What is a Network?

A network consists of 2 or more computers connected together, and they can communicate and share resources (e.g. information)

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low many kinds of Networks?

Depending on one's perspective, we can classify networks in different ways

- Based on **transmission media**: Wired (UTP, coaxial cables, fiber-optic cables) and Wireless
- Based on **network size**: LAN and WAN (and MAN)
- Based on **management method**: Peer-to-peer and Client/Server
- Based on **topology** (connectivity): Bus, Star, Ring …

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Transmission Media

Two main categories:

- **Guided** — wires, cables
- **Unguided** — wireless transmission, e.g. radio, microwave, infrared, sound, sonar

We will concentrate on guided media here:

- **Twisted-Pair cables:**
  - Unshielded Twisted-Pair (UTP) cables
  - Shielded Twisted-Pair (STP) cables
- **Coaxial cables**
- **Fiber-optic cables**

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Categories of UTP Cables

EIA classifies UTP cables according to the quality:

- *Category 1* — the lowest quality, only good for voice, mainly found in very old buildings, not recommended now
- *Category 2* — good for voice and low data rates (up to 4Mbps for low-speed token ring networks)
- *Category 3* — at least 3 twists per foot, for up to 10 Mbps (common in phone networks in residential buildings)
- *Category 4* — up to 16 Mbps (mainly for token rings)
- *Category 5* (or *5e*) — up to 100 Mbps (common for networks targeted for high-speed data communications)
- *Category 6* — more twists than Cat 5, up to 1 Gbps

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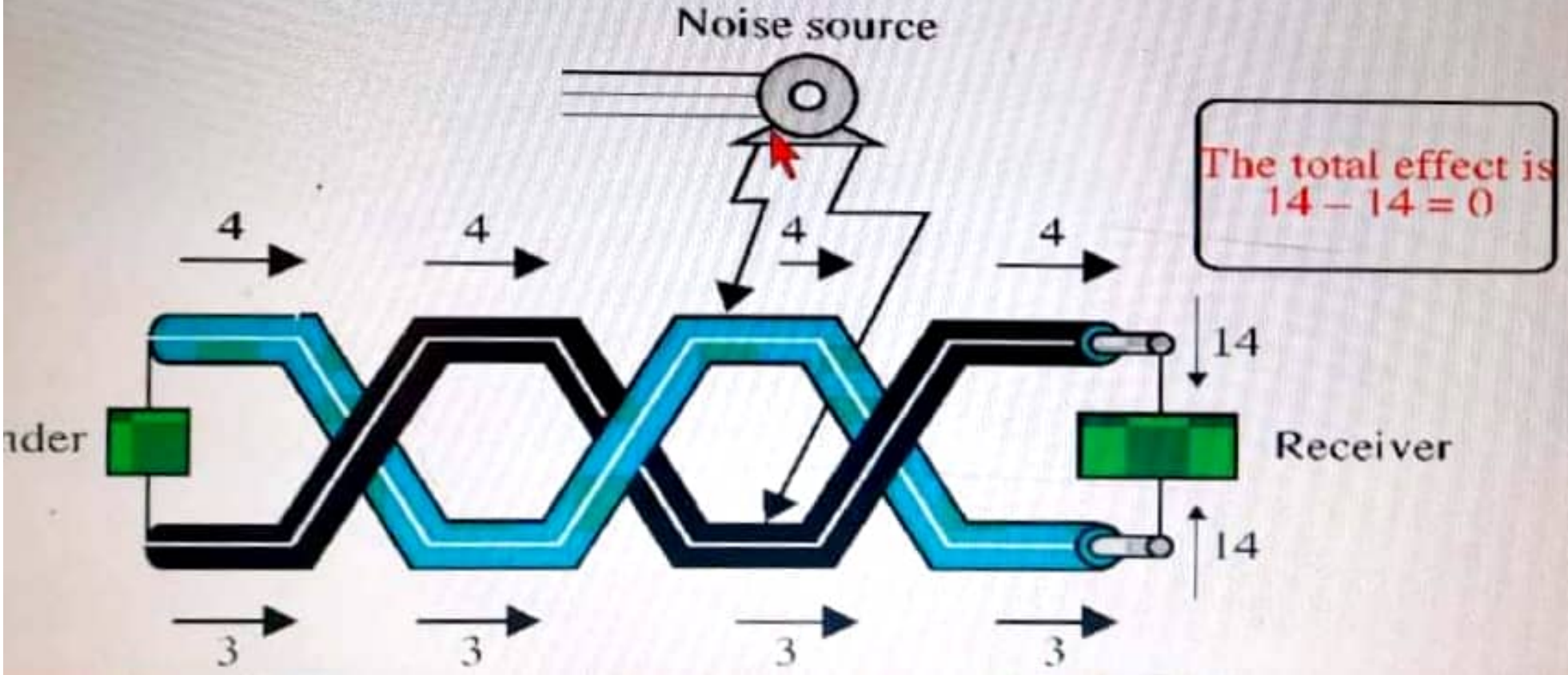
Twisted-Pair Cables

