



Mercedes-Benz



# Diagnostic communication within networks based on AUTOSAR configuration

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# Diagnostic communication within networks based on AUTOSAR configuration

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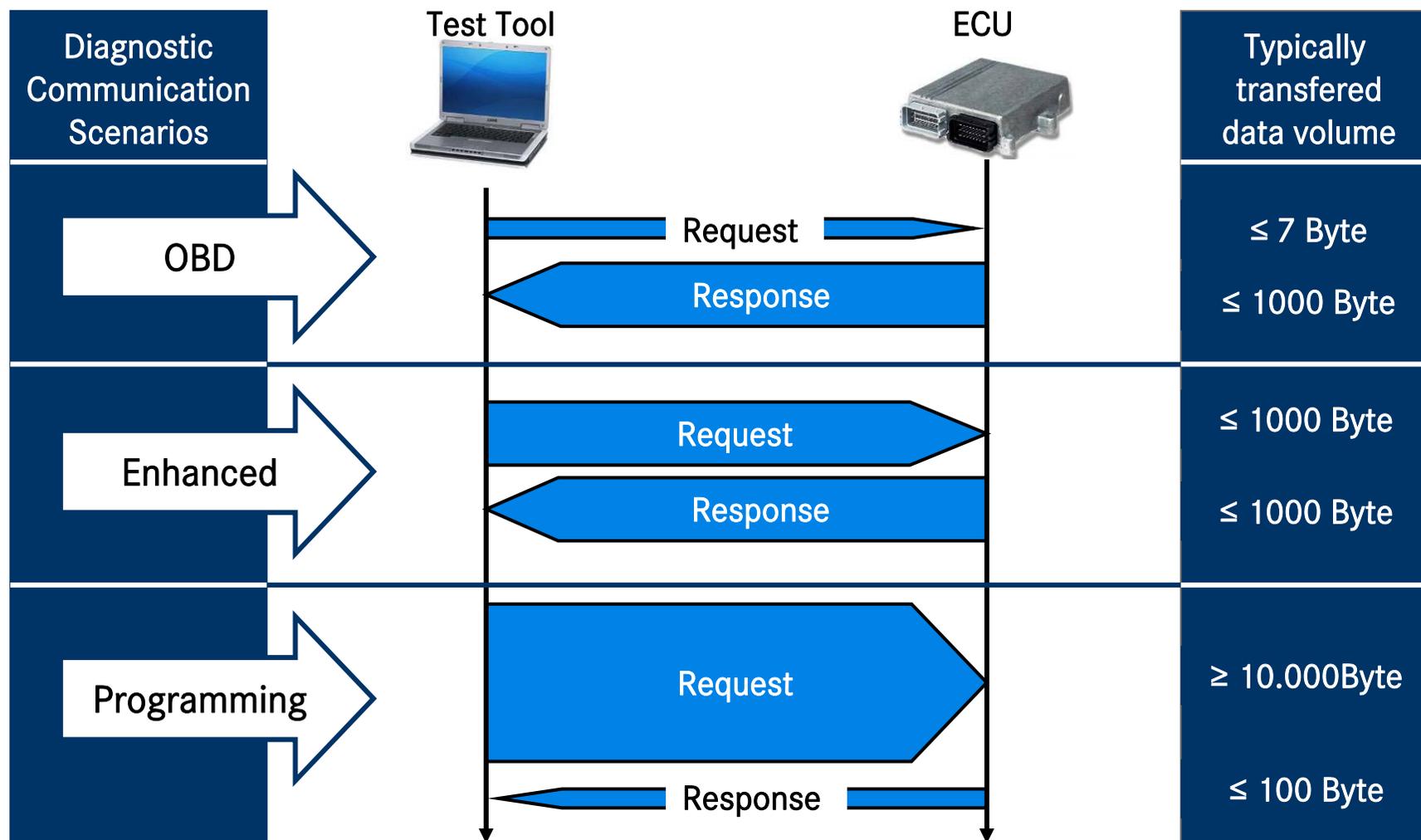
AUTOSAR Gateway

