6GSNS

Smart Networks and Services

SNS JU TRIALS & PILOTS

BROCHURE n°2

June 2026

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Introduction

The Smart Networks and Services Joint Undertaking (SNS JU) is advancing Europe's connectivity ambitions through its Trials and Pilots (T&Ps), a key instrument under Horizon Europe. These initiatives are designed to validate advanced and Beyond 5G (B5G) and pre-6G technologies in real operational environments, with a strong focus on strategic vertical sectors that are critical to Europe's digital and green transitions. By concentrating efforts on a limited number of verticals per project, the SNS JU ensures greater depth of validation, measurable performance outcomes, and clearer pathways towards market adoption and standardisation.

To date, the SNS JU has funded 80 projects in total since 2022, through its first three Calls for Action, while an additional 20 projects are expected to start shortly, funded under SNS Calls 4 and 5. SNS JU enters its final phase in 2026 and will conclude its operations through the funding of an additional number of projects though Call 6 (2026) and Call 7 (2027), with an additional total funding of more than 250 million €. As the programme matures, so do the projects, delivering more advanced and mature Trials & Pilots, bringing cutting-edge 5G and 5G-Advanced enabled technologies and solutions closer to real-world implementation. This progress further highlights the importance of the T&P Brochure as a snapshot of the experimentation efforts of the SNS JU projects, tracking year-on-year progress and developments.

The portfolio of SNS JU projects is organised into specific Streams and Strands, including Stream A, "Smart communication components, systems and networks for 5G mid-term Evolution systems" — included only in Call 1 — Stream B, "Research for revolutionary technology advancement towards 6G" / "6G Enabling Technologies", Stream C, "SNS experimental infrastructures", Stream D, "Large-Scale SNS Trials and Pilots", and Coordination and Support Actions (CSAs). The T&P Brochure, naturally focuses on SNS JU Stream D projects as their core focal point was large scale experimentation, even including Open Calls to extend and complement their vertical use cases, without however excluding mature experimental efforts from other streams.

The first edition of the SNS JU Trials and Pilots Brochure was released at an early stage, in May 2025, and featured a total of eight selected T&Ps. It built on the highly successful experience of the EC H2020 5G Infrastructure Public Private Partnership (PPP), which produced a series of five impactful T&P brochures. In parallel, drawing on the PPP Verticals Cartography experience, the SNS JU also developed (and continues to develop) the Verticals Engagement Tracker (VET) to monitor activities across vertical sectors.

The process for the second SNS JU Trials and Pilots Brochure was launched in January 2026, aggregating information from SNS JU Project Trials & Pilots, including network architecture, deployment details, key results obtained, and innovative features enabled by 5G-Advanced / B5G, and emerging 6G technologies. The information collected highlights the benefits and added value delivered by 5G Advanced / B5G and 6G networks, enabling novel and innovative services and applications, not possible to be supported with previous generation networks.

A total of 28 Trials & Pilots were received by SNS JU projects for the 2nd edition of the brochure and were evaluated by the appointed evaluation committee comprised of experts of varying background representing key bodies of the SNS JU ecosystem, including the SNS JU Office and the European Commission, the 6G-IA, the SNS JU Steering Board and Technology Board leaders as well as SNS JU Working Group leaders.

The selected 12 T&Ps featured in this 2nd edition of the T&Ps Brochure, are the top-ranked submissions, representing scientific excellence, real-world deployment, and realistic problem-solving in the field, validating B5G/6G enabled solutions of a high maturity level. Importantly, the featured T&Ps demonstrate strong social relevance, economic potential, and/or the validation of ground-breaking services and applications, illustrating how 5G Advanced / B5G and 6G are driving innovation and impact.

Selected Trials and Pilots

The selected Trials and Pilots are listed below:

FIDAL - Open Call - SwarmCatcher.

IMAGINE-B5G - Autonomous Boat for Safety & Security with 5G (AbySS-5G).

IMAGINE-B5G - Connectivity on Upper 6 GHz (n104) Proof of Concept.

IMAGINE-B5G - Smart Component Analysis through Novel XR Environments and Robotics (SCANNER).

TrialsNet - Remember Ascari.

TrialsNet - Service Robots for Enhanced Passengers Experience.

TrialsNet - Mass Casualty Incident (MCI) and Emergency Rescue in Populated Areas.

6G-XR - IMS Control Plane Optimisations for Holographic Communications.

RIGOUROUS - Protection of 6G-enabled Services against Cyber Threats.

6GPATH - XR Rural Schools.

6GPATH - 3D Bioprinted Patch for Chronic Wounds Patients.

6GPATH - B5G for Precision Agriculture.

The broader context and panoramic perspective of the progress and achievements of the 6G SNS JU Programme can be explored through the SNS Vertical Engagement Tracker (VET)[1], a range of specific White Papers[2] and via the many webinars organised by the SNS JU at the programme and projects levels[3].

Given the scale and diversity of ongoing work across the SNS JU projects portfolio, this T&Ps Brochure n°2 represents just a snapshot of current SNS developments. We sincerely hope that you find it as insightful and engaging to read as we did in compiling it.

Didier Bourse, Kostas Trichias, Alexandros Kaloxylos, Carles Antón-Haro, Mikael Fallgren, Carole Manero, Valeriya Fetisova and Veronica Vuotto (SNS Brochure Editorial Core Team).

1 https://sns-trackers.sns-ju.eu/vertical-engagement-tracker/vertical-cartography
2 https://smart-networks.europa.eu/sns-publications/
3 https://smart-networks.europa.eu/event/

field trials beyond 5G

FIDAL

SwarmCatcher

Website: https://fidal-he.eu/

SwarmCatcher is an AI-powered anti-drone and surveillance system that uses B5G networks to provide real-time situational awareness and automated threat response for public safety and critical infrastructure protection.

Overview

SwarmCatcher operates by integrating a **multi-sensory approach** (optical/thermal cameras, RF detectors, acoustic arrays) whose feeds are processed with AI/ML at the network edge to detect, classify, and track potential threats like malicious drones or environmental hazards. The project conducted phased trials from mid-July 2024 to March 2025 (Months 2–10) at the Centre for Research and Technology Hellas (CERTH) testbed, the FIDAL 5G testbed at the University of Patras, and p-Net. It is part of the FIDAL Horizon-JU-SNS-2022 initiative and **aims to provide advanced surveillance for Law Enforcement Agencies (LEAs) and PPDR organisation.**

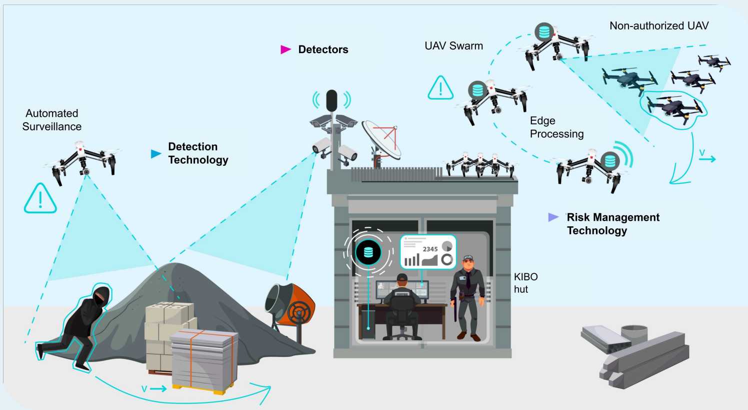

Figure 1 - Overview SwarmCatcher

Architecture

SwarmCatcher's architecture is composed of interconnected components across multiple layers:

Sensor Layer: Equipped with a variety of high-resolution sensors, this layer enables comprehensive Unmanned Aerial Vehicle (UAV) detection. Sensors are deployed in both stationary setups and mobile UAVs to cover ground and aerial perspectives.

Edge Processing Layer: The edge layer houses processing units deployed close to the sensors, providing fast data handling and decision-making. Containerised AI models run on edge nodes, where data is filtered and analysed. This setup minimises latency, delivering efficient, real-time threat assessment without depending on centralised systems.

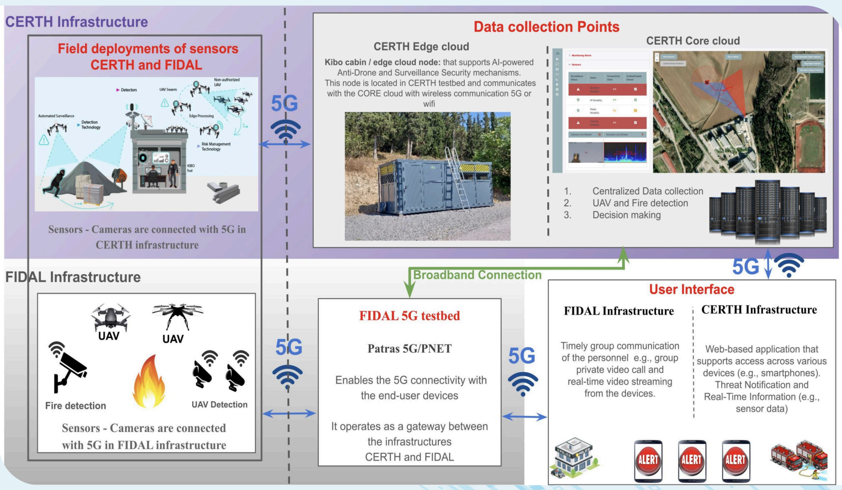

Figure 2 - Architecture SwarmCatcher

Control and Command Layer: this layer aggregates processed data, communicates with edge nodes, and coordinates responses to detected threats. Operators can adjust the system's sensitivity, calibrate detection parameters, and initiate countermeasures based on real-time information.

User Interface (UI) Layer: SwarmCatcher's dashboard provides a user-friendly, interactive platform for monitoring and control. It supports data visualisation through real-time maps, alerts, video.

Deployment

Deployment occurred at CERTH, featuring a modular "KIBO" cabin used as an edge node, along with a networked infrastructure of optical, thermal, radar, RF, and acoustic sensors. It also included the University of Patras p-Net testbed (FIDAL testbed) for urban-like 5G experimentation. The setup used Teltonika RUTX50 5G routers to enabled high-speed connectivity over commercial 5G Non Standalone (5G NSA) and experimental 5G Standalone (5G SA) networks. The trials tested the ability for high data quality and low latency when handling multiple data streams from distributed sensors, and the system's ability to manage network loads across various scenarios.

Figure 3 - Deployment of SwarmCatcher

Results

Trials validated stable 1080p/25 video streaming frame-per-second (fps) and effective AI detection with inference latencies between 20–33ms. Key achievements include successful operational testing during the NATO "Immediate Response 25" exercise and high user satisfaction scores (average 92.2% for Safety/ Security) from stakeholders like the Hellenic Police and Civil Protection.

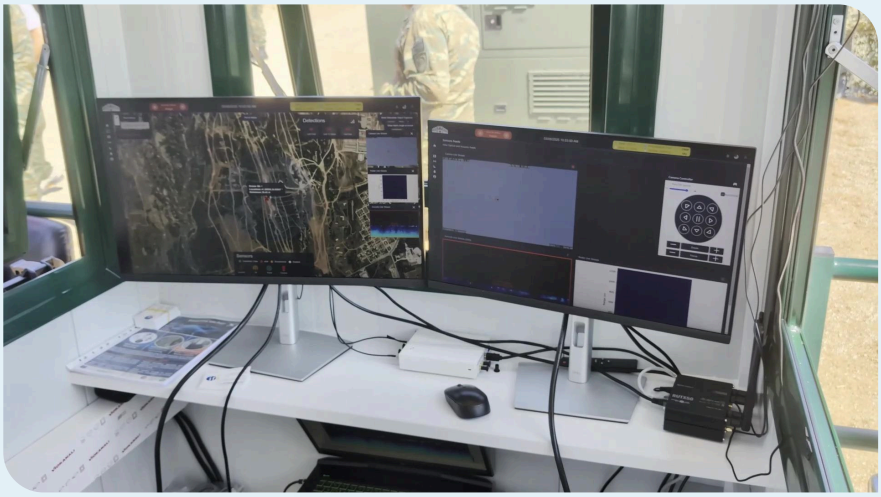

Figure 4 - SwarmCatcher Results

5G Advanced / 6G Empowerment

Cloud-native 5G/B5G infrastructure provides the high throughput and low latency necessary for high-resolution sensor data fusion and real-time edge decision-making. It enables massive data transfer from distributed sensors (e.g., peak throughput target of 500 Mbps) which previous generations could not reliably support for such high-stakes security applications.

Imagine B5G

IMAGINE-B5G
Autonomous Boat for Safety & Security with 5G (AbySS-5G)
Website: https://imagineb5g.eu/

Demonstrating how B5G connectivity enables safe, cost-efficient and fully unmanned maritime surveillance, search and rescue, and pollution detection using autonomous surface vessels.

Overview

The ABySS-5G Trial/Pilot demonstrated the **use of public and private 5G networks to enable remote and autonomous operation of an Unmanned Surface Vessel (USV) for maritime surveillance, search and rescue, and pollution detection**. The pilot validated reliable low-latency connectivity, real-time video streaming and precise navigation between the USV and a ground control station.

The final demonstration took place at the Port of Valencia and Patacona Beach (Spain), with trials completed in July 2025. The trial involved UTEK, Nokia, UPV and Telefónica, under the IMAGINE-B5G Open Call.

The trial contributes to the SNS JU Programme by validating 5G capabilities for vertical maritime applications and autonomous systems, with relevance for future 5G Advanced and 6G trials involving unmanned vehicles and mission-critical communications.

Architecture

The trial architecture was divided into components related to **USV Kaluga** and the **Ground Control Station (GCS)**.
The USV includes the components required for navigation; this includes a 5G Router and a Starlink antenna to prevent connectivity losses. On the other hand, the GCS is formed with two suitcases containing the navigation software and the necessary routers to connect to the 5G Nokia router. Several 5G antennas were placed on the beach to provide the boat with a 5G connection to the Nokia router. Additionally, a Virtual Private Network (VPN) was set between the router located inside of USV Kaluga and the GCS router.

