

Controller Area Network

Team 5

Introduction

- Controller Area Network
- Originally developed by Robert Bosch for automobile in-vehicle network
- Multi-drop, multi-master serial bus provides communications between controllers, sensors and actuators
- Very reliable, robust
- Inexpensive



There are 2 versions:

- CAN 2.0 A (standard)

- CAN 2.0 B (extended)

International Standard ISO 11898

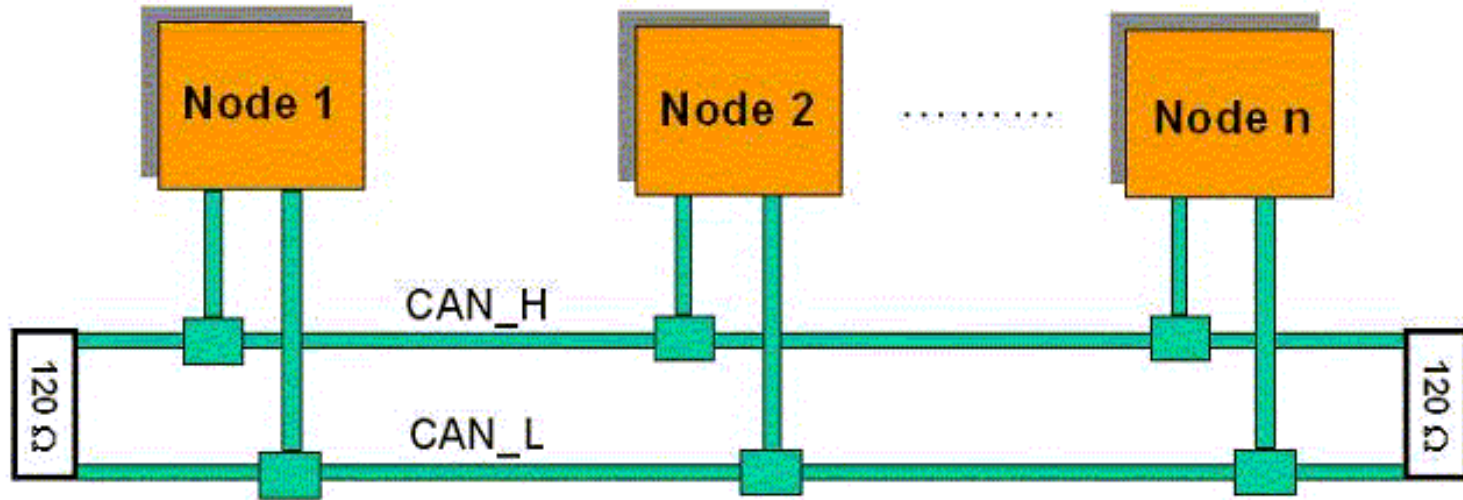
- ISO 11898 2 High Speed applications

- ISO 11898 3 Low Speed applications

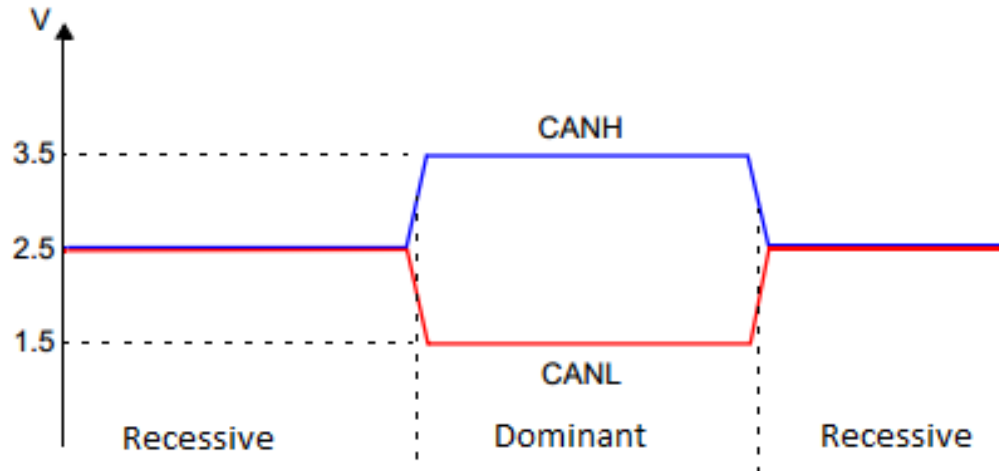
CAN Characteristics

- All messages are broadcast messages
- All nodes are allowed to broadcast
- All messages contain an ID that identifies the source or content
- Each receiver decides to process or ignore the message

