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Study on Network Simulation using Cisco Packet Tracer

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Abstract: It's a network that connects us. Network system continues to evolve in complexity. New services are being developed everyday to take the advantage of the network. Educational tools are emerging to facilitate teaching and learning about networking technology. Cisco Packet tracer is one such tool helps in better understanding about networking and its working is similar to real time. Its simulation based learning environment helps learners to critical thinking, troubleshooting network problems, Creative and decision making. Cisco Packet tracer helps to build "virtual network world". Packet tracer provides visualization, simulation, assessment, visualization, and collaboration capabilities. This paper briefs on address class, network and host portion, types of cables used for connecting network, packet transformation, modes of Cisco router, services and IP configuration.

Keywords: Simulation, Network, Packet Tracer, Command Line interface, Router

I. INTRODUCTION

CISCO network simulation software – Packet Tracer which works on certain configurations such as security and routing purpose. Packet tracer helps in building network topologies, it simulates behaviour of the network and simulates routers and switches using command line interface and it imitates modern computers. The below figures show the class address of IP, network and host identification [1][2][3].

Address Class	Octet Range	Default Sub Net Mask	Supports
A	0-126	255.0.0.0	Supports 16 million hosts on each of 127 network
B	128-191	255.255.0.0	Supports 65,0000 hosts on each of 16,000 networks
C	192-223	255.255.255.0	Supports 254 hosts on each of 2 million networks.
D	224-239	Reserved Multicast	Multicast Groups
E	240-255	Research/Future Use/Experiments	Development purposes

Fig 1.1: 5 Classes of IPV4

Class	8 bits	8 bits	8 bits	8 bits
Class A	NETWORK	HOST	HOST	HOST
Class B	NETWORK	NETWORK	HOST	HOST
Class C	NETWORK	NETWORK	NETWORK	HOST

Network Portion Host Portion

IP Address	10.10.10.10
Subnet Mask	255.0.0.0
IP Address	171 .168.10.1
Subnet Mask	255.255.0.0
IP Address	192.168.1.1
Sub Net Mask	255.255.255.0

Fig 1.2: Network and Host Identification

IP address is classified into two types. Network address and host address. First IP is reserved for network address and last for broadcast address, while left out IP address will be assigned for host address. Network address is physical or logical address that identifies different nodes over network. Subnet mask/subnetwork mask gives the range of IP address available in the given network. Dividing networks into two or more is subnetting. Subnetting is assigned with IP address. Class A has a range from 0 to 126, subnet mask is 255.0.0.0, i.e it uses network portion of 8 bits for 32 bit IPV4. Class B has a range from 128-191 subnet mask is 255.255.0.0, uses 16 bit of of network portion. Class C from 192 to 223 its subnet mask is 255.255.255.0, 24 bit of network portion. Class D has range from 224 to 239 its subnet mask is reserved multicast. Class E from 240 to 255 subnet used for research /future use. Fig IP address 10.10.10.10 is is the range of class A. 171.168.10.1 is in class B, 192.168.1.1 is the example of class C. To calculate host IP address, 2 IP address are decreased they cannot be assigned to hosts. First IP is the gateway and last is for broadcast[1].

II. CONNECTION

Network can be complex as connected to internet or as simple as connecting two computers with single cable. Connection can be wired or wireless. Here wired connection between similar device and different devices as shown in fig.2.2, Connection is established using straight through and cross over. Similar devices are connected using cross over and two different devices are connected through straight through.[4] Different types of cable are Copper straight-through cable, Copper Cross-Over cable, Fibre cable , Phone cable, Serial DTE, Serial DCE, Coaxial cable, and octal cable[4][5][6]. The below figures show the networking of devices.

DEVICES	CABLES
Laptop to Laptop	Cross-Over
Switch to Switch	Cross-Over
PC to PC	Cross-Over
PC to Switch	Straight-Through
Switch to Router	Straight-Through
Router to Router	Serial Cable

Fig 2.1: Cable Connection for different networking devices such as Laptop, Switch, PC, Router

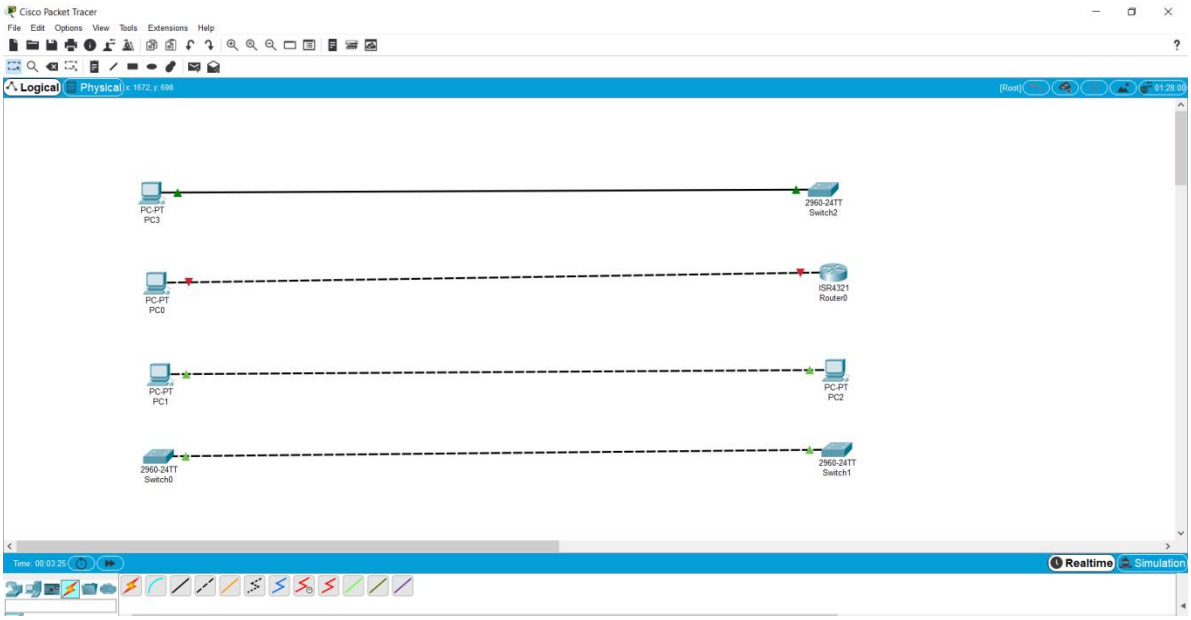


Fig 2.2: Workspace of Cisco Packet Tracer: Cables used for connecting different devices

III. IMPLEMENTATION

This section briefs on workspace of packet tracer, service of desktop and assigning static IP to device/PC and to set gateway. Gateway should be always setted to 1. It also briefs on modes of routers, how to navigate from one mode to another, commands used to navigate in CLI , configuration of IP address to interface. At last shows packet transformation status either successful or failed from router to PC, PC to router via switch using straight through cable .Green arrow in the connection establishes the connection and indicates to send or receive packet. Orange arrow indicate configuration is not setted up so cannott transform or receive packet from one end to another [4][7][8][9][10]

