**Evolution of the JPSS Ground Project Calibration and Validation System**

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**JPSS Introduction**

- The Joint Polar Satellite System (JPSS) is the NOAA's next-generation operational Earth observation program that acquires and distributes global environmental data from multiple polar-orbiting satellites.
- The JPSS program plays a critical role to NOAA's mission to understand and predict changes in weather, climate, oceans, and coasts environments, which supports the nation's economy and protects lives and property.
- The NASA is acquiring and implementing the JPSS, comprised of flight and ground systems on behalf of NOAA.
- The JPSS satellites are planned to fly in afternoon orbit and will provide operational continuity of satellite-based observations and products for NOAA's polar-orbiting Operational Environmental Satellites (POES) and the Suomi National Polar-orbiting Partnership (SNPP) satellite.

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**GRAVITE Overview**

- GRAVITE stands for "Government Resource for Algorithm Verification, Independent Test, and Evaluation."
- GRAVITE is a mature NOAA system developed and deployed by JPSS Ground Project that supports SNPP mission and has been in operations since SNPP launch.
- GRAVITE is:
  - NASA system 5048
  - Assessed as "moderate" security impact as per NIST 199
  - A mission data support system, Class "C" under NASA Procedural Requirements (NPR)-7150.2A
  - Data center housed at the NOAA Satellite Operations Facility
- GRAVITE services facilitate:
  - Algorithm Integration and Checkout
  - Algorithm and Product Operational Tuning
  - Instrument Calibration
  - Product Validation
  - Algorithm Investigation
  - Data Quality Support and Monitoring

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**GRAVITE Evolution**

- **GRAVITE Version 1.0 (GV1.0):** Evolved from NPOESS GRAVITE; originally not intended for formal Cal/Val but "play ground" for scientists
- **GRAVITE Version 2.0 (GV2.0):** Self-directed analysis of GRAVITE capabilities, design, and performance. Initiated and led improvements in storage design, defect corrections, and performance
- **GRAVITE Version 3.0 (GV3.0):** Major re-architecture that incorporated GRAVITE lessons learned. Addressed a number of issues related to data rights conflicts, performance issues (multiple databases, multiple file copies, redundant data storage), direct access to database without validation, scale and maintenance, and multiple distribution mechanisms
- **GRAVITE Version 4.0 (GV4.0):** Requirement updates and minor enhancements that do not impact the overall design. Host Data Quality Assurance (DQA)/Offline tool suite on GRAVITE

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**GRAVITE Data Flow**

- **Landing Zone:** Data sources either push files to the Landing Zone (LZ) or Pull Server pulls remote files and place them on the Landing Zone.
- **Ingest:** Looks for new files on Landing Zone, Reads file metadata, writes metadata related entries to the database. Archives files in GPFS storage
- **Workflow Manager:** Sends PGE information to the Planner. Planner checks to see if all pre-conditions are met for running a PGE. If conditions are met, Workflow Manager sends a task to Resource Manager
- **Resource Manager:** Executes task on available machine. Outputs are sent to the Landing Zone for ingest
- **Job Manager:** Executes repetitive task on available machine
- **Godard Mission Services Evolution Center (GMSEC):** Events are written to and read from Message Bus
- **GRAVITE Inventory:** Includes Database and GPFS storage

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**Summary**

- **GRAVITE is currently in operations and has been successfully supporting SNPP since its launch in Oct 2011**
  - Exceeds GV3.0 ingest requirements of 5TB/day. Observed ingest rates up to 16TB/day
  - Largest implementation of Apache OODT
- **GRAVITE has evolved as a system with increased performance:**
  - Robust, stable, reliable, maintainable, scalable, and secure
  - Supports development, test, and production strings
  - Replaces proprietary and custom software
  - Uses open source software
  - Compliant with NASA and NOAA standards
- **GV4.0 adds enhancements to GV3.0 to support JPSS:**
  - Minor architecture updates are anticipated as a result of these requirements changes/adding
  - Necessary interfaces and documents are baselined
  - GRAVITE is on schedule to support JPSS Launch