# Flight Software Overview

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**Stanford Linear Accelerator Center**
**Stanford CA**

# Requirements on Flight Software System

- **Gather, process and output 3 types of data.**
  - **Physics Data**
  - **Housekeeping Data**
  - **Low Rate Science Data**
- **Provide real-time notification of transient events.**
  - **Flight Software supports on-board science**
  - **Accepts input from the GBM**
  - **Issues repointing requests to the spacecraft.**
- **Monitor the LAT performance**
- **Calibrate the LAT subsystems**

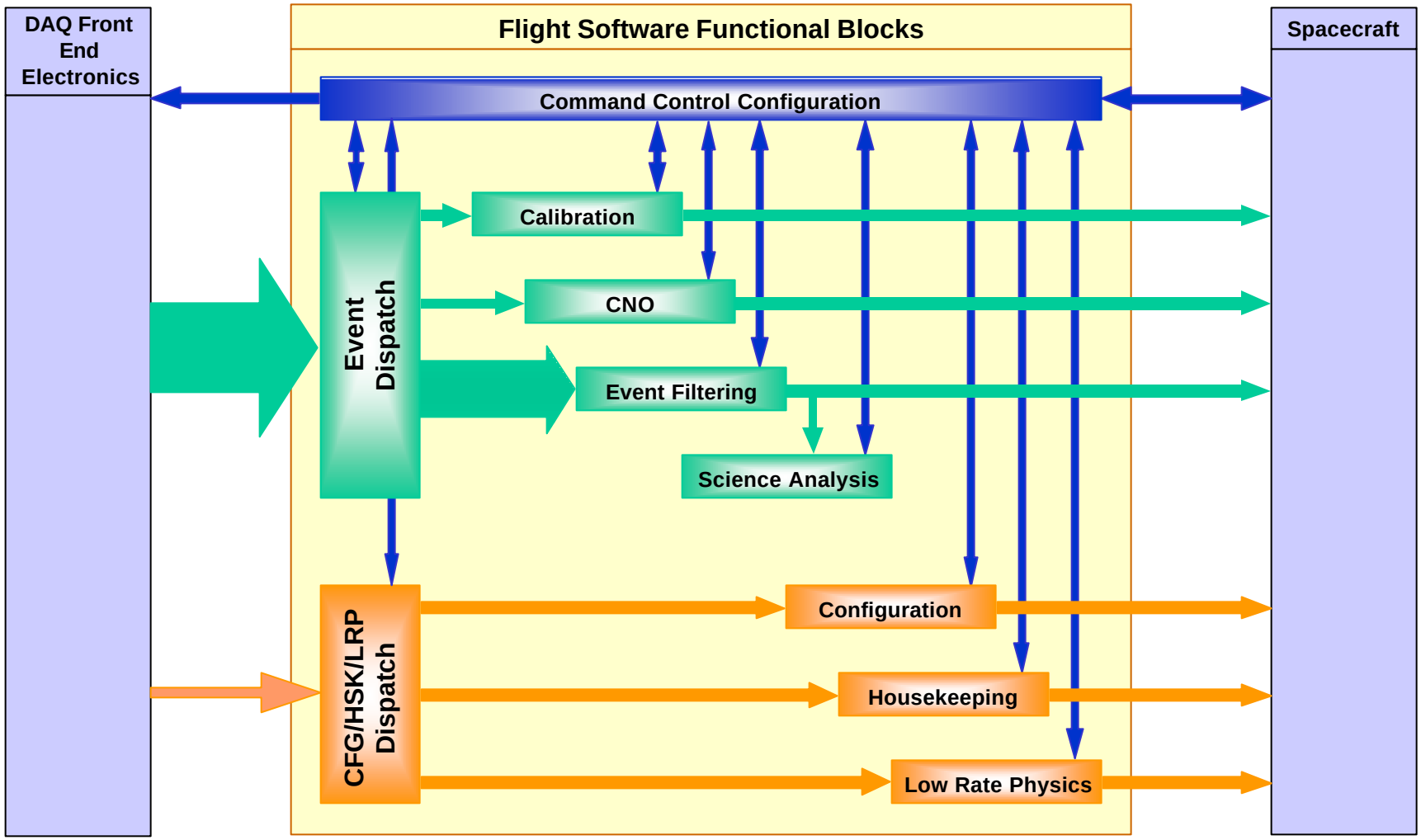
# Flight Software - Background

- **Flight Software Group works closely with the Electronics group.**
  - **Most of the technical work by FSW group has been in the dataflow architecture area.**
    - **Longer lead time**
    - **It is the foundation of everything that comes after.**
      - **Getting the correct hardware architecture simplifies the software.**

