

SIGNALS:

A function that represents the change in physical quantity with respect to time. e.g: Change in temperature of a city in 24 hours.

FUNCTION:

A mathematical concept that takes a value x , applies the function to x and returns $f(x)$.

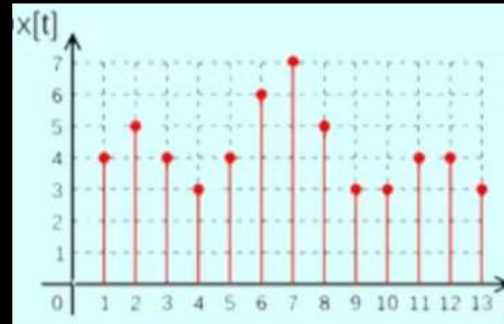
Here in the example of the signal, the signal function gets time and temperature as values. The signal function is applied to it and gives the output as the relationship of both the quantities in the form of graph of something else. So here it represents the relationship as the output of signal function in the form of graph.

TYPES OF SIGNALS:

Signals can be analog or digital.

DIGITAL SIGNALS:

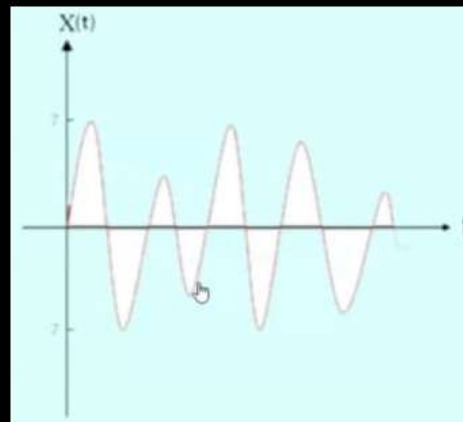
A signal that can take finite values at any given time. Incase of these signals, we discretize both time and magnitude.



The signal $x[t]$ can only take one value out of 0, 1, 2, 3, 4, 5, 6, and 7 for any discrete value of time. But not infinite as in analog signals. Infinite means 1.1, 1.2, 1.3, 1.11, 1.12 etc. So these values are infinite.

ANALOG SIGNALS:

It is the signal that can take any value in the defined range. e.g: All real-life signals like the colors we see, the temperature we feel etc are analog in nature. When we have infinite values in the defined range, then this is called analog signal.



The signal $x(t)$ can take any value between -7 to +7.

We need to deal with signals because In physical layer media we are ultimately focussing on signals.

COMMON WIRED AND WIRELESS MEDIA:

WIRED MEDIA:

- ★ Copper cable (Ethernet cable)
 - Unshielded Twisted Pair (UTP).
 - Shielded Twisted Pair (STP).
- ★ Copper coaxial cable.
- ★ Fiber optic cable.

ETHERNET CABLE:

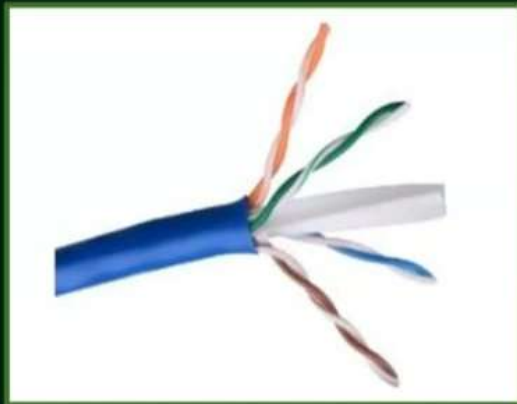
An Ethernet cable is a common type of network cable used with wired networks. Ethernet cables connect devices such as PCs, routers, and switches within a local area network.

UNSHIELDED TWISTED PAIR CABLE:

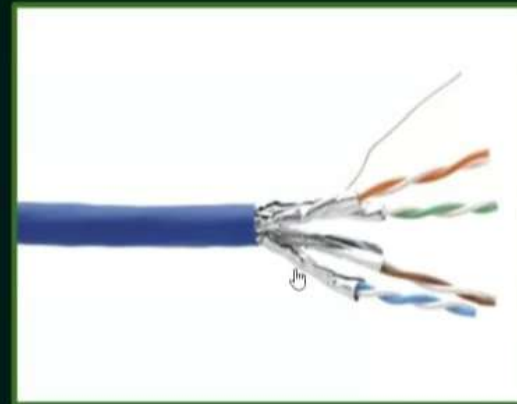
In this cable, there are 8 wires, each 2 wires twisted around each other making 4 pairs, but these 4 pairs have no coating outside it which make it prone to electromagnetic interference and radio frequency interference. Suitable for small networks because in small networks the traffic is less. This interference is called crosstalk. The negative effect of crosstalk can be reduced by increasing the number of twists per wire pair.

SHIELDED TWISTED PAIR CABLE:

Here each pair is coated separately to protect from EMI and RFI.



Unshielded Twisted Pair (UTP)
Ethernet Cable



Shielded Twisted Pair (STP)
Ethernet cable

COPPER COAXIAL CABLE:

Coaxial cables transmit electrical signals with minimal loss.

USES OF COAXIAL CABLE:

- Coaxial cables provide internet and TV.

- Used for sound and video in home theaters and security cameras.

FIBER OPTIC CABLE:

Fiber optic cables are thin strands of glass or plastic that carry data as light signals, allowing for very fast and long-distance communication.

WIRELESS MEDIA:

Wireless media has the following areas to deal with:

- ★ Coverage area (How much is the range of a wireless device is)
- ★ Interference (How much a wireless media is exposed to outside frequencies and noise)
- ★ Security (Data flows through space or air in wireless devices, so what is level of security of exposed signals is there)

POPULAR WIRELESS TECHNOLOGIES:

- Wi-Fi (Wireless Fidelity)
- Wi MAX
- Bluetooth

SPEED:

Wi-Fi > Wi MAX > Bluetooth.

	COMPARISON OF VARIOUS PHYSICAL MEDIA	
MEDIA	PHYSICAL COMPONENTS	SIGNAL
Copper cable (Wired)	<ul style="list-style-type: none"> • UTP/STP • Coaxial • Connectors • NICs • Ports/ Interfaces 	Electromagnetic Signals
Fiber optic cable (Wired)	<ul style="list-style-type: none"> • Single mode fiber • Multimode fiber • Connectors • NICs and Interfaces • Lasers and LEDs 	A light pulse equals 1 No light pulse is zero
Wireless Media	<ul style="list-style-type: none"> • Access Points • NICs (Different from that of wired NICs) • Radio • Antennae 	Radio Waves

COPPER VS FIBER OPTIC MEDIA:

	COPPER WIRE	FIBER OPTIC
Bandwidth supported	10 Mbps - 10 Gbps	10 Mbps - 100 Gbps
Range	Upto 100 meters	Upto 100,000 meters
Immunity to EMI and RFI	Low	High
Media and connector costs	Lowest	Highest
Installation skill required	Lowest	Highest