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New Space Resilience Initiatives: A focus on Distributed In Space Processing (DISP)

EUROPEAN SPACE AGENCY

Two Parallel Dynamics: Sovereignty and Federation

1 National capability development

Member States are investing in national space-security capabilities, driven by sovereignty and assured access to critical services.

Risk: uncoordinated growth may fragment architectures, standards and industrial solutions — reducing the collective value of European investment.

2 European-level integration

The EU is pursuing a federated architecture — national, commercial and European assets working together via common interfaces and interoperability.

The emerging Space Shield concept: not one infrastructure, but coherent capability built by federating national, commercial and European assets.

An evolving concept of dual use:

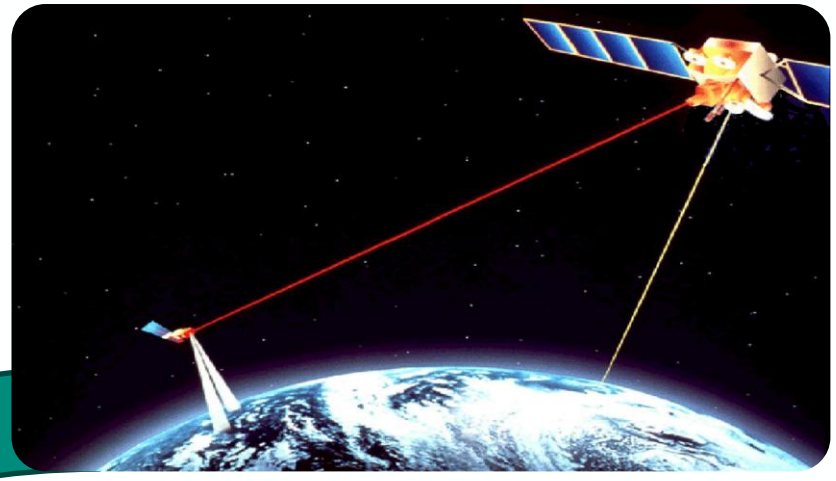
From: civil systems later adapted for defence use

To: civil, commercial and defence needs considered together from the outset

Resilience: ESA Vision

Future resilience needs are evolving rapidly

OBSERVE CONNECT POSITION PROTECT



Interoperability

European, national and commercial capabilities operating together by design while preserving ownership and sovereignty.

Common Enabling Infrastructure

Future-ready transport, processing and orchestration services, common simulation environment developed ahead of emerging needs.

Scaling Europe's resilience while creating new market opportunities

The role of RNC

A dedicated strategic and architectural interface with Member States, their MoDs, and the EU on resilience-related capabilities.

1. Engage systematically with Member States and governmental users to consolidate capability requirements
2. Translate user needs into capability concepts, system requirements and system-of-systems architectures
3. Identify how national, commercial and institutional capabilities can be federated and interoperable
4. Assess maturity of existing European capabilities and identify gaps requiring new development
5. Support governance, security and information-sharing frameworks
6. Engage with European institutions for coherence with EU capability initiatives
7. Prepare and implement activities through the most appropriate ESA programme instrument

The starting point is the capability required by the user — not the technology available from industry.

Priority areas for cooperation

A number of areas already show significant potential

Distributed In-Space Processing (DISP)

Protection against interference, jamming, spoofing and physical proximity threats (e.g. RFI)

Space Domain Awareness

Early Warning for European security

Space cybersecurity and cyber resilience

Interoperability, data fusion & orchestration

In-orbit servicing and inspection

These areas share a common trend: future resilience capabilities must operate as systems of systems — combining multiple assets, not relying on a single institutional infrastructure.

