

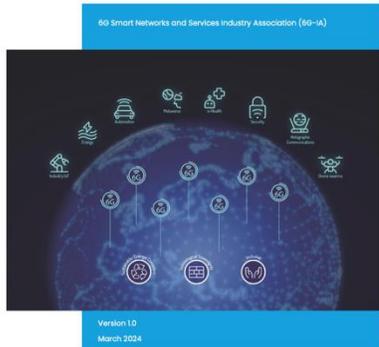
The logo consists of the text '6G SNS IA' in a bold, sans-serif font. '6G' is in a light blue color, while 'SNS IA' is in white. The background features a glowing blue globe with intricate network lines and nodes, set against a dark blue background with bokeh light effects.

**6G SNS
IA**

European View on 6G

Dr. Alexandros Kaloxylos
6G-IA Executive Director

The Voice of European Industry and Research for Next Generation Networks and Services



White paper
OPEN RAN AND 6G FUTURE NETWORKS DEVELOPMENT

URL: <https://6g-ia.eu/plans-papers/>



Open Networks and Services Whitepaper
Platforms Subdomain



WHITE PAPER
THE EUROPEAN VISION FOR THE 6G NETWORK ECOSYSTEM

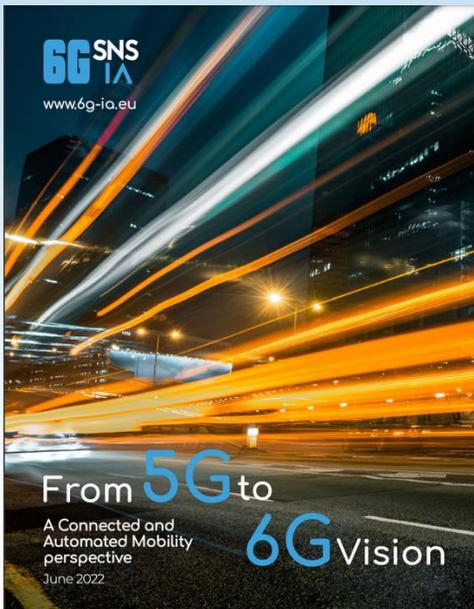
DOI: 10.5281/zenodo.6577506
URL: <https://doi.org/10.5281/zenodo.6577506>



PUBLIC-PRIVATE PARTNERSHIP



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From **5G** to **6G** Vision
A Connected and Automated Mobility perspective
June 2022



Position paper
KEY STRATEGIES FOR 6G SMART NETWORKS AND SERVICES

DOI: 10.5281/zenodo.8315347
URL: <https://6g-ia.eu/plans-papers/>



[Download the White Paper](#)



POSITION PAPER January 2025

DOI: 10.5281/zenodo.14619618
URL: <https://doi.org/10.5281/zenodo.14619618>

smart-networks.europa.eu



Position paper
RESEARCH PRIORITIES ON MICROELECTRONICS FOR 6G NETWORKS R&I ACTIVITIES

Editors: Bernard Bonani, Steve Kulkarni

Endorsed by **Aeneas**



More than 40 white papers. All of them are publicly available at <https://6g-ia.eu/plans-papers/>

IMMERSIVE EXPERIENCE

Immersive Experience use cases are based on an evolving XR technology.

Immersive Experience is all about meeting the fundamental human need of "experiencing" a now digitally extended or virtual environment to understand and to act.

Use Cases
Seamless Immersive Reality | Immersive Enterprise & Industry | Immersive Education | Interactive Immersive Content Creation

COLLABORATIVE ROBOTS

The network's main users are machines.

Emphasis lies on task-specific local connectivity. Depending on the task or needs, the network topology may undergo frequent changes. The level of machine autonomy determines the communication requirements.

Use Cases
Cooperating Mobile Robots | Autonomous Embodied Agents with Flexible Manufacturing | Mesh Embodied Int

PHYSICAL AWARENESS

Physical Awareness use cases build on beyond-communication capabilities in networks: sensing, positioning, compute, and AI. By gathering 3D data about physical scenarios and situations, efficiency and safety can be improved.

Use Cases
Network Assis
Environment

TRUSTED ENVIRONMENTS

Comprehends use cases in local environments (streets, hospitals, schools, retirement homes) delivering human-centric services and promoting health, well-being, safety, inclusion, and autonomy in daily life.

