Network Project Documentation

The following information illustrates the physical and logical layout of a company network infrastructure with all the applied protocols, configuration, and network addressing . This Enterprise Network is designed to provide scalability , Flexibility, Redundancy, and High Security.

Many different protocols are presented to show a good understanding of network fundamentals such as, IP addressing and Subnetting, VLANs, Access Control, Port configuration and Port-Security. Besides Routing Protocols (OSPF, STP). Additionally, three Servers are configured: DNS Server to resolve names to IP addresses, DHCP server to assign IP 4 addresses to users, and WEB server to provide website access for the company Website.

- ***Departments***
  1. *Accounting*
  2. *Research*
  3. *Logistics*
  4. *Marketing*
  5. *Human Resource*
  6. *Management*
  7. *Business*
  8. *Finance*
  9. *Server Room*

1-The Core Layer

The core layer consists of 4 Cisco Routers (Model 2901), directly connected to each other using Full-mesh topology to offer the highest level of redundancy, using Serial DCE cable. Furthermore, The Core Layer connected to the Distribution Layer using Copper Straight-Through cable, and every router is connected to two Layer 3 Switches to support the internet access in case of Single Points of Failure across the Routers.

- **Core Layer Protocols and Configuration**
  1. spanning-tree mode pvst
  2. Routing Protocol OSPF (ospf 1)
  3. Access Control (class 20)
  4. Remote Access Privilege 15 (transport input ssh)
  5. Password Encryption
  6. Password For (line console 0 , line vty 0 15, Privilege EXEC user mode)
  7. ip domain-name mustafa@net

- All the Information for Router 1, 2, 3, and 4 are presented in the following table

Router 1

Router 1 , R1, Point-to-point connection				
Interface	IP4 Address	Connected to	Interface	IP4 Address
GigabitEthernet0/0	192.168.190.1/30	S2 Layer 3 switch	GigabitEthernet1/0/2	192.168.190.2/30
GigabitEthernet0/1	192.168.111.2/30	S1 Layer 3 switch	GigabitEthernet1/0/2	192.168.111.1/30
Serial0/0/0	192.168.130.1/30	R4 Router	Serial0/0/0	192.168.130.2/30
Serial0/0/1	192.168.5.2/30	R2 Router	Serial0/0/1	192.168.5.1/30
Serial0/1/0	192.168.150.1/30	R3 Router	Serial0/1/0	192.168.150.2/30

R1
Line console 0 Password (R1@123)
Privileged EXEXC Password (R1@)
Line Vty password (R1@123)
Access Control List Class 20
 access-list 20 permit host 192.168.2.10
 access-list 20 permit host 192.168.2.11

Router 2

Router 2 , R2, point-to-point connection				
Interface	IP4 Address	Connected to	Interface	IP4 Address
GigabitEthernet0/0	192.168.180.1/30	S2 Layer 3 switch	GigabitEthernet1/0/3	192.168.180.2/30
GigabitEthernet0/1	192.168.170.2/30	S3 Layer 3 switch	GigabitEthernet1/0/4	192.168.170.1/30
Serial0/0/0	192.168.200.1/30	R3 Router	Serial0/0/0	192.168.200.2/30
Serial0/0/1	192.168.5.1/30	R1 Router	Serial0/0/1	192.168.5.2/30
Serial0/1/0	192.168.140.2/30	R4 Router	Serial0/1/0	192.168.140.1/30

R2
Line console 0 Password (R2@123)
Privileged EXEXC Password (R2@)
Line Vty password (R2@123)

Access Control List Class 20
access-list 20 permit host 192.168.2.10
access-list 20 permit host 192.168.2.11
access-list 20 permit host 192.168.1.5
access-list 20 permit host 192.168.1.10
access-list 20 permit host 192.168.1.11

Router 3

Router 3 , R3, Point-to-point connection

Interface	IP4 Address	Connected to	Interface	IP4 Address
GigabitEthernet0/0	192.168.100.2/30	S3 Layer 3 switch	GigabitEthernet1/0/5	192.168.100.1/30
GigabitEthernet0/1	192.168.160.2/30	S4 Layer 3 switch	GigabitEthernet1/0/6	192.168.111.1/30
Serial0/0/0	192.168.200.2/30	R2 Router	Serial0/0/0	192.168.200.1/30
Serial0/0/1	192.168.120.2/30	R4 Router	Serial0/0/1	192.168.120.1/30
Serial0/1/0	192.168.150.2/30	R1 Router	Serial0/1/0	192.168.150.1/30

R3
Line console 0 Password (R3@123)
Privileged EXEXC Password (R3@)
Line Vty password (R3@123)
Access Control List Class 20
access-list 20 permit host 192.168.2.10
access-list 20 permit host 192.168.2.11
access-list 20 permit host 192.168.12.5
access-list 20 permit host 192.168.13.2

