GOES-R Impact on NCEP Computing: Enterprise Framework for High Performance Environmental Processing

James Gundy, Gregg Kowalski, Bradley Brown-Bergtold & Allan Weiner | Harris Corporation - Melbourne, FL

- The Harris SOA based ground system architecture is composed of services for EM, MM, PG, & PD
- Fault tolerant data movement via the ground system’s Enterprise Service Bus ensures NOAA’s mission critical applications run reliably
- Fast, reliable product processing efficiently manages the complexity of NOAA’s GOES-R science mission, leveraging multiple HPC and high reliability technologies:
  - Parallel processing at the image block level in an HPC cluster
  - Redundant, high bandwidth, low latency data access through a high performance data fabric

Service Model

Enterprise Management (EM)
- Common Support Services
- Enterprise Supervision

Enterprise Service Bus (ESB)
- Satellite Control
- Downlink Monitoring
- Service Management
- Product Performance
- Sectorize & Formal
- Distribution

High Performance Data Fabric
- Processing Service
  - Processing Service
  - Processing Service
  - Processing Service
- HPC Product Processing Cluster

Product Generation (PG)
- L1/L2 Products

Data Fabric Architecture
- The Data Fabric Interface provides high bandwidth, low latency access to imagery and binary data for the Product Generation services. The DF provides an abstract data blocking interface that notifies services when imagery is available, regardless of the dimensions the data being written. Replicated data in the High Performance Data Cache provides increased reliability or avoids data loss due to hardware failure.

Service Architecture
- Services encapsulate the science that processes satellite data, decoupling science execution from the service infrastructure.
- The Executive component controls when the service runs and what control (area and time) is processed.

Tiered Service Model
- The Tiered Service Model provides a framework to organize the flow of control and status for the Enterprise, allowing tens of thousands of system components to be controlled and monitored.

1. Satellite Data sent from MM in the form of Data Packets is converted to imagery and/or binary data, then stored in the Data Fabric.
2. Processing begins before the first swath is completely received. This provides more time for processing while reducing latency.
3. Algorithms that are compute intensive are decomposed into multiple services, which work on smaller datasets (blocks) in parallel.
4. Algorithms that are less compute intensive require fewer services, which work on larger datasets (blocks).
5. As product data is created by PG services, PD retrieves the product data and distributes it to External Data Customers.