



6G SNS

Insights from the Vision and Roadmap of the European SNS Research Program

Smart Networks and Services Joint Undertaking

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SNS JU Activities and Roadmap



Our European Research Work Program



Non-terrestrial Networks in our 6G Vision

Smart Networks and Services
Joint Undertaking

JU
Members



States
Representatives
Group



Stakeholders
Group



International
Partnerships



- **Representation of Private & Public Sector (50/50)**
- Governing Board: Strategic orientation and roadmap
- Long term commitment (planning and implementation)

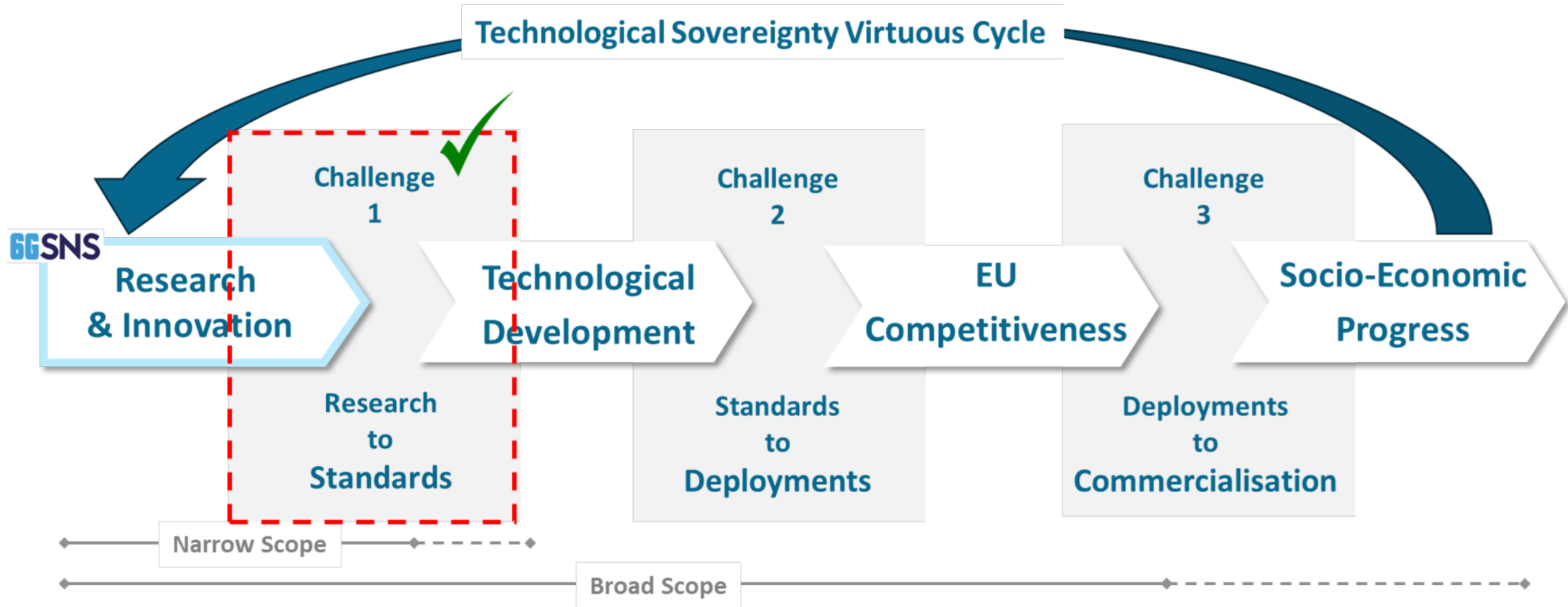
Total Funding
1.8 Billion €
2022-27

- **Synergies with national investments and 6G R&I plans**, through a coordinated approach.
- Consultation and Strategic Guidance.
- Strategic coordination of EU piloting and deployment initiatives

