MID-TERM EXAM PROJECT NETWORK CONFIGURATION

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29061 BANK

COMPUTER NETWORKS

Contents

Introduction

The Computer Networks Mid-Term Examination project, focuses on building a fully functional and secure enterprise network named 29061 Bank Network Deployment**.**
This configuration was implemented using Cisco Packet Tracer.

The project's objective was to design, configure, and test a multi-departmental network that integrates key enterprise technologies such **as** Inter-VLAN Routing**,** VTP**,** EtherChannel**,** Spanning Tree Protocol (RSTP)**,** Port Security**,** Access Control Lists (ACLs)**,** and essential server services including DHCP**,** DNS**,** and NTP**.**

Each device in the topology—including routers, core, distribution, and access switches—was configured following institutional naming and credential standards. The setup ensured interconnectivity between all VLANs and secure network access for departments such as IT, HR, Finance, Accounting, Risk, Teller**,** and Visitors**,** while maintaining strong security and access control policies through ACLs and Port Security.

The project demonstrates practical knowledge in enterprise networking**,** emphasizing secure communication, logical segmentation, and centralized management of network devices.

PHASE 1: Naming and Credential Standards

DEVICE: HQ-MAIN-ROUTER

TABLE OF USED COMMANDS

```
Router>enable
Router#configure terminal
Router(config)#hostname 29061-HQ-MAIN-ROUTER
29061-HQ-MAIN-ROUTER(config)#no ip domain-lookup
29061-HQ-MAIN-ROUTER(config)#ip domain-name 29061.f25
29061-HQ-MAIN-ROUTER(config)#username Joseph privilege 15 secret 29061
29061-HQ-MAIN-ROUTER(config)#enable secret 29061
29061-HQ-MAIN-ROUTER(config)#service password-encryption
29061-HQ-MAIN-ROUTER(config)#banner motd # Authorized Access Only - 29061 BANK #
29061-HQ-MAIN-ROUTER(config)#crypto key generate rsa
```

DEVICE: SWITCHES

```
29061-CORE-SWC(config)#ip ssh version 2
29061-CORE-SWC(config)#line console 0
29061-CORE-SWC(config-line)#login local
29061-CORE-SWC(config-line)#exec-timeout 10
29061-CORE-SWC(config-line)#line vty 0 4
29061-CORE-SWC(config-line)#login local
29061-CORE-SWC(config-line)#transport input ssh
29061-CORE-SWC(config-line)#exec-timeout 10
29061-CORE-SWC(config-line)#vtp domain 29061.f25
29061-CORE-SWC(config-line)#vtp password 29061
29061-CORE-SWC(config-line)#vtp mode server
29061-CORE-SWC(config-line)#end
29061-CORE-SWC#write memory
```

TABLE OF VERIFICATION COMMANDS

```
29061-HQ-MAIN-ROUTER#show running-config
29061-HQ-MAIN-ROUTER#show ip ssh
29061-HQ-MAIN-ROUTER#show crypto key mypubkey rsa
29061-HQ-MAIN-ROUTER#show users
```

```
29061-A-SWC#show vtp status
```

#show running-config

```
ip dhcp pool IT_NET
 network 192.168.10.0 255.255.255.240
 default-router 192.168.10.1
 dns-server 192.168.80.10
 domain-name 29061.f25
ip dhcp pool FIN_NET
 network 192.168.20.0 255.255.255.240
 default-router 192.168.20.1
 dns-server 192.168.80.10
 domain-name 29061.f25
ip dhcp pool ACC_NET
 network 192.168.30.0 255.255.255.240
 default-router 192.168.30.1
 dns-server 192.168.80.10
 domain-name 29061.f25
ip dhcp pool HR_NET
 network 192.168.40.0 255.255.255.240
 default-router 192.168.40.1
 dns-server 192.168.80.10
 domain-name 29061.f25
```

```
29061-A-SWC#show running-config
Building configuration...

Current configuration : 2789 bytes
!
version 15.0
service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname 29061-A-SWC
!
enable secret 5 $1$mERr$v7VzzgNAsagbdf/4Motki/
!
!
!
ip ssh version 2
no ip domain-lookup
ip domain-name 29061.f25
!
username Joseph secret 5 $1$mERr$v7VzzgNAsagbdf/4Motki/
!
vtp domain 29061.f25
vtp mode transparent
vtp password 29061
```

#show ip ssh

```
29061-HQ-MAIN-ROUTER#show ip ssh
SSH Enabled - version 2.0
Authentication timeout: 120 secs; Authentication retries: 3
29061-HQ-MAIN-ROUTER#
```

#show crypto key mypubkey rsa

```
29061-HQ-MAIN-ROUTER#show crypto key mypubkey rsa
% Key pair was generated at: 0:0:52 UTC March 1 1993
Key name: HQ-MAIN-ROUTER.29061.f25
 Storage Device: not specified
 Usage: General Purpose Key
 Key is not exportable.
 Key Data:
 00001347  00006a27  000022e2  000071cf  00004617  000040c4  00007a22  00006207
 00007dd0  000041bb  00003b16  00001edb  0000667a  00004f82  00004aac  0000149b
 000029fe  00005ff3  00002ca7  00004806  000049e6  00007efb  00004b89  0ea8
% Key pair was generated at: 0:0:52 UTC March 1 1993
Key name: HQ-MAIN-ROUTER.29061.f25.server
Temporary key
 Usage: Encryption Key
```

#show users

```
29061-HQ-MAIN-ROUTER#show users
    Line       User       Host(s)              Idle       Location
*  0 con 0     joseph     idle                 00:00:00

  Interface    User               Mode         Idle     Peer Address
29061-HQ-MAIN-ROUTER#
```

#show vtp

```
29061-A-SWC#show vtp status
VTP Version capable             : 1 to 2
VTP version running             : 1
VTP Domain Name                 : 29061.f25
VTP Pruning Mode                : Disabled
VTP Traps Generation            : Disabled
Device ID                       : 0001.4238.4970
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00

Feature VLAN :
--------------
VTP Operating Mode                : Transparent
Maximum VLANs supported locally   : 255
Number of existing VLANs          : 14
Configuration Revision            : 0
MD5 digest                        : 0x57 0x04 0xF0 0xEA 0x72 0xBC 0x4F 0xC4
                                    0x6F 0xA8 0x8D 0x5D 0x6F 0xCA 0xE1 0x1D
29061-A-SWC#
```

Explanation of commands used in Phase 1

enable
→ Enters privileged EXEC mode (allows advanced commands).

configure terminal
→ Enters global configuration mode to change settings.

hostname HQ-MAIN-ROUTER
→ Sets the device's name to "HQ-MAIN-ROUTER."

no ip domain-lookup
→ Disables DNS lookups when a command is mistyped.

ip domain-name 29061.f25
→ Sets the device's domain name (needed for SSH key generation).

username Joseph privilege 15 secret 29061
→ Creates user "Joseph" with full admin rights and encrypted password "29061."

enable secret 29061
→ Sets an encrypted password for privileged (enable) mode.

service password-encryption
→ Encrypts all plaintext passwords in the configuration.

banner motd # Authorized Access Only - 29061 BANK #
→ Displays a login message warning unauthorized users.

crypto key generate rsa
→ Generates RSA keys for SSH encryption.

