BMW GROUP

Rolls-Royce Motor Cars Limited

# SysTime Classic Integration Manual

| | |
|---|---|
| Project | BMW AUTOSAR 4 Core Rel. 3 |
| Author | BMW AG |
| Release Date | 2017-12-14 |
| Version | 5.0.3 |
| Status | Release |
| Hotline | +49 89 382 - 32233 |
| Contact | bac@bmw.de<br>https://asc.bmw.com/jira/browse/BSUP (extern)<br>https://asc.bmwgroup.net/jira/browse/BSUP (intern) |

## Revision History

| Version | Date | Description |
|---|---|---|
| 5.0.3 | 2017-12-14 | Version Update |
| 5.0.2 | 2017-10-12 | Version Update |
| 5.0.1 | 2017-08-10 | Version update, no change of content. |
| 5.0.0 | 2017-06-08 | Initial version for SP2021 |

**Company**
Bayerische Motoren Werke Aktiengesellschaft
**Postal address**
BMW AG
80788 München
**Office address**
Forschungs- und Innovationszentrum (FIZ)
Hufelandstr. 1
80937 München
**Telephone**
Switchboard
+49 89 382-0
**Internet**
www.bmwgroup.com

# Table of Contents

# 1 Introduction

This Integration Manual describes the basic functionality of the BMW system function "System Time Client", the configuration of the SysTime module and of dependant modules, and the integration of the SysTime module into the BAC4.

**[IM_SysTime_0001]** ⌈The SysTime module shall be integrated in every diagnosable ECU. ⌋(DMA_PA_9033)

## Functional overview

The system time represents the time, which has passed since the initialization of the System Time Master. The main objective of the System Time Client functionality is to maintain the current system time for the local ECU. This means:

- Receiving the system time from the System Time Master
- Interpolation of the system time if no system time signal was received from the System Time Master
- Providing the system time to the Dem and to other software components
- Providing the system time for diagnostic requests

# 2 Related documentation

## References

# 3 Limitations

No limitations are known.

# 4 Software Architecture

## Dependencies on AUTOSAR modules

The current version of the Module SysTime depends on the following BSW modules:

### RTE

As a software component, the SysTime module uses Rte client/server communication as well as sender/receiver communication to communicate with other SWCs and BSW modules. Additionally the scheduling is done by the Rte.

### Det

The System Time Client optionally reports development errors to the Det.

### Dcm

The System Time Client implements a ReadDataByIdentifier service. Dcm shall be configured in a way, that it dispatches the job 0x22 0x17 0x01 to the SysTime SWC.

### Dem

The System Time Client provides a port interface for the Dem to get the current system time, which will be attached to an event as event related data.

### Com

The System Time Client receives the signal containing the current system time from the Com module.

### BswM

The System Time Client receives and requests mode switches from the BswM.

## Dependencies to other modules

SysTime does not have dependencies to other modules.

# 5 Integration

## Configuration of other Modules

The following modules shall be configured, before this module can be generated, compiled and linked.

### Dcm

**[IM_SysTimeClassic_0003]** ⌈The ReadDataByIdentifier request 0x22 0x17 0x01 shall be configured in the Dcm module with the following settings:

- a container "DcmDspData" with
  - a "DcmDspDataSize" of 32 bit (4 bytes)
  - "DcmDspDataType" = UINT8$_N$ ”$DcmDspDataUsePort$” = $USE\_DATA\_SYNCH\_CLIENT\_SERVER$
- "DcmDspDataConditionCheckReadFncUsed" = FALSE
- a container "DcmDspDid" with
  - "DcmDspDidIdentifier" = 0x1701
  - only read-access, without session or security restrictions
  - one DID Signal "DcmDspDidSignal" with Data Position = 0 and a Data Reference to the "DcmDspData" container configured before.

⌋(DMA_PA_8550, DMA_PA_8551, DMA_PA_8552)

### Com

In the Com module, a signal has to be configured, that receives the message containing the 32-bit system time from the bus.

