**VoIP-IP Telephony System Network Design and Implementation**

**Problem:**

Turtle Consultancy Limited specialised in delivering IT infrastructure solutions to medium sized organizations worldwide. With the expansion of the company, a newly acquired branch needs a network. Your manager is faced with the demands of business and a plethora of technology challenges.

You have been recently hired as a Network Engineer and assigned the task of designing and implementing a VoIP network that is based on the requirements and specifications outlined by your manager.

All desktops have an associated telephone set (each PC is connecting directly to a Phone, not a switch). The network consists of four servers (DHCP, EMAIL, DNS,HTTP) located at the server side site and is fully configured for the operations, and all servers are shared between all users.

Each group has been assigned the task of designing, and implementing a network infrastructure for Turtle Consultancy Limited by internetworking three departments which are as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Department | Phones | PCs | Printer | Servers |
| Finance | 20 | 20 | 1 | 0 |
| HR | 20 | 20 | 1 | 0 |
| Sales | 20 | 20 | 1 | 0 |
| ICT | 20 | 20 | 1 | 0 |
| Server Room | 0 | 0 | 0 | 4(DHCP, EMAIL, DNS, HTTP) |

The IT Manager emphasized scalability and availability, and hence you are required to provide a complete network infrastructure design and implementation. Turtle Consultancy Limited will be using the following IP address: 192.168.100.0/24 for Data, 172.16.100.0/24 for Voice, and 10.10.10.0/24 between the routers.

1. Design a networked system to meet the given specifications. Use packet tracer software to design your network.
2. **Routers**: Each department is to have VoIP enabled router with server-side LAN attached to the ICT department router. Note: use Cisco 2811 router.
3. **Switches**: Each department has an access layer switch. Note: use Cisco 2960 switch.
4. **Connections**: Use serial connections between a router and a router, then a straight through cable between the router to switch, switch to hosts, phones to PCs.
5. **Subnets**: Each department will be accessing two subnetworks, for example, data and voice subnets. Note: carry out appropriate subnetting.
6. **Basic settings**: Configure basic device settings such as hostnames, console passwords, enable passwords, banner messages, encrypt all passwords, and disable IP domain lookup.
7. **DHCP Server**: For voice (VoIP), use the respective router as the DHCP server while for Data use the DHCP server device at the server-side site.
8. **VLANs**: Each department will be in two VLANS. One for data and another for voice. Note: All IP phones in the network should be in VLAN 100.
9. **Inter-VLAN Routing**: Use router-on-a-stick to enable inter-VLAN routing on the network. Note: create sub interfaces for both data and voice VLANs.
10. **IP Addressing**: All devices in the network are expected to obtain an IP address dynamically from the respective DHCP servers while the devices in the server room are to be allocated IP addresses statically.
11. **Routing protocol**: Use OSPF as the routing protocol to advertise routes on the routers.
12. **Remote Access**: Configure SSH in all the routers for remote login.
13. **Telephony service**: Configure VoIP on the routers and allocate dial numbers in this format for the departments, Finance(1..), HR (2..), Sales (3..), and ICT (4..), (where 1.. can be 101 to 199) and so on.
14. **Routing for VoIP**: Configure dial-peering on the routers to allow IP phones from different routers to communicate.
15. **Finalize**: Test Communication, ensure everything configured is working as expected.

**Solution:**

**Note:**

**1. Data Network**: 192.168.100.0/24 (for PCs and other devices)

We have four departments with 20 PCs, 1 printer each, and servers in the Server Room. We can subnet the data network based on department size.

**Subnetting Plan for Data (PCs and Printers):**

We need four subnets for Finance, HR, Sales, and ICT. Each department has 20 PCs, 1 printer, and one additional for server room for only server. Hence, we required 4 subnets and 1 different subnet.

* Each department requires a minimum of 21 IP addresses (20 PCs + 1 printer).
* So, we need at least 21 usable IP addresses per subnet + 2 additional IPs for the network address and broadcast address.
* Hence, we required total 23 IP addresses per subnet.
* The formula to determine the number of IP addresses for a subnet is: Number of IPs = 2^Number of host bits
* So, the next power of 2 greater than or equal to 23 is 32. So, we need a subnet that provides at least IP addresses. example: a. 2^4 = 16 this is less than needed hence not accepted. b. 2^5 = 32 this is greater than needed hence it can be acceptable.
* Hence, here 5 is number of host bits. Hence, we need to borrow 8-5 = 3 bits from host.
* To accommodate this, we can use a /27 subnet (which gives 32 IP addresses). i.e. [11111111.11111111.11111111.11100000]
* Note: For Server room, we required 4 Server i.e 4 Usable IP + 2 additional IPs for the network address and broadcast address hence total 6 IPs.
* So, the next power of 2 greater than or equal to 6 is 8. So, we need a subnet that provides at least IP addresses. example: a. 2^2 = 4 this is less than needed hence not accepted. b. 2^3 = 8 this is greater than needed hence it can be acceptable.
* Hence, here 3 is number of host bits. Hence, We need to borrow 8-3 = 5 bits from host.
* To accommodate this, we can use a /29 subnet (which gives 8 IP addresses). i.e. [11111111.11111111.11111111.11111000]

1. **Here is the subnetting information For Base Address 192.168.100.0 i.e. for Data Network:**
2. **Finance Department (Data Network)**

* VLAN: 10
* Network ID: 192.168.100.0
* Usable IPs: 192.168.100.1 - 30
* Broadcast Address: 192.168.100.31
* Subnet Mask: 255.255.255.224 (/27)

1. **HR Department (Data Network)**

* VLAN: 20
* Network ID: 192.168.100.32
* Usable IPs: 192.168.100.33 - 62
* Broadcast Address: 192.168.100.63
* Subnet Mask: 255.255.255.224 (/27)

1. **Sales Department (Data Network)**

* VLAN: 30
* Network ID: 192.168.100.64
* Usable IPs: 192.168.100.65 - 94
* Broadcast Address: 192.168.100.95
* Subnet Mask: 255.255.255.224 (/27)

1. **ICT Department (Data Network)**

* VLAN: 40
* Network ID: 192.168.100.96
* Usable IPs: 192.168.100.97 - 126
* Broadcast Address: 192.168.100.127
* Subnet Mask: 255.255.255.224 (/27)

1. **Server Room (Data Network)**

* VLAN: 50
* Network ID: 192.168.100.128
* Usable IPs: 192.168.100.129 - 134
* Broadcast Address: 192.168.100.135
* Subnet Mask: 255.255.255.248 (/29)

1. **Here is the subnetting information For Base Address 172.16.100.0 i.e for Voice Network:**
2. **Finance Department (Voice Network)**

* VLAN: 100
* Network ID: 172.16.100.0
* Usable IPs: 172.16.100.1 - 30
* Broadcast Address: 172.16.100.31
* Subnet Mask: 255.255.255.224 (/27)

1. **HR Department (Voice Network)**

* VLAN: 100
* Network ID: 172.16.100.32
* Usable IPs: 172.16.100.33 - 62
* Broadcast Address: 172.16.100.63
* Subnet Mask: 255.255.255.224 (/27)

