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| 1249 | CFS HK Requirements Document |
| SR\_Contains:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **ID** | **ReqID** | **Text** | **Rationale** | **Heritage\_Reference** | | 1595 |  | CFS Housekeeping (HK) Requirements1.0       Introduction1.1        Document Purpose The Core Flight Software System (CFS) Housekeeping Application will be developed by the Flight Software Systems Branch (FSB) of the Software Engineering Division (SED).  The purpose of this requirements specification is to define the requirements to be satisfied by the Housekeeping Application.  This application is developed for re-use.  For this reason, several nomenclatures are used in this document to identify configurations for a mission.  The CFS is specified as a multi-platform product. Mission-specific features and customization requirements which are applicable for all platforms are tagged with <MISSION\_DEFINED>.  Platform-specific features and customizations requirements are tagged with either “<PLATFORM\_DEFINED>” or “<OPTIONAL>.”  Additional nomenclature is used along with the tag to specify a CFS default value for the platform-specific feature: “<PLATFORM\_DEFINED, Default\_Value>”.  Reference platforms (single processor and multi-processor architectures) are defined to supply the default CFS application configuration.  These configurations define the “maximum” CFS Application deployments such that any refined deployment is a subset of a reference platform.   1.2        Document Scope The scope of this document is limited to the specification of requirements for the Housekeeping software requirements.  These include functional, performance, qualification, and design requirements*.* 1.3        Document Organization This document is organized into three additional sections and several appendices.  Section 2 gives the Housekeeping context.  Section 3 documents the Housekeeping system design decisions and constraints.  Section 4 contains the Housekeeping functional and performance requirements.  Appendix A contains a list of abbreviations and acronyms used in this document. 1.4        Relevant Documents1.4.1     Parent Documents CFS Housekeeping Application Heritage Analysis    582-2007-029   1.4.2     Reference Documents  OSAL  cFE Application Developer’s Guide  582-2007-001  cFE User’s Guide   2.0       CFS Housekeeping Application Context   The Housekeeping (HK) component of the Core Flight System (CFS) is responsible for building and sending combined telemetry messages from individual system applications.  Combining messages is performed in order to minimize downlink telemetry bandwidth.  Combining certain data from multiple messages into one message eliminates the message headers that would be required if each message was sent individually.  HK provides the capability to generate multiple combined packets so that data can be organized and output at different rates (e.g. a fast, medium and slow packet).      Figure 1 shows the context diagram for the CFS Housekeeping (HK) Application.  During initialization, HK subscribes to housekeeping messages from other applications. The Scheduler Application (SCH) sends periodic commands to HK. Ground commands come from the Command Ingest task (CI). Combined output messages, and events messages are routed to the appropriate task(s) by the cFE SB Application. The copy table defines the output message formats. HK learns of ground updates to the copy table through the cFE Table Services application.            **Figure 1.0 – CFS HK Context**   2.1        Assumptions The following list summarizes the assumptions made by the CFS Housekeeping Application:  ·         A scheduler or similar application will send out a housekeeping request at a periodic rate.  ·         A scheduler or similar application will send commands to inform HK to send the output messages.  ·         cFE API’s are  available for use.  ·         OSAL API’s are available for use.  ·         Housekeeping is not responsible for uploading or downloading files.  Files generated by or loaded for Housekeeping are transferred using a file transfer application such as CFDP.   3.0       Design Specifications The Housekeeping Application’s requirements and design is based on the results of the CFS heritage analysis effort.  The results of the heritage analysis are document in the CFS Housekeeping Application Heritage Analysis document.  The Housekeeping Application is based on the Core Flight Executive (cFE) and the OSAL. In addition, HK exists in the context of the CFS architecture.    The Housekeeping application does most of its processing based on the contents of the Copy Table. The Copy Table is made up of a list of entries. Each entry includes five items, input message id, input message offset, output  message id, output message offset and number of bytes to copy.  During initialization, the Housekeeping application subscribes to the system application housekeeping messages (input message ids) that are listed in the Copy Table. When the system application housekeeping messages are received by HK, the entire Copy Table is scanned to determine where the data in the received message is to be copied.   When the Housekeeping application does not receive an expected message from an application, HK will increment the missing data counter and send an event message to the ground.     4.0       Subsystem Requirements |  |  | | 1597 | CFS-100 | The CFS shall provide the capability to combine housekeeping data from system applications into output messages | Reduces bandwidth by using one msg header for tlm from multiple apps. Also makes subscribing to tlm simpler. | LRO, BAT, SDO | | 1599 |  | 5.0       Detailed Requirements5.1        Basic Command Requirements   With the exception of the No-op and Reset command requirements, the following requirements apply to all Housekeeping commands.  