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CODECO

Cognitive Decentralised Edge Cloud Orchestration

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@ University of Piraeus Research Centre

Date: 22/01/25

Venue: HIPEAC ML4CS Workshop

CODECO EXPERIMENTATION FRAMEWORK (CODEF)

Funded by the European Union under Grant Agreement 101092696

Funded by the Swiss Federal Government

FLEXIBLE EDGE-CLOUD CONTINUUM

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**

CODECO Website

CODECO Eclipse Research Lab

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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, Manufacturing, Mobility)

A5
R&I Engagement Programme
Community engagement via hands-on events

A6
Open Experimentation Framework
CODECO components, 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

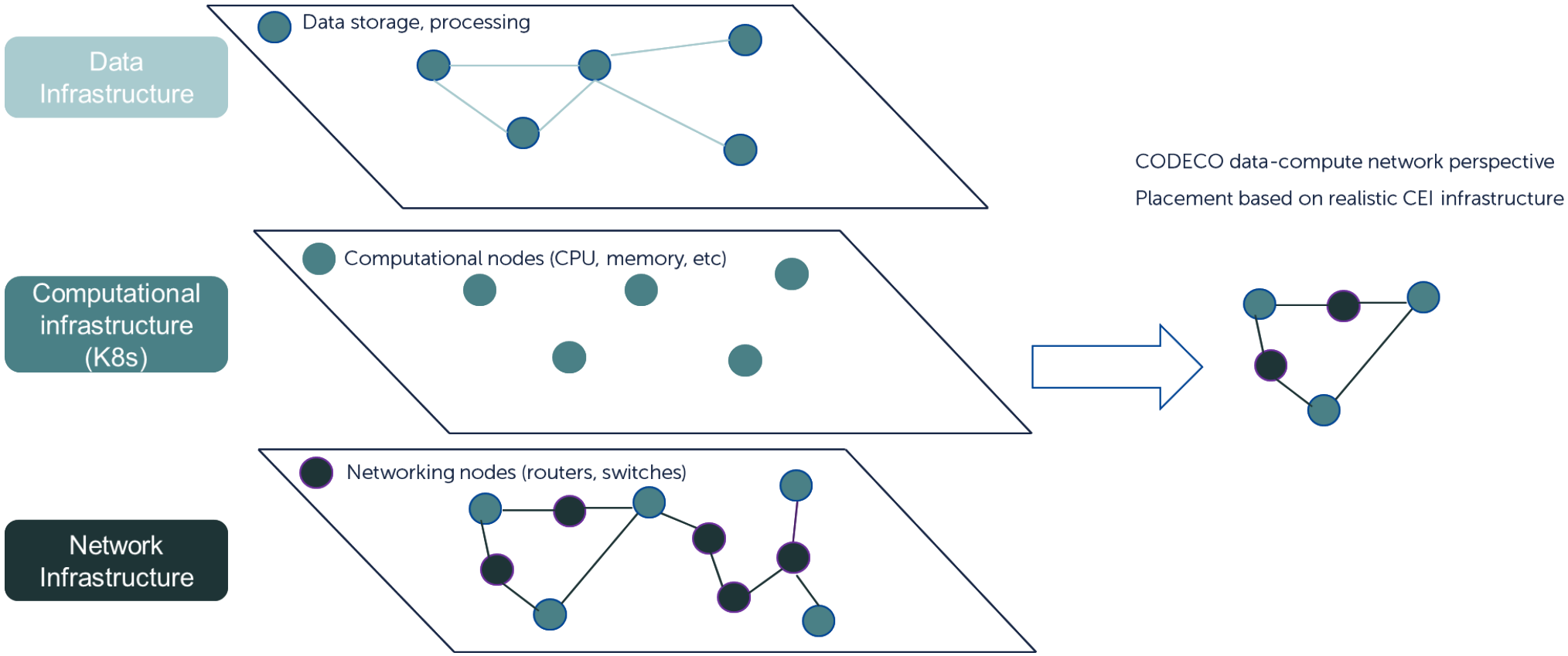
P3: Decentralized Edge MDS
Lead: Telefonica, SP
VP: cross-layer resource optimization for MDS
Domain: Smart Cities

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'S DATA-COMPUTE-NETWORK APPROACH



