3rd 6G-XR Open Call Information Webinar

Vertical Replicability enablers

Co-funded by the European Union

6GSNS

www.6g-xr.eu

AGENDA

14:00 – 14:05
Agenda & introduction to 6G-XR

14:05 – 12:15
3rd Open Call process

14:15 – 14:35
Research Infrastructures

14:35 – 15:10
Topics presentation

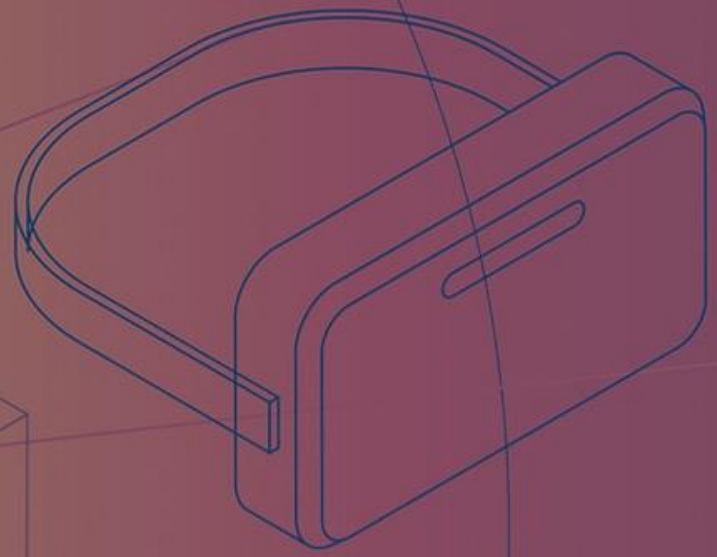
15:10 – 15:30
Q&A

Webinar Netiquette

ADD YOUR QUESTION
IN THE Q&A SECTION

IF NEEDED, CONTACT
US USING THE CHAT

THE SESSION IS RECORDED AND WILL BE AVAILABLE ON WWW.6G-XR.EU/



Project Overview & Open Call 3 objectives

Jussi-Pekka Haapola,
University of Oulu

6G-XR Project Overview

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

Stream: Horizon Europe – SNS JU Phase 1 Stream C – SNS Experimental Infrastructures

Project Coordinator: Dr Jussi Haapola, *University of Oulu*
Technical Manager: Dr Mohammed Al-Rawi, *IT*

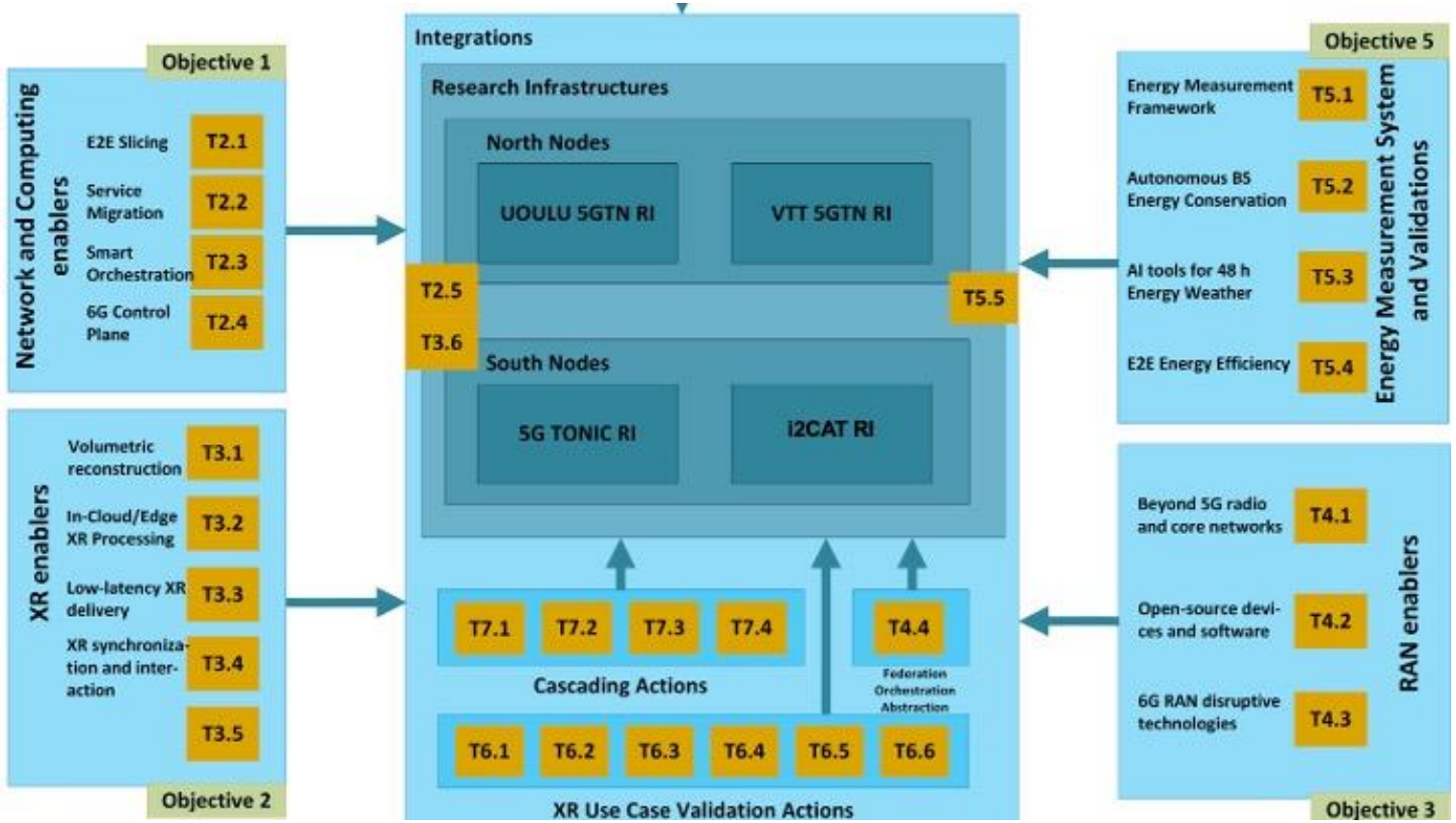
Objective: Strengthen European leadership in 6G technologies by enabling **next-generation XR services and infrastructures** that will provide beyond-state-of-the-art capabilities **towards the 6G era**

15 *partners*

8 *countries*

36 *months*

6G-XR in a nutshell



6G-XR OC3 Objectives

By accessing the 6G-XR infrastructure, testbeds and enabling technologies applicants are able to deploy, replicate, and validate their own XR Use Cases in:

- ✓ Real-time holographic communications
- ✓ Immersive technologies
- ✓ Energy measurement framework for energy sustainability

Open Call process

Maria Chiara Campodonico, Martel

6G-XR Cascading Actions

6G-XR OC1 (2023):

- **6G-XR platform and network enablers** targeting development and extension of the 4 research infrastructures: i) Networking and Computing enablers; ii) XR enablers; iii) RAN enablers; iv) Sustainability enablers

8 *Projects*

6G-XR OC2 (2024):

- **Stream B enablers** targeting the accepted Stream B projects with potential topics related to system architecture, wireless communication technologies, signal processing, communication infrastructure technologies and devices

10 *Projects*

6G-XR OC3 (2025):

- **Vertical replicability enablers** to allow third-party to leverage 6G-XR's enablers, infrastructure facilities and testbeds to deploy, replicate and validate the verticals of their interest

12 *Projects*

 |

KEY DATES

ACTION	DEADLINE
Submission Feasibility Check deadline	10 January 2025, @17:00 CET
Final Submission deadline	7 March 2025, @17:00 CET
Notification of the result	Early April 2025
Start of the Experiment	End April 2025
End of the Experiment	End October 2025

Who can apply?

- ✓ SME
- ✓ Industry
- ✓ Research/scientific organisation
- ✓ Academia

Eligibility criteria

- Legal entity established in EU Member State or Associated Country
- Submission by single party
- Absence of conflict of interest towards 6G-XR
- Type of activity qualified for funding:
  - personnel,
  - travel,
  - indirect costs
- English language
- Feasibility check submission is mandatory and requires Sections A, B, C and J
- Submission through the online tool
- Use of the provided template
- Deadlines for both Feasibility Check and Final submission
- GDPR compliant

What we offer?

60.000€

6 months

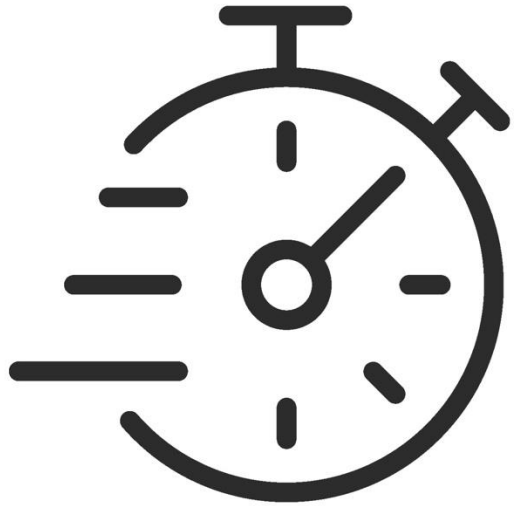
12 projects

Project budget & payments

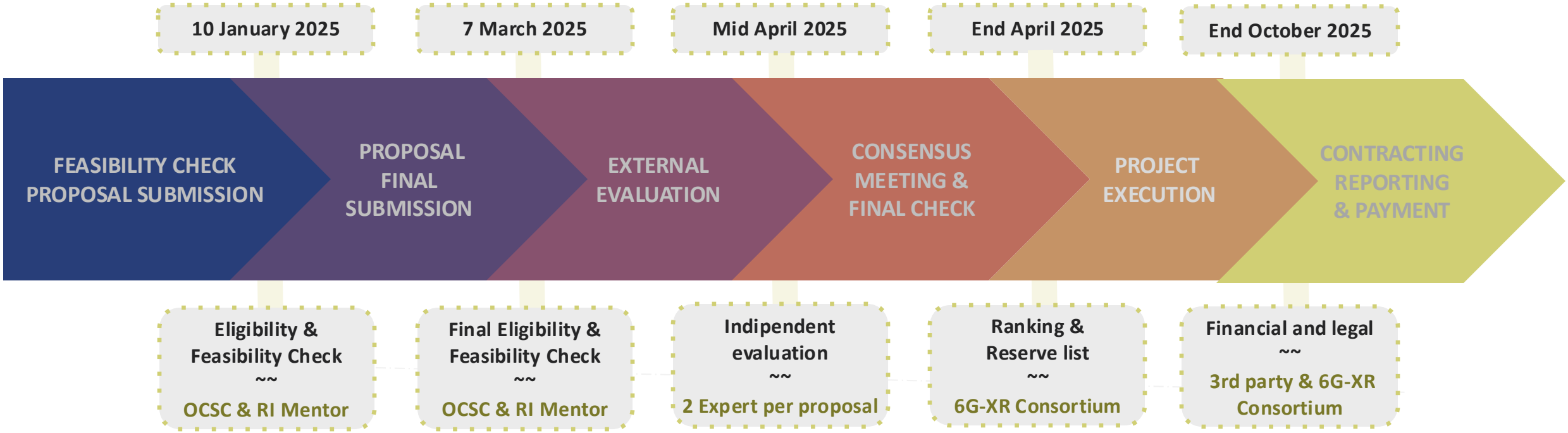
Open Call	Project duration	Max funding per project	No of projects	Total funding
6G-XR-OC3	6 months	60 000 EUR	12	720 000 EUR

- One payment of the awarded amount at the end of the project.
- Lump sum grant model (no financial documents are required)
- Final report (financial & technical) within 15 days after completion (by using the provided template).
- Assessment and approval by consortium.

