Information & Brokerage Session

Horizon Europe Cloud-Edge-IoT Call 2022

2 February 2022 | 9:30 - 12:30 CET, online

Organised by

European Commission

In collaboration with

HORIZON CLOUD

NEXT GENERATION IoT

HOUSEKEEPING RULES

- All sessions will be recorded and published on the event platform.
- Feel free to post your questions and comments in the Live Discussion Chat of your session.
- Join the discussion online by using the hashtag #ComputingContinuum and tagging @DigitalEU @NetTechEU @CnectCloud @HCLOUD_project @NGIoT4eu.
- If you have any technical issue, please ask your question at the Help-Desk.

Information & Brokerage Session

Information & Brokerage Session

Horizon Europe Cloud-Edge-IoT Call 2022

9:30
10:30

Opening Session & Introduction to Horizon Europe Calls

Rolf Riemenschneider
Head of Sector IoT
European Commission

Maria Tsakali
Programme Officer, Cloud and Software Unit, European Commission

Luis Busquets Pérez
Programme Officer, Cloud and Software Unit, European Commission

Moderator

Monique Calisti
CEO
Martel Innovate

Jan Komarek
Topic Coordinator, IoT Unit, European Commission

HORIZON-CL4-2022-DATA-01-02: Cognitive Cloud: AI-enabled computing continuum from Cloud to Edge (RIA)

HORIZON-CL4-2022-DIGITAL-EMERGING-01-26: Open source for cloud-based services (RIA)

HORIZON-CL4-2022-DATA-01-03: Programming tools for decentralised intelligence and swarms (RIA)

ROLF RIEMENSCHNEIDER
MARIA TSAKALI
LUIS C. BUSQUETS PÉREZ
JAN KOMAREK

DG CNECT
European Commission

Research and Innovation

A European Data Strategy

EU Data Strategy

Cloud actions:
- Cloud Rulebook
- Co-Investments in cloud-to-edge services, cloud federation and marketplaces.

Data actions:
- New legislation (Data Governance Act & Data Act)
- Co-investments in EU data spaces

DEP

IPCEI* on Next Generation Cloud
*(*Important Project of Common European Interest)*

