IRIS²
Infrastructure for Resilience, Interconnectivity and Security via Satellite

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Strategic autonomy for European Secure connectivity

ESA Secure Connectivity Team / EC
24/03/2026

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Introduction


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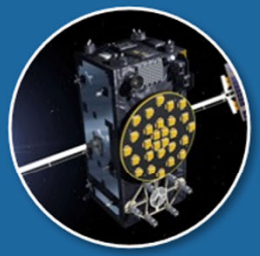
Introduction

The new EU flagship space programme

- **IRIS²** (Infrastructure for Resilience, Interconnectivity and Security by Satellite) is the **new flagship space programme of the European Union**:

Satellite Constellations of the EU Space Programme



GALILEO

Satellite Navigation Made in Europe

COPERNICUS

Europe's Eyes on Earth

IRIS²

Connecting Europe. Connecting the World. Securely.

Introduction

The IRIS² vision

Multi-orbit broadband global coverage

LEO and MEO, low latency and high throughput
Combined with existing GOVSATCOM assets in GEO

Security by design

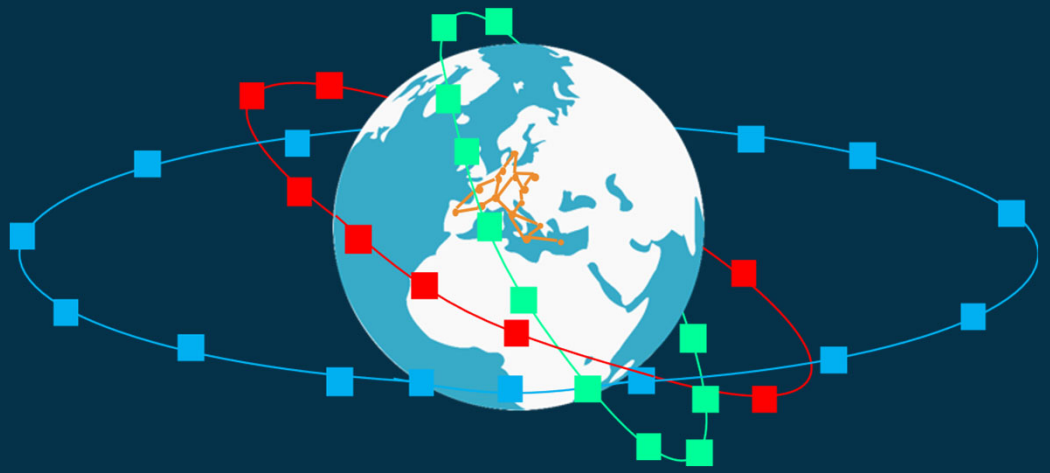
State-of-the-art cryptographic mechanisms, ground segment located in the EU, security accreditation
Future Quantum Key Distribution (QKD) service

Open standards and interoperability

Regenerative mode: 5G in space, ground and user segments
Transparent mode: support for sovereign and legacy

Innovative

System must integrate innovative/disruptive technologies and services, participation of SMEs, start-ups and New Space actors



GEO: Geostationary Earth Orbit
GOVSATCOM: Governmental Satellite Communications
LEO: Low Earth Orbit
MEO: Medium Earth Orbit
QKD: Quantum Key Distribution
SME: Small and Medium Enterprise

Introduction

EU policy context

- **Regulation (EU) 2023/588** establishes the **Union Secure Connectivity Programme**:
  - Objective: deploy an **EU-owned satellite constellation for secure communications** (IRIS²)
  - Total cost: **€10.6bn**

- Procurement of the **concession agreement** for IRIS² (Public-Private Partnership):
  - **Contract signature** on 16/12/2024

Introduction

ESA Role in IRIS²

ESA plays a key role in the Union Secure Connectivity Programme, IRIS²:

- **Contribution Agreement signed with the European Commission** on 21 September 2023: ESA is entrusted the role of Qualification & Validation Authority for IRIS². ESA will also closely follow-up the design, development and verification activities performed by the SpaceRISE consortium under the Concession Agreement.
- **ESA Programme Related to EU Secure Connectivity:** implemented through a Partnership Project Contract procured according to ESA's rules and managed by ESA in close coordination with the European Commission. ESA will contribute to the development and validation of the EU Secure Connectivity governmental infrastructure which will provide the services restricted to government authorised users requiring a high level of security.

The ESA Partnership Project Contract is expected to span **68 months**. ESA will contribute up to **€550 million** to this ESA Partnership Project Contract which will be complemented by a co-funding contribution of at least 20% by the SpaceRISE consortium.

Introduction

Rationale for the IRIS² public-private partnership

Public

- **Infrastructure owned by the EU** (governmental infrastructure)
- Delivering **sovereign services** for **Member States' civil**, **institutional** and **defense** users
- Ensures compliance with **security** and **sovereignty requirements**, including **priority** for **governmental services** and **needs**

Private

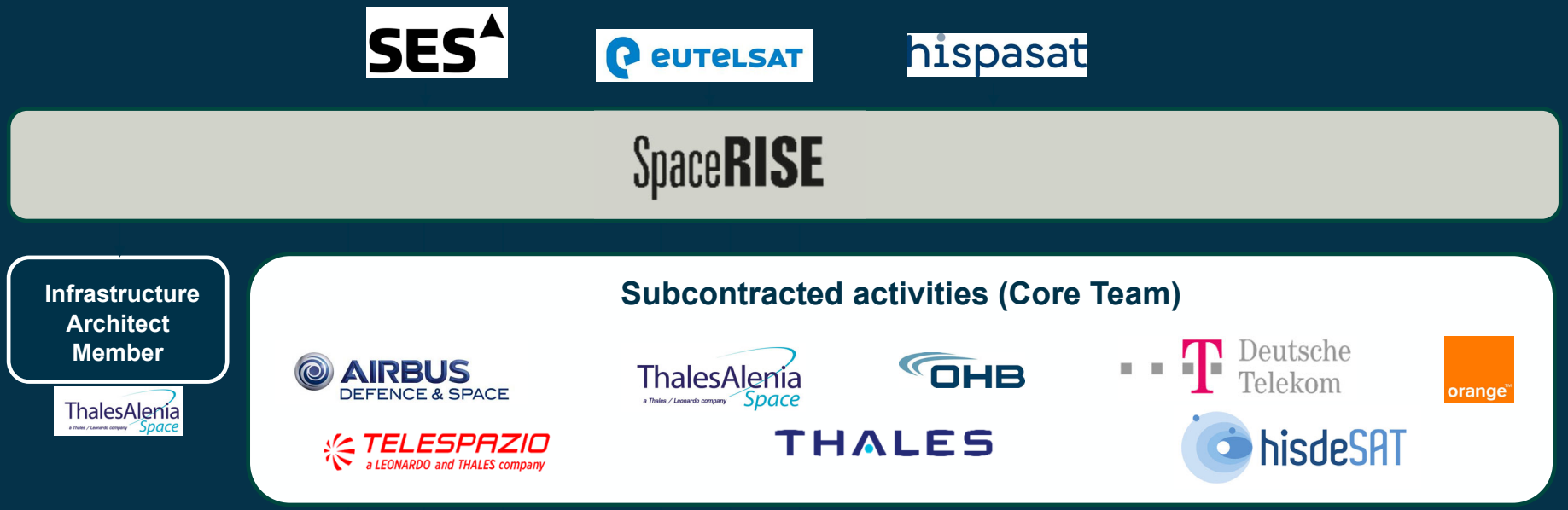
- The **governmental infrastructure** is **shared** with **EU commercial operators**
- They **develop**, **deploy** and **operate** the IRIS² system
- They **invest** and **commercialise** the part of the system **not used by EU/MS**
- They **complement** it with their **own assets** (space and ground)

