Document Title	Requirements on Vehicle Data Protocol
Document Category	Requirement specification (RS)
Document UID	1118
Document Status	published
Part of AUTOSAR Standard	Foundation
Part of Standard Release	R26-11

Document Change History			
Date	**Release**	**Changed by**	**Description**
2026-11-26	R26-11	AUTOSAR Release Management	• No content changes
2025-11-27	R25-11	AUTOSAR Release Management	• Editorial change: Set all requirements to apply to FO and (newly added) CP.
2024-11-27	R24-11	AUTOSAR Release Management	• Initial release

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Table of Contents

1 Scope of Document 4

2 Conventions to be used 5

2.1 Document Conventions 5

3 Acronyms and abbreviations 6

4 Requirements Specification 7

4.1 Functional Overview 7

4.2 Functional Requirements 7

5 References 11

A Change history of AUTOSAR traceable items 12

A.1 Traceable item history of this document according to AUTOSAR Release R26-11 12

A.1.1 Added Requirements in R26-11 12

A.1.2 Changed Requirements in R26-11 12

A.1.3 Deleted Requirements in R26-11 12

A.2 Traceable item history of this document according to AUTOSAR Release R25-11 12

A.2.1 Added Requirements in R25-11 12

A.2.2 Changed Requirements in R25-11 12

A.2.3 Deleted Requirements in R25-11 12

A.3 Traceable item history of this document according to AUTOSAR Release R24-11 13

A.3.1 Added Requirements in R24-11 13

A.3.2 Changed Requirements in R24-11 13

A.3.3 Deleted Requirements in R24-11 13

1 Scope of Document

This document specifies the requirements on the Vehicle Data Protocol (VDP).

VDP aims at adressing the need for distributing data collection tasks from a central data collection unit on an HPC to remote ECUs (in particular Classic Platform ECUs) as depicted in figure 1.1. The remote ECUs are assumed to have local access to the required data. This distribution requires independent adaptations of used sampling and transmission modes and hence a systematic decoupling of those. This and related requirements are listed in this document.

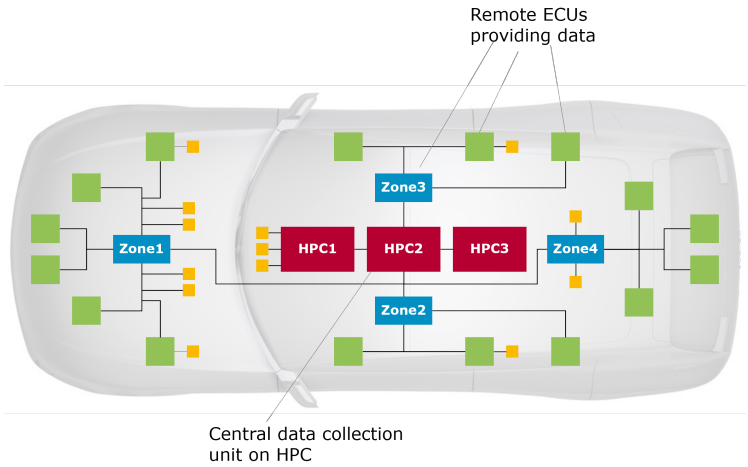


Figure 1.1: Representative vehicle architecture with the central data collection unit in an HPC and remote ECUs providing data.

2 Conventions to be used

2.1 Document Conventions

The representation of requirements in AUTOSAR documents follows the table specified in [TPS_STDT_00078], see [1, Standardization Template].

The verbal forms for the expression of obligation specified in [TPS_STDT_00053] shall be used to indicate requirements, see [1, Standardization Template].

3 Acronyms and abbreviations

The glossary below includes acronyms and abbreviations relevant to FO_RS_VDP that are not included in the AUTOSAR Glossary [2].

Abbreviation / Acronym:	Description:
VDP	Vehicle Data Protocol
Remote ECU	A remote ECU is the owner of the data resource wherein a functional cluster can have local access for retrieving this data.
Central ECU	A central ECU is the location of a vehicle central data collection unit, which aggregates all data from the remote ECUs provided with VDP.
HPC	High performance computer or high performance computing machine
Data point	A data point refers to a data resource inside the vehicle with a well-defined semantic that can be collected (e.g. vehicle speed).
Data point sample	A data point sample refers to the value of a data point acquired at a specific point in time (e.g. vehicle speed at 12 am).

Table 3.1: Acronyms and abbreviations used in the scope of this Document

4 Requirements Specification

This chapter describes all requirements driving the work to define the RS_VDP.

4.1 Functional Overview

VDP aims at addressing the need for dynamic adaptation of data sampling and transmission modes and the set of retrieved data after production of vehicles, as summarized in the use case below.

ID	*Name*	*Description*
UC_VDP_00001	Dynamic In-Vehicle Data Collection	The dynamic collection of data from ECUs in the vehicle. Therein it shall support both data following a push semantic (notifications, event-based) as well as data following a pull semantic (get-APIs). The transmission may happen immediately after sampling, but it may also be delayed until a transmission trigger condition is fulfilled.

Table 4.1: Use cases of VDP.

