**Part 1: Design and Implement a VLSM Addressing Scheme. (10%)**

**Step 1:** Design a VLSM addressing scheme given a network address   **10.0.0.0/8**  and host requirements. You will configure addressing on routers, switches, and network hosts.

**Subnet Table**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Subnet Description** | **VLAN ID** | **VLAN Name** | **Required Number of Hosts** | **Network Address/CIDR** | **First Usable Host Address** | **Last Usable Host Address** | **Broadcast Address** |
| **Main** | VLAN 110 | VL 110 | 61 | 10.0.0.0/26 | 10.0.0.1/26 | 10.0.0.62/26 | 10.0.0.63/26 |
| **R** | VLAN 170 | VL 170 | 31 | 10.0.0.64/26 | 10.0.0.65/26 | 10.0.0.126/26 | 10.0.0.127/26 |
| **Main** | VLAN 120 | VL 120 | 30 | 10.0.0.128/27 | 10.0.0.129/27 | 10.0.0.158/27 | 10.0.0.159/27 |
| **N** | VLAN 160 | VL 160 | 29 | 10.0.0.160/27 | 10.0.0.161/27 | 10.0.0.190/27 | 10.0.0.191/27 |
| **R** | VLAN 180 | VL 180 | 25 | 10.0.0.192/27 | 10.0.0.193/27 | 10.0.0.222/27 | 10.0.0.223/27 |
| **S** | VLAN 140 | VL 140 | 20 | 10.0.0.224/27 | 10.0.0.225/27 | 10.0.0.254/27 | 10.0.0.255/27 |
| **N** | VLAN 150 | VL 150 | 15 | 10.0.1.0/27 | 10.0.1.1/27 | 10.0.1.30/27 | 10.0.1.31/27 |
| **S** | VLAN 30 | VL 30 | 12 | 10.0.1.32/28 | 10.0.1.33/28 | 10.0.1.46/28 | 10.0.1.47/28 |
| **From SW-S to MIU-MIU-GW** | - | VL SW-S | 7 | 10.0.1.48/28 | 10.0.1.49/28 | 10.0.1.62/28 | 10.0.1.63/28 |
| **From Main-MLS to MIU-MIU-GW** | - | VL Main-MLS | 2 | 10.0.1.64/30 | 10.0.1.65/30 | 10.0.1.66/30 | 10.0.1.67/30 |
| **From S-MLS to MIU-MIU-GW** | - | VL S-MLS | 2 | 10.0.1.68/30 | 10.0.1.69/30 | 10.0.1.70/30 | 10.0.1.71/30 |
| **From N-MLS to MIU-MIU-GW** | - | VL N-MLS | 2 | 10.0.1.72/30 | 10.0.1.73/30 | 10.0.1.74/30 | 10.0.1.75/30 |
| **From R-MLS to MIU-MIU-GW** | - | VL R-MLS | 2 | 10.0.1.76/30 | 10.0.1.77/30 | 10.0.1.78/30 | 10.0.1.79/30 |