1. **Sales Department (Voice Network)**

* VLAN: 100
* Network ID: 172.16.100.64
* Usable IPs: 172.16.100.65 - 94
* Broadcast Address: 172.16.100.95
* Subnet Mask: 255.255.255.224 (/27)

1. **ICT Department (Voice Network)**

* VLAN: 100
* Network ID: 172.16.100.96
* Usable IPs: 172.16.100.97 - 126
* Broadcast Address: 172.16.100.127
* Subnet Mask: 255.255.255.224 (/27)

1. **Here is the subnetting information For Base Address 10.10.10.0 i.e for Inter-Router Network:**
2. **Link 1**

* Network ID: 10.10.10.0
* Usable IPs: 10.10.10.1 - 2
* Broadcast Address: 10.10.10.3
* Subnet Mask: 255.255.255.252 (/30)

1. **Link 2**

* Network ID: 10.10.10.4
* Usable IPs: 10.10.10.5 - 6
* Broadcast Address: 10.10.10.7
* Subnet Mask: 255.255.255.252 (/30)

1. **Link 3**

* Network ID: 10.10.10.8
* Usable IPs: 10.10.10.9 - 10
* Broadcast Address: 10.10.10.11
* Subnet Mask: 255.255.255.252 (/30)

1. **Link 4**

* Network ID: 10.10.10.12
* Usable IPs: 10.10.10.13 - 14
* Broadcast Address: 10.10.10.15
* Subnet Mask: 255.255.255.252 (/30)

**All Configuration**

**Finance-Router:**

Router>en

Router#conf t

**#Set the hostname**

Router(config)#hostname Finance-Router

**#Set console password**

Finance-Router(config)#line console 0

Finance-Router(config-line)#password finance

Finance-Router(config-line)#login

Finance-Router(config-line)#exit

**#Set enable secret password for privileged EXEC mode**

Finance-Router(config)#enable secret finance

**#Enable password encryption for all passwords**

Finance-Router(config)#service password-encryption

**#Configure banner for unauthorized access warning**

Finance-Router(config)#banner motd # Unauthorized access is prohibited. #

**#Disable domain name lookup to prevent delays caused by incorrect commands**

Finance-Router(config)#no ip domain-lookup

**#Configure SSH**

Finance-Router(config)#ip domain-name finance.com

**#Generate RSA key pairs for SSH encryption**

Finance-Router(config)#crypto key generate rsa

How many bits in the modulus [512]: 1024

**#Enable SSH version 2**

Finance-Router(config)#ip ssh version 2

**#Create a local user for SSH access**

Finance-Router(config)#username finance secret finance

**#Configure VTY lines to accept only SSH connections**

Finance-Router(config)#line vty 0 4

Finance-Router(config-line)#transport input ssh

Finance-Router(config-line)#login local

Finance-Router(config-line)#exit

**#Set SSH time-out and retries to improve security**

Finance-Router(config)#ip ssh time-out 60

Finance-Router(config)#ip ssh authentication-retries 3

Finance-Router(config)#do wr

Finance-Router(config)#exit

**#Up the link**

Finance-Router(config)#int fa 0/0

Finance-Router(config-if)#no shutdown

Finance-Router(config-if)#do wr

Finance-Router(config-if)#exit

Finance-Router(config)#int fa 0/1

Finance-Router(config-if)#no shutdown

Finance-Router(config-if)#do wr

Finance-Router(config-if)#exit

Finance-Router(config)#int se 0/0/0

Finance-Router(config-if)#no shutdown

Finance-Router(config-if)#clock rate 64000

Finance-Router(config-if)#do wr

Finance-Router(config-if)#exit

Finance-Router(config)#int se 0/0/1

Finance-Router(config-if)#no shutdown

Finance-Router(config-if)#do wr

Finance-Router(config-if)#exit

**#Assinging IP Address to port**

Finance-Router(config)#int se 0/0/0

Finance-Router(config-if)#ip address 10.10.10.1 255.255.255.252

Finance-Router(config-if)#exit

Finance-Router(config)#int se 0/0/1

Finance-Router(config-if)#ip address 10.10.10.14 255.255.255.252

Finance-Router(config-if)#exit

Finance-Router(config)#do wr

Finance-Router(config)#exit

**#Configure DHCP For Voice**

Finance-Router(config)#service dhcp

Finance-Router(config)#ip dhcp pool finance\_voice\_pool

Finance-Router(dhcp-config)#network 172.16.100.0 255.255.255.224

Finance-Router(dhcp-config)#default-router 172.16.100.1

Finance-Router(dhcp-config)#dns-server 192.168.100.131

Finance-Router(dhcp-config)#option 150 ip 172.16.100.1

Finance-Router(dhcp-config)#exit

Finance-Router(config)#ip dhcp excluded-address 172.16.100.1

Finance-Router(config)#do wr

Finance-Router(config)#exit

**#Inter-Vlan Routing [Create Sub-interfaces] + Assign IP DHCP Helper Address for Data**

Finance-Router(config)#int fa0/0.10

Finance-Router(config-subif)#encapsulation dot1Q 10

Finance-Router(config-subif)#ip address 192.168.100.1 255.255.255.224

Finance-Router(config-subif)#ip helper-address 192.168.100.130

Finance-Router(config-subif)#exit

Finance-Router(config)#int fa0/0.100

Finance-Router(config-subif)#encapsulation dot1Q 100

Finance-Router(config-subif)#ip address 172.16.100.1 255.255.255.224

Finance-Router(config-subif)#exit

Finance-Router(config)#do wr

Finance-Router(config)#exit

**#Enable Routing Protocol (OSPF)**

Finance-Router(config)#router ospf 10

Finance-Router(config-router)#network 10.10.10.0 0.0.0.3 area 0

Finance-Router(config-router)#network 10.10.10.12 0.0.0.3 area 0

Finance-Router(config-router)#network 192.168.100.0 0.0.0.31 area 0

Finance-Router(config-router)#network 172.16.100.0 0.0.0.31 area 0

Finance-Router(config-router)#exit

Finance-Router(config)#do wr

Finance-Router(config)#exit

**#Configure VoIP configuration**

Finance-Router(config)#telephony-service

Finance-Router(config-telephony)#max-dn 20

Finance-Router(config-telephony)#max-ephone 20

Finance-Router(config-telephony)#ip source-address 172.16.100.1 port 2000

Finance-Router(config-telephony)#auto assign 1 to 20

Finance-Router(config-telephony)#exit

Finance-Router(config)#ephone-dn 1

Finance-Router(config-ephone-dn)#number 101

Finance-Router(config-ephone-dn)#exit

Finance-Router(config)#ephone-dn 2

Finance-Router(config-ephone-dn)#number 102

Finance-Router(config-ephone-dn)#exit

Finance-Router(config)#ephone-dn 3

Finance-Router(config-ephone-dn)#number 103

Finance-Router(config-ephone-dn)#exit

Finance-Router(config)#ephone-dn 4

Finance-Router(config-ephone-dn)#number 104

Finance-Router(config-ephone-dn)#exit

Finance-Router(config)#ephone-dn 5

Finance-Router(config-ephone-dn)#number 105

Finance-Router(config-ephone-dn)#exit

Finance-Router(config)#ephone-dn 6

Finance-Router(config-ephone-dn)#number 106

Finance-Router(config-ephone-dn)#exit

Finance-Router(config)#ephone-dn 7

Finance-Router(config-ephone-dn)#number 107

Finance-Router(config-ephone-dn)#exit

Finance-Router(config)#ephone-dn 8

Finance-Router(config-ephone-dn)#number 108

Finance-Router(config-ephone-dn)#exit

Finance-Router(config)#ephone-dn 9

Finance-Router(config-ephone-dn)#number 109

Finance-Router(config-ephone-dn)#exit

Finance-Router(config)#ephone-dn 10

Finance-Router(config-ephone-dn)#number 110

Finance-Router(config-ephone-dn)#exit

Finance-Router(config)#do wr

Finance-Router(config)#exit

**#Dial Peer Configuration for VoIP**

Finance-Router(config)#dial-peer voice 1 voip

Finance-Router(config-dial-peer)#destination-pattern 2..

