3rd 6G-XR Open Call

Vertical Replicability enablers

6G eXperimental Research infrastructure to enable next-generation XR services (6G-XR)

Co-funded by the European Union

6G SNS

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DISCLAIMER

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TABLE OF CONTENTS

6G-XR Consortium			
No	**Partner Organisation Name**	**Short name**	**Country**
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2	TEKNOLOGIAN TUTKIMUSKESKUS VTT OY	VTT	Finland
3	NOKIA SOLUTIONS AND NETWORKS OY	NOKIA	Finland
4	FUNDACIO PRIVADA I2CAT, INTERNET I INNOVACIO DIGITAL A CATALUNYA	I2CAT	Spain
5	TELEFONICA INNOVACION DIGITAL SL	TID	Spain
6	CAPGEMINI ESPANA SL	CGE	Spain
7	MATSUKO S.R.O	MATSUKO	Slovakia
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10	FUNDACION CENTRO DE TECNOLOGIAS DE INTERACCION VISUAL Y COMUNICACIONES VICOMTECH	VICOM	Spain
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1 GENERAL OPEN CALL INFORMATION

1.1 INTRODUCTION

The 6G-XR project hereby announces its 3rd Open Call to provide financial support to third parties.

6G-XR project has identified three different application areas that would benefit from the large-scale deployment of B5G/6G networks:

- Real-Time Holographic Communications
- Collaborative 3D Digital Twin-like Environment
- Energy Measurement Framework for Energy Sustainability

around which five internal Use Cases have been developed: UC1, UC2, UC3 under Real-Time Holographic Communications, UC4 under Collaborative 3D Digital Twin-like Environment and UC5 under Energy Measurement Framework for Energy Sustainability.

The infrastructures are divided between the North and South Node (see section 2.2 Research Infrastructures for more details). There are also some themes that are relevant to both nodes, such as Artificial intelligence.

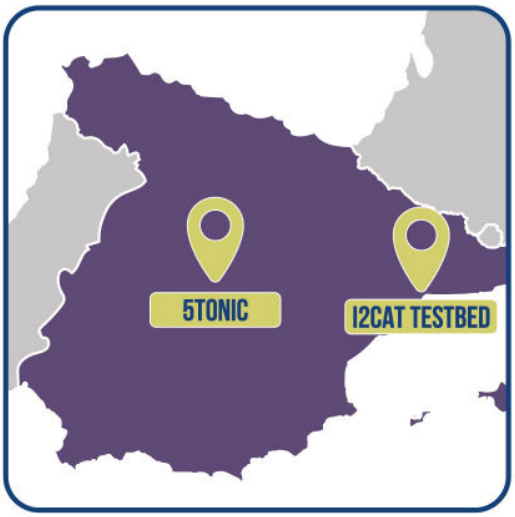
In this third wave of Open Calls, third parties are invited to submit projects that qualify for receiving financial support that leverage 6G-XR's enablers, infrastructure facilities and testbeds to deploy, replicate and validate the verticals of their interest. This is strongly aligned with, and enabled by, key expected outcomes of the project:

- modular, flexible and interoperable enablers to replicate and/or realize any service, application or vertical of interest, beyond the internal 6G-XR validation use cases; and
- comprehensive and accurate modules for determining cross-layer performance- and value-oriented metrics, and smart orchestration and decision making to trigger efficient adaptations.

Candidate media / XR services for selection include but are not limited to: (i) novel delivery paradigms (e.g., one-to-many, many-to-many) for traditional and immersive media; (ii) metaverse-like services; (iii) gaming-like services; (iv) interactive and distributed AR/XR/VR services; (v) adaptation of classical audio-visual services to assess the benefits of 6G(-XR) technology.

1.1.1 South Node Use Case Topics

Within the South Node, the following Use Cases have been internally developed, leveraging the advanced network capabilities of the infrastructures of 5TONIC (Madrid) and i2CAT (Barcelona) testbeds.



Real-Time Holographic Communications

Three of the internal 6G-XR Use Cases (UC) revolve around real time holographic communications, by incorporating novel XR, network and cloud continuum enablers to enhance their performance and interoperability.

UC1: Resolution Adaptation or Quality on Demand

• Detect network congestion or Quality of Service (QoS) dropped to trigger network-assisted Rate Adaption recommendation or request Quality on Demand (QoD)

UC2: Routing to the Best Edge

• Discover, select and make use of the most appropriate Edge resources to run XR processing or communication functions, based on specific criteria and goals

UC3: Control Plane Optimizations

• Integrate holographic communications to the network control plane

In addition, 6G-XR has identified some verticals that are considered complimentary to the internally developed Use Cases and can serve as examples of verticals that are welcome to this Open Call within the South Node:

- **6G-XR-OC3-TOP1.1: Full-fledged multimedia platforms / services** providing new encoding and streaming solutions for Holographic Communications [Mentor: VICOM, i2CAT]
- **6G-XR-OC3-TOP1.2: Training and education,** by using immersive platforms that support rich interaction and collaboration between distributed users [Mentor: i2CAT]

- **6G-XR-OC3-TOP1.3: Culture visits and events, by using immersive platforms** that support real-time tele-portation to a virtual place or an event, and rich interaction therein. [Mentor: i2CAT]
- **6G-XR-OC3-TOP1.4: Smart Industry / Spaces, by using immersive platforms** that support rich data sharing, manipulation of digital twins, and/or remote collaboration. [Mentor: i2CAT]
- **6G-XR-OC3-TOP1.5: Interactive multiuser multi-sensory experiences**, by integrating multiple data modalities beyond audio and video. [Mentor: i2CAT]
- **6G-XR-OC3-TOP1.6: Energy immersive platforms for virtual testing and evaluation** [Mentor: CGE]
- **6G-XR-OC3-TOP1.7: Cooperative, Connected and Automated Mobility (CCAM) in micro-mobility scenarios**. [Mentor: i2CAT]

1.1.2 North Node Use Case Topics

Likewise, other internal Use Cases have been developed under the North node, leveraging the advanced capabilities of the VTT 5GTN, UOULU 5GTN testbeds located in Oulu (Finalnd)

Collaborative 3D Digital Twin-like Environment

Infrastructures: UOULU 5GTN

Remote collaboration enhances societal and team productivity/efficiency. Real collaboration around of a common asset, machine, manufacturing place or environment is enabled thanks to a collaborative 3D DT environment. Key outcome is extracted due to the capabilities of bridge regional disparities and provide equal opportunities regardless of the geographical location. Traditional example of gaps covered is the disparity between industrial and rural locations.

UC4: Collaborative 3D Digital Twin-like Environment

- Enable real-time collaboration and control of physical assets in virtual reality

For the purpose of this 3rd Open Call, 6G-XR has identified some verticals that are considered complimentary to the internally developed Use Case 4: Collaborative 3D Digital Twin-like Environment within the North Node:

- **6G-XR-OC3-TOP2.1: Simulation and prediction**; Prototyping simulation, Predictive maintenance in Industry. [Mentor: UOULU]
- **6G-XR-OC3-TOP2.2**: **Training and Education**; Operational training, remote collaborative operations in education, medicals. [Mentor: UOULU]
- **6G-XR-OC3-TOP2.3**: **Visualization and data sharing**; visualization of complex system and environment, real-time data dashboard in smart media, smart city, smart agriculture. [Mentor: UOULU]

Energy Measurement Framework for Energy Sustainability

UC5: Energy Measurement Framework for Energy Sustainability

- Measure and optimise end-to-end energy consumption in mobile networks

Infrastructures: VTT 5GTN, UOULU 5GTN

The 6G-XR project aims to deploy an extensive energy measurement framework for the test sites as well as to introduce the required intelligence and functionality into the network components so that the energy consumption data can be utilized to optimize the end-to-end energy consumption and use of local renewable energy for variety of different XR related applications.

For the purpose of this 3rd Open Call, 6G-XR has identified some verticals that are considered complimentary to the internally developed Use Case 5: Energy Measurement Framework for Energy Sustainability within the North Node:

- **6G-XR-OC3-TOP3.1**: **Utilization of open data in the optimization of RAN energy usage** [Mentor: UOULU, VTT]
- **6G-XR-OC3-TOP3.2**: **End-to-end energy budgeting for the sustainable mobile network infrastructure** [Mentor: UOULU, VTT]
- **6G-XR-OC3-TOP3.3: Visualization of mobile network measurement data** [Mentor: UOULU, VTT]
- **6G-XR-OC3-TOP3.4: Calibrations, validations, and verification of energy measurement data** [Mentor: VTT]

1.1.3 Common Topics

Artificial Intelligence

Infrastructures**: UOULU 5GTN, VTT 5GTN, 5TONIC, i2CAT**

This topic invites proposals, e.g., considering simulated factory environments supervised by AI processes utilising a private 5G network. Other environments than factory can also be considered, as long as they are under the supervision of an AI process and utilises a private 5G network. Simulated environment can be run in a server provided by the facility. Connectivity to the simulator is created by 5G modems that the facility will also provide. AI algorithm is to be run in an Edge server connected to the facility 5G test network. If needed the AI algorithm can also be run as an xApp in the FlexRIC that is available in UOULU O-RAN environment. 5G slices are also available for the experimenter if those are needed. Intention is that the all the operation in the final demo is run real time and including the AI control of the respective simulated operation. Facility for the experiment is to be selected based on the technology needs of the projects as the capabilities of the 6G-XR facilities are not the same for all of them. Note that the simulator, simulated environment and AI algorithm are to be provided by the experimenter.