Data-Compute-Network Approach for Cloud-Edge-IoT

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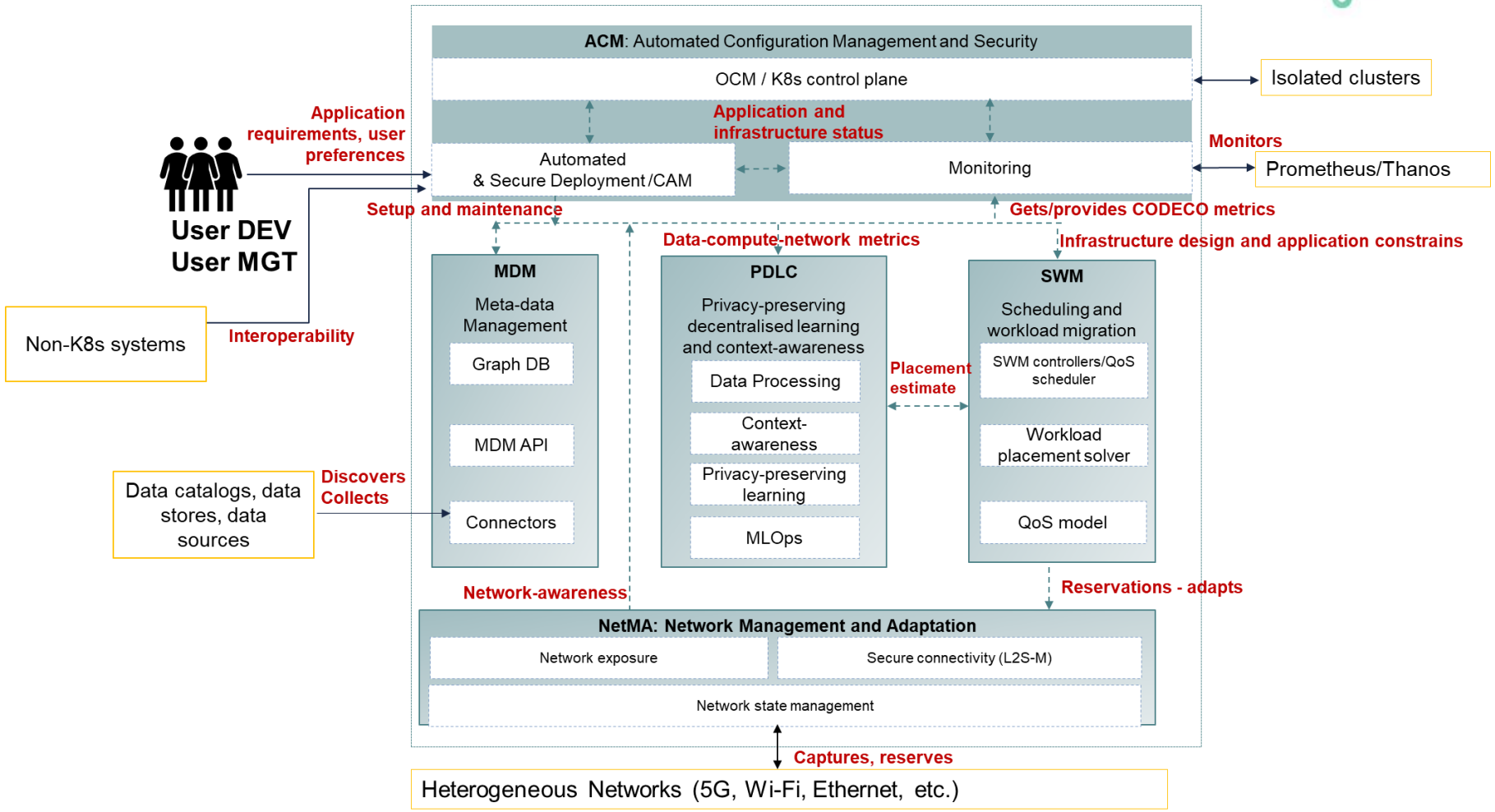
CODECO'S FUNCTIONAL REPRESENTATION



