**Bank Network Design**

Radeon Company Ltf. Is a US-owned company that deals with Banking and Insurance. The company is intended to expand its services across the African continent with the first branch to be located in Nairobi, Kenya. The company has secured a four-story building to operate within the Kenya's 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 the role., carefully read own the requirements, then model the design ad implement the network based on the company’s needs. Each floor has departments as provided in the table below.

1st Floor

|  |  |  |  |
| --- | --- | --- | --- |
| No | Department | No. of PC | No. of Printers |
| 1 | Management | 20 | 4 |
| 2 | Research | 20 | 4 |
| 3 | Human Resource | 20 | 4 |

2nd Floor

|  |  |  |  |
| --- | --- | --- | --- |
| No | Department | No. of PC | No. of Printers |
| 1 | Marketing | 20 | 4 |
| 2 | Accounting | 20 | 4 |
| 3 | Finance | 20 | 4 |

3rd Floor

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No | Department | No. of PC | No. of Printers |  |  |
| 1 | Logistics | 20 | 4 |  |  |
| 2 | Customer care | 20 | 4 |  |  |
| 3 | Guest | 40 | 2 |  |  |

4th Floor

|  |  |  |  |
| --- | --- | --- | --- |
| No | Department | No. of PC | No. of Servers |
| 1 | Administration |  | Dhcp |
| 2 | ICT |  | http |
| 3 | Server Room | 2 admin PCs | email |

**Requirements:**

1. Use a software modeling tool to visualize the network topology. (I used draw.io)
2. There should be 1 router on each floor.
3. Use OSPF to advertise routes.
4. Each department is required to have a wireless network.
5. Each department except the server is expected to have 60 users both wired and wirelss.
6. Devices in all department are expected to communicate with each other.
7. IP addresses are to be assigned using DHCP
8. Create HTTP and Email servers
9. Configure SSH in all routers for remote login.

**Basic configurations to be done on devices**

* Hostnames
* Line console and vty passwords.
* Banner messages
* Disable domain IP Lookup

**Each Department should be in different Vlans**

* Create Vlans in every department
* Each VLAN should be a different Subnetwork

**Planning of IP Addresses**

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

**End Devices**

* Configure all end devices in the network with appropriate IP addresses based on the calculations above

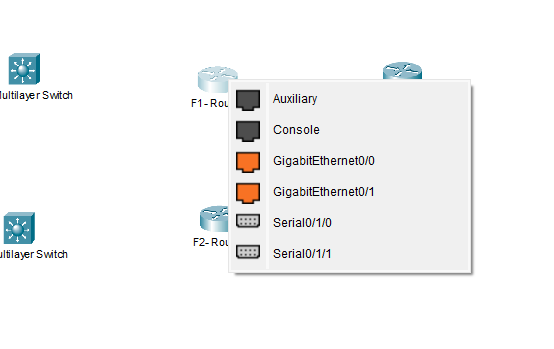
**Configure port-security**

* Use the sticky command to obtain MAC Address.
* Violation mode of shutdown

**Test Communications among end devices.**

Configurations :

1. -Routers should be connected with DCE cables. The serial interfaces should be turned on and clock rate set accordingly. When we connect using serial DCE cables, we wont see any serial interfaces. Turn off the router and insert the HWIC module. And turn it back on.  
   A screenshot of a computer

   Description automatically generated  
     
   Note – We will also connect router 1 and 4, and 2 and 3 together with a normal cross over cable. This will help in network redundancy. Meaning if a router fails therse a secondary path. Our final connection for the router will look like below.  
   A diagram of a network

   Description automatically generated
2. Now connect these routers to the L3 switch we have. Provide redundancy again but connecting them to another router as shown below.  
   A diagram of a network

   Description automatically generated
3. Our final topology before configuring anything looks like this.  
   A diagram of a network

   Description automatically generated
4. Going back to point 1, we need to turn on the interfaces, and enable clock rate on the correct ones.  
   The interfaces that has a clock sign, we need to enable clock rate on that.  
   A screenshot of a computer program

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   Alternatively you can click on the router, click on config, and turn on the interfaces as shown below. But I prefer using the commands.  
   A screenshot of a computer

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5. Clock rate can be easily configured, goven over the dce cables, the interfaces that has a clock sign means we need to enable clock rate on them.

**Layer 3 switch configurations.**

1. Add power supply to each layer 3 switch.  
   Drag and drop the power supply and put it in any empty slot.  
   A screenshot of a computer

   Description automatically generated

**Configuring Hostnames, Line console, vty passwords, and disable domain ip lookup.**

All commands will be don eon switch

**Below command used to enter privileged exec mode**

en

conf t

**Below command used to configure hostname, and banner**

hostname Switch

banner motd "This is Layer 2 Switch"

**Below command is used to access console line config mode via a password**

line console 0

password hammaz

login

exit

**Below command used to refer to the logical interfaces used for remote access to the device, such as through Telnet or SSH**

line VTY 0 15

password hammaz

login

exit

**Below command used to disable domain ip lookup and encrypt passwords.**

no ip domain-lookup

enable password hammaz

service password-encryption

I’ll be copy-pasting these commands on the switch hence I’ll use the same hostname on all.

A screenshot of a computer program

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**Configurations on L3 Switch. The steps are similar to above, but we also add ssh configuration L3 switches and routers**

Commands

en

conf t

hostname L3Switch

banner motd "This is Core Router"

line console 0

password hammaz

login

exit

no ip domain-lookup

enable password hammaz

service password-encryption

ip domain-name cisco.net

username hammaz password hammaz1

crypto key generate rsa

1024

line vty 0 15

login local

transport input ssh

exit

exit

wr

**Assigning VLANs and switch port security to access layer switches.**

A close-up of a computer

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For all access layer switches the port inside purple circle will be access port, and the other two will be trunk ports.

Commands are simple as shown below.  
A screenshot of a computer program

Description automatically generated

We also have to configure port security, with maximum of 2 mac addresses, learned via the sticky mac add commands, and mode violation.

Commands are:

switchport port-security

switchport port-security maximum 2

switchport port-security mac-address sticky

switchport port-security violation shutdown

A screen shot of a computer screen

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The above commands are done on all layer 2 switches.

The below interfaces on the L3 switch will be trunk ports too.

A screenshot of a computer

Description automatically generated

Interface g1/0/2

Switchport mode trunk

Do write

These commands will be done on all layer 3 switches.

**IP Addressing**

**Base Network: 192.168.10.0**

**1st Floor**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Department | Network Address | Subnet Mask | Host Address Range | Broadcast Address |
| Marketing | 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 |
| HR | 192.168.10.128 | 255.255.255.192/26 | 192.168.10.129 to 192.168.10.190 | 192.168.10.191 |

**2nd 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 |

**3rd Floor**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Department | Network Address | Subnet Mask | Host Address Range | Broadcast Address |
| Logistics | 192.168.11.128 | 255.255.255.192/26 | 192.168.11.127 to 192.168.11.190 | 192.168.11.191 |
| Customer | 192.168.11.192 | 255.255.255.192/26 | 192.168.11.192 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 |

**4th 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 |
| Server-Room | 192.168.12.192 | 255.255.255.192/26 | 192.168.12.193 to 192.168.12.254 | 192.168.12.255 |

We also need ip addresses between the routers and layer 3 switches. We will start with 10.10.10.0/30, and move up to 10.10.10.4/30, and so on.

Base network for routers and L3 switches. – 10.10.10.0/30

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Network Address | Subnet Mask | Host Address Range | Broadcast Address |
| 1 | 10.10.10.0 | 255.255.255.252 |  |  |
| 2 | 10.10.10.4 | 255.255.255.252 |  |  |
| 3 | 10.10.10.8 | 255.255.255.252 |  |  |
| 4 | 10.10.10.12 | 255.255.255.252 |  |  |
| 5 | 10.10.10.16 | 255.255.255.252 |  |  |
| 6 | 10.10.10.20 | 255.255.255.252 |  |  |
| 7 | 10.10.10.24 | 255.255.255.252 |  |  |
| 8 | 10.10.10.28 | 255.255.255.252 |  |  |
| 9 | 10.10.10.32 | 255.255.255.252 |  |  |
| 10 | 10.10.10.36 | 255.255.255.252 |  |  |
| 11 | 10.10.10.40 | 255.255.255.252 |  |  |
| 12 | 10.10.10.44 | 255.255.255.252 |  |  |
| 13 | 10.10.10.48 | 255.255.255.252 |  |  |
| 14 | 10.10.10.52 | 255.255.255.252 |  |  |

End result will look like below

A diagram of a router

Description automatically generated

Before configuring IP addresses on L3 interfaces we need to use the command “no switchport” on the router-facing interfaces, to make that interface a “Layer 3 Interface”.

A screenshot of a computer

Description automatically generated

A screenshot of a computer program

Description automatically generated

Now we assign ip addresses to itnerfaces shows below.

A computer screen shot of a network

Description automatically generated

**Configuring OSPF on all routers and L3Switches**

How to know which networks will be advertised by the routers and switches? A simple trick you can use is see how many networks they are connecting to.

A computer screen shot of a network

Description automatically generated

For Layer 3 switch we can see 6 cables on the left of the switch and 2 on the right. So its connected to 8 networks. Similarly, for R1, its connecting to 5 networks.

For R1 the commands are

Router ospf 10

Network 10.10.10.0 0.0.0.3 area 0

Network 10.10.10.4 0.0.0.3 area 0

Network 10.10.10.16 0.0.0.3 area 0

Network 10.10.10.28 0.0.0.3 area 0

Network 10.10.10.32 0.0.0.3 area 0

A computer screen with green text

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For L3 switch the commands are the same, just the networks will change. Be sure you use the command “ip routing” before enabling ospf on the L3 switches.

A screenshot of a computer program

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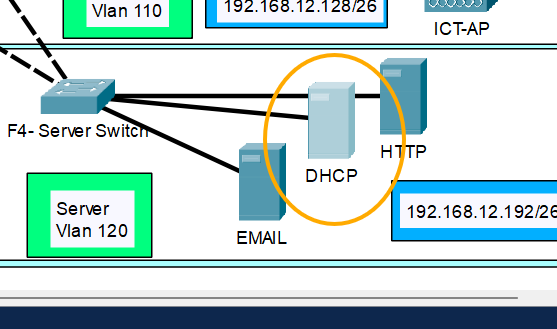
**Setting up Statics ip addresses to server room devices**

Click on the email server, Desktop, IP Configuration, and set the IPv4 as 192.168.12.196, 197 and 198 for each device, subnet mask as 255.255.255.192, and default gateway as 192.168.12.193/.  
A screenshot of a computer

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**Setting up the DHCP Server**

We need to make sure the below DHCP Server allocates IP addresses to all other devices in the topology.



Steps

Click on the DHCP server, followed by services, DHCP, and click on on.

A screenshot of a computer

Description automatically generated

Now we will create pools for every department.

For each department, I will be taking the first usable address as the default gateway.

These were the configurations for the Mgt pool.

A screenshot of a computer

Description automatically generated

For every pool, the default gateway and starting IP address will change accordingly.

**Final Admin Pool**  
A screenshot of a computer

Description automatically generated

**Setting up Inter Vlan routing on L3 switches and ip-helper address.**

Depending on which vlans a layer 3 switch is connected we will make vlans for them and assign the first usable ip address of that network to each of the vlans, making it the default gateway.

If you notice the topology First floor L3 switch is connected to 6 vlans. Vlan10-60.

Below are the commands to configure inter vlan routing. We are also adding ip helper-address command and we wil use the ip address of our dhcp server. The ip helper-address command in Cisco Packet Tracer is used to forward DHCP requests from clients in one subnet to a DHCP server located in another subnet.

Vlan 70

Vlan 80

Vlan 90

Vlan 100

Vlan 110

Vlan 120

Interface vlan 70

No shutdown

Ip add 192.168.11.129 255.255.255.192

ip helper-address 192.168.12.197

ex

Interface vlan 80

No shutdown

Ip add 192.168.11.193 255.255.255.192

ip helper-address 192.168.12.197

ex

Interface vlan 90

No shutdown

Ip add 192.168.12.1 255.255.255.192

ip helper-address 192.168.12.197

ex

Interface vlan 100

No shutdown

Ip add 192.168.12.65 255.255.255.192

ip helper-address 192.168.12.197

ex

Interface vlan 110

No shutdown

Ip add 192.168.12.129 255.255.255.192

ip helper-address 192.168.12.197

ex

Interface vlan 120

No shutdown

Ip add 192.168.12.193 255.255.255.192

ex

A screenshot of a computer program

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Now you must go manually on each PC, go to config tab and choose DHCP instead of static, so ip addresses can be assigned.

To confirm if your topology works, try pinging different devices from different pcs.