ORGANIZATIONAL NETWORK

A COURSE PROJECT REPORT

By

MURALIDHARAN M (RA1911030010031)

KESHAV BALAJI BABU (RA1911030010005)

SIRPHY S (RA1911030010031)

Under the guidance of

HEMAMALINI V

In partial fulfilment for the Course

of

18CSC302J - COMPUTER NETWORKS

in

NETWORKING AND COMMUNICATION

FACULTY OF ENGINEERING AND TECHNOLOGY

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

Kattankulathur, Chenpalpattu District

NOVEMBER 2021

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

(Under Section 3 of UGC Act, 1956)

BONAFIDE CERTIFICATE

Certified that this project report "**ORGANIZATIONAL NETWORK** " is the bonafide work of Students – Muralidharan M (RA1911030010031), Keshav Balaji Babu (RA1911030010005), Sirphy S (RA1911030010031) who carried out the project work under my supervision.

SIGNATURE

Dr.V.Hemamalini

Associate Professor

Department

SRM Institute of Science and Technology
Potheri, SRM Nagar, Kattankulathur,
Tamil Nadu 603203

SIGNATURE

Dr.E. Sasikala,

Course Coordinator

Associate Professor,

Data Science and Business Systems
SRM Institute of Science and Technology
Potheri, SRM Nagar, Kattankulathur,
Tamil Nadu 603203

ACKNOWLEDGEMENT

We express our heartfelt thanks to our honorable **Vice Chancellor Dr. C. MUTHAMIZHCHELVAN**, for being the beacon in all our endeavors.

We would like to express my warmth of gratitude to our **Registrar Dr. S. Ponnusamy,** for his encouragement

We express our profound gratitude to our **Dean (College of Engineering and Technology) Dr. T. V.Gopal,** for bringing out novelty in all executions.

We would like to express my heartfelt thanks to Chairperson, School of Computing **Dr. Revathi Venkataraman,** for imparting confidence to complete my course project

We wish to express my sincere thanks to **Course Audit Professor Dr.M.LAKSHMI, Professor and Head, Data Science and Business Systems** and **Course Coordinator Dr.E. Sasikala, Associate Professor, Data Science and Business Systems** for their constant encouragement and support.

We are highly thankful to our Course project Internal guide **Dr.V.Hemamalini , Associate Professor , Department of Networking and Communication ,** for **her** assistance, timely suggestion and guidance throughout the duration of this course project.

We extend our gratitude to **Dr. Annapurani Panaiyappan .K, HOD, Department of Networking and Communications** and my Departmental colleagues for their Support.

Finally, we thank our parents and friends near and dear ones who directly and indirectly contributed to the successful completion of our project. Above all, we thank the almighty for showering his blessings on us to complete our Course project

TABLE OF CONTENTS

1. ABSTRACT

Organizational Network (ON) is a **structured way to visualize how communications, information, and decisions flow** through an organization. Organizational networks consist of nodes and ties, the foundation for understanding how information in your organization is flowing, can flow, and should flow. The organization network also enhances communication between departments resulting in a smooth workflow resulting in an enhanced productive environment.

Organizational networks bring together numerous different departments to work together and collaborate around a common purpose. However there are many different types of organizational networks, each oriented towards different goals and contexts.

In this project we will be developing a basic level organization network which shows the communication between the IT team , the HR department and the servers of the company, both IT as well as the HR department is the client side of the program which interacts with the server part.The interaction with servers result in the direct extraction of information regardless of the department which in turn helps the organization on a whole in terms of productivity and integrity and respective security measures are to be taken to provide a safe accessibility of information.Here the client and server departments are connected to respective switches and all these switches are connected to a common router which acts as

the central hub of the network.

2. INTRODUCTION

This project is designed to give an overview of an organizational network consisting of several departments, each consisting of a different number of endpoints such as PC, mobile etc. Each department needs a different amount of computing and network resources. It is an overview of how networking can be implemented in an organization with multiple departments.

Some of the terms / components used in the project:

- SWITCH:

Switches are key building blocks for any network. They connect multiple devices, such as computers, wireless access points, printers, and servers; on the same network within a building or campus. A switch enables connected devices to share information and talk to each other.

- ROUTER:

A router is a device that connects two or more packet-switched networks or subnetworks. It serves two primary functions: managing traffic between these networks by forwarding data packets to their intended IP addresses , and allowing multiple devices to use the same Internet connection.

- SERVER FARM

A server farm is a set of many servers interconnected together and housed within the same physical facility. A server farm provides the combined computing power of many servers by simultaneously executing one or more applications or services.

- HTTP SERVER:

An HTTP server is software that understands URLs (web addresses) and HTTP (the protocol your browser uses to view webpages). An HTTP server can be accessed through the domain names of the websites it stores, and it delivers the content of these hosted websites to the end user's device.

- DNS SERVER:

When users type domain names into the URL bar in their browser, DNS servers are responsible for translating those domain names to numeric IP addresses, leading them to the correct website.

