School of Computer Science and Information Technology

Department of Computer Science and Information Technology

Semester: IV
Specialisation: Internet of Things (E)

23BCA4VC02: Network Administration

Activity 2

ENTERPRISE NETWORK

(Simulation on CISCO Packet Tracer)

Date of Submission: 15-04-2025

Submitted by:
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CERTIFICATE

This is to certify that **SOMNATH GORAI** has satisfactorily completed activity prescribed by JAIN (Deemed to be University) for the fourth semester degree course in the year 2024-2025.

Sl. No	CRITERIA	MARKS	MARKS OBTAINED
1	**On-time Submission**	**5**	
2	**Presentation Skill**	**10**	
3	**Communication Skill**	**10**	
4	**Content with example program**	**15**	
5	**Documentation**	**10**	
	Total	**50**	
	Convert	**15**	

MARKS	
MAX	**OBTAINED**
15	

Signature of the Student   Signature of the Faculty

Date of Submission: 15th April, 2025

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GitHub Link:
https://github.com/AlaxNeon/EnterpriseNetwork_CPT

1. OBJECTIVE / CASE STUDY

1.1 Case Study

Radeon Company Ltd. is a US-owned company that deals with Banking and Insurance. The company is intending to expand its services across the African continent having the first branch to be located in Nairobi, Kenya. The company has secured a four-story building to operate within the Kenyan capital city. Therefore, the company would like to allow sourcing the knowledge from a group of final-year students from the local university to design and implement their company network. Assume you are among the students to take over this role, carefully read down the requirements then model the design and implement the network based on the company's needs. Each floor has departments as provided in the table below.

First Floor			
No.	Departments	No. of PC	No. of Printers
1	Management	20	4
2	Research	20	4
3	Human resource	20	4

Second Floor			
No.	Departments	No. of PC	No. of Printers
1	Marketing	20	4
2	Accounting	20	4
3	Finance	20	4

Third Floor			
No.	Departments	No. of PC	No. of Printers
1	Logistics and store	20	4
2	Customer care	20	4
3	Guest Area	40	2

Fourth Floor				
No.	Departments	No. of PC	No. of Printers	No of Servers
1	Administration	20	2	
2	ICT	20	2	
3	Server Room	2 Admin PCs		3 (DHCP, HTTP and Email)

1.2 Objectives

1. Use a software modelling tool to visualize the network topology (Use Hierarchical Network Design

   - Software Modelling Tools: MS Visio, Visual Paradigm, or Draw.io for modelling network design.

2. Use any of the following network simulation software to implement the above topology.

   - Simulation software: Cisco Packet tracer or GNS3 for design and implementation.
   - Theres should be one router on each floor. The router should be connecting switches on the floor
   - Use OSPF as the routing protocol to advertise routes.
   - Each department is required to have a wireless network for the users.
   - Each department except the server room will be anticipated to have around 60 users both wired and wireless users.
   - Host devices in the network are required to obtain IPv4 addresses automatically.
   - Devices in all the departments are required to communicate with each other.
   - Create HTTP, and E-mail servers.
   - All devices in the network are expected to obtain an IP address dynamically from the dedicated DHCP servers located at the server room.
   - Configure SSH in all the routers for remote login.

3. Use a Hierarchical network design with redundancy included:

   - Having Core, distribution and access layers

4. Configure the basic configuration of the devices:

   - Hostnames
   - Line Console and VTY passwords
   - Banner messages
   - Disable domain IP lookup

5. Each department should be in a different VLAN and subnetwork; VLANs you will use in your case, e.g. 10, 20, 30… etc..

6. Planning of IP Addresses:

   - You have been given 192.168.10.0 as the base address for this network.
   - Do subnetting based on the number of hosts in every department as provided above.
   - Identify subnet mask, useable IP address range, and broadcast address for each subnet.

7. End Device Configurations: Configure all the end devices in the network with the appropriate IP address based on the calculations above.

8. Configure port-security: Use sticky command to obtain MAC Address and Violation

mode of the shutdown.

9. Test and Verifying Network Communication.

10. Document the project design and implementation

1.3 Required Technologies

1. Creating a network topology using Cisco Packet Tracer.

2. Hierarchical Network Design.

3. Connecting Networking devices with Correct cabling.

4. Configuring Basic device settings.

5. Creating VLANs and assigning ports VLAN numbers.

6. Subnetting and IP Addressing.

7. Configuring Inter-VLAN Routing on the Multilayer switches (Switch Virtual Interface).

8. Configuring Dedicated DHCP Server device to provide dynamic IP allocation.

9. Configuring SSH for secure Remote access.

10. Configuring OSPF as the routing protocol.

11. Configuring switchport security or Port-Security on the switches.

12. Configuring WLAN or wireless network (Cisco Access Point).

13. Host Device Configurations.

14. Test and Verifying Network Communication.

2. LIST OF DEVICES USED & VISUALISATION

2.1 List of Devices Used

1. **Routers (Cisco 2911) x 4**

   - FLOOR-1-ROUTER
   - FLOOR-2-ROUTER
   - FLOOR-3-ROUTER
   - FLOOR-4-ROUTER

2. **Layer 3 Switches x 4**

   - FLOOR-1-L3-SW
   - FLOOR-2-L3-SW
   - FLOOR-3-L3-SW
   - FLOOR-4-L3-SW

3. **Layer 2 Switches (2960-24TT or 2960-24PT) x 12**

   - FLOOR-1-MGT-SW
   - FLOOR-1-RSC-SW
   - FLOOR-1-HR-SW
   - FLOOR-2-MKT-SW
   - FLOOR-2-ACC-SW
   - FLOOR-2-FINANCE-SW
   - FLOOR-3-LOG-SW
   - FLOOR-3-CUST-SW
   - FLOOR-3-GST-SW
   - FLOOR-4-ADMIN-SW
   - FLOOR-4-ICT-SW
   - FLOOR-4-SVR-SW