If the pair of wires are not twisted, electromagnetic noises from, e.g., motors, will affect the closer wire more than the further one, thereby causing errors



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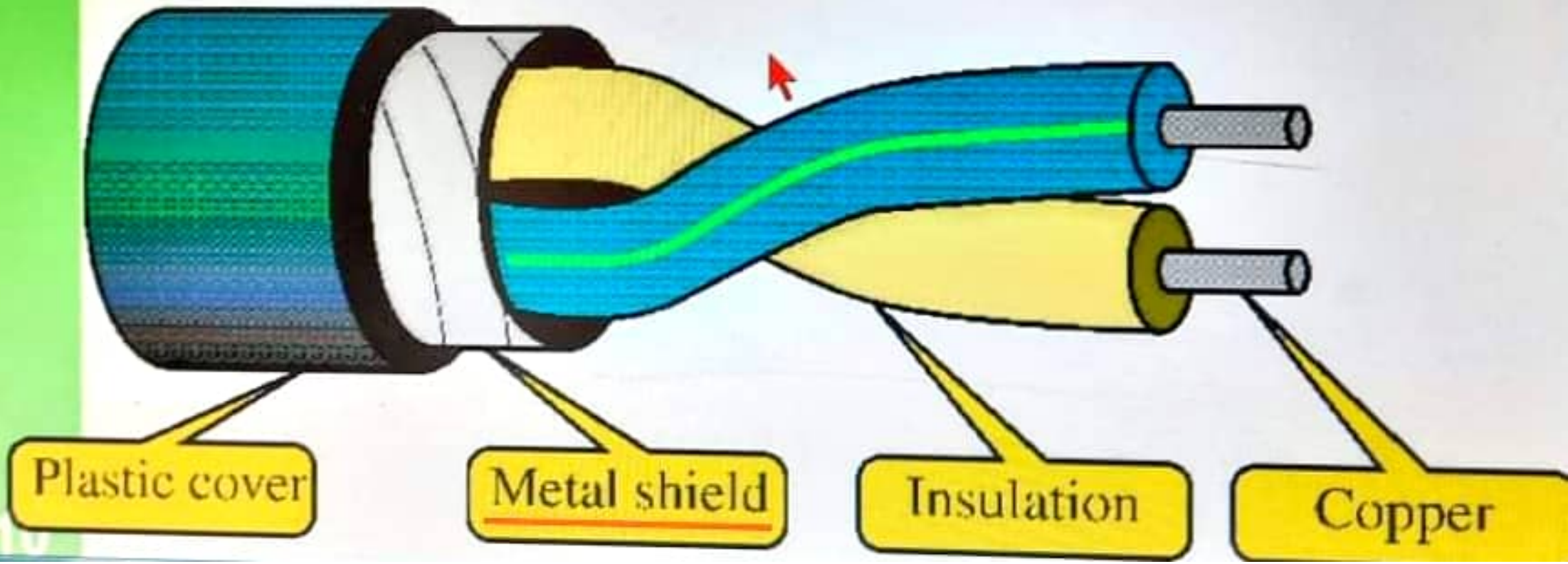
Shielded Twisted-Pair (STP)

