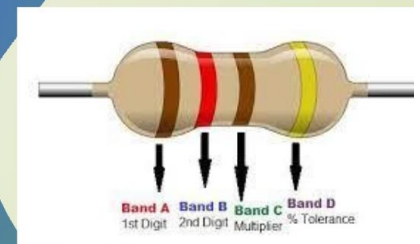
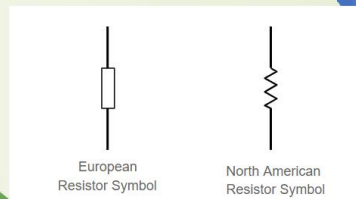


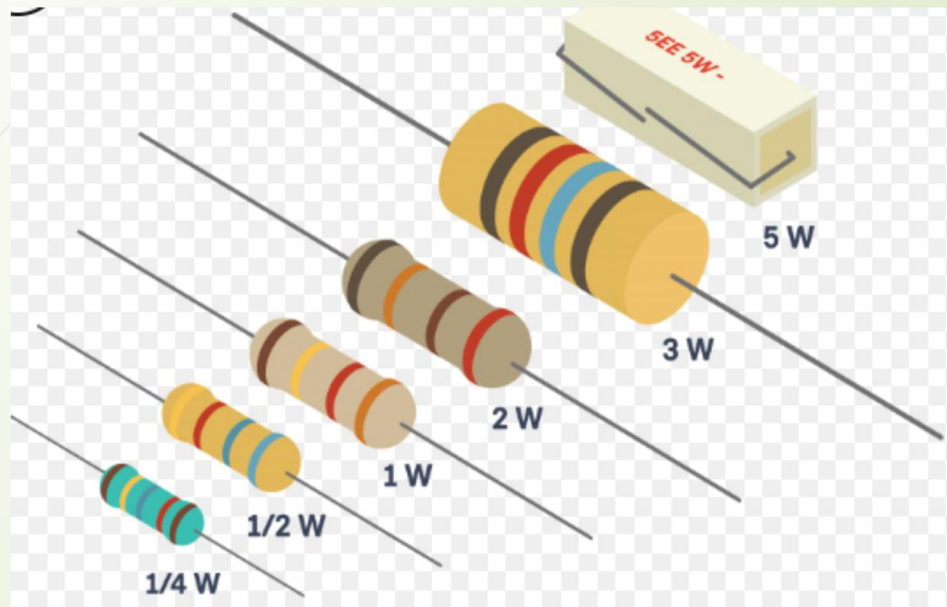
Press **Esc** to exit full screen

- Resistor
- Inductor
- Capacitor
- Micro processor
- Micro Controller
- CAN
- Types of protocols

What is Resistor?

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltage, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat may be used as part of motor controls, in power distribution systems, or as test loads for generator.



