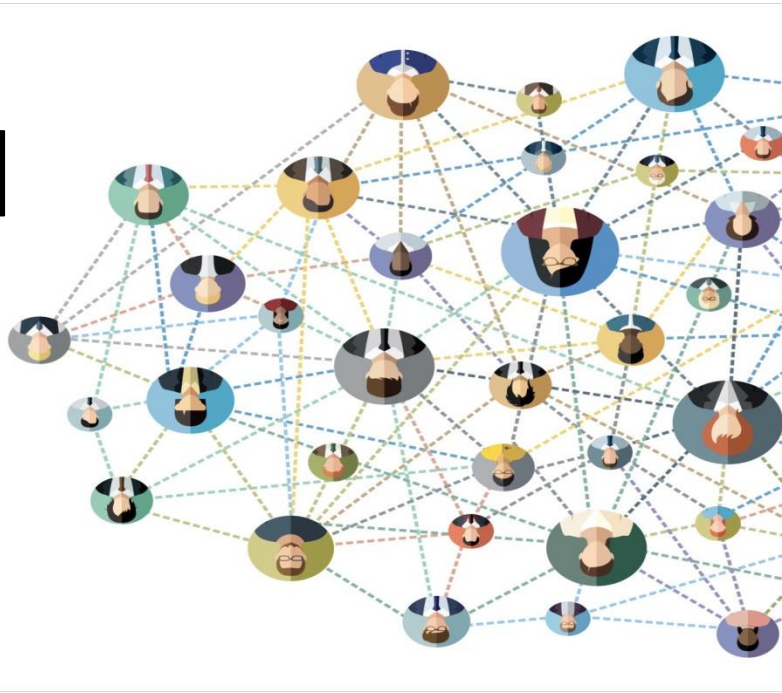
Basic Networking Course

Training Center- ITCSD

What is Network and Networking?



Network Fundamentals

In network, basic two aspects

(i) Entities – information or resources want to be shared.

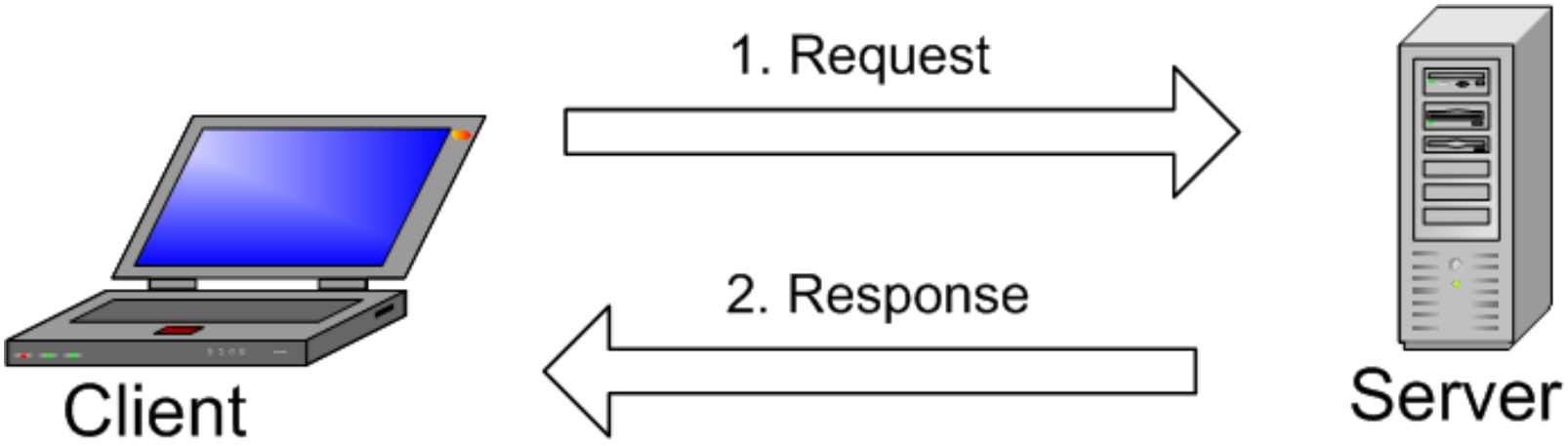
(ii) Media – enables to communicate entities

(eg, cable or wireless)

Basic Network Components

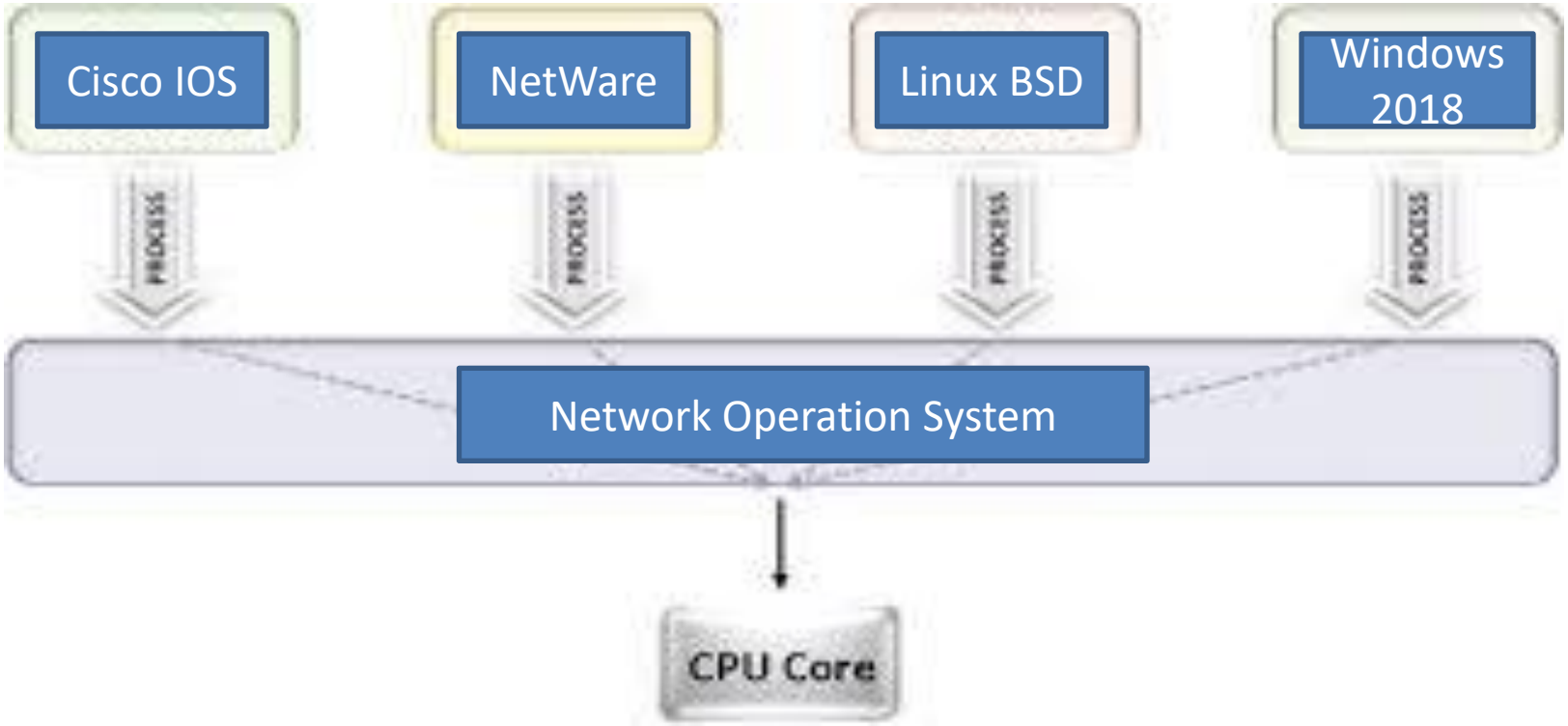
- Computing Devices (Clients/Servers)
- Network Interface Card (NIC)
- Transmission Media (eg. Hub, Bridge, Repeater, Switch, Router, Access Point, Modem, etc)
- Transmission Media (Cables)
- Network Security Devices (eg. Firewall, IPS, IDS)
- Network Protocol
- Network Address

Client/Server

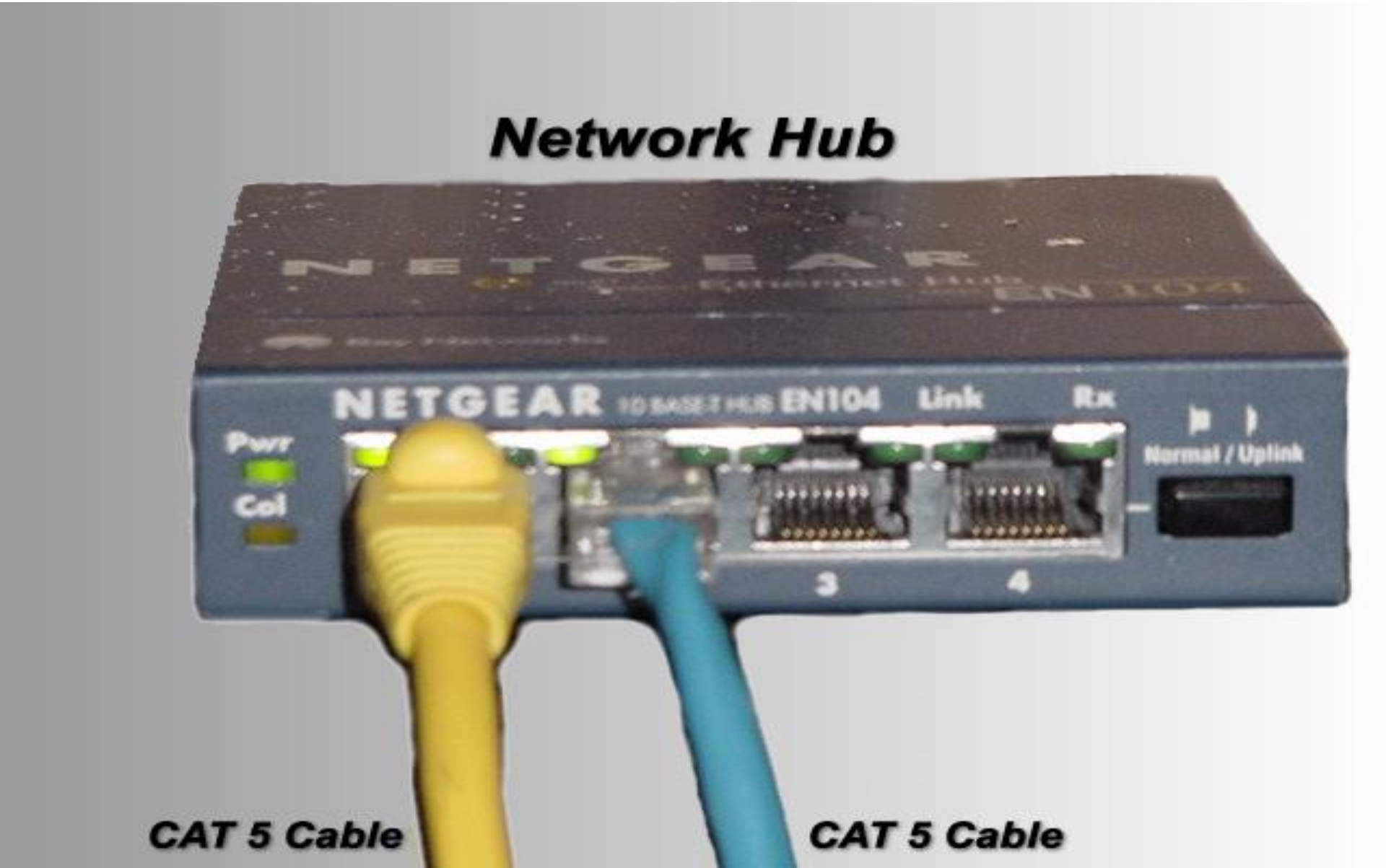


Network Interface Card (NIC)

Network Operating System



Hub

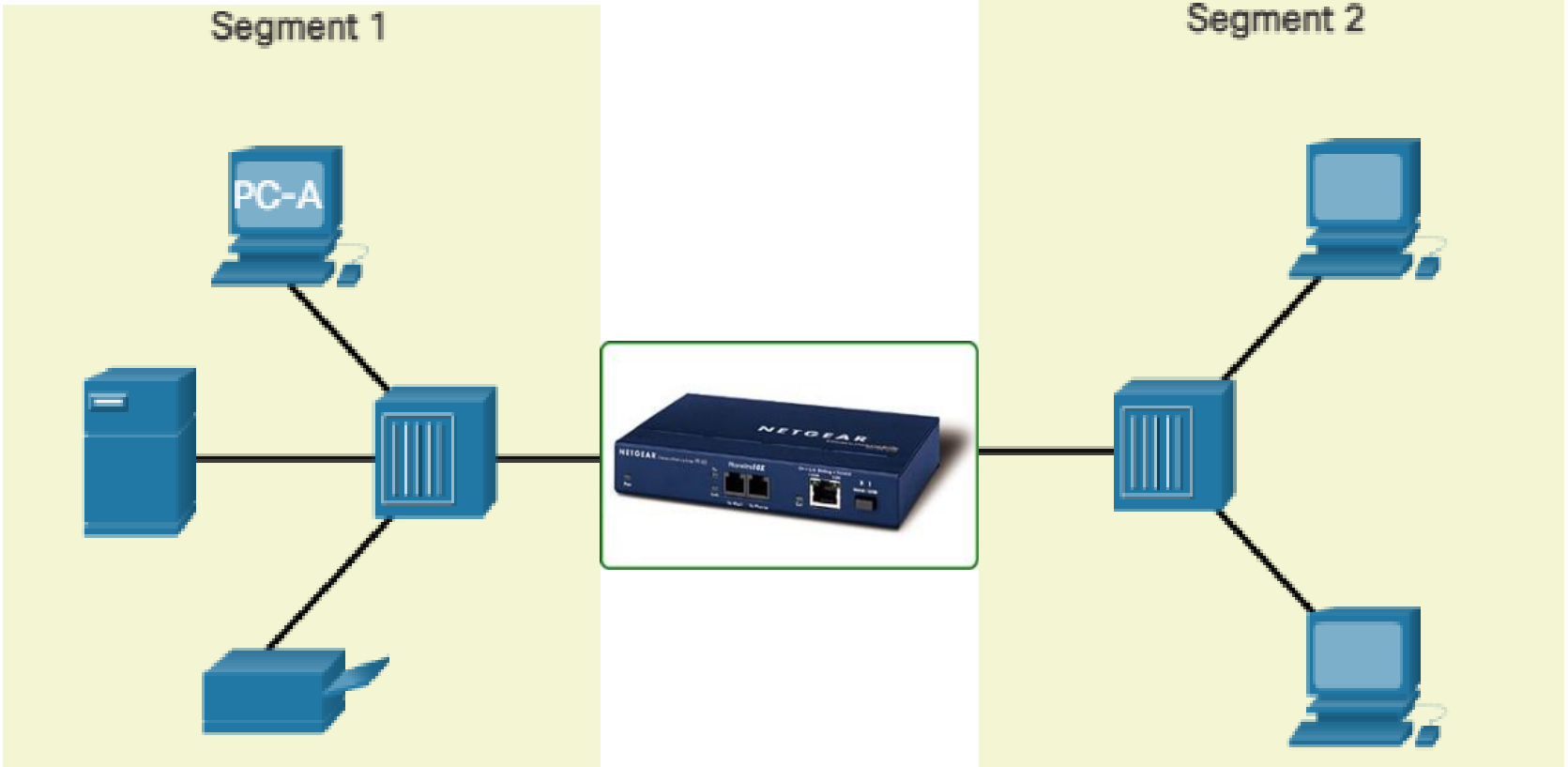

Network Hub
NETGEAR
NETGEAR 10 BASE-T HUB EN104
Pwr
Col
Link
Rx
Normal / Uplink
3
4
CAT 5 Cable
CAT 5 Cable

Repeater

- Regenerate the signal
- Implies the signal from one port to another
- Increase the length of signal

Bridge

- Separate collision domain
- Inspects each incoming frame
- Make forward decisions learning MAC



Switches

Manageable Switch

Unmanageable Switch

Modular Switch

Multilayer Switch

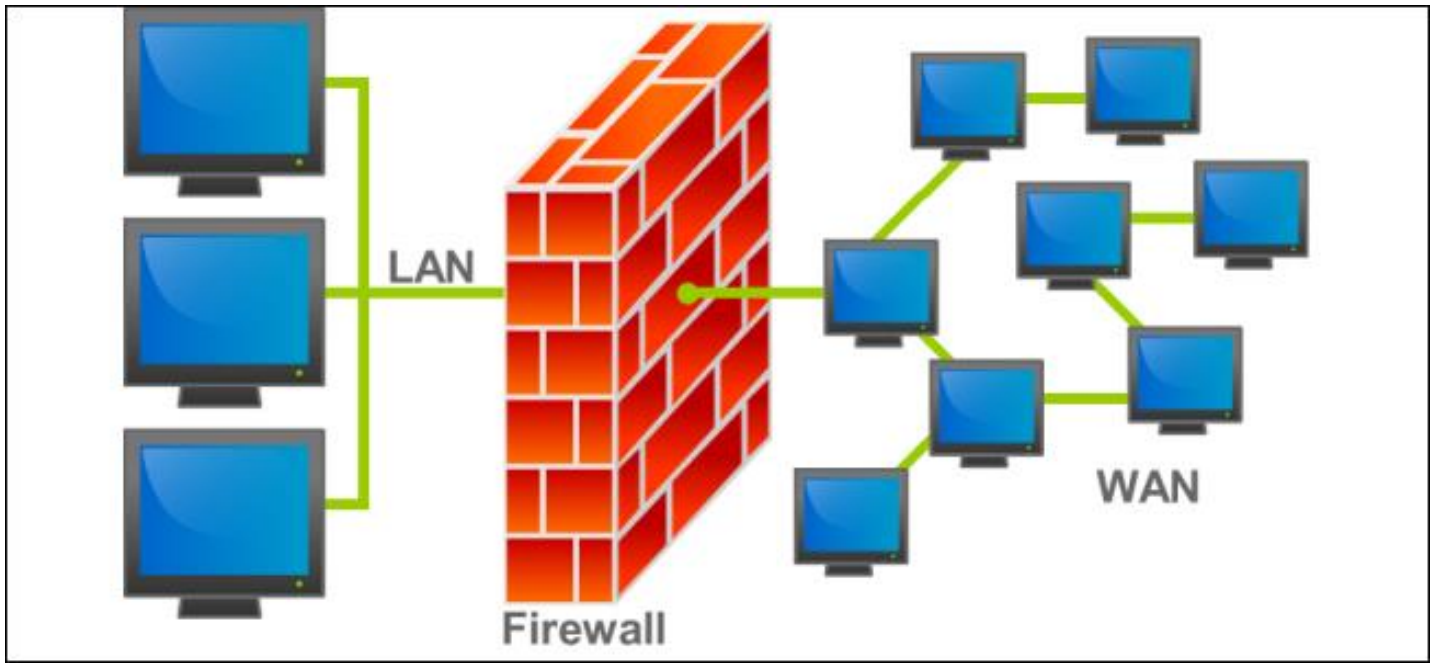
Routers

SOHO Router

Enterprise Router

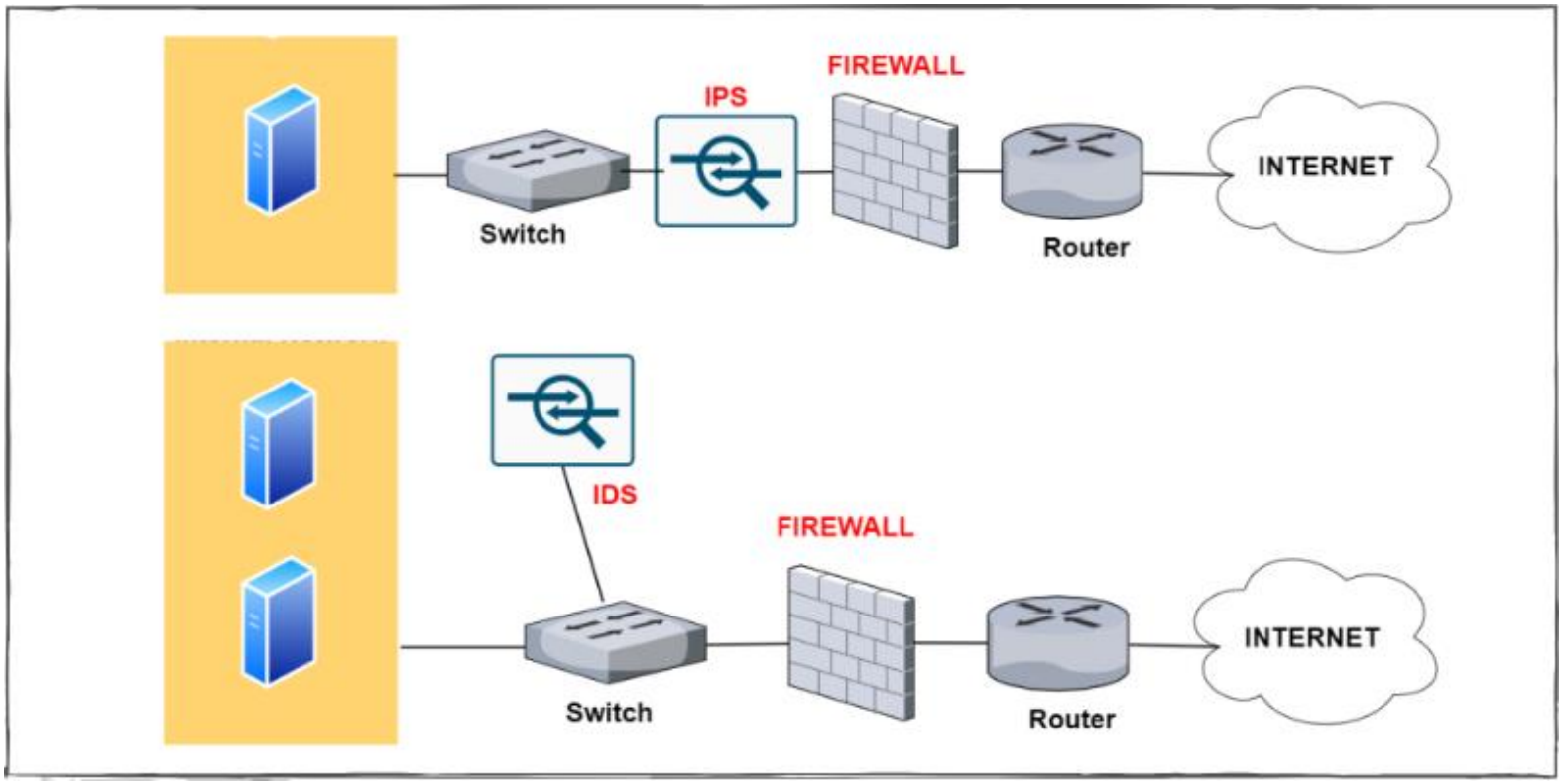
Access Point

Firewall



- A demilitarized zone (DMZ) is a network that keep servers and provides services to an untrusted network
- Firewall prevent traffic from untrusted network to DMZ
- Firewall uses ACL to permit or deny access to network
- Internal operation system firewall, windows defender firewall

Intrusion Detection/Prevention

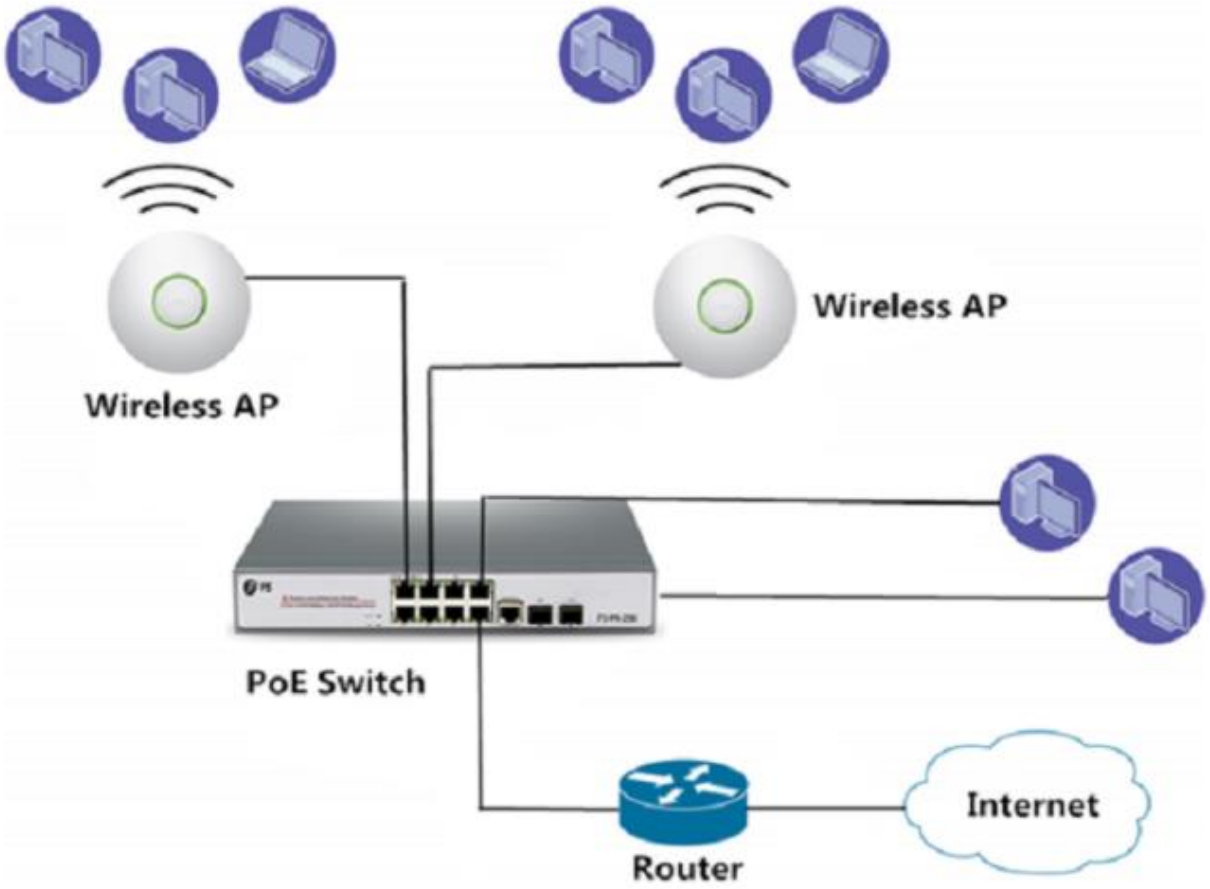


IDS	IPS
Copy the traffic streams and analyze the copied traffic	Analyze the real time traffic and allow/block the packets
Allow the malicious traffic	Doesn't allow malicious traffic and

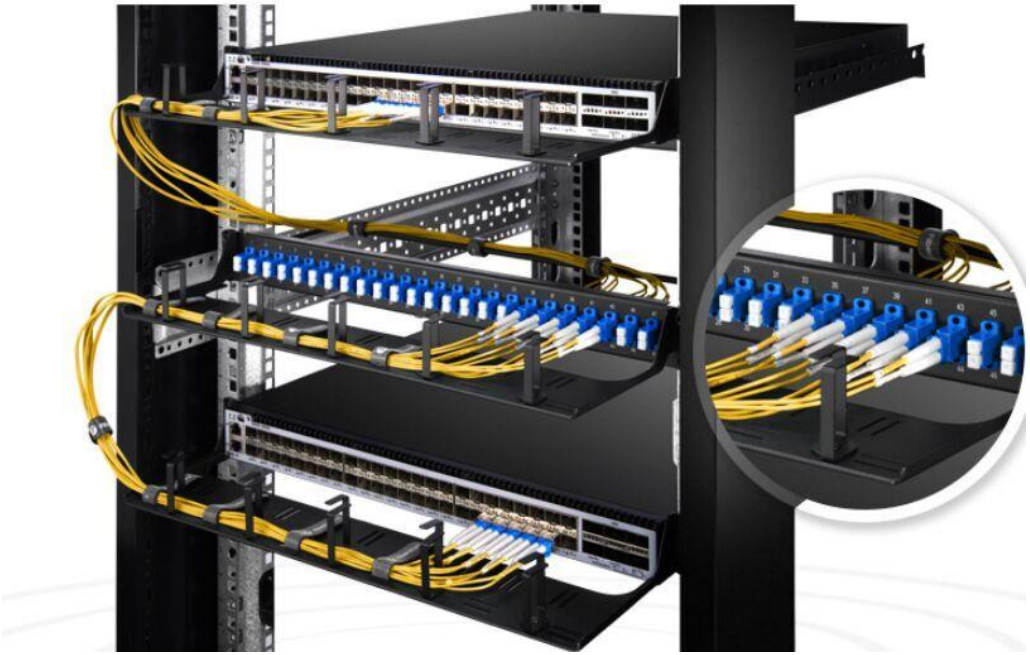
Universal Threat Management

- All–in–one security appliance.
- Features are vendor–specific but could include firewall services, IDS/IPS services
- Additional security services against
  - Denial of Service (DOS)
  - Distributed Denial of Service (DDoS)
  - Spyware
  - Proxy and email filtering
  - Network access control and VPN services.

PoE Switch / PoE Injector



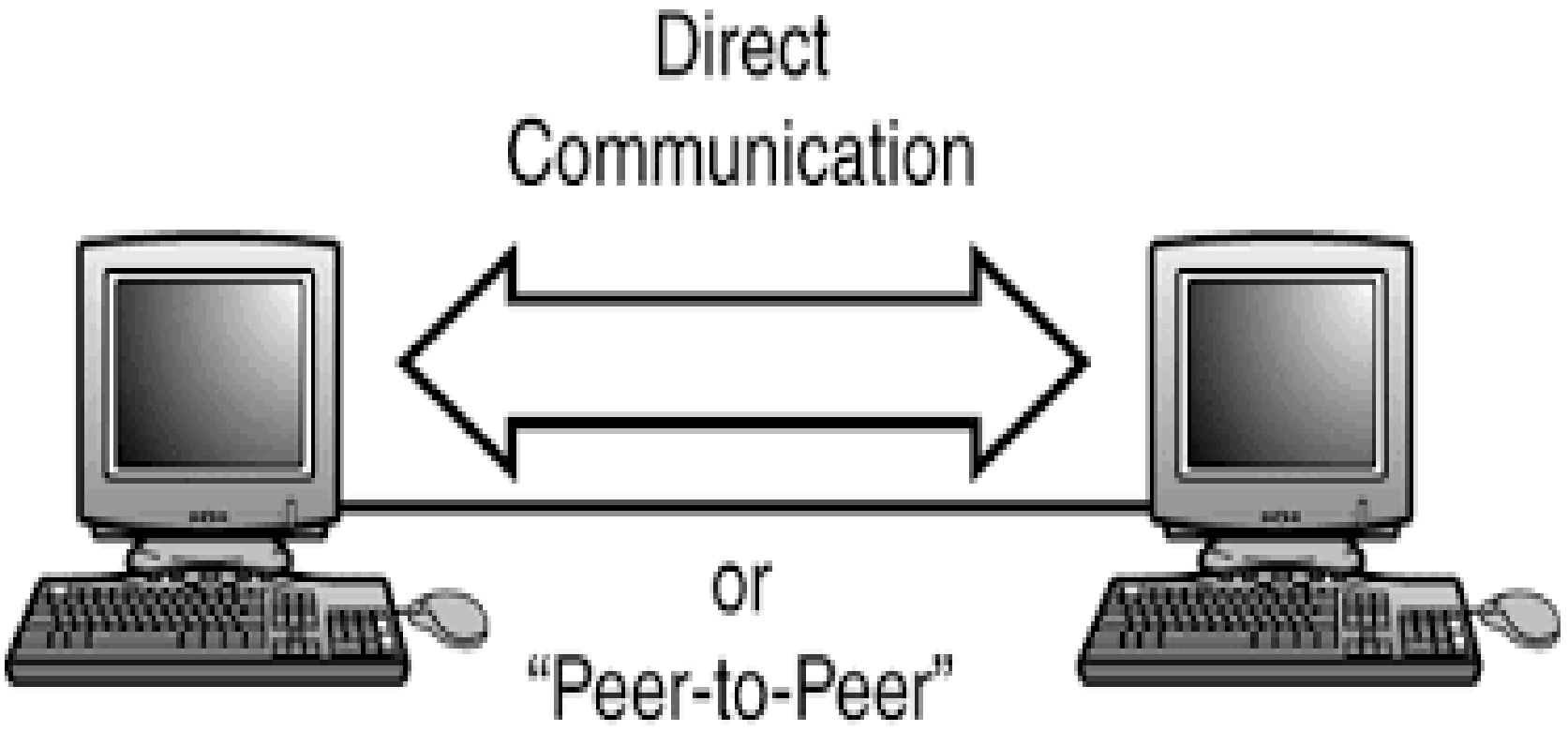
Patch Panel



Types of Network

- Peer-to-Peer Network
- Server-based Network
- Personal Area Network
- Local Area Network
- Metropolitan Area Network
- Wide Area Network

Peer–to–Peer Network

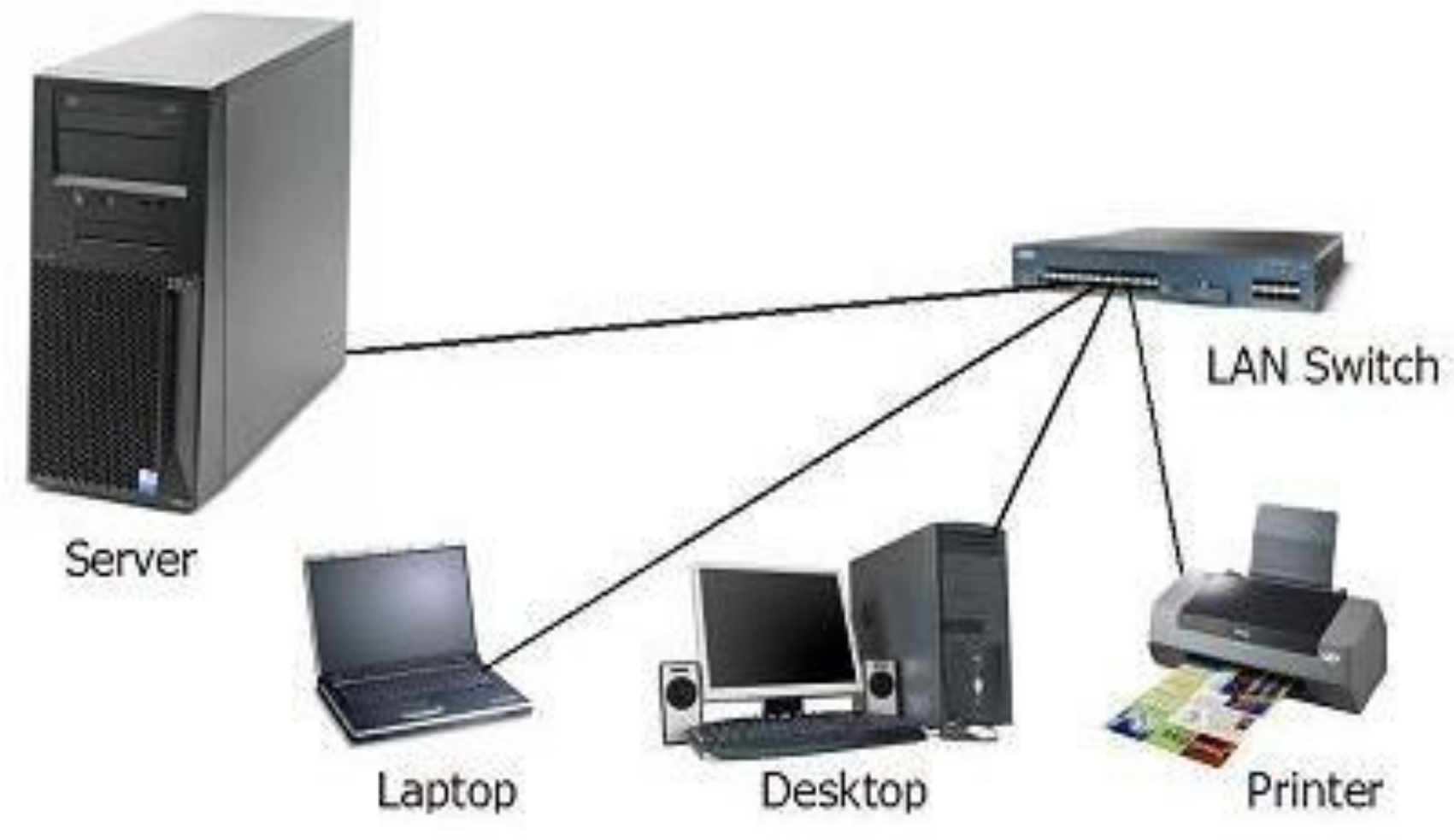


Server–based Network

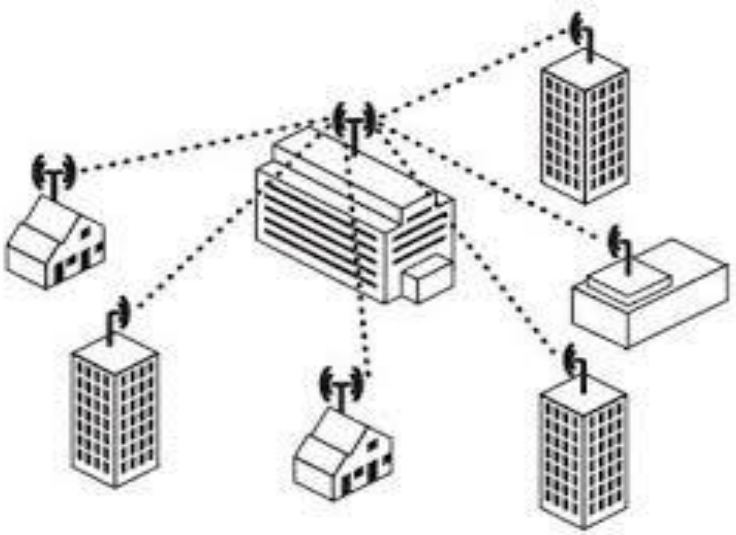
Personal Area Network (PAN)

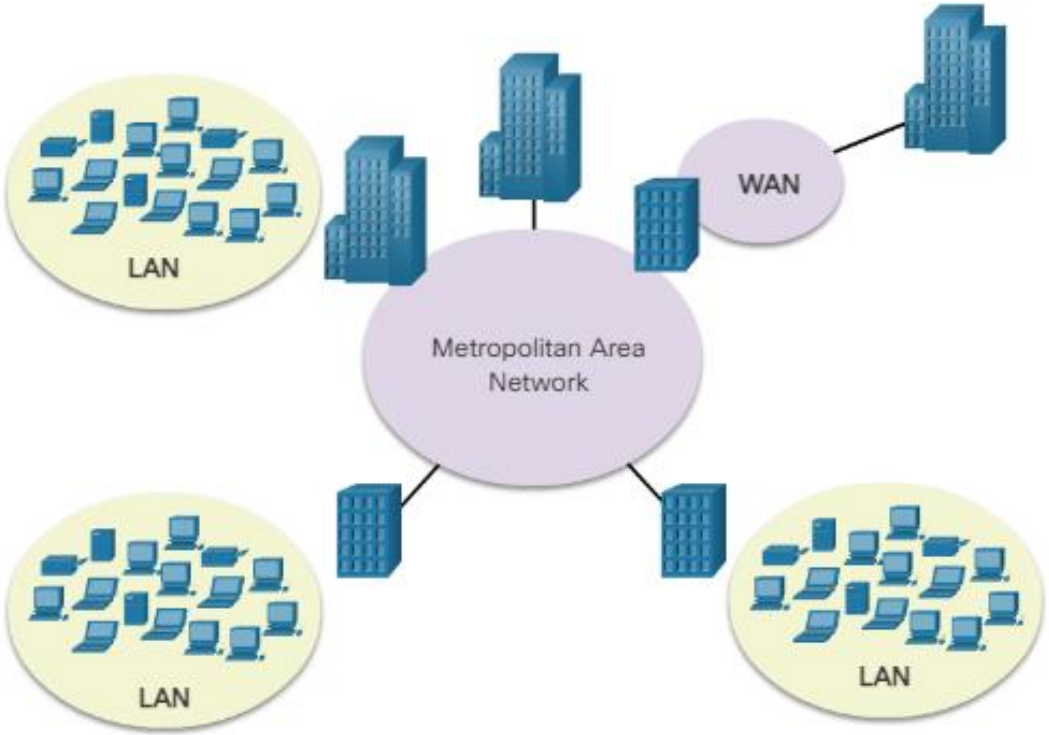
A personal area network (PAN) is a network that connects devices (mouse, keyboard, printer, smartphone, etc) within the range of an individual person. These devices are connected with Bluetooth technology, wireless technology over short distances.

Local Area Network

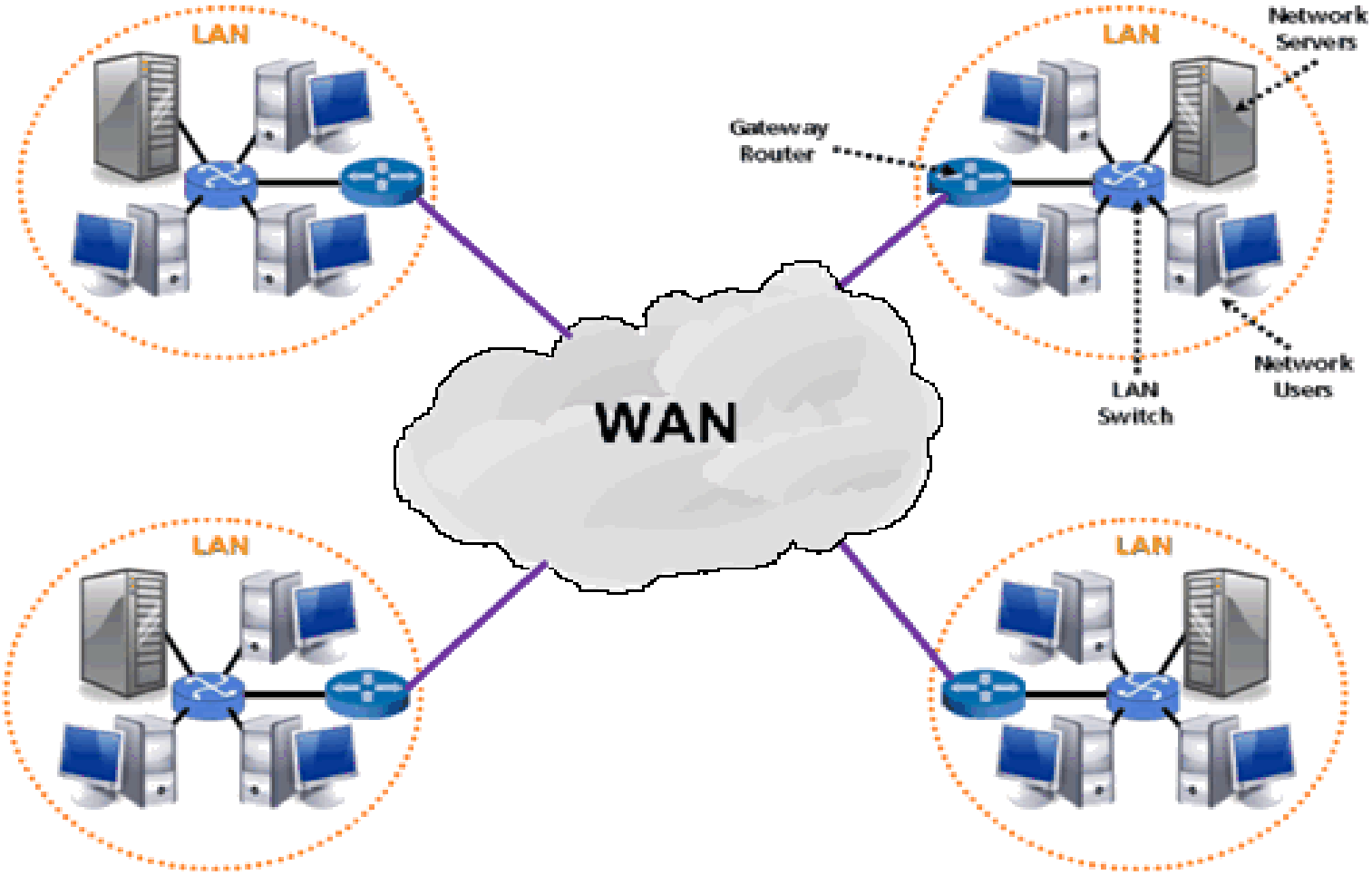


Metropolitan Area Network



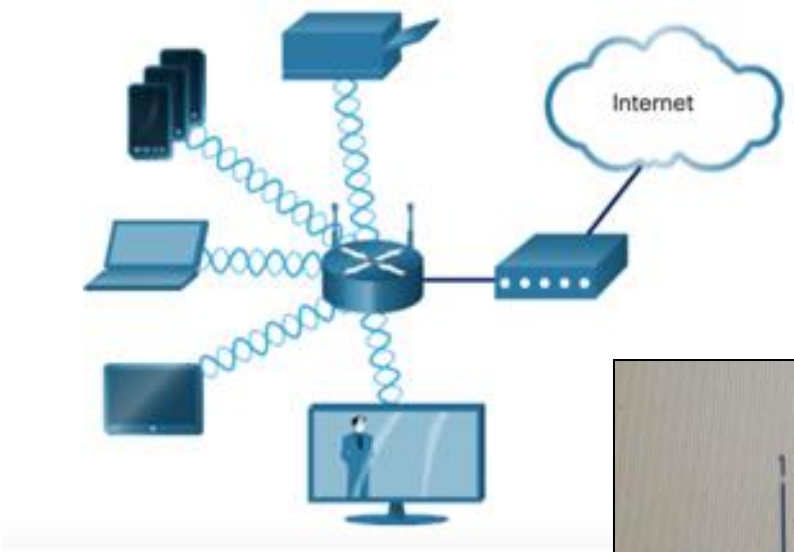


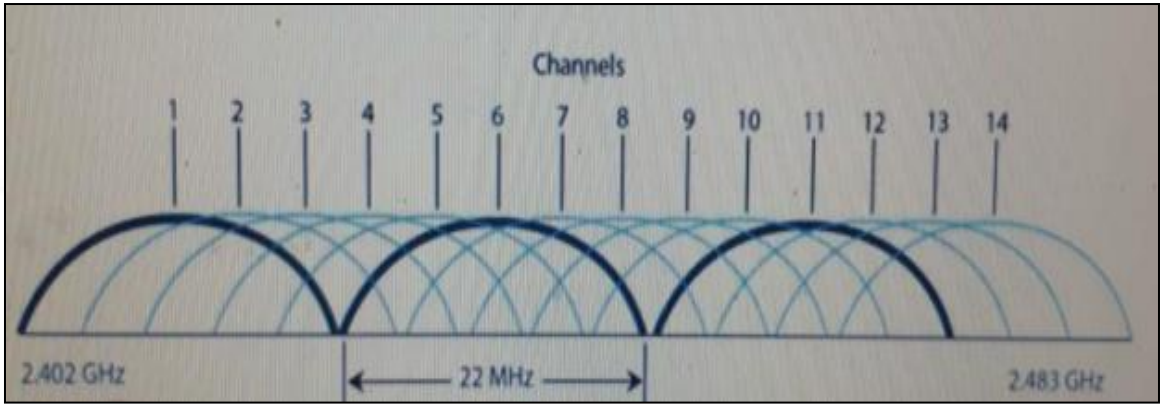
Wide Area Network



Wireless LAN

Wireless LAN connects multiple wireless devices and uses an access point or wireless network interface cards (NICs)





Intranet


Social Platform
Document Management
Calendar
Forum
Mobile
Portal
Social Network
Cloud
Wiki
Answer
Dashboard

Topology

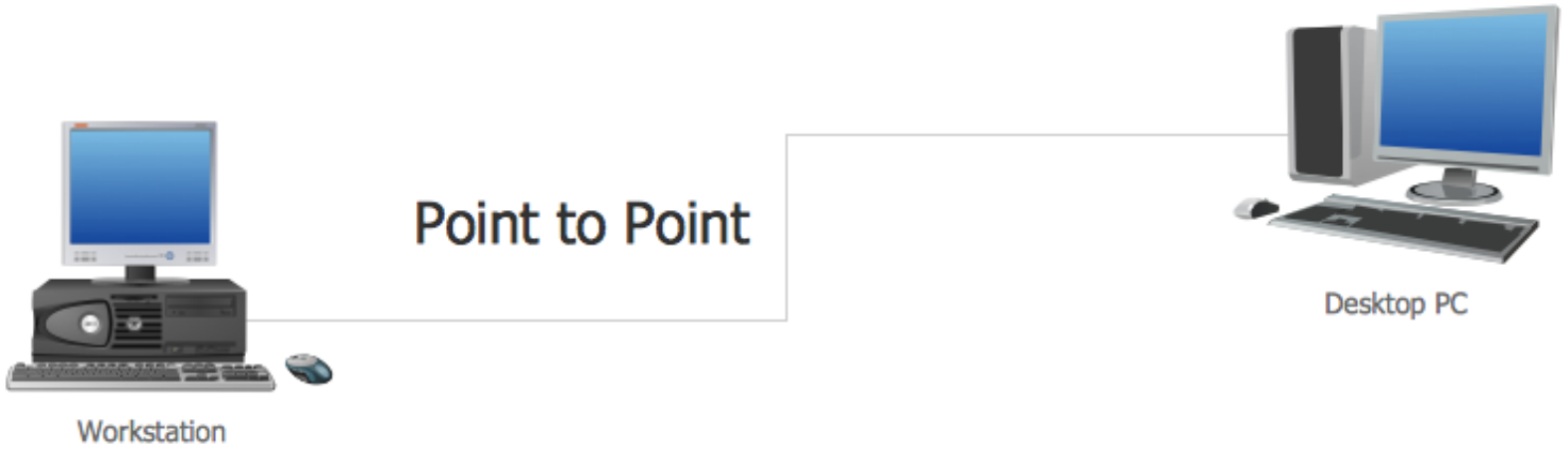
- As network has two components as physical and logical components, it has physical topologies in which servers, switches, routers, firewalls and various devices are being place on the blueprint/layout with where the cabling is to connect physically.

- Logical topologies that deals with the data and its flow throughout a network.

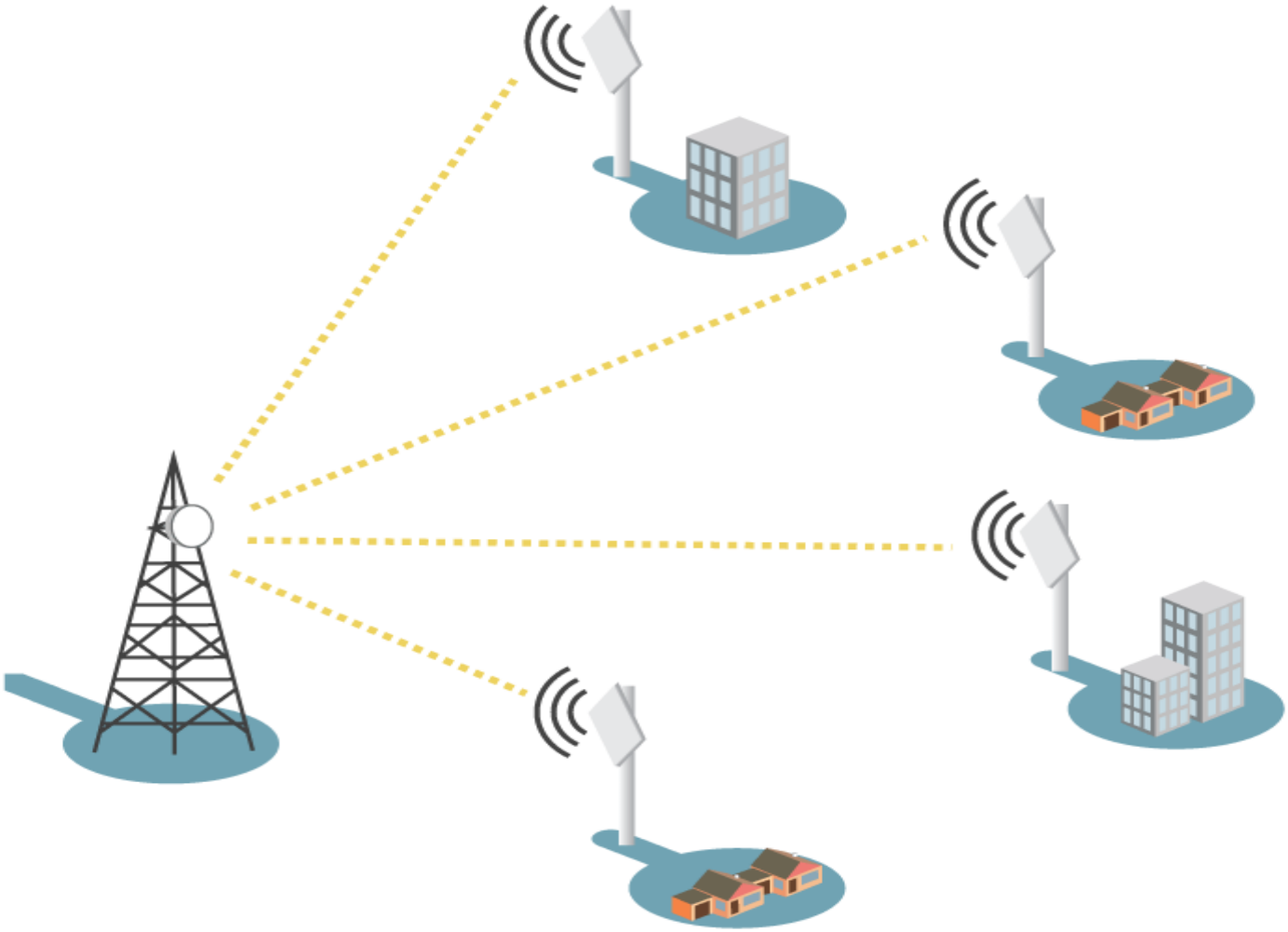
Network Topologies

- Point-to-Point topology
- Point-to-Multipoint
- Bus topology
- Star topology
- Ring topology
- Mesh topology
- Hybrid topology
- Wireless topology

