

Lab 1 VLAN and Inter-VLAN Routing with DHCP + Basic Hardening

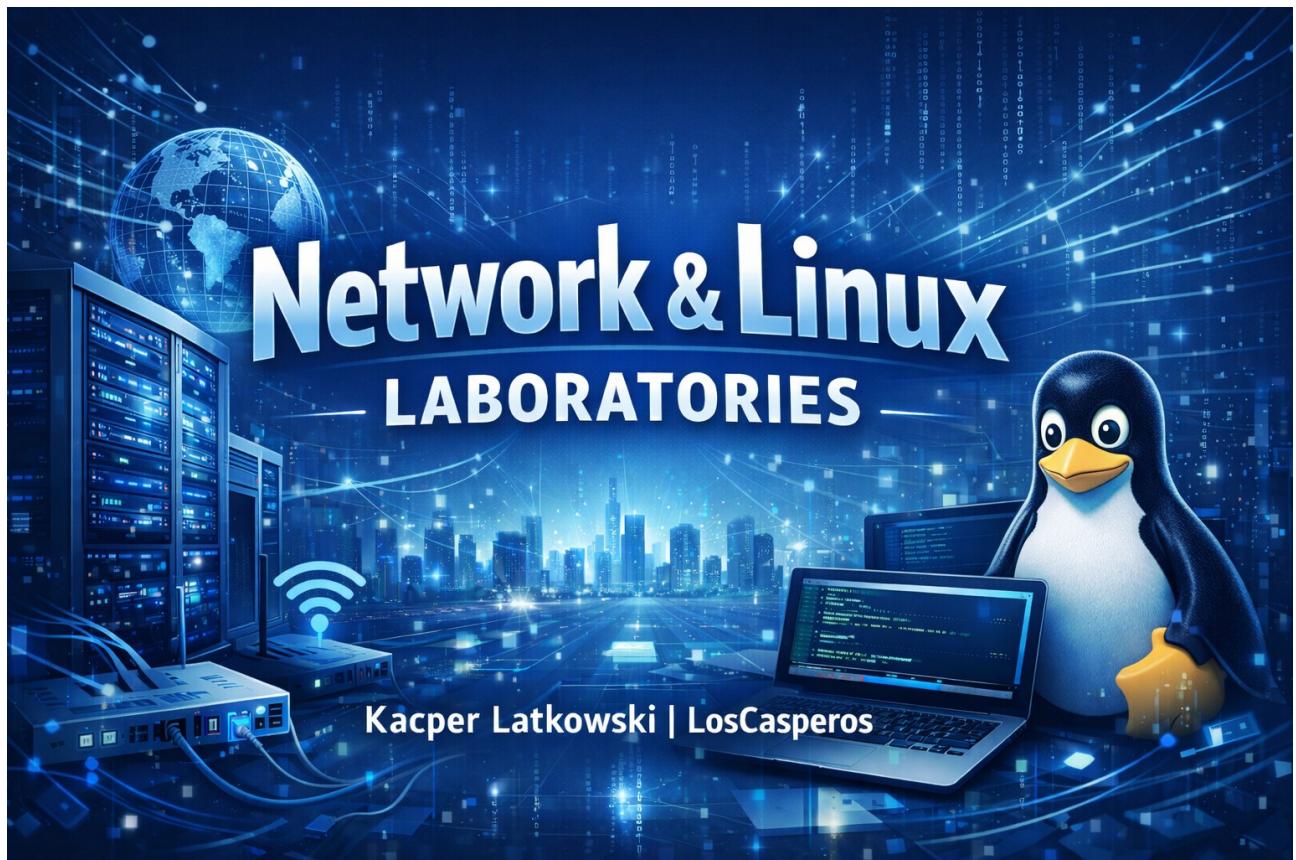


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1. Lab Metadata

- **Lab Name:** Lab 1 VLAN and Inter-VLAN Routing with DHCP + Basic Hardening
- **Tools:** Cisco Packet Tracer
- **Devices:** 1x Router (R1), 1x Switch (S1), 6x PCs
- **Date:** 06.01.2026
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2. Overview

