Network Simulation using Cisco Packet Tracer

A Project Report

Submitted in the partial fulfillment of the requirements for the award of the degree of

# Bachelor of Technology in

Department of Computer Science and Engineering

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**DECLARATION**

The Project Report entitled “Network Simulation using Cisco Packet Tracer” is a record of bonafide work of N.Hemanth Srivathsav(2010030113), Peri Vishwanadha Sastry (2010030470), M.Abhiram Sharma (2010030523), P.Vinay Kumar (2010030469), submitted in partial fulfillment for the award of B.Tech in the Department of Computer Science and Engineering to the K L University, Hyderabad. The results embodied in this report have not been copied from any other Departments/universities/institutes.

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**CERTIFICATE**

This is to certify that the Project Report entitled “Network Simulation using Cisco Packet Tracer” is being submitted by N.Hemanth Srivathsav(2010030113), Peri Vishwanadha Sastry (2010030470), M.Abhiram Sharma (2010030523) submitted in partial fulfillment for the award of B.Tech in CSE to the K L University, Hyderabad is a record of Bonafede work carried out under our guidance and supervision.

The results embodied in this report have not been copied from any other departments/universities/institutes.

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1. **ABSTRACT**

Computer networks have become extremely important in our present-day society. A majority of companies depend on the proper functioning of their networks for communications, administration, automation, e-business solutions, etc.

In the process of learning computer network systems, the use of virtual laboratories is very important. In this project, we will be using CISCO Packet Tracer Tool. CISCO Packet Tracer is a powerful Simulation Program that allows Us to experiment with Network Behaviour. By using the CISCO tool we simulate complex scenarios on packet tracer and understand the real-world applications of the network Layout with its networking devices.

The WAN is the most necessary computer network used to join the different cities and states So in this paper, with the use of Cisco Packet Tracer we will design a WAN network.

This paper defines how we can use the cisco packet simulation tool to improve a simulation model for the WAN network to the cities. The study provides an understanding of the different concepts, for example, designing the topology for WAN networks, the assignment of IP addresses to devices, switches, and routers, and the transmission of information using Virtual Wide Area Networks. (VWANs).

1. **INTRODUCTION**

This Project will be dealing with the Configuration of various components of a WAN (wide area network), Such as Connections between working Routers, Switches, and Servers across the large coverage area under its range. Network Simulation is a network modeling on a computer and testing how the network will work without being physically installed. The vast majority of network simulator programs are programs used by companies developing network products for training and design purposes. We will learn about various types of servers used in this project.

We can create a WAN by connecting large numbers of local area networks. Computer networks were used to share information between different systems. The WAN is an interconnecting network between cities and capitals or countries. The WAN is the interconnecting network of cities and capitals. In the present day, the network is accessible from everywhere at any time, so we have to provide a fast and secure connection irrespective of the location to every user. The Cisco packet tracer provides the path to calculate the effect of a hardware upgrade, changing topology, an increase in network traffic, or the use of the latest applications on the network. A WAN network is developed with the use of the Cisco Packet Tracer in this document. The paper describes how to use the Cisco packet method to build a WAN simulation system between 3 countries. This study delivers awareness of multiple concepts such as the configuration of IP addresses and how to transmit information to a single network in the form of a packet and the use of Virtual Wide Area Networks. It is used by Cisco to identify basic capabilities for the setting up and maintenance of medium-sized networks. This software allows us to connect different computers like routers, switches, and different users to establish communication between each other to exchange data. It is also scalable to construct a methodological and reliable network. Portability is one of the features of the WAN function software.

1. **RELATED WORK**

**3.1 LITERATURE SURVEY**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S.no** | **Title** | **Authors** | **Publishing** | **Year of Publishing** | **Methods** |
| 1. | Design and Simulation of Local Area Network Using Cisco Packet Tracer | Nathaniel S. Tarkaa , Paul I. Iannah , Isaac T. Iber | The International Journal of Engineering and Science (IJES) | 2017 | * Switch Configurations * Configuring Default-Gateway * Wireless Access Point Configurations |
| 2. | Using Cisco Packet Tracer to simulate Smart Home | [Ghaliya Muslem Alfarsi](https://www.researchgate.net/profile/Ghaliya-Alfarsi), [Jasiya Jabbar](https://www.researchgate.net/profile/Jasiya-Jabbar-2), Sohail Iqbal Malik,  Ragad M Tawafak, Abir Alsidiri, Mariam Juma | International Journal of Engineering Research & Technology  (IJERT) | 2019 | * Cisco Packet Tracing Features in Simulated smart home and IoT devices * IOT technology, Cisco Packet Tracer, Home gateway * IoT server, IoT monitor |
| 3. | Visual Learning Tools for Teaching/Learning Computer Networks | Jozef Janitor, František Jakab, Karol Kniewald | Institute of Electrical and Electronics Engineers (IEEE) | 2010 | * Visual Learning * Logical and Physical Workspaces * Real-Time and Simulation Modes |
| 4. | Performance Evaluation of Wide Area Network using Cisco Packet Tracer | Sanam. Nagendram, P. Sai Anil, E. V. S. Pavan, V. Amarendra | International Journal of Advanced Trends in Computer Science and Engineering  (IJATCSE) | 2019 | * Router Configuration * IPv4 ADDRESSING * BASIC WAN ARCHITECTURE * Topology design * VWAN |