Finance-Router(config-dial-peer)#session target ipv4:10.10.10.2

Finance-Router(config-dial-peer)#exit

Finance-Router(config)#dial-peer voice 2 voip

Finance-Router(config-dial-peer)#destination-pattern 4..

Finance-Router(config-dial-peer)#session target ipv4:10.10.10.13

Finance-Router(config-dial-peer)#exit

Finance-Router(config)#dial-peer voice 3 voip

Finance-Router(config-dial-peer)#destination-pattern 3..

Finance-Router(config-dial-peer)#session target ipv4:10.10.10.6

Finance-Router(config-dial-peer)#exit

Finance-Router(config)#do wr

Finance-Router(config)#exit

**HR-Router:**

Router>en

Router#conf t

**#Set the hostname**

Router(config)#hostname HR-Router

**#Set console password**

HR-Router(config)#line console 0

HR-Router(config-line)#password hr

HR-Router(config-line)#login

HR-Router(config-line)#exit

**#Set enable secret password for privileged EXEC mode**

HR-Router(config)#enable secret hr

**#Enable password encryption for all passwords**

HR-Router(config)#service password-encryption

**#Configure banner for unauthorized access warning**

HR-Router(config)#banner motd # Unauthorized access is prohibited. #

**#Disable domain name lookup to prevent delays caused by incorrect commands**

HR-Router(config)#no ip domain-lookup

**#Configure SSH**

HR-Router(config)#ip domain-name hr.com

**#Generate RSA key pairs for SSH encryption**

HR-Router(config)#crypto key generate rsa

How many bits in the modulus [512]: 1024

**#Enable SSH version 2**

HR-Router(config)#ip ssh version 2

**#Create a local user for SSH access**

HR-Router(config)#username hr secret hr

**#Configure VTY lines to accept only SSH connections**

HR-Router(config)#line vty 0 4

HR-Router(config-line)#transport input ssh

HR-Router(config-line)#login local

HR-Router(config-line)#exit

**#Set SSH time-out and retries to improve security**

HR-Router(config)#ip ssh time-out 60

HR-Router(config)#ip ssh authentication-retries 3

HR-Router(config)#do wr

HR-Router(config)#exit

**#Up the link**

HR-Router(config)#int fa 0/0

HR-Router(config-if)#no shutdown

HR-Router(config-if)#do wr

HR-Router(config-if)#exit

HR-Router(config)#int fa 0/1

HR-Router(config-if)#no shutdown

HR-Router(config-if)#do wr

HR-Router(config-if)#exit

HR-Router(config)#int se 0/0/0

HR-Router(config-if)#no shutdown

HR-Router(config-if)#do wr

HR-Router(config-if)#exit

HR-Router(config)#int se 0/0/1

HR-Router(config-if)#no shutdown

HR-Router(config-if)#do wr

HR-Router(config-if)#exit

**#Assinging IP Address to port**

HR-Router(config)#int se 0/0/0

HR-Router(config-if)#ip address 10.10.10.2 255.255.255.252

HR-Router(config-if)#exit

HR-Router(config)#int se 0/0/1

HR-Router(config-if)#ip address 10.10.10.5 255.255.255.252

HR-Router(config-if)#exit

HR-Router(config)#do wr

HR-Router(config)#exit

**#Configure DHCP For Voice**

HR-Router(config)#service dhcp

HR-Router(config)#ip dhcp pool hr\_voice\_pool

HR-Router(dhcp-config)#network 172.16.100.32 255.255.255.224

HR-Router(dhcp-config)#default-router 172.16.100.33

HR-Router(dhcp-config)#dns-server 192.168.100.131

HR-Router(dhcp-config)#option 150 ip 172.16.100.33

HR-Router(dhcp-config)#exit

HR-Router(config)#ip dhcp excluded-address 172.16.100.33

HR-Router(config)#do wr

HR-Router(config)#exit

**#Inter-Vlan Routing [Create Sub-interfaces] + Assign IP DHCP Helper Address for Data**

HR-Router(config)#int fa0/0.20

HR-Router(config-subif)#encapsulation dot1Q 20

HR-Router(config-subif)#ip address 192.168.100.33 255.255.255.224

HR-Router(config-subif)#ip helper-address 192.168.100.130

HR-Router(config-subif)#exit

HR-Router(config)#int fa0/0.100

HR-Router(config-subif)#encapsulation dot1Q 100

HR-Router(config-subif)#ip address 172.16.100.33 255.255.255.224

HR-Router(config-subif)#exit

HR-Router(config)#do wr

HR-Router(config)#

**#Enable Routing Protocol (OSPF)**

HR-Router(config)#router ospf 10

HR-Router(config-router)#network 10.10.10.0 0.0.0.3 area 0

HR-Router(config-router)#network 10.10.10.4 0.0.0.3 area 0

HR-Router(config-router)#network 192.168.100.32 0.0.0.31 area 0

HR-Router(config-router)#network 172.16.100.32 0.0.0.31 area 0

HR-Router(config-router)#exit

HR-Router(config)#do wr

HR-Router(config)#exit

**#Configure VoIP configuration**

HR-Router(config)#telephony-service

HR-Router(config-telephony)#max-dn 20

HR-Router(config-telephony)#max-ephone 20

HR-Router(config-telephony)#ip source-address 172.16.100.33 port 2000

HR-Router(config-telephony)#auto assign 1 to 20

HR-Router(config-telephony)#exit

HR-Router(config)#ephone-dn 1

HR-Router(config-ephone-dn)#number 201

HR-Router(config-ephone-dn)#exit

HR-Router(config)#ephone-dn 2

HR-Router(config-ephone-dn)#number 202

HR-Router(config-ephone-dn)#exit

HR-Router(config)#ephone-dn 3

HR-Router(config-ephone-dn)#number 203

HR-Router(config-ephone-dn)#exit

HR-Router(config)#ephone-dn 4

HR-Router(config-ephone-dn)#number 204

HR-Router(config-ephone-dn)#exit

HR-Router(config)#ephone-dn 5

HR-Router(config-ephone-dn)#number 205

HR-Router(config-ephone-dn)#exit

HR-Router(config)#ephone-dn 6

HR-Router(config-ephone-dn)#number 206

HR-Router(config-ephone-dn)#exit

HR-Router(config)#ephone-dn 7

HR-Router(config-ephone-dn)#number 207

HR-Router(config-ephone-dn)#exit

HR-Router(config)#ephone-dn 8

HR-Router(config-ephone-dn)#number 208

HR-Router(config-ephone-dn)#exit

HR-Router(config)#ephone-dn 9

HR-Router(config-ephone-dn)#number 209

HR-Router(config-ephone-dn)#exit

HR-Router(config)#ephone-dn 10

HR-Router(config-ephone-dn)#number 210

HR-Router(config-ephone-dn)#exit

HR-Router(config)#do wr

HR-Router(config)#exit

**#Dial Peer Configuration for VoIP**

HR-Router(config)#dial-peer voice 1 voip

HR-Router(config-dial-peer)#destination-pattern 1..

