UNIT-1 :- Topics:

- Network hardware & Software
- OSI Reference model
- TCP/IP Reference model
- ARPANET, Internet

PART -1

- Guided Transmission media:-

twisted pairs

Coaxial cable

fibre optics

Wireless transmission.

PART-2

Network Hardware

• The basic Hardware Components in a Network are:-

→ **Network cables** :- Network cables are the transmission media to transfer data from one device to another

→ **Routers** :- Router is a connecting device which transfers Data packets between different Computer Networks.

→ **Repeaters** :- A repeater receives signal and regenerates it before re-transmitting so that it can travel longer

→ **Hubs** :- A Hub is a multi-port repeater

→ **Bridge** :- A Bridge connects two seperate Ethernet network

→ **Gateways** :- A gateway connects entirely different networks that work upon completely different protocols.
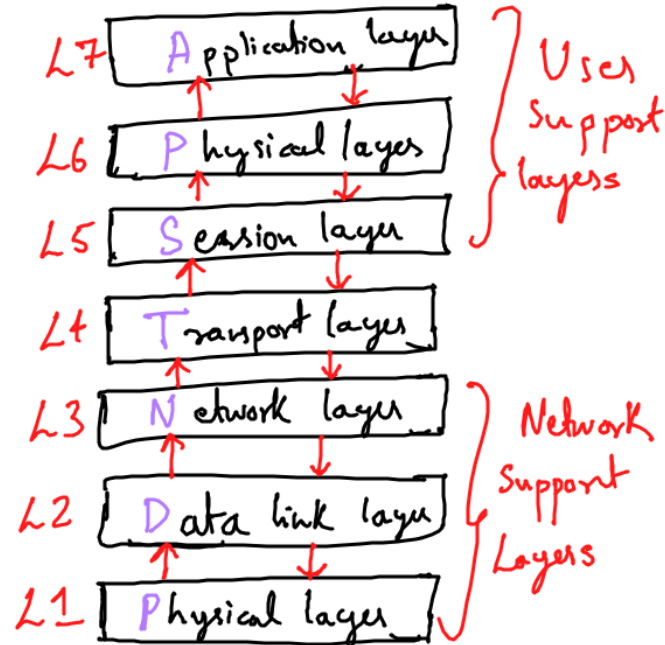
Network Software

- Network Software comprises a broad range of software used for design, implementation, operation and monitoring of Computer Networks.
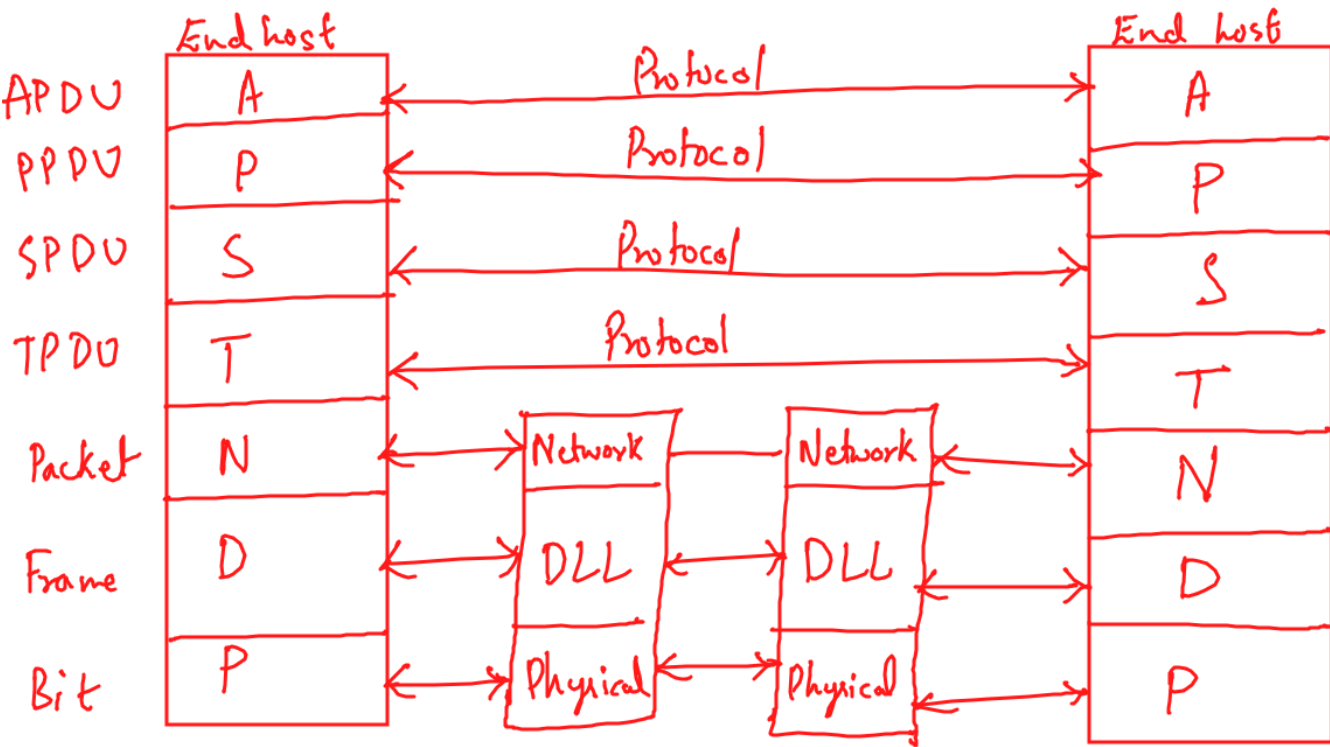
OSI :-

- OSI stands for Open Standard Interconnection
- The OSI model does not specify the Communication Standard or protocols to be used to perform networking tasks
- It defines point of interconnection for the exchange of information between system.
- It has 7 interconnected layers
- The 7 layer are :- Application layer
  Presentation layer
  Session layer
  Transport layer
  → Network layer
  Data link layer
  Physical layer.

OSI Reference Model

L7	Application layer
L6	Physical layer
L5	Session layer
L4	Transport layer
L3	Network layer
L2	Data link layer
L1	Physical layer

User Support layers (L7, L6, L5)

Network Support Layers (L3, L2, L1)

Left labels (PDUs):
APDU
PPDU
SPDU
TPDU
Packet
Frame
Bit

Left End host stack: A, P, S, T, N, D, P

Right End host: A, P, S, T, N, D, P

Protocol (between A–A)
Protocol (between P–P)
Protocol (between S–S)
Protocol (between T–T)

Intermediate nodes: Network / DLL / Physical — Network / DLL / Physical

Notes:

1. Physical layer :- It is the Lowest layer in OSI Reference Model
 • Its function is to transmit individual bits from one node to another over a physical medium.

2. Data link layer :- It transforms the physical layer to a reliable link making it an error free link to upper layer.

3. Network layer :- It is responsible for the delivery of packets from the source to the destination

4. Transport layer :- It is responsible for delivery of the entire message from the source node to destination node

5. Session layer :- It establishes sessions between users and offers services like dialog control & synchronization.

6. **Presentation layer:** It deals with Syntax & Semantics of the information being exchanged

7. **Application layer :** It is responsible for accessing the network by user. It provides User Interfaces and other supporting services like email, file transfer & sharing database.

TCP/IP : • It stands for Transmission Control protocol / Internet protocol.

• TCP/IP reference model is a set of protocols that allow communication across Multiple diverse networks.

