6GSNS

Co-funded by the European Union

Grant Agreement # 101192912

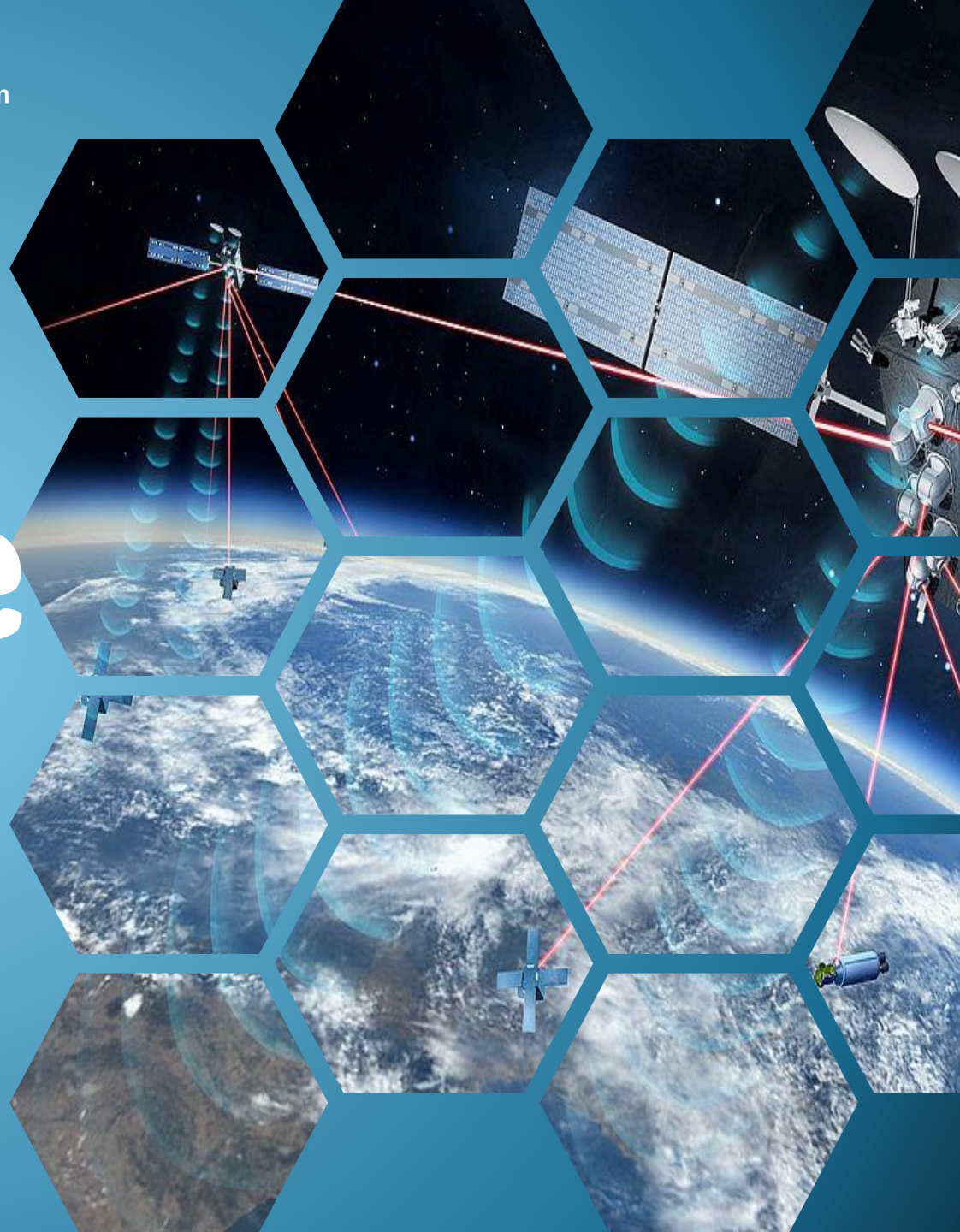
NexaSphere

NexGen 3D Networks Spin Harmonies across 6G, AI, and unified TN/NTN.

