

Experimentation environments – 5G/6G Test Network Finland

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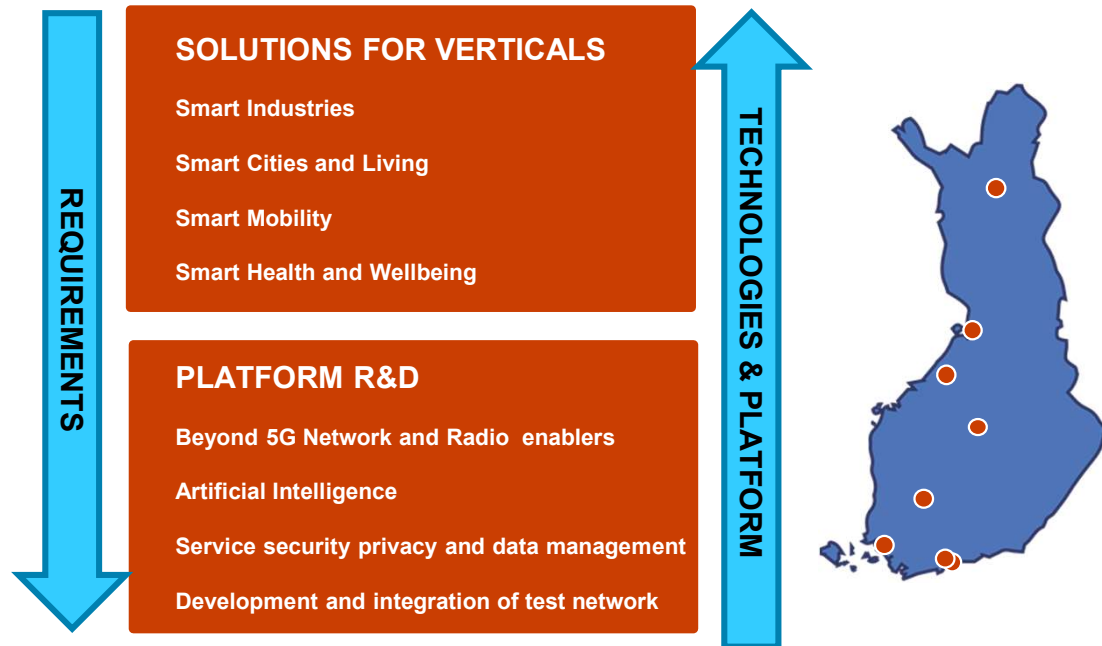
5G Test Network Finland Targets

MISSION

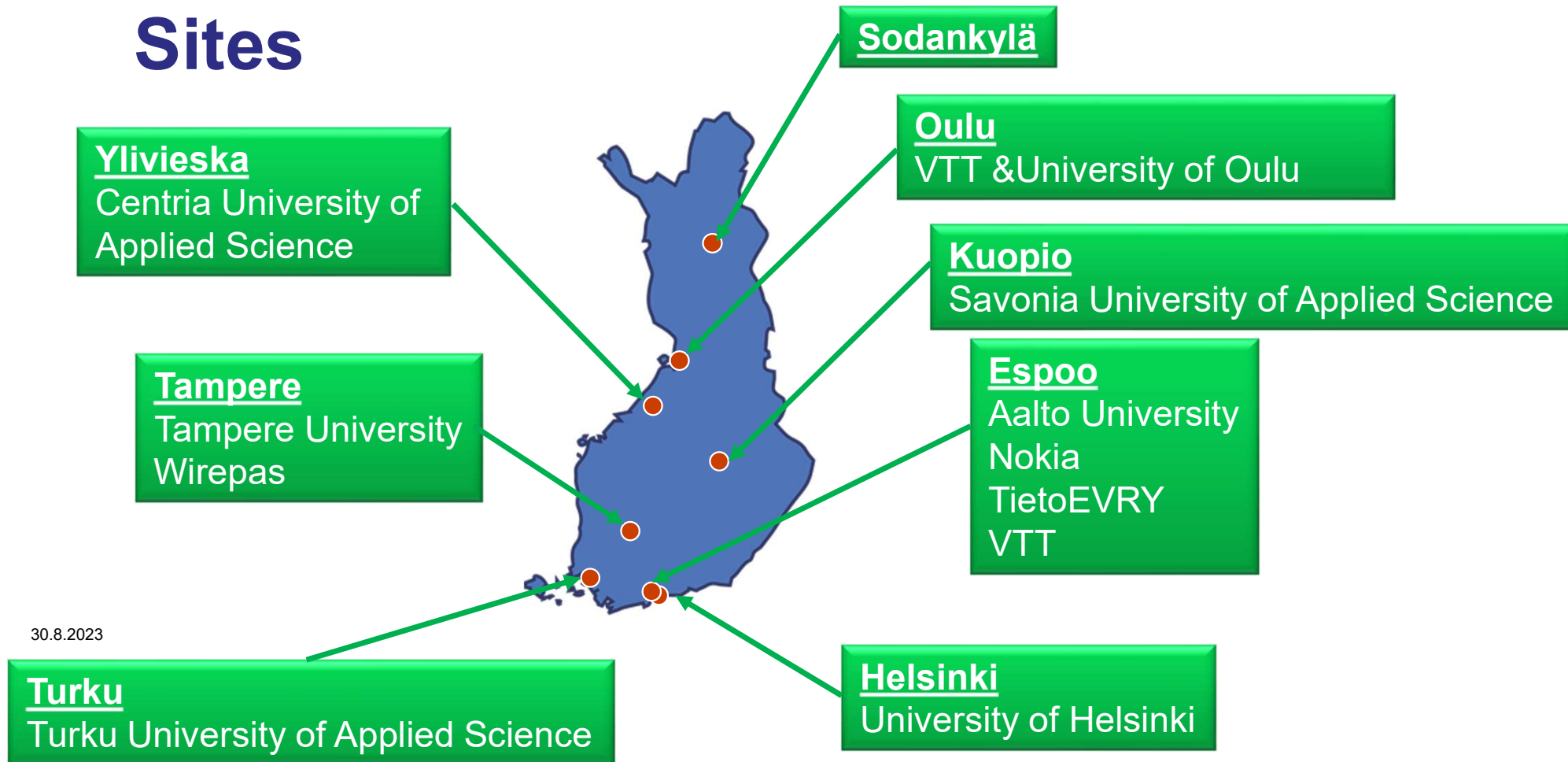
5G Test Network Finland is open and evolving innovation ecosystem supporting **5G evolution and Beyond 5G technology research and validation, vertical industry product development** and pioneer company experiments.

