ETHER- Self-Evolving Terrestrial/Non-Terrestrial Hybrid Networks

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SNS Lunch Webinars, 06/03/2023

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
7	BEN	I2CAT	FUNDACIO PRIVADA I2CAT, INTERNET I INNOVACIO DIGITAL A CATALUNYA	ES
8	BEN	NBC	NEARBY COMPUTING SL	ES
9	BEN	NCSR "D"	NATIONAL CENTER FOR SCIENTIFIC RESEARCH "DEMOKRITOS"	EL
10	BEN	LIU	LINKOPINGS UNIVERSITET	SE
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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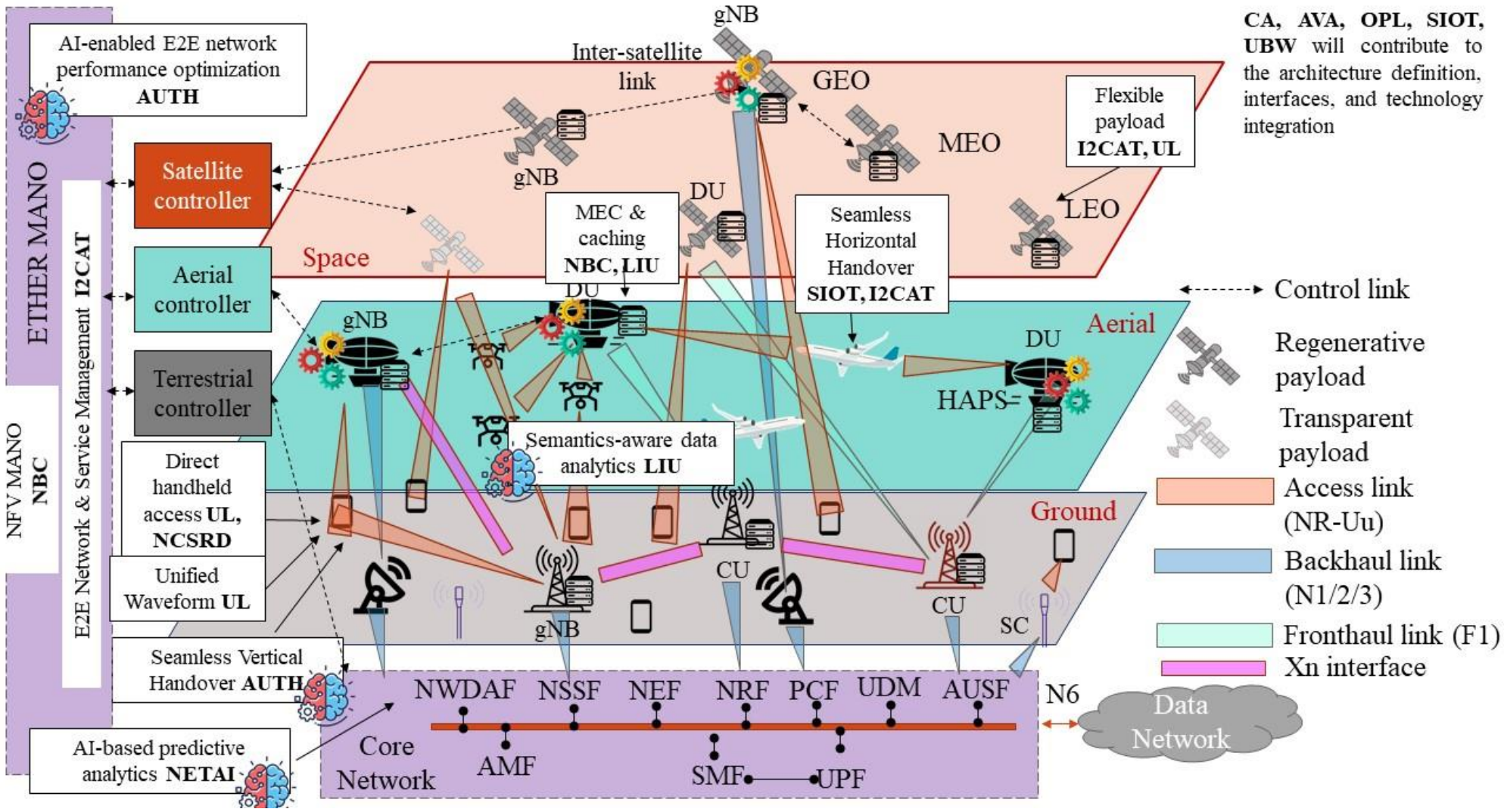
Vision



