

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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DG DEFIS · European Commission



EU SPACE

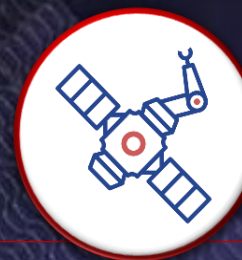
A key strategic capacity: Act in Space

In-Space Operations and Services (ISOS)

Servicing
Assembly
Manufacturing
Logistics
Debris Removal
Reuse/Recycling



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 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



Pilot Mission ISOS4I

In-Space Operations & Services 4 Infrastructure

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



satAPPs

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



ISOS4I - Baseline demonstration

MISSION ACCOMPLISHED →

Baseline Demonstration completed

BASILINE 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

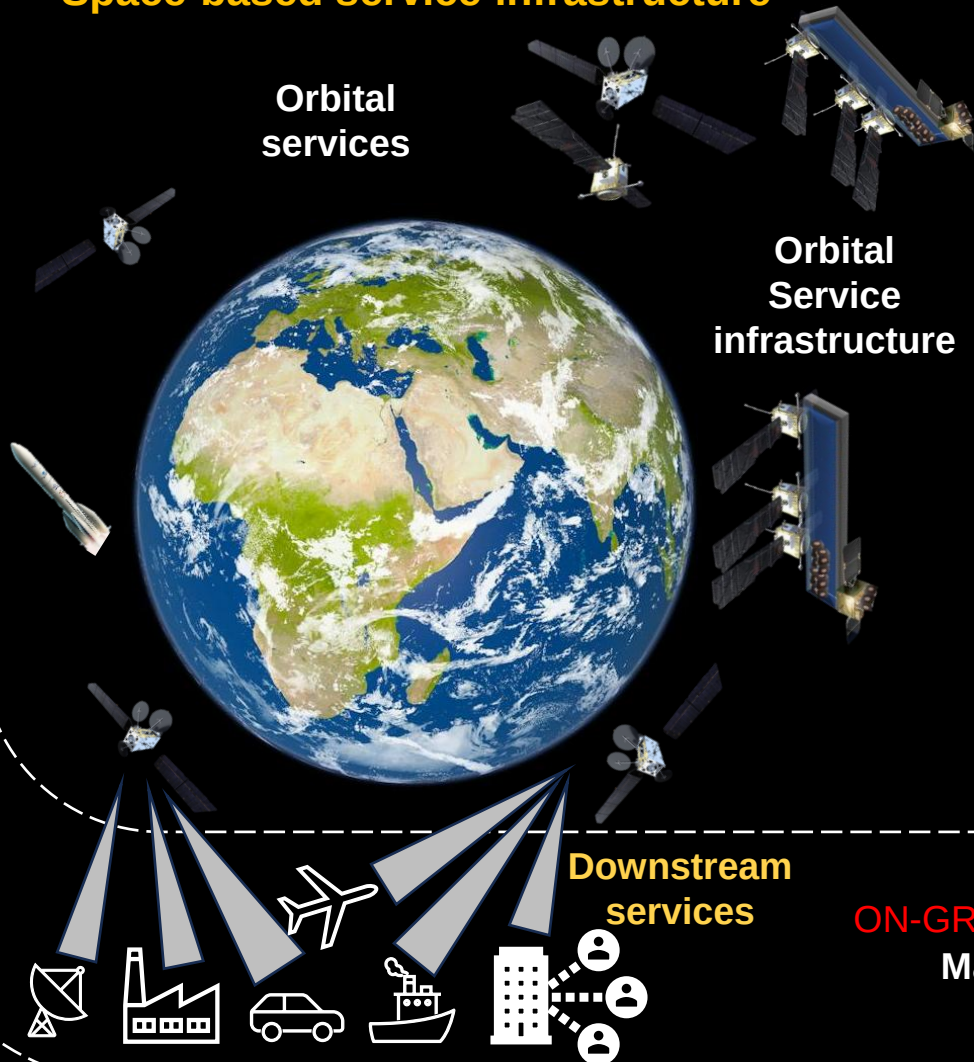


Space Economy

In-Space Economy

Orbital economy

Space-based service infrastructure



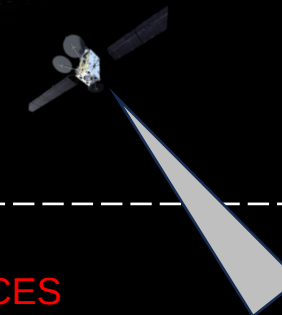
IN-SPACE OPERATIONS & SERVICES



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

Beyond Earth's Orbit economy

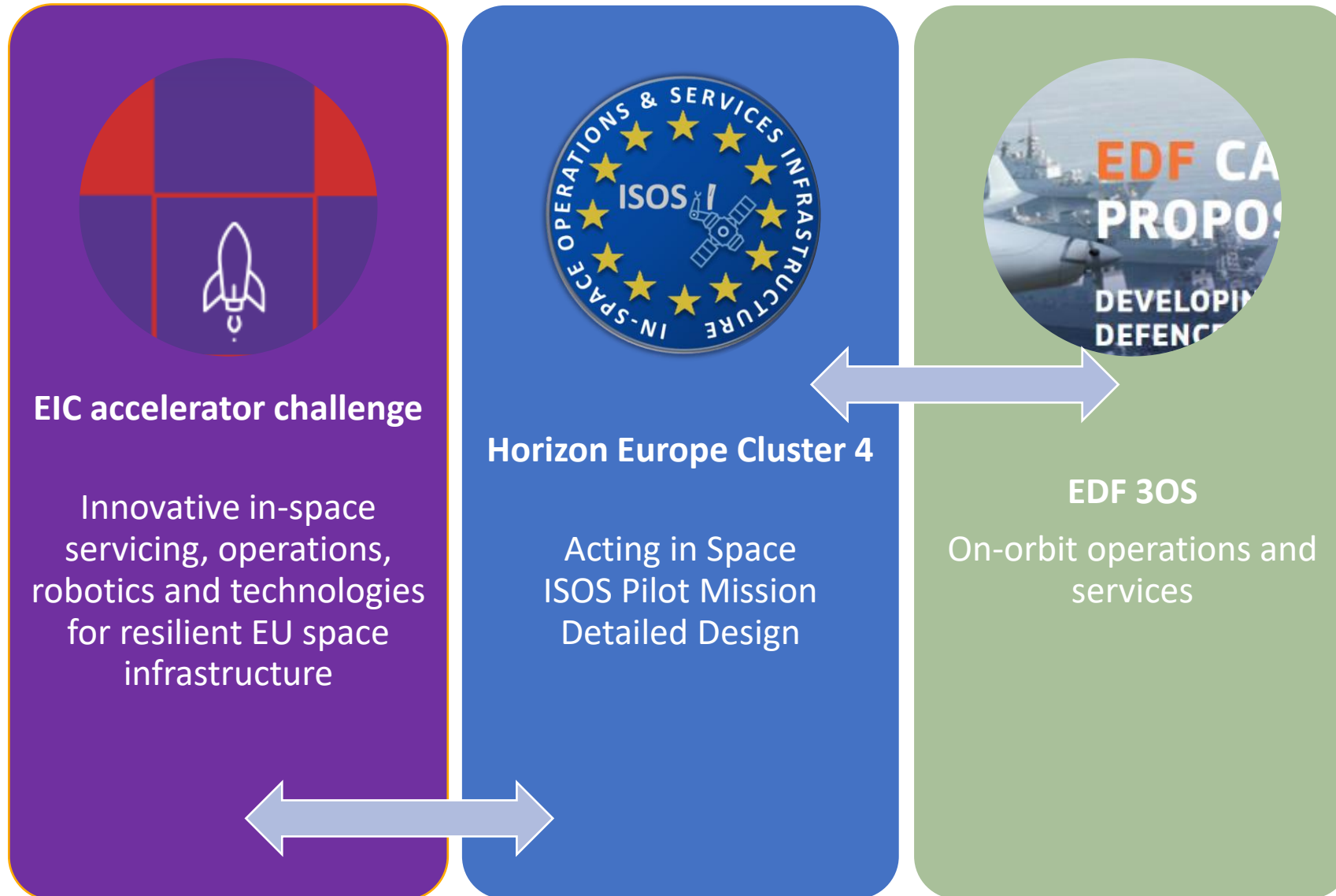
Robotic missions to the Moon,
Mars, and other celestial bodies
Asteroid Mining for resources
extraction (water, helium 3, metals),
Distributed power capacity