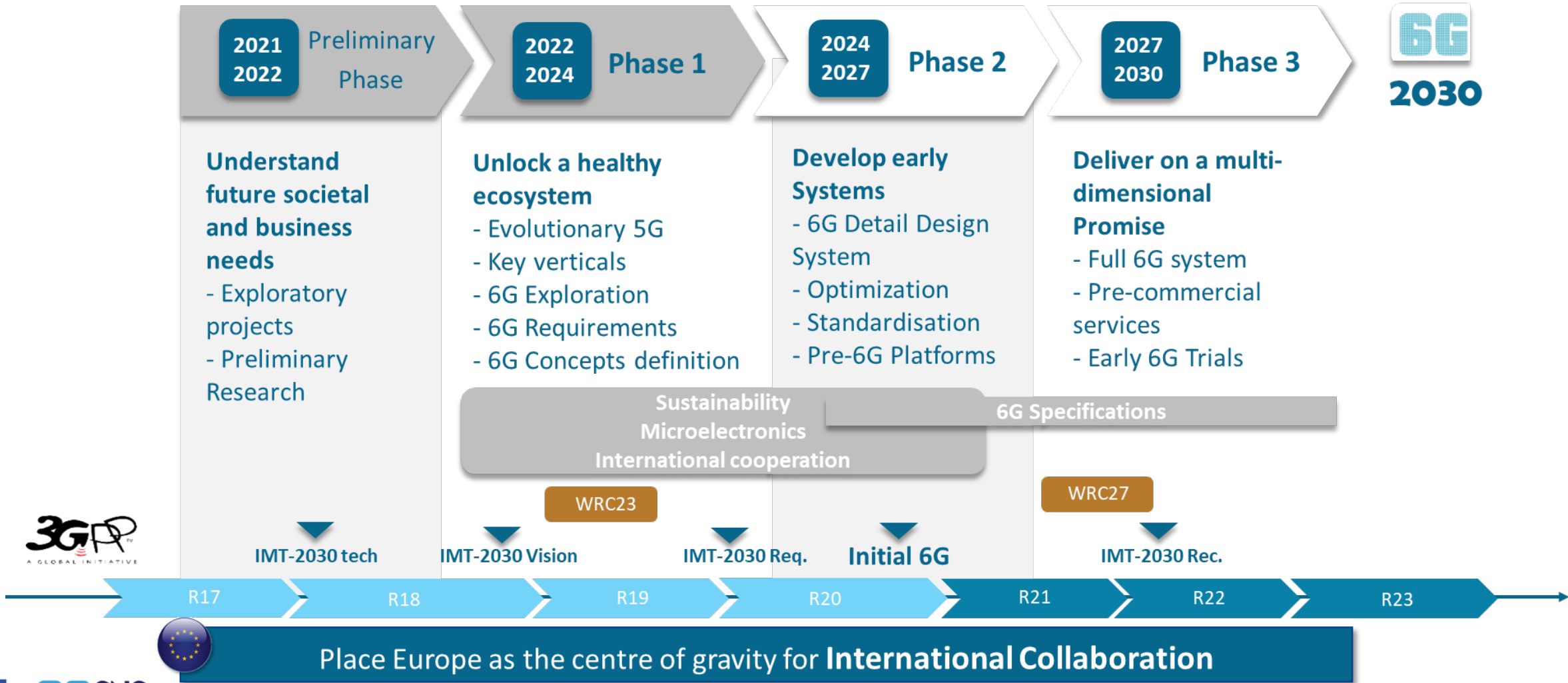
- **Synergies with other partnerships and associations**
- Advisory body

- **Cooperation in mutually relevant domains**
- Associated Countries / multilateral participation
- Long term collaborative cross-roadmaps possible

Collaboration and Partnerships is a Strategic priority for the SNS program



TS: the ability for Europe to develop, provide, protect, and retain critical technologies



Place Europe as the centre of gravity for International Collaboration

Examples
Non-exhaustive

Smart
Network
Infrastructure
(6G capabilities)



Convergence
with other
adjacent
technologies

6G will require significant **technological breakthroughs** to enable its ambitious goals