1024
→ Specifies the RSA key size (1024 bits).

ip ssh version 2
→ Enables secure SSH version 2.

line console 0
→ Enters console line configuration mode.

login local
→ Uses local usernames and passwords for login.

exec-timeout 10
→ Logs out inactive sessions after 10 minutes.

line vty 0 4
→ Configures virtual terminal lines for remote access.

login local
→ Uses local login for remote sessions.

transport input ssh
→ Allows only SSH connections (disables Telnet).

exec-timeout 10
→ Sets 10-minute timeout for SSH/Telnet sessions.

end
→ Exits configuration mode.

write memory
→ Saves the running configuration to startup memory.

vtp domain 29061.f25
→ Sets the VTP domain name so switches can share VLAN info.

vtp password 29061
→ Sets the VTP authentication password for domain members.

vtp mode server
→ Sets the switch to *server mode* (can create and manage VLANs).

Phase 2: Network Device Setup & Addressing

TABLE OF USED COMMANDS

DEVICE: HQ-MAIN-ROUTER CREATING SUB-INTERFACES AND ASSIGNING IP ADDRESS (ROUTER-ON-A-STICK)

```
29061-HQ-MAIN-ROUTER(config)#interface GigabitEthernet0/0
29061-HQ-MAIN-ROUTER(config-if)#no shutdown
29061-HQ-MAIN-ROUTER(config-if)#exit

29061-HQ-MAIN-ROUTER(config)#interface GigabitEthernet0/0.10
29061-HQ-MAIN-ROUTER(config-subif)#encapsulation dot1Q 10
29061-HQ-MAIN-ROUTER(config-subif)#ip address 192.168.10.1 255.255.255.240
29061-HQ-MAIN-ROUTER(config-subif)#exit
```

```
29061-HQ-MAIN-ROUTER(config)#interface GigabitEthernet1/0.1
29061-HQ-MAIN-ROUTER(config-subif)#encapsulation dot1Q 1
29061-HQ-MAIN-ROUTER(config-subif)#ip address 192.168.100.97 255.255.255.240
29061-HQ-MAIN-ROUTER(config-subif)#exit

29061-HQ-MAIN-ROUTER(config)#interface GigabitEthernet1/0.80
29061-HQ-MAIN-ROUTER(config-subif)#encapsulation dot1Q 80
29061-HQ-MAIN-ROUTER(config-subif)#ip address 192.168.80.1 255.255.255.240
29061-HQ-MAIN-ROUTER(config-subif)#exit

29061-HQ-MAIN-ROUTER(config)#interface GigabitEthernet1/0.90
29061-HQ-MAIN-ROUTER(config-subif)#encapsulation dot1Q 90
29061-HQ-MAIN-ROUTER(config-subif)#ip address 192.168.90.1 255.255.255.240
```

DEVICE: HQ-MAIN-ROUTER DHCP EXCLUDING IP ADDRES

```
29061-HQ-MAIN-ROUTER(config)#ip dhcp excluded-address 192.168.10.1 192.168.10.5
29061-HQ-MAIN-ROUTER(config)#ip dhcp excluded-address 192.168.20.1 192.168.20.5
29061-HQ-MAIN-ROUTER(config)#ip dhcp excluded-address 192.168.30.1 192.168.30.5
29061-HQ-MAIN-ROUTER(config)#ip dhcp excluded-address 192.168.40.1 192.168.40.5
29061-HQ-MAIN-ROUTER(config)#ip dhcp excluded-address 192.168.50.1 192.168.50.5
29061-HQ-MAIN-ROUTER(config)#ip dhcp excluded-address 192.168.60.1 192.168.60.5
29061-HQ-MAIN-ROUTER(config)#ip dhcp excluded-address 192.168.70.1 192.168.70.5
29061-HQ-MAIN-ROUTER(config)#ip dhcp excluded-address 192.168.80.1 192.168.80.5
29061-HQ-MAIN-ROUTER(config)#ip dhcp excluded-address 192.168.90.1 192.168.90.5
```

DEVICE: HQ-MAIN-ROUTER DHCP POOL

```
29061-HQ-MAIN-ROUTER(config)#ip dhcp pool IT_NET
29061-HQ-MAIN-ROUTER(dhcp-config)#network 192.168.10.0 255.255.255.240
29061-HQ-MAIN-ROUTER(dhcp-config)#default-router 192.168.10.1
29061-HQ-MAIN-ROUTER(dhcp-config)#dns-server 192.168.80.10
29061-HQ-MAIN-ROUTER(dhcp-config)#domain-name 29061.f25
29061-HQ-MAIN-ROUTER(dhcp-config)#exit
```

```
29061-HQ-MAIN-ROUTER(config)#ip dhcp pool RISK_NET
29061-HQ-MAIN-ROUTER(dhcp-config)#network 192.168.50.0 255.255.255.240
29061-HQ-MAIN-ROUTER(dhcp-config)#default-router 192.168.50.1
29061-HQ-MAIN-ROUTER(dhcp-config)#dns-server 192.168.80.10
29061-HQ-MAIN-ROUTER(dhcp-config)#domain-name 29061.f25
29061-HQ-MAIN-ROUTER(dhcp-config)#exit
```

TABLE OF VERIFICATION COMMANDS

```
29061-HQ-MAIN-ROUTER#show ip interface brief
29061-HQ-MAIN-ROUTER#show ip dhcp pool
29061-HQ-MAIN-ROUTER#show ip dhcp binding
```

#show ip interface brief

```
29061-HQ-MAIN-ROUTER#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0     unassigned      YES unset  up                    up
GigabitEthernet0/0.1   unassigned      YES unset  up                    up
GigabitEthernet0/0.10  192.168.10.1    YES manual up                    up
GigabitEthernet0/0.20  192.168.20.1    YES manual up                    up
GigabitEthernet0/0.30  192.168.30.1    YES manual up                    up
GigabitEthernet0/0.40  192.168.40.1    YES manual up                    up
GigabitEthernet0/0.50  192.168.50.1    YES manual up                    up
GigabitEthernet0/0.60  192.168.60.1    YES manual up                    up
GigabitEthernet0/0.70  192.168.70.1    YES manual up                    up
GigabitEthernet1/0     unassigned      YES unset  up                    up
GigabitEthernet1/0.1   192.168.100.97  YES manual up                    up
GigabitEthernet1/0.80  192.168.80.1    YES manual up                    up
GigabitEthernet1/0.90  192.168.90.1    YES manual up                    up
29061-HQ-MAIN-ROUTER#
```

#show ip dhcp pool

```
1 subnet is currently in the pool
Current index         IP address range                    Leased/Excluded/Total
192.168.30.1          192.168.30.1      - 192.168.30.14     9     / 12    / 14

Pool HR_NET :
 Utilization mark (high/low)     : 100 / 0
 Subnet size (first/next)        : 0 / 0
 Total addresses                 : 14
 Leased addresses                : 6
 Excluded addresses              : 12
 Pending event                   : none
```

#show ip dhcp binding

```
29061-HQ-MAIN-ROUTER#show ip dhcp binding
IP address       Client-ID/              Lease expiration        Type
                 Hardware address
192.168.10.6     0040.0B18.A708          --                      Automatic
192.168.10.7     0002.4AA3.CA93          --                      Automatic
192.168.10.8     00E0.B0AE.5317          --                      Automatic
192.168.10.9     0040.0B1C.A917          --                      Automatic
192.168.10.10    00D0.97CC.0BD5          --                      Automatic
192.168.10.11    0060.2F6C.A705          --                      Automatic
192.168.10.12    0001.6426.EB05          --                      Automatic
192.168.10.13    00E0.8FAB.63CC          --                      Automatic
192.168.20.6     000C.CF96.0692          --                      Automatic
192.168.20.8     0007.ECDB.B5D8          --                      Automatic
192.168.20.7     0005.5E5D.1EE6          --                      Automatic
192.168.20.11    000C.859C.C6B3          --                      Automatic
192.168.20.10    00D0.BA39.29E1          --                      Automatic
192.168.20.9     0003.E432.2DB9          --                      Automatic
192.168.20.12    0060.70DD.DB4B          --                      Automatic
192.168.20.13    0001.C76C.93CB          --                      Automatic
192.168.30.6     00D0.5868.528A          --                      Automatic
```