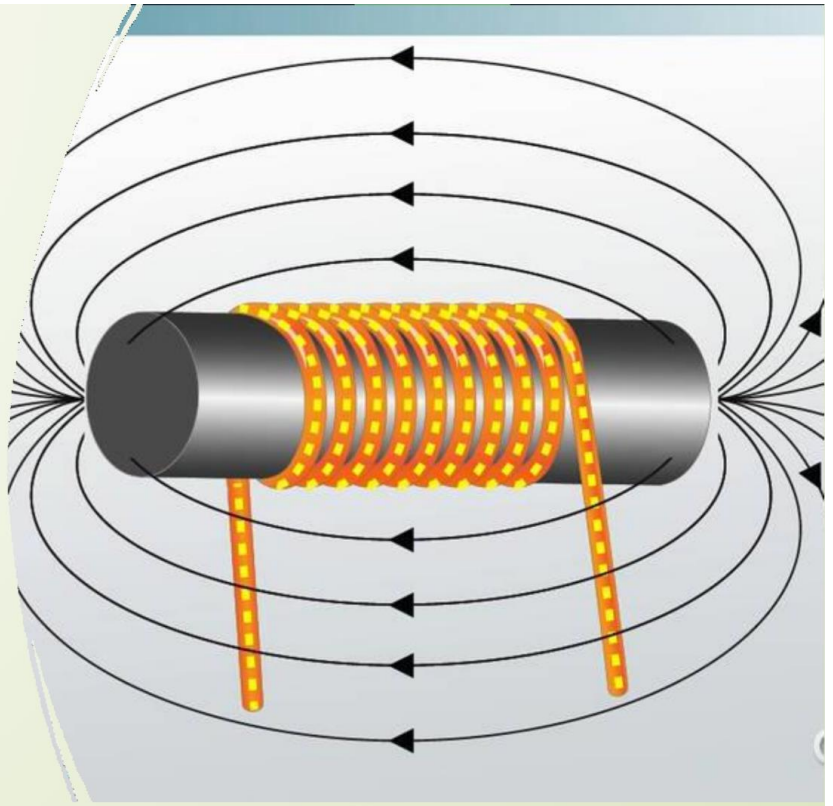


Different types of Resistor

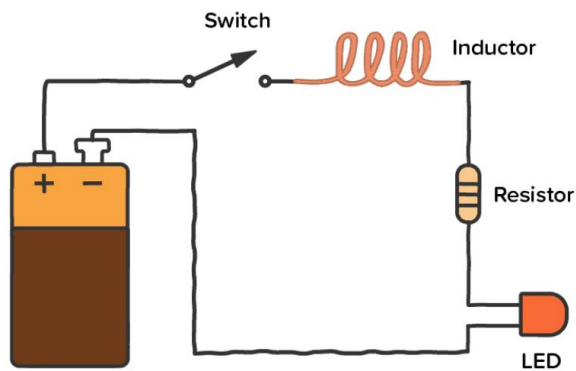


What is inductor

- An inductor is a passive electronic component that stores energy in the form of a magnetic field. In its simplest form, an inductor consists of a wire loop or coil. The inductance is directly proportional to the number of turns in the coil.

