NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE

COMPUTER NETWORKS LAB

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Lab	02
Course	Computer Networks
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IN LAB TASKS

Step-By-Step Procedure

1. Obtain samples of UTP (Cat5e or Cat6), coaxial, and fiber optic cables.

- **UTP (Unshielded Twisted Pair) Cables**:
  These are network cables made of pairs of copper wires twisted together. The twisting reduces electromagnetic interference so signals can travel cleanly.
- **Cat5e (Category 5 Enhanced)**:
  A type of UTP cable designed mainly for Ethernet networking, supporting up to 1 Gigabit per second (Gbps). It's commonly used for home and office LANs.
- **Cat6 (Category 6)**:
  A newer UTP cable standard that allows faster data transfer (up to 10 Gbps) and handles higher frequencies. It's more suitable for business networks, data centers, and future-proofing.

Feature	Cat5e	Cat6
Full Name	Category 5 Enhanced	Category 6
Cable Type	UTP (Unshielded Twisted Pair)	UTP (Unshielded Twisted Pair), sometimes shielded
Main Purpose	Standard Ethernet networking (home/office)	High-speed Ethernet, professional networks, data centers
Max Speed	Up to **1 Gbps**	Up to **10 Gbps** (up to 55m)
Bandwidth (Frequency)	100 MHz	250 MHz

Max Cable Length	100 meters for 1 Gbps	55 meters for 10 Gbps, 100m for 1 Gbps
Crosstalk (Signal Interference)	Reduced compared to Cat5, but still present	Much lower due to tighter twists and thicker insulation
Cost	Cheaper	More expensive
Typical Use	Homes, small offices	Large offices, data centers, future-proof setups

- **Coaxial Cable (Coax)**
    - A type of cable with a single copper conductor in the center, surrounded by insulation, metallic shielding, and an outer cover.
    - Purpose: Used for TV signals, cable internet, CCTV, and radio transmission**.**
    - Example: the cable that connects your TV to the dish/antenna.

- **Fiber Optic Cable**
    - ❖ Made of thin glass or plastic fibers that carry data as light signal**s** instead of electricity.
    - ❖ Purpose: Used for **very high-speed internet, long-distance communication, and backbone networks**.
    - ❖ Example: used by ISPs for broadband connections and undersea internet cables.

2. Visually inspect and handle each cable type. Note the differences in flexibility, thickness, and connector types.

- ❖ **UTP (Cat5e/Cat6):** Flexible, medium thickness, ends with clear RJ-45 connectors. Inside, you'll find 4 pairs of twisted copper wires. Common for internet cables.

- ❖ **Coaxial:** Thicker and stiffer than UTP, usually with metal **F-type or BNC connectors**. Inside, there's a single copper conductor with layers of insulation and shielding. Often used for TV and CCTV.
- ❖ **Fiber Optic:** Light but fragile, very thin inside (glass or plastic fibers that carry light). Uses small connectors like **SC, ST, or LC**. Delivers very high-speed internet and long-distance data.

3. Examine the internal structure of a UTP cable segment. Identify the twisted pairs of wires and their color coding.

When you cut open a **UTP cable (Cat5e/Cat6)**, you'll see **4 pairs of twisted wires** (8 wires total). Each pair is twisted together to reduce interference.

The **standard color coding** of the twisted pairs is:

- **Orange pair:** Orange + White/Orange
- **Green pair:** Green + White/Green
- **Blue pair:** Blue + White/Blue
- **Brown pair:** Brown + White/Brown

Each pair carries signals, and the twists help cancel noise. In Cat6, the twists are tighter, and sometimes there's a plastic separator in the middle for extra insulation.

2. Obtain pre-made straight-through and crossover Ethernet cables.

Straight-Through Cable

- Both ends follow the **same wiring standard** (either T568A–T568A or T568B–T568B).

- Used for connecting **different devices** (e.g., PC → Switch, Router → Modem).
- If you look inside the transparent RJ-45 plugs, you'll see the **wire colors in the same order** on both ends.

Crossover Cable

- One end follows **T568A** and the other end **T568B**.
- Used for connecting **similar devices directly** (e.g., PC → PC, Switch → Switch) without a hub/switch.
- If you look at the RJ-45 plugs, the **green and orange pairs are swapped** between ends.

3. Examine the RJ45 connectors at both ends of the straight-through cable. Compare it to the T568A and T568B diagrams. Determine which standard was used.

Steps to Examine RJ45 on a Straight-Through Cable

1. **Hold the RJ-45 plug** with the clip facing down and the contacts (gold pins) facing you.
    - Pin 1 is on the **left** side, Pin 8 is on the **right**.
2. **Look at the wire colors inside** the connector.
    - A straight-through cable means both ends have the same color order**.**
3. **Compare with the standards:**
    - **T568A Order (Left → Right):**
        1. White/Green
        2. Green
        3. White/Orange
        4. Blue
        5. White/Blue
        6. Orange
        7. White/Brown

8. Brown
   - **T568B Order (Left → Right):**
     1. White/Orange
     2. Orange
     3. White/Green
     4. Blue
     5. White/Blue
     6. Green
     7. White/Brown
     8. Brown
4. **Determine the standard:**
   - If you see **white/green and green** in positions 1–2 → it's **T568A**.
   - If you see **white/orange and orange** in positions 1–2 → it's **T568B**.

