Core Flight Software



Version Description Document

core Flight Executive (cFE)

Build: 6.5.0

June 7, 2016

Signatures

Submitted by:



Approved by:



Signatures – continued

Approved by:



1.0 FSW Version Description

1.1 purpose and summary

The purpose of this build is to continue to refine the cFE FSW product. This build provides various bug fixes, as well as, new features and enhancements including:

* Class A safety-critical MISRA 2004 and cppcheck static analysis updates
* Class A safety-critical black box unit test updates
* New File Services standard file header initialization API function
* Enhanced cmake build system (in addition to classic build)
* Configurable priority for Executive Services child task
* 64-bit architecture support
* Assert Based unit test library

There were some minor API changes to this build that may result in compiler warnings with applications/tasks built via previous cFE releases. These API changes were made to correct and improve the function input parameter types. The changes include:

1. CFE\_ES\_CreateChildTask: stack pointer is `const`
2. CFE\_ES\_ProcessCoreException: context data pointer is `const` and string argument is now ‘const char \* instead of ‘uint8 \*’
3. CFE\_ES\_CalculateCRC: source data pointer is `const`
4. All name arguments are now `const char\*` instead of `char\*` for all API calls

In addition, this build was updated to comply with the minor API changes that were made in OSAL version 4.2.0 and PSP version 1.3.0. Backward compatibility is not supported with older versions of the OSAL and PSP libraries.

Unit testing has been completed and baselined on cFE build 6.5.0 using the updated cFE test suite. Results are included in the release package in the “Results” directories included under:

/fsw/cfe-core/unit-test/

Regression testing was performed on cFE 6.5.0 on a PPC/mcp750 running VxWorks 6.9. Results are included in the release package under:

/test-and-ground/test-review-packages/Results

Functional testing was performed on a variety of platforms. See section 1.5, [Tested Platforms](#TestedPlatforms), for a listing of the platforms on which functional testing was performed.

There are some outstanding issues being investigated. Resolutions to these issues may require a new release. The project CCB and community inputs will determine which Trac Tickets to include in the next release.

1.2 new/Changed functionality in this VERSION

Table 1.2-1 identifies new FSW functionality that has been implemented and is integrated into this FSW version and the Trac tickets associated with these changes.

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Trac Ticket #** | **High Level Description of Functionality** | **Component** | **Type** | **Priority** |
| 1 | #1 | Enhanced build system for cFS. The alternate build system uses CMake and offers several enhancements:   * Completely isolated build tree - No mixing of source files and generated files * Dynamic application search path, supports "app-store" concept by keeping app repos separate from cFS repos * Supports multiple different build configurations from the same source tree * Includes mechanisms for electronic data sheets (data dictionary) support and Lua functional testing support in the future | build | enhancement | major |
| 2 | #6 | Added InitHeader API function in cFE FS to initialize standard cFE file header. | fs | enhancement | minor |
| 3 | #48 | CMake support for elf2cfetbl usage | build | enhancement | major |
| 4 | #84 | CMake build support for statically linked CFS applications. Some platforms (RTEMS, for example) do not natively support the concept of dynamic module loading. Even on platforms that perform dynamic loading, it is sometimes beneficial to statically link since there is some extra runtime overhead when using a dynamically linked library vs. a statically linked library. Also adds the necessary hooks to include statically linked modules into the PSP as well as CFS applications and libraries. | other | enhancement | minor |
| 5 | #109 | ES Performance Child Task Priority is now configurable via platform configuration macro. | other | defect | major |
| 6 | #163 | Add cFE ITOS Record Files | other | enhancement | minor |

Table 1.2-2 identifies changes to FSW functionality and bug fixes from previously delivered FSW versions and the Trac Tickets associated with these changes.