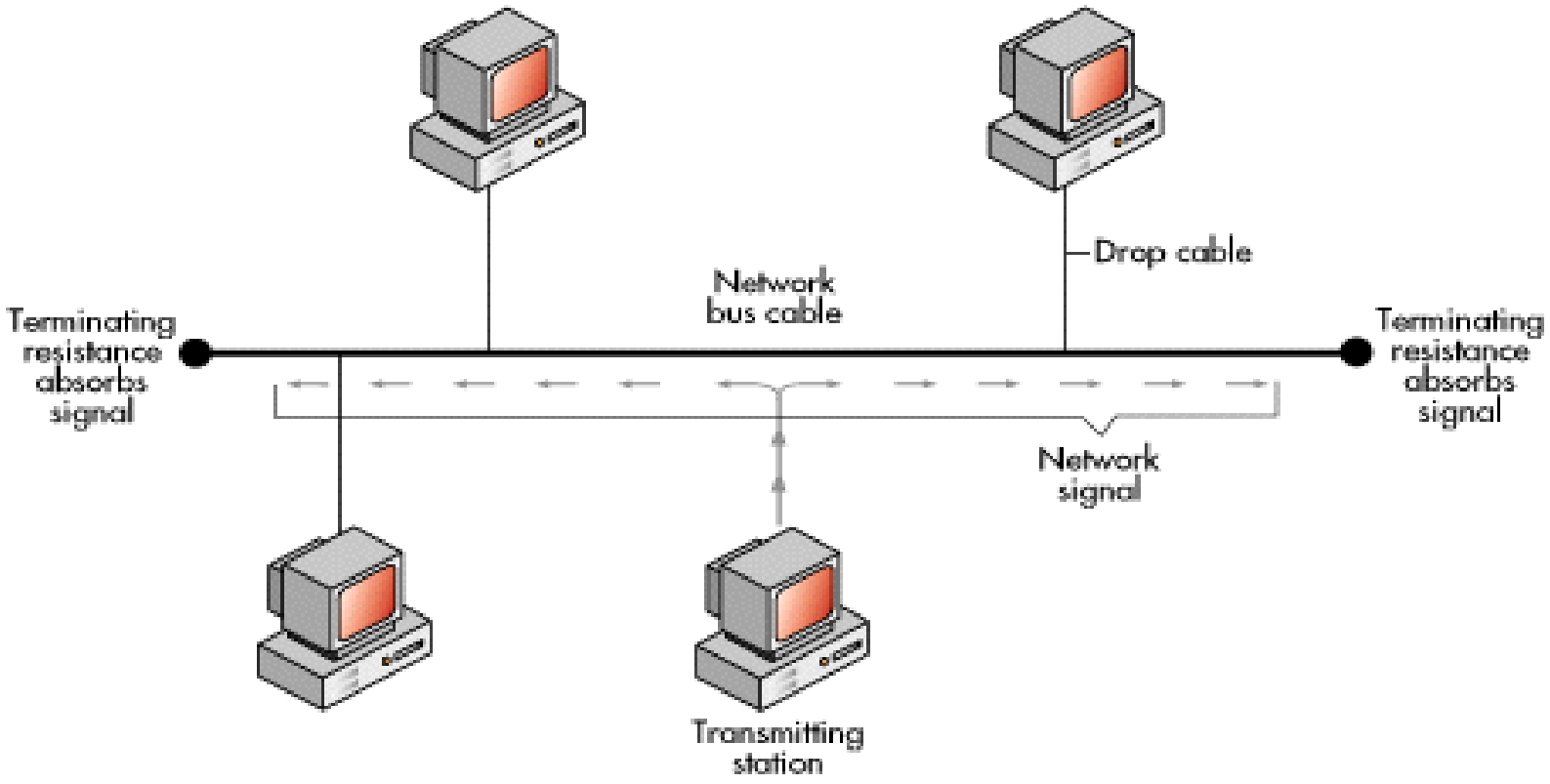
Point–to–Point



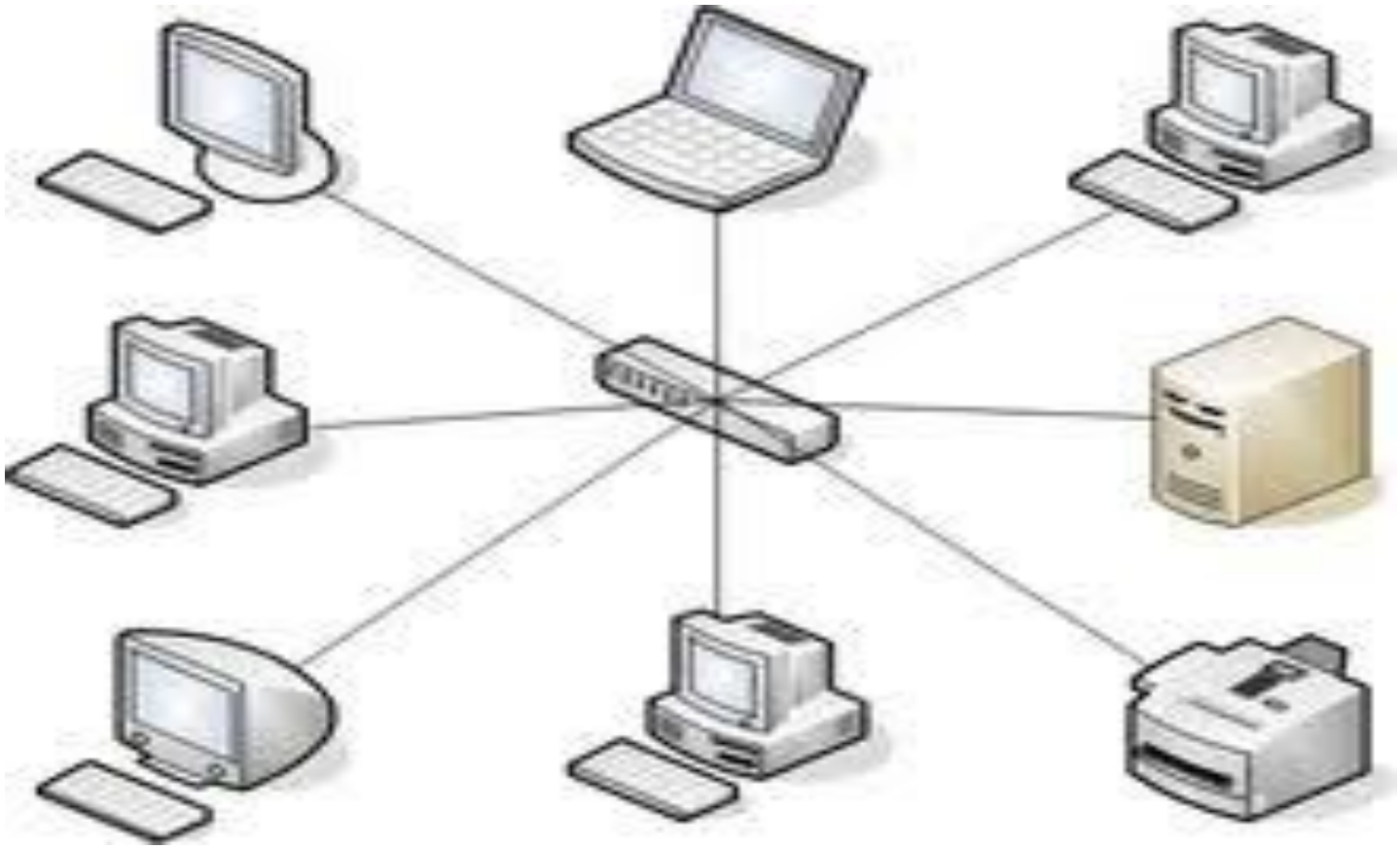
Point–to–Multipoint



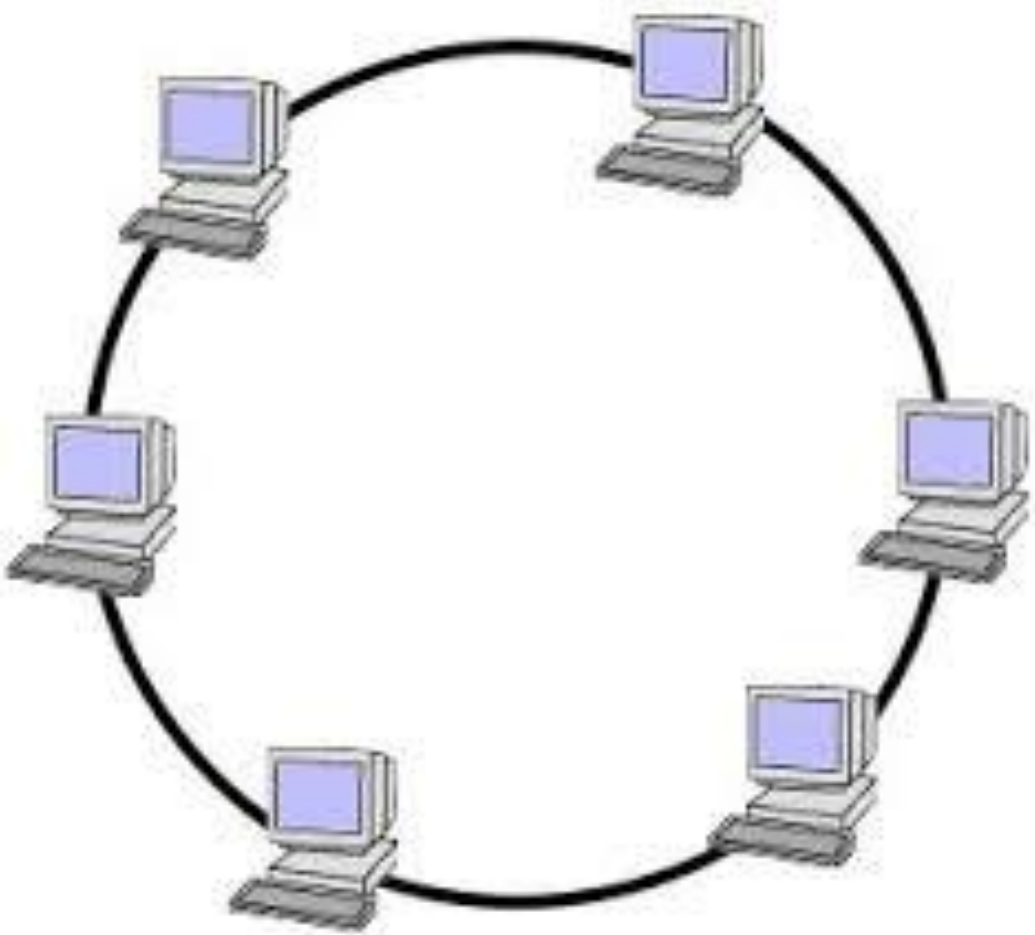
Bus Topology (Physical)



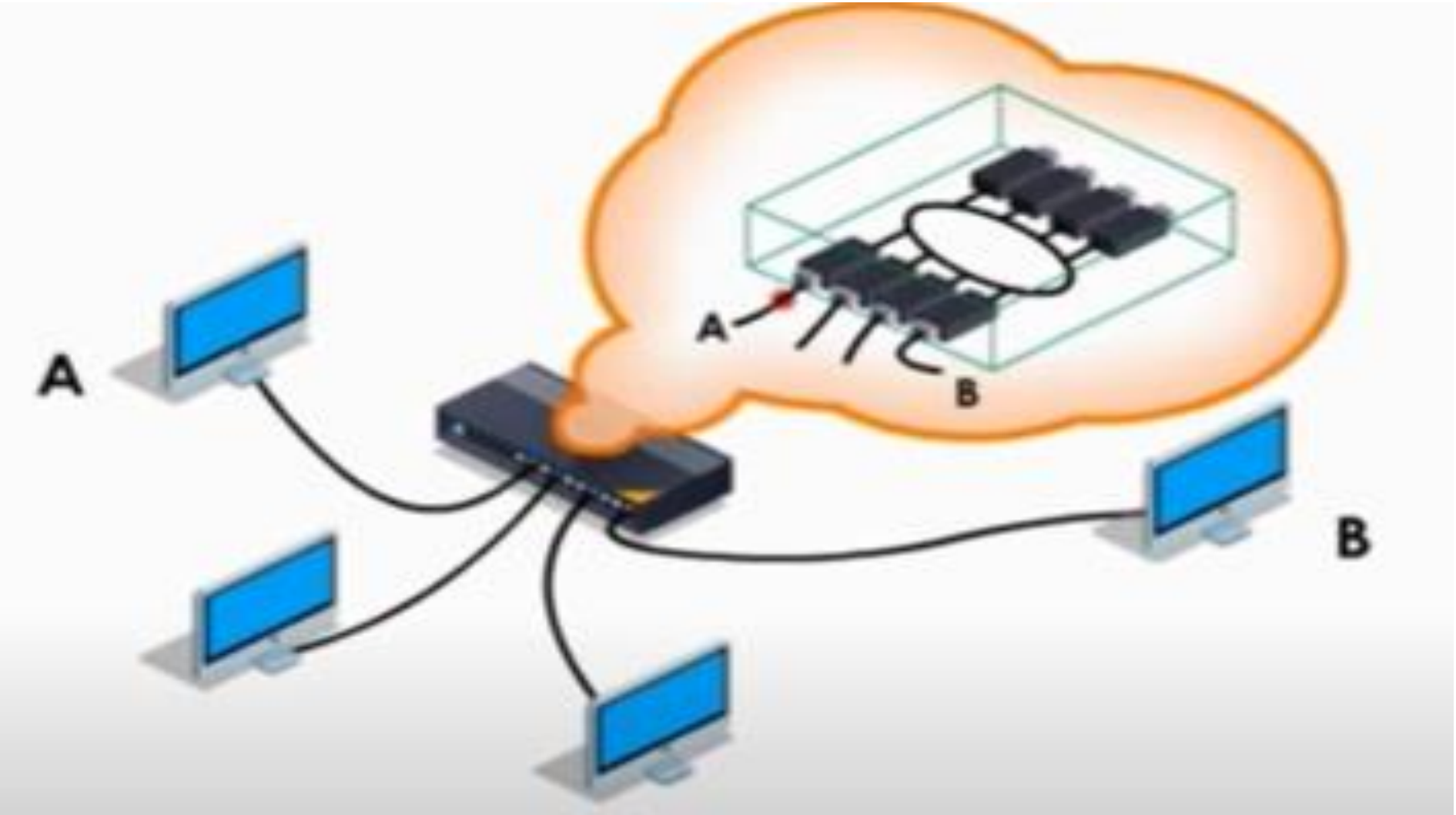
Star Topologies (Physical)



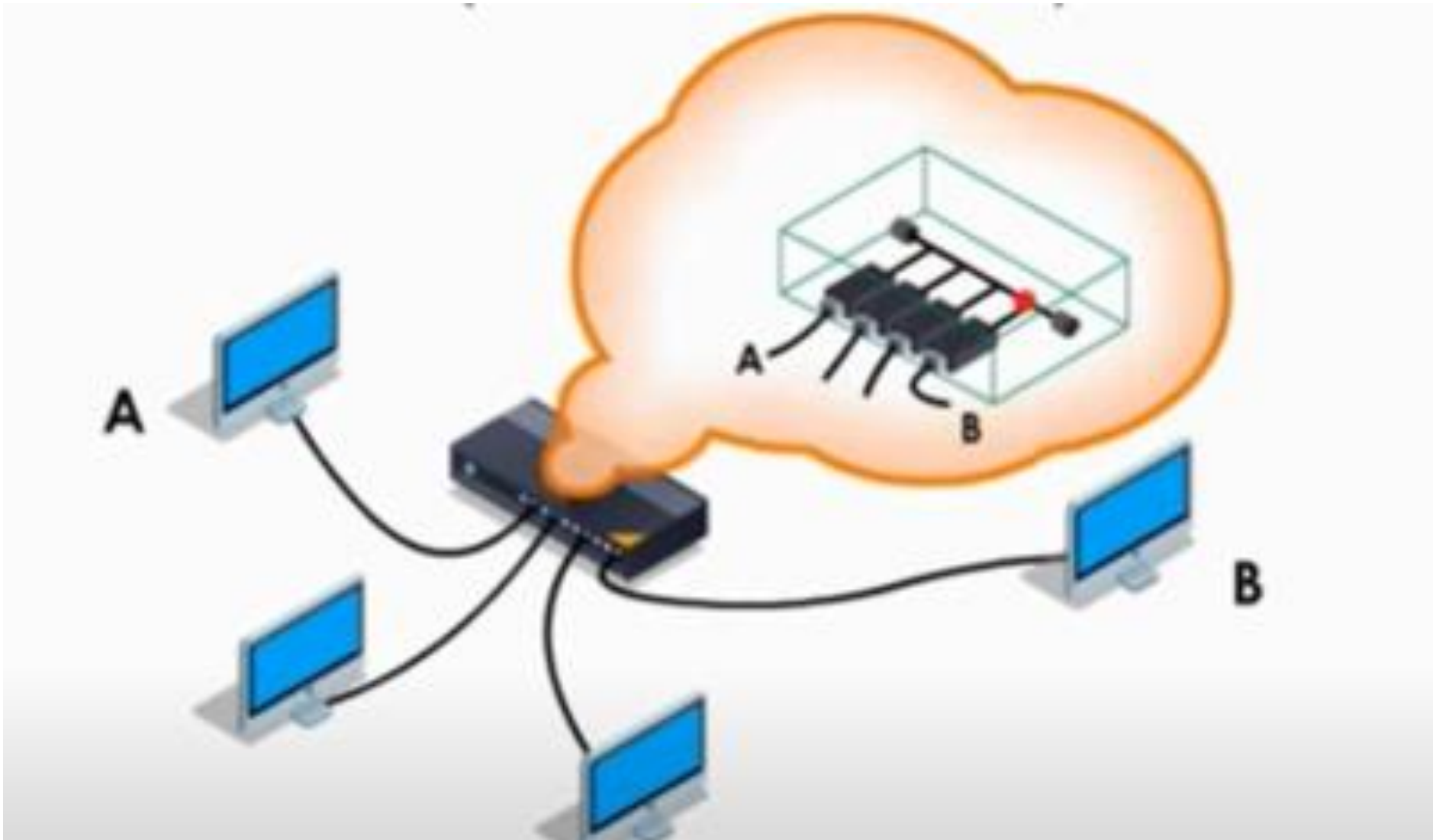
Ring topology (Physical)



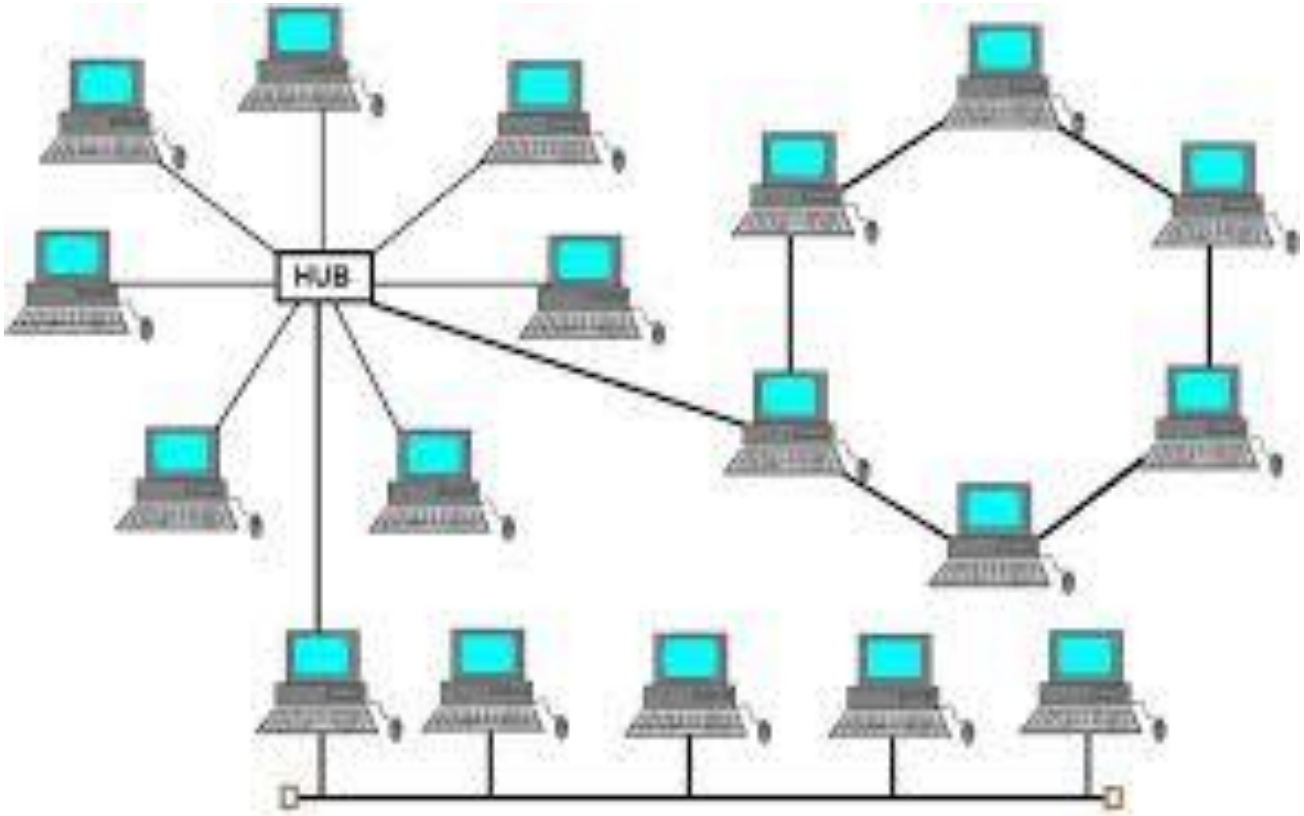
Ring Topologies (Logical)



