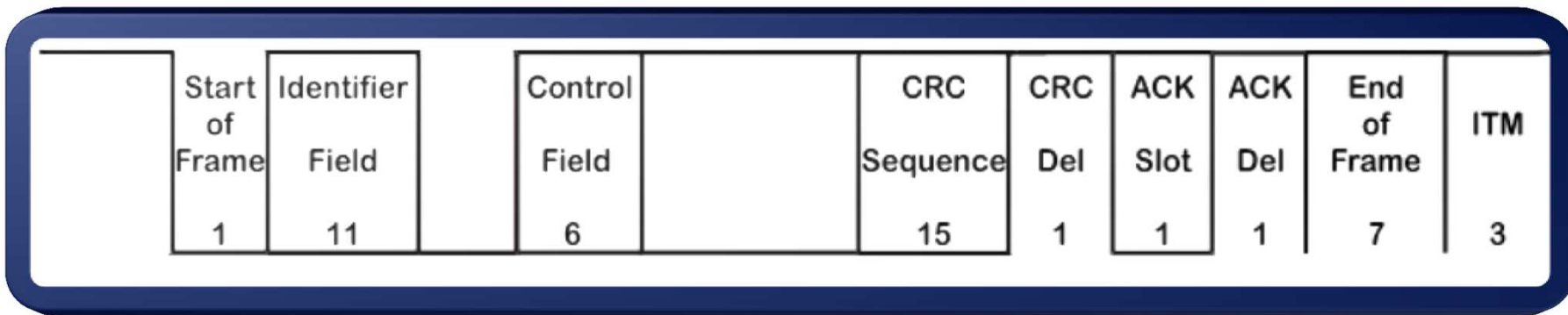


CAN (CONTROLLER AREA NETWORK)



A serial communication protocol which supports distributed real-time control

Agenda

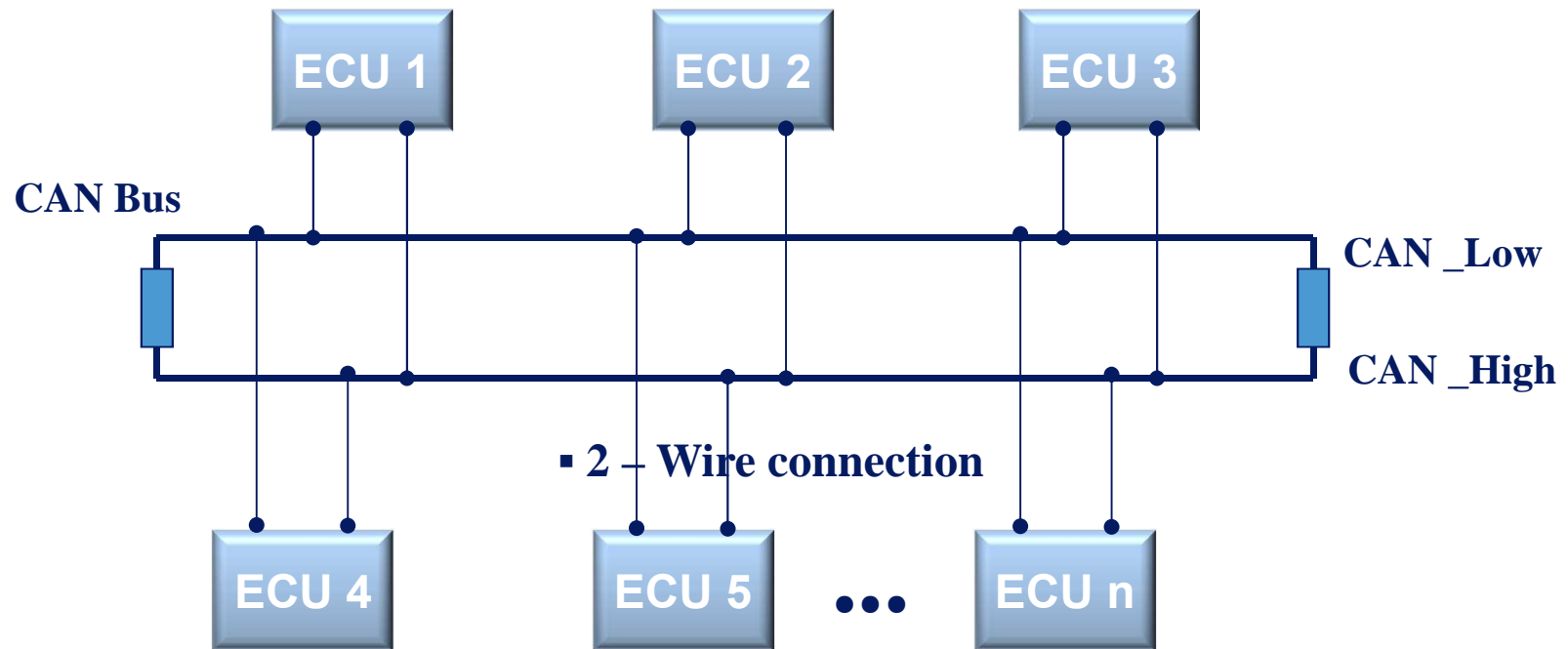
- Serial Communication Systems
 - In-Vehicle Networking
 - Introduction to CAN

- Fundamentals of the CAN Protocol
 - Bus access
 - Synchronization
 - Message Transfer
 - Error Detection and Handling
 - Bit Timing

