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2011-12-22	4.0.3	AUTOSAR Administration	• Added support for deactivation of transmission capabilities
2010-09-30	3.1.5	AUTOSAR Administration	• Initial Release

Disclaimer

Table of Contents

1 Scope of Document

This document defines general rules and formats for requirements specification within AUTOSAR. It shall be used as a basis for each requirements document.

The AUTOSAR Requirements on XCP specifies the XCP feature-set, which shall be supported by the AUTOSAR XCP Software Specification document.

A detailed list can be found on Chapter 4.2 “Functional Requirements”.

2 Conventions to be used

- The representation of requirements in AUTOSAR documents follows the table specified in [1].

- In requirements, the following specific semantics shall be used (based on the Internet Engineering Task Force IETF).

  The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as:

  - SHALL: This word means that the definition is an absolute requirement of the specification.
  - SHALL NOT: This phrase means that the definition is an absolute prohibition of the specification.
  - MUST: This word means that the definition is an absolute requirement of the specification due to legal issues.
  - MUST NOT: This phrase means that the definition is an absolute prohibition of the specification due to legal constraints.
  - SHOULD: This word, or the adjective "RECOMMENDED", mean that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.
  - SHOULD NOT: This phrase, or the phrase "NOT RECOMMENDED" mean that there may exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
  - MAY: This word, or the adjective „OPTIONAL“, means that an item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because the vendor feels that it enhances the product while another vendor may omit the same item. An implementation, which does not include a particular option, MUST be prepared to interoperate with another implementation, which does include the option, though perhaps with reduced functionality. In the same vein an implementation, which does include a particular option, MUST be prepared to interoperate with another implementation, which does not include the option (except, of course, for the feature the option provides.)

3 Functional Overview

XCP is an ASAM standard for calibration purpose of an ECU. This protocol provides the following functionality:

XCP provides the following basic features:

- Synchronous data acquisition
- Synchronous data stimulation
- Online memory calibration (read / write access)
- Calibration data page initialization and switching
- Flash Programming for ECU development purposes
- Various transportation layers (CAN, Ethernet (TCP/IP, UDP), USB,…)
- Block communication mode
- Interleaved communication mode
- Dynamic data transfer configuration
- Timestamped data transfer
- Synchronization of data transfer
- Priorization of data transfer
- Atomic bit modification
- Bitwise data stimulation

XCP improves the following features compared to CCP 2.1:

- compatibility and specification
- efficiency and throughput
- power-up data transfer
- data page freezing
- auto configuration
- flash programming.

XCP was designed according to the following principles:

- Minimal Slave resource consumption (RAM, ROM, runtime)
- Efficient communication
- Simple Slave implementation

4 Requirements Specification

4.1 Functional Requirements

4.1.1 General

4.1.1.1 [SRS_Xcp_29001] The AUTOSAR XCP module shall be located above the bus interfaces / Socket Adaptor

⌈

Type:	valid
Description:	Within the AUTOSAR layered architecture, the AUTOSAR XCP module shall be located above the bus specific interfaces (CAN, FlexRay) and for Ethernet on top of the Socket Adaptor.
Rationale:	Due to performance reason, the AUTOSAR XCP is located as low as possible within the layered architecture.
Use Case:	--
Dependencies:	--
Supporting Material:	BSW Layered Software Architecture

⌋(RS_BRF_01016,RS_BRF_01656)

4.1.1.2 [SRS_Xcp_29002] The AUTOSAR XCP shall make use of the data transmit- and receive APIs of the Bus Interfaces

⌈

Type:	Valid
Description:	For sending and transmission of XCP Messages, the corresponding APIs provided by the bus specific interfaces shall be used
Rationale:	Usage of available APIs
Use Case:	Transmit and receive XCP Messages
Dependencies:	--
Supporting Material:	SWS FlexRay Interface, SWS CAN Interface, SWS Socket Adaptor