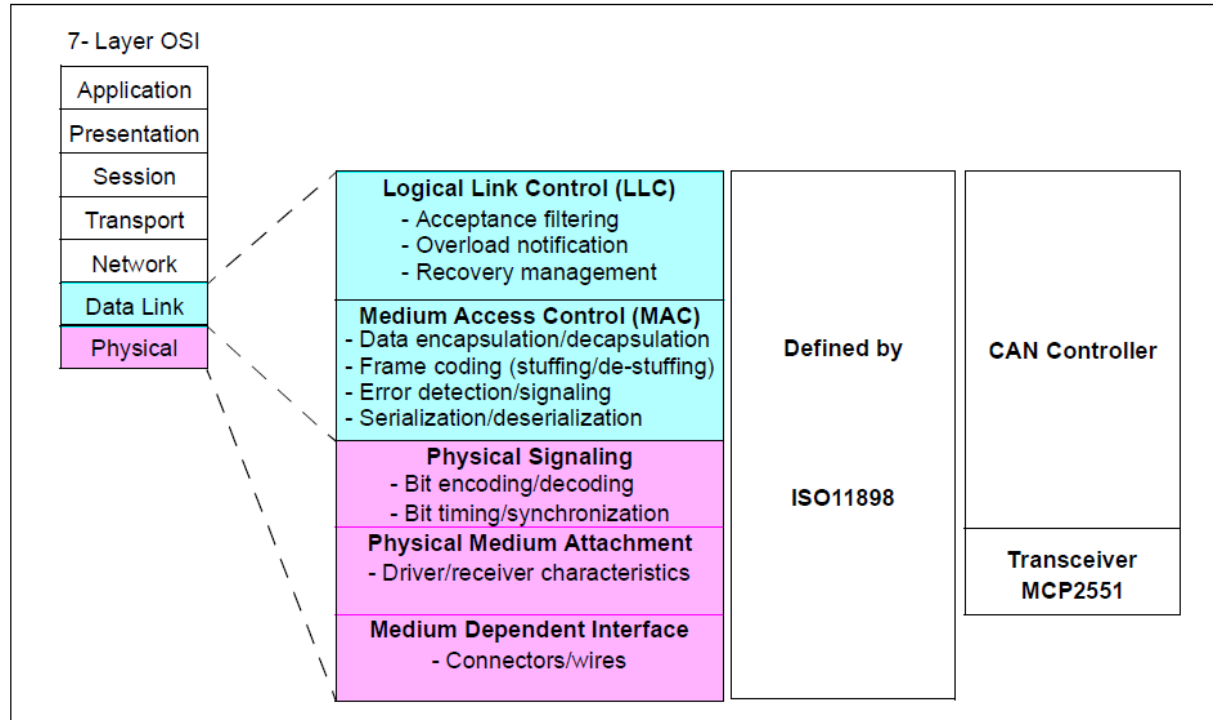
Physical Medium



Signal Level



Seven layers in OSI model



Physical Layer

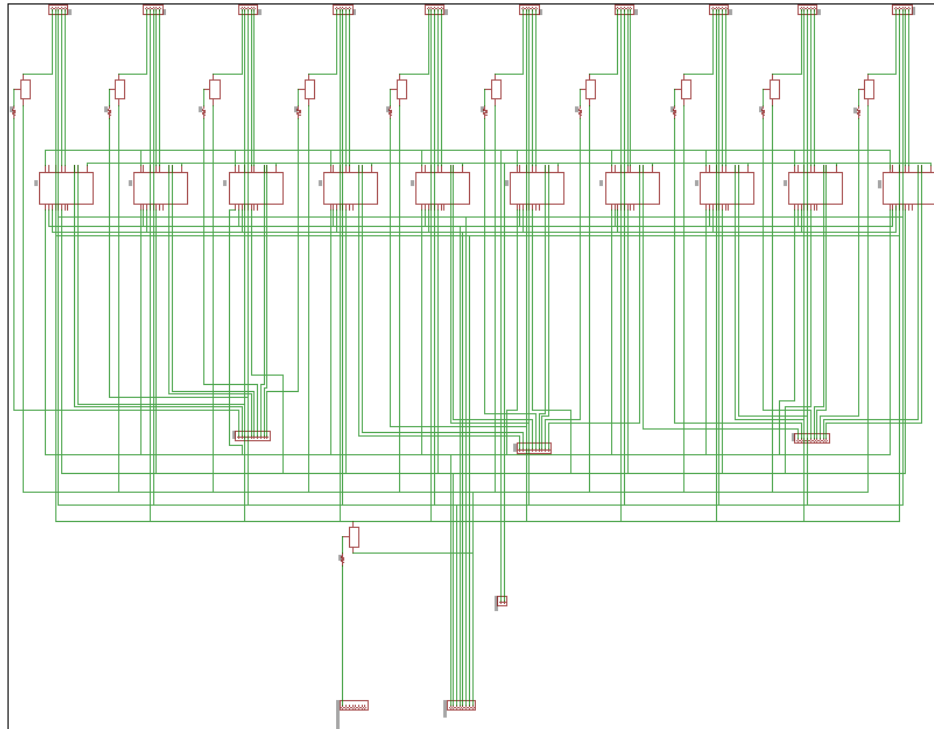
No Specifications

- driver/receiver

- transport medium

- wires

- connectors



Data Link Layer

Defined by the CAN specification

- Filtering
- Error detection