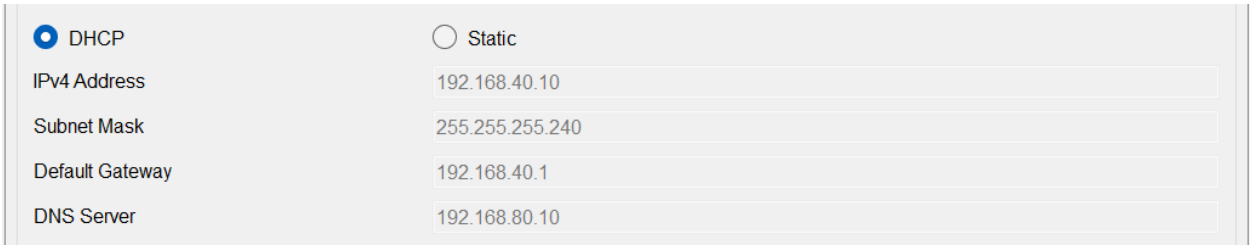
On PCs and Laptops to get IP address Dynamic

Step 1: Open PC/Laptop

Step 2: Click Desktop Tab

Step 3: Choose IP Configuration

Step 4: Select DHCP




```
C:\>ipconfig

FastEthernet0 Connection:(default port)

   Connection-specific DNS Suffix..: 29061.f25
   Link-local IPv6 Address.........: FE80::260:3EFF:FEA4:E665
   IPv6 Address....................: ::
   IPv4 Address....................: 192.168.40.10
   Subnet Mask.....................: 255.255.255.240
   Default Gateway.................: ::
                                     192.168.40.1
```

Explanation of commands used in Phase 2

These are some from many subinterfaces for VLAN routing I had to configure

interface GigabitEthernet0/0
→ Enters config mode for the main physical interface (G0/0).

no shutdown
→ Activates the interface (brings it up).

exit
→ Leaves interface configuration mode.

interface GigabitEthernet0/0.1
→ Creates subinterface for VLAN 1.

encapsulation dot1Q 1
→ Assigns VLAN 1 to this subinterface using 802.1Q tagging.

ip address 192.168.100.97 255.255.255.240
→ Sets IP address and subnet mask for VLAN 1's gateway.

exit
→ Returns to global configuration mode.

interface GigabitEthernet0/0.10
→ Creates subinterface for VLAN 10.

encapsulation dot1Q 10
→ Assigns VLAN 10 to this subinterface.

ip address 192.168.10.1 255.255.255.240
→ Sets IP address and subnet mask for VLAN 10's gateway.

interface GigabitEthernet1/0.90
→ Creates subinterface for VLAN 90.

encapsulation dot1Q 90
→ Assigns VLAN 90 to this subinterface.

ip address 192.168.90.1 255.255.255.240
→ Sets IP address and subnet mask for VLAN 90's gateway.

ip dhcp excluded-address 192.168.10.1 192.168.10.5
→ Reserves these IPs (1–5) so DHCP won't assign them to clients in VLAN 10.

ip dhcp excluded-address 192.168.20.1 192.168.20.5
→ Reserves these IPs (1–5) so DHCP won't assign them to clients in VLAN 20.

ip dhcp pool IT_NET
→ Creates a DHCP pool named *IT_NET*.

network 192.168.10.0 255.255.255.240
→ Defines the network range for this pool (VLAN 10).

default-router 192.168.10.1
→ Sets the gateway for DHCP clients in this pool.

dns-server 192.168.80.10
→ Assigns a DNS server address for this network.

domain-name 29061.f25
→ Sets the domain name given to DHCP clients.

ip dhcp pool FIN_NET
→ Creates a DHCP pool named *FIN_NET*.

network 192.168.20.0 255.255.255.240
→ Defines the network range for this pool (VLAN 20).

default-router 192.168.20.1
→ Sets the gateway for DHCP clients in this pool.

dns-server 192.168.80.10
→ Assigns the DNS server for this network.

domain-name 29061.f25
→ Sets the domain name given to DHCP clients.

ip dhcp pool ACC_NET
→ Creates a DHCP pool named *ACC_NET*.

network 192.168.30.0 255.255.255.240
→ Defines the network range for this pool (VLAN 30).

default-router 192.168.30.1
→ Sets the gateway for DHCP clients in this pool.

dns-server 192.168.80.10
→ Assigns the DNS server for this network.

domain-name 29061.f25
→ Sets the domain name given to DHCP clients.

PHASE 3: VLANS Configuration & Port Assignments

TABLE OF USED COMMANDS

VLANs creation

```
29061-CORE-SWC>enable
29061-CORE-SWC#configure terminal
29061-CORE-SWC(config)#vlan 1
29061-CORE-SWC(config-vlan)#name PUBLIC-NET
29061-CORE-SWC(config)#vlan 10
29061-CORE-SWC(config-vlan)#name IT-NET
29061-CORE-SWC(config)#vlan 20
29061-CORE-SWC(config-vlan)#name FIN-NET
29061-CORE-SWC(config)#vlan 30
29061-CORE-SWC(config-vlan)#name ACC-NET
29061-CORE-SWC(config)#vlan 40
29061-CORE-SWC(config-vlan)#name HR-NET
29061-CORE-SWC(config)#vlan 50
29061-CORE-SWC(config-vlan)#name RISK-NET
```

```
29061-CORE-SWC(config-vlan)#name RISK-NET
29061-CORE-SWC(config)#vlan 60
29061-CORE-SWC(config-vlan)#name TELLER-NET
29061-CORE-SWC(config)#vlan 70
29061-CORE-SWC(config-vlan)#name VISITOR-NET
29061-CORE-SWC(config)#vlan 80
29061-CORE-SWC(config-vlan)#name SERVER-NET
29061-CORE-SWC(config)#vlan 90
29061-CORE-SWC(config-vlan)#name MGMT-NET
29061-CORE-SWC(config)#end
29061-CORE-SWC#write memory
```

ACCESS SWITCH VLAN ASSIGNMENTS

```
29061-IT-SWC>enable
29061-IT-SWC#configure terminal
29061-IT-SWC(config)#interface range FastEthernet0/1 - 3
29061-IT-SWC(config-if)#switchport mode access
29061-IT-SWC(config-if)#switchport access vlan 10
29061-IT-SWC(config-if)#spanning-tree portfast
29061-IT-SWC(config-if)#exit
29061-IT-SWC(config)#end
29061-IT-SWC#write memory
```

TABLE OF VERIFICATION COMMANDS

```
29061-CORE-SWC#show vlan brief
29061-IT-SWC#show interfaces switchport
```

#show vlan brief

```
29061-CORE-SW#show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Po3, Fa0/1, Fa0/2, Fa0/3
                                                Fa0/4, Fa0/5, Fa0/6, Fa0/7
                                                Fa0/8, Fa0/9, Fa0/10, Fa0/11
                                                Fa0/12, Fa0/13, Fa0/14, Fa0/15
                                                Fa0/16, Fa0/17, Fa0/18, Fa0/19
                                                Fa0/24
10   IT-NET                           active
20   FIN-NET                          active
30   ACC-NET                          active
40   HR-NET                           active
50   RISK-NET                         active
60   TELLER-NET                       active
70   VISITOR-NET                      active
80   SERVER-NET                       active
90   MGT-NET                          active
```