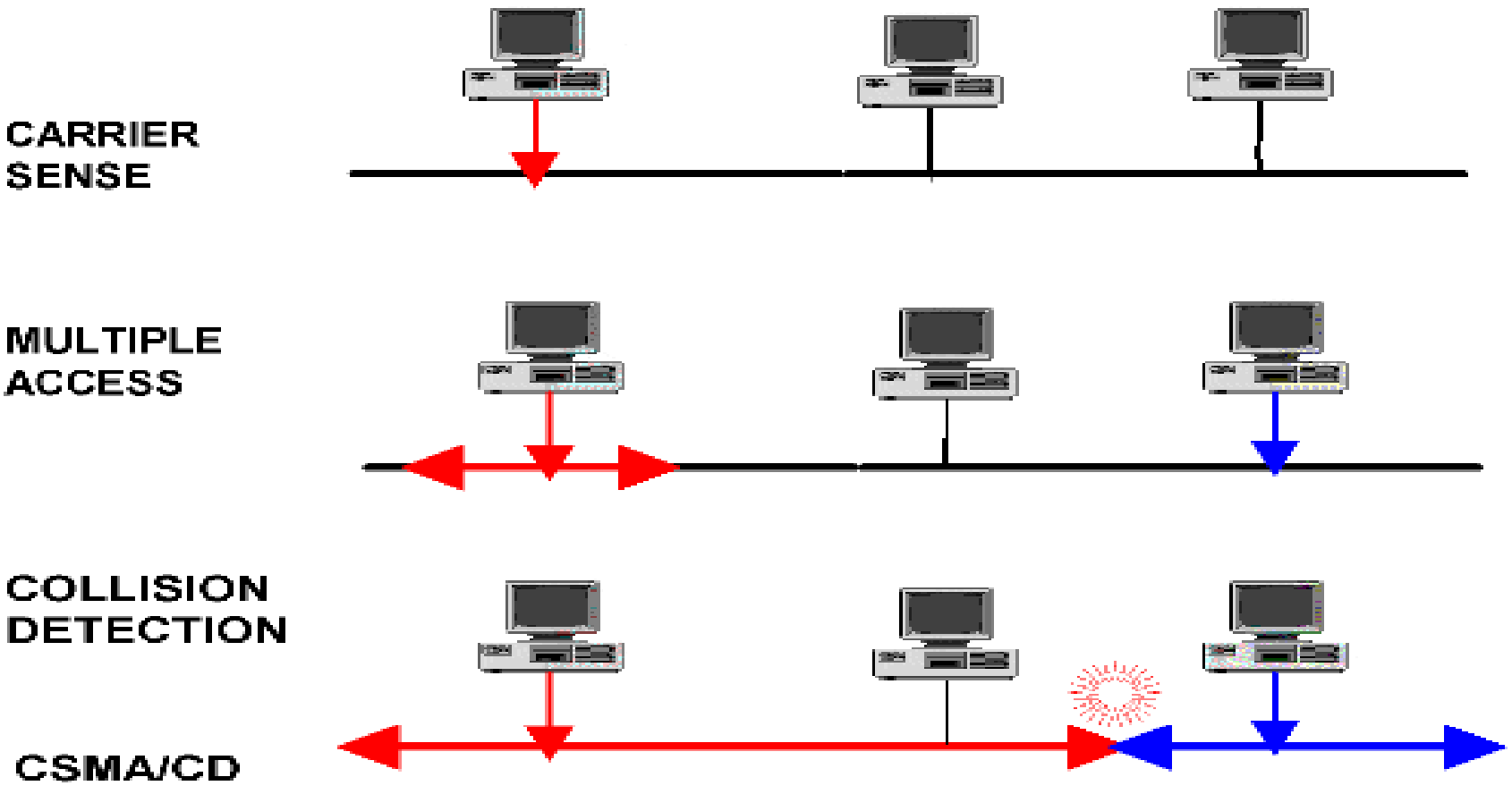
Bus Topologies (Logical)



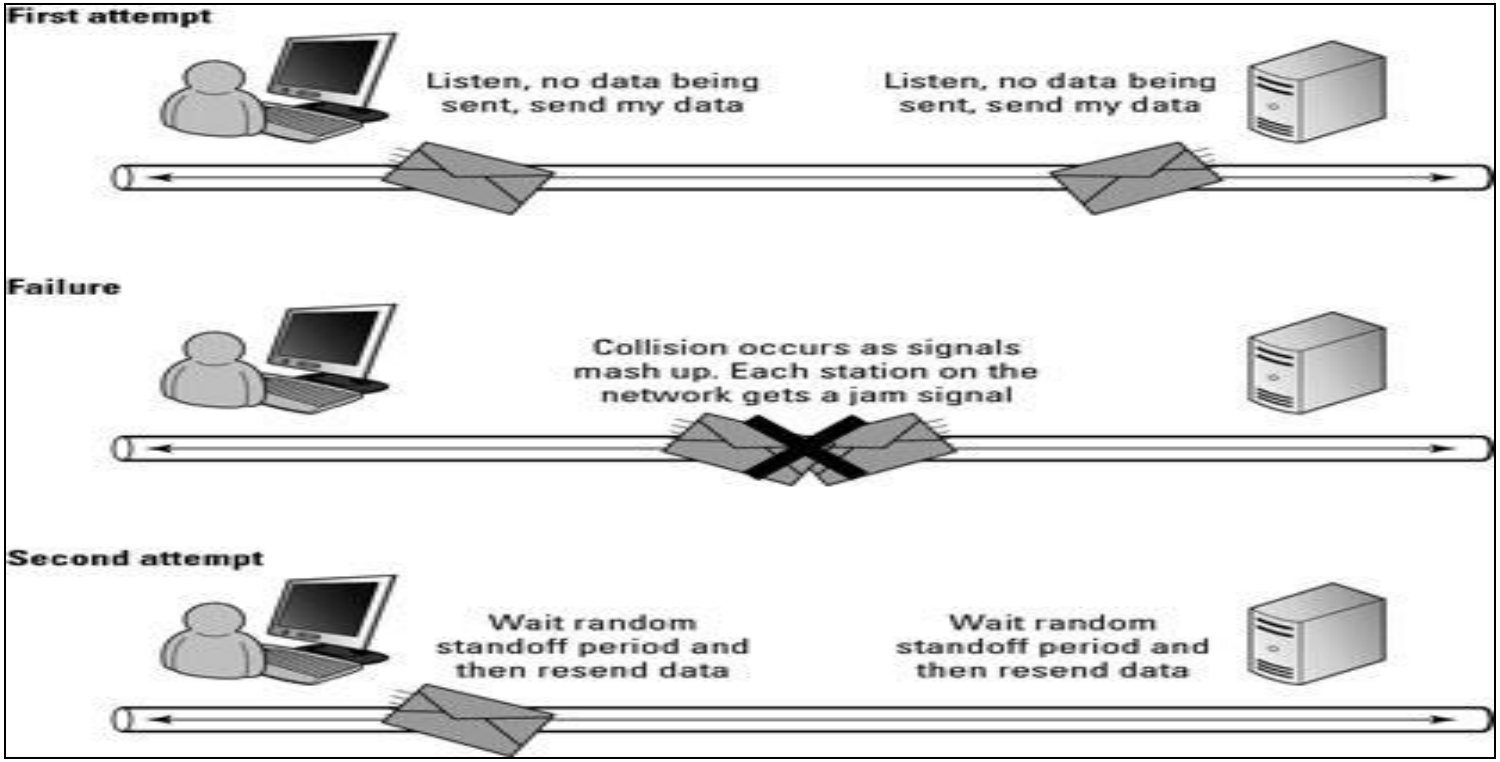
Hybrid Topologies (Physical & Logical)



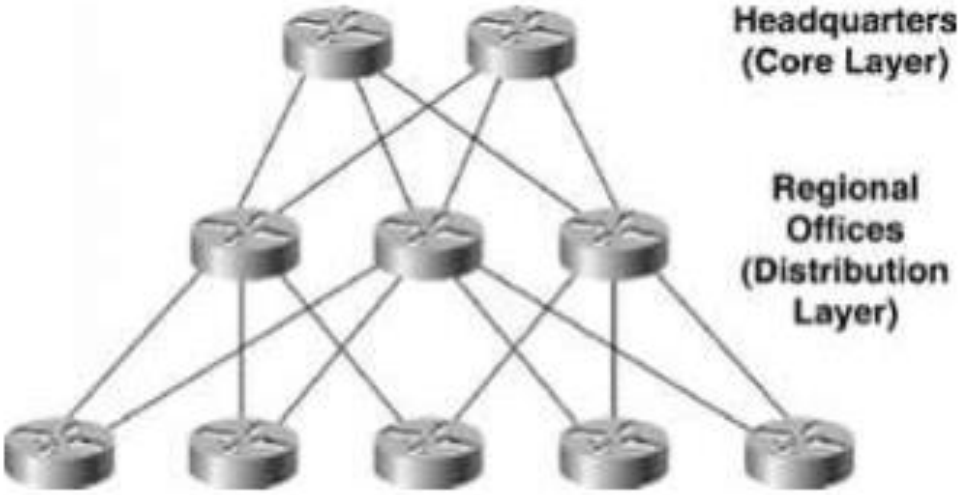
Media Access Method (CSMA/CD)

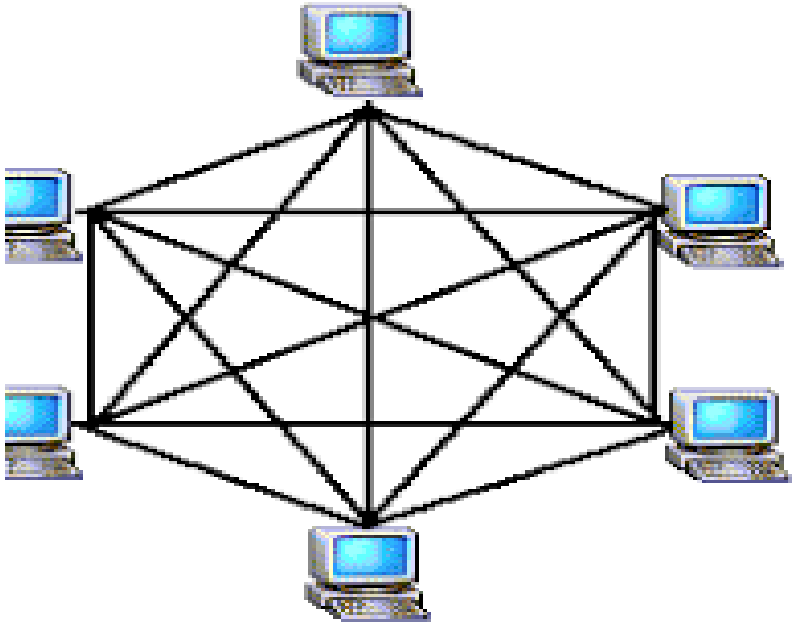


Carrier Sense and Collision Detection

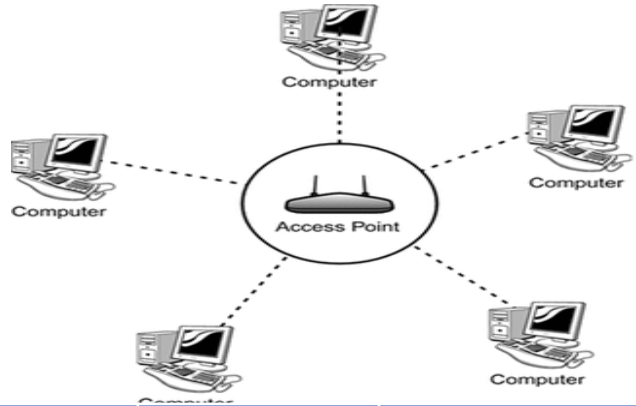


Mesh topology



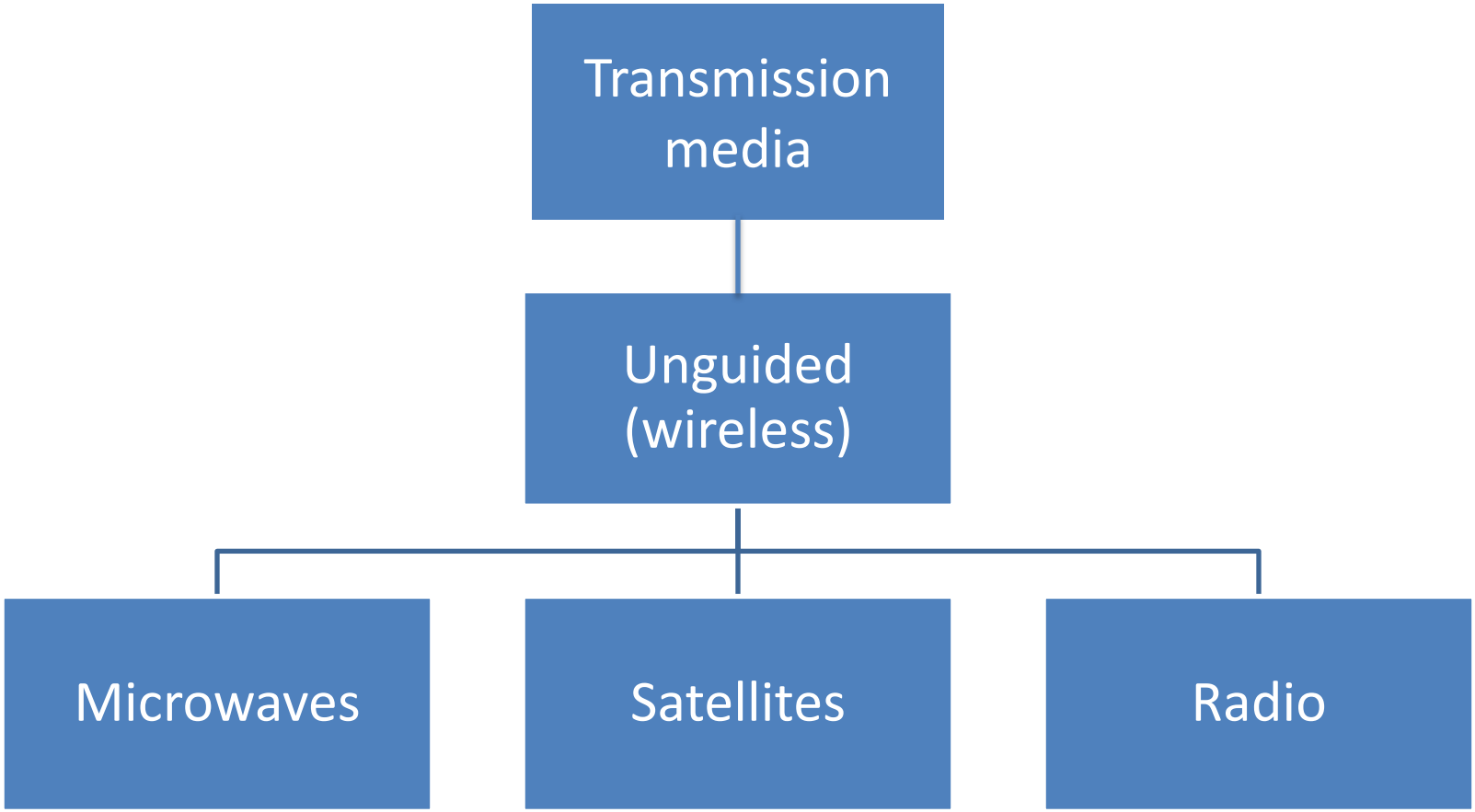


Wireless Topologies

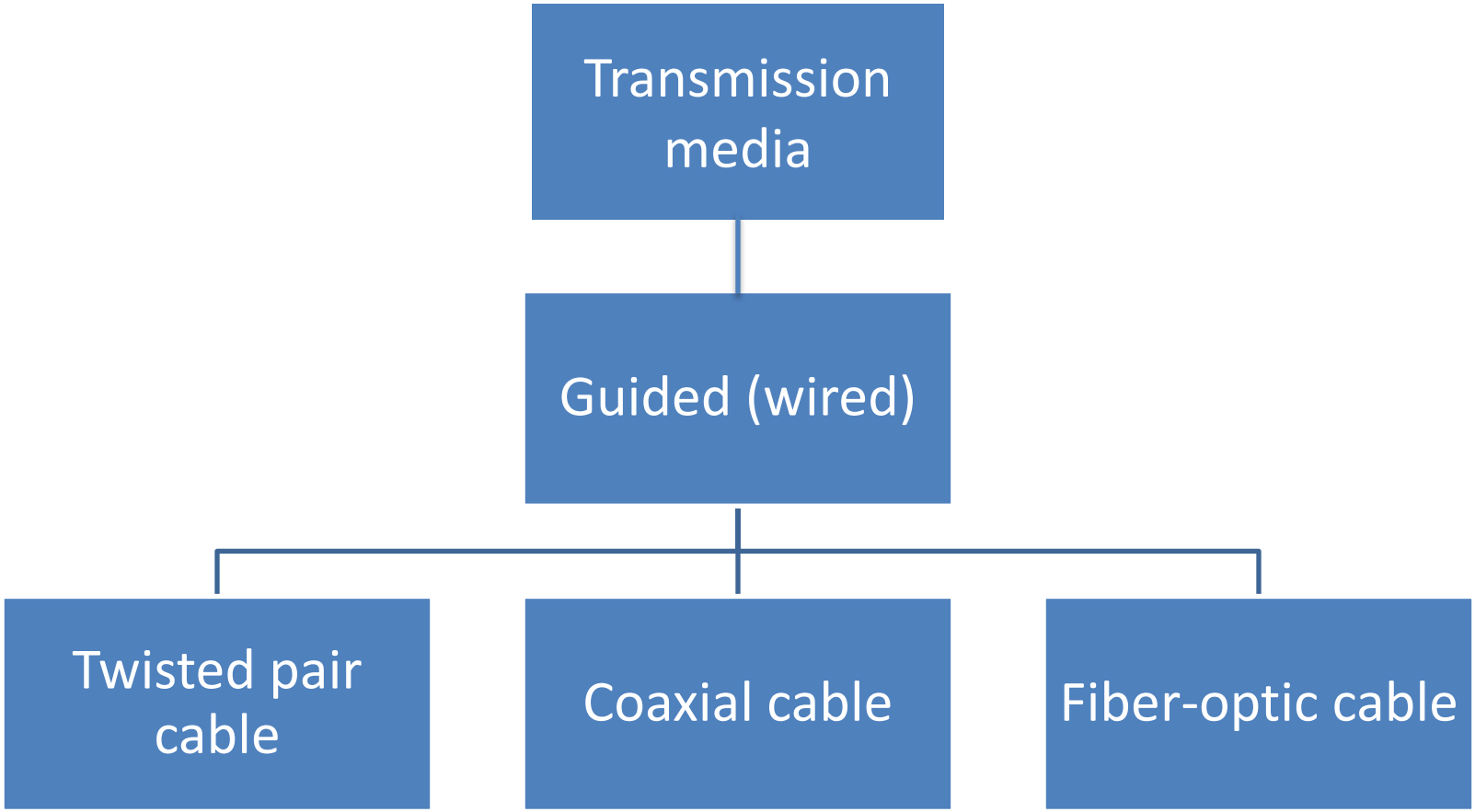


Wi–Fi Generation	Standard	Maximum data rate (Mbps)	RF band (GHz) /Channel width (MHz)	Release Year
Wi–Fi 1	802.11b	11	2.4 / 20	1999
Wi–Fi 2	802.11a	54	5 / 20	1999
Wi–Fi 3	802.11g	54	2.4 / 20	2003
Wi–Fi 4	802.11n	~500	2.4 (or) 5 / 20 (or) 40	2009
Wi–Fi 5	802.11ac	~800	Below 6GHz / 20–160	2013
Wi–Fi 6	802.11ax	9607	Up to 60GHz / 80–160	2019