Partnership

- Allows **sharing of development costs** and **optimise resource allocation**
- In case of crisis, the **entire system resources** can be mobilised for the **benefit of the public sector**
- The same capacity entirely funded by the public sector would be **oversized** and **underused** in the absence of crises

Introduction

IRIS² industrial setup



SpaceRISE: Consortium for a Resilient, Interconnected and Secure Europe
Subco: subcontractor

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IRIS² use cases and service portfolio

IRIS² overview

Use cases and service portfolio

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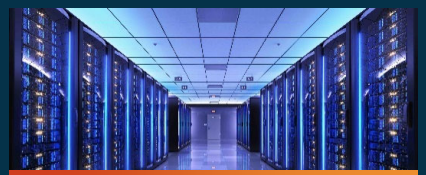
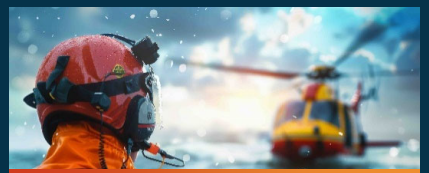
IRIS² use cases



Connecting key infrastructures



Crisis management and external actions

Defence and security

Governmental use cases

Global satellite connectivity

Commercial use cases

IRIS² service portfolio

1. **Robust Worldwide Low-Latency**
2. **Robust Space Data Relay**
3. **Assured Worldwide Low-Latency**
4. **Assured Worldwide Narrowband**

Commercial satellite services

(e.g., residential broadband, transportation, B2B satellite trunking, etc.)

- Hard-Gov services
- Light-Gov services
- Commercial services

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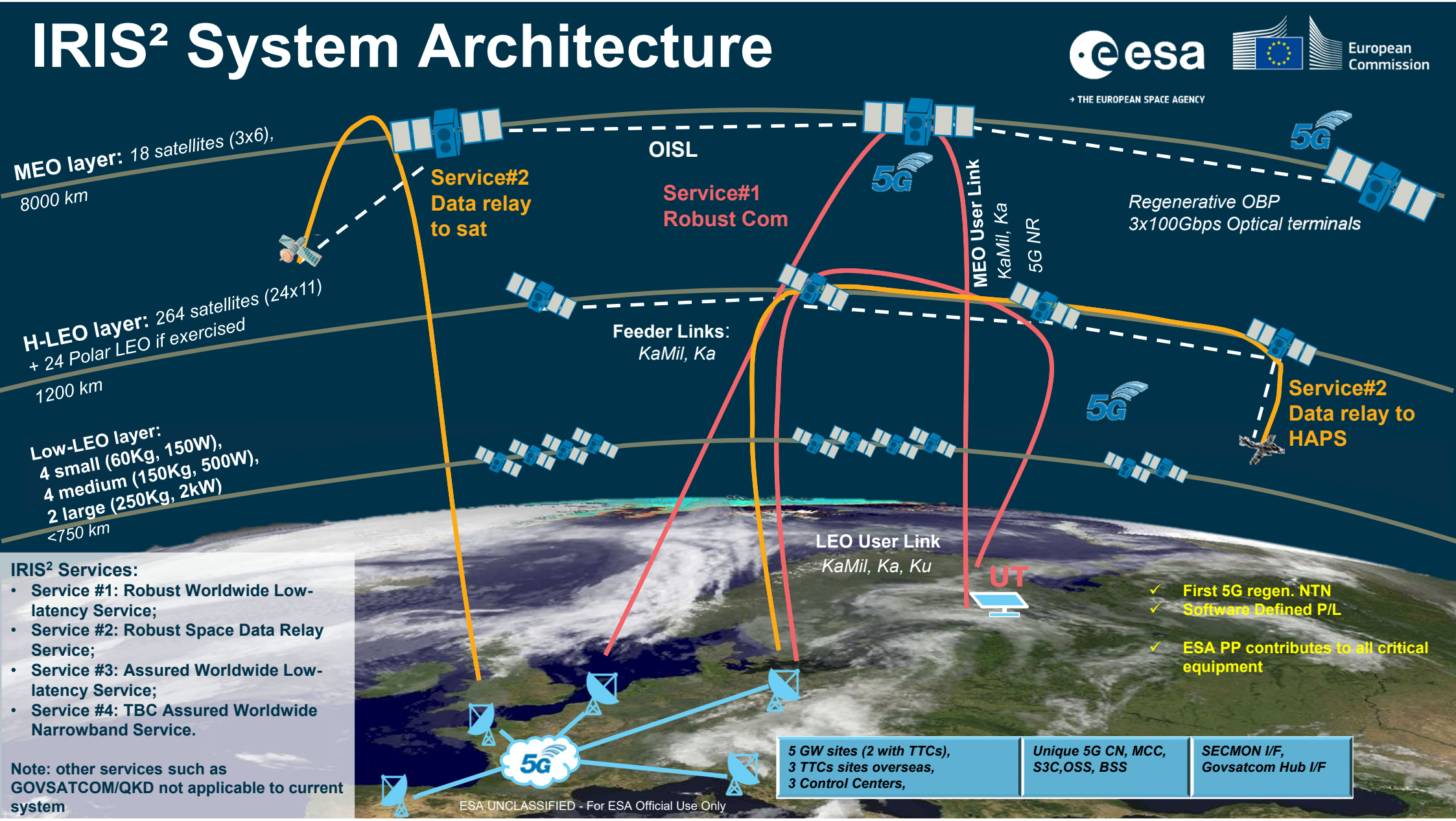
IRIS² technical overview

