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01.12.2011	1.4.0	AUTOSAR Administration	• Consistent naming pattern for memory allocation keywords is introduced • Refine definition the <PREFIX> part in memory allocation keywords
03.11.2010	1.3.0	AUTOSAR Administration	• ECU Configuration Parameters for MemMap defined • Define generation of MemMap header files • New standardised Memory Allocation Keywords for new initialisation policy CLEARED added • Refinement of <SIZE> suffix of Memory Allocation Keywords to <ALIGNMENT> suffix, • Clarify link MetaModel attribute values, o Define MemorySectionType and SectionInitializationPolicy for the standardised Memory Allocation Keywords o Define that <NAME> used for Memory Allocation Keywords is the MemorySection shortName • Application hint for usage of INLINE and LOCAL_INLINE added • Handling structs, arrays and unions redefined

Document Change History			
Date	**Version**	**Changed by**	**Change Description**
04.12.2009	1.2.0	AUTOSAR Administration	• Typo errors are corrected throughout the document • Memory Mapping section has been extended for application SWC • Common Published information has been updated • Legal disclaimer revised
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12.12.2007	1.1.0	AUTOSAR Administration	• In MEMMAP004,all size postfixes for memory segment names were listed, the keyword 'BOOLEAN was added, taking into account the particular cases where boolean data need to be mapped in a particular segment. • In MEMMAP004 and MEMMAP021,tables are defining the mapping segments associated to #pragmas instructions, adding some new segments to take into account some implementation cases • Document meta information extended • Small layout adaptations made
13.02.2006	1.0.0	AUTOSAR Administration	Initial release

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1 Introduction and functional overview

This document specifies mechanisms for the mapping of code and data to specific memory sections via memory mapping files. For many ECUs and microcontroller platforms it is of utmost necessity to be able to map code, variables and constants module wise to specific memory sections. Selection of important use cases:

Avoidance of waste of RAM
If different variables (8, 16 and 32 bit) are used within different modules on a 32 bit platform, the linker will leave gaps in RAM when allocating the variables in the RAM. This is because the microcontroller platform requires a specific alignment of variables and some linkers do not allow an optimization of variable allocation.

This wastage of memory can be circumvented if the variables are mapped to specific memory sections depending on their size. This minimizes unused space in RAM.

Usage of specific RAM properties
Some variables (e.g. the RAM mirrors of the NVRAM Manager) must not be initialized after a power-on reset. It shall be possible to map them to a RAM section that is not initialized after a reset.

For some variables (e.g. variables that are accessed via bit masks) it improves both performance and code size if they are located within a RAM section that allows for bit manipulation instructions of the compiler. Those RAM sections are usually known as ‘Near Page’ or ‘Zero Page’.

Usage of specific ROM properties
In large ECUs with external flash memory there is the requirement to map modules with functions that are called very often to the internal flash memory that allows for fast access and thus higher performance. Modules with functions that are called rarely or that have lower performance requirements are mapped to external flash memory that has slower access.

Usage of the same source code of a module for boot loader and application
If a module shall be used both in boot loader and application, it is necessary to allow the mapping of code and data to different memory sections.

A mechanism for mapping of code and data to memory sections that is supported by all compilers listed in chapter 3.1 is the usage of pragmas. As pragmas are very compiler specific, a mechanism that makes use of those pragmas in a standardized way has to be specified.

Support of Memory Protection
The usage of hardware memory protection requires a separation of the modules variables into different memory areas. Internal variables are mapped into protected memory, buffers for data exchange are mapped into unprotected memory.

Support of partitioning
In some cases it is necessary to separate partition assigned memory.
Therefore an additional separation of the module variables into different memory (partition-)areas is needed if the BSW Module shall support a split over several Partitions.

2 Acronyms and abbreviations

Abbreviation / Acronym:	Description:
BSW	Basic Software
ISR	Interrupt Service Routine
NVRAM	Non-Volatile RAM

3 Related documentation

3.1 Input documents

[1] List of Basic Software Modules
AUTOSAR_TR_BSWModuleList.pdf

[2] AUTOSAR Layered Software Architecture
AUTOSAR_EXP_LayeredSoftwareArchitecture.pdf

[3] General Requirements on Basic Software Modules
AUTOSAR_SRS_BSWGeneral.pdf

[4] Basic Software Module Description Template,
AUTOSAR_TPS_BSWModuleDescriptionTemplate.pdf

[5] Software Component Template,
AUTOSAR_TPS_SoftwareComponentTemplate.pdf

[6] ECU Configuration Specification
AUTOSAR_SWS_ECU_StateManager.pdf

[7] Methodology
AUTOSAR_TR_Methodology.pdf

[8] Cosmic C Cross Compiler User’s Guide for Motorola MC68HC12, V4.5

[9] ARM ADS compiler manual

[10] GreenHills MULTI for V850 V4.0.5:
Building Applications for Embedded V800, V4.0, 30.1.2004

[11] TASKING for ST10 V8.5:
C166/ST10 v8.5 C Cross-Compiler User's Manual, V5.16
C166/ST10 v8.5 C Cross-Assembler, Linker/Locator, Utilities User's Manual, V5.16

[12] Wind River (Diab Data) for PowerPC Version 5.2.1:
Wind River Compiler for Power PC - Getting Started, Edition 2, 8.5.2004
Wind River Compiler for Power PC - User's Guide, Edition 2, 11.5.2004

[13] TASKING for TriCore TC1796 V2.0R1:
TriCore v2.0 C Cross-Compiler, Assembler, Linker User's Guide, V1.2

[14] Metrowerks CodeWarrior 4.0 for Freescale HC9S12X/XGATE (V5.0.25):
Motorola HC12 Assembler, 2.6.2004
Motorola HC12 Compiler, 2.6.2004
Smart Linker, 2.4.2004

3.2 Related standards and norms

Not applicable.

4 Constraints and assumptions

4.1 Limitations

During specification of abstraction and validation of concept the compilers listed in chapter 3.1 have been considered. If any other compiler requires keywords that cannot be mapped to the mechanisms described in this specification this compiler will not be supported by AUTOSAR. In this case, the compiler vendor has to adapt its compiler.

The concepts described in this document do only apply to C compilers. C++ is not in scope of this version.

A dedicated pack-control of structures is not supported. Hence global set-up passed via compiler / linker parameters has to be used.

A dedicated alignment control of code, variables and constants is not supported. Hence affected objects shall be assigned to different sections or a global setting passed via compiler / linker parameters has to be used.

4.2 Applicability to car domains

No restrictions.

4.3 Applicability to safety related environments

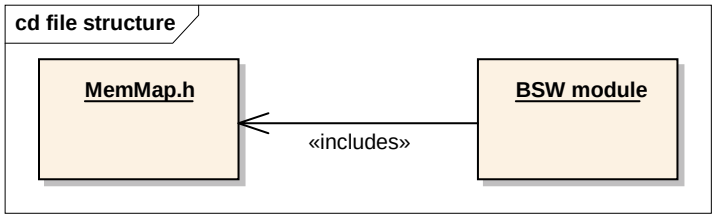
No restrictions. The memory mapping files do not implement any functionality, only symbols and macros.

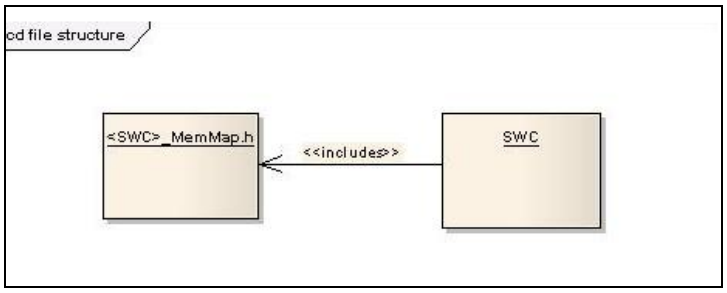
5 Dependencies to other modules

[MEMMAP020]「The SWS Memory Mapping is applicable for each AUTOSAR basic software module and software component. Therefore the implementation of memory mapping files shall fulfill the implementation and configuration specific needs of each software module in a specific build scenario. See also Recommendation A:, MEMMAP003, MEMMAP018 and MEMMAP001.」(BSW00384)

5.1 File structure

5.1.1 Code file structure

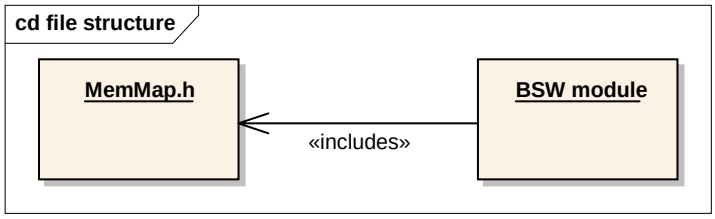


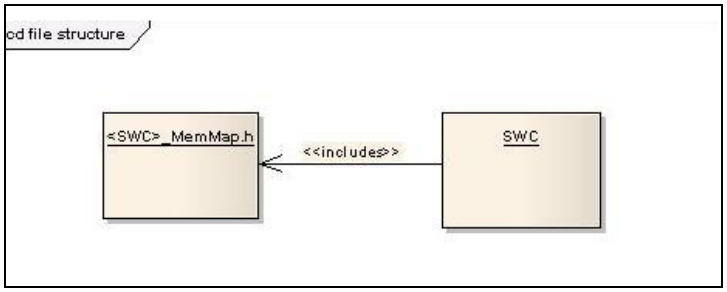


5.1.2 Header file structure

[MEMMAP028]「The Memory Mapping shall provide one BSW memory mapping header file '<MemMap.h'.」()

[MEMMAP029]「For each software component type which is part of the input configuration a software component type specific memory mapping header file '<SWC>_MemMap.h' shall be provided by the Memory Mapping.」()


cd file structure
MemMap.h
BSW module
«includes»


cd file structure
<SWC>_MemMap.h
<<includes>>
SWC

6 Requirements traceability

Requirement	Satisfied by
-	MEMMAP021
-	MEMMAP029
-	MEMMAP027
-	MEMMAP022
-	MEMMAP018
-	MEMMAP016
-	MEMMAP023
-	MEMMAP015
-	MEMMAP026
-	MEMMAP030
-	MEMMAP028
BSW00300	MEMMAP999
BSW00301	MEMMAP999
BSW00302	MEMMAP999
BSW00304	MEMMAP999
BSW00306	MEMMAP010, MEMMAP011, MEMMAP013, MEMMAP006, MEMMAP005, MEMMAP003, MEMMAP007
BSW00307	MEMMAP999
BSW00308	MEMMAP999
BSW00309	MEMMAP999
BSW00310	MEMMAP999
BSW00312	MEMMAP999
BSW00314	MEMMAP999
BSW00323	MEMMAP999
BSW00324	MEMMAP999
BSW00325	MEMMAP999
BSW00326	MEMMAP999
BSW00327	MEMMAP999
BSW00328	MEMMAP005, MEMMAP001
BSW00329	MEMMAP999
BSW00330	MEMMAP999
BSW00331	MEMMAP999
BSW00333	MEMMAP999
BSW00334	MEMMAP999
BSW00335	MEMMAP999

BSW00336	MEMMAP999
BSW00337	MEMMAP999
BSW00338	MEMMAP999
BSW00339	MEMMAP999
BSW00341	MEMMAP999
BSW00342	MEMMAP999
BSW00343	MEMMAP999
BSW00344	MEMMAP999
BSW00345	MEMMAP999
BSW00346	MEMMAP999
BSW00347	MEMMAP999
BSW00348	MEMMAP999
BSW00350	MEMMAP999
BSW00353	MEMMAP999
BSW00355	MEMMAP999
BSW00357	MEMMAP999
BSW00358	MEMMAP999
BSW00359	MEMMAP999
BSW00360	MEMMAP999
BSW00361	MEMMAP002
BSW00369	MEMMAP999
BSW00370	MEMMAP999
BSW00371	MEMMAP999
BSW00373	MEMMAP999
BSW00375	MEMMAP999
BSW00377	MEMMAP999
BSW00378	MEMMAP999
BSW00380	MEMMAP999
BSW00381	MEMMAP999
BSW00383	MEMMAP999
BSW00384	MEMMAP020
BSW00385	MEMMAP999
BSW00386	MEMMAP999
BSW00387	MEMMAP999
BSW00388	MEMMAP999
BSW00389	MEMMAP999
BSW00390	MEMMAP999
BSW00391	MEMMAP999
BSW00392	MEMMAP999
BSW00393	MEMMAP999

BSW00394	MEMMAP999
BSW00395	MEMMAP999
BSW00396	MEMMAP999
BSW00397	MEMMAP999
BSW00398	MEMMAP999
BSW00399	MEMMAP999
BSW004	MEMMAP999
BSW00400	MEMMAP999
BSW00401	MEMMAP999
BSW00404	MEMMAP999
BSW00405	MEMMAP999
BSW00406	MEMMAP999
BSW00407	MEMMAP999
BSW00408	MEMMAP999
BSW00409	MEMMAP999
BSW00410	MEMMAP999
BSW00411	MEMMAP999
BSW00412	MEMMAP999
BSW00413	MEMMAP999
BSW00414	MEMMAP999
BSW00415	MEMMAP999
BSW00416	MEMMAP999
BSW00417	MEMMAP999
BSW00419	MEMMAP999
BSW00420	MEMMAP999
BSW00421	MEMMAP999
BSW00422	MEMMAP999
BSW00423	MEMMAP999
BSW00424	MEMMAP999
BSW00425	MEMMAP999
BSW00426	MEMMAP999
BSW00427	MEMMAP999
BSW00428	MEMMAP999
BSW00429	MEMMAP999
BSW00431	MEMMAP999
BSW00432	MEMMAP999
BSW00433	MEMMAP999
BSW00434	MEMMAP999
BSW005	MEMMAP999
BSW006	MEMMAP010, MEMMAP011, MEMMAP013, MEMMAP006, MEMMAP005, MEMMAP003, MEMMAP007