- DHCP SERVER:

A DHCP Server is a network server that automatically provides and assigns IP addresses, default gateways and other network parameters to client devices. It relies on the standard protocol known as Dynamic Host Configuration Protocol or DHCP to respond to broadcast queries by clients.

- ACCESS POINT:

An access point is a device that creates a wireless local area network, or WLAN, usually in an office or large building. An access point connects to a wired router, switch, or hub via an Ethernet cable, and projects a Wi-Fi signal to a designated area.

- 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.

3. REQUIREMENT ANALYSIS

1. Hardware Requirements

- **Processor :** 2.4 GHz Clock Speed
- **RAM :** Minimum 2 GB
- **Hard Disk :** At Least 1GB of Free Space

2. Software Requirements

- **Operating System :** Windows 7 and above
- **Platform :** Cisco Packet tracer

4. ARCHITECTURE & DESIGN

We have taken two departments, namely HR and IT, which are connected to a server farm. Both the departments have two PC's each and the IT department has an additional access point to which a smartphone is connected. Three types of server, namely DNS, HTTP, and DHCP are configured and connected to all the devices in both the networks. We have also configured the IP address of all the devices using the given addressing table. A web page is hosted on the HTTP server, which can be accessed using given list of servers, which are configured using the DNS server as URLs . These two can be accessed using any endpoint devices in the network, for example using a browser in the smartphone connected to the access point in the IT department, we can access the webpage hosted in the HTTP server in the Server-farm.

Addressing Table					
Device	Interface	IPv6 Address/Prefix		Default Gateway	Comments
		IP Address	Subnet Mask		
R1	G0/0	2001:DB8:ACAD:1::1/64		NOT APPLICABLE	Connected to IT-Switch G0/1
		192.168.1.1	255.255.255.128	NOT APPLICABLE	
	G0/1	2001:DB8:ACAD:128::1/64		NOT APPLICABLE	Connected to HR-Switch G0/1
		192.168.1.129	255.255.255.192	NOT APPLICABLE	
	G0/2	2001:DB8:ACAD:192::1/64		NOT APPLICABLE	Connected to SERVER-FARM G0/1
		192.168.1.193	255.255.255.224	NOT APPLICABLE	
IT-Switch	VLAN 1	192.168.1.2	255.255.255.128	192.168.1.1	SVI For IT-Switch Management
HR-Switch	VLAN 1	192.168.1.130	255.255.255.192	192.168.1.129	SVI For HR-Switch Management
SERVER-FARM	VLAN 1	192.168.1.194	255.255.255.224	192.168.1.193	SVI For SERVER-FARM Management
HTTP SERVER	NIC	2001:DB8:ACAD:192::2/64		FE80::1	Connected to SERVER-FARM Fa0/1
		192.168.1.221	255.255.255.224	192.168.1.193	
DNS SERVER	NIC	2001:DB8:ACAD:192::3/64		FE80::1	Connected to SERVER-FARM Fa0/2
		192.168.1.222	255.255.255.224	192.168.1.193	
DHCP SERVER	NIC	2001:DB8:ACAD:192::4/64		FE80::1	Connected to SERVER-FARM Fa0/3
		192.168.1.220	255.255.255.224	192.168.1.193	
Guest_Phone	Wireless NIC	SLAAC			Wirelessly Connected to AP_Guest
		DHCP			
IT-PC1	NIC	2001:DB8:ACAD:1::2/64		FE80::1	Connected to IT-Switch Fa0/1
		192.168.1.3	255.255.255.128	192.168.1.1	
IT-PC2	NIC	2001:DB8:ACAD:1::3/64		FE80::1	Connected to IT-Switch Fa0/2
		192.168.1.4	255.255.255.128	192.168.1.1	
HR-PC1	NIC	2001:DB8:ACAD:128::2/64		FE80::1	Connected to HR-Switch Fa0/1
		192.168.1.131	255.255.255.192	192.168.1.129	
HR-PC2	NIC	2001:DB8:ACAD:128::3/64		FE80::1	Connected to HR-Switch Fa0/2
		192.168.1.132	255.255.255.192	192.168.1.129	

