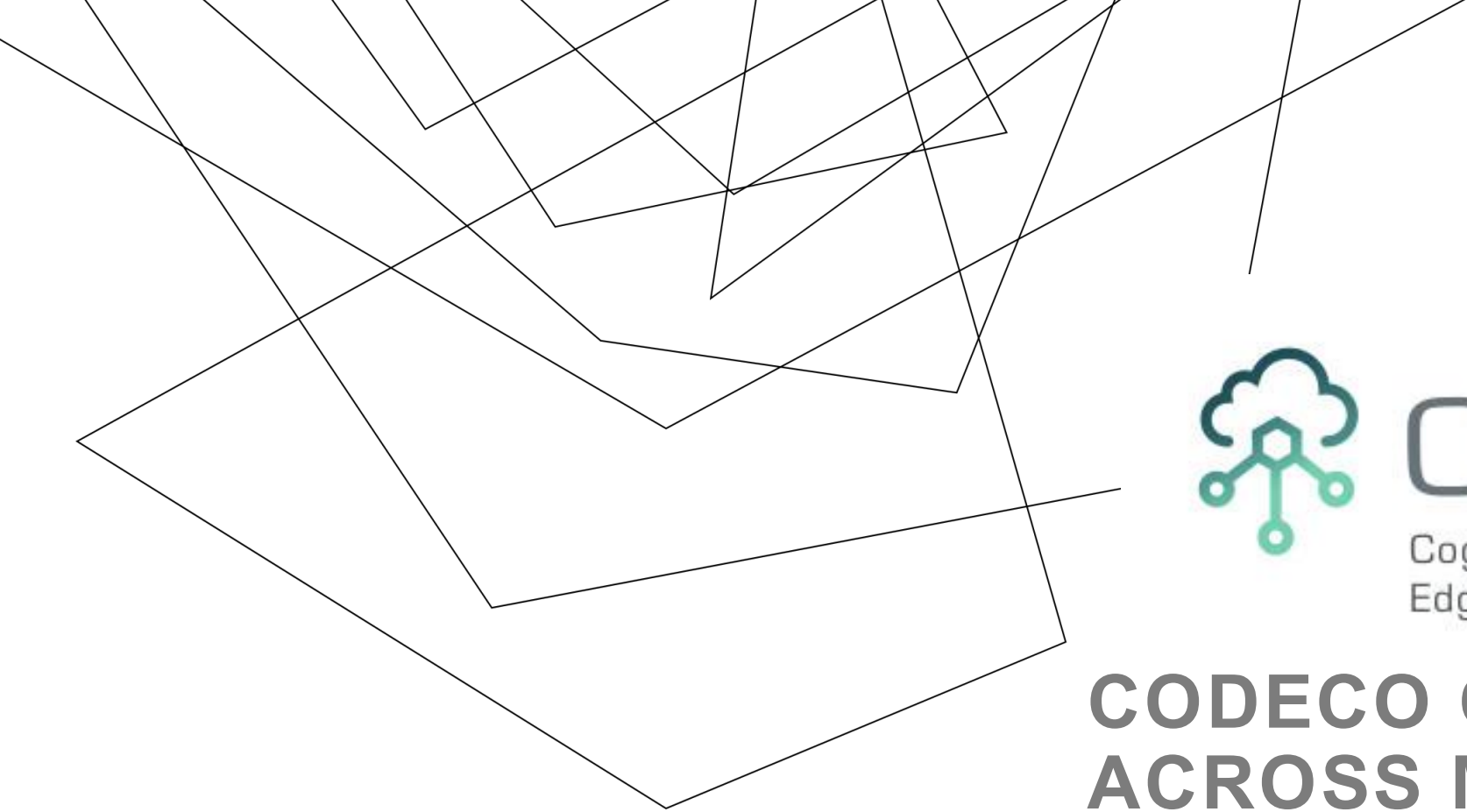

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CODECO

Cognitive Decentralised Edge Cloud Orchestration

CODECO OSS ACROSS MULTI-CLUSTERS

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Presenter: Artur Krukowski (krukowa@intracom-telecom.com)

