Funded by the European Union

CODECO
Cognitive Decentralised Edge Cloud Orchestration

OVERVIEW, ASSETS, ENGAGEMENT
HTTPS://HE-CODECO.EU

SCAN ME

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fortiss - research Institute of the Free State of Bavaria

HiPEAC 2024 | First CODECO Industrial Workshop

18.01.2024, LRZ, Garching

OVERVIEW

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**

Simplification & Automation

O1: Reduce Edge-Cloud Setup and Management Time

Data-compute-network Orchestration

O2: Optimize Edge-Cloud Operation via privacy-preserving data-compute-network orchestration

Security & Privacy Preservation

O3: Provide automated, privacy preserving secure management for multi-clusters

Openness & Greenness

O4: Support multi-domain Edge Cloud operations integrating openness and greenness

Broad Impact

O5: Build a consolidated ecosystem appealing to the different CODECO stakeholder groups

ASSETS AND USE-CASES

CODECO

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, ManufacturingMobility)

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

APPROACH

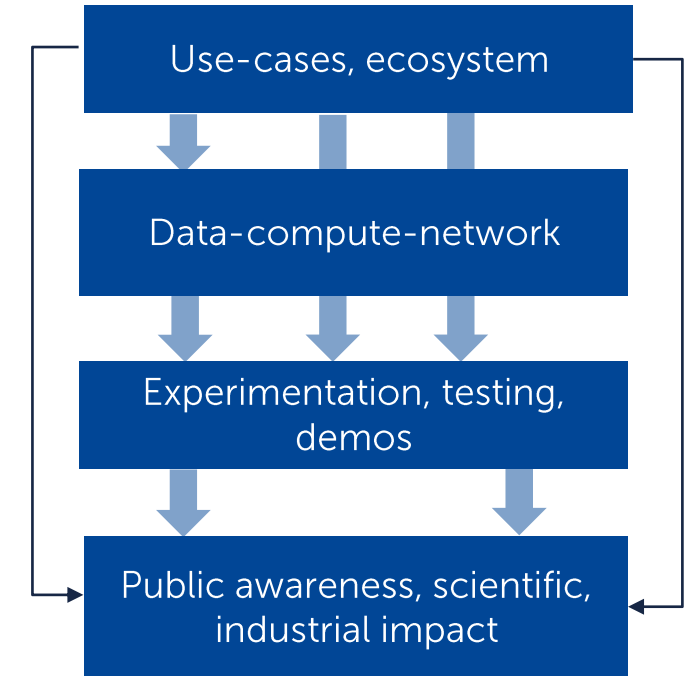Kubernetes as basis for the CODECO OSS development

