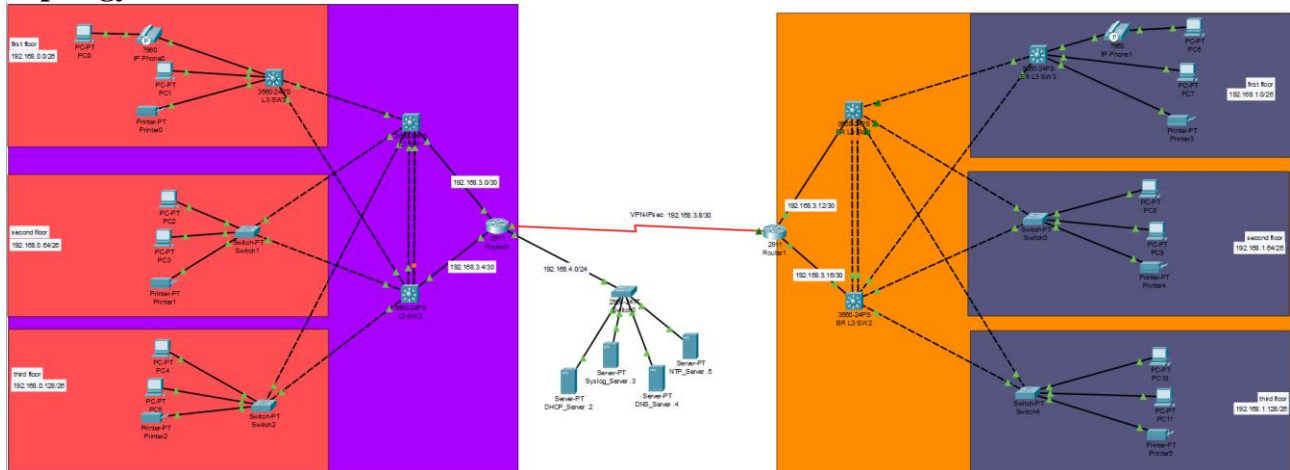


## Final Project

### Topology:



### Details:

- 1- Basic Device Configurations.
- 2- VLAN Configuration.
- 3- Spanning Tree Protocol (STP): PortFast, BPDU Guard.
- 4- EtherChannel (LACP).
- 5- Port Security.
- 6- Inter-VLAN Routing on Multilayer Switches.
- 7- Subnetting.
- 8- OSPF routing protocol.
- 9- DHCP, DNS, NTP and Syslog Server.
- 10- Dynamic ARP Inspection (DAI), DHCP Snooping.
- 11-VPN site-to-site.
- 12- Testing Connectivity.

## HQ\_R1

```
enable
conf t
hostname HQ_R1
enable secret cisco

service password-encryption
banner motd ^
*****
UNATHOURIZED ACCESS IS BROHIBITED
*****
^
line con 0
pass cisco
login local
logging synchro
no exec-timeout
exit

ip domain-name admin.com
username admin secret cisco
crypto key generate rsa general-keys modulus 2024
ip ssh version 2

line vty 0 15
login local
logging synchro
no exec-timeout
transport input ssh
exit

int gi0/0
no sh
ip address 192.168.3.1 255.255.255.252
ip helper-address 192.168.4.2

int gi0/1
no sh
ip address 192.168.3.5 255.255.255.252
ip helper-address 192.168.4.2

int gi0/0
no sh
ip address 192.168.3.9 255.255.255.252

ip routing
router ospf 1
```

```
router-id 4.4.4.4
network 192.168.3.0 0.0.0.3 a 0
network 192.168.3.4 0.0.0.3 a 0
network 192.168.3.8 0.0.0.3 a 0
network 192.168.4.0 0.0.0.255 a 0
exit

int r gi0/0-1
ip ospf authentication message-digest
ip ospf message-digest-key 1 md5 cisco
exit

int se0/1/0
ip ospf authentication message-digest
ip ospf message-digest-key 1 md5 cisco
exit

logging host 192.168.4.3
logging trap debugging
service timestamps log datetime msec

ntp server 192.168.4.5

license boot module c2900 technology-package securityk9
access-list 150 permit ip 192.168.0.0 0.0.0.255 192.168.1.0 0.0.0.255

crypto isakmp policy 10
encryption aes 256
authentication pre-share
group 5
exit

crypto isakmp key secretcisco address 192.168.3.10
crypto ipsec transform-set HQ_R1-BR_R1 esp-aes 256 esp-sha-hmac

crypto map IPSEC-MAP 10 ipsec-isakmp
set peer 192.168.3.10
set pfs group5
set security-association lifetime seconds 86400
set transform-set HQ_R1-BR_R1
match address 150
exit

int se0/1/0
crypto map IPSEC-MAP
ex
do wr
```

