Science Data Latency

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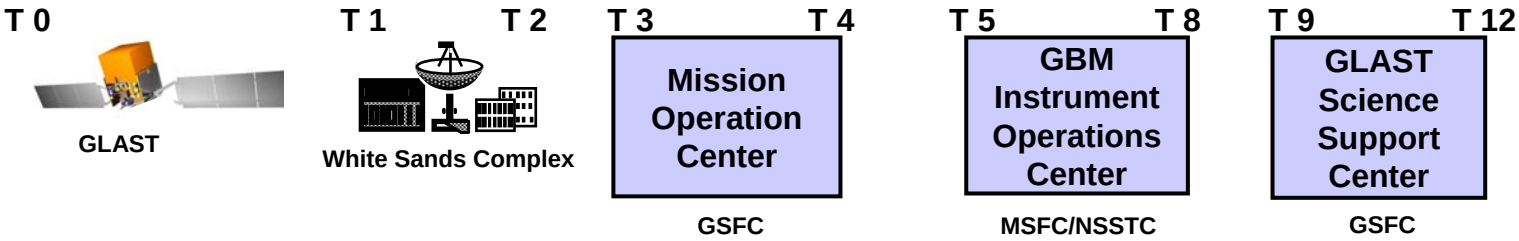
Requirements etc

- The ground system shall retrieve and process the science and GBM trigger data products within 72 hours 95% of the time.
- Comments: The time starts when the data are stored in the on-board SSR and ends once the level 1 data products have been generated at the LAT ISOC and GBM trigger files are generated at GIOC.
- The requirement was written when there was one data downlink per day and the LAT data rate was 300 kps. The original breakdown was 36 hours on-board, 12 hours to transfer to the IOCs and 24 hours to process level 0 to level 1 data.
- However, we now have ~8 downlinks/day so the on-board latency is greatly reduced. The data rate has increase by factor of ~4 so the time taken for each downlink to be processed has not decreased so much.
- “nominal” latency is considerably better than 72 hours, the design of the system is now sufficiently mature that we can get reasonable estimates of the actual performance (<12hours).

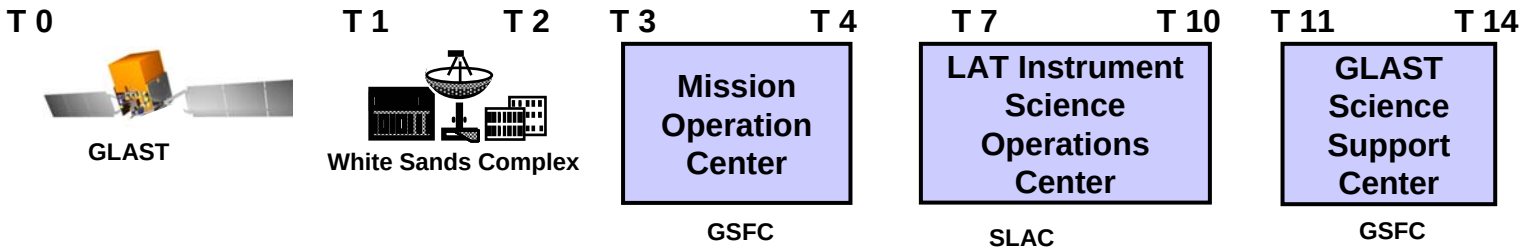
Longest Nominal Data Latency by Path (not requirements)

GBM DATA PATH



180m + 12m + 70m + 120m + 4m + 20m + 8m + 120m = 534m = 8h54m

LAT DATA PATH



180m + 12m + 70m + 120m + 56m + 60m + 56m + 120m = 674m = 11h14m

Data sit on SSR

4.3Mbps, unlikely (at the moment) to do much better than this.

Level 0 processing conservative estimate.

Guaranteed 4Mbps but may achieve higher bandwidth.

Nominal case, assuming no manual intervention or new calibrations.

Data ingest, conservative estimate

Assumptions

- Data is dumped every three hours eight times per day
  - It is likely that downlinks will NOT be scheduled exactly three hours apart but it is likely they will average three hours apart
- Data consist of
  - 1.2 Mbps LAT data
  - 26 kbps GBM data
  - 51 kbps HKPG data
  - No Diagnostic Data is generated
- L1 Volume is normally less than or equal to L0 Volume

- **LAT data available at GSSC within ~11h.**
- **Level 2 processing (quicklook search for flares, bursts etc) available within ~9h30m (and could be much less than this)**
- **These are conservative estimates of the science data latencies in the nominal case, i.e. assuming that there was no manual (re)processing, missed TDRS contacts or data retransmission requests.**

When might it take longer?

- **Missing a scheduled TDRS contact**
  - **During a autonomous repoint there is a ~50% chance that we would miss a TDRS contact. This could occur up to 2 times for a 5 hour GRB observation adding up to 6 hours of latency.**
- **Calibrations, manual processing**
  - **The data processing pipeline at the LISOC will be sized to process a single downlink in one hour. However there is the potential for human intervention for calibrations which would delay delivery by several hours.**
- **Retransmission (either from the spacecraft, or some element of the ground system)**
  - **This is likely to be relatively uncommon.**

Next Steps

- **Investigate possible improvements from quasi-streaming approaches.**
- **Requirements are specified at 95% of cases, examine optimisation of the system at nominal performance.**