SRM INSTITUTE OF SCIENCE AND TECHNOLOGY
TIRUCHIRAPPALLI CAMPUS

Computer Networks Case Study Report

Network Design for XYZ Company

Summary:

This report presents the Network design for XYZ Company which features a Centralized Network architecture, employing a Single router & Switch, with Segmentation based on Vlan's. The design ensures Improved & stable Network efficiency, Security and Scalability by Isolating departmental traffic and facilitating Inter-departmental Communication via a router. The departments are Admin/IT, Finance, HR, CS/Reception - each have their distinct VLANs and IP Subnets, with their own dedicated devices, including printers, access points and End-user devices Such as Mobiles, Tablets and Laptops.

Network Overview

XYZ Company is structured with four main departments in this Network.

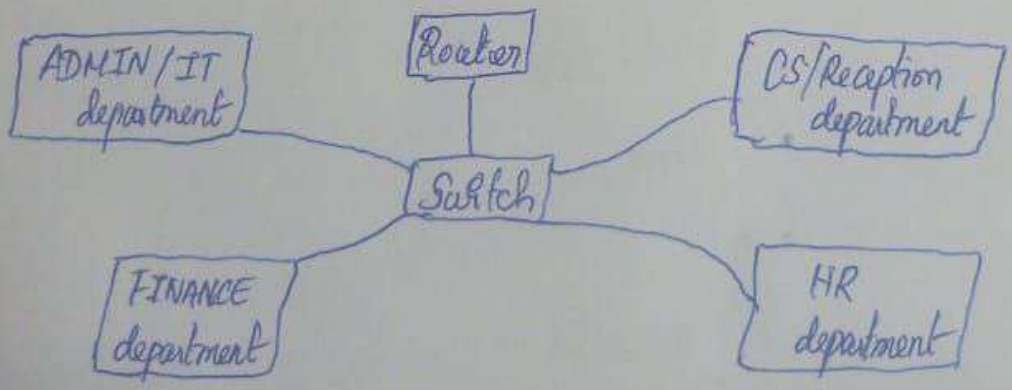
- Admin/IT
- Finance
- HR
- CS/Reception

The Network uses VLANs to Separate traffic between the departments for Security and operational efficiency. The Setup Consists of:

- Single router for Inter-VLAN routing
- Single Switch with VLAN Configuration to Segment traffic.
- Access points for Wireless Connectivity in Each department.
- End-user devices Such as Laptops, Mobiles and Tablets.

Network topology

The Network follows a Star topology, where all departments are Connected to Central Switch. The router Connects to the Switch providing Inter-VLAN routing. Each department has its Own Subnet and VLAN, and Acces points provide wireless Access to devices



VLAN Configuration & IP Addressing

Each department is assigned a unique VLAN and corresponding IP Subnet for proper Segmentation and Management.

Admin / IT

VLAN ID - 10

IP Address - 192.168.0.1/26

IP range - [192.168.0.1 - 192.168.0.62]

Gateway IP - 192.168.0.1

Devices - Two Smartphones.

Finance

VLAN ID - 20

IP Address - 192.168.0.64/26

IP Range - [192.168.064 - 192.168.0.126]

Gateway IP - 192.168.0.65

Devices - Laptop, Smartphone

HR

VLAN ID - 30

IP Address - 192.168.0.128/26

IP Range - [192.168.0.128 - 192.168.0.190]

Gateway IP - 192.168.0.129

Devices - Tablet, Smartphone

CS/Reception

VLAN ID - 40

IP Address - 192.168.0.192/26

IP Range - [192.168.0.192 - 192.168.0.254]

Gateway IP - 192.168.0.193

Devices - Laptop, Tablet.

Router and Switch Configuration

The router is Configured to Support Inter-VLAN Routing, allowing Communication between different VLANs. Each VLAN is assigned an Interface on the router for routing purposes.

Also, Static routing (or) Routing protocols (eg: OSPF) can be used depending on Network requirements for Scalability and future growth.

Switch, Trunk Configuration and Accesspoints

The Switch is Configured to handle VLANs and Seperate traffic from different departments. Each VLAN is Assigned a unique VLAN ID. The Switchport Connecting to the router is Configured as a trunk to allow Multiple VLAN traffic.

Each department has it's own Access point to enable wireless Connectivity for Mobile devices. The APs are Configured to broadcast SSIDs that Corresponds to the department. Each wireless device will obtain an IP address from respective VLAN's DHCP Server.

Security Considerations

VLAN Based

Each department is Isolated on it's respective VLAN to limit Unauthorized Access to Sensitive data.

Access Control Lists

Implement ACL's on the router to Control traffic between VLANs and limit access to Critical resources.

WPA2 (or) WPA3 encryption

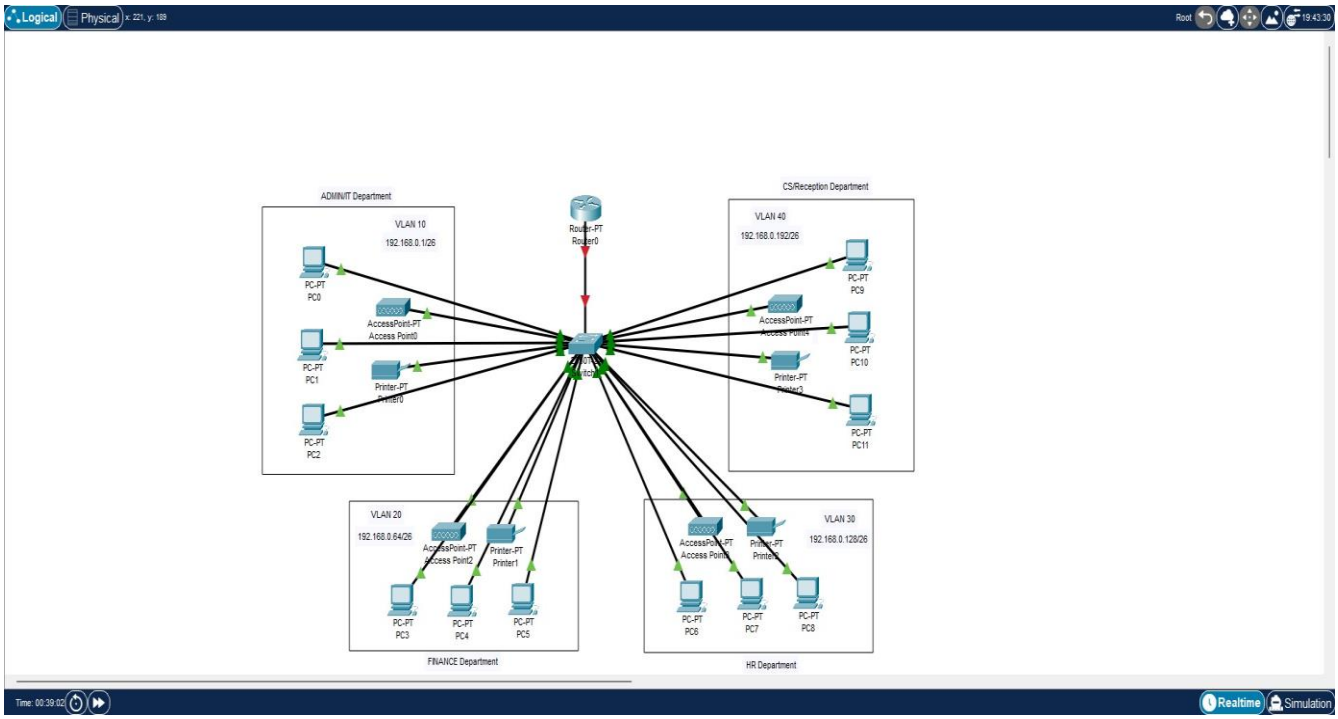
Can be used for wireless devices to ensure Secure Communication Over the airwaves and also Regular Monitoring of Network devices and traffic to detect anomalies and ensure network Security.

