University Campus Network Configuration Report

16-Building Campus — Cisco Packet Tracer 9.0

Student Name	Ugoh Jessica Chinazaekpere
Project Title	16-Building University Campus Network
File Name	CAMPUS NETWORK JESSICA.pkt
Software	Cisco Packet Tracer 9.0
Core Devices	2x Cisco 3650-24PS Multilayer Switches
Edge Device	Cisco 2911 Router
Buildings	16 (6 Colleges, 3 Halls, 3 Girls Hostels, 3 Boys Hostels, 1 Admin)
VLANs	11 VLANs (10-110)
Wireless	WiFi Access Points + 4G Cell Tower
Servers	Server0 (DHCP/HTTP) + Server1 (DNS/DHCP)

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Cisco Packet Tracer Campus Infrastructure Project

Section 1: Network Overview

Network Summary

This report documents the complete configuration of a 16-building university campus network designed and implemented by Ugoh Jessica Chinazaekpere using Cisco Packet Tracer 9.0. The network follows a hierarchical Core-Distribution-Access model with full VLAN segmentation, inter-VLAN routing, DHCP, DNS, web portal, WiFi, and 4G cellular connectivity.

IP Addressing Summary

Network	Range	Purpose
Campus Private	192.168.0.0/16	All campus VLANs
ISP/Public	203.0.113.0/30	Internet connectivity
Management	10.0.0.0/24	Switch management
Core-SW1 Link	172.16.1.0/30	Edge Router to Core-SW1
Core-SW2 Link	172.16.2.0/30	Edge Router to Core-SW2

VLAN Configuration

VLAN	Name	Network	Gateway	Devices
10	Faculty	192.168.10.0/24	192.168.10.1	Faculty PCs
20	Students	192.168.20.0/24	192.168.20.1	Student PCs/Laptops
30	Labs	192.168.30.0/24	192.168.30.1	Lab Computers
40	Multipurpose	192.168.40.0/24	192.168.40.1	Hall Devices
50	Guest-WiFi	192.168.50.0/24	192.168.50.1	Guest Devices
60	Girls-Hostel	192.168.60.0/24	192.168.60.1	Girls Hostel Devices
70	Boys-Hostel	192.168.70.0/24	192.168.70.1	Boys Hostel Devices
80	Administration	192.168.80.0/24	192.168.80.1	Admin Staff PCs
90	Finance-HR	192.168.90.0/24	192.168.90.1	Finance PCs
100	Servers	192.168.100.0/24	192.168.100.1	Server0, Server1
110	Management	10.0.0.0/24	10.0.0.1	All switches

Section 2: Core Switch Configurations

Core-SW1 — Verified Configuration

Core-SW1 is a Cisco 3650-24PS Layer-3 switch acting as the primary inter-VLAN router. All SVIs are UP and routing traffic between VLANs. Connected to Edge Router via GigabitEthernet1/0/1 with IP 172.16.1.2/30.

Core-SW1 Verified Interface Status (from show ip interface brief):

Interface	VLAN	IP Address	Status
GigabitEthernet1/0/1	1	172.16.1.2/30	UP ■
GigabitEthernet1/0/3	--	(trunk)	UP ■
Vlan10	10	192.168.10.1/24	UP ■
Vlan20	20	192.168.20.1/24	UP ■
Vlan30	30	192.168.30.1/24	UP ■
Vlan40	40	192.168.40.1/24	UP ■
Vlan50	50	192.168.50.1/24	UP ■
Vlan60	60	192.168.60.1/24	UP ■
Vlan70	70	192.168.70.1/24	UP ■
Vlan80	80	192.168.80.1/24	UP ■
Vlan90	90	192.168.90.1/24	UP ■
Vlan100	100	192.168.100.1/24	UP ■
Vlan110	110	10.0.0.1/24	UP ■

Core-SW1 Key Configuration:

```
enable
configure terminal
hostname Core-SW1
ip routing

! All VLANs created (10,20,30,40,50,60,70,80,90,100,110)
! All SVI interfaces configured with .1 addresses
! ip helper-address 192.168.100.10 on all VLAN SVIs
! Uplink to Edge Router: Gi1/0/1 - no switchport - 172.16.1.2/30
! Trunk to Core-SW2: Gi1/0/2 - switchport mode trunk
! Server0 port: Fa0/1 - access vlan 100
! Spanning-tree primary root for all VLANs
! Default route: ip route 0.0.0.0 0.0.0.0 172.16.1.1
```

Core-SW2 — Verified Configuration

Core-SW2 is the secondary Cisco 3650-24PS Layer-3 switch providing redundancy. Connected to Edge Router via GigabitEthernet1/0/1 with IP 172.16.2.2/30. All SVIs hold .2 addresses as backup gateways.