AI-Driven Architecture



- Programmability and Control
- AI governance
- Deterministic networking

Radio & Signal Processing



- 6G RAN modulation
- Disaggregated RAN
- Beamforming, RIS
- THz bands, VLC
- Harmonized Comms and Sensing

Optical Networks



- Intrinsically secure, green and flexible transport networks.
- Sustainability

Ubiquitous Computing



- Edge-Cloud Integration
- Responsiveness, reduced data flows
- Distributed microservices

Security



- Network and Services
- Larger attack surface
- Micro-segmentation
- Security as-a-Service

Non-terrestrial Networks



- **Integration with TN**
- (LEO) networks
- UAM services
- Edge flying nodes

Focus of today

Devices & Components



- **Advanced micro-electronics**
- Efficient Tx/Rx modules
- Optical & hybrid transceivers
- Neural processing units

Special purpose (sub)-networks



- **Vertical sub-networks** such as in-body, in-robot, in-car networks, etc

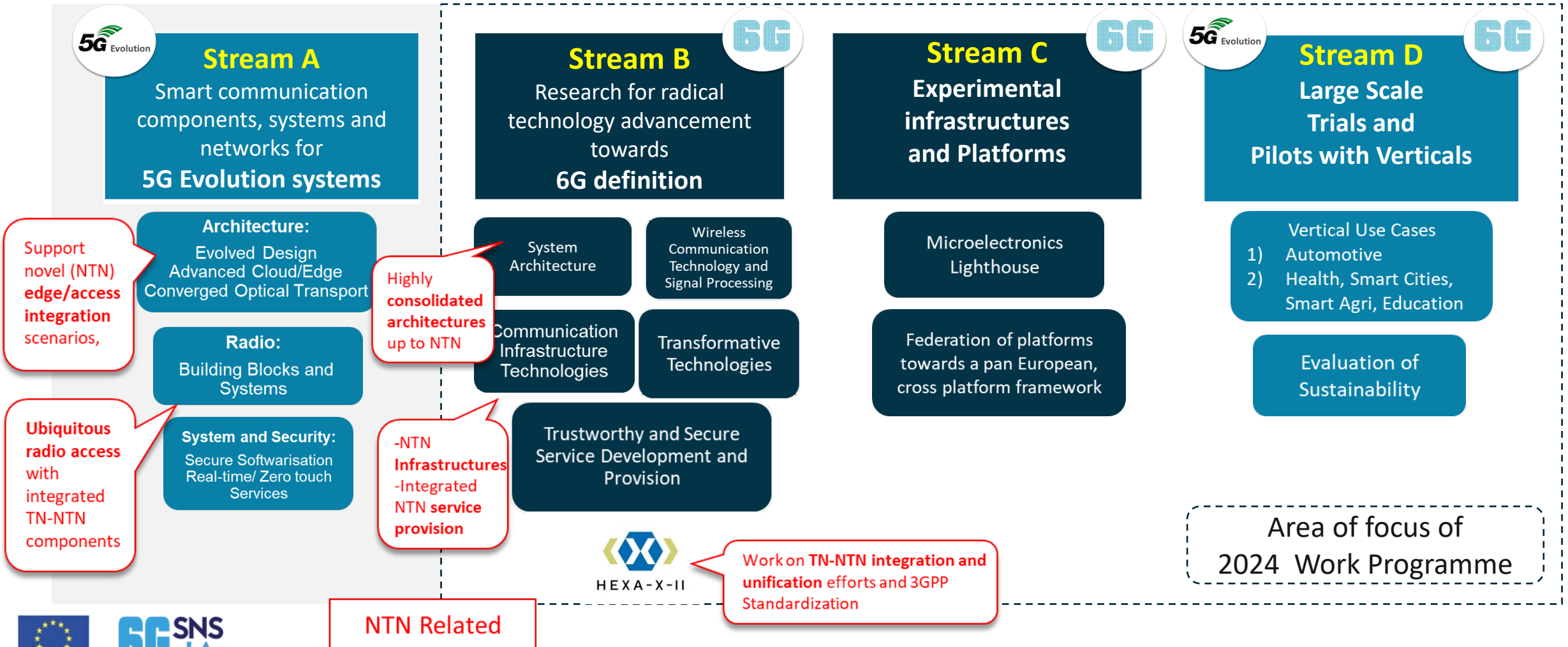
Future Emerging Technologies



- May have deep impact in the future
- Do not have a clear industrial path yet

Source: Network Europe SRIA - <https://www.networkeurope.eu/sria-and-whitepapers/>

EU upfront commitment of €900M up to 2027



129 MM €

What is new?

Higher TRL
Focus on 6G
Standardisation
Extended PoCs

International
Collaboration

Lighthouse
Projects

Artificial
Intelligence

Trials with
Verticals

Stream B

Research for radical technology advancement
towards **6G** definition

B1. System Architecture

B2. Wireless Tech

B3. Infrastructure & devices

B4. Reliability & Security

B5. Japan



B6. South Korea



B7. Sustainability



B8. Reliable AI

Stream C

Experimental
infrastructures
and Platforms

Stream D

Large Scale
Trials and
Pilots with Verticals

Other

Synergies and CSA

CSA. Operations

C. Microelectronics



D. Large Scale Trials

Synergy EU-Rail
FRMCS



Open for Proposals
Until **18 April 24**

TN-NTN Integration guarantees full-service reliability



Cost

Improved network economics



Ubiquity

Bridge digital divide anywhere & for anyone



Mobility

Fast moving up to 800 km/h



Scalability

Massive number of objects connected



Security

End-to-end control of data path



Resilience

Always-on Back-up network availability

Non-exhaustive



Multi-Layer Architecture

- Full network integration
- Spectrum (coexistence and sharing)
- Standardisation roadmap



Constellation Management

- Synchronisation
- Resource Management
- Integration of computing and networking



Sustainability

- Energy efficiency
- Space Debris
- Life cycle of satellites



Data Security & Privacy

- Ultra-precise positioning
- Regulation of data computation in space



Full Unification TN-NTN

- Technological Sovereignty
- IP for space networks

TN-NTN convergence will incentive **network management and orchestration innovation**



Dedicated Session
4th April

SNS Projects	Members	Areas of Focus
	<p>11</p>	<ul style="list-style-type: none"> Satellite and Terrestrial Access for Distributed, Ubiquitous, and Smart Telecommunications Fully integrated 5G-NTN autonomous system Flexible multi-constellation/multi-orbit architect. Self-adapting to diverse vertical requirements.
	<p>15</p>	<ul style="list-style-type: none"> Design and validate key enablers for the integration of TN /NTN components into 6G Multidimensional network infrastructure, multi-constraint RANs, and multi-user terminals. Sustainable and resilient 3D multi-layered (GSO, NGSO, HAPS, drones) network architecture
	<p>13</p>	<ul style="list-style-type: none"> Self-evolving terrestrial/non-Terrestrial Hybrid Networks Unified Radio Access Network (RAN) and energy-efficient, AI-enabled (zero-touch) resource management across TN/NTN domains.
	<p>18</p>	<ul style="list-style-type: none"> Complete and modular facility for the European experimentation ecosystem Fully configurable, manageable and controlled end-to-end trial networks MoU with European Space Agency 5G/6G Hubs
	<p>13</p>	<ul style="list-style-type: none"> Distributed AI-Driven Open & Programmable Architecture for 6G Networks Combined communications, computation and control enabling IT-Network convergence for highly reliable IoT services

- The definition of the 6G vision has begun and **NTN is recognized as playing a pivotal role** in future fully integrated systems.
- SNS vision is multilayer and involves the **cooperation of terrestrial, airborne and space nodes**.
- A **complex landscape for research ahead** as each layer of the architecture presents differing challenges.

Europe should not miss this opportunity to be at the forefront of the next frontier in telecommunications