# Addressing Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Device** | **Interface** | **Address** | **Subnet Mask** | **Default Gateway** | **VLAN ID** |
| **Main-MLS** | G1/1/1 | 10.0.1.66 | 255.255.255.252 | - | - |
| VLAN 110 | 10.0.0.1 | 255.255.255.192 | - | VLAN 110 |
| VLAN 120 | 10.0.0.129 | 255.255.255.224 | - | VLAN 120 |
| **S-MLS** | G1/1/1 | 10.0.1.70 | 255.255.255.252 | - | - |
| VLAN  30 | 10.0.1.33 | 255.255.255.240 | - | VLAN 30 |
| VLAN  140 | 10.0.0.225 | 255.255.255.224 | - | VLAN 140 |
| **N-MLS** | G1/1/1 | 10.0.1.74 | 255.255.255.252 | - | - |
| VLAN  150 | 10.0.1.1 | 255.255.255.224 | - | VLAN 150 |
| VLAN  160 | 10.0.0.161 | 255.255.255.224 | - | VLAN 160 |
| **R-MLS** | G1/0/5 | 10.0.1.78 | 255.255.255.252 | - |  |
| VLAN  170 | 10.0.0.65 | 255.255.255.192 | - | VLAN 170 |
| VLAN  180 | 10.0.0.193 | 255.255.255.224 | - | VLAN  180 |
| **MIU-MIU-GW** | Gig0/0 | 209.165.200.225 | 255.255.255.252 | - | - |
| Gig0/1 | 10.0.1.77 | 255.255.255.252 | - | - |
| Gig0/0/0 | 10.0.1.49 | 255.255.255.240 | - | - |
| Gig0/1/0 | 10.0.1.65 | 255.255.255.252 | - | - |
| Gig0/2/0 | 10.0.1.69 | 255.255.255.252 | - | - |
| Gig0/3/0 | 10.0.1.73 | 255.255.255.252 | - | - |
| **ISP** | Gig 0/0 | 209.165.200.226 | 255.255.255.240 | - | - |
| Gig 0/1 | 64.100.1.1 | 255.255.255.224 | - | - |
| Gig 0/2 | 64.100.2.1 | 255.255.255.224 | - | - |
| **Branch-GW** | Gig 0/0.2 | 192.168.2.1 | 255.255.255.0 | - | - |
| Gig 0/0.3 | 192.168.3.1 | 255.255.255.0 | - | - |
| Gig 0/1 | 64.100.1.2 | 255.255.255.224 | - | - |
| **Wireless Home Router** | G0/1 | 64.100.2.2 | 255.255.255.224 | - | - |
| Router IP | 192.168.10.1 | 255.255.255.128 | - | - |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **PC-number** | **VLAN ID** | **IP Address** | **Subnet Mask** | **Default Gateway** |
| **MIU** | | | | |
| **PC-1** | VLAN 110 | 10.0.0.2 | 255.255.255.192 | 10.0.0.1/26 |
| **PC-2** | VLAN 110 | 10.0.0.3 | 255.255.255.192 | 10.0.0.1/26 |
| **PC-3** | VLAN 120 | 10.0.0.130 | 255.255.255.224 | 10.0.0.129/27 |
| **PC-4** | VLAN 30 | 10.0.1.34 | 255.255.255.240 | 10.0.1.33/28 |
| **PC-5** | VLAN 30 | 10.0.1.35 | 255.255.255.240 | 10.0.1.33/28 |
| **PC-6** | VLAN 140 | 10.0.0.226 | 255.255.255.224 | 10.0.0.225/27 |
| **PC-7** | VLAN 150 | 10.0.1.2 | 255.255.255.224 | 10.0.1.1/27 |
| **PC-8** | VLAN 160 | 10.0.0.162 | 255.255.255.224 | 10.0.0.161/27 |
| **PC-9** | VLAN 170 | 10.0.0.66 | 255.255.255.192 | 10.0.0.65/26 |
| **PC-10** | VLAN 180 | 10.0.0.194 | 255.255.255.224 | 10.0.0.193/27 |
| **MIU\_ Branch 1** | | | | |
| **PC-11** | VLAN 2 | 192.168.2.2/24 | 255.255.255.0 | 64.100.2.1/24 |
| **PC-12** | VLAN 3 | 192.168.3.2/24 | 255.255.255.0 | 64.100.3.1/24 |
| **Wireless Home Network** | | | | |
| **Laptop** |  | 192.168.10.10 | 255.255.255.128 | 192.168.10.1 |
| **Tablet** |  | 192.168.10.30 | 255.255.255.128 | 192.168.10.1 |
| **Smartphone** |  | 192.168.10.20 | 255.255.255.128 | 192.168.10.1 |
| **Servers** | | | | |
| **DHCP Server** |  | 10.0.1.51 | 255.255.255.240 | 10.0.1.49 |
| **Email Server** |  | 10.0.1.52 | 255.255.255.240 | 10.0.1.49 |
| **Web server** |  | 10.0.1.53 | 255.255.255.240 | 10.0.1.49 |
| **DNS server** |  | 10.0.1.54 | 255.255.255.240 | 10.0.1.49 |
| **NTP and Syslog server** |  | 10.0.1.55 | 255.255.255.240 | 10.0.1.49 |

**Host address**

**3)**

**Step 1:  Create VLANs on all switches.**

**enable**

**configure terminal**

**vlan (num)**

**name (vlan num)**

**exit**

### **Step 2: Configure Access Ports for PCs.**

#### **On the switched we used the commands**

Interface fa(port)

switchport mode access

switchport access vlan (num)

to switch the PC’s to the VLAN’s

**Step 3:** **Configure an 802.1Q Trunk between the Switches.**

**trunk between the switches and all the VLAN’s**

interface range (for example: f0/1-2)

switchport mode trunk

switchport trunk allowed vlan all

**Step 4: On the L3 switch:**

**We will also create the VLAN’s on the L3 switch**

**enable**

**configure terminal**

**vlan (num)**

**name (vlan num)**

**exit**

**To configure the VLAN’s with the IP’s**

interface vlan (ID)

