بسم الله الرحمن الرحيم

Design Network Infrastructure for Headquarter and Branch office.

Osama Saleh Al-Jamal

Khidmat Watan Final Project Documentation.

Computer Science (ICT)
Mobile phone: +962788690737
E-mail: samaaljamal84@gmail.com
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1- Introduction

A basic Network infrastructure allude to the resources like hardware and software of an entire network that let network connectivity, communication, operations and control of an topology where you can achieve full connectivity between the clients in headquarter and branch site.

Cisco packet Tracer latest version was used to design & simulate this design. Using Cisco packet tracer we can simulate application layer protocols, basic routing with RIP, OSPF, EIGRP, etc. My design consist two locations for Ranet Company, headquarter and branch site. The total cost of this project 40,000$ [1].

The main purpose of a network is to reduce isolated users and workgroups. All systems should be capable of communicate and provide and desired information. Additionally, physical systems and devices should be able to maintain and provide satisfactory performance, reliability and security.

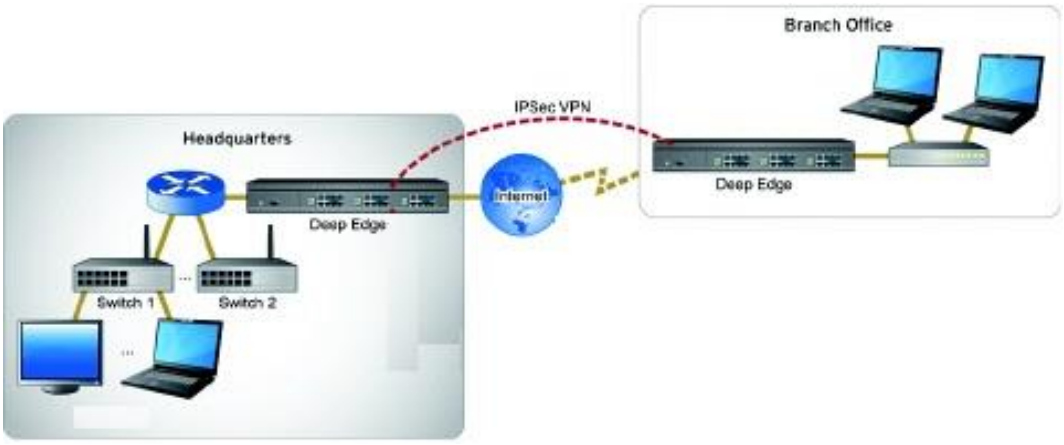

Figure (1): Connectivity between the clients in headquarter and branch office in general.[2]

2- Methodology

In order to design and implement of a Network the following methodology was used:

a) Conceptualizing the Ideas.

b) Designing the Network Architecture.

c) Add devices and network tools.

d) Configuration of Devices in accordance to Topology.

e) Network Troubleshooting.

