CSE405
Computer Networks
Lab-1

Contents

- Familiarization with transmission media and orientation of CAT5
- Creating straight through and cross over cable and data transmission between hosts

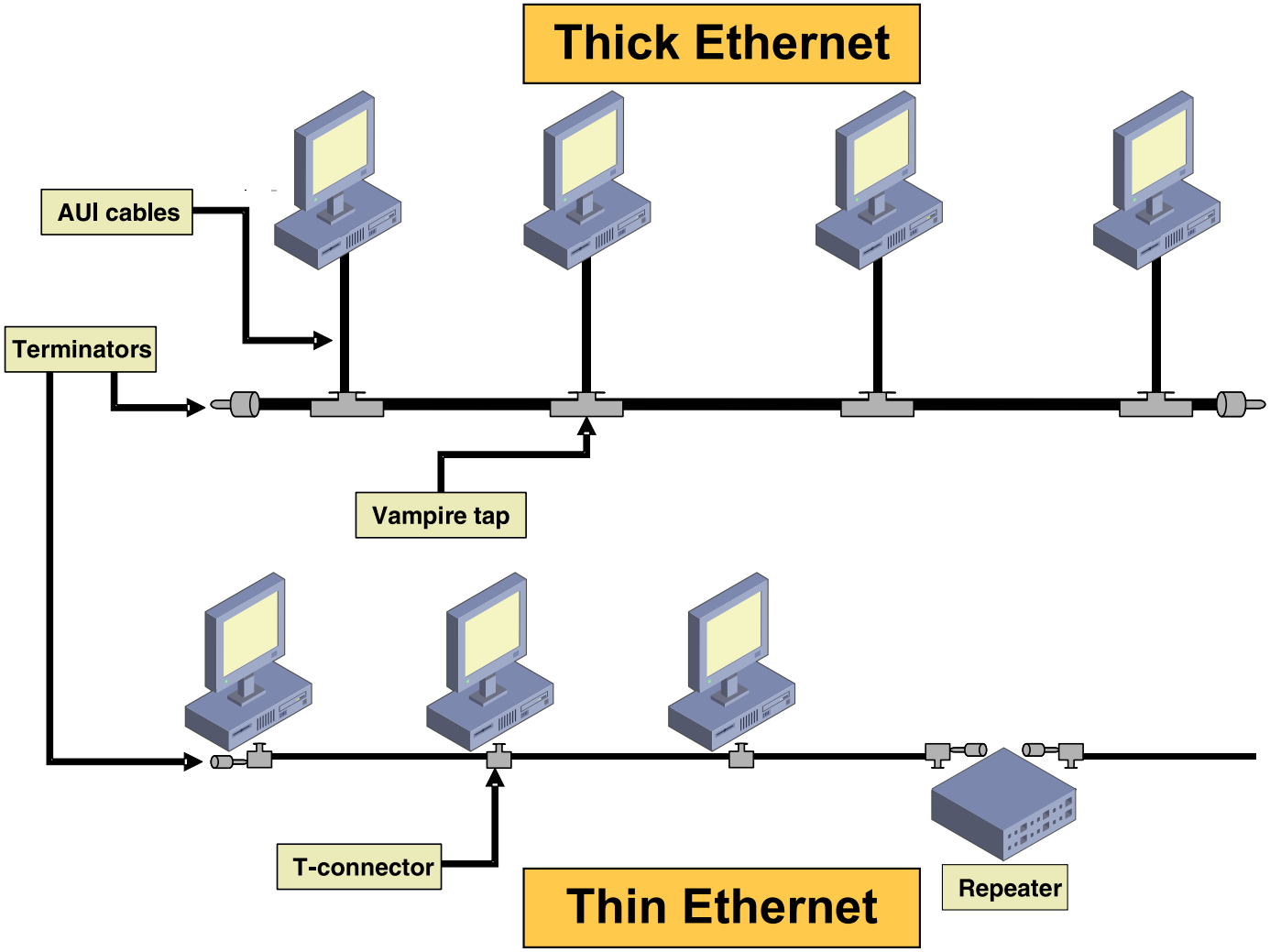
TOPOLOGIES

- There are three main local area network (LAN) topologies:
  - Bus
  - Star
  - Ring
- Other network topologies include:
  - Mesh
  - Wireless

BUS TOPOLOGY

- The bus topology supports thick and thin coaxial segments.
- Segments are connected by repeaters.
- The bus topology uses the baseband signaling method.
- Signals are broadcast in both directions simultaneously.
- Both ends of each segment require termination to avoid reflection.
- End systems connect to the segment in a linear manner.