5. Using a cable tester tool, insert both ends of the straight-through cable. Verify that the pinout corresponds to a 1-to-1 connection.

Using a Cable Tester on a Straight-Through Cable

1. **Plug in both ends:**
   - Insert one RJ-45 connector into the **main unit** of the tester.
   - Insert the other end into the **remote unit**.
2. **Turn the tester on:**
   - The tester will send signals through each wire (pins 1–8).
   - LEDs (or numbers on the screen) light up in sequence.
3. **Check the sequence:**
   - For a correct **straight-through cable**, the lights (1 → 8) on both units should flash **in the exact same order**.
   - Example: If main shows 1-2-3-4-5-6-7-8, the remote should also show 1-2-3-4-5-6-7-8.

4. **Interpret results:**
    - **All matching (1→1, 2→2, etc.)** = Cable is wired correctly.
    - **Any mismatch (like 1→3, 2→6)** = Miswiring or crossover cable.
    - **Missing light** = Broken wire or bad termination.

Warm up Task

Open your packet tracer simulator and Sign in using cisco id.

Step 1. Click on the End User Devices icon.

Record any 5 devices Names and screen shot.

a. PC

b. Laptops

c. Servers

d. VoIP device

e. Network Computer

SCREEN SHOT:

Step 2. Click on the Network Devices icon.

Record any 3 devices Name, screen shot and 3 to 4 lines of description of your understanding about device.

a. 4331

b. 4321

c.1941

Step 3. Click on the Device Connection icon.

Identify wires, record each wire purpose in 2 to 3 lines and Fill the blanks.

a. (PC to PC)

Crossover

b. (PC to Switch)

Straight through

c. (Switch to Switch)

Crossover

d. (Switch to Router)

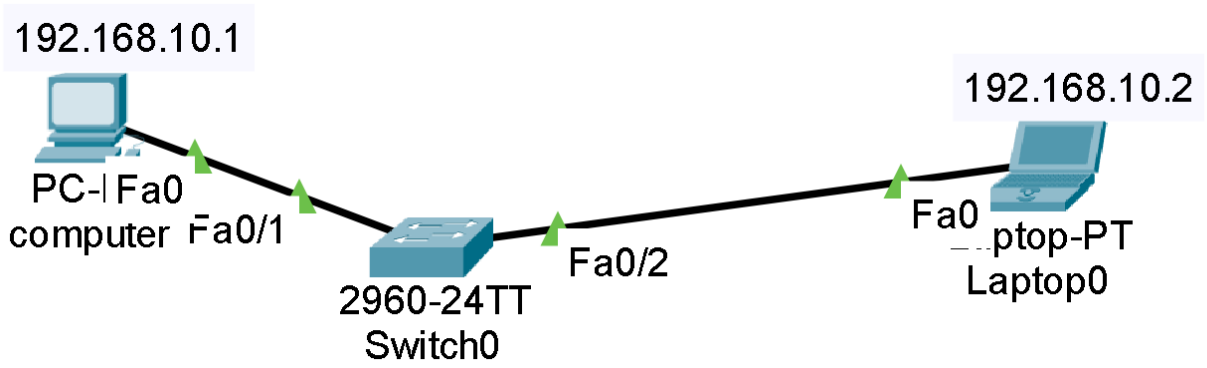
Straight through

e. (Router to Router)

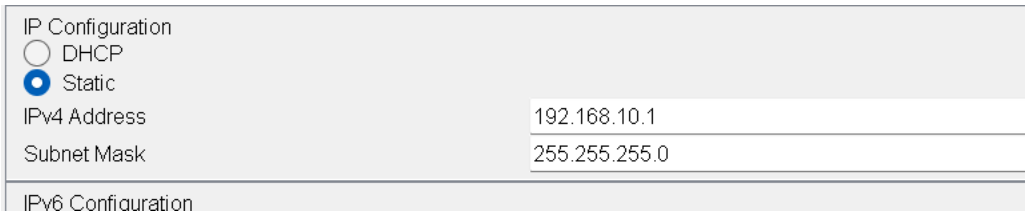
Crossover

LAB TASK 02:

TOPOLOGY DIAGHRAM:



Assigning IP Addresses:

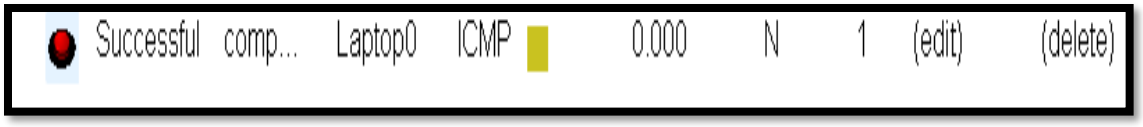


Same step for both devices .

