# Core Flight Software Version Description Document

**Abstract**


Figure 1: cFS Logo

## core Flight Executive (cFE)
## Version 6.6.0

# Contents

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# 1 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:

- Symmetric Multi-Processor (SMP) updates to ensure multi-thread saftey when writing to the system log and performing internal time updates and time services
- New platform configuration to expand the Consultative Committee for Spacecraft Data Systems (CCSDS) APID name space beyond 2^11. Using the CCSDS Version 2 Spacecraft Onboard Interface Services Area (SOIS) standard, this new configuration uses the extensions to the CCSDS Space Packet secondary header containing APID qualifier and subsystem ID information. The CCSDS Primary Header APID continues to be used as a unique system-wide message identifier. Configurable macros are then utilized to generate a unique mission wide message identifier from the APID qualifier, command/telemetry bit, subsystem ID, and APID information with the CCSDS headers. This new configuration addresses several issues including:
  - Difficulties allocating and managing the limited number of APIDs during development
  - Insufficient number of APIDs for large systems
  - APID allocations for formation flying, distributed systems, multi-core, and partitioned systems
  - Loss of spacecraft and subsystem identifying information as packets traverse the network stacks
- ES Memory Pool updates to guarantee buffers allocated from a pool meet the target CPU architecture requirements for the largest C99 data types (long long int, long double, and void*). Additionally, this introduces a new platform configuration option to increase the alignment to greater value, as this can yield performance improvements on some architectures.
- CCSDS Electronic Data Sheets (EDS) support. An EDS is a formal machine readable (XML) specification of interfaces for both hardware and software components. The primary use cases are to warrent: Exchange of unambiguous interface definitions in a standard format between organizations (As CCSDS is an international standards body, organizations includes other international agencies, and industry partners); Automatic generation of interface code, system models, system tests, and mission operational databases; and Run-time support for Plug-and-Play systems. EDS updates in this release include:
  - SOIS EDS XML files for each of the core applications (ES, EVS, SB, FS, TBL, and TIME)
  - Adoption and implementation of a consistent naming convention for all identifiers. This serves as a prerequisite to using any sort of generated header files or source code from the EDS XML files.
  - Ensuring library loads are not duplicates. The lack of a runtime ID becomes important/relevant if a loadable library contains an EDS that needs to be registered in the local EDS table for other apps to use.
  - Message dispatch consistency across the core applications. Every interface message defined in the external interface (be it EDS or otherwise) now has a separate dedicated handler function. This includes no-op and send housekeeping commands. The message handler functions all have a similar prototype:

    int32 MessageHandler(const MessageType_t *data);
- Actual short format event message
- Removal of compile time upper bound checks on platform configuration parameters
- Adoption and implementation of a consistent naming convention for all mission and platform configuration parameters
- New platform configuration to define the length of time (in milliseconds) ES will delay when sending shell command packets over the software bus
- Moving Performance ID definitions from private to public header files
- Adding missing command length verification for SB and TIME applications
- Adding new Software Bus API to control whether the app publishing a message receives the message in its own pipe.

There were no changes to existing APIs made in this build however, there were two changes that result in expected compiler warnings building with the latest release of the OSAL, Version 4.2.1:

1. cfe/fsw/cfe-core/src/es/cfe_es_shell.c: In function 'CFE_ES_ShellOutputCommand': line 98: warning: passing argument 1 of 'OS_ShellOutputToFile' discards qualifiers from pointer target type. osal/src/os/inc/osapi-os-filesys.h:439: note: expected 'char *' but argument is of type 'const char *'
2. cfe/fsw/cfe-core/src/tbl/cfe_tbl_task_cmds.c: In function 'CFE_TBL_DumpToFile': line 784: warning: passing argument 2 of 'OS_write' discards qualifiers from pointer target type. osal/src/os/inc/osapi-os-filesys.h:280: note: expected 'void *' but argument is of type 'const void *'

These warnings will be resolved in a future release of the OSAL.

In addition, backward compatibility is not supported with versions of the OSAL library older than 4.2.0 and versions of the PSP library older than 1.3.0. Additional release notes may be found at:

https://babelfish.arc.nasa.gov/trac/cfs_cfe/wiki/ReleaseNotes

These release notes are also include in the /docs directory where this VDD is located.

Unit testing has been completed and baselined on cFE build 6.6.0 using the updated cFE test suite. Results are included in the release package in the "Results" directories included under:

/fsw/cfe-core/unit-test/

Additional unit testing has been performed on each of the platforms listed in Table 1.4-1.
The test results have been archived on babelfish.arc.nasa.gov in the cfs_cfe Trac Ticketing system under Trac #207.

