



University of
Bedfordshire

BSc (Hons) Computer Networks

Advanced Networking - CIS005-3

Assignment 1 – Individual Report

Course Instructor: Mr Vibhavi Attigala

Student Name: V. Gurunivasan

Student ID: 2526303

ABSTRACT

The project is about designing and implementing a network solution which is suitable for Crescent Studios, an animation and production company for movies. The main challenge here was to provide an infrastructure that supports bandwidth-intensive applications, such as 4K video editing, CGI editing and 3D rendering, while also enforcing tight security between departments.

I have applied the concept of a segmented network architecture through the application of VLANs to logically separate the two major groups: Technical and Operations. To manage the traffic flow, I applied well-configured Access Control Lists. This ensures animators have unrestricted access, which they need for collaboration, while other departments operate in controlled environments. The network also sports a secure wireless setup with six strategically placed access points, each using WPA2 encryption. Testing shows that the system meets all operational requirements by supporting high-speed data transfer for creative work and preventing unauthorized cross-departmental access effectively.

TABLE OF CONTENTS

01. INTRODUCTION AND NETWORK DESIGN	4
1.1 Introduction	4
1.2 Network Design and Architecture	4
1.3 IP Addressing Scheme	5
02. METHODOLOGY AND RESULTS	7
2.1 VLAN Configurations	7
2.2 Trunk Port Configurations	8
2.3 DHCP Configurations	9
2.4 Wireless Access Points Implementation	11
2.5 Network Controller Setup	13
2.6 ACL Configuration	15
2.7 EIGRP Configurations	16
2.8 Connectivity Testing and Results	17
03. DISCUSSION AND CONCLUSIONS	19
3.1 The Network Design	19
3.2 VLAN Segmentation Strategy	20
3.3 IP Addressing Reasoning	20
3.4 How Does Packet Tracer Limitations Affect Wireless Implementation?	20
3.5 Why Use Serial Connections Between the Branches?	20
3.6 What Alternative Technologies Were Considered but Rejected?	20
3.7 How does this design address operational challenges?	21
04. REFERENCES	21
05. APPENDICES	22

TABLE OF FIGURES

Figure 1_MainRouterRouting_ColomboBranch	6
Figure 2_Routing On Kandy Branch	6
Figure 3_VLAN Configurations.....	7
Figure 4_Trunk Configuration On Multilayer Switch.....	8
Figure 5_Trunk Configuration on Technical Department Switch	8
Figure 6_DHCP Configuration on Technical Department Router.....	9
Figure 7_DHCP Configuration on Operations Department Router	9
Figure 8_DHCP Successful.....	10
Figure 9_Technical Department APs for each type of user	11
Figure 10_AP on Operations Department for each user	11
Figure 11_Setting Up SSIDs and WPA2-PSK for the Technical Department.....	12
Figure 12_Setting Up the Network Controller	13
Figure 13_Network Controller Discoveries	14
Figure 14_ACL Configuration on Technical Router	15
Figure 15_ACL Configuration on Core Switch	15
Figure 16_ACL on Operation Router	16
Figure 17_EIGRP Topology Taken From the Main Branch Router.....	16
Figure 18_Ping tests from a device in VLAN 10	18
Figure 19_Ping test from a device in VLAN 20.....	18
Figure 20_Ping Test from a Device in VLAN 30	19
Figure 21_Testing Connectivity from Router in Colombo Branch to Router in Kandy Branch.....	19
Figure 22_Colombo Main Router Running Config.....	22
Figure 23 Multilayer Switch Running Configurations	23
Figure 24_Technical Department Router Running Configurations	24
Figure 25_Operations Department Router Running Configuration.....	25
Figure 26_Kandy Branch Office Core Router Running Configurations.....	26

LIST OF TABLES

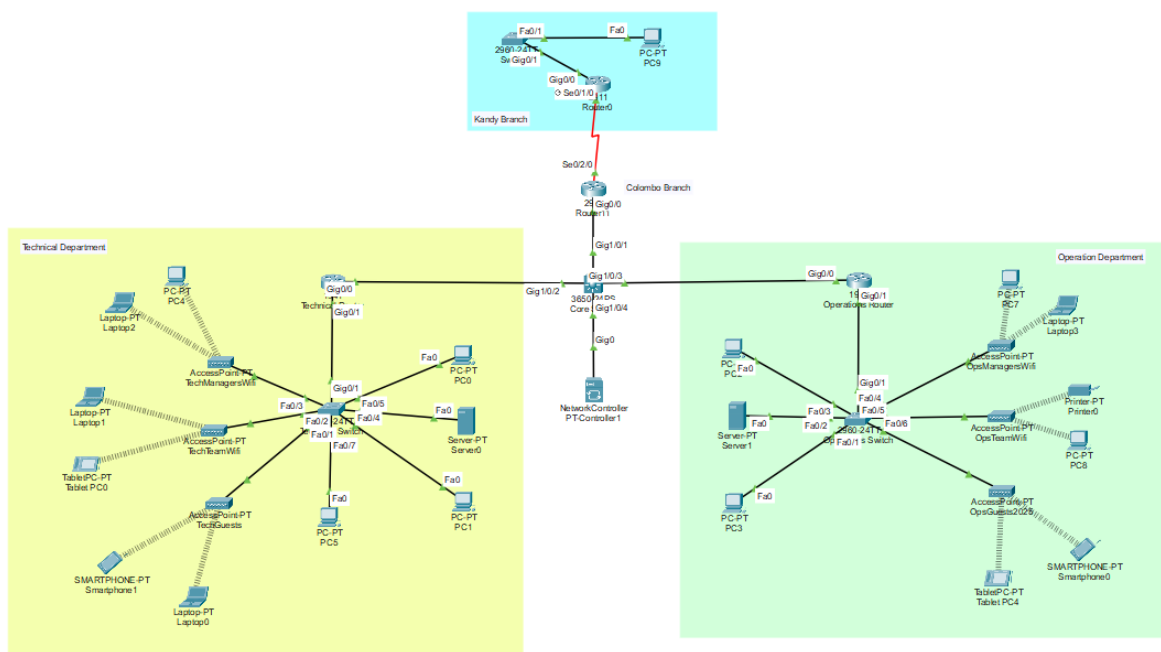
Table 1_Colombo Office VLAN Subnets and IP Addressing Scheme	5
Table 2_Connection Between Colombo Branch (Main Router) and Kandy Branch (Branch Router)	5
Table 3_Branch Office Scheme_Kandy Branch	5
Table 4_Allowed and Denied Communications Between the Networks and Justification	17

01. INTRODUCTION AND NETWORK DESIGN

1.1 Introduction

This report describes a proposed network design for Crescent Studios, a mid-sized creative company specializing in CGI, animation, video editing, and client operations. The organization consists of 2 branches (Kandy and Colombo) and two major departments on 2 floors on one branch (Technical and Operations) with different performance and security requirements for each. Due to increased workloads, collaborative projects, and client meetings, it's important that Crescent Studios be fitted with a modern, secure, and scalable network infrastructure design. The objective of this proposed network is to provide a high-performance office environment with advanced VLAN segmentation, inter-VLAN routing, secure switching technologies, and structured IP addressing. Primary considerations in the design include security, wireless connectivity, and easy expansion.

1.2 Network Design and Architecture



1.3 IP Addressing Scheme

Host / VLAN	Subnet	Network Address	Broadcast Address	1st Usable	Last Usable	Subnet Mask
Tech Managers - VLAN 10	192.168.1.0/24	192.168.1.0	192.168.1.255	192.168.1.1	192.168.1.254	255.255.255.0
Tech Team -VLAN 20	192.168.2.0/24	192.168.2.0	192.168.2.255	192.168.2.1	192.168.2.254	255.255.255.0
Tech Guests - VLAN 30	192.168.3.0/24	192.168.3.0	192.168.3.255	192.168.3.1	192.168.3.254	255.255.255.0
Operation Managers -VLAN 40	192.168.4.0/24	192.168.4.0	192.168.4.255	192.168.4.1	192.168.4.254	255.255.255.0
Operation Team - VLAN 50	192.168.5.0/24	192.168.5.0	192.168.5.255	192.168.5.1	192.168.5.254	255.255.255.0
Operation Guests - VLAN 60	192.168.6.0/24	192.168.6.0	192.168.6.255	192.168.6.1	192.168.6.254	255.255.255.0
Infrastructure-VLAN 99	192.168.99.0/24	192.168.99.0	192.168.99.255	192.168.99.1	192.168.99.254	255.255.255.0

Table 1_Colombo Office VLAN Subnets and IP Addressing Scheme

Link	Subnet	Network Address	Broadcast Address	1st Usable	Last Usable	Branch / Details
Main Router <=> Branch Router	10.0.0.0/30	10.0.0.0	10.0.0.3	10.0.0.1	10.0.0.2	Main Branch to Kandy Branch
Core Router	10.0.0.1/30	10.0.0.1	10.0.0.3	10.0.0.1	10.0.0.1	Main Router Interface
Branch Router	10.0.0.2/30	10.0.0.2	10.0.0.3	10.0.0.2	10.0.0.2	Kandy Branch Router Interface

Table 2_Connection Between Colombo Branch (Main Router) and Kandy Branch (Branch Router)

Host / LAN	Subnet	Network Address	Broadcast Address	1st Usable	Last Usable	Branch
Branch Router LAN	192.168.200.0/24	192.168.200.0	192.168.200.255	192.168.200.1	192.168.200.254	Kandy Branch