SNS-JU Call 3 projects intro webinar

Presenter : Babak Mafakheri (Safran, Germany)

Project Coordinator



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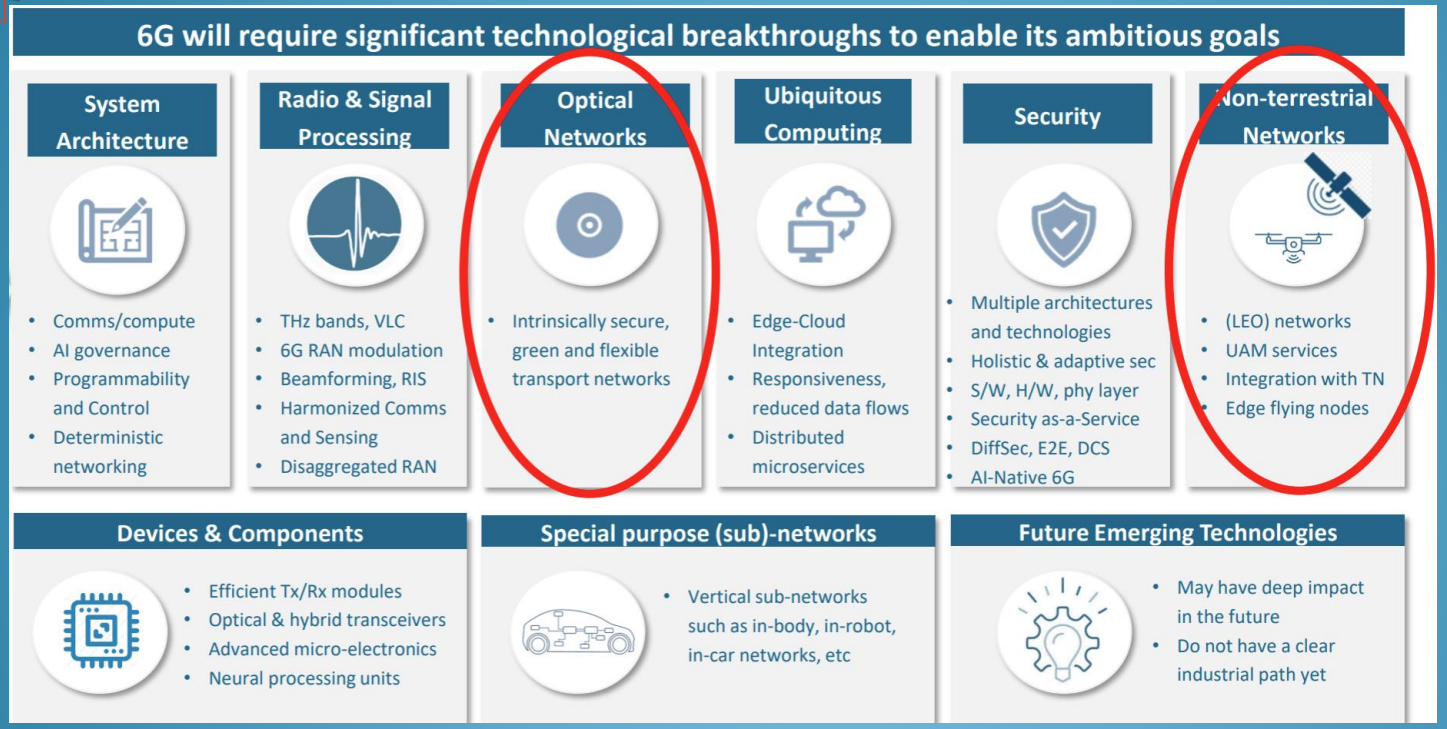
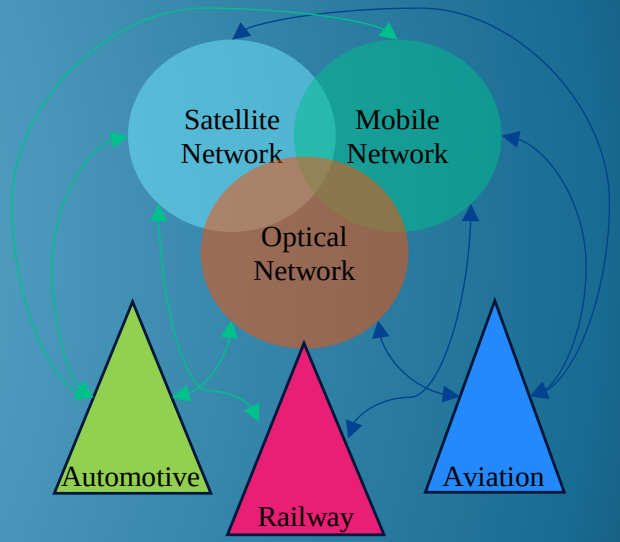
NexaSphere ambitious





