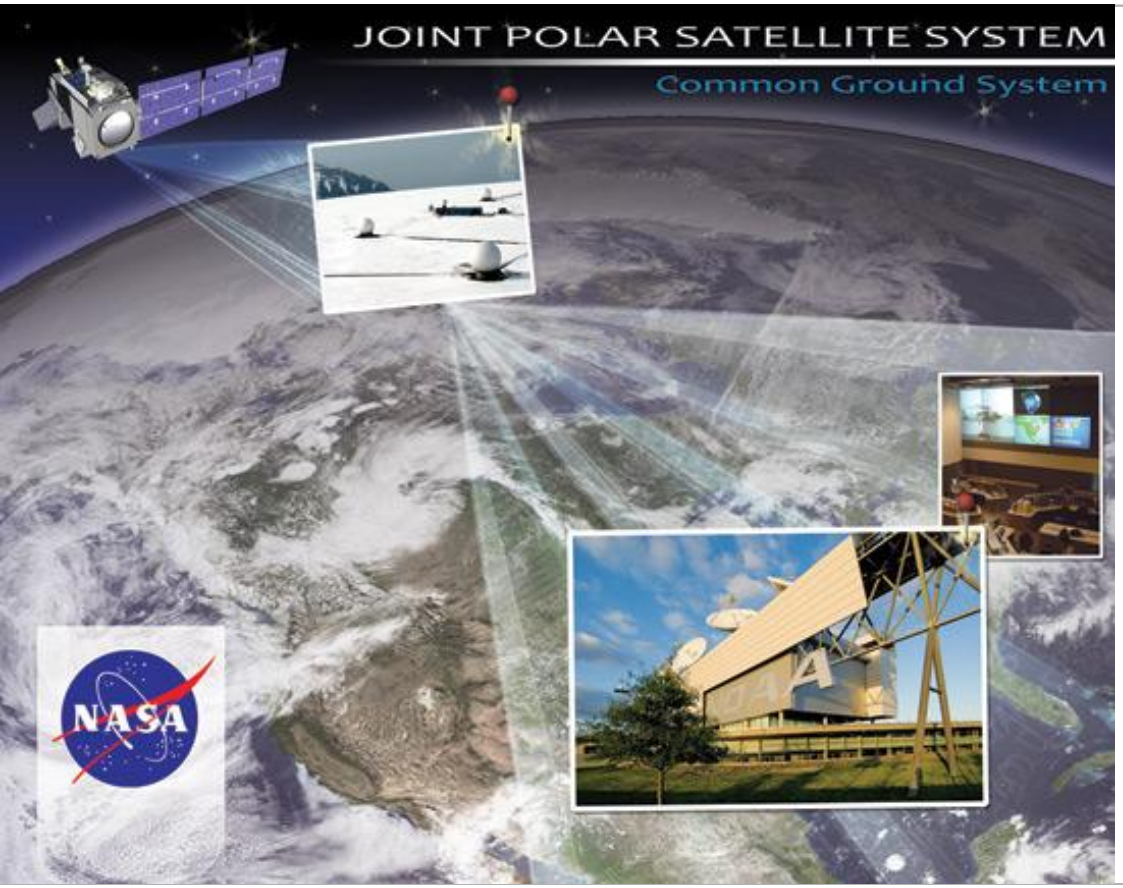

JPSS CGS IDPS Product Generation

January, 2012

Raytheon
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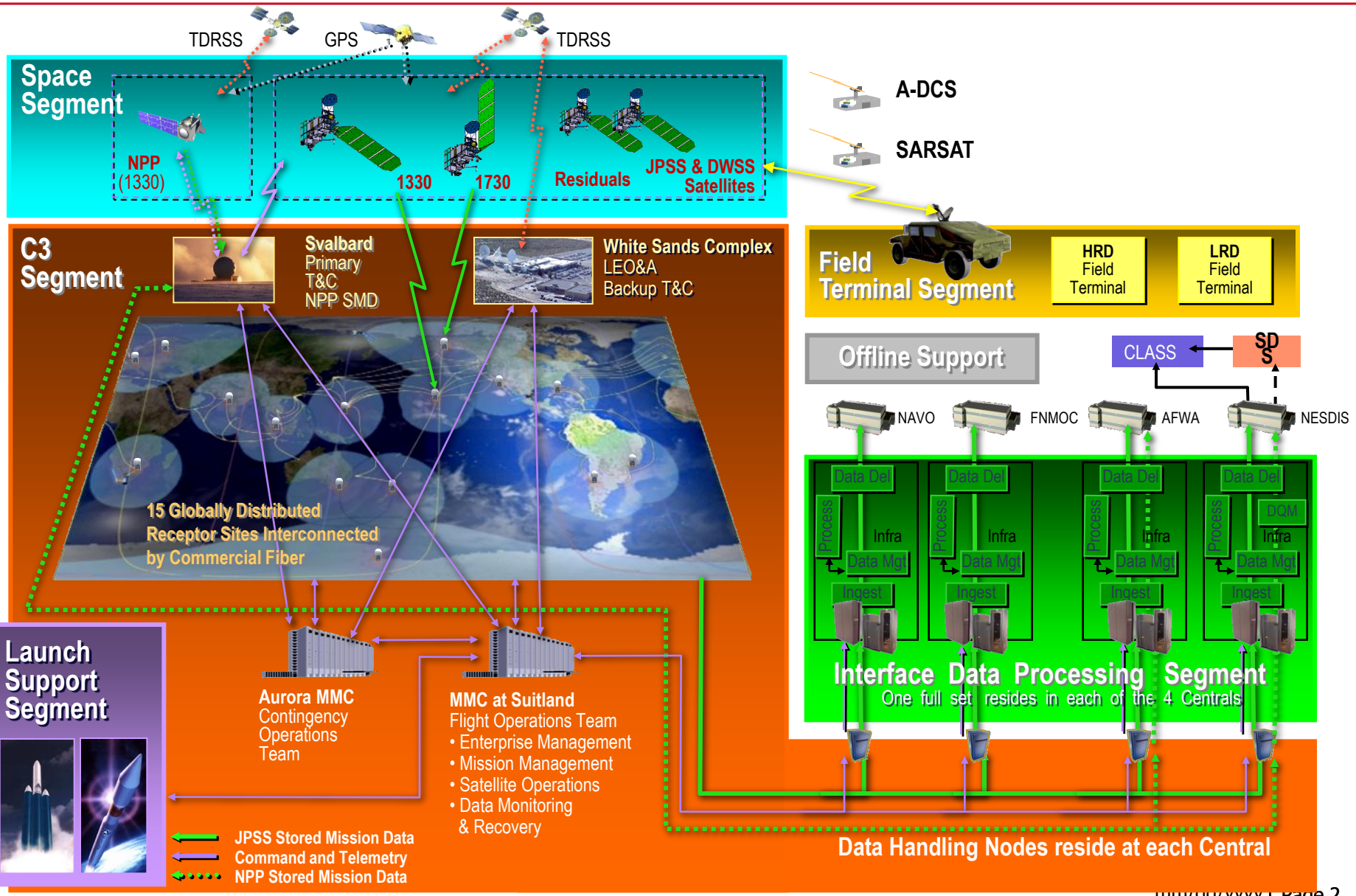
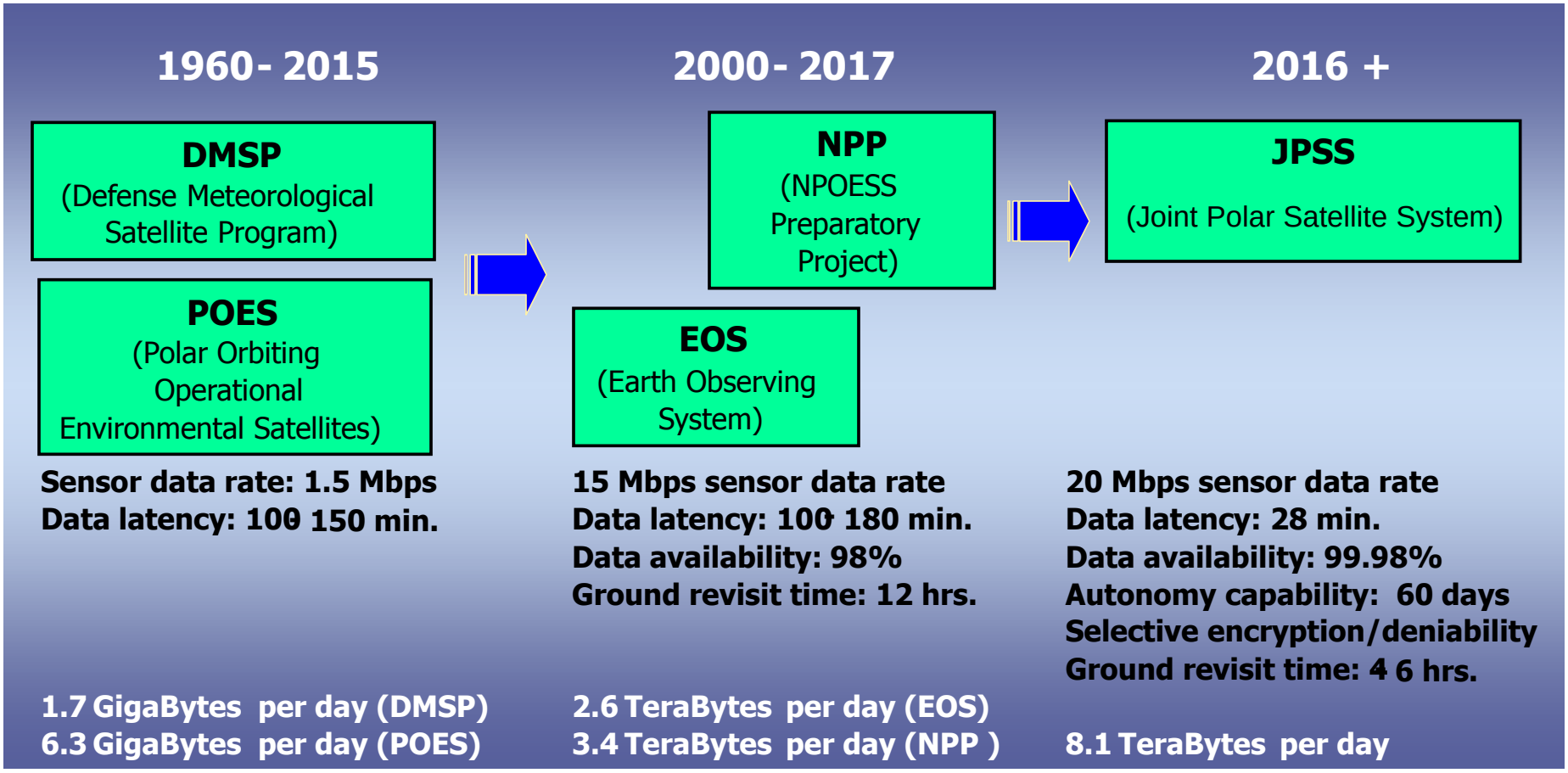
Kerry Grant, JPSS CGS Chief Scientist

JPSS System


TDRSS
GPS
TDRSS
Space Segment
NPP (1330)
1330
1730
Residuals
JPSS & DWSS Satellites
A-DCS
SARSAT
C3 Segment
Svalbard
Primary T&C
NPP SMD
White Sands Complex
LEO&A
Backup T&C
15 Globally Distributed Receptor Sites Interconnected by Commercial Fiber
Field Terminal Segment
HRD Field Terminal
LRD Field Terminal
Offline Support
CLASS
SDS
NAVO
FNMOC
AFWA
NESDIS
Data Del
Process
Infra
Data Mgt
Ingest
DQM
Interface Data Processing Segment
One full set resides in each of the 4 Centrals
Launch Support Segment
Aurora MMC
Contingency Operations Team
MMC at Suitland
Flight Operations Team
• Enterprise Management
• Mission Management
• Satellite Operations
• Data Monitoring & Recovery
JPSS Stored Mission Data
Command and Telemetry
NPP Stored Mission Data
Data Handling Nodes reside at each Central

Remote Sensing System Evolution



The evolution of Government remote sensing systems over the last 40 years. JPSS, the Joint Polar Satellite System, is the next generation low-earth orbiting environmental remote sensing platform. JPSS will play a pivotal role in our nation's weather forecasting and environmental awareness for the next two decades.

* -- current estimates

Mission Data Processing Capabilities

- Mission data processing is performed by the Interface Data Processing Segment (IPDS)
- The IDP segment combines software and hardware flexibility, expandability, and robustness to meet stringent performance requirements levied by the Joint Polar Satellite System Common Ground System (JPSS CGS) requirements.
- Sensor application packets are passed to IDPS. The data stream is broken into granules, which are a subsectioning of the data stream into manageable time intervals. The granules of data can be processed in parallel by IDPS thus ensuring processing of high quality products within latency timelines.

Mission Data Processing Subsystem Capabilities

Ingest (ING)

- The ING Subsystem creates sensor Raw Data Records (RDR) from multiple Sensor Application Packet streams received from C3S. It separates the incoming streams into granules by sensor. Ingest extracts JPSS Auxiliary data from Stored Mission Data (SMD) and create RDRs or Bus TM and S/C Diary information. It also accepts external Ancillary data sets that are required for EDR processing.

Processing (PRO)

- The PRO Subsystem encapsulates all of the data algorithms that must be executed to turn the RDRs into higher level products. First processing creates sensor specific SDRs or Temperature Data Records (TDRs) from RDRs. These are corrected, calibrated and geolocated sensor data. A complex set of processing chains (see Figure 6) is then used to produce the required 46 EDRs. Some of these are produced as individual products or one algorithm may yield a group of related EDR products.

Data Management (DMS)

- The DMS Subsystem provides internal short-term (24 hour requirement) storage of all JPSS data, as well as management of shared memory (cache), which is a critical component of the IDPS in meeting data product latency.

Infrastructure (INF)

- The INF Subsystem provides the Workflow management functions for IDPS. It has total control of process startup, monitoring, shutdown and re-start upon error conditions. INF also provides common utilities and tools, such as logging, debug, timers, performance monitoring, data availability and accounting, and HW monitoring.

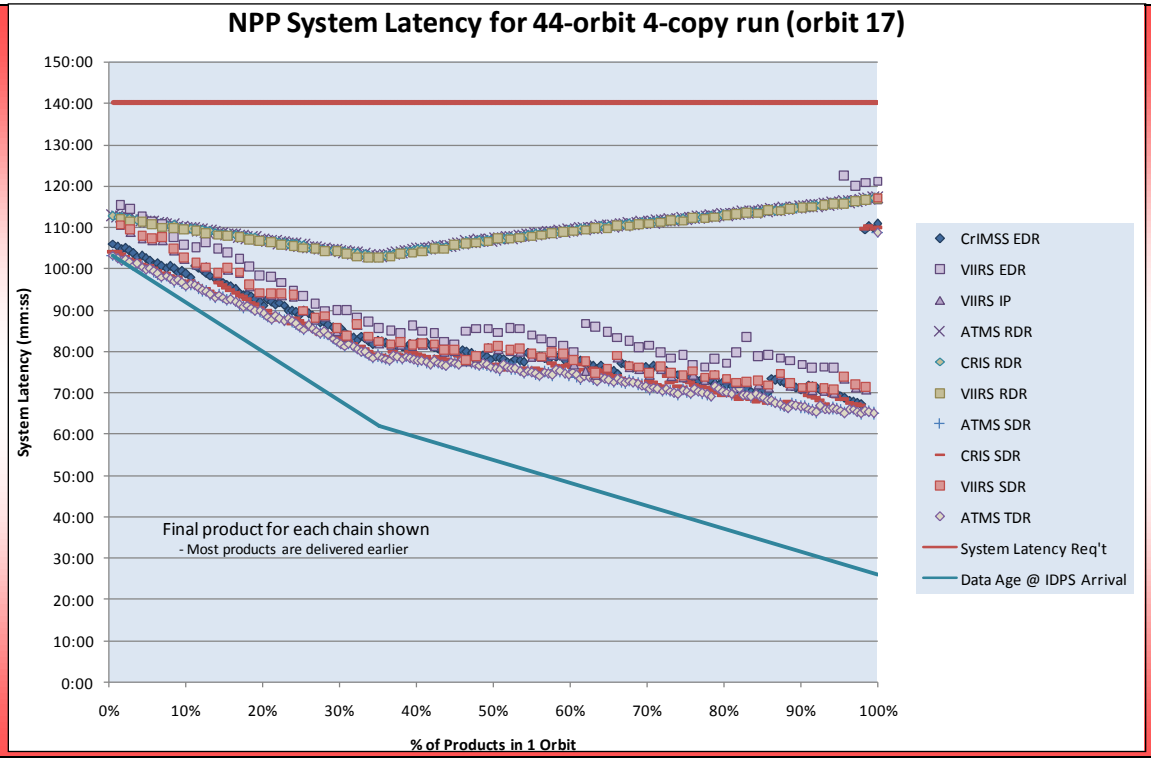
Data Delivery (DDS)

- The DDS Subsystem is the single provider of all data between IDPS and the local Central. It converts requested products into Hierarchical Data Format 5 (HDF5) format with data and metadata aggregation. HDF5 is a self-describing data format with community supplied implementation libraries.

Data Quality Monitoring (DQM)

- The DQM Subsystem provides the Data Quality Engineer automated and ad-hoc processing in support of Data Quality Notifications from the Processing system. The Data Quality Engineer is provided with a tool kit of Geographic Information System based modules that allow the IDPS data to be registered to a geographic grid and analyzed, viewed, and trended. The DQM and the DQE support the program's larger Calibration and Validation (Cal/Val) activities and supports the troubleshooting of data anomalies.

JPSS EDR Latency

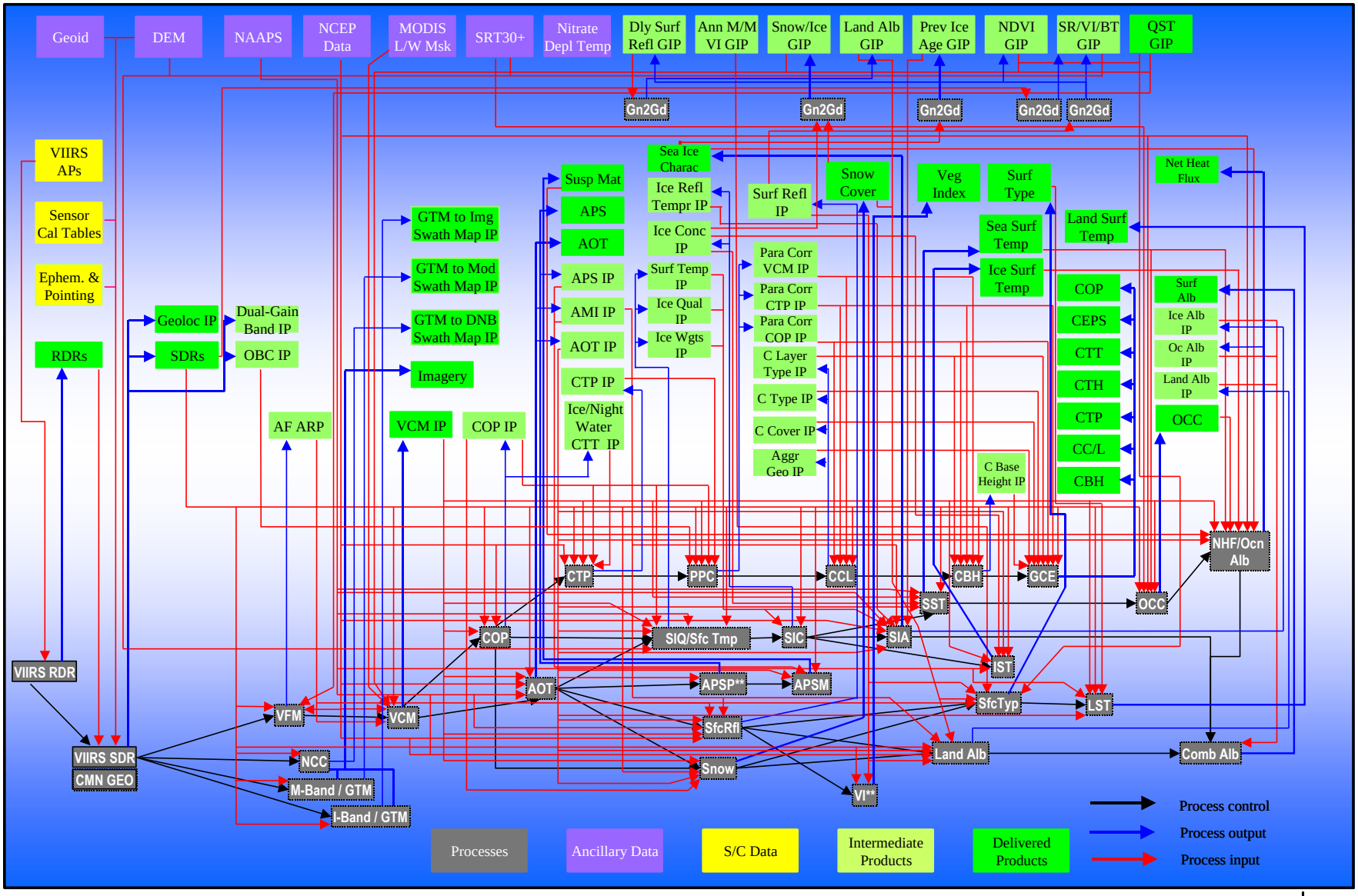


The JPSS sensor suites on the JPSS vehicles produce data at up to a 20 MB/sec rate. **This is an increase over DMSP of more than 13:1**. The total xDR (RDR, SDR and EDR) products produced by an instance of IDPS per day have a volume **increase over DMSP of 2000:1** In addition to handling these increased rates, latency requirements (defined as time from sensing of phenomena to production and delivering of products) **decreases by a factor of 4.** A graphical representation of the latency requirements that are imposed on JPSS CGS and projected actual performance is contained in Figure 3.

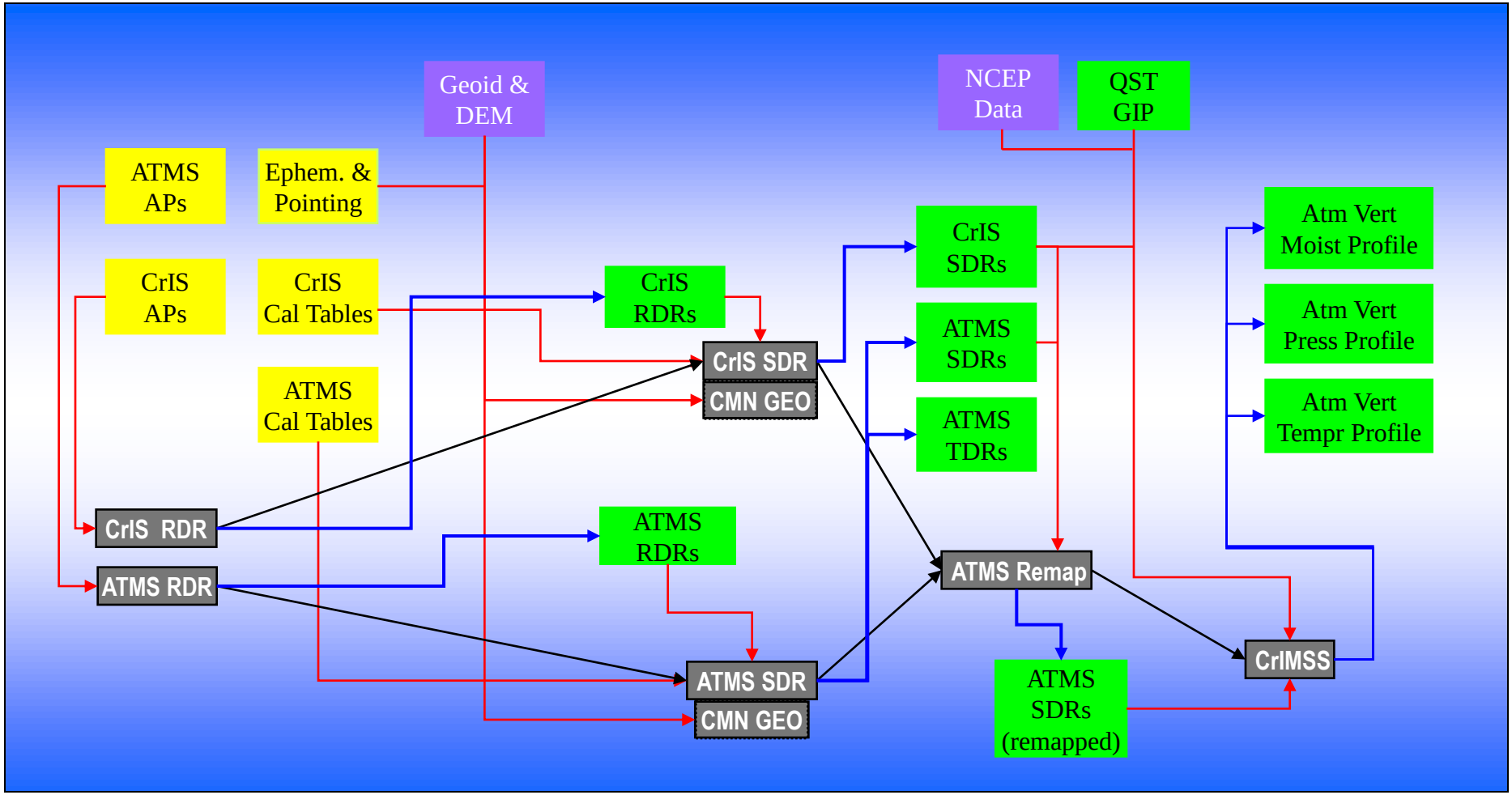
Algorithm Workflow

- JPSS products are generated from a complex network of processing algorithms.
- A number of interdependencies between algorithms exist in order to provide the required data quality to the end User.
- The following slides illustrate the interdependencies between products and processes within the IDPS needed to produce the NPP-era SDRs, EDRs, and Gridded Intermediate Products (GIP's).
- The execution of this processing flow for each granule of data is managed within the Infrastructure SI by the Workflow Manager (WFM) component through the use of a configurable Data Processing Guide (DPG).

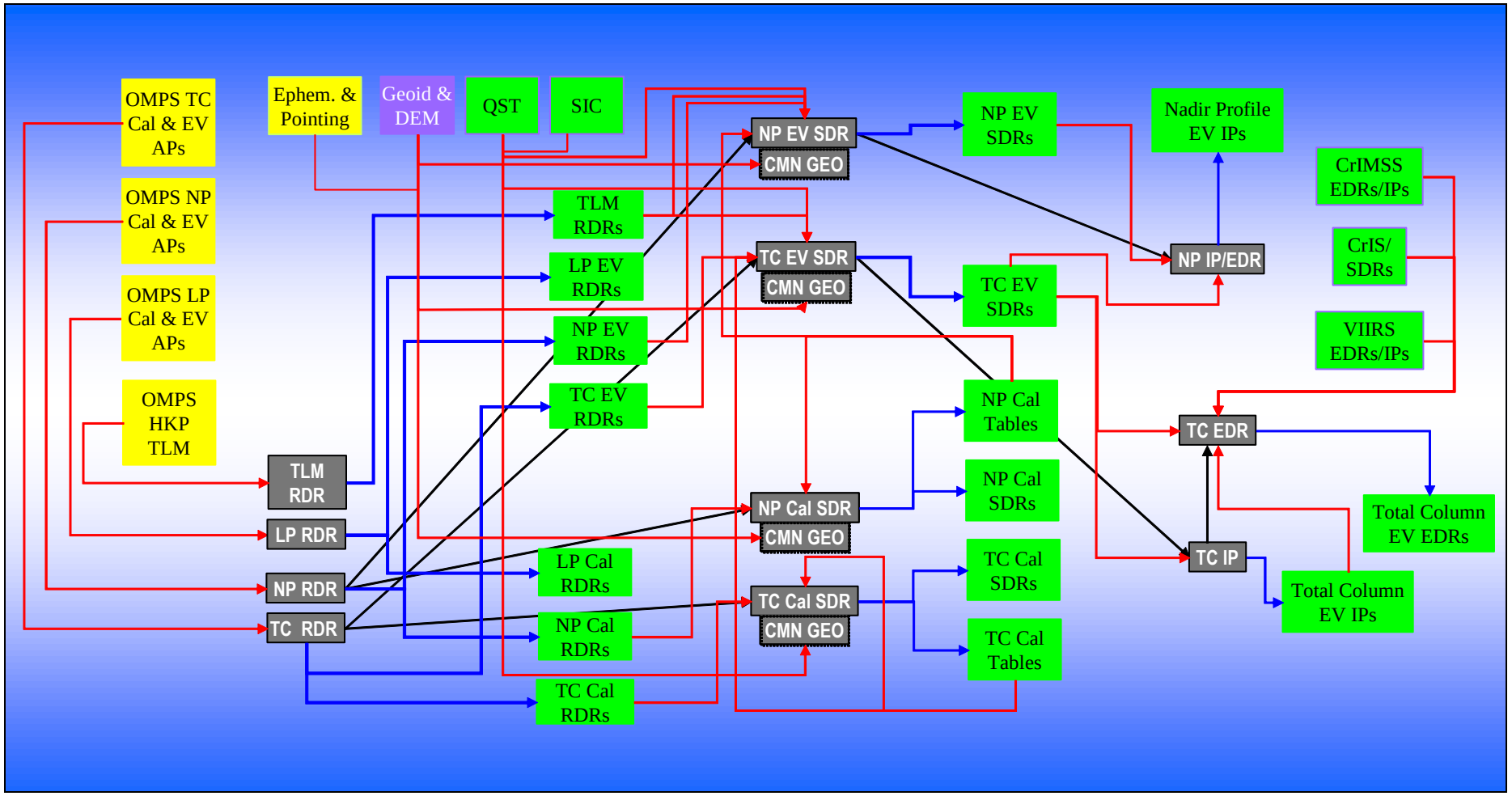
VIIRS Algorithm Data and Control Flow



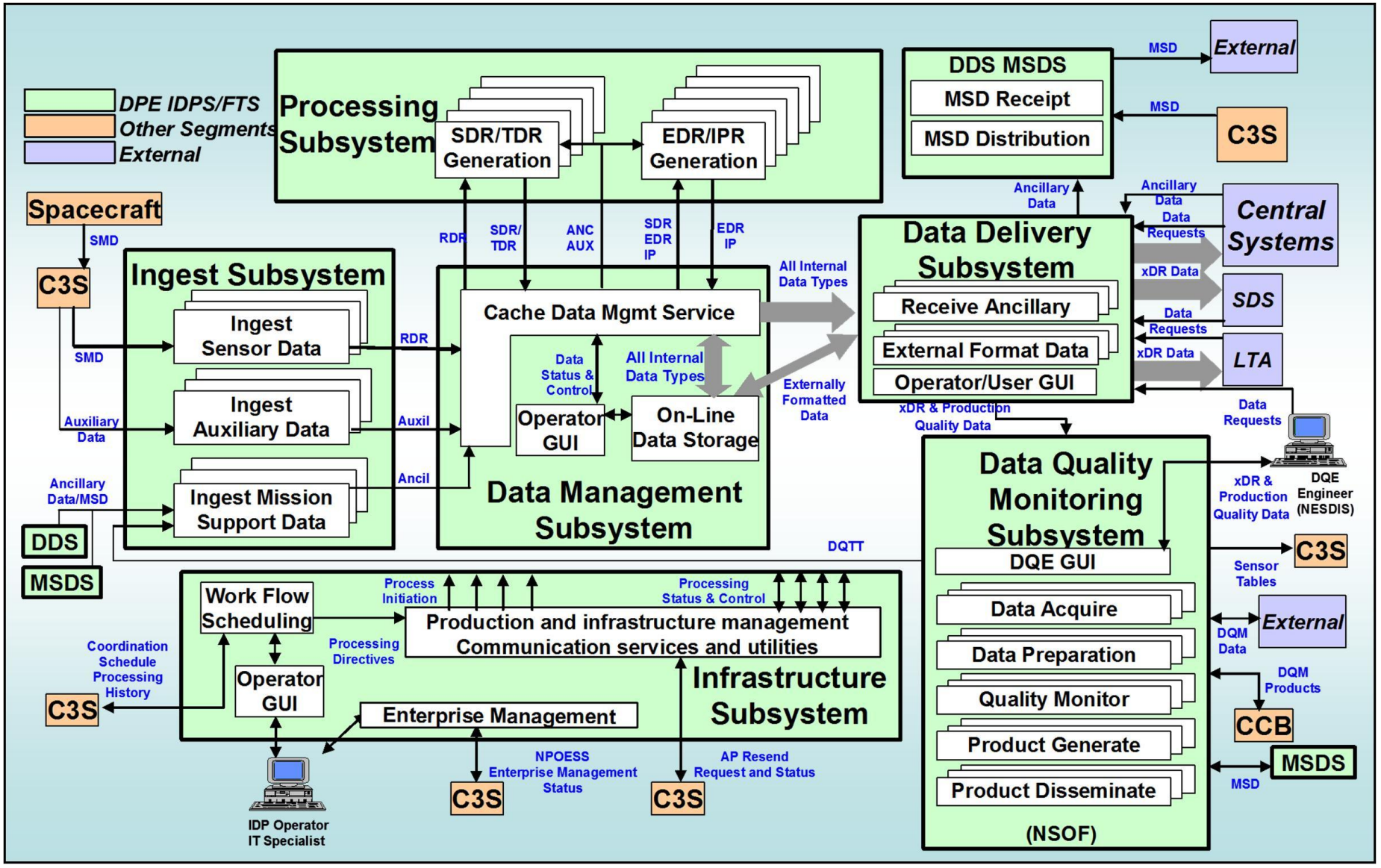
CrIMSS Algorithm Data and Control Flow



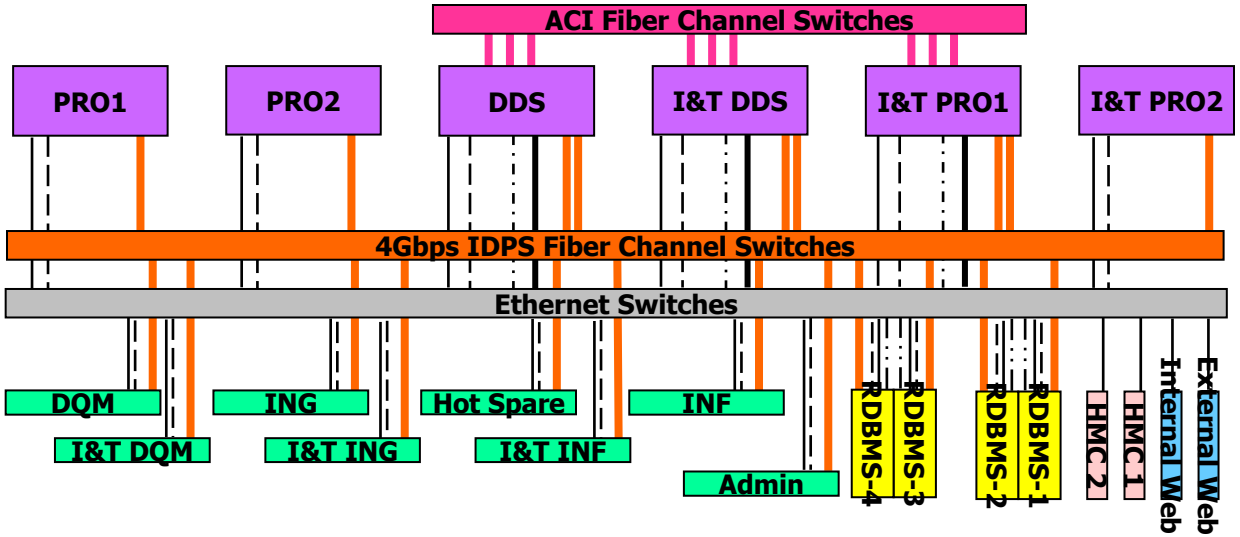
OMPS Algorithm Data and Control Flow



Interface Data Processing Segment Architecture



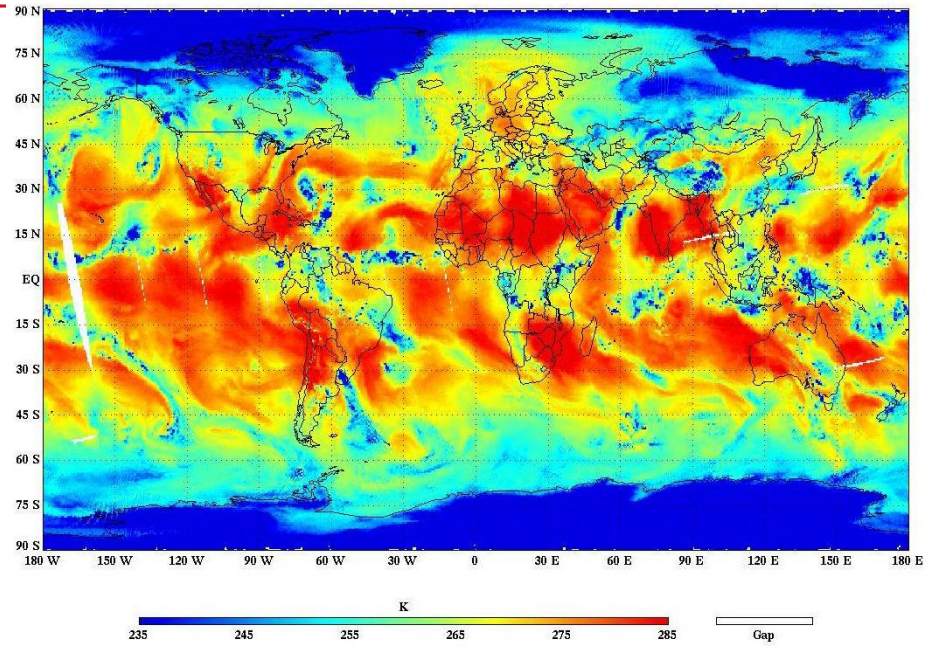
IDPS Hardware Architecture

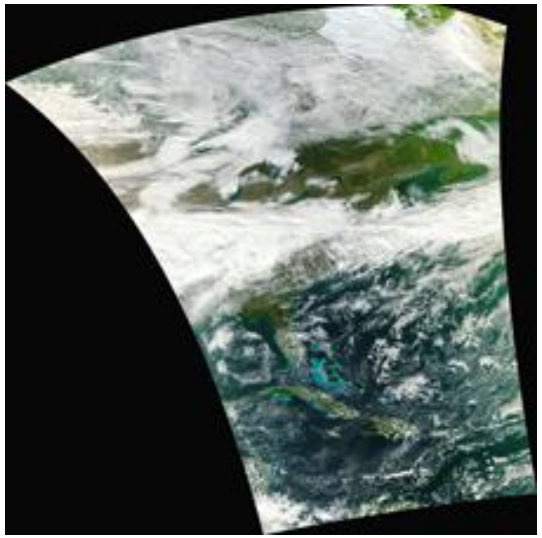


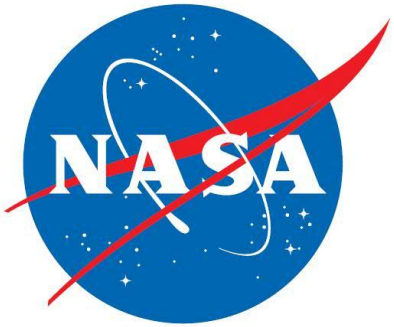
IDPS utilizes a mix of IBM System p servers and Storage Area Network (SAN) / Fibre Channel technology to meet the program's demanding data product latencies, assure fast and successful delivery of data to Users, provide very high operational availability, and allow for significant expandability to meet any changes to support JPSS objectives.

SUMMARY

- JPSS data processing is designed to provide high-quality environmental and meteorological data to the JPSS System Users with very low latency
- Leverages highly flexible and expandable, robust hardware to maximize data availability, operational availability, and assured delivery
- The SW architecture provides an efficient solution for NPP and provides a scalability to meet future JPSS needs.







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