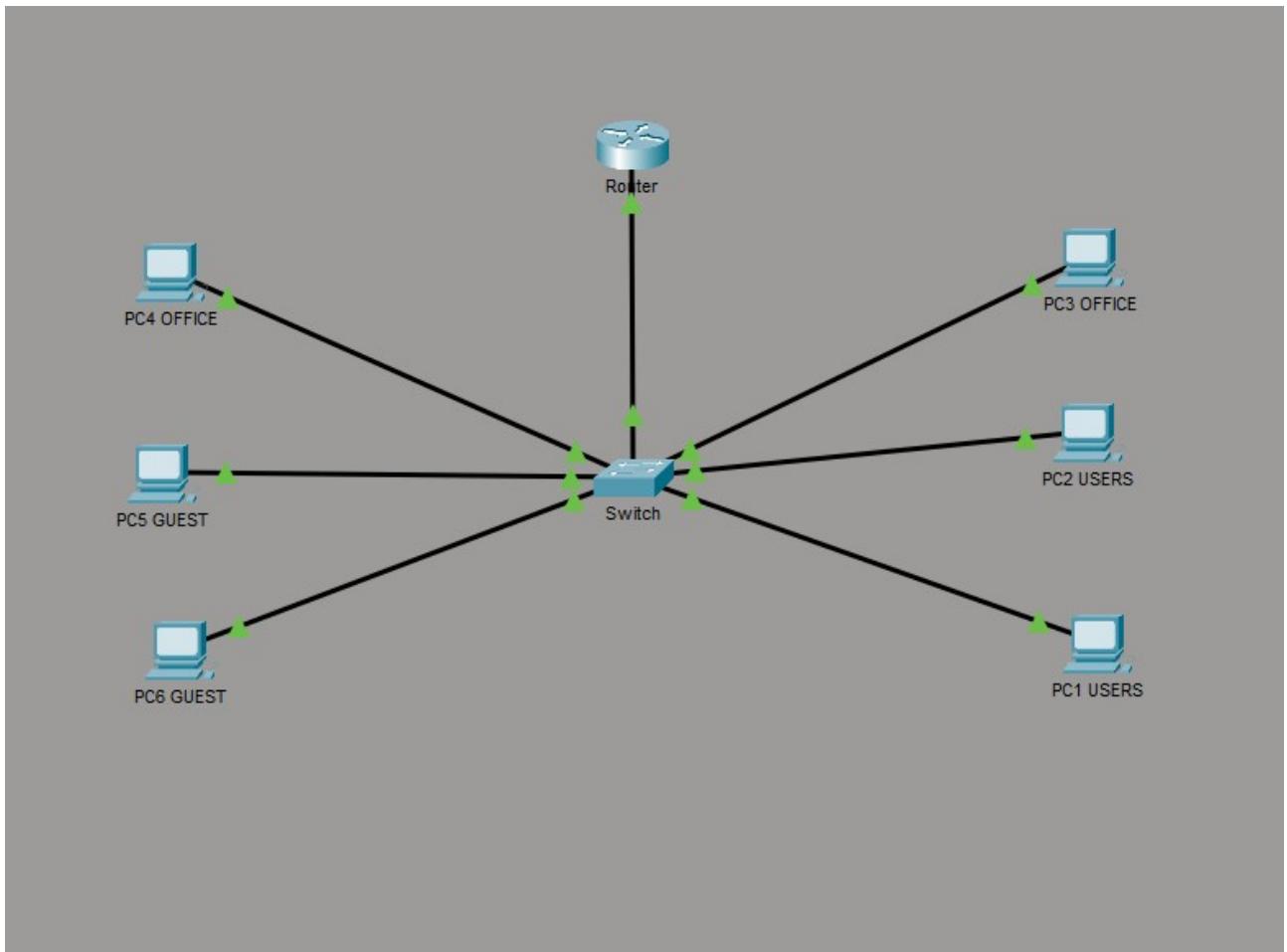
2.1. Objectives

- Create VLAN segmentation on a Layer 2 switch (VLAN 10 / 20 / 30).
- Configure a trunk link between the switch and router (802.1Q).
- Implement inter-VLAN routing using router-on-a-stick (router subinterfaces).
- Configure DHCP on the router with separate pools per VLAN.
- Apply basic Layer 2 and router hardening practices.
- Verify end-to-end connectivity (DHCP + inter-VLAN ping).

3. Network Topology

3.1. Topology Summary

- R1 G0/0 is connected to S1 G0/1 (802.1Q trunk).
- PCs are connected to S1 access ports:
 - VLAN 10: PC1 (F0/1), PC2 (F0/2)
 - VLAN 20: PC3 (F0/3), PC4 (F0/4)
 - VLAN 30: PC5 (F0/5), PC6 (F0/6)



01_topology.png

4. IP Addressing Plan

VLAN	Name	Network	Default Gateway	DHCP Range
10	USERS	192.168.10.0/24	192.168.10.1	192.168.10.11-254
20	OFFICE	192.168.20.0/24	192.168.20.1	192.168.20.11-254
30	GUEST	192.168.30.0/24	192.168.30.1	192.168.30.11-254

4.1. DHCP Exclusions (Infrastructure Reservation)

The first 10 IP addresses in each VLAN were excluded from DHCP to reserve them for infrastructure devices and to avoid address conflicts.

5. Step-by-Step Implementation

5.1. Build the Topology (Packet Tracer)

Actions:

- Place devices: R1, S1, PC1-PC6.
- Connect devices using Copper Straight-Through cables:
 - R1 G0/0 to S1 G0/1
 - PC1 to S1 F0/1
 - PC2 to S1 F0/2
 - PC3 to S1 F0/3
 - PC4 to S1 F0/4
 - PC5 to S1 F0/5
 - PC6 to S1 F0/6

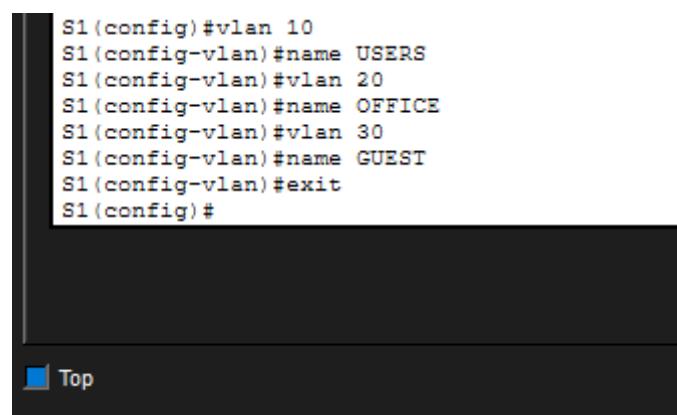
5.2. Switch S1 - Basic Setup

Configuration (S1 CLI)

The switch was configured with a hostname and DNS lookup was disabled to prevent unnecessary delays caused by mistyped commands.

