Simulation of Communication Network Using Cisco Packet Tracer

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Abstract: Every Multinational Company requires a network that allows company's data to be accessed and oversees effective communication flow between employees at different locations of the company's sites. This research paper consists of simulation of a network designed using Cisco Packet Tracer having Routers, Switches, Servers and PC's. Here in this paper we are establishing various algorithms such as RIP, DHCP, Telnet, HTTP, DNS etc. In this paper, we worked on the elementary router configuration then the Routing techniques necessary to route the data between all the branches. This network will help the user to simulate the configuration of Cisco Routers and give an experience which is the same as real time devices

Keywords: Network, Protocols, Routing tables, IP, DHCP, Telnet, HTTP, DNS

I. INTRODUCTION

A computer network [3] connects two or more devices together to share a nearly infinite range of services and information, including Databases, Emails, Messaging, Telephony, and Websites etc. An internetwork is an expansive term portraying numerous systems associated together. The Internet is the greatest and most certainly understood internetwork. Network types are frequently defined by purpose, requirement, capacity and size: LAN, MAN, WAN, VPNs etc.

Network models are organized into layers. The TCP/IP suite is the most far reaching convention suite, and is the foundation of the Internet. It consists of 4 layers. Top layer protocols usually provide services that cover the top three layers in the OSI Model. The Process/Application layer characterizes conventions for end to- end application correspondence and UI Interface. The Host-to-Host layer parallels the functions of OSI's Transport layer. It handles issues like making dependable end-to-end connection and end-to-end connection and handles packet sequencing. The Internet layer is equivalent to OSI's Network layer, assigns the conventions identifying with sensible transmission of packets over the system. It takes considerations of the devices and hosts connected by giving them an IP (Internet Protocol) address and handles the routing of packets amongst various systems. The Network Access layer implements the data transfer between the network and the host. In the OSI model, this is the equivalent to the Data Link and Physical layers. The Network Access layer monitors the hardware addressing using MAC addresses and determines the protocols for the physical communication of data.

II. OVERVIEW

Devices used are:

A. ***SWITCHES:*** Layer-2 devices, like switches, build hardware address tables that contain the following:

- Hardware addresses of the host devices.
- The port that each hardware address is linked with
- Bridging was the term used earlier to refer to Layer-2 forwarding. This now is generally known as switching.

B. ***ROUTERS***: Routers make routing tables to carry out forwarding decision that have source address, intermediate node addresses and destination address. It also has distance or other factor associated with link.

Routers contain inside tables of data called routing tables that monitor all known Network IP addresses and possible ways throughout the network, alongside cost of reaching to every network. Routers send packets based on the accessible paths and their costs, hence taking favorable position of redundant ways that can exist in a network topology. Routing tables are the fastest means by which a router selects the nearest path to the next "hop" or "stop" on the way to a data packet`s final destination. This is the process which is done by using routing metrics.

Protocols are guidelines that manage how gadgets transmit and share data over a system.

Routing Protocol [4-6]

A. Routing Information Protocol (RIP)

The function of this protocol is to share routing tables with other routers. The Routing Information Protocol depends on distance-vector protocol that uses the number of hop counts as it's metric. RIP transmits the entire routing table after every update that happens after a fixed interval of time. RIP utilizes the Bellman-Ford Distance Vector algorithm to know the best suited "path" to reach to the required destination in the network. RIP has maximum 15 hops as hop counts. RIP works at Application Layer.

- Dynamic Host Configuration protocol (DHCP)

Dynamic Host Configuration Protocol is basically client/server protocol which gives regular information about IP address, subnet mask and other associated information.

- Domain Name System (DNS)

Domain Name System interprets between domain names and IP addresses, and is assisted by each working framework. All Internet based websites use DNS.

- Telnet

It is a service which enable users to associate with remotely located PCs working on a TCP/IP system, (for example, the web). Utilizing telnet customer programming at a PC, user can make an association with the telnet server (i.e., the remotely located host). After the telnet user sets up a relationship with the remotely located host, the user transforms into a virtual terminal, empowering him to connect with the remotely located host from his PC. Generally speaking, you'll need to sign into the remote host, which requires that you have a record on that structure.

