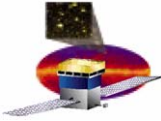


# **GLAST Large Area Telescope**

## **Instrument Flight Software**

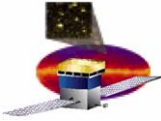
**Functional Demonstration  
March 2004  
(actual date, 2 April 2004)**

**Stanford Linear Accelerator Center**



# Demo Agenda

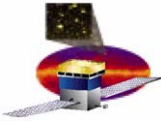
Demo Agenda Item	Presenter
1. Introductions	NA
2. Overview of the Demonstrations	J.J. Russell
3. CCSDS Packet Demo	Tony Waite
4. GASU Configuration Demo	James Swain
5. Single Event Display Demo	James Swain
6. Watchdog Function Demo	Steve Mazzoni
7. Questions from Attendees	NA



# CCSDS Packet Demo

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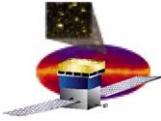
- **NOTE**: This demo is rescheduled for the end of April session
- **CCSDS Packet Demo**
  - **Focuses on the CCSDS and CTDB software packages:**
    - **Required for use of the 1553 data bus.**
    - **Required for transmission of CCSDS packets back and forth on that bus.**
  - **In the demo, this command and telemetry infrastructure is used to support transmission of CCSDS packets between a simulated LAT and a simulated Spacecraft.**
    - **But the CCSDS and 1553 infrastructure are real.**
    - **And two pieces of flight hardware will be used:**
      - **RAD750 CPU**
      - **Spacecraft Interface Board for 1553 communications.**
- **CCSDS and CTDB packages are complete and in maintenance.**



# Software Watchdog Demo

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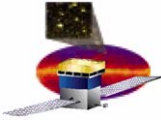
- **Watchdog Demo**
  - Focuses on the LSW package.
  - A software watchdog is a very high priority task that monitors whether other tasks in the system are making progress, and resets a hardware countdown timer if none of the other tasks are stalled.
  - The demo shows that a proof-of-concept design for the FSW software watchdog is complete.
    - Our watchdog is a facility that other tasks and services use to report progress, but progress is something that each FSW task defines for itself.
    - Tasks register a callback with the watchdog, which checks back regularly with each task for a progress report.
  - A test implementation of this design, the LSW package, runs on a RAD750.
    - In the demo, the Watchdog function will monitor the progress of 4 test tasks.
    - One test task is instructed to hang. LSW detects the failure of the task to make progress, then reboots the RAD750.
- **So, the demo shows that this basic software watchdog already runs on the flight CPU.**
  - The LSW package already implements the callback infrastructure that existing and new FSW tasks and services will use for registration.
  - When the inter-task communication (ITC) facility is complete, the current watchdog design can be tested and refined.



# GASU Configuration and Single Event Display Demos

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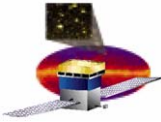
- Two demonstrations, but actually one large block of functionality.
- **GASU Configuration**
  - **Focuses on the DEM, DAB, and LCB software packages.**
    - **Required for configuring several major pieces of the data acquisition system housed in the GASU:**
      - **Command/Response Unit (CRU)**
      - **ACD Electronics Module (AEM)**
      - **Global trigger Electronics Module (GEM)**
      - **Event Builder Module (EBM)**
    - **LCB is a driver package for the LAT Communications Boards mounted on each CPU. LCB controls communications on the LATp communications fabric throughout the LAT.**
    - **DEM and DEB set registers on GASU (and other) subsystems by writing and reading bit strings, thereby defining the system's configuration.**
  - **In the demo, the CRU, AEM, GEM, and EBM are set up for event taking:**
    - **The CRU acts as a router for commands sent from an SIU crate.**
    - **The AEM assembles data from the ACD front-end electronics boards.**
    - **The GEM decides to trigger the instrument to read out its data. The GEM also contributes event summary data to the stream.**
    - **The EBM builds complete “events” out of contributions from all sources.**



