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## 1 Scope of document

The goal of AUTOSAR WP Diagnostics and this document is to define to what extent elements of the diagnostic basic software have to be configurable and what preliminaries they shall comply with to meet the tailoring requirements. The handling of the legislated OBD and enhanced Diagnostics shall also be achieved.

As far as possible the set of diagnostic basic software elements should consist of already existing elements of modules of automotive software. Only in case of 'good reasons' new elements of basic software should be part of the set.

If such the definition of these new elements is not part of this work package. Nevertheless the information about basic software elements additionally required shall be given to related work groups.

### Constraints

First scope for specification of requirements on basic software modules are systems which are not safety relevant. For implementation of the basic software modules in safety relevant systems, it shall be checked if additional requirements are necessary.

For this document we refer to ISO 15031-5. The equivalent SAEJ1979 is not mentioned explicitly but is covered accordingly.

## 2 Conventions to be used

In requirements, the following specific semantics are used (taken from Request for Comment RFC 2119 from 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 described in RFC 2119. Note that the requirement level of the document in which they are used modifies the force of these words.

- **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, or the terms "REQUIRED" or "SHALL", mean that the definition is an absolute requirement of the specification.
- **MUST NOT:** This phrase, or the phrase „SHALL NOT“, means that the definition is an absolute prohibition of the specification.
- **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 Acronyms and abbreviations

<b>Acronym:</b>	<b>Description:</b>
External diagnostic tool	<p>It is a device which is NOT permanently connected within the vehicle communication network. This device could be connected to the vehicle for various purposes, as e.g.</p> <ul style="list-style-type: none"> <li>• development</li> <li>• manufacturing</li> <li>• service (garage)</li> </ul> <p>Known devices are e.g.</p> <ul style="list-style-type: none"> <li>• a diagnostic tester</li> <li>• an OBD scan tool</li> </ul> <p>The external diagnostic tool is to be connected by a mechanic to gather information from "inside" the car.</p>
Internal diagnostic tool	<p>It is a device/ECU which could be connected permanently within the vehicle communication network. The purpose of this device/ECU could be a functionality as e.g.</p> <ul style="list-style-type: none"> <li>• advanced event tracking</li> <li>• advanced analysis's</li> </ul> <p>for service mechanics.</p> <p>The behavior of the device/ECU could be the same as if it is an external diagnostic tool.</p> <p>The meaning of 'internal diagnostic tool' is NOT that it is included in each ECU as a AUTOSAR SW-Component.</p>
AUTOSAR application	A SW-application above the RTE which is using the API's defined by DCM and DEM
Monitoring path	A monitoring path represents a diagnostic symptom and it is assigned to a unique event ID.
Event	In case of the use of the term Event a Diagnostic event is meant.
Diagnostic test results	De-bounced and qualified test result provided by a monitoring function.

## 4 Requirement Specification

### 4.1 Functional Requirements

#### 4.1.1 General

##### 4.1.1.1 [BSW04010] Interface between Diagnostic service handling and Diagnostic event (fault) management

<b>ID:</b>	BSW04010
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	21.7.2004
<b>Short Description:</b>	The DEM module and DCM module shall ensure interaction in order to fulfill ISO 14229-1 and ISO 15031-5.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	If the DCM module shall respond diagnostic services of a tester/scan-tool (e.g. read DTC information), the DCM module shall use interfaces to collect the required data from the DEM module (e.g. setting the DTC status mask, get filtered DTCs and the corresponding event related data) and from SW-Cs (e.g. read current diagnostic values). The DEM module shall provide interfaces to process the storage of events and event related data.
<b>Rationale:</b>	ISO 14229-1 and ISO 15031-5
<b>Use Case:</b>	Improved fault and event tracking, analysis for services, assembly line, OBD-SCAN-Tool
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	ISO 14229-1 ISO 15031-5
<b>Contributes to:</b>	--

##### 4.1.1.2 [BSW04082] Support of ISO15031-5 and SAE J1979

<b>ID:</b>	BSW04082
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	27.03.2008
<b>Short Description:</b>	The diagnostic modules DCM and DEM shall provide standardized interfaces to support OBD services as defined in ISO15031-5 and SAE J1979.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DCM and the DEM provide interface to support OBD services \$01 to \$0A to access Parameter Identifiers (PIDs), diagnostic test results and further OBDII specific data.
<b>Rationale:</b>	--
<b>Use Case:</b>	--
<b>Dependencies:</b>	Configuration
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

##### 4.1.1.3 [BSW04065] Clearing of events or event groups

<b>ID:</b>	BSW04065
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<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	03.8.2004
<b>Short Description:</b>	The DEM and DCM shall process the deletion of events or event groups according to ISO 14229-1 (Annex D1) and ISO 15031-5. .
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DEM and DCM shall be able to remove a specific event or event groups from the configured event memory.
<b>Rationale:</b>	ISO 14229 ISO15031-5
<b>Use Case:</b>	Delete single events: <ul style="list-style-type: none"> <li>- Support of 'mechanics' which can follow step by step (DTC by DTC) the repair process</li> </ul> Delete event groups: <ul style="list-style-type: none"> <li>- Support of 'mechanics' who can delete areas of faults which are subsequent faults of the first one.</li> <li>- OBD faults</li> </ul>
<b>Dependencies:</b>	[BSW111] [BSW113]
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.1.4 [BSW04067] Counting and evaluation of diagnostic events

<b>ID:</b>	BSW04067
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	03.8.2004
<b>Short Description:</b>	The DCM and DEM shall provide the diagnostic status information according to ISO 14229-1 (refer to DTC status mask).
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DCM and DEM shall provide the diagnostic status information according to the DTCStatusMask, ISO 14229-1, Annex D5
<b>Rationale:</b>	Advanced fault analysis
<b>Use Case:</b>	Improved fault and event tracking and analysis
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	ISO 14229-1
<b>Contributes to:</b>	--

#### 4.1.1.5 [BSW04097] Decentralized modular diagnostic configuration of SW-Cs

<b>ID:</b>	BSW04097
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	02.02.2009
<b>Short Description:</b>	Support of Decentralized modular diagnostic configuration of SW-Cs
<b>Type:</b>	New
<b>Importance:</b>	Medium
<b>Description:</b>	Each SW-C provides additional diagnostic configuration information for other SW-Cs and for diagnostic modules. The DCM and the DEM module shall be able to generate ports to be connected between these modules in order to allow for diagnostic data to be accessible through the DCM (if requested by an external scan tool) and the DEM (for triggering event entries and collecting event related data).
<b>Rationale:</b>	Because of decentralized configuration & interface requirements each SW-C



	shall provide and implement diagnostic interfaces to allow code generation and port connection in the DCM (DSP).
<b>Use Case:</b>	<p>Use-case example:</p> <ul style="list-style-type: none"> <li>As of today functions and associated diagnostics are developed by several parties. Thus for each function and its diagnostic monitors (e.g. torque management in an engine controller) the diagnostic capabilities are defined separately and will not necessarily be coordinated during development.</li> <li>System integration and combination of diagnostics for accessibility through DCM and DEM requires that the individual functions and diagnostic features are connected to be compiled as a complete diagnostic system (which is in case of OBD2 certification relevant.)</li> </ul> <p>Use-case summary:</p> <ol style="list-style-type: none"> <li>develop decentralized modular software and its diagnostics without permanent interaction with other SW-Cs developers</li> <li>Combine modules and extract module-specific diagnostic data</li> <li>link diagnostic data from SW-Cs to DCM and DEM</li> </ol>
<b>Dependencies:</b>	WP General Methodology and Configuration
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	ISO 14229-1 BRF00027 BRF00229
<b>Contributes to:</b>	--

