

IAF EARTH OBSERVATION SYMPOSIUM (B1)  
Earth Observation Data System Development and Management (4)

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“DON’T TRY THIS AT HOME” PILOT FOR A COGNITIVE CLOUD COMPUTING IN SPACE  
INFRASTRUCTURE**Abstract**

In ESA vision “Cognitive Cloud Computing in Space (3CS)” is the future edge and cloud computing infrastructure in space for the next generation of AI-powered space missions (<https://ideas.esa.int/servlet/hype/IMT?document=72822>). “Don’t try this at home” (named after one of the AI ships from I.Banks Culture series) is a concept demonstrating the capabilities of such a 3CS architecture, integrating IOT and EO and providing comprehensive and scalable commercial services to final users that span any EO sensor platform. 3CS enables the efficient fusion of information at a variety of wavelengths, resolutions, and times, and can provide timely, precise information that optimizes EO downlinking, storage, processing, and memory. It traces needs and constraints, designs the infrastructure and the common data gateway (for satellites or any sources), a processing facility and an autonomous workflow manager able to use each of the 3CS capabilities, where and when it is most appropriate in order to fit application needs. A 3CS-enhanced workflow brings advantages in terms of lowering latency, enhancing accuracy, improving coverage and responsiveness and in-short making sustainable something was not “Don’t try this at home” moreover implements a real use case application as a pilot helping to drive the trade-offs and defining the system architecture: a monitoring and alerting service for real-time detection of anomalous floating objects on ships commercial routes, based on the heterogeneous EO, IOT and meteo data fusion. Furthermore, 3CS also enables autonomous reaction to events, as for instance in a tip and cue acquisition workflow driven by the detected alerts. Several entities take part to the initiative: ICEYE for EO, SPIRE for IOT, Stellar Project for laser communications, D-Orbit for the satellite constellation, AIKO for the onboard autonomy and Planetek for the SW framework, the security and communications infrastructure itself. The pilot application defines measurable key performance indicators on the designed system infrastructure so to provide a quantitative measurement of the advantages such an infrastructure brings to the application scenario. The definition of the pilot concept 3CS aims at the improvement of the application workflow in terms of: • Information latency, • Information accuracy, • Geographical coverage, • System responsiveness to information, • Workflow sustainability.