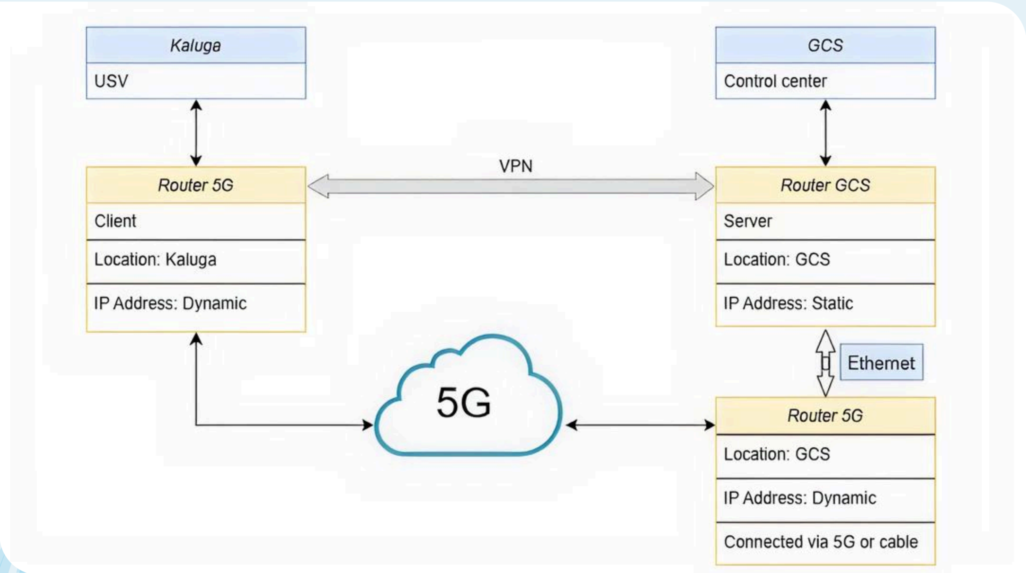

Figure 5 - ABySS-5G Architecture

Deployment

The deployment of the USV Kaluga was performed using a crank available at the port. Before that, part of the team spent time arranging the correct configuration in the USV to be able to perform the operations.

Meanwhile, the rest of the team deployed the Ground Control Station in the proper location of the port and its antennas. The following photos show how the USV was deployed, UTEL planner and UTEK Viewer with the software to control and monitor the USV and the proper connectivity systems.

Figure 6 - ABySS-5G Deployment

Results

The trial/pilot achieved positive Key Performance Indicators (KPI) and Key Value Indicators (KVI) results. Key outcomes include a **30% reduction in deployment time**, **50% reduction in operational costs**, **zero crew risk**, **navigation precision of 1 m**, and **stable 5G connectivity** with Reference Signal Received Power (RSRP) values around -80 dBm over ranges up to 4 km. The system successfully demonstrated maritime surveillance, suspicious vessel detection, search and rescue support, and pollution detection.

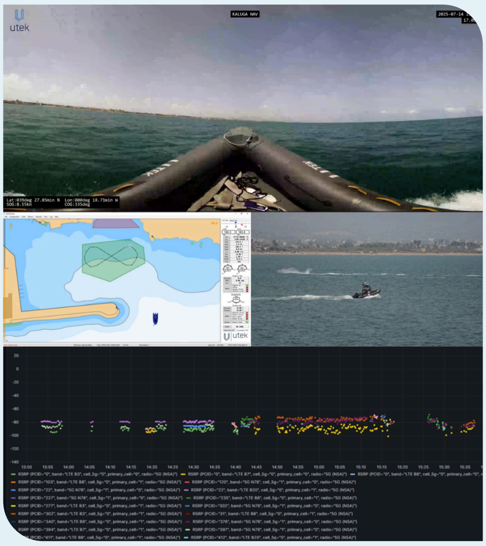

Figure 7 - ABySS-5G Results

5G Advanced / 6G Empowerment

The trial demonstrated how 5G enables reliable low-latency communication, high-bandwidth ideo streaming and extended coverage for autonomous maritime operations. Features such as network slicing, International Mobile Subscriber Identity (IMSI) prioritisation and stable Reference Signal Received Power (RSRP) values allowed safe remote control and autonomous navigation, capabilities not feasible with legacy RF systems. The results highlight the relevance of 5G as a foundation for future 5G Advanced and 6G autonomous and mission-critical services.

Imagine B5G

IMAGINE-B5G
Connectivity on Upper 6GHz (n104) Proof of concept
Website: https://imaginebg5.eu/

Validating the upper 6 GHz band for 6G. This pilot proves the spectrum can deliver massive capacity using existing grids, ensuring communities enjoy reliable smart-city services without the disruption of building dense new cell towers.

Overview

As part of the IMAGINE-B5G project, a pivotal Proof of Concept (PoC) was successfully completed on September, 2025, at the Universitat Politècnica de València (UPV). This trial validated the upper 6 GHz band (6,425-7,125 MHz, 3GPP n104), a frequency range recognised by major European operators as essential for securing Europe's future digital connectivity.

The primary objective was to validate that this spectrum can deliver 6G capacity using existing urban macro-layer grids, avoiding the need for costly network densification.
Utilising UPV's private 5G infrastructure, the pilot characterised network performance across diverse scenarios, including Line of Sight (LoS), Non-Line of Sight (NLoS), and indoor environments. The trial specifically demonstrated the necessity of a 200 MHz bandwidth allocation to meet future capacity demands. This work directly supports SNS JU goals by validating the scalable, high-capacity spectrum required for next-generation services.

The results confirm the feasibility of deploying upper 6 GHz technology on current infrastructure, complementing SNS JU efforts in spectrum efficiency.

Architecture

The trial integrated a portable node into UPV's private 5G network. Its core and baseband resided in a portable rack within the server room, while a Nokia upper 6 GHz massive Multiple-Input Multiple-Output (MIMO) antenna was roof-mounted, co-located with existing private network antennas. This setup reused prior cabling to emulate a realistic macro-cell.

Specialised User Equipment (UE) executed high-load speed tests while monitoring real-time radio metrics. Keysight WaveJudge and FieldFox hardware enabled deep packet analysis. These tools characterised Radio Frequency (RF) performance by decoding control signalling, like Synchronisation Signal Blocks (SSB) and System Information Blocks (MIB/SIB), validating spectrum behaviour.

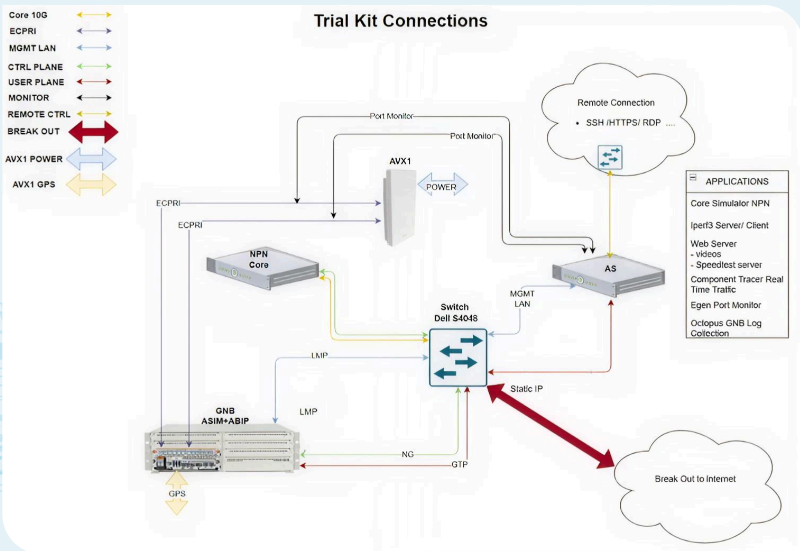

Figure 8 - Upper 6GHz Architecture

Deployment

The 6 GHz antenna was configured to cover the UPV campus, creating a diverse testing environment. Specific measurement spots were established in near/mid-range and long-range/cell-edge zones. This configuration ensured comprehensive testing across LoS, NLoS, and indoor scenarios. A dedicated User Equipment (UE) performed tests to monitor throughput, Reference Signal Received Power (RSRP), and Signal-to-Interference-Plus-Noise Ratio (SINR), while Keysight hardware validated spectrum performance.

Figure 9 - Upper 6GHz Deployment

Results

The proof of concept confirmed the feasibility of upper 6 GHz on existing macro grids. Using a 100 MHz bandwidth, the trial achieved peak Downlink (DL) throughputs over 1.5 Gbps and Uplink (UL) over 190 Mbps in LoS. In NLoS scenarios, it sustained robust connectivity over 900 Mbps nearby and 450 Mbps at the cell edge. Advanced Multiple Input Multiple Output (MIMO) compensated for losses, ensuring robust NLoS/Indoor performance and proving the band's viability for high-capacity urban networks.

Figure 10 - Upper 6GHz Results

5G Advanced / 6G Empowerment

This trial validates the upper 6 GHz band (n104) as a cornerstone for IMT-2030 (6G). Unlike previous generations limited by sub-6 GHz congestion or millimeter-wave (mmWave) coverage gaps, this spectrum offers a balance of macro-scale coverage and extreme capacity (supporting 200 MHz channels). 5G Advanced technologies, particularly high-density massive MIMO and beamforming, compensate for propagation losses to match existing 3.5 GHz grid coverage. This empowers 6G to deliver consistent, multi-gigabit connectivity required for next-gen urban applications, such as immersive Extended Reality (XR) and dense IoT (Internet of Things), without the environmental cost of building thousands of new small cells.

Imagine B5G

IMAGINE-B5G
Smart Component Anlysis through Novel XR Evironments and Robotics (SCANNER)
Website: https://imaginebg5.eu/

SCANNER enables remote, high-precision inspection of industrial components by combining micrometer-level 3D scanning, XR, robotics, and 5G networks, improving quality assurance, reducing errors, and connecting experts anywhere.

Overview

SCANNER transformed industrial component inspection by creating high-precision digital twins visualised in Extended Reality (XR), enabling remote experts to assess wear and tear. Two trials were conducted at Telenor's 5G premises in Oslo.
During the first session on 27 June 2025, point cloud loading tests were conducted for large 3D XR models, achieving acceptable latency and stability, as well as multi-user synchronisation tests to assess whether two or more users in different locations could manipulate and inspect the same model in real time.

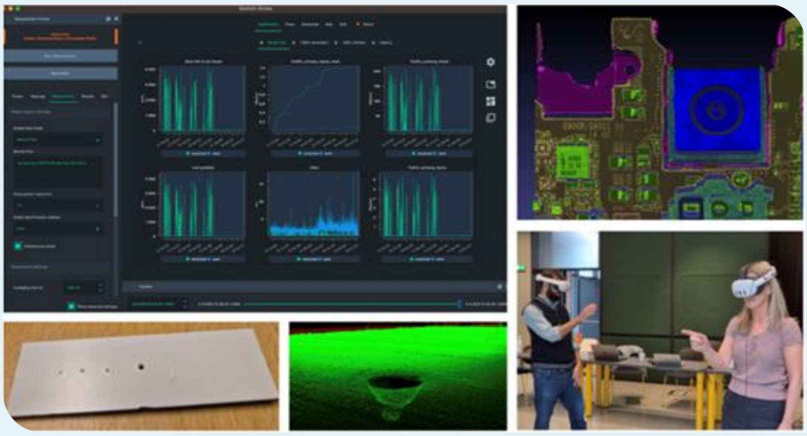

Figure 11 - SCANNER Overview

Architecture

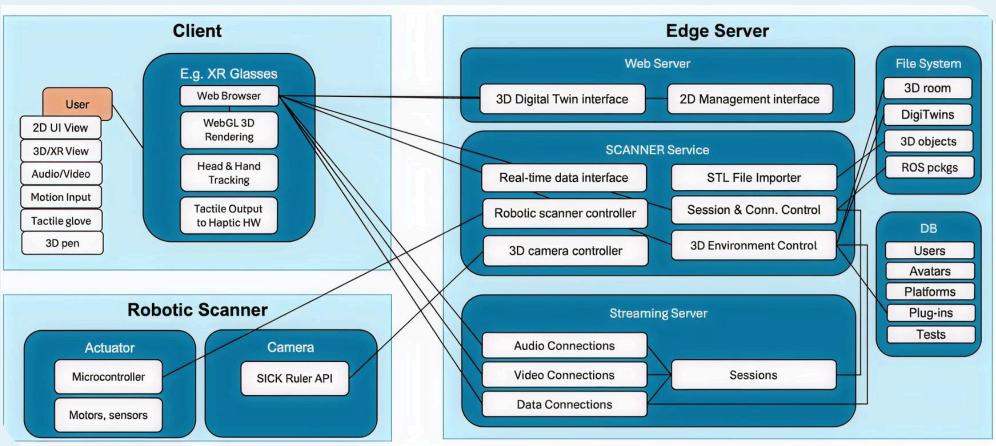

Figure 12 - SCANNER Architecture

The SCANNER architecture combined a WebXR client (Meta Quest headsets or browser) with an edge-hosted backend deployed as Docker containers inside Telenor's 5G Standalone (5G SA) indoor network. Users appeared as head-and-hands avatars with voice, annotations and optional haptic interaction.

Robotic scanning generated calibrated point clouds processed into three levels of detail (LOD): a low-resolution full model (~100k points) and medium/high tiled regions (~25k points per tile) dynamically streamed based on zoom and viewport focus. A Node.js Application Programming Interface (API) managed sessions and assets, while Kurento/OpenVidu handled media and signalling. Qosium probes captured latency, jitter, throughput and packet loss. All services used encrypted transport and trial-scoped accounts.

Deployment

Each Oslo trial session began with backend container start-up, modem configuration, and alignment of Qosium probes with server logs. Two users entered the XR session as avatars with voice chat and annotation tools enabled, performing zoom, scaling, rotation, and joint inspection tasks. Stress cases required simultaneous focus on high-detail tiles. Four participants completed structured usability questionnaires. At Finwe, three users tested TactGlove DK2, with pulsed and constant haptic feedback.