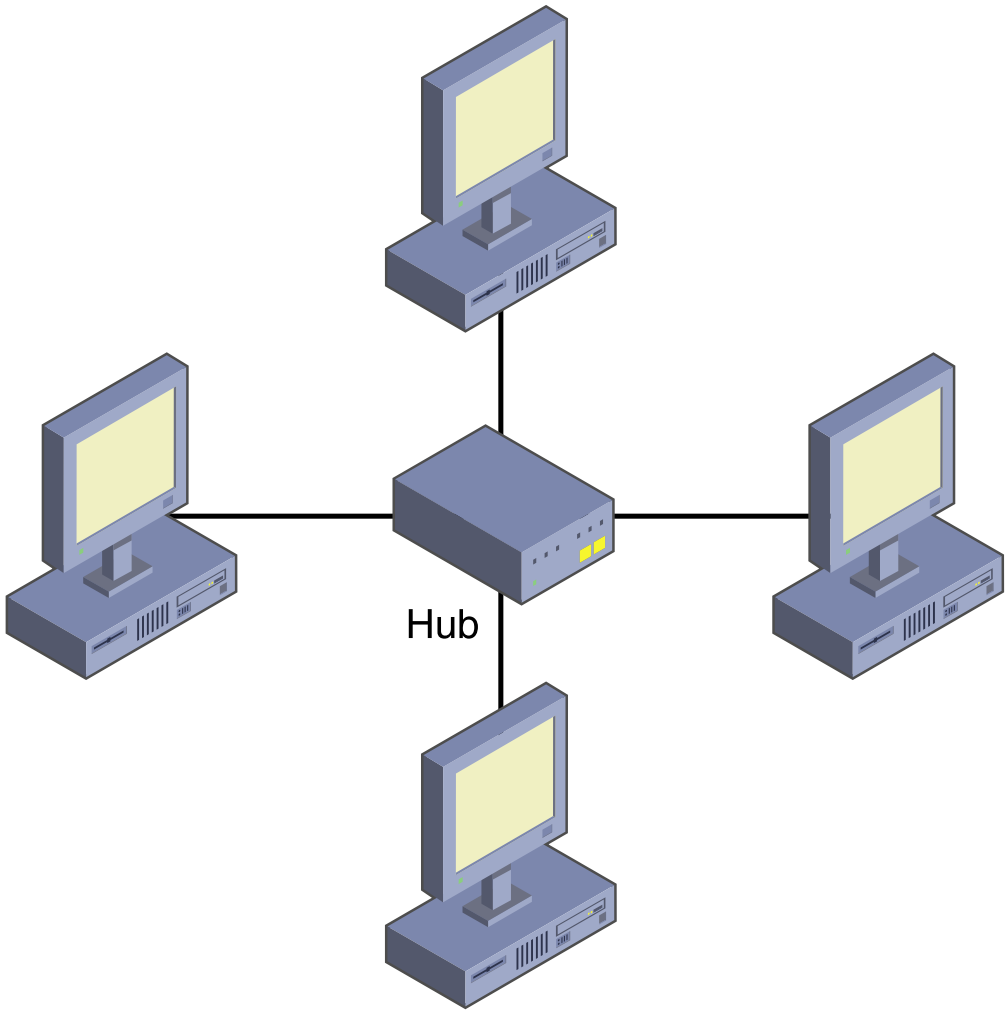
THICK AND THIN COAXIAL BUS



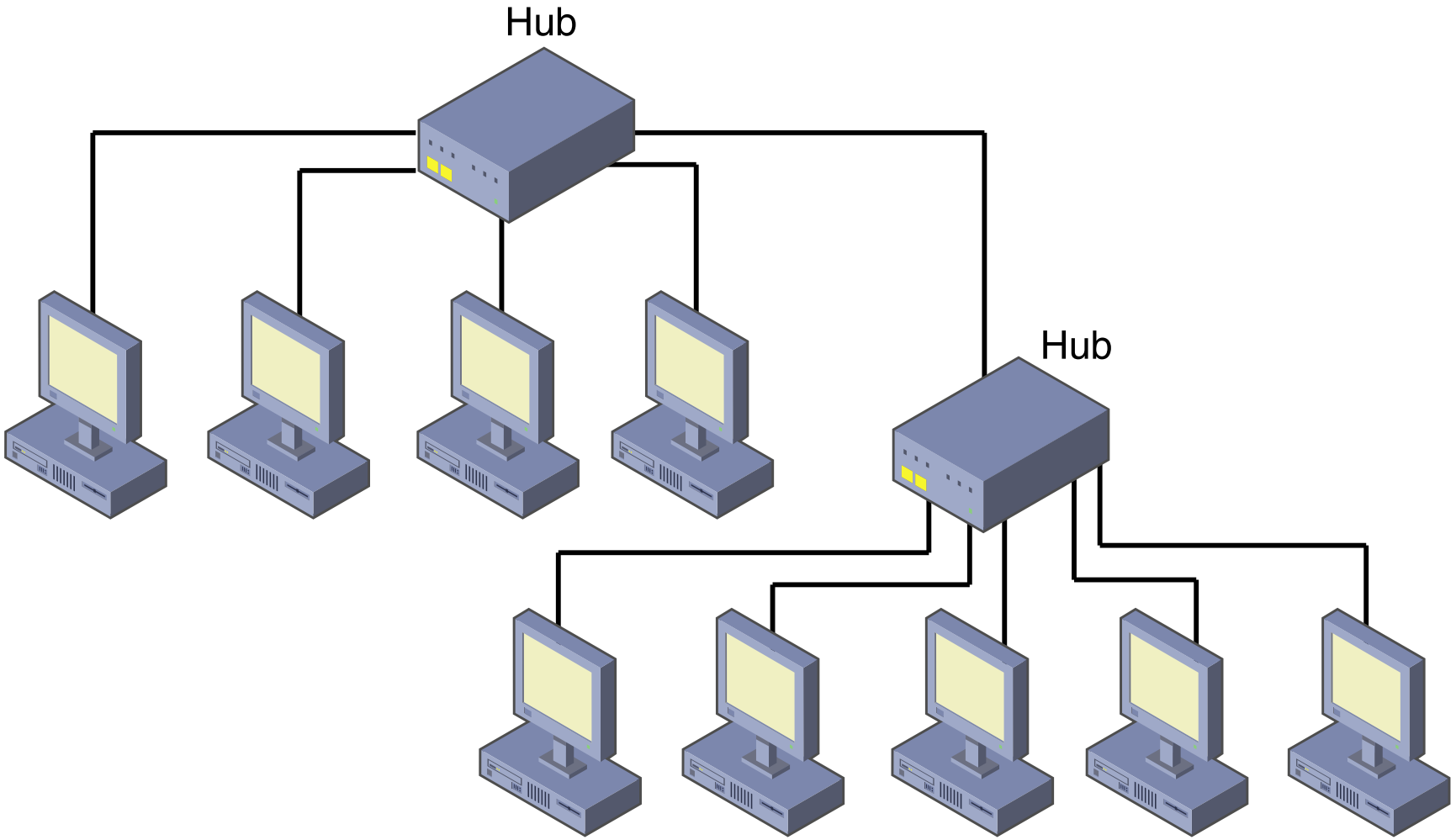
STAR TOPOLOGY

- The star topology can use coaxial, twisted pair, or fiber optic cable.
- A central device (hub) connects hubs and nodes to the network.
  - Each node connects to its own dedicated port on the hub.
  - Hubs broadcast transmitted signals to all connected devices.
  - You can connect multiple hubs to form a hierarchical star topology.
- The star topology uses the baseband signaling method.

A SIMPLE STAR TOPOLOGY



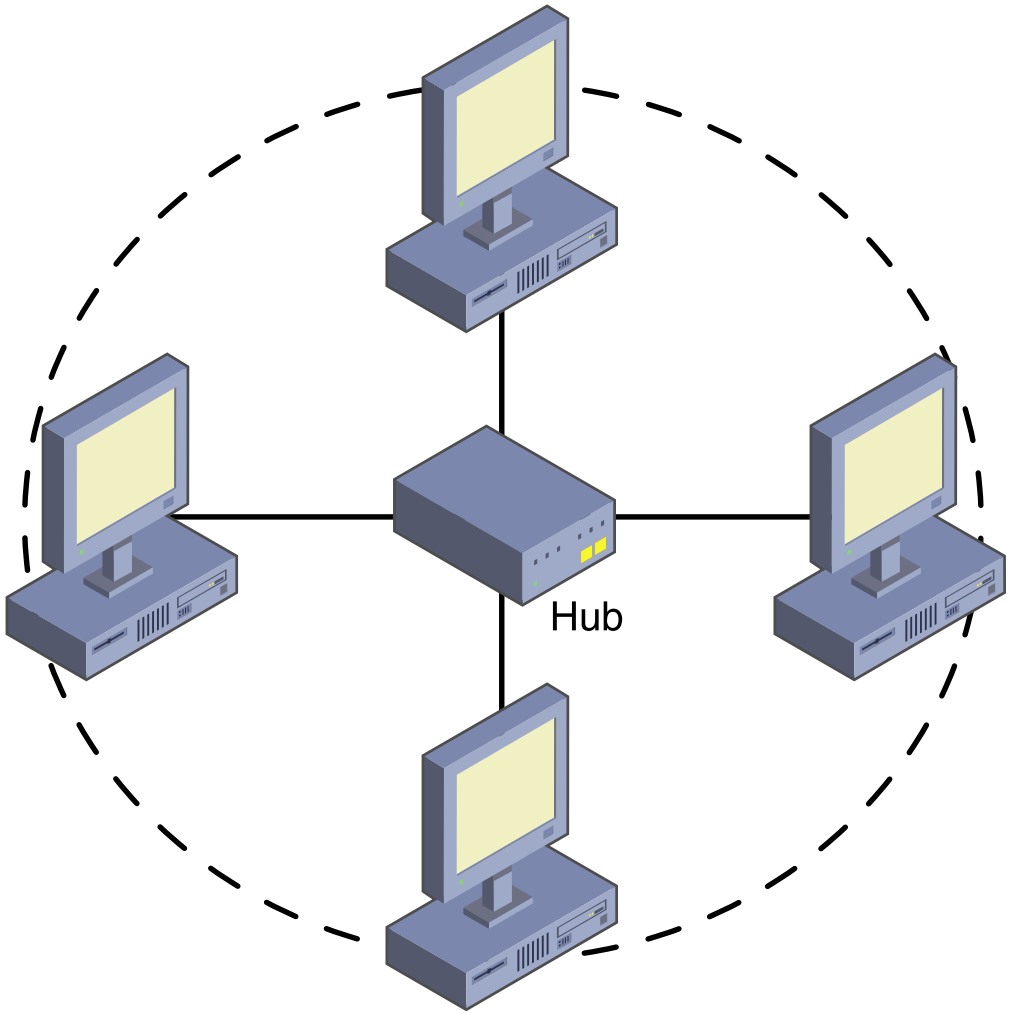
A HIERARCHICAL STAR TOPOLOGY



RING TOPOLOGY

- The ring topology can use twisted pair or fiber optic cabling.
- A central device (hub) connects hubs and nodes to the network.
  - Each node connects to its own dedicated port on the hub.
  - You can connect multiple hubs to form a larger ring.
- The ring topology uses the baseband signaling method.
- Frames are transmitted around the ring from node to hub to node.
- Media Access Control (MAC) is used for token passing.

