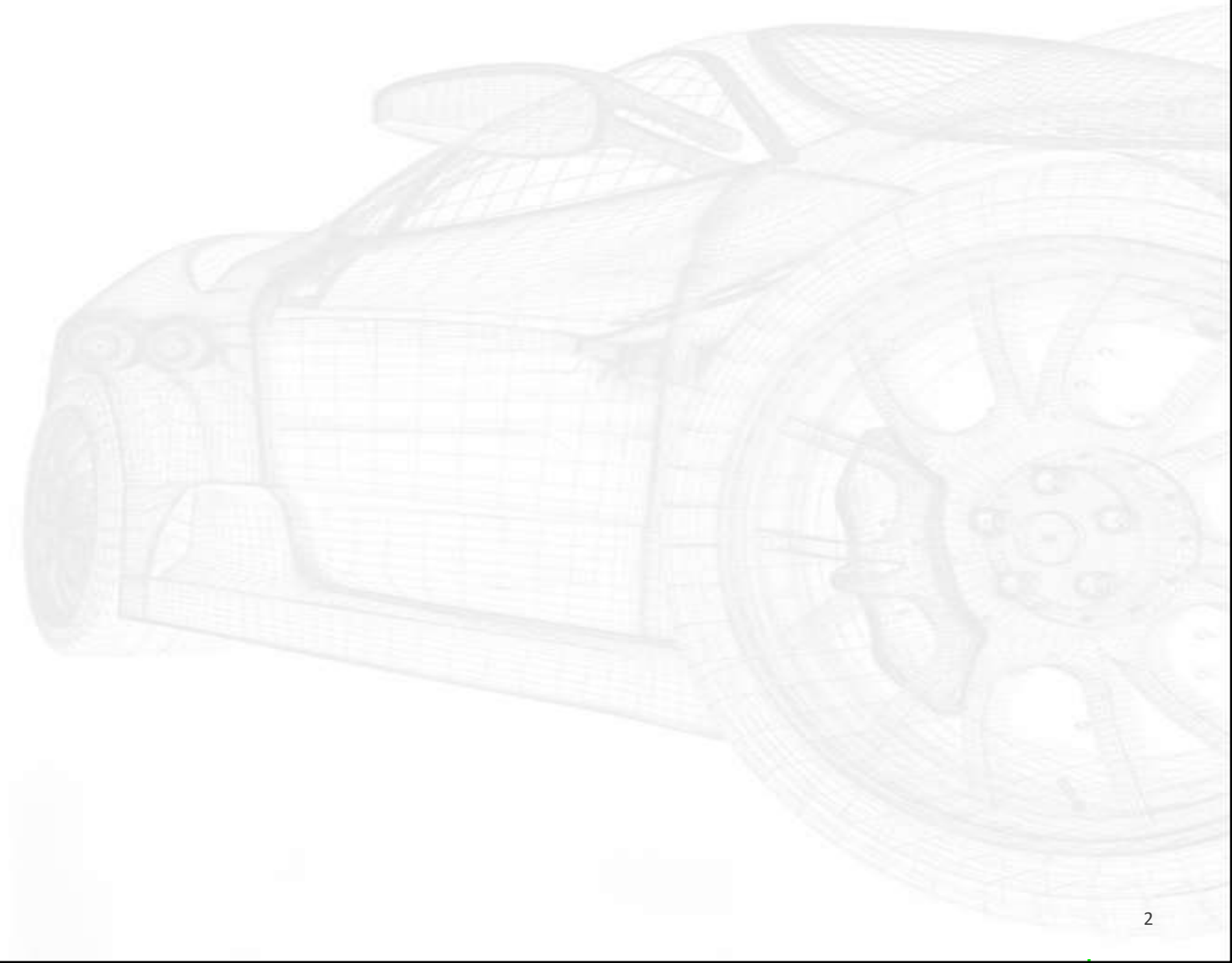
EB tresos AutoCore J1939 Stack

Agenda

- General and background information
- PDU Layout
- Transport Protocol
- Application and signal types
- Application diagnostic layer
- Signal types : J1939 NM, RM, DCM



General and background information

EB tresos AutoCore J1939 Stack
SAE J1939 background

- J1939 is a higher-layer protocol based on Controller Area Network(CAN)

- ISO Documents with relevant information :
  - SAE J1939 - “Serial Control and Communications Heavy Duty Vehicle Network - Top Level Document”
  - SAE J1939-1 - ”On-Highway Equipment Control and Communication Network”

- Key points of the J1939 communication network according to SAE Standard:
  - Physical Layer
  - Data Link Layer
  - Application Layer
  - Application Diagnostic Layer
  - Network Layer

EB tresos AutoCore J1939 Stack
SAE J1939 background

Enabling communication between vehicle components of different types or manufacturers

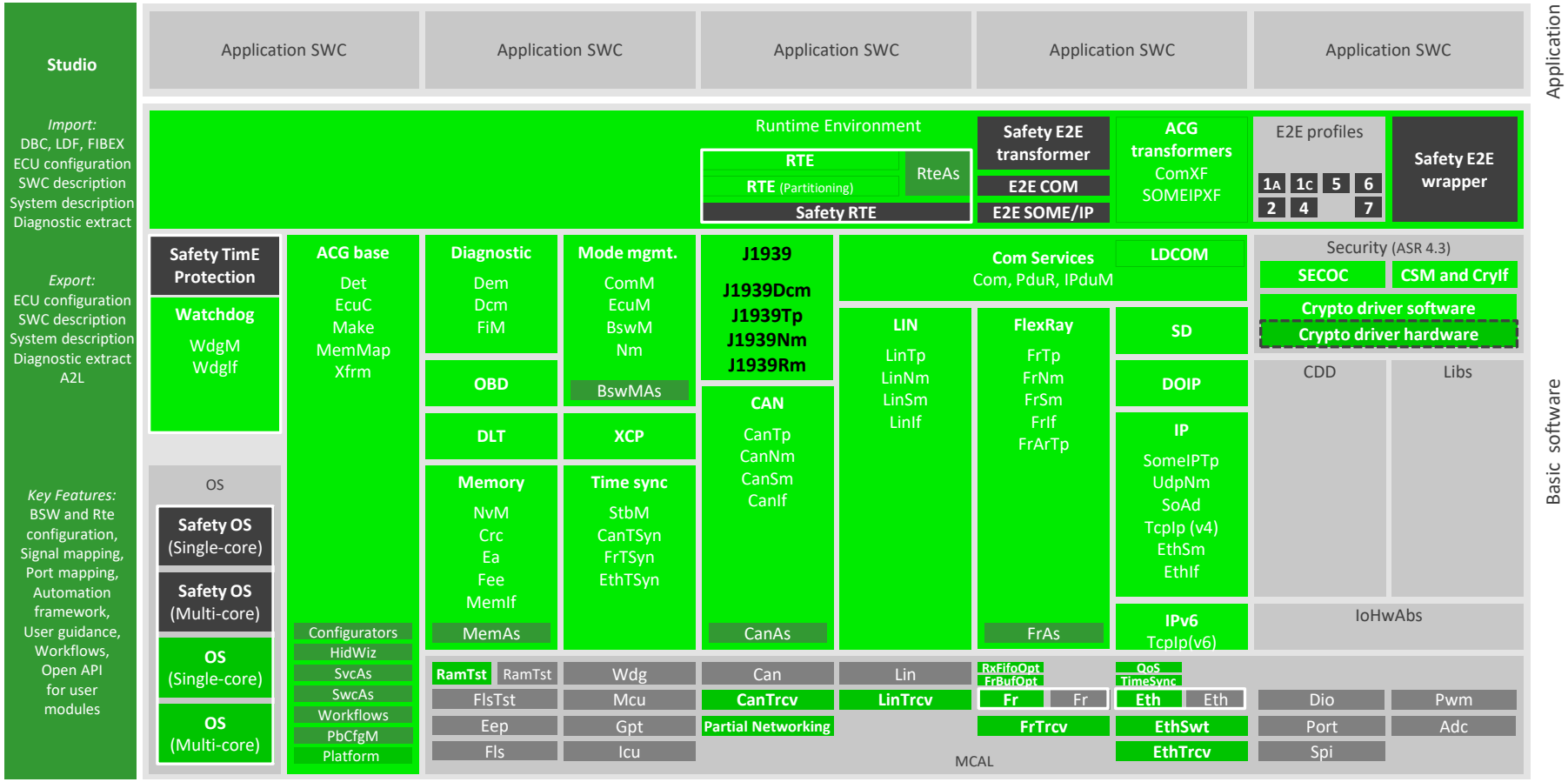
- J1939 was developed by the Society of Automotive Engineers (SAE) as a standard for heavy-duty on-highway, farming, and construction vehicles
- Based on CAN communication physical and data link layer (ISO 11898)
- Used as the base for other standards like
  - ISOBUS (ISO 11783), NMEA 2000, Truck & Trailer Interface (ISO 11992), and Fleet Management System (FMS)
- The standard is clustered on different topics like
  - General usage, specific application areas, physical layer, data link layer, network layer (gateway), application, network management

EB tresos AutoCore J1939 Stack
SAE J1939 background

- 29 bit extended CAN identifier
- 250 kbit/s, 500 kbit/s or 1Mbit/s are used
- Support for peer-to-peer node addressing and broadcast messages
- Definition of a transport protocol for multi-packet messages
- Definition of diagnostic messages
- Message definition for complete vehicle communication

EB tresos AutoCore J1939 Stack
SAE J1939 in AUTOSAR

All **bold** names are licensable items.