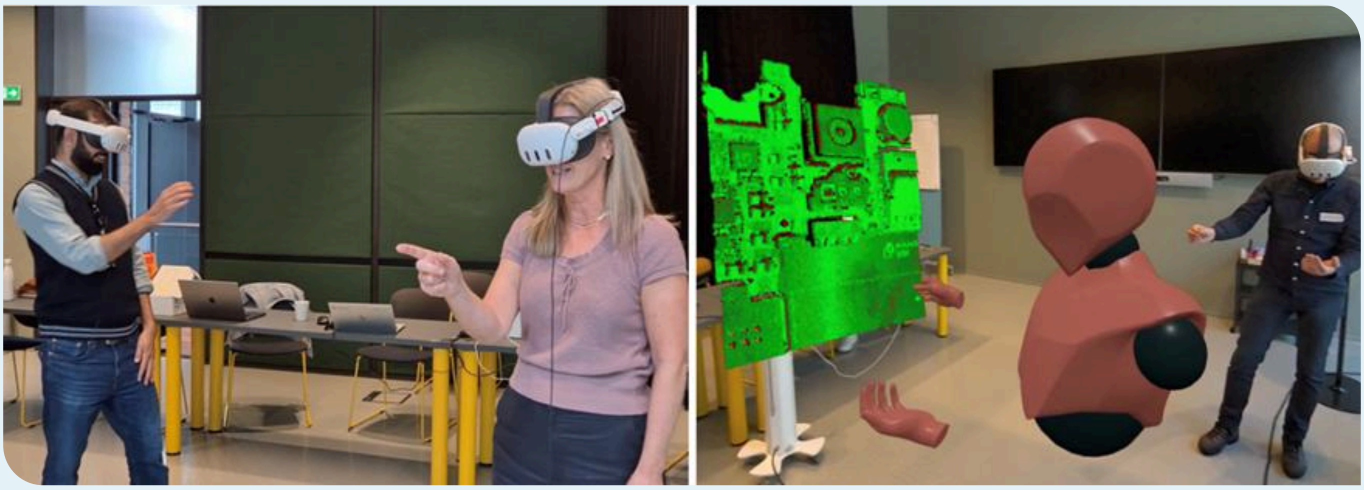

Figure 13 - SCANNER Deployment

Results

High-resolution point clouds were streamed over 5G to two XR users simultaneously. Tiled LOD streaming enabled fast, smooth visualisation with latency <25 ms and throughput up to 220 Mbps. Single XR sessions moved up to 2.4 GB of point-cloud data, with downlink bursts above 200 Mbps. Multi-user synchronisation (avatars, voice, annotations) remained stable. Three external users validated haptic interaction using TactGlove DK2, confirming improved realism in collaborative inspection.

Setup	Connection	Download	Delay	Jitter
1	Ethernet (1 Gbps)	*200–500 Mbps (peak 600)*	*0.15–0.65 ms (peak 1.4 ms)*	*12–40 µs (peak 110 µs)*
2	*Wi-Fi 4*	*20–90 Mbps (peak 100)*	*Not measured*	*Not measured*
3	Wi-Fi 6	100–400 Mbps (peak 500)	25–50 ms (peak 360 ms)	2–15 ms (peak 140 ms)
4	Quest 3 + Wi-Fi 6	100–250 Mbps (peak 450)	10–20 ms (peak 140 ms)	2–15 ms (peak 120 µs)
5	Quest 3 + Ethernet	50–300 Mbps (peak 500)	0.2–0.8 ms (peak 1.2 ms)	30–40 µs (peak 510 µs)
6	Quest 3 + 5G (Telenor Oslo)	>100 Mbps (peak >220)	4–9 ms (peak 28 ms)	1–4 ms (peak 26 µs)

Figure 14 - SCANNER Results

5G Advanced / 6G Empowerment

The project highlighted the efficiency of deploying XR and robotic inspection in an end-to-end managed 5G environment. Integration with edge computing showed the potential for zero-touch operation and reduced operational expenditures, as scanning tasks and visualization could be orchestrated centrally. Open interfaces supported modularity, allowing external tools (Quality of Service/Quality of Experience measurements, XR clients, haptic gloves) to be plugged in. These capabilities were not achievable with previous wireless generations, enabling collaborative inspection in operational environments.

TrialsNet

TrialsNet
Remeber Ascari
Website: http://trialsnet.eu/

A pioneering multiplayer XR location-based experience which combines immersive storytelling and real-time collaboration. Designed for cultural venues, it enables visitors to connect with motorsport history in an accessible and cultural enriched way.

Overview

"Remember Ascari" is a 5G-enabled cultural innovation trial developed within the TrialsNet Open Call, merging Virtual Reality (VR) and multiplayer Mixed Reality (MR) to reinterpret Alberto Ascari's life through an immersive journey. Branded "Black Cats & Chequered Flags", the public trial was hosted at *Museo Nazionale Dell'Automobile* (MAUTO) in Turin in March 2025, engaging over 150 participants, and later exhibited at Museo Ferrari Maranello, reaching nearly 4,000 visitors.

The trial combined real-time VR/MR interaction, cinematic 360° content, and synchronised multiplayer logic on standalone headsets supported by low-latency 5G. Visitors shared the same physical and virtual space within a museum-grade interactive story, culminating in a collaborative MR Formula One pit stop. Its seamless technical performance, coupled with high user engagement and cross generational accessibility, positions the application as a pioneering model for how 5G (and 6G in future) can enable next generation cultural exhibitions and interactive storytelling formats in museums. Addressing museum challenges, the trial introduced a compact, wireless multiplayer MR setup requiring minimal infrastructure, enabling continuous operation and offering a flexible, high-impact alternative to static exhibits.

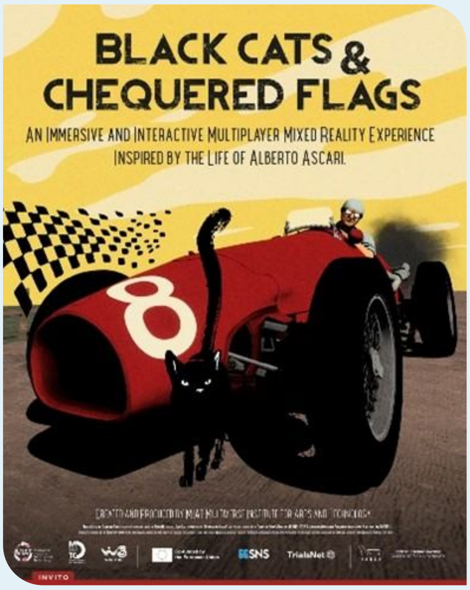

Figure 15 - Remember Ascari Logo

Architecture

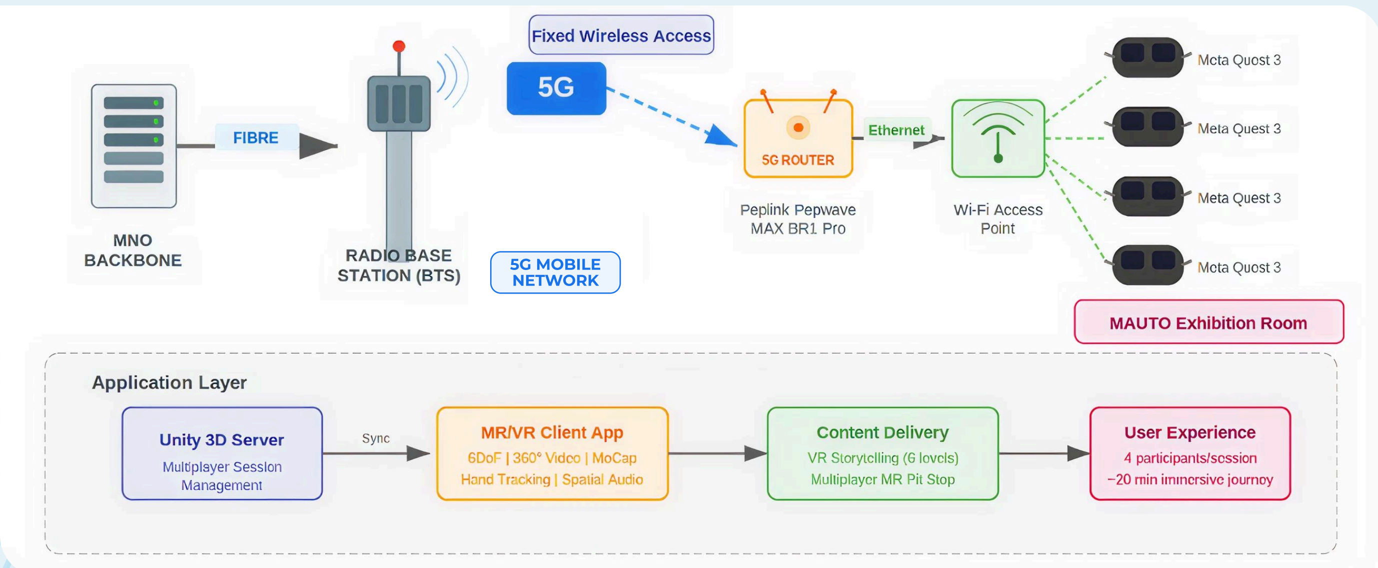

Figure 16 - Remember Ascari Architecture

The architecture relies on a custom client-server framework and a private 5G network to deliver synchronised multiplayer MR experience. The 5G connectivity was provided on the 1800 MHz and 2600 MHz frequency bands using Dynamic Spectrum Sharing (DSS). A 5G router and indoor Wi-Fi access point ensured stable connectivity for real-time VR, MR passthrough, 360° video and motion-capture animations. Users' equipment consisted of Meta Quest 3 headsets which automatically connected to the Wi-Fi network. The system supports six narrative environments with seamless transitions, precise spatial alignment and coordinated multiplayer actions during the pit-stop sequence, demonstrating the robustness of 5G-enabled immersive deployments.

Deployment

The immersive and interactive multiplayer MR experience staged within a fully customised exhibition environment located inside the MAUTO. The exhibition space was equipped with a dedicated welcome/onboarding area. A separate area was designated for the signing of necessary documentation, and mechanic suits were provided to all participants, contributing both to the immersive nature of the experience and to the operational smoothness of each session.

Figure 17 - Remember Ascari Deployment

Results

The performance provided by the 5G private solution proved highly reliable, with download peaks reaching 191Mbps and latency values between 20-29 milliseconds. User feedback was overwhelmingly positive: 96% of participants wished to repeat the experience, 88% expressed willingness to pay, and 80% reported learning new information. Accessibility, onboarding clarity and audiovisual quality exceeded expectations (81.16% positive feedback), confirming cultural relevance and technical robustness.

How intuitive were the interactions during the immersive and interactive multiplayer mixed reality experience?

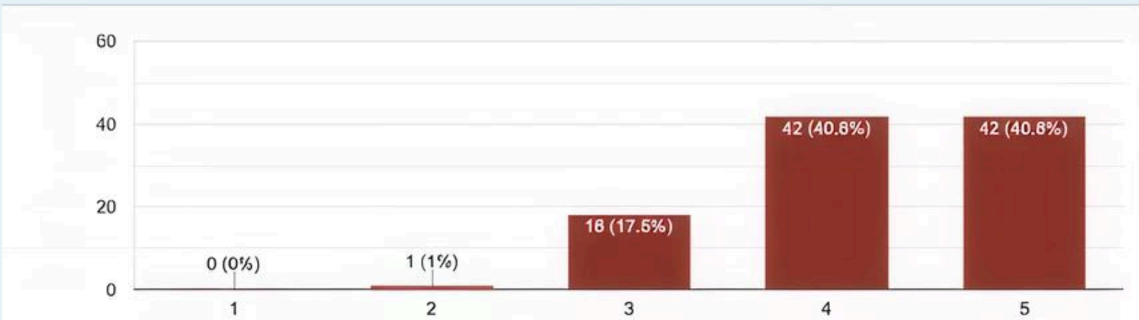

Figure 18 - Remember Ascari Deployment

5G Advanced / 6G Empowerment

The trial demonstrated the 5G private network solution as a key enabler for responsive and tightly synchronised MR experiences. Its combination of high throughput, reliable uplink performance, and consistently low end-to-end latency proved essential for coordinating multiple users and delivering real time immersive media. Advancements expected with 5G Advanced and 6G, such as deterministic and guaranteed latency, AI driven network optimisation, and more sophisticated network slicing, will further expand what cultural and creative institutions can achieve with XR. These enhancements will support richer and more photorealistic graphics, larger participant groups, and enable more complex, interactive, and high-fidelity immersive installations.

TrialsNet

TrialsNet
Service Robots for Enhanced Passengers' Experience
Website: http://trialsnet.eu/

Service Robots for Enhanced Passengers' Experience leverages on AI-driven analytics, real-time video data from thermal cameras, and intelligent humanoid service robots, to streamline pax flow and enhance passenger experience.

Overview

The Service Robots for Enhanced Passengers' Experience use case, led by WINGS ICT Solutions and Athens International Airport (AIA), introduces a 5G/B5G-powered smart airport ecosystem designed to improve passenger flow management and travel comfort. The objective was to demonstrate how AI-driven analytics, real-time video data from thermal cameras, and intelligent humanoid service robots, can streamline terminal operations, minimise congestion, and provide personalised assistance to travellers while supporting Terminal Operations Supervisors in real-time decision-making.

Figure 19 - Remember Ascari Deployment

On April 10, 2025, a large-scale field trial took place at the arrivals area of AIA. This trial complements past and future SNS JU trials in mobility and passenger safety.

Architecture

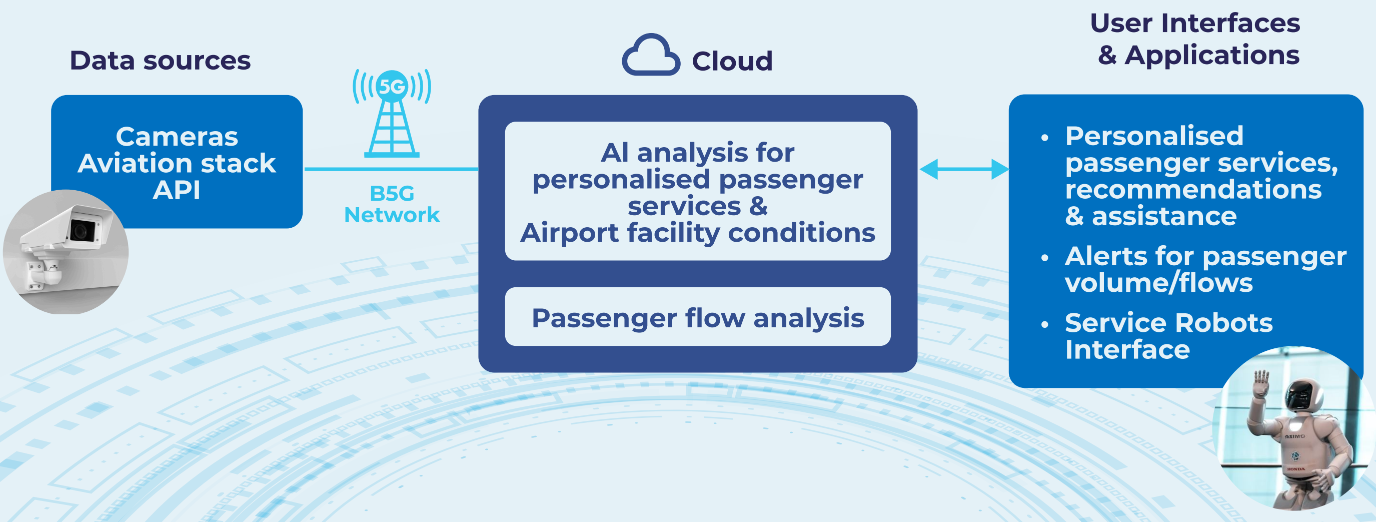

Figure 20 - Remember Ascari Architecture

The trial architecture integrates input from thermal cameras, 5G connectivity, and WINGS wi.move platform as the central intelligence hub, processing video streams through advanced computer vision algorithms. Thermal cameras monitor passenger movements across check-in areas, security zones, and departure entrances while maintaining privacy compliance. The video feeds are processed on WINGS Graphics Processing Unit (GPU) servers. AI-powered analytics provide insights on passenger count statistics, flow rate analysis, queue length monitoring, and anomaly detection. A humanoid service robot, equipped with Robot Operating System (ROS) navigation capabilities and Natural Language Processing (NLP) interfaces, provides real-time assistance including flight information, way finding guidance, and congestion avoidance recommendations.

