

Project Overview – Enterprise Network Design and Simulation (Cisco CCNA)

1. Project Objective

The objective of this project is to design and simulate a small enterprise network using **Cisco Packet Tracer**, based on **CCNA-level networking concepts**.

The project focuses on:

- Network segmentation using VLANs
- Inter-VLAN communication
- Structured IP addressing
- Basic network security
- Connectivity testing and validation

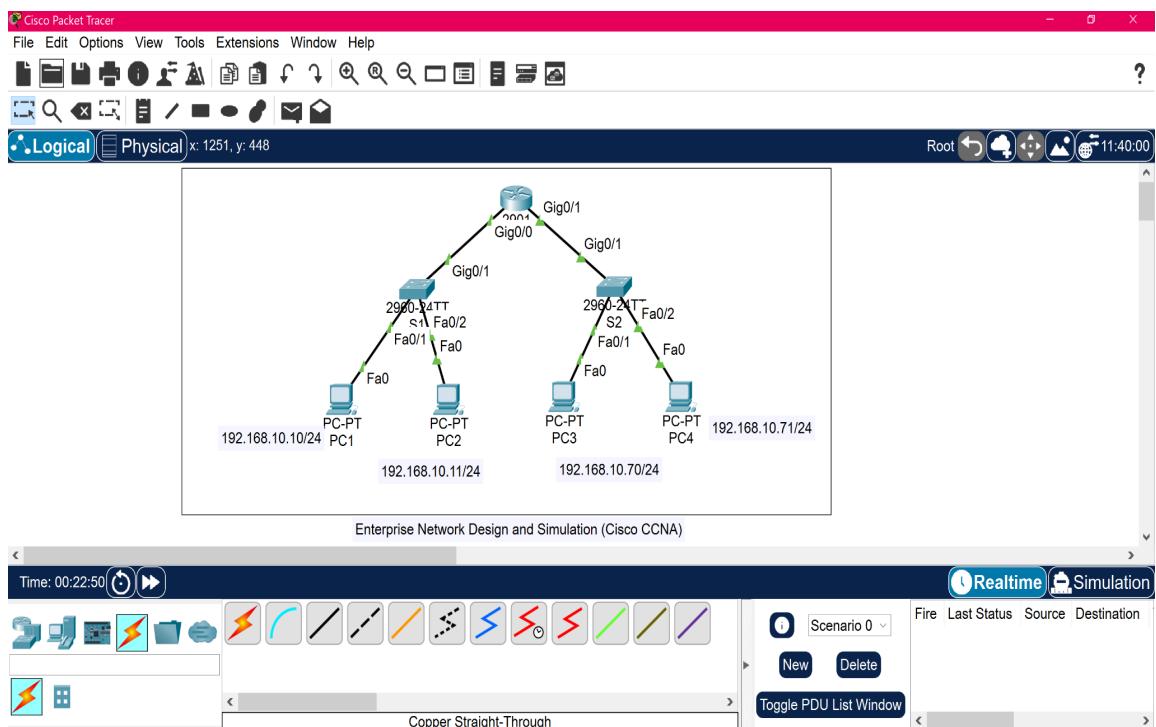
This project was developed to strengthen practical networking skills and demonstrate the ability to design and implement a functional enterprise network.

2. Network Topology Overview

The simulated network represents a small company infrastructure composed of:

- **1 Cisco Router (2911)**
- **2 Cisco Switches (2960)**
- **4 End Devices (PCs)**

The router is responsible for **inter-VLAN routing**, while the switches handle **VLAN segmentation** for different departments.