#show interface switchport

```
29061-IT-SWC#show int switchport
Name: Fa0/1
Switchport: Enabled
Administrative Mode: static access
Operational Mode: static access
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: native
Negotiation of Trunking: Off
Access Mode VLAN: 10 (IT-NET)
Trunking Native Mode VLAN: 1 (default)
```

Explanation of commands used in Phase 3 VLAN creation and assigned ports

enable
→ Enters privileged EXEC mode.

configure terminal
→ Enters global configuration mode.

vlan 1
→ Creates or enters VLAN 1 configuration mode.

name PUBLIC-NET
→ Names VLAN 1 as “PUBLIC-NET.”

vlan 10
→ Creates or enters VLAN 10 configuration mode.

name IT-NET
→ Names VLAN 10 as “IT-NET.”

vlan 20
→ Creates or enters VLAN 20 configuration mode.

name FIN-NET
→ Names VLAN 20 as “FIN-NET.”

interface range FastEthernet0/1 - 3
→ Selects interfaces F0/1 through F0/3 to configure together.

switchport mode access
→ Sets ports as access ports (for end devices, not trunks).

switchport access vlan 10
→ Assigns these ports to VLAN 10 (IT-NET).

switchport port-security
→ Enables port security on the interfaces.

switchport port-security maximum 1
→ Allows only one MAC address per port.

switchport port-security violation shutdown
→ Shuts down the port if a security violation occurs.

spanning-tree portfast
→ Enables immediate forwarding state for end-device ports (bypasses STP learning).

spanning-tree bpduguard enable
→ Disables the port if a BPDU (Spanning Tree message) is received — protects against loops.

no shutdown
→ Activates the interfaces.

PHASE 4: Trunking and EtherChannel Configuration

TABLE OF USED COMMANDS

```
29061-CORE-SWC#configure terminal
29061-CORE-SWC(config)#interface GigabitEthernet0/1
29061-CORE-SWC(config-if)#switchport mode trunk
29061-CORE-SWC(config-if)#switchport trunk allowed vlan 10,20,30,40,50,60,70
29061-CORE-SWC(config-if)#no shutdown
29061-CORE-SWC(config-if)#exit
```

```
29061-CORE-SWC(config)#interface GigabitEthernet0/2
29061-CORE-SWC(config-if)#switchport mode trunk
29061-CORE-SWC(config-if)#switchport trunk allowed vlan 1,80,90
29061-CORE-SWC(config-if)#no shutdown
29061-CORE-SWC(config-if)#exit
```

```
29061-CORE-SWC(config)#interface range FastEthernet0/22 - 23
29061-CORE-SWC(config-if-range)#switchport mode trunk
29061-CORE-SWC(config-if-range)#switchport trunk allowed vlan 10,20,30,40,50,60,70
29061-CORE-SWC(config-if-range)#channel-group 4 mode active
```

```
29061-CORE-SWC(config)#interface Port-channel4
29061-CORE-SWC(config-if)#switchport mode trunk
29061-CORE-SWC(config-if)#switchport trunk allowed vlan 10,20,30,40,50,60,70
29061-CORE-SWC(config-if)#no shutdown
29061-CORE-SWC(config-if)#exit
```

TABLE OF VERIFICATION COMMANDS

```
29061-CORE-SWC#show interfaces trunk
29061-CORE-SWC#show etherchannel summary
29061-A-SWC#show etherchannel summary
29061-B-SWC#show interfaces trunk
29061-C-SWC#show interfaces trunk
```

#show interface trunk

```
29061-B-SWC#show interface trunk
Port        Mode         Encapsulation  Status        Native vlan
Po3         on           802.1q         trunking      1
Fa0/20      on           802.1q         trunking      1
Fa0/21      on           802.1q         trunking      1

Port        Vlans allowed on trunk
Po3         10,20,30,40,50
Fa0/20      10,20,30,40,50
Fa0/21      10,20,30,40,50

Port        Vlans allowed and active in management domain
Po3         10,20,30,40,50
Fa0/20      10,20,30,40,50
Fa0/21      10,20,30,40,50

Port        Vlans in spanning tree forwarding state and not pruned
Po3         10,20,30,40,50
Fa0/20      10,20,30,40,50
Fa0/21      10,20,30,40,50
```

```
29061-C-SWC#show interface tr
29061-C-SWC#show interface trunk
Port        Mode         Encapsulation  Status        Native vlan
Po4         on           802.1q         trunking      1
Fa0/20      on           802.1q         trunking      1
Fa0/21      on           802.1q         trunking      1
Gig0/1      on           802.1q         trunking      1
Gig0/2      on           802.1q         trunking      1

Port        Vlans allowed on trunk
Po4         10,20,30,40,50,60,70
Fa0/20      10,20,30,40,50
Fa0/21      10,20,30,40,50
Gig0/1      10,20,30,40,50,60,70
Gig0/2      70
```

#show etherchannel summary

```
29061-CORE-SW#show etherchannel su
29061-CORE-SW#show etherchannel summary
Flags:  D - down        P - in port-channel
        I - stand-alone s - suspended
        H - Hot-standby (LACP only)
        R - Layer3      S - Layer2
        U - in use      f - failed to allocate aggregator
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port


Number of channel-groups in use: 3
Number of aggregators:           3

Group  Port-channel  Protocol    Ports
------+-------------+-----------+-----------------------------------------------

1      Po1(SU)           LACP   Fa0/20(P) Fa0/21(P)
3      Po3(SD)           -
4      Po4(SU)           LACP   Fa0/22(P) Fa0/23(P)
29061-CORE-SW#
```

```
29061-A-SWC#show etherchannel summary
Flags:  D - down        P - in port-channel
        I - stand-alone s - suspended
        H - Hot-standby (LACP only)
        R - Layer3      S - Layer2
        U - in use      f - failed to allocate aggregator
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port


Number of channel-groups in use: 3
Number of aggregators:           3

Group  Port-channel  Protocol    Ports
------+-------------+-----------+-----------------------------------------------

1      Po1(SU)           LACP   Fa0/20(P) Fa0/21(P)
2      Po2(SU)           LACP   Gig0/1(P) Gig0/2(P)
3      Po3(SU)           LACP   Fa0/22(P) Fa0/23(P)
29061-A-SWC#
```

Explanation of commands used in Phase 4, Trunking and EtherChannel

interface GigabitEthernet0/1
→ Enters configuration mode for interface G0/1.

switchport mode trunk
→ Sets the port to trunk mode (carries multiple VLANs).

switchport trunk allowed vlan 10,20,30,40,50,60,70
→ Allows only listed VLANs on this trunk link.

no shutdown
→ Activates the interface.

! Trunk to HQ-MAIN-ROUTER Gi0/2
→ Notes that interface Gi0/2 is another trunk link to HQ-MAIN-ROUTER.

interface GigabitEthernet0/2
→ Enters configuration mode for interface G0/2.

switchport mode trunk
→ Sets the port to trunk mode.

switchport trunk allowed vlan 1,80,90
→ Allows VLANs 1, 80, and 90 across this trunk.

no shutdown
→ Enables the interface.

