Version Description Document

for the

**Core Flight System SP0-VxWorks6.9 Platform Support Package**

Engineering Directorate

Software, Robotics and Simulation Division

Availability:

NASA & NASA contractor employees as required

June 2022

Release 1.5.1



National Aeronautics and

Space Administration

**Lyndon B. Johnson Space Center**

Houston, Texas

**Change Record**

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# INTRODUCTION

## Purpose and Scope

The purpose of the Version Description Document (VDD) is to provide a precise description of a particular version of the software being released. It documents the “as-built” configurations for the software, the version of requirements applicable to this version, and an exact description of the software contents in this version. If applicable, this document also describes the hardware configurations on which the software is intended to operate.

The purpose of this VDD is to provide a precise list of controlled items for the Release 1.5.1 of the Core Flight System SP0-VxWorks6.9 Platform Support Package (PSP).

## Responsibility and Change Authority

This document is prepared in accordance with EA-WI-025, “GFE Flight Project Software and Firmware Development”. The responsibility for the development of this document lies with the Engineering Directorate Software, Robotics, & Simulation Division (SR&SD), Spacecraft Software Engineering Branch/ER6. Change authority is the Software, Robotics and Simulation Division of the Johnson Space Center.

# Applicable and Reference Documents

## Applicable Documents

The following documents, of the exact issue and revision shown, form a part of this VDD to the extent specified herein.

Table ‑: Applicable Documents

| ***Document***  ***Number*** | ***Document Title*** | ***Revision /***  ***Release Date*** |
| --- | --- | --- |
| NPR 7150.2 | NASA Software Engineering Procedural Requirements | Rev C / Aug 2019 |
| EA-WI-025 | GFE Flight Project Software and Firmware Development | Rev D / Sep 2013 |
| GP-10021 | cFS Certification Software Development Plan | Baseline / May 2020 |

## Reference Documents

The following documents are reference documents utilized in the development of this VDD. These documents do not form a part of this VDD and are not controlled by their reference herein.

Table ‑: Reference Documents

| ***Document***  ***Number*** | ***Document Title*** | ***Revision /***  ***Release Date*** |
| --- | --- | --- |
| None |  |  |

## Order of Precedence

In the event of a conflict between the text of this specification and an applicable document cited herein, the text of this specification takes precedence*.*

# PRODUCT DESCRIPtion

Release 1.5.1 of the Core Flight Software (cFS) SP0-VxWorks6.9 Platform Support Package (PSP) is the baseline version of the software.

# INVENTORY AND PRODUCTs

## Materials Released

### Software Media Description

The software will be available for download or checkout on a server designated by the project or program that uses it. There will be a Git tag labeled “v1.5.1” to identify the Release 1.5.1 of the SP0-VxWorks6.9 PSP.

### Software Documentation Description

**Table 4-1** lists the main documents that are released with and form a part of this software release.

Table ‑: Software Documentations

| ***Document Number*** | ***Document Title*** | ***Document Name and Location*** | ***Revision / Release Date*** |
| --- | --- | --- | --- |
| N/A | Software Design Document (SDD) | Release Artifacts package: PSP\_SP0-VXWORKS6.9\_SDD.pdf | Baseline / May 2022 |
| N/A | Software Test Plan and Procedures (STP) | Release Artifacts package: PSP\_SP0-VXWORKS6.9\_STP.pdf | Baseline / May 2022 |
| N/A | Software User's Guide (SUG) | Release Artifacts package: PSP\_SP0-VXWORKS6.9\_SUG.pdf | Baseline / May 2022 |
| N/A | Software Version Description Document (VDD) | Release Artifacts package: PSP\_SP0-VXWORKS6.9\_VDD.pdf | Rel 1.5.1 / Jun 2022 |

**Table 4-2** lists the supporting documents that are either referenced or linked from the main documents listed in Table 4-1. They are also released with and form a part of this software release.