IP address (IP address) (Subnet mask)

no shutdown

**To ensure Trunk members are up**

interface (for example Gig1/0/1)

channel-group 1 mode active

switchport mode trunk

no shutdown

**In the MIU\_Branch1 router we will do the follow Set the encapsulation type to 802.1Q and Refer to the Address Table and assign the correct IP address to the sub interface.**

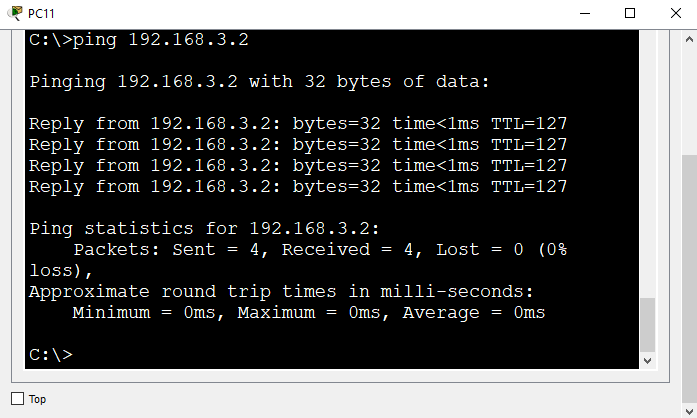
interface (for example gig0/0.2)

encapsulation dot1Q 2

ip address 192.168.2.1 255.255.255.0

no shutdown

**Step 5:** inter-VLAN routing is working as pinging from PC11 to PC12 is Successful.



**Step 6:**

Step 7:

**Part 4: Configure Routing Protocols. (10%)**

In this part, you will configure IPv4 routing protocols. At the end of this part, the network should be fully converged.

**Step 1: Point-to-Point Single-Area OSPFv2 Configuration**

1. router ospf 100

b.      router-id 1.1.1.1 # On MIU-GW

router-id 2.2.2.2 # On Main-MLS

ip routing was not enabled so we used (ip routing) command to enable it then we used router-id 3.3.3.3 # On S-MLS

c.       network (network address) (wildcard mask) area 0

d.      passive-interface default

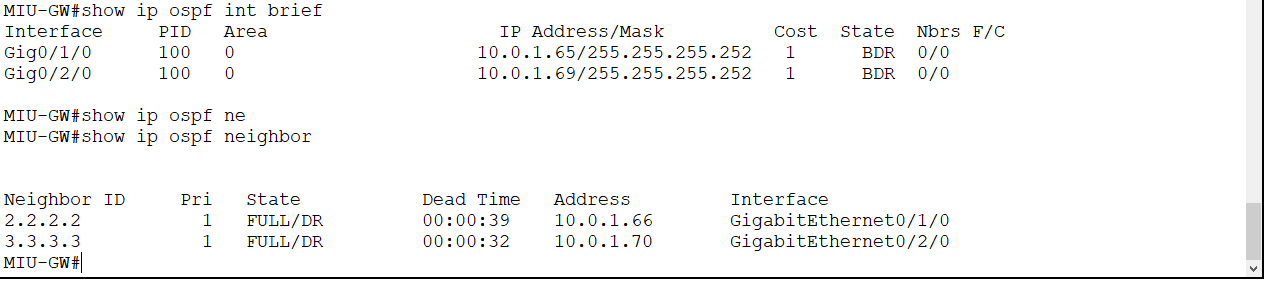
no passive-interface [interface connected to other routers]

e.       default-information originate

f.        show ip protocols

show ip ospf interface brief

there was an issue with assigning the ip address to the gig1/1/1 with the S-MLS, N-MLS, R-MLS but we managed to resolve it by applying the following command (no switchport)



**Step 2: Basic EIGRP with IPv4 Configuration**

a.     router eigrp 10

b.     network (example 10.0.1.73 0.0.0.3)

c.      passive-interface default

no passive-interface (example gig1/1/1)

d.     Configure EIGRP to propagate the default route in OSPF routing updates on **MIU-GW** router.

e.       Verify EIGRP Routing

**Step 3: Configure Route Redistribution Between EIGRP and OSPF**

a.      Configure Redistribution from OSPFv2 to EIGRP.

b.     Configure Redistribution from EIGRP to OSPFv2.

c.      Verify OSPF, EIGRP, and redistribution settings.

