ETHER: A 6G Architectural Framework for 3D Multi-Layered Networks

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www.ether-project.eu

Consortium

Number	Role	Short name	Legal name	Country
1	COO	uni.lu	UNIVERSITE DU LUXEMBOURG	LU
2	BEN	AUTH	ARISTOTELIO PANEPISTIMIO THESSALONIKIS	EL
3	BEN	CA	COLLINS AEROSPACE IRELAND, LIMITED	IE
4	BEN	AVA	AVANTI HYLAS 2 CYPRUS LIMITED	CY
5	BEN	SIOT	SATELIO IOT SERVICES, SL	ES
6	BEN	Ubiwhere	UBIWHERE LDA	PT
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11	BEN	OPL	ORANGE POLSKA SPOLKA AKCYJNA	PL
12	AP	MARTEL GMBH	MARTEL GMBH	CH
13	AP	Net AI	NET AI TECH LTD	UK

- 5 Academic partners
- 8 industry partners (5 SMEs)

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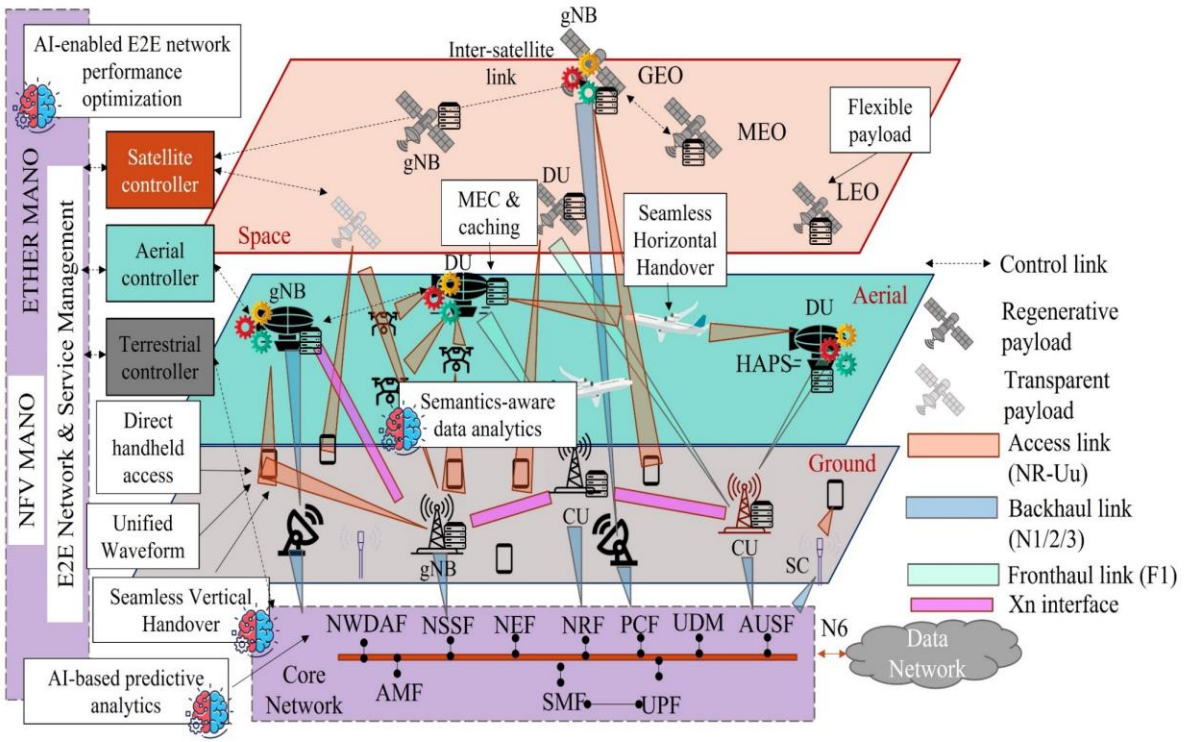
Vision, Objectives, and Technical Innovations

Objectives

O-1	Provide solutions for a **unified and sustainable RAN** for the integrated terrestrial and non-terrestrial network
O-2	Provide an **AI-based framework** for the self-evolving network slicing management and orchestration of the integrated network
O-3	**Architect a viable, highly energy- and cost-efficient**, flexible integrated terrestrial and non-terrestrial 6G network offering seamless and continuous connectivity
O-4	Demonstrate the effectiveness of ETHER solutions by **experimentation activities** that target practical applications
O-5	Identify the key **benefits** that will drive the **investment** in the integration of non-terrestrial with terrestrial networks