4. **End Devices (Computers / PCs)**

   - MGT-PC
   - RSC-PC
   - HR-PC
   - MKT-PC
   - ACC-PC
   - FINANCE-PC
   - LOG-PC
   - CUST-PC
   - GST-PC
   - ADMIN-PC
   - ICT-PC

5. **Printers**

- MGT-Printer
- RSC-Printer
- HR-Printer
- MKT-Printer
- ACC-Printer
- FINANCE-Printer
- LOG-Printer
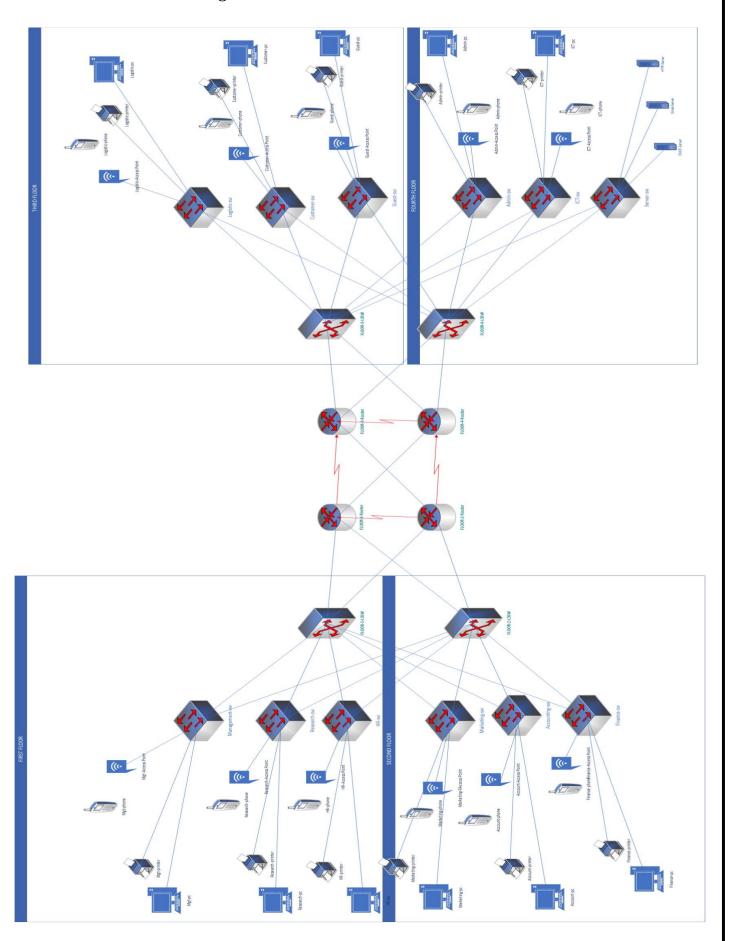- CUST-Printer
- GST-Printer
- ADMIN-Printer
- ICT-Printer

6. **Access Points**

- MGT-Access Point
- RSC-Access Point
- HR-Access Point
- MKT-Access Point
- ACC-Access Point
- FINANCE-Access Point
- LOG-Access Point
- CUST-Access Point
- GST-Access Point
- ADMIN-Access Point
- ICT-Access Point

7. **Servers**

- DHCP-SERVER
- EMAIL-SERVER
- HTTPS-SERVER

2.2 Visualisation using MS Visual

3. IP ADDRESSING SCHEME

3.1 IP Addressing

Base Network: 192.168.10.0

First Floor

Department	Network Address	Subnet Mask	Host Address Range	Broadcast Address
Management	192.168.10.0	255.255.255.192/26	192.168.10.1 to 192.168.10.62	192.168.10.63
Research	192.168.10.64	255.255.255.192/26	192.168.10.65 to 192.168.10.126	192.168.10.127
Human Res	192.168.10.128	255.255.255.192/26	192.168.10.129 to 192.168.10.190	192.168.10.191

Second Floor

Department	Network Address	Subnet Mask	Host Address Range	Broadcast Address
Marketing	192.168.10.192	255.255.255.192/26	192.168.10.193 to 192.168.10.254	192.168.10.255
Accounts	192.168.11.0	255.255.255.192/26	192.168.11.1 to 192.168.11.62	192.168.11.63
Finance	192.168.11.64	255.255.255.192/26	192.168.11.65 to 192.168.11.126	192.168.11.127

Third Floor

Department	Network Address	Subnet Mask	Host Address Range	Broadcast Address
Logistics	192.168.11.128	255.255.255.192/26	192.168.11.129 to 192.168.11.190	192.168.11.191
Customer	192.168.11.192	255.255.255.192/26	192.168.11.193 to 192.168.11.254	192.168.11.255
Guest	192.168.12.0	255.255.255.192/26	192.168.12.1 to 192.168.12.62	192.168.12.63

Fourth Floor

Department	Network Address	Subnet Mask	Host Address Range	Broadcast Address
Admin	192.168.12.64	255.255.255.192/26	192.168.12.65 to 192.168.12.126	192.168.12.127
ICT	192.168.12.128	255.255.255.192/26	192.168.12.129 to 192.168.12.190	192.168.12.191
ServerRoom	192.168.12.192	255.255.255.192/26	192.168.12.193 to 192.168.12.254	192.168.12.255