Regression testing was performed on cFE 6.6.0 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 Tested Platforms 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.

### 1.2.1 New Functionality in this Version

| Trac | Component | Summary | Commits |
|---|---|---|---|
| #167 | es | Additional CFE start up state for application sync | `465a958`: Add additional sync state for apps `b227d57`: Remove stale comment in CFE_ES_ExitApp |
| #175 | common | CCSDS APID Name Space Expansion | `b68417f`: Changes to implement extended APID name space. Also other assorted minor cleanup `a6e3d70`: Minor cleanup action items `d3d39e2`: Fixes for MsgKey/MsgId/RouteIdx `3521508`: Cleanup APID qualifier header |

| Trac | Component | Summary | Commits |
|---|---|---|---|
| #176 | common | CCSDS Electronic Data Sheet (EDS) integration | `8ae2f8d`: Naming convention updates `fc652ab`: Add EDS files for CFE core apps `d124688`: Make CFE_TIME_Copy macro public `b54a2b7`: prefer sizeof(instance) rather than type `69edaa0`: Implement Generic status codes `4737d6a`: Update ES message dispatch pattern `3244d92`: Update EVS message dispatch pattern `b91baff`: Update TBL message dispatch pattern `478ffdb`: Update TIME message dispatch pattern `0f46da2`: Update SB message dispatch pattern `27cc676`: Correlate TLM struct names between code and EDS `d547d5c`: Fix issue with EVS mode/format command |
| #190 | sb | option to not receive messages I send? | `a47335c`: Added CFE_SB_{Set\|Get}PipeOpts() API, with one field currently defined to control whether the app publishing a message receives the message in its own pipe. Addresses . |
| #203 | build | CMake script cleanup | `8ba8be4`: CMake script file cleanup `6ea63f8`: Build PSP earlier in the build process |
| #204 | other | CFE SB and TIME components missing length verification on incoming messages | `bd40a2d`: Add command length checks for SB and TIME |

### 1.2.2 Changes to Previously Delivered Functionality, Bug Fixes, and Documentation Updates

| Trac | Component | Summary | Commits |
|---|---|---|---|
| #12 | other | External CFE message definitions should not depend on values from cfe_platform_cfg.h or osconfig.h | `81c64e0`: Separate PLATFORM, OS, and API limits `5099bc5`: Cleanup msgid inclusion in public header |
| #30 | other | Review use of CFE_PSP_MemCpy/CFE_PSP_MemSet | `57485cf`: Replace CFE_PSP_MemCpy/MemSet |
| #39 | other | Enforce Strict ASCII | `8474136`: Scrub all non-ASCII characters in source files |
| #43 | time | SMP: CFE TIME uses OSAL IntLock/IntUnlock for mutual exclusion | `ebbb081`: Fix TIME use of OS_IntLock for SMP `2a42f5f`: 2017-10-20 CCB - Volatile shared memory values |
| #44 | es | SMP: CFE_ES_WriteToSyslog() is not multi-thread safe | `05fdcb0`: Make CFE_ES_WriteToSysLog() thread safe `baa53e5`: Fixup from 2017-10-10 review |
| #64 | other | Suspicious implementation of SHORT_FORMAT mode in EVS_SendPacket() | `d49d4ef`: Alternate MsgID Solution |
| #83 | other | Default Configuration Setting for CFE_ES_STARTUP_SCRIPT_TIMEOUT_MSEC is Too Big | `cee20c9`: Changed default from 30 to 1 |
| #86 | sb | Correction of an infinite loop in cfe_sb_task.c | `59640e0`: Replaced continue with if/else statement |