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Summary and Outlook



# Diagnostic Communication Scenarios and data volume

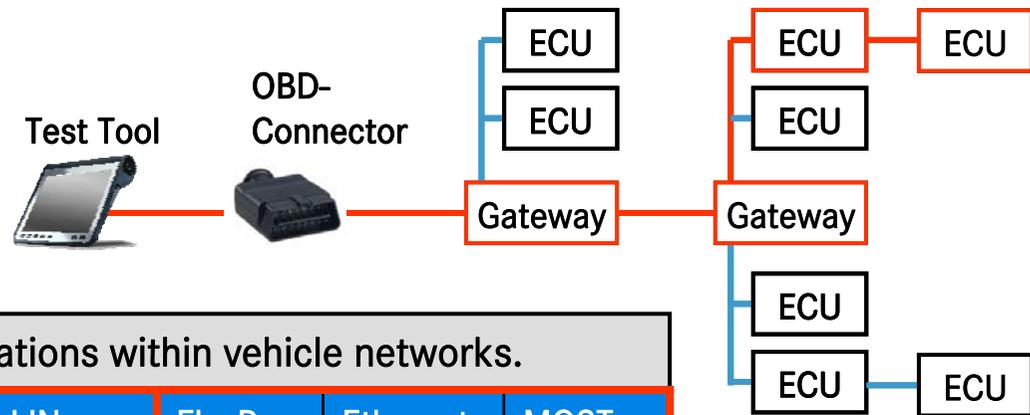
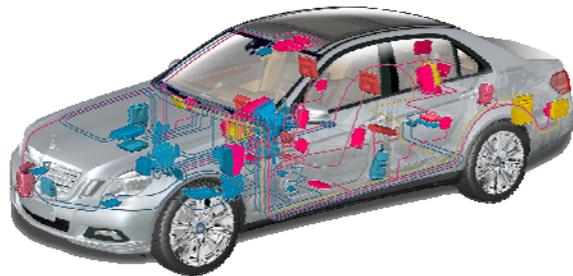




# Diagnostic Communication

## Diagnostic Communication using functional network

Diagnostic communication using the functional network.  
Diagnostic communication needs access to each ECU.



Possible routing relations within vehicle networks.

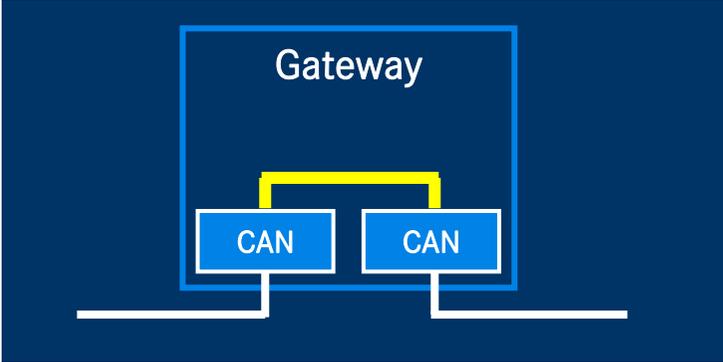
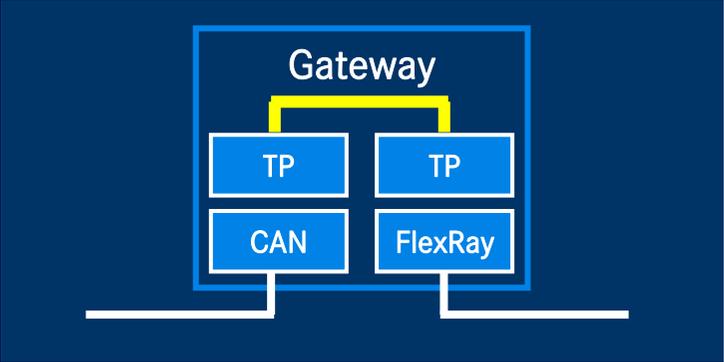
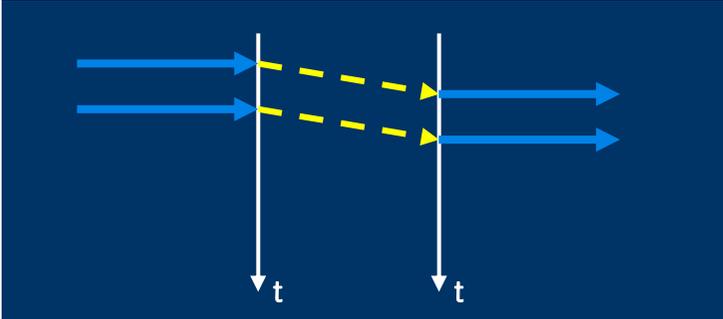
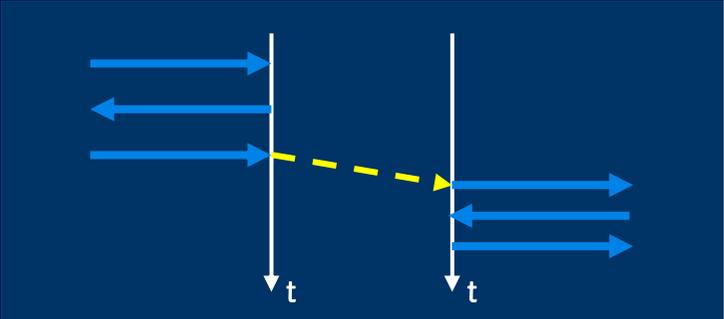
	CAN	LIN	FlexRay	Ethernet	MOST
CAN	X				
LIN					
FlexRay					
Ethernet					
MOST					

