AIMM

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Project Website

www.celticnext.eu/project-aimm

AI-enabled Massive MIMO

The AIMM project targets radical performance improvements and efficiency dividends for 5G and beyond Radio Access Network (RAN) through advanced antenna array (Massive MIMO) and Reconfigurable Intelligent Surface (RIS) technologies powered through and managed by the latest advancements in AI.

The AIMM project is divided into six tightly coupled work-packages (WPs):

♦ WP1 provides the overall project management and dissemination activities.

♦ WP2 provides use case definitions including key-performance-indicators which will drive comparisons between new and existing architectural approaches.

♦ WP3 focuses on the benefits and practical realisation of extremely large antenna arrays and intelligent radio surfaces.

♦ WP4 considers the design and implementation of AI/ML-based radio interface technologies

♦ WP5 considers enabling frameworks and algorithms for AI-based RAN intelligence and automation

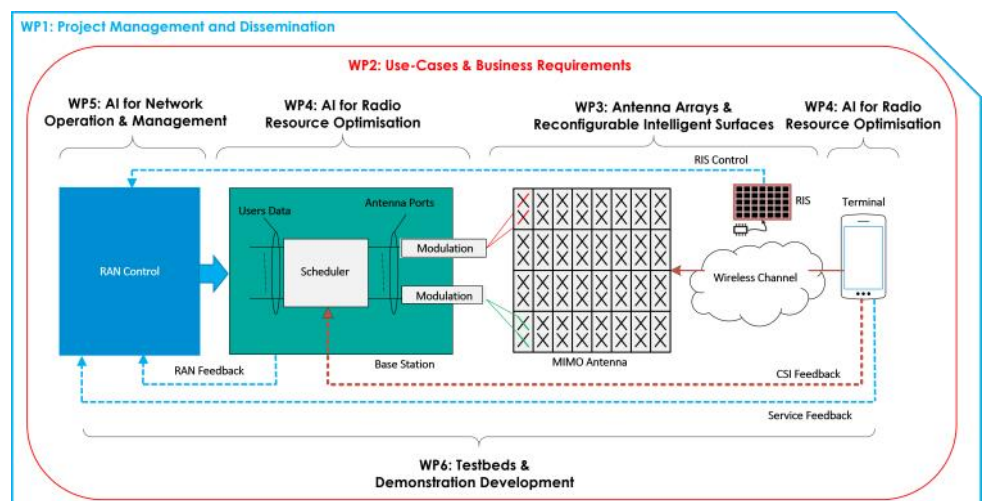♦ WP6 focuses on the building of standards-compliant testbeds for assessing and demonstration of the technical solutions

This structure has been designed to maximise interaction between different work areas while maintaining each package with a clearly defined goal and output.

Main focus

AIMM is a European collaborative project dedicated to incorporating AI capabilities in 5G and beyond RAN, from both link-level and system-level perspectives. The main focus of the AIMM project includes:

♦ Defining key-performance-indicators, use-cases, and architectures for AI-embedded 5G and beyond RAN.

♦ Exploring novel antenna configurations including collocated and distributed structures, and the use of intelligent radio surfaces for practical deployment.

♦ Building of comprehensive and sophisticated AI/ML algorithms for the air-interface and the network operation.

♦ Implementing testbeds based on off-the-shelf software-defined radio technology for both centralised and cell-less antenna systems.

Approach

AIMM will consider the use of AI in 5G and beyond RAN in two complementary aspects. A bottom-up approach to optimising the radio interface, enabling novel antenna structures and deployment techniques, and a top-down approach using AI to improve management and to optimise the RAN at a system level. For both bottom-up and top-down approaches, novel solutions will be identified and assessed, not only for the technical improvement they bring compared to existing techniques and architectures, but also for the achievable difference in cost and ease of implementation and deployment. The outputs of the AIMM project will be promoted through the relevant RAN standardisation bodies including 3GPP RAN TSG and the O-RAN Alliance to ensure market adoption of the developed solutions.

Main results

By using AI techniques and considering alternative deployment methods, including radio intelligent surfaces and cell-less antenna systems, this project will provide a route to improve the capability of 5G network implementations. The consortium will also indicate additional areas for improvement that might only be realisable if significant changes to the radio network, beyond 5G, are implemented. The major deliverables of the project are quantification of the gains that can be achieved in both capacity and customer service of the AI techniques and their commercial applicability. The various architec-

tural and algorithmic solutions will be mapped onto the AIMM testbeds for the purposes of testing towards real-world applications. We anticipate the findings of the project to unveil new and improved products in network provisioning and also in the services that can operate over the network.

In summary, AIMM will produce a wide range of outputs including enabling new differentiated services, development of intellectual property, publications in the form of conference and journal papers, multiple testbeds capturing the performance of the technical findings based on real-world deployments and use-cases, and contributions to relevant RAN standardisation bodies (namely 3GPP RAN TSG and O-RAN Alliance).
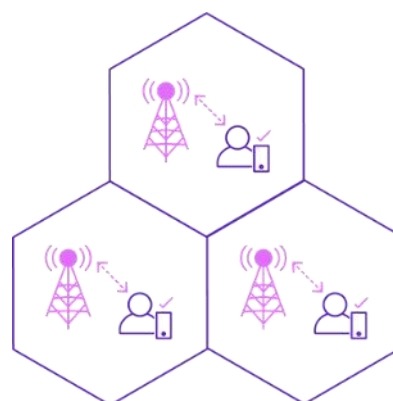
Impact

The economic benefits of the AIMM project will primarily be realised through cost reduction associated with improved connectivity, energy efficiency, and service differentiation. This will also provide a number of other benefits to industries requiring or exploiting mobile communications to satisfy end customer requirements. Obvious benefits are the ability to accommodate the continued growth in traffic without the requirement for a commensurate increase in service price. The improved capability to offer different qualities of connectivity on the same shared radio infrastructure will enable other industry sectors, including retail service providers, vertically integrated service providers and application developers to innovate
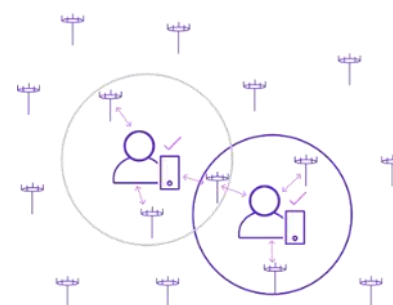
their offerings.

AIMM intends, through this partnership, for Europe to lead the innovation of the next phases of 5G telecoms networks and services. In future, the output of AIMM will be used as a building block towards future research activities and interactions with the wider industry towards B5G/6G.

Centralised Massive MIMO

Cell-less Massive MIMO

About CELTIC–NEXT

CELTIC-NEXT is the EUREKA Cluster for next-generation communications enabling the digital society. CELTIC-NEXT stimulates and orchestrates international collaborative projects in the Information and Communications Technology (ICT) domain. The CELTIC-NEXT programme includes a wide scope of ICT topics based on new high-performance communications networks supporting data -rich applications and advanced services, both in the ICT sector and across all vertical sectors. CELTIC-NEXT is an industry-driven initiative, involving all the major ICT industry players as well as many SMEs, service providers, and research institutions. The CELTIC-NEXT activities are open to all organisations that share

the CELTIC-NEXT vision of an inclusive digital society and are willing to collaborate to their own benefit, aligned with their national priorities, to advance the development and uptake of advanced ICT solutions.

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