Router 4

Router 4 , R4, Point-to-point connection				
Interface	IP4 Address	Connected to	Interface	IP4 Address
GigabitEthernet0/0	192.168.110.2/30	S4 Layer 3 switch	GigabitEthernet1/0/5	192.168.110.1/30
GigabitEthernet0/1	192.168.220.2/30	S1 Layer 3 switch	GigabitEthernet1/0/3	192.168.220.1/30
Serial0/0/0	192.168.130.2/30	R1 Router	Serial0/0/0	192.168.130.1/30
Serial0/0/1	192.168.120.1/30	R3 Router	Serial0/0/1	192.168.120.2/30
Serial0/1/0	192.168.140.1/30	R2 Router	Serial0/1/0	192.168.140.2/30

R4
Line console 0 Password (R4@123)
Privileged EXEXC Password (R4@)
Line Vty password (R4@123)
Access Control List Class 20
access-list 20 permit host 192.168.2.10
access-list 20 permit host 192.168.2.11
access-list 20 permit host 192.168.3.70

2.Distribution Layer

The distribution layer consists of 4 Layer 3 Switches (Model 3650-24PS), each one connected to two Routers in the Core layer using Copper Straight-through, and Layer 2 switches in the access layer using Copper Cross-Over The layer 3. Every Layer 2 switch has VLANs and DHCPs configuration.

- **Distribution Layer Protocols and Configuration**
  8. spanning-tree mode pvst
  9. Routing Protocol OSPF (ospf 1)

10. Access Control (class 20)
11. Remote Access Privilege 15 (transport input ssh)
12. Password Encryption
13. Password For (line console 0 , line vty 0 15, Privilege EXEC user mode)
14. ip domain-name mustafa@net

Layer 3 Switch 1

Switch Layer 3 , S1, Server Room

Interface	IP4 Address	Connected to	Interface	IP4 Address
GigabitEthernet1/0/2	192.168.111.1/30	R1 Router	GigabitEthernet0/0	192.168.111.2/30
GigabitEthernet1/0/3	192.168.220.1/30	R4 Router	GigabitEthernet0/1	192.168.220.2/30

Port	Mode	Connected to	Port	Location
GigabitEthernet1/0/1	Trunk	Server Layer 2 switch	FastEthernet0/24	Server Room

S1

- **Vlan** 100 interface Vlan100
- mac-address 0001.4398.8601
- ip address 192.168.2.1 255.255.255.0

Line console 0 Password (S1@123)
Privileged EXEXC Password (S1@)
Line Vty password (S1@123)
Access Control List Class 20
    access-list 20 permit host 192.168.2.10
    access-list 20 permit host 192.168.2.11

Layer 3 Switch 2

Switch Layer 3 , S2, Accounting

Interface	IP4 Address	Connected to	Interface	IP4 Address
GigabitEthernet1/0/2	192.168.190.2/30	R1 Router	GigabitEthernet0/0	192.168.190.1/30
GigabitEthernet1/0/3	192.168.180.2/30	R2 Router	GigabitEthernet0/0	192.168.180.1/30

Port	Mode	Connected to	Port	Location
GigabitEthernet1/0/1	Trunk	Accounting Layer 2 switch	FastEthernet0/24	Accounting Dep

S2

DHCP pools and VLANs

- interface Vlan10

mac-address 0060.3e7c.4a02
ip address 192.168.1.1 255.255.255.0

- ip dhcp pool Accounting

network 192.168.1.0 255.255.255.0
default-router 192.168.1.1
dns-server 192.168.2.3

Line console 0 Password (S2@123)
Privileged EXEXC Password (S2@)
Line Vty password (S2@123)
Access Control List Class 20
access-list 20 permit host 192.168.2.10

access-list 20 permit host 192.168.2.11

Layer 3 Switch 3

Switch Layer 3 , S3, Marketing, Logistics, Research				
Interface	IP4 Address	Connected to	Interface	IP4 Address
GigabitEthernet1/0/5	192.168.100.1/30	R2 Router	GigabitEthernet0/1	192.168.100.2/30
GigabitEthernet1/0/4	192.168.170.1/30	R3 Router	GigabitEthernet0/0	192.168.170.2/30

Port	Mode	Connected to	Port	Location
GigabitEthernet1/0/1	Trunk	Marketing Layer 2 switch	FastEthernet0/5	Marketing Dep
GigabitEthernet1/0/2	Trunk	Logistics Layer 2 switch	FastEthernet0/5	Logistics Dep
GigabitEthernet1/0/3	Trunk	Research Layer 2 switch	FastEthernet0/5	Research Dep

S3

- DHCP Pools and VLANs

1. ip dhcp pool Marketing

network 192.168.10.0 255.255.255.192
default-router 192.168.10.1
dns-server 192.168.2.3

- interface Vlan30

mac-address 0002.17cd.e301
ip address 192.168.10.1 255.255.255.192

2.ip dhcp pool Logistics

network 192.168.11.0 255.255.255.192
default-router 192.168.12.1
dns-server 192.168.2.3

- interface Vlan40

mac-address 0002.17cd.e302
ip address 192.168.12.1 255.255.255.192

3.ip dhcp pool Research

network 192.168.13.0 255.255.255.192
default-router 192.168.13.1
dns-server 192.168.2.3