4.2 Functional Requirements

[FO_RS_VDP_00001] Multi-Version Support ⌈

Description:	VDP shall support multiple protocol versions to distinguish network message versions.
Rationale:	–
AppliesTo:	FO, CP
Dependencies:	–
Use Case:	–
Supporting Material:	–

⌋

[FO_RS_VDP_00002] VDP Dynamic Configuration of Data Points ⌈

Description:	VDP shall support dynamic configuration of data points at a remote ECU. Additional Information: This means in particular that the relevant data can be described by structured information which can be processed by the remote unit. The structured description must be assigned by the protocol to a dynamic identifier.
Rationale:	The aim is to allow for a more flexible selection of data points to be sampled while reducing the process overload of introducing static descriptions into the remote ECUs.
AppliesTo:	FO, CP
Dependencies:	–
Use Case:	–
Supporting Material:	–

⌋

[FO_RS_VDP_00003] VDP Different Modes for Data Sampling ⌈

Description:	VDP shall support different modes for data sampling in context of dynamically configured data points. The sampling modes VDP shall support are: • **Cyclic**: The data point shall be sampled cyclically with a dynamically configured frequency. • **On-Change**: The data point shall be sampled when it changed (here, the definition of change depends on the specific data retrieval implementation). • **Cyclic and On-Change**: The data point shall be sampled cyclically and additionally when it changed (here, the definition of change depends on the specific data retrieval implementation). • **On-Request**: The data point shall be sampled only when an external request has been received.
Rationale:	–
AppliesTo:	FO, CP
Dependencies:	–
Use Case:	–
Supporting Material:	–

⌋

[FO_RS_VDP_00004] VDP Different Modes for Data Transmission ⌈

Description:	VDP shall support different modes for transmission of the dynamically configured data points independent of the desired sampling mode. The transmission modes VDP shall support are: • **Cyclic**: The sampled data points shall be transmitted cyclically with a dynamically configured frequency. • **On-Sampling**: The sampled data points shall be transmitted when specifically marked data points are sampled. These markings shall be dynamically configurable. • **Default** / **On-Request**: The sampled data points shall be transmitted when a specific default condition is reached (e.g. buffer full) or when an external request has been received.
Rationale:	–
AppliesTo:	FO, CP
Dependencies:	–
Use Case:	–
Supporting Material:	–

⌋

[FO_RS_VDP_00005] Detection of Missing Data on the Central ECU ⌈

Description:	VDP shall support the detection of missing data point samples in the data provided by the remote ECU on the central ECU.
Rationale:	Data may be missing because the sampling of the data failed or because the data message was not received by the central ECU. Both cases must be detectable by the central ECU.
AppliesTo:	FO, CP
Dependencies:	–
Use Case:	–
Supporting Material:	–

⌋

[FO_RS_VDP_00006] VDP Temporary Interruption of Data Sampling ⌈

Description:	VDP shall support controlling the temporary interruption and resuming of data sampling at a remote ECU from a central ECU.
Rationale:	To minimize the impact on the system, VDP must provide means to temporarily interrupt the sampling of the requested data in driving situations which are irrelevant for the data collection use case. When entering a relevant driving situation, the sampling must be resumed.
AppliesTo:	FO, CP
Dependencies:	–
Use Case:	–

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△

Supporting Material:	–

⌋

[FO_RS_VDP_00011] VDP Control Sequence Enforcement ⌈

Description:	VDP shall provide means to identify when a control message has been lost.
Rationale:	VDP must be a stateful protocol. Therefore, stable and intended use can only be guaranteed when the protocol provides means to identify missing control messages. Exemplarily, a sequence counter on the control messages would provide a mean to identify when a control message was lost.
AppliesTo:	FO, CP
Dependencies:	–
Use Case:	–
Supporting Material:	–

⌋

[FO_RS_VDP_00009] VDP Efficient Representation of Meta Data ⌈

Description:	VDP shall use an efficient representation of meta data. Additional Information: Meta data such as timestamp and association to identifying properties of the data point sample.
Rationale:	–
AppliesTo:	FO, CP
Dependencies:	–
Use Case:	–
Supporting Material:	–

⌋

[FO_RS_VDP_00010] VDP Error Handling ⌈

Description:	VDP shall allow the central ECU to analyze and mitigate specific error scenarios occurring at the remote ECUs either on a protocol level or during execution of the sampling or any related tasks in the remote ECUs.
Rationale:	–
AppliesTo:	FO, CP
Dependencies:	–
Use Case:	–
Supporting Material:	–

⌋

5 References

[1] Standardization Template
AUTOSAR_FO_TPS_StandardizationTemplate

[2] Glossary
AUTOSAR_FO_TR_Glossary

A Change history of AUTOSAR traceable items

Please note that the lists in this chapter also include traceable items that have been removed from the specification in a later version. These items do not appear as hyperlinks in the document.

A.1 Traceable item history of this document according to AUTOSAR Release R26-11

A.1.1 Added Requirements in R26-11

none

A.1.2 Changed Requirements in R26-11

none

A.1.3 Deleted Requirements in R26-11

none

A.2 Traceable item history of this document according to AUTOSAR Release R25-11

A.2.1 Added Requirements in R25-11

none

A.2.2 Changed Requirements in R25-11

none

A.2.3 Deleted Requirements in R25-11

none

A.3 Traceable item history of this document according to AUTOSAR Release R24-11

A.3.1 Added Requirements in R24-11

Number	Heading
[FO_RS_VDP_00001]	Multi-Version Support
[FO_RS_VDP_00002]	VDP Dynamic Configuration of Data Points
[FO_RS_VDP_00003]	VDP Different Modes for Data Sampling
[FO_RS_VDP_00004]	VDP Different Modes for Data Transmission
[FO_RS_VDP_00005]	Detection of Missing Data on the Central ECU
[FO_RS_VDP_00006]	VDP Temporary Interruption of Data Sampling
[FO_RS_VDP_00009]	VDP Efficient Representation of Meta Data
[FO_RS_VDP_00010]	VDP Error Handling
[FO_RS_VDP_00011]	VDP Control Sequence Enforcement

Table A.1: Added Requirements in R24-11

A.3.2 Changed Requirements in R24-11

none

A.3.3 Deleted Requirements in R24-11

none