- Hypertext transfer Protocol (HTTP)-Internet Access Protocol

The HTTP is an application oriented protocol for hypermedia, common and scattered information frameworks. HTTP is the base of information communication for the World Wide Web. HTTP gives a system rule standard that web programs and servers use to convey. This principle is similar to others, like in FTP in that it's utilized by a customer program to demand records from a remote server. On account of HTTP, it's typically a web program that solicitations HTML records from the web servers that are then shown in the program associated with content, pictures, and so forth.etc.

III. SCENARIO DESIGNED

Here, we have 2 branches of a Multinational Company's Network design; they are accessing the internet through ISP as shown in Figure 3. It allows access to company's data and permits effective and profitable communication flow among employees located in different project or company's sites. We started from the functioning of basic configuration of the routers. Then we covered the Routing techniques necessary to direct data among branches including activating RIP, DHCP, and Telnet Service.

After that, we implemented HTTP service to offer a network protocol standard so that servers and web browsers can be communicated by the users. In a nutshell, it can be said that a lot of techniques and technologies have been considered, studied and implemented to successfully complete this paper.

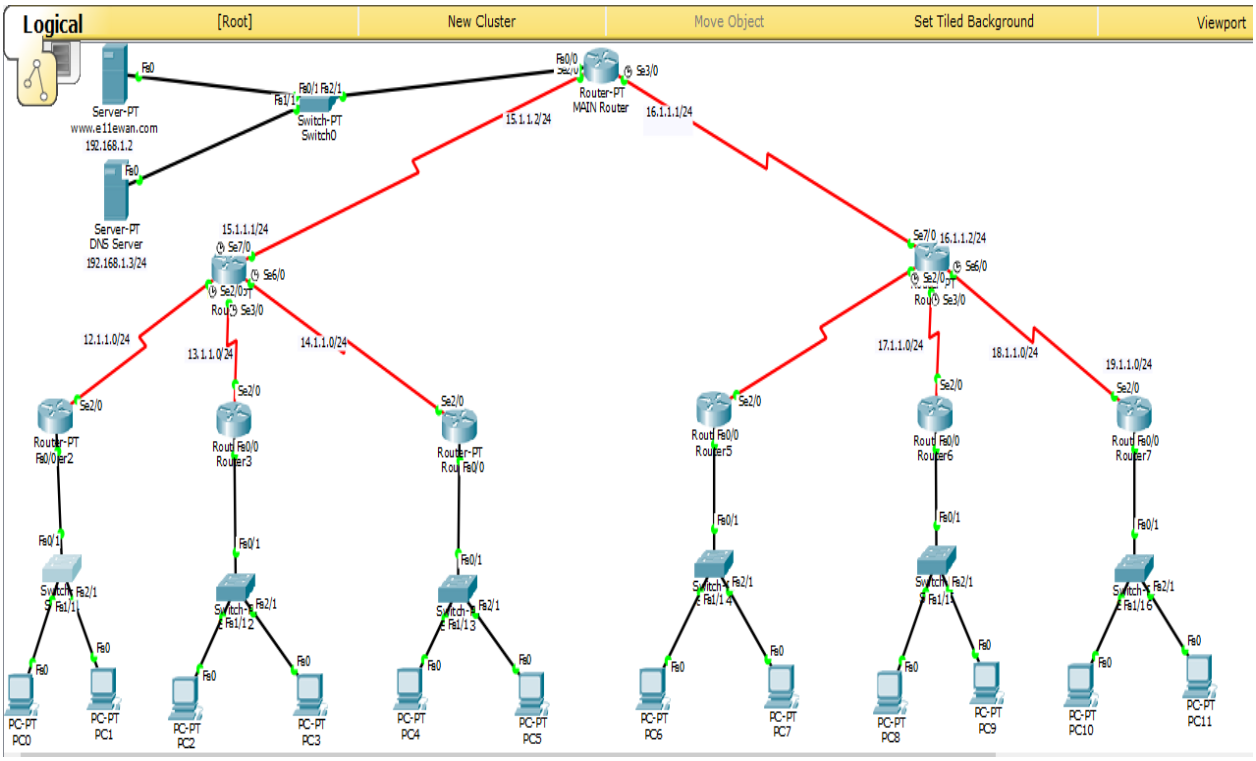

Figure 1: Overall Network Simulation

IV. RESULTS

We have analyzed the working of various protocols and services like RIP, HTTP, DHCP, Telnet, and DNS over a well-designed computer network of an MNC on cisco packet tracer [1][7]. We made the network secure, by enabling secret password service in the routers. Enabling the Telnet Service made sure that one doesn't need to be physically present at the location of the router to access it; and hence can be accessed remotely as shown in figure 2. Entire connectivity of the network was checked using the ping commands over different devices including the servers as shown in Figure 3 and Figure 4. DNS service [2] was analyzed by clicking on the browser and searching for the Website of the company as shown in the Figure 7.