In addition to the previous complementary verticals directly related to the 5 internal Use Cases, 6G-XR has identified an cross-cutting theme that extends beyond the internally developed use cases: Artificial Intelligence. Applicants are welcome to submit proposals for both the South and North nodes.

- **6G-XR-OC3-TOP4.1**: **AI supervised manufacturing** (UOULU Mentor UOULU, VTT, CGE, I2CAT)
- **6G-XR-OC3-TOP4.2**: **Distributed AI for Energy** [Mentor: CGE]

However, this third and final Open Call welcomes any other vertical or different Use Cases under any other relevant vertical under topic

- **6G-XR-OC3-TOP5.1: Open vertical replicability** [Mentor: Based on the selected infrastructure]

Summary of the topics of particular interest for 6G-XR-OC3:

Call Identifier	Areas	Sub-area	6G-XR facility	Selected Node	Mentors
6G-XR-OC3-TOP1.1	Real-Time Holographic Communications	Full-fledged multimedia platforms / services	South	I2CAT	VICOM, i2CAT
6G-XR-OC3-TOP1.2	Immersive Services	Training and education	South	I2CAT	i2CAT
6G-XR-OC3-TOP1.3		Culture visits and events, by using immersive platforms	South	I2CAT	i2CAT
6G-XR-OC3-TOP1.4		Smart Industry / Spaces, by using immersive platforms	South	I2CAT, 5TONIC	i2CAT, CGE
6G-XR-OC3-TOP1.5		Interactive multiuser multi-sensory experiences	South	I2CAT	i2CAT
6G-XR-OC3-TOP1.6		Energy immersive platforms for virtual testing and evaluation	South	5TONIC	CGE
6G-XR-OC3-TOP1.7	CCAM	CCAM in micro-mobility scenarios	South	I2CAT, 5TONIC	i2CAT, CGE
6G-XR-OC3-TOP2.1	Collaborative 3D Digital Twin-like Environment	Simulation and predictionin Industry	North	UOULU 5GTN	UOULU
6G-XR-OC3-TOP2.2		Operational training, remote collaborative operations in education	North	UOULU 5GTN	UOULU
6G-XR-OC3-TOP2.3		Visualization and data sharing	North	UOULU 5GTN	UOULU
6G-XR-OC3-TOP3.1	Energy Measurement Framework for Energy Sustainability	Utilization of open data in the optimization of RAN energy usage	North	UOULU 5GTN, VTT 5GTN	UOULU, VTT
6G-XR-OC3-TOP3.2		End-to-end energy budgeting	North	UOULU 5GTN, VTT 5GTN	UOULU, VTT
6G-XR-OC3-TOP3.3		Visualization of mobile network measurement data	North	UOULU 5GTN VTT 5GTN	UOULU, VTT
6G-XR-OC3-TOP3.4		Calibrations, validations, verification of energy measurement data	North	VTT 5GTN	VTT
6G-XR-OC3-TOP4.1	Artificial Intelligence	AI supervised manufacturing	North/ South	UOULU 5GTN, VTT 5GTN, 5TONIC, I2CAT	Based on the selected RI
6G-XR-OC3-TOP4.2		Distributed AI for Energy	South	5TONIC	CGE
6G-XR-OC3-TOP5.1	Open Topic	Open vertical replicability[1]	North/ South	UOULU 5GTN, VTT 5GTN, 5TONIC, I2CAT	Based on the selected RI

A detailed description of the expected topics can be found in section 3.

[1] Open vertical replicability: the applicant must select the desired node and infrastructure. The feasibility check will confirm or suggest an alternative infrastructure to the one selected, based on the most appropriate infrastructure for the proposal received.

Each topic is supervised by a project partner (mentor) who is responsible for supporting the third-party projects during execution and following up on the project results.

1.2 CALL INFORMATION

Project full name: 6G eXperimental Research infrastructure to enable next-generation XR services

Project Grant Agreement number: 101096838

Call identifier: 6G-XR-OC3

Call title: 3rd 6G-XR Open Call – Vertical Replicability enablers

Feasibility check deadline: 10 January 2025 @17:00 CET

Final Submission deadline: 7 March 2025 @17:00 CET

Information Webinar on 3rd 6G-XR Open Call: 11 December 2024 @14:00 CET

1.3 AVAILABLE BUDGET

Open Call	Project duration	Max funding (€)	No of projects	Total funding (€)
6G-XR-OC3	6 months	60.000	12	720.000 €

For the implementation of the third-party project, a total lump sum of the awarded amount will be paid upon the completion of the project. No advance payments will be made. The payment of the total amount will be made once the project activities have been performed completely, the deliverables and final report have been reviewed and accepted by the 6G-XR project and a final decision on the approval of the third-party project and deliverables has been issued.

1.3.1 Requirements related to the proposer:

- Proposers must be **eligible for funding in the Horizon Europe programme** and be established in an EU Member State or in an Associated Country.
- Proposals will only be accepted from a **single party**.
- Feasibility check is **mandatory**, and the proposals must be submitted for feasibility evaluation before the **Feasibility check deadline**. Proposals failing submission for feasibility will not be evaluated.
- A proposer can only be selected for funding for **one** proposal, even if the proposer submitted multiple proposals that are ranked high enough to be selected for funding. In the latter case, the proposer may be given the opportunity to choose the one to be retained for funding.

- To avoid potential conflict of interest, **proposals will not be accepted from individuals or organisations who are partners in the 6G-XR consortium or who are formally linked in any way to partners of the consortium**. All proposers will be required to declare that they are aware of no such potential conflict of interest that should prevent them from applying.
- Projects funded under 6G-XR-OC1 or 6G-XR-OC2 are not eligible for funding under 6G-XR-OC3.
- The proposer must select a single Node and at least a single infrastructure to conduct their experiment.
- Language in which the proposal must be submitted: **English**.
- Proposals must follow the provided **template** (see Section 6.1 of this document).
- Proposer must reserve travel budget for a final demo in South or North Node facilities.
- Proposals (draft for Feasibility Check as well as final proposals) must be submitted through the **online submission portal** (https://6g-xr.eu/open-calls/oc3/)

1.4 TIMETABLE AND DEADLINES

ACTION	DEADLINE
Submission deadline of draft proposal for the Feasibility check	10 January 2025 @17:00 CET
Submission deadline (of final proposal)	7 March 2025 @17:00 CET
Notification of the result	Mid April 2025
Estimated Start of the Project	End April 2025
Estimated End of the Project	End October 2025

2 THE 6G-XR PROJECT

6G eXperimental Research's ambition is to strengthen European leadership in 6G technologies by enabling next-generation XR services and infrastructures that will provide beyond-state-of-the-art capabilities towards the 6G era. The project will develop an experimental multisite Research Infrastructure (RI) to provide a validation platform for various 6G-use cases by developing enablers for networking and computing, radio access technologies beyond 5G, enablers for XR services with in-build federation, trial management, abstraction tools as well as energy measurement frameworks.

2.1 INTRODUCTION TO THE PROJECT

Objectives and Approach - 6G-XR is building its objectives, ambition, and methodology on top of four state-of-the-art research (SoTA) RIs, namely 5GTN UOULU, 5GTN VTT, 5TONIC, and the i2CAT testbed. These well-developed RIs represent the most evolved open environments for communications research in Europe. 6G-XR project will enhance the capabilities of these research infrastructures to provide beyond-state-of-the-art (BSoTA) capabilities towards 6G by:

- Building a multisite Research Infrastructure that can provide validation platform for multitude of foreseen (extreme) 6G use cases by developing enablers for networking and computing, radio access technologies beyond 5G, enablers for XR services with in-build federation, trial management, abstraction tools as well as energy measurement framework.
- Validating multi access edge computing scenarios and their integration into a complete cloud continuum, support innovative use cases with vertical actors, beyond 5G capabilities, and support showcasing events.
- Demonstrating and validating performance of innovative 6G applications with a focus on demanding immersive applications such as holographic, digital twins, and XR/VR.

