IAF SPACE SYSTEMS SYMPOSIUM (D1)
Space Systems Architectures (2)

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BUILDING BLOCK-BASED EARTH OBSERVATION GROUND SEGMENT ARCHITECTURE: A FLEXIBLE AND SCALABLE APPROACH TO DESIGNING AND BUILDING GROUND SYSTEMS

Abstract

The paper presents the results of the DOMINO-X project on standardized Earth Observation ground segment architectures and interfaces. Eleven industrial partners led by Airbus have invested massively in the project with additional public funding support.

By standardizing ground segment architectures and interfaces, industrials, customers and space agencies can improve ground segment costs, reduce the delivery schedules, answer variability between missions, ensure evolutivity and enable delivery of building blocks by the most innovative and competitive providers. The building-block, called domino, is standalone, self-monitored, produces KPIs on the delivered service, may serve more than one mission and may rely on its own infrastructure. The system is then customized

by inter-connecting existing and/or new dominoes according to the system's specificities. The domino based architecture answers a wide array of current and future use cases involving multi-mission federation, Ground Station as a service for reactivity, event based satellite acquisition programming, AI on images, datacubes, digitalized RF and modems, data integrity.

This paper describes the domino based ground segment architecture initiated by the DOMINO-X project. Engineering teams from the Consortium have gone through a methodical engineering process, identifying end-to-end use cases, deriving the functional architecture, allocating the functions into 22 meaningful autonomous dominoes and then defining logical interfaces of dominoes taken one by one. In order to ensure low coupling between dominoes, an approach inspired by the European Copernicus Payload Data Ground Segment has been adopted, and extrapolated to the entire ground segment. Typically, so-called pick-up points are adopted. The Consortium defined interface guidelines and defined interface protocols as well as the payload. It is the unhidden objective of the paper to get the word out on this interface standardization initiative and get system integrators, component and technology providers, agencies and institutions on-board. Key to the future success of this initiative is the involvement of the largest number of players in the domain. In order to help adoption, wherever already available and in line with general functional and performance considerations, existing standards are adopted, such as those from OGC and CCSDS. When such an adoption was not possible, the Consortium defined new interfaces. It is typically the case for the Federation Services domino which optimizes the reactivity of a heterogeneous system. The results of the architecture activities are made available publicly in an engineering model via a free modeling tool.