## 4.1.2 Diagnostic Event Manager (DEM)

### 4.1.2.1 [BSW04002] Basic SW Module for Diagnostic event (fault) management

<b>ID:</b>	BSW04002
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	21.7.2004
<b>Short Description:</b>	The Diagnostic event (fault) management shall be established as Basic SW Module.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The Diagnostic event (error) management shall be a Basic SW Module described in the Diagnostic WP. Diagnostic event (error) management is out of scope for Mode Management
<b>Rationale:</b>	SW Architecture
<b>Use Case:</b>	Improved fault and event tracking and analysis for Service, assembly line, OBD-SCAN-Tool
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

### 4.1.2.2 [BSW04057] Classification of event

<b>ID:</b>	BSW04057
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	17.06.2004
<b>Short Description:</b>	The DEM shall support a classification of events for series production, OBD and expert usage.
<b>Type:</b>	New
<b>Importance:</b>	High

<b>Description:</b>	The DEM shall support a classification of events for the following types of events: <ul style="list-style-type: none"> <li>• Events that are defined for error analysis in the service station shall be stored in the primary event memory.</li> <li>• Events that are defined for detailed error analysis by experts in the after sale department are stored in the secondary error memory.</li> </ul> Errors that occur during the development process shall be stored in the DET. Therefore, a special DET API shall be used which is not provided by the DEM.
<b>Rationale:</b>	After sales analysis
<b>Use Case:</b>	Distinction between service station relevant and after sales relevant events.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.2.3 [BSW04061] Distinction between different function groups

<b>ID:</b>	BSW04061
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	03.8.2004
<b>Short Description:</b>	The DEM shall provide mechanisms to distinguish between the reported fault of different applications and basic software modules.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DEM shall process event information of different applications (SW-Cs) and BSW modules. Therefore a unique identifier is required to distinguish between different function calls using the same interface. .
<b>Rationale:</b>	Introduce unique event identifiers (EventId) in DEM
<b>Use Case:</b>	Distinction between different applications using the same DEM by their application function group in case of merged applications on one single ECU.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.2.4 [BSW04063] Single Event ID for each monitoring path

<b>ID:</b>	BSW04063
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	03.8.2004
<b>Short Description:</b>	The DEM module shall process a dedicated event identifier (EventId) for each monitoring path to support an autonomous handling of different events/faults.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	For the internal administration the DEM needs a unique identification of each monitoring path. This identification shall be handled via an Event ID value (Integer).
<b>Rationale:</b>	Introduce unique event identifiers (EventIds) in DEM
<b>Use Case:</b>	Unique fault identification which can be used for enhanced debugging.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.2.5 [BSW04066] Support different event (fault) memories

<b>ID:</b>	BSW04066
<b>Initiator:</b>	BMW
<b>Date:</b>	03.08.2004
<b>Short Description:</b>	The DEM module shall provide different event memories which have to be configurable per event.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	<p>The DEM module shall provide different event memories (e.g. primary, mirror, secondary, permanent) supporting the development phase or product improvements as well as the service applications:</p> <ul style="list-style-type: none"> <li>• The service station has only access to the primary event memory.</li> <li>• The development departments of the OEMs and Suppliers needs access to all configured event memories.</li> </ul> <p>The different event memories allow the storage of development events and they are not suited as a trace tool.</p>
<b>Rationale:</b>	Advanced fault analysis
<b>Use Case:</b>	The development departments of the OEMs and Suppliers need as much as possible deeper fault/event analysis although the mechanics may have deleted the faults or may not need to know if there are more detailed root causes for an event or fault
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.2.6 [BSW04068] Debouncing of diagnostic events

<b>ID:</b>	BSW04068
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	03.8.2004
<b>Short Description:</b>	The DEM module shall provide event specific debounce algorithms.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	<p>The DEM module shall support event specific debounce/unlearn counters to improve signal quality internally. The configuration of the DEM module shall support the following types of debounce mechanisms:</p> <ul style="list-style-type: none"> <li>• counter based</li> <li>• time based</li> <li>• handling of external debouncing</li> </ul>
<b>Rationale:</b>	Advanced fault analysis
<b>Use Case:</b>	All SW-Cs and BSW modules can report events to the DEM module. The diagnostic module processes all these events and is able to provide a central de-bounce behavior for event classification & status management.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	BRF00230
<b>Contributes to:</b>	--

#### 4.1.2.7 [BSW04106] Aging/Unlearning of diagnostic events

<b>ID:</b>	BSW04106
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	12.05.2009
<b>Short Description:</b>	The DEM module shall provide an event specific set of configurable

	debouncing algorithms.
<b>Type:</b>	Old
<b>Importance:</b>	High
<b>Description:</b>	The DEM module shall provide debounce counters and timers which are configurable per event (e.g. defining the number of operation cycles) to qualify the reported event DEM internally. Furthermore for special use-cases the DEM module shall support the possibility to handle events which are debounced by SW-Cs or other BSW modules.
<b>Rationale:</b>	Fault analysis for OBD and non-OBD systems
<b>Use Case:</b>	Several software modules (applications or basic software) report events to the DEM module. Because of optimization such a central diagnostic instance has to provide debounce algorithms to avoid several implementations of the same behavior.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	ISO 14229-1 BRF00230
<b>Contributes to:</b>	--

#### 4.1.2.8 [BSW04069] Warning indicator handling

<b>ID:</b>	BSW04069
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	03.8.2004
<b>Short Description:</b>	The DEM module shall provide event specific information of warning indicators requested by SW-Cs or other BSW modules.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DEM module is able to activate or deactivate indicators (e.g. lamps, text message, beep) per event stored in the configured event memory. The information on indicators is requested by SW-Cs or other BSW modules to process further calculation or react on the received result.
<b>Rationale:</b>	Information distribution to the SW-Cs and BSW modules
<b>Use Case:</b>	Indications of the Malfunction Indicator Lamp (MIL)
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.2.9 [BSW04070] Event 'occurrence order' definition

