SMART INDUSTRY

# 5GECO

**Intelligent, flexible and automated management of neutral host sharing on an Open Radio Access Network with a shared transport network**

## SETTING THE SCENE

The rollout of public 5G networks is anticipated to be significantly more expensive than previous generations of wireless communication networks, with projections estimating costs up to ten times higher. A key factor is the need for more radio sites compared to 4G, especially in hyper-dense urban areas. Additionally, the increased throughput demands more advanced and extensive optical transport networks.

Alongside these rising expenses, there is a growing demand for faster, more reliable connectivity with lower latency. Operators face the challenge of balancing energy consumption with coverage requirements to deliver sustainable and dependable network services. Moreover, they must navigate stringent regulations, taxation, and intensified competition.

To overcome these challenges and successfully implement public 5G networks, operators need innovative approaches. As part of the solution, this project explores intelligent network-sharing strategies to reduce the cost of deploying 5G.

## FRAMING THE RESEARCH OBJECTIVE

To improve the efficiency of 5G deployment, the 5GECO project aims to develop an Intelligent Neutral Host (INH) platform that integrates Open Radio Access Networks (O-RAN), edge computing, and a network-sharing architecture.

This platform will support AI-enhanced algorithms within the RAN Intelligent Controller to enable a smarter, more adaptive network management. Additionally, 5GECO will unify the control planes for Radio Access Network (RAN) and edge Software Defined Network (SDN), facilitating seamless coordination between RAN and transport networks. This will improve the overall network performance, scalability, and resource efficiency.

## FOUR MAIN OUTCOMES

These are the main outcomes of the 5GECO project:

- **Intelligent Neutral Hosting.** We deployed a neutral hosting solution, showcasing a next-generation architecture for operators of mobile networks that seek to reduce the total cost of ownership of their solutions and create new opportunities for innovation in business models and services.
- **Cross-optimization of Radio Access and Transport Networks.** We introduced Low-Latency, Low-Loss, and Scalable Throughput (L4S) technology to enable seamless network and application symbiosis. This was specifically aimed at delivering end-to-end low latency for real-time services such as cloud gaming. Additionally, we developed a Dynamic Physical Resource Block (PRB) allocation solution that leverages monitoring and interactions across different network domains.
- **Machine Learning for Management and Orchestration (MANO) of network functions.** We designed and developed machine learning algorithms that manage and orchestrate the different network functions of a 5G Network. This way, our INH network provides self-optimizing capabilities that ensure the best performance possible.
- **Integration of machine learning lifecycle management.** To fully automate the INH control, we developed the enablers to achieve zero-touch deployments of machine learning-empowered network functions. This enables native integration of these functions in the network.

With these outcomes, we set up two demonstrators:

- **Intelligent Neutral Host.** In this INH, we implemented several algorithms for dynamic Radio Resource Management (RRM) policy application, showcasing the capability to better adapt resources to fulfill different Service Level Agreements while maintaining the high performance. We also deployed a Multi-Operator Core Network (MOCN) scenario in which

the Centralize Unit (CU) part of the 5G RAN decides where and how to route traffic from various UEs over different core networks.

- **Smart Football Stadium.** This demonstrator aimed at cross-optimizing the end-to-end networks and user experience using L4S technology in a real-world 5G network deployment at the football stadium of KRC Genk. The result was a significant improvement not only in lower end-to-end latency but also in user experience for all tested applications, even when the 5G network was congested.

Alongside these demonstrators, we also achieved positive results in more experimental setups, mainly on the MANO of 5G networks to intelligently scale and adapt computing resources based on machine learning algorithms. We further integrated Machine Learning Operations (MLOps) into our deployment framework to enable fully automated, intelligence-driven network orchestration.

## NEXT STEPS

The project demonstrated the feasibility of the INH architecture, the advantages of cross-domain optimization and the power of machine learning for scaling computing resources. The project partners will continue to invest in these technologies and architectures. We believe that the results achieved during the 5GECO project can be translated into real gains in future networks. This includes a better quality of experience for the users, more reliable and optimized networks, and substantial improvements in the cost of ownership for the operators that venture into new opportunities and service models.

AI4FoodLogistics project partners:

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## FACTS

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| NAME | **5GECO** |
| OBJECTIVE | Design and develop an Intelligent Neutral Host platform that integrates O-RAN, edge computing, and network-sharing architecture while unifying RAN and edge SDN control plans to support cross-optimizing domain optimization. |
| TECHNOLOGIES USED | 5G, neutral hosting, machine learning, L4S, dynamic resource management |
| TYPE | imec.icon project |
| DURATION | 01/03/2022 – 31/05/2024 |
| PROJECT LEAD | Jens Buysse, Citymesh |
| RESEARCH LEAD | Miguel Camelo, imec – IDLAB - UAntwerpen |
| BUDGET | 3.065.502,64 euro |
| PROJECT PARTNERS | Citymesh, Accelleran, Nokia Bell Labs |
| RESEARCH GROUPS | imec – IDLab – Ugent, imec – IDLab – UAntwerpen |
| USER GROUPS | K.R.C. Genk Stadium |

WHAT IS AN

## IMEC.ICON PROJECT?

The imec.icon research program equals demand-driven, cooperative research. The driving force behind imec.icon projects are multidisciplinary teams of imec researchers, industry partners and/or social-profit organizations. Together, they lay the foundation of digital solutions which find their way into the product portfolios of the participating partners.

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