How the OC process works?



Open Calls Process



 |

General terms

- All final proposals passing the **eligibility and feasibility** checks will be sent for external evaluation and will receive an independent scoring
- The **final ranking** is based on the points received from the evaluation. However, **only the top four projects of any given RI** will be considered for funding. Other projects **above the threshold** will be included in a **reserve list**.
- A **minimum of one and a maximum of four** proposals will be funded per RI
- **Negotiation on the use of alternative RI** if the chosen RI is unavailable/unbalanced in terms of available resources.

Evaluation criteria

1. **Clarity and methodology**
2. **Ambition: a**dvancement regard the SotA 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**
6. **Team capacity to perform**
7. **Value for money**
8. **SME participation** is encouraged
9. **Gender dimension awareness**
10. **Maturity/trajectory of the proposing organization/proposed development**

How to apply?

Submit your proposal!

CONTACT INFORMATION

Important information is already included in the available Open Call 3 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 Open Call 3 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 7 calendar days before the submission deadline.

Dec 01st, 2024
Application process starts

Dec 11th, 2024
Information Webinar OC3

Jan 10th, 2025
Feasibility check deadline

Mar 07th, 2025
Final Submission deadline

Early Apr 2025
Results notification

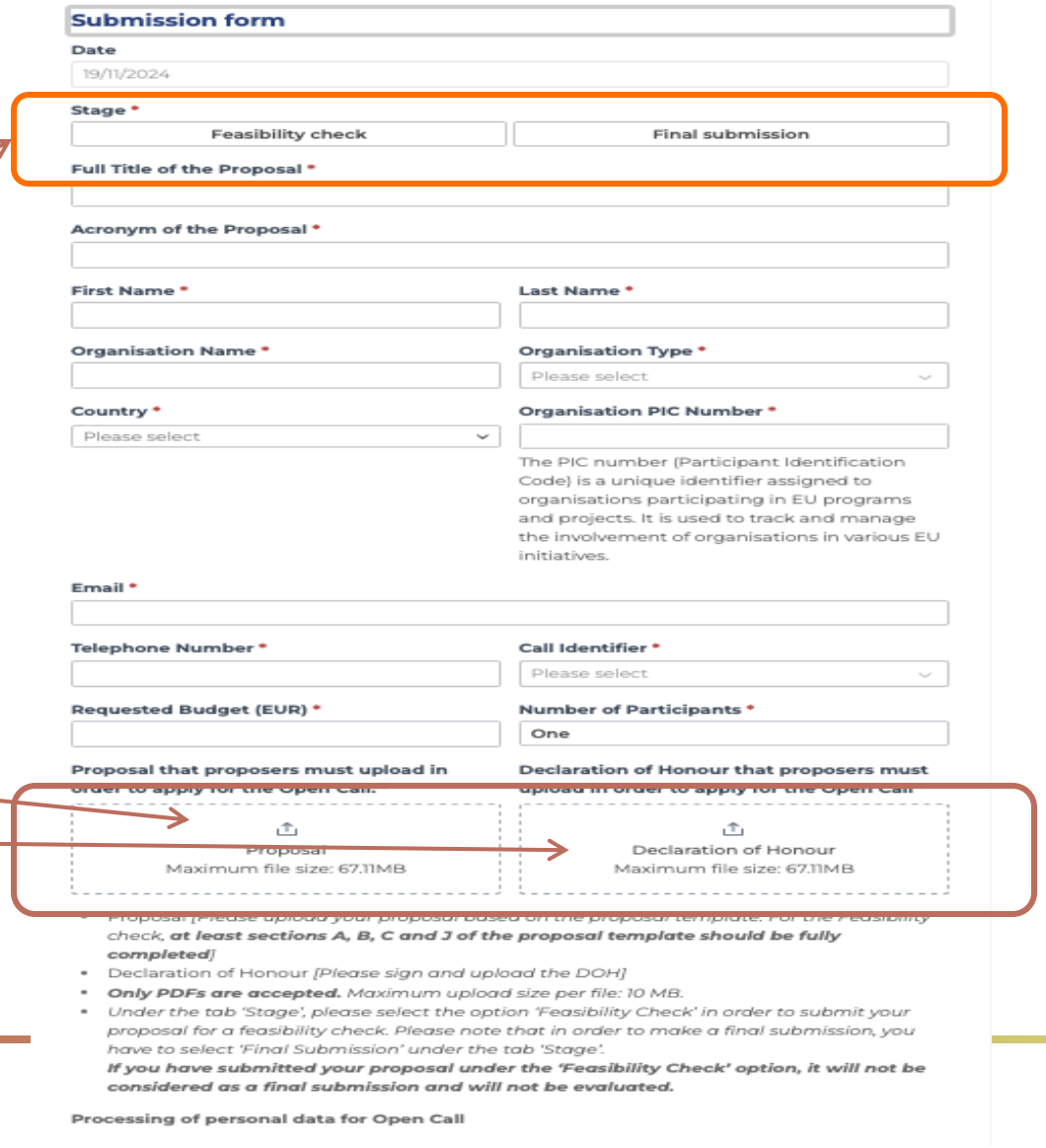
End Apr 2025
Start of the experiment

End Oct 2025
Expected end of the experiment

Submission process

- Apply through: https://6g-xr.eu/open-calls/oc3/
- Fill in the online form selecting the option:
  - ✓ **Feasibility Check**
  - ✓ **Final submission**
- Upload in pdf format:
  - ✓ **your proposal**
  - ✓ **Declaration of Honour**

  by using the provided templates



 |

Useful tips

- ✓ Read carefully the Open Call Toolkit
- ✓ Submit in advance for both phases: feasibility check and final submission
- ✓ Follow the feasibility feedback received by the mentor
- ✓ Have your PIC number ready

Support during the OC3 process

- Frequently Asked Questions page:

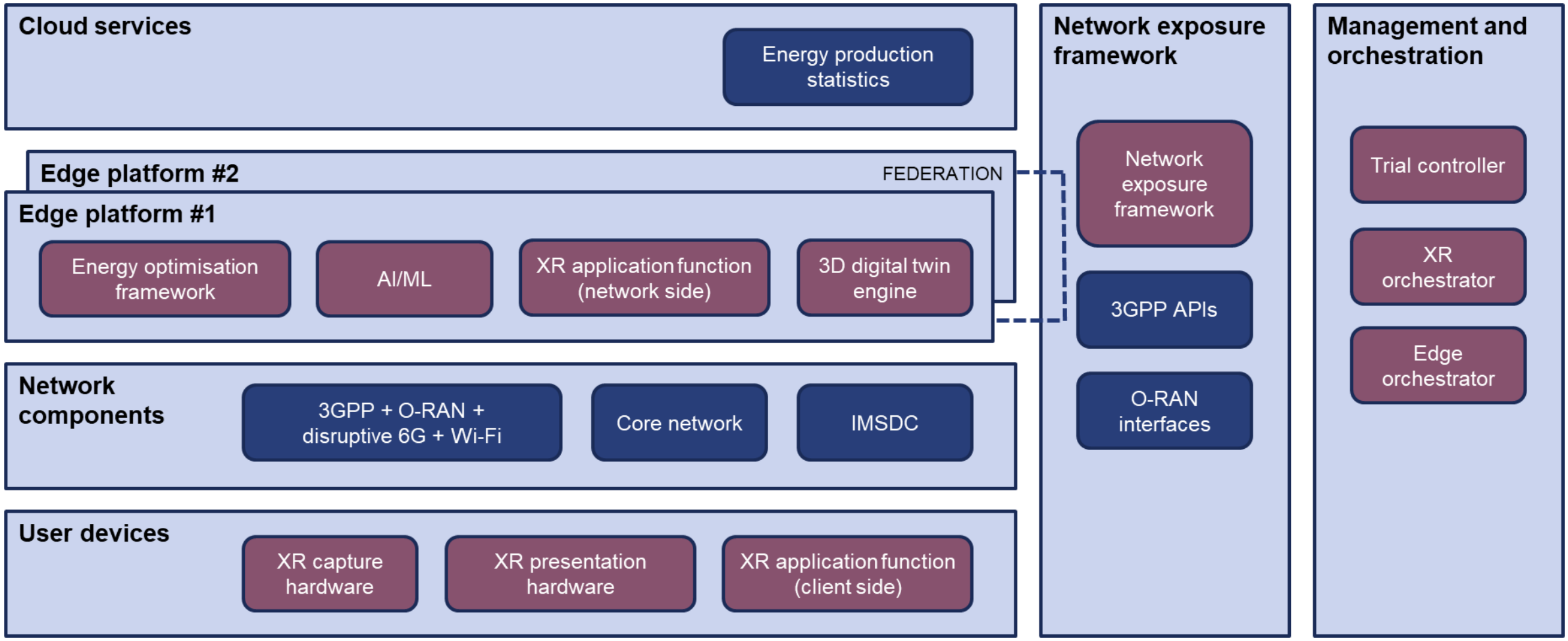
  https://6g-xr.eu/open-calls/oc3/

- Templates available:
  - ✓ 3rd 6G-XR Open Call Info Document
  - ✓ Proposal template
  - ✓ Declaration of Honour
  - ✓ Draft Third Party Agreement
- If more questions: **opencalls@6g-xr.eu**

Research Infrastructures

Antti Pauanne, UOULU
Jarno Pinola, VTT
Aurora Ramos, CGE
Mario Montagud, i2CAT

6G-XR Reference Architecture Overview [6G-XR D1.2]



 |

Enablers Facilitating Collaboration [6G-XR D1.2]

User devices:

- Variety of devices for communication and XR content capture/consumption

RAN and core network:

- Technologies covering 3GPP evolution, open networking, and disruptive 6G solutions

Edge and cloud:

- Capacity to host a different types of services/applications on site

Management and orchestration:

- Enablers for remote experimentation and service/edge orchestration

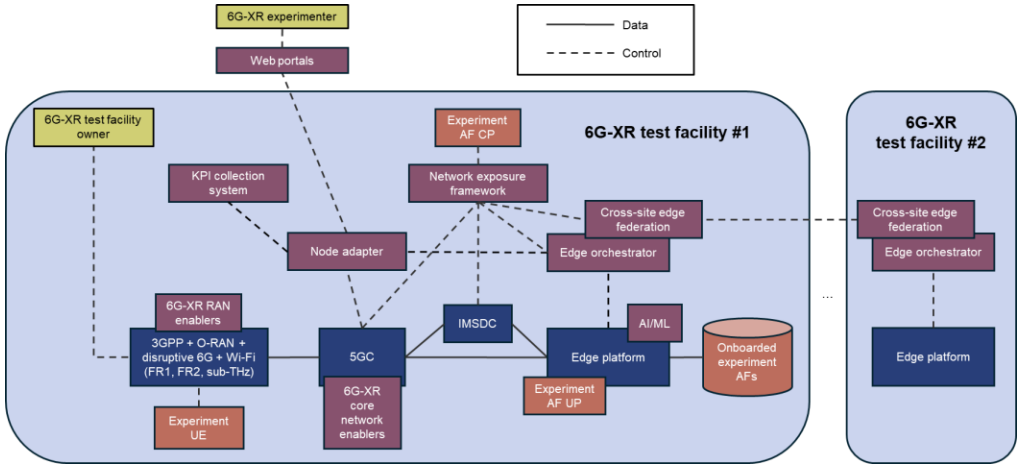
Network exposure framework:

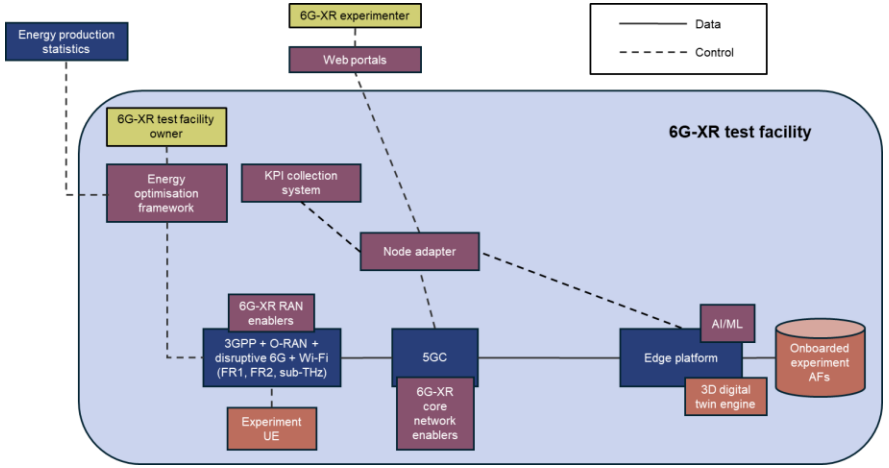
- Different options to expose network resources and capabilities (3GPP, CAMARA, O-RAN, etc.)

Architecture Deployment [6G-XR D1.3]

Key architecture enablers deployed at the **South Node** experimental site in Spain:

- RAN and core network enhancements
- Edge processing, orchestration, and federation
- Open and standardized network resource and capability exposure APIs

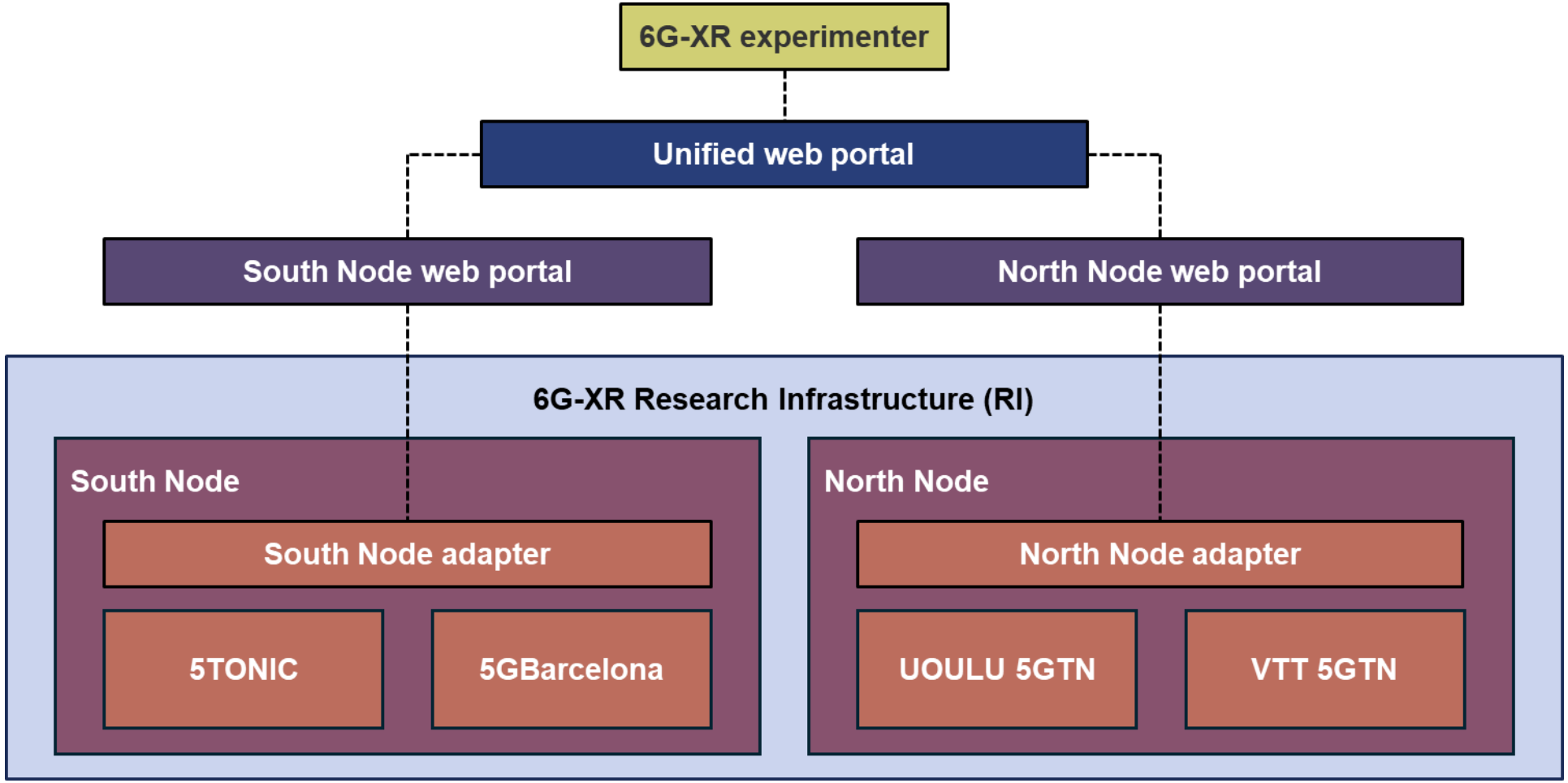




Key architecture enablers deployed at the **North Node** experimental site in Finland:

- RAN and core network enhancements
- 3D digital twin engine for real-time VR collaboration
- End-to-end energy measurement and optimization

Overall Research Infrastructure [6G-XR D1.3]



 |

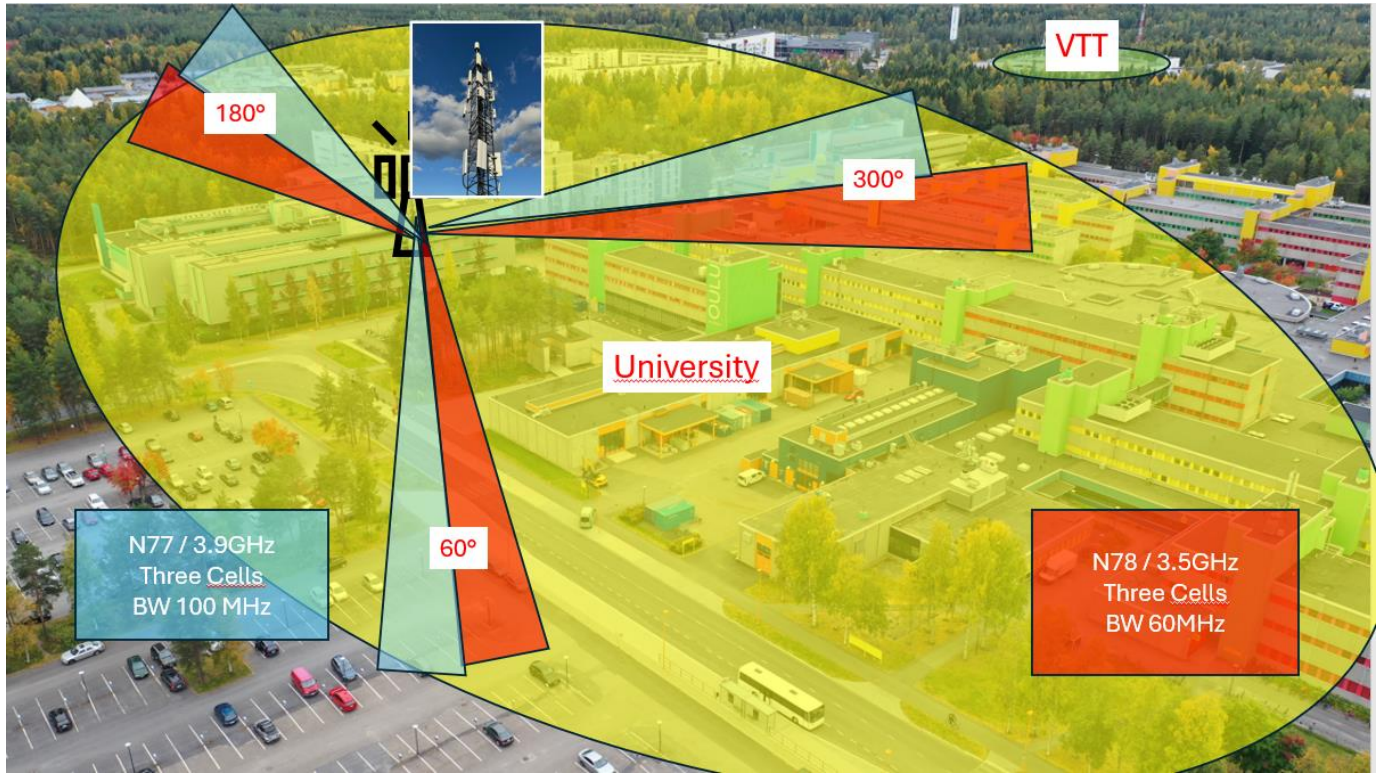
NORTH NODE

(Finland)