| Trac | Component | Summary | Commits |
|---|---|---|---|
| #100 | common | Update CFE_ES_SYSTEM_LOG_SIZE Verify to Allow Larger Sys Log Files | `03ea234`: Removed unnecessary ES verify.h checks Updated the comments in the platform configuration file accordingly. `5a8f876`: Updated upper bound verification on RAM disk parameters, CDS size, user reserved memory size, and reset area size to use UINT_MAX macro. Updated platform configuration comments in accordance. `aab911a`: Corrected/removed upper bound checks on RAM_DISK_SECTOR_SIZE and RAM_DISK_NUM_SECTORS configuration parameters. Updated the comments in the platform configuration file accordingly. Updated sample_defs cpu1 platform_cfg.h to match comment changes made to the /fsw/platform_inc/cpu1 copy. `e24fdfd`: Removed unneeded upper bound verifications from EVS, SB, TBL, and TIME verify.h files. Updated configuration file documentation accordingly. Added missing STACK_SIZE verifications. Added "disclaimer" to top of configuration files. `fd32572`: Updated CFE_PLATFORM_ES_START_TASK_STACK_SIZE default value to CFE_PLATFORM_ES_DEFAULT_STACK_SIZE in the platform_cfg.h files. Updated ES and SB verify.h files to use UINT32_MAX macro vs. the UINT_MAX macro. |
| #107 | sb | SB - Duplicate Pipe Creation Causes Failure to Delete Pipe | `2ef96fd`: In the initializer for OriginalPipeIdParfamValue, the value assigned when the PipeIdPtr is NULL needs to be of the same type as the variable being initialized. We all missed the fact that NULL (in C) explicitly includes a cast that forces it to be a pointer, but the data type needed is an integer. This fix modifies the code: if PipeIdPtr is NULL, then set the original PipeID to zero, not NULL. This value is not subsequently used: all subsequent uses of this variable are beyond an early exit taken if PipeIdPtr is NULL. |
| #111 | other | Naming convention for macros in cfe_mission_cfg and cfe_platform_cfg | `35a2d07`: Proposed macro naming conventions |
| #115 | other | Standardize Version Numbering (in CFE) | `987cd80`: Added cFS version standards info from wiki to both the main.dox and cfe_version.h files |
| #117 | es | CFE_ES_GetAppName() undefined output when failure occurs | `42025d1`: CFE_ES_GetAppName() empty string on error `d0d0554`: Doxygen update associated with proposed fix |
| #133 | es | CFE_ES_AppCreate does not unload an object file if the entry point is not found | |
| #135 | sb | SB: "cfe_sb.h" should not depend on cfe_platform_cfg.h | `b6d65a3`: Remove SB implicit plafform_cfg include |

| Trac | Component | Summary | Commits |
|---|---|---|---|
| #137 | es | Possible buffer overrun in format strings used for scanf | `28244a6`: Avoid using scanf in startup script `7e450fc`: CCB 2017-10-20: Warn about permissive parsing |
| #140 | es | EDS: The ES "LoadLibrary()" call - avoid duplicates and pass ID | `b65114f`: Refactor CFE_ES_LoadLibrary |
| #143 | es | ES does not check target file existence before attempting to reload an application | `624aae7`: Added check (OS_stat call) to ensure file file exists before updating the variables to notify ES to restart application. `3f6d729`: Added doxygen documentation for the CFE_ES_ReloadApp function prototype comments describing recovery sequence in the event an application cannot be restarted due to existing/corrupt file. |
| #144 | time | SMP: Thread safety issues in CFE_TIME around the Sync Callbacks | `ae8eedd`: Thread safety of timer sync callbacks |
| #156 | time | Incorrect leap seconds in docs | `51e721f`: Replaced hardcoded "current" leap seconds with a link to the official source for determining leap seconds. |
| #164 | es | cFE cES1702.3 and cES1703.3 Requirement Failures | `2089d9b`: Updated the doxygen documentation for the CFE_PLATFORM_ES_EXCEPTION_FUNTION parameter to provide user guidance on where this callback function is invoked. `887e11f`: Updated doxygen comments for CFE_PLATFORM_ES_EXCEPTION_FUNCTION platform config parameter with 10/10/17 CCB approved example. |
| #165 | sb | Misleading cFE Doxygen: CFE_SB_DeletePipe | `1190340`: CFE_SB_DeletePipe documentation was claiming that applications were responsible for deleting pipes in their normal shutdown process; in reality, this is done by CFE_SB_CleanUpApp, which is called by CFE_ES_CleanUpApp, as part of the framework support for application shutdown. |
| #169 | other | cFE Cmake Does Not Build Out-of-the-Box | `86ce044`: In order to enable the out-of-box experience for CMake users of CFE 6.5 this imports the correct sample_defs which coorespond to the remainder of the release. |