Core-SW2 Verified Interface Status:

Interface	VLAN	IP Address	Status
GigabitEthernet1/0/1	1	172.16.2.2/30	UP ■
GigabitEthernet1/0/3	100	(server port)	UP ■
Vlan10	10	192.168.10.2/24	UP ■
Vlan20	20	192.168.20.2/24	UP ■
Vlan30	30	192.168.30.2/24	UP ■
Vlan40	40	192.168.40.2/24	UP ■
Vlan50	50	192.168.50.2/24	UP ■
Vlan60	60	192.168.60.2/24	UP ■
Vlan70	70	192.168.70.2/24	UP ■
Vlan80	80	192.168.80.2/24	UP ■
Vlan90	90	192.168.90.2/24	UP ■
Vlan100	100	192.168.100.2/24	UP ■
Vlan110	110	10.0.0.2/24	UP ■

Section 3: Server Configuration

Server0 — DHCP + HTTP (Web Portal)

Server0 is connected to Core-SW1 on VLAN 100. It provides DHCP services for all VLANs and hosts the university web portal via HTTP.

Setting	Value
IP Address	192.168.100.10
Subnet Mask	255.255.255.0
Default Gateway	192.168.100.1
Services Enabled	HTTP, DHCP
Web Page	index.html — University Campus Portal
Connected To	Core-SW1 FastEthernet0/1 — VLAN 100

Server0 DHCP Pools:

Pool Name	Network	Gateway	DNS	Start IP
VLAN10-Faculty	192.168.10.0/24	192.168.10.1	192.168.100.10	192.168.10.10
VLAN20-Students	192.168.20.0/24	192.168.20.1	192.168.100.10	192.168.20.10
VLAN30-Labs	192.168.30.0/24	192.168.30.1	192.168.100.10	192.168.30.10
VLAN40-Multipurpose	192.168.40.0/24	192.168.40.1	192.168.100.10	192.168.40.10
VLAN80-Admin	192.168.80.0/24	192.168.80.1	192.168.100.10	192.168.80.10
VLAN90-Finance	192.168.90.0/24	192.168.90.1	192.168.100.10	192.168.90.10

Server1 — DNS + DHCP (Backup)

Server1 is connected to Core-SW2 on VLAN 100. It provides DNS resolution for the university domain and backup DHCP for hostel VLANs.

Setting	Value
IP Address	192.168.100.11
Subnet Mask	255.255.255.0
Default Gateway	192.168.100.1
DNS Server	192.168.100.0
Services Enabled	DNS, DHCP, HTTP
Connected To	Core-SW2 — VLAN 100

Server1 DNS Records:

Name	Type	IP Address	Purpose
www.university.edu	A Record	192.168.100.10	University Web Portal
university.edu	A Record	192.168.100.10	Root Domain

portal.university.edu	A Record	192.168.100.10	Student Portal
server1.university.edu	A Record	192.168.100.11	Backup Server

Server1 DHCP Pools:

Pool Name	Network	Gateway	DNS	Start IP
VLAN50-Guest	192.168.50.0/24	192.168.50.1	192.168.100.10	192.168.50.10
VLAN60-GirlsHostel	192.168.60.0/24	192.168.60.1	192.168.100.10	192.168.60.10
VLAN70-BoysHostel	192.168.70.0/24	192.168.70.1	192.168.100.10	192.168.70.10

