**Project #6 Case Study and Requirements**

A trading floor Support centre employs 600 staff. They have recently expanded and as a result, need to move to a new building. A building has been identified but has no network. This means that before they can make to move out, new network service needs to be designed and implemented in the new building. Existing Network comprises of the following elements: The new building is expected to have three floors with two departments in each for example;

1. **First floor-** (Sales and Marketing Department-120 users expected, Human Resource and Logistics Department-120 users expected).
2. **Second floor-** (Finance and Accounts Department-120 users expected, Administrator and Public Relations Department-120 users expected).
3. **Third floor-** (ICT-120 users expected, Server Room-12 devices expected).

Therefore, as a key member of the Networks Team, you have been tasked to design a network for the new building. At this stage, logical design is required, which shows the measures that you would put in place to ensure that the new network meets the current business need and is future-proofed:

* Use Cisco Packet Tracer to design and implement the network solution.
* Use hieratical model providing redundancy at every layer i.e. two routers and two multilayer switches are expected to be used to provide redundancy.
* The network is also expected to connect to at least two ISPs to provide redundancy and each router to the connected to the two ISPs.
* Each department is required to have a wireless network for the users.
* Each department should be in a different VLAN and in different subnetwork.
* Provided a base network of **172.16.1.0**, carry out subnetting to allocate the correct number of IP addresses to each department.
* The company network is connected to the static, public IP addresses (Internet Protocol) **195.136.17.0/30**, **195.136.17.4/30**, **195.136.17.8/30** and **195.136.17.12/30** connected to the two Internet providers.
* Configure basic device settings such as hostnames, console password, enable password, banner messages, disable IP domain lookup.
* Devices in all the departments are required to communicate with each other with the respective multilayer switch configured for inter-VLAN routing.
* The Multilayer switches are expected to carry out both routing and switching functionalities thus will be assigned IP addresses.
* All devices in the network are expected to obtain an IP address dynamically from the dedicated DHCP servers located at the server room.
* Devices in the server room are to be allocated IP address statically.
* Use **OSPF** as the routing protocol to advertise routes both on the routers and multilayer switches.
* Configure SSH in all the routers and layer three switches for remote login.
* Configure **port-security** for the Finance and Accounts department to allow only one device to connect to a switchport, use sticky method to obtain mac-address and violation mode shutdown.
* Configure PAT to use the respective outbound router interface IPv4 address, implement the necessary ACL rule.
* Test Communication, ensure everything configured is working as expected.

**Technologies Implemented**

1. Creating a network topology using Cisco Packet Tracer.
2. Hierarchical Network Design.

A diagram of a network

Description automatically generated

1. Connecting Networking devices with Correct cabling.
2. Configuring Basic device settings & Configuring SSH for secure Remote access.

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| **ISP 1 Router**  Router(config)#interface Serial0/0/0  Router(config-if)#no shutdown  Router(config-if)#exit  Router(config)#interface Serial0/0/1  Router(config-if)#exit | **ISP 2 Router**  Router(config)#interface Serial0/0/0  Router(config-if)#no shutdown  Router(config-if)#exit  Router(config)#interface Serial0/0/1  Router(config-if)#no shutdown |
| **Core 1 Router**  Router(config)#interface Serial0/0/0  Router(config-if)#no shutdown  Router(config-if)#exit  Router(config)#interface Serial0/0/1  Router(config-if)#no shutdown  Router(config-if)#exit  Router(config)#interface GigabitEthernet0/0  Router(config-if)#no shutdown  Router(config-if)#exit  Router(config)#interface GigabitEthernet0/1  Router(config-if)#no shutdown  Router(config-if)#exit  Router(config)#hostname CORE-Router1  CORE-Router1(config)#banner motd $No Authorized Access$  CORE-Router1(config)#no ip domain lookup  CORE-Router1(config)#line console 0  CORE-Router1(config-line)#password cisco  CORE-Router1(config-line)#login  CORE-Router1(config-line)#exit  CORE-Router1(config)#enable password cisco  CORE-Router1(config)#service password-encryption  CORE-Router1(config)#exit  CORE-Router1#wr  CORE-Router1(config)#ip domain name cisco.net  CORE-Router1(config)#username admin password cisco  CORE-Router1(config)#crypto key generate rsa  CORE-Router1(config)#line vty 0 15  CORE-Router1(config-line)#login local  CORE-Router1(config-line)#transport input ssh  CORE-Router1(config-line)#exit  CORE-Router1(config)#ip ssh version 2  CORE-Router1(config)#do wr | **Core 2 Router**  Router(config)#interface Serial0/0/0  Router(config-if)#no shutdown  Router(config-if)#exit  Router(config)#interface Serial0/0/1  Router(config-if)#no shutdown  Router(config-if)#exit  Router(config)#interface GigabitEthernet0/0  Router(config-if)#no shutdown  Router(config-if)#exit  Router(config)#interface GigabitEthernet0/1  Router(config-if)#no shutdown  Router(config-if)#exit  Router(config)#hostname CORE-Router2  CORE-Router2(config)#banner motd $No Authorized Access$  CORE-Router2(config)#no ip domain lookup  CORE-Router2(config)#line console 0  CORE-Router2(config-line)#password cisco  CORE-Router2(config-line)#login  CORE-Router2(config-line)#exit  CORE-Router2(config)#enable password cisco  CORE-Router2(config)#service password-encryption  CORE-Router2(config)#exit  CORE-Router2#wr  CORE-Router2(config)#ip domain name cisco.net  CORE-Router2(config)#username admin password cisco  CORE-Router2(config)#crypto key generate rsa  CORE-Router2(config)#line vty 0 15  CORE-Router2(config-line)#login local  CORE-Router2(config-line)#transport input ssh  CORE-Router2(config-line)#exit  CORE-Router2(config)#ip ssh version 2  CORE-Router2(config)#do wr |