Rather than repeating these requirements for each applicable requirement, they have been grouped together to cover all requirements. |  |  | | 1287 | HK1000 | Upon receipt of a No-Op command, HK shall increment the HK Valid Command Counter and generate an event message. | Debug command to verify application is alive | LRO, SDO, BAT | | 1289 | HK1001 | Upon receipt of a Reset command, HK shall reset the following housekeeping variables to a value of zero: a) HK Valid Command Counter b) HK Command Rejected Counter c) Number of Output Messages Sent  d) Missing Data Counter | Important for testing and on-orbit flight operations in order to start with a “clean slate” | LRO, SDO, BAT | | 1291 | HK1002 | For all HK commands, if the length contained in the message header is not equal to the expected length, HK shall reject the command. | Basic command verification in the event of  SEU or memory corruption | LRO, SDO, BAT | | 1293 | HK1003 | If HK accepts any command as valid, HK shall execute the command, increment the HK Valid Command Counter and issue an event message | Provides basic verification of each HK command (i.e. HK command parameters are acceptable) | LRO, SDO, BAT | | 1295 | HK1004 | If HK rejects any command, HK shall abort the command execution, increment the HK Command Rejected Counter and issue an error event message | Provides indicator or erroneous command | LRO, SDO, BAT | | 1666 |  | 5.2        Operational Requirements |  |  | | 1297 | HK2000 | HK shall collect flight software housekeeping data from table-specified input messages | SCH sends the request and HK receives the housekeeping data.  Use of tables makes it easier to modify/maintain | LRO, BAT | | 1299 | HK2001 | HK shall output table-defined messages, at the scheduled rate, by combining input message data starting at the table-defined offset and table-defined number of bytes to the table-defined offset in the output message. | Useful to group telemetry from multiple apps into a single message | LRO, BAT | | 1301 | HK2001.1 | Upon a table update, HK shall update the output message formats specified in the table during normal execution. | Supports the capability to adding and removing applications at runtime (or modifying messages) | LRO, BAT | | 1303 | HK2001.2 | If the <PLATFORM\_DEFINED> parameter Discard Combo Packets is set to NO and HK does not receive a message from an application, HK shall use all values associated with last received message for that application in the combined message for that telemetry collection period. | Zeroing data could have undesirable effects. | None/was accomplished by task checkin, which is now part of HS not HK | | 1305 | HK2001.3 | If HK does not receive a message from an application, HK app shall increment the missing data counter and send an event specifying  the message ID for the missing message | Important to inform the ground of any failure detection. missing data ctr incremented when any message not received.  In addition, Debug event message sent to inform ground. | None | | 1307 | HK2001.4 | DELETED: If HK receives all messages within a telemetry collection period, HK shall clear the Stale flag. | Stale flag gets cleared when all messages received |  | | 1309 | HK2001.5 | If the <PLATFORM\_DEFINED> parameter Discard Combo Packets is set to NO and the input message offset + bytes for any input message specified in the HK table is greater than the received message length then HK shall use the last received data associated with that message and issue no more than one event message per input message. | Prevents reading past the end of message (If there is an error in the HK table where the offset + bytes for a specific message exceeds the total message length) |  | | 19398 | HK2001.6 | If the <PLATFORM\_DEFINED> parameter Discard Combo Packets is set to YES and HK does not receive a message from an application, HK shall discard the combined message containing the values associated with the missing application message for that telemetry collection period. | Prevents ground processing of combination packets containing stale data. | None | | 19400 | HK2007.7 | If the <PLATFORM\_DEFINED> parameter Discard Combo Packets is set to YES and the input message offset + bytes for any input message specified in the HK table is greater than the received message length then HK shall discard the combined message containing the values associated with the illegal length application message for that telemetry collection period. | Prevents reading past the end of message (If there is an error in the HK table where the offset + bytes for a specific message exceeds the total message length).  Prevents ground processing of combination packets containing stale data. | None | | 1668 |  | 5.3        Status Reporting |  |  | | 1311 | HK3000 | HK shall generate a housekeeping message containing the following: a) Valid Command Counter b) Command Rejected Counter c) Number of Output Messages Sent d) Missing Data Counter |  | Derived | | 1670 |  | 5.4        Initialization Requirements |  |  | | 1313 | HK4000 | Upon initialization of the HK Application, HK shall initialize the following data to Zero a) Valid Command Counter b) Command Rejected Counter c) Number of Output Messages Sent d) Missing Data Counter | HK does not preserve data across any type of reset. | Derived | | | | | |
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