Single Cluster Operation: first 18 months

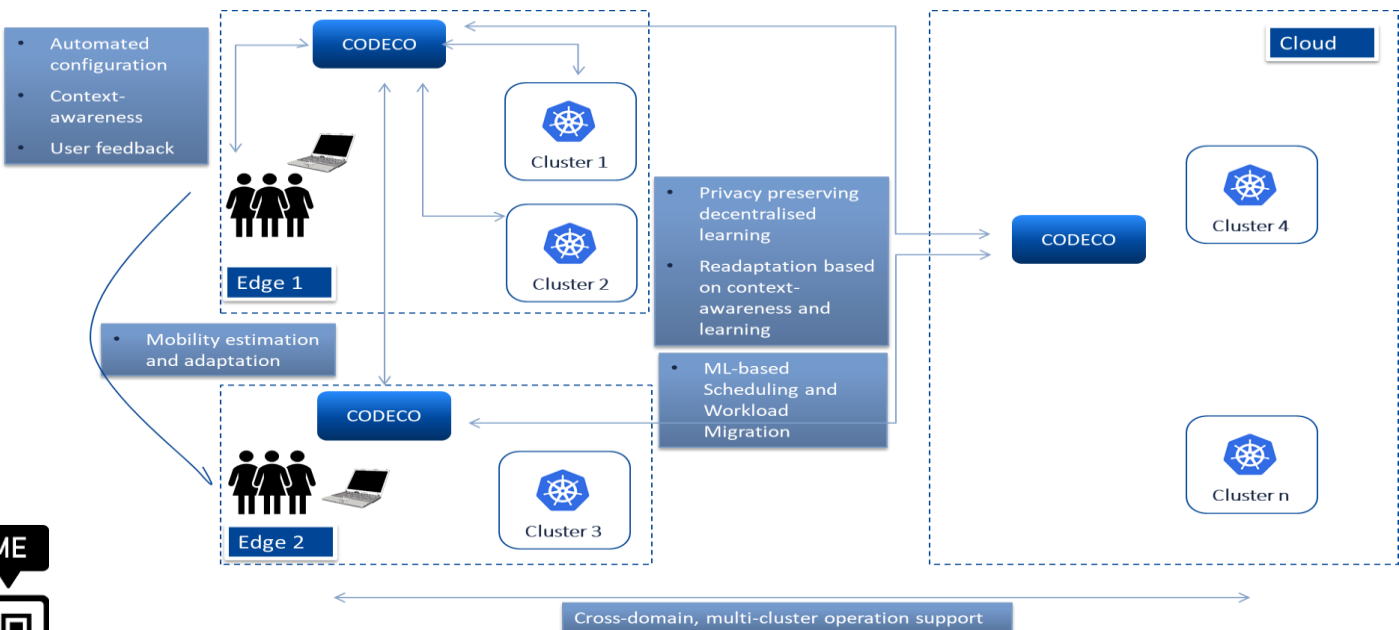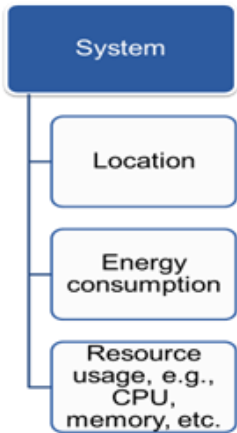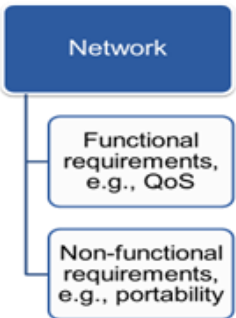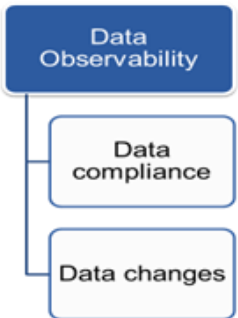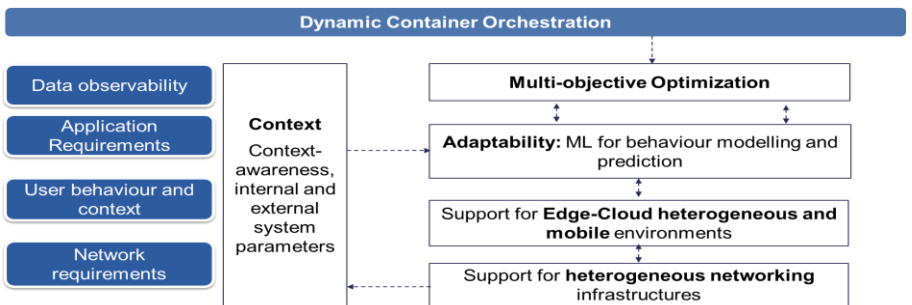| Operation within 1 cluster	Modular approach, implementation and validation of individual blocks (ACM, MDM, etc)	Software release – open basic toolkit •M9, early release •M18 final release	Single cluster validation and performance evaluation
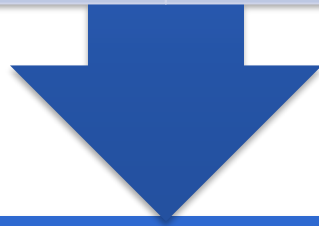
Federated Clusters Operation: last 18 months

Multi-cluster domains	Modular approach, focus on decentralised learning for heterogeneous mobile Edge-Cloud domains •Software release •Demos