Deployment

Eight thermal cameras were deployed across the airport to create a comprehensive monitoring network: four cameras in the check-in area, three at security checkpoints, and one at Departures Entrance. These privacy-compliant thermal imaging sensors captured detailed passenger flow metrics including average speed, stationary time, directional movement patterns, and crowd density measurements without recording personally identifiable information. All system components operated over a B5G network.

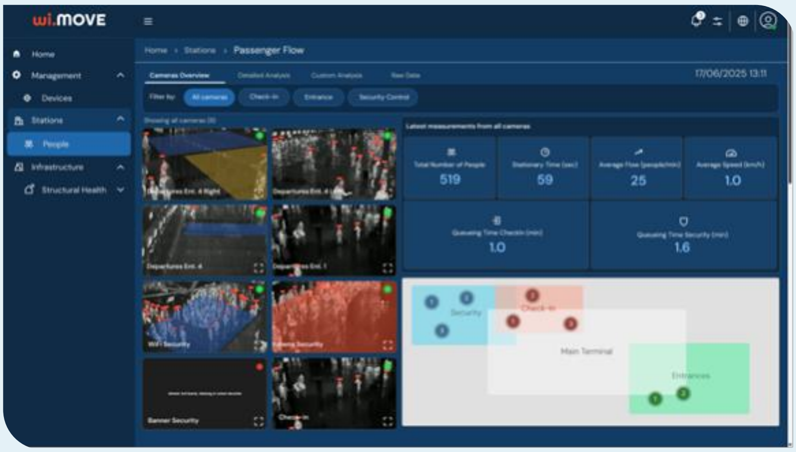

Figure 21 - Remember Ascari Deployment

Results

Six months of real-world trials demonstrated technical excellence, with application round-trip latency of 42.9 ms, 100% service reliability and availability, and passenger satisfaction scores of 4.3/5 across all evaluated dimensions. The integrated system successfully processed over ten thousands passenger interactions while maintaining sub-fifty ms response times for critical robotic functions. Results indicate significant potential for scalable deployment across major international airports.

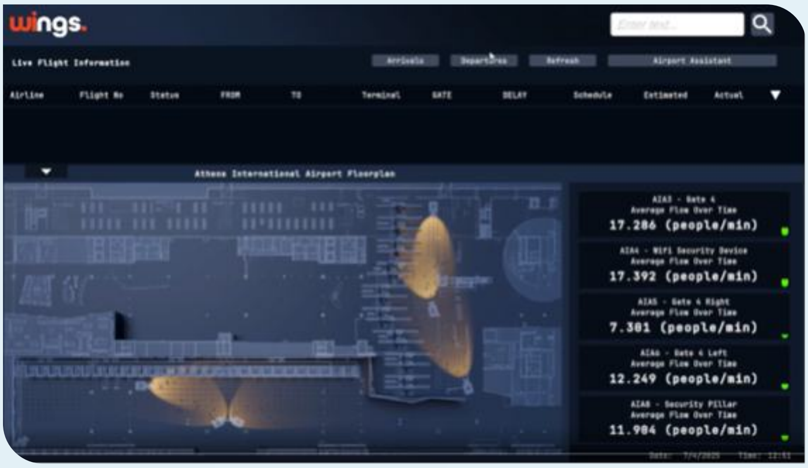

Figure 22 - Remember Ascari Results

5G Advanced / 6G Empowerment

The trial identified key network performance characteristics essential for large-scale smart airport deployments. Uplink throughput requirements ~5Mbps/robot for continuous video streaming and downlink requirements: 2Mbps/robot for control (baseline spec. for multi-robot environments). Round Trip Time (RTT) latency: avg. 20-25ms for low-data Message Queuing Telemetry Transport (MQTT) traffic, 25-30ms for video streaming. These findings align with emerging 6G requirements for Ultra Reliable Low Latency Communications (URLLC) and High-Reliability Low-Latency Communications (HRLLC) essential for industrial robotic applications. Future 6G networks will provide ultra-low latency below 1 millisecond, deterministic communication with minimal jitter, and massive machine-type communications supporting thousands of concurrent devices.

TrialsNet

TrialsNet
Mass Casualty Incident (MCI) and Emergency Rescue in Populated Areas
Website: http://trialsnet.eu/

Enabling real-time 5G-powered emergency response and semi-automated triage in mass casualty incidents through AI, wearables, robotics, and mission-critical connectivity.

Overview

The use case Casualty Incident (MCI) and Emergency Rescue in Populated Areas led by WING ICT Solutions, demonstrates a 5G-enabled emergency response system for managing Mass Casualty Incidents (MCIs) in densely populated areas. The trial was conducted in 2025 at the Technopolis area in Athens and the Movistar Arena in Madrid, simulating large-scale emergency incidents with multiple casualties and dynamic emergency conditions.
The solution integrates the wi.care+ platform, wearable medical devices for continuous vital-sign monitoring, AI-assisted semi-automated triage, and robotic live video streaming with human detection. Project partners, acting as operational end users under informed consent, validated system performance, usability, and decision-support capabilities in a realistic environment.
The trial contributes to SNS JU's mission by providing practical insights into the use of B5G/6G, AI analytics, and wearable devices for pre-hospital emergency care. It demonstrates the feasibility of integrating multiple technologies in real MCI scenarios and informs the design of future trials and operational deployments.

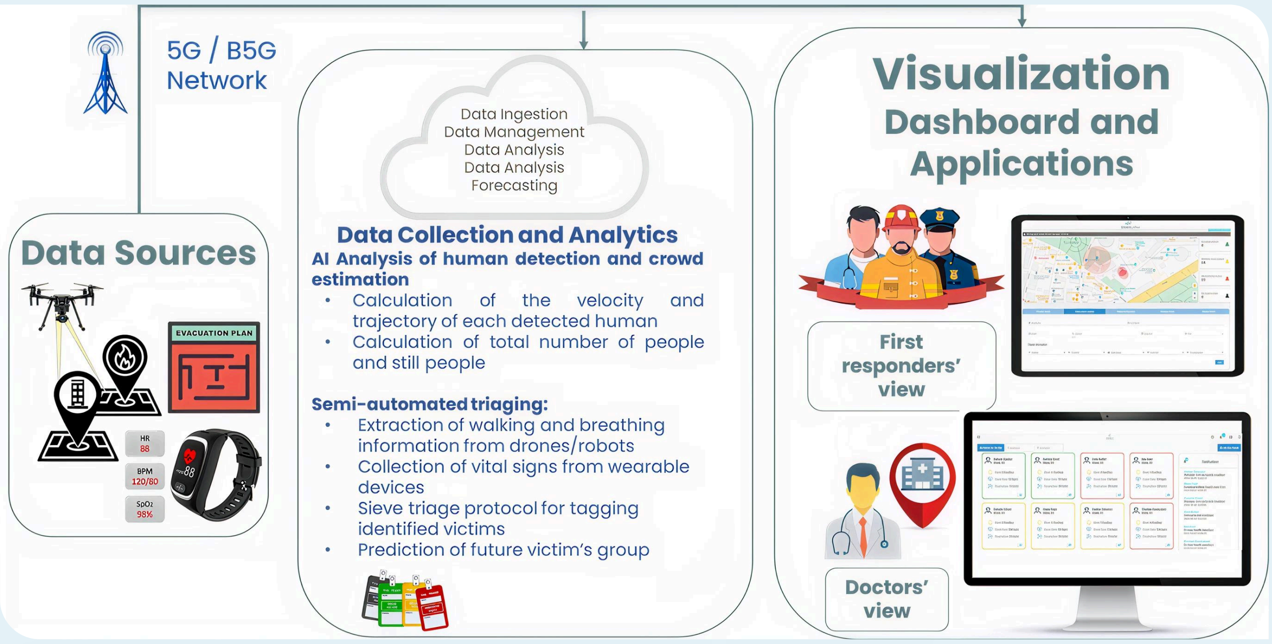

Figure 23 - MCI Overview

Architecture

The use case architecture integrates wearable devices, robotics, AI analytics, and 5G connectivity into a unified emergency coordination platform. Wearable devices continuously capture vital signs including electrocardiogram, heart rate, Peripheral Capillary Oxygen Saturation (SpO2), temperature, and blood pressure. These data streams are transmitted over 5G/B5G networks to the wi.care+ cloud-based platform.
Robots equipped with cameras provide real-time live video streaming and AI-based human detection, enhancing situational awareness in complex environments. Edge and cloud processing support low-latency triage classification, short-term triage forecasting, and centralised coordination via an operational dashboard.

Deployment

The trial was deployed at Technopolis (Athens) in June 2025 and the Movistar Arena (Madrid) in March 2025 under simulated realistic emergency conditions. Project partners acted as end users, interacting with wearable devices, the wi.care+ MCI dashboard, and robotic live video systems. Participation followed informed consent procedures. The deployment validated system scalability, usability, and real-time 5G performance in a populated urban environment.

Figure 24 - MCI Deployment

Results

The trial validated ultra-low application latency (<100 ms), reliable uplink/downlink throughput, high service availability (≥99.999%), and location accuracy (<2 m). AI supported triage achieved strong precision and recall performance, supporting reliable semi-automated classification. User-centric indicators (trust, resilience, experience) were rated above 4/5, confirming operational readiness and acceptance.

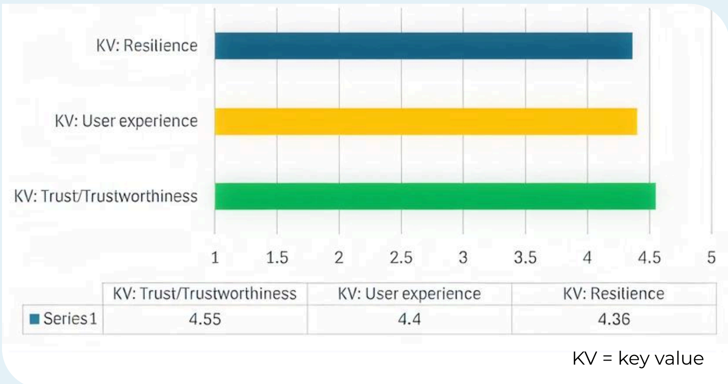

Figure 25 - MCI KVIs

Measurement ID	Requirement	Measurement result	Validation
6.1_FieldA_1 (Creation of new patient profile flow)	KPI608: 100 ms	KPI408: 65.28 ms	Complied. The results are satisfying and follow the trial requirement
6.1_FieldA_2 (Meaturements of the vital signs, triaging and the updated patient bealth status flows)	KPI608: 100 ms	KPI408: 99.42 ms	Complied. The results are satisfying and follow the trial requirement
6.1_FieldA_3 (Streaming video)	KPI608: 30 ms	KPI408: 4.83 ms	Complied. The results are satisfying and follow the trial requirement
6.1_FieldA_4 (Streaming video)	KPI608: 800 ms	KPI608: 24.87 ms	Complied. The results are satisfying and follow the trial requirement
6.1_FieldA_3 (Basic data transfer)	KPI406: 25 Mbps	KPI606: 29 Mbps	Complied. The results are satisfying and follow the trial requirement
6.1_FieldA_4 (Basic data transfer)	KPI608: 800 ms	KPI408: 25.29 ms	Complied. The results are satisfying and follow the trial requirement
6.1_FieldA_5	KPI611: > 0.80 KPI612: > 0.65 KPI613: > 0.70 KPI615: ≥ 99.999 KPI618: 5m (robot - MCI & GPS location)	KPI611: 0.8419 KPI612: 0.5274 KPI613: 0.6485 KPI615: 99.999 KPI618: <2m	Complied. The large number of objects (multiple people in an image) that were labelled in the dataset was expected to influence the Recall. This metric can be improved when collecting a custom dataset.

Figure 26 - MCI KPIs

5G Advanced / 6G Empowerment

The trial demonstrates that mission-critical emergency healthcare operations require capabilities beyond legacy networks. Ultra-low latency, high uplink capacity for live video and vital-sign data, reliable connectivity under load, and edge-enabled AI analytics are essential for real-time triage and coordination. Future 5G Advanced and 6G features—deterministic latency, AI-native network management, advanced network slicing, and integrated sensing and communication—will further enable scalable, resilient, and autonomous emergency healthcare systems not feasible with previous generations.

6G-XR
IMS Control Plane Optimisation for Holographic Communications
Website: https://6g-xr.eu/

This pilot validates the integration of holographic calls directly into smartphone native dialers via the IMS Data Channel solution, allowing end users to experience enriched communications seamlessly with no need for additional applications. This pilot starts the path to move beyond 2D video calls to real-time 3D holographic interactions, enabling more natural human communications including eye contact and spatial perception.

Overview

6G-XR project developed enablers in the areas of networking, computing, radio access technologies and Extended Reality (XR) services, for validating innovative XR use cases. In line with this goal, the IMS Control Plane Optimisations for Holographic Communications use case leverages the novel IP Multimedia Subsystem (IMS) Data Channel described in 3GPP Release 18. By integrating these capabilities directly into standard mobile services, operators can provide secure, trusted, and value-added experiences. The use case flow is: (1) **On the client side**, the user dials a service phone number. (2) **On the other end**, the call is accepted, video is captured, reconstructed and sent to the client. (3) Finally, once the system pushes an application to the client phone, the end user sees the hologram **on the screen**. After the development, integration and internal validation phases, the pilot was crowned with the demo conducted during the 6G-XR Impact Day, where the general audience could experience the holographic call in first person. For the success of the pilot, Matsuko integrated the holographic functions and applications, while Telefonica and Ericsson provided a fully-fledged 5G Advanced mobile network to establish and manage phone-to-phone communication.