EtherChannel CORE <-> A-SWC
→ Defines EtherChannel connection between CORE switch and A-SWC.

interface range FastEthernet0/20 - 21
→ Selects interfaces F0/20 and F0/21 to configure together.

switchport mode trunk
→ Sets both ports to trunk mode.

switchport trunk allowed vlan 1,10,20,30,40,50,60,70,80,90
→ Allows all listed VLANs on these trunks.

channel-group 1 mode active
→ Bundles ports into EtherChannel group 1 using LACP (active mode).

no shutdown
→ Enables the interfaces.

interface Port-channel1
→ Configures the logical EtherChannel interface.

switchport mode trunk
→ Sets Port-channel1 as a trunk.

switchport trunk allowed vlan 1,10,20,30,40,50,60,70,80,90
→ Allows all listed VLANs on this Port-channel.

no shutdown
→ Activates the EtherChannel interface.

PHASE 5: Server IPs Configurations & Services

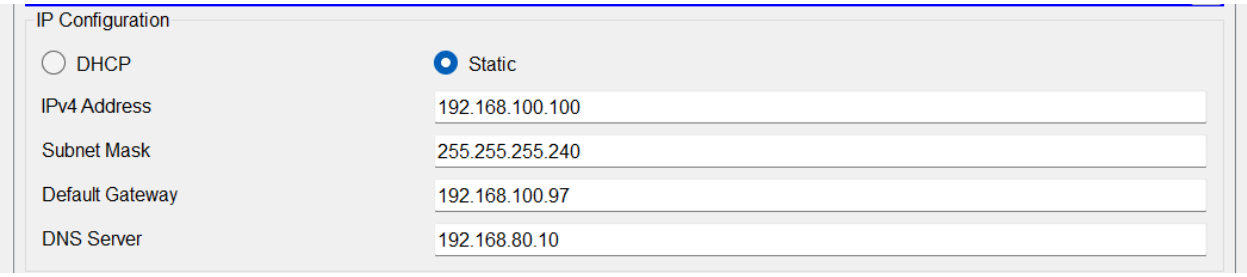
STATIC IP ADDRESS ON WEB SERVER

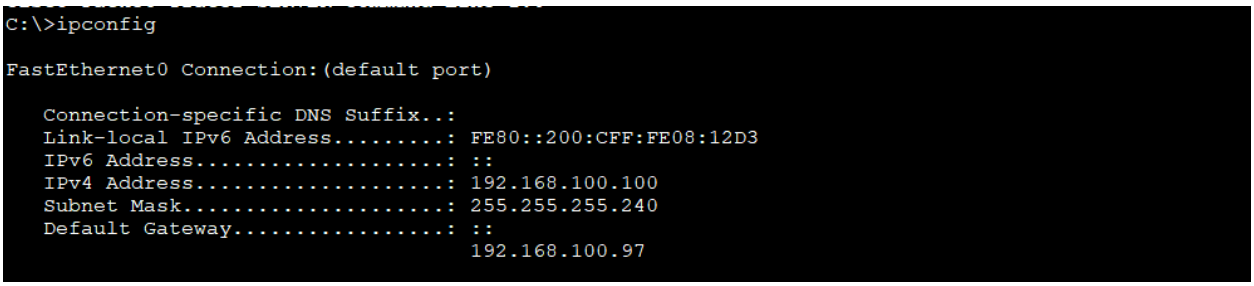
Step 1: Open Server

Step 2: Click Desktop Tab
Step 3: Choose IP Configuration

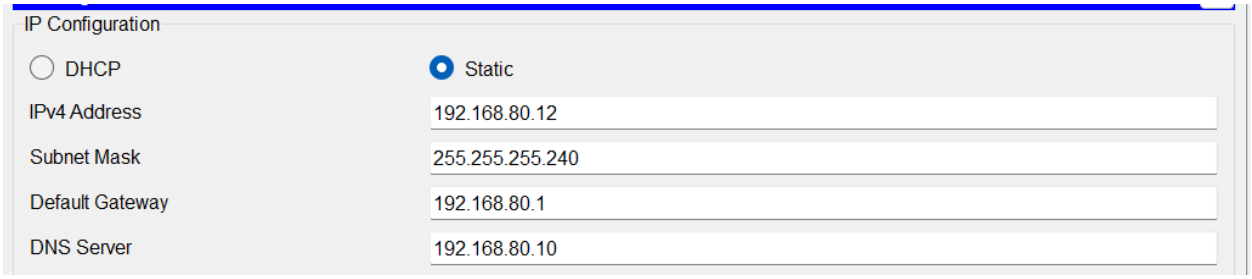
Step 4: Click on Static

Step 5: Fill required field



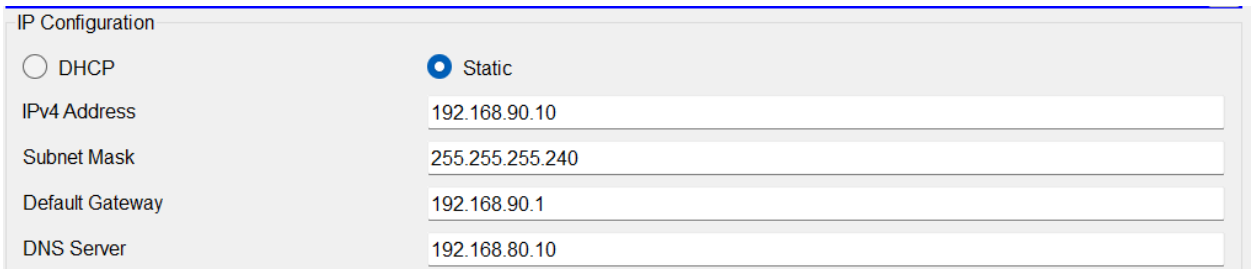


STATIC IP ADDRESS ON EDWH SERVER




```
C:\>ipconfig

FastEthernet0 Connection:(default port)

   Connection-specific DNS Suffix..:
   Link-local IPv6 Address.........: FE80::201:42FF:FED7:6D54
   IPv6 Address....................: ::
   IPv4 Address....................: 192.168.80.12
   Subnet Mask.....................: 255.255.255.240
   Default Gateway.................: ::
                                     192.168.80.1
```

STATIC IP ADDRESS ON SYSLOG




```
C:\>ipconfig

FastEthernet0 Connection:(default port)

   Connection-specific DNS Suffix..:
   Link-local IPv6 Address.........: FE80::20B:BEFF:FE1E:4B70
   IPv6 Address....................: ::
   IPv4 Address....................: 192.168.90.10
   Subnet Mask.....................: 255.255.255.240
   Default Gateway.................: ::
                                     192.168.90.1
```

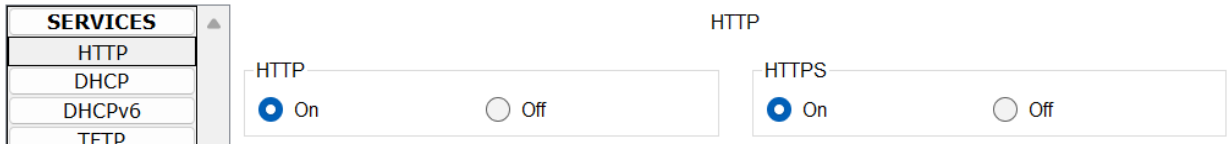
SERVICE HTTP AND HTTPS ON WEB SERVER

Step 1: Open Server

Step 2: Click Service Tab

Step 3: Select HTTP on left side

Step 4: Enable HTTP(ON) & HTTPS (ON)