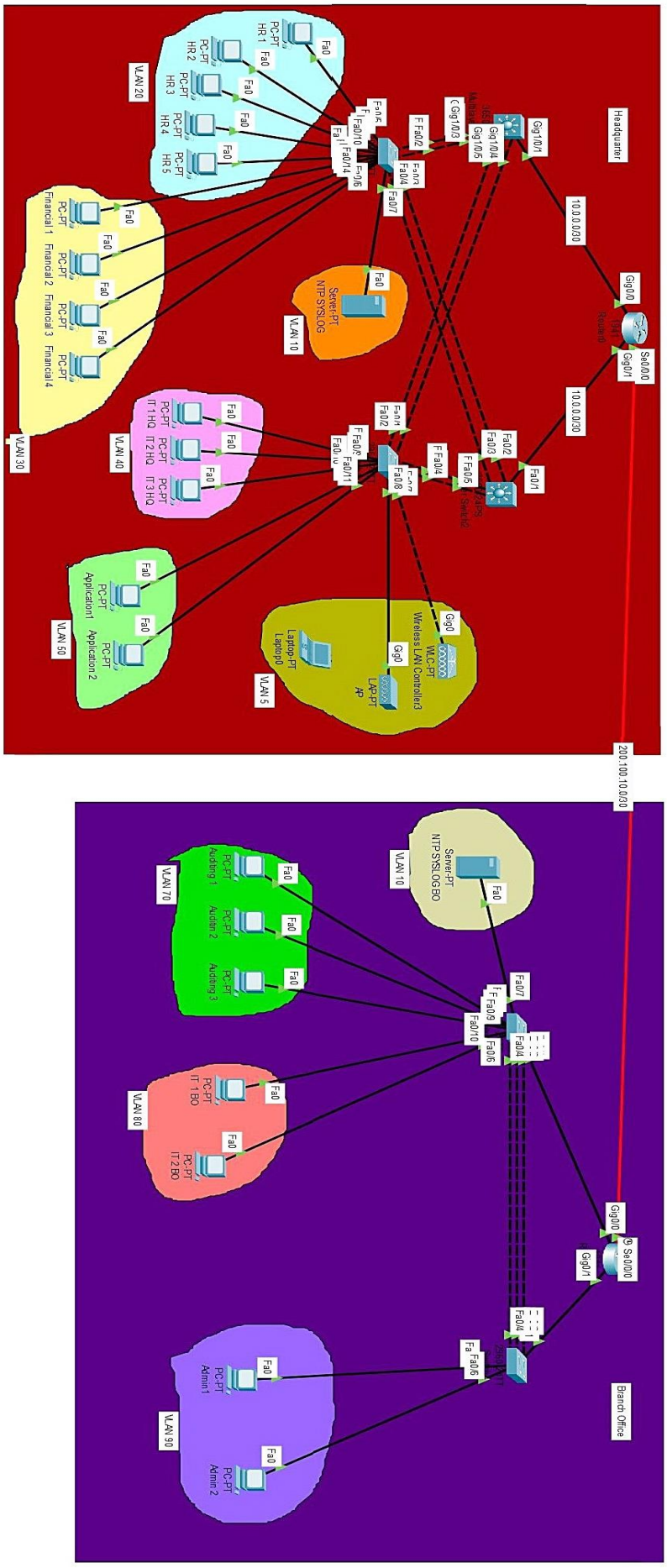

Figure: HQ & BO network design.

3- Tables of requirement

- Devices Price List:

Devices Name	Quantity	Price
Router 1941	2	3000
Switch 3650	1	6000
Switch 3560	1	4000
Switch 2960	4	6000
Workstation	2	1200
Wireless LAN Controller	1	5000
Access Point	1	300
WAN Interface card (HWIC)	2	2000
Wireless Adapter	1	50
Total >		27,550 $

Table (1): Devices Price List

- Headquarter VLANs:

VLANs Name	Network IP	Subnet mask	Gateway
10 Mgmt.	192.168.1.0	255.255.255.0	192.168.1.1
99 Native	192.168.2.0	255.255.255.0	192.168.2.1
20 HR	192.168.3.0	255.255.255.240	192.168.3.1
30 Financial	192.168.3.16	255.255.255.240	192.168.3.17
40 IT	192.168.3.32	255.255.255.248	192.168.3.33
50 Application	192.168.3.40	255.255.255.248	192.168.3.41
5 Wireless	192.168.3.48	255.255.255.248	192.168.3.49

Table (2): Headquarter VLANs

- Headquarter Routers:

R,SW Hostname / Interfaces	HQ_AGSW1	HQ_AGSW2	HQ_WAN_R
GigabitEthernet1/0/1	10.0.0.1/30	Null	Null
FastEthernet0/1	Null	10.0.0.5/30	Null
GigabitEthernet0/1	Null	Null	10.0.0.2/30
GigabitEthernet0/2	Null	Null	10.0.0.6/30
Serial 0/0/0	Null	Null	200.100.10.1/30

Table (3): Headquarter Routers

- Branch Office VLANs:

VLAN Name	Network IP	Subnet mask	Gateway
10 Mgmt.	172.16.1.0	255.255.255.0	172.16.1.1
99 Native	172.16.2.0	255.255.255.0	172.16.2.1
70 Auditing	172.16.3.0	255.255.255.248	172.16.3.1
80 IT	172.16.3.8	255.255.255.248	172.16.3.9
90 Admin	172.16.3.16	255.255.255.248	172.16.3.17

Table (4): Branch Office VLANs

- Branch Office Router:

R Hostname / Interfaces	BO_W_R
Serial 0/0/0	200.100.10.2/30
GigabitEthernet0/0.70	172.16.3.1/29
GigabitEthernet0/0.80	172.16.3.18/29
GigabitEthernet0/1.90	172.16.3.16/29

Table (5): Branch Office Router

4- Configuration Part

♦ Headquarter Router (HQ_WAN_R) Configurations:

```
hostname HQ_WAN_R

enable password Cisco@123

username Osama password Cisco@123

ip domain-name osamalab.com


interface Tunnel1
ip address 192.168.20.1 255.255.255.0
tunnel source Serial0/0/0
tunnel destination 200.100.10.2


interface GigabitEthernet0/0
ip address 10.0.0.2 255.255.255.252
```

```
ip access-group ssh in

interface GigabitEthernet0/1
ip address 10.0.0.6 255.255.255.252
ip access-group ssh in

interface Serial0/0/0
ip address 200.100.10.1 255.255.255.252

router ospf 100
network 10.0.0.0 0.0.0.3 area 0
network 10.0.0.4 0.0.0.3 area 0
network 192.168.20.0 0.0.0.255 area 0

ip access-list extended ssh
permit tcp 192.168.3.32 0.0.0.7 172.16.0.0 0.0.3.255 eq 22
permit ip 192.168.3.32 0.0.0.7 192.168.3.40 0.0.0.7
deny tcp 192.168.0.0 0.0.7.255 172.16.0.0 0.0.3.255 eq 22
deny ip any 192.168.3.40 0.0.0.7
permit ip any any

crypto key generate rsa
 How many bits in the modulus [512]: 1024
ip ssh version 2
line vty 0 4
 login local
 transport input telnet ssh

line vty 5 15
 login local
 transport input ssh

ntp server 192.168.1.5

logging host 192.168.1.5
```

