ACROSS

ACROSS is a HORIZON-JU-SNS-2022 funded research project that designs and implements an end-to-end service deployment and management platform for next generation networks and services, aiming at unprecedented levels of automation, performance, scalability, and energy efficiency.

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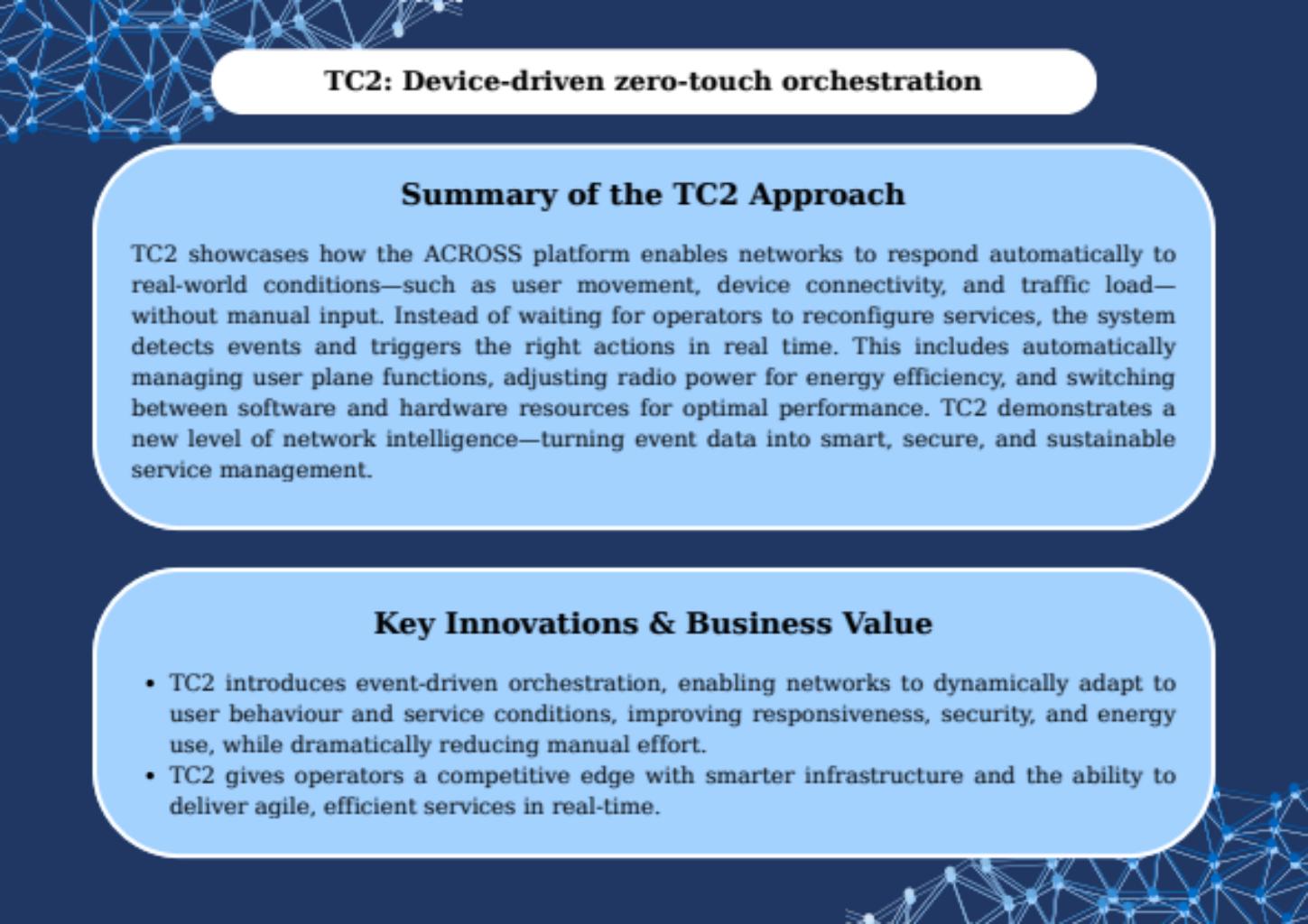
TC2: Device-driven zero-touch orchestration

Summary of the TC2 Approach

TC2 showcases how the ACROSS platform enables networks to respond automatically to real-world conditions—such as user movement, device connectivity, and traffic load—without manual input. Instead of waiting for operators to reconfigure services, the system detects events and triggers the right actions in real time. This includes automatically managing user plane functions, adjusting radio power for energy efficiency, and switching between software and hardware resources for optimal performance. TC2 demonstrates a new level of network intelligence—turning event data into smart, secure, and sustainable service management.

Key Innovations & Business Value

- TC2 introduces event-driven orchestration, enabling networks to dynamically adapt to user behaviour and service conditions, improving responsiveness, security, and energy use, while dramatically reducing manual effort.
- TC2 gives operators a competitive edge with smarter infrastructure and the ability to deliver agile, efficient services in real-time.

Architecture & Core Technologies

TC2 is deployed in a single, isolated edge domain in Patras. A domain orchestrator governs the core logic, coordinating compute, network, and telemetry services that enable end-to-end operational efficiency. Real-time telemetry probes detect deviations from service policies and trigger automatic responses via dedicated controllers. The TC2 mechanism enables continuous performance optimization and resilience. The setup integrates policy enforcement with domain-level orchestration, ensuring low-latency, adaptive control across the service lifecycle.

