SovereignEDGE.EU
COGNIT

FOSDEM – 04/02/2023

The Role of Open Source at the EU Technology Roadmap for a European Sovereign Cloud

Dr Alberto P. Martí
VP of Open Source Innovation
OpenNebula

~$ whoami

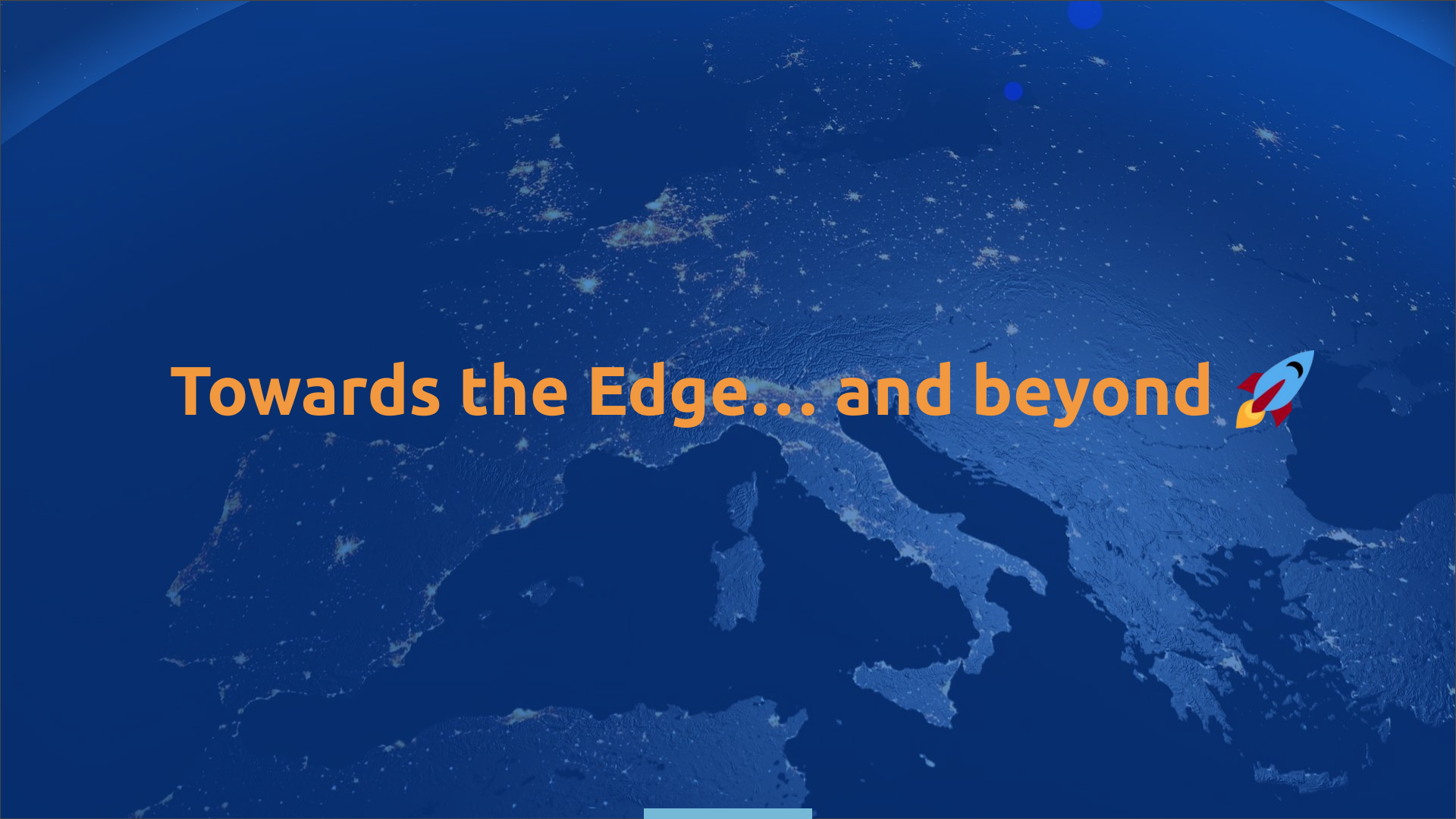
Dr Alberto P. Martí

VP of Open Source Innovation

amarti@opennebula.io

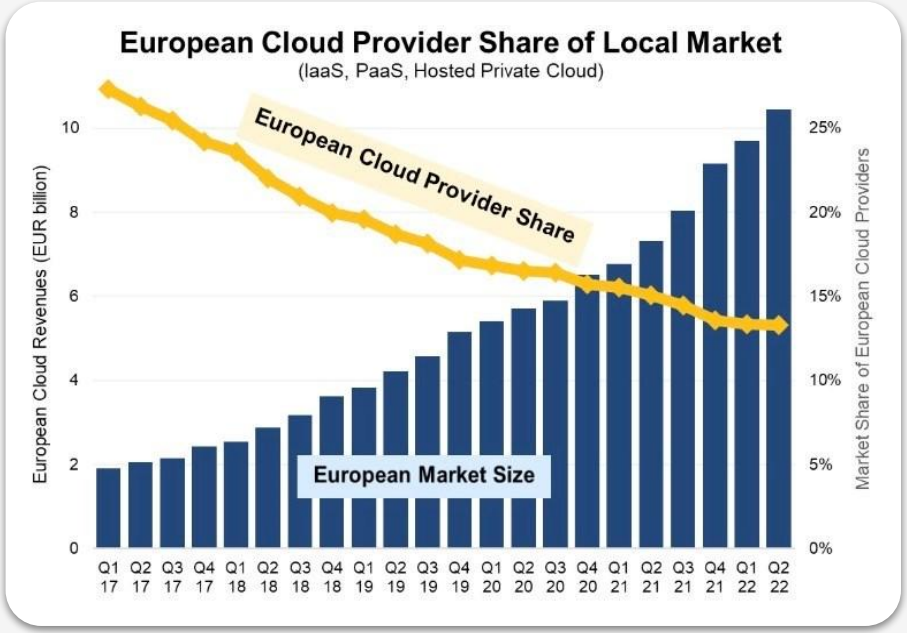
EUROPEAN ALLIANCE FOR INDUSTRIAL DATA, EDGE AND CLOUD