HR-Router(config-dial-peer)#session target ipv4:10.10.10.1

HR-Router(config-dial-peer)#exit

HR-Router(config)#dial-peer voice 4 voip

HR-Router(config-dial-peer)#destination-pattern 3..

HR-Router(config-dial-peer)#session target ipv4:10.10.10.6

HR-Router(config-dial-peer)#exit

HR-Router(config)#dial-peer voice 5 voip

HR-Router(config-dial-peer)#destination-pattern 4..

HR-Router(config-dial-peer)#session target ipv4:10.10.10.10

HR-Router(config-dial-peer)#exit

HR-Router(config)#do wr

HR-Router(config)#exit

**Sales-Router:**

Router>en

Router#conf t

**#Set the hostname**

Router(config)#hostname Sales-Router

**#Set console password**

Sales-Router(config)#line console 0

Sales-Router(config-line)#password sales

Sales-Router(config-line)#login

Sales-Router(config-line)#exit

**#Set enable secret password for privileged EXEC mode**

Sales-Router(config)#enable secret sales

**#Enable password encryption for all passwords**

Sales-Router(config)#service password-encryption

**#Configure banner for unauthorized access warning**

Sales-Router(config)#banner motd # Unauthorized access is prohibited. #

**#Disable domain name lookup to prevent delays caused by incorrect commands**

Sales-Router(config)#no ip domain-lookup

**#Configure SSH**

Sales-Router(config)#ip domain-name sales.com

**#Generate RSA key pairs for SSH encryption**

Sales-Router(config)#crypto key generate rsa

How many bits in the modulus [512]: 1024

**#Enable SSH version 2**

Sales-Router(config)#ip ssh version 2

**#Create a local user for SSH access**

Sales-Router(config)#username sales secret sales

**#Configure VTY lines to accept only SSH connections**

Sales-Router(config)#line vty 0 4

Sales-Router(config-line)#transport input ssh

Sales-Router(config-line)#login local

Sales-Router(config-line)#exit

**#Set SSH time-out and retries to improve security**

Sales-Router(config)#ip ssh time-out 60

Sales-Router(config)#ip ssh authentication-retries 3

Sales-Router(config)#do wr

Sales-Router(config)#exit

**#Up the link**

Sales-Router(config)#int fa 0/0

Sales-Router(config-if)#no shutdown

Sales-Router(config-if)#do wr

Sales-Router(config-if)#exit

Sales-Router(config)#int fa 0/1

Sales-Router(config-if)#no shutdown

Sales-Router(config-if)#do wr

Sales-Router(config-if)#exit

Sales-Router(config)#int se 0/0/0

Sales-Router(config-if)#no shutdown

Sales-Router(config-if)#do wr

Sales-Router(config-if)#exit

Sales-Router(config)#int se 0/0/1

Sales-Router(config-if)#no shutdown

Sales-Router(config-if)#clock rate 64000

Sales-Router(config-if)#do wr

Sales-Router(config-if)#exit

**#Assinging IP Address to port**

Sales-Router(config)#int se 0/0/0

Sales-Router(config-if)#ip address 10.10.10.9 255.255.255.252

Sales-Router(config-if)#exit

Sales-Router(config)#int se 0/0/1

Sales-Router(config-if)#ip address 10.10.10.6 255.255.255.252

Sales-Router(config-if)#exit

Sales-Router(config)#do wr

Sales-Router(config)#exit

**#Configure DHCP For Voice**

Sales-Router(config)#service dhcp

Sales-Router(config)#ip dhcp pool sales\_voice\_pool

Sales-Router(dhcp-config)#network 172.16.100.64 255.255.255.224

Sales-Router(dhcp-config)#default-router 172.16.100.65

Sales-Router(dhcp-config)#dns-server 192.168.100.131

Sales-Router(dhcp-config)#option 150 ip 172.16.100.65

Sales-Router(dhcp-config)#exit

Sales-Router(config)#ip dhcp excluded-address 172.16.100.65

Sales-Router(config)#do wr

Sales-Router(config)#exit

**#Inter-Vlan Routing [Create Sub-interfaces] + Assign IP DHCP Helper Address for Data**

Sales-Router(config)#int fa0/0.30

Sales-Router(config-subif)#encapsulation dot1Q 30

Sales-Router(config-subif)#ip address 192.168.100.65 255.255.255.224

Sales-Router(config-subif)#ip helper-address 192.168.100.130

Sales-Router(config-subif)#exit

Sales-Router(config)#int fa0/0.100

Sales-Router(config-subif)#encapsulation dot1Q 100

Sales-Router(config-subif)#ip address 172.16.100.65 255.255.255.224

Sales-Router(config-subif)#exit

Sales-Router(config)#do wr

Sales-Router(config)#exit

**#Enable Routing Protocol (OSPF)**

Sales-Router(config)#router ospf 10

Sales-Router(config-router)#network 10.10.10.8 0.0.0.3 area 0

Sales-Router(config-router)#network 10.10.10.4 0.0.0.3 area 0

Sales-Router(config-router)#network 192.168.100.64 0.0.0.31 area 0

Sales-Router(config-router)#network 172.16.100.64 0.0.0.31 area 0

Sales-Router(config-router)#exit

Sales-Router(config)#do wr

Sales-Router(config)#exit

**#Configure VoIP configuration**

Sales-Router(config)#telephony-service

Sales-Router(config-telephony)#max-dn 20

Sales-Router(config-telephony)#max-ephone 20

Sales-Router(config-telephony)#ip source-address 172.16.100.65 port 2000

Sales-Router(config-telephony)#auto assign 1 to 20

Sales-Router(config-telephony)#exit

Sales-Router(config)#ephone-dn 1

Sales-Router(config-ephone-dn)#number 301

Sales-Router(config-ephone-dn)#exit

Sales-Router(config)#ephone-dn 2

Sales-Router(config-ephone-dn)#number 302

Sales-Router(config-ephone-dn)#exit

Sales-Router(config)#ephone-dn 3

Sales-Router(config-ephone-dn)#number 303

Sales-Router(config-ephone-dn)#exit

Sales-Router(config)#ephone-dn 4

Sales-Router(config-ephone-dn)#number 304

Sales-Router(config-ephone-dn)#exit

Sales-Router(config)#ephone-dn 5

Sales-Router(config-ephone-dn)#number 305

Sales-Router(config-ephone-dn)#exit

Sales-Router(config)#ephone-dn 6

Sales-Router(config-ephone-dn)#number 306

Sales-Router(config-ephone-dn)#exit

Sales-Router(config)#ephone-dn 7

Sales-Router(config-ephone-dn)#number 307

Sales-Router(config-ephone-dn)#exit

Sales-Router(config)#ephone-dn 8

Sales-Router(config-ephone-dn)#number 308

Sales-Router(config-ephone-dn)#exit

Sales-Router(config)#ephone-dn 9

Sales-Router(config-ephone-dn)#number 309

Sales-Router(config-ephone-dn)#exit

Sales-Router(config)#ephone-dn 10

Sales-Router(config-ephone-dn)#number 310

Sales-Router(config-ephone-dn)#exit

Sales-Router(config)#do wr

Sales-Router(config)#exit

**#Dial Peer Configuration for VoIP**

Sales-Router(config)#dial-peer voice 4 voip

Sales-Router(config-dial-peer)#destination-pattern 2..

