GLAST Large Area Telescope

WBS 4.1.B
Instrument Science Operations Center
Manager’s Face to Face Meeting
15 June 2005

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ISOC Implementation Status

- **Schedule drivers**
  - Ground tests
  - LAT testing

- **Interfaces**
  - External
    - Ops Data Products ICD
    - Science Data Products ICD
  - Internal

- **Databases**
  - T&C DB
  - Configuration DB
  - Data archives

- **Software**
  - Online
  - Offline

- **Operations readiness**
  - Procedures
  - Facilities
ISOC Schedule Drivers

- **Ground tests**
  - Dates for all ground tests are in place
  - Broad requirements for each ground test are defined in GLAST ground system test plan (Jan 2005 draft, not released yet)
  - Specific test procedure details worked through GRTT telecons (organizer: Beth Pumphrey, ISOC rep: Steve Culp). GRT 2 procedure in signoff cycle.
  - **STATUS:**
    - ISOC is ready for GRT2. ISOC “online” software development schedule synced to later ground tests, via requirements allocation per release.

- **LAT testing**
  - ISOC involvement in late stages of LAT testing, at NRL and SASS, is still evolving
  - **Key requirements:**
    - Exercise flight-like procedures as much as possible
    - Establish flight-ready configurations
    - Collected data and associated LAT commanding and configurations should be tracked through LISOC DBMS
  - **STATUS:**
    - Only placeholders for procedures, no details
    - Some progress on FSW/ground agreements on config tracking
    - Config DBMS: some elements in place (LATC)
Mission Interfaces

- **Ops Data Products ICD, GLAST-GS-ICD-0002**
  - Defines data interface (contents, format) between IOCs, MOC, GSSC
    - Level0 data (ITOS headers+CCSDS packets)
    - Realtime data (ITOS messages, PDUs)
    - Mission planning products (timelines, ephemerides)
    - PDB (T&C database)
    - LAT command loads (ATS, file loads)
    - PROC requests (NOTE: procedure format defined in GLAST-GS-PROC-0002)
  - **STATUS:** baselined on 16 May 2005. Tested in GRTs.

- **Science Data Products ICD**
  - Defines science deliverables to GSSC
  - **STATUS:** in progress. Some LISOC elements still to be defined.
## STATUS OF GLAST SCIENCE DATA PRODUCTS

On this webpage I attempt to present the up-to-date status of the Science Data Products ICD on a data products by data products basis. For each data product I assess the status of the conceptual definition of its contents and then the FITS definition (keywords, columns). In addition to the text, I provide a color code:

<table>
<thead>
<tr>
<th>Definition Status</th>
<th>FITS Status</th>
<th>Sample Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Known quantitatively, FITS definition could be written</td>
<td>Complete, satisfies OMG standards</td>
<td>Sample as defined exists</td>
</tr>
<tr>
<td>Known qualitatively</td>
<td>Draft or based on existing OMG format</td>
<td>Modified sample exists</td>
</tr>
<tr>
<td>Unknown</td>
<td>No draft or candidate format</td>
<td>No sample yet</td>
</tr>
</tbody>
</table>

The following are the science data products the GSSC will receive from the ISOC (the LAT's ICD):

<table>
<thead>
<tr>
<th>Data Product</th>
<th>Description</th>
<th>Priority</th>
<th>Definition Status</th>
<th>FITS Status</th>
<th>Sample Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS-002 LAT Events</td>
<td>Merit n-tuple for LAT events</td>
<td>1</td>
<td>Exists, but may change as understanding of LAT evolves</td>
<td>Exists</td>
<td>Sample CALDB with FITS files exist</td>
</tr>
<tr>
<td>LS-004 Pointing and dwell history</td>
<td>LAT orientation and mode at 30 s intervals, used to calculate exposures</td>
<td>1</td>
<td>Known</td>
<td>FT2 format</td>
<td>FT2 files exist</td>
</tr>
<tr>
<td>LS-004 LAT IRFs</td>
<td>Data necessary to calculate LAT IRFs</td>
<td>1</td>
<td>Exists</td>
<td>FT1 format</td>
<td>FT1 files can be used as placeholders</td>
</tr>
<tr>
<td>LS-009 LAT burst catalog</td>
<td>Catalog of burst information derived from the LAT</td>
<td>3</td>
<td>ICD draft has a definition that should be reviewed</td>
<td>Draft</td>
<td>None</td>
</tr>
<tr>
<td>LS-006 LAT Point Source Catalog</td>
<td>Detected gamma-ray sources with derived information</td>
<td>2</td>
<td>ICD draft has a definition that should be reviewed</td>
<td>Draft</td>
<td>None</td>
</tr>
<tr>
<td>LS-010 Interstellar Emission Model</td>
<td>Model for diffuse Galactic and extragalactic gamma-ray emission</td>
<td>1</td>
<td>Flux and spectral index on spatial grid</td>
<td>Draft</td>
<td>None</td>
</tr>
<tr>
<td>LS-007 LAT Transient data</td>
<td>Summary information for transient sources (GRBs, solar flares, AGN flares)</td>
<td>3</td>
<td>ICD draft has a definition that should be reviewed</td>
<td>Draft</td>
<td>None</td>
</tr>
<tr>
<td>LS-009 Low-level calibration</td>
<td>Files necessary to run LAT Level 1 pipeline</td>
<td>2</td>
<td>Whatever data files are necessary for pipeline</td>
<td>Undefined—detailed description of internal contents not required</td>
<td>None</td>
</tr>
<tr>
<td>LS-006 LAT configuration history</td>
<td>High level history of the LAT configuration (e.g., PMT gains, etc.)</td>
<td>2</td>
<td>Undefined</td>
<td>Undefined</td>
<td>None</td>
</tr>
</tbody>
</table>
Databases

- T&C DB
  - Controlled by FSW, with inputs from ISOC
  - Tool: LCAT
  - I&T online format: XML.
  - Mission deliverable: ITOS dbx files. PDB delivered to ISOC in dbx format.
  - STATUS:
    - Dbx delivery to GLAST started to support GRTs. PDB received from SASS.
    - future updates from FSW: HSK not completely defined. Science APIDs not fully defined for dbx (placeholder now).
    - Only 1 HSK XML ingest in LATTE, but still largely current.

- Configuration DB
  - FSW tool: LATC. Input: XML files.
  - STATUS:
    - Some elements in place, but overall design not finalized. Key to ISOC support of LAT testing.
    - FSW will downlink config info in science tlm as filename lists. Offline will retrieve needed info from ground config DB.

- Calibration DB
  - SAS
    - calibration meta-database in place. Interfaces being updated/improved (Bogart).
    - Agreement with GSSC on scope of LAT calibration data provided. Test delivery unscheduled
  - SVAC: calibration trending database stagnant (was Xin Chen supported).
  - STATUS: SVAC calib trending needs to be restarted.

- Data archiving, data serving
  - Science data: ISOC uses Offline implementation
  - LAT Data server in development
  - Non-science data: trending DB in place. L0 archiving prototyped.
  - Ops data products IO being tracked.
  - STATUS: Archiving elements are progressing.
Software

- **Online**
  - Supports: LAT mission planning; RT tlm receive and display; monitoring, trending, logging; alert handling; Fastcopy IO of ops data products and science data products
  - Primary realtime interface to MOC is via ITOS
  - Much of ISOC online s/w is not ITOS (nor LATTE)
  - Some development should be shared/coordinated between ISOC and I&T
    - telemetry displays
    - procedure development
  - **STATUS:**
    - Development mapped onto ISOC software releases, but development schedule is threatened by developer FTEs.
    - Expect to redeploy developer time from FSW to ISOC
    - Elements of ITOS can assist I&T online effort (CCSDS packet handling), but this further threatens developer resources

- **Offline**
  - **STATUS:**
    - Level1: see Richard Dubois report
    - Level2: quicklook processing. Need to solidify requirements and move to code production, for incorporation into pipeline. Olaf Reimer (SU) will assist on reqts.
Operations Readiness

