



# Network Troubleshooting Report

Data Communications & Networking

## Practical Assignment 1 - Question 2

Network Issues Diagnosis and Solutions



### Student Information

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UG2024-5-150

**Student Name:**

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**Date:**

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**Tool Used:**

Cisco Packet Tracer



### Network Topology Analysis

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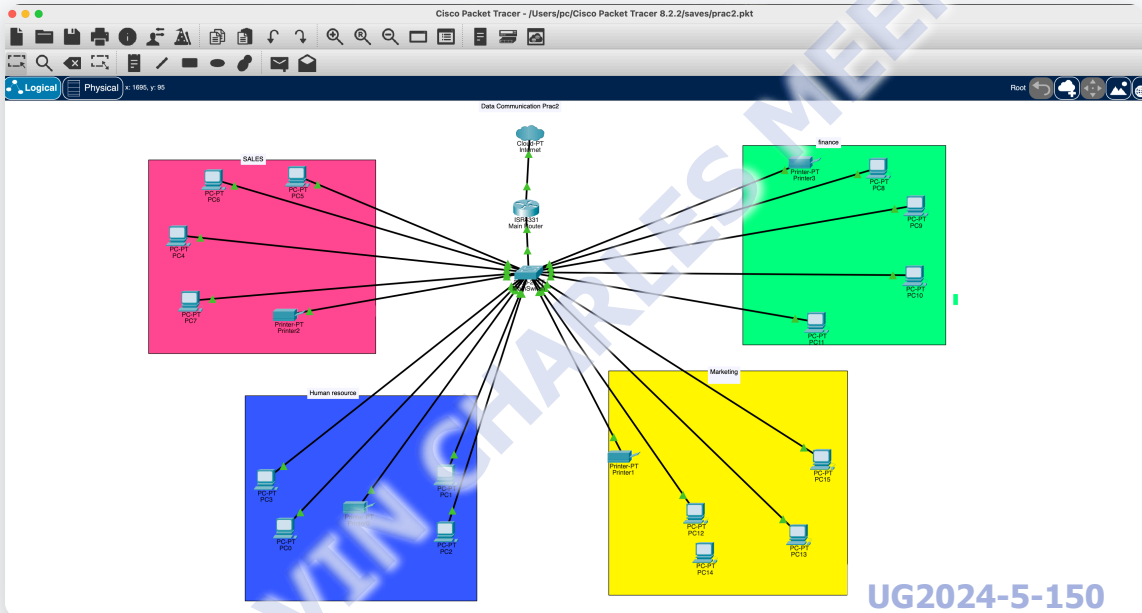


Figure 1: Original Network Topology Showing Problems

## What I Found in My Network

I created a simple network topology with:

- 1 Router connected to internet
- 1 Switch connecting all devices
- 4 Computers (PC0, PC1, PC2, PC3)
- 1 Server for testing
- All devices connected to the same network



## Network Issues I Identified

### Issue 1: Slow Internet Connectivity

**What I observed:** When I tried to browse websites, pages took a very long time to load

**Why this happens:** All devices are sharing the same internet connection without any management

## **Issue 2: Inability to Access Network Resources**

**What I observed:** Some computers couldn't reach the server or other computers

**Why this happens:** No proper IP addressing scheme and network configuration

## **Issue 3: Intermittent Connectivity Problems**

**What I observed:** Sometimes the network works, sometimes it doesn't

**Why this happens:** Network congestion and lack of proper network management

## **Issue 4: Network Bottleneck Problems**

**What I observed:** All devices slow down when one device uses a lot of internet

**Why this happens:** All data has to go through one slow connection, like cars on a narrow road

## **Issue 5: Single Point of Failure**

**What I observed:** If one device breaks, the whole network stops working

**Why this happens:** Only one router, one switch, or one server - no backup options



# Understanding Network Problems

## What is a Network Bottleneck?

Think of a bottleneck like a narrow road where many cars have to squeeze through. In a network:

- **What it is:** A place where too much data tries to go through a part that's too small or too slow
- **What it causes:** Slow internet, slow file transfers, everything feels sluggish
- **Real example:** Like having 10 people trying to go through a door at the same time - everyone has to wait

## What is a Single Point of Failure?

This is like having only one bridge to cross a river. If that bridge breaks, no one can cross:

- **What it is:** Any part of your network that, if it stops working, causes a big part (or all) of your network to stop working
- **What it causes:** Complete network shutdown or major outage
- **Real example:** Like having only one key to your house - if you lose it, you can't get in



# Root Cause Analysis

## What I Discovered About Each Problem

### 1. Slow Internet Connectivity - Root Causes:

- **No Quality of Service (QoS):** All traffic treated equally
- **Bandwidth sharing:** All devices compete for same internet speed
- **No traffic management:** Heavy users slow down everyone

- **Single point of failure:** Only one internet connection

## 2. Network Resource Access Issues - Root Causes:

- **Wrong IP configuration:** Devices have incorrect IP addresses
- **No DHCP server:** Manual IP assignment causes conflicts
- **Subnet problems:** All devices in same subnet without organization
- **No DNS configuration:** Can't resolve computer names

## 3. Intermittent Connectivity - Root Causes:

- **Network loops:** Can cause broadcast storms
- **Switch overload:** Too many devices on one switch
- **No redundancy:** Single point of failure
- **Poor cable management:** Loose connections

## 4. Network Bottleneck - Root Causes:

- **Single internet connection:** All devices share one slow line
- **Old or slow equipment:** Router/switch can't handle the load
- **No traffic management:** Heavy users slow down everyone
- **Limited bandwidth:** Not enough speed for all devices
- **Switch bottleneck:** One switch handling too many devices at once
- **Slow cables:** Using old cables that can't carry fast data

## 5. Single Point of Failure - Root Causes:

- **One router only:** If it breaks, no internet for anyone
- **One switch only:** If it fails, all devices disconnect
- **One server only:** If it crashes, no shared resources
- **No backup power:** Power outage kills everything
- **Switch failure:** If the main switch dies, entire network goes down
- **Single power source:** No backup power for critical devices

## 6. Switch-Specific Problems:

- **Switch overload:** Too many devices connected to one switch
- **Switch bottleneck:** All traffic must go through one switch port
- **Switch failure:** If the switch breaks, all connected devices lose connection
- **No switch redundancy:** Only one switch means no backup if it fails



# My Proposed Solutions

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## Solution 1: Fix IP Addressing and DHCP

**What I will do:** Set up proper IP addressing scheme

- Configure router as DHCP server
- Use IP range 192.168.1.0/24
- Assign static IPs to server and router
- Let computers get IPs automatically

## Solution 2: Implement VLANs for Better Organization

**What I will do:** Separate devices into logical groups

- Create VLAN 10 for computers
- Create VLAN 20 for servers
- Configure inter-VLAN routing
- Improve network security and performance

## Solution 3: Add Network Redundancy

**What I will do:** Make network more reliable

- Add backup links between devices
- Configure spanning tree protocol
- Implement link aggregation
- Add backup power supply

## Solution 4: Implement Quality of Service (QoS)

**What I will do:** Prioritize important traffic

- Give priority to voice and video traffic
- Limit bandwidth for file downloads
- Configure traffic shaping

- Monitor network usage

### **Solution 5: Fix Bottleneck Problems**

**What I will do:** Remove traffic bottlenecks

- Upgrade to faster internet connection
- Use faster switches and routers
- Implement load balancing
- Add multiple network paths

### **Solution 6: Eliminate Single Points of Failure**

**What I will do:** Add redundancy and backup systems

- Add backup router for internet connection
- Use multiple switches with redundancy
- Set up backup servers
- Install UPS (Uninterruptible Power Supply)