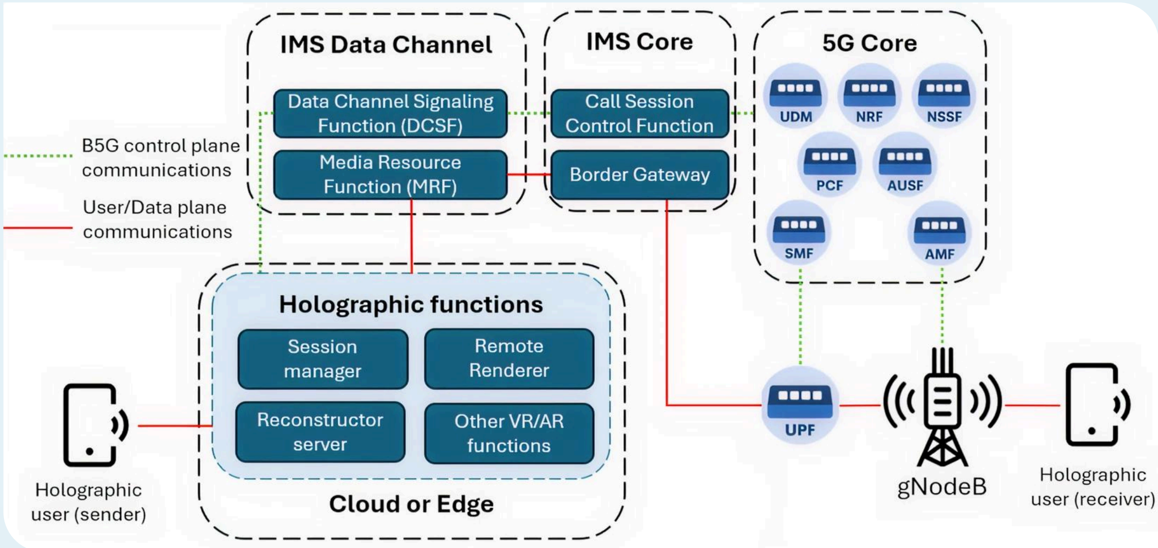

Figure 27 - Pilot Architecture

Architecture

The architecture integrates the two main components of the IMS Data Channel: the Data Channel Signaling Function (DCSF), which manages the holographic session control; and the Media Resource Function (MRF), which handles the ongoing holographic call traffic. The aggregation of those functions to the IMS Core platform, the 5G Core (the widely-known NRF, SMF, AMF and more) and the 5G radio access state-of-the-art features forms an interesting beyond-5G (B5G) network for validating innovative use cases.
Note: UDM (User Data Management), NRF (Network Repository Function), NSSF (Network Slice Selection Function), PCF (Policy Control Function), AUSF (Authentication Server Function), SMF (Session Management Function), AMF (Access and Mobility Management Function) and UPF (User Plane Function).

Deployment

This pilot was showcased in NEXTONIC (formerly 5TONIC) lab. NEXTONIC offers 5G Standalone (SA) coverage in the 3.5-3.6 GHz band plus the 24-26 GHz band (also known as millimeter wave bands). The full 5G Core and the IMS Core platform functions run on NEXTONIC premises. The IMS Data Channel and the holographic functions were deployed on cloud environments and interconnected via public connectivity to NEXTONIC. Holographic calls were made from a phone which implemented an IMS Data Channel client.

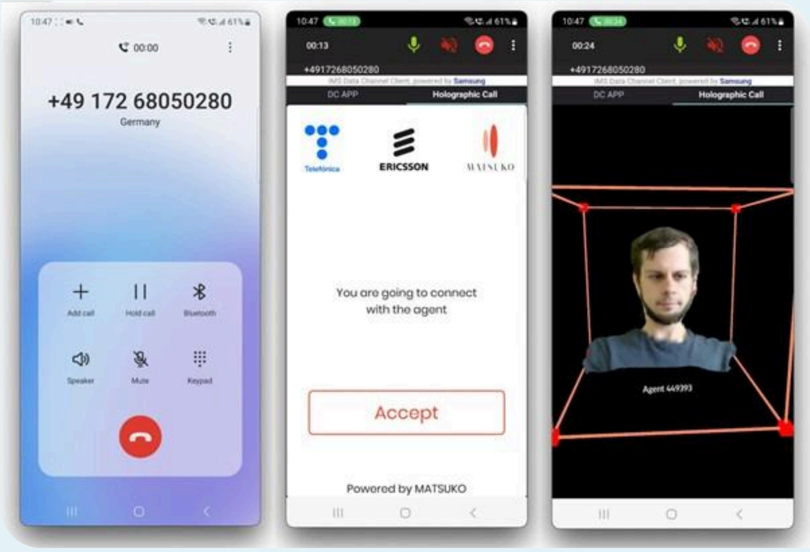

Figure 28 - Pilot Demo

Results

The data rate demanded by the service is around 12 Mbps because the data is compressed before being sent, to optimise the use of resources. The measured latency between reconstructor server and receiver (averaged over 1 second periods) stays consistently at 41 or 42 ms, with a low jitter under a few ms. The survey conducted after the demo revealed a positive perception about the potential of this technology to transform the way people communicate.

Figure 29 - Metrics

5G Advanced / 6G Empowerment

The IMS Data Channel validated in this pilot is a solution that further enhances the 5G system. By adding data channel capabilities over traditional mobile-to-mobile calls, new value-added forms of communication are enabled. Having the applications contained in the IMS platform, the mobile operators can guarantee session management, quality of service, reliability, seamless mobility and security. Besides, working together with 5G Advanced New Radio features, the enriched services can keep end-to-end low latency and benefit from the high capacity of the new frequency bands, delivering an improved user experience than previous generations.

RIGOUROUS

RIGOUROUS
Protection of 6G-enabled Services against Cyber Threats
Website: https://rigourous.net/

A modular and distributed 6G security orchestration, policy based framework combining AI-driven decision making, secure onboarding and network slicing to automatically detect, isolate and mitigate cyber threats, for trustworthy digital services.

Overview

This Trial/Pilot validates an advanced 6G security orchestration framework developed within the RIGOUROUS project, combining Security Orchestration, Automation and Response (SOAR) principles, AI-driven decision engines, secure onboarding mechanisms and network slicing to protect critical services against cyber threats.
The pilot builds upon the use case "DDoS mitigation", extending the scope from threat mitigation to end-to-end security lifecycle management. It was demonstrated during EuCNC 2024 and Def.Camp 2025 and is completed with concrete experimental results obtained in controlled but realistic environments.

The trial addresses large-scale cyber incidents, such as IoT-driven Distributed Denial of Service (DDoS) attacks, affecting service availability across Edge–Transport–Core–Cloud continuums, while ensuring trust, policy compliance and automated response. Detection, decision-making and enforcement are fully automated following a Development, Security, and Operations (DevSecOps) and SOAR closed-loop paradigm.

The pilot involved a multi-domain deployment across testbeds operated by Orange Romania (ORO) and the University of the West of Scotland (UWS), with orchestration and decision components developed by the University of Murcia (UMU).

Architecture

The trial architecture implements a distributed SOAR framework for 6G networks, spanning multiple administrative and technological domains. All functional components are securely onboarded and continuously monitored during operation.

Network flow analytics and AI-based anomaly detection identify cyber threats and abnormal behaviours. Events are forwarded to an AI or rules driven Decision Engine, which evaluates risk, context and policy constraints to determine mitigation actions.

Enforcement is performed by a Security Orchestrator through intent-based interfaces, dynamically actuating network slicing, traffic isolation or service reconfiguration, being capable of doing so along diverse architectures.

In this way, malicious traffic is isolated into constrained slices, while legitimate services recover normal operation.

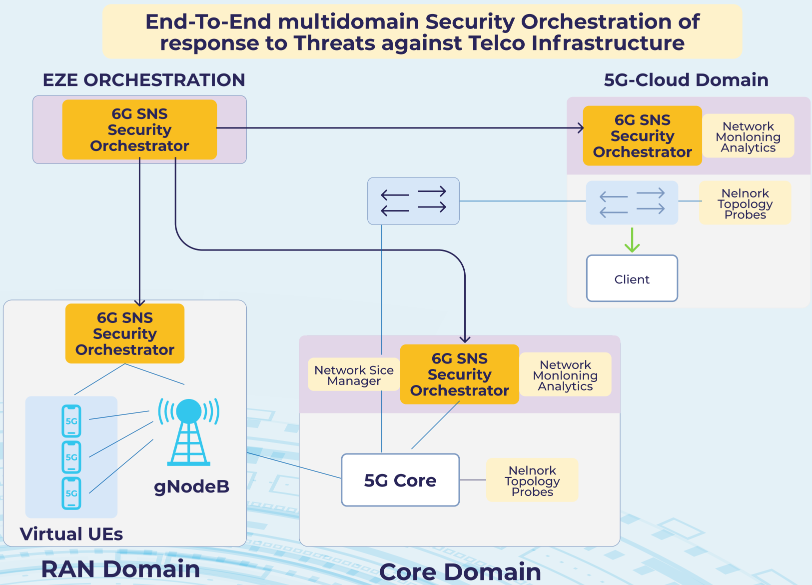

Figure 30 - Architecture

Deployment

We began our integration and multi-domain activities by deploying the Security Orchestrator (SO) to the 5G Core Domain, the 5G-RAN Domain and the private-cloud domain. At the same time, the E2E Security Orchestrator was deployed on the end-to-end (E2E) domain, while the Slice Manager (SM) and Slice Control Enablers were also deployed. A large-scale DDoS attack was generated at ingress point in the 5G-RAN domain, and the Network Security Flow Monitoring (NSFM) detected the attack.

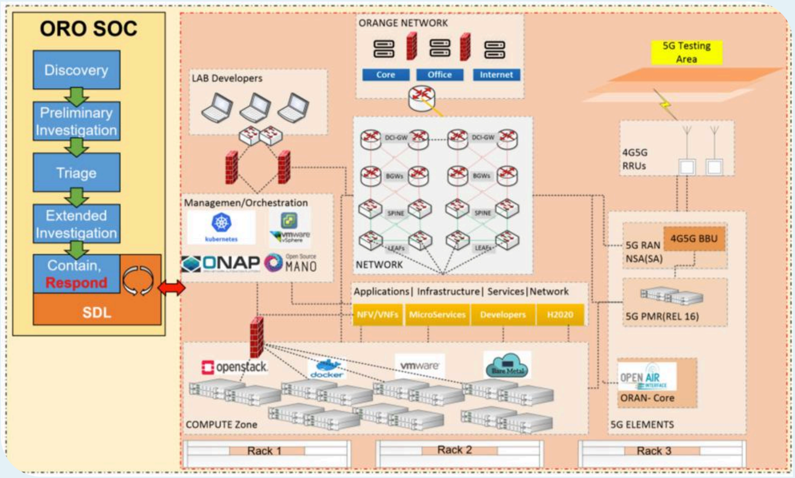

Figure 31 - Deployment

Results

Through the utilisation of intent-based orchestration in a 6G environment, the operators and technology integrators can achieve relevant, reliable operational capacity to effectively mitigate current threats against telco infrastructures, and to enable a fully integrated Development, Security, and Operations (DevSecOps) paradigm in their operational and security stacks. The technologies of RIGOUROUS will pave the way for an innovative development of cyber security protections to Network Continuums, in multi-domain environment.

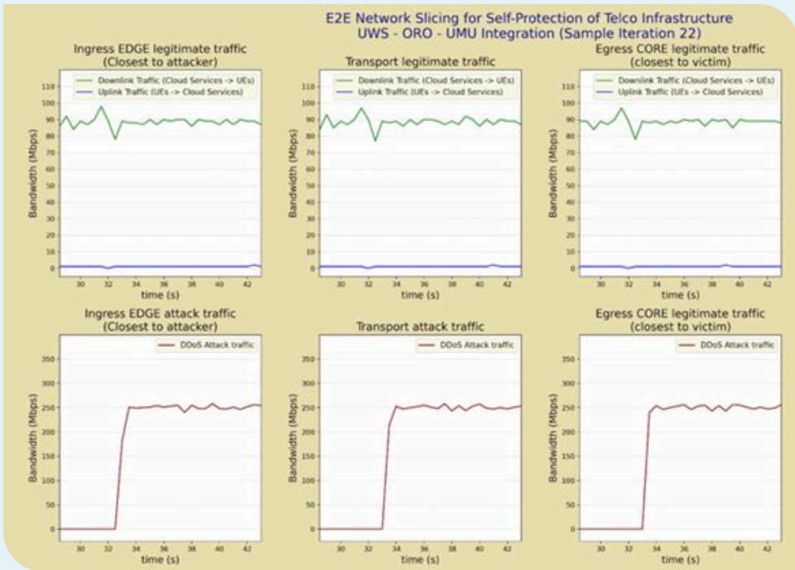

Figure 32 - Results

5G Advanced / 6G Empowerment

Unlike legacy networks, 6G supports AI-assisted decision making, policy-driven SOAR loops and dynamic slice reconfiguration, enabling fine-grained isolation of malicious traffic while preserving service continuity. Secure onboarding, cross-domain orchestration and DevSecOps integration further enhance scalability and trust. These features collectively empower autonomous, resilient and trustworthy digital services, positioning 6G networks as active security enablers rather than passive connectivity providers.

This trial demonstrates how 5G Advanced and 6G capabilities enable security and resilience levels not achievable with previous generations, combining of end-to-end network slicing, ultra-low latency control loops and intent-based policy.

6G-Path

6G PATH
XR Rural Schools

Website: https://6gpath.eu/

The pilot validated the use of XR technologies in rural education through 5G networks. The implementation of XR-enabled education in two rural schools in Romania improves academic performance while delivering enhanced learning experiences.

Overview

The trial took place in May and June 2025 at two rural schools in Romania: Corbii Mari School and "Nicolae Russu" School in Sita Buzăului. The trials were based on an existing Digital Learning platform – Digitaliada – and were deployed on Orange Romania's B5G networks.

The activities included introductory sessions with teachers, deployment of Extended Reality (XR) headsets, and validation of connectivity and 6G-technology performance. Focus group discussions were also conducted to gather qualitative insights.

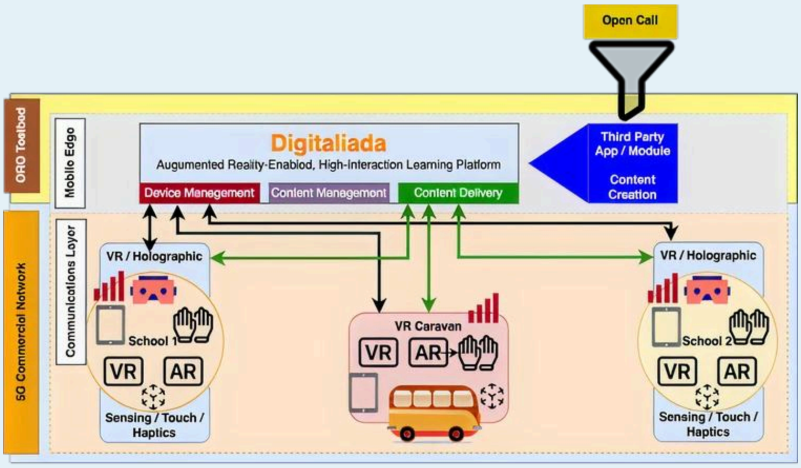

Figure 33 - Trial Scenarios Overview

The main objective was to assess user acceptance, evaluate usability, and collect feedback on training requirements and the perceived relevance of the educational content. Moreover, the sessions included simulated lessons in real classroom settings, using predefined learning scenarios aligned with the national curriculum.

