IRIS²

The New EU Programme Providing Secure Communications Via Satellites

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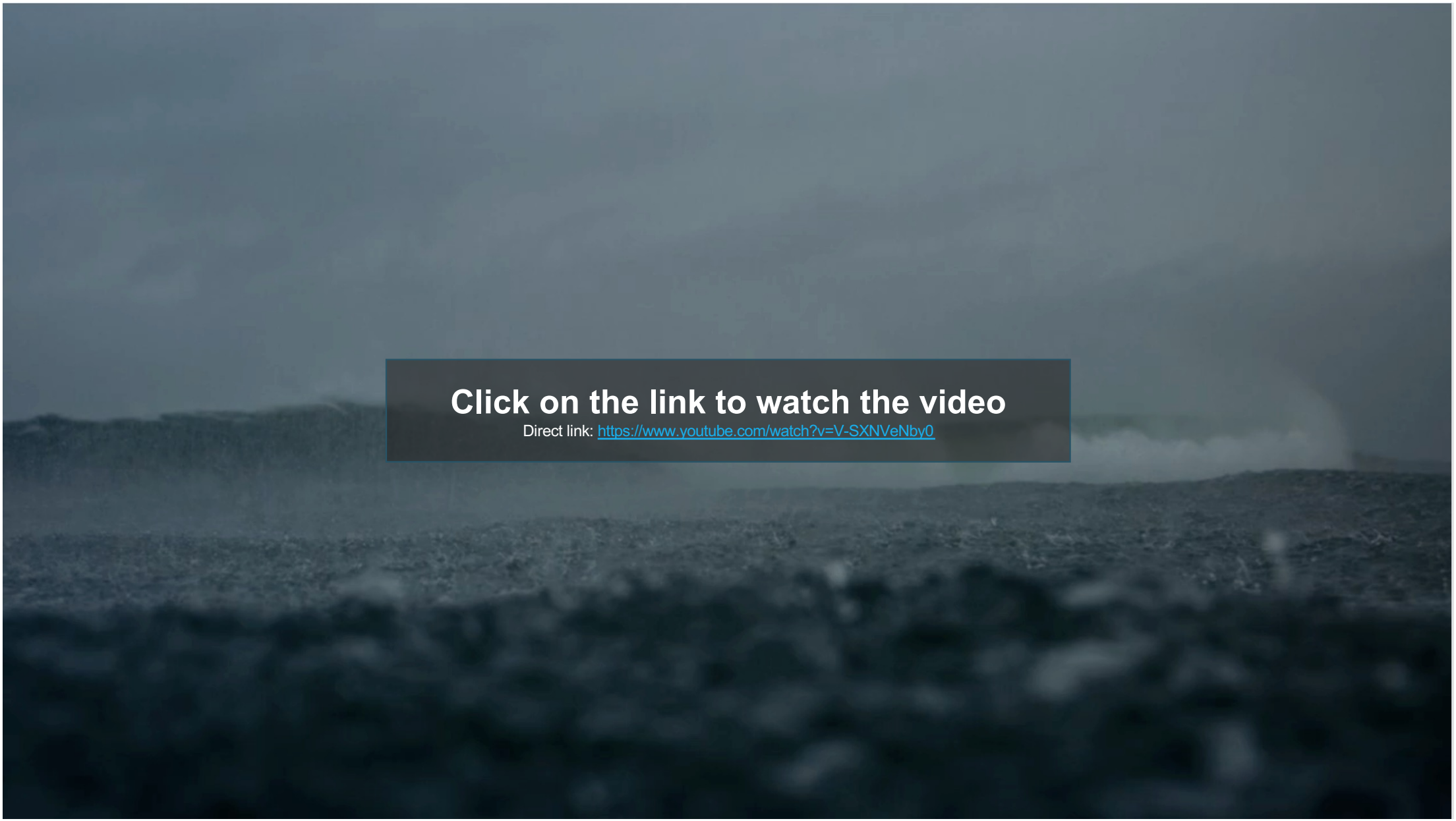
Click on the link to watch the video
Direct link: https://www.youtube.com/watch?v=V-SXNVeNby0

