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Disclaimer

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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

- 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 [BSW429001] Location of XCP within the architecture

ID:	BSW429001
Initiator:	BMW
Date:	21.07.2008
Short Description:	The AUTOSAR XCP module shall be located above the bus interfaces / Socket Adaptor
Type:	new
Importance:	high
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:	--
Conflicts:	--
Supporting Material:	BSW Layered Software Architecture
Contributes to:	BRF00280

4.1.1.2 [BSW429002] API usage

ID:	BSW429002
Initiator:	BMW
Date:	21.07.2008
Short Description:	The AUTOSAR XCP shall make use of the data transmit- and receive APIs of the Bus Interfaces
Type:	new
Importance:	high
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:	FlexRay Interface, CAN Interface, Socket Adaptor
Conflicts:	--
Supporting Material:	SWS FlexRay Interface, SWS CAN Interface, SWS Socket Adaptor
Contributes to:	--

4.1.1.3 [BSW429003] Unique PDU-ID

ID:	BSW429003
Initiator:	BMW
Date:	21.07.2008
Short Description:	The AUTOSAR XCP messages shall be identified by unique PDU-IDs
Type:	new
Importance:	high
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:	--
Conflicts:	--
Supporting Material:	BSW Layered Software Architecture
Contributes to:	--

4.1.1.4 [BSW429004] XCP Specification Version 1.1

ID:	BSW429004
Initiator:	BMW
Date:	21.07.2008
Short Description:	The XCP Specification Version 1.1 shall be used
Type:	new
Importance:	high
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:	--
Conflicts:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=
Contributes to:	--

4.1.1.5 [BSW429005] XCP on CAN

ID:	BSW429005
Initiator:	BMW
Date:	21.07.2008
Short Description:	Support of the CAN communications bus
Type:	new
Importance:	high
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:	CAN Interface
Conflicts:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=239&memberlogin=
Contributes to:	--

4.1.1.6 [BSW429006] XCP on FlexRay

ID:	BSW429006
Initiator:	BMW
Date:	21.07.2008
Short Description:	Support of the FlexRay communications bus
Type:	new
Importance:	high
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:	FlexRay Interface

Conflicts:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=376&memberlogin=
Contributes to:	--

4.1.1.7 [BSW429007] XCP on Ethernet

ID:	BSW429007
Initiator:	BMW
Date:	21.07.2008
Short Description:	Support of the Ethernet communications bus
Type:	new
Importance:	high
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:	Socket Adaptor
Conflicts:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=240&memberlogin=
Contributes to:	--

4.1.2 Features

4.1.2.1 [BSW429008] A2L IF_DATA Section Support

ID:	BSW429008
Initiator:	ASAM-AUTOSAR joint meeting
Date:	21.07.2008
Short Description:	Support of A2L description files
Type:	new
Importance:	high
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:	--
Conflicts:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=240&memberlogin=
Contributes to:	--

4.1.2.2 [BSW429009] Synchronous data acquisition

ID:	BSW429009
Initiator:	BMW
Date:	21.07.2008
Short Description:	Support of the XCP feature “Synchronous data acquisition”
Type:	new
Importance:	high
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:	--
Conflicts:	--

Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=
Contributes to:	--

4.1.2.3 [BSW429010] Synchronous data stimulation

ID:	BSW429010
Initiator:	BMW
Date:	21.07.2008
Short Description:	Support of the XCP feature “Synchronous data stimulation”
Type:	new
Importance:	high
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:	--
Conflicts:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=
Contributes to:	--

4.1.2.4 [BSW429011] Block communication mode

ID:	BSW429011
Initiator:	BMW
Date:	21.07.2008
Short Description:	Support of the XCP feature “Block communication mode”
Type:	new
Importance:	high
Description:	Multiple direct successive packets without acknowledge can be sent / received
Rationale:	Speed up memory uploads and downloads
Use Case:	Stimulation/Calibration purpose
Dependencies:	--
Conflicts:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=
Contributes to:	--

4.1.2.5 [BSW429012] Interleaved communication mode

ID:	BSW429012
Initiator:	BMW
Date:	21.07.2008
Short Description:	Support of the XCP feature “Interleaved communication mode”
Type:	new
Importance:	high
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:	--
Conflicts:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=
Contributes to:	--

4.1.2.6 [BSW429013] Dynamic data transfer configuration

ID:	BSW429013
Initiator:	BMW
Date:	21.07.2008
Short Description:	Support of the XCP feature “Dynamic data transfer configuration”
Type:	new
Importance:	high
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:	--
Conflicts:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=
Contributes to:	--

4.1.2.7 [BSW429014] Timestamped Data transfer

ID:	BSW429014
Initiator:	BMW
Date:	21.07.2008
Short Description:	Support of the XCP feature “Timestamped Data transfer”
Type:	new
Importance:	high
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:	--
Conflicts:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=
Contributes to:	--

4.1.2.8 [BSW429015] Bypassing

ID:	BSW429015
Initiator:	BMW
Date:	21.07.2008
Short Description:	Support of the XCP feature “Bypassing”
Type:	new
Importance:	high
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
Conflicts:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin= SWS RTE
Contributes to:	--

4.1.2.9 [BSW429016] Seed & Key

ID:	BSW429016
Initiator:	BMW
Date:	21.07.2008

Short Description:	Support of the XCP feature “Seed&Key”
Type:	new
Importance:	high
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:	--
Conflicts:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=
Contributes to:	--

4.1.2.10 [BSW429018] Calibration Data Page Switching

ID:	BSW429018
Initiator:	BMW
Date:	12.11.2008
Short Description:	Support of the XCP feature “Online Calibration Data Page Switching”. If the slave supports the optional commands GET_CAL_PAGE and SET_CAL_PAGE, page switching shall be supported.
Type:	new
Importance:	high
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:	--
Conflicts:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=
Contributes to:	--

4.1.2.11 [BSW429019] DAQ configuration storing with power-up data transfer (RESUME mode)

ID:	BSW429019
Initiator:	BOSCH
Date:	24.09.2008
Short Description:	Support of the ASAM XCP RESUME mode
Type:	new
Importance:	high
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:	--
Conflicts:	--
Supporting Material:	http://www.asam.net/doc_int/getfile/getfile.php?id=238&memberlogin=
Contributes to:	BRF00280

4.1.2.12 [BSW420020] Suppress TX Capabilities

ID:	BSW420020
Initiator:	BOSCH

Date:	26.08.2011
Short Description:	Communication Enabling and Disabling
Type:	new
Importance:	high
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:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.1.3 Initialisation

4.1.3.1 [BSW429017] XCP Initialization

ID:	BSW429017
Initiator:	BMW
Date:	21.07.2008
Short Description:	The AUTOSAR XCP module shall implement an interface for initialization.
Type:	new
Importance:	high
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:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

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 References

There are no references for this document.