LEONARDO
TECHNOLOGY FOR A SAFER FUTURE

3rd EO Commercialisation Forum 2026:

Commercialisation in dual use

Marco Brancati

Leonardo Space Division – SVP Technology, Innovation & Systems Architecture

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Leonardo Space Division

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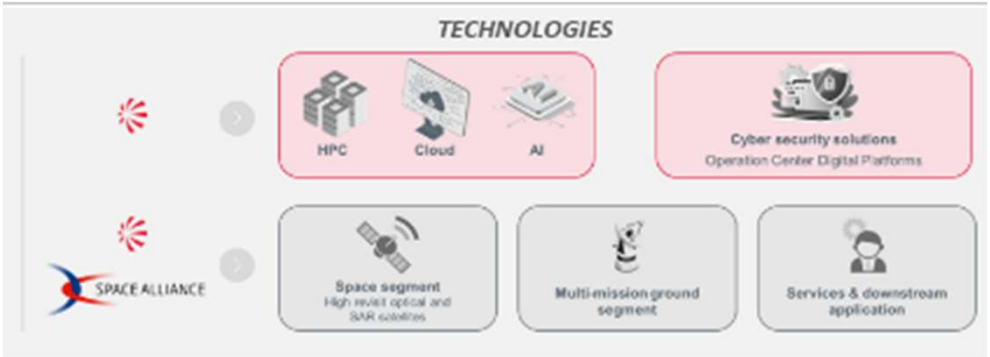
Leonardo's strategy in Space, a solution provider for integrated systems

Leonardo aims to provide **integrated solutions** through systemic approach and to design and deliver compelling **converging space and digital technologies** all over the value chain in support to all space legacy (EO, Connectivity, Navigation, Exploration …) and emerging domains (Space Surveillance, In Orbit Services, Cloud in Space,…) and **multi domain operations**



Powered by **satellites and constellations based systems**, multi-mission digital ground segment, access to downstream services, **high power computing, cloud** and **AI toolkit**, Leonardo solutions leverage **own architectures, products** and **technologies, Space Alliance and partners components** to offer high revisit cyber secured Earth Observation, space surveillance capabilities, connectivity, cloud and operations in space, orbital and space data center, scientific payloads, space robotics systems and IoS solutions and planetary communication networks

from SPACE 4 SPACE

…to MULTI DOMAIN OPS

LDO Space Division – strategic plan pillars – 1/2

EO / Geoinfo

1

Complete E2E offering, from space segment (satellites / constellations) to user segment and data fusion capabilities through cutting-edge digital technos (HPC, Cloud, AI) to provide actionable information with minimum latency.

Geo Information Center data analytics solutions enabled by proprietary constellation through full deployment of HPC/AI tool box features powered geospatial and IMINT service platforms

Space Surveillance

2

Integrated surveillance systems: Architectures for space surveillance and Early Warning, Missiles defense (incl. both **passive sentinels** with on-board edge computing and sovereign ground segment with on-prem HPC

SDA systems providing surveillance of space assets (LEO,MEO and GEO) and awareness of the space domain to early detect and avoid threats: Space Surveillance &Tracking (SST), Space Traffic Management (STM), Space Intelligence & Information (SI2), Space Weather (SWE)

SDA analytics service with data fusion of third-party ground- and space-based data, leveraging Leonardo access to potential extra capacity of SSA System

Security & Intelligence

Emerging missions and operational concepts from space superiority to space dominance (e.g., defensive/ offensive counter-space).

LDO Space Division – strategic plan pillars – 2/2

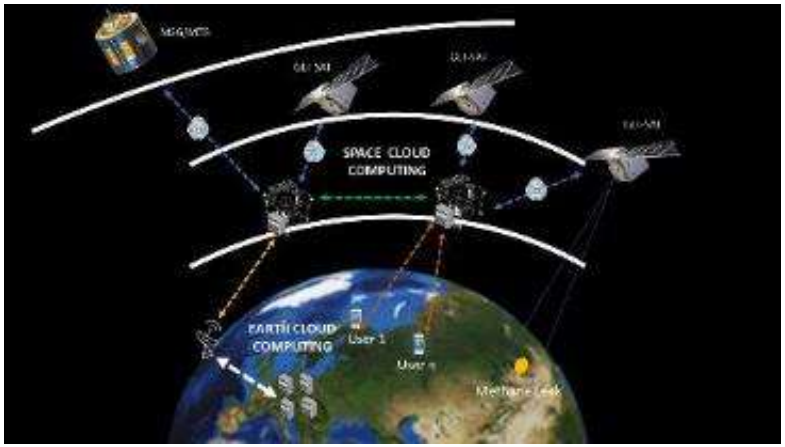
Connectivity / Cloud in Space

3

Infrastructures for multi orbit connectivity: GEO sat and low latency (constellation) infrastructures and services for institutional and governmental application and Cloud in Space solutions.

Space cloud systems to support **Storage and Computing capabilities in space** and boosting infrastructures and services to provide secure transport layer and advanced cybersecurity with full integration of Space and Ground Domains.

