IAF EARTH OBSERVATION SYMPOSIUM (B1)
Earth Observation Data Systems and Technology (4)

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BIG DATA CLOUD COMPUTING FOR THE SURFACE WATER AND OCEAN TOPOGRAPHY PROJECT

Abstract

A new satellite mission for oceanography and hydrology science called Surface Water and Ocean Topography (SWOT) was developed jointly by the U.S. National Aeronautics and Space Administration and France's Centre National d'Etudes Spatiales (CNES) and launched on December 16, 2022. Using state-of-the-art "radar interferometry" technology to measure the elevation of water, SWOT will observe major lakes, rivers and wetlands while detecting ocean features with unprecedented resolution. SWOT data will provide critical information that is needed to assess water resources on land, track regional sea level changes, monitor coastal processes, and observe small-scale ocean currents and eddies.

The SWOT Science Data System (SDS) is the first operational flight project Big Data System with significant data volumes (7.3 Tbits per day, production volume 21 TBytes per day) and orchestration of concurrent jobs. 'Scalable' production capacity is developed on Amazon Web Services (AWS) commercial cloud utilizing up to 1300 'undedicated' Amazon Elastic Compute Cloud (EC2) instances scaling up to 55,000 jobs per day.

SWOT is a Global Hybrid Science Data System Architecture with shared responsibility with the international partner, CNES. The SDS team designed, developed, and tested twenty-five (25) science product executables and delivered these along with the control execution rules to CNES for its seamless integration into their on-premises system.

SWOT is the first in a series of Earth Missions to benefit from a multi-mission science data system architecture design approach that yields a consistent approach for NASA-ISRO SAR Mission (NISAR) and Observational Products for End-Users from Remote Sensing Analysis (OPERA) data systems. The team is forward looking into the next decade that adds to the multi-mission science data system family Surface Biology Geology (SBG) and other Information System projects. The team maintains a consistent processing architecture, adaptable system, and robust operations for future evolutions as well as continue to respond to emerging information technology security requirements.

We will present our pre-launch challenges and experiences in developing and testing the SWOT cloud-based science data processing system that support large-scale processing. We will share post-launch operations experiences, approaches to get the best performance out of the cloud computing, issues dealing with large-scale computing.