Routing complexity has been increased significantly.



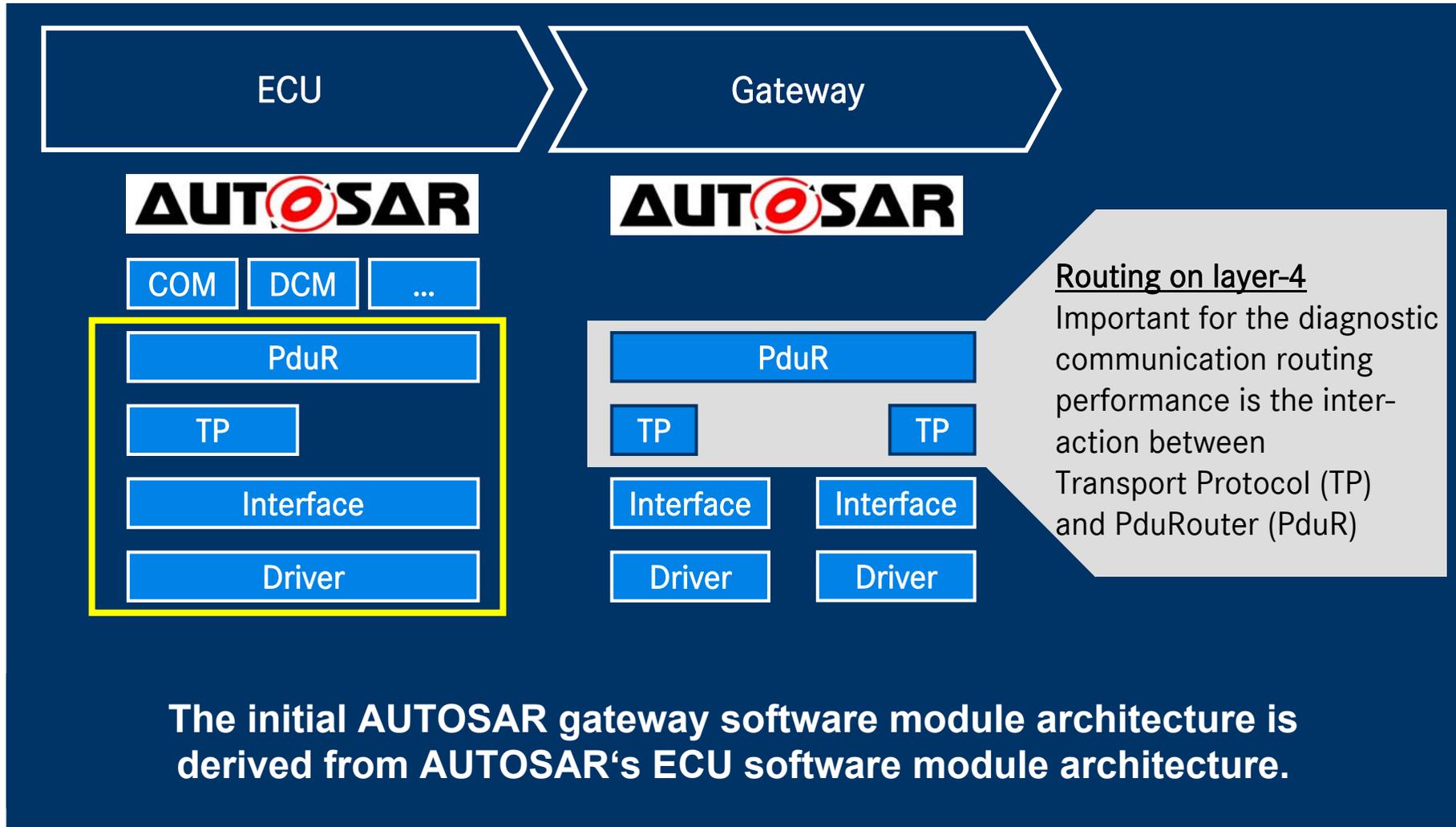
# Gateway Routing Strategies

## Homogeneous vs. heterogeneous networks

OSI Reference Model	Homogeneous network	Heterogenous network
Layer 5-7		
Layer 4		
Layer 1-3		
Routing strategy	 <ul style="list-style-type: none"><li>• Routing on Network Layer (Layer 3)</li><li>• Gateway (Bridge) is transparent</li><li>• Routing: „On-The-Fly“</li></ul>	 <ul style="list-style-type: none"><li>• Routing on Transport Layer (Layer 4)</li><li>• Gateway is not transparent</li><li>• Routing: „Store-And-Forward“</li></ul>



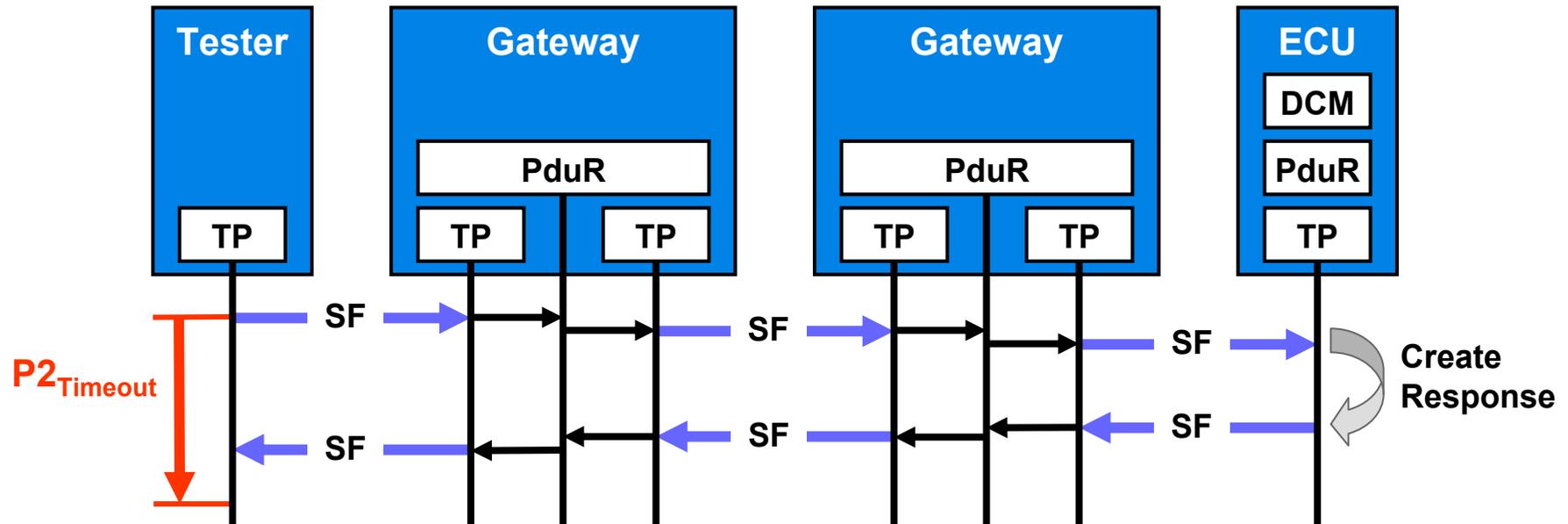
# AUTOSAR Gateway Software module architecture





