Lab Report-04

CSE 2213: Data and Telecommunication Lab
Batch: 29/2nd Year 2nd Semester 2024

Report's Title: Study and Testing of Different Types of Transmission Media (Wires) in Data and Telecommunication.

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1. Theoretical Background

In data and telecommunication, transmission media refer to the physical pathways used to transmit signals between devices. These media can be classified into two broad categories:

A. Twisted Pair Cable (UTP - Unshielded Twisted Pair)

UTP cables consist of pairs of wires twisted together to reduce electromagnetic interference (EMI). They are widely used in local area networks (LANs).

Types of UTP Cables:

- Cat5 : Supports up to 100 Mbps at 100 MHz
- Cat5e : Enhanced Cat5, up to 1 Gbps
- Cat6 : Up to 10 Gbps for short distances

Function: Used in Ethernet networks, telephone lines, and video applications.

Wiring Layout (T568A and T568B):

Pin	T568A	T568B
1	Green/White	Orange/White
2	Green	Orange
3	Orange/White	Green/White
4	Blue	Blue
5	Blue/White	Blue/White
6	Orange	Green
7	Brown/White	Brown/White
8	Brown	Brown

B. Coaxial Cable

Consists of a central conductor, insulating layer, metallic shield, and outer cover.

Function: Used for cable television, broadband internet, and CCTV systems.

C. Optical Fiber Cable

Optical fiber uses light to transmit data at very high speeds over long distances. It consists of:

- **Core**: Transmits the light
- **Cladding**: Reflects light back into the core
- **Buffer Coating**: Protects from damage

Types:

- **Single-mode**: Long-distance, narrow core
- **Multi-mode**: Short-distance, wider core

Wiring Layout:

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[Transmitter]–(Fiber Core)–[Receiver]
        |           |           |
    Light Source   Cladding  Light Detector
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2. Objectives

- To study different types of transmission media (UTP, Coaxial, and Optical Fiber)
- To understand cable structures and functions
- To test the performance of each cable type using standard tools
- To learn proper cable layout and termination techniques

3. Apparatus and Materials Required

- UTP cables (Cat5e/Cat6)
- Optical fiber cables
- RJ45 connectors
- Crimping tool
- Cable tester
- Network switches and PCs
- OTDR (Optical Time-Domain Reflectometer) or fiber tester
- LAN cable tester
- Stripper and cutter

4. Experimental Procedure

A. UTP Cable Testing

1. Cut the UTP cable to desired length.
2. Strip about 2 inches of the outer insulation.
3. Untwist and arrange wires according to the T568B layout.
4. Insert wires into RJ45 connectors.
5. Crimp the connector using the crimping tool.
6. Test the cable using a LAN tester to verify pin mapping and continuity.

B. Optical Fiber Cable Testing

1. Use pre-terminated fiber or polish the ends manually.
2. Connect the fiber cable between transmitter and receiver.
3. Test continuity and signal loss using an OTDR.
4. Observe and record signal strength and error rate.

5. Experimental Results

UTP Cable Test: All 8 pins mapped successfully with "PASS" indication.

Fig: UTP Cable Test

Optical Fiber Test: Light signal detected at receiver end, loss measured at 0.3 dB/km.

Fig: Optical Fiber Test

6. Discussion

During this lab, we gained hands-on experience in the construction and testing of different cable types used in data communication. The UTP cable test helped us understand the importance of proper pin configuration (T568A/B).

The most interesting part was working with optical fiber cables. We observed how fiber transmits data as light, offering significantly higher speeds and lower signal loss compared to electrical cables. We also learned to use OTDR, which helps in identifying breaks and measuring losses in fiber cables.

This lab emphasized the practical challenges like maintaining clean terminations, accurate wire orders, and the necessity of using correct tools.

7. Conclusion

This experiment successfully demonstrated the structure, functionality, and performance of UTP and optical fiber cables. Among them, optical fiber is the most efficient for long-distance high-speed communication, while UTP remains a cost-effective choice for LANs. The practical skills acquired, such as cable crimping, testing, and layout design, are fundamental for anyone pursuing a career in networking or telecommunications.