5.3. Switch S1 - Create VLANs

VLANs 10, 20, and 30 were created on switch S1 and named according to their purpose



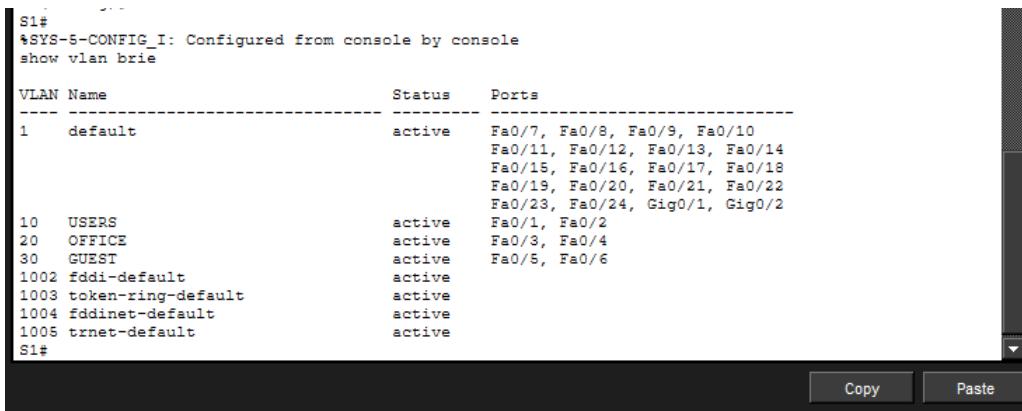
```
S1(config)#vlan 10
S1(config-vlan)#name USERS
S1(config-vlan)#vlan 20
S1(config-vlan)#name OFFICE
S1(config-vlan)#vlan 30
S1(config-vlan)#name GUEST
S1(config-vlan)#exit
S1(config)#
[REDACTED]
```

Top

02_vlan_create.png

5.4. Switch S1 - Assign Access Ports to VLANs

Access ports were configured in access mode and assigned to the appropriate VLANs based on the connected end devices.



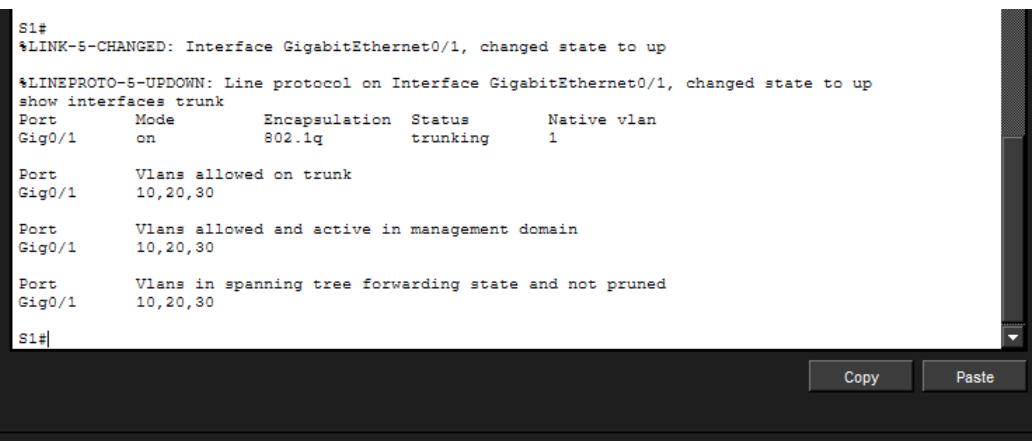
```
S1#  
%SYS-5-CONFIG_I: Configured from console by console  
show vlan brief  
  
VLAN Name Status Ports  
---- -- ----  
1 default active Fa0/7, Fa0/8, Fa0/9, Fa0/10  
Fa0/11, Fa0/12, Fa0/13, Fa0/14  
Fa0/15, Fa0/16, Fa0/17, Fa0/18  
Fa0/19, Fa0/20, Fa0/21, Fa0/22  
Fa0/23, Fa0/24, Gig0/1, Gig0/2  
10 USERS active Fa0/1, Fa0/2  
20 OFFICE active Fa0/3, Fa0/4  
30 GUEST active Fa0/5, Fa0/6  
1002 fddi-default active  
1003 token-ring-default active  
1004 fddinet-default active  
1005 trnet-default active  
S1#
```

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03_show_vlan_brief.png

5.5. Switch S1 - Configure Trunk to Router

An IEEE 802.1Q trunk link was configured between switch S1 and router R1, allowing VLANs 10, 20, and 30.



```
S1#  
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up  
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up  
show interfaces trunk  
Port Mode Encapsulation Status Native vlan  
Gig0/1 on 802.1q trunking 1  
  
Port Vlans allowed on trunk  
Gig0/1 10,20,30  
  
Port Vlans allowed and active in management domain  
Gig0/1 10,20,30  
  
Port Vlans in spanning tree forwarding state and not pruned  
Gig0/1 10,20,30  
S1#
```

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04_show_interfaces_trunk.png

5.6. Router R1 - Basic Setup and Enable Physical Interface

Basic router configuration was applied, including hostname assignment and enabling the physical interface connected to the switch.

```
--- System Configuration Dialog ---  
Would you like to enter the initial configuration dialog? [yes/no]: no  
Press RETURN to get started!  
  
Router>en  
Router#conf t  
Enter configuration commands, one per line. End with CNTL/Z.  
Router(config)#hostname R1  
R1(config)#no ip domain  
R1(config)#no ip domain-lookups  
R1(config)#int gi 0/0  
R1(config-if)#no shut  
R1(config-if)#no shutdown  
  
R1(config-if)#  
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up  
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up  
|
```

