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TECHNOLOGY FOR A SAFER FUTURE

TELESPAZIO
a LEONARDO and THALES company

Leonardo Space

Space-Enabled Solutions for the Future of Logistics

Leonardo Space BU / Telespazio keynote: Marco Brancati, Giuseppe Tomasicchio

ASI Headquarters,

Rome – May, 8th 2025

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Company General Use

SUMMARY

- Leonardo Group capabilities and activities
- Space enabled Technologies and Services for logistics
- RPAS Operations with precise positioning
- Space enabled solutions with hybrid Sat/Terrestrial networks
- Space enabled solutions case studies
- In Space Services & Logistics

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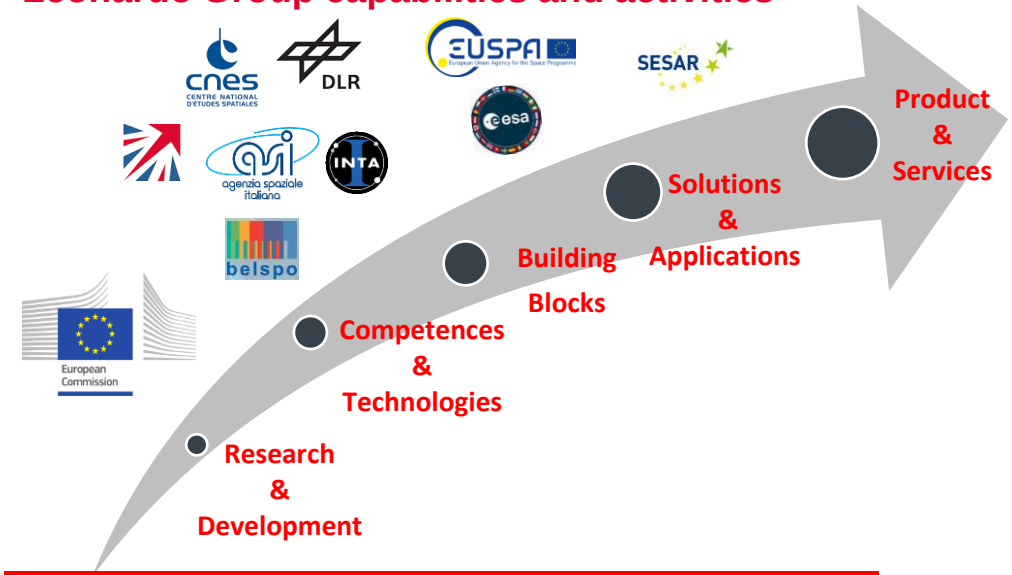
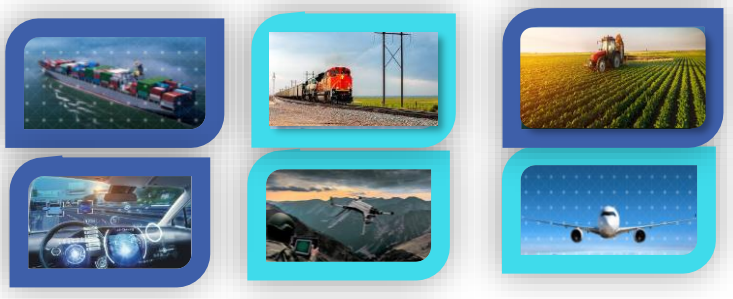
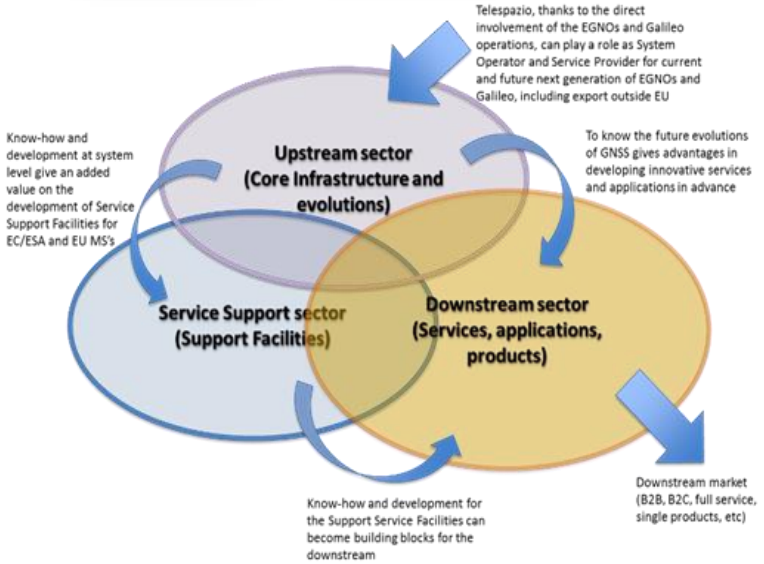
Leonardo Group capabilities and activities