♦ Multilayer Switch1 (HQ_MLSW1) Configurations:

```
hostname HQ_MLSW1

enable password Cisco@123

ip dhcp excluded-address 192.168.1.1 192.168.1.3
ip dhcp excluded-address 192.168.2.1 192.168.2.3
ip dhcp excluded-address 192.168.3.1 192.168.3.3
ip dhcp excluded-address 192.168.3.17 192.168.3.19
ip dhcp excluded-address 192.168.3.33 192.168.3.35
ip dhcp excluded-address 192.168.3.41 192.168.3.43
ip dhcp excluded-address 192.168.3.49 192.168.3.51
ip dhcp excluded-address 192.168.3.52
ip dhcp excluded-address 192.168.1.5

ip dhcp pool vlan10
network 192.168.1.0 255.255.255.0
default-router 192.168.1.1
dns-server 192.168.1.1

ip dhcp pool vlan99
network 192.168.2.0 255.255.255.0
default-router 192.168.2.1
dns-server 192.168.2.1

ip dhcp pool vlan20
network 192.168.3.0 255.255.255.240
default-router 192.168.3.1
dns-server 192.168.3.1
```

```
ip dhcp pool vlan30
network 192.168.3.16 255.255.255.240
default-router 192.168.3.17
dns-server 192.168.3.17

ip dhcp pool vlan40
network 192.168.3.32 255.255.255.248
default-router 192.168.3.33
dns-server 192.168.3.33

ip dhcp pool vlan50
network 192.168.3.40 255.255.255.248
default-router 192.168.3.41
dns-server 192.168.3.41

ip dhcp pool vlan5
network 192.168.3.48 255.255.255.248
default-router 192.168.3.49
dns-server 192.168.3.48

ip routing

username Osama password Cisco@123

ip domain-name osamalab.com

interface Port-channel1
switchport trunk native vlan 99
switchport trunk encapsulation dot1q
switchport mode trunk

interface Port-channel3
switchport trunk native vlan 99
switchport trunk encapsulation dot1q
switchport mode trunk
```

```
interface GigabitEthernet1/0/1
no switchport
ip address 10.0.0.1 255.255.255.252

interface GigabitEthernet1/0/2
switchport trunk native vlan 99
switchport trunk encapsulation dot1q
switchport mode trunk
channel-group 1 mode desirable

interface GigabitEthernet1/0/3
switchport trunk native vlan 99
switchport trunk encapsulation dot1q
switchport mode trunk
channel-group 1 mode desirable

interface GigabitEthernet1/0/4
switchport trunk native vlan 99
switchport trunk encapsulation dot1q
switchport mode trunk
channel-group 3 mode desirable

interface GigabitEthernet1/0/5
switchport trunk native vlan 99
switchport trunk encapsulation dot1q
switchport mode trunk
channel-group 3 mode desirable

interface Vlan5
mac-address 0005.5e7a.0d01
ip address 192.168.3.50 255.255.255.248
standby 0 ip 192.168.3.49
standby 0 priority 150
standby 0 preempt
```

```
interface Vlan10
mac-address 0005.5e7a.0d02
ip address 192.168.1.2 255.255.255.0
standby 0 ip 192.168.1.1
standby 0 priority 150
standby 0 preempt

interface Vlan20
mac-address 0005.5e7a.0d03
ip address 192.168.3.2 255.255.255.240
standby 0 ip 192.168.3.1
standby 0 priority 150
standby 0 preempt

interface Vlan30
mac-address 0005.5e7a.0d04
ip address 192.168.3.18 255.255.255.240
standby 0 ip 192.168.3.17
standby 0 priority 150
standby 0 preempt

interface Vlan40
mac-address 0005.5e7a.0d05
ip address 192.168.3.34 255.255.255.248
standby 0 ip 192.168.3.33
standby 0 priority 150
standby 0 preempt

interface Vlan50
mac-address 0005.5e7a.0d06
ip address 192.168.3.42 255.255.255.248
standby 0 ip 192.168.3.41
standby 0 priority 150
standby 0 preempt
```

```
interface Vlan99
mac-address 0005.5e7a.0d07
ip address 192.168.2.2 255.255.255.0
standby 0 ip 192.168.2.1
standby 0 priority 150
standby 0 preempt

router ospf 100
network 192.168.3.48 0.0.0.7 area 0
network 192.168.1.0 0.0.0.255 area 0
network 192.168.3.0 0.0.0.15 area 0
network 192.168.3.16 0.0.0.15 area 0
network 192.168.3.32 0.0.0.7 area 0
network 192.168.3.40 0.0.0.7 area 0
network 192.168.2.0 0.0.0.255 area 0
network 10.0.0.0 0.0.0.3 area 0

crypto key generate rsa
 How many bits in the modulus [512]: 1024
ip ssh version 2
line vty 0 4
 login local
 transport input telnet ssh

line vty 5 15
 login local
 transport input ssh

ntp server 192.168.1.5

logging host 192.168.1.5
```