⌋(RS_BRF_01656,RS_BRF_02264)

4.1.1.3 [SRS_Xcp_29003] The AUTOSAR XCP messages shall be identified by unique PDU-IDs

⌈

Type:	valid
Description:	Unique PDU-IDs have to be assigned to the the XCP messages by configuration
Rationale:	PDU-IDs are used by the Bus Interfaces to route the PDUs to the assigned target AUTOSAR modules (PDUR, NM, TP, XCP, CDD)
Use Case:	Routing / Scheduling
Dependencies:	--
Supporting Material:	BSW Layered Software Architecture

⌋(RS_BRF_01656,RS_BRF_01024)

4.1.1.4 [SRS_Xcp_29004] The XCP Specification Version 1.1 shall be used

⌈

Type:	Valid
Description:	The XCP Specification Version 1.1 shall be used for implementation
Rationale:	XCP Specification Version 1.1 is the latest Version available for AUTOSAR at this time
Use Case:	Calibration purpose
Dependencies:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=

](RS_BRF_01656)

4.1.1.5 [SRS_Xcp_29005] XCP on CAN shall be supported

[

Type:	valid
Description:	XCP on CAN shall be supported as described within the ASAM “XCP Transport Layer on CAN” specification
Rationale:	It shall be possible to exchange XCP data using the CAN communications bus
Use Case:	Calibration/Stimulation purpose
Dependencies:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=239&memberlogin=

](RS_BRF_01656,RS_BRF_01704)

4.1.1.6 [SRS_Xcp_29006] XCP on FlexRay shall be supported

[

Type:	Valid
Description:	XCP on FlexRay shall be supported as described within the ASAM “XCP Transport Layer on FlexRay” specification
Rationale:	It shall be possible to exchange XCP data using the FlexRay communications bus
Use Case:	Calibration/Stimulation purpose
Dependencies:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=376&memberlogin=

](RS_BRF_01656,RS_BRF_01752)

4.1.1.7 [SRS_Xcp_29007] XCP on Ethernet shall be supported

[

Type:	Valid
Description:	XCP on Ethernet shall be supported as described within the ASAM “XCP Transport Layer on Ethernet” specification, using TCP/IP and/or UDP
Rationale:	It shall be possible to exchange XCP data using the Ethernet communications bus
Use Case:	Calibration/Stimulation purpose
Dependencies:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=240&memberlogin=

](RS_BRF_01656,RS_BRF_01776)

4.1.2 Features

4.1.2.1 [SRS_Xcp_29008] The code generator of the XCP Module shall generate the A2L IF_DATA section

[

Type:	Valid
Description:	The code generator of the XCP Module shall generate the A2L IF_DATA section, based on the configuration of XCP.
Rationale:	The configuration information of the XCP Slave (AUTOSAR XCP Module) should also be used for the configuration of the XCP Master.
Use Case:	Ensure consistency of XCP Master and XCP Slave configuration.
Dependencies:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=240&memberlogin=

](RS_BRF_01656, RS_BRF_02264)

4.1.2.2 [SRS_Xcp_29009] The slave shall transfer the contents of the elements defined in each ODT of the DAQ-list to the master

[

Type:	Valid
Description:	The slave has to transfer the contents of the elements defined in each ODT of the DAQ-list to the master.
Rationale:	-
Use Case:	Calibration purpose
Dependencies:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=

](RS_BRF_01656, RS_BRF_02264)

4.1.2.3 [SRS_Xcp_29010] Synchronous Data Stimulation shall be the inverse mode of Synchronous Data Acquisition

[

Type:	Valid
Description:	Synchronous Data Stimulation is the inverse mode of Synchronous Data Acquisition. The master has to transfer the contents of the elements defined in each ODT of the DAQ-list to the slave.
Rationale:	-
Use Case:	Stimulation purpose
Dependencies:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=

](RS_BRF_01656, RS_BRF_02264)