Sovereign EDGE.EU


Towards the Edge... and beyond 🚀

Trends in the Cloud Market

The EU is **heavily dependent on non-EU** cloud services, infrastructure, and technologies



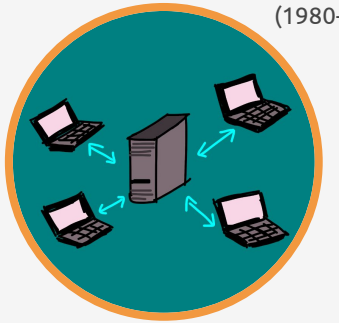
Since 2017, the EU cloud market has **grown more than threefold** (over €23 billion for 2020)
… but European cloud service providers' **market share keeps declining**!

Trends in the Cloud Market

Towards a new **multi-provider & vendor-neutral** Edge Computing paradigm

DECENTRALIZED INFRASTRUCTURE

CENTRALIZED INFRASTRUCTURE



Client/Server
(1980-2000)

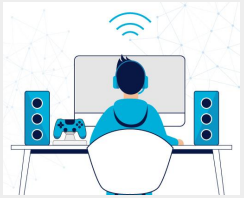
Distributed Cloud
(2020-)

Mainframe
(1960-1970)

Centralized Cloud
(2006-2020)

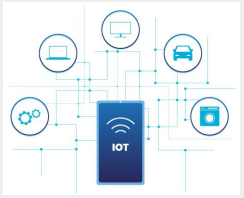
Trends in the Cloud Market

Edge Computing is opening up **new business models** and disrupting old ones

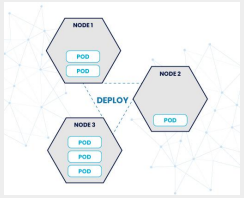

Gaming

OTT & Broadcasting

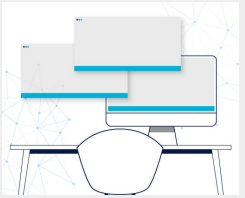
5G Applications



Internet of Things



Smart Cities


Virtual Desktop

- 🚀 Deploy (Ultra-) Low-Latency Applications
- 🚀 Improve User Experience
- 🚀 Expand Service Availability
- 🚀 Reduce Data Transfers and Security Risks
- 🚀 Reduce Energy Consumption
- 🚀 Minimize Vendor Dependency
- 🚀 Foster 🇪🇺 Ecosystem of New Infra Providers — *Including Telcos!*

