COMPUTER COMMUNICATION AND NETWORK

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Section: **BSE-5A**

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Project: Smart Resort Network Infrastructure Design Using Cisco Packet Tracer

Introduction:

This project involves the design and configuration of an advanced network infrastructure uniquely tailored for a hotel environment using Cisco Packet Tracer. The setup includes a range of elements such as serial router configurations, enhanced password security measures, and dynamic DHCP implementation to optimize IP address management and facilitates routing using OSPF.

Objective:

The primary goal of this project is to develop a resilient and efficient network infrastructure designed to cater to the specific requirements of a hotel setting. This involves creating segmented VLANs for effective traffic management, configuring routers for inter-VLAN communication, implementing robust security measures, deploying a multifunctional web server for guest services, and integrating advanced DHCP services for streamlined IP address allocation. Efficient Routing through OSPF ensures optimized communication across the network.

Scope of the Project:

This project encompasses networking infrastructure for a four-floor layout with specific functionalities:

1. **1st Floor:** Marketing and IT Department.
2. **2nd Floor:** Admin and Reception Areas.
3. **3rd Floor:** Workstations and Network devices.

Description of System:

First Floor:

This floor houses the Marketing and IT departments. The Marketing department requires high bandwidth for creative work, such as graphic design and video editing, as well as reliable internet access for social media campaigns and research. The IT department needs a robust and secure network infrastructure to support server operations, data storage, and network management.

Marketing Department (First Floor):

- Router 2, dedicated to the Marketing Department, utilizes advanced VLAN segmentation techniques to isolate network traffic. This ensures secure and efficient communication within the department.

IT Department (First Floor):

- Connected to Router 7, the IT Department operates on its own VLAN, allowing for independent network management and resource allocation. This setup ensures that IT operations are not disrupted by other departments.

Second Floor:

The second floor accommodates the Administration and Reception areas. Administration staff require reliable internet access for email, document management, and communication with external parties. The Reception area needs network connectivity for front desk operations, visitor management, and potential integration with security systems.

Admin Office:

- Located on the first floor, Router 1 acts as the gateway, managing network traffic and providing internet access to administrative devices. It also hosts the central management console for network monitoring.

Reception Area:

- The reception area is connected to the Admin Office router, serving as the main interaction hub for guests. This area includes IP phones and smart kiosks for guest services, all connected through the network.

Third Floor:

The third floor houses general office workstations for various departments. These workstations require reliable internet access for everyday tasks, access to shared resources like printers and file servers, and basic network security measures.

Server Room:

- Situated on the third floor, the Server Room is connected via Router 3 to the central network. It hosts critical services including a web server, file servers, and database servers, all secured and accessible to authorized personnel.

Network Topology:

The network topology includes the following components:

1. **Routers:** Enable interconnection between VLANs and act as gateways to the internet.
2. **Switches:** Connect devices within each VLAN segment, supporting high-speed data transfer.
3. **PCs and Mobile Devices:** Representing guest devices, including laptops, smartphones, and tablets.
4. **Web Server:** Hosts essential services such as the guest portal, room service requests, and hotel management applications.
5. **DHCP Server:** Provides automatic IP address assignment and management for network devices.
6. **OSPF:** Ensures scalable and efficient routing between different network floors, adapting dynamically to network changes.
7. **Wi-Fi Access Points:** Distributed across all floors to provide robust wireless connectivity for guests and staff.

Security Measures:

To ensure a secure network, the following measures are implemented:

- **Password Protection:** Strong password policies are enforced across all network devices.
- **Access Control Lists (ACLs):** Control traffic flow and restrict unauthorized access.
- **VLAN Segmentation:** Isolates different network segments to minimize security risks.
- **Firewall Implementation:** Protects the network from external threats and unauthorized access.