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| **Multilayer Switch1**  Switch(config)#hostname Multilayer\_1-Switch  Multilayer\_1-Switch(config)#banner motd $No Authorized Access$  Multilayer\_1-Switch(config)#no ip domain lookup  Multilayer\_1-Switch(config)#line console 0  Multilayer\_1-Switch(config-line)#password cisco  Multilayer\_1-Switch(config-line)#login  Multilayer\_1-Switch(config-line)#exit  Multilayer\_1-Switch(config)#enable password cisco  Multilayer\_1-Switch(config)#service password-encryption  Multilayer\_1-Switch(config)#exit  Multilayer\_1-Switch#wr  Multilayer\_1-Switch(config)#ip domain name cisco.net  Multilayer\_1-Switch(config)#username admin password cisco  Multilayer\_1-Switch(config)#crypto key generate rsa  Multilayer\_1-Switch(config)#line vty 0 15  Multilayer\_1-Switch(config-line)#login local  Multilayer\_1-Switch(config-line)#transport input ssh  Multilayer\_1-Switch(config-line)#exit  Multilayer\_1-Switch(config)#ip ssh version 2  Multilayer\_1-Switch(config)#do wr | **Multilayer Switch2**  Switch(config)#hostname Multilayer\_2-Switch  Multilayer\_2-Switch(config)#banner motd $No Authorized Access$  Multilayer\_2-Switch(config)#no ip domain lookup  Multilayer\_2-Switch(config)#line console 0  Multilayer\_2-Switch(config-line)#password cisco  Multilayer\_2-Switch(config-line)#login  Multilayer\_2-Switch(config-line)#exit  Multilayer\_2-Switch(config)#enable password cisco  Multilayer\_2-Switch(config)#service password-encryption  Multilayer\_2-Switch(config)#exit  Multilayer\_2-Switch#wr  Multilayer\_2-Switch(config)#ip domain name cisco.net  Multilayer\_2-Switch(config)#username admin password cisco  Multilayer\_2-Switch(config)#crypto key generate rsa  Multilayer\_2-Switch(config)#line vty 0 15  Multilayer\_2-Switch(config-line)#login local  Multilayer\_2-Switch(config-line)#transport input ssh  Multilayer\_2-Switch(config-line)#exit  Multilayer\_2-Switch(config)#ip ssh version 2  Multilayer\_2-Switch(config)#do wr |