Use-cases, ecosystem

Data-compute-network

Experimentation, testing, demos

Public awareness, scientific, industrial impact

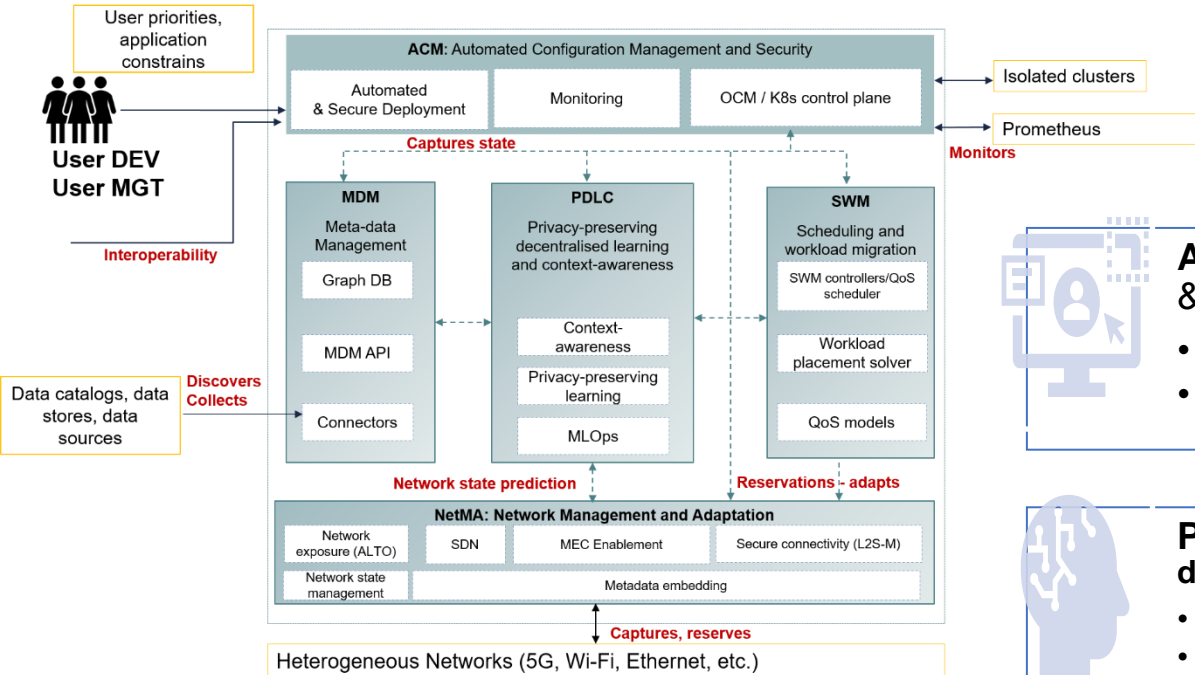# CONCEPT: CONTEXT-AWARE ORCHESTRATION
FAR EDGE TO CLOUD CONTINUUM

[CODECO D9 -Technological Guidelines, Reference Architecture, and Initial Open-source Ecosystem Design v1.0](#)

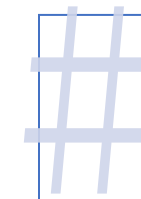# COMPONENTS

ACM: Automated Configuration & Management
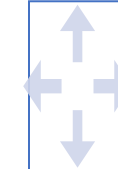- User interfacing
- Zeroconfig

MDM: Meta-data Manager
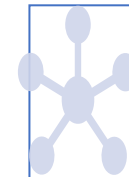- Meta-data management and discovery

PDLC: Privacy-preserving decentralised learning
- Cross-layer context-awareness
- Decentralised learning+Privacy Preservation

SWM: Seamless Workload Migration
- Multi-objective scheduling
- ML-based workload migration

NetMA: Network Management
- Network exposure
- Network adaptation
- Secure data exchange

CODECO ARCHITECTURAL DESIGN
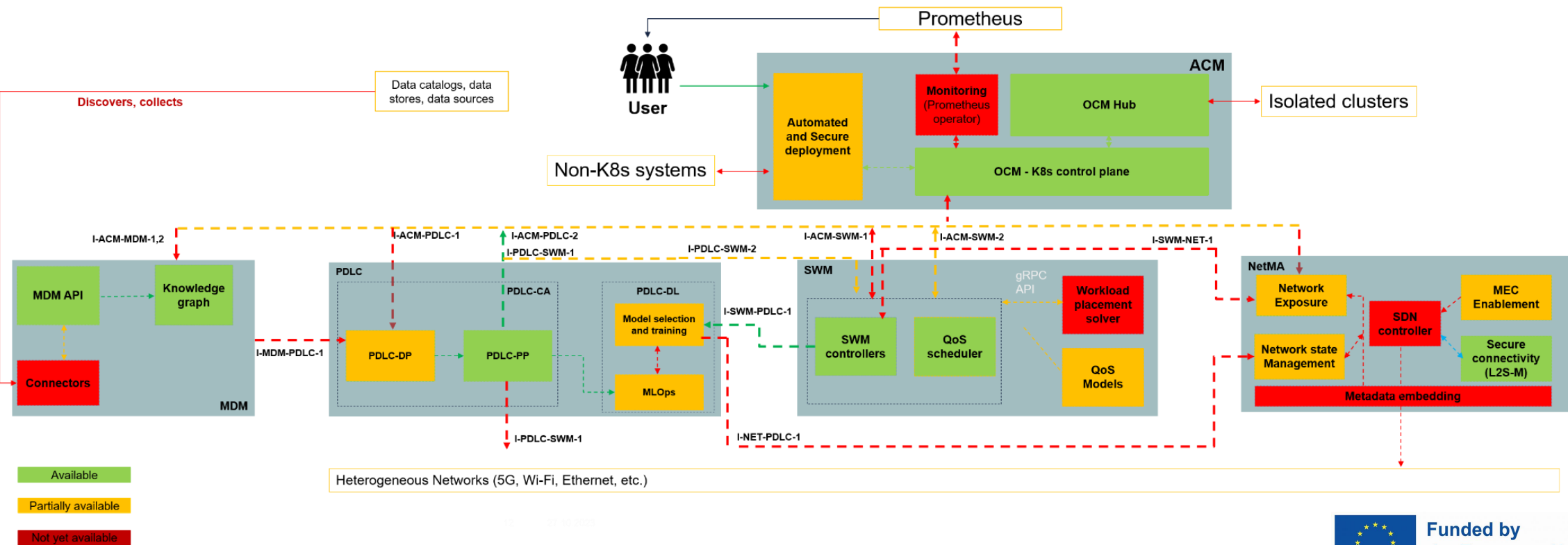
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CODECO D11 - CODECO Basic Operation and Open Toolkit v1.0

