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# ADVANCING TOWARDS THE CLOUD, EDGE, AND IOT CONTINUUM: INSIGHTS AND IMPACTS

25 September 2023

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# WELCOME!

Maria Giuffrida (m.giuffrida@trust-itservices.com)

# AGENDA:

- 14:30 Setting the scene
  - Welcome and opening remarks, **Maria Giuffrida**, Trust-IT
  - Opening Keynote: Advancing Towards the Cloud, Edge, and IoT Continuum, **Rolf Riemenschneider**, European Commission
  - An overview of UNLOCK-CEI project and the EUCloudEdgeIoT initiative, **Golboo Pourabdollahian**, *IDC*
- 14:45 Presentation of research results
  - Demand-Side Market Trends and Outcomes, **John Gole**, IDC
  - Value Chains and Industry requirements: a focus on Manufacturing, Energy, Healthcare, Agriculture and Transportation, **Inessa Seifert**, VDI-VDE IT
  - Bridging demand and supply: Collaboration with Research Projects, **Jose Enrique Alvarez**, *Bluspecs*

Q&A session

- 15:20 Panel Discussion: "Cloud-Edge-IoT: Reflecting on Results, Collaborations, and Architecture"
  - **Geert Audenaert**, Whitesky
  - **Francesco Bellesini**, eMotion
  - **Rosalia Davi**, SSE Airtricity
  - **Francisco Javier Martinez Borreguero**, Telefonica
  - **Antonio Kung**, Trialog
  - **Natalie Samovich**, AIOTI
  - **Albert Seubers**, Martel Innovate
  - Moderator: **Maria Giuffrida**, Trust-IT

Q&A session

# AGENDA:

- 16:00 Impact and success stories: Inspiring Achievements in the Cloud-Edge-IoT Continuum
  - **Alissa Zaccaria**, Intellimech with **Fabrizio Mazzoleni**, SCAMM
  - **Francesco Bellesini**, eMotion (NEMO project)
  - Rosalia Davi, SSE Airtricity (ICOS project)
  - Moderator: **Claudio de Majo**, Trust-IT

Q&A session

- 16:25 Closing Remarks:
  - Shaping the Future of Cloud, Edge, and IoT**, Golboo Pourabdollahian,** IDC

# BEFORE STARTING…

- This session will be **recorded**
  - The recording will be available to all participants after the event
- Please always **keep your mics and cameras off** during presentations
- Get engaged by
  - Asking questions via the **Q/A function** anytime during the event
  - Writing comments in the **chat**
  - **Raising your hand** if you want to comment via audio/video

# SOME UPCOMING RELATED EVENTS

- **5-6 October 203:** EUCloudEdgeIoT at NexusForum2023, Bruxelles, Belgium
- **10 October:** AIOTI Signature event, Bruxelles, Belgium
- **10-12 October 2023:** Horizon Europe info days – Cluster 4 – DIGITAL, INDUSTRY & SPACE, Online
- **15-19 October 2023:** ECLIPSE CON2023, Ludwigsburg, Germany
- **25-27 October 2023:** ECloudEdgeIoT at European Big Data Value Forum, Valencia, Spain
- **28-30 November 2023:** ECloudEdgeIoT at ENLIT Europe, Paris, France

Find them all here: https://eucloudedgeiot.eu/events/

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# ADVANCING TOWARDS THE CLOUD, EDGE, AND IOT CONTINUUM: INSIGHTS AND IMPACTS

Rolf Riemenschneider, European Commission

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# OVERVIEW OF EU-CLOUDEDGEIOT AND UNLOCK-CEI

Golboo Pourabdollahian, IDC

25 September 2023

# EU-CEI IN A NUTSHELL

A European Commission research and innovation initiative that aims to:

- Realise a pathway for the **understanding and development of the Cloud, Edge and IoT Continuum**
- By promoting **cooperation** between a wide range of research projects, developers and suppliers, business users and potential adopters of this new technological paradigm.
- Support the definition of **large scale pilots**

The community is supported and coordinated by two Horizon Europe projects:

- **Unlock-CEI** (Demand side coordinated by IDC)
- **Open Continuum** (Supply Side coordinated by Martel)

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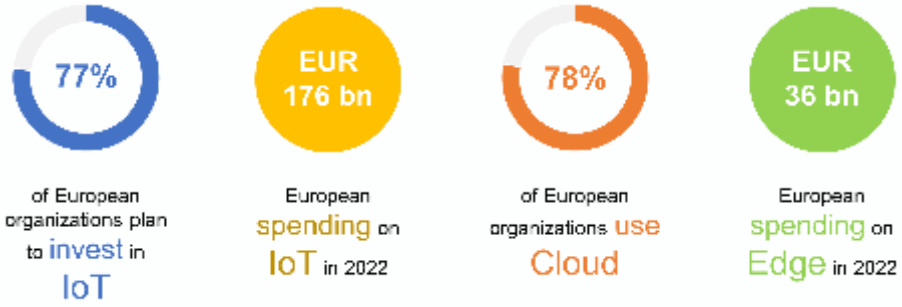
CLOUD EDGE IOT

# UNLOCK-CEI IN A NUTSHELL

## Context




Expected European **Enterprise Edge spending** in Europe in 2026 approaching **$75B**

Industrial stakeholders are still struggling to adapt to a CEI continuum environment and to deal with the **paradigm change** created by a Cloud-Edge-IoT (CEI) scenario.

**Get closer to the market!**

- Defined purchase decisions and criteria
- Identify demand drivers, structure and chain
- Gain insights on market and commercial feasibility
- Understand adoption levels across sectors

## Consortium

IDC · VDI|VDE|IT · egi · BluSpecs · TrustIT · COMMpla Communication Platforms and Online Solutions

# UNLOCK-CEI VISION & OBJECTIVES

UNLOCK-CEI's ambition is to facilitate and accelerate the **deployment of the Cloud-to-Edge-IoT (CEI)** computing continuum in Europe by focusing on the **demand-side drivers and challenges** to identify **technology-driven innovation** and **business opportunities** driving demand value chains.