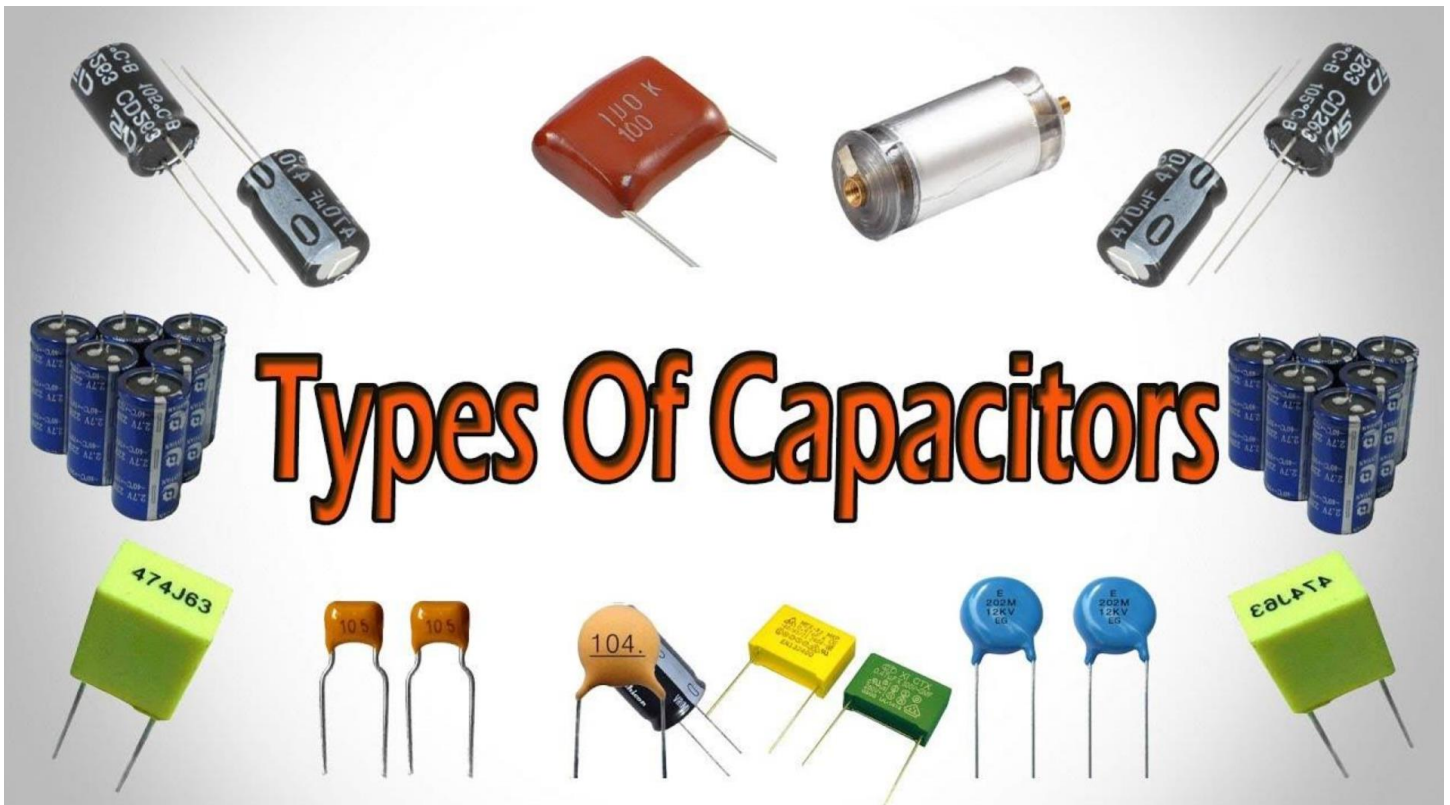


Inductor circuit diagram



What is capacitor?

- Capacitor is an electronic component that stores electric charge. The capacitor is made of 2 close conductors (usually plates) that are separated by a dielectric material. The plates accumulate electric charge when connected to power source. One plate accumulates positive charge, and the other plate accumulates negative charge.