# AUTOSAR-Gateway

## P2-Timeout

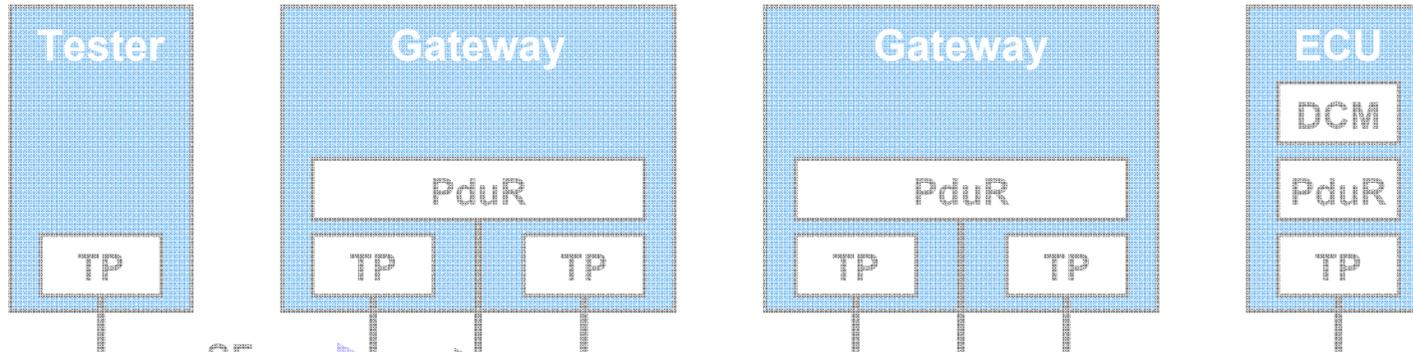


**ISO 15765-4 OBD communication requirement:  $P2_{Timeout} = 50\text{ ms}$**   
This is required for segmented and unsegmented communication.