Capabilities:

- GNSS upstream and downstream exploitation
- GNSS performance monitoring (post processing/real-time)
- GNSS-PNT navigation application development and testing via RF and SW simulated environments
- GNSS-PNT e2e Testing Capabilities
- System Architect capabilities for GNSS System Design
- PNT robustness, resilience and security aspects analysis

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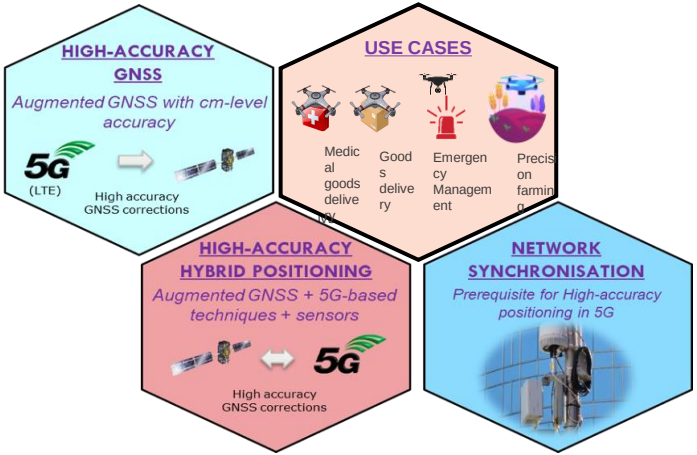
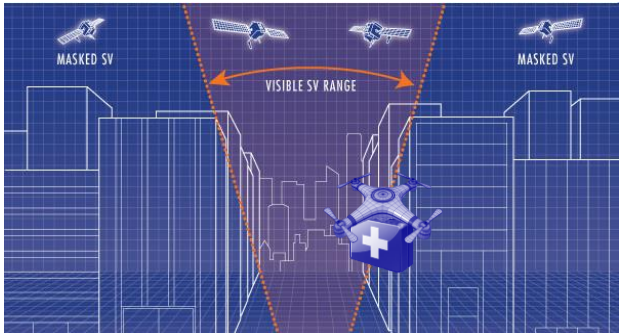
Space enabled Technologies and Services for logistics

The new widespread and safety-critical drone applications under development requires **alternative PNT** technologies to be employed **when GNSS is unavailable** (e.g. due to jamming, spoofing, visibility)

Complementary 5G positioning techniques holds the promise to expand ubiquitous PNT capabilities to GNSS-denied environments such as **deep urban canyons or application requiring high level navigation performances:**

- Goods delivery/ Medical goods delivery
- Emergency management
- Precision Farming
- Infrastructure Monitoring





