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EE-424L Data Communication & Networking
Fall 2024

Habib University

Dhanani School of Science & Engineering

LAB 2: Introduction to Packet Tracer, Networking Devices, and Switch Modes

Objectives	**By the end of this lab, students should be able to use Packet Tracer to design and simulate simple network topologies and demonstrate a basic understanding of network devices and their configurations.**

Lab #2 Marks distribution:

		LR2=20	LR4=15	LR5=35	LR9=10	AR4=20
In-Lab Tasks	**Task 1**		/10		/5	/20
	Task 2	/5	/10	/10		
	Task 3	/5	/5	/10		
	Task 4		/10	/10		
Total Marks	**/100**					

Familiarization with Packet Tracer Software

Packet Tracer make available a way of reliability, network capable, and simulation-based knowledge surroundings for networking novices to design, configure, and troubleshoots computer networks

1. Open you packet tracer, and observe the different type of options and menus that are available to you, Go through the description of each available option in Table 1.

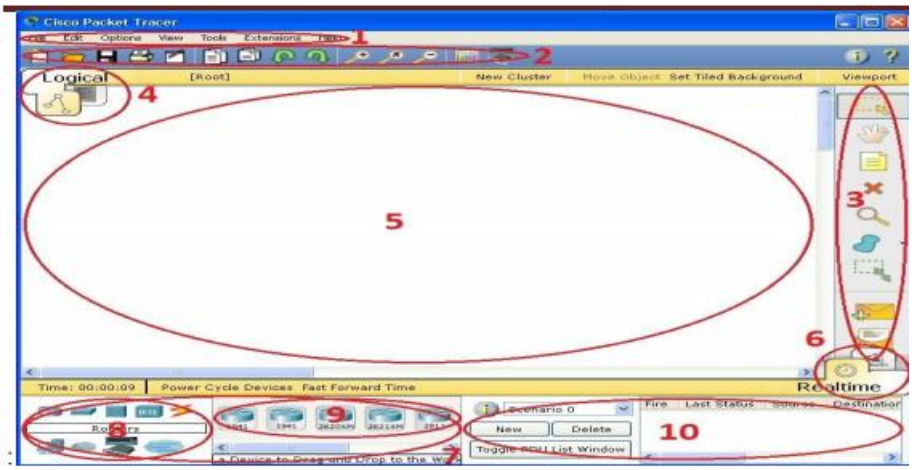


Figure 1 Packet Tracer Lay out

1.	Menu Bar	This bar has following option. File, Edit, Option, View, Tools, Extensions and Basic Command Like Open, Save, Save as, Pkz and Preferences.
2.	Main Tool Bar	This bar provides following shortcut icons of the File and Edit Menu command and buttons for Copy, Paste, Undo, and Redo, Zoom the Drawing.
3.	Common Tools Bar	This bar provides commonly used tools like Select, Move, Layout Place Note, Delete, Inspect, Resize Shape.

4.	Logical/Physical Workspace and Navigation Bar	We can toggle between both workspaces with the tabs on this bar. The logical workspace allow go back to a previous level in a cluster, create new cluster, Move Object, Set tiled Background. Physical workspace allow to navigate through physical location , Create a new city , Create a new building , Create a new closet , Move object .
5.	Workspace	The workspace allows creating our network, watching simulation and view information and statistic.
6.	Real time / Simulation Bar	This bar provide buttons to power cycle device and fast forward time and play control button and event list button in simulation mode.
7.	Network Component Box	This box, we choose device and connection to put in to the workspace. It has device type selection box and device specific selection box.
8.	Device-Type Selection Box	It has types of devices and connection.
9.	Device-Specific Selection Box	This box, we choose specifically device, We want to put in our network and connection make.