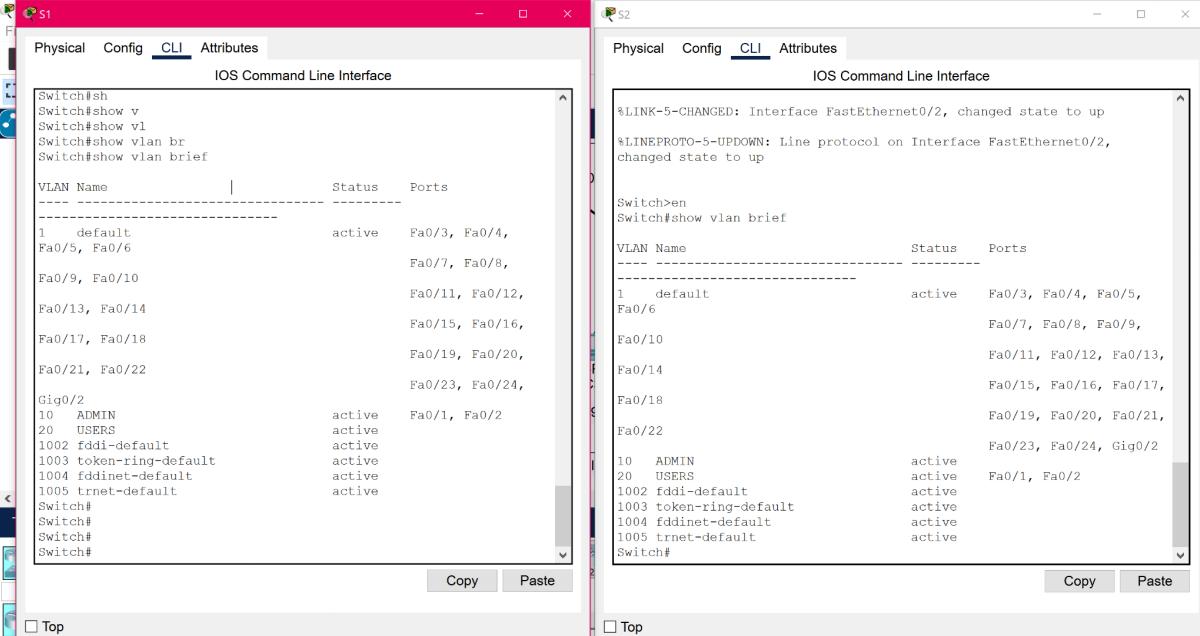


3. VLAN Design

To improve network organization and security, the network is divided into two VLANs:

VLAN ID	VLAN Name	Description
10	ADMIN	Administration department
20	USERS	Employees / Users

Each VLAN is assigned to specific switch ports to ensure proper traffic separation.



The image shows two terminal windows, S1 and S2, running the IOS Command Line Interface (CLI). Both windows have tabs for Physical, Config, CLI, and Attributes, with the CLI tab selected.

Switch#sh
Switch#show v
Switch#show vl
Switch#show vlan br
Switch#show vlan brief

VLAN Name	Status	Ports
1 default	active	Fa0/3, Fa0/4, Fa0/5, Fa0/6
Fa0/9, Fa0/10		Fa0/7, Fa0/8,
Fa0/13, Fa0/14		Fa0/11, Fa0/12,
Fa0/17, Fa0/18		Fa0/15, Fa0/16,
Fa0/21, Fa0/22		Fa0/19, Fa0/20,
Gig0/2		Fa0/23, Fa0/24,
10 ADMIN	active	Fa0/1, Fa0/2
20 USERS	active	
1002 fddi-default	active	
1003 token-ring-default	active	
1004 fddinet-default	active	
1005 trnet-default	active	
Switch#		

Switch#

Switch#sh
Switch#show vlan brief

VLAN Name	Status	Ports
1 default	active	Fa0/3, Fa0/4, Fa0/5, Fa0/6
Fa0/10		Fa0/7, Fa0/8, Fa0/9,
Fa0/14		Fa0/11, Fa0/12, Fa0/13,
Fa0/18		Fa0/15, Fa0/16, Fa0/17,
Fa0/22		Fa0/19, Fa0/20, Fa0/21,
10 ADMIN	active	Fa0/23, Fa0/24, Gig0/2
20 USERS	active	Fa0/1, Fa0/2
1002 fddi-default	active	
1003 token-ring-default	active	
1004 fddinet-default	active	
1005 trnet-default	active	
Switch#		