| Trac | Component | Summary | Commits |
|---|---|---|---|
| #170 | common | Doxygen generator code had gotten stale | `0075b72`: Fix cmake doxygen documentation builds. The existing "mission-doc" target will build the detailed documentation, which includes all functions. This target had been broken since it referenced a nonexistent Doxyfile and this fixes it. This also adds another target called "cfe-usersguide" which generates the CFE users guide package, which should match the output of the classic build. This is only CFE focused and does not include the apps. NOTE: this commit takes a slightly different approach than the previous attempts at this. This does not change any existing files that were used by the classic build EXCEPT for correcting some non-UTF8 characters. Therefore this will not break the classic build. |
| #177 | common | Remove all MKS $log comments in file header prologs | `b748523`: Removed MKS $log information from comment blocks |
| #180 | other | 'printf': Mismatch between the type expected by the conversion specifier %x and the type of the argument. | `5567bb4`: Added missing type casts to all EVS_SendEvent calls |
| #183 | es | ES Shell Command Telemetry Timing is Hardcoded | `ae5473b`: Added new CFE_PLATFORM_ES_SHELL_OS_DELAY platform configuation parameter. Replaced hardcoded task delay in CFE_ES_ShellOutputCommand with new configuration parameter. `c00fde0`: Updated name of new platform configuration parameter from CFE_PLATFORM_ES_SHELL_OS_DELAY to CFE_PLATFORM_ES_SHELL_OS_DELAY_MILLISE Minor fix to comment for this configuation parameter. |
| #184 | other | cFE Performance IDs are Private Definitions | `142a9ef`: Moved performance id definitions to platform configuration, changing the name of the file to be consistent with cFS. `21e5683`: Moved performance IDs to mission include. Renamed the performance ID macros to follow mission configuration naming standard. Updated macros accordingly in source code files. |
| #193 | sb | CFE_SB_CreatePipe should avoid nesting locks | `54a1ad`: Removed nested locks |
| #194 | other | Add "Maximum EID" Comment to the Top of ALL cFE events.h Files | `37342e3`: Added max EID comments to ES, EVS, TBL, and TIME events.h files as was done for SB under ticket #190. |

| Trac | Component | Summary | Commits |
|---|---|---|---|
| #197 | es | ES - Incorrect Use of CFE_SB_MessageStringGet Function in CFE_ES_ShellOutputCommand | 06a9a6a: Removed all calls to CFE_SB_MessageStringGet from the CFE_ES_ShellOutputCommand function. Removed unneeded local buffers. Corrected usage of strncmp to strcmp. 99e3d2a: Corrected undefined behavior when checking Filname for NULL and assigning default. 1a9d3a1: removed type cast in call to OS_ShellOutputToFile in CFE_ES_ShellOutputCommand function. |
| #198 | sb | Build failure when using std=c99 | 7b27925: Fix build failure with strict flags |
| #199 | es | CFE_ES mempool returns buffers that are not aligned | fd4d9da: Patch for mempool alignment issues 5c53b99: Updates per CCB discussion |
| #202 | other | Clean up build warnings for CFE 6.6 | 5344db9: Fix warnings in the current build 18c3d0a: in CFE_ES_SetupResetVariables function, removed "status =" from all calls to CFE_ES_WriteToERLog c099fc6: in CFE_ES_GetAppID function, removed "Result" variable initialization 769e198: in CFE_ES_AppCreate function, added return code check after call to OS_remove(RamDiskPath), if error then WriteToSysLog 8157f47: cfe_es_apps.c:890 - in CFE_ES_LoadLibrary function, added return code check after call to OS_remove(RamDiskPath), if error then WriteToSysLog 08add53: In CFE_ES_ExitApp function, add explicit ReturnCode check and return after call to CFE_ES_ResetCFE 252ed2a: CFE_ES_ProcessCoreException function, removed "Status =" from call to CFE_ES_RestartApp. In CFE_ES_RestartApp function, else case where "App ID is not valid" added WriteToSysLog |
| #213 | other | Update cFE Version Number for 6.6.0 Release | 657b40c: Updated version number to 6.6.0 for 6.6.0 testing and release |
| #215 | tbl | Table services sometimes copies buffers to itself | 8a7faa5: Avoid memcpy overlap in TBL services |
| #216 | other | Table Services Task Pipe Function Incorrectly Handling Commands | 25d7de3: Fix TBL service message truncation |
| #217 | other | Fix EDS discrepancies after #175 merge | f10a142: XML and corresponding header changes 6e3ecbd: Move "CFE_SB_RoutingTblIdx_t" cc5c8fc: Fix bug route file output c6008ca: Improve forward compatibility |
| #219 | es E 3 | S - Memory Pool Size No Longer Requires 2-bit Alignment | bfa1e46: Updated requirements to remove memory pool 32-bit alighment. Requirements updated to be in sync with the changes associated with Trac #199 |

## 1.3 Missing features and known problems

Information on currently open Trac tickets is available at https://babelfish.arc.nasa.gov/trac/cfs_cfe/report/1. Note that this is a restricted website that requires a server account.

The regression test report located in the /test-and-ground/test-review-packages/Results directory includes a listing of the functions and known discrepancies that were absent from cFE Build 6.6.0 at the time of testing. Additional Trac Tickets may have been submitted after preparation of this test report.