**Table 1.2-2 – Changes to Previously Delivered Functionality and Bug Fixes**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Trac Ticket #** | **High Level Description of Functionality/Bug Report** | **Component** | **Type** | **Priority** |
| 1 | #2 | Compiler errors/warnings on EVS\_SendEvent() calls on some architectures | evs | defect | major |
| 2 | #4 | Split message definitions from headers. All of the cFS messages are currently defined in C structures. As a first step toward moving to "electronic data sheets" to describe the external data format, these need to be slightly modified to better separate the header portion of the structure from the payload portion of the structure. Currently, message structures are typically defined by reserving a block of space for the header as a uint8 array of size CFE\_SB\_CMD\_HDR\_SIZE or CFE\_SB\_TLM\_HDR\_SIZE. This approach has several issues:   1. Using a fixed-size block assumes only a single type of encapsulation (CCSDS) will ever occur. This may not be the case, as other non-CCSDS encapsulations may be a requirement for some missions 2. The fixed size block is not guaranteed to be properly aligned for a CCSDS header. Since it is declared as a uint8 array, the compiler will not ensure any alignment this structure. It is technically not valid to cast this as a CCSDS header since that contains uint16's 3. This is unlikely to be compatible with electronic data sheets (EDS) no matter what specific implementation is used. Since the definition of the message content (payload) and the message header (CCSDS or other format) will come from different data sheets, it becomes very problematic to have them mixed together like this.   To solve this problem requires a bit of restructuring: instead of declaring the format of the payload directly within the message structure, declare a separate "Payload" structure and define it in there.  This adds one extra layer to the structure tree but will improve flexibility going forward, and it will NOT change the external data format, so compatibility with ground systems is unaffected. It only affects the syntax of code accessing members of the payload structure. | other | enhancement | major |
| 3 | #5 | Reentrant version of decompress routine in CFE FS. The decompression routine keeps its internal state in global variables which makes it non-reentrant. To protect against concurrent usage a mutex is used but this has a major performance impact. The global variables have been replaced with a state structure so that it can be multithreaded like all other parts of CFS. A global state object has been implemented in order to preserve API compatibility. | fs | enhancement | minor |
| 4 | #7 | Fix use of uint32 to store a memory address: In many places a uint32 is used to store a memory address which breaks horribly on 64-bit architectures. The new version of OSAL (version 4.2.0) "common\_types.h" introduced a "cpuaddr" type to address this -- it is defined as an integer type large enough to store a memory address on the local processor. All uses of a uint32 to store a memory address have been replaced with the cpuaddr type for better portability. This is a requirement for a native 64-bit build to work. | other | defect | major |
| 5 | #8 | Clean up "extern" declarations at the top of C files: In the cFE core apps, many files reference functions and data structures defined in other files. However, the function prototypes or "extern" declarations are not in common header files, but simply put at the top of the C file that uses it. While this does build, it defeats the type checking done by the compiler. It is far from ideal because if the real variable type or function prototype ever changes, the linker will still happily link it together even though they might be completely incompatible (or worse, incompatible in a really subtle way). The only reason to NOT put a declaration in a header file is if it should not be called or referenced by CFS apps. This has been solved by creating a private cFE core shared header file. | other | defect | major |
| 6 | #10 | CFE ES makes assumptions about OSAL opaque objects: The OSAL returns object identifiers which are defined as uint32 values. In the current implementation of OSAL they happen to be zero-based but this should not be a requirement; in fact there are several advantages to making these identifiers non-zero-based. The primary offender is the ES core application using the task ID from OSAL directly as an array index. To ensure future compatibility with OSAL updates, the OSAL object IDs are treated as opaque integers of undefined range. | es | defect | minor |