<b>ID:</b>	BSW04070
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	03.8.2004
<b>Short Description:</b>	The DEM module shall process the order of the event occurrences in an appropriate and obvious manner.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	<ul style="list-style-type: none"> <li>- The occurrence order shall be recognizable by e.g. time stamps or age. (storage of events shall be connected to age or timestamp)</li> <li>- Reoccurrence of events takes over the old position of the event</li> <li>- Reoccurrence of healed events are handled as new events.</li> </ul>
<b>Rationale:</b>	Advanced fault analysis
<b>Use Case:</b>	Improved clustering and judging of events
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--

<b>Supporting Material:</b>	ISO14229-1
<b>Contributes to:</b>	--

#### 4.1.2.10 [BSW04071] Event importance definition

<b>ID:</b>	BSW04071
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	03.8.2004
<b>Short Description:</b>	The DEM module shall process events according to their defined importance like priority and/or severity.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The events shall be sorted or assigned to a specific priority (e.g. Severity Mask – ISO14229-1, Annex D3) representing their importance like: <ul style="list-style-type: none"> <li>- Healed events can be overwritten</li> <li>- Privileged storing in case of Event Buffer filled up with less privileged events</li> </ul>
<b>Rationale:</b>	ISO14229-1
<b>Use Case:</b>	Improved clustering and judging of events
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	ISO14229-1
<b>Contributes to:</b>	--

#### 4.1.2.11 [BSW04072] Extended event information

<b>ID:</b>	BSW04072
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	03.8.2004
<b>Short Description:</b>	The DEM shall provide additional event information to report the occurrence of an event by km-stamp, driving cycles or time.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	Fault duration e.g. by km-stamp, driving cycles or time <ul style="list-style-type: none"> <li>- Between failed and passed</li> <li>- Since failed</li> <li>- Since last clear</li> </ul>
<b>Rationale:</b>	Advanced fault analysis
<b>Use Case:</b>	Improved clustering and judging of events/faults
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	ISO14229-1
<b>Contributes to:</b>	--

#### 4.1.2.12 [BSW04073] Event combination and compression

<b>ID:</b>	BSW04073
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	03.8.2004
<b>Short Description:</b>	DEM shall process combined events which shall consist of several different events.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DEM shall allow for combining several individual events to a different representing (combined) event that has its own event ID.

	<p>The configuration of the DEM shall allow for enabling and disabling the support for “combined diagnostic events”.</p> <p>If “combined diagnostic events” are supported the configuration of the DEM shall allow for assigning each “diagnostic event” the attribute “combined diagnostic event ID”.</p>
<b>Rationale:</b>	Advanced fault analysis
<b>Use Case:</b>	Improved clustering and judging of events/faults. Several internal hardware faults of an electronic control unit can be mapped onto a single “ECU internal” failure to reduce the number of Diagnostic Trouble Codes shown to the technician in the service workshop.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.2.13 [BSW04074] Event related data

<b>ID:</b>	BSW04074
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	03.8.2004
<b>Short Description:</b>	The DEM module shall process event related data (e.g. freeze frames and extended data records).
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DEM module shall be able to store different sets of environmental data (freeze frames or extended data records) per event. The point in time when the event related data is captured, updated or stored (e.g. depending on status bit transition of the UDS DTC status byte) shall be configurable (limited to common use-cases or definitions of ISO 14229-1). Based on the configuration the DEM module shall be able to access data elements provided by SW-Cs or other BSW modules of freeze frames or extended data records.
<b>Rationale:</b>	Advanced fault analysis
<b>Use Case:</b>	Improved clustering and judging of events/faults
<b>Dependencies:</b>	<ul style="list-style-type: none"> <li>Configuration/calibration: The number of freeze frame sets shall be configurable due to the different domain requirements and ECU complexities.</li> <li>BSW04024</li> </ul>
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.2.14 [BSW04079] The size of a FreezeFrame shall be reported to the DCM by the DEM

<b>ID:</b>	BSW04079
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	03.11.2004
<b>Short Description:</b>	The DEM module shall be able to report the size of a FreezeFrame to the DCM module.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	If the DEM module is requested to support freeze frames, the DEM module shall be able to determine the size of a FreezeFrame and to provide this information via API call..

<b>Rationale:</b>	The DCM requires this information due to the allocation of memory space for the storage of the FreezeFrame information.
<b>Use Case:</b>	An external testing tool connected to the vehicle requests currently stored error codes and the corresponding environmental data.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.2.15 [BSW04104] Configuration of event related data

<b>ID:</b>	BSW04104
<b>Initiator:</b>	Daimler
<b>Date:</b>	15.08.2008
<b>Short Description:</b>	The DEM module shall support a signal based configuration of event related data (define freeze frames and extended data records).
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	--
<b>Rationale:</b>	Advanced fault analysis
<b>Use Case:</b>	A SW-C or other a BSW modul provides diagnostic signals (data elements) which will be merged to different data identifiers (DIDs).
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	Refer to concept "Functional diagnostics of SW-Cs", ServiceNeeds described in SW-C Template, BRF00230
<b>Contributes to:</b>	--

#### 4.1.2.16 [BSW04075] Event and DTC assignment

<b>ID:</b>	BSW04075
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	03.8.2004
<b>Short Description:</b>	The DEM module shall support a configuration to assign specific events (reported by SW-Cs or BSW modules) to a customer specific DTC.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	Assignment of events to customer specific / standardized DTC's which shall be configurable related to number of DTCs.
<b>Rationale:</b>	The event identifier is used DEM internally only. An external scan tool requests a DTC number which was assigned to one specific or several events (combined events).
<b>Use Case:</b>	The DTC number is used for external fault analysis and is reported by the DCM module if a connected scan tool requests fault memory information (e.g. service \$19 to read DTC information).
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.2.17 [BSW04076] System Cycle definition

<b>ID:</b>	BSW04076
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	03.8.2004
<b>Short Description:</b>	The DEM module shall provide a set of system cycles that may qualify the

	event in an additional manner (e.g. OBD)
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The cycles are used for event qualification, event aging or warning indicator handling. Typical cycles are: - driving cycle - engine warm up cycle - ignition on off cycle - power up power down cycle - operation active passive cycle - in or out of voltage range cycle
<b>Rationale:</b>	Event status management, ISO14229
<b>Use Case:</b>	Improved clustering and judging of events/faults
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.2.18 [BSW04091] Notifications about new freeze frame data

<b>ID:</b>	BSW04091
<b>Initiator:</b>	BMW/Elektrobit
<b>Date:</b>	15.08.2008
<b>Short Description:</b>	Forwarding of notifications about new freeze frame data
<b>Type:</b>	New
<b>Importance:</b>	Medium
<b>Description:</b>	The DEM shall be enabled to notify other SW-C (or BSW modules) about new freeze frame data (e.g. time stamp). If this functionality is configured for an event, it shall be executed on each entry of a new freeze frame of this event into the event memory.
<b>Rationale:</b>	In the current version of the DEM SWS, there is no possibility to provide freeze frame data (like time stamp) to another SW-C / BSW module beside the DCM. Additionally this functionality provides a simple way for supporting this data to other components (at every time, where new data are available), so that no cyclic polling is needed.
<b>Use Case:</b>	The information provided by this functionality is needed by modules like a special 'Diagnostic active response handler'.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	BRF00231
<b>Contributes to:</b>	--

