**Module Design Document**

**For**

**XCP Interface (XcpIf)**

**VERSION: 2.0**

**DATE: 29-Aug-2016**

**Prepared By:**

**Kevin Smith**

**EPS Software,**

**Nexteer Automotive,**

**Saginaw, MI, USA**

**Location:** The official version of this document is stored in the Nexteer Configuration Management System.

**Revision History**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Description** | **Author** | **Version** | **Date** | **Approved By** |
| 1 | Initial Version | K. Smith | 1.0 | 16-Jun-15 |  |
| 2 | Updates for anomaly EA4#6672 | K. Smith | 2.0 | 29-Aug-16 |  |

**Table of Contents**

[1 Abbrevations And Acronyms 5](#_Toc422301803)

[2 References 6](#_Toc422301804)

[3 XCP Interface & High-Level Description 7](#_Toc422301805)

[4 Design details of software module 8](#_Toc422301806)

[4.1 Graphical representation of XCP Interface 8](#_Toc422301807)

[4.2 Data Flow Diagram 8](#_Toc422301808)

[4.2.1 Module level DFD 8](#_Toc422301809)

[4.2.2 Sub-Module level DFD 8](#_Toc422301810)

[4.3 COMPONENT FLOW DIAGRAM 8](#_Toc422301811)

[5 Variable Data Dictionary 9](#_Toc422301812)

[5.1 User defined typedef definition/declaration 9](#_Toc422301813)

[5.2 Variable definition for enumerated types 9](#_Toc422301814)

[6 Constant Data Dictionary 10](#_Toc422301815)

[6.1 Program(fixed) Constants 10](#_Toc422301816)

[6.1.1 Embedded Constants 10](#_Toc422301817)

[6.1.1.1 Local 10](#_Toc422301818)

[6.1.1.2 Global 10](#_Toc422301819)

[6.1.2 Module specific Lookup Tables Constants 10](#_Toc422301820)

[7 Software Module Implementation 11](#_Toc422301821)

[7.1 Sub-Module Functions 11](#_Toc422301822)

[7.2 Initialization Functions 11](#_Toc422301823)

[7.3 PERIODIC FUNCTIONS 11](#_Toc422301824)

[7.3.1 Xcp2msDaq 11](#_Toc422301825)

[7.3.1.1 Design Rationale 11](#_Toc422301826)

[7.3.1.2 Store Module Inputs to Local copies 11](#_Toc422301827)

[7.3.1.3 (Processing of function)……… 11](#_Toc422301828)

[7.3.1.4 Store Local copy of outputs into Module Outputs 11](#_Toc422301829)

[7.4 Non PERIODIC FUNCTIONS 11](#_Toc422301830)

[7.5 Interrupt Functions 11](#_Toc422301831)

[7.6 Serial Communication Functions 11](#_Toc422301832)

[7.7 Local Function/Macro Definitions 11](#_Toc422301833)

[7.8 GLObAL Function/Macro Definitions 11](#_Toc422301834)

[7.8.1 ApplXcpGetTimestamp 11](#_Toc422301835)

[7.8.1.1 Description 12](#_Toc422301836)

[7.8.2 ApplXcpGetPointer 12](#_Toc422301837)

[7.8.2.1 Description 12](#_Toc422301838)

[7.8.3 ApplXcpCalibrationWrite 12](#_Toc422301839)

[7.8.3.1 Description 12](#_Toc422301840)

[7.8.4 ApplXcpWrCmn 13](#_Toc422301841)

[7.8.4.1 Description 13](#_Toc422301842)

[7.8.5 ApplXcpCalibrationRead 13](#_Toc422301843)

[7.8.5.1 Description 13](#_Toc422301844)

[7.9 TRANSIENT FUNCTIONS 13](#_Toc422301845)

[8 Unit Test Considerations 14](#_Toc422301846)

[9 Known Limitations With Design 15](#_Toc422301847)

[10 Appendix 16](#_Toc422301848)

# Abbrevations And Acronyms

|  |  |
| --- | --- |
| Abbreviation | Description |
| DFD | Design functional diagram |
| MDD | Module design Document |
|  | <ADD more to the table if applicable> |
|  |  |

# References

This section lists the title & version of all the documents that are referred for development of this document

|  |  |  |
| --- | --- | --- |
| Sr. No. | Title | Version |
| <1> | <MDD Guidelines> | 4.0.0 |
| <2> | <Software Naming Conventions> | 4.0.0 |
| <3> | <Coding standards> | 4.0.0 |
| <4> | <FDD > | Not available |
|  | <Add if more available> |  |

# XCP Interface & High-Level Description

XCP Interface provides multiple functions that allow XCP end users and tools to interface with software components contained in the application.