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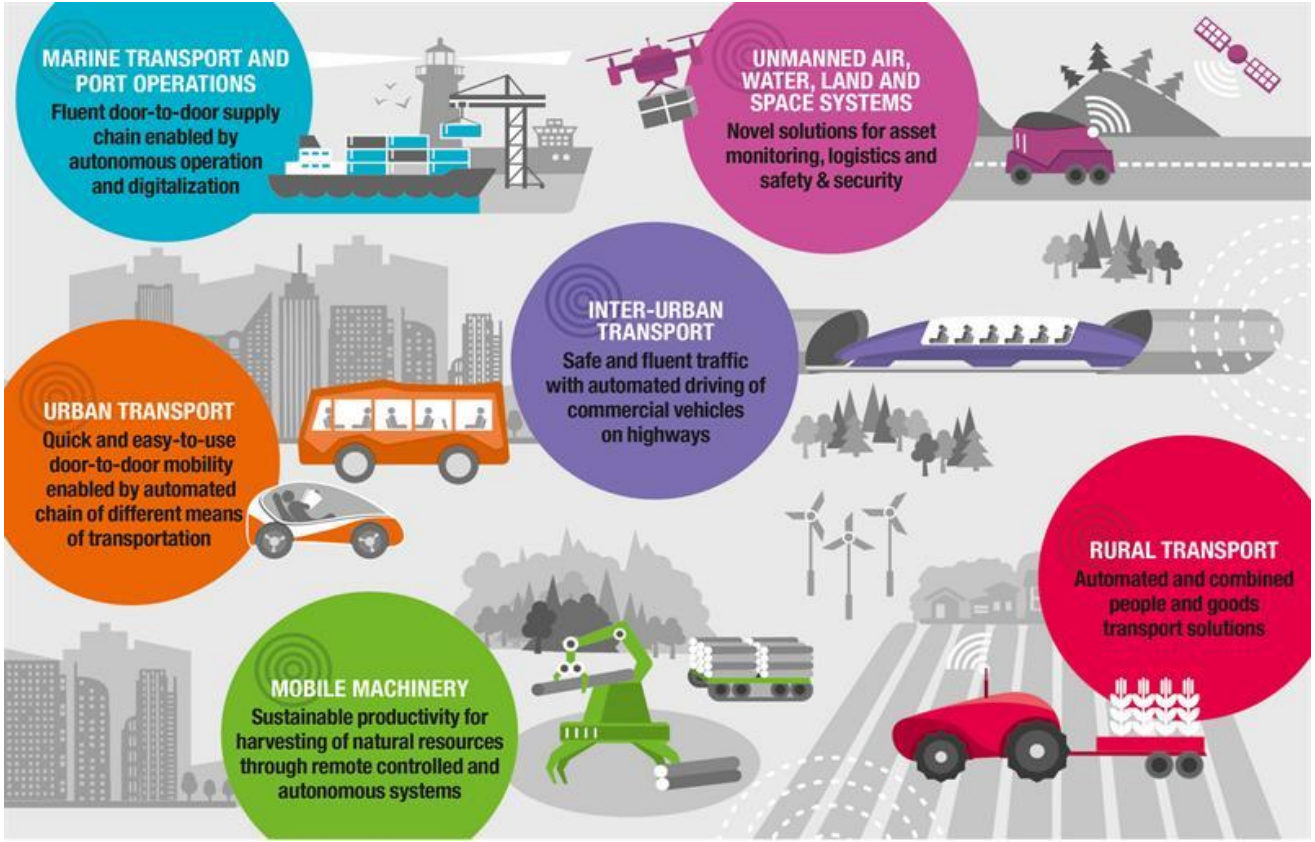
Unmanned and autonomous systems (Satellite Navigation & Comm. services)



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RPAS Operations with precise positioning

According to EUSPA's GNSS Market Report survey, almost **50%** of **drone users** expect a **horizontal accuracy** of below **10 cm** and **38%** a **vertical accuracy** of below **10cm**. This increased performance is **critical** for multiple drone applications and is not achievable without any GNSS signal augmentation.

- **GNSS** has become a **'must have'** for drone operators for high accuracy positioning in many applications in particular in outdoor environments and also to be compliant with Regulations (tracking, monitoring, geo-awareness/geo-tagging to avoid obstacles or no fly zones)

Regulation Compliance

	Precision Farming		Infrastructure monitoring		Goods delivery		Buildings inspection	
5G POSITIONING SERVICE ACCURACY (5G Positioning Service Level 2-7), ≅99% service availability	H 0,2-1m	V 2m	H 1-3m	V 0,2-3m	H 0.2m	V 0,2m	H 0,2-3m	V 2m

Need of Cooperative PNT solutions for cm level pos. accuracy

The **urban environment** and the safety-based drone operations can **pose various challenges** to the reception/performances of GNSS signals

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Services with Drones

Project U-Elcome

- Part of the wider U-space European COMmon dEpLoyment (U-ELCOME) project, part of the European SESAR 3 JU Digital Sky Demonstrators initiative
- Project aims to ensure the delivery of medicines to patients in remote areas using remotely piloted aircraft and satellite technologies that will be tested in the coming months.
- Innovations developed in the field of unmanned aircraft and satellite navigation and communication services.
- Management of the entire drone delivery service through the **T-DROMES platform**
- Commercial drones equipped with the **TPZ Air 100 box.** Command and control managed through both satellite and terrestrial communication channels.