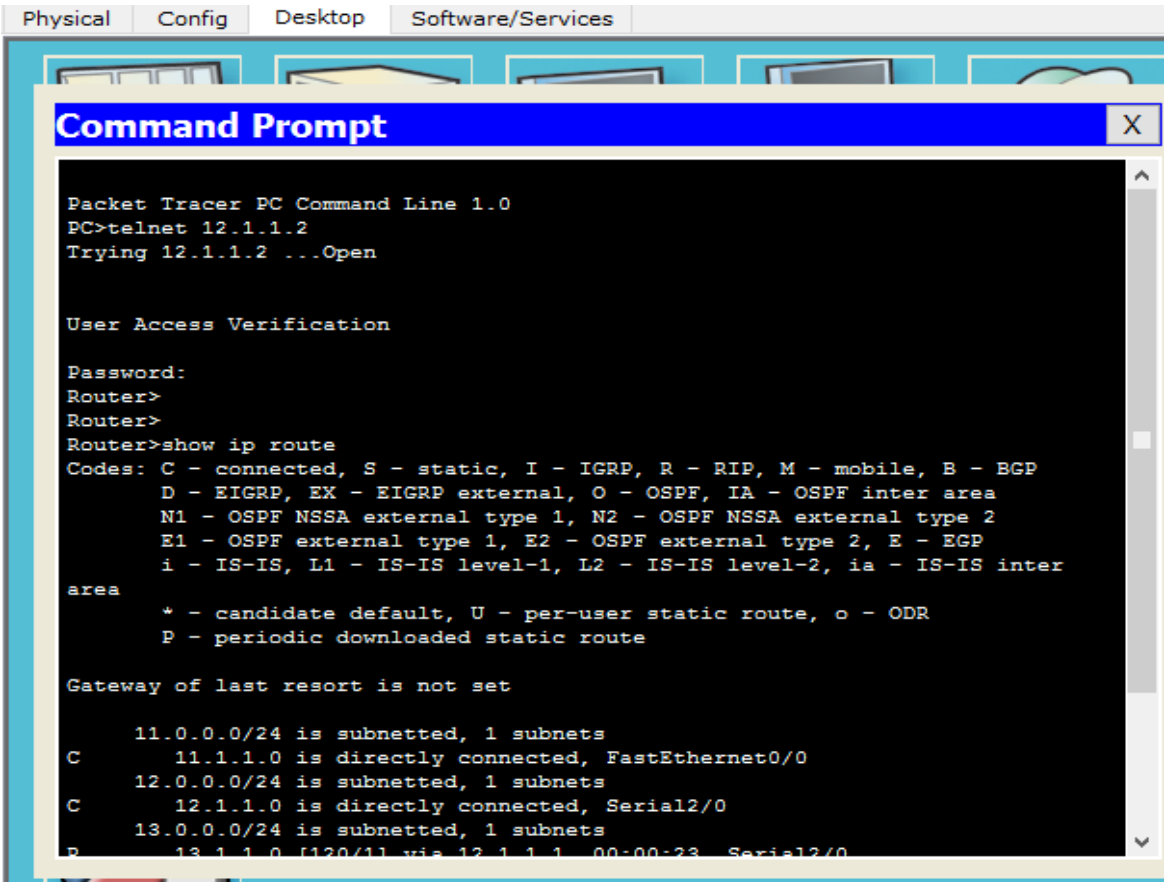

Figure 2. Telnet Service

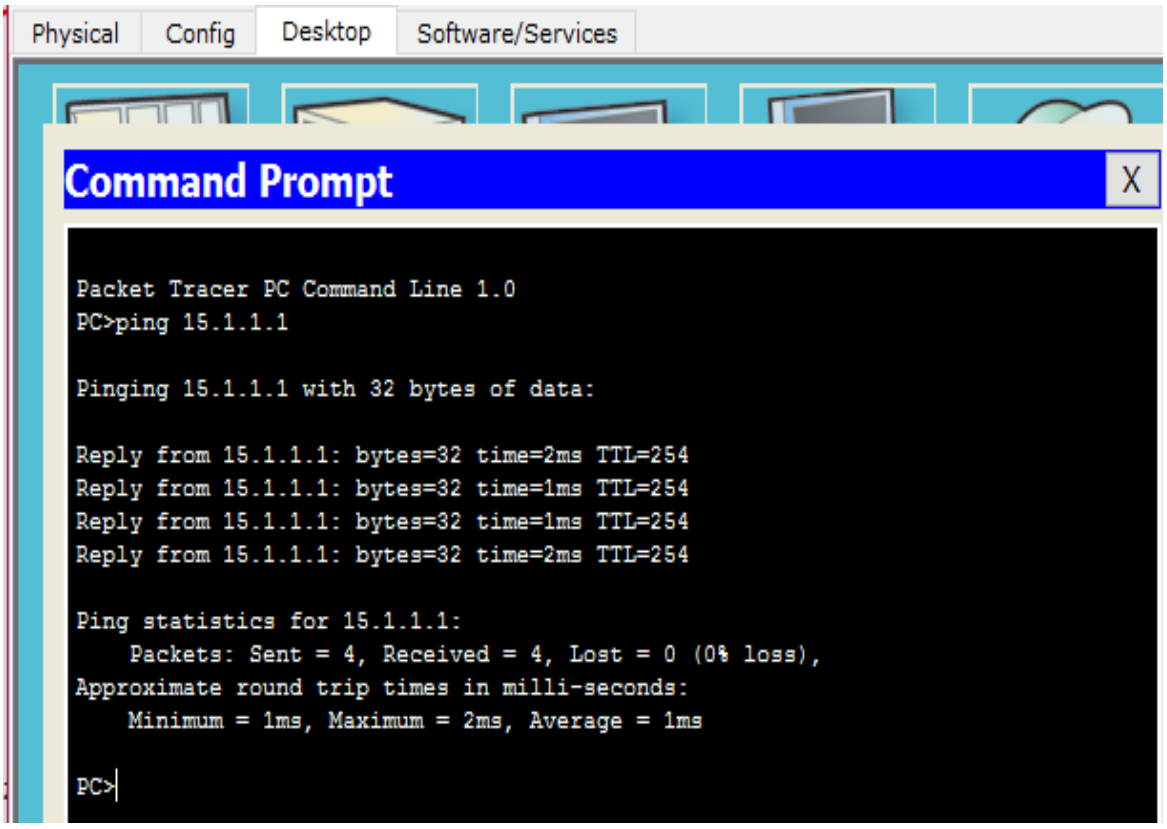

Figure 3. Ping Command

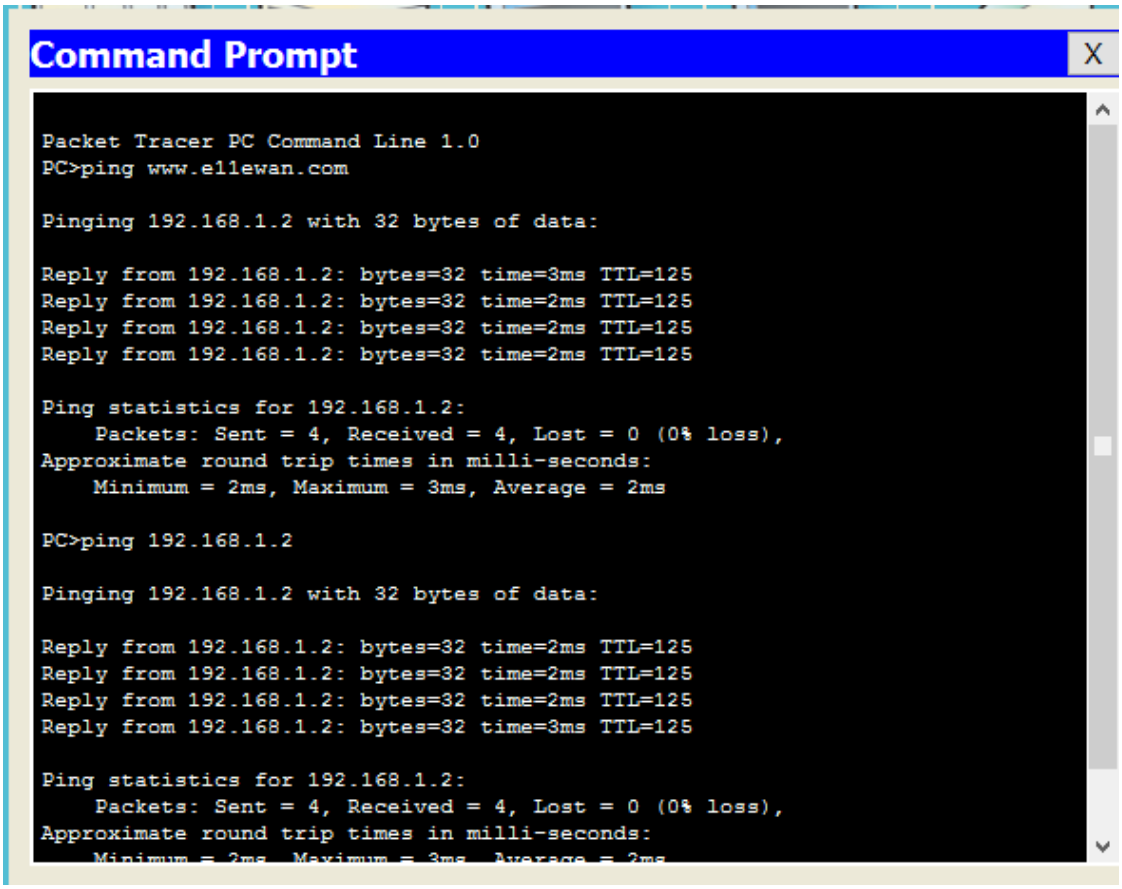

Figure 4: Reply from Server

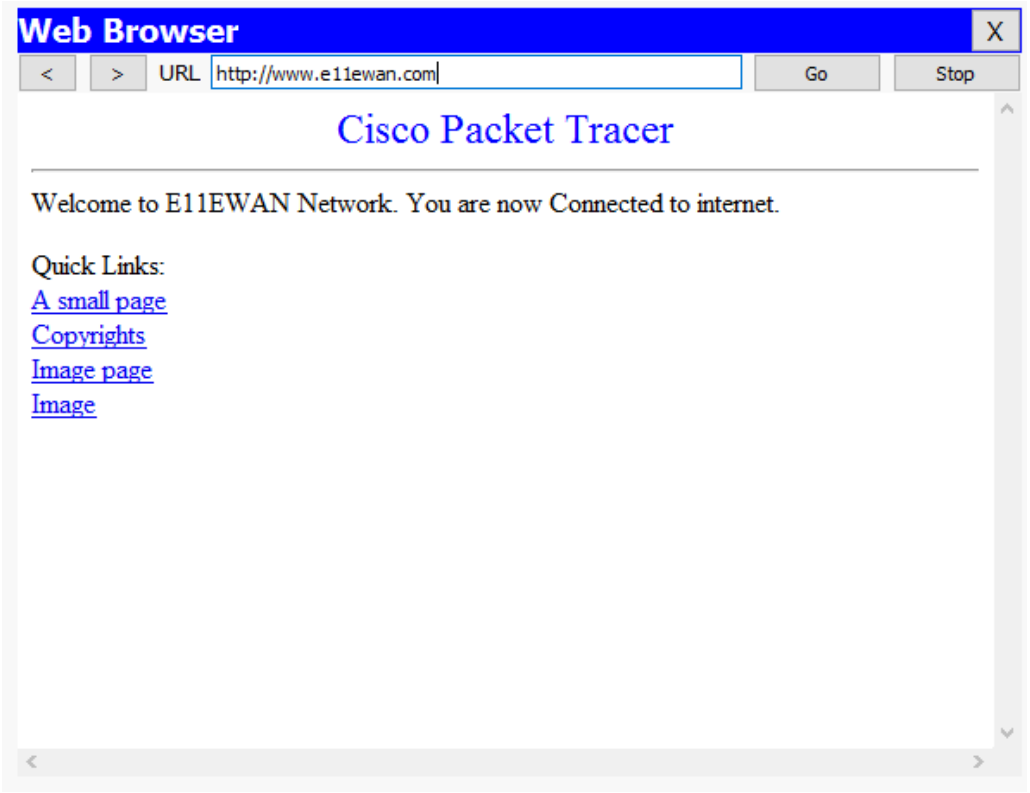

Figure 5. Browsing Website

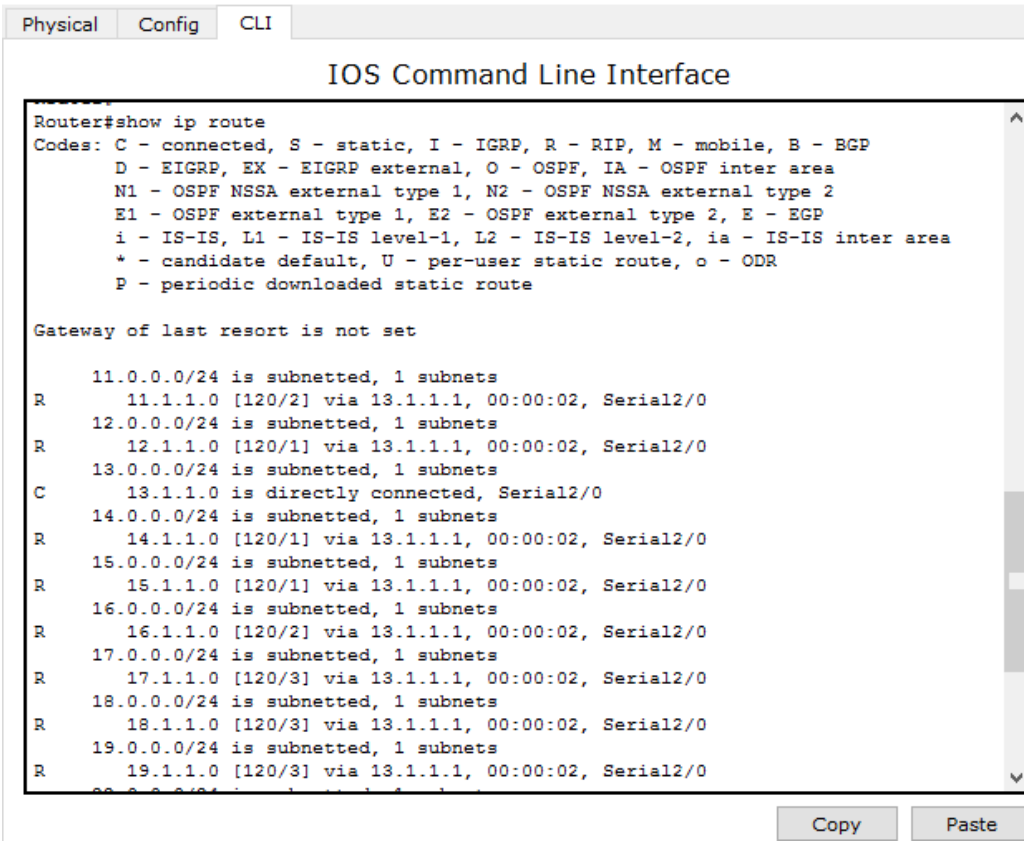

Figure 6. Router CLI Command

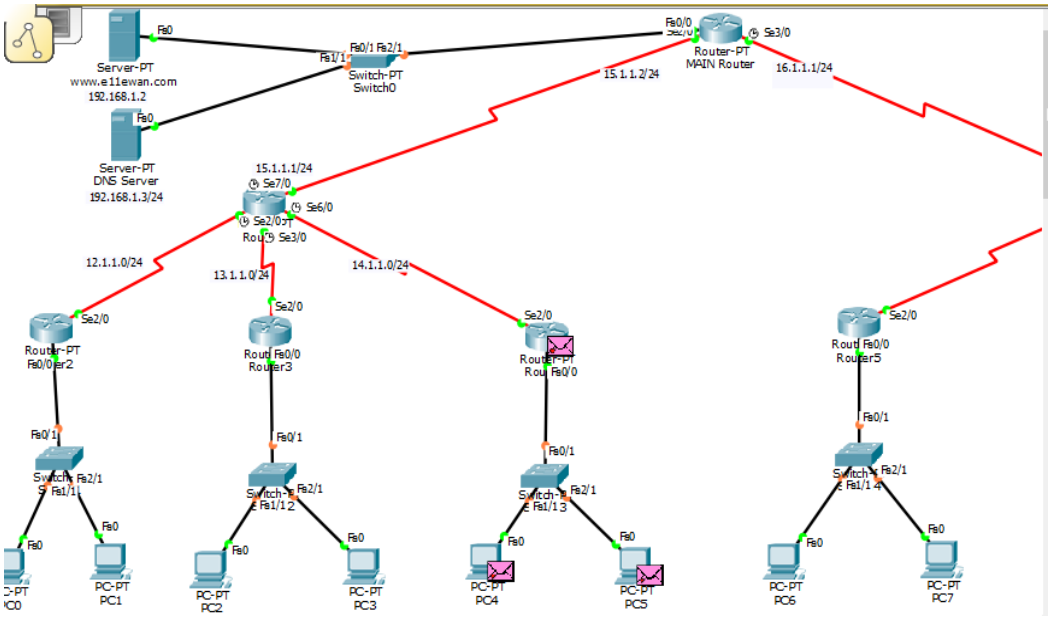

Figure 7. Packet Flow

V. CONCLUSION

On analyzing the performance of the above protocols and services, we concluded that the network designed, had entire end-to-end connectivity with each other as shown in Figure 6. Packet