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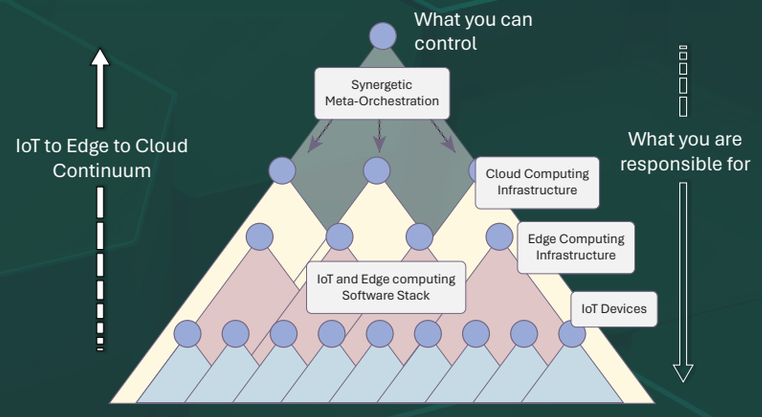
A lightweight software stack and synergetic meta-orchestration framework for the next generation compute continuum

Vision and Approach

• The NEPHELE's vision is to enable the efficient, reliable and secure end-to-end orchestration of hyper-distributed applications over programmable infrastructure that is spanning across the computing continuum from IoT to Edge to Cloud.

• A "system of systems" approach is adopted, where responsibility is managed in the upper levels, while control is distributed across various entities.



Two successful open calls

• 8 projects in the 1st Open Call (focus of Virtual Objects).

• 8 projects in the 2nd Open Call (focus on Orchestration Platform and Distributed Applications management).

Validation results, feedback, performance evaluation, business value identification from various verticals.

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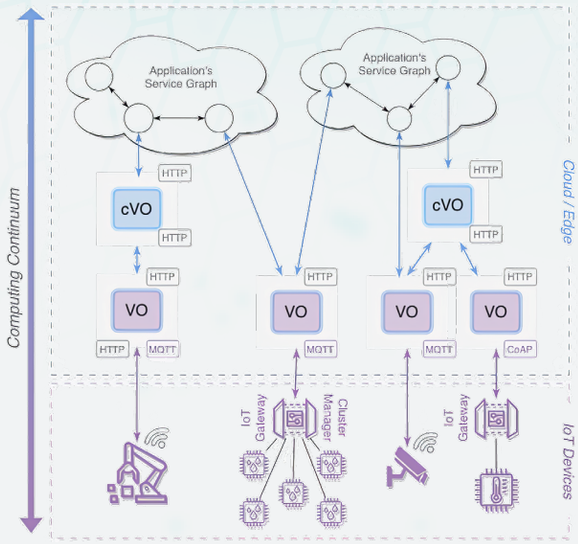
Main Innovations

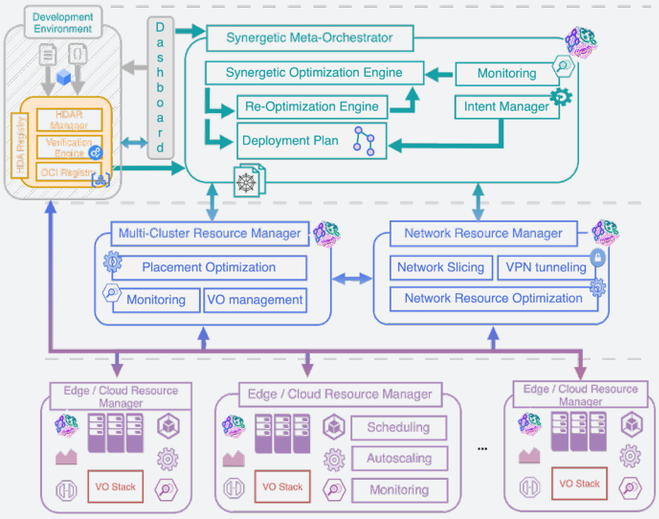


Development of a **synergetic meta-orchestration framework** for managing the coordination between cloud and edge computing orchestration platforms.

- Open-source release of the NEPHELE meta-orchestration platform.

Development of an **IoT and edge computing software stack (Virtual Object Stack - VOStack)** for leveraging virtualization of IoT devices at the edge part of the infrastructure.

- Open-source release of VOStack, aligned with W3C WoT (VO-WOT software) and OMA LwM2M.
- Plan for release of VO-WoT as an Eclipse open-source project.



Use Cases and Main Results

Successful deployment and evaluation of the NEPHELE artifacts in four use cases.

Trials in both lab and operational environments (Use Case 1 and Use Case 2 have been evaluated in the Slovenia's port of Koper).

