Use-Cases and Requirements for 1722A

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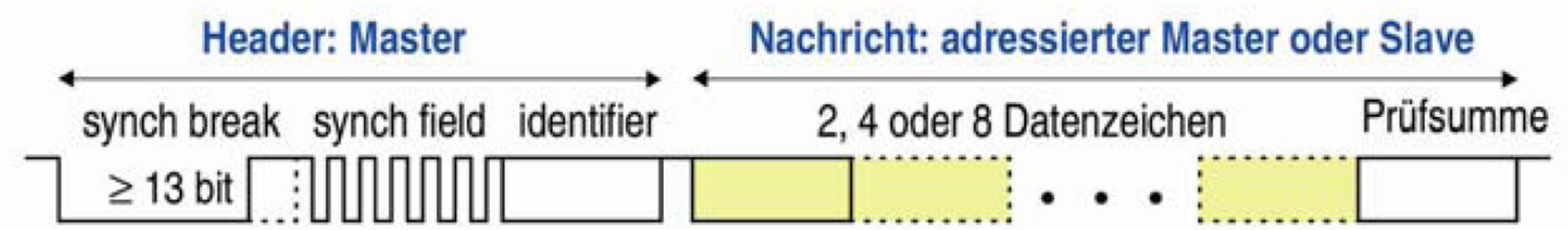
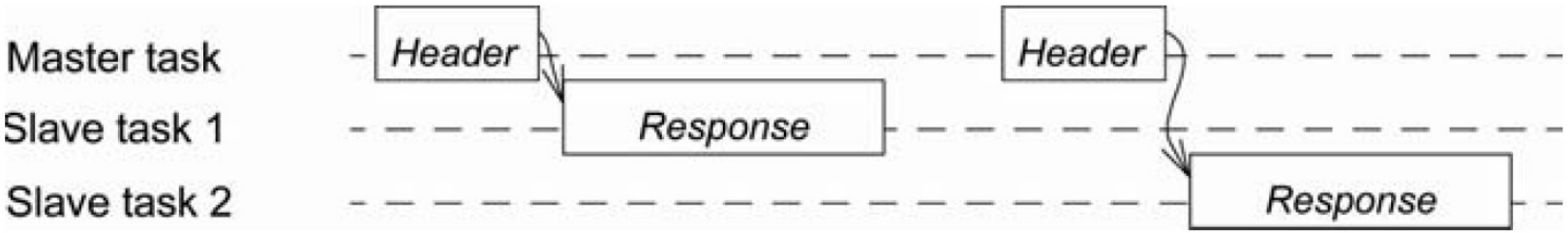
LIN: Local Interconnect Network

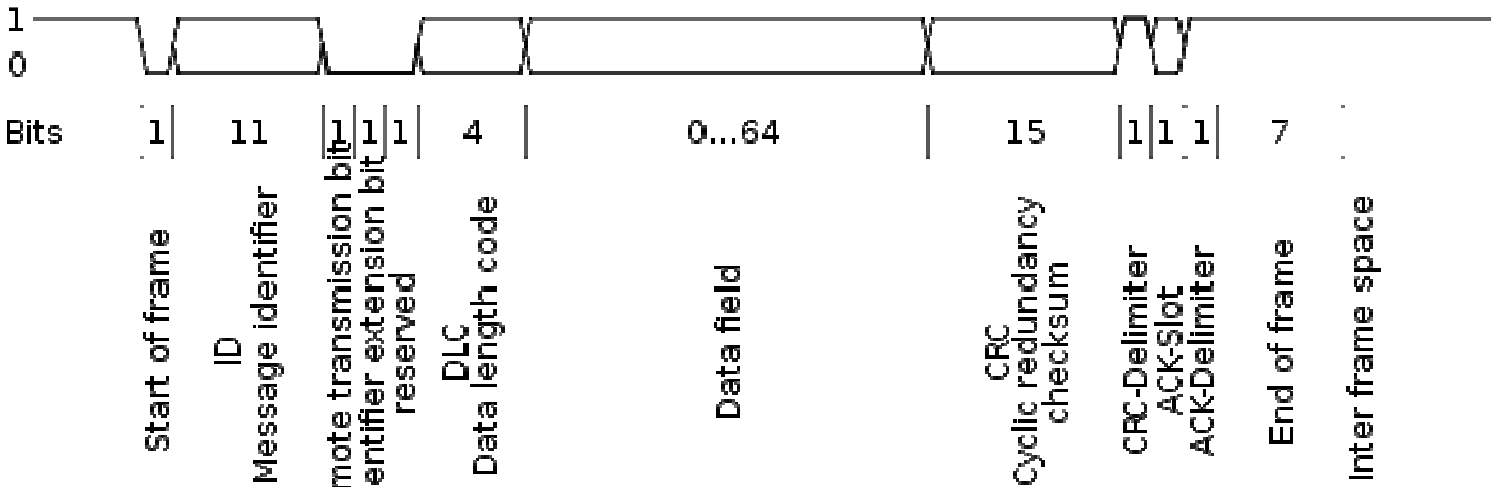


- 1. Master:
  - Frame start: 13 Bit dominant level (sync break)
  - Synchronization: alternating 1-0 bits (sync field)
  - 6 Bit message ID
- 2. Master or slave is addressed by message ID and send its payload:
  - 2, 4, 8 data bytes
  - Check sum
- Communication directions (always initiated by master)
  - From master to one or multiple slaves
  - From one slave to master and/or slaves