**The first frame of a segmented or unsegmented communication shall be routed immediately by the PDU-Router**



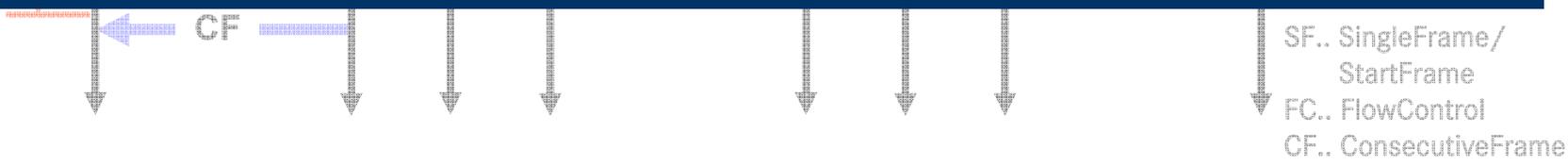
# AUTOSAR Gateway N\_Cr-Timeout



**ISO 15765-4 OBD communication requirement:  $N_{Cr\_Timeout} = 150\text{ ms}$**



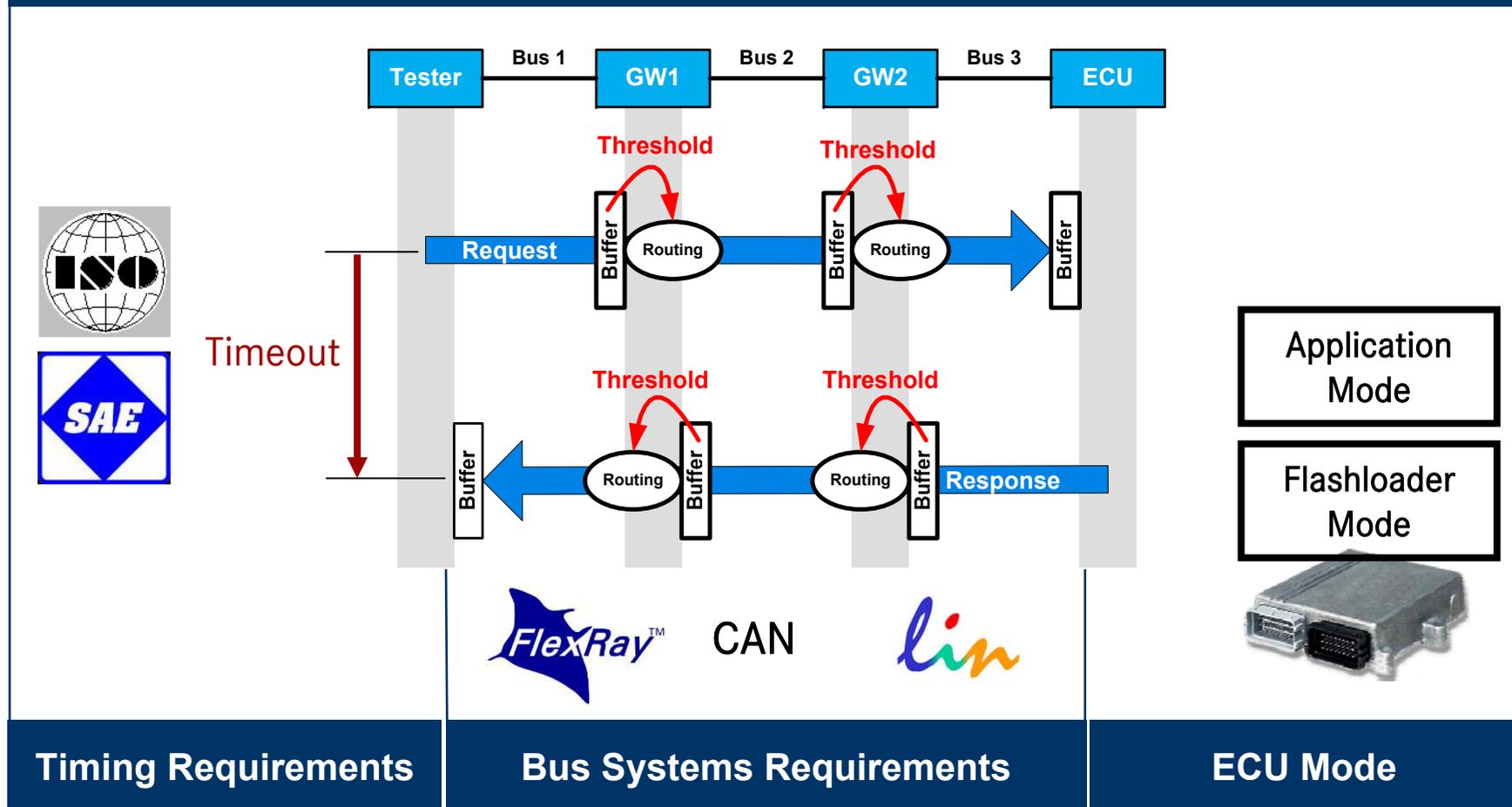
**The communication performance is influenced by the PDU-Router configuration.**