Table 1: Settings for Packet Tracer

Tasks:

Task1: Creating First Network

1. From the network component box, click on **End Devices** and drag-and-drop a **Generic** PC icon and a **Generic** laptop icon into the Workspace.
2. *Click on **Connections**, then click on **Copper Cross-Over**, then on **PC0**, and select **Fast Ethernet or Giga Ethernet**. After this, click on **Laptop0** and select **Fast Ethernet**. The link status LED should show up in green, indicating that the link is up as shown in Fig. 2

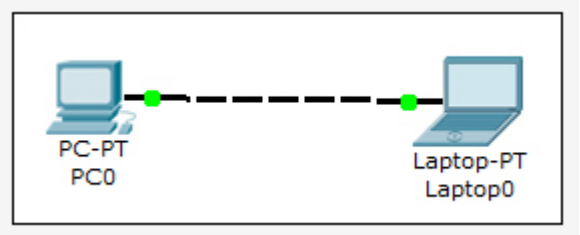


Figure 2

3. Click on the PC, go to the **Desktop** tab, click on **IP Configuration**, and enter an IP address and subnet mask. In this topology, the default gateway and DNS server information is not needed as there are only two end devices in the network.

   Configure the following IPs

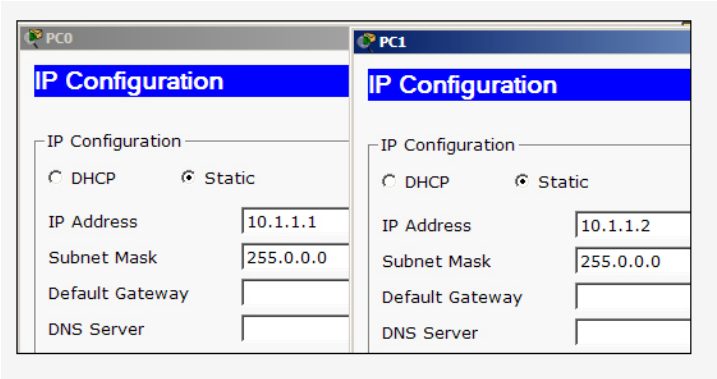
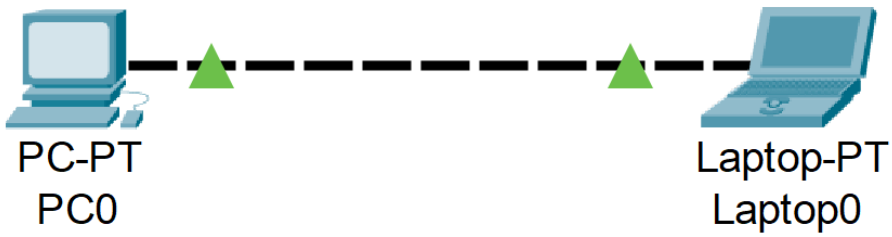
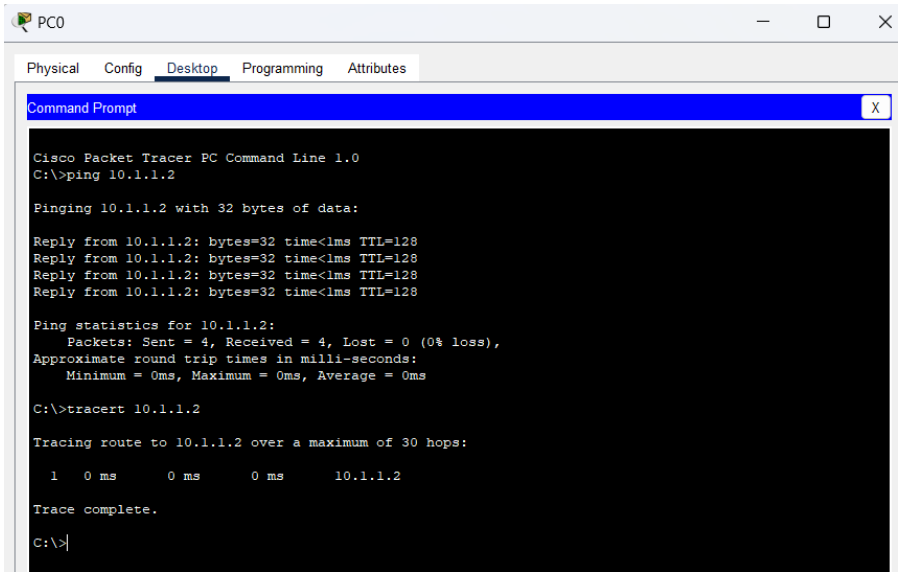