#### 4.1.2.19 [BSW04092] Control of event handling

<b>ID:</b>	BSW04092
<b>Initiator:</b>	BMW/Elektrobit
<b>Date:</b>	15.08.2008
<b>Short Description:</b>	Control of event handling
<b>Type:</b>	New
<b>Importance:</b>	Medium
<b>Description:</b>	The DEM shall provide locking functionality for dedicated events. If this functionality is configured for an event, it shall be called before clearing this event from the event memory. Unless the functionality does not allow clearance, the event must not be cleared.
<b>Rationale:</b>	It shall be possible to disable the clearance of some dedicated events e.g.



	during a flash process.
<b>Use Case:</b>	Some dedicated events must never get cleared from event memory, while the ECU is in an special operation mode (e.g. assembly-, transport-, or flash-mode).
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	BRF00232
<b>Contributes to:</b>	--

#### 4.1.2.20 [BSW04093] Memory Overflow indication

<b>ID:</b>	BSW04093
<b>Initiator:</b>	BMW/Elektrobit
<b>Date:</b>	15.08.2008
<b>Short Description:</b>	Memory Overflow indication
<b>Type:</b>	New
<b>Importance:</b>	Medium
<b>Description:</b>	For each Event Memory it shall be indicated if the related event memory (e.g. primary, secondary, mirror) is full and the next event occurs to be stored in this event memory.
<b>Rationale:</b>	The information that an event memory overflow occurred is very important for fault analysis.
<b>Use Case:</b>	<ul style="list-style-type: none"> <li>• Triggering further internal behavior of the DEM module (e.g displacement strategies)</li> <li>• Linking this information to a dedicated Extended Data Record</li> <li>• Vendor specific UDS-Service</li> </ul>
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	BRF00233
<b>Contributes to:</b>	--

#### 4.1.2.21 [BSW04095] Enable & Storage conditions

<b>ID:</b>	BSW04095
<b>Initiator:</b>	Daimler
<b>Date:</b>	12.05.2009
<b>Short Description:</b>	The DEM module shall provide the ability to handle event specific enable and storage conditions.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	Depending on environmental data or the current status of an ECU the DEM module considers a certain number of conditions/checks before the event get qualified. <ul style="list-style-type: none"> <li>• Enable condntions affects the ability of a diagnostic monitor to report events</li> <li>• Storage conditions affects the qualification of the reported event before the event is stored in its configured event memory</li> </ul>
<b>Rationale:</b>	Support mechanisms to avoid reams of event memory entries in case of specific ECU conditions.
<b>Use Case:</b>	For specific fault groups (e.g. network faults) it is necessary to evaluate the current status of an ECU (e.g. undervoltage) before the reported events are qualified by the DEM module.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	BRF00230
<b>Contributes to:</b>	--

#### 4.1.2.22 [BSW04096] Status bit support & handling

<b>ID:</b>	BSW04096
<b>Initiator:</b>	Daimler
<b>Date:</b>	15.08.2008
<b>Short Description:</b>	The DEM module shall support the UDS DTC status bit support & handling according to ISO 14229-1.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DEM module shall provide the ability to handle the UDS DTC status bit information according to ISO14229-1.
<b>Rationale:</b>	UDS DTC status bit transitions are defined in ISO14229-1.
<b>Use Case:</b>	Provide the UDS DTC status bit information requested by a scan tool.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	ISO 14229-1 BRF00230
<b>Contributes to:</b>	--

#### 4.1.2.23 [BSW04105] Event memory management

<b>ID:</b>	BSW04105
<b>Initiator:</b>	Daimler
<b>Date:</b>	15.08.2008
<b>Short Description:</b>	Basic requirements of the event memory management
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DEM module shall be able to handle new events, update existing event memory entries or replace events in case of a full event memory.  The processing is triggered externally (e.g. by the reported event status) or depends on internal information (e.g. value of debounce counter/timer, occurrence counter, ...)
<b>Rationale:</b>	Support of fault storage and analysis
<b>Use Case:</b>	Support of fault storage and analysis
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	ISO 14229-1 BRF00230
<b>Contributes to:</b>	--

#### 4.1.2.24 [BSW04102] Reporting of stored events

<b>ID:</b>	BSW04102
<b>Initiator:</b>	Daimler
<b>Date:</b>	12.05.2009
<b>Short Description:</b>	The DEM module shall provide a chronological reporting order of the events located in the configured event memory.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DEM module is able to handle the occurrence of events (e.g. represented by a time stamp or odometer value) refer to BSW04070. If the DCM module requests fault information, the DEM module shall reports all faults, which fits to the configured status mask, in a defined chronological order.
<b>Rationale:</b>	Advanced fault analysis
<b>Use Case:</b>	Advanced fault analysis

<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	BRF00230
<b>Contributes to:</b>	--

#### 4.1.2.25 [BSW04099] Notification about data changes for log & trace (DLT)

<b>ID:</b>	BSW04099
<b>Initiator:</b>	BMW/Fraunhofer ESK
<b>Date:</b>	12.05.2009
<b>Short Description:</b>	The DEM should forward incoming events to the DLT interface.
<b>Type:</b>	New
<b>Importance:</b>	Medium
<b>Description:</b>	The DEM should forward error events to the DLT.
<b>Rationale:</b>	To have an overview of all log, trace error messages and to set all of them in the correct context with the error events reported to the DEM, it is important to have all this messages and events in one list (context). This makes an analysis of the reported errors more efficient and gives a correct picture of the ongoing sequences, which report an error.
<b>Use Case:</b>	<ul style="list-style-type: none"> <li>• a SWC or BSW module sets an DTC in the DEM</li> <li>• the DEM forwards this event to the DLT</li> <li>• the DLT turns these events in the DLT format and sends it over the a network interface to a DLT client (PC)</li> </ul>
<b>Dependencies:</b>	DLT/DEM module
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.2.26 [BSW04107] Defensive behavior of the DEM module

<b>ID:</b>	BSW04107
<b>Initiator:</b>	WP Functional Safety
<b>Date:</b>	15.11.2007
<b>Short Description:</b>	Protection of error events memory
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	For safety-related applications, the Diagnostics Event Manager shall ensure data integrity of errors information stored in non-volatile memory.
<b>Rationale:</b>	Protection of error events memory is needed for safety-related
<b>Use Case:</b>	Error events memory could have been corrupted
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	Use the optional CRC and redundancy capabilities provided by the NVRAM Manager for Diagnostics Event Manager NVRAM Blocks. Only blocks assigned to error events of high severity can be protected. These blocks can be stored in non-volatile memory when the error event is confirmed (before shutdown of the ECU), refer to BRF00129
<b>Contributes to:</b>	--

