



6G SANDBOX:

Supporting **A**rchitectural and technological **N**etwork evolutions through an intelligent, secure**D** and twinning ena**B**led **O**pen e**X**perimentation facility

6GSNS

Selected use case experimentation with 6G-SANDBOX:
initial results

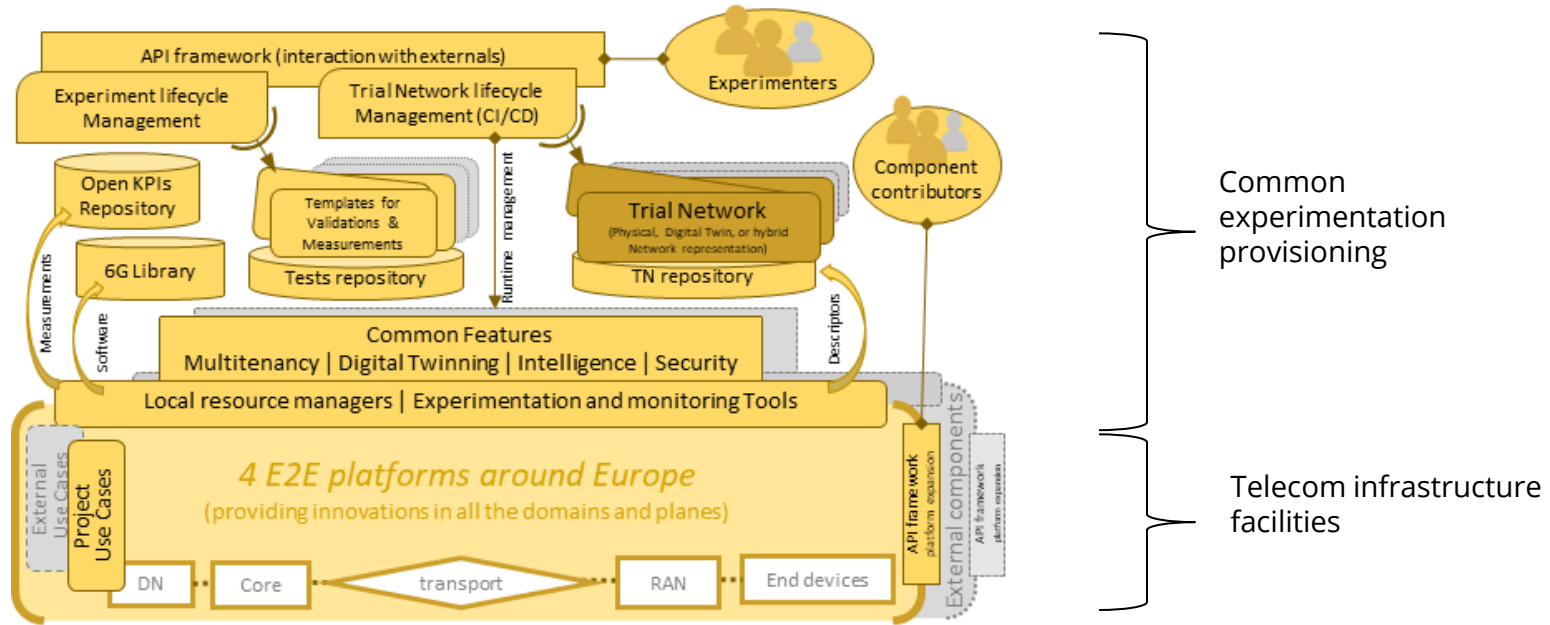
Michael Dieudonne – Project Coordinator

June 3, 2024

Agenda

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- 6G-SANDBOX recap
 - Use cases & technology experimentation

