



**CORE FLIGHT SOFTWARE SYSTEM (CFS)**

**DATA STORAGE (DS) APPLICATION**

**BUILD: 2.5.1.0**

**FSW VERSION DESCRIPTION DOCUMENT**

**RELEASE DATE: 2/15/2017**



## **SIGNATURES**

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Approved by:

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## 1.0 FSW VERSION DESCRIPTION

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### 1.1 PURPOSE AND SUMMARY

The purpose of this build is to continue to refine the cFS Data Storage (DS) application product. This build provides bug fixes and new assert based unit tests.

This document serves as the notification of the Build 2.5.1.0 release of the cFS DS application. The DS Build 2.5.1 release contains the changes associated with Builds 2.5.0.0 and 2.5.1.0. The 2.5.1.0 revision includes a minor bug fix found during DS Build 2.5.0.0 Build Verification Testing. Build 2.5.1.0 is the final release of the cFS DS application following BVT of Builds 2.5.0.0 and 2.5.1.0 of the cFS DS application. For more details on the issues encountered during testing, please refer to attachment 1 for a full listing of the DCRs and Trac Tickets included in this release and the DS 2.5.1.0 Test Report located in the /test\_and\_ground/results folder.

Data Storage (DS) version 2.5.1.0 is compatible with cFE builds 6.5.0 and above and OSAL builds 4.2.0 and above.

### 1.2 NEW FUNCTIONALITY IN THIS VERSION

Table 1.2-1 identifies new FSW functionality that has been implemented and is integrated into this FSW version. Requirement references are included.

**Table 1.2-1 – New Functionality in this Version**

No.	FSB DCR # (or N/A )	Requirements	Functionality or Change Description
N/A	N/A	N/A	None

Table 1.2-2 identifies changes to FSW functionality from a previously delivered FSW version and the DCRs and Trac Ticket numbers associated with these changes. See attachment 1 for a full listing of the DCRs and Trac Tickets included in this release.

**Table 1.2-2 – Changes to Previously Delivered Functionality**

No.	FSB DCR # (or N/A )	Requirements	High Level Description of Functionality
1	4126	DS3000.1 DS3000.1.1	Sequence Counter always rolled over to zero. The initial value of the counter is specified in the Destination File Table. The Sequence Counter has been updated to always rollover to the table specified initial value.



No.	FSB DCR # (or N/A )	Requirements	High Level Description of Functionality
2	145916	N/A	<p>Hash Table bug. The DS_CmdAddMID command was not adding new Message IDs to the hash table. Other commands (DS_SetFilterFile, DS_SetFilterType, DS_SetFilterParms) call the DS_TableFindMsgID function which uses the hash table to search for message IDs. Newly added Message IDs could not be found since they were not added to the hash table. The DS_CmdAddMID command was updated to appropriately add the new Message IDs to the hash table.</p>

### 1.3 MISSING PLANNED FEATURES AND KNOWN PROBLEMS

Table 1.3-1 identifies the functions and known discrepancies that are absent from DS Build 2.5.1.0. Any workarounds that may apply are identified.

Information on currently open DCRs is available at:

<http://gs580v-fsbmks10.ndc.nasa.gov:7001/index.html>.

Information on currently open Trac tickets is available at:

[https://babelfish.arc.nasa.gov/trac/cfs\\_apps/report/1](https://babelfish.arc.nasa.gov/trac/cfs_apps/report/1).

Note that these are restricted websites that requires a server account. Additional DCRs and/or Trac Tickets may have been submitted after preparation of this VDD. A cFS DS DCR report containing a listing of open DCRs and Trac tickets is available on request for customers who do not have access to the restricted servers. Please contact Susanne Strege, [susie.strege@nasa.gov](mailto:susie.strege@nasa.gov).

**Table 1.3-1 – Functions absent from this Release**

Trac ticket references are proceeded with a ‘#’ character.

No.	FSB DCR or Trac #	Description	Reason for Absence	Affected Requirement or Component	Workaround	Planned Delivery
1	#73	DS file header values should be big-endian. As with CCSDS, which is standardizing on big-endian for message headers, the fields in the DS file header (close time, FileTableIndex, FileNameType) should be stored in big-endian order.	Implementation is dependent on customer needs. Community input is needed.	DS App	Commit 05bc36c	Not Determined
2	#63	DS file header should include additional metadata. DS currently stores a number of fields in the DS file header (DS_FileHeader_t), namely the time the file was closed, the file name, the file table index, and the file name type.  When reading DS-created files on other platforms with other	Implementation is dependent on customer needs. Community input is needed.	DS App	Commit 386aa5b	Not Determined

		configurations, it is possible to tease apart platform/mission-specific information but it would be easier to store the configuration in the header for easier analysis of DS files.				
3	#71	<p>DS should (optionally) add a timestamp for each packet stored. CCSDS telemetry packets include a timestamp in the CCSDS headers. Command packets, on the other hand, do not. Also, if CCSDS timestamps are generated by something other than the local CPU, the timestamp may reflect when the packet was generated but not when the packet was received/stored by DS. Thirdly, if the CCSDS timestamp is generated using a different clock that is not in sync, the timestamps may not coincide. This is particularly important in multi-CPU environments, such as when cFS busses are connected via SBN.</p> <p>This will particularly help with replay using the ds_replay application as the timestamps will accurately reflect when DS received the packets and will be in the correct order.</p>	Implementation is dependent on customer needs. Community input is needed.	DS App	Commit d9f0061	Not Determined
4	4113	DS - Add Trick Simulation Support (JSC Request)	Implementation is dependent on customer needs. Community input is needed.	N/A	None	Not Determined

2	4123	Unsubscribing to Filter Messages May Cause Flooding of SB No Subscribers Event. When a new filter table is loaded, DS unsubscribes to all packets in the old table and then subscribes to all packets in the new table. This is true even if the message IDs in question are present in both the old and new filter tables. If packets are being generated at the time DS is unsubscribing and DS is the only application that has subscribed to a packet, the system could be flooded with SB no subscriber events.	The new data structure required to keep track of previously loaded MIDs will cause a significant performance hit. If a hashing table is used to perform the MID lookup, then there could be a significant memory hit (depending on the number of MIDs in the system). This issue is more than likely a FSW systems issue rather than an application issue. The issue and its solution will require more thought and customer/team input.	DS App	None	Not Determined
3	4193	When using a DS configuration with Critical Tables, the Filter Table Filename is cleared when DS is restarted after a Processor and Application Reset AND the table is restored from the CDS. This was not expected. Dumping the Table Registry after such a restart confirmed that the Last Loaded file is cleared from the Table Registry which could be the cause of this problem.	Implementation is dependent on customer needs.	DS8000	None	Not Determined
4	145950	Add Global Tables and Initialize Tables In Unit Test setup function.	Enhancement. Unit tests function as written.	Unit Tests	None	Not Determined

		<p>In the current unit test implementation, the tables are created in each unit test as local variables. Global pointers are set to point to the local tables however, the table data is not initialized to 0. The tables may contain old data or junk data, which may lead to incorrect results depending what has been run prior to a particular test.</p> <p>The new variables should be global rather than local, in order to allow them to be initialized in the Setup function without the memory being de-allocated at the end of the function, which would allow the possibility of being overwritten by other local variables in the test function.</p>				
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#### 1.4 DEVELOPMENT TOOL VERSIONS ASSOCIATED WITH THIS FSW VERSION

Table 1.4-1 identifies the versions of development tools used to generate this FSW version:

**Table 1.4-1 – Development Tool Versions Associated with this FSW Version**

Tool Type.	Tool Name	Version Used
RTOS	BVTed with VxWorks 6.9, however, OSAL provides ability to use multiple OSes	6.9
Compiler	GNU	3.3.2
cFE	Core Flight Executive	6.5.0.0
OSAL	Operating System Abstraction Layer	4.2.0.0



