



**Alliance for AI, IoT and Edge
Continuum Innovation**



22-23 Sep
MADRID

CODECO: Cognitive Decentralised Edge-Cloud Orchestration

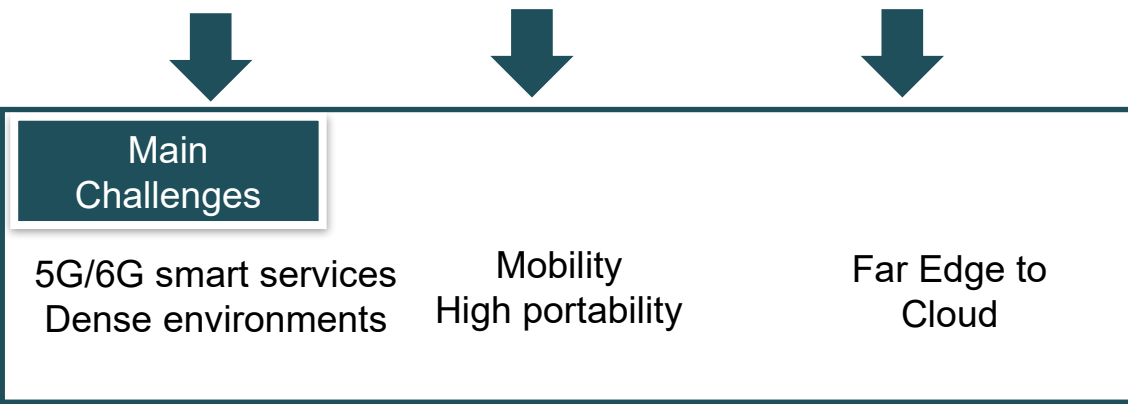
Rute C. Sofia, fortiss GmbH (Coordinator)

23.09.2025

FLEXIBLE EDGE-CLOUD CONTINUUM



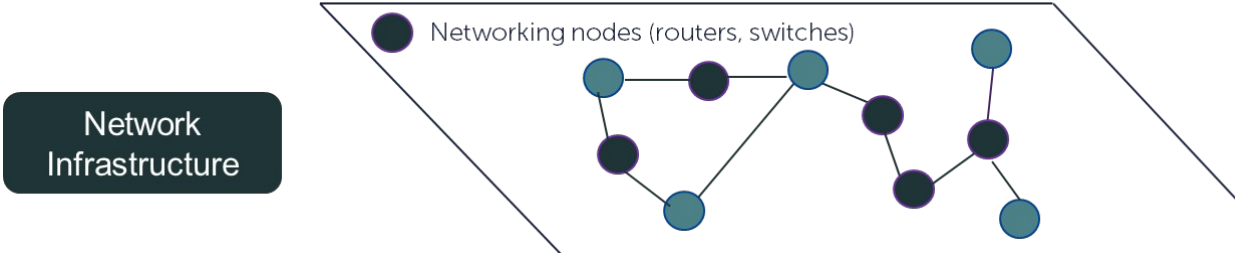
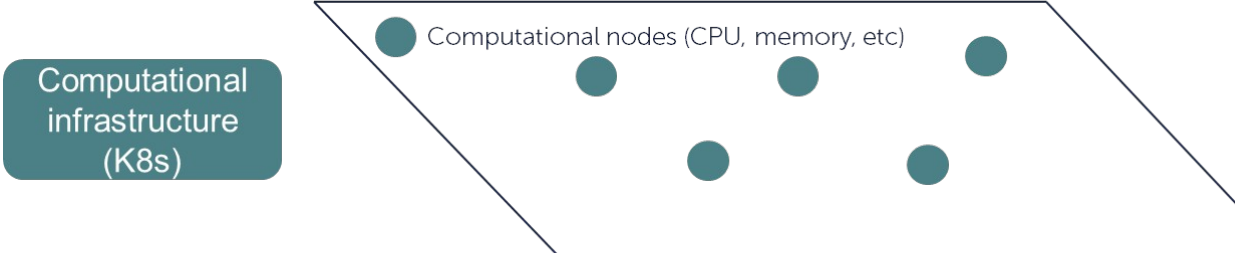
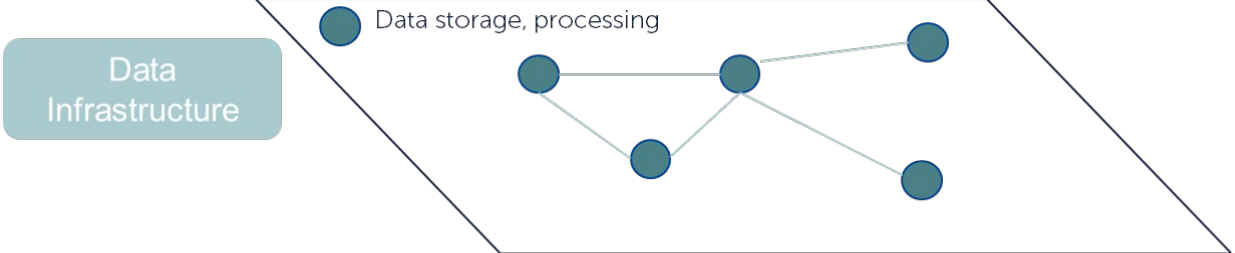
A novel Edge-Cloud orchestration framework, focusing on data-compute-network adaptability