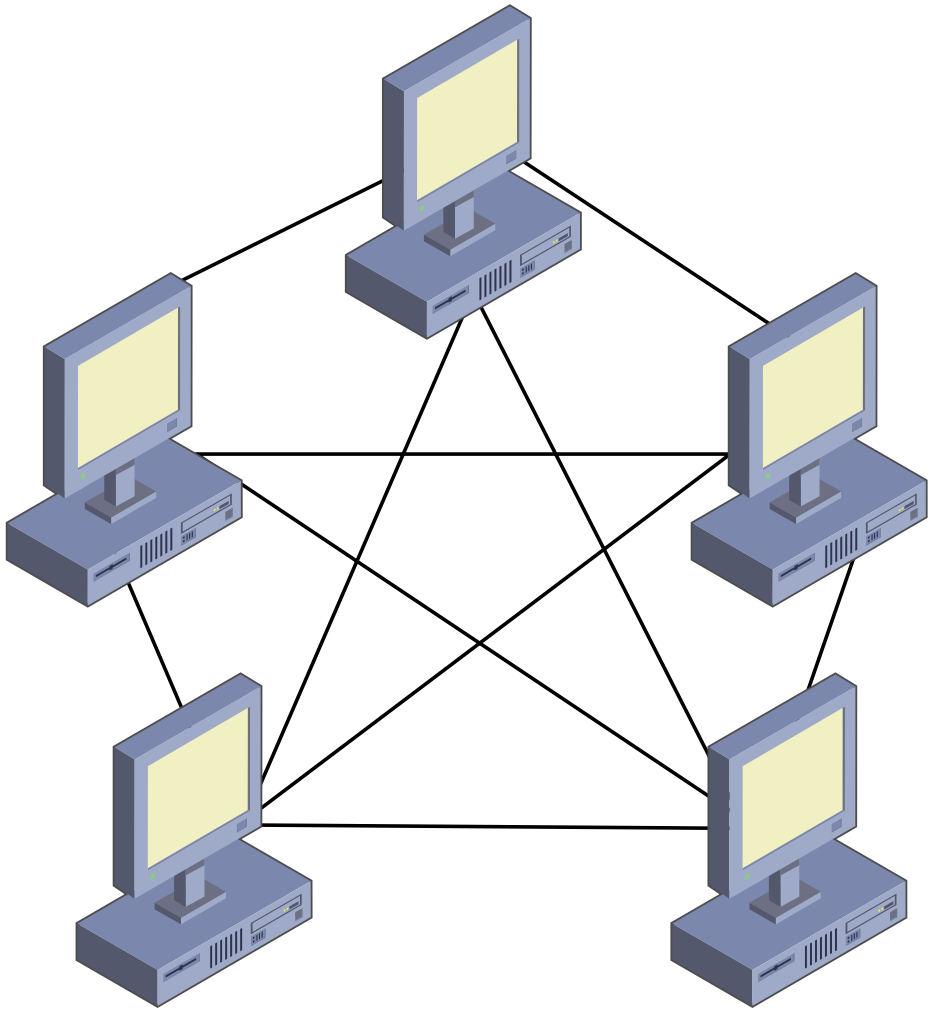
A RING NETWORK



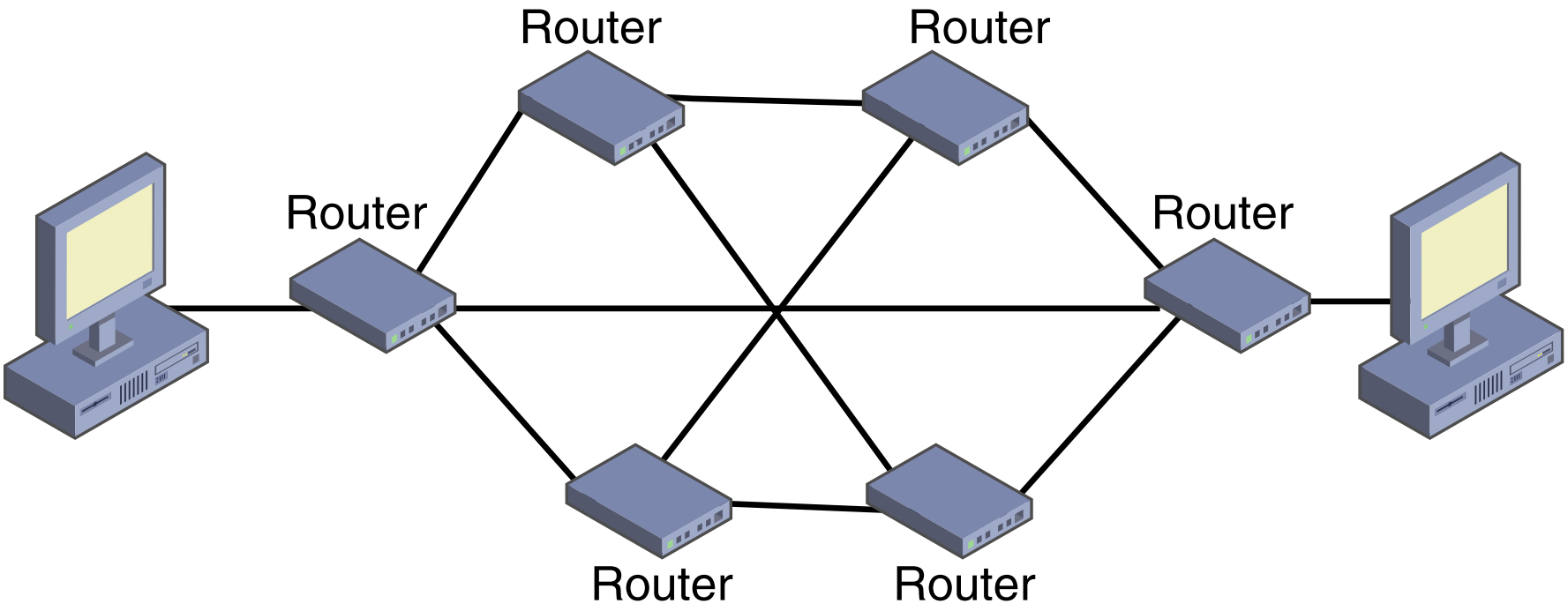
MESH TOPOLOGY

- Typically uses fiber optic cabling for redundant wide area network (WAN) links
- Provides multiple paths to destinations for fault tolerance
- Supports baseband and broadband signals
- Requires an enormous amount of cable