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| **Sales and Marketing Department Switch (Floor 1)**  Switch(config)#hostname Sales\_and\_Marketing\_Department\_Switch  Sales\_and\_Marketing\_Department\_Switch(config)#banner motd #No Authorized Access#  Sales\_and\_Marketing\_Department\_Switch(config)#no ip domain lookup  Sales\_and\_Marketing\_Department\_Switch(config)#line console 0  Sales\_and\_Marketing\_Department\_Swi(config-line)#password cisco  Sales\_and\_Marketing\_Department\_Swi(config-line)#login  Sales\_and\_Marketing\_Department\_Swi(config-line)#exit  Sales\_and\_Marketing\_Department\_Swi(config-line)#enable password cisco  Sales\_and\_Marketing\_Department\_Switch(config)#service password-encryption  Sales\_and\_Marketing\_Department\_Switch(config)#exit  Sales\_and\_Marketing\_Department\_Switch#wr | **Human Resource and Logistics Department Switch (Floor 1)**  Switch(config)#hostname Human\_Resource\_and\_Logistics\_Department\_Switch  Human\_Resource\_and\_Logistics\_Department(config)#banner motd $No Authorized Access$  Human\_Resource\_and\_Logistics\_Department(config)#no ip domain lookup  Human\_Resource\_and\_Logistics\_Department(config)#line console 0  Human\_Resource\_and\_Logistics\_Depar(config-line)#password cisco  Human\_Resource\_and\_Logistics\_Depar(config-line)#login  Human\_Resource\_and\_Logistics\_Depar(config-line)#exit  Human\_Resource\_and\_Logistics\_Depar(config-line)#enable password cisco  Human\_Resource\_and\_Logistics\_Department(config)#service password-encryption  Human\_Resource\_and\_Logistics\_Department(config)#exit  Human\_Resource\_and\_Logistics\_Department\_Switch#wr |
| **Finance and Accounts Department Switch (Floor 2)**  Switch(config)#hostname Finance\_and\_Account\_Department\_Switch  Finance\_and\_Account\_Department\_Switch(config)#banner motd $No Authorized Access$  Finance\_and\_Account\_Department\_Switch(config)#no ip domain lookup  Finance\_and\_Account\_Department\_Switch(config)#line console 0  Finance\_and\_Account\_Department\_Swi(config-line)#password cisco  Finance\_and\_Account\_Department\_Swi(config-line)#login  Finance\_and\_Account\_Department\_Swi(config-line)#exit  Finance\_and\_Account\_Department\_Switch(config)#enable password cisco  Finance\_and\_Account\_Department\_Switch(config)#service password-encryption  Finance\_and\_Account\_Department\_Switch(config)#exit  Finance\_and\_Account\_Department\_Switch#wr | **Administrator and Public Relations Department Switch (Floor 2)**  Switch(config)#hostname Administrator\_and\_Public\_Relations\_Department\_Switch  Administrator\_and\_Public\_Relations\_Depa(config)#banner motd $No Authorized Access$  Administrator\_and\_Public\_Relations\_Depa(config)#no ip domain lookup  Administrator\_and\_Public\_Relations\_Depa(config)#line console 0  Administrator\_and\_Public\_Relations(config-line)#password cisco  Administrator\_and\_Public\_Relations(config-line)#login  Administrator\_and\_Public\_Relations(config-line)#exit  Administrator\_and\_Public\_Relations\_Depa(config)#enable password cisco  Administrator\_and\_Public\_Relations\_Depa(config)#service password-encryption  Administrator\_and\_Public\_Relations\_Depa(config)#exit  Administrator\_and\_Public\_Relations\_Department\_S#wr |
| **ICT Switch (Floor 3)**  Switch(config)#hostname ICT\_Switch  ICT\_Switch(config)#banner motd $No Authorized Access$  ICT\_Switch(config)#no ip domain lookup  ICT\_Switch(config)#line console 0  ICT\_Switch(config-line)#password cisco  ICT\_Switch(config-line)#login  ICT\_Switch(config-line)#exit  ICT\_Switch(config)#enable password cisco  ICT\_Switch(config)#service password-encryption  ICT\_Switch(config)#exit  ICT\_Switch#wr | **Server Room Switch (Floor 3)**  Switch(config)#hostname Server\_Room\_Switch  Server\_Room\_Switch(config)#banner motd $No Authorized Access$  Server\_Room\_Switch(config)#no ip domain lookup  Server\_Room\_Switch(config)#line console 0  Server\_Room\_Switch(config-line)#password cisco  Server\_Room\_Switch(config-line)#login  Server\_Room\_Switch(config-line)#exit  Server\_Room\_Switch(config)#enable password cisco  Server\_Room\_Switch(config)#service password-encryption  Server\_Room\_Switch(config)#exit  Server\_Room\_Switch#wr |