VISION

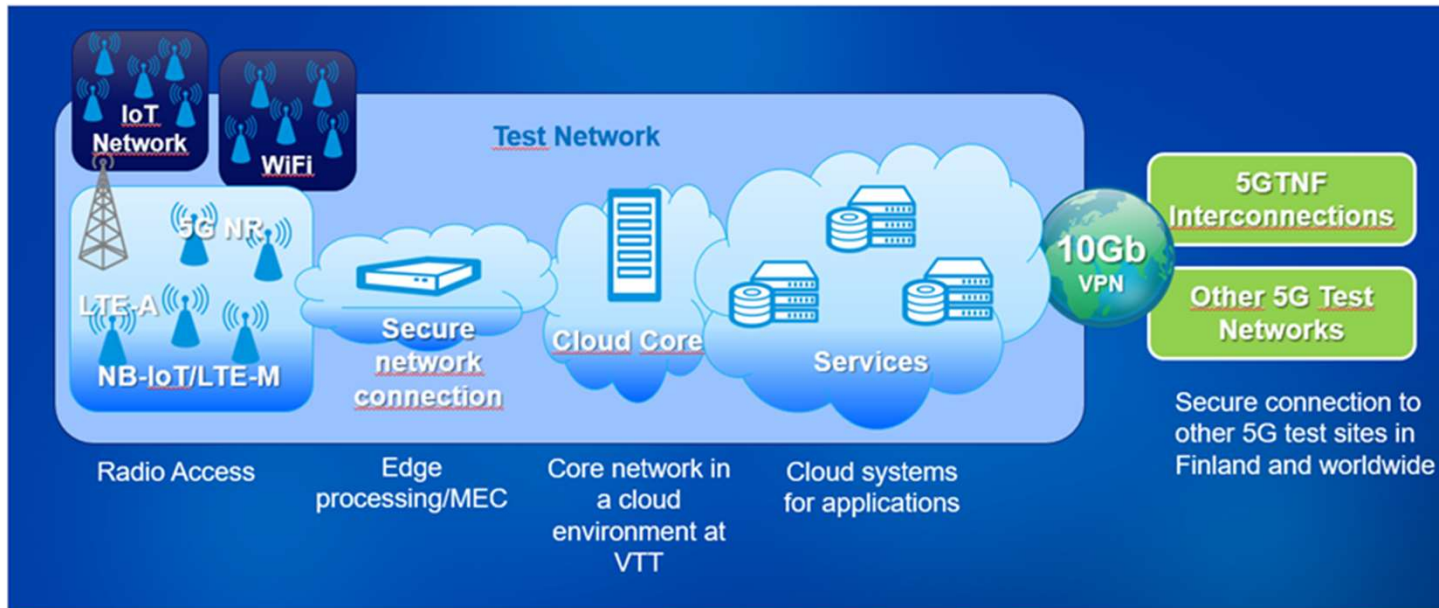
5G evolution and B5G R&D and utilization of AI and novel cyber security concepts are ramping up and offer excellent business opportunities to both telecom and vertical industries