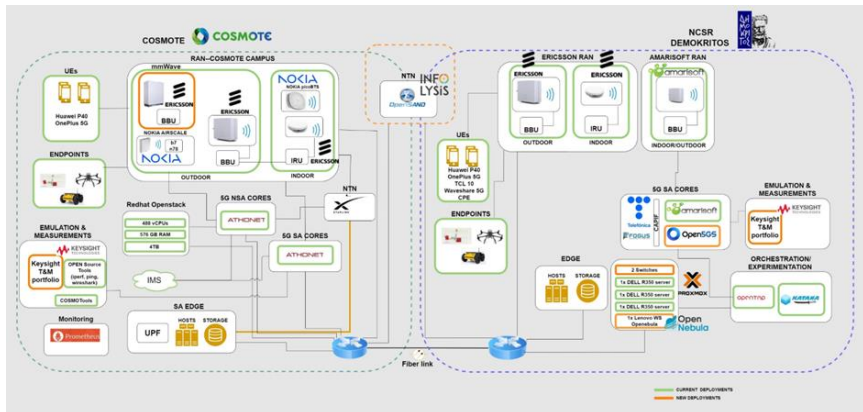
6G-SANDBOX Concept



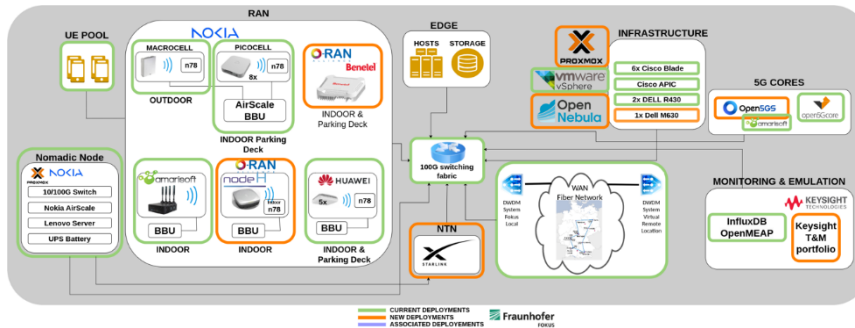
(6G-SANDBOX) TRIAL NETWORK: fully configurable, manageable and controllable network which *combines digital and physical nodes* and provides services for 6G *technology validation* and 6G *KPI measurements*

- the experimenter can manage the lifecycle of the experiment and the trial network
- the open calls target both experimenters and component contributors

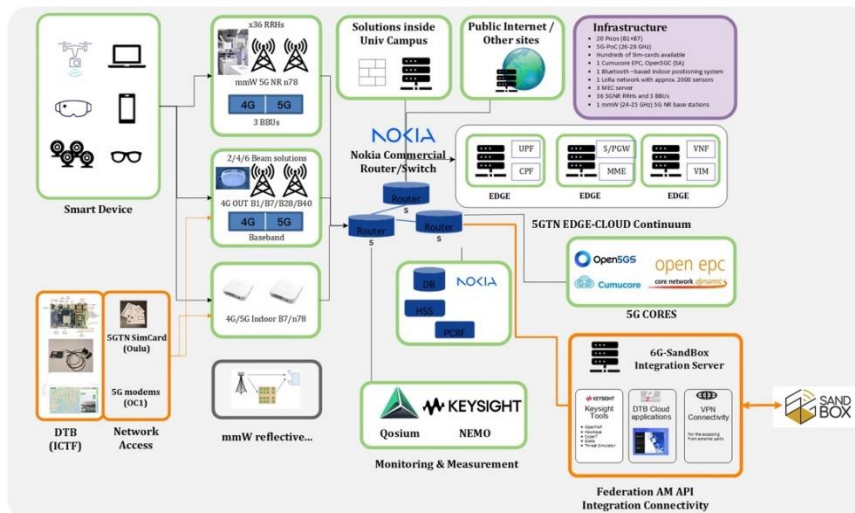
Athen platform



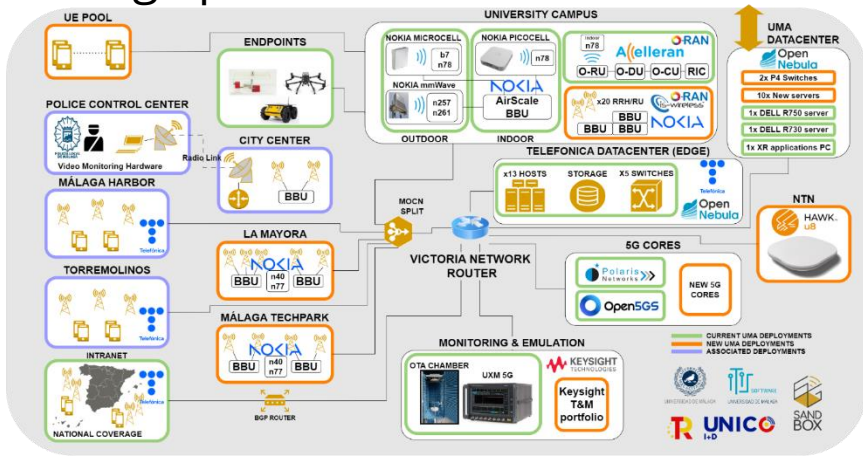
Berlin platform



Oulu platform



Malaga platform



Experimentation with 6G-SANDBOX



- All energy topics, we can measure
- All visibility topics across Back-hall and Front-hall, we can measure
- All ORAN topics, we can measure
- Most AI topics (RIC, network,...), we can measure
 - This can also generate the data you need to train your AI
 - Xapp testing and deployment also possible
- Most deterministic network topics, we can measure
- Working on Digital Twin, extract models, deploy...
- Create datasets for....
- Quite some Cybersecurity, DevSecOps topics, we can test and attack
- RIS, we can deploy and integrate in the testbed
- Any network scenario, traffic, load, impairment, NTN (emulated and real sat)...

Let us know what you want to test and demonstrate! You can start anytime.