4.1.2.4 [SRS_Xcp_29011] Multiple direct successive packets without acknowledge shall be sent / received

[

Type:	Valid
Description:	Multiple direct successive packets without acknowledge can be sent / received
Rationale:	Speed up memory uploads and downloads
Use Case:	Stimulation/Calibration purpose
Dependencies:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=

](RS_BRF_01656, RS_BRF_02264)

4.1.2.5 [SRS_Xcp_29012] The XCP master shall already send the next request before having received the response on the previous request

[

Type:	Valid
Description:	The XCP master may already send the next request before having received the response on the previous request.
Rationale:	Speed up data transfer
Use Case:	Stimulation/Calibration purpose
Dependencies:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=

](RS_BRF_01656, RS_BRF_02264)

4.1.2.6 [SRS_Xcp_29013] It shall be possible to configure the DAQ Lists dynamically

[

Type:	Valid
Description:	It shall be possible to configure the DAQ Lists dynamically
Rationale:	Allow flexibility for selection of different data/signal values to be transmitted
Use Case:	Stimulation/Calibration purpose
Dependencies:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=

](RS_BRF_01656, RS_BRF_02264)

4.1.2.7 [SRS_Xcp_29014] It shall be possible to transmit a timestamp within the XCP packet

[

Type:	Valid
Description:	It shall be possible to transmit a timestamp within the XCP packet
Rationale:	Timing information of the XCP packets are important for the XCP master to be able to reorder the received XCP packets if necessary
Use Case:	Reordering received XCP packets
Dependencies:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=

](RS_BRF_01656, RS_BRF_02264)

4.1.2.8 [SRS_Xcp_29015] It shall be possible to bypass data by making use of Synchronous Data Acquisition and Synchronous Data Stimulation simultaneously

[

Type:	Valid
Description:	It shall be possible to bypass data by making use of Synchronous Data Acquisition and Synchronous Data Stimulation simultaneously.
Rationale:	Including additional calculation / manipulation of data
Use Case:	Calibration / Stimulation purpose
Dependencies:	Support of Synchronous Data Acquisition and Synchronous Data Stimulation, interaction with AUTSAR RTE required

Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin= SWS RTE

](RS_BRF_01656, RS_BRF_02264)

4.1.2.9 [SRS_Xcp_29016] The feature “Seed&Key” shall be used for protection handling purpose

[

Type:	Valid
Description:	The feature “Seed&Key” is used for protection handling purpose.
Rationale:	Secure access to the XCP slave’s memory
Use Case:	The need for information hiding is different, depending on the project phase
Dependencies:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=

](RS_BRF_01656, RS_BRF_02264)

4.1.2.10 [SRS_Xcp_29018] Page switching shall be supported

[

Type:	Valid
Description:	The master can request the slave to answer the current active PAGE. The XCP slave shall be able to switch to another page if this is requested by the XCP master at any point in time.
Rationale:	
Use Case:	Data Page switching is required for high end ECUs because of the huge amount of different data/variables to be transmitted via XCP
Dependencies:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=

](RS_BRF_01656, RS_BRF_02264)

4.1.2.11 [SRS_Xcp_29019] DAQ configuration storing with power-up data transfer (RESUME mode) shall be supported

[

Type:	Valid
Description:	The XCP master requests the XCP slave to set the RESUME bit of selected DAQ lists. After power-up, the slave has to restore the DAQ lists and indicate the RESUME mode to the XCP master autonomously.
Rationale:	The purpose of the resume mode is to enable automatic data transfer (DAQ, STIM) directly after the power up of the XCP slave
Use Case:	Calibration data are immediately needed after power-up of an ECU for optimization purpose (e.g. optimization of engine start behaviour).
Dependencies:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=

](RS_BRF_01656, RS_BRF_02264)

4.1.2.12 [SRS_Xcp_29021] The XCP shall provide a feature to enable and disable communication on specific channel

