



# ***The Strategic Framework of the 6G-PATH Project: Supporting Opportunities for 6G Deployment in Diverse Market Use Cases***

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**6GSNS**

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# 6G-Path



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# Introduction – The Global 5G's View



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- **The fast and worldwide 5G deployment has resulted to the growth of numerous data-intensive applications and verticals** due to the availability of high data rate, bandwidth and reliability.
- **The Global establishment of the 5G mobile communications technology is already showing signs of becoming a major factor, in driving productivity.**
- **5G is expected to**
  - **be the “key enabler”** for long-envisaged, highly integrated & autonomous applications in many sectors.
  - **accelerate the digitalization** of economies and society.
- **5G and its advancements towards B5G/6G practically aim for *industrial* communications to help digitize the economy**, in a broader scope and also contribute towards a form of global digital transformation.
- **Various vertical sectors such as *industrial IoT, eHealth, automotive and transportation, education, media and entertainment, public safety, smart cities, manufacturing and agriculture* will be the leading adopters.**

Recently, the **IMT-2030** has released the **overall objectives for 6G networks**:

- **6G creates a new era** where billions of connected “things”, humans and other equipment (such as vehicles, robots and drones) will generate **Zettabytes of digital information**.
- **6G is set to support various novel and evolved use cases (UCs) and application domains that shall “meet” important societal needs and create value** in multiple ways.
- **6G will be a self-contained ecosystem of Artificial Intelligence (AI), progressively evolving from being human-centric to being both human- and machine-centric.**
- **6G will bring a near-instant and unrestricted complete wireless connectivity.**

**The novel 6G architecture should be sufficiently flexible and efficient to:**

- **enable easy integration of “everything”** (*i.e., a network of networks, joint communication and sensing, non-terrestrial networks and terrestrial communication*)
- **encompass AI-powered enablers along with local and distributed compute capabilities.**

**AI and ML will help, *inter-alia*, to:**

- **Maintain operation cost-effectiveness** of envisioned complex 6G services;
- **automate some level of decision-making processes**, and;
- **achieve a zero-touch approach.**

The foreseen **scenery of ubiquitous B5G/5G services** implicates for

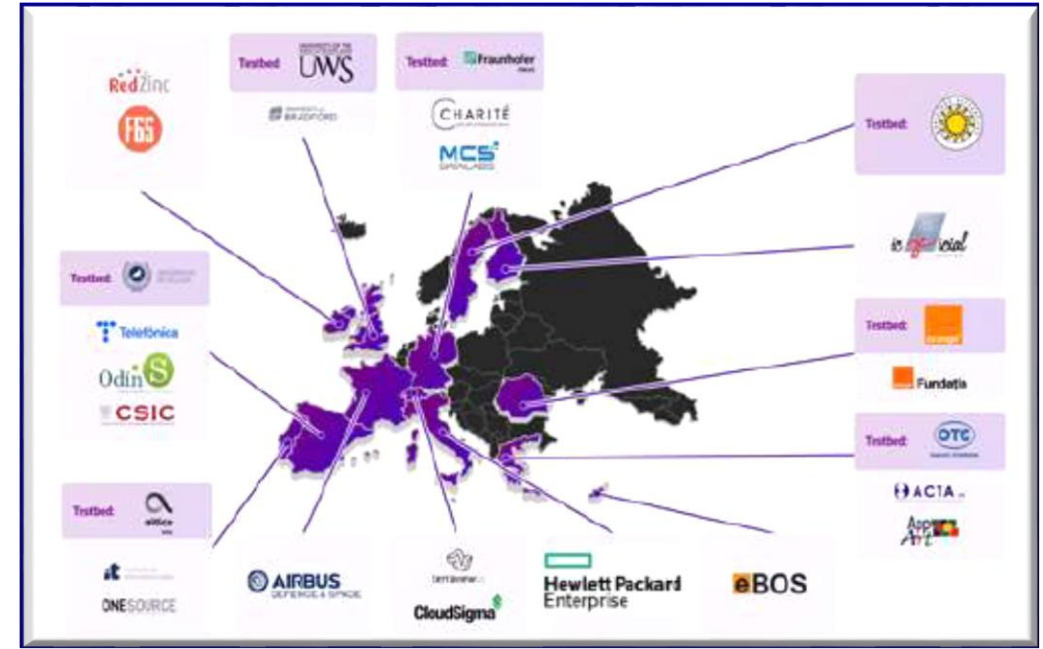
- ◆ concrete and extensive trials,
- ◆ validation tests and a
- ◆ appropriate sets of measurements