Sales-Router(config-dial-peer)#session target ipv4:10.10.10.5

Sales-Router(config-dial-peer)#exit

Sales-Router(config)#dial-peer voice 6 voip

Sales-Router(config-dial-peer)#destination-pattern 4..

Sales-Router(config-dial-peer)#session target ipv4:10.10.10.10

Sales-Router(config-dial-peer)#exit

Sales-Router(config)#dial-peer voice 3 voip

Sales-Router(config-dial-peer)#destination-pattern 1..

Sales-Router(config-dial-peer)#session target ipv4:10.10.10.1

Sales-Router(config-dial-peer)#exit

Sales-Router(config)#do wr

Sales-Router(config)#exit

**ICT-Router:**

Router>en

Router#conf t

**#Set the hostname**

Router(config)#hostname ICT-Router

**#Set console password**

ICT-Switch(config)#line console 0

ICT-Switch(config-line)#password ict

ICT-Switch(config-line)#login

ICT-Switch(config-line)#exit

**#Set enable secret password for privileged EXEC mode**

ICT-Switch(config)#enable secret ict

**#Enable password encryption for all passwords**

ICT-Switch(config)#service password-encryption

**#Configure banner for unauthorized access warning**

ICT-Switch(config)#banner motd # Unauthorized access is prohibited. #

**#Disable domain name lookup to prevent delays caused by incorrect commands**

ICT-Switch(config)#no ip domain-lookup

**#Configure SSH**

ICT-Router(config)#ip domain-name ict.com

**#Generate RSA key pairs for SSH encryption**

ICT-Router(config)#crypto key generate rsa

How many bits in the modulus [512]: 1024

**#Enable SSH version 2**

ICT-Router(config)#ip ssh version 2

**#Create a local user for SSH access**

ICT-Router(config)#username ict secret ict

**#Configure VTY lines to accept only SSH connections**

ICT-Router(config)#line vty 0 4

ICT-Router(config-line)#transport input ssh

ICT-Router(config-line)#login local

ICT-Router(config-line)#exit

**#Set SSH time-out and retries to improve security**

ICT-Router(config)#ip ssh time-out 60

ICT-Router(config)#ip ssh authentication-retries 3

ICT-Router(config)#do wr

ICT-Router(config)#exit

**#Up the link**

ICT-Router(config)#int fa 0/0

ICT-Router(config-if)#no shutdown

ICT-Router(config-if)#do wr

ICT-Router(config-if)#exit

ICT-Router(config)#int fa 0/1

ICT-Router(config-if)#no shutdown

ICT-Router(config-if)#do wr

ICT-Router(config-if)#exit

ICT-Router(config)#int se 0/0/0

ICT-Router(config-if)#no shutdown

ICT-Router(config-if)#clock rate 64000

ICT-Router(config-if)#do wr

ICT-Router(config-if)#exit

ICT-Router(config)#int se 0/0/1

ICT-Router(config-if)#no shutdown

ICT-Router(config-if)#clock rate 64000

ICT-Router(config-if)#do wr

ICT-Router(config-if)#exit

**#Assinging IP Address to port**

ICT-Router(config)#int se 0/0/0

ICT-Router(config-if)#ip address 10.10.10.10 255.255.255.252

ICT-Router(config-if)#exit

ICT-Router(config)#int se 0/0/1

ICT-Router(config-if)#ip address 10.10.10.13 255.255.255.252

ICT-Router(config-if)#exit

ICT-Router(config)#do wr

ICT-Router(config)#exit

**#Configure DHCP For Voice**

ICT-Router(config)#service dhcp

ICT-Router(config)#ip dhcp pool ict\_voice\_pool

ICT-Router(dhcp-config)#network 172.16.100.96 255.255.255.224

ICT-Router(dhcp-config)#default-router 172.16.100.97

ICT-Router(dhcp-config)#dns-server 192.168.100.131

ICT-Router(dhcp-config)#option 150 ip 172.16.100.97

ICT-Router(dhcp-config)#exit

ICT-Router(config)#ip dhcp excluded-address 172.16.100.97

ICT-Router(config)#do wr

ICT-Router(config)#exit

**#Inter-Vlan Routing [Create Sub-interfaces] + Assign IP DHCP Helper Address for Data**

ICT-Router(config)#int fa0/0.40

ICT-Router(config-subif)#encapsulation dot1Q 40

ICT-Router(config-subif)#ip address 192.168.100.97 255.255.255.224

ICT-Router(config-subif)#ip helper-address 192.168.100.130

ICT-Router(config-subif)#exit

ICT-Router(config)#int fa0/0.100

ICT-Router(config-subif)#encapsulation dot1Q 100

ICT-Router(config-subif)#ip address 172.16.100.97 255.255.255.224

ICT-Router(config-subif)#exit

ICT-Router(config)#int fa0/1.50

ICT-Router(config-subif)#encapsulation dot1Q 50

ICT-Router(config-subif)#ip address 192.168.100.129 255.255.255.224

ICT-Router(config-subif)#exit

ICT-Router(config)#do wr

ICT-Router(config)#exit

**#Enable Routing Protocol (OSPF)**

ICT-Router(config)#router ospf 10

ICT-Router(config-router)#network 10.10.10.8 0.0.0.3 area 0

ICT-Router(config-router)#network 10.10.10.12 0.0.0.3 area 0

ICT-Router(config-router)#network 192.168.100.96 0.0.0.31 area 0

ICT-Router(config-router)#network 172.16.100.96 0.0.0.31 area 0

ICT-Router(config-router)#network 192.168.100.128 0.0.0.7 area 0

ICT-Router(config-router)#exit

ICT-Router(config)#do wr

ICT-Router(config)#exit

**#Configure VoIP configuration**

ICT-Router(config)#telephony-service

ICT-Router(config-telephony)#max-dn 20

ICT-Router(config-telephony)#max-ephone 20

ICT-Router(config-telephony)#ip source-address 172.16.100.97 port 2000

ICT-Router(config-telephony)#auto assign 1 to 20

ICT-Router(config-telephony)#exit

ICT-Router(config)#ephone-dn 1

ICT-Router(config-ephone-dn)#number 401

ICT-Router(config-ephone-dn)#exit

ICT-Router(config)#ephone-dn 2

ICT-Router(config-ephone-dn)#number 402

ICT-Router(config-ephone-dn)#exit

ICT-Router(config)#ephone-dn 3

ICT-Router(config-ephone-dn)#number 403

ICT-Router(config-ephone-dn)#exit

ICT-Router(config)#ephone-dn 4

ICT-Router(config-ephone-dn)#number 404

ICT-Router(config-ephone-dn)#exit

ICT-Router(config)#ephone-dn 5

ICT-Router(config-ephone-dn)#number 405

ICT-Router(config-ephone-dn)#exit

ICT-Router(config)#ephone-dn 6

ICT-Router(config-ephone-dn)#number 406

ICT-Router(config-ephone-dn)#exit

ICT-Router(config)#ephone-dn 7

ICT-Router(config-ephone-dn)#number 407

ICT-Router(config-ephone-dn)#exit

ICT-Router(config)#ephone-dn 8

ICT-Router(config-ephone-dn)#number 408

ICT-Router(config-ephone-dn)#exit

ICT-Router(config)#ephone-dn 9

ICT-Router(config-ephone-dn)#number 409

ICT-Router(config-ephone-dn)#exit

ICT-Router(config)#ephone-dn 10

ICT-Router(config-ephone-dn)#number 410

ICT-Router(config-ephone-dn)#exit

ICT-Router(config)#do wr

ICT-Router(config)#exit

**#Dial Peer Configuration for VoIP**

ICT-Router(config)#dial-peer voice 2 voip

ICT-Router(config-dial-peer)#destination-pattern 1..

ICT-Router(config-dial-peer)#session target ipv4:10.10.10.14

ICT-Router(config-dial-peer)#exit

ICT-Router(config)#dial-peer voice 6 voip

ICT-Router(config-dial-peer)#destination-pattern 3..

ICT-Router(config-dial-peer)#session target ipv4:10.10.10.9

ICT-Router(config-dial-peer)#exit

ICT-Router(config)#dial-peer voice 5 voip

ICT-Router(config-dial-peer)#destination-pattern 2..

