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IAF SPACE OPERATIONS SYMPOSIUM (B6)
Innovative Space Operations Concepts and Advanced Systems (2)

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DATAX: A STATE OF THE ART DATA STRATEGY FOR MISSION OPERATIONS

Abstract

The European Space Operations Centre (ESOC) operates numerous heterogeneous missions, collecting, storing and distributing data on a daily basis. This is achieved through a set of siloed data processing systems, each processing and storing internal data. The current decentralised architecture employed, while efficient for complex operations and reliable data delivery, presents several challenges for data users such as scientists, engineers, and Artificial Intelligence (AI) systems, who need to access, analyze, and interpret the vast amounts of structured and unstructured data in the Centre. Issues commonly encountered are related to integrating data from various sources, suboptimal access control and difficulties in scaling on-premises systems. This decentralized nature of the data architecture and governance complicates advanced analytics including AI applications, as traditional systems are not equipped to handle the volume, velocity, and variety of data produced in modern space operations.
ESOC's goal is to improve the scalability of advanced analytics applications by adopting best practices on the assetization of data and analytics products, treating them as valuable assets that can be reused, thereby increasing their value within the organization and democratising access.

In order to identify the most effective design of the common data layer at ESOC, a systematic analysis of the data and system landscape has taken place, multiple approaches and architectures investigated, including various data platform architecture archetypes and cloud-native capabilities. During the investigation, three key aspects have become the focus. Firstly, to demonstrate the value and utility of the common data layer, a diverse set of representatives and data users were interviewed about their use cases. These use cases covered various domains and applications, such as system monitoring and reporting. Secondly, the architecture of the common data layer was designed to support a wide range of data types and formats, from structured data in databases to unstructured data in files and streams. The tooling includes data ingestion tools to collect and import data, data processing tools to clean and transform data, data storage tools to store as well and data analytics tools to analyze. Lastly, data governance approaches were outlined to ensure the quality, consistency, and security of data.
This paper will present the afore mentioned process and conclusions to date, in order to address the unique needs of a mission operations Centre, and future steps on further refining the architecture and expanding its capabilities to support the evolving data needs.