Figure 3

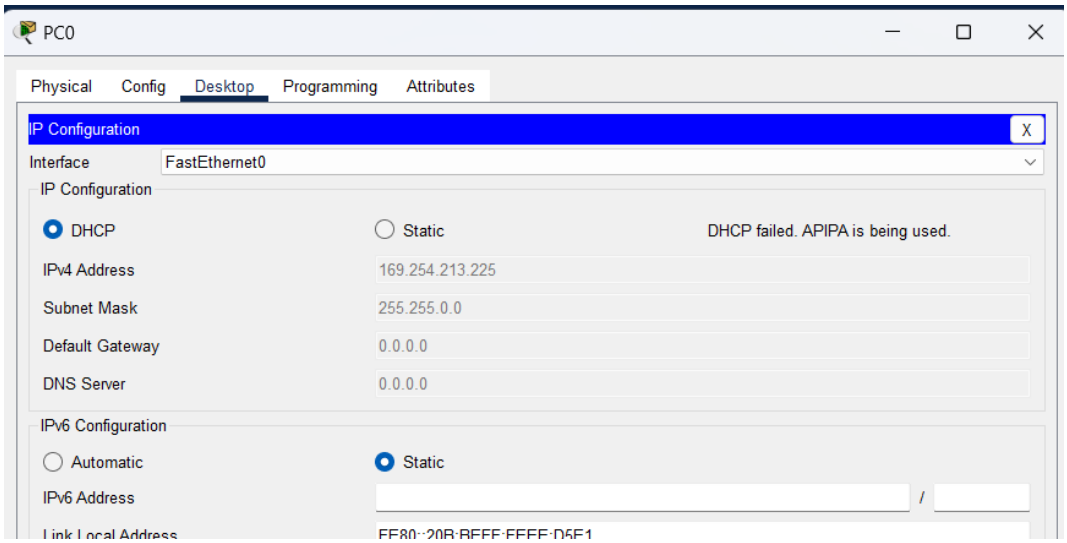
4. Using Ping and Tracert ip to check the connectivity of computers together. Attach the screenshot of result and briefly explain them.





When I went to PC0, and went into its command prompt and pinged the PC1 by using the ping command then the packets were successfully sent to the PC1 which shows that the both PC's are connected. And when I used the tracert command the path was completely traced without any hops in between which shows that both PC's are connected with each other and link is up.

5. From IP configuration settings, select DHCP to assign IPs automatically to end devices and check whether it is successful or not, if failed why?



We can see that DHCP failed and that APIPA(Automatic Private IP Addressing) is being used. This actually happens when there's no DHCP server available to assign an IP automatically so it assigns an IP address to itself.

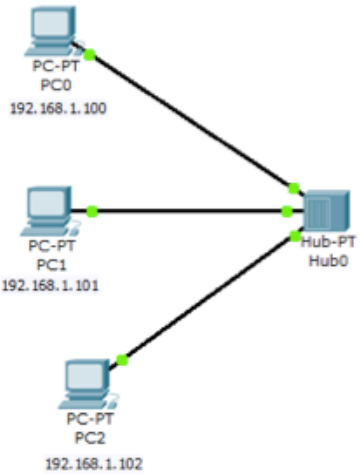
Task 2: Adding a Hub to the network

A hub is probably the most common Physical layer device found on networks. A hub serves as a central connection point for several network devices. It repeats what it receives on one port to all other ports, excluding the port on which the signal was received, so that the transmitting device may monitor and recover from collisions because every device in the network connects directly to the hub through a single cable. The properties of HUB are showing in fig. 4.

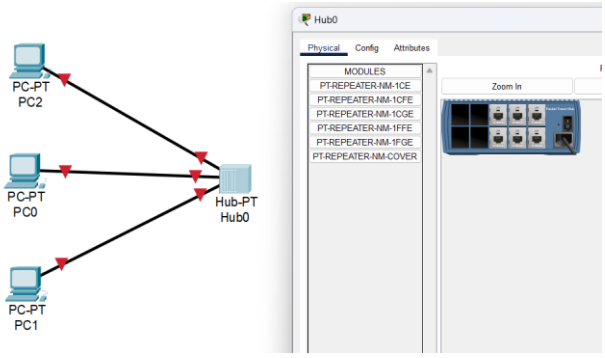
	Hub
Layer in the OSI model:	Physical layer(Layer 1 Device)
Transmission Type:	Only Broadcast
Table:	There is no MAC table in Hub, Hub can't learn MAC address.
Usage :	LAN
Ports:	4 ports
Collision:	In Hub collision occur.
Transmission Mode:	Half duplex
Collision Domain:	Hub has One collision domain.
Cost:	Cheaper than switches
Broadcast Domain:	Hub has one Broadcast Domain.

Figure 4

1. Build the following topology. Make sure to select suitable connection type for this configuration. Assign the IPs as shown in topology below:

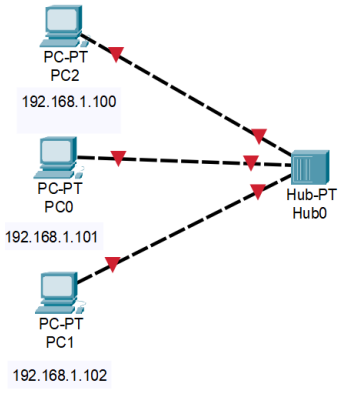


2. Double click the hub and switch it off. What happens to green LEDs? What does the new state of LEDs mean?



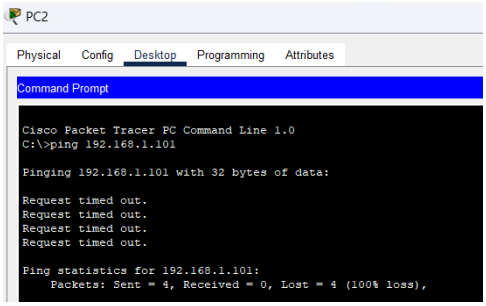
When we turn off the hub the LED's become red which shows that the devices aren't connected with each other and the link is down.

3. Repeat the same process but this time use Copper cross over cable. How does this effect the network?

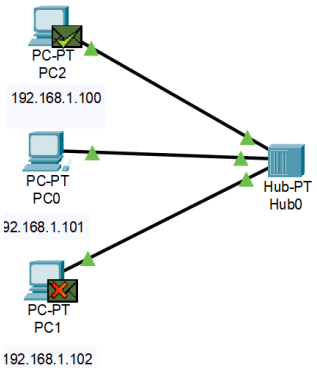


When we used copper-cross over the LEDs turn red (even when the Hub is turned on). This means that the connection between the PCs and the Hub is not established.

4. Can you ping one computer to another computer with in the network? No
Attach the screenshot below:

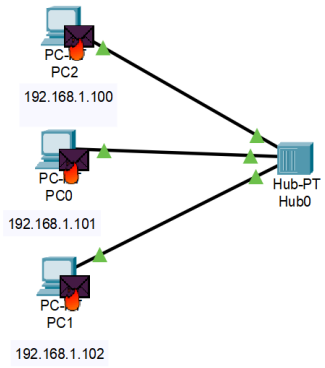


5. How Hub is broadcasting the information in a network? Explain it with the help of running topology in simulation-mode. Attach the screenshot of model and showing broadcasting in network.



The hub simply takes the information it receives and multiplies it – that is, sends it to all other ports. It basically broadcasts the data sent to all the other computers in the network. When we ping PC2 with PC0 then the hub sends the packets to PC0 and PC1 as well but only PC0 accepts and PC1 rejects it.

6. If two end devices send the Packets simultaneously, will the Data Collide? Yes or no and why?



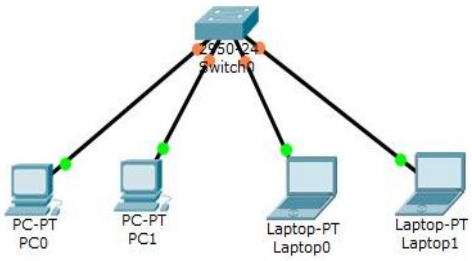
Yes the data collides, this collision occurs because a hub does not manage data traffic, it simply repeats incoming signals to all connected devices. When two devices, like PC2 and PC1, transmit data simultaneously, their signals interfere with each other since the hub sends both signals out on all ports. This leads to a collision.

Task 3: Making Switch Topology

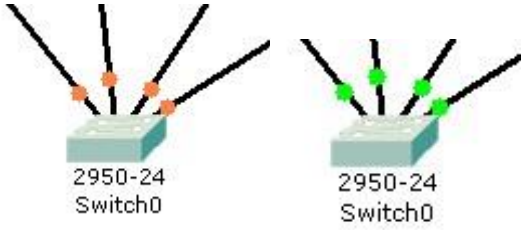
Step 1 : Building the Topology – Connecting the Hosts (end devices) to Switch. Connect Switch to PC0, PC1, Laptop0 and Laptop1 by choosing automatic Connection type or appropriate type from Connections.

How many ports/interfaces of switch 2950-24 are available?

24 ports are available



Note: Because Packet Tracer also simulates the Spanning Tree Protocol, at times the switch may show amber lights on its interfaces. You will need to wait for the lights to turn green on the switches before they will forward any Ethernet frames.

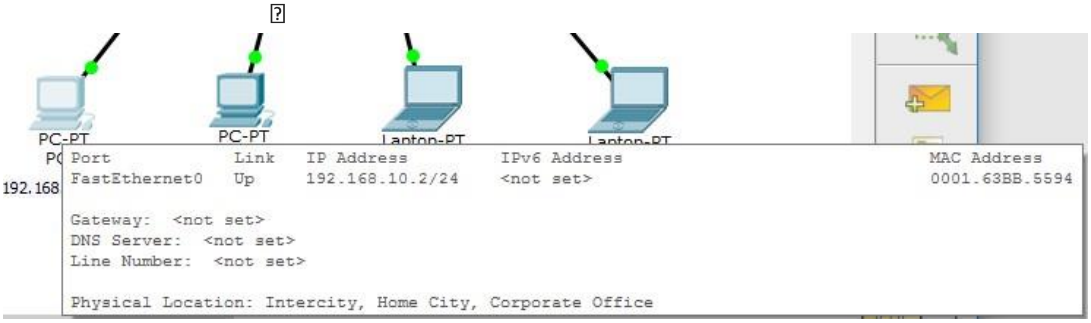


Step 2 : Configure IP Addresses and Subnet Masks on the Hosts

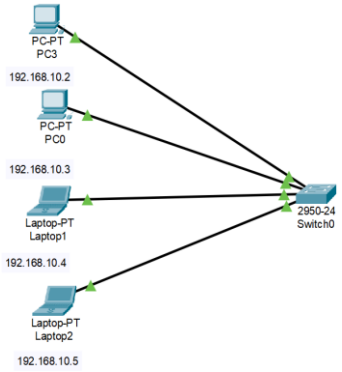
We need to configure IP Addresses and Subnet Masks on the devices to communicate between the hosts. Use the below information for IP Addresses and Subnet Masks.

Host	IP Address	Subnet Mask
PC0	192.168.10.2	255.255.255.0
PC1	192.168.10.3	255.255.255.0
Laptop0	192.168.10.4	255.255.255.0
Laptop1	192.168.10.5	255.255.255.0

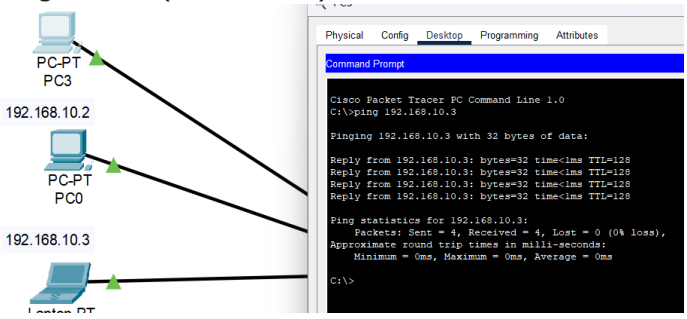
Verify the information: To verify the information that you entered, move the Select tool (arrow) over each host.