Sites

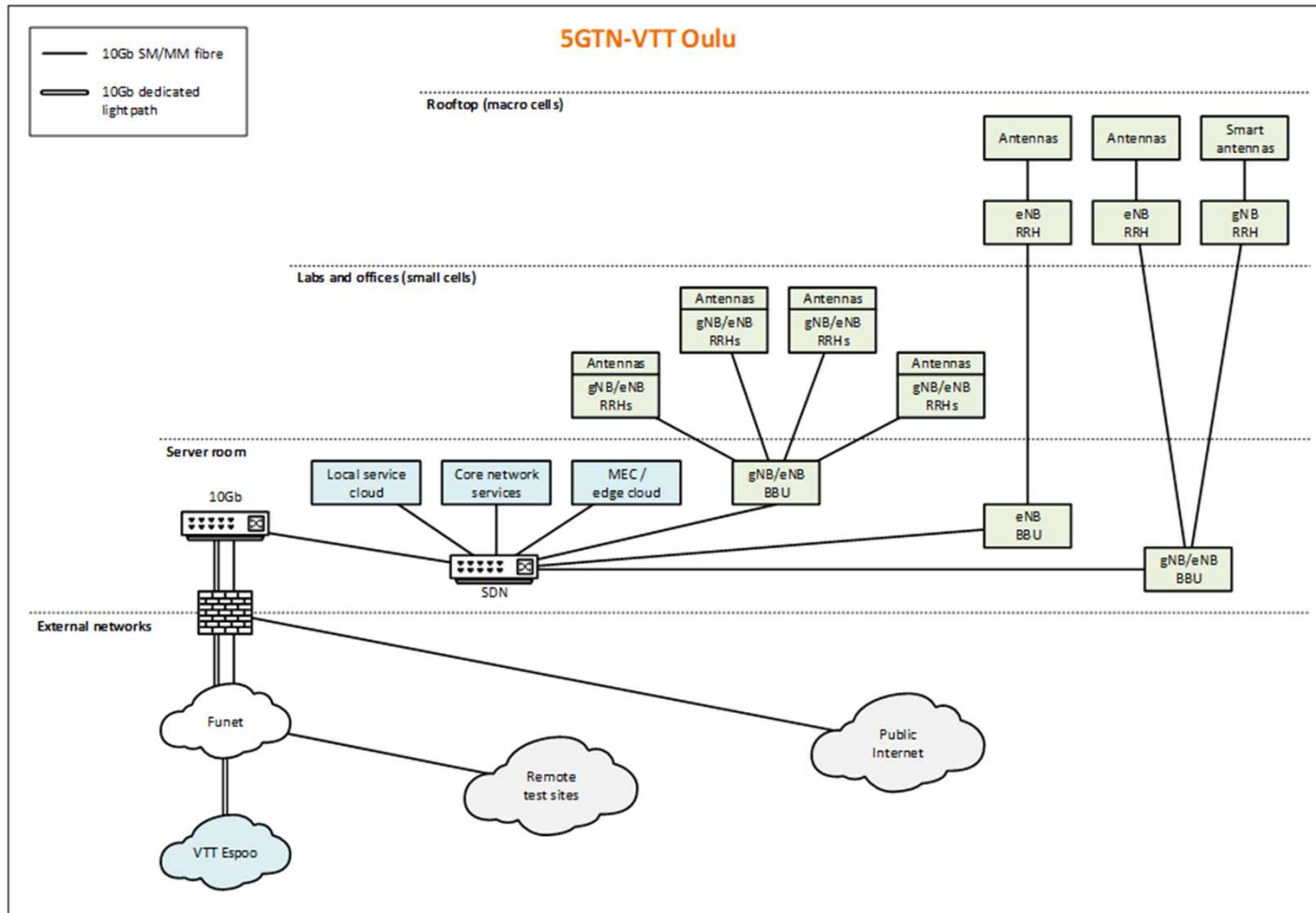


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Sites

| | |
|------------|---|
| VTT | <ul style="list-style-type: none"> • <u>RAN</u>: 5G NR-Rel15 macro and pico base stations (3,6 GHz), 5G mmWave (24GHz), 4G NB-IoT, 4G macro base stations, 4G pico base stations, Wi-Fi6, Lora • <u>Core</u>: Open source 5GC, 5GC NSA, 5GC SA, Simulated 4G EPC, Open source 4G EPC, 4G vEPC, eMBMS in 4G, MEC/edge cloud for both 4G and 5G • <u>User equipment</u>: COTS UEs, evaluation boards, SDR based UE emulator • <u>Testing tools</u>: Qosium for network traffic monitoring, InfluxDB database and Grafana visualization tool, Nemo Handy for field testing and trouble shooting • <u>Other</u>: LEO and GEO Satellite GW's, edge and MEC platforms including AI edge platform |
|------------|---|



5G TNF

Ecosystem founding members ~6 years ago

Network manufacturers

Operators

Technology and R&D service providers

Testing systems and tools manufactures







Verticals/ applications developers

Public organizations

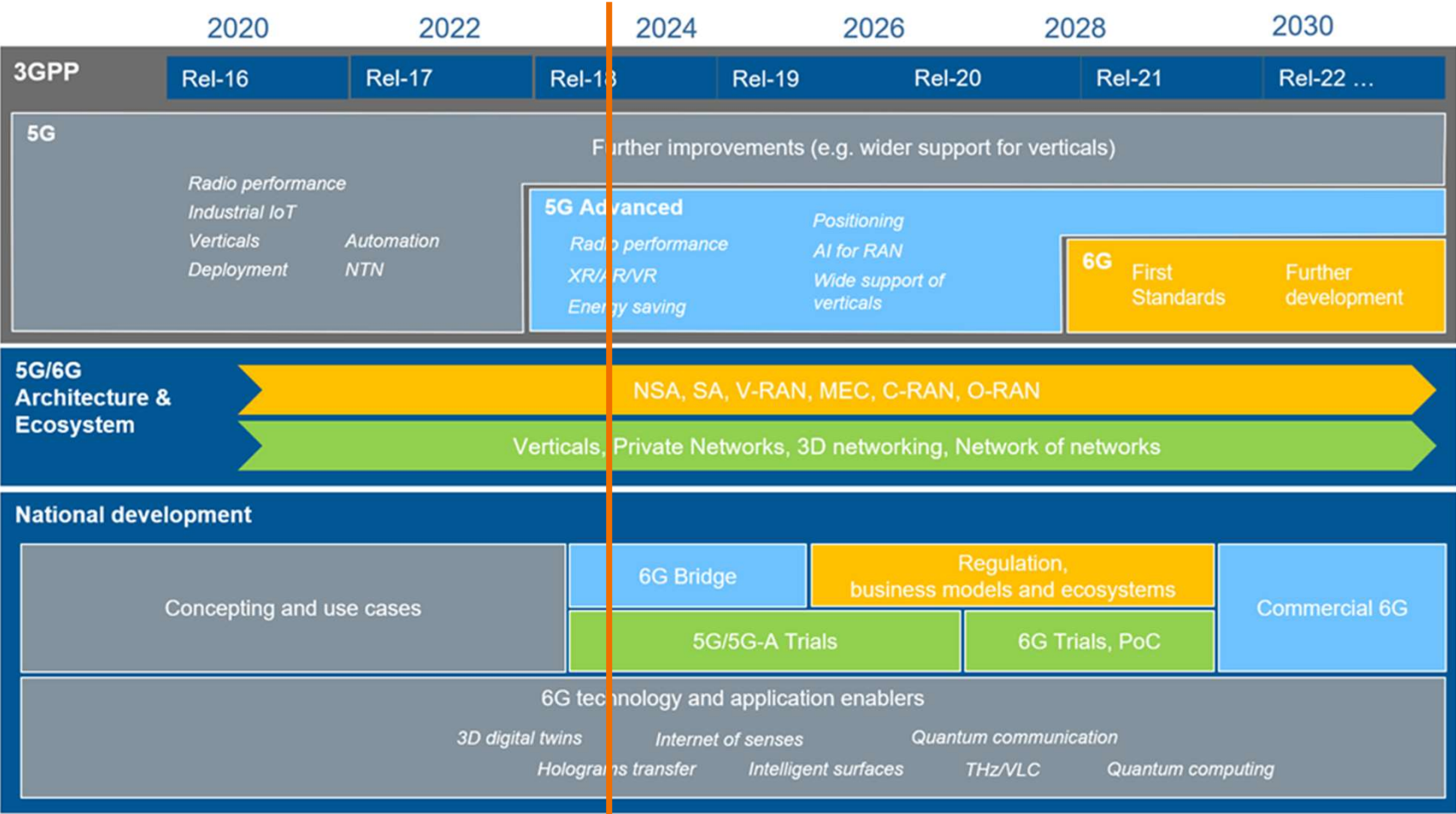
Research organisations



Examples of VTT's 5G based solutions for verticals

| Vertical | Description | Service Type |
|---|---|-------------------|
| Public safety  | <ul style="list-style-type: none"> • Rapid deployable 5G private network for mission critical communication. [1,2] • Satellite backbone for 5G private network backbone [3]. | eMBB, uRRLC, mMTC |
| Healthcare & wellbeing  | <ul style="list-style-type: none"> • Human tachograph [3] • Low energy cellular IoT communication for wearable devices [4]. • 5G for remote learning and remote attendance of clinical operations. [5] | eMBB, mMTC |
| Transport/ Automotive  | <ul style="list-style-type: none"> • Autonomous connected cars and road safety [5] • Smart Globally-Connected IoT Devices. [6] | eMBB, uRRLC, mMTC |
| Energy  | <ul style="list-style-type: none"> • Control and protection of smart grid with Ultra-Reliable Low Latency Communication (URLLC) [7] | uRLLC |
| Manufacturing  | <ul style="list-style-type: none"> • Applying 5G and Edge Processing in Smart Manufacturing [8] • Remote controlled/operated vehicles [9] | uRLLC |
| Media  | <ul style="list-style-type: none"> • Media broadcast via data networks[10] • Live video streaming for low latency use cases [11] | eMBB |

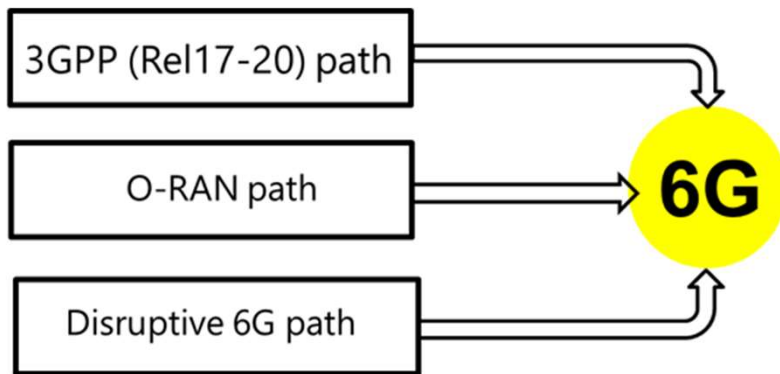
Finnish Strategic Research and Innovation Agenda (SRIA)



6G Test Network Finland – strategic objectives

- Development of test environments which allows rapid evaluation of 5G evolution, 5G Advanced and 6G service concepts, technologies, system solutions and business models, at a level that minimizes risks related to introduction of commercial services and products.