Table ‑: Supporting Software Documentations

| ***Document Description*** | ***Document Name and Location*** | ***Referenced/Linked By*** |
| --- | --- | --- |
| APIs for Common Public Functions | Release Artifacts package: PSP\_sp0-vxworks6.9\_common.pdf | PSP\_SP0-VXWORKS6.9\_SDD.pdf PSP-SP0-VXWORKS6.9\_SUG.pdf |
| APIs for Startup Functions | Release Artifacts package: PSP\_sp0-vxworks6.9\_startup.pdf | PSP\_SP0-VXWORKS6.9\_SDD.pdf PSP-SP0-VXWORKS6.9\_SUG.pdf |
| APIs for FLASH Functions | Release Artifacts package: PSP\_sp0-vxworks6.9\_flash.pdf | PSP\_SP0-VXWORKS6.9\_SDD.pdf PSP-SP0-VXWORKS6.9\_SUG.pdf |
| APIs for Exception Storage | Release Artifacts package: PSP\_sp0-vxworks6.9\_exceptionstorage.pdf | PSP\_SP0-VXWORKS6.9\_SDD.pdf PSP-SP0-VXWORKS6.9\_SUG.pdf |
| APIs for Memory | Release Artifacts package: PSP\_sp0-vxworks6.9\_memory.pdf | PSP\_SP0-VXWORKS6.9\_SDD.pdf PSP-SP0-VXWORKS6.9\_SUG.pdf |
| APIs for Memory Scrubbing | Release Artifacts package: PSP\_sp0-vxworks6.9\_memoryscrub.pdf | PSP\_SP0-VXWORKS6.9\_SDD.pdf PSP-SP0-VXWORKS6.9\_SUG.pdf |
| APIs for Module | Release Artifacts package: PSP\_sp0-vxworks6.9\_module.pdf | PSP\_SP0-VXWORKS6.9\_SDD.pdf PSP-SP0-VXWORKS6.9\_SUG.pdf |
| APIs for SP0 Statistical Data | Release Artifacts package: PSP\_sp0-vxworks6.9\_sp0.pdf | PSP\_SP0-VXWORKS6.9\_SDD.pdf PSP-SP0-VXWORKS6.9\_SUG.pdf |
| APIs for NTP Time Synchronization | Release Artifacts package: PSP\_sp0-vxworks6.9\_timesync.pdf | PSP\_SP0-VXWORKS6.9\_SDD.pdf PSP-SP0-VXWORKS6.9\_SUG.pdf |
| Section 5 of the SDD | Release Artifacts package: PSP\_sp0-vxworks6.9\_sdd\_s5.pdf | PSP\_SP0-VXWORKS6.9\_SDD.pdf |
| Test Rig Description | Release Artifacts package: cFS\_Test\_Rig.pdf | PSP\_SP0-VXWORKS6.9\_STP.pdf |

## Product Configuration Accounting

This section identifies the exact configuration of the products delivered in this version. A key function of the VDD is to provide the traceability between the end product (e.g., executable) and the original input products (e.g., source code).

### Software Configuration Accounting

This section describes each source file and their version. These files are related to a Git commit hash, TBD. This unique Git commit hash identifies a specific version of each source file that is part of the Git tag labeled “v1.5.1” in the Gitlab repository at <https://js-er-code.jsc.nasa.gov/gateway/cfs/gateway_msg>. This repository is not accessible outside of NASA Gateway program.

Note: Git commit hashes are unique identifiers generated by Git when a code change is recorded. Every Git commit contains the unique commit hash, the time and date, the user who recorded the change, and the description of the change.

