Horizon Europe Calls 2024 Information & Brokerage Session: Digital Platforms for the Cloud-Edge-IoT, Innovation through Open Source and Software
4 December 2023
ICT use in EU enterprises, 2021
(\% of enterprises with at least 10 employees and self-employed people)

- 94\% used a fixed broadband internet connection
- 78\% had a website
- 59\% used social media
- 38\% used Enterprise Resource Planning (ERP) software
- 35\% used Customer Relationship Management (CRM) software
- 41\% used cloud computing
- 29\% used Internet of Things (IoT)*
- 22\% had e-commerce sales**
- 8\% used Artificial Intelligence (AI) technologies

* Internet-connected devices or systems that can be monitored or controlled remotely via the internet
** in 2020 reference year
Our vision: Digital Decade objectives by 2030

- >10,000 edge nodes by 2030
- 75% of cloud uptake by EU enterprises in 2030

<table>
<thead>
<tr>
<th>Typical distance</th>
<th>&lt;1 km</th>
<th>1-100 km</th>
<th>100-1000 km</th>
<th>&gt;1000 km</th>
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<tbody>
<tr>
<td>Average latency</td>
<td>1 ms</td>
<td>2-5 ms</td>
<td>10-20 ms</td>
<td>&gt;20 ms</td>
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</table>

- **EDGE TO CLOUD**
  - ON-DEVICE
  - ON-PREMISE
  - FAR EDGE
  - NEAR EDGE
  - CLOUD

- **CLOUD TO EDGE**
  - Central office
  - In-country data centre
  - Central data centre

- **Energy**
- **Manufacturing**
- **Aerospace-defence**
- **Mobility**
- **Public administration**
- **Health**
Horizon Europe Work Programmes 2021/22, 2023/24
Innovative technologies for the next generation Cloud-Edge-IoT continuum

Software technologies

IoT Research

IoT and Digitising Industry Pilots

Cloud Computing

Open Source for Cloud based services

Environments & tools for Decentralised Intelligence at edge

Future European Platforms for the Edge: Meta OS

Cognitive Cloud Framework: AI-enabled Computing Continuum

Open Source for Cloud/edge Digital Autonomy:
- Open architectures for Cloud/Edge processing
- Complementing on SW-level EU semiconductor projects
- Enabling EU HW data-centres
- Stimulating open source comm.
- Increase strategic autonomy

Piloting emerging Smart IoT Platforms and decentralised intelligence (IA)
- Mature and customise emerging smart IoT technologies
- Validate reference architectures and open platforms in application context
- Foster innovation scenarios in CCC
- Consensus and ecosystem building
- Bridging between research & adoption through piloting in/across verticals

Cognitive Computing Continuum: Intelligence & automation for more efficient data processing:
- Management of the CCC
- Swarm computing and decentralised intelligence
- End-to-end security and identity management
- „Green“ optimisation of data processing across the CCC

Funding > 250 Mill € WP2021-24
Market size and interest from the Computing Continuum perspective
Study on the Economic Impact of Open Source in the EU economy

- Confirmation of big impact: EU companies invested over €1b in OSS
- Cost Benefit ratio above 1:4
- Impact between €65 and €95b
- Positive correlation with GDP and confirmation of causality
- Open Source → Public good
- EU policies required.
- Case studies confirm TCO reduction, avoid vendor lock-in and increase digital autonomy.

→ Digital Autonomy

Inflection points in Computing history

Applications
Libraries/Platforms
Window Managers
Kernel
Embedded Software
Electronic systems
Processors/Components
Open Source for Cloud/Edge and Software Engineering Fundamentals to support Digital Autonomy

- HORIZON-CL4-2024-DIGITAL-EMERGING-01-21: Open Source for Cloud/Edge to support European Digital Autonomy (RIA)
- HORIZON-CL4-2024-DIGITAL-EMERGING-01-23: Public recognition scheme for Open Source (CSA)
HORIZON-CL4-2024-DIGITAL-EMERGING-01-21: Open Source for Cloud/Edge to support European Digital Autonomy (RIA)

Expected Outcomes:

• Prototypes of cloud and edge servers demonstrated in relevant centralised and distributed environments and allowing full computing infrastructure deployments based on European processor technology, thereby establishing a full Open Computing Architecture stack, which supports emerging processing architectures (e.g. RISC-V).

• Standards and best practices consolidating the European Open Computing Architecture, as well as its interfaces to current industry standards.

Scope:

• Developing open source alternatives to enable the physical use of emerging processors in cloud and edge server systems. Such modules include basic input/output systems, preboot execution environments, power-on authentication, etc., supporting heterogeneous processor architectures, and

• Demonstrating actual cloud and edge systems in real life or emulated computing environments exploiting the benefits of an extended open source stack (socket to application) on emerging processor architectures (e.g. RISC-V).

Indicative budget: 20 000 000 EUR
EU contribution per project: 4-6 MM EUR
Type of Action: RIA
TRL: From 4 to 6
RISC-V Development foci from Architecture to Application

**Processor Architecture**
- System Specification: RISC-V ISA
- Architectural Design
- Functional and Logic Design
- SIP EDA Tools

**Component Implementation**
- IC Verification EDA Tools
- Circuit Design
- Physical Design
- Layout Post processing
- Fabrication: Foundry
- Packaging and Testing
- IC Socket Descriptions
- Logical behaviour
- Specific IC

**FPGA**
- FPGA Programming
- Socket Interfaces?

**Component Integration**
- Relevant industry interfaces
- IC Socket Descriptions
- PCB Development
- PCB EDA Tools

**Module level**
- PCB Manufacturing
- PCB Assembly
- PCB EDA Tools

**System Integration**
- Open Source Stack: Kernel, Middleware, Application
- High Performance Computing
- Cloud Computing
- Automotive
- Communication
- Industrial Automation

**Application level**
- Increased Complexity
- App 1
- App 2
- App (n)

Expected Outcomes:
• Responsible software engineering methods and tools
• Best practices leveraging, among others, novel AI and data technologies to accelerate the development and maintenance of software
• Methods and tools for multi-architecture systems
• Efficient and agile modelling, verification and validation, vulnerability assessment and mitigation.

Scope:
• Methods, mechanisms and tools that allow smart intelligent system specification, agile system and code development, advanced code analysis, fault prediction and location and self-repair by using emerging techniques, in particular based on AI and data technologies.
• Methods and tools for the development of dynamic and resilient software for systems running on multiple processing architectures including cross-compilation, run-time self adaptation and multi-architecture executables.

Indicative budget: 13 5000 000 EUR
EU contribution per project: 4-6 MM EUR
Type of Action: RIA
TRL: From 2 to 5
HORIZON-CL4-2024-DIGITAL-EMERGING-01-23: Public recognition scheme for Open Source (CSA)

Expected Outcomes:
• Establishment of a system of European annual awards that acts as a spotlight stirring up contributions to Open Source Software and Hardware projects.
• Increased interest for the contribution to, integration of and exploitation of Open Source assets

Scope:
• Development of a scheme including a list of fields related to Open Source
• Ellaboration of an adequate process to:
  • scrutinize different fields of action relevant to open source
  • select appropriate candidates for being recognized
  • implement adequate award ceremonies.

Indicative budget: 2 000 000 EUR
EU contribution per project: 2 000 000 EUR
Type of Action: CSA
TRL: N/A