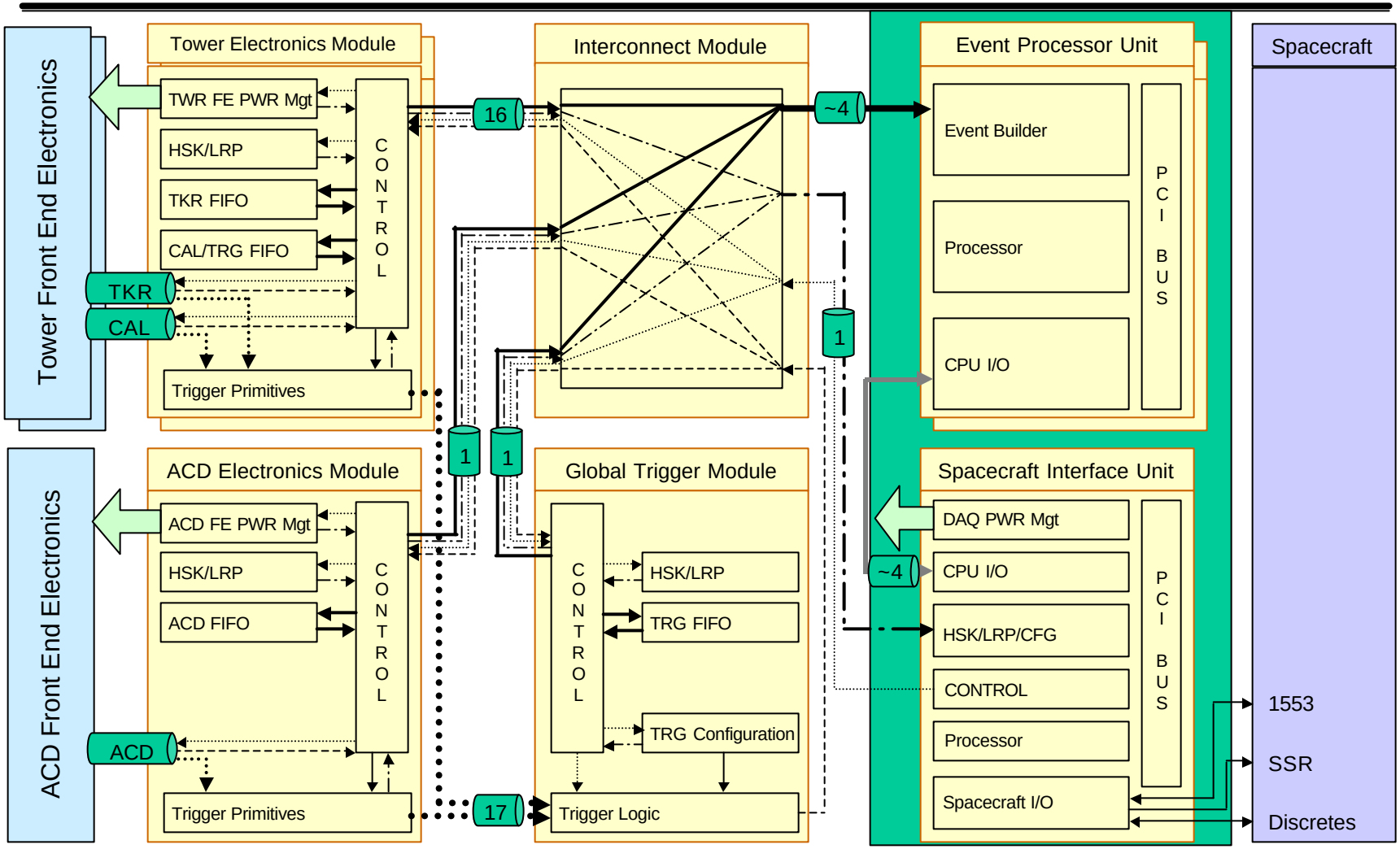
- **Requirements all follow from**

| | |
|---|---|
| LAT-SS-284 | Trigger Level 4 Subsystem Specification |
| LAT-SS-285 | Dataflow Level 4 Subsystem Specification |

