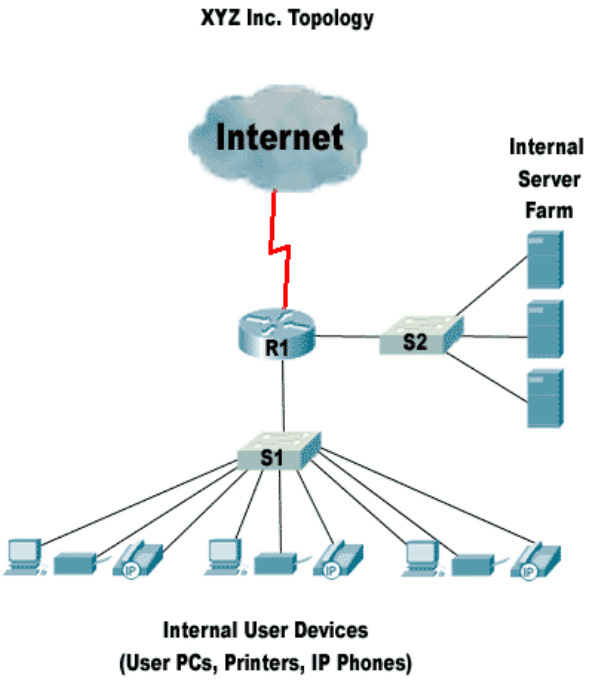
Objectives:

- Define the role of the Internetwork Operating System (IOS).
- Define the purpose of a configuration file.
- Identify several classes of devices that have the IOS embedded.
- Identify the factors contributing to the set of IOS commands available to a device.
- Demonstrate the basic IOS commands.

Intro:

Following up with XYZ Inc. project, it is time to configure their network devices. The network was cabled according to your project and you place another visit to their office to perform the first configurations.

Topology:



The Scenario:

You decide to start on the switches S1 and S2. To save time you create a plain text file with basic configuration which must be applied to both switches. Commands to configure console line behavior, passwords, switch name, domain name lookup enable/disable and etc can be placed in this text file and pasted into the device's console window to save time. Below is a sample of such text file:

SW1 Plain Text File Sample:

configure terminal

hostname SW1

no ip domain-lookup

enable secret XYZSw14ch1

line console 0

logging synchronous

exec-timeout 2 0

line vty 0 4

password XYZSw14ch1431n34

login

transport input telnet

Note: Not only basic configuration can be copied/pasted from a plain text into the device's configuration mode. Any valid command can be placed on such text but it is usual to do advanced configuration direct on the device due the possible need of troubleshoot.

Step 1 - Configuring the Switches:

As stated before, VLANs must be created to separate data, voice and management traffic. In order to properly separate traffic you define the following VLAN mapping:

VLAN 10 – Data Vlan

VLAN 15 – Voice Vlan

VLAN 50 – Management Vlan

S1/S2 VLAN Mapping:

Ports 1 – 11: Data Vlan

Ports 12- 22: Voice Vlan

Port 23: Link to R1 (Trunk)

Port 24: Management VLAN

Notes:

1. Historically, the **vlan database** command was used to create/delete VLANs on Cisco Switches. Even though this command is about to be depreciated, some devices still have it (older IOS images versions). Newer IOS images support the creation of VLANs directly under the configuration mode.
2. The command **interface range fa0/1 – 11** is used to configure multiple interfaces at the same time. Older IOS versions might not support this feature and the interfaces must be configured individually.

The used commands used by you to configure VLANs are listed below:

Commands to SW1:

SW1# vlan database

SW1(vlan)# vlan 10 name Data state active

SW1(vlan)# vlan 15 name Voice state active

SW1(vlan)# vlan 50 name Management state active

SW1(vlan)# exit

SW1# configure terminal

SW1(config)# int range fa0/1 – 11

SW1(config-if)# switchport mode access

SW1(config-if)# switchport access vlan 10

SW1(config-if)# no shutdown

SW1(config)# int range fa0/12 – 22

SW1(config-if)# switchport mode access

SW1(config-if)# switchport access vlan 15

SW1(config-if)# no shutdown

SW1(config)# int range fa0/23

SW1(config-if)# switchport mode trunk

SW1(config-if)# switchport trunk encapsulation dot1q

SW1(config-if)# no shutdown

SW1(config)# int range fa0/24

SW1(config-if)# switchport mode access

SW1(config-if)# switchport access vlan 50

SW1(config-if)# no shutdown

Commands to SW2:

SW2# vlan database

SW2(vlan)# vlan 10 name Data state active

SW2(vlan)# exit

SW2# configure terminal

SW2(config)# int range fa0/1 – 11

SW2(config-if)# switchport mode access

SW2(config-if)# switchport access vlan 10

SW2(config-if)# no shutdown

SW2(config)# int range fa0/12 – 22

SW2(config-if)# shutdown

SW2(config)# int range fa0/23

SW2(config-if)# switchport mode acess

SW2(config-if)# switchport access vlan 10

SW2(config-if)# no shutdown

SW2(config)# int range fa0/24

SW2(config-if)# shutdown

Question 1:

How can VLANs help to improve voice traffic?