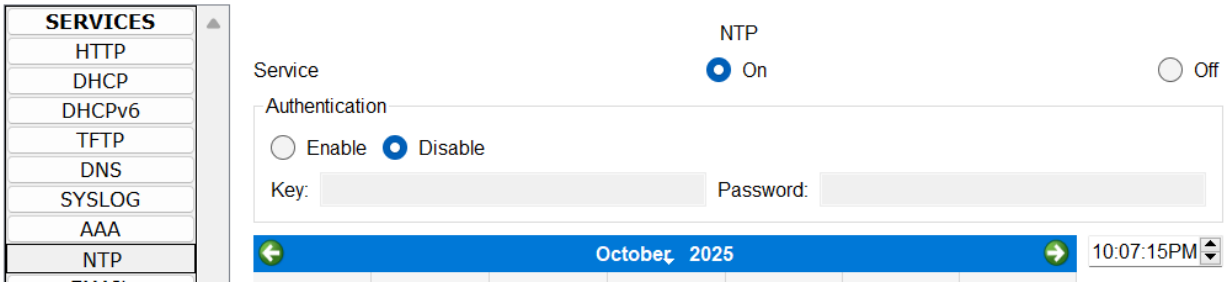
SERVICE NTP ON NET-MONITORING SERVER

Step 1: Open Server

Step 2: Click Service Tab

Step 3: Select NTP on the left side
Step 4: Enable NTP (ON)

Step 5: Set time



SERVICE NTP ON SYLOG SERVER

Step 1: Open Server

Step 2: Click Service Tab

Step 3: Select SYSLOG on the left side
Step 4: Enable SYSLOG (ON)

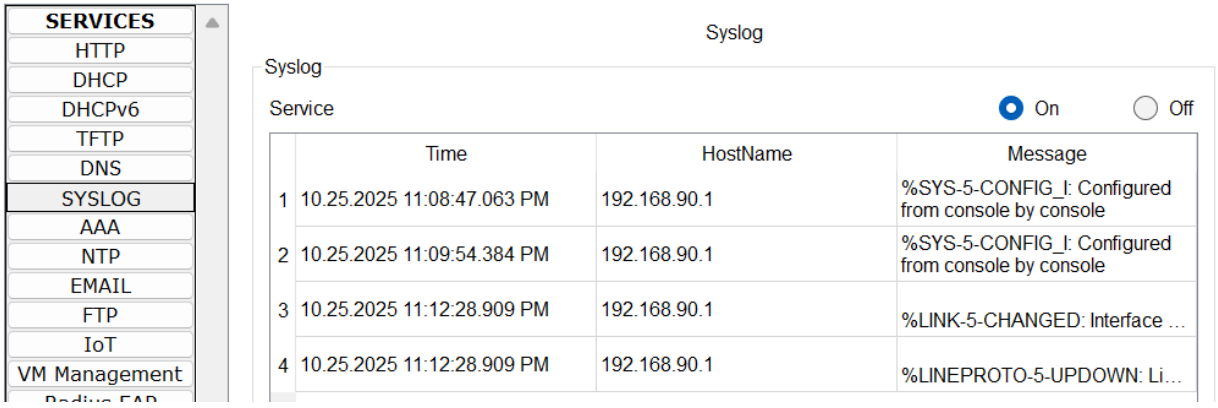


TABLE OF USED COMMANDS ON BOTH SWITCH AND HQ-MAIN-

```
29061-HQ-MAIN-ROUTER#configure terminal
29061-HQ-MAIN-ROUTER(config)#service timestamps log datetime msec
29061-HQ-MAIN-ROUTER(config)#logging host 192.168.90.10
29061-HQ-MAIN-ROUTER(config)#ntp server 192.168.90.11
29061-HQ-MAIN-ROUTER(config)#end
29061-HQ-MAIN-ROUTER#write memory
```

```
29061-CORE-SWC#configure terminal
29061-CORE-SWC(config)#service timestamps log datetime msec
29061-CORE-SWC(config)#logging host 192.168.90.10
29061-CORE-SWC(config)#ntp server 192.168.90.11
29061-CORE-SWC(config)#end
29061-CORE-SWC#write memory
```

TABLE OF VERIFICATION COMMANDS

```
29061-HQ-MAIN-ROUTER#show clock
29061-HQ-MAIN-ROUTER#show logging
29061-HQ-MAIN-ROUTER#show ntp associations
29061-HQ-MAIN-ROUTER#show hosts
```

#show show clock

```
29061-HQ-MAIN-ROUTER#show clock
23:18:39.716 UTC Sat Oct 25 2025
29061-HQ-MAIN-ROUTER#
```

#show logging

```
29061-HQ-MAIN-ROUTER#show logging
Syslog logging: enabled (0 messages dropped, 0 messages rate-limited,
          0 flushes, 0 overruns, xml disabled, filtering disabled)

No Active Message Discriminator.


No Inactive Message Discriminator.
```

#show ntp association

```
29061-HQ-MAIN-ROUTER#show ntp associations

address         ref clock       st   when     poll    reach  delay          offset
disp
*~192.168.90.11 127.127.1.1     1    1        16      377    0.00           169430111.00
-137269716642235.45
 * sys.peer, # selected, + candidate, - outlyer, x falseticker, ~ configured
29061-HQ-MAIN-ROUTER#
```

#show hosts

```
29061-HQ-MAIN-ROUTER#show hosts
Default Domain is 29061.f25
Name/address lookup uses domain service
Name servers are 255.255.255.255

Codes: UN - unknown, EX - expired, OK - OK, ?? - revalidate
       temp - temporary, perm - permanent
       NA - Not Applicable None - Not defined

Host                      Port  Flags      Age Type   Address(es)
29061-HQ-MAIN-ROUTER#
```

PHASE 6: Security Implementation

Port Security Commands

```
29061-IT-SWC(config)# interface range FastEthernet0/1 - 3
29061-IT-SWC(config-if-range)# switchport mode access
29061-IT-SWC(config-if-range)# switchport access vlan 10
29061-IT-SWC(config-if-range)# switchport port-security
29061-IT-SWC(config-if-range)# switchport port-security maximum 1
29061-IT-SWC(config-if-range)# switchport port-security violation shutdown
```

Port Security Verification Commands

```
29061-IT-SWC#show port-security int fa0/1
Port Security              : Enabled
Port Status                : Secure-up
Violation Mode             : Shutdown
Aging Time                 : 0 mins
Aging Type                 : Absolute
SecureStatic Address Aging : Disabled
Maximum MAC Addresses      : 1
Total MAC Addresses        : 1
Configured MAC Addresses   : 0
Sticky MAC Addresses       : 0
Last Source Address:Vlan   : 0060.2F6C.A705:10
Security Violation Count   : 0
```

SSH

```
29061-CORE-SWC(config-line)#transport input ssh
```

```
line con 0
 login local
!
line vty 0 4
 login local
 transport input ssh
line vty 5 15
 login
```

ACL 1— Allow VLAN 70 (Visitors) Only HTTP & DNS

```
29061-HQ-MAIN-ROUTER(config-ext-nacl)# remark --- Allow DNS to AD-DC server (192.168.80.10) ---
29061-HQ-MAIN-ROUTER(config-ext-nacl)# permit udp 192.168.70.0 0.0.0.15 host 192.168.80.10 eq 53
29061-HQ-MAIN-ROUTER(config-ext-nacl)# permit tcp 192.168.70.0 0.0.0.15 host 192.168.80.10 eq 53

29061-HQ-MAIN-ROUTER(config-ext-nacl)# remark --- Allow HTTP to Web Server (192.168.100.100) ---
29061-HQ-MAIN-ROUTER(config-ext-nacl)# permit tcp 192.168.70.0 0.0.0.15 host 192.168.100.100 eq 80
```