Assessment of CEI demand landscape


Define market scenarios and guidance

Build and Activate CEI Industry Constituency

Coordination and interaction with supply side

Awareness and impact generation

Agriculture

Energy (Utilities, Oil and Gas)

Healthcare

Manufacturing

Transportation

# READ OUR REPORTS & WHITE PAPER






https://eucloudedgeiot.eu/reports/

# JOIN EUCEI TASK FORCES

Strategic Liaisons

Open Source Engagement

Architecture

Ecosystem Engagement

Market & Sectors

Communications

| Task Force 1 | Task Force 2 | Task Force 3 | Task Force 4 | Task Force 5 | Task Force 6 |
|---|---|---|---|---|---|
| **Open Continuum INSIDE** | **Open Continuum ECLIPSE** | **Open Continuum ATOS/EVIDEN** | **UNLOCK-CEI BLUSPECS** | **UNLOCK-CEI IDC** | **Open Continuum & UNLOCK-CEI Martel & Trust-IT** |
| Liaison with EU initiatives | Strategy for European digital autonomy in edge-to-cloud through Open Source | Taxonomy definitions | Coordination of Open Calls activities | Demand market adoption, drivers and challenges | Joint branding and community |
| Interactions with AIOTI/ECS/Gaia-x, etc. | Contribute to the definition of a common open architecture for the computing continuum | Enable the architectural discussion among projects in the area of IoT/Edge and Cloud to create a continuum. | Definition of commercial pilots | Use-cases characterisation | Coordination of Common events |
| Share results of strategic analysis | | Identification of the thematic areas and building blocks. | Commercial relationships and workshops | Definition of relevant value chains | Amplification of RIAs activities |
| Identification of common ground for the computing continuum | | | | Sector specific needs and requirements | Sustain a continue debate on CEI continuum |
| | | | | Commercialisation support | |

https://eucloudedgeiot.eu/task-forces/

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# THANK YOU!

Golboo Pourabollahian
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EUCloudEdgeIot.eu is supported by the Open Continuum and Unlock CEI and both received funding from the European Union's Horizon Europe Research and Innovation Programme under the Grant Agreement numbers 101070030 and 101070571.

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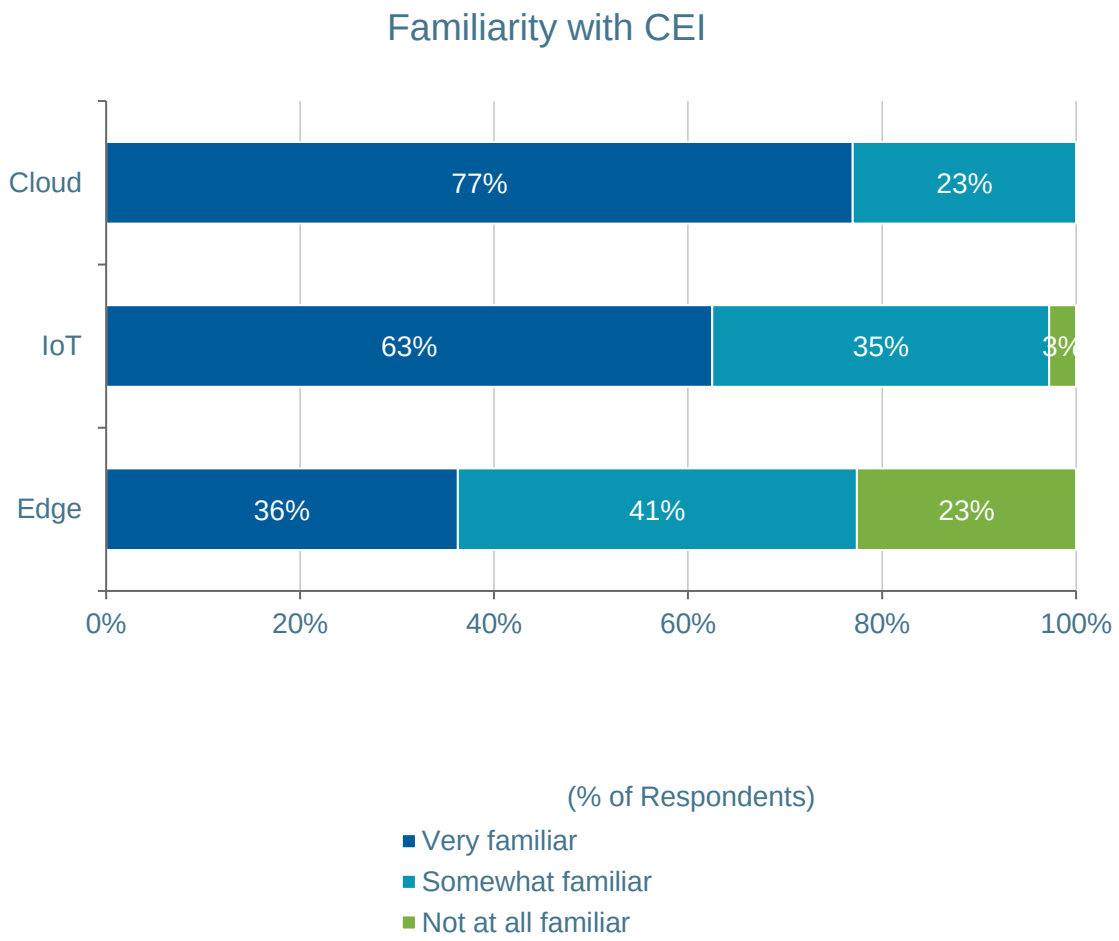
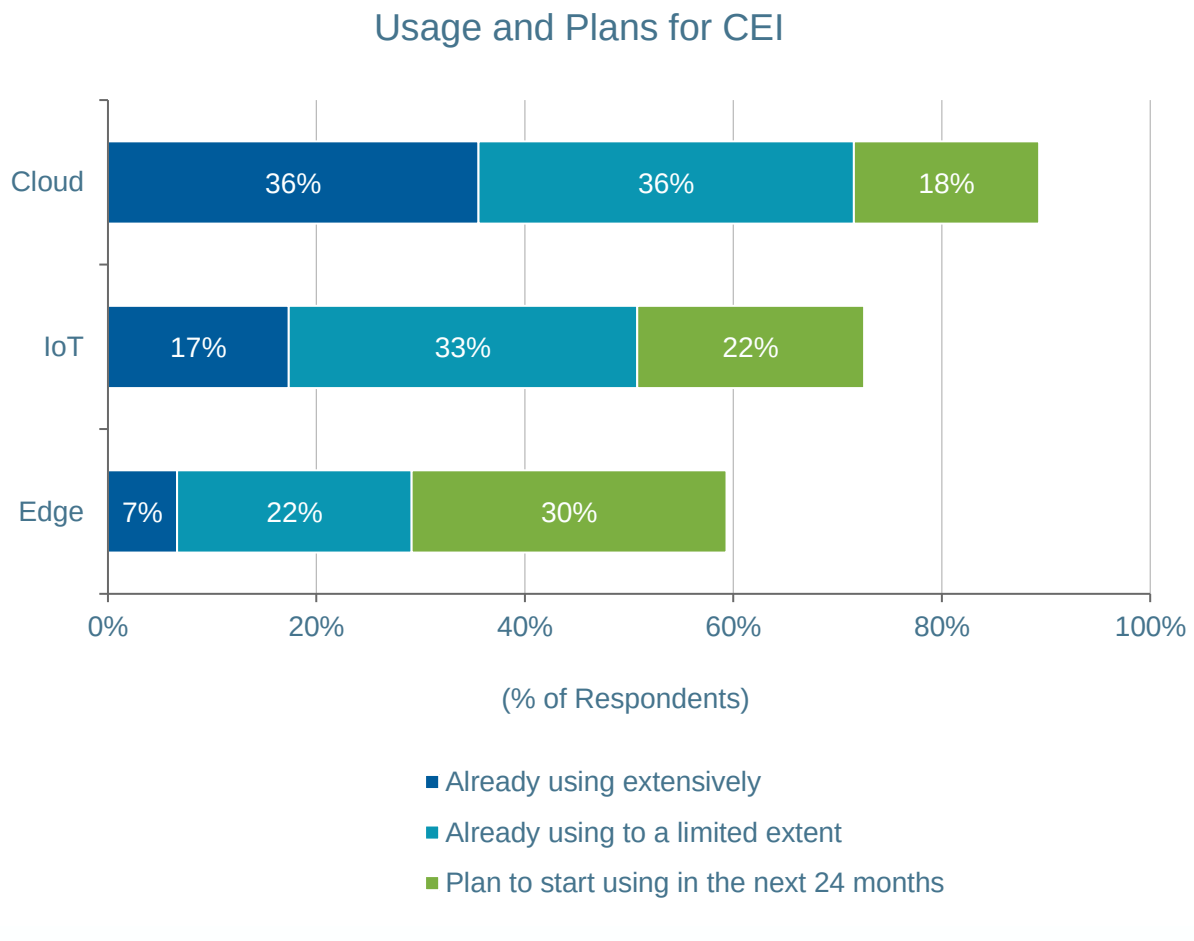
# DEMAND-SIDE MARKET TRENDS AND OUTCOMES