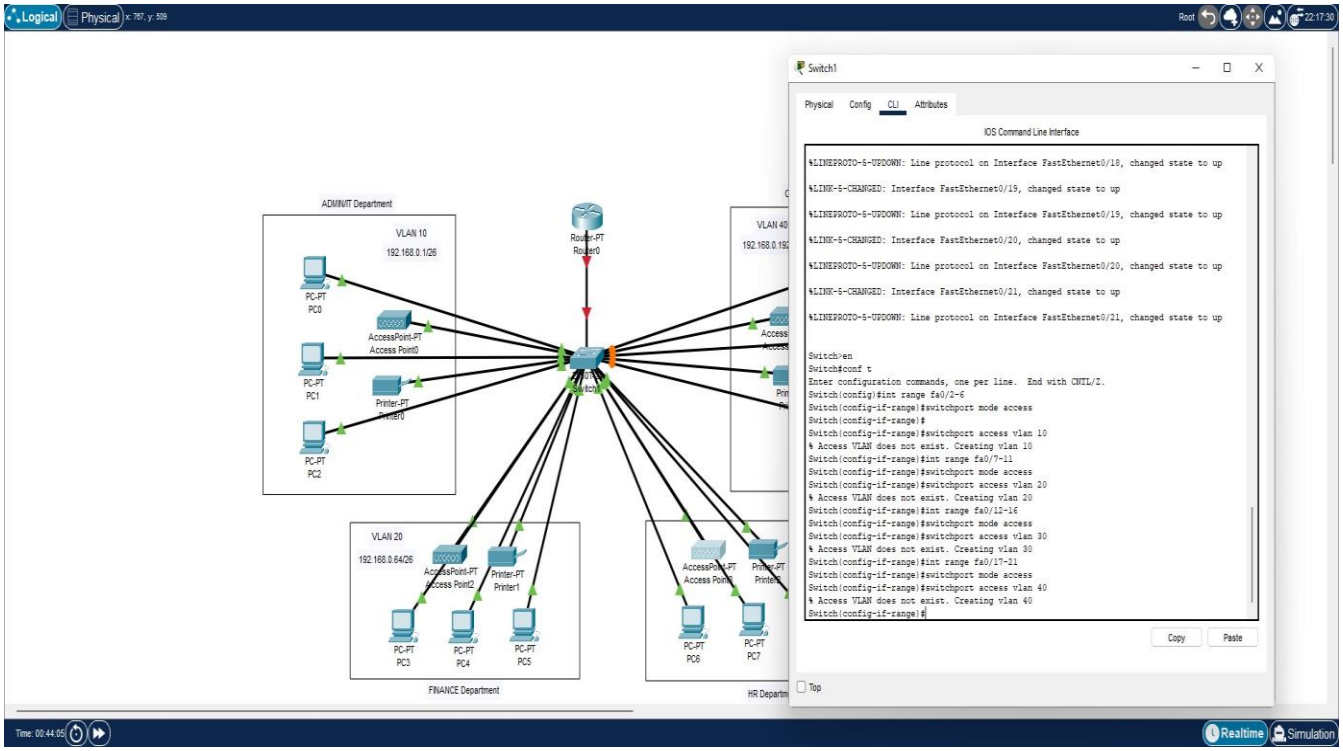
Conclusion

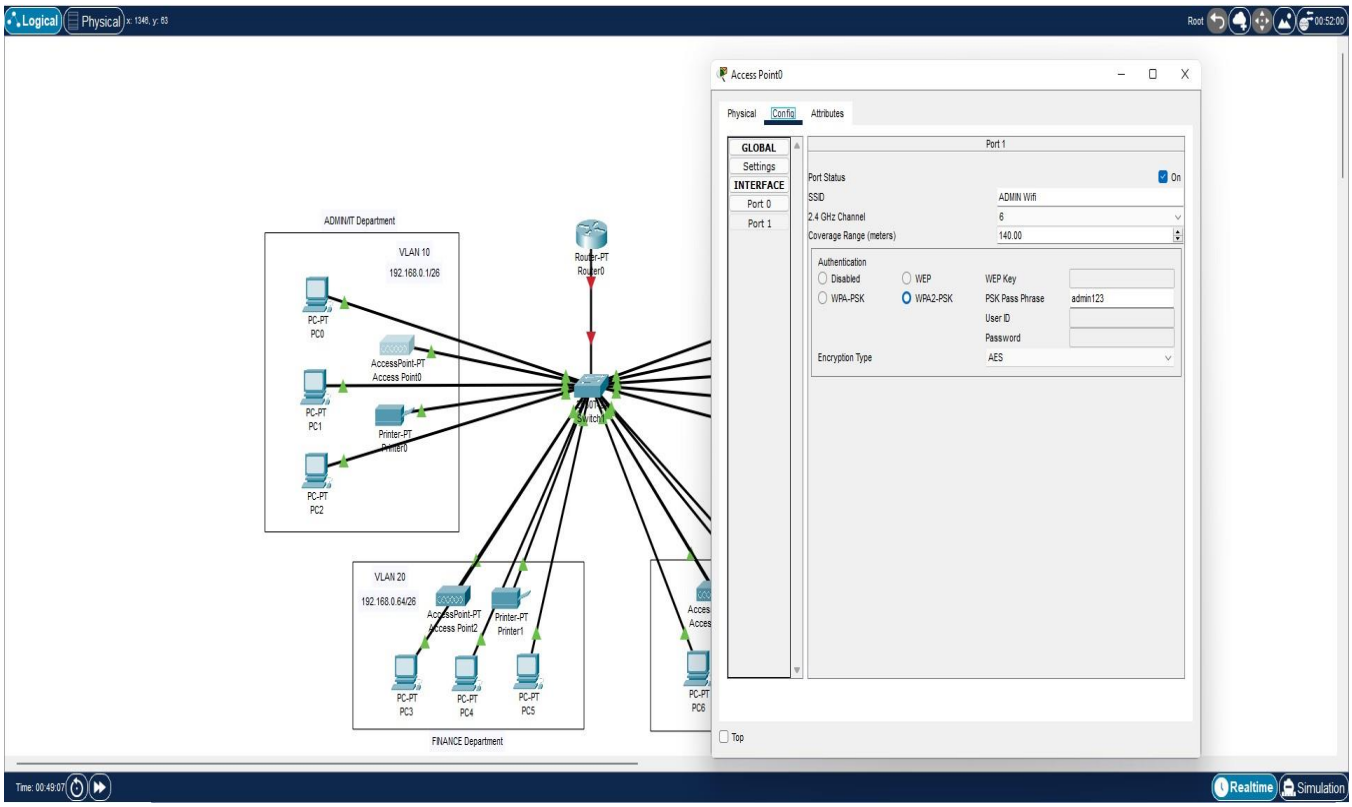
The Network design for XYZ Company provides a Scalable, Secure and efficient Infrastructure by Implementing VLANs and Inter VLAN routing, the Network ensures Isolation and optimized Communication between departments.