ETHER 3D Network



Technical Innovations

T-1	Integrated Architecture	**T-2**	Direct handheld device access at the Ka band from LEO satellites	**T-3**	Unified waveform design	**T-4**	Flexible payloads
T-5	Data analytics, edge computing, and caching	**T-6**	Horizontal/vertical handovers	**T-7**	Automated MANO for the integrated network	**T-8**	AI-driven E2E network performance optimization

ETHER Use Case 1

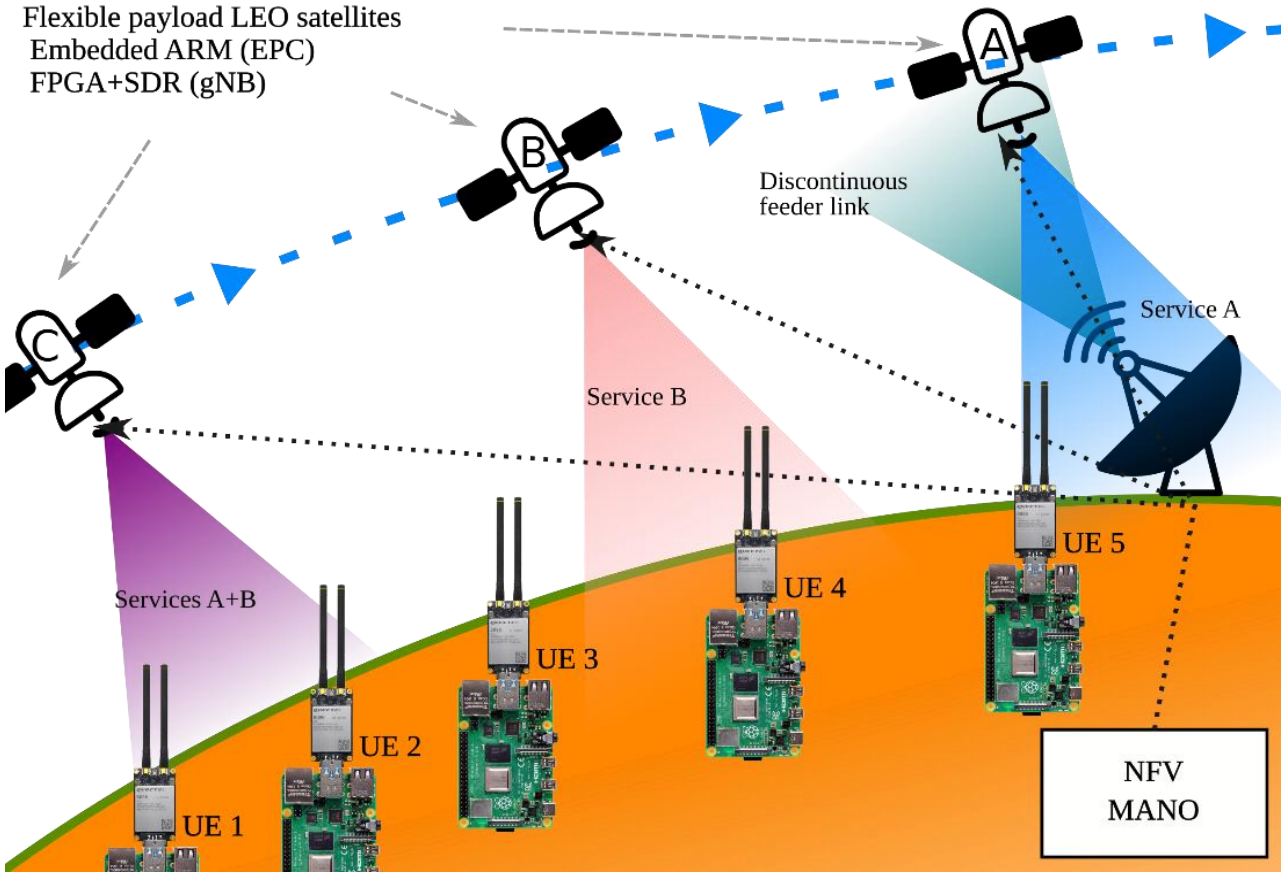
Service provision to delay-tolerant IoT applications

Assumptions:

- ❑ Feeder-link discontinuity
- ❑ Satellites with store-and-forward capability
- ❑ Delay-tolerant IoT applications

Key ETHER Enablers:

- ❑ Horizontal handovers
- ❑ ETHER MANO
- ❑ Flexible payloads
- ❑ Semantics-aware information handling for high energy efficiency
- ❑ Edge computing and caching



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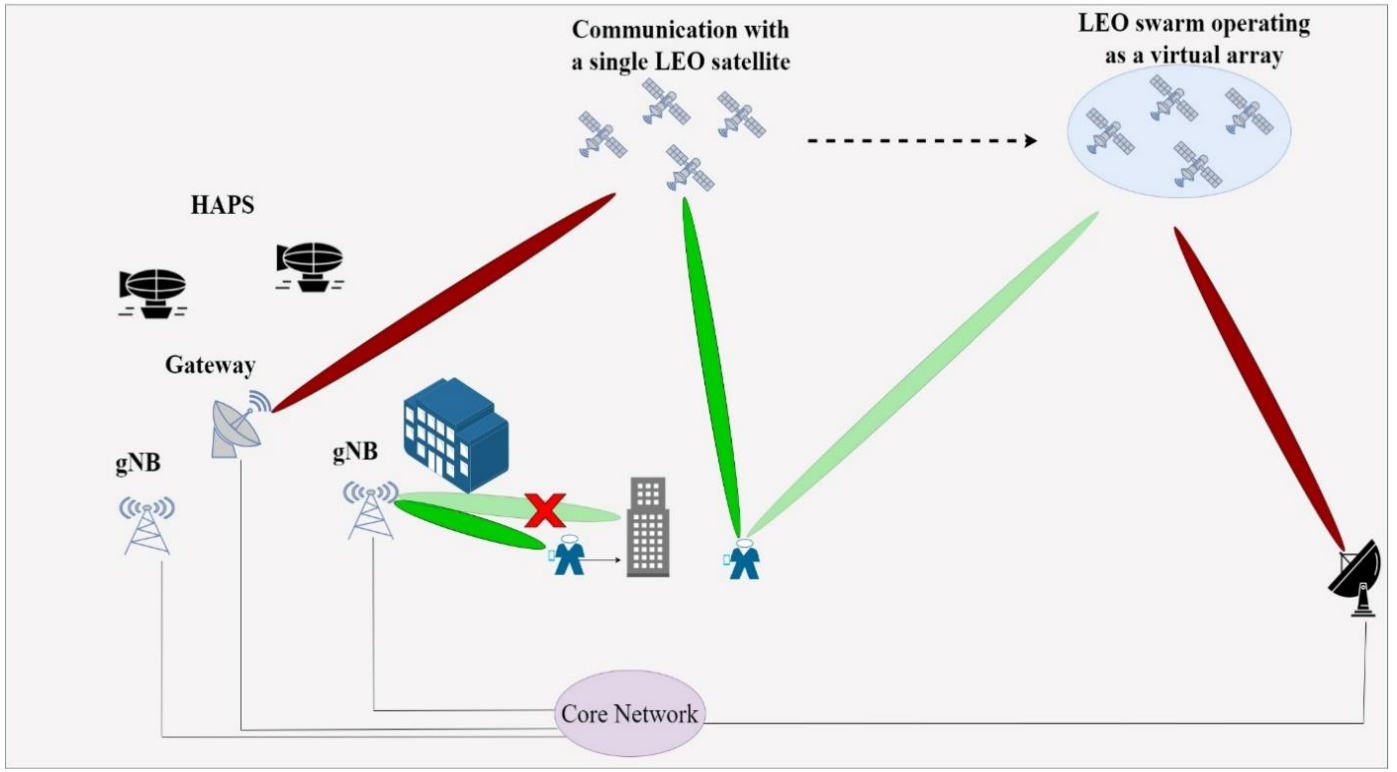
ETHER Use Case 2

Broadband direct handheld device access at the Ka band

Assumptions:

- ❑ Communication with a terrestrial small cell infeasible either due to lack of infrastructure (remote/rural areas) or bad link/high cell traffic
- ❑ Broadband communication required for the handheld device



Key ETHER Enablers:

- ❑ Vertical handovers across RATs
- ❑ Unified waveform design
- ❑ Terminal antenna design
- ❑ Distributed beamforming from LEO-satellite swarms