| 7 | #11 | cFE enumeration names: In order to reduce the chance of name space conflicts, enumerated names now follow the general form, with the value prefixed by the group name and the app name:  <APPNAME>\_<GROUPNAME>\_<VALUEID\_1> <APPNAME>\_<GROUPNAME>\_<VALUEID\_2> .... <APPNAME>\_<GROUPNAME>\_<VALUEID\_N>  This ensures that even if two enums use the same value name(s) they will not conflict with each other. | other | defect | major |
| 8 | #13 | Display extended version information from the build: git and Cmake offer additional build information where the current git commitid and most recent tag name are built into a global object that is accessible at runtime. When it is available, this extended build information will be displayed along with the official four digit version number. | build | enhancement | major |
| 9 | #16 | Removed cfe\_es\_devsrvr code: cfe\_es\_devsrvr.c and .h appear to be stale/obsolete and not being called or referenced by anything else in cFE. Furthermore, it should be deprecated anyway since device-support code logically fits better within the PSP. At the cFE layer it should be all hardware-independent code. These two files have been removed from the build. | other | defect | minor |
| 10 | #18 | Modify code that reads or writes memory addresses in external messages to use wrapper: In the current version, some external interface (command/telemetry) messages contain direct CPU memory addresses. This can be very bad for several reasons:  Memory addresses can be a different size on different CPUs Since memory addresses are likely to change from run to run (even in the same build) it makes it difficult to script tests The receiver has no way to validate it (other than NULL). If the address value ever gets corrupted or an invalid value is used, the consequence is usually dire (a crash).  Ultimately the use of direct memory addresses in messages should be avoided. This ticket modified locations where a memory address performs a read/write from/to an external message to use a wrapper function. The wrapper function does not change any functionality in itself, but it will provide a path going forward such that the wrapper function can be modified to convert the address to/from a safe, verifiable, architecture independent value rather than using the address directly. | other | enhancement | major |
| 11 | #19 | Fix inclusion of PSP private header files in CFE layer | other | defect | minor |
| 12 | #20 | Stack pointer parameter to CFE\_ES\_CreateChildTask should not be marked "const" | es | defect | major |
| 13 | #22 | Error constants defined in "cfe\_error.h" incorrectly use the "L" suffix | build | defect | major |
| 14 | #23 | Code in CFE TIME fails to compile with strict compiler settings | time | defect | minor |
| 15 | #24 | Fix duplicate mempool structure definitions in unit test code | es | defect | minor |
| 16 | #26 | Fix type mismatches and remove unnecessary typecasting | other | defect | minor |
| 17 | #27 | Clean up unused local variables | other | defect | minor |
| 18 | #28 | Pointer arguments to functions that are input only should be declared "const" | other | enhancement | minor |
| 19 | #29 | Ensure that return codes from PSP functions are checked | other | enhancement | minor |
| 20 | #31 | Fix duplicate structure definitions in table unit test | tbl | defect | minor |
| 21 | #32 | Unit test stubs need to be kept in sync with their respective real implementations | build | defect | minor |
| 22 | #33 | Fix "no return" warning on CFE\_SB\_ReadQueue() function | sb | defect | trivial |
| 23 | #34 | Update cFE unit tests: Updated to cover cFE version 6.5.0 containing source code updates to all files necessary to pursue a Class A safety-critical classification of the cFE software. Tests were modified and new tests were added to improve the branch path and line coverage. | test | defect | major |
| 24 | #52 | CFE\_TIME fails to build with CFE\_TIME\_CFG\_SRC\_MET set to TRUE | time | defect | major |
| 25 | #55 | Many command processors in CFE do not confirm null-termination of strings within the message | other | defect | major |
| 26 | #56 | Clean up massive number of warnings in sb\_UT.c | sb | defect | minor |
| 27 | #60 | Fix startup file pathnames in CMake version of the sample configurations | other | defect | minor |
| 28 | #65 | Some symbols not making it into final core executable file | build | defect | major |
| 29 | #66 | Minor fixes for cmake unit test build | other | defect | minor |
| 30 | #73 | CFE ES Mempool code uses "uint32" where it should be "cpuaddr" | es | defect | major |
| 31 | #76 | CFE is closing filehandles that were not opened | other | defect | minor |
| 32 | #77 | Remove dependencies on SOFTWARE\_BIG/LITTLE\_BIT\_ORDER | other | enhancement | major |
| 33 | #79 | Fix build failures on RTEMS | other | defect | major |
| 34 | #80 | Integrate CFE\_TIME with OSAL timebase API | time | enhancement | minor |
| 35 | #103 | Remove "cpu" directories from fsw/platform\_inc | common | defect | major |
| 36 | #106 | CCSDS header file macro CCSDS\_INC\_SEQ generates a compiler warning when referenced (GSFC DCR 22932) | common | defect | major |
| 37 | #113 | Copies to/from message payloads should use the sizeof() operator where possible | other | enhancement | major |
| 38 | #114 | ES unit test failing on x86\_64 due to uint32 memory handle | es | defect | major |
| 39 | #120 | resolve "-m32" CFE classic build issues | build | defect | major |
| 40 | #122 | Add missing ".Payload" structure member designations | time | defect | major |
| 41 | #123 | JSC: Remove unnecessary cast on OS\_write | es | defect | minor |
| 42 | #124 | JSC: Update code constructs to MISRA recommendations | other | defect | major |
| 43 | #125 | JSC: change uint8 to char for strings in interface structures | other | defect | major |
| 44 | #126 | Fix potential issues in ES\_CleanUpApp() | es | defect | major |
| 45 | #127 | Fix size check in CFE\_ES\_InitializeCDS() | es | defect | major |
| 46 | #128 | JSC: Type correctness fixes | other | defect | major |
| 47 | #132 | Add explicit "return" after functions that are not supposed to return | other | defect | major |
| 48 | #139 | Remove unused "StackPtr" variable in ES startup object table | es | enhancement | minor |
| 49 | #149 | Hush cppcheck warnings. There are some specific places in the code where we want cppcheck to not produce warnings, without generalizing in any way to other code.  This involves inserting comments like:  /\* cppcheck-suppress unsignedPositive \*/ | cppcheck | defect | major |
| 50 | #150 | Redundant Initializations. When a variable is declared and initialized during the declaration and then a value is immediately stored in it, a cppcheck warning is produced. The redundant initializer does not need to be added. These redundant initializers are being removed. | cppcheck | defect | minor |
| 51 | #151 | cppcheck - Strncpy-fills May Not Be Null Terminated. addressing the following cppcheck warnings:  E-JA/cfe/fsw/cfe-core/src/es/cfe\_es\_apps.c:502: warning: The buffer 'RamDiskPath' may not be null-terminated after the call to strncpy().  /home/bamboo-remote-agent/bamboo-agent-home/xml-data/build-dir/CFS-CFSCFE-JA/cfe/fsw/cfe-core/src/es/cfe\_es\_apps.c:807: warning: The buffer 'RamDiskPath' may not be null-terminated after the call to strncpy().  /home/bamboo-remote-agent/bamboo-agent-home/xml-data/build-dir/CFS-CFSCFE-JA/cfe/fsw/cfe-core/src/es/cfe\_es\_shell.c:122: warning: The buffer 'Cmd' may not be null-terminated after the call to strncpy().  /home/bamboo-remote-agent/bamboo-agent-home/xml-data/build-dir/CFS-CFSCFE-JA/cfe/fsw/cfe-core/src/es/cfe\_es\_shell.c:96: warning: The buffer 'OutputFilename' may not be null-terminated after the call to strncpy().  4-8-16 - CCB meeting discussed solution to replace strncpy call with CFE\_SB\_MessageStringGet | other | defect | major |
| 52 | #153 | Fix git version strings built into executable. The cmake build system includes version information acquired by running git describe in various source trees being used by the build. These version strings are then linked directly into the output executable.  In testing the CFE 6.5 release it was observed that this wasn't quite working correctly. The git revs were OK but it in some cases was referencing the wrong base tag or no base tag at all. | build | defect | minor |
| 53 | #154 | SB Timeout Receive Unit Test Failure. When running the SB unit tests via the "classic build", the SB is failing due to an unexpected return:  Unexpected return in timeout receive test, exp=-905969663, act=-905969662  The failure appears to be due to the unit test not setting the proper return value before the call to CFE\_SB\_RcvMsg. In the sb\_UT.c source code file in the Test\_RcvMsg\_Timeout function there is an #ifndef statement around the UT\_SetRtnCode function that is blocking the return code from being set properly. | other | defect | major |
| 54 | #155 | Enhanced build version.h collisions. The CMAKE build system CFE/cmake/version.cmake code generates a version.h file that overrides the version.h required to build for VxWorks.  T fix changed the generated filename to cmake\_version.h, and make the change to CFE/cmake/target/src/target\_config.c to include the new filename | build | defect | minor |
| 55 | #157 | EVS - CFE\_EVS\_WriteAppDataCmd References Incorrect Variable in Call to OS\_creat | evs | defect | major |
| 56 | #160 | CFE\_ES\_ReloadAppCmd References Incorrect Data in Call to CFE\_ES\_ReloadApp | es | defect | major |
| 57 | #162 | CFE\_ES\_ShellOutputCommand is Truncating Output Filename | es | defect | major |