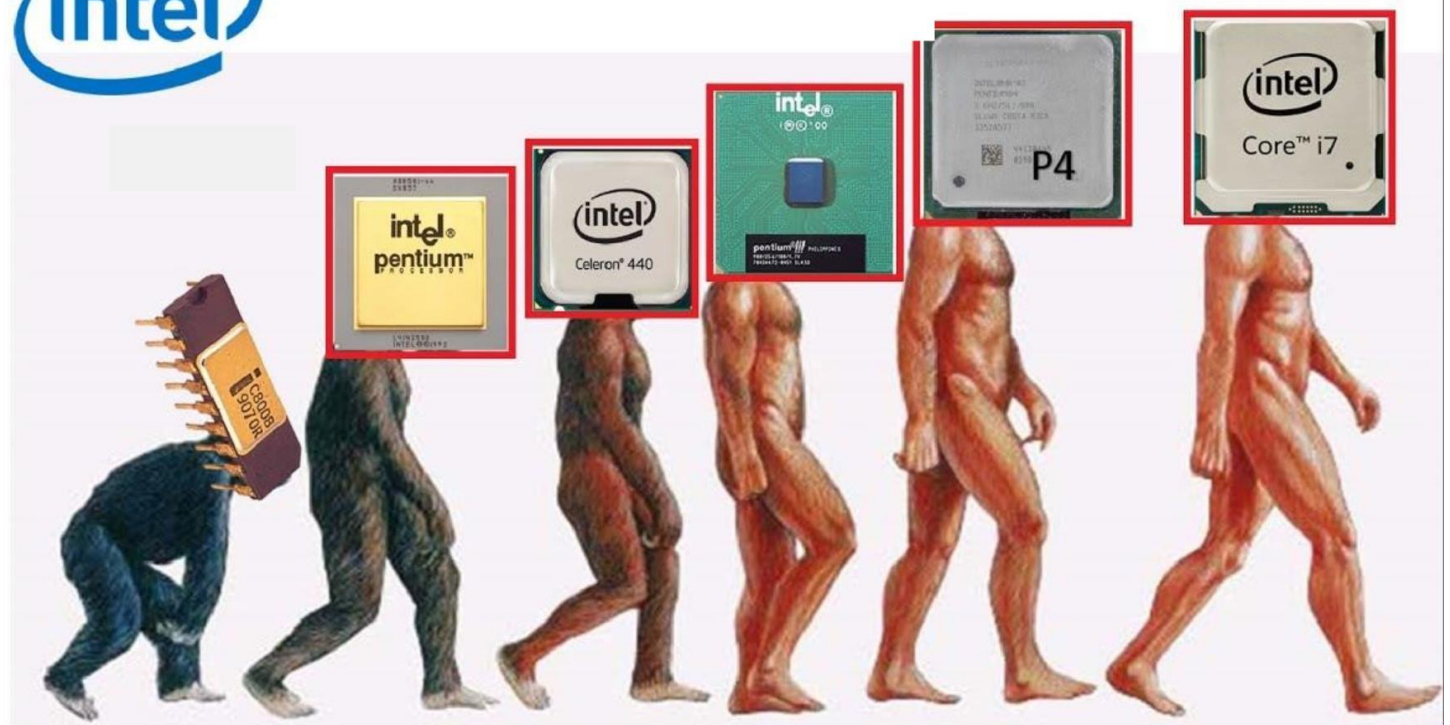
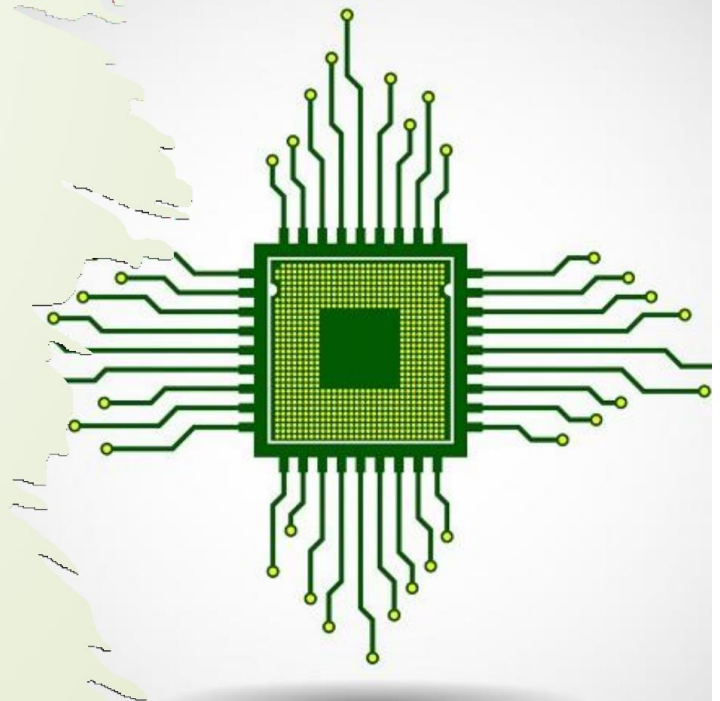


What Microprocessor

?

- A microprocessor is a component that performs the instructions and tasks involved in computer processing. In a computer system, the microprocessor is the central unit that executes and manages the logical instructions passed to it.

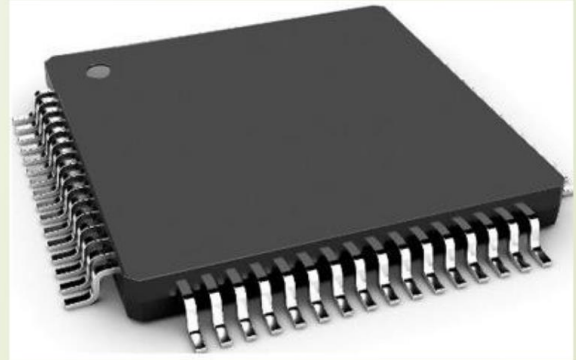
A microprocessor may also be called a processor or central processing unit, but it is actually more advanced in terms of architectural design and is built over a silicon microchip.



What is Microcontroller

?

A microcontroller is an integrated circuit (IC) device used for controlling other portions of an electric system, usually via microprocessor unit (MPU), memory, and some peripherals. these devices are optimized for embedded application that required both processing functionality and agile, responsive interaction with digital, analog, or electromechanical components.