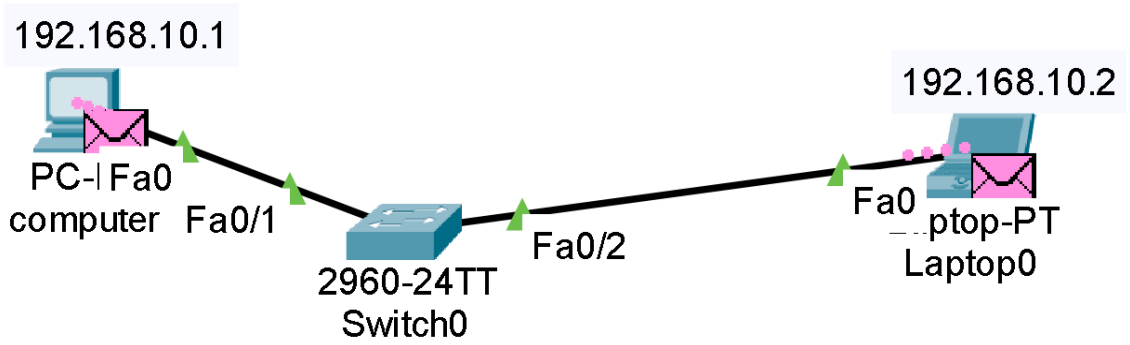
5. **ping Pc1 to Pc2.**

```
Cisco Packet Tracer PC Command Line 1.0
C:\>
ping 192.168.10.2

Pinging 192.168.10.2 with 32 bytes of data:

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

Ping statistics for 192.168.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

6. Send packet from Pc1 to Pc2 (Real time).



7. **Send packet from Pc1 to Pc2 (Simulation).**

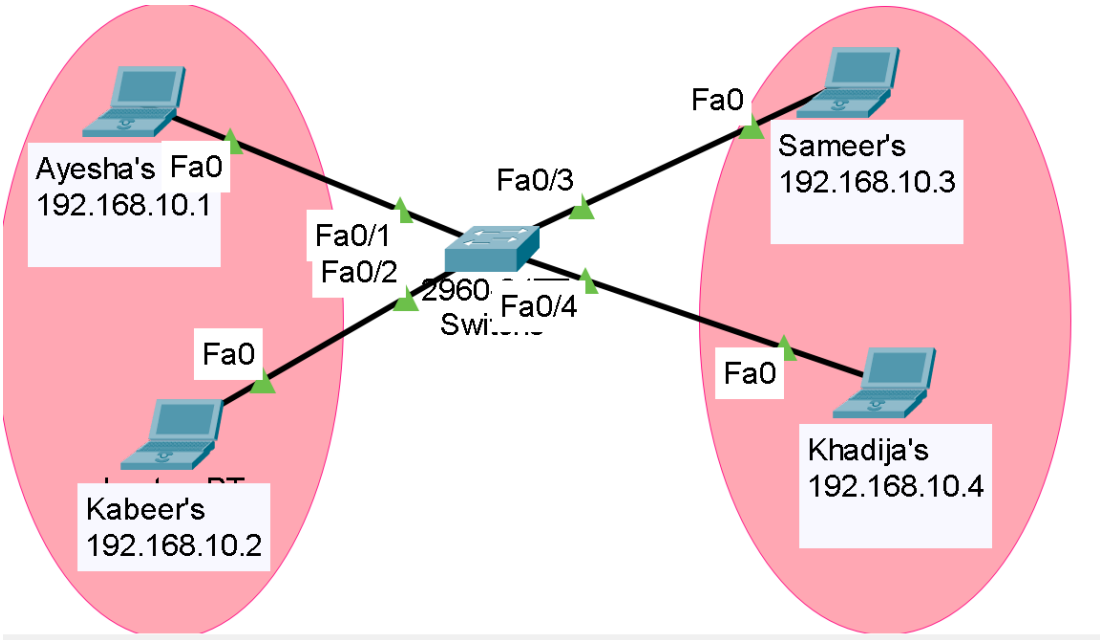


Lab Task 3

By using Drag and drop draw topology diagram as Shown below and attach screenshot of each step.

1. Label each Laptop with unique ip address.

2. Highlight different sections



3. ping different Laptops.

Pinging laptop 1 (Ayesha) with Laptop 4(Khadija's).

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.10.4

Pinging 192.168.10.4 with 32 bytes of data:

Reply from 192.168.10.4: bytes=32 time<1ms TTL=128
Reply from 192.168.10.4: bytes=32 time<1ms TTL=128
Reply from 192.168.10.4: bytes=32 time=3ms TTL=128
Reply from 192.168.10.4: bytes=32 time=1ms TTL=128

Ping statistics for 192.168.10.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 3ms, Average = 1ms

C:\>
```

4. Send packet Laptop0 to Laptop3 (Real time).

6. Send packet Laptop1 to Laptop2(Simulation).