## HQ\_L3\_SW1

```
enable
conf t
hostname HQ_sw1
enable secret cisco

service password-encryption
banner motd ^
*****
UNATHOURIZED ACCESS IS BROHIBITED
*****
^

line con 0
pass cisco
login local
logging synchro
no exec-timeout
exit

ip domain-name admin.com
username admin secret cisco
crypto key generate rsa general-keys modulus 2024
ip ssh version 2

line vty 0 15
login local
logging synchro
no exec-timeout
transport input ssh
exit

vlan 10
name first_floor
vlan 20
name second_floor
vlan 30
name third_floor
vlan 40
name voice_vlan
exit

int vlan 10
no sh
ip helper-address 192.168.4.2
ip address 192.168.0.1 255.255.255.192
exit
```

```
int vlan 20
no sh
ip helper-address 192.168.4.2
ip address 192.168.0.65 255.255.255.192
exit
```

```
int vlan 30
no sh
ip helper-address 192.168.4.2
ip address 192.168.0.129 255.255.255.192
exit
```

```
int vlan 40
no sh
ip helper-address 192.168.4.2
ip address 192.168.0.193 255.255.255.192
exit
```

```
spanning-tree mode rapid-pvst
spanning-tree vlan 10 root primary
spanning-tree vlan 20 root primary
spanning-tree vlan 30 root primary
spanning-tree vlan 40 root primary
```

```
int r fa0/4-6
channel-group 1 mode active
channel-protocol lacp
```

```
int fa0/7
no switchport
ip address 192.168.3.2 255.255.255.252
```

```
ip routing
router ospf 1
router-id 2.2.2.2
network 192.168.0.0 0.0.0.63 a 0
network 192.168.0.64 0.0.0.63 a 0
network 192.168.0.128 0.0.0.63 a 0
network 192.168.0.192 0.0.0.63 a 0
network 192.168.3.0 0.0.0.3 a 0
passive-interface fa0/1
passive-interface fa0/2
passive-interface fa0/3
exit
```

```
int fa0/7
ip ospf authentication message-digest
```

```
ip ospf message-digest-key 1 md5 cisco
exit
```

```
logging host 192.168.4.3
logging trap debugging
service timestamps log datetime msec
```

```
ntp server 192.168.3.1
do wr
```