John Gole, IDC

25 September 2023

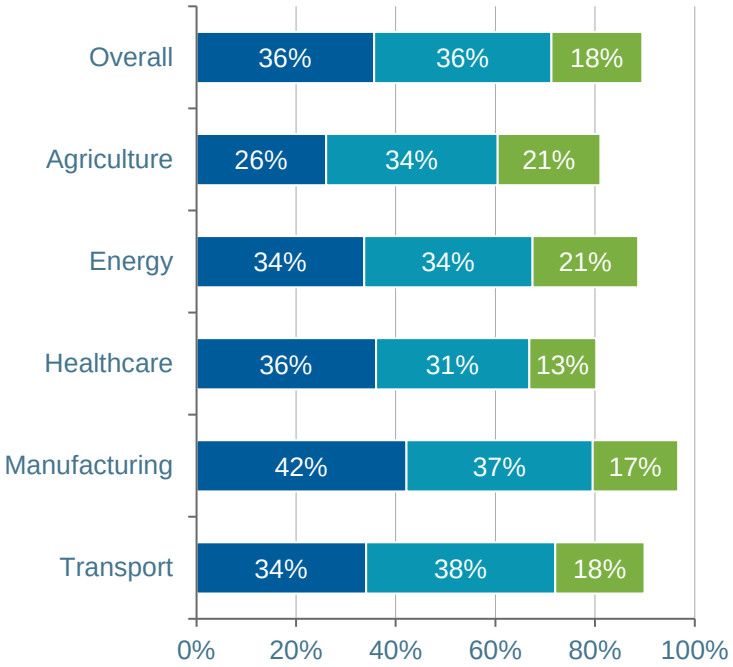
# FAMILIARITY AND ADOPTION



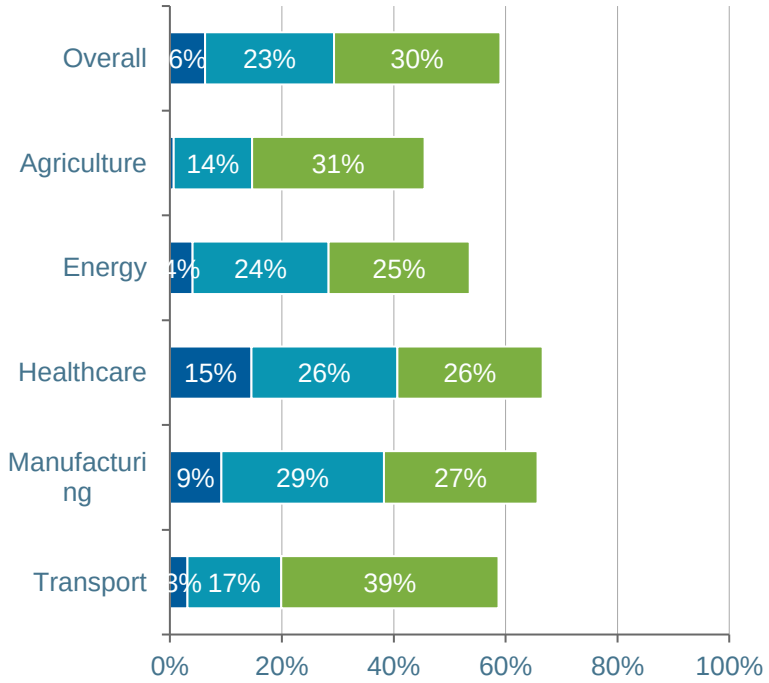
# ALL INDUSTRIES ARE COMMITTED TO CEI

## Usage and Plans for Cloud Computing by Industry



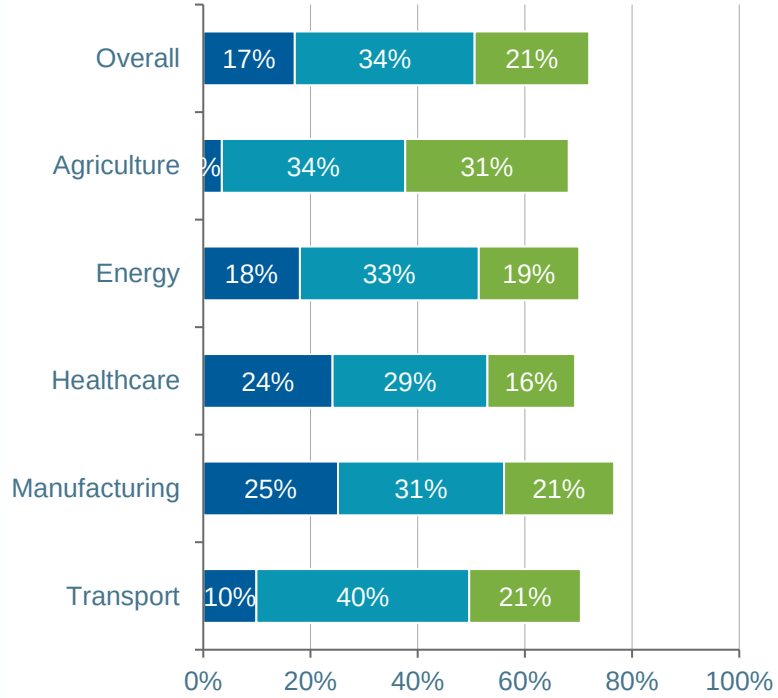

(% of Respondents)

## Edge Usage and Plans by Industry




(% of Respondents)

## IoT Usage by Industry




(% of Respondents)

- Already using extensively
- Already using to a limited extent
- Plan to start using in the next 24 months

# LARGE MARKETS, POISED TO GROW LARGER

European Cloud, Edge and IoT Markets

| Cloud | Edge | IoT |
| --- | --- | --- |
| Spending in 2022<br>EUR 109.6 bn | Spending in 2022<br>EUR 33.5 bn | Spending in 2022<br>EUR 172.3 bn |
| CAGR to 2026<br>20.8% | CAGR to 2026<br>14.1% | CAGR to 2026<br>10.8% |

# VARIED USE CASES HELP ADDRESS EU NEEDS

## Spotlight Use Cases by Industry

### Agriculture

- Precision agriculture
- Asset tracking/monitoring (e.g. animal tagging)
- Equipment automation

### Energy (Utilities, Oil and Gas)

- Smart grid
- EV Charging
- Drone-based observation

### Healthcare

- Hospital asset tracking
- Bedside telemetry
- AI-assisted diagnosis and treatment

### Manufacturing

- Asset monitoring and maintenance
- Autonomously guided vehicles (AGVs) and robots
- Visual inspection and quality control

### Transportation

- Port and warehouse automation
- Fleet tracking and freight monitoring
- Autonomous vehicles and infrastructure

# DRIVERS AND BARRIERS TO ADOPTION

## Top Benefits

**Cloud**
- Flexible and reliable IT
- Faster testing of new ideas
- Helps to build cloud-native apps

**Edge**
- Better security and compliance – data is not traveling
- Less data sent across networks
- Overcomes unreliable connectivity

**IoT**
- Efficiency and productivity
- Better customer experience
- Better decision-making

## Top Challenges

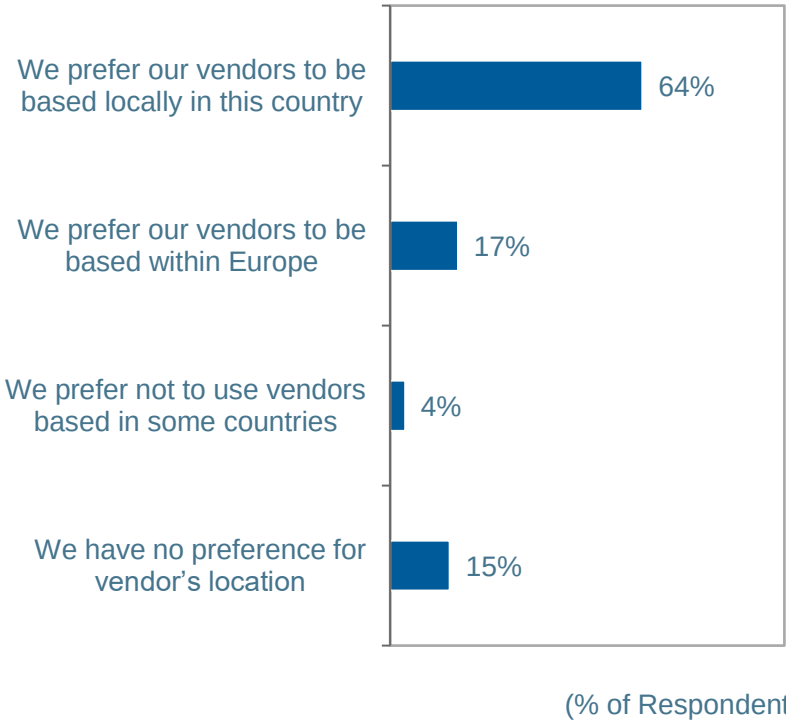
**Cloud**
- Digital sovereignty concerns
- Security and Trust Issues
- Difficult to control costs

**Edge**
- High costs and unclear ROI
- Security Concerns
- Lack of adequate IT Infrastructure

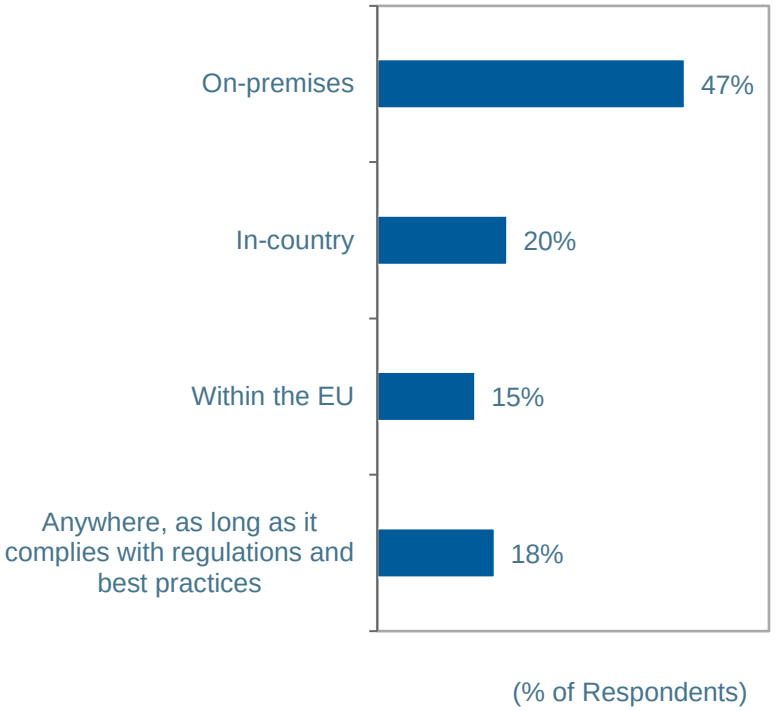
**IoT**
- Overall costs of deployment
- Security concerns
- Deployment complexity

# SOVEREIGNTY ISSUES

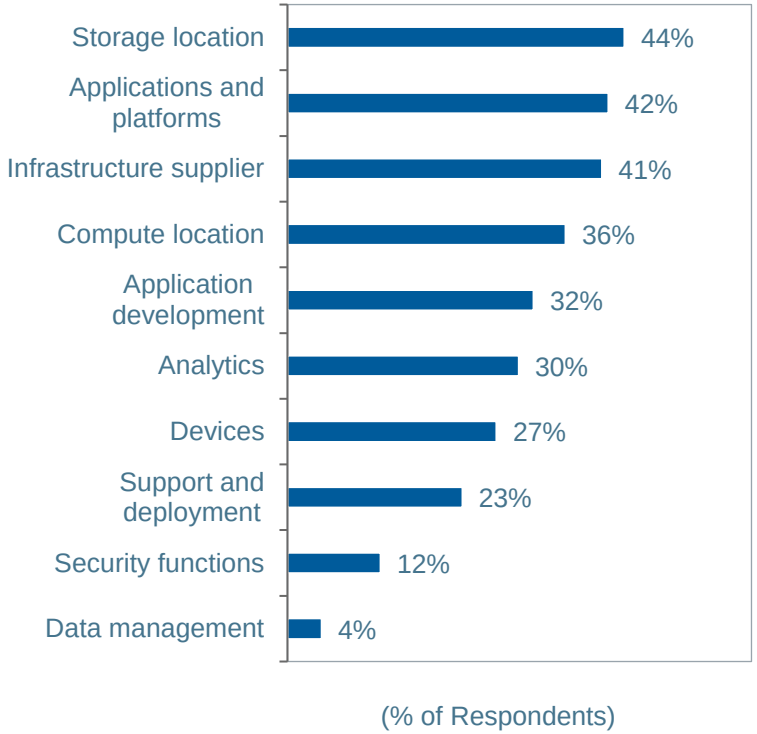
## Preferred Vendor Location




## Location of Data Storage




## Key Areas In Which Local Provider is Preferred



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# THANK YOU!

John Gole
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# VALUE CHAINS AND INDUSTRY REQUIREMENTS

Contact: Dr. Inessa Seifert (Inessa.Seifert@vdivde-it.de)

## Fill the gap!

## Get closer to the market!

- Defined purchase decisions and criteria
- Identify demand drivers, structure and chain

- Gain insights on market and commercial feasibility
- Understand adoption levels across sectors

# OUR APPROACH: VALUE CHAIN ADOPTER GROUPS

## Get involved: Value and Benefits

- Manufacturing
- Agriculture
- Health
- Energy and Utilities
- Transportation


Adobe stock: Artur

# WHY TO JOIN THE VALUE CHAIN ADOPTER GROUPS?

## Get involved: value and benefits

Adobe Stock: jojokrap

- Contribute with **recommendations for the large-scale pilots**
- Actively shape CEI towards **energy efficiency, reduction of $CO_2$ emissions, resilient supply chains, data privacy**
- Estimate **cost-benefit ratio** regarding the **infrastructure investments**
- Foster the "twin green & digital transitions" to build together **sustainable European data-driven value chains**

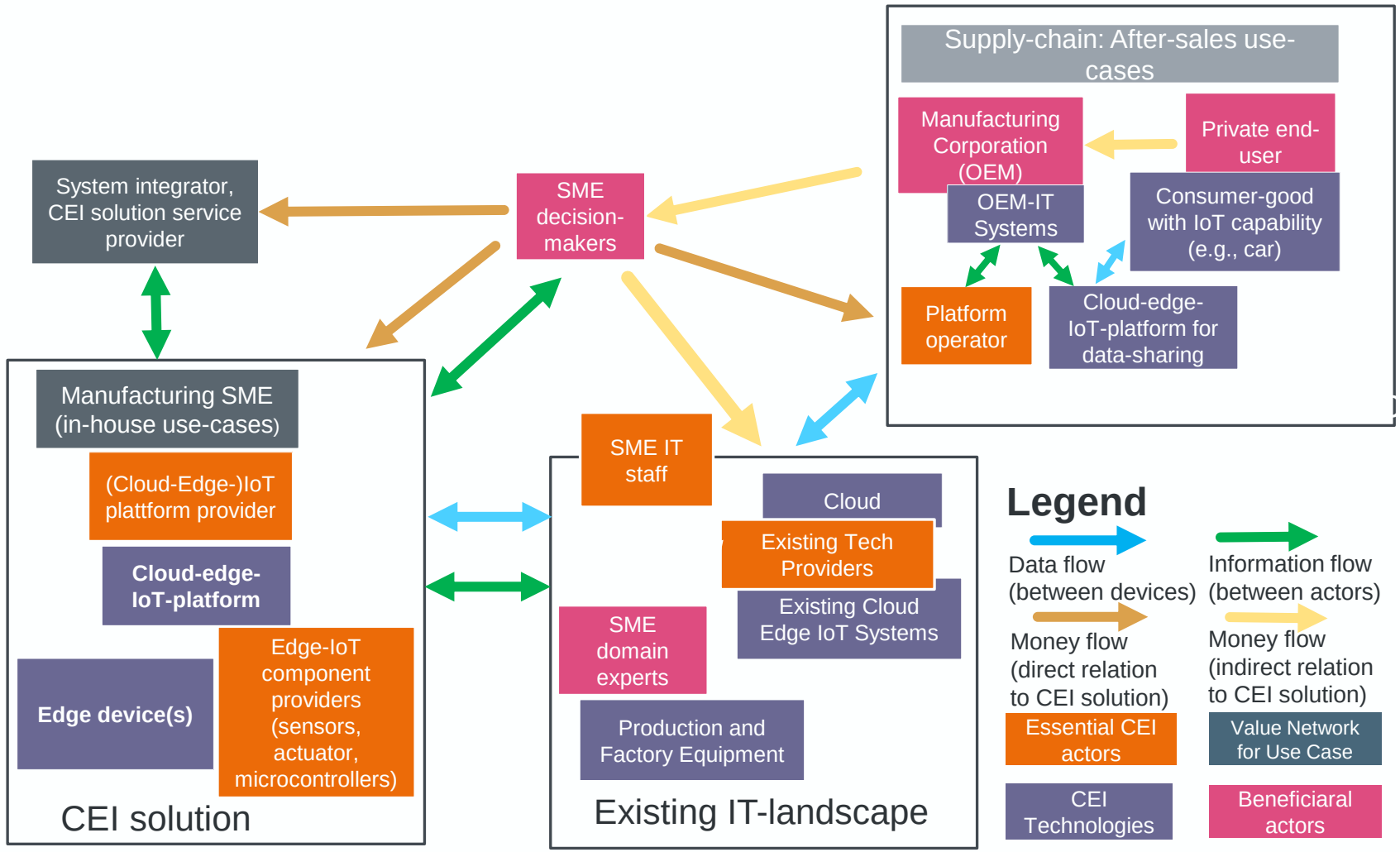
# FIRST WORKSHOP WAVE WITH SECTOR-SPECIFIC GROUPS (FINISHED)

## Get involved: value and benefits

- What are the major business drivers?
- How do the **value** and **revenue streams flow**?
- Where are the **potential vendor lock-ins**, or **gaps** and **business opportunities**?
- What are the first **ideas** and **use cases** for the **large-scale pilots**?


Adobe stock: KanawatTH

# EXAMPLE VALUE STREAM NETWORK MANUFACTURING

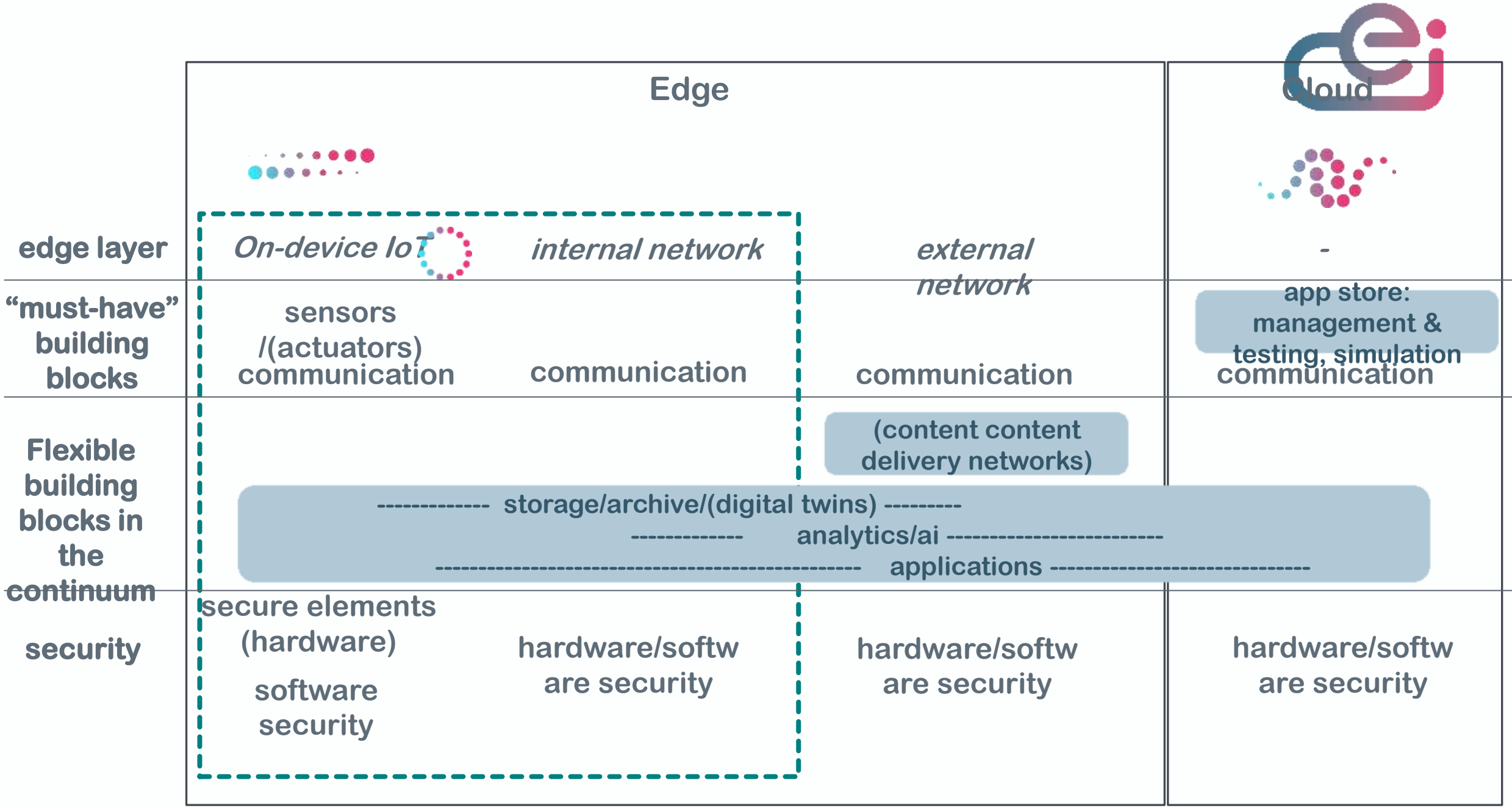


# SECOND WORKSHOP "WAVE": FUTURE CLOUD-EDGE- IOT M SCENARIOS

- What are the most important **service requirements** regarding **security, sustainability and sovereignty**?
- What are the **key purchase decisions** and **criteria** ?
- Which **market structures** and **scenarios** are evolving?
- How can the European companies sustain and increase the **market shares**?

## Get involved: value and benefits


Adobe stock: KanawatTH


Edge
Cloud
edge layer
On-device IoT
internal network
external network
-
“must-have” building blocks
sensors /(actuators) communication
communication
communication
app store: management & testing, simulation
communication
Flexible building blocks in the continuum
(content content delivery networks)
storage/archive/(digital twins)
analytics/ai
applications
security
secure elements (hardware)
software security
hardware/softw are security
hardware/softw are security
hardware/softw are security

# CROSS DOMAIN PANEL (3-4H, IN PRESENCE, PER INVITATION)


Adobe stock: everythingpossible

## Get involved: value and benefits

- Final discussion of the pathways for **emerging market structures**, along with **key decision points** for **government actions**
- **Recommendations** for the **large-scale pilots** that will be funded by the European Commission (2024-2027)

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# JOIN THE VALUE CHAIN ADOPTER GROUPS!

Contact: Dr. Inessa Seifert (Inessa.Seifert@vdivde-it.de)

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# KEY SERVICE REQUIREMENTS FOR THE MANUFACTURING SECTOR

Design:

- Solutions should be customised to on-site processes, offering tangible benefits.