## 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
Executable for this build	Yes	2.5.1.0	Not application. Executables must be created for the specific mission/platform
Installation Procedures & Special Instructions ( <b>See Section 3.0</b> )	No	3.1	See cFS Deployment Guide  babelfish.arc.nasa.gov (in git system TOOLS master branch)  and  <a href="http://sourceforge.net/projects/coreflightexec">http://sourceforge.net/projects/coreflightexec</a>
Source Code of this FSW Build	Yes	2.5.1.0	gs580v-fsbmks10.ndc.nasa.gov. MKS label DS-ALL-Build2.5.1.0_FEB15-2017  babelfish.arc.nasa.gov (in git system ds_app_master branch)  and  <a href="http://sourceforge.net/projects/cfs-ds">http://sourceforge.net/projects/cfs-ds</a>
FSW Build Plan	N/A	N/A	None
Annotated S/W Detailed Design Docs	No	N/A	fsb.gsfc.nasa.gov/cFS
Ground System T&C Database	Yes	2.5.1.0	gs580v-fsbmks10.ndc.nasa.gov. MKS label DS-ALL-Build2.5.1.0_FEB15-2017  babelfish.arc.nasa.gov (in git system ds_app_master branch)  and  <a href="http://sourceforge.net/projects/cfs-ds">http://sourceforge.net/projects/cfs-ds</a>

Software Element	Changed with this Version?	New Version or Date	Location
Ground System Scripts developed by FSB	Yes	2.5.1.0	gs580v-fsbmks10.ndc.nasa.gov. MKS label DS-ALL-Build2.5.1.0_FEB15-2017  babelfish.arc.nasa.gov (in git system ds_app_master branch)  and  <a href="http://sourceforge.net/projects/cfs-ds">http://sourceforge.net/projects/cfs-ds</a>
Simulator and Test Data Generator Software	No	N/A	None
Executable - Ground Tools associated with FSW (tools to build stored command loads, etc.)	No	N/A	None
Source Code - Ground Tools associated with FSW (tools to build stored command loads, etc.)	No	N/A	Perl scripts to generate ground database and build verification procedures from templates (see cFS Deployment Guide)
Unit Test Procedures	Yes	2.5.1.0	gs580v-fsbmks10.ndc.nasa.gov. MKS label DS-ALL-Build2.5.1.0_FEB15-2017  babelfish.arc.nasa.gov (in git system ds_app_master branch)  and  <a href="http://sourceforge.net/projects/cfs-ds">http://sourceforge.net/projects/cfs-ds</a>
Unit Test Data	Yes	2.5.1.0	gs580v-fsbmks10.ndc.nasa.gov. MKS label DS-ALL-Build2.5.1.0_FEB15-2017  babelfish.arc.nasa.gov (in git system ds_app_master branch)  and  <a href="http://sourceforge.net/projects/cfs-ds">http://sourceforge.net/projects/cfs-ds</a>
Unit Test Results	Yes	2016/10/28	gs580v-fsbmks10.ndc.nasa.gov. MKS label DS-ALL-Build2.5.1.0_FEB15-2017  babelfish.arc.nasa.gov (in git system ds_app_master branch)  and  <a href="http://sourceforge.net/projects/cfs-ds">http://sourceforge.net/projects/cfs-ds</a>



Software Element	Changed with this Version?	New Version or Date	Location
FSW Make Files	No	2.5.1.0	gs580v-fsbmks10.ndc.nasa.gov. MKS label DS-ALL-Build2.5.1.0_FEB15-2017  babelfish.arc.nasa.gov (in git system ds_app_master branch)  and  <a href="http://sourceforge.net/projects/cfs-ds">http://sourceforge.net/projects/cfs-ds</a>
Linker & Compiler Configuration Files	No	2.5.1.0	gs580v-fsbmks10.ndc.nasa.gov. MKS label DS-ALL-Build2.5.1.0_FEB15-2017  babelfish.arc.nasa.gov (in git system ds_app_master branch)  and  <a href="http://sourceforge.net/projects/cfs-ds">http://sourceforge.net/projects/cfs-ds</a>
Requirements version (from MKS)	No	1.3	MKS label – version 1.3



### 3.0 INSTALLATION PROCEDURES

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Table 3-1 identifies the nominal FSW Installation Procedure(s) for this FSW Build onto the intended target system (including the commercial applications used and the configuration settings). The procedure version identifier, the date of the procedure and where it can be located are also provided.