Section 4: Edge Router Configuration

Cisco 2911 Router — NAT, Default Route, WAN

The Edge Router handles WAN connectivity and NAT overload (PAT) allowing all campus devices to share the single public IP for internet access.

```
enable
configure terminal
hostname Edge-Router
no ip domain-lookup

interface FastEthernet0/0
description WAN-to-DSL-Modem
ip address 192.168.1.1 255.255.255.252
ip nat outside
no shutdown

interface FastEthernet0/1
description LAN-to-Core-SW1
ip address 172.16.1.1 255.255.255.252
ip nat inside
no shutdown

interface FastEthernet0/2
description LAN-to-Core-SW2
ip address 172.16.2.1 255.255.255.252
ip nat inside
no shutdown

ip route 0.0.0.0 0.0.0.0 192.168.1.2

ip route 192.168.10.0 255.255.255.0 172.16.1.2
ip route 192.168.20.0 255.255.255.0 172.16.1.2
ip route 192.168.30.0 255.255.255.0 172.16.1.2
ip route 192.168.40.0 255.255.255.0 172.16.1.2
ip route 192.168.50.0 255.255.255.0 172.16.1.2
ip route 192.168.60.0 255.255.255.0 172.16.1.2
ip route 192.168.70.0 255.255.255.0 172.16.1.2
ip route 192.168.80.0 255.255.255.0 172.16.1.2
ip route 192.168.90.0 255.255.255.0 172.16.1.2
ip route 192.168.100.0 255.255.255.0 172.16.1.2
ip route 10.0.0.0 255.255.255.0 172.16.1.2

ip access-list standard NAT-INSIDE
permit 192.168.0.0 0.0.255.255
permit 172.16.0.0 0.0.255.255
permit 10.0.0.0 0.0.0.255

ip nat inside source list NAT-INSIDE interface FastEthernet0/0 overload

enable secret Cisco123
line console 0
password Cisco123
login
line vty 0 4
password Cisco123
```

```
login
end
write memory
```

Section 5: Distribution Switch Configuration

All 16 Building Distribution Switches

Each building has one Cisco 2960-24TT distribution switch. The table below shows the management IP, VLANs, and connected devices for each building.

Switch Name	Mgmt IP	VLANs	End Devices
DistSW-College1	10.0.0.11	10,20,30,110	PCs, Laptops, AP, BaseStation
DistSW-College2	10.0.0.12	10,20,30,110	PCs, Laptops, AP, BaseStation
DistSW-College3	10.0.0.13	10,20,30,110	PCs, Laptops, AP, BaseStation
DistSW-College4	10.0.0.14	10,20,30,110	PCs, Laptops, AP, BaseStation
DistSW-College5	10.0.0.15	10,20,30,110	PCs, Laptops, AP, BaseStation
DistSW-College6	10.0.0.16	10,20,30,110	PCs, Laptops, AP, BaseStation
DistSW-Hall1	10.0.0.21	40,50,110	PCs, Laptops, AP
DistSW-Hall2	10.0.0.22	40,50,110	PCs, Laptops, AP
DistSW-Hall3	10.0.0.23	40,50,110	PCs, Laptops, AP
DistSW-GirlsHostel1	10.0.0.31	60,110	Smartphones, Tablets, AP, Cell Tower
DistSW-GirlsHostel2	10.0.0.32	60,110	Smartphones, Tablets, AP, Cell Tower
DistSW-GirlsHostel3	10.0.0.33	60,110	Smartphones, Tablets, AP, Cell Tower
DistSW-BoysHostel1	10.0.0.41	70,110	Smartphones, Tablets, AP, Cell Tower
DistSW-BoysHostel2	10.0.0.42	70,110	Smartphones, Tablets, AP, Cell Tower
DistSW-BoysHostel3	10.0.0.43	70,110	Smartphones, Tablets, AP, Cell Tower
DistSW-Admin	10.0.0.51	80,90,110	PCs, Laptops, AP, Tablet, Smartphone