- Reusability and evolvability of the test environments over the lifetime of the national and European programmes (BF 6GBridge & 6G, Horizon Europe/SNS, Digital Europe TEF, 6G Flagship, ...) and 5G/6G standardization (3GPP, ORAN, IETF, ETSI, IEEE, ...)
- Accessibility, and openness, and optimization of previous and related investments in Finland, friendliness to disruptions and support to E2E demonstrations.
- Validation of core technologies and architectures in the context of specific vertical use-case implementations and relevant deployment scenarios. Use cases should be tested and validated across a multiplicity of industrial sectors and including also innovative 6G applications.
- Update of 5G Test Network Finland (5GTNF) ecosystem and testbed towards 6G era.

6G Test Network Finland – next steps



- **3GPP path:** coverage, medium data rate and jitter, zero carbon footprint solutions and RedCap devices.
- **O-RAN path:** low capex with moderate performance, high opex, goals: improve security, energy consumption, jitter/latency performance and stability.
- **Disruptive 6G:** 1 Tbps, joint communication and sensing, sub-cm positioning, reflective surfaces, and sub-THz transceivers.

| Investment area | Investment plan 2023-2024 |
|---|---|
| Testing and measurement tools | Traffic generation, latency measurement, network and traffic monitoring tools and systems |
| 5G-A, 6G PoC radios | RRH's for O-RAN, Rel16 & 17 (uRLLC, mMTC) radios, 5G small cells (24-83 GHz), sub-THz radio |
| Radio and core network control devices and software | O-RAN and cloud-RAN equipment, security analysis tools, O-RAN based edge and RIC platforms |
| Devices and data platforms | 5G-uRLLC and 5G-mMTC sensor devices, 5G transceiver-based radar |