BSW00605	MEMMAP999
BSW007	MEMMAP999
BSW009	MEMMAP999
BSW010	MEMMAP999
BSW101	MEMMAP999
BSW158	MEMMAP999
BSW159	MEMMAP999
BSW160	MEMMAP999
BSW161	MEMMAP999
BSW162	MEMMAP999
BSW164	MEMMAP999
BSW167	MEMMAP999
BSW168	MEMMAP999
BSW170	MEMMAP999
BSW171	MEMMAP999
BSW172	MEMMAP999

Document: AUTOSAR General Requirements on Basic Software Modules

Requirement	***Satisfied by***
[BSW00344] Reference to link-time configuration	Not applicable (Memory Mapping is specific per build scenario)
[BSW00404] Reference to post build time configuration	Not applicable (Memory Mapping is specific per build scenario)
[BSW00405] Reference to multiple configuration sets	Not applicable (Memory Mapping is specific per build scenario)
[BSW00345] Pre-compile-time configuration	Not applicable (Memory Mapping is specific per build scenario)
[BSW159] Tool-based configuration	Not applicable (Memory Mapping is specific per build scenario)
[BSW167] Static configuration checking	Not applicable (Memory Mapping is specific per build scenario)
[BSW171] Configurability of optional functionality	Not applicable (Memory Mapping is specific per build scenario)
[BSW170] Data for reconfiguration of AUTOSAR SW-Components	Not applicable (Memory Mapping is specific per build scenario)
[BSW00380] Separate C-Files for configuration parameters	Not applicable (Memory Mapping is specific per build scenario)

Requirement	*Satisfied by*
[BSW00419] Separate C-Files for pre-compile time configuration parameters	Not applicable (Memory Mapping is specific per build scenario)
[BSW00381] Separate configuration header file for pre-compile time parameters	Not applicable (Memory Mapping is specific per build scenario)
[BSW00412] Separate H-File for configuration parameters	Not applicable (Memory Mapping is specific per build scenario)
[BSW00383] List dependencies of configuration files	Not applicable (Memory Mapping is specific per build scenario)
[BSW00384] List dependencies to other modules	MEMMAP020
[BSW00387] Specify the configuration class of callback function	Not applicable (Memory Mapping is specific per build scenario)
[BSW00388] Introduce containers	Not applicable (Memory Mapping is specific per build scenario)
[BSW00389] Containers shall have names	Not applicable (Memory Mapping is specific per build scenario)
[BSW00390] Parameter content shall be unique within the module	Not applicable (Memory Mapping is specific per build scenario)
[BSW00391] Parameter shall have unique names	Not applicable (Memory Mapping is specific per build scenario)
[BSW00392] Parameters shall have a type	Not applicable (Memory Mapping is specific per build scenario)
[BSW00393] Parameters shall have a range	Not applicable (Memory Mapping is specific per build scenario)
[BSW00394] Specify the scope of the parameters	Not applicable (Memory Mapping is specific per build scenario)
[BSW00395] List the required parameters (per parameter)	Not applicable (Memory Mapping is specific per build scenario)
[BSW00396] Configuration classes	Not applicable (Memory Mapping is specific per build scenario)
[BSW00397] Pre-compile-time parameters	Not applicable (Memory Mapping is specific per build scenario)
[BSW00398] Link-time parameters	Not applicable (Memory Mapping is specific per build scenario)
[BSW00399] Loadable Post-build time parameters	Not applicable (Memory Mapping is specific per build scenario)
[BSW00400] Selectable Post-build time parameters	Not applicable (Memory Mapping is specific per build scenario)
[BSW00402] Published information	MEMMAP019
[BSW00375] Notification of wake-up reason	Not applicable (Memory Mapping is not a BSW module)

Requirement	*Satisfied by*
[BSW101] Initialization interface	Not applicable (Memory Mapping is not a BSW module)
[BSW00416] Sequence of Initialization	Not applicable (Memory Mapping is not a BSW module)
[BSW00406] Check module initialization	Not applicable (Memory Mapping is not a BSW module)
[BSW168] Diagnostic Interface of SW components	Not applicable (Memory Mapping is not a BSW module)
[BSW00407] Function to read out published parameters	Not applicable (Memory Mapping is not a BSW module)
[BSW00423] Usage of SW-C template to describe BSW modules with AUTOSAR Interfaces	Not applicable (Memory Mapping is not a BSW module)
[BSW00424] BSW main processing function task allocation	Not applicable (Memory Mapping is not a BSW module)
[BSW00425] Trigger conditions for schedulable objects	Not applicable (Memory Mapping is not a BSW module)
[BSW00426] Exclusive areas in BSW modules	Not applicable (Memory Mapping is not a BSW module)
[BSW00427] ISR description for BSW modules	Not applicable (Memory Mapping is not a BSW module)
[BSW00428] Execution order dependencies of main processing functions	Not applicable (Memory Mapping is not a BSW module)
[BSW00429] Restricted BSW OS functionality access	Not applicable (Memory Mapping is not a BSW module)
[BSW00431] The BSW Scheduler module implements task bodies	Not applicable (Memory Mapping is not a BSW module)
[BSW00432] Modules should have separate main processing functions for read/receive and write/transmit data path	Not applicable (Memory Mapping is not a BSW module)
[BSW00433] Calling of main processing functions	Not applicable (Memory Mapping is not a BSW module)
[BSW00434] The Schedule Module shall provide an API for exclusive areas	Not applicable (Memory Mapping is not a BSW module)
[BSW00336] Shutdown interface	Not applicable (Memory Mapping is not a BSW module)
[BSW00337] Classification of errors	Not applicable (Memory Mapping is not a BSW module)
[BSW00338] Detection and Reporting of development errors	Not applicable (Memory Mapping is not a BSW module)
[BSW00369] Do not return development error codes via API	Not applicable (Memory Mapping is not a BSW module)
[BSW00339] Reporting of production relevant error status	Not applicable (Memory Mapping is not a BSW module)
[BSW00421] Reporting of production relevant error events	Not applicable (Memory Mapping is not a BSW module)
[BSW00422] Debouncing of production relevant error status	Not applicable (Memory Mapping is not a BSW module)
[BSW00420] Production relevant error event rate detection	Not applicable (Memory Mapping is not a BSW module)
[BSW00417] Reporting of Error Events by Non-Basic Software	Not applicable, (Memory Mapping does not report errors)
[BSW00323] API parameter checking	Not applicable (Memory Mapping is not a BSW module)
[BSW004] Version check	Not applicable (Memory Mapping is not a BSW module)
[BSW00409] Header files for production code error IDs	Not applicable (Memory Mapping is not a BSW module)

Requirement	*Satisfied by*
[BSW00385] List possible error notifications	Not applicable (Memory Mapping is not a BSW module)
[BSW00386] Configuration for detecting an error	Not applicable (Memory Mapping is not a BSW module)
[BSW161] Microcontroller abstraction	Not applicable (non-functional requirement)
[BSW162] ECU layout abstraction	Not applicable (non-functional requirement)
[BSW00324] Do not use HIS I/O Library	Not applicable (non-functional requirement)
[BSW005] No hard coded horizontal interfaces within MCAL	Not applicable (non-functional requirement)
[BSW00415] User dependent include files	Not applicable (non-functional requirement)
[BSW164] Implementation of interrupt service routines	Not applicable (non-functional requirement)
[BSW00325] Runtime of interrupt service routines	Not applicable (Memory Mapping is not a BSW module)
[BSW00326] Transition from ISRs to OS tasks	Not applicable (Memory Mapping is not a BSW module)
[BSW00342] Usage of source code and object code	Not applicable (non-functional requirement)
[BSW00343] Specification and configuration of time	Not applicable (Memory Mapping is not a BSW module)
[BSW160] Human-readable configuration data	Not applicable (Memory Mapping is not a BSW module)
[BSW007] HIS MISRA C	Not applicable, (Memory Mapping is the C-language extension header)
[BSW00300] Module naming convention	Not applicable (Memory Mapping is not a BSW module)
[BSW00413] Accessing instances of BSW modules	Not applicable (Memory Mapping is not a BSW module)
[BSW00347] Naming separation of different instances of BSW drivers	Not applicable (Memory Mapping is not a BSW module)
[BSW00305] Self-defined data types naming convention	Not applicable (Memory Mapping is not a BSW module)
[BSW00307] Global variables naming convention	Not applicable (Memory Mapping is not a BSW module)
[BSW00310] API naming convention	Not applicable (Memory Mapping is not a BSW module)
[BSW00373] Main processing function naming convention	Not applicable (Memory Mapping is not a BSW module)
[BSW00327] Error values naming convention	Not applicable (Memory Mapping is not a BSW module)
[BSW00335] Status values naming convention	Not applicable (Memory Mapping is not a BSW module)
[BSW00350] Development error detection keyword	Not applicable (Memory Mapping is not a BSW module)
[BSW00408] Configuration parameter naming convention	Not applicable (Memory Mapping is not a BSW module)
[BSW00410] Compiler switches shall have defined values	Not applicable (Memory Mapping is not a BSW module)
[BSW00411] Get version info keyword	Not applicable (Memory Mapping is not a BSW module)
[BSW00346] Basic set of module files	Not applicable (Memory Mapping is not a BSW module)

Requirement	*Satisfied by*
[BSW158] Separation of configuration from implementation	Not applicable (Memory Mapping is not a BSW module)
[BSW00314] Separation of interrupt frames and service routines	Not applicable (Memory Mapping is not a BSW module)
[BSW00370] Separation of callback interface from API	Not applicable (Memory Mapping is not a BSW module)
BSW00348] Standard type header	Not applicable (Memory Mapping is not a BSW module)
[BSW00353] Platform specific type header	Not applicable (Memory Mapping is a C-language extension header)
[BSW00361] Compiler specific language extension header	MEMMAP002
[BSW00301] Limit imported information	Not applicable (Memory Mapping is not a BSW module)
[BSW00302] Limit exported information	Not applicable (Memory Mapping is not a BSW module)
[BSW00328] Avoid duplication of code	supported by: MEMMAP001, MEMMAP005
[BSW00312] Shared code shall be reentrant	Not applicable (Memory Mapping is not a BSW module)
[BSW006] Platform independency	supported by: MEMMAP010, MEMMAP004, MEMMAP003, MEMMAP005, MEMMAP006, MEMMAP007, MEMMAP011, MEMMAP013
[BSW00357] Standard API return type	Not applicable (Memory Mapping is not a BSW module)
[BSW00377] Module specific API return types	Not applicable (Memory Mapping is not a BSW module)
[BSW00304] AUTOSAR integer data types	Not applicable (Memory Mapping is not a BSW module)
[BSW00355] Do not redefine AUTOSAR integer data types	Not applicable (Memory Mapping is not a BSW module)
[BSW00378] AUTOSAR boolean type	Not applicable (Memory Mapping is not a BSW module)
[BSW00306] Avoid direct use of compiler and platform specific keywords	supported by: MEMMAP010, MEMMAP004, MEMMAP003, MEMMAP005, MEMMAP006, MEMMAP007, MEMMAP011, MEMMAP013
[BSW00308] Definition of global data	Not applicable (Memory Mapping is not a BSW module)
[BSW00309] Global data with read-only constraint	Not applicable (Memory Mapping is not a BSW module)
[BSW00371] Do not pass function pointers via API	Not applicable (Memory Mapping is not a BSW module)
[BSW00358] Return type of `init()` functions	Not applicable (Memory Mapping is not a BSW module)
[BSW00414] Parameter of init function	Not applicable (Memory Mapping is not a BSW module)
[BSW00414] Parameter of init function	Not applicable (Memory Mapping is not a BSW module)
[BSW00359] Return type of callback functions	Not applicable (Memory Mapping is not a BSW module)
[BSW00360] Parameters of callback functions	Not applicable (Memory Mapping is not a BSW module)
[BSW00329] Avoidance of generic interfaces	Not applicable

Requirement	*Satisfied by*
	(Memory Mapping is not a BSW module)
[BSW00330] Usage of macros / inline functions instead of functions	Not applicable (Memory Mapping is not a BSW module)
[BSW00331] Separation of error and status values	Not applicable (Memory Mapping is not a BSW module)
[BSW009] Module User Documentation	Not applicable (Memory Mapping is not a BSW module)
[BSW00401] Documentation of multiple instances of configuration parameters	Not applicable (Memory Mapping is not a BSW module)
[BSW172] Compatibility and documentation of scheduling strategy	Not applicable (Memory Mapping is not a BSW module)
[BSW010] Memory resource documentation	Not applicable (Memory Mapping is not a BSW module)
[BSW00333] Documentation of callback function context	Not applicable (Memory Mapping is not a BSW module)
[BSW00374] Module vendor identification	MEMMAP019
[BSW00379] Module identification	MEMMAP019
[BSW003] Version identification	MEMMAP019
[BSW00318] Format of module version numbers	MEMMAP019
[BSW00321] Enumeration of module version numbers	MEMMAP019
[BSW00341] Microcontroller compatibility documentation	Not applicable (Memory Mapping is not a BSW module)
[BSW00334] Provision of XML file	Not applicable (Memory Mapping is not a BSW module)

7 Analysis

This chapter does not contain requirements. It just gives an overview to used keywords and their syntax within different compilers. This analysis is required for a correct and complete specification of methods and keywords.

