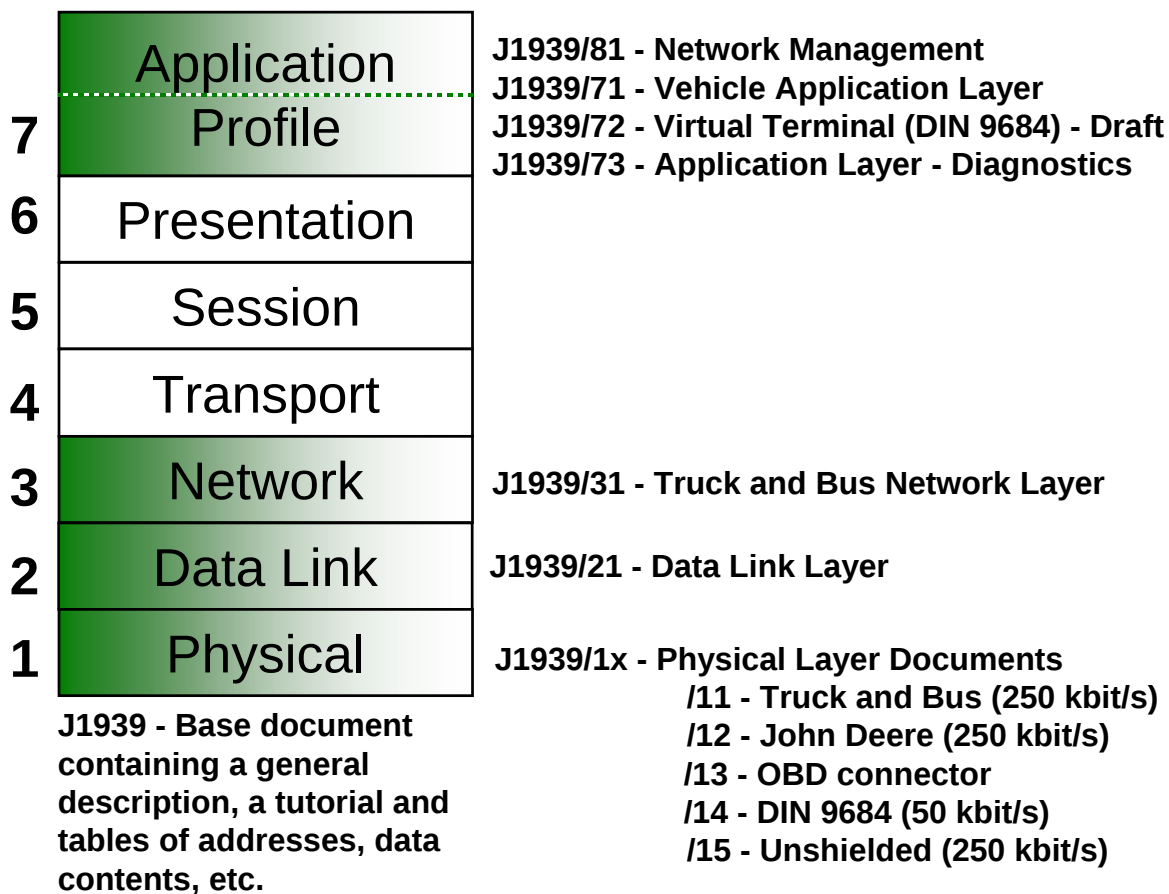


J1939-based application profiles



Holger Zeltwanger

J1939 reference model



J1939/01 - Truck and Bus document defining application of J1939 to on-highway heavy duty vehicles.

J1939/02 - Construction and agriculture-based and agriculture-equipment-based document.