**Table 4-3** lists the implementation source files.

**Table 4-4** lists the unit test source files.

**Table 4-5** lists the functional test source files.

**Table 4-6** lists the test artifacts.

Table ‑: Source Files

|  |
| --- |
| ***File Name and Location*** |
| psp/fsw/inc/cfe\_psp.h |
| psp/fsw/modules/eeprom\_direct/cfe\_psp\_eeprom\_direct.c |
| psp/fsw/modules/ntp\_clock\_vxworks/cfe\_psp\_ntp.c |
| psp/fsw/modules/port\_direct/cfe\_psp\_port\_direct.c |
| psp/fsw/modules/ram\_direct/cfe\_psp\_ram\_direct.c |
| psp/fsw/modules/timebase\_vxworks/cfe\_psp\_timebase\_vxworks.c |
| psp/shared/inc/cfe\_psp\_exceptionstorage\_api.h |
| psp/shared/inc/cfe\_psp\_exceptionstorage\_types.h |
| psp/shared/inc/cfe\_psp\_memory.h |
| psp/shared/inc/cfe\_psp\_module.h |
| psp/shared/src/cfe\_psp\_exceptionstorage.c |
| psp/shared/src/cfe\_psp\_memrange.c |
| psp/shared/src/cfe\_psp\_memutils.c |
| psp/shared/src/cfe\_psp\_module.c |
| psp/shared/src/cfe\_psp\_version.c |
| psp/fsw/sp0-vxworks6.9/inc/cfe\_psp\_config.h |
| psp/fsw/sp0-vxworks6.9/inc/psp\_flash.h |
| psp/fsw/sp0-vxworks6.9/inc/psp\_mem\_scrub.h |
| psp/fsw/sp0-vxworks6.9/inc/psp\_sp0\_info.h |
| psp/fsw/sp0-vxworks6.9/inc/psp\_start.h |
| psp/fsw/sp0-vxworks6.9/inc/psp\_time\_sync.h |
| psp/fsw/sp0-vxworks6.9/inc/psp\_verify.h |
| psp/fsw/sp0-vxworks6.9/inc/psp\_version.h |
| psp/fsw/sp0-vxworks6.9/src/cfe\_psp\_exception.c |
| psp/fsw/sp0-vxworks6.9/src/cfe\_psp\_mem\_scrub.c |
| psp/fsw/sp0-vxworks6.9/src/cfe\_psp\_memory.c |
| psp/fsw/sp0-vxworks6.9/src/cfe\_psp\_flash.c |
| psp/fsw/sp0-vxworks6.9/src/cfe\_psp\_sp0\_info.c |
| psp/fsw/sp0-vxworks6.9/src/cfe\_psp\_start.c |
| psp/fsw/sp0-vxworks6.9/src/cfe\_psp\_support.c |
| psp/fsw/sp0-vxworks6.9/src/cfe\_psp\_watchdog.c |

Table ‑: Unit Test Source Files

| ***File Name and Location*** |
| --- |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_exception\_testcase.c |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_exception\_testcase.h |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_memory\_testcases.c |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_memory\_testcases.h |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_flash\_testcases.h |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_flash\_testcases.c |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_mem\_scrub\_testcases.c |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_mem\_scrub\_testcases.h |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_ntp\_testcases.c |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_ntp\_testcases.h |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_sp0\_info\_testcases.c |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_sp0\_info\_testcases.h |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_start\_testcases.c |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_start\_testcases.h |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_support\_testcases.c |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_support\_testcases.h |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_watchdog\_testcases.c |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_watchdog\_testcases.h |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_testcases.c |
| psp/fsw/sp0-vxworks6.9/unit\_test/psp\_testcases.h |

Table ‑: Functional Test Source Files

|  |
| --- |
| ***File Name and Location*** |
| psp/fsw/sp0-vxworks6.9/functional\_test/psp\_ft.h |
| psp/fsw/sp0-vxworks6.9/functional\_test/psp\_ft.c |

Table ‑: Test Artifacts

|  |
| --- |
| ***File Name and Location*** |
| Release Artifacts package: psp\_sp0-vxworks6.9\_ut\_results.log |
| Release Artifacts package: psp\_sp0-vxworks6.9\_ut\_coverage.zip |
| Release Artifacts package: psp\_sp0-vxworks6.9\_ft\_results.log |

### Software Build Tools Configuration Accounting

**Table 4-7** lists the build files. They are also part of the Git tag labeled “v1.5.1”.

**Table 4-8** lists the software tools, and their versions, that are used to build the SP0-VxWorks6.9 PSP Release 1.5.1.

Table ‑: Build Files

|  |
| --- |
| ***File Name and Location*** |
| psp/CMakeLists.txt |
| psp/fsw/modules/eeprom\_direct/CMakeLists.txt |
| psp/fsw/modules/ntp\_clock\_vxworks/CMakeLists.txt |
| psp/fsw/modules/port\_direct/CMakeLists.txt |
| psp/fsw/modules/ram\_direct/CMakeLists.txt |
| psp/fsw/modules/timebase\_vxworks/CMakeLists.txt |
| psp/fsw/shared/CMakeLists.txt |
| psp/fsw/sp0-vxworks6.9/CMakeLists.txt |
| psp/fsw/sp0-vxworks6.9/unit\_test/CMakeLists.txt |