- CAN Interfaces
 - CAN Controller
 - CAN Transceiver

Communication Between Electronic Components

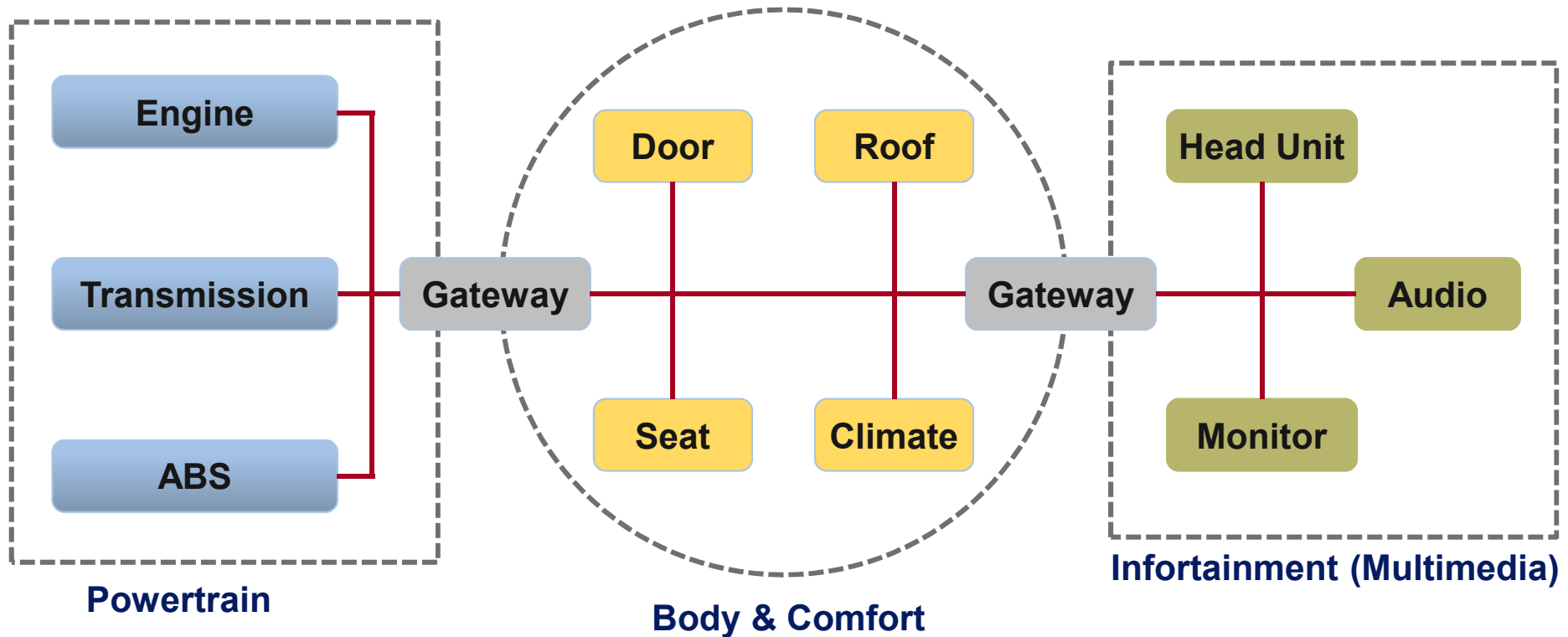
- ❑ The gradual increase of functions
- ❑ The distribution of functions
- ❑ Data exchange between ECUs is getting essential