- STP cables are similar to UTP cables, except there is a metal foil or braided-metal-mesh cover that encases each pair of insulated wires



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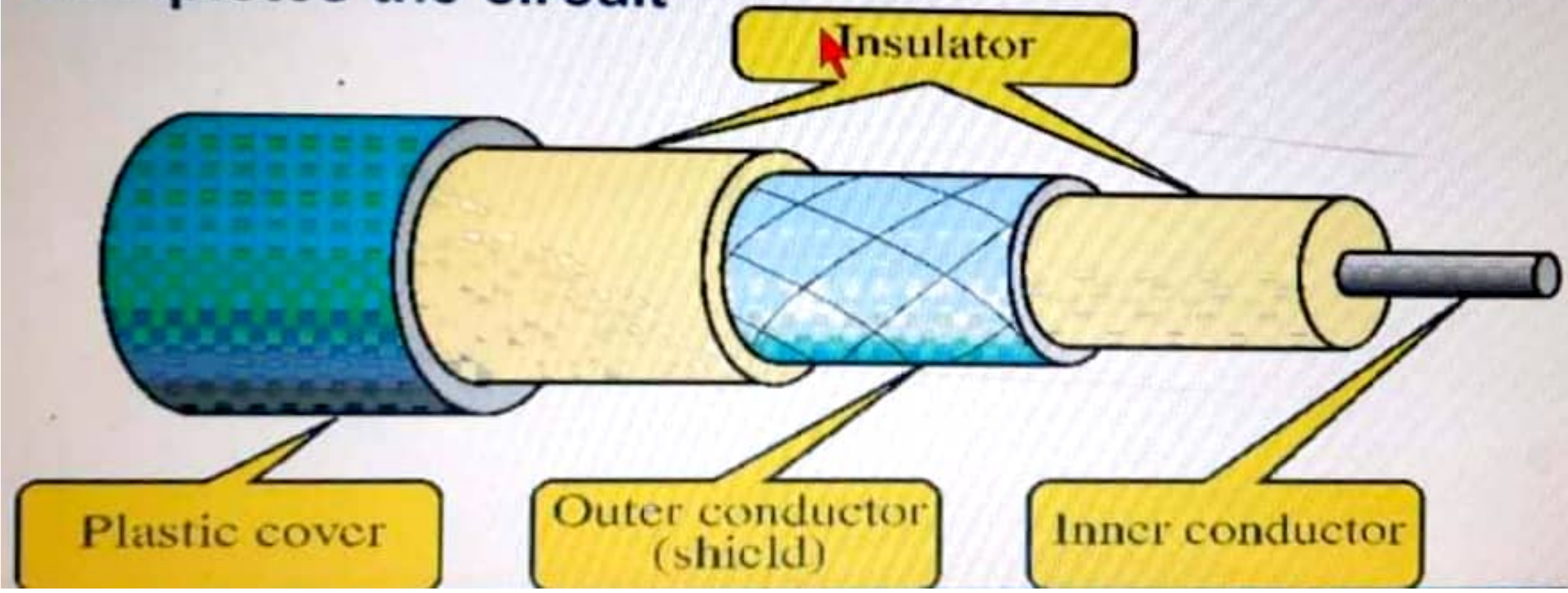
Coaxial Cables

In general, coaxial cables, or coax, carry signals of higher freq (100KHz–500MHz) than UTP cables

Outer metallic wrapping serves both as a shield against noise and as the second conductor that completes the circuit