Functional Representation

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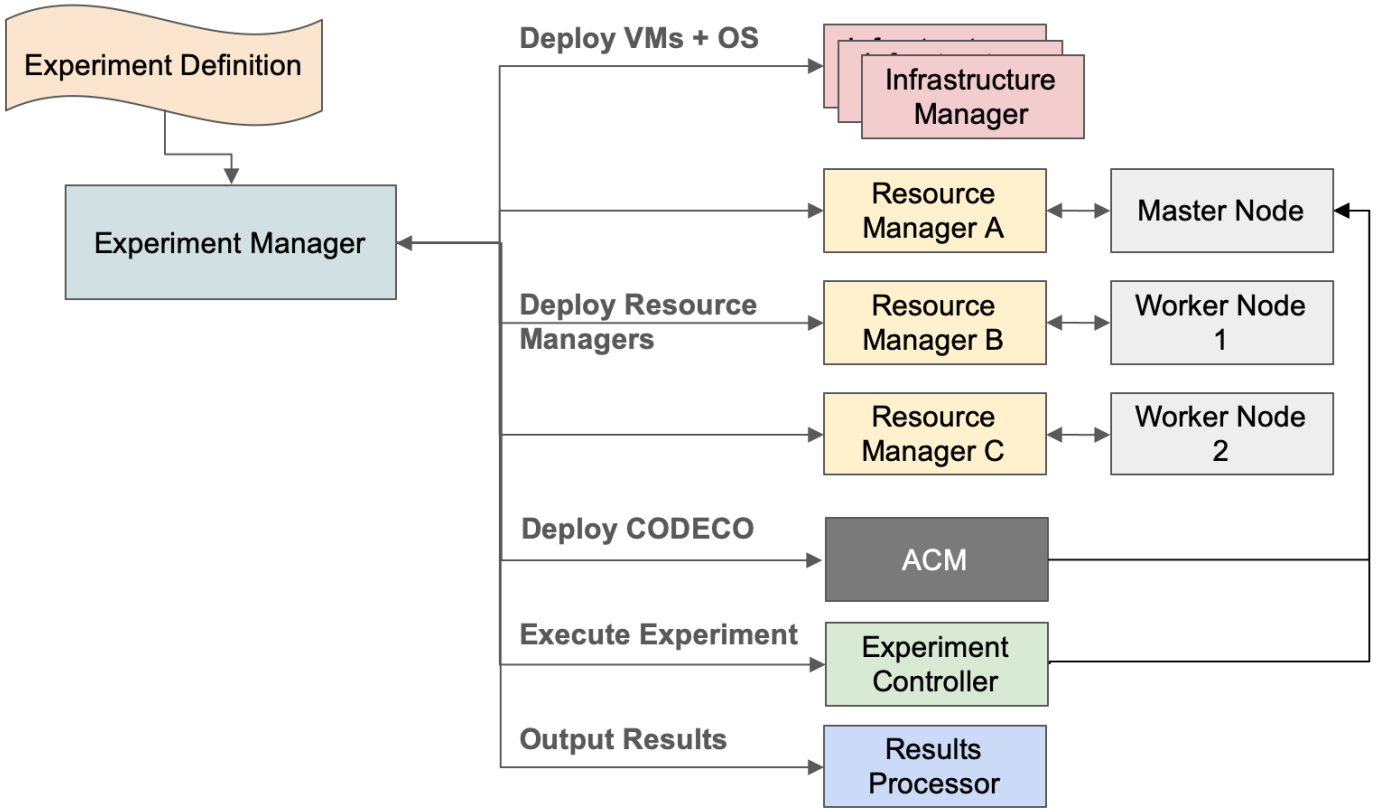
CODEF ARCHITECTURE



- **Infrastructure Managers:** cluster nodes allocation over heterogeneous test-beds
- **Resource Managers:** node-level automation abstraction & software deployment
- **Experiment Controller:** experiments execution based on the defined parameters
- **Result processor:** management of results