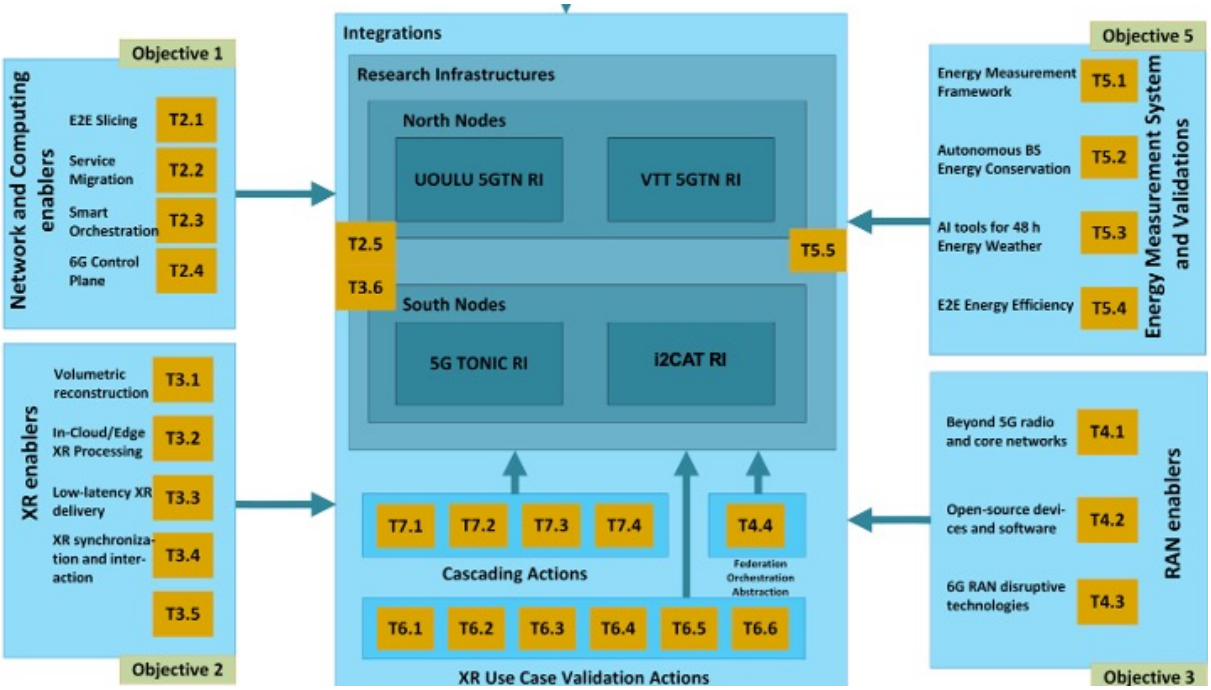


Figure 1. The Approach and objectives of 6G-XR project

Use Case 1-2-3: Real-time holographic communications - Key challenges are addressed to successfully deliver real-time multi-party holographic communication services at scale and over heterogeneous environments. 6G-XR aims to go beyond the state-of-the-art in this field with the goal of increasing the visual resolution of holograms, as well as the performance, scalability, interoperability, and efficiency of such services. The envisioned next-generation holographic services adopt many new features fully compliant with 6G architectural and communication paradigms, and are expected to contribute to the maturity, robustness, and wide adoption of high-quality, scalable, and affordable holographic communication services.

In this context, 6G-XR is exploring strategies to offload processing tasks from end-clients to the edge to alleviate the bandwidth and processing requirements on the client side. Examples of Virtualized Network Functions (VNFs) being provided include: Edge-assisted 3D volumetric reconstruction, Edge-assisted communication modules (e.g., Selective Forwarding Units (SFUs), mixers, transcoders...) and Remote Rendering modules. In addition, 6G-XR is devising 2 Network-as-a-Service (NaaS) APIs for enhancing the adaptability and interoperability of XR services: (i) network-assisted rate control, including Quality-on-Demand (QoD) mechanisms; and (ii) Edge Discovery, Selection and Application Function (AF) Licecycle Management, including the strategic orchestration of the previously introduced VNFs over the Cloud Continuum. Finally, 6G-XR is proposing a new network architecture capable of supporting holographic calls, based on control plane and IMS Data Channel (IMSDC), guaranteeing compatibility and easing integration with state-of-the-art devices.

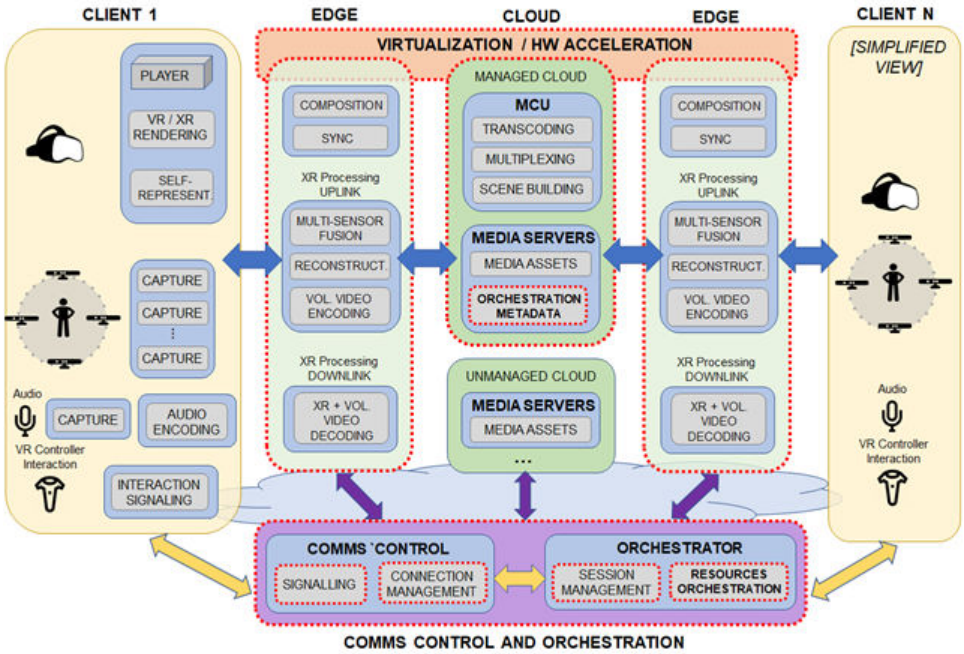


Figure 2. High-level system overview of the end-to-end holographic comm platform in 6G-XR (newly envisioned components and components being evolved represented as boxes with red dashed lines).

Use Case 4: Collaborative 3D Digital Twin Environments - As industries increasingly adopt advanced technologies, the fusion of 3D digital twins with cyber-physical systems opens new dimensions for digital-physical interaction. This integration empowers users to interact with virtual representations of physical assets, offering real-time insights, control, and visualization capabilities that were once beyond reach. By creating a dynamic, immersive environment, 3D digital twin technology enhances

situational awareness, streamlines operations, and supports more informed decision-making across industrial and operational settings.

This Fab Lab 3D digital twin use case offers a multi-platform, multi-user cyber-physical system designed for remote instruction in design and production using 3D printers, with integrated real-time video surveillance. Through a shared open API, customizable hardware, and flexible architecture, users can monitor and control 3D printing processes remotely within an XR environment. The system's innovative interfaces visualize essential data, such as production status and enhancing situational awareness. Leveraging modern game engines and best practices in VR/XR, the project prioritizes performance, interoperability, and user experience.

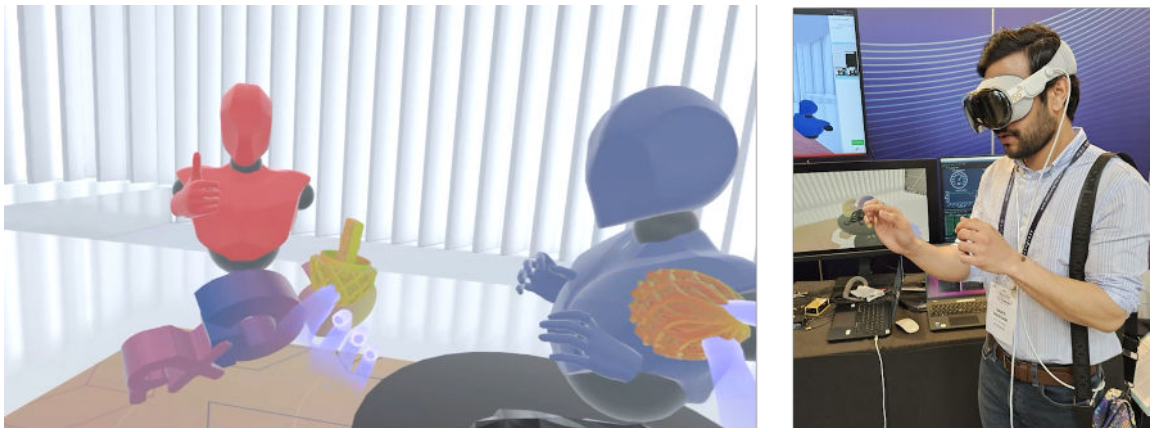


Figure 3. Multi-user collaboration work under 5G connectivity

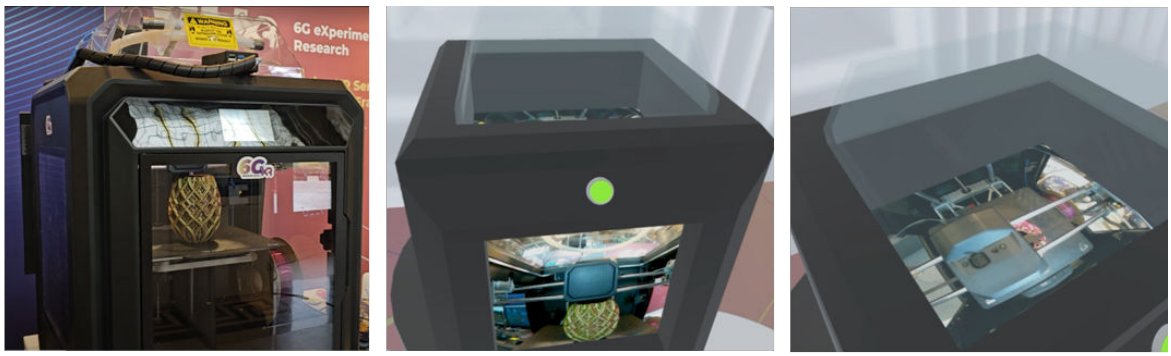


Figure 4. Remote control and real-time video surveillance to VR scene

In the 3D digital Twin use case a remote user wishes to print an object using Fab Lab 3D printer. The remote user enters the Fab Lab 3D digital Twin environment using VR glasses. Fab Lab Instructor enters the 3D environment also wearing VR glasses. Both persons will use their own avatars in the 3D world. Communicate is handled through real time audio and the avatars are visible for the users. The Fab Lab Instructor evaluates the object the remote user proposes to be printed and if it is not directly printable it can be modified in real time to reach a state where the object can be printed. When the Instructor approves the object and gives permission to start the printing process, the Remote User puts the object inside the digital twin of the real-world Fab Lab 3D printer and starts the printing process by pressing a button in the digital printer (see Figure 4). Now, the real-world 3D printer in the Fab Lab starts to print the object. The Fab Lab printer has two cameras recording videos of the printing process: one on