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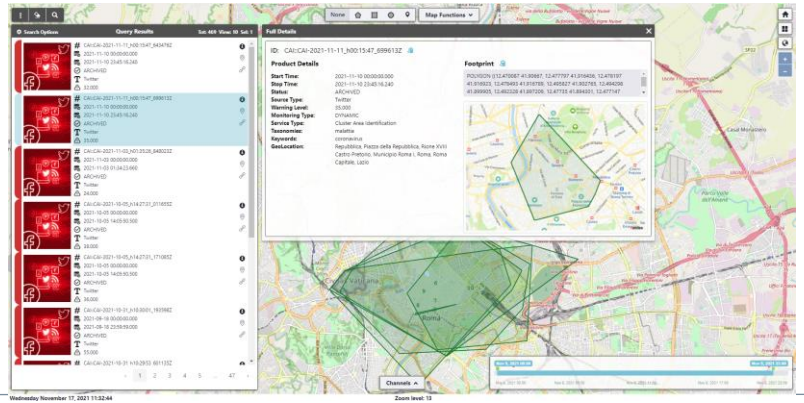
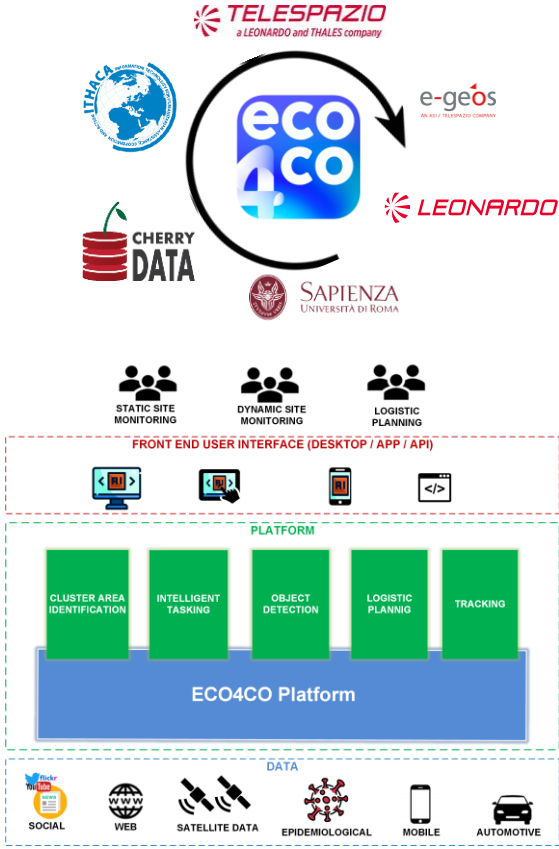
ESA ECO4CO Space Solution for COVID Project

- **Object Detection**: An AI service able to detect **possible gatherings of people** from cameras and **vehicles** from Satellite Images, basing on neural networks.
- **Tracking**: A service capable of tracking the **traffic movement** and the **concentration of devices** detected in a given zone. A Mobile App allows to track in anonymous way the people devices.
- **Logistic Planning for Region Color Coding**: a forecasting data analysis service to predict change of regions color coding, basing on neural networks.





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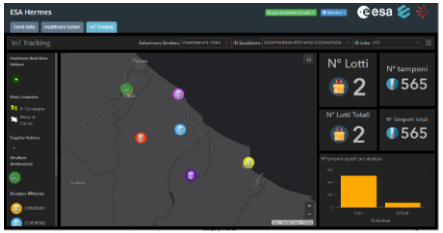
ESA HERMES Space Solution for COVID Project - IoT Tracking Sensor System

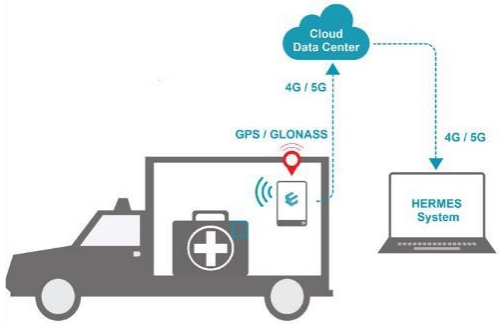
IoT Tracking Sensors kit:

- GNSS receiver, LTE modem
- QR Code reader

Tracking sensor App screenshot

IoT Tracking Dashboard





IoT Tracking System

"Healthcare Emergency support system for the distributed Response and Monitoring of Epidemics in the Society"

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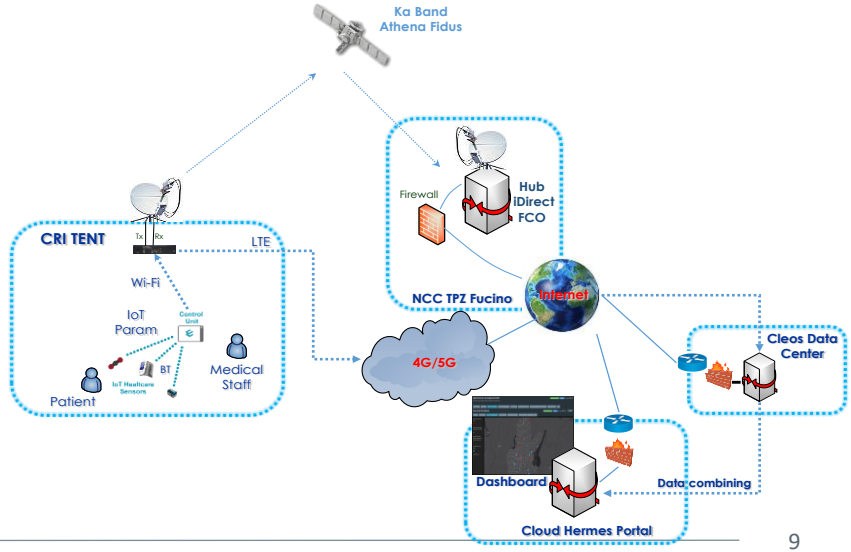

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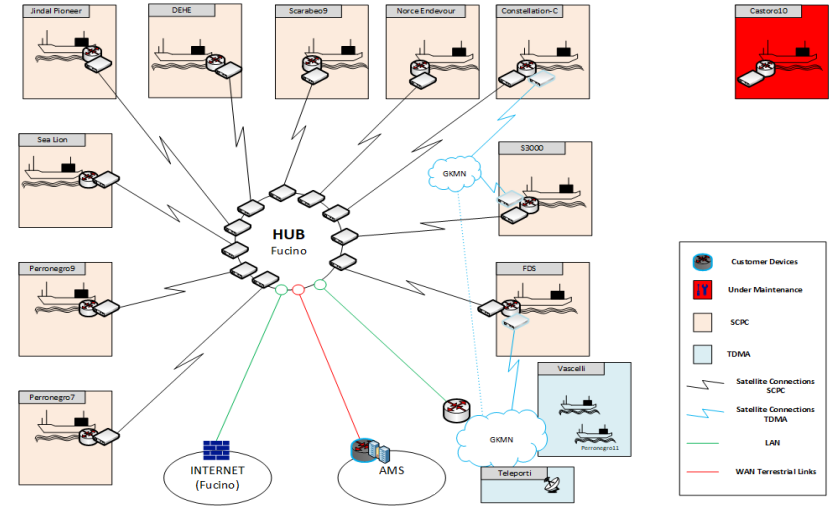
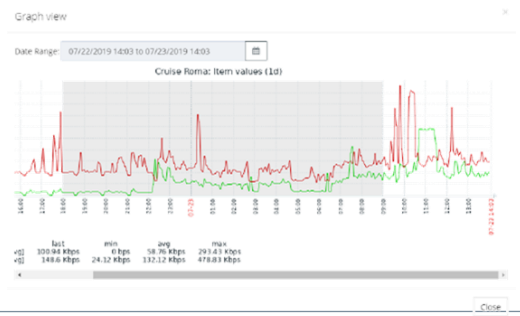
Space enabled solutions with hybrid Sat/Terrestrial networks: for Vessel and off-shore operations





- A multi satellite-multi tecnology Fucino hub realize a worlwide Hybrid WAN to support the customer applications for production, administration, crew welfare and other emerging application.

- Connectivity monitoring and reporting:
  - Monitoring and tracking of the vessels
  - Status of the vessels
  - Reporting of the bandwidth consumption

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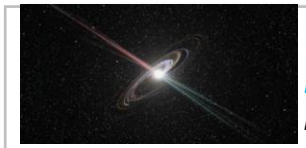
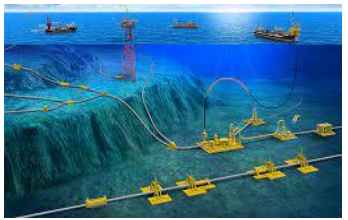
Space enabled solutions for Underwater operations



PULSAR

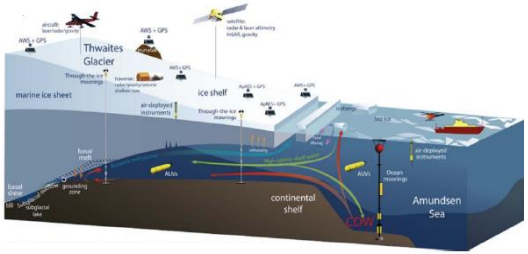
PNT Unknown trends: a Long-term key Sectors Assessment & Roadmap study

ESA NAVISP EL1 Frame Contract N° 4000132185/20/NL/GLC
PULSAR: Assessment of Technology Trend in Key PNT – Call for Order 2



The **main objectives** of the activity lead by ***TELESPAZIO*** (TPZ) are:

- To assess with ESA the key PNT sectors with a view to identify the **main innovation trends** on each sector
- The identification of enabling actions for the identified technical innovation trends with the **aim of future possible injection into NAVISP**
- To **enhance cooperation between the industry and research institutions** on R&D subjects within PNT areas of common interest.



A team of **technical experts**, led by TELESPAZIO supported the activities related to their field of proficiency and will investigate in the **Call-Off Order 2 (CoO-2)** the following Work Item: **Underwater PNT (Positioning, Navigation & Timing) for a greener Earth .** The project has been successfully completed in May 2023.

The team of expert includes also the "**Centre for Maritime Research and Experimentation**" (**CMRE**) **NATO** institute in La Spezia (IT) and SpaceExe srl.

Within the project TPZ Italy as Consortium prime will provide :

- a stakeholder needs and use cases analysis,
- a survey of the State-of-the-Art,
- an analysis of innovation beyond the State-of-the-Art and gap analysis
- a definition of the next steps to suggest with ESA for the definition of a technological roadmap for the Underwater PNT.

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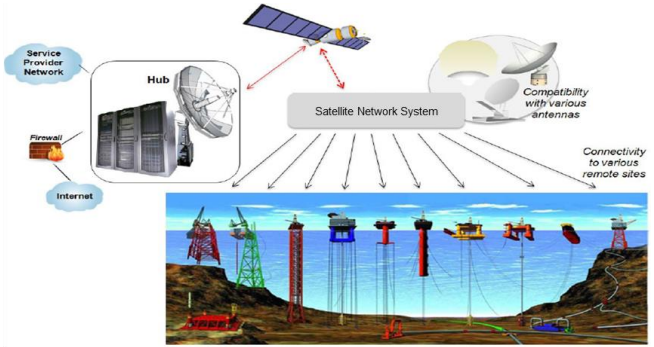
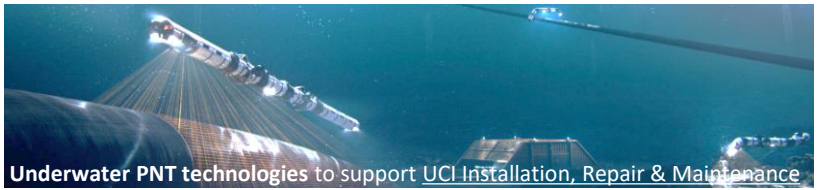
Space enabled solutions for Underwater operations

- **Underwater Critical Infrastructures (UCIs)**, such as offshore platforms and windfarms, underwater oil/gas pipelines and fiber optic cables networks, represent undersea assets or systems which are essential for the maintenance of vital social functions.
- The activities related to their **installation**, **operation** and **inspection** require instruments and vehicles that operate with a very high level of **Position Navigation and Timing (PNT) accuracy.**
- The recent **Nord Stream 2 accident**, occurred on September 2022, strengthened the need for a rapid and accurate UCI monitoring and control processes, and the usage of Autonomous Underwater Vehicles (AUVs) became a key point.



Nord Stream 2 accident


Underwater PNT technologies to support UCI Installation, Repair & Maintenance

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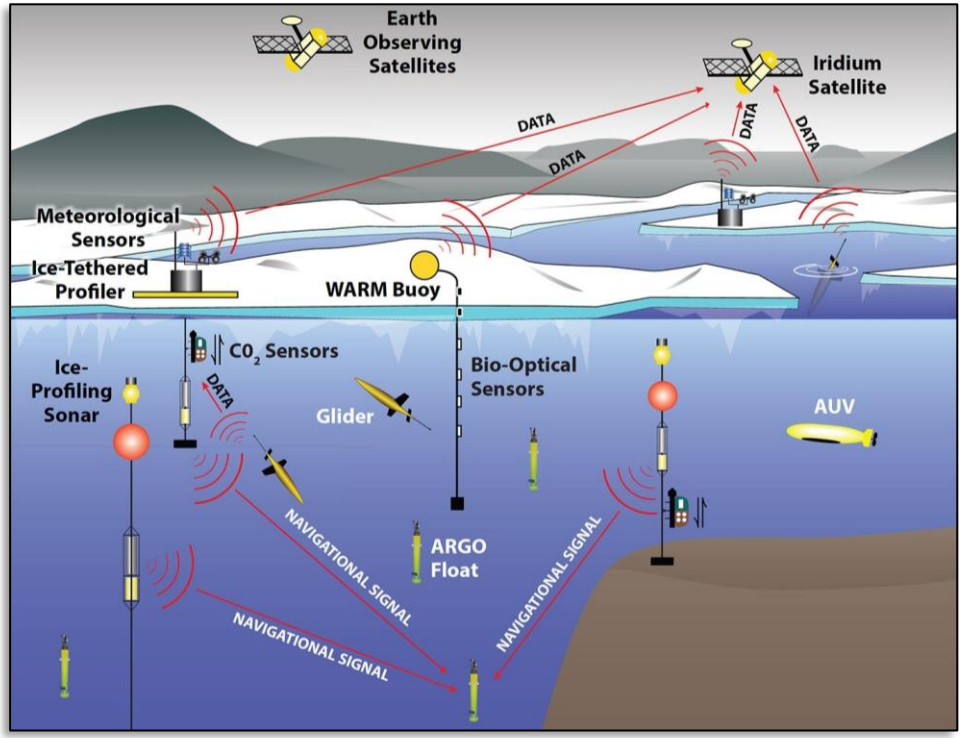
Space enabled solutions for mission planning and logistics in harsh environments

- Space enabled solutions for mission planning and logistics are indispensable for harsh environments and safe operations (e.g. **Climate Change monitoring**)
- The accurate knowledge of **ice morphology** is indispensable to perform safe operation, especially when a mothership is involved → usage of **EO satellites** (e.g., *Copernicus*).
- In order to cope with the EO revisit time & responsiveness, **Geo-information techniques** are able to exploit different EO Satellites and fuse different remote sensing imaging sources including also the ones collected by manned aircrafts and Unmanned Aerial Vehicles (UAVs) equipped with cameras, lidars, etc.
- Fundamental role of satellite observations is namely **ranging observations**. Underwater assets exchange signals one each other. Some among them are characterized by a surface part, out of the water (e.g., the WARM buoy). There it is possible to get also a data link with a satellite.



Technologies for autonomous Arctic Ocean observing. Red lines mark examples of underwater acoustic navigation and communication paths and satellite telemetry for instruments on the surface. (C.M. Lee , et al. "Emerging technologies and approaches for in situ, autonomous observing in the Arctic", 2022)

