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

EM sends **Functional Directives** to Elements (**MM**,**PG**,**PD**) to control their high level individual functions like L2+ Product Processing.

Tiers 1-3

Enterprise Management **(EM)**

Common Support Services | Enterprise Supervision

Tiers 1-3

Status from Elements are received, aggregated and processed to display and report **GS** status for the domain, site/zone, & Elements.

Control / Element Status

Enterprise Service Bus (ESB)

Element Managers receive and process **Functional Directives**, commanding internal Services to comply using control messages.

Tier 4

Control / Status MM

Control / Status PG

Control / Status PD

Tier 4

Elements aggregate and process their service status to determine their functional status. Functional status is then reported to **EM**.

Satellite Data

Satellite Control | Downlink Monitoring

Mission Management **(MM)**

Service Management | Product Performance

Sectorize & Format | Distribution

Product Distribution **(PD)**

L1/L2 Products

AWIPS
External Data Customers
NCEP

Services receive and process the control messages (i.e. Startup, Shutdown, Change Mode, etc) from their **Element Managers**.

Tier 5

HPC Product Processing Cluster

1 Processing Service | 2 Processing Service | 3 Processing Service | 4 Processing Service

5

High Performance Data Fabric

Product Generation (PG)

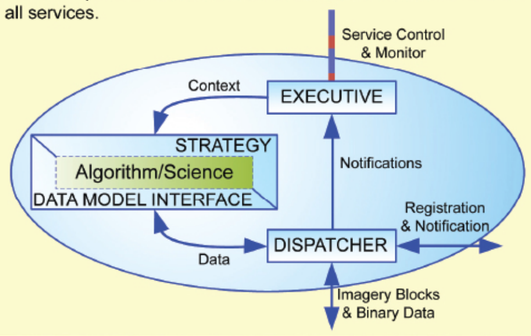
Tier 5

Individual services report their status up to their Element's Manager. Status includes their state (Operational, Degraded, etc.)

Service Model

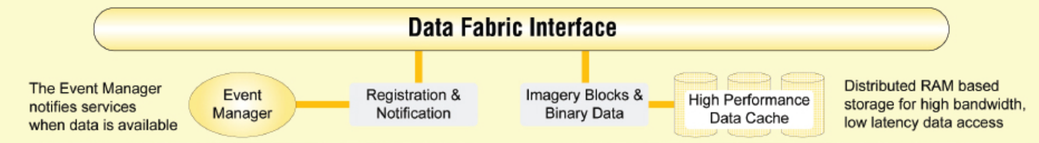
Service Architecture

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 *context* (area and time) is processed. The **Dispatcher** provides the interface to the DF. The **Strategy** provides the "glue code" between the service and the science. The **Data Model Interface** provides a consistent data interface for science across all services.



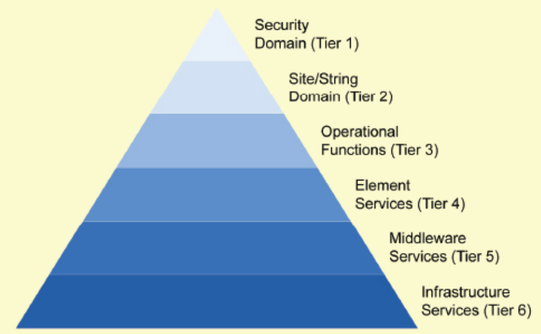
Data Fabric Architecture

The **High Performance Data Fabric** (DF) provides high bandwidth, low latency read/write 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.



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**.