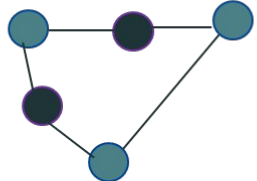
Vision Highly adaptive Edge-Cloud management framework (TRL4-5) that integrates a unique, smart, and cross-layer orchestration considering **decentralised data flow**, **computation**, and **adaptive networking**



CODECO APPROACH: DATA-COMPUTE-NETWORK



CODECO data-compute network perspective
Placement based on realistic CEI infrastructure



CODECO takes an application-centric approach to infrastructure management (resource management)

Components of an application stack can operate across Edge-Cloud (different clusters)



Priority 1: Control plane decentralisation across data-compute-network layers



Priority 2: (Decentralised) AI integration for resilient Edge-Cloud orchestration



Priority 3: Enhanced semantic abstraction and flexible internetworking

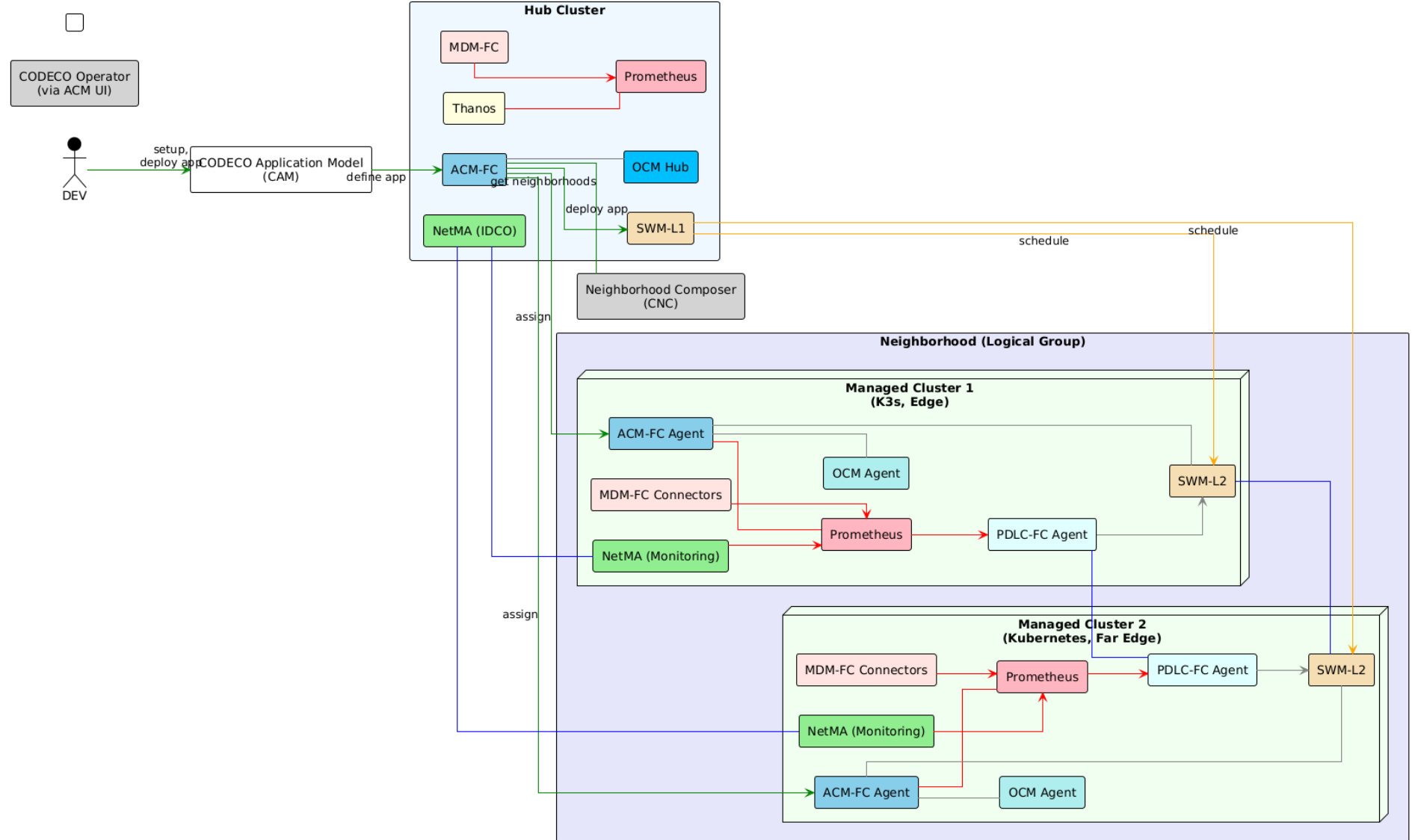


Priority 4: Adaptive, decentralised scheduling