- Source: Networld Europe SRIA - https://www.networldeurope.eu/sria-and-whitepapers/

- Integrate Radio-Optical wireless technologies for unified TN/NTN 3D connectivity systems,
- Support innovative solutions to the verticals, notably in the field of transportation,
- TRL 4-5 outcomes -> Technology validated in the lab.

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Nexasphere

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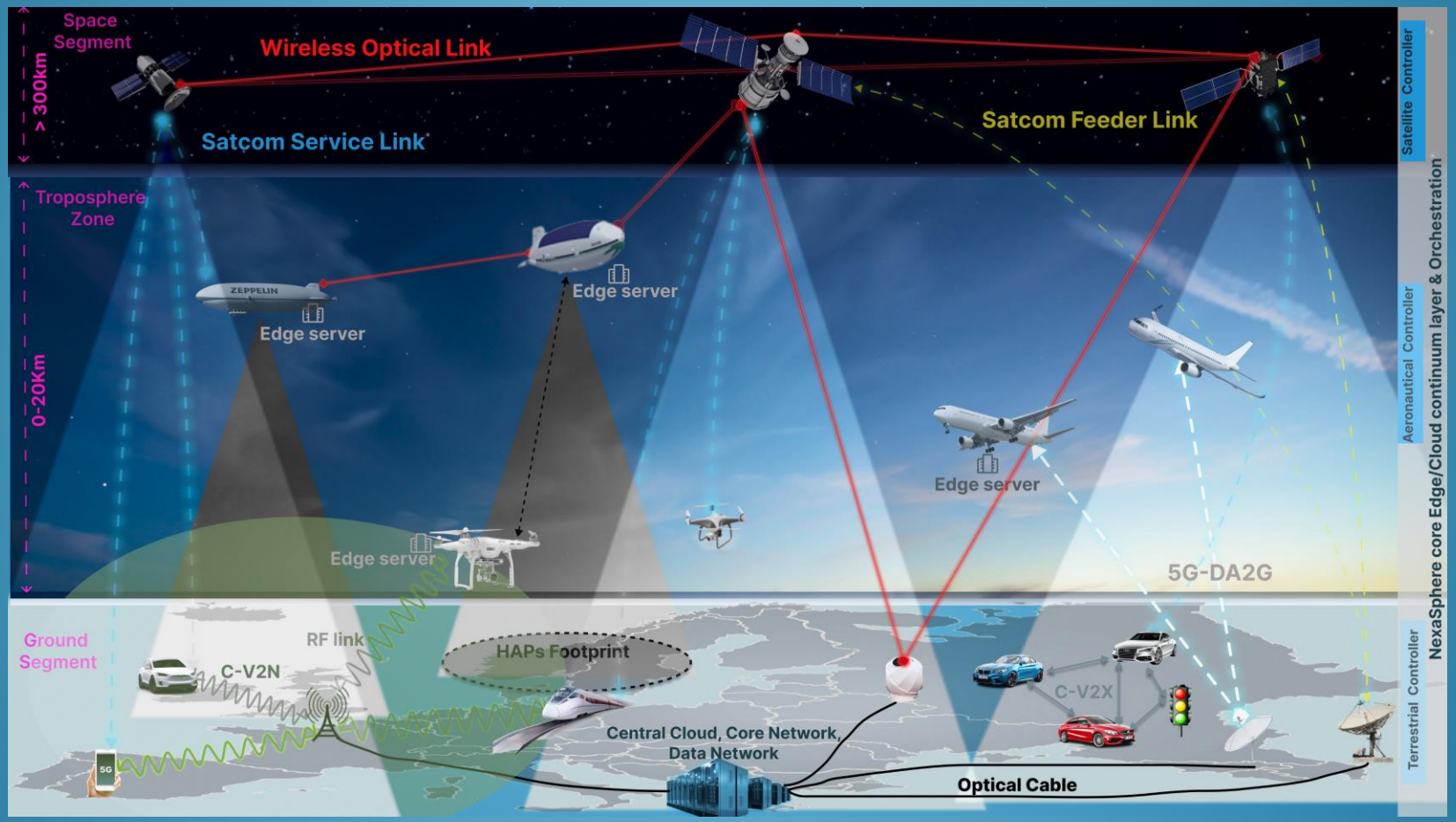
System Overview