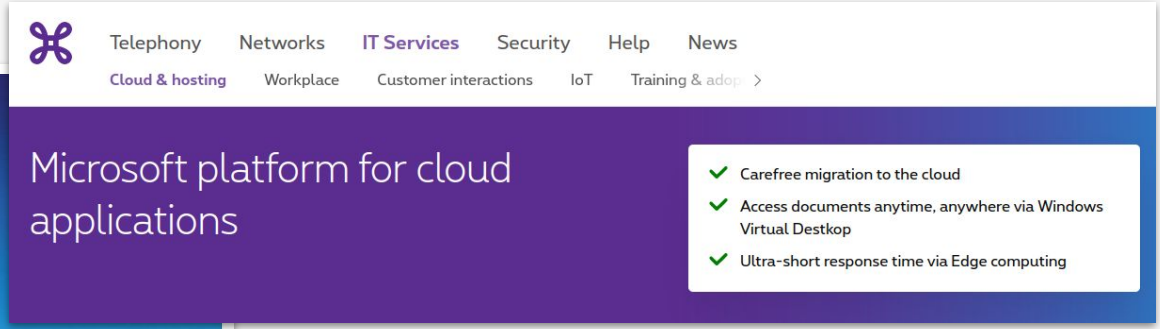
Edge Computing

Hyperscalers ❤️ **Telecom/5G** Operators

Linkedin Facebook Twitter

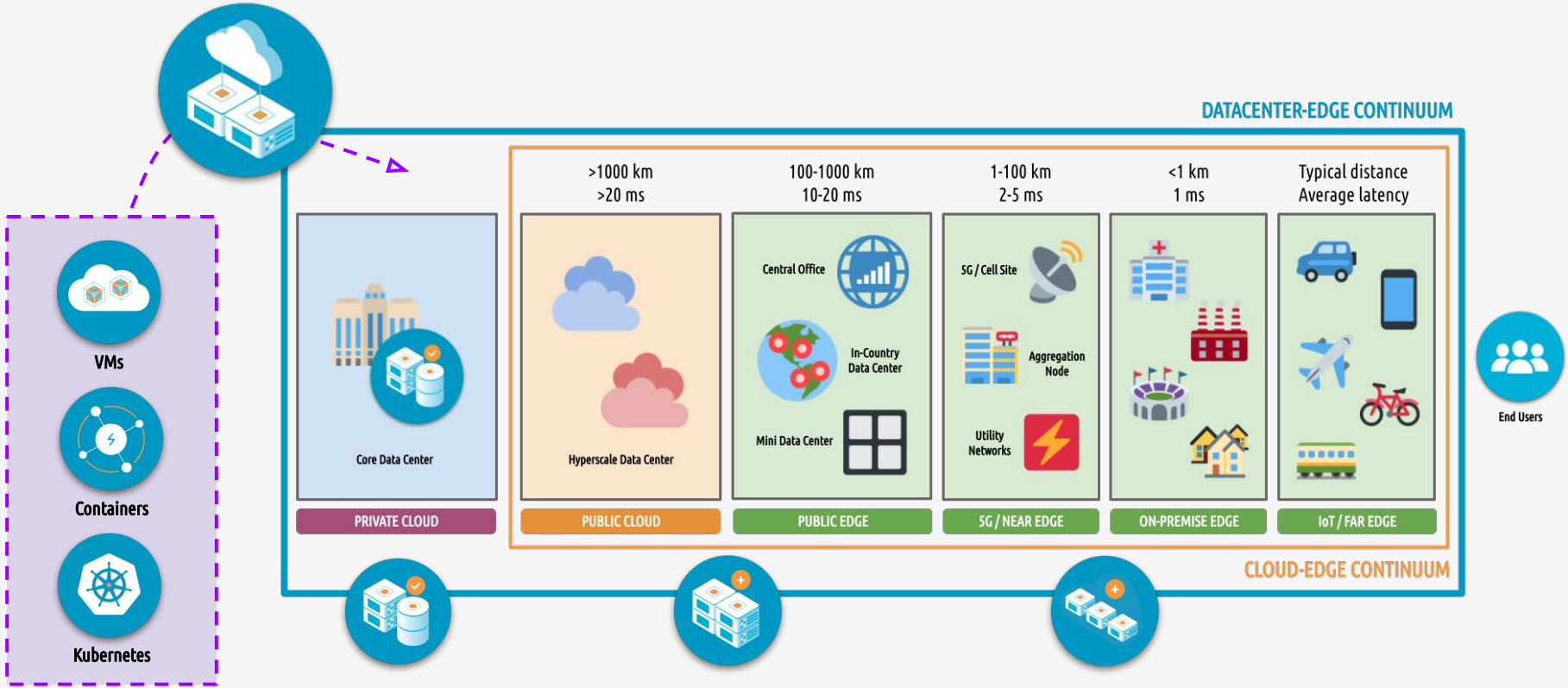
Published: 19/05/2021 | by O2

O2 partners with Microsoft to develop Mobile Edge Computing capability within a Private 5G Network



Edge Computing

How to manage the emerging **Datacenter-Cloud-Edge** continuum?



Signals from the EU 📡

European Commission

MY AGENDA FOR EUROPE:
POLITICAL GUIDELINES FOR THE NEXT COMMISSION (2019-2024)

"It may be too late to replicate hyperscalers, but it is not too late to achieve technological sovereignty in some critical technology areas"

Ursula von der Leyen
President of the European Commission

European Commission

"Open source impacts the digital autonomy of Europe. Against the hyperscalers in the cloud, it is likely that open source can give Europe a chance to create and maintain its own, independent digital approach and stay in control of its processes, its information and its technology".

European Commission

Open Source Software Strategy 2020-2023

"In the digital decade, open source will be a key element to achieve Europe's resilience and digital sovereignty. Open source helps breaking entry barriers for innovative companies and cutting costs for users. It improves market competition and technology neutrality. In one word: it gives people choice".

Commissioner Thierry Breton

Open Source in the European Economy: A Driver for Digital Sovereignty (Open Source Lisbon 2021)

2030 Digital Compass

ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en

Skills
ICT Specialists: 20 millions + Gender convergence
Basic Digital Skills: min 80% of population

Secure and sustainable digital infrastructures
Connectivity: Gigabit for everyone, 5G everywhere
Cutting edge Semiconductors: double EU share in global production
Data - Edge & Cloud: 10,000 climate neutral highly secure edge nodes
Computing: first computer with quantum acceleration

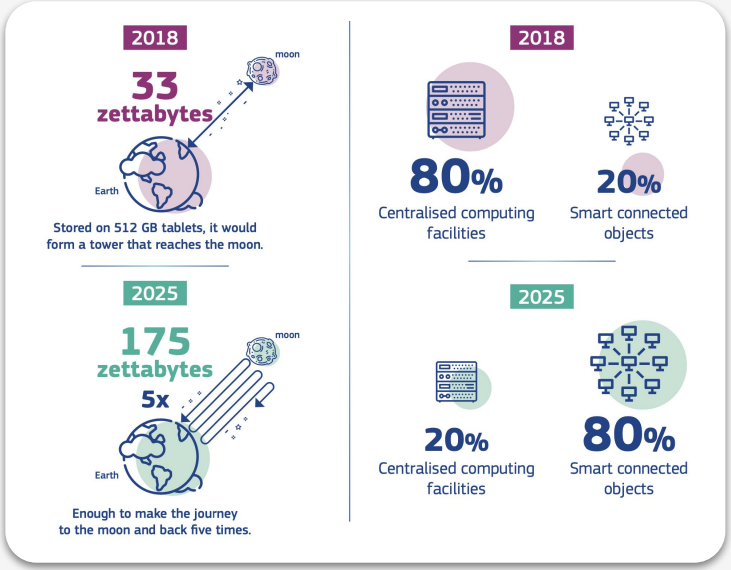
Digital transformation of businesses
Tech up-take: 75% of EU companies using Cloud/AI/Big Data
Innovators: grow scale ups & finance to double EU Unicorns
Late adopters: more than 90% of SMEs reach at least a basic level of digital intensity

Digitalisation of public services
Key Public Services: 100% online
e-Health: 100% availability medical records
Digital Identity: 80% citizens using digital ID

"[Europe's] increased dependency on critical, often non-EU based, technologies"

New Industrial Strategy

Strategic Dependencies & Capacities — **Opportunities for Europe's Autonomy**



- "*Europe has a unique market opportunity in the next five years to strengthen its data processing technologies by capitalising on the changes to come, in particular related to edge computing*".
- Europe can leverage its current strengths in Industrial Internet of Things, 5G networks, and telco-cloud solutions:
  - "*A competitive European alternative for a multi-cloud solution would be needed, building on an **open source** and governance by an independent organisation.*"

The European Alliance for
Industrial Data, Edge and Cloud

Member States Declaration

digital-strategy.ec.europa.eu/en/news/towards-next-generation-cloud-europe

Feb 2020

European Strategy for Data aims to build a single market for data

May 2020

Recovery and Resilience Facility 20% Digital EU Flagship "Scale-up"