**3.2 CISCO Packet Tracer**

Cisco Packet Tracer has two modes namely Physical mode and Logical mode. This Packet Tracer is developed by the Cisco for virtual design of network architectures and the topologies this tool allows all the users to create their network designs and simulate according to present world computer networks. This software permits all users to use a graphical command-line interface to run the setup of Cisco routers and devices. It is a drag-drop interface that includes configuring IP addresses of routers, switches, PC, and many more. In this, we can configure switches in two different ways. Firstly, by writing some commands in CLI which is Command Line Interface and the other way is by giving IP addresses to the external devices which are connected to the switch. As Packet Tracer is flexible it allows users to add or it allows users to remove virtual network devices.

Some of the objectives of the CISCO packet tracer are:

• Allows students to design complex networks

• Can be used as a learning aid among students

• Allows students to explore IoT concepts

• Allows users to build, design, and configure smart cities and smart homes by providing a different intelligent object that uses them.

• Provides realistic visualization and simulation of IoT devices

1. **PROPOSED WORK**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.NO.** | **TITLE** | **METHODS** | **CRITICAL ASSESSMENT** |
| 1. | Implementation Of CISCO PACKET TRACER In Computer Network | * Network topology * CommandLine Interface(CLI) Scenario * Configuration of routers and servers by following respected protocols. | 7 servers, 3 routers,3 switches,3 PCs including assigning of IP address to each of the devices. |

**4.1 Real-Time or Simulation Mode**

The Real-Time or Simulation Mode is used to create network topologies and to simulate processes inside the created topology. The real-time mode simulates a real environment, with the same speed of simulated networks and protocols as in real situations. If some operation for a simulated protocol in Packet Tracer in the real world takes 30 seconds, it takes a similar time also in the Packet Tracer simulation. New devices can be easily added to the real-time topology just by dragging them from a device’s toolbar and dropping them into the real-time logical topology view. The device toolbar contains various devices divided into groups of routers, switches, end devices, etc. Connectivity tests based on simple “ping” PDU tests, or more advanced application-specific PDU tests are available to check whether the connectivity between two or more end devices is working properly. When switching into the simulation mode, Packet Tracer displays the actual data exchange between devices. Each packet, or frame, that carries some data is displayed as a small envelope moving on a link between devices. Step by step packet or frame tracing is supported, while in each step, students can see explanations of what is happening with the carried data on different layers of the ISO OSI model. It is also possible to define filters, so only protocols that are interested in a simulation will be displayed in the topology.

**Diagram

Description automatically generated**

**Fig: 4a (Network)**

**As shown in Fig: 4a**

* We have established connections between routers-servers, routers-routers routers-switches.
* We have also configured routers, switches, and servers by assigning IP addresses, and default gateway.
* We progressed our network by analyzing problems in the alpha testing stage.

**Hardware interfaces**

We need certain basic requirements for the usage of the cisco packet simulator, which are:-

1. A system with a minimum RAM of 512 MB
2. A system containing storage of 500MB minimum disk space

**Software interfaces:**

The requirements for the project are:

1. The system with an operating system of Windows 7 or above
2. The system with the installation of the Cisco network simulation tool.
3. **IMPLEMENTATION**