7.1 Memory allocation of variables

Compiler analysis for starting/stopping a memory section for variables:

Compiler	***Required syntax***

Cosmic, S12X	Initialized variables:
	`#pragma section {name}`
	`#pragma section {}`
	
	Non Initialized variables:
	`#pragma section [name]`
	`#pragma section []`

Metrowerks, S12X	`#pragma DATA_SEG" (<Modif> <Name> | "DEFAULT")`
	<Modif>: Some of the following strings may be used:
	`SHORT, __SHORT_SEG,`
	`DIRECT, __DIRECT_SEG,`
	`NEAR, __NEAR_SEG,`
	`FAR, __FAR_SEG,`
	`DPAGE, __DPAGE_SEG,`
	`RPAGE, __RPAGE_SEG`
	Pragma shall be used in definition and declaration.

Tasking, ST10	`#pragma class mem=name`
	`#pragma combine mem=ctype`
	`#pragma align mem=atype`
	`#pragma noclear`
	
	`#pragma default_attributes`
	`#pragma clear`
	
	atype is one of the following align types:
	B Byte alignment
	W Word alignment
	P Page alignment
	S Segment alignment
	C PEC addressable
	I IRAM addressable
	
	ctype is one of the following combine types:
	L private ('Local')
	P Public
	C Common
	G Global
	S Sysstack
	U Usrstack
	A address Absolute section AT constant address
	`(decimal, octal or hexadecimal number)`

Tasking, TC1796	`#pragma pack 0 / 2` packing of structs. Shall be visible at type declaration

Compiler	*Required syntax*

	`#pragma section type "string"`
	`#pragma noclear`
	
	`#pragma clear`
	
	`#pragma for_extern_data_use_memory`
	`#pragma for_initialized_data_use_memory`
	`#pragma for_uninitialized_data_use_memory`

GreenHills, V850	`#pragma align (n)`
	`#pragma alignvar (n)`
	`#pragma ghs section sect=”name”`
	`#pragma ghs section sect =default`
	Section Keyword: `data, sdata, tdata, zdata, bss, sbss, zbss`

ADS, ST30	`#pragma arm section [sort_type[[=]"name"]] [,sort_type="name"]*`
	`sort_type="rwdata, zidata`
	`alignment control via key words:`
	`__packed, __align()`

DIABDATA, MPC5554	`#pragma section class_name [init_name] [uninit_name] [address_mode] [access]`
	`#pragma section class_name`
	Pragma shall be used before declaration.
	
	`class_name for variables:`
	`BSS, DATA, SDATA`

7.2 Memory allocation of constant variables

Compiler analysis for starting/stopping a memory section for constant variables:

Compiler	*Required syntax*
Cosmic, S12X	`#pragma section const {name}` `#pragma section const {}`

Metrowerks, S12X	`#pragma CONST_SEG” (<Modif> <Name> | “DEFAULT”)`
	<Modif>: Some of the following strings may be used:
	`PPAGE, __PPAGE_SEG,`
	`GPAGE, __GPAGE_SEG`
	Pragma shall be used in definition and declaration.

Tasking, ST10	`#pragma class mem=name`
	`#pragma align mem=atype`
	`#pragma combine mem=ctype`
	`#pragma default_attributes`
	
	atype is one of the following align types:
	B Byte alignment
	W Word alignment
	P Page alignment
	S Segment alignment
	C PEC addressable
	I IRAM addressable
	
	ctype is one of the following combine types:
	L private ('Local')
	P Public
	C Common

Compiler	*Required syntax*
	G Global S Sysstack U Usrstack A address Absolute section AT constant address (decimal, octal or hexadecimal number)

Tasking, TC1796	`#pragma pack 0 / 2`
	Packing of structs. Shall be visible at type declaration
	
	`#pragma section type "string"`
	`#pragma for_constant_data_use_memory`

GreenHills, V850	`#pragma ghs section sect=”name”`
	`#pragma ghs section sect =default`
	Section Keyword: `rodata, rozdata, rosdata`

ADS, ST30	`#pragma arm section [sort_type[[=]"name"]] [,sort_type="name"]*`
	`sort_type="rodata`
	
	alignment control via key words:
	`__packed, __align()`

DIABDATA, MPC5554	`#pragma section class_name [init_name] [uninit_name] [address_mode] [access]`
	`#pragma section class_name`
	Pragma shall be used before declaration.
	
	class_name for constant variables:
	`CONST, SCONST, STRING`

7.3 Memory allocation of code

Compiler analysis for starting/stopping a memory section for code::

Compiler	*Required syntax*
Cosmic, S12X	`#pragma section ( name )` `#pragma section ()`

Metrowerks, S12X	`#pragma CODE_SEG” (<Modif> <Name> | “DEFAULT”)`
	<Modif>: Some of the following strings may be used:
	`DIRECT, __DIRECT_SEG,`
	`NEAR, __NEAR_SEG,`
	`CODE, __CODE_SEG,`
	`FAR, __FAR_SEG,`
	`PPAGE, __PPAGE_SEG,`
	`PIC, __PIC_SEG`
	Pragma shall be used in definition and declaration.

Tasking, ST10	`#pragma class mem=name`
	`#pragma combine mem=ctype`
	`#pragma default_attributes`
	
	ctype is one of the following combine types:
	L private ('Local')
	P Public
	C Common
	G Global
	S Sysstack
	U Usrstack
	A address Absolute section AT constant address

Compiler	***Required syntax***

Tasking, TC1796	`#pragma section code "string"`
	`#pragma section code_init`
	`#pragma section const_init`
	`#pragma section vector_init`
	`#pragma section data_overlay`
	`#pragma section type[=]"name"`
	`#pragma section all`

GreenHills, V850	`#pragma ghs section sect=”name”`
	`#pragma ghs section sect =default`
	Section Keyword: `text`

ADS, ST30	`#pragma arm section [sort_type[[=]"name"]]`
	`[,sort_type="name"]*`
	
	`sort_type``="code"`

DIABDATA, MPC5554	`#pragma section class_name [init_name]`
	`[uninit_name] [address_mode] [access]`
	`#pragma section class_name`
	Pragma shall be used before declaration.
	
	`class_name` for code:
	`CODE`

8 Functional specification

8.1 General issues

The memory mapping files include the compiler and linker specific keywords for memory allocation into header and source files. These keywords control the assignment of variables and functions to specific sections. Thereby implementations are independent from compiler and microcontroller specific properties.
The assignment of the sections to dedicated memory areas / address ranges is not the scope of the memory mapping file and is typically done via linker control files.

[MEMMAP001] 「For each build scenario (e.g. Boot loader, ECU Application) an own set of memory mapping files has to be provided.」(BSW00328)

[MEMMAP002] 「The memory mapping file name shall be 'MemMap.h' for basic software modules and "<SWC>_MemMap.h" for software components where <SWC> is the name of the software component type.」(BSW00361)

[MEMMAP010] 「If a compiler/linker does not require or support requisite functionality of SWS Memory Mapping, the Memory Allocation Keyword defines shall be undefined without further effect.」(BSW006, BSW00306)

For instance:

```
#ifdef EEP_START_SEC_VAR_CLEARED_16
    #undef EEP_START_SEC_VAR_CLEARED_16
#endif
```

As described in MEMMAP029 the number of files depends on the number of `SwComponentTypes` in the input configuration. To determine the number of `MemorySections` the applicable `SwcImplementations` have to be known. These are described in an AUTOSAR environment with the `SwcToImplMapping` in the `SystemMapping` and / or via ECU Configuration values `RteImplementationRef` in a `RteSwComponentType` container.
Knowing the `SwcImplementations` provides as well the number of `MemorySections` which have to be identified for MEMMAP027. For more details about the content of a `SwcImplementation` see document [5] and [4]

Further on the total number of used `MemorySections` depends as well on the number of used BSW modules. These can be determined by the M1 instance of the `EcucValueCollection` which refers to the MemMap's `EcucModuleConfigurationValues`. This `EcucValueCollection` refers as well to `EcucModuleConfigurationValues` of other Bsw Modules which refer again to `BswImplementations` via `moduleDescription` references.

Knowing the `BswImplementations` provides as well the number of `MemorySections` which have to be identified for MEMMAP026. For more details about the content of a `BswImplementation` see document [4]

In [7] further information is provided how Memory Mapping is used in the AUTOSAR Methodology.

8.2 Mapping of variables and code

8.2.1 Requirements on implementations using memory mapping header files for BSW Modules and Software Components

Recommendation A:

Each AUTOSAR basic software module and software component shall support the configuration of at least the following different memory types as described in Tabelle 8-1 and Tabelle 8-2.

It is allowed to add module specific sections as they are mapped and thus are configurable within the module's configuration file.

The shortcut '<ALIGNMENT>' means the variable alignment. In order to avoid memory gaps in the allocation variables are allocated according their size. Possible ALIGNMENT postfixes are

BOOLEAN, used for variables and constants of size 1 bit
8, used for variables and constants which have to be aligned to 8 bit. For instance used for variables and constants of size 8 bit or used for composite data types: arrays, structs and unions containing elements of maximum 8 bits.

16, used for variables and constants which have to be aligned to 16 bit. For instance used for variables and constants of size 16 bit or used for composite data types: arrays, structs and unions containing elements of maximum 16 bits

32, used for variables and constants which have to be aligned to 32 bit. For instance used for variables and constants of size 32 bit or used for composite data types: arrays, structs and unions containing elements of maximum 32 bits.

UNSPECIFIED, used for variables, constants, structure, array and unions when SIZE (alignment) does not fit the criteria of 8,16 or 32 bit.
For instance used for variables and constants of unknown size

In case structures and unions, it shall be allowed to use an alignment larger than the bit size of the elements. For instance to facilitate copy instruction a structure may have minimum 2 byte alignment, even if members are byte aligned. In this case, it should be possible to use alignment 16 bit instead of 8 bit for this structure.

Please note that the values 8BIT, 16BIT, 32BIT are changed to 8, 16, 32 in order to reach a harmonization with Meta Model attributes. These values are classified as deprecated.

The shortcut '<INIT_POLICY>' means the initialization policy of variables. Possible INIT_POLICY postfixes are:

- NO_INIT, used for variables that are never cleared and never initialized.
- CLEARED, used for variables that are cleared to zero after every reset.
- POWER_ON_CLEARED, used for variables that are cleared to zero only after power on reset.
- INIT, used for variables that are initialized with values after every reset.
- POWER_ON_INIT, used for variables that are initialized with values only after power on reset.

[MEMMAP022] 「The keywords to be used before inclusion of the memory mapping header file shall use the templates <PREFIX>_START_SEC_<NAME> or <PREFIX>_STOP_SEC_<NAME>
Where:

- <PREFIX> is composed according <snp>[_<vi>_<ai>] for basic software modules where
  - <snp> is the *Section Name Prefix* which shall be the Module Abbreviation from the BSW Module list (e.g. 'EEP' or 'CAN') in upper case letters of the BSW module. For the generation of the MemMap.h file following rules apply:
    - <snp> shall be the `BswModuleDescription`'s `shortName` converted in upper case letters if **no** `SectionNamePrefix` is defined for the `MemorySection`.
    - <snp> shall be the symbol of the `SectionNamePrefix` associated to the `MemorySection` if **a** `SectionNamePrefix` is defined for the `MemorySection`.
  - <vi> is the `vendorId` of the BSW module
  - <ai> is the `vendorApiInfix` of the BSW module

  The sub part in squared brackets [_<vi>_<ai>] is omitted if no `vendorApiInfix` is defined for the Basic Software Module which indicates that it does not use multiple instantiation.
- <PREFIX> is the `shortName` of the software component type for software components (case sensitive)
- <NAME> is the `shortName` of the `MemorySection` described in Basic Software Module Description or a Software Component Description (case sensitive) if the `MemorySection` has **no** `symbol` attribute defined.
- <NAME> is the `symbol` of the `MemorySection` described in Basic Software Module Description or a Software Component Description (case sensitive) if the `MemorySection` has **a** `symbol` attribute defined.」()

Please note if the Memory Allocation Keywords shall appear in capital letters in the code the related Memory Sections in the BSWMD or SWC Descriptions have to be named with capital letters.

