

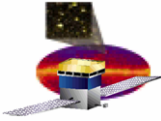
GLAST Large Area Telescope

**Instrument Flight Software
EM2 Design Review
26 February 2004**

Secondary Boot Code (SBC)

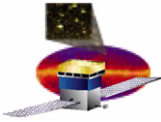
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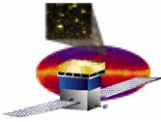
Secondary Boot Overview

- **Primary boot handles initialization from power-on or reset to start of RTOS execution**
 - **Software contained in SUROM**
 - **No RTOS services available**
- **Secondary boot handles initialization from start of RTOS execution to application control of instrument**
 - **Software contained in EEPROM or delivered by file upload to primary boot**
 - **RTOS services available**
- **Secondary boot described in [LAT-TD-02150](#)**



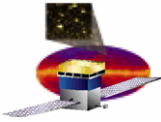
SBC Requirements

- **Configure and initialize VxWorks RTOS**
 - **VxWorks 5.5 kernel**
 - **BSP and drivers for RAD750 CPU board hardware**
- **Provide file system non-volatile storage**
 - **Small code object modules (variable length)**
 - **Small configuration objects (variable length)**
- **Load application object modules**
- **Call application initialization functions**
- **Report diagnostics and error from secondary boot process**
 - **Fatal errors reboot and leave behind information in boot diagnostics area**