Coordination

EUROPEAN ALLIANCE FOR INDUSTRIAL DATA, EDGE AND CLOUD

Federation & interoperability standards

GAIA-X

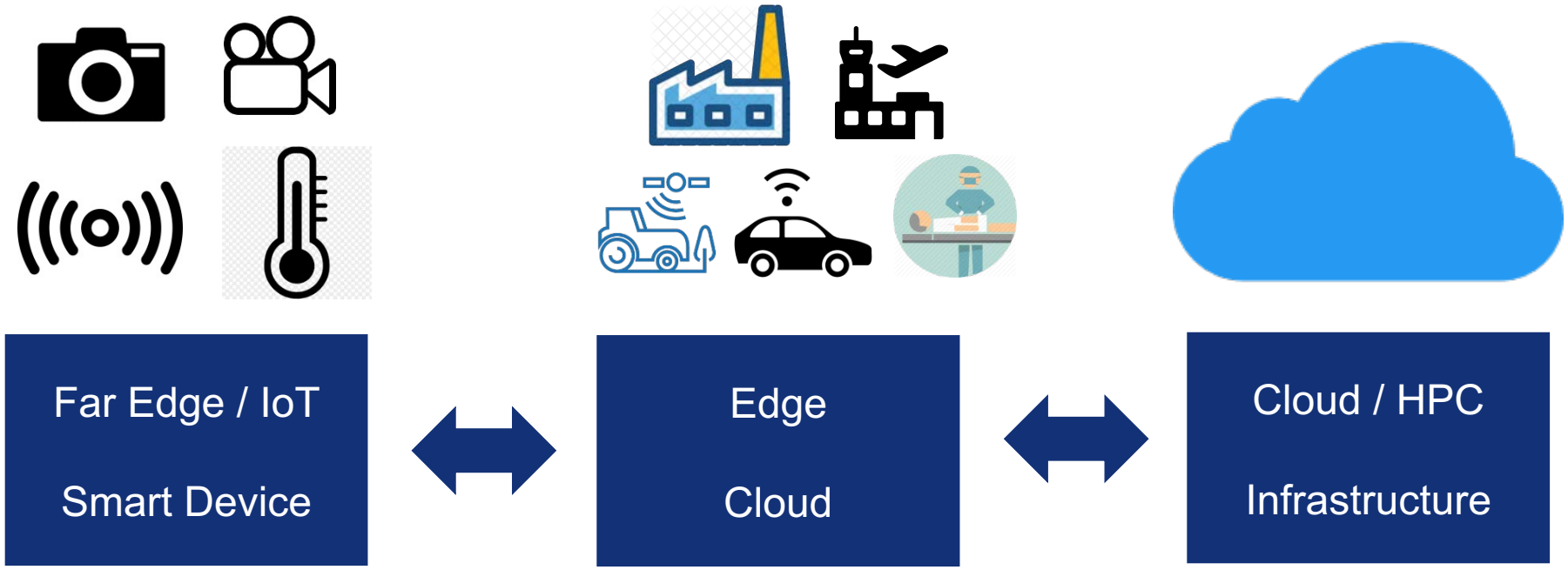
Use cases; technical architecture

European Common Data spaces

European Commission

Cloud-Edge-IoT Orchestration

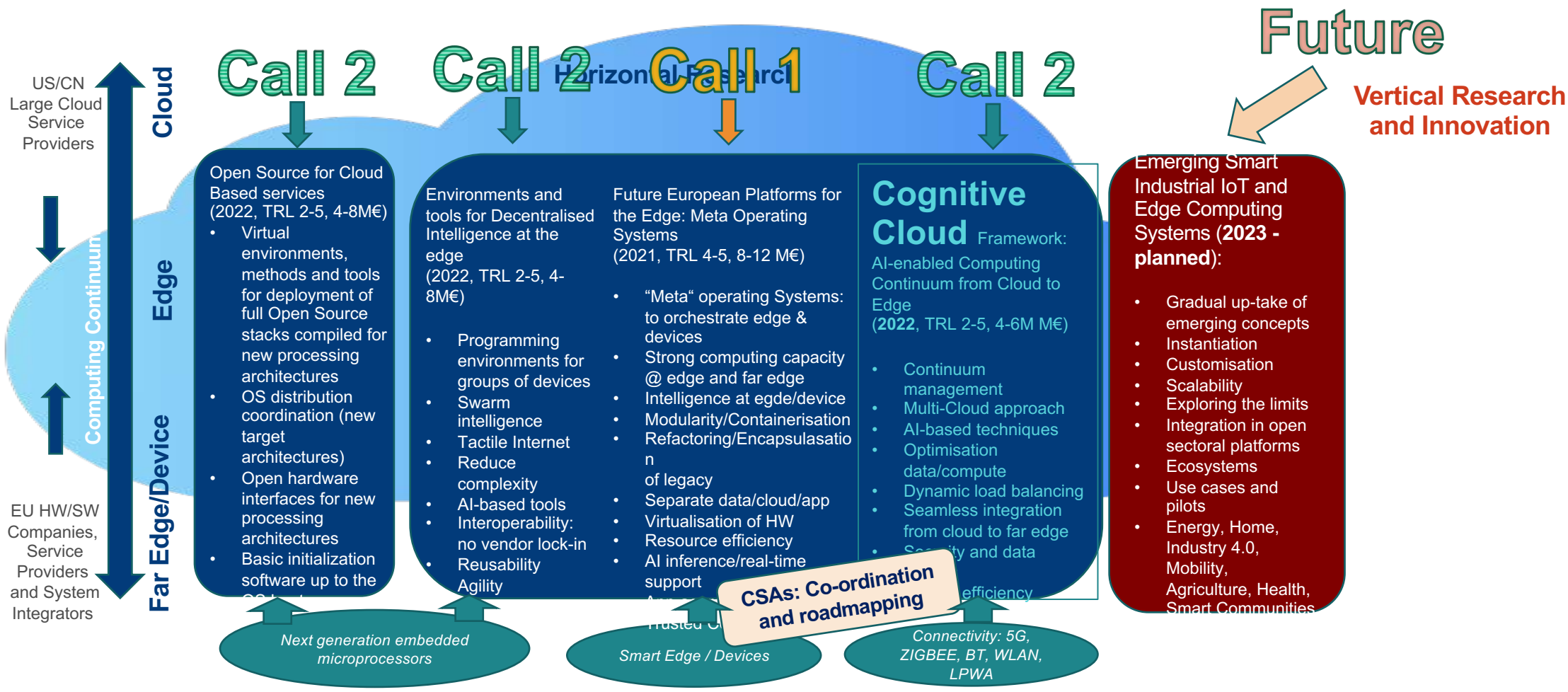
Trend/Paradigm Shift: from Cloud to Edge
Bringing compute resources closer to the data



Federating far edge resources ad hoc via 5G
to provide cloud resources close to the edge

HORIZON EUROPE WP2021-2022

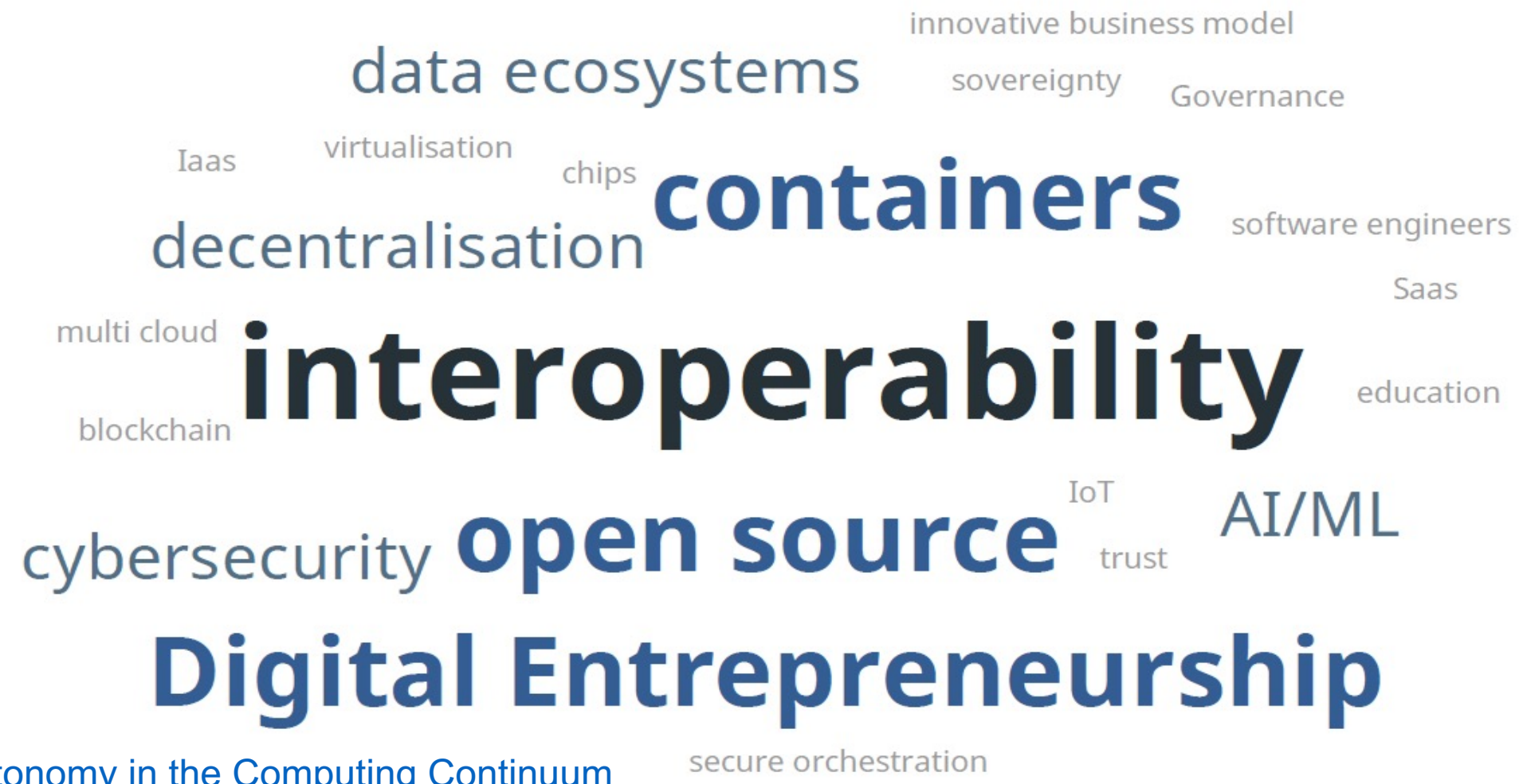
A coherent EU Research Agenda from Cloud to Edge to IoT



