Connectors and Wiring Standards

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Physical Media

Coaxial Cable
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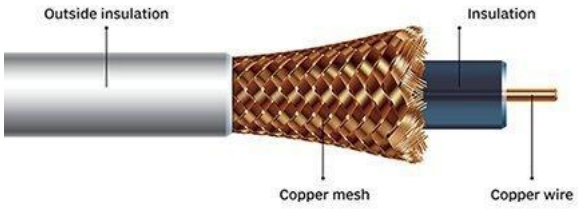
Coaxial Cable

A type of copper cable specially built with a metal shield and other components engineered to block signal interference



- Inexpensive
- Easy to install
- Easy to expand
- Resistance to EMI
- Up to 10 Mbps
- Durable

Coaxial Cable

There are two types of coaxial cable:

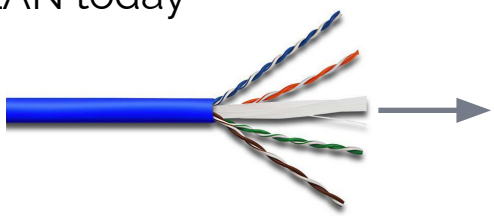
Thicknet (10Base5)

Thinnet (10Base2)

Thicknet and thinnet are used in Ethernet implementations

Twisted-Pair Cable

The most common type of network medium used in LAN today



UTP - Unshielded Twisted pair

STP - Shielded Twisted pair

- Cheaper
- Easy to work
- High transmission

Twisted-Pair Cable

N <Signaling> X

N: Signaling rate in Mbps

<Signaling>: Signalling type *(baseband or broadband)*

X: Unique identifier

Examples:

10Base-T: 10Mb or 10Megabits twisted pair

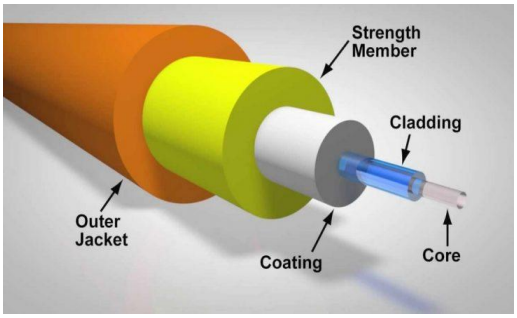
100Base-F: 100Mb or 100Megabits fiber

Twisted-Pair Cable

Category	Maximum Speed	Max. Length	Frequency	SHIELDING	Application
CAT 1	Up to 1Mbps(Carry only Voice)	--	1MHz	Unshielded	Old telephone cabling
CAT 2	Up to 4Mbps	--	4MHz	Unshielded	Token Ring Network
CAT 3	Up to 10Mbps	100m	16MHz	Unshielded	Token Ring & 10BASE-T Network
CAT 4	Up to 16Mbps	100m	20MHz	Unshielded	Token Ring Network
CAT 5	Up to 100Mbps	100m	100MHz	Unshielded	Ethernet, Fast ethernet and Token Ring
CAT 5e	Up to 1Gbps	100m	100MHz	Unshielded or Shielded	Ethernet, Fast ethernet & Gigabit ethernet
CAT 6	Up to 10Gbps	100m	250MHz	Unshielded or Shielded	Ethernet, Fast ethernet, Gigabit ethernet & 10G Ethernet(37 - 55 meter)
CAT 6a	Up to 10Gbps	100m	500MHz	Shielded	Ethernet, Fast ethernet, Gigabit ethernet & 10G Ethernet(37 - 55 meter)
CAT 7	Up to 10Gbps	100m	600MHz	Shielded	Ethernet, Fast ethernet, Gigabit ethernet & 10G Ethernet(100 meter)
CAT 8	Up to 40Gbps	100m	2000MHz	Shielded	Ethernet, Fast ethernet, Gigabit ethernet & 25G-40G Ethernet(30 meter)

Fiber-Optic Cable

Very thin strand of pure glass that acts as a waveguide for light over long distances