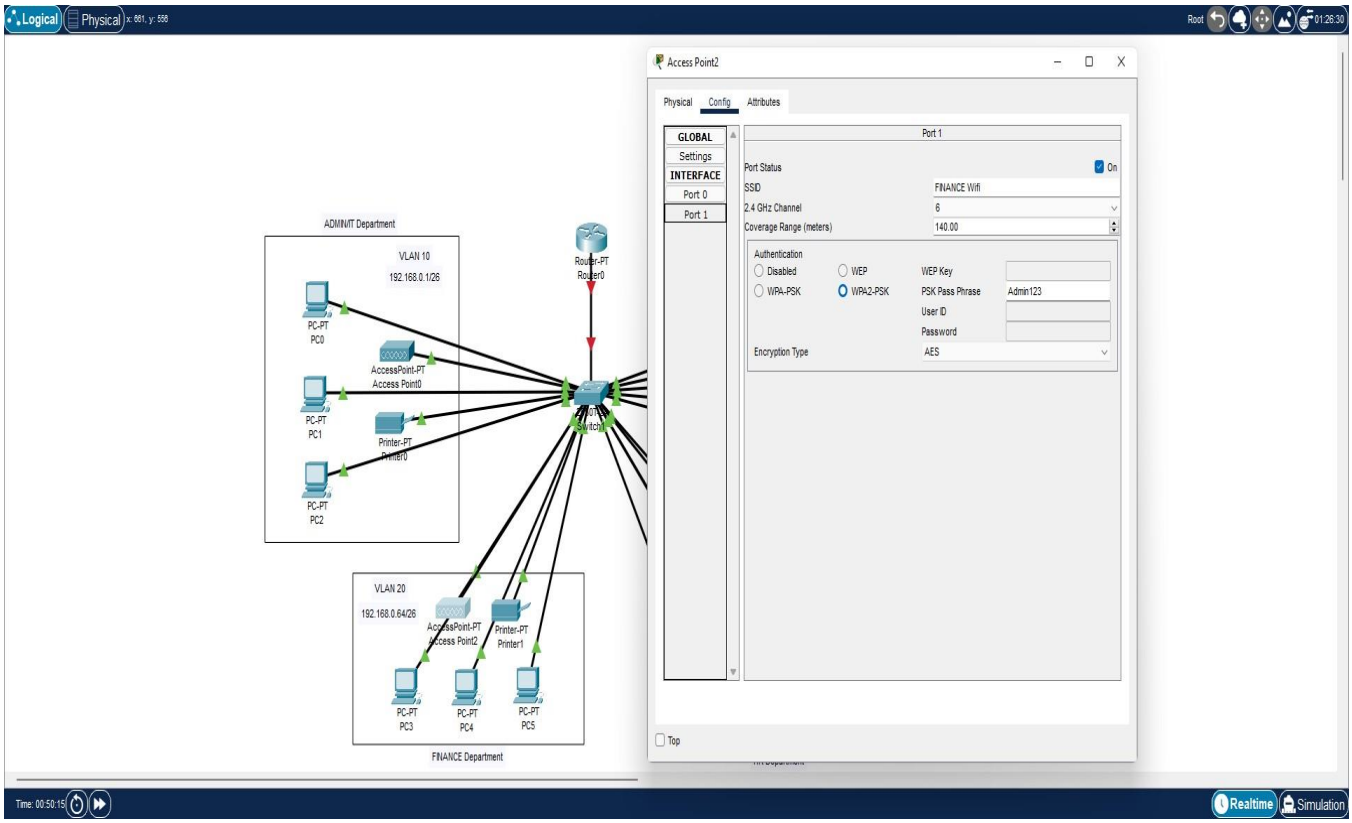
The Inclusion of wireless access points and dedicated devices ensures that employees have reliable access to Network resources. future growth can be easily accomodated by adding additional VLANs, departments or devices as needed.

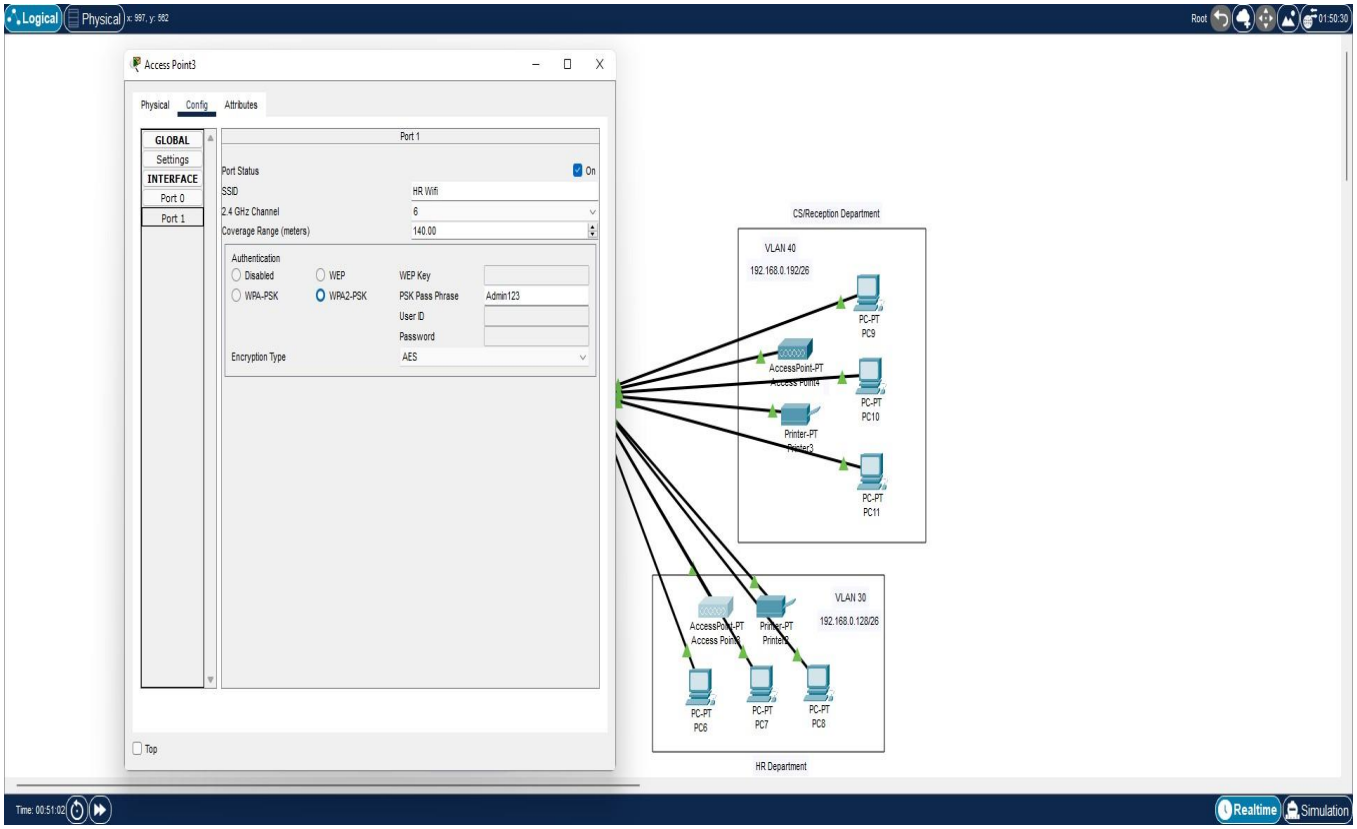
RESULT:

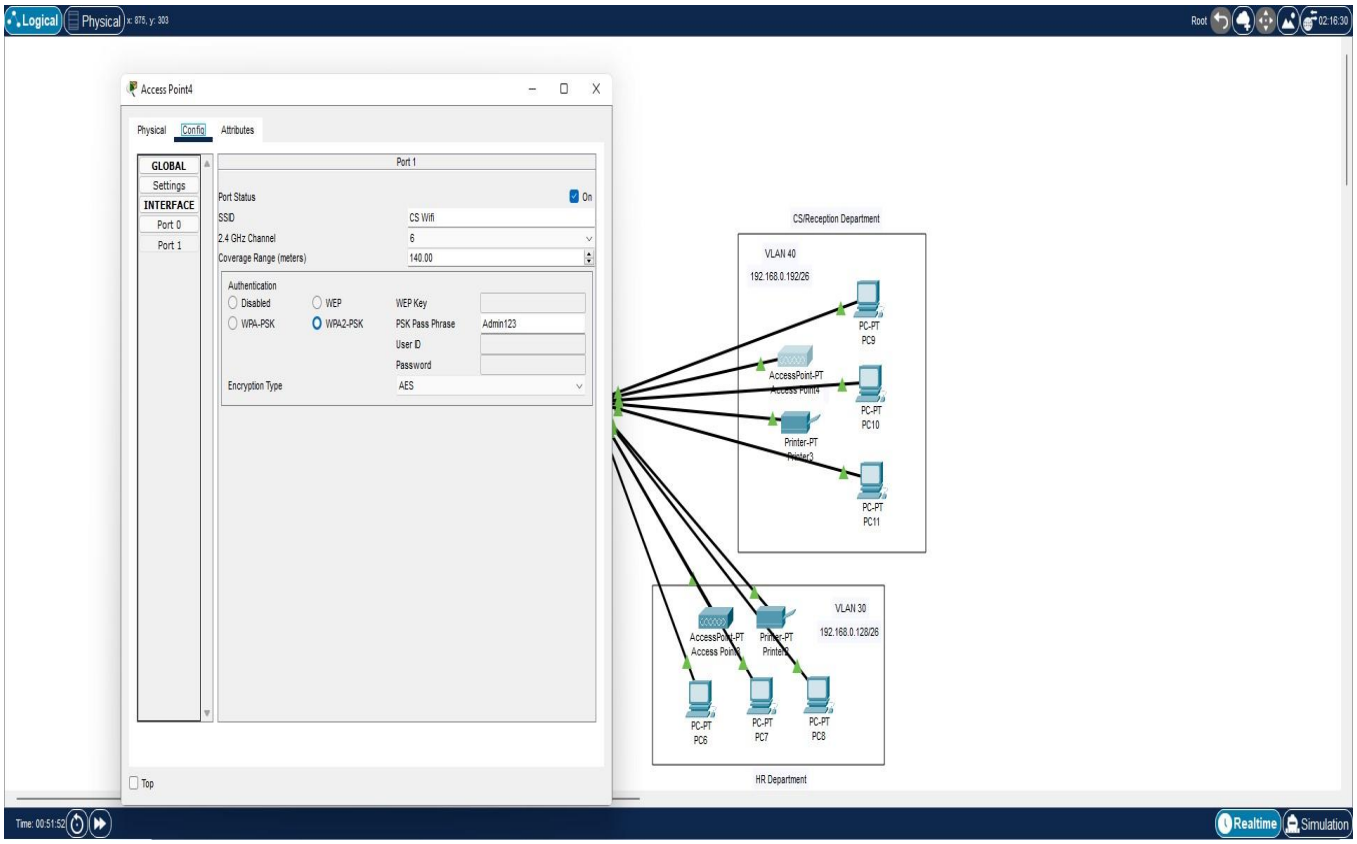

Logical
Physical
Root
ADMIN/IT Department
VLAN 10
192.168.0.1/26
CS/Reception Department
VLAN 40
192.168.0.192/26
VLAN 20
192.168.0.64/26
VLAN 30
192.168.0.128/26
FINANCE Department
HR Department
Realtime
Simulation

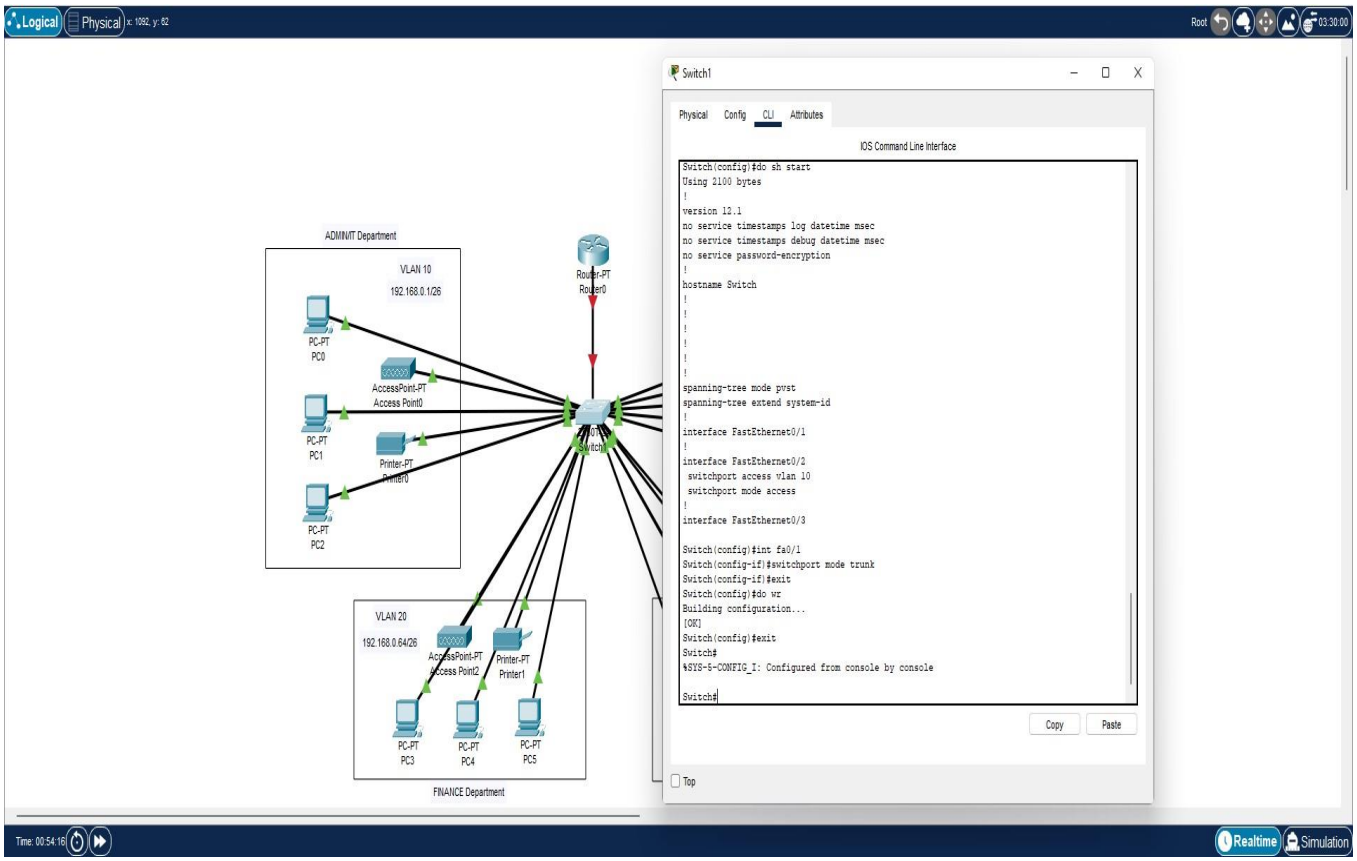

Logical
Physical
Root
Switch1
Physical
Config
CLI
Attributes
IOS Command Line Interface
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/18, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/19, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/19, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/20, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/20, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/21, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/21, changed state to up
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int range fa0/2-6
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#
Switch(config-if-range)#switchport access vlan 10
% Access VLAN does not exist. Creating vlan 10
Switch(config-if-range)#int range fa0/7-11
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 20
% Access VLAN does not exist. Creating vlan 20
Switch(config-if-range)#int range fa0/12-16
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 30
% Access VLAN does not exist. Creating vlan 30
Switch(config-if-range)#int range fa0/17-21
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 40
% Access VLAN does not exist. Creating vlan 40
Switch(config-if-range)#
Copy
Paste
Top
ADMIN/IT Department
VLAN 10
192.168.0.1/26
VLAN 20
192.168.0.64/26
FINANCE Department
Realtime
Simulation