Table ‑: Software Build Tools and Their Versions

| ***Software Build Tool*** | ***Version*** |
| --- | --- |
| gcc | ﻿gcc (GCC) 4.8.5 20150623 (Red Hat 4.8.5-44) |
| ccppc | (Wind River VxWorks G++ 4.3-386) 4.3.3 |
| Linux (CentOS/RedHat) | 7.9.2009 |
| cmake | 3.17.5 |
| Git | 1.8.3.1 |
| Understand (static analysis) | 5.1 |
| Cppcheck (static analysis) | 2.5 |

### Software Build Process

The software build process is documented in the SP0-VxWorks6.9 PSP Software User’s Guide.

## Non-Released Software or Equipment

None.

# CONFIGURATION AND CHANGE STATUS

## Installed Changes

Release 1.5.1 of the SP0-VxWorks6.9 PSP is the baseline for the software. Its capabilities are described in its Application Programming Interfaces (APIs). This section will contain capabilities newly installed in future releases.

## Waivers

None.

## Known Problems

All known issues related to the SP0-VxWorks6.9 PSP are being tracked in the project’s Jira system at <https://bender.jsc.nasa.gov/jira/secure/RapidBoard.jspa?rapidView=133&projectKey=GWCFS>. This Jira system is not accessible outside of the cFS development team.

Release 1.5.1

1. None.

## Planned Changes

All planned changes related to GW\_MSG are being tracked in the project’s Jira system at <https://bender.jsc.nasa.gov/jira/secure/RapidBoard.jspa?rapidView=133&projectKey=GWCFS>. This Jira system is not accessible outside of the cFS development team.

Release 1.5.1

1. None.

# APPENDICES

## Abbreviations and Acronyms

|  |  |
| --- | --- |
| ***Term*** | ***Definition*** |
| API | Application Programming Interface |
| CBCS | Computer Based Control System |
| cFE | Core Flight Executive |
| cFS | Core Flight System |
| ES | cFE Executive Services |
| EVS | cFE Event Services |
| GFE | Government Furnished Equipment |
| GSFC | Goddard Space Flight Center |
| ICD | Interface Control Document |
| ISR | Interrupt Service Routine |
| JSC | Johnson Space Center |
| LRO | Lunar Reconnaissance Orbiter |
| MDT | Message Definition Table (for SCH\_TT cFS Application) |
| Msg | Message |
| NASA | National Aeronautics and Space Administration |
| PMP | Project Management Plan |
| PSP | cFE Platform Support Package |
| SB | cFE Software Bus |
| SBNG | Software Bus Network for Gateway cFS Application |
| TTE\_LIB | Time-Triggered Ethernet Scheduler cFS Library |
| SDD | Software Design Document |
| SDG | Software Developer’s Guide |
| SDP | Software Development Plan |
| SDT | Schedule Definition Table (for SCH\_TT cFS application) |
| SRS | Software Requirements Specification |
| SR&SD | JSC Engineering Directorate Software, Robotics & Simulation Division |
| SSET | JSC Spacecraft Software Engineering Team |
| SUG | Software User’s Guide |
| TTE | Time-Triggered Ethernet |
| TTE\_LIB | Time-Triggered Ethernet cFS Library |
| TTE\_MGR | Time-Triggered Ethernet Manager cFS library |
| VDD | Version Description Document |

## Definition of Terms

|  |  |
| --- | --- |
| ***Term*** | ***Definition*** |
| Configuration Item | An entity whose configuration is tracked as a single entity. Note that a configuration item may be comprised of other configuration items. |
| Conversion | The process of transforming one item into a different item (e.g. a compiler converts source code into object code, a linker converts object code into load modules, etc.). |
| Intermediate Products | Items that are conversions of input products or other intermediate products but require more conversion to become output products (see “input products” and “output products”). |
| Output Products | The items that are the result of the build process converting input products (and possibly intermediate products) and are directly loadable or usable by the target system, e.g. the executable load module or binary data file (see “input products” and “intermediate products”). |
| Release | A combination of configuration items that are designed to work together and released as a single entity. |
| Source Products | See “intermediate products” and “output products” |
| Version | A unique identifier for a configuration item. |

# Notes

None.