flow and communication from one destination to the other was effectively happening as shown in Figure 7.

Giving IP addresses to all the hosts and devices in a network can be tedious and time consuming task. Dynamic Host Configuration Protocol (DHCP) allowed user to give all the hosts and devices, IP addresses automatically from a pool of IP addresses provided. Free IP addresses from the pool were provided to the hosts and devices. Setting up and enabling passwords allowed secure communication so that only privileged users can have access to the information shared. Telnet services helped in accessing the routers and devices located at the remote locations. Internet services were activated using the Hypertext Transfer Protocol (HTTP) servers. We were able to access the website not only by using the IP address but also by using the domain name, with the help of the Domain Name Servers installed. On further appropriate extension, this network can be used by the companies to communicate among them.

Conflict of interest: The authors declare that they have no conflict of interest.

Ethical statement: The authors declare that they have followed ethical responsibilities.

REFERENCES

[1] Todd Lammle and William Tedder "CCNA Routing and Switching Deluxe Study Guide: Exams 100-101, 200-101, and 200-120".

[2] Aaron Balchunas "DNS v1.11-INF DNS Fundamentals" paper available at https://www.scribd.com/document/62382863/INF-DNS-Fundamentals.

[3] S. Sudharsan, M. Naga Srinivas, G. Sai Shabareesh, P. Kiran Rao "Campus Network Security And Management" International Journal of Emerging Trends & Technology in Computer Science (IJETTCS)

[4] Nahush K. Kulkarni, Rutuja V. Jadhav "Routing Protocols" International Journal for Scientific Research & Development International Journal of Emerging Trends & Technology in Computer Science (IJETTCS)

[5] Ahmad Karim, Minhaj Ahmad Khan "Behaviour of Routing Protocols for Medium to Large Scale Networks", Australian Journal of Basic and Applied Sciences, 5(6): 1605-1613, 2011

[6] Pankaj Rakheja, Prabhjot Kaur, Anjali Gupta, Aditi Sharma "Performance Analysis of RIP, OSPF, IGRP, and EIGRP Routing Protocols in a Network" International Journal of Computer Applications (0975-888) Volume 48- No. 18, June 2012

[7] "Cisco ASA 5500 Series Command Reference OL-18972-02" document available at http://www.cisco.com/c/en/us/td/docs/security/asa/asa82/command/reference/cmd_ref/p.pdf