*that innovating vertical players have to perform, if they desire reaching to reliable conclusions affecting 5G and/or 5BG performance.*

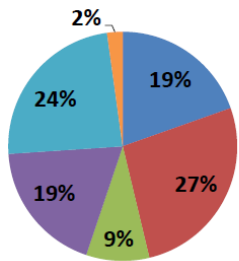
- ◆ The proposed **trial environments** shall “reflect” the conditions and configuration that the vertical applications will face/confront on their launch in production networks, *to verify whether the corresponding application may be potentially considered as “5G-ready”.*
- ◆ Furthermore, by **early testing innovative UCs over a standards-based 5G facility/testbed** and by **applying a methodical approach**, *a broad range of vertical industries may timely make well-informed business decisions on launching their services with guaranteed performance levels and, therefore, with higher chances of business success.*
- ◆ **It is important to define suitable test & measurement methods, test cases, procedures and KPI formalization & validation to the greatest possible extent, from R&D to real environments.**

# 6G-PATH at a glance

- # **Title: 6G Pilots and Trials Through Europe**
- # **Grant Agreement No.: 101139172**
- # **H2020 Call: Horizon-JU-SNS-2023**
- # **Funding Instrument: HORIZON-JU-IA**
- # **Coordinator: OTE – Technical Coordinator: OneSource**
- # **Duration: 36 months – Starting Date: January 01, 2024**
- # **EU Contribution: 12.571 M€ – FSTP: 3.0 M€**
- **26 Partners – 13 Countries (GR, FI, RO, ES, PT, FR, DE, SW, IE, CY, IT, CH, UK)**
- **10 Use Cases (+30 Use Cases in FSTP) – 7 Test-beds/Pilots**



## Budget allocation



- Industry
- SME
- University
- Research
- FSTP
- NGO

## 5 industry partners



## 8 academic & research partners



## 12 SMEs & 1 NGO



## The Challenge:

- ✦ **The path towards 6G** is gradually taking place *following to the 5G's worldwide deployment both publicly and privately.*
- ✦ Although 5G brought major benefits in many fields (e.g., performance and efficiency), **more is always expected** *in terms of efficiency by the overall community* and *of performance by industry and technology providers* who want to further increase their offerings and products.
- ✦ **Continuous demands** for higher throughput, lower latency and more energy efficient communications needs to be supported by relevant use cases, *being able to claim & demonstrate the needs for such requests.*