J1939/11 Physical Layer

Line Driver	Differential bus (2 lines)
Network Access Arbitration	Random, nondestructive, bit wide
Baud Rate	250,000
Maximum Nodes	30
Topology Trunk Length Drop Length Termination	Linear bus 40 meters (120 ft.) 1 meter (3 ft.) 2 required
Cable	Shielded, twisted pair with a drain
Connector	3 -pin unshielded

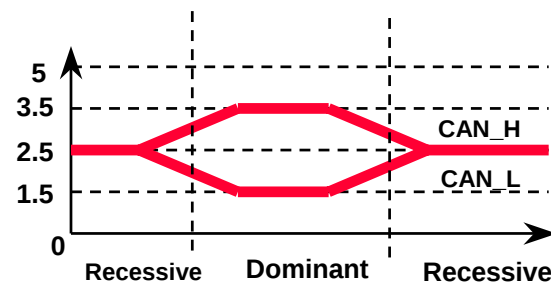
J1939 Physical Layers

Truck and Bus Physical Layer - 250 kbit/s

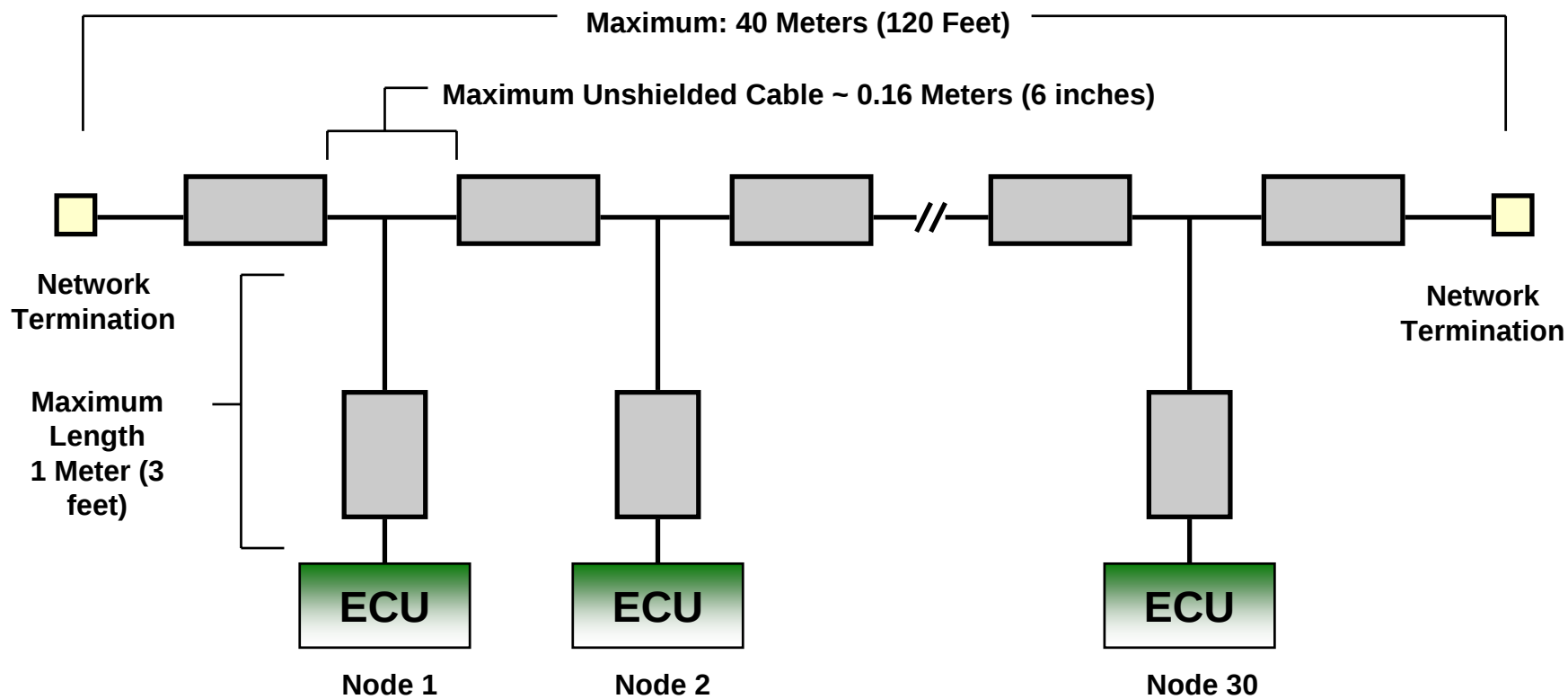
- ◆ The communication media is a shielded, twisted pair cable with a drain that requires a termination resistor at each end.
- ◆ Network connections are made using a three-pin, unshielded connector. The three pins are defined as CAN_H, CAN_L, and shield.
- ◆ The physical layer is not fault-tolerant.
- ◆ 30 nodes per segment are allowed.