♦ Multilayer Switch2 (HQ_MLSW2) Configurations:

```
hostname HQ_AGSW2

enable password Cisco@123

ip dhcp excluded-address 192.168.1.1 192.168.1.3
ip dhcp excluded-address 192.168.2.1 192.168.2.3
ip dhcp excluded-address 192.168.3.1 192.168.3.3
ip dhcp excluded-address 192.168.3.17 192.168.3.19
ip dhcp excluded-address 192.168.3.33 192.168.3.35
ip dhcp excluded-address 192.168.3.41 192.168.3.43
ip dhcp excluded-address 192.168.3.49 192.168.3.51
ip dhcp excluded-address 192.168.3.52
ip dhcp excluded-address 192.168.1.5

ip dhcp pool vlan10
 network 192.168.1.0 255.255.255.0
 default-router 192.168.1.1
 dns-server 192.168.1.1

ip dhcp pool vlan99
 network 192.168.2.0 255.255.255.0
 default-router 192.168.2.1
 dns-server 192.168.2.1

ip dhcp pool vlan20
 network 192.168.3.0 255.255.255.240
 default-router 192.168.3.1
 dns-server 192.168.3.1

ip dhcp pool vlan30
 network 192.168.3.16 255.255.255.240
 default-router 192.168.3.17
 dns-server 192.168.3.17
```

```
ip dhcp pool vlan40
 network 192.168.3.32 255.255.255.248
 default-router 192.168.3.33
 dns-server 192.168.3.33

ip dhcp pool vlan50
 network 192.168.3.40 255.255.255.248
 default-router 192.168.3.41
 dns-server 192.168.3.41

ip dhcp pool vlan5
 network 192.168.3.48 255.255.255.248
 default-router 192.168.3.49
 dns-server 192.168.3.48

ip routing

username Osama password Cisco@123

ip domain-name osamalab.com

interface Port-channel2
 switchport trunk native vlan 99
 switchport trunk encapsulation dot1q
 switchport mode trunk

interface Port-channel4
 switchport trunk native vlan 99
 switchport trunk encapsulation dot1q
 switchport mode trunk

interface FastEthernet0/1
 no switchport
 ip address 10.0.0.5 255.255.255.252
```

```
interface FastEthernet0/2
 switchport trunk native vlan 99
 switchport trunk encapsulation dot1q
 switchport mode trunk
 channel-group 2 mode desirable

interface FastEthernet0/3
 switchport trunk native vlan 99
 switchport trunk encapsulation dot1q
 switchport mode trunk
 channel-group 2 mode desirable

interface FastEthernet0/4
 switchport trunk native vlan 99
 switchport trunk encapsulation dot1q
 switchport mode trunk
 channel-group 4 mode desirable

interface FastEthernet0/5
 switchport trunk native vlan 99
 switchport trunk encapsulation dot1q
 switchport mode trunk
 channel-group 4 mode desirable

interface Vlan5
 mac-address 00d0.ff3b.1201
 ip address 192.168.3.51 255.255.255.248
 standby 0 ip 192.168.3.49

interface Vlan10
 mac-address 00d0.ff3b.1202
 ip address 192.168.1.3 255.255.255.0
 standby 0 ip 192.168.1.1
```

```
interface Vlan20
 mac-address 00d0.ff3b.1203
 ip address 192.168.3.3 255.255.255.240
 standby 0 ip 192.168.3.1

interface Vlan30
 mac-address 00d0.ff3b.1204
 ip address 192.168.3.19 255.255.255.240
 standby 0 ip 192.168.3.17

interface Vlan40
 mac-address 00d0.ff3b.1205
 ip address 192.168.3.35 255.255.255.248
 standby 0 ip 192.168.3.33

interface Vlan50
 mac-address 00d0.ff3b.1206
 ip address 192.168.3.43 255.255.255.248
 standby 0 ip 192.168.3.41

interface Vlan99
 mac-address 00d0.ff3b.1207
 ip address 192.168.2.3 255.255.255.0
 standby 0 ip 192.168.2.1

router ospf 100
 network 192.168.3.48 0.0.0.7 area 0
 network 192.168.1.0 0.0.0.255 area 0
 network 192.168.3.0 0.0.0.15 area 0
 network 192.168.3.16 0.0.0.15 area 0
 network 192.168.3.32 0.0.0.7 area 0
 network 192.168.3.40 0.0.0.7 area 0
 network 192.168.2.0 0.0.0.255 area 0
 network 10.0.0.4 0.0.0.3 area 0
```

```
crypto key generate rsa
 How many bits in the modulus [512]: 1024
ip ssh version 2
line vty 0 4
 login local
 transport input telnet ssh

line vty 5 15
 login local
 transport input ssh

ntp server 192.168.1.5

logging host 192.168.1.5
```