- Signaling
- Coding

Data Transmission

Serial Bus

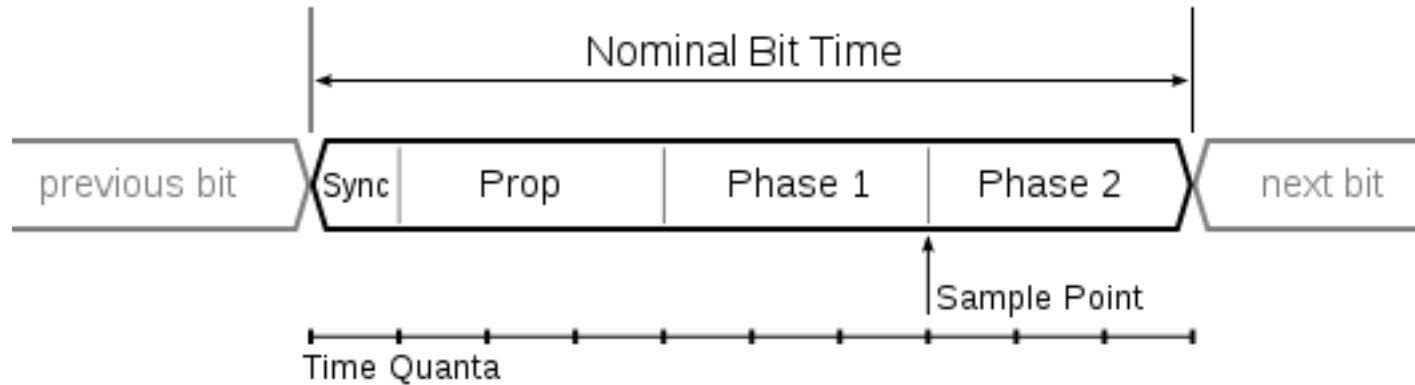
CAN High and CAN Low

CAN 2.0 C 250 kbps

CAN 2.0 B 500 kbps

Data Transmission

Synchronous



Data Transmission

Priority System

Truth tables for dominant/recessive, logical or, and logical and (for comparison)

