IAF SPACE SYSTEMS SYMPOSIUM (D1)
Innovative Systems toward Future Architectures (1)

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IN-ORBIT SPACE LAB: THE ITALIAN MULTI-MISSION SPACE LABORATORY FOR THE DEVELOPMENT OF APPLICATIONS, SERVICES, AND NEW SATELLITE DATA ALGORITHMS DIRECTLY IN ORBIT AND ON-DEMAND

Abstract

In several vertical industries where EO data are used today (e.g., agriculture, resource management, etc.), users are focused on their core application, less interested in the data itself and more in the tools that can make their business more efficient and effective. In some contexts (e.g., fire detection) the right information needs to be provided to end users/customers at the right time and in the right place. The former can be in some cases the space segment, where the availability of usable information is a tipping point. Moreover, part of the EO value chain is shifted from the ground segment to the space segment, to transform sensed data into "intelligence" in a timely manner, to exploit it directly or to enable the optimized exploitation of limited on-board resources (in fire detection this means the downlink of the alert alone with its geographic location, a few dozen bytes instead of GB of raw data). This is the path to transform Earth Observation into "Earth Intelligence.". However, such a transition still has inefficiencies that can reduce mission effectiveness and increase operational costs, and most importantly lengthen development time along the entire value chain, from the implementation of new sensors, to the testing of innovative algorithms on orbit. In this rapidly changing scenario, training and incubation processes need

to be adapted to the new reality, breaking down barriers and mitigating mortality risks for new ventures. This is why the Italian Space Agency is promoting, evolving the activities carried out to date by Planetek Italia, D-Orbit and AIKO under ESA's Incubed program (called AI-EXPRESS - AIX), the development of an augmented hybrid infrastructure, named as Enhanced AIX, consisting of a Space and Ground Segment, ensuring mission capabilities such as in orbit processing, edge computing, AI, IOD/IOV activities under a new approach that stimulates and speeds up access to space. Thus, such an "In-Orbit Space Lab" is an on-orbit laboratory, based on the availability of tools, applications, services and resources, also distributed on different orbiting platforms, oriented to satellite edge data processing in "edge computing" paradigm, also in "as a service" mode. Then a long-term objective of the lab is to stimulate the creation of multi-purpose systems that can be reconfigured during their life-cycle and can benefit from on-board direct processing, generating real-time information immediately expendable downstream. The activity is funded by the complementary fund (national investment) to the NextGenerationEU program.