CODECO OSS ECOSYSTEM DEVELOPMENT AND EXPLOITATION
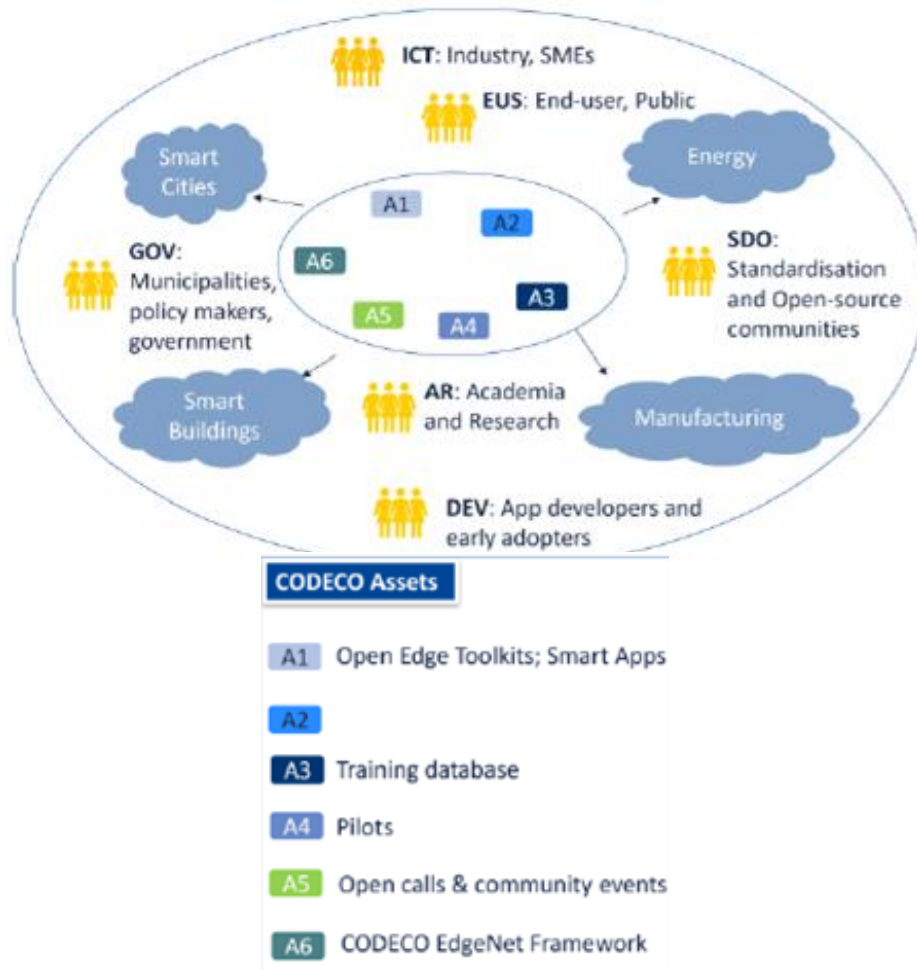
Implement an **open-source strategy** of community building

Enable an **active take-up** of the CODECO assets

Potentialize CODECO across domains and stakeholders

Develop **training materials** concerning CODECO toolkits

Promote **long-term impact** of CODECO

Explore **synergies** between partners

CODECO | Get Engaged!

Engagement: Innovation and Research Community Engagement Programme

- Engagement events
- Possibilities to extend and re-use CODECO
- Awards!
- Contacts: Ana Leal & Vitor Vieira, INOVA +

Play with the CODECO early code release – Eclipse Gitlab

- Sub-components of CODECO
- Examples
- Synthetic Data Generator

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Follow Us!

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Twitter @CODECOProject

Zenodo Community

Funded by the European Union

THANK YOU FOR YOUR ATTENTION!

Questions?

MEET OUR CONSORTIUM

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SIEMENS

netcompany

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ECLIPSE
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i2cat

UNIVERSITY OF PIRAEUS
RESEARCH CENTER

Telefónica

UNIVERSIDAD
POLITÉCNICA
DE MADRID

POLITÉCNICA

Red Hat

almende
ORGANIZING NETWORKS

AFFILIATED
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GÖTTINGEN
STADT, DIE WISSEN SCHAFFT

uc3m | Universidad
Carlos III
de Madrid

Atos EVIDEN
an atos business