"By adopting a hybrid network, NTNs can offer significant capex and opex reductions compared to deploying only terrestrial base stations to achieve the same amount of coverage. According to the same case study, providing full 5G coverage across the UK would require tens of thousands of additional terrestrial sites, while the same coverage could be achieved with a fleet of around 60 HAPs[1]"

[1]5G's future is hybrid – the non-terrestrial opportunity," Mobile World Live, Tech. Rep.

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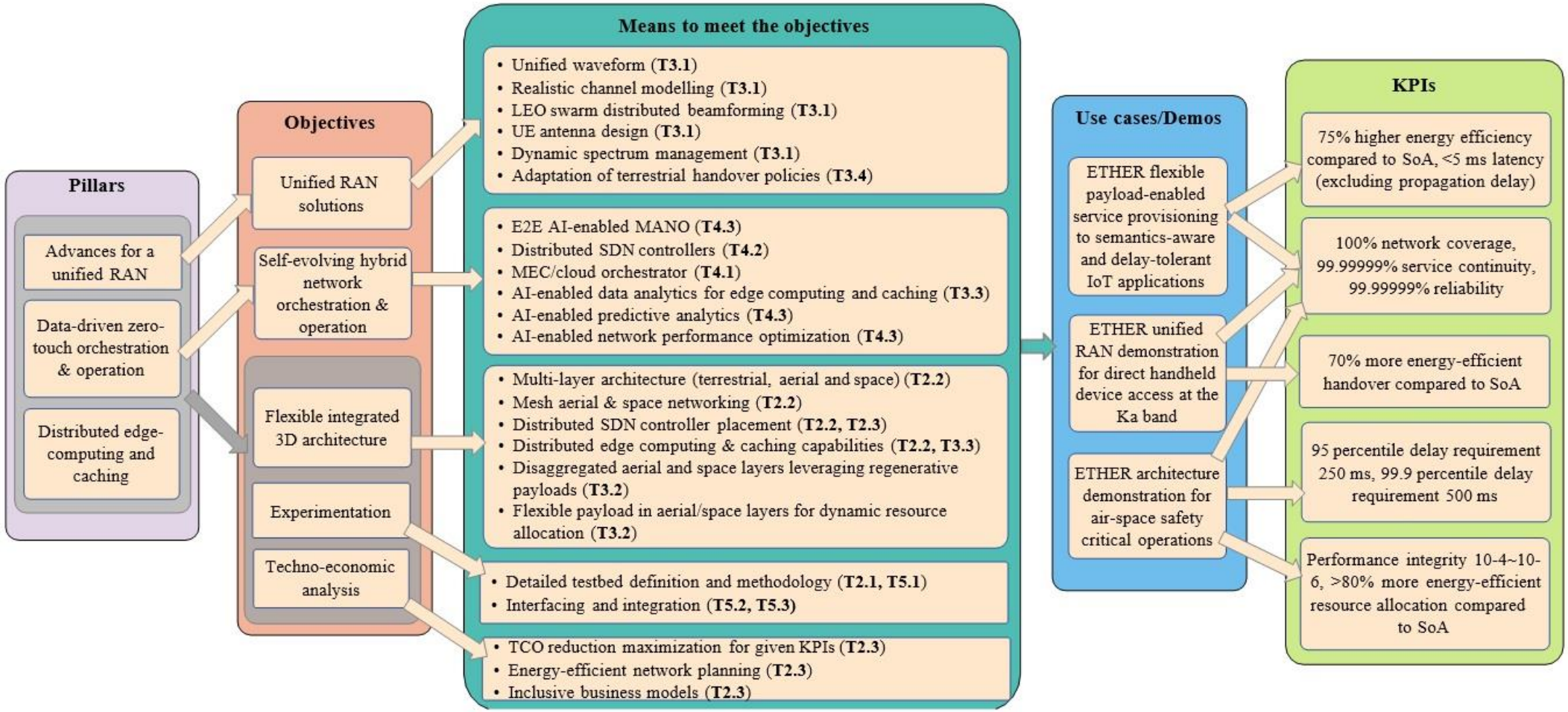
ETHER in a Nutshell

ETHER is going to provide a framework for the terrestrial/non-terrestrial network ecosystem that involves an efficient and zero-touch resource management, provides solution for key radio access network (RAN) challenges, and identifies the business opportunities for potential stakeholders



Objectives

Pillar I	**O-1**	Provide solutions for a **unified and sustainable RAN** for the integrated terrestrial and non-terrestrial network
Pillar II	**O-2**	Provide an **AI-based framework** for the self-evolving network slicing management and orchestration of the integrated network, automatically adjusting its management policies and allocated resources based on stimuli corresponding to unknown environments and situations
Pillars I, II, and III	**O-3**	**Architect a viable, highly energy- and cost-efficient**, flexible integrated terrestrial and nonterrestrial 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

Technical Innovations to be Brought

ID	ETHER Technical Innovations	ETHER Pillars		
		Pillar I	Pillar II	Pillar III
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	√	√	√

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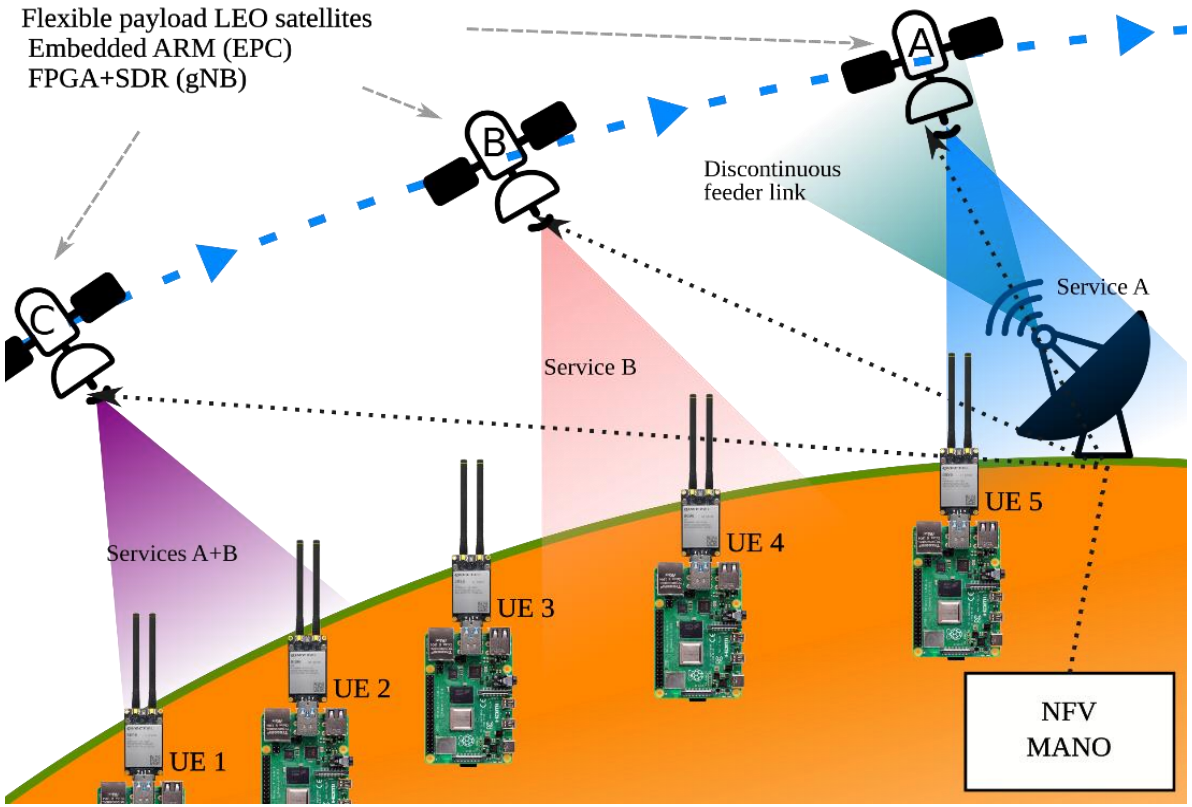
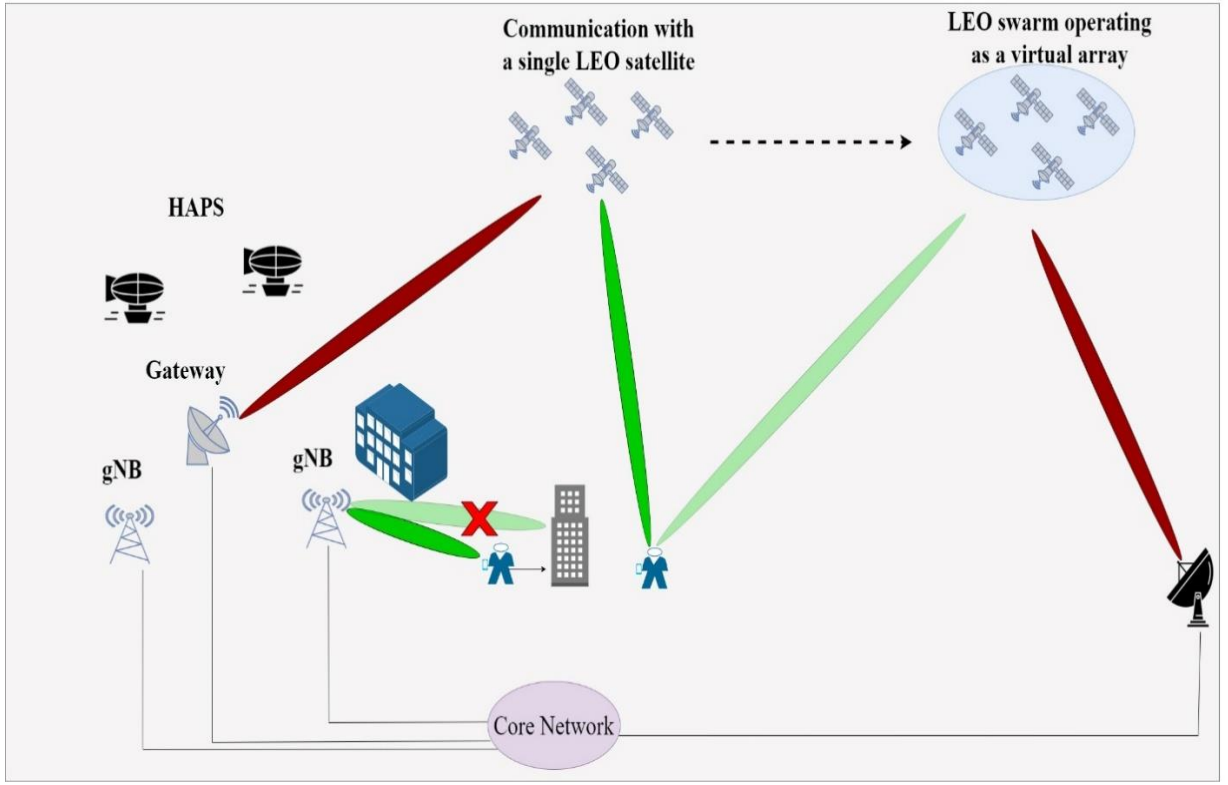
Demonstrator 1



Demo 1: Horizontal handovers for delay-tolerant IoT services	
Involved Actors	I2CAT, SIOT, LIU, AVA, OPL, UBW
KPIs	100% coverage, and >75% higher energy efficiency leveraging semantics-aware information handling combined with edge computing and caching

Demonstrator 2



Demo 2: ETHER Unified RAN for direct handheld device access at the Ka band	
Involved Actors	UL, NCSRD, AUTH, AVA, SIOT, OPL
KPIs	100% coverage, 99.99999% service continuity, 99.99999% reliability, 70% more energy-efficient handover compared to SoA [6]

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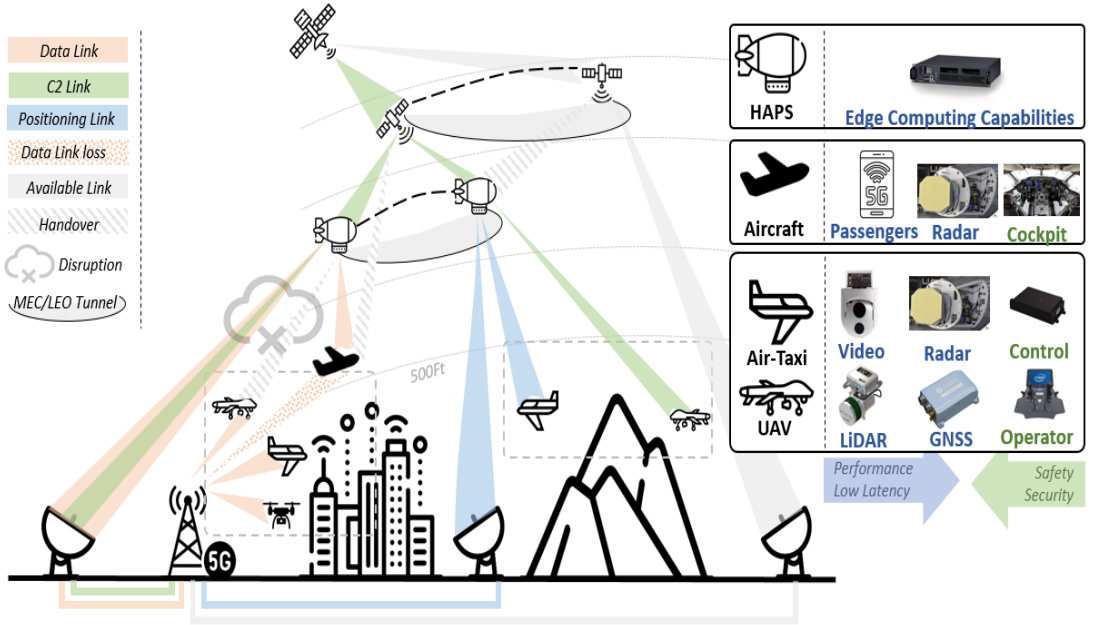
Demonstrator 3



Demo 3: ETHER Architecture demonstration for air-space safety critical operations	
Involved Actors	CA, NBC, AUTH, AVA, SIOT, OPL, NETAI, UBW, I2CAT, UL
KPIs	Performance requirements for safety-critical operation shall be comparable with EASA or EUROCONTROL requirements or Control and Non-Payload Communications (CNPC) data link from RTCA SC 208 / EUROCAE WG 73/93. Given the use of single LEO satellite in end-to-end connectivity, the targeted performance is as follows: 95 percentile delay requirement 250 ms, 99.9 percentile delay requirement 500 ms, 99.99999% service continuity [7], 99.99999% reliability [9], performance integrity 10^{-4} ~

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Work Package List

WP No	Work Package Title	Lead Part. No	Lead Part. Short Name	Person-Months	Start Month	End month
1	Project Management and Ethics	1	UL	47	M01	M36
2	ETHER 3D Architecture, Use Case Requirements, and Business Study	11	OPL	109.5	M01	M18
3	Key Technological Enablers for the seamless and energy-efficient ETHER Network Operation	9	NCSRD	114.5	M04	M30
4	Zero-touch data-driven network and service orchestration in the 3D ETHER architecture	7	I2CAT	113	M04	M30
5	Technology Integration and Live Demonstration of ETHER technologies	6	UBW	160	M12	M36
6	Communication, Dissemination, Exploitation and Standardization	12	MAR	75.5	M01	M36
			Total months	**619.5**		

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		

Thanks

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ETHER project is funded by the EU's Horizon Europe programme under Grant Agreement number 101096526