1.3 MISSING Planned FEATURES AND KNOWN PROBLEMS

Table 1.3-1 identifies the functions and known discrepancies that are absent from cFE Build 6.5.0. Any workarounds that may apply are identified.

Information on currently open DCRs is available at <http://tlserver3.gsfc.nasa.gov:7001/index.html> and <https://babelfish.arc.nasa.gov/trac/cfs_cfe/report/1>. Note that these are restricted websites that requires a server account. Additional DCRs/Trac Tickets may have been submitted after preparation of this VDD. A cFE DCR and/or Trac Ticket report containing a listing of open DCRs/Trac Tickets is available on request for customers who do not have access to the above servers. Please contact Susanne Strege, [susie.strege@nasa.gov](mailto:susie.strege@nasa.gov). Table 1.3-1 below only contains a listing of the open DCRs on the MKS tlserver3 server. Open trac tickets are not listed.

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

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No.** | **Trac Ticket #** | **Description** | **Component** | | **Status** | **Planned Delivery** | **Type** | **Priority** |
| 1 | #14 | CFE\_TIME\_GetTime() should not return a structure | other | new | | Not Determined | enhancement | minor |
| 2 | #15 | CFE\_TIME\_GetReference() has insufficient protection against update while reading | time | new | | Not Determined | defect | major |
| 3 | #17 | Implement "bootstrap" script | build | new | | Not Determined | enhancement | major |
| 4 | #25 | Consolidate CDS and generic/ram mempool code into single implementation | es | on\_hold | | Not Determined | enhancement | minor |
| 5 | #30 | Review use of CFE\_PSP\_MemCpy/CFE\_PSP\_MemSet | other | review | | Not Determined | task | minor |
| 6 | #34 | update cFE unit tests | test | assigned | | Not Determined | defect | major |
| 7 | #38 | Update CFE\_FS\_InitHeader to to Handle Error/Invalid Length Conditions | fs | new | | Not Determined | enhancement | major |
| 8 | #39 | Enforce Strict ASCII | other | new | | Not Determined | defect | minor |
| 9 | #43 | CFE TIME uses OSAL IntLock/IntUnlock for mutual exclusion | time | review | | Not Determined | defect | major |
| 10 | #44 | CFE\_ES\_WriteToSyslog() is not multi-thread safe | es | review | | Not Determined | defect | major |
| 11 | #45 | CFE\_ES\_ProcessCoreException() is not interrupt-safe | other | review | | Not Determined | defect | major |
| 12 | #46 | Application Startup Race Conditions (GSFC DCR 22819) | es | new | | Not Determined | defect | major |
| 13 | #47 | CFE TIME fails to build when CFE\_TIME\_CFG\_SIGNAL set to TRUE | time | review | | Not Determined | defect | minor |
| 14 | #49 | Extend CMake app search path | build | new | | Not Determined | enhancement | minor |
| 15 | #53 | File operations in CFE\_ES\_ShellOutputCommand() need cleanup | es | review | | Not Determined | defect | minor |
| 16 | #54 | Pre-CMake fallback build script needs updating. | build | in\_work | | Not Determined | task | minor |
| 17 | #58 | Exiting an Application Creates an Application with an Unknown State (GSFC DCR 23035) | es | new | | Not Determined | defect | major |
| 18 | #61 | CFE\_SB\_GetMsgTime() and CFE\_SB\_TimeStampMsg() do not handle byte-swapping on \_EL platforms | sb | new | | Not Determined | defect | major |
| 19 | #62 | Clean up EVS\_SendViaPorts() function | evs | new | | Not Determined | enhancement | minor |
| 20 | #63 | EVS "output ports" should be a function of the PSP | evs | review | | Not Determined | enhancement | minor |
| 21 | #64 | Suspicious implementation of SHORT\_FORMAT mode in EVS\_SendPacket() | other | review | | Not Determined | defect | major |
| 22 | #69 | SB Pipes are not protected. | sb | review | | Not Determined | defect | major |
| 23 | #70 | SB Only Increments Message Sequence Count Where There are Subscribers | other | new | | Not Determined | defect | major |
| 24 | #78 | cFE TIME unit tests break when different configuration options are used | time | new | | Not Determined | defect | major |
| 25 | #83 | Default Configuration Setting for CFE\_ES\_STARTUP\_SCRIPT\_TIMEOUT\_MSEC is Too Big | other | new | | Not Determined | enhancement | major |
| 26 | #85 | Add UT assert stubs to CFE | test | on\_hold | | Not Determined | enhancement | major |
| 27 | #86 | Correction of an infinite loop in cfe\_sb\_task.c | sb | new | | Not Determined | defect | minor |
| 28 | #89 | ES Does Not Check CFE\_PSP\_MemRead8 Return Code | es | new | | Not Determined | defect | major |
| 29 | #90 | ES - Invalid Memory Handle When Restarting/Deleting an Application with Tables (GSFC DCR 14483) | tbl | new | | Not Determined | defect | major |
| 30 | #92 | cFE Time subsystem has calls to OS functions that do not exist | time | new | | Not Determined | defect | major |
| 31 | #93 | Executive Services always creates tasks with floating point enabled (GSFC DCR 21293) | es | new | | Not Determined | defect | major |