Integration with CODECO components via ACM

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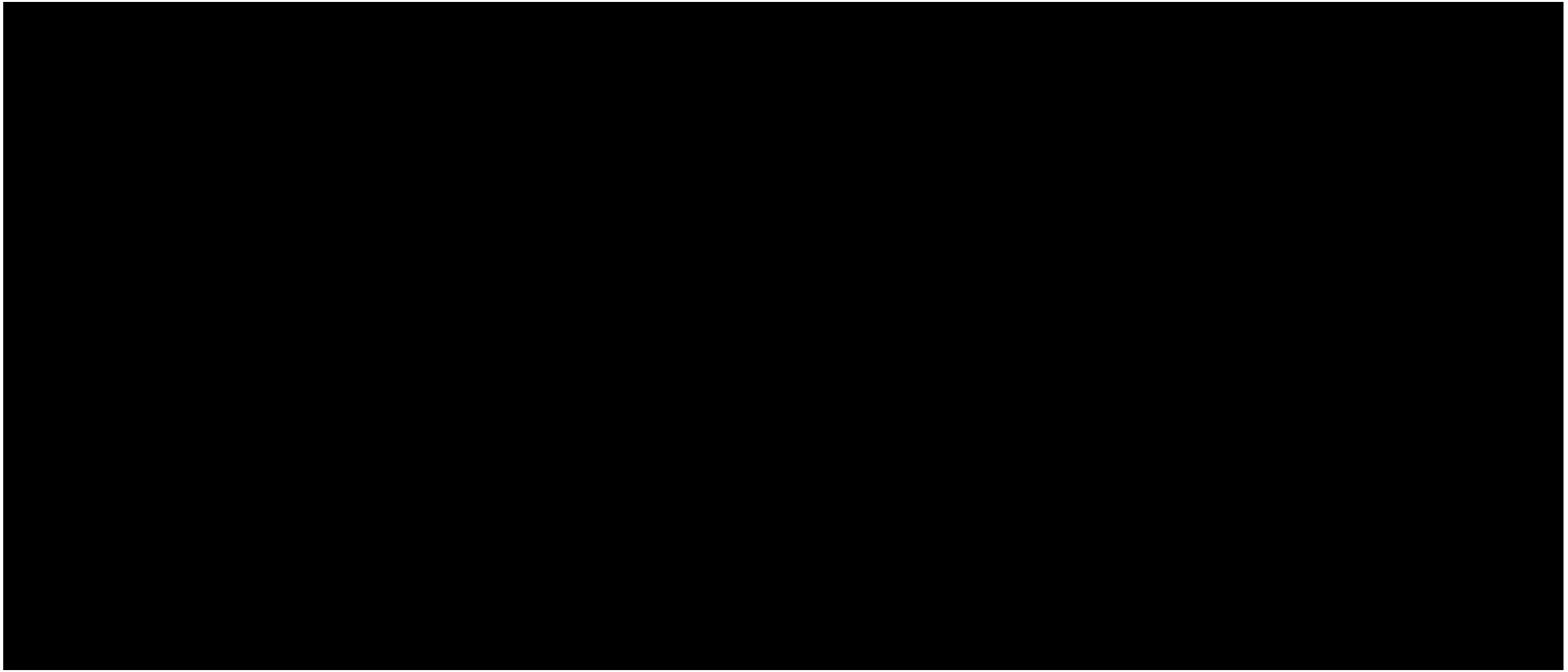
CODEF DEMO