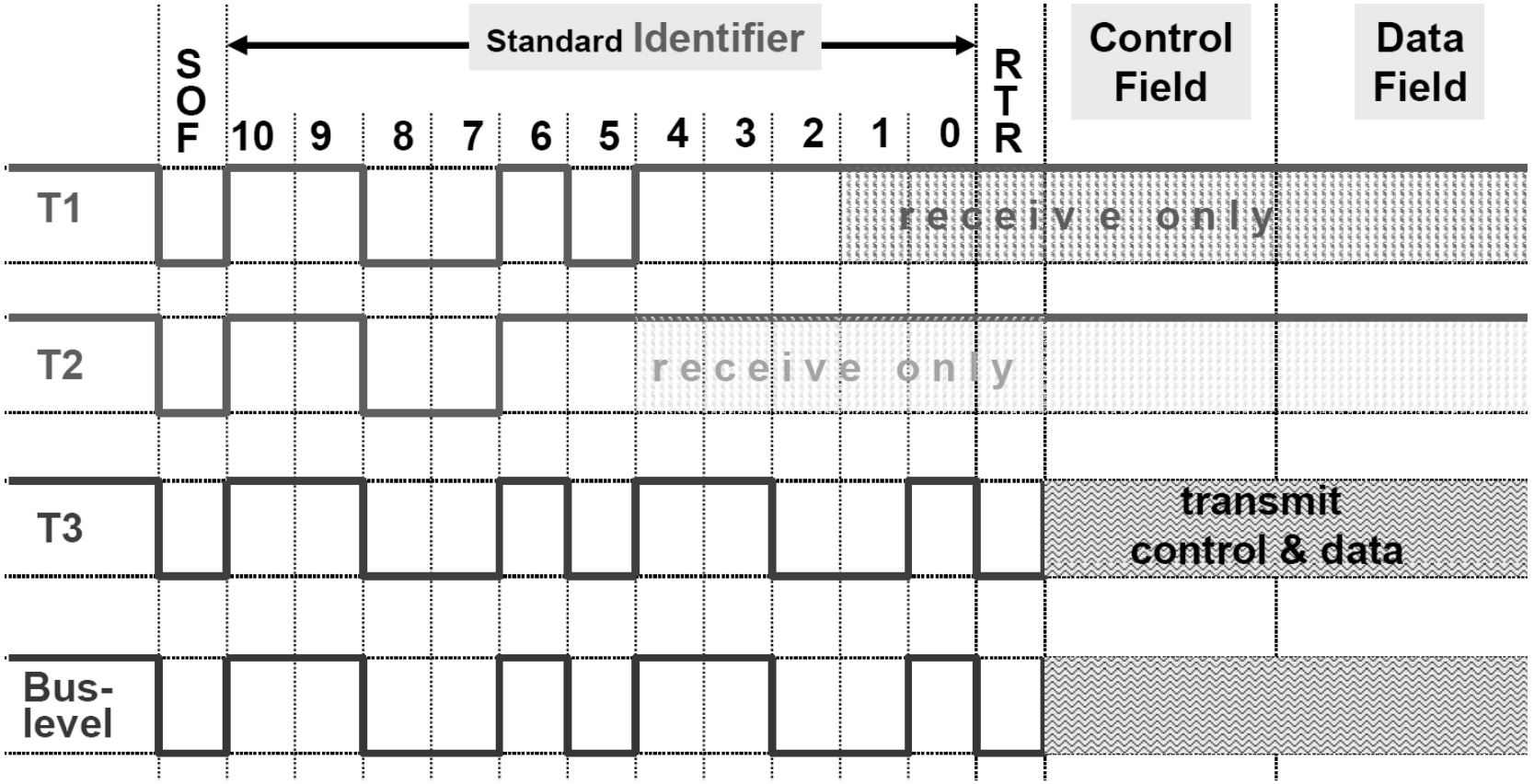


CAN-Frame

CAN-ID: Unique ID used for arbitration and identification of data field content
Remote Trans. Bit: By setting this bit another node is requested to send a message