Oct 2020

Member States Declaration for next generation European cloud

Mar 2021

Digital Decade Strategy sets targets on edge and cloud for 2030

May 2021

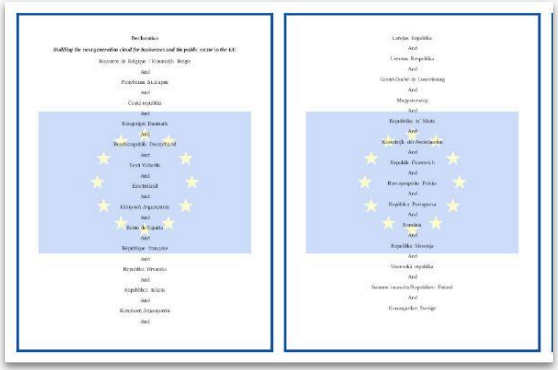
Updated EU Industrial Strategy evidences strategic dependencies

Member States Declaration

digital-strategy.ec.europa.eu/en/news/towards-next-generation-cloud-europe

In October 2020, all 27 EU Member States signed a joint declaration on "**Building the next generation cloud for businesses and the public sector in the EU**":

- "The EU has a unique opportunity to address the need for more data sharing and decentralised data processing, closer to the user (at the edge)".
- "Completely interoperable, **open**, multi-vendor cloud platforms and services, based on European, international or **open source standards**, will enable users to migrate effectively to the cloud (...)".



The Signatories agreed on an ambitious investment plan (~**10 billion EUR**) gathering private, national and EU efforts and leading to the next generation of EU cloud and edge services…

EU Alliance for Data, Edge & Cloud

digital-strategy.ec.europa.eu/en/policies/cloud-alliance

EUROPEAN ALLIANCE FOR INDUSTRIAL DATA, EDGE AND CLOUD

16 December 2021
First working-level meeting of the Alliance
Agenda of meeting (.pdf)

14 December 2021
CEO kick-off meeting of the European Alliance for Industrial Data, Edge and Cloud hosted by Commissioner Breton

19 July 2021
Official launch of the European Alliance for Industrial Data, Edge and Cloud

7 May 2021
27 European CEOs submit the 'European industrial technology roadmap for the next generation cloud-edge offering' (.pdf) to Commissioner Breton

5 May 2021
Commission announced the European Alliance for Industrial Data, Edge and Cloud in the updated European industrial strategy

15 October 2020
27 EU Member States declare their will to collaborate on building the next generation of cloud in Europe

19 February 2020
Publication of the European data strategy

EU Alliance for **Data, Edge & Cloud**

digital-strategy.ec.europa.eu/en/policies/cloud-alliance

WHO

- To bring together **Businesses**, **Member States** representatives, and relevant **experts**.

WHAT

- To assist the European Commission in designing the detailed **business, investment and implementation plan** to deploy the **next generation cloud capacities** for the public and private sector to achieve the **2030 European Digital Compass** targets.

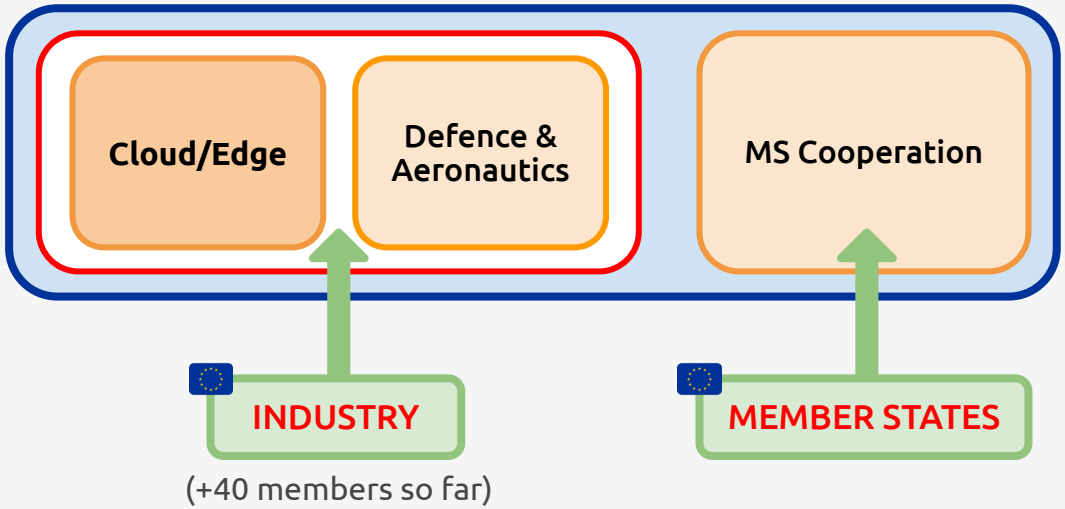
HOW

- To foster the development and deployment of the **next generation of secure, low-carbon, and interoperable cloud and edge** services and infrastructure for Europe as envisaged in the **European Data Strategy**.