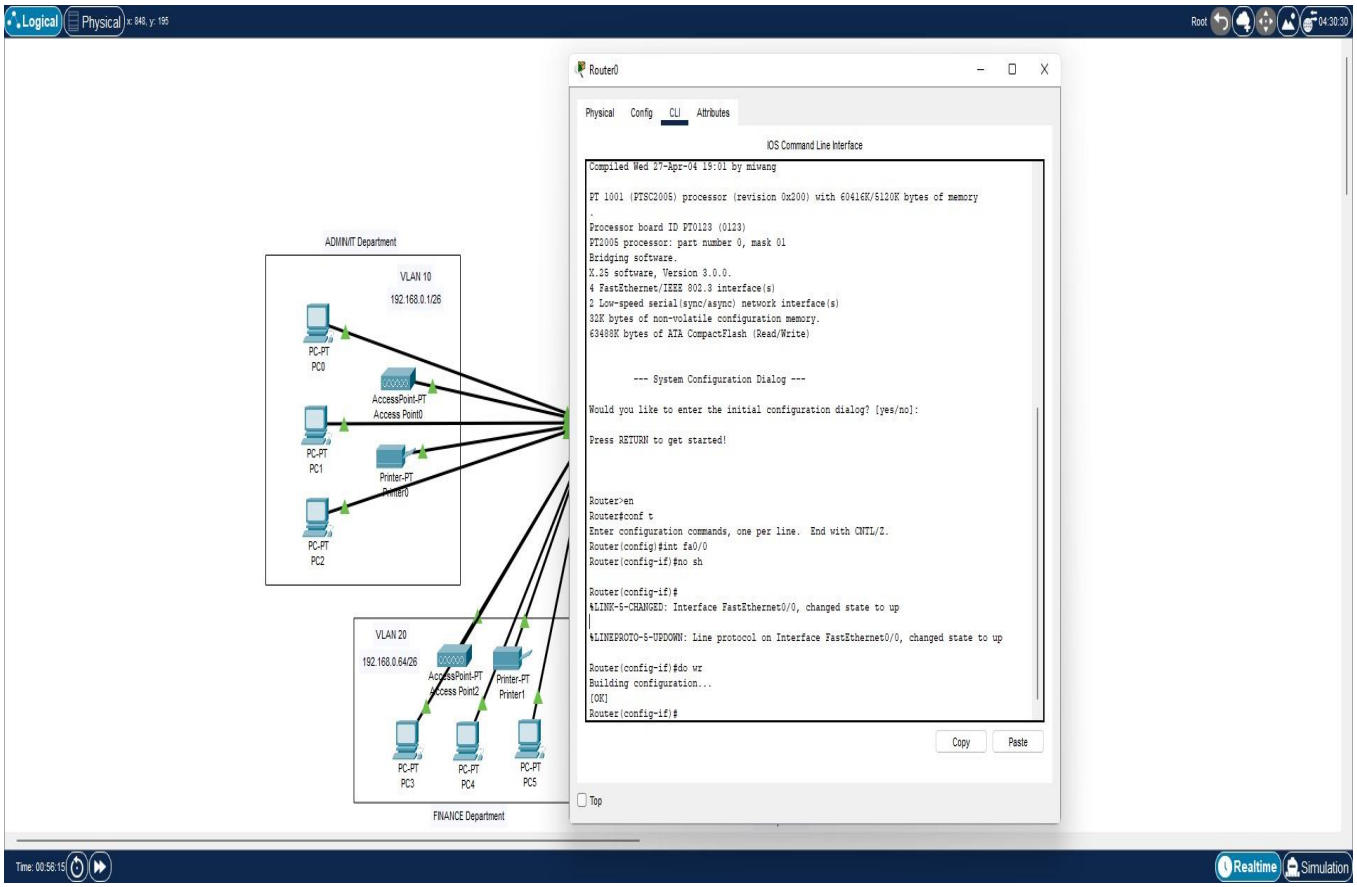

Logical
Physical
Root
Access Point0
Physical
Config
Attributes
GLOBAL
Settings
INTERFACE
Port 0
Port 1
Port 1
Port Status
On
SSID
ADMIN Wifi
2.4 GHz Channel
6
Coverage Range (meters)
140.00
Authentication
Disabled
WEP
WPA-PSK
WPA2-PSK
WEP Key
PSK Pass Phrase
admin123
User ID
Password
Encryption Type
AES
Top
ADMIN/IT Department
VLAN 10
192.168.0.1/26
Router-PT
Router0
PC-PT
PC0
AccessPoint-PT
Access Point0
PC-PT
PC1
Printer-PT
Printer0
PC-PT
PC2
VLAN 20
192.168.0.64/26
AccessPoint-PT
Access Point2
Printer-PT
Printer1
PC-PT
PC3
PC-PT
PC4
PC-PT
PC5
PC-PT
PC6
FINANCE Department
Time: 00:49:07
Realtime
Simulation

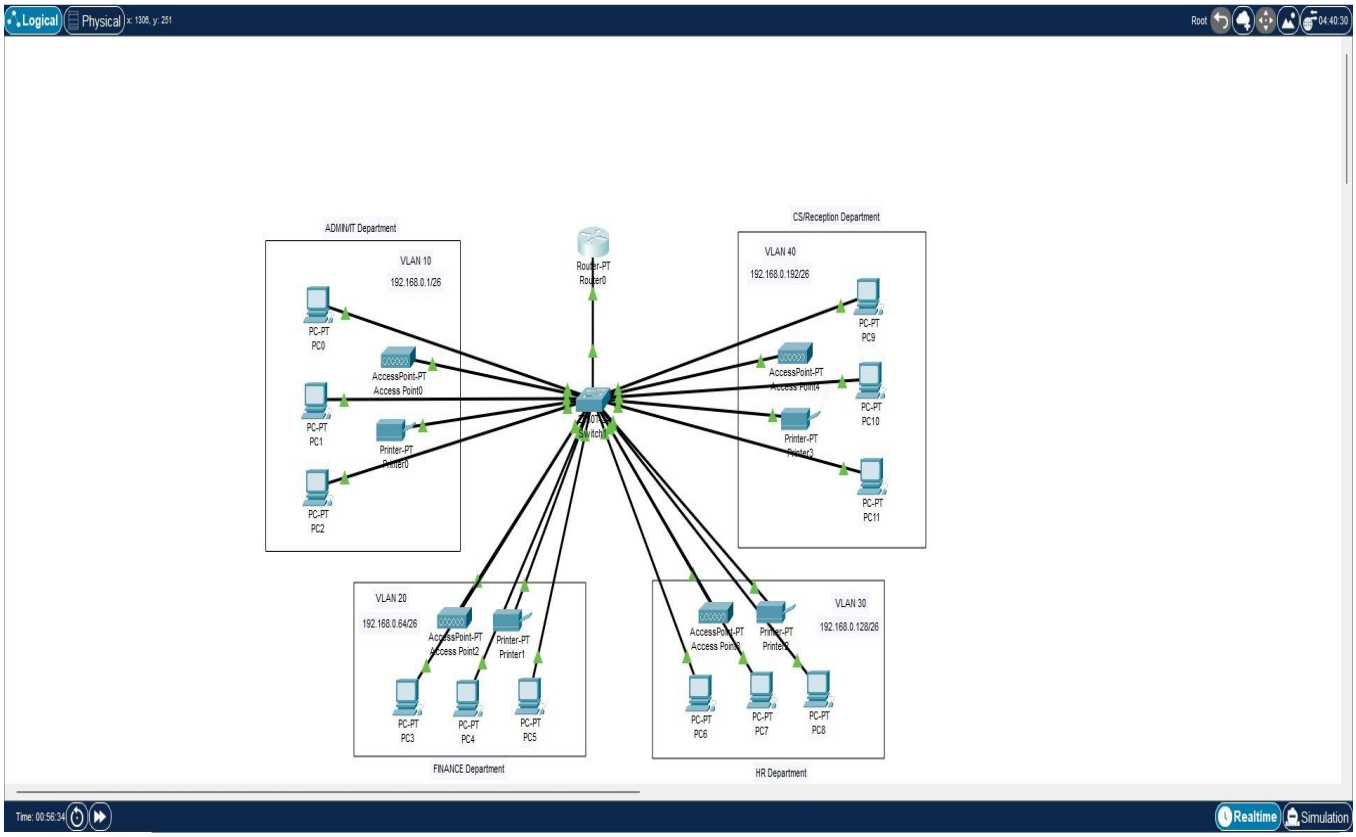

Logical
Physical
Root
Access Point2
Physical
Config
Attributes
GLOBAL
Settings
INTERFACE
Port 0
Port 1
Port 1
Port Status
On
SSID
FINANCE Wifi
2.4 GHz Channel
6
Coverage Range (meters)
140.00
Authentication
Disabled
WEP
WPA-PSK
WPA2-PSK
WEP Key
PSK Pass Phrase
Admin123
User ID
Password
Encryption Type
AES
Top
ADMIN/IT Department
VLAN 10
192.168.0.1/26
Router-PT
Router0
PC-PT
PC0
AccessPoint-PT
Access Point0
PC-PT
PC1
Printer-PT
Printer0
PC-PT
PC2
VLAN 20
192.168.0.64/26
AccessPoint-PT
Access Point2
Printer-PT
Printer1
PC-PT
PC3
PC-PT
PC4
PC-PT
PC5
FINANCE Department
Time: 00:50:15
Realtime
Simulation