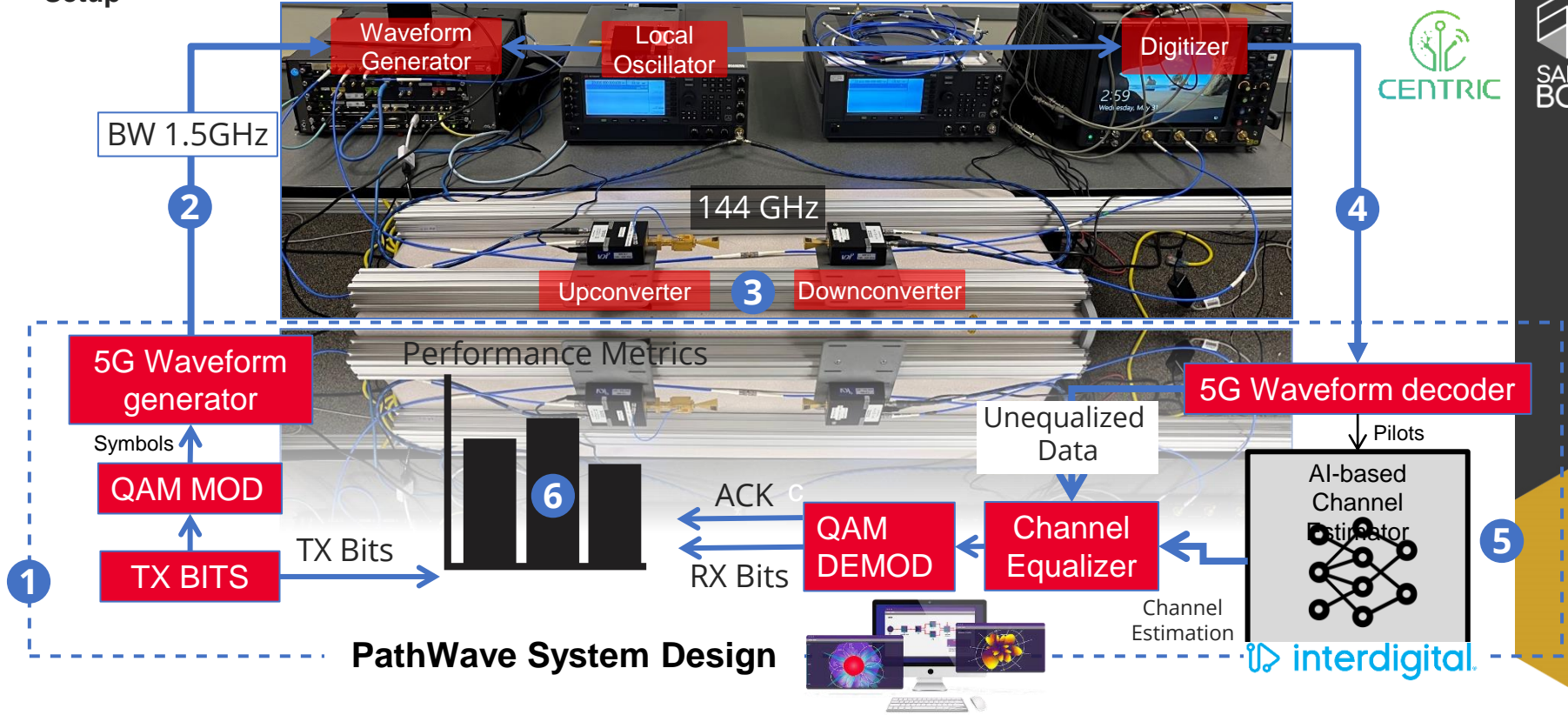
Open call 3 for funded experimentation will open June 2024 with a deadline in September 2024
www.6g-sandbox.eu/open-call-3/

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 - AIAI (Artificial Intelligence Air Interface) (**Lab**)
 - Calibrated Digital Twin (**Lab towards Live**)
 - JCAS experimentation (**Lab towards Live**)
 - XR (**Live**)