## HQ\_L3\_SW2

```
enable
conf t
hostname HQ_sw2
enable secret cisco
```

```
service password-encryption
banner motd ^
```

```
*****
```

```
UNATHOURIZED ACCESS IS BROHIBITED
```

```
*****
```

```
^
```

```
line con 0
pass cisco
login local
logging synchro
no exec-timeout
exit
```

```
ip domain-name admin.com
username admin secret cisco
crypto key generate rsa general-keys modulus 2024
ip ssh version 2
```

```
line vty 0 15
login local
logging synchro
no exec-timeout
transport input ssh
exit
```

```
vlan 10
name first_floor
vlan 20
name second_floor
vlan 30
name third_floor
```

```
vlan 40
name voice_vlan
exit

int vlan 10
no sh
ip helper-address 192.168.4.2
ip address 192.168.0.1 255.255.255.192
exit

int vlan 20
no sh
ip helper-address 192.168.4.2
ip address 192.168.0.65 255.255.255.192
exit

int vlan 30
no sh
ip helper-address 192.168.4.2
ip address 192.168.0.129 255.255.255.192
exit

int vlan 40
no sh
ip helper-address 192.168.4.2
ip address 192.168.0.193 255.255.255.192
exit

spanning-tree mode rapid-pvst

int r fa0/4-6
channel-group 1 mode passive
channel-protocol lacp

int fa0/7
no switchport
ip address 192.168.3.6 255.255.255.252

ip routing
router ospf 1
router-id 1.1.1.1
network 192.168.0.0 0.0.0.63 a 0
network 192.168.0.64 0.0.0.63 a 0
network 192.168.0.128 0.0.0.63 a 0
network 192.168.0.192 0.0.0.63 a 0
network 192.168.3.4 0.0.0.3 a 0
passive-interface fa0/1
passive-interface fa0/2
```

```
passive-interface fa0/3
exit

int fa0/7
ip ospf authentication message-digest
ip ospf message-digest-key 1 md5 cisco
exit

logging host 192.168.4.3
logging trap debugging
service timestamps log datetime msec

ntp server 192.168.3.5
do wr
```

## HQ\_L3\_SW3

```
enable
conf t
hostname HQ_sw3

line con 0
logging synchro
no exec-timeout
exit

line vty 0 15
logging synchro
no exec-timeout
exit

vlan 10
name first_floor
vlan 40
name voice_vlan
exit

int r fa0/4-5
switchport trunk encapsulation dot1q
switchport mode trunk

int fa0/1
switchport mode access
switchport access vlan 10
switchport voice vlan 40
int r fa0/2-3
switchport mode access
switchport access vlan 10
```



```
int fa0/1
switchport port-security
switchport port-security mac-address sticky
switchport port-security maximum 2
switchport port-security violation restrict
exit
```

```
int r fa0/2-3
switchport port-security
switchport port-security mac-address sticky
switchport port-security maximum 1
switchport port-security violation restrict
exit
```

```
ip dhcp snooping
ip dhcp snooping vlan 10
ip dhcp snooping vlan 30
ip arp inspection vlan 10
ip arp inspection vlan 30
ip arp inspection validate scr-mac ip dst-mac
int r fa0/4-5
ip dhcp snooping trust
ip arp inspection trust
exit
int r fa0/1-3
ip dhcp snooping limit rate 3
exit
no ip dhcp snooping information option
```

```
logging host 192.168.4.3
logging trap debugging
service timestamps log datetime msec
```

```
int r fa0/1-3
spanning-tree portfast
spanning-tree bpduguard enable
ex
```

```
do wr
```

## HQ\_L2\_SW1

```
enable
conf t
hostname HQ_l2sw1

line con 0
logging synchro
no exec-timeout
exit

line vty 0 15
logging synchro
no exec-timeout
exit

vlan 20
name second_floor
exit

int r fa3/1, fa6/1
switchport mode trunk
exit

int r fa0/1, fa1/1, fa2/1
switchport mode access
switchport access vlan 20
exit

int r fa0/1, fa1/1, fa2/1
switchport port-security
switchport port-security mac-address sticky
switchport port-security maximum 1
switchport port-security violation restrict
exit

ip dhcp snooping
ip dhcp snooping vlan 20
ip arp inspection vlan 20
ip arp inspection validate src-mac ip dst-mac
int r fa3/1 ,fa6/1
ip dhcp snooping trust
ip arp inspection trust
exit
int r fa0/1, fa1/1, fa2/1
ip dhcp snooping limit rate 3
exit
no ip dhcp snooping information option
```

```
logging host 192.168.4.3
logging trap debugging
service timestamps log datetime msec
```

```
int r fa0/1, fa1/1, fa2/1
spanning-tree portfast
spanning-tree bpduguard enable
ex
```

```
do wr
```