European Commission

Enablers in the area

- What **technology or other enablers** would you consider to be most relevant for competing in an evolving data (cloud-edge-IoT) economy?



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Event: [Digital Autonomy in the Computing Continuum]

European Industrial Technology Roadmap for the Next Generation Cloud-Edge Offerings

Priority areas for EU joint investments efforts revolve around three pillars:

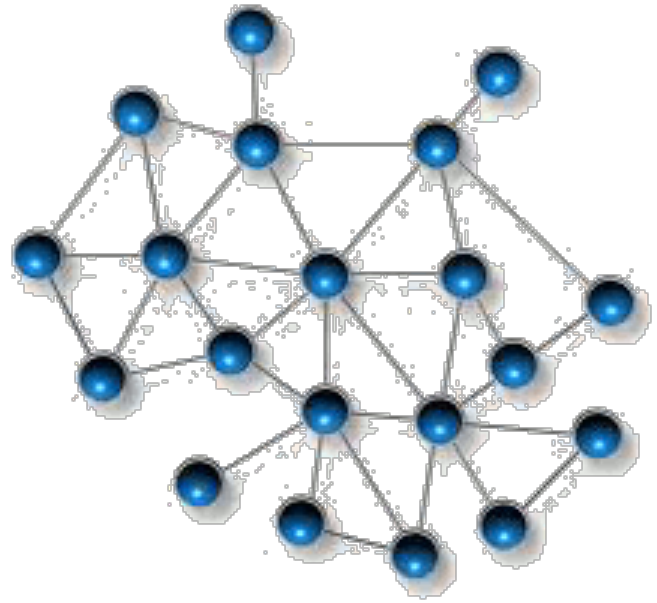
1. **Becoming the leader in domains that will shape European cloud and edge offerings on the global market, focusing on climate-neutrality, cybersecurity, trustworthy data exchange and interoperability**

   ➢ **Strong role for R&I**

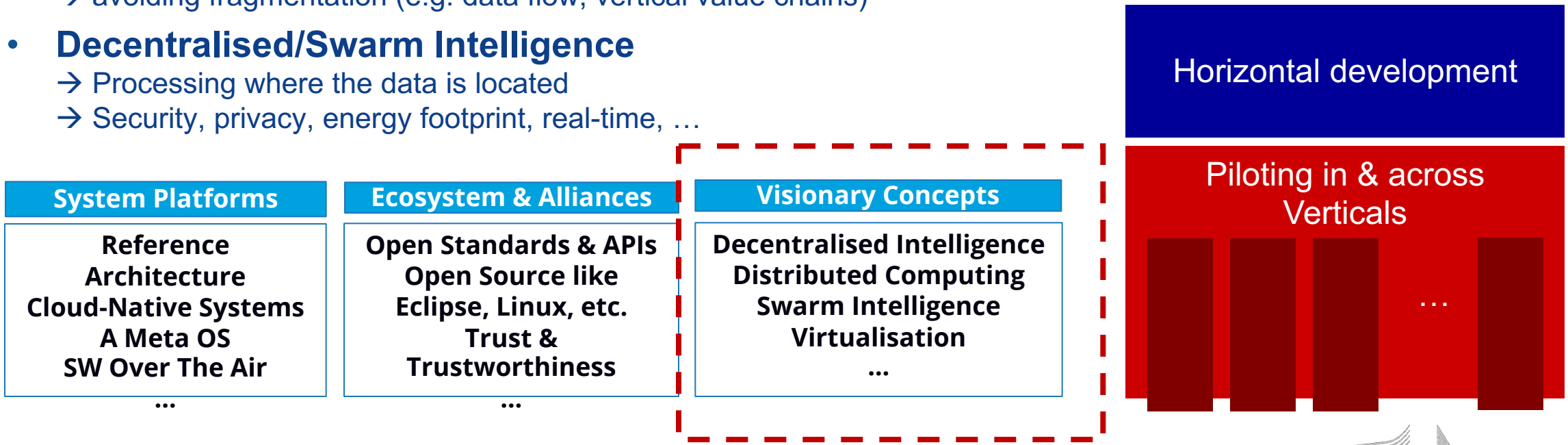
2. Renewing and expanding infrastructure foundations across Europe, including an increased density of edge and cloud facilities across the continent, backed by network and interconnectivity services that will enable innovative use cases at scale

3. Enabling sovereign and sector-specific services to end-users, providing businesses with trusted options that match global standards in terms of price and resilience.

Recommendations Strategy Forum:
Next Generation IoT and Edge Computing



- **Computing Continuum**: Cloud – EDGE – 5G/IoT – HW Devices
- **Partnering to grow the opportunity**, accelerate adoption
  → Fierce competition from Internet giants
  → Multivendor partnerships, alliances
- **System Integration Platforms**
  → a must for interoperability and open standards
  → avoiding fragmentation (e.g. data flow, vertical value chains)
- **Decentralised/Swarm Intelligence**
  → Processing where the data is located
  → Security, privacy, energy footprint, real-time, …



Public Event Report Next Generation IoT and Edge Computing

European Commission

Section:
From Cloud to Edge to IoT for European Data

Horizontal Coordination

RIA:

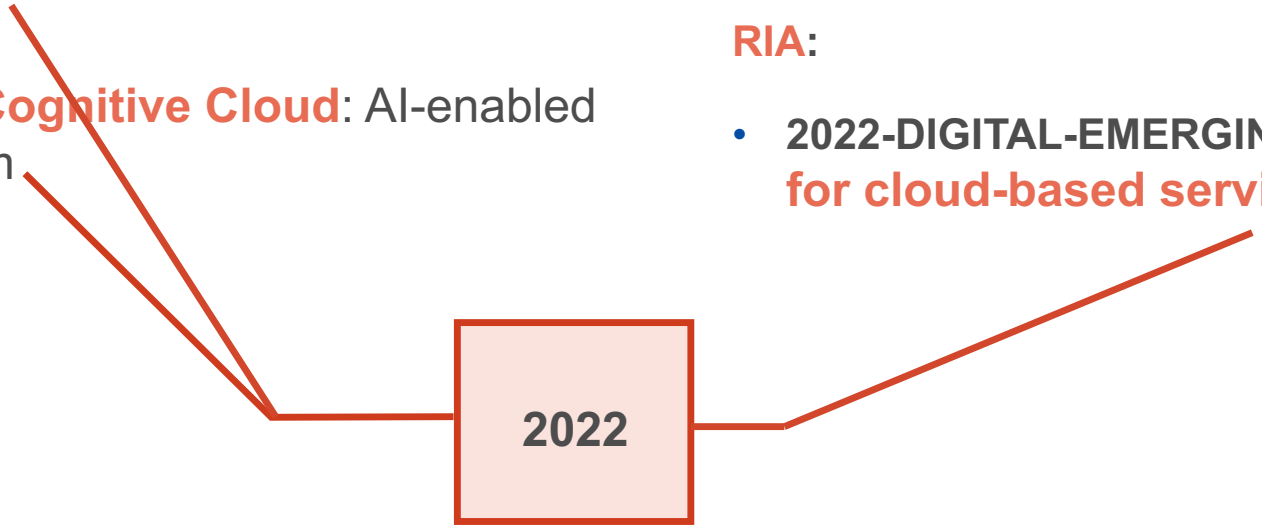
- **DATA-2021-01-05**: Edge Operating System
- **DATA-2022-01-03**: **Programming Environments** and Tools for Decentralised Intelligence
- **DATA-2022-01-02**: **Cognitive Cloud**: AI-enabled computing continuum

CSA:

- **DATA-2021-01-07**: Coordination and Support of the 'Cloud-Edge-IoT' domain
- **DATA-2021-01-08**: Roadmap for next generation computing and systems

RIA:

- **2022-DIGITAL-EMERGING-01-26**: **Open source for cloud-based services**



European Commission

#HorizonEU

HORIZON-CL4-2022-DATA-01-02: Cognitive Cloud: AI-enabled computing continuum from Cloud to Edge

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European Commission

Research and Innovation

Cloud Topic Evolution – from Cloud to Cognitive Cloud

FP7

- **"Software & services and Cloud computing"**
  - **Total EU contribution: €351.5 million**
  - **Number of projects: 95 (s/w and cloud)**
  - **Average per project: €3.7 million/project**

H2020

- **"Advanced Cloud Infrastructures and Services"**
- **"Cloud Computing"**
- **"Cloud Computing: towards a smart cloud computing continuum"**
- **"International collaboration with Japan, Korea and Brazil"**
  - **Total EU contribution: € 195 million**
  - **Number of projects: 59**
  - **Average per project: €3.8 million/project**

HE

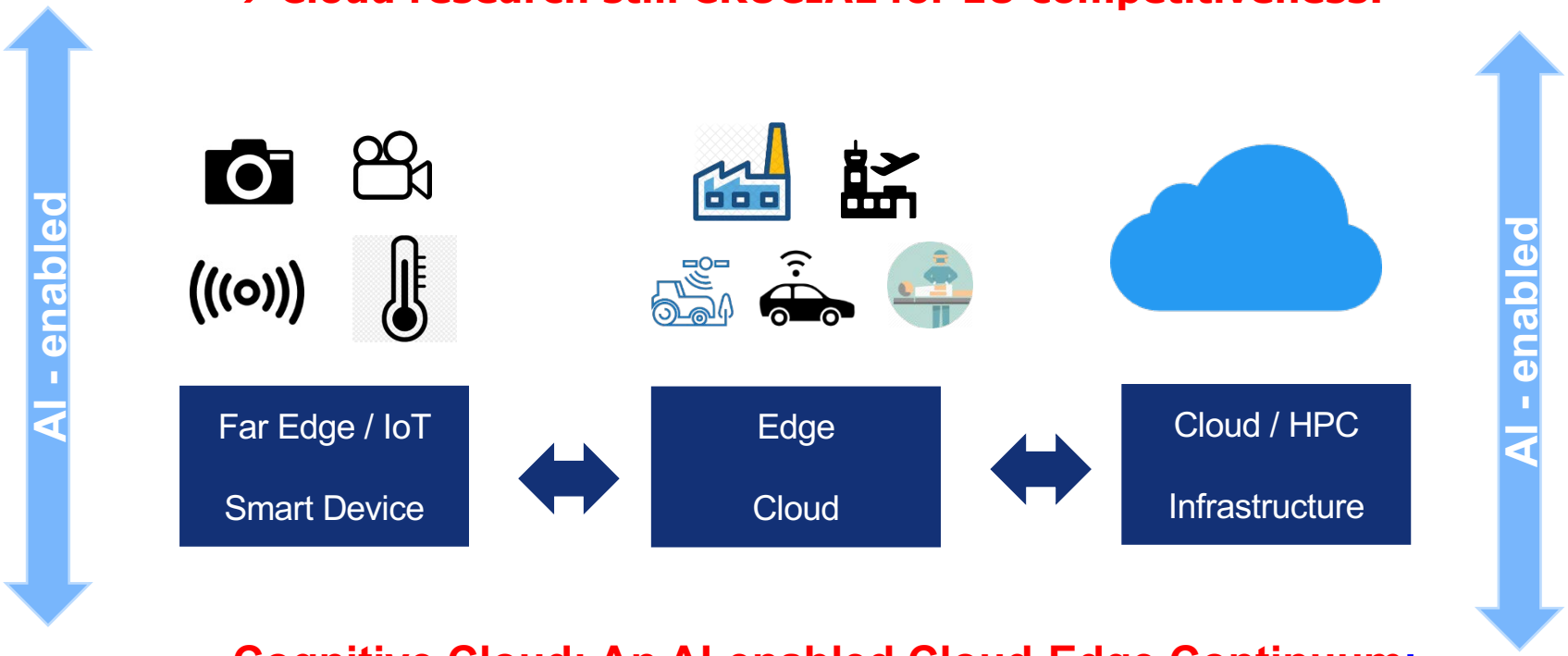
2022 Topic:

- **HORIZON-CL4-2022-DATA-01-02: Cognitive Cloud: AI-enabled computing continuum from Cloud to Edge**
  - **Total EU contribution: €50 million**

Paradigm Shift: Cloud – Edge – IoT

R&I on the next generation Cloud-to-Edge-to-IoT technologies

Trend/Paradigm Shift: from Cloud to Edge
Bringing compute resources closer to the data
→ Cloud research still CRUCIAL for EU competitiveness!



Cognitive Cloud: An AI-enabled Cloud-Edge Continuum:
Seamless, transparent and trustworthy integration of diverse computing and data environments spanning from core cloud to edge

INTELLIGENCE, AUTOMATION and INTEROPERABILITY → ADAPTABILITY

European Commission

COGNITIVE CLOUD

AI-enabled Computing Continuum from Cloud to Edge

AI and Cloud

Artificial Intelligence will transform current clouds into Cognitive Clouds

Applying AI-techniques:

- **dynamic load balancing**
- **optimise energy efficiency**
- **balanced data traffic and**
- **high, distributed, reliable throughput from cloud to edge**
- **etc.**

The **Cognitive Cloud** will **interface with all the layers in the computing continuum layers** and will respond and **adapt intelligently** to changes in application behaviour and data variability **offering automatic deployment, mobility and adaptability of services from cloud to edge.**

Application developers will be empowered with **greater control** over **network, computing and data infrastructures and services**, and the end-user will benefit from seamless access to a continuous service environment

European Commission

HORIZON-CL4-2022-DATA-01-02:
Cognitive Cloud: AI-enabled computing continuum from Cloud to Edge

- **Type of Action**: Research and Innovation Action (RIA)

Opening: 23 November 2021	**Deadline: 5 April 2022**
Budget: EUR 50 million	**EU contribution per project**: EUR 4 – 6 million

- **Technology Readiness:** Level Activities are expected to start at TRL 2 and achieve TRL 5 by the end of the project

HE WP2021-22:

https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2021-2022/wp-7-digital-industry-and-space_horizon-2021-2022_en.pdf

European Commission

COGNITIVE CLOUD

AI-enabled Computing Continuum from Cloud to Edge

Scope:

- Highly innovative **cloud management** layer making the **best application of artificial intelligence techniques and AI models** with **automatic adaptation** to the **computing resources** (i.e., connectivity, computing & storage) in cloud and edge to optimize where data are being processed (e.g. very close to the user at the edge, or in centralized capacities in the cloud).
- **Seamless, transparent and trustworthy integration of diverse computing and data environments** spanning from core cloud to edge, in an AI-enabled computing continuum.
- **Automatic adaptation** to the growing complexity of requirements and the exponential increase of data driven by IoT deployment across sectors, users and contexts while achieving optimal use of resources, **holistic security and data privacy and credibility**.
- **Interoperability** challenges among computing and data platform providers should be addressed and **cloud federation approaches** (based on **open standards, interoperability models and open platforms**) should be considered where appropriate.

COGNITIVE CLOUD

AI-enabled Computing Continuum from Cloud to Edge

Expected Outcome:

- A new **AI-enabled** Cloud framework that will **automatically adapt** to the growing complexity and data deluge by integrating **seamlessly** and **securely** diverse computing and data environments, spanning from core cloud to edge.
- This framework will **respond and adapt intelligently** to changes in application behaviour and data variability offering automatic deployment, mobility and adaptability of services from cloud to edge.
- The Cognitive Cloud will **interface with all the layers in the computing continuum plane** and will learn through the monitoring and management of resources deployed on Cloud/Edge.
- Applying AI-techniques will cater for **dynamic load balancing** to **optimise energy efficiency** and maintaining **balanced data traffic** and **high, distributed, reliable throughput from cloud to edge** according to the application needs and the underlying infrastructures.
- Application developers will be empowered with **greater control** over **network, computing and data infrastructures and services**, and the end-user will benefit from seamless access to a continuous service environment

HORIZON-CL4-2022-DATA-01-02:
Cognitive Cloud: AI-enabled computing continuum from Cloud to Edge

What are we looking for?

- Development of **generic and advanced cloud technologies, mechanisms, techniques, etc.** ➡ **Research in cloud technologies! (not in AI)**
- The proposals should **demonstrate the applicability and viability of the proposed technological solutions** across multiple application domains.
- **Beyond State-of-the-art**, not incremental type of research →cutting-edge novel approaches, TRL 2-5.

What do we NOT want?

- Using existing Cloud technologies as an enabler for research in other domains (e.g., AI, Security, BigData, IoT, etc.)
- Any User Application development using existing Cloud technologies

European Commission

Information about European Cloud Research and Cloud projects

Cloud CSAs:

- H-CLOUD https://www.h-cloud.eu/

- Hub4CLOUD https://www.h-cloud.eu/ict_40-projects/hub4cloud/

European Commission

HORIZON-CL4-2022-DIGITAL-EMERGING-01-26

Open Source for Cloud based services

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Programme officer
DG CNECT E2 Cloud and Software