EB tresos AutoCore J1939 Stack
EB tresos AutoCore J1939 Stack - Features

J1939Nm

Address loss

- Trigger transmission of a CannotClaimAddress PG when a node identifies an address conflict

Address claimed

- Transmission of address claimed messages
- Reception of address claimed messages

J1939Rm

Acknowledgement support

- Support of acknowledgement indications
- Support of acknowledgement transmission

Request support

- Support of request indications
- Support of request transmission

Timeout

- Support of request time-out supervision

J1939Tp

J1939 Tp protocol type

- BAM for broadcast transmission
- CMDT for point-to-point transmission
- Support for segmentation and reassembling of large PDUs
- Direct PG of non segmented PDUs

J1939Dcm

Diagnostic messages *

- DM1 - active diagnostic trouble codes
- DM2 - reports previously active DTCs
- DM3 - Diagnostic Data Clear/Reset for Previously Active DTCs
- DM4 - Freeze Frame Parameters
- DM5 - reports the diagnostic readiness
- DM6 - emission-related pending DTCs
- DM11 - diagnostic data clear/reset for active DTCs
- DM12 - emission-related active DTCs
- DM13 – Stop Start Broadcast
- DM19 - calibration information
- DM23 - reports OBD-relevant previously active DTCs
- DM28 - permanent DTCs
- DM29 - regulated DTC counts

*For all supported DM’s, please consult the product description of the EB tresos ACG8

General J1939 Overview + ISO Documents Walk Through
Physical Layer

- ISO Documents with relevant information :
  - SAE J1939-11 - ”Physical Layer, 250 Kbps, Twisted Shielded Pair”
  - SAE J1939-14 - “Physical Layer, 500 Kbps - Note: Revision A”
  - SAE J1939-15 - “Physical Layer, 250 Kbps, Un-Shielded Twisted Pair (UTP)”
  - SAE J1939-16 - “Automatic Baud Rate Detection Process”

- Key points related to the Physical Layer:
  - Using Can2.0B
  - Baud rate of 250 kbps and 500kbps supported by standard.
  - 1 Mbits is also used in practice thou the standard doesn’t support it explicitly.
  - Maximum number of ECUs supported is 30 by standard thou in practice a system architecture will have more then that, but nodes will be connected thru a central gateway/bridge.
  - EB doesn’t provide any method for Automatic Baud Rate, so if project requests it the customer has to implement the driver.
    - This is usually only used for ECUs that can be connected to a diagnostic tester. Because the tester can be configured to either 250 or 500 k.

General J1939 Overview + ISO Documents Walk Through
Data Link Layer

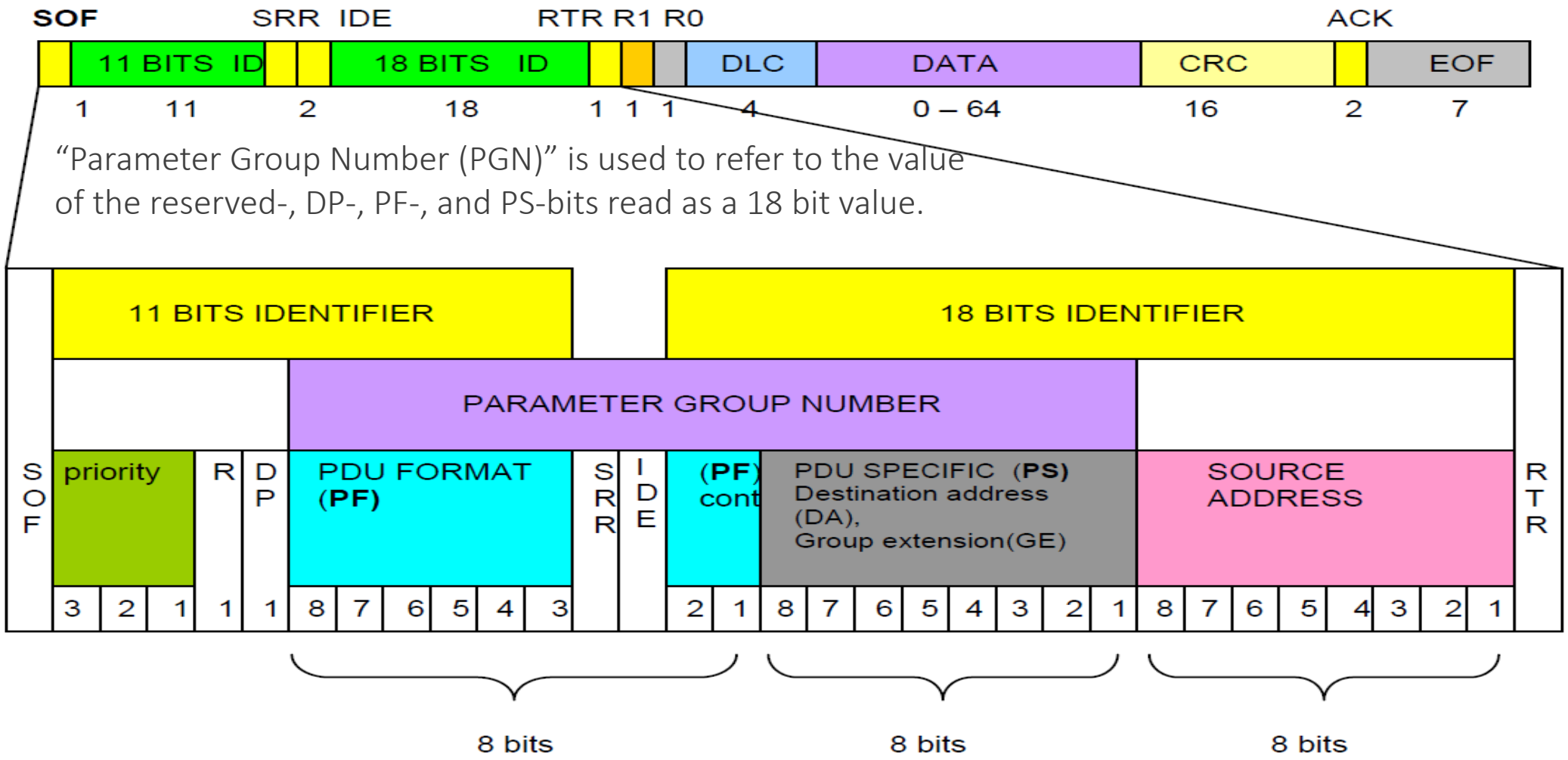
- ISO Documents with relevant information :
  - SAE J1939-21 “Data Link Layer”

- Key points related to the Data Link Layer:
  - J1939 uses 29 bits extended IDs:
  - 11 Bits IDs can still be used in the j1939 network but are not standardized by the J1939 protocol and are considered as proprietary messages.
  - Messages length of up to 1785 Bytes using transport protocols
  - J1939 defines two types of transport protocols :
    - BAM(Broadcast announce message) is a type of message sent to all nodes in a J1939 Network
    - CMDT(Peer to Peer) is a type of message directed from a specific node to a specific node.

PDU Layout

PDU Layout

29-Bit Identifier In Detail (incl. Parameter Group Number, PGN)



PDU Layout

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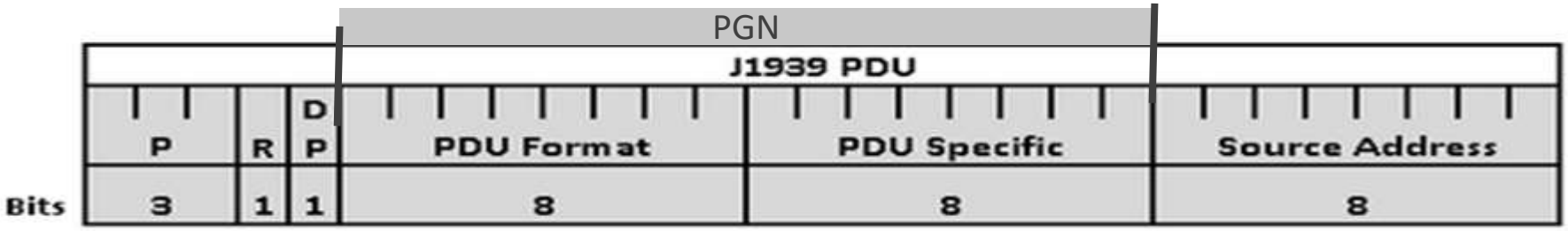

Figure 1. J1939 29-bit Identifier Fields

- P: Message priority. The Priority field is only for transmission. Default priority is 6 (110bin)
- R (EDP): reserved
- EDP: Extended data page. J1939 devices must set to 0.
- DP: Data page. Used to create a second page of PGNs
- PF: PDU format:

  < 240, PS is destination address. (PDU1 format)

  >= 240, PS is group extension. (PDU2 format)

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Figure 2. PDU 1 Format

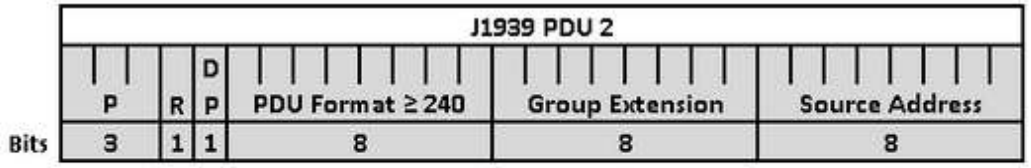

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Figure 3. PDU 2 Format

PS: PDU specific. Either destination address or group extension.
SA: Source address of controller application (CA).