## HQ\_L2\_SW2

```
enable
conf t
hostname HQ_L2sw2
```

```
line con 0
logging synchro
no exec-timeout
exit
```

```
line vty 0 15
logging synchro
no exec-timeout
exit
```

```
vlan 30
name third_floor
exit
```

```
int r fa3/1, fa8/1
switchport mode trunk
exit
```

```
int r fa0/1, fa1/1, fa2/1
switchport mode access
switchport access vlan 30
exit
```

```
int r fa0/1, fa1/1, fa2/1
switchport port-security
switchport port-security mac-address sticky
switchport port-security maximum 1
switchport port-security violation restrict
exit
```

```
ip dhcp snooping
ip dhcp snooping vlan 30
ip arp inspection vlan 30
ip arp inspection validate src-mac ip dst-mac
int r fa3/1 ,fa8/1
ip dhcp snooping trust
ip arp inspection trust
exit
int r fa0/1, fa1/1, fa2/1
ip dhcp snooping limit rate 3
exit
no ip dhcp snooping information option

logging host 192.168.4.3
logging trap debugging
service timestamps log datetime msec

int r fa0/1, fa1/1, fa2/1
spanning-tree portfast
spanning-tree bpduguard enable
ex

do wr
```

## BR\_R1

```
enable
conf t
hostname BR_R1
enable secret cisco

service password-encryption
banner motd ^
*****
UNATHOURIZED ACCESS IS BROHIBITED
*****
^
line con 0
pass cisco
login local
logging synchro
no exec-timeout
exit

ip domain-name admin.com
username admin secret cisco
crypto key generate rsa general-keys modulus 2024
ip ssh version 2

line vty 0 15
login local
logging synchro
no exec-timeout
transport input ssh
exit

int gi0/0
no sh
ip address 192.168.3.13 255.255.255.252
no ip helper-address 192.168.3.10
ip helper-address 192.168.4.2

int gi0/1
no sh
ip address 192.168.3.17 255.255.255.252
no ip helper-address 192.168.3.10
ip helper-address 192.168.4.2

ip routing
router ospf 1
router-id 3.3.3.3
network 192.168.3.12 0.0.0.3 a 0
```

```
network 192.168.3.16 0.0.0.3 a 0
network 192.168.3.8 0.0.0.3 a 0
exit

int r gi0/0-1
ip ospf authentication message-digest
ip ospf message-digest-key 1 md5 cisco
exit

int se0/1/0
ip ospf authentication message-digest
ip ospf message-digest-key 1 md5 cisco
exit

logging host 192.168.4.3
logging trap debugging
service timestamps log datetime msec

ntp server 192.168.3.9

license boot module c2900 technology-package securityk9
access-list 150 permit ip 192.168.1.0 0.0.0.255 192.168.0.0 0.0.0.255

crypto isakmp policy 10
encryption aes 256
authentication pre-share
group 5
exit

crypto isakmp key secretcisco address 192.168.3.9
crypto ipsec transform-set BR_R1-HQ_R1 esp-aes 256 esp-sha-hmac

crypto map IPSEC-MAP 10 ipsec-isakmp
set peer 192.168.3.9
set pfs group5
set security-association lifetime seconds 86400
set transform-set BR_R1-HQ_R1
match address 150
exit

int se0/1/0
crypto map IPSEC-MAP
ex
do wr
```