Memory Section Type / Section Initialization Policy	***Syntax of Memory Allocation Keyword***	***Comments***
VAR / <INIT_ POLICY>	<PREFIX>_START_SEC_VAR_<INIT_POLICY>_<ALIGNMENT>	To be used for all global or static variables.
	<PREFIX>_STOP_SEC_VAR_<INIT_POLICY>_<ALIGNMENT>	
VAR / <INIT_ POLICY>	<PREFIX>_START_SEC_VAR_FAST_<INIT_POLICY>_<ALIGNMENT>	To be used for all global or static variables that have at least one of the following properties: • accessed bitwise • frequently used • high number of accesses in source code Some platforms allow the use of bit instructions for variables located in this specific RAM area as well as shorter addressing instructions. This saves code and runtime.
	<PREFIX>_STOP_SEC_VAR_FAST_<INIT_POLICY>_<ALIGNMENT>	
VAR / <INIT_ POLICY>	<PREFIX>_START_SEC_VAR_SLOW_<INIT_POLICY>_<ALIGNMENT>	To be used for all infrequently accessed global or static variables.
	<PREFIX>_STOP_SEC_VAR_SLOW_<INIT_POLICY>_<ALIGNMENT>	
VAR / <INIT_ POLICY>	<PREFIX>_START_SEC_INTERNAL_VAR_<INIT_POLICY>_<ALIGNMENT>	To be used for global or static variables those are accessible from a calibration tool.
	<PREFIX>_STOP_SEC_INTERNAL_VAR_<INIT_POLICY>_<ALIGNMENT>	
VAR / NO-INIT	<PREFIX>_START_SEC_VAR_NOINIT_<ALIGNMENT>	To be used for all global or static variables that are never initialized. This section is **DEPRECATED** and shall not be used in future development. [1]
	<PREFIX>_STOP_SEC_VAR_NOINIT_<ALIGNMENT>	
VAR / POWER-ON-INIT	<PREFIX>_START_SEC_VAR_POWER_ON_INIT_<ALIGNMENT>	To be used for all global or static variables that are initialized with values only after power on reset. This section is **DEPRECATED** and shall not be used in future development.[1]
	<PREFIX>_STOP_SEC_VAR_POWER_ON_INIT_<ALIGNMENT>	

[1] This section was replaced by the generic definition of <PREFIX>_START_SEC_VAR_<INIT_POLICY>_<ALIGNMENT>.

Memory Section Type / Section Initialization Policy	*Syntax of Memory Allocation Keyword*	*Comments*
VAR / POWER-ON-CLEARED	<PREFIX>_START_SEC_VAR_POWER_ON_CLEARED_<ALIGNMENT> <PREFIX>_STOP_SEC_VAR_POWER_ON_CLEARED_<ALIGNMENT>	To be used for all global or static variables that are cleared to zero only after power on reset. This section is **DEPRECATED** and shall not be used in future development. [1]
VAR / INIT	<PREFIX>_START_SEC_VAR_<ALIGNMENT> <PREFIX>_STOP_SEC_VAR_<ALIGNMENT>	To be used for global or static variables that are initialized with values after every reset. This section is **DEPRECATED** and shall not be used in future development. [1]
VAR / CLEARED	<PREFIX>_START_SEC_VAR_CLEARED_<ALIGNMENT> <PREFIX>_STOP_SEC_VAR_CLEARED_<ALIGNMENT>	To be used for global or static variables that are cleared to zero after every reset (the normal case). This section is **DEPRECATED** and shall not be used in future development. [1]
VAR / INIT	<PREFIX>_START_SEC_VAR_FAST_<ALIGNMENT> <PREFIX>_STOP_SEC_VAR_FAST_<ALIGNMENT>	To be used for all global or static variables that have at least one of the following properties: • accessed bitwise • frequently used • high number of accesses in source code Some platforms allow the use of bit instructions for variables located in this specific RAM area as well as shorter addressing instructions. This saves code and runtime. Variables are initialized with values after every reset (the normal case). This section is **DEPRECATED** and shall not be used in future development.[2]
VAR / CLEARED	<PREFIX>_START_SEC_VAR_FAST_CLEARED_<ALIGNMENT>	To be used for all global or static variables that have at

[2] This section was replaced by the generic definition of <PREFIX>_START_SEC_VAR_FAST_<INIT_POLICY>_<ALIGNMENT>.

Memory Section Type / Section Initialization Policy	*Syntax of Memory Allocation Keyword*	*Comments*
	<PREFIX>_STOP_SEC_VAR_FAST_CLEARED_<ALIGNMENT>	least one of the following properties: • accessed bitwise • frequently used • high number of accesses in source code Some platforms allow the use of bit instructions for variables located in this specific RAM area as well as shorter addressing instructions. This saves code and runtime. Variables are initialized to zero after every reset (the normal case). This section is **DEPRECATED** and shall not be used in future development.[2]
VAR / INIT	<PREFIX>_START_SEC_INTERNAL_VAR_<ALIGNMENT> <PREFIX>_STOP_SEC_INTERNAL_VAR_<ALIGNMENT>	To be used for global or static variables that are accessible from a calibration tool and initialized with values after every reset. This section is **DEPRECATED** and shall not be used in future development.[3]
VAR / CLEARED	<PREFIX>_START_SEC_INTERNAL_VAR_CLEARED_<ALIGNMENT> <PREFIX>_STOP_SEC_INTERNAL_VAR_CLEARED_<ALIGNMENT>	To be used for global or static variables that are accessible from a calibration tool and cleared to zero after every reset. This section is **DEPRECATED** and shall not be used in future development.[3]
VAR / NO-INIT	<PREFIX>_START_SEC_VAR_SAVED_ZONE<X>_<ALIGNMENT> <PREFIX>_STOP_SEC_VAR_SAVED_ZONE<X>_<ALIGNMENT>	To be used for RAM buffers of variables saved in non volatile memory.
CONST / --	<PREFIX>_START_SEC_CONST_SAVED_RECOVERY_ZONE<X> <PREFIX>_STOP_SEC_CONST_SAVED_RECOVERY_ZONE<X>	To be used for ROM buffers of variables saved in non volatile memory.

[3] This section was replaced by the generic definition of <PREFIX>_START_SEC_INTERNAL_VAR_<INIT_POLICY>_<ALIGNMENT>.

Memory Section Type / Section Initialization Policy	*Syntax of Memory Allocation Keyword*	*Comments*
CONST / --	<PREFIX>_START_SEC_VAR_SAVED_RECOVERY_ZONE<X>	To be used for ROM buffers of variables saved in non volatile memory. This section is **DEPRECATED** and shall not be used in future development.[4]
	<PREFIX>_STOP_SEC_VAR_SAVED_RECOVERY_ZONE<X>	
CONST / --	<PREFIX>_START_SEC_CONST_<ALIGNMENT>	To be used for global or static constants.
	<PREFIX>_STOP_SEC_CONST_<ALIGNMENT>	
CAL-PRM / --	<PREFIX>_START_SEC_CALIB_<ALIGNMENT>	To be used for calibration constants.
	<PREFIX>_STOP_SEC_CALIB_<ALIGNMENT>	
CONST / --	<PREFIX>_START_SEC_CARTO_<ALIGNMENT>	To be used for cartography constants.
	<PREFIX>_STOP_SEC_CARTO_<ALIGNMENT>	
CONFIG-DATA / --	<PREFIX>_START_SEC_CONFIG_DATA_<ALIGNMENT> <PREFIX>_STOP_SEC CONFIG_DATA_<ALIGNMENT>	Constants with attributes that show that they reside in one segment for module configuration.

Tabelle 8-1 data sections

[MEMMAP021] 「There are different kinds of execution code sections. This code sections shall be identified with dedicated keywords. If a section is not supported by the integrator and micro controller then be aware that the keyword is ignored. The table below defines the keyword to be used for each code section:

Memory Section Type / Section Initialization Policy	*Syntax of Memory Allocation Keyword*	*Comments*
CODE / --	<PREFIX>_START_SEC_CODE	To be used for mapping code to application block, boot block, external flash etc.
	<PREFIX>_STOP_SEC_CODE	
CODE / --	<PREFIX>_START_SEC_CALLOUT_CODE	To be used for mapping callouts of the BSW Modules
	<PREFIX>_STOP_SEC_CALLOUT_CODE	
CODE / --	<PREFIX>_START_SEC_CODE_FAST[_<NUM>]	To be used for code that shall go into fast code memory segments. The optional suffix [_<NUM>] can qualify the expected access commonness, e.g. typical period of code execution.
	<PREFIX>_STOP_SEC_CODE_FAST[_<NUM>]	
CODE / --	<PREFIX>_START_SEC_CODE_SLOW	To be used for code that shall go into slow code memory segments.
	<PREFIX>_STOP_SEC_CODE_SLOW	
CODE / --	<PREFIX>_START_SEC_CODE_LIB	To be used for code that shall go into library segments for BSW module or Software Component.
	<PREFIX>_STOP_SEC_CODE_LIB	

[4] This section was replaced by the definition of <PREFIX>_START_SEC_CONST_SAVED_RECOVERY_ZONE<X>.

Tabelle 8-2 code sections」()

[MEMMAP003]「Each AUTOSAR basic software module and software component shall wrap declaration and definition of code, variables and constants using the following mechanism:

1. Definition of start symbol for module memory section
2. Inclusion of the memory mapping header file
3. Declaration/definition of code, variables or constants belonging to the specified section
4. Definition of stop symbol for module memory section
5. Inclusion of the memory mapping header file

For code which is invariably implemented as inline function the wrapping with Memory Allocation Keywords is not required.」(BSW006, BSW00306)

Application hint:
For code which is implemented with the `LOCAL_INLINE` macro of the “Compiler.h” the wrapping with Memory Allocation Keywords is required. In the case that the `LOCAL_INLINE` is set to the inline keyword of the compiler the related Memory Allocation Keywords shall not define any linker section assignments or change the addressing behavior because this is already set by the environment of the calling function where the code is inlined. In the case that the `LOCAL_INLINE` is set to empty the related Memory Allocation Keywords shall be configured like for regular code.
For code which his implemented with the `INLINE` macro of the “Compiler.h” the wrapping with Memory Allocation Keywords is required at least for the code which is remaining if `INLINE` is set to empty.

Please note as well that in the Basic Software Module Description the `MemorySection` related to the used Memory Allocation Keywords has to document the usage of `INLINE` and `LOCAL_INLINE` in the option attribute. For further information see [4].

The inclusion of the memory mapping header files within the code is a MISRA violation. As neither executable code nor symbols are included (only pragmas) this violation is an approved exception without side effects.

The start and stop symbols for section control are configured with section identifiers defined in the inclusion of memory mapping header file. For details on configuring sections see “Configuration specification”

For example (BSW Module):

```
#define EEP_START_SEC_VAR_INIT_16
#include “MemMap.h”
static uint16 EepTimer = 100;
static uint16 EepRemainingBytes = 16;
#define EEP_STOP_SEC_VAR_INIT_16
#include “MemMap.h”
```

For example (SWC):

```
#define Abc_START_SEC_CODE
#include “Abc_MemMap.h”
/* --- Write a Code here */
#define Abc_STOP_SEC_CODE
#include “Abc_MemMap.h”
```

[MEMMAP018] 「Each AUTOSAR basic software module and software component shall support, for all C-objects, the configuration of the assignation to one of the memory types (code, variables and constants). 」()

Application hint:
An implicit assignment of objects to default sections is not allowed because properties of default sections are platform and tool dependent and therefore these implementations are not platform independent.

[MEMMAP023] 「Memory mapping header files shall not be included inside the body of a function.」()

The goal of this requirement is to support compiler which do not support #pragma inside the body of a function. To force a special memory mapping of a function’s static variable, this variable must be moved to file static

8.2.2 Requirements on memory mapping header files

[MEMMAP005] 「The memory mapping header files shall provide a mechanism to select different code, variable or constant sections by checking the definition of the module specific Memory Allocation Key Words for starting a section (see Recommendation A:). Code, variables or constants declared after this selection shall be mapped to this section. 」(BSW00328, BSW006, BSW00306)

[MEMMAP026] 「The BSW memory mapping header file ‘MemMap.h’ shall support the Memory Allocation Keywords to start and to stop a section for each `MemorySection` defined in a `BswImplementation` which is part of the input configuration.」()

[MEMMAP027] 「The software component type specific memory mapping header file '<SWC>_MemMap.h' shall support the Memory Allocation Keywords to start and to stop a section for each `MemorySection` defined in a `SwcImplementation` associated of this software component type.」()

[MEMMAP015] 「The selected section shall be activated, if the section macro is defined before include of the memory mapping header file.」()

[MEMMAP016] 「The selection of a section shall only influence the linker's behavior for one of the three different object types code, variables or constants concurrently.」()

Application hint:
On one side the creation of combined sections (for instance code and constants) is not allowed. For the other side the set-up of the compiler / linker must be done in a way, that only the settings of the selected section type is changed. For instance the set-up of the code section shall not influence the configuration of the constant section and other way around.

For instance:

```
#ifdef EEP_START_SEC_VAR_INIT_16
    #undef EEP_START_SEC_VAR_INIT_16
    #define START_SECTION_DATA_INIT_16
#elif
/*
   additional mappings of modules sections into project
   sections
*/
...
#endif


#ifdef START_SECTION_DATA_INIT_16
    #pragma section data "sect_data16"
    #undef START_SECTION_DATA_INIT_16
    #undef MEMMAP_ERROR
#elif
/*
   additional statements for switching the project sections
*/
...
#endif
```

Application hint:

Those code or variables sections can be used for the allocation of objects from more than one module.
Those code or variables sections can be used for the allocation of objects from different module specific code or variable sections of one module.