**Note**: In a Can or FlexRay environment, the system time is received within the signal named T_SEC_COU_REL. In an Ethernet environment, the system time is received within the Parameter "timeSecondCounterRelative" of the Event "RelativeTimeBN2020".

### Dem

**[IM_SysTimeClassic_0006]** ⌈To attach the system time to a freeze frame of a Dem entry, the following has to be configured in the Dem module:

- a Data Element Class "DemDataElementClass"
  - of type "DemExternalCSDataElementClass"
  - with a size "DemDataElementDataSize" of 4 byte
  - with port usage "DemDataElementUsePort" = TRUE
- a Data Id "DemDidClass" with reference to the Data Element Class mentioned above
  - with reference to the Data Element Class mentioned above
  - with "DemDidIdentifier" = 0x1701

– a Freeze Frame Class "DemFreezeFrameClass" with reference to the Data Id above

This DemFreezeFrameClass has to be referenced in the "DemDTCAttributes" of every DTC. ](DK_T3_1374, DK_T3_452, DK_T3_453)

#### BswM

The BswM has to provide one BswMModeRequestPort to receive mode switches of the ModeDeclarationGroup "SysTime_LifeCycle" from the SysTime module, and one RteModeRequestPort to request modes of the ModeDeclarationGroup "SysTime_LifeCycle".

To initialize the SysTime module the BswM has to provide a rule, that results in an action that requests the mode "SYSTIME_INITIALIZED"of the mode declaration group "SysTime_LifeCycle".

To set the SysTime module to normal operation mode the BswM has to provide a rule, that results in an action that requests the mode "SYSTIME_RUNNING" of the mode declaration group "SysTime_LifeCycle". This rule shall be triggered, if the mode has been switched to "SYSTIME_INITIALIZED" by the SysTime module itself, AND it is technically possible to receive the system time on the bus. When the SysTime module is in normal operation mode, the SysTime module switches the mode to "SYSTIME_RUNNING".

To deactivate the SysTime module the BswM has to provide a rule, that results in an action that requests the mode "SYSTIME_STOPPED" of the mode declaration group "SysTime_LifeCycle".

For details on how to initialize / deactivate the SysTime module, please refer to chapter 6.4.

#### Det

A SysTime entry shall be added to the Software Component List from Det. This is only necessary, if the parameter "SysTimeDevErrorDetect" is set to "true" (see chapter 6.2).

### Configuration of generic part

#### SysTimeGeneral

This container contains the configuration parameters of the generic part of the SysTime module

#### SysTimeDevErrorDetect

This parameter activates/deactivates the Development Error Detection and Notification.

If set to true: Development Error Detection and Notification is activated. If set to false: Development Error Detection and Notification is deactivated.

#### SysTimeMainTaskCycle

This parameter describes the cycle rate, in which the function "SysTime_MainFunction" is called. This value has to be configured according to the cycle time of the task, which the Timing Event "TimingEvent" is mapped to (see chapter 6.3.1). Allowed values are 0.01s (10ms) to 0.10s (100ms).

The function "SysTime_MainFunction" is mapped to the Runnable Entity "MainFunction", which is triggered by the Timing Event "TimingEvent".

#### SysTimeInitialTimeout

**[IM_SysTime_0002]** ⌈This parameter describes the initial timeout value for the system time signal. The System Time Client will set the system time to 0xFFFFFFFF, if no valid system time has been received until this timeout has expired. If the system time signal is received via Can, FlexRay or Ethernet, this parameter has to be set to 5.0 seconds. ⌋(DMA_PA_8471)

### Configuration of adapter part

#### SysTimeGeneral

This container contains the configuration parameters of the classic adapter of the SysTime module.

#### SysTimeEnableServiceInterface

This parameter describes whether the system time is received via Service Interface or via a plain signal. On Ethernet the system time is transmitted via Parameter "timeSecondCounterRelative" of Event "RelativeTimeBN2020" of Service Interface "VehicleInformation". On Can and Flexray the system time is transmitted via Signal T_SEC_COU_REL.

true: system time is received via Service Interface (needed for Ethernet communication)

false: System time is received via plain signal (needed for Can and Flexray communication)

### Configuration of the RTE

After performing the steps indicated in chapter 6.1 and 6.2, the RTE configuration can be started. In other way, the RTE will report an interface incompatibility error.