Installation:

- Cost-effectiveness is key, with system integration and customisation being major cost factors. Standardising data formats and interfaces can reduce these costs.
- For future solutions providing post-sales consumer data, the value derived from the data should justify the service cost.

Operation:

- The system must operate in near-real-time, even with internet disruptions, relegating only offline processes like AI-model-learning to the cloud.
- A user-friendly interface is essential for non-engineers, ensuring seamless integration with end-user workflows.

Value-added Supplements:

- Data can enable external monetization strategies, like enhancing OEM customer service or aiding compliance with regulations like the Supply Chain Act.

Maintenance:

- The system should require minimal maintenance, considering SMEs' limited on-site staff.
- Non-engineers should handle basic maintenance tasks, and customer service should be reliable with a dedicated contact.

Disposal/Upgrade:

- The system should be long-lasting, with upgrades causing no interruptions.
- Major upgrades should come with staff training options.

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# COLLABORATION WITH RESEARCH PROJECTS

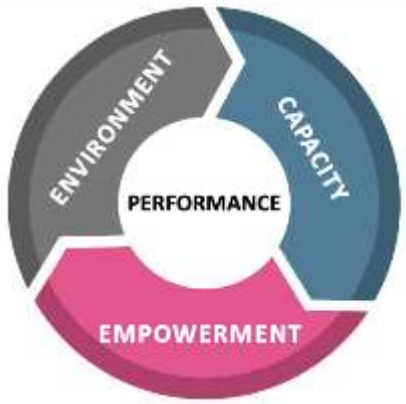
September 25, 2023

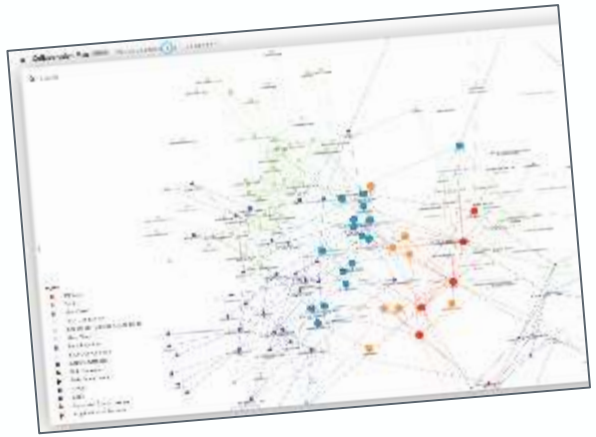
José Enrique Álvarez, BluSpecs

# 1 YEAR IN..

Main achievements from the collaboration with Research Projects (Meta-Operating System Cluster)

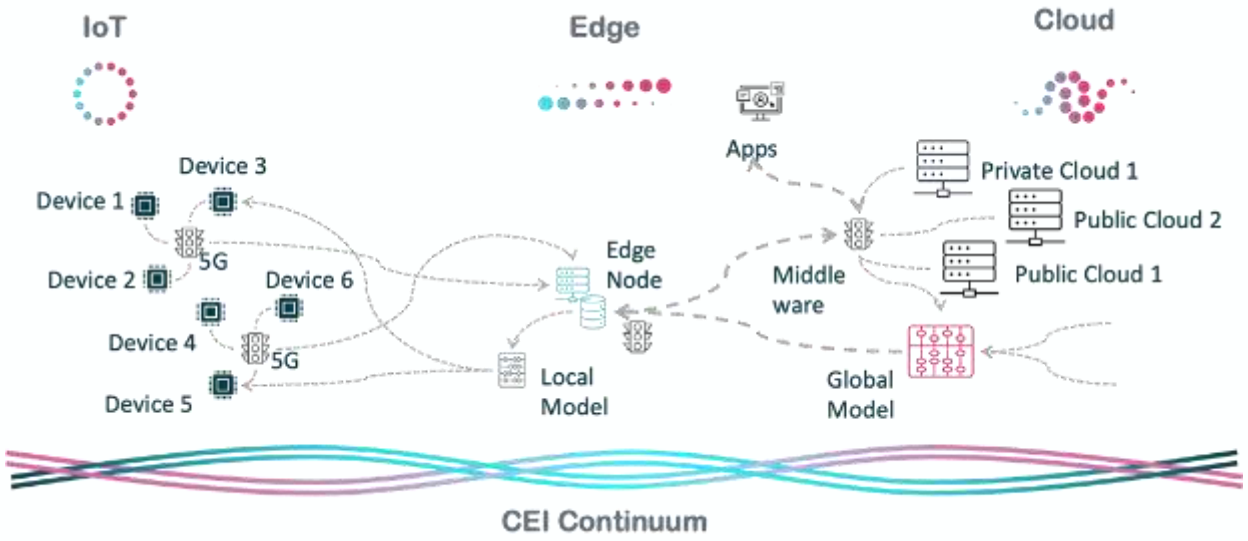
- Technology Scoping paper
- Map project use cases to industry use cases
- Task Force 5: Collaboration Map
- Conceptual model to evaluate F.A.T.