3.2 Between the Routers and Layer-3 Switches

Base Network Address: 10.10.10.0

No.	Network Address	Subnet Mask	Host Address Range	Broadcast Address
1	10.10.10.0	255.255.255.252	10.10.10.33 to 10.10.10.34	10.10.10.35
2	10.10.10.4	255.255.255.252	10.10.10.37 to 10.10.10.38	10.10.10.39
3	10.10.10.8	255.255.255.252	10.10.10.41 to 10.10.10.42	10.10.10.43
4	10.10.10.12	255.255.255.252	10.10.10.45 to 10.10.10.46	10.10.10.47
5	10.10.10.16	255.255.255.252	10.10.10.49 to 10.10.10.50	10.10.10.51
6	10.10.10.20	255.255.255.252	10.10.10.53 to 10.10.10.54	10.10.10.55
7	10.10.10.24	255.255.255.252	10.10.10.33 to 10.10.10.34	10.10.10.35
8	10.10.10.28	255.255.255.252	10.10.10.37 to 10.10.10.38	10.10.10.39
9	10.10.10.32	255.255.255.252	10.10.10.41 to 10.10.10.42	10.10.10.43
10	10.10.10.36	255.255.255.252	10.10.10.45 to 10.10.10.46	10.10.10.47
11	10.10.10.40	255.255.255.252	10.10.10.49 to 10.10.10.50	10.10.10.51
12	10.10.10.44	255.255.255.252	10.10.10.53 to 10.10.10.54	10.10.10.55
13	10.10.10.48	255.255.255.252	10.10.10.33 to 10.10.10.34	10.10.10.35
14	10.10.10.52	255.255.255.252	10.10.10.37 to 10.10.10.38	10.10.10.39

4. ACRONYMS / DEFINITIONS

LAN (Local Area Network):

A network that connects devices within a limited geographical area, such as an office, building, or campus.

VLAN (Virtual Local Area Network):

A logically segmented network at Layer 2 that isolates broadcast domains for better security, efficiency, and network management.

DHCP (Dynamic Host Configuration Protocol):

A network service that dynamically assigns IP addresses and other network configuration parameters to devices, enabling them to communicate on an IP network.

DNS (Domain Name System):

A hierarchical naming system that translates human-readable domain names (e.g., www.example.com) into IP addresses understood by machines.

OSPF (Open Shortest Path First):

A link-state routing protocol used to distribute IP routing information throughout a single autonomous system. It calculates the shortest path using Dijkstra's algorithm.

IP Address (Internet Protocol Address):

A unique identifier assigned to each device connected to a network that uses the Internet Protocol for communication.

Subnet Mask:

A 32-bit number that segments IP addresses into network and host portions, determining the size of each subnet.

Router:

A network device that forwards data packets between different networks based on destination IP addresses. It operates at Layer 3 of the OSI model.

Switch (Layer 2 / Layer 3):

A Layer 2 switch forwards frames based on MAC addresses, whereas a Layer 3 switch can also perform routing functions using IP addresses.

Access Point (AP):

A device that allows wireless devices to connect to a wired network using Wi-Fi or other wireless standards.

SSH (Secure Shell):

A cryptographic protocol used to securely log into remote devices, providing strong authentication and encrypted communications.

ACL (Access Control List):

A set of rules that control the traffic allowed into and out of network interfaces, used for filtering and securing traffic.

SVI (Switch Virtual Interface):

A virtual interface configured on Layer 3 switches for inter-VLAN routing. It acts as a gateway for devices in each VLAN.

GNS3 (Graphical Network Simulator-3):

A network software emulator used for more advanced simulations than Cisco Packet Tracer, supporting real router IOS images.

Banner Message:

A customizable message displayed upon device login to inform users of authorized access policies.

MAC Address (Media Access Control Address):

A hardware identifier assigned to a network interface card (NIC) for communications at the data link layer.
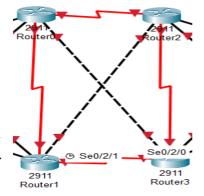
5. STEP BY STEP, IMPLIMENTATION PROCESS

5.1 Basic Topology Setup

Step 1: Draw the Backbone Routers

Place the following **four routers** at the center of your canvas to form the backbone connection:

- FLOOR-1-ROUTER

- FLOOR-2-ROUTER

- FLOOR-3-ROUTER

- FLOOR-4-ROUTER

Connect these routers in a **fully meshed** manner using serial links (red lines in your image). This ensures inter-router communication across all floors.
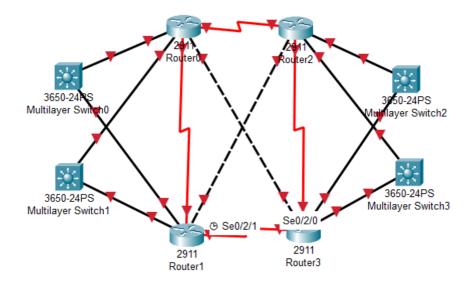
Step 2: Place Layer 3 Switches (Core Switches)

Place one **Layer 3 Switch** per floor near its corresponding router:

- FLOOR-1-L3-SW (connect to FLOOR-1-ROUTER)

- FLOOR-2-L3-SW (connect to FLOOR-2-ROUTER)

- FLOOR-3-L3-SW (connect to FLOOR-3-ROUTER)

- FLOOR-4-L3-SW (connect to FLOOR-4-ROUTER)

Connect each router to its respective L3 switch via Ethernet links.