These are based on sensing technologies as well as AI/ML and compute support to create spatial and situation awareness and enable context-driven interventions.

Use Cases
Human-Centric Networks | Industrial Sensors Network for Safe Production & Manufacturing | Wireless In-Vehicle Network

DIGITAL TWINS

Digital Twins is a set of use cases where digital equivalents of the real world are created and displayed for interaction, control, maintenance, as well as process and component management.

Use Cases
Realtime Digital Twins | Cloud Continuum | Smart Maintenance | Digital Twins (Building Mo
PPDR Digital Twin

FULLY CONNECTED WORLD

Ensuring connectivity everywhere, expanding beyond purely traditional terrestrial networks to deliver the benefits of communications to everybody.

Besides expanding coverage cost-effectively, it also enables network function availability for crisis management, earth monitoring, digital health services, virtualisation of device functionalities, or support of autonomous supply chains.

Use Cases
Ubiquitous and Resilient Networks | Digital Sobriety and Enhanced Awareness | Earth Monitor & Sustainable Food Production | Autonomous Supply Chain | Virtualization of Device Functionalities | Resilient Communication for Safety Critical Applications

Work Items to meet the IMT-2030 targets

INTEGRATED SENSING AND COMMUNICATION

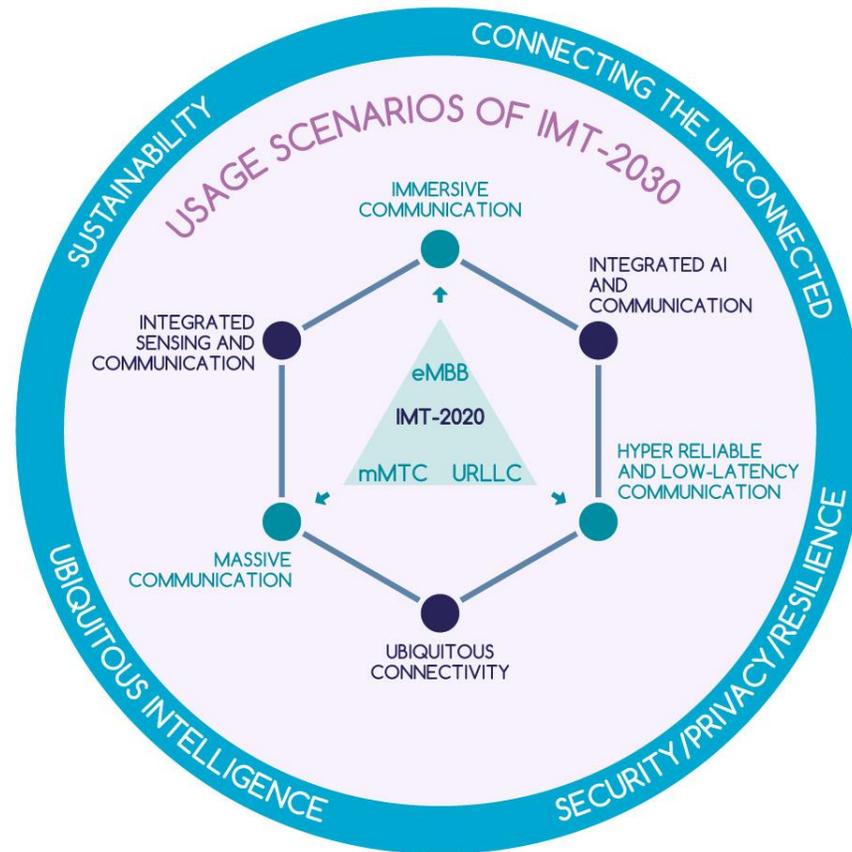
- Distributed sensing services
- Compact & Complete Data Representation
- Sensing control functions
- Continuity of sensing service
- mmWave spectrum blocking
- ISAC functionalities distribution across network elements
- Waveform and signalling optimization
- Deployment limitations (cost, power, size)
- Object/Target Management Function

INTEGRATED AI AND COMMUNICATION

- Data-driven Architecture
- AI model trustworthiness
- Intelligence at the edge
- AI framework & conflict management
- AI for RAN energy efficiency
- Self-evolving autonomous systems

UBIQUITOUS CONNECTIVITY

- Global, Open Service APIs
- Trust models
- Integration with NTN
- Integration of AI-solutions
- Federation
- User-centric approach
- Management plane centralization