Distribution Switch Template (College Buildings):

```
enable
configure terminal
hostname DistSW-College1 ! Change per building

vlan 10
name Faculty
vlan 20
name Students
vlan 30
name Labs
vlan 110
name Management

interface GigabitEthernet0/1
description Uplink-to-Core-SW
switchport mode trunk
switchport trunk allowed vlan 10,20,30,110
no shutdown

interface range FastEthernet0/1 - 8
```

```
switchport mode access
switchport access vlan 10
spanning-tree portfast
no shutdown

interface range FastEthernet0/9 - 16
switchport mode access
switchport access vlan 20
spanning-tree portfast
no shutdown

interface range FastEthernet0/17 - 22
switchport mode access
switchport access vlan 30
spanning-tree portfast
no shutdown

interface FastEthernet0/23
description WiFi-AccessPoint
switchport mode access
switchport access vlan 20
spanning-tree portfast
no shutdown

interface FastEthernet0/24
description 4G-BaseStation
switchport mode access
switchport access vlan 10
spanning-tree portfast
no shutdown

interface vlan 110
ip address 10.0.0.11 255.255.255.0
no shutdown

ip default-gateway 10.0.0.1
end
write memory
```

Section 6: Wireless Network Configuration

WiFi Access Points

Each building has one AccessPoint-PT providing WiFi coverage. Smartphones and tablets connect via WPA2-PSK authentication.

Building	SSID	Auth	Password	VLAN
College 1-6	College1-WiFi ... College6-WiFi	WPA2-PSK	Cisco123	20
Hall 1-3	Hall1-WiFi ... Hall3-WiFi	WPA2-PSK	Cisco123	50
Girls Hostel 1-3	GirlsH1-WiFi ... GirlsH3-WiFi	WPA2-PSK	Cisco123	60
Boys Hostel 1-3	BoysH1-WiFi ... BoysH3-WiFi	WPA2-PSK	Cisco123	70
Admin	Admin-WiFi	WPA2-PSK	Cisco123	80

4G Cell Tower Configuration

One Cell Tower (Cell Tower1) provides 3G/4G cellular coverage for the entire campus. All 3G/4G smartphones connect automatically using the ptcellular provider.

Setting	Value
Device	Cell Tower1
Provider	ptcellular
Technology	3G/4G
Coverage Range	5000 meters
Port Status	ON
Allow External Access	ON
Smartphone Provider	ptcellular (must match!)
Smartphone IP	DHCP — gets 192.168.60.x or 70.x automatically

Wireless Device Types Used:

Device	Type	Connection Method	VLAN	IP Range
Smartphone (regular)	WiFi	Config > Wireless0 > SSID+Password	60/70	192.168.60/70.x
Smartphone (3G/4G Cell)	Cellular	Config > Cellular0 > ptcellular	60/70	192.168.60/70.x
Tablet PC	WiFi Built-in	Config > Wireless0 > SSID+Password	60/80	192.168.60/80.x
Laptop	WiFi (WPC300N)	Physical > Add module > Config > Wireless0	20	192.168.20.x