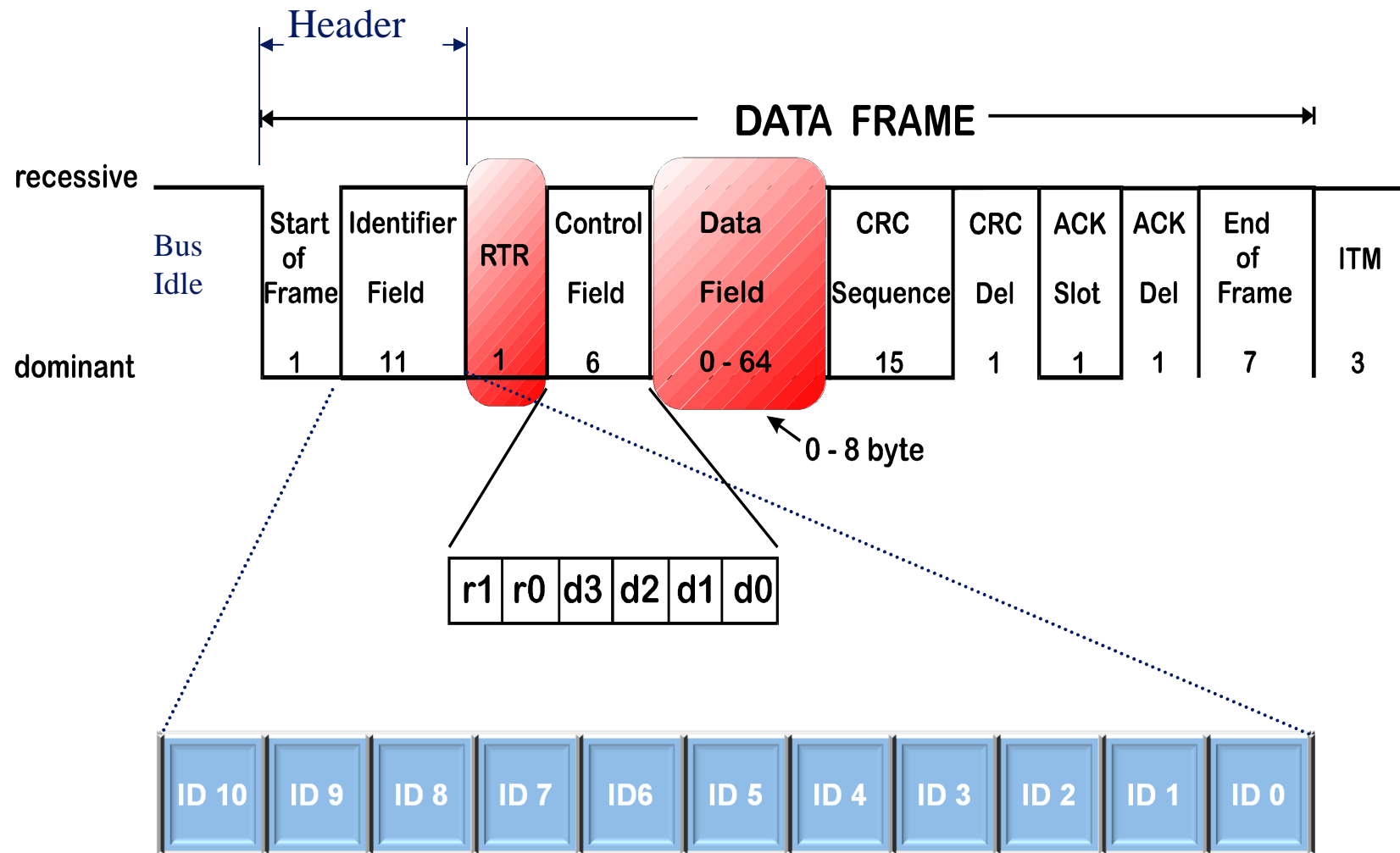
Network Architecture in Motor Vehicle

Example

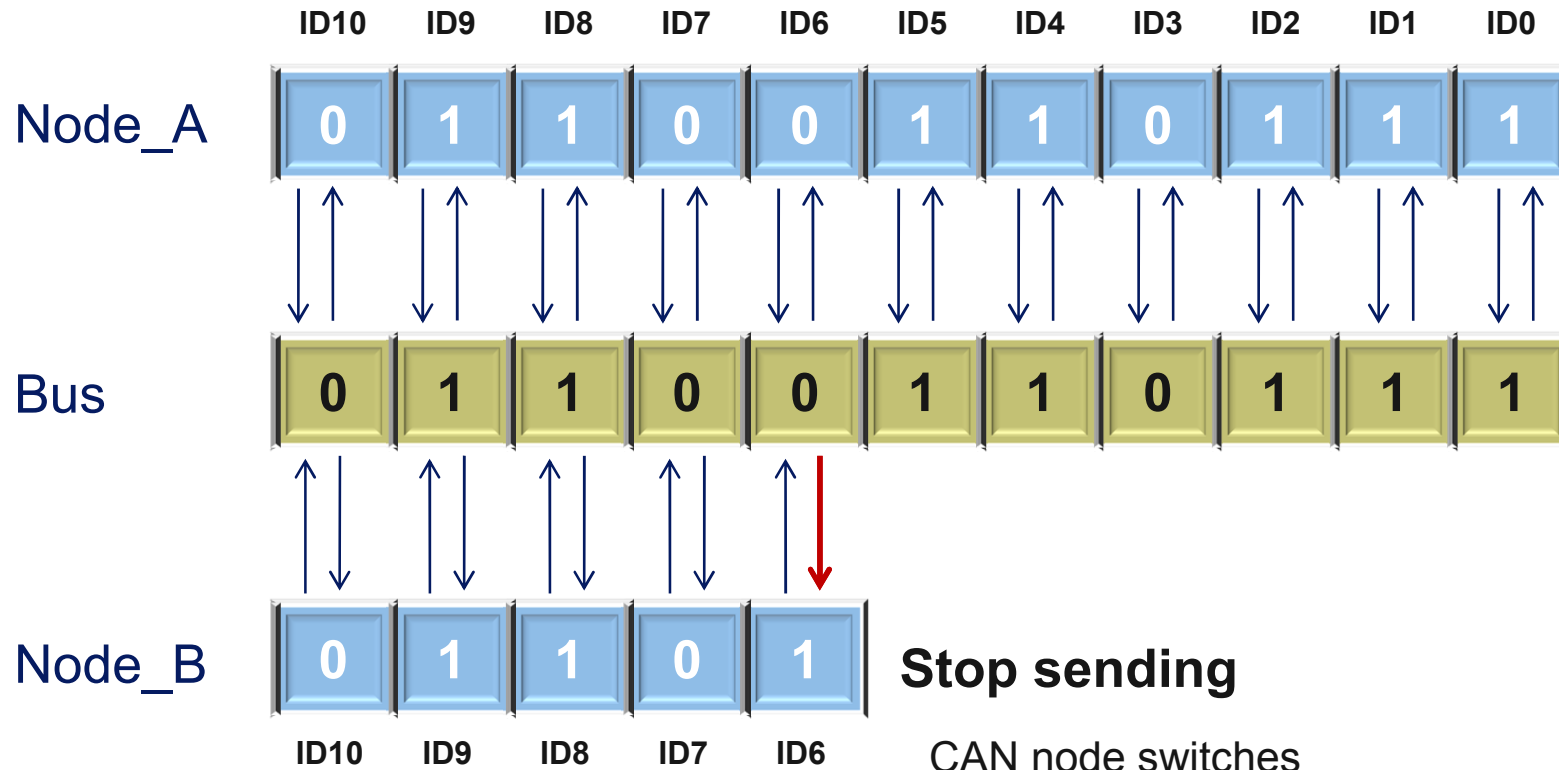
- Power-train
- Body& Comport
- Infortainment