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05_router_basic.png

5.7. Router R1 - Inter-VLAN Routing (Router-on-a-Stick)

Inter-VLAN routing was implemented using the router-on-a-stick method with 802.1Q subinterfaces for each VLAN.

```
R1>en  
R1#conf t  
Enter configuration commands, one per line. End with CNTL/Z.  
R1(config)#int  
R1(config)#interface gi  
R1(config)#interface gigabit  
R1(config)#interface gigabitEthernet 0/0.10  
R1(config-subif)#  
%LINK-3-UPDOWN: Interface GigabitEthernet0/0.10, changed state to down  
  
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.10, changed state to up  
enc  
R1(config-subif)#encapsulation do  
R1(config-subif)#encapsulation dot1Q 10  
R1(config-subif)#ip add  
R1(config-subif)#ip address 192.168.10.1 255.255.255.0  
R1(config-subif)#exit  
R1(config)#int  
R1(config)#interface gi  
R1(config)#interface gigabitEthernet 0/0.20  
R1(config-subif)#  
%LINK-3-UPDOWN: Interface GigabitEthernet0/0.20, changed state to down  
  
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.20, changed state to up  
enc  
R1(config-subif)#encapsulation d  
R1(config-subif)#encapsulation dot1Q 20  
R1(config-subif)#ip add  
R1(config-subif)#ip address 192.168.20.1 255.255.255.0  
R1(config-subif)#exit  
R1(config)#int  
R1(config)#interface gi  
R1(config)#interface gigabitEthernet 0/0.30  
R1(config-subif)#  
%LINK-3-UPDOWN: Interface GigabitEthernet0/0.30, changed state to down  
  
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.30, changed state to up  
enca  
R1(config-subif)#encapsulation do  
R1(config-subif)#encapsulation dot1Q 30  
R1(config-subif)#ip add  
R1(config-subif)#ip address 192.168.30.1 255.255.255.0  
R1(config-subif)#exit  
R1(config)#  
R1(config)#  
R1(config)#do wr  
Building configuration...  
done.
```

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06_subinterfaces_config.png

```

R1(config)#exit
R1#
*SYS-5-CONFIG_I: Configured from console by console
show
R1#show ip i
R1#show ip interface b
R1#show ip interface brief
Interface          IP-Address      OK? Method Status        Protocol
GigabitEthernet0/0  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
GigabitEthernet0/1   unassigned     YES unset  administratively down down
Vlan1              unassigned     YES unset  administratively down down
R1#

```

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07_show_ip_int_brief.png

5.8. Router R1 - DHCP Configuration

DHCP pools were configured on the router for each VLAN. The first ten IP addresses in each subnet were excluded to reserve them for infrastructure devices.

```

R1#
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#ip dhcp ex
R1(config)#ip dhcp excluded-address 192.168.10.1 192.168.10.10
R1(config)#ip dhcp excluded-address 192.168.20.1 192.168.20.10
R1(config)#ip dhcp excluded-address 192.168.30.1 192.168.30.10
R1(config)#do wr
Building configuration...
[OK]
R1(config)#ip dhcp pool1 VLAN10_USERS
               ^
* Invalid input detected at '^' marker.

R1(config)#ip dhcp pool VLAN10_USERS
R1(dhcp-config)#net
R1(dhcp-config)#network 192.168.10.0 255.255.255.0
R1(dhcp-config)#defa
R1(dhcp-config)#default-router 192.168.10.1
R1(dhcp-config)#dns
R1(dhcp-config)#dns-server 8.8.8.8
R1(dhcp-config)#exit
R1(config)#ip dhcp pool VLAN20_OFFICE
R1(dhcp-config)#ne
R1(dhcp-config)#network 192.168.20.0 255.255.255.0
R1(dhcp-config)#defa
R1(dhcp-config)#default-router 192.168.20.1
R1(dhcp-config)#dns
R1(dhcp-config)#dns-server 8.8.8.8
R1(dhcp-config)#exit
R1(config)#ip dhcp pool VLAN30 GUEST

```

08_dhcp_config.png

```

R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#
R1#
R1#show ip dhcp pool

Pool VLAN10_USERS :
  Utilization mark (high/low)      : 100 / 0
  Subnet size (first/next)        : 0 / 0
  Total addresses                 : 254
  Leased addresses                : 0
  Excluded addresses              : 3
  Pending event                  : none

  1 subnet is currently in the pool
  Current index      IP address range          Leased/Excluded/Total
  192.168.10.1       192.168.10.1 - 192.168.10.254    0 / 3 / 254

Pool VLAN20_OFFICE :
  Utilization mark (high/low)      : 100 / 0
  Subnet size (first/next)        : 0 / 0
  Total addresses                 : 254
  Leased addresses                : 0
  Excluded addresses              : 3
  Pending event                  : none

  1 subnet is currently in the pool
  Current index      IP address range          Leased/Excluded/Total
  192.168.20.1       192.168.20.1 - 192.168.20.254    0 / 3 / 254

Pool VLAN30_GUEST :
  Utilization mark (high/low)      : 100 / 0
  Subnet size (first/next)        : 0 / 0
  Total addresses                 : 254
  Leased addresses                : 0
  Excluded addresses              : 3
  Pending event                  : none

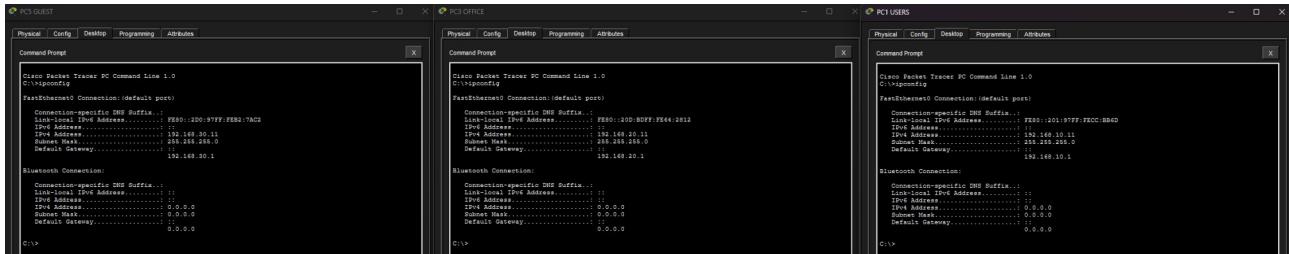
  1 subnet is currently in the pool
  Current index      IP address range          Leased/Excluded/Total
  192.168.30.1       192.168.30.1 - 192.168.30.254    0 / 3 / 254
R1#

```

09_show_ip_dhcp_pool.png

5.9. End Devices - DHCP Configuration

End devices were configured to obtain IP addressing information dynamically via DHCP.

