

# Networking

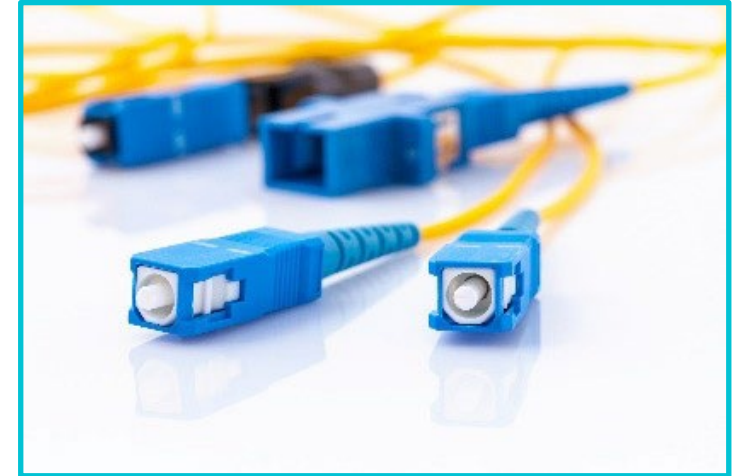
## Fiber-Optic Cables



# Fiber-Optic Cables

- A **fiber-optic cable** transmits data via a digital light impulse
  - Fiber-optic cables have a glass or plastic core that reflect the light through the cable
  - Higher speeds and longer distances than twisted pair cables
  - More expensive than twisted pair cables
  - More difficult to install and repair

BigStock ID 444683681



Fiber-optic cable/connector



Inside a fiber-optic cable



# Single-Mode vs Multimode

- **Single-mode** fiber-optic cables (SMF) have one mode of light to propagate
  - Faster data transmission
  - 50x further distance than multimode
- **Multimode** fiber-optic cables (MMF) have multiple cores for multiple paths through the cable
  - Higher bandwidth
  - Further than twisted pairs
- SMF and MMF cannot interchange



# Fiber-Optic Standards

| Standard    | Year | Speed    | Distance |
|-------------|------|----------|----------|
| 100BASE-FX  | 1995 | 100 Mbps | 2 km     |
| 100BASE-SX  | 2000 | 100 Mbps | 300 m    |
| 1000BASE-SX | 1998 | 1 Gbps   | 500 m    |
| 1000BASE-LX | 1998 | 1 Gbps   | 550 m    |
| 10GBASE-SR  | 2002 | 10 Gbps  | 300 m    |
| 10GBASE-LR  | 2002 | 10 Gbps  | 10 km    |



# Multiplexing

- **Bidirectional wavelength division multiplexing (WDM)** is the ability to send multiple data/digital signals down one strand of fiber-optic cables by using different light wavelengths

| Multiplexing Method                            | Number of Channels | Distance | Wavelength Separation |
|--|--------------------|----------|-----------------------|
| Course Wavelength-Division Multiplexing (CWDM) | Up to 18           | 70 km    | 20 nm                 |
| Dense Wavelength-Division Multiplexing (DWDM)  | Up to 80           | 1 km     | 0.8 nm                |