LAN MESH



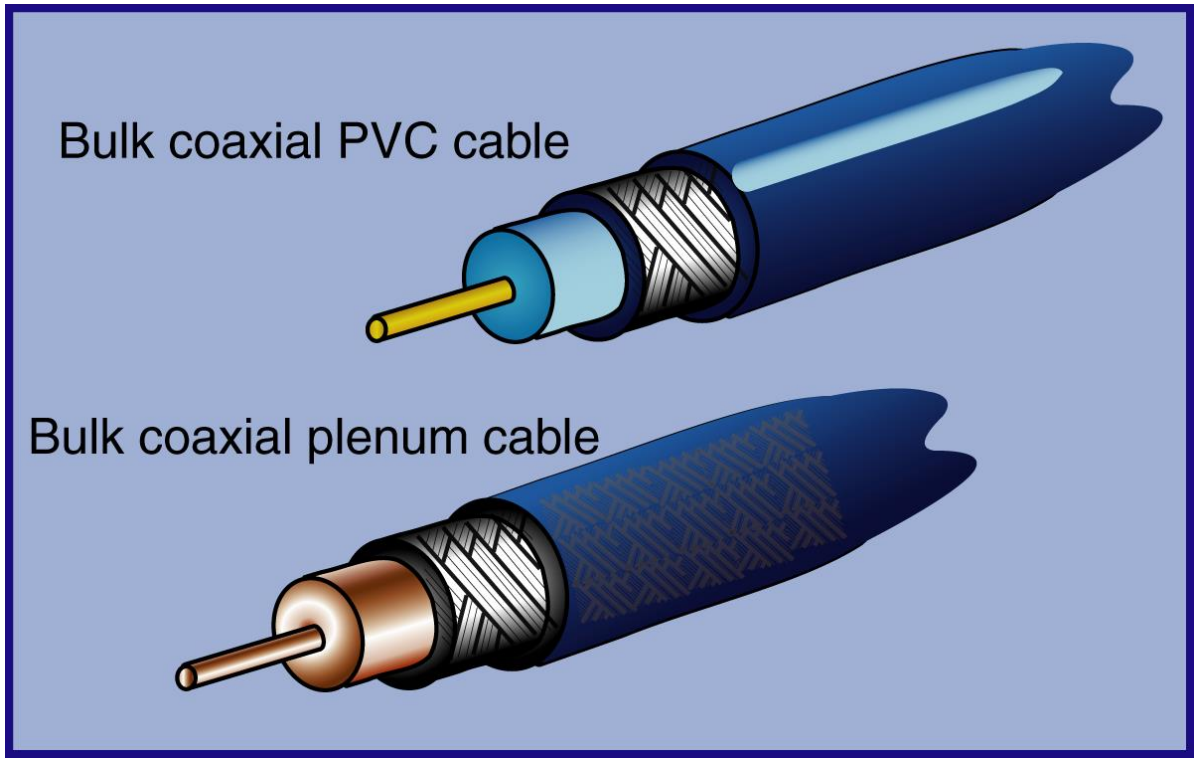
ENTERPRISE MESH



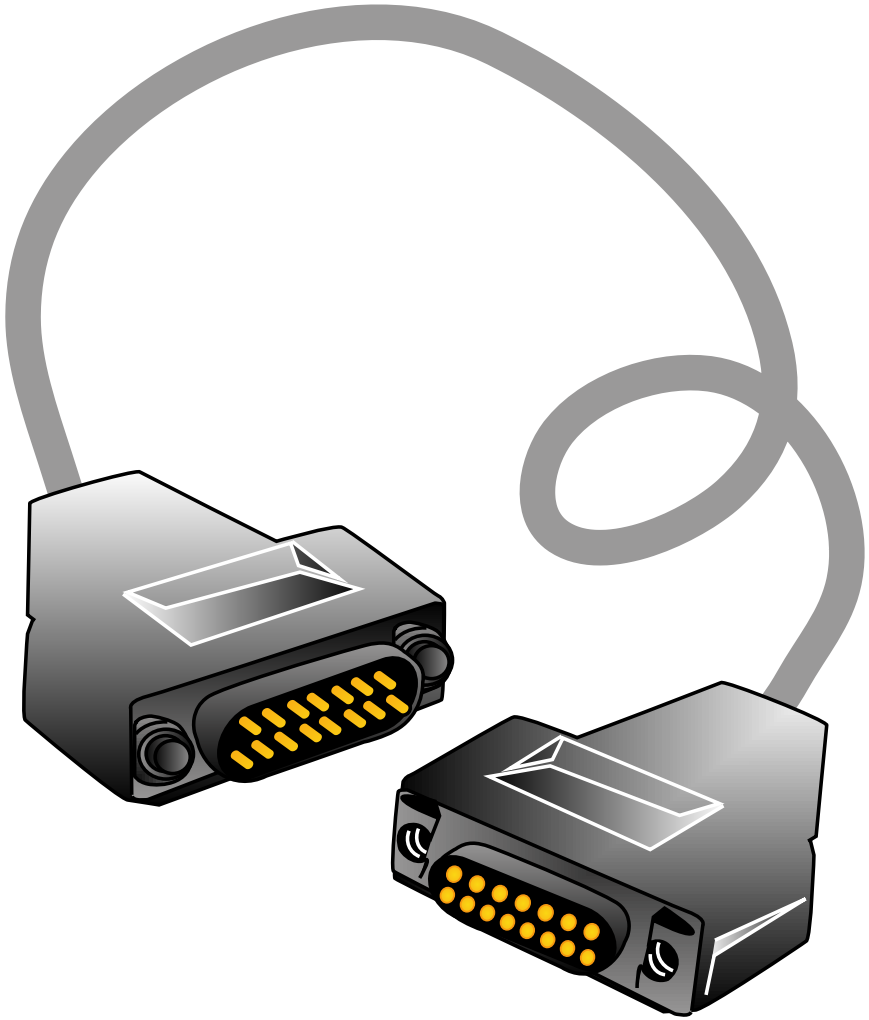
LAN CABLE TYPES

- Three cable types are used in LANs:
  - Coaxial
  - Twisted pair
  - Fiber optic