144 GHz Testbed for 6G AI-AI UE Channel Estimation Setup

Setup

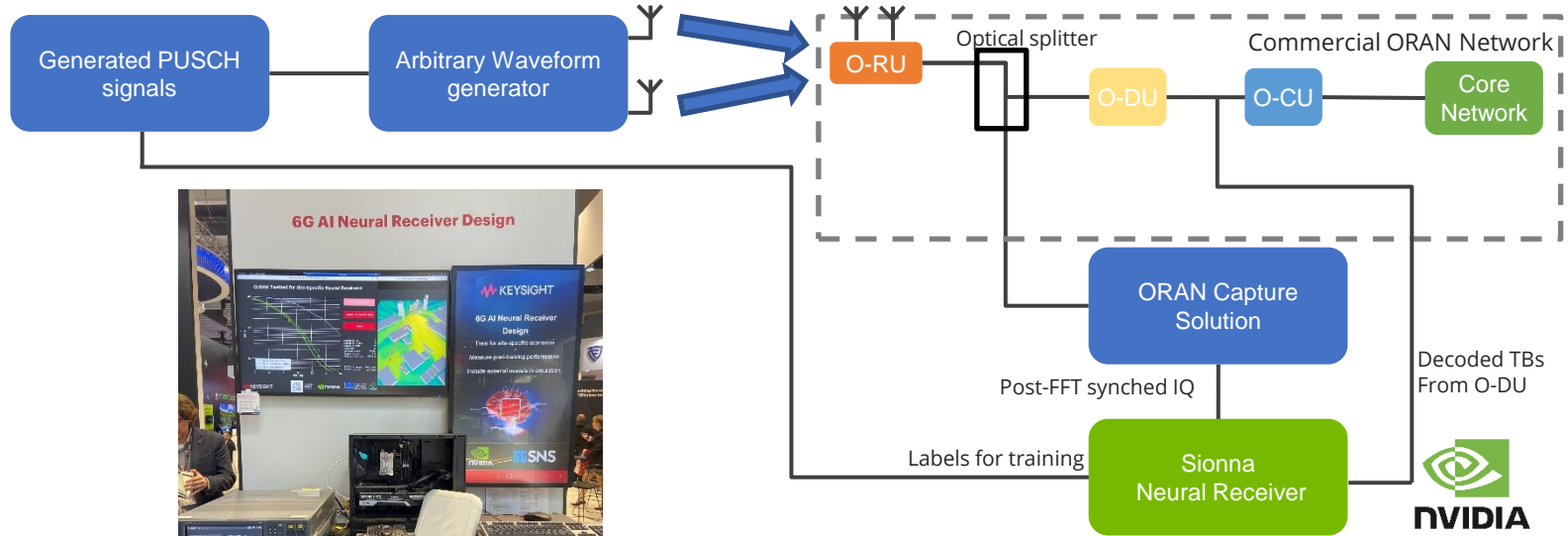


Demo at the Keysight booth

6G-SANDBOX EUCNC 2024

6G AI Neural Receiver Design

Black-Box Testing of an AI ORAN base station receiver System



- **Testing over-the-air performance of NVIDIA's neural receiver architecture**
- **Testbed allows for both training and inference using real 5G network**
- **Also allows for comparative benchmarking against conventional receiver**



Demo at the CENTRIC booth

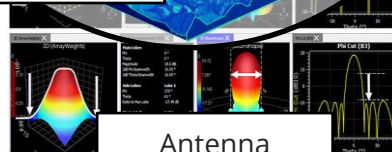
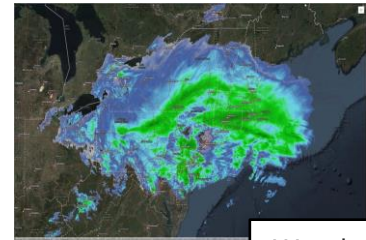
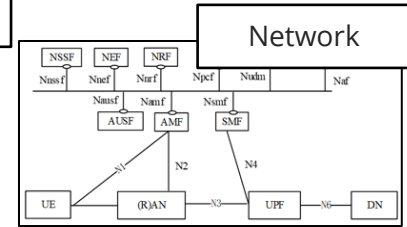
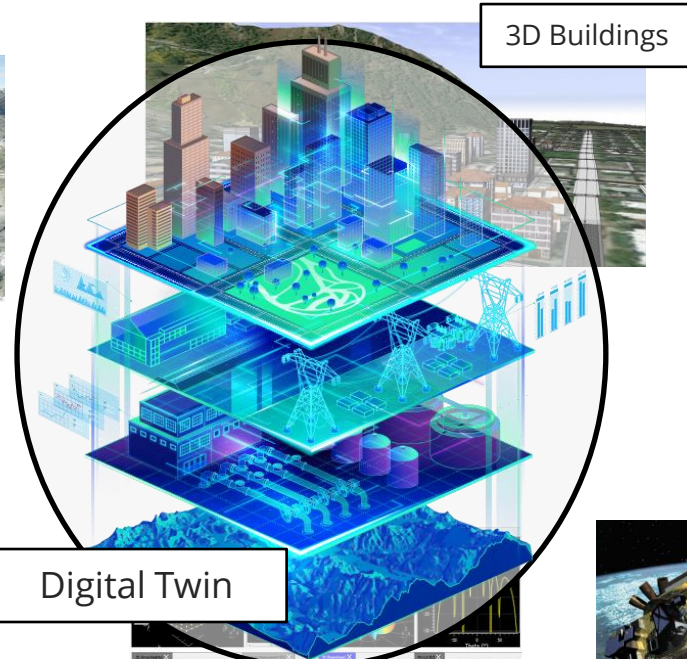
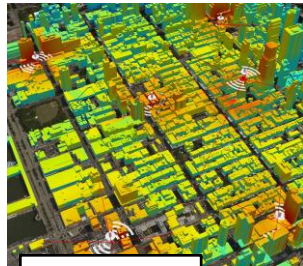
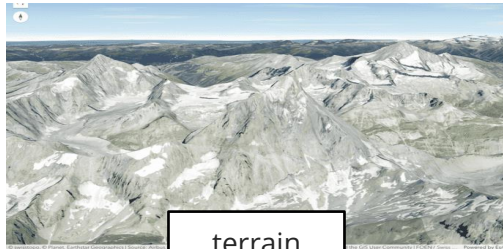
Overview

