Overview of JPSS GRAVITE system

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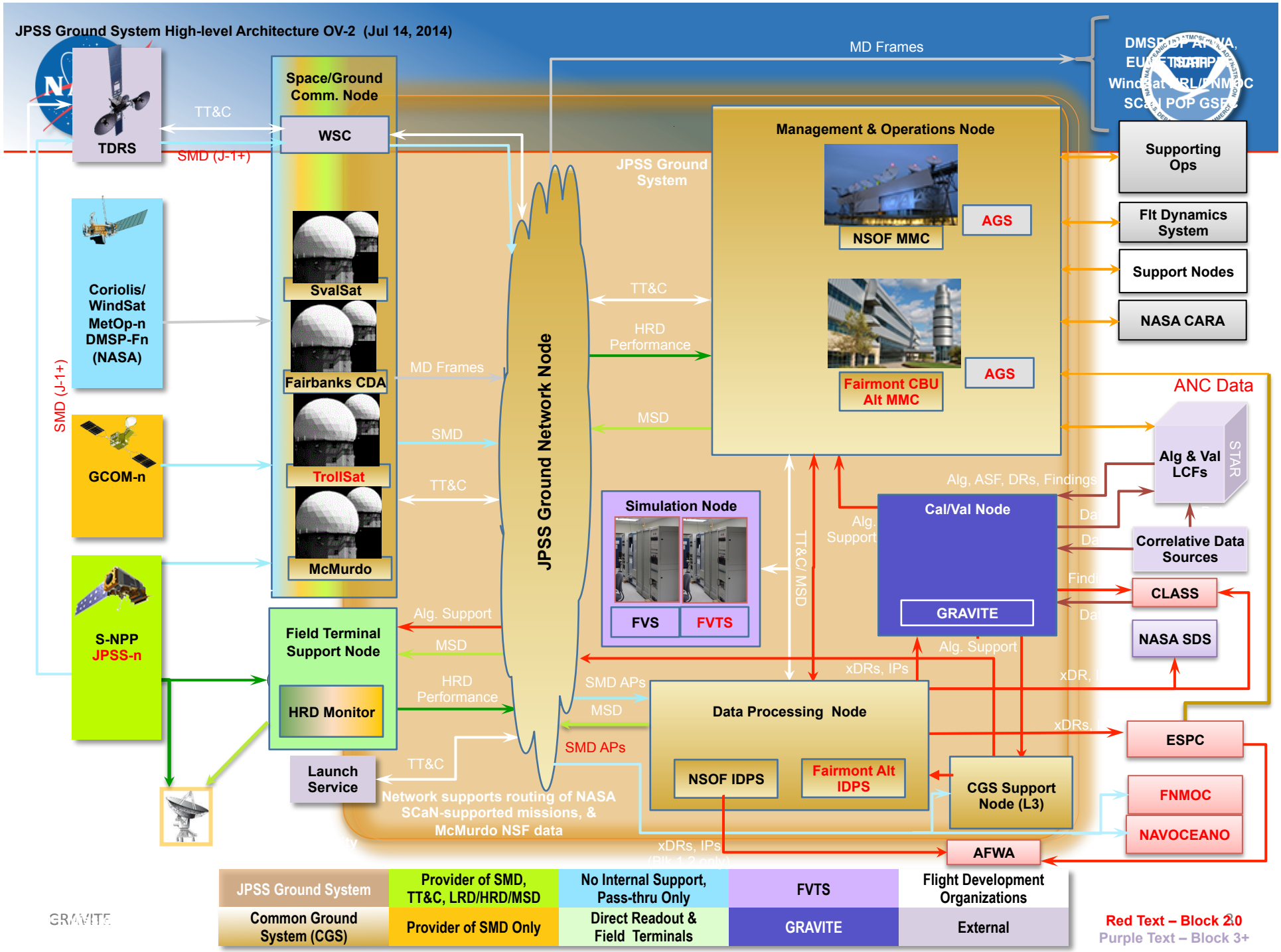
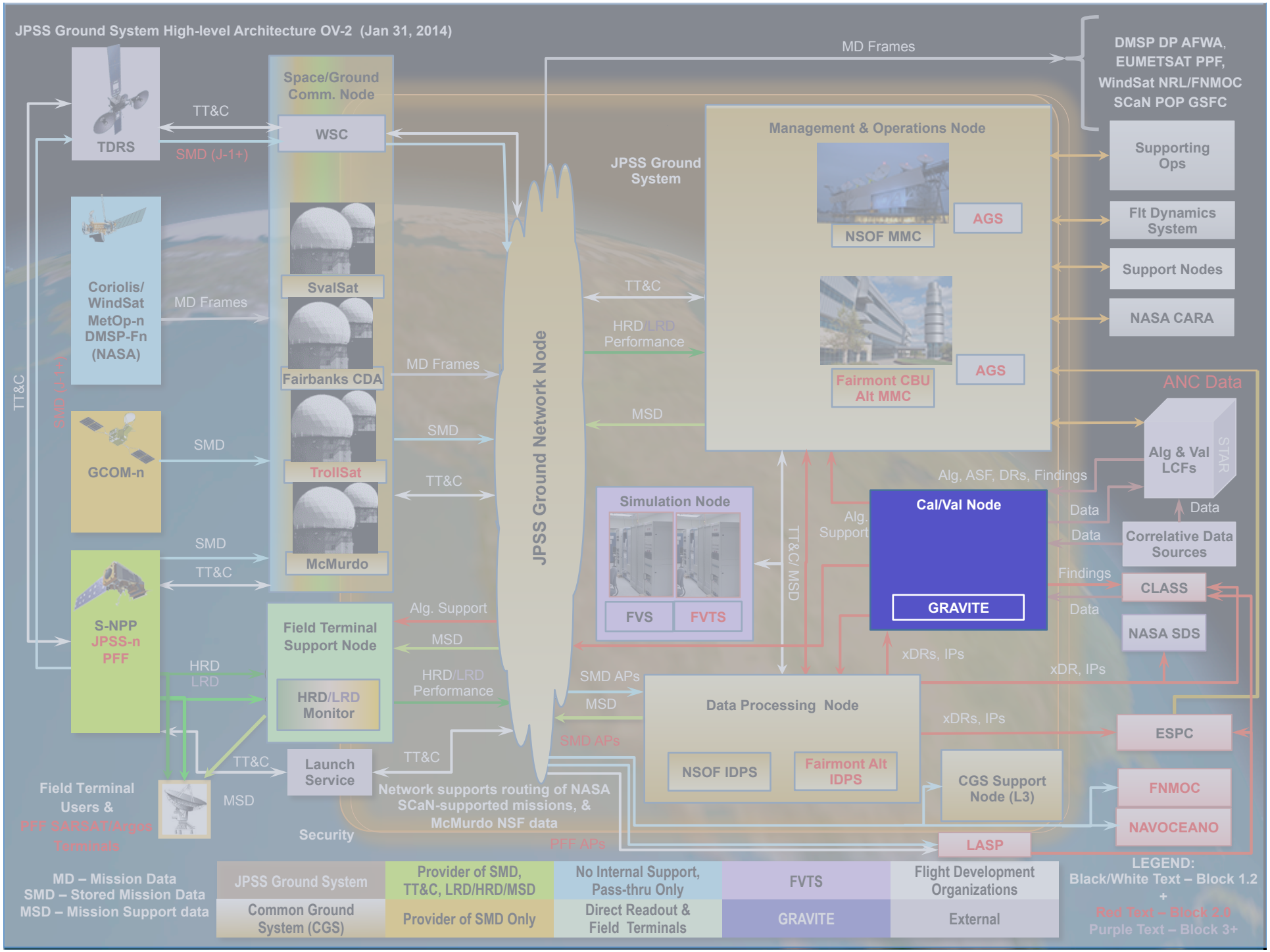
NASA GSFC Code 586

Joint Polar Satellite System

- JPSS is a collaborative program between National Oceanic and Atmospheric Administration's (NOAA) and National Aeronautics and Space Administration (NASA). NASA is acquiring and implementing the JPSS, (comprised of flight and ground systems) on behalf of NOAA
- JPSS Program plays a critical role to understand and predict changes in weather, climate, oceans, and coasts environments
- JPSS will provide operational continuity of polar-orbiting satellite-based weather observations and products

JPSS Launch Readiness Date	FY 2017 (JPSS-1); FY 2022 (JPSS-2)
Program Architecture	3 Satellites (S-NPP, JPSS-1 and JPSS-2)
Program Operational Life	FY 2012 through FY 2025


JPSS Ground System High-level Architecture OV-2 (Jul 14, 2014)
TDRS
TT&C
SMD (J-1+)
Space/Ground Comm. Node
WSC
SvalSat
Fairbanks CDA
TrollSat
McMurdo
Coriolis/ WindSat MetOp-n DMSP-Fn (NASA)
GCOM-n
S-NPP JPSS-n
MD Frames
SMD
TT&C
Field Terminal Support Node
HRD Monitor
Alg. Support
MSD
HRD Performance
Launch Service
TT&C
Network supports routing of NASA SCaN-supported missions, & McMurdo NSF data
JPSS Ground Network Node
JPSS Ground System
TT&C
HRD Performance
MSD
Management & Operations Node
NSOF MMC
AGS
Fairmont CBU Alt MMC
AGS
Simulation Node
FVS
FVTS
TT&C/ MSD
Alg. Support
Cal/Val Node
GRAVITE
Alg, ASF, DRs, Findings
Alg. Support
Data Processing Node
NSOF IDPS
Fairmont Alt IDPS
SMD APs
MSD
SMD APs
xDRs, IPs
xDRs, IPs
CGS Support Node (L3)
AFWA
MD Frames
DMSP-DP AFWA, EUMETSAT, STAR, Windsat NRL/FNMOC SCaN POP GSFC
Supporting Ops
Flt Dynamics System
Support Nodes
NASA CARA
ANC Data
Alg & Val LCFs
STAR
Correlative Data Sources
CLASS
NASA SDS
ESPC
FNMOC
NAVOCEANO
JPSS Ground System
Common Ground System (CGS)
Provider of SMD, TT&C, LRD/HRD/MSD
Provider of SMD Only
No Internal Support, Pass-thru Only
Direct Readout & Field Terminals
FVTS
GRAVITE
Flight Development Organizations
External
Red Text – Block 2.0
Purple Text – Block 3+
GRAVITE


JPSS Ground System High-level Architecture OV-2 (Jan 31, 2014)
TDRS
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MD – Mission Data
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LEGEND:
Black/White Text – Block 1.2
+
Red Text – Block 2.0
Purple Text – Block 3+

GRAVITE

- GRAVITE stands for "Government Resources for Algorithm Verification, Independent Test and Evaluation"
- GRAVITE is the Calibration and Validation Node to support JPSS mission data products and algorithm operational science
- GRAVITE services facilitate:
  - Algorithm Integration and Checkout
  - Algorithm and Product Operational Tuning
  - Instrument Calibration
  - Product Validation
  - Algorithm Investigation
  - Data Quality Support and Monitoring
- Science algorithms are provided by NOAA Satellite Applications and Research (STAR)

GRAVITE Subsystems

- Four subsystems:
  - IPS (Investigator-led Processing System)
    - In-house developed. Production system, operator managed. Consists of Ingest, Automated Processing, and Distribution components. Runs PGEs (Product Generation Executable) for Cal/Val and Data Quality Monitoring.
  - G-ADA (GRAVITE Algorithm Development Area)
    - Interface Data Processing Segment (IDPS) compliant development and testing platform for JPSS algorithms and Look-Up-Tables. After verification, proposed changes are sent to CGS as Algorithm Change Packages (ACP) for integration.
  - ICF (Investigator Computing Facility)
    - Science tools and libraries, personal user space, access to data, and computing power are provided to run CPU and memory intensive applications.
  - GIP (GRAVITE Information Portal)
    - Coordination and knowledge sharing for GRAVITE projects through Blogs, Wikis, Action trackers, etc.

GV2.0

- GRAVITE version 2 (GV2.0) issues:
  - Data rights conflicts
  - Performance issues
    - Multiple databases
    - Multiple file copies
    - Redundant data storage
  - Direct application access to database without validation
  - Scale and maintenance
  - Multiple distribution mechanisms

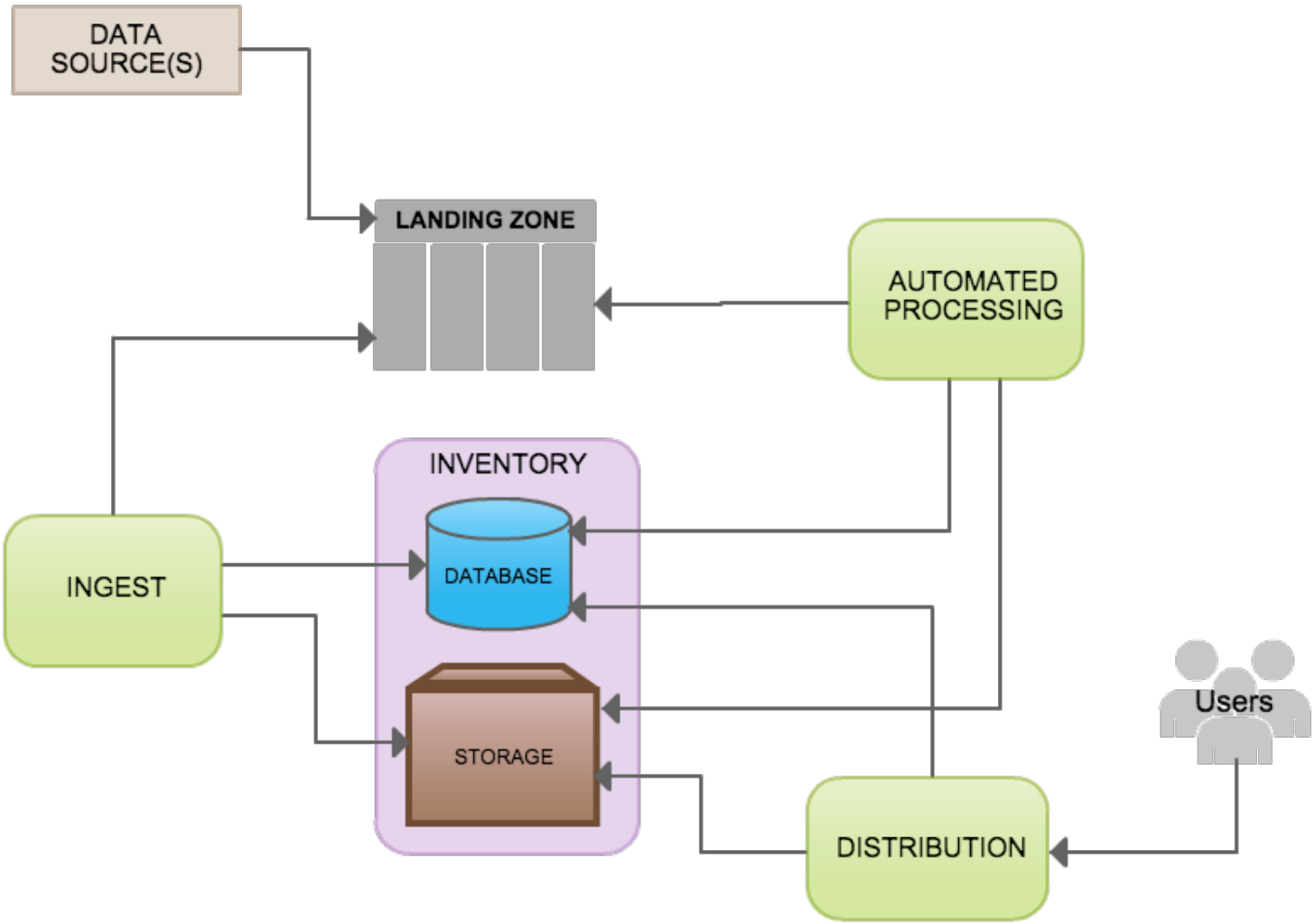
Apache OODT

- Apache OODT (http://oodt.apache.org) is middleware for science data processing and retrieval. It provides suite of components, structures and tools for:
  - File crawling and ingestion
  - Science algorithm wrapping and integration
  - File management
  - Workflow management
  - Resource management
  - Automated remote data acquisition
- Open source

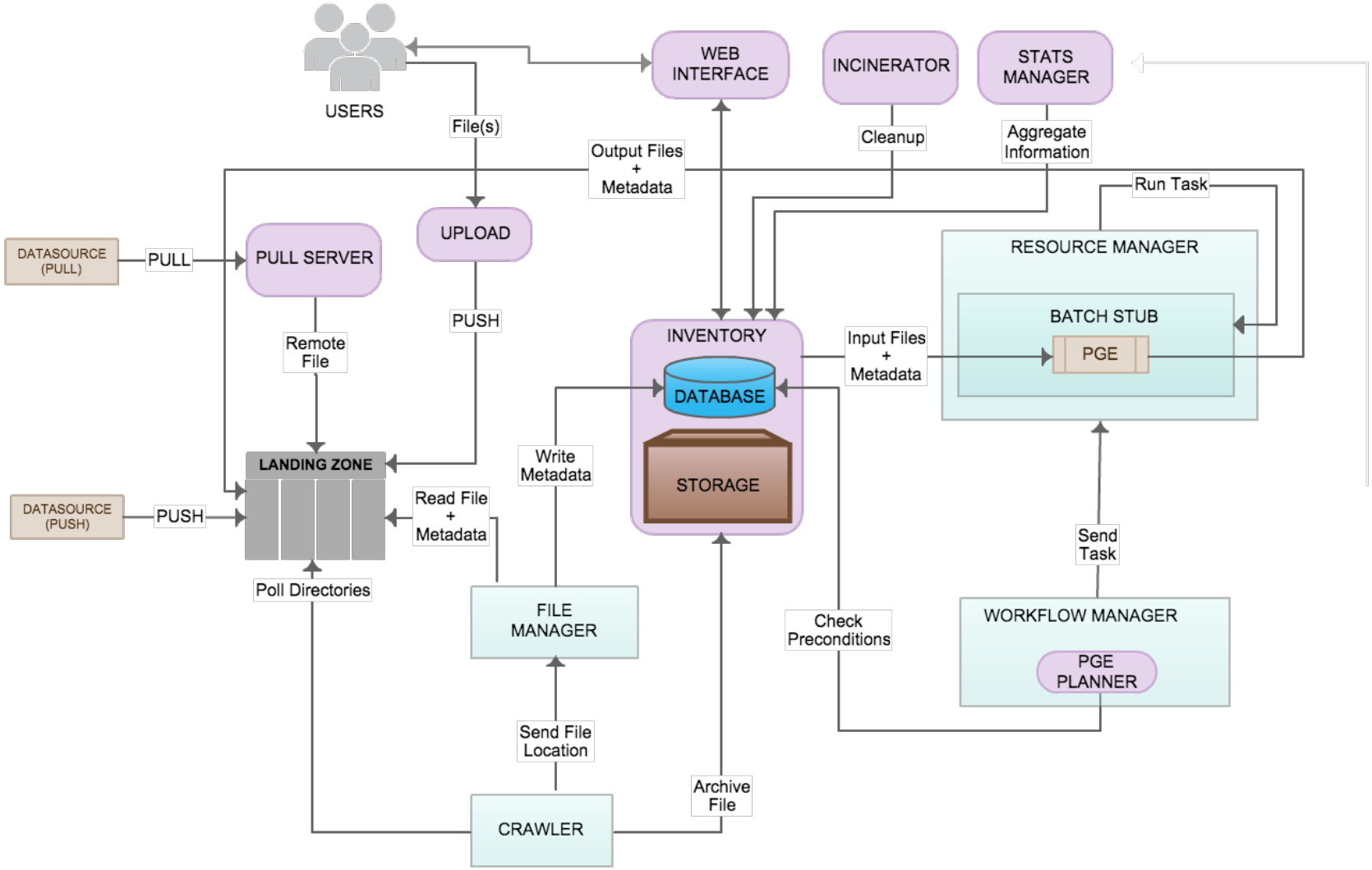
GV3.0

- GRAVITE IPS requirements mapped nicely to some of the features offered by OODT.
  - Developed a prototype using OODT. Replaced automated remote data acquisition component (Push/Pull Framework) with our own implementation (Pull Server)
  - Developed GV3.0 system with minimal configuration and code changes to: File management, File crawling and ingestion, Workflow management, and Resource management
- Developed distribution and monitoring system.
- Incorporated lessons learned from GV2.0.

GV3.0
High Level Functions



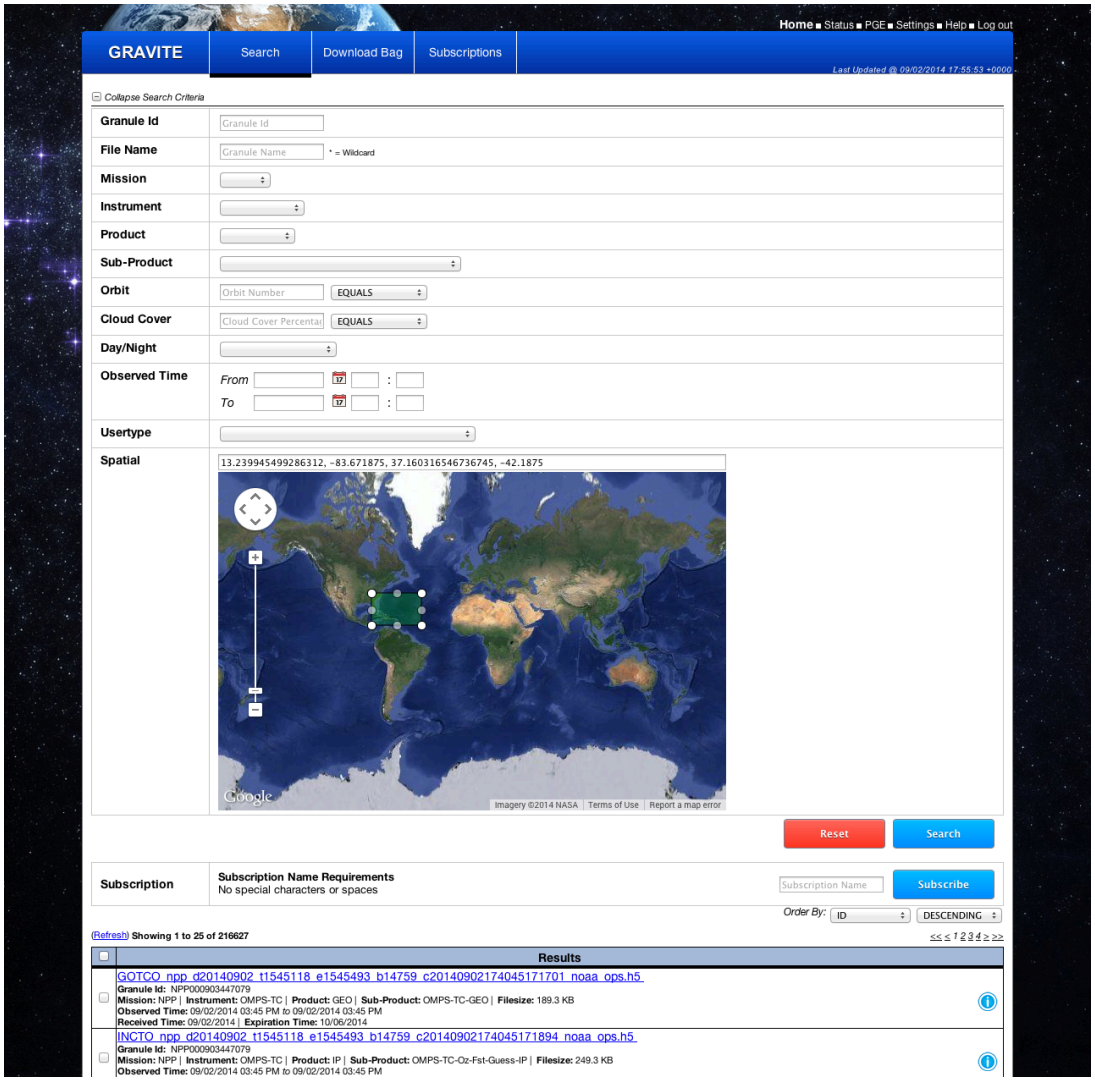
GV3.0
Data Flow



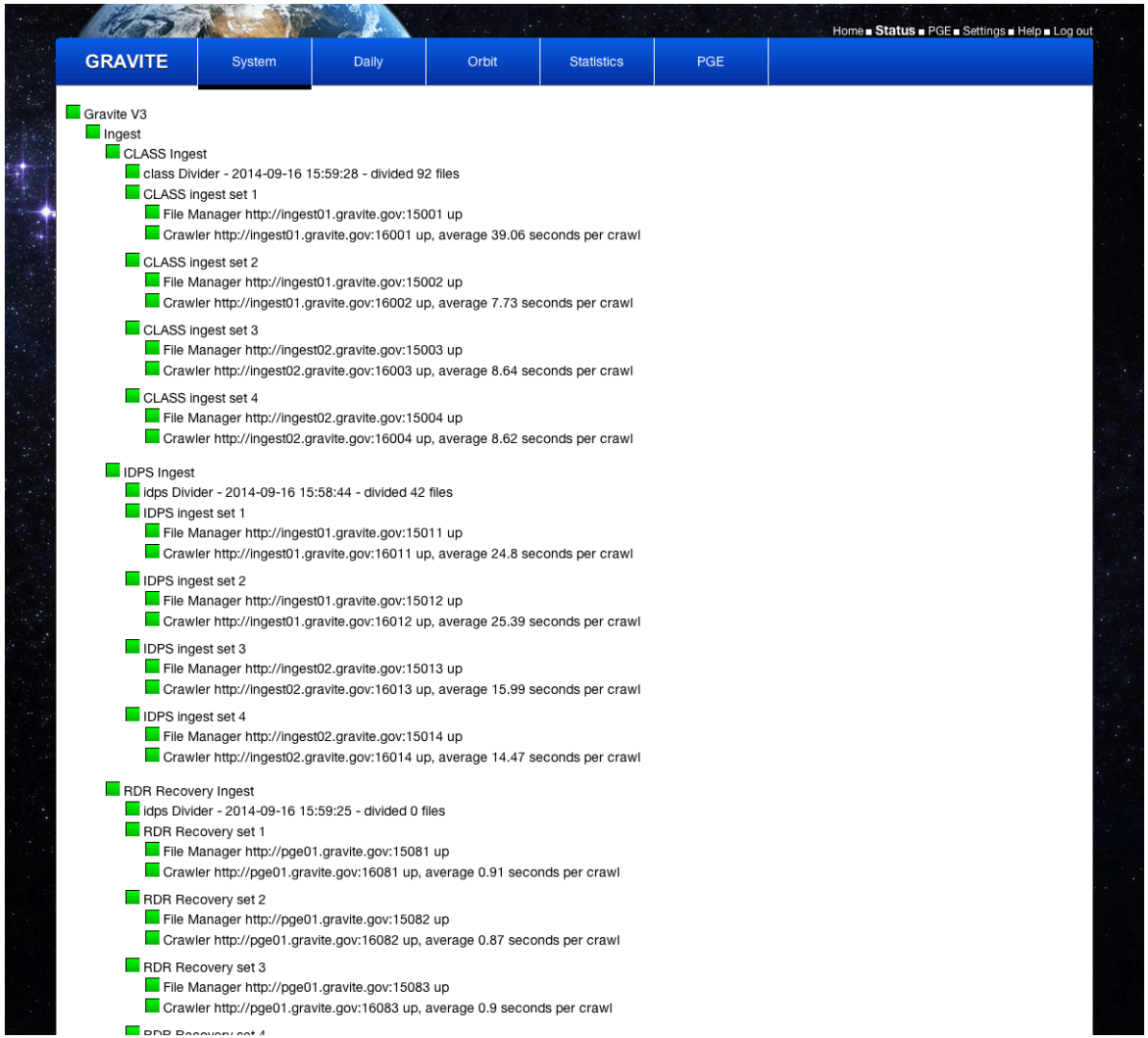
GV3.0
Data Flow

- **Landing Zone**
  - Data sources either push files to the Landing Zone or Pull Server pulls remote files and place them on the Landing Zone
- **Crawler (OODT Component)**
  - Looks for new files on Landing Zone and passes file locations to File Manager
  - Archives files in GPFS storage
- **File Manager (OODT Component)**
  - Reads file metadata; writes metadata related entries to the database
- **Workflow Manager (OODT Component)**
  - 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 (OODT Component)**
  - Executes task on available machine. Outputs are sent to the Landing Zone for ingest
- **GRAVITE Inventory**
  - Includes Database and GPFS storage
- **Distribution**
  - Makes data available to the users

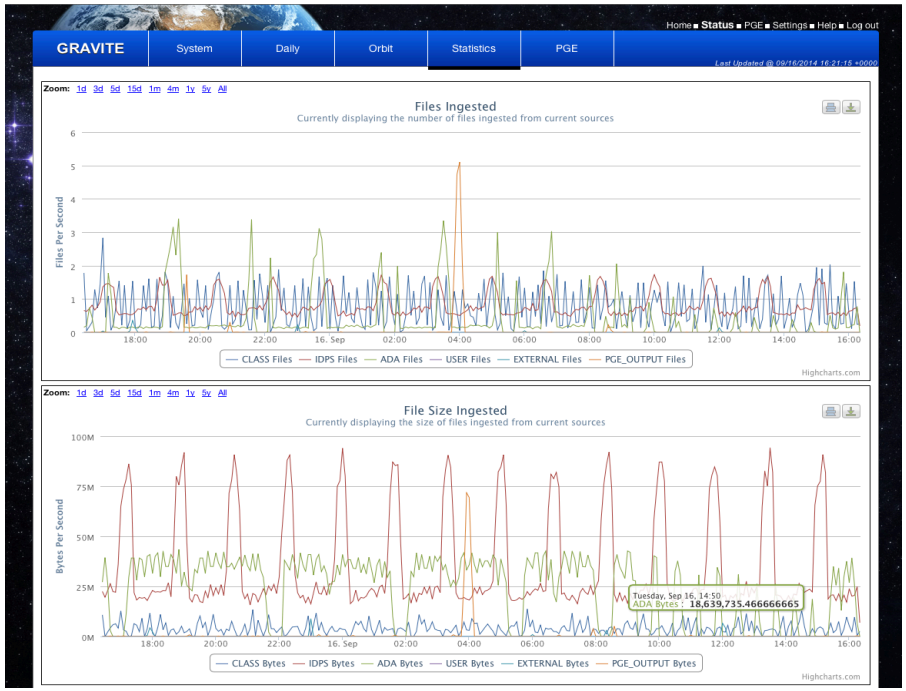
Search Interface

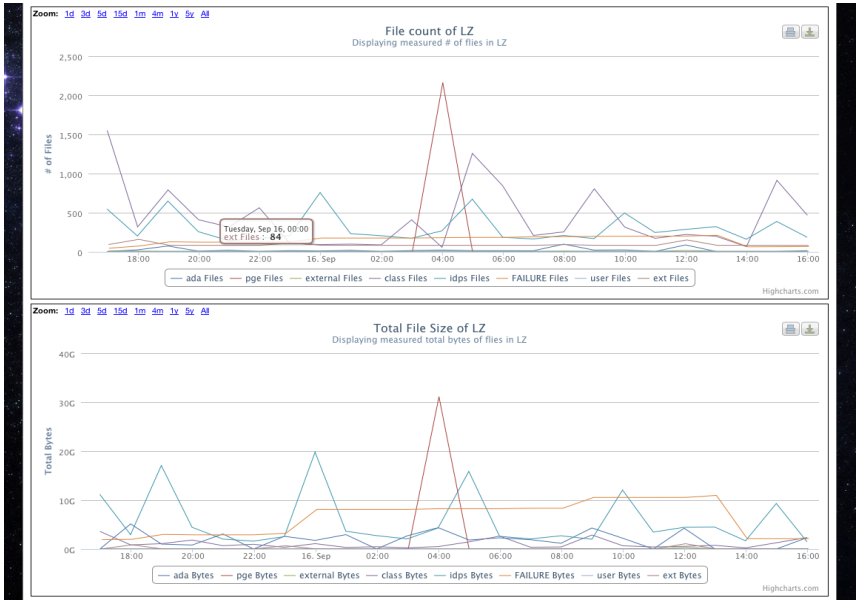


System Status



Ingest Statistics





Orbit Statistics

Home ■ Status ■ PGE ■ Settings ■ Help ■ Log out

GRAVITE | System | Daily | Orbit | Statistics | PGE

Last Updated @ 09/16/2014 22:08:22 +0000

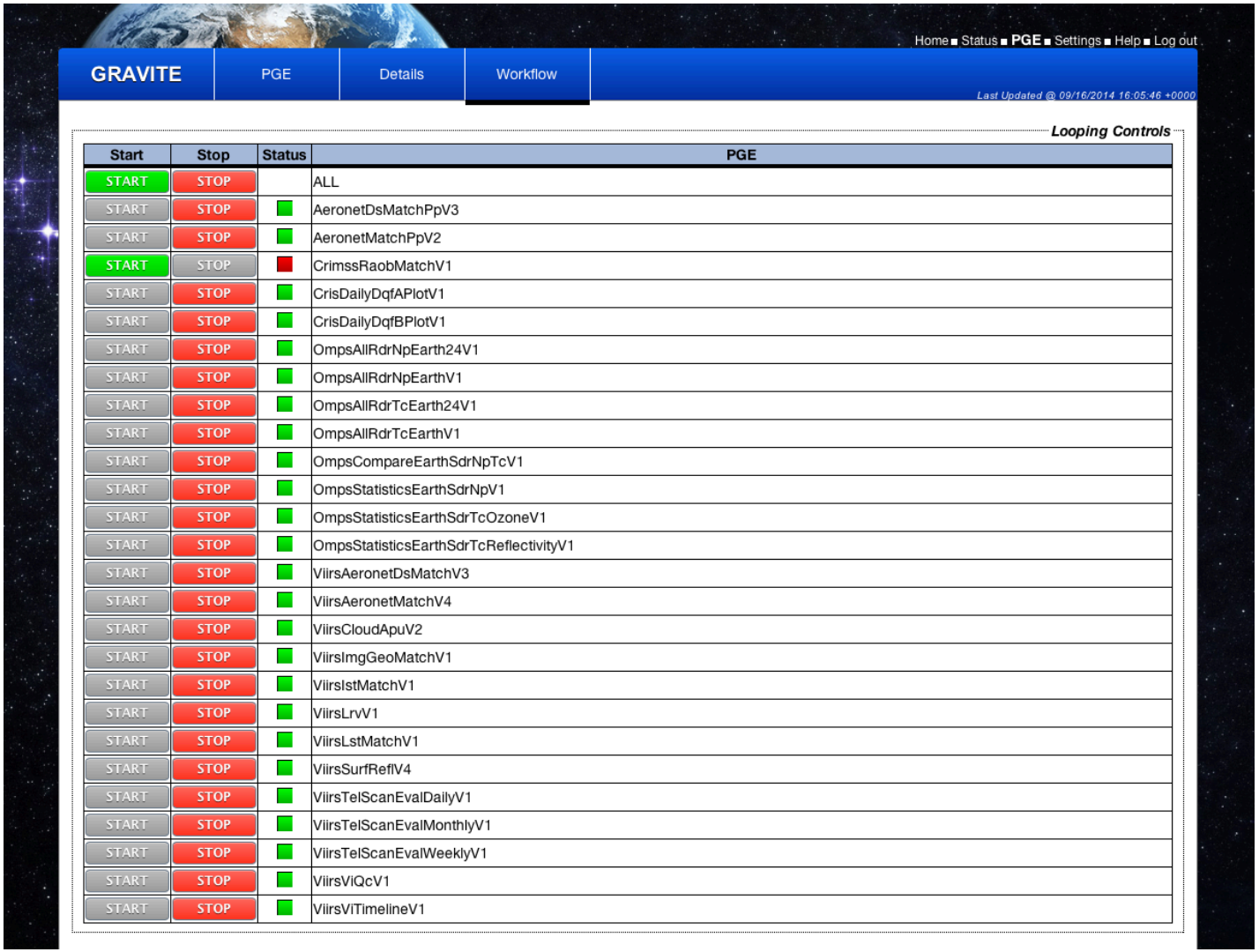
Orbit: 14 Orbits Back 7 Orbits Back 1 Orbit Back Reset Orbit 1 Orbit Forward 7 Orbits Forward 14 Orbits Forward

Jump To: Orbit Number Search

14829 - 14843: 1987
Max Ingested Orbit: 14961
Max Ingested Orbit, CLASS: 14957
Max Ingested Orbit, IDPS: 14961

Sub-Product	14829	14830	14831	14832	14833	14834	14835	14836	14837	14838	14839	14840	14841	14842	14843
SPACECRAFT-DIARY-RDR	1067	1060	1074	985	1085	1072	1074	1074	1075	1074	1075	1072	1076	1069	1066
SPACECRAFT-TELEMETRY-RDR	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
ATMS-DIAGNOSTIC-RDR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ATMS-DUMP-RDR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ATMS-DWELL-RDR	10	11	10	10	10	10	11	11	11	10	10	10	10	10	10
ATMS-SCIENCE-RDR	193	192	192	192	192	192	193	192	192	193	192	192	193	191	190
ATMS-TELEMETRY-RDR	191	190	190	191	190	190	192	190	190	191	190	190	190	191	190
ATMS-SDR	191	190	190	191	190	190	191	190	190	191	190	190	191	190	190
ATMS-SDR-GEO	191	190	190	191	190	190	191	190	190	191	190	190	191	190	190
ATMS-TDR	191	190	190	191	190	190	191	190	190	191	190	190	191	190	190
ATMS-REMAP-SDR	191	190	190	191	190	190	191	191	190	191	190	19	-	-	-
ATMS-REMAP-SDR-GEO	191	190	190	191	190	190	191	191	190	191	190	19	-	-	-
CRIS-DIAGNOSTIC-RDR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRIS-DUMP-RDR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRIS-HSKDWELL-RDR	10	11	10	10	10	10	11	11	11	10	10	10	10	10	10
CRIS-IMDWELL-RDR	10	11	10	10	10	10	11	11	11	10	10	10	10	10	10
CRIS-SSMDWELL-RDR	10	11	10	10	10	10	11	11	11	10	10	10	10	10	10
CRIS-SCIENCE-RDR	193	192	192	193	192	192	193	193	192	193	192	192	193	191	190
CRIS-TELEMETRY-RDR	191	190	190	191	190	190	192	190	190	191	190	190	191	190	190
CrIMSS-CrIS-AVMP-LOS-IR-IP	191	191	190	191	190	190	194	191	190	191	190	191	191	190	-
CrIMSS-CrIS-AVMP-LOS-MW-IP	191	191	190	191	190	190	194	191	190	191	190	191	191	190	-
CrIMSS-CrIS-AVTP-LOS-IR-IP	191	191	190	191	190	190	194	191	190	191	190	191	191	190	-
CrIMSS-CrIS-AVTP-LOS-MW-IP	191	191	190	191	190	190	194	191	190	191	190	191	191	190	-
CrIMSS-CrIS-CLOUD-CLEARED-RAD-IP	191	191	190	191	190	190	194	191	190	191	190	191	191	190	-
CrIMSS-CrIS-IR-SURF-EMISSIVITY-IP	191	191	190	191	190	190	194	191	190	191	190	191	191	190	-
CrIMSS-CrIS-MW-SURF-EMISSIVITY-IP	191	191	190	191	190	190	194	191	190	191	190	191	191	190	-
CrIMSS-CrIS-SKIN-TEMP-IP	191	191	190	191	190	190	194	191	190	191	190	191	191	190	-
CrIMSS-EDR-GEO-TC	191	191	190	191	190	190	194	191	190	191	190	191	191	190	-
CrIS-SDR	191	190	190	191	190	190	191	190	190	191	190	190	191	190	190
CrIS-SDR-GEO	191	190	190	191	190	190	191	190	190	191	190	190	191	190	190
CrIS-IR-OZ-Prof-IP	191	190	190	191	190	190	191	191	190	191	190	140	-	-	-
CrIMSS-EDR	191	190	190	191	190	190	191	191	190	191	190	19	-	-	-

PGE Control



Start	Stop	Status	PGE
START	STOP		ALL
START	STOP		AeronetDsMatchPpV3
START	STOP		AeronetMatchPpV2
START	STOP		CrimssRaobMatchV1
START	STOP		CrisDailyDqfAPlotV1
START	STOP		CrisDailyDqfBPlotV1
START	STOP		OmpsAllRdrNpEarth24V1
START	STOP		OmpsAllRdrNpEarthV1
START	STOP		OmpsAllRdrTcEarth24V1
START	STOP		OmpsAllRdrTcEarthV1
START	STOP		OmpsCompareEarthSdrNpTcV1
START	STOP		OmpsStatisticsEarthSdrNpV1
START	STOP		OmpsStatisticsEarthSdrTcOzoneV1
START	STOP		OmpsStatisticsEarthSdrTcReflectivityV1
START	STOP		ViirsAeronetDsMatchV3
START	STOP		ViirsAeronetMatchV4
START	STOP		ViirsCloudApuV2
START	STOP		ViirsImgGeoMatchV1
START	STOP		ViirsIstMatchV1
START	STOP		ViirsLrvV1
START	STOP		ViirsLstMatchV1
START	STOP		ViirsSurfReflV4
START	STOP		ViirsTelScanEvalDailyV1
START	STOP		ViirsTelScanEvalMonthlyV1
START	STOP		ViirsTelScanEvalWeeklyV1
START	STOP		ViirsViQcV1
START	STOP		ViirsViTimelineV1

Summary

- GV3.0 has been successfully supporting S-NPP in operations since March 2014.
  - 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
  - Stable, reliable, scalable, maintainable, and secure
  - Uses open source software
  - Replaces proprietary software
  - Supports development, test, and production strings
  - Compliant with NASA and NOAA standards

Questions?