Towards a sustainable connected world

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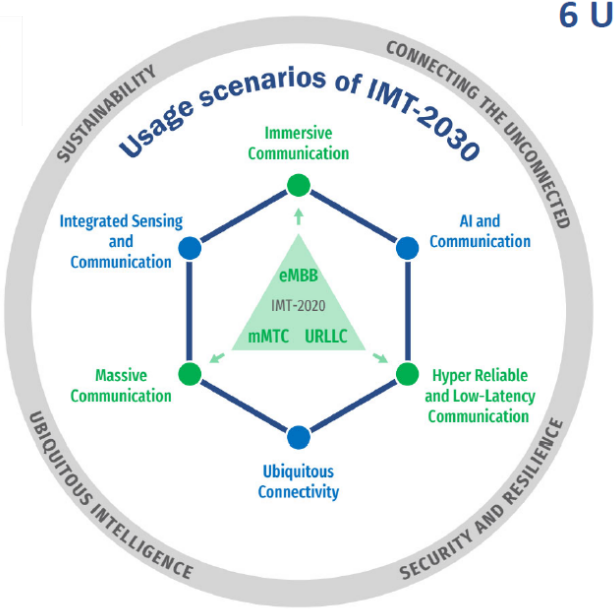
Outline

- Introduction
- IMT-2030 Scenarios and Capabilities
- Sustainable 6G
- Key Enablers (Native AI & Multi-Access)
- CelticNext Flagship - SUSTAINET


5G
6G

IMT-2030 (aka 6G) Scenarios

Usage scenarios



So called "Wheel diagram"

6 Usage scenarios

Extension from IMT-2020 (5G)

- eMBB ➡ Immersive Communication
- mMTC ➡ Massive Communication
- URLLC ➡ HRLLC (Hyper Reliable & Low-Latency Communication)

New

- Ubiquitous Connectivity
- AI and Communication
- Integrated Sensing and Communication

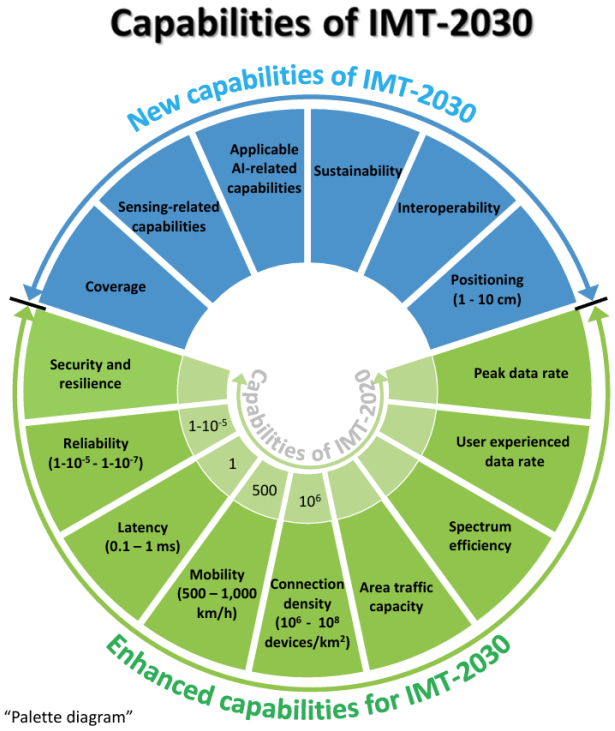
4 Overarching aspects:

act as design principles commonly applicable to all usage scenarios

Sustainability, Connecting the unconnected,
Ubiquitous intelligence, Security/resilience

Source: ITU

IMT-2030 (aka 6G) Capabilities



So called "Palette diagram"