EU Alliance for Data, Edge & Cloud

digital-strategy.ec.europa.eu/en/policies/cloud-alliance

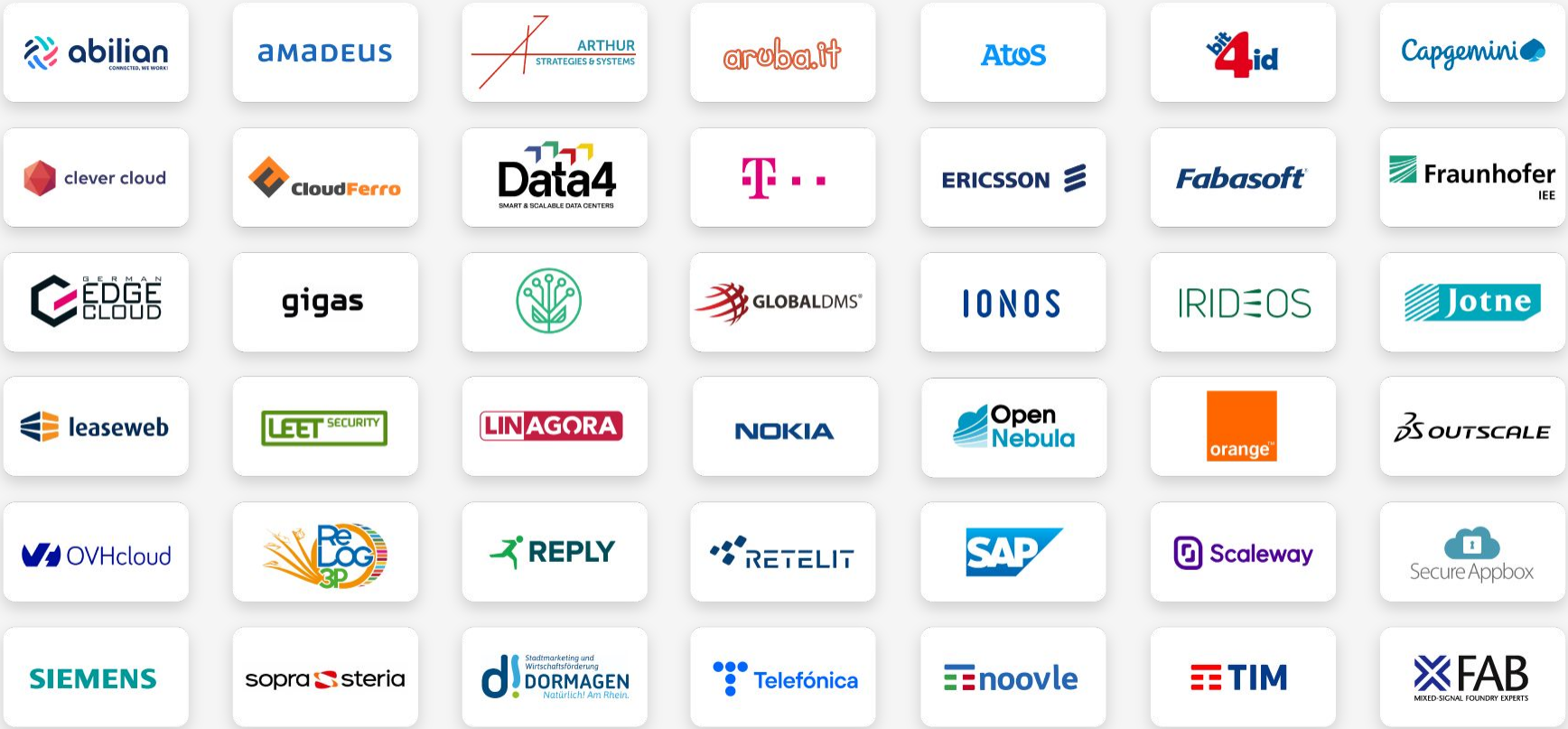
- The work is facilitated by the European Commission's Directorate-General for Communications Networks, Content and Technology (**DG CONNECT**).
- The operational work is driven by an appointed **Steering Committee** and relevant **Working Groups** and **Task Forces**.



(+40 members so far)

EU Alliance for Data, Edge & Cloud

Cloud/Edge Working Group



EU Alliance for Data, Edge & Cloud

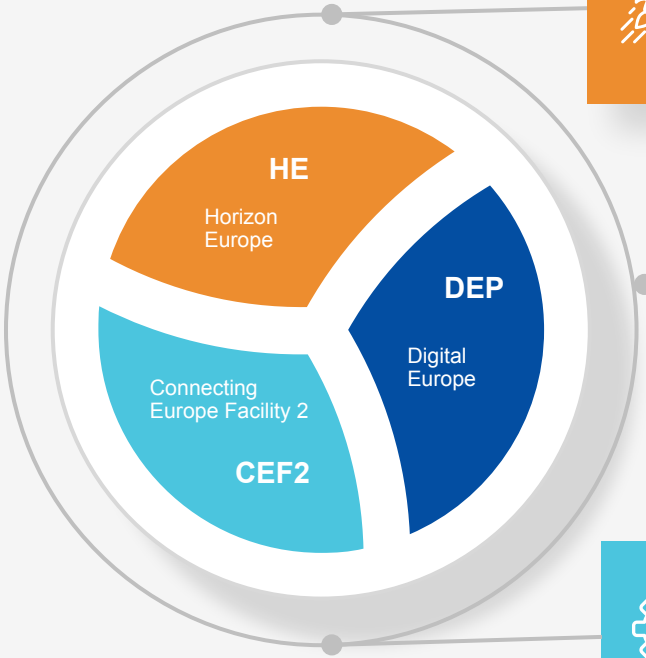
Cloud/Edge Working Group

VERSION 1.0

- "European collaborative edge platforms could also be developed further, based on open standards and maximized use of open source code to reinforce competitiveness, portability and interoperability.".
- "Development of open standard/open source cloud software stack (...) that reduces or removes dependency on 'as a service' infrastructure products from non-EU players.

EU Alliance for Data, Edge & Cloud

Cloud/Edge Working Group



Long Term Research

– Beyond State-of-the-art, not incremental research. Cutting-Edge disruptive approaches.

Deployment of Digital Services

– Bridge the gap between digital technology research and market deployment
– State-of-the-art developments deployed in operational environments

Deployment of Digital Infrastructures

– Support and catalyse both public and private investments in digital connectivity infrastructures, including 5G Deployments.