Step 3: Draw Layer 2 Access Switches Floor-wise

First Floor:

- FLOOR-1-MGT-SW

- FLOOR-1-RSC-SW

- FLOOR-1-HR-SW

  Connect all these three to **FLOOR-1-L3-SW**

Second Floor:

- FLOOR-2-MKT-SW

- FLOOR-2-ACC-SW

- FLOOR-2-FINANCE-SW

  Connect all these three to **FLOOR-2-L3-SW**
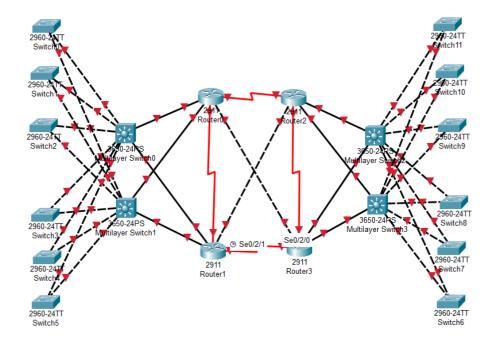
Third Floor:

- FLOOR-3-LOG-SW

- FLOOR-3-CUST-SW

- FLOOR-3-GST-SW

  Connect all these three to **FLOOR-3-L3-SW**

Fourth Floor:

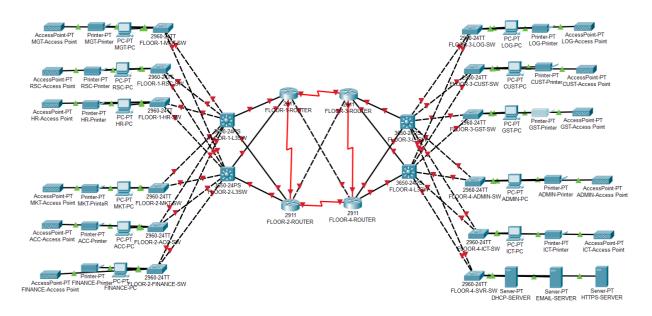- FLOOR-4-ADMIN-SW

- FLOOR-4-ICT-SW

- FLOOR-4-SVR-SW

  Connect all these three to **FLOOR-4-L3-SW**

Step 4: Add End Devices to Each Access Switch

Each Layer 2 Switch connects to:

- 1 PC

- 1 Printer

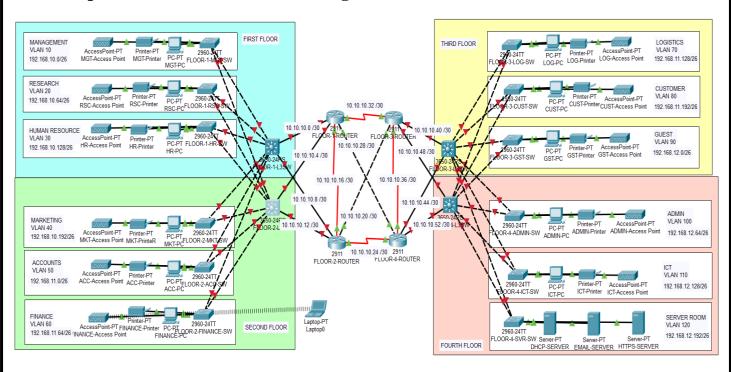- 1 Access Point

Step 5: Add Servers (Fourth Floor)

Connect the following devices to **FLOOR-4-SVR-SW**:

- DHCP-SERVER

- EMAIL-SERVER

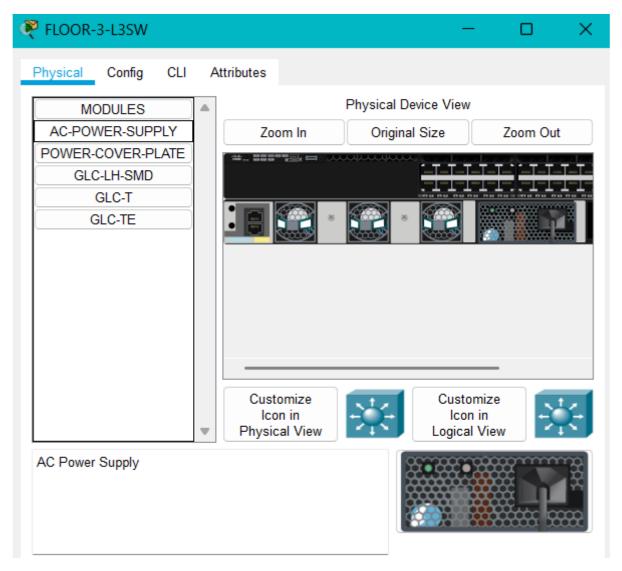- HTTPS-SERVER

Step 6: Label VLANs and IP Subnets

- **MANAGEMENT VLAN 10** – IP Subnet: 192.168.10.0/26

- **RESEARCH VLAN 20** – IP Subnet: 192.168.10.64/26

- **HUMAN RESOURCE VLAN 30** – IP Subnet: 192.168.10.128/26

- **MARKETING VLAN 40** – IP Subnet: 192.168.10.192/26

- **ACCOUNTS VLAN 50** – IP Subnet: 192.168.11.0/26

- **FINANCE VLAN 60** – IP Subnet: 192.168.11.64/26

- **LOGISTICS VLAN 70** – IP Subnet: 192.168.11.128/26

- **CUSTOMER VLAN 80** – IP Subnet: 192.168.11.192/26

- **GUEST VLAN 90** – IP Subnet: 192.168.12.0/26

- **ADMIN VLAN 100** – IP Subnet: 192.168.12.64/26

- **ICT VLAN 110** – IP Subnet: 192.168.12.128/26

- **SERVER ROOM VLAN 120** – IP Subnet: 192.168.12.192/26

Step 7: Label the Routers according to the Table in 3.2

Step 8: Add a Power Supply to all the Layer-3 Switches

- Drag an **AC-POWER-SUPPLY** and drop it in the **Physical Device View**

- This will turn ON all the all the connections with the Layer-3 Switch making all the connections Green in colour.
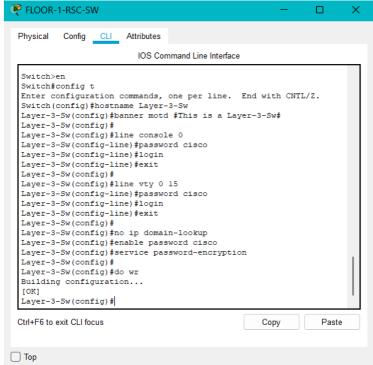
5.2 Basic settings to all the devices with ssh on routers and Layer-3 Switches

Step1: Configuring Layer-2 Switches (Access Layer)

- Host Name
  hostname Layer-2-Sw

- Banner Message
  banner motd #This is a Layer-2-Sw#

- Line Console Password
  line console 0
  password cisco
  login
  exit

- Line VTY Password
  line vty 0 15
  password cisco
  login
  exit

- Disable IP Domain Look-up
  no ip domain-lookup

- Enable Password
  enable password cisco

- Encrypt all Passwords
  service password-encryption

- Save the configurations
  do wr

NOTE: Use *conf t* to edit the configuration and *do wr* command to save the configuration whenever it is changed

TIP: To avoid typing the commands multiple time in all the Layer-2 Switches, Type once in a Notepad, and simple execute the commands by simply pasting in the CLI

Step2: Configuring Layer-3 Switches

- Host Name
  hostname Layer-3-Sw

- Banner Message
  banner motd #This is a Layer-3-Sw#

- Line Console Password
  line console 0
  password cisco
  login
  exit

- Set up Domain Name
  ip domain-name cisco.net
  username cisco password cisco
  crypto key generate rsa
  1024

- Line VTY Password
  line vty 0 15
  login local
  transport input ssh
  exit

- Disable IP Domain Look-up
  no ip domain-lookup

- Enable Password
  enable password cisco

- Encrypt all Passwords
  service password-encryption

- Save the configurations
  do wr

Step2: Configuring Core Layer Routers

- Host Name
  hostname Core-LayerR

- Banner Message
  banner motd #This is a Core-LayerR#

- Line Console Password
  line console 0
  password cisco
  login
  exit

- Set up Domain Name
  ip domain-name cisco.net
  username cisco password cisco
  crypto key generate rsa
  1024

- Line VTY Password

> *line vty 0 15*
> *login local*
> *transport input ssh*
> *exit*

- Disable IP Domain Look-up
  no ip domain-lookup

- Enable Password
  enable password cisco

- Encrypt all Passwords
  service password-encryption

- Save the configurations
  do wr

5.3 Assign VLANs, configure Access & Trunk ports to the respective Layer-2 Switches

The ports used to connect the devices in the Access layer should be set a Access Ports and the ports connected to the Layer-03 Switch will be the Trunk Port

conf t
int range fa0/1-2
switchport mode trunk
exit
int range fa0/3-24
switchport mode access
switchport access vlan 120

TIP: *5.3 and 5.4 can executed at the same time for all the switches to save time*

```
FLOOR-1-MGT-SW

Physical   Config   CLI   Attributes

                                    IOS Command Li

spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
 switchport mode trunk
!
interface FastEthernet0/2
 switchport mode trunk
!
interface FastEthernet0/3
 switchport access vlan 10
 switchport mode access
 switchport port-security
 switchport port-security maximum 2
 switchport port-security mac-address sticky
!
interface FastEthernet0/4
 switchport access vlan 10
 switchport mode access
 switchport port-security
 switchport port-security maximum 2
 switchport port-security mac-address sticky
!
interface FastEthernet0/5

Ctrl+F6 to exit CLI focus

[ ] Top
```

```
F1-Mgt-SW(config)#do sh port-security
Secure Port MaxSecureAddr CurrentAddr SecurityViolation Security Action
               (Count)       (Count)        (Count)
-------------------------------------------------------------------------
    Fa0/3         2             0              0           Shutdown
    Fa0/4         2             0              0           Shutdown
    Fa0/5         2             0              0           Shutdown
    Fa0/6         2             0              0           Shutdown
    Fa0/7         2             0              0           Shutdown
    Fa0/8         2             0              0           Shutdown
    Fa0/9         2             0              0           Shutdown
   Fa0/10         2             0              0           Shutdown
   Fa0/11         2             0              0           Shutdown
   Fa0/12         2             0              0           Shutdown
   Fa0/13         2             0              0           Shutdown
   Fa0/14         2             0              0           Shutdown
   Fa0/15         2             0              0           Shutdown
   Fa0/16         2             0              0           Shutdown
   Fa0/17         2             0              0           Shutdown
   Fa0/18         2             0              0           Shutdown
   Fa0/19         2             0              0           Shutdown
   Fa0/20         2             0              0           Shutdown
   Fa0/21         2             0              0           Shutdown
   Fa0/22         2             0              0           Shutdown
```

5.4 Switchport security to all 12 layer-2 switches

switchport port-security
switchport port-security maximum 2
switchport port-security mac-address sticky
switchport port-security violation shutdown