Fig: Addressing Table for the network

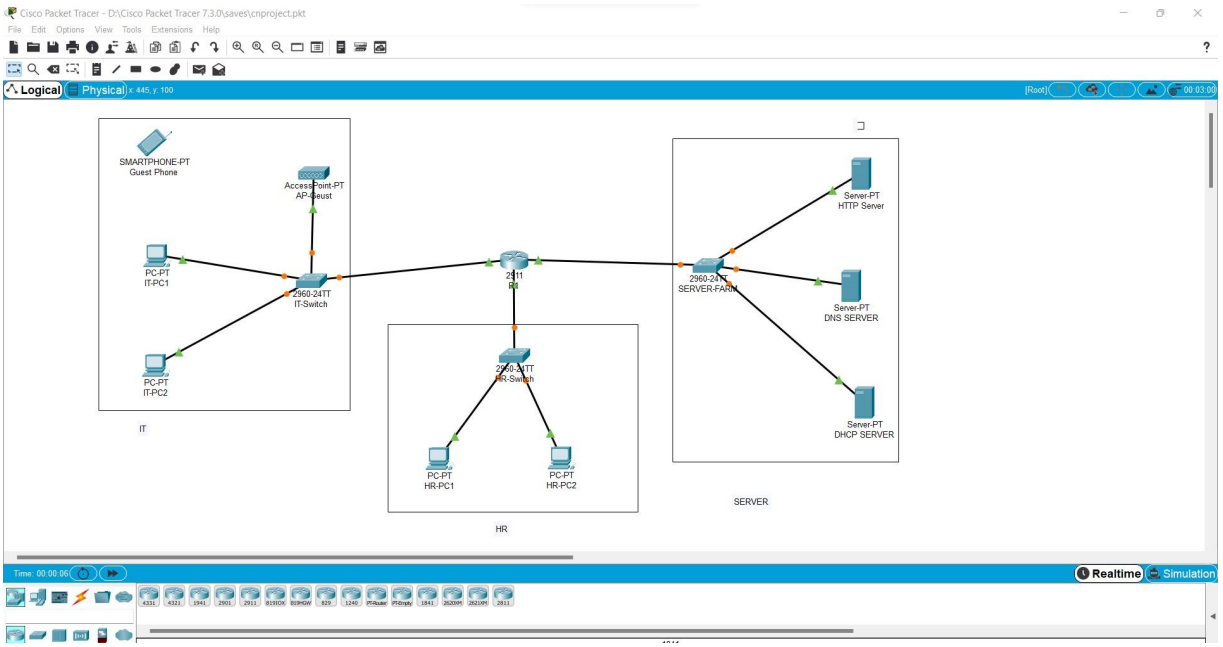
The above addressing table is used to configure all the devices in the network. The router R1 is connected to three switches, i.e. the IT-Switch, HR-Switch, and the switch in the Server-farm. These switches are further connected to a number of endpoint devices. We have also implemented ssh connection to the switches and routers using a password.

VLSAM TABLE							
Department	Number of Users	Network Address	First Usable IP Address	Last Usable IP Address	Broadcast Address	Prefix	Subnet Mask
IT	126	192.168.1.0	192.168.1.1	192.168.1.126	192.168.1.127	/25	255.255.255.128
HR	60	192.168.1.128	192.168.1.129	192.168.1.190	192.168.1.191	/26	255.255.255.192
Server-Farm	30	192.168.1.192	192.168.1.193	192.168.1.222	192.168.1.223	/27	255.255.255.224

Fig: VSLAM Table

The VSLAM table given above is used to allot the ip addresses for each department in the organizational network.