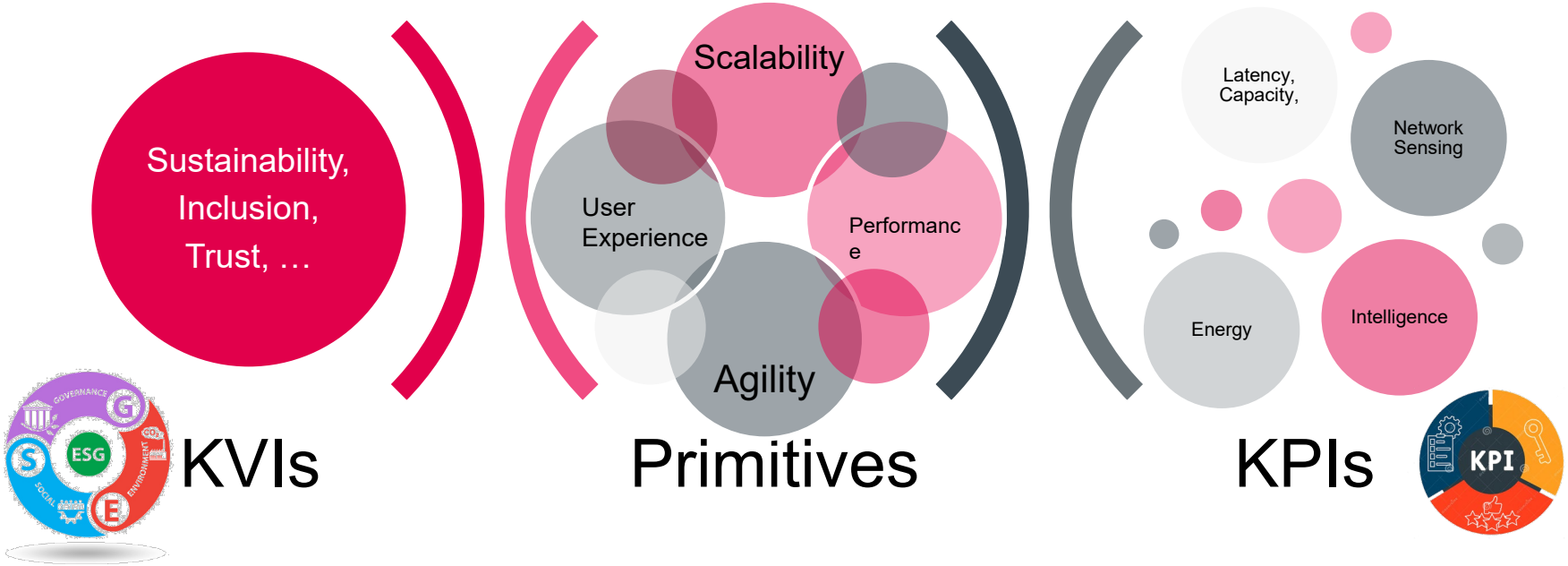
The range of values given for capabilities are estimated targets for research and investigation of IMT-2030.

All values in the range have equal priority in research and investigation.

For each usage scenario, a single or multiple values within the range would be developed in future in other ITU-R Recommendations/Reports.

