European Commission

THE EU RESEARCH & INNOVATION PROGRAMME

2021 – 2027

Destination 3: World leading data and computing technologies

Research and Innovation

Destination 3 - Objective "Data sharing and analytics capacity"

European Commission

Topic HORIZON-CL4-2023-DATA-01-02

Integration of data life cycle, architectures and standards for complex data cycles and/or human factors, language

1. **We are looking for proposals that:**

- Address the entire data life cycle
- Build on existing/emerging standards, models, architectures
- Address/support compliance with applicable legislation & FAIR principles
- Account for human factors/intervention
- Involve at least 3 Common European Data Spaces (or equivalent platforms)

Topic HORIZON-CL4-2023-DATA-01-02

2. **What do we <u>NOT</u> want?**

- Vertical projects addressing a **single** area/industry/data space
- Stand-alone actions ignoring the numerous required links
- Actions addressing only one period of the data life cycle
- Theoretical or scientific actions without use cases involving real data spaces (or equivalent platforms)
- Re-inventing/ignoring past achievements where these can be relevant/useful

Topic HORIZON-CL4-2023-DATA-01-02

3. Is this new or has it been called before?

This is a new topic.

However, cross-sectoral/cross-border data flows were addressed in H2020-ICT-14-2016-2017.

It is closely linked to Digital Europe:

- Must liaise with Data Spaces Support Centre
- Must involve min. three Data Spaces (or equivalent platforms).

HORIZON-CL4-2023-DATA-01-02– topic evolution

4. Current project portfolio

- Data Spaces Support Centre (Digital Europe CSA project)
- *Data platform project portfolio (H2020 topic ICT-13-2019)*
- *Compliance and privacy preservation portfolio (HORIZON-CL4-2021-DATA-01-01)*

5. Who are the types of main stakeholders that are addressed?

6. Is there a key group of actors (eg. Partnership or other) driving this?

HORIZON-CL4-2023-DATA-01-02 – Key actors

5. Who are the types of main stakeholders that are addressed?

- Data producers, processors, intermediaries, users
- Technology/system developers
- Researchers of data governance & architectures, human factors

6. Is there a key group of actors (eg. Partnership or other) driving this?

- Big Data Value (BDVA) community
- ADRA partnership (AI, Data & Robotics)
- Data Spaces Business Alliance (DSBA)

Topic HORIZON-CL4-2023-DATA-01-02

7. Are there any additional / background documents?

ADRA Strategic Research, Innovation and Deployment Agenda (SRIDA)
EU Data Strategy, Data Governance Act, Data Act

Future Outlook

8. Do you have information about future trends, emerging initiatives, roadmaps, key players in this area?

   The ADRA SRIDA document will be updated in Q2 2023 to reflect the new policy and technology drivers and to inform the strategic planning process for 2025-2027.

Upcoming events / information days

Horizon Europe Cluster 4 information days 12-14 December 2022

HORIZON-CL4-2023-DATA-01-07:

Collaboration between European Commission and NSF across the computing continuum

Paradigm Shift: Cloud – Edge - IoT

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

Far Edge / IoT
Smart Device

Edge
Cloud

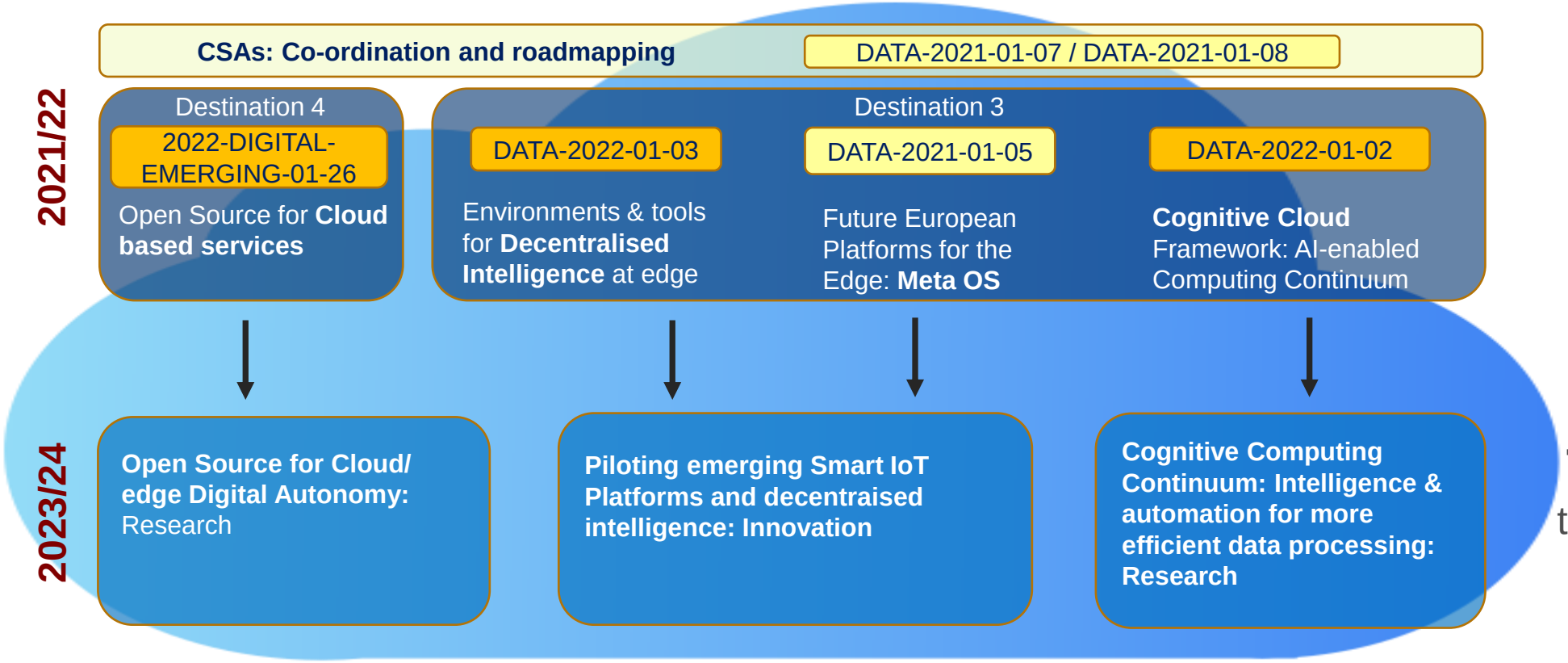
Cloud / HPC
Infrastructure

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

European Commission

Cloud - Edge – IoT: A strategic initiative over 4 years +

→ **Support of HIPEAC Vision & Roadmapping (2022-2024)**



Tentative:
to be published
01 Dec. 2022

→ Coordination Support of NSF-EU Cooperation

From Cloud to Edge to IoT for European Data – Collaboration with NSF on fundamental research on new concepts for distributed computing and swarm intelligence (CSA)

Scope:

- Develop mutual interest of the EC and US National Science Foundation (NSF) in collaborating on longer-term **fundamental research on new concepts for distributed computing and swarm intelligence**.
- Common workshops for exchange of research results organised through the CSA HIPEAC (of HORIZON-CL4-2021-DATA-01-08: Roadmap for next generation computing and systems technologies)
- **NSF would provide supplement of funding for to drive joint research.**
- **EC matching/reinforcing of on-going work streams in projects (~ 100 Mill €),**
  especially linked to the topics *Programming tools for decentralised intelligence and swarms / Intelligence + automation across the computing continuum*

Expected Outcome:

- **Support structure** for secretarial services, networking including travel, research exchange and fellowship programmes, promotion and brokerage events
- networking events and vision workshops for the academic and industrial computing community
- Yearly common workshops for exchange of research results organised in close collaboration with the HIPEAC CSA + NSF.
- **Joint Vision for design of a trustful evolution at the edge, towards a spatial web or Metaverse**
- Trigger **research community amid strong competition from Asia**

HORIZON-CL4-2023-DATA-01-07:

Collaboration with NSF on fundamental research on new concepts for distributed computing and swarm intelligence (CSA)

We expect the CSA to support structure for cooperation between the EU and National Science Foundation of U.S. by:

Organising networking events,

Providing exchange and fellowship programmes,

Vision workshops for the academic and industrial comp. community,

Organising at least one annual EU-US workshop

HORIZON-CL4-2023-DATA-01-07:

Collaboration with NSF on fundamental research on new concepts for distributed computing and swarm intelligence (CSA)

What do we NOT want?