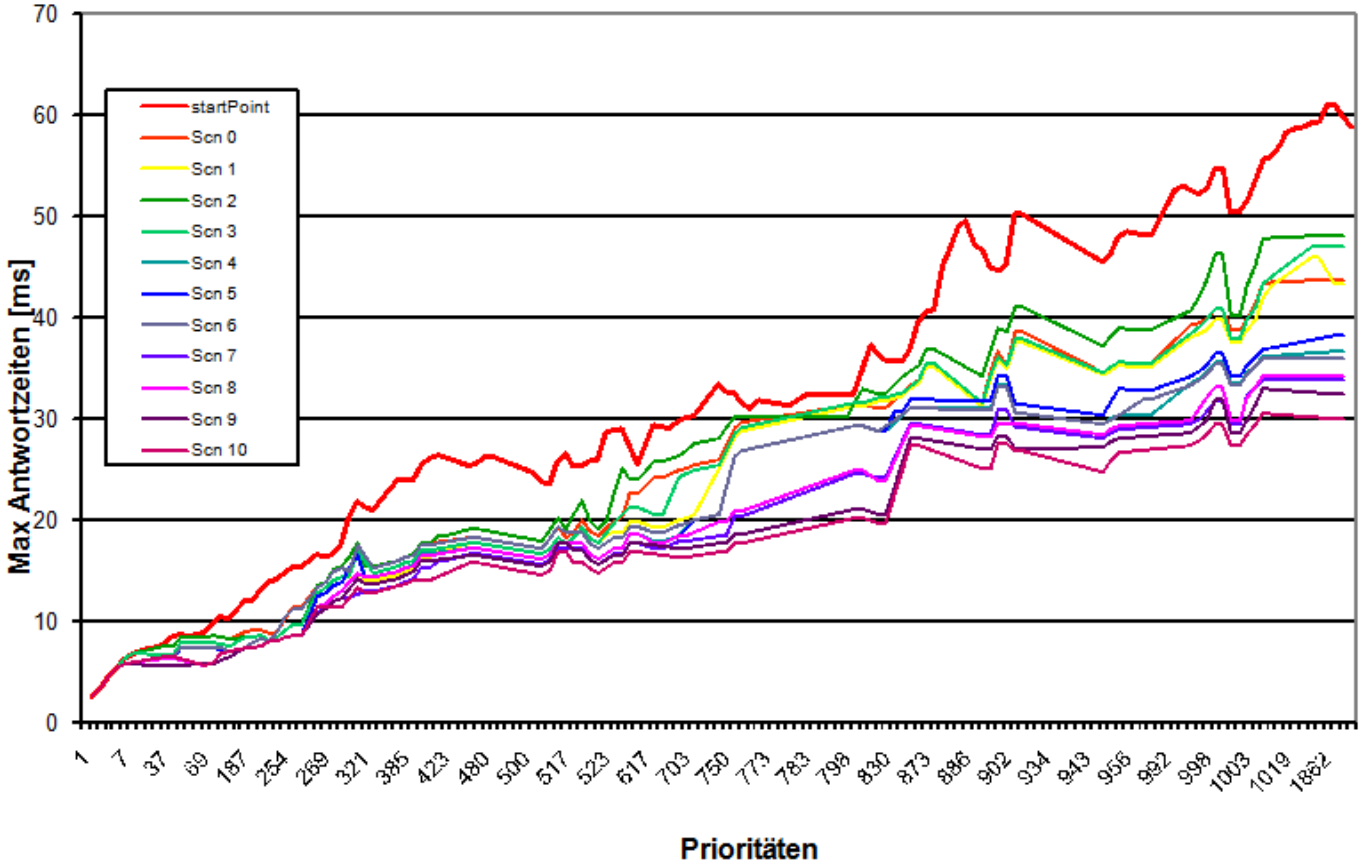


CAN-Arbitration



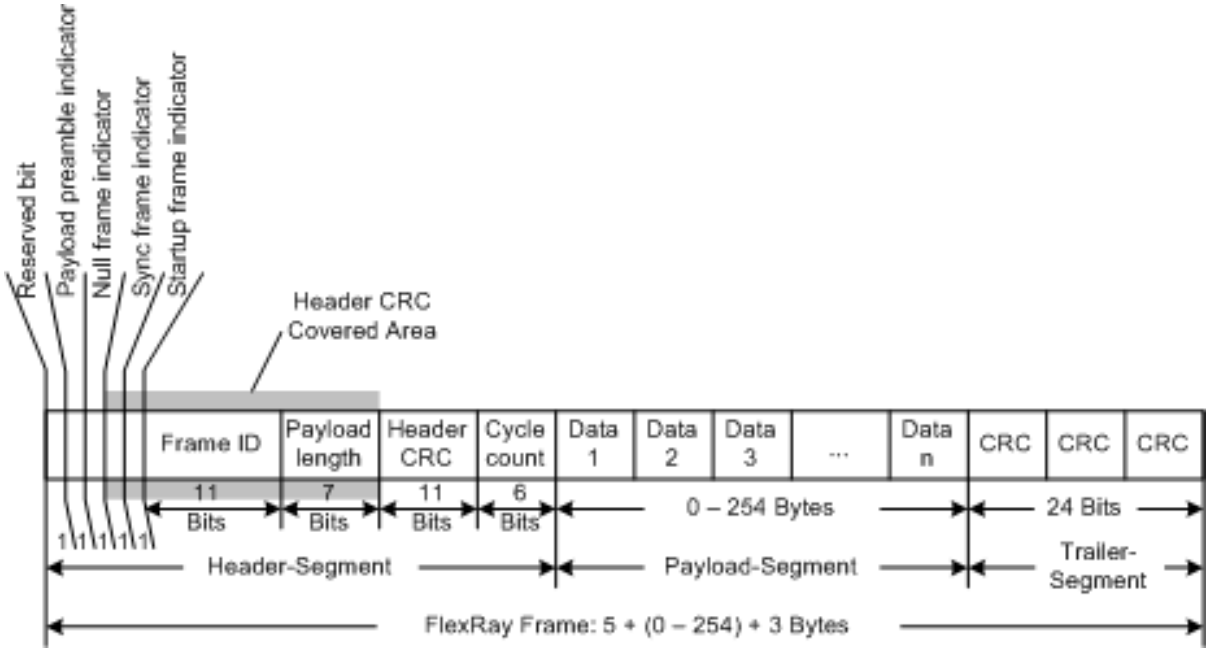
Example: Arbitration Effect on Response Time