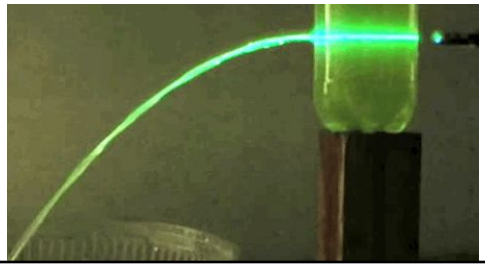


Total internal reflection

Fiber-Optic Cable

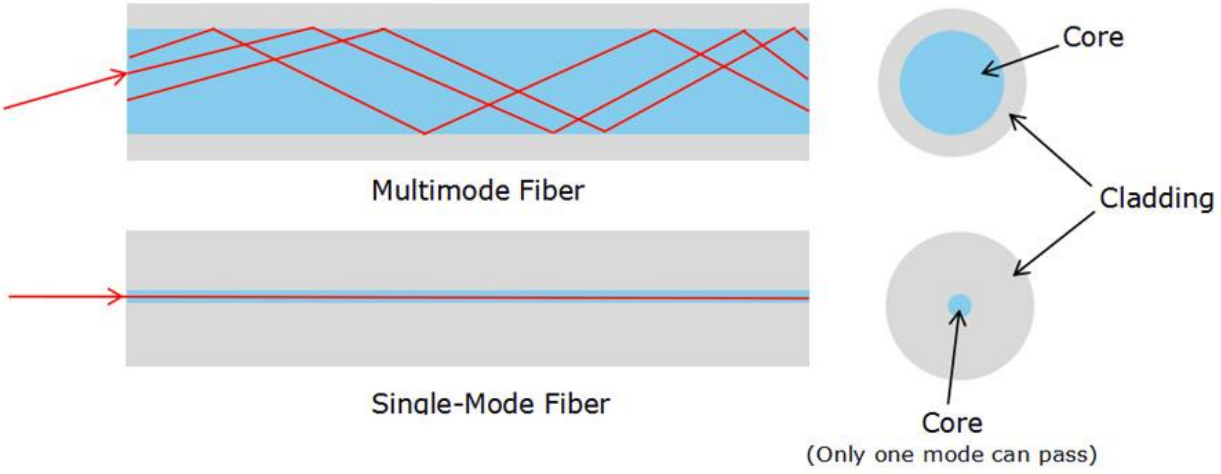
- Immune to EMI and RFI*
- Very long range
- Broad bandwidth (Tbits/s or THz)
- Low transmission loss
- Not dissipate heat

- Difficult to install
- More expensive than TP
- Troubleshooting equipment is more expensive then TP test equipment
- Harder to troubleshoot



*__EMI:__ Electromagnetic interference
__RFI:__ Radio frequency interference

Fiber-Optic Cable

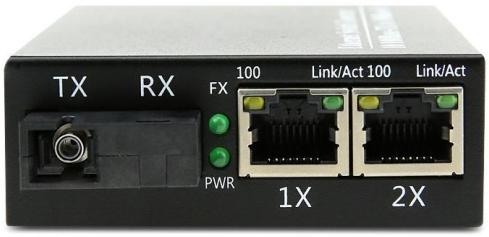


Media Converters

Converts Ethernet or other communication protocols from one cable type to another type

Main types:

- Fiber-to-Ethernet
- Fiber-to-Coaxial
- Fiber-to-Fiber
- Ethernet-to-Coaxial



Fiber-to-Ethernet converter

2 Cable Properties

Cable Properties

Transmission Speeds

Based on the type of cable or fiber, network administrators can control the speed of a network to meet the network's traffic demands

Media Type	Bandwidth	Performance: Typical Error Rate
Twisted-pair for analog voice applications	1 MHz	Poor to fair (10^{-5})
Coaxial cable	1 GHz	Good (10^{-7} to 10^{-9})
Microwave	100 GHz	Good (10^{-9})
Satellite	100 GHz	Good (10^{-9})
Fiber	75 THz	Great (10^{-11} to 10^{-13})

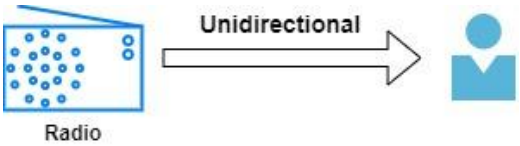
Cable Properties

Distance

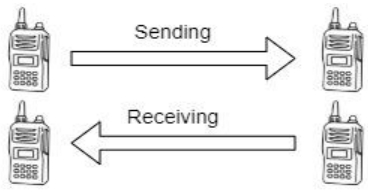
Standard	Data Rate	Max Distance	Cable Type
10Base2	10 Mbps	185 m	Coaxial
10Base5	10 Mbps	500 m	Coaxial
10BaseT	10 Mbps	100 m	Ethernet
100BaseT	100 Mbps	100 m	Ethernet
1000BaseT	1 Gbps	100 m	Ethernet
10BaseFL	10 Mbps	2 km	Fiber (Multi Mode)
100BaseSX	100 Mbps	300 m	Fiber (Multi Mode)
100BaseLX	100 Mbps	100 km	Fiber (Single Mode)
1000BaseLH	1 Gbps	70 km	Fiber (Single Mode)

Cable Properties

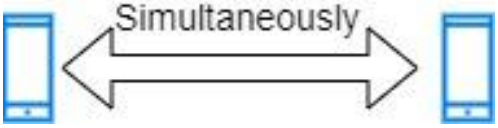
Simplex



Half-duplex



Full-duplex



THANKS!

Any questions?

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