- *Generic domain knowledge: → need to support a Strategic Vision*
- *Carrying out R&D, scientific papers as outcome // tons of deliverables*
- *Newcomers in CSA actions → track record in community buildings and stakeholder mobilisation*
- *Large consortia: → need of a powerful but lean consortium*
- *Closed club → need to open up target communities to interdisciplinary topics and have insights into ongoing HE projects*

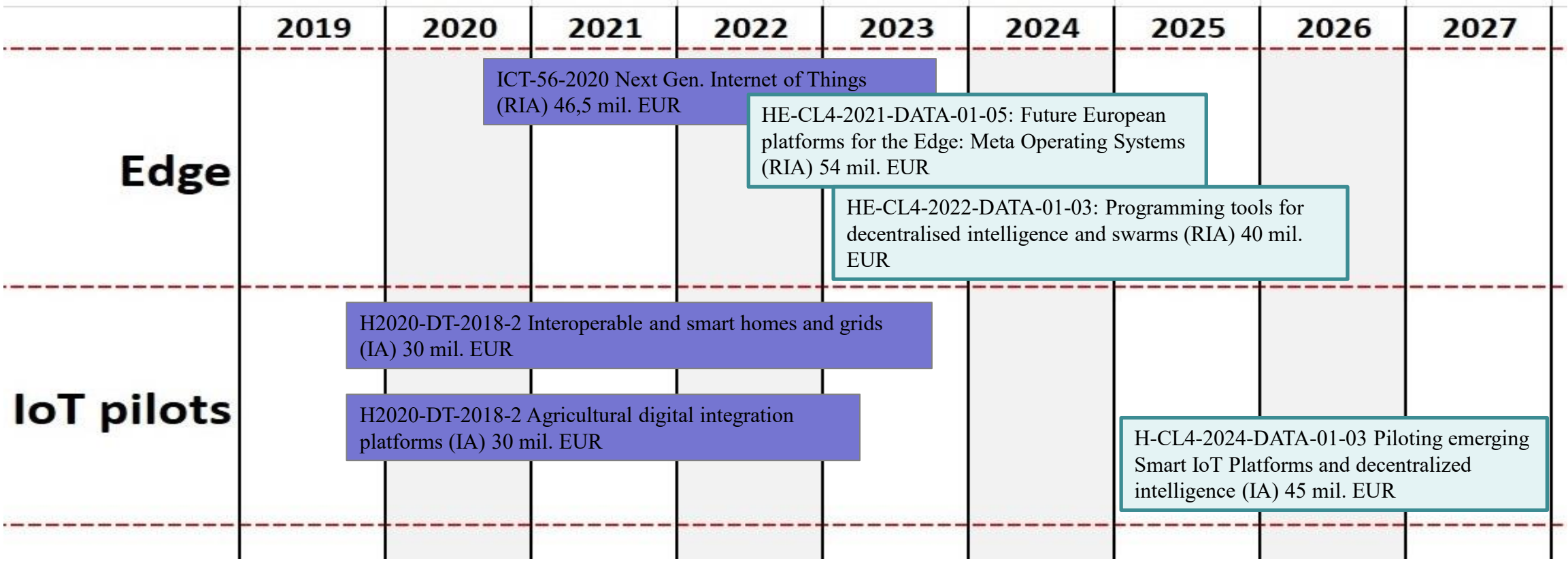
HORIZON-CL4-2023-DATA-01-07:

Collaboration with NSF on fundamental research on new concepts for distributed computing and swarm intelligence (CSA)

→ A new action, building on on-going projects

- *Focus on match-making for on-going projects*
  - **HE-CL4-2021-DATA-01-05 – Platforms for the Edge: Meta Operating Systems**
  - **HE-CL4-2022-DATA-01-03 – Programming tools for Decentralised Intelligence and Swarms**

HORIZON-CL4-2023-DATA-01-07: Collaboration with NSF on fundamental research on new concepts for distributed computing and swarm intelligence (CSA) – topic evolution



5. Who are the types of main stakeholders that are addressed?

6. Is there a key group of actors (eg. Partnership or other) driving this?

HORIZON-CL4-2023-DATA-01-07:

Collaboration with NSF on fundamental research on new concepts for distributed computing and swarm intelligence (CSA) – Key actors

5. **Who are the types of main stakeholders** that are addressed?

- Research establishments and academic partners with interest in collaboration with the NSF

6. **Is there a key group of actors** (eg. Partnership or other) driving this? - NO

HORIZON-CL4-2023-DATA-01-07: Collaboration with NSF on fundamental research on new concepts for distributed computing and swarm intelligence (CSA)

***Commission Communications**:*
→ European Data Strategy, Industrial Strategy, Fit fir 55

Position Papers and Event Reports
→ Next Generation ***IoT and Edge Computing Strategy Forum***,

*Portal – **https://eucloudedgeiot.eu/***

HIPEAC Vision - https://www.hipeac.net/vision/#/latest/

ARTEMIS SRIA - https://artemis-ia.eu/

Upcoming events / information days

- Horizon Europe Cluster 4 – WP 2023
  12-14 December 2022

- Brokerage event on HORIZON-CL4-2023-DATA-01-07
  end January 2023 – TBC

Destination 3 – Objective "From Cloud to Edge to IoT for European Data"

European Commission

WORLD LEADING DATA AND COMPUTING TECHNOLOGIES 2023

From Cloud to Edge to IoT

HORIZON-CL4-2023-DATA-01-04

Cognitive Computing Continuum: Intelligence and automation for more efficient data processing (RIA)

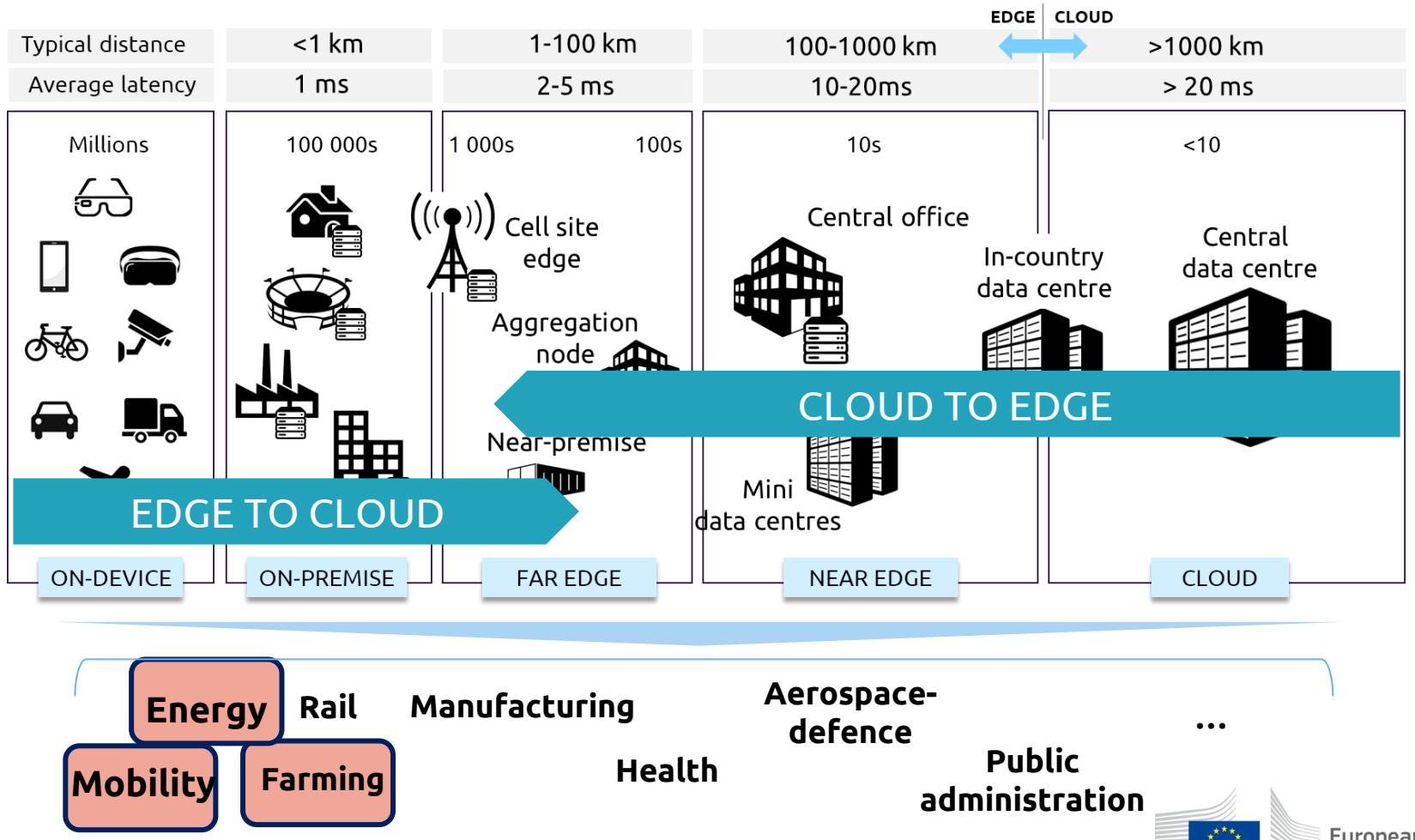
HORIZON-CL4-2023-DATA-01-06

Cognitive Computing Continuum: Intelligence and automation for more efficient data processing (CSA)

Research and Innovation

Digital Decade objectives for the cloud & edge computing continuum by 2030

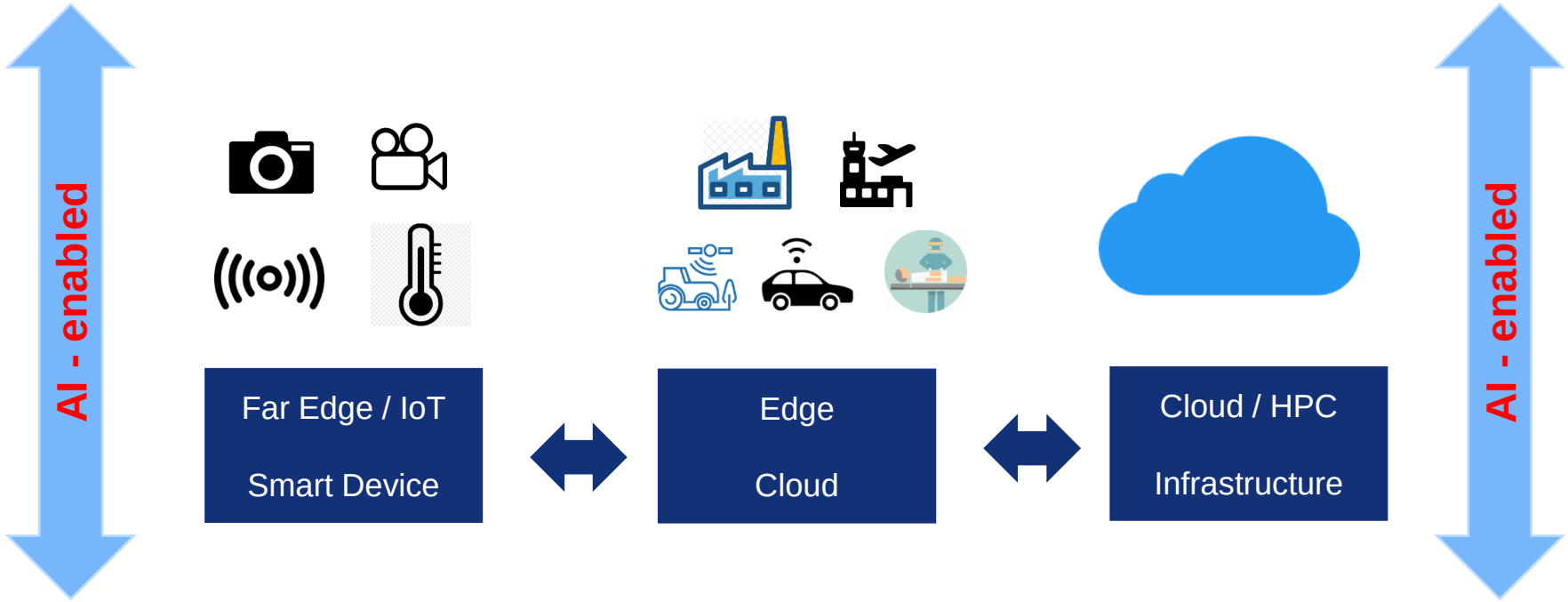
- ✓ **>10.000 edge nodes by 2030**
- ✓ **75% of cloud uptake by EU enterprises in 2030**