EU Alliance for Data, Edge & Cloud

Cloud/Edge Working Group

Chair: OpenNebula

Co-chairs: Capgemini, SAP

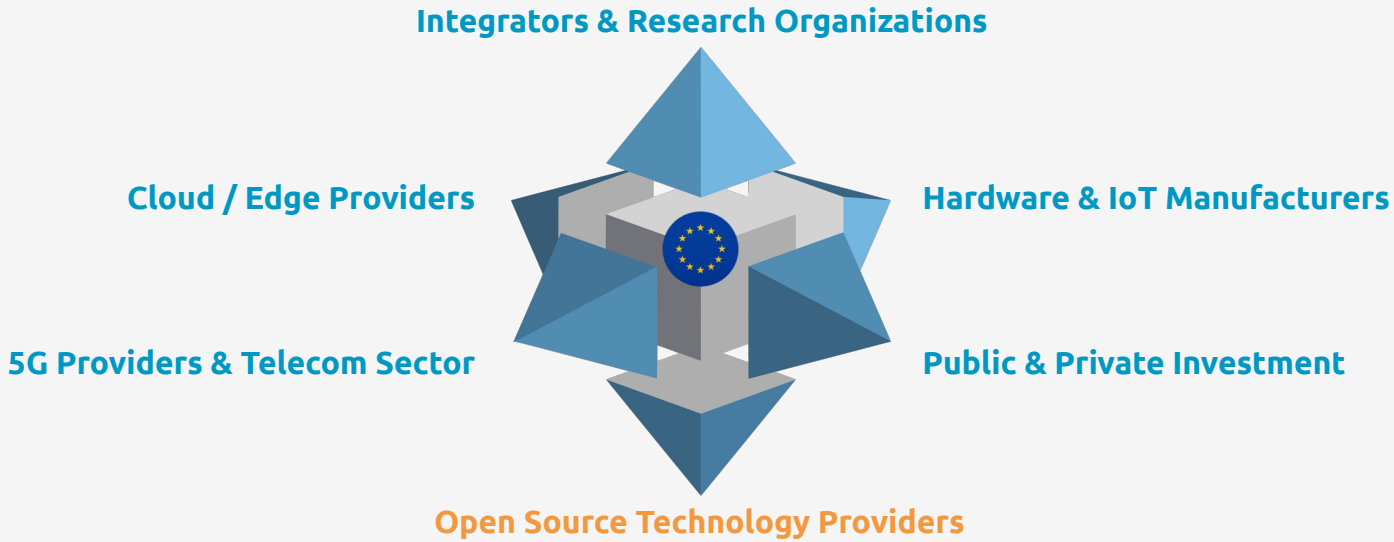
1. EU CLOUD / EDGE COMPUTING LANDSCAPE
2. DEFINITION OF TECHNICAL SOVEREIGNTY FOR EDGE/CLOUD

Transversal domains	Technology foundations	Sector-specific services
3 CLIMATE NEUTRALITY AND RESOURCE EFFICIENCY	6 EDGE AND DATA CENTRE INFRASTRUCTURE	9 INFRASTRUCTURE SERVICES
4 CYBERSECURITY	7 NETWORK INTEGRATION AND CONNECTIVITY	9 PLATFORM SERVICES
5 INTEROPERABILITY AND MULTI-PROVIDER SERVICES	8 CLOUD / EDGE FOUNDATION INFRASTRUCTURE	10 APPLICATION & DATA SERVICES

SovereignEdge.EU

SovereignEdge.EU

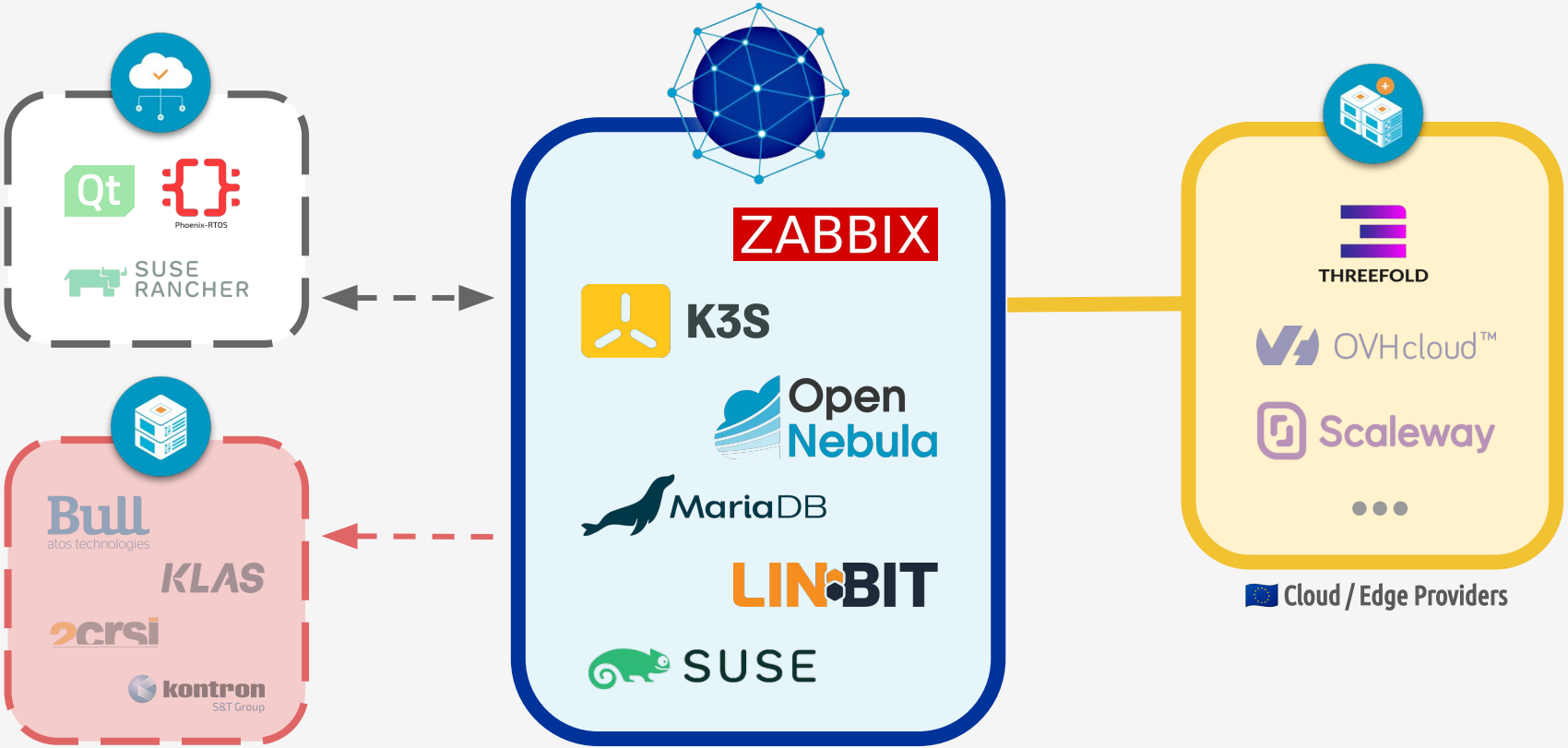
Many opportunities for **European Open Source Companies**



- 🚀 Contribute to build cloud & edge ecosystems around open platforms.
- 🚀 Bring high-impact use cases and applications to key industrial sectors.
- 🚀 Leverage Europe’s R&D, technological innovation, and investment capacities.
- 🚀 Open up new business cases and spaces for collaboration among competitors.