5. IMPLEMENTATION



Organizational Network implementation using Packet tracer

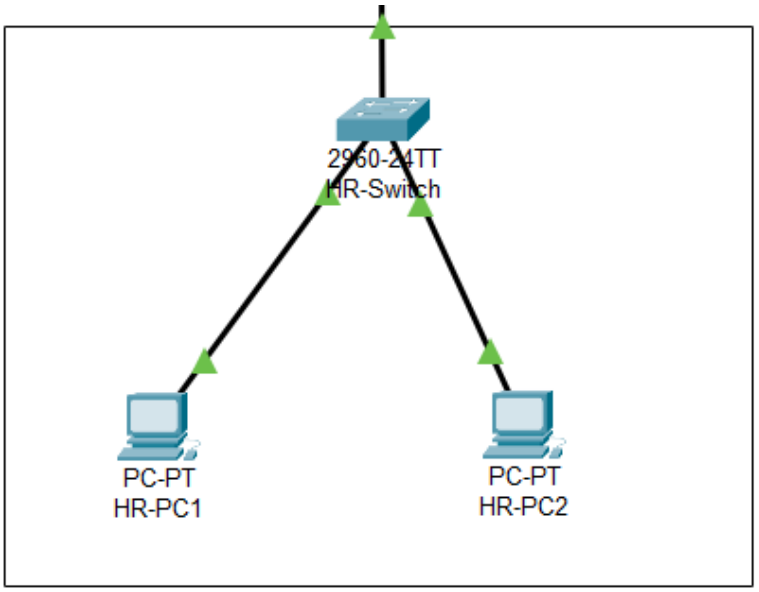


Fig: HR department

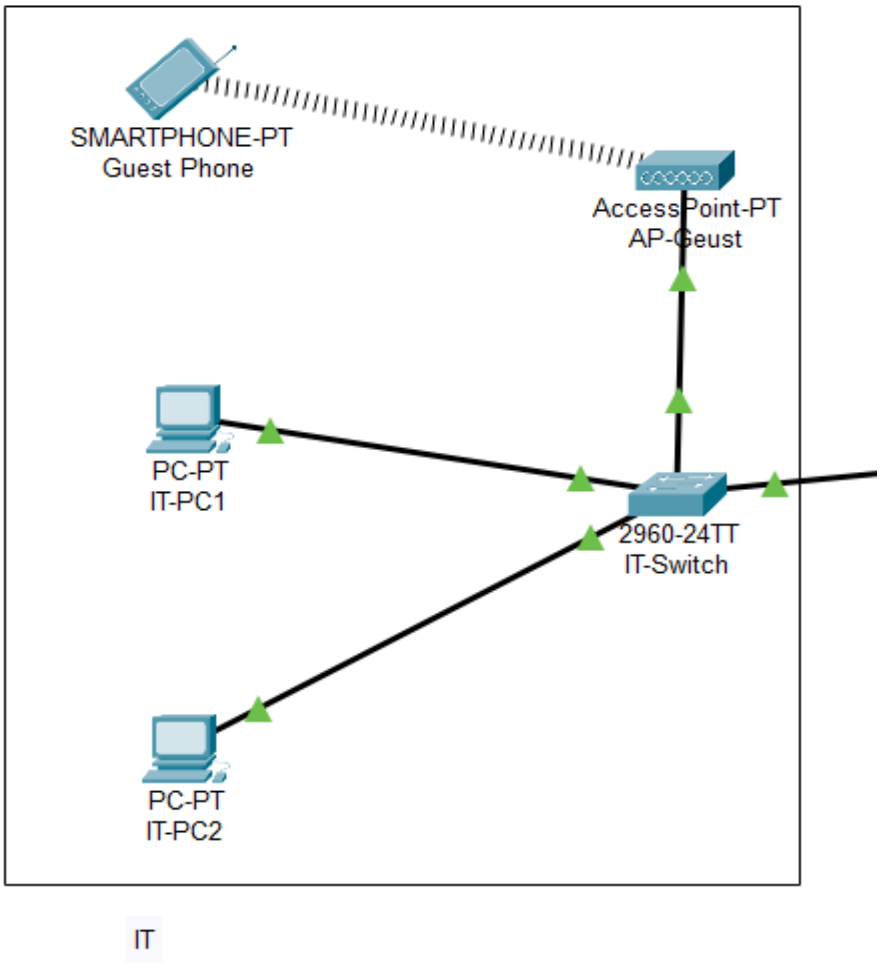


Fig: IT department

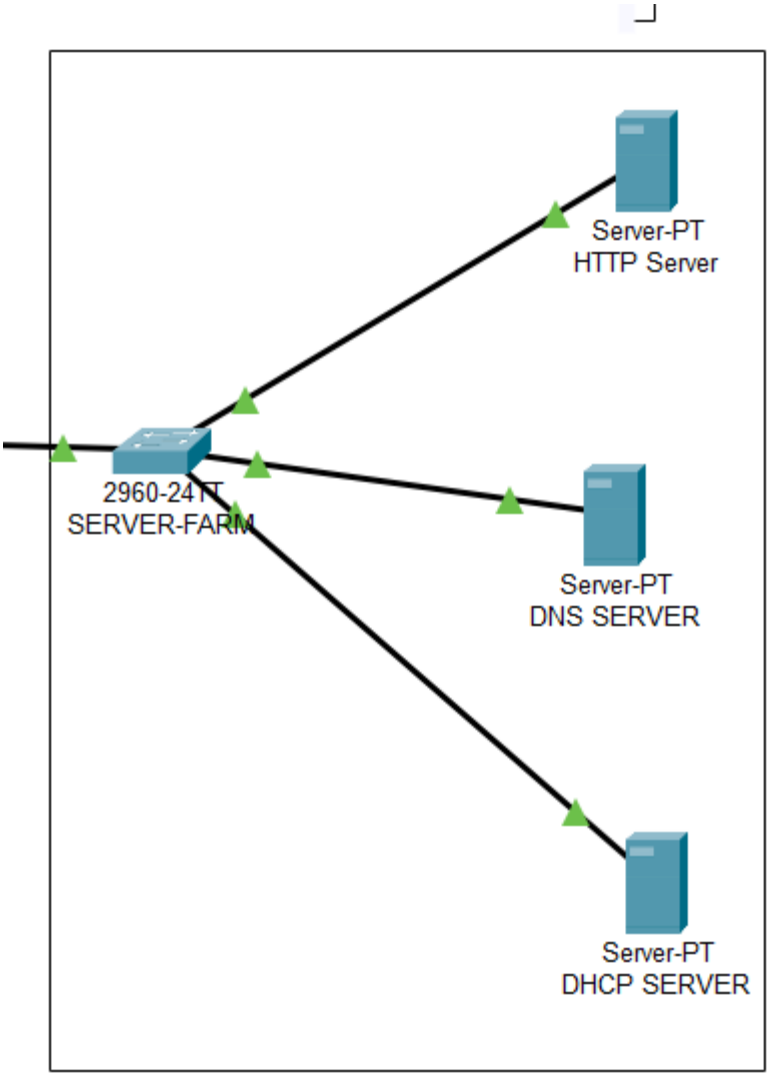


Fig: SERVER FARM

The CLI INTERFACE for the router and switches are as shown below:

1) Router R1:

R1(config-line)#

R1 con0 is now available

Press RETURN to get started.