Source: ITU

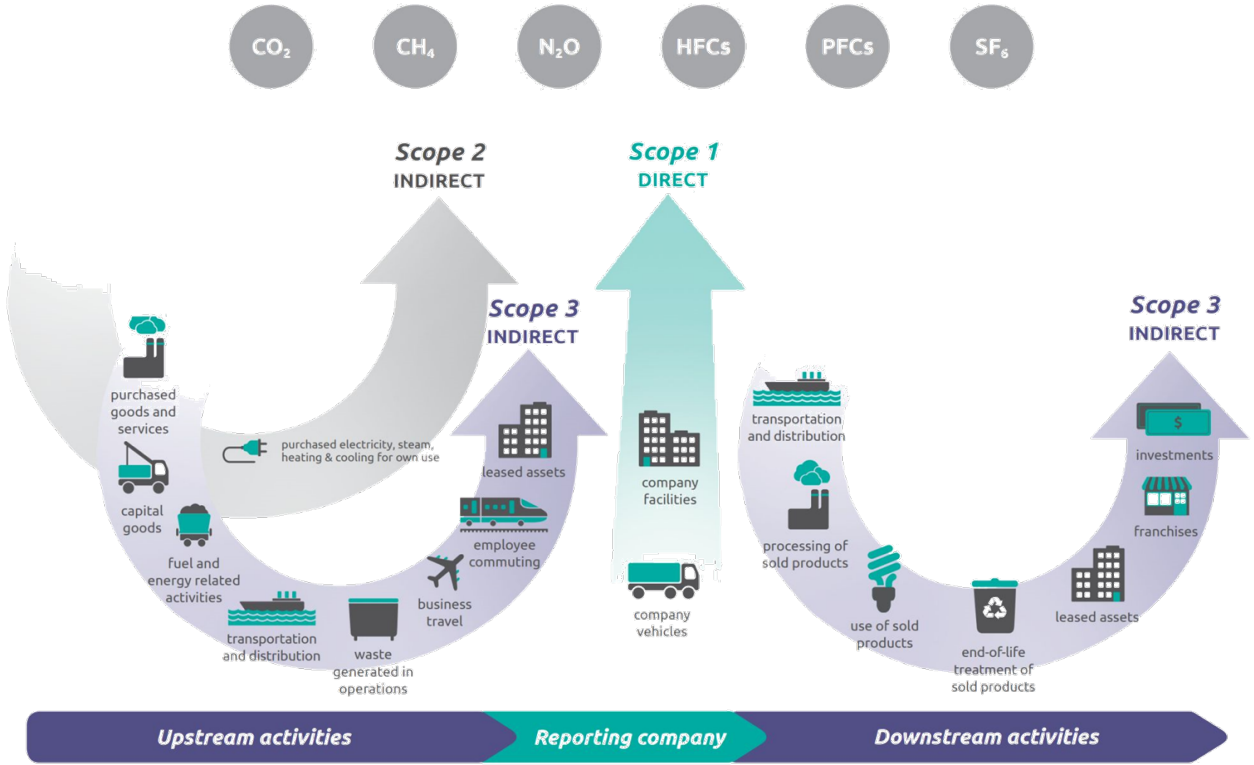
From KPIs to KVIs



Sustainable 6G

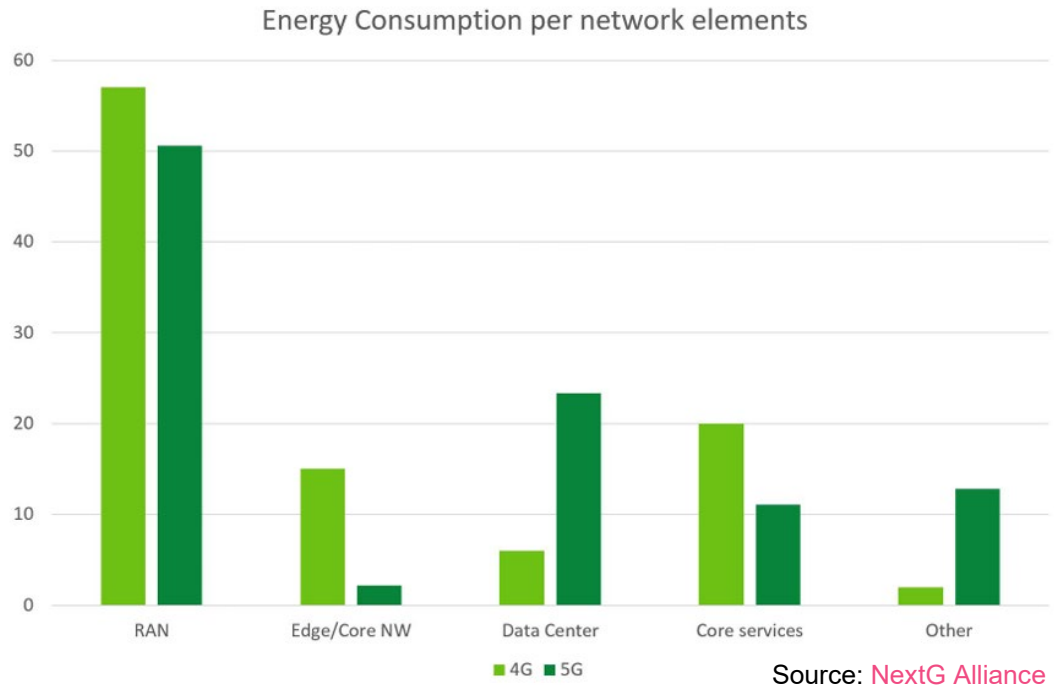
Source: Ericsson

Telco GHG Emissions



Source GHG Protocol

Energy Consumption in Telecoms &roadmap



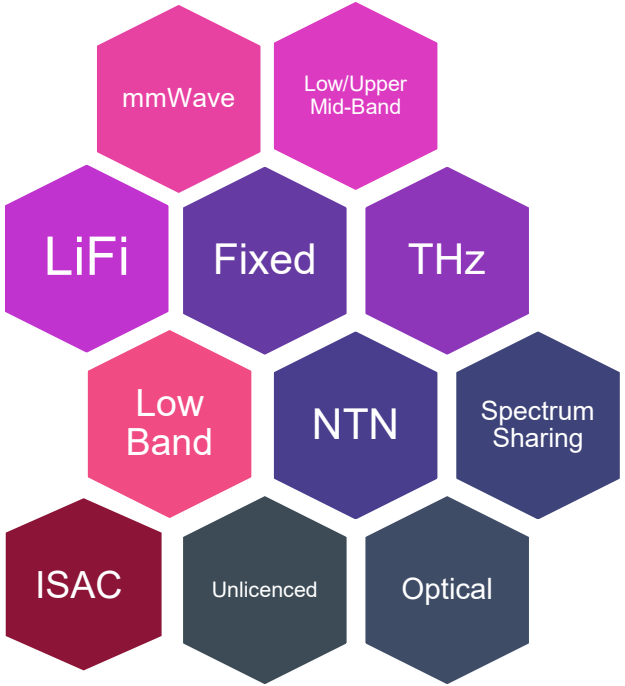
Source: NextG Alliance

Area	Energy Saving Solution	Examples of Energy Saving Potential	Timeframe
Process Optimisation	Rules-based automation (of 3GPP energy saving features) (Sec. 2.1.3.1)	3% energy reduction in a 4G/5G network	Short term
	AI based automation (of 3GPP energy saving features) (Sec. 2.1.3.2)	9% energy reduction in a 4G/5G network	Short term
Engineering Optimisation	Replace single band RRUs with tri-band remote radio units (RRUs) using multi-band Power Amplifiers (Sec. 3.1.1.1)	30% energy saving per RRU	Medium term
	Increase 'antenna gain' by doubling antenna elements per Power Amplifier in the vertical direction (Sec. 3.1.1.1)	Up to 30% energy saving per active antenna unit (AAU)	Medium term
	Passive Antennas: Simplify RF feeding paths (Sec. 3.1.3.1)	Up to 50% reduction in feeding path losses for a typical passive antenna configuration	Medium term
	Reduce DC power losses in cell sites by moving to bus based architectures (Sec 3.2)	60% reduction in DC power losses per RRU	Medium term
New Technologies	Direct Contact Liquid Cooling (DCLC) (Sec. 4.1.1.2)	Lower energy saving than for liquid immersion cooling but easier to migrate RAN baseband cards or IT equipment to liquid cooling than to immerge entire racks	Medium term
	Liquid Immersion Cooling (Sec. 4.1.1.1)	Can reduce the Power Usage Effectiveness (PUE) of a data centre to 1.02 (compared to PUE= 1.3 to 2 for air cooled)	Long term
New Technologies	Network Disaggregation and cloudification (closely matching network supply to demand) (Sec. 4.2)	Further study needed	Long term
	Reconfigurable Intelligent Surfaces (RIS) (Sec. 4.3.1)	Network Energy Efficiency up to 3.5 times greater than baseline (non-RIS assisted) networks	Late 5G Advanced / Long term
	Distributed (cell-free) Massive MIMO (DMIMO) (Sec. 4.3.2)	Network Energy Efficiency up to 2.5 times greater than cellular massive MIMO	Long term