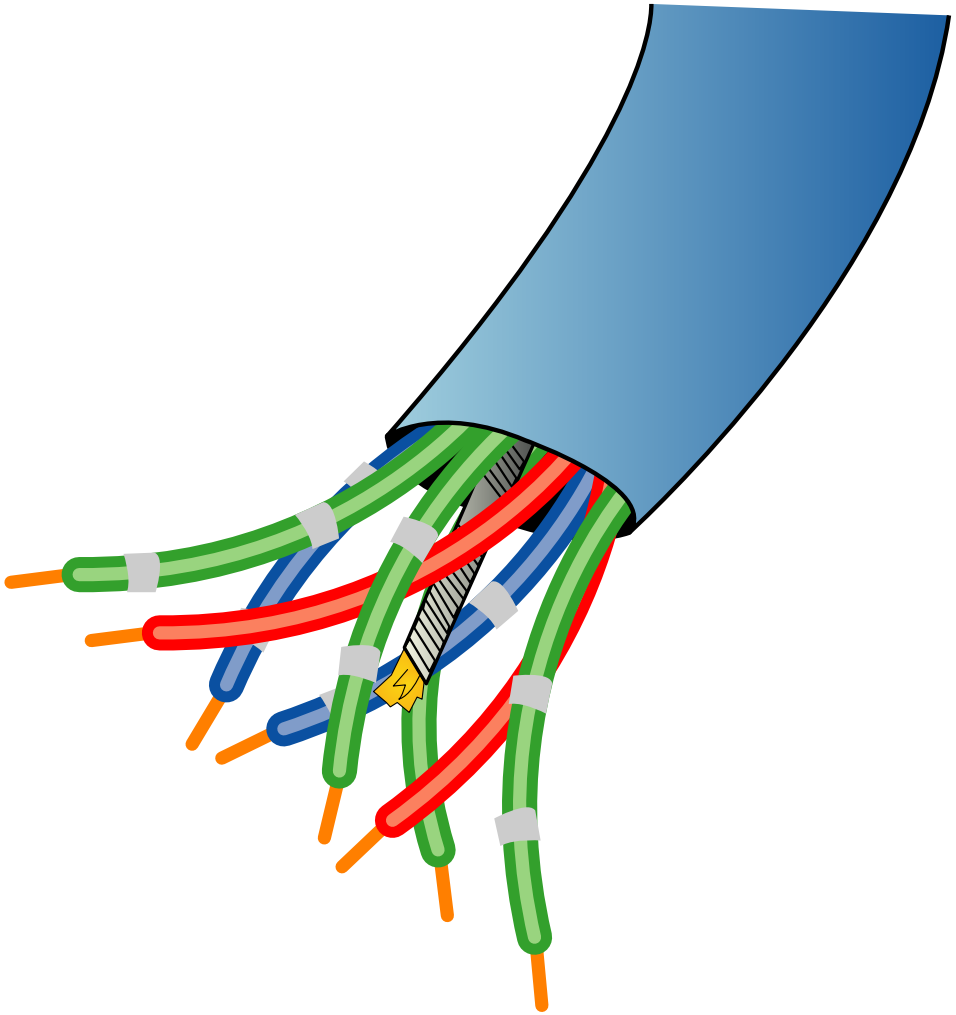
COAXIAL CABLE



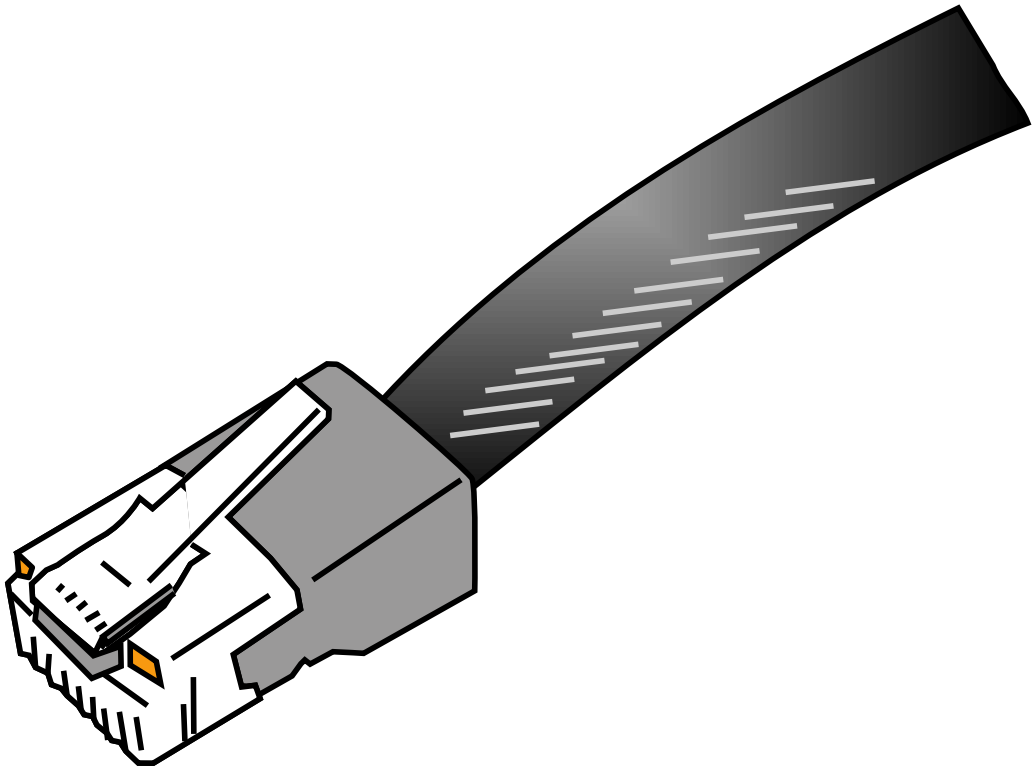
AUI (ATTACHMENT UNIT INTERFACE) CABLE



UNSHIELDED TWISTED PAIR (UTP) CABLE



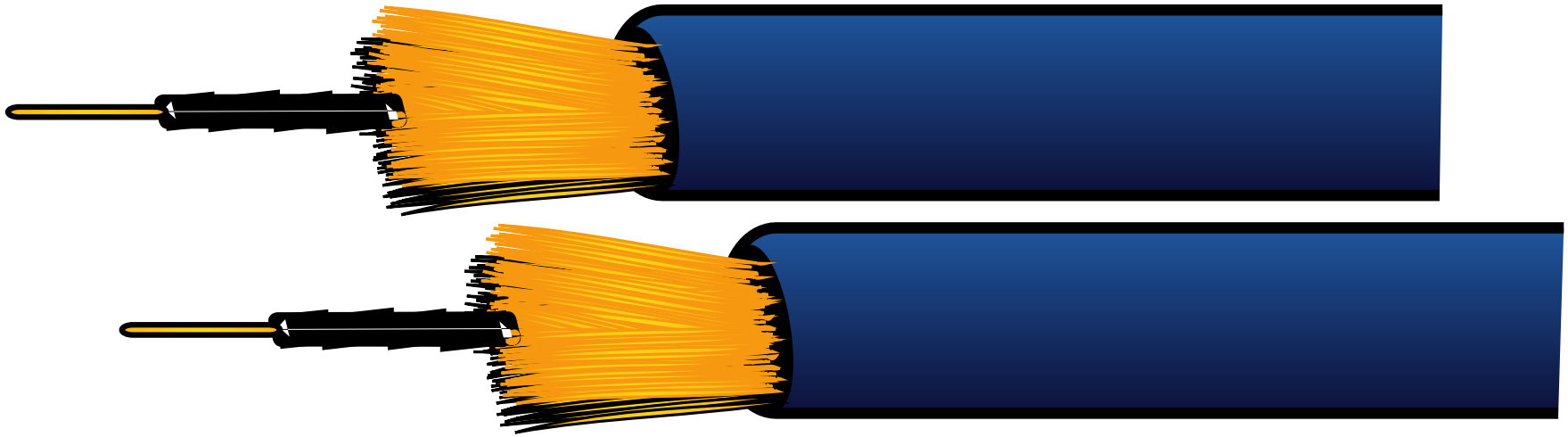
UTP CONNECTORS



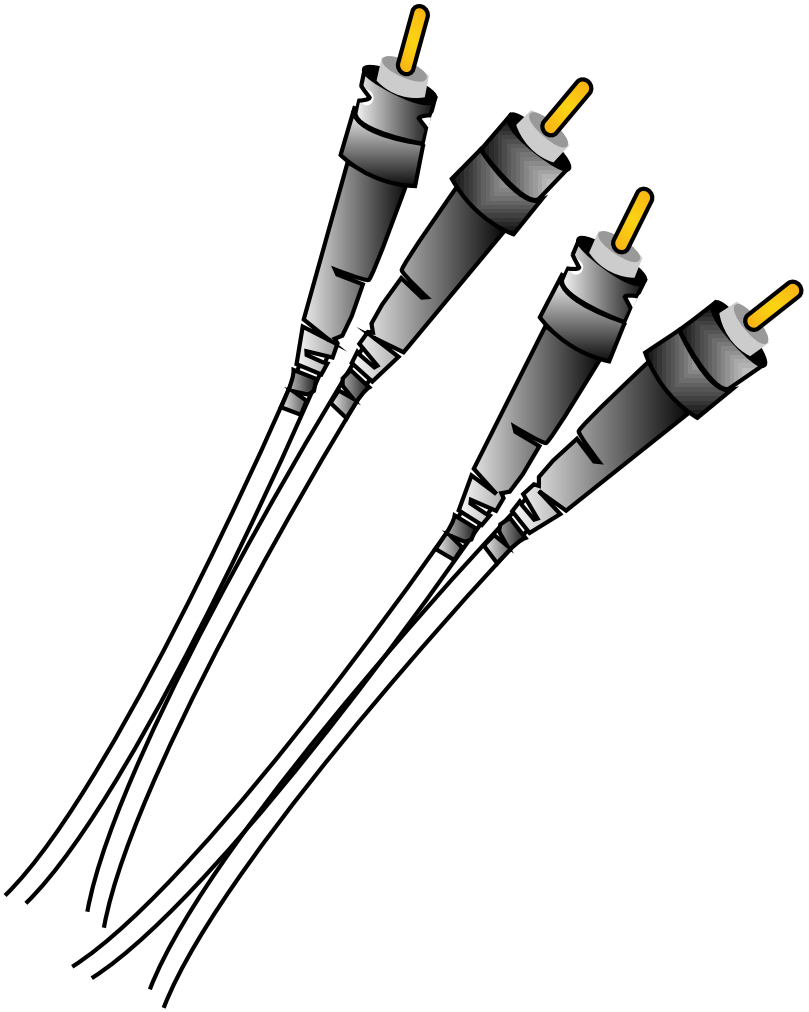
UTP CABLE GRADES

UTP Categories - Copper Cable				
UTP Category	**Data Rate**	**Max. Length**	**Cable Type**	**Application**
CAT1	Up to 1Mbps	-	Twisted Pair	Old Telephone Cable
CAT2	Up to 4Mbps	-	Twisted Pair	Token Ring Networks
CAT3	Up to 10Mbps	100m	Twisted Pair	Token Rink & 10BASE-T Ethernet
CAT4	Up to 16Mbps	100m	Twisted Pair	Token Ring Networks
CAT5	Up to 100Mbps	100m	Twisted Pair	Ethernet, FastEthernet, Token Ring
CAT5e	Up to 1 Gbps	100m	Twisted Pair	Ethernet, FastEthernet, Gigabit Ethernet
CAT6	Up to 10Gbps	100m	Twisted Pair	GigabitEthernet, 10G Ethernet (55 meters)
CAT6a	Up to 10Gbps	100m	Twisted Pair	GigabitEthernet, 10G Ethernet (55 meters)
CAT7	Up to 10Gbps	100m	Twisted Pair	GigabitEthernet, 10G Ethernet (100 meters)

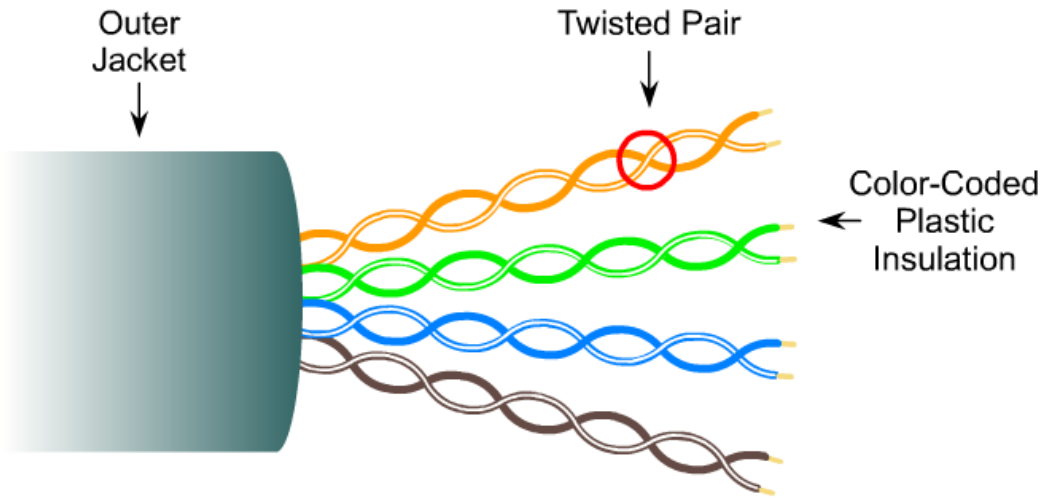
FIBER OPTIC CABLE



STRAIGHT TIP (ST) CONNECTOR



Unshielded Twisted Pair (UTP)



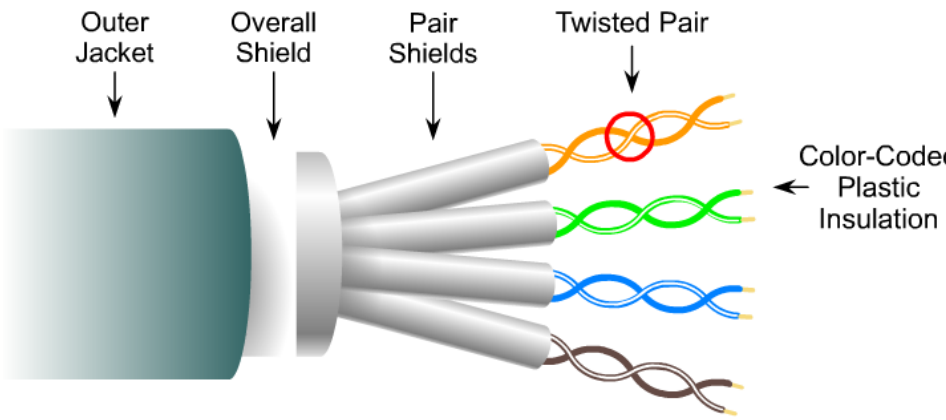
Unshielded Twisted Pair UTP is a four-pair wire medium used in a variety of networks. Each of the eight copper wires in the UTP cable is covered by insulating material.

-Each pair of wires is twisted around each other. This type of cable relies on the cancellation effect produced by the twisted wire pairs to limit signal degradation caused by EMI and RFI.

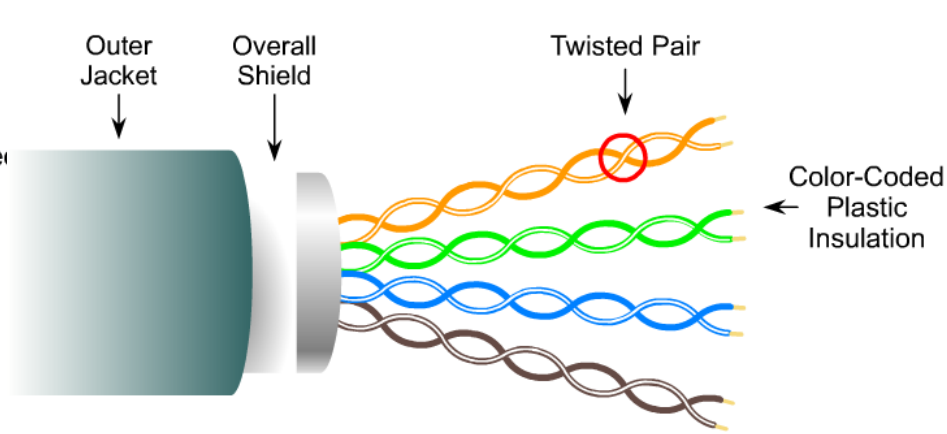
- Reduce crosstalk between the pairs in UTP cable, the number of twists in the wire pairs varies.

Shielded Twisted Pair (STP and ScTP)

STP – Shielded Twisted Pair

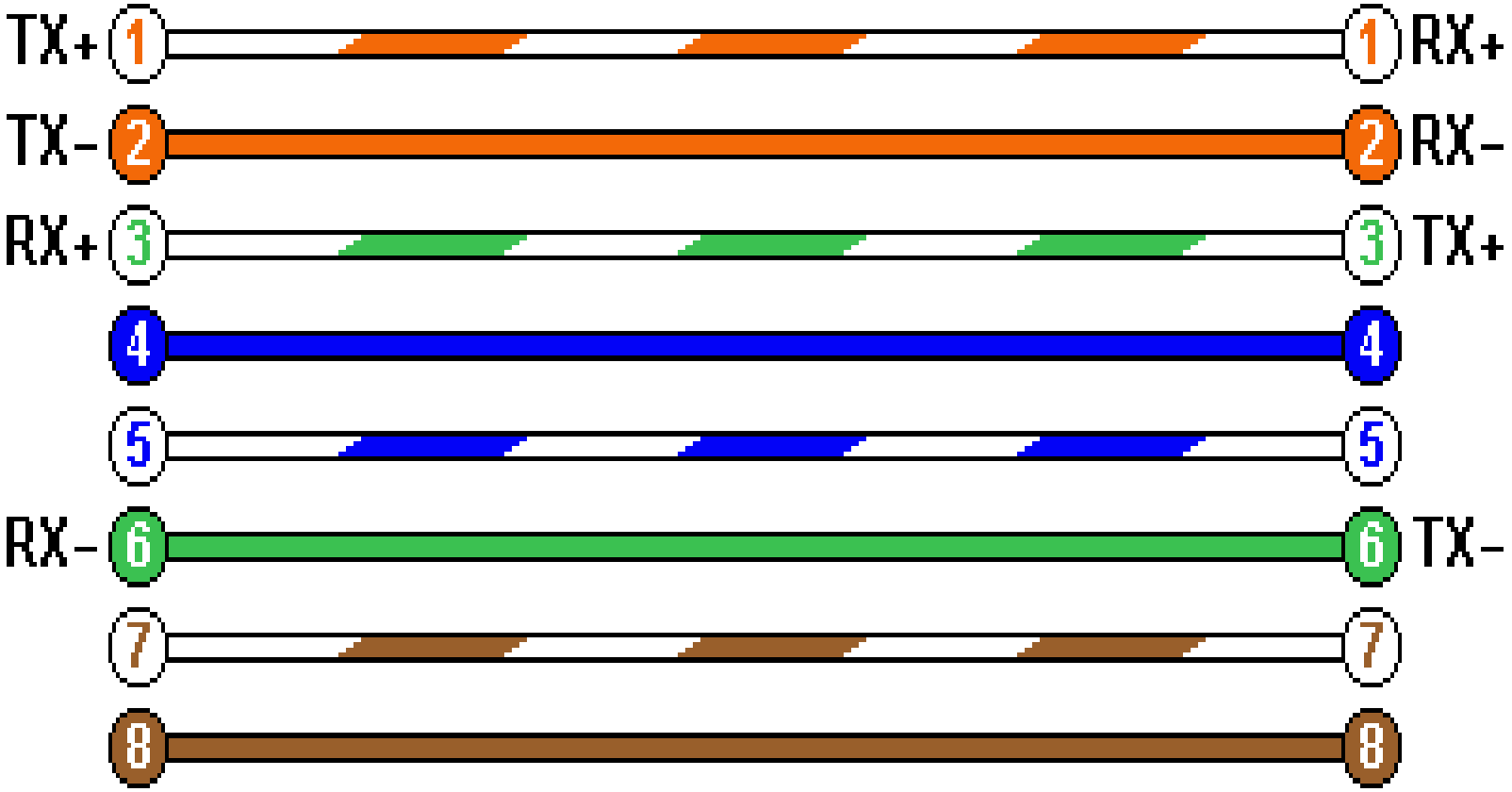


ScTP – Screened Twisted Pair

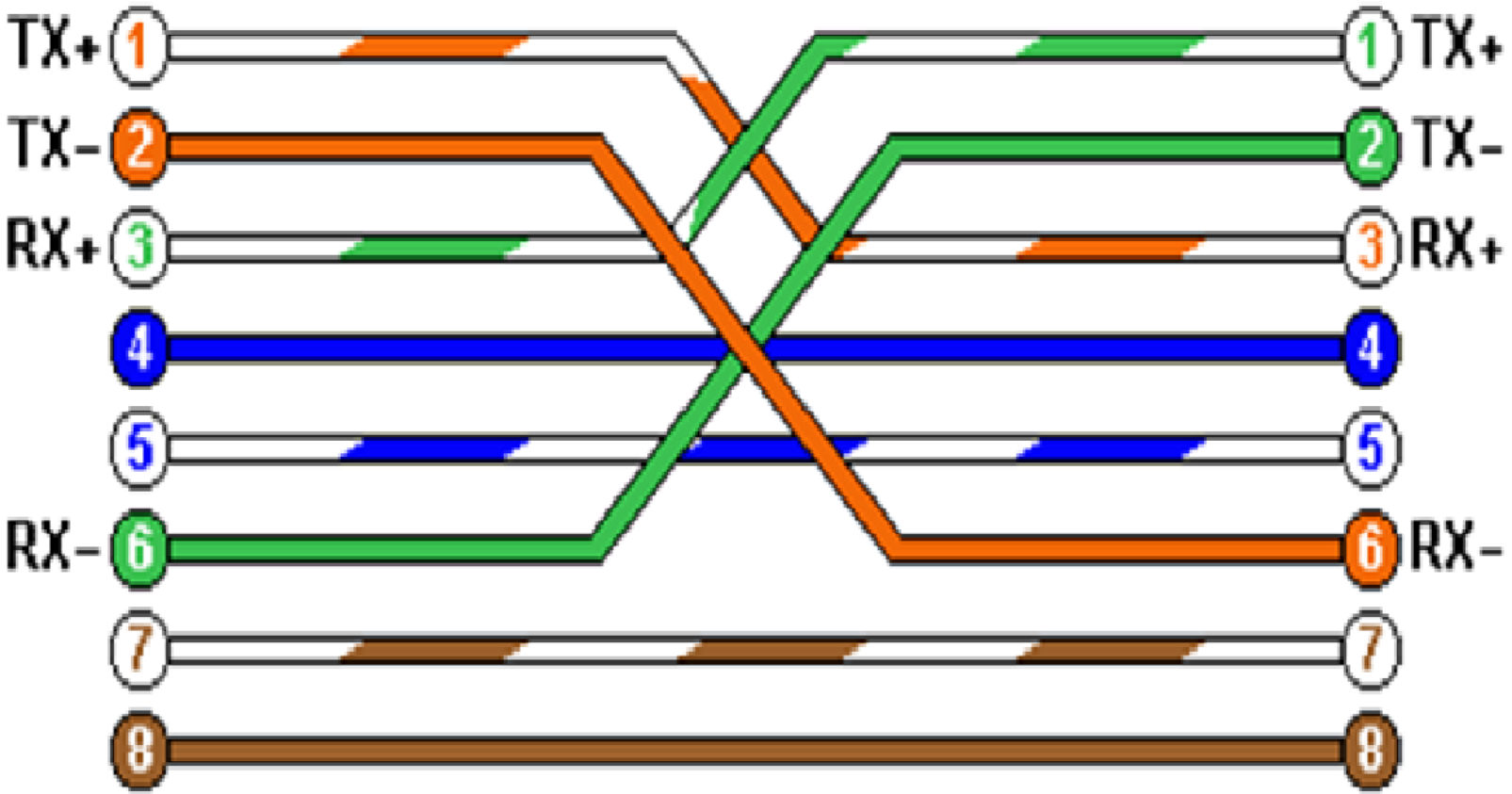


- **Shielded twisted-pair cable (STP)** combines the techniques of shielding, cancellation, and twisting of wires.
  - Each pair of wires is wrapped in metallic foil.
  - The four pairs of wires are wrapped in an overall metallic braid or foil.
- A new hybrid of UTP with traditional STP is **Screened UTP (ScTP),** also known as **Foil Twisted Pair (FTP).**
  - ScTP is essentially UTP wrapped in a metallic foil shield, or screen.