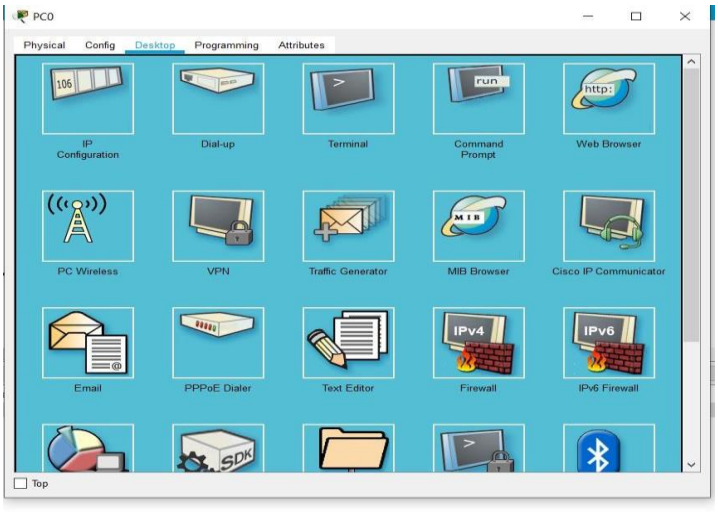


Fig 3.1: Services of Desktop in PC and gateway to PC

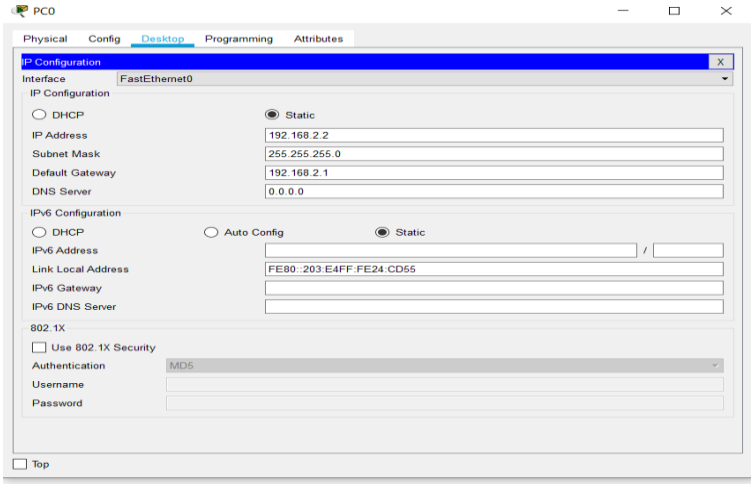


Fig 3.2: IPV4 configuration-assigning IP address

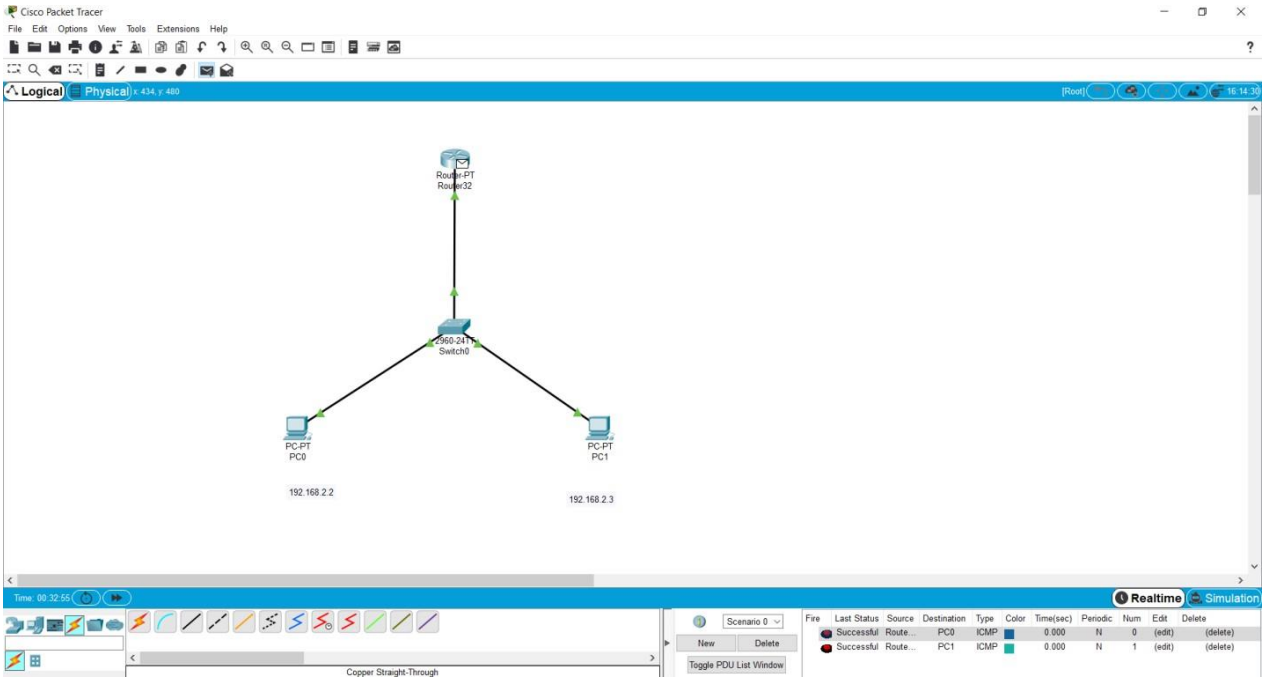
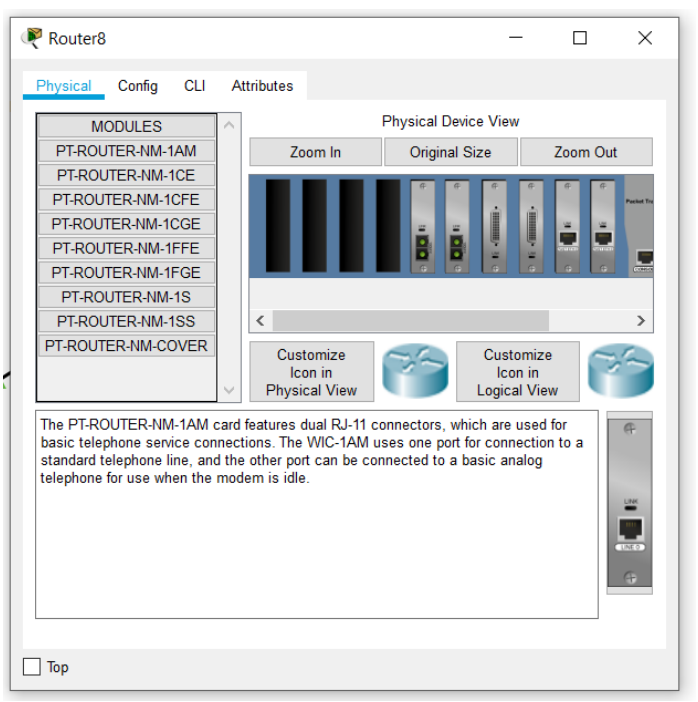


