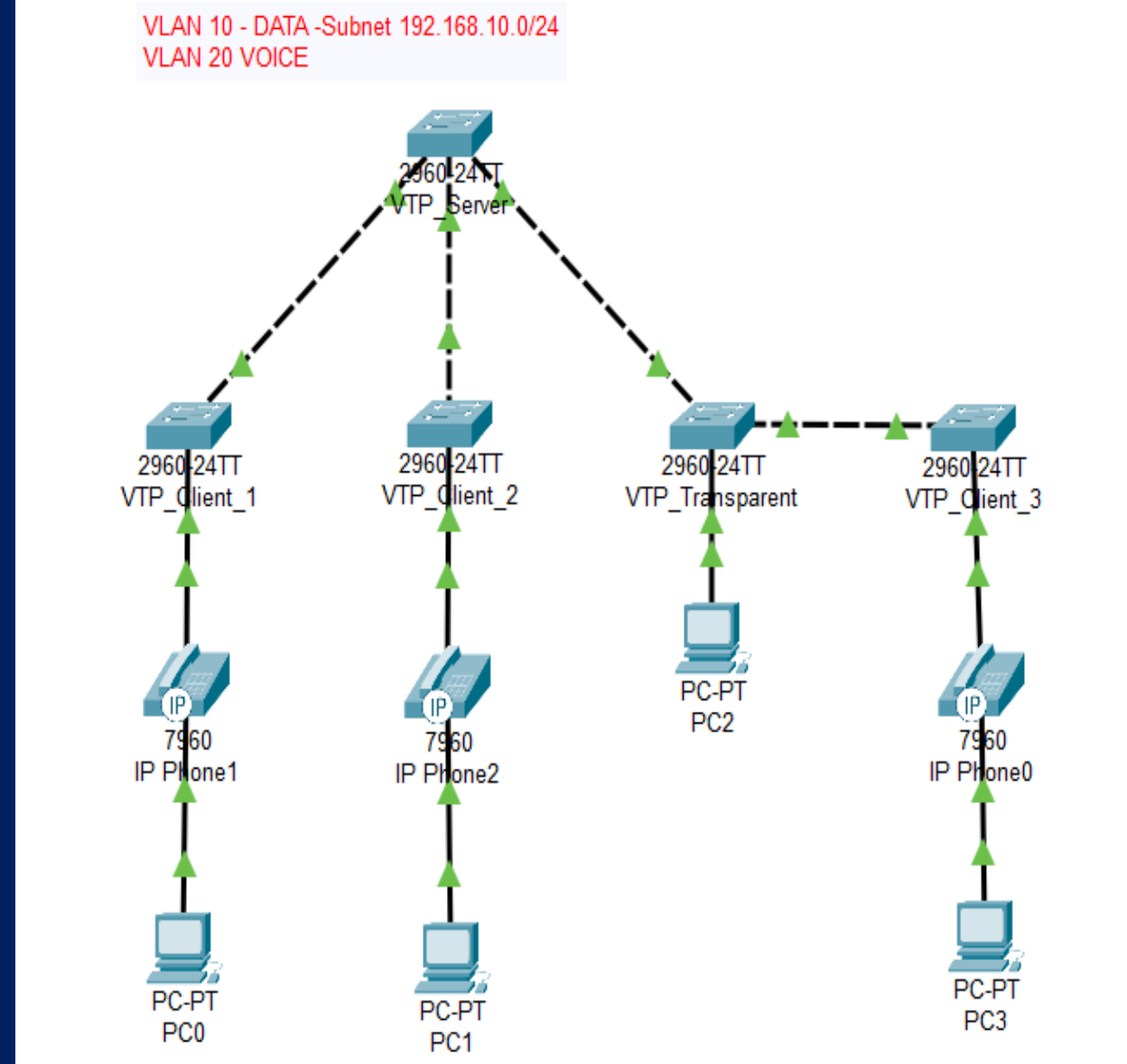
That is all for Lesson 9

The key is :

Learn

Repeat

Practice

You will be able to reach your goals.

GOOD LUCK !!!!!...