Architecture

The pilot infrastructure was deployed in representative rural school environments to validate the integration of XR educational technologies within the 6G-PATH architecture. The XR headsets (ClassVR) were installed and tested in two schools—Corbii Mari and Sita Buzăului—alongside existing school IT equipment. The infrastructure also included local Wi-Fi access points configured to reflect conditions of limited or fluctuating connectivity often present in rural environments. The transport and access network in use was Orange Romania's 5G commercial network, and the experiment components were hosted in an Edge deployment in Orange 5G Lab Facility in Bucharest. The facility replicates a production-level 6G network and hosts the 6G-PATH experimentation environment.

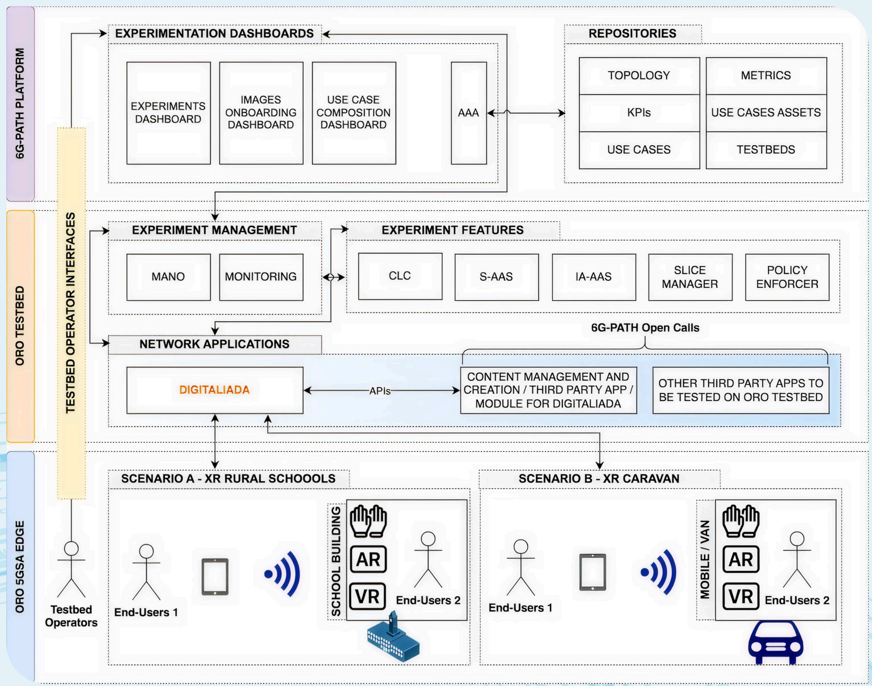

Figure 34 - ORO 5G Lab Multi-Domain Architecture in 6G-PATH

Deployment

The deployment of the XR in Rural Schools scenario combined classroom-ready XR tools with existing school infrastructure, to enable immersive educational sessions. The ClassVR headsets, and Wi-Fi Access Points (APs) connected to the 5G Network, were deployed alongside interactive whiteboards and laptops. The ClassVR and the Digitaliada platforms served as the main content provision, device management and class activity tracking tools, and were deployed in a "far-edge" configuration, in the Orange 5G Lab.

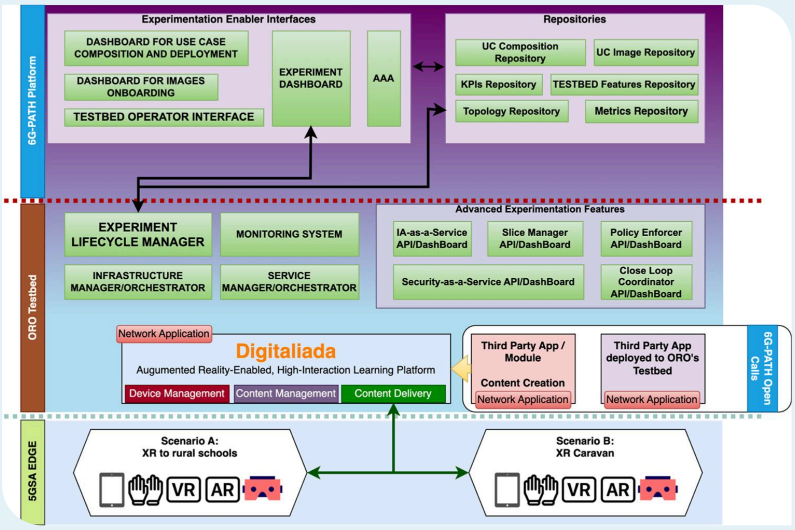

Figure 35 - Trials Deployment

Results

The trials validated dynamic slicing and composition, dynamic QoS adjustments and effective orchestration of edge resources to deliver a consistent experience across the two geographically distinct areas of Romania. Overall, these early trials successfully validated the relevance and alignment of XR-based learning with several of the 6G-PATH project's Key Value Indicators, particularly in areas related to digital inclusion, improved learning outcomes, and user engagement.

Figure 36 - Trials demonstration in the Corbii Mari School

5G Advanced / 6G Empowerment

The trial demonstrated the validity of large-scale usage of XR-enabled devices, and consumption of XR-tailored content through the next generation of mobile networks, while enhancing the learning experience of students and helping to reduce the discrepancies between students learning in rural and urban environments, respectively. Using existing 5G technology for access and transport of network-intensive content such as XR, and with the reliance of 6G technologies such as advanced dynamic slicing and QoS showcases the real and immediate impact that access to 6G technologies will have in education.

6G-Path

6G PATH

Bioprinted Patch for Chronic Wound Patients

Website: https://6gpath.eu/

B5G/6G-powered care enables nurses in underserved areas to perform 3D wound scanning, run 2D/3D analytics to produce personalised hydrogel patches, and consult hospital specialists via teleconference, supported by a secure and reliable micro-network.

Overview

This use case validates a novel approach to enhance patient care for customised wound patches in remote areas using 5G/6G-enabled medical services. A nurse equipped with a mobile phone for scanning, documenting and analysing via 2D&3D engines the wounded area, can print tailored hydrogel patches, and perform teleconferencing. Wound expert attend remotely to ensure proper treatment instructions. The nomadic micro-network, deployed from the nurse's vehicle, acts as an extension of the hospital's campus network for reliable and secure connectivity. The effort is powered by the nursing researchers from Charité and technology from Fraunhofer FOKUS. The trial took place in June 2025 and the pilot started in December 2025 in a nursing home.

Figure 37 - Overview

Architecture

The Nurse Care App on the mobile phone enables secure, interoperable wound documentation, visualisation, and multimedia communication with clinical experts via Over-The-Top (OTT) calls. A dedicated external tool generates detailed 3D models of chronic wound regions, while cloud infrastructure at the medical headquarters stores all medical data within an Fast Healthcare Interoperability Resources (FHIR) repository connected to an access control service for role-based authorisation.

Transferred 2D and 3D data are processed by Wound Analytics to measure wound characteristics and derive accurate 3D models used for customised hydrogel patch production. Analytical outcomes are automatically recorded in the FHIR Store and made accessible to specialists through integrated administration and care portals for clinical review and decision support.

A nomadic 5G base station with edge core functions enables secure local connectivity, authentication, mobility, and end-to-end sessions at the care site. It connects to the central core via 5G or satellite backhaul using encrypted OTT transport and Software Defined Wide Area network (SD-WAN) traffic steering, while a local User Plane Function (UPF) offloads data and centralised control ensures simplified management and privacy.

Deployment

The deployment uses Open5Gcore, implemented as a large collection of mobile core network micro-services, with the Application Programming Interface (API) aligned with the 3GPP technical specifications (3GPP TS23501) for very high level of flexibility regarding deployment options, including fundamental control plane functionality and splitting functionality between the edge of the network and the central core. It features a Wireguard based Security as a Service, a small cell from Amarisoft and a 20 MHz spectrum license, in Berlin.

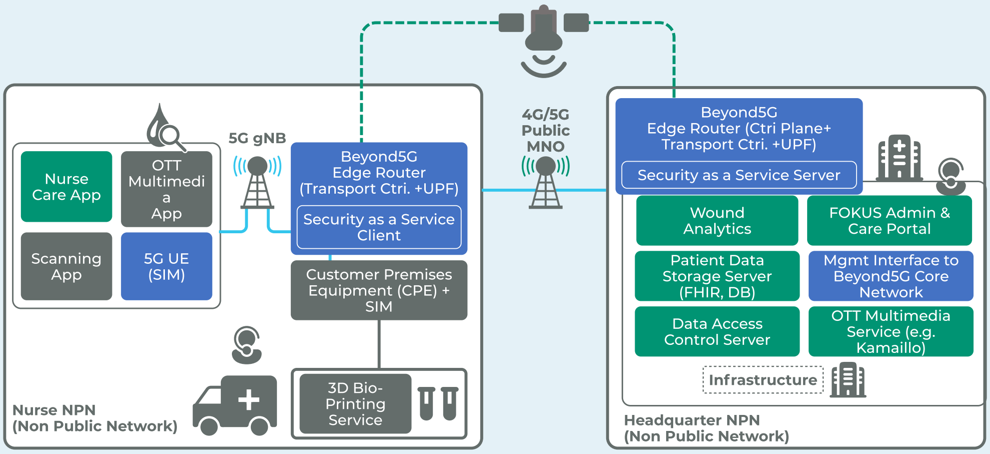

Figure 38 - Deployment

Results

Clinical pilots and demonstrations confirmed strong acceptance among nurses, wound experts, and healthcare providers. Participants highlighted improved documentation accuracy, faster clinical decision-making, and clear potential for decentralised, telehealth-supported care. End-users reported enhanced quality of life, time savings, and professional empowerment, while emphasising network reliability, training, and infrastructure readiness as key factors for sustainable adoption.

Figure 39 - Demonstrations

5G Advanced / 6G Empowerment

The system ensures reliable connectivity between the nurse's NPN and the remote wound expert. It connects the mobile device and local 3D printer in remote areas, using satellite as fallback. The testbed enables sub-second upload latency of 3D scans. The flexible routing through traffic steering enables local printing and optional edge-based Wound Analytics for large 3D scans. Quality on Demand maintains low latency during OTT video calls. Closed-loop coordination is being evaluated to enable just-in-time deployment and processing of large 3D models, improving integration into nursing procedures. The solution introduces an evidence based and objective new approach for treating patients in remote areas, increasing the patient safety.

Figure 39 - Demonstrations

6G-Path

6G PATH
B5G for Precision Agriculture

Website: https://6gpath.eu/

This trial demonstrates how B5G enables concurrent agricultural services with distinct performance requirements, supporting drone-based monitoring, remote UAV control, and real-time sensor data processing for precision farming.

Overview

Conducted at the La Mayora experimental farm, the the trial deplpoyed a private 5G Standalone (5G SA) network configured with multiple dedicated network slices to support agricultural operations. Distinct slices were allocated to unmanned aerial vehicle (UAV) video streaming, remote drone control, and IoT-based environmental monitoring, each mapped to specific latency, bandwidth, and reliability requirements.

The experimentation validated service isolation, guaranteed Quality of Service (QoS), and stable low-latency performance under simultaneous traffic loads in a real farming environment.

Figure 40 - Overview

Edge computing resources hosted AI-driven analytics for real-time processing of UAV imagery, enabling plant stress detection, disease identification, fruit counting, ripeness estimation, and irrigation prediction based on combined visual and sensor data inputs.

Architecture

The trial infrastructure is built on a private 5G Standalone network at La Mayora, where the 5G Core and an edge computing server are co-located on-site to enable low-latency processing and local service execution. Three dedicated network slices operate concurrently: an enhanced mobile broadband (eMBB) slice for 4K UAV video streaming, a Ultra Reliable Low latency Communications (URLLC)-type slice for reliable low-latency drone control, and an massive Mobile Type Communication (mMTC)-type slice for energy-efficient soil and microclimate sensor data transmission.

Devices access the network via dedicated SIMs mapped to their respective slices, while edge processing enables near-real-time analytics and reduced backhaul usage.

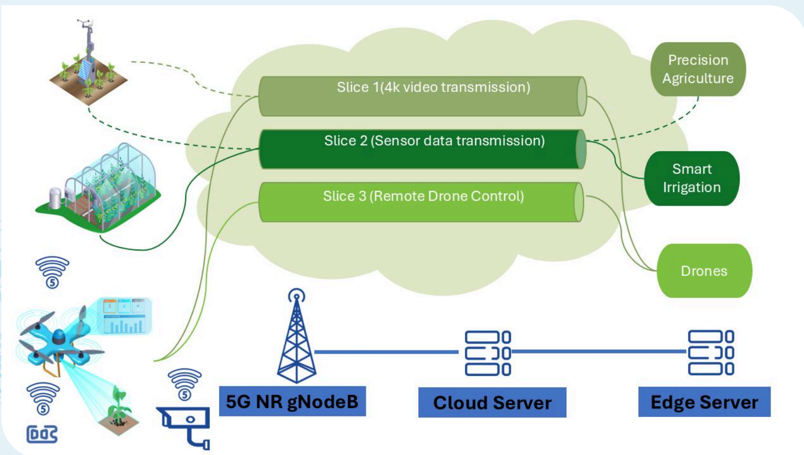

Figure 41 - Architecture

Deployment

The deployment was carried out at La Mayora experimental farm (Algarrobo, Spain), where UAV platforms and distributed soil and microclimate sensors were installed across cultivated plots. A private 5G Standalone (5G SA) infrastructure was activated on-site, integrating radio access, core functions, and edge resources. Field validation included live UAV flights, real-time crop monitoring, and continuous sensor data acquisition under operational farming conditions.