• There are four layers in TCP/IP Reference model

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Application layer
Transport layer
Internet layer
Host to network
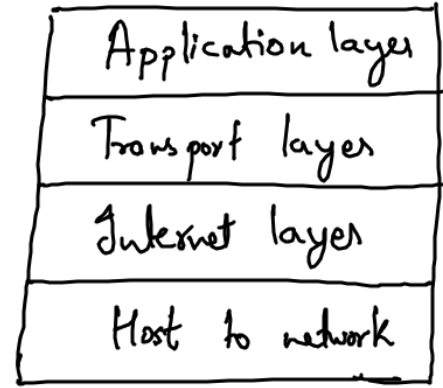
1. **Application layer :** It is a combination of Session, presentation, application layer of the OSI reference model

2. **Transport layer :** TCP/IP defines two protocols at Transport layer :- TCP & UDP
• Uses Datagram protocol is connection less protocol

3. **Internet layer:-** • It is also called Network layer
• Internet layer handles communication from one machine to the other.
• Routing of packets takes place in this layer

4. **Host to network:-** This layer is responsible for accepting and transmitting IP datagrams
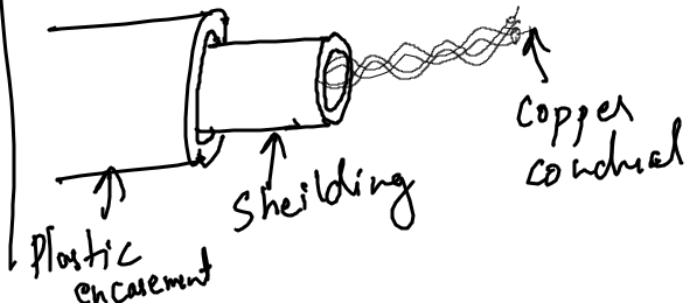
Guided Transmission media

1. **Twisted pair Cable:-** • Twisted pair cable is least expensive & most widely used.

• It consists of two insulated copper wires arranged in a regular spiral pattern

• TP ⟨ UTP:- Unshielded twisted pair
         STP :- Shielded twisted pair

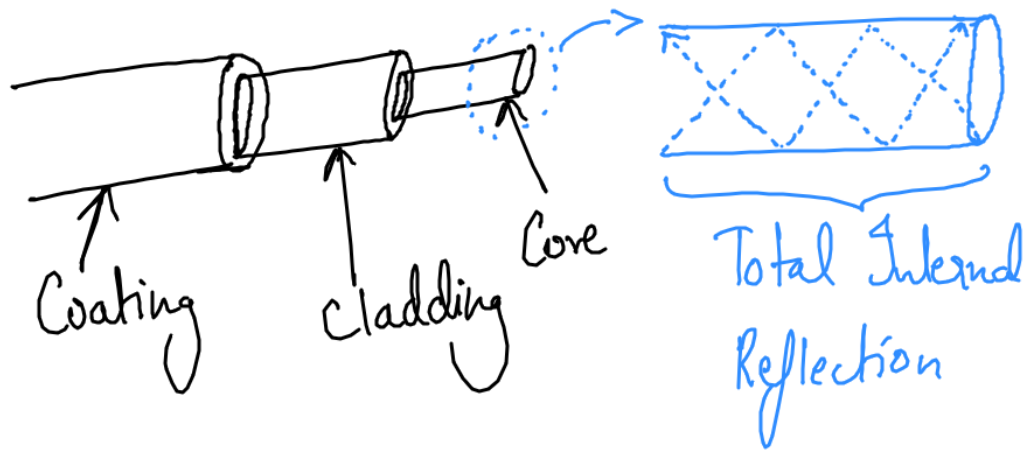**UTP:-** It is a set of twisted pairs within a plastic sheet