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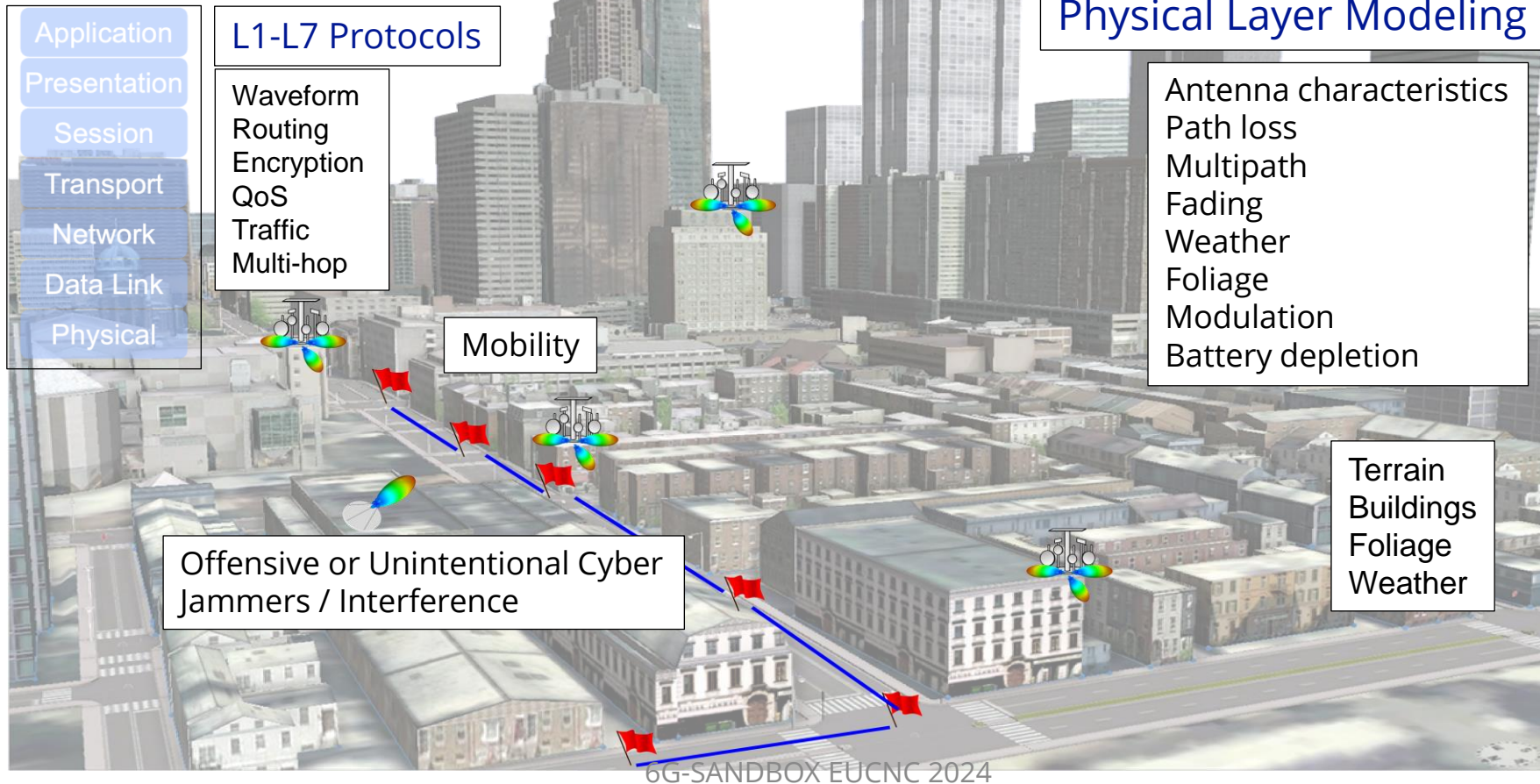


What is a Network Digital Twin?

Digital Twins: Accurate living models of real-world systems



Starting from EXata Network Digital Twin

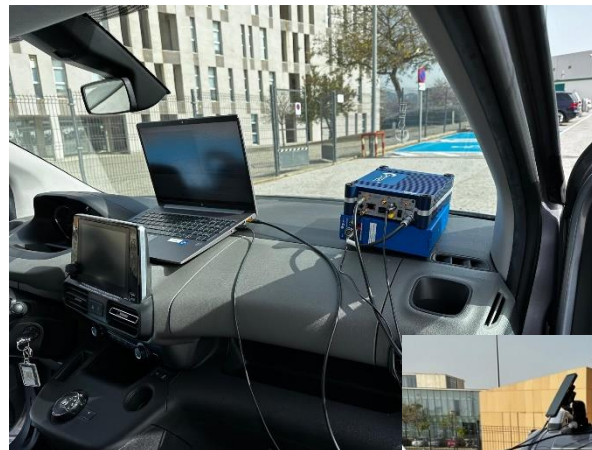


Validation and Calibration of Digital Twin

Measurement Campaign - Collaboration with **SIRADEL** 



Ada Byron Building



Channel Measurements for different deployments:

- picocell (3.5 GHz, indoor)
- microcell (3.5 GHz, outdoor)
- mmWave (26 GHz, outdoor)

Nemo outdoor
Nemo Handy
PcTel Scanner

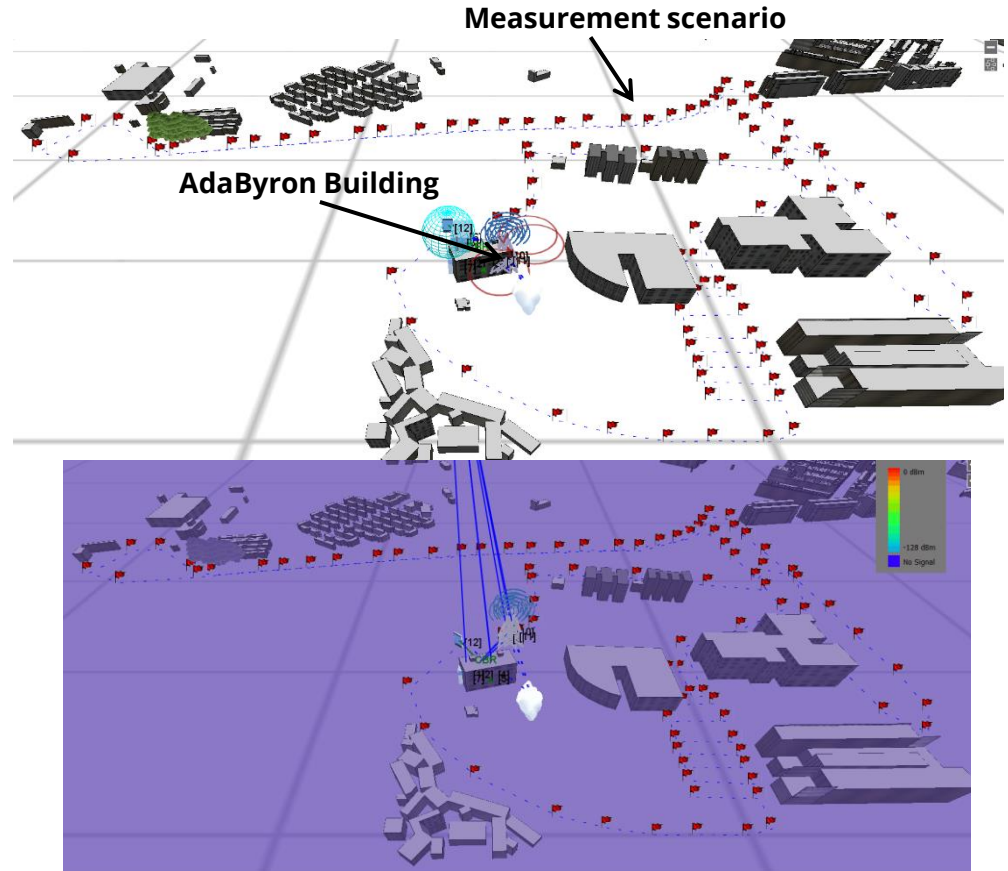
Validation and Calibration of Digital Twin

Reproducing the measurement campaign in EXata for different scenarios

- picocell (3.5 GHz, indoor)
- microcell (3.5 GHz, outdoor)
- mmWave (26 GHz, outdoor)

Compare the output of Exata to the **real measurements**

Adjust the prediction of EXata by modifying different parameters such as propagation model, etc,



