Memory Allocation Specification

Embedded Systems

Francisco Martinez Chavez

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ITESO

Universidad Jesuita de Guadalajara

Author Francisco Martínez Chávez

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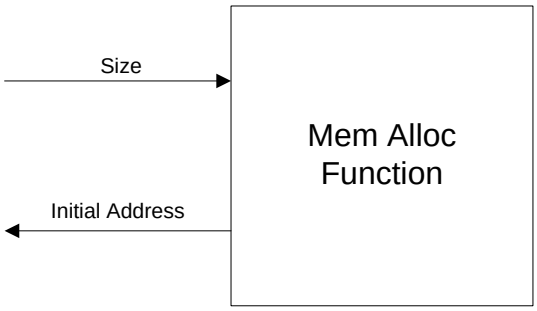
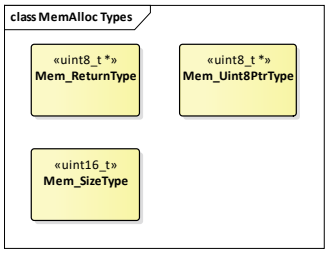
2. FUNCTIONAL SPECIFICATION

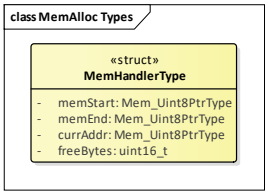


1 MEMORY ALLOCATION DATA FLOW DIAGRAM

2.1. TYPE DEFINITIONS

Types used by the memory handler shall be declared as follows:

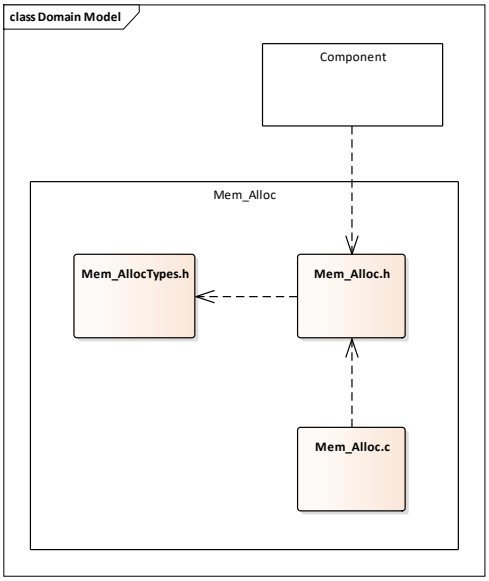




Those type definitions shall be used internally by the driver.

2.2. FILE STRUCTURE

The image below the file dependencies where *A* → *B* indicates A includes B.



The table below shows a brief description of each file.

File	Description
Mem_AllocTypes.h	Contains all the internal data types definitions use by the memory allocation handler Module
Mem_Alloc.h	Contains all the interfaces provided to the user component modules
Mem_Alloc.c	Contains the main functionality of the memory allocation handler

2.3. MEMORY AREA

Memory Allocation area name shall be "HEAP". The HEAP section shall be allocated in the RAM location 0x20450000. The total size of the section shall be 64KB.

The HEAP space and corresponding section references shall be provided from the Linker Configuration File.

The provided labels shall be named as follows:

- MEM_HEAP_START
- MEM_HEAP_END

2.4. MEMORY HANDLERS

2.4.1. MEMORY INITIALIZATION

Memory Initialization handler is shown below.

Service Name	Mem_Init	
Syntax	void Mem_init (void)	
Sync/Async	Syncronous	
Reentrancy	Non-Reentrant	
Param (in)	None	
Param (out)	None	
Return Value	None	
Description	Mem_Init Initialize the Heap content to zero	

- Mem_Init shall be invoked at project specific start up initialization and shall initialize the HEAP content to zero.
- Memory start address *memStart*, memory end address *memEnd*, memory current address *currAddr* and available memory bytes indicator *freeBytes* shall be initialized within this handler.

2.4.2. MEMORY ALLOCATION

Memory allocation handler is shown below.