What is ISO?



International
Organization for
Standardization

ISO (International Standard organization):

International Standard organization is a global organization that works to provide standardization Across the world of products and companies. Its main goal is to facilitate trade, but its focus is on process improvement, **safety , and quality in several areas.**

Why Iso is Important ?

Iso standards provides a strong basis for the development of national and international regulations, helping save time and reduce barriers to international trade

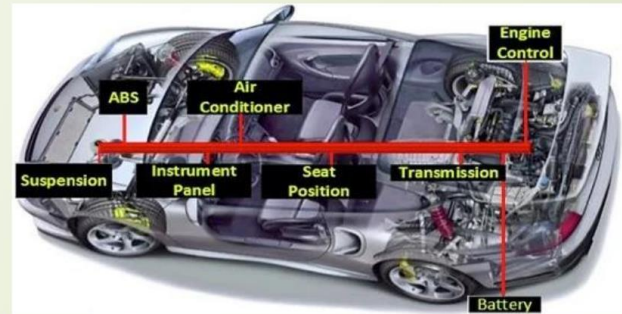
Some List of ISO:

ISO 14229 ----- UDS
ISO 11898----- CAN
ISO 17409----- Electrical vehicles
ISO 26262----- Functional Safety
ISO 2575----- Controls and indications

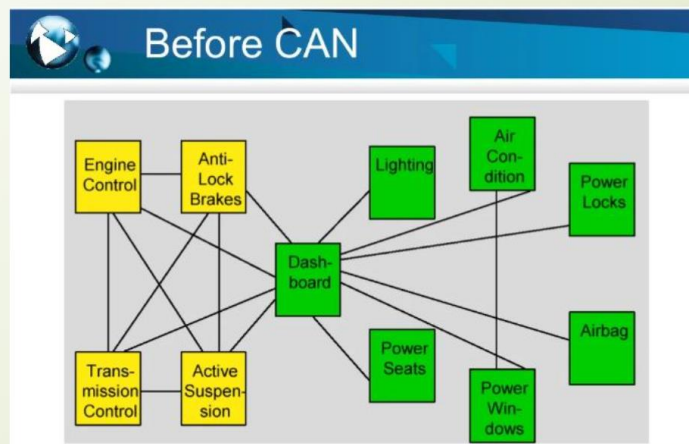


CAN [Controlled area network]

- Controlled area network (CAN) is the powerful Multi Master serial Vehicle bus. The CAN devices on bus are known as the nodes.
The nodes are connected each other via two wires bus and the wires are 120 ohms twisted pair. By making use of CAN the microcontroller and the devices are allowed to communicate with each other in any application without the host computer.