**Table 3-1 FSW Installation Procedure(s)**

Destination (Target System)	Filename	Version and Date	Location
N/A	See cFS Deployment Guide	Version 3.1	Available with cFE open source release: <a href="http://sourceforge.net/projects/coreflightexec/">http://sourceforge.net/projects/coreflightexec/</a>  babelfish.arc.nasa.gov (in git system TOOLS master branch)  and on gs580v-fsbmks10.ndc.nasa.gov

### 4.0 CONFIGURATION SUMMARY AND VERSION IDENTIFICATION

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DS Build 2.5.1.0 can be found on gs580v-fsbmks10.ndc.nasa.gov, sourceforge: <http://sourceforge.net/projects/cfs-ds>, and babelfish.arc.nasa.gov (in git system ds\_app\_master branch). Verification of the version can be done by sending a DS 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.

### 5.0 SOFTWARE COPYRIGHT NOTICE

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## ACRONYMS

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ACS .....	Attitude Control System
C&DH.....	Command and Data Handling
cFE.....	core Flight Executive
cFS.....	core Flight Software System
CM .....	Configuration Management
COTS .....	Commercial Off-The-Shelf
DCR .....	Discrepancy/Change Request
DS.....	Data Storage Application
ETU.....	Engineering Test Unit
FSB.....	Flight Software Branch
FSW .....	Flight Software
I&T .....	Integration & Test
OSAL.....	Operating System Abstraction Layer
RTOS .....	Real-Time Operating System
T&C.....	Telemetry and Command
URL.....	Universal Resource Locator
VDD .....	Version Description Document

## ATTACHMENT 1 – CFS DATA STORAGE BUILD 2.5.0.0 DCRS/TRAC TICKETS

Trac ticket references are proceeded with a '#' character.

No.	DCR/Trac Ticket #	Description	Type	Priority	State	Date Reported	Build Target
1	#29	DS: Fix compiler error using with the latest build scripts	defect	minor	Test Complete	06/29/2015	2.5.0.0
2	#39	Allow C99 code in APPS	defect	minor	Test Complete	01/28/2016	2.5.0.0
3	#64	DS: inconsistent type for FileTableIndex in command structures	defect	minor	Test Complete	06/09/2016	2.5.0.0
4	4126	Sequence Counter Will Always Roll Over to Zero. The initial value of the counter however, is specified in the Destination File Table. The Sequence Counter has been updated to always rollover to the table specified initial value.	defect	minor	Test Complete	06/26/2013	2.5.0.0
5	141398	Remove redundant lines of code from ds_cmds.c	defect	minor	Test Complete	01/27/2016	2.5.0.0
6	141537	Move function prototype from .c file to .h file. Unit tests need access to function definitions.	defect	minor	Test Complete	02/05/2016	2.5.0.0
7	141542	Missing #include statement. Need to add #include "ds_appdefs.h" to ds_app.h so the constant "DS_FILE_HEADER_GPM" will be defined when used in the file.	defect	minor	Test Complete	02/08/2016	2.5.0.0
8	145916	Hash Table bug. The DS_CmdAddMID command was not adding new Message IDs to the hash table. Other commands (DS_SetFilterFile, DS_SetFilterType, DS_SetFilterParms) call the DS_TableFindMsgID function which uses the hash table to search for message IDs. Newly added Message IDs could not be found since they were not added to the hash table. The DS_CmdAddMID command was updated to appropriately add the new Message IDs to the hash table.	defect	major	Test Complete	10/23/2016	2.5.0.0
9	145921	DS - CFE_EVS_SendEvent Format Warnings	defect	minor	Test Complete	10/24/2016	2.5.0.0
10	146041	Updated commands are no longer 32-bit aligned. May cause incompatibility with ground system. All commands should explicitly pad to 32-bit aligned to avoid unexpected compiler induced padding.	defect	minor	Test Complete	01/31/2017	2.5.1.0