NexaSphere vision of a unified TN/NTN for aviation, automotive, and trains connectivity

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NexaSphere Fact Sheet

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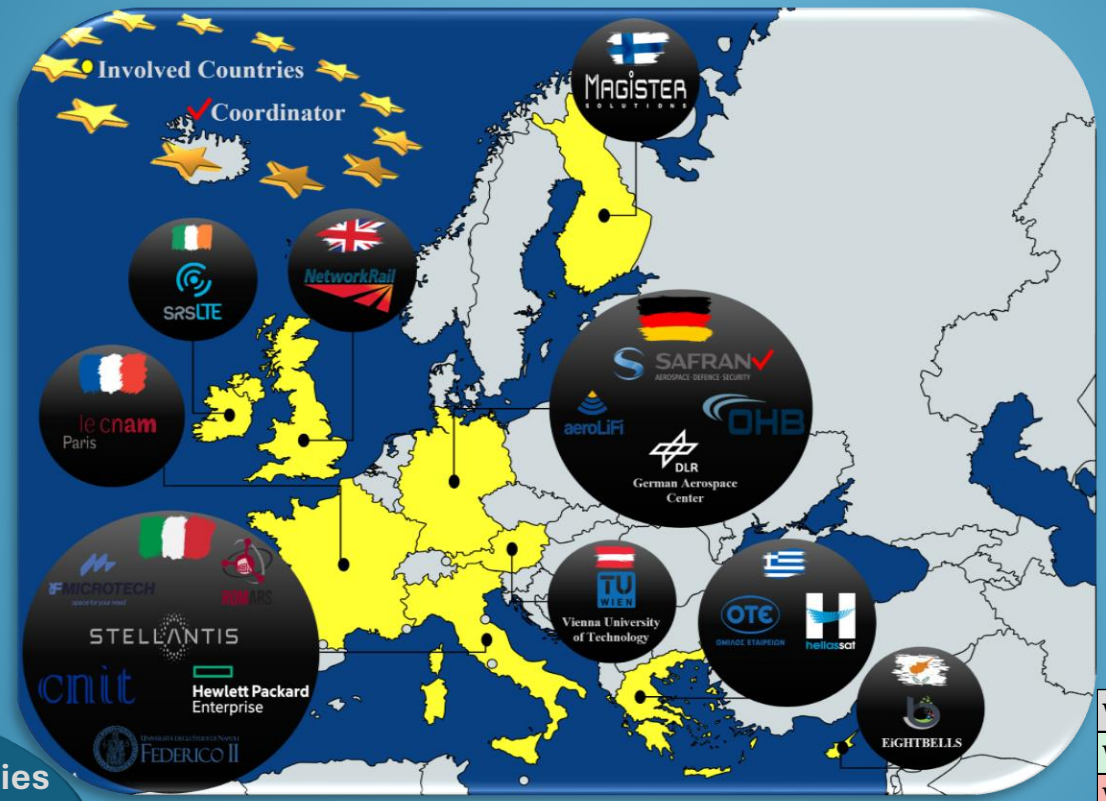
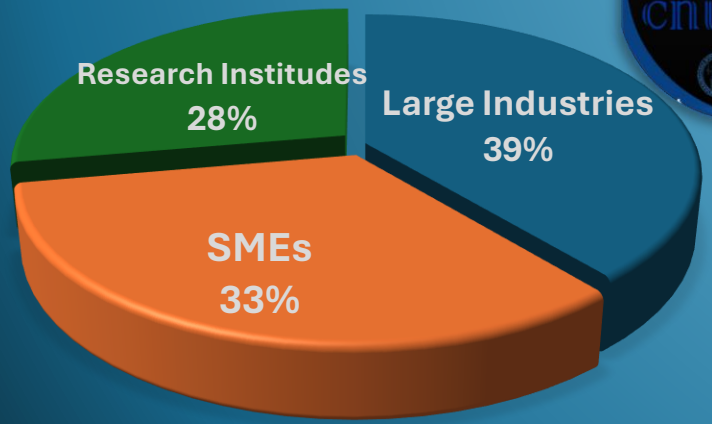
- ✓ 18 partners
- ✓ 9 countries
- ✓ € ~8.5M
- ✓ 36 months (Jan 2025 – Dec 2027)





Project Coordinator:
Dr. Babak Mafakheri
(Safran Germany, SPI)
Technical Manager:
Dr. Tomaso deCola
(German Aerospace Center, DLR)

WorkPackage	PM	Percentage
WP1 (Project Management)	60	7%
WP2 (System Design)	124	15%
WP3 (Technical works)	151	18%
WP4 (Technical works)	146	17%
WP5 (Technical works)	103	12%
WP6 (PoCs)	167	20%
WP7 (Impact & Visibility)	95	11%
Total	846	100%

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Energy-Efficient Radio-Optical 3D Network Components

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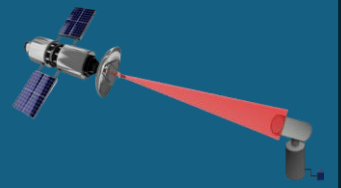
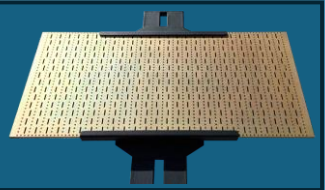
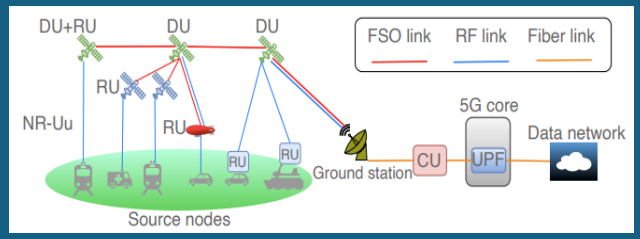
- Wireless Optics
  - Energy-efficient free-space optics and satellite transceivers with on-board computing,
  - Design and prototype implementations of LiFi components and transceivers.



- NTN Antenna
  - Avionic combined Ku/Ka band antenna
  - Automotive smaller flat antenna in either Ka or Ku band



- Disaggregated RAN
  - An NTN-capable gNodeB with support for LEO & GEO scenarios, with extensions to allow for multi-DU support with NTN & TN DUs



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Multi-Connectivity Solutions for Integrated Wireless Radio-Optical 3D Networks

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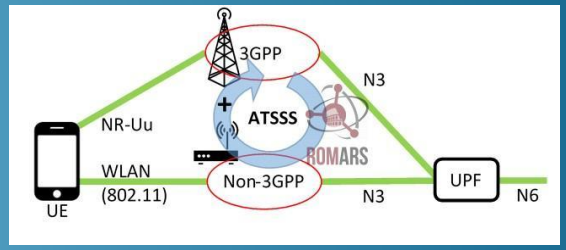
- Multi-Connectivity Solutions for Integrated Wireless Radio-Optical
- Prediction-based models for sustainable connectivity in heterogeneous 3D networks.
- Develop large-scale simulation models for multi-connectivity in 3D networks.



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6G TN/NTN Network Management and Orchestration

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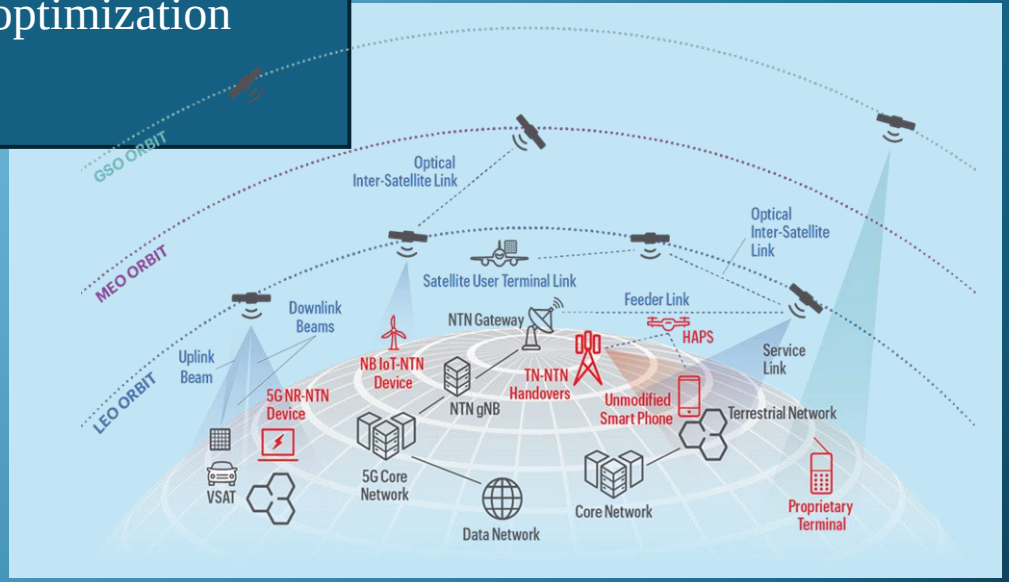
- Development of TN/NTN 3D edge-to-cloud platform development with AI-driven orchestration & resource provisioning.

- Design a 6G system architecture with a holistic energy and performance optimization approach across the hyper-distributed edge-to-cloud continuum



3D Continuum

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Use-case Integrations, Validation and Demonstration (PoC)

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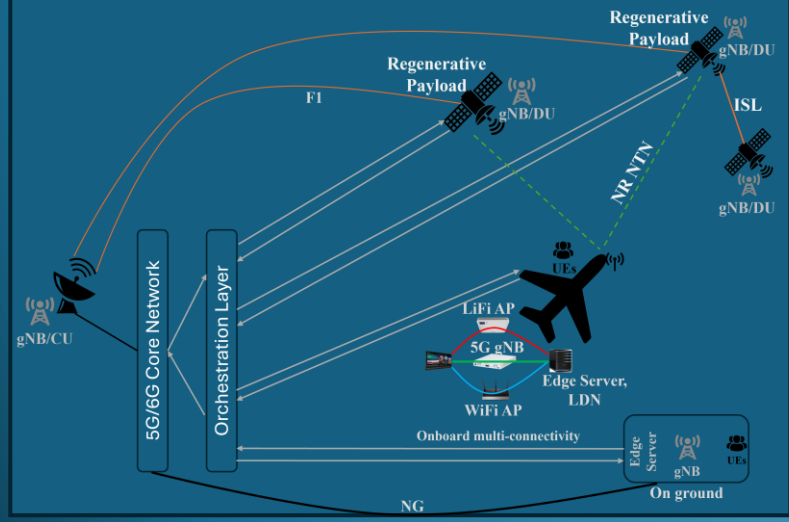
Aviation

SAFRAN AEROSPACE · DEFENCE · SECURITY

- Seamless in-flight NTN connectivity for civilian aircraft
  - Passengers Internet
  - Aero edge-cloud



Automotive

STELLANTIS

- Healing data hoarding disorder for connected vehicles, with AI-based data distillation
  - Predictive maintenance
  - EV range prediction

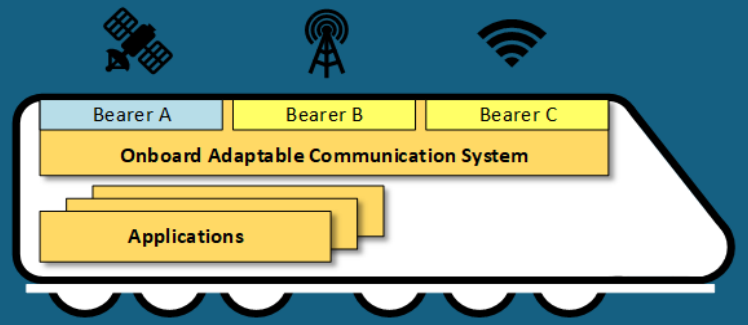
Seamless 6G geographical coverage offered by TNs and NTNs

- Advanced Driver Assistance Systems (ADAS)
- Automated Driving Functions (ADFs)

Railways

NetworkRail

- Train on-board integration of NTN for improved connectivity, reliability, safety, and operations
  - Predictive maintenance, real-time monitoring, energy management
  - Passenger experience: Ticketing, on-board connectivity, information systems.