♦ **Switch0 (HQ_SW1) Configurations:**

```
hostname HQ_SW1

enable password Cisco@123

ip dhcp excluded-address 192.168.1.5

username Osama privilege 1 password Cisco@123

ip domain-name osamalab.com

spanning-tree mode pvst
spanning-tree portfast bpduguard default
spanning-tree extend system-id

interface Port-channel1
 switchport trunk native vlan 99
 switchport mode trunk
```

```
interface Port-channel2
 switchport trunk native vlan 99
 switchport mode trunk

interface FastEthernet0/1
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 1 mode desirable

interface FastEthernet0/2
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 1 mode desirable

interface FastEthernet0/3
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 2 mode desirable

interface FastEthernet0/4
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 2 mode desirable

interface FastEthernet0/5
 switchport access vlan 20
 switchport mode access
 switchport port-security
 switchport port-security maximum 5
 switchport port-security mac-address sticky
 switchport port-security violation restrict
```

```
interface FastEthernet0/6
 switchport access vlan 30
 switchport mode access
 switchport port-security
 switchport port-security maximum 5
 switchport port-security mac-address sticky
 switchport port-security violation restrict

interface FastEthernet0/7
 switchport access vlan 10
 switchport mode access

interface FastEthernet0/8
 switchport access vlan 20
 switchport mode access
 switchport port-security
 switchport port-security maximum 5
 switchport port-security mac-address sticky
 switchport port-security violation restrict

interface FastEthernet0/9
 switchport access vlan 20
 switchport mode access
 switchport port-security
 switchport port-security maximum 5
 switchport port-security mac-address sticky
 switchport port-security violation restrict

interface FastEthernet0/10
 switchport access vlan 20
 switchport mode access
 switchport port-security
 switchport port-security maximum 5
 switchport port-security mac-address sticky
 switchport port-security violation restrict
```

```
interface FastEthernet0/11
 switchport access vlan 20
 switchport mode access
 switchport port-security
 switchport port-security maximum 5
 switchport port-security mac-address sticky
 switchport port-security violation restrict

interface FastEthernet0/12
 switchport access vlan 30
 switchport mode access
 switchport port-security
 switchport port-security maximum 5
 switchport port-security mac-address sticky
 switchport port-security violation restrict

interface FastEthernet0/13
 switchport access vlan 30
 switchport mode access
 switchport port-security
 switchport port-security maximum 5
 switchport port-security mac-address sticky
 switchport port-security violation restrict

interface FastEthernet0/14
 switchport access vlan 30
 switchport mode access
 switchport port-security
 switchport port-security maximum 5
 switchport port-security mac-address sticky
 switchport port-security violation restrict
```

```
interface Vlan10
 mac-address 00e0.a331.1701
 ip address dhcp

logging 192.168.1.5

crypto key generate rsa
 How many bits in the modulus [512]: 1024
ip ssh version 2
line vty 0 4
 login local
 transport input telnet ssh

line vty 5 15
 login local
 transport input ssh

ntp server 192.168.1.5
```

♦ Switch1 (HQ_SW2) Configurations:

```
hostname HQ_SW2

enable password Cisco@123

username Osama privilege 1 password Cisco@123

ip domain-name osamalab.com

spanning-tree portfast bpduguard default – disabled BPDU on access ports
```

```
interface Port-channel3
 switchport trunk native vlan 99
 switchport mode trunk

interface Port-channel4
 switchport trunk native vlan 99
 switchport mode trunk

interface FastEthernet0/1
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 3 mode desirable

interface FastEthernet0/2
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 3 mode desirable

interface FastEthernet0/3
 switchport mode trunk
 channel-group 4 mode desirable
 shutdown

interface FastEthernet0/4
 switchport mode trunk
 channel-group 4 mode desirable
 shutdown

interface FastEthernet0/5 – map port to the VLAN
 switchport access vlan 40
 switchport mode access
 switchport port-security – configuration port security
 switchport port-security maximum 5
 switchport port-security mac-address sticky
```

```
 spanning-tree bpduguard enable

interface FastEthernet0/6
 switchport access vlan 50
 switchport mode access
 switchport port-security
 switchport port-security maximum 5
 switchport port-security mac-address sticky

interface FastEthernet0/7
 switchport access vlan 5
 switchport mode access

interface FastEthernet0/8
 switchport access vlan 5
 switchport mode access

interface Vlan10
 ip address dhcp

crypto key generate rsa
 How many bits in the modulus [512]: 1024
ip ssh version 2
line vty 0 4
 login local
 transport input telnet ssh

line vty 5 15
 login local
 transport input ssh

ntp server 192.168.1.5
logging host 192.168.1.5
```