| 32 | #94 | ES - Add Ability to Recreate the RAM Disk via Command (GSFC DCR 21594) | es | new | | Not Determined | defect | major |
| 33 | #95 | ES - RegisteredTasks Counter Does Not Decrement When Child Tasks are Exited (GSFC DCR 21771) | es | new | | Not Determined | defect | major |
| 34 | #96 | Add support to allow SBN to pass sender information across the network (GSFC DCR 22063) | other | new | | Not Determined | defect | major |
| 35 | #97 | EVS - Add Configuration To Output Events Upon Command Message vs. Function Call (GSFC DCR 22080) | evs | new | | Not Determined | defect | major |
| 36 | #98 | SB - Add Last Pipe ID and Msg ID to Routine Telemetry for Diagnosing Message Limit Error and Buffer Overrun Errors (GSFC DCR 22081) | sb | new | | Not Determined | defect | major |
| 37 | #99 | TBL - Update Table Services to Send Messages to Notify Applications of Pending Table Updates (GSFC DCR 22622) | tbl | new | | Not Determined | defect | major |
| 38 | #100 | Update CFE\_ES\_SYSTEM\_LOG\_SIZE Verify to Allow Larger Sys Log Files (GSFC DCR 22684) | es | new | | cfe\_next | defect | major |
| 39 | #101 | Table Services Name Buffer Overflow | tbl | new | | Not Determined | defect | major |
| 40 | #102 | ES Creates Redundant Sys Log Entries When Creating ER Log Entries (GSFC DCR 22768) | es | new | | Not Determined | defect | major |
| 41 | #104 | MMS-IVV-013 (OBS-1238) - Static Code Analysis: Possible Buffer Underrun in cfe\_fs\_decompress.c (GSFC DCR 22838) | fs | new | | Not Determined | defect | major |
| 42 | #105 | cFE Does Not Meet Double Floating Point Alignment Requirements on PPC440x5 Book E Architecture (GSFC DCR 22813) | common | new | | Not Determined | defect | major |
| 43 | #107 | SB - Duplicate Pipe Creation Causes Failure to Delete Pipe (GSFC DCR 22934) | sb | new | | Not Determined | defect | major |
| 44 | #108 | TBL - Dump Table Registry Data Command Can Hog CPU (GSFC DCR 23031) | tbl | new | | Not Determined | defect | major |
| 45 | #110 | ES - Recursive Exit Application Error Message | es | new | | Not Determined | defect | major |
| 46 | #111 | Naming convention for macros in cfe\_mission\_cfg and cfe\_platform\_cfg | other | new | | Not Determined | enhancement | major |
| 47 | #112 | Simplify Function Pointer Manipulations | other | new | | Not Determined | task | minor |
| 48 | #115 | Standardize Version Numbering (in CFE) | other | new | | Not Determined | defect | major |
| 49 | #116 | printf format specs need to be cleaned up | other | new | | Not Determined | defect | minor |
| 50 | #117 | CFE\_ES\_GetAppName() undefined output when failure occurs | es | new | | cfe\_next | defect | major |
| 51 | #118 | Improve cppcheck configuration for CFE | cppcheck | new | | Not Determined | enhancement | major |
| 52 | #119 | cppcheck a vxworks build | cppcheck | in\_work | | Not Determined | task | major |
| 53 | #133 | CFE\_ES\_AppCreate does not unload an object file if the entry point is not found | other | new | | cfe\_next | defect | major |
| 54 | #135 | SB: "cfe\_sb.h" should not depend on cfe\_platform\_cfg.h | sb | new | | cfe\_next | defect | minor |
| 55 | #137 | Possible buffer overrun in format strings used for scanf | es | new | | cfe\_next | defect | major |
| 56 | #138 | FS - ExtractFilenameFromPath Function Needs Revision | other | new | | cfe\_next | enhancement | major |
| 57 | #140 | The ES "LoadLibrary()" call - avoid duplicates and pass ID | es | new | | cfe\_next | enhancement | minor |
| 58 | #141 | Macro Parameters need Parens | common | new | | cfe\_next | defect | minor |
| 59 | #142 | Refactor CFE\_ES\_AppCreate and CFE\_ES\_LoadLibrary | es | new | | cfe\_next | enhancement | minor |
| 60 | #143 | ES does not check target file existence before attempting to reload an application (GSFC DCR 145460) | other | new | | cfe\_next | defect | major |
| 61 | #144 | Thread safety issues in CFE\_TIME around the Sync Callbacks | time | new | | cfe\_next | defect | major |
| 62 | #145 | use the OSAL configuration file loader library | es | new | | cfe\_next | enhancement | minor |
| 63 | #147 | ES - CreateChildTask API Function Does Not Use "Flags" Input Parameter | es | new | | Not Determined | defect | major |
| 64 | #152 | Redundant Assignments and Unread Variables | other | new | | Not Determined | defect | minor |
| 65 | #156 | Incorrect leap seconds in docs | time | new | | Not Determined | defect | minor |
| 66 | #158 | EVS Unit Test Code Coverage Incomplete in Task.c (GSFC DCR 8492) | evs | new | | Not Determined | enhancement | minor |
| 67 | #159 | ES Unit Test Code Coverage Incomplete in apps.c | es | new | | Not Determined | enhancement | minor |
| 68 | #161 | CFE\_ES\_DeleteChildTask SysLog Message/Comments are Misleading | es | new | | cfe\_next | defect | minor |
| 69 | #164 | cFE cES1702.3 and cES1703.3 Requirement Failures | es | new | | cfe\_next | defect | major |
| 70 | #168 | cFE cES1515.1 Requirement Failure | es | new | | cfe\_next | defect | major |

