Information Technology Department

Jigme Namgyel Engineering College

Deothang: Samdrup Jongkhar

Mini Project

Routing and Switching Network

(NET203)

Topic: Dungsam Resort

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Mini-Project

Question:

As a part of your Mini-project for the Routing and Switching module, design and implement a network for the Dungsam Resort, located in Dewathang, which provides services to the international tourists. The Resort has three buildings; in the first building there are three floors (reception in the first floor, store in the second floor, and the logistics in the third floor). In the second building there are three floors as well (finance in the first floor, HR in the second floor, and Marketing in the third floor). The third building as two floors (IT in the first floor and Admin in the second floor). For the successful design of the network for this resort, the following considerations have to be taken:

(a) There has to be 3 routers connecting each building

(b) Use serial DCE cables to connect between each of the routers

(c) Use 10.10.10.0/30, 10.10.10.4/30 and 10.10.10.8/30 networks between the routers

(d) All the 3 buildings must have a switch each

(e) Each building must have a dedicated WiFi network to connect the mobile devices such as laptops and phones

(f) Every floor of the buildings is expected to have a printer each

(g) Every floor of the building is be in a different VLAN with the following details;

Building One:

(a) **Floor 1 for Reception:** V*LAN 80, Network is 192.168.8.0/24*

(b) **Floor 2 for Store:** *VLAN 70, Network of 192.168.7.0/24*

(c) **Floor 3 for Logistics:** *VLAN 60, Network of 192.168.6.0/24*

Building Two:

(a) **Floor 1 for Finance:** *VLAN 50, Network of 192.168.5.0/24*

(b) **Floor 2 for HR:** *VLAN 40, Network of 192.168.4.0/24*

(c) **Floor 3 for Sales:** *VLAN 30, Network of 192.168.3.0/24*

Building Three:

(a) **Floor 1 for Admin:** *VLAN 20, Network of 192.168.2.0/24*

(b) **Floor 2 for IT:** *VLAN 10, Network of 192.168.1.0/24*

Once the design is completed; for the successful implementation of the network for the resort, consider the following information:

(a) For advertising the routes to the networks use the OSPF as the routing protocol

(b) Configure all the routers as the DHCP server to dynamically assign IP addresses to all the devices in its network

(c) All the devices should be able to communicate each other in the network (Inter-VLAN routing)

(d) On all the routers, configure the Secure Shell (SSH) for logging in securely and remotely

(e) Include a PC/Laptop to the port fa0/1 in IT department to login remotely to the routers.

(f) On the IT department switch, configure the security for the port to allow the PC/Laptop to be attached to port fa0/1 only (Use the sticky method to learn or obtain the MAC address and set the violation to shutdown mode)

For marking the mini-project, the following criteria would be used:

(a) Designing the envisioned network following the provided requirements [5 Marks]

(b) Implementing the designed network with required configurations [5 Marks]

(c) Creating a detailed report of the project with all the important sections [5 Marks]

(d) Presentation / Viva (Skills and knowledge) [5 Marks]

As a part of the delivery, include the following and submit in the VLE:

(a) Packet Tracer File which has your design and implementation of the network

(b) Report in PDF with all the important details

(c) Video of the explanation of the design, implementation and proof of working captured precisely

(d) Submit the three files zipped in the VLE (Each of the files have to be named MINI_PRO_ROLLNO)

(e) Penalties will be applied for late submission, copying, plagiarism and for not following the instructions.
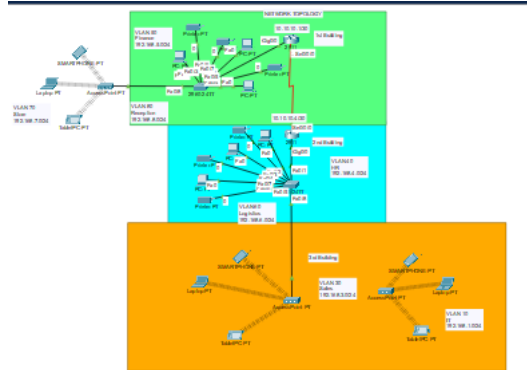
Aim of The Project

