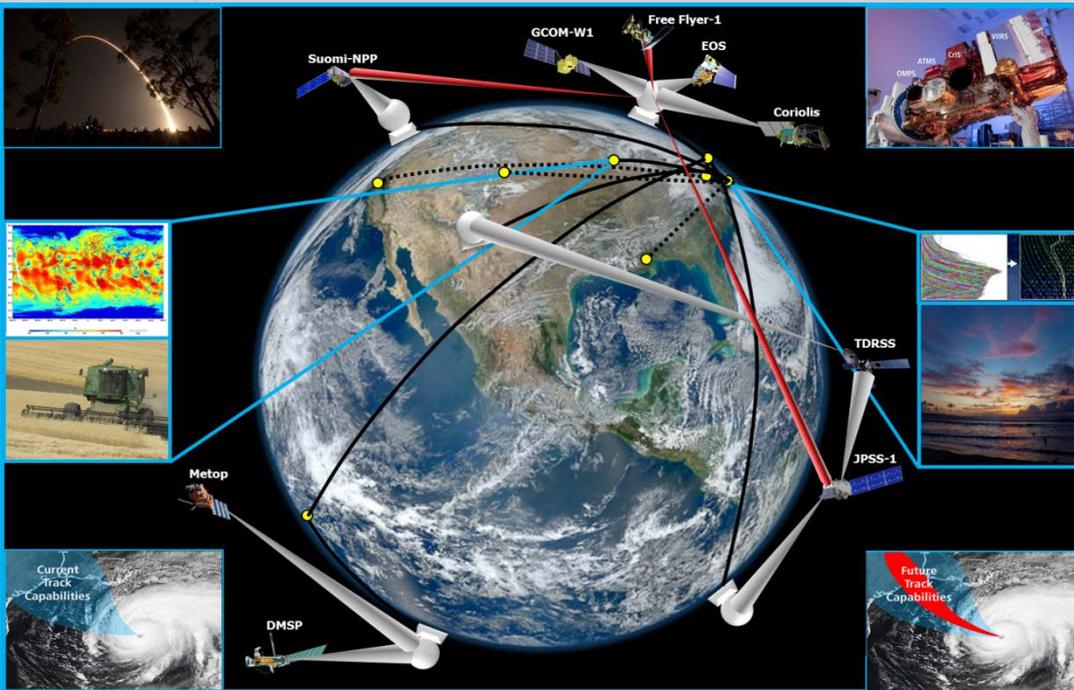


Joint Polar Satellite System (JPSS) Common Ground System (CGS) Architectural Overview and Tenets

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5 February 2014



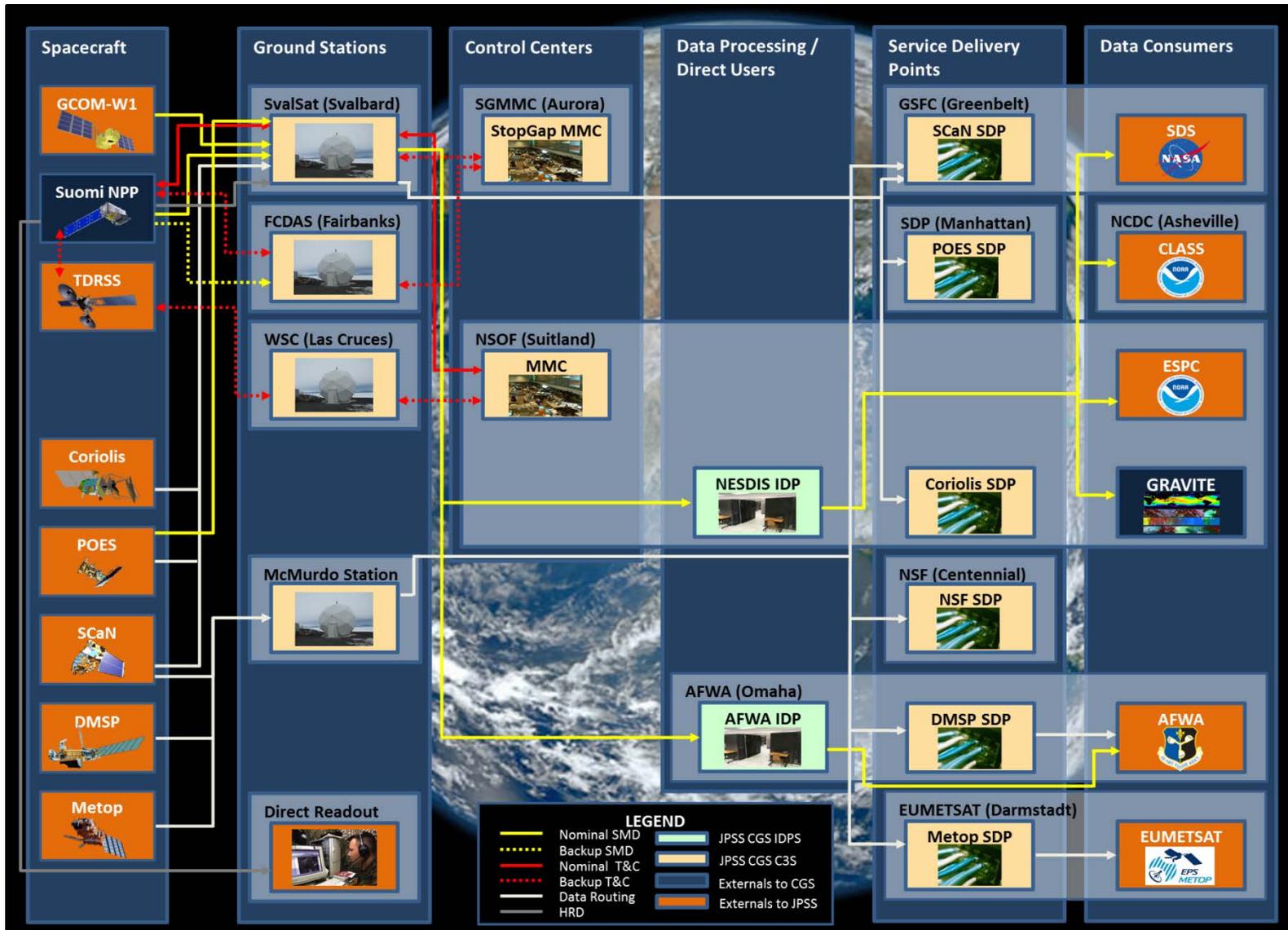
- Introduction
- CGS Block 1.2 (Today)
- CGS Multi-Mission Support, Today and Tomorrow
- Architectural Tenets for CGS Block 2.0
- CGS Block 2.0 (2015)
- Summary and Conclusion

- The Joint Polar Satellite System (JPSS) will contribute the afternoon orbit component and ground processing system to replace the current Polar-orbiting Operational Environmental Satellites (POES)
 - JPSS satellites will carry a suite of sensors designed to collect meteorological, oceanographic, climatological, and solar-geo-physical observations of the earth, atmosphere, and space
 - The ground processing system for JPSS, known as the Common Ground System (CGS), provides: command and control; data acquisition and routing; data processing, and product delivery
 - JPSS constellation consists of Suomi National Polar-orbiting Partnership (S-NPP), JPSS-1, JPSS-2, and Free Flyer 1

- The CGS currently flies S-NPP and acquires, routes and processes S-NPP mission data to provide Environmental Data Records (EDRs) to NOAA and DoD processing centers operated by the U.S. government, generating multiple terabytes per day across more than two dozen environmental data products



CGS Block 1.2.2 (Operational Today)





CGS Multi-Mission Support Today and Tomorrow

JPSS Service & Mission Info.		JPSS-Supported Missions Managed and operated by other agencies and supported by one or more JPSS services						JPSS-Managed Missions Managed and operated by the JPSS Program				
		NSF USAP	Coriolis/ Wind-Sat	POES	SCaN-supported Missions	DMSP	Metop	GCOM-W1	S-NPP	JPSS		Free Flyer
										J1	J2	FF1
Mission/Payload Type	Comm	MW	MW-IR-UV Vis-SEM	IR-Vis-O ₃ - UV-Chem	MW-IR-UV Vis-SEM	MW-IR- Vis-SEM	MW	MW-IR-UV Vis-O ₃ -ER	MW-IR-UV Vis-O ₃ -ER	MW-IR-UV Vis-O ₃ -ER	DCS-SAR-TSI	
Number of Payloads Supported	N/A	1	10	15	6	7	1	5	5	5	3	
Number of Supported Spacecraft	Now (13-15)	N/A	1	3 - 5	3	2	2	1	1	0	0	0
	Future (16)	N/A	1	0	4	2	3	2	1	1	1	1
Launch Date	N/A	Operational						2017	2021 (ready by 2019)	~+/- 6 mos of J1		
Support Date	N/A	Current						2015	2018	TBD		
Mission Planning	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	
Spacecraft Control	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	
Satellite Command & Telemetry	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	
Data Acquisition	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	
Data Routing	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Data Processing & Distribution	No	No	No	No	No	No	RDR-level	xDR-level	xDR-level	xDR-level	No	
Cal/Val	No	No	No	No	No	No	No	Yes	Yes	Yes	No	
Field Terminal Support	No	No	No	No	No	No	No	Yes (in Block 2.0)	Yes	Yes	No	

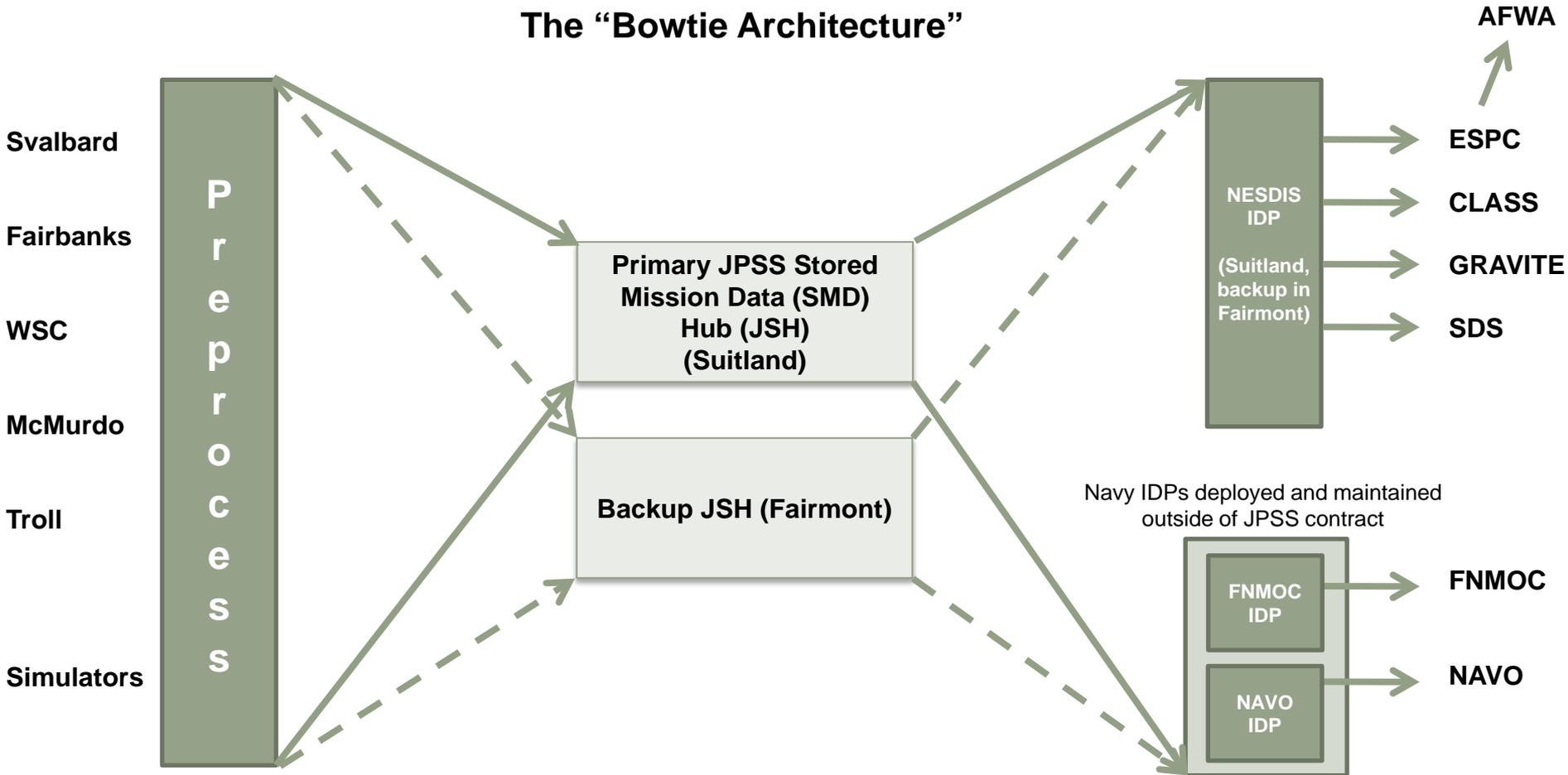
- **Key Objectives:**
 - Increasing operational robustness for S-NPP
 - Leveraging lessons learned to date in multi-mission support
 - Taking advantage of newer, more reliable and efficient technologies
 - Satisfying new requirements and budgetary constraints

- **Architectural Tenets to meet the Key Objectives:**
 - System-wide technology refresh for enhanced performance and security
 - New front end architecture for mission data acquisition and transport
 - Enhanced modularity and flexibility in the Interface Data Processing Segment (IDPS) for new and evolving algorithms
 - Comprehensive situational awareness
 - Full backup capability for Continuity of Operations (COOP)

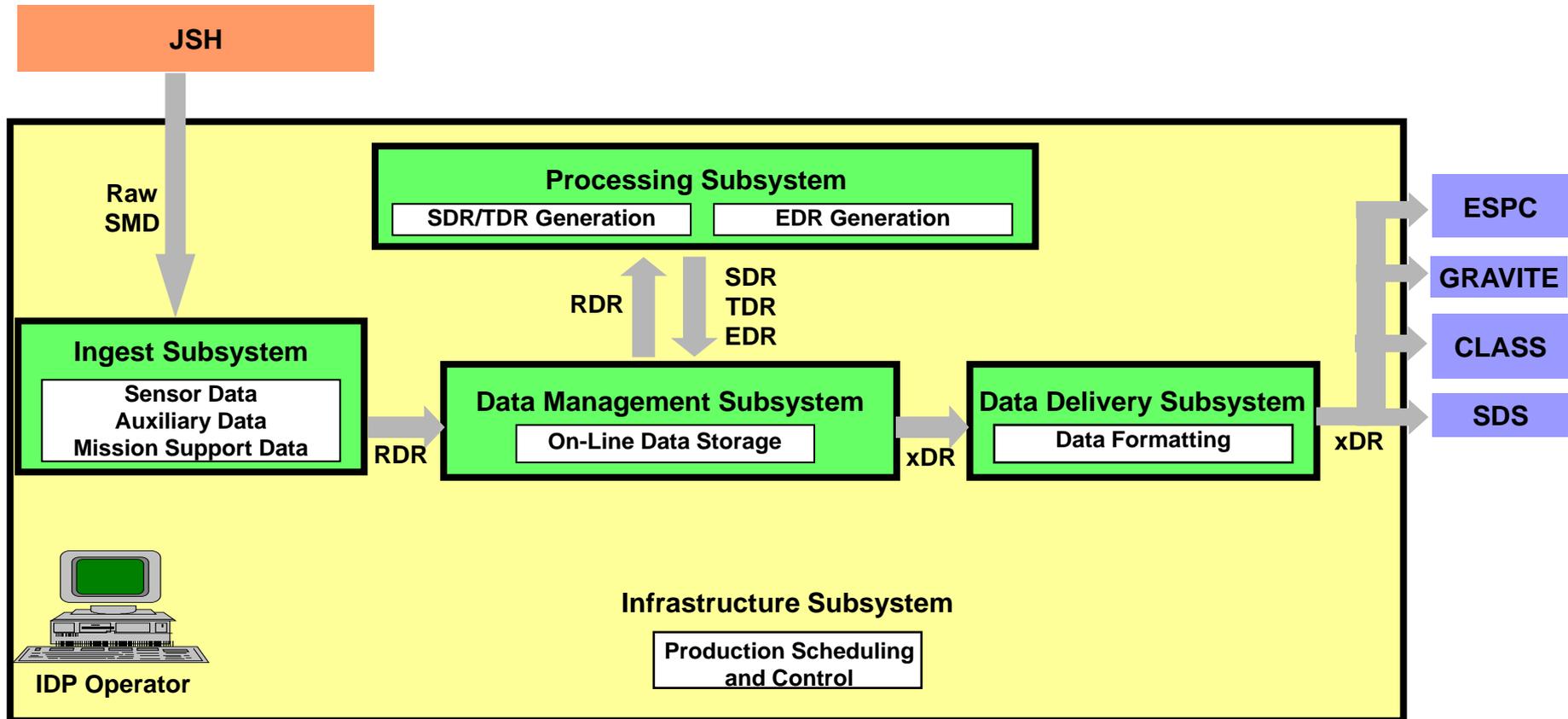
- Security requirements migrating from DoD 8500 to National Institute of Standards and Technology (NIST) 800-53
 - Requirements decomposition approach yields a small set of security solutions that can efficiently drive implementation across the CGS

- Technology refresh:
 - Blades and virtualization to provide greater operational flexibility
 - Operating system upgrades to increase security (including porting of IDPS to x86-based Linux)
 - Commercial Off The Shelf (COTS) hardware and software refreshes to enhance performance, supportability and maintainability
 - Expanded networking capacity to support larger data volumes to the consumers of the NESDIS Interface Data Processor (IDP)

The "Bowtie Architecture"



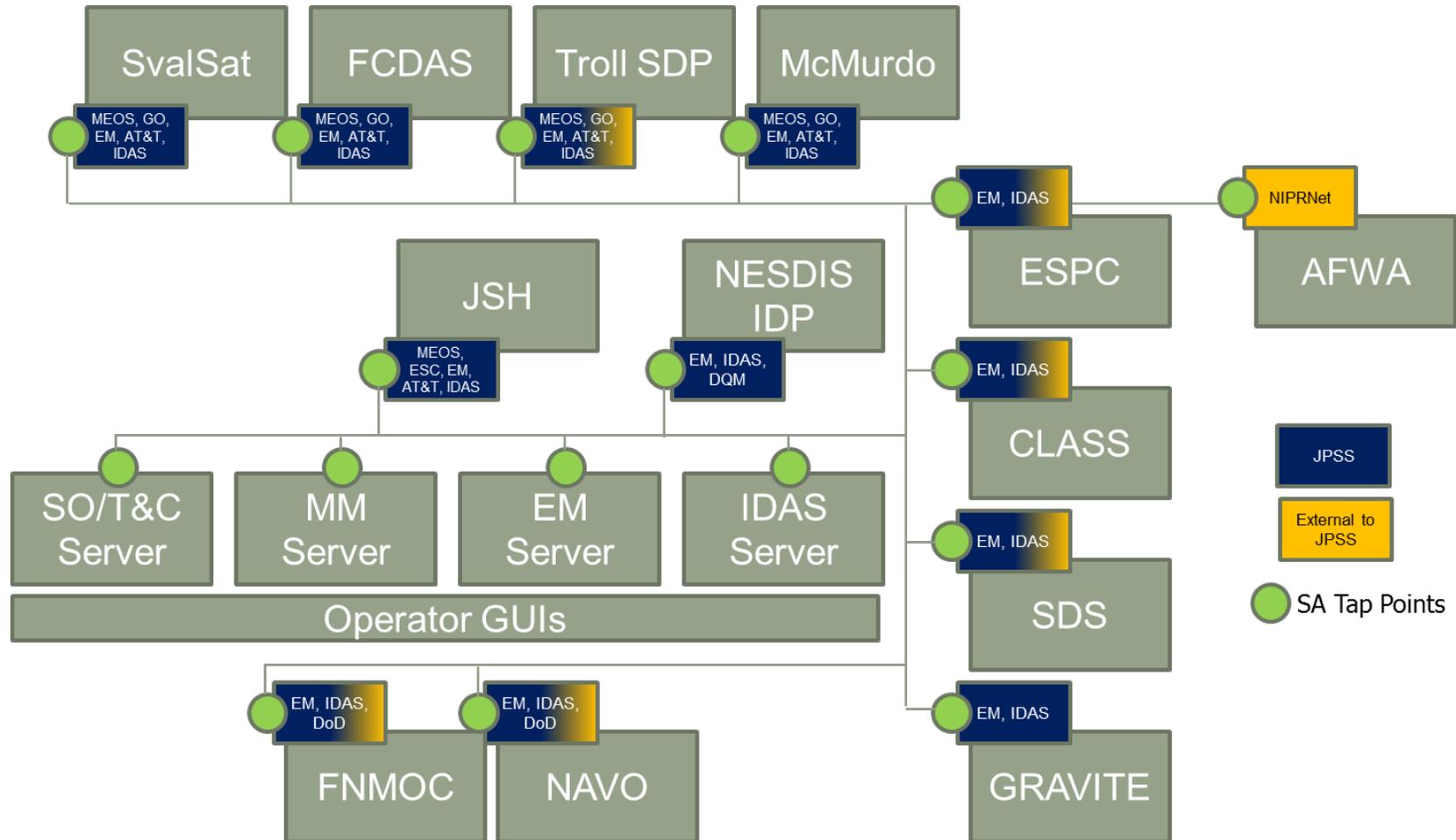
Raw data sent from ground stations to JSH via Space Link Extension (SLE), a standardized extension to CCSDS for ground communications, using TCP/IP



Objectives:

- Reduce potential for human error in configuring operational IDP
- Streamline configuration updates and reduce downtime for upgrades
- Speed the incorporation of new and modified algorithms

Situational Awareness (SA)

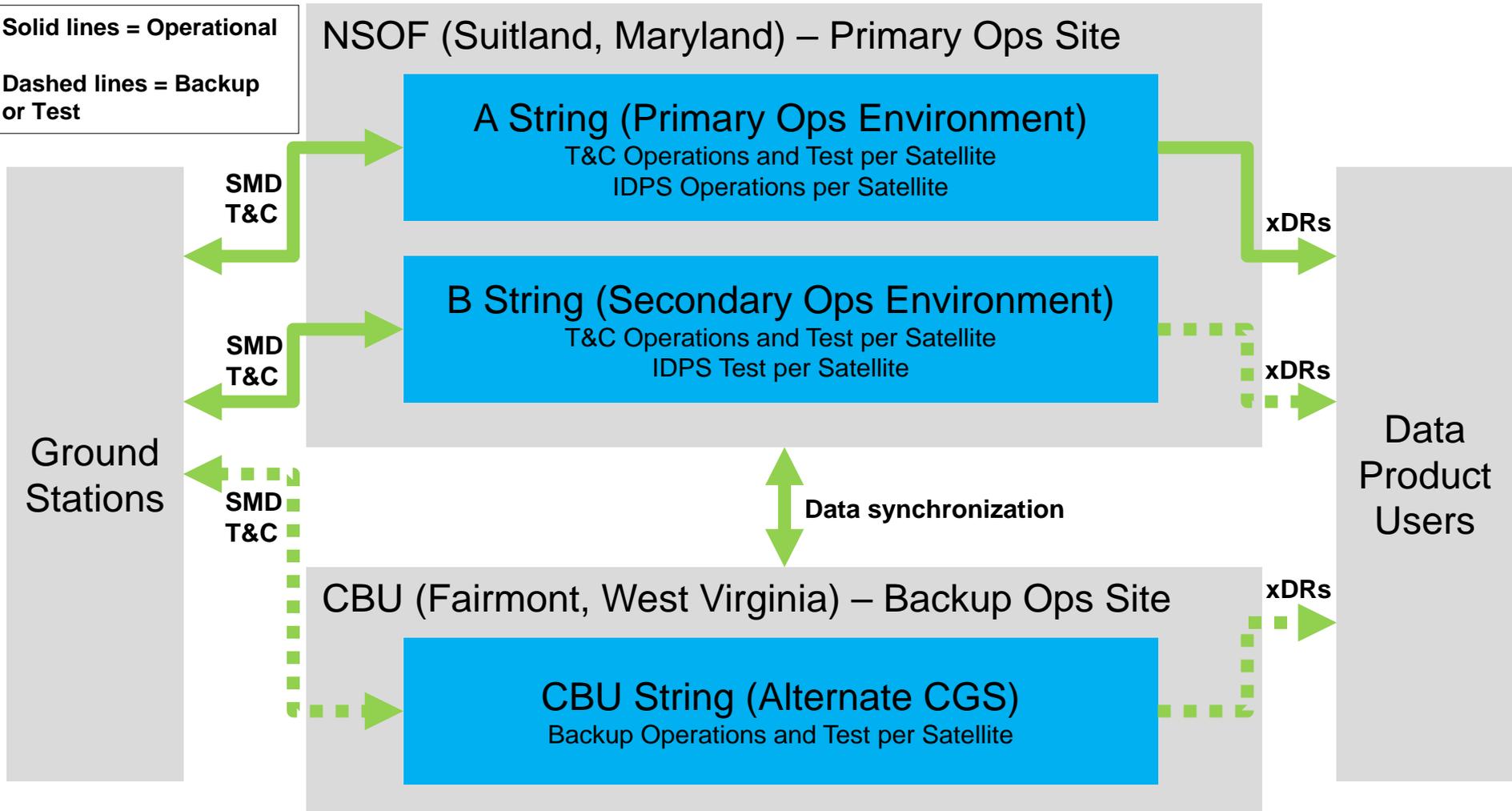


Objective: provide a comprehensive picture of data flow from observation to product delivery, enabling rapid anomaly resolution by the operators

Continuity of Operations

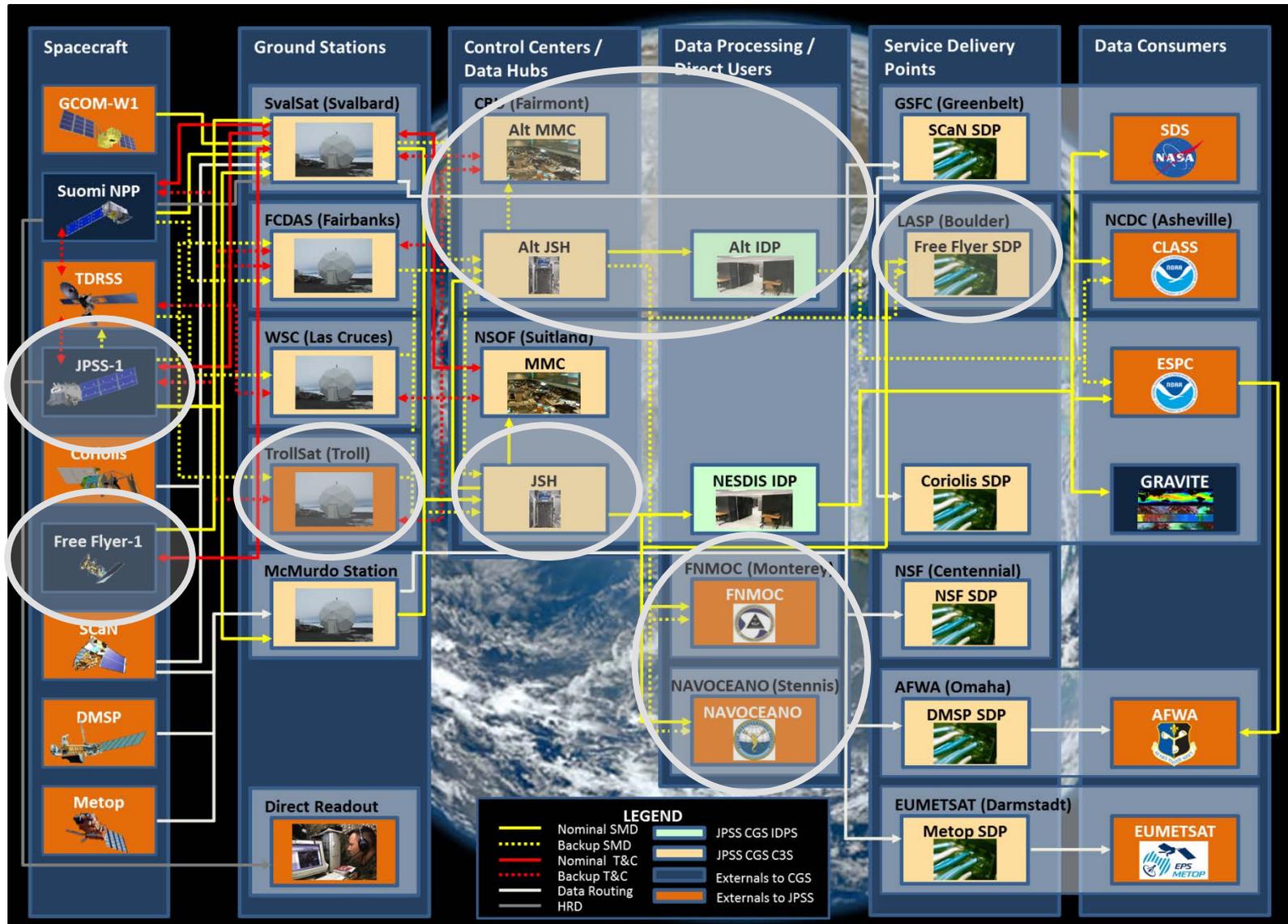
Solid lines = Operational

Dashed lines = Backup
or Test



**Planned Transitions between A&B within 5 minutes of initiation.
Planned or Unplanned Transitions between sites within 12 hours.**

CGS Block 2.0 (Operational in 2015)



CGS Changes
Highlighted

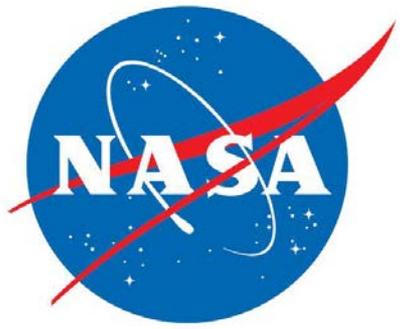
Summary and Conclusion

- First 2 years of S-NPP Operations have been a success
 - Risk reduction for JPSS, but also generating products for operational weather forecasting today
 - Lessons learned that have flowed into our Block 2.0 architecture for the CGS

- We have developed architectural tenets to guide the multi-mission upgrades to the CGS in several key areas
 - Security, technology refresh, front end communications architecture, IDPS modularity/flexibility, situational awareness, COOP

- The Block 2.0 CGS will provide enhanced multi-mission support to JPSS and its national and international partners

- AFWA (Air Force Weather Agency)
- AT&T (American Telephone and Telegraph)
- CBU (Consolidated Back-Up)
- C3S (Command Control and Communications Segment)
- CGS (Common Ground System)
- CLASS (Comprehensive Large Array Stewardship System)
- COOP (Continuity Of Operations)
- COTS (Commercial Off The Shelf)
- DCS (Data Collection System)
- DMSP (Defense Meteorological Satellite Platform)
- DoD (Department of Defense)
- EDR (Environmental Data Record)
- EM (Enterprise Management)
- ESPC (Environmental Satellite Processing Center)
- EUMETSAT (European Organisation for the Exploitation of Meteorological Satellites)
- FCDAS (Fairbanks Command & Data Acquisition Station)
- FNMOC (Fleet Numerical Meteorological and Oceanographic Center)
- GCOM (Global Change Observation Mission)
- GO (Ground Operations)
- GRAVITE (Government Resource for Algorithm Verification, Independent Test, and Evaluation)
- GSFC (Goddard Space Flight Center)
- HRD (High Rate Data)
- IDAS (Integrated Data Accountability System)
- IDP (Interface Data Processor)
- IDPS (Interface Data Processing Segment)
- IR (Infrared)
- JPSS (Joint Polar Satellite System)
- JSH (JPSS SMD Hub)
- MEOS (Multi-mission Earth Observation System, Kongsberg SpaceTec)
- MetOp (Meteorological Operational Satellite)
- MMC (Mission Management Center)
- MW (Microwave)
- NASA (National Aeronautics & Space Administration)
- NAVO or NAVOCEANO (Naval Oceanographic Center)
- NCDC (National Climatic Data Center)
- NESDIS (National Environmental Satellite Data & Information Service)
- NIST (National Institute of Standards and Technology)
- NIPRNet (Non-classified Internet Protocol (IP) Router Network)
- NOAA (National Oceanic and Atmospheric Administration)
- NSF (National Science Foundation)
- NSOF (National Satellite Operations Facility)
- POES (Polar-orbiting Operational Environmental Satellite)
- RDR (Raw Data Record)
- S-NPP (Suomi National Polar-orbiting Partnership)
- SA (Situational Awareness)
- SAR (Search and Rescue)
- SCaN (Space Communications and Navigation)
- SDP (Service Delivery Point)
- SDR (Sensor Data Record)
- SDS (Science Data Segment)
- SEM (Space Environment Monitor)
- SLE (Space Link Extension)
- SMD (Stored Mission Data)
- SO/T&C (Satellite Operations/Telemetry and Command)
- T&C (Telemetry and Command)
- TDR (Temperature Data Record)
- TDRSS (Tracking & Data Relay Satellite System)
- TSI (Total Solar Irradiance)
- USAP (United States Antarctic Program)
- UV (Ultraviolet)
- WSC (White Sands Complex)
- xDR (RDR/SDR/TDR/EDR)



Raytheon



JPSS



CGS