♦ Router1 (BO_W_R) Configurations:

```
hostname BO_W_R

enable password Cisco@123

ip dhcp excluded-address 172.16.1.1

ip dhcp pool AUDITING
 network 172.16.3.0 255.255.255.248
 default-router 172.16.3.1
 dns-server 172.16.3.1
ip dhcp pool IT
 network 172.16.3.8 255.255.255.248
 default-router 172.16.3.9
 dns-server 172.16.3.9
 domain-name wr
ip dhcp pool ADMIN
 network 172.16.3.16 255.255.255.248
 default-router 172.16.3.16
 dns-server 172.16.3.16
 domain-name wr
ip dhcp pool Mgmt
 network 172.16.1.0 255.255.255.0
 default-router 172.16.1.1
 dns-server 172.16.1.1

username Osama password 0 Cisco@123

ip domain-name osamalab.com
```

```
interface Tunnel1
 ip address 192.168.20.2 255.255.255.0
 mtu 1476
 tunnel source Serial0/0/0
 tunnel destination 200.100.10.1

interface GigabitEthernet0/0.10
 encapsulation dot1Q 10
 ip address 172.16.1.1 255.255.255.0

interface GigabitEthernet0/0.70
 encapsulation dot1Q 70
 ip address 172.16.3.1 255.255.255.248

interface GigabitEthernet0/0.80
 encapsulation dot1Q 80
 ip address 172.16.3.9 255.255.255.248

interface GigabitEthernet0/1.90
 encapsulation dot1Q 90
 ip address 172.16.3.17 255.255.255.248

interface Serial0/0/0
 ip address 200.100.10.2 255.255.255.252
 clock rate 2000000

router ospf 100
 network 172.16.1.0 0.0.0.255 area 0
 network 172.16.3.0 0.0.0.7 area 0
 network 172.16.3.8 0.0.0.7 area 0
 network 172.16.3.16 0.0.0.7 area 0
 network 192.168.20.0 0.0.0.255 area 0
```

```
crypto key generate rsa
 How many bits in the modulus [512]: 1024
ip ssh version 2
line vty 0 4
 login local
 transport input telnet ssh

line vty 5 15
 login local
 transport input ssh
```

♦ Switch3 (BO_SW1) Configurations:

```
hostname BO_SW1

enable password Cisco@123

username Osama privilege 1 password 0 Cisco@123
ip domain-name osamalab.com

spanning-tree portfast bpduguard default

interface Port-channel1
switchport trunk native vlan 99
switchport mode trunk

interface FastEthernet0/1
switchport trunk native vlan 99
switchport mode trunk

interface FastEthernet0/2
switchport trunk native vlan 99
switchport mode trunk
channel-group 1 mode desirable
```

```
interface FastEthernet0/3
switchport trunk native vlan 99
switchport mode trunk
channel-group 1 mode desirable

interface FastEthernet0/4
switchport trunk native vlan 99
switchport mode trunk
channel-group 1 mode desirable

interface FastEthernet0/5
switchport access vlan 70
switchport mode access
switchport port-security
switchport port-security maximum 5
switchport port-security mac-address sticky
switchport port-security violation restrict

interface FastEthernet0/6
switchport access vlan 80
switchport mode access
switchport port-security
switchport port-security maximum 5
switchport port-security mac-address sticky
switchport port-security violation restrict

interface FastEthernet0/7
switchport access vlan 10
switchport mode access
```

```
interface Vlan10
mac-address 0001.c949.e601
ip address dhcp

logging 172.16.1.3

crypto key generate rsa
 How many bits in the modulus [512]: 1024
ip ssh version 2
line vty 0 4
 login local
 transport input telnet ssh

line vty 5 15
 login local
 transport input ssh

ntp server 172.16.1.3
```

♦ **Switch4 (BO_SW2) Configurations:**

```
hostname BO_SW2

enable password Cisco@123
username Osama privilege 1 password 0 Cisco@123

ip domain-name osamalab.com

spanning-tree portfast bpduguard default

interface Port-channel1
switchport trunk native vlan 99
switchport mode trunk
```

```
interface FastEthernet0/1
switchport trunk native vlan 99
switchport mode trunk

interface FastEthernet0/2
switchport trunk native vlan 99
switchport mode trunk
channel-group 1 mode desirable

interface FastEthernet0/3
switchport trunk native vlan 99
switchport mode trunk
channel-group 1 mode desirable

interface FastEthernet0/4
switchport trunk native vlan 99
switchport mode trunk
channel-group 1 mode desirable

interface FastEthernet0/5
switchport access vlan 90
switchport mode access
switchport port-security
switchport port-security maximum 5
switchport port-security mac-address sticky
switchport port-security violation restrict

interface Vlan10
ip address dhcp

logging 172.16.1.3

crypto key generate rsa
 How many bits in the modulus [512]: 1024
ip ssh version 2
```

```
line vty 0 4
 login local
 transport input telnet ssh

line vty 5 15
 login local
 transport input ssh

ntp server 172.16.1.3
```

5- Verification and troubleshooting

VLAN verification:

Command	Description
show interface switchport	Displays information about the ports, including those in private **VLANs**.
show vlan	Displays summary information for all **VLANs**.
show vlan private-**vlan**	Displays summary information for all private **VLANs**.

