HORIZON-CL4-Destination 3: Spurring Edge innovation through Open Platforms

2021 – 2027

ROLF RIEMENSCHNEIDER
HEAD OF SECTOR IOT
European Commission
DG CONNECT / E4
Internet of Things

Ludwigsburg, 17 October 2023
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

<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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</thead>
<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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- Energy
- Rail
- Manufacturing
- Aerospace-defence
- Mobility
- Farming
- Health
- Public administration
- ...
In 2021, the EU players are well positioned in the leading professional IoT segments:

- Automotive electronics
- Factory Automation
- Energy
- Health & Care

EU ecosystems face numerous challenges that should hampers its global competitive position:

- Reversing the trend of outsourcing to Asia
- Competition from Hyperscalers

Source: DECISION Etudes & Conseil
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

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 based services
Piloting emerging Smart IoT Platforms and decentralised intelligence (IA)
Cognitive Computing Continuum: Intelligence & automation for more efficient data processing:

Open Source for Cloud/edge Digital Autonomy:

Funding > 250 Mill € WP2021-24
Technology Drivers

- Reasoning ‘on the go’ (Edge and Core)
- Enhanced Secure Edge
- Cloud-edge-IoT Orchestration
- Real-time response
- Green solutions
- Seamless Service Architecture
Edge Topology

IoT ecosystem: From Smart devices to Cloud

Smart devices

- IoT modules
  - Hardware
  - Software
  - IA/ML

Network

- LP WAN
- WiFi
- LTE-M
- 5G
- Bluetooth
- MQTT

Near Edge Cloud

- Network / joint server

Security / IAM

Far Edge Cloud

- Hyperscalers
- Big Data Cloud

Applications

- Mobility
- Manufacturing & Logistics
- Energy
- Smart City
- Smart Building
- Agriculture

Applications

- Bosch IoT
- Legrand
- Siemens

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April 2022
Platforms for the Edge

- **Challenges of System Integration**
- **Embedded Systems & Control**
- **Internet of Things – Connected Objects**
- **Cloud – Digital Twins - Orchestration**

**A Platform Economy @theEdge**

- **taking a system-level approach**
  * from hardware of smart devices
  * to operating systems at device and at system level,
  * to middleware and to application software

- **Functions/Apps over the Air up-dates**

- **Avoid Vendor Lock-in - Open, vibrant ecosystem**
A reference architecture – edge design space
### Momentum of Open Source Initiatives

<table>
<thead>
<tr>
<th>Collect</th>
<th>Process</th>
<th>Store</th>
<th>Retrieve</th>
<th>Analyse</th>
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<tbody>
<tr>
<td>fluentd</td>
<td>Flink</td>
<td>cassandra</td>
<td>elasticsearch</td>
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<td>Hadoop</td>
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<td>Grafana</td>
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<tr>
<th>Orchestration</th>
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<tbody>
<tr>
<td>kubernetes</td>
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<tr>
<td>MESOS</td>
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<tr>
<td>ZooKeeper</td>
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<tr>
<td>SWARM</td>
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<tr>
<td>yarn</td>
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<th>Container</th>
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<tr>
<td>docker</td>
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<tr>
<td>Rocket</td>
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<th>Infrastructure</th>
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<tbody>
<tr>
<td>openstack</td>
</tr>
<tr>
<td>Amazon</td>
</tr>
<tr>
<td>Microsoft</td>
</tr>
<tr>
<td>IBM BlueMix</td>
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**Courtesy: Omar Elloumi, Nokia**
A framework to spur a vibrant IoT ecosystem

- Manage Complexity through an open platform approach
- *The value of an IoT-Edge Platform corresponds to the size of its ecosystem* behind the platform
- Require consensus on interoperability and standards as well as ecosystem building in and across verticals
- *Edge platforms* could leverage the momentum of Open Source Communities

Source: Deloitte analysis.
Navigation Map of Open Source

Courtesy: ECLIPSE Foundation
Key Use cases requiring Edge Computing

**aerOS**

Manufacturing: Data-Driven Cognitive Production Lines (Manufacturing Autonomy Level 4 – MAL4)

Renewable energy: Containerised Edge Computing near Renewable Energy Sources

**Smart Buildings:**
Energy Efficient, Health Safe & Sustainable Smart Buildings

Logistics:
Cloud/Edge for automated routing and warehouse solutions

**ICOS**

Renewable energy: Cloud/Edge for secure and sustainable solutions Flexibility adapted to consumer needs

**Railway:**
Cloud/Edge for Structural Alert Monitoring system, local safety

**SW-defined Vehicle:**
Cloud/Edge for onboard intelligence and connected infrastructure In-car multimedia management

Farming:
Agriculture Operational Robotic Platform

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Scaling up – Open Calls

Driving Innovation => Edge OS Platform

Online InfoDay 10 Nov. 2023 => Energy Focus
Industrial IoT Use cases underpinning the trend towards the edge

Orchestration of resources: storage – network – computing centres

Carbon Footprint
Safety
Security
Privacy

Cross-domain Pilots

Environmental Footprint

Energy Consumption

Closing: March 2024

Strategy: A Platform Approach to share hardware and foster an Open Ecosystem
Piloting Smart IoT Platforms + decentralised Intelligence

- **More Computing Capacity at the Edge**
  - Leverage next generation of chip supply in Europe

- **Platform Economy at the Edge**
  - Open APIs .. Towards an App Store at the Edge
  - Up to 20% for Open Call for Edge applications

- **Fostering the Green and Digital Transition**
  - Edge services spanning across different key domains
  - Common architectures and open standards

- HE WP2024 call for Innovation Actions with 45 Mill €
HORIZON-CL4-2024-DATA-01-05: Platform Building, standardisation and Up-scaling of the ‘Cloud-Edge-IoT’ Solutions (Horizontal Activities - CSA)

Related Background

• Horizon Europe:
  → Calls, topics, deadlines WP2023-24

• Position Papers and Event Reports
  → Alliance AIOTI Strategic Foresight: IoT and Edge Computing Convergence

• Cloud-Edge-IoT Portal – see www.EUCloudEdgeIoT.eu

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

• Edge-IoT Policy on Europa

➢ Brokerage Event Meeting 04 December 2023  ..  → Registration