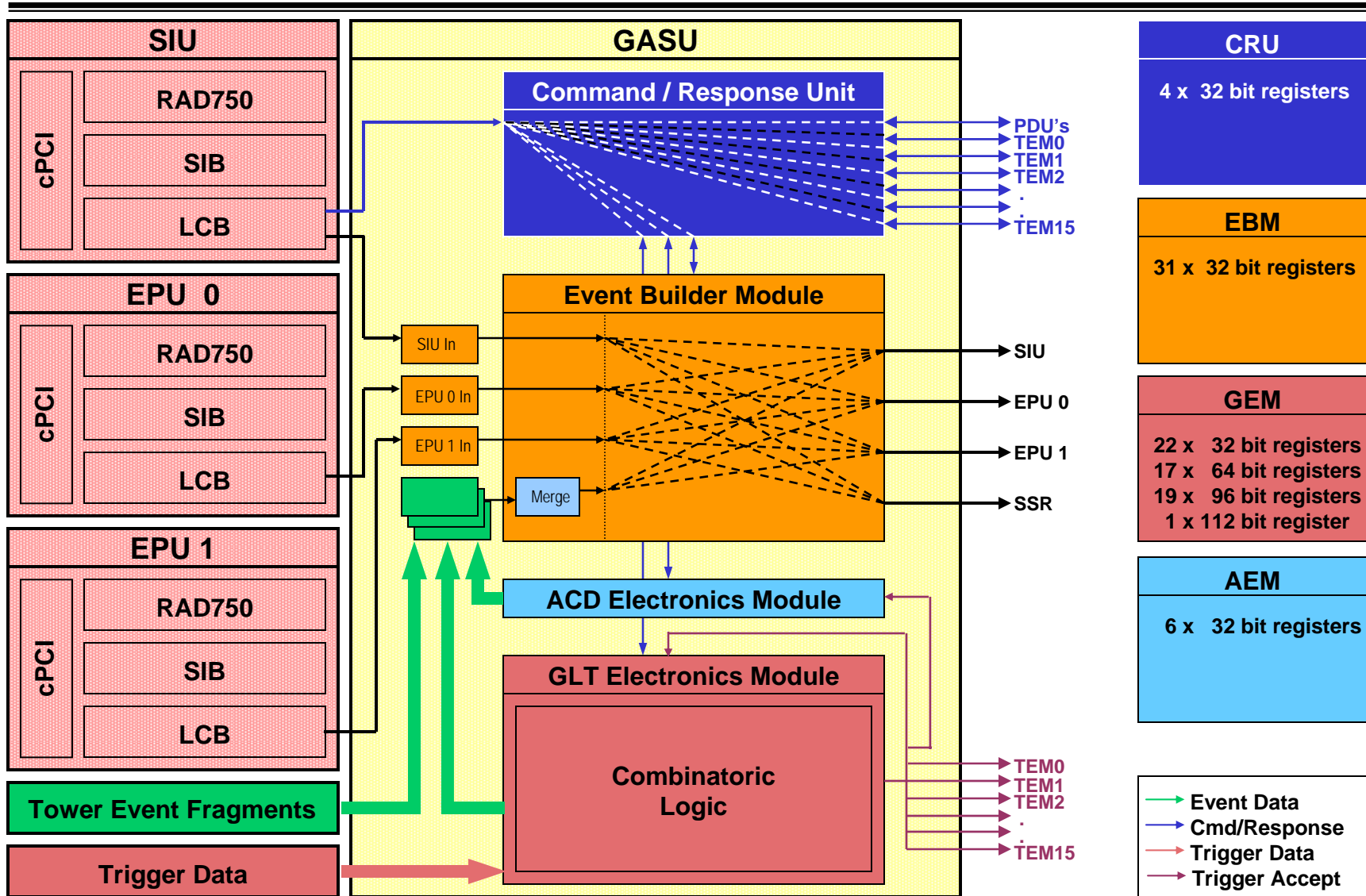
# GASU Configuration and Single Event Display Demos (cont'd)

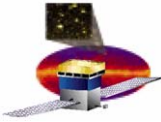
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- **Single Event Display**
  - **When configuration is complete, a trigger command is sent to the GEM.**
  - **Event data is read out from the AEM and GEM.**
    - **For today, no ACD detector hardware or TEMs are present**
    - **But the AEM will send real ACD event data packets, and the GEM will send packets containing event data (TKR, CAL, ACD) summaries and trigger statistics**
  - **The EBM assembles all contributions, then returns events to a RAD750 crate, where they are parsed and displayed.**
  - **Today's goal is not to drive detectors and front-end boards, but to drive the event delivery pipeline from trigger, through event assembly, to delivery to the CPU**
- **DEM, DAB, and LCB are in development, but today's demonstration illustrates that they have the functionality needed to configure numerous pieces of data acquisition hardware and successfully manage event data delivery.**



# GASU and CPUs (Final Configuration)





# Evaluating the Demonstrations

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- **Links to documentation for the systems demonstrated today are available on the FSW Web site. Follow the “Monthly Functional Demonstration” link.**
- **Refer to the Demonstration Guidebook for details:**
  - **Expected outputs of each demonstration**
  - **Hardware and software context of each demonstration**
  - **Procedures followed for each demonstration**
- **Comments and evaluation are welcome.**