Intracom Telecom, Greece

Date: 26/1/2026

Venue: HIPEAC ML4CS Workshop

INTRACOM TELECOM

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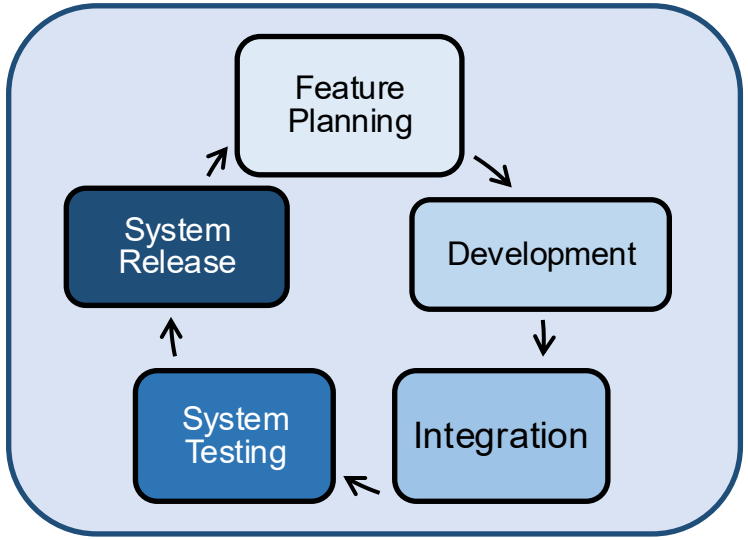
CODECO INTEGRATION & OPERATION

As integration leader ICOM has the following responsibilities:

- Central **integration point** between CODECO component owners
- Coordinate **code readiness**, version alignment, and dependencies
- Design and execute **integration tests** across components
- Validate **end-to-end deployments** (single & federated setups)
- Define and maintain **CI/CD pipelines** and packaging
- Ensure **reproducible deployment** of the full CODECO stack



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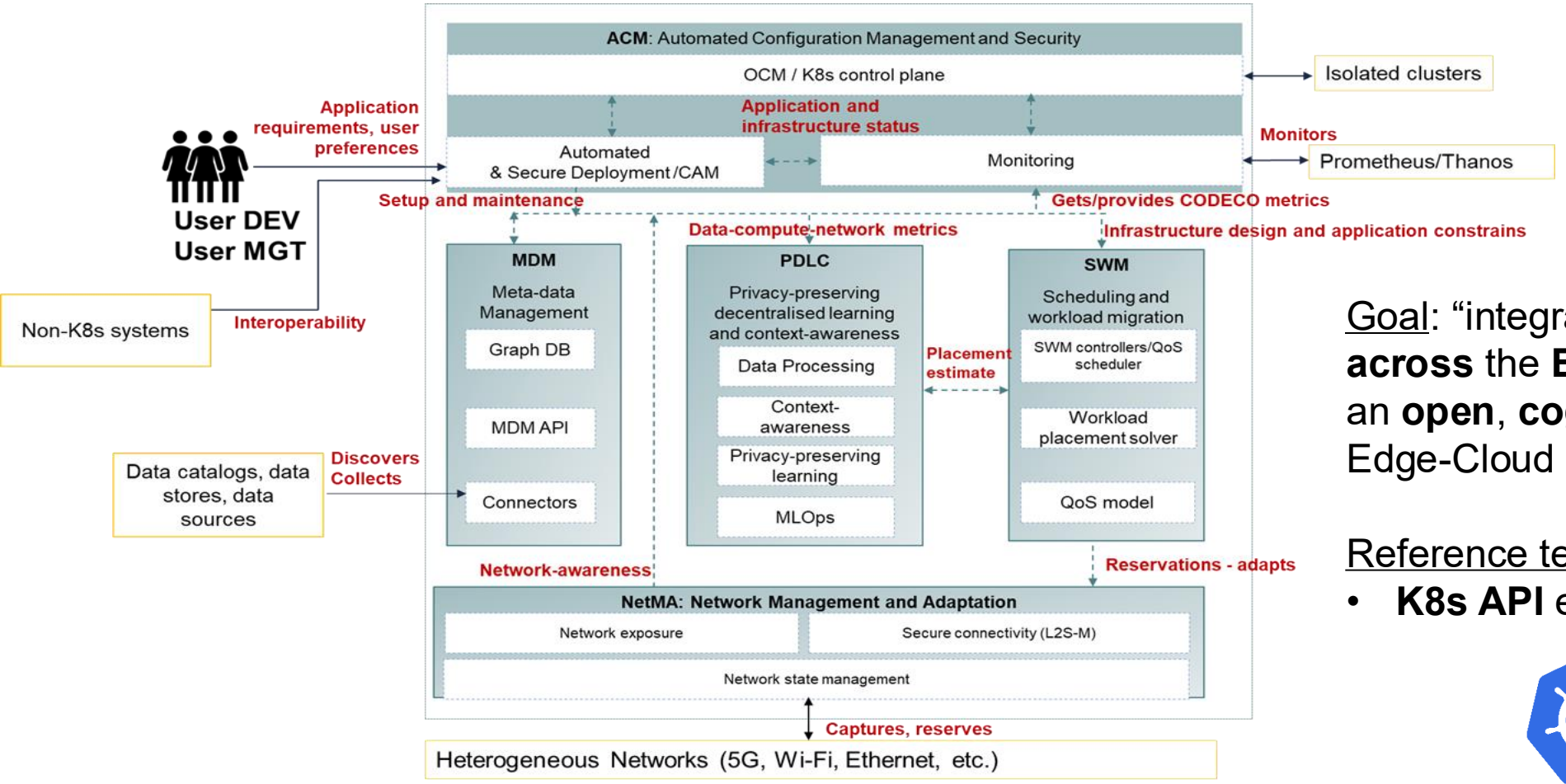
FUNCTIONAL REPRESENTATION