ICT-Router(config-dial-peer)#session target ipv4:10.10.10.5

ICT-Router(config-dial-peer)#exit

ICT-Router(config)#do wr

ICT-Router(config)#exit

**Finance-Switch:**

Switch>en

Switch#conf t

**#Set the hostname**

Switch(config)#hostname Finance-Switch

**#Set console password**

Finance-Switch(config)#line console 0

Finance-Switch(config-line)#password finance

Finance-Switch(config-line)#login

Finance-Switch(config-line)#exit

**#Set enable secret password for privileged EXEC mode**

Finance-Switch(config)#enable secret finance

**#Enable password encryption for all passwords**

Finance-Switch(config)#service password-encryption

**#Configure banner for unauthorized access warning**

Finance-Switch(config)#banner motd # Unauthorized access is prohibited. #

**#Disable domain name lookup to prevent delays caused by incorrect commands**

Finance-Switch(config)#no ip domain-lookup

Finance-Switch(config)#do wr

Finance-Switch(config)#exit

**#Create VLAN**

Finance-Switch(config)#vlan 10

Finance-Switch(config-vlan)#name Finance

Finance-Switch(config-vlan)#exit

Finance-Switch(config)#vlan 100

Finance-Switch(config-vlan)#name Voice

Finance-Switch(config-vlan)#exit

**#Configure trunk ports to carry VLAN traffic**

Finance-Switch(config)#interface fa0/1

Finance-Switch(config-if)#switchport mode trunk

Finance-Switch(config-if)#exit

**#Configure access ports for Finance PCs and access point, apply port security and enable PortFast**

Finance-Switch(config)#interface range fa0/2-24

Finance-Switch(config-if-range)#switchport mode access

Finance-Switch(config-if-range)#switchport access vlan 10

Finance-Switch(config-if-range)#switchport voice vlan 100

Finance-Switch(config-if-range)#switchport port-security

Finance-Switch(config-if-range)#switchport port-security maximum 4

Finance-Switch(config-if-range)#switchport port-security mac-address sticky

Finance-Switch(config-if-range)#switchport port-security violation shutdown

Finance-Switch(config-if-range)#spanning-tree portfast

Finance-Switch(config-if-range)#exit

Finance-Switch(config)#do wr

Finance-Switch(config)#exit

**HR-Switch:**

Switch>en

Switch#conf t

**#Set the hostname**

Switch(config)#hostname HR-Switch

**#Set console password**

HR-Switch(config)#line console 0

HR-Switch(config-line)#password hr

HR-Switch(config-line)#login

HR-Switch(config-line)#exit

**#Set enable secret password for privileged EXEC mode**

HR-Switch(config)#enable secret hr

**#Enable password encryption for all passwords**

HR-Switch(config)#service password-encryption

**#Configure banner for unauthorized access warning**

HR-Switch(config)#banner motd # Unauthorized access is prohibited. #

**#Disable domain name lookup to prevent delays caused by incorrect commands**

HR-Switch(config)#no ip domain-lookup

HR-Switch(config)#do wr

HR-Switch(config)#exit

**#Create VLAN**

HR-Switch(config)#vlan 20

HR-Switch(config-vlan)#name HR

HR-Switch(config-vlan)#exit

HR-Switch(config)#vlan 100

HR-Switch(config-vlan)#name Voice

HR-Switch(config-vlan)#exit

**#Configure trunk ports to carry VLAN traffic**

HR-Switch(config)#interface fa0/1

HR-Switch(config-if)#switchport mode trunk

HR-Switch(config-if)#exit

**#Configure access ports for Finance PCs and access point, apply port security and enable PortFast**

HR-Switch(config)#interface range fa0/2-24

HR-Switch(config-if-range)#switchport mode access

HR-Switch(config-if-range)#switchport access vlan 20

HR-Switch(config-if-range)#switchport voice vlan 100

HR-Switch(config-if-range)#switchport port-security

HR-Switch(config-if-range)#switchport port-security maximum 4

HR-Switch(config-if-range)#switchport port-security mac-address sticky

HR-Switch(config-if-range)#switchport port-security violation shutdown

HR-Switch(config-if-range)#spanning-tree portfast

HR-Switch(config-if-range)#exit

HR-Switch(config)#do wr

HR-Switch(config)#exit

**Sales-Switch:**

Switch>en

Switch#conf t

**#Set the hostname**

Switch(config)#hostname Sales-Switch

**#Set console password**

Sales-Router(config)#line console 0

Sales-Router(config-line)#password sales

Sales-Router(config-line)#login

Sales-Router(config-line)#exit

**#Set enable secret password for privileged EXEC mode**

Sales-Router(config)#enable secret sales

**#Enable password encryption for all passwords**

Sales-Router(config)#service password-encryption

**#Configure banner for unauthorized access warning**

Sales-Router(config)#banner motd # Unauthorized access is prohibited. #

**#Disable domain name lookup to prevent delays caused by incorrect commands**

Sales-Router(config)#no ip domain-lookup

**#Create VLAN**

Sales-Switch(config)#vlan 30

Sales-Switch(config-vlan)#name Sales

Sales-Switch(config-vlan)#exit

Sales-Switch(config)#vlan 100

Sales-Switch(config-vlan)#name Voice

Sales-Switch(config-vlan)#exit

#Configure trunk ports to carry VLAN traffic

Sales-Switch(config)#interface fa0/1

Sales-Switch(config-if)#switchport mode trunk

Sales-Switch(config-if)#exit

**#Configure access ports for Finance PCs and access point, apply port security and enable PortFast**

Sales-Switch(config)#interface range fa0/2-24

Sales-Switch(config-if-range)#switchport mode access

Sales-Switch(config-if-range)#switchport access vlan 30

Sales-Switch(config-if-range)#switchport voice vlan 100

Sales-Switch(config-if-range)#switchport port-security

Sales-Switch(config-if-range)#switchport port-security maximum 4

Sales-Switch(config-if-range)#switchport port-security mac-address sticky

Sales-Switch(config-if-range)#switchport port-security violation shutdown

Sales-Switch(config-if-range)#spanning-tree portfast