North Node

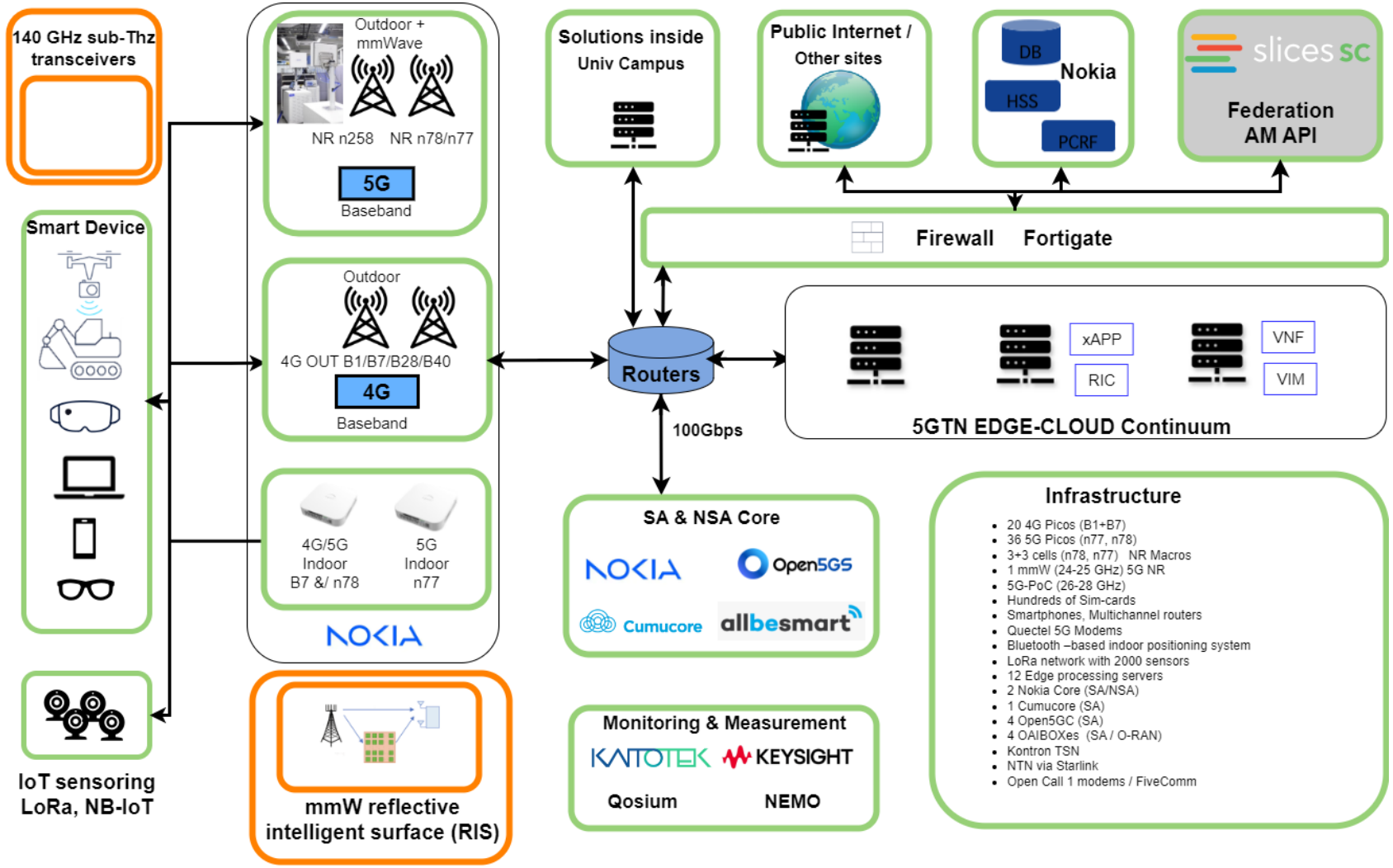
University of Oulu 5G Test Network (UOULU 5GTN) 1/4

- Located at the University of Oulu, Finland
- Micro Operator
- 5G Standalone (SA) available
- 2/4/6 Beam solutions tested
- 4G and 5G with various frequencies
- Cellular IOT
- 400+ sensors at campus
- Energy consumption / production measurement environment
- Integrations to different verticals
- Roadmap evolution towards 6GTN



 |

North Node/University of Oulu 5GTN



University of Oulu 5G Test Network (UOULU 5GTN) 3/4

Technology

- 1 webportal
- Frequency licences (in collaboration VTT - UOULU):
  - 700MHz (B28) BW=10MHz, VTT radio permit
  - 2100MHz (B1) BW=10MHz, TTO-license
  - 2300MHz (B40) BW=20MHz, Private LTE
  - 2600MHz (B7) BW=20MHz, TTO-license
  - 2600MHz (B7) BW=10MHz, Loan from Elisa
  - 3.5GHz (n78) BW=60MHz, TTO-license
  - 4.0GHz (n77) BW=200MHz, 5G license
  - 25GHz (n258) BW=850MHz, 5G license
- 2 Macros (B28) with NB-IoT and Cat-M
- 2 Macro (B7)
- 1 Macro (B40), LTE-TDD
- 20 Picos (B1+B7) on air (10+ picos available/in use for different tests)

- 3 pcs 5G NR (NSA + SA)
- 3 pcs 5G NR remote radio heads operating in NSA mode
- Hundreds of Sim-cards available
- 1 EPC (5G NSA), 1 OpenEPC, 1 Cumucore,3 Open5GC (SA) and one commercial SA/NSA 5G core
- 1 Bluetooth –based indoor positioning system, (700 beacons)
- 1 LoRa network with approx. 2000 sensors (partially NB-IoT enabled)
- 12 Edge servers
- 9 OpenEDGE servers
- 4 OAIBOXes
- 36 5GNR remote radio heads (RRHs) and 3 baseband units (BBUs)
- 1 mmW 5G NR base stations
- Several tens of different UE's: phones, modems, 5G routers, etc.
- 3D scanner and powerful GPUs available
- Test car with 5G and Starlink capabilities
- Test SW and HW like: Kaitotek Qosium, Keysight Nemo
- Remote controllable Universal Robots UR5 & UR10 robot arms

 |

North Node

University of Oulu 5G Test Network (UOULU 5GTN) 4/4

Several different 5G networks available

- Nokia SA Core
  - N78
  - Outdoor + indoor
  - Bandwidth: 60 MHz
- Cumucore SA Core
  - N77
  - Outdoor + indoor
  - Bandwidth: 100 MHz
  - Slicing
- OAIBOX
  - 3 independent units
  - N77 indoor
  - Bandwidth: 100 MHz
- OAIBOX O-RAN
  - 1 unit with Split 8.0 (USRP X410)
  - 1 unit with Split 7.2 in delivery (Benetel)
  - N77 indoor
  - Bandwidth: 100 MHz
  - FlexRIC for xApps
  - Slicing

North Node

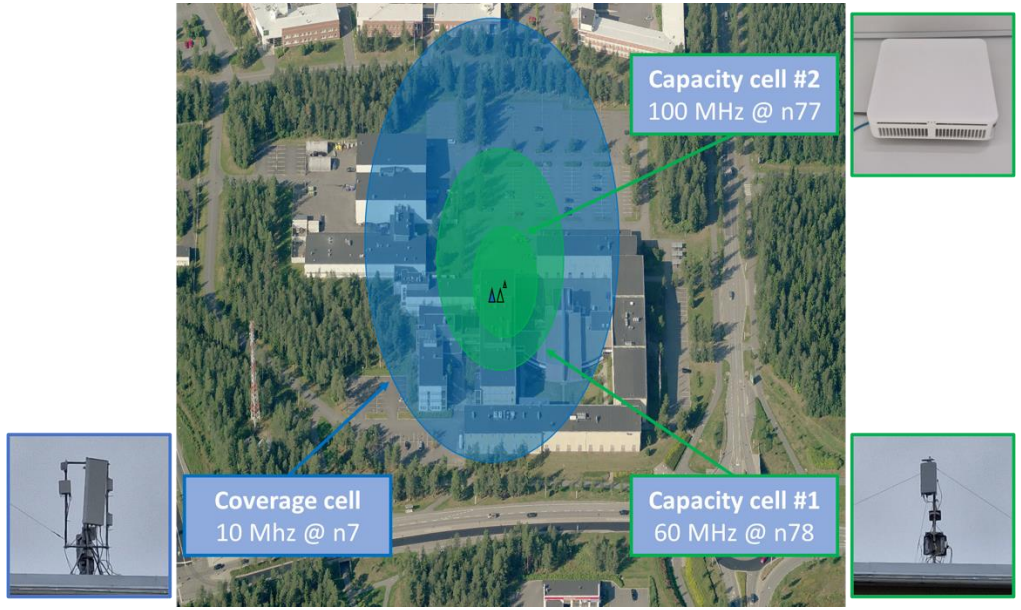
VTT 5G Test Network (VTT 5GTN) 1/3

- Managed and operated by VTT
- 5G, 4G, O-RAN, WiFi-6 connectivity
- Satellite links (including Starlink)
- Frequency bands:
  - LTE/NB-IoT: 450 Mhz (BW: 5 MHz), 700 MHz (BW: 3 Mhz), 1.8 Ghz (BW: 5 MHz), 2.1 GHz and 2.6 GHz (BW: 10 MHz)
  - 5GNR: 3.5 GHz (BW: 60 MHz), 3.9 GHz (BW: 100 Mhz), 26 GHz (BW: 800 Mhz)
- Core network options
  - Proprietary: Carrier grade telco cloud
  - Open source: Open5GS
- User equipment
  - Commercial: Smart phones and CPEs (~10 users)
  - Emulated: SDR-based UE emulator (up to 100 users)
- Edge processing and local storage
  - Several edge platform implementations, inluding Nvidia H100 GPUs for AI processing
  - Server and storage space can be tailored for experimentation needs
- Connected to GÉANT
- Local renewable energy sources and accurate power consumption monitoring framework
- Accurate time synchronization also for client devices

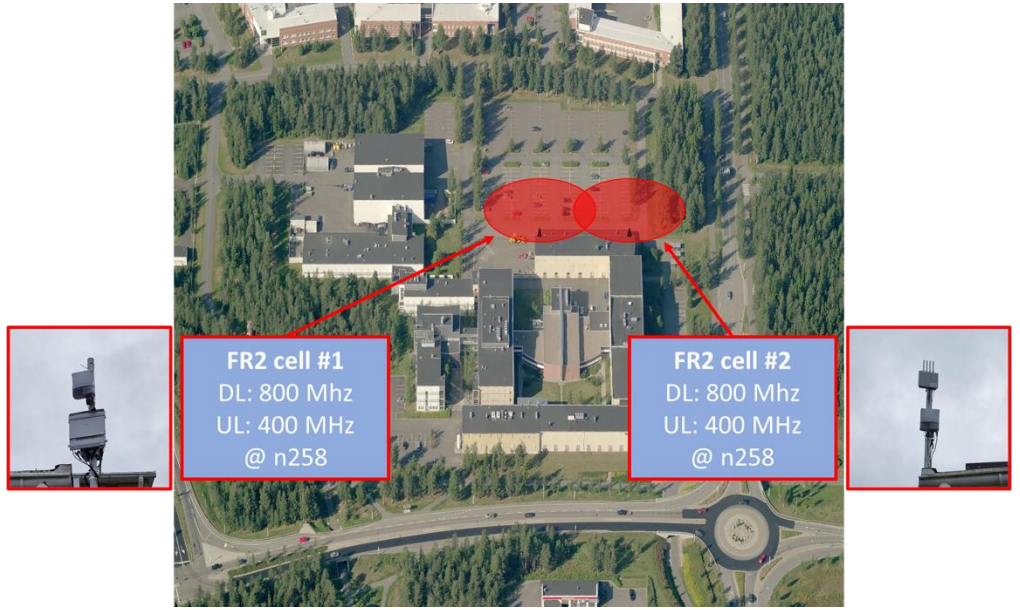
North Node

VTT 5G Test Network (VTT 5GTN) 2/3

- 5G (NSA and SA) and 4G (including LTE-M and NB-IoT)
  - Indoor and outdoor coverage
  - Commercial RAN equipment



