



Alliance for IoT
and Edge Computing
Innovation

AIOTI
DAYS 2024

Continuum, digital twins
and virtual worlds

24-25 Sep
BRUSSELS

Session: Cloud-Edge-IoT technologies at the service of European sustainable Manufacturing Industries

CODECO Manufacturing Use-case: Mobile Automated Robots and Decentralized Control

Rute Sofia, fortiss

Event Sponsors





CODECO

Cognitive Decentralised
Edge Cloud Orchestration



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



Main Challenges

5G/6G smart services
Dense environments

Mobility
High portability

Far Edge to
Cloud



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**



Funded by
the European Union

Funded by the European Union under Grant Agreement 101092696

CODECO ASSETS AND USE-CASES

A1

Open toolkits and smart Apps

Advanced management of containerized applications across far Edge to Cloud, federated and single cluster environments

A2

Open-source Eclipse repository

<https://gitlab.eclipse.org/eclipse-research-labs/codeco-project>

A3

Training Database

Training tools and events, to support the development of services based on the CODECO framework.

A4

Edge-Cloud Use-cases

6 Use-cases across 4 domains (Smart Cities, Energy, Manufacturing, Mobility)

A5

R&I Engagement Programme

Community engagement via hands-on events

A6

Open Experimental Framework

CODECO components in the large-scale EdgeNet, accessible to the wide research community