- Attach screenshot of topology. Ping devices from PC0 and PC 1 and attach the result below:



Ping result: (successful)

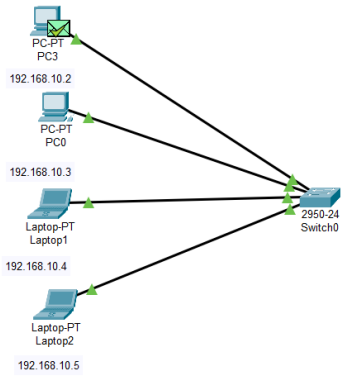


- Ping 192.168.10.10 from laptop 1. Write down your observations.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.10.10

Pinging 192.168.10.10 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.10.10:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

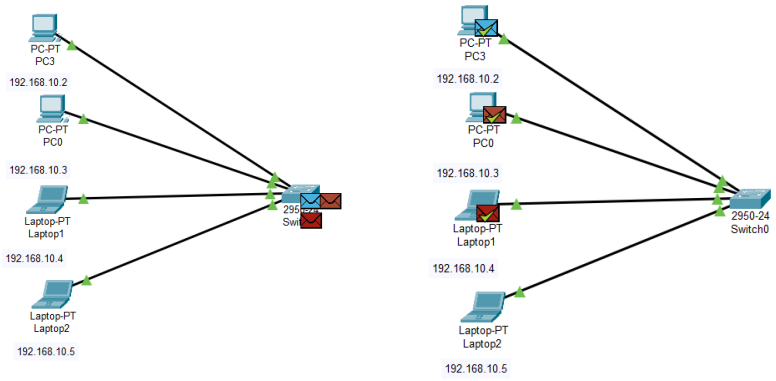
When we pinged the 192.168.10.10 from laptop 1 (laptop 2 in my case) then the request timed out because there was no device with this IP address in the network model we made, we just had 192.168.10.2 to 192.168.10.5 in the model we made hence no packets sent to the specified address.

- Does Switch broadcast the Packets? Explain and support your answer with the help of above topology. Attach the screenshot of broadcasting in simulation mode.



I observed packets going directly from PC3 to PC0 and then back from PC0 to PC3. The switch already knows the MAC addresses of both PC3 and PC0 from its MAC address table, so it forwards the packets directly to the correct port without broadcasting.

- If two end devices send the Packets simultaneously, will the Data Collide? Yes or no and why?



When we sent the data packets simaltaneously there was no collision because when two devices send packets at the same time, the switch checks its MAC address table and forwards each packet only to the specific port where the destination device is connected. This creates dedicated communication paths for each transmission, preventing any possibility of collisions.

Task 4:

Set name on switch

Switch name can be set from global configuration mode. Use **hostname [*desired hostname*]** command to set name on switch.

Set your name as hostname of switch and attach its screenshot below.

```
Switch(config)#host hostname
hostname(config)#host basilkhowaja
basilkhowaja(config)#
```

Set password on a Switch

Passwords are used to restrict physical access to switch. Cisco switch supports console line for local login and VTYs for remote login. All supported lines need be secure for User Exec mode. For example, if you have secured VTYs line leaving console line unsecure, an intruder can take advantage of this situation in connecting with device. Once you are connected with device, all remaining authentication are same. No separate configuration is required for further modes.

Password can be set from their respective line mode. Enter in line mode from global configuration mode.

```
Zareen(config)#line console 0
Zareen(config-line)#password 124
Zareen(config-line)#login
Zareen(config-line)#exit
Zareen(config)#
Zareen(config)#exit
Zareen#
```

To remove the password:

```
Zareen(config-line)#no password 124
```

Attach the screenshot of setting up Console password and verify by exit out from user mode.

```
basilkhowaja(config)#line console 0
basilkhowaja(config-line)#password 124
basilkhowaja(config-line)#login
basilkhowaja(config-line)#exit
basilkhowaja(config)#exit
basilkhowaja#
basilkhowaja#no password 124
```

```
basilkhowaja(config)#line console 0
basilkhowaja(config-line)#no password 124
basilkhowaja(config-line)#
```

Along with User Exec mode we can also secure Privilege Exec mode. Two commands are available for it.

Switch(config)# enable password abc
or
Switch(config)# enable secret abc

Set these passwords and attac7h its screenshot below.

```
basilkhowaja(config)#enable password abc
basilkhowaja(config)#enable secret abc
```

show mac-address-table

Switch stores MAC address of devices those are attached with its interfaces. We can use *show mac-address-table* command to list all learned devices. Switch uses this table to make forward decision. This command 'll run in Privilege mode.

