Lab 03: IP Addressing basics & Packet Tracer Part A

Objectives:

This lab gives a basic understanding of the address used in pc mainly MAC, IP and PORT This will enable students to differentiate between different classes of address

Tutorial

MAC Address:

Media Access Control address is a hardware address, usually 48 bits, which is used to uniquely identify each node of a network. They are also called Data Link addresses. MAC addresses are expressed in hexadecimal notation in the following format: 01-23-45-67-89-AB, in the case of a 48-bit address. Colons (:) are sometimes used instead of dashes (-).

Run ipconfig/all from a Command Prompt window.

(Click **Start**, then **Run**, then type "cmd" in the text box)

type in **ipconfig/all** in the Command Prompt Windows.

The 12-digit "Physical Address" is the same as MAC address

IP Address:

IP address is the address of a computer interface on the network. A computer may have several IP addresses if it has more than one interface. For example, a computer with two NICs will have two IP addresses.

IP addresses fall into one of the five classes. This classification depends on the leading bits in an address. Possible classes are:

Class	Leading bits	Range
А	0	1.0.0.0-127.255.255.255
В	10	128.0.0.0-191.255.255.255
С	110	192.0.0.0-223.255.255.255

D	1110	224.0.0.0-239.255.255.255
Е	1111	240.0.0.0-255.255.255.255

Generally, you will rarely see class D or E addresses.

IP addresses can also be divided into two groups: Private addresses or Globally unique addresses. Non-Routable or Private Addresses fall in the range as under:

> 10.0.0.–10.255.255.255 172.16.0.0–172.31.255.255 169.254.0.0–169.254.255.255 (auto configure IP addresses) 192.168.0.0–192.168.255.255

All other class A, class B and class C addresses are legal.

Routers do not forward packets from non-routable/private IP addresses. However, this does not mean that these machines are not able to communicate over the Internet; their addresses must be remapped to global addresses for communication to happen. Routers that support network address translation (NAT) provide a way of doing this.

Network Mask:

Network addresses can be divided into two parts. The higher order bits are used to identify the network and the lower order bits are used to identify the host. If Subnetting is used, the higher order bits will be divided between the network number and the subnet number.

Non-zero bits in the network mask are used to determine the address bits that are used for the network portion of the address. The remaining bits are number of hosts in the network. For example, a network mask of 255.255.255.0 uses the first 24 bits to determine the network and the last eight bits as the host number. The class of the address determines the default network mask.

Broadcast Address:

This address is used to send requests to each and every computer on the local network. It is used by protocols like ARP. Broadcast address is formed by simply setting all the bits in the host portion of the address to ones.

Default Router or Gateway:

If two machines have the same network and subnet numbers, they are on the same subnet and can communicate directly. If this is not the case, packets must be routed for one subnet to another. A host may know which router to send the packet to for a specific host. If this is not the case, then the packet is sent to a default router that must forward the packet onto the next network on the path to its destination.

Part B

Cisco Packet Tracer: A Network Simulation Tool

About Packet Tracer:

Packet Tracer is a cross-platform visual simulation tool designed by Cisco Systems that allows users to create network topologies and imitate modern computer networks. The software allows users to simulate the configuration of Cisco routers and switches using a simulated command line interface. Packet Tracer makes use of a drag and drop user interface, allowing users to add and remove simulated network devices as they see fit. The software is mainly focused towards Cisco Network Associate Academy students as an educational tool for helping them learn fundamental Networking concepts.

You all are suggested to Download and Install Cisco Packet Tracer tool on your PCs from the following links (free):

Download Links

Link 1: https://www.filehorse.com/download-cisco-packet-tracer-64/download/

Link 2: https://www.netacad.com/courses/packet-tracer

How to Install Cisco Packet Tracer on Windows System:

https://ipwithease.com/how-to-install-packet-tracer-on-windows-system/

Part C

1. Introduction:

Packet Tracer is a network simulator developed at Cisco Systems. Packet Tracer (PT) is a powerful and dynamic tool that simulates the various protocols used in networking, in either Real Time or Simulation mode. This includes layer 2 protocols such as Ethernet and PPP, layer 3 protocols such as IP, ICMP, and ARP, and layer 4 protocols such as TCP and UDP. Routing protocols can also be traced. Packet Tracer is a supplement to and not a replacement for experience with real equipment. Students are encouraged to compare the results obtained from Packet Tracer network models with the behavior of real equipment.