# AUTOSAR Gateway PDUR-Parameter

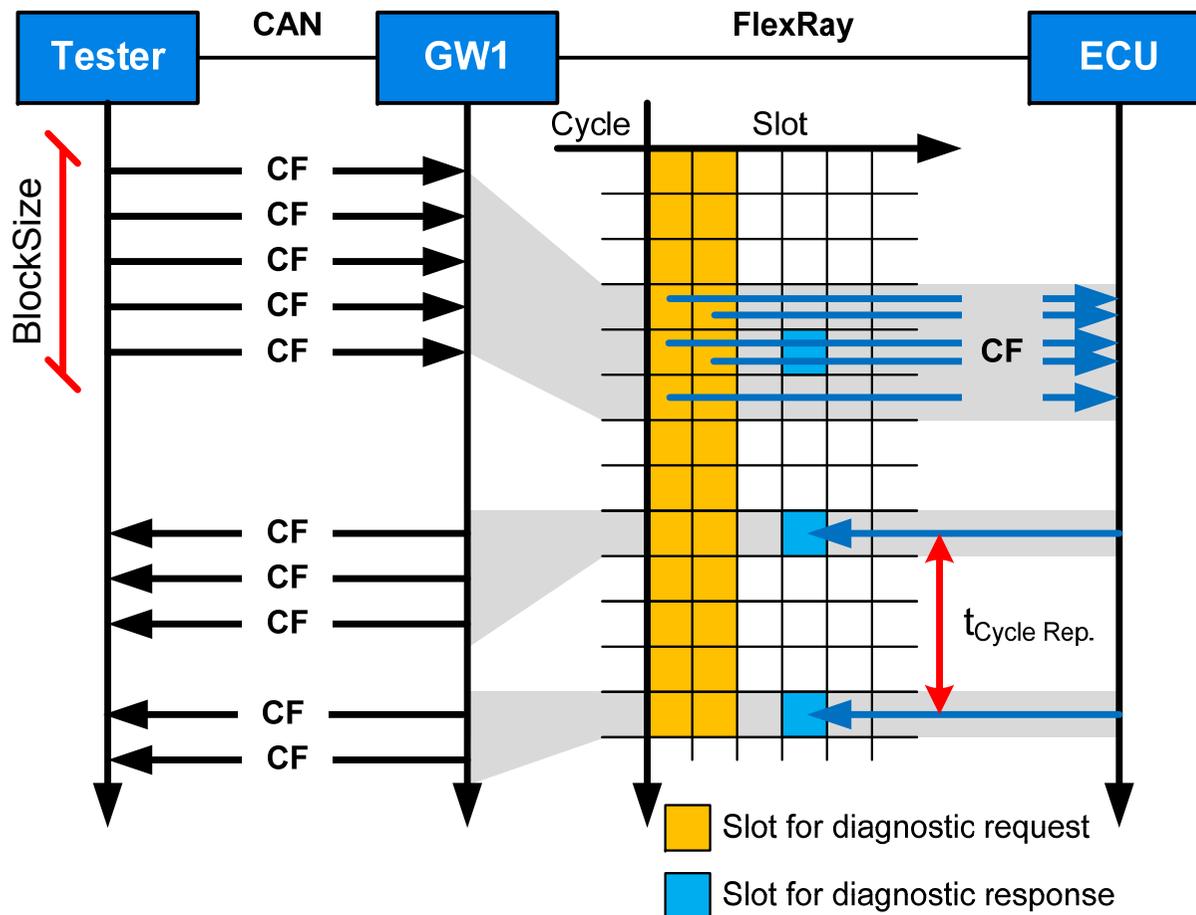
## Threshold – The central parameter for gateway performance





# AUTOSAR Gateway PDUR-Parameter

## CAN – FlexRay Routing Performance (Layer4-Routing)



**CAN-TP Parameter**

- Blocksize
- STmin

**FlexRay TP Parameter:**

- MaxPduPerCycle (MPPC)