Goal: "integrate novel **services** operating **across** the **Edge-Cloud continuum**, into an **open**, **cognitive**, **decentralised** Edge-Cloud **framework**"

Reference technology: K8s

- **K8s API** extensions via **CRD/CRs**

CODECO extends Kubernetes using CRDs to represent application intent, infrastructure capabilities, and optimization objectives across the Edge–Cloud continuum

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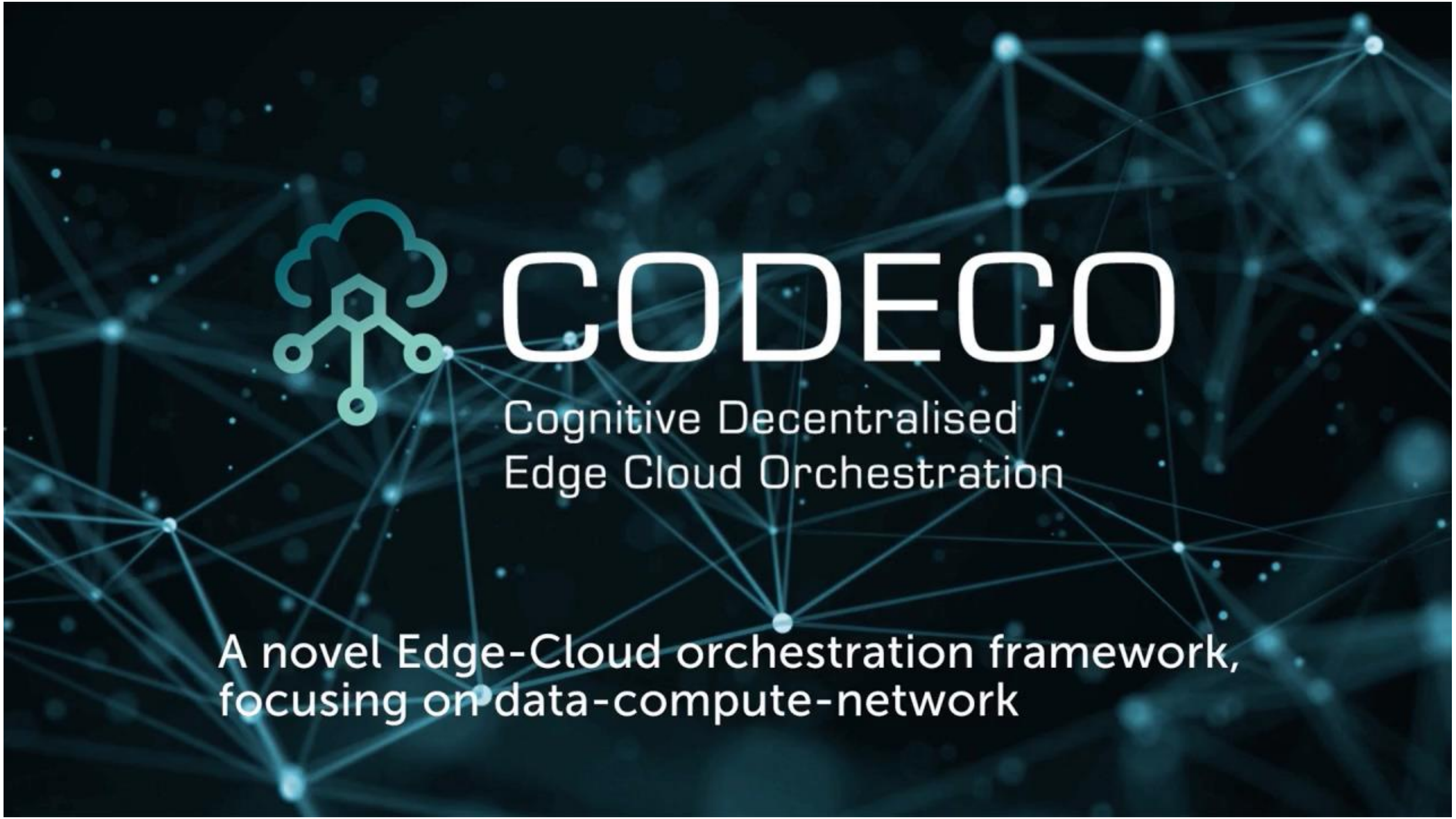
CODECO
Cognitive Decentralised
Edge Cloud Orchestration
A novel Edge-Cloud orchestration framework,
focusing on data-compute-network