CON-AG Physical Layer - 250 kbit/s

- ◆ The communication media is a twisted, non-shielded quad. The media is terminated with a current sourcing and sinking bias network.
- ◆ Network connections are made using a four-pin, unshielded connector. The four pins are defined as CAN_H, CAN_L, Power, and Ground.
- ◆ The physical layer is fault-tolerant.
- ◆ 30+ nodes per segment are allowed.



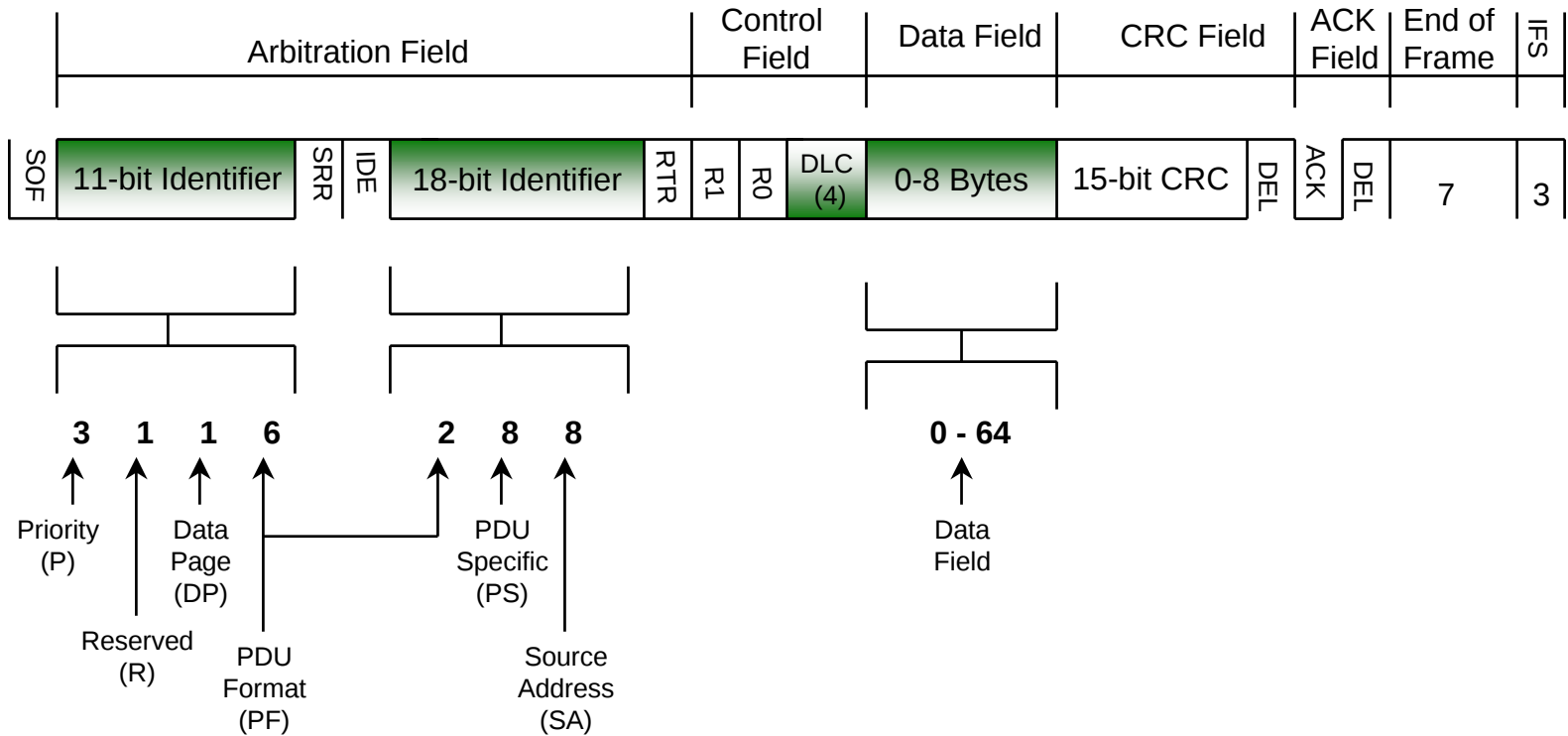
J1939/11 Topology



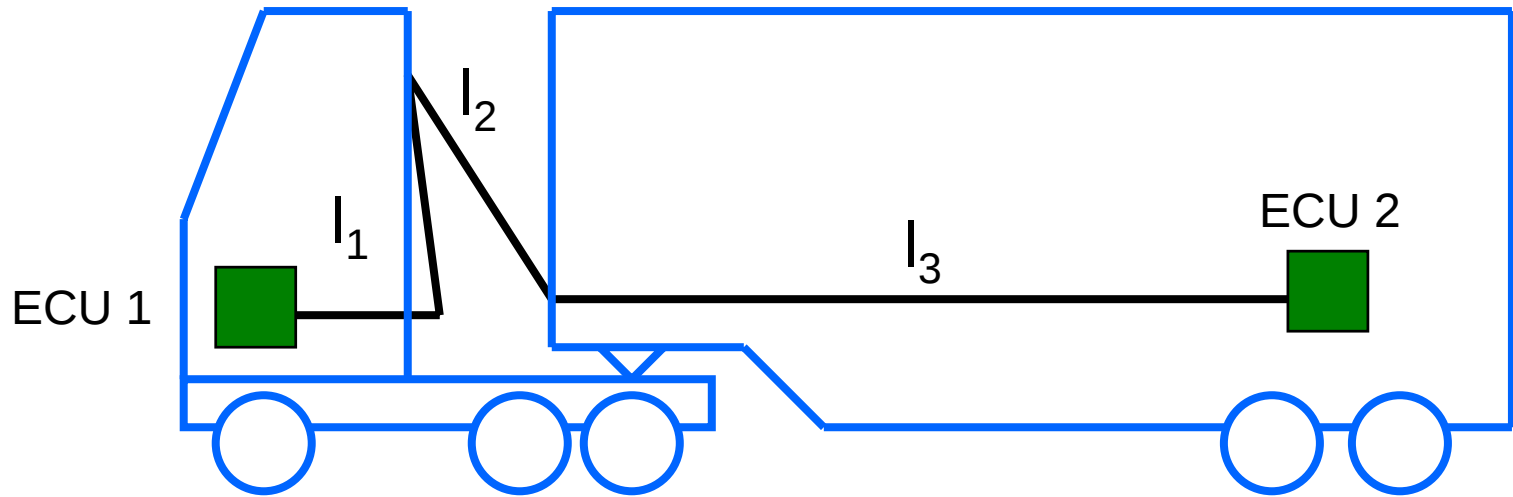
Data Link Layer (/21)

