EDGE-TO-CLOUD Continuum

ECS COLLABORATION TOOL

NEPHELE

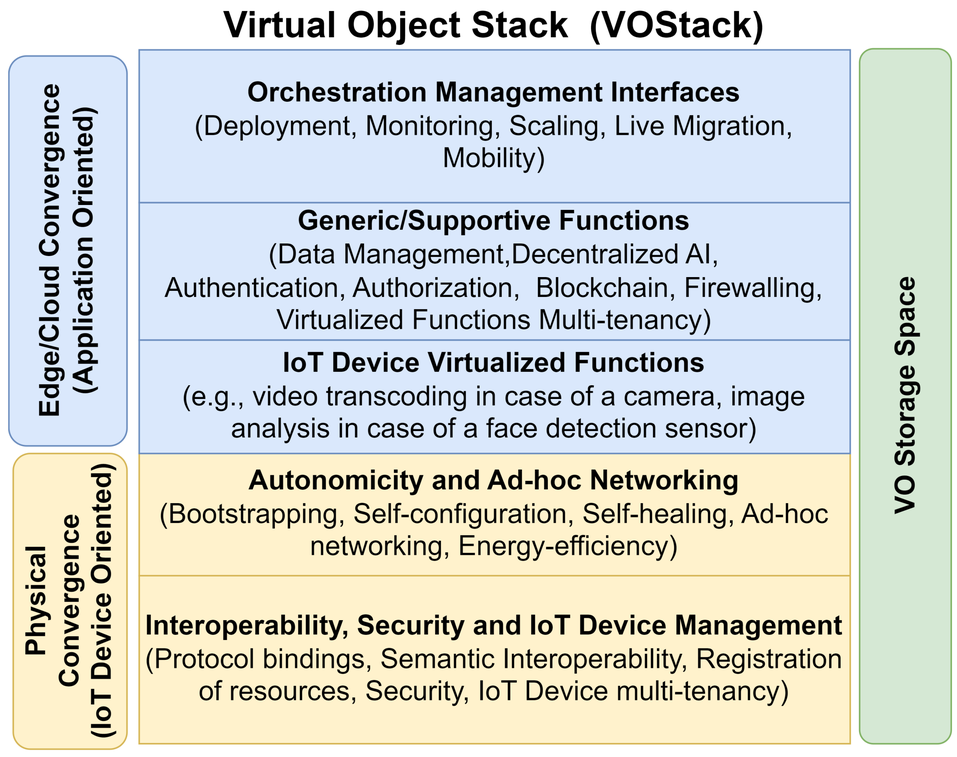
A lightweight software stack and synergetic meta-orchestration framework for the next generation compute continuum

Project Summary

NEPHELE is a RIA (Research and Innovation Action) project funded by the Horizon Europe programme under the topic "Future European platforms for the Edge: Meta Operating Systems". Its vision is to enable the **efficient, reliable and secure end-to-end orchestration of hyper-distributed applications over programmable infrastructure that is spanning the compute continuum from Cloud-to-Edge to IoT**, removing existing **openness** and **interoperability barriers** in **the convergence of IoT technologies** against **cloud and edge computing orchestration platforms**, and introducing **automation** and **decentralised intelligence** mechanisms powered by 5G and distributed AI technologies.

Areas of Research

- **Virtualization of IoT devices** and **IoT technologies interoperability** based on the development of an **open-source software stack**, called as VOStack.
- **Convergence of IoT with edge and cloud computing technologies** based on the development of Virtual Objects and Composite Virtual Objects that can be part of application graphs.
- **Synergetic orchestration mechanisms** for the computing continuum considering various synergies among agents and edge/cloud computing stakeholders.
- **AI-assisted orchestration mechanisms** to increase automation and decentralized intelligence.



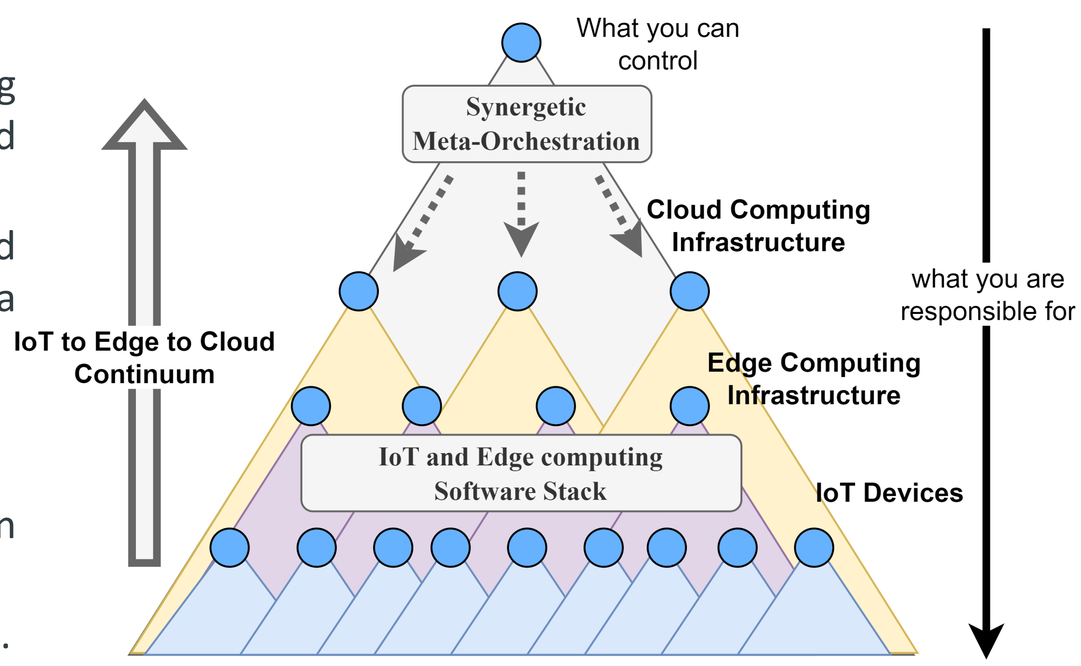
Project's added value, impact, innovation and results

The NEPHELE project introduces **two core innovations**, namely:

- An **IoT and edge computing software stack (VOStack)** for leveraging virtualization of IoT devices at the edge and supporting openness and interoperability aspects in a device-independent way.
- A **synergetic meta-orchestration framework** for managing distributed applications in the compute continuum based on the adoption of a **"system of systems" approach**.

It also provides:

- **Open-source software** aligned with the W3C Web of Things (WoT).
- **Demonstrations** in the areas of disaster management, logistic operation in ports, smart buildings and remote healthcare services.
- Numerous **publications** in international journals, conferences, workshops.



Follow-up and new project ideas

Intelligent orchestration solutions over multi-cluster/multi-cloud infrastructures based on intent-driven approaches and the integration of AI mechanisms; Extension of the open-source IoT Software Stack (VOStack) with advanced security and network management mechanisms, as well as consideration of various IoT devices, including robotics. Integration with pilots and demonstrators.

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