- 5G mmWave
  - Outdoor coverage
  - Commercial RAN equipment

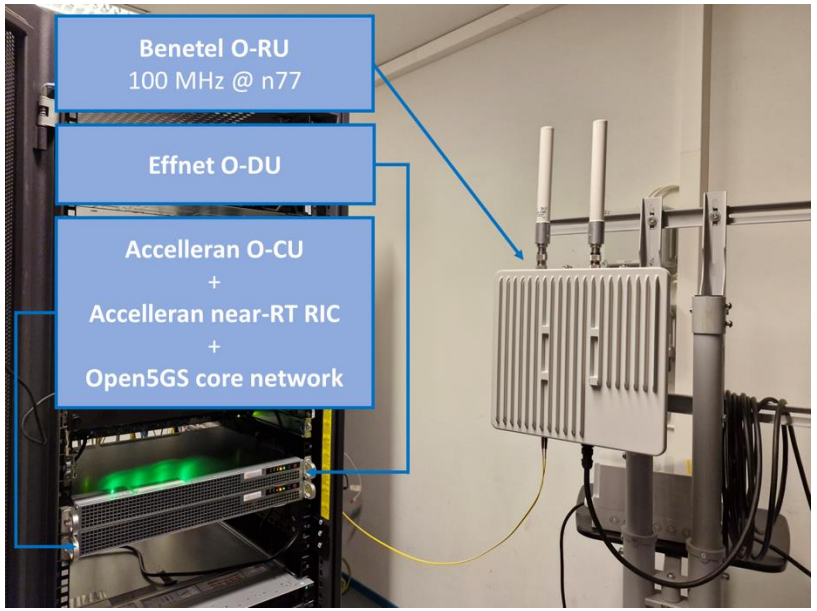


 |

North Node

VTT 5G Test Network (VTT 5GTN) 3/3

- O-RAN
  - Indoor (and outdoor) coverage
  - Commercial RAN equipment

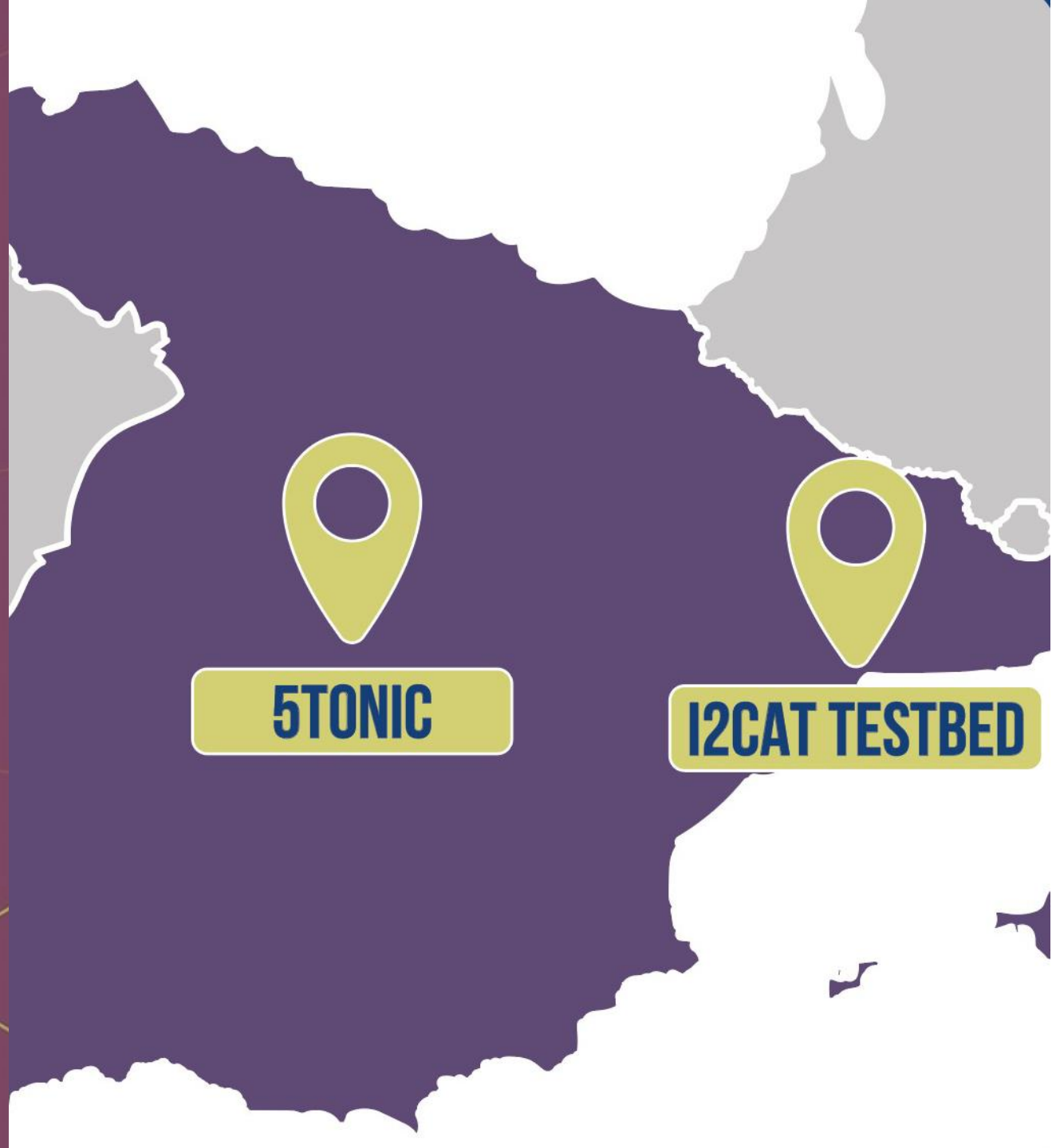


 |

6G-XR

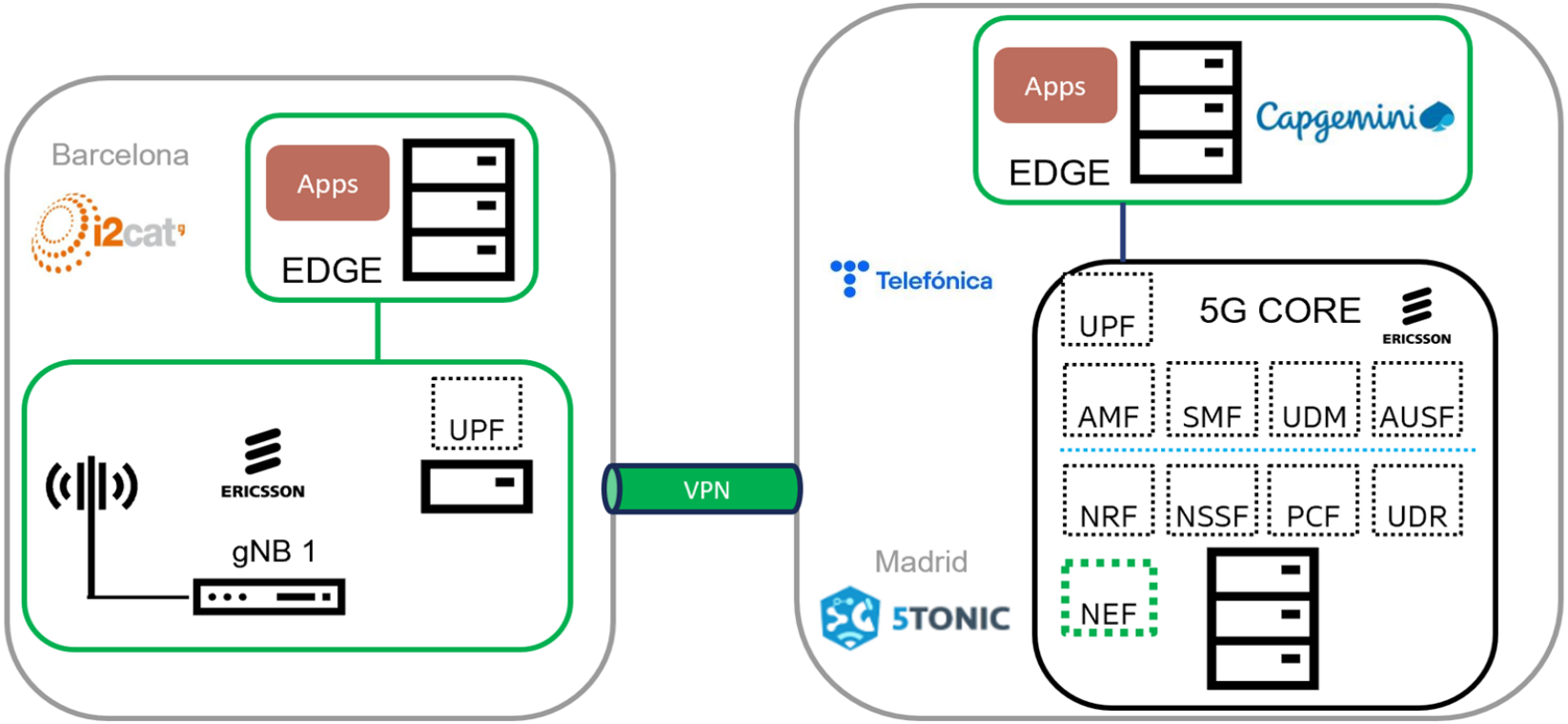
SOUTH NODE

(Spain)