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Introduction

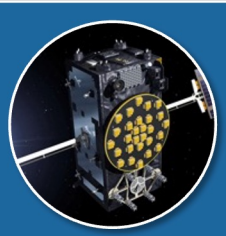
European Commission

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, high throughput
Combined with GOVSATCOM (GEO)

Security by design

State-of-the-art cryptographic mechanisms, cyber- and RF-threats resilient, assets located in EU, security accreditation
Future Quantum Key Distribution service

Open standards and interoperability

Regenerative mode: built-in 5G NTN in space, ground and user segments
Transparent mode: support of sovereign waveforms and user terminals

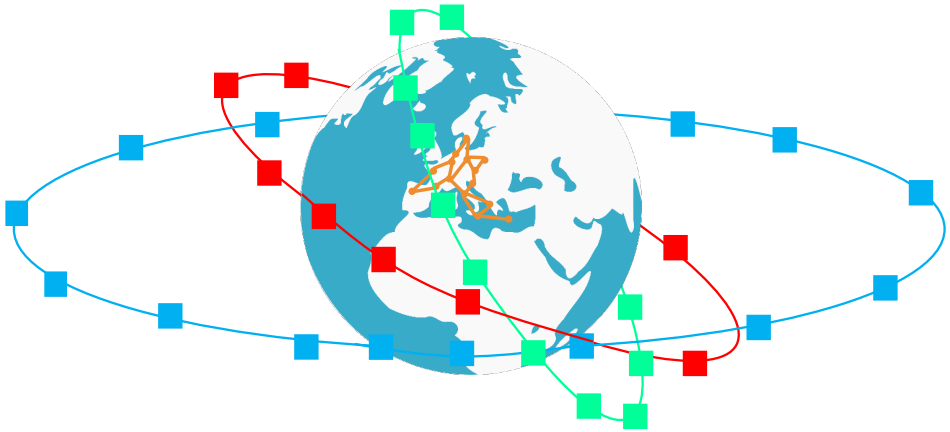
Innovative

System must integrate innovative/disruptive technologies and services, participation of SMEs, New Space entrants

Environmental and space sustainability

GHG minimisation and offset, space debris mitigation, anti-collision, prevention of illumination pollution

- LEO (new)
- MEO (new)
- GEO (GOVSATCOM, existing)
- EU ground infrastructure (new)



GEO: Geostationary Earth Orbit
GHG: Greenhouse Gas
GOVSATCOM: Governmental Satellite Communications
LEO: Low Earth Orbit
MEO: Medium Earth Orbit
NTN: Non-Terrestrial Networks
RF: Radio Frequency
SME: Small and Medium Enterprise

Introduction

EU policy context

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

€6bn (EU)	€550mn (ESA)	€4.1bn (private investment)