#### 4.1.2.27 Interfaces and APIs

##### 4.1.2.27.1 [BSW04077] Interaction with NVRAM manager

<b>ID:</b>	BSW04077
<b>Initiator:</b>	WP Diagnostic

<b>Date:</b>	21.07.2004
<b>Short Description:</b>	The DEM uses standard mechanisms provided by NVRAM-Manager.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	--
<b>Rationale:</b>	Non volatile data storage
<b>Use Case:</b>	The DEM triggers data storage during normal ECU operation to avoid loss of volatile data / event information.
<b>Dependencies:</b>	NVRAM Manager
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.2.27.2 [BSW04030] Interaction with Software Components (SW-Cs)

<b>ID:</b>	BSW04030
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	21.07.2004
<b>Short Description:</b>	The DEM shall provide an interface via the RTE to monitoring SW components for reporting and processing diagnostic test results.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DEM shall provide via the RTE an Interface to Monitoring SW Components for reporting and processing diagnostic results. Monitoring SW-components report diagnostic results as soon as new results are available.
<b>Rationale:</b>	Interface to event generating monitoring SW-Components
<b>Use Case:</b>	Ensure the basic diagnostic functionality
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.2.27.3 [BSW04031] Interaction with Function Inhibition Manager (FIM)

<b>ID:</b>	BSW04031
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	21.07.2004
<b>Short Description:</b>	The DEM shall notify the Function Inhibition Manager (FIM) upon changes of the event status in order to process them according to the SW components dependencies.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	Control (enable/disable) of functionalities of SW components based on the following inhibit condition: - faults
<b>Rationale:</b>	DEM information for Inhibition of functions.
<b>Use Case:</b>	Usage of DEM information for Inhibition of functions.
<b>Dependencies:</b>	FIM is not specified yet.
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

### 4.1.3 Diagnostic Communication Manager (DCM)

#### 4.1.3.1 [BSW04007] Provide Diagnostic service handling

<b>ID:</b>	BSW04007
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<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	21.07.2004
<b>Short Description:</b>	The DCM shall provide a diagnostic service handling for the SW-Components which are using the DCM.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DCM shall provide the diagnostic service handling, according to ISO14229-1, ISO 15031-5 and ISO 15765-3 for the communication between an AUTOSAR conform ECU and an internal tester or an external diagnostic tool.
<b>Rationale:</b>	Only one diagnostic service instance in an ECU.
<b>Use Case:</b>	Communication with an external diagnostic tools in <ul style="list-style-type: none"> <li>- development</li> <li>- manufacturing</li> <li>- service (garage)</li> <li>- OBD scan tools</li> </ul> Communication with an internal tester.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	ISO14229-1 ISO 15031-5 ISO 15765-3
<b>Contributes to:</b>	--

#### 4.1.3.2 [BSW04021] Switch diagnostic communication access

<b>ID:</b>	BSW04021
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	11.08.2004
<b>Short Description:</b>	The DCM shall support the handling of different diagnostic sessions in parallel.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	DCM needs to handle an established diagnostic communication and a parallel diagnostic access request in parallel. This is necessary to open a diagnostic access with high priority and the controlled shutdown of the established diagnostic access with low priority.
<b>Rationale:</b>	To prioritize handling of different Diagnostic Protocols e.g. OBD and normal diagnostic communication as UDS.
<b>Use Case:</b>	A internal vehicle diagnostic tester communication is interrupted by OBD diagnostic access request.
<b>Dependencies:</b>	<a href="#">[BSW04032]</a> Support of different diagnostic addresses <a href="#">[BSW04061]</a> Multiple or parallel usage from different applications of the DEM functionality
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.3.3 [BSW04032] Support of different diagnostic addresses

<b>ID:</b>	BSW04032
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	18.08.2004
<b>Short Description:</b>	Different diagnostic addresses shall be supported by multiple (physical) channels.
<b>Type:</b>	New
<b>Importance:</b>	High

<b>Description:</b>	Modern ECUs contain more than one functionality (e.g. board computer, instrument cluster). Each functionality shall be addressable by a diagnostic tool with a different diagnostic address. This does not imply that those multiple request are allowed in parallel.
<b>Rationale:</b>	High flexibility and granularity for addressing of SW-Components
<b>Use Case:</b>	At the service (garage) a fault symptom is based on functionality. The service only wants to address this functionality.
<b>Dependencies:</b>	<a href="#">[BSW04021]</a> Switch diagnostic communication access
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.3.4 [BSW04058] Access to different event (fault) memories

<b>ID:</b>	BSW04058
<b>Initiator:</b>	BMW
<b>Date:</b>	03.08.2004
<b>Short Description:</b>	The DCM module shall be able to access different event memories provided by the DEM module.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DCM module shall support diagnostic services to read or remove event entries from the configured event memory seperatly.
<b>Rationale:</b>	Advanced fault analysis
<b>Use Case:</b>	The development departments of the OEMs and Suppliers need as much as possible deeper fault/event analysis although the mechanics may have deleted the faults or may not need to know if there are more detailed root causes for an event or fault.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.3.5 [BSW04024] Configurable size of transferred data

<b>ID:</b>	BSW04024
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	18.08.2004
<b>Short Description:</b>	The DCM module shall be able to access and handle specific data elements and data element groups (e.g. freeze frames, extended data records) if requested by an external scan tool.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DCM module shall provide interfaces for the DEM module and for SW-Cs to access diagnostic data and to proccess diagnostic services. The size of a diagnostic data element is derived from the RTE or provided as an attribute of the API call itself.
<b>Rationale:</b>	Optimized usage of resources.
<b>Use Case:</b>	Transfer environmental / FreezeFrame data between DEM and DCM
<b>Dependencies:</b>	BSW04074
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.3.6 [BSW04098] Standard bootloader interaction

<b>ID:</b>	BSW04098
<b>Initiator:</b>	Vector-Informatik
<b>Date:</b>	19.12.2008
<b>Short Description:</b>	Standard bootloader interaction
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	<p>Integration of a standard bootloader into the AUTOSAR architecture.</p> <ul style="list-style-type: none"> <li>• If the DCM is requested to change into the programming session (\$10 02), the DCM shall activate the bootloader and the final response shall be sent by the bootloader (according HIS [FL-504]).</li> <li>• The DCM shall check the environmental conditions like engine speed before activating the bootloader (Interface already supported in AUTOSAR 3.0).</li> <li>• The behavior of the DCM to optionally issue a NRC 0x78 (RCRRP, retrigger the timeout supervision of the diagnostic client) during transition to the bootloader shall be configurable.</li> </ul>
<b>Rationale:</b>	Bootloader concept has to be standardized within AUTOSAR.
<b>Use Case:</b>	Usage of "off-the-shelf" boot loader
<b>Dependencies:</b>	Security concepts, OBD, VMM
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	BRF00034
<b>Contributes to:</b>	--