Source NGNM

Key Technology Enablers for 6G
AI – Native Networks

Key Technology Enablers for 6G
Multi-Access/Converged Connectivity



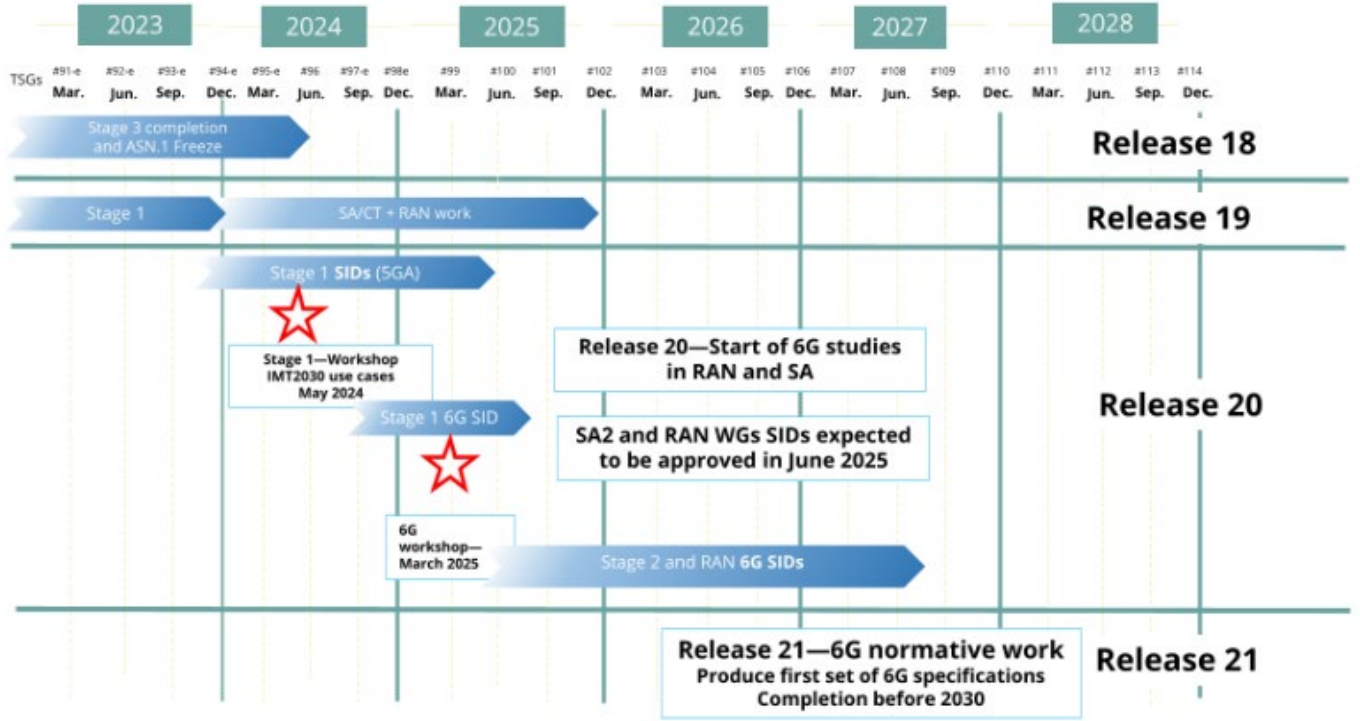
Key Drivers for 6G – findings from ITU Use Case Workshop – May 2024