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

Introduction

IRIS² public sector setup

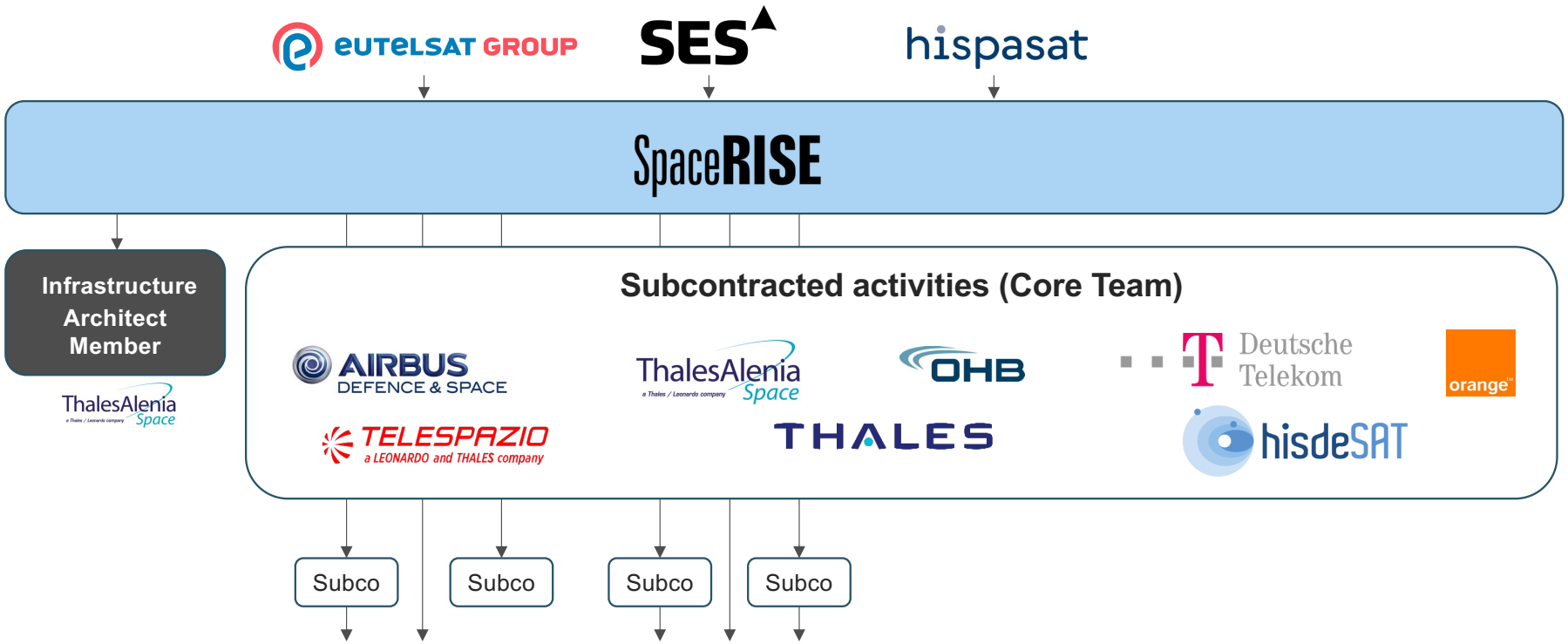
- The **European Commission** has the **overall responsibility** for the **implementation** of the **Union Secure Connectivity Programme – IRIS²**

- The **European Space Agency (ESA)** is the **Qualification and Validation Authority** of the **IRIS² governmental infrastructure**

- The **European Union Agency for the Space Programme (EUSPA)** is in charge of the **security accreditation** and **provision of governmental services**

Introduction

IRIS² industrial setup



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

IRIS² use cases and service portfolio

European Commission

IRIS² overview

Service portfolio terminology (simplified)

Type of service →

Type of infrastructure ↑	Governmental	Commercial
Governmental	Hard-Gov (Robust)	N/A
Commercial	Light-Gov (Assured)	Commercial

N/A: Not applicable

IRIS² overview

Use cases and service portfolio

IRIS² use cases

Governmental use cases

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.)