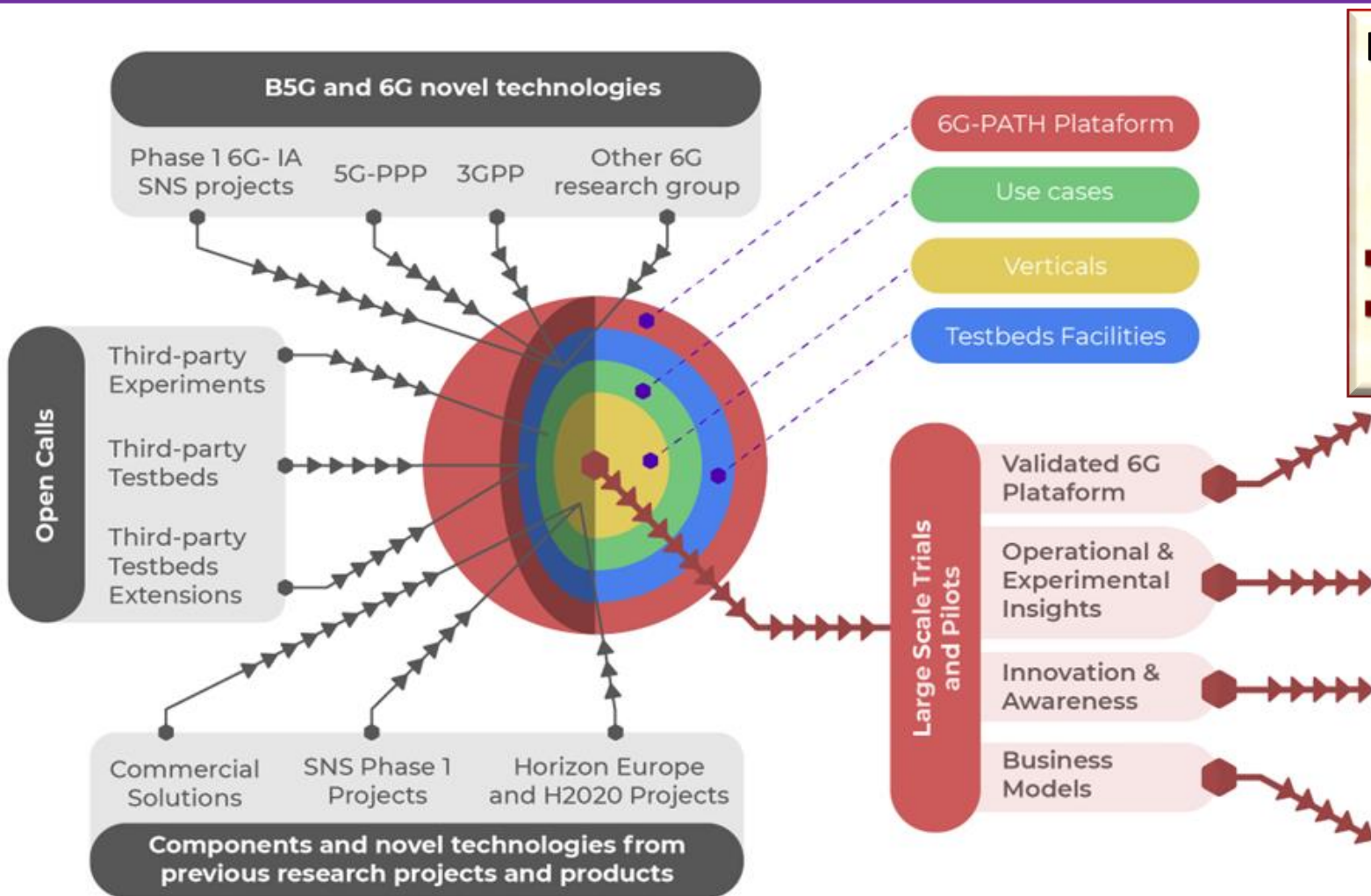
## The Way forward:

- **6G-PATH's goal is to help foster the further development and integration of new and improved tools and products from EU companies with 5G/6G, while also measuring relevant KPIs & KVIs.**
- **7 testbeds** will be part of the project consortium, which will be used by **10 use cases** spread across **four key verticals: Healthcare, Education, Smart Cities and Farming.**
- **A portion of the budget will be used for FSTP**, where there is vision for the integration of **2 new Pilot Sites**, extension of the testbeds with **10 additional technologies**, as well as **30 new Use Cases**, **through Open Calls**, *to further involve the community and obtain more metrics and outcomes.*
- **6G-PATH will work closely with other ongoing/starting Stream-B and Stream-C projects** [in a feedback loop.](#)

# 6G-PATH – Main Scope



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*6G-PATH concept and driving innovation motivators*

In the B5G/6G transition it is essential that

- ▣ *requirements are set and*
- ▣ *both new and demanding Use Cases (UCs) are specified*

➔ *as means of setting the 6G challenges, and*

➔ *for supporting 6G validation in realistic scenarios.*

6G-PATH aims to foster the development of new technologies supporting 6G,

- ▣ *in close collaboration with other 6G-IA projects and*
- ▣ *through the process of Open Calls*

- **to engage European companies** developing innovations for B5G and 6G systems, as well as
- **to bring new UCs and pilot sites** to the 6G ecosystem.



- **Integrate and operate** a large set of testbeds and pilot sites that will go beyond 5G and **follow 3GPP Releases 18, 19 and 20**. *(A total of 7 testbeds will be initially made available by the Consortium, and up to 2 more testbeds or pilot sites will be integrated by means of Open Calls).*
- **Use** these testbeds as a common infrastructure for systematic integration of B5G/6G innovations **being developed in the scope of other 6G-IA projects and/or by third parties (by means of Open Calls);** *those innovations can be demonstrated and validated across multiple testbeds, Use Cases, and applications (with a specific focus on the aforementioned Verticals).*
- **Offer** a transversal experimentation platform which will streamline: **(i) the technical integration of demanding UCs and applications into the testbeds** and; **(ii) the collection of relevant metrics** during the pilots and trials. *This transversal platform is also expected to considerably lower the barriers for innovative Use Case or application promoters interested in adopting or assessing the suitability of B5G/6G technologies for their services and applications.*
- **Integrate, demonstrate and evaluate** a wide range of demanding UCs in the four envisaged verticals. **At least 40 UCs will be evaluated** *(10 directly provided by the Consortium, and a minimum of 30 to be engaged by means of Open Calls).*

# 6G-PATH - Goals (cont'd)



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- **Perform** a comprehensive and meaningful validation of technological innovations and pilot setups *to ensure an ambitious and clear path towards 6G by the end of the project.*
- **Perform** an extensive analysis of potential business models for the envisaged UCs, *to identify the most viable solutions from this perspective for each Use Case in specific, and for the related Verticals industry business model in general.*

Overall, 6G-PATH will build an extensive B5G/6G infrastructure where a set of core architectures and domain-specific capabilities will:

- *be brought together and*
- *be made available for integration of applications and UCs of relevance (within the four addressed verticals),* to conduct large-scale pilots and trials.

**The results of these pilots and trials will be collected and analysed in detail,**

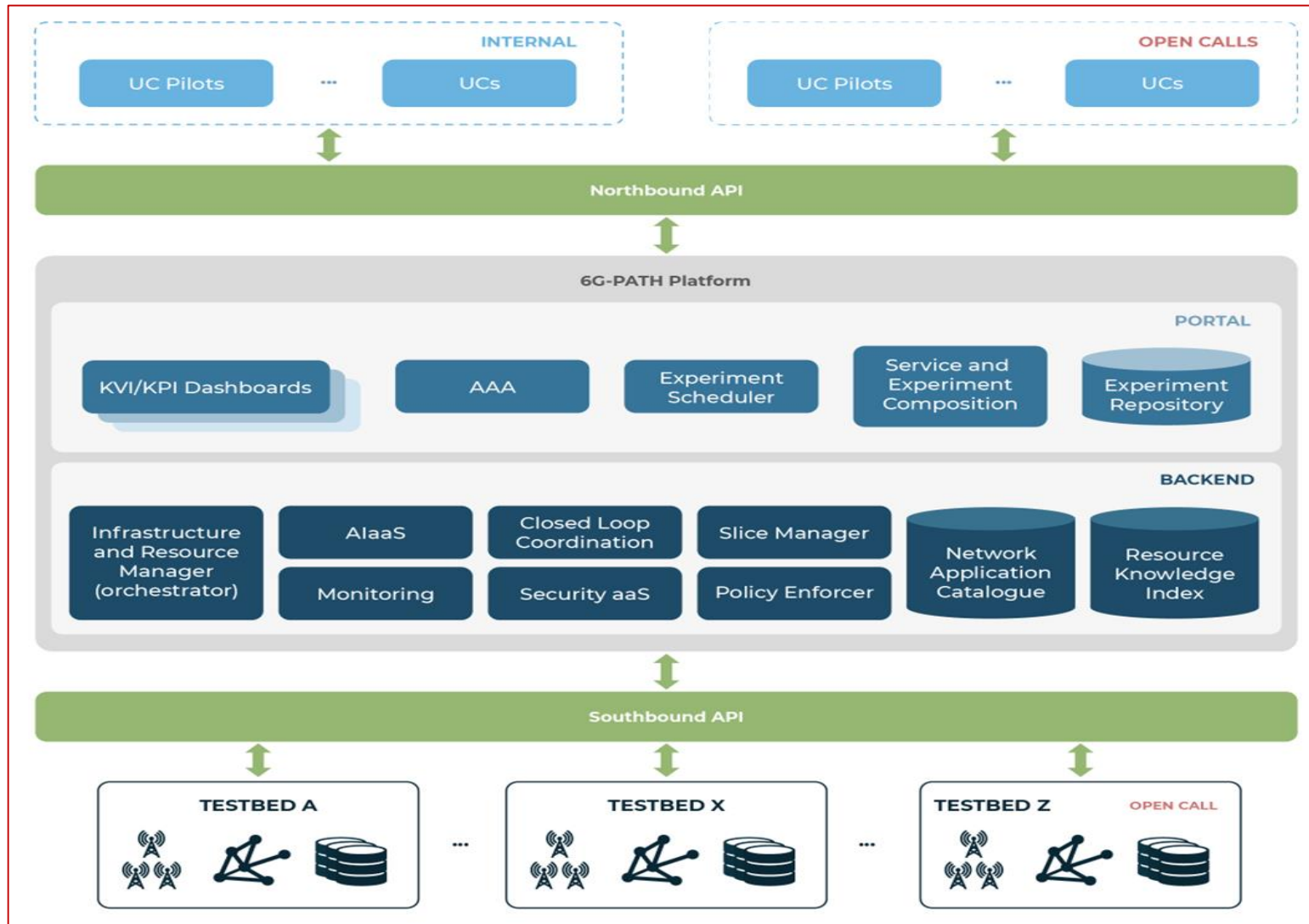
- *to generate appropriate lessons and requirements for future 6G communications*
  - *to identify, characterize and refine leading-edge business models*
- towards the commercialisations and exploitation of 6G use cases and technologies.**