ISO 11898-1

J1939/21



$\approx$ *ISO truck/trailer interface*

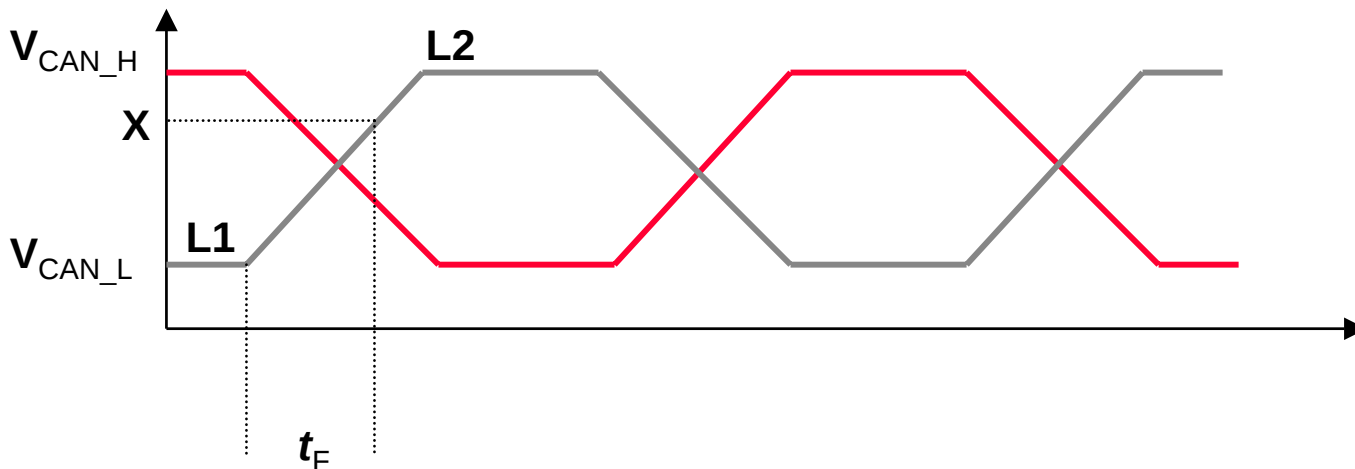


$$l_{\max} = l_1 (15 \text{ m}) + l_2 (7 \text{ m}) + l_3 (18 \text{ m}) = 40 \text{ m}$$