Service Name	Mem_Alloc	
Syntax	Mem_ReturnType Mem_Alloc (Mem_SizeType Size)	
Sync/Async	Syncronous	
Reentrancy	Non-Reentrant	
Param (in)	Mem_SizeType Size	Size in Bytes to be allocated
Param (out)	None	
Return Value	Mem_ReturnType	Initial address of the new allocated memory space
Description	Allocates and returns the initial address of the memory currently being allocated	

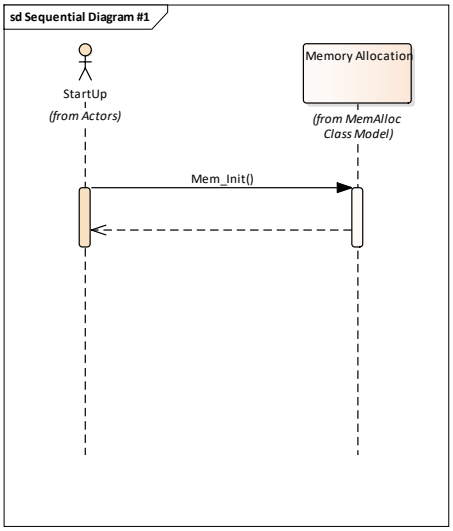
- Memory Allocation shall be invoked when memory allocation is requested by the project specific driver initialization.
- Mem_Alloc shall return the initial address of the new allocated memory space.
- Current Address *currAddr* shall be updated according to the requested size.
- After allocating a new area, Mem_Alloc shall assure the current address is aligned with 32bit address.
- The available memory in the HEAP *freeBytes* shall be updated accordingly.

- Mem_Alloc shall return a NULL pointer and the requested memory allocation shall not be handled if the size exceeds the available memory in the HEAP.

2.5. SEQUENCE AND ACTIVITY DIAGRAMS

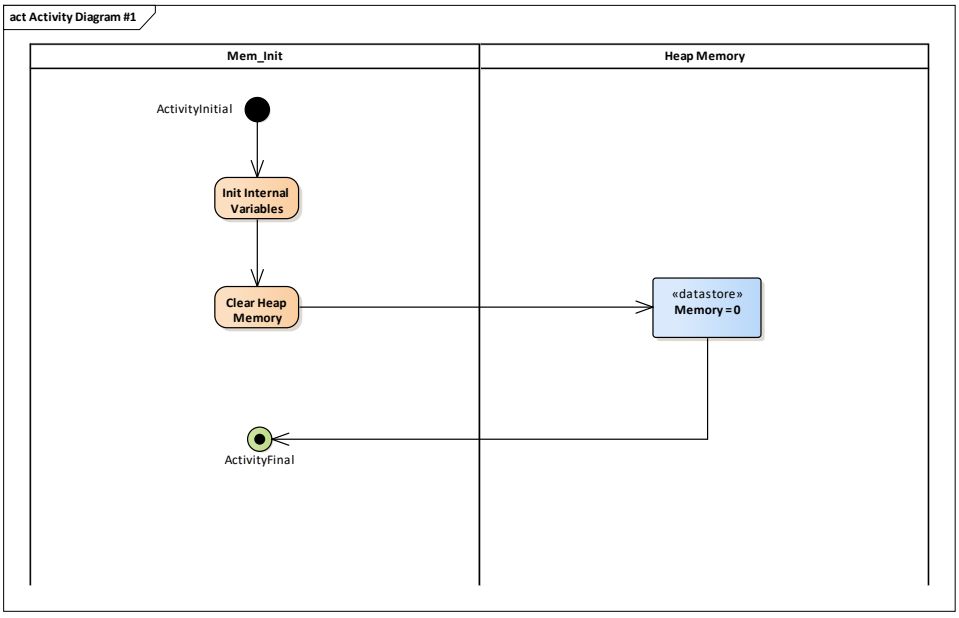
2.5.1. MEMORY INITIALIZATION SEQUENCE

The basic initialization sequence is shown below:



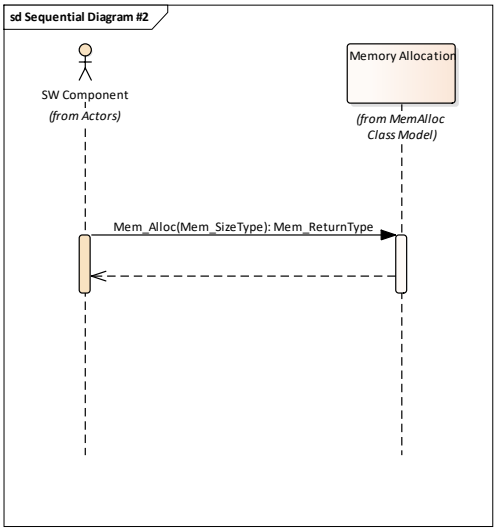
2.5.2. MEMORY INITIALIZATION ACTIVITY

The basic steps to initialize the heap memory through the invocation of Mem_Init are shown below:



2.5.3. MEMORY ALLOCATION SEQUENCE

The basic memory allocation sequence is shown below:



2.5.4. MEMORY ALLOCATION ACTIVITY

The basic steps to allocate memory through the invocation of Mem_Alloc are shown below: