NASA GSFC FLIGHT SOFTWARE SYSTEMS BRANCH

FSW VERSION DESCRIPTION DOCUMENT

CFS MD APPLICATION

BUILD: MD 2.3.2

RELEASE DATE: APRIL 1, 2020

1.0 FSW VERSION DESCRIPTION

1.1 PURPOSE AND SUMMARY

The purpose of this build is to continue to refine the cFS Memory Dwell (MD) application product. This build provides various bug fixes and enhancements, but does not include any new functionality.

This document serves as the notification of the Build 2.3.2 release of the cFS MD application.

Memory Dwell (MD) version 2.3.2 is compatible with cFE builds 6.6.0 and above.

1.2 NEW/CHANGED FUNCTIONALITY IN THIS VERSION

Table 1.2-1 identifies the DCRs that have been implemented in this FSW version. For each DCR the "Key" column shows the corresponding DCR in the GSFC cFS tracking system.

Table 1.2-1 – DCRs Implemented in this Version

Key	Summary	Description
GSFCCFS-1071	MD Readme file needs updates	Readme file includes out of date information on sources for cFE and OSAL.
GSFCCFS-1056	Table paths must be updated to work with cFE 6.6	Finding from JSC code review. MD_TBL_FILENAME_FORMAT should have "apps" removed from path.
GSFCCFS-1055	CMakeLists.txt must be updated to build tables	Finding from JSC code review
GSFCCFS-1054	Remove dead function MD_ValidAddrIndex	Finding from JSC code review
GSFCCFS-1053	MD Design document needs updates	Finding from JSC code review
GSFCCFS-1052	Remove dead function MD_StopTable	Finding from JSC code review
GSFCCFS-1051	Simplify MD utility functions	In the following functions, if "IsValid" is initialized to FALSE, the "else" clause could be removed to simplify the function. Functions: MD_ValidFieldLength MD_ValidTableId MD_ValidAddrRange MD_ValidEntryId This is also the case for the "Status" variable in "MD_TableIsInMask" function. Finding from JSC code review.
GSFCCFS-1050	Consider initializing MD_DwellTables with memset	in MD_InitControlStructures, could be more efficient if MD_DwellTables[] was initialized to all 0 first with CFE_PSP_MemSet(). Then just initialize values that are non-zero.

		Finding from JSC code review.
GSFCCFS-1049	Potential buffer overflow in snprintf	md_app.c, MD_InitTableServices Questionable buffer overflow in line 411. From comment it seems intentional, but involves a somewhat magic number. Finding from JSC code review.
GSFCCFS-1046	Unchecked return value in MD_DwellLoop	In file md_dwell_pkt.c, function MD_DwellLoop, line 84 - return value of MD_GetDwellData is not checked even though it can fail.
GSFCCFS-1045	Uninitialized variables in MD	All variables should be assigned some initial value at declaration. Finding from JSC code review.
GSFCCFS-1044	"Else if" chain should end with an else	Finding from JSC code review. In md_dwell_tbl.c, some functions have if-else-if chains that do not end with else. MD_UpdateTableEnabledField MD_TableValidationFunc (multiple instances in this function, one might benefit from a switch-case) MD_InitTableServices MD_ProcessJamCmd (multiple instances)
GSFCCFS-1043	Potential buffer overflow in strncpy	In functions: MD_UpdateTableSignature MD_CopyUpdatedTbl MD_ProcessSignatureCmd last argument of strncpy should include "-1" to leave room for a null terminator and resolve the static code analysis finding. Finding from JSC code review.
GSFCCFS-1042	Function parameters must be checked for NULL	Finding from JSC code review. Should be checked throughout. Specifically cited examples include: MD_CheckTableEntries MD_ValidTableEntry MD_CopyUpdateTable MD_ReadDwellTable MD_ExecRequest MD_ProcessJamCmd MD_ProcessStopCmd MD_ProcessStartCmd
GSFCCFS-1038	Unchecked return value	In the following functions in md_dwell_tbl.c, GetAddressResult is never checked. MD_LoadTablePtr could be NULL if GetAddressResult status is bad.

		Static code analysis finding from JSC code review. Functions: MD_UpdateTableEnabledField MD_UpdateTableSignature MD_UpdateTableDwellEntry
GSFCCFS-948	Fix MD compilation warnings with cFE 6.6	Building MD with cFE 6.6 generates compilation warnings
GSFCCFS-771	MD: Fix SendEvent using TBL defintiion	A CFE_SendEvent call in MD uses the CFE_TBL_MAX_SNGL_TABLE_SIZE macro definition that is private to the table services (TBL) module. This fails to build when MD does not have this definition.