Validation and Calibration of Digital Twin

Integrating of Siradel Ray Tracing tool in EXata Digital Twin tool

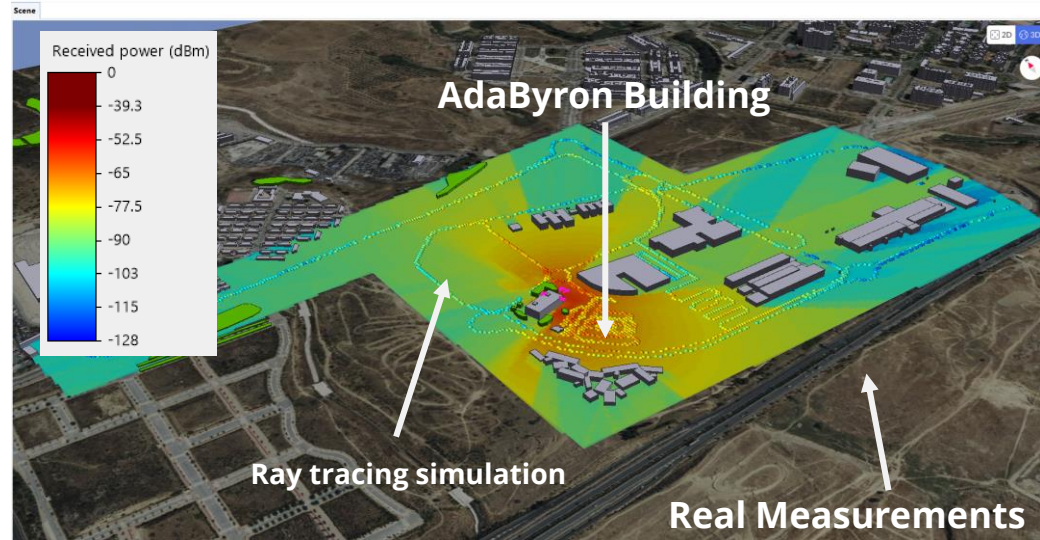


Calibration of Ray Tracing based on the real measurements

- Adjusting the propagation models for different scenarios

Integrating the Ray tracing in EXata:

- Increase precision of EXata
- Collecting more KPIs related to physical layer and propagation environment



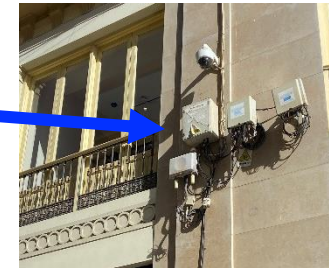
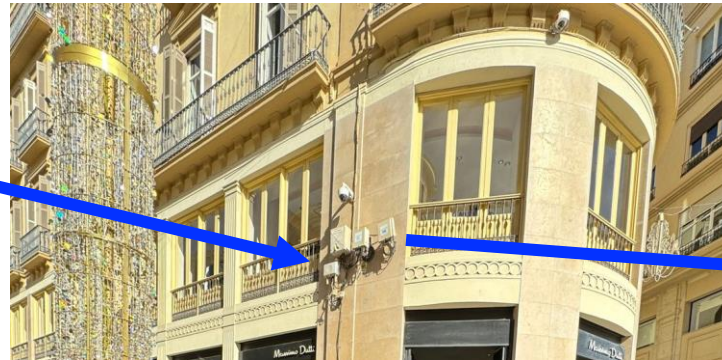
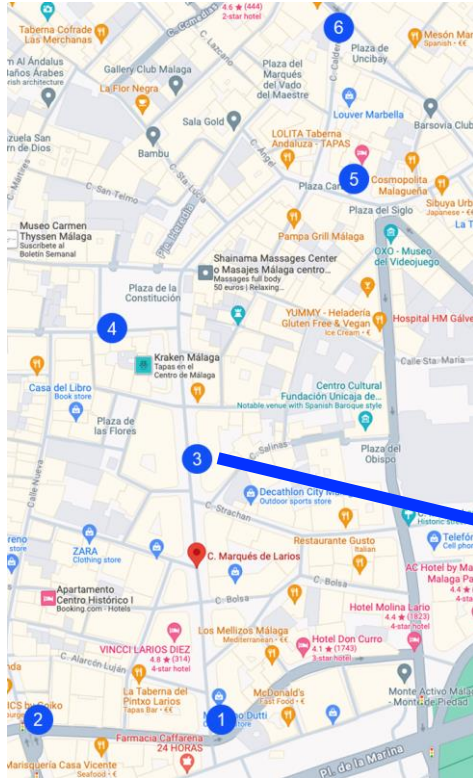
Creating a Digital Twin of Malaga city center

Calibrated Digital Twin of Calle Marques de Larios

- Creating a calibrated Digital Twin reference environment of a busy city street
- Full ray tracing characterization for FR1, FR2
- Full network characterization

To be used for

- Deploying virtual technologies
- Deploying real technologies



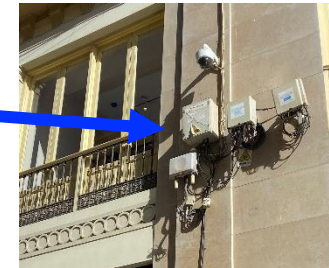
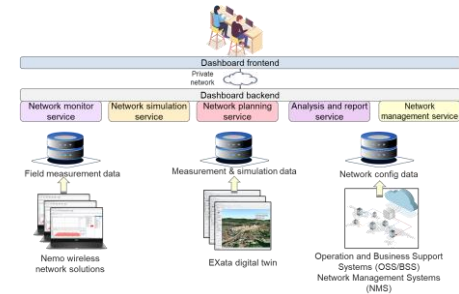
6G-SANDBOX EUCNC 2024

Telefónica



KEYSIGHT

SIRADEL
ENGIC



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Understanding the limitations of JCAS