Transmission Media



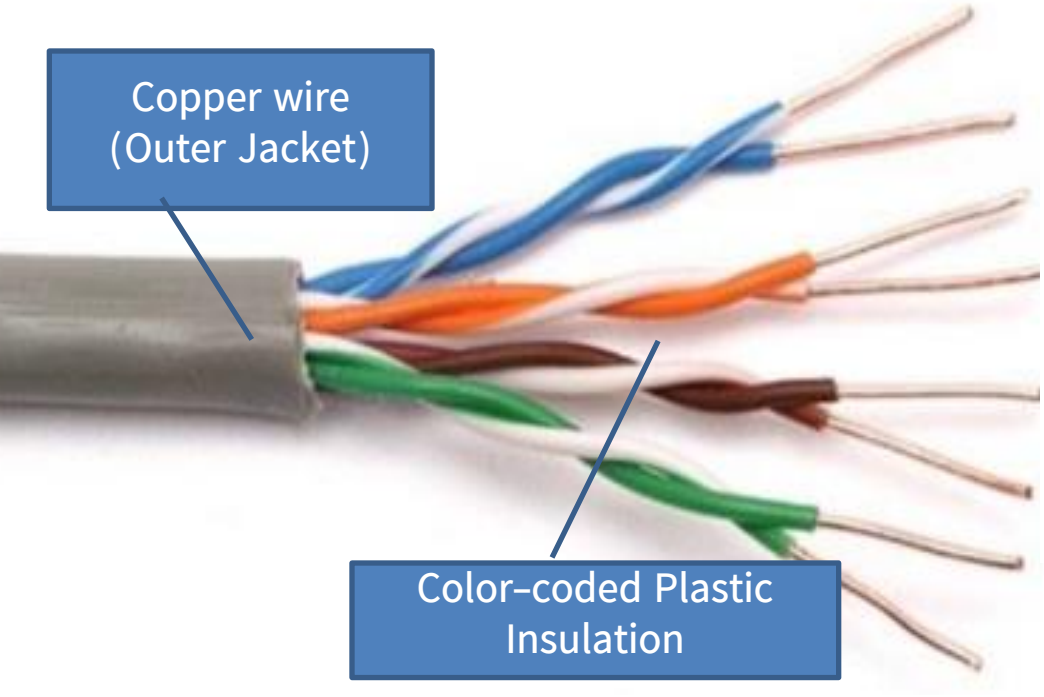
Transmission Media



Coaxial Cable

Coaxial Connector

Twisted–Pair Cable



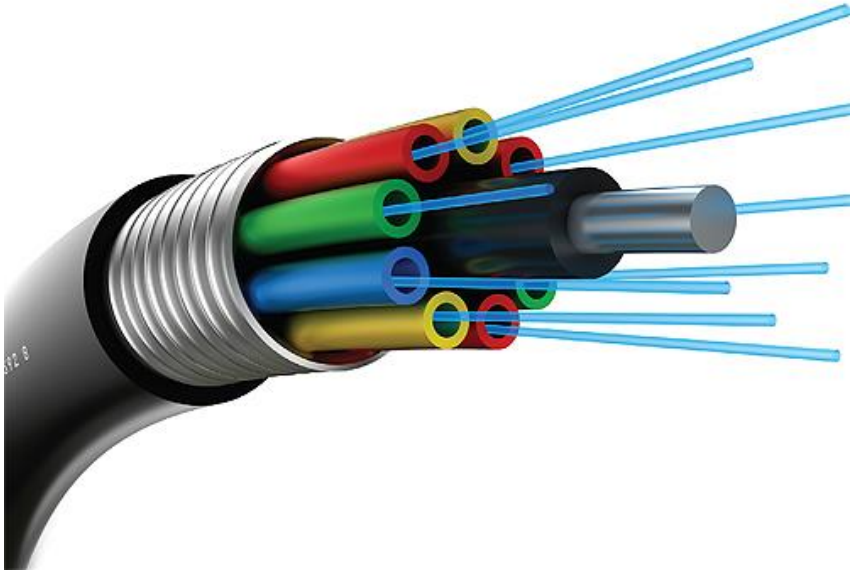
Unshielded twisted–Pair (UTP)

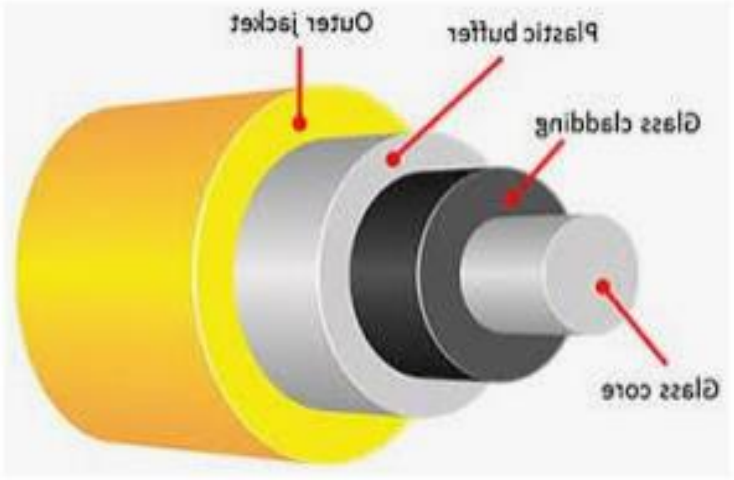
Shielded twisted–Pair (STP)

Twisted–Pair Connector

RJ-11	RJ-45
6 pin 	8 pin 

Fiber–optic Cable

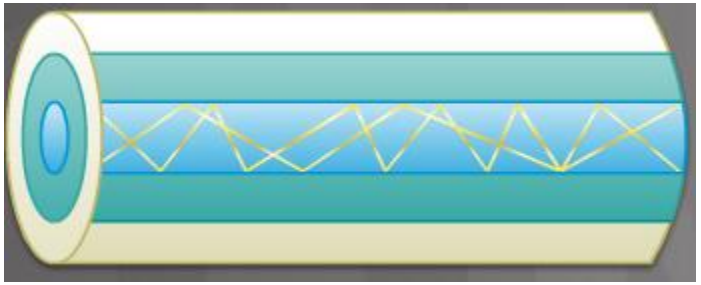




Types of Fiber–optic Cable

Single–Mode Fiber (SMF)

Outdoor Connection



Multi–Mode Fiber (MMF)

Indoor Connection

Fiber–optic Connectors

ST Connectors

SC Connectors

LC Connector

Duplex Multimode LC Connectors

Hot Pluggable Transceiver

Network Cabling

- UTP Cable Category

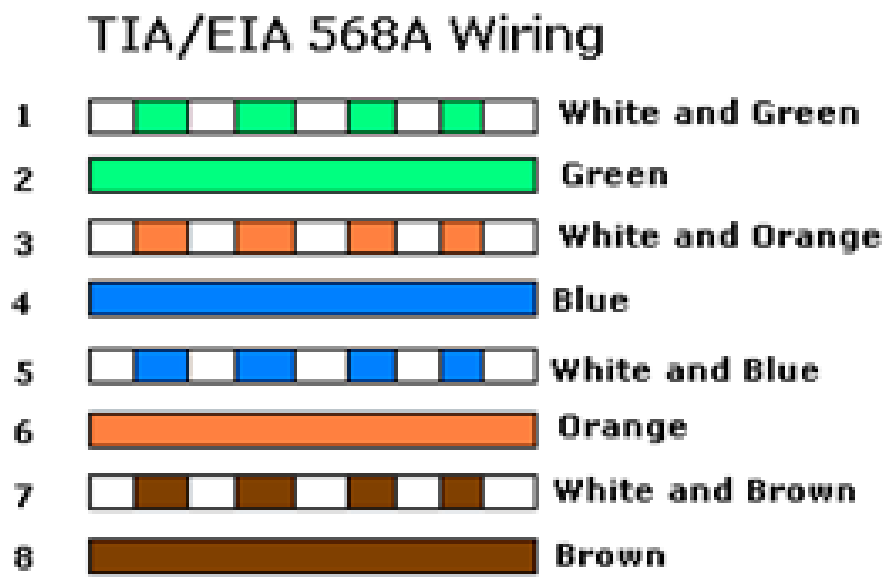
UTP Category	Use	Bandwidth (Capability)
Category 1	Telephone/Analog Modem	Up to 1 Mbps
Category 2	Telephone and Token Ring Networks	Up to 4 Mbps
Category 3	Data Network	Up to 10 Mbps
Category 4	Data Network (Token Ring Networks)	Up to 16 Mbps
Category 5	Ethernet/Fast Ethernet/Token Ring	UP to 100 Mbps
Category 5e	Ethernet/FastEthernet/Gigabit Ethernet	Up to 1 Gbps
Category 6	Gigabit Ethernet	Up to 10 Gbps (55 meters)
Category 6e	Gigabit Ethernet	Up to 10 Gbps (100 meters)
Category 7	Gigabit Ethernet	Up to 10 Gbps (100 meters)
Category 7e	Gigabit Ethernet	Up to 100 Gbps (100 meters)

Network Cabling

Wiring Standards

Standard from Telecommunications Industry Association (TIA)