1. Creating VLANs and assigning ports VLAN numbers.

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| **Multilayer Switch 1**  Multilayer\_1-Switch(config)#interface range gigabitEthernet1/0/3-8  Multilayer\_1-Switch(config-if-range)#switchport mode trunk  Multilayer\_1-Switch(config-if-range)#exit  Multilayer\_1-Switch(config)#do wr  Multilayer\_1-Switch(config)#interface range gigabitEthernet 1/0/3-8  Multilayer\_1-Switch(config-if-range)#switchport mode trunk  Multilayer\_1-Switch(config-if-range)#vlan 10  Multilayer\_1-Switch(config-vlan)#name Sales&Marketing  Multilayer\_1-Switch(config-vlan)#vlan 20  Multilayer\_1-Switch(config-vlan)#name HR&Logistic  Multilayer\_1-Switch(config-vlan)#vlan 30  Multilayer\_1-Switch(config-vlan)#name Finance&Account  Multilayer\_1-Switch(config-vlan)#vlan 40  Multilayer\_1-Switch(config-vlan)#name Administrator&Public  Multilayer\_1-Switch(config-vlan)#vlan 50  Multilayer\_1-Switch(config-vlan)#name ICT  Multilayer\_1-Switch(config-vlan)#vlan 60  Multilayer\_1-Switch(config-vlan)#name SERVER  Multilayer\_1-Switch(config-vlan)#exit  Multilayer\_1-Switch(config)#do wr | **Multilayer Switch 2**  Multilayer\_2-Switch(config)#interface range gigabitEthernet1/0/3-8  Multilayer\_2-Switch(config-if-range)#switchport mode trunk  Multilayer\_2-Switch(config-if-range)#exit  Multilayer\_2-Switch(config)#do wr  Multilayer\_2-Switch(config)#interface range gigabitEthernet 1/0/3-8  Multilayer\_2-Switch(config-if-range)#switchport mode trunk  Multilayer\_2-Switch(config-if-range)#vlan 10  Multilayer\_2-Switch(config-vlan)#name Sales&Marketing  Multilayer\_2-Switch(config-vlan)#vlan 20  Multilayer\_2-Switch(config-vlan)#name HR&Logistic  Multilayer\_2-Switch(config-vlan)#vlan 30  Multilayer\_2-Switch(config-vlan)#name Finance&Account  Multilayer\_2-Switch(config-vlan)#vlan 40  Multilayer\_2-Switch(config-vlan)#name Administrator&Public  Multilayer\_2-Switch(config-vlan)#vlan 50  Multilayer\_2-Switch(config-vlan)#name ICT  Multilayer\_2-Switch(config-vlan)#vlan 60  Multilayer\_2-Switch(config-vlan)#name SERVER  Multilayer\_2-Switch(config-vlan)#exit  Multilayer\_2-Switch(config)#do wr |