IRIS² System Architecture



IRIS² Services:

- **Service #1: Robust Worldwide Low-latency Service;**
- **Service #2: Robust Space Data Relay Service;**
- **Service #3: Assured Worldwide Low-latency Service;**
- **Service #4: TBC Assured Worldwide Narrowband Service.**

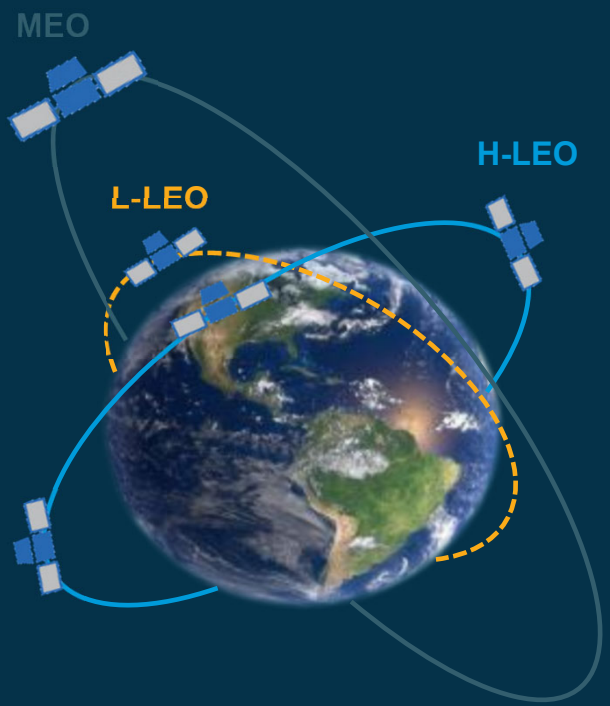
Note: other services such as GOVSATCOM/QKD not applicable to current system

- ✓ **First 5G regen. NTN**
- ✓ **Software Defined P/L**
- ✓ **ESA PP contributes to all critical equipment**

5 GW sites (2 with TTCs), 3 TTCs sites overseas, 3 Control Centers,	*Unique 5G CN, MCC, S3C,OSS, BSS*	*SECMON I/F, Govsatcom Hub I/F*