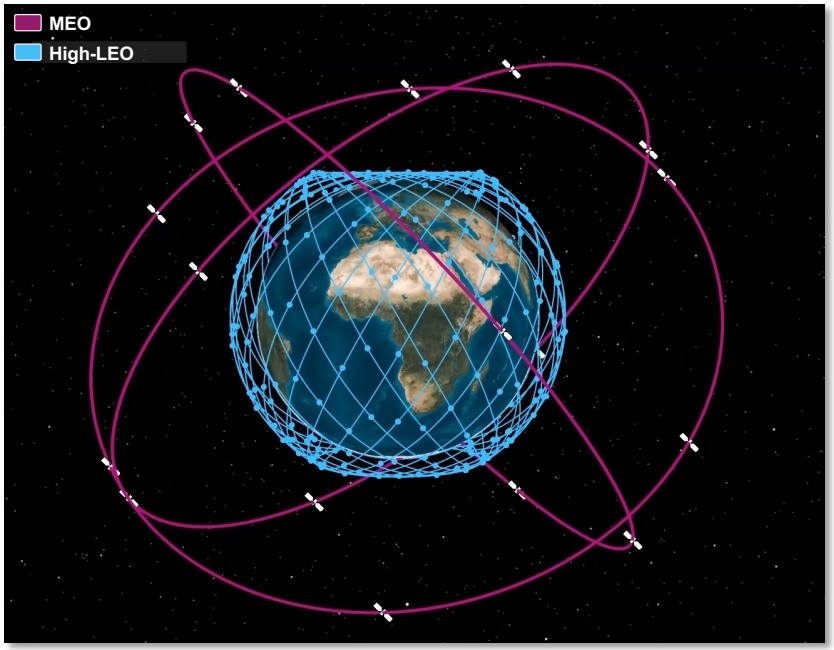
- Hard-Gov services
- Light-Gov services
- Commercial services

IRIS² technical overview

European Commission

IRIS² technical overview

Summary of features



Space

- **264** satellites in **High-LEO** (1200 km)
- **18** satellites in **MEO** (8000 km)
- **10** satellites in **Low-LEO** (<750 km)

Ground

- **3 Ground Control Centers** (France, Italy, Luxembourg)
- **5 EU gateway sites** (2 of them including TT&C)
- **3 TT&C overseas stations**

Connectivity

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

TT&C: Telemetry, Tracking and Command

IRIS² technical overview

Multi-orbital design architecture

	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** + **UHF** (TBD) + **SDR**	**Ka-Mil/Ka** + **Ku** + **SDR**	
	Network	**5G mesh**		
Ground segment		**5G Core Network**		
User segment		Multi-purpose FPA | Multi-waveform | Multi-orbit		

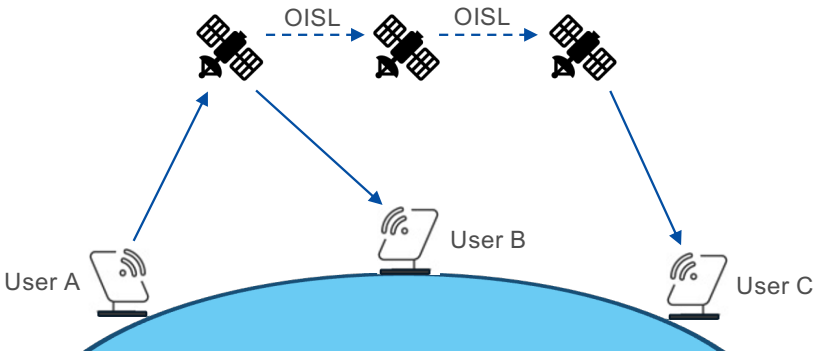
FPA: Flat-Panel Antenna
SDR: Space Data Relay
UHF: Ultra-High Frequency

IRIS² technical overview

Mesh vs star network topology

Mesh topology

User terminals communicate with each other through the space segment only

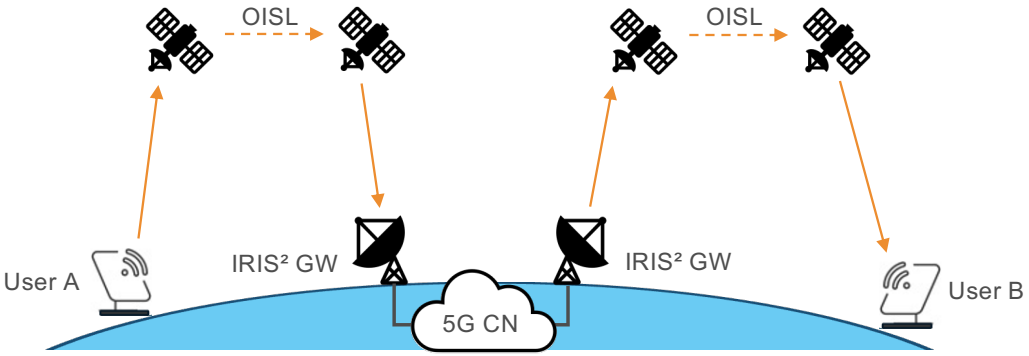


Secure E2E communications (user traffic routed through the space segment only)

Low-latency communications (use of OISLs)

Star topology

User terminals communicate with each other (and with the 5G Core Network) via the space and ground segments



Access to external networks (national networks, Internet, etc.)