top of the real-world printer and another at front of the printer. These videos are streamed to the 3D environment and attached to the top and front view of the digital printer so that the real-world printing process can be followed on the real time in the 3D Digital Twin environment. The printed object is then sent to the remote user when the printing process has been completed.

Use Case 5: Energy Measurement Framework for Energy Sustainability

The need for energy efficiency in ICT sector is essential to reduce both operational cost and the environmental impact of digital infrastructure. The deployed energy measurement framework enables real time energy monitoring, storing and visualization for the entire End-to End (E2E) system including application servers, client machines, baseband units, Standalone /Non-Standalone (SA/NSA) core, RAN devices, radio units, OAIBOX, USRPs, end-user devices, on-site sensors and PV-hybrid supply).

The sustainability experimentation framework offers almost real-time electricity metering system which covers the whole E2E-system. Through the integration of central controller (OpenEdge server) with the energy measurement framework which enable bridge connection between north node sites for data exchange, control and power saving measures. The framework provides forecasting APIS to external data-services such as producing 66 hour ahead PV-yield forecasts (energy weather forecast), indirect CO2 emission estimates to grid intake and day ahead hourly price of electricity to assist control decisions which are integrated, stored and visualized using the central controller.

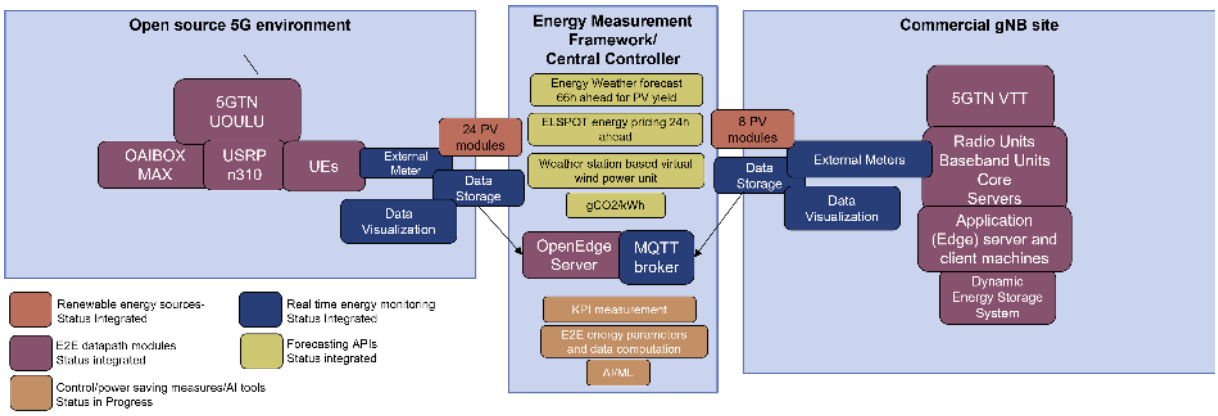


Figure 2. Energy measurement framework North Node architecture

2.2 RESEARCH INFRASTRUCTURES

2.2.1 6G-XR North Node (UOULU 5GTN and VTT 5GTN)

The **University of Oulu** (UOULU) has 5G Test Network (UOULU 5GTN) with campus-wide small cell, macro-cell and distributed antenna based cellular network to be complemented by NFV based EPC and 5G backhauling solution (http://5gtn.fi/).

The Full-scale 5G Test Network in the University of Oulu supports usage of 5G devices, higher frequency bands, cognitive management functionalities, system testing tools for new solutions. The 5G Test Network feature evolution follows 5G research and standardisation progress, acting as verification platform for theoretical 5G research. The cellular devices part of the network is composed of 30 LTE small cells (700 MHz, 2.1, 2.3, 2.6, 3.5 GHz) and 2 macro cells (2.3 GHz). The network has two 5GNR

outdoor base stations, one on n78 (at 3.5 GHz with 60MHz bandwidth) and one on n77 (3.9 to 4.0 GHz with 100 MHz bandwidth). Network is complemented with several tens of User Equipment from various manufacturers that are easily integrated to any device, and tens of 5G enabled mobile phones from several vendors. Commercial 5G baseband and radio modules has been updated to new versions during the summer 2024. The network is currently being complemented by commercial mmW (24-28 GHz) 5G NR base stations with several mmW capable UE's as well as with 36 in-door remote radio head (RRH) based cloud RAN 5G NR devices for both n77 and n78. N78 andn77 indoor cells are working on the same frequency as the oudoor cells. Additionally there is 3.8 to 3.9 GHz n77 band (100 MHz) reserved for separate independent research oriented indoor networks. The network is controlled by operator grade EPC (Evolved Packet Core), and 5G cores, thus making UOULU in practice a network operator with own SIM production for mobile devices. The current operational EPC version is 5G NSA compliant, 5G cores are SA compliant and for research purposes 5G stand-alone (SA) solution with their own cores and basebands + radios are also available. 5G slicing is also supported in one of the 5G SA networks. OAIBOX based O-RAN system capable of 5G slicing has also been introduced during the summer 2024. The network within the campus is complemented by wireless sensor network (IoT, internet of things) extension with estimated 2000 different kinds of sensors with wireless connectivity through NB-IoT, LTE-M and LoRa. Furthermore, the network has big data computing servers for network data analytics purposes. Some of these servers are distributed as edge servers within the network thus allowing multi-access edge computing (MEC). Diagram of the University of Oulu 5G Test Network can be seen in Figure 2.

On top of the commercial 4G, 5G and mmW solutions also open standard solutions are offered. Several different 4G and 5G core solutions are available for research use. Technologies in use are for example Open5GS core, Open Air Interface (OAI), O-RAN, different kinds of USRP radios, etc. Whole 5GTN is protected by Firewall, internet connection is available together with possibility to apply for VPN access to the network.

Several different kinds of test equipment and software is offered to be used. There are for example commercial grade radio parameter measurement equipment and software available. For IP network traffic an extensive Quality of Service (QoS) test software is in use.

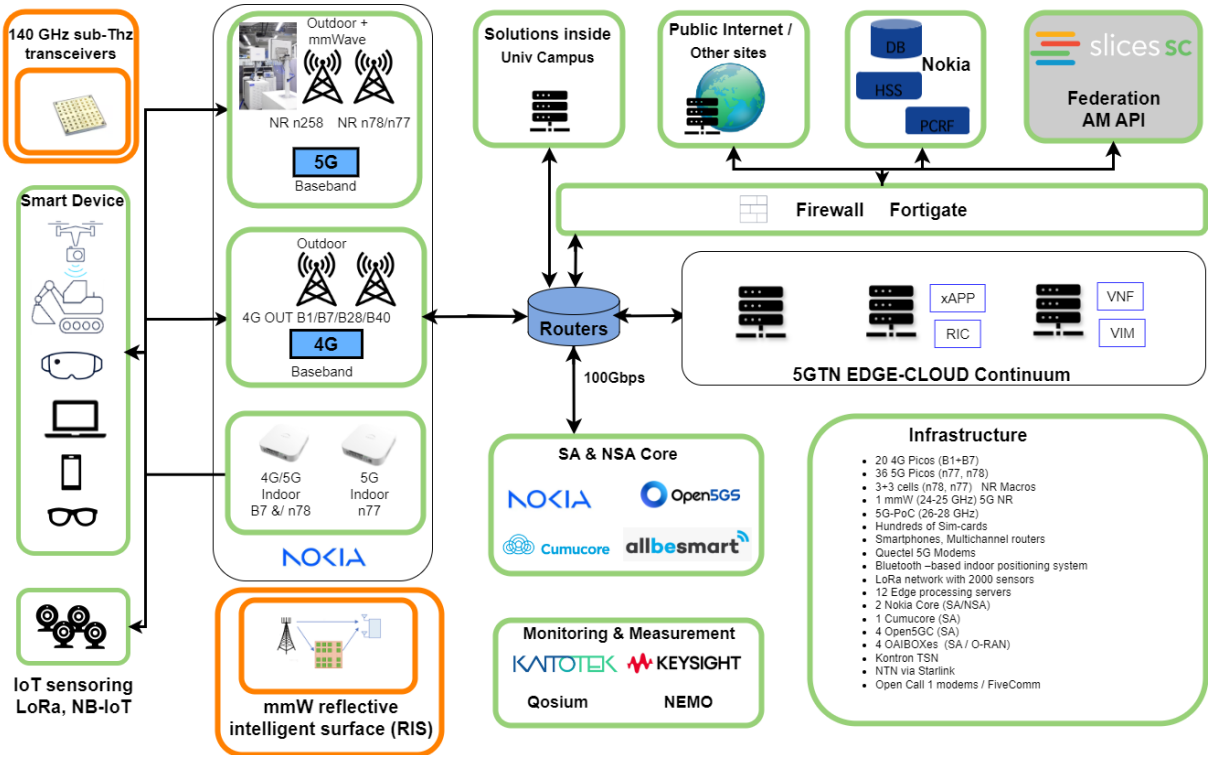


Figure 3: University of Oulu 5G Test Network

Through 6G-XR Open Calls 1 and 2 following technologies are offered to be used in the University of Oulu 5G Test Network:

- OC1: OAIBOX O-RAN system
- OC1: 3D Digital Twin VR environment
- OC1: Automated QoS measurement system
- OC2: Several AI based dynamic slice resource allocation systems for the O-RAN

The main **VTT Technical Research Centre of Finland Ltd** (VTT) site for 6G-XR experiments is located in Oulu. The current radio coverage is deployed with 4G LTE, 5G NR, and Wi-Fi 6 technologies. The current deployment includes the following licensed frequency bands:

- 4G LTE:
  - B1/n1: 2100 MHz (BW: 10 MHz)
  - B3/n3: 1800 MHz (BW: 5 MHz)
  - B7/n7: 2600 MHz (BW: 10 MHz)
  - B28: 700 MHz (BW: 3 MHz)
  - B31: 450 MHz (BW: 5 MHz)
- 5G NR:
  - n77: 3700 MHz (BW: 100 MHz)
  - n78: 3500 MHz (BW: 60 MHz)
  - n258: 26 GHz (BW: 800 MHz)

The network has been designed to support dynamicity in the experimentation. Network configurations (e.g., number of cells, frequency) and antenna setups including transmitting power may be changed towards specific vertical use case requirements. While the network coverage with high frequency 5G

NR is typically < 1 km, with cellular IoT technology such as, NB-IoT the coverage will reach above 10 km distances for mMTC. In addition to 4G LTE and 5G NR coverage test sites include indoor deployments with WiFi 6 technology. The available user equipment (UE) includes a variety of commercial UEs, evaluation boards as well as a software-defined radio (SDR) based UE emulator (Keysight UeSIM) capable of emulating with current setup hundreds of 4G LTE and tens of 5G NR UEs. Radio Access Network (RAN) options based on commercial eNBs/gNBs and SDR-based solutions running open-source srsRAN protocol stack are available. Open RAN (O-RAN) interfaces as well as RAN Intelligent Controller (RIC) functionality are also available on commercial and open-source O-RAN platforms. For the core network functionalities there are several open-source Open5GS instances available.

Edge processing has been deployed with several edge platform implementations with local data break out following the ETSI multi-access edge computing (MEC) specifications and application development in local / private networks. Edge solutions include general hardware and open-source software as well as well as commercial proprietary solutions. Deployment includes Nvidia H100 GPUs for AI processing at the mobile network edge server, which can be tailored to process application/service data or telecom data. Fixed backbone network includes 40/100 Gb connections on site as well as 10 Gb links towards open internet. The test site also includes an off-grid powering system for the cellular network site components including local power production with solar cells. The system is modular and capable of supplying both 48 VDC and 230 VAC for the indoor and outdoor RAN components

6G-XR North Node Beyond State-of-the-Art

The described beyond state of the art below is a roadmap towards what the North Node will have available by the end of the project. At the time of 3rd 6G-XR Open Call feasibility check deadline all of the components may not be available and feedback from the Feasibility Check will be used to match the proposals to the target state of the RIs.

VTT 5GTN and UOULU 5GTN will be upgraded throughout the 6G-XR project to allow B5G and 6G experimentation and research activities. 3GPP 5G-Advanced evolution will be supported by upgrading the 5G core network (commercial and open source), RAN, and user equipment with 3GPP Rel. 16/17 functionality as it becomes available. The focus of the upgrades at 3.5-3.7 GHz and 24-26 GHz frequency bands will be to support URLLC. At 450-850 MHz frequency bands, support to mMTC UOULU use cases is provided with LTE-M and NB-IoT at the VTT 5GTN test facility. Possible new frequency bands and support for both 5G NR TDD and FDD is also expected. For non-3GPP technologies, WiFi 7 technology will be adopted when it comes available.

The different experimental facilities will adopt O-RAN architecture and interfaces at some extend to study the impact of having virtualised distributed function splits in the RAN. The different RAN functionalities will be managed and monitored by the near-real time and non-real-time RIC. The controlling and monitoring aspects of O-RAN will enable AI algorithms for RAN resource consumption and energy efficiency optimisations. Virtualised radio unit (RU) functionalities will run on SDR platforms providing up 300 GHz radio links and MIMO schemes.

Accurate time synchronization for the deployed network equipment is provided with a GNSS-based PTPv2 grandmaster. Accurate and robust atomic clock-based time synchronisation is also available for mobile clients and indoor environments. Time synchronisation plays a key role for the accurate data delivery and measurement timings expected to be needed in the various validation test cases.

The test network infrastructure has been equipped with energy meters for continuous measurement of the total power consumption at different network elements. Measurements can be collected at ~1/s

intervals. There are also renewable energy availability forecasting systems, storing assets, and base station(s) with energy optimization features available enabling analysis and control approaches to maximize the utilization of renewable and local energy by the network components.

2.2.2 6G-XR South Node (I2CAT and 5TONIC)

i2CAT Foundation offers a fully-fledged 5G network for experimentation purposes in the city of Barcelona. This is a multi-site network distributed in various locations of the Barcelona metropolitan area, mixing indoor and outdoor deployments. Sites are interconnected with dedicated point-to-point fibre links (10 Gbps) to i2CAT's headquarters. 5G Barcelona covers media, health, industry, transport, security, and automation, among other services, ranging from encouraging the adoption and validation of 5G technology, and the transfer of knowledge in 5G, to the creation of business opportunities. Its current equipment can be categorized in the (1) radio, (2) edge and (3) datacentre segments. Under an open and multi-vendor perspective, the (1) radio infrastructure is composed three 4G small cells (two in b43 and one in b42, both with a maximum bandwidth of 20MHz), one 5G small cell (N77 with a maximum bandwidth of 100 MHz and a starting frequency of 3900 MHz), as well as 23 multi-purpose SDRs (each of them with a maximum bandwidth of 50MHz, central frequencies of 100-6000 MHz, and featuring 4G and 5G in NSA/SA modes). The cellular infrastructure is connected to a fully virtualized 5G core (5GC) from different open-source projects (i.e., Open5GS, Free5GC, OpenAirInterface), and all of them support NSA and SA modes. Regarding non-3GPP radio access, the i2CAT testbed has six WIFI nodes (five WIFI 5 and one WIFI 6), that can be used either as access points or as backhaul links. On the (2) edge segment, the i2CAT testbed features 3 NUCs with a combined maximum theoretical capacity of ~700 vCPUs and 192 GB of memory. Finally, the (3) datacentre segment consists of 3 servers with a maximum capacity of ~2600 vCPUs and 512 GB of memory. The whole cellular and WIFI infrastructure is managed by a radio controller developed by i2CAT. On top of this, i2CAT's Slicing and Orchestration Engine manages the whole lifecycle of network slices. The i2CAT testbed will be interconnected with 5TONIC with the best available alternative in terms of throughput and latency with the objective of easing the federation of resources across network slices.

Telefónica/Ericsson/Capgemini Spain operate 5TONIC, an open research and innovation laboratory focusing on 5G technology integration, adoption, and evolution (https://www.5tonic.org/). 5TONIC aims to create an open global environment where members of industry and academia alike can work together on specific research and innovation projects related to 5G technologies with their combined insight allowing them to boost technology and business innovation ventures. Ericsson is the partner that provides the RAN and the 5G core network of the laboratory. The infrastructure supports common 5G Services: (1) enhanced Mobile Broadband (eMBB), (2) massive Machine Type Communication (mMTC) and (3) Ultra Reliable Low Latency Communications (URLLC). It provides a 5G NR access network in low, mid and millimetre waves bands with different bandwidths (20,40,50, 60, 100 MHz) and with the possibility of doing carrier aggregation, to achieve sustained throughput beyond the Gbps and lower latency than LTE networks (up to 4 milliseconds in the access network). The access network also supports MIMO technology, NB-IOT and Cat-M for testing machine-to-machine use cases, and a dedicated edge data network that is in less than 1 millisecond from the access and allows to deploy vertical applications at the network edge.