[MEMMAP006] 「The memory mapping header files shall provide a mechanism to deselect different code and variable sections by checking the definition of the module specific Memory Allocation Key Words for stopping a section (see Recommendation A:). Code or variables declared after this selection shall be mapped to default section. The selected section shall be deactivated if the section macro is defined before include of the memory mapping header file. 」(BSW006, BSW00306)

For instance:
```
#ifdef EEP_STOP_SEC_CODE
    #undef EEP_STOP_SEC_CODE
    #define STOP_SECTION_COMMON_CODE
#elif
/*
   additional mappings of modules sections into project
   sections
*/
...
#endif


/* additional module specific mappings */
...

#ifdef STOP_SECTION_COMMON_CODE
    #pragma section code restore
    #undef STOP_SECTION_COMMON_CODE
    #undef MEMMAP_ERROR
#elif
/*
   additional statements for switching the project sections
*/
#endif
```

[MEMMAP007] 「The memory mapping header files shall check if they have been included with a valid memory mapping symbol and in a valid sequence (no START preceded by a START, no STOP without the corresponding START). This shall be done by a preprocessor check.」(BSW006, BSW00306)

For instance:
```
#define MEMMAP_ERROR
```

```
/*
   mappings of modules sections into project sections and
   statements for switching the project sections
*/

...
#elif STOP_SECTION_COMMON_CODE
    #pragma section code restore
    #undef STOP_SECTION_COMMON_CODE
    #undef MEMMAP_ERROR
#endif

#ifdef MEMMAP_ERROR
  #error "MemMap.h, wrong pragma command"
#endif
```

[MEMMAP011]「The memory mapping header files shall undefine the module or software component specific Memory Allocation Key Words for starting or stopping a section.」(BSW006, BSW00306)

For instance:

```
#ifdef EEP_STOP_SEC_CODE
    #undef EEP_STOP_SEC_CODE
```

[MEMMAP013]「The memory mapping header files shall use if-else structures to reduce the compilation effort.」(BSW006, BSW00306)

For instance:

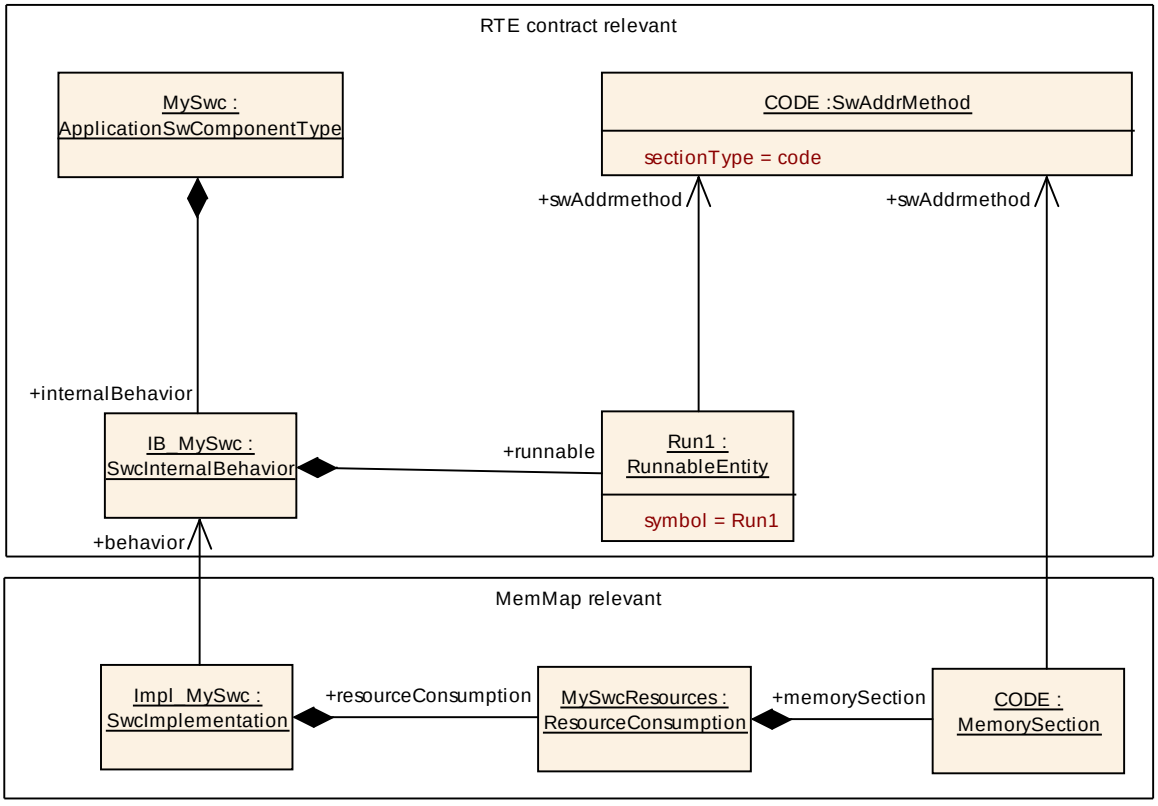
```
#define MEMMAP_ERROR
...
/* module and ECU specific section mappings */
#if defined START_SECTION_COMMON_CODE
    #pragma section ftext
    #undef START_SECTION_COMMON_CODE
    #undef MEMMAP_ERROR
#elif defined START_SECTION_UNBANKED_CODE
    #pragma section code text
    #undef START_SECTION_UNBANKED_CODE
    #undef MEMMAP_ERROR
#elif defined ...
...

#endif
```

8.3 Examples

The examples in this section shall illustrate the relationship between the Basic Software Module Descriptions, Software Component Descriptions, the ECU configuration of the Memory Mapping and the Memory Mapping header files.

8.3.1 Code Section

The following example shows `ApplicationSwComponentType` “MySwc” which contains in its `SwcInternalBehavior` a `RunnableEntity` “Run1”.
The `RunnableEntity` “Run1” references the `SwAddrMethod` “CODE” which `sectionType` attribute is set to `code`. This expresses the request to allocate the `RunnableEntity` code into a code section with the name CODE.



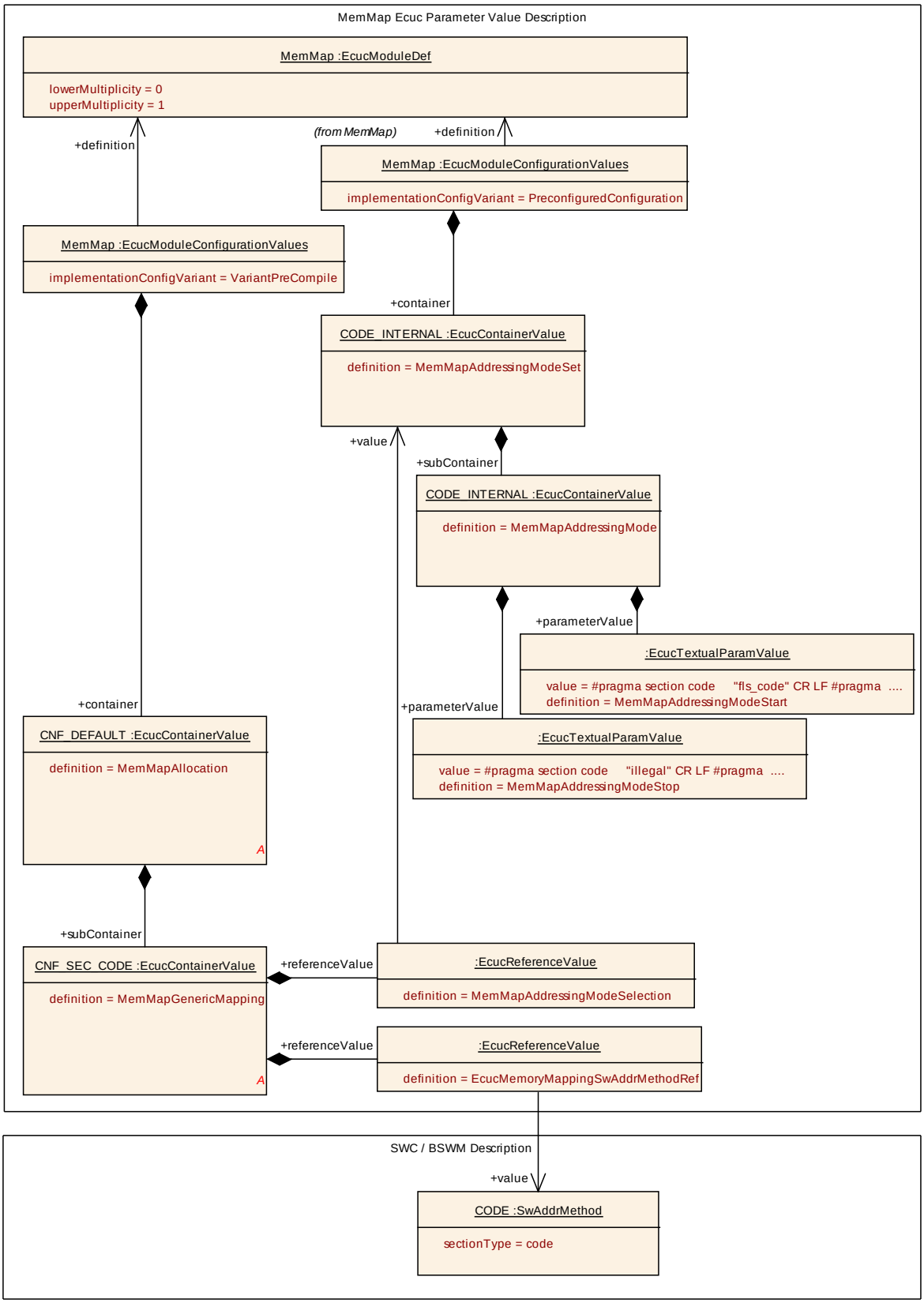
According the SWS RTE the Runnable Entity prototype in the Application Header File of the software component is emitted as:

```
/* Runnable Entity prototype in Application Header File
   Rte_MySwc.h according rte_sws_7194 */

#define MySwc_START_SEC_CODE
```

```
#include "MySwc_MemMap.h"

FUNC(void, MySwc_CODE) Run1 (void);

#define MySwc_STOP_SEC_CODE
#include "MySwc_MemMap.h"
```

Please note that the same Memory Allocation Keywords have to be used for the function definition of “Run1” and all other functions of the Software Component which shall be located to same `MemorySection`.

The `SwcImplementation` “Impl_MySwc” associated with the `ApplicationSwComponentType` “MySwc” defines that it uses a `MemorySection` named CODE. The `MemorySection` “CODE” refers to `SwAddrMethod` “CODE”. This indicates that the module specific (abstract) memory section CODE share a common addressing strategy defined by `SwAddrMethod` “CODE”.



With the means of the MemMapGenericMapping “CNF_SEC_CODE” Memory Mapping is configured that all module specific (abstract) memory sections referring to SwAddrMethod “CODE” are using the MemMapAddressingModeSet

“CODE_INTERNAL”. MemMapAddressingModeSet “CODE_INTERNAL” defines the proper statements to start and to stop the mapping of code to the specific linker sections by the usage of the related Memory Allocation Keywords.

With this information of the Memory Allocation Header for the Software Component can be generated like:

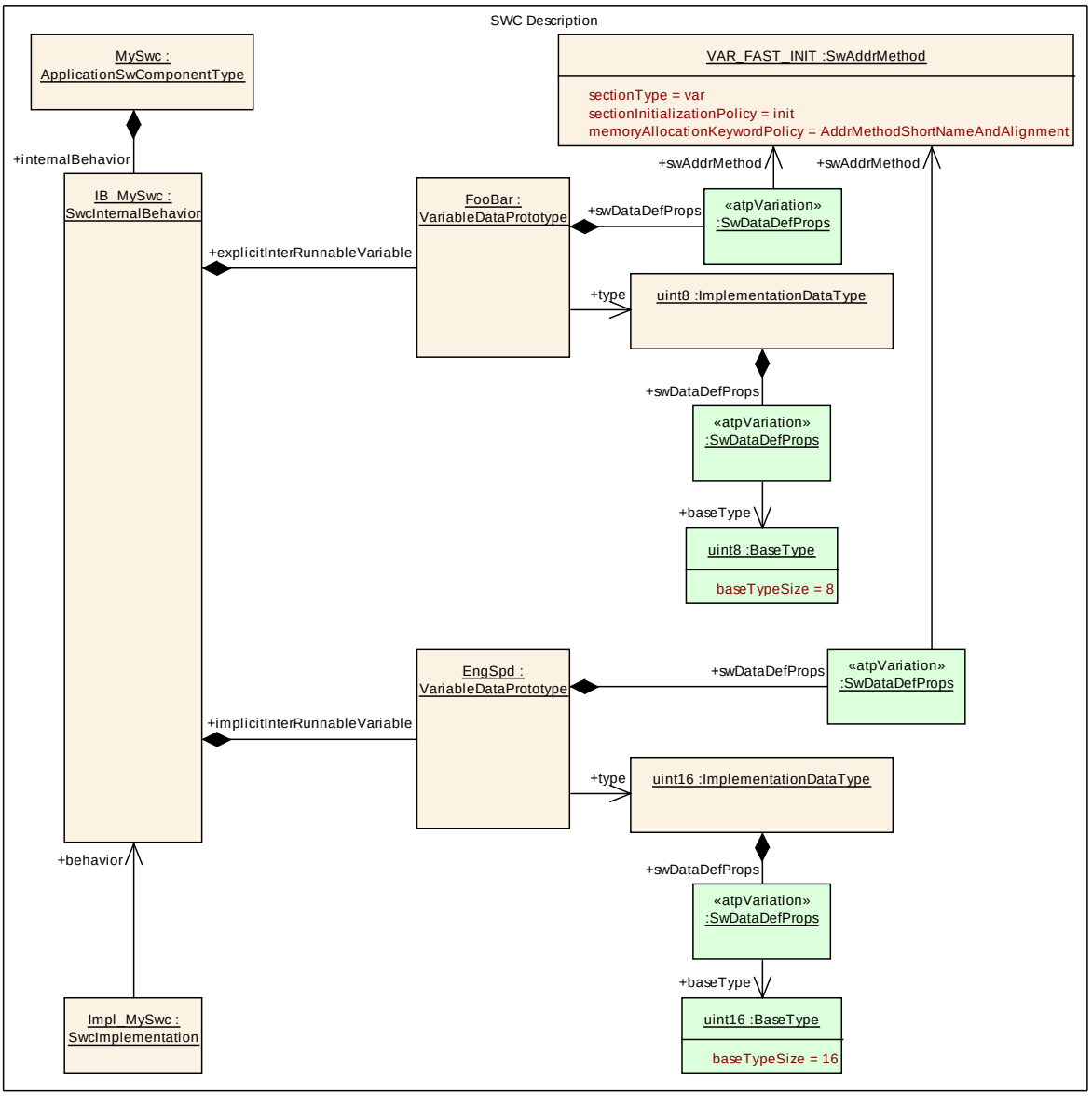
```
/* MemMap Header file MySwc_MemMap.h*/
/*MEMMAP022*/

#ifdef MySwc_START_SEC_CODE
#pragma section_code "fls_code"
#pragma ...
    #undef MySwc_START_SEC_CODE

#ifdef MySwc_STOP_SEC_CODE
#pragma section_code "illegal"
    #undef MySwc_STOP_SEC_CODE
```