Authorized access only

```
User Access Verification

Password:

R1>enable
Password:
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#ipv6 unicast-routing
R1(config)#interface g0/0
R1(config-if)#ip address 192.168.1.1 255.255.255.128
R1(config-if)#ipv6 address 2001:DB8:ACAD:1::1/64
R1(config-if)#ipv6 FE80::1 link-local
^
% Invalid input detected at '^' marker.
R1(config-if)#no shutdown
R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to
up

R1(config-if)#description connected to IT-Switch G0/1
R1(config-if)#INTERFACE g0/1
R1(config-if)#ip address 192.168.1.129 255.255.255.192
R1(config-if)#ipv6 address 2001:DB8:ACAD:128::1/64
R1(config-if)#ipv6 address FE80::1 link-local
R1(config-if)#description Connected to HR-Switch G0/1
R1(config-if)#no shutdown

R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to
up

R1(config-if)#
R1(config-if)#
R1(config-if)#INTERFACE g0/2
R1(config-if)#description Connected to Server-Farm G)/1
R1(config-if)#ip address 192.168.1.193 255.255.255.224
R1(config-if)#ipv6 address 2001:DB8:ACAD:192::1/64
R1(config-if)#ipv6 address FE80::1 link-local
R1(config-if)#no shutdown
```

```
R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to
up

R1(config-if)#
R1(config-if)#

R1 con0 is now available

Press RETURN to get started.

Authorized access only

User Access Verification

Password:

R1>class
Translating "class"...domain server (255.255.255.255)
% Unknown command or computer name, or unable to find computer address

R1>enable
Password:
Password:
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface g0/0
R1(config-if)#ip helper-address 192.168.1.220
R1(config-if)#
R1(config-if)#exit
R1(config)#ip domain-name cnproject.com
R1(config)#crypto key generate rsa
The name for the keys will be: R1.cnproject.com
Choose the size of the key modulus in the range of 360 to 2048 for your
General Purpose Keys. Choosing a key modulus greater than 512 may take
a few minutes.

How many bits in the modulus [512]: 1024
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]

R1(config)#
*Mar 1 1:31:59.676: %SSH-5-ENABLED: SSH 1.99 has been enabled
```

```
R1(config)#ip ssh version 2
R1(config)#username admin
R1(config)#username admin password admin
R1(config)#line vty 0 15
R1(config-line)#transport input ssh
R1(config-line)#login local
R1(config-line)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
R1 con0 is now available
Press RETURN to get started.
```

2) IT-SWITCH :

```
Press RETURN to get started!

%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up

Switch>enable
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname IT-Switch
IT-Switch(config)#enable secret class

IT-Switch(config)#service password-encryption
IT-Switch(config)#banner motd "Authorized acess only"
IT-Switch(config)#line console 0
IT-Switch(config-line)#password cisco
```

```
IT-Switch(config-line)#login
IT-Switch(config-line)#logging synch
IT-Switch(config-line)#line vty 0 15
IT-Switch(config-line)#password cisco
IT-Switch(config-line)#login
IT-Switch(config-line)#logging synch
IT-Switch(config-line)#

IT-Switch con0 is now available

Press RETURN to get started.

%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to
up

Authorized acess only

User Access Verification

Password:

IT-Switch>class
Translating "class"...domain server (255.255.255.255)
% Unknown command or computer name, or unable to find computer address

IT-Switch>enable
Password:
IT-Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
IT-Switch(config)#interface vlan 1
IT-Switch(config-if)#ip address 192.168.1.2 255.255.255.128
IT-Switch(config-if)#description SVI for IT-Switch Management
IT-Switch(config-if)#no shutdown

IT-Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

IT-Switch(config-if)#ip default-gateway 192.168.1.1
IT-Switch(config)#

IT-Switch con0 is now available
```

Press RETURN to get started.

Authorized access only

User Access Verification

Password:

IT-Switch>enable
Password:
IT-Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
IT-Switch(config)#ip domain-name cnprojecthelp.com
IT-Switch(config)#crypto key generate rsa
The name for the keys will be: IT-Switch.cnprojecthelp.com
Choose the size of the key modulus in the range of 360 to 2048 for your
General Purpose Keys. Choosing a key modulus greater than 512 may take
a few minutes.

How many bits in the modulus [512]: 1024
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]

IT-Switch(config)#
*Mar 1 1:34:26.497: %SSH-5-ENABLED: SSH 1.99 has been enabled
IT-Switch(config)#ip ssh version 2
IT-Switch(config)#username admin password admin
IT-Switch(config)#line vty 0 15
IT-Switch(config-line)#transport input all
IT-Switch(config-line)#login
IT-Switch(config-line)#login local
IT-Switch(config-line)#end
IT-Switch#
%SYS-5-CONFIG_I: Configured from console by console

IT-Switch#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
IT-Switch#
IT-Switch#

IT-Switch con0 is now available

Press RETURN to get started.

3) HR-SWITCH:

Press RETURN to get started!