THANK YOU

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CODEF

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Telefónica

POLITÉCNICA UNIVERSIDAD POLITÉCNICA DE MADRID

Red Hat

almende ORGANIZING NETWORKS

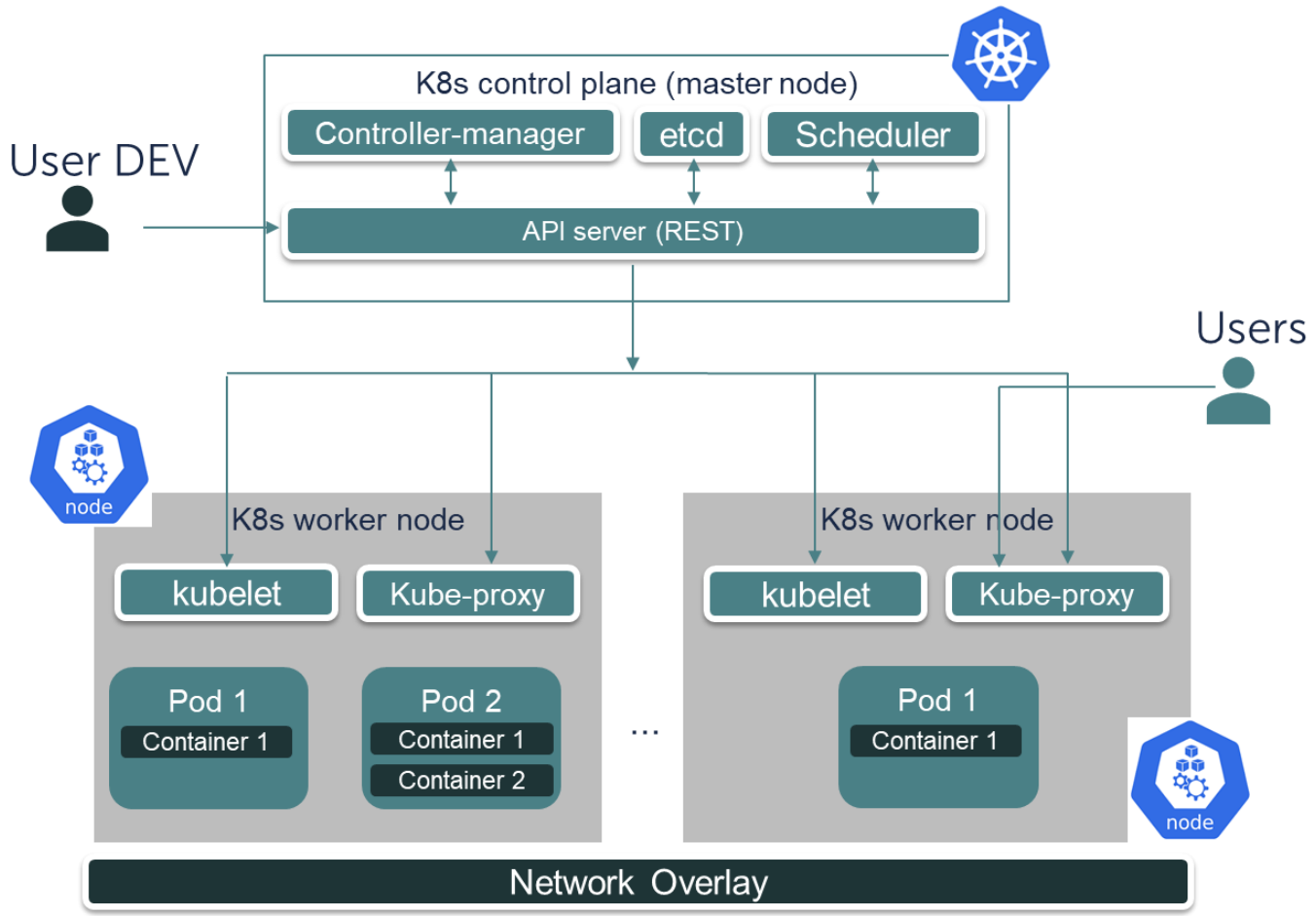
AFFILIATED ENTITIES:

GÖTTINGEN STADT, DIE WISSEN SCHAFFT

uc3m Universidad Carlos III de Madrid

Atos EVIDEN an atos business

A QUICK LOOK ON KUBERNETES



Kubernetes High-Level Operation

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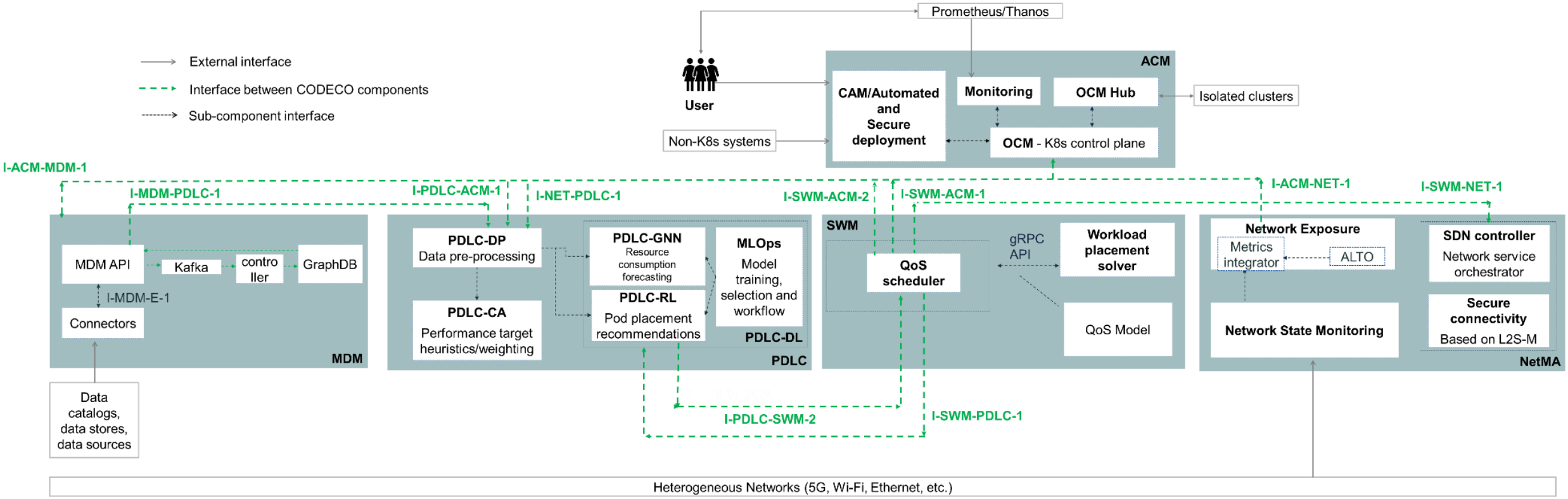
CODECO'S SINGLE-CLUSTER ARCHITECTURE