CODECO IN FEDERATED CLUSTERS



- **ACM:** Entrypoint to user; lifecycle management
- **PDLC:** AI/ML and metadata aggregation – energy-awareness and resilience estimations
- **NetMA:** Network awareness, secure connectivity
- **MDM:** Data status and awareness
- **SWM:** New scheduler informed re-scheduling (weighing estimations)



CODECO AND THE CEI CONTINUUM



K8s (native Cloud) view: While you can technically have a cluster with several nodes located in different regions, this is generally regarded as something you should avoid due to the extra latency.

CODECO view: The Edge-Cloud continuum requires nodes in a cluster to be in the proximity; being “close” is a form of centrality which is not necessarily related with geography nor just latency.

•Key Difference from Kubernetes:

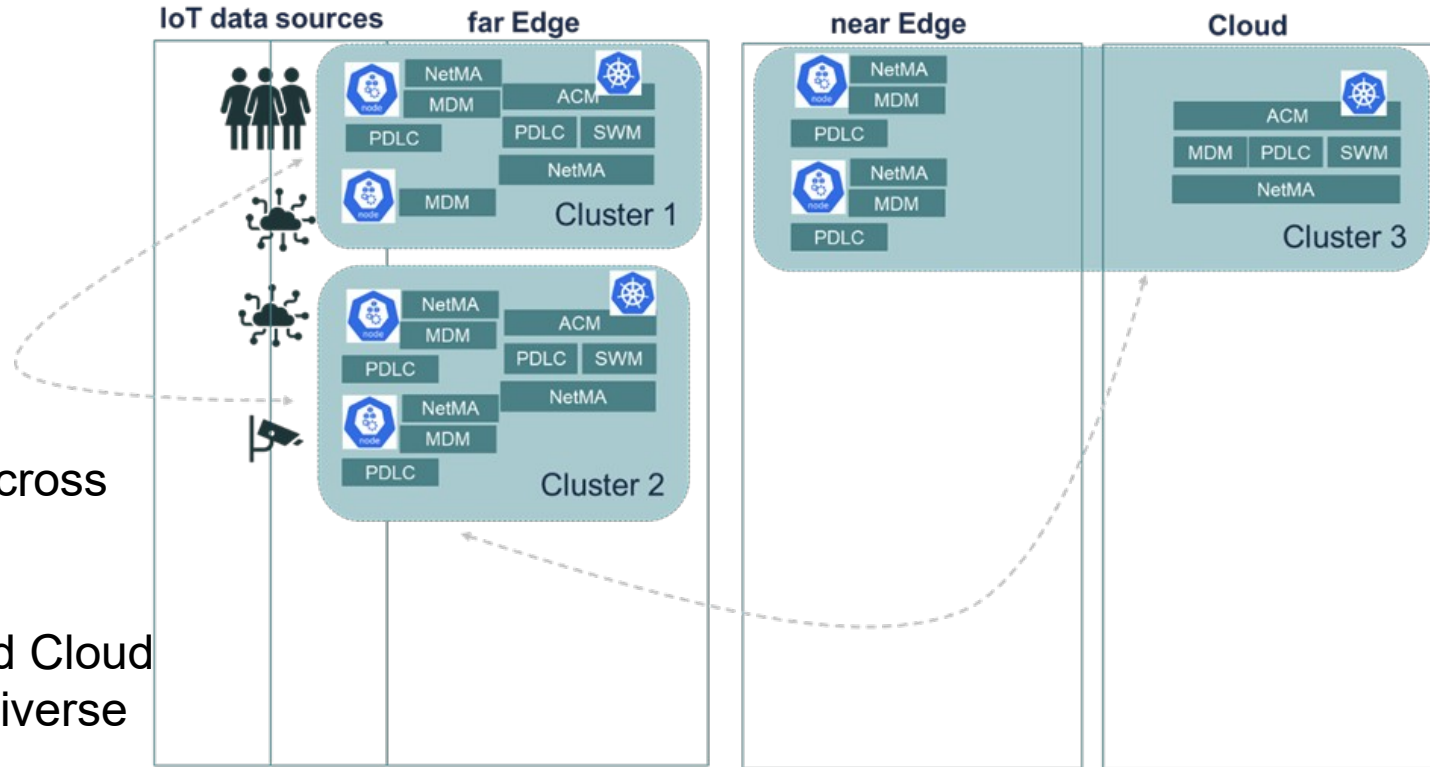
- Focus on **containerized microservices** across clusters (multi-tenant, multi-location).