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Research and Innovation

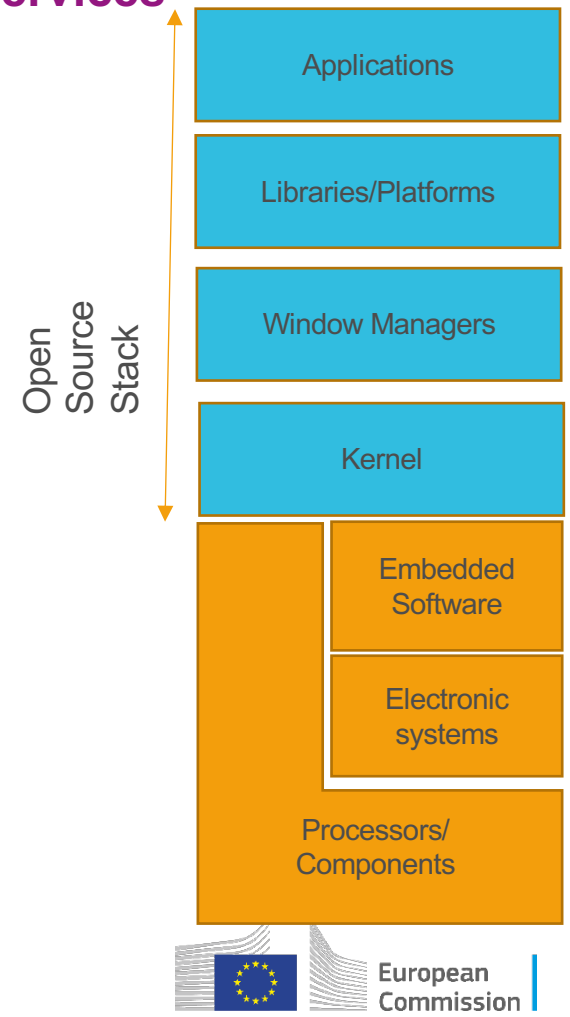
HORIZON-CL4-2022-DIGITAL-EMERGING-01-26: Open source for cloud-based services

What are we looking for?

- Type of Action: Research and Innovation Action (RIA)

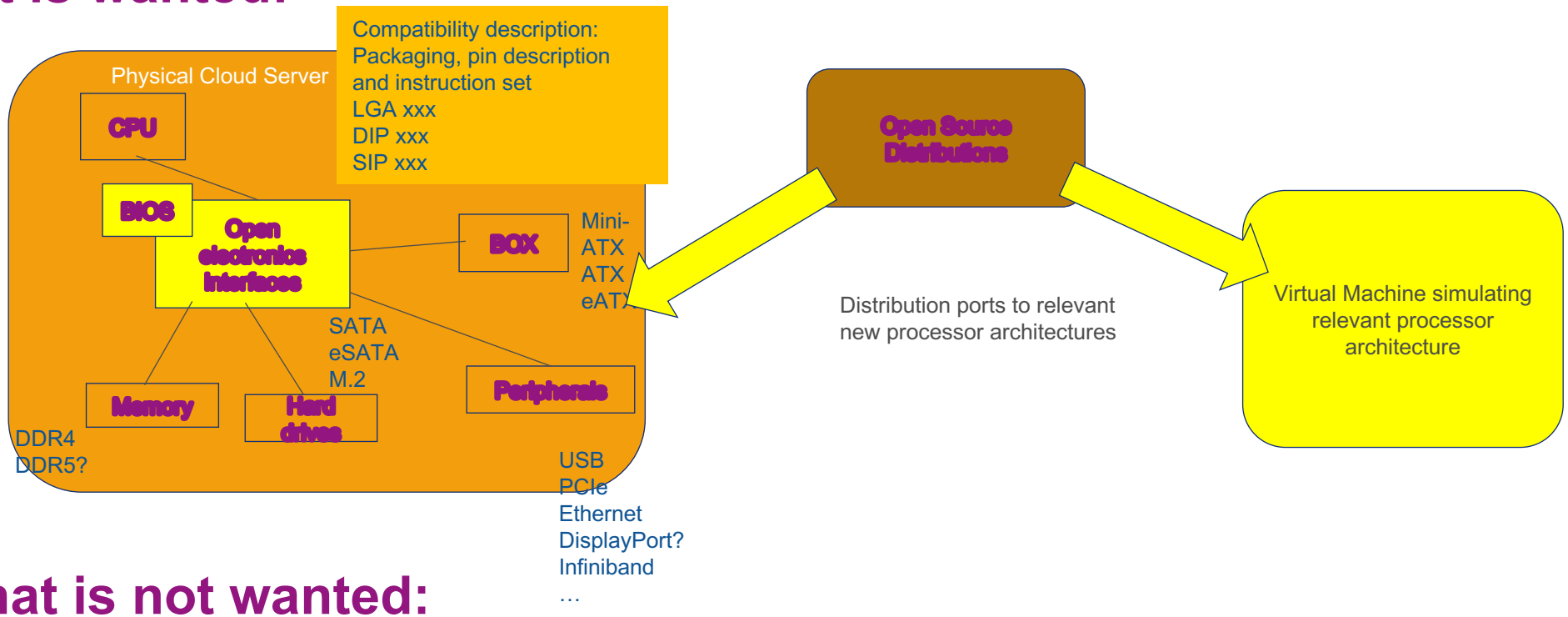
Opening: 23 November 2021	Deadline: 05 April 2022
Budget: EUR 22 million	**EU contribution per project**: EUR 4-6 million

- Expected Outcome:
  - **Virtual environments, methods and tools**
    - Simulation of targeted architectures
    - Development and coordination with relevant software distributions
  - **Open source interfaces that permit the deployment of tested stacks on the outcomes of European processor initiatives. Proposals should address at least one of these points:**
    - Open hardware interfaces
    - Software to provide the basic initialization



Expected Open Source developments

What is wanted:



What is not wanted:

- TRL 1-3 developments
- Standalone modules
- Development of Interfaces for unimplemented services
- Work on dominant market-established processing architectures