Space to Space services, providing support to satellites and constellations, allowing the storage and/or processing of data and their wider distribution to users through full deployment of HPC/AI features



Exploration & Logistics

4

Complete offering from space infrastructures, scientific payload, instruments and robotic systems to support services for future LEO space stations, lunar economy and planetary exploration. Space and Lunar data centers / cloud infrastructure / Planetary communication networks**.**

E2E In-orbit operational services - robotic arms in dedicated modules for IoS to space stations, surface rovers and orbital modules, proximity operations with cooperative and non-cooperative objects, debris removal, and military surveillance in space

EO / Geoinfo Domain

Leonardo proprietary Constellation

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The Leonardo EO Constellation

~ 20 **Civil EO LEO multi sensor sats** internally financed

Space Alliance Smart Factory up and running in 2025

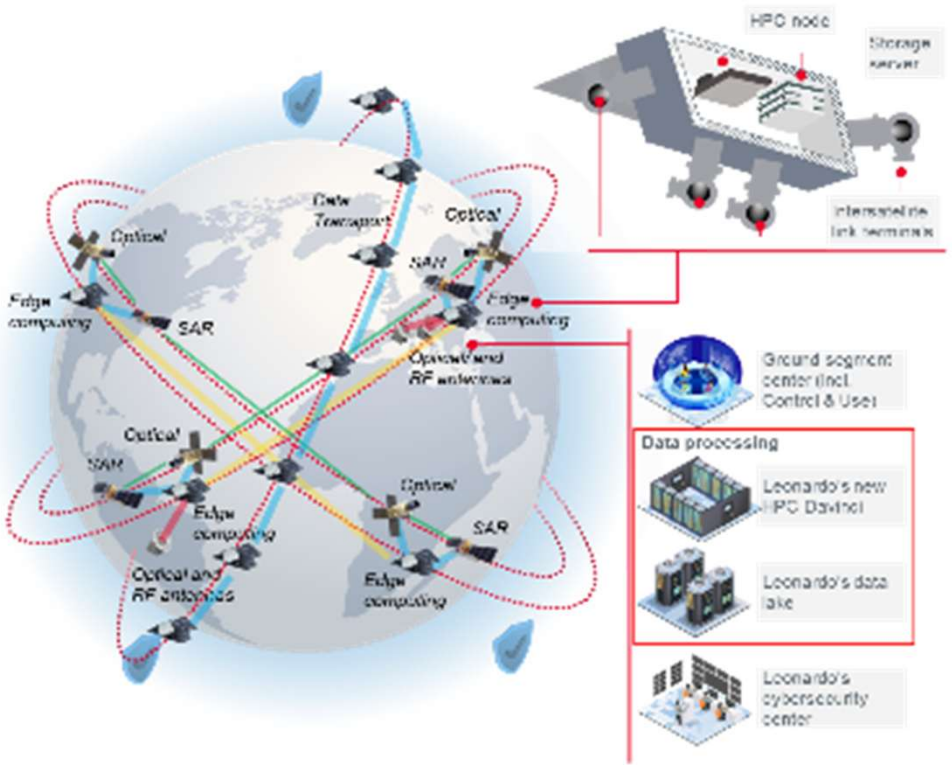
Launch windows 2027 and 2028

- **Sinergies with national initiatives (PNRR IRIDE, civil, military)**
- **Sinergies with European initiatives (ERS, EOGS, …)**
- **Full capitalization of EO GS study led by Telespazio to address requirements for security and defence needs**

STRATEGIC RATIONALE

- **Strategic positioning** as a European leading space player and key contributor to national and EU defence security and EO Governmental Services **leveraging Leonardo thoroughly knowledge of user needs and requirements** and through **full capitalization of Space Alliance and strategic partnership assets and solutions**
- **Laboratory to foster situational awareness and competitiveness** along the value chain up to down-stream in Earth Observation constellations and Geospatial domain
- **Enabler of space end-to-end solution positioning**, in export market and institutional driven G2G prospects
- **Full control of data policy**, without being limited into specific time slots or span windows
- **Distinctive space as-a-service offering**, potentially leveraging **Public-Private Partnership** infrastructure
- **Space backbone architecture**, enabling integration through space layer of multiple sensors and capabilities
- **Multi domain integration** across segments (EO, Connectivity, …) and solutions

The Leonardo EO Constellation



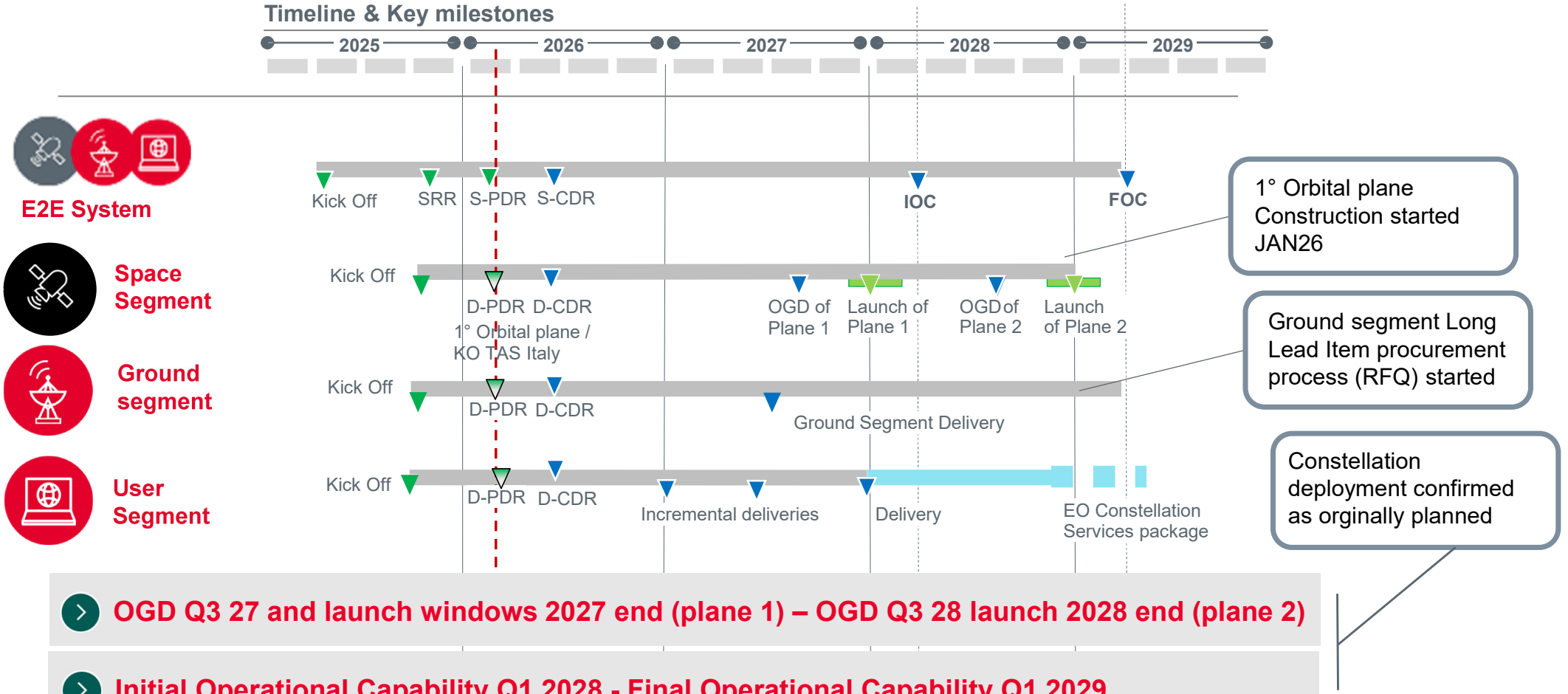
ARCHITECTURAL AND TECHNOLOGY KEYS

- **High Revisit** all time all weather to provide high temporal resolution with best leverage of state-of-art radar technologies and competitive Optical VHR/Hyperspectral
- **High Data Quality** through sub metric (50 cm range) resolution sensors (Radar/Optical)
- **Multi Sensor Architecture** to provide a powerful data stream for full AI/Analytics powered apps and services
- **Low Latency** through intersatellite link features and connection to **transport layer** for the fastest access to data and information generation
- **On Board Computing and data storage** to build a first cloud in space and edge computing architecture
- Full Exploitation of **AI/HPC powered geospatial service platforms** through full fledged digital marketplace

All system keys and time plan confirmed at System PDR

3 types of satellites identified: EOSAR, EOVHR and COM

Baseline Master Plan - Design, Construction and Launch of multi sensor EO Constellation



- OGD Q3 27 and launch windows 2027 end (plane 1) – OGD Q3 28 launch 2028 end (plane 2)
- Initial Operational Capability Q1 2028 - Final Operational Capability Q1 2029

System and Architecture Overview

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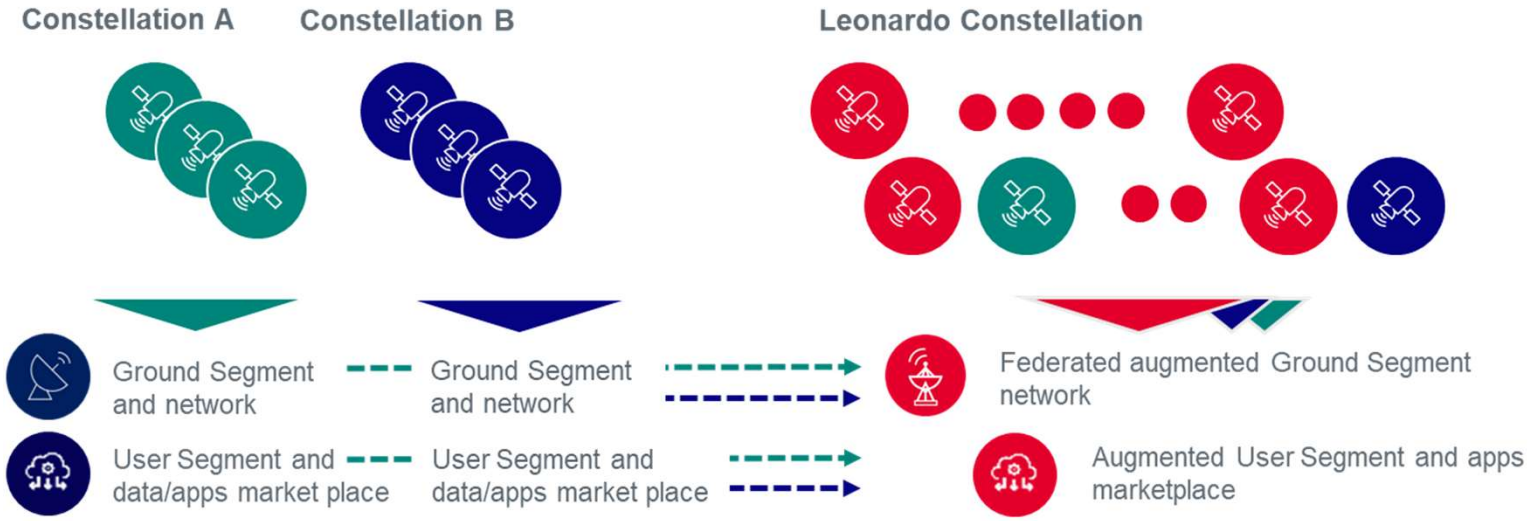
LDO EO system overview

System requirements and space segment baseline configuration

- **CONSTELLATION SYSTEM ARCHITECTURE -** The Leonardo EO Constellation is a complete E2E satellite system, that consists of a dedicated and proprietary **Multi Sensors Space Segment** and a **modular, scalable and shareable Ground Segment** and **User segment.**

- The constellation is conceived to be federated, also with hybrid configuration in orbit, with third party infrastructures to produce the most powerful data set to feed user segment and data analytics applications and marketplace. A complete **Infrastructure as a Service** business model is enabled. Federation allows to share data improving key figures as **revisit time** and **data latency** and **keeping individual status and sovereignty**



Space Segment

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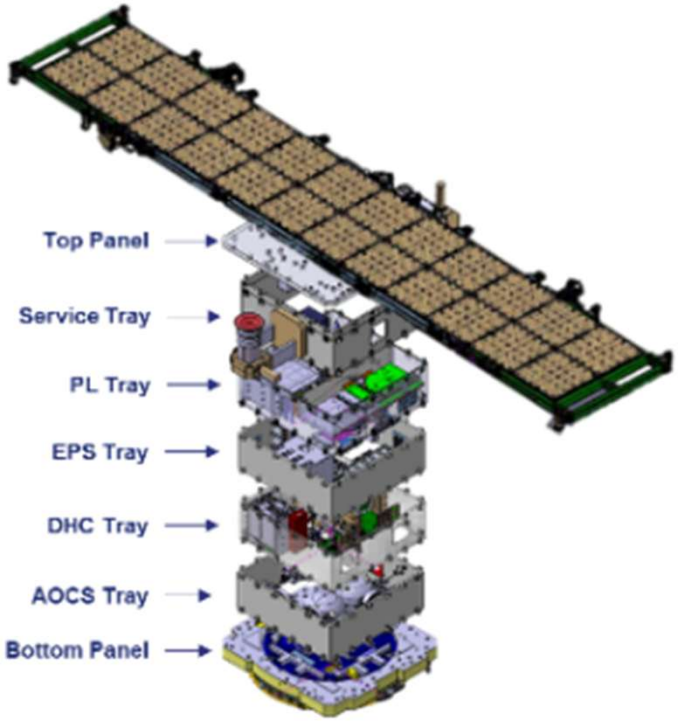
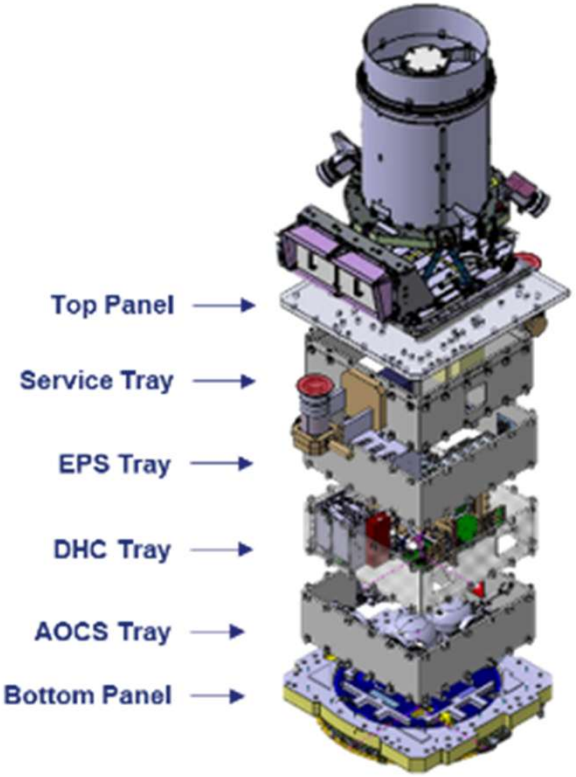
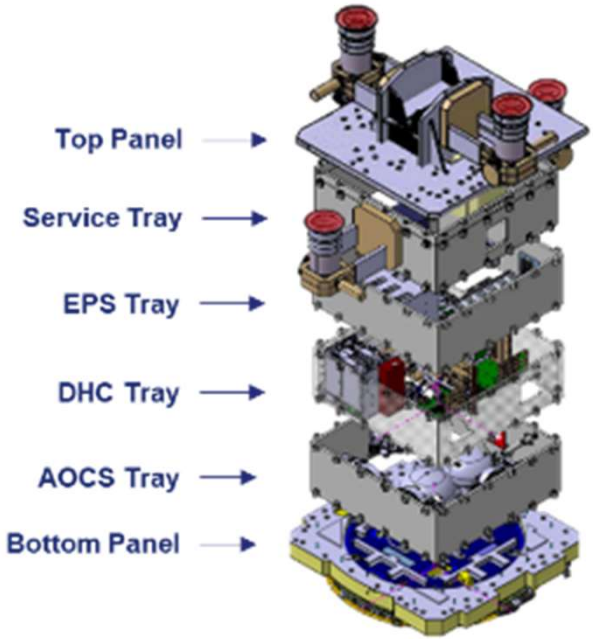
SAR / VHR / COM Satellite – ARCHITECTURE OVERVIEW







The general architecture refers to a highly modular spacecraft based on 3 **main modules, a radar payload tray for the EO SAR, a service tray and the solar array.** Top Panel interfacing the trays and the P/L instruments /appendages and a Bottom Panel to interface with the tray and the LVA ring as well as to accommodate PRP S/S. SAR Antenna, Optical telescope instrument and **The COM Payload** (4x Optical Terminals and 1 HPC)

SPACE SMART FACTORY

// SATELLITE AIT ACTIVIES WILL BE CARRYED OUT AT SPACE SMART FACTORY SECURING LDO CONSTELLATION CHALLENGING SCHEDULE

DEDICATED INTEGRATION & TESTING LINES

Dedicated work cells in place ensuring availability of qualified areas, means and personnel:

AIT Work Cell for DHC Tray

ANTENNA PRODUCTION LINE

Dedicated work cells in place ensuring availability of qualified areas , means and personnel:

// AIT Work Cell for Mechanisms Subassemblies: Antenna Hinges and HRM's

// AIT Work Cell for Electrical & RF Parts : Radiating Boards - Harness - BFN

// AIT Work Cell for Wing-1 : Wing-1 Assembly and relevant Panels

// AIT Work Cell for Wing-2 : Wing-2 Assembly and relevant Panels

// Antenna Subsystem AIT Work Cell : complete Antenna Subsystem

Dedicated Incoming and storage area

Two working areas dedicated to the antenna assembly, equipped with automatic test benches, tailored GSE and S/W tools for mechanical and electrical tests.

Main test facilities are: Thermal chamber, Shaker System, Near Field, Laser Tracker. Double shifts operations are possible to improve capacities or to support antenna troubleshooting phase if needed.

Dedicated AIT Work Cells

Key Enabling Technologies

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Unibap Space Solutions

HARDWARE


Unibap iX5 ADS


Unibap iX10 ADS


Unibap iX5-106

Leonardo Constellation

Orbital Plane 1


Unibap iX10-102

Orbital Plane 2


Unibap iX20-101M

Synthetic-aperture radar (SAR) → *Realtime ISR*

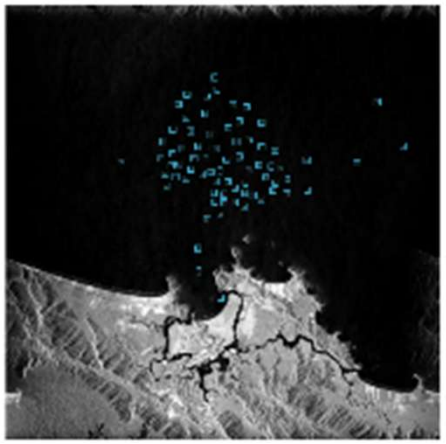
SAR raw-data pre-processing pipeline

- Raw data from Copernicus' Sentinel-1A
  - *16384 x 16384 pixel images*
- *Takes ~9 s to record (~30 megapixel/s)*

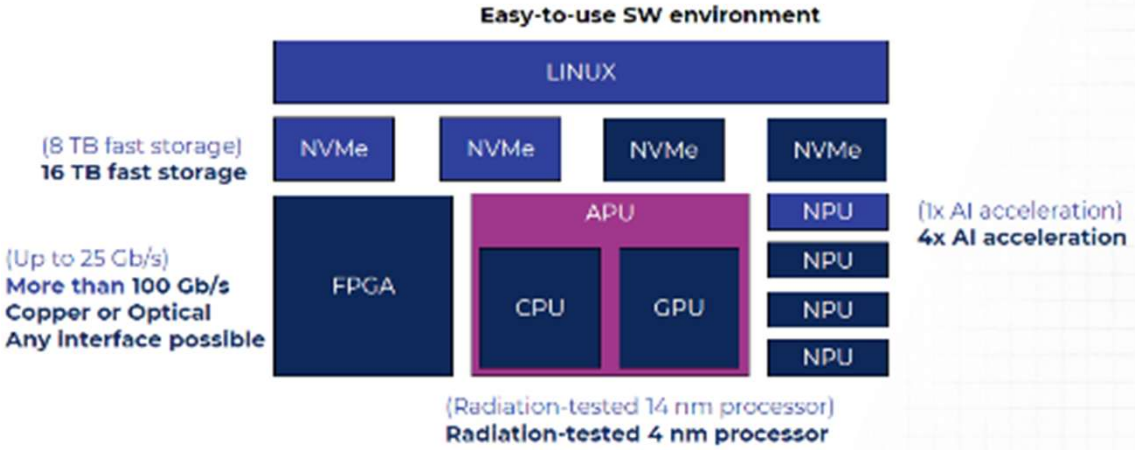
Prep-processing in Unibap's optimized iX10 image formation pipeline

- *Takes ~3 s*
- *90 megapixel/s*

Enables live in-orbit object detection and cognitive SAR sensor



iX10 vs **iX20**



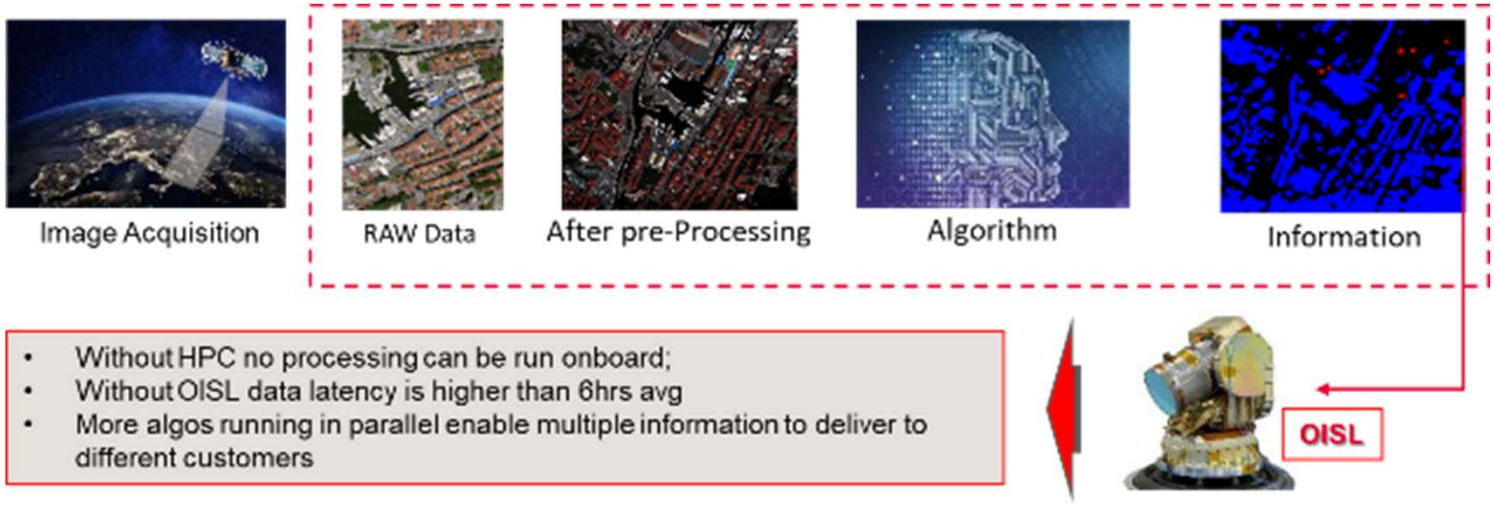
Optical Inter Satellite Link

- Data relay: near instantaneous data transfer across the globe (one hop is ≈10 minutes for avionics maneuvers) -> Near instantaneous data transfer;
- Earth Observation: Low Latency Delivery
- Resilient and Secure Comms: Data transferred via OISL are harder to intercept or jam and routing in space reduces dependency on vulnerable terrestrial networks;
- Cross-Theater Data fusion and C2: integration of EO data across dispersed military or operational theaters by fusing and sharing data from multiple sensors/satellites in (near) real time (Joint All Domain Command and Control, Battlefield awareness, Maritime Situational Awareness)
- Reduced GS Costs and Footprint: lower infrastructure requirements on Earth (centralized data aggregation via satellite mesh)