%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up

Switch>enable
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname HR-Switch
HR-Switch(config)#enable secret class
HR-Switch(config)#service password-encryption
HR-Switch(config)#banner motd "Authorized access only"
HR-Switch(config)#line console 0
HR-Switch(config-line)#password cisco
HR-Switch(config-line)#login
HR-Switch(config-line)#logging synch
HR-Switch(config-line)#line vty 0 15
HR-Switch(config-line)#password cisco
HR-Switch(config-line)#login
HR-Switch(config-line)#logging synch
HR-Switch(config-line)#

HR-Switch con0 is now available

Press RETURN to get started.

%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up

Authorized access only

User Access Verification

Password:

```
HR-Switch>enable
Password:
HR-Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
HR-Switch(config)#interface vlan 1
HR-Switch(config-if)#description SVI for HR-Switch Management
HR-Switch(config-if)#ip address 192.168.1.130 255.255.255.192
HR-Switch(config-if)#no shutdown

HR-Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

HR-Switch(config-if)#
HR-Switch(config-if)#exit
HR-Switch(config)#ip default-gateway 192.168.1.129
HR-Switch(config)#
HR-Switch(config)#

HR-Switch con0 is now available

Press RETURN to get started.

Authorized access only

User Access Verification

Password:

HR-Switch>enable
Password:
HR-Switch#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
HR-Switch#

HR-Switch con0 is now available

Press RETURN to get started.
```

4) SERVER-FARM SWITCH:

Press RETURN to get started!

%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/3, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to up

Switch>enable
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname SERVER-FARM
SERVER-FARM(config)#enable secret class
SERVER-FARM(config)#service password-encryption
SERVER-FARM(config)#banner motd "Authorized access only"
SERVER-FARM(config)#line console 0
SERVER-FARM(config-line)#password cisco
SERVER-FARM(config-line)#login
SERVER-FARM(config-line)#logging synch
SERVER-FARM(config-line)#line vty 0 15
SERVER-FARM(config-line)#password cisco
SERVER-FARM(config-line)#login
SERVER-FARM(config-line)#logging synch
SERVER-FARM(config-line)#

SERVER-FARM con0 is now available
Press RETURN to get started.

%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up

Authorized access only

User Access Verification

Password:

SERVER-FARM>enable
Password:
SERVER-FARM#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SERVER-FARM(config)#interface vlan 1
SERVER-FARM(config-if)#description SVI for server-farm
SERVER-FARM(config-if)#ip address 192.168.1.194 255.255.255.224
SERVER-FARM(config-if)#no shutdown

SERVER-FARM(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

SERVER-FARM(config-if)#exit
SERVER-FARM(config)#ip default-gateway 192.168.1.193
SERVER-FARM(config)#

SERVER-FARM con0 is now available

Press RETURN to get started.

Authorized access only

User Access Verification

Password:

SERVER-FARM>enable
Password:
SERVER-FARM#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
SERVER-FARM#

SERVER-FARM con0 is now available

Press RETURN to get started.

6. EXPERIMENT RESULTS & ANALYSIS

6.1. RESULTS

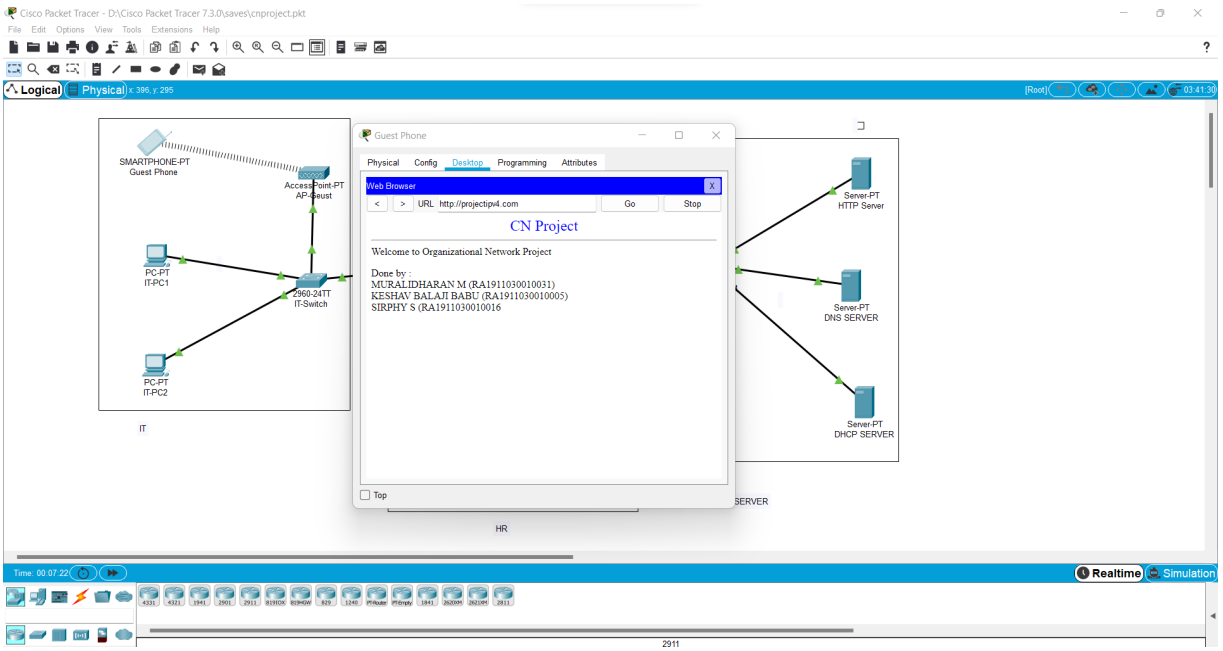
General result:

The implementation of an organizational network has been executed successfully using cisco packet tracer.

