Welcome to the MULTIX Newsletter!

Welcome to the second edition of the MultiX newsletter! The second half of 2025 has been a period of immense productivity for our consortium. Over the last six months, we have successfully achieved Milestone 3 (MS3), released our first major technical architectures, hosted our second plenary meeting, and published groundbreaking research across top-tier global conferences

MultiX Newsletter #2: Pushing the Boundaries of ISAC and 6G Architecture

Period: July 2025 – December 2025 (Months 7-12)

Launched in January 2025, the MultiX-6G Project brings together a consortium of 17 partners from 7 European countries. As we complete our first full year, we are transitioning from laying the theoretical groundwork to active experimental validation. Through our 6G ISAC (Integrated Sensing and Communication) roadmap and new Open Lab deployments, we continue to revolutionize next-generation connectivity by turning networks into intelligent, perceptive systems.

🎯 Spotlight on WP1: Defining the 6G ISAC Roadmap & Standardization Success

The collection and analysis of our core use cases represent a key milestone in defining the foundational framework for the MultiX Perceptive 6G-RAN system. Through WP1, we have shaped the system design and operational scenarios by defining specific applications that demonstrate the power of 6G ISAC.

The 6G Perceptive Use Cases: We have outlined six transformative scenarios, including:

- Precise tracking and trajectory control for UAVs (drones) to support safe logistics and delivery services.
- Touchless gesture control for machinery, improving worker ergonomics and safety in factory settings.
- Privacy-compliant customer analytics for retailers to optimize store layouts.
- Transforming wireless infrastructure into a non-invasive security system for intruder detection.
- Two primary scenarios that will be directly validated in our project's Proofs of Concept (PoCs): integrating sensing in a Multi-Layer Digital Twin for collaborative robotics, and using RF signals for contact-free health monitoring (detecting vital signs and falls indoors).

Standardization Impact: We are proud to announce a major standardization achievement: three of the MultiX use cases and their requirements have been successfully submitted to 3GPP and are now officially included in the **3GPP 6G Study TR 22.870**!

Measuring Success: KPIs and KVIs: To ensure our 6G technology serves the broader interests of society, we distinguish between technical performance and qualitative societal impact:

- **Performance (KPIs):** Technically, we are targeting centimeter-level positioning accuracy and ultra-low latency sensing to support real-time applications.
- **Societal Value (KVIs):** We measure our qualitative success through Key Value Indicators, including environmental, social, and economic sustainability, as well as user trust, acceptance, and overall cost efficiency.

Privacy by Design: Our roadmap ensures strict alignment with European regulations, including the GDPR, Data Act, and the AI Act. By building a system that respects personal boundaries by design and prioritizes privacy and confidentiality, we aim to create a 6G ecosystem that people not only use but truly trust.

🛠️ Spotlight on WP4: Integration Framework and Open Lab Deployments

As we transition from architectural design to experimental validation, Work Package 4 (WP4) has reached a major milestone this semester. WP4 coordinates the hands-on integration of our technologies, ensuring that the theoretical models developed across the project seamlessly translate into functional, real-world testbeds.

Defining the Validation Methodology (D4.1) We have successfully completed deliverable **D4.1**, which outlines the initial integration and validation methodology that will govern all experimental activities throughout the project. This robust framework is built around structured experiment and test templates, guaranteeing consistency and reproducibility across all our Proofs of Concept (PoCs). It establishes a clear roadmap, perfectly aligning the software deliveries from WP2 and WP3 with the active testbed integration activities that kicked off in December.

Gearing up the MultiX Open Labs: Across the consortium, testbed preparation and initial software deployments are actively underway, bringing our perceptive network to life:

- **Madrid Open Lab**: The 5TONIC and IMDEA facilities are currently being configured to host the MultiX Perception System (MPS) and the MP6R Controller.
- **UC/IHP Open Lab:** Our integration here focuses on Sub-6 GHz, mmWave (60 GHz), and OTFS testbeds. We are thrilled to report that early sensing results have already been obtained for presence detection and multi-target localization.
- **KU Leuven Networked Systems Open Lab**: Targeting crucial channel data collection using its Distributed Massive MIMO and 6G REF-RAN testbeds. To support our eHealth PoC 2 experiments, Motion Capture and CNC positioning systems are now fully integrated for precise ground-truth labeling.
- **Siemens Technikum (Garching)**: Current integration activities at this industrial lab include a BubbleRAN-based 5G gNB with sensing capabilities, an O-RAN RIC, a UC3M mmWave Wi-Fi sensing system, and a NEC Reconfigurable Intelligent Surface (RIS).