5TONIC also provides a full-fledged portable 5G network that can be used for demonstrating use case in the vertical premises or in an event. It allows for exploring and validating a variety of Edge Computing models by extending the URLLC slice towards the location of the use case. The portable network is composed by a Radio Access Network and the 5G core user-plane, which are the elements deployed near the users, and allows to connect through a secure connection with the 5TONIC central core for

managing the control plane. The portable system support two kind of antennas for providing outdoor (e.g., a 5G MIMO mid-band antenna) and indoor (e.g., Ericsson Dot system) coverage. Such coverage is used to extend 5G coverage in vertical offices or in events. 5TONIC regularly cooperates with 5G handset and CPE manufacturers for their use in E2E validation activities of mutual benefit. 5TONIC establishes regular cooperation with 5G handsets and CPE manufacturers for their use in E2E validation activities of mutual benefit. WNC, Fivecomm, Xacom and ASKEY are representative manufacturers engaged in 5TONIC activities. 5TONIC also integrates in its 5G Core a MEC implementation, compliance with ETSI MEC specification, that offers multiple capabilities, accelerators and frameworks for rapid development of MEC solutions with optimized HW infrastructure resources and increased computing and IOPS (Input/output Operations per Second) performance and reduced network latency. The platform integrates OpenNESS and can reside on micro data centres close to the access network, aggregation points, regional data centres and central offices, as best suited for edge app developers. The platform offers API integrations compliant with Linux Foundation CAMARA APIs and GSMA Operator Platform specifications. .

6G-XR South Node Beyond State-of-the-Art

The described beyond state of the art below is a roadmap towards what the South Node will have available by the end of the project. At the time of the 3rd 6G-XR Open Call Open all of the components may not be available and feedback from the Feasibility Check can be used to match the proposals to the current state of the RIs.

The i2CAT testbed and 5TONIC will see upgrades on its equipment and functionality to support the 6G capabilities by addressing four main pillars: (1) AI/ML powered XR service awareness; (2) holistic end to end XR awareness, service migration and continuity, (3) XR-aware eMBB/URLLC; and (4) native XR session control. The infrastructure will also be upgraded to meet these capabilities. Firstly, (1) the AI/ML powered XR service awareness aims to integrate decision-making components and algorithms that enable to optimize the usage of resources (e.g., XR applications, energy efficient policies) in each segment and keep track of their serving needs across multiple domains. Secondly, (2) the holistic E2E XR awareness, an extension to AI/ML-powered XR service awareness that will require extending the inter-domain and intra-PLMN mechanism and APIs defined by the GSMA and TMF, as well as mechanisms for edge federation and PLMN roaming / federation with focus at service migration / continuity. Thirdly, (3) the XRaware eMBB/URLLC is an evolution of the eMBB/URLLC use case aiming at dealing with superior downlink and uplink bandwidths and, at the same time, minimizing E2E application delay. In practice, this evolution for XR will require the use of additional carriers or RATs (Radio Access Technology) and an optimal selection of edge resources based on load conditions and/or proximity to the end user to reduce latencies. Finally, (4) the Native XR session control will take care of the integration of the XR service control layer (e.g., IMS) with the XR services and ecosystem (e.g., the media session orchestrator), as well as with the holistic XR orchestrators mechanism derived from above mentioned development.

Besides this, the infrastructure will also be upgraded: (i) RAN will be extended to operate in new mid and mmW bands with commercial and open solutions, as well as updating the existing radio infrastructure to 3GPP Release 16 and 17 and WIFI 7. (ii) The edge will add new servers, mostly focusing on cores and memory processing (considering both CPU and GPU resources, e.g., to use with AI workloads). The (iii) data centre will introduce new servers in 5TONIC to achieve full compliance of the 5G core network with 3GPP releases 16 and 17. Finally, (iv) the i2CAT testbed will incorporate XR hardware, like VR/XR headsets, RGB-D cameras (Azure Kinect) and VR-ready PCs or laptops.

2.3 RELEVANT DELIVERABLES

The 6G-XR project has produced at the time of the publication of this info document two deliverables containing relevant and more detailed information related to the use cases and infrastructures:

- D1.1: Requirements and use case specifications, available at the 6G-XR website here.
- D2.2: Orchestration, AI techniques, End- to-end slicing and signalling for the core enablers – design, available at the 6G-XR website, here
- D1.3: Test infrastructure specification available at the 6G-XR website, here
- D4.2: Intermediate deployment of beyond 5G RAN, core, and open-source networks, disruptive RAN technologies and trial controller, available at the 6G-XR website, here, also in the project YouTube channel is available the demo supporting video
- D5.1: Description of sustainability experimentation framework, available at the 6G-XR website, here

3 SCOPE OF THE CALL

The purpose of the 3rd Open Call is to invite innovators to participate in the Vertical Replicability Enablers Open Call (6G-XR-OC3), offering access to cutting-edge 6G-XR infrastructure, testbeds, and enabling technologies. Through this initiative, third parties can deploy, replicate, and validate their own XR use cases—ranging from real-time holographic communications to immersive technologies and energy measurement framework for energy sustainability —contributing to the development of the 6G ecosystem.

We encourage submissions that align with the topics outlined below, though proposals are not restricted to these areas, provided they are consistent with the overarching objectives of 6G-XR.

Please note that a minimum of one and a maximum of four proposals will be funded per infrastructure.

The use of an alternative infrastructure may be negotiated if the chosen one is unavailable/unbalanced in terms of available resources.

3.1 6G-XR OPEN CALL 3 TOPICS

3.1.1 Real-Time Holographic Communications

6G-XR-OC3-TOP1.1: Full-fledged multimedia platforms / services providing new encoding and streaming solutions for Holographic Communications [Mentor: VICOM, i2CAT]

This topic seeks full-fledged multimedia applications and services needed for Holographic Communications. The proposals will be deployed and tested on top of the South Node / I2CAT test facility. Multimedia solutions can encompass heterogenous processing capabilities, including but not limited to volumetric video encoding and streaming protocols:

- **Encoding:** applications or services that address encoding scalability (e.g., novel encoder/decoder, GPU acceleration and motion/time-aware encoding) or image quality improvements (e.g., volumetric video reconstruction and supersampling methods).
- **Streaming:** applications or services that address novel protocols based on QUIC transport layer (e.g., RTP over QUIC and Media over QUIC) or adaptive streaming strategies (e.g., adaptation algorithms for volumetric video and tiled streaming).

Target 6G-XR RI: South Node / I2CAT

6G-XR-OC3-TOP1.2: Training and education, by using immersive platforms that support rich interaction and collaboration between distributed users [Mentor: i2CAT]

This topic seeks experiments on verticals revolving around education and/or training, by involving the adoption of full-fledged platforms and/or applications that preferably support immersive formats and rich interaction and/or collaboration features between distributed users.

The experiment(s) shall leverage the 5G network and edge computing capabilities from the South Node, in particular those available at the i2CAT testbed.

Target 6G-XR RI: South Node / I2CAT

6G-XR-OC3-TOP1.3: Culture visits and events, by using immersive platforms that support real-time tele-portation to a virtual place or event, and rich interaction therein [Mentor: i2CAT]

This topic seeks experiments on verticals revolving around culture visits / events, and/or tourism, by involving the adoption of full-fledged platforms and/or applications that preferably support immersive formats and rich interaction with the environment and between distributed users.

The experiment(s) shall leverage the 5G network and edge computing capabilities from the South Node, in particular those available at the i2CAT testbed.

Target 6G-XR RI: South Node / I2CAT

6G-XR-OC3-TOP1.4: Smart Industry / Spaces, by using immersive platforms that support rich data sharing, manipulation of digital twins, and/or remote collaboration [Mentor: i2CAT, CGE]

This topic experiments on verticals revolving around Smart Industry / Spaces, by involving the adoption of full-fledged platforms and/or applications including Digital Twins of counterpart real spaces, which allow for rich data inspection and sharing, simulation, manipulation of the Digital Twins (and ideally of the linked real-world counterpart), and/or remote collaboration.

The experiment(s) shall leverage the 5G network and edge computing capabilities from the South Node, in particular those available at the i2CAT testbed and/or 5TONIC.

Target 6G-XR RI: South Node / I2CAT, 5TONIC

6G-XR-OC3-TOP1.5: Interactive multiuser multi-sensory experiences, by integrating multiple data modalities beyond audio and video [Mentor: i2CAT]

This topic seeks experiments on verticals revolving around multi-sensory experiences, by involving the adoption of full-fledged platforms and/or applications that support multi-modal data beyond audio, video and text, like haptic and computer-generated scents, and which involve the participation of, ideally multiple, remote users.The experiment(s) shall leverage the 5G network and edge computing capabilities from the South Node, in particular those available at the i2CAT testbed.

Target 6G-XR RI: South Node / I2CAT

6G-XR-OC3-TOP1.6: Energy immersive platforms for virtual testing and evaluation [Mentor: CGE]

This topic experiments on verticals revolving around Energy storage by involving the adoption of full-fledged platforms for virtual testing for battery aging and evaluation.

The experiment(s) shall leverage the 5G network and edge computing capabilities from the South Node, in particular those available at 5TONIC.