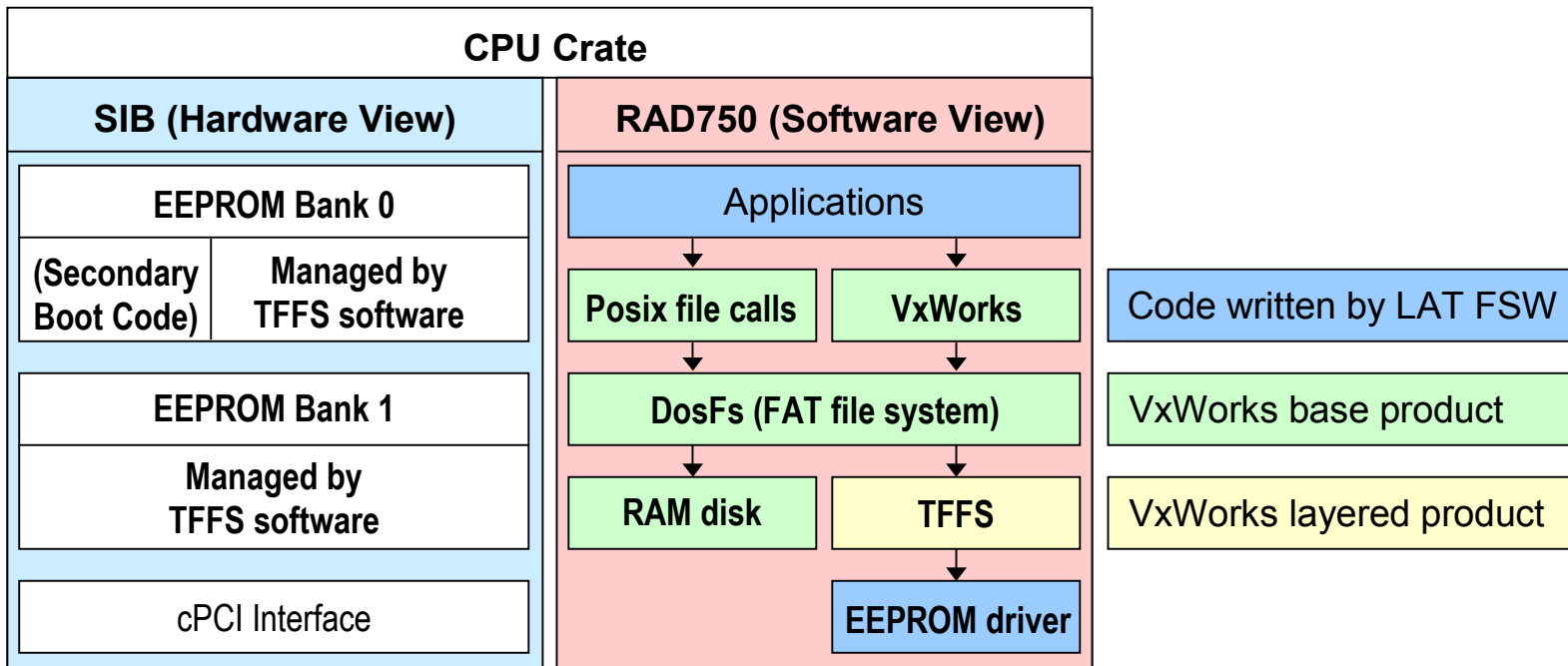


SBC Software Organization

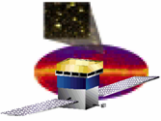
- **Package VXW contains VxWorks BSP**
 - **Constituent: vxw_flight** - provides kernel, BSP, and drivers for RAD750 board accessories
 - **vxw_flight constituent also contains a small number of application modules statically linked with it**
 - **ZLIB/zlib_inflate, FILE/file_hdr**
 - **TFFS EEPROM driver is part of BSP image**
 - **Package VXW also contains many BSP variants**
 - **Development configurations run debugger, shell, networking, etc...**
 - **Flight configuration is subset of development configurations**
 - **Similar configurations available for COTS CPU boards**
- **Package SBC contains application loader**
 - **Constituent: sbc** – provides application initialization