WHY Distributed in Space Processing Capability

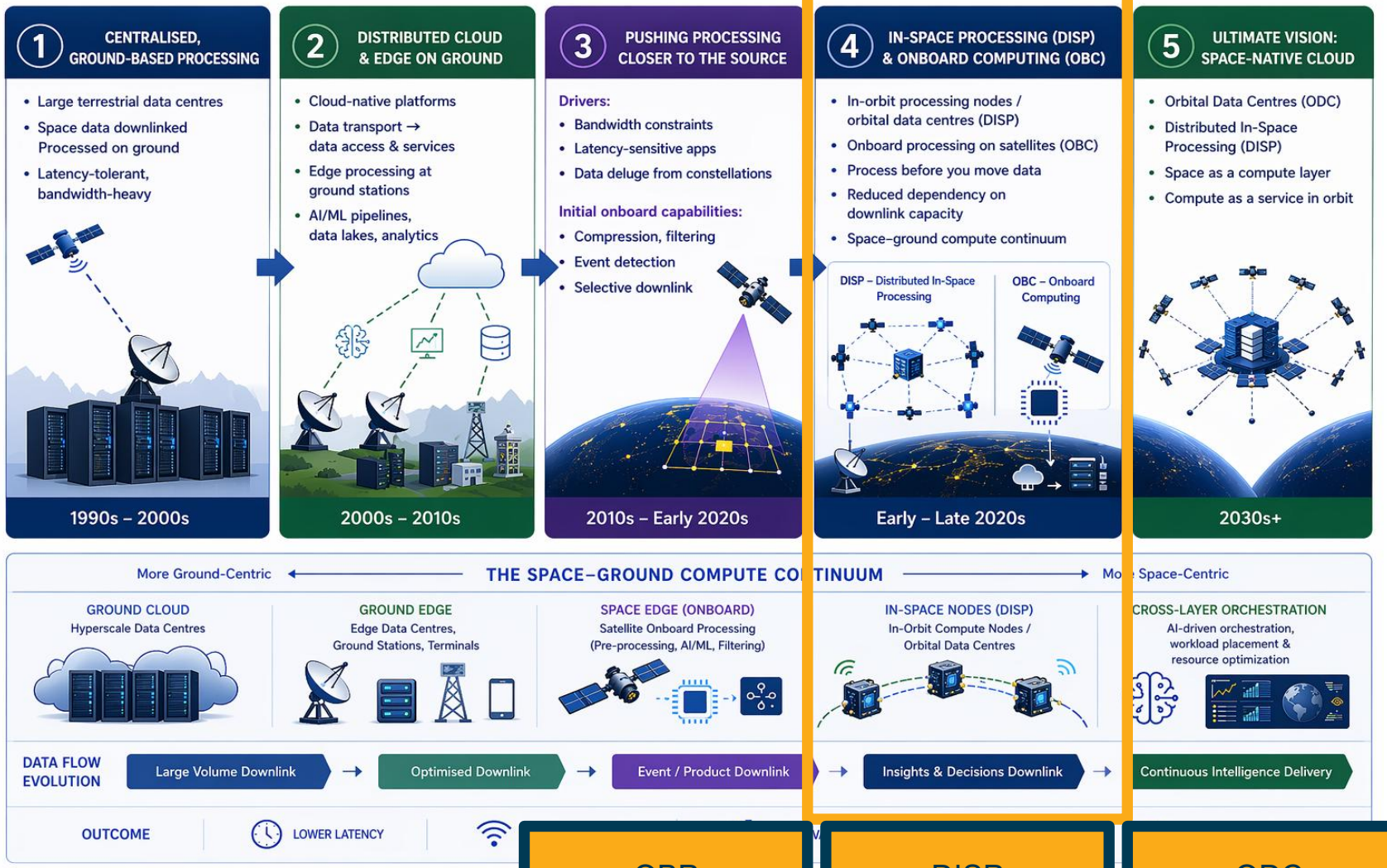
The new Emerging Domain

Evolution of the Space Systems Processing architecture
→ From Centralised to Edge
→ From Ground to Space to Continuum hybrid

Increasing demand of Computational capabilities
→ Larger Sensing Information available
→ More sophisticated elaboration model accessible
→ Gain operational advantage

→ Opportunities for the service providers

Offering dedicated capability for strategic users (e.g. SpaceShield)



OBP | DISP | ODC

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Examples of DISP use cases

Tip & Cue

- SNC Vindlér 2.0
- Xingshu Plan – DISP already in place
- BAE Systems Azalea
- European Space Shield!?