8.3.2 Fast Variable Section

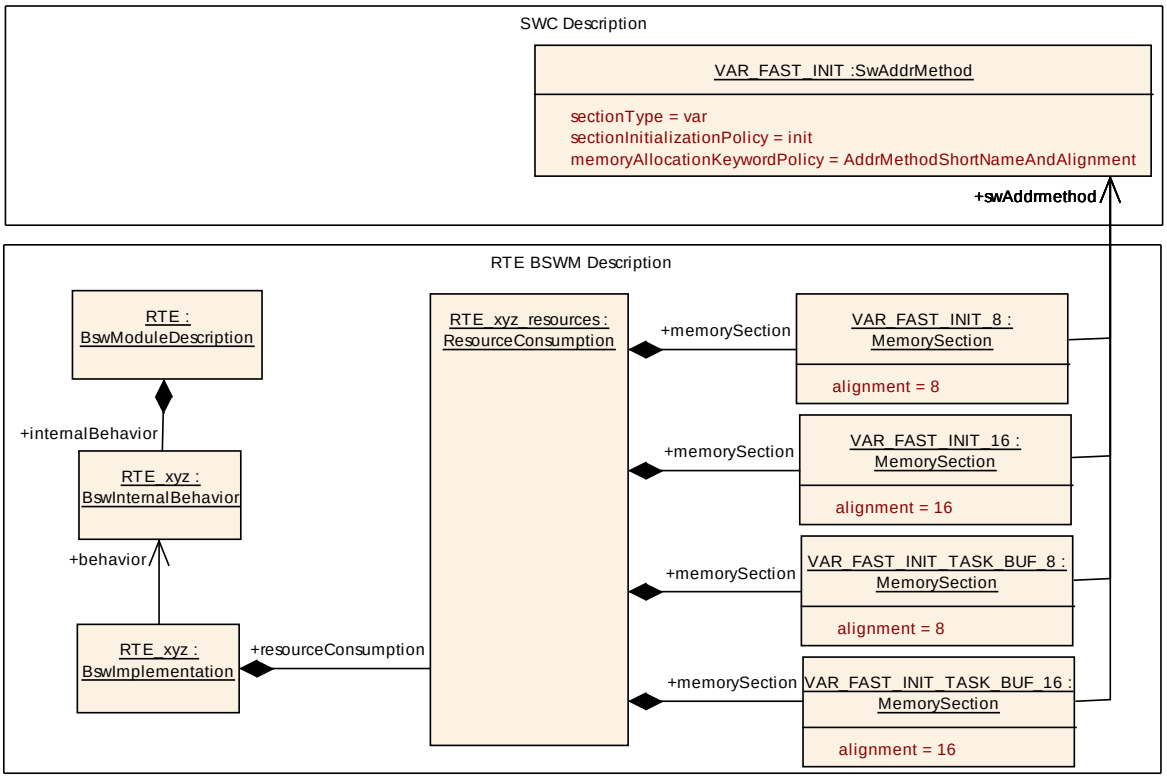
The following example shows `ApplicationSwComponentType` “MySwc” which contains in its `SwcInternalBehavior` two `VariableDataPrototypes` “FooBar” and “EngSpd”.
The `VariableDataPrototype` “FooBar” references a `ImplementationDataType` which is associated to a `SwBaseType` defining `baseTypeSize` = 8. This denotes a variable size of 8 bit for the data implementing “FooBar”.
The `VariableDataPrototype` “EngSpd” references a `ImplementationDataType` which is associated to a `SwBaseType` defining `baseTypeSize` = 16. This denotes a variable size of 16 bit for the data implementing “EngSpd”.

Both `VariableDataPrototypes` references the `SwAddrMethod` “VAR_FAST” which `sectionType` attribute is set to `var` and the `memoryAllocationKeywordPolicy` is set to `AddrMethodShortNameAndAlignment`.

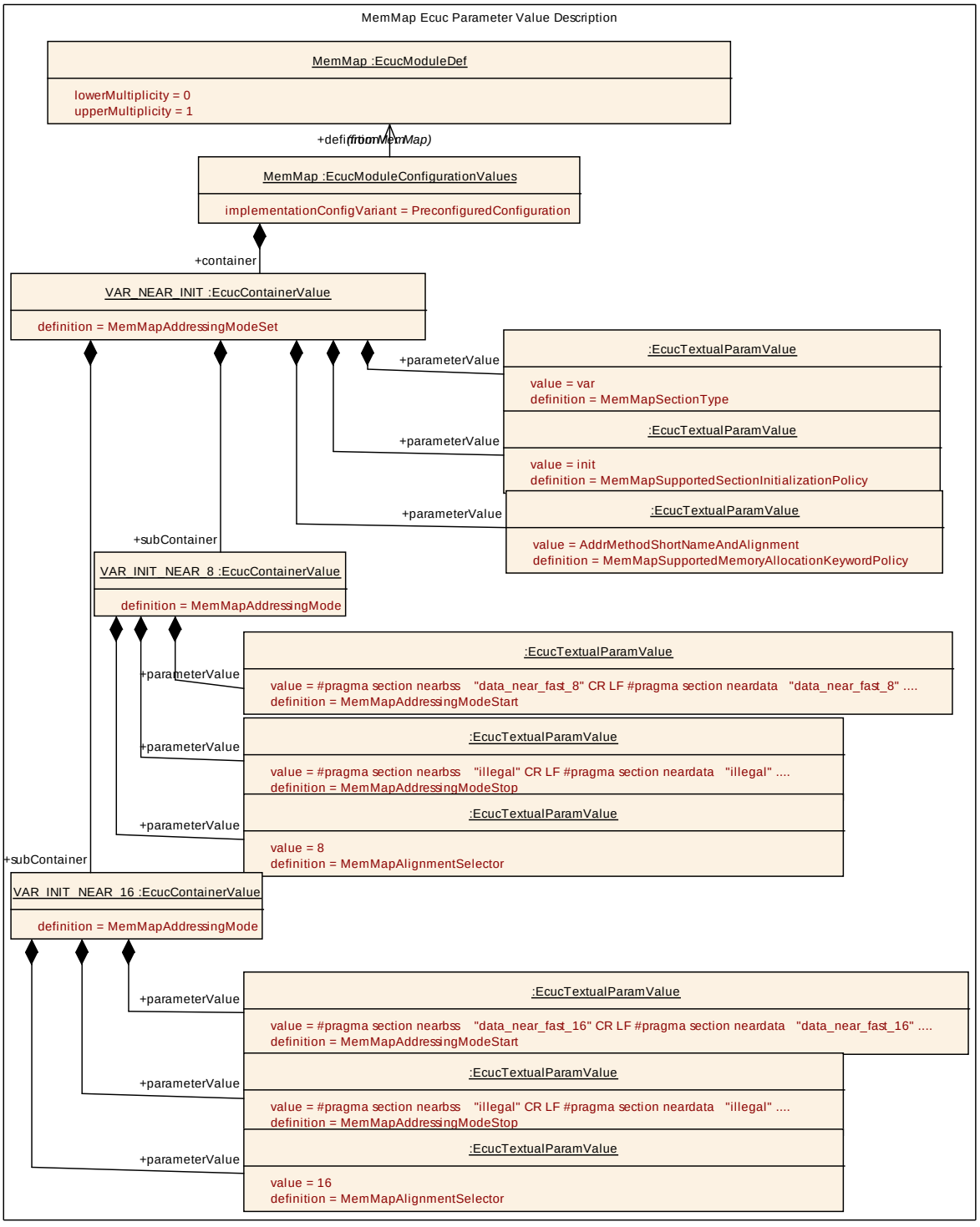
This denotes that the variables implementing the associated `VariableDataPrototypes` have to be sorted according their size into different `MemorySections`. The code section with the names shall contain “VAR_FAST”



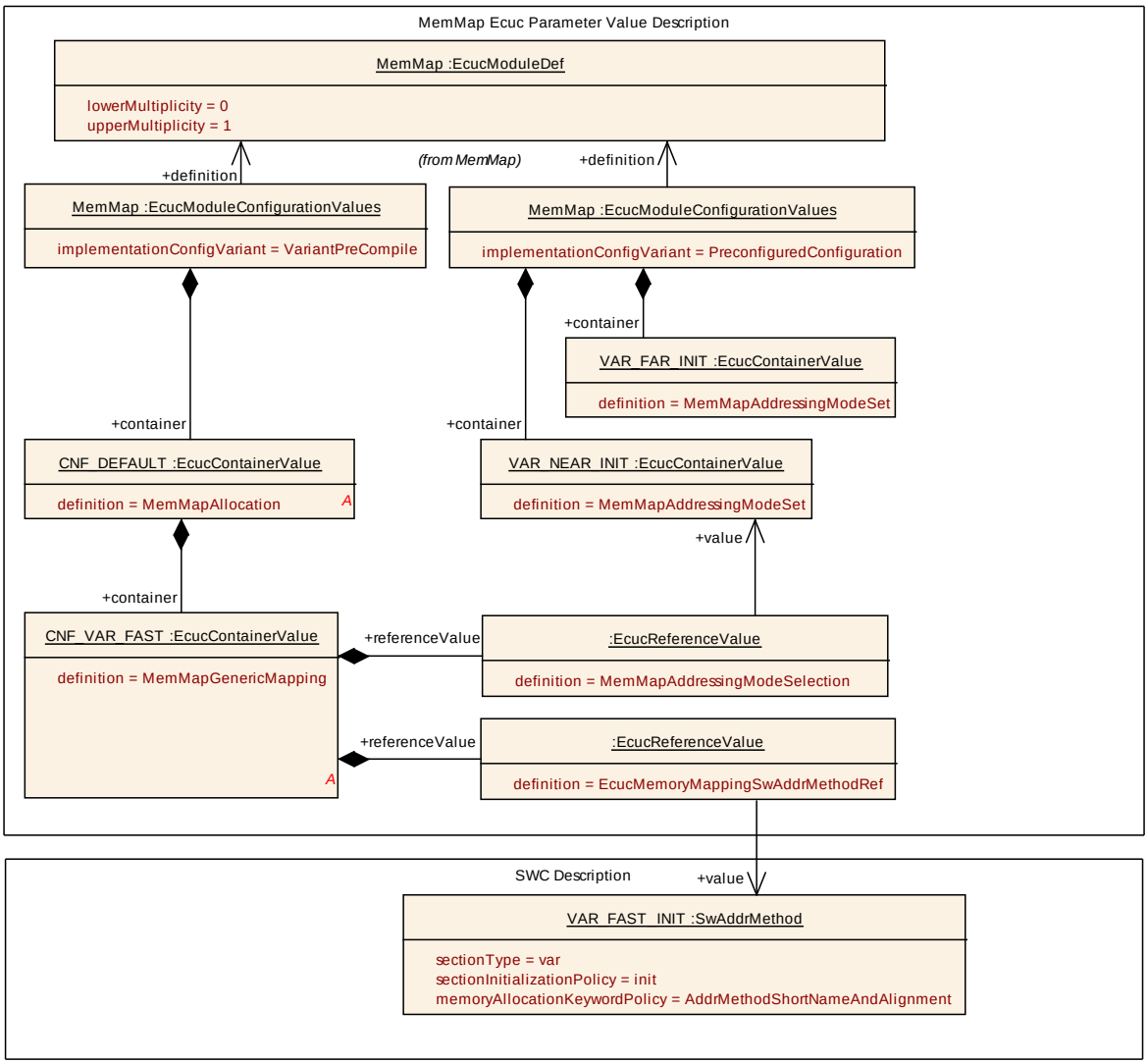
Please note that in this example both `VariableDataPrototypes` have to be implemented by RTE. The RTE again has to provide a BSW Module description defining the used `MemorySections`. Further on the RTE might allocate additional buffer for instance to implement implicit communication behavior. In this example the RTE uses four different `MemorySections` “VAR_FAST_8”, “VAR_FAST_16”, “VAR_FAST_TASK_BUF_8” and “VAR_FAST_TASK_BUF_8” to sort variables according their size and to allocate additional buffers.



All of these `MemorySections` are associated with the `SwAddrMethod` “VAR_FAST” This indicates that the module specific (abstract) memory sections “VAR_FAST_8”, “VAR_FAST_16”, “VAR_FAST_TASK_BUF_8” and “VAR_FAST_TASK_BUF_8” share a common addressing strategy defined by `SwAddrMethod` “VAR_FAST”.



