Usman Institute of Technology

Department of Computer Science
Course Code: CS222
Course Title: Data Communication & Computer Networks
Fall 2022

Lab 07

Objective:
This lab focuses on the basic configuration of switches and segregation of network using VLANs

Student Information

Student Name	
Student ID	
Date	

Assessment

Marks Obtained	
Remarks	
Signature	

Usman Institute of Technology
Department of Computer Science
CS222- Data Communication & Computer Networks

Lab 07

Instructions

State the instruction that student needs to follow for performing the example and exercises. Some sample instructions are given below which can be altered as needed
E.g.
- Come to the lab in time. Students who are late more than 15 minutes, will not be allowed to attend the lab.
- Students have to perform the examples and exercises by themselves.
- Raise your hand if you face any difficulty in understanding and solving the examples or exercises.
- Lab work must be submitted on or before the submission date.

1. Objective

This lab is directed towards the basic configuration of switches and segregation of network using VLANs

2. Labs Descriptions

SWITCH Switches are the devices that connect multiple other devices (like PCs, hubs, other switches, routers) to form a network. This device usually has 24 ports with each port having the ability to learn 132 mac addresses this can give you an idea of how accommodating a switch can be. Un-like hub a switch enables multiple ports to communicate with each other this is achieved through hardware called ASIC (application specific Integrated Circuit) it create circuits between two ports so that they can communicate without collision with other port traffic. The basic symbol of a switch which is universally used is shown below

Image of such a switch is shown below with all its ports that accommodate variety of devices.

Figure1: Depicting both the symbolic representation of switch in packet tracer along with the physical view

Initially the ports of switch use to support data rates of 10Mbps with 2 special ports for high speed data traffic called "Fast Ethernet" having data rate of 100Mbps these ports are used to connect two switches together or a switch with a router. There are three modes once you enter command line interface of a switch these modes are named below:

1) User Mode.

2) Privileged Mode.

3) Configuration Mode

USER MODE This mode contains non-destructive commands that can be used either to see present state of device or to check its connectivity. User mode begins with > symbol. Some of the commands that can be used in this Mode are shown below:

User Mode Commands	Description
enable	Used to move from User Mode to Privilege Mode
Exit	To exit from present Mode
Ping	Echo message usually sent to check network connectivity
Show	Used to see running system configuration
Trace route	It is used to trace the whole route to destination and showing all intermediate networks being traversed.

Table 1: Depicting some of the commands of user mode

PRIVILEGE MODE: Privilege mode gives us freedom to set clock, copy from one file to another configure virtual LAN settings and many more list of some useful commands are shown below:

Commands	Description
Delete	Delete a file
enable	To move to configuration mode
write	To write running configuration to memory
clock	Manage the system clock

Table2: Depicting some of the basics commands at Privillage mode

CONFIGURATION MODE: Configuration mode can be accessed if you type **config t** at privilege mode. This mode is used to configure individual port which is referred to as "interface" you can specify how your device will behave from this mode.

Here in this lab we will see what switch is and how it is configured. We have already done a lab in which we connected two PCs directly but in real world the network is all about several devices working together to perform a task and for that we need switches that have multiple ports and some switches also have provision for ports to be added for greater connectivity. Our task is to connect two switches together successfully while doing so we will get acquainted with the devices and will also see how these devices can be configured to work. We will perform this task on "Packet tracer".

Step 1: First step is to select two switched and drag n drop them on your work area.

Step 2: Select appropriate wire to connect the two devices. The suitable wire for such connectivity is "copper cross over".

Step 3: After following above steps you will see your work area as follow
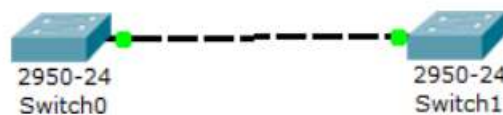

2950-24
Switch0

2950-24
Switch1

Figure2: Two switches connected via Cross Cable

Step 4: In the above image you can see green dots these dots are representing LEDs on switch that can be green or amber. Amber means switch is in learning mode and once it recognizes a link it turns green showing link is physically up now you have to configure it to make it work.