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ETHER Use Case 3

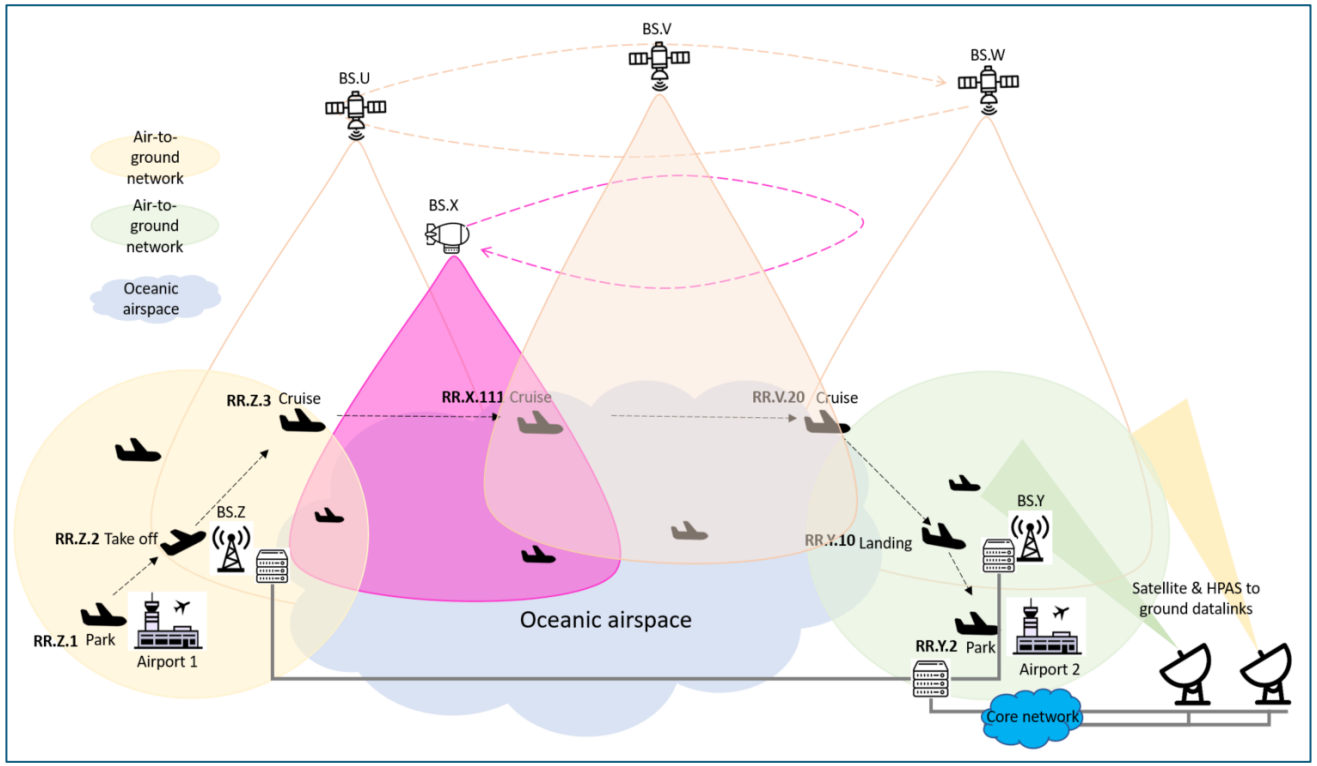
Air-space safety critical operations

Assumptions:

- ❑ Aircraft moving from one airport to another
- ❑ Coverage of the flight through terrestrial stations is imposible. Hence, cannot provide E2E aircraft communication services through only terrestrial stations

Key ETHER Enablers:

- ❑ Horizontal and vertical handovers across RATs
- ❑ Edge computing and caching
- ❑ ETHER MEC orchestrator
- ❑ Unified waveform design
- ❑ Predictive analytics
- ❑ E2E network performance optimization algorithms