## BR\_L3\_SW1

```
enable
conf t
hostname BR_sw1
enable secret cisco

service password-encryption
banner motd ^
*****
UNATHOURIZED ACCESS IS BROHIBITED
*****
^

line con 0
pass cisco
login local
logging synchro
no exec-timeout
exit

ip domain-name admin.com
username admin secret cisco
crypto key generate rsa general-keys modulus 2024
ip ssh version 2

line vty 0 15
login local
logging synchro
no exec-timeout
transport input ssh
exit

vlan 60
name first_floor
vlan 70
name second_floor
vlan 80
name third_floor
vlan 90
name voice_vlan
exit

int vlan 60
no sh
ip helper-address 192.168.4.2
ip address 192.168.1.1 255.255.255.192
exit
```

```
int vlan 70
no sh
ip helper-address 192.168.4.2
ip address 192.168.1.65 255.255.255.192
exit
```

```
int vlan 80
no sh
ip helper-address 192.168.4.2
ip address 192.168.1.129 255.255.255.192
exit
```

```
int vlan 90
no sh
ip helper-address 192.168.4.2
ip address 192.168.1.193 255.255.255.192
exit
```

```
spanning-tree mode rapid-pvst
spanning-tree vlan 60 root primary
spanning-tree vlan 70 root primary
spanning-tree vlan 80 root primary
spanning-tree vlan 90 root primary
```

```
int r fa0/4-6
channel-group 1 mode active
channel-protocol lacp
```

```
int fa0/7
no switchport
ip address 192.168.3.2 255.255.255.252
```

```
ip routing
router ospf 1
router-id 2.2.2.2
network 192.168.1.0 0.0.0.63 a 0
network 192.168.1.64 0.0.0.63 a 0
network 192.168.1.128 0.0.0.63 a 0
network 192.168.1.192 0.0.0.63 a 0
passive-interface fa0/1
passive-interface fa0/2
passive-interface fa0/3
exit
```

```
int fa0/7
ip ospf authentication message-digest
ip ospf message-digest-key 1 md5 cisco
```



```
exit
```

```
logging host 192.168.4.3
logging trap debugging
service timestamps log datetime msec
```

```
ntp server 192.168.3.13
do wr
```

## BR\_L3\_SW2

```
enable
```

```
conf t
```

```
hostname BR_sw2
```

```
enable secret cisco
```

```
service password-encryption
```

```
banner motd ^
```

```
*****
```

```
UNATHOURIZED ACCESS IS BROHIBITED
```

```
*****
```

```
^
```

```
line con 0
```

```
pass cisco
```

```
login local
```

```
logging synchro
```

```
no exec-timeout
```

```
exit
```

```
ip domain-name admin.com
```

```
username admin secret cisco
```

```
crypto key generate rsa general-keys modulus 2024
```

```
ip ssh version 2
```

```
line vty 0 15
```

```
login local
```

```
logging synchro
```

```
no exec-timeout
```

```
transport input ssh
```

```
exit
```

```
vlan 60
```

```
name first_floor
```

```
vlan 70
```

```
name second_floor
```

```
vlan 80
```

```
name third_floor
```

```
vlan 90
```

```
name voice_vlan
exit

int vlan 60
no sh
ip helper-address 192.168.4.2
ip address 192.168.1.1 255.255.255.192
exit

int vlan 70
no sh
ip helper-address 192.168.4.2
ip address 192.168.1.65 255.255.255.192
exit

int vlan 80
no sh
ip helper-address 192.168.4.2
ip address 192.168.1.129 255.255.255.192
exit

int vlan 90
no sh
ip helper-address 192.168.4.2
ip address 192.168.1.193 255.255.255.192
exit

spanning-tree mode rapid-pvst

int r fa0/4-6
channel-group 1 mode passive
channel-protocol lacp

int fa0/7
no switchport
ip address 192.168.3.2 255.255.255.252

ip routing
router ospf 1
router-id 1.1.1.1
network 192.168.1.0 0.0.0.63 a 0
network 192.168.1.64 0.0.0.63 a 0
network 192.168.1.128 0.0.0.63 a 0
network 192.168.1.192 0.0.0.63 a 0
passive-interface fa0/1
passive-interface fa0/2
passive-interface fa0/3
exit
```

```
int fa0/7
ip ospf authentication message-digest
ip ospf message-digest-key 1 md5 cisco
exit
```

```
logging host 192.168.4.3
logging trap debugging
service timestamps log datetime msec
```

```
ntp server 192.168.3.17
do wr
```