ACL 2 — Block Visitor VLAN (70) from accessing other networks

```
29061-HQ-MAIN-ROUTER(config-ext-nacl)# remark --- Deny all other traffic from VLAN 70 ---
29061-HQ-MAIN-ROUTER(config-ext-nacl)# deny ip 192.168.70.0 0.0.0.15 any
```

```
29061-HQ-MAIN-ROUTER(config)# interface GigabitEthernet0/0.70
29061-HQ-MAIN-ROUTER(config-if)# ip access-group Extended_29061_Visitor_Access in
29061-HQ-MAIN-ROUTER(config-if)# exit
```

ACL 3 — AD-DC Server Access (IT Full, Others Limited)

```
Q-MAIN-ROUTER(config)#ip access-list extended Extended_29061_ADDC_Access
Q-MAIN-ROUTER(config-ext-nacl)#permit ip any 192.168.90.0 0.0.0.15
Q-MAIN-ROUTER(config-ext-nacl)#permit ip 192.168.10.0 0.0.0.15 host 192.168.80.10
Q-MAIN-ROUTER(config-ext-nacl)#permit icmp any host 192.168.80.10
Q-MAIN-ROUTER(config-ext-nacl)#permit udp any host 192.168.80.10 eq 53
Q-MAIN-ROUTER(config-ext-nacl)#deny ip any host 192.168.80.10
Q-MAIN-ROUTER(config-ext-nacl)#exit
```

```
29061-HQ-MAIN-ROUTER(config)# interface GigabitEthernet1/0.80
29061-HQ-MAIN-ROUTER(config-if)# ip access-group Extended_29061_ADDC_Access out
29061-HQ-MAIN-ROUTER(config-if)# end
29061-HQ-MAIN-ROUTER# wr
```

ACL 4 — CBS Server Access (FTP Only for Non-IT

```
29061-HQ-MAIN-ROUTER(config)# ip access-list extended Extended_29061_CBS_Access
29061-HQ-MAIN-ROUTER(config-ext-nacl)# permit ip 192.168.10.0 0.0.0.15 host 192.168.80.11
29061-HQ-MAIN-ROUTER(config-ext-nacl)# permit tcp any host 192.168.80.11 eq 20
29061-HQ-MAIN-ROUTER(config-ext-nacl)# permit tcp any host 192.168.80.11 eq 21
29061-HQ-MAIN-ROUTER(config-ext-nacl)# deny ip any host 192.168.80.11
```

```
29061-HQ-MAIN-ROUTER(config)# interface GigabitEthernet1/0.80
29061-HQ-MAIN-ROUTER(config-if)# ip access-group Extended_29061_CBS_Access out
29061-HQ-MAIN-ROUTER(config-if)# end
29061-HQ-MAIN-ROUTER# wr
```

ACL 5 — EDWH Server Access (Only IT-NET

```
29061-HQ-MAIN-ROUTER(config)# ip access-list extended Extended_29061_EDWH_Access
29061-HQ-MAIN-ROUTER(config-ext-nacl)# permit ip 192.168.10.0 0.0.0.15 host 192.168.80.12
29061-HQ-MAIN-ROUTER(config-ext-nacl)# deny ip any host 192.168.80.12
29061-HQ-MAIN-ROUTER(config-ext-nacl)# exit
29061-HQ-MAIN-ROUTER(config)# interface GigabitEthernet1/0.80
29061-HQ-MAIN-ROUTER(config-if)# ip access-group Extended_29061_EDWH_Access out
29061-HQ-MAIN-ROUTER(config-if)# end
29061-HQ-MAIN-ROUTER# wr
```

ACL 5 — Verification1 IT-NET ping EDWH Server

```
C:\>ping 192.168.80.12

Pinging 192.168.80.12 with 32 bytes of data:

Request timed out.
Reply from 192.168.80.12: bytes=32 time=1ms TTL=127
Reply from 192.168.80.12: bytes=32 time=11ms TTL=127
Reply from 192.168.80.12: bytes=32 time=11ms TTL=127

Ping statistics for 192.168.80.12:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 11ms, Average = 7ms

C:\>ipconfig

FastEthernet0 Connection:(default port)

   Connection-specific DNS Suffix..: 29061.f25
   Link-local IPv6 Address.....: FE80::2E0:B0FF:FEAE:5317
   IPv6 Address.....: ::
   IPv4 Address.....: 192.168.10.8
   Subnet Mask.....: 255.255.255.240
   Default Gateway.....: ::
                                 192.168.10.1
```

ACL 5 — Verification 2 Other-NET can’t ping EDWH Server

```
C:\>ping 192.168.80.12

Pinging 192.168.80.12 with 32 bytes of data:

Reply from 192.168.50.1: Destination host unreachable.
Reply from 192.168.50.1: Destination host unreachable.
Reply from 192.168.50.1: Destination host unreachable.
Reply from 192.168.50.1: Destination host unreachable.

Ping statistics for 192.168.80.12:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ipconfig

FastEthernet0 Connection:(default port)

   Connection-specific DNS Suffix..: 29061.f25
   Link-local IPv6 Address.........: FE80::2D0:FFFF:FE57:82C2
   IPv6 Address....................: ::
   IPv4 Address....................: 192.168.50.9
   Subnet Mask.....................: 255.255.255.240
   Default Gateway.................: ::
                                     192.168.50.1
```

PHASE 6 ACL LIST VERIFICATION

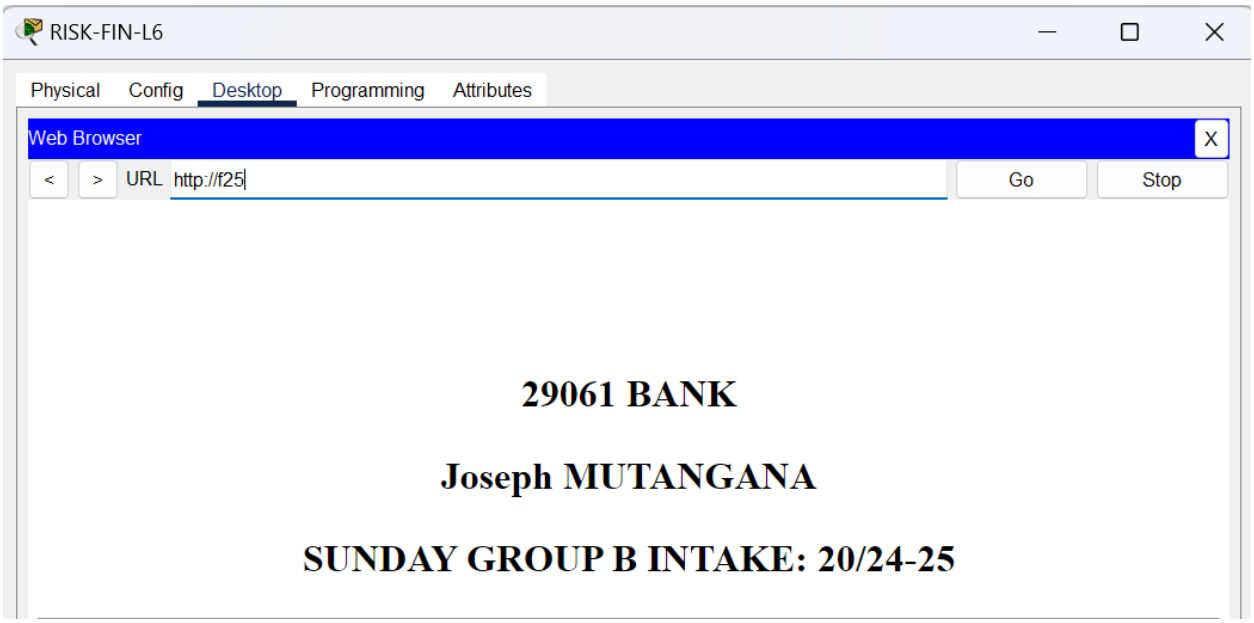
```
29061-HQ-MAIN-ROUTER#show access-lists
Standard IP access list Standard_29061_Visitor_Block
    10 deny 192.168.70.0 0.0.0.15
    20 permit any
Extended IP access list Extended_29061_Visitor_Access
    10 permit tcp 192.168.70.0 0.0.0.15 host 192.168.100.100 eq www
    20 permit udp 192.168.70.0 0.0.0.15 host 192.168.80.10 eq domain
    30 deny ip 192.168.70.0 0.0.0.15 any
Extended IP access list Extended_29061_ADDC_Access
    10 permit ip any 192.168.90.0 0.0.0.15
    20 permit ip 192.168.90.0 0.0.0.15 any
    30 permit ip 192.168.10.0 0.0.0.15 host 192.168.80.10 (8 match(es))
    40 permit icmp any host 192.168.80.10
    50 permit udp any host 192.168.80.10 eq domain
    60 deny ip any host 192.168.80.10
Extended IP access list Extended_29061_CBS_Access
    10 permit ip 192.168.10.0 0.0.0.15 host 192.168.80.11
    20 permit tcp any host 192.168.80.11 eq 20
    30 permit tcp any host 192.168.80.11 eq ftp
    40 deny ip any host 192.168.80.11
Extended IP access list Extended_29061_EDWH_Access
    10 permit ip 192.168.10.0 0.0.0.15 host 192.168.80.12
    20 deny ip any host 192.168.80.12
Extended IP access list h
```