**Step 4: Configure IPv4 Static routing and Default Routes**

a.      On **MIU-GW** and **Branch\_GW** create IPv4 static default routes that point to **ISP**.

b.     On **ISP**, create IPv4 static routes that point to **MIU-GW**, **Branch\_GW, and Home Network**.

Steps to configure step 4

* **SPF Configuration:** Set up OSPF 100 on MIU-GW, Main-MLS, and S-MLS with appropriate router IDs and network statements. Faced issue with multilayer switch interfaces requiring "no switchport" command to convert them to routed ports.
* **EIGRP Configuration:** Configured EIGRP AS 10 on MIU-GW for the GigabitEthernet0/1 network. Initially attempted configuration on wrong device (Main-MLS) but corrected by moving to MIU-GW.
* **Route Redistribution:** Set up bidirectional redistribution between OSPF and EIGRP on MIU-GW. Encountered syntax error with "default-information out" command but succeeded using "redistribute static" instead.
* **Static Routes:** Configured default routes on MIU-GW and Branch\_GW pointing to ISP, plus three static routes on ISP for return traffic. Verified full network convergence through routing tables.

**Part 5: Configure DHCP Server. (5%)**

**Step1: Configure DHCP Server on Main Branch**

1. Gg
2. Gg
3. Gg
4. Gg

**Step2: Configure a Branch\_GW Router as DHCP Server**

1. Enable

Configure terminal

ip dhcp excluded-address 192.168.2.1 192.168.2.5 to excluded the address in vlan2

ip dhcp excluded-address 192.168.3.1 192.168.3.5 to excluded the address in vlan3

1. Enable

Configure terminal

ip dhcp pool B-LAN2

network 192.168.2.0 255.255.255.0

default-router 192.168.2.1

dns-server 10.0.1.54

exit

ip dhcp pool B-LAN3

network 192.168.3.0 255.255.255.0

default-router 192.168.3.1

dns-server 10.0.1.54

exit

1. A computer screen shot of a number

   AI-generated content may be incorrect.

A screenshot of a computer screen

AI-generated content may be incorrect.pinging from pc 11 to the default server

**Part 6: Configure Dynamic NAT with PAT and Static NAT. (5%)**

**A screenshot of a computer code

AI-generated content may be incorrect.#Step 1:** Configure Dynamic NAT with PAT on **MIU-GW.**The Public IP should use the **third**address from **209.165.200.224/28**address space

**Step 2:** Configure static NAT on **MIU-GW**to map the **miu.edu.eg** server inside address to the **fourth** address from the **209.165.200.224/28**address space.

ip nat inside source static 10.0.1.53 209.165.200.228

show ip nat translations

Pro Inside global Inside local Outside local Outside global

--- 209.165.200.228 10.0.1.53 --- ---

**Step 3:** Configure the interfaces that will participate in NAT.

**Part 7: Configure Network Management Features**

* **NTP Configuration:** Configured all network devices (MIU-GW, Main-MLS, S-MLS, N-MLS, R-MLS, Branch-GW) to use the dedicated NTP server (10.0.1.55) as their time source. Simple configuration using the "ntp server 10.0.1.55" command on each device.
* **Syslog Configuration:** Set up centralized logging on all network devices pointing to the Syslog server (10.0.1.55). Initial attempts to set logging trap level faced syntax issues, so simplified to basic logging configuration with "logging 10.0.1.55" and "logging on" commands.
* **Web Server Configuration:** Set up the web server (10.0.1.53) with HTTP services enabled. Modified the index.html file to display "Misr International University" and reference the MIU logo. Added the domain name "miu.edu.eg" to the website content.
* **Email Server Configuration:** Configured the email server (10.0.1.52) with SMTP and POP3 services enabled. Set the domain name to "miu.edu.eg" to support email addresses with this domain.
* **DNS Server Configuration:** Enabled DNS service on the DNS server (10.0.1.54). Created A records to resolve "miu.edu.eg" to the web server's IP address (10.0.1.53) and "mail.miu.edu.eg" to the email server's IP address (10.0.1.52). Added MX record to direct email traffic for the domain to the mail server.