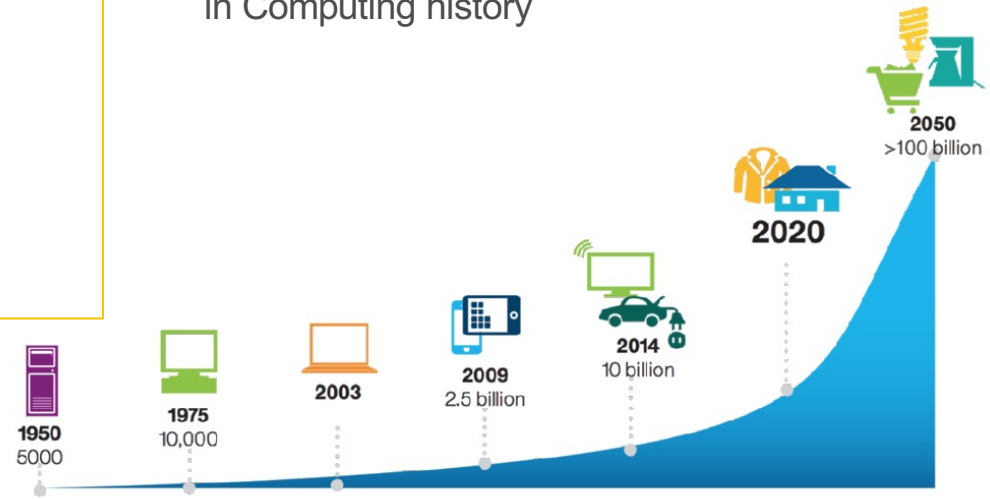
European Commission

Relevant projects

- *Topics funded under Horizon 2020 WorkProgramme 2018-20*
  - *ICT-15-2019 Cloud Computing*
  - *ICT-16-2018 Software Technologies*
  - *ICT-40-2020 Cloud Computing: Towards a smart cloud computing continuum*
  - *ICT-50-2020 Software Technologies*
- *European Processor Initiative*
  - *New relevant Processing architectures*

European Processor Initiative

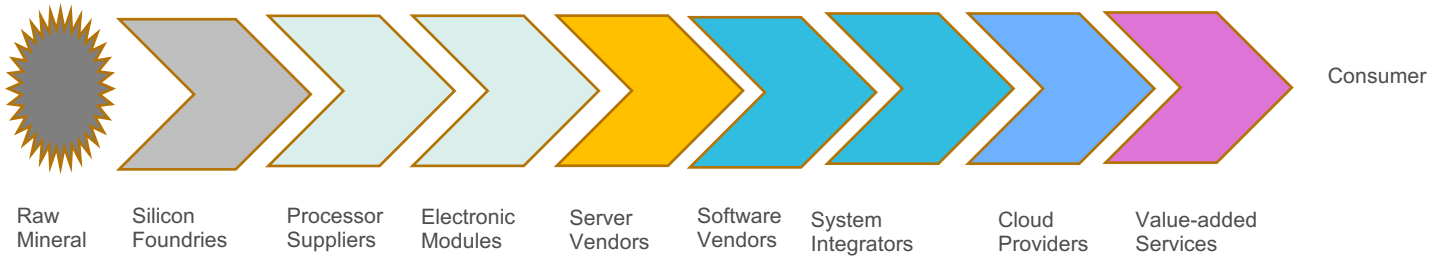
Software and inflection points in Computing history



Relevant Stakeholders

- *Electronics industry*
- *Software industry*
- *Universities*
- *Supercomputing centers*
- *Data centers*
- *Stakeholders in the area of the EPI*

Cloud Value Chain

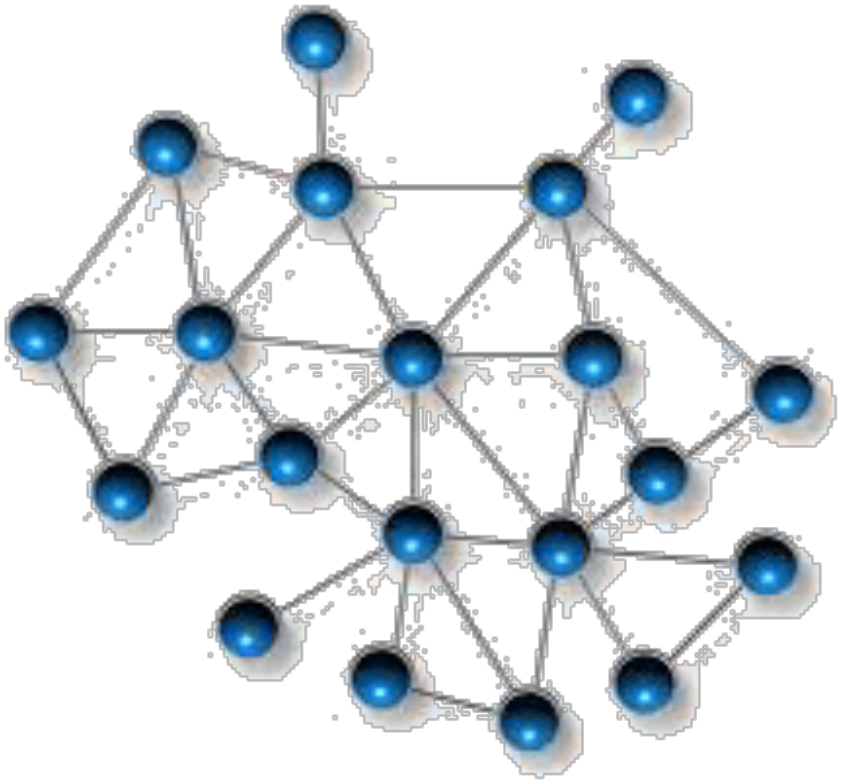


A Vibrant R&I Ecosystem

- **Computing Continuum**:
  - Cloud – EDGE – 5G/IoT – HW Devices

- **Partnering to grow the opportunity**,
  → Fierce competition from Internet giants
  → **Balance** Top down <-> Bottom-up
  → *Alliance Industrial Data/Cloud, GAIA-X, AIOTI, KDT, NESSI,...*

Openess, multi-platform, EU value chains
→ a must for interoperability and open standards
→ avoiding fragmentation (e.g. data flow, vertical value chains)



System Platforms	Ecosystem & Alliances	Visionary Concepts
Reference Architecture Cloud-Native Systems A Meta OS SW Over The Air ...	Open Standards & APIs Open Source like Eclipse, Linux, etc. Trust & Trustworthiness ...	Cognitive Cloud Decentralised Intelligence Edge Computing Swarm Intelligence 5G / 6G ...

