



PROJECT COORDINATOR:

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CONSORTIUM



One of the leading partners for development, production and launch of space systems, including integrated services for specific customer applications, e.g., the operation of infrastructures, provision of software solutions, image processing/AI based solutions, IT security, cryptography, development of earth observation services for climate, environment and ecology.



Expertise on system design and architectures, data platform development, context sensitive solution, collaborative environments, context-sensitive and knowledge-based systems, data-based service design including consent aspects.



Leading Belgian Space company active in the field of Space based RF applications. AWS core business is in the delivery of satellite communication-, navigation- and radar solutions as well as instruments for scientific and exploration missions.



Research in remote sensing information extraction, processing chain design for change detection, artificial intelligence.



Research in high frequency physics and radar technology, real-time and on-board SAR processing (algorithms and hardware), development and application of advanced imaging sensor systems.



R&D in UAV-based autonomous obstacle detection in railways: Field Evaluation and demonstration of technology in real-world operational railway environment.

Instantaneous Infrastructure Monitoring by Earth Observation



Started in December 2022

The project contributes to an **end-to-end solution** for the **operational real-time, high-resolution monitoring of critical infrastructure** by means of an **innovative observation payload for a future Low Earth Orbit (LEO) constellation**.

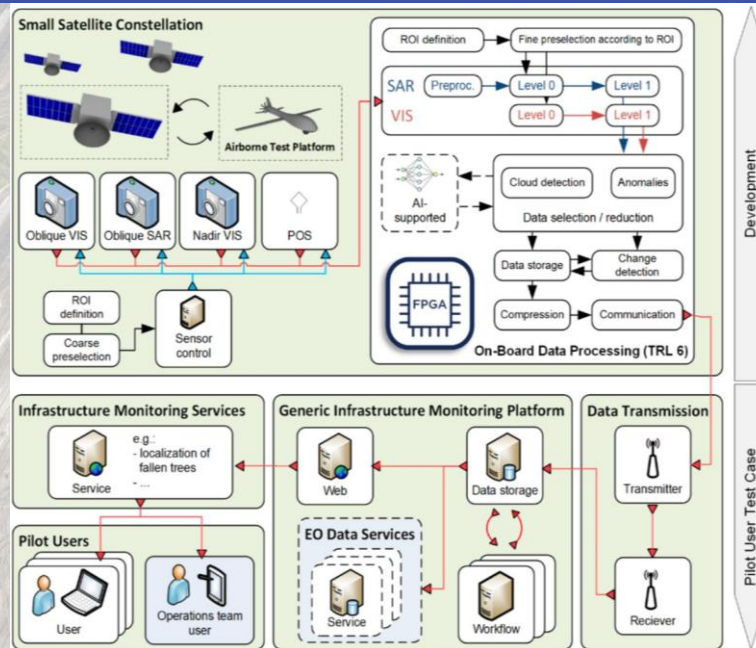


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OVERVIEW

IIMEO is a project that aims to create a new satellite-based Earth Observation (EO) system with advanced capabilities for real-time monitoring of infrastructure. The project focuses on two main areas: developing a powerful processing unit that will be installed onboard the satellite, and creating a unique sensor configuration. The ultimate goal of IIMEO is to demonstrate the technological advancements of this system and its ability to provide instant and accurate monitoring of infrastructure in near real-time.



This figure summarizes the IIMEO system concept. For demonstration and testing purposes, a pilot infrastructure monitoring service will be implemented and made available to a pilot user.

OBJECTIVES

- To work towards *improving the safety and reliability* with EO satellites for critical European infrastructure;
- To *build a system* which demonstrates that special infrastructure monitoring by earth observation actually works by *providing a real user with real railway monitoring data* from a satellite platform (i.e., plane);
- To *keep track of process* to ease similar, future projects;
- To *develop a plan to deploy IIMEO on an actual LEO constellation*.

IIMEO is open for any use case involving critical infrastructure, for instance pipelines, high voltage power lines etc.



POTENTIAL PILOT USER

SRI JSC (Serbian Railway Infrastructure and its main interests:



- In order to prevent derailments and collisions between trains and obstacles on or adjacent to the railway tracks, *rail operations should be made even safer* in a way of reducing the number of collisions. *Effective monitoring* is the basic requirement for developing a proactive infrastructure maintenance.
- *Risks from the environment* (natural disasters, unauthorized access to infrastructure, etc.) have become the dominant risks in railway traffic in recent years, and due to climate and social changes, this trend is expected to continue.

MAIN TECHNOLOGIES

For the IIMEO project, **SAR and VIS sensors** serve as the primary data sources. SAR sensors are capable of providing high-resolution data regardless of weather or time of day. The oblique VIS sensor is aligned with the SAR sensor with the intention to provide service users with more accessible data of sites of interest.



SAR Railway Infrastructure

Furthermore, technological innovation focuses on *the payload* that is intended for future deployment on **LEO constellation satellites**. EO missions in LEO utilize lower-cost small satellites and are capable of providing high-resolution data, but in turn require numerous units for global coverage. To avoid data transfer bottlenecks associated with data volume, a promising approach is to perform *crucial processing operations on-board*. This is referred to as *edge computing* (contrasting cloud computing, where data is transferred away from the source to some platform prior to processing).

For further processing and the *change detection* (model based as well as Deep Learning/AI based) as well as *anomaly detection* will be estimated within this project. We will *adapt or choose candidate algorithms* for the on-board processor to be in line with the planned time of the fast availability of one hour.