These collective integration and validation efforts are laying the essential groundwork for our upcoming live showcases. Get ready to see these Open Lab results materialize at **MWC 2026** and **EuCNC 2026** in our **following newsletters**!

📜 Technical Milestones & Key Deliverables

This semester marks a crucial step in defining the core architecture of our project. We are proud to announce the release of our foundational technical deliverables, which lay the structural and theoretical groundwork for the MultiX ecosystem. All public documents are now available on our Zenodo Community:

- **D1.1 - MultiX Perception 6G Use Cases, Reference Scenarios, Requirements, and KPIs**: This foundational document sets the stage for the project, defining the roadmap for 6G Perceptive Networks across six representative use cases (Industrial, Smart Home, Healthcare, UAV, Gesture, and Retail) that showcase the power of ISAC. Read it here: https://zenodo.org/records/18401312
- **D2.1 - MultiX Perceptive 6G-RAN System Design**: Unveils the blueprint for our perceptive Radio Access Network. This includes the hybrid integration of 3GPP and non-3GPP sensing technologies and the initial design of DASH (Data Access and Security Hub), prioritizing security and privacy in data access. Read it here: https://zenodo.org/records/18222516
- **D3.1 - MultiX Perception System Enablers**: Lays the foundation for the MultiX Perception System (MPS), introducing m-SePFs (Measurement Sensing Processing Functions), the modular signal-processing blocks that will power the architecture. It introduces ISAC enablers for the FR3 band, multi-static & Wi-Fi sensing fusion, and energy-efficient AI strategies (such as Neuromorphic/Spiking Neural Networks) targeting a ≥20% reduction in AI energy consumption. Read it here: https://zenodo.org/records/18401558
- **D4.1 - Integration and validation plans and Open labs design**: Outlines the initial integration and validation methodology that will govern all experimental activities throughout the project, ensuring consistency and reproducibility across our Proofs of Concept (PoCs) through structured experiment and test templates. Read it here: https://zenodo.org/records/19183735
- **D5.3 - Communication, Dissemination and Exploitation Plan (CoDEP) Report for Reporting 1**: Details the progress and ongoing strategy of our global outreach to maximize our impact on 6G ecosystems and standardization bodies.
- **D6.2 - First Periodic Report of the Project**: A comprehensive summary of our successful achievements, milestones, and technical progress during the first year of the MultiX Project.

Spotlight: MultiX Plenary Meeting in Madrid

This fall, the MultiX consortium gathered at the **Universidad Carlos III de Madrid (UC3M)** for a highly productive three-day plenary meeting. Hosted in the beautiful city of Madrid, this gathering was a pivotal moment for our team to reconnect, share progress, and align our vision for the future of intelligent 6G networks.

During the sessions, we drove deep into our technical work packages, focusing specifically on integrating **Multi-Sensor Fusion** and discussing the latest architectural enhancements required for our perceptive 6G RAN. The collaborative energy was infectious, allowing us to streamline our transition from theoretical models to experimental validation.

We left Madrid energized and fully aligned, with a solid foundation laid for the next phase of the MultiX Project.

Events & Global Outreach

Throughout the second half of 2025, the MultiX consortium actively engaged with the global telecommunications and research community. From hosting our own internal plenaries to presenting at major industry summits, here is where we have been sharing our vision:

- **ISAC Workshop (Madrid)**: Following the ETSI ISG ISAC meeting in July, UC3M hosted a joint workshop with the DISCO6G project to foster synergies on the integration of sensing and communication.
- **InfoCom World 2025 (Athens)**: In November, our partner OTE represented MultiX at the 27th InfoCom World conference under the theme "AI-Volution". They showcased how MultiX is bridging the gap between communication and perception by presenting our use cases and KPIs/KVIs.
- **Techritory Forum 2025**: Our coordinator Antonio de la Oliva presented the “MultiX Vision and Technical Approach” at the 6G IA workshop, outlining our strategic roadmap for moving ISAC from a technical promise to a commercial reality.
- **GACLM 2025 (Virtual/Valencia):** In August, Valerio Frascolla delivered a keynote titled "Regulation of Data and AI, why it is important" at the 2nd International Generative AI and Computational Language Modelling Conference. He presented the MultiX vision on the critical need for compliance with European regulations when defining the forthcoming 6G architecture.
- **SoftCOM 2025 (Split, Croatia):** Alongside presenting a paper, Valerio Frascolla represented the MultiX vision in the industrial panel at the 33rd SoftCOM conference in September, sharing key insights on the impact of Artificial Intelligence in the industrial sector.
- **EBDVF 2025 (Copenhagen):** Valerio Frascolla organized and moderated the insightful panel "Empowering Europe’s future with AI and Data: the present and future of industrial AI in Europe", which served as a successful joint collaboration between the INTEND and MultiX projects.

Research Highlights & Innovations

Our consortium partners have been incredibly active in sharing MultiX innovations with the scientific community. Pushing the boundaries of wireless sensing, artificial intelligence, and network orchestration, here are some of our top publications from this semester (including a few highlights from earlier this year!):

- **REACT** (ICRA 2025, Atlanta): i2CAT presented an energy-aware multi-robot orchestrator for indoor Search and Rescue (SAR) critical tasks, boosting exploration and coverage through collaborative robotics.
- **RISENSE** (ACM MobiSys 2025): We introduced a novel in-band wireless control interface for passive Reconfigurable Intelligent Surfaces (RIS), directly leveraging the existing 5G data channel to seamlessly integrate with current 5G pipelines.

- **COLoRIS**: We published an innovative, low-complexity, low-energy solution for RIS-based user localization that operates efficiently on a microcontroller.
- **Wi-Fi Sensing Breakthrough** (Globecom 2025, Taipei): In December, Intel's Jessica Sanson presented a novel method to extract high-precision Range-Doppler information from moving targets using commercial Wi-Fi Channel State Information, all without hardware modifications.
- **RiLoCo**: We published an ISAC-oriented AI solution leveraging reinforcement learning to optimize the deployment and placement of RIS devices in 6G networks.
- **UAV Localization** (IEEE WCNC 2025): i2CAT published cutting-edge research leveraging 5G-New Radio (NR) for finding mobile devices with UAVs, achieving sub-meter positioning accuracy for critical Search and Rescue missions.
- **Human Sensing with mmWave Radar**: We introduced the first network architecture capable of open-set gait recognition from sparse mmWave radar point clouds. To advance open science, we also released **mmGait10**, a new dataset with over five hours of radar measurements.
- **AI-Enhanced Seamless Handover (SoftCOM 2025, Split):** In September, Valerio Frascolla and co-authors presented the paper "AI-Enhanced Seamless Handover in Wi-Fi Networks with Multi-Link Management" at the 33rd SoftCOM conference, contributing to the advancement of seamless network management and AI integration.

Media Features & New Resources

Beyond academic publications and technical deliverables, MultiX continues to make headlines and produce accessible content. We have been featured in major industry journals and released new multimedia resources to help the public understand the potential of perceptive networks:

- **The Innovation Platform**: MultiX was prominently featured in an article titled "Sensing the future: How MultiX is turning 6G networks into intelligent eyes and ears" (p. 80), exploring how we are building real-time awareness through sensor fusion and digital twins.
- **SNS Journal 2025**: We were thrilled to be featured in the newly released SNS Journal 2025 (pages 186-189), detailing how our MP6R system is revolutionizing the RAN design.
- **MultiX Integration Video**: We released a new video featuring Giada Landi from NextWorks, explaining their crucial role in coordinating the integration work and bringing our 6G architecture to life.

📣 Stay Connected! 🌐

Don't miss any updates on our journey to redefine 6G. Follow us on your preferred platform:

- **Website:** https://multix-6g.eu/
- **LinkedIn:** MultiX-6G
- **X (Twitter):** @MultiX6GProject
- **Mastodon:** @MultiX6GProject
- **Bluesky:** @multix-6gproject.bsky.social
- **YouTube:** MultiX-6GProject