- Worst-case response time can be analyzed in CAN-networks
- Example with typical automotive communication matrix:

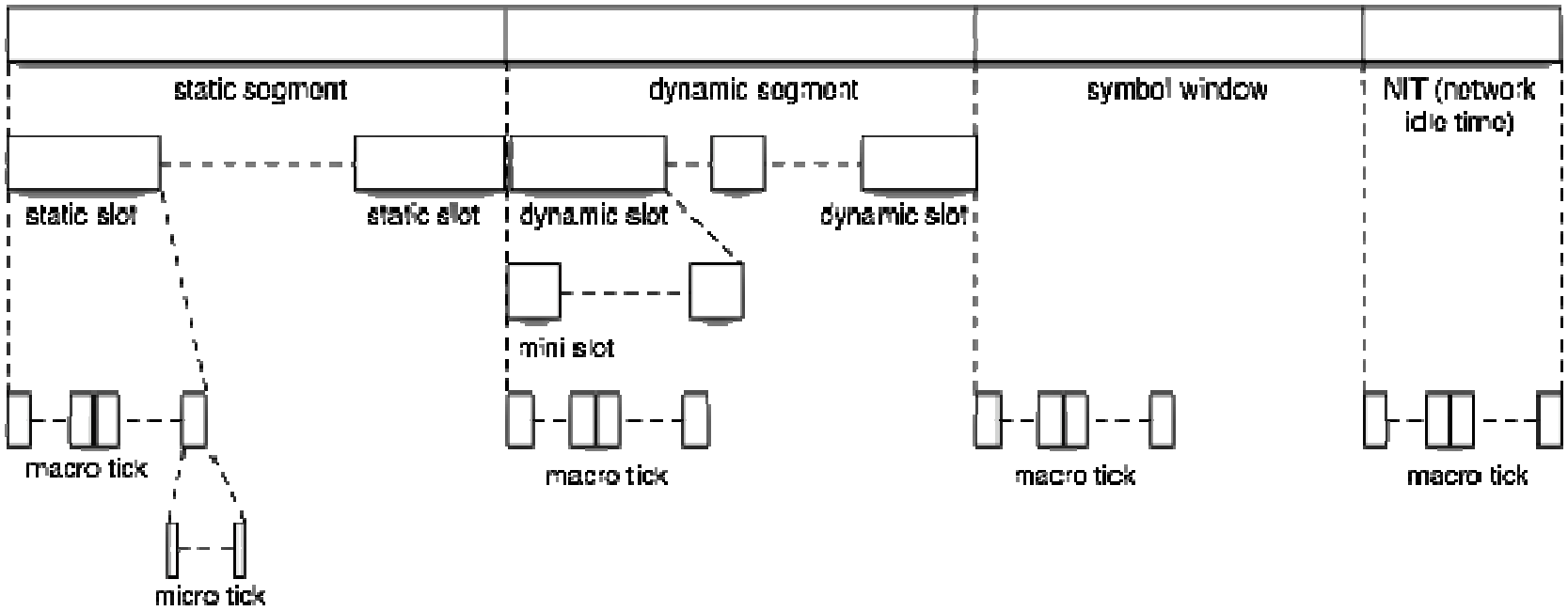


FlexRay-Frame

- Payload preamble indicator: denotes whether the payload contains control information
- Null frame indicator: if bit is set, the payload contains valid data
- Up to 254 byte payload data