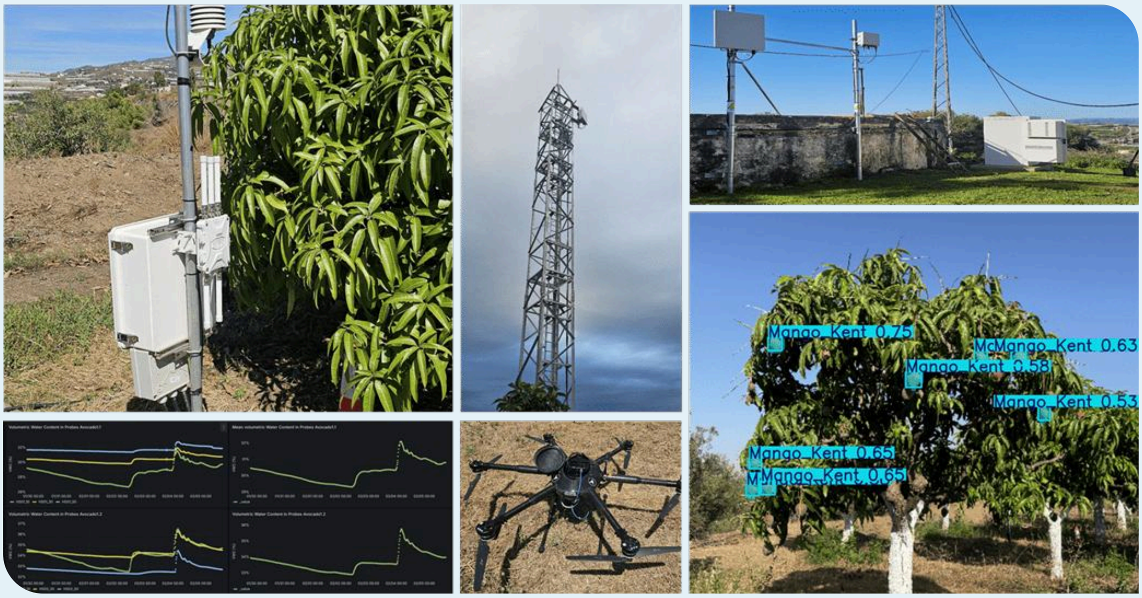

Figure 42 - Deployment

Results

Trial results confirm successful 5G network slicing for precision agriculture. Drone control latency remained consistently below 15 ms, validating low-latency slice performance. AI-processed UAV imagery enabled automated crop health assessment.

Simultaneous operation of three slices demonstrated full traffic isolation, with peak throughputs of 30 Mbps (video), 10 Mbps (control), and 5 Mbps (sensors). Sensor data correlation further supported integrated field monitoring.

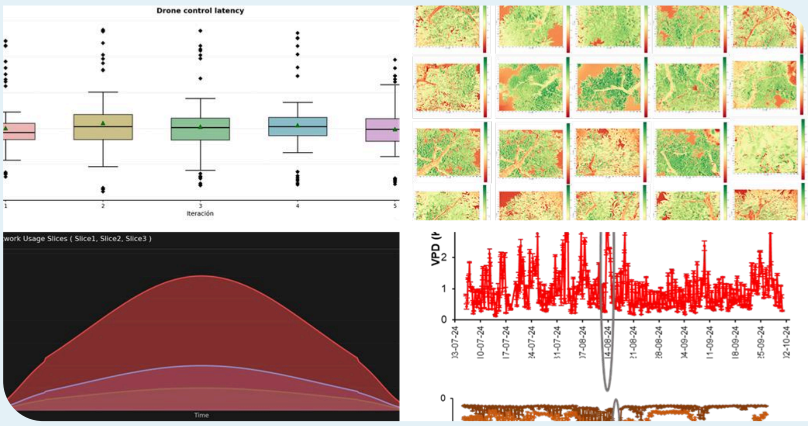

Figure 43 - Results

5G Advanced / 6G Empowerment

The trial moves beyond baseline 5G by demonstrating 5G Advanced capabilities such as enhanced slicing granularity, improved uplink performance for high-resolution UAV streams, and tighter edge integration for time-critical AI workloads. It validates the network's ability to deliver predictable performance under concurrent, heterogeneous service demands, an essential step toward 6G service-aware and compute-integrated architectures. The results support the evolution toward deterministic, programmable networks capable of natively integrating sensing, communications, and distributed intelligence for autonomous agricultural systems.

Highlights

The SNS JU R&I Work Programme allocates significant efforts to develop innovative solutions for multiple vertical industries. Specifically, 6G development efforts target sustainable solutions to address environmental, societal, and business aspects for the networking domain (i.e., "Sustainable 6G") as well as for a variety of the so-called "vertical" industries (i.e., "6G for sustainability") such as Industry 4.0/manufacturing, automotive, smart city, media, transportation/logistic, e-health, etc.

According to the SNS Vertical Engagement Tracker (VET)[4] and inputs included as of May 2026, Industry 4.0/Manufacturing, Media/XR and Automotive/Transports/Logistics are the top-3 vertical sectors addressed by SNS JU Projects (all TRLs levels), as the following Figure 44 illustrates. Moreover, the results show broad coverage across many vertical sectors, with significant overlap that enables cross-validation opportunities.

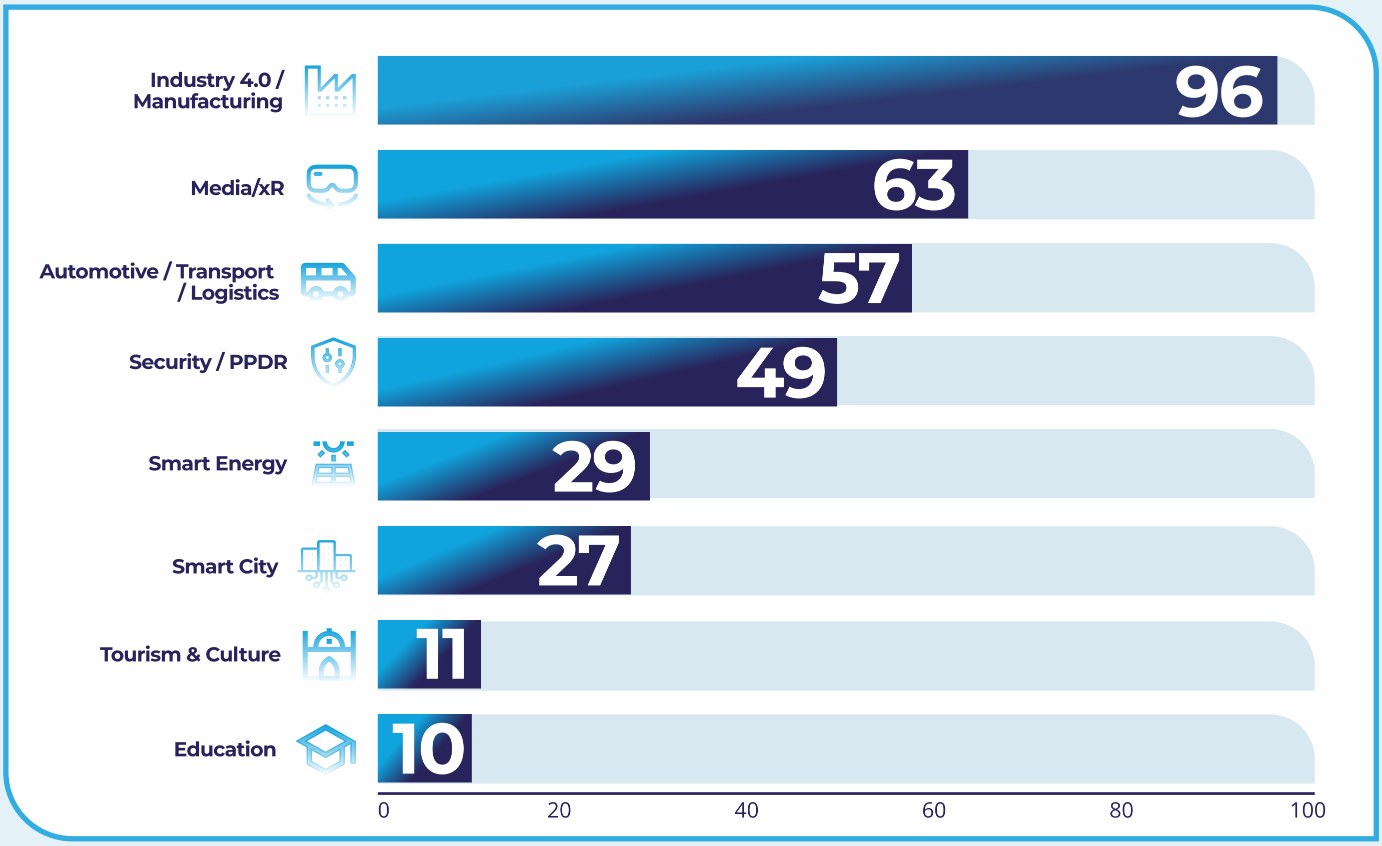

Figure 44 - SNS Verticals Engagement Tracker (VET) – SNS JU Projects Targeted Verticals Sectors

According to the SNS JU VET and inputs included as of May 2026, (1) Early modelling (TRL2) and Proof of Concept/Simulation (TRL3) remain the most widely used validation methods across the overall set of SNS JU projects. At the same time, however, Trials (TRL5-6) and Pilots (TRL7) are showing significant growth, reflecting both the increasing maturity of individual SNS JU projects and the progressive development of the SNS JU programme through its successive phases. As expected, there are also substantial Lab Test achievements (TRL4), representing an intermediate stage between Proofs of Concept and Trials.

4 https://sns-trackers.sns-ju.eu/vertical-engagement-tracker

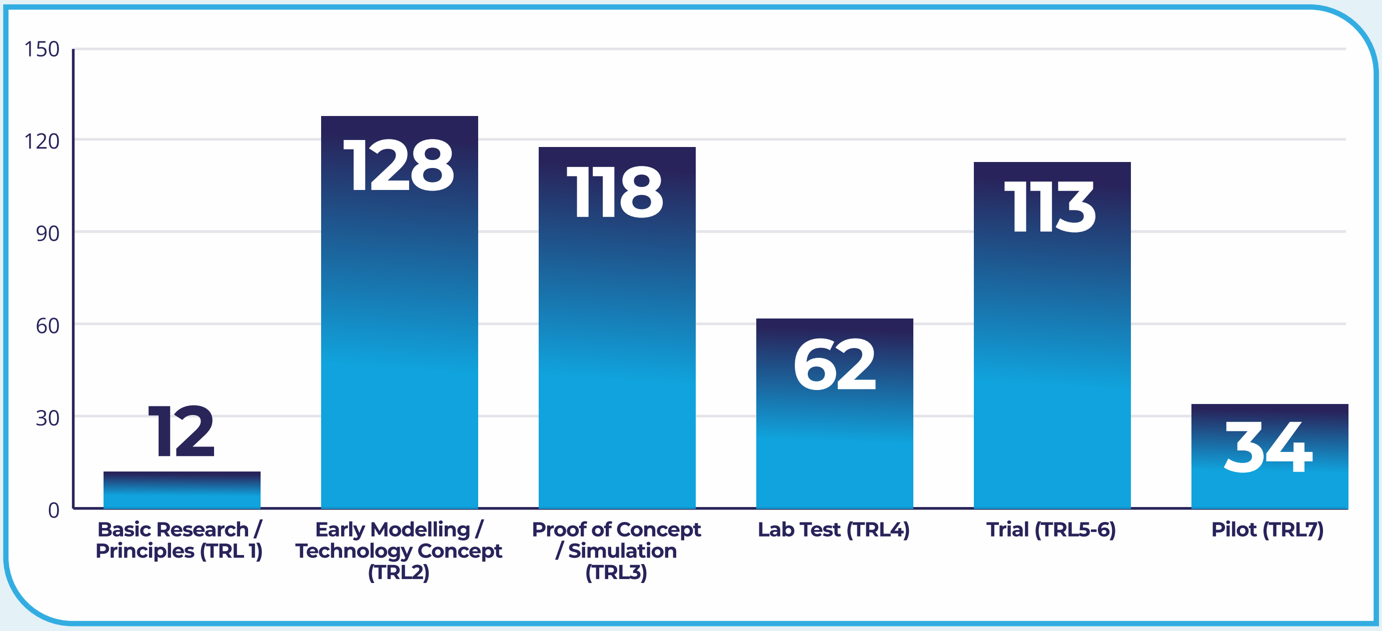

Figure 45: SNS JU Verticals Engagement Tracker (VET) – SNS JU Projects Validation Methods / TRLs

Based on the SNS CO-OP annual questionnaire (SNS JU Calls 1, 2 and 3 projects) and as highlighted in SNS JU T&Ps Brochure n°1, Figure 46 summarises the end-user equipment used in testing and trials across these projects. Mobile phones were by far the most common used User Equipment (UE), followed by Customer Premises Equipment (CPEs), IoT sensors, and modems/routers, while more specialised devices were deployed for targeted use cases.

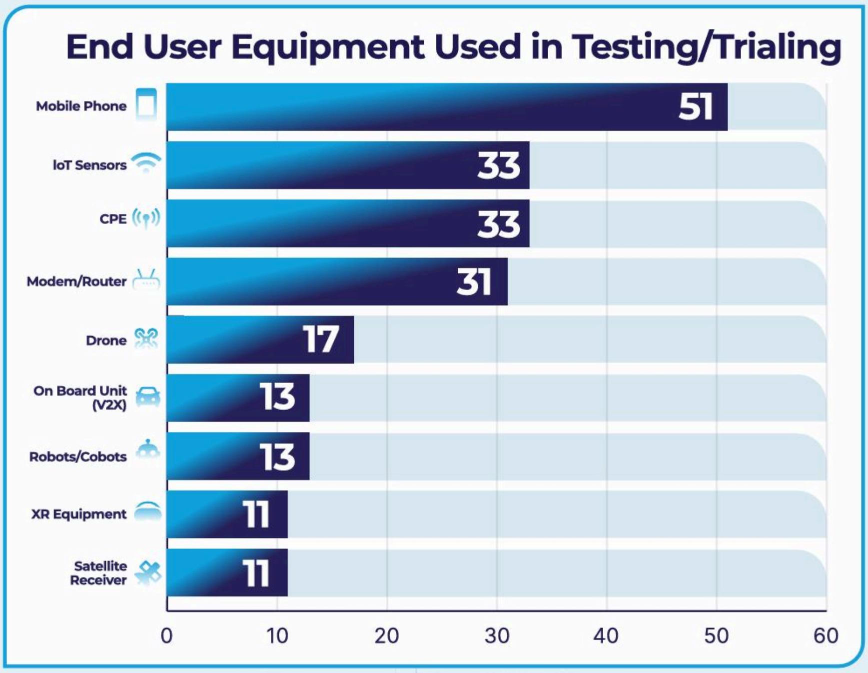

Figure 46: CO-OP Questionnaire Analysis – SNS JU Calls 1, 2 and 3 End-User Equipment for Testing/Trialing

Some of the key 5G, 5G Advanced and 6G enabling features demonstrated in this SNS JU T&Ps Brochure n°2 include:

- ☑ Cloud-native 5G/B5G infrastructure delivers the high throughput and low latency required for high-resolution sensor data fusion and real-time edge decision-making. It enables massive data transfers from distributed sensors (e.g., peak throughput target of 500 Mbps), which previous generations could not reliably support for such high-stakes security applications.