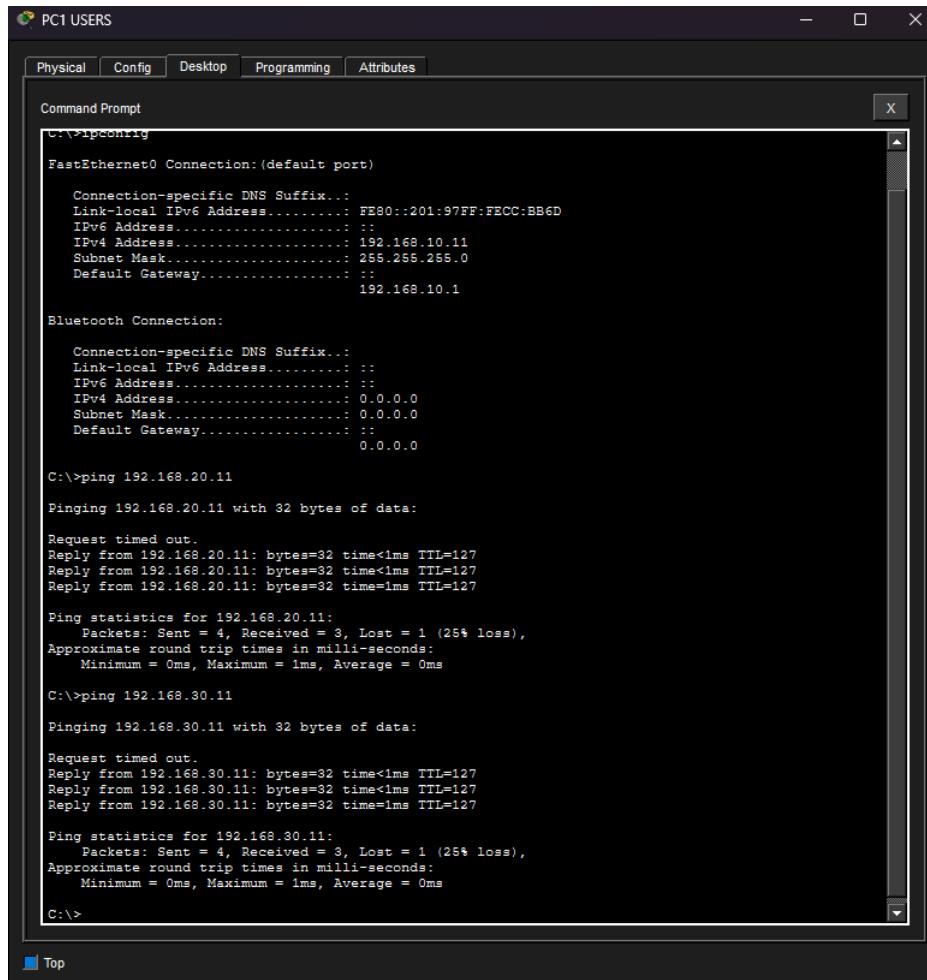


10_pc1_ipconfig.png

6. Verification & Testing

6.1. Inter-VLAN Connectivity Test

Inter-VLAN connectivity was verified using ICMP echo requests between hosts.