P1: Smart Monitoring of the Public Infrastructure

Lead: Univ Göttingen/City of Göttingen, DE

VP: Improved QoE

Domain: Smart Cities



P2: Vehicular Digital Twin for safe urban mobility

Lead: I2CAT, SP

VP: Increasing road safety

Domain: Mobility



P3: Decentralized Edge MDS

Lead: Telefonica, SP

VP: cross-layer resource optimization for MDS

Domain: Smart Cities



P4: Decentralized Grids Collective Demand Side Management

Lead: Univ Politecnica de Madrid, SP

VP: Smart monitoring of the energy generation, consumption, availability

Domain: Energy



P5: Decentralised, wireless AGV Control for Flexible Factories

Lead: fortiss, DE

VP: Increased AGV autonomy and scalability via decentralized control

Domain: Manufacturing



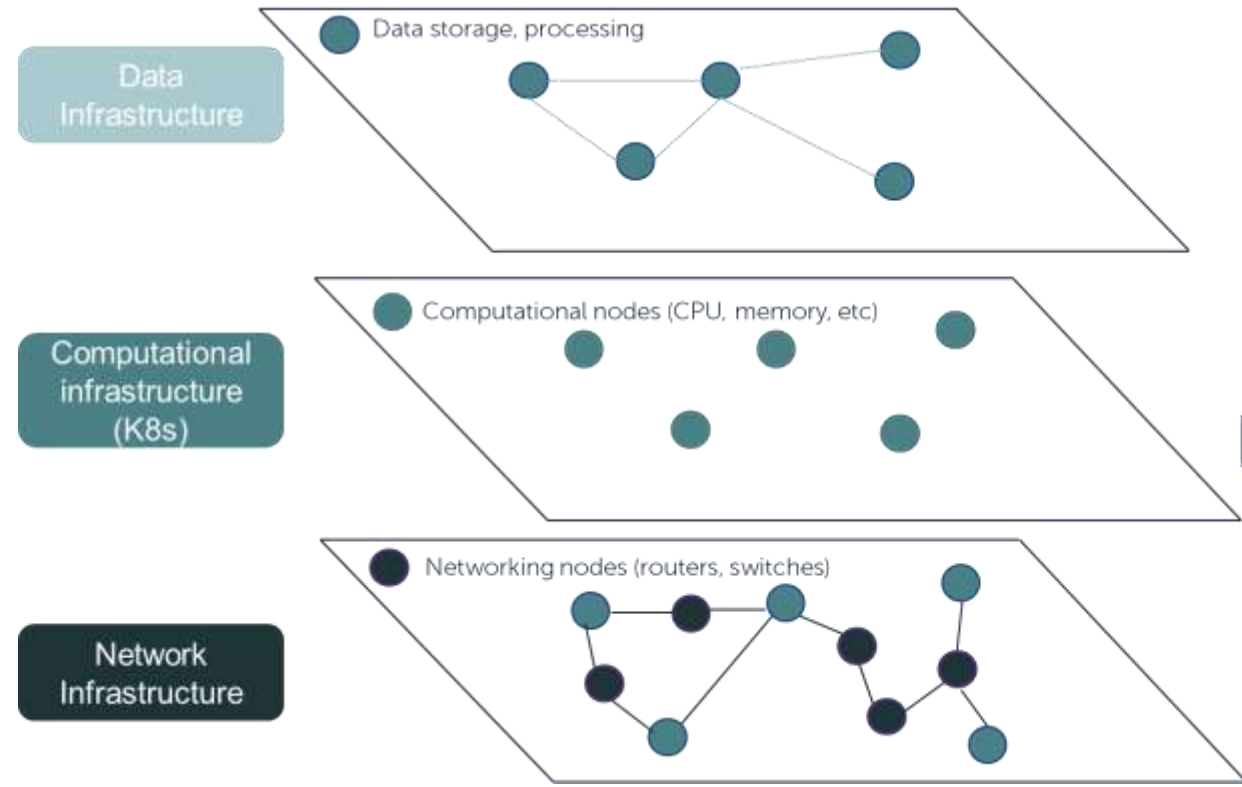
P6: Smart Buildings

Lead: Almende, NL

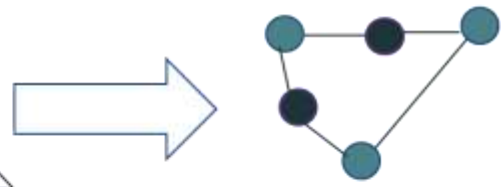
VP: far Edge management of Crownstone meshes and their appliances

Domain: Energy

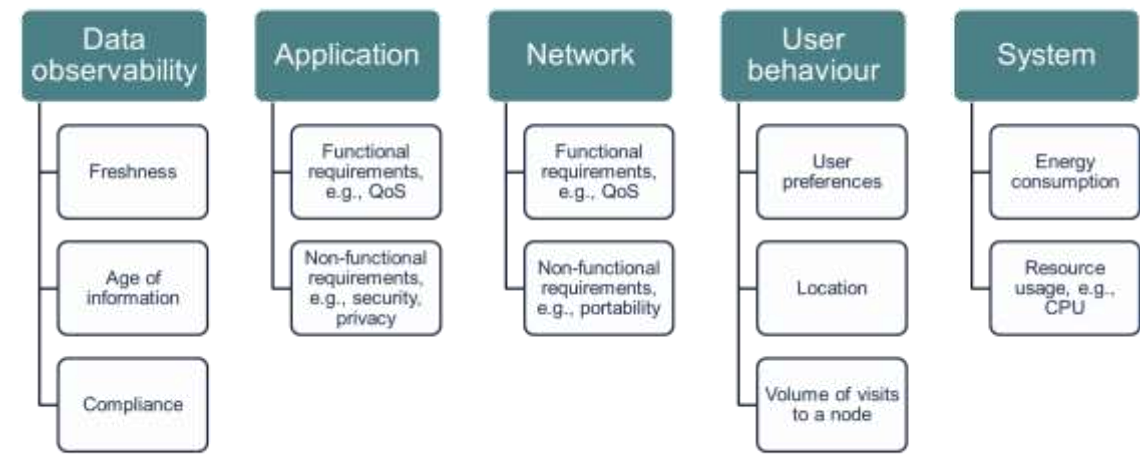
CODECO: CEI IS ABOUT DATA, COMPUTE, NETWORK