PDU Layout
Parameter Group Number (PGN)

A PGN acts as a unique ID for looking up the function of a J1939 message and the associated data parameters (i.e. the SPN)

- Parameter Group is expressed in 18 bits
- The Parameter Group Number is a 24-bit value that has the following constituent components
  - 6 bits set to zero
  - Extended Data Page bit
  - Data Page bit
  - PDU Format Field (8 bits)
  - PDU Specific Group Extension Field (8 bits)

A PGN will contain several suspect parameter numbers (SPN) in the 8 data bits reflecting parameter

See SAE J1939-71 to see the lists of PGNs and SPNs and how to interpret them.

PDU Layout

Suspect Parameter Number (SPN)

A suspect parameter number is assigned to each parameter of a parameter group or component. It is used for diagnostic purpose to report information to other ECUs or testers, or to identify abnormal operation of a Controller Application (CA).

The SPN is a 19 bit number and has a range from 0 to 524287. For proprietary parameters a range from 520192 to 524287 is reserved.

PDU priority

- Used for transmission into the bus only, Receiver should ignore this data
- Priority of any message can be set from highest, 0 (000), to lowest, 7 (111).
- The default for all control-oriented messages is 3 (011)
- The default for all other informational, proprietary, request, and ACK messages is 6 (110).

PDU Layout

Protocol Data Unit (PDU) – EDP and DP

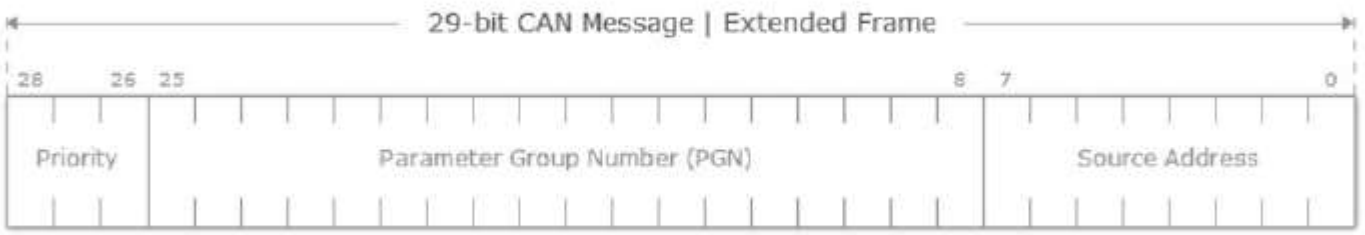
- Used in conjunction with the Data Page bit
- All J1939 messages should set the Extended Data Page bit to ZERO on transmit

Extended Data Page	Data Page	Description
0	0	SAE J1939 page 0 PGNs
0	1	SAE J1939 page 1 PGNs
1	0	SAE J1939 Reserved
1	1	ISO 15765-3 defined

PDU Layout

Protocol Data Unit (PDU) – Source Address (SA)

- The Source Address field is 8 bits long
- There shall only be one device on the network with a given source address



PDU Layout

Protocol Data Unit (PDU) – PDU Format

- PDU Format
  - Determines the PDU format (PDU1 or PDU2)
  - Determine the Parameter Group Number

PDU Type	PDU Format Field	PDU Specific Field
PDU 1	0 – 239	Destination Address
PDU 2	240 - 255	Group Extension

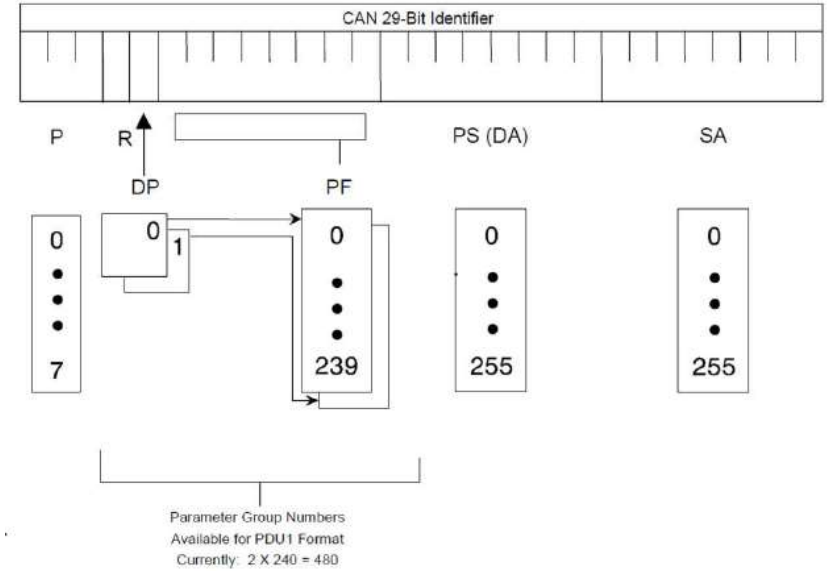
PDU Layout

Protocol Data Unit (PDU) – PDU1 Format

- Destination Address (PDU1 Format)
  - Will have 254 destination addresses
  - The global destination address (255) requires all devices to listen and respond accordingly
  - Proprietary A & A2 will be defined and used by each manufacturer

Extended DP	DP	PDU Format Field	PDU Usage
0	0	0 to 238	Public PGNs
0	0	239	Proprietary A 0x00EF00
0	1	239	Proprietary A2 0x01EF00

- Total Available PGNs in PDU1 format

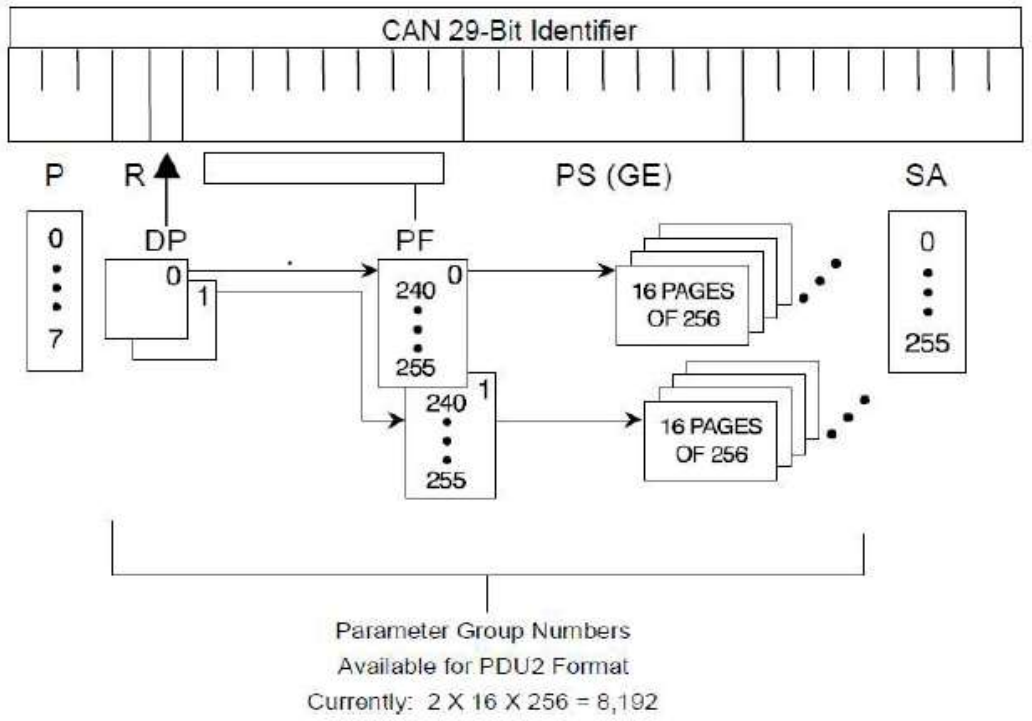


PDU Layout

Protocol Data Unit (PDU) – PDU2 Format

- Group Extension
  - Communicate Parameter Groups as global messages.
  - PDU Format value is equal to 240 to 255.