**FlexRay Schedule**

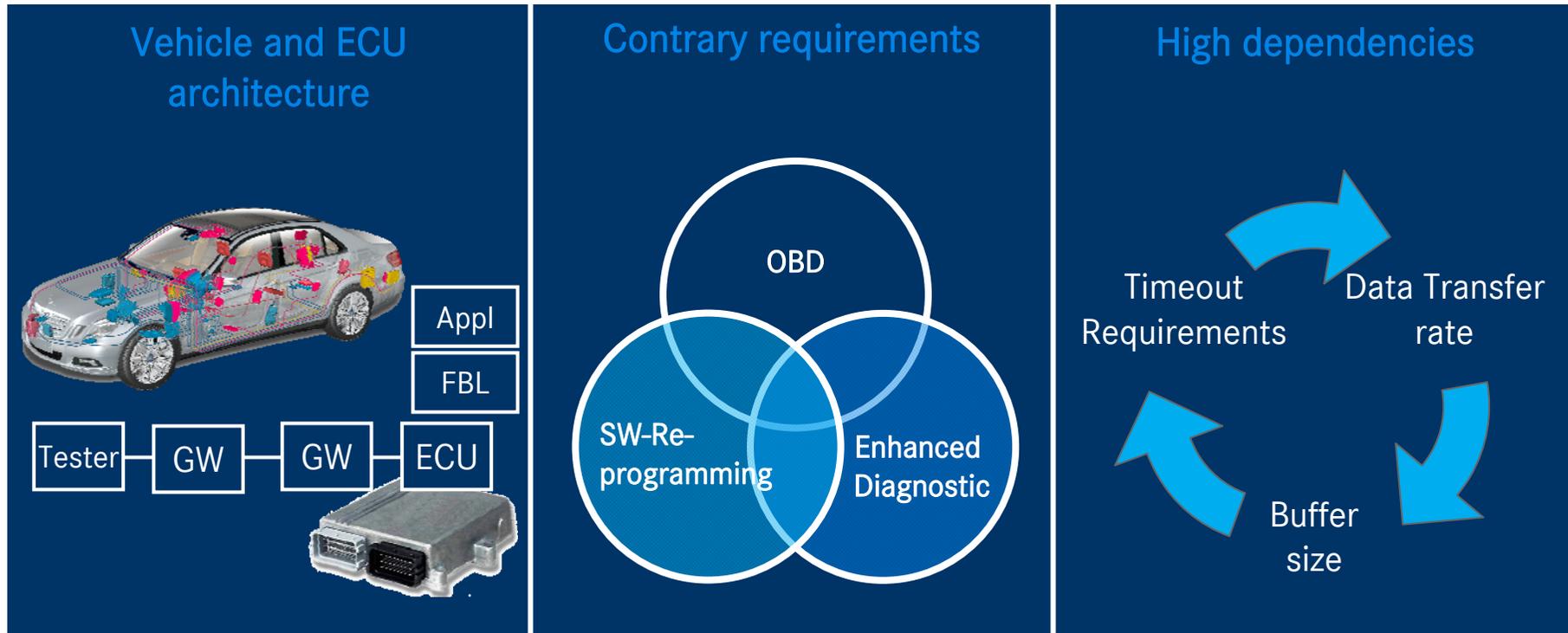
- Cycle Repetition

Diagnostic communication performance depends on the basic FlexRay schedule definitions (slot arrangement).



# AUTOSAR Gateway

## PDUR-Parameter definition is complex



### PduR Configuration

- Each diagnostic connection is divided into the different bus segments.
- Definition of a parameter set for each bus segment and the corresponding gateways.
- Some additional parameters shall be part of the system description.



## Summary and Outlook

### Summary

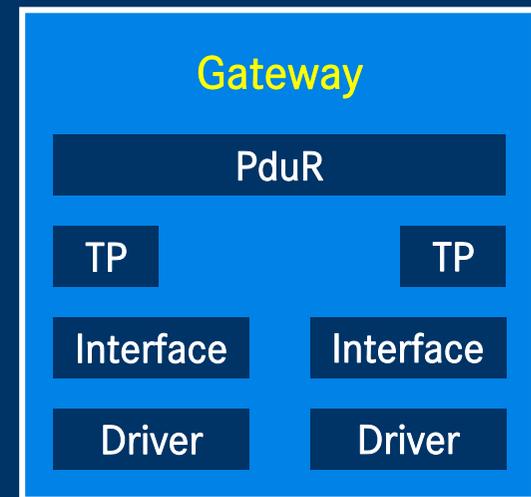
- Diagnostic communication configuration within AUTOSAR is complex (parameters set for gateways within System Description).
- With different physical bus systems a layer-4 routing is necessary.
- Gateway configuration has a deep impact for communication performance
- The PduR was initially not designed with focus on gateway activities for diagnostic communication scenarios (OBD, Reprogramming, enhanced diagnostic).

### Outlook

Discussion (lessons learned) within the AUTOSAR community about the basic gateway functionalities like:

- layer-3 routing
- layer 4 routing
- buffer handling
- timing/timeout handling
- ...

→ Provides the PduR all required functionality?



A close-up photograph of the Mercedes-Benz hood ornament, a three-pointed star on a pedestal, set against a blurred background of a car's hood. A bright light source creates a lens flare effect above the ornament.

Vielen Dank für Ihre Aufmerksamkeit