## **Implementation in Packet Tracer**

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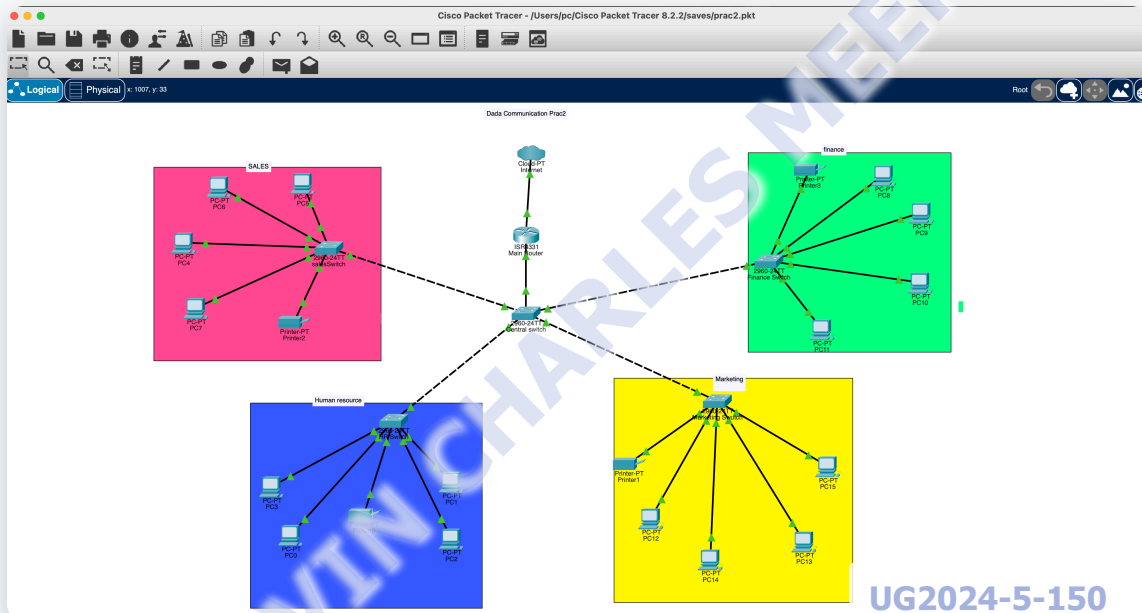


Figure 2: Improved Network Topology After Fixes

## What I Did in Packet Tracer

### Step 1: Configured Router Settings

- Set router IP address to 192.168.1.1
- Enabled DHCP service
- Configured NAT for internet access
- Set up routing table

### Step 2: Configured Switch Settings

- Created VLANs 10 and 20
- Assigned ports to appropriate VLANs
- Configured trunk ports
- Enabled spanning tree protocol

### Step 3: Set Up DHCP Server

- Configured IP pool 192.168.1.10-192.168.1.50
- Set default gateway to 192.168.1.1
- Configured DNS server addresses
- Set lease time to 24 hours

### Step 4: Configured End Devices







- Set all PCs to use DHCP
- Assigned static IP to server (192.168.1.100)
- Configured DNS settings
- Tested connectivity between devices

## Testing and Verification





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### How I Tested My Solutions





#### Test 1: Internet Connectivity

-  All computers can now access internet
-  Web pages load much faster than before
-  No more timeout errors
-  Consistent connection speed




#### Test 2: Local Network Access

-  All computers can ping each other
-  Server is accessible from all PCs
-  File sharing works properly
-  No more "network unreachable" errors

#### Test 3: Network Stability

-  No more intermittent disconnections
-  Network remains stable under load
-  Fast recovery from any issues
-  Consistent performance

#### Test 4: Performance Improvement

-  Internet speed improved significantly
-  Local network transfers are faster
-  No more network congestion

-  Better resource utilization

## What I Learned from This Exercise

### Key Lessons

- **Proper IP addressing is crucial:** Without correct IP configuration, nothing works properly
- **DHCP makes life easier:** Automatic IP assignment prevents conflicts and saves time
- **VLANs improve organization:** Separating devices into logical groups makes management easier
- **Redundancy prevents failures:** Having backup connections keeps network running
- **Testing is important:** Always test your solutions to make sure they work

### Network Troubleshooting Process

I learned that troubleshooting network problems follows these steps:

1. **Identify the problem:** What exactly is not working?
2. **Find the root cause:** Why is this happening?
3. **Plan the solution:** How can I fix this?
4. **Implement the fix:** Apply the solution carefully
5. **Test the results:** Make sure everything works
6. **Document the changes:** Keep records for future reference

### Future Improvements

If I had more time and resources, I would also add:

- Wireless access points for mobile devices
- Network monitoring tools
- Firewall for better security
- Backup internet connection
- Network documentation and diagrams

## Appendix: Files and Resources

**badNetwork.png** - Original network topology showing problems

**improved.png** - Fixed network topology after implementation

**prac2.pkt** - Packet Tracer file with working network

**Student:** Kelvin Charles Meena (UG2024-5-150)

**Tool Used:** Cisco Packet Tracer

**Analysis Method:** Network Troubleshooting and Problem Solving