IRIS² technical overview

Multi-orbital design architecture



UHF: Ultra-High Frequency
FPA: Flat-Panel Antenna
SDR: Space Data Relay

IRIS² design architecture			
Space segment	Constellation	**18** MEO	**264** LEO-High	**10** LEO-Low
	Payload	5G regenerative + transparent	5G regenerative + transparent	
	Multiband	**Ka-Mil/Ka** virtualised + **UHF** (TBD) + **SDR**	**Ka-Mil/Ka** virtualised + **Ku** + **SDR**	
	Network	5G mesh		
Ground segment		5G Core Network		
User segment		Multi-purpose FPA | Multi-waveform | Phased array | Multi-orbit		

Connectivity

- **5G regenerative** capabilities from LEO and MEO
- Support for **transparent-mode services**
- Support for **direct UT-to-UT connectivity**

Critical Technologies

Innovation on board and on ground

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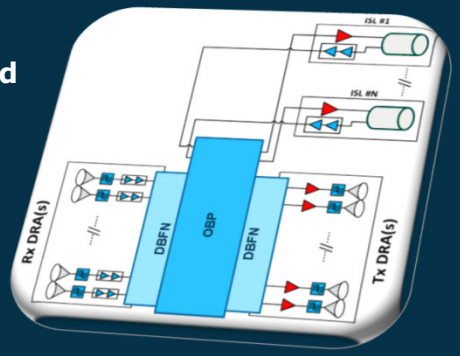
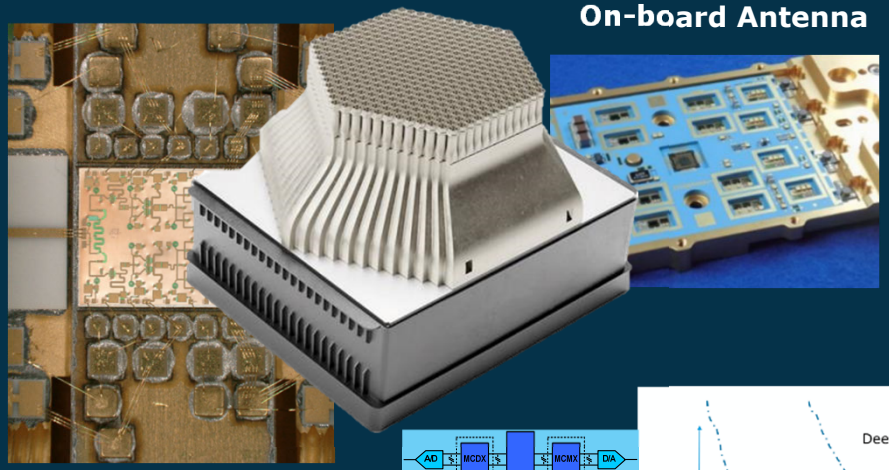
Payload