European Commission

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

An AI-enabled Cloud-Edge-IoT Continuum

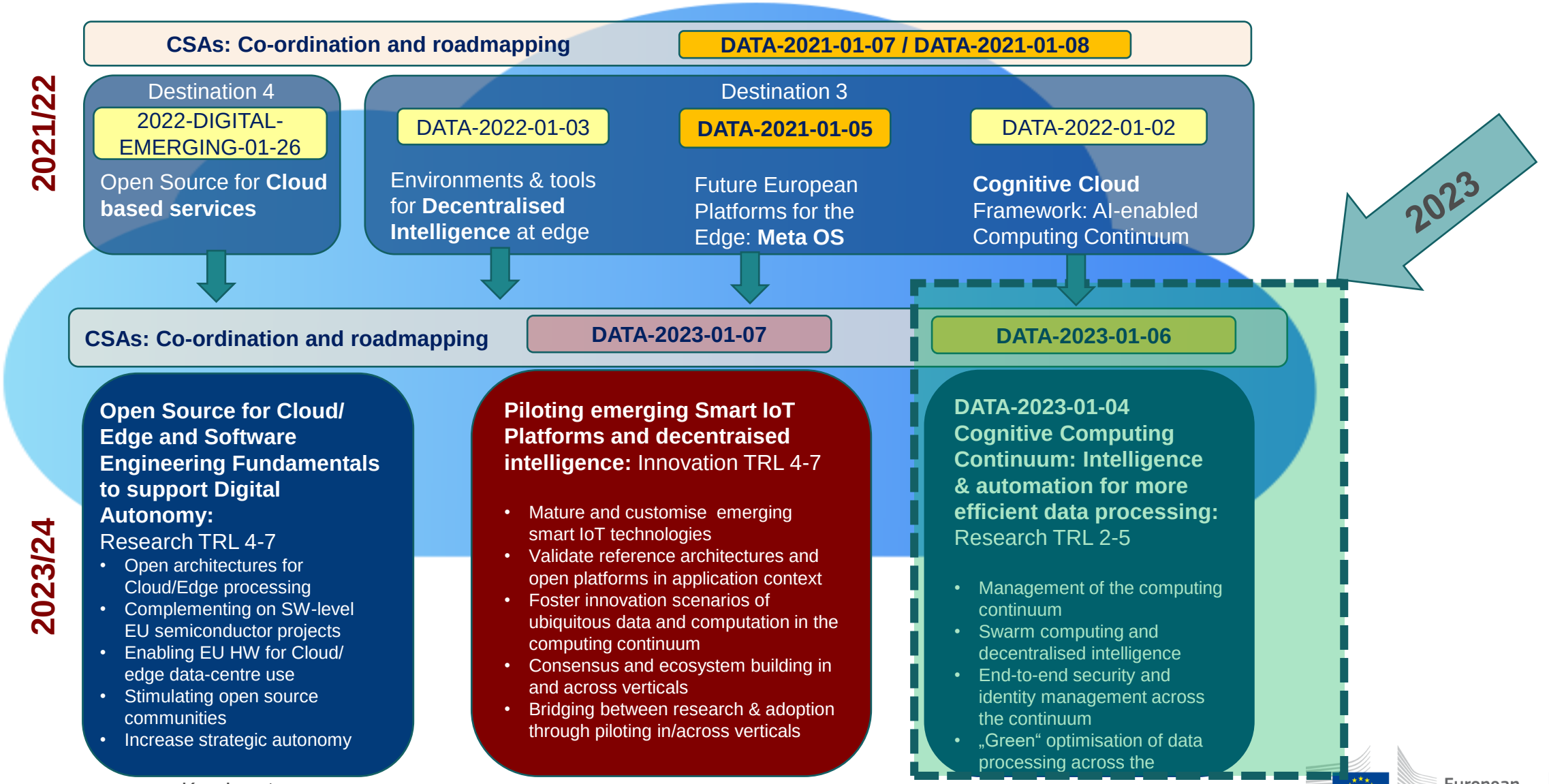


Seamless, transparent and trustworthy integration of diverse computing and data environments spanning from core cloud to edge

INTELLIGENCE, AUTOMATION and INTEROPERABILITY ➔ ADAPTABILITY

European Commission

From Cloud to Edge to IoT for European Data Horizon Europe Work Programme 2023/24



Key Input: Industrial Cloud / Edge Technology Roadmap

Key Input: Cloud-Edge-IoT Strategy Forum

Key Input: Industrial Cloud / Edge Technology Roadmap ADRA SRIDA

European Commission

From Cloud to Edge to IoT for European Data - HORIZON-CL4-2023-DATA-01-04: Cognitive Computing Continuum: Intelligence and automation for more efficient data processing (RIA)