Packet Tracer is a powerful network simulator that can be utilized in training for Network certifications by allowing students to create networks with an almost unlimited number of devices and to experience troubleshooting without having to buy real Cisco routers or switches. The tool is created by Cisco Systems. The purpose of Packet Tracer is to offer students a tool to learn the principles of networking as well as develop Cisco technology specific skills. However, it is not being used as a replacement for Routers or Switches.

As a network engineer, it is used to simulate complex scenarios first on packet tracer and then deploy them on the real equipment's. Please notice though, the labs will not teach you networking, but rather let teach you how to simulate and apply your networking related knowledge.

2. Tools required:

• CISCO Packet tracer

3. Objective of the Experiment:

After completing this Lab student should able to:

- Installation of Cisco Packet Tracer.
- To have understanding of CISCO Packet Tracer.
- To have knowledge about each and every component used in this software as related to course.
- Basic knowledge to make topologies and further working on this easily.

4. Installating Cisco Packet Tracer 7.0 in Windows 7,8,10 – 32/64 Bit:

Once you have finished downloading the software, it's time to install it. Let us see how to install Cisco Packet Tracer in Windows.

Any installation in Windows is just clicks and mouse and the same applies to **Packet tracer**. Click on the exe file downloaded.

The below screen appears. Select "I accept the agreement" and click on "Next ".



Figure 1: first step of cisco packet tracer

Setup will show the folder in which the program's shortcuts will be created. If you want to change the folder, you can change it. Click on "Next".

Setup - cisco Packet macer 7.0 040	it		
Select Destination Location			
Where should Cisco Packet Tracer	7.0 64Bit be installed?		Ċ
Setup will install Cisco Pac	ket Tracer 7.0 64Bit into t	ne following fol	der.
To continue, click Next. If you wou	ld like to select a different	folder, click Bro	owse.
C:\Program Files\Cisco Packet Tra	cer 7.0	B	rowse
At least 218,6 MB of free disk spac	e is required.		

Figure 2: second step of cisco packet tracer

Then the program will ask whether to create a Desktop icon and create a Quick Launch icon. Make your own choice and click on "Next".

🕞 Setup - Cisco Packet Tracer 7.0 64Bit			\times
Select Additional Tasks			
Which additional tasks should be performed?			C A
Select the additional tasks you would like Setup to perform Tracer 7.0 64Bit, then dick Next.	while installing	Cisco Packe	t
Additional icons:			
reate a desktop icon			
Create a Quick Launch icon			
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Figure 3: Third step of cisco packet tracer

Then the summary of the settings we selected is displayed. Click on "Install ".

leady to Install		
Setup is now ready to begin installing Cisco Packet Tra computer.	cer 7.0 64Bit on your	Ć
Click Install to continue with the installation, or dick Ba change any settings.	<mark>ck if you want to revi</mark> e	ew or
Destination location: C:\Program Files\Cisco Packet Tracer 7.0 Start Menu folder: Cisco Packet Tracer Additional tasks: Additional icons: Create a desktop icon		^
c		> ~

Figure 4: Fourth step of cisco packet tracer

The installation will begin like this:

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In	stalling	
	Please wait while Setup installs Cisco Packet Tracer 7.0 64Bit on your computer.	Č
	Extracting files	
	C:\Program Files\Cisco Packet Tracer 7.0\bin\PacketTracer7.exe	
_		
	2 E	Cancel

Figure 5: Fifth step of cisco packet tracer

In seconds, installation gets completed and the below screen is shown. Click on "Finish".



Figure 6: sixth step of cisco packet tracer

Then the below popup appears asking you to close or restart your computer. Click on "OK ".



Figure 7: ok notification

As we selected Launch option, Packet tracer is automatically launched. It should look like below.

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File Edit Options View Tools	Extensions Help			<u></u>		1) ?
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Figure 8: packet tracer Console

5. Walk-through Tasks:

5.1 Creating a New Topology in Packet Tracer:

Start Packet Tracer



Figure 9: Packet tracer console

5.2 Choosing Devices and Connections

We will begin building our network topology by selecting devices and the media in which to connect them. Several types of devices and network connections can be used. For this lab we will keep it simple by using End Devices, Switches, Hubs, and Connections.