[

Type:	Valid
Description:	The XCP shall provide a feature to enable and disable communication on specific channel (TX capabilities)
Rationale:	
Use Case:	Allowing only requested channel communication in order to use bandwidth effectively
Dependencies:	--
Supporting Material:	--

](RS_BRF_01656, RS_BRF_02264)

4.1.2.13 [SRS_Xcp_29020] Flash Programming for ECU development purposes

[

Type:	Valid
Description:	XCP shall support flash programming as described within the ASAM "XCP Protocol Layer Specification".
Rationale:	Speeding up ECU development purposes through enabling programming feature.
Use Case:	--
Dependencies:	--
Supporting Material:	ASAM_XCP_Part2-Protocol-Layer-Specification_V1-1-0.pdf

](RS_BRF_01656, RS_BRF_02264)

4.1.3 Initialisation

4.1.3.1 [SRS_Xcp_29017] The AUTOSAR XCP module shall implement an interface for initialization.

[

Type:	Valid
Description:	The AUTOSAR XCP module implements an interface for initialization. This service shall initialize all global variables of the module.
Rationale:	Basic functionality.
Use Case:	Set the AUTOSAR XCP module into a defined state
Dependencies:	--
Supporting Material:	--

](RS_BRF_01656, RS_BRF_02264,RS_BRF_01136)

4.1.4 Normal Operation

The AUTOSAR XCP module shall operate as described within the ASAM XCP Specification Version 1.1. Please refer to
http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=

4.1.5 Shutdown Operation

The AUTOSAR XCP module shall operate as described within the ASAM XCP Specification Version 1.1. Please refer to
http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=

4.1.6 Fault Operation

The AUTOSAR XCP module shall operate as described within the ASAM XCP Specification Version 1.1. Please refer to
http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=

5 Requirements Tracing

Requirement	Description	Satisfied by
RS_BRF_01016	AUTOSAR shall provide a modular design inside software layers	SRS_Xcp_29001
RS_BRF_01024	AUTOSAR shall provide naming rules for public symbols	SRS_Xcp_29003
RS_BRF_01136	AUTOSAR shall support variants of configured BSW data resolved after system start-up	SRS_Xcp_29017
RS_BRF_01656	AUTOSAR communication shall support XCP	SRS_Xcp_29001, SRS_Xcp_29002, SRS_Xcp_29003, SRS_Xcp_29004, SRS_Xcp_29005, SRS_Xcp_29006, SRS_Xcp_29007, SRS_Xcp_29008, SRS_Xcp_29009, SRS_Xcp_29010, SRS_Xcp_29011, SRS_Xcp_29012, SRS_Xcp_29013, SRS_Xcp_29014, SRS_Xcp_29015, SRS_Xcp_29016, SRS_Xcp_29017, SRS_Xcp_29018, SRS_Xcp_29019, SRS_Xcp_29020, SRS_Xcp_29021
RS_BRF_01704	AUTOSAR communication shall support the CAN communication bus	SRS_Xcp_29005
RS_BRF_01752	AUTOSAR communication shall support FlexRay	SRS_Xcp_29006
RS_BRF_01776	AUTOSAR communication shall support Ethernet	SRS_Xcp_29007
RS_BRF_02264	AUTOSAR shall support XCP for setting measurement and calibration data	SRS_Xcp_29002, SRS_Xcp_29008, SRS_Xcp_29009, SRS_Xcp_29010, SRS_Xcp_29011, SRS_Xcp_29012, SRS_Xcp_29013, SRS_Xcp_29014, SRS_Xcp_29015, SRS_Xcp_29016, SRS_Xcp_29017, SRS_Xcp_29018, SRS_Xcp_29019, SRS_Xcp_29020, SRS_Xcp_29021

6 References

[1] Software Standardization Template
AUTOSAR_TPS_StandardizationTemplate.pdf