plastic encasement   colour code insulation   copper conductor
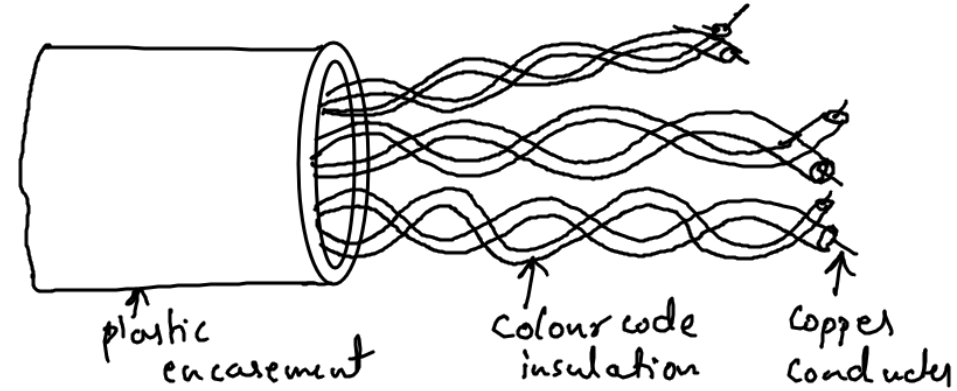
STP:- It provides a protective sheathing around the copper wire
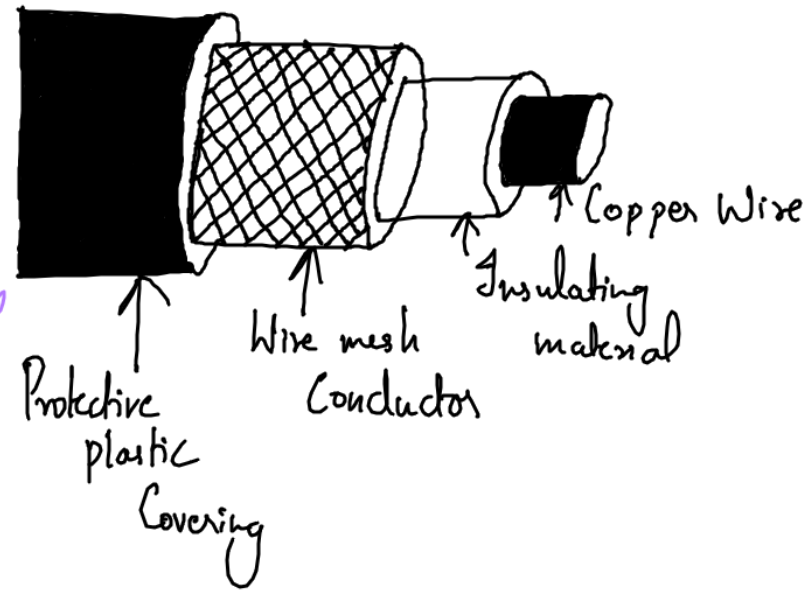

Plastic encasement   Sheilding   copper conductor

Fibre Optic Cable :-

- A fibre optic cable is a light pipe which is used to carry a light beam from one place to another
- Fibre optic cable works on the principle of Total internal Reflection

Coating

Cladding

Core

Total Internal Reflection

Coaxial Cable :-

- A Coaxiale Cable is made up of two conductors that share the common axis.

Protective plastic Covering

Wire mesh Conductor

Insulating material

Copper Wire

Co-axial Cable	Twisted Pair Cable	Fibre Optic Cable
• It uses electrical signal for transmission	• It uses electrical signal for transmission	• Uses Optical form of signal over a glass Fibre
• Less affect by EMI	• Affected by EMI	• Not affected by EMI
• Bandwidth is moderately High (350 MHz)	• Bandwidth is Low (3 MHz)	• Bandwidth is very High (2 GHz)
• Support moderately high rates (500 Mbps)	• Support Low data rates (4 Mbps)	• Data rates are very High (2 Gbps)
• Moderately costly	• Cheaper	• Costly
• Repeater spacing is 1-10 KM	• Repeter Spacing is 2-10 KM	• Repeater spacing is 10-100 KM
• It Supports all radio frequencies	• Supports all radio frequencies	• Frequency range is 902 MHz to 928 MHz
• Low attenuation	• High attenuation	• Very low attenuation.