The screenshot shows a Windows Command Prompt window titled "PC1 USERS". The window has tabs: Physical, Config, Desktop, Programming, and Attributes. The Command Prompt tab is active, displaying the following text:

```
C:\>ipconfig
FastEthernet0 Connection:(default port)
  Connection-specific DNS Suffix..:
  Link-local IPv6 Address.....: FE80::201:97FF:FECC:BB6D
  IPv6 Address.....: :::
  IPv4 Address.....: 192.168.10.11
  Subnet Mask.....: 255.255.255.0
  Default Gateway.....: :::
                           192.168.10.1

Bluetooth Connection:
  Connection-specific DNS Suffix..:
  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 192.168.20.11
Pinging 192.168.20.11 with 32 bytes of data:
Request timed out.
Reply from 192.168.20.11: bytes=32 time<1ms TTL=127
Reply from 192.168.20.11: bytes=32 time<1ms TTL=127
Reply from 192.168.20.11: bytes=32 time=1ms TTL=127

Ping statistics for 192.168.20.11:
  Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
  Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.30.11
Pinging 192.168.30.11 with 32 bytes of data:
Request timed out.
Reply from 192.168.30.11: bytes=32 time<1ms TTL=127
Reply from 192.168.30.11: bytes=32 time<1ms TTL=127
Reply from 192.168.30.11: bytes=32 time=1ms TTL=127

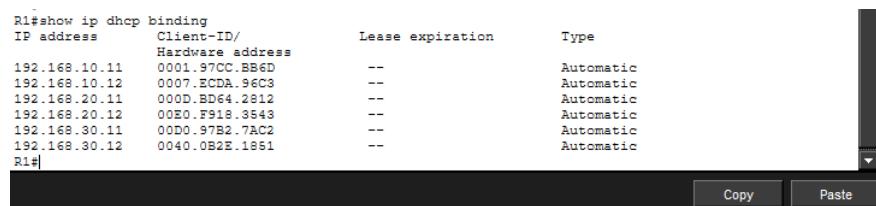
Ping statistics for 192.168.30.11:
  Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
  Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

11_ping_intervlan.png

6.2. DHCP Lease Verification

DHCP lease assignments were verified on the router.



The screenshot shows a terminal window with the command "R1#show ip dhcp binding" entered. The output displays the following table of DHCP lease bindings:

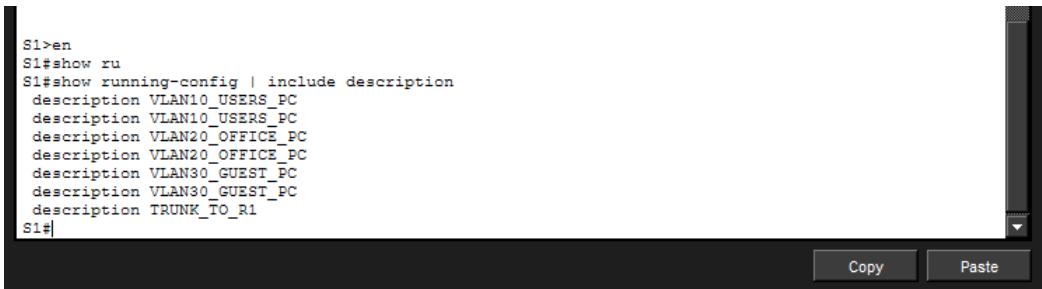
IP address	Client-ID/ Hardware address	Lease expiration	Type
192.168.10.11	0001.97CC.BB6D	--	Automatic
192.168.10.12	0007.ECDA.96C3	--	Automatic
192.168.20.11	000D.BD64.2812	--	Automatic
192.168.20.12	00E0.F918.3543	--	Automatic
192.168.30.11	00D0.97B2.7AC2	--	Automatic
192.168.30.12	0040.0B2E.1851	--	Automatic

19_show_dhcp_binding.png

7. Security Hardening

7.1. Switch S1 - Port Descriptions (Documentation Hygiene)

Interface descriptions were added to improve configuration readability and network documentation.



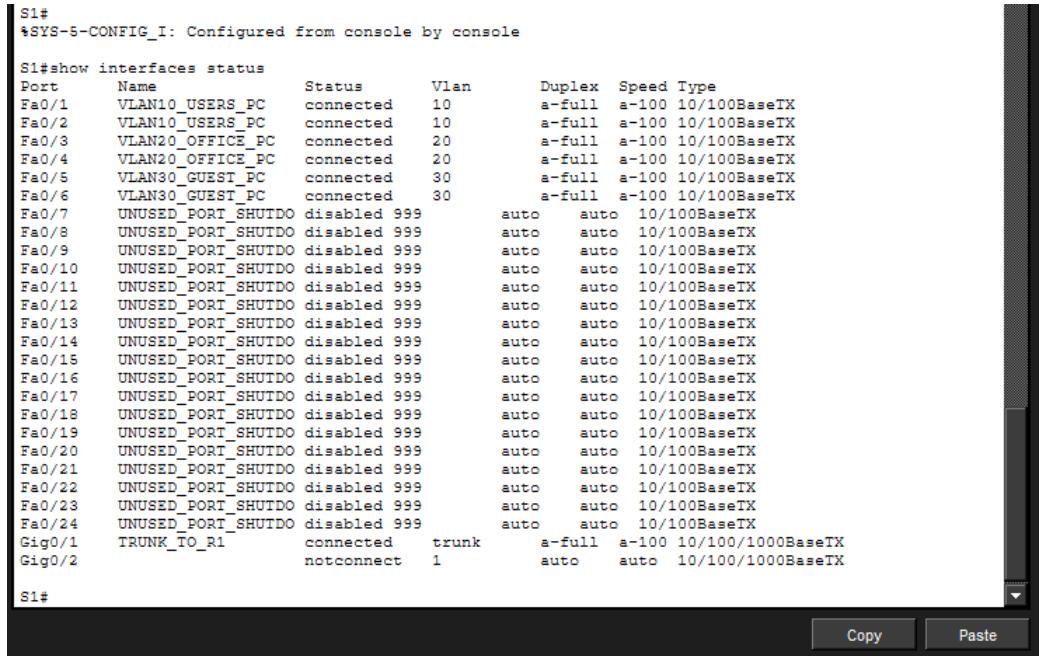
```
S1>en
S1#show ru
S1#show running-config | include description
description VLAN10_USERS_PC
description VLAN10_USERS_PC
description VLAN20_OFFICE_PC
description VLAN20_OFFICE_PC
description VLAN30_GUEST_PC
description VLAN30_GUEST_PC
description TRUNK_TO_R1
S1#
```

The screenshot shows a terminal window with the Cisco IOS command-line interface. The user has entered 'en' to enable privileged mode, then 'show ru' to view running configurations. The output includes several 'description' commands for interfaces, such as 'VLAN10_USERS_PC', 'VLAN20_OFFICE_PC', and 'VLAN30_GUEST_PC'. At the bottom right of the terminal window are 'Copy' and 'Paste' buttons.

12_port_descriptions.png

7.2. Switch S1 - Unused Ports and Parking VLAN

Unused switch ports were administratively shut down and assigned to a parking VLAN to reduce the attack surface.