**Configuration of INDIA ROUTER:**

Router>enable

Router#config t

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

Router(config)#hostname INDIA

INDIA(config)#int fa0/0

INDIA(config-if)#ip address 10.0.0.1 255.0.0.0

INDIA(config-if)#no shut

INDIA(config-if)#

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

INDIA(config-if)#exit

INDIA(config)#int se0/0/0

INDIA(config-if)#ip address 20.0.0.1 255.0.0.0

INDIA(config-if)#clock rate 64000

INDIA(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down

INDIA(config-if)#

INDIA(config-if)#exit

INDIA(config)#ip ftp username KLUniversity

INDIA(config)#ip ftp password peri

**USA Router Configuration**

Router#config t

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

Router(config)#hostname USA

USA(config)#int fa0/0

USA(config-if)#ip address 40.0.0.1 255.0.0.0

USA(config-if)#no shutdown

USA(config-if)#

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

USA(config-if)#exit

USA(config)#int se0/0/0

USA(config-if)#ip address 20.0.0.2 2555.0.0.0

USA(config-if)#no shutdown

USA(config-if)#

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

USA(config-if)#

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

USA(config-if)#exit

USA(config)#

USA(config)#int se0/0/1

USA(config-if)#ip address 30.0.0.1 255.0.0.0

USA(config-if)#clock rate 64000

This command applies only to DCE interfaces

USA(config-if)#no shut

%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down

USA(config-if)#exit

USA(config)#ip ftp username KLUniversity

USA(config)#ip ftp password peri

USA(config)#

**UK router Configuration**

Router>enable

Router#config t

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

Router(config)#hostname UK

UK(config)#int fa0/0

UK(config-if)#ip address 50.0.0.1 255.0.0.0

UK(config-if)#no shut

UK(config-if)#

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

UK(config-if)#exit

UK(config)#int se0/0/0

UK(config-if)#ip address 30.0.0.2 255.0.0.0

UK(config-if)#no shut

UK(config-if)#

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

UK(config-if)#exit

UK(config)#

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

UK(config)#ip ftp username KLUniversity

UK(config)#ip FTP password peri

UK(config)#

**5.1 FLOW CHART**

**Diagram

Description automatically generated**

**Fig 5.1**

Here we see how a network is simulated by establishing connections (i.e. by configuring routers and servers with respective IP addresses, MAC addresses)

1. **DISCUSSION**

**KEY POINTS:**

1. **NTP** -Network time protocol gives all systems a time zone.
2. **SYSLOG**- server helps to check the logs of each router’s problem or issues or any work done will be shown in the SYSLOG server.
3. **TELNET**- (remote login)flexible but not secure connection b/w client-server is simple text.
4. **SSH**- completely encrypted security.
5. **DNS** – Domain Name Service.
6. **TFTP** is faster than **FTP** used for backup.
7. **DHCP**- Dynamic Host Configuration Protocol is a client/server protocol that automatically provides an Internet Protocol (IP) host with its IP address and other related configuration information such as the subnet mask and default gateway.

**TELNET Server:**

* REMOTELY LOGIN to any System using **TELNET.**

Graphical user interface, text

Description automatically generated

**Fig 6a**

UK: PC 2 remotely logs in using an enabled password as “redhat”.

Text

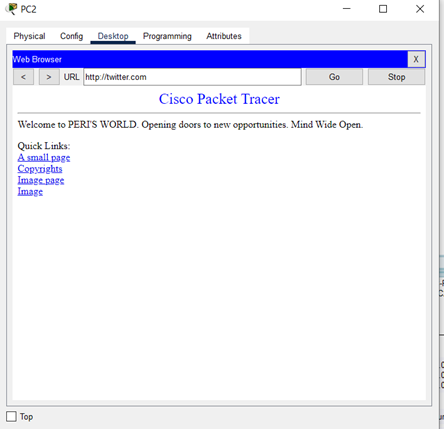
Description automatically generated with medium confidence

**Fig 6b**

CLI shows INDIA(20.0.0.1) server being accessed from the UK(50.0.0.1) PC

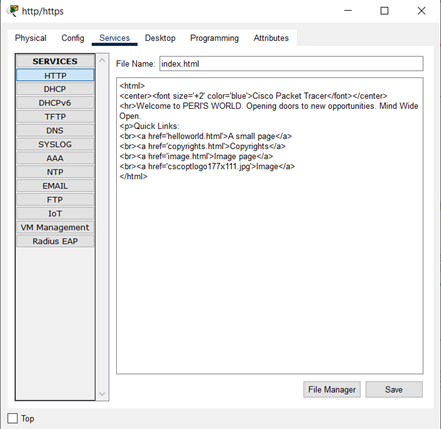
**HTTPS/HTTP :**

Used for Connectivity of a network in form of the webpage in a secure way that is it helps in communication between client and server.



**Fig: 6c**

Twitter (DNS server-name provider) Web Page content is accessed with the help of an HTTP server



**Fig: 6d**

HTTP server configuration in Services which is responsible for giving an Output as shown in **Fig:6c**

**SMTP Server:**

The SMTP is used as the common mechanism for transporting electronic mail among different hosts within the available network.

**Email Service:**

The email service results show a message from a registered email user on the network, sending a mail to another registered mail user. Fig. displays the results of the email service. From the results, it is seen that the mail server set up on the network is working properly.