Single-Cluster Architecture

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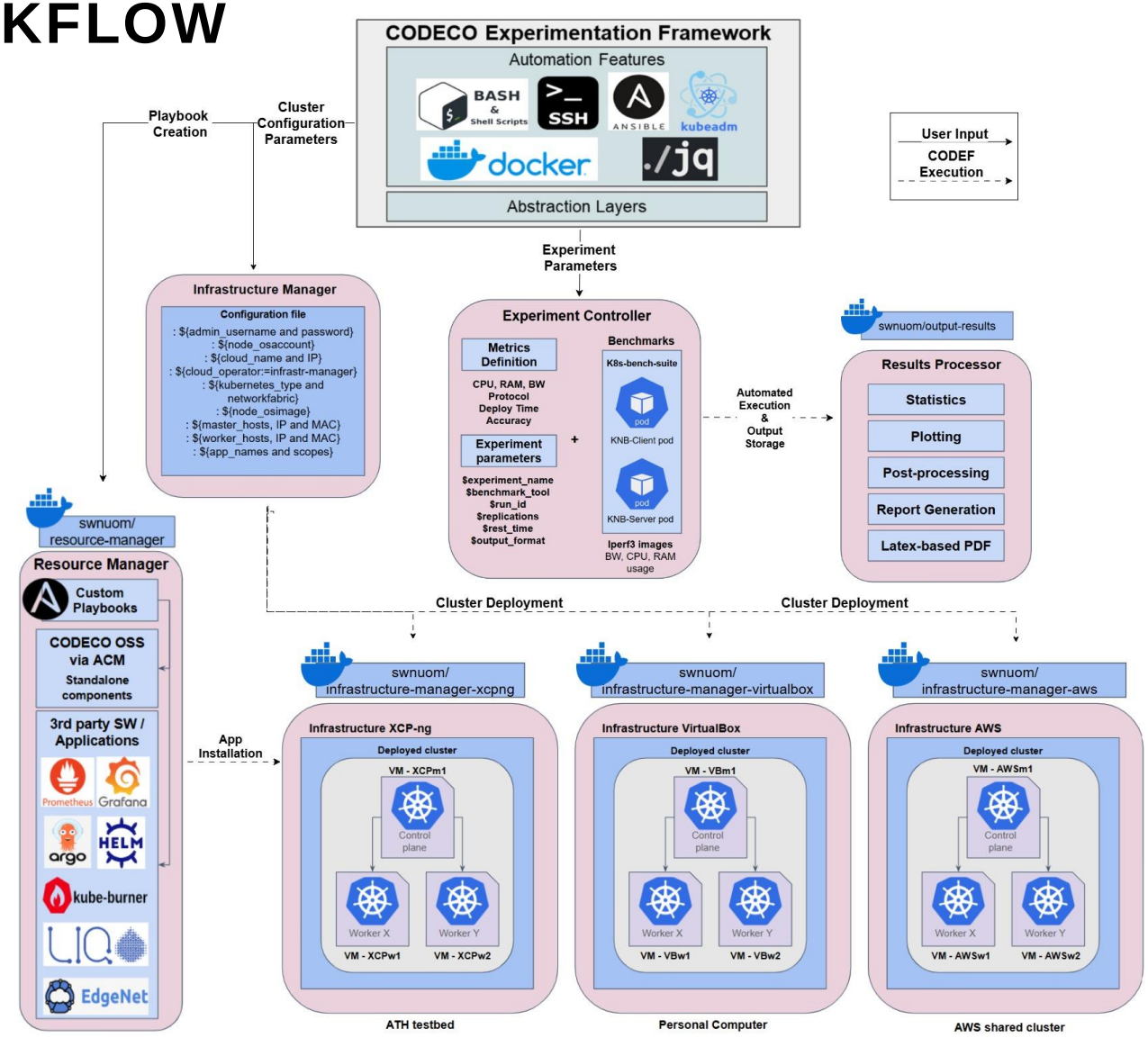
CODEF WORKFLOW