- 5G enables reliable low-latency communication, high-bandwidth video streaming and extended coverage for autonomous maritime operations. Features such as network slicing, International Mobile Subscriber Identity (IMSI) prioritisation and stable Reference Signal Received Power (RSRP) values allowed safe remote control and autonomous navigation, capabilities not feasible with legacy radio frequency systems. The results highlight the relevance of 5G as a key enabler for advanced maritime autonomy and mission-critical services.

- The upper 6 GHz band (3GPP n104, 6,425 MHz-7,125 MHz) is validated as a cornerstone for IMT-2030 (6G). Unlike previous generations limited by sub-6 GHz congestion or mmWave coverage gaps, this spectrum offers a unique balance of macro-scale coverage and very high capacity (supporting 200 MHz channels). 5G Advanced technologies, particularly high-density Massive Multiple Input Multiple Output (MIMO) and beamforming, compensate for propagation losses and help achieve coverage performance comparable to existing 3.5 GHz deployments. This enables 6G to deliver consistent, multi-gigabit connectivity required for next-gen urban applications, such as immersive Extended Reality (XR) and dense IoT, while avoiding the environmental impact of deploying thousands of additional small cells.

- The deployment validated the efficiency of Extended Reality (XR) and robotic inspection within an end-to-end managed 5G environment. Integration with edge computing showed the potential for zero-touch operation and reduced operational expenditures, as scanning tasks and visualisation could be centrally orchestrated. Open interfaces enabled a high degree of modularity, allowing external tools (Quality of Service/Experience) measurements, XR clients, and haptic gloves to be seamlessly plugged in. These capabilities were not achievable with previous wireless generations, enabling collaborative inspection in operational environments.

- The 5G private network solution was demonstrated as a key enabler for responsive and tightly synchronised Mixed Reality (MR) experiences. Its combination of high throughput, reliable uplink performance, and consistently low end-to-end latency proved essential for coordinating multiple users and delivering real-time immersive media. Advancements expected with 5G Advanced and 6G, such as deterministic and guaranteed latency, AI driven network optimisation, and more sophisticated network slicing, will further expand the capabilities of cultural and creative institutions using Extended Reality (XR). These enhancements will support richer and more photorealistic graphics, larger participant groups, and enable more complex, interactive, and high-fidelity immersive installations.

- Key network performance characteristics were identified as essential for large-scale smart airport deployments. Uplink throughput requirements of approximately 5 Mbps per robot were needed for continuous video streaming, while downlink requirements of around 2 Mbps per robot supported control functions (baseline specifications for multi-robot environments). Round-Trip Time (RTT) latency averaged 20-25 ms for low-data Message Queuing Telemetry Transport (MQTT) traffic, 25-30 ms for video streaming. These findings align with emerging 6G requirements for Ultra-Reliable Low-Latency Communications (URLLC) and High-Reliability Low-Latency Communications (HRLLC), which are essential for industrial robotic applications. Future 6G networks are expected to provide ultra-low latency below 1 ms, deterministic communication with minimal jitter, and massive machine-type communications supporting thousands of concurrent devices.

- Demonstration that mission-critical emergency healthcare operations require capabilities beyond legacy networks. Ultra-low latency, high uplink capacity for live video and vital-sign data, reliable connectivity under load, and edge-enabled AI analytics are essential for real-time triage and coordination. Future 5G Advanced and 6G features—deterministic latency, AI-native network management, advanced network slicing, and integrated sensing and communication—will further enable scalable, resilient, and autonomous emergency healthcare systems not feasible with previous generations.

- The IMS Data Channel validated in the pilot further enhances the 5G system by introducing data channel capabilities over traditional mobile-to-mobile calls, enabling new value-added forms of communication. By hosting applications within the IMS platform, mobile operators can guarantee session management, quality of service, reliability, seamless mobility and security. In combination with 5G Advanced New Radio features, the enriched services can keep end-to-end low latency and leverage the high capacity of new frequency bands, delivering a significantly improved user experience compared to previous generations.

- Unlike legacy networks, 6G supports AI-assisted decision making, policy-driven Security Orchestration, Automation and Response (SOAR) loops and dynamic slice reconfiguration, enabling fine-grained isolation of malicious traffic while preserving service continuity. Secure onboarding, cross-domain orchestration and Development, Security and Operations (DevSecOps) integration further enhance scalability and trust. Together, these features enable autonomous, resilient and trustworthy digital services, positioning 6G networks as active security enablers rather than passive connectivity providers. This trial demonstrates how 5G Advanced and 6G capabilities deliver security and resilience levels beyond those achievable with previous generations, combining end-to-end network slicing, ultra-low latency control loops and intent-based policy management.

- Demonstration of the viability of large-scale usage of Extended Reality (XR)-enabled devices, and the delivery of XR-tailored content over next generation of mobile networks, while enhancing student learning experiences and helping to reduce discrepancies between students in rural and urban environments. By leveraging existing 5G technology for the access and transport of network-intensive XR content, and incorporating emerging 6G capabilities such as advanced dynamic slicing and Quality of Service (QoS) management, the trial highlights the tangible and near-term impact that advanced network technologies can have on education.

- The system ensured reliable connectivity between the nurse's Non-Public Network (NPN) and the remote wound care expert. It enables communication between mobile devices and a local 3D printer in remote areas, using satellite as a fallback. The testbed achieved sub-second upload latency of 3D scans. Flexible routing through traffic steering supported local printing and optional edge-based Wound Analytics for large 3D scans. Quality on Demand mechanisms maintained low latency during Over-The-Top (OTT) video calls. Closed-loop coordination is being evaluated to enable just-in-time transmission and processing of large 3D models, improving integration into nursing workflows. Overall, the solution introduces an evidence based, objective approach to remote patient care, increasing patient safety.

- Moved beyond baseline 5G by demonstrating 5G-Advanced capabilities, including enhanced slicing granularity, improved uplink performance for high-resolution Unmanned Aerial Vehicle (UAV) streams, and tighter edge integration for time-critical AI workloads. It validates the network ability to deliver predictable performance under concurrent, heterogeneous service demands, an essential step toward 6G service-aware and compute-integrated architectures. The results support the evolution toward deterministic, programmable networks capable of natively integrating sensing, communications, and distributed intelligence for autonomous agricultural systems.

Please note that significant achievements and results across a wide range of vertical sectors have been thoroughly documented in recent SNS JU programme White Papers and Webinars. These materials provide valuable insights into the progress and impact of the initiatives undertaken within the scope of SNS JU activities.

In addition, a considerable number of the SNS JU Trials and Pilots are currently undergoing further development, validation and refinement as part of their ongoing implementation lifecycle. The results emerging from these activities will be progressively included into future editions of the SNS JU T&Ps brochures, ensuring that the latest technical and operational advancements are adequately captured.

More broadly, this continuous update cycle across dissemination channels ensures a coherent and up-to-date representation of SNS JU achievements, strengthening visibility, traceability, and knowledge transfer across the full ecosystem of stakeholders.

Conclusion and Next Steps

This SNS JU SNS Trials and Pilots Brochure n°2 has provided a summary overview of 12 outstanding T&Ps. Many SNS JU projects are currently further developing their R&I and producing further significant results including with specific T&Ps addressing key vertical industries in the path to full digitisation.

This SNS JU T&Ps Brochure n°2 will certainly encourage readers to look for more information and details, visit the SNS JU and projects websites, watch the T&Ps videos, read the related documents, interact with SNS JU participants in meetings, workshops, and conferences.

Many new achievements are expected in the coming months/years through the further development of the SNS JU Phase 2 and Phase 3 projects.

A third edition of the Brochure may be targeted beginning of 2027, highlighting more Trials and Pilots, breakthrough innovations and the continued evolution of Europe's 6G ecosystem.

Trials & Pilots Brochure n°2 Editors and Champions

The editors/Core Team of this SNS Trials and Pilots Brochure n°2 are Didier Bourse (Nokia), Kostas Trichias (6G-IA), Alexandros Kaloxylos (6G-IA), Carles Antón-Haro (CTTC), Mikael Fallgren (Ericsson), Carole Manero (IDATE), Valeriya Fetisova and Veronica Vuotto (TRUST-IT).

The Members of the T&Ps Brochure n°2 Panel having evaluated/selected the 12 T&Ps are listed in the following table.

Panel Participants	SNS Roles
Didier Bourse (Panel Chair)	6G-IA SNS Work Programme Task Force / Core Team (Chair), Trials Working Group (WG), TB, Verticals Task Force (VTF)
Kostas Trichias	6G-IA Office, SNS Technology Board (TB) (Chair)
Carles Antón-Haro	6G-IA Board, Trials WG (Chair), Verticals Task Force (VTF)
Paul Harris	Trials WG (Vice-Chair)
Alexandros Kaloxylos	6G-IA Executive Director, Trials WG, TB, Verticals Task Force (VTF)
Mikael Fallgren	SNS SB (Chair)
Raffaele de Peppe	6G-IA Board, Verticals Task Force (VTF) (Chair), Trials WG
Veronica Vuotto	Verticals Engagement Tracker (VET), COMMS WG, Pre-Std WG (Vice-Chair)
Valeriya Fetisova	Verticals Engagement Tracker (VET), COMMS WG, SNS CO-OP WP4 Leader
Jyrki Huusko	Trials WG
Carole Manero	COMMS WG, SNS Journal, Trials WG
Mir Ghoraishi	Trials WG
Hakon Lonsethagen	6G-IA Board, Vision WG (Co-Chair)
Omer Bulakci	Architecture WG (Chair or Vice-Chair)
Michael Dieudonne	TMV WG (Chair)
Dimitris Tsolkas	Reliable Software Network WG (Chair or Vice-Chair)
Christoph Schmelz	Sustainability WG (Chair)
Javier Garcia	SNS CO-OP WP3 Leader
Pierre-Yves Danet	6G-IA Office Replicability
Pavlos Fournogerakis	SNS Office

The following table summarises the key SNS JU Champions involved in the 12 Trials & Pilots highlighted in this SNS JU T&Ps Brochure n°2.

	Trials & Pilots Champions
FIDAL - Open Call-SwarmCatcher	Dr. Antonios Lalas, Centre for Research and Technology Hellas (CERTH) / Information Technologies Institute (ITI), Dr. Konstantinos Votis, Centre for Research and Technology Hellas (CERTH) / Information Technologies Institute (ITI), Georgios Glentos, KIBO-G. GLENTOS S.A. (KIBO Cabins)
IMAGINE-B5G - Autonomous Boat for Safety & Security with 5G (AbySS-5G)	Jaime Ruiz (Nokia), Cesar Martinez (UTEK), Joan Meseguer (Fundacion Valencia Port), Arturo Torrealba (Telefonica) and Ricardo Nicanor (Universitat Politècnica de València (UPV))
IMAGINE-B5G - Connectivity on Upper 6 GHz (n104) Proof of Concept	Lucia Martinez (UPV), David Gomez-Barquero (Universitat Politècnica de València (UPV), Jaime Ruiz (Nokia), Carles Navarro (Keysight) and Arturo Torrealba (Telefonica)
IMAGINE-B5G - Smart Component Analysis through Novel XR Environments and Robotics (SCANNER)	Juha Kela and Tapani Rantakokko (Finwe), Muhammad Faheem Awan (Telenor Research and Innovation) and Konstantinos Kousias (University of Oslo)
TrialsNet - Remember Ascari	Created and Produced by MIAT - Credits: Elisabetta Rotolo, Siobhan McDonnell (Director), Lewis Ball (Writer), Elisabetta Rotolo (Executive Producer/Creative Producer/Producer), Daniel Stankowski (Lead XR Design), Stephen Stephenson (Art Direction), Michele Falasconi, Luca Meloni (Artist), Mustafa Bal (Music Composition & Sound Design), Paolo De Rocco (Director of Photography/Shooting/Editing/Compositing), Carlo Borean (Director of Photography/Shooting/Editing/Compositing - Courtesy of Centrica), Matteo Milani (Voice Narration & Car Sound Recordings), Lorenzo Di Tria (Voice Narration & Car Sound Recordings - Courtesy of U.S.O. Production), Saverio Buono (Narration), Antonio Ascari, Alberto Ascari, Christian Zecca (Cast), Ian Thomas Szemere (Young Alberto Ascari), Giorgio Shön (Alberto Ascari Driving on Monza Race Track), Patrizia Ascari (Alberto Ascari's daughter)
TrialsNet - Service Robots for Enhanced Passengers Experience	Eleni (Nelly) Giannopoulou, Antonis Karaolanis, Charalambos Korovesis, Irene Kolokytha, Nikos Tzagkarakis, Ioannis Panagopoulos, Miltiadis Filippou, Lefteris Amitsis and Panagiotis Demestichas (WINGS) and Nikolaos Papagiannopoulos and Sofia Saliverou (AIA)
TrialsNet - Mass Casualty Incident (MCI) and Emergency Rescue in Populated Areas	Gianna Karanasiou, Ioannis Stenos, Manos Anezinis, Vera Stavroulaki and Panagiotis Demestichas (WINGS), Ilia Christantoni and Dimitra Tsakanika (DAEM), Aruna Prem Bianzino and Marco Gramaglia (UC3M) and Aristotelis Spiliotis, Ioannis Symeonidis, and Matina Loukea (CERTH)
6G-XR - IMS Control Plane Optimisations for Holographic Communications	Matus Kirchmayer, Ali Daniali and Lubomir Pangrac (Matsuko), Fernando Pargas Nieto (Telefonica) and Rocio Dominguez and Diego San Cristobal (Ericsson)
RIGOUROUS - Protection of 6G-enabled Services against Cyber Threats	Antonio Skarmeta, Jorge Bernal and Santiago Corcoles (University of Murcia) and João Paulo Barraca and Rui Aguilar (IT-University of Aveiro)
6GPATH - UC-EDU-1 XR Rural Schools.	Andra Carmen Lazar (Orange Foundation) and Ioan Constantin (Orange (Romania)
6GPATH - UC-HEALTH-1 3D Bioprinted Patch for Chronic Wounds Patients	Andreea Corici (Fraunhofer Fokus) and Nils Lahmann, Simone Kuntz and Martin Hocquel-Hans (Charité)
6GPATH - UC-FARM-1 B5G for Precision Agriculture	Juan Losada (CSIC) and Almudena Díaz Zayas (University of Málaga)

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