ISO 11992-1 bus level

For 24-V nominal voltage systems bus voltage is min. 0 V and max. 32 V

For 12-V nominal voltage systems bus voltage is min. 0 V and max. 16 V

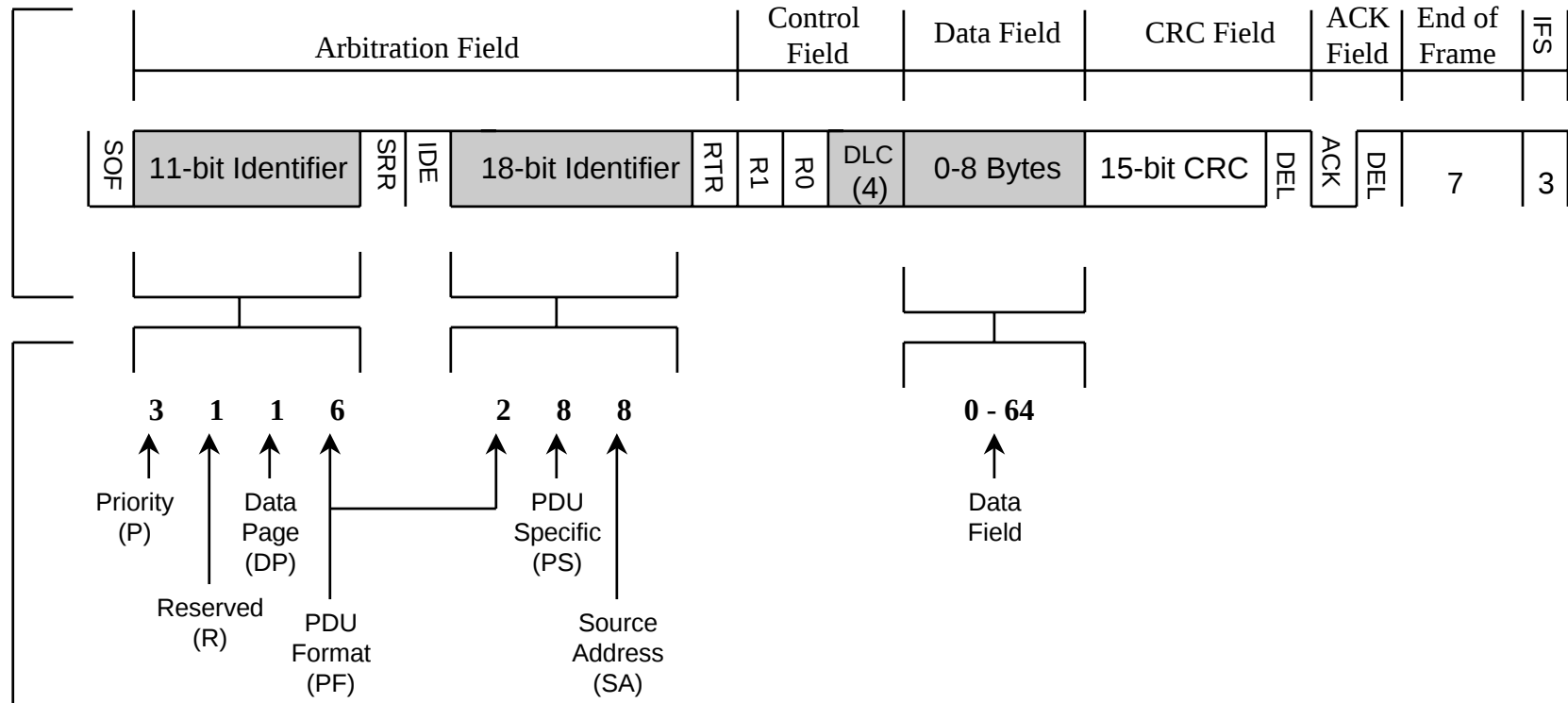


$$X = V_{CAN_L1} + 0.63 \times (V_{CAN_L2} - V_{CAN_L1})$$

Protocol data unit

CAN

PDU



PS is destination address for PDU formats 0 to 239
 PS is group extension for PDU formats 240 to 255

