

Protocol

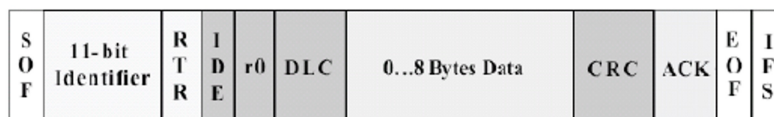
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1) UDS protocol

- UDS (Unified Diagnostic Services) is an automotive protocol that allows diagnostic systems to communicate with a car's electronics (ECUs) and reprogram them.
- The "unified" element indicates that the protocol is universal (that is, it allows interacting with a wide range of ECUs), is international, and does not depend on a particular manufacturer.

2) CAN

- Can(Controller Area Network) bus is standard which is designed to allow micro controller and other devices to communicate with other without host computer.
- Can is a serial half duplex and asynchronous type of communication protocol, asynchronous because there is no need of clock signal between sender and receiver to synchronise the data.
- Can is two wire communication protocol which means all nodes are connected to each other through two wire bus the wires are twisted pairs with 120 ohm characteristics impedance connected at each end
- Can is a message based protocol means each message must carry a message identifier based on which the priority of message will be decided.
- The features which make can bus unique amongst other protocols is, it is broadcast type of bus which means each node can hear all transmission
- There is no need of node identification in the can network which makes it very flexible to insert and remove node from the network
- Why can ?
 - The need for a centralized standard communication protocol CAN came into picture due to increasing the number of electronic control units(ECU) in modern vehicles there can be more than 70 ECU for various subsystems for eg. Dashboard, engine, transmission, airbag etc.
 - There is no doubt if all communication nodes are connected one to one the speed of communication will be high but the network complexity and the cost of wires and connectors will also be very high.
 - To overcome this issue CAN was introduced as a centralized solution which required only two wires CAN high and CAN low this solution is quite efficient due to its message privatization and flexible as node can be inserted or removed without affecting the network
 - CAN has two versions CAN 2.0 A has 11 bit identifiers and CAN 2.0 B is extended version has 29 bit identifiers.
- Can frames



(a)



(b)

- SOF (start of frame)
 - Start a new frame in the network is a 1bit.
- Arbitration field
 - Arbitration field denotes the ID of the CAN frame and also it shows the priority of the CAN message
 - Priority is used when two CAN nodes try to send a message in the CAN bus so depending on priority only one can send the message on the CAN bus
 - If arbitration field is 11 bit then it is called a standard frame format if the arbitration field is 29 bit then it

called as extended frame format.

- **RTR(Remote transmission request)**
 - RTR bit value define which type of your can message, can message contain different type of message which contain 1)data frame 2)error frame 3)request frame
 - Data frame is used to send data and if error occurs in any can node and it want to indicate that error to others can node then can node send error frame to other nodes and if any can node want to request any particular message then can node send request frame
- **IDE(Identifiers extension bit)**
 - This bit defines the length of arbitration length
 - If this bit is '0' then the arbitration length is 11 bit
 - If this bit is '1' then the arbitration length is 29 bit
- **Reserved bit**
 - This bit not have any major significant
- **Data length code**
 - Basically Data length code is used to define how many data byte we are going to send.
- **Data field**
 - Data field are used to carry data.
 - This field is 8 bit
- **CRC field(cyclic redundancy check)**
 - This field is used to data integrity
- **Acknowledgment slot**
 - Ack slot is used to check message is reaches desired node or not.
 - When we send the message ack bit value is one when the message reaches the particular node then target node set the value of ack field is 0 to ack the sender node that message is send successfully.
- **EOF(End of frame)**
 - This bit indicated that the can frame is end
- **Advantages of can protocol**
 - 1) **Low cost**
 - Because of using can protocol less wire required
 - Complexity of wire get reduced so cost is reduced
 - 2) **Robust protocol**
 - It work very well in high noise environment.
 - 3) **High speed**
 - Can is a high speed protocol it can work up-to 1 mbps speed.
 - 4) **Longer distance**
 - Can protocol is also used for longer distance communication is can work up-to 1 km.
- **Can architecture**
 - Logic 1 is a recessive state. To transmit 1 in can bus both can high and can low should be applied with 2.5v
 - Logic 0 is a dominant state. To transmit 0 in can bus can high should be applied at 3.5v and can low should applied at 1.5v
 - Ideal state of can bus is recessive
 - If the node reaches the dominant state it can not move back to the recessive state by any other node.