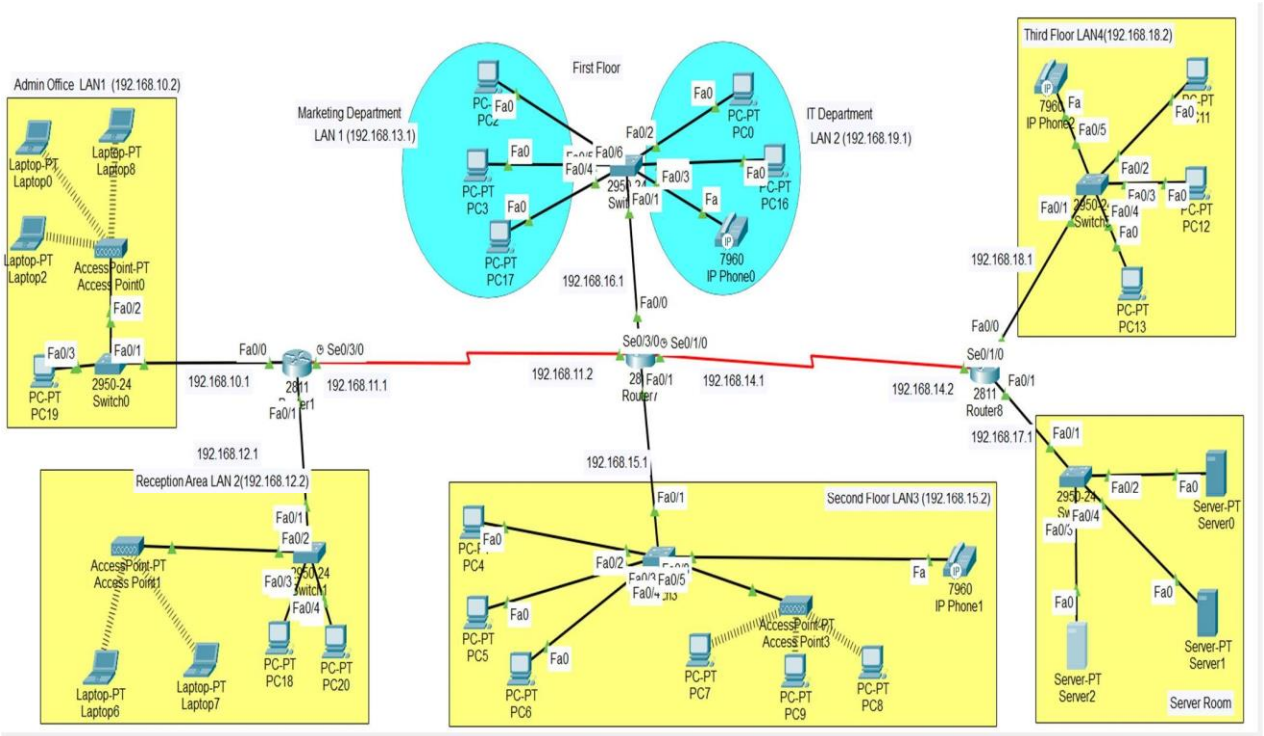
DHCP Implementation:

The DHCP server is configured to streamline IP address allocation, ensuring efficient and automated management of IP addresses. This reduces the need for manual configuration and minimizes the risk of IP conflicts.

Web and Guest Services:

The web server hosts a variety of services, including a guest portal, room service requests, and hotel information. It is optimized for high availability and quick response times to enhance the guest experience.