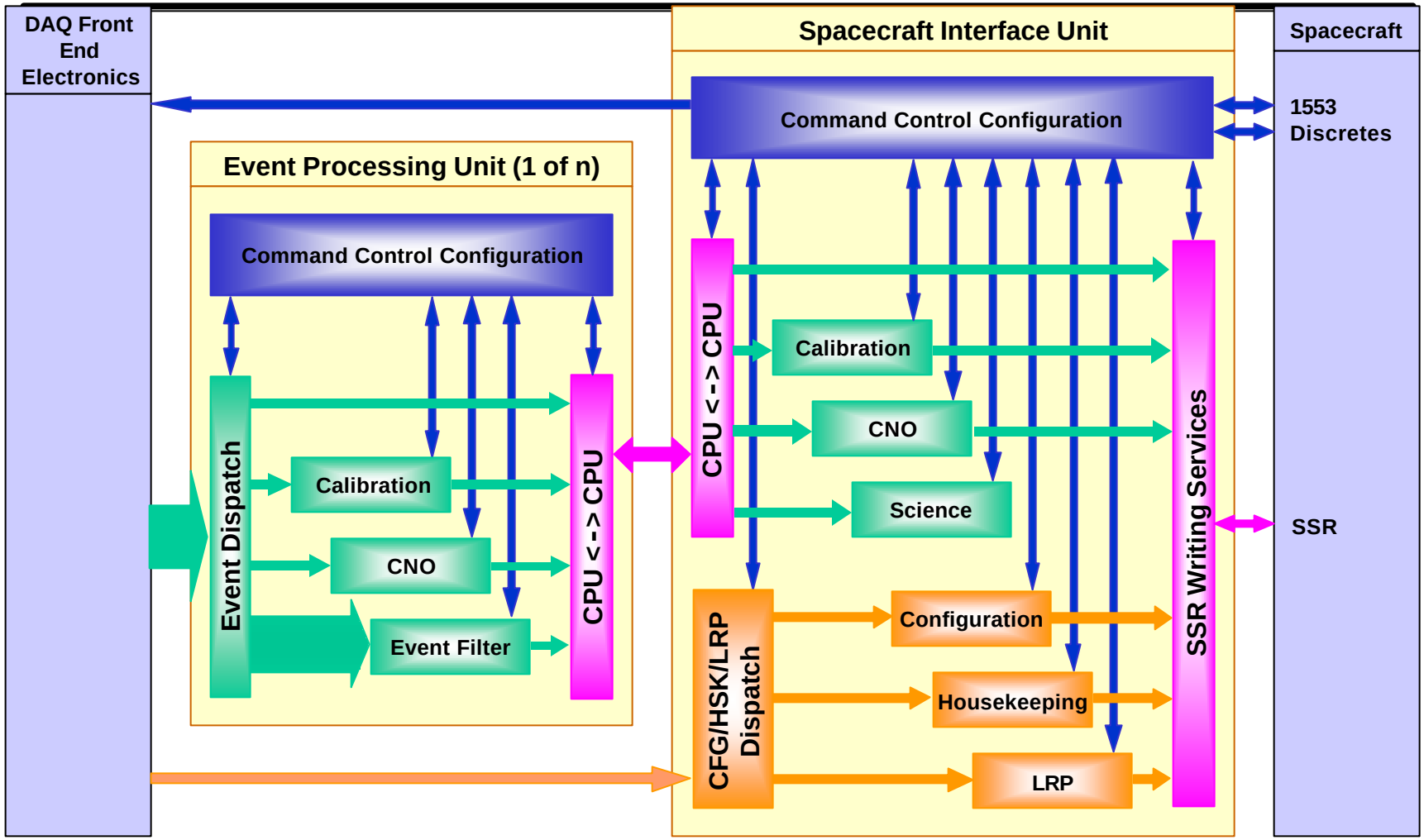
# Idealized Flight Software Architecture



# Dataflow Architecture



# Realization of FSW Architecture

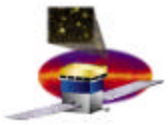


# Considerations

- The 3 Cs
  - Configure the instrument
  - Command the instrument
  - Control the instrument
    - Human control
    - Autonomous control
- Handle high rate transient events.
    - Use a heavily buffered, asynchronous distributed software architecture.
- Acquire attitude and timing information from the spacecraft.
  - Attached to event data to give an absolute fix in space and time.
- Handle Gamma Ray Burst alerts from the GBM.
- Calibrate and Monitor instrument performance.

# Other Considerations

- **Reliable and robust booting process.**
- **Configurable and malleable software base.**
  - **Ability to upload new code.**
    - **Demands the code be very modular**
  - **Track the software configuration.**
- **Distributed software development environment.**
  - **Multi-person, multi-site effort.**
- **Environment for testing both software and hardware.**
  - **Test/check-out software forms the basis of diagnostics**
- **Support for ACD,TKR and CAL detector development.**



# Software Roadmap

| Design And Engineering | Tower Integration | LAT Integration |
|---|---|---|
| **Support Software** | | |
| o Software Architecture<br>o Mode Control<br>– Physics<br>– Calibration<br>– Diagnostic<br>– Front-end commanding | o Multi-Tower Support<br>o Multi-CPU Support<br>– CPU-to-CPU<br>– Scatter/Gather<br>o Power Distribution<br>o 1553 Services | o Scripting<br>o Autonomous Control<br>o IOC Support<br>o GBM Support<br>o Recorder Services |
| **Science Software** | | |
| o Event Flow<br>– Pipeline<br>– Filtering<br>– Formatting & Outputting<br>o Timing Services<br>o Calibration, Hsk | | |