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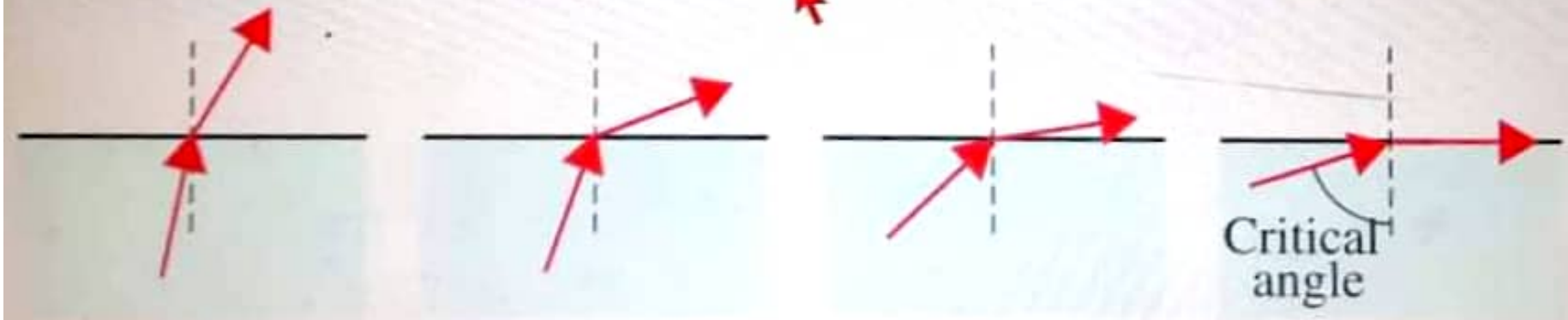
Fiber-Optic Cables

Light travels at 3×10^8 ms^{-1} in free space and is the fastest possible speed in the Universe

Light slows down in denser media, e.g. glass

Refraction occurs at interface, with light bending away from the normal when it enters a less dense medium



Beyond the *critical angle* ⇒ total internal reflection

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Advantages of peer-to-peer networks:

- Low cost
- Simple to configure
- User has full accessibility of the computer

Disadvantages of peer-to-peer networks:

- May have duplication in resources
- Difficult to uphold security policy
- Difficult to handle uneven loading

Where peer-to-peer network is appropriate:

- 10 or less users
- No specialized services required
- Security is not an issue
- Only limited growth in the foreseeable future

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Clients and Servers

- Network **Clients** (**Workstation**)
  - Computers that request network resources or services
- Network **Servers**
  - Computers that manage and provide network resources and services to clients
    - Usually have more processing power, memory and hard disk space than clients
    - Run Network Operating System that can manage not only data, but also users, groups, security, and applications on the network
    - Servers often have a more stringent requirement on its performance and reliability

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eer-to-Peer Networks

Peer-to-peer network is also called workgroup

No hierarchy among computers ⇒ all are equal

No administrator responsible for the network

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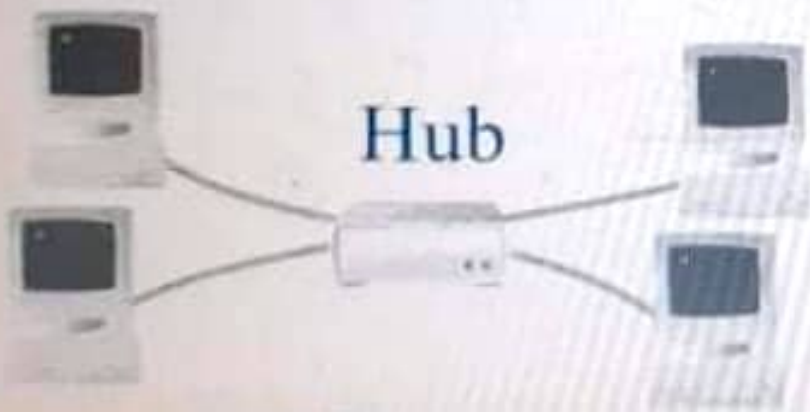
Topology — 3 basic types

How so many computers are connected together?

Bus Topology

Ring Topology

Star Topology



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