UNIVERSIDAD
DE MÁLAGA

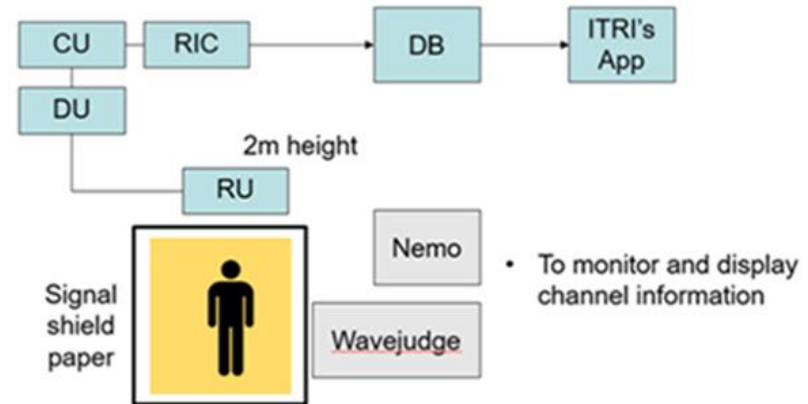


ITRI
Industrial Technology
Research Institute



What can we do with COS, FR1 & standard Waverforms...?

- Starting from purely « commercial » technologies
- Can we create a model detecting an object in a closed environment? E.g. a room
- Step 1: Leveraging ORAN architecture to monitor the RU/DU info (see demo at the 6G-SANDBOX booth)
- Step 2: Using xApp to do the same
- Step 3: Extend the concept to a real room with Digital Twin and propagation
- Step 4: Extend the concept to the street



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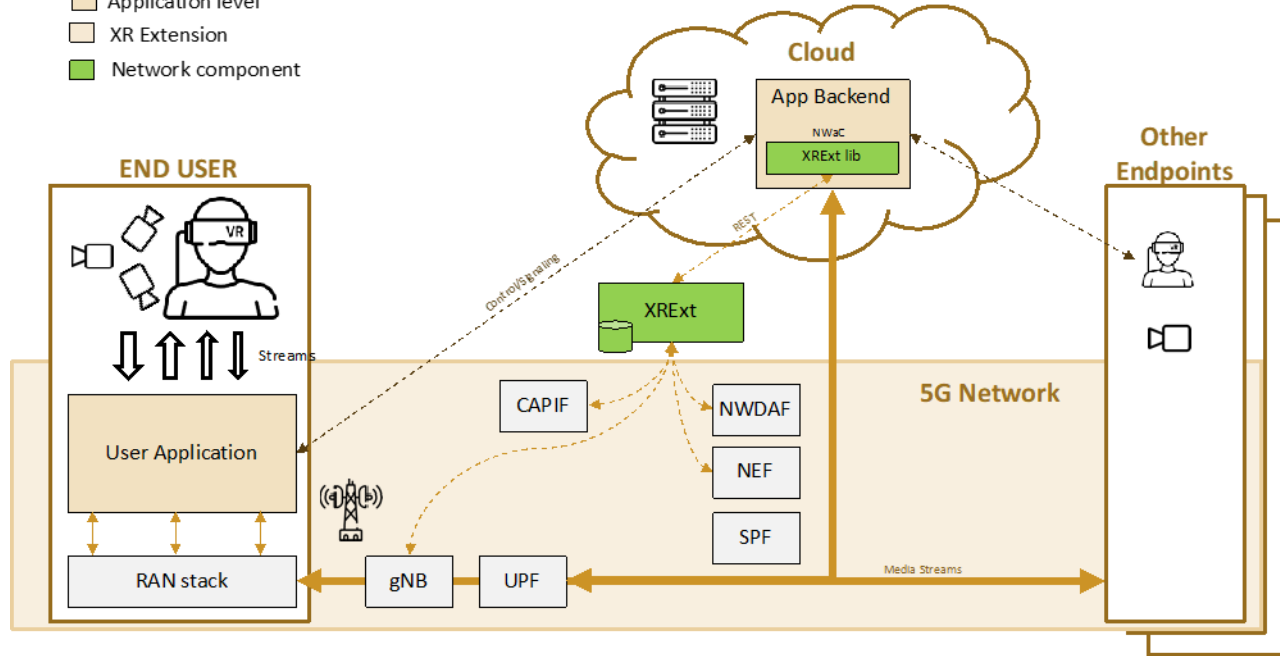


XR experimentation

Around the painting of « El Rosario de la Aurora », Tissen museum, Malaga



- Application level
- XR Extension
- Network component



XR Experiment “at the Museum”

- Where?: University of Malaga
- When?: June 2024
- # Participants: ~ 10-15 people
- Storytelling: based on video demo
- VR + Sensing via OWO jacket
- Data collection: (subjective testing)
 - Participant profile
 - Closed questionnaire
 - Open questions / Personal Interview



Demo at the 6G-SANDBOX booth

Take away

- Infrastructure to run a wide range of technology experimentation for 'B5G or 6G' is available thanks to SNS-JU 6G-SANDBOX
- Very clear value of Stream C as a large-scale enabler
- Central facility enables different SNS-JU project experiments
- Need to transform this work into measurements best practices
- Experimentation from Lab to Live is possible thanks to technologies such as Digital Twin

- There is a lot of work ahead and much more experimentation fun

join us!



Thank you!

Questions?

66SNS