# 6G-PATH Ecosystem



**6G-PATH Use Cases, Testbeds and Open Calls and Third-parties**

# 6G-PATH Unified Platform - Components



6G-PATH proposes a modern architectural approach that integrates modules from prior EU-funded projects such as:

- 5G-EPICENTRE
- TRIANGLE
- 5GENESIS
- 5G-INDUCE
- FUDGE-5G
- 5G-SOLUTIONS
- 5GMediaHUB
- 5GASP
- CHARITY
- 6G-BRAINS
- RIGOROUS
- SLICENET
- NEPHELE

**6G-PATH Architectural flavor**

# 6G-PATH – Testbed Innovations and Integrations



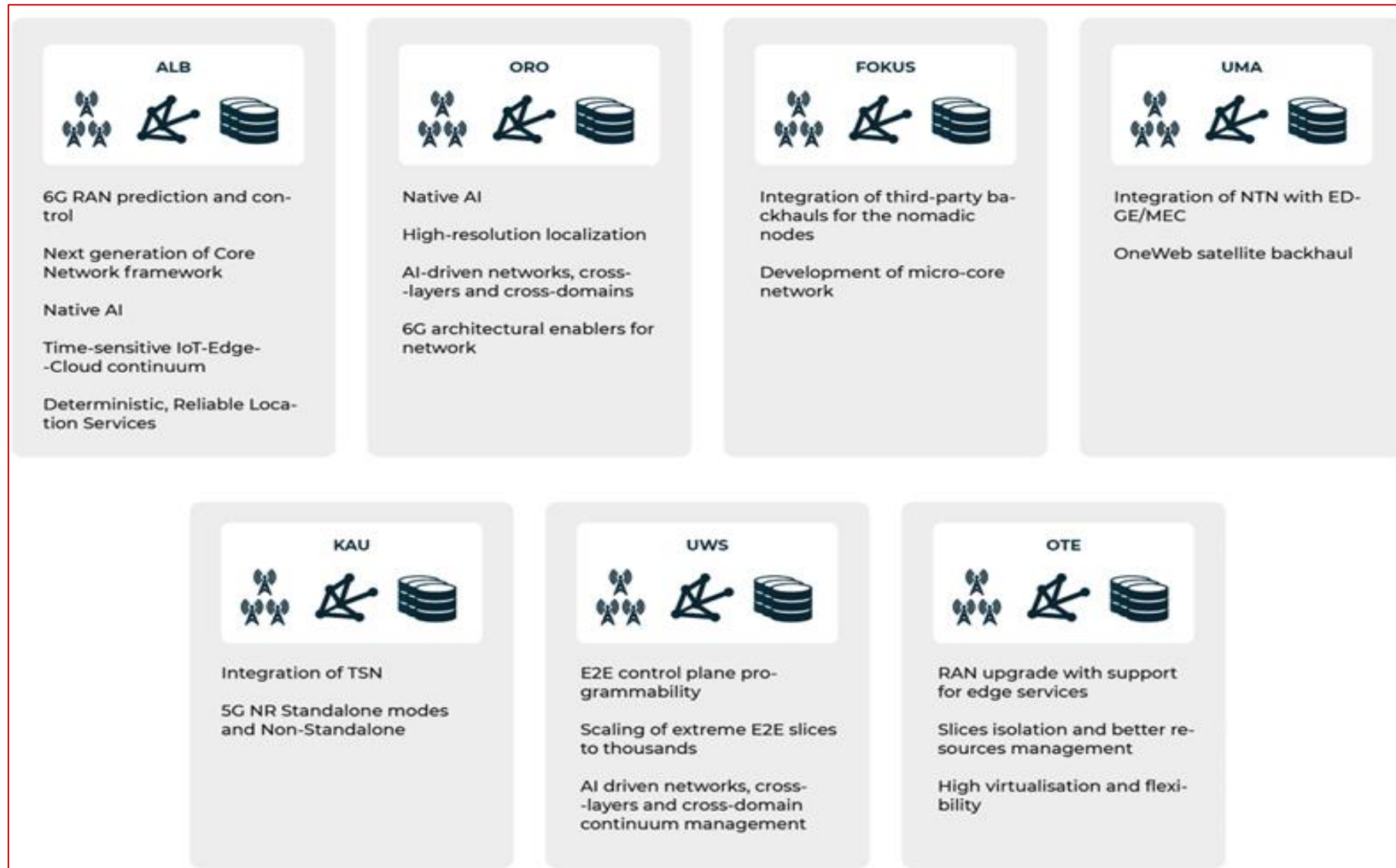
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- ➔ **Native AI, AI-Driven Networks, Intelligent Cross-Domain continuum management and 6G RAN prediction capabilities** *are key features in the 6G roadmap.*
- ➔ **Deterministic, Reliable and High-Resolution Localization Services.**
- ➔ **Non-Terrestrial Networks (NTN)** *are being considered as a solution for extending cell coverage, especially in locations where terrestrial networks are difficult to deploy, such as across oceans, or are not cost-effective for traditional operators, such as rural areas.*
- ➔ **Time Sensitive Networks (TSN) and Time-sensitive IoT-Edge-Cloud Continuum** *address the need for a more deterministic network, required by some time-sensitive scenarios, such as IoT applications or, more significantly, the emerging Industry 5.0 concept.*
- ➔ **Next-Generation of Core, Backhauling and Micro-Networks.**
- ➔ **E2E Control Programmability, Extreme E2E slicing and resource isolation.**
- ➔ **De-biasing of metadata and co-creation**, through the project's approach and methodology for the KPIs and KVIs, and the AlaaS containing metadata for AI/ML datasets and each AI/ML training set **will be accompanied by information on how data is collected and annotated.**
- ➔ **Energy efficient core and management platform through the usage of advanced AI algorithms** *that are energy-aware and orchestrate energy-efficient solutions, including the optimization of edge-core continuum.*

# 6G-PATH – Testbed Innovations and Integrations (cont'd)



**The Farming vertical** is composed of **two use cases** (i.e.: *Water saving and Smart vineyards*).

- ❑ It will be used to **evaluate different types of deployments** (*off-grid, intermittent and interconnected*), *network slicing with support for different kinds of QoS (i.e., eMBB, URLLC, eMTC)*.
- ❑ It will also **study the integration with AI-driven capabilities of the Edge-Cloud computing**.

**The Education vertical** is composed of **three use cases** (i.e.: *XR rural schools, classroom of the future and XR Health Training*).

- ❑ It will be mainly **devoted to XR (AR, VR and MR) and Holographic-based education and training scenarios**.
- ❑ Focus will be set upon the **concepts of Edge Computing, location-sensitive processing and about “how the network and continuum infrastructure can natively support the KPI and QoE measurement”**.
- ❑ The education vertical will also serve to **evaluate and explore the native integration with AI-driven capabilities for video and data processing**.