Connectivity verification

IT-NET PINGs OTHER NETs

```
C:\>ipconfig

FastEthernet0 Connection:(default port)

   Connection-specific DNS Suffix..: 29061.f25
   Link-local IPv6 Address.........: FE80::240:BFF:FE1C:A917
   IPv6 Address....................: ::
   IPv4 Address....................: 192.168.10.9
   Subnet Mask.....................: 255.255.255.240
   Default Gateway.................: ::
                                     192.168.10.1

Bluetooth Connection:

   Connection-specific DNS Suffix..: 29061.f25
   Link-local IPv6 Address.........: ::
   IPv6 Address....................: ::
   IPv4 Address....................: 0.0.0.0
   Subnet Mask.....................: 0.0.0.0
   Default Gateway.................: ::
                                     0.0.0.0

C:\>ping 192.168.90.10

Pinging 192.168.90.10 with 32 bytes of data:

Reply from 192.168.90.10: bytes=32 time=10ms TTL=127
Reply from 192.168.90.10: bytes=32 time=10ms TTL=127
Reply from 192.168.90.10: bytes=32 time<1ms TTL=127
Reply from 192.168.90.10: bytes=32 time=6ms TTL=127

Ping statistics for 192.168.90.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 10ms, Average = 6ms

C:\>ping 192.168.10.1

Pinging 192.168.10.1 with 32 bytes of data:

Reply from 192.168.10.1: bytes=32 time<1ms TTL=255
Reply from 192.168.10.1: bytes=32 time<1ms TTL=255
Reply from 192.168.10.1: bytes=32 time<1ms TTL=255
```

DNS Resolution


RISK-FIN-L6
Physical
Config
Desktop
Programming
Attributes
Web Browser
X
<
>
URL
http://f25
Go
Stop
29061 BANK
Joseph MUTANGANA
SUNDAY GROUP B INTAKE: 20/24-25

HR-NET PINGs OTHER NETs

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ipconfig

FastEthernet0 Connection:(default port)

   Connection-specific DNS Suffix..: 29061.f25
   Link-local IPv6 Address.........: FE80::230:A3FF:FE61:2428
   IPv6 Address....................: ::
   IPv4 Address....................: 192.168.50.11
   Subnet Mask.....................: 255.255.255.240
   Default Gateway.................: ::
                                     192.168.50.1

Bluetooth Connection:

   Connection-specific DNS Suffix..: 29061.f25
   Link-local IPv6 Address.........: ::
   IPv6 Address....................: ::
   IPv4 Address....................: 0.0.0.0
   Subnet Mask.....................: 0.0.0.0
   Default Gateway.................: ::
                                     0.0.0.0

C:\>ping 192.168.30.7

Pinging 192.168.30.7 with 32 bytes of data:

Request timed out.
Reply from 192.168.30.7: bytes=32 time<1ms TTL=127
Reply from 192.168.30.7: bytes=32 time<1ms TTL=127
Reply from 192.168.30.7: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.30.7:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

DNS Resolution

```
C:\>nslookup f25

Server: [192.168.80.10]
Address:  192.168.80.10

Non-authoritative answer:
Name:   f25
Address:   192.168.100.100
```

NTP Sync Router

```
29061-HQ-MAIN-ROUTER#show ntp status
Clock is synchronized, stratum 2, reference is 192.168.90.11
nominal freq is 250.0000 Hz, actual freq is 249.9990 Hz, precision is 2**24
reference time is EC7AE145.00000111 (20:40:37.273 UTC Sat Oct 25 2025)
clock offset is 0.00 msec, root delay is 1.00  msec
root dispersion is 15.54 msec, peer dispersion is 0.23 msec.
loopfilter state is 'CTRL' (Normal Controlled Loop), drift is - 0.000001193 s/s system poll
interval is 5, last update was 26 sec ago.
29061-HQ-MAIN-ROUTER#
```

NTP Sync SWITCH

```
29061-CORE-SW#show ntp status
Clock is unsynchronized, stratum 16, no reference clock
nominal freq is 250.0000 Hz, actual freq is 249.9990 Hz, precision is 2**24
reference time is 00000000.00000000 (00:00:00.000 UTC Mon Jan 1 1990)
clock offset is 0.00 msec, root delay is 0.00  msec
root dispersion is 0.00 msec, peer dispersion is 0.00 msec.
loopfilter state is 'FSET' (Drift set from file), drift is - 0.000001193 s/s system poll
interval is 4, never updated.
```

Challenges

During the configuration and testing of the **29061 Bank Network**, several practical issues were encountered:

1. **Wireless VLAN Integration (HomeRouter Configuration)**
   A major challenge occurred when configuring the HomeRouter (Wireless Router) connected to the C-SWC.
   Since the wireless router connects through a single interface while needing to serve multiple VLANs (for example, the Visitor and Teller networks), it was hard how the router could receive multiple VLANs from the switch trunk link.
   The limitation arose because most wireless home routers in Packet Tracer do not support trunk encapsulation (802.1Q).
   This made it difficult to properly assign VLAN-based IPs and caused connection issues for wireless clients. This toonwas resolved by connecting the different cable to C-SWC and switchport mode to access mode the cable through C-SWC to Homerouter.
   Teller VLAN Access Through HomeRouter
   The TELLER-SWC was connected to the same HomeRouter, creating a dependency on the router for network access.
   Because the HomeRouter interface operates as an access port rather than a trunk, the Teller VLAN could not properly tag its traffic.
   As a workaround, VLAN 60 (Teller) was maintained through the C-SWC trunk link.
2. Public / Web Server Connectivity Failure
   Another challenge involved the Public-NET / WEB-SERVER VLAN (VLAN 1).
   All other networks could successfully ping their gateways and communicate across VLANs, but the Web Server could neither send nor receive pings, but later this solved by making priority of VLAN 1 on C-SWC.