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

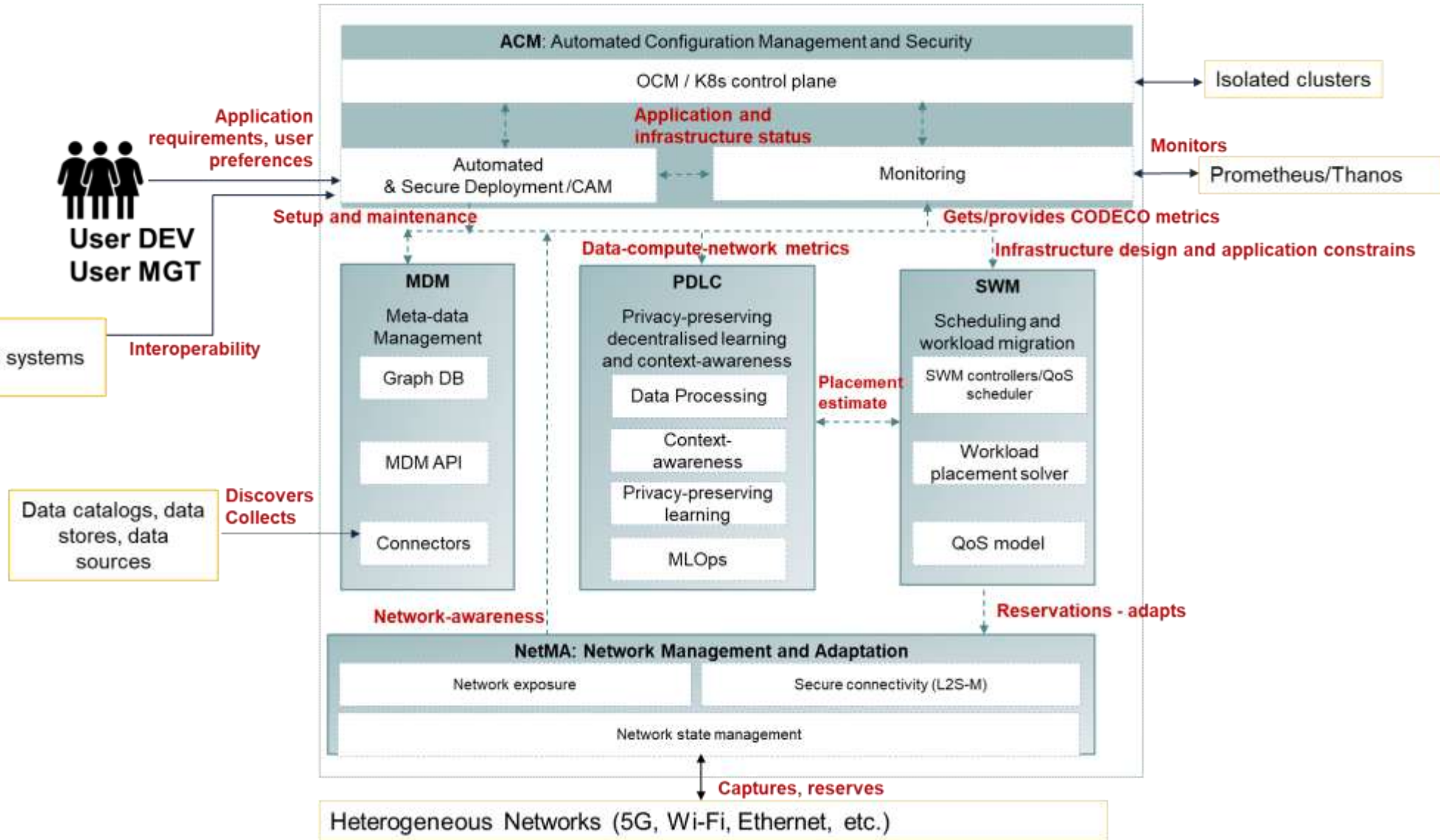


ZENODO (PUBLICATIONS AND DELIVERABLES)



CODECO OSS BASIC TOOLKIT

- **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)



P5: Decentralized Wireless AGV Control for Flexible Factories | Manufacturing, Logistics

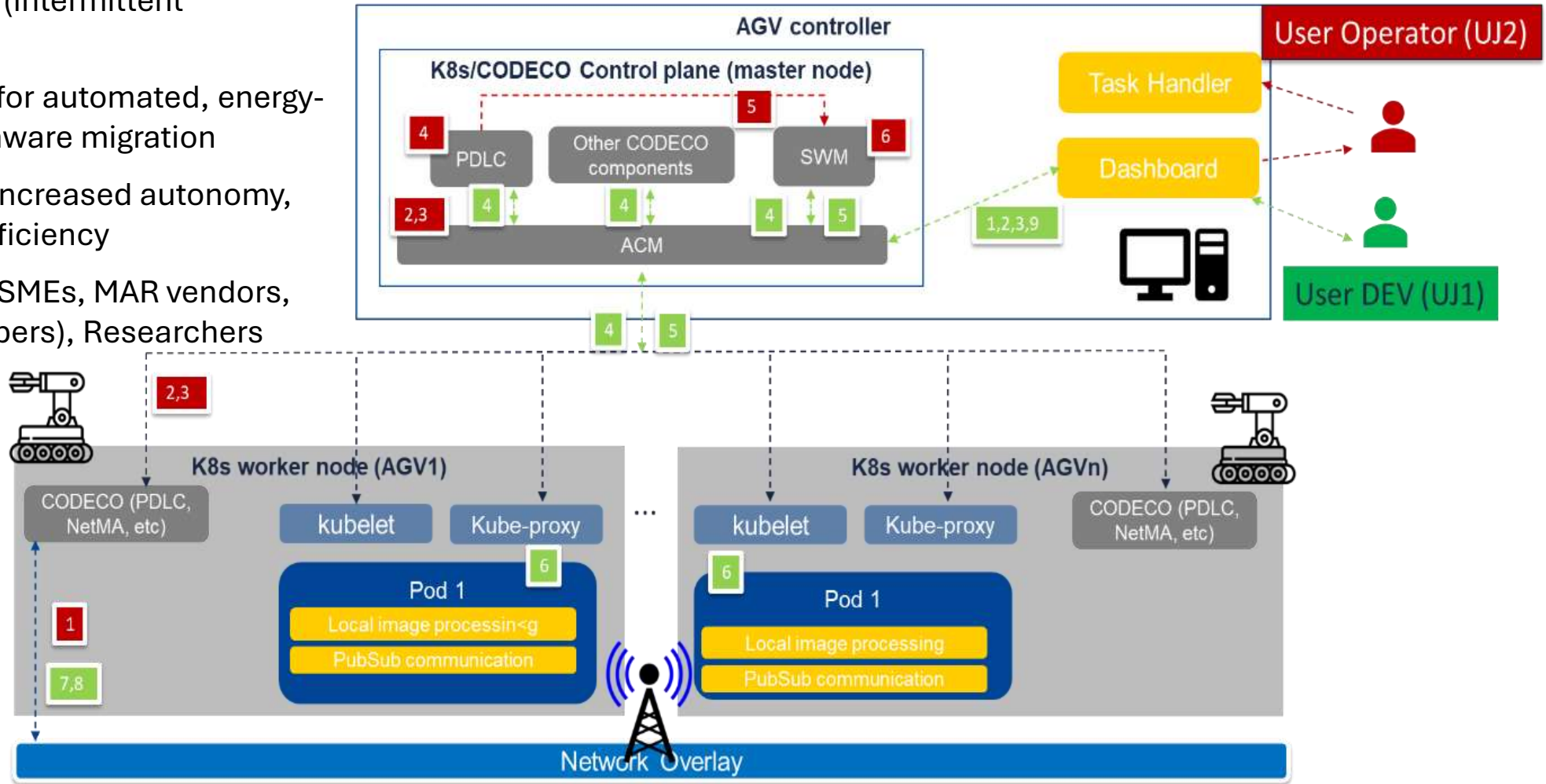
P5 aims at increasing Mobile Automated Robots Autonomy for Production/Logistics