Sales-Switch(config-if-range)#exit

Sales-Switch(config)#do wr

Sales-Switch(config)#exit

**ICT-Switch:**

Switch>en

Switch#conf t

**#Set the hostname**

Switch(config)#hostname ICT-Switch

**#Set console password**

ICT-Switch(config)#line console 0

ICT-Switch(config-line)#password ict

ICT-Switch(config-line)#login

ICT-Switch(config-line)#exit

**#Set enable secret password for privileged EXEC mode**

ICT-Switch(config)#enable secret ict

**#Enable password encryption for all passwords**

ICT-Switch(config)#service password-encryption

**#Configure banner for unauthorized access warning**

ICT-Switch(config)#banner motd # Unauthorized access is prohibited. #

**#Disable domain name lookup to prevent delays caused by incorrect commands**

ICT-Switch(config)#no ip domain-lookup

ICT-Switch(config)#do wr

ICT-Switch(config)#exit

**#Create VLAN**

ICT-Switch(config)#vlan 40

ICT-Switch(config-vlan)#name ICT

ICT-Switch(config-vlan)#exit

ICT-Switch(config)#vlan 100

ICT-Switch(config-vlan)#name Voice

ICT-Switch(config-vlan)#exit

**#Configure trunk ports to carry VLAN traffic**

ICT-Switch(config)#interface fa0/1

ICT-Switch(config-if)#switchport mode trunk

ICT-Switch(config-if)#exit

**#Configure access ports for Finance PCs and access point, apply port security and enable PortFast**

ICT-Switch(config)#interface range fa0/2-24

ICT-Switch(config-if-range)#switchport mode access

ICT-Switch(config-if-range)#switchport access vlan 40

ICT-Switch(config-if-range)#switchport voice vlan 100

ICT-Switch(config-if-range)#switchport port-security

ICT-Switch(config-if-range)#switchport port-security maximum 4

ICT-Switch(config-if-range)#switchport port-security mac-address sticky

ICT-Switch(config-if-range)#switchport port-security violation shutdown

ICT-Switch(config-if-range)#spanning-tree portfast

ICT-Switch(config-if-range)#exit

ICT-Switch(config)#do wr

ICT-Switch(config)#exit

**Server-Room-Switch:**

Switch>en

Switch#conf t

**#Set the hostname**

Switch(config)#hostname Server-Room-Switch

**#Set console password**

Server-Room-Switch(config)#line console 0

Server-Room-Switch(config-line)#password serverroom

Server-Room-Switch(config-line)#login

Server-Room-Switch(config-line)#exit

**#Set enable secret password for privileged EXEC mode**

Server-Room-Switch(config)#enable secret serverroom

**#Enable password encryption for all passwords**

Server-Room-Switch(config)#service password-encryption

**#Configure banner for unauthorized access warning**

Server-Room-Switch(config)#banner motd # Unauthorized access is prohibited. #

**#Disable domain name lookup to prevent delays caused by incorrect commands**

Server-Room-Switch(config)#no ip domain-lookup

Server-Room-Switch(config)#do wr

Server-Room-Switch(config)#exit

**#Create VLAN**

Server-Room-Switch(config)#vlan 50

Server-Room-Switch(config-vlan)#name Server-Room

Server-Room-Switch(config-vlan)#exit

**#Configure trunk ports to carry VLAN traffic**

Server-Room-Switch(config)#interface fa0/1

Server-Room-Switch(config-if)#switchport mode trunk

Server-Room-Switch(config-if)#exit

**#Configure access ports for Finance PCs and access point, apply port security and enable PortFast**

Server-Room-Switch(config)#interface range fa0/2-5

Server-Room-Switch(config-if-range)#switchport mode access

Server-Room-Switch(config-if-range)#switchport access vlan 50

Server-Room-Switch(config-if-range)#switchport port-security

Server-Room-Switch(config-if-range)#switchport port-security maximum 2

Server-Room-Switch(config-if-range)#switchport port-security mac-address sticky

Server-Room-Switch(config-if-range)#switchport port-security violation shutdown

Server-Room-Switch(config-if-range)#spanning-tree portfast

Server-Room-Switch(config-if-range)#exit

Server-Room-Switch(config)#do wr

Server-Room-Switch(config)#exit

**DHCP-Server:**

**Static IP Configuration:**

**IP Address**: 192.168.100.130

**Subnet Mask**: 255.255.255.248

**Default Gateway**: 192.168.100.129

**DNS Server**: 192.168.10.131

1. **Finance Department (VLAN 10)**

* Pool Name: finance\_pool
* Default Gateway: 192.168.100.1
* DNS Server: 192.168.100.131
* Starting IP Address: 192.168.100.2
* Subnet Mask: 255.255.255.224 (/27)
* Maximum Number of Users: 29 (usable IPs range from 192.168.100.2 to 192.168.100.30)

1. Exclusions:

* 192.168.100.0 (Network Address)
* 192.168.100.1 (Default Gateway)
* 192.168.100.31 (Broadcast Address)

1. **HR Department (VLAN 20)**

* Pool Name: hr\_pool
* Default Gateway: 192.168.100.33
* DNS Server: 192.168.100.131
* Starting IP Address: 192.168.100.34
* Subnet Mask: 255.255.255.224 (/27)
* Maximum Number of Users: 29 (usable IPs range from 192.168.100.34 to 192.168.100.62)

1. Exclusions:

* 192.168.100.32 (Network Address)
* 192.168.100.33 (Default Gateway)
* 192.168.100.63 (Broadcast Address)

1. **Sales Department (VLAN 30)**

* Pool Name: sales\_pool
* Default Gateway: 192.168.100.65
* DNS Server: 192.168.100.131
* Starting IP Address: 192.168.100.66
* Subnet Mask: 255.255.255.224 (/27)
* Maximum Number of Users: 29 (usable IPs range from 192.168.100.66 to 192.168.100.94)

1. Exclusions:

* 192.168.100.64 (Network Address)
* 192.168.100.65 (Default Gateway)
* 192.168.100.95 (Broadcast Address)

1. **ICT Department (VLAN 40)**

* Pool Name: ict\_pool
* Default Gateway: 192.168.100.97
* DNS Server: 192.168.100.131
* Starting IP Address: 192.168.100.98
* Subnet Mask: 255.255.255.224 (/27)
* Maximum Number of Users: 29 (usable IPs range from 192.168.100.98 to 192.168.100.126)

1. Exclusions:

* 192.168.100.96 (Network Address)
* 192.168.100.97 (Default Gateway)
* 192.168.100.127 (Broadcast Address)

