

# **The EU's ambition on ISOS**

A PILOT MISSION TO BUILD THE IN-SPACE ECONOMY AND  
A SERVICE INFRASTRUCTURE IN SPACE

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EU SPACE

# A key strategic capacity: Act in Space

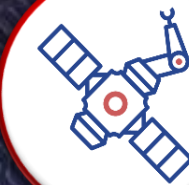
## *In-Space Operations and Services (ISOS)*

Servicing  
Assembly  
Manufacturing  
Logistics  
Debris Removal



European  
Commission

Ability to inspect, maintain, repair, reconfigure, build, assemble, disassemble, recycle, relocate, remove and transport operational, non-operational and defect objects in space with autonomous systems, including platforms or larger structures for operations and services.







EU SPACE

# EU ISOS Pilot Mission

IN-SPACE OPERATIONS AND SERVICES  
4 INFRASTRUCTURE (ISOS4I)



Information page at the  
Digital EU Space Ecosystem







# EU SPACE

## HOST

*Providing supply for docked commercial and governmental servicer and logistic spacecraft, hosting and distributing satAPPs, IOD/V experiments, propellant*

## SERVICING

*Providing commercial and governmental services*

## EMBARKING PUBLIC AND PRIVATE ACTORS

## LOGISTIC

*Transporting cargo and supply to HOST, disposal of old cargo, providing other transport services to commercial and governmental spacecraft*

## satAPPs

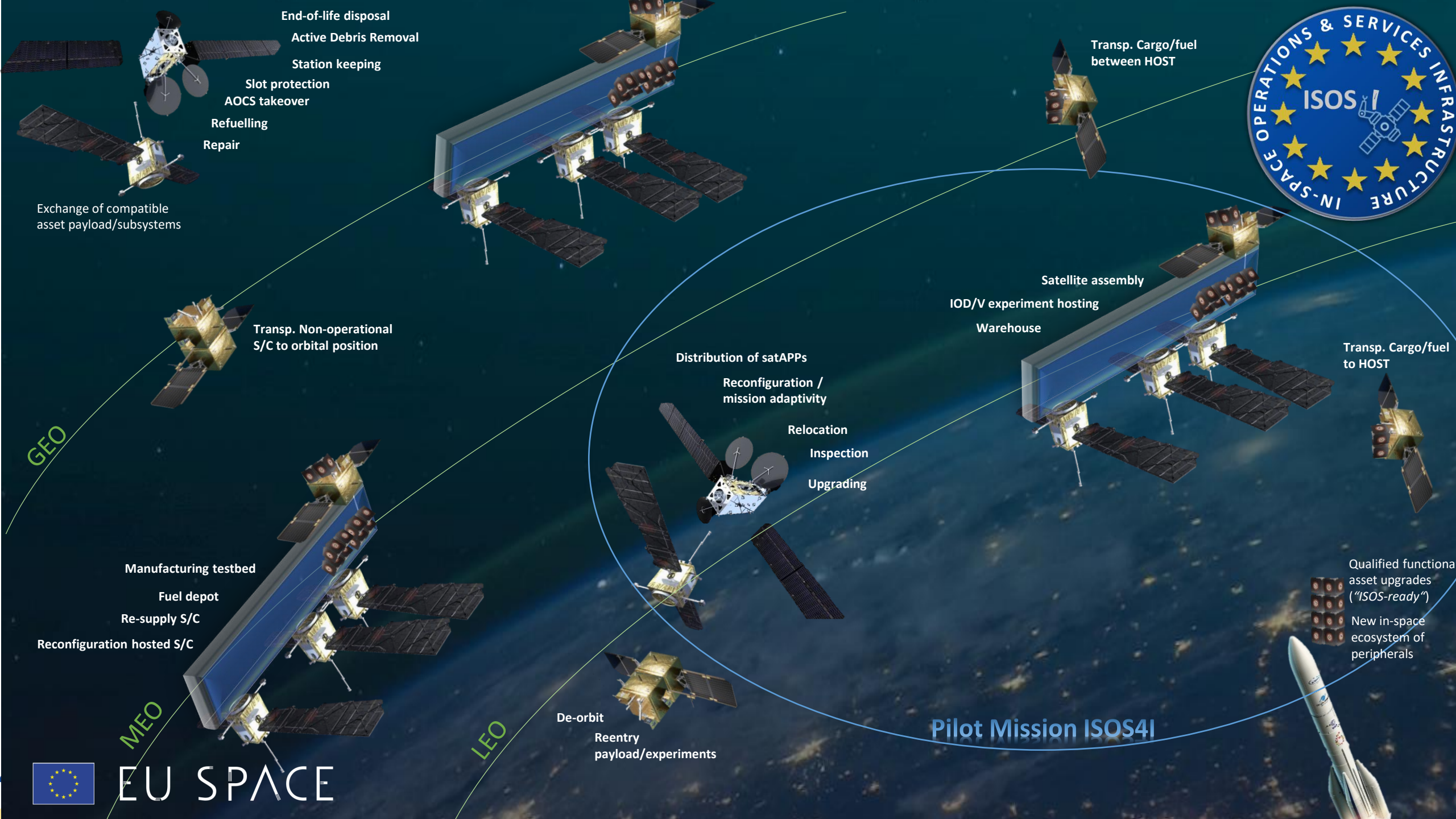
*Building an ecosystem of functional satellite upgrades (plug'n'play peripherals)*

### Pilot Mission ISOS4I

### In-Space Operations & Services 4 Infrastructure

Pre-cursor for continuous provision of on-demand in-space services to the Space infrastructure







# Space Economy

## In-Space Economy

### Orbital economy

#### Space-based service infrastructure

Orbital services

Orbital Service infrastructure

#### IN-SPACE OPERATIONS & SERVICES



Satellite Servicing  
Assembly  
Manufacturing  
Transportation  
Removal  
Recycling  
Resource mining  
Energy harvesting  
ISRU

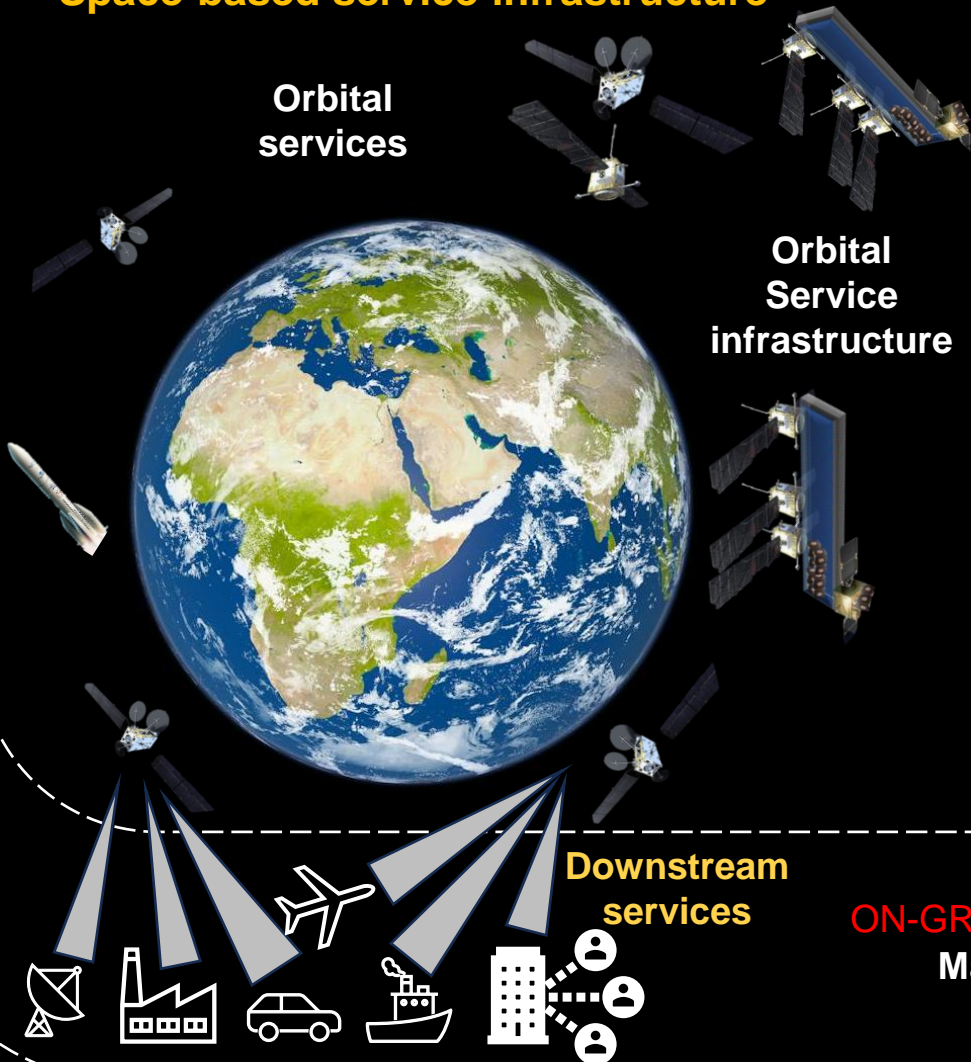
### Beyond Earth's Orbit economy

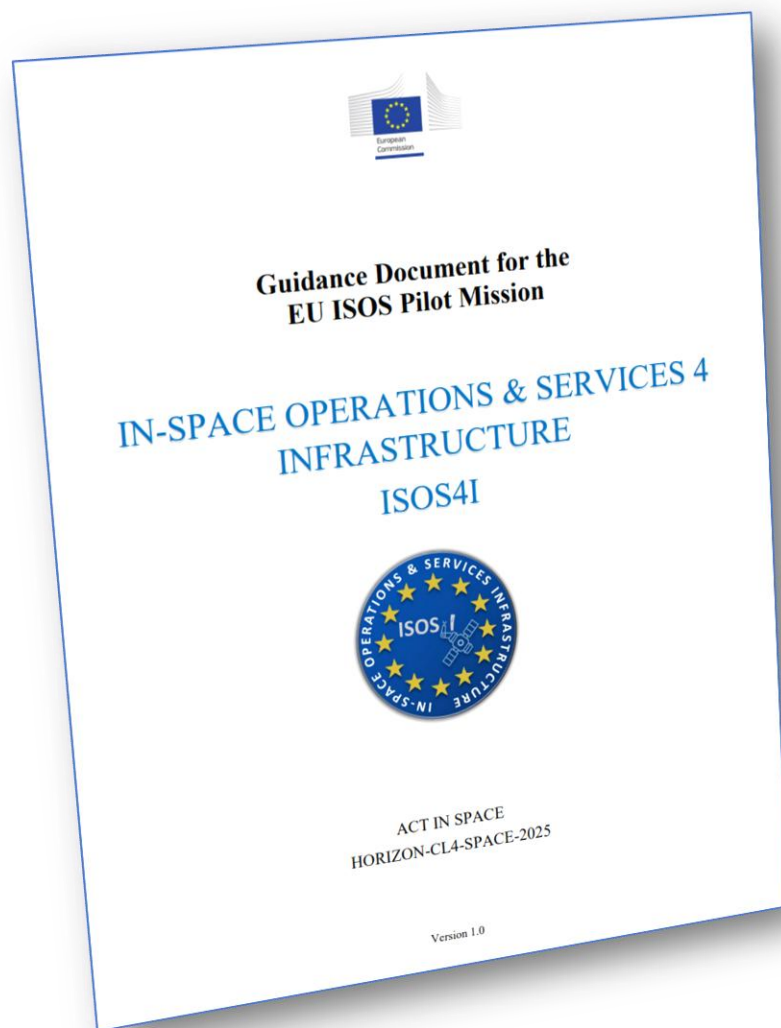
Robotic missions to the Moon, Mars, and other celestial bodies  
Asteroid Mining for resources extraction (water, helium 3, metals),  
Distributed power capacity

#### Downstream services

#### ON-GROUND MANUFACTURING, OPERATIONS & SERVICES

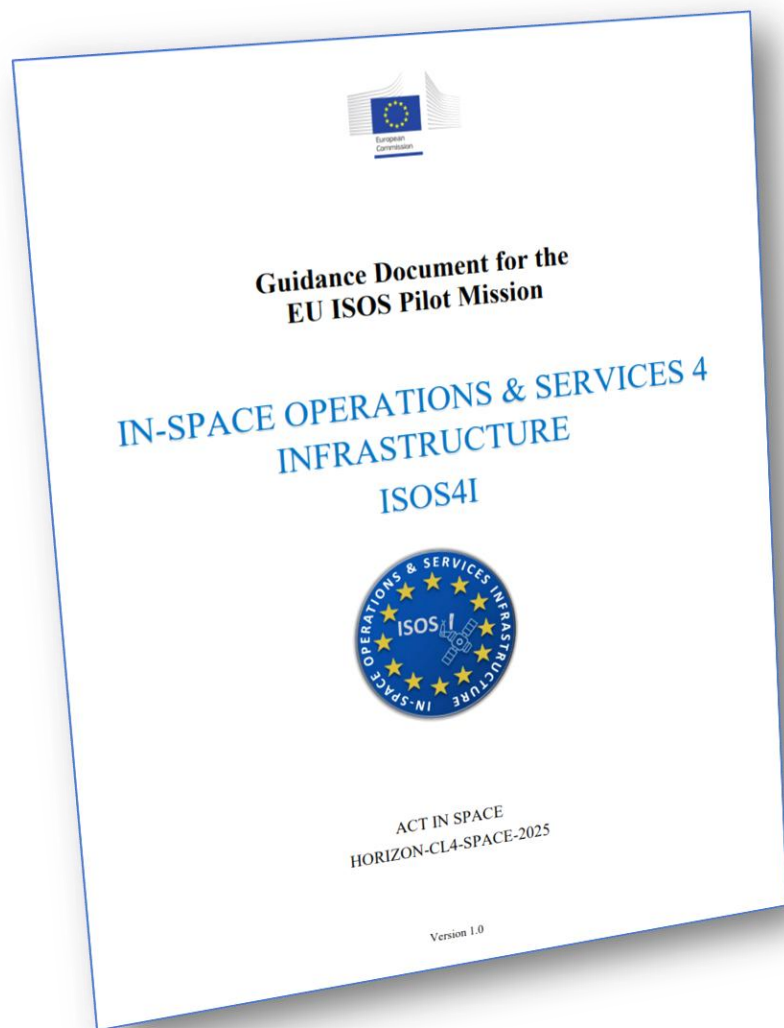
Manufacturing of satellites and space infrastructure  
Ground Segment Operations





- **Collaborative work** since last summer between the **European Commission and Member States and EEA countries (PMAG\*)**

- Annex for HE CL4 calls
- Informing also EDF and EIC calls



Mission objectives



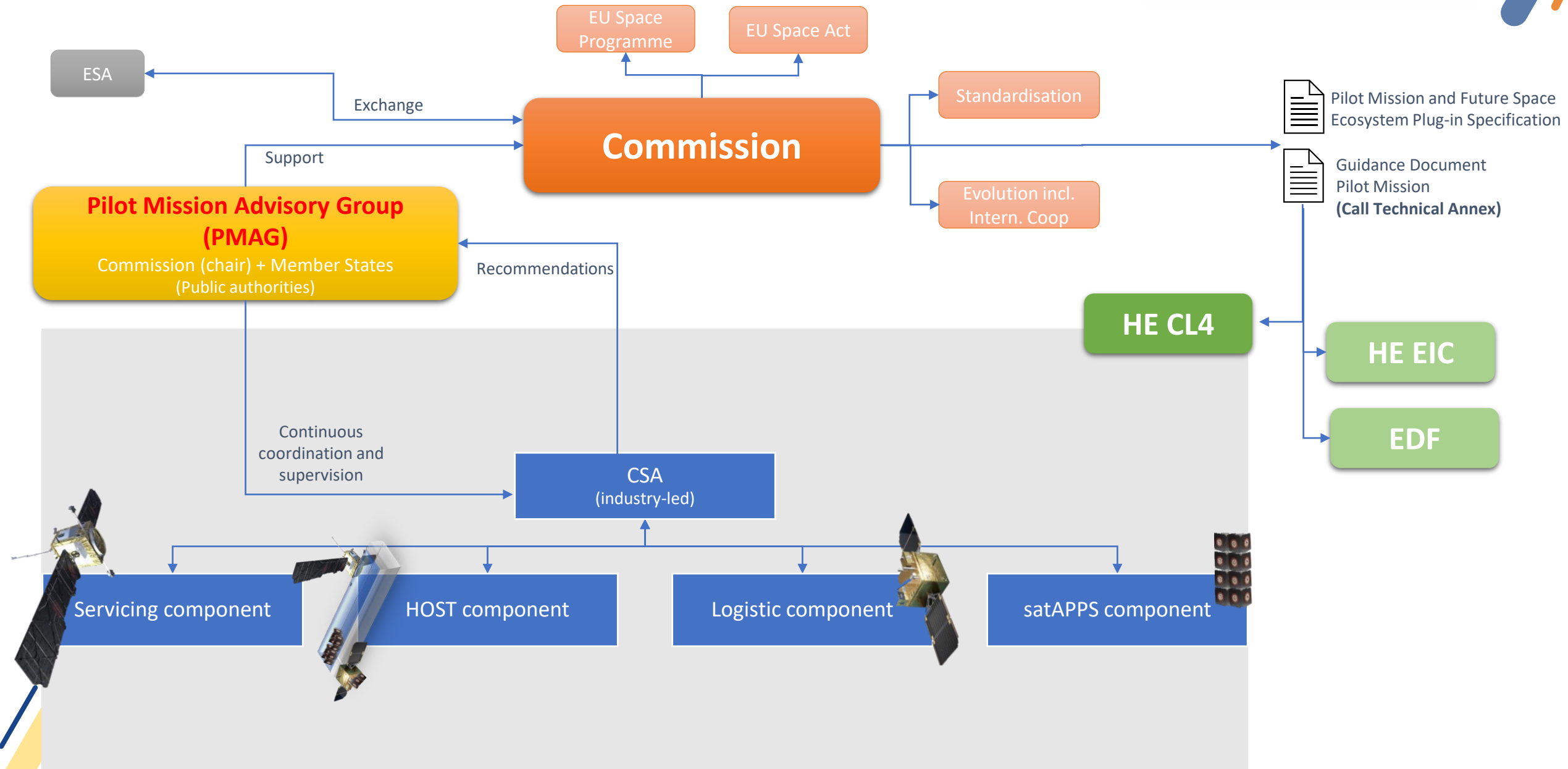
Boundary conditions



High-level requirements

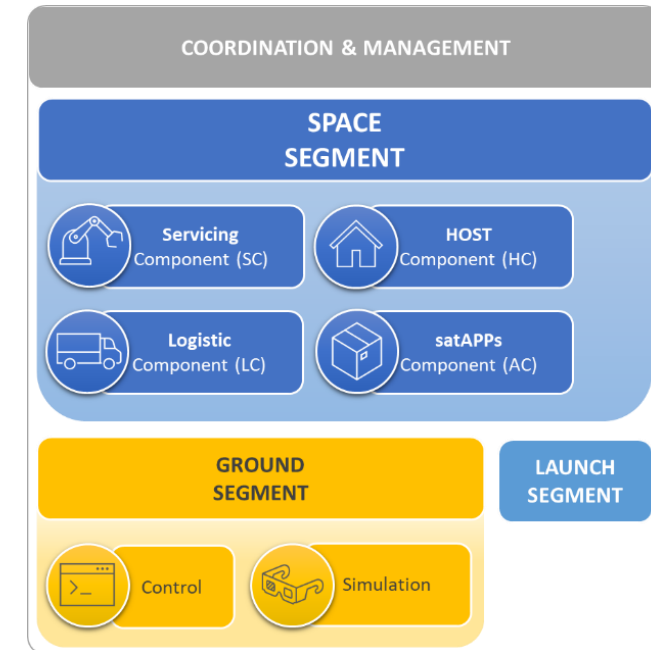


# Coordination of actions




# ISOS4I - Mission architecture

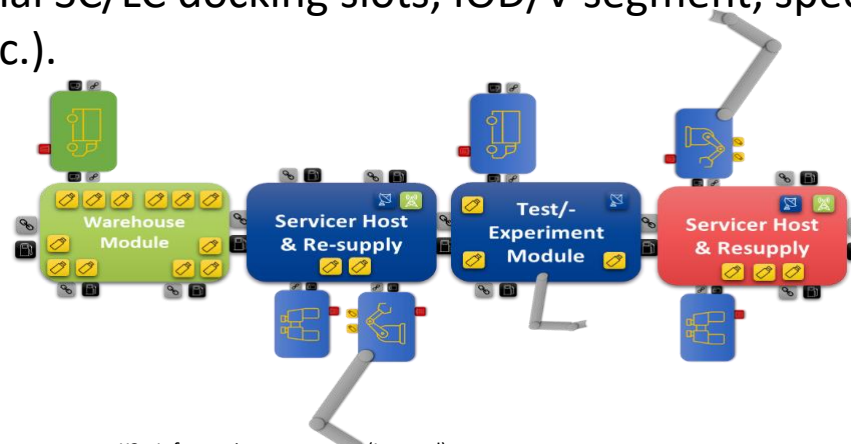
- ISOS4I has **unique mission character** also with regards to its **mission architecture that is not limited to the mission baseline demonstration**, and objectives respectively
- **Mission coordination and management** will be treated in the ISOS Pilot Mission Coordination and Support Action (CSA)
  - Coordination between the mission components incl. interoperability scheme
  - Preparing the deployment plan and operational sequences of the overall pilot mission
  - Consolidate specifications for ground and launch segments of the mission components
- **Each of the projects** implementing the four components **of the space segment** should **identify and consider specific needs for ground segment and launch segment**.