Attach the screenshot of mac-table below.

```
basilkhowaja#show mac-address-table
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----

   1    0001.c73b.51ae    DYNAMIC     Fa0/1
   1    000b.beee.d5e1    DYNAMIC     Fa0/2
basilkhowaja#
```

Show and Set Clock time

Run show clock command in privilege mode and note down the time below. Set clock time on your switch. Attach its screenshot and how did you set it (syntax).

```
basilkhowaja#show clock
*0:41:25.751 UTC Mon Mar 1 1993
basilkhowaja#clock set 11:09:00 Aug 27 2024
basilkhowaja#show clock
11:9:0.0 UTC Tue Aug 27 2024
basilkhowaja#
```

This is the syntax I used:

clock set hh:mm:ss day month year

Show port configuration information

To see the configuration information for just Fast Ethernet port 0/1, write the following command in privileged EXEC mode:

Switch#show interface fastethernet 0/1

Attach the screenshot of interface below.

```
basilkhowaja#show interface fastEthernet 0/1
FastEthernet0/1 is up, line protocol is up (connected)
  Hardware is Lance, address is 0002.4a3b.9c01 (bia 0002.4a3b.9c01)
 BW 100000 Kbit, DLY 1000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/s
  input flow-control is off, output flow-control is off
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:08, output 00:00:05, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue :0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     956 packets input, 193351 bytes, 0 no buffer
     Received 956 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 watchdog, 0 multicast, 0 pause input
     0 input packets with dribble condition detected
     2357 packets output, 263570 bytes, 0 underruns
 --More--
```

Lab Evaluation Assessment Rubric
EE-424 Lab 2

#	Assessment Elements	Level 1: Unsatisfactory Points 0-1	Level 2: Developing Points 2	Level 3: Good Points 3	Level 4: Exemplary Points 4
LR2	**Program/Code/ Simulation Model/ Network Model**	Program/code/simulation model/network model does not implement the required functionality and has several errors. The student is not able to utilize even the basic tools of the software.	Program/code/simulation model/network model has some errors and does not produce completely accurate results. Student has limited command on the basic tools of the software.	Program/code/simulation model/network model gives correct output but not efficiently implemented or implemented by computationally complex routine.	Program/code/simulation /network model is efficiently implemented and gives correct output. Student has full command on the basic tools of the software.
LR4	**Data Collection**	Measurements are incomplete, inaccurate and imprecise. Observations are incomplete or not included. Symbols, units and significant figures are not included.	Measurements are somewhat inaccurate and imprecise. Observations are incomplete or vague. Major errors are there in using symbols, units and significant digits.	Measurements are mostly accurate. Observations are generally complete. Minor errors are present in using symbols, units and significant digits.	Measurements are both accurate and precise. Data collection is systematic. Observations are very thorough and include appropriate symbols, units and significant digits and task completed in due time.
LR5	**Results & Plots**	Figures/ graphs / tables are not developed or are poorly constructed with erroneous results. Titles, captions, units are not mentioned. Data is presented in an obscure manner.	Figures, graphs and tables are drawn but contain errors. Titles, captions, units are not accurate. Data presentation is not too clear.	All figures, graphs, tables are correctly drawn but contain minor errors or some of the details are missing.	Figures / graphs / tables are correctly drawn and appropriate titles/captions and proper units are mentioned. Data presentation is systematic.
LR9	**Report**	All the in-lab tasks are not included in report.	Most of the tasks are included in report but are not well explained. All the necessary figures / plots are not included.	Good summary of most of the in-lab tasks is included in report. The work is supported by figures and plots with explanations.	Detailed summary of the in-lab tasks is provided. All tasks are included and explained well. Data is presented clearly including all the necessary figures, plots and tables.
AR4	***Report Submission**	Late submission after 1 week and in between 2 weeks.	Late submission after 2 days and within a week.	Late submission after the lab timing and within 2 days of the due date.	Timely submission of the report and in the lab time.

***Report:** Report will not be accepted after 1 week of due date