**The Healthcare vertical** is composed of **two use cases** (i.e.: **3D hydrogel patches and elderly monitoring**).

- ❑ It will be used to evaluate: the concept of micro and nomadic edge nodes and networks; Ubiquitous, Reliable and Secure connection Over-The-Top 5G MNO and NTN integration; XR with ultra-high bandwidth (>50 Gbps) available to the XR platform & ultra-low latency (<3ms).
- ❑ It will also serve for testing security-related KPIs of network and infrastructure (e.g., mutual authentication and authorization of communication between the edge-core and the core network).

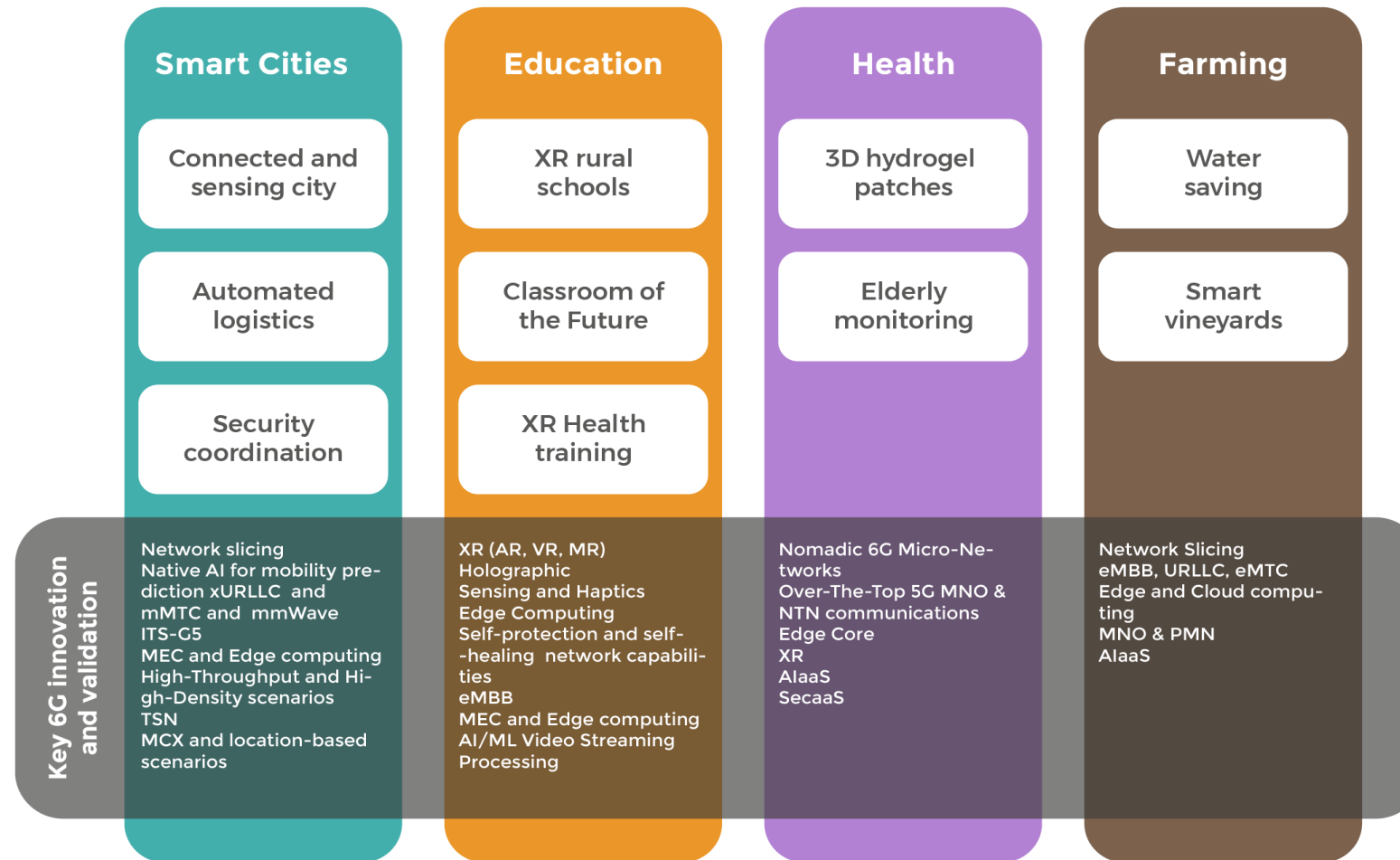
**The Smart Cities vertical** is composed of **three use cases**

(i.e.: **connected and sensing city, automated logistics and security coordination**).

