IAF SPACE OPERATIONS SYMPOSIUM (B6)
Interactive Presentations - IAF SPACE OPERATIONS SYMPOSIUM (IP)

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MASTER ACTIVITY PLANNING FOR LANDSAT 8 AND 9

Abstract

Mission Planning and Scheduling (MPS) for imagery satellites requires the coordination of many complex systems; imagery collection planning is coupled with the contact scheduling problem and other onboard mission needs. Orbit Logic built on its STK Scheduler and Collection Planning and Analysis Workstation (CPAW) products to develop MPS software for the Landsat Multi-Satellite Operations Center (LMOC) to support the Landsat 8 and 9 missions. The software schedules satellite activities – imagery collection, contact scheduling, calibration, housekeeping, and associated slews – incorporating any externally scheduled events – such as orbit keeping maneuvers – to generate a Master Activity List (MAL) which the command system interprets and uses to command the spacecraft. In addition, the software generates an Image Data Schedule Report (IDSR) containing the status of all tasks and provides reasons for why they were or were not collected. IDSR generation leverages post-processing to explain task infeasibility to human operators, enabling them to interact with the system more effectively.

STK Scheduler generates a deconflicted schedule for satellite communications between the Landsat satellites, U.S. and international ground stations, and Tracking Data Relay Satellite System (TDRSS) satellite communication nodes. Since communications scheduling is subject to approval by other entities, the MPS software includes a feedback loop to incorporate contact request approval/denial/revision from other network entities into a rolling schedule that includes confirmed and forecasted contacts.

CPAW generates validated, deconflicted, and optimized plans for imagery collection, calibration, housekeeping, and all associated maneuvers. The system ingests task orders from USGS and LMOC in the form of Long-Term Acquisition Plan Collection Requests (LCRs), Special Collection Requests (SCRs), and Calibration Collection Requests (CalCRs). CPAW creates plans to support these collections request with both instruments onboard Landsat 8 and 9 – the Operational Land Imager (OLI) and the Thermal Infrared Sensor (TIRS) – including any slewing needed to support task execution, solid state recorder management (e.g., capacity, record rates, and data downlink rate), energy management, mission-specific considerations, and other activities to support the tasking. In addition, CPAW plans routine calibration tasks, dynamic recalibration tasks, housekeeping tasks, and other activities to maintain the general health and welfare of the satellite.

Although tailored for Landsat, this MPS software suite is composed of COTS products that are applied to other imaging satellites or imaging satellite constellations. Orbit Logic's software is configurable to other satellites, can handle planning for constellations, and can perform contact scheduling for any constellation or communication network.