Address Assignment

Commercial
Vehicle

SA = 32

- Sends SA to successor

Towed
Vehicle #1

SA = 200

- Receives SA from predecessor
- Claims SA
- Sends SA to successor

Towed
Vehicle #2

SA = 192

- Receives SA from predecessor
- Claims SA
- Sends SA to successor

Towed
Vehicle #3

SA = 184

- Receives SA from predecessor
- Claims SA
- Sends SA to successor

Towed
Vehicle #4

SA = 176

- Receives SA from predecessor
- Claims SA
- Sends SA to successor

Towed
Vehicle #5

SA = 168

- Receives SA from predecessor
- Claims SA
- Sends SA to successor

SA = 255 global destination address

Parameter Specification

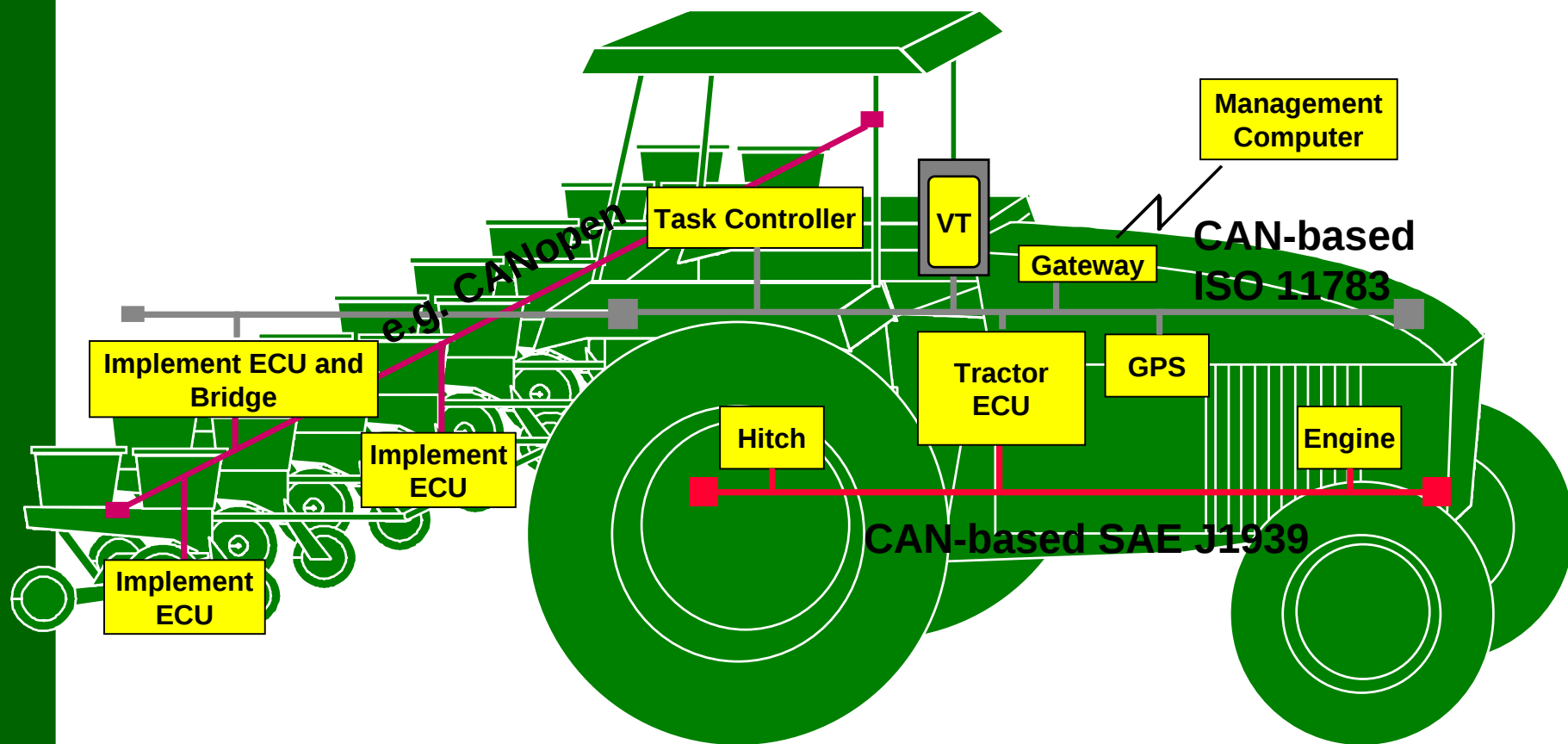
◆ Braking and running gear equipment

Example: Actual percentage of retarder peak torque
Data length: 1 byte
Resolution: 1%/bit gain, -125% offset
Data range: -125% to + 125%
Operating range: -125% to 0%
Type: Measured

◆ Other equipment

Example: Maximum vehicle speed limit
Data length: 1 byte
Resolution: 1kmph/bit gain, 0 km/h offset
Data range: 0 km/h to 250kmph
Type: Measured

ISO 11783 or ISOBUS



ISO 11783 documents

Part	Title	Status
1	General standard for mobile data communication	WD
2	Physical layer	IS
3	Data link layer	IS
4	Network layer	IS
5	Network management	IS
6	Virtual terminal	IS
7	Implement message layer	IS
8	Power train messages	WD
9	Tractor ECU	IS
10	Task controller & management computer interface	WD
11	Data dictionary	WD
12	Diagnosis	NWI
13	File server	NWI