Table 3_Branch Office Scheme_Kandy Branch

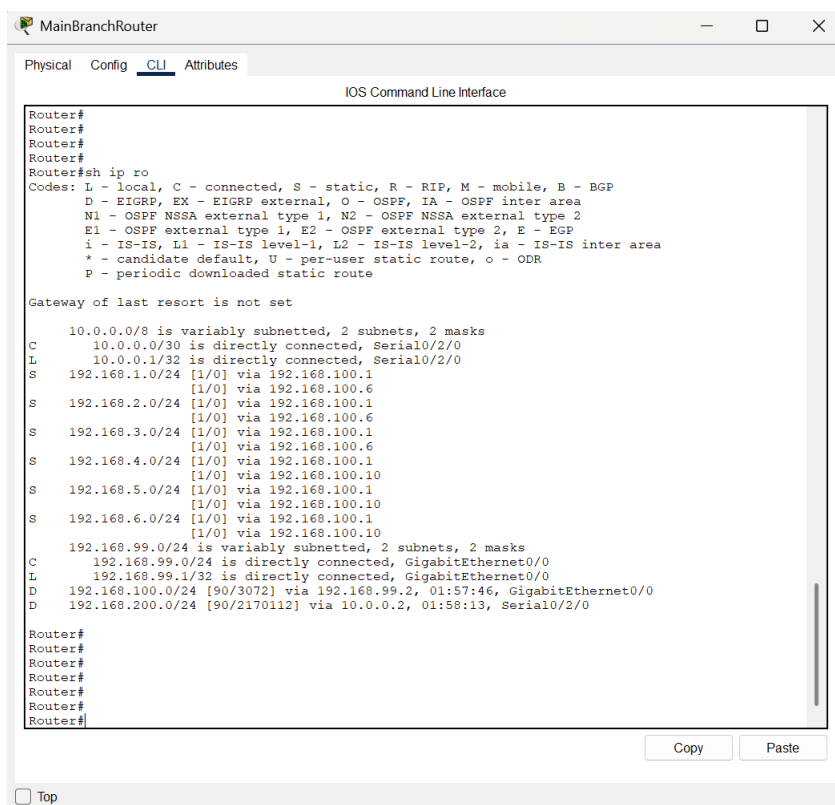


Figure 1_MainRouterRouting_ColomboBranch

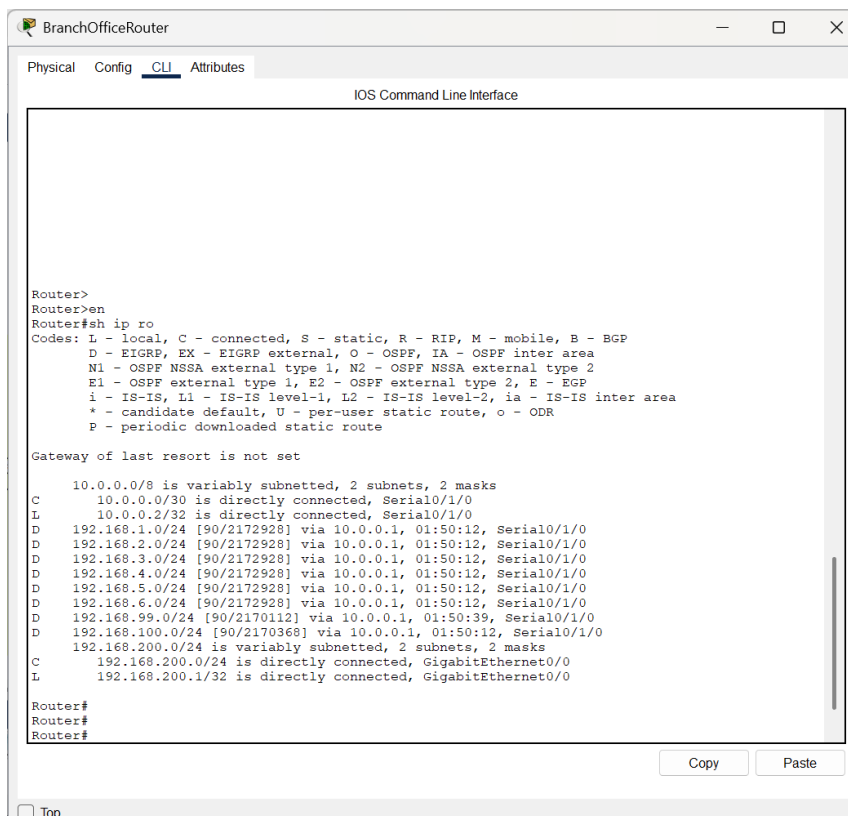


Figure 2_Routing On Kandy Branch

02. METHODOLOGY AND RESULTS

2.1 VLAN Configurations

The screenshot displays the 'Core Switch' configuration window, specifically the 'Config' tab. The left sidebar shows a navigation tree with categories: GLOBAL (Settings, Algorithm Settings), ROUTING (Static, RIP), SWITCHING (VLAN Database), and INTERFACE (GigabitEthernet1/0/1 through 1/16). The 'VLAN Database' is selected, showing a table of VLANs.

VLAN No	VLAN Name
1	default
10	Tech-Managers
20	Tech-Team
30	Tech-Guests
40	Ops-Managers
50	Ops-Team
60	Ops-Guests
99	Infrastructure
1002	fddi-default
1003	token-ring-default
1004	fddinet-default
1005	trnet-default

At the top of the VLAN Database, there is a 'VLAN Configuration' section with fields for 'VLAN Number' (99) and 'VLAN Name' (Infrastructure), and buttons for 'Add' and 'Remove'.

Below the VLAN Database, the 'Equivalent IOS Commands' section shows the following commands:

```
Switch(config-vlan)#vlan 50
Switch(config-vlan)# name Ops-Team
Switch(config-vlan)#vlan 50
Switch(config-vlan)# name Ops-Guests
Switch(config-vlan)#vlan 60
Switch(config-vlan)# name Ops-Team
Switch(config-vlan)#vlan 60
Switch(config-vlan)# name Ops-Guests
Switch(config-vlan)#vlan 99
Switch(config-vlan)# name Infrastructure
Switch(config-vlan)#
```

A 'Top' button is located at the bottom left of the interface.

Figure 3_VLAN Configurations

2.2 Trunk Port Configurations

```
Switch>
Switch>en
Switch#
Switch#show interfaces trunk
Port      Mode           Encapsulation  Status        Native vlan
Gig1/0/1   on             802.1q         trunking      99

Port      Vlans allowed on trunk
Gig1/0/1   10,20,30,40,50,60,99

Port      Vlans allowed and active in management domain
Gig1/0/1   10,20,30,40,50,60,99

Port      Vlans in spanning tree forwarding state and not pruned
Gig1/0/1   10,20,30,40,50,60,99

Switch#
```

Figure 4_ Trunk Configuration On Multilayer Switch

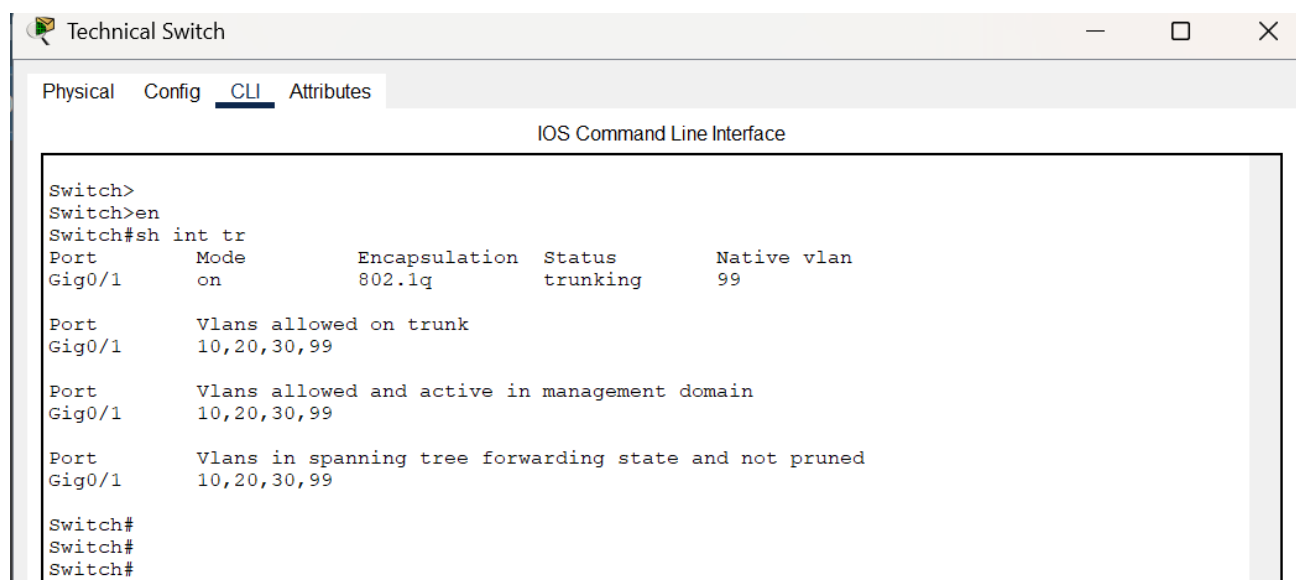
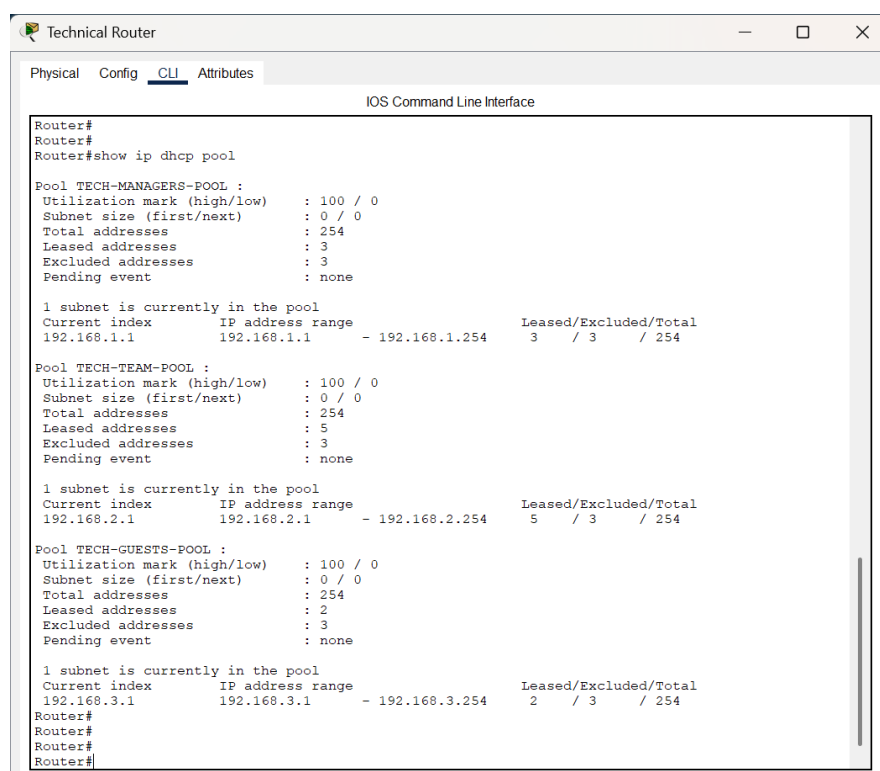