CODEF abstraction layers and workload

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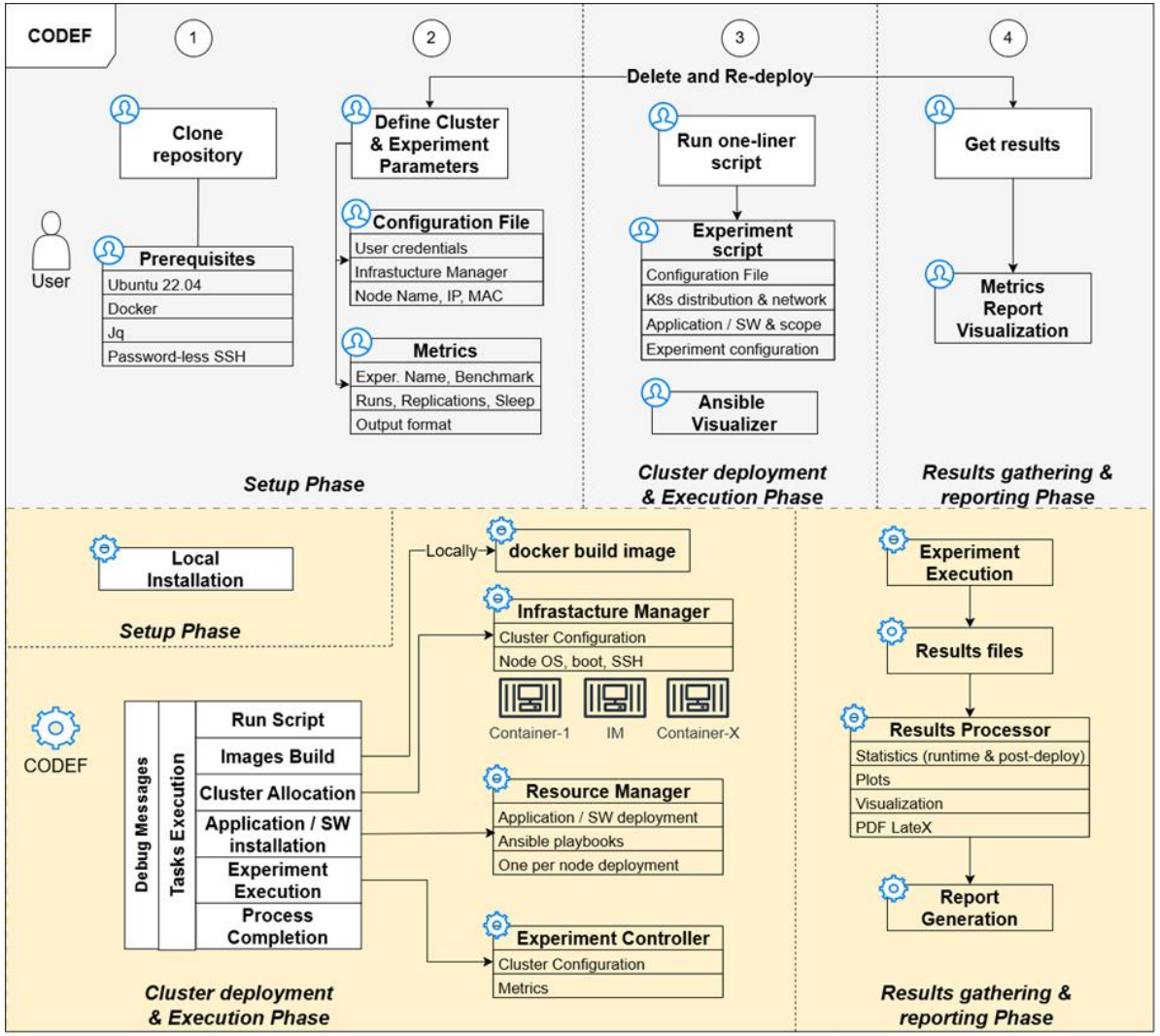
CODEF USER INTERACTION & SYSTEM ACTIONS



CODEF sequence diagram for users and system

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