IMMERSIVE COMMUNICATION
HYPER RELIABLE AND LOW-LATENCY COMMUNICATION
MASSIVE COMMUNICATION

- Flexible Service-Centric Design
- Minimized MIMO Processing Complexity,
- Efficient Orchestration (of Orchestrators)
- Energy-Efficient RAN
- Excellent Interoperability of RAN Components
- Integration of Localized Networks
- Optimization of Control Plane Signalling
- Alignment of Network Intelligence with network infrastructure
- Seamless Connectivity
- Quantum-Resilient Security
- Sustainable RAN Virtualization
- Reconfigurable Multi-Connectivity
- Optimization of RU Energy Consumption
- Programmable Transport

6G Use Cases	Networld Europe SRIA 2022	5G Americas / Next G Alliance	Huawei (China)	B5G Consortium (Japan)	TSDSI (India)	MediaTek (Taiwan)	Survey Paper	ITU IMT-2030
Holographic Communications	✓	✓	✓	✓	✓	✓	✓	✓
Cyber-Physical Systems, DT, Manufacturing	✓	✓	✓	✓	✓	✓	✓	✓
Multi-Sensory extended Reality (XR), Gaming/Entertainment	✓	✓	✓	✓	✓	✓	✓	✓
Tactile/Haptic Communications	✓	✓	✓	✓	✓	✓		✓
Medical/Health Vertical, Telesurgery	✓	✓	✓	✓	✓	✓	✓	
Cooperative Operation among a Group of Service Robots / drones	✓	✓	✓	✓	✓		✓	✓
Imaging and Sensing	✓	✓	✓	✓	✓			✓
Transportation Vertical (automotive, logistics, aerial, marine, etc.)	✓	✓	✓	✓	✓		✓	
Space-Terrestrial integrated network	✓	✓		✓	✓		✓	✓
Intelligent Operation Network	✓		✓		✓		✓	✓
Critical Infra, Government/National Security	✓	✓		✓				
First Responder/Emergency Services		✓		✓	✓			
Smart Buildings			✓	✓	✓			
Agriculture / Smart Farming				✓	✓			



Major differences with respect to 5G



Capabilities	IMT-2030 (6G)	IMT-2020 (5G)
Peak data rate	50-100-200 Gb/s	20 Gb/s
User exp. data rate	300-500 Mb/s	100 Mb/s
Spectrum efficiency	1.5-3 x IMT-2020	
Area traffic capacity	30-50 Mb/s/m ²	10 Mb/s/m ²
Connection Density	10 ⁶ - 10 ⁸ dev./km ²	10 ⁶ dev./km ²
Mobility	500 - 1 000 km/h	500 km/h
Latency	0.1 - 1 ms.	1 ms.
Reliability	10 ⁻⁵ - 10 ⁻⁷	10 ⁻⁵



- IMT-2030 KPIs significantly more demanding than those for IMT-2020
- 6G to support selected United Nations' SDGs: sustainability, inclusion, trustworthiness,...
- Requires integration of new technology components: key innovations in radio access and core networks

Plan future instruments

Network Computing platform as European technology aggregator with underpinning technologies (Draghi Annex, 3.1)



Cloud (Draghi Annex, 3.2)

- New architectures for EU services
- Cloud AI convergence
- Cloud for Networks

Artificial Intelligence (Draghi Annex, 3.2)

- Network specific LLM (GSMA)
- Distributed archs
- Frugal AI, low computation
- Cross Domain AI
- Network for AI

Quantum (Draghi Annex, 3.2)

- Post Quantum Security
- Quantum computing for Net/service management

Micro Electronics, chipsets on selected domains (Draghi Annex, 3.3)



Societal Resilience
 Large scale digitization of businesses/social processes



- > **Synergies from R&I to pre-deployment** from the start & at the Programme level: not all technologies are at the same maturity level.
- > Include the entire **life cycle through** a well-defined set of technologies, use cases, and timelines, akin to initiatives in other regions.
- > **Include new activities:** defence, transfer of technologies to start ups.
- > **Facilitate the execution of cross-cutting activities** (Chips JU, Photonics HPC, Quantum, etc.)
- > **Respond to the suggestions from PKH, Draghi, and Heitor reports**



Thanks for your attention!

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