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Event Report Next Generation IoT and Edge Computing

European Commission

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Horizontal Coordination

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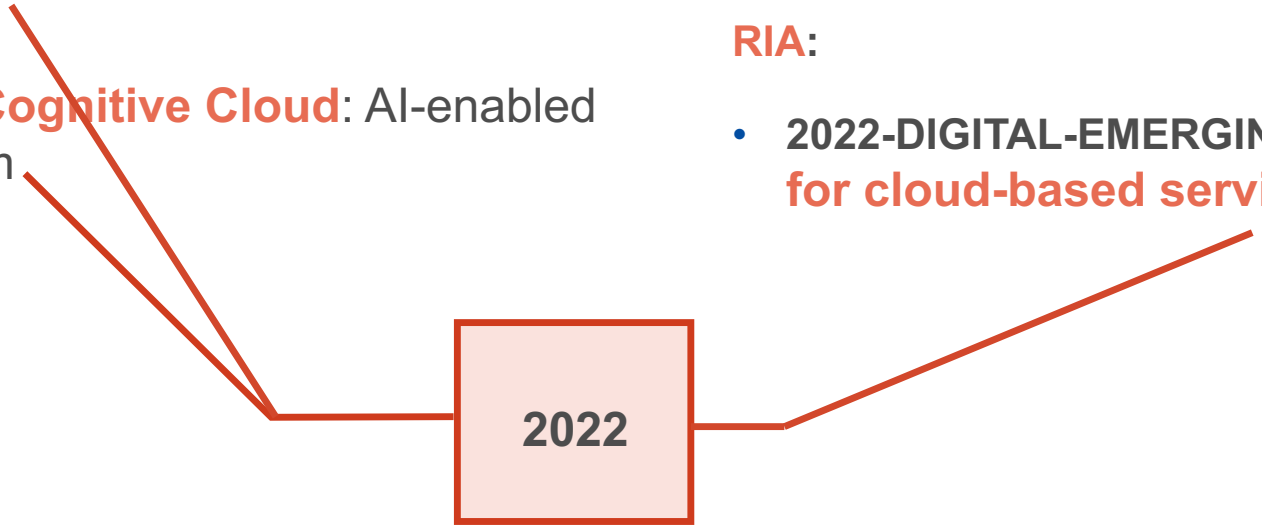

European Commission

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HORIZON-CL4-2022-DATA-01-03
Programming tools for decentralised intelligence and swarms

JAN KOMAREK
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DDG CNECT E4 – Internet of things
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Research and Innovation

Technology Drivers for Edge Computing

Energy Footprint

- Real-time decision making
- Automation & safety

Analytics Performance

- Lightweight OS on resource restricted environments as Edge
- Integration of AI/ML

Open Architectures

- Vendor Lock-in
- Regain market shares in data economy

Security & Privacy

- Keep data close to source

Network Evolution

- Mesh topology / 5G

Latency

- Real-time decision making
- Automation & safety

Decreasing HW/sensor costs

- New functionalities, sensing, control
- Reduces complexities of distributed installations and unit cost economics

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Cloud-Edge-IoT Orchestration

Trend/Paradigm Shift: from Cloud to Edge
Bringing compute resources closer to the data

Federating far edge resources ad hoc via 5G
to provide cloud resources close to the edge

European Commission

HORIZON-CL4-2022-DATA-01-03:
Programming tools for decentralised intelligence and swarms

➢ **Type of Action: Research and Innovation Action (RIA)**

Opening: 23 November 2021	**Deadline: 05 April 2022**
Budget: EUR 40 million	**EU contribution per project**: EUR 4-8 million

➢ **Scope:**

- To develop **agile and secure architectures**,

→ dynamic programming environments and tools for the compute continuum from the device and edge perspective

- Energy-efficient, lightweight AI-based approaches, tools for decentralised device and edge intelligence, innovative mesh architectures with mixed topologies to support concepts like tactile internet and swarm intelligence.

- Shift from programming environments for individual devices to dynamic groups of devices like swarms.

- Proof of concept or prototype implementations should validate the concepts in at **least 3 application areas** like for example automated driving, health, farming, smart factories, utilities, cities and communities, logistics, buildings.

WP2022 – HE-CL4 - HORIZON-CL4-2022-DATA-01-03:

Programming tools for decentralised intelligence and swarms (RIA)

- **Agile and secure architectures for collaborative smart nodes**
  - with decentralised or swarm intelligence, which build on European strengths in embedded sensors and devices and wireless communication, both non-cellular and mobile 5G networks.
- **Programming environments for smart edge-connected nodes**
  - **..** and dynamic groups of nodes across the device-edge-cloud continuum, which reduce the complexity of programming and maintenance.
- **Dynamic open environments and tools**,
  - E.g. SDKs which stimulate open architectures and interfaces, interoperability and avoiding vendor lock-in, open source where appropriate.
- **Reinforced Europe's position in the market of next generation smart systems**
  - E.g. systems**,** sensors and devices integrated in an evolving Internet of Things and cyber-physical ecosystems with strong capacities at the edge.

HORIZON-CL4-2022-DATA-01-03:

Programming tools for decentralised intelligence and swarms

What are we looking for?

- New decentralized architectures for smart nodes,
  → **Swarm Intelligence**
- Programming tools for decentralized intelligent nodes
  → **Open source, where applicable**
- The proposals should **demonstrate the applicability and validation of the proposed concepts** in at least 3 application domains
  → **Contribution to SDGs**

What do we NOT want?

- **Proprietary technology** development → need to consider open interfaces and standards, where applicable build on open source projects
- **Narrowly focused scope** → need interdisciplinary proposals SW-HW-network
  → need to connect different dots IoT, EPI, cloud, ARTEMIS, KDT , SNS..

European Commission

Thank you!

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HorizonEU

http://ec.europa.eu/horizon-europe

https://digital-strategy.ec.europa.eu/en/policies/cloud-computing