Federated CODECO: Motivation & Design Principles

- Edge–Cloud–IoT environments span **multiple clusters and administrative domains**
- Centralized orchestration alone does not scale to the far edge
- CODECO introduces **federation-aware orchestration** on top of Kubernetes
- Data, compute, and network treated as **first-class resources** across clusters
- Federation enables **scalability, resilience, and locality awareness**

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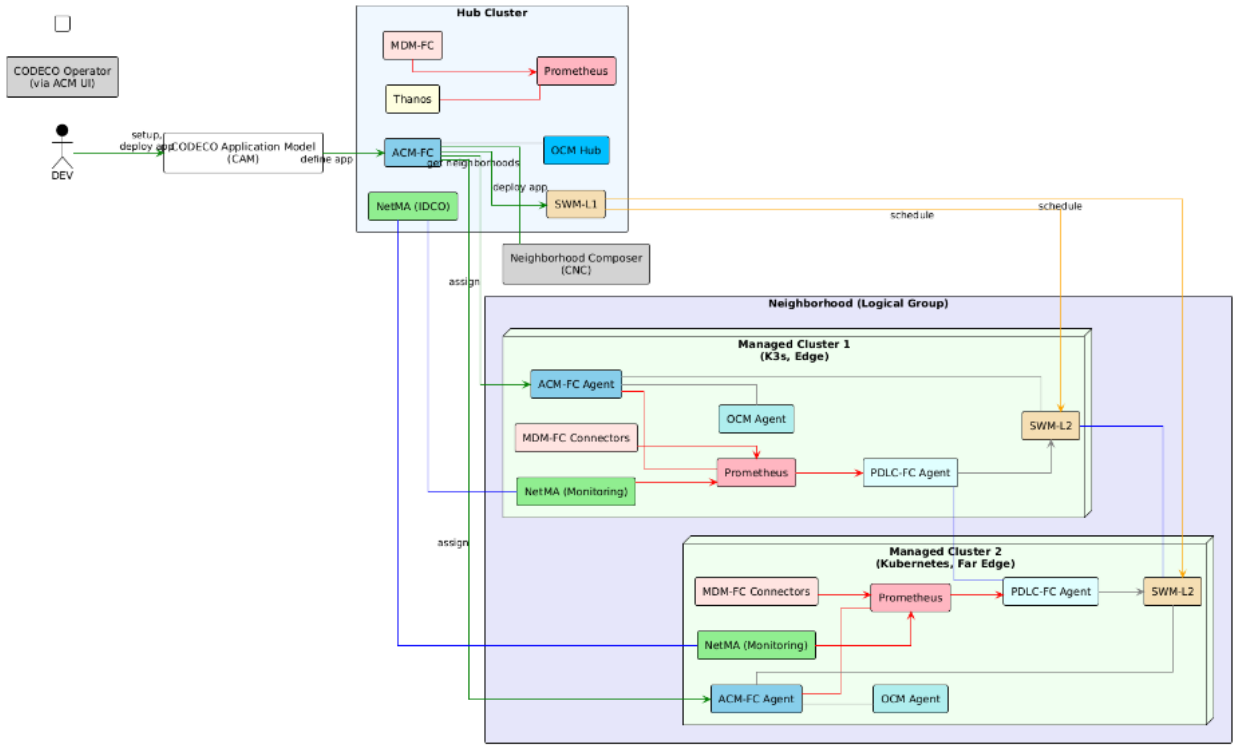
Federated Architecture Overview (Hub–Spoke)