Network interconnection

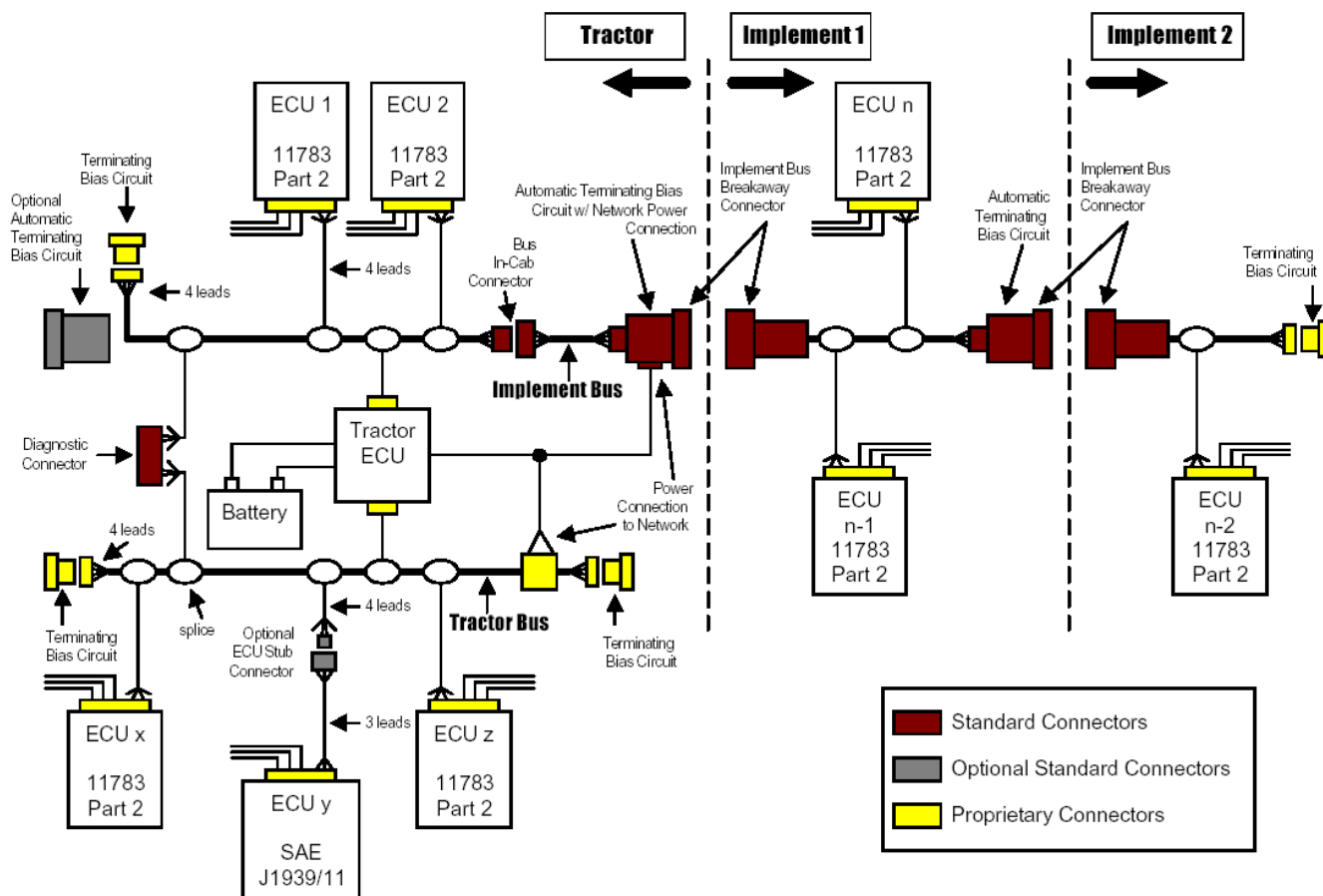


FIGURE B.1 - EXAMPLE NETWORK INTERCONNECTION

≠Data link and network layer

- CAN extended frame format (29-bit identifier)
- Frame format compatible to SAE J1939
- Broadcast and peer-to-peer communication services
- Transport protocol for parameter groups with DLC > 8
 - Connection mode data transfer (SAE J1939)
 - Broadcast announce message (SAE J1939)
 - Extended transport protocol (ISO 11783)
 - Fast packet transport protocol (NMEA2000)