•Microservice Flexibility:

- Distribute components across far Edge and Cloud
- Better adaptability to mobile clusters and diverse Edge environments

•Challenge:

- Control plane needs possible decentralisation (Edge-to-Cloud control strategy).

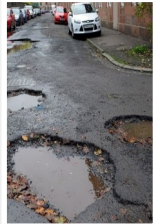


FEDERATED CLUSTERS

CODECO USE CASES



CODECO benefits will be demonstrated across four European competitiveness domains: **Smart Cities**, **Mobility**, **Energy**, and **Manufacturing**

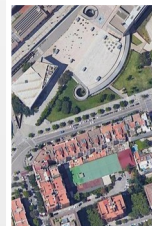


P1: Smart Monitoring of the Public Infrastructure

Lead: Univ Göttingen/City of Göttingen, DE

Goal: Improved QoE

Domain: Smart Cities



P2: Vehicular Digital Twin for safe urban mobility

Lead: I2CAT, SP

Goal: Increasing road safety

Domain: Mobility



P3: Decentralized Edge MDS

Lead: Telefonica, SP

Goal: Cross-layer resource optimization for MDS

Domain: Smart Cities

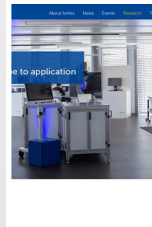


P4: Decentralized Grids Collective Demand Side Management

Lead: Univ Politecnica de Madrid, SP

Goal: Smart monitoring of the energy generation, consumption & availability

Domain: Energy

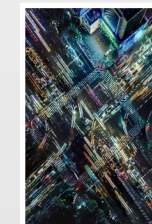


P5: Decentralised, wireless AGV Control for Flexible Factories

Lead: fortiss, DE

Goal: Increased AGV autonomy and scalability via decentralized control

Domain: Manufacturing



P6: Smart Buildings

Lead: Almende, NL

Goal: Far Edge management of Crownstone meshes & their appliances

Domain: Energy

Key Exploitable Results – Open-source



CODECO Blueprint architecture



CODECO OSS Toolkits



CODEF: CODECO Experimentation Framework



Use-cases, Apps



Data sets



Data Generator



CARG: AI Resilience and Governance tooling



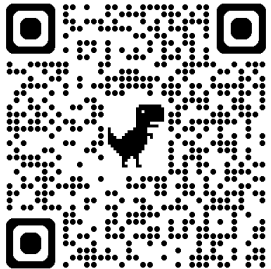
Training Center

Additional Ways to Engage | IRCEP Challenges



WHAT ARE WE LOOKING FOR?

The IRCEP Programme aims to develop and expand the project's ecosystem. In order to do so, multiple stakeholders are invited in order to build applications, services and extensions of CODECO's framework.



PILLARS

WHAT

IRCEP stands for Innovation and Research Community Engagement Programme. It consists of exploiting the CODECO ecosystem by building applications, services, and extensions of the CODECO framework.

WHO

The target groups of IRCEP are: SMEs, Early Developers, Researchers and Students in areas closely connected to the opportunities on offer.

WHERE

Collaborate with CODECO at: Events and Conferences, Innovation Workshops, Hackathons and Summer Schools.

HOW

IRCEP supports the costs to take part in multiple initiatives and offers prizes.

September-December 2025 | Engage | Awards!

MEET OUR CONSORTIUM