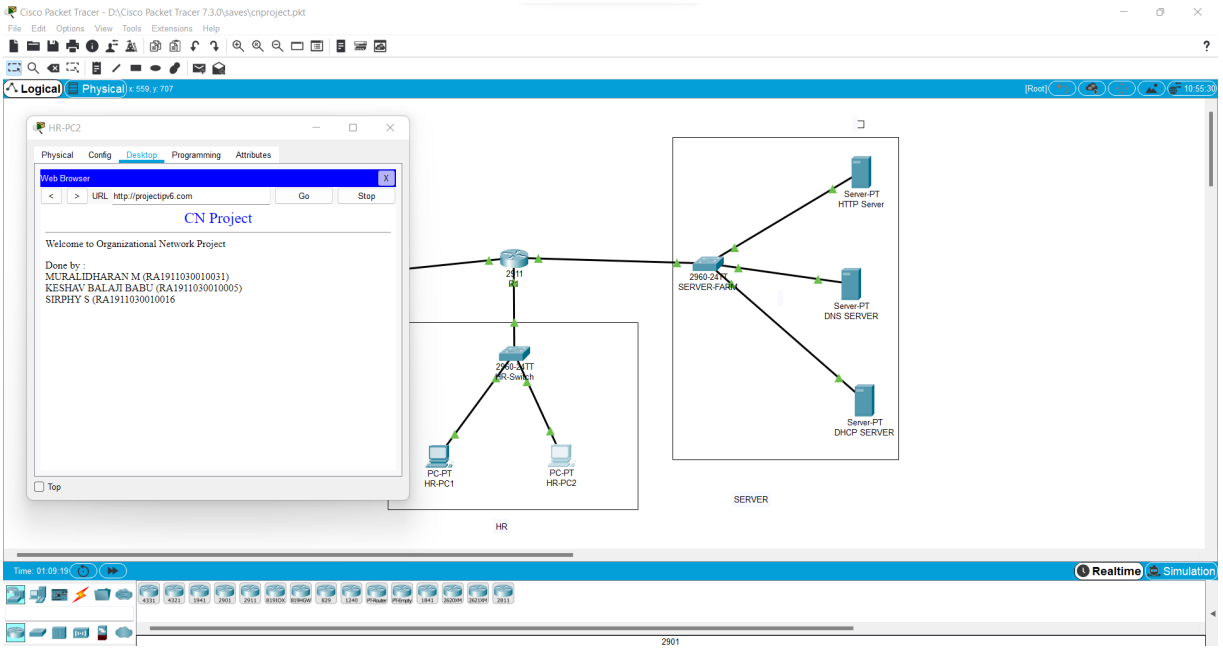
Observatory results:

The servers can be accessed by the IT and HR departments respectively and the respective outputs have been studied and observed as shown in the result analysis section below.

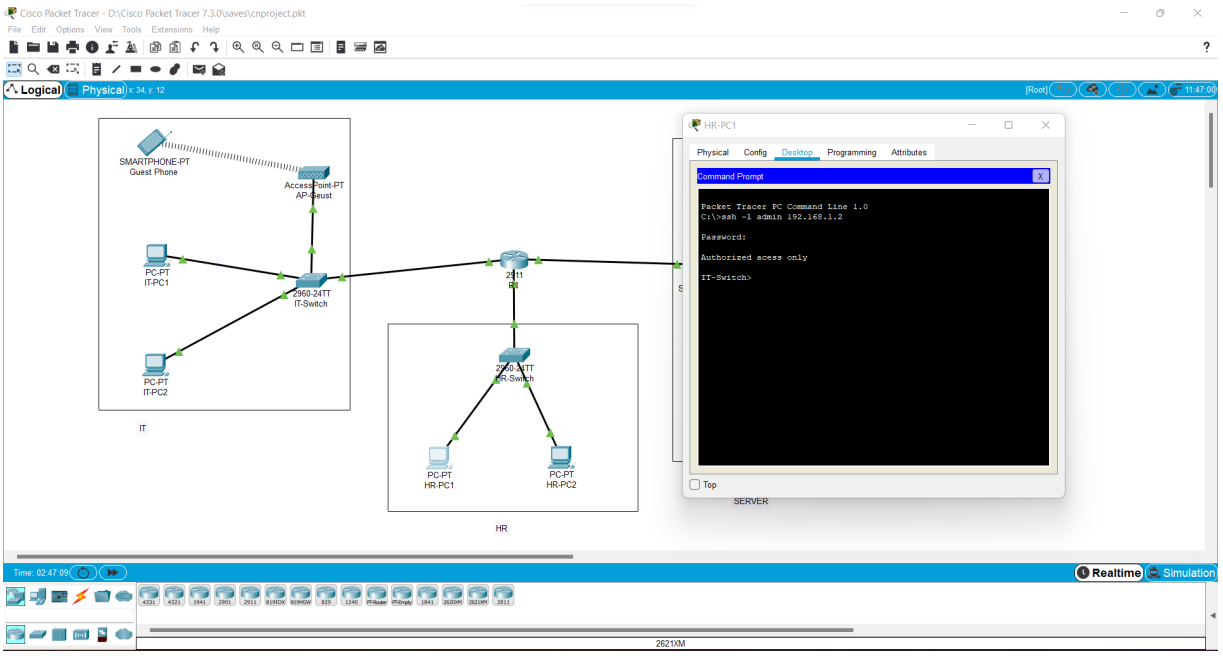
6.2. RESULT ANALYSIS



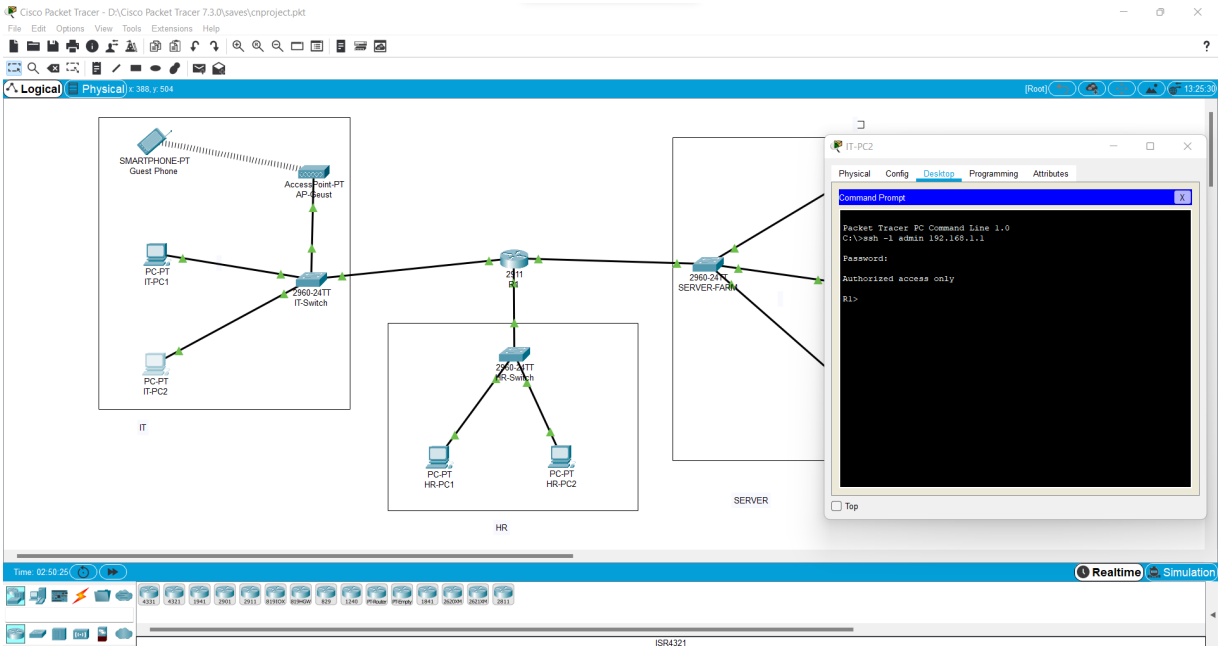
The webpage hosted in the http server in the server farm can be accessed using the guest phone connected to the access point in the IT department.



The webpage hosted in http server in the server farm can be accessed by a PC in the HR department.



We have also checked for ssh remote connectivity by connecting to IT-Switch through HR-PC1.



We have also checked for ssh connection for R1 router using IT-PC2.

6.3. CONCLUSION & FUTURE WORK

CONCLUSION: The Network was successfully implemented in Cisco packet tracer. All the components have been configured according to the given addressing table. The webpage hosted on the HTTP server can be accessed using any endpoint devices. The SSH connection has also been verified.

FUTURE WORK: The organizational network can be scaled up and implemented on a large company with multiple departments, each having multiple sub departments. This structure can be constructed in Packet Tracer to check for any kind of errors or vulnerabilities that may be found in the network that is to be implemented.

7. REFERENCES

- https://www.netacad.com/courses/packet-tracer/introduction-packet-tracer
- https://www.wikipedia.org/
- https://www.google.co.in/
- Froom, R., Sivasubramanian, B. and Frahim, E., 2010. Implementing Cisco IP Switched Networks (SWITCH) Foundation Learning Guide: Foundation learning for SWITCH 642-813. Cisco press.