**Note**: Configure DHCP For Voice on Router

**1. Finance Department (Voice Network)**

* Pool Name: finance\_voice\_pool
* Network ID: 172.16.100.0
* Default Gateway: 172.16.100.1
* DNS Server: 192.168.100.131
* Starting IP Address: 172.16.100.2
* Subnet Mask: 255.255.255.224 (/27)
* Maximum Number of Users: 29 (usable IPs range from 172.16.100.2 to 172.16.100.30)

1. Exclusions:

* 172.16.100.0 (Network Address)
* 172.16.100.1 (Default Gateway)
* 172.16.100.31 (Broadcast Address)

1. Options:

* option 150 ip 172.16.100.1 (TFTP Server for VoIP phones)

**2. HR Department (Voice Network)**

* Pool Name: hr\_voice\_pool
* Network ID: 172.16.100.32
* Default Gateway: 172.16.100.33
* DNS Server: 192.168.100.131
* Starting IP Address: 172.16.100.34
* Subnet Mask: 255.255.255.224 (/27)
* Maximum Number of Users: 29 (usable IPs range from 172.16.100.34 to 172.16.100.62)

1. Exclusions:

* 172.16.100.32 (Network Address)
* 172.16.100.33 (Default Gateway)
* 172.16.100.63 (Broadcast Address)

1. Options:

* option 150 ip 172.16.100.33 (TFTP Server for VoIP phones)

**3. Sales Department (Voice Network)**

* Pool Name: sales\_voice\_pool
* Network ID: 172.16.100.64
* Default Gateway: 172.16.100.65
* DNS Server: 192.168.100.131
* Starting IP Address: 172.16.100.66
* Subnet Mask: 255.255.255.224 (/27)
* Maximum Number of Users: 29 (usable IPs range from 172.16.100.66 to 172.16.100.94)

1. Exclusions:

* 172.16.100.64 (Network Address)
* 172.16.100.65 (Default Gateway)
* 172.16.100.95 (Broadcast Address)

1. Options:

* option 150 ip 172.16.100.65 (TFTP Server for VoIP phones)

**4. ICT Department (Voice Network)**

* Pool Name: ict\_voice\_pool
* Network ID: 172.16.100.96
* Default Gateway: 172.16.100.97
* DNS Server: 192.168.100.131
* Starting IP Address: 172.16.100.98
* Subnet Mask: 255.255.255.224 (/27)
* Maximum Number of Users: 29 (usable IPs range from 172.16.100.98 to 172.16.100.126)

1. Exclusions:

* 172.16.100.96 (Network Address)
* 172.16.100.97 (Default Gateway)
* 172.16.100.127 (Broadcast Address)

1. Options:

* option 150 ip 172.16.100.97 (TFTP Server for VoIP phones)

**DNS-Server:**

**Static IP Configuration:**

**IP Address**: 192.168.100.131

**Subnet Mask**: 255.255.255.248

**Default Gateway**: 192.168.100.129

**DNS Record:**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Name | Type | Detail |
| 1 | www. turtle.com | A Record | 192.168.100.133 |
| 2 | smtp. turtle.com | A Record | 192.168.100.132 |
| 3 | pop. turtle.com | A Record | 192.168.100.132 |

**Email-Server:**

**Static IP Configuration:**

**IP Address**: 192.168.100.132

**Subnet Mask**: 255.255.255.248

**Default Gateway**: 192.168.100.129

**DNS Server**: 192.168.100.131

**Set the Email Domain:**

**Domain Name**: turtle.com

**Users Email Table:**

|  |  |  |  |
| --- | --- | --- | --- |
| Finance | | | |
| No. | **Username** | **Password** | **Email** |
|  | finance | Finance@12345 | finance@turtle.com |

|  |  |  |  |
| --- | --- | --- | --- |
| HR | | | |
| No. | **Username** | **Password** | **Email** |
| 1. | hr | HR@12345 | hr@turtle.com |

|  |  |  |  |
| --- | --- | --- | --- |
| Sales | | | |
| No. | **Username** | **Password** | **Email** |
| 1. | sales | Sales@12345 | sales@turtle.com |

|  |  |  |  |
| --- | --- | --- | --- |
| ICT | | | |
| No. | **Username** | **Password** | **Email** |
| 1. | ict | ICT@12345 | ict@turtle.com |

**Client-Side Email Setting:**

Your Name: XYZ

Email Address: XYZ@turtle.com

Incoming Server: pop. turtle.com Port 995 (SSL)

Outgoing Server: smtp. turtle.com Port 465 (SSL)

User Name: XYZ@turtle.com

Password: XYZ@12345

**HTTP-Server:**

**Static IP Configuration:**

**IP Address**: 192.168.100.133

**Subnet Mask**: 255.255.255.248

**Default Gateway**: 192.168.100.129

**DNS Server**: 192.168.100.131

**Site Link**: www. turtle.com

**Our Web Page:**

<!DOCTYPE html>

<html lang="en">

<head>

<meta charset="UTF-8">

<meta name="viewport" content="width=device-width, initial-scale=1.0">

<title>Turtle Consultancy Limited - IT Infrastructure Solutions</title>

<style>

body {

font-family: Arial, sans-serif;

background-color: #f4f4f4;

margin: 0;

padding: 0;

}

header {

background-color: #4CAF50;

color: white;

padding: 20px;

text-align: center;

}

h1 {

margin: 0;

}

nav {

background-color: #333;

overflow: hidden;

}

nav a {

float: left;

display: block;

color: white;

text-align: center;

padding: 14px 20px;

text-decoration: none;

}

nav a:hover {

background-color: #ddd;

color: black;

}

section {

padding: 20px;

background-color: white;

margin: 20px;

border-radius: 8px;

box-shadow: 0 2px 4px rgba(0, 0, 0, 0.1);

}

footer {

background-color: #4CAF50;

color: white;

padding: 10px;

text-align: center;

position: fixed;

bottom: 0;

width: 100%;

}

</style>

</head>

<body>

<header>

<h1>Turtle Consultancy Limited</h1>

<p>Delivering IT Infrastructure Solutions to Medium-Sized Organizations Worldwide</p>

</header>

<nav>

<a href="#">Home</a>

<a href="#">About Us</a>

<a href="#">Services</a>

<a href="#">Contact</a>

</nav>

<section>

<h2>About Turtle Consultancy Limited</h2>

<p>At Turtle Consultancy Limited, we specialize in providing cutting-edge IT infrastructure solutions tailored for medium-sized organizations around the globe. Our mission is to empower businesses to thrive in an ever-evolving technological landscape.</p>

</section>

<section>

<h2>Our Current Expansion</h2>

<p>With the rapid growth of our company, we have recently acquired a new branch that requires an efficient and secure network setup. Our team is working tirelessly to ensure that the network is built to the highest standards to support the demands of the business.</p>

</section>

<section>

<h2>Facing Technology Challenges?</h2>

<p>We understand the complexity of IT infrastructure and the challenges it brings. Our expert team is equipped to tackle a plethora of technology challenges, helping your business to stay competitive and efficient.</p>

</section>

<footer>

&copy; 2024 Turtle Consultancy Limited | All Rights Reserved

</footer>

</body>

</html>

**Result:**