Figure 5_ Trunk Configuration on Technical Department Switch

2.3 DHCP Configurations



Technical Router

Physical Config CLI Attributes

IOS Command Line Interface

```
Router#
Router#
Router#show ip dhcp pool

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

  1 subnet is currently in the pool
  Current index IP address range Leased/Excluded/Total
  192.168.1.1 192.168.1.1 - 192.168.1.254 3 / 3 / 254

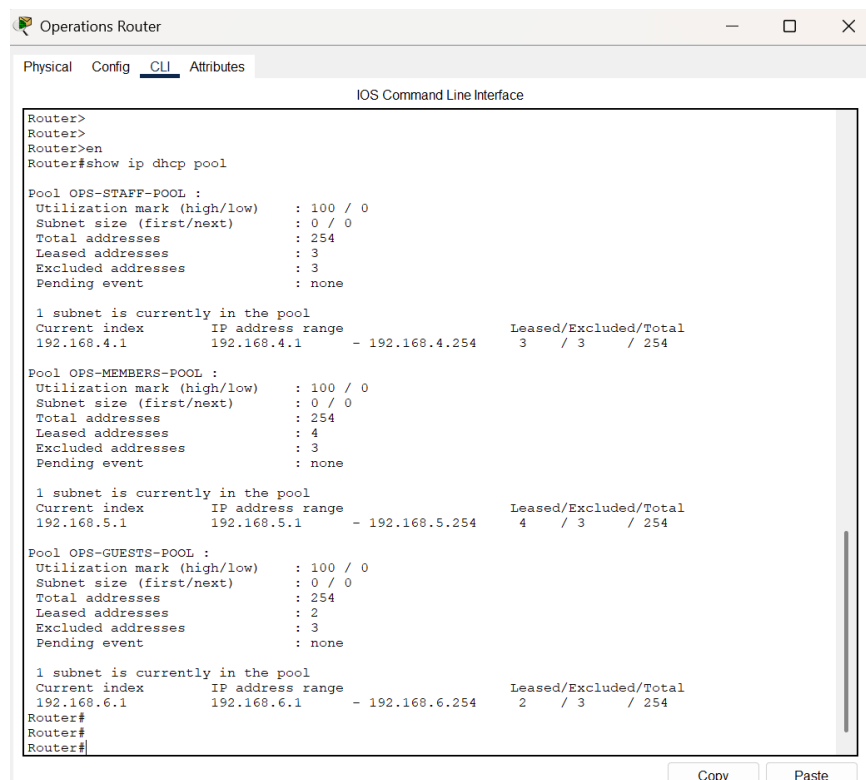
Pool TECH-TEAM-POOL :
  Utilization mark (high/low) : 100 / 0
  Subnet size (first/next) : 0 / 0
  Total addresses : 254
  Leased addresses : 5
  Excluded addresses : 3
  Pending event : none

  1 subnet is currently in the pool
  Current index IP address range Leased/Excluded/Total
  192.168.2.1 192.168.2.1 - 192.168.2.254 5 / 3 / 254

Pool TECH-GUESTS-POOL :
  Utilization mark (high/low) : 100 / 0
  Subnet size (first/next) : 0 / 0
  Total addresses : 254
  Leased addresses : 2
  Excluded addresses : 3
  Pending event : none

  1 subnet is currently in the pool
  Current index IP address range Leased/Excluded/Total
  192.168.3.1 192.168.3.1 - 192.168.3.254 2 / 3 / 254
Router#
Router#
Router#
Router#
```

Figure 6_DHCP Configuration on Technical Department Router



Operations Router

Physical Config CLI Attributes

IOS Command Line Interface

```
Router>
Router>
Router>en
Router#show ip dhcp pool

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

  1 subnet is currently in the pool
  Current index IP address range Leased/Excluded/Total
  192.168.4.1 192.168.4.1 - 192.168.4.254 3 / 3 / 254

Pool OPS-MEMBERS-POOL :
  Utilization mark (high/low) : 100 / 0
  Subnet size (first/next) : 0 / 0
  Total addresses : 254
  Leased addresses : 4
  Excluded addresses : 3
  Pending event : none

  1 subnet is currently in the pool
  Current index IP address range Leased/Excluded/Total
  192.168.5.1 192.168.5.1 - 192.168.5.254 4 / 3 / 254

Pool OPS-GUESTS-POOL :
  Utilization mark (high/low) : 100 / 0
  Subnet size (first/next) : 0 / 0
  Total addresses : 254
  Leased addresses : 2
  Excluded addresses : 3
  Pending event : none

  1 subnet is currently in the pool
  Current index IP address range Leased/Excluded/Total
  192.168.6.1 192.168.6.1 - 192.168.6.254 2 / 3 / 254
Router#
Router#
Router#
```

Copy Paste

Figure 7_DHCP Configuration on Operations Department Router

PC0

Physical Config **Desktop** Programming Attributes

IP Configuration [X]

Interface FastEthernet0

IP Configuration

☒ DHCP ☐ Static DHCP request successful.

IPv4 Address 192.168.2.26

Subnet Mask 255.255.255.0

Default Gateway 192.168.2.254

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::201:C9FF:FE51:C654

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

Password

Figure 8_ DHCP Successful

2.4 Wireless Access Points Implementation

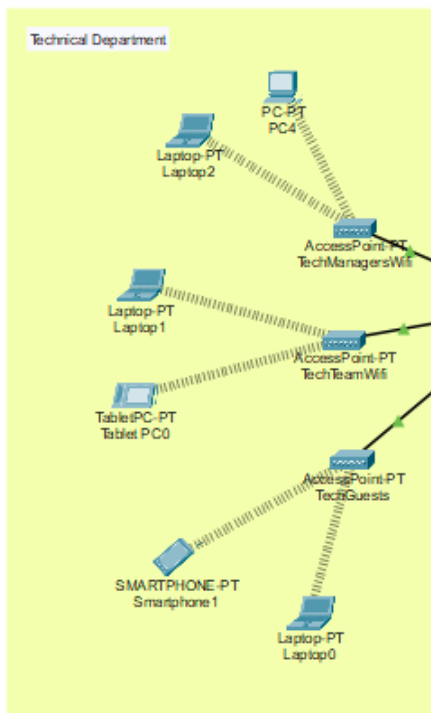


Figure 9_ Technical Department APs for each type of user

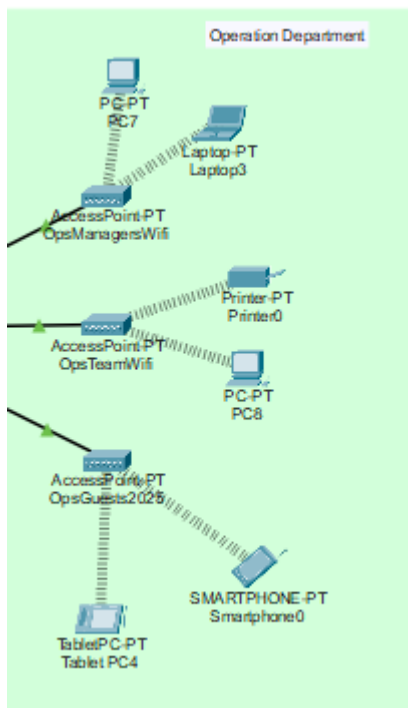


Figure 10_ AP on Operations Department for each user

TechTeamWifi

Physical Config Attributes

GLOBAL

Settings

INTERFACE

Port 0

Port 1

Port 1

Port Status ☒ On

SSID TechTeam2025

2.4 GHz Channel 6

Coverage Range (meters) 140.00

Authentication

☐ Disabled
☐ WEP
☒ WPA2-PSK

WEP Key

PSK Pass Phrase TechTeam2025

User ID

Password

Encryption Type AES

TechManagersWifi

Physical Config Attributes

GLOBAL

Settings

INTERFACE

Port 0

Port 1

Port 1

Port Status ☒ On

SSID ManagersWifi2025

2.4 GHz Channel 6

Coverage Range (meters) 140.00

Authentication

☐ Disabled
☐ WEP
☒ WPA2-PSK

WEP Key

PSK Pass Phrase ManagersWifi2025

User ID

Password

Encryption Type AES

TechGuests

Physical Config Attributes

GLOBAL

Settings

INTERFACE

Port 0

Port 1

Port 1

Port Status ☒ On

SSID Guests12025

2.4 GHz Channel 6

Coverage Range (meters) 140.00

Authentication

☐ Disabled
☐ WEP
☒ WPA2-PSK

WEP Key

PSK Pass Phrase Guests2025

User ID

Password

Encryption Type AES

Figure 11_Setting Up SSIDs and WPA2-PSK for the Technical Department

2.5 Network Controller Setup

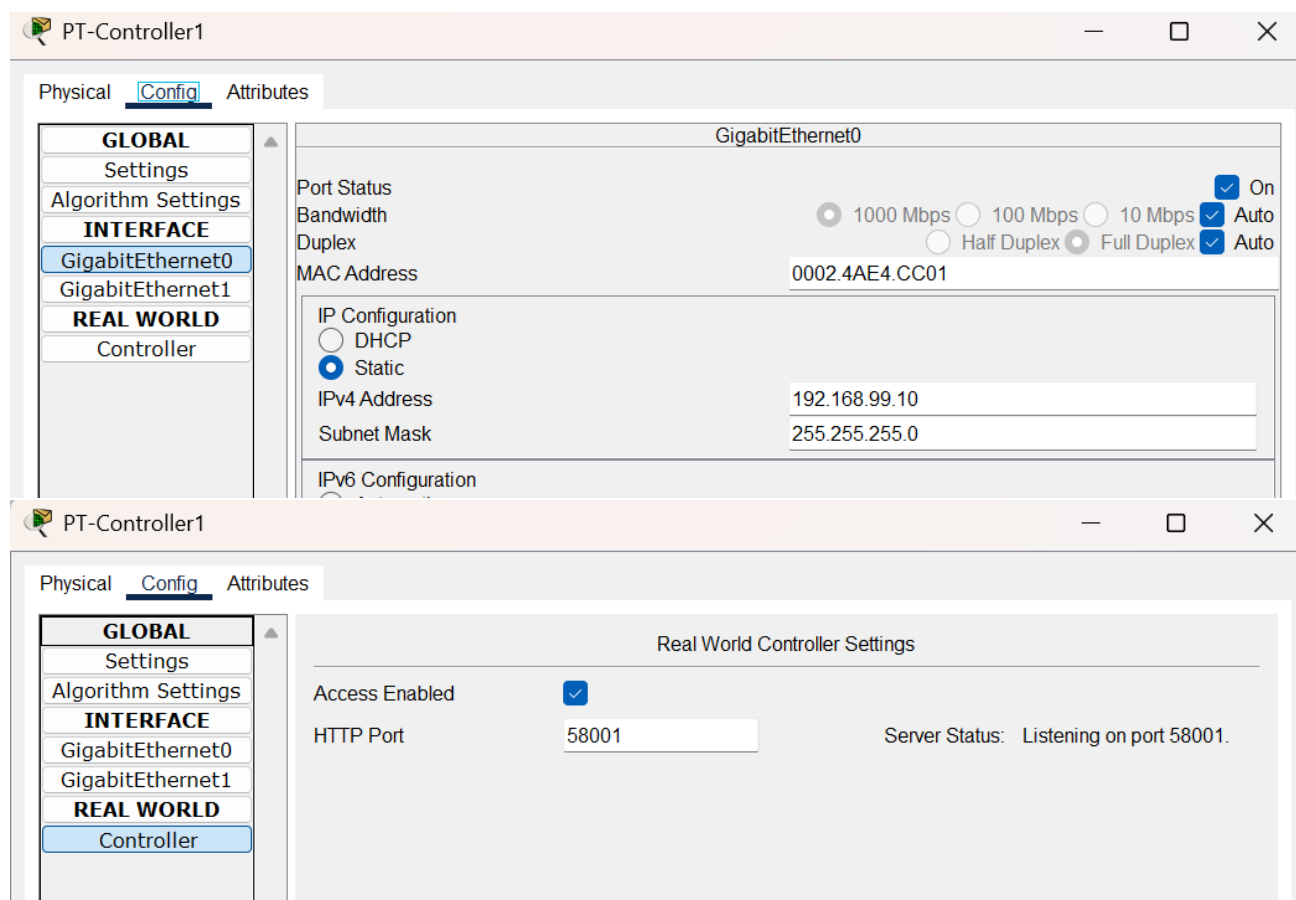


Figure 12_Setting Up the Network Controller

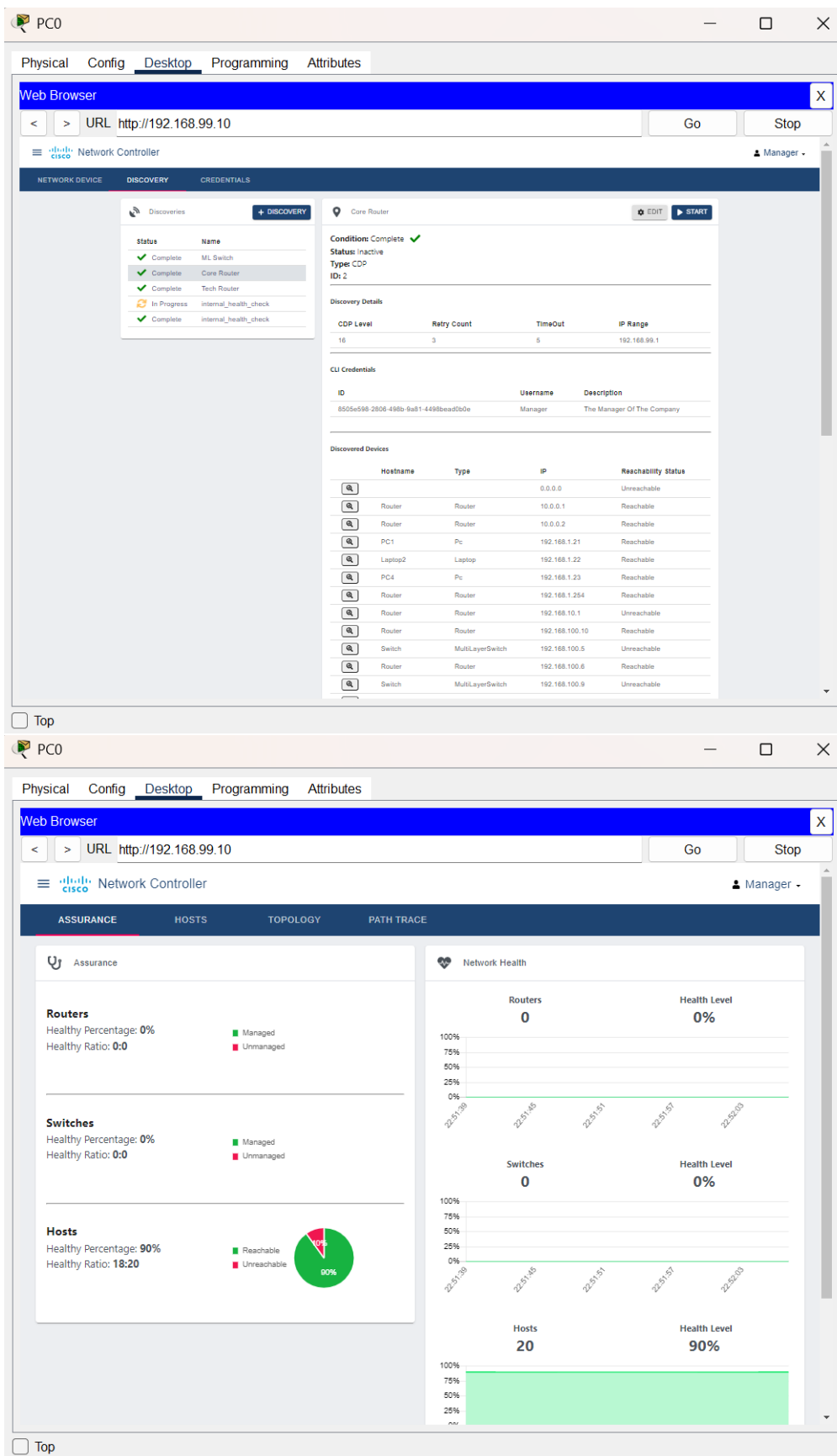
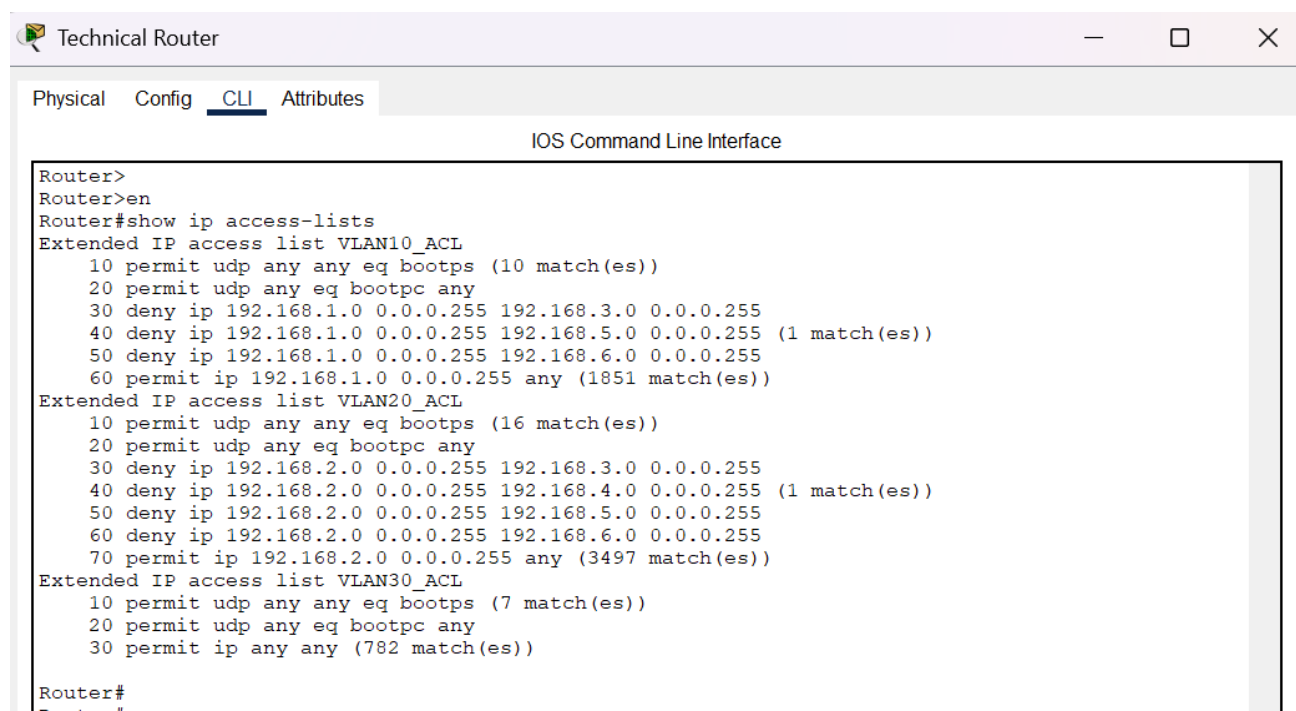


Figure 13_ Network Controller Discoveries

2.6 ACL Configuration

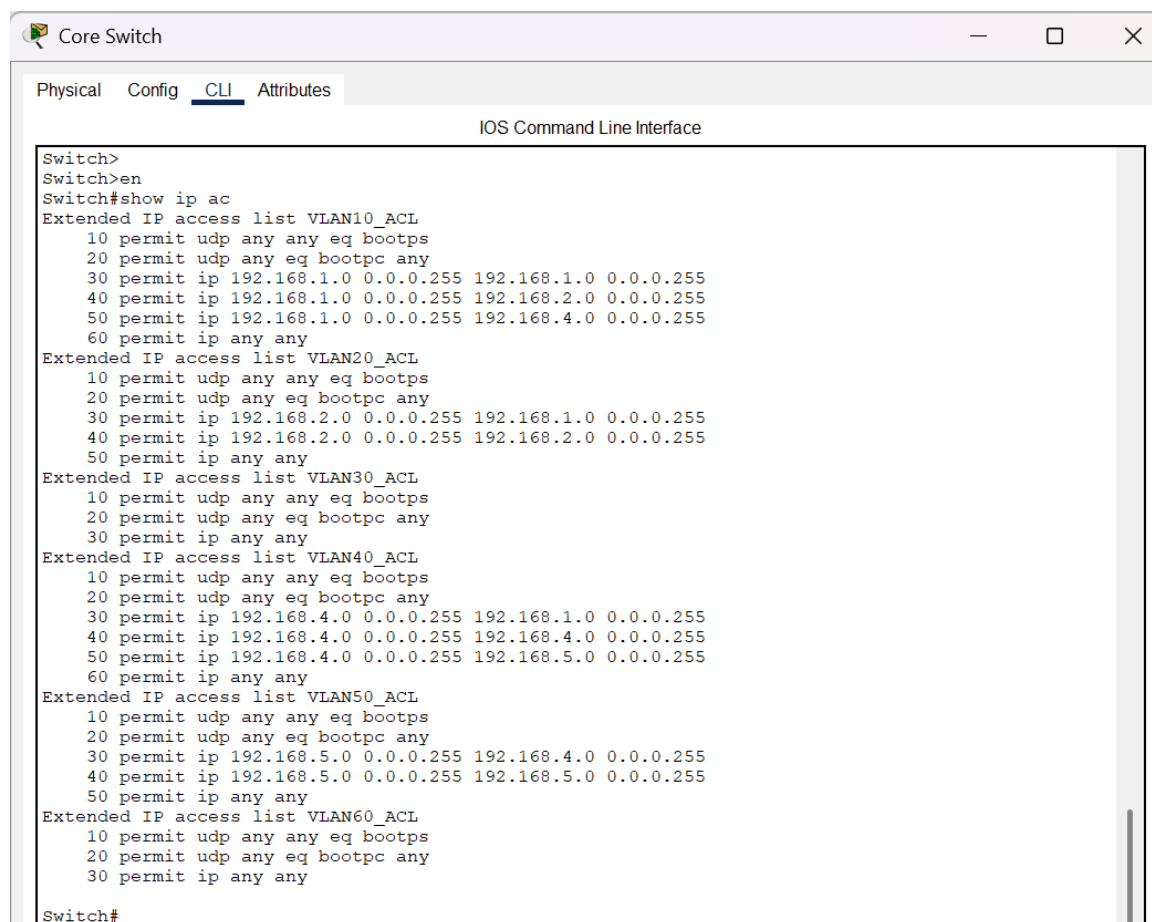


The screenshot shows the CLI of a 'Technical Router'. The 'CLI' tab is selected. The output of the 'show ip access-lists' command is displayed, showing three extended IP access lists: VLAN10_ACL, VLAN20_ACL, and VLAN30_ACL. Each list contains several permit and deny rules for various protocols and IP addresses.

```
Router>
Router>en
Router#show ip access-lists
Extended IP access list VLAN10_ACL
 10 permit udp any any eq bootps (10 match(es))
 20 permit udp any any eq bootpc any
 30 deny ip 192.168.1.0 0.0.0.255 192.168.3.0 0.0.0.255
 40 deny ip 192.168.1.0 0.0.0.255 192.168.5.0 0.0.0.255 (1 match(es))
 50 deny ip 192.168.1.0 0.0.0.255 192.168.6.0 0.0.0.255
 60 permit ip 192.168.1.0 0.0.0.255 any (1851 match(es))
Extended IP access list VLAN20_ACL
 10 permit udp any any eq bootps (16 match(es))
 20 permit udp any any eq bootpc any
 30 deny ip 192.168.2.0 0.0.0.255 192.168.3.0 0.0.0.255
 40 deny ip 192.168.2.0 0.0.0.255 192.168.4.0 0.0.0.255 (1 match(es))
 50 deny ip 192.168.2.0 0.0.0.255 192.168.5.0 0.0.0.255
 60 deny ip 192.168.2.0 0.0.0.255 192.168.6.0 0.0.0.255
 70 permit ip 192.168.2.0 0.0.0.255 any (3497 match(es))
Extended IP access list VLAN30_ACL
 10 permit udp any any eq bootps (7 match(es))
 20 permit udp any any eq bootpc any
 30 permit ip any any (782 match(es))

Router#
Router#
```

Figure 14_ ACL Configuration on Technical Router

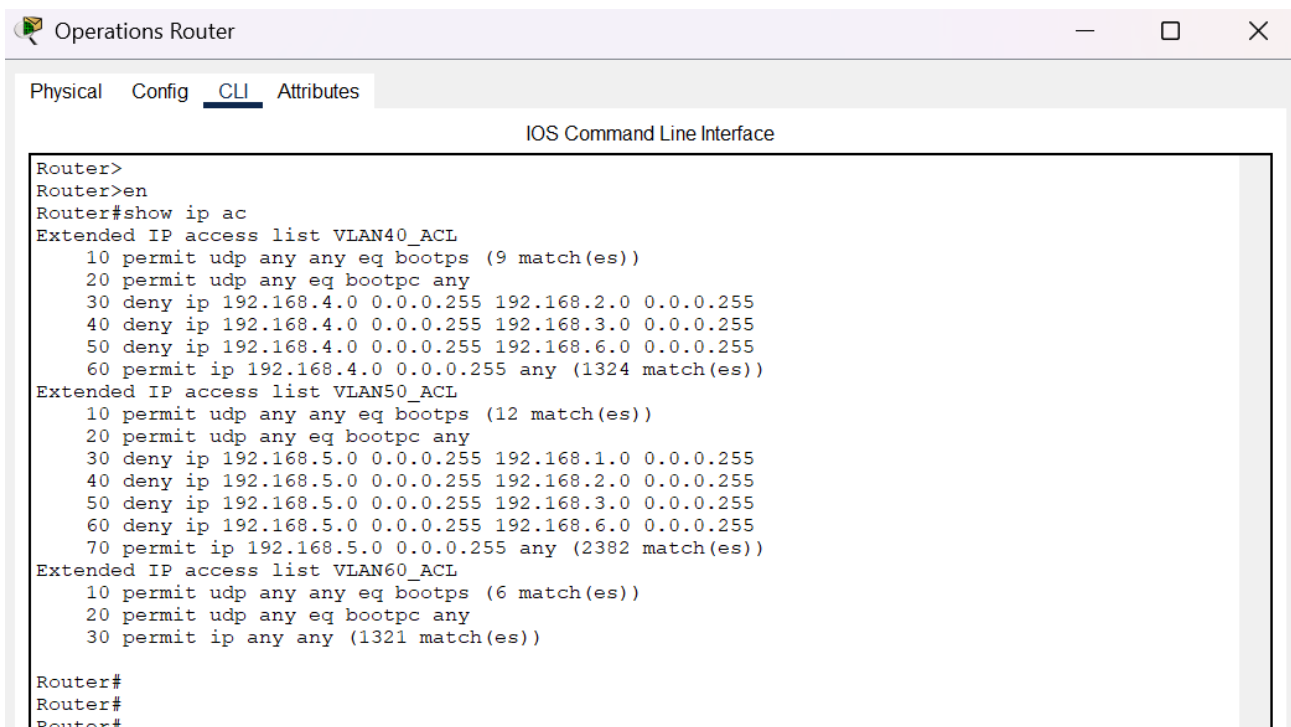


The screenshot shows the CLI of a 'Core Switch'. The 'CLI' tab is selected. The output of the 'show ip access-lists' command is displayed, showing six extended IP access lists: VLAN10_ACL, VLAN20_ACL, VLAN30_ACL, VLAN40_ACL, VLAN50_ACL, and VLAN60_ACL. Each list contains several permit rules for various protocols and IP addresses.

```
Switch>
Switch>en
Switch#show ip ac
Extended IP access list VLAN10_ACL
 10 permit udp any any eq bootps
 20 permit udp any any eq bootpc any
 30 permit ip 192.168.1.0 0.0.0.255 192.168.1.0 0.0.0.255
 40 permit ip 192.168.1.0 0.0.0.255 192.168.2.0 0.0.0.255
 50 permit ip 192.168.1.0 0.0.0.255 192.168.4.0 0.0.0.255
 60 permit ip any any
Extended IP access list VLAN20_ACL
 10 permit udp any any eq bootps
 20 permit udp any any eq bootpc any
 30 permit ip 192.168.2.0 0.0.0.255 192.168.1.0 0.0.0.255
 40 permit ip 192.168.2.0 0.0.0.255 192.168.2.0 0.0.0.255
 50 permit ip any any
Extended IP access list VLAN30_ACL
 10 permit udp any any eq bootps
 20 permit udp any any eq bootpc any
 30 permit ip any any
Extended IP access list VLAN40_ACL
 10 permit udp any any eq bootps
 20 permit udp any any eq bootpc any
 30 permit ip 192.168.4.0 0.0.0.255 192.168.1.0 0.0.0.255
 40 permit ip 192.168.4.0 0.0.0.255 192.168.4.0 0.0.0.255
 50 permit ip 192.168.4.0 0.0.0.255 192.168.5.0 0.0.0.255
 60 permit ip any any
Extended IP access list VLAN50_ACL
 10 permit udp any any eq bootps
 20 permit udp any any eq bootpc any
 30 permit ip 192.168.5.0 0.0.0.255 192.168.4.0 0.0.0.255
 40 permit ip 192.168.5.0 0.0.0.255 192.168.5.0 0.0.0.255
 50 permit ip any any
Extended IP access list VLAN60_ACL
 10 permit udp any any eq bootps
 20 permit udp any any eq bootpc any
 30 permit ip any any

Switch#
```

Figure 15_ ACL Configuration on Core Switch



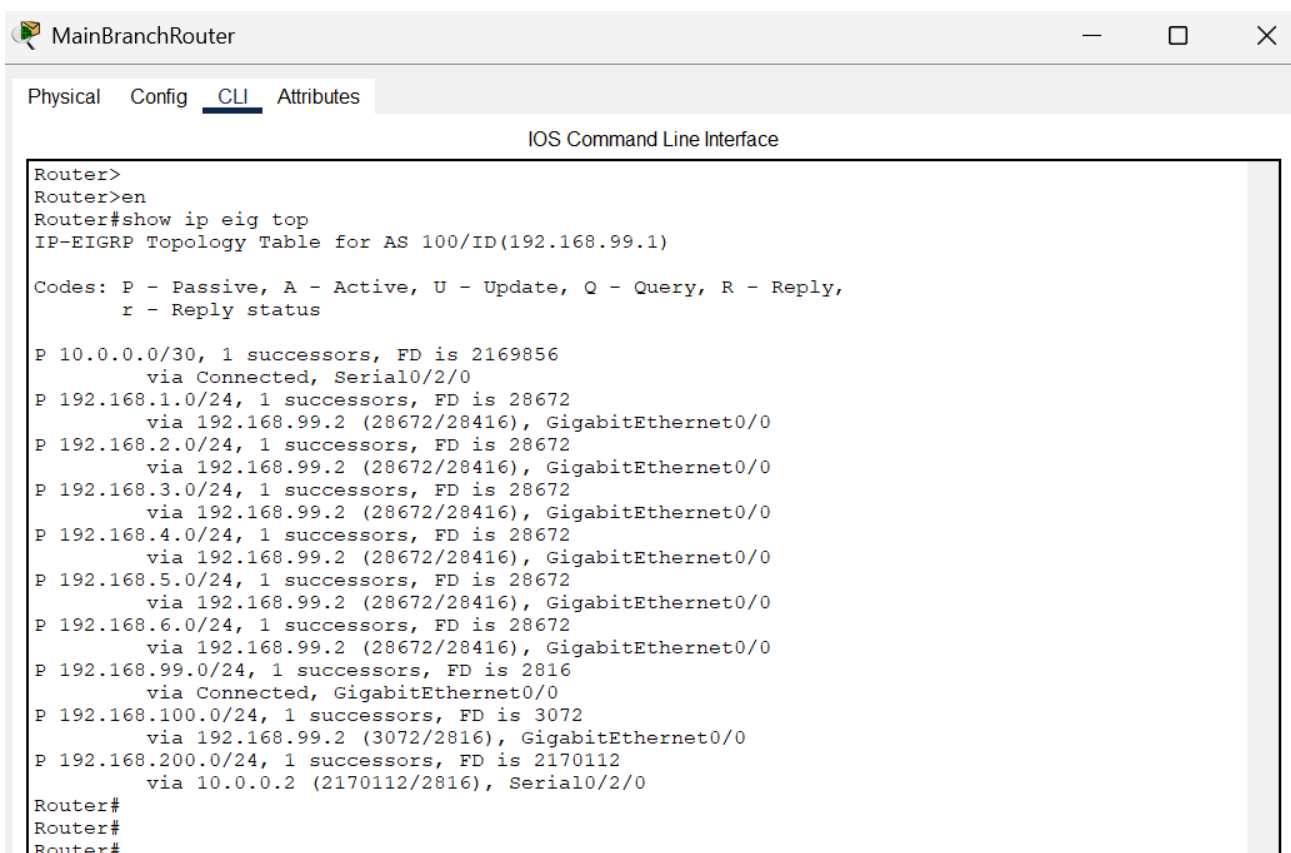
The screenshot shows a terminal window titled "Operations Router" with tabs for Physical, Config, CLI, and Attributes. The CLI tab is active, displaying the IOS Command Line Interface. The user has entered the following commands:

```
Router>
Router>en
Router#show ip ac
Extended IP access list VLAN40_ACL
 10 permit udp any any eq bootps (9 match(es))
 20 permit udp any eq bootpc any
 30 deny ip 192.168.4.0 0.0.0.255 192.168.2.0 0.0.0.255
 40 deny ip 192.168.4.0 0.0.0.255 192.168.3.0 0.0.0.255
 50 deny ip 192.168.4.0 0.0.0.255 192.168.6.0 0.0.0.255
 60 permit ip 192.168.4.0 0.0.0.255 any (1324 match(es))
Extended IP access list VLAN50_ACL
 10 permit udp any any eq bootps (12 match(es))
 20 permit udp any eq bootpc any
 30 deny ip 192.168.5.0 0.0.0.255 192.168.1.0 0.0.0.255
 40 deny ip 192.168.5.0 0.0.0.255 192.168.2.0 0.0.0.255
 50 deny ip 192.168.5.0 0.0.0.255 192.168.3.0 0.0.0.255
 60 deny ip 192.168.5.0 0.0.0.255 192.168.6.0 0.0.0.255
 70 permit ip 192.168.5.0 0.0.0.255 any (2382 match(es))
Extended IP access list VLAN60_ACL
 10 permit udp any any eq bootps (6 match(es))
 20 permit udp any eq bootpc any
 30 permit ip any any (1321 match(es))

Router#
Router#
Router#
```

Figure 16_ ACL on Operation Router

2.7 EIGRP Configurations



The screenshot shows a terminal window titled "MainBranchRouter" with tabs for Physical, Config, CLI, and Attributes. The CLI tab is active, displaying the IOS Command Line Interface. The user has entered the following commands:

```
Router>
Router>en
Router#show ip eig top
IP-EIGRP Topology Table for AS 100/ID(192.168.99.1)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - Reply status

P 10.0.0.0/30, 1 successors, FD is 2169856
   via Connected, Serial0/2/0
P 192.168.1.0/24, 1 successors, FD is 28672
   via 192.168.99.2 (28672/28416), GigabitEthernet0/0
P 192.168.2.0/24, 1 successors, FD is 28672
   via 192.168.99.2 (28672/28416), GigabitEthernet0/0
P 192.168.3.0/24, 1 successors, FD is 28672
   via 192.168.99.2 (28672/28416), GigabitEthernet0/0
P 192.168.4.0/24, 1 successors, FD is 28672
   via 192.168.99.2 (28672/28416), GigabitEthernet0/0
P 192.168.5.0/24, 1 successors, FD is 28672
   via 192.168.99.2 (28672/28416), GigabitEthernet0/0
P 192.168.6.0/24, 1 successors, FD is 28672
   via 192.168.99.2 (28672/28416), GigabitEthernet0/0
P 192.168.99.0/24, 1 successors, FD is 2816
   via Connected, GigabitEthernet0/0
P 192.168.100.0/24, 1 successors, FD is 3072
   via 192.168.99.2 (3072/2816), GigabitEthernet0/0
P 192.168.200.0/24, 1 successors, FD is 2170112
   via 10.0.0.2 (2170112/2816), Serial0/2/0

Router#
Router#
Router#
```

Figure 17_ EIGRP Topology Taken From the Main Branch Router

2.8 Connectivity Testing and Results

VLAN / ACL	ALLOWED COMMUNICATION	DENIED COMMUNICATION	REASON / JUSTIFICATION
VLAN 10 – TECH MANAGERS	VLAN 10, VLAN 20, VLAN 40	VLAN 30, VLAN 50, VLAN 60	Allow full access to team members and Ops management. Block guests and non-related Ops VLANs to maintain internal security.
VLAN 20 – TECH MEMBERS	VLAN 10, VLAN 20	VLAN 30, VLAN 40, VLAN 50, VLAN 60	Allow collaboration within Tech department. Restrict access to other departments and guests.
VLAN 30 – TECH GUESTS / CLIENTS	Internet only	VLAN 10, VLAN 20, VLAN 40, VLAN 50, VLAN 60	Limit guest access to Internet. Prevent internal resource access.
VLAN 40 – OPERATIONS MANAGERS	VLAN 40, VLAN 50, VLAN 10	VLAN 20, VLAN 30, VLAN 60	Allow Ops staff and management to collaborate internally and with Tech managers. Restrict unrelated Tech members and guests.
VLAN 50 – OPERATION MEMBERS (HR/FINANCE)	VLAN 40, VLAN 50	VLAN 10, VLAN 20, VLAN 30, VLAN 60	Allow internal Ops collaboration. Restrict Tech VLANs and guest access.
VLAN 60 – OPERATION GUESTS / CLIENTS	Internet only	VLAN 10, VLAN 20, VLAN 30, VLAN 40, VLAN 50	Limit external clients to Internet. No access to internal systems.
VLAN 99 – INFRASTRUCTURE	All VLANs (10–60)	N/A	Full access for management and IT infrastructure to monitor and maintain all departments.

Table 4_ Allowed and Denied Communications Between the Networks and Justification

PC1

Physical Config Desktop Programming Attributes

Command Prompt

```
C:\>ping 192.168.2.26

Pinging 192.168.2.26 with 32 bytes of data:

Reply from 192.168.2.26: bytes=32 time<1ms TTL=127
Reply from 192.168.2.26: bytes=32 time<1ms TTL=127
Reply from 192.168.2.26: bytes=32 time<1ms TTL=127
Reply from 192.168.2.26: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.2.26:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.4.24

Pinging 192.168.4.24 with 32 bytes of data:

Reply from 192.168.4.24: bytes=32 time<1ms TTL=125
Reply from 192.168.4.24: bytes=32 time<1ms TTL=125
Reply from 192.168.4.24: bytes=32 time<1ms TTL=125
Reply from 192.168.4.24: bytes=32 time<1ms TTL=125

Ping statistics for 192.168.4.24:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.5.22

Pinging 192.168.5.22 with 32 bytes of data:

Reply from 192.168.1.254: Destination host unreachable.
Reply from 192.168.1.254: Destination host unreachable.
Reply from 192.168.1.254: Destination host unreachable.
Reply from 192.168.1.254: Destination host unreachable.

Ping statistics for 192.168.5.22:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.3.22

Pinging 192.168.3.22 with 32 bytes of data:

Reply from 192.168.1.254: Destination host unreachable.
```

☐ Top

Figure 18_Ping tests from a device in VLAN 10

PC0

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.25

Pinging 192.168.1.25 with 32 bytes of data:

Reply from 192.168.1.25: bytes=32 time<1ms TTL=127
Reply from 192.168.1.25: bytes=32 time<1ms TTL=127
Reply from 192.168.1.25: bytes=32 time<1ms TTL=127
Reply from 192.168.1.25: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.1.25:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.3.22

Pinging 192.168.3.22 with 32 bytes of data:

Reply from 192.168.2.254: Destination host unreachable.
Reply from 192.168.2.254: Destination host unreachable.
Reply from 192.168.2.254: Destination host unreachable.
Reply from 192.168.2.254: Destination host unreachable.

Ping statistics for 192.168.3.22:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.4.22

Pinging 192.168.4.22 with 32 bytes of data:

Reply from 192.168.2.254: Destination host unreachable.
Reply from 192.168.2.254: Destination host unreachable.
Reply from 192.168.2.254: Destination host unreachable.
Reply from 192.168.2.254: Destination host unreachable.

Ping statistics for 192.168.4.22:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

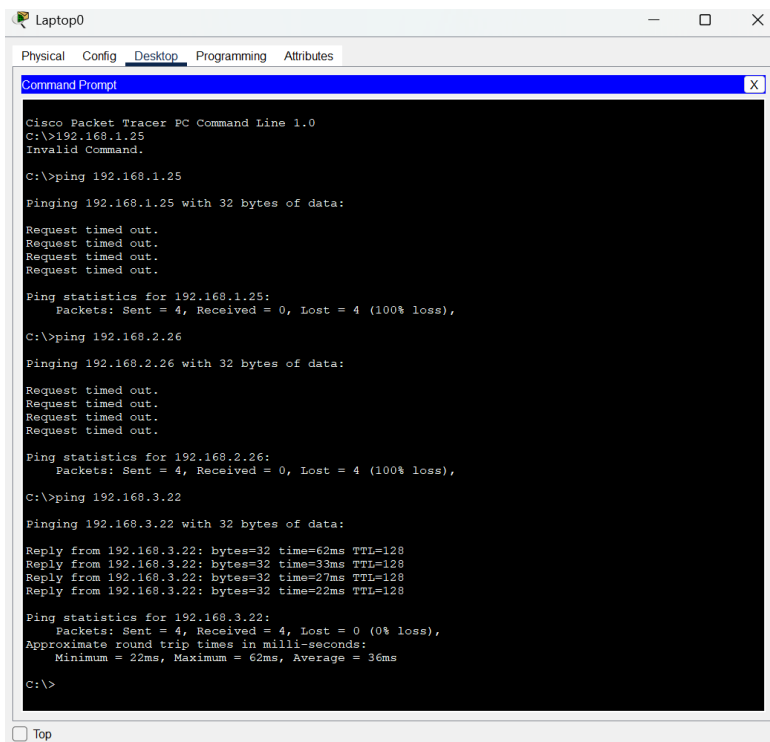
C:\>ping 192.168.5.22

Pinging 192.168.5.22 with 32 bytes of data:

Reply from 192.168.2.254: Destination host unreachable.
```

☐ Top

Figure 19_Ping test from a device in VLAN 20



```
Cisco Packet Tracer PC Command Line 1.0
C:\>192.168.1.25
Invalid Command.

C:\>ping 192.168.1.25

Pinging 192.168.1.25 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.1.25:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.2.26

Pinging 192.168.2.26 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.2.26:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

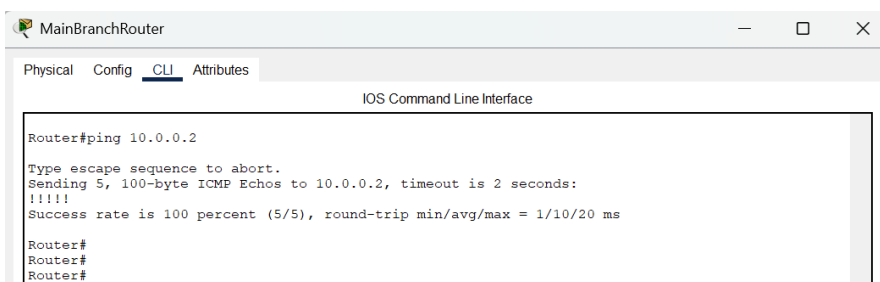
C:\>ping 192.168.3.22

Pinging 192.168.3.22 with 32 bytes of data:
Reply from 192.168.3.22: bytes=32 time=62ms TTL=128
Reply from 192.168.3.22: bytes=32 time=33ms TTL=128
Reply from 192.168.3.22: bytes=32 time=27ms TTL=128
Reply from 192.168.3.22: bytes=32 time=22ms TTL=128

Ping statistics for 192.168.3.22:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 22ms, Maximum = 62ms, Average = 36ms

C:\>
```

Figure 20_Ping Test from a Device in VLAN 30



```
MainBranchRouter
Physical Config CLI Attributes

IOS Command Line Interface

Router#ping 10.0.0.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/10/20 ms

Router#
Router#
Router#
```

Figure 21_ Testing Connectivity from Router in Colombo Branch to Router in Kandy Branch

03. DISCUSSION AND CONCLUSIONS

3.1 The Network Design

The network design used in Crescent Studios was used to address the challenges in media production environments. In contrast to typical office networks, an animation studio needs high performance for huge file transfers, along with strict security for the valuable intellectual property. A clear boundary is maintained among the three layers (core, distribution, and access) to prevent traffic from impacting administrative operations while ensuring defined security zones between creative and business data. This approach ensures that 4K video editing sessions remain smooth even at peak network usage while simultaneously protecting unreleased content through structured segmentation.

3.2 VLAN Segmentation Strategy

The reason why there were 6 VLANs is because it was necessary to not disrupt the workflow of the company. Technical teams of animators and visual effects artists need shared access to rendering clusters and network-attached storage, so they must be grouped across VLANs 10 through 20. At the same time, full isolation of guest networks in VLANs 30 and 60 protects production assets during client reviews and visits. This level of granularity shows how creative organizations in the modern world balance collaboration needs with security requirements.

3.3 IP Addressing Reasoning

The decision to use multiple Class C networks is based on operational efficiency rather than the theoretical optimization of address space. In real IT support environments, this greatly reduces resolution time when troubleshooting network issues because a device's IP address immediately identifies the department and function. This practice is quite common in medium enterprises where operational simplicity weighs stronger than perfect address utilization.

3.4 How Does Packet Tracer Limitations Affect Wireless Implementation?

This wireless design shows large gaps in simulation capabilities compared to real-world deployment. Packet Tracer is unable to represent multi-SSID enterprise access points, which forces us to use different devices for each wireless network. What this means is that our wireless design will show conceptual separation but not reflect the efficiency of the hardware or the advanced features found in actual studio deployments.

3.5 Why Use Serial Connections Between the Branches?

While selecting the serial connections for the branch offices, this shows that there are, in fact, specific real-world scenarios where leased lines make more sense. Even though SD-WAN and MPLS are modern alternatives, serial links-such as T1/E1 circuits-offer bandwidth immune to congestion over the public internet, which is important for transferring high-bandwidth media files between studio locations. Physical isolation from the public networks inherently provides security benefits, and for organizations with predictable inter-site traffic patterns, a leased line often proves more cost-effective than the equivalent managed services. This represents a solution that shows network design must consider the specific business needs rather than automatically choosing the newest technology.

3.6 What Alternative Technologies Were Considered but Rejected?

Several other design approaches were reviewed and discarded in arriving at the final design. OSPF was initially considered instead of EIGRP but proved to have slower convergence times critical for large file transfers. A single network subnetting approach was considered and then discarded in favour of multiple Class C networks for ease of operational management. Cloud-only wireless controllers were considered but more traditional on-premises management was selected for reliability of media transfer scenarios.

3.7 How does this design address operational challenges?

The network architecture explicitly targets weak points of an animation studio, such as bottlenecks in large file transfers, needs for collaborative workflow, and protection of intellectual property. Branch connectivity enables remote collaboration across locations. The security framework protects unreleased content yet permits necessary communication across departments. Each element addresses real operational challenges faced by media production companies rather than just generic best practices for networking.

04. REFERENCES

Cisco Systems (2023) *EIGRP Configuration Guide, Cisco IOS Release 15M&T*. Available at: https://www.cisco.com/c/en/us/td/docs/ios-xml/ios/iproute_eigrp/configuration/15-mt/ire-15-mt-book.html (Accessed: 20 November 2025).

Cisco Systems (2023) *VLAN Configuration Guide, Cisco IOS XE Release 3SE*. Available at: https://www.cisco.com/c/en/us/td/docs/switches/lan/catalyst9500/software/release/16-9/configuration_guide/vlan/b_169_vlan_9500_cg.html (Accessed: 5 November 2025).

Tanenbaum, A. and Wetherall, D. J. (2021) *Computer Networks*. 6th edition. Pearson.

Wi-Fi Alliance (2023) *WPA2 Security for Wireless Networks*. Available at: <https://www.wi-fi.org/discover-wi-fi/security> (Accessed: 15 November 2025).

Cisco Systems (2023) *DHCP Configuration Guide, Cisco IOS Release 15M&T*. Available at: https://www.cisco.com/c/en/us/td/docs/ios-xml/ios/ipaddr_dhcp/configuration/15-mt/dhcp-15-mt-book.html (Accessed: 10 November 2025).

05. APPENDICES

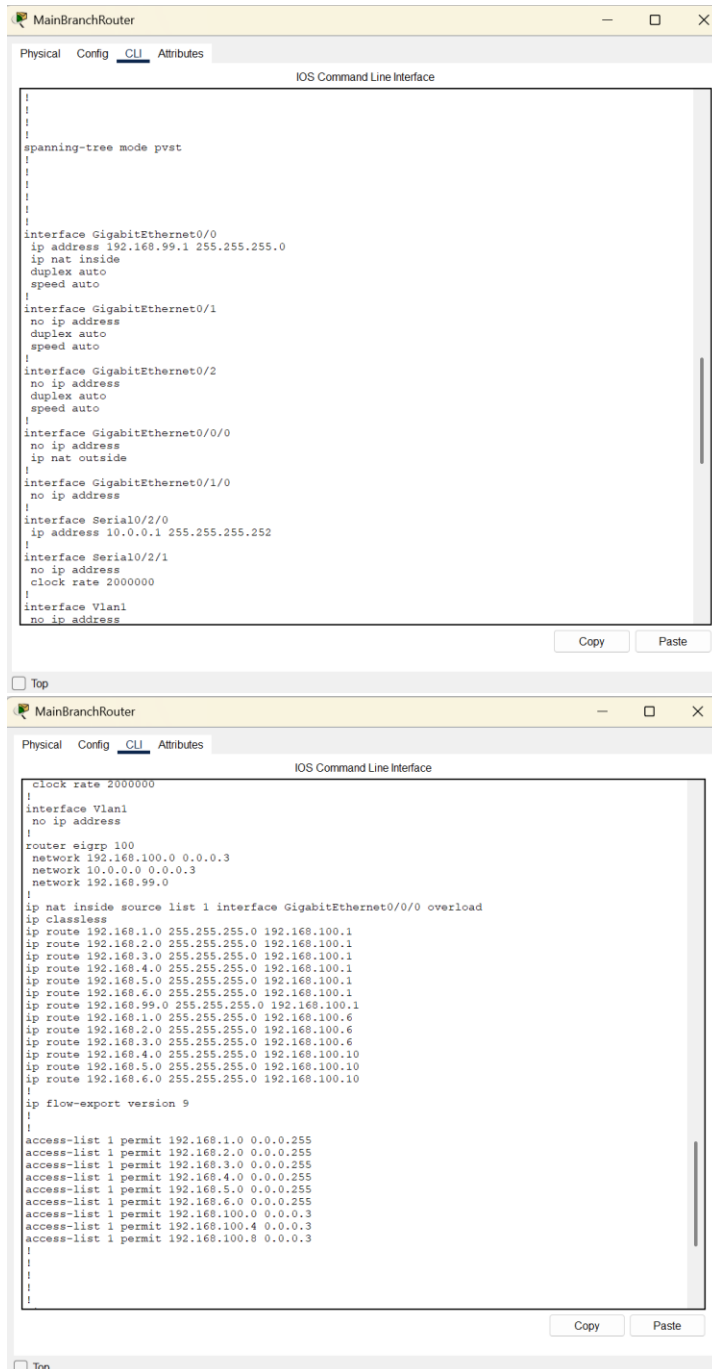


Figure 22_Colombo Main Router Running Config

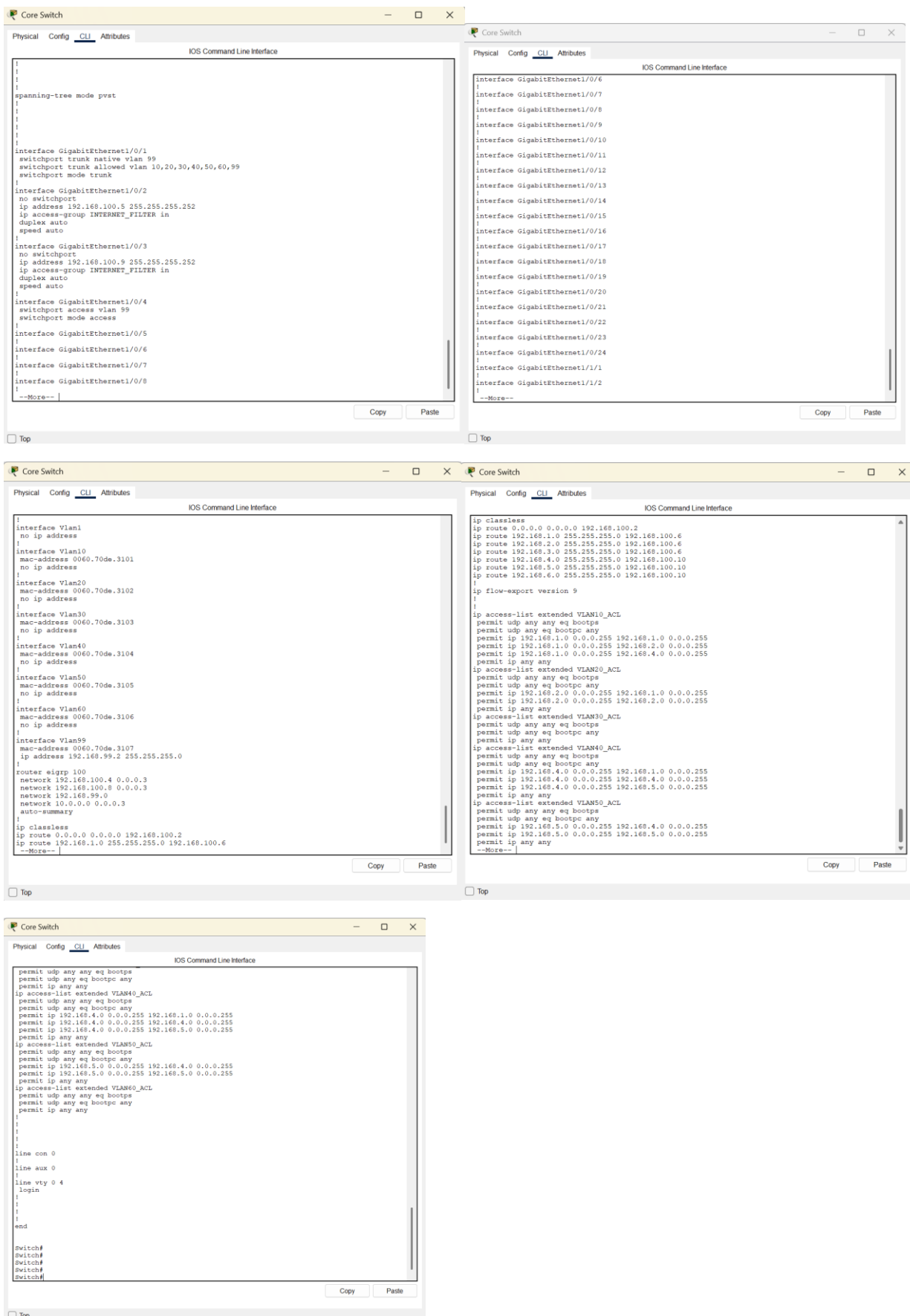


Figure 23 Multilayer Switch Running Configurations

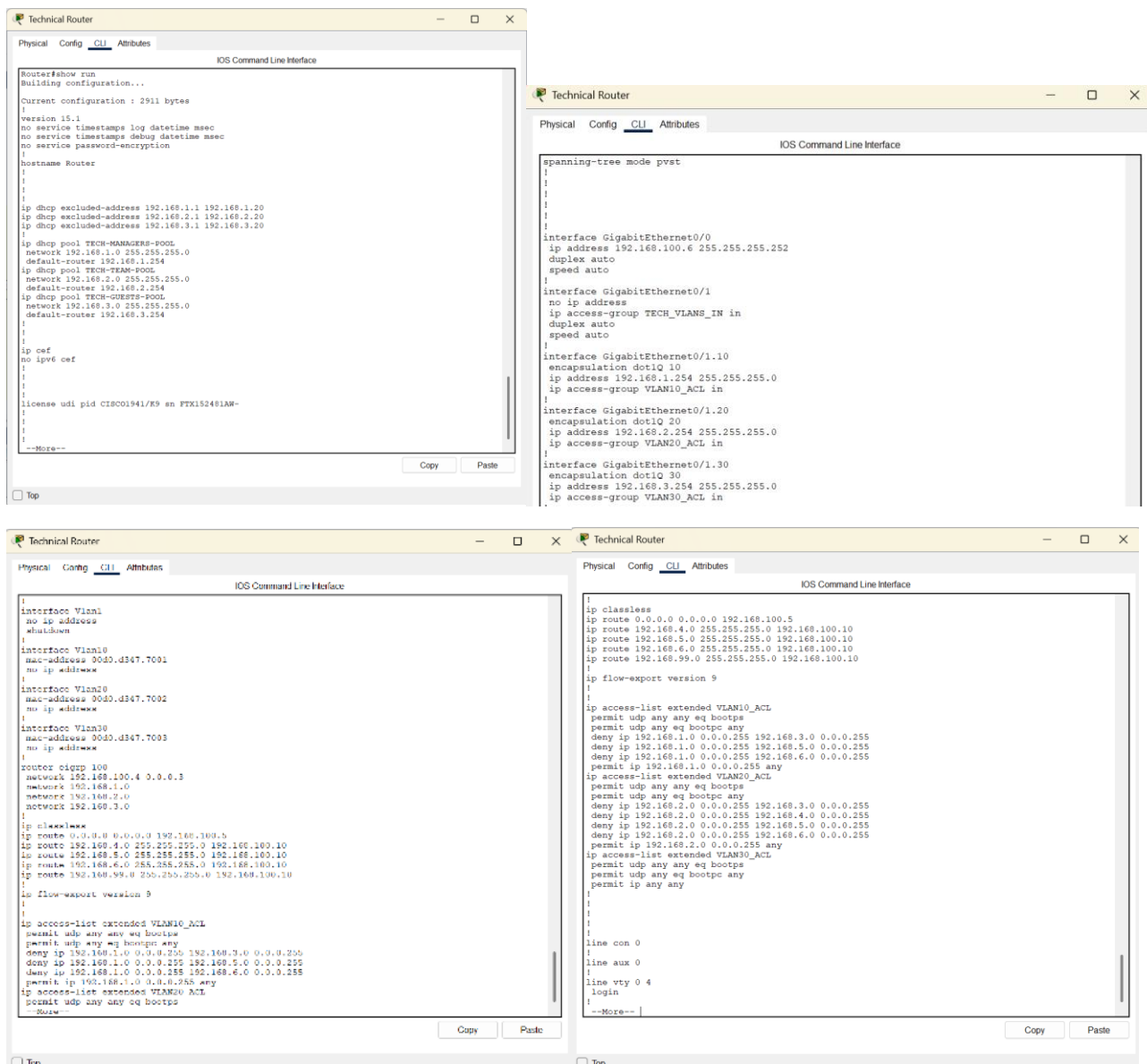


Figure 24_Technical Department Router Running Configurations