TIP: Use the **do sh start** to display all the configurations of the device

5.4 Setup IP Address to the Routers and the Layer-3 Switches

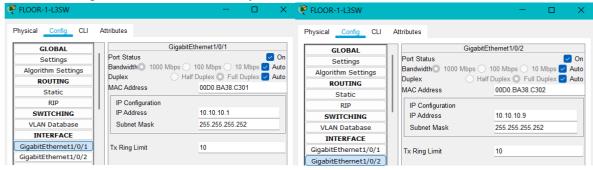**TIP:** Refer them from the Lebling in Step7 of 5.1 or the 3.1 & 3.2

Step1: Set up trunk ports in the Layer-3 Switches

int range gig1/0/3-8
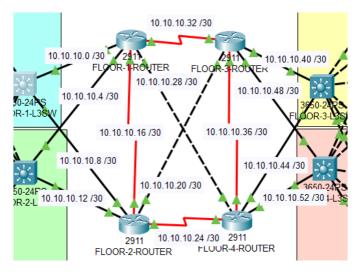*switchport mode trunk*
exit

Step2: Set up IP Addresses to the Layer-3 Ports that are connecting to the Routers

- Use the No Switchport command to assign IP Adress to the Layer-3 Switch
  int rage gig1/0/1-2
  no switchport
- Assing the IP Adress to the Layer-3 Switch

Step3: Set up IP Addresses to the Router Ports

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5.5 OSPF on the Routers and the Layer-3 Switches

We have to advertise all the networks that the device is connecting.

The bellow command is for the Layer-3 Switch in Fourth Floor. It is connecting to two router networks and six layer-2 switch ports. Hence the following command.

ip routing
router ospf 10

network 10.10.10.48 0.0.0.3 area 0
network 10.10.10.52 0.0.0.3 area 0

network 192.168.11.128 0.0.0.63 area 0
network 192.168.11.192 0.0.0.63 area 0
network 192.168.12.0 0.0.0.63 area 0
network 192.168.12.64 0.0.0.63 area 0
network 192.168.12.128 0.0.0.63 area 0
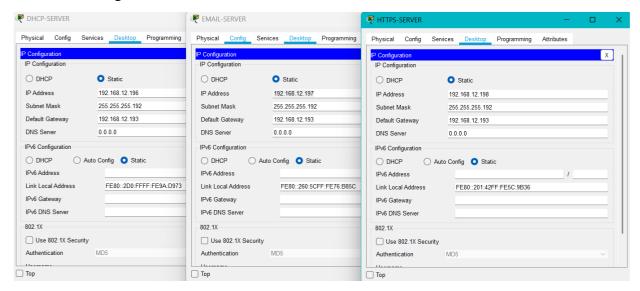*network 192.168.12.192 0.0.0.63 area 0*

This network advertisement has to be done on all the Routers and the Layer-3 Switches

```
Core-LayerR(config)#router ospf 10
Core-LayerR(config-router)#network 10.10.10.24 0.0.0.3 area 0
Core-LayerR(config-router)#
01:04:55: %OSPF-5-ADJCHG: Process 10, Nbr 10.10.10.25 on
Serial0/2/0 from LOADING to FULL, Loading Done

Core-LayerR(config-router)#network 10.10.10.28 0.0.0.3 area 0
Core-LayerR(config-router)#
01:05:11: %OSPF-5-ADJCHG: Process 10, Nbr 10.10.10.33 on
GigabitEthernet0/0 from LOADING to FULL, Loading Done

Core-LayerR(config-router)#network 10.10.10.36 0.0.0.3 area 0
Core-LayerR(config-router)#
01:05:23: %OSPF-5-ADJCHG: Process 10, Nbr 10.10.10.50 on
Serial0/2/1 from LOADING to FULL, Loading Done

Core-LayerR(config-router)#network 10.10.10.44 0.0.0.3 area 0
Core-LayerR(config-router)#network 10.10.10.52 0.0.0.3 area 0
Core-LayerR(config-router)#ex
Core-LayerR(config)#do wr
Building configuration...
[OK]
Core-LayerR(config)#
```
Above is the Screen shot of advertising networks in the Fourth floor Router.

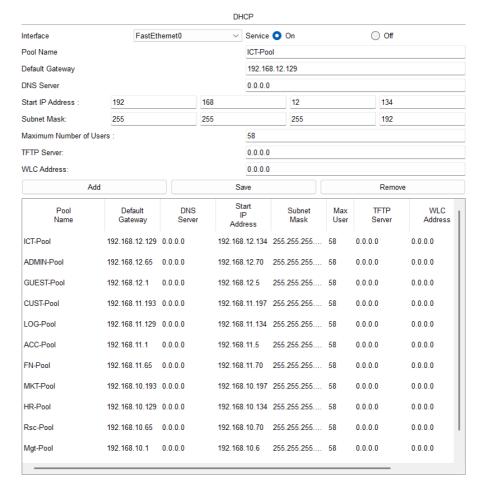## 5.6 Static IP Adress to the Server Room Devices

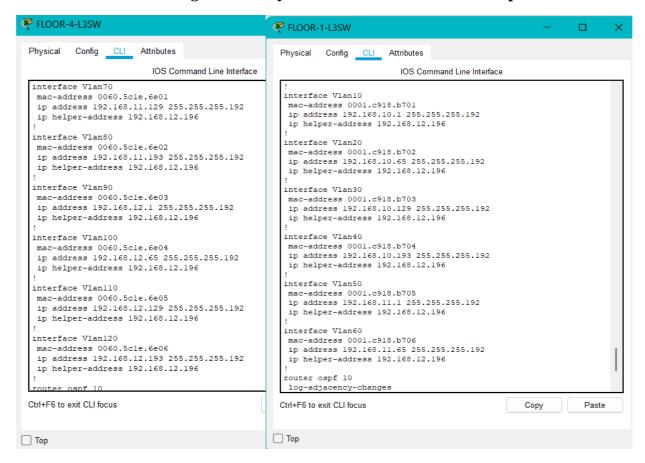We have to assign Static IP Adress to the Servers in the Server room

5.7 DHCP server device configurations

Set up the DHCP configuration in the server so that the devices in the access layer can get dynamic IP Addresses.