Cross-cueing between sensing assets and tasking chains

RF Monitoring / SIGINT

- HAWKEYE/ SPIRE
- Yaogan ELINT Constellations
- CERES ELINT Constellation
- European Space Shield!?

Detection and localisation of RF sources and signals

Bodyguard Satellites

- Ares (Action et Résilience Spatiale) programme
- Ares Shield (private)
- EDF Bodyguard project

Threat detection, proximity awareness and response triggering

Early Warning

- Golden Dome
- ODIN'S EYE II/ TWISTER /HYDRIS
- Huoyan-1 (Fire Eye)/TJS satellites

Rapid detection and alerting for emerging threats or events

Processing in Space

Detect → Classify → Fuse → Predict → Re-task → Alert

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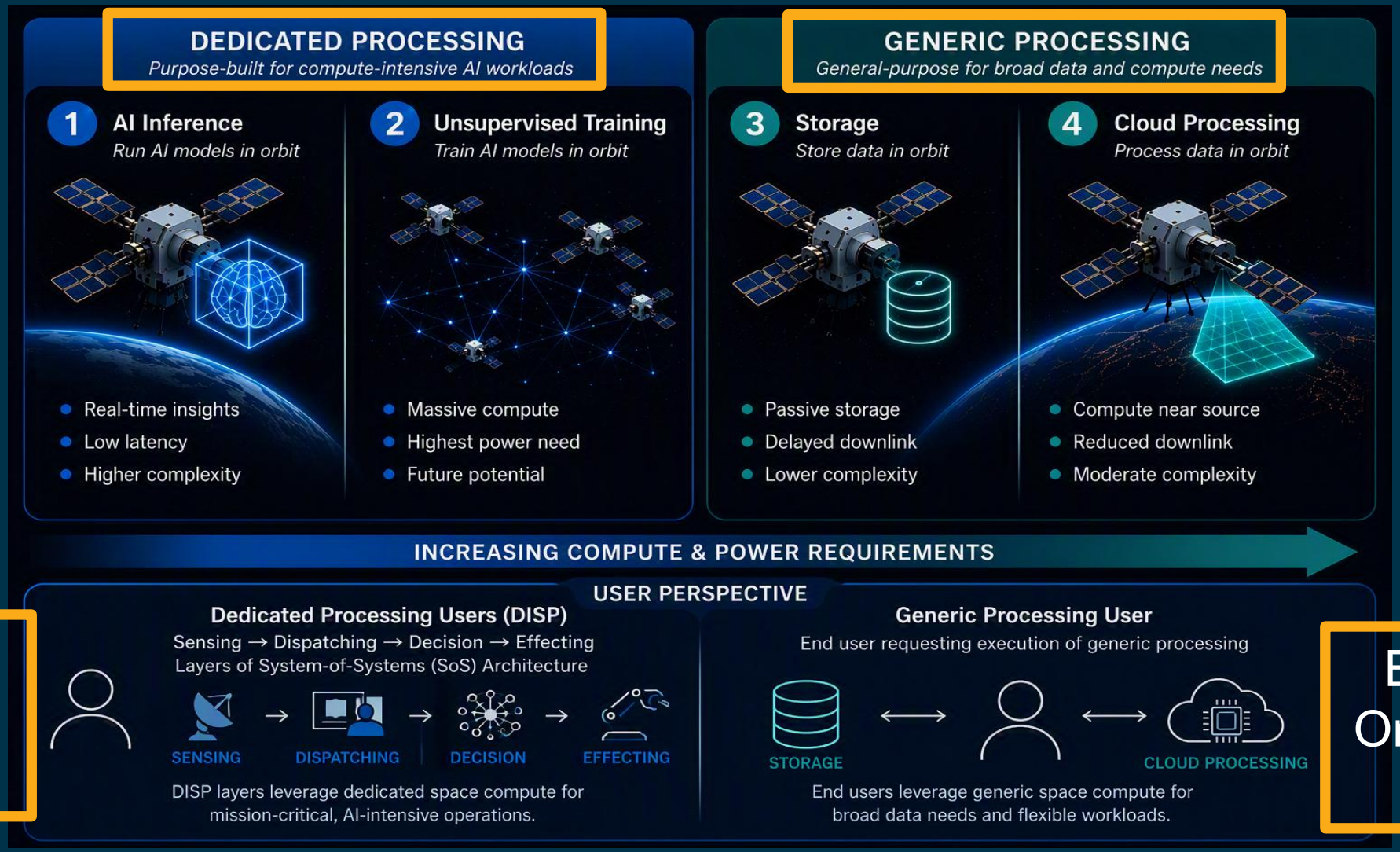
OnSo