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 | VxWorks | 6.9 |
| Compiler | GNU (ccppc) | 3.3.2 |
| CFS PSP | CFS Platform Support Package | 1.3.0.0 |
| OSAL | Operating System Abstraction Layer | 4.2.0 |
| Ground System | ASIST | 20.2 |

**1.5** **TESTED PLATFORMS**

Since the cFE uses the Operating System Abstraction Layer (OSAL), multiple operating systems are supported. Build Testing of cFE Build 6.5.0 has been done on a PPC/mcp750 using the RTOS and compiler specified in Table 1.4-1 above. In addition, cFE Build 6.5.0 has been functionally tested with the hardware/software platforms listed in Table 1.5-1 below (build test platform is included for completeness).

**Table 1.5-1 – Functional Test Platforms Associated with this FSW Version**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **No.** | **Machine** | **CPU** | **Operating System** | **cFE Build** | **PSP** | **Notes** |
| 1 | Motorola MCP750 | PowerPC 750 32-bit microprocessor | VxWorks 6.9 | 32-bit | mcp750-vxworks6.4 | mcp750-vxworks6.4 PSP supports VxWorks 6.x versions  Built via classic build in accordance with "Deployment Guide" instructions.   Used for build, regression, and requirements verification testing |
| 2 | Standard PC | x86-64 / Intel Xeon CPU E5-1650 | Ubuntu 14.04.4 LTS 64-bit, kernel version 3.13.0 | 64-bit | pc-linux | Using "posix-ng" OSAL layer for native 64-bit OSAL support  Built via CMake |
| 3 | QEMU v2.5.0 | i686 / QEMU virtual 32-bit | RTEMS 4.11 (prerelease) + pc686 BSP | 32-bit | pc-rtems | Built via CMake and according to "README" file included in pc-rtems PSP |
| 4 | Custom Hardware | Xilinx Microblaze / Virtex-5 FPGA | SCLinux, kernel version 3.6.0 | 32-bit | pc-rtems | PSP extension modules in use to support custom hardware  Built via CMake |
| 5 | Vadatech AMC516 | PowerPC e500mc / Freescale QorIQ (quad-core) | Embedded Linux (customized), kernel version 3.12.19 | 32-bit | pc-linux | Built via CMake |
| 6 | Beaglebone Black | ARMv7 / Texas Instruments AM3359 | Debian Wheezy 7.9, kernel version 3.8.13 | 32-bit | pc-linux | Built via Cmake |
| 7 | Linux Workstation | x86\_64 / Intel Xeon CPU E5-2640 | CentOS 6.8 64-bit | 32-bit | pc-linux | Unit test verificaiton and integrated build running test applications  Built via classic build |
| 8 | Aeroflex Gaisler ut699 development board | SPARC Leon3 | VxWorks 6.7 | 32-bit | grut699-vxworks6 | Built via classic build. Integrated build running test applications. |
| 9 | Aitech's SP0 3U CompactPCI SBC | PowerQUICC-III MPC8548E | VxWorks 6.9 | 32-bit | sp0-vxworks6.9 | Built via classic build. Integrated build running test applications. |
| 10 | VirtualBox VM | single core X86 | Debian Jessie, 32-bit x86 | 32-bit | pc-linux | Build and unit test verification:    - Bamboo Job A build uses classic build  - BambooJB build uses CMake build  - cppcheck is run by both jobs  - runs unit tests produced by both jobs |
| 11 | Dell Precision Standard PC | 2C Core i3-2120,3.3G,3M,1GT,Dell Precision T1650 | RedHatEnterpriseClient 5.11 32-bit | 32-bit | pc-linux | Built via classic build. Unit test verification only. |