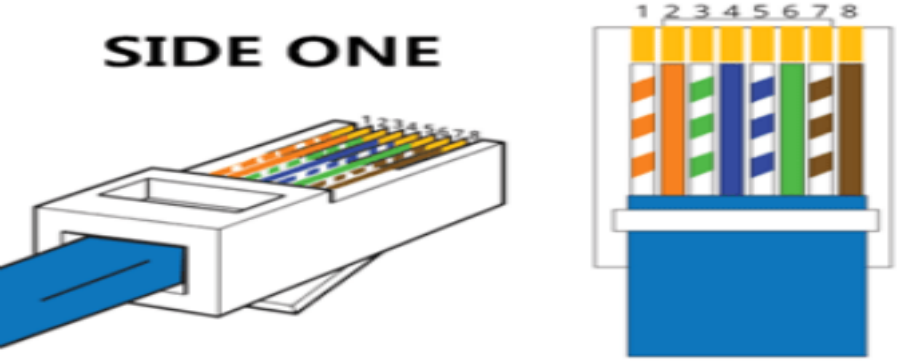
- T-568A and T-568B



Straight through Cable Vs Crossover Cables

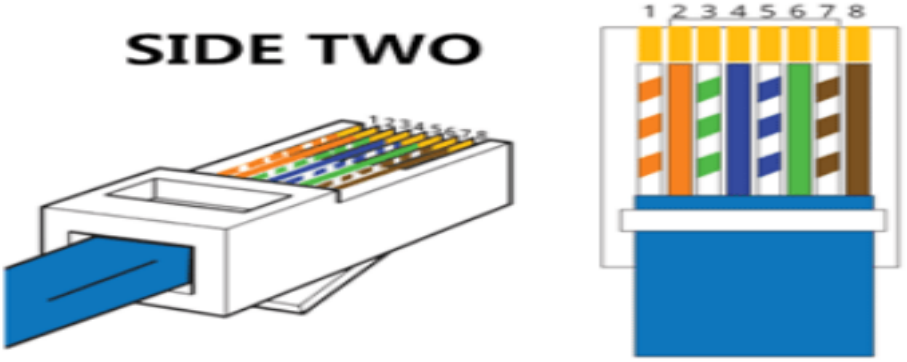
STRAIGHT-THROUGH

SIDE ONE



1. White Orange	5. White Blue
2. Orange	6. Green
3. White Green	7. White Brown
4. Blue	8. Brown

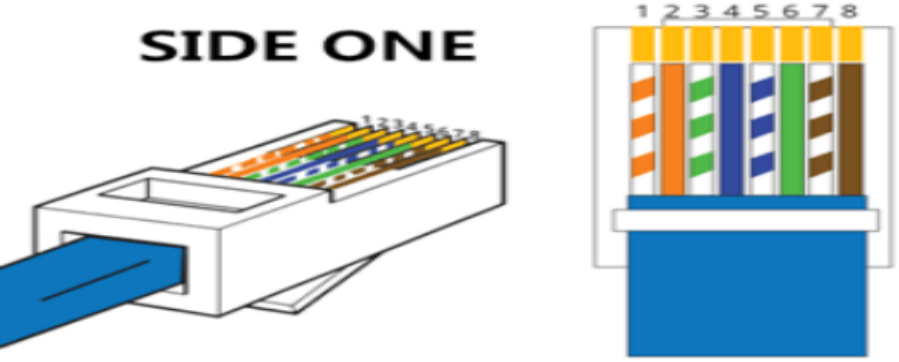
SIDE TWO



1. White Orange	5. White Blue
2. Orange	6. Green
3. White Green	7. White Brown
4. Blue	8. Brown

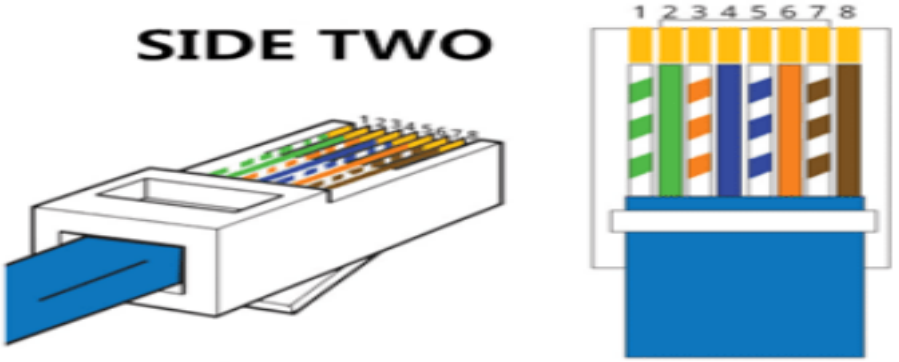
CROSSOVER

SIDE ONE



1. White Orange	5. White Blue
2. Orange	6. Green
3. White Green	7. White Brown
4. Blue	8. Brown

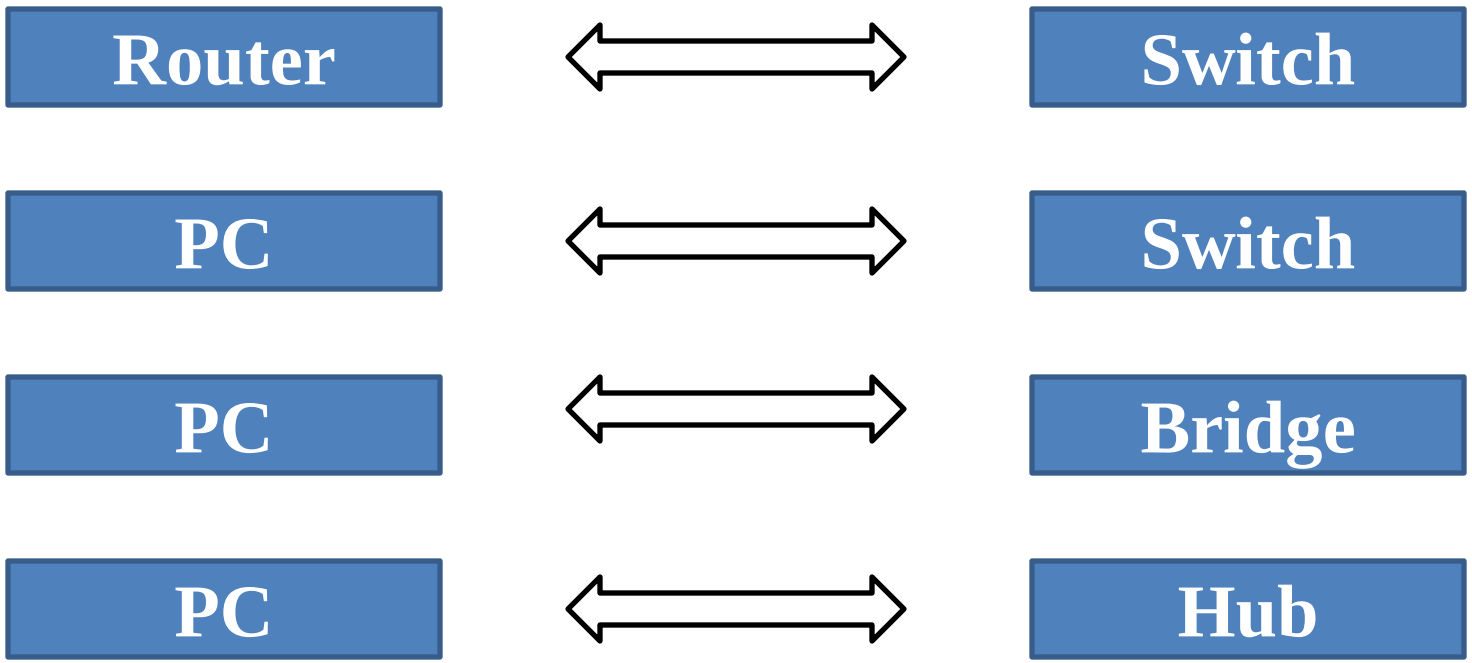
SIDE TWO



1. White Green	5. White Blue
2. Green	6. Orange
3. White Orange	7. White Brown
4. Blue	8. Brown

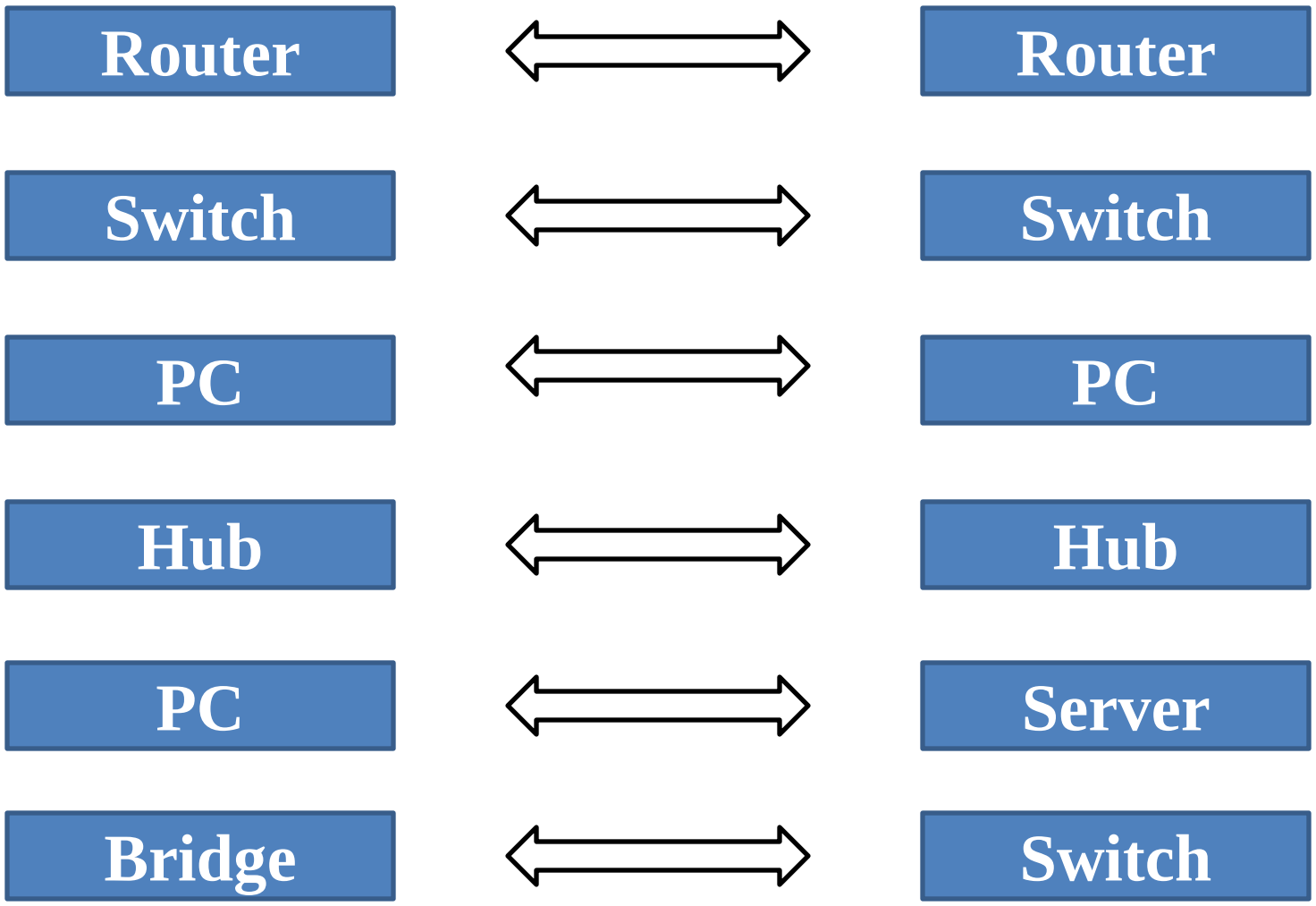
When to use straight/cross cables?

1. Straight Cable Use



When to use straight/cross cables?