What can DISP offer

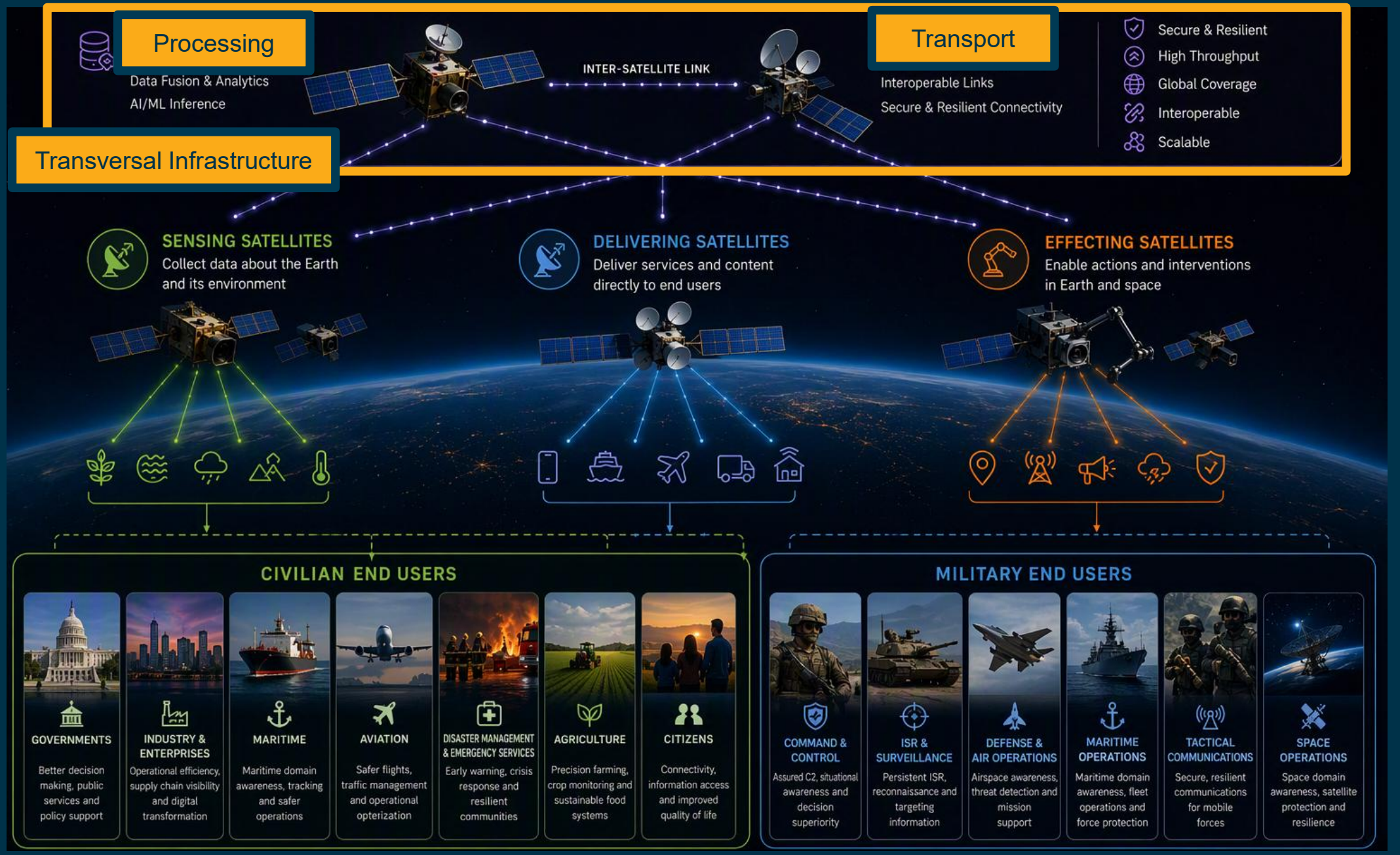


System of System Task

End User On Demand Task

STORAGE	CONNECTIVITY	COMPUTE	MISSION SERVICES
• Buffering and caching	• Inter-satellite exchange	• Signal and image processing	• Sensing support
• Data replication	• Space-to-ground routing	• AI inference	• Autonomous response
• Distributed archives	• Data relay	• Data fusion	• Tasking and processing chains
• Store-and-forward services	• Resilient network paths	• Mission-specific applications	• Secure or sovereign workloads

DISP as part of the global SoS of System Architecture



Near-Term Industrial Engagement Opportunities for Resilience

Preparatory Phase

Institutions

Consultation

- MSs Delegates (including MoDs rep.) in PBs and bilateral workshops
- EC European Space Shield WG

Involvement

- Seconded personnels from MoDs to be integrated in project offices
- Dedicated Expert Working Groups

1- Consultation and analyses — Q2-Q4 2026

- Mapping of space resilience capability development plans of National and Industrial actors
- European Capabilities roadmap to enable Resilience vision (possibly in cooperation with EU)

2- Exploration / incubation — ~40-50 M€ — Q1-Q4 2027

- Architectures studies
- Simulator & Digital Twins
- Interoperability standards & protocols
- Techno Dev & early Demo missions

3- Preparation of CMIN 28 Proposals — 2028

- Definition of Resilient Initiative Architecture
- Preparation of Program proposal for CMIN28

Industries

On Going

- DG/CEO meeting in June /September
- Consultations with Industry
- Industrial Forums to cover definitions, opportunities, priorities (e.g. Strategy Forum on Space-Based Data Centres)

Involvement

- On-going (1-13572 ITT for Resilient High Elliptical Orbit link)