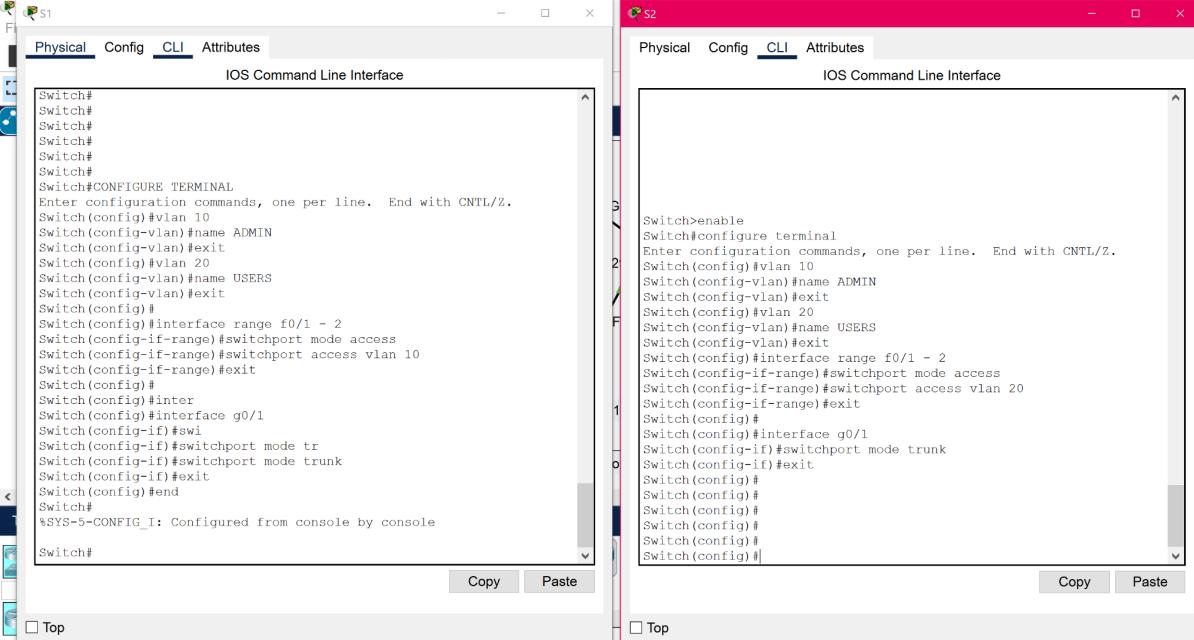
Switch#

4. IP Addressing Plan

A structured IP addressing scheme was implemented using private IPv4 addresses.

VLAN	Network Address	Subnet Mask	Default Gateway
10 (ADMIN)	192.168.10.0	255.255.255.192 (/26)	192.168.10.1
20 (USERS)	192.168.10.64	255.255.255.192 (/26)	192.168.10.65

All end devices were configured with **static IP addresses** to ensure full control and clarity during testing.



The image shows two windows side-by-side, each titled "IOS Command Line Interface". Both windows have tabs for Physical, Config, CLI, and Attributes, with the CLI tab selected. The left window is for switch S1 and the right window is for switch S2. Both windows show the same configuration commands being entered:

```
Switch#CONFIGURE TERMINAL
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name ADMIN
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#name USERS
Switch(config-vlan)#exit
Switch(config)#
Switch(config)interface range f0/1 - 2
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 10
Switch(config-if-range)#exit
Switch(config)#
Switch(config)inter
Switch(config)#interface g0/1
Switch(config)#swi
Switch(config-if)#switchport mode tr
Switch(config-if)#switchport mode trunk
Switch(config-if)#exit
Switch(config)#end
Switch#
%SYS-5-CONFIG_I: Configured from console by console
Switch#
```

At the bottom of each window, there are "Copy" and "Paste" buttons. The status bar at the bottom of each window also includes a "Top" button.