Key Innovations

- Unified exposure of monitoring metrics across compute, transport, and RAN segments.
- Real-time metric aggregation and policy-based evaluation for actionable insights.
- Zero-touch updates across the full edge domain: 5G core updates triggered by usage pattern analysis; transport network adjustments based on live traffic data; RAN optimization via efficiency-focused update logic.
- Policy-driven automation enabling adaptive, intelligent system behavior with minimal manual input.

Implementation & Validation

TC2 uses open-source tools enhanced with ACROSS components. Domain management and oversight are provided by an Operations Support System (OSS) built on ETSI OpenSlice (OSL), which serves as the central domain orchestrator and aggregator of the entire domain's monitoring metrics. The implementation integrates a wider suite of advanced technologies: (i) ETSI Open-Source MANO (OSM) for orchestrating 5G network functions, (ii) ETSI TeraFlowSDN (TFS) for transport network monitoring, management, and programmability, (iii) Kubernetes for compute resource management, (iv) Prometheus for collecting 5G-related metrics, and (v) a proprietary Radio Controller dedicated to managing gNBs within the domain.

TC2 validates its zero-touch framework via key KPIs:
- Reaction time ranged from below 1 second up to 6 seconds, remaining within the target of ≤10 seconds.
- Setup time varied between <1 second and ~13 seconds, remaining within the target of ≤20 seconds.
- The degree of automation reached 90-100% across the evaluated scenarios, exceeding the target of ≥80%.

Overview of the ACROSS Test Case 2
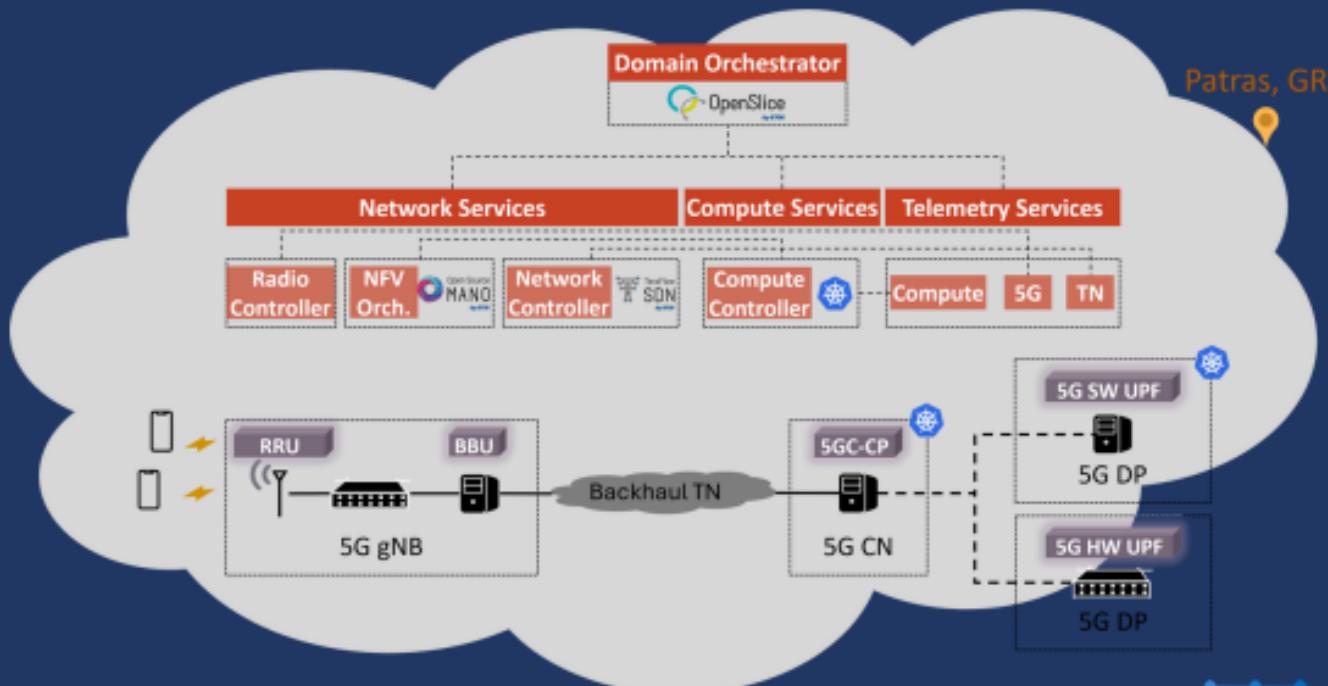
Expected Impact & Market Potential

TC2 addresses a key challenge in modern networks: the need for real-time, intelligent adaptation. By automating reactions to device and network events—like user mobility or traffic surges—TC2 enhances service continuity, resource efficiency, and user experience.

This has strong market potential across telecom and enterprise sectors deploying private 5G or edge networks. TC2 supports industries needing guaranteed performance and adaptability, including manufacturing, logistics, healthcare, and smart cities. TC2 aligns with market demand for more agile, secure, and cost-effective 5G and edge solutions.

Technical Benefits

TC2 brings technical innovation through event-driven orchestration that enables zero-touch provisioning, dynamic UPF management, and load-aware migration between compute nodes. It integrates with SDN, 5G core, and edge compute resources to react to real-time user or device triggers. This leads to smarter traffic handling, optimized radio transmission, and enhanced network resilience. TC2 also supports multi-domain orchestration through standards-aligned APIs, helping network operators build more adaptive and scalable architectures.

Business & Industry Value

For telecom providers and enterprise infrastructure owners, TC2 delivers faster response times, reduced operational costs, and improved service quality through automation.

Its ability to adapt to changing user and network conditions—without human intervention—creates a strong foundation for premium SLAs and future-ready business models, with its energy-aware architecture supports sustainability targets, while the use of open standards ensures smooth integration with existing systems.