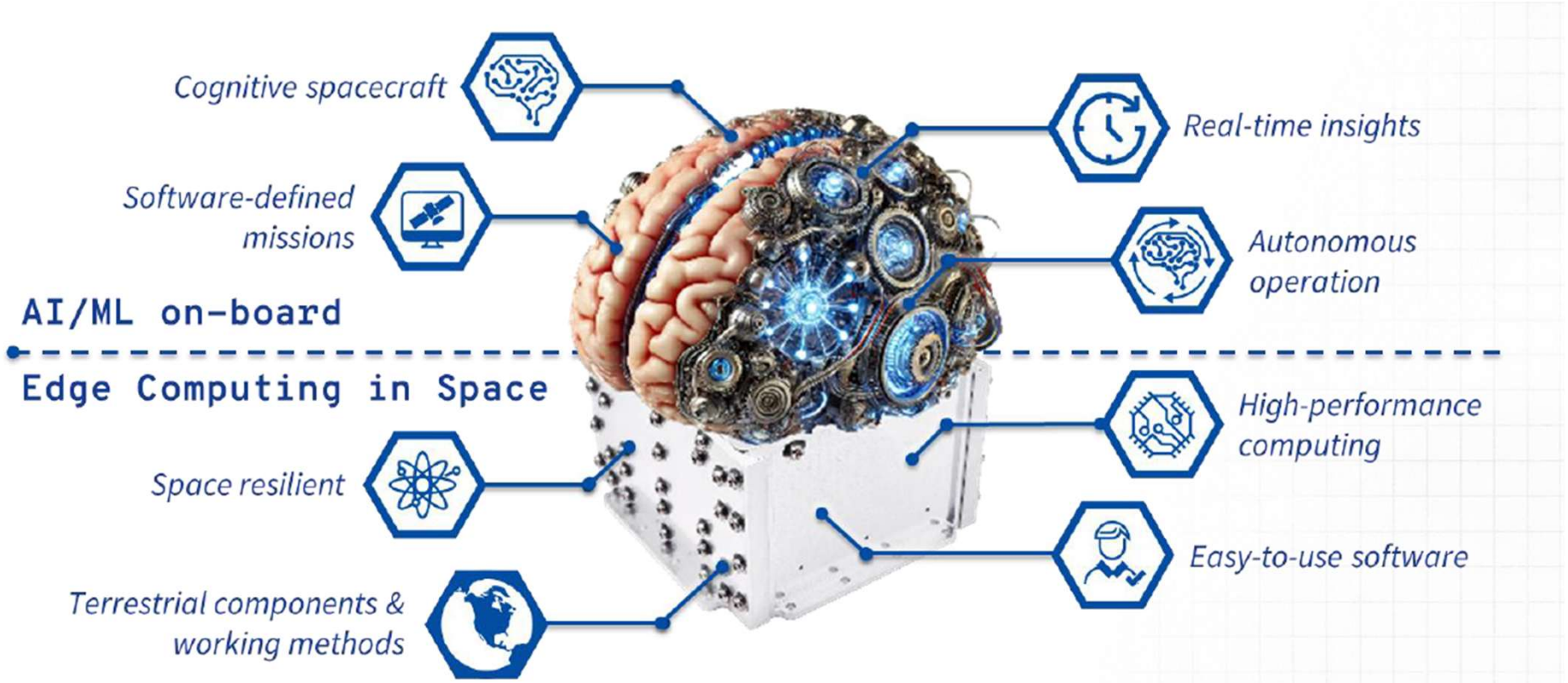
OnBoard HPC

+

OISL



The brain in spacecrafts



Space Cloud Digital Twin

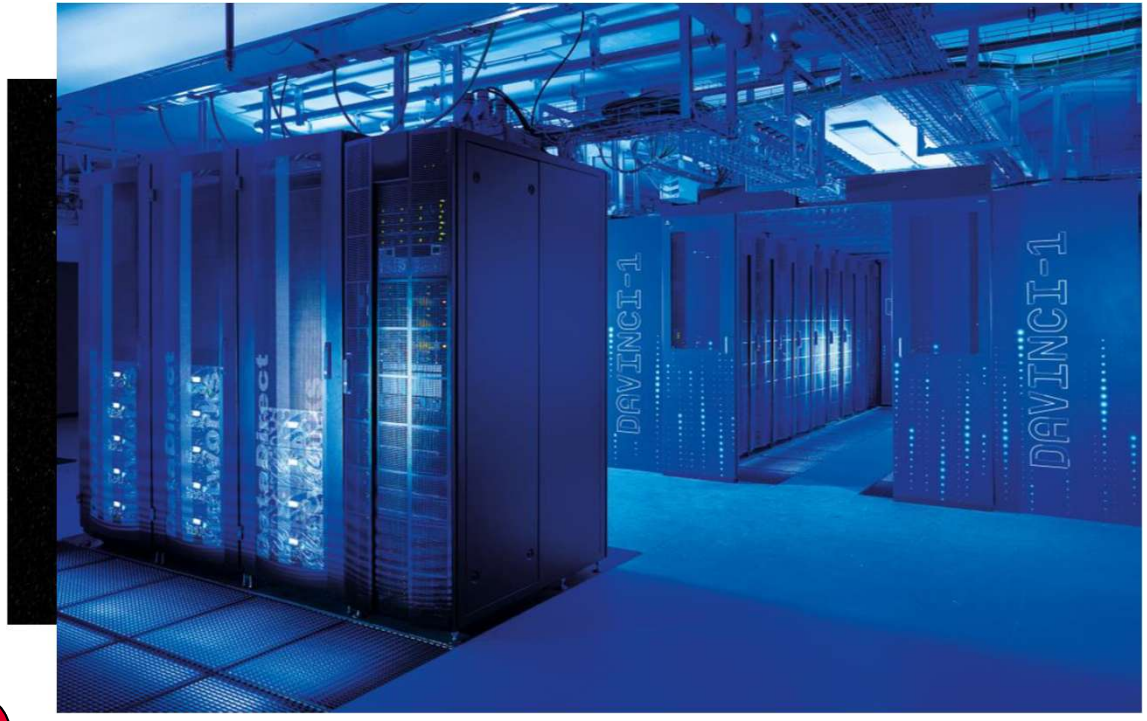
Davinci-1 can support Digital Twin for a Space Cloud: distributed agentic simulation of the Constellation

All agents are active entities that act autonomously, interacting with the environment and each other

Communication, resource utilizations and tasks are monitored; data is stored in TimeSeriesDB, allowing for data collection and analysis

Focus is put in the study of the correlation between environment configuration and agents reactions, planning to add HIL (Hardware In The Loop) capabilities

- Modelled Satellites as independent Agents
- Added GUI for constellation visualization and interaction
- Network traffic monitoring



31.9 PB
storage capacity

100 gbps
read/write speed

6.6 PFLOPS
peak performance

Ground and User Segment

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Key Elements of Ground Segment and Operations

SPACE SEGMENT

ENGINEERING

Ground Segment and ILS & OPS

- Definition
- Design
- Development
- Integration
- Validation
- Qualification
- Simulation & Training

Launch

LEOP&IOT

GROUND SEGMENT

GROUND CONTROL and USER SYSTEMS →

GROUND STATIONS NETWORK (Antennas) →

GROUND INFRASTRUCTURES →

- Infrastructures Monitor&Control Systems and Antennas Scheduler
- Networking and Security Systems, Data Centers
- Building, civil infrastructures and Energy Services

ILS&OPS PREPARATION AND TRAINED PERSONNEL →

- Integrated Logistic Support Systems
- Personnel Training for ILS&OPS services

OPERATIONS

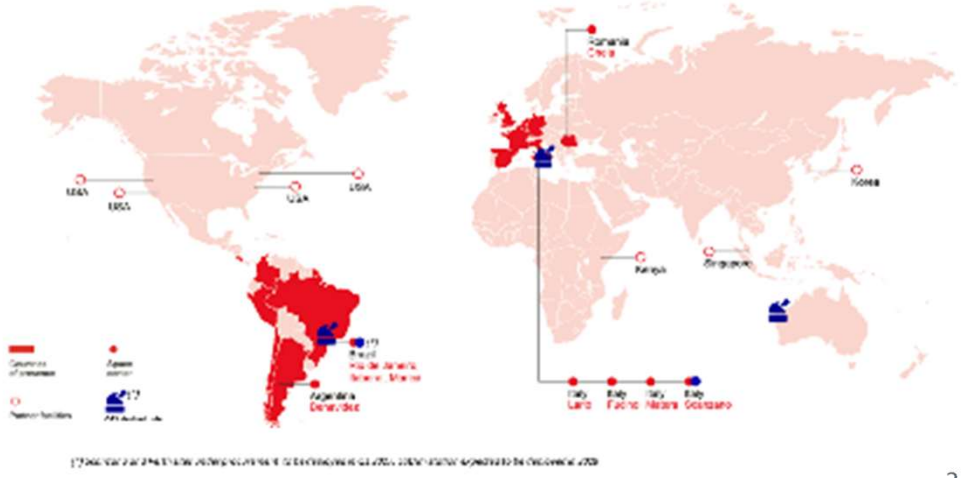
- Flight Operations
- Ground Infrastructures Operations
- Network and Security Operations
- Mission Operations
- Logistics and Maintenance