# Design details of software module

## Graphical representation of XCP Interface

*None*

## Data Flow Diagram

*None*

## Module level DFD

*None*

## Sub-Module level DFD

*None*

## COMPONENT FLOW DIAGRAM

*None*

# Variable Data Dictionary

## User defined typedef definition/declaration

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Typedef Name | Element Name | User Defined Type | Legal Range  (min) | Legal Range  (max) |
|  |  |  |  |  |
|  |  |  |  |  |

## Variable definition for enumerated types

|  |  |  |
| --- | --- | --- |
| Enum Name | Element Name | Value |
|  |  |  |

# Constant Data Dictionary

## Program(fixed) Constants

## Embedded Constants

## Local

|  |  |  |  |
| --- | --- | --- | --- |
| Constant Name | Resolution | Units | Value |
|  |  |  |  |

## Global

|  |
| --- |
| Constant Name |
| XcpEventChannel\_2ms\_DAQ\_2 |

## Module specific Lookup Tables Constants

|  |  |  |  |
| --- | --- | --- | --- |
| Constant Name | Resolution | Value | Software Segment |
|  |  |  |  |

# Software Module Implementation

## Sub-Module Functions

*None*

## Initialization Functions

*None*

## PERIODIC FUNCTIONS

## Xcp2msDaq

## Design Rationale

*This function is called every 2ms for executing the XcpEvent functions for the 2ms DAQ.*

## Store Module Inputs to Local copies

*None*

## (Processing of function)………



## Store Local copy of outputs into Module Outputs

*None*

## Non PERIODIC FUNCTIONS

*None*

## Interrupt Functions

*None*

## Serial Communication Functions

*None*

## Local Function/Macro Definitions

None

## GLObAL Function/Macro Definitions

## ApplXcpGetTimestamp

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ApplXcpGetTimestamp | Type | Min | Max |
| **Arguments Passed** | None |  |  |  |
|  |  |  |  |  |
| **Return Value** | Timestamp\_Cnt\_T\_u32 | XcpDaqTimestampType | See description | See description |

## Description

This function returns the timestamp that is based on a reference timer. The range of return values vary depending on the configuration of the Xcp Component. The data type can range from a full range of a uint8 to a uint32 value.



## ApplXcpGetPointer

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ApplXcpGetPointer | Type | Min | Max |
| **Arguments Passed** | addr\_ext | vuint8 | 0 | 255 |
|  | addr | vuint32 | 1 | 4294967295 |
| **Return Value** | RtnAddr\_Cnt\_T\_u32 | MTABYTEPTR | 1 | 4294967295 |

## Description

This function takes the extension and address of and returns the physical address of the item.



## ApplXcpCalibrationWrite

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ApplXcpCalibrationWrite | Type | Min | Max |
| **Arguments Passed** | addr | MTABYTEPTR | 1 | 4294967295 |
|  | size | Vuint8 | 0 | 255 |
|  | data | BYTEPTR | 1 | 4294967295 |
| **Return Value** | XCP\_CMD\_OK | Uint8 | 0 | 0 |

## Description

This function calls the common XCP writing function. For this deisgn, the function call will be translated into a trusted function call.



## ApplXcpWrCmn

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ApplXcpWrCmn | Type | Min | Max |
| **Arguments Passed** | addr | MTABYTEPTR | 1 | 4294967295 |
|  | size | Vuint8 | 0 | 255 |
|  | data | BYTEPTR | 1 | 4294967295 |
| **Return Value** | XCP\_CMD\_OK | Uint8 | 0 | 0 |

## Description

This function writes the data passed in by the XCP user to the designated address.



## ApplXcpCalibrationRead

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ApplXcpCalibrationRead | Type | Min | Max |
| **Arguments Passed** | addr | MTABYTEPTR | 1 | 4294967295 |
|  | size | Vuint8 | 0 | 255 |
|  | data | BYTEPTR | 1 | 4294967295 |
| **Return Value** | XCP\_CMD\_OK | Uint8 | 0 | 0 |

## Description

This function reads the data in the designated address and returns it to the XCP user.



## ApplXcpCheckWriteAccess

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ApplXcpCheckWriteAccess | Type | Min | Max |
| **Arguments Passed** | addr | MTABYTEPTR | 1 | 4294967295 |
|  | Size\_Cnt\_T\_u08 | Vuint8 | 0 | 255 |
| **Return Value** | XCP\_CMD\_OK | Uint8 | 0 | 0 |

## Description

This function checks access for XCP writes. Since the functions in tuning selection management handle the presmissions for writes, this function shall always return a positive response.