Message Addressing



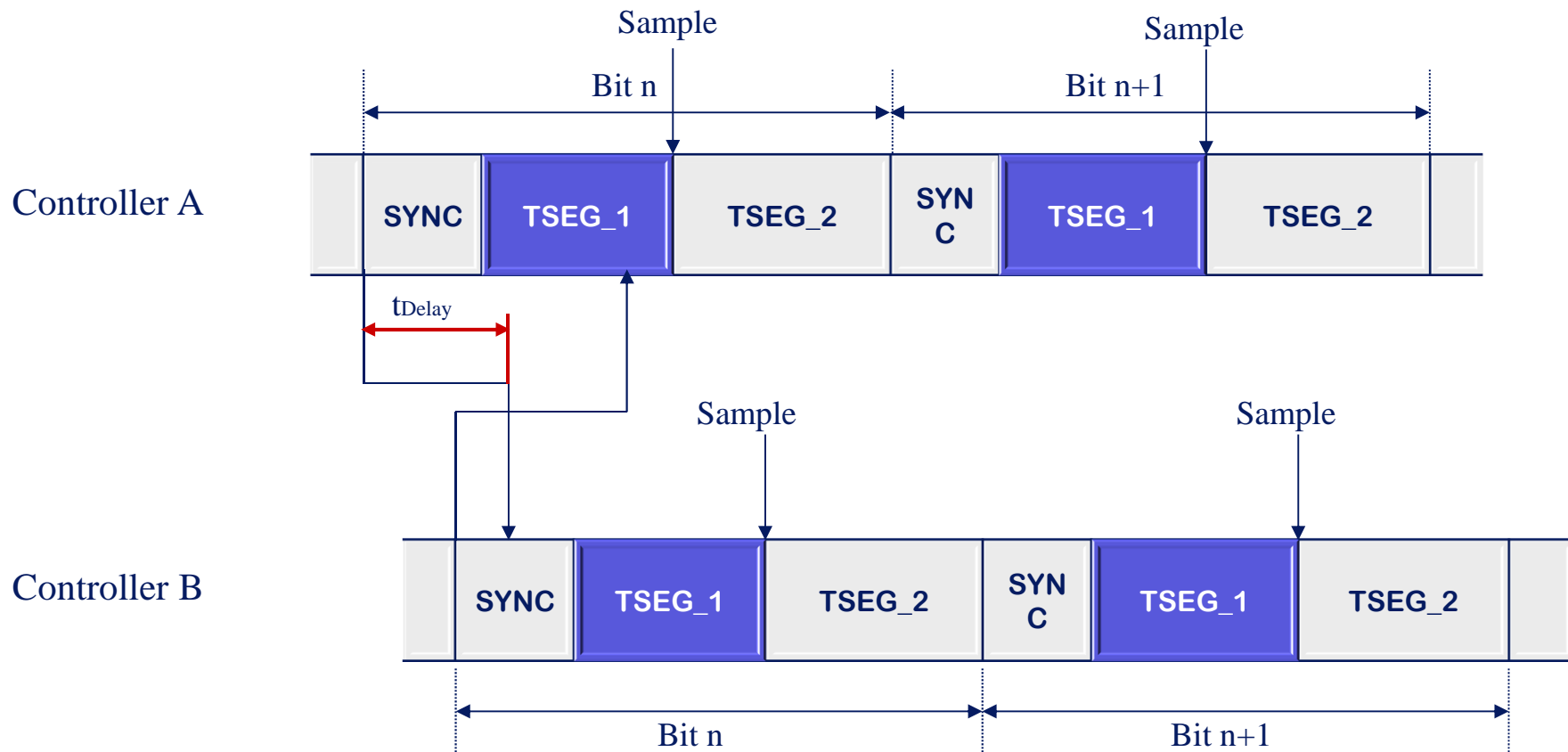
Bus Access



Stop sending

CAN node switches from Send state to Receive state

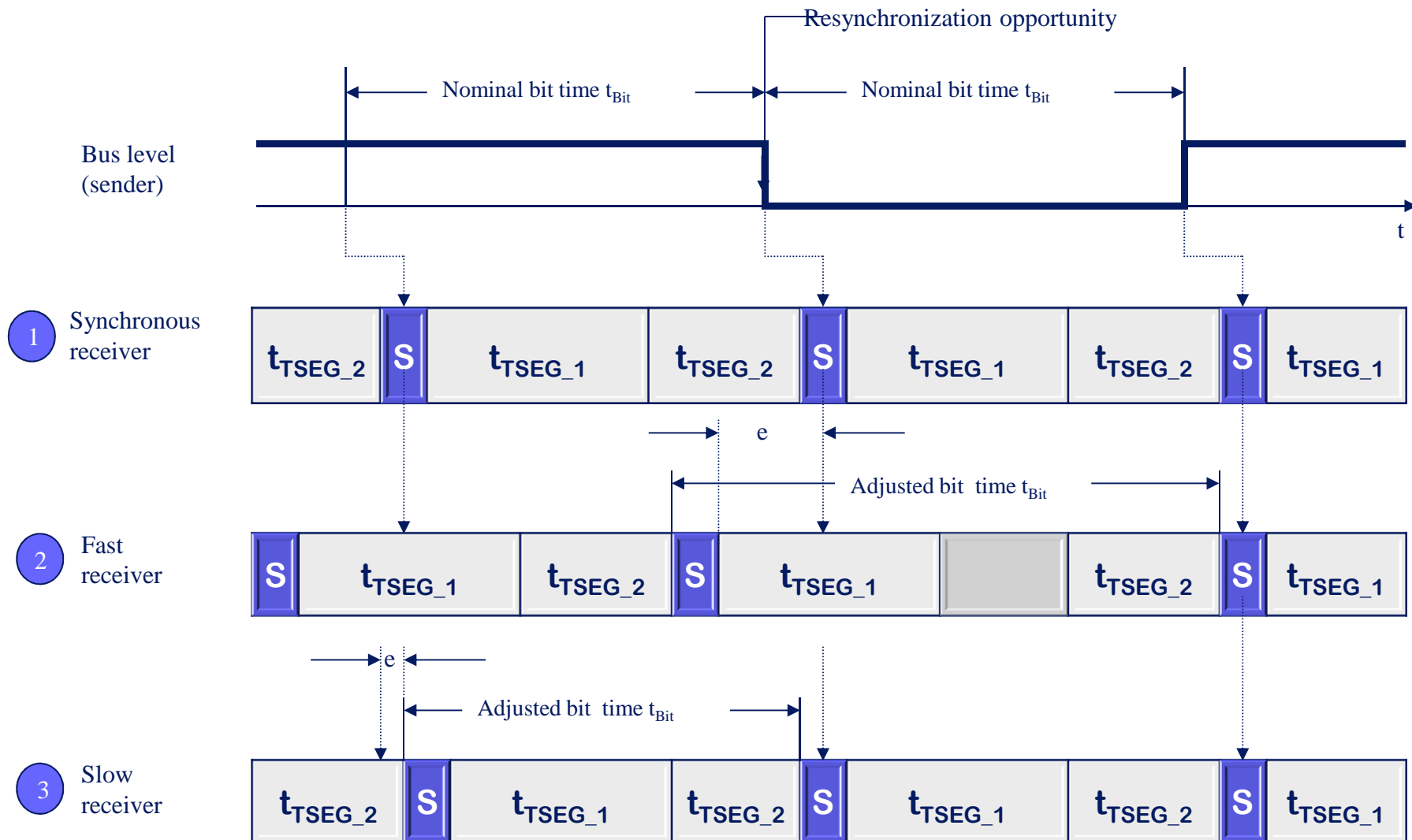
Signal Delay



$$t_{TSEG_1} \geq 2 \cdot t_{Delay}$$

$$t_{TSEG_1} \geq 2 \cdot (2 \cdot t_{CAN} + t_{Tx} + t_{Rx} + t_{Bus}) \quad t_{Bus} = I_{bus} / v_{Bus} \quad v_{Bus} = 0.2 \text{ m/nsec}$$

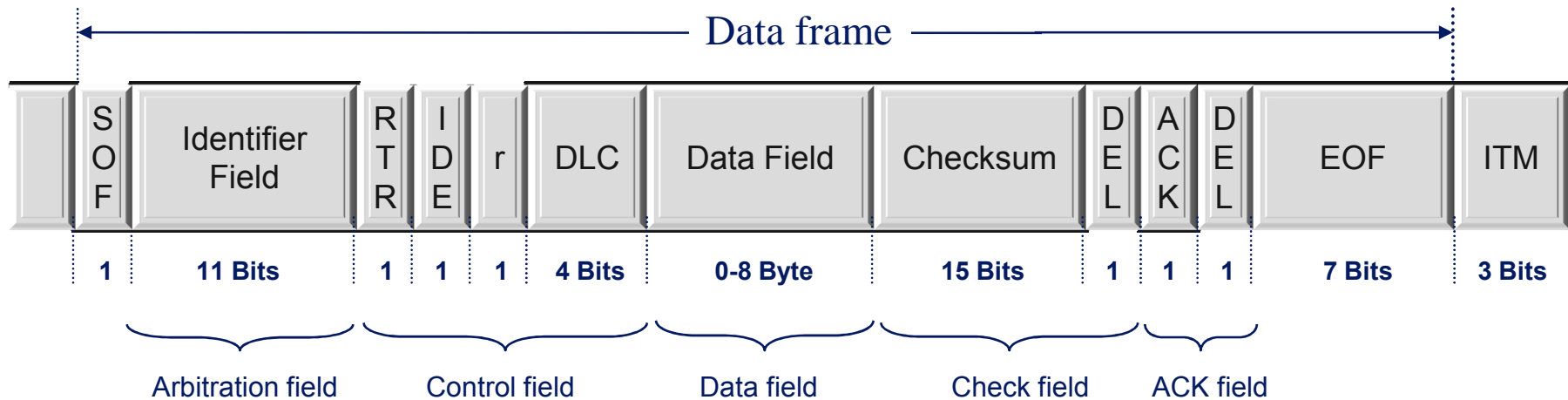
Resynchronization



Frame Types

Frame Types	Description	Control
Data Frame	Carries data from a transmitter to the receivers	User
Remote Frame	Used to request the transmission of the Data Frame	User
Error Frame	Transmitted by any node detecting a bus error	Hardware
Overload Frame	Used to provide for an extra delay between Data or Remote Frames This frame is used by the receive unit to notify that it has not been prepared to receive frame yet	Hardware
Interframe Space	Used to separate a Data or Remote Frame from a preceding frame	Hardware