The ECU Configuration of Memory Mapping defines a MemMapAddressingModeSet "VAR_NEAR" This supports the `sectionType var`, `sectionInitializationPolicy = init` and `memoryAllocationKeywordPolicy = AddrMethodShortNameAndAlignment`. In this example MemMapAddressingModes are shown for the alignment 8 and 16 (MemMapAlignmentSelector = 8 and MemMapAlignmentSelector = 16).



With the means of the MemMapGenericMapping “CNF_VAR_FAST” Memory Mapping is configured that all module specific (abstract) memory sections referring to SwAddrMethod “VAR_FAST” are using the MemMapAddressingModeSet “VAR_NEAR”. MemMapAddressingModeSet “VAR_NEAR” defines the proper statements to start and to stop the mapping of variables with different alignments (in this example 8 and 16) to the specific linker sections by the usage of the related Memory Allocation Keywords.

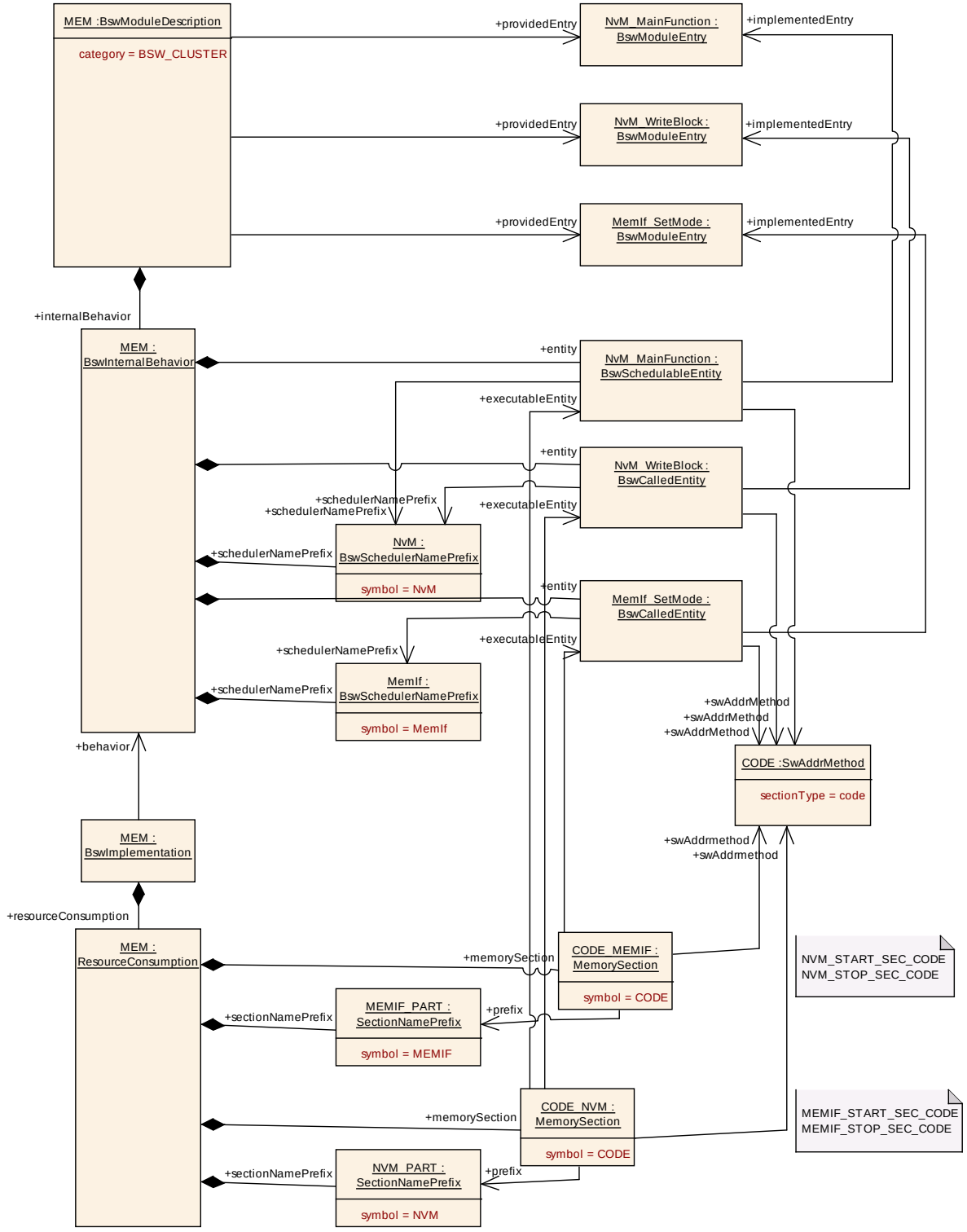
With this information of the Memory Allocation Header for the BSW can be generated like:

```
/* MemMap Header file MemMap.h*/

#ifdef RTE_START_SEC_VAR_FAST_8
```

```
#pragma section nearbss    "data_near_fast_8"
#pragma section neardata   "data_near_fast_8"
....
#pragma ...
    #undef RTE_START_SEC_VAR_FAST_8

#ifdef RTE_STOP_SEC_VAR_FAST_8
#pragma section_code "illegal"
    #undef RTE_STOP_SEC_VAR_FAST_8

#ifdef RTE_START_SEC_VAR_FAST_16
#pragma section nearbss    "data_near_fast_16"
#pragma section neardata   "data_near_fast_16"
....
#pragma ...
    #undef RTE_START_SEC_VAR_FAST_16

#ifdef RTE_STOP_SEC_VAR_FAST_16
#pragma section_code "illegal"
    #undef RTE_STOP_SEC_VAR_FAST_16

#ifdef RTE_START_SEC_VAR_FAST_TASK_BUF_8
#pragma section nearbss    "data_near_fast_8"
#pragma section neardata   "data_near_fast_8"
....
#pragma ...
    #undef RTE_START_SEC_VAR_FAST_TASK_BUF_8

#ifdef RTE_STOP_SEC_VAR_FAST_TASK_BUF_8
#pragma section_code "illegal"
    #undef RTE_STOP_SEC_VAR_FAST_TASK_BUF_8

#ifdef RTE_START_SEC_VAR_FAST_TASK_BUF_16
#pragma section nearbss    "data_near_fast_16"
#pragma section neardata   "data_near_fast_16"
....
#pragma ...
    #undef RTE_START_SEC_VAR_FAST_TASK_BUF_16

#ifdef RTE_STOP_SEC_VAR_FAST_TASK_BUF_16
#pragma section_code "illegal"
    #undef RTE_STOP_SEC_VAR_FAST_TASK_BUF_16
```

8.3.3 Code Section in ICC2 cluster

The following Basic Software Module Description would result in the support of the Memory Allocation Keywords in the MemMap.h file:




```
/* MemMap Header file MemMap.h*/

#ifdef NVM_START_SEC_CODE
…
#ifdef NVM_STOP_SEC_CODE
```

```
…
#ifdef MEMIF_START_SEC_CODE
…
#ifdef MEMIF_STOP_SEC_CODE
```

9 API specification

Not applicable.

10 Sequence diagrams

Not applicable.

11 Configuration specification

In general, this chapter defines configuration parameters and their clustering into containers. In order to support the specification Chapter 11.1 describes fundamentals. It also specifies a template (table) you shall use for the parameter specification. We intend to leave Chapter 11.1 in the specification to guarantee comprehension.

Chapter 11.2 specifies the structure (containers) and the parameters of the module Memory Mapping.

Chapter 11.3 specifies published information of the module Memory Mapping.

11.1 How to read this chapter

In addition to this section, it is highly recommended to read the documents:

- AUTOSAR Layered Software Architecture [2]
- AUTOSAR ECU Configuration Specification [6]
  This document describes the AUTOSAR configuration methodology and the AUTOSAR configuration metamodel in detail.

The following is only a short survey of the topic and it will not replace the ECU Configuration Specification document.

11.1.1 Configuration and configuration parameters

Configuration parameters define the variability of the generic part(s) of an implementation of a module. This means that only generic or configurable module implementation can be adapted to the environment (software/hardware) in use during system and/or ECU configuration.

The configuration of parameters can be achieved at different times during the software process: before compile time, before link time or after build time. In the following, the term “configuration class” (of a parameter) shall be used in order to refer to a specific configuration point in time.

11.1.2 Variants

Thus describe the possible configuration variants of this module. Each Variant must have a unique name which could be referenced to in later chapters. The maximum number of allowed variants is 3. Each variant shall have its own requirement ID.

11.1.3 Containers

Containers structure the set of configuration parameters. This means:

- *all* configuration parameters are kept in containers.
- (sub-) containers can reference (sub-) containers. It is possible to assign a multiplicity to these references. The multiplicity then defines the possible number of instances of the contained parameters.

11.1.4 Specification template for configuration parameters

The following tables consist of three sections:

- the general section
- the configuration parameter section
- the section of included/referenced containers

SWS Item	*<[ReqXXX]>*
Container Name	*<Identifies the container by a name, e.g., CanDriverConfiguration>*
Description	*<Explains the intention and the content of the container .>*
Configuration Parameters	

Name	*<Identifies the parameter by name. The naming convention shall follow BSW00408.>*		
Description	*<Explains the intention of the configuration parameter.>*		
Type	*<Specify the type of the parameter (e.g., uint8..uint32) if possible or mark it "--">*		
Unit	*<Specify the unit of the parameter (e.g., ms) if possible or mark it "--" >*		
Range	*<Specify the range (or possible values) of the parameter (e.g., 1..15, ON,OFF) if possible or mark it "--">*	*<Describe the value(s) or ranges.>*	
Configuration Class	***Pre-compile***	*see*[5]	*<Refer here to (a) variant(s).>*
	Link time	*see*[6]	*<Refer here to (a) variant(s).>*
	Post Build	*see*[7]	*<Refer here to (a) variant(s).>*
Scope	*<Describe the scope of the parameter if known or mark it as "- -". The scope describes the impact of the configuration parameter: Does the setting affect only one instance of the module (instance), all instances of this module (module), the ECU or a network. Possible values of scope : instance, module, ECU, network>*		
Dependency	*<Describe the dependencies with respect to the scope if known ot mark it as "- -".>*		

[5] see the explanation below this table - Pre-compile time
[6] see the explanation below this table - Link time
[7] see the explanation below this table - Post Build

Included Containers		
Container Name	***Multiplicity***	***Scope / Dependency***
<Reference a valid (sub)container by its name, e.g.,CanController>	*<Specifies the possible number of instances of the referenced container and its contained configuration parameters.* *Possible values:* *<multiplicity>* *<min_multiplicity..max_multiplicity>* *>*	*<Describe the scope of the referenced sub-container if known or mark it as "- -".* *The scope describes the impact of the configuration parameter: Does the setting affect only one instance of the module (instance), all instances of this module (module), the ECU or a network.* *Possible values of scope :* *instance, module, ECU, network>* *<Describe the dependencies with respect to the scope if known ot mark it as "- -".>*

11.2 Containers and configuration parameters

The following chapters summarize all configuration parameters. The detailed meanings of the parameters describe Chapter 8.

11.2.1 Variants

The Memory Mapping provides one configuration variant.

11.2.1.1 VARIANT-PRE-COMPILE

MEMMAP024:
Variant 1 – VARIANT-PRE-COMPILE: In this configuration variant all parameters need to be configured pre compile time.

11.2.2 MemMap

SWS Item	**MemMap001_Conf :**
Module Name	*MemMap*
Module Description	Configuration of the MemMap module.

Included Containers		
Container Name	***Multiplicity***	***Scope / Dependency***
MemMapAddressingModeSet	0..*	Defines a set of addressing modes which might apply to a SwAddrMethod.
MemMapAllocation	0..*	Defines a set of addressing modes which might apply to a SwAddrMethod.