Table (6): VLANs verification commands

OSPF verification:

Command	Description
show ip route	Display all routes from routing table
show ip route ospf	Display all routers learned through OSPF from routing table
show ip ospf	Display basic information about OSPF
show ip ospf interface	Display information about all OSPF active interfaces
show ip ospf interface serial 0/0/0	Display OSPF information about serial 0/0/0 interface
show ip ospf neighbor List all	OSPF neighbors with basic info
show ip ospf neighbor detail	List OSPF neighbors with detail info
show ip ospf database	Display data for OSPF database

Table (7): OSPF verification commands

STP verification:

Command	Description
show spanning-tree active	Displays information about STP active interfaces only.
show spanning-tree bridge	Displays the bridge ID, timers, and protocol for the local bridge on the switch.
show spanning-tree brief	Displays a brief summary about STP.
show spanning-tree detail	Displays detailed information about STP.
show spanning-tree interface	Displays the STP interface status and configuration of specified interfaces.
show spanning-tree mst	Displays information about Multiple Spanning Tree (MST) STP.
show spanning-tree root	Displays the status and configuration of the root bridge for the STP instance to which this switch belongs.
show spanning-tree summary	Displays summary information about STP.
show spanning-tree vlan	Displays STP information for specified VLANs.

Table (8): STP verification commands

HSRP verification:

Command	Description
show hsrp type	Interface type. For more information, use the question mark (?) online help function.
show hsrp [interface-path-id]	Physical interface or virtual interface. **Note : Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
show hsrp group-number	(Optional) Group number on the interface for which output is displayed.
show hsrp brief	(Optional) A single line of output summarizes each standby group. The brief keyword is the default if detail is not specified.
show hsrp detail	(Optional) This keyword has the same effect as not specifying brief ; more output is provided.

Table (9): HSRP verification commands

DHCP verification:

Command	Description
Show IP DHCP Pool	It used to display all of the information regarding the DHCP address pools.
Show IP DHCP Import	displays you with all the parameters which were imported to the DHCP server database during the process of configuration.
Show IP DHCP server statistics	display the statistics regarding the DHCP server, such as the number of address pools.

Table (10): DHCP verification commands

ACL verification:

Command	Description
show access-lists	Displays all access lists and their parameters configured on the router. This command doesn't show which interface the list is configured on.
show access-list [list #]	Shows only the parameters for the access list specified. This command does not show you the interface the list is configured on.
show ip access-list	Shows only the IP access lists configured on the router.
show ip interface	Shows which interfaces have IP access lists on them.
ip access-group	Applies an IP access list to an interface.
show running-config	Shows the access lists and which interfaces have access lists set.
any	Keyword used to represent all hosts or networks, replaces 0.0.0.0 255.255.255.255 in access list.
host	Keyword that specifies that an address should have a wildcard mask of 0.0.0.0 (i.e will match only 1 host)
clear access-list counter [list#]	Clears extended access lists counter of the number of matches per line of the access list.

Table (11): ACL verification commands

EtherChannel verification:

Command	Description
show port-channel summary	display summary information about EtherChannels
channel-group (Ethernet)	Assigns and configures a physical interface to an EtherChannel.
interface port-channel	**Creates an EtherChannel interface and enters interface configuration mode.**

Table (12): EtherChannel verification commands

NAT verification:

Command	Description
show running-config	Display NAT configuration lines you entered are actually there in the running configuration of the router.
show ip nat translations	Display local addresses mapped to inside global address as configured.
show ip nat statistics	Display NAT statistics including the number of translated packets or hits.
ip nat inside source	Display configures a static translation between inside local and inside global IP addresses

Table (13): NAT verification commands

6- References

[1] Ashraf H. Ali, ""Enterprise Network Design and Implementation for Airports" by Ashraf," 27 April 2016. [Online]. https://scholar.valpo.edu/ms_ittheses/2/. [Accessed 25 July 2020].

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