```
S1#
*SYS-5-CONFIG_I: Configured from console by console

S1#show interfaces status
Port      Name          Status     Vlan      Duplex   Speed Type
Fa0/1    VLAN10_USERS_PC connected  10       a-full   a-100  10/100BaseTX
Fa0/2    VLAN10_USERS_PC connected  10       a-full   a-100  10/100BaseTX
Fa0/3    VLAN20_OFFICE_PC connected  20       a-full   a-100  10/100BaseTX
Fa0/4    VLAN20_OFFICE_PC connected  20       a-full   a-100  10/100BaseTX
Fa0/5    VLAN30_GUEST_PC connected  30       a-full   a-100  10/100BaseTX
Fa0/6    VLAN30_GUEST_PC connected  30       a-full   a-100  10/100BaseTX
Fa0/7    UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Fa0/8    UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Fa0/9    UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Fa0/10   UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Fa0/11   UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Fa0/12   UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Fa0/13   UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Fa0/14   UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Fa0/15   UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Fa0/16   UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Fa0/17   UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Fa0/18   UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Fa0/19   UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Fa0/20   UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Fa0/21   UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Fa0/22   UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Fa0/23   UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Fa0/24   UNUSED_PORT_SHUTDO disabled 999      auto    auto   10/100BaseTX
Gig0/1   TRUNK_TO_R1      connected   trunk    a-full   a-100  10/100/1000BaseTX
Gig0/2      notconnect    1          auto    auto   10/100/1000BaseTX
S1#
```

The screenshot shows a terminal window with the Cisco IOS command-line interface. The user has entered 'show interfaces status' to view the status of all interfaces. The output lists 24 ports (Fa0/1 to Fa0/24) as disabled (999), which corresponds to the 'UNUSED_PORT_SHUTDO' state mentioned in the text above. The 'TRUNK_TO_R1' port is connected and configured as a trunk link. The 'Gig0/1' and 'Gig0/2' ports are also listed. At the bottom right of the terminal window are 'Copy' and 'Paste' buttons.

13_show_int_status_unused.png

```

S1#show vlan brief
VLAN Name          Status    Ports
---- -----
1    default        active    Gig0/2
10   USERS          active    Fa0/1, Fa0/2
20   OFFICE         active    Fa0/3, Fa0/4
30   GUEST          active    Fa0/5, Fa0/6
999  PARKING_LOT   active    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, Fa0/20, Fa0/21, Fa0/22
                           Fa0/23, Fa0/24
1002 fddi-default  active
1003 token-ring-default  active
1004 fddinet-default  active
1005 trnet-default   active
S1#

```

Copy Paste

14_vlan999_parking.png

7.3. Switch S1 - Port Security

Port security was enabled on access ports using sticky MAC addresses, allowing a single device per port. Violation Mode set to Restrict.

```

S1#show port-security
Secure Port MaxSecureAddr CurrentAddr SecurityViolation Security Action
(Count) (Count) (Count)
-----
Fa0/1      1      0      0      Restrict
Fa0/2      1      0      0      Restrict
Fa0/3      1      0      0      Restrict
Fa0/4      1      0      0      Restrict
Fa0/5      1      0      0      Restrict
Fa0/6      1      0      0      Restrict
-----
S1#

```

Copy Paste

15_show_port_security.png

```

S1#show port-security interface f0/1
Port Security       : Enabled
Port Status          : Secure-up
Violation Mode      : Restrict
Aging Time          : 0 mins
Aging Type          : Absolute
SecureStatic Address Aging : Disabled
Maximum MAC Addresses : 1
Total MAC Addresses  : 0
Configured MAC Addresses : 0
Sticky MAC Addresses : 0
Last Source Address:Vlan : 0000.0000.0000:0
Security Violation Count : 0
S1#

```

Copy Paste

16_ps_int_f01.png

7.4. Switch S1 — Disable DTP on Trunk

Dynamic Trunking Protocol (DTP) was disabled on the trunk interface to prevent unauthorized trunk negotiations.

```

S1#show interfaces trunk
Port      Mode       Encapsulation  Status        Native vlan
Gig0/1    on         802.1q          trunking     1

Port      Vlans allowed on trunk
Gig0/1    10,20,30

Port      Vlans allowed and active in management domain
Gig0/1    10,20,30

Port      Vlans in spanning tree forwarding state and not pruned
Gig0/1    10,20,30

S1#

```

17_trunk_after_hardening.png

7.5. Router R1 — Basic Hardening

Basic router hardening was applied, including password encryption and a login warning banner.

```

R1#
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#enable secret cisco123
R1(config)#ser
R1(config)#service pass
R1(config)#service password-encryption
R1(config)#banner motd # UNAUTHORIZED ACCESS PROHIBITED #
R1(config)#

```

18_router_hardening.png

7.6. Post-Hardening Verification

Network functionality was re-verified after hardening to ensure that security measures did not impact connectivity.

```

C:\>ping 192.168.20.11

Pinging 192.168.20.11 with 32 bytes of data:
Reply from 192.168.20.11: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.20.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.30.11

Pinging 192.168.30.11 with 32 bytes of data:
Reply from 192.168.30.11: bytes=32 time<1ms TTL=127
Reply from 192.168.30.11: bytes=32 time<1ms TTL=127
Reply from 192.168.30.11: bytes=32 time=3ms TTL=127
Reply from 192.168.30.11: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.30.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 3ms, Average = 0ms

```

20_ping_after_hardening.png

8. Appendix A - Screenshot Checklist

- 01_topology.png
- 02_vlan_create.png
- 03_show_vlan_brief.png
- 04_show_interfaces_trunk.png
- 05_router_basic.png
- 06_subinterfaces_config.png
- 07_show_ip_int_brief.png
- 08_dhcp_config.png
- 09_show_ip_dhcp_pool.png
- 10_pc1_ipconfig.png
- 11_ping_intervlan.png
- 12_port_descriptions.png
- 13_show_int_status_unused.png
- 14_vlan999_parking.png
- 15_show_port_security.png
- 16_ps_int_f01.png
- 17_trunk_after_hardening.png
- 18_router_hardening.png
- 19_show_dhcp_binding.png
- 20_ping_after_hardening.png

9. Appendix B – Device Configuration

9.1. Switch S1 — Running Configuration