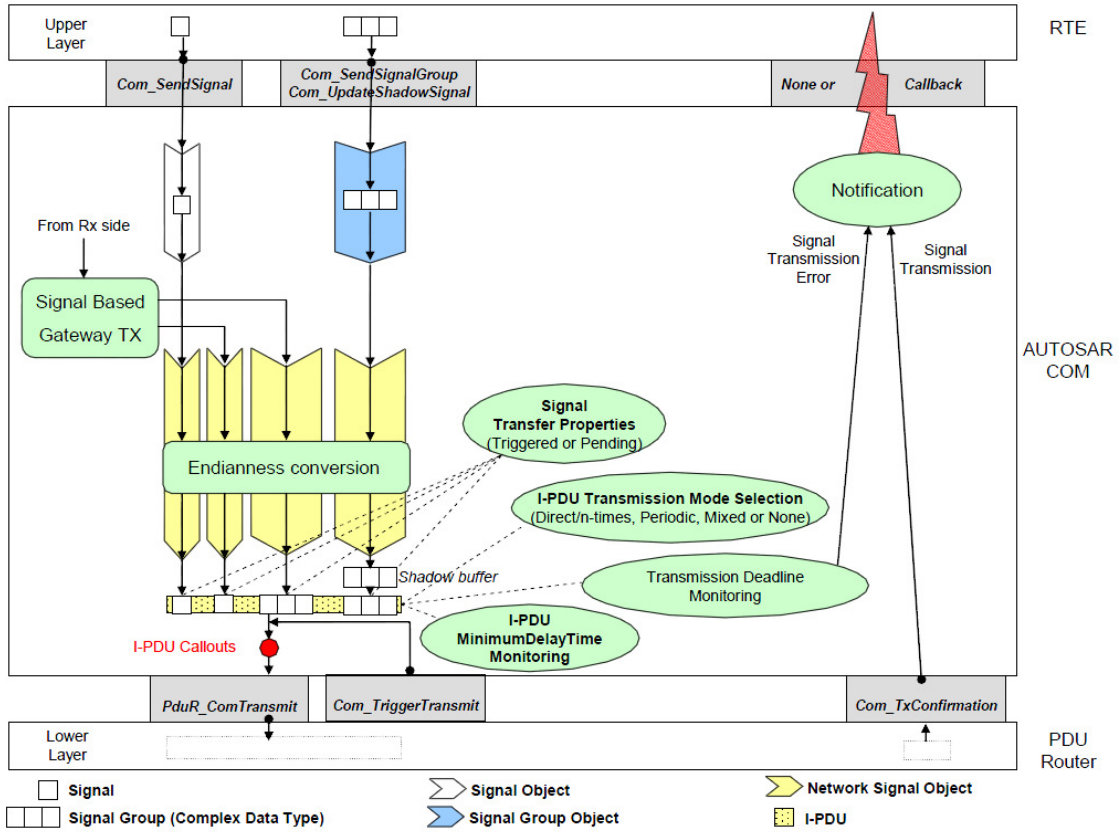
FlexRay Slots and Cycle



- Single or dual channel operation: second channel can be used for redundancy or additional bandwidth
- TDMA- with a kind of Round-Robin-Arbitration in the dynamic segment
- Data rate: 10 Mbps