South Node – highlevel view and partners

i2CAT TESTBED & 5TONIC

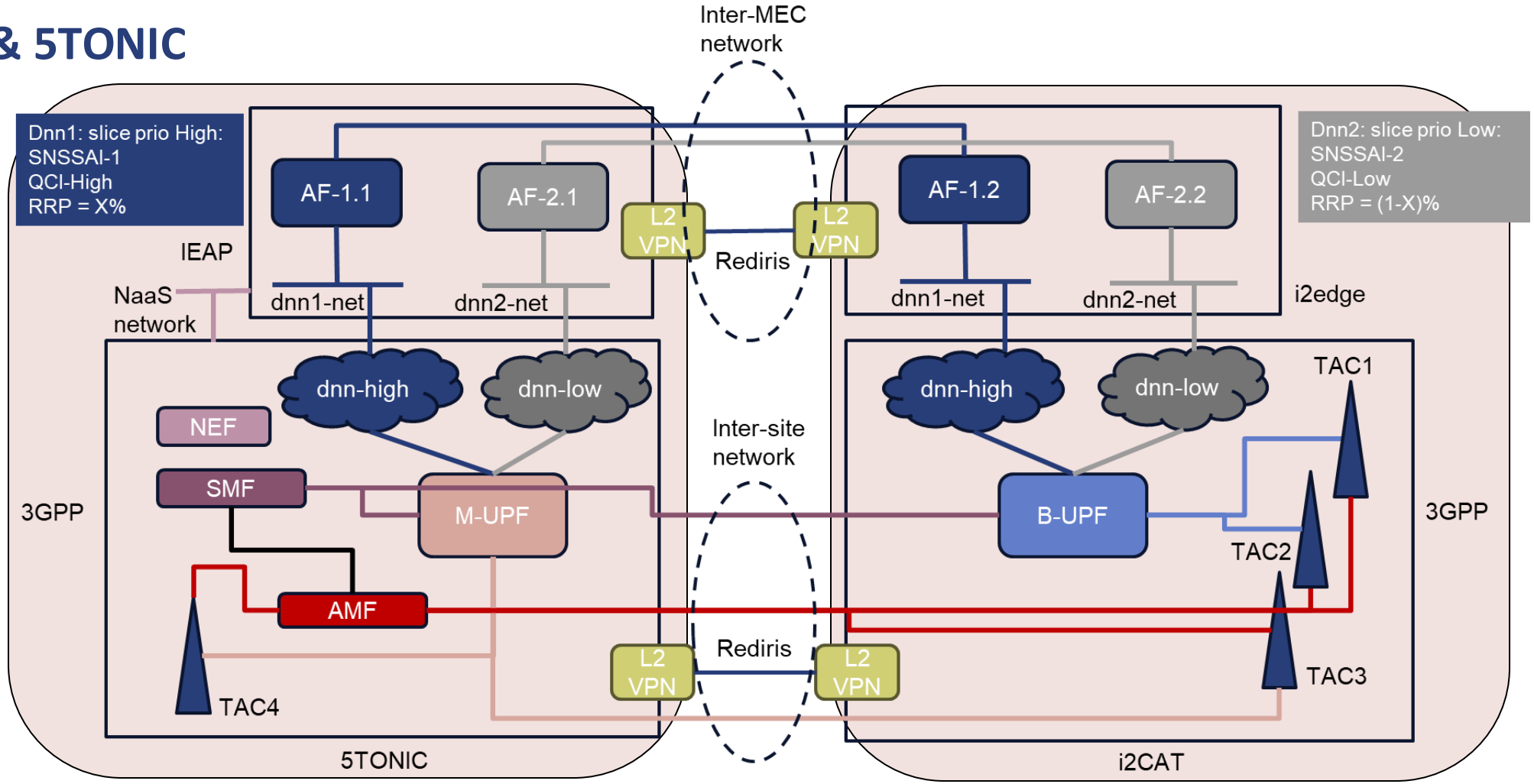


 |

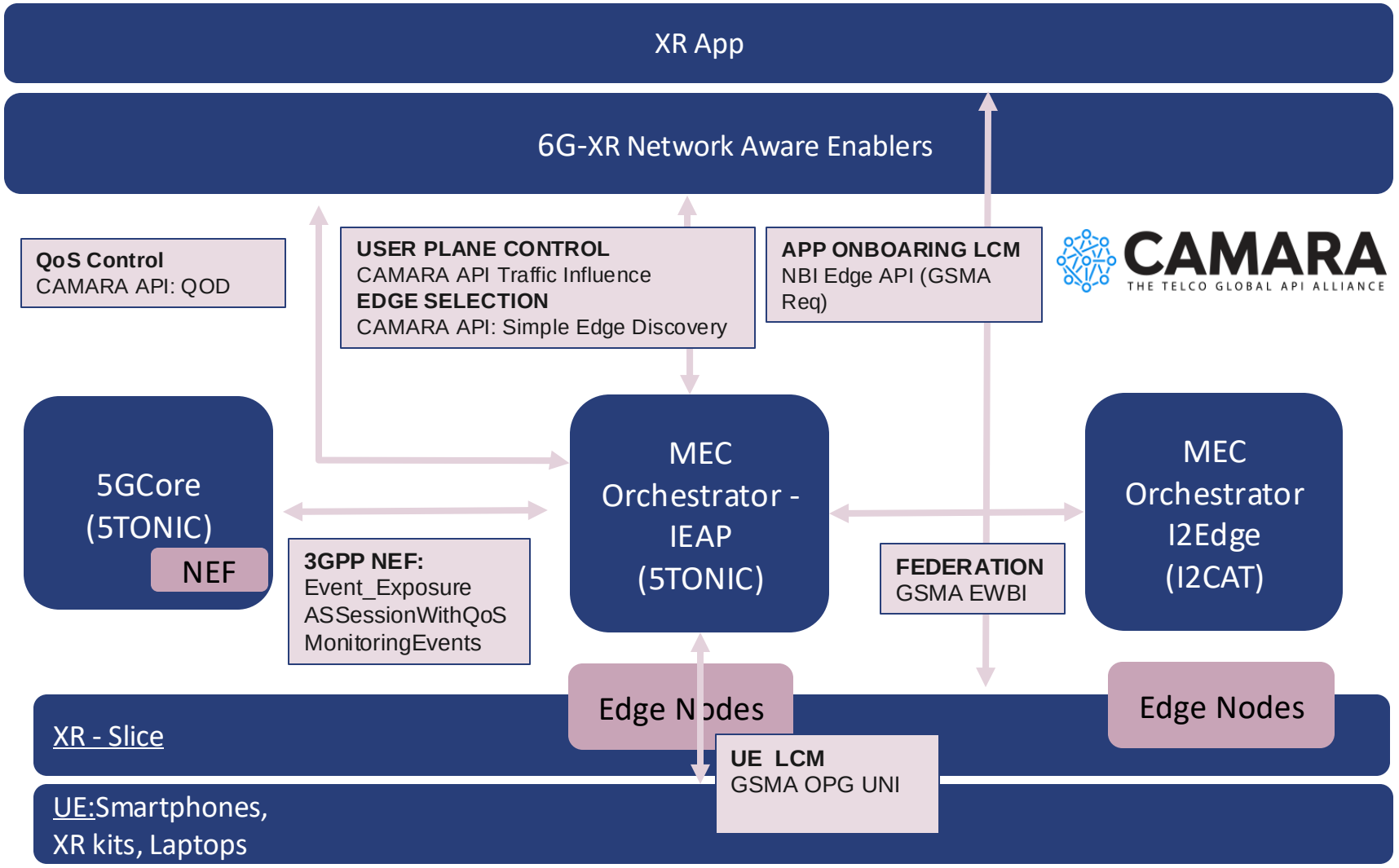
South Node – connectivity details

I2CAT Tetsbed & 5TONIC

- Two edge locations
- Multiple pre-configured Slices & DNN
- NaaS Exposure
- RAN at both nodes
- Core at 5TONIC



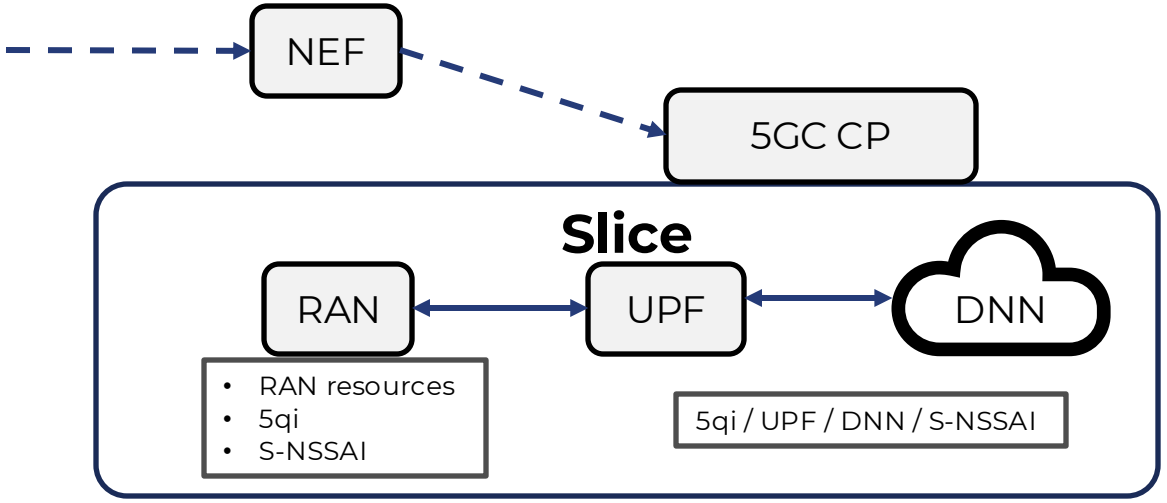
South-node: 5Tonic Edge Orchestration APIs



South Node: 5TONIC NEF APIs

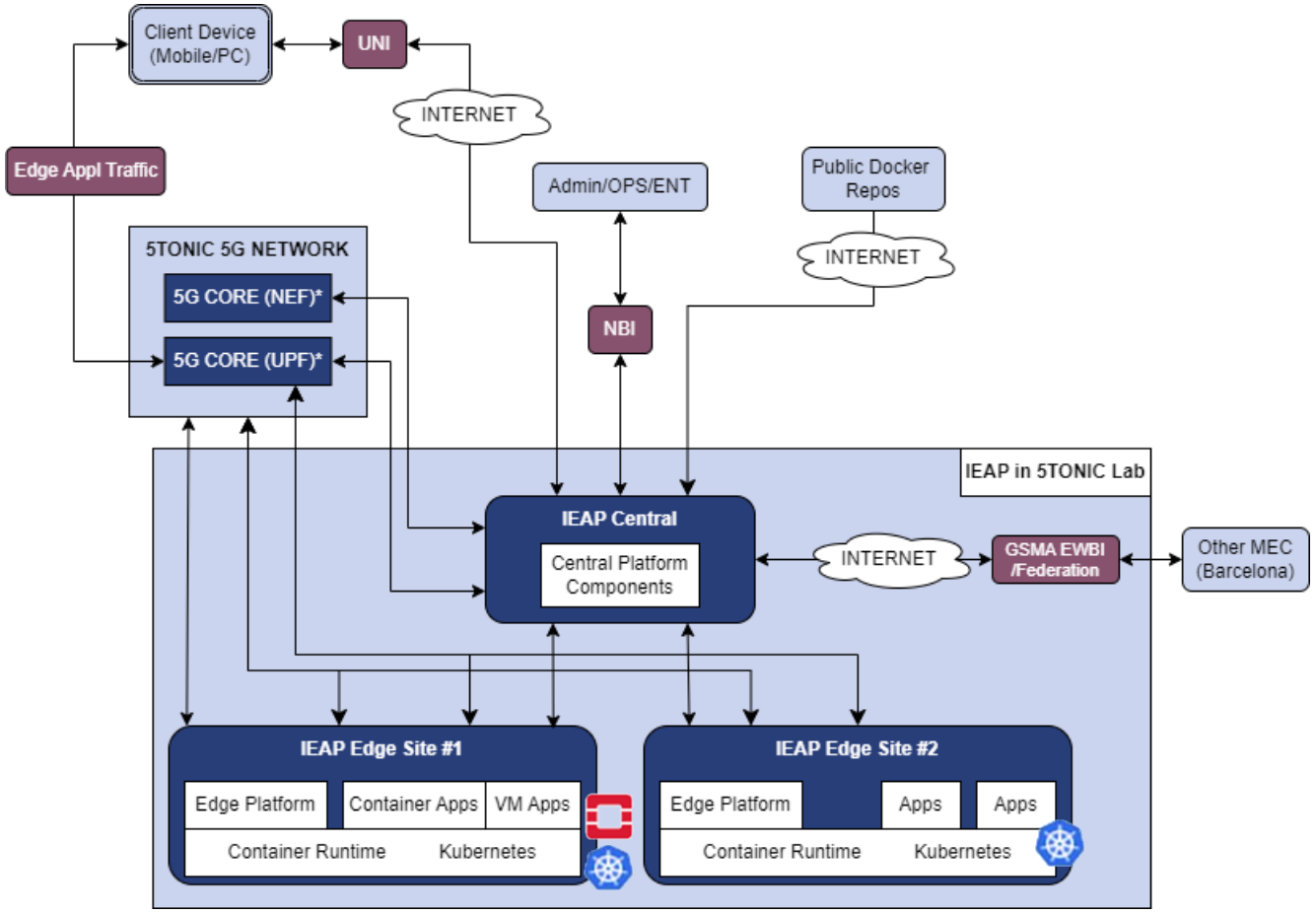
Features available through the NEF at 5Tonic:

- Service Parameter API – to select which UPF to be used by the user traffic
- UE Location API – to find where the UE is located
- QoS Session API – to adapt the QoS of the user traffic flow
- Data Collection API – to fetch network performance metrics



 |

Edge Nodes (Computing Resources) at 5Tonic



	Resources
IEAP Central	vCPU-5, RAM-8, Disk-500GB
Edge -1	vCPU-5, RAM-8, Disk-500GB
Edge - 2	vCPU-5, RAM-8, Disk-500GB
K8s Cluster -ENT-1	vCPU-6, RAM-20, Disk-400GB
ISV – Dedicated K8s Cluster	vCPU-6, RAM-20, Disk-400GB
ISV – Docker Node	vCPU-6, RAM-20, Disk-400GB
Single node K8s Cluster – **SR-IOV, GPU, CEPH**	CPU-20, RAM-128, Disk-1.2TB
Single node K8s Cluster –**GPU**	CPU-20, RAM-128, Disk-1.2TB