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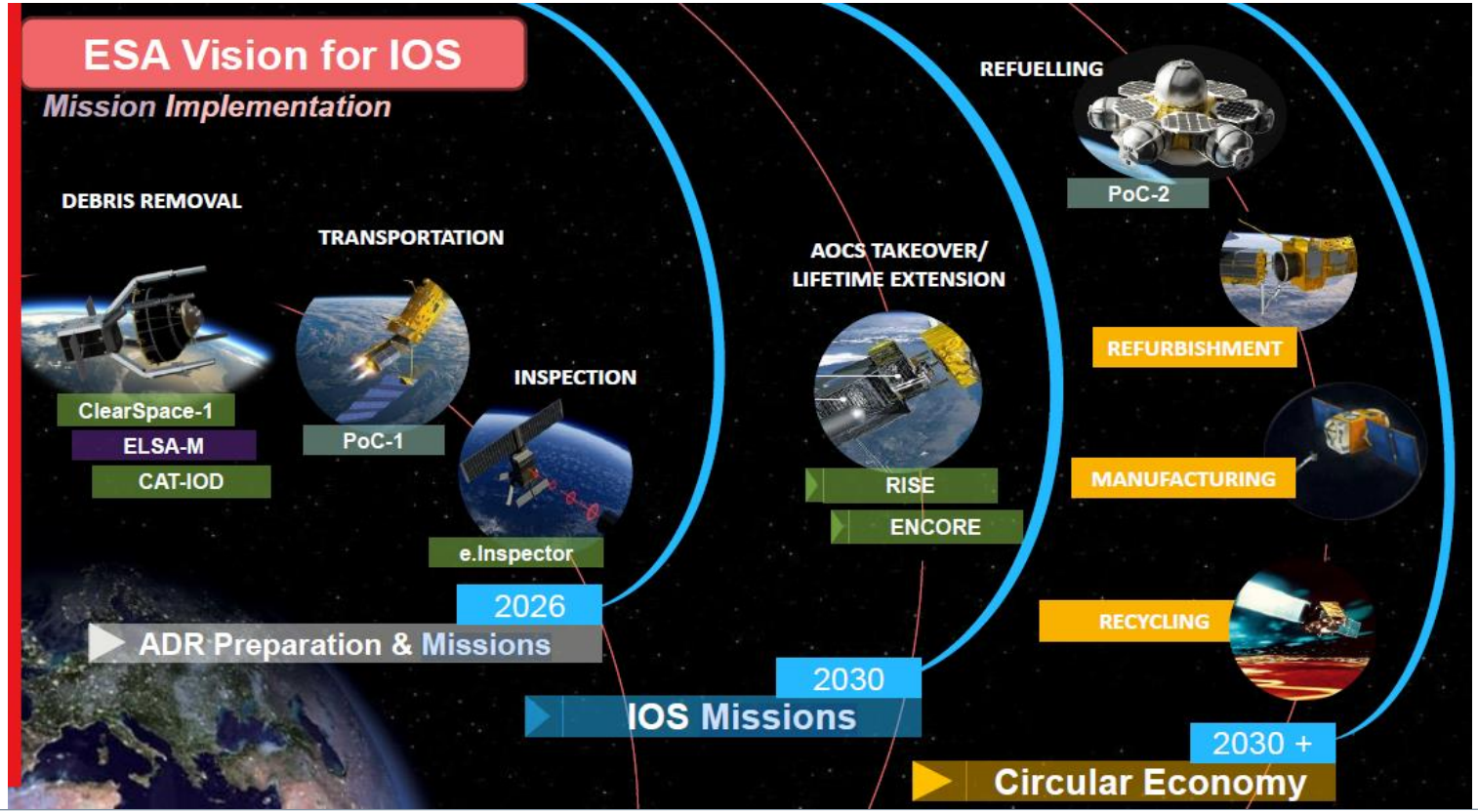
In Space Services & Logistics - ESA Vision



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Finanziato dall'Unione europea NextGenerationEU

In Space Services & Logistics - IOS PNRR:

A Commercial Ground Segment Provider and Spacecraft Operator Perspective

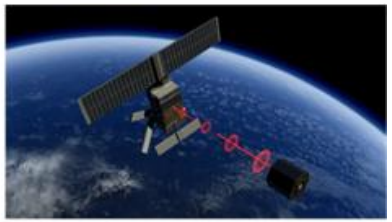
Project led by ASI for the development and implementation of an "In Orbit Servicing" demonstration mission aimed at achieving orbital interoperability capabilities with an approach of incremental difficulty

Industrial organisation

TAS-I (Prime)	System Level Servicer Avionics
AVIO	Orbital Support Module (OSS) Orbital Propulsion Module (OPM)
LDO	Robotic System
D-ORBIT	Target System (ION modified) Refuelling system
TPZ	Ground Segment and Operations

Main incremental functions

- Target tracking & Inspection, Rendezvous and Capture
- Attitude and orbit control of the target satellite (AOCS Takeover)
- Relocation to a different operative orbit
- Separation to disengage and perform disposal operations
- Refuelling
- Refurbishment or assembling of new components/parts



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