5. Technologies and Tools Used

- Cisco Packet Tracer 8.2.2
 - Cisco Router 2911
 - Cisco Switch 2960
 - VLAN configuration
 - Inter-VLAN routing (Router-on-a-Stick)
 - Static IP addressing
 - Basic network security configurations
 - ICMP testing (Ping)
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6. Configuration and Implementation

The following configurations were implemented:

- Creation and naming of VLANs on switches
- Assignment of access ports to specific VLANs
- Configuration of trunk links between switches and router
- Configuration of router sub-interfaces for each VLAN
- Assignment of IP addresses and default gateways

These steps ensure correct communication within and between VLANs.

R1

Physical Config **CLI** Attributes

IOS Command Line Interface

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int g0/0
Router(config-if)#nu sh
^
% Invalid input detected at '^' marker.

Router(config-if)#no sh
Router(config-if)#exit
Router(config)#int g0/1
Router(config-if)#no sh
Router(config-if)#exit
Router(config)#int g0/0.10
Router(config-subif)#en
Router(config-subif)#encapsulation d
Router(config-subif)#encapsulation dot1Q 10
Router(config-subif)#ip add 192.168.10.1 255.255.255.192
Router(config-subif)#exit
Router(config)#int g0/1.20
Router(config-subif)#encapsulation dot1Q
% Incomplete command.
Router(config-subif)#encapsulation dot1Q 20
Router(config-subif)#ip add 192.168.10.65 255.255.255.192
Router(config-subif)#exit
Router(config)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#
```

Top

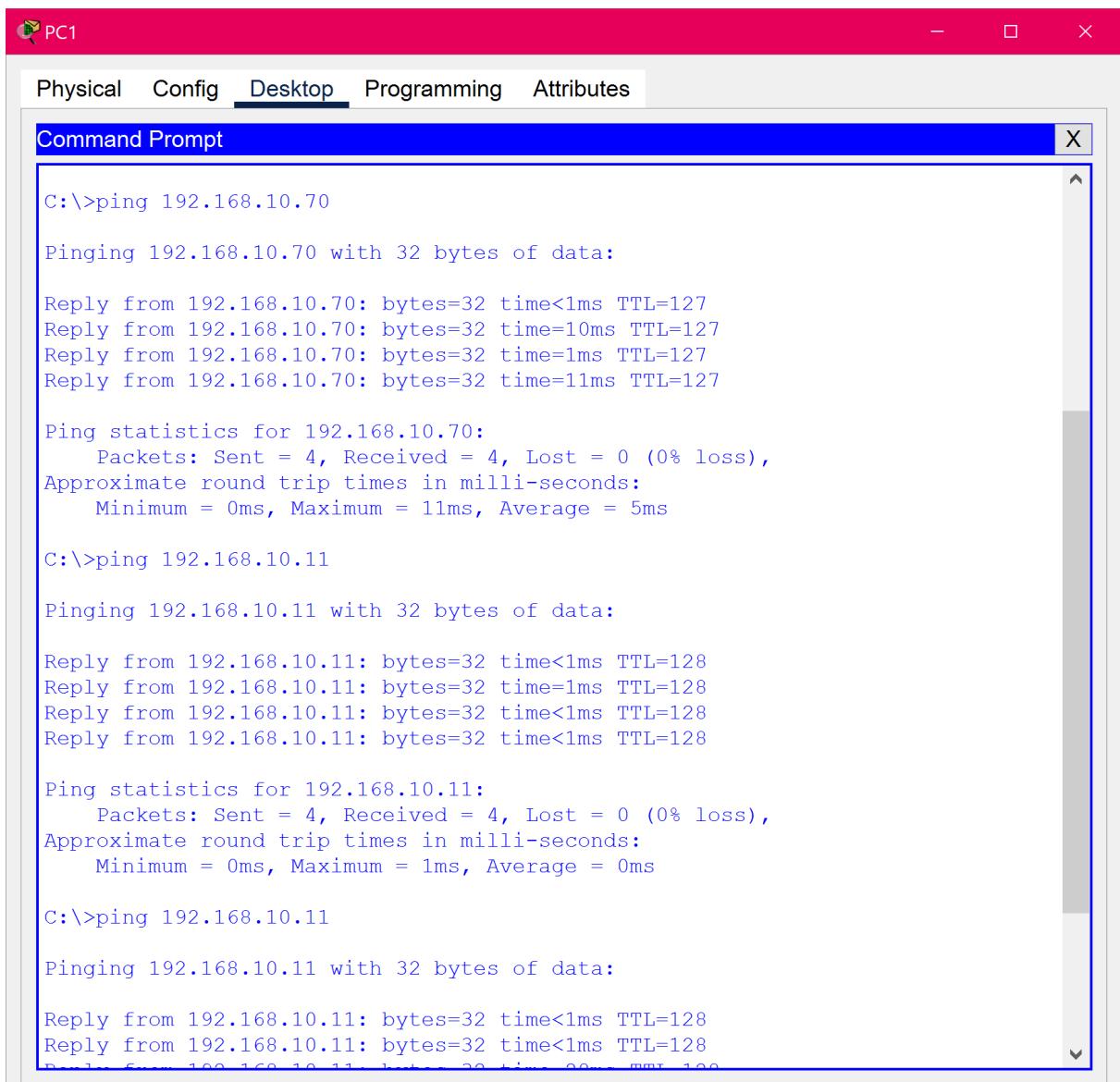
Copy Paste

7. Testing and Validation

Network connectivity was verified using **ICMP (ping)** tests:

- Communication between devices in the same VLAN
- Communication between devices in different VLANs

All tests were successful, confirming proper VLAN configuration and inter-VLAN routing.



The screenshot shows a software interface for managing network devices. At the top, there's a navigation bar with tabs: Physical, Config, Desktop, Programming, and Attributes. The 'Desktop' tab is currently selected. Below the navigation bar is a title bar for a 'Command Prompt' window, which also has tabs for Physical, Config, Desktop, Programming, and Attributes, mirroring the main interface. The main area of the window contains command-line output from a terminal session. The user has run three 'ping' commands: one to 192.168.10.70 and two to 192.168.10.11. Each ping command shows four successful replies with low latency (less than 1ms) and TTL values of 127 or 128. The statistics for each ping show 0% loss and average round-trip times of 5ms or 0ms.