Step 5: Click on switch 0.

Step 6: Go to Command Line Interface (CLI) of this switch.

Step 7: Press enter to go in to User Mode.

Step 8: Here type "enable" or "en" to move in to Privilege mode. Step 9: Here type following command

<p style="text-align:center">Switch# show interface fa0/1</p>

Explanation of above Command

"Show" command is used to view certain configuration. In the above command I have used interface along with "show" command this means that I want to view interface configuration. (Interface is something through which a device can connect to another device for example all the ports of a switch or router or PC are interfaces). After Interface comes fa0/1, "fa" is short for fast Ethernet we can also use term "fast Ethernet" instead of "fa" then comes 0/1 "0" is slot number/ module number and "1" is port number. By using this command, a huge list will open showing different parameters the only parameter that is of concern to you at this level is the first line that should display Fa0/1 is up and line protocol is up The above means that there is physical connectivity.

Step 10: Now move on to "configuration" mode by simply typing configure terminal command or config t.

<p style="text-align:center">Switch # configure terminal   Or   Switch # config t.</p>

Step 11: Now you are in configuration mode. Here type vlan which stand for Virtual LAN. To connect two switches together you have to create virtual LAN basically VLAN tells that the two switches and their devices can communicate with each other as if they are part of same LAN.

<p style="text-align:center">Switch (config) # vlan number of vlan</p>

Step 12: After specifying vlan number, allocate a Name to it. Switch (config) # name vlan2

Step 13: Now type "exit" to come back to "configuration mode" here after allocating name and number to vlan we will finally configure it.

<p style="text-align:center">Switch (config)# interface vlan 2</p>

With the above command we entered in to interface of vlan .

Step 14: Next we will specify IP Address to this VLAN. IP Address is important for accessing this VLAN remotely.

<p style="text-align:center">Switch(config-if)# ip address 192.168.1.1 255.255.255.0</p>

IP Address is followed by subnet mask 255.255.255 means that first 24 bits are of network and last 8 bits are for end node or client or users that can be part of this network (254 end users in this network)

<p style="text-align:center">Switch (config-if)# no shutdown</p>

"No shutdown" command will make this interface active or up because by default the interface is usually down. Here comes an important step now all you have to do is to place the interface that you connected with other switch in to your vlan list.

Step 15: Go to interface fa0/1 because fa0/1 of switch 0 is connected with fa0/1 of Switch 1

switch(config)# interface fa0/1

switch(config-if)#switchport access vlan 2

Above command is stating that we are switching the selected port to vlan 2 Now repeat the above steps for "switch 1" assign it IP address 192.168.1.2 rest of the steps will be same after configuring both the devices use PING command to check the network connectivity if PING is successful then it means connection is up and running.