Data Frame

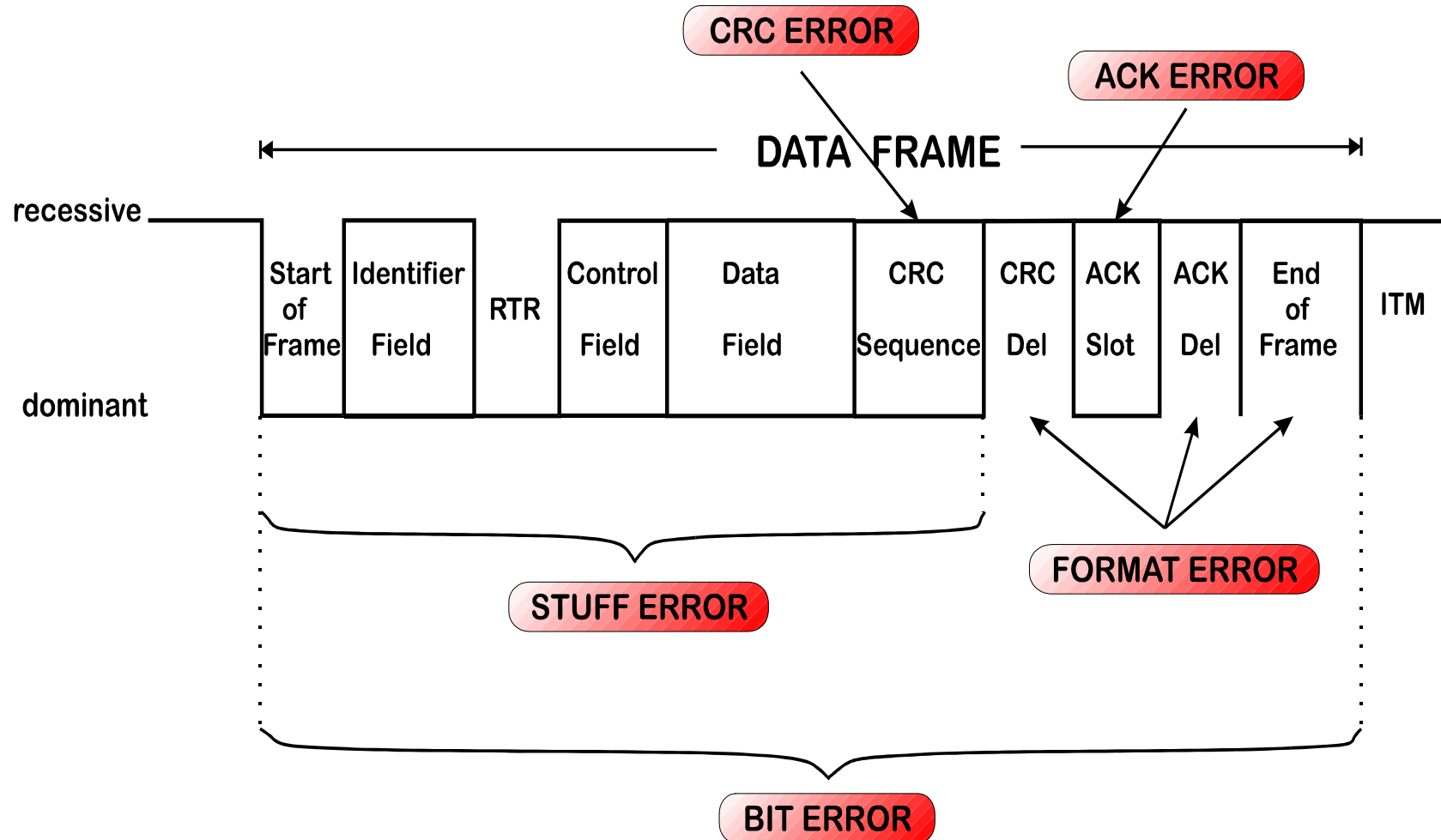


- SOF Start Of Frame
- RTR Remote Transmission Request
- IDE Identifier Extension
- DLC Data Length Code
- ACK Acknowledgement
- EOF End Of Frame