SovereignEdge.EU

An **Edge Computing** stack based on **open source technologies** backed by **EU vendors**



Sovereign EDGE.EU

European Open Source for Europe's Next-Gen Edge Cloud

Building a Sovereign Edge Cloud Stack for the Digital Decade

Technologies

Webinar

European Open Source for Europe's Cloud-Edge Continuum

A **Unique Consortium** for a **Unique HE Proposal** >> Call **HORIZON-CL4-2021-DATA-01-05**

Data Center

Public Cloud

Public Edge

Sovereign EDGE.EU // MetaOS

5G Edge

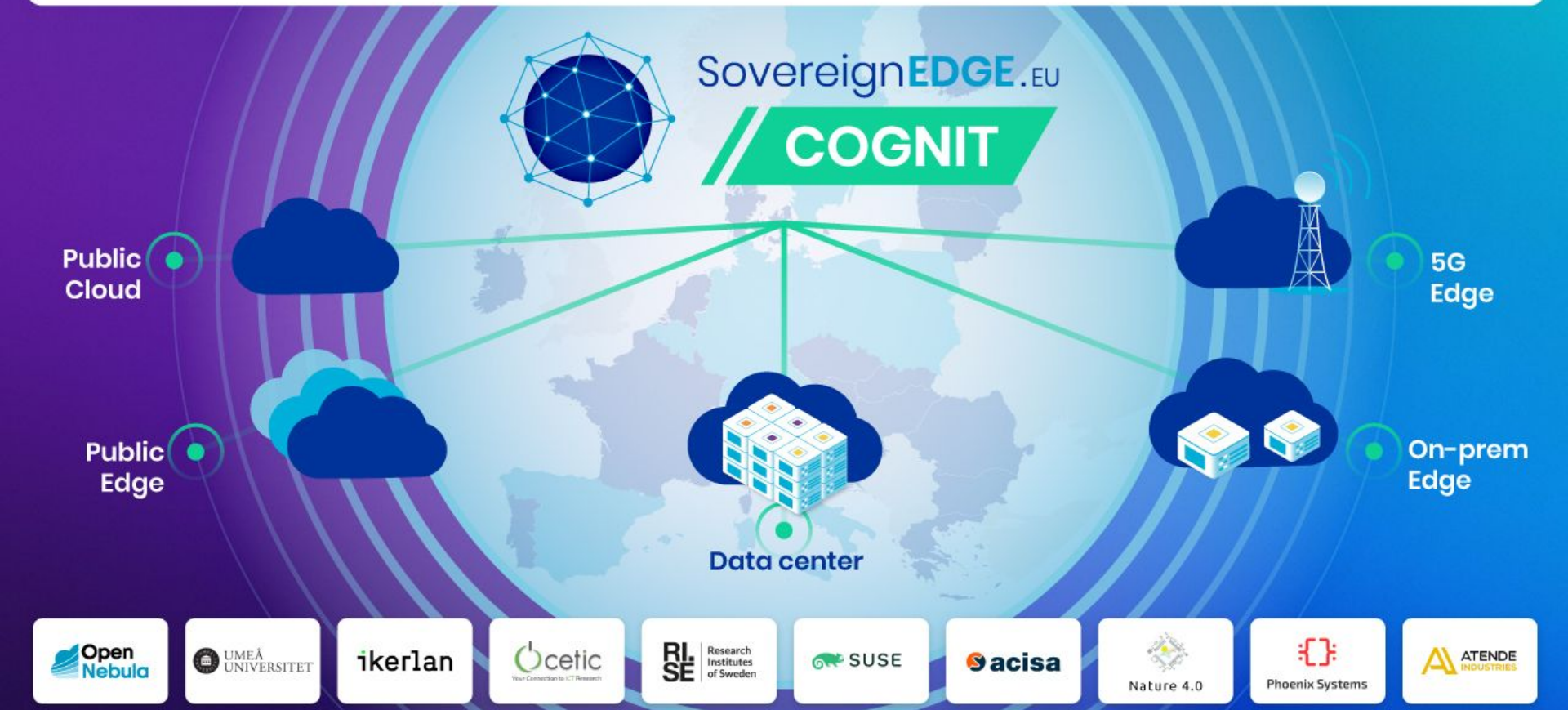
IoT Edge

On-prem Edge

Open Nebula · LINBIT · MariaDB · THREEFOLD · SUSE · ZABBIX · TNO · cetic · ECLIPSE FOUNDATION · RISE Research Institutes of Sweden · UMEÅ UNIVERSITET

A Cognitive Serverless Framework for the Cloud-Edge Continuum

Topic: **HORIZON-CL4-2022-DATA-01-02** (Cognitive Cloud) · Execution Dates: **2023 - 2025**



Open Nebula · UMEÅ UNIVERSITET · ikerlan · cetic · RISE Research Institutes of Sweden · SUSE · acisa · Nature 4.0 · Phoenix Systems · ATENDE INDUSTRIES

IPCEI on Next Generation Cloud
Infrastructure & Services
(IPCEI-CIS)

IPCEI Cloud Infra & Services

ipcei-cis.eu

The main objectives of this initiative included:

- Enable Multi-Provider Cloud-Edge Continuum.
- Strengthening of EU digital industry.
- Development of **European Open Source** technologies.