A Trac Ticket report containing a listing of open Trac Tickets is available on request for customers who do not have access to the above servers. Please contact David McComas, david.c.mccomas@nasa.gov.

## 1.4 Development Tool Versions Associated with this FSW Version

Table 1.4-1 identifies the versions of development tools known to work with this FSW version:

Table 3: 1.4-1 – Development Tool Versions Associated with this FSW Version

| Tool Type | Tool Name | Version Used |
|---|---|---|
| RTOS | VxWorks | 6.9 |
| Compiler | VxWorks ccppc | 3.3.2 |
| RTOS | RTEMS | 4.11.2 |
| Compiler | i386-rtems4.11-gcc | 4.9.3 |
| RTOS | Yocto “Poky” Linux Distribution | 2.4 |
| Kernel | RTLinux | 4.12.12-yocto-rt |
| Compiler | arm-poky-linux-gcc | 7.2.0 |
| Dev Host | Ubuntu | 16.04.3 LTS |
| 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 6.6.0 has been done on a PPC/mcp750 using the RTOS and compiler specified in Table 1.4-1 above. In addition, cFE Build 6.6.0 has been functionally tested with the hardware/software platforms listed in Table 1.5-1 below (build test platform is included for completeness).

Table 4: 1.5-1 – Functional Test Platforms Associated with this FSW Version

| Machine | CPU | Operating System | PSP | Notes |
|---|---|---|---|---|
| PC | x86-64 | Ubuntu 16.04 LTS, Kernel 4.13.0-16 | pc-linux | Verify operation of native 64-bit build on 8-core SMP, little endian machine. |
| Virtual PC (QEMU 2.5.0) | i686 | RTEMS 4.11.2 with “pc686” BSP | pc-rtems | Verify operation on 32-bit RTEMS. Updated PSP needed for compatibility with RTEMS 4.11.2 release (no change to CFE itself). |
| Beaglebone Black | ARMv7 | Yocto Project Poky Distribution 2.4, RTLinux 4.12.12 | pc-linux | Verify operation on 32-bit little endian ARM processor on Linux with Realtime (RT) kernel, running on actual hardware (TI AM3359 CPU). |
| Virtual G4 (QEMU 2.10.0) | PowerPC 7400 | Yocto Project Poky Distribution 2.4, Linux 4.12.12 | pc-linux | Verify operation on 32-bit big endian processor |
| Virtual Malta (QEMU 2.10.0) | MIPS 64 (64-bit) | Yocto Project Poky Distribution 2.4, Linux 4.12.12 | pc-linux | Verify operation on 64-bit big endian processor (native 64 bit build) |

| Machine | CPU | Operating System | PSP | Notes |
|---|---|---|---|---|
| Maxwell SCS750 | PowerPC 750FX | VxWorks 6.9 | sp0-vxworks | Verify operation on 32-bit VxWorks platform |

# 2 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 | 6.6.0 | N/A. Executables are not delivered for the cFE |
| Installation Procedures & Special Instructions | No | N/A | See Deployment Guide |
| Source Code of this FSW Build | Yes | 6.6.0 | babelfish.arc.nasa.gov (in git system master branchs – cFE and TOOLS) and http://sourceforge.net/projects/coreflightexec 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 |
| Ground System T&C Database | Yes | 6.6.0 | babelfish.arc.nasa.gov (in git system master branch) and http://sourceforge.net/projects/coreflightexec 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 | 6.6.0 | babelfish.arc.nasa.gov (in git system master branch) and http://sourceforge.net/projects/coreflightexec |
| Unit Test Data | Yes | 6.6.0 | babelfish.arc.nasa.gov (in git system master branch) and http://sourceforge.net/projects/coreflightexec |
| Unit Test Results | Yes | 6.6.0 | babelfish.arc.nasa.gov (in git system master branch) and http://sourceforge.net/projects/coreflightexec |

| | | | |
|---|---|---|---|
| FSW Make Files | Yes | 6.6.0 | babelfish.arc.nasa.gov (in git system master TOOLS branch) and http://sourceforge.net/projects/coreflightexec |
| Linker & Compiler Configuration Files | Yes | 6.6.0 | babelfish.arc.nasa.gov (in git system master TOOLS branch) and http://sourceforge.net/projects/coreflightexec |

# 3 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 Configuration summary and version identification

cFE Build 6.6.0 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 6.6.0 and is documented in the following source file: /fsw/cfe/core/src/inc/cfe_version.h.

# 5 Appendix

## 5.1 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