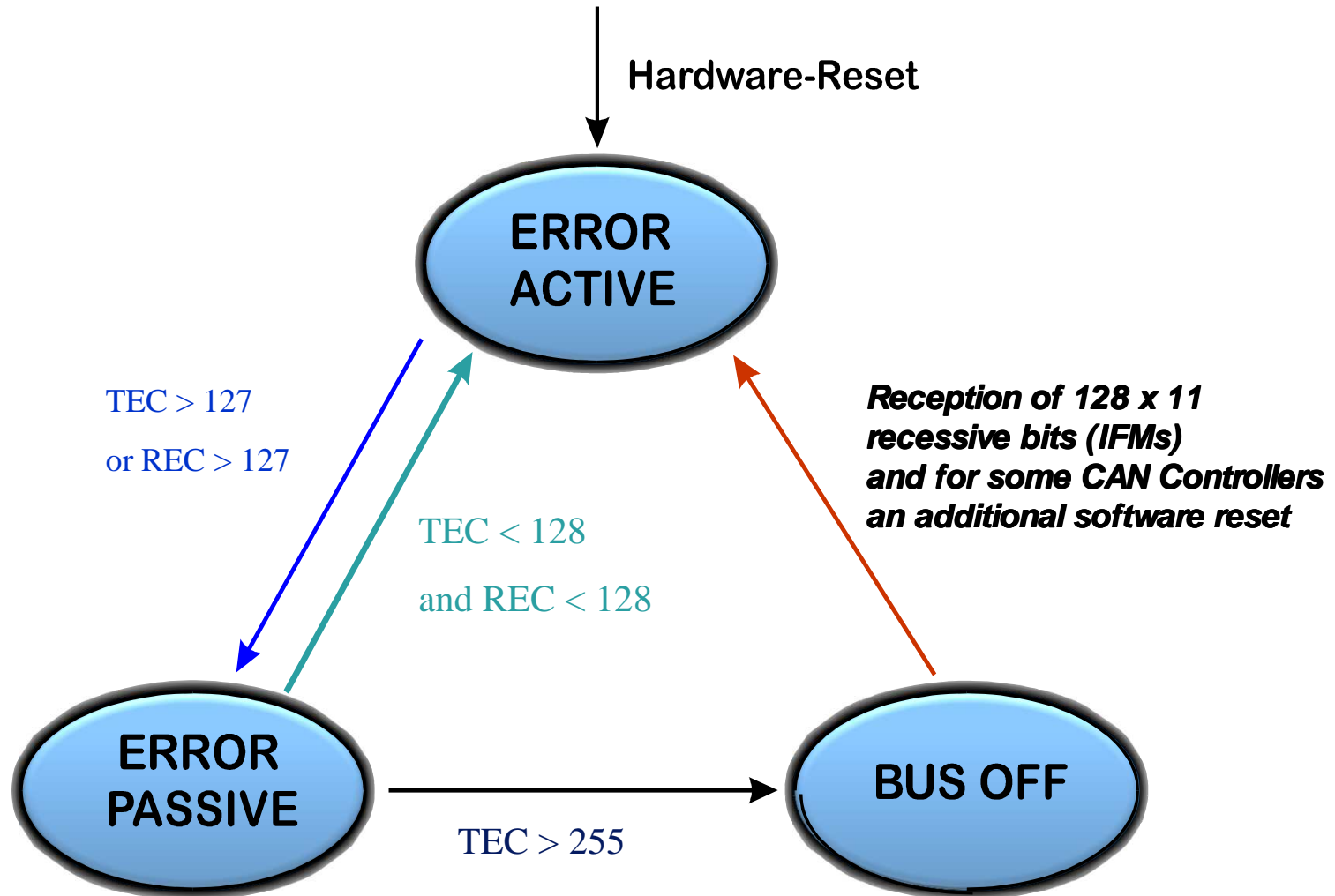
Error Detection

Error Types	Detection Fields	Node Types
Bit Error	SOF to EOF in Data Frame or Remote Frame, Error Frame, Overload Frame	Transmitter, receiver
Stuff Error	SOF to CRC Sequence in Data Frame or Remote Frame	Transmitter, receiver
CRC Error	CRC Sequence in Data Frame or Remote Frame	Receiver
Form Error	Delimiter of each frame (CRC, ACK, Error, Overload), EOF	Transmitter, receiver
ACK Error	ACK Slot in Data Frame or Remote Frame	Transmitter