# ISOS4I - Mission architecture (2)

- 
- A small icon of a robotic arm with a blue base and a grey arm, positioned to the left of the first bullet point.
- **Servicing component (SC):** This component will deliver different services in space to governmental, institutional or commercial satellites, addressing specific use-cases, ranging from inspection to relocation, robotic manipulation and refuelling of client spacecraft. It may consist of different types of commercial or governmental servicer spacecraft addressing additional use-cases.
  - **HOST component (HC):** The HOST “Hub for Operational Services and Testing” will provide supply for docked servicer and logistic spacecraft, host IOD/V experiments (enhancing the European Commission’s IOD/V initiative) and a robotic testbed for on-orbit assembly/manufacturing. The HOST will be designed as a scalable, modular, flexible platform component, equipped with robotic manipulation capabilities, and satAPPs-compatible slots and refuelling capability (for the HOST and docked servicer/logistic spacecraft). After the pilot mission, the HC capabilities could be extended and reconfigured to meet different demands (e.g., governmental and commercial SC/LC docking slots, IOD/V segment, specific robotic/manufacturing testbeds, warehouse/stockpile, etc.).



K2 - Informacja wewnętrzna (Internal)

Example illustration of the HOST component (with docked servicer/logistic spacecraft)

# ISOS4I - Mission architecture (3)

- **Logistic component (LC):** This component will provide transport services in space of cargo, i.e. satAPPs, fuel and other consumables. It will bring supply taken over from launcher to the HC. While for the pilot mission one single logistics spacecraft is foreseen, the ISOS LC may consist of different types of logistic spacecraft addressing additional use-cases such as last-mile delivery services or logistic services beyond Earth orbits or return to earth of cargo/experiments and disposal services.



- **satAPPs component (AC):** This component will create an ecosystem of composable and exchangeable functional satellites modules that can bring additional functionality to satellite platforms (based on the plug'n'play principle), host experiments for IOD/V or fuel for life extension. A satAPP is a composable and exchangeable functional satellite module that can be connected to other satAPPs or a spacecraft prepared with a specific USB-like interface (Universal Service Interfaces - USI).





# ISOS4I – Mission/system policy drivers

Main **policy drivers of this mission** are to boost:

- **Sustainability:** offering solutions for maintenance and repair services, e.g., for life extension
- **Competitiveness:** introducing a new in-space economy, on-boarding new commercial entrants and offering solutions for enhance operational flexibility and mission adaptivity to the assets, e.g., through plug'n'play upgrades and relocation or platform reconfiguration services
- **Safety:** enhancing the safety of space assets and critical infrastructure, e.g., through debris removal
- **Resilience:** offering solutions for inspection, damage assessment, repair and maintenance, refuelling, upgrading and reconfiguration of assets



# ISOS4I - Baseline demonstration

MISSION ACCOMPLISHED → Baseline Demonstration completed

## BASELINE DEMONSTRATION

A

+

B

A sequenced operation involving all four components

- **A logistic operation** supplying the HOST platform with functional modules (satAPPs, incl. experiments), and fuel
- **A HOST-based manoeuvre** that displaces satAPPs across the platform and assembles a small functional asset based on satAPPs with robotic means, and refuels and recharges a docked servicer/logistic spacecraft;
- **A servicing operation** implementing satellite upgrade and maintenance using the satAPPs hosted on the platform

A servicing operation to a cooperative\* client (non-prepared)

- **Service operations** that demonstrates rendezvous, inspection, berthing or docking, AOCS takeover and relocation or End-of-Life disposal

\*Not necessarily fully functional



































# Interoperability aspects

- Mission and system design process has to ensure interoperability of mission components
- CSA will further elaborate and consolidate interface requirements in coordination with other mission components and PMAG

Major aspects:

- Docking and refuelling interfaces should be the same for SC, HC and LC
- HC to support of multiple EU-based USI solutions; chosen solution(s) are of sufficient maturity to reach TRL 6
- AC should support by design satAPPs series based either on multiple EU-based USI solutions or a single USI solution in its baseline configuration; chosen solution(s) are of sufficient maturity to reach TRL 6