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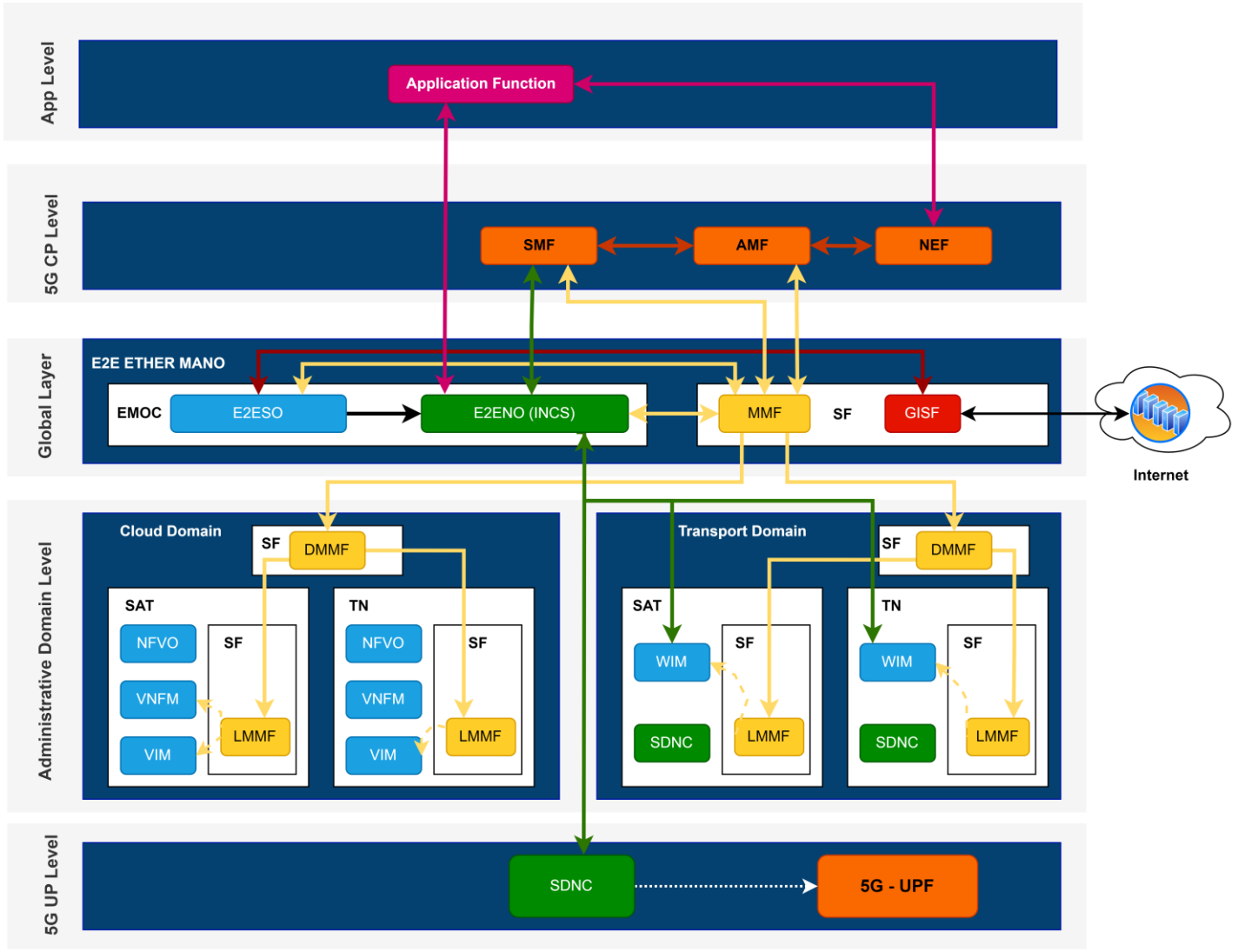
ETHER Management and Orchestration Framework



Project activities/technologies that may lead to standardization

ETHER MANO	Individual components of the ETSI OSM will be updated to account for both the aerial and space layers	**AI-Based ETHER Joint Communication, Computational and Storage Resource Allocation Framework**	Expansion of these algorithms to also account for both aerial and space layers	**AI-Based ETHER Monitoring Framework for Integrated Multi-RAT Traffic**	NetAI's Microscope traffic monitor will be extended to account for heterogeneous terrestrial, aerial, and space traffic apart from terrestrial	**ETHER Core Network**	The proof-of-concept core network with store-and-forward capability for discontinuous link operation will be expanded to account for the satellite dynamics, relative mobility and UEs location management
ETHER MEC Orchestrator	Nearby's MEC Orchestrator will be extended to allow integration with NTNs and zero-touch automation	**ETHER Flexible Payload System**	Integrating the flexible payload system in an SDR board, also incorporating the ETHER MANO	**ETHER UE Antenna for Direct Handheld Device Access at the Ka Band**	Design of a handheld device antenna for broadband communication across the 3 layers		

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Thanks

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