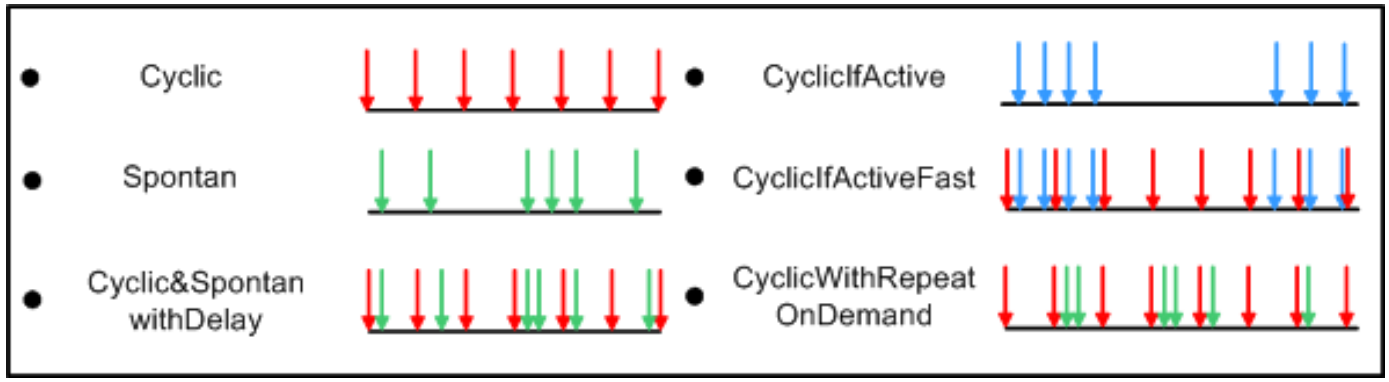
Signal→PDU→Frame

- I-PDU transmission in AUTOSAR



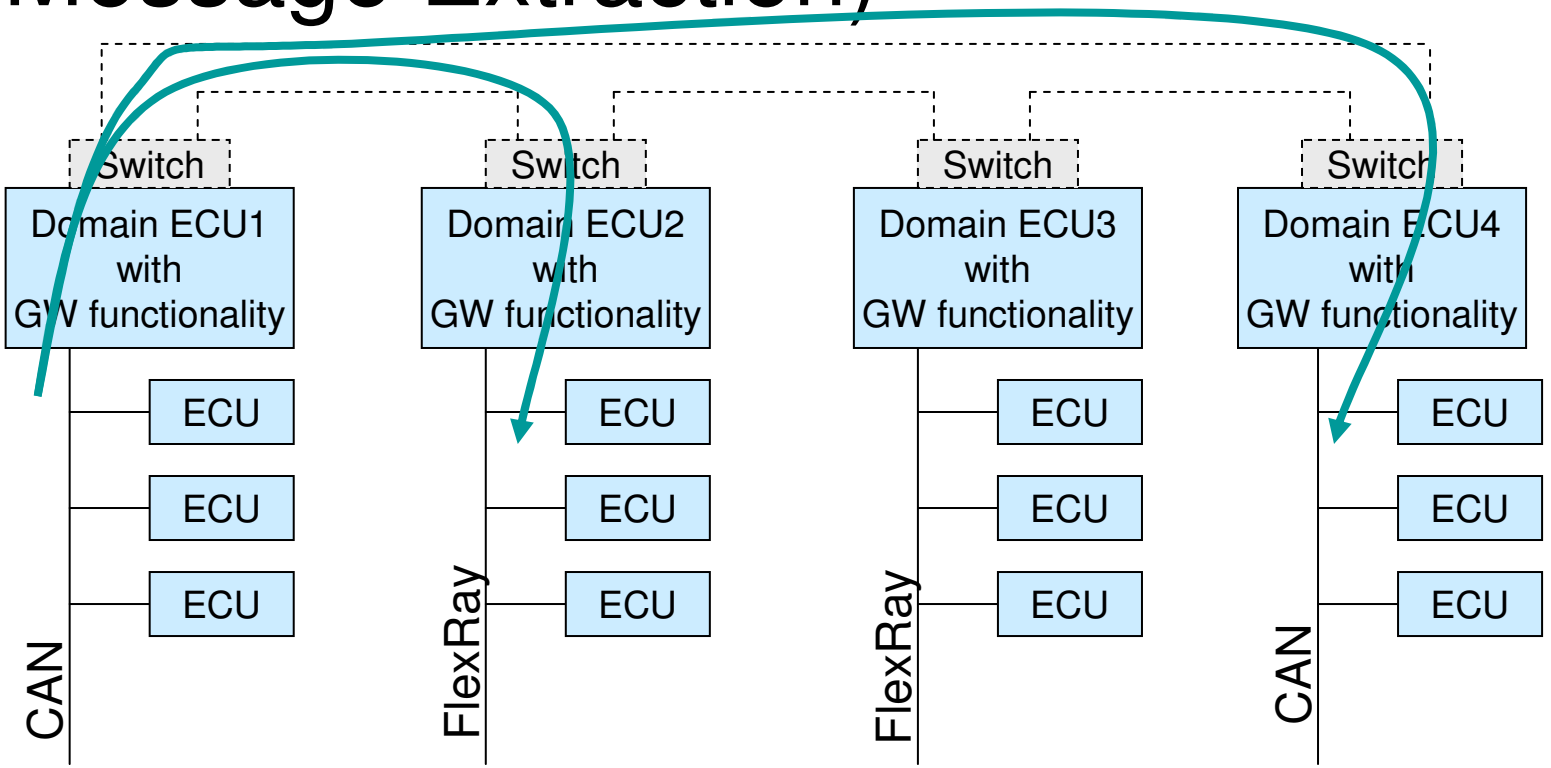
Typical Send Types

- CAN-DBC



- AUTOSAR I-PDU Transmission Modes:
  - Direct/N-Times: PDU will be sent immediately N-times
  - Periodic: periodic transmission
  - Mixed: Mixture of Direct/N-Times and Periodic
  - None: No transmission via AUTOSAR COM

Use-Case 1a: Ethernet as a Backbone „Bus“ (Message Extraction)



Transmission of data from a CAN bus over several gateways into arbitrary bus systems:

Messages on CAN-Bus:

CAN-Hdr1	Payload1	CAN-Hdr2	Payload2	CAN-Hdr3	Payload3

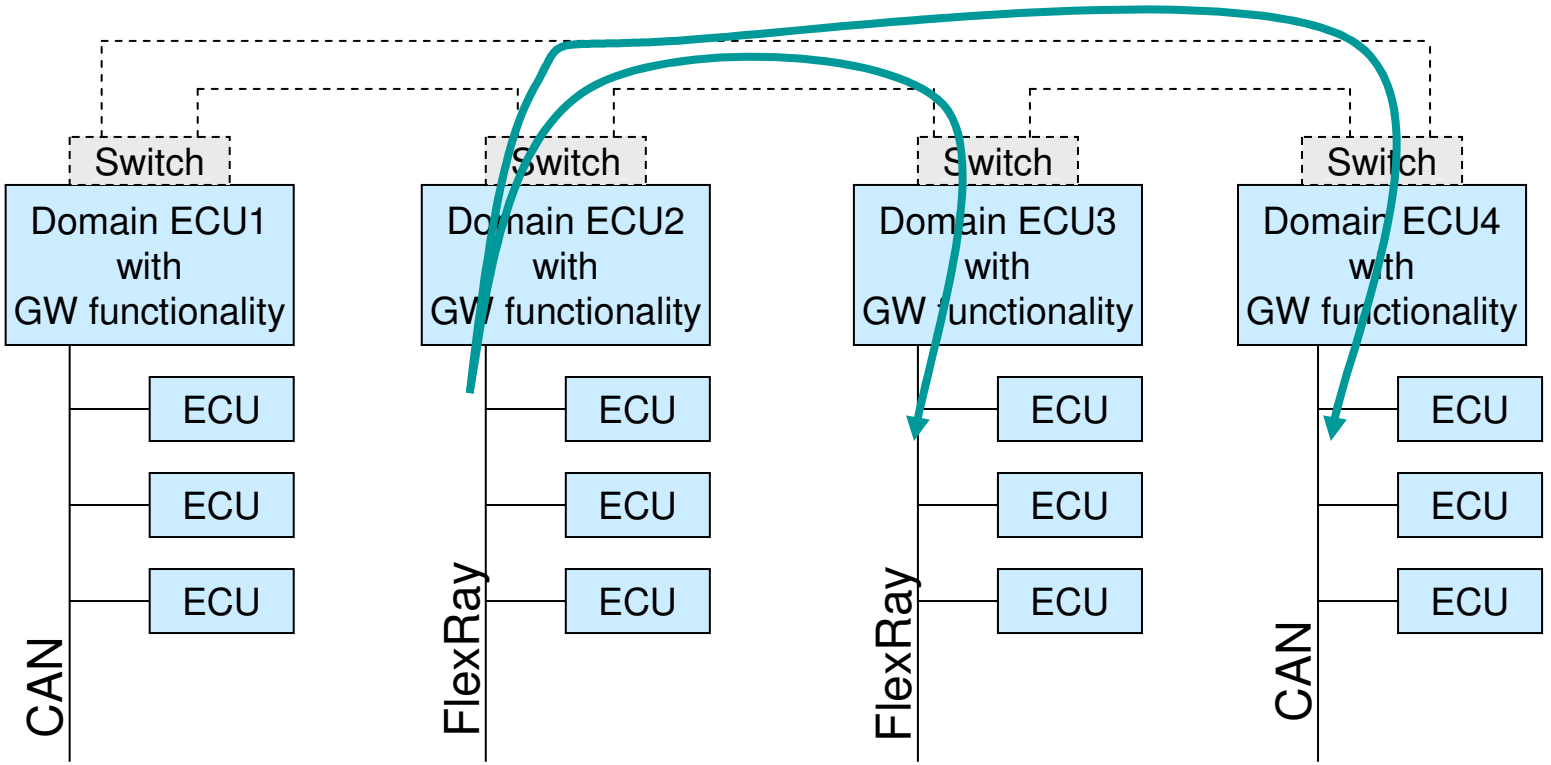
Messages in Ethernet-NW (v1):