#### Assembly Software Connectors

The ports of the SysTime module have to be connected with ports of other modules as follows:

### Dcm

**[IM_SysTimeClassic_0002]** ⌈SystemTime <-> DataServices_<Data> where <Data> is the name of the corresponding container "DcmDspData" configured in the Dcm module. ⌋(DMA_PA_8552)

### Dem

**[IM_SysTimeClassic_0007]** ⌈SystemTime <-> CBReadData_<SyncDataElement> where <SyncDataElement> is the name of the corresponding container "DemDataElementClass" configured in the Dem module. ⌋(DK_T3_1374)

### Det

SysTimeReportError <-> DS<xxx> where <xxx> is an identifier of the module id of the SysTime configured in the Det module.

### BswM

LifeCycle <-> BswMModeRequestPort_xxx where BswMModeRequestPort_xxx means the R-Port of the BswM that receives a mode switch from the SysTime module. LifeCycleRequest <-> RteModeRequestPort_xxx where RteModeRequestPort_xxx means the P-Port of the BswM that provides a mode request to the SysTime module.

### Other Application SWC

SysTime <-> ApplicationPort where ApplicationPort means the R-Port of an Application SWC that wants to read the current system time from the SysTime module.

### Event Mapping

The timing event "TimingEvent" of the SysTime module has to be mapped to a cyclic task with a cycle time according to parameter "SysTimeMainTaskCycle" in chapter 6.2. The data received event "SysTimeRx" has to be mapped to an os-task.

### Data Mapping

**[IM_SysTimeClassic_0001]** ⌈If the system time is received via Can or FlexRay, the data element "timeSignal" of the sender-receiver-interface "SysTimeRx" has to be mapped to the signal in the Com configuration mentioned in chapter 6.1. In the BNE export this signal is named T_SEC_COU_REL. ⌋(DMA_PA_8471)

If the system time is received via Ethernet, the data element "RelativeTimeBN2020" of the sender-receiver-interface "SysTimeEventRx" has to be mapped to the signal group in the Com configuration, which represents the Event "RelativeTimeBN2020".

### Exclusive Areas

The exclusive area "SysTimeGetTimeArea" has to be configured in the RTE.

## Software Integration

### Startup/Initialization

Before initialization of the SysTime module, the Det module and the RTE have to be initialized.

**[IM_SysTimeClassic_0004]** ⌈To initialize the SysTime module, the BswM shall request the mode "SYSTIME_INITIALIZED" of the mode declaration group "SysTime_LifeCycle". This shall be done before any monitoring function is active which could lead to error memory entries. ⌋(DMA_PA_8300)

When initialization of the SysTime has been finished successfully, the SysTime module switches the mode to "SYSTIME_INITIALIZED".

### Normal Operation

When the SysTime module switches the mode to "SYSTIME_INITIALIZED", AND it is technically possible to receive the system time on the bus, the BswM shall request the mode "SYSTIME_RUNNING". When the SysTime module switches the mode to "SYSTIME_RUNNING", the module is in normal operation mode.

### Shutdown/Deactivation

**[IM_SysTimeClassic_0005]** ⌈To deactivate the SysTime module, the BswM has to request the mode "SYSTIME_STOPPED". When the SysTime module switches the mode to "SYSTIME_STOPPED", the module is deactivated. This shall not be done as long as any monitoring function is active which could lead to error memory entries. ⌋(DMA_PA_8300)

### SWCD

If the modules Dem and Dcm are configured correctly, there should be no changes necessary in the file SysTime_ext_interfaces.arxml. If the RTE importer complains about incompatible interfaces, please check the Dem and Dcm configuration, or adapt the interfaces in SysTime_ext_interfaces.arxml according to the generated Software Component Description files of Dcm and Dem.