- ❑ It will focus on exploring and testing the integration of large-scale extreme IoT-Edge-Cloud scenarios.
- ❑ This includes differentiated QoS support (e.g., xULLC, mMTC) applied to MCX (mission critical) communications and extreme high-throughput video/data streaming.
- ❑ This will also serve for evaluating the emerging deterministic, reliable, and high-resolution services and the resilience, safety and security of the next-generation networks (as a key aspect for **PPDR** (Public Protection & Disaster Relief) **and emergency-related applications**).



# 6G-PATH – Verticals & Use Cases (cont'd)



## Use Case Innovations

# 6G-PATH – Expected Outcomes & Impacts

**Contribution to the further refinement of sustainable seamless E2E 5G Advanced and 6G test infrastructures with fine-tuned capability** to integrate vertical use cases specific performance/KPI requirements, as applicable also across public and non-public networks and services.

**Validate infrastructure core technologies and architectures in the context of vertical large-scale pilot use-case implementations** and relevant deployment scenarios.

**Validate core technologies and architectures across the value chain (IoT, connectivity, services) for differentiated performance requirements** originating from concurrent implementation of use-cases and specialized services for verticals.

**Promote viable business models for innovative digital use cases tested and validated across a multiplicity of industrial sectors**, including demonstration of required device/network/service resource control from the vertical industry business model perspective.

**Support to impactful contributions towards standardisation bodies** notably for 6G use cases and technologies

# 6G-PATH – Expected Outcomes & Impacts (cont'd)



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**European 5G Advanced and 6G know-how showcasing:** Visible events widely open to the public are particularly relevant.

**Stimulate large industrial stakeholders, SMEs and the European Academic and Research community to engage in experimental activities in a timely fashion,** aimed to validate technological trends for 6G networks.

**Repository of requirements from verticals and of “lessons learned” to prepare for subsequent phases of the SNS programme.** It should include records and evaluation of 6G KPIs considering 5G Evolution and the aforementioned requirements and validating them with services linked to specific vertical sectors and related KPIs.

**Contribution to a repository of open-source tools and modules** that may be openly accessed and used by SNS projects over the programme's lifetime

**Collection of new requirements that are needed in subsequent phases for the key 6G technological building blocks, notably those identified in Stream B.** Those requirements may stem from: **(i)** the emergence of new application domains (Internet of Senses, holographic type communications...); **(ii)** the native support of AI/ML by future networks; **(iii)** the introduction of zero-touch solutions; **(iv)** high resilience/availability needs.

# 6G-PATH – Expected Outcomes & Impacts (cont'd)



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**Horizon Europe Key Strategic Impact: Promoting an open strategic autonomy by leading the development of key digital, enabling and emerging technologies, sectors and value chains to accelerate and steer the digital and green transitions through human-centered technologies and innovations.**

**Moving beyond a simple increase in speed or performance of connectivity platforms, and beyond 5G capabilities, bringing unique new service capabilities with wider economic implications.**

**Bring new actors from, and beyond the verticals.** Contributions from industry, RTO, academics and SMEs actors in the connectivity, IoT and cloud/IT domains are expected to be complemented by appropriate participation of the microelectronics industry, in view of their potential impacts at downstream standardisation level.

**Perform a strong European impact at future downstream 6G standardisation stages, including a Europe-wide consensus of 6G Key Performance Indicator (KPIs) that will frame future developments.**

**Stimulate strategic alliances, with vertical (industrial) sectors to build and offer powerful and persuasive Business to Business (B2B) and Business to Consumer (B2C) propositions.**

**“Position” Europe as a lead market and positively impact the citizen’s quality of life, by supporting key Sustainable Development Goals (SDGs) while boosting the European data economy.**

# Thank you for you attention!



Company Name

Hellenic Telecommunications  
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