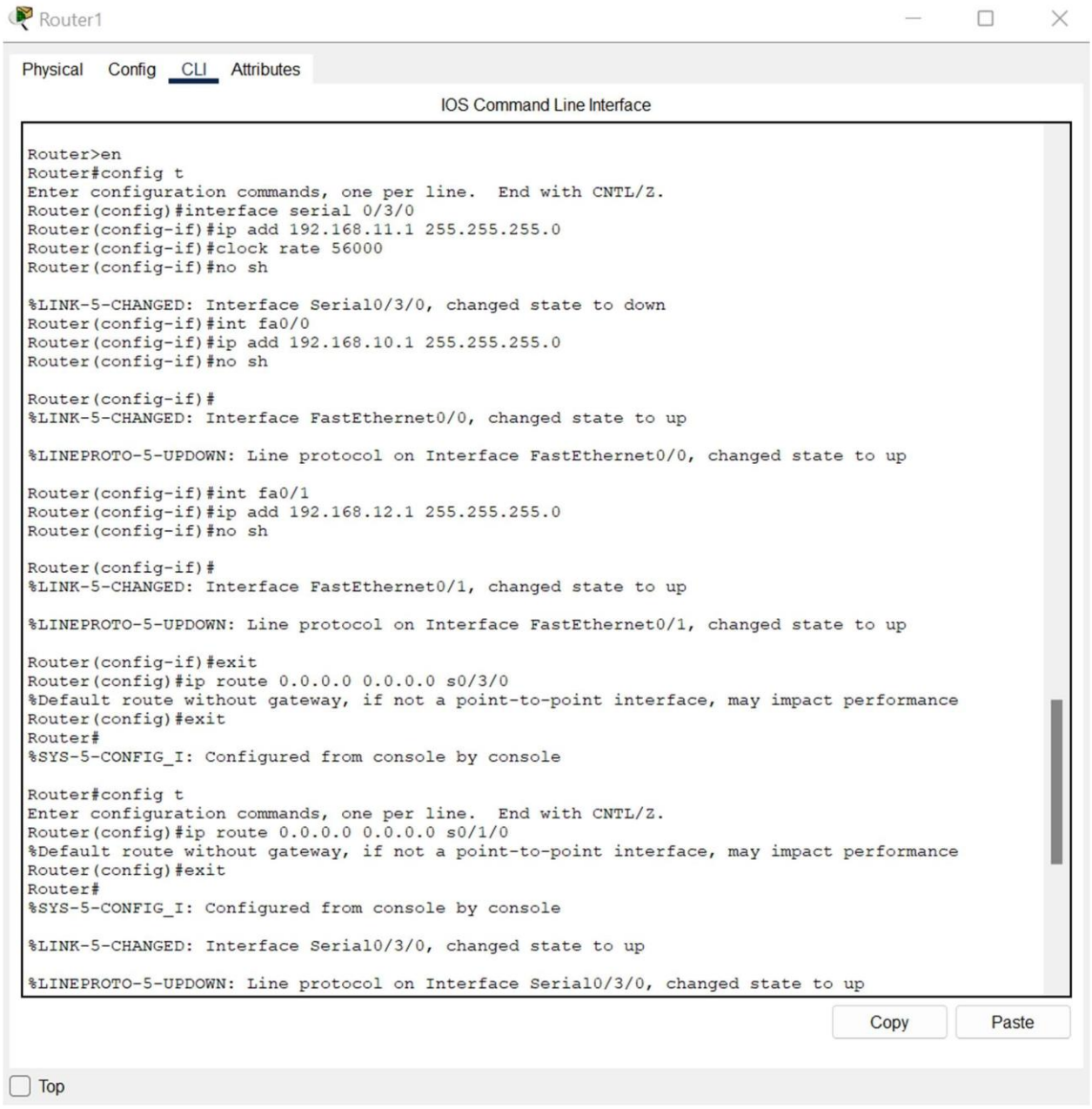
Screenshots:



Configuration Details:

1. Serial Router Configuration

Router 1:



```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route 0.0.0.0 s0/3/0
                                ^
% Invalid input detected at '^' marker.

Router(config)#ip route 0.0.0.0 0.0.0.0 s0/3/0
Router(config)#ip route 0.0.0.0 0.0.0.0 s0/1/0
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

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Router 2:

Router7

Physical Config CLI Attributes

IOS Command Line Interface

```
Would you like to enter the initial configuration dialog? [yes/no]: no


Press RETURN to get started!



Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface serial 0/3/0
Router(config-if)#ip add 192.168.11.2 255.255.255.0
Router(config-if)#no sh

Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/3/0, changed state to up

Router(config-if)#interfac
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/3/0, changed stat
Router(config-if)#exit
Router(config)#interface serial 0/1/0
Router(config-if)#ip add 192.168.14.1 255.255.255.0
Router(config-if)#no sh

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
Router(config-if)#int fa0/0
Router(config-if)#ip add 192.168.16.1 255.255.255.0
Router(config-if)#no sh

Router(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

Router(config-if)#int fa0/1
Router(config-if)#ip add 192.168.15.1 255.255.255.0
Router(config-if)#no sh

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

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

Router(config-if)#exit
Router(config)#
```

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```
Router(config)#ip route 0.0.0.0 0.0.0.0 s0/3/0
%Default route without gateway, if not a point-to-point interface, may impact performance
Router(config)#ip route 0.0.0.0 0.0.0.0 s0/1/0
Router(config)#ip route 0.0.0.0 0.0.0.0 s0/3/0
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

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Router 3:

Router8

Physical Config CLI Attributes

IOS Command Line Interface

```
Press RETURN to get started!



Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface s0/1/0
Router(config-if)#ip add 192.168.14.2 255.255.255.0
Router(config-if)#no sh

Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up

Router(config-if)#e
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up
xi
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#ip add 192.168.18.1 255.255.255.0
Router(config-if)#no sh

Router(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

Router(config-if)#int fa0/1
Router(config-if)#ip add 192.168.17.1 255.255.255.0
Router(config-if)#exit
Router(config)#int fa0/1
Router(config-if)#ip add 192.168.17.1 255.255.255.0
Router(config-if)#no sh

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

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

Router(config-if)#exit
Router(config)#
```

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```
Router#en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route 0.0.0.0 0.0.0.0 s0/1/0
%Default route without gateway, if not a point-to-point interface, may impact performance
Router(config)#ip route 0.0.0.0 0.0.0.0 s0/3/0
Router(config)#ip route 0.0.0.0 0.0.0.0 s0/1/0
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

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2. Stick VLAN Implementation Switch

Physical Config CLI Attributes

IOS Command Line Interface

```
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name marketing
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#name it
Switch(config-vlan)#exit
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#wr
Building configuration...
[OK]
Switch#show vlan br

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/7, Fa0/9, Fa0/10, Fa0/11
                                                Fa0/12, Fa0/13, Fa0/14, Fa0/15
                                                Fa0/16, Fa0/17, Fa0/18, Fa0/19
                                                Fa0/20, Fa0/21, Fa0/22, Fa0/23
                                                Fa0/24
10   marketing                        active
20   it                               active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int range f0/2-3
Switch(config-if-range)#switchport access vlan 10
Switch(config-if-range)#exit
Switch(config)#int range f0/4-6
Switch(config-if-range)#switchport access vlan 20
Switch(config-if-range)#exit
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#wr
Building configuration...
[OK]
Switch#show vlan br
```

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```
VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/7, Fa0/9, Fa0/10, Fa0/11
                                                 Fa0/12, Fa0/13, Fa0/14, Fa0/15
                                                 Fa0/16, Fa0/17, Fa0/18, Fa0/19
                                                 Fa0/20, Fa0/21, Fa0/22, Fa0/23
                                                 Fa0/24
10   marketing                         active
20   it                                active
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int f0/1
Switch(config-if)#switchport mode trunk
Switch(config-if)#exit
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#wr
Building configuration...
[OK]
Switch#
```

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Router 2:

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int f0/0
Router(config-if)#no sh
Router(config-if)#int f0/0.10
Router(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.10, changed state to up

Router(config-subif)#encapsulation dot1q 10
Router(config-subif)#ip address 192.168.13.1 255.255.255.0
Router(config-subif)#exit
Router(config)#int f0/0.20
Router(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.20, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.20, changed state to up