Optical Ground Stations SoW

Telespazio investment on Optical Ground Stations Network

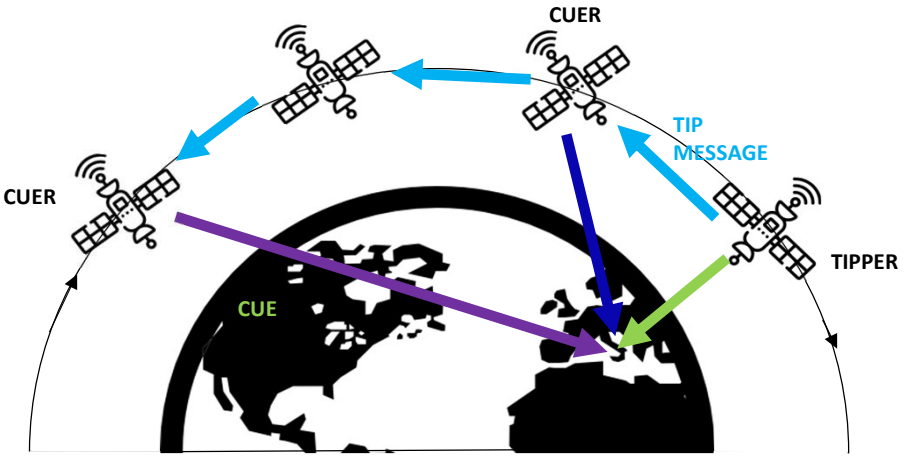
- Purpose: design, manufacturing, and deployment of an initial core of **2 Optical Ground Stations** for the future provision of optical satellites communication links globally
- Target sites: Scanzano (Italy): Telespazio teleport, colocated with future **HyDRON** station
  - Perth (West Australia): ESA site, test site for other OGS
- Station required to implement **downlink** and **uplink** for Earth Observation use cases
- State of art interfaces (CCSDS and SDA protocols) at the highest standardised datarates (10 and 2.5Gbps respectively)
- Innovations - Suppliers to provide data and models to implement Telespazio **predictive maintenance** algorithms, Stations shall be ready to integrate **QKD modems**
- Timeline:
  - RFQ Issued: November 2025
  - deadline for proposals: January 2026
  - Initial core 2-stations OGSN commissioning: Q2 2027

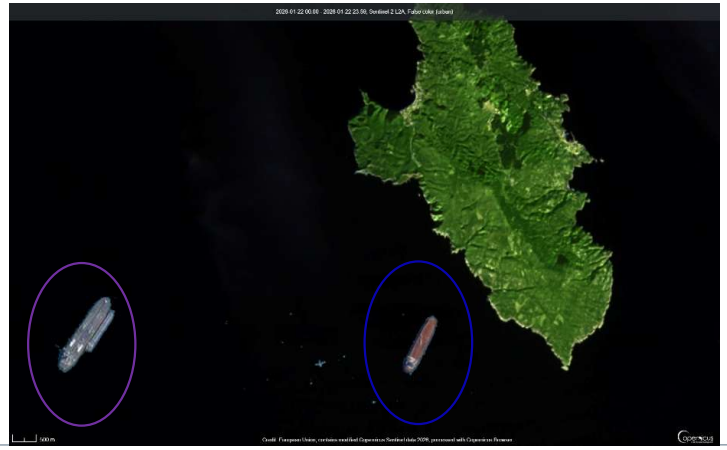
ARGUS
Optical Communications



Extended Ground Segment

- EO Constellations performance are constrained by the need to communicate with the ground for the decision process
- **Edge HPC units** can bring in space several services now implemented in the Ground Segment
- **Onboard processing** highly improve constellation performance in several aspects
  - Increase reactivity
  - Downlink optimization
  - Reduce latency in decision making process
- New service concepts are possible: tip&cue, dynamic routing of P/L data
- Ground segment is evolving to support these new opportunities and federate ground and flight assets
  - AI algorithm are at the core of the process: feature extraction, autonomous planning, optimize acquisition parameters





User Segment and User network

- Through **eGEOS** Leonardo GI offering can rely on (i) **high-end datasets generated by the coherent tasking of radar and optical sensors** and on (ii) **high speed delivery chain to feed NRT requirements.** Integration of data from LDO Constellation with other current national assets (Iride, Cosmo), as well as third parties' data, will **enhance LDO Group role as "data provider / data broker" for its reference customers**, and will **augment capabilities of its application platforms and services in the different vertical segments** (agriculture, maritime, critical infrastructures, natural resources, emergency, law enforcement, land management, urban planning, global monitoring / security).

- Digitally enhanced user ground segment **(e-GIC**) with advanced tasking and processing capabilities, thanks to recourse to **HPC, AI, Cloud and data analytics**, further strengthens LDO GI offer, enriching solutions portfolio, in particular for institutional customers.

- Architecture, features and performances of the LDO constellation are conceived to support its **potential federation/ convergence with the envisaged MoD It sovereign ISR assets**

- Enhanced **marketplace** to access Geo Information Analytics and Digital Service enabled by LDO Constellation data will be developed taking benefit from the cloud based eGEOS CLEOS plartform and the experience developed in IRIDE program.

Thank you
for your attention

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