بسم الله الرحمن الرحيم

**Design Network Infrastructure**

**for Headquarter and Branch office**.



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Khidmat Watan Final Project Documentation.

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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.

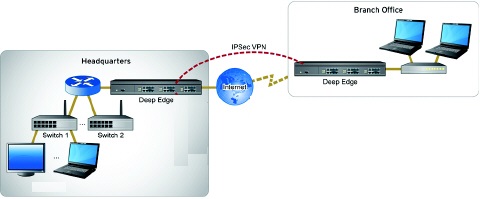


Figure (1): Connectivity between the clients in headquarter and branch office in general.[2]

**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.

**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](mailto:Cisco@123)

username Osama password [Cisco@123](mailto: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](mailto: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].

[2] trendmicro.com," IP Sec Example 1: Branch Office Configuration Example ", NA NA 2012.[Online].https://docs.trendmicro.com/all/ent/de/v1.5/enus/de\_1.5\_olh/ctm\_ag/ctm1\_ag\_ch3/c\_vpn\_example1.htm. [Accessed 25 July 2020].