```
C:\>ping 192.168.10.70

Pinging 192.168.10.70 with 32 bytes of data:

Reply from 192.168.10.70: bytes=32 time<1ms TTL=127
Reply from 192.168.10.70: bytes=32 time=10ms TTL=127
Reply from 192.168.10.70: bytes=32 time=1ms TTL=127
Reply from 192.168.10.70: bytes=32 time=11ms TTL=127

Ping statistics for 192.168.10.70:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 11ms, Average = 5ms

C:\>ping 192.168.10.11

Pinging 192.168.10.11 with 32 bytes of data:

Reply from 192.168.10.11: bytes=32 time<1ms TTL=128
Reply from 192.168.10.11: bytes=32 time=1ms TTL=128
Reply from 192.168.10.11: bytes=32 time<1ms TTL=128
Reply from 192.168.10.11: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.10.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.10.11

Pinging 192.168.10.11 with 32 bytes of data:

Reply from 192.168.10.11: bytes=32 time<1ms TTL=128
```

8. Conclusion

This project demonstrates the ability to design, configure, and validate a small enterprise network using Cisco technologies.

It highlights a solid understanding of **network fundamentals**, **VLAN segmentation**, and **routing concepts**, in line with **Cisco CCNA standards**.

This project serves as a practical example of entry-level network engineering skills and readiness for real-world networking environments.