Target 6G-XR RI: South Node / 5TONIC

6G-XR-OC3-TOP1.7: Cooperative, connected and automated mobility (CCAM) in micro-mobility scenarios. [Mentor: i2CAT, CGE]

This topic seeks experiments demonstrating advanced CCAM services in micro-mobility scenarios that take advantage of: (i) high Uplink capacities provided by FR2 radios, (ii) low latency provided by Edge resources located next to the radio sites, and (iii) the capability of differentiate selected User Equipment by means of slices.

The experiment(s) shall leverage the 5G network and edge computing capabilities from the South Node, in particular those available at the i2CAT testbed, and/or 5TONIC.

Target 6G-XR RI: South Node / I2CAT, 5TONIC

6G-XR-OC3-TOP2.1: UC4 - Simulation and prediction; Prototyping simulation, Predictive maintenance in Industry [Mentor: UOULU]

This theme invites proposals for VR-assisted research and development in a real-life factory, construction environment, operation room, etc. aimed at production efficiency. R&D gearing towards simulated development is expected here with predictive tools for making development more efficient than current state of the art. Alternatively, prototyping in VR space over wireless communications through component simulation is a topic of interest. Digital model based predictive maintenance is further a topic of interest where the operator interacts with the digital model stress/performance testing through wireless VR space environment.

Expected use of infra: Cumucore 5G core based 5G network, Babylon.js 3D engine, Meta Quest 3 and/or Apple Vision Pro with integrated 5G modems, edge computing, similar application but different usage to the current 3D Digital Twin use case.

Target 6G-XR RI: North Node / UOULU 5GTN

6G-XR-OC3-TOP2.2: UC4 - Training and Education; Operational training, remote collaborative operations in education. [Mentor: UOULU]

This theme invites proposals focused on VR enables training and education. For training in VR, collaborative operations with VR and real world are expected. This topic can address e.g. vocational schoolwork, medical school training, and teaching. Operational training mainly focuses on human communication-assisted training rather than computer aided like VR game one. Multi-user collaborative education can be proposed. Verification can be done with limited number of VR headsets (3D) and computers (2D LCD). Partially remote VR connection may be considered.

Expected use of infra: Cumucore 5G core based 5G network, Babylon.js 3D engine, Meta Quest 3 and Apple Vision Pro with integrated 5G modems.

Target 6G-XR RI: North Node / UOULU 5GTN

6G-XR-OC3-TOP2.3: UC4 - Visualization and data sharing; visualization of complex system and environment, real-time data dashboard in smart media, smart city, smart agriculture. [Mentor: UOULU]

This theme invites proposals for visualization of large spaces/areas and interaction with them through sensor fusion, environmental analytics, big data, etc with edge-computing. Predictions can be made based on input data and the user can provide real-time feedback and telepresence in the visualized system, especially in smart entertainment media, smart city, smart buildings, and smart farming scenarios.

Expected use of infra: Cumucore 5G core based 5G network, Babylon.js 3D engine, Meta Quest 3 and Apple Vision Pro with integrated 5G modems, edge computing.

Target 6G-XR RI: North Node / UOULU 5GTN

6G-XR-OC3-TOP3.1: Utilization of open data in the optimization of RAN energy usage [Mentor: UOULU, VTT**]**

Use the integrated open data APIs at the North Node, such as the energy weather forecasts, CO_2 grid linked emissions, and electricity spot pricing forecasts, as an input to a network control system to change RAN configurations without restarting the gNB. This can be achieved by using open-source RAN platforms or commercial O-RAN solutions that allow changing of RAN parameters dynamically. For example:

- If PV production is high and pricing is low: Maximize power consumption with optimal network performance.
- If PV production is low and pricing is high: Minimize power consumption without severe degradation to service quality.
- Perform task scheduling or load balancing.

Objective: Develop decision algorithms that analyze the forecast information from the open data APIs and propose/trigger appropriate configurations in the RAN.

- Enablers offered by the UOULU 5GTN test facility: OAIBOX Max, USRP n310 and Quectel Modem, all connected to external power meter individually for control and monitoring real time power consumption. Forecasting APIs such as FMI energy weather forecasts, ELSPOT pricing and CO2 emissions integrated within the central controller.
- Enablers offered by the VTT 5GTN test facility: Distributed O-RAN architecture and UEs connected to dedicated external power meters for control and monitoring real time power

consumption. Forecasting APIs such as ELSPOT pricing and CO2 emissions integrated within the central controller.

Target 6G-XR RI: North Node / UOULU 5GTN, VTT 5GTN

6G-XR-OC3-TOP3.2: End-to-end energy budgeting for the sustainable mobile network infrastructure [Mentor: UOULU, VTT**]**

Use the energy consumption data collected with the energy measurement framework and network traffic data collected with the network KPI measurement system to enable energy budgeting for the end-to-end communication system. The target is to enable the network to run on renewable energy as much as possible.

Objective: Apply relevant AI methods and tools to predict and balance the network infrastructure's traffic load, total energy need, and renewable energy availability for the next 24h.

- Enablers offered by the test facilities: Measurement logs on the energy consumption and data traffic from the O-RAN mobile network infrastructure, open data API for energy weather forecast, edge server acting as analysis/control platform, MySQL/InfluxDB database, and Grafana for visualization.

Target 6G-XR RI: North Node / UOULU 5GTN & VTT 5GTN

6G-XR-OC3-TOP3.3: Visualization of mobile network measurement data [Mentor: UOULU, VTT**]**

The energy measurement framework supports tracking component-by-component energy consumption across the end-to-end O-RAN mobile network system as well as the production of local and renewable PV energy at the site. The network KPI measurement system supports collection of data traffic related metrics at different granularities. Application server software provides information on the server resource utilization related to application processing.

Objective: Create visualization dashboards for near-real-time monitoring of communication and computing infrastructure resource usage and energy production and consumption parameters as well as for the production-consumption balance at the experimentation site. Different dashboards should be created for different network usage scenarios defined together in the beginning of the project.

- Enablers offered by the test facilities: Edge computing with real-time and historical data on energy and resource consumption in the network as well as on the production of local and renewable PV energy.

Target 6G-XR RI: North Node/ UOULU 5GTN & VTT 5GTN

6G-XR-OC3-TOP3.4: Calibrations, validations, and verification of energy measurement data [Mentor: VTT**]**

Energy measurement framework contains various 1-phase energy metering units and sensors and related ICT-systems processing almost real time data to end users.

Objective: Propose and execute a methodology/protocol to perform reference measurements to ensure that the energy metering devices and systems in the framework are intact and operate as planned and according to specifications. Verify correct operation of data-processing pathways from metering units to primary data storage. Report weaknesses and themes where these kind of energy metering frameworks could be developed further.

- Enablers offered by the test facility: Deployed energy metering units measuring O-RAN mobile network components and implemented measurement data pipelines collecting the data from individual metering units to a central database.
- **Target 6G-XR RI:** North Node / VTT 5GTN

6G-XR-OC3-TOP4.1: AI supervised manufacturing [Mentor: based on the selected RI**]**

This topic invites proposals, e.g., considering simulated factory environments supervised by AI processes utilising a private 5G network. Other environments than factory can also be considered, as long as they are under the supervision of an AI process and utilises a private 5G network.

Expected use of infra: Cumucore 5G core or Open5GS based 5G network, Edge servers for AI and simulation environment

NOTE: The simulation environment and AI algorithm to be delivered by the 6G-XR-OC3 project, including possible licensing.

Target 6G-XR RI: North Node/ UOULU 5GTN & VTT 5GTN and South Node/ 5GTN, 5TONIC, i2CAT

6G-XR-OC3-TOP4.2: Distributed AI for Energy [Mentor: CGE**]**

This topic invites proposals bringing distributed AI for experimental and testing strategies for energy storage devices.

Expected use of infra: Network Core, Edge servers for AI and simulation environment

NOTE: The simulation environment and AI algorithm to be delivered by the 6G-XR-OC3 project, including possible licensing.

Target 6G-XR RI: South Node/ 5TONIC

6G-XR-OC3-TOP5.1: Open vertical replicability [Mentor: based on the selected RI**]**

This topic looks for other verticals or different use cases under other relevant verticals not covered by the previous ones. Applicants are invited to select their preferred node and research infrastructure, but the feasibility check will examine whether the selected node is the most appropriate for the proposed experiment.

Target 6G-XR RI: North Node/ UOULU 5GTN & VTT 5GTN and South Node/ 5GTN, 5TONIC, I2CAT (Barcelona)

4 GUIDE FOR PROPOSERS & SUBMISSION

4.1 ELIGIBILITY

A proposal will be considered eligible for the 3rd 6G-XR Open Call if it complies will **ALL** the following rules:

- The proposal is submitted by a legal entity established and based in one of the EU Member States or a Horizon Europe Associated country. The targeted organisations in this Call are (i) SMEs; (ii) Industry; (iii) Research/scientific organisation; (iv) Academia.
- The proposal is submitted by a single party. The submission of proposals by consortia is not eligible.
- The proposer **CANNOT BE AFFILIATED TO ANY OF THE CONSORTIUM PARTNERS OF THE 6G-XR PROJECT**.
- The proposal complies with the type of activity qualified for financial support: (i) Personnel costs; (ii) Travel costs (including travel for a live demo at the end of the project); (iii) Indirect costs (25% of the direct costs). No other cost categories are eligible.
- The proposal is submitted in English.
- The proposal is submitted through the official Open Call Submission Tool on the 6G-XR website providing all the required documents (completed proposal template and declaration of honour).
- Feasibility Check submission is mandatory, and for Feasibility Check must include at least the following sections:
    - Section A Project Summary,
    - Section B Detailed description and expected results,
    - Section C Usage of 6G-XR research infrastructures,
    - Section J Ethical and Privacy Framework) before the Feasibility check deadline.