- **Hub–Spoke federation model** based on Open Cluster Management (OCM)
- **Hub Cluster**
- Maintains global intent, policies, and application models
- **Managed Clusters**
- Execute workloads and collect local telemetry
- Hybrid control plane:
- Decentralized **execution and monitoring**

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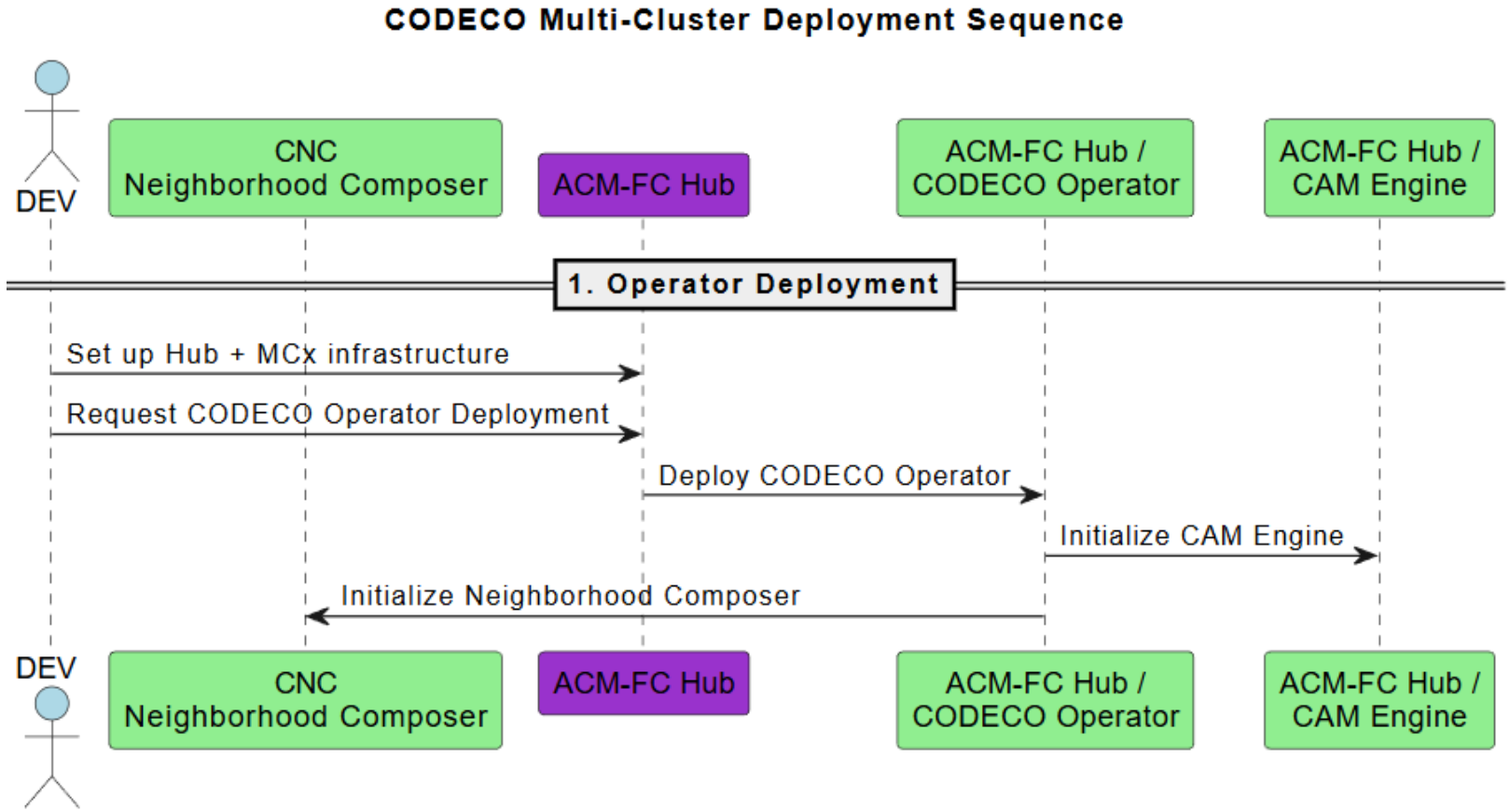
CODECO FC - Workflows