Single click on each group of devices and connections to display the various choices. When we select a device in the left panel, in the right panel we see all the listed devices of that type.

Click on end devices

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Time: 00:07:17 Power Cycle Device	es Fast Forward Time				Realtime	•
		eneric IP Phone VoIP Device P	hone TV Wireless Tablet	Smart Device Wireless Generic Wired S	iniffer	
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			Server-PT			

Figure 10: Showing end devices on Packet tracer

Single click on the Generic host.

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	2960 Generic Generic	3650 16 2000 Ge	neric 2950-24	950T			•
	<						>
			Router-PT				

Figure 11: showing generic hosts Move the cursor into topology area. You will notice it turns into a plus "+" sign.

Single click in the topology area and it copies the device.

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			PC-PT			

Figure 12: Selection of generic computer

Add three more hosts.

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	PC-PT PC-P PC0 PC1	T PC-PT PC2	PC-PT PC3			•
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Time: 00:11:12 Power Cycle Dev	ices Fast Forward Time				Realtime	
		eneric IP Phone VoIP Device	wireless TV Wireless	Generic Wireless Generic	Sniffer	
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			PC-PT			

Figure 13: selection of further three generic hosts

5.3 Adding a Hub

Select a hub, by clicking once on Hubs and once on a Generic hub.

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Time: 00:12:44 Power Cycle Devices Fast Forward Time	Realtime
Generic Coaxial Generic Splitter	
	>
	PC-PT

Figure 14: selection of Hub

Add the hub by moving the plus sign "+" below PC0 and PC1 and click once.

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< Time: 00:13:40 Power Cycle De	vices Fast Forward Time				Realtime
"]]]]]]]]]]]]]]]]]]]		eneric IP Phone VolP Device Phone	e V Wireless Smar	te Generic Generic S	niffer
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			PC-PT		

Figure 15: Adding PC'S with Hubs

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Connect PC0 to Hub0 by first choosing Connections.

Figure 16: Showing how to select connections

Click once on the Copper Straight-through cable.

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Figure 17: Selection of copper wire

Perform the following steps to connect PC0 to Hub0:

1. Click once on PC0

- 2. Choose FastEthernet
- 3. Drag the cursor to Hub0
- 4. Click once on Hub0 and choose Port 0
- 5. Notice the green link lights on both the PC0 Ethernet NIC and the Hub0 Port 0 showing that the link is active.



Repeat the steps above for PC1 connecting it to Port 1 on Hub0. (The actual hub port you choose does not matter.



Figure 18: Connecting through copper wire

5.4 Adding a Switch

Select a switch, by clicking once on Switches and once on a 2950-24 switch.



Figure 19: Selection of switch

Add the switch by moving the plus sign "+" below PC2 and PC3 and click once.

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	PC-PT PC4	-
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Time: 00: 19:46 Power Cycle I	Devices Fast Forward Time	Realtime
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Figure 20: Selecting two PC'S and Switch Connect PC3 to switch0 by first choosing Connections. Click once on the CopperStraightthrough cable.

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	2	950-24 Switch0			>	<
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	PC-PT	PC-PT				• •
	PC3	PC4				
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Time: 00:22:27 Power Cycle Devic	ces Fast Forward Time				Realtime	
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Figure 21: Selecting copper wire

Perform the following steps to connect PC2 to Switch0:

1. Click once on PC3

- 2. Choose FastEthernet
- 3. Drag the cursor to Switch0
- 4. Click once on Switch0 and choose FastEthernet0/1
- 5. Notice the green link lights on PC4 Ethernet NIC and amber light Switch0 FastEthernet0/1 port. The switch port is temporarily not forwarding frames, while it goes through the stages for the Spanning Tree Protocol (STP) process.
- 6. After a about 30 seconds the amber light will change to green indicating that the port has entered the forwarding stage. Frames can now have forwarded out the switch port.



Repeat the steps above for PC3 connecting it to Port 3 on Switch0 on port FastEtherent0/2. (The actual switch port you choose does not matter.)



Figure 22: Connecting Pc's with switch through copper wire

Move the cursor over the link light to view the port number. Fa means FastEthernet, 100 Mbps Ethernet.