Error Detection Mechanisms

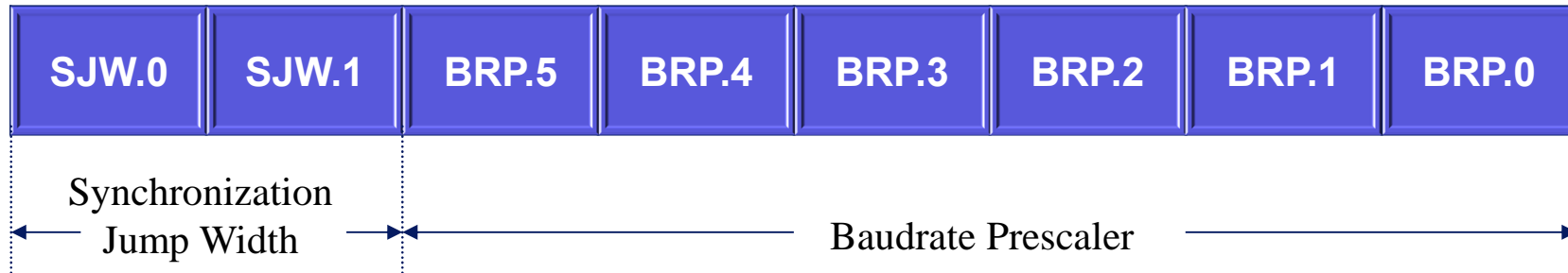


Error Tracking

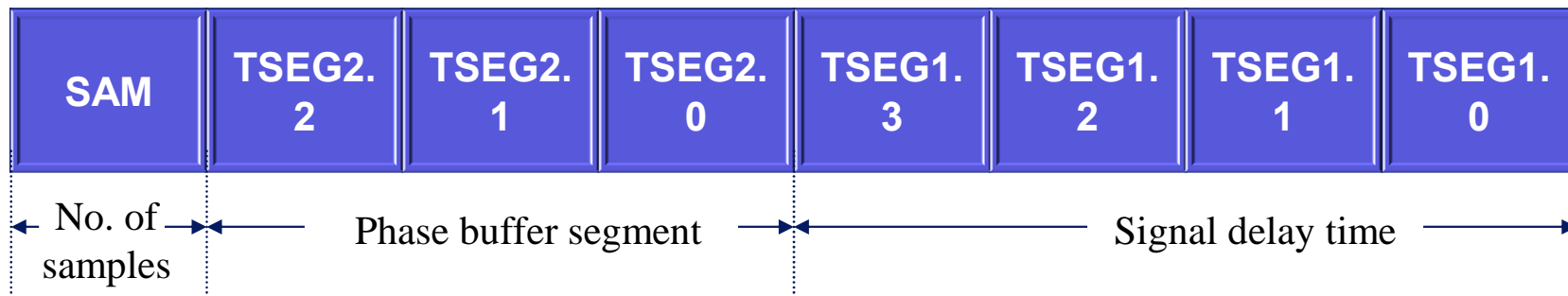


Bus Timing Register

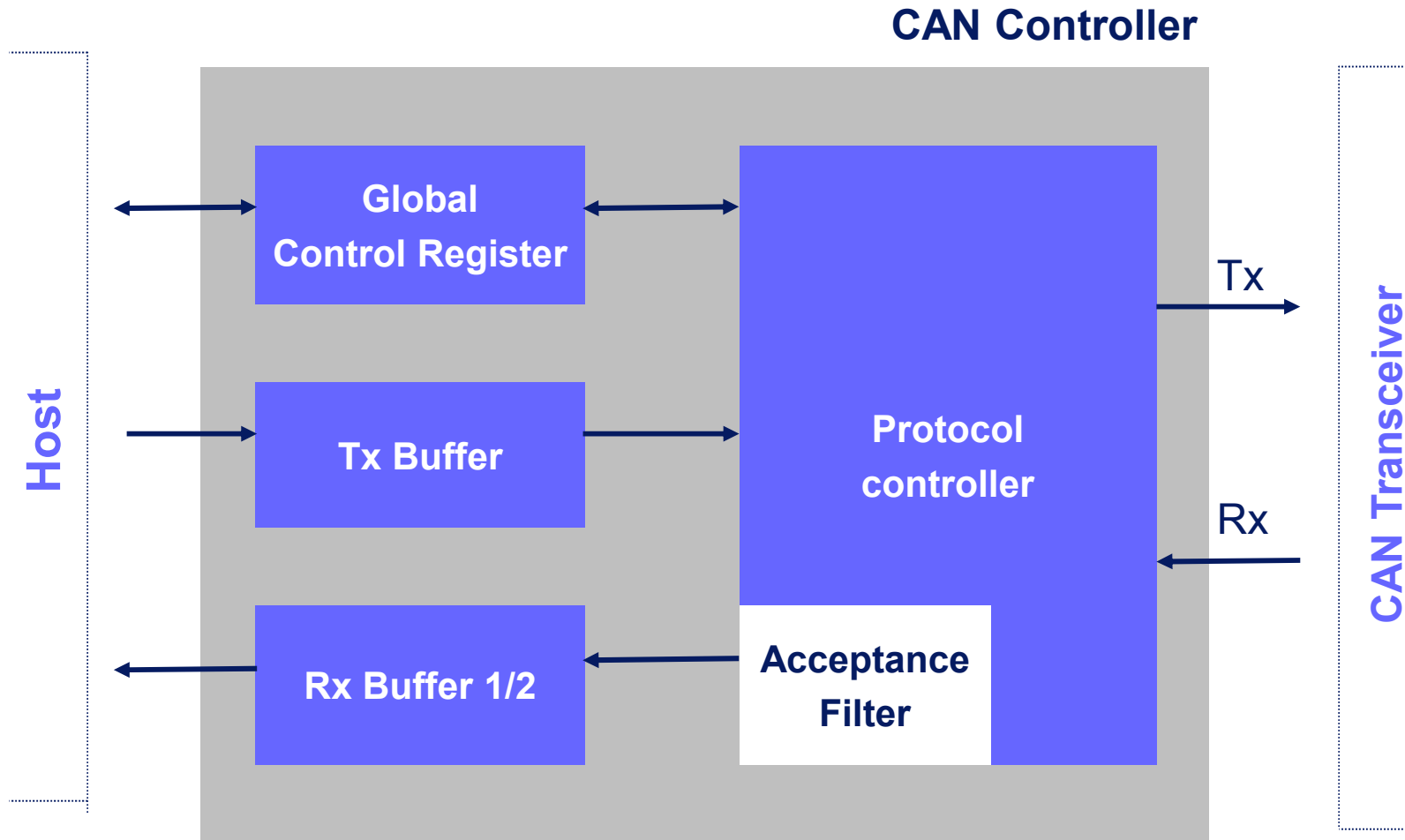
Bus Timing Register 0



Bus Timing Register 1



Basic-CAN Implementation



CAN Physical Layers

High speed CAN

- ISO 11898-2
- Max. 1Mbps baud rate
- 2 bus wires (twisted pair)
- Engine management, backbone bus, body & comfort
- Termination resistor suppresses reflections

Fault-tolerant CAN

- ISO 11898-3
- Max. 125kbps baud rate
- 2 bus wires (twisted pair)
- Body & comfort
- Termination resistor (at each ECU) keeps the recessive level

Single wire CAN

- SAE/J2411
- 33 (88)kbps baud rate
- 1 bus wire
- Body & comfort

고객과 함께 성장하는 한일프로텍이 되겠습니다.

감사합니다.

◆ 문의처

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