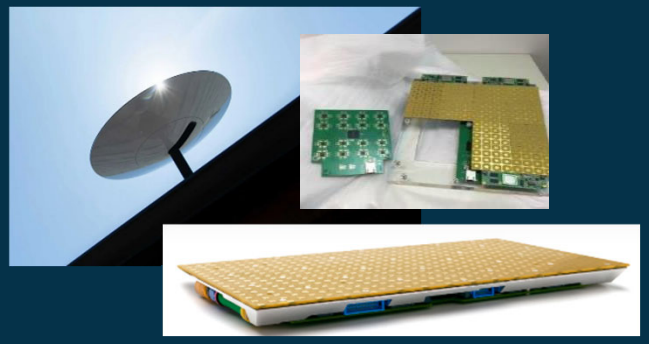


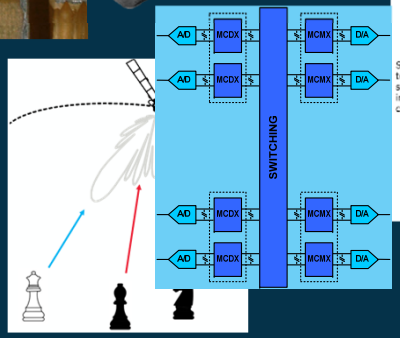
On-board Antenna

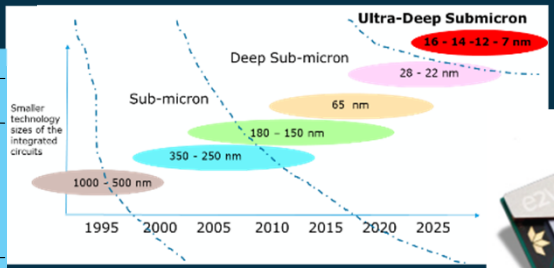


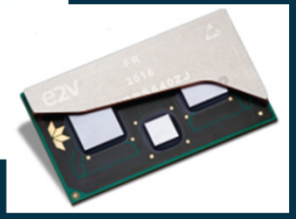
RF/Optical ISL

User Terminal









On-board Processing

IRIS² will heavily depend on advanced EEE (OBP, RFICs, FPGAs,…), at constellation scale!

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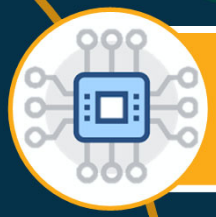
IRIS² - Focus on EEE Sovereignty

Access to Space Comms Sovereignty for Europe

EEE Space Components Sovereignty

The context of IRIS²

"EEE sovereignty is becoming as critical as launch capability or spectrum access for the success of future constellations."



Space systems—especially telecom constellations—are increasingly dependent on advanced EEE components (ASICs, FPGAs, RF chips, beamforming ICs)

Europe still rely heavily on **non-European supply chains** exposing programs to:

- Export controls (e.g., ITAR/EAR)
- Geopolitical disruptions

Sovereignty is not isolation: it's about **assured access, resilience, and strategic autonomy**.

Pain Points:

- Limited availability of space-qualified European components, especially for cutting-edge nodes (e.g., high-performance digital payloads)
- Long qualification cycles vs. fast constellation timelines
- Big entry investments needed
- Single point of failure suppliers (no back-ups)
- Mismatch between commercial and space ecosystems

EEE sovereignty for IRIS2 is not a constraint, it is an enabler of security and long-term competitiveness

EEE Space Components Sovereignty

The "What"

Design Sovereignty

- Control of architecture, IP,…

Manufacturing sovereignty

Access to foundries, packaging,…

Qualification Sovereignty

Faster and smarter qualification, access to facilities, define new qualification framework for constellations (Tailored ECSS, …)

But not all components are equal: sovereignty should be strategic and focus first on mission critical technologies → **priorities!**

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IRIS² evolution: ESA CM25

IRIS² at CMIN25 – Element 3

Three Activities Lines

IRIS² Resilience Improvement

- Europeanisation of Critical Technologies
- Development and qualification of critical technologies in Europe
- Removal of sole source dependencies

Support to IRIS² Adoption by Users

- Support to Standardisation Aspects & User Terminals
- Technological aspects Design to cost and industrialization of UT for S1 and S2
- Dev of design enablers
- Enable interoperability

IRIS² Expansion to Low-LEO Layer

- Low-LEO layer definition, development, and deployment
- Expansion to New Services/capabilities and allows to keep the system competitive through introduction of evolutions in an agile manner

Conclusions

Three key takeaways

- **IRIS²** is **the new flagship constellation** of the **EU Space Programme**:
  - A **strategic asset** for the **security of the EU** and its **Member States**
  - **Strong support from ESA** in full cooperation with EC
- **Innovative and forward-looking technology approach**:
  - Relys on development of **Innovative components and systems**
  - Use of **5G NTN standards** in the **space**, **ground** and **user segments**
  - Participation of **SMEs, start-ups** and **New Space actors**
- **Sovereignty of European connectivity**:
  - Is not only about providing access to a secure and sovereign system but also allowing the **growth of the supply chain** around it!

Thank you

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