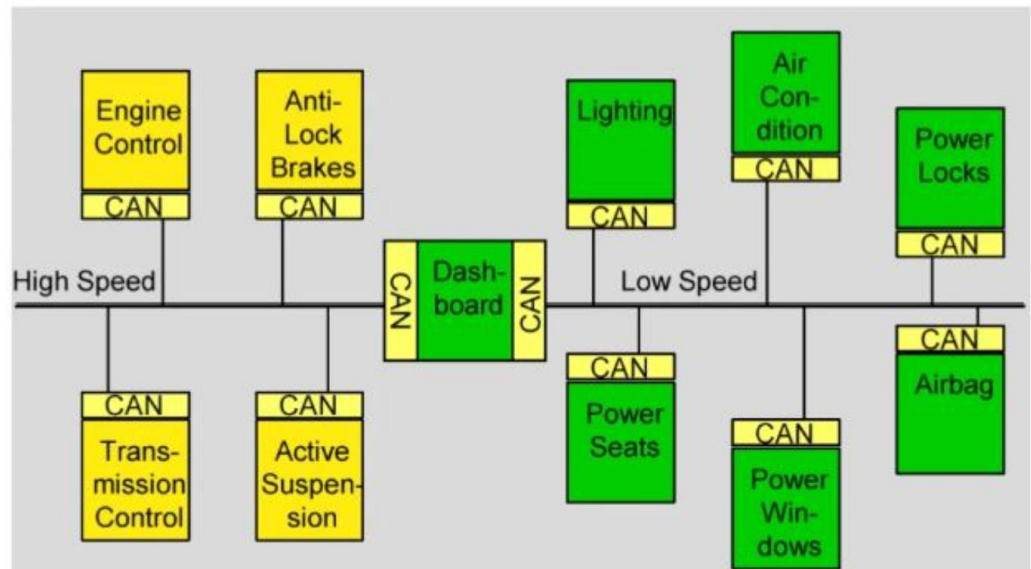


- CAN is invented by **Robert Bosch** in **1980** for automotive applications.
- CAN is an **asynchronous** Communication protocol.
- CAN is a **MESSAGE based protocol** (Each message carries a message identifier based on which the priority of message will be decided)
- CAN is a **Two wired communication**.





After CAN

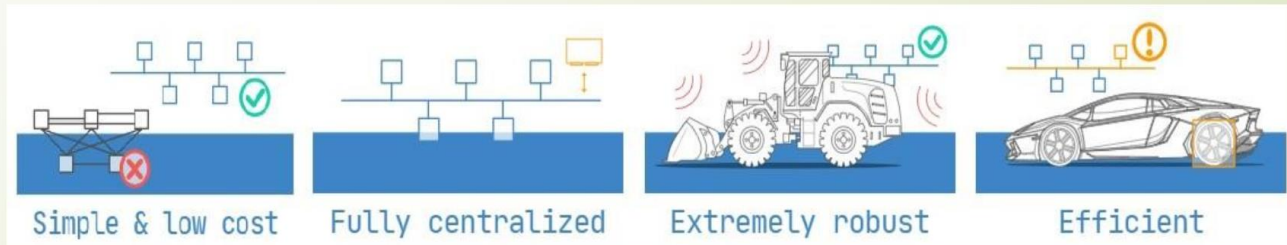


Why is CAN introduced?

To increase speed of the communication with ECU's

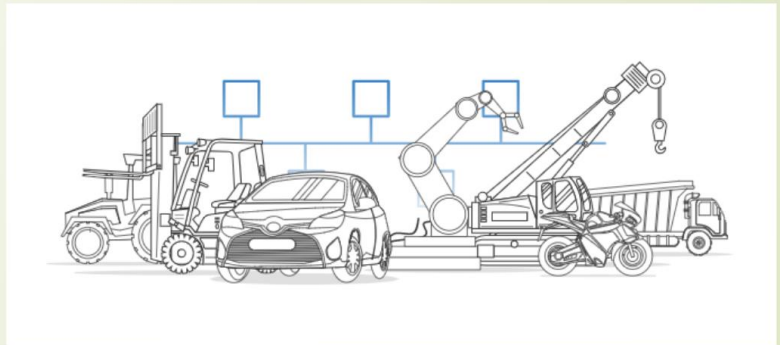
OBD II / EOBD → Old technology that used in 90's

Benefits of CAN



CAN APPLICATIONS:

1. Passenger vehicles.
2. Trucks.
3. Industrial automation.
4. Escalators.
5. Building Automation.
6. Medical instruments
7. Military etc....



(LIN) Local Interconnect Network

The Local Interconnect Network (LIN) is a serial bus that is used for the communication between the components in the vehicle.

The LIN is comparatively less expensive protocol for serial communication which supports applications within a car's network.

It is mainly used for the mechatronics nodes of the automotive applications. The LIN bus is the single master and the multi slaves bus architecture network where master polls for each slave.

LIN has a feature mechanism which allows the devices to enter the sleep mode when they are in the idle mode and thereby power conservation is achieved potentially.

Flex Ray

- Flex ray is the most reliable network communication protocol in the automotive. The Flex ray is designed in such a way that it is more reliable than CAN and the TTP. The Flex ray bus will operate on time signal that divided into two parts i.e dynamic and the static segments. The first production vehicle to have the **Flex ray bus was BMW X5 (E70) at the end of the year 2006.**
- The Flex ray nodes are interconnected by using the twisted pair of wires.

