JOINT POLAR SATELLITE SYSTEM (JPSS) COMMON GROUND SYSTEM (CGS) ARCHITECTURAL OVERVIEW & TECHNICAL PERFORMANCE MEASURES (TPMs)

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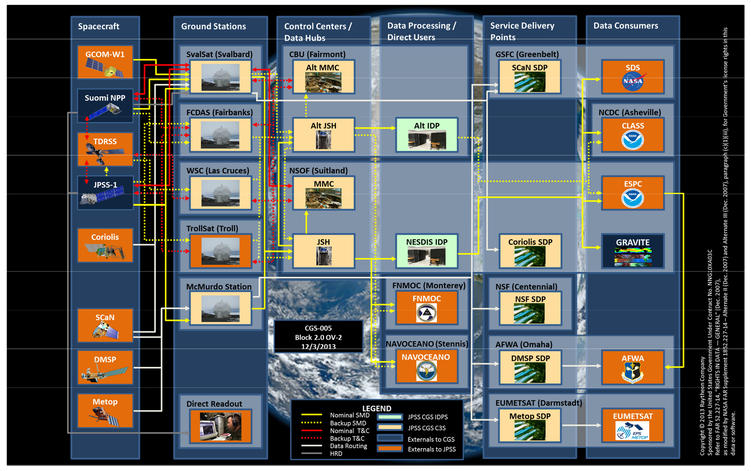

Figure 1. Multi-Mission Architecture and Data Flow.

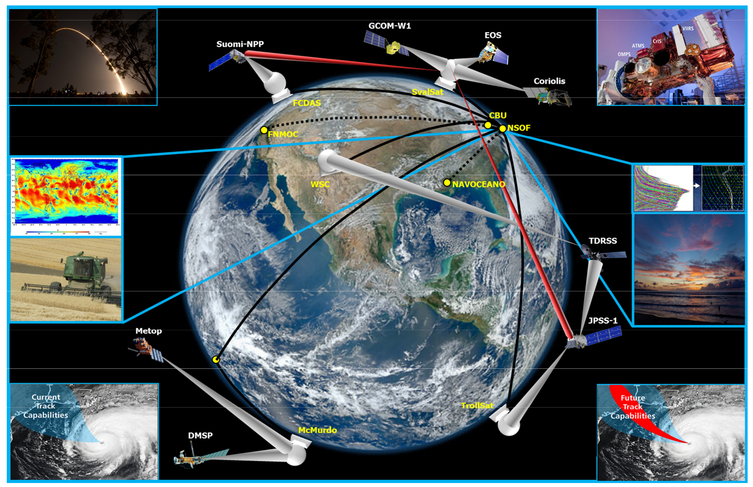

Figure 2. Multi-Mission Operations Concept.

Table 1. CGS TPM Categories.

TPM Category	Description	# of Items Tracked	Example
Data Latency	Time from photons sensed to data products delivered	12	JPSS-1 EDR Data Latency
Data Availability	Percent of raw data captured and archived	13	JPSS Raw Data Availability to CLASS
Operational Availability	Percent of time mission critical functions are satisfied	7	Data Processing Node Operational Availability
Situational Awareness	Timeliness of system response and alerts to operators	3	Alert Display Timeliness
Efficiency	Utilization of resources	1	CGS WAN Throughput Efficiency
Recovery	Ability of system to clear backlog for recover products	1	Recovery Processing
Scalability	Ability of system to incorporate new missions	3	CGS Scalability for JPSS-Managed Missions
Margin	Capacity for modest growth during operations	4	CGS Storage Capacity Margin
Transition	Timeliness of transitioning to alternate resources	4	Transition Time from Primary to Alternate Facility (MON)

Multi-Mission Support for Current and Future Systems

The Joint Polar Satellite System (JPSS) Common Ground System (CGS), developed and deployed by Raytheon Intelligence, Information and Services (IIS), manages and supports numerous missions, as shown in Figures 1 and 2. (JPSS-1 will launch in 2017). The CGS architecture is evolving over the next few years to increase operational robustness of Suomi NPP (S-NPP) for critical weather forecasting, leverage S-NPP lessons learned for latency and availability performance, and take advantage of newer, more reliable and efficient technologies for delivering key environmental data products to end users. To accomplish these goals, the CGS is being upgraded in Block 2.0 (late 2015) in the following key ways:

1. Performing a system-wide technology refresh for enhanced performance and security
2. Increasing robustness/extensibility of mission data transport
3. Standardizing data protocols for a wider variety of missions
4. Enhancing flexibility and modularity in data processing for new and evolving algorithms
5. Achieving comprehensive situational awareness
6. Deploying a full backup capability for Continuity of Operations
7. Providing an enclave in compliance with the latest security standards from the National Institute of Standards and Technology (NIST) 800-53

Technical Performance Measures (TPMs)

To ensure the CGS will meet all of its performance needs in Block 2.0, we have established nine categories of Technical Performance Measures (TPMs) to track through Block 2.0 System Acceptance Testing (SAT). These TPM categories are summarized in Table 1. On a quarterly basis, we generate updated reports of expected performance against each of these categories, including assessment of margin to support any associated risk management activities. Table 2 shows examples of this tracking and status.

Ensuring TPMs are Met in Block 2.0 Operations

To achieve the expected latency shown in Table 2, several enhancements are in the updated CGS architecture and concept of operations. First, JPSS-1 will downlink twice per orbit, once in each polar region, which will reduce data aging on the spacecraft by over 50 minutes. Second, as shown in Figures 1 and 2, the CGS provides two receiving stations in each polar region, to ensure continued low-latency performance in the event of a primary station failure. Third, the concept of operations shown in Figure 3 is applied:

1) Stored Mission Data (SMD) from the most recent half-orbit are transmitted first (Original Transmission #1, or OX #1)
2) SMD from the previous downlink are retransmitted to ensure data availability (R-Transmission, or RX)
3) SMD collected during OX #1 and RX are transmitted to improve latency in the critical polar regions.

Table 2. Example of CGS TPM Tracking (Data Latency)

TPM	Specification (95% of Data within x Minutes)	Current Best Estimate	Current Performance Margin	Maturity	TPM Confidence Index
JPSS-1 EDR Data Latency	80	63	22%	Medium	High

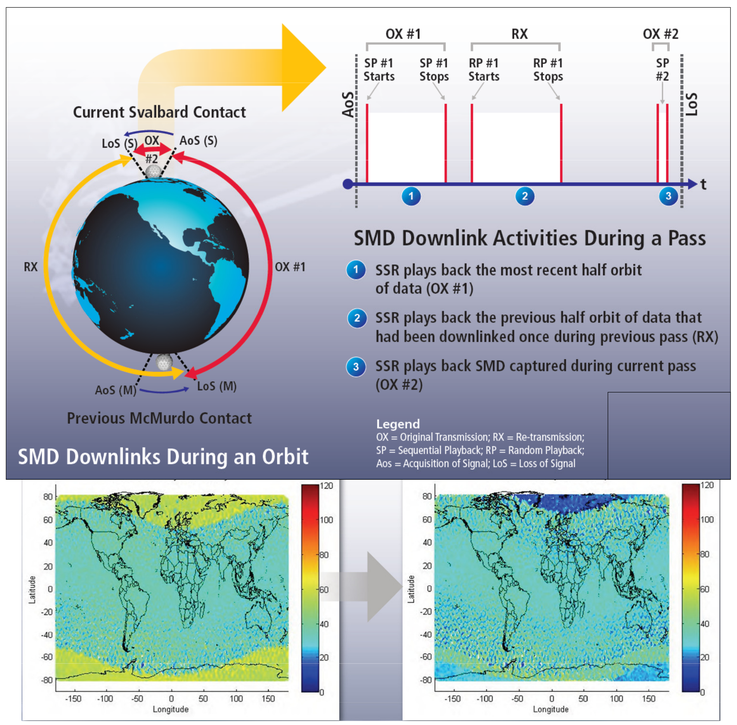

Figure 3. Block 2.0 ConOps Significantly Improves Latency.