



# CANOPY

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### Partners:

- Celfinet, Portugal
- Detecon International GmbH, Germany
- Expleo Germany GmbH, Germany
- Fraunhofer IIS/EAS, Germany
- Instituto Superior de Engenharia do Porto, Portugal

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### Project Websites

[www.celticnext.eu/project-canopy](http://www.celticnext.eu/project-canopy)  
<https://tools.celfinet.com/CANOPY/index.htm>

## Cognitive and Automated Network Operations for Present and Beyond

The CANOPY project focuses on developing Artificial Intelligence (AI) models for Mobile Network Operators (MNOs), transitioning from reactive to proactive network operations management. By continuously analysing network-generated data, these models predict and prevent performance issues, enabling MNOs to address root causes and uphold end-user service quality effectively.

### Main focus

The CANOPY project is reshaping mobile network operations by deploying advanced AI models that empower MNOs to proactively predict, prevent, and manage performance issues. Through automated data analysis and predictive fault detection, the project aims to significantly reduce Mean Time to Repair (MTTR), enhance service availability, and minimize customer complaints. This transformative approach defies the boundaries of traditional reactive monitoring modes, establishing a new industry standard in network operations amid the escalating complexity driven by the increasing number of connected elements. The expected impact includes a more resilient and efficient mobile network ecosystem, marked by increased operational efficiency, reduced costs, and elevated Quality of Experience (QoE) for end-users. Considering these goals, the CANOPY project is introducing

an array of cutting-edge solutions, including Smart Trouble Ticket Management (STTM), Smart Predictive Fault Management (SPFM), Smart Root Cause Analysis (SRCA), Secure and Energetically Efficient Network Operations, and Self-Optimization algorithms - all strategically set for smooth integration into a future Smart Network Operation Center (NOC).

### Approach

The CANOPY project's approach revolves around leveraging AI techniques to expedite decision-making, process network information in near real-time and automate network functions. By detecting known patterns based on historical data, the project predicts and addresses future occurrences of network issues proactively, enabling the implementation of self-healing actions before customer impact. AI's crucial role in enhancing NOC teams' efficiency is highlighted, utilizing specific knowledge modules for anomalous information, ticket resolution, and problem anticipation. In pursuing its objectives, the CANOPY project introduces a novel approach with a dual focus. Firstly, it integrates complementary algorithms into a unified framework. This holistic approach, while individually addressing familiar topics, innovatively contributes to building a customizable platform for multiple use cases. Secondly, the project tackles the

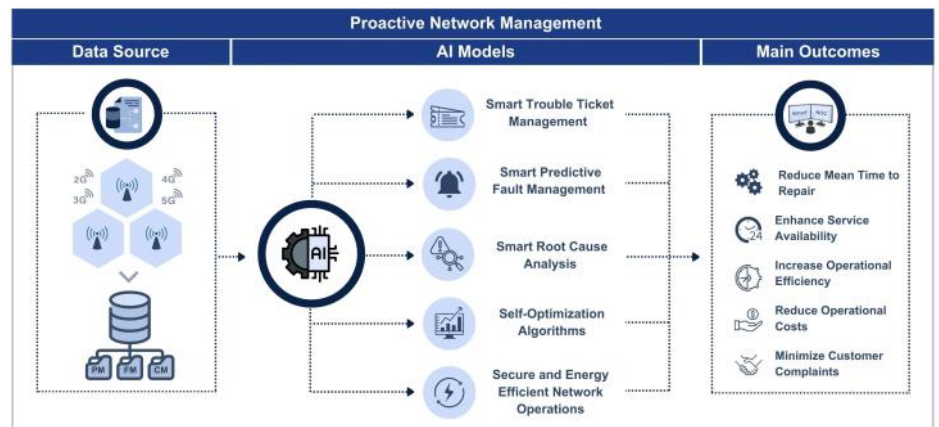


Figure 1: CANOPY Project Use Case

specific challenges posed by 5G network evolution, positioning itself as a practical research initiative to assist operators in reducing operational (OPEX) and capital (CAPEX) expenditures while meeting future network requirements. Acknowledging the sensitivity of substituting human activities with AI decisions, particularly in critical services, the project incorporates innovative approaches and leverages the latest trends in AI. Three key concepts underscore the chosen methods and algorithms:

- ◆ **Trustworthy AI with Hybrid Systems:** Integrating expert knowledge into AI algorithms, forming hybrid systems that combine data-driven and model-driven approaches.
- ◆ **Explainable AI (XAI):** Ensuring algorithmic decisions are transparent, utilizing post-hoc and ante-hoc approaches for explicit declarative knowledge representation.
- ◆ **Human-in-the-Loop (HITL) Computing:** Integrating human intelligence with AI, fostering interactive Machine Learning (ML), and maintaining human involvement for hybrid decision-making, feedback, and monitoring.

## Main results

The CANOPY project strives to establish an innovative Smart NOC, featuring key elements for transformative operational excellence:

Proactive Issues Prediction: Implementation of an advanced system

for predicting potential problems before they impact customer service, enabling early intervention to minimize disruptions.

- ◆ **Smart Auto-Ticketing Management:** Introduction of a system that automatically generates precise trouble tickets based on contextual performance degradations, streamlining issue reporting.
- ◆ **Integrated Problem Diagnosis:** Development of an integrated view for efficient issue resolution using automatic Root Cause Analysis (RCA) mechanisms, ensuring a comprehensive understanding of network problems.
- ◆ **Automated Network Regeneration:** Implementation of automated actions post-network failure, minimizing downtime and enhancing overall network resilience.
- ◆ **Comprehensive Engineer Dashboards:** Equipping engineers with easy-to-use dashboards that include various performance indicators and seamlessly integrate AI algorithms, offering a complete overview and actionable insights.

The project seeks to revolutionize the traditional NOC, driving a groundbreaking shift in operational paradigms.

## Impact

The project unfolds with a profound impact on two crucial fronts: economic and sustainable, complemented by a significant scientific contribution. Anticipated economic

benefits encompass a notable reduction in network operational costs, potentially reaching up to 60%, along with a significant 30% improvement in network service quality, a substantial up to 70% decrease in ticket escalations, and a noteworthy reduction in MTTR by up to 20%. Simultaneously, the CANOPY project introduces sustainability measures, aiming to optimize energy intensity and spectral efficiency. Scientifically, the project spearheads cutting-edge solutions through the application of disruptive AI techniques, effectively tackling current challenges within the telecommunications sector. Simultaneously, it cultivates collaboration between industry and academia partners, laying a robust foundation for future advancements in the field. In essence, this initiative transcends conventional boundaries, shaping a landscape that is not only economically and ecologically conscious but also at the forefront of scientific innovation.

## 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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