  Proposals failing submission for feasibility will not be evaluated.
- The proposal has been submitted within the deadline set in this document. Late proposals will not be admitted.
- The proposal complies with the Regulation (EU) 2016/679 (General Data Protection Regulation) regarding all personal data that might be included in the proposal.

PROPOSAL TEMPLATE

The use of the specific proposal template is mandatory.

The full proposal template can be found on 6G-XR website**https://6g-xr.eu/open-calls/oc3/** as indicated in section 6.1 of this document.

As indicated in the previous section, the draft proposal that will be submitted for the Feasibility Check must include **at least sections A, B, C and J should be fully completed**. Please be aware that the partner responsible for the Feasibility Check will NOT review draft proposals or propose any changes to the proposal. The partner will only give feedback on the feasibility of the proposed Experiment based on the provided information described in the above-mentioned sections.

The Feasibility Check **does not provide a commitment** that the proposal will be selected.

4.3 SUBMISSION PROCESS

Before submitting the proposal, please download and carefully read the provided documentation and templates through the link below:

https://www.6g-xr.eu/open-calls/oc3/

The proposal must be submitted in English and through the 6G-XR online form that is located on the same page.

All form fields should be filled with no exceptions.

A Feasibility Check is required before submission. Proposers **MUST submit their draft proposal by Friday 10 January 2025 @17:00 CET** (for more details see Section 4.4).

Once the deadline for submitting a proposal is reached, the call will be closed, and the evaluation process will start. The duration of the evaluation of the proposals and approval by the EU is planned to be kept within 1,5 months. The outcome of the evaluation will be communicated to the proposers via email as soon as the process is completed. The notification will include a report of the evaluation process where for each criterion the score and the motivation of the evaluators will be reported.

It is highly recommended to submit your proposal well before the deadline. If the proposer discovers an error in their submitted proposal, and provided that the call deadline has not passed, the proposer can re-submit it (for this purpose please contact us at opencalls@6g-xr.eu).

Failure of the proposal to arrive within the deadline for any reason, including network communications delays or working from multiple browsers or multiple browser windows, is not acceptable as an extenuating circumstance.

Selected experiments can start at the earliest on **End April 2025**. Please note that a later start may imply a shorter experiment.

FEASIBILITY CHECK SUBMISSION & MENTORING

The Open Call proposers are encouraged to contact the 6G-XR consortium and share their intentions in order to verify the feasibility of their proposals to be implemented in the scope of the project. The Feasibility Check will be carried out by the 6G-XR consortium partners acting as Mentor organisations with the support of other partners as needed. The description of the experimental facilities in Section 2 of this document provides insights of the state and targets of each of the facilities and hence proposals should adhere to those targets. Initial feedback will be provided for the proposed planned activities. In order to be eligible and receive feedback, a description of planned experiment (sections A, B, C and J of the proposal template) **must be submitted through the 6G-XR Open Call Submission**

Tool on the project's website by the designated deadline https://6g-xr.eu/open-calls/oc3/. **U**nder the tab 'Stage', please select the option 'Feasibility Check' in order to submit your proposal for a Feasibility Check.

If you have submitted your proposal under the 'Feasibility Check' option, it will not be considered as a final submission and will not be evaluated.

Actual Feasibility Check of the proposal will be conducted after the submission deadline.

Each awarded project will be supervised by a project partner (mentor) who is responsible for supporting the experimenters during execution and following up on the experiment results.

The key responsibilities of the mentors to the third-party experimenters will be to:

- Understand the requirements and needs of the experiment.
- Providing insight into the technical capabilities.
- Follow the progress and reporting process for each experiment.
- Making recommendations to the 6G-XR consortium (Work Packages 2-6) for upgrades and helping validate the experiment's applicability.
- Coach the experimenter during the execution phase.
- Follow up on the results/outputs of the experiment.
- Identifying issues to be escalated to the 6G-XR partners which pose a risk to the experiment.

4.5 FINAL SUBMISSION

The proposals for final submission shall be submitted through **the 6G-XR Open Call Submission Tool** on the project's website by the designated deadline https://6g-xr.eu/open-calls/oc3/ **u**nder the 'Stage' tab, select 'Final Submission'.

4.6 FURTHER ASSISTANCE & CONTACT INFORMATION

Important information is already included in the available 3rd 6G-XR Open Call documents (Information Document, Proposal Template, Declaration of Honour, Draft Third Party Agreement). Please review thoroughly these documents as well as the Frequently Asked Questions section of the 3rd 6G-XR Open Call page.

If the answer to your question cannot be found in the documentation, you can send your question to the following email address: opencalls@6g-xr.eu. In case your question refers to technical details of the offered research infrastructure, you can send your question to the same email address opencalls@6g-xr.eu, clearly mentioning which infrastructure the question relates to. Questions can be sent at the latest seven calendar days before the submission deadline.

4.7 EVALUATION AND AWARD PROCEDURE

Evaluation and ranking will be carried out by an external jury of experts, which cannot be part of the consortium and cannot evaluate proposals where a conflict of interest can be identified. For each of the received proposals, at least two assigned experts will perform reviews independently of each other.

Afterwards, consensus meetings among involved experts will be held, where a common opinion and rating will be built up for the proposals, based on which the final ranking along with a reserve list will be defined.

Proposals submitted by Parties meeting the requirements will be further evaluated according to the following criteria:

1. **Clarity and methodology:** Soundness of the approach and credibility of the proposed methodology
2. **Ambition:** Advancement regard the state-of-the-art and expected output.
3. **Impact:** Technology and domain fit to 6G-XR scope and objectives.
4. **Replicability** of the proposed solution.
5. **Contribution to standardisation** of the proposed solution.
6. **Team capacity to perform**; knowledge, technological and business expertise; commitment; research domain & track-record.
7. **Value for money:** quality and effectiveness of the requested resources.
8. **SME participation** is encouraged.
9. **Gender dimension awareness** requested to the proposers.
10. **Maturity/trajectory of the proposing organization/proposed development** in the specific field of their proposal.

Criterion	Short description	Weight	Maximum score (score X weight)	Minimum threshold
1	Clarity & methodology	1	5	2
2	Ambition	2	10	5
3	Impact	2	10	5
4	Replicability	2	10	5
5	Contribution to standardisation	1	5	2
6	Team capacity	2	10	5
7	Value for money	1	5	2
8	SME participation	1	2	n/a
9	Gender dimension awareness	1	2	n/a
10	Maturity of the proposing organisation	1	5	2
Maximum total score			**64 (max)**	**28 (min)**

Proposals not reaching the minimum thresholds either in individual criteria or in the overall score will not be considered for funding.

The proposal template requires to provide an implementation plan including deliverables, and a cost estimate justifying the costs and resources. In the evaluation phase, the resource adequacy to fulfil the planned work will be assessed and the justification of the budgeted items. Before the award of the grant, it will be checked whether the third party is a legal entity with a stable financial history and has not been declared insolvent.

5 REPORTING

The third party will be required to submit a final report after completion of the Experiment. The below template, which is subject to changes, needs to be used and will include the following sections:

Part A. Summary

Part B. Detailed description

This section describes the details on the Experiment It includes:

- B.1 Concept, Objectives, Set-up and Background
- B.2 Technical results and Functionality Validation
- B.3 Impact

Part C. Feedback to 6G-XR

This section contains valuable information for the 6G-XR consortium and describes the third party's experiences while performing the Experiment.

Part D. Promotion Material

This section provides information that can be used to create communication material based on your Experiment for promotional purposes.

Part F. Method of Replicability

This section describes how the proposed solutions can be replicated.

This report will serve as an evaluation tool to approve the payment of the third party but will also serve as: (i) input for the further development and/or extension of the 6G-XR facilities, and (ii) identification of gaps in the offered facilities and functionalities. Part of this report may be used by the 6G-XR consortium for inclusion in their reporting documents to the European Commission and in public presentations. Inclusion of confidential information should therefore be indicated and discussed with the 6G-XR consortium. This report will also be used for the formal review by the European Commission, which the third parties should attend if required by the European Commission. The final template will be made available during the execution of the Experiment.

6 FINANCIAL AND CONTRACTUAL INFORMATION

6.1 THIRD PARTY AGREEMENT

Once a proposer is selected to perform the proposed Experiment, the proposer will become a third party receiving financial support, and to this end needs to sign a Third Part Agreement.

The template that is available on the project website https://6g-xr.eu/open-calls/oc3/ is a draft and is subject to changes.

6.2 PROPOSAL TEMPLATE

The proposal template is available on the project's website https://www.6g-xr.eu/open-calls/oc3/ in a Word document format. Instructions for filling in all sections are included. Please follow the submission instructions.