Router(config-subif)#encapsulation dot1q 20
Router(config-subif)#ip address 192.168.19.1 255.255.255.0
Router(config-subif)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#wr
Building configuration...
[OK]
Router#
```

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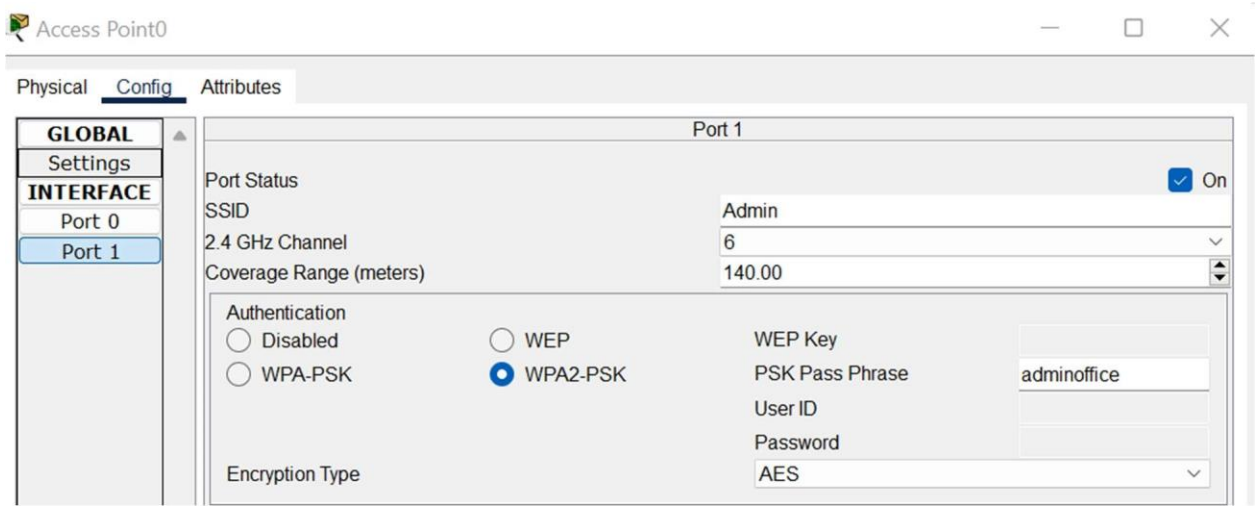
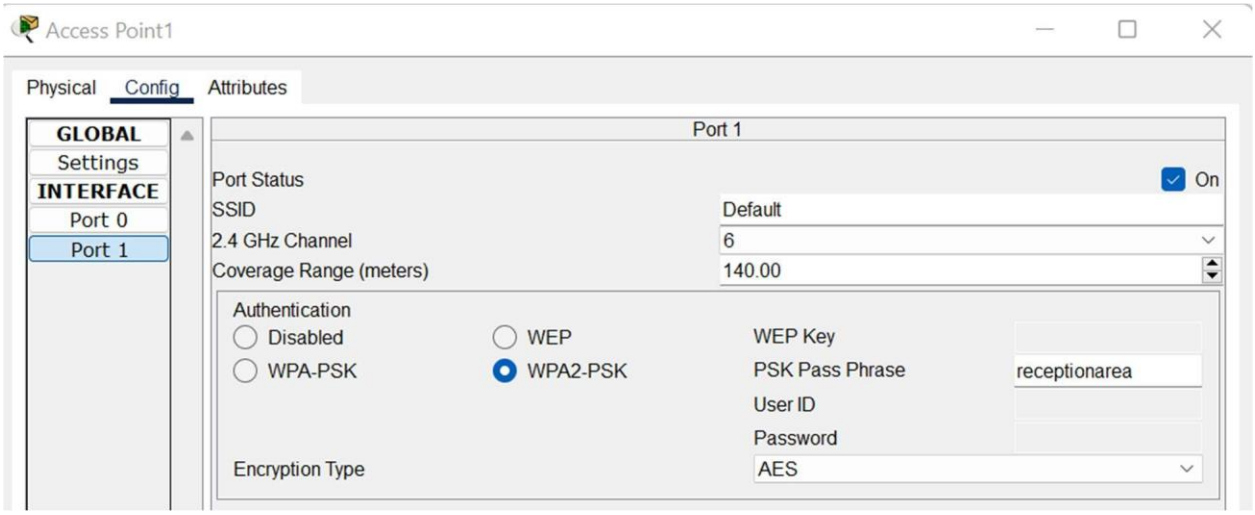
3. **Password Setting**

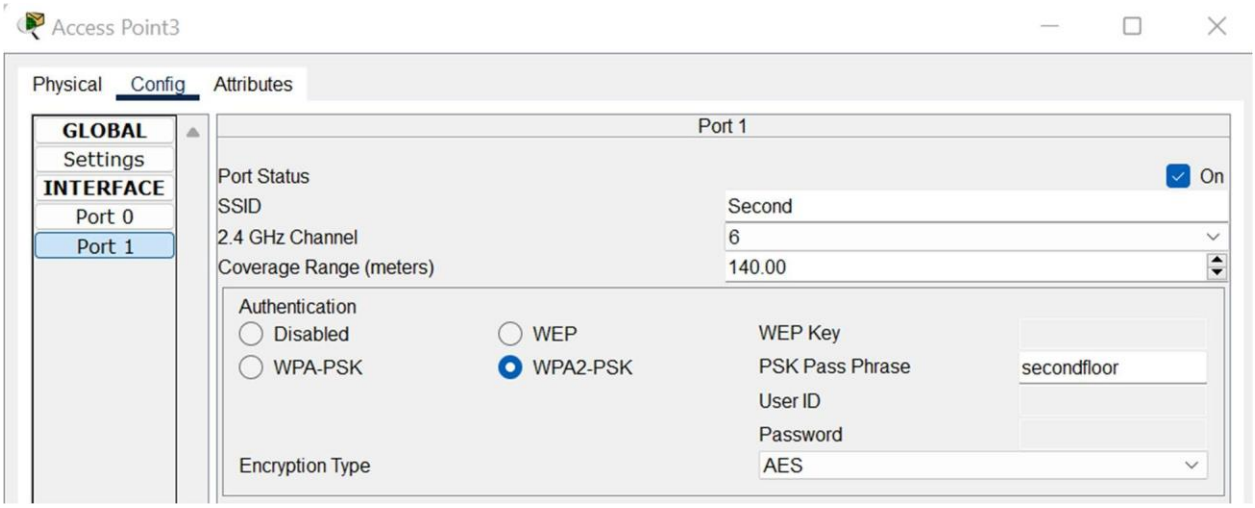
Admin Office:



Reception Area:

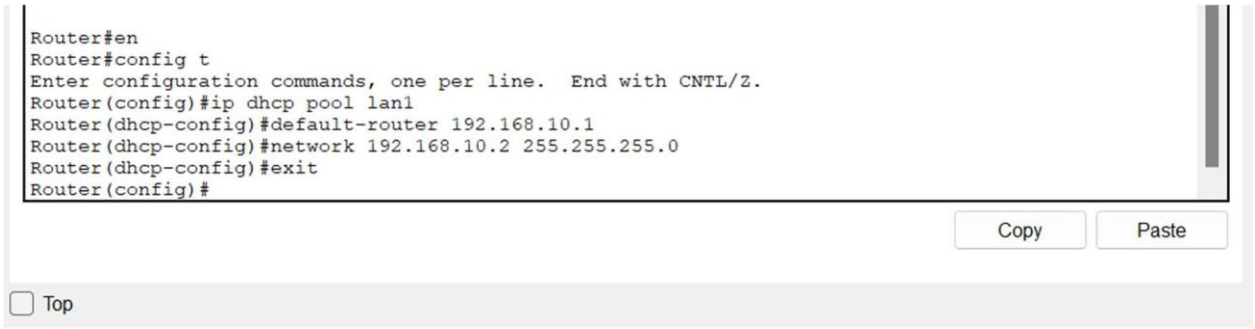


Second Floor:

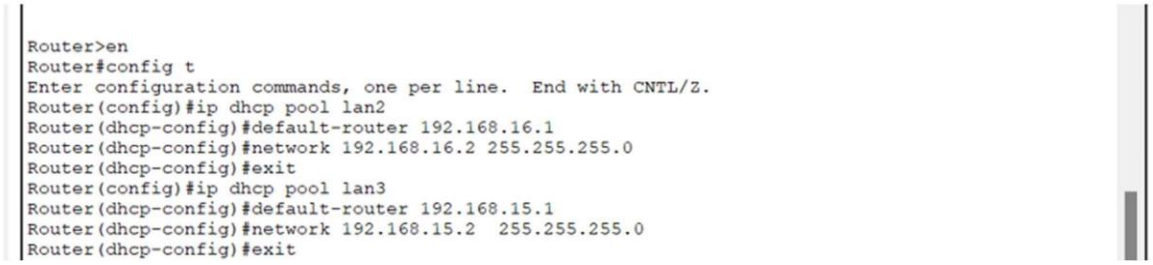


4. DHCP Implementation

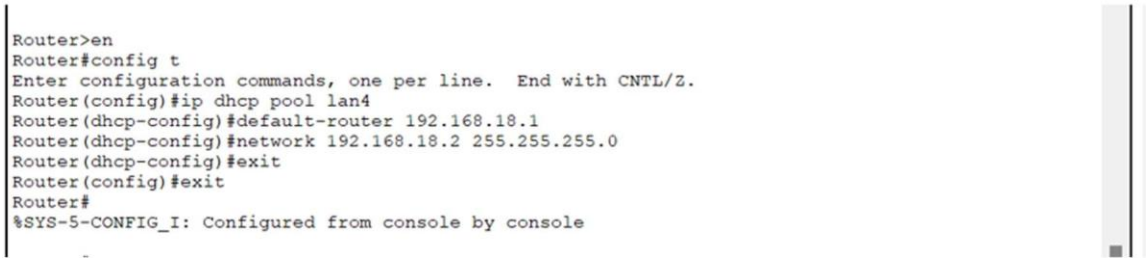
Router 1:



Router 2:



Router 3:



```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip dhcp pool lan4
Router(dhcp-config)#default-router 192.168.18.1
Router(dhcp-config)#network 192.168.18.2 255.255.255.0
Router(dhcp-config)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

Conclusion:

The **Smart Resort Network Infrastructure Project** effectively addresses the unique networking requirements of a hotel by leveraging advanced technologies and best practices in network design. The implementation of segmented VLANs, inter-VLAN routing, robust security measures, and automated IP address management ensures a resilient and efficient network. The configuration caters to the specific needs of various departments, including Marketing, IT, Administration, and Guest Services, while maintaining high security and performance. This design demonstrates a thorough understanding of network infrastructure and its application in real-world scenarios, providing a scalable and reliable solution tailored for a smart resort environment.