	2 servers
Processors	2 X Intel(R) Xeon(R) Silver 4114 CPU @ 2.20GHz (10 cores, 20 threads)
Memory	128GB
Networking	1 x 4 Port Broadcom NetXtreme BCM5719 Gigabit Ethernet PCIe 1 X 2 Port Intel Ethernet Controller X710 for 10GbE SFP+
Local Storage	2 X HPE Enterprise - Hard Drive - 1.2 Tb - SAS 12GB/S Model=EG001200JWJNQ

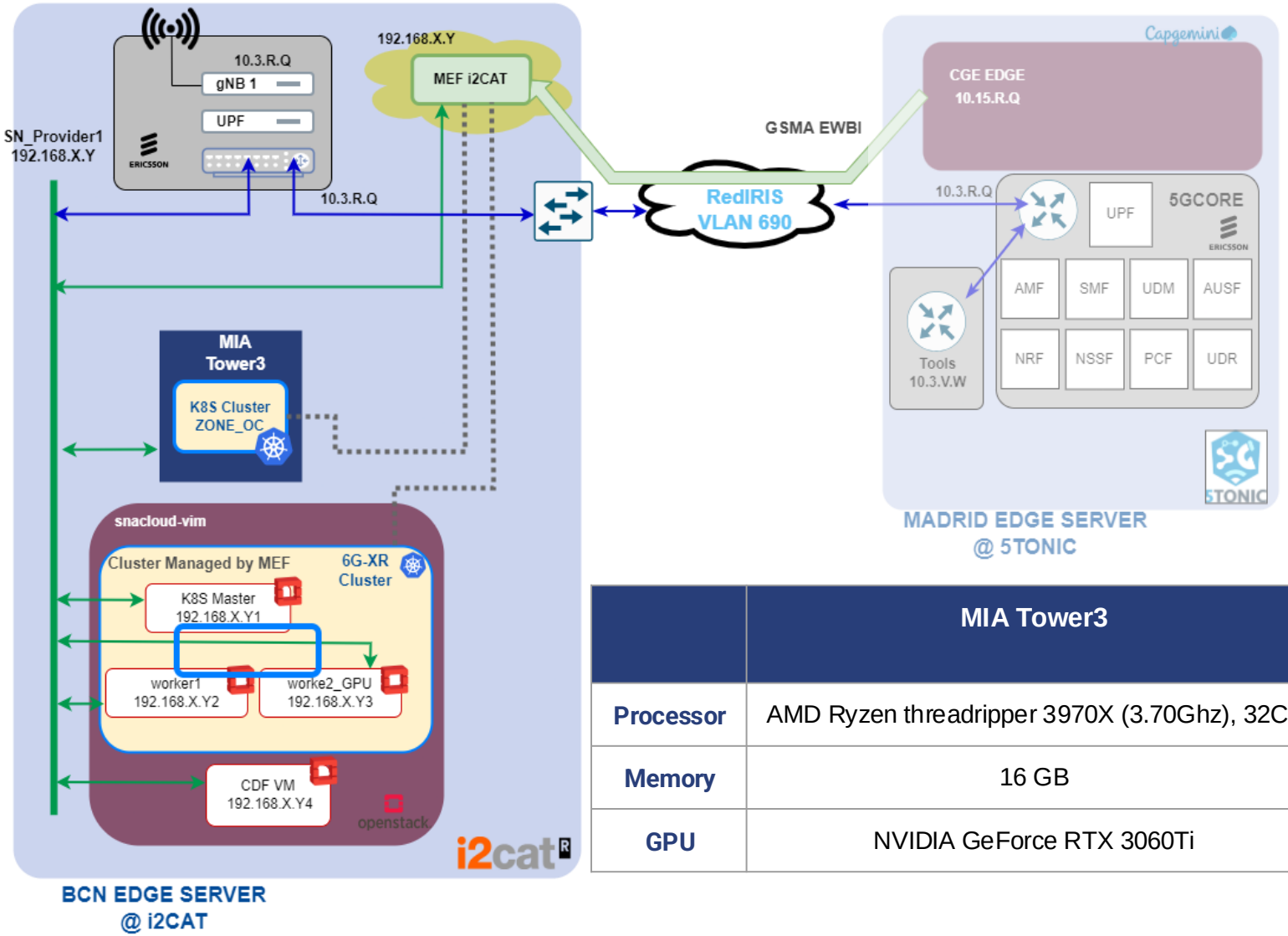
	2 servers
Processor	Intel Xeon Silver 4310 2.1G, 12C/24T, 10.4GT/s, 18M Cache, Turbo, HT (120W) DDR4-2666
Memory	16GB
GPU	NVIDIA(R) Tesla(TM) T4 Single Slot, Full Height GPU

Edge Node (Computing Resources) at i2CAT

The i2CAT testbed in Barcelona includes an Edge node seamlessly interconnected with the Edge node in Madrid via **RedIRIS.**

Experimenters can access computing resources in two locations: the **SNACLOUD-VIM** server and **MIA Tower3**. Both locations feature Kubernetes (K8S) clusters for application deployment and orchestration. The SNACLOUD-VIM server runs its K8S cluster on top of an OpenStack environment, while MIA Tower 3 offers baremetal K8S resources.

The specific resources available on these nodes are as follows:

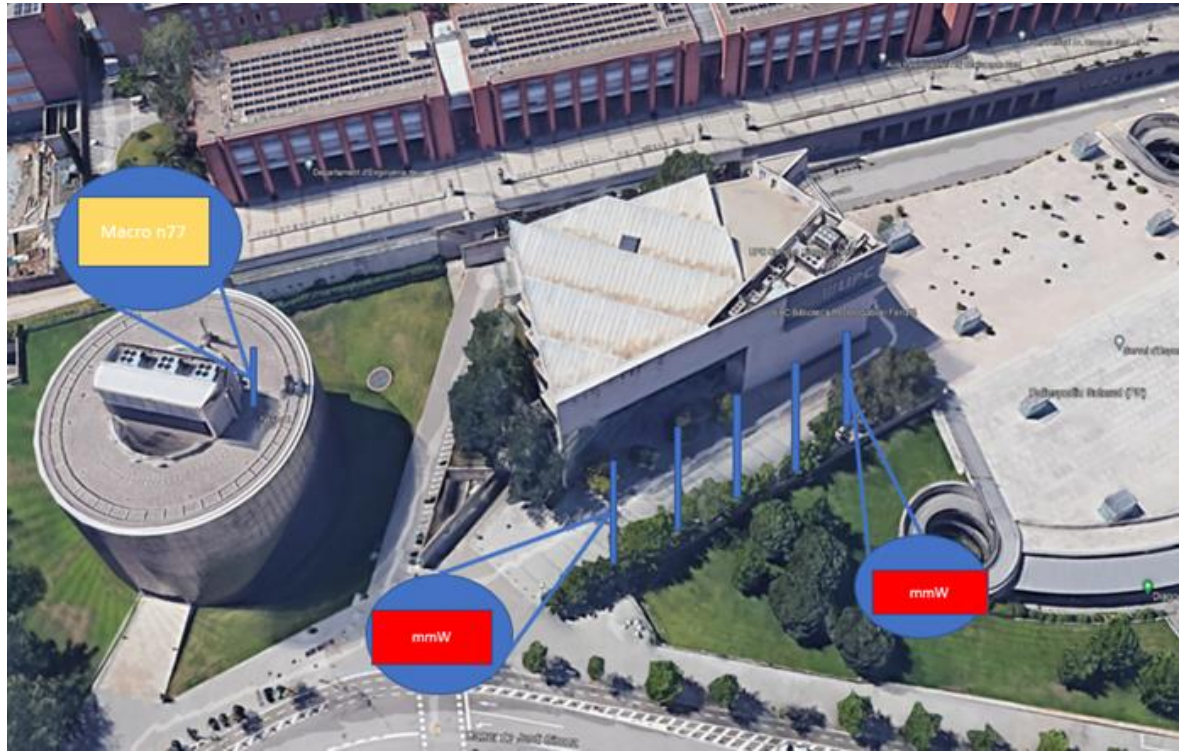


	snacloud VIM
Processor	2 x Intel (R) Xeon (R) Gold 5218R (2.1 GHz), 40C/80T
Memory	115 GB RAM
GPU	NVIDIA Tesla T4 16GB

	MIA Tower3
Processor	AMD Ryzen threadripper 3970X (3.70Ghz), 32C
Memory	16 GB
GPU	NVIDIA GeForce RTX 3060Ti

South Node: Radio Access Network at i2CAT

FR1+FR2 RAN



FR1+FR2 CPE

- RAN infrastructure:
  - One macro-cell site n77 (3700-3980 MHz) at 40 MHz carrier
  - Two n258 (24.25-27.5 GHz) at 400 MHz carrier
  - FR2 CPE: Askey NUQ3000M + HP Z2 Mini G9
    - Only one available
    - OC3 applicants can deploy their service in the HP Z2 or connect via Ethernet
- Mobility capabilities:
  - FR1 + FR2 (1st cell) --> FR1 only --> FR1 + FR2 (2nd cell)
- **Experiments encouraged to test outdoor FR2!**

South Node: Radio Access Network

- Performance measured in laboratory conditions:

	Band	Bandwidth	TDD patt	Power	Modulation DL/UL	DL Layers	UL Layers	DL carriers	UL carriers
Macro FR1	Mid	40 MHz	4:1	1W	256/64 QAM	4	1	-	-
mmWave FR2	High	4x100 MHz	variable	4x2.5W	256/64 QAM	2	2	4	2

TDD pattern	Per-cell FR2 DL Throughput	Per-cell FR2 UL Throughput	User plane round-trip time latency
Regular 4:1 - DDDSU	2.08 Gbps	404 Mbps	5.20 ms
Balanced - DDSUU	1.60 Gbps	902 Mbps	5.47 ms
UL Heavy - DSUUU	951 Mbps	1.63 Gbps	6.85 ms

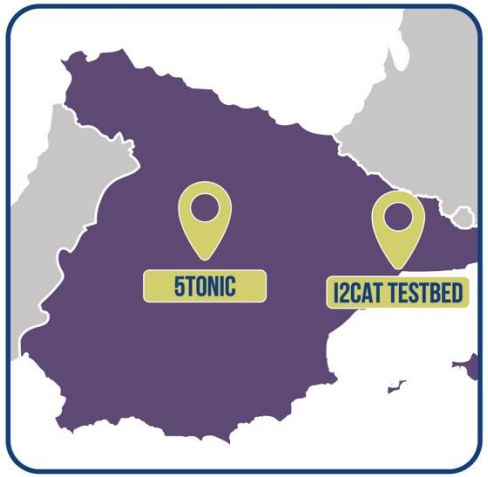
- Testing in campus scenario still ongoing and expected to be lower due to harder propagation conditions

6G XR

Internal Use Cases

Internal Use Cases

South Node



Real-time Holographic Communications

UC1: Resolution Adaptation or Quality on Demand

- Detect cell congestions and adapt XR resolutions or XR traffic priority

UC2: Routing to the Best Edge

- Select and make use of the most appropriate Edge based on specific goals

UC3: Control Plane Optimizations

- Integrate holographic communications to the network control plane

 |

Use Cases Driving the RI Development

North Node

Digital Twins

UC4: Collaborative 3D Digital Twin-like Environment

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

Energy Consumption

UC5: Energy Measurement Framework for Energy Sustainability

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

 |

Targeted Topics

- Real-Time Holographic Communications
- Immersive Services
- CCAM
- Collaborative 3D Digital Twin-like Environment
- Energy Measurement Framework for Energy Sustainability
- Artificial Intelligence
- Open Topic

