JOINT POLAR SATELLITE SYSTEM (JPSS) COMMON GROUND SYSTEM (CGS) USE OF SPACE LINK EXTENSION (SLE) PROTOCOL

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NOAA and NASA are jointly acquiring the next-generation civilian operational weather and environmental satellite system: the Joint Polar Satellite System (JPSS). JPSS will contribute the afternoon orbit component and ground processing system to replace the current Polar-orbiting Operational Environmental Satellites (POES) managed by NOAA and the ground processing component of the POES. The JPSS satellites will carry a suite of sensors designed to collect meteorological, oceanographic, climatological, and solar-physical observations of the Earth, atmosphere, and space. The ground processing system for JPSS, known as the Common Ground System (CGS), provides command, control, communications, data processing and product delivery. The CGS currently flies the Suomi National Polar Partnership (S-NPP) satellite and acquires, routes and processes S-NPP mission data to provide Environmental Data Records (EDR) 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. New Space Link Extension (SLE) capable ground hardware will provide a standardized and reliable data delivery interface. Implementation of CCSDS Standardized Space Link Extension (SLE) data delivery protocol for JPSS Storred Mission Data and Low Rate Telemetry provides benefits such as a new interface using TCP/IP guaranteed delivery, an increased access to simulation capabilities, increased system availability and a reduced overall footprint.

**JPSS CGS Space-Link Prototype Conceptual architecture**

- **Communications Node (SNC)**
  - **To facilitate SLE risk reduction and prototyping**: Multiple SLE prototypes can be utilized.
  - **Protocols**
    - SLE: two SLE and GOMS protocols.
  - **Results**
    - No data dropped on ILE.

**SMD and TLM Prototyping**

- JPSS CGS supports mission data through Managed Missions, Aquisition, Data Routing, Data Processing and is designed to be scalable for future mission growth.
- JPSS CGS acquires mission data from five ground stations hosted and operated by JPSS CGS and mission partners.
- For missions where ground processing is performed, the JPSS CGS Ground Station Environment implements CCSDS AOS Space Link Extension (SLE) protocols within the SMD Ground Station (SGS).
- JPSS CGS network provides the scalable high rate data paths through the JPSS CGS World for transforming SMD to the Management and Operation Data and data processing entities; implements WiN acceleration to maximize throughput efficiency.
- Additional SMD from SGE via SLE, allows EAPs and sends to EAP, PIMOC, and NAVQ for data product generation; additionally provides EAPs to CDA, SLA, and PSTC for approval and instrument analysis.

**SMD Downlink**

- **SLE data delivery prototyping via Support Order**
- **Rationale**
  - Need to define SLE and SMD HW.
  - Need to define and verify upon delivery of the SLE HW.
- **Design**
  - **SLE HW**
    - External Antennas
  - **System Architecture**
    - Developed prototyping software (CDA, TOC) and ready for delivery.
  - **Space Link Prototyping**
    - New SLE interface utilizes TCP/IP guaranteed delivery.
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**JPSS CGS Global Ground Station Architecture**

- **Mission** S (T&C) X (SMD) Ka (SMD)
- **Space Link Prototyping**
  - **Two-Service Services**
    - Results: Successful Block 2.0 Prototyping Activities
  - **Performance**
    - TCP/IP compliant COTS with minimal to no NRE required from the COTS supplier.
  - **Improved System Availability**
    - Backup Telemetry and Command Hub.

**Simplified Data Flow**

- **Implementation of CCSDS Standardized Space Link Extension (SLE) data delivery protocol for Storred Mission Data and Low Rate Telemetry**
  - New SLE interface utilizes TCP/IP guaranteed delivery.
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  - Centralized SMD distribution and guaranteed delivery.
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  - Centralized SMD distribution and guaranteed delivery.
  - Simplified GCOM SMD data acquisition.
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**Major C3S Changes for JPSS CGS Block 2.0**

- **System Evolution**
  - **Description**
    - JPSS CGS Block 2.0: Additional SLE and TLM connections.
  - **Advantage over Block 1.2**
    - Increased capability.
    - Reduced overall footprint.

**JPSS CGS Worldwide Communications Lines**

- **Fast Data Delivery Using Existing Commercial Communications Networks**
  - **Successful Block 2.0 Prototyping Activities**
    - **Rationale**
      - Increased access to simulation capabilities.
  - **Reliable SLE Data Transfer System Redesign Right on!**

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