This can be done by creating pools for all the networks in the topology.
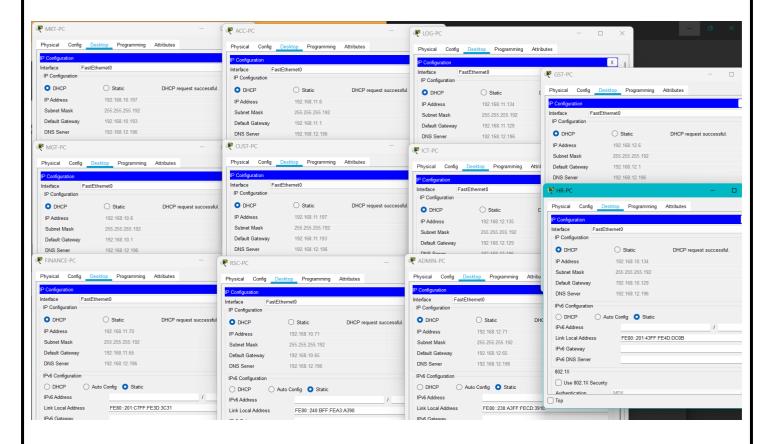
5.8 Inter-VLAN routing on the Layer-3 Switches and DHCP helper addresses

Bellow is the command syntax to set up the inter-VLAN and the DHCP helper Address
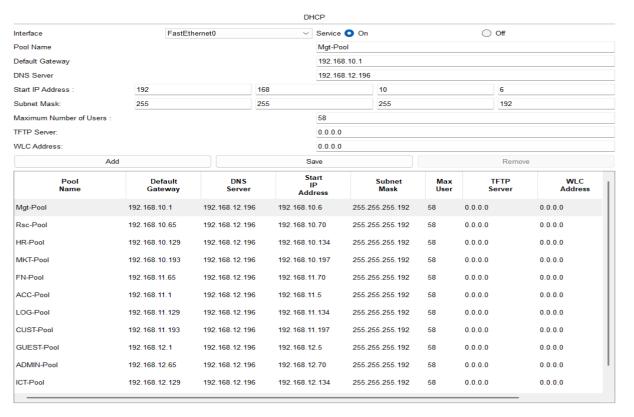
int vlan 10
no shutdown
ip add 192.168.10.1 255.255.255.192
ip helper-address 192.168.12.196
exit

int vlan 20
no shutdown
ip add 192.168.10.65 255.255.255.192
ip helper-address 192.168.12.196
exit

Once the dhcp helper address is set up in all the layer-3 switches, the DHCP server will be able to allocate IP address to the all the devices int eh access layer.
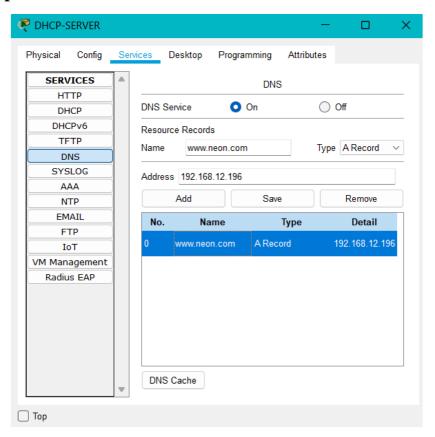

5.9 Set up the DNS in the DHCP server

Step1: Set up DNS *for all the pools in the DHCP servers*

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
Mgt-Pool	192.168.10.1	192.168.12.196	192.168.10.6	255.255.255.192	58	0.0.0.0	0.0.0.0
Rsc-Pool	192.168.10.65	192.168.12.196	192.168.10.70	255.255.255.192	58	0.0.0.0	0.0.0.0
HR-Pool	192.168.10.129	192.168.12.196	192.168.10.134	255.255.255.192	58	0.0.0.0	0.0.0.0
MKT-Pool	192.168.10.193	192.168.12.196	192.168.10.197	255.255.255.192	58	0.0.0.0	0.0.0.0
FN-Pool	192.168.11.65	192.168.12.196	192.168.11.70	255.255.255.192	58	0.0.0.0	0.0.0.0
ACC-Pool	192.168.11.1	192.168.12.196	192.168.11.5	255.255.255.192	58	0.0.0.0	0.0.0.0
LOG-Pool	192.168.11.129	192.168.12.196	192.168.11.134	255.255.255.192	58	0.0.0.0	0.0.0.0
CUST-Pool	192.168.11.193	192.168.12.196	192.168.11.197	255.255.255.192	58	0.0.0.0	0.0.0.0
GUEST-Pool	192.168.12.1	192.168.12.196	192.168.12.5	255.255.255.192	58	0.0.0.0	0.0.0.0
ADMIN-Pool	192.168.12.65	192.168.12.196	192.168.12.70	255.255.255.192	58	0.0.0.0	0.0.0.0
ICT-Pool	192.168.12.129	192.168.12.196	192.168.12.134	255.255.255.192	58	0.0.0.0	0.0.0.0