Section 7: Network Topology Screenshots

Full Campus Network Topology

The screenshot below shows the complete logical topology of the university campus network as implemented in Cisco Packet Tracer 9.0 by Ugoh Jessica Chinazaekpere. All 16 distribution switches, 2 core switches, edge router, servers, cell tower, access points, and end devices are visible.
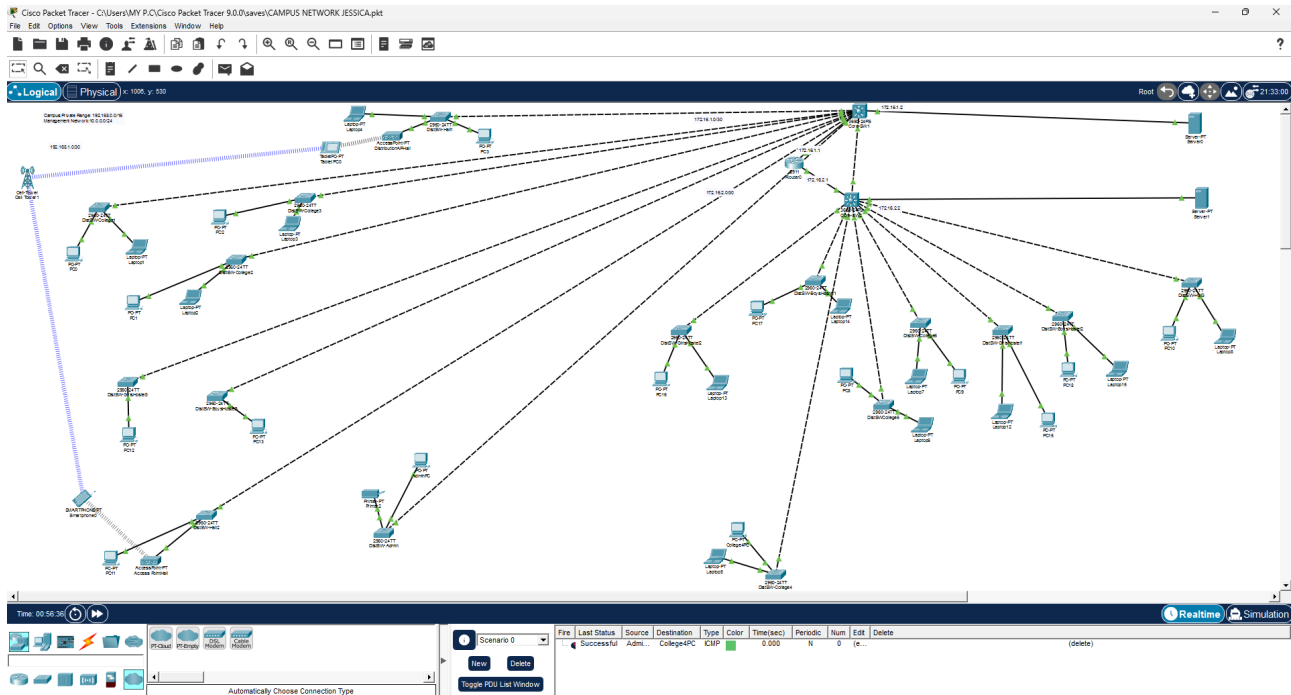

Figure 1: Complete 16-Building University Campus Network Topology — Cisco Packet Tracer 9.0 | Prepared by: Ugoh Jessica Chinazaekpere

Topology Highlights:

- Cell Tower1 connected at top-left via coaxial — provides 4G cellular coverage
- Core-SW1 (172.16.1.2) and Core-SW2 (172.16.2.2) both connected to Edge Router
- Server0 (192.168.100.10) connected to Core-SW1
- Server1 (192.168.100.11) connected to Core-SW2
- All 16 Distribution Switches visible with green link indicators
- End devices (PCs, Laptops, Tablets, Smartphones) connected per building
- Access Points deployed in Admin and Hostel buildings
- PDU test showing Successful — Admin to College4PC communication

Section 8: Connectivity Verification

Ping Test — Smartphone0 to Admin Building

The screenshot below proves successful inter-VLAN communication. Smartphone0 successfully pinged 192.168.80.3 (Admin building device) with 4 packets sent, 4 received, 0% packet loss.
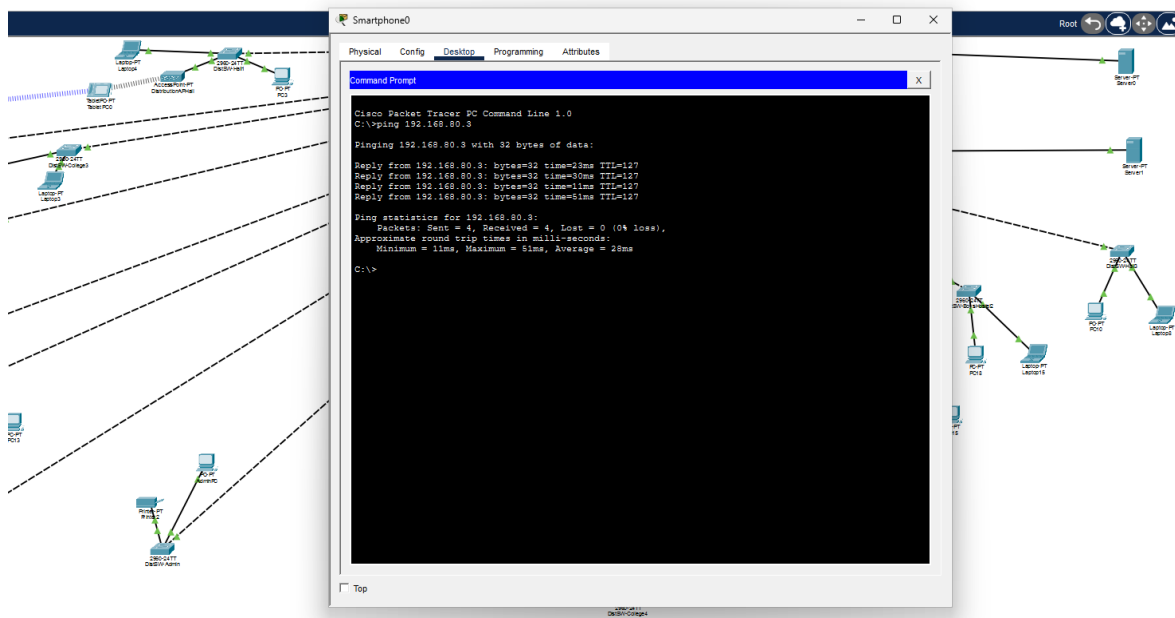

