This Communication is part of a project that has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement Nº101069732

Meta OS cluster workshop
3rd April 2024 - Online
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GOAL, ARCHITECTURE AND USE CASES

- Using context-awareness to distribute software task (application) execution requests
- Supporting intelligence as close to the events as possible
- Supporting execution of services using “abstract resources” (e.g., virtual machines, containers) connected through a smart network infrastructure
- Allocating and orchestrating abstract resources, responsible for executing service chain(s)
- Supporting scalable data autonomy

aerOS overarching goal is to design and build a virtualised, platform-agnostic meta operating system for the IoT edge-cloud continuum. As a solution, to be executed on any Infrastructure Element within the IoT edge-cloud continuum - hence, independent from underlying hardware and operating system(s)

Manufacturing: Data-Driven Cognitive Production Lines (Manufacturing Autonomy Level 4 – MAL4)

Renewable energy: Containerised Edge Computing near Renewable Energy Sources

Maritime ports: Smart edge services for the Port Continuum

Machinery: High Performance Computing Platform for Connected and Cooperative Agricultural Mobile Machinery to Enable CO2 Neutral Farming (HPCP-

Smart Buildings: Energy Efficient, Health Safe & Sustainable Smart Buildings
Main focus of aerOS: Orchestration, Data Accessibility and Interoperability, Service Monitoring, Heterogeneous underlying systems, automation in the continuum.

Key open source technologies leveraged:

- KubeEdge
- NGSI-LD
- KrakenD
- FIWARE
- KeyCloak
- IOTA
- Redpanda
- Morph-kgc
- PowerTOP
- Cilium
- Zenoh
- OpenAPI
- DCAT
- Kopf
- Helm
Distributed state repository for domains federation

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Two-layer service orchestration

- Homogeneous description of services
  - Custom TOSCA model

- Indication of SLA and requirements via user-friendly portal (UI)

- Supports heterogeneous container management frameworks for workload deployment:
  - K8s, Docker, containerd

- Lightweight messaging
  - Redpanda

- Decentralization BOTH in decision and in deployment
Data Fabric

- Data products → Batch data sources enabled. Several extensions to Morph-KGC tool.
- Data security → Validated basic role-based authentication and authorization using Keycloak + OpenLDAP.
- Data catalog → aerOS user metadata (from LDAP) integrated in the knowledge graph.
Automating the continuum: scripting and DevPrivSecOps

- Inclusion of security and privacy tests in the software development lifecycle

- Guaranteed security and privacy in the deployment of components in aerOS and beyond

- Will be made available for all projects to follow the process
What can be anticipated for the future of the continuum?

- **Security, privacy and data spaces** for the continuum.

- Advanced (frugal, explainable, trustworthy) AI mechanisms for improving continuum performance: robustness, autonomy, traceability, governance.

- Underlying **network automation**, IP-abstraction and connectivity by service names (eBPF, kernel technologies...).

- Achievement of a true AI-based cognitive mesh with ambient intelligence.

- **Miniaturization** of workloads’ containers and packages.

- Business models for effective **federation** of resource sharing in multi-stakeholder scenarios.

The next calls in the programme must target long-term goals:

- **European values**: GDPR natively and lightweight DLT to govern all continuum transactions (sovereign continuum).

- **Europe’s own technology must stand out**: Alternative CPU architectures completely embedded in the continuum, prominently RISC-V.

- **True tactile deployments**: Reconfiguration of the continuum in runtime in milliseconds time.

- **Metaverse of the continuum**, including VR simulation and IoT-powered ubiquitous data. Self-organizing networks with automatic formation, maintenance, and adaptation to ensure optimal data flow, load balancing, and resource allocation in complex, distributed computing environments.
Two open calls to be conducted

A total of **900k€** will be distributed to external third parties.

Expected ~15 contributions in total.

Each open call will be funded with a fixed amount of **60k€**.

Each open call funded proposal will have to focus on one of the three pilots.

**What’s the focus of each round?**

**Round #1**
- (1) extension of functionalities delivered by aerOS
- (2) expansion of application of aerOS in the five use case verticals considered in the project

**Round #2**
- (3) application of aerOS to verticals outside of these considered in the project

**Round #2 Opening on May 2024!!**
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THANK YOU!

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