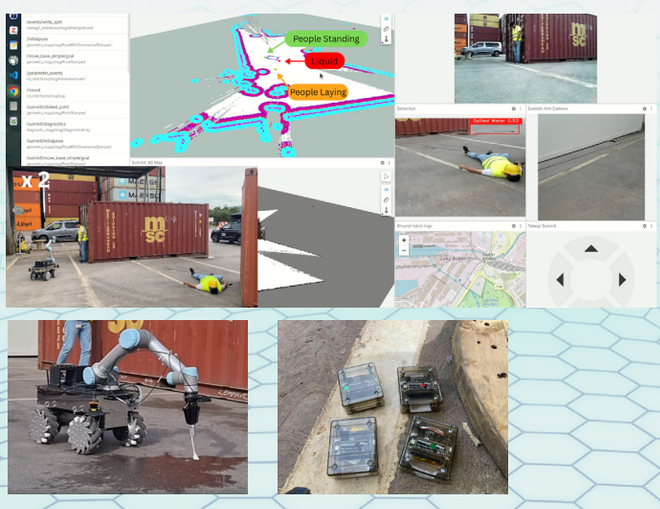
- Validation of efficient operation of the NEPHELE platform.
- Assessment of a wide set of KPIs, including platform efficiency and business metrics.

UC#1: Emergency/Disaster Recovery

Post-disaster management scenarios.

- Deploy network infrastructure and devices for the mission.
- Map the area to locate and identify victims.
- Assess the damages and comprehend the remaining or upcoming risks to prioritize rescue operations.

KPIs: Victim detection and assessment precision (target values: accuracy > 93% and false negative rate < 5%); Times to task completion (e.g., device deployment, liquid sampling, victim detection); Packet Delivery Ratio (target value: > 95%).



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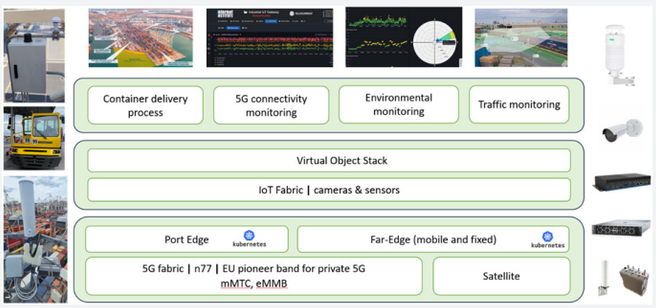
UC #2: AI assisted Logistics Operations in the Port of Koper

Routing Optimization Services.

- Delivery of containers to warehouses.
- Environmental monitoring, Safety conditions, SLAs.
- Digital twin.

KPIs: Delivery/routing times reduction (~5%), Truck utilization increase (~5%), Reducing delivery errors (up to 2 errors/day), Reducing CO2 emissions of reach stackers (~1%), Time Sensitive Networking (latency, jitter).

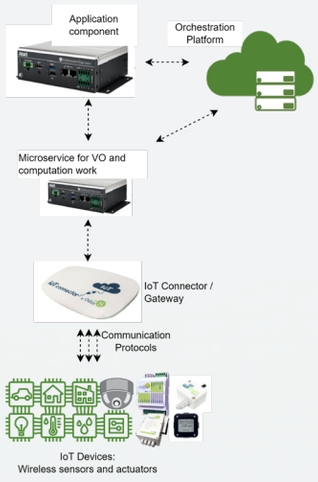


UC#3: Energy Management in Smart Buildings

Energy efficiency in smart buildings.

- Distributed automation system.
- The system continuously collects data from sensors appliances and HVAC systems and suggests control actions.
- Digital twin.

KPIs: Energy consumption reduction (~22%), System reliability (~100%), User Comfort and Well-Being Index (~84%), Security and Trust, Scalability.

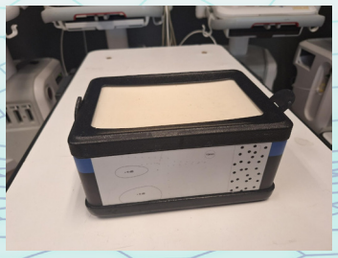


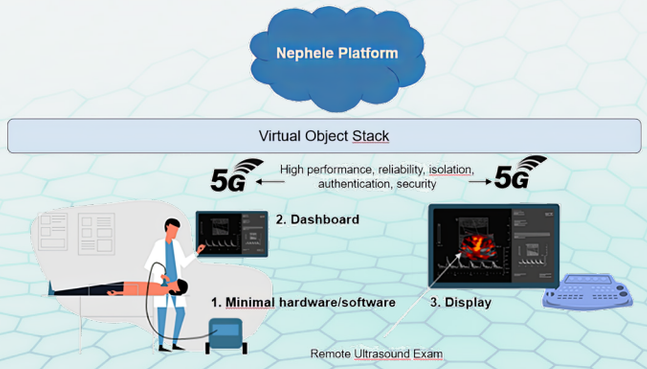
UC#4: Remote Healthcare

Dematerialised Ultrasound Solution (DmUSS).

- The Ultrasound Exam (USEx) is transmitted towards remote healthcare professionals.
- Video streaming service.

KPIs: Latency (15-35 ms), Bandwidth (15-20 MB/sec), FPS (50-65 Hz).





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