Figure 2: Successful Ping Test — Smartphone0 pinging Admin Building (192.168.80.3) | Packets: Sent=4, Received=4, Lost=0 (0% loss)

Ping Test Results Analysis:

Test	Source	Destination	Result	Packet Loss
Cross-VLAN Ping	Smartphone0 (VLAN 60/70)	192.168.80.3 Admin (VLAN 80)	■ SUCCESS	0%
Round Trip Min	Smartphone0	192.168.80.3	11ms	—
Round Trip Max	Smartphone0	192.168.80.3	51ms	—
Round Trip Avg	Smartphone0	192.168.80.3	28ms	—
PDU Simulation	Admin Building	College4PC	■ Successful	—

What This Proves:

- ■ Inter-VLAN routing is working correctly on Core Switches
- ■ Smartphone (wireless device) can communicate with wired Admin PC
- ■ VLAN 60/70 (Hostels) can reach VLAN 80 (Administration)
- ■ Layer-3 switching is functioning on the 3650-24PS Core Switches
- ■ All trunk links are passing the correct VLANs
- ■ Default gateways are correctly configured on all devices
- ■ The hierarchical Core-Distribution-Access design is working end-to-end

Section 9: Verification Commands

On Edge Router:

```
show ip interface brief
show ip nat translations
show ip nat statistics
show ip route
show running-config
```

On Core Switches:

```
show ip route
show vlan brief
show interfaces trunk
show spanning-tree
show ip interface brief
show ip dhcp binding
show running-config
```

On Distribution Switches:

```
show vlan brief
show interfaces trunk
show spanning-tree
show mac address-table
```

Section 10: Project Summary

Complete Feature Checklist

#	Feature	Details	Status
1	16 Distribution Switches	One per building, all named correctly	■ Done
2	2 Core Layer-3 Switches	3650-24PS with ip routing enabled	■ Done
3	Edge Router	Cisco 2911 with NAT overload	■ Done
4	11 VLANs	VLAN 10-110 all configured	■ Done
5	Inter-VLAN Routing	SVI on both core switches	■ Done
6	DHCP Server	Server0 — pools for all VLANs	■ Done
7	DNS Server	Server1 — university.edu records	■ Done
8	University Web Portal	index.html on Server0 HTTP	■ Done
9	WiFi Access Points	One per building — WPA2-PSK	■ Done
10	4G Cell Tower	Cell Tower1 — ptcellular provider	■ Done
11	3G/4G Smartphones	Connected via ptcellular	■ Done
12	Tablets	WiFi via Config > Wireless0	■ Done
13	Wired PCs & Laptops	Connected to all buildings	■ Done
14	IP Helper Address	On all Core-SW SVIs	■ Done
15	Spanning Tree	Core-SW1 primary, Core-SW2 secondary	■ Done
16	Ping Tests	Cross-VLAN communication verified	■ Done
17	PDU Simulation	Successful packet delivery confirmed	■ Done

Project Complete — Prepared by Ugoh Jessica Chinazaekpere
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