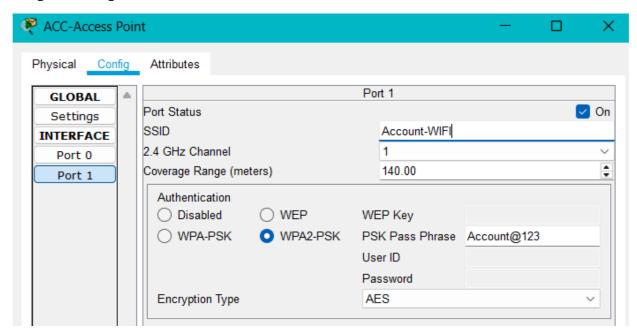## Step2: Set up DNS service *in the DHCP servers*

We can use the DNS name in the Web Browser in the PCs to open the default webpage.
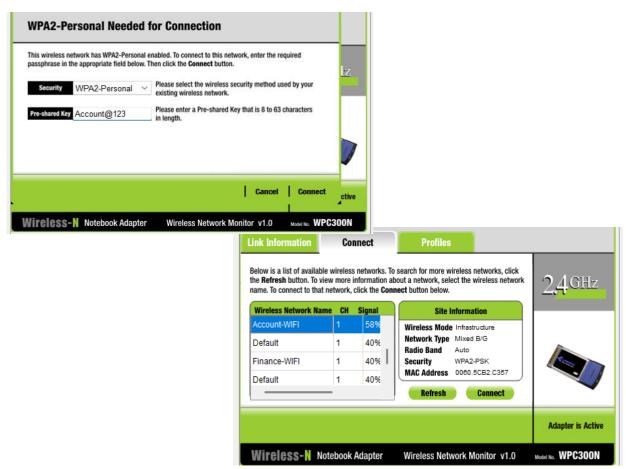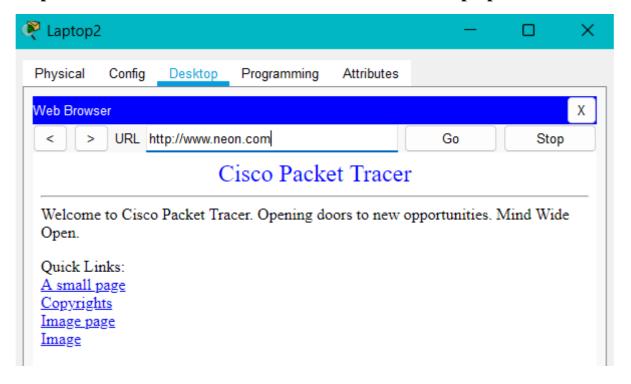
5.9 Set up Wireless Configuration

Step1: Set up the Port 1 in the Access Point

Step2: Connect to the wireless network through as device

Step3: Use the DNS name in the Web Browser in the Laptop.

Laptop2 — □ ×

Physical   Config   Desktop   Programming   Attributes

Web Browser   X

< | > | URL | http://www.neon.com | Go | Stop

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Image

6. LEARNING OUTCOMES

o Acquired deep understanding of enterprise-level network planning and simulation through the hands-on implementation of a multi-floor, multi-department topology.

o Learned how to apply **Hierarchical Network Design principles** by effectively dividing the topology into **Core, Distribution, and Access layers**, resulting in better manageability, scalability, and redundancy.

o Mastered the configuration and deployment of **VLANs** for logical segmentation and secure interdepartmental communication.

o Successfully implemented **Inter-VLAN Routing** using **Layer 3 switches**, enabling seamless communication between departmental networks.

   Practiced subnetting and learned how to calculate:

   - Subnet masks

   - Usable IP ranges

   - Broadcast addresses

      for departments with ~60 hosts using the base network 192.168.10.0/24.

o Configured **OSPF** as the interior gateway protocol, promoting efficient routing across routers and Layer 3 switches in the multi-floor setup.

o Deployed a centralized **DHCP server** and used **DHCP relay (helper-address)** on Layer 3 switches to dynamically assign IP addresses to all end devices.

o Understood the practical use of **SSH configuration** to enable secure remote administration of routers and switches.

o Applied **sticky port security** on Layer 2 switches to enhance LAN security by preventing unauthorized device connections.

o Configured and tested **wireless connectivity** using Access Points, ensuring support for wireless users on each floor.

o Learned how to integrate **server-based services** (HTTP, Email, DNS, DHCP) into the network and statically assign IP addresses to them for consistent operation.

o Explored **device configuration best practices**, including hostnames, login banners, and password encryption, to standardize and secure network infrastructure.

o Verified network communication using **ping, browser testing via DNS, and end-device connectivity**, ensuring functional and optimized deployment.

o Gained exposure to real-world enterprise network implementation challenges such as IP address planning, device role segregation, and multi-protocol integration.

7. REFERENCES

YouTube Links:

Case Study Explanation || Visualisation using MS Visual:

https://www.youtube.com/watch?v=ebAqdDfIGhk&list=PLyEymK89ZUabd7h9FK4dGVdONbx FEJoyk&index=9&pp=iAQB

Enterprise Network Topology Setup:

https://www.youtube.com/watch?v=NU3jmb0eN_A&list=PLyEymK89ZUabd7h9FK4dGVdONbx FEJoyk&index=10&pp=iAQB

Enterprise Network Final Configuration:

https://www.youtube.com/watch?v=SEO0GGTtyIk&list=PLyEymK89ZUabd7h9FK4dGVdONbx FEJoyk&index=11&pp=iAQB