## BR\_L3\_SW3

```
enable
conf t
hostname BR_sw3
```

```
line con 0
logging synchro
no exec-timeout
exit
```

```
line vty 0 15
logging synchro
no exec-timeout
exit
```

```
vlan 60
name first_floor
vlan 90
name voice_vlan
exit
```

```
int r fa0/4-5
no sh
switchport trunk encapsulation dot1q
switchport mode trunk
exit
```

```
int fa0/1
no sh
switchport mode access
switchport access vlan 60
switchport voice vlan 90
exit
```

```
int r fa0/2-3
no sh
switchport mode access
switchport access vlan 60
exit

int fa0/1
switchport port-security
switchport port-security mac-address sticky
switchport port-security maximum 2
switchport port-security violation restrict
exit

int r fa0/2-3
switchport port-security
switchport port-security mac-address sticky
switchport port-security maximum 1
switchport port-security violation restrict
exit

ip dhcp snooping
ip dhcp snooping vlan 60
ip dhcp snooping vlan 90
ip arp inspection vlan 60
ip arp inspection vlan 90
ip arp inspection validate src-mac ip dst-mac
int r fa0/4-5
ip dhcp snooping trust
ip arp inspection trust
exit
int r fa0/1-3
ip dhcp snooping limit rate 3
exit
no ip dhcp snooping information option

logging host 192.168.4.3
logging trap debugging
service timestamps log datetime msec

int r fa0/1-3
spanning-tree portfast
spanning-tree bpduguard enable

ex

do wr
```

## HQ\_L2\_SW1

```
enable
conf t
hostname BR_l2sw1

line con 0
logging synchro
no exec-timeout
exit

line vty 0 15
logging synchro
no exec-timeout
exit

vlan 70
name second_floor
exit

int r fa3/1, fa6/1
switchport mode trunk
exit

int r fa0/1, fa1/1, fa2/1
switchport mode access
switchport access vlan 70
exit

int r fa0/1, fa1/1, fa2/1
switchport port-security
switchport port-security mac-address sticky
switchport port-security maximum 1
switchport port-security violation restrict
exit

ip dhcp snooping
ip dhcp snooping vlan 70
ip arp inspection vlan 70
ip arp inspection validate src-mac ip dst-mac
int r fa3/1, fa6/1
ip dhcp snooping trust
ip arp inspection trust
exit
int r fa0/1, fa1/1, fa2/1
ip dhcp snooping limit rate 3
exit
no ip dhcp snooping information option
```

```
logging host 192.168.4.3
logging trap debugging
service timestamps log datetime msec
```

```
int r fa0/1, fa1/1, fa2/1
spanning-tree portfast
spanning-tree bpduguard enable
ex
```

```
do wr
```

## HQ\_L2\_SW2

```
enable
conf t
hostname BR_l2sw2
```

```
line con 0
logging synchro
no exec-timeout
exit
```

```
line vty 0 15
logging synchro
no exec-timeout
exit
```

```
vlan 80
name third_floor
exit
```

```
int r fa3/1, fa8/1
switchport mode trunk
exit
```

```
int r fa0/1, fa1/1, fa2/1
switchport mode access
switchport access vlan 80
exit
```

```
int r fa0/1, fa1/1, fa2/1
switchport port-security
switchport port-security mac-address sticky
switchport port-security maximum 1
switchport port-security violation restrict
exit
```

```
ip dhcp snooping
ip dhcp snooping vlan 80
ip arp inspection vlan 80
ip arp inspection validate src-mac ip dst-mac
int r fa3/1 ,fa8/1
ip dhcp snooping trust
ip arp inspection trust
exit
int r fa0/1, fa1/1, fa2/1
ip dhcp snooping limit rate 3
exit
no ip dhcp snooping information option

logging host 192.168.4.3
logging trap debugging
service timestamps log datetime msec

int r fa1/1, fa2/1, fa3/1
spanning-tree portfast
spanning-tree bpduguard enable
ex
do wr
```