Extended DP	DP	PDU Format Field	PDU Usage
0	0	240 to 254	Public Parameter Groups
0	0	239	Proprietary B

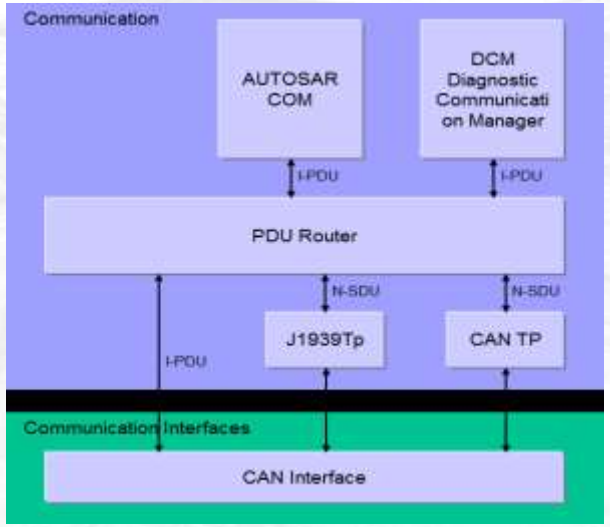


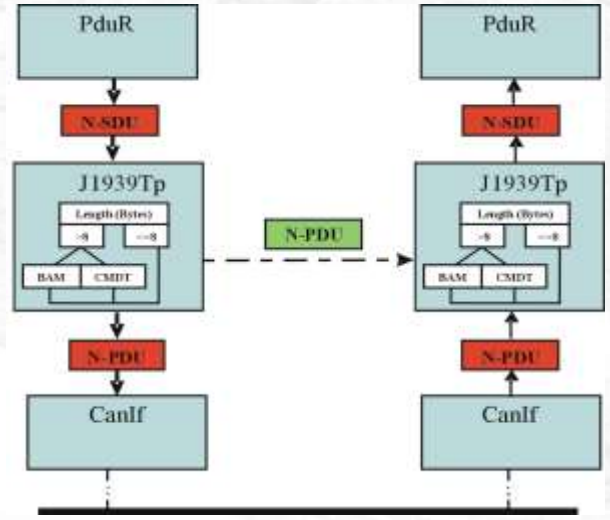
- Total Available PGNs in PDU2 format
  - 2 (Data Page) X 16 x 256 = 8,192
- Proprietary B will be defined and used by each manufacturer

Transport Protocol

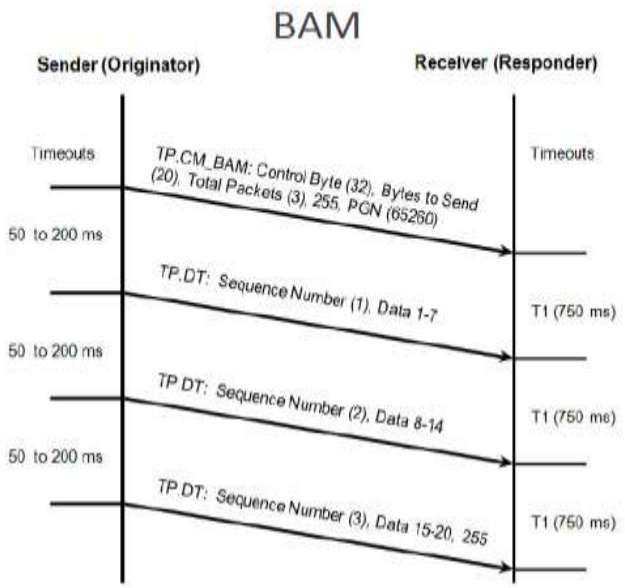
Signal types : J1939 NM, RM, TP, DCM
J1939TP (Transportprotocol)

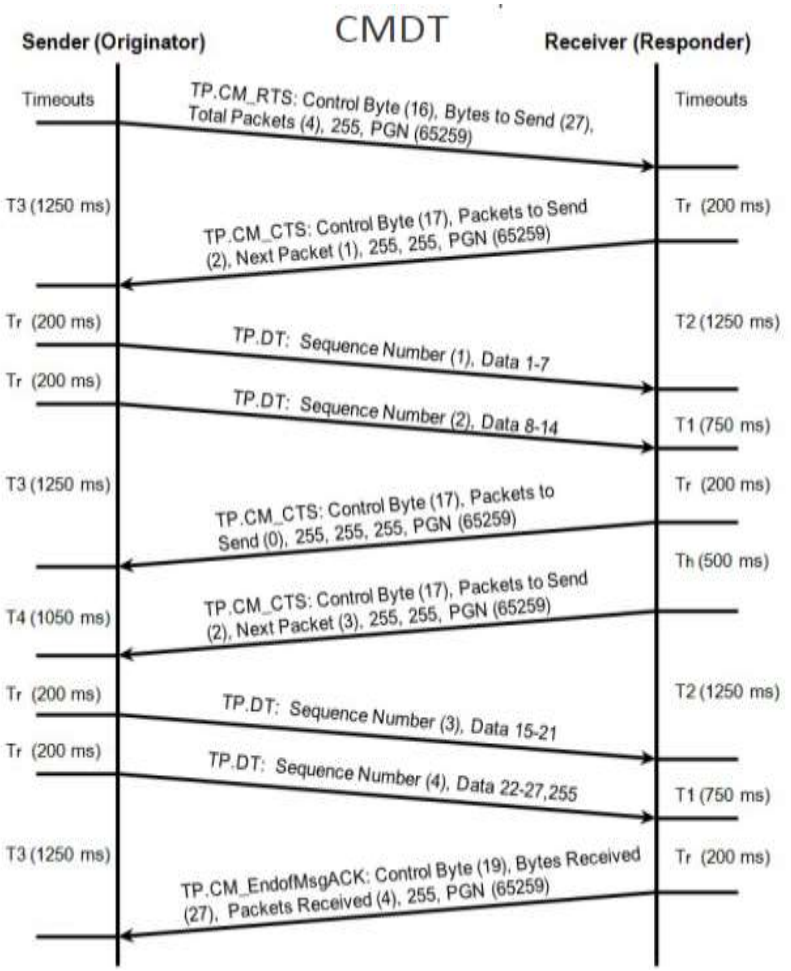
- according to SAE J1939-21 for J1939Tp: “J1939Tp - J1939 transport layer” handles segmentation and reassembling of data, control of data flow, and timeout supervision according to SAE J1939-21
- The main aim of J1939Tp is to segment and reassemble J1939 PGNs (N-SDUs) that are longer than 8 bytes. The segmented messages are sent and received via the CAN Interface (CanIf).
- J1939Tp provides the following functionality:
  - Segmentation and direct transmission of data in transmit direction
  - Reassembling and direct reception of data in receive direction
  - Control of data flow
  - Timeout supervision
  - Detection of errors during segmentation or reassembly





Transport Protocol
Message Flow





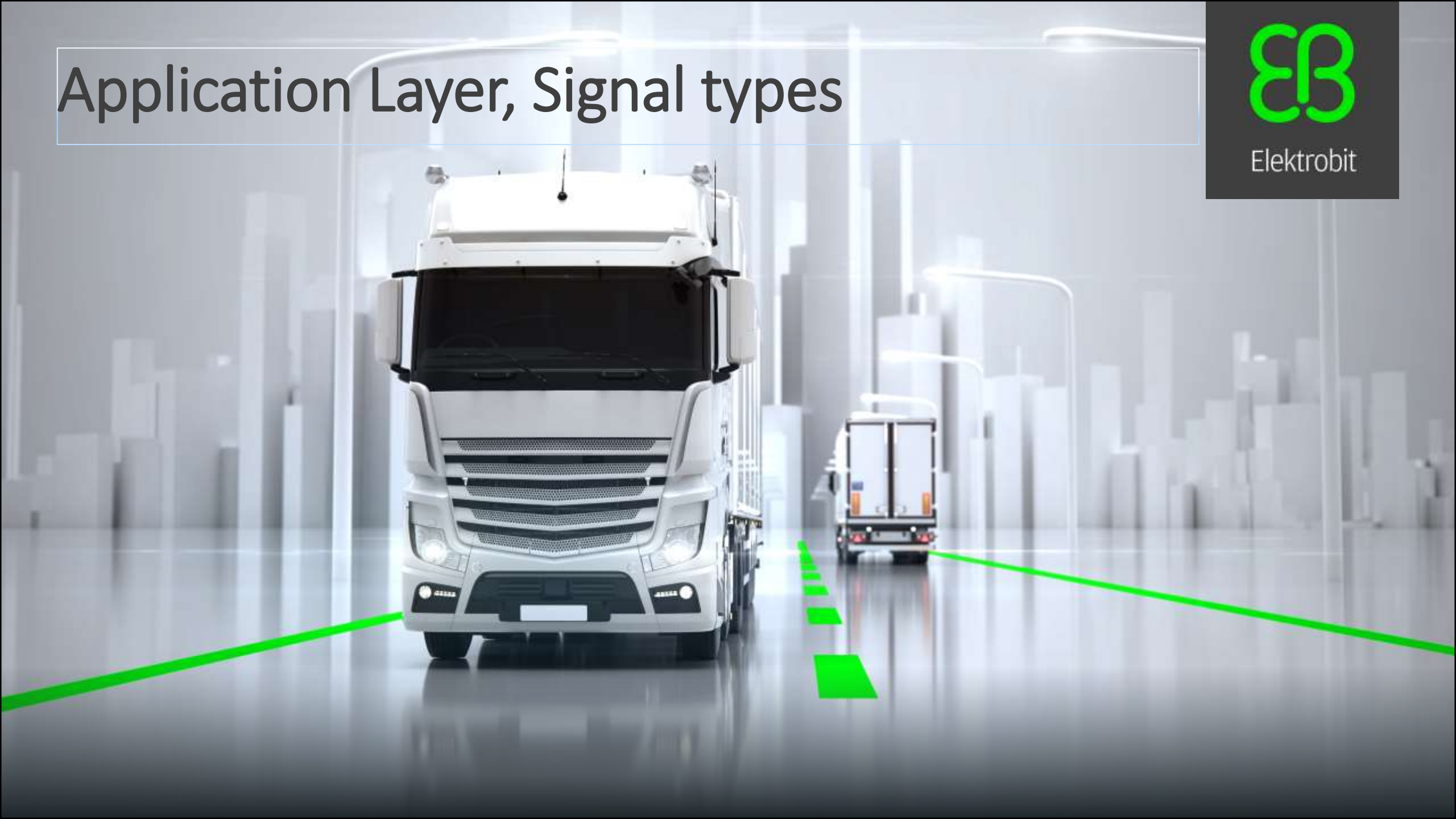
TP.CM_BAM: TransportProtocol Connection Management Broadcast Address Message

TP.CM_RTS: TransportProtocol Connection Management Request To Send

TP.CM_CTS: TransportProtocol Connection Management Clear To Send

TP.DT: TransportProtocol Data

Application Layer, Signal types



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Application Layer, Signal Types
What does J1939 not include?