Installation Phase:

1. User installs OCM on a designated cluster
2. User downloads CODECO from ECLIPSE GitLab
3. ACM deploys CODECO components across Hub and Managed Clusters



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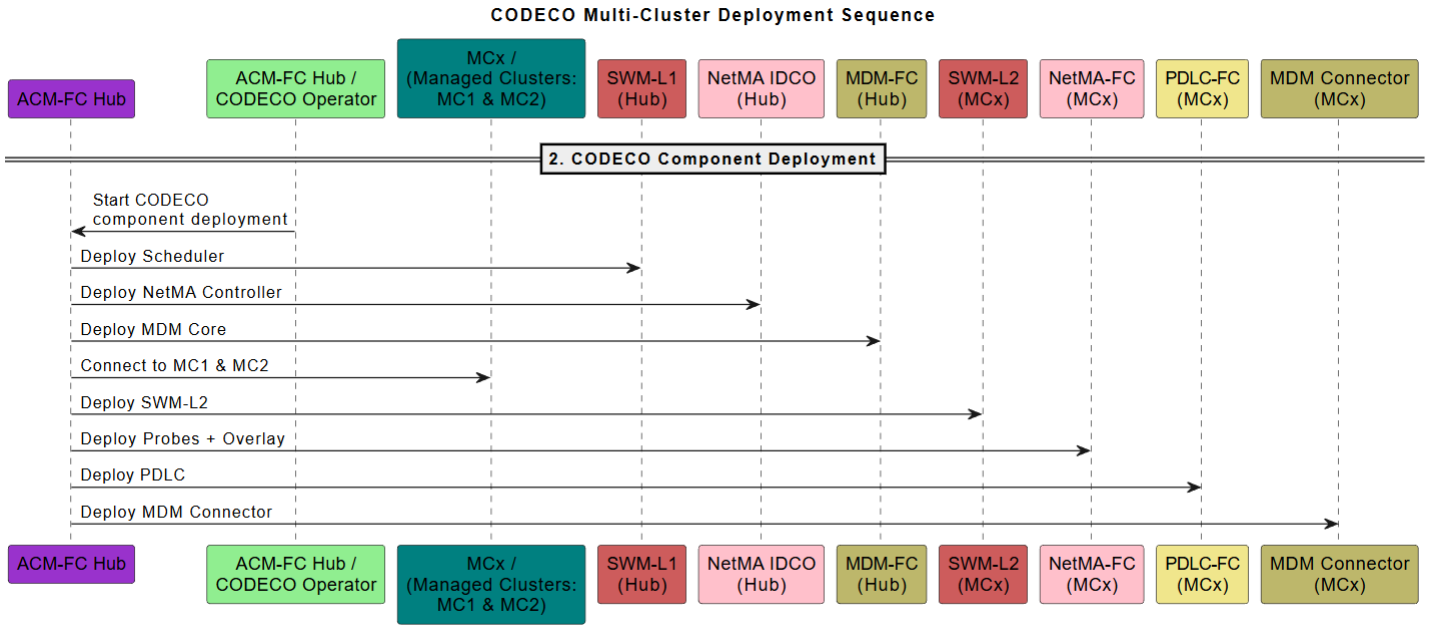
CODECO FC - Workflows

Application Deployment Phase:

- User defines application via CODECO Application Model (CAM)
- Specifies compute, network and data requirements per microservice
- Defines target performance profiles (e.g. greenness, resilience)
- ACM distributes CAM to CODECO components
- SWM performs placement decision across federated clusters
- Graph-based optimization for optimal resource matching
- OCM Work API distributes manifests to selected Managed Clusters



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CONCLUSION

CODECO

- CODECO provides a **Kubernetes-based framework** for the Edge–Cloud–IoT continuum
- Introduces **data–compute–network** as first-class orchestration resources
- Extends Kubernetes using **CRDs and controllers** for intent-based operation
- Supports **single-cluster and federated multi-cluster** environments via OCM
- Enables **application-aware deployment and runtime adaptation**

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THANK YOU FOR YOUR ATTENTION!

Any questions?

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