Answer: Functions like QoS work better once traffic is separate in VLANs.

Question 2:

Notice that on SW2, the ports which suppose to be assigned to the voice VLAN are brought down (shutdown command), the Voice and Management VLANs were not created. Why?

Answer: There are no IP Phones connected on SW2 at the moment, that's why the voice VLAN was not created. Since no phones will be using those ports, it is a security risk to have such ports up. The management VLAN is mostly used to reach and remotely configure the switch. Because no configuration will be done from the servers, no Management VLAN was created.

Step 2 – Configuring the Router:

Once the switches are configured, it is time to configure the router. XYZ switches are not Layer 3 switches and therefore, routing between VLANs must be done by router R1.

An IP addressing scheme was already created by the ISP and given to you. According to them, you must use the range 201.102.200.0/24 on your internal network. A default route, pointing to **201.102.201.1**, must also be created on R1 in order to allow XYZ to reach the internet. Because the links S1 - R1 is a trunk, R1's interface fa0/0 must be configured as trunks as well.

PCs and IP Phones need to learn IP information via DHCP. Since R1 will act as the DHCP server, R1 must be configured accordingly.

For a matter of documentation, you record your configuration as follows:

Commands to R1:

```
hostname R1

!

boot-start-marker

boot system flash c2800nm-ipvoicek9-mz.124-9.T1.bin

boot-end-marker

!
```

```
enable secret 7 XYZB0rd3rR0u43r
!
ip dhcp pool Data
  network 201.102.200.0 255.255.255.192
  default-router 201.102.200.1
  dns-server 24.25.5.150 24.25.5.149
!
ip dhcp pool Voice
  network 201.102.200.64 255.255.255.192
  default-router 201.102.200.65
  dns-server 24.25.5.150 24.25.5.149
!
ip dhcp pool Management
  network 201.102.200.128 255.255.255.192
  default-router 201.102.200.129
  dns-server 24.25.5.150 24.25.5.149
!
interface FastEthernet 0/0
 no ip address
 no shutdown
interface FastEthernet0/0.10
 ip address 201.102.200.1 255.255.255.192
 encapsulation dot1q 10
 duplex auto
 speed auto
 no shutdown
```

```
!
interface FastEthernet0/0.15
 ip address 201.102.200.65 255.255.255.192
 encapsulation dot1q 15
 duplex auto
 speed auto
 no shutdown
!
interface FastEthernet0/0.50
 ip address 201.102.200.129 255.255.255.192
 encapsulation dot1q 50
 duplex auto
 speed auto
 no shutdown
!
interface FastEthernet0/1
 ip address 201.102.200.193 255.255.255.192
 duplex auto
 speed auto
 no shutdown

ip route 0.0.0.0 0.0.0.0 201.102.201.1

line con 0
 exec-timeout 2 0
 logging synchronous
```

line aux 0

line vty 0 4

login local

transport input telnet

Step 3 - Configuring the User PCs, IP Phones and Servers:

Configure User PCs and IP Phones to acquire IP information automatically via DHCP. Information like IP Addresses, network mask, default router, DNS servers will be sent to user PCs and IP Phones when they become online.

The servers will not use DHCP and must be configured with static addresses according to the table below:

Server Protocol	IP Address
Web Server	201.102.200.210/26
Mail Server	201.102.200.211/26
Internal Server	201.102.200.212/26

Note: All servers located on the Server Farm network must use the address 201.102.200.193 as their default router and 24.25.5.150 as their DNS server.

Question 4:

Can you think of one reason why the Servers don't have dynamically assigned IP addresses on this topology?

Answer: servers must be accessed by other devices. If the addresses are dynamically assigned, an address change could happen, making the server unreachable by a client. Static address assignment is way to ensure no address changes will take place.

Note: Even though internet access is required on the project and shown on the topology, the WAN link configuration was not covered on this case study. Therefore, on the shown topology, user PCs, servers and internal devices are not able to ping the ISP (201.102.201.1) simply because there is no such device

configured. If a successful ping to the ISP becomes necessary as a matter of routing testing/troubleshooting, a loopback interface can be created on R1 and the mentioned IP address assigned to it to **simulate** the ISP. Notice that in a real-world scenario, a WAN link would exist between the ISP and R1 and ISP's IP address would be provided by the ISP. Before a valid WAN link is established between R1 and ISP, the IP address assigned to loopback interface lo0 must be removed to avoid address conflicts. The commands needed to create a loopback interface are listed below:

```
R1# config t

R1 (config)# int loopback0

R1 (config-if)# ip address 201.102.201.1 255.255.255.0

R1 (config-if)# end
```