The aim of this mini project is to design, analyze, and implement an efficient networking infrastructure tailored to the specific needs of a resort in Dungsam Resort, Dewathang Town, optimizing connectivity, security, and scalability to enhance guest experiences and operational efficiency.
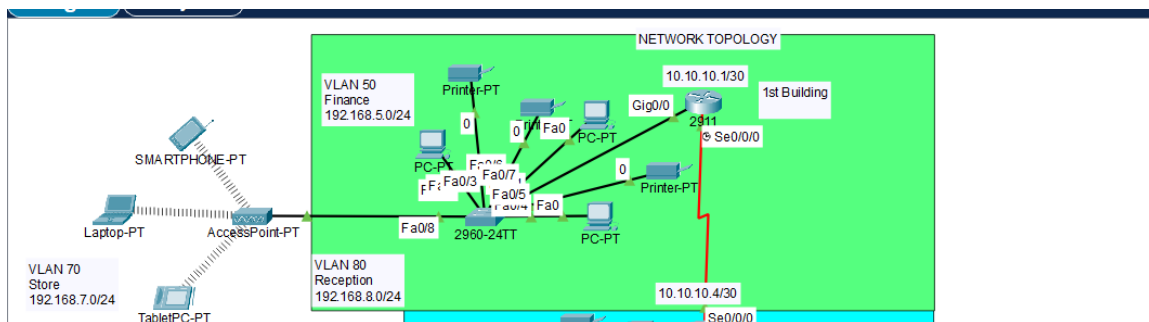
Objective

- ✓ Design and implement a comprehensive networking infrastructure for a building resort in Dewathang Town, focusing on seamless connectivity, security, and efficient management.

- ✓ Configure a robust network topology integrating routers, switches, dedicated Wi-Fi networks, printers, and workstations across the resort's buildings.

- ✓ Establish serial DCE connections among routers using specific IP subnets (10.10.10.0/30, 10.10.10.4/30, 10.10.10.8/30) to ensure secure and reliable inter-router communication.

- ✓ Implement VLANs for each floor of the buildings and assign appropriate IP subnets to each VLAN, optimizing network segmentation and traffic management.

- ✓ Design and deploy distinct Wi-Fi networks tailored for each building to enhance guest experience and ensure reliable wireless connectivity.

- ✓ Strategically place printers on every floor, assign IP addresses, and link them to respective VLANs for efficient printing services.

- ✓ Configure routers with OSPF to facilitate seamless route advertisement within the network, enhancing network scalability and reliability.

- ✓ Set up DHCP servers on routers to dynamically assign IP addresses to devices, ensuring efficient resource utilization and ease of device management.

- ✓ Enable inter-VLAN routing on routers to facilitate communication between different VLANs, enhancing overall network flexibility.

- ✓ Implement Secure Shell (SSH) on routers to establish secure remote access for network administration and monitoring.

- ✓ Establish a secure connection from the IT department's laptop/PC to switch port fa0/1, enabling remote SSH access to the routers for efficient management.

- ✓ Configure port security on switch port fa0/1 in the IT department, employing sticky MAC address techniques and violation mode adjustments to enhance network security and prevent unauthorized access.

Network Topology

Building 1

Building 2

Se0/0/0
Printer-PT
0
PC-PT
2911
2nd Building
Fa0
PC-
Fa0
Gig0/0
Printer-PT
0
Fa0/1
VLAN 40
HR
192.168.4.0/24
Fa0/3
2
Fa0
Fa0/7
PC-PT
Fa0/6
Fa0/5
24TT
0
Fa0/8
Printer-PT
VLAN 60
Logistics
192.168.6.0/24

Building 3

192.168.6.0/24
SMARTPHONE-PT
3rd Building
SMARTPHONE-PT
Laptop-PT
VLAN 30
Sales
192.168.3.0/24
AccessPoint-PT
Laptop-PT
AccessPoint-PT
VLAN 10
IT
192.168.1.0/24
TabletPC-PT
TabletPC-PT
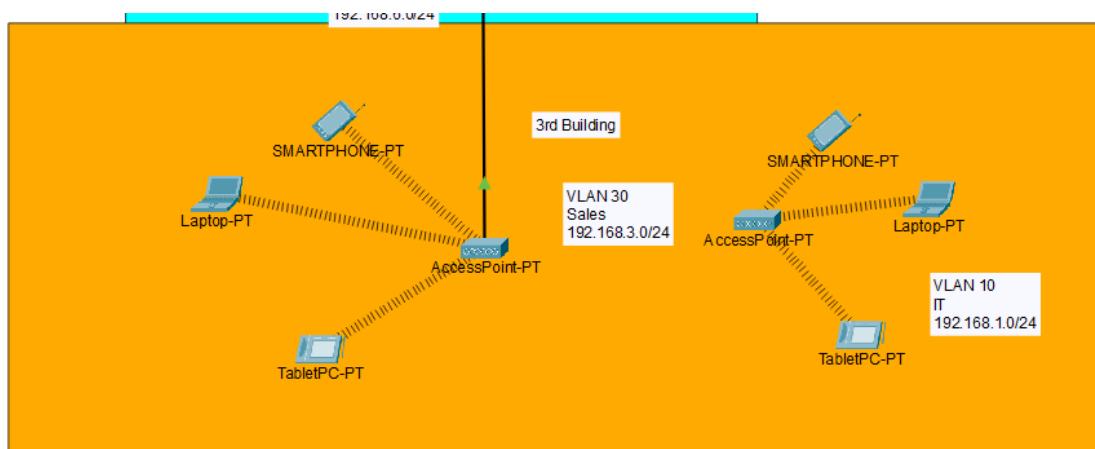
6
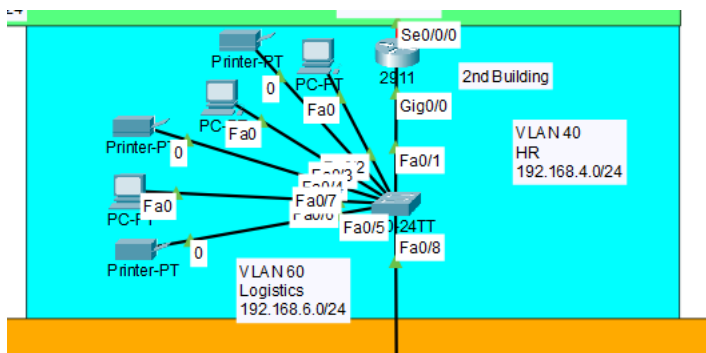
Creating VLAN

1st Building

VLAN 80- Reception
VLAN 70- Store
VLAN 60- Logistics

```
Switch>en
Switch#confi t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int range fa0/2-3
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 80
% Access VLAN does not exist. Creating vlan 80
Switch(config-if-range)#int range fa0/4-5
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 70
% Access VLAN does not exist. Creating vlan 70
Switch(config-if-range)#int range fa0/6-8
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 60
% Access VLAN does not exist. Creating vlan 60
Switch(config-if-range)#do wr
Building configuration...
[OK]
```

2nd Building

VLAN 50- Finance
VLAN 40- HR
VLAN 30- Sales

```
Switch(config-if-range)#int range fa0/2-3
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 50
% Access VLAN does not exist. Creating vlan 50
Switch(config-if-range)#
Switch(config-if-range)#int range fa0/4-5
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 40
% Access VLAN does not exist. Creating vlan 40
Switch(config-if-range)#int range fa0/6-8
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 30
% Access VLAN does not exist. Creating vlan 30
Switch(config-if-range)#
Switch(config-if-range)#int range fa0/1
Switch(config-if-range)#switchport mode trunk
```

3rd Building

VLAN 20- Admin

VLAN 10- IT

```
Switch(config)#int range fa0/2-3
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 10
% Access VLAN does not exist. Creating vlan 10
Switch(config-if-range)#
Switch(config-if-range)#int range fa0/4-6
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 20
% Access VLAN does not exist. Creating vlan 20
Switch(config-if-range)#
Switch(config-if-range)#int range fa0/1
Switch(config-if-range)#switchport mode trunk
```

OSPF

Router

```
Router(config)#router ospf 10
Router(config-router)#network 10.10.10.4 255.255.255.252 area 0
Router(config-router)#network 10.10.10.8 255.255.255.252 area 0
Router(config-router)#
Router(config-router)#network 192.168.8.0 255.255.255.0 area 0
Router(config-router)#network 192.168.7.0 255.255.255.0 area 0
Router(config-router)#network 192.168.6.0 255.255.255.0 area 0
```

Router

```
Router(config)#router ospf 10
Router(config-router)#network 10.10.10.0 255.255.255.252 area 0
Router(config-router)#network 10.10.10.8 255.255.255.252 area 0
Router(config-router)#
Router(config-router)#network 192.168.3.0 255.255.255.0 area 0
Router(config-router)#network 192.168.4.0 255.255.255.0 area 0
Router(config-router)#network 192.168.5.0 255.255.255.0 area 0
Router(config-router)#do wr
```

Router

```
Router(config)#router ospf 10
Router(config-router)#network 10.10.10.0 255.255.255.252 area 0
Router(config-router)#network 10.10.10.4 255.255.255.252 area 0

Router(config-router)#network 192.168.1.1 255.255.255.0 area 0
Router(config-router)#network 192.168.1.0 255.255.255.0 area 0
Router(config-router)#network 192.168.2.0 255.255.255.0 area 0
Router(config-router)#do wr
```

DHCP Server

Router

```
Router(config)#service dhcp
Router(config)#ip dhcp pool Reception
Router(dhcp-config)#network 192.168.8.0 255.255.255.0

Router(dhcp-config)#default-router 192.168.8.1
Router(dhcp-config)#dns-server 192.168.8.1

Router(config)#ip dhcp pool Store
Router(dhcp-config)#network 192.168.7.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.7.1
Router(dhcp-config)#dns-server 192.168.7.1
Router(dhcp-config)#ex
Router(config)#
Router(config)#ip dhcp pool Logistic
Router(dhcp-config)#network 192.168.6.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.6.1
Router(dhcp-config)#dns-server 192.168.6.1
Router(dhcp-config)#do wr
```

Router

```
Router(config)#service dhcp
Router(config)#ip dhcp pool Finance
Router(dhcp-config)#network 192.168.5.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.5.1
Router(dhcp-config)#dns-server 192.168.5.1
Router(dhcp-config)#ex
Router(config)#
Router(config)#ip dhcp pool HR
Router(dhcp-config)#network 192.168.4.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.4.1
Router(dhcp-config)#dns-server 192.168.4.1
Router(dhcp-config)#ex
Router(config)#
Router(config)#ip dhcp pool Marketting
Router(dhcp-config)#network 192.168.3.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.3.1
Router(dhcp-config)#dns-server 192.168.3.1
```

Router

```
Router(config)#service dhcp
Router(config)#ip dhcp pool IT
Router(dhcp-config)#network 192.168.1.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.1.1
Router(dhcp-config)#dns-server 192.168.1.1

Router(config)#ip dhcp pool Admin
Router(dhcp-config)#network 192.168.2.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.2.1
Router(dhcp-config)#dns-server 192.168.2.1
```

Inter-VLAN routing

Router

```
Router(config)#int gig0/0.80
Router(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0.80, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.80, changed state to
up

Router(config-subif)#encapsulation dot1Q 80
Router(config-subif)#ip address 192.168.8.1 255.255.255.0
Router(config)#int gig0/0.70
Router(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0.70, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.70, changed state to
up

Router(config-subif)#encapsulation dot1Q 70
Router(config-subif)#ip address 192.168.7.1 255.255.255.0
Router(config)#int gig0/0.60
Router(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0.60, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.60, changed state to
up

Router(config-subif)#encapsulation dot1Q 60
Router(config-subif)#ip address 192.168.6.1 255.255.255.0
```

Router

```
Router(config)#int gig0/0.30
Router(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0.30, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.30, changed state to
up

Router(config-subif)#encapsulation dot1Q 30
Router(config-subif)#ip address 192.168.3.1 255.255.255.0
Router(config)#int gig0/0.50
Router(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0.50, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.50, changed state to
up

Router(config-subif)#encapsulation dot1Q 50
Router(config-subif)#ip address 192.168.5.1 255.255.255.0
Router(config)#int gig0/0.40
Router(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0.40, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.40, changed state to
up

Router(config-subif)#encapsulation dot1Q 40
Router(config-subif)#ip address 192.168.4.1 255.255.255.0
Router(config-subif)#ex
```

Router

```
Router(config)#int gig0/0.10
Router(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0.10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.10, changed state to
up

Router(config-subif)#encapsulation dot1Q 10
Router(config-subif)#ip address 192.168.1.1 255.255.255.0
Router(config)#int gig0/0.20
Router(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0.20, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.20, changed state to
up

Router(config-subif)#encapsulation dot1Q 20
Router(config-subif)#ip address 192.168.2.1 255.255.255.0
```

Secure Shell (SSH)

Router

```
Router(config)#hostname B1-router
B1-router(config)#ip domain-name cisco
B1-router(config)#username cisco password cisco
B1-router(config)#
B1-router(config)#crypto key generate rsa
The name for the keys will be: B1-router.cisco
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]

B1-router(config)#line vty 0 15
*Mar 1 1:15:7.98: %SSH-5-ENABLED: SSH 1.99 has been enabled
B1-router(config-line)#login local
B1-router(config-line)#transport input ssh
```

Router

```
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname B2-router
B2-router(config)#ip domain-name cisco
B2-router(config)#username cisco password cisco
B2-router(config)#crypto key generate rsa
The name for the keys will be: B2-router.cisco
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]

B2-router(config)#line vty 0 15
*Mar 1 1:12:7.254: %SSH-5-ENABLED: SSH 1.99 has been enabled
B2-router(config-line)#login local
B2-router(config-line)#transport input ssh
B2-router(config-line)#do wr
```

Router

```
Router(config)#hostname B3-router
B3-router(config)#ip domain-name cisco
B3-router(config)#username cisco password cisco
B3-router(config)#crypto key generate rsa
The name for the keys will be: B3-router.cisco
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]

B3-router(config)#line vty 0 15
*Mar 1 1:8:44.568: %SSH-5-ENABLED: SSH 1.99 has been enabled
B3-router(config-line)#login local
B3-router(config-line)#transport input ssh
```

Security for Port (Switch-port Security)

```
Switch>en
Switch#confi t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int fa0/2
Switch(config-if)#switchport port-security
Switch(config-if)#switchport port-security maximum 1
Switch(config-if)#switchport port-security mac-address sticky
Switch(config-if)#switchport port-security violation shutdown
Switch(config-if)#do wr
Building configuration...
[OK]
```

Reference

ChatGPT

N.T(November 27, 2003). Configuration of Networks. Configure Network. Video.
https;//www.youtube.com/watch?v=9tf5J0Z6cRIxc95