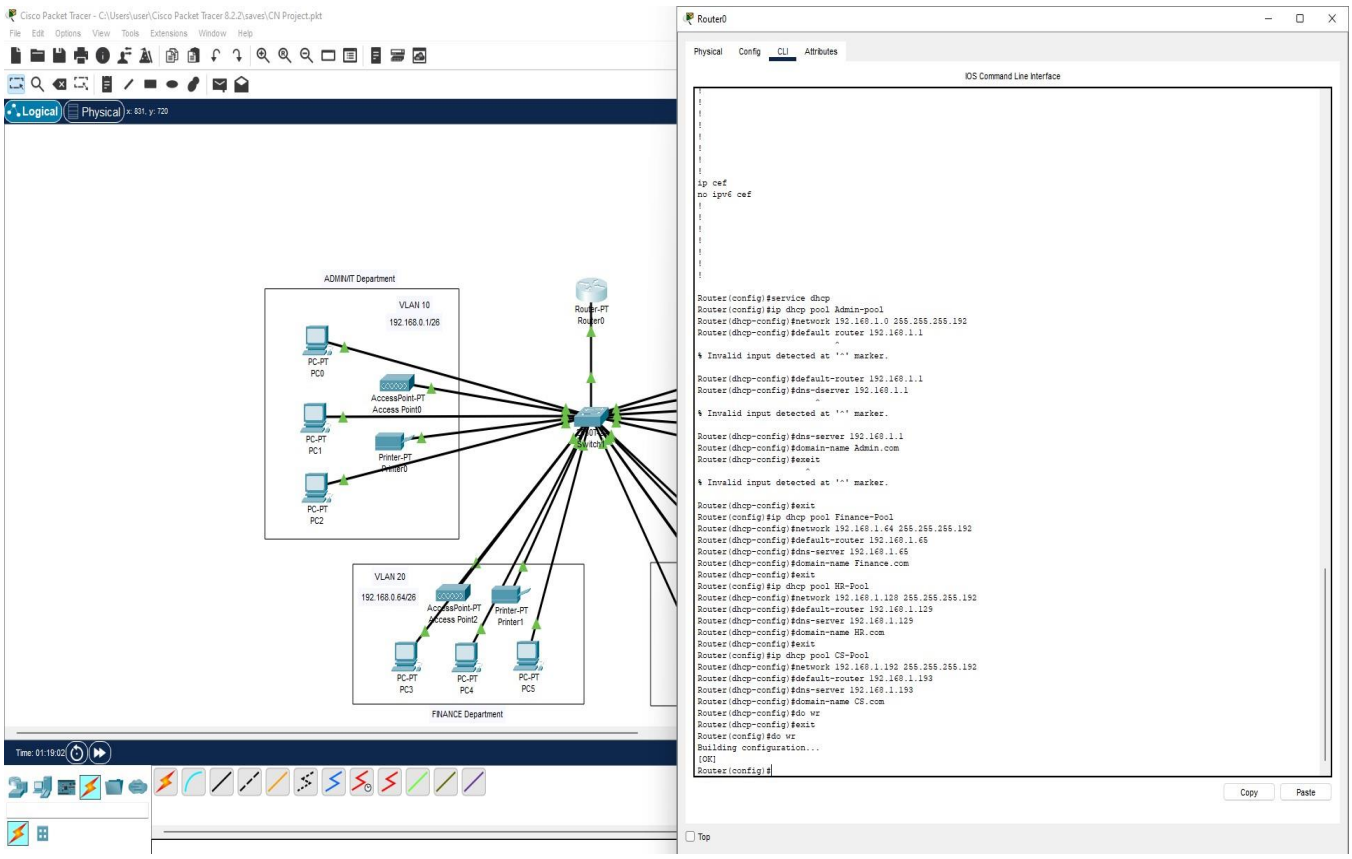

Logical
Physical
x: 997, y: 982
Root
01:50:30
Access Point3
Physical
Config
Attributes
GLOBAL
Settings
INTERFACE
Port 0
Port 1
Port 1
Port Status
On
SSID
HR Wifi
2.4 GHz Channel
6
Coverage Range (meters)
140.00
Authentication
Disabled
WEP
WEP Key
WPA-PSK
WPA2-PSK
PSK Pass Phrase
Admin123
User ID
Password
Encryption Type
AES
Top
CS/Reception Department
VLAN 40
192.168.0.192/26
PC-PT PC9
AccessPoint-PT
PC-PT PC10
Printer-PT
PC-PT PC11
VLAN 30
192.168.0.128/26
AccessPoint-PT
Printer-PT
PC-PT PC6
PC-PT PC7
PC-PT PC8
HR Department
Time: 00:51:02
Realtime
Simulation

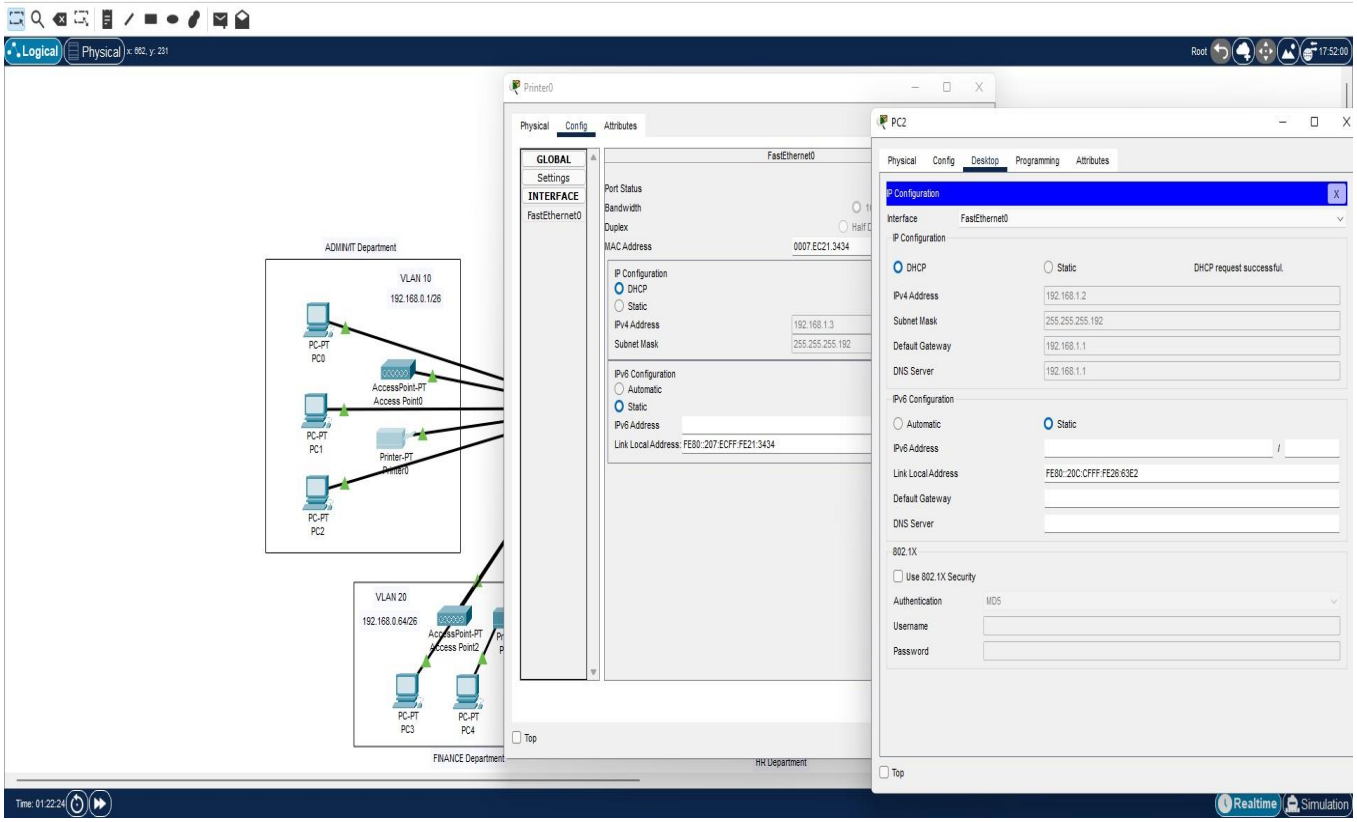

Logical
Physical
x: 875, y: 303
Root
02:16:30
Access Point4
Physical
Config
Attributes
GLOBAL
Settings
INTERFACE
Port 0
Port 1
Port 1
Port Status
On
SSID
CS Wifi
2.4 GHz Channel
6
Coverage Range (meters)
140.00
Authentication
Disabled
WEP
WEP Key
WPA-PSK
WPA2-PSK
PSK Pass Phrase
Admin123
User ID
Password
Encryption Type
AES
Top
CS/Reception Department
VLAN 40
192.168.0.192/26
PC-PT PC9
AccessPoint-PT
PC-PT PC10
Printer-PT
PC-PT PC11
VLAN 30
192.168.0.128/26
AccessPoint-PT
Printer-PT
PC-PT PC6
PC-PT PC7
PC-PT PC8
HR Department
Time: 00:51:52
Realtime
Simulation