This slide is an information about what needs to be implemented in an application for J1939.
The basic software (EB tresos ACG) does not include this.

- ISO Documents with relevant information :
  - SAE J1939-71 - " Vehicle Application Layer - Note: Revision B"
  - SAE J1939-74 - "Application - Configurable Messaging"
  - SAE J1939DA - "J1939 Digital Annex Of Serial Control And Communication Heavy Duty Vehicle Network Data - See Also SAE J1939; Includes Access to Additional Content"

- Key points related to the Application Layer:
  - Standardized data messages to Parameter Groups(PG).
  - All PGs definition can be found in the document "SAE J1939DA "
  - Provides the means for the Application Processes to access the data and signals that are available in a J1939 network.
  - Processing of PGs will be the responsibility of application developed by Customer (with the exception of system and diagnostic messages)
  - -Signal Types, -J1939 Signal Values and Meaning, J1939 Signal Positioning

Application Layer, Signal Types
J1939 Signal values and meaning

Logical signal ranges

Range Name	1 Byte	2 Bytes	4 Bytes	ASCII
Valid Signal	0x00 to 0xFA	0x0000 to 0xFAFF	0x00000000 to 0xFAFFFFFF	0x01 to 0xFE
Parameter specific indicator	0xFB	0xFB00 to 0xFBFF	0xFBxxxxxx	none
Reserved range fo future indicator bits	0xFC to 0xFD	0xFC00 to 0xFDFF	0xFC000000 to 0xFDFFFFFF	none
Error indicator	0xFE	0xFExx	0xFExxxxxx	0x00
Not available or not requested	0xFF	0xFFxx	0xFFxxxxxx	0xFF

Application Layer, Signal Types
J1939 Signal values and meaning-cont.

Transmitted values for discrete parameters (measured)

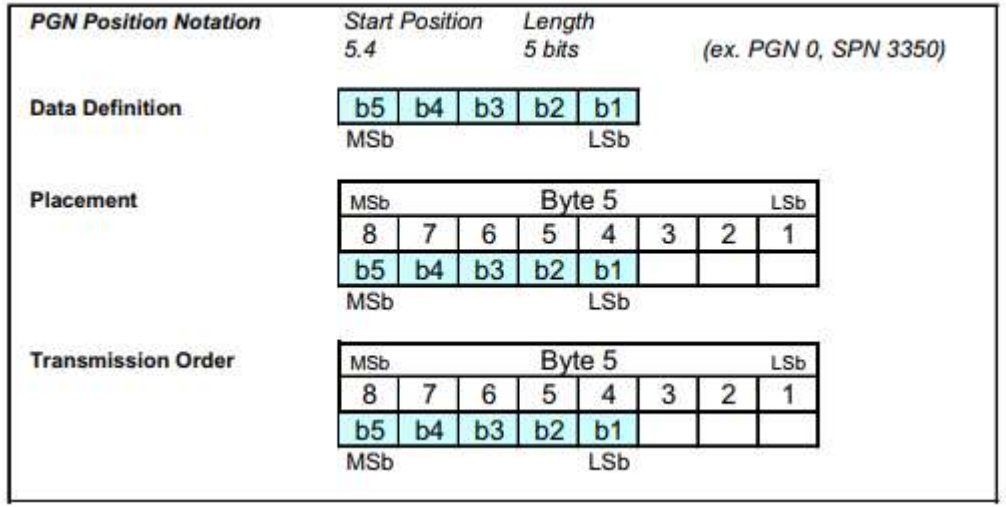
Range Name	Value
Disabled (off, passive, etc.)	00
Enabled (on, active, etc.)	01
Error indicator	10
Not available or not installed	11

Transmitted values for control commands (status)

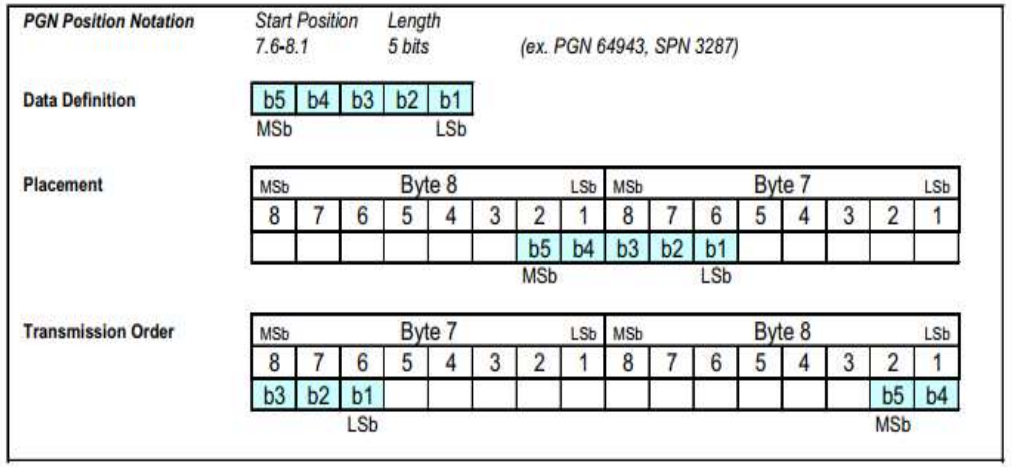
Range Name	Value
Command to disable function (turn off, etc.)	00
Command to enable function (turn on, etc.)	01
Reserved	10
Don't care/take no action (leave function as is)	11

Application Layer, Signal Types
J1939 Signal placement

- R.x / (Y Bits < 8) Fixed position of the data within a byte boundary for a fractional byte length parameter with less than 8 bits. The parameter occupies 'Y' number of bits of byte 'R' with the least significant bit of the parameter data at bit 'x' in byte 'R' and the most significant bit of the parameter data is at bit ('x' + ('Y'-1)) in byte 'R'.



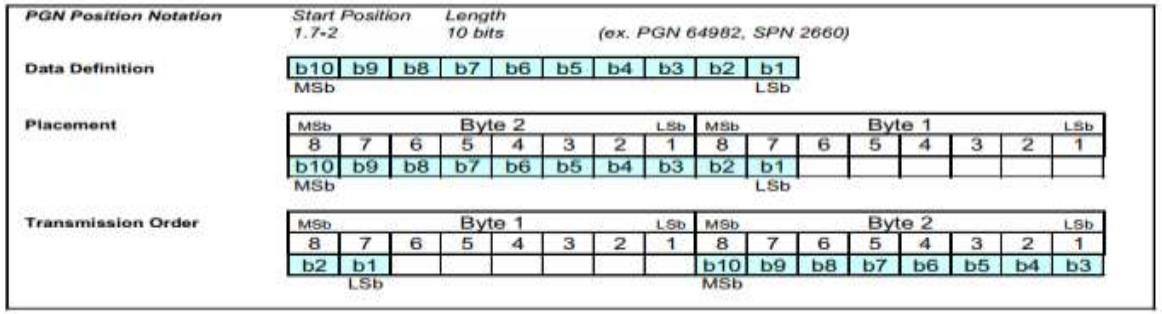
- R.x – S.w / (Y Bits < 8) Fixed position of the data across a byte boundary for a fractional byte length parameter with less than 8 bits. The parameter occupies the most significant bits of byte 'R' from bit 'x' to bit 8 and the remaining number of data bits start from bit 'w' in byte 'S'. The least significant bit of the parameter data is placed at bit 'x' in byte 'R'.

