

University Network Setup Using Cisco Packet Tracer

Project Report

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Software Used: Cisco Packet Tracer v7.3

1. Introduction

This project involves designing and configuring a **university network** with multiple departments. The network includes **switches, routers, VLANs, DHCP, and routing protocols** to ensure **secure and efficient data communication**.

2. Network Topology & Components

A. Departments & Network Structure

The university network consists of four buildings:

- 1. **Building A:** Electrical and Computer Engineering Department
- 2. **Building B:** Mathematics Department
- 3. **Building C:** Admissions Office
- 4. **Building D:** Computer Science Department (Branch Campus)

Each department is assigned a **separate VLAN** for isolation and security.

B. Network Devices Used

Device	Purpose
Cisco 2911 Router	Main routing between departments
Cisco 3650-24PS Switch	Core switch for inter-VLAN communication

Cisco 2960-24TT Switches	Switches for each department
Cloud Router	Internet connectivity
Servers	Email, Web, DHCP, and File Sharing
Host Devices (PCs, Printers)	Used by staff and students
Copper & Fiber Cables	Network connectivity

3. Step-by-Step Configuration

This section details the **configuration of switches, routers, VLANs, DHCP, and routing protocols.**

A. Switch Configuration

1. Create VLANs for Departmental Separation

Each department has a VLAN assigned for **logical segmentation.**

Commands to configure VLANs on Switches:

```

cisco
CopyEdit
Switch(config)# vlan 10
Switch(config-vlan)# name Electrical_Engineering
Switch(config-vlan)# exit

Switch(config)# vlan 20
Switch(config-vlan)# name Mathematics
Switch(config-vlan)# exit

Switch(config)# vlan 30
Switch(config-vlan)# name Admissions
Switch(config-vlan)# exit

Switch(config)# vlan 40
Switch(config-vlan)# name Computer_Science

```

```
Switch(config-vlan)# exit
```

2. Assign VLANs to Specific Ports

Each department's **PCs and devices** are assigned to the correct VLAN.

Example: Assigning VLAN 10 to ports (FastEthernet 0/2 to 0/10):

```
cisco
CopyEdit
Switch(config)# interface range FastEthernet 0/2-10
Switch(config-if)# switchport mode access
Switch(config-if)# switchport access vlan 10
Switch(config-if)# exit
```

Repeat this for VLAN 20, 30, and 40, assigning the correct ports.

3. Configure Trunk Ports

Trunk ports allow **VLAN traffic to pass between switches and routers**.

Configuring Trunking on the Switch:

```
cisco
CopyEdit
Switch(config)# interface FastEthernet 0/1
Switch(config-if)# switchport mode trunk
Switch(config-if)# switchport trunk allowed vlan 10,20,30,40
Switch(config-if)# exit
```

This ensures that all VLANs can communicate through this trunk link.

B. Router Configuration

To allow **communication between VLANs**, a **router-on-a-stick** configuration is used.

1. Enable Inter-VLAN Routing (Router-on-a-Stick)

Each VLAN gets a **subinterface** on the router for routing.

Configure Router Subinterfaces:

```
cisco
CopyEdit
Router(config)# interface GigabitEthernet0/0.10
Router(config-subif)# encapsulation dot1Q 10
Router(config-subif)# ip address 192.168.10.1 255.255.255.0
Router(config-subif)# exit

Router(config)# interface GigabitEthernet0/0.20
Router(config-subif)# encapsulation dot1Q 20
Router(config-subif)# ip address 192.168.20.1 255.255.255.0
Router(config-subif)# exit

Router(config)# interface GigabitEthernet0/0.30
Router(config-subif)# encapsulation dot1Q 30
Router(config-subif)# ip address 192.168.30.1 255.255.255.0
Router(config-subif)# exit
```

C. DHCP Server Configuration

DHCP is configured to **dynamically assign IP addresses** to VLAN users.

1. Configure DHCP Server on Router

```
cisco
CopyEdit
Router(config)# ip dhcp pool VLAN10_Pool
Router(dhcp-config)# network 192.168.10.0 255.255.255.0
```

```
Router(dhcp-config)# default-router 192.168.10.1
Router(dhcp-config)# dns-server 8.8.8.8
Router(dhcp-config)# exit
```

Repeat this for VLAN 20, 30, and 40 with different IP ranges.

2. Exclude Reserved IPs

```
cisco
CopyEdit
Router(config)# ip dhcp excluded-address 192.168.10.1 192.168.10.10
```

This prevents **IP conflicts** with routers and servers.

D. Routing Configuration

For communication between **different VLANs and external networks**, we configure **RIPv2 and Static Routing**.

1. Enable RIPv2 for Internal Routing

```
cisco
CopyEdit
Router(config)# router rip
Router(config-router)# version 2
Router(config-router)# network 192.168.10.0
Router(config-router)# network 192.168.20.0
Router(config-router)# network 192.168.30.0
Router(config-router)# network 192.168.40.0
Router(config-router)# no auto-summary
Router(config-router)# exit
```

2. Configure Static Routing for Internet Access

```
cisco
CopyEdit
Router(config)# ip route 0.0.0.0 0.0.0.0 192.168.100.1
```

This directs **all non-local traffic** to the internet.

E. Testing & Verification

After configuring the network, we perform **testing** to ensure everything works.

1. Test VLAN Connectivity with Ping

```
bash
CopyEdit
ping 192.168.10.2
ping 192.168.20.2
ping 192.168.30.2
```

Expected Output:

```
bash
CopyEdit
Reply from 192.168.10.2: bytes=32 time<1ms TTL=128
```

2. Check VLANs on Switch

```
cisco
CopyEdit
Switch# show vlan brief
```

This confirms VLANs are properly assigned.

3. Verify Trunk Ports

```
cisco  
CopyEdit  
Switch# show interfaces trunk
```

4. Check DHCP IP Assignment

On a PC, run:

```
bash  
CopyEdit  
ipconfig /all
```

It should display a **DHCP-assigned IP** from the VLAN subnet.