- interface Vlan50

mac-address 0002.17cd.e303
ip address 192.168.13.1 255.255.255.192

Line console 0 Password (S3@123)
Privileged EXEXC Password (S3@)
Line Vty password (S3@123)
Access Control List Class 20
access-list 20 permit host 192.168.2.10
access-list 20 permit host 192.168.2.11

Layer 3 Switch 4

Switch Layer 3 , S4,

Interface	IP4 Address	Connected to	Interface	IP4 Address
GigabitEthernet1/0/5	192.168.110.1/30	R4 Router	GigabitEthernet0/0	192.168.110.2/30
GigabitEthernet1/0/6	192.168.160.1/30	R3 Router	GigabitEthernet0/1	192.168.160.2/30

VLANS AND DHCP pools

1- ip dhcp pool Human Resource

- network 192.168.3.0 255.255.255.192

default-router 192.168.3.1
dns-server 192.168.2.3

- interface Vlan60

mac-address 00e0.b02b.9b02
ip address 192.168.3.1 255.255.255.192

2- ip dhcp pool Management

network 192.168.3.64 255.255.255.192
default-router 192.168.3.65
dns-server 192.168.2.3

- interface Vlan70

mac-address 00e0.b02b.9b03
ip address 192.168.3.65 255.255.255.192

3- ip dhcp pool Business

network 192.168.3.128 255.255.255.192
default-router 192.168.3.129
dns-server 192.168.2.3

- interface Vlan80

mac-address 00e0.b02b.9b04
ip address 192.168.3.129 255.255.255.192

4- ip dhcp pool Finance

network 192.168.3.192 255.255.255.192
default-router 192.168.3.193
dns-server 192.168.2.3

- interface Vlan90

mac-address 00e0.b02b.9b05
ip address 192.168.3.193 255.255.255.192

Layer 3 switch, S4,Management, Business, Finance, Human Resource				
Port	Mode	Connected to	Port	Location
GigabitEthernet1/0/1	Trunk	HR Layer 2 switch	FastEthernet0/24	Human Resource Dep
GigabitEthernet1/0/2	Trunk	Management Layer 2 switch	FastEthernet0/24	Management Dep
GigabitEthernet1/0/3	Trunk	Business Layer 2 switch	FastEthernet0/24	Business Dep
GigabitEthernet1/0/4	Trunk	Business Layer 2 switch	FastEthernet0/24	Finance Dep

Line console 0 Password (S4@123)
Privileged EXEXC Password (S4@)
Line Vty password (S4@123)
Access Control List Class 20
access-list 20 permit host 192.168.2.10
access-list 20 permit host 192.168.2.11

3. The Access Layer and Devices

- **Server Room (192.168.2.0/24)**
  Layer 2 switch, VLAN 100, (Server) connected to S1, Layer 3 Switch and

1- DHCP server (192.168.2.2/24) fa0/1
The DHCP has Ip 4 address pool (serverpool) to offer ip address to the device connected to it (admin PCs)
2- DNS server (192.168.2.3/24) fa0/2
DNS (bank.com, mustafa.com)
3- Web server (192.168.2.4/24) fa0/3

4- Two administration PCs with Control access to all the devices over this network

- **Accounting Department (192.168.1.0/24)**

Layer 2 switch, VLAN 10, connected to S2 layer 3 switch and

1- Four User PCs
2- Printer
3- Wireless Access Point
SSID Accounting
Password Accounting@123
5- One Admin Pc
6- Laptop

- **Marketing Department (192.168.10.0)**

Layer 2 switch, VLAN 30, connected to S3 layer 3 switch and

1- Three User PCs
2- Printer

- **Logistics Department (192.168.12.0)**

Layer 2 switch, VLAN 40, connected to S3 layer 3 switch and

1- Three User PCs
2- Printer

- **Research Department (192.168.13.0)**

Layer 2 switch, VLAN 50, connected to S3 layer 3 switch and

1- Three User PCs
2- Printer

- **Human Resource Department (192.168.3.0/26)**

Layer 2 switch, VLAN 60, connected to S4 layer 3 switch and

1- Four User PCs
2- Printer
3- Wireless Access Point
SSID HR@123456
Password HR@123456

5- Laptop

- **Management Department (192.168.3.64/26)**

Layer 2 switch, VLAN 70, connected to S4 layer 3 switch and

1- Four User PCs
2- Printer
3- Wireless Access Point
SSID Management@123456
Password Managment@123456
5- Laptop

- **Business Department (192.168.3.128/26)**

Layer 2 switch, VLAN 80, connected to S4 layer 3 switch and

1- Four User PCs
2- Printer
3- Wireless Access Point
SSID business@123456
Password Business@123456
5- Laptop

- **Finance Department (192.168.3.192/26)**

Layer 2 switch, VLAN 90, connected to S4 layer 3 switch and

1- Four User PCs
2- Printer
3- Wireless Access Point
SSID Management@123456
Password Managment@123456
5- Laptop