Sovereign communications (IRIS² gateways located in the EU)

5G CN: 5G Core Network
E2E: End-to-End
GW: Gateway
OISL: Optical Inter-Satellite Link

IRIS² technical overview

Adoption of 5G NTN standards in IRIS²

Technological benefits

- Integrated **Quality-of-Service** (QoS) architecture
- **Flexible resource management** (e.g., dynamic time-frequency resource allocation)
- Built-in 3GPP **security** and **authentication** mechanisms
- **Interworking** with other **3GPP core networks** (e.g., national broadband mission-critical communications systems)

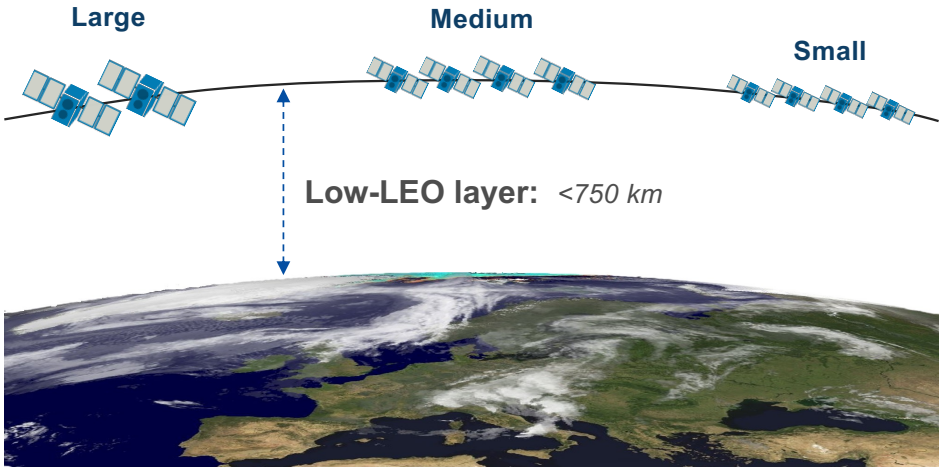
Commercial benefits

- **Mature** and **open** standards ecosystem with a **clear evolution path**
- 3GPP standards enable **vendor operability** and **economies of scale**
- **Lower entry barriers** for **new SATCOM actors** (space, ground and user segments)
- Synergies with **key verticals** (e.g., automotive, railway, etc.)

QoS: Quality of Service

IRIS² technical overview

LEO-Low shell



Mission concept

- **LEO-Low** will be implemented in an **orbit below 750 km**
- **10 satellites** for the **first generation** (small, medium, large)
- Planned missions:
  - **Governmental narrowband IoT**, **robust D2D**
  - **Hosted payloads** from **EU**, **MSs** and **private entities**

Mission rationale

- **Dedicated shell** to foster **European participation** and **industrial competitiveness**
- Focus on **disruptive technologies** for **satellite systems** and **services**
- **Next steps:**
  - Dedicated InfoDay sessions planned throughout EU in Q2 2025

D2D: Direct to Device
IoT: Internet of Things
MSs: Member States

Conclusions

European Commission

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**:
  - Use of **5G NTN standards** in the **space**, **ground** and **user segments**
  - Participation of **SMEs, start-ups** and **New Space actors**
- One-of-a-kind **space Public-Private Partnership**:
  - Allows **high level of mutualisation** to **help optimise development**, **deployment** and **operation costs**

SME: Small and Medium Enterprise

Thank you

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