	SC	HC	LC	AC
SC	   	   	  	 
HC	<i>preliminary baseline configuration</i>		   	 
LC			 	Cargo rack
AC				 

 Universal Service Interface (USI) 
  Refuelling Interface 
  Docking Interface 
  Removal Interface  
 Communication protocol compliance 
  Software format compliance 
  Ground Communication Link

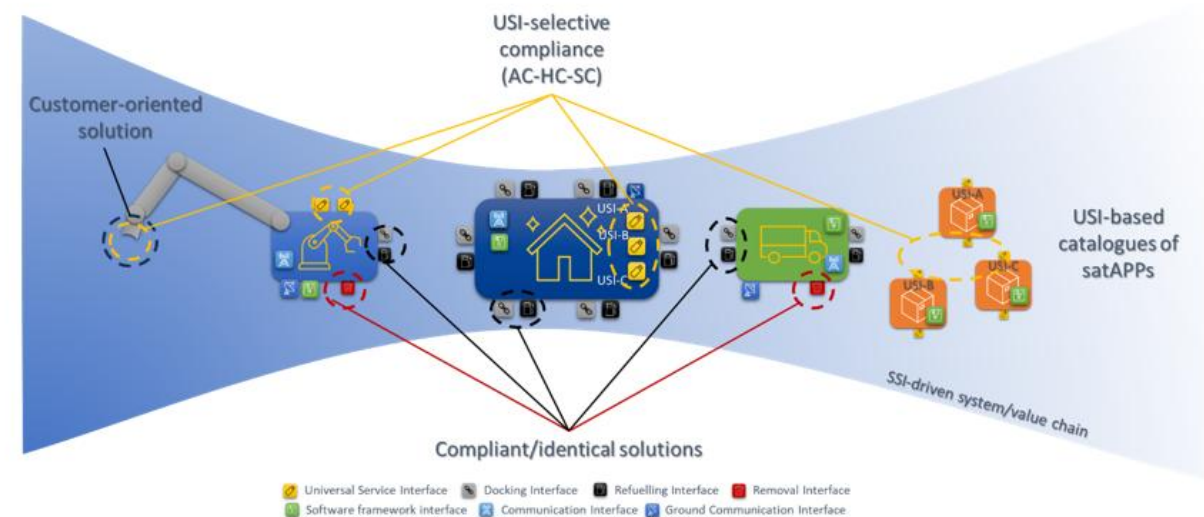


FIGURE 5 SSI-DRIVEN SYSTEM AND VALUE CHAIN

# HORIZON-CL4-2025-02-SPACE-ISOS topics

## Common topic expectations – cross-cutting aspects



- Proposals should clearly present a **concrete plan to ensure that required technologies reach the necessary TRL at the end of the project**. Moreover, **complementarities with previous and/or ongoing R&I** for the proposed [...] component should be clearly described. More specifically, proposals should **explore relevant and promising solutions** developed in Horizon Europe, Horizon 2020, or other EU-funded relevant activities, in particular, the topics: Future Space Ecosystem (HORIZON-CL4-2021-SPACE-01-12/ 2022-SPACE-01-11/ 2023-SPACE-01-12) and in relevant projects funded by the European Space Agency (ESA) and/or national programmes. Finally, proposals are also expected to **consider the use of existing European technologies and/or building blocks, including at component level**, contributing to European non-dependence and strengthen competitiveness (**except for CSA**)
- The project(s) selected from this topic are **expected to collaborate among themselves** and with those selected under topics HORIZON-CL4-2025-02-SPACE-21-22, 23, 24 and ISOS Pilot Mission Coordination and Support Action, in order to ensure **interoperability and the necessary and sufficient documentation and information sharing for the implementation of the Pilot Mission**, to make economies of scale in sharing best practices, defining common processes for addressing the different challenges, ensuring efficient monitoring and review, organising dissemination and communication activities, etc. Such collaboration among all those projects will be formalised by a **collaboration agreement**.
- Proposals are expected to **consider and contribute to a balanced provision of Member States' and eligible Associated Countries' expertise and capabilities** to the overall ISOS pilot mission, to support a successful introduction of the strategic capacity 'Act in Space' for the EU, its Member States and other partners. (**except for -24: satAPPs**)
- **Ensuring the availability of results to the next mission phases.**





**Thank you!**

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