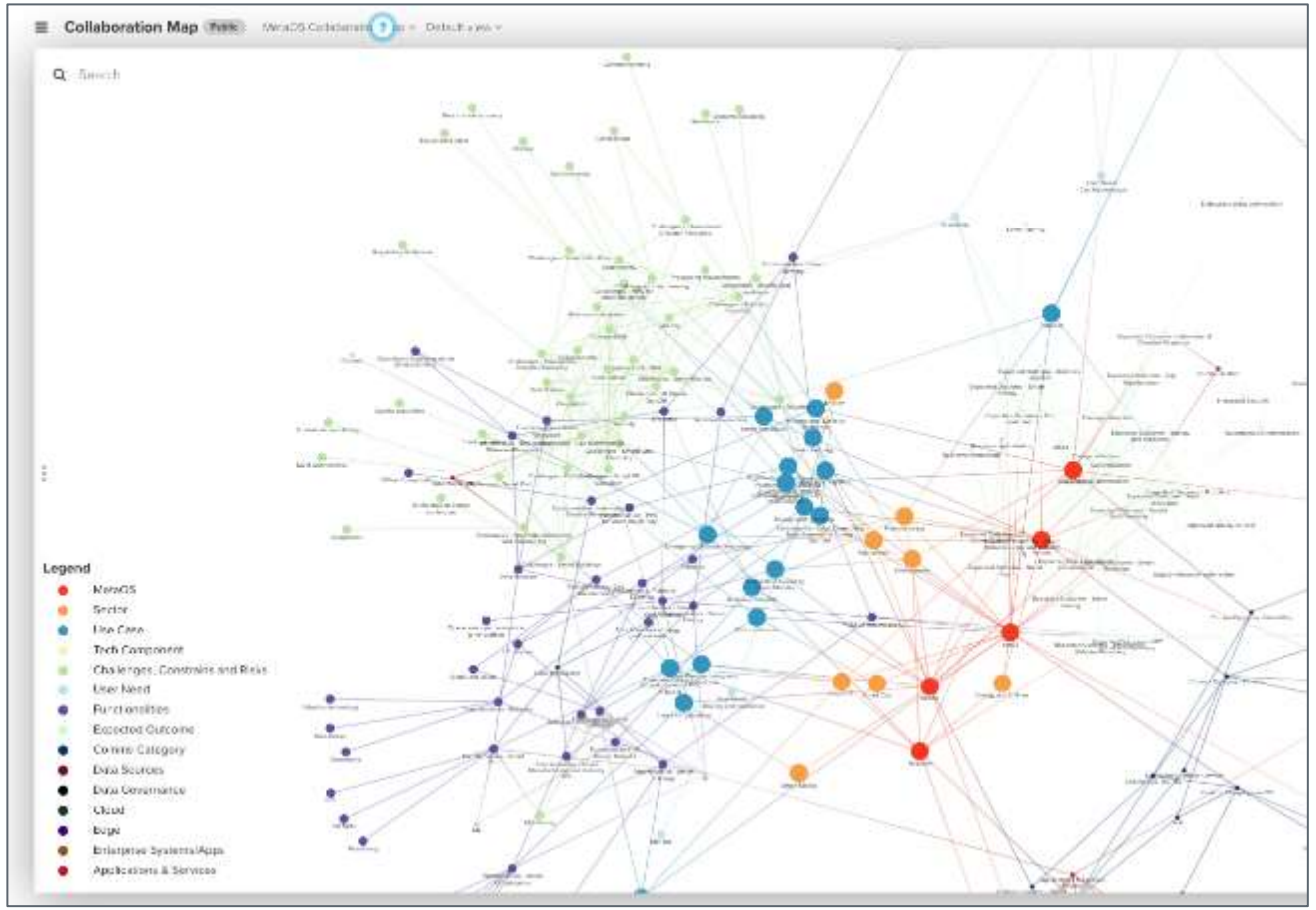
# TECHNOLOGY SCOPING PAPER

- Technology scoping paper provided an overview of
  - the European Cloud-Edge-IoT continuum initiative
  - Meta-Operating Systems for IoT and Edge Computing
- Technologies' categories addressing the main challenges and solutions were presented.
- Starting point of creating the interface between demand and supply actors and successfully delivering valued projects.




# TASK FORCE 5 - COLLABORATION MAP

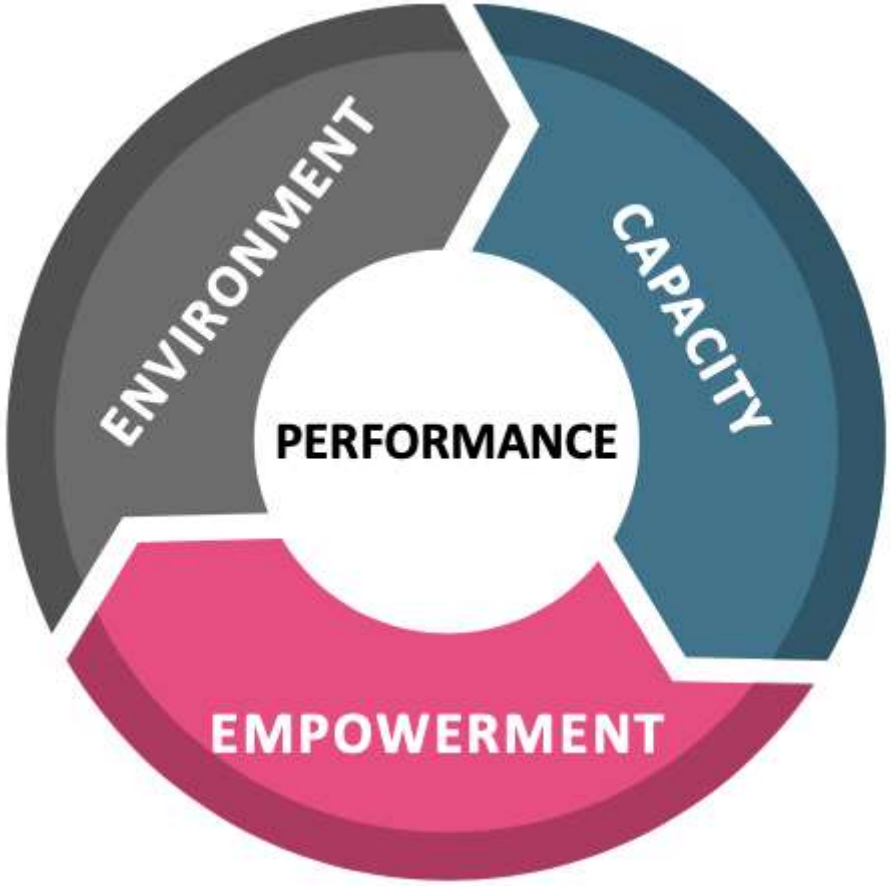
- Aids Meta OS projects by visually representing their use cases and common connections.
- It fosters proactive dialogues, identifies overlaps, and promotes efficient decision-making in European Cloud-Edge-IoT projects.
- The map categorises use cases into Project Landscape, User-Centred Impact, and Tech Components, encouraging collaboration and innovation.



# COMMERCIAL FEASIBILITY TOOL

## Conceptual Model

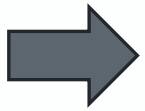
- Aims to include KPIs in a **structured** and **extensive** manner
- Hierarchies include:
  - Environment
    - Rules, Culture, Competencies & Assets
  - Capacity
    - Strategic leadership, organisational Structure, Process Management, etc.
  - Empowerment
    - Purpose, Culture
  - Performance
    - Effectiveness, Efficiency, Relevance, etc.



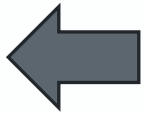
# COMMERCIAL FEASIBILITY TOOL

## Next steps

- Workshop with Meta-OS use-case partners  with the following objectives:

Supply 

- Assess viability in each use case
- Risk assessment
- Cost-benefit analysis
- Technical feasibility
- Operational feasibility
- Financial feasibility
- Required Skills assessment

 Demand

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# THANK YOU!

For any questions or comments:
José Enrique Álvarez: jealvarez@bluspecