This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101004152

19-20 November 2020

Workshop on Big Data and Artificial Intelligence for Earth Observation

CALLISTO - "Copernicus Artificial Intelligence (AI) Services and data fusion with other distributed data sources and processing at the edge to support DIAS and HPC infrastructures"

Agenda

- Project facts
- Background
- Goal and concept
- Pilot use cases
- Scientific and Technological objectives
- Key results

Project Facts

CALLISTO - "Copernicus Artificial Intelligence (AI) Services and data fusion with other distributed data sources and processing at the edge to support DIAS and HPC infrastructures"

Research and Innovation Action, Call H2020-SPACE-2020, topic "Big data technologies and Artificial Intelligence for Copernicus"

Coordinated by **SERCO Italia S.p.A.**

Grant Amount: 3,999,953.75 €

Project Start
01/01/2021

01 **MS1 (M6)**
Project set up

02 **MS2 (M12)**
Platform development roadmap

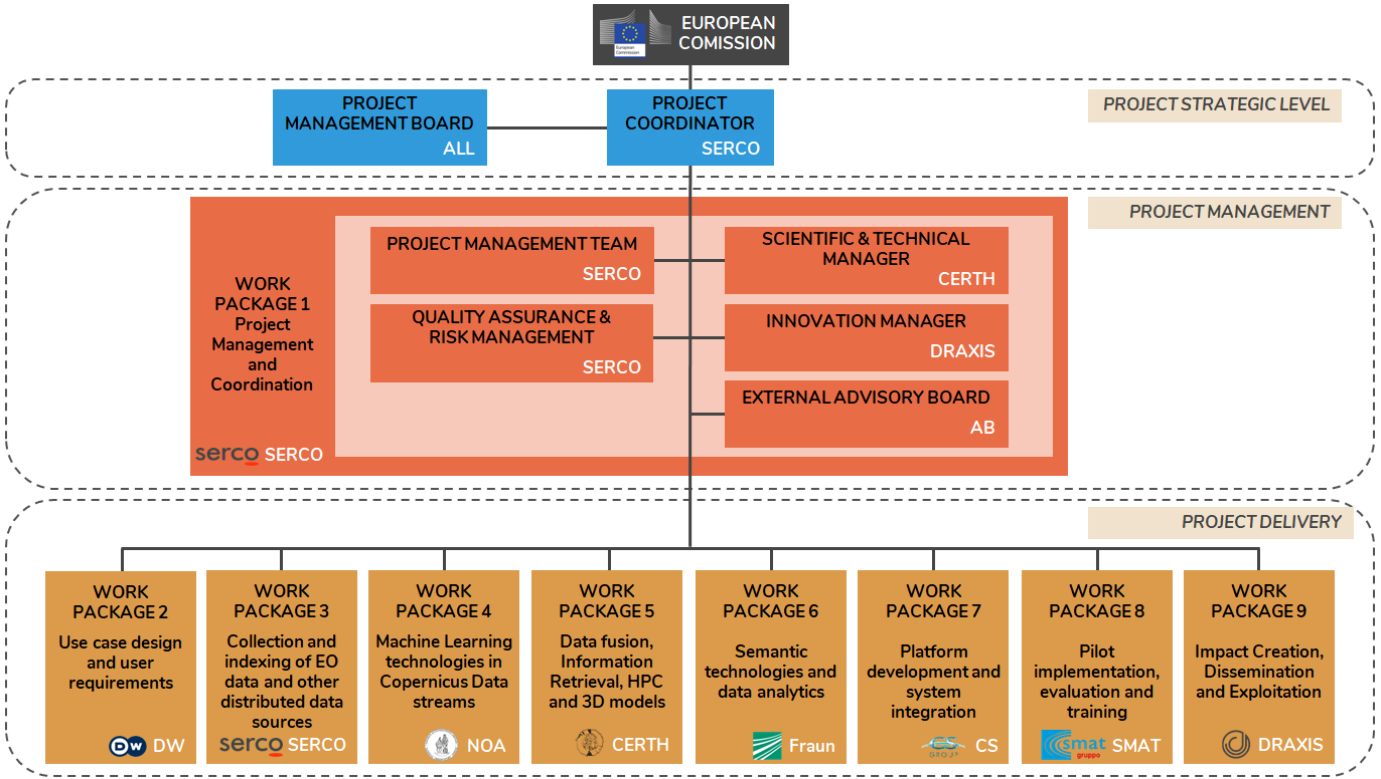
03 **MS3 (M20)**
First Prototype

04 **MS4 (M28)**
Second prototype

Final system and project end (M36)
31/12/2023

Project Facts: Consortium

Project Facts: Management Structure



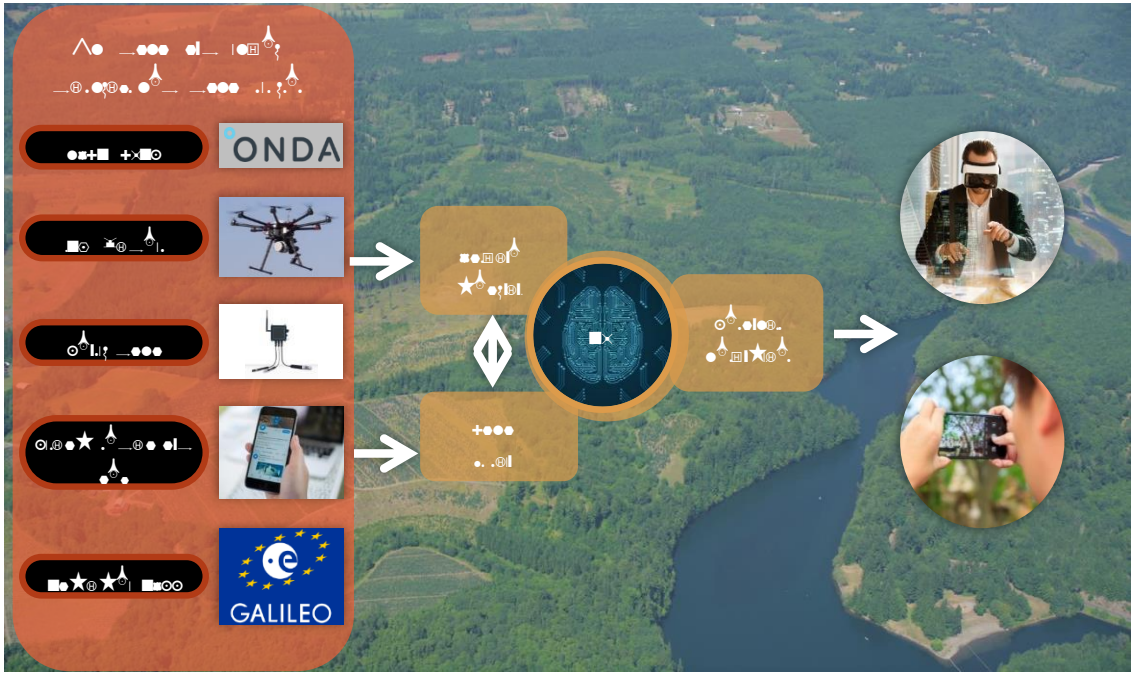
Background

Launched by the European Commission, will support the *Digital Agenda* and the *Green Deal.*

Develop a very high precision digital model of our Planet to *monitor and simulate* human and environmental activity to enable sustainable development.

Combine satellite with in-situ and socio-economic data to derive *digital twins,* dynamic replicas of our planet that mimic its behaviour, based on the integration of federated Cloud platform with Big Data features (AI, HPC…).

Goal and concept

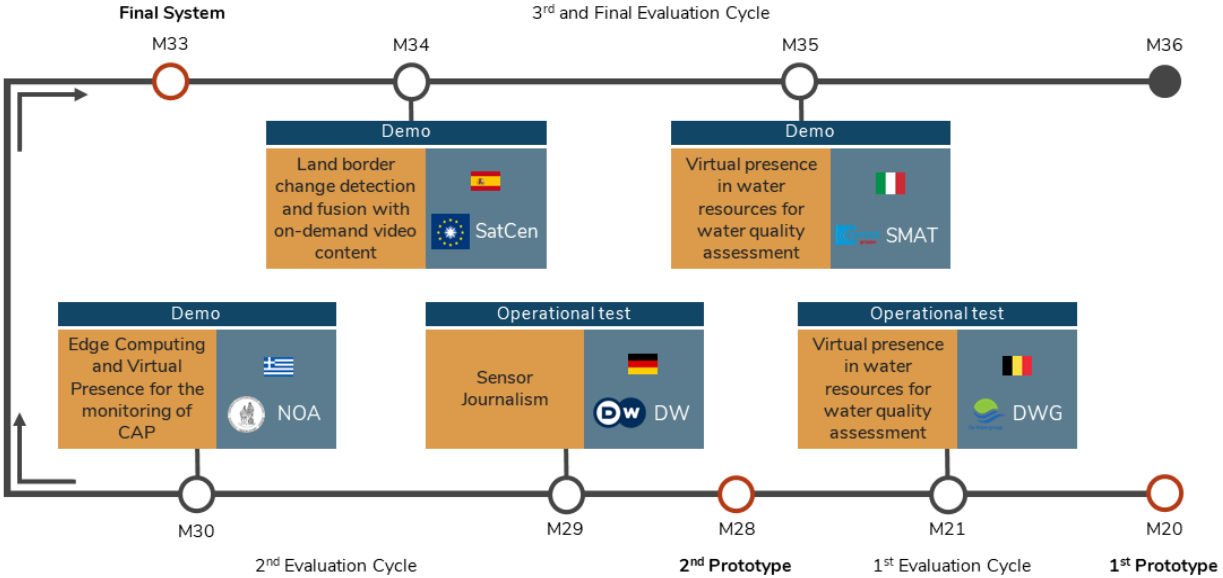


Enable *virtual presence* and situational awareness, through *Virtual, Augmented and Mixed Reality*.

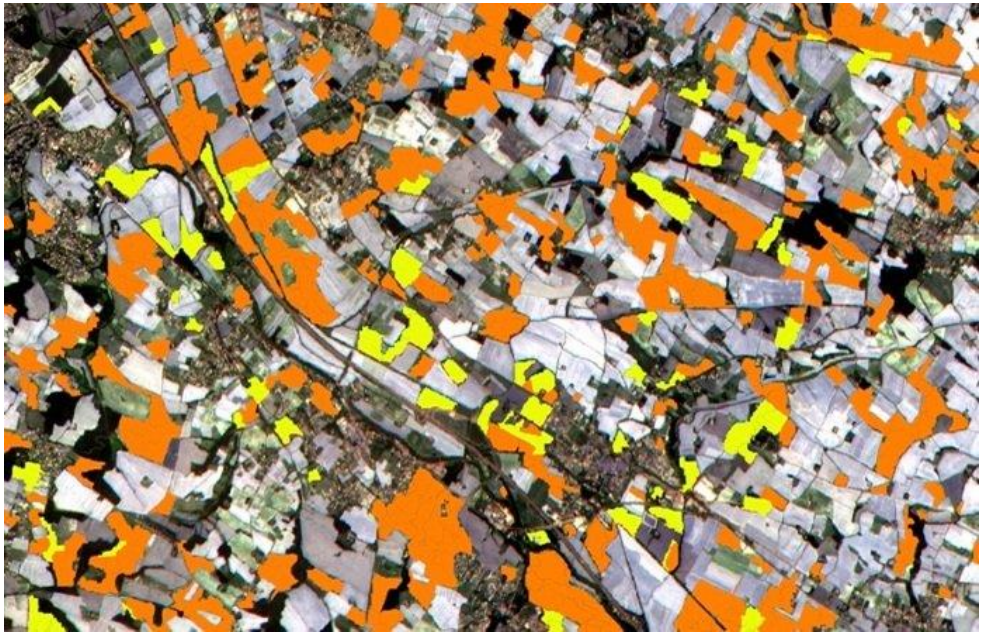
Combine heterogeneous data through *Artificial Intelligence (AI)* and *semantics*.

Support the *EC Destination Earth* and ESA *Digital Twin Earth;* bridge the gap between the DIAS providers and the end users.

Pilot Use Cases



Virtual Presence for CAP monitoring



Toulouse, France. Sentinel can distinguish between two types of crops: sunflower (in orange) and maize (in yellow).

Virtual presence for CAP obligations monitoring, enabling targeted on-the-spot checks and evidence-based decision making.

Sentinel 1, Sentinel 2 and optical imagery from UAV mounted sensor; *deep learning* models; *inference at the edge.*

Increase transparency, efficiency and scalability of the CAP inspection processes towards exhaustive monitoring and the priorities of the new CAP.

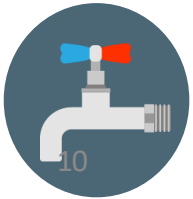
Virtual Presence for water quality assessment

Raw water basin of WPC De Blankaart. Aerial view (top) with detailed view of the circled area (red) in May 2019 (right, normal) and August 2019 (left, algae bloom).

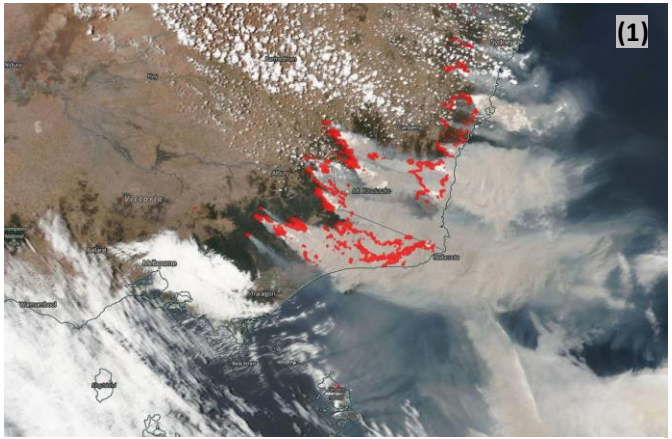
Assess water quality wrt algae, hazardous materials or treatment by-products and monitor surface water through virtual presence in the water resources (DeWaterGroep, SMAT).

Collect and analyse in-situ measurements, Copernicus data, video content from a camera mounted on Unmanned Aerial Vehicles.

Tackle the problem of the deteriorating raw water quality, an increasing concern for future drinking water supply.



Sensor Journalism



(1) The extent of bush fires as seen in Australia could only be really understood by looking at satellite imagery. Active fires are highlighted in red. NASA/NOAA
Source: https://www.vox.com/2020/1/3/21048700/australia-fires-2019-map-satellite-smoke-pollution.

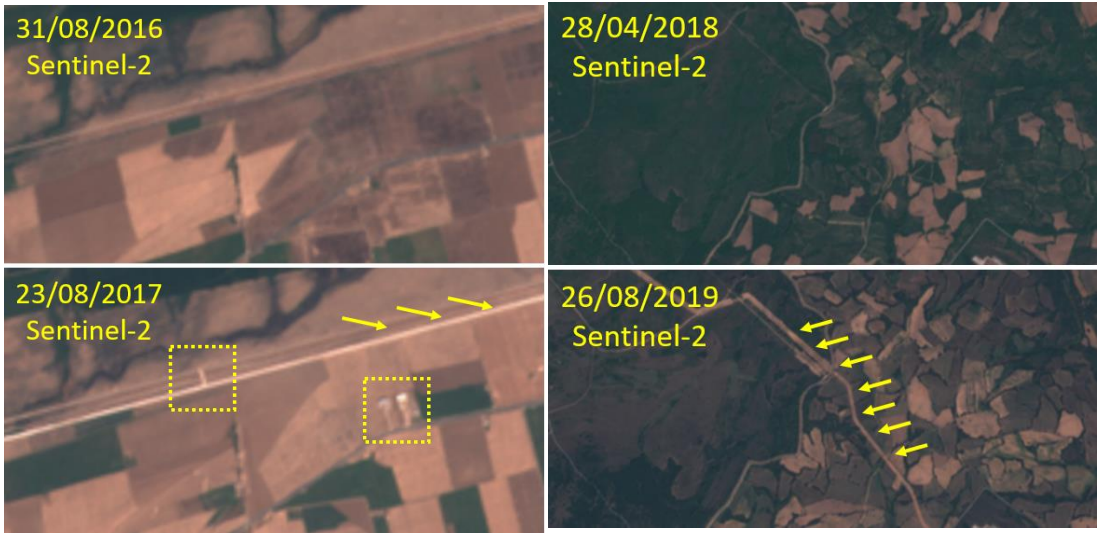
(2) Abstracting information and providing context of the spread of wildfires by using an infographic.
Source: https://p.dw.com/p/3iggO

An easy-to-use monitoring tool that provides journalists with satellite data contextualized and put into reference with information from multiple sources for storytelling.

EO data combined and aggregated with other sensor data, e.g. from air, sea and ground measurement stations, as well as with information from traditional and social media.

Support investigative journalism in the field of climate politics; create environmental awareness.

Land border change detection



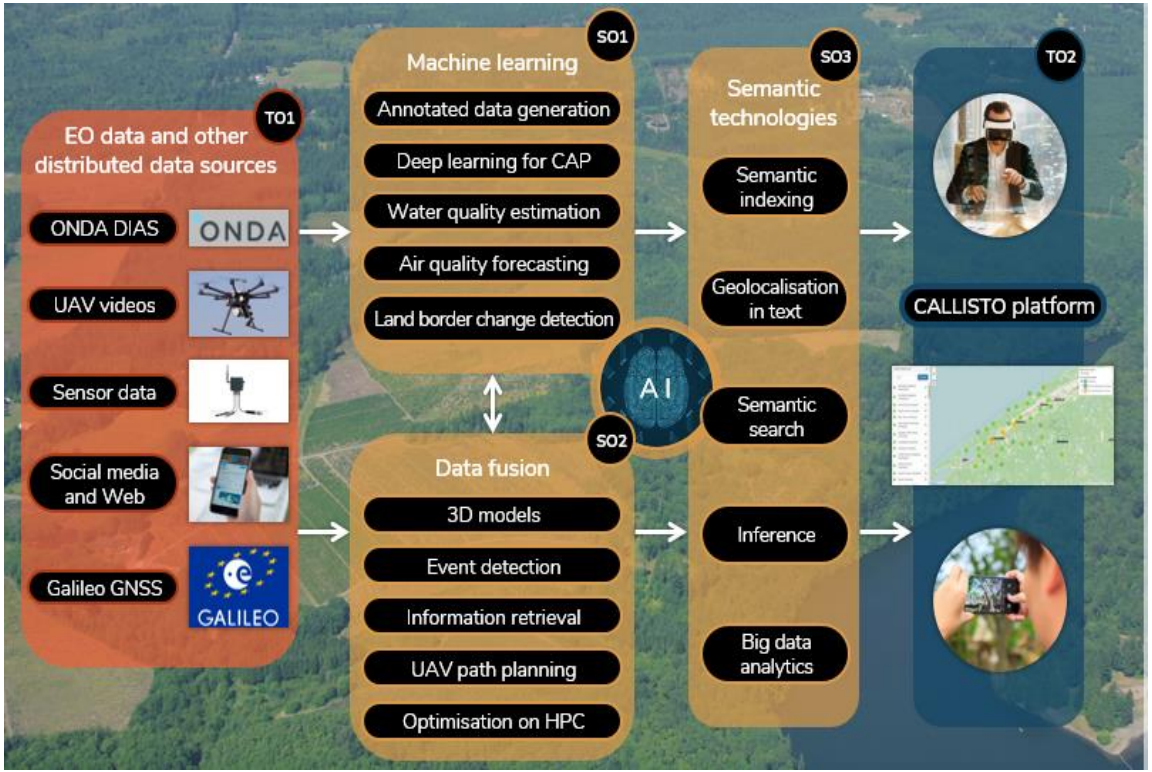
Relevant changes manually detected near land borders with Sentinel-2 (true-color RGB).

Operating at EU border scale, detect relevant land changes and provide alerts, that the operator can validate; generate proposed flight plans for UAV mission for further monitoring.

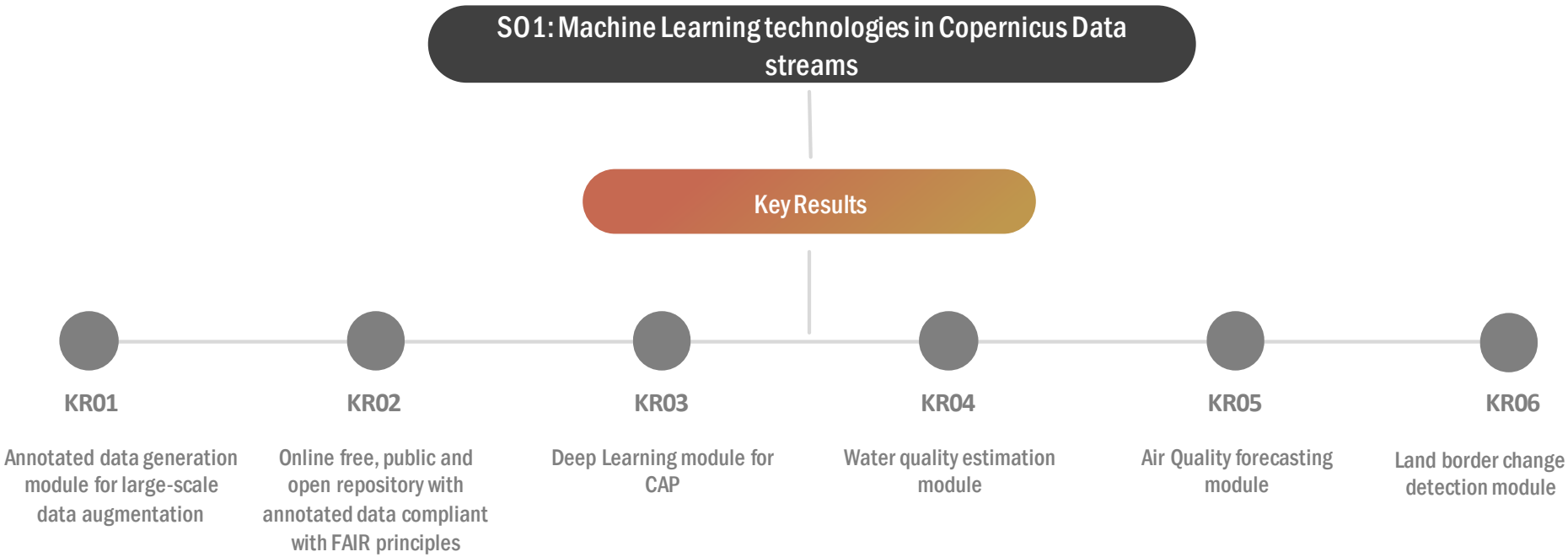
Process Sentinel-2 data with models able to recognise “relevant” (new buildings, barriers, roads) and “non-relevant” (snow cover alterations, agricultural crop stages) changes, based on proper user-centric definition.

Situational awareness to guarantee protection and security of EU citizens.

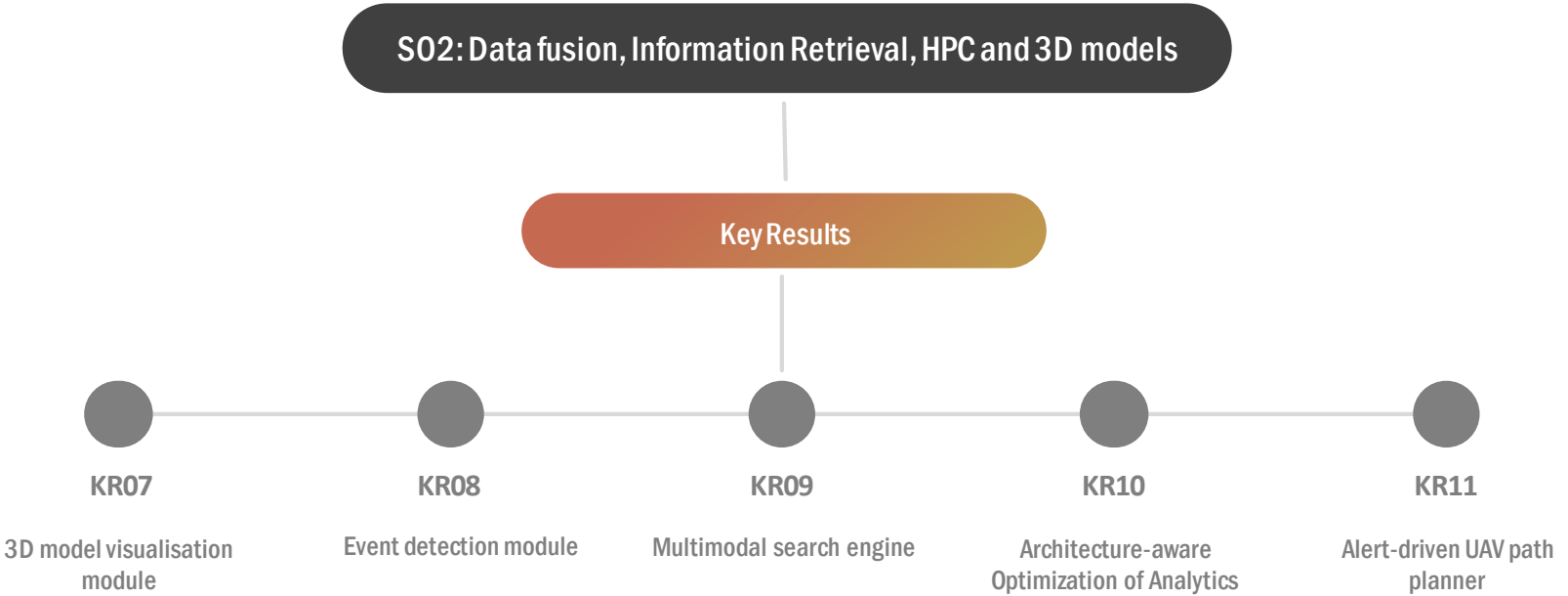
Scientific and Technological Objectives



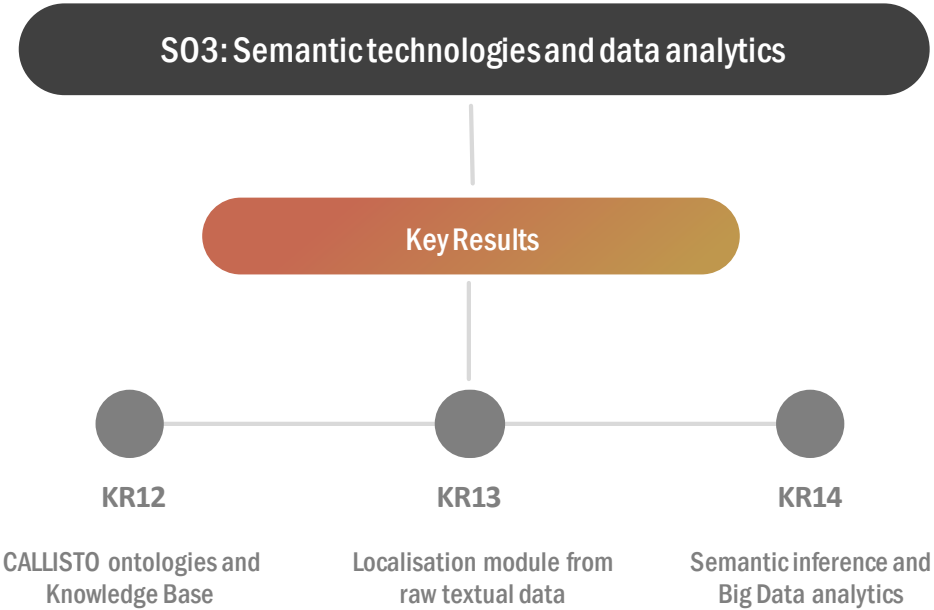
Key Results (1)



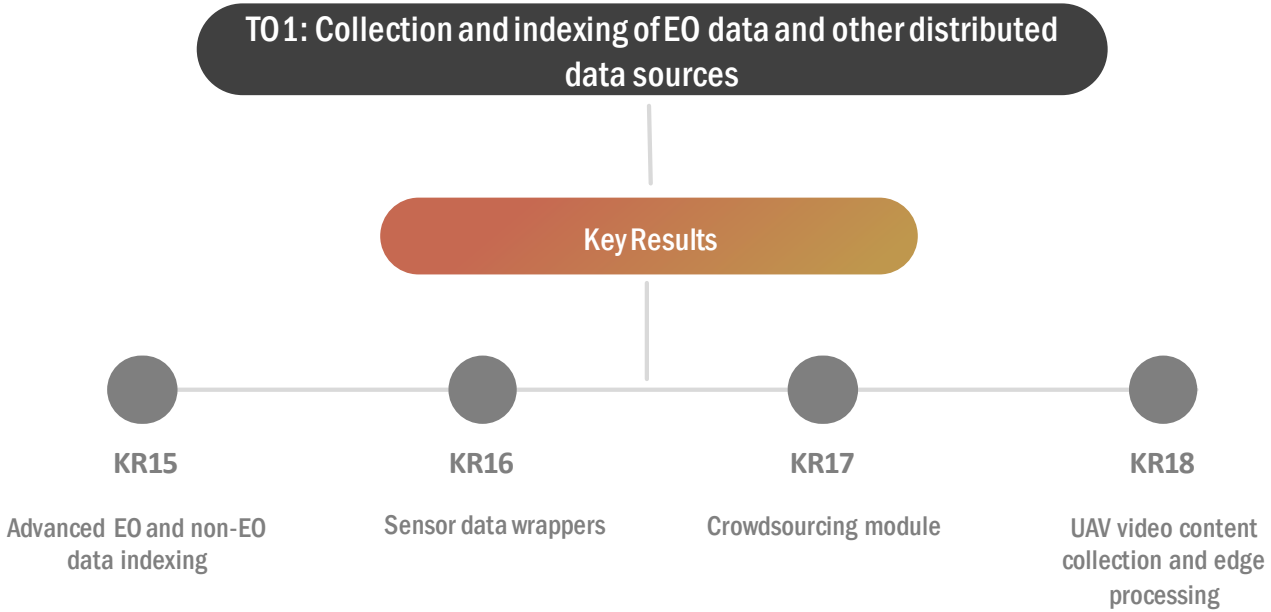
Key Results (2)



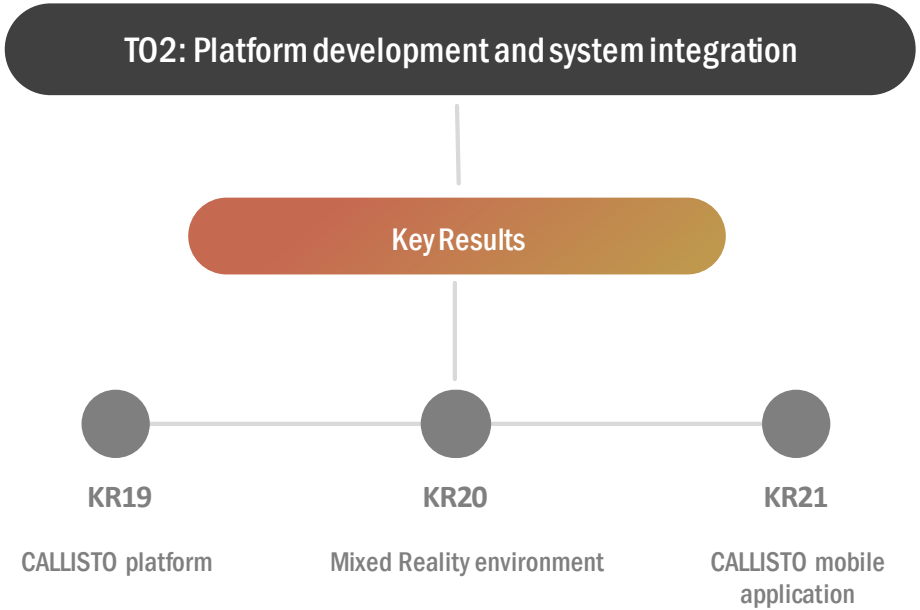
Key Results (3)



Key Results (4)



Key Results (5)



CALLISTO in summary

Supports the EC *Destination Earth* and ESA *Digital Twin Earth*, bridges the gap between the DIAS providers and the end users.

Enables virtual presence and situational awareness, through Virtual, Augmented and Mixed Reality, creating a novel and innovative immersive environment for the Copernicus market.

Combines EO with crowdsourced data, videos from UAVs and in situ data, through machine learning and data fusion technologies; the outcomes are semantically-enriched and served to humans in interactive interfaces and mobile apps.

Focuses on CAP monitoring, water quality assessment, sensor journalism and border surveillance. Has the potential to serve a variety of user communities.

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CALLISTO

Thank You

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