**Graphical user interface

Description automatically generated**

**Fig 6e : (Email Configuration)**

**Graphical user interface, text, application, email

Description automatically generated**

**Fig: 6f**

Adding **user 1** details

**Graphical user interface, text, application, email

Description automatically generated**

**Fig: 6g**

Adding **user 2** details

**Graphical user interface

Description automatically generated**

**Fig: 6h**

**Mail Browser (**Inbox**)** of mail which can be found in any **PC🡪Desktop🡪Mail Section**

**Graphical user interface, text, application

Description automatically generated**

**Fig: 6i**

Sending Mail from **user 1** to **user2**

**Graphical user interface, text, application

Description automatically generated**

**Fig 6j: (Email Service Result)**

**SYSLOG Server:**

**Ping Test:**

Network connectivity and communication can be tested using the ping command, followed by the domain name or the IP address of the device (equipment) one wishes to test connectivity to. Two VLANs have been added to the existing network and the ping test was performed to test if the devices connected to those VLANs are communicating with the rest of the devices on the network. The results obtained are as shown in **Fig 6j**

Graphical user interface, text, application

Description automatically generated

**Fig: 6g**

Showing data in CLI of USA when we ping 30.0.0.1 in PC2 in DHCP router of UK

Graphical user interface, table

Description automatically generated with medium confidence

**Fig: 6h (SYSLOG Services Log)**

**NTP Server:**

**Before Configuration of the NTP server**

**Time:**

**Logo

Description automatically generated**

**NTP Server Configuration:**

INDIA>en

INDIA#show clock

\*4:56:5.68 UTC Mon Mar 1, 1993

**After Configuration of NTP server:**

Text

Description automatically generated

1. **RESULT**

As a result, it was seen that the network system was operated without any problem. If there will be any problem, for example, interruption of the internet, the cables, DHCP, IP settings, and IPs of other devices, switches, and routers should be checked.

**OUTPUTS :**

**Graphical user interface, application

Description automatically generated**

**Fig: 7a**

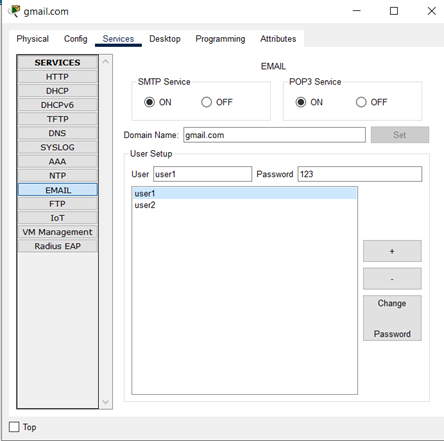
Connection from USA router to INDIA router when IP configuration of INDIA

**Text

Description automatically generated**

**Fig: 7b**

Synchronized Time Zone

****

**Fig: 7c**

Sent mail

**Graphical user interface, text, application

Description automatically generated**

**Fig: 7d**

Received Mail

**7.1 TASK ACCOMPLISHED**

**Graphical user interface, application

Description automatically generated**

**Fig: 7e (Network Model)**

Here we can see our final network where we performed various simulations as discussed in earlier Figs. It is a WAN (Wide Area Network) consisting of different routers, switches, PCs, and servers, each configured in its respective manner.

1. **CONCLUSION & FUTURE SCOPE**

Cisco Packet Tracer was not only used to simulate computer networks but also to learn computer networks. In this study, we also saw that Cisco Packet Tracer was implemented to design an advanced computer network. Most of the Configurations that can be done in WAN using Cisco training were applied to this network simulation system. Designing the Wide Area Network scenario provides the substructure for all other system exposures, such as network security and provides the basis for safety, organizational effectiveness, e-learning environments, and secure transactions. This paper tells us the design of the network made by the Cisco tool, as well as we can be able to implement these scenarios in a district’s various locations. Finally, basic devices and protocols that were supposed to be in a network were used and as a result, it was seen that the network system was operated without any problem.

Graphical user interface

Description automatically generatedA screenshot of a cell phone

Description automatically generated with low confidence

**Fig:** **8**  (**Features)**

By using the above-mentioned features of Desktop we can go through various simulations within a network and can apply them to Real-time applications by enhancing each one of these features while testing

In the wide-area network, we can also provide email security and further improve its security during message transmission and we can also come up with the use of Cisco Packet Tracking Features Simulated smart home and IoT devices monitoring. Simulation results show that smart objects can be connected to the home portal and objects can be successfully monitored which leads to the idea of real-life implementation.

In this research, a cisco packet tracer was utilized to design and simulate the WAN(wide area network). Cisco public tutorials and previous research were very beneficial in the implementation process. Cisco Packet Tracer gives us the possibility of controlling and monitoring the devices through the End User device.

Cisco packet tracer gives various facilities which make simulation easy. The results prove that there is an opportunity to apply this model in real life.

1. **GITHUB**

**GITHUB Repository:**

<https://github.com/KLH-Tech/Network-Simulation-using-Cisco-Packet-Tracer>

**A screenshot of a computer

Description automatically generated with medium confidence**

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