#### 4.1.3.7 [BSW04100] DLT debug interface using diagnostic services

<b>ID:</b>	BSW04100
<b>Initiator:</b>	BMW/Fraunhofer ESK
<b>Date:</b>	12.05.2009
<b>Short Description:</b>	The DCM should provide an interface for DLT to transport log and trace data over a diagnostic service.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	<p>DCM should provide an interface for DLT to send and receive data over the diagnostic service. Logging and tracing data are sent over this service and control requests for DLT are received.</p> <p>For this purpose the DCM should implement the ResponseOnEvent service (see UDS spec.). DCM should provide an interface for DLT to send data and receive control requests.</p>
<b>Rationale:</b>	<p>Log&amp;Trace needs an interface to send Log&amp;Trace data out of the ECU. DCM provides a bus independent access to the ECU over standardized diagnostic. This is available during production phase and provides a secured session control.</p> <p>Because log and trace messages are event triggered and the storage on the ECU is limited, these messages must be sent when they occur.</p>
<b>Use Case:</b>	<ul style="list-style-type: none"> <li>• Transmitting log and trace data during a diagnostic session</li> <li>• Advanced Diagnostic Tracing, optional over telematic services</li> </ul>
<b>Dependencies:</b>	DLT/DEM module
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	BRF00295
<b>Contributes to:</b>	--

#### 4.1.3.8 [BSW04015] Timing handling according to ISO15765-3

<b>ID:</b>	BSW04015
<b>Initiator:</b>	WP Diagnostic

<b>Date:</b>	11.08.2004
<b>Short Description:</b>	The DCM shall support timing handling according to ISO15765-3.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	In ISO15765-3 timing handling for physical and functional communication is described. Also how to react on errors. DCM shall work according this specification. Timing parameters shall be configurable (see dependencies).
<b>Rationale:</b>	Ensure a steady and save communication link and guarantee specified timing conditions.
<b>Use Case:</b>	Optimizing of timing for high performance during reprogramming.
<b>Dependencies:</b>	[BSW04059] Configuration of timing parameter
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	ISO15765-3
<b>Contributes to:</b>	--

#### 4.1.3.9 [BSW04000] Support Diagnostic Standard UDS (ISO14229-1)

<b>ID:</b>	BSW04000
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	20.07.2004
<b>Short Description:</b>	The DEM and DCM shall support the Diagnostic Standard UDS (ISO14229-1).
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DEM and DCM shall support all diagnostic services of UDS Standard (ISO14229-1).
<b>Rationale:</b>	Use standardized diagnostic services for communication between the ECU and an external scan tool.
<b>Use Case:</b>	Diagnostic with a UDS tester/scan tool
<b>Dependencies:</b>	[BSW04004] Configuration of Services by ISO Standards
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	ISO 14229-1
<b>Contributes to:</b>	--

#### 4.1.3.10 [BSW04001] Support Diagnostic Standard OBD (ISO15031-5)

<b>ID:</b>	BSW04001
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	20.07.2004
<b>Short Description:</b>	The DEM and DCM shall support the Diagnostic Standard OBD (ISO15031-5).
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DEM and DCM shall support all services of OBD Standard (ISO15031-5).
<b>Rationale:</b>	This standard is required for emission related control units by law
<b>Use Case:</b>	Diagnostic with a OBD Tester (e.g. Scan Tool)
<b>Dependencies:</b>	[BSW04004] Configuration of Services by ISO Standards
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	ISO15031-5
<b>Contributes to:</b>	--

#### 4.1.3.11 [BSW04005] SecurityAccess level handling is managed by DCM

<b>ID:</b>	BSW04005
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	21.07.2004



<b>Short Description:</b>	The DCM shall manage Security Access level handling.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DCM shall manage the handling of the UDS-service SecurityAccess (0x27) and also the Security level handling. The accessibility of the services (service identifier) in the actual security level shall be checked by the DCM
<b>Rationale:</b>	Some diagnostic services are in dependence to a security access level. Therefore it is necessary that the DCM has knowledge about the current level and no service which is restricted by security will be processed without authorization.
<b>Use Case:</b>	Not all diagnostic services are allowed in each security level.
<b>Dependencies:</b>	<a href="#">[BSW04000]</a> Support Diagnostic Standard UDS
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.3.12 [BSW04006] Session handling is managed by DCM

<b>ID:</b>	BSW04006
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	21.07.2004
<b>Short Description:</b>	Session handling of different diagnostic sessions is managed by DCM.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The DCM shall support the transition from a default session to any other session, also back to the default session. (A diagnostic session enables a specific set of diagnostic services and/or functionality.)
<b>Rationale:</b>	Some diagnostic services are not available in the default session. Therefore it is necessary that the DCM has knowledge about the current session and no service which is connected to a non default session will be processed in the default session.
<b>Use Case:</b>	Special services need a different session than the default session, e.g. Reduction of communication traffic on the network in order to get more performance for the flash programming.
<b>Dependencies:</b>	<a href="#">[BSW04000]</a> Support Diagnostic Standard UDS <a href="#">[BSW04005]</a> SecurityAccess level handling is managed by DCM
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.3.13 [BSW04016] Provision of Busy Handling

<b>ID:</b>	BSW04016
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	11.08.2004
<b>Short Description:</b>	The DCM shall support a "Busy handling" by sending a negative response 0x78.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	DCM shall provide the sending of the negative response 0x78 in order get more time to build up the final positive or negative response.
<b>Rationale:</b>	Ensure a steady and save communication link and guarantee specified timing conditions.
<b>Use Case:</b>	When an application cannot provide the response in the protocol specific time.
<b>Dependencies:</b>	<a href="#">[BSW04000]</a> Support Diagnostic Standard UDS

<b>Conflicts:</b>	--
<b>Supporting Material:</b>	ISO15765-3 ISO14229-1
<b>Contributes to:</b>	--

#### 4.1.3.14 [BSW04019] Application callback after transmit confirmation

<b>ID:</b>	BSW04019
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	11.08.2004
<b>Short Description:</b>	The DCM shall confirm transmitting if complete to continue processing.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	In some cases it is necessary that the application starts execution of the requested functionality after the positive response is completely transmitted. The application needs the callback functionality to get the information that the positive response is complete transmitted. After this callback the application can execute the requested functionality.
<b>Rationale:</b>	This behavior is specified by ISO 14229.
<b>Use Case:</b>	E.g. call of the reset function. This call needs to be done after transmission of the positive response is over.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	ISO14229-1
<b>Contributes to:</b>	--

#### 4.1.3.15 [BSW04020] Suppression of Responses

<b>ID:</b>	BSW04020
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	11.08.2004
<b>Short Description:</b>	DCM shall suppress responses to diagnostic tool requests.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	DCM shall suppress responses in following cases: - Suppress positive response (SuppressPosRequest Bit set) - Suppress negative responses (NRC 11, 12 and 31 at functional addressing)
<b>Rationale:</b>	This behavior is specified by ISO 14229-1. Prevent bus burst as result of a functional request.
<b>Use Case:</b>	--
<b>Dependencies:</b>	[BSW04000] Support Diagnostic Standard UDS
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	ISO14229-1 chapter 6.5.2.2 "Functionally addressed client request message" ISO15031-5 chapter 4.1.4 "Data not available"
<b>Contributes to:</b>	--

#### 4.1.3.16 [BSW04033] Upload/Download services for data handling

<b>ID:</b>	BSW04033
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	18.08.2004
<b>Short Description:</b>	The DCM shall support the upload/download services for reading/writing data in an ECU in an extended and manufacturer specific diagnostic session.
<b>Type:</b>	New

<b>Importance:</b>	High
<b>Description:</b>	The UDS services RequestDownload, RequestUpload, TransferData, RequestTransferExit (0x34-0x37) are used for data handling, e.g. accessing NVRAM. This does not interfere the reprogramming, because this is handled by the bootloader.
<b>Rationale:</b>	Enable a possibility to modify set of parameters.
<b>Use Case:</b>	End of line configuration in the manufacturing.
<b>Dependencies:</b>	[BSW04000] Support Diagnostic Standard UDS
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	ISO14229-1
<b>Contributes to:</b>	--

#### 4.1.3.17 [BSW04036] Format checking of diagnostic services

<b>ID:</b>	BSW04036
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	18.08.2004
<b>Short Description:</b>	The DCM shall check the format of diagnostic service. An incorrect service shall be rejected by a negative response.
<b>Type:</b>	New
<b>Importance:</b>	Low
<b>Description:</b>	The format checking shall include the service identifier (SID). Existing sub-service identifier shall be checked. The checks shall include the following attributes: - diagnostic session level - diagnostic security level - message length Note: Further checking is done by the application.
<b>Rationale:</b>	The application won't get a request with incorrect format.
<b>Use Case:</b>	Failure Handling in communication.
<b>Dependencies:</b>	[BSW04000] Support Diagnostic Standard UDS
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	ISO14229-1
<b>Contributes to:</b>	--

#### 4.1.3.18 Interfaces and APIs

##### 4.1.3.18.1 [BSW04078] Interface to fault memory, fault status

<b>ID:</b>	BSW04078
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	29.02.2004
<b>Short Description:</b>	The DCM shall use a common API of the diagnostic event manager to access the fault memory.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	An external or internal diagnostic tool needs access to the fault memory to get or change information about the fault status. An interface between diagnostic communication management and diagnostic event management is required.
<b>Rationale:</b>	The DCM and the DEM are separated modules with the necessity to interact. Therefore an interface is necessary.
<b>Use Case:</b>	A diagnostic test tool needs to read or clear the fault memory with the corresponding diagnostic services, e.g. "ReadDTCInformation", "ClearDiagnosticInformation"

<b>Dependencies:</b>	[BSW04002] Diagnostic event (error) management
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.3.18.2 [BSW04011] Provide diagnostic state information

<b>ID:</b>	BSW04011
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	21.07.2004
<b>Short Description:</b>	The DCM shall provide diagnostic state information (e.g. session state, security access information) for AUTOSAR Software Component via RTE.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The Software modules above the RTE need to know about the actual session and security state, because it is not predictable if the information's lead to a different functional diagnostic behavior.
<b>Rationale:</b>	Functional requirement
<b>Use Case:</b>	With the diagnostic session which the garage is using, it is allowed to switch between different sets of parameters. With an enhanced diagnostic session which could be used in development and a corresponding security level, it is allowed to change the data within the set of parameters.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.3.18.3 [BSW04003] Interface to PDU Router shall be network independent

<b>ID:</b>	BSW04003
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	21.07.2004
<b>Short Description:</b>	The interface of the DCM to PDU Router (CAN/LIN; FlexRay; MOST) shall be network independent.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	All network (CAN, LIN, FlexRay, MOST) dependent parts shall be done outside the DCM module. That means the module PDU Router shall provide a network independent interface.
<b>Rationale:</b>	The DCM describes only the services for communication and the behavior of network is out of scope. Highest granularity and best option to adapt upcoming networks.
<b>Use Case:</b>	DCM has to be network independent. So, the interface to the Transport Protocol shall be network independent.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

### 4.1.4 Function Inhibition Manager (FIM)

The specification of software requirements of the function inhibition manager is not a part of this specification. For details please refer to the AUTOSAR\_FIM\_SRS.

## 4.1.5 Diagnostic Error Tracer (DET)

### 4.1.5.1 [BSW04090] Provide a configurable list of error report receivers

<b>ID:</b>	BSW04090
<b>Initiator:</b>	WP Architecture
<b>Date:</b>	01.12.2008
<b>Short Description:</b>	Configurable list of error report receivers
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The Diagnostic Error Tracer shall support a configurable list of functions for fan-out of received error reports. This list can be empty.
<b>Rationale:</b>	This implements the debugging concept in R4.0 (DocumentId 298).
<b>Use Case:</b>	<ul style="list-style-type: none"> <li>- Even development errors shall be captured by the Log and Trace functionality</li> <li>- Error Handling shall be enabled to react on development errors</li> </ul>
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

### 4.1.5.2 [BSW04086] Provide a dedicated set of information

<b>ID:</b>	BSW04086
<b>Initiator:</b>	WP Architecture
<b>Date:</b>	01.12.2008
<b>Short Description:</b>	Report errors shall contain a dedicated set of information
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	Error reports, which the Development Error Tracer receives, shall consist of the ID of the reporting module, the ID of reporting instance, the ID of the API service in which the error has been detected and the error id it self.
<b>Rationale:</b>	For optimal support of the error tracing some tracing information is necessary.
<b>Use Case:</b>	During software development phase a BSW module has been called using wrong parameters. Due to communication of some tracing information the location of the error source will be supported.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

### 4.1.5.3 [BSW04087] Provide a development error report reception service

<b>ID:</b>	BSW04087
<b>Initiator:</b>	WP Architecture
<b>Date:</b>	01.12.2008
<b>Short Description:</b>	The Diagnostic Error Tracer shall provide a development error report reception service
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The Development Error Tracer shall be accessible by SW-C's to report development error.
<b>Rationale:</b>	It shall be possible to perform error tracing during development of SW-C's.
<b>Use Case:</b>	During software development phase a SW-C has received an unexpected response by a BSW module. By generating a development error and

	reporting it to the DET, configuration errors can be detected.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.5.4 [BSW04089] Fan-out of received error reports

<b>ID:</b>	BSW04089
<b>Initiator:</b>	WP Architecture
<b>Date:</b>	01.12.2008
<b>Short Description:</b>	Fan-out of received error reports
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The Diagnostic Error Tracer shall forward each received error report by calling each element of a configurable list of functions.
<b>Rationale:</b>	This implements the debugging concept in R4.0 (DocumentId 298)
<b>Use Case:</b>	- Even development errors shall be captured by the Log and Trace functionality - Error Handling shall be enabled to react on development errors
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.5.5 [BSW04085] Provide an interface to receive error reports

<b>ID:</b>	BSW04085
<b>Initiator:</b>	WP Architecture
<b>Date:</b>	01.12.2008
<b>Short Description:</b>	The Diagnostic Error Tracer shall provide an interface to receive error reports
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The Diagnostic Error Tracer shall provide an interface to get an development error report.
<b>Rationale:</b>	An interface will be needed to enable handling of development errors
<b>Use Case:</b>	During software development phase a BSW module has been called using wrong parameters. By generating a development error and reporting it to the DET, configuration errors can be detected.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

#### 4.1.5.6 [BSW04101] Notification interface for log & trace (DLT)

<b>ID:</b>	BSW04101
<b>Initiator:</b>	BMW/Fraunhofer ESK
<b>Date:</b>	12.05.2009
<b>Short Description:</b>	The DET module should forward its trace events to the DLT.
<b>Type:</b>	New
<b>Importance:</b>	Medium
<b>Description:</b>	The DET receives trace events from errors from the BSW and SWC during debugging time. If a DLT module exists, these events should be forwarded to

	the DLT to collect logs and traces only in one instance.
<b>Rationale:</b>	To have an overview of all log, trace and error messages and to set all of them in the correct context, it is important to have all these messages and events in one list (context). Also it is not practicable to use more than one mechanism to report errors, logs and traces to a debugging interface. So all these sources should be routed to the DLT.
<b>Use Case:</b>	<ul style="list-style-type: none"> <li>in a debugging scenario, an SWC or BSW Module uses the DET interface to trace an error</li> <li>this error is forwarded by the DET to the DLT</li> <li>the DLT turns these events in the DLT format and sends it over the debugging interface, together with all the other logs and traces</li> </ul>
<b>Dependencies:</b>	DET/DLT module
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	BRF00295
<b>Contributes to:</b>	--

## 4.1.6 Configuration

### 4.1.6.1 [BSW04059] Configuration of timing parameter

<b>ID:</b>	BSW04059
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	30.08.2004
<b>Short Description:</b>	The DCM and DEM shall support the configuration of timing parameters.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	Every physical layer requires specific timing parameter values therefore it is necessary to include the ability to configure the timing constrains depending on the used network. The timing parameters are set to default values when a communication starts and shall be changeable at runtime.
<b>Rationale:</b>	Usability with different networks.
<b>Use Case:</b>	The diagnostic communication can be done at different networks (e.g. CAN/LIN/FlexRay)
<b>Dependencies:</b>	<a href="#">[BSW04015]</a> Provision of timing handling according to ISO15765-3
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--

### 4.1.6.2 [BSW04064] Event buffer shall be configurable concerning size

<b>ID:</b>	BSW04064
<b>Initiator:</b>	WP Diagnostic
<b>Date:</b>	03.08.2004
<b>Short Description:</b>	The DEM shall support buffers of scalable sizes for the storage of the events, status information and environmental data.
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	<ol style="list-style-type: none"> <li>For the internal administration the DEM needs an Event buffer which shall be configurable depending on the number of the possible events in the system i.e. related to all SW components which are assigned to the DEM</li> <li>The fault storage [event buffer] shall provide enough space to store all high priority failures.</li> </ol>
<b>Rationale:</b>	Processor resource constraints
<b>Use Case:</b>	In case of large Systems with many events a selection of Events shall take

	place to fulfill NVRAM / RAM constraints of smaller processors.
<b>Dependencies:</b>	[BSW106] (see SWS DEM document)
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--
<b>Contributes to:</b>	--



## 5 References

### 5.1 Deliverables of AUTOSAR

- [1] General Requirements of Basic Software Modules  
AUTOSAR\_SRS\_BSWGeneral.pdf
- [2] Specification of the Virtual Functional Bus  
AUTOSAR\_EXP\_VFB.pdf

### 5.2 Related standards and norms

#### 5.2.1 ITEA-EAST

- [3] D1.5-General Architecture; ITEA/EAST-EEA, Version 1.0; chapter 3, page 72 et seq.
- [4] D2.1-Embedded Basic Software Structure Requirements; ITEA/EAST-EEA, Version 1.0 or higher
- [5] D2.2-Description of existing solutions; ITEA/EAST-EEA, Version 1.0 or higher.

#### 5.2.2 ISO

- [6] ISO 14229-1 Unified diagnostic services (UDS) – Part 1: Specification and Requirements (ISO DIS 26.05.2004)
- [7] ISO 15031-5 Communication between vehicle and external equipment for emissions-related diagnostics – Part 5: Emissions-related diagnostic services (2005-01-13)
- [8] ISO 15765-3 Diagnostics on controller area network (CAN) – Part 3: Implementation of unified diagnostic services (UDS on CAN) (2004-10-06)
- [9] ISO 15765-4 Diagnostics on controller area network (CAN) – Part 4: Requirements for emissions-related systems (2005 01-04)

### 5.3 Requirement change history

#### 5.3.1 Changes to Release 3.1

<b>Removed BSW Item</b>	<b>Rationale</b>
BSW04017	Obsolete because the DCM design changed
BSW04108	Already covered by BSW04097
BSW04088	DET functionality not needed by any concept

<b>Replaced BSW Item</b>	<b>Rationale</b>
none	

<b>Changed BSW Item</b>	<b>Rationale</b>
BSW04058	Improve description
BSW04024	Improve description
BSW04066	Improve description
BSW04068	Improve description

<b>Added BSW Item</b>	<b>Rationale</b>
BSW04085	Requirements of diagnostic error tracer (DET)
BSW04086	Requirements of diagnostic error tracer (DET)
BSW04087	Requirements of diagnostic error tracer (DET)
BSW04088	Requirements of diagnostic error tracer (DET)
BSW04089	Requirements of diagnostic error tracer (DET)
BSW04090	Requirements of diagnostic error tracer (DET)
BSW04091	Notification about new freeze frame data (BRF00231)
BSW04092	Control of event handling (BRF00230)
BSW04093	Overflow indication (BRF00233)
BSW04095	DEM behaviour concept (BRF00230)
BSW04096	DEM behaviour concept (BRF00230)
BSW04097	Decentralized modular diagnostic configuration of SW-Cs (BRF00229)
BSW04098	Bootloader interaction (BRF00034)
BSW04100	DCM Support for diagnostic log & trace (DLT), BRF00295
BSW04101	DET Support for diagnostic log & trace (DLT) BRF00295
BSW04102	DEM behaviour concept (BRF00230)
BSW04104	DEM behaviour concept (BRF00230)
BSW04105	DEM behaviour concept (BRF00230)
BSW04106	DEM behaviour concept (BRF00230)
BSW04107	Safety concept (BRF00129)