SEGREGATING COMMUNICATING DEVICES BY USING VLAN

Given below is a pictorial representation of a network being separated by using VLAN here you can see though PC0 and PC1 exist at the same location but they are separated as they are placed in different virtual LANs by doing so PC0 would be able to communicate with PC2 as they are in same VLAN (VLAN10) but won't be able to communicate PC1 as it exists in different VLAN. We will perform this task on CISCO PACKET TRACER
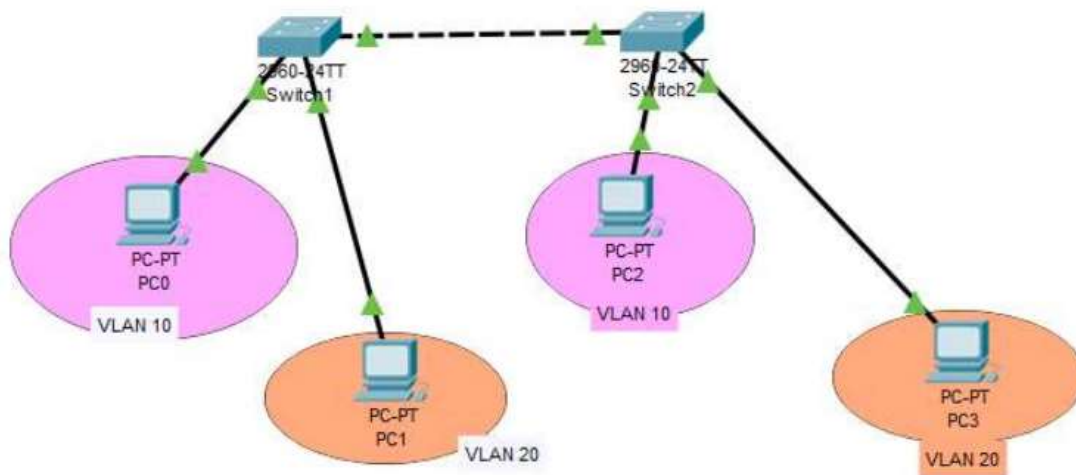

Figure3: Depicting creation of different VLANs now communication is only possible between similar Virtual LANS.

Here first we will configure the two switches and then will allocate IP addresses to PCs, statically.

- Select 2900 series switch.

- VLAN1 exist by default

- Create a another VLAN (VLAN 10 and 20)

- Name them

- Configure ports that are used to connect two switches together.

- Configure them as trunks

- Trunk defines that this link will carry data of both the virtual LANs to and from the two switches.

- Shown below are the 2 ports that will be configured as Trunk

Configuration steps for creating new VLANs (Switch 1):

```
Switch>en
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name faculty
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#name student
Switch(config-vlan)#
```

Assign VLANs to interfaces (Switch 1):

(As VLAN 10 is assigned to interface fa0/1 and VLAN 20 is assigned to interface fa0/2)

Switch>en Switch#config t

Enter configuration commands, one per line. End with CNTL/Z.

Switch(config)#interface fa0/1

Switch(config-if)#switchport mode access

Switch(config-if)#switchport access vlan 10

Switch(config-if)#exit

Switch(config)#interface fa0/2

Switch(config-if)#switchport mode access

Switch(config-if)#switchport access vlan 20

Switch(config-if)#exit Switch(config)#

[Important Note: Use the switchport access vlan command to assign the port or range of ports into access ports. A port in access mode can have only one VLAN configured on the interface which can carry traffic for only one VLAN.]

In the following example we assigning vlan 10 to the following range of ports : port fa0/5 to

fa0/6

Switch#confi t

Enter configuration commands, one per line. End with CNTL/Z.

Switch(config)#interface range fa0/5-6

Switch(config-if-range)#switchport mode access

Switch(config-if-range)#switchport access vlan 10

Switch(config-if-range)#exit

There is another port mode:

Trunk Port - The frames received on the interface are assumed to have VLAN tags. Trunk ports

are for links between switches or other network devices and are capable of carrying traffic for

multiple VLANs.

In our case port fa0/3 of both switches are linked between switches so we will configure fa0/3 as

trunk in Switch 1 and 2.

Switch(config)#interface fa0/3

Switch(config-if)#switchport mode trunk

Now, Check the status of VLANs using show VLAN command

Now, Check the status of VLANs using show VLAN command

```
Switch#show vlan brief

VLAN Name                             Status     Ports
---- -------------------------------- ---------- -------------------------------
1    default                          active     Fa0/4, Fa0/7, Fa0/8, Fa0/9
                                                 Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                                 Fa0/14, Fa0/15, Fa0/16, Fa0/17
                                                 Fa0/18, Fa0/19, Fa0/20, Fa0/21
                                                 Fa0/22, Fa0/23, Fa0/24, Gig0/1
                                                 Gig0/2
10   faculty                          active     Fa0/1, Fa0/5, Fa0/6
20   student                          active     Fa0/2
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
```