	Security	AI	Immersive Com	Sustainability, Energy Efficiency	Ubiquitous and resilient coverage	Sensing	"Smart life"	Native Vo6G	FWA-FWC	LPWA	Northbound API	Healthcare	Autonomous Driving	Positionning	Backward Compatibility
GSMA	✓	✓	✓	✓				✓							
NGMN	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓		✓	✓
5GAA	✓	✓	✓	✓	✓	✓							✓	✓	
5G-ACIA	✓	✓	✓	✓		✓					✓				✓
5G-MAG	✓	✓	✓	✓	✓	✓	✓				✓				
GSOA	✓				✓									✓	
TCCA	✓	✓			✓										✓
WBA	✓	✓				✓									
B5GPC	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓	
6GForum	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓	
IMT-2030RG	✓	✓	✓	✓	✓	✓	✓							✓	
B6GA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
NextGA	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓		✓	
6GSNS-ICE	✓	✓	✓	✓	✓	✓	✓					✓		✓	
ITU	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓	

Note: Non-exhaustive list, showing the topics appearing in at least two presentations

Source: Free 6G Training

3GPP Rel-18 to Rel-21 timeline



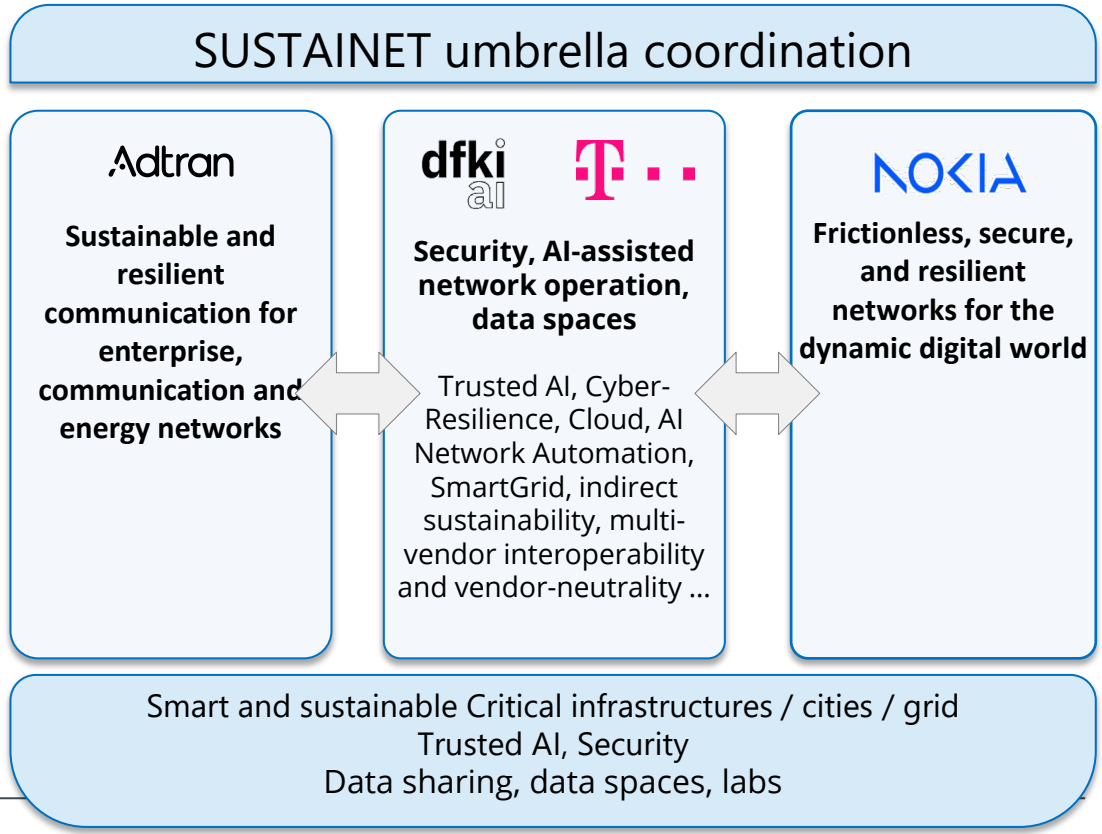
NOTE: Dates for Release 20 and Release 21 are not discussed/approved in 3GPP. This figure shows an approximate timeline for 6G work and is not an approved official timeline