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Thank you!

Babak Mafakheri
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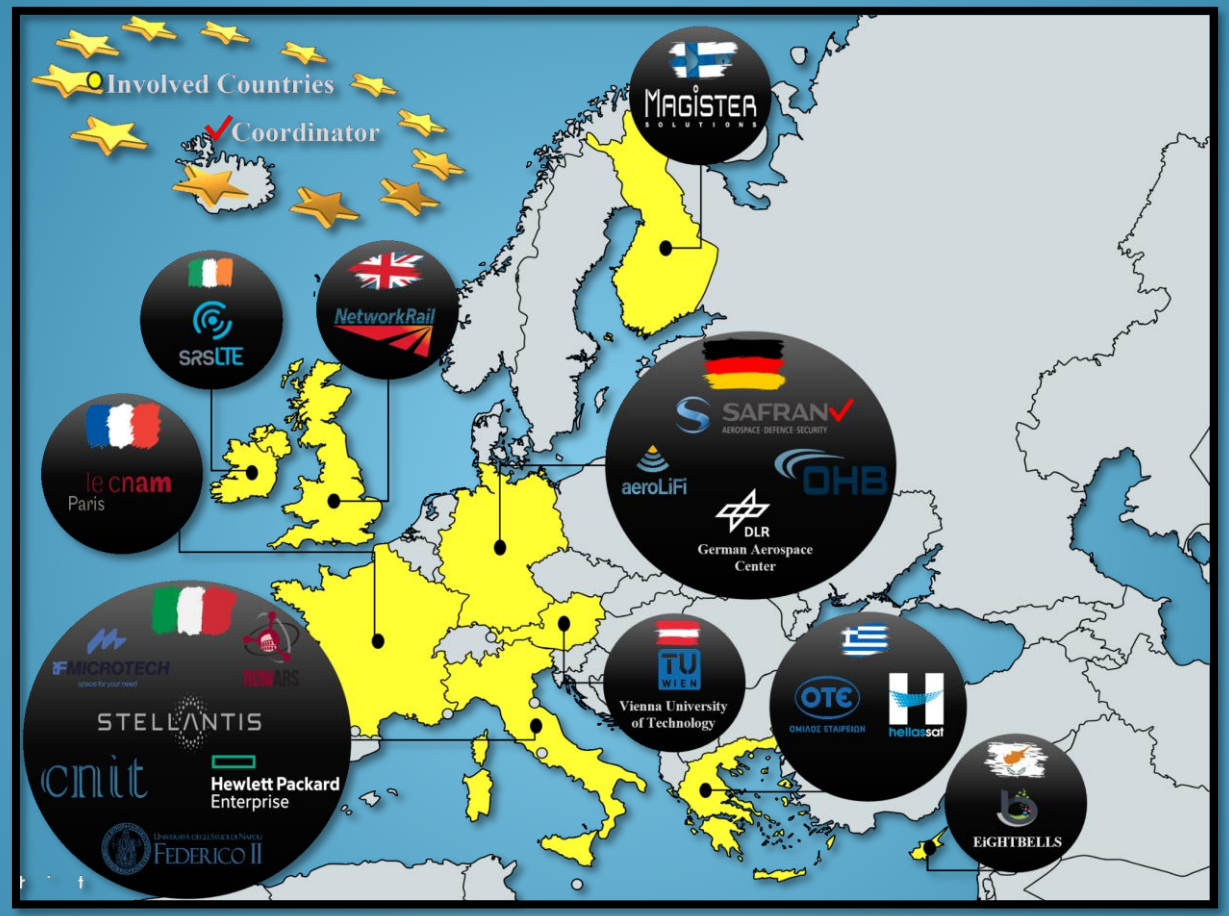

NexaSphere Linkedin
https://www.linkedin.com/company/nexasphere-eu

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