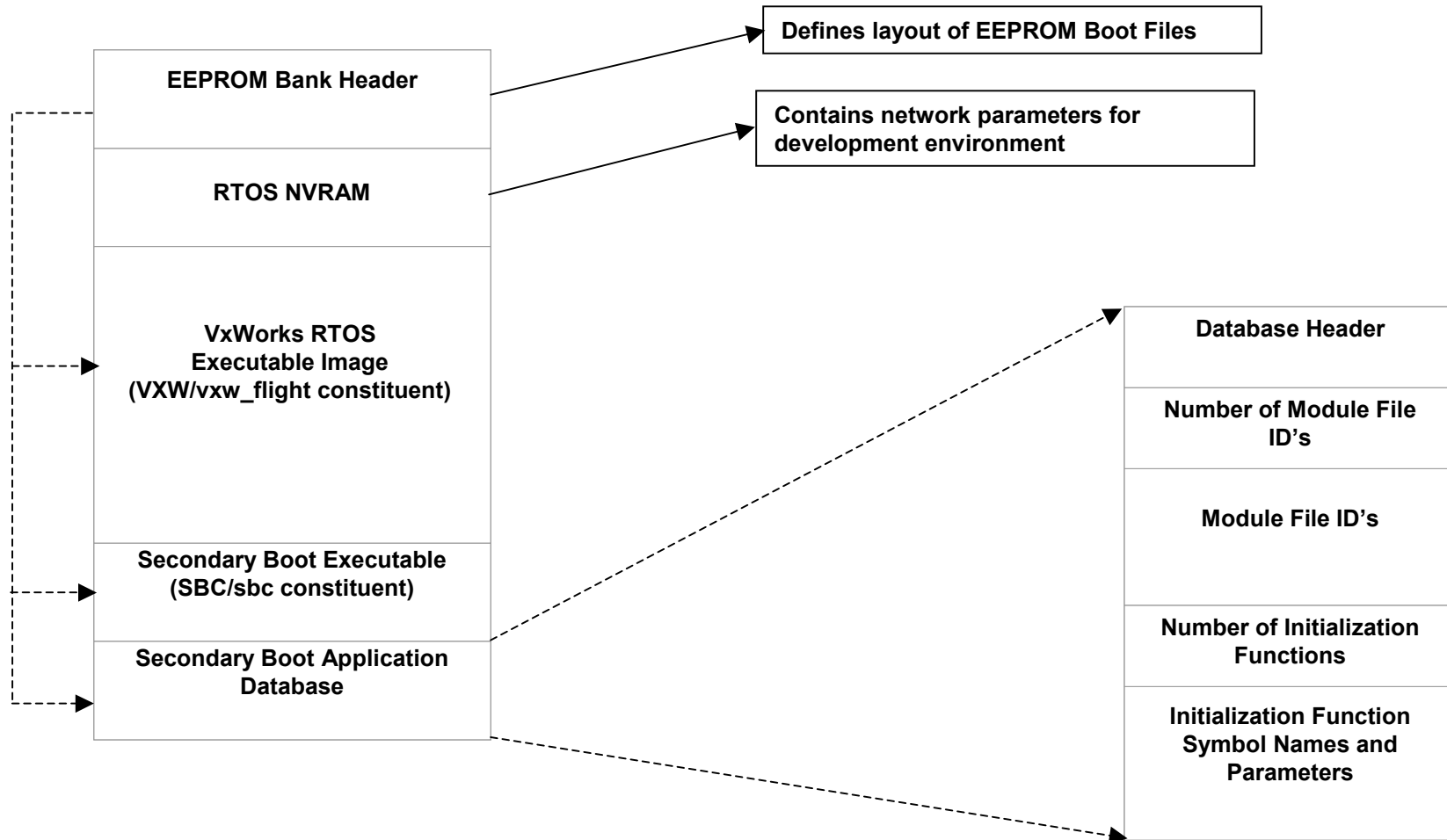
TFFS/EEPROM File System Architecture

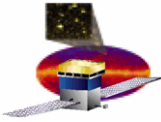


- **TFFS provides wear-leveling of EEPROM locations**
 - Multiple updates of the same file or file system meta-data is spread across all locations
 - Provides access to raw EEPROM driver functions (memory dump, memory poke)
 - Two independent file systems provided for every CPU
- **EEPROM Driver manages interaction with Austin EEPROM chips on SIB board**
 - Write programming and completion status
 - Manages write lock and unlock of SIB EEPROM banks



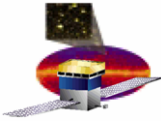
Boot EEPROM Organization





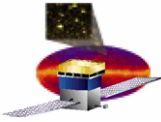
Application Initialization

- **Create RAM disk file system partition**
- **Mount TFFS file system partitions**
- **Validate application database boot file**
- **Read list of application object module files**
- **Validate each object module file**
- **Inflate each object module file**
- **Invoke VxWorks dynamic loader for each object module file**
- **Read list of application initialization functions**
- **Call each application initialization function with parameters**
- **Examine status code returned by functions for fatal errors**
- **Report any errors in boot diagnostics area**
- **Reboot if error is fatal**
- **Otherwise, applications are now in control**



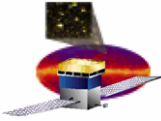
File system / EEPROM Driver Testing

- File system / EEPROM driver testing
 - Two functional tests developed and in use
 - sib_eeprom_test – performs raw read and write operations on all EEPROM locations
 - Thorough test of hardware interface
 - Thorough test of SIB EEPROM driver functions
 - Does not require file system formatting
 - tffs_func_test – performs common file system operations as employed by application software
 - Create, read, write, copy, and delete file objects
 - Create and delete directory objects
 - Obtain file and directory status
 - Requires DOS/TFFS formatting
 - Short and long form of test



SBC Status (1)

- **VxWorks BSP for RAD750 is available and in use**
 - **Final flight configuration may still need small adjustments**
 - **Latest workarounds for BAE errata incorporated**
- **TFFS / EEPROM running and working at functional level**
 - **Genuine file system with all expected POSIX functionality**
 - **Testing has demonstrated capability to load and use application code modules**
 - **Issue: advertised fault tolerant features do not work**
 - **Bad blocks detected by driver are not automatically marked**
 - **Requires discussion on possible remediations**



SBC Status (2)

- **SBC Application Loader is developed and functional**
 - **Currently, SBC package provides simple script parser to produce binary database file**
 - **Move to XML script to maintain commonality with other LAT configuration formats**
 - **Demonstration of the application initialization process has been done**
 - **Work needs to be done on defining critical verses non-critical application initialization errors**
 - **Work needs to be done to provide a more formal test method of the SBC software**