Challenge: Wireless (intermittent connectivity); energy

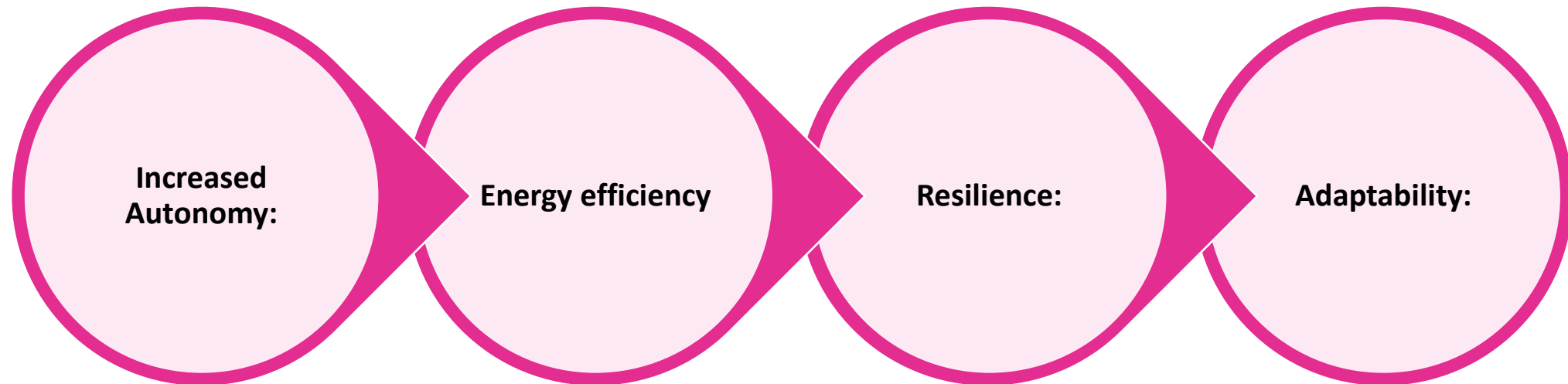
Solution: CODECO for automated, energy-aware and network-aware migration

Value-proposition: Increased autonomy, scalability, energy-efficiency

Stakeholders: ICT (SMEs, MAR vendors, Telcos), DEV (developers), Researchers



CODECO's differentiator for manufacturing lies in its AI-based decentralized control approach



- CODECO enhances MAR autonomy via smooth migration in case of need, reducing reliance on centralized control.

- By providing a better, distributed placement of micro-services, CODECO reduces the overall system energy

- In case of communication failures or component failures, MARs can adapt and take over tasks

- AI is used to estimate the impact of changes to the system and to provide re-scheduling recommendations



Thank you for listening

Any questions?

You can email [sofia at fortiss dot org](mailto:sofia@fortiss.org)