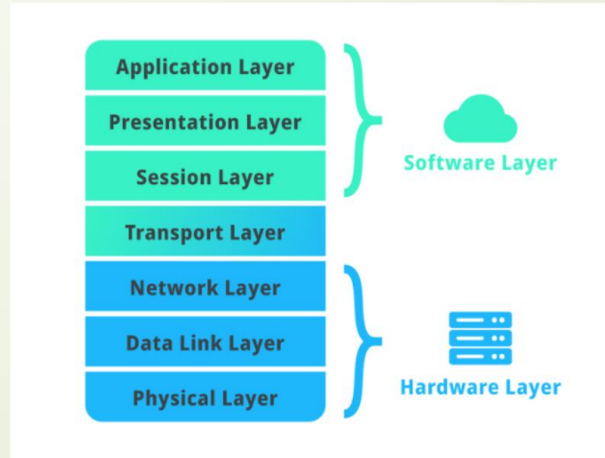
What is Ethernet protocols

- Ethernet protocol is a typical LAN technology. Standard Ethernet-based local area networks transmit data at speed up to 10 Mbps. New Ethernet cards known as Fast Ethernet represent high-speed LAN technology as it can provide data transfer rates as high as **100 Mbps**.
- Ethernet is primarily a standard communication protocol used to create local area networks. It transmits and receives data through cables. This facilitates network communication between two or more different types of network cables such as from copper to fibre optic and vice versa.



| Attribute | CAN | LIN | Flex-Ray | ETHERNET |
|-----------------------|--|--|---|---|
| Range | 1-5kms | 40mts | 10mts | 5mts |
| Baud rate | Fast- 1Mbps Slow- 500kbps (variable with distance) | Upto 20kbps (variable with distance) | 10mbps (variable with distance) | 150mbps |
| Payload | 8 bytes | 8 bytes | 256 bytes | 60 bytes |
| Physical Layer | 2 wire bus | 1 wire bus | 2 or 4 wire bus | Dual wire based fiber optic |
| Network Topology | MultiMaster | SingleMaster | Multimaster | MultiMaster |
| Operating Voltage | 3.3v | 8v to 9v | Differential voltage of +2.0v | 3.3v |
| Bandwidth | 125kbps max | 10kbps (variable) | 10Mbps | 1130Mbps |
| Cost | Medium | Low | High | Very high |
| Identifier ID | 11 and 29 bits | 6 bits | 11 bits | 16 bits |
| Message transfer type | Asynchronous | Synchronous | Asynchronous and Synchronous | Asynchronous Synchronous Isochronous |
| Applications | Powertrain (Chassis, engine, ABS) | Body electronics (mirror, power seat, accessories) | High performance powertrain safety (Active suspension, Adaptive cruiser control) | Transmit audio, video, data and control info. |

The **OSI Model** or **Open Systems Interconnection model** is a conceptual model that is used to understand how data is communicated between one device to another within a computer network. It was developed by ISO (**International Organization of Standardization**) in 1984. OSI Model consists of 7 abstraction layers, wherein each layer is a package of standard communication protocols specifically designed to perform specific functionalities.



CAN FRAMES :

Two types:

1. Standard format
2. Extended Format

1. Standard Format : **Standard Format** is a **11 bit** identifier. It can transmit 2048 messages.
2. Extended Format : Extended format is a **29 bit** identifier. It can transmit 536 million messages.

Types of frame:

1. Data Frame (a frame containing node data for transmission)
2. Remote Frame (a frame requesting the transmission of a specific identifier)
3. Error Frame (a frame transmitted by any node detecting an error)
4. Overload frame (a frame to inject a delay between data or remote frame)



BIT RATE :

The Bit rate refers to the total Bits transmitted in one unit time. **Bit rate indicates the total bits that travel per second.**

Baud Rate :

The Baud rate refers to the total number of signal units transmitted in one second. **Baud rate indicates the total number of times the overall state of a given signal changes.**

Arbitration :

If two or more Messages are ready to transmit on bus From various nodes. Then There should be a priority for the priority Message. This concept is called as Arbitration.