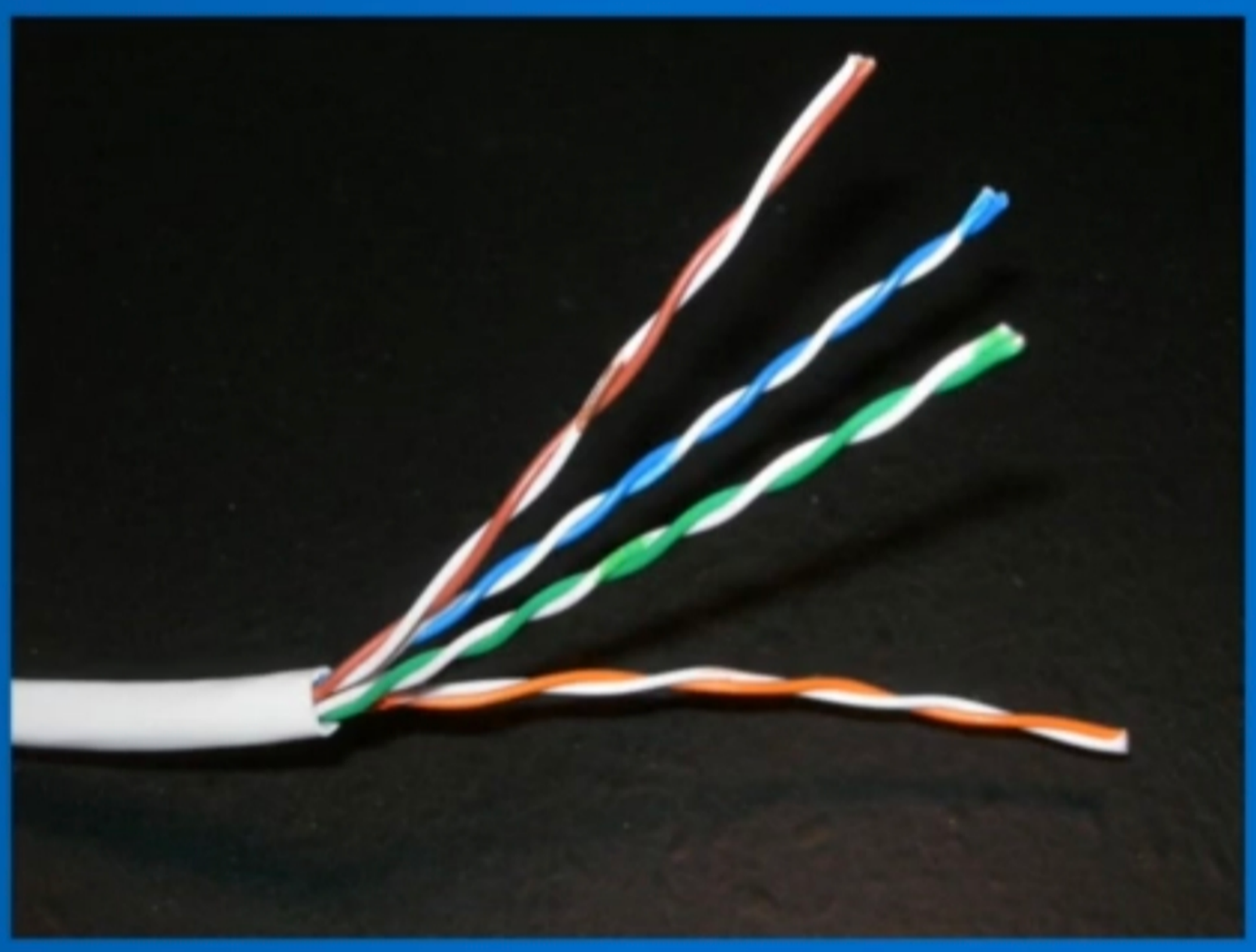
# Twisted-pair Cable

- the most commonly used cable type in local area networks
- relatively easy to work with, flexible, efficient, and fast
- contains eight wires grouped into four twisted pairs, typically blue, orange, green, and brown
- The twisted wires reduce crosstalk and interference

10 seconds



## Twisted Pair Categories

- Twisted-pair cables are categorized according to the frequency at which they transmit signals and their data transfer rate

| Cable Type | Speed |
|---|---|
| Category 3 (Cat-3) | 10 Mbps |
| Category 5 (Cat-5) | 100 Mbps |
| Category 5e (Cat-5e) | 100 Mbps and 1000 Mbps+ |
| Category 6 (Cat-6) | 1000 Mbps+ |

# Types of Patch Cables

- Straight through cable
  - Most common type of patch cable
  - Used to connect a computer to a central connecting device like a switch
- Crossover cable
  - Used to direct connect similar devices without the use of a hub

# Attenuation

*The quantity of information reaching the receiver as compared to the transmitted quantity of information*

- Measured in decibels (dB)
- According to the IEEE 802.3 standard, twisted-pair cables can be run 100 meters. Beyond this the signal degrades to such a point that it cannot be interpreted by the destination host.
- A signal repeater, a hub, or switch can be used If a cable needs to be run farther

# Interference

*anything that disrupts or modifies a signal that is traveling along a wire*

- Electrical Sources
  - Lights
  - Electrical Outlets
  - Motors
  - Appliances
- Copper-based cables and network devices should be kept away from these electrical devices and cables if at all possible