More detailed information on 6G planning can be found here: https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_102/Docs/RP-233985

Source: ABI

CelticNext Flagship – SUSTAINET
Sustainable **T**echnologies for **A**dvanced Resi**l**ient and E**n**ergy-Efficient Ne**t**works

SUSTAINET promotes the development of sustainable, resilient, and energy-efficient telecommunication systems, ensuring connectivity of critical infrastructure, enterprise, and communities. It encourages collaboration of key players in the communication business to drive and demonstrate innovative solutions and readiness to contribute to the evolution of telecommunications infrastructure, targeting the integration and operation of future 6G networks.



SUSTAINET common research topics

- Control and monitoring of the telecommunications network
- Monitoring and sensing in telecommunications networks
- AI-assisted network operation
- Dependencies between telecommunications infrastructure and power supply
- Smooth digital full interconnection
- Sustainable and energy-efficient increase in transmission capacity
- Cybersecurity aspects
- Increasing the resilience of critical infrastructures
- Increasing energy efficiency and sustainability
- Convergence of telecommunications networks
- Automation, zero-touch

Thank You!

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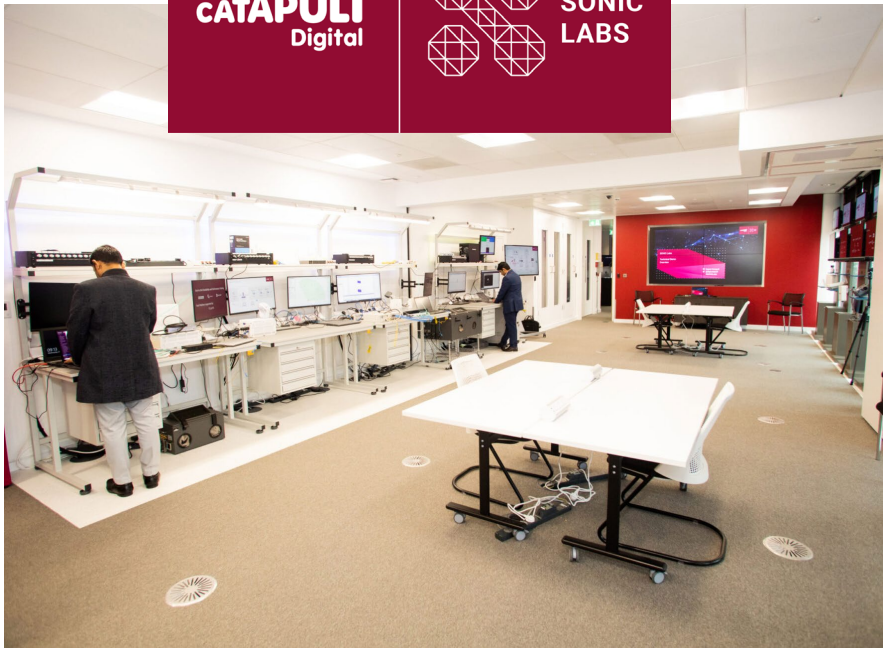

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