28 Million EUR (LUMP SUM)

TRL2-5, 4-6 mil. EUR per project

Scope:

- **AI-enabled Management of the whole computing continuum enabled by Swarm computing and decentralized intelligence. This will allow services and data to be seamlessly processed across various providers, connectivity types and network zones.**
- **Novel automated management tools, programming models, learning and decision-making methods, and approaches able to cope with end-to-end security and identity management, resources heterogeneity, extreme scale and fault-tolerance together with elasticity to flexibly allocate resources and tasks.**
- **Intelligent compute, data and code orchestration mechanisms to allow efficient value extraction from the huge volumes of generated data while supporting resource dynamicity and scalability across the compute continuum.**
- **Optimization of energy efficiency and ecological sustainability taking into account end-to- end data processing across the continuum.**

European Commission

From Cloud to Edge to IoT for European Data - HORIZON-CL4-2023-DATA-01-04: Cognitive Computing Continuum: Intelligence and automation for more efficient data processing (RIA)

28 Million EUR (LUMP SUM)

TRL2-5, 4-6 mil. EUR per project

Expected Outcome:

- Enhanced openness and strategic autonomy in the evolving data and AI economies across the computing continuum including adapted system integration at the edge and at device level, validation of key sectors and nurturing European value chains to accelerate and steer the digital and green transitions.
- Paving the way to strategic industrial cooperation in data processing required to support future hyper-distributed applications by building open platforms, underpinning an emerging industrial open edge ecosystem critical to establishing a mature European supply chain.
- Establishment of adaptive hybrid computing, cognitive clouds and edge intelligence beyond today's investments on data infrastructure.
- Better international collaboration with trusted partner regions, guaranteeing a minimum level of interoperability, portability thereby fostering competition in the Cloud/Edge services market for the European cloud/edge and software industry and facilitate European access to foreign markets.

European Commission

From Cloud to Edge to IoT for European Data - HORIZON-CL4-2023-DATA-01-04: Cognitive Computing Continuum: Intelligence and automation for more efficient data processing (RIA)

28 Million EUR(LUMP SUM)

TRL2-5, 4-6 mil. EUR per project

Other Important aspects:

RIAs:

- **For security and identity management**, proposals are expected to apply state-of-the-art technologies, develop synergies and relate to activities and outcomes in *Cluster 3 (namely, HORIZON-CL3-2023-CS-01-01: Secure distributed platforms (IoT, Edge, Cloud, Dataspaces) and HORIZON-CL3-2023-CS-01-02: Privacy-preserving and identity technologies*).

- Projects are expected to **develop synergies** and **relate to activities** and outcomes of the Digital Europe Programme (DEP) *(topics 2.1.1, 2.1.2 and 2.1.3*) and any existing or emerging Important Projects of Common European Interest (IPCEI) initiative, IPCEI on Next Generation Cloud Infrastructure and Services.

- Interoperability approaches (based on open standards, interoperability models and open platforms) should be considered where appropriate.

RIAs and CSAs:

- **International cooperation** is encouraged, especially with **Japan and S. Korea**.
  - NO FUNDING by the EU for international entities!

  They need to secure their own funding!

European Commission

HORIZON-CL4-2023-DATA-01-04: Cognitive Computing Continuum: Intelligence and automation for more efficient data processing (RIA)

What are we looking for?

- Development of **generic and advanced AI-enabled Cloud/Edge technologies, mechanisms, techniques, etc. covering the whole continuum.**

  Research on cloud/edge technologies! not in AI

  - For example: hyper-distributed computing approaches encompassing resources from IoT and far-edge constrained devices, to federated fog/edge computing nodes to central cloud computing centres and hybrid cloud models which exploit Artificial Intelligence techniques

- **Beyond State-of-the-art**, **not incremental type of research** →cutting-edge novel approaches, TRL 2-5.

- The proposals should **demonstrate the applicability and viability of the proposed technological solutions** across multiple application domains.

What do we NOT want?

- Using existing Cloud/Edge technologies as an enabler for research in other domains (e.g., AI, IoT, BigData, 5G, etc.)

