

# Decentralized AI-native 6G network management for resilience and sustainability



The expected growth and scale of 6G networks shall demand crafting new and smarter network management paradigms. Multiple stakeholders will jointly define the ecosystem, and this poses several administrative and technical challenges. Natively embedding AI-based cycles while delegating decisions throughout the network offers the required resilience and sustainability at scale. A consortium of four industrial partners (ERICSSON Spain, EVIDEN, Software Radio Systems and Telcaria) representing the 5G and beyond value chain and led by the CTTC (Centre Tecnològic de Telecomunicacions de Catalunya) are investigating these challenges within the framework of the UNICO R+D project 6G DAWN.

6G DAWN is a 2.6M€ research and innovation project funded by the Recovery, Transformation, and Resilience Plan of the Spanish Government via the UNICO I+D programme, which fosters the creation of a Spanish industry-academia 6G ecosystem.

6G DAWN proposes a zero-touch distributed 6G network management plane to handle the deployment of a massive number of network slices (virtual networks built over the same shared physical infrastructure) covering all network segments (i.e., RAN, Transport, Core, Cloud, Extreme Edge). The main challenges are elasticity (the capacity to adapt to varying demands and network conditions to improve the energy efficiency and sustainability of the network) and resilience (guaranteeing secure and continuous operation among the multiple stakeholders). Furthermore, given the increasing scale, automated energy-aware decision-making appears as a transversal component of any sustainable 6G network. In this respect, AI is natively embedded in the architecture at the various decision levels by enabling the support of techniques such as federated learning, graph neural networks, and explainable AI, which are coordinated towards a global network-wide goal. Provided these essential characteristics, 6G networks will be well-equipped to address a wide range of vertical requirements, enabling them to become the foundational infrastructure for diverse industries, including automotive, industry 4.0, extended reality (XR), energy, eHealth, and emergency response systems, hence will become the backbone of society.

Multiple proof-of-concepts (PoCs) are being built to experimentally validate the potential of such an AI-native decentralized management architecture in a variety of close-to-real scenarios. This includes dynamically adjusting radio access network (RAN) parameters in open RANs, energy optimization of non-public networks (NPN), the integration of the extreme edge in the network management framework, intrusion detection and mitigation, and QoS and network resiliency optimization. The PoCs are deployed having the EXTREME Testbed® of the CTTC as a central experiment-as-a-service facility, with some of the components distributed in labs of the industrial partners.



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