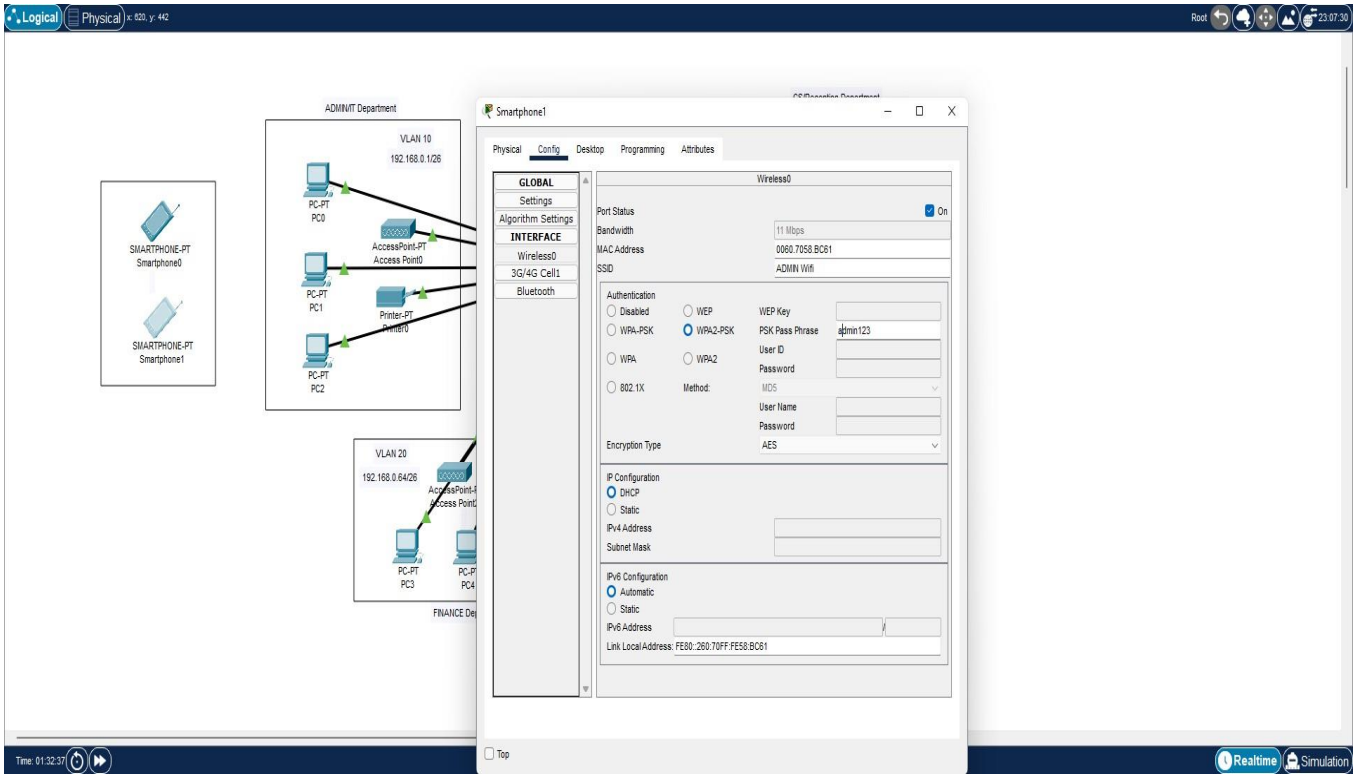

Logical
Physical
Root
Switch1
Physical
Config
CLI
Attributes
IOS Command Line Interface
Switch(config)#do sh start
Using 2100 bytes
!
version 12.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Switch
!
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet0/2
switchport access vlan 10
switchport mode access
!
interface FastEthernet0/3
Switch(config)#int fa0/1
Switch(config-if)#switchport mode trunk
Switch(config-if)#exit
Switch(config)#do wr
Building configuration...
[OK]
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console
Switch#
Copy
Paste
Top
ADMIN/IT Department
VLAN 10
192.168.0.1/26
Router-PT
Router0
PC-PT
PC0
AccessPoint-PT
Access Point0
PC-PT
PC1
Printer-PT
Printer0
PC-PT
PC2
VLAN 20
192.168.0.64/26
AccessPoint-PT
Access Point2
Printer-PT
Printer1
PC-PT
PC3
PC-PT
PC4
PC-PT
PC5
FINANCE Department
Time: 00:54:16
Realtime
Simulation