```
S1#show running-config
```

```
Building configuration...
```

```
Current configuration : 4630 bytes
```

```
!
```

```
version 15.0
```

```
no service timestamps log datetime msec
```

```
no service timestamps debug datetime msec
```

```
no service password-encryption
```

```
!
```

```
hostname S1
```

```
!
```

```
!
```

```
!
```

```
no ip domain-lookup
```

```
!
```

```
!
```

```
!
```

```
spanning-tree mode pvst
```

```
spanning-tree extend system-id
```

```
!
```

```
interface FastEthernet0/1
```

```
description VLAN10_USERS_PC
```

```
switchport access vlan 10
```

```
switchport mode access
```

```
switchport port-security
```

```
switchport port-security mac-address sticky
```

```
switchport port-security violation restrict
```

```
switchport port-security mac-address sticky 0001.97CC.BB6D
```

```
spanning-tree portfast
```

```
!
```

```
interface FastEthernet0/2
```

```
description VLAN10_USERS_PC
```

```
switchport access vlan 10
```

```
switchport mode access
```

```
switchport port-security
```

```
switchport port-security mac-address sticky
```

```
switchport port-security violation restrict
switchport port-security mac-address sticky 0007.ECDA.96C3
spanning-tree portfast
!
interface FastEthernet0/3
description VLAN20_OFFICE_PC
switchport access vlan 20
switchport mode access
switchport port-security
switchport port-security mac-address sticky
switchport port-security violation restrict
switchport port-security mac-address sticky 000D.BD64.2812
spanning-tree portfast
!
interface FastEthernet0/4
description VLAN20_OFFICE_PC
switchport access vlan 20
switchport mode access
switchport port-security
switchport port-security mac-address sticky
switchport port-security violation restrict
switchport port-security mac-address sticky 00E0.F918.3543
spanning-tree portfast
!
interface FastEthernet0/5
description VLAN30_GUEST_PC
switchport access vlan 30
switchport mode access
switchport port-security
switchport port-security mac-address sticky
switchport port-security violation restrict
switchport port-security mac-address sticky 00D0.97B2.7AC2
spanning-tree portfast
!
interface FastEthernet0/6
description VLAN30_GUEST_PC
switchport access vlan 30
switchport mode access
switchport port-security
switchport port-security mac-address sticky
switchport port-security violation restrict
switchport port-security mac-address sticky 0040.0B2E.1851
```

```
spanning-tree portfast
!
interface FastEthernet0/7
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
shutdown
!
interface FastEthernet0/8
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
shutdown
!
interface FastEthernet0/9
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
shutdown
!
interface FastEthernet0/10
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
shutdown
!
interface FastEthernet0/11
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
shutdown
!
interface FastEthernet0/12
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
shutdown
!
interface FastEthernet0/13
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
```

```
shutdown
!
interface FastEthernet0/14
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
shutdown
!
interface FastEthernet0/15
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
shutdown
!
interface FastEthernet0/16
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
shutdown
!
interface FastEthernet0/17
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
shutdown
!
interface FastEthernet0/18
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
shutdown
!
interface FastEthernet0/19
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
shutdown
!
interface FastEthernet0/20
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
```

```
shutdown
!
interface FastEthernet0/21
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
shutdown
!
interface FastEthernet0/22
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
shutdown
!
interface FastEthernet0/23
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
shutdown
!
interface FastEthernet0/24
description UNUSED_PORT_SHUTDOWN
switchport access vlan 999
switchport mode access
shutdown
!
interface GigabitEthernet0/1
description TRUNK_TO_R1
switchport trunk allowed vlan 10,20,30
switchport mode trunk
switchport nonegotiate
!
interface GigabitEthernet0/2
!
interface Vlan1
no ip address
shutdown
!
!
!
!
line con 0
```

```
!
line vty 0 4
login
line vty 5 15
login
!
!
!
!
end
```

9.2. Router R1 — Running Configuration

R1#show run

Building configuration...

```
Current configuration : 1492 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname R1
!
!
!
enable secret 5 $1$mERr$5.a6P4JqbNiMX01usIfka/
!
!
ip dhcp excluded-address 192.168.10.1 192.168.10.10
ip dhcp excluded-address 192.168.20.1 192.168.20.10
ip dhcp excluded-address 192.168.30.1 192.168.30.10
!
ip dhcp pool VLAN10_USERS
network 192.168.10.0 255.255.255.0
default-router 192.168.10.1
dns-server 8.8.8.8
ip dhcp pool VLAN20_OFFICE
network 192.168.20.0 255.255.255.0
default-router 192.168.20.1
```

```
dns-server 8.8.8.8
ip dhcp pool VLAN30_GUEST
network 192.168.30.0 255.255.255.0
default-router 192.168.30.1
dns-server 8.8.8.8
!
!
!
ip cef
no ipv6 cef
!
!
!
!
license udi pid CISCO1941/K9 sn FTX1524JO4X-
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
no ip domain-lookup
!
!
spanning-tree mode pvst
!
!
!
!
!
!
interface GigabitEthernet0/0
no ip address
duplex auto
speed auto
!
interface GigabitEthernet0/0.10
```

```
encapsulation dot1Q 10
ip address 192.168.10.1 255.255.255.0
!
interface GigabitEthernet0/0.20
encapsulation dot1Q 20
ip address 192.168.20.1 255.255.255.0
!
interface GigabitEthernet0/0.30
encapsulation dot1Q 30
ip address 192.168.30.1 255.255.255.0
!
interface GigabitEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface Vlan1
no ip address
shutdown
!
ip classless
!
ip flow-export version 9
!
!
!
banner motd ^C UNAUTHORIZED ACCESS PROHIBITED ^C
!
!
!
!
line con 0
!
line aux 0
!
line vty 0 4
login
!
!
!
end
```