- Procedures
  - Aim to use similar instrument control procedures for late stages of LAT testing and flight operations
    - LAT tests at SLAC, NRL (LATTE, python)
    - Observatory I&T (Astro-RT)
    - Flight operations (STOL)
  - ISOC must provide narrative procedures to SASS, NASA to be translated into Astro-RT, STOL
  - **STATUS:** Candidate list of procedures
## Candidate Procedures

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Description</th>
<th>Commands associated with procedure</th>
<th>Command mnemonics</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-FILE-001</td>
<td>File Upload</td>
<td>File upload to SIU or EPU</td>
<td>File Upload Start</td>
<td>LFILUPLSTART</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>File Upload Cancel</td>
<td>LFILUPLCANCEL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>File Upload Commit</td>
<td>LFILUPLCOMMIT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>File Upload Data</td>
<td>LFILUPLDATA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>File Upload to EPU</td>
<td>LFILUPLEPU</td>
</tr>
<tr>
<td>L-FS-001</td>
<td>File Delete</td>
<td>Delete a file</td>
<td>File Delete</td>
<td>LLFSFILEDELETE</td>
</tr>
<tr>
<td>L-FS-002</td>
<td>File Copy</td>
<td>Copy a file</td>
<td>File Copy Local</td>
<td>LLFSFILECOPY</td>
</tr>
<tr>
<td>L-FS-003</td>
<td>Directory Create</td>
<td>Create a directory</td>
<td>Directory Create</td>
<td>LLFSDIRCREATE</td>
</tr>
<tr>
<td>L-FS-004</td>
<td>Directory Delete</td>
<td>Delete a directory</td>
<td>Directory Delete</td>
<td>LLFSDIRDELETE</td>
</tr>
<tr>
<td>L-FS-005</td>
<td>File Dump</td>
<td>Dump a file</td>
<td>File Dump CTDB</td>
<td>LLFSFILEDUMPC</td>
</tr>
<tr>
<td>L-FS-006</td>
<td>Directory Dump</td>
<td>Dump a directory</td>
<td>Directory Dump</td>
<td>LLFSDIRDUMP</td>
</tr>
<tr>
<td>L-FS-007</td>
<td>File System Status</td>
<td>Dump file system status</td>
<td>File System Status</td>
<td>LLFSYSSTATUS</td>
</tr>
<tr>
<td>L-HK-001</td>
<td>Dwell Telemetry</td>
<td>Start and stop dwell telemetry</td>
<td>Request a Housekeeping Diagnostic Packet</td>
<td>LMEMDUMP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Stop</td>
<td>LMEMDUMPCANCEL</td>
</tr>
<tr>
<td>L-HK-002</td>
<td>LHK System Reset</td>
<td></td>
<td>System reset</td>
<td>LMEMDUMPPCIC</td>
</tr>
<tr>
<td>L-MEM-001</td>
<td>Memory Dump</td>
<td></td>
<td>Memory Dump Symbol Relative</td>
<td>LMEMDUMPPOOL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Send Next Dump Packet</td>
<td>LMEMDUMPSYMREL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Memory Dump Symbol Relative</td>
<td>LMEMDUMPSYMVAL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Memory Dump Symbol Relative</td>
<td>LMEMDUMPNEXT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Memory Dump Symbol Relative</td>
<td>LMEMLOADMEM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Memory Dump Symbol Relative</td>
<td>LMEMLOADPCI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Memory Dump Symbol Relative</td>
<td>LMEMLOADREG</td>
</tr>
<tr>
<td>L-MEM-002</td>
<td>Memory Write</td>
<td>Write to memory</td>
<td>Memory Write</td>
<td>LBTSTART</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Memory Write</td>
<td>LBTRESET</td>
</tr>
<tr>
<td>L-PBC-001</td>
<td>Boot No-op</td>
<td>Boot code no-op</td>
<td>Boot Code No-op</td>
<td>LLFSFILEDELETE</td>
</tr>
<tr>
<td>L-PBC-002</td>
<td>Warm Reboot</td>
<td>Warm reboot</td>
<td>Warm reboot</td>
<td>LLFSFILECOPY</td>
</tr>
</tbody>
</table>