EUCloudEdgeIoT.eu
Open Continuum

Driving Innovation in the Cloud-Edge-IoT Continuum

A summary of the Concertation meeting in Brussels on 10 May 2023

Author
Dr. Amjad Yousef Majid
amjad.majid@martel-innovate.com

Grant Agreement No.: 101070030 **Topic:** HORIZON-CL4-2021-DATA-01-07
Call: HORIZON-CL4-2021-DATA-01 **Type of action:** HORIZON-CSA

Driving Innovation In the Cloud-Edge-IoT Continuum

In the realm of digital advancement, the Cloud-Edge-IoT continuum is seen as a key factor in shaping the future of technology. This continuum represents the evolution of data processing and management as data moves from IoT devices to Edge and Cloud. On 10 May 2023, Open Continuum under the EUCloudEdgeIoT initiative[1] and the European Commission organised a concertation meeting in Brussels, where the importance of shared knowledge and ideas in shaping the European research agenda for 2025-2027 was emphasised.

Speakers at the event presented different perspectives and insights about the future of this continuum. **Pearse O'Donohue**, Director for the Future Networks at the European Commission (EC), discussed the role of digitisation and disruptive developments in creating a technologically advanced European society and affirmed the EC's commitment to its Digital Decade objectives. **Manuel Mateo Goyet**, Deputy Head of Unit Cloud and Software at EC, highlighted the need to align projects with EC objectives, with particular emphasis on standardisation across the 27 member states. He discussed the Cloud Alliance's Procurement Guidelines for Cloud systems and the role of legislation, monitoring, and road mapping in policymaking. **Max Lemke**, Head of Unit Internet of Things at EC, focused on the strategic importance of Industrial IoT for Europe, the need for next-generation IoT, and the expectation of significant growth in the Cloud-edge-IoT sector. He urged smaller actors to collaborate to compete against bigger ones and emphasised the importance of research results reaching the market.

Several projects were presented at the event, with a common thread of using advanced technologies to maximise the potential of the Cloud-Edge-IoT continuum. Each project, from AC3 to DECICE and others, shared a common focus on using AI/ML algorithms, focusing on efficient and secure data management, and creating resilient, automated, and energy-efficient continuum systems. The projects also commonly emphasised the development of new architectural models, efficient use of resources, and enhanced interoperability in their systems. The AC3 project, for example, plans to predict cloud edge computing continuum usage and far edge availability, which will help determine the optimal placement of the microservices that will run applications on the infrastructure. ACES aims to develop cognitive behaviours for an edge-services cloud to increase resilience while managing simultaneous service constraints. Meanwhile, the CODECO project seeks to enhance communication services by deploying its components across federated networks. In projects like Cognifog, MlSysOps, and EDGELESS, the focus is on efficient data management, development of decentralised AI capabilities along the Cloud-Edge Continuum and leveraging serverless concepts in all layers of the edge-cloud continuum. The DECICE project aims to develop an AI-based open and portable cloud management framework for automatic and adaptive optimisation and deployment of applications in a federated infrastructure. Meanwhile, Cognit is focused on supporting a new innovative FaaS paradigm in Europe for edge application management.

---

[1] Thank you to the rapporteurs for providing inputs to this document: Giovanni Rimassa (Martel/Open Continuum), Amjad Majid (Martel/Open Continuum), Golboo Pourabdollahian (IDC/Unlock CEI), Antonio Kung (Trialog/Open Continuum, Lara López (Atos-Eviden/Open Continuum), Juncal Alonso Ibarra (Tecnalia/SW Forum), and John Favaro (Trust-IT/SW Forum).

Funded by Horizon Europe Framework Programme of the European Union

Projects like AERO, OpenCUBE, and RISER are developing compilers, runtime systems, operating systems, hardware, and auxiliary software deployment services to accelerate the adoption of EU cloud hardware based on European technology. They aim to enable power efficiency and ease the integration of different data architectures. Projects such as INCODE, OASEES, and OPEN SWARM focus on creating an open computing continuum, developing decentralised architectures, orchestrating smart nodes, and promoting collaborative edge-aware AI. They highlight impacts on multiple IoT platforms, enhancing security, and addressing business and social impacts on security and safety in areas like utilities, mobility, robotics, renewable energy, and buildings.

Other projects focus on the development of metaOS for the orchestration of resources across the continuum. AerOS aims to develop a meta-operating system for the edge-cloud-IoT continuum, focusing on security and cost. FLUIDOS plans to create a seamless continuum for microservices deployment. ICOS designs an open-source middleware for edge-to-cloud integration. NebulOuS is working on a meta-operating system to optimise application data. NEMO focuses on bringing intelligence closer to data sources, considering cybersecurity and privacy. Nephele introduces two innovations: IoT and edge computing software stack for interoperability and a synergic meta-orchestration framework to manage the cloud and edge computing continuum. All projects aim to enhance data analysis closer to the data sources and are interested in collaborations.

Success stories and lessons learned from previous projects were also presented. PHYSICS emphasised the importance of early user engagement and simplicity in integration. DATACLOUD faced challenges in decentralising big data systems and pipeline definition. CHARITY focused on advanced media solutions, emphasising the need for consumer-friendly language. SERRANO integrated edge, cloud, and High-performance computing (HPC) resources, highlighting the importance of storage. AI-SPRINT highlighted the benefits of FAAS and stressed the need for standardisation and resource management. COSMOS, ELEGANT, FOCETA, PIACERE, VeriDevOps, and XANDAR shared lessons on DevOps pipelines, elastic runtimes, data importance, market awareness, and challenges in dynamic environments. ASSIST-IoT, INGENIOUS, IoT-NGIN, TERMINET, INTELLIOT, and VEDLIOT shared success stories on Kubernetes use, digitalising supply chains, integrating emerging technologies, and developing efficient deep learning for IoT.

In conclusion, the Cloud-Edge-IoT continuum is a transformative force in the digital landscape, driving innovation and shaping technology's future. Speakers emphasised the continuum's importance in optimising data processing, management, and analysis. Discussions on policy-making and standardisation, alongside groundbreaking projects, showcased collective efforts to unlock the continuum's full potential. Success stories and lessons learned from mature projects emphasised user engagement, simplicity, standardisation, and market awareness. Finally, the dynamic synergy between speakers, projects, and lessons learned at the event highlighted the immense potential of the Cloud-Edge-IoT continuum and underscored the importance of collaborative efforts in driving innovation and shaping the future of technology.

Funded by Horizon Europe Framework Programme of the European Union

EUCloudEdgeIoT.eu
Open Continuum

www.eucloudedgeiot.eu

@EU_CloudEdgeIoT

eucloudedgeiot

Grant Agreement No.: 101070030 **Topic:** HORIZON-CL4-2021-DATA-01-07
Call: HORIZON-CL4-2021-DATA-01 **Type of action:** HORIZON-CSA