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DEVELOPING AN INTELLIGENT ASSISTANT FOR MISSION OPERATIONS: DRIVERS, USE CASES AND DESIGN

Abstract

This contribution presents an ongoing activity to design, develop and deploy an Intelligent Assistant (IA) for mission operations at the European Space Operations Centre (ESOC). The IA will support the operations personnel in their day-to-day activities and improve how they interface with the multiple operational and non-operational systems.

The ESOC in Darmstadt, Germany, is ESA's mission operations centre. On their day-to-day work, the teams at ESOC need to interact with a heterogeneous set of systems and data sources to conduct activities such as monitoring and control, telemetry analysis to detect novelties/anomalies, planning of mission activities, reporting and tracking of anomalies, review of mission documents, compilation and distribution of operational reports, among others.

The IA for mission operations will provide intelligent and helpful services to the user, beyond fetching information, using predefined and acquired/inferred knowledge and reasoning capabilities. In the context of mission operations at ESOC, the IA should be able to help the operations teams in performing the following four types of tasks:

1. *Data, information and knowledge management*, where the IA supports the user in storing, managing, retrieving and making sense of data, information and knowledge;
2. *Analysis and decision support*, where the IA helps the user conduct analysis of the data/information and take decisions;
3. *Health and performance monitoring*, where the IA supports the user in monitoring the health and performance of the systems;

4. *Automation and control*, where the IA supports the user in automating repetitive tasks and controlling the systems.

This paper starts by reviewing mission operations at ESOC, existing systems and workflows. It then analyses some of the key drivers behind the decision to develop an Intelligent Assistant for mission operations and introduces the main use cases that influence the design and validation activities. Next, it presents the concept of operations, system design choices and architecture, detailing its use of Natural Language Processing (NLP) and Knowledge Graph (KG) technologies. Finally, the paper discusses some preliminary results and lessons learnt.