Assigning IP address to VLAN:

The IP address is configured under a logical interface, known as the VLAN. Usually, the default

VLAN 1 acts like the switch's own NIC for connecting into a LAN to send IP packets. Here are

the steps to configure an IP address under VLAN:

1. enter the VLAN configuration mode with the interface vlan vlan_number global configuration command.
2. assign an IP address with the ip address IP_ADDRESS SUBNET_MASK interface subcommand.
3. enable the VLAN interface with the no shutdown interface subcommand.

```
Switch>en
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#
Switch(config)#int vlan 10
Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan10, changed state to up

Switch(config-if)#ip
Switch(config-if)#ip address 10.0.0.1 255.0.0.0
Switch(config-if)#
```

Lab tasks

1. What is the difference between 29xx switch series and 35xx/36xx switch. What benefit the later series will give explore using Packet Tracer
2. Implement the scenario given below on packet tracer and show the connectivity between PC's by using PING Command.
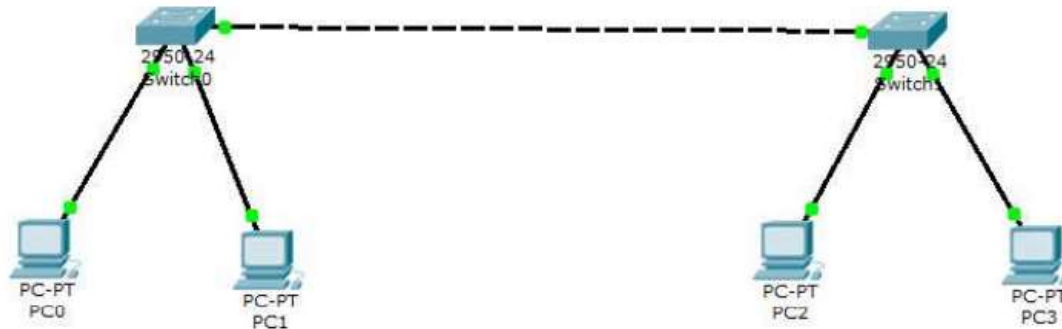
3. Use Packet Tracer to complete the following network shown below by connecting another switch SW1 and create VLANs in both switches and assign VLANs to the ports: VLAN 2 to FastEthernet Port 5-10 VLAN 3 to FastEthernet Port 11-15 VLAN 4 to FastEthernet Port 16-20 VLAN 5 to FastEthernet Port 21
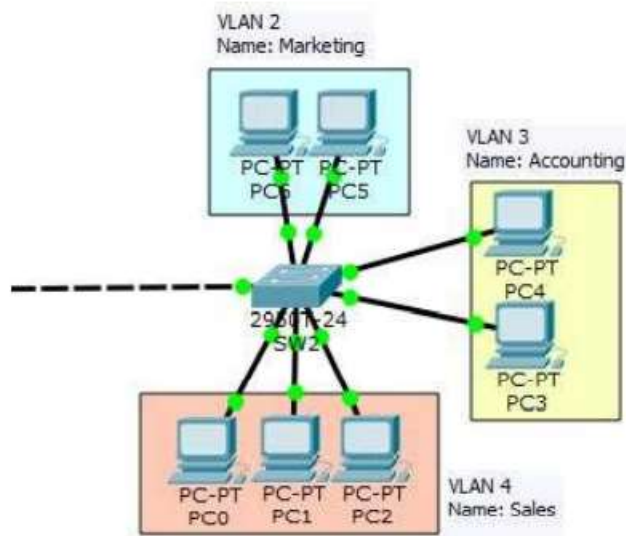
Attach Screenshot of complete topology, show VLAN status, also show communication between devices at same VLANs and between different VLANs.