Bus state with two nodes
transmitting

	Dominant	Recessive
Dominant	Dominant	Dominant
Recessive	Dominant	Recessive

Logical
or

	0	1
0	0	1
1	1	1

Logical
and

	0	1
0	0	0
1	0	1

Data Transmission

Priority System

Module 1 ID: 00011111 31

Module 2 ID: 00100000 32

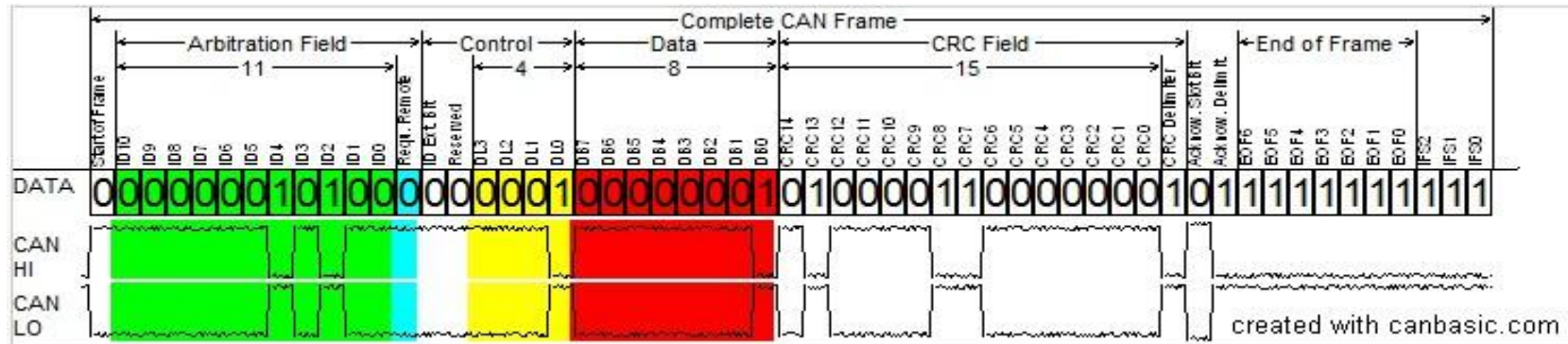
Frames

- Four types of frame
 1. data frame
 2. remote frame
 3. error frame
 4. overload frame

Data Frame

In data frame, there are two message format.

1. base frame format
2. extended frame format



Remote Frame

- What is remote frame
- What is the difference between data frame and remote frame
 1. RTR difference
 2. no data field

Error Frame

- There are two different field
 1. Error Flag (two types)
 - a. active
 - b. passive
 2. Error Delimiter (8 recessive bit)

Overload Frame

- Two bit fields
 1. Overload Flag
 2. Overload Delimiter
- two conditions
 1. require delay of next data or remote frame
 2. detection of dominant bit

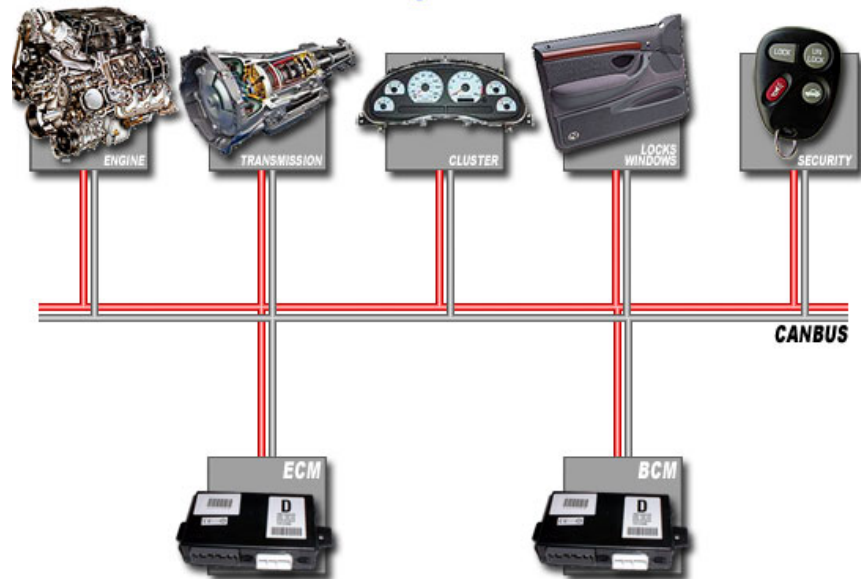
Modern Application

- Up to 70 ECUs per vehicle
- Supports over 100
- Allows for full communication without host computer
- Communication between main Engine Control Module and other ECUs
- In first application, reduced wiring by over 1 mile, reduced weight by over 100 lbs

Vehicle Wiring: conventional multi-wire looms



Vehicle Wiring: CAN Bus network



Application: Others

- Industrial Machinery
- Medical Systems
- Agricultural Machinery
- Elevator Control Systems