2. Crossover Cable Use

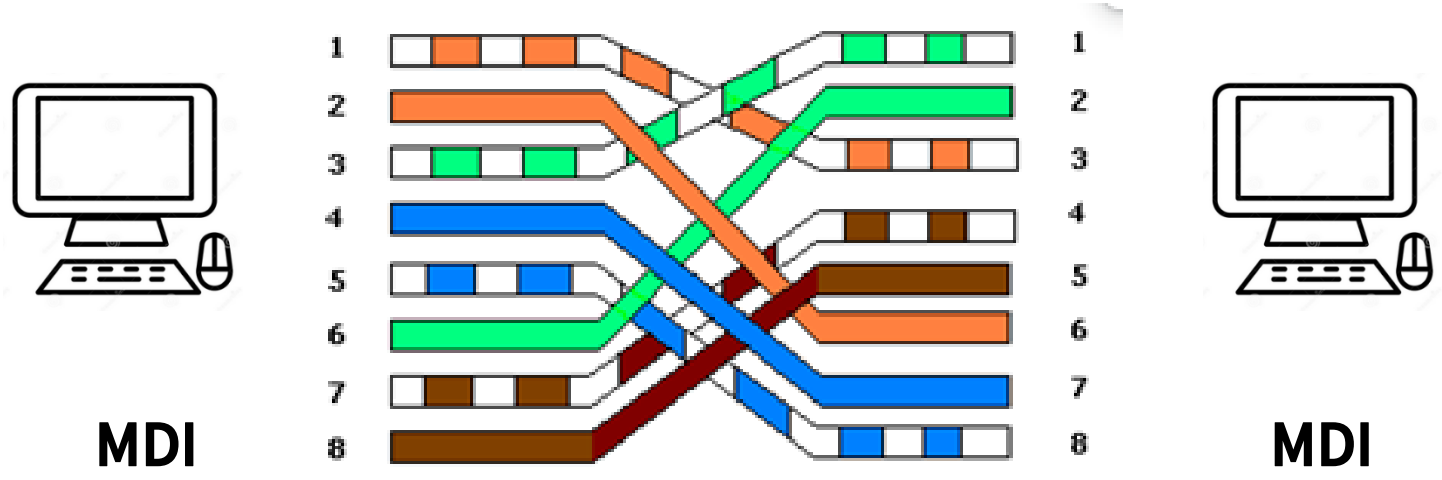


Auto MDI/ MDIX

Medium Dependent Interface Crossover Devices

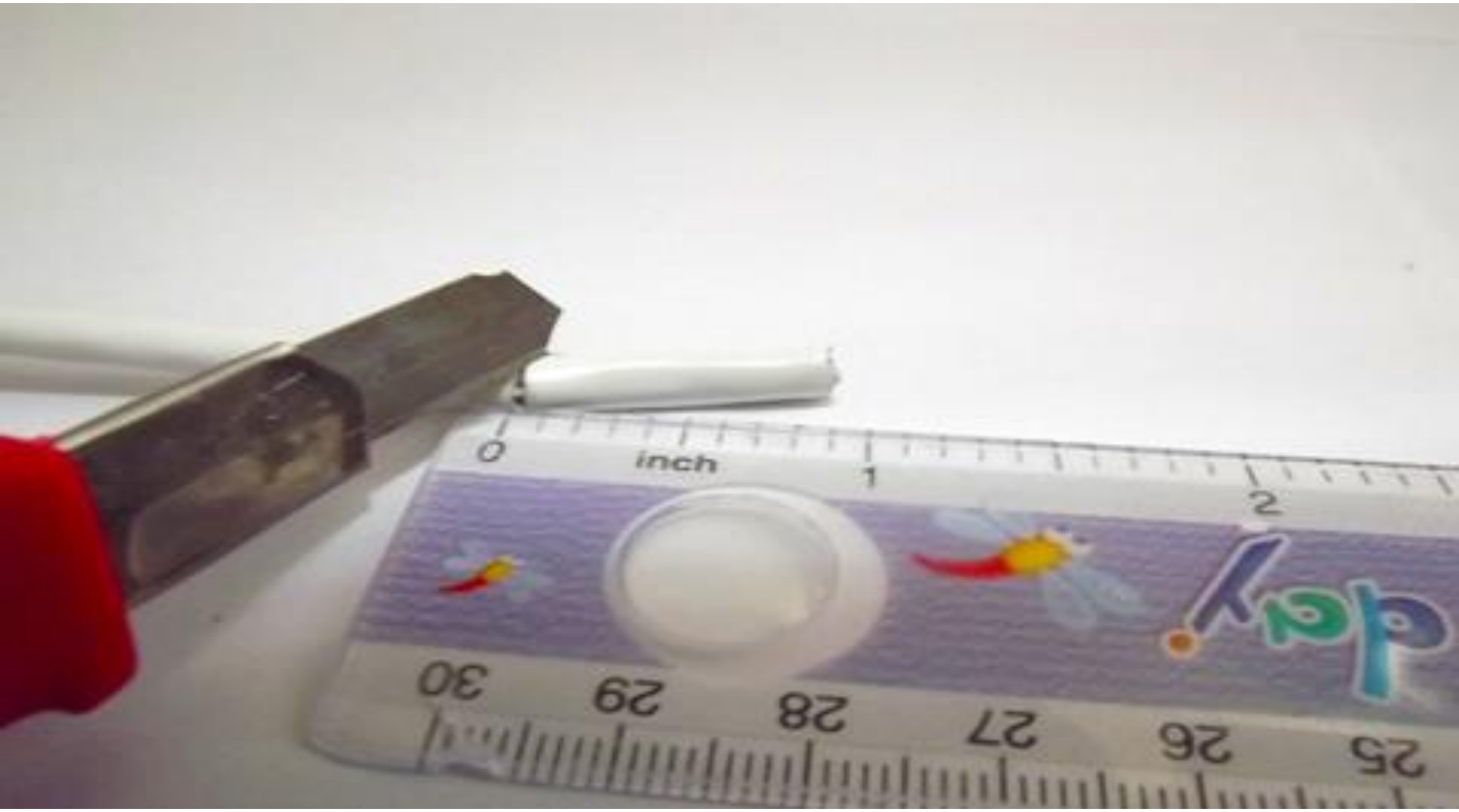
MDI devices
- Routers
- PCs

MDIX devices
- Switches
- Hubs

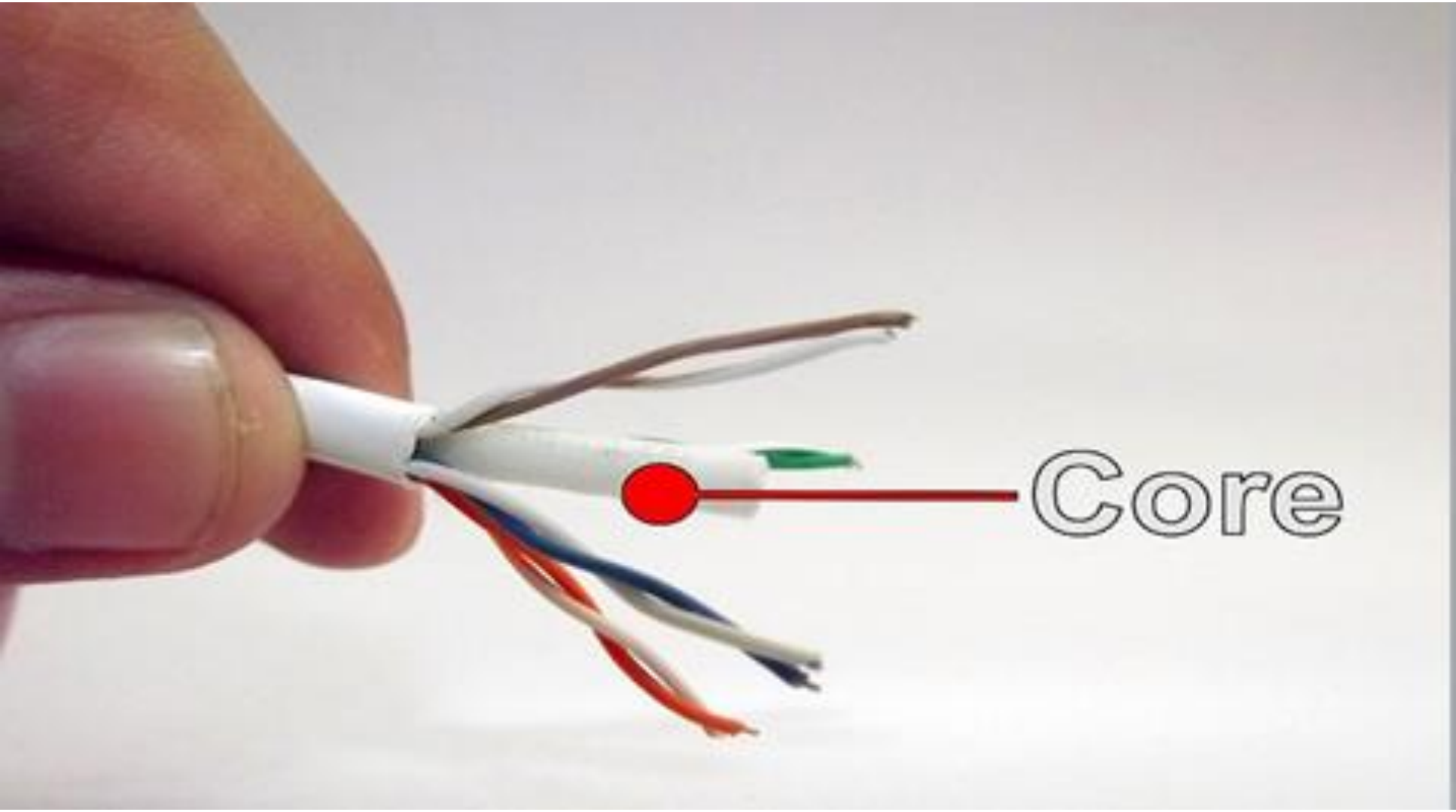


Cabling Steps

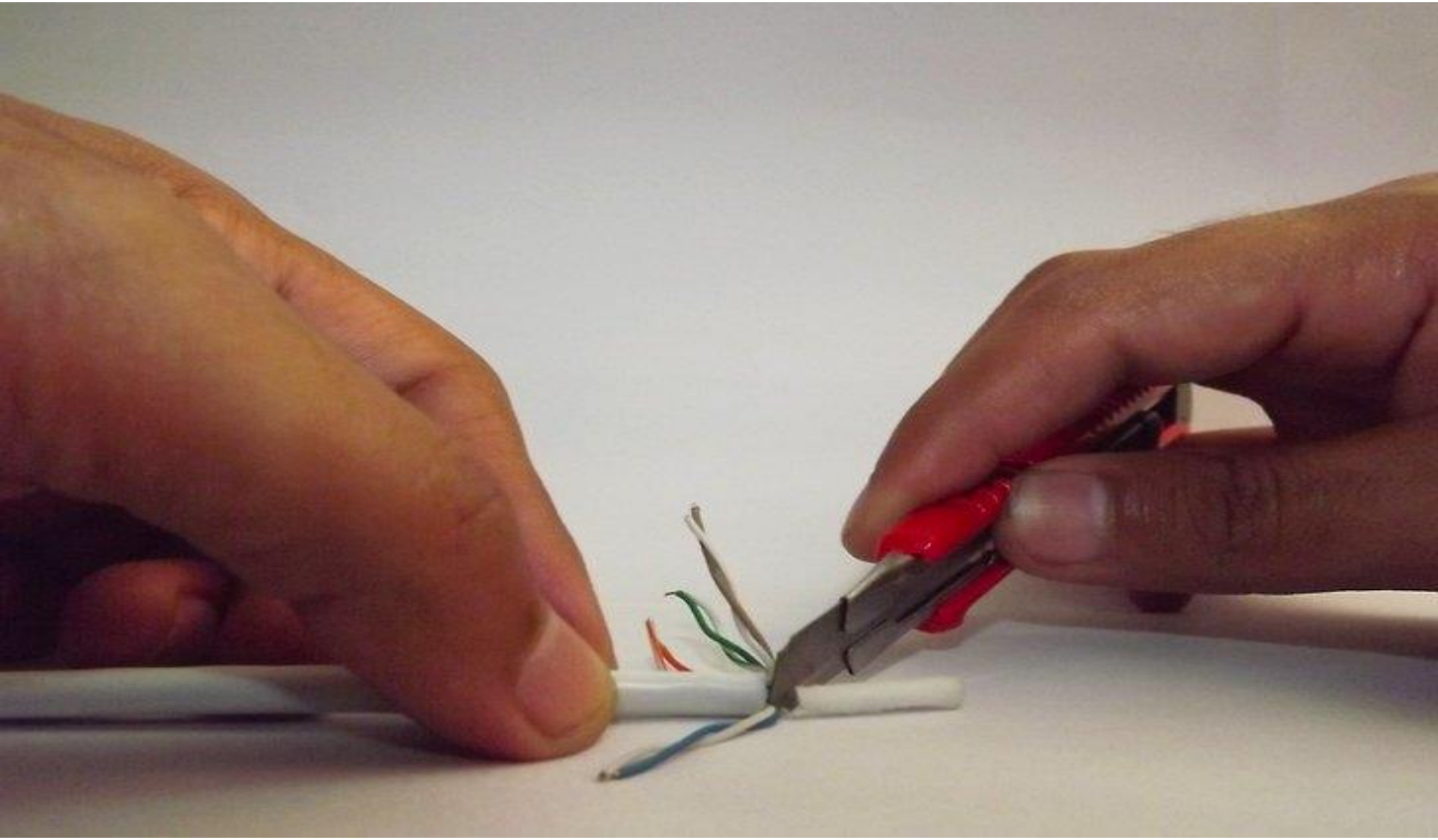
Step–1



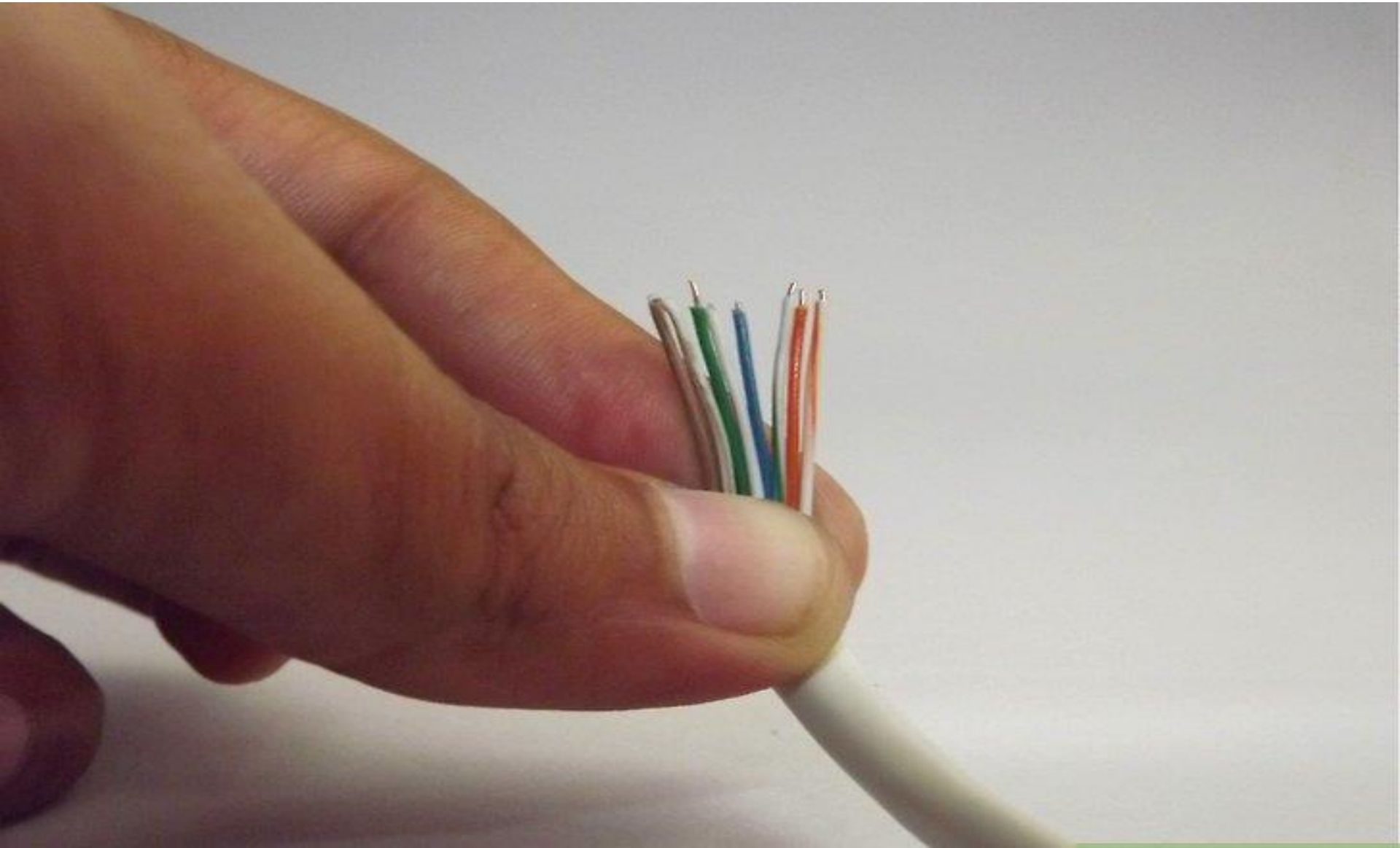
Step–2



Step–3

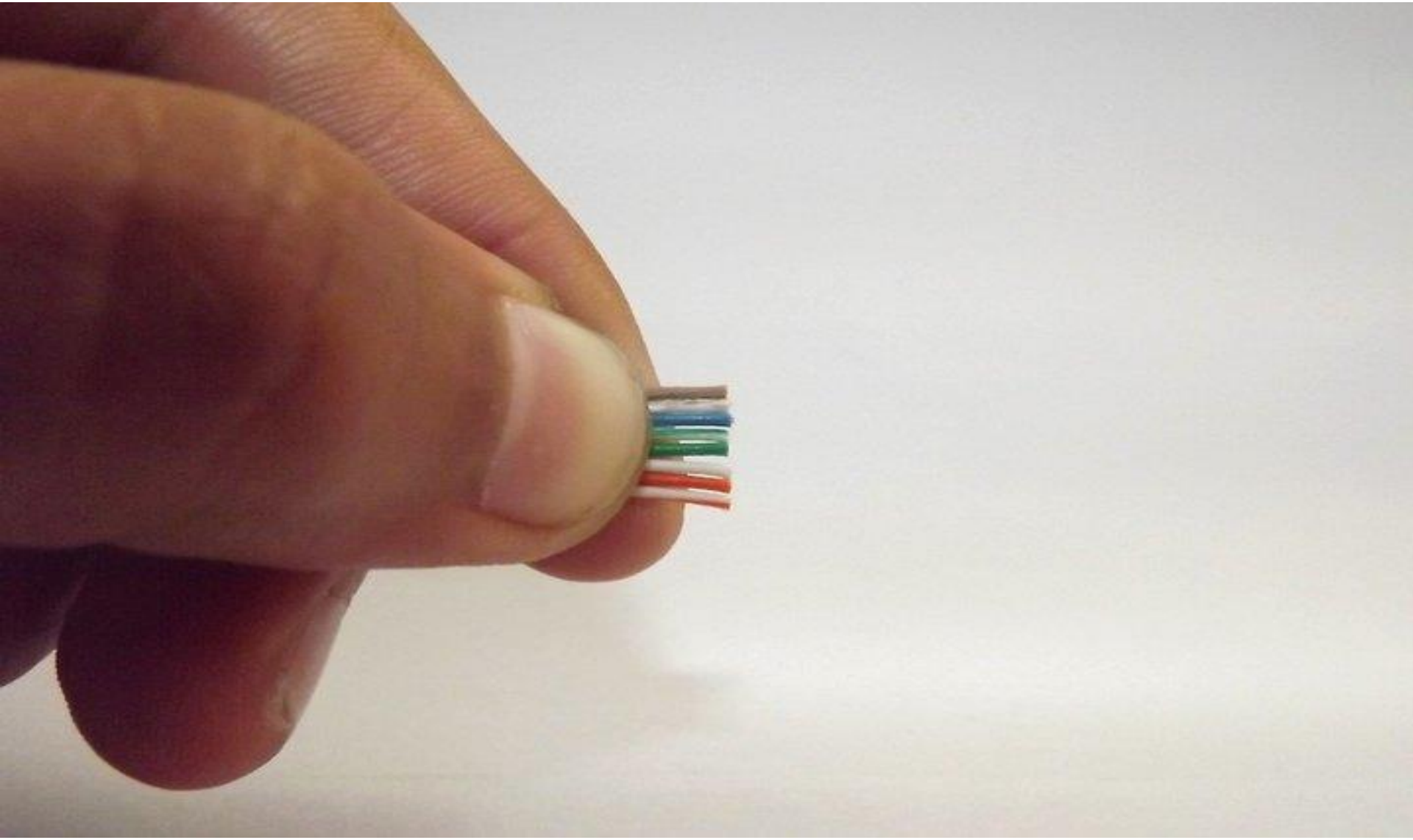


Step–4

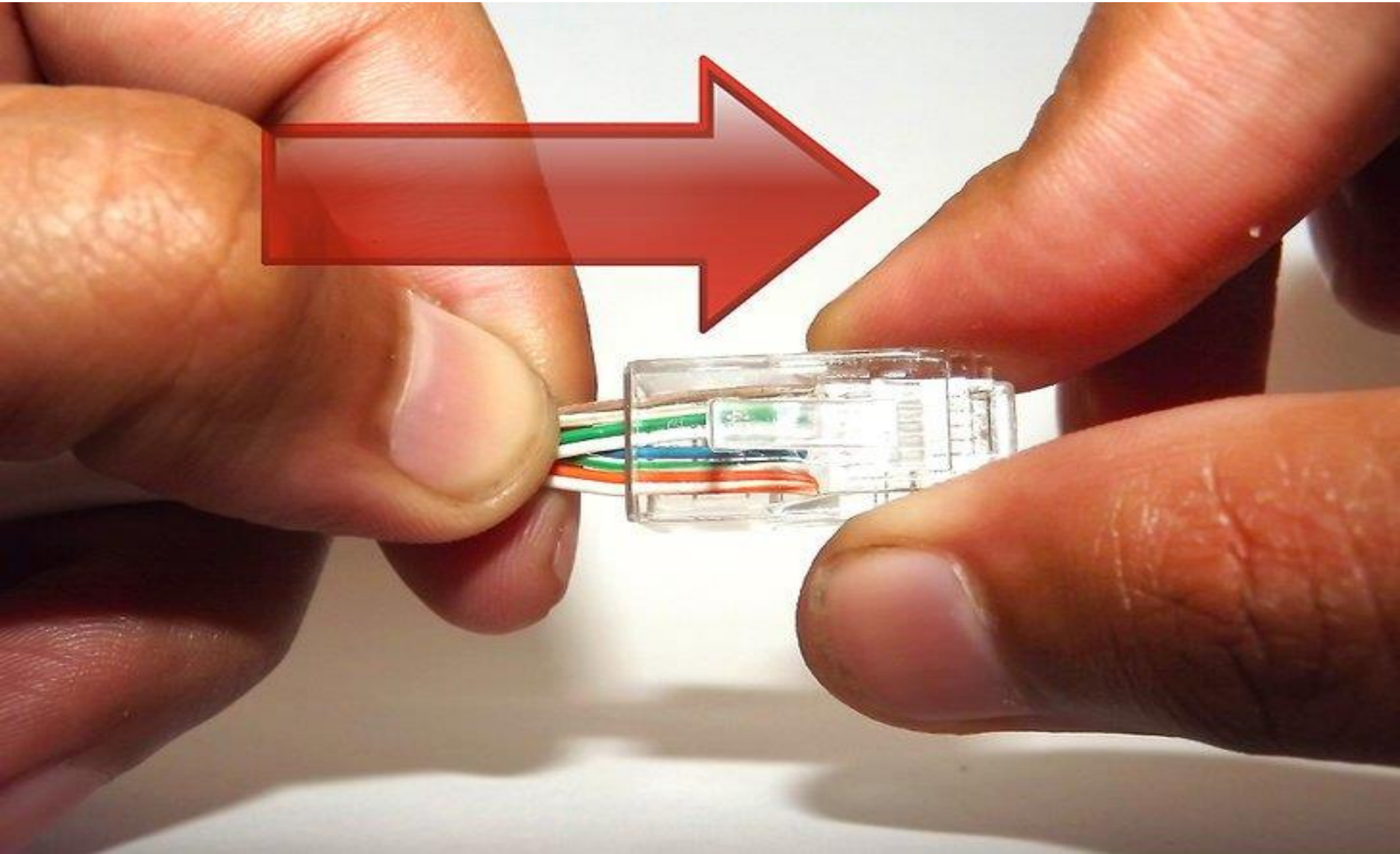


Step–5

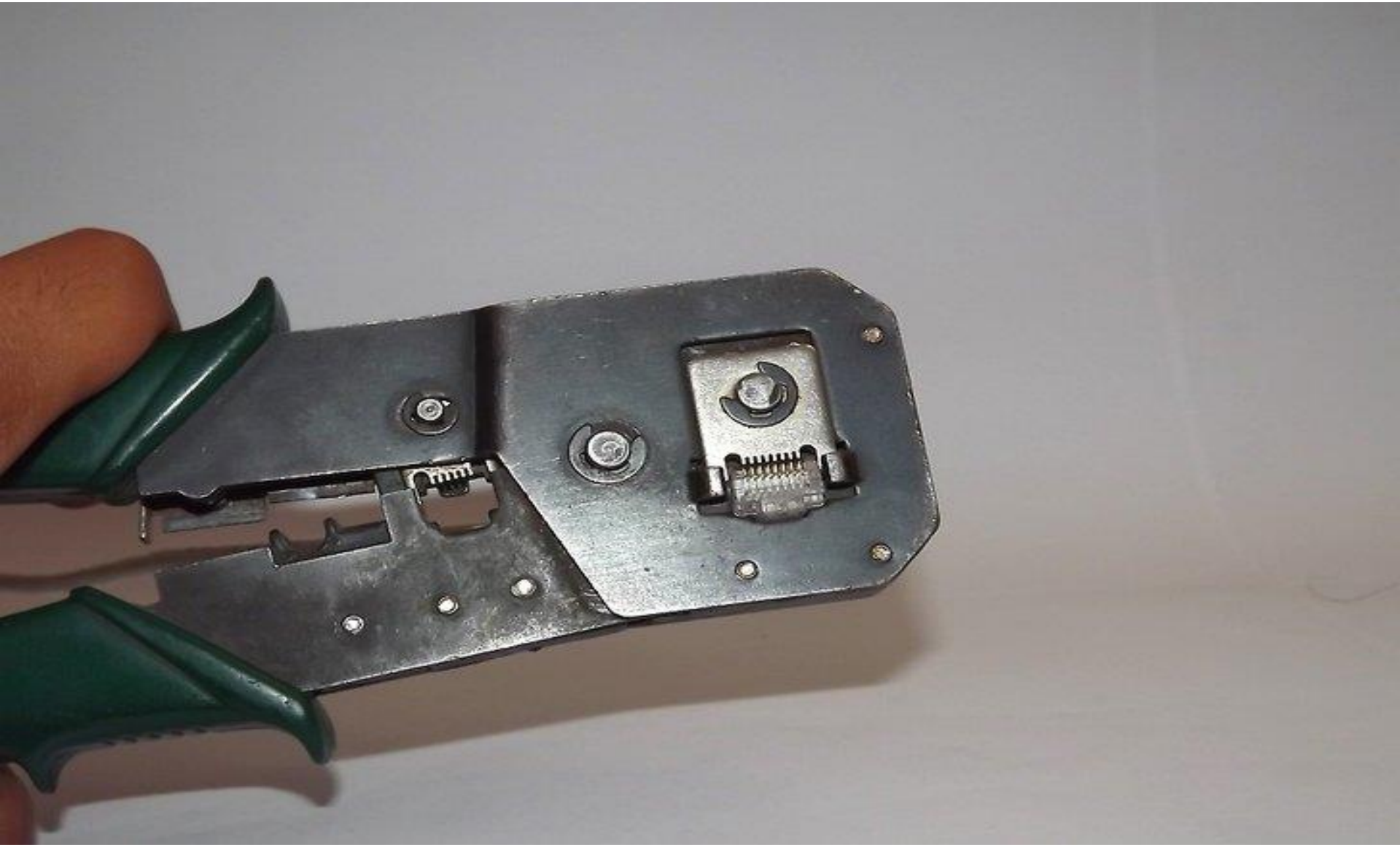
Step–6



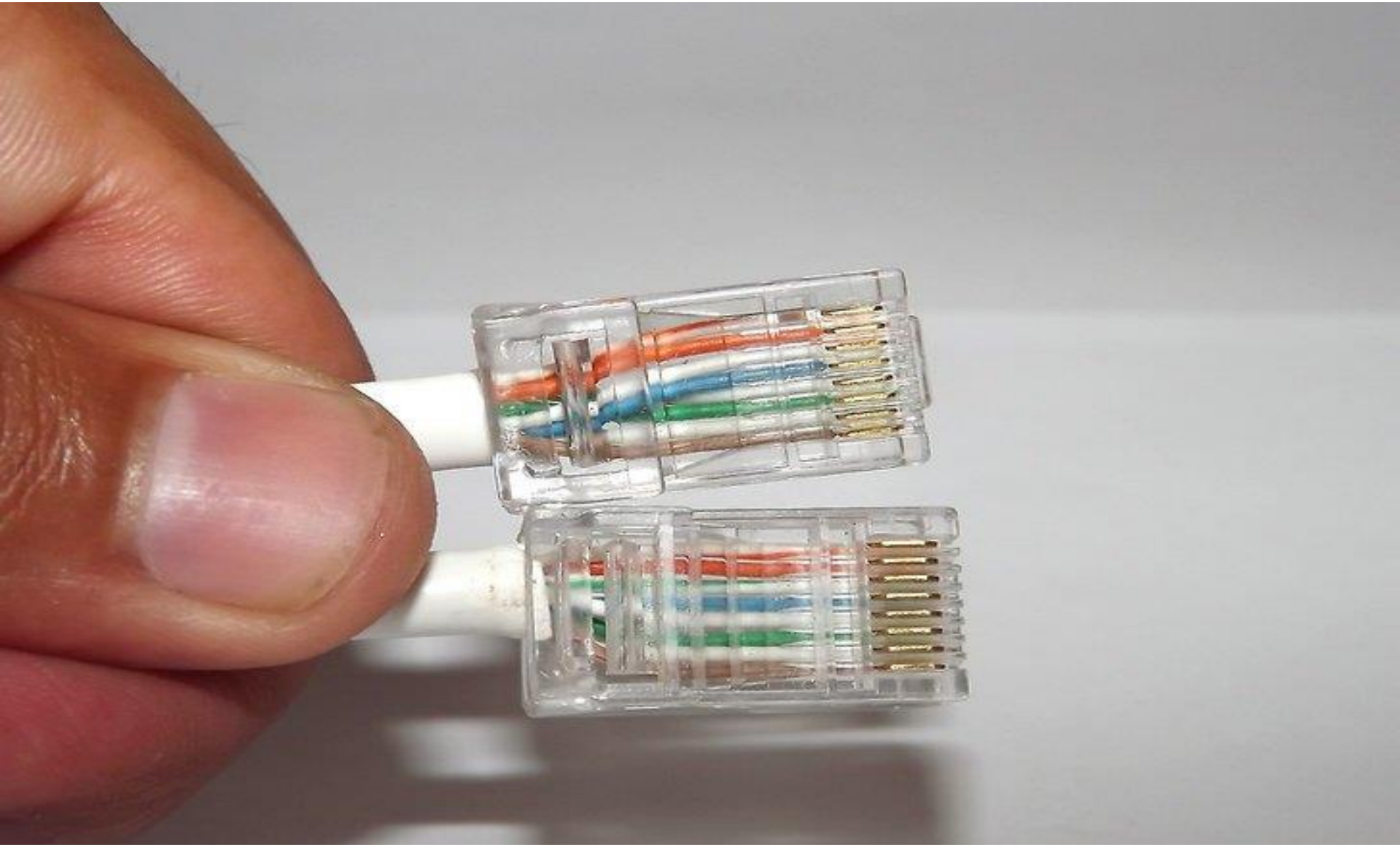
Step–7



Step–8



Step–9



Step–10


RJ11
REMOTE
RJ45
RJ11
CABLE
TESTER
APO
2S→ON
2S→M
5S→OFF
FUNC
MASTER
NS-468AT

Other Connectors

Rollover cable

RS232 cable