



NPP/NPOESS

Calibration/Validation Data Management System

Central Technical Support Infrastructure for the IPO NPP Calibration and Validation (Cal/Val) Program

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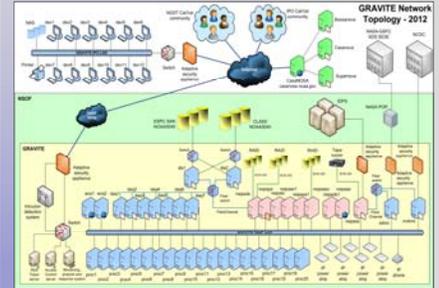
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Characterization, calibration, verification and validation of instruments' sensor and derived environmental parameters for the National Polar-orbiting Operational Environmental Satellite System (NPOESS) and NPOESS Preparatory Program (NPP) will be accomplished using a partnership among industry, academia and the US Government. Two distinct facets of the work are the prime contractor's verification activities focused on contractual performance specifications and the Government's validation activities focused on the suitability of the data products for use in operational and decision support applications. These efforts are complementary and are designed as a managed collaboration. The management of data associated with the activity is likewise a coordinated use of a group of systems.

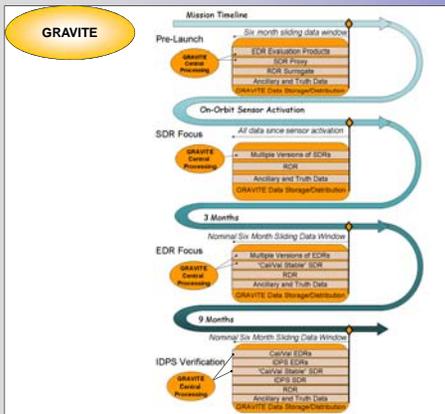
The Government Resource for Algorithm Verification, Independent Testing, and Evaluation (GRAVITE) is a multifunction Information Technology resource serving as the Cal/Val Team Lead Investigator Computing Facility (ICF) for the acquisition, routine processing, and distribution of relevant data product resources to subject matter focused ICFs at remote institutions. Within GRAVITE is Northrop Grumman's contribution to the combined resource, an ICF called the NPOESS Science Investigator-led Processing System (NSIPS). GRAVITE also includes interfaces to NASA's NPP Science Data Segment (SDS) and for long-term preservation of the Cal/Val record by NOAA's Comprehensive Large-array Storage System (CLASS).

A set of projects on NOAA's agency-wide CasaNOSA collaborative development environment is also used. These projects include a comprehensive pre-launch instrument test data repository, a technical library of instrument and algorithm documentation, and an active repository for both the operational algorithm code and for modified versions proposed by the Collaborative Team. CasaNOSA also serves as the collection point for findings from the calibration and validation activities, including not only recommended code changes, and specific non-conformance or bug reports but also reports on the performance of the sensors and products and updates to lookup tables, etc.



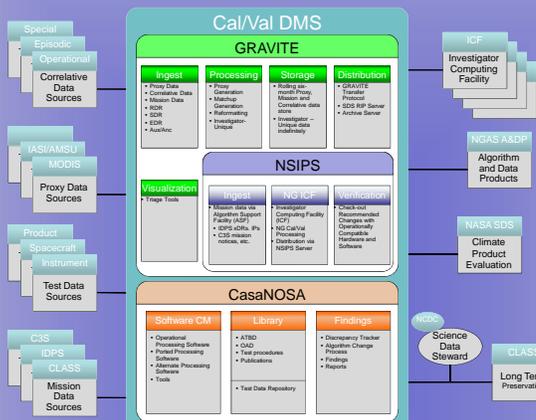
This figure represents the network topology for the GRAVITE System in 2012.

GRAVITE



The Government Resource for Algorithm Verification, Independent Testing and Evaluation (GRAVITE) is the NPOESS Cal/Val team leader "Investigator Computing Facility (ICF)" infrastructure for coordinating the calibration and validation of the NPP and NPOESS observatory sensors and derived operational sensor and environmental data records. The primary function is to ensure that the IPO Cal/Val subject matter expert teams have reliable and timely access to the various data sets necessary to efficiently achieve the goals of the program. In general, mission data, including IDPS RDRs, SDRs, EDRs, and Auxiliary data, along with various ancillary products such as model fields are continuously stored on-line for a nominal six month period Correlative data, according to their overlap and utility for comparison with the mission data, are obtained from in-situ or remote sensors, and multi-source models. Data are stored for cal/val use and are distributed to the cal/val team member ICFs.

The data managed on the system are expected to evolve through the course of the Cal/Val program according to the needs of the Cal/Val Subject Matter Experts (SMEs). For instance, during pre-launch preparations, data from heritage sensors are transformed into proxies for instrument data, and used to exercise the system. Directly post-launch, the emphasis will be almost entirely on SDR data. As the various products produced by the mission IDPS systems mature, the focus will start to shift to higher level data products.



CasaNOSA

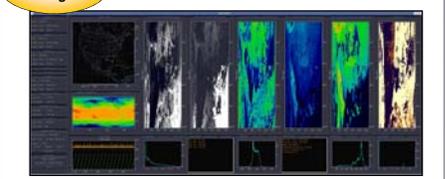
Technical Library

The objectives of the technical library are:

1. Timely access to comprehensive, and current, documentation and information regarding the spacecraft, instruments, algorithms, data products, and correlative data sets and systems.
2. Communication of plans, status, and results regarding ongoing calibration and validation activities.

The technical library is implemented on the CasaNOSA content management web site as a collection of documents, relational databases, and datasets. Tools and displays are provided with the intent that a Cal/Val investigator can find desired information with a small number of mouse clicks, keywords, and selections. The library is organized to facilitate a user "walking the system" from a known object, such as a data product or sensor, to a needed piece of information, such as the specifications and location of a thermistor used in an algorithm.

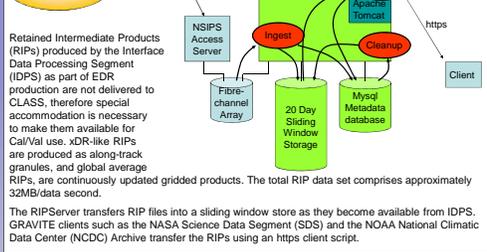
Visualization/Triage



Data products are predominantly based on observations from an individual sensor. As a result, much of the calibration and validation work becomes increasingly focused on single aspects of the overall system. The goal of the Triage application is to provide a counter-balanced view, by presenting a high-fidelity integrated view of all of the data products.

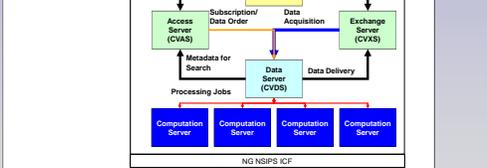
The application accesses the data stored on the GRAVITE file servers and the technical library. Analysts are automatically presented graphically with the mission context at any instant in time, including views of the spacecraft orbital position, attitude, angles with respect to the sun, moon, man-made satellites, and sensor lines of sight. Data observations, telemetry measurements, and correlative data are time aligned with context information, and available to the analyst in an immediate random-access fashion.

RIP Server



The RIPServer transfers RIP files into a sliding window store as they become available from IDPS. GRAVITE clients such as the NASA Science Data Segment (SDS) and the NOAA National Climatic Data Center (NCDC) Archive transfer the RIPs using an https client script.

NSIPS



The NPOESS Science Investigator-led Processing System (NSIPS) is a contractor ICF within the GRAVITE system security boundary. NSIPS resources are dedicated to support the Northrop Grumman (NG)-sponsored calibration and validation activity with an integrated capability for acquiring, processing, and disseminating Cal/Val related data products. NG's tools on NSIPS include data match-up and reprocessing of selected data sets via an instance of the IDPS Algorithm Development Area. Disks may be cross mounted between NSIPS and the rest of GRAVITE to support data sharing.

Software CM

The Software Configuration Management (CM) system resides on CasaNOSA. It provides revision controlled "operational" and "science" versions of the IDPS processing software to the IPO Cal/Val team. The repository facilitates effective software collaboration among Cal/Val team members, and concise communication of software change requests to the IDPS developer.

A "Linux Compatibility" branch is maintained relative to the IDPS baseline that includes changes and additions to the source code required to compile and execute the processing modules on x86 computers running the Linux operating system. Developers can create "Algorithm Modification" branches from which to implement remedial and enhancement changes in pursuit of the goals of the Cal/Val program. The revision control features provide the mechanism for preparation of "Algorithm Change Packages" for use in communicating recommended code changes to the IDPS developer for inclusion in later versions of the IDPS software baseline.

Test Data Repository

NPP will be launched with four instruments flying for the first time. During the development of each instrument, significant testing was performed, both in ambient and simulated orbital conditions, at the factory, and during spacecraft integration. Substantially all of the raw instrument data, instrument telemetry, ground support equipment telemetry, test procedures and logs, analyses, characterizations, and reports are stored on the CasaNOSA server to facilitate comparison of on-orbit operating characteristics with that observed prior to launch.

Web pages organize the data sets in such a manner that complete information regarding the conduct of a particular test can be retrieved easily. Alternative presentations make it quick and easy to find all test artifacts having to do with a particular sensor characteristic. Additional tools support search and review of the data to be able to identify periods in the pre-launch testing where an instrument was configured in a particular way, regardless of the purpose of the testing being conducted at that time.