2.0 Delivered products

Table 2.0-1 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 2.0-1 – Delivered Products and their Locations**

| Software Element | Changed with this Version? | New Version or Date | Location |
| --- | --- | --- | --- |
| Executable for this build | Yes | 6.5.0 | N/A. Executables are not delivered for the cFE |
| Installation Procedures & Special Instructions | No | N/A | See Deployment Guide  babelfish.arc.nasa.gov (in git system master branchs – cFE and TOOLS) and <http://sourceforge.net/projects/coreflightexec> |
| Source Code of this FSW Build | Yes | 6.5.0 | babelfish.arc.nasa.gov (in git system master branch) and <http://sourceforge.net/projects/coreflightexec> |
| FSW Build Plan | No | N/A | None |
| Annotated S/W Detailed Design Docs | No | N/A | cFE Application Developer’s Guide  babelfish.arc.nasa.gov (in git system master branch) and <http://sourceforge.net/projects/coreflightexec> |
| Ground System T&C Database | Yes | 6.5.0 | babelfish.arc.nasa.gov (in git system master branch) and <http://sourceforge.net/projects/coreflightexec> |
| Ground System Scripts developed by FSB | No | N/A | babelfish.arc.nasa.gov (in git system master branch) and <http://sourceforge.net/projects/coreflightexec> |
| Simulator and Test Data Generator Software | N/A | N/A | None |
| Executable - Ground Tools associated with FSW (tools to build stored command loads, etc.) | No | N/A | babelfish.arc.nasa.gov (in git system TOOLS master branch) and <http://sourceforge.net/projects/coreflightexec> |
| Source Code - Ground Tools associated with FSW (tools to build stored command loads, etc.) | Yes | N/A | $WORK  Perl scripts to generate ground database and build verification procedures from templates |
| Unit Test Procedures | Yes | 6.5.0 | babelfish.arc.nasa.gov (in git system master branch) and <http://sourceforge.net/projects/coreflightexec> |
| Unit Test Data | Yes | 6.5.0 | babelfish.arc.nasa.gov (in git system master branch) and <http://sourceforge.net/projects/coreflightexec> |
| Unit Test Results | Yes | 6.5.0 | babelfish.arc.nasa.gov (in git system master branch) and <http://sourceforge.net/projects/coreflightexec> |
| FSW Make Files | Yes | 6.5.0 | babelfish.arc.nasa.gov (in git system master TOOLS branch) and <http://sourceforge.net/projects/coreflightexec> |
| Linker & Compiler Configuration Files | Yes | 6.5.0 | babelfish.arc.nasa.gov (in git system master TOOLS branch) and <http://sourceforge.net/projects/coreflightexec> |

3.0 INSTALLATION PROCEDURES

Table 3.0-1 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 3.0-1 FSW Installation Procedure(s)**

| Destination  (Target System) | Filename | Version and Date | Location |
| --- | --- | --- | --- |
| Procedure is generic for each CPU | cFS Deployment Guide | 3.0 | babelfish.arc.nasa.gov (in git system master TOOLS branch) and <http://sourceforge.net/projects/coreflightexec> |

4.0 Configuration summary and version identification

cFE Build 6.5.0 can be found on babelfish.arc.nasa.gov (in git system master branch) and is provided as open source on sourceforge.net:

<http://sourceforge.net/projects/coreflightexec/>

Telemetry is available to indicate cFE Build 6.5.0 and is documented in the following source file: /fsw/cfe/core/src/inc/cfe\_version.h.

Acronyms

API………………………………………...…………………………………………….Application Program Interface

cFE Core Flight Executive

C&DH Command and Data Handling

cFS…………………………………………………………………………………………Core Flight Software System

CM Configuration Management

CPM CFS Performance Monitor

COTS Commercial Off-The-Shelf

DCR Discrepancy/Change Request

EDS Electronic Data Sheet

ES Executive Services

ETU Engineering Test Unit

EVS Event Services

FSB Flight Software Branch

FSW Flight Software

I&T Integration & Test

MISRA Integration & Test

OSAL……………………………………………………………………….……Operating System Abstraction Layer

PPC Power Personal Computer

RTOS Real-Time Operating System

SB Software Bus Services

TBL Table Services

TIME Time Services

T&C Telemetry and Command

URL Universal Resource Locator

UTF…………………………………………………………………………………………….….Unit Test Framework

VDD Version Description Document