11.2.3 MemMapAddressingModeSet

SWS Item	**MemMap002_Conf :**
Container Name	MemMapAddressingModeSet
Description	Defines a set of addressing modes which might apply to a SwAddrMethod.
Configuration Parameters	

SWS Item	**MemMap009_Conf :**
Name	MemMapSupportedAddressingMethodOption
Description	This constrains the usage of this addressing mode set for Generic Mappings to swAddrMethods. The attribute option of a swAddrMethod mapped via MemMapGenericMapping to this MemMapAddressingModeSet shall be equal to one of the configured MemMapSupportedAddressMethodOption's
Multiplicity	0..*
Type	EcucStringParamDef
Default value	--
maxLength	--

minLength	--		
regularExpression	[a-zA-Z]([a-zA-Z0-9]|_[a-zA-Z0-9])*_?		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: ECU		

SWS Item	**MemMap017_Conf :**		
Name	MemMapSupportedMemoryAllocationKeywordPolicy		
Description	This constrains the usage of this addressing mode set for Generic Mappings to swAddrMethods. The attribute MemoryAllocationKeywordPolicy of a swAddrMethod mapped via MemMapGenericMapping to this MemMapAddressingModeSet shall be equal to one of the configured MemMapSupportedMemoryAllocationKeywordPolicy's		
Multiplicity	0..*		
Type	EcucEnumerationParamDef		
Range	MEMMAP_ALLOCATION_KEYWORD_POLICY_ADDR_METHOD_SHORT_NAME	The Memory Allocation Keyword is build with the short name of the SwAddrMethod. This is the default value if the atttribute does not exist in the SwAddrMethod.	
	MEMMAP_ALLOCATION_KEYWORD_POLICY_ADDR_METHOD_SHORT_NAME_AND_ALIGNMENT	The Memory Allocation Keyword is build with the the short name of the SwAddrMethod and the alignment attribute of the MemorySection. This requests a separation of objects in memory dependent from the alignment and is not applicable for RunnableEntitys and BswSchedulableEntitys.	
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: ECU		

SWS Item	**MemMap008_Conf :**
Name	MemMapSupportedSectionInitializationPolicy
Description	This constrains the usage of this addressing mode set for Generic Mappings to swAddrMethods. The sectionIntializationPolicy attribute value

	of a swAddrMethod mapped via MemMapGenericMapping to this MemMapAddressingModeSet shall be equal to one of the configured MemMapSupportedSectionIntializationPolicy's Please note that SectionInitializationPolicyType describes the intended initialization of MemorySections. The following values are standardized in AUTOSAR Methodology: * '"NO-INIT"': No initialization and no clearing is performed. Such data elements must not be read before one has written a value into it. * '"INIT"': To be used for data that are initialized by every reset to the specified value (initValue). * '"POWER-ON-INIT"': To be used for data that are initialized by "Power On" to the specified value (initValue). Note: there might be several resets between power on resets. * '"CLEARED"': To be used for data that are initialized by every reset to zero. * '"POWER-ON-CLEARED"': To be used for data that are initialized by "Power On" to zero. Note: there might be several resets between power on resets. Please note that the values are defined similar to the representation of enumeration types in the XML schema to ensure backward compatibility.		
Multiplicity	0..*		
Type	EcucStringParamDef		
Default value	--		
maxLength	--		
minLength	--		
regularExpression	--		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: ECU		

SWS Item	**MemMap007_Conf :**	
Name	MemMapSupportedSectionType	
Description	This constrains the usage of this addressing mode set for Generic Mappings to swAddrMethods. The attribute sectionType of a swAddrMethod mapped via MemMapGenericMapping or MemMapSectionSpecificMapping to this MemMapAddressingModeSet shall be equal to one of the configured MemMapSupportedSectionType's.	
Multiplicity	0..*	
Type	EcucEnumerationParamDef	
Range	MEMMAP_SECTION_TYPE_CALIBRATION_OFFLINE	Program data which can only be used for offline calibration. Note: This value is deprecated and shall be substituted by calPrm.
	MEMMAP_SECTION_TYPE_CALIBRATION_ONLINE	Program data which can be used for online calibration. Note: This value is deprecated and shall be substituted by calPrm.
	MEMMAP_SECTION_TYPE_CAL_PRM	To be used for calibratable constants of ECU-functions.
	MEMMAP_SECTION_TYPE_CODE	To be used for mapping code to application block, boot block, external flash etc.
	MEMMAP_SECTION_TYPE_CONFIG_DATA	Constants with attributes that show that they reside in one segment for module configuration.
	MEMMAP_SECTION_TYPE_CONST	To be used for global or static constants.
	MEMMAP_SECTION_TYPE_EXCLUDE_FROM_FLASH	Values existing in the ECU but not dropped down in the binary file. No upload should be needed to obtain access to the ECU data. The ECU will never be touched by the instrumentation tool, with the exception of upload. These are memory areas which are not overwritten by downloading the executable.
	MEMMAP_SECTION_TYPE_USER_DEFINED	No specific categorization of sectionType possible. Note: This value is deprecated and shall be substituted by var,

		code, const, calPrm, configData, excludeFromFlash and the appropriate values of the orthogonal attributes sectionInitializationPolicy, memoryAllocationKeywordPolicy and option.	
	MEMMAP_SECTION_TYPE_VAR	To be used for global or static variables. The expected initialization is specified with the attribute sectionInitializationPolicy.	
	MEMMAP_SECTION_TYPE_VAR_FAST	To be used for all global or static variables that have at least one of the following properties: - accessed bit-wise - frequently used - high number of accesses in source code Some platforms allow the use of bit instructions for variables located in this specific RAM area as well as shorter addressing instructions. This saves code and runtime. Note: This value is deprecated and shall be substituted by var and the appropriate values of the orthogonal attributes sectionInitializationPolicy, memoryAllocationKeywordPolicy and option.	
	MEMMAP_SECTION_TYPE_VAR_NO_INIT	To be used for all global or static variables that are never initialized. Note: This value is deprecated and shall be substituted by var and the appropriate values of the orthogonal attributes sectionInitializationPolicy, memoryAllocationKeywordPolicy and option.	
	MEMMAP_SECTION_TYPE_VAR_POWER_ON_INIT	To be used for all global or static variables that are initialized only after power on reset. Note: This value is deprecated and shall be substituted by var and the appropriate values of the orthogonal attributes sectionInitializationPolicy, memoryAllocationKeywordPolicy and option.	
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: ECU		

Included Containers		
Container Name	***Multiplicity***	***Scope / Dependency***
MemMapAddressingMode	1..*	Defines a addressing mode with a set of #pragma statements implementing the start and the stop of a section.

11.2.4 MemMapAddressingMode

SWS Item	**MemMap003_Conf :**
Container Name	MemMapAddressingMode
Description	Defines a addressing mode with a set of #pragma statements implementing the start and the stop of a section.
Configuration Parameters	

SWS Item	**MemMap004_Conf :**
Name	MemMapAddressingModeStart
Description	Defines a set of #pragma statements implementing the start of a section.
Multiplicity	1
Type	EcucMultilineStringParamDef

Default value	--		
maxLength	--		
minLength	--		
regularExpression	--		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: ECU		

SWS Item	**MemMap005_Conf :**		
Name	MemMapAddressingModeStop		
Description	Defines a set of #pragma statements implementing the start of a section.		
Multiplicity	1		
Type	EcucMultilineStringParamDef		
Default value	--		
maxLength	--		
minLength	--		
regularExpression	--		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: ECU		

SWS Item	**MemMap006_Conf :**		
Name	MemMapAlignmentSelector		
Description	Defines a the alignments for which the MemMapAddressingMode applies. The to be used alignment is defined in the alignment attribute of the MemorySection. If the MemMapAlignmentSelector fits to alignment attribute of the MemorySection the set of #pragmas of the related MemMapAddressingMode shall be used to implement the start and the stop of a section. Please note that the same MemMapAddressingMode can be applicable for several alignments, e.g. "8" bit and "UNSPECIFIED".		
Multiplicity	1..*		
Type	EcucStringParamDef		
Default value	--		
maxLength	--		
minLength	--		
regularExpression	[1-9][0-9]*|0x[0-9a-f]*|0[0-7]*|0b[0-1]*|UNSPECIFIED|UNKNOWN|BOOLEAN|		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: ECU		

No Included Containers

11.2.5 MemMapAllocation

SWS Item	**MemMap010_Conf :**
Container Name	MemMapAllocation
Description	Defines a set of addressing modes which might apply to a SwAddrMethod.
Configuration Parameters	

Included Containers		
Container Name	***Multiplicity***	***Scope / Dependency***
MemMapGenericMapping	0..*	Defines which SwAddrMethod is implemented with which MemMapAddressingModeSet. The pragmas for the implementation of the MemorySelectorKeywords are taken from the MemMapAddressingModeStart and MemMapAddressingModeStop parameters of the MemMapAddressingModeSet for the individual alignments. That this mapping becomes valid requires matching MemMapSupportedSectionType's, MemMapSupportedSectionInitializationPolicy's and MemMapSupportedAddressingMethodOption's. The MemMapGenericMapping applies only if it is not overruled by an MemMapSectionSpecificMapping
MemMapSectionSpecificMapping	0..*	Defines which MemorySection of a BSW Module or a Software Component is implemented with which MemMapAddressingModeSet. The pragmas for the implementation of the MemorySelectorKeywords are taken from the MemMapAddressingModeStart and MemMapAddressingModeStop parameters of the MemMapAddressingModeSet for the specific alignment of the MemorySection. The MemMapSectionSpecificMapping precedes a mapping defined by MemMapGenericMapping.

11.2.6 MemMapGenericMapping

SWS Item	**MemMap011_Conf :**
Container Name	MemMapGenericMapping
Description	Defines which SwAddrMethod is implemented with which MemMapAddressingModeSet. The pragmas for the implementation of the MemorySelectorKeywords are taken from the MemMapAddressingModeStart and MemMapAddressingModeStop parameters of the MemMapAddressingModeSet for the individual alignments. That this mapping becomes valid requires matching MemMapSupportedSectionType's, MemMapSupportedSectionInitializationPolicy's and MemMapSupportedAddressingMethodOption's. The MemMapGenericMapping applies only if it is not overruled by an MemMapSectionSpecificMapping
Configuration Parameters	

SWS Item	**MemMap012_Conf :**		
Name	MemMapAddressingModeSetRef		
Description	Reference to the MemMapAddressingModeSet which applies to the MemMapGenericMapping.		
Multiplicity	1		
Type	Reference to [MemMapAddressingModeSet]		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: ECU		

SWS Item	**MemMap013_Conf :**		
Name	MemMapSwAddressMethodRef		
Description	Reference to the SwAddrMethod which applies to the MemMapGenericMapping.		
Multiplicity	1		
Type	Foreign reference to [SW-ADDR-METHOD]		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: ECU		

No Included Containers

11.2.7 MemMapSectionSpecificMapping

SWS Item	**MemMap014_Conf :**
Container Name	MemMapSectionSpecificMapping
Description	Defines which MemorySection of a BSW Module or a Software Component is implemented with which MemMapAddressingModeSet. The pragmas for the implementation of the MemorySelectorKeywords are taken from the MemMapAddressingModeStart and MemMapAddressingModeStop parameters of the MemMapAddressingModeSet for the specific alignment of the MemorySection. The MemMapSectionSpecificMapping precedes a mapping defined by MemMapGenericMapping.
Configuration Parameters	

SWS Item	**MemMap015_Conf :**		
Name	MemMapAddressingModeSetRef		
Description	Reference to the MemMapAddressingModeSet which applies to the MemMapModuleSectionSpecificMapping.		
Multiplicity	1		
Type	Reference to [MemMapAddressingModeSet]		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: ECU		

SWS Item	**MemMap016_Conf :**		
Name	MemMapMemorySectionRef		
Description	Reference to the MemorySection which applies to the MemMapSectionSpecificMapping.		
Multiplicity	1		
Type	Foreign reference to [MEMORY-SECTION]		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: ECU		

No Included Containers

Pre-compile time - specifies whether the configuration parameter shall be of configuration class *Pre-compile time* or not

Label	*Description*
X	The configuration parameter shall be of configuration class *Pre-compile time*.
--	The configuration parameter shall never be of configuration class *Pre-compile time*.

Link time - specifies whether the configuration parameter shall be of configuration class *Link time* or not

Label	*Description*
X	The configuration parameter shall be of configuration class *Link time*.
--	The configuration parameter shall never be of configuration class *Link time*.

Post Build - specifies whether the configuration parameter shall be of configuration class *Post Build* or not

Label	*Description*
X	The configuration parameter shall be of configuration class *Post Build* and no specific implementation is required.
L	*Loadable* - the configuration parameter shall be of configuration class *Post Build* and only one configuration parameter set resides in the ECU.
M	*Multiple* - the configuration parameter shall be of configuration class *Post Build* and is selected out of a set of multiple parameters by passing a dedicated pointer to the init function of the module.
--	The configuration parameter shall never be of configuration class *Post Build*.

11.3 Published Information

[MEMMAP030] 「The standardized common published parameters as required by BSW00402 in the General Requirements on Basic Software Modules [3] shall be published within the header file of this module and need to be provided in the BSW Module Description. The according module abbreviation can be found in the List of Basic Software Modules [1].」()

Additional module-specific published parameters are listed below if applicable.

12 Not applicable requirements

[MEMMAP999] 「 These requirements are not applicable to this specification. 」 (BSW00344, BSW00404, BSW00405, BSW00345, BSW159, BSW167, BSW171, BSW170, BSW00380, BSW00419, BSW00381, BSW00412, BSW00383, BSW00387, BSW00388, BSW00389, BSW00390, BSW00391, BSW00392, BSW00393, BSW00394, BSW00395, BSW00396, BSW00397, BSW00398, BSW00399, BSW00400, BSW00375, BSW101, BSW00416, BSW00406, BSW168, BSW00407, BSW00423, BSW00424, BSW00425, BSW00426, BSW00427, BSW00428, BSW00429, BSW00431, BSW00432, BSW00433, BSW00434, BSW00336, BSW00337, BSW00338, BSW00369, BSW00339, BSW00421, BSW00422, BSW00420, BSW00417, BSW00323, BSW004, BSW00409, BSW00385, BSW00386, BSW161, BSW162, BSW00324, BSW005, BSW00415, BSW164, BSW00325, BSW00326, BSW00342, BSW00343, BSW160, BSW007, BSW00300, BSW00413, BSW00347, BSW00605, BSW00307, BSW00310, BSW00373, BSW00327, BSW00335, BSW00350, BSW00408, BSW00410, BSW00411, BSW00346, BSW158, BSW00314, BSW00370, BSW00348, BSW00353, BSW00301, BSW00302, BSW00312, BSW00357, BSW00377, BSW00304, BSW00355, BSW00378, BSW00308, BSW00309, BSW00371, BSW00358, BSW00414, BSW00359, BSW00360, BSW00329, BSW00330, BSW00331, BSW009, BSW00401, BSW172, BSW010, BSW00333, BSW00341, BSW00334)