- Any User Application development using existing Cloud/Edge/AI technologies

European Commission

From Cloud to Edge to IoT for European Data - HORIZON-CL4-2023-DATA-01-06: Coordination and Support of Cognitive Computing Continuum research and policy (CSA)

1 CSA 2 Mill. EUR

Scope:

- To support the European Commission and the European computing constituency by providing to them annually updated roadmaps for research and innovation.
- Facilitate awareness of stakeholders in research and policy matters related to Cloud-Edge-IoT Computing continuum.
- Coordinate stakeholders in the Cloud to Edge to IoT Computing Continuum and act as support to R&D programmes/activities by disseminating project results and organising scientific and policy events, and addressing pre-standardisation initiatives.
- Collaboration with other relevant initiatives in the field, such as those related to the Important Project of Common European Interest on Cloud Infrastructure and Services (IPCEI CIS) and the European Alliance for Industrial Data, Edge and Cloud.

Expected Outcome:

- Support structure for the European Computing ecosystem: networking events and vision workshops for the academic and industrial computing community.
- Yearly updated roadmaps on the computing continuum addressing the area from a broad perspective from edge device to edge cloud to cloud to HPC, from scientific to industrial to societal and research applications, and addressing all relevant aspects such as real-time, security, etc. Developments should complement the Industrial Roadmap from the European Alliance for Industrial Data, Edge and Cloud by offering a long-term research perspective which enables disruptive innovations.
- Creation of a sustainable European forum of stakeholders representing the whole Cloud to Edge to IoT Computing research, industry and users.

European Commission

HORIZON-CL4-2023-DATA-01-04: Cognitive Computing Continuum: Intelligence and automation for more efficient data processing (CSA)

What are we looking for?

- **New action**, building on existing HE CSAs (UnlockCEI and OpenContinuum)
  - Seek for complementarity!
- Bring together **all stakeholders** in the Cloud-Edge continuum and produce annually updated **research** roadmaps involving on-going research projects, EU initiatives (DEP related projects, Cloud Alliance, AIOTI, NESSI, IPCEI, etc.)
  - Long-term, Forward looking perspectives!
- **Scientific and policy related events** that provide input to the research roadmaps and policy and standardization initiatives

What do we NOT want?

- Business as usual… generic and not focus on the strategic vision of the cloud-edge-iot continuum
  - Avoid too generic, short time to market perspectives
- Static/boring web sites and difficult to find information
  - CSAs are to be used by community stakeholders and citizens

European Commission

Call opens: 8th December 2022
Call closes: 28th March 2023

HORIZON-CL4-2023-DATA-01-04:
Cognitive Computing Continuum: Intelligence and automation for more efficient data processing (RIA)

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

Budget: EUR 28 million (LUMP SUM)	EU contribution per project: EUR 4 – 6 million

HORIZON-CL4-2023-DATA-01-06:
Cognitive Computing Continuum: Intelligence and automation for more efficient data processing (CSA)

Budget: EUR 2 million	EU contribution per project: up to 2 million

Link to HE WP2023-24

European Commission

HORIZON-CL4-2023-DATA-01-04 & 06

Current Project Portfolio and Future Outlook

- HE cloud-edge-iot projects https://eucloudedgeiot.eu/
- H2020 Cloud projects https://www.h-cloud.eu/projects/research-innovation/ and Funding and Tenders (F&T) portal: ICT-40 , ICT-15, ICT-16, HE projects on the F&T portal
- Roadmap published by the Alliance on Industrial Data and Cloud
- **White paper on future cloud research** https://www.h-cloud.eu/news/h-cloud-publishes-final-version-of-white-paper-cloud-computing-in-europe/
- Related videos on future research https://www.h-cloud.eu/videos/
- DEP and IPCEI on Next Generation Cloud Infrastructure and Services
- Lump Sum https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/programmes/horizon/lump-sum/guidance and Link to the related training https://ec.europa.eu/research/participants/docs/h2020-funding-guide/other/event221020.htm

Upcoming information days and other events of relevance to this area

- *12-14 December 2022* **Horizon Europe info day - Cluster 4 https://research-innovation-community.ec.europa.eu/events/3jM2kV6qwHjteovSf3VOrp/overview**
  - 12 December 2022 **Horizontal issues of W2023** 10:00-11:30 **Lump sum funding in HE**
  - 13 December 2022 **HORIZON-CL4-2023-DATA-01-04 & 06 topics** 14:30-14:50
  - 14 December 2022 **Application and Evaluation process** 14:30-15:00
- *DG Connect units E2-E4 Brokerage event/InfoDay – planned end January 2023 -tbc.*

European Commission