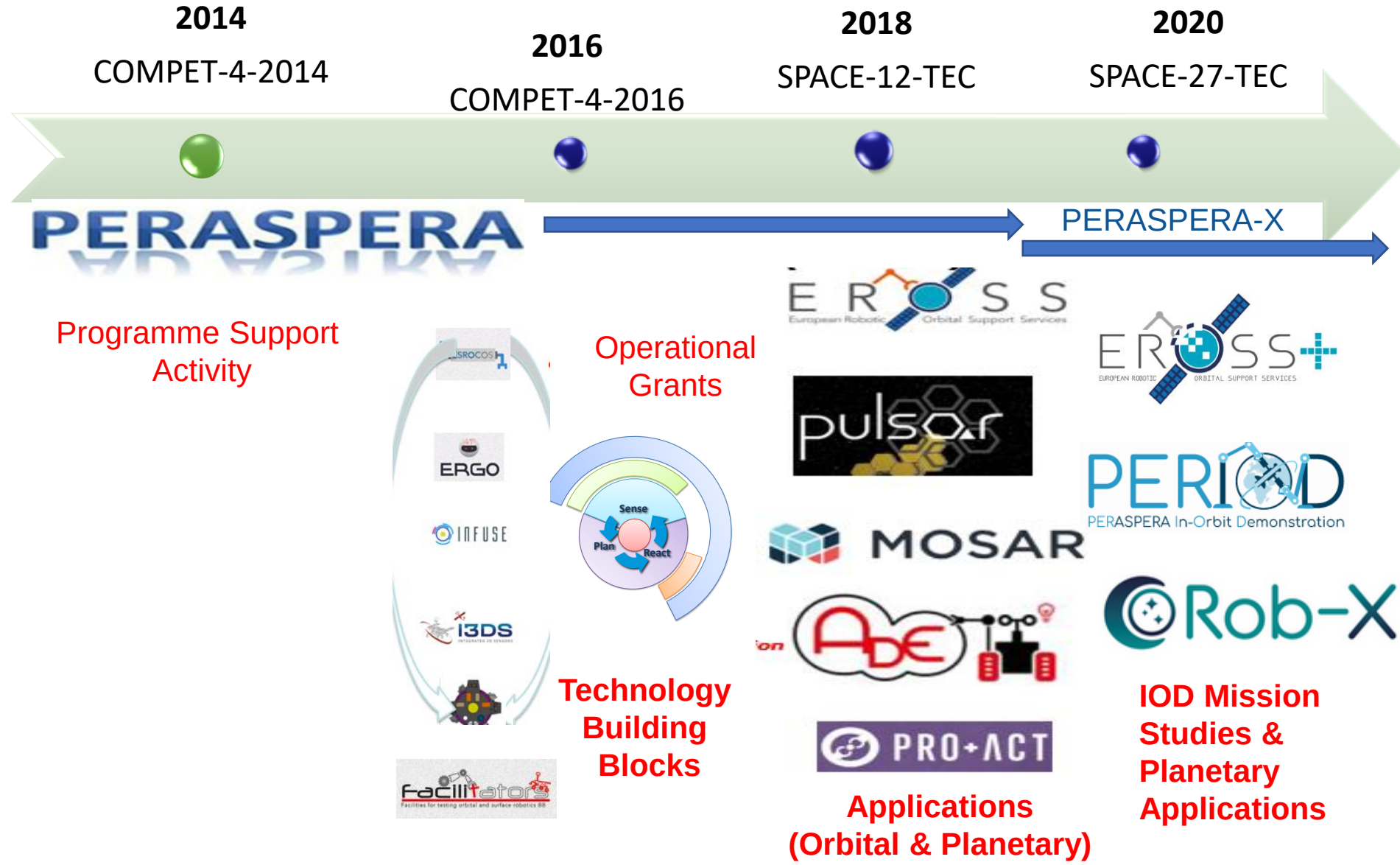
ON-GROUND MANUFACTURING, OPERATIONS & SERVICES

Manufacturing of satellites and space infrastructure
Ground Segment Operations

EU-funding opportunities on ISOS



The H2020 Strategic Research Cluster on Space Robotics Technologies



HE ISOS Cluster



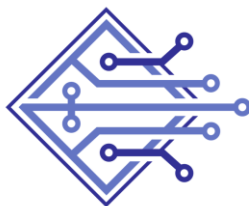
Orbital Replacement Unit



Robotic Servicing
Component

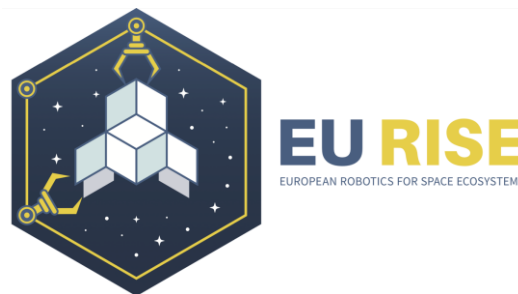


Orbital Replacement Unit



SPACE USB

Interoperable System Interconnects
for an Open standard



In-Space Manufacturing and Assembly



STARFAB:
Orbital Warehouse



Cryogenic propellant, in-orbit refuelling

European Innovation Council

ENDURANCE – GEO Life Extension

ASTROLIFT – Robotic Servicing Tech



GEO RYDER

Kickstage from GTO to GEO



EU Space Act

Chapter IV IN-SPACE OPERATIONS AND SERVICES (ISOS)

Article 101

ISOS

1. Union space operators carrying out ISOS shall comply with the requirements laid down in this Article and Annex VIII from 1 January 2034.
2. For Union owned assets, spacecraft above the mini-satellite class that are operated by Union space operators shall possess a minimal technical capacity to receiving in-space services.
3. For the purposes of ensuring the minimal technical capacity referred to in paragraph 2, a client spacecraft operated by Union space operators shall be equipped with dedicated Spacecraft Service Interfaces (SSI).
4. The Commission is empowered to adopt delegated acts in accordance with Article 113 to further supplement this Regulation by specifying:
 - (a) the main features of the dedicated operational mode for the service that ensures a cooperative behaviour of the client spacecraft and minimises the risk of collision and malfunctions after the service;
 - (b) where space debris objects are threatening other spacecraft and increase the risk of orbit pollution, the requirements needed to enable removal of debris objects from orbits by means of ISOS (active debris removal), including those requirements applicable to the concept of operations.
5. The Commission shall, by means of implementing acts, lay down:
 - (a) the design principles for the dedicated SSI referred to in paragraph 3;
 - (b) the design principles for Composable and Exchangeable Functional Satellite Modules (satAPPs) that can be connected to a spacecraft to deliver new spacecraft functionality or payload, making use of SSIs.

Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 114(2).

Vision for the European Space Economy

Action box 12

The Commission will enhance collaboration on in-space economy with EU Member States in coordination with ESA, focusing on orbital, cislunar and lunar space activities, supporting EU industry, research and academia.

The Commission, in coordination with Member States and ESA, will:

- explore options for an ISOS4I pilot mission by 2030;
- prepare the ground for a new strategic flagship by 2035 that provides on-demand in-space services for maintenance, upgrade, assembly, manufacturing, repair, removal, recycling and logistics tasks for satellites and other objects in space; and
- support the transformation of space infrastructure towards greater sustainability, adaptability and resilience.

The Commission will contribute to the development of the next generation of space infrastructure for in-space services, in collaboration with like-minded partners.

The Commission will prepare the ground for and support maturation of enabling technology for demonstrators of space data centres and distributed computation in space.

The Commission will coordinate with Member States and ESA research activities for resource extraction and utilisation studies, the development of scientific instruments, cooperative and interoperable robotics, building on relevant initiatives such as the Public Private Partnerships on AI, Data and Robotics.

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EU ISOS STRATEGIC FORUM 2025

16-17 DECEMBER 2025
Munich, Germany

IN-SPACE OPERATIONS AND SERVICES

Hosted by



 Federal Ministry
of Research, Technology
and Space

Registration at the
Digital EU Space Ecosystem



SPACE AND DEFENCE

Opportunities for EC-ESA cooperation (mission plug-ins)




Servicing
Providing
Commercial and
governmental
services





- Active Debris Removal and Life Extension
- Refurbishment & Upgrade



IRUS

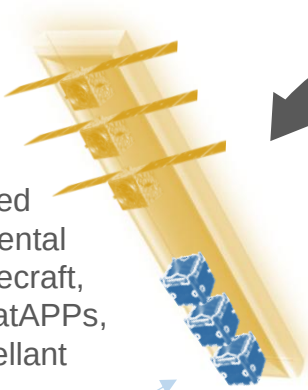
CAT-IOD

ELSA-M

RISE

ERASE


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





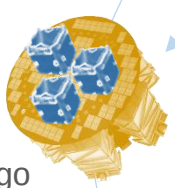
- IOD/V
- In-orbit infrastructure



PoC-4

ODYSSEY


Logistics
Transporting cargo
and supplies, disposal
of old cargo, providing
transport services to
spacecraft





- Transportation
- InSPoCs



InSPoC-1

InSPoC-2

InSPoC-3




Pilot Mission ISOS4I
In-Space Operations & Services 4 Infrastructure
Pre-cursor for continuous provision of on-demand
in-space services to the Space infrastructure



- ESA involvement under discussion



- Refurbishment & Upgrade
- Modular platforms


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





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Thank you!

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