GSFCCFS-765	MD Unit Test Stack Smashing	In the MD_ProcessSignatureCmd_Test_InvalidSignatureLength(), you will see the following line:
		
		for(i = 0; i <= MD_SIGNATURE_FIELD_LENGTH; i++)
		
		This is causing stack smashing and should be changed to:
		
		for(i = 0; i < MD_SIGNATURE_FIELD_LENGTH; i++)

GSFCCFS-736	Memory Dwell MD_AppData_t MD_AppData Location	1/16/18: Reported by Allen Brown(Odyssey Space Research) MD 2.3.1 (compared to 2.3.0) moved the MD_AppData_t MD_AppData; definition into md_app.h (along with a few other things) from out of md_app.c. While this compiles and links just fine under Linux/x86/GCC, it doesn't link under RTEMS/SPARC/GCC due to multiple definitions. Several .c files in MD include this header and they each end up with the same symbol. Simply moving it back from the .h into the .c fixes the problem for these platforms. (And it keeps MD consistent with all the other cFS apps.)

1.3 MISSING PLANNED FEATURES AND KNOWN PROBLEMS

Table 1.3-1 identifies currently open DCRs that are not addressed in this build. Any workarounds that may apply are identified.

Information on currently open DCRs is available at:

https://etdjira.gsfc.nasa.gov/projects/GSFCCFS/issues

Note that this is a restricted website that requires a server account. Additional DCRs may have been submitted after preparation of this VDD. A cFS MD DCR report containing a listing of open DCRs is available upon request for customers who do not have access to the restricted server. Please contact Elizabeth Timmons, elizabeth.timmons@nasa.gov.

Table 1.3-1 – Currently open DCRs

Key	Summary	Description
GSFCCFS-1048	Consider using an enum for MD error codes	In file md_dwell_pkt.c function MD_GetDwellData, all the "-1" status values could be replaced with an enum. Finding from JSC code review.
GSFCCFS-1047	Code could be streamlined with a switch/case statement	In md_dwell_pkt.c function MD_GetDwellData, the if-else chain could be streamlined with a switch statement. Finding from JSC code review
GSFCCFS-764	MD - Table Configuration is Not Consistent with Other Applications	MD currently gets the dwell tables from the CDS or zeros them out. The MD table design is not consistent with other cFS applications: The MD task should allow the option to save or not save tables in the CDS (and therefore behave like the other applications). The MD task should allow the option to have default tables in EEPROM (and therefore behave like the other applications). The default address to be used, should a table not be found, should be user defined. 0 may not be a valid address. The MD task doesn't use the CFE_TBL_Manage feature.
GSFCCFS-1037	Return statements not needed in void functions	Finding in JSC code review
GSFCCFS-1036	Use sizeof(<SYMBOL_NAME>) instead of sizeof(<TYPE>)	Finding from JSC code review. In several places, sizeof references a type instead of an actual symbol. This is a potential maintenance

		issue if the size of the field is changed. md_dwell_tbl.c lines 327, 331, 335

2.0 DELIVERED PRODUCTS

Table 2-1 identifies the locations of FSW products relevant to this FSW Build. The version or date of the Build and where the product can be located are provided. Changes from a previous VDD are identified.

Table 2-1 – Delivered Products and their Locations

Software Element	Changed with this Version?	New Version or Date	Location
Source Code of this FSW Build	Yes	2.3.2	https://github.com/nasa/md
Doxygen Documentation	Yes	N/A	https://github.com/nasa/md
Unit Test Data	Yes	2.3.2	https://github.com/nasa/md
FSW Make Files	Yes	2.3.2	https://github.com/nasa/md

3.0 INSTALLATION PROCEDURES

In order to build and install the MD application, it must be added to the cFE CMake build system. This is done by modifying the TGTX_APPLIST in the cFE targets.cmake file. This is shown in the trivial example below.

```
SET(TGT1_NAME cpu1)
SET(TGT1_APPLIST md)
SET(TGT1_FILELIST cfe_es_startup.scr)
```

After MD is added to the targets.cmake file, it is built and installed using the standard cFE CMake build instructions. These instructions are available in cFE CMake documentation:

https://github.com/nasa/cFE/blob/master/cmake/README.md

4.0 CONFIGURATION SUMMARY AND VERSION IDENTIFICATION

This software can be found in the MD GitHub repository (https://github.com/nasa/MD) under the tag "2.3.2".

Verification of the version can be done by sending an MD NOOP command which produces an event message containing the version information. In addition, the initialization event message generated during the application startup provides the version information.

ACRONYMS

ACS ..... Attitude Control System
C&DH ..... Command and Data Handling
cFS ..... Core Flight System
CM ..... Configuration Management
COTS ..... Commercial Off-The-Shelf
CPU ..... Central Processing Unit
DCR ..... Discrepancy/Change Request
ETU ..... Engineering Test Unit
FSB ..... Flight Software Branch
FSW ..... Flight Software
GSFC ..... Goddard Space Flight Center
I&T ..... Integration & Test
JSC ..... Johnson Space Center
MD ..... Memory Dwell
POSIX ..... Portable Operating System Interface
RTOS ..... Real-Time Operating System
SMP ..... Symmetric Multiprocessing
T&C ..... Telemetry and Command
TBD ..... To Be Determined
URL ..... Universal Resource Locator
VDD ..... Version Description Document