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| **Sales and Marketing Department Switch (Floor 1)**  Sales\_and\_Marketing\_Department\_Switch(config)#interface range gigabitEthernet 0/1-2  Sales\_and\_Marketing\_Department(config-if-range)#switchport mode trunk  Sales\_and\_Marketing\_Department(config-if-range)#exit  Sales\_and\_Marketing\_Department\_Switch(config)#vlan 10  Sales\_and\_Marketing\_Department\_Swi(config-vlan)#name Sales&Marketing  Sales\_and\_Marketing\_Department\_Swi(config-vlan)#exit  Sales\_and\_Marketing\_Department\_Switch(config)#interface range fastEthernet 0/1-24  Sales\_and\_Marketing\_Department(config-if-range)#switchport mode access  Sales\_and\_Marketing\_Department(config-if-range)#switchport access vlan 10  Sales\_and\_Marketing\_Department(config-if-range)#exit  Sales\_and\_Marketing\_Department\_Switch(config)#do wr | **Human Resource and Logistics Department Switch (Floor 1)**  Human\_Resource\_and\_Logistics\_Department(config)#interface range gigabitEthernet 0/1-2  Human\_Resource\_and\_Logistics\_D(config-if-range)#switchport mode trunk  Human\_Resource\_and\_Logistics\_D(config-if-range)#exit  Human\_Resource\_and\_Logistics\_Department(config)#vlan 20  Human\_Resource\_and\_Logistics\_Depar(config-vlan)#name HR&Logistic  Human\_Resource\_and\_Logistics\_Depar(config-vlan)#exit  Human\_Resource\_and\_Logistics\_Department(config)#interface range fastEthernet 0/1-24  Human\_Resource\_and\_Logistics\_D(config-if-range)#switchport mode access  Human\_Resource\_and\_Logistics\_D(config-if-range)#switchport access vlan 20  Human\_Resource\_and\_Logistics\_D(config-if-range)#exit  Human\_Resource\_and\_Logistics\_Department(config)#do wr |
| **Finance and Accounts Department Switch (Floor 2)**  Finance\_and\_Account\_Department\_Switch(config)#interface range gigabitEthernet 0/1-2  Finance\_and\_Account\_Department(config-if-range)#switchport mode trunk  Finance\_and\_Account\_Department(config-if-range)#exit  Finance\_and\_Account\_Department\_Switch(config)#vlan 30  Finance\_and\_Account\_Department\_Swi(config-vlan)#name Finance&Account  Finance\_and\_Account\_Department\_Swi(config-vlan)#exit  Finance\_and\_Account\_Department\_Switch(config)#interface range fastEthernet 0/1-24  Finance\_and\_Account\_Department(config-if-range)#switchport mode access  Finance\_and\_Account\_Department(config-if-range)#switchport access vlan 30  Finance\_and\_Account\_Department(config-if-range)#exit  Finance\_and\_Account\_Department\_Switch(config)#do wr | **Administrator and Public Relations Department Switch (Floor 2)**  Administrator\_and\_Public\_Relations\_Depa(config)#interface range gigabitEthernet 0/1-2  Administrator\_and\_Public\_Relat(config-if-range)#switchport mode trunk  Administrator\_and\_Public\_Relat(config-if-range)#exit  Administrator\_and\_Public\_Relations\_Depa(config)#vlan 40  Administrator\_and\_Public\_Relations(config-vlan)#name Administrator&Public  Administrator\_and\_Public\_Relations(config-vlan)#exit  Administrator\_and\_Public\_Relations\_Depa(config)#interface range fastEthernet 0/1-24  Administrator\_and\_Public\_Relat(config-if-range)#switchport mode access  Administrator\_and\_Public\_Relat(config-if-range)#switchport access vlan 40  Administrator\_and\_Public\_Relat(config-if-range)#exit  Administrator\_and\_Public\_Relations\_Depa(config)#do wr |
| **ICT Switch (Floor 3)**  ICT\_Switch(config)#interface range gigabitEthernet 0/1-2  ICT\_Switch(config-if-range)#switchport mode trunk  ICT\_Switch(config-if-range)#exit  ICT\_Switch(config)#vlan 50  ICT\_Switch(config-vlan)#name ICT  ICT\_Switch(config-vlan)#exit  ICT\_Switch(config)#interface range fastEthernet 0/1-24  ICT\_Switch(config-if-range)#switchport mode access  ICT\_Switch(config-if-range)#switchport access vlan 50  ICT\_Switch(config-if-range)#exit  ICT\_Switch(config)#do wr | **Server Room Switch (Floor 3)**  Server\_Room\_Switch(config)#interface gigabitEthernet 0/1  Server\_Room\_Switch(config-if)#switchport mode trunk  Server\_Room\_Switch(config-if)#exit  Server\_Room\_Switch(config)#interface gigabitEthernet 1/1  Server\_Room\_Switch(config-if)#switchport mode trunk  Server\_Room\_Switch(config-if)#exit  Server\_Room\_Switch(config)#vlan 60  Server\_Room\_Switch(config-vlan)#name SERVER  Server\_Room\_Switch(config-vlan)#exit  Server\_Room\_Switch(config)#interface gigabitEthernet 2/1  Server\_Room\_Switch(config-if)#switchport mode access  Server\_Room\_Switch(config-if)#switchport access vlan 60  Server\_Room\_Switch(config-if)#exit  Server\_Room\_Switch(config)#interface gigabitEthernet 3/1  Server\_Room\_Switch(config-if)#switchport mode access  Server\_Room\_Switch(config-if)#switchport access vlan 60  Server\_Room\_Switch(config-if)#exit  Server\_Room\_Switch(config)#interface gigabitEthernet 4/1  Server\_Room\_Switch(config-if)#switchport mode access  Server\_Room\_Switch(config-if)#switchport access vlan 60  Server\_Room\_Switch(config-if)#exit  Server\_Room\_Switch(config)#interface gigabitEthernet 5/1  Server\_Room\_Switch(config-if)#switchport mode access  Server\_Room\_Switch(config-if)#switchport access vlan 60  Server\_Room\_Switch(config-if)#exit  Server\_Room\_Switch(config)#interface gigabitEthernet 6/1  Server\_Room\_Switch(config-if)#switchport mode access  Server\_Room\_Switch(config-if)#switchport access vlan 60  Server\_Room\_Switch(config-if)#exit  Server\_Room\_Switch(config)#interface gigabitEthernet 7/1  Server\_Room\_Switch(config-if)#switchport mode access  Server\_Room\_Switch(config-if)#switchport access vlan 60  Server\_Room\_Switch(config-if)#exit  Server\_Room\_Switch(config)#interface gigabitEthernet 8/1  Server\_Room\_Switch(config-if)#switchport mode access  Server\_Room\_Switch(config-if)#switchport access vlan 60  Server\_Room\_Switch(config-if)#exit  Server\_Room\_Switch(config)#interface gigabitEthernet 9/1  Server\_Room\_Switch(config-if)#switchport mode access  Server\_Room\_Switch(config-if)#switchport access vlan 60  Server\_Room\_Switch(config-if)#exit  Server\_Room\_Switch(config)#do wr |

1. Subnetting and IP Addressing.

**First Floor**

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| **Department** | **Network Address** | **Subnet Mask** | **Host Address Range** | **Broadcast Address** |
| Sales & Marketing | 172.16.1.0 | 255.255.255.128/25 | 172.16.1.1-126 | 172.16.1.127 |
| HR & Logistic | 172.16.1.128 | 255.255.255.128/25 | 172.16.1.129-254 | 172.16.1.255 |

**Second Floor**

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| **Department** | **Network Address** | **Subnet Mask** | **Host Address Range** | **Broadcast Address** |
| Finance & Accounts | 172.16.2.0 | 255.255.255.128/25 | 172.16.2.1-126 | 172.16.2.127 |
| Admin & Public | 172.16.2.128 | 255.255.255.128/25 | 172.16.2.129-254 | 172.16.2.255 |

**Third Floor**

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| **Department** | **Network Address** | **Subnet Mask** | **Host Address Range** | **Broadcast Address** |
| ICT | 172.16.3.0 | 255.255.255.128/25 | 172.16.3.1-126 | 172.16.3.127 |
| Server Room | 172.16.3.128 | 255.255.255.128/25 | 172.16.3.129-254 | 172.16.3.255 |

**Between the Routers and Layer-3 Switches**

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| **No.** | **Network Address** | **Subnet Mask** | **Host Address Range** | **Broadcast Address** |
| R1 – MLSW - 1 | 172.16.3.144 | 255.255.255.252 | 172.16.3.145-146 | 172.16.3.147 |
| R1 – MLSW - 2 | 172.16.3.148 | 255.255.255.252 | 172.16.3.149-150 | 172.16.3.151 |
| R2 – MLSW – 1 | 172.16.3.152 | 255.255.255.252 | 172.16.3.153-154 | 172.16.3.155 |
| R2 – MLSW – 2 | 172.16.3.156 | 255.255.255.252 | 172.16.3.157-158 | 172.16.3.159 |

**Between the Routers and ISP**

Public IP address 195.136.17.0/30, 195.136.17.4/30, 195.136.17.8/30, 195.136.17.12/30

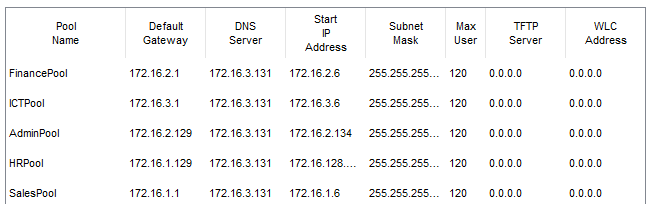
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| **Core 1 Router**  CORE-Router1(config)#interface GigabitEthernet0/0  CORE-Router1(config-if)#ip address 172.16.3.146 255.255.255.252  CORE-Router1(config-if)#no shutdown  CORE-Router1(config-if)#exit  CORE-Router1(config)#do wr  CORE-Router1(config)#interface GigabitEthernet0/1  CORE-Router1(config-if)#ip address 172.16.3.154 255.255.255.252  CORE-Router1(config-if)#no shutdown  CORE-Router1(config-if)#exit  CORE-Router1(config)#do wr  CORE-Router1(config)#interface serial 0/0/0  CORE-Router1(config-if)#ip address 195.136.17.1 255.255.255.252  CORE-Router1(config-if)#no shutdown  CORE-Router1(config-if)#exit  CORE-Router1(config)#do wr  CORE-Router1(config)#interface serial 0/0/1  CORE-Router1(config-if)#ip address 195.136.17.5 255.255.255.252  CORE-Router1(config-if)#no shutdown  CORE-Router1(config-if)#exit  CORE-Router1(config)#do wr | **Core 1 Router**  CORE-Router2(config)#interface GigabitEthernet0/0  CORE-Router2(config-if)#ip address 172.16.3.158 255.255.255.252  CORE-Router2(config-if)#no shutdown  CORE-Router2(config-if)#exit  CORE-Router2(config)#do wr  CORE-Router2(config)#interface GigabitEthernet0/1  CORE-Router2(config-if)#ip address 172.16.3.150 255.255.255.252  CORE-Router2(config-if)#no shutdown  CORE-Router2(config-if)#exit  CORE-Router2(config)#do wr  CORE-Router2(config)#interface serial 0/0/0  CORE-Router2(config-if)#ip address 195.136.17.13 255.255.255.252  CORE-Router2(config-if)#no shutdown  CORE-Router2(config-if)#exit  CORE-Router2(config)#do wr  CORE-Router2(config)#interface serial 0/0/1  CORE-Router2(config-if)#ip address 195.136.17.9 255.255.255.252  CORE-Router2(config-if)#no shutdown  CORE-Router2(config-if)#exit  CORE-Router2(config)#do wr |

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| **Multilayer Switch 1**  Multilayer\_1-Switch(config)#interface range gigabitEthernet 1/0/1-2  Multilayer\_1-Switch(config-if-range)#no switchport  Multilayer\_1-Switch(config-if-range)#exit  Multilayer\_1-Switch(config)#do wr  Multilayer\_1-Switch(config)#interface gigabitEthernet 1/0/1  Multilayer\_1-Switch(config-if)#ip address 172.16.3.145 255.255.255.252  Multilayer\_1-Switch(config-if)#no shutdown  Multilayer\_1-Switch(config-if)#exit  Multilayer\_1-Switch(config)#do wr  Multilayer\_1-Switch(config)#interface GigabitEthernet1/0/2  Multilayer\_1-Switch(config-if)#ip address 172.16.3.149 255.255.255.252  Multilayer\_1-Switch(config-if)#no shutdown  Multilayer\_1-Switch(config-if)#exit  Multilayer\_1-Switch(config)#do wr | **Multilayer Switch 2**  Multilayer\_2-Switch(config)#interface range gigabitEthernet 1/0/1-2  Multilayer\_2-Switch(config-if-range)#no switchport  Multilayer\_2-Switch(config-if-range)#exit  Multilayer\_2-Switch(config)#do wr  Multilayer\_2-Switch(config)#interface GigabitEthernet1/0/1  Multilayer\_2-Switch(config-if)#ip address 172.16.3.157 255.255.255.252  Multilayer\_1-Switch(config-if)#no shutdown  Multilayer\_2-Switch(config-if)#exit  Multilayer\_2-Switch(config)#do wr  Multilayer\_2-Switch(config)#interface GigabitEthernet1/0/2  Multilayer\_2-Switch(config-if)#ip address 172.16.3.153 255.255.255.252  Multilayer\_2-Switch(config-if)#no shutdown  Multilayer\_2-Switch(config-if)#exit  Multilayer\_2-Switch(config)#do wr |

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

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| **Multilayer Switch 1**  Multilayer\_1-Switch(config)#interface vlan 10  Multilayer\_1-Switch(config-if)#no shutdown  Multilayer\_1-Switch(config-if)#ip address 172.16.1.1 255.255.255.128  Multilayer\_1-Switch(config-if)#ip helper-address 172.16.3.130  Multilayer\_1-Switch(config-if)#exit  Multilayer\_1-Switch(config)#interface vlan 20  Multilayer\_1-Switch(config-if)#no shutdown  Multilayer\_1-Switch(config-if)#ip address 172.16.1.129 255.255.255.128  Multilayer\_1-Switch(config-if)#ip helper-address 172.16.3.130  Multilayer\_1-Switch(config-if)#exit  Multilayer\_1-Switch(config)#interface vlan 30  Multilayer\_1-Switch(config-if)#no shutdown  Multilayer\_1-Switch(config-if)#ip address 172.16.2.1 255.255.255.128  Multilayer\_1-Switch(config-if)#ip helper-address 172.16.3.130  Multilayer\_1-Switch(config-if)#exit  Multilayer\_1-Switch(config)#interface vlan 40  Multilayer\_1-Switch(config-if)#no shutdown  Multilayer\_1-Switch(config-if)#ip address 172.16.2.129 255.255.255.128  Multilayer\_1-Switch(config-if)#ip helper-address 172.16.3.130  Multilayer\_1-Switch(config-if)#exit  Multilayer\_1-Switch(config)#interface vlan 50  Multilayer\_1-Switch(config-if)#no shutdown  Multilayer\_1-Switch(config-if)#ip address 172.16.3.1 255.255.255.128  Multilayer\_1-Switch(config-if)#ip helper-address 172.16.3.130  Multilayer\_1-Switch(config-if)#exit  Multilayer\_1-Switch(config)#interface vlan 60  Multilayer\_1-Switch(config-if)#no shutdown  Multilayer\_1-Switch(config-if)#ip address 172.16.3.129 255.255.255.240  Multilayer\_1-Switch(config-if)#ip helper-address 172.16.3.130  Multilayer\_1-Switch(config-if)#exit  Multilayer\_1-Switch(config)#do wr | **Multilayer Switch 2**  Multilayer\_2-Switch(config)#interface vlan 10  Multilayer\_2-Switch(config-if)#no shutdown  Multilayer\_2-Switch(config-if)#ip address 172.16.1.1 255.255.255.128  Multilayer\_2-Switch(config-if)#ip helper-address 172.16.3.130  Multilayer\_2-Switch(config-if)#exit  Multilayer\_2-Switch(config)#interface vlan 20  Multilayer\_2-Switch(config-if)#no shutdown  Multilayer\_2-Switch(config-if)#ip address 172.16.1.129 255.255.255.128  Multilayer\_2-Switch(config-if)#ip helper-address 172.16.3.130  Multilayer\_2-Switch(config-if)#exit  Multilayer\_2-Switch(config)#interface vlan 30  Multilayer\_2-Switch(config-if)#no shutdown  Multilayer\_2-Switch(config-if)#ip address 172.16.2.1 255.255.255.128  Multilayer\_2-Switch(config-if)#ip helper-address 172.16.3.130  Multilayer\_2-Switch(config-if)#exit  Multilayer\_2-Switch(config)#interface vlan 40  Multilayer\_2-Switch(config-if)#no shutdown  Multilayer\_2-Switch(config-if)#ip address 172.16.2.129 255.255.255.128  Multilayer\_2-Switch(config-if)#ip helper-address 172.16.3.130  Multilayer\_2-Switch(config-if)#exit  Multilayer\_2-Switch(config)#interface vlan 50  Multilayer\_2-Switch(config-if)#no shutdown  Multilayer\_2-Switch(config-if)#ip address 172.16.3.1 255.255.255.128  Multilayer\_2-Switch(config-if)#ip helper-address 172.16.3.130  Multilayer\_2-Switch(config-if)#exit  Multilayer\_2-Switch(config)#interface vlan 60  Multilayer\_2-Switch(config-if)#no shutdown  Multilayer\_2-Switch(config-if)#ip address 172.16.3.129 255.255.255.240  Multilayer\_2-Switch(config-if)#ip helper-address 172.16.3.130  Multilayer\_2-Switch(config-if)#exit  Multilayer\_2-Switch(config)#do wr |