Fig 3.3: Packet transformation successful from router to PC, PC to router through switch



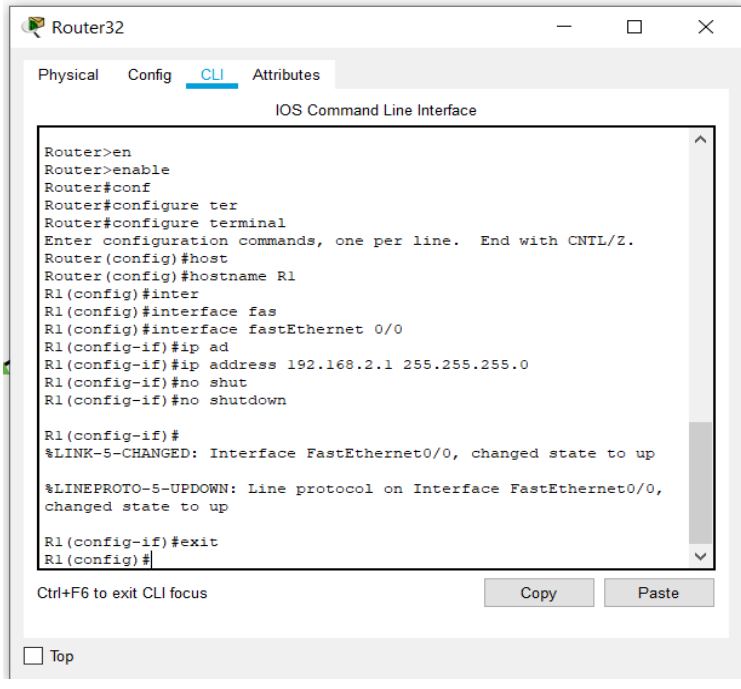


Fig 3.4: Different interfaces of Cisco Router. Fig 3.5: Configuration of IP address to interface

MODE	SYMBOL
User Mode	Router>
Privilege Mode	Router#
Global Configuration Mode	Router(config)#
Interface Configuration Mode	Router(config-if)#
Line Configuration Mode	Router(config-line)#

Fig 3.6: Modes of Router

In router there are various modes. All the modes are shown in above table. It also shows how to move from one mode to another. If a user is not sure with command, user can type '?' it is help symbol, gives the clear instruction what command can be entered in the given mode.

1. Additional Features

1. Compatible with platforms: Windows, Windows XP, Windows 7, Vista, and Linux
2. International language support
3. Lab grading function
4. Available to registered networking academy instructors and students etc.

It supports various protocols and simulation simplify the process of learning[1][2]

Layer	Supported protocols of Cisco Packet Tracer
Application	SMTP, FTP, HTTP, POP3, TFTP, TELNET, DNS, SSH, SNMP, AAA, ISR VOIP, NTP, ISR.
Transport	TCP and UDP, RTP IP fragmentation
Network	BGP, IPv4, ICMP, ARP, IPV6, ICMPv6, QoS, NAT, OSPF, CBAL,VPN
Network Access/ Interface	Ethernet (802.3),802.11, HDLC, Frame Relay, WPA, EAP, DTP, STP

Fig 1.6: Packet Tracer supports the following protocols

IV. CONCLUSION

This paper is helpful for understanding fundamentals of packet tracer and transmission of packet successfully to destination and protocols supported in tool. Cisco packet tracer demonstrates networking concepts simulation through command line interface. It is cost effective tool and it builds "virtual network world". It is user friendly tool to understand various concepts of computer network. It gives a feel of real time project implementation and provides understanding the difference between hubs, switch, routers, etc. and assigning logical address to various devices, different cables used for networking and checking its connectivity. Packet tracer is helpful in designing real networks. Students can also use this tool for their projects and excel in this.

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