TOPICS SUMMARY

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	North/ South	UOULU 5GTN, VTT 5GTN, 5TONIC, I2CAT	Based on the selected RI

TOP1.1: Full-fledged multimedia platforms / service

Context

- ✓ Volumetric video streams require high network bandwidth to be transmitted since real-time compression algorithms are still limited
- ✓ Streaming protocols employed for volumetric video are usually an adaptation of legacy streaming protocols meant for plain video

Goals

- ✓ This topic seeks a full-fledged multimedia platform to process volumetric video streams for holographic communications
  - ✓ Novel implementation of volumetric video encoder/decoder
  - ✓ Novel streaming protocols designed to handle volumetric video transmission

RI: South Node (i2CAT)

MENTOR: VICOM, i2CAT

Presenter: VICOM – Roberto Viola

TOP1.2: Training and education

Context

- ✓ Immersive & Interactive and (toward) 6G technologies become key enablers for **education and training**

Goals

- ✓ Vertical experiments and demonstrations providing full-fledged applications / platforms for immersive education / training
- ✓ Support for immersive formats and rich interaction and/or collaboration features between distributed users
- ✓ Exploit the 5G network and edge computing capabilities from i2CAT facilities

RI: South Node (i2CAT)

MENTOR: i2CAT

Presenter: I2CAT – Mario Montagud

 |

TOP1.3: Culture visits and events, by using immersive platforms

Context

- ✓ Immersive & Interactive and (toward) 6G technologies become key enablers for **culture, virtual visits and events**

Goals

- ✓ Vertical experiments and demonstrations providing full-fledged applications / platforms for immersive culture / tourism / events
- ✓ Support for immersive formats and rich interaction with the environment and between distributed users
- ✓ Exploit the 5G network and edge computing capabilities from i2CAT facilities

RI: South Node (i2CAT)

MENTOR: i2CAT

Presenter: I2CAT – Mario Montagud

 |

TOP1.4: Smart Industry / Spaces, by using immersive platforms

Context

- ✓ Immersive & Interactive and (toward) 6G technologies become key enablers for **Smart Industry / Spaces**

Goals

- ✓ Vertical experiments and demonstrations providing full-fledged applications / platforms including Digital Twins of counterpart real spaces (or of ideated ones)…
- ✓ … which allow for rich data inspection and sharing, simulation, manipulation of the Digital Twins (and ideally of linked real-world counterparts), and/or remote collaboration between users.
- ✓ Exploit the 5G network and edge computing capabilities from i2CAT and/or 5TONIC facilities

RI: South Node (i2CAT, 5TONIC)

MENTOR: i2CAT, CGE

Presenter: I2CAT – Mario Montagud

TOP1.5: Interactive multiuser multi-sensory experiences

Context

- ✓ Multi-modal and multi-sensory media experiences are becoming increasingly mature and attracting increased interest for new interactive and distributed services.

Goals

- ✓ Vertical experiments and demonstrations providing full-fledged applications / platforms which support multi-modal data beyond audio, video and text, like haptic (in its different forms) and computer-generated scents
- ✓ … and which involve the participation of, ideally multiple, remote users.
- ✓ Exploit the 5G network and edge computing capabilities from i2CAT facilities

RI: South Node (i2CAT)

MENTOR: i2CAT

Presenter: I2CAT – Mario Montagud

 |

TOP1.6: Energy immersive platforms for virtual testing and evaluation

Context

- ✓ Energy sector in general, and concretely batteries studies can benefit from XR applications and/or Digital Twins for simulation purposes.

Goals

- ✓ 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.

RI: South Node (5TONIC)

MENTOR: CGE

Presenter: CGE – Aurora Ramos

TOP1.7: CCAM in micro-mobility scenarios

Context

- ✓ Interest for validation in the south node:
  - Mobility is possible in the i2cat campus environment
  - Urban mobility infrastructure (e.g. traffic lights, intersections) available in the coverage area
- ✓ Demonstrate CCAM services that are intensive in terms of media processing, e.g.:
  - Obstacle detection, vulnerable road users, autonomous mobility
- ✓ CCAM devices need to be provided by experimenters

Goals

- ✓ Validate performance of FR2 under mobility conditions, focusing specially in UL constrained scenario
- ✓ Validate performance of CCAM edge services hosted near the RAN

RI: South Node (i2CAT,5TONIC)

MENTOR: i2CAT,CGE

Presenter: CGE – Aurora Ramos

TOP2.1: Simulation and prediction in Industry

Context

- ✓ VR-assisted communication in industry for such R&D designers, manufacturing, construction environment and operation room etc. as interactive real-time communication.
- ✓ VR enables prototyping and simulation in a digital space ahead of implementation, while edge computing capabilities deliver advanced intelligence for enhanced productivity and efficient operations, such as predictive maintenance and real-time decision-making.

Goals

- ✓ Experiments and demonstrations focused on fully developed applications and platforms that enable VR-assisted communication and remote control across industrial vertical domains.
- ✓ Utilize Babylon.js as VR engine, the 5G radio network and edge computing capabilities provided by 5GTN facilities.

RI: North Node (UOULU 5GTN) **MENTOR: UOulu**

Presenter: UOULU – Kenichi Komatsu

TOP2.2: Operational training, remote collaborative operations in education

Context

- ✓ Focusing on VR facilitates training and education, offering enhanced remote learning and an immersive approach to skill development in vocational school, medical training and teaching etc.
- ✓ Operational training prioritizes human communication-assisted methods over computer-aided approaches like VR gaming, enabling the proposal of multi-user collaborative education models.

Goals

- ✓ Experiments and demonstrations focused on fully developed applications and platforms that support collaborative education models.
- ✓ Babylon.js serves as the VR engine, leveraging the 5G radio network and edge computing capabilities of 5GTN facilities, with verification conducted using a limited number of VR headsets (3D) and computers (2D LCD), and the possibility of partially remote VR connections.

RI: North Node (UOULU 5GTN) **MENTOR: UOulu**

Presenter: UOULU – Kenichi Komatsu

TOP2.3: Visualization and data sharing

Context

- ✓ Digital visualization of large spaces and areas, combined with interaction enabled through sensor fusion, environmental analytics, big data, and edge computing.
- ✓ Predictions can be generated from input data, enabling users to provide real-time feedback and telepresence within the visualized system, particularly in scenarios such as smart entertainment media, smart cities, smart buildings, and smart farming.

Goals

- ✓ Experiments and demonstrations focus on fully developed applications and platforms that enable visualized systems to provide real-time feedback and telepresence, functioning as a big data digital twin.
- ✓ Utilize Babylon.js as VR engine, the 5G radio network and edge computing capabilities provided by 5GTN facilities.

RI: **North Node (UOULU 5GTN)**

MENTOR: **UOulu**

Presenter: UOULU – Kenichi Komatsu

 |

TOP3.1: Utilization of open data in the optimization of RAN energy usage

Context

- ✓ Use the integrated open data APIs at the North Node as an input to a network control system to change RAN configurations without restarting the gNB.
- ✓ Available open data includes energy weather forecasts, CO2 grid linked emissions, and electricity spot pricing forecasts.
- ✓ Target systems are open-source RAN platforms or commercial O-RAN solutions that allow changing of RAN parameters dynamically.

Goals

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

RI: North Node (UOULU 5GTN, VTT 5GTN)

MENTOR: UOulu, VTT

Presenter: VTT – Jarno Pinola

 |

TOP3.2: End-to-end energy budgeting

Context

- ✓ 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.

Goals

- ✓ 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.

RI: **North Node (UOULU 5GTN, VTT 5GTN)**

MENTOR: **UOulu, VTT**

Presenter: **VTT** – Jarno Pinola

TOP3.3: Visualization of mobile network measurement data

Context

- ✓ The energy measurement framework supports tracking component-by-component energy consumption across the end-to-end mobile network 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.

Goals

- ✓ Create visualization dashboards for near-real-time monitoring of communication and computing infrastructure resource usage, energy production and consumption parameters, and 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.

RI: North Node (UOULU 5GTN, VTT 5GTN)

MENTOR: UOulu, VTT

Presenter: VTT – Jarno Pinola

 |

TOP3.4: Calibrations, validations, verification of energy measurement data

Context

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

Goals

- ✓ 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.

RI: North Node (VTT 5GTN)

MENTOR: VTT

Presenter: VTT – Jarno Pinola

TOP4.1: AI supervised manufacturing

Context

- ✓ Simulated factory or another similar environment. Also hybrid environment with partly simulated and partly real environment can be used.
- ✓ Other environments and use cases are welcome, factory only as an example.
- ✓ Environment supervised by an AI process.
- ✓ Utilizes private 5G network (like the University of Oulu 5GTN) for the factory control functions.

Goals

- ✓ Explore the usability of private 5G network in AI assisted remote control of a factory.
- ✓ Study what is to be considered to be able to effectively execute the AI supervision either locally in the factory or remotely. Focus on both IP and 5G network architectures.
- ✓ Using experiments study the threshold values for the QoS parameters that needs to be fulfilled to enable the AI control of the factory environment. For both local and remote AI.

RI: North Node (UOULU 5GTN, VTT 5GTN, 5TONIC, i2CAT)

MENTOR: UOulu, VTT, CGE, i2CAT

Presenter: UOULU-Antti Pauanne /Jussi Haapola

 |

TOP4.2: Distributed AI for Energy

Context

- ✓ Energy sector in general can benefit from AI for multiple applications: energy production optimization, including renewable sources, predictive maintenance, processes automation, among others.

Goals

- ✓ This topic expects proposals bringing distributed AI for experimental strategies in the energy sector.
- ✓ Expected use of infra: Network Core, Edge servers for AI and simulation environment

RI: North Node (5TONIC)

MENTOR: CGE

Presenter: CGE – Aurora Ramos

 |

TOP5.1: Open vertical replicability

Context

- ✓ This third Open Call welcomes any other vertical or different Use Cases under any other relevant vertical under topic.
- ✓ 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.
  - ✓ Any proposal needs to target one particular research infrastructure and/or its components.
  - ✓ 6G-XR Use Cases are tied to infrastructures, i.e. UC1-UC3 are deployed in South Node; UC4-UC5 in North Node.

Goals

- ✓ Leverage 6G-XR's enablers, infrastructure facilities and testbeds to deploy, replicate and validate the verticals of their interest.
- ✓ Support 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.
  - ✓ comprehensive and accurate modules for determining cross-layer performance- and value-oriented metrics, and smart orchestration and decision making to trigger efficient adaptations.

RI: North Node (UOULU 5GTN, VTT 5GTN, 5TONIC, i2CAT) **MENTOR: Uoulu, VTT, CGE, i2CAT**

UOulu: Jussi Haapola

Check the FAQ:

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

For more questions:

opencalls@6g-xr.eu

 |

6G-XR

Thanks

6G-XR.eu

@6GXR_eu

@6g-xr

Co-funded by the European Union

6GSNS

6G-XR project has received funding from the Smart Networks and Services Joint Undertaking (SNS JU) under the European Union's Horizon Europe research and innovation programme under Grant Agreement No 101096838. This work has received funding from the Swiss State Secretariat for Education, Research and Innovation (SERI).