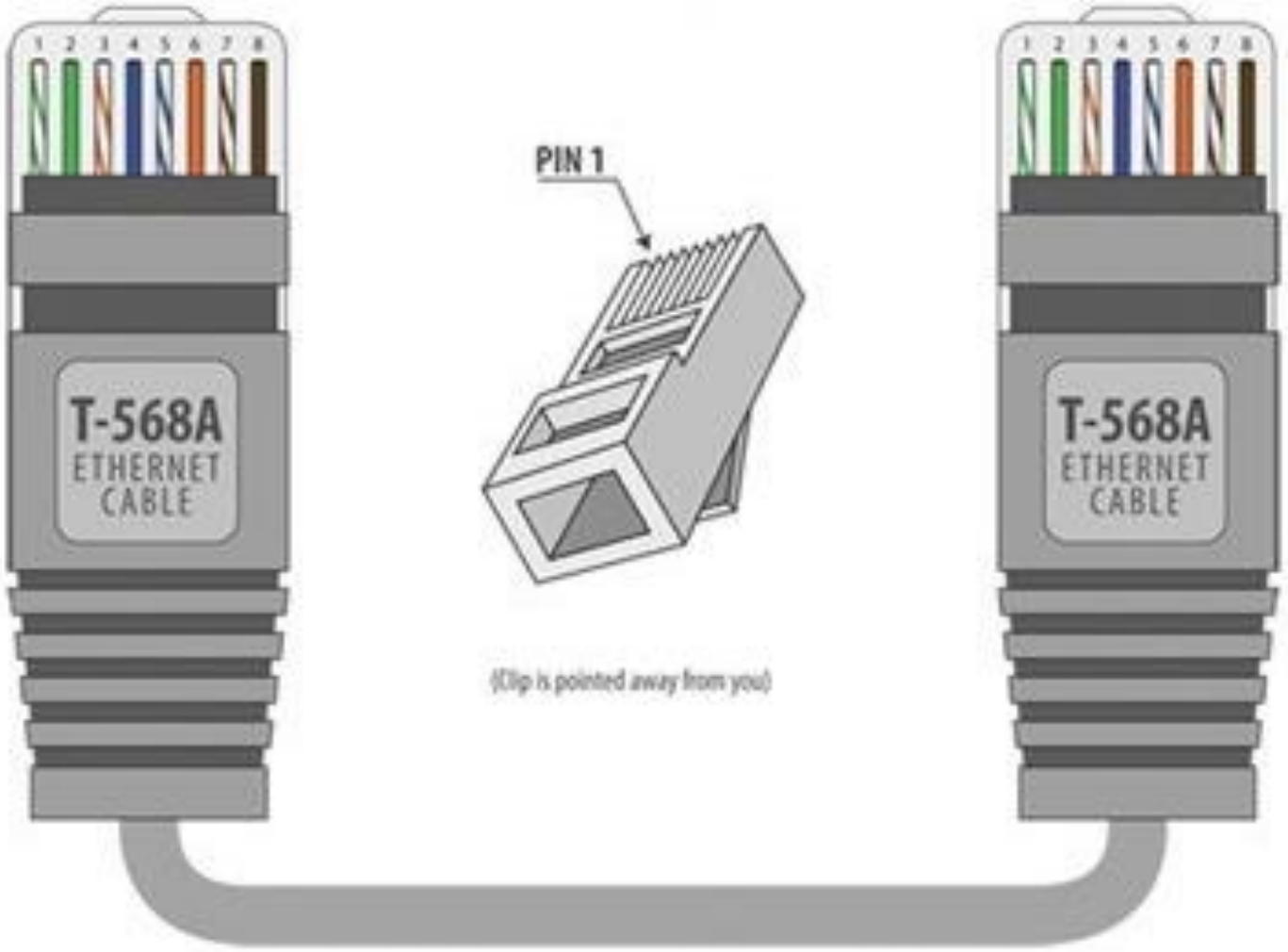
UTP Straight-through Cable



UTP Cross-over Cable



Wiring-Diagram



Straight or Crossover

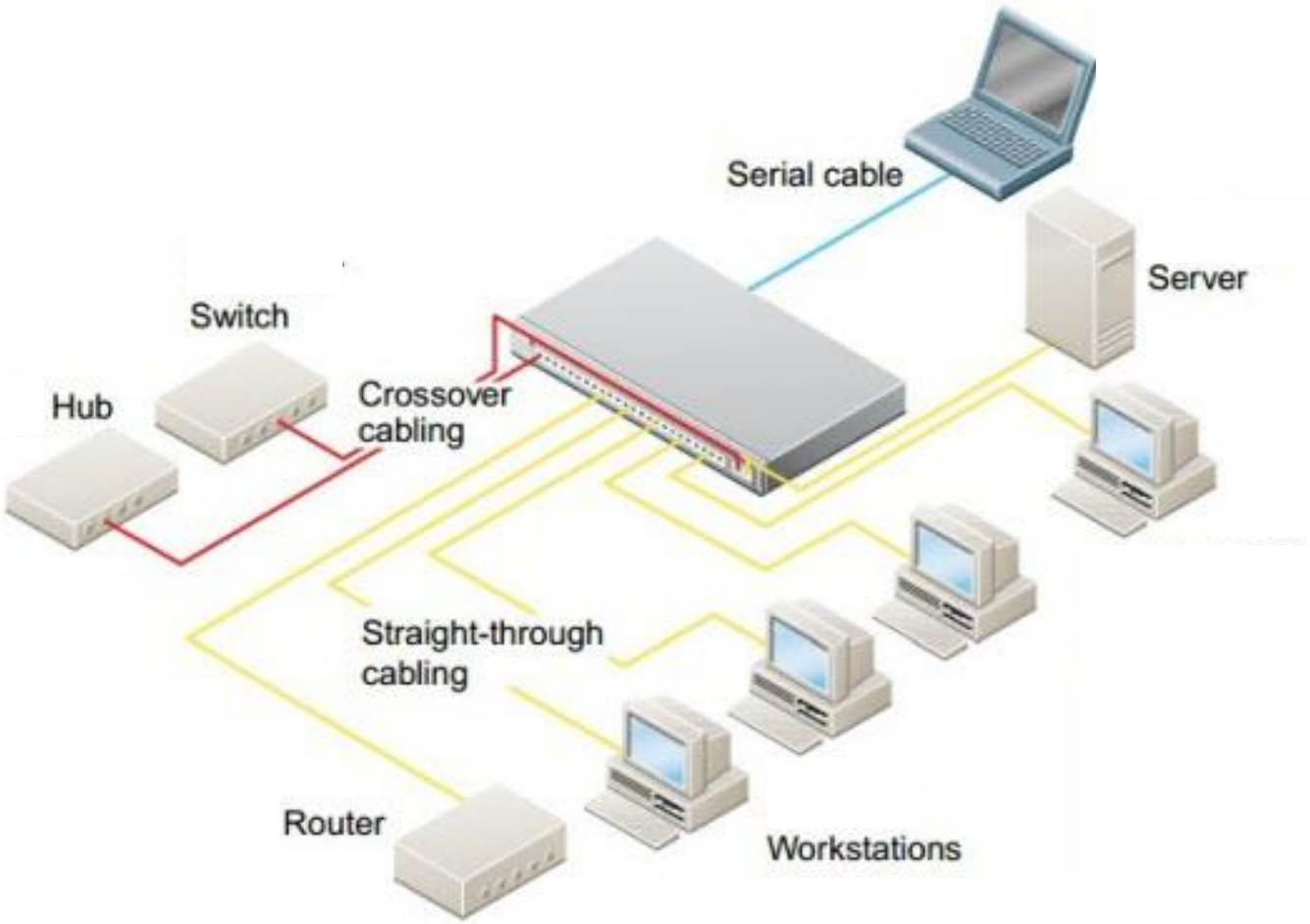
Use straight-through cables for the following cabling:

- **Switch to router**
- **Switch to PC or server**
- **Hub to PC or server**

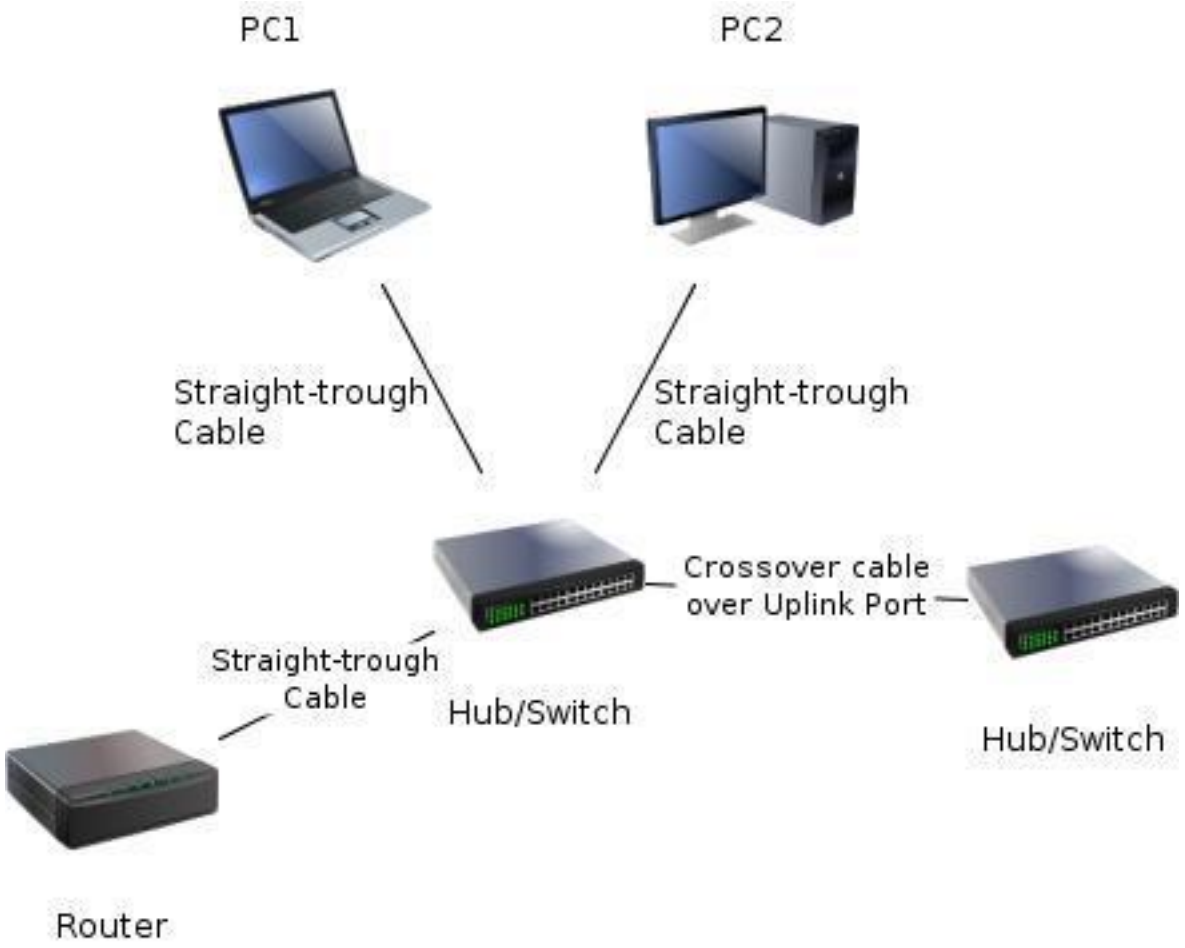
Use crossover cables for the following cabling:

- **Switch to switch**
- **Switch to hub**
- **Hub to hub**
- **Router to router**
- **PC to PC**
- **Router to PC**

Straight or Crossover



Straight or Crossover



Twisted Pair - Applications

- Most common medium
- Telephone network
  - Between house and local exchange
- For local area networks (LAN)
  - 10Mbps or 100Mbps

Twisted Pair - Properties

- Cheap
- Easy to work
- Low data rate
- Short range

How To Make Ethernet Cable - Straight Through & Crossover

- https://www.youtube.com/watch?v=Uw8FSXx4dnU&list=PLHBld7nDHwgsbZ9tLRSbPF4OZDQBthcpA&index=3