The IPCEI will comprise both the RDI and the FID, *"including the associated middleware based on cutting-edge **open-source frameworks** and distributed, sustainable and highly scalable architectures."*

IPCEI Cloud Infra & Services

ipcei-cis.eu

STATE OF THE ART

Cloud-Edge Hybrid Architectures

- ✓ Mostly based on **proprietary**, **complex** technologies, leading to **vendor lock-in**.
- ✓ **Centralized cloud structures** that assume highly **homogeneous** datacenters.

Multi-provider Interoperability and Portability

- ✓ **Low adoption of standards**, with **abstraction layers** based on containers with **reduced security** (i.e. K8s).
- ✓ Storage and network model **not well suited for the highly distributed** cloud-edge continuum.
- ✓ **Partial use of automation techniques** (e.g. Terraform) for infrastructure provisioning automation.
- ✓ **Lack of specific edge node architectures** able to meet the needs of HPC and 5G/telco environments.

Multicloud Management and Orchestration

- ✓ Lack of **AI used to optimize and automate** cloud/edge infrastructure management.
- ✓ Centralized control planes that **do not allow the federation** of cloud and edge infrastructures.
- ✓ Limited support for **optimized orchestration**, **energy efficiency,** and enforcement of **security policies**.

Use Cases

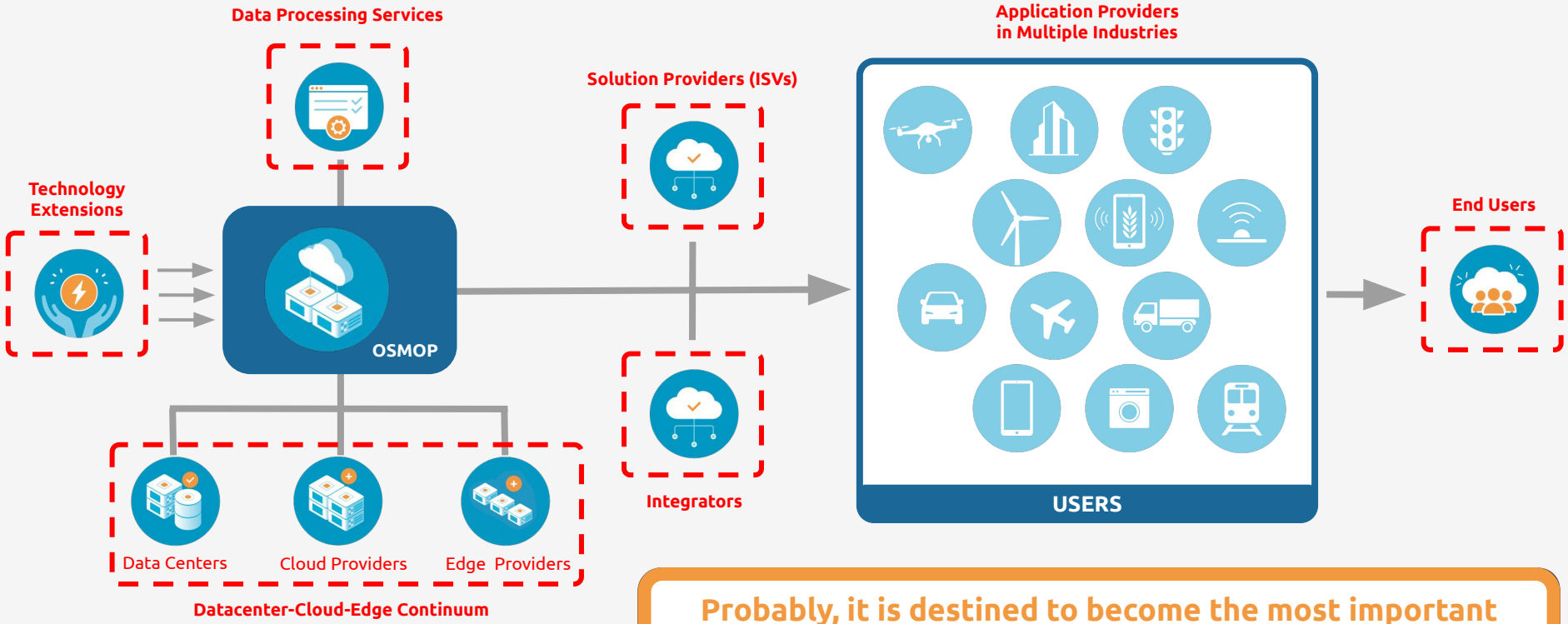
- ✓ Deployed as **static solutions** on a **case-by-case basis,** lacking automation, interoperability and portability.
- ✓ Creating **silos in strategic sectors** based on different technological stacks and ad hoc implementations.
- ✓ **Jeopardizes the consolidation of a cloud-edge continuum** and an associated industry ecosystem.

FUTURE CHALLENGES

- ✓ Increasing number of **edge providers** in the market.
- ✓ Emergence of **tens of thousands** of geographically distributed edge nodes.
- ✓ Need for complete **automation** of cloud edge operations.
- ✓ New **security threats** and larger impact of vulnerabilities.
- ✓ Preference for **energy-efficient** nodes.
- ✓ Tendency to platform **heterogeneity**.
- ✓ Infrastructure **dynamicity** and **volatile** devices.
- ✓ Dependency on **general-purpose**, **public** networks.
- ✓ Widely **distributed** environments.

IPCEI Cloud Infra & Services

ipcei-cis.eu



Probably, it is destined to become the most important European open source project in the coming years…

SovereignEDGE.EU

COGNIT

A Cognitive Serverless Framework for the Cloud-Edge Continuum

COGNIT.SovereignEdge.EU

A project coordinated by **OpenNebula Systems** and funded by the European Union's **Horizon Europe** Research and Innovation programme, under Grant Agreement 101092711 – SovereignEdge.Cognit (2023-2025)