## ApplXcpCheckReadAccess

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ApplXcpCheckReadAccess | Type | Min | Max |
| **Arguments Passed** | addr | MTABYTEPTR | 1 | 4294967295 |
|  | Size\_Cnt\_T\_u08 | Vuint8 | 0 | 255 |
| **Return Value** | XCP\_CMD\_OK | Uint8 | 0 | 0 |

## Description

This function checks access for XCP reads. Since the functions in tuning selection management handle the presmissions for reads, this function shall always return a positive response.



## ApplXcpCheckDAQAccess

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ApplXcpCheckDAQAccess | Type | Min | Max |
| **Arguments Passed** | addr | MTABYTEPTR | 1 | 4294967295 |
|  | Size\_Cnt\_T\_u08 | Vuint8 | 0 | 255 |
| **Return Value** | XCP\_CMD\_OK | Uint8 | 0 | 0 |

## Description

This function checks access for XCP DAQ access. Since all reads are allowed, this function will also always return a positive response.



## ApplXcpSetCalPage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ApplXcpSetCalPage | Type | Min | Max |
| **Arguments Passed** | Seg\_Cnt\_T\_u08 | Vuint8 | 0 | 255 |
|  | Page\_Cnt\_T\_u08 | Vuint8 | 0 | 255 |
|  | Mod\_Cnt\_T\_u08 | Vuint8 | 0 | 255 |
| **Return Value** | Rtn\_Cnt\_T\_u08 | Uint8 | 0 | 0x28 |

## Description

This function sets the calibration page access. It directly calls the functions used in tuning selection management.



## ApplXcpGetCalPage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ApplXcpGetCalPage | Type | Min | Max |
| **Arguments Passed** | Seg\_Cnt\_T\_u08 | Vuint8 | 0 | 255 |
|  | Mod\_Cnt\_T\_u08 | Vuint8 | 0 | 255 |
| **Return Value** | Rtn\_Cnt\_T\_u08 | Uint8 | 0 | 0x28 |

## Description

This function sets the calibration page access. It directly calls the functions used in tuning selection management.



## ApplXcpCopyCalPage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ApplXcpCopyCalPage | Type | Min | Max |
| **Arguments Passed** | SrcSeg\_Cnt\_T\_u08 | Vuint8 | 0 | 255 |
|  | SrcPage\_Cnt\_T\_u08 | Vuint8 | 0 | 255 |
|  | DestSeg\_Cnt\_T\_u08 | Vuint8 | 0 | 255 |
|  | DestPage\_Cnt\_T\_u08 | Vuint8 | 0 | 255 |
| **Return Value** | XCP\_CMD\_OK | Uint8 | 0 | 0x28 |

## Description

This function sets the calibration page access. It directly calls the functions used in tuning selection management.



## ApplXcpUserService

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ApplXcpUserService | Type | Min | Max |
| **Arguments Passed** | pCmd | BYTEPTR | 0 | 4294967295 |
| **Return Value** | XCP\_CMD\_OK | Uint8 | 0 | 0x3 |

## Description

This function handles user service requests.



## ApplXcpOpenCmdIf

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ApplXcpOpenCmdIf | Type | Min | Max |
| **Arguments Passed** | pCmd | BYTEPTR | 0 | 4294967295 |
|  | pRes | BYTEPTR | 0 | 4294967295 |
|  | pLength | BYTEPTR | 0 | 4294967295 |
| **Return Value** | XCP\_CMD\_OK | Uint8 | 0 | 0x3 |

## Description

This function handles XCP service requests that are not supported by the driver but defined by the XCP protocol specification.



## NONTRUSTED\_NtWrapS\_Rte\_Call\_CopyCalPageReq\_Oper

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | NONTRUSTED\_NtWrapS\_Rte\_Call\_CopyCalPageReq\_Oper | Type | Min | Max |
| **Arguments Passed** | FunctionIndex | NonTrustedFunctionIndexType | 0 | 65535 |
|  | FunctionParams | NonTrustedFunctionParameterRefType | N/A | N/A |
| **Return Value** | N/A | N/A | N/A | N/A |

## Description



## NONTRUSTED\_NtWrapS\_Rte\_Call\_SetCalPageReq\_Oper

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | NONTRUSTED\_NtWrapS\_Rte\_Call\_SetCalPageReq\_Oper | Type | Min | Max |
| **Arguments Passed** | FunctionIndex | NonTrustedFunctionIndexType | 0 | 65535 |
|  | FunctionParams | NonTrustedFunctionParameterRefType | N/A | N/A |
| **Return Value** | N/A | N/A | N/A | N/A |

## Description



## TRANSIENT FUNCTIONS

*None*

# Unit Test Considerations

* The value datatype of XcpDaqTimestampType can be uint8, uint16, or uint32 depending on the configuration of XCP. Unit testing shall test full ranges for all three types to ensure proper functionality.

# Known Limitations With Design

* There are no protections in this design for executing on NULL\_PTRs

# Appendix

*None*