- Contracts and/or RFIs in preparatory phase

CMIN28

- TECNOLOGICAL DEMOSTRATOR
- IOV
- EUROPEAN COMMON INFRASTRUCTURE ELEMENTS ??
- NATIONAL CLUSTERS ?

Near-Term Industrial Engagement Opportunities for DISP – Distributed In-Space Processing

SHORT TERM OPPORTUNITIES: ARTES IC WORK PLAN 27

- Resilient in-orbit data centre
- Testbed for a mixed orbital and terrestrial data centre cluster for cloud services
- Scalable building block for orbital secure data processing and storage
- ASPIRE FedSatcommLab - Autonomous Space-based Processing for Interconnected REsilient Federated **Satcom**
- DISP System Study (TBC)
- Security Building blocks in GSTP

TIMING: KO Q1 2027

Engage now to shape next generation of European Resilience

Strategy Forum on Space-Based Data Centres (SBDC)

- **Save the date:** November 12-13, ESTEC
- **Register:** online until Sep 25
- **100 Participants selected:** space industry, digital ecosystem, institutions, finance, research…
- **Format:** Tabletop workshop, no slides or roundtables, co-build & prioritise strategy scenarios

Help shape the Strategy Forum by contributing to ESA's Request for Information on OSIP and share your views on the future of Space-Based Data Centres:

- Edge computing technologies
- Distributed In-Space Processing (DISP) architectures
- AI-enabled space computing
- Sovereign and resilient infrastructures
- Hybrid space-ground ecosystems
- Industry and supply chain development
- ...and more

1- Scan the QR code
2- Submit your input to the RFI
3- Register to attend the Strategy Forum

*RFI contribution is not required to register, but contributors get priority if demand exceeds capacity

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