ETH/1722-Hdr	CAN-ID1	Payload1	CAN-ID2	Payload2	CAN-ID3	Payload3

Messages in Ethernet-NW (v2):

ETH/1722-Hdr with unique ID	Payload with data from Payload 1, 2, and 3

Use-Case1b: Ethernet as a Backbone „Bus“ (Message Extraction)



Transmission of FlexRay payload without the FlexRay-header in a 1722 frame:

Messages on FR-Bus:

FR-Hdr1	Payload1	FR-Hdr2	Payload2	FR-Hdr3	Payload3

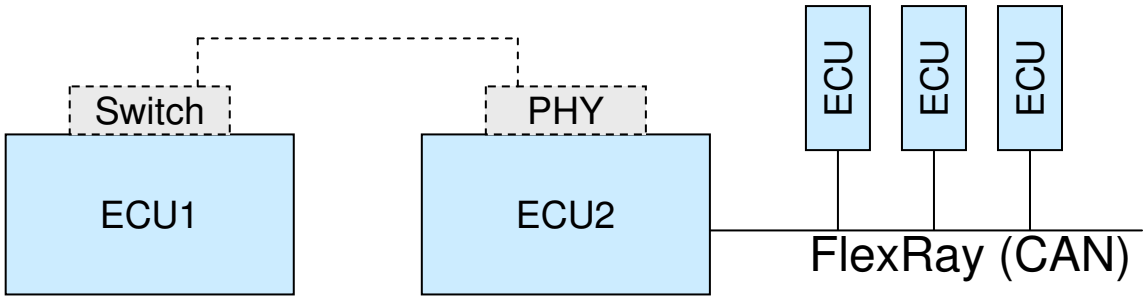
Messages in Ethernet-NW (v1):

ETH/1722-Hdr	FR-ID1	Payload1	FR-ID2	Payload2	FR-ID3	Payload3

Messages in Ethernet-NW (v2):

ETH/1722-Hdr with unique ID	Payload with data from Payload 1, 2, and 3

Use Case1c – CAN/FlexRay-Ethernet (Message Extraction)



Messages on FR-Bus:

FR-Hdr1	Payload1	FR-Hdr2	Payload2	FR-Hdr3	Payload3

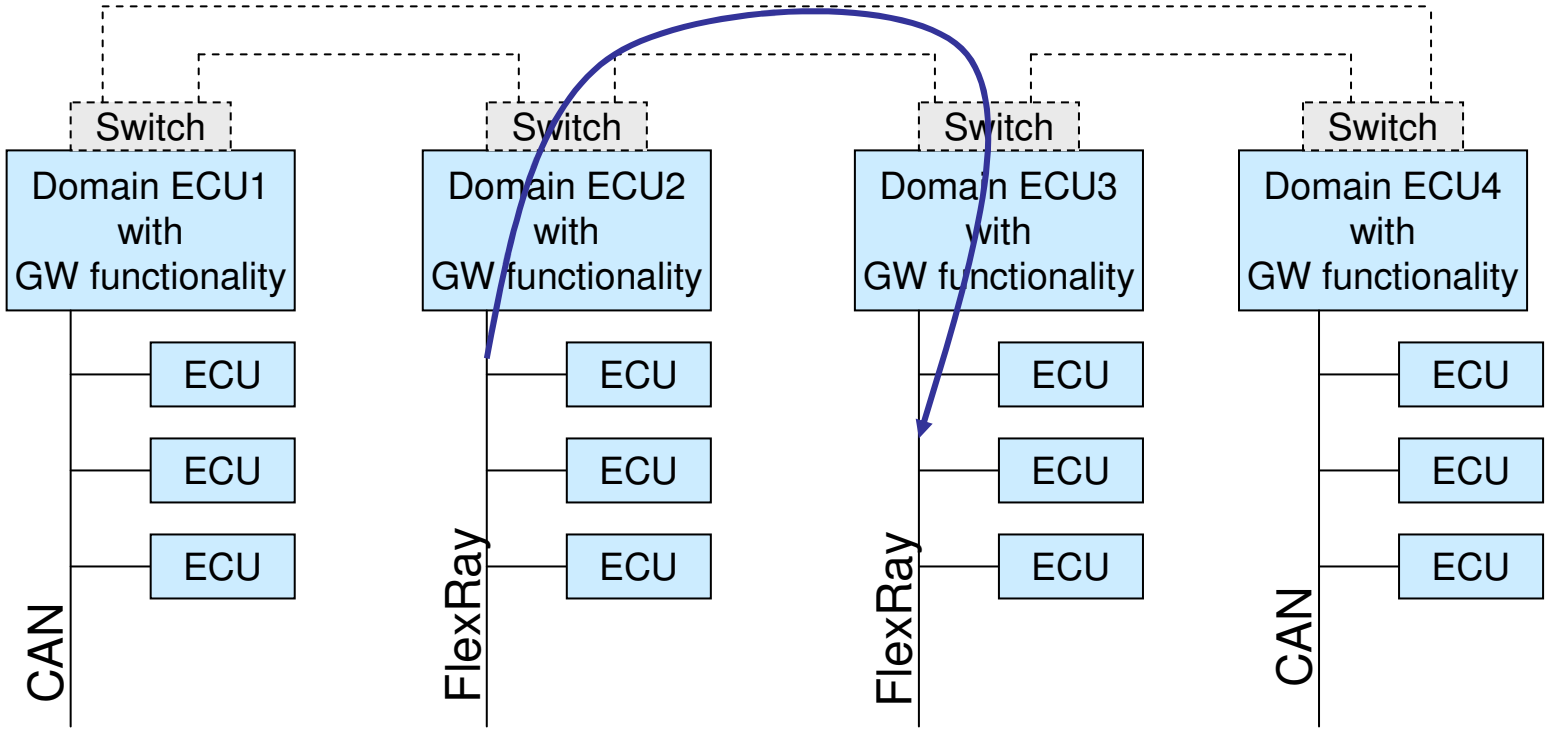
Messages in Ethernet-NW (v1):

ETH/1722-Hdr	FR-ID1	Payload1	FR-ID2	Payload2	FR-ID3	Payload3

Messages in Ethernet-NW (v2):

ETH/1722-Hdr with unique ID	Payload with data from Payload 1, 2, and 3

Use-Case2: Ethernet as a Backbone „Bus“ (Encapsulation)



Transmission of FlexRay-Frames between FlexRay-Clusters where the timing information (slot/cycle count) of a FR-message is required

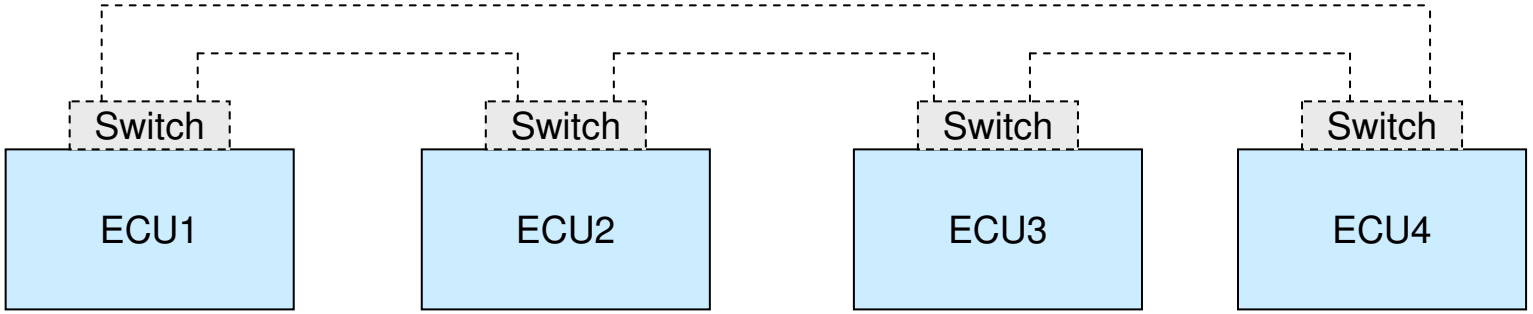
Messages on FR-Bus:

FR-Hdr1	Payload1	FR-Hdr2	Payload2	FR-Hdr3	Payload3

Messages in Ethernet-NW (v1):

ETH/1722-Hdr	FR-Hdr1	Payload1	FR-Hdr2	Payload2	FR-Hdr3	Payload3

Use-Case3: Pure Ethernet Network



Transmission of PDUs within a 1722-Frame

- No frame encapsulation of CAN/FlexRay/... frames
- Time stamping is required depending on the application
- Unique identifier is required for identifying the content of the payload or other serialization .

Open Points

- Definition of presentation time
- Encapsulation: three scenarios exist:
  - Combination of an identifier and the payload
  - Encapsulated CAN/LIN/FR-Frames
  - Key/Value pairs or complex data structures in serialized streams