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



1. Configuring OSPF as the routing protocol.

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| **Core 1 Router**  CORE-Router1(config)#router ospf 10  CORE-Router1(config-router)#router-id 3.3.3.3  CORE-Router1(config-router)#network 195.136.17.4 0.0.0.3 area 0  CORE-Router1(config-router)#network 195.136.17.0 0.0.0.3 area 0  CORE-Router1(config-router)#network 172.13.3.144 0.0.0.3 area 0  CORE-Router1(config-router)#network 172.13.3.152 0.0.0.3 area 0  CORE-Router1(config-router)#exit  CORE-Router1(config)#do wr | **Core 2 Router**  CORE-Router2(config)#router ospf 10  CORE-Router2(config-router)#router-id 4.4.4.4  CORE-Router2(config-router)#network 195.136.17.8 0.0.0.3 area 0  CORE-Router2(config-router)#network 195.136.17.12 0.0.0.3 area 0  CORE-Router2(config-router)#network 172.13.3.148 0.0.0.3 area 0  CORE-Router2(config-router)#network 172.13.3.156 0.0.0.3 area 0  CORE-Router2(config-router)#exit  CORE-Router2(config)#do wr |

1. Configuring NAT Overload (Port Address Translation PAT).

A close up of a computer screen

Description automatically generated

1. Configuring standard and extended Access Control Lists ACL.

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| **Core 1 Router**  CORE-Router1(config)#ip nat inside source list 1 interface serial 0/0/0 overload  CORE-Router1(config)#ip nat inside source list 1 interface serial 0/0/1 overload  CORE-Router1(config)#access-list 1 permit 172.16.1.0 0.0.0.127  CORE-Router1(config)#access-list 1 permit 172.16.1.128 0.0.0.127  CORE-Router1(config)#access-list 1 permit 172.16.2.0 0.0.0.127  CORE-Router1(config)#access-list 1 permit 172.16.2.128 0.0.0.127  CORE-Router1(config)#access-list 1 permit 172.16.3.0 0.0.0.127  CORE-Router1(config)#access-list 1 permit 172.16.3.128 0.0.0.15  CORE-Router1(config)#interface range gigabitEthernet 0/0-1  CORE-Router1(config-if-range)#ip nat inside  CORE-Router1(config-if-range)#exit  CORE-Router1(config)#interface Serial0/0/0  CORE-Router1(config-if)#ip nat outside  CORE-Router1(config-if)#exit  CORE-Router1(config)#interface Serial0/0/1  CORE-Router1(config-if)#ip nat outside  CORE-Router1(config-if)#exit  CORE-Router1(config)#do wr | **Core 2 Router**  CORE-Router2(config)#ip nat inside source list 1 interface serial 0/0/0 overload  CORE-Router2(config)#ip nat inside source list 1 interface serial 0/0/1 overload  CORE-Router2(config)#access-list 1 permit 172.16.1.0 0.0.0.127  CORE-Router2(config)#access-list 1 permit 172.16.1.128 0.0.0.127  CORE-Router2(config)#access-list 1 permit 172.16.2.0 0.0.0.127  CORE-Router2(config)#access-list 1 permit 172.16.2.128 0.0.0.127  CORE-Router2(config)#access-list 1 permit 172.16.3.0 0.0.0.127  CORE-Router2(config)#access-list 1 permit 172.16.3.128 0.0.0.15  CORE-Router2(config)#interface range gigabitEthernet 0/0-1  CORE-Router2(config-if-range)#ip nat inside  CORE-Router2(config-if-range)#exit  ORE-Router2(config)#interface Serial0/0/0  CORE-Router2(config-if)#ip nat outside  CORE-Router2(config-if)#exit  CORE-Router2(config)#interface Serial0/0/1  CORE-Router2(config-if)#ip nat outside  CORE-Router2(config-if)#exit  CORE-Router2(config)#do wr |

1. Test and Verifying Network Communication.