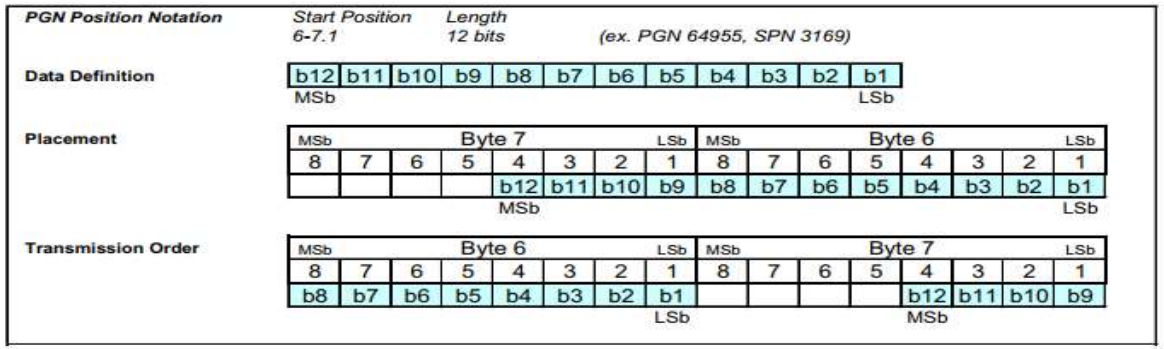


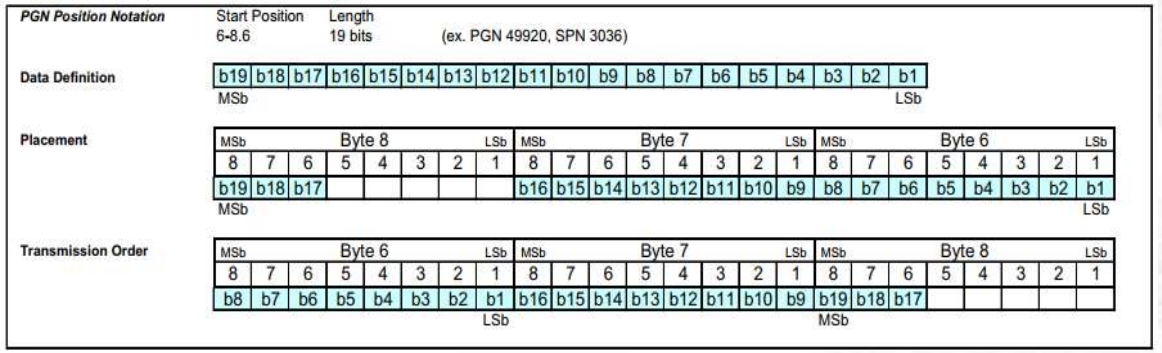
Application Layer, Signal Types
J1939 Signal placement-cont.

- R.x - S / (Y Bits > 8) Fixed position of a fractional byte lengt parameter with more than 8 bits where the data crosses a byte boundary and stops on a whole byte. The parameter occupies the most significant bits of byte 'R' from bit 'x' to bit 8 plus all whole bytes up to 'S'.

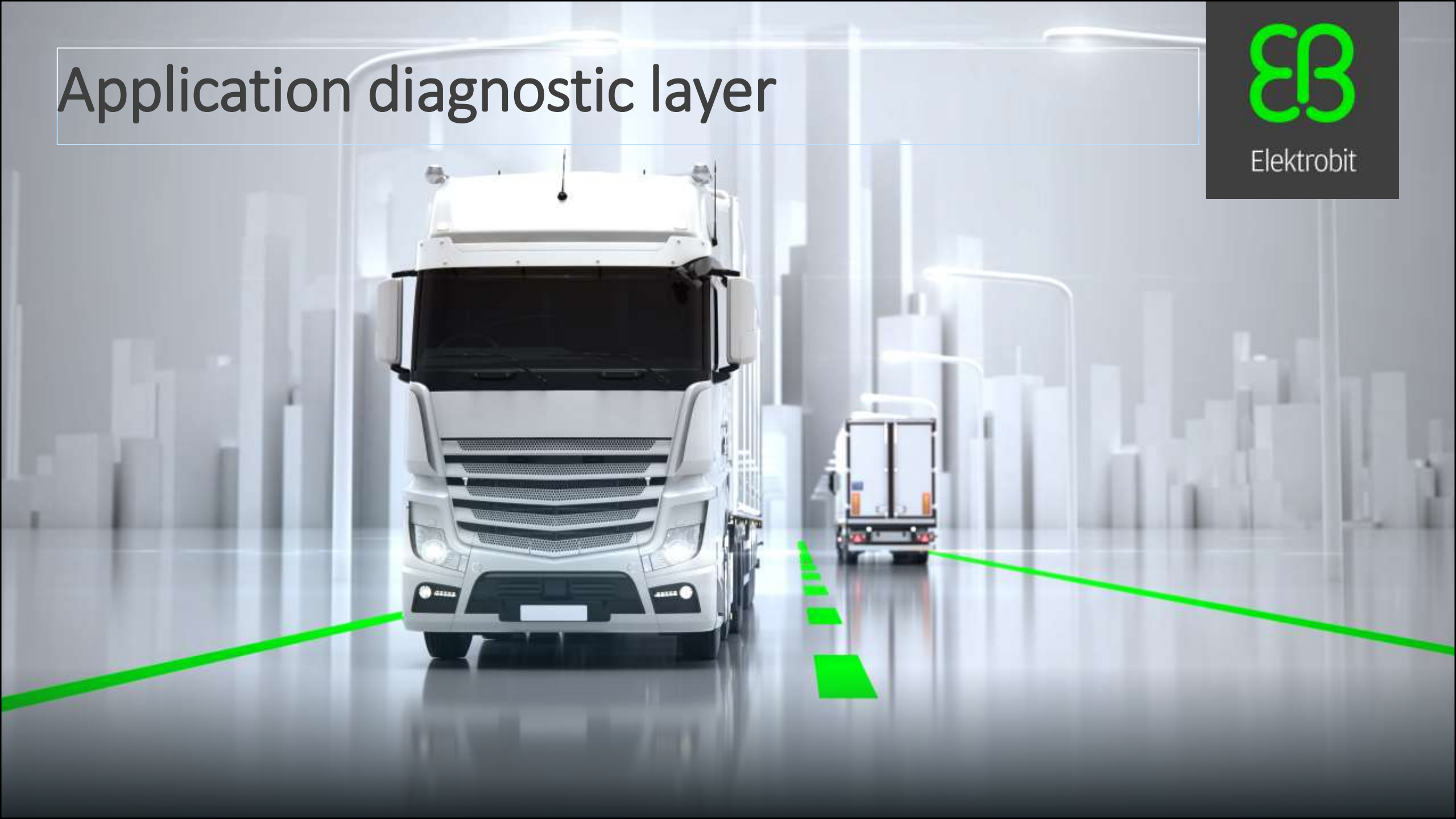
- R – S.w / (Y Bits > 8) Fixed position of a fractional byte length parameter with more than 8 bits where the data crosses a byte boundary and starts on a whole byte. The parameter occupies all whole bytes from 'R' up to 'S' and the remaining modulo-8 number of bits starting from bit 'w' in byte 'S'.







Application diagnostic layer



Application diagnostic layer
Key information

- There is a special J1939-DCM available supporting a project to use J1939 diagnostics
- ISO Documents with relevant information :
  - SAE J1939-73 - “Application Layer – Diagnostics”
  - SAE J1939-03 - “On Board Diagnostics Implementation Guide”

- Key points related to the Diagnostic Layer:
  - Provides the J1939 messages(DMs) used for accessing diagnostic and calibration data
  - There is a number of 58 predefined messages
  - Diagnostic messages can be used for :
    - Reading and writing to ECU memory
    - Reporting diagnostic information when running
    - Identification of lamp status
    - Reading and clearing Diagnostic Trouble Codes (DTCs)
    - Start/stop broadcast DMs

Application diagnostic layer
Diagnostic Message1 (DM1) example

- Diagnostic Massage 1 (DM1) provides diagnostic lamp status and Diagnostic Trouble Codes (DTCs). Together, the lamp and DTC information convey the diagnostic condition of the transmitting electronic component to other components on the network.
- From Autosar spec to prevent high BUS loads the number of DTCs is limited to 20 per message.
- Layout :
  - Byte: 1 bits 8-7 Malfunction indicator lamp
  - bits 6-5 Red stop lamp
  - bits 4-3 Amber warning lamp
  - bits 2-1 Protect lamp
  - Byte: 2 bits 8-7 Flash malfunction indicator lamp
  - bits 6-5 Flash red stop lamp
  - bits 4-3 Flash amber warning lamp
  - bits 2-1 Flash protect lamp
  - Byte: 3 bits 8-1 SPN, 8 least significant bits of SPN (most significant at bit 8)
  - Byte: 4 bits 8-1 SPN, second byte of SPN(most significant at bit 8)
  - Byte: 5 bits 8-6 SPN, 3 most significant bits(most significant at bit 8)
  - bits 5-1 FMI (most significant at bit 5)
  - Byte: 6 bit 8 SPN conversion method
  - bits 7-1 Occurrence count

Application diagnostic layer
Diagnostic Message1 (DM1) example

- 0.001232 18FECA27x 00 FF 01 00 01 01 FF FF
- 0.946902 18FECA27x 00 FF 01 00 01 01 FF FF
- 1.949384 18FECA27x 00 FF 01 00 01 01 FF FF

- 10.400309 1CECFF27x 20 0A 00 02 FF CA FE 00
- 10.460459 1CEBFF27x 01 00 FF 01 00 01 01 02
- 10.520610 1CEBFF27x 02 00 02 01 FF FF FF FF

- 35.031309 1CECFF27x 20 1E 00 05 FF CA FE 00
- 35.091462 1CEBFF27x 01 00 FF 01 00 01 01 02
- 35.151610 1CEBFF27x 02 00 02 01 03 00 03 01
- 35.211761 1CEBFF27x 03 04 00 04 01 05 00 05
- 35.271906 1CEBFF27x 04 01 06 00 06 01 07 00
- 35.332062 1CEBFF27x 05 07 01 FF FF FF FF FF

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bits 5-1 FMI (most significant at bit 5)
Byte: 6 bit 8 SPN conversion method
bits 7-1 Occurrence count

Signal types : J1939 NM, RM, DCM

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Signal types : J1939 NM, RM, DCM
SAE J1939 in AUTOSAR

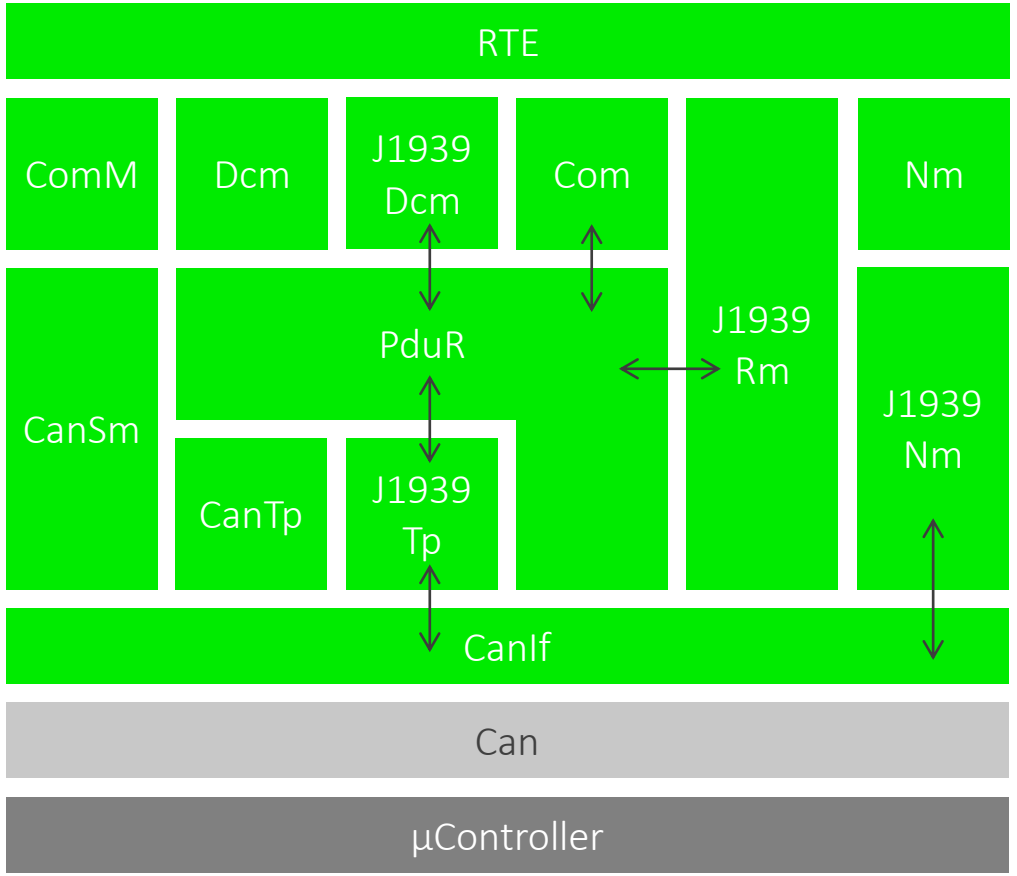
Architectural overview

EB tresos AutoCore J1939 Stack basic software:

- J1939Tp - J1939 transport layer
  - Handles segmentation and reassembling of data, control of data flow, and timeout supervision according to SAE J1939-21
- J1939Dcm – J1939 Diagnostic Communication Manager
  - Defines the message structures and behavior of so-called ‘diagnostic messages’ which are used for diagnostic communication in J1939 networks according to SAE J1939-73.
- J1939Rm – J1939 request manager
  - Handles received and transmitted request and acknowledgement parameter groups according to SAE J1939-21
- J1939Nm - J1939 network management
  - Handles received and transmitted address-claimed parameter groups according to SAE J1939-81

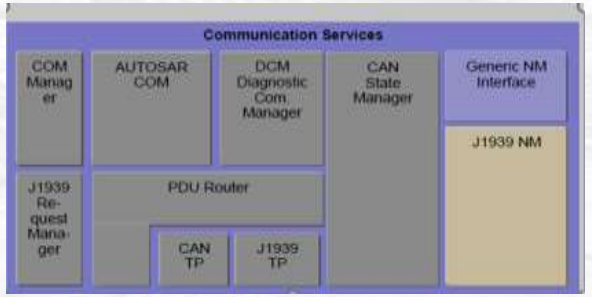
Connection to other EB tresos AutoCore modules:

- CanIf, Dem, EcuC, PduR, BswM , Nm , ComM and Com

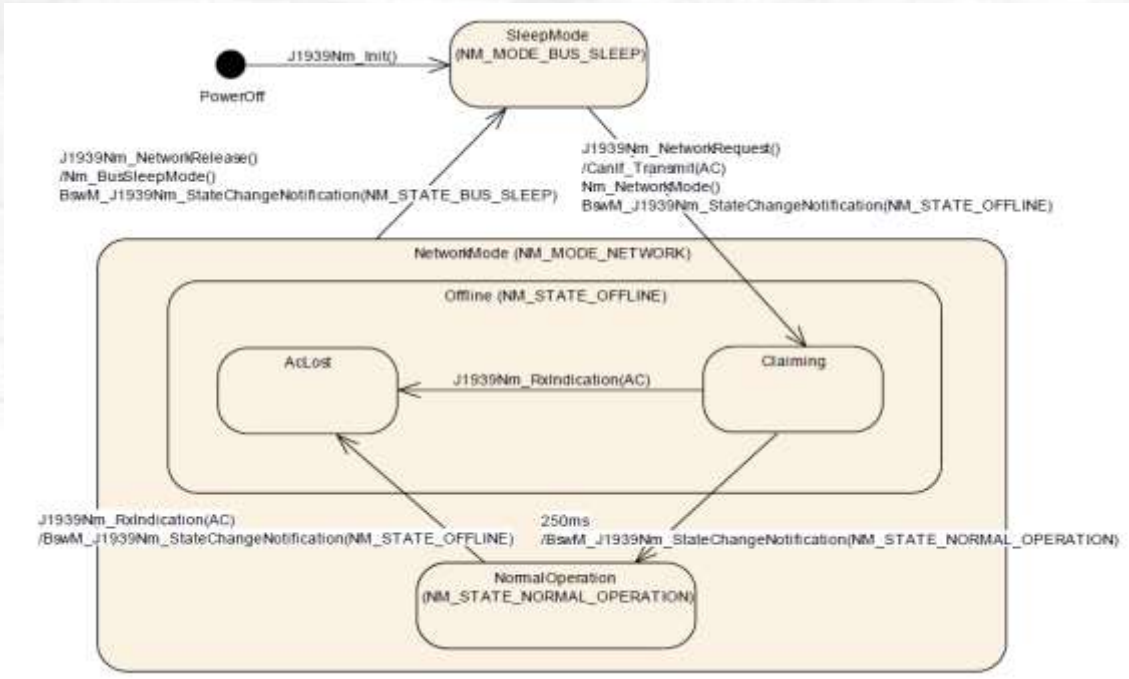


Signal types : J1939 NM, RM, DCM

J1939NM (Networkmanager)



- The J1939 Network Management module (J1939Nm) handles received and transmitted AddressClaimed (AC) PGs. It supports transmission of AC on start-up, after a contending AC received from another node, and on request (triggered by the J1939 Request Manager).
- Besides this, the J1939 Network Management module also ensures that the ECU does not send any messages during startup or after address loss.



Signal types : J1939 NM, RM, DCM
J1939NM (Networkmanager)

- Limitations
  The J1939 Network Management module does not support changing of the address, neither after a CommandedAddress PG, nor after address loss. It also does not support for Name Management
- The J1939 Network Management module reports state changes to the NM Interface and to the Basic Software Mode Manager (BswM).
  While the states reported to the NM Interface are accumulated states of all NodeChannels of a CAN channel, the J1939 Network Management module reports states to the BswM separately for each NodeChannel.
- The J1939 Network Management module starts all NodeChannels in ‘SleepMode’ (corresponding to NM_MODE_BUS_SLEEP). The CAN channels will be switched to ‘NetworkMode’ (corresponding to NM_MODE_NETWORK) immediately afterwards by a network request issued from the ComM via NM Interface.
- When a node of the J1939 Network Management module loses its claimed address on one of its channels (see section 7.5), it will switch that NodeChannel to the sub state ‘AcLost’ of state ‘Offline’, notifying the NM Interface and the BswM of this state change and sending a CannotClaimAddress PG for the losing node on that channel (see section 7.4).
- To shut down the network, ComM calls the Nm_NetworkRelease API of the NM Interface, which in turn calls J1939Nm_NetworkRelease. The J1939 Network Management module will then switch to ‘SleepMode’, and notify this to the NM Interface
- The source address of received AddressClaimed PGs must be immediately compared to the source addresses of all NodeChannels attached to the same channel (see J1939NmNodePreferredAddress). If any of these match, the payload of the received PG must be compared to the configured NAME for the matching source address (see J1939NmNodeNameXxx), and depending on the relative priority, the J1939 Network Management module must send an AddressClaimed or a CannotClaimAddress PG. The priority is determined by the numerical value of the NAME.

Signal types : J1939 NM, RM, DCM
Networklayer – Address Claiming

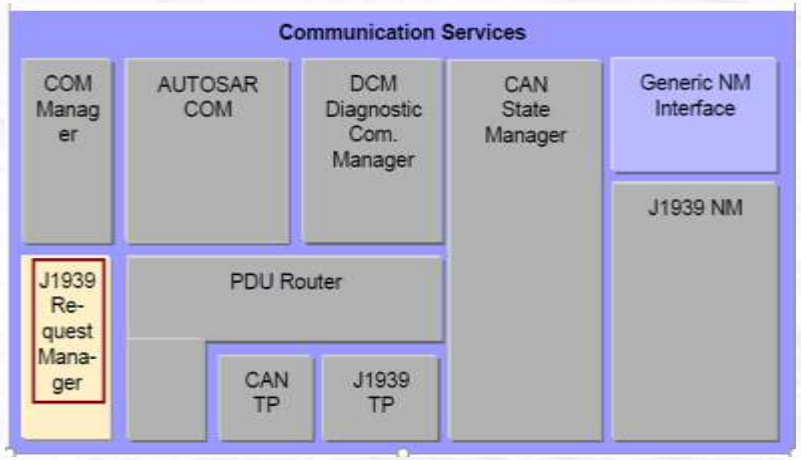
- ISO Documents with relevant information :
  - SAE J1939-31 - “(R) Network Layer”
  - SAE J1939-81 - “Network Management”

- Key points related to the Network Layer:
  - Network Management under J1939 is primarily represented by the Address Claiming Process.
  - Address Claiming Procedure Overview
    - Each ECU in a J1939 vehicle network must hold at least one NAME and one address for identification purposes. Single electronic units are allowed, however, to control multiple names and addresses(Virtual ECUs).
    - SAE J1939 defines a 64 bit NAME, to uniquely identify each ECU in a network.
    - The address claim procedure is designed to assign addresses to ECUs right after the network has been initialized and thus assuring that the assigned address is unique to the ECU
    - In the event that two ECUs attempt to claim the same address, the ECU with the lowest NAME value will succeed and use the address as claimed. The remaining ECUs must claim a different address by sending another Address Claimed message containing a different address or send a Cannot Claim Address message.

Signal types : J1939 NM, RM, DCM

J1939RM (Request Manager)

- Request Manager is mostly used for diagnostics: With a Request-PGN another PGN can be requested
- J1939Rm supports transmission & reception of ACKM PGs & Request Messages with variable SA, DA, and Priority. It also provides timeout monitoring for any outgoing request.
- J1939Rm provides the following functionality as mentioned below:
  - Forwarding incoming requests to intended destinations.
  - Forwarding incoming acknowledgements to intended destinations.
  - Interface for transmission of request messages.
  - Interface for transmission of acknowledgement messages.
  - Timeout supervision for outgoing requests.



- J1939Rm module provides interface with following module for different request:
  - Com, PduR & CanIf for COM PG.
  - J1939Nm for Address Claim PG.
  - J1939Dcm for Diagnostic Messages
  - RTE & Application SW for Acknowledgements.
  - CDD for user configured interfaces.

Signal types : J1939 NM, RM, DCM
J1939RM (Request Manager)

- In general, request handling is only active when the ECU is online. The exceptions to this rule are received and transmitted requests for the AddressClaimed PG, which must be possible in all cases. The J1939 Request Manager provides an API that is used by the BSW Mode Manager (BswM) to notify the J1939 communication state

- Besides forwarding to the J1939 Network Management module, the J1939 Diagnostic Communication Manager, and CDDs, the J1939 Request Manager can also forward requests to SW-Cs, and trigger COM to send requested PGs.

- Forwarding to other BSW modules is done via the generic callout function <User>_RequestIndication (see section 8.6.3.1). Forwarding to SW-C uses a dedicated service port function with the same signature as the <User>_RequestIndication

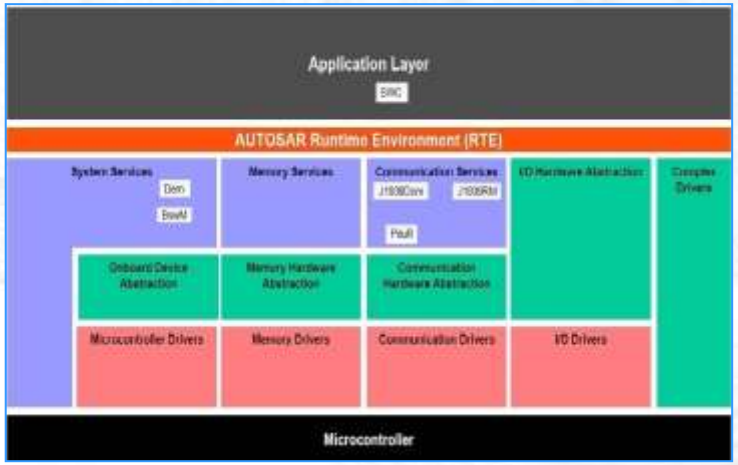
- If COM is configured as destination for the request of a certain PGN, the J1939 Request Manager will prepare the MetaData, and request COM to send the PDU with the MetaData provided via Com_TriggerIPDUSendWithMetaData. This sequence is shown in Figure 3.

- If COM is configured as destination for the request of a certain PGN, the J1939 Request Manager will prepare the MetaData, and request COM to send the PDU with the MetaData provided via Com_TriggerIPDUSendWithMetaData. This sequence is shown in Figure 3.
- The J1939 Request Manager shall respond to requests for unknown PGNs with a NACK, but only when the request was sent to a specific destination address.
- As stated in section 7.1, the J1939 Request Manager also supports transmission of requests, reception of responding acknowledgements, and timeout supervision for the responses.
- The SAE J1939 specification [18] defines a maximum delay of 200ms for the answer to a request. This delay is not supervised by the J1939 Request Manager. On the other hand, the timeout of 1.25s for the reception of the answer to a request will be supervised by the J1939 Request Manager, if configured accordingly via J1939RmUserTimeoutSupervision. In that case, when the request is transmitted, the timer is started and the request data is stored as described in

Signal types : J1939 NM, RM, TP, DCM

J1939DCM (Diagnostic communication manager)

- J1939Dcm is a part of a diagnostic protocol that is used for communication with the vehicle while it is being repaired and also during vehicle operation, when it is used to report immediate diagnostic information into the vehicle like periodically broadcasting active DTCs to the instrument cluster to communicate, to the driver, the status of the vehicle by turning on/off different status lamps.



Signal types : J1939 NM, RM, TP, DCM
J1939DCM (Diagnostic communication manager)

- The J1939 Diagnostic Communication Manager (J1939Dcm) has interfaces towards the PDU Router (PduR, upper and lower), the J1939 Request Management module (J1939Rm), the Diagnostic Event Manager module (DEM) and the Development Error Tracer (DET).
- When a node of the J1939 Network Management module loses its claimed address on one of its channels (see section 7.5), it will switch that NodeChannel to the sub state 'AcLost' of state 'Offline', notifying the NM Interface and the BswM of this state change and sending a CannotClaimAddress PG for the losing node on that channel (see section 7.4).
- The J1939 Diagnostic Communication Manager provides an API that is
  used by the BSW Mode Manager (BswM) to notify the J1939 communication state.
- Module limitations
  - During operation time it could be that at a specific moment in time two request need to be answered , in this case requests will be processed sequentially (this limitation is linked with the Dem module).Due to this in order to start processing a new request, the processing of the current request needs to be finished (the next DM processing will wait until the transmission is started for the current DM if the two DM's are not sharing the response buffer or the Transmission finished confirmation when same buffer is used).

  - *For supported dignostic messegas please consult the product description of the EB tresos ACG8*
  - *If a diagnostic message is unsupported, a dummy message will be sent*

Signal types : J1939 NM, RM, TP, DCM
Functional Safety in J1939

- ISO Documents with relevant information :
  - SAE J1939-76 – “Functional Safety Communications Protocol”

- Key points related to the Functional Safety:
  - Defines a communication protocol to deliver critical data in a safe and reliable way between 2 software applications over an J1939 based communication channel.
  - If requirements provided in the SAE J1939-76 document are strictly met the protocol is deem capable of meeting a safety ASIL-D level with a PFH (Probability of Failure per Hour) of less than 10e-7.
  - The communication protocol can only be used for PGs with a size of 8 Bytes or less.
  - The SAE defined that the implementation of the Functional Safety Protocol must be done in the safety application layer. This requirement allows the rest of the J1939 communication stack to function as a black channel that doesn’t need to be safety qualified

Integration hints

- Mainfunctions for J1939Tp, J1939Rm , J1939Dcm and J1939Nm should be mapped to a RTE task.
- J1939Rm and J1939Dcm have service generator (Depend on Configurations)
- Exclusive area of J1939Nm should be integrated in RTE (SchM)

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