# Electromagnetic Interference (EMI)

- Electromagnetic Interference (EMI) disturbance can affect electrical circuits, devices, and cables due to electromagnetic conduction and possibly radiation
- Any type of electrical device causes EMI: TVs, air conditioning units, motors, unshielded electrical cables (Romex)
- Copper-based cables and network devices should be kept away from these electrical devices and cables to prevent network communication issues

# Radio Frequency Interference (RFI)

- This is interference that can come from AM/FM transmissions and cell phone towers
- It is often considered part of the EMI family and is sometimes even referred to as EMI
- Filters can be installed on the network to eliminate the signal frequency being broadcast by a radio tower, although this will usually not affect standard wired Ethernet networks

# Crosstalk

*When the signal that is transmitted on one copper wire or pair of wires creates an undesired effect on another wire or pair of wires*

- When it comes to twisted-pair cabling, crosstalk is broken down into two categories:
  - ***Near end crosstalk*** (NEXT) occurs when there is measured interference between two pairs in a single cable, measured on the cable end nearest the transmitter.
  - ***Far end crosstalk*** (FEXT) occurs when there is similar interference, measured at the cable end farthest from the transmitter.

# Shielded twisted-pair cables

- STP cables have an aluminum shield inside the plastic jacket that surrounds the pairs of wires

# Plenum-Rated

- Cables installed inside walls or above drop ceilings where they cannot be accessed by sprinkler systems in the case of a fire should be plenum-rated or low-smoke rated
- Plenum-rated cables have a Teflon coating that makes them more impervious to fire
- They are used in these situations because standard twisted-pair cables have a PVC jacket, which can emit deadly gas into the air

# Fiber Optic Cable

*transmits light (photons) instead of electricity over glass or plastic "fibers"*

- Very good for high-speed, high-capacity data transmission due to lack of attenuation
- Single-mode
  - meant to carry a single ray of light—one ray of light, one mode
  - This type of cable is normally used for higher-bandwidth, longer-distance runs, generally 10-80 km
  - More expensive equipment
- Multi-mode
  - Cable with a larger fiber core, capable of carrying multiple rays of light.
  - This type of cable is used for shorter distance runs, up to 600 meters.
  - Though much shorter than single mode fiber runs, this is still six times the distance of twisted-pair cable runs.
  - Less expensive equipment

# Wireless Networks

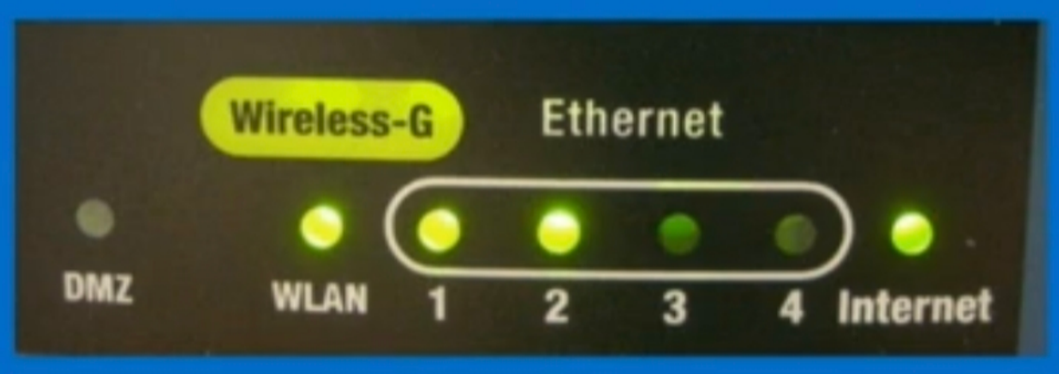
- Enables connection to the network without using a wired connection
- Provide a degree of portability
- Extend connectivity to a pre-existing wireless network and could be used to connect entire local area networks to the Internet
- Some wireless devices can be connected directly to each other in a point-to-point fashion

## Wireless Network Adapters

- Wireless network adapters enable connectivity between a desktop computer or laptop and the wireless access point
- These network adapters come in a variety of shapes and sizes, including USB, PC Card, and as an internal PCI or PCI Express adapter card

# Wireless Access Point

- A wireless access point (WAP) enables wireless devices to connect to a wired network
- A wireless router can also acts as a router, firewall, and IP proxy




## Wireless Modes

- There several different methods to connect to a wireless network
  - Infrastructure – the mode used when wireless clients connect to and are authenticated by a wireless access point
  - Ad-hoc – used when all of the clients communicate directly with each other

# Wireless LAN (WLAN)

- Wireless LAN or WLAN is a network composed of at least one WAP and a computer or handheld device that connect to the WAP
- Usually these networks are Ethernet based, but they can be built on other networking architectures
- In order to ensure compatibility, the WAP and other wireless devices must all use the same IEEE 802.11 WLAN standard
- Wireless Fidelity (WiFi ) is a trademark to brand products that belong to the category of WLAN devices

—> wireless repeater is used to extend the coverage of wireless network

# Wireless Encryption Options

| Wireless Encryption Protocol | Description | Encryption Level (Key Size) |
|---|---|---|
| WEP | Wired Equivalent Privacy | 64-bit |
| WPA & WPA2 | Wi-Fi Protected Access | 256-bit |
| TKIP | Temporal Key Integrity Protocol | 128-bit |
| AES | Advanced Encryption Standard | 128-, 192- and 256-bit |

# Service Set Identifier

- When utilizing infrastructure mode, the base unit (normally a WAP) will be configured with a service set identifier (SSID)
- The SSID is the name of the wireless network, and it is broadcast over the airwaves
- When clients want to connect to the WAP, they can identify it by the SSID
- For security, the SSID can be hidden from public discovery