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Logical Back	[Root]	New Cluster Move Obje	ect Set Tiled Background	Viewport	Environment: 12:32:00
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Figure 23: Showing Interfaces

After you successfully create the topology like here

Be sure you are in Realtime mode.

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File Edit Options View Tools Extensions Help Image: Second se	1)?
Logical Back [Root] New Cluster Move Object Set Tiled Background Viewport	Environment: 13:23:00
	^
Site Switch	
	×
PC-PT PC-PT	9
PC3 PC4	
Time: 00:26:49 Power Cycle Devices Fast Forward Time	Realtime
Copper Straight-Through	>

Figure 24: Showing Real time Mode

Select the Add Simple PDU tool used to ping devices.

Assigning IP addresses:

After connecting devices with switch, now for checking them you have to assign IP address to end devices, which is our case is PC0 and PC1 or either one you have, how you will assign IP address follow the following steps:

- 1. Click on PC0 once.
- 2. Select Desktop tap when terminal open on above tab.
- 3. You will have a multiple tab in front of you, select IP configuration
- 4. Enter valid IP addresses, subnet mask and default gateway.



Figure 25: Showing Desktop of PC

Select IP configuration, the first tab then,

ysical Config Deskto	Programming A	ttributes					
Configuration							
P Configuration							
) DHCP		 Static 					
P Address		192.168.1.2					
Subnet Mask		255.255.255.0					
Default Gateway		192.168.1.1					
NS Server		0.0.0.0					
Pv6 Configuration							
	O Auto Conf	g	Stat	tic			
Pv6 Address						1	
ink Local Address		FE80::207:ECFF:	FE30:4CC				
Pv6 Gateway							
Pv6 DNS Server							

Figure 26: IP configuration

And close the window by filling up with the valid IP addresses, subnet mask and default gateway.

Do same for the next PC1 and enter the valid IP addresses, subnet mask and default gateway.

Configuration								
IP Configuration								
		Static						
IP Address		192.168.1.3						
Subnet Mask		255.255.255.	0					
Default Gateway		192.168.1.1						
DNS Server		0.0.0.0						
IPv6 Configuration								
	O Auto Conf	ig		Static				
IPv6 Address							1	
Link Local Address		FE80::201:96	FF:FE59:9	CCD				
IPv6 Gateway								
IPv6 DNS Server					 	 		

Figure 27: IP configuration of other PC

Results:

Logical	Back	[Root]	New Cluster	Move Obje	ect	Set T	ïled Backgrou	ind	Viewpo	rt	Envir	onment:	17:59:0	0
R					^	Simulation Event L	on Panel .ist					Β×	G	i
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Time: 00:27:08.708	Power Cycle Devices PLAY CC	NTROLS: Back Auto Capture / F	Play Capture / F	Forward							Event List	Simula	ation	
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		VolP		Wireles		J Scer		I	In Progress	PC0	PC2	ICMP		0
	Generic Generic (aeneng generg (P Mone (Device)		laulec		New	Delet	te	In Progress	PC0	PC2	ICMP		0

Figure 28: Results showing packet sending

Click once on PC0, then once on PC3.

The PDU Last Status should show as Successful.

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Figure 29: shows successful packet sending

PART-A TASKS:

- 1. Run **ipconfig/all** from a Command Prompt window.
- 2. Click Start, then Run, then type "cmd" in the text box
- 3. Type in **ipconfig/all** in the Command Prompt Windows.
 - i. What is your machine's IP address?
 - ii. What is the class of its address?
- iii. Is this a local or global address?
- iv. What is the network mask?
- v. Is Subnetting used?
- vi. What is the host number, the network number, and, if applicable, the subnet number?
- vii. Can you determine the broadcast address? If so, what is it?
- viii. What is the host name and network name for the computer?
 - ix. What is the default gateway for the computer?
 - x. What is the data-link address?
 - xi. Can you determine if DHCP is used? If so, what are the DNS parameters?
- xii. Compare your machine's IP and MAC address with another computer and point the difference?

PART-C TASKS:

Task 1:

Construct a network topology which have one switch connected with 3 computers and assign them proper IP addresses, subnet mask and default gateways.

Task 2:

Construct a network topology having one switch with connected with 5 PC's with Fast Ethernet Cable, assign them proper IP addresses, subnet mask and default gateways and send message from PC5 to PC1 and demonstrate the simulation.