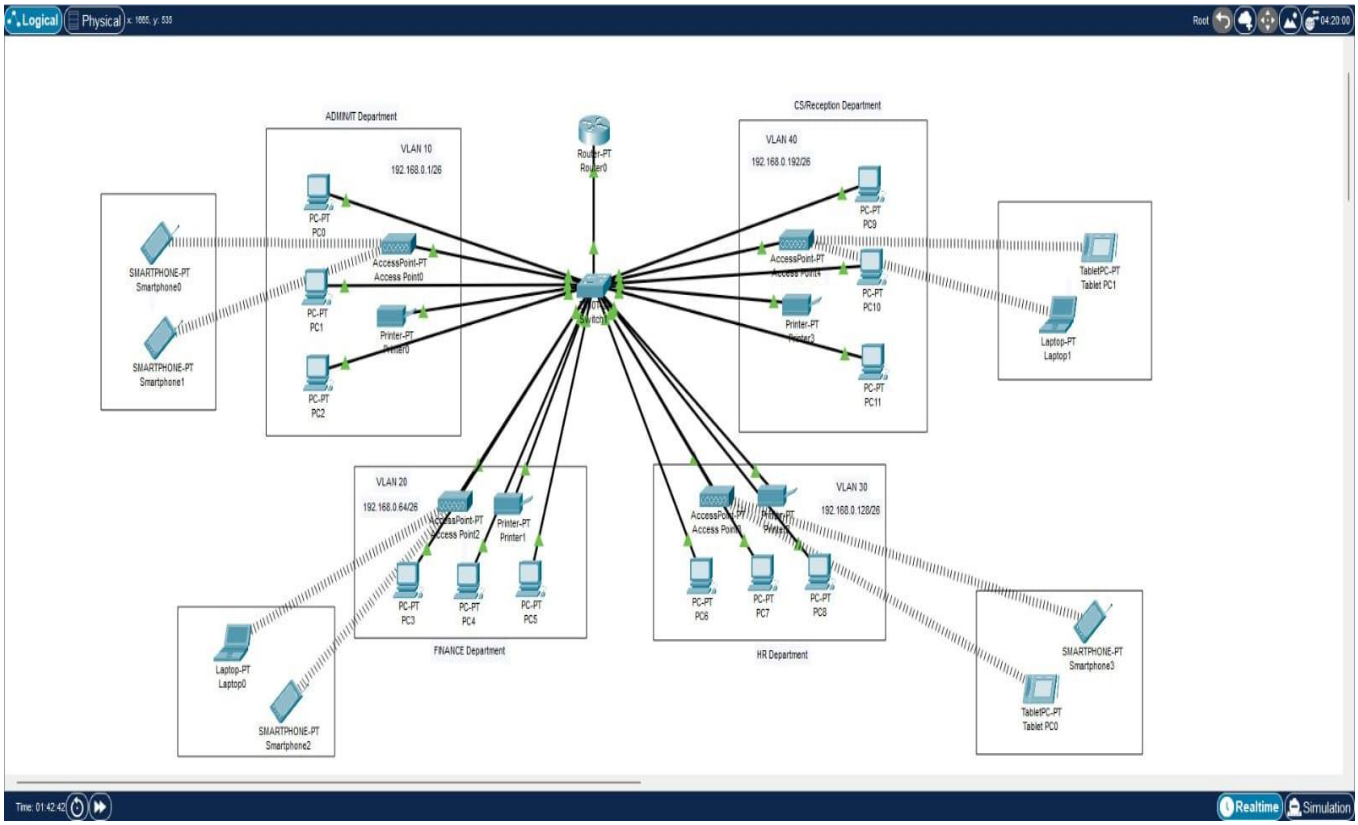

Logical
Physical
Root
Router0
Physical
Config
CLI
Attributes
IOS Command Line Interface
Compiled Wed 27-Apr-04 19:01 by miwang
PT 1001 (PTSC2005) processor (revision 0x200) with 60416K/5120K bytes of memory
.
Processor board ID PT0123 (0123)
PT2005 processor: part number 0, mask 01
Bridging software.
X.25 software, Version 3.0.0.
4 FastEthernet/IEEE 802.3 interface(s)
2 Low-speed serial(sync/async) network interface(s)
32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)
--- System Configuration Dialog ---
Would you like to enter the initial configuration dialog? [yes/no]:
Press RETURN to get started!
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#no sh
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
Router(config-if)#do wr
Building configuration...
[OK]
Router(config-if)#
Copy
Paste
Top
ADMIN/IT Department
VLAN 10
192.168.0.1/26
PC-PT
PC0
AccessPoint-PT
Access Point0
PC-PT
PC1
Printer-PT
Printer0
PC-PT
PC2
VLAN 20
192.168.0.64/26
AccessPoint-PT
Access Point2
Printer-PT
Printer1
PC-PT
PC3
PC-PT
PC4
PC-PT
PC5
FINANCE Department
Time: 00:56:15
Realtime
Simulation


Logical
Physical
Root
ADMIN/IT Department
VLAN 10
192.168.0.1/26
PC-PT PC0
PC-PT PC1
PC-PT PC2
AccessPoint-PT Access Point0
Printer-PT Printer0
Router-PT Router0
Switch1
CS/Reception Department
VLAN 40
192.168.0.192/26
PC-PT PC9
PC-PT PC10
PC-PT PC11
AccessPoint-PT Access Point4
Printer-PT Printer3
VLAN 20
192.168.0.64/26
PC-PT PC3
PC-PT PC4
PC-PT PC5
AccessPoint-PT Access Point2
Printer-PT Printer1
FINANCE Department
VLAN 30
192.168.0.128/26
PC-PT PC6
PC-PT PC7
PC-PT PC8
AccessPoint-PT Access Point3
Printer-PT Printer2
HR Department
Time: 00:56:34
Realtime
Simulation


Cisco Packet Tracer - C:\Users\user\Cisco Packet Tracer 8.2.2\saves\CN Project.pkt
File Edit Options View Tools Extensions Window Help
Logical
Physical
ADMIN/IT Department
VLAN 10
192.168.0.1/26
VLAN 20
192.168.0.64/26
FINANCE Department
Time: 01:19:02
Router0
Physical
Config
CLI
Attributes
IOS Command Line Interface
ip cef
no ipv6 cef
Router(config)#service dhcp
Router(config)#ip dhcp pool Admin-pool
Router(dhcp-config)#network 192.168.1.0 255.255.255.192
Router(dhcp-config)#default router 192.168.1.1
% Invalid input detected at '^' marker.
Router(dhcp-config)#default-router 192.168.1.1
Router(dhcp-config)#dns-dserver 192.168.1.1
% Invalid input detected at '^' marker.
Router(dhcp-config)#dns-server 192.168.1.1
Router(dhcp-config)#domain-name Admin.com
Router(dhcp-config)#exeit
% Invalid input detected at '^' marker.
Router(dhcp-config)#exit
Router(config)#ip dhcp pool Finance-Pool
Router(dhcp-config)#network 192.168.1.64 255.255.255.192
Router(dhcp-config)#default-router 192.169.1.65
Router(dhcp-config)#dns-server 192.168.1.65
Router(dhcp-config)#domain-name Finance.com
Router(dhcp-config)#exit
Router(config)#ip dhcp pool HR-Pool
Router(dhcp-config)#network 192.168.1.128 255.255.255.192
Router(dhcp-config)#default-router 192.168.1.129
Router(dhcp-config)#dns-server 192.168.1.129
Router(dhcp-config)#domain-name HR.com
Router(dhcp-config)#exit
Router(config)#ip dhcp pool CS-Pool
Router(dhcp-config)#network 192.168.1.192 255.255.255.192
Router(dhcp-config)#default-router 192.168.1.193
Router(dhcp-config)#dns-server 192.168.1.193
Router(dhcp-config)#domain-name CS.com
Router(dhcp-config)#do wr
Router(dhcp-config)#exit
Router(config)#do wr
Building configuration...
[OK]
Router(config)#
Copy
Paste
Top


Logical
Physical
Root
ADMIN/IT Department
VLAN 10
192.168.0.1/26
PC-PT PC0
AccessPoint-PT Access Point0
PC-PT PC1
Printer-PT Printer0
PC-PT PC2
VLAN 20
192.168.0.64/26
AccessPoint-PT Access Point2
PC-PT PC3
PC-PT PC4
FINANCE Department
HR Department
Printer0
Physical
Config
Attributes
GLOBAL
Settings
INTERFACE
FastEthernet0
Port Status
Bandwidth
Duplex
MAC Address
0007.EC21.3434
IP Configuration
DHCP
Static
IPv4 Address
192.168.1.3
Subnet Mask
255.255.255.192
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address: FE80::207:ECFF:FE21:3434
Top
PC2
Physical
Config
Desktop
Programming
Attributes
IP Configuration
Interface
FastEthernet0
DHCP
Static
DHCP request successful.
IPv4 Address
192.168.1.2
Subnet Mask
255.255.255.192
Default Gateway
192.168.1.1
DNS Server
192.168.1.1
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::20C:CFFF:FE26:63E2
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top
Time: 01:22:24
Realtime
Simulation


Logical
Physical
Root
SMARTPHONE-PT Smartphone0
SMARTPHONE-PT Smartphone1
ADMIN/IT Department
VLAN 10
192.168.0.1/26
PC-PT PC0
AccessPoint-PT Access Point0
PC-PT PC1
Printer-PT Printer0
PC-PT PC2
VLAN 20
192.168.0.64/26
PC-PT PC3
PC-PT PC4
Smartphone1
Physical
Config
Desktop
Programming
Attributes
GLOBAL
Settings
Algorithm Settings
INTERFACE
Wireless0
3G/4G Cell1
Bluetooth
Wireless0
Port Status
On
Bandwidth
11 Mbps
MAC Address
0060.7058.BC61
SSID
ADMIN Wifi
Authentication
Disabled
WEP
WEP Key
WPA-PSK
WPA2-PSK
PSK Pass Phrase
admin123
WPA
WPA2
User ID
Password
802.1X
Method:
MD5
User Name
Password
Encryption Type
AES
IP Configuration
DHCP
Static
IPv4 Address
Subnet Mask
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address: FE80::260:70FF:FE58:BC61
Top
Time: 01:32:37
Realtime
Simulation


Logical
Physical
x: 1005, y: 535
Root
04:20:00
ADMIN/IT Department
VLAN 10
192.168.0.1/26
CS/Reception Department
VLAN 40
192.168.0.192/26
Router-PT
Router0
SMARTPHONE-PT
Smartphone0
SMARTPHONE-PT
Smartphone1
PC-PT
PC0
AccessPoint-PT
Access Point0
PC-PT
PC1
Printer-PT
Printer0
PC-PT
PC2
PC-PT
PC9
AccessPoint-PT
Access Point4
PC-PT
PC10
Printer-PT
Printer2
PC-PT
PC11
TabletPC-PT
Tablet PC1
Laptop-PT
Laptop1
VLAN 20
192.168.0.64/26
AccessPoint-PT
Access Point2
Printer-PT
Printer1
PC-PT
PC3
PC-PT
PC4
PC-PT
PC5
FINANCE Department
VLAN 30
192.168.0.128/26
AccessPoint-PT
Access Point3
Printer-PT
Printer3
PC-PT
PC6
PC-PT
PC7
PC-PT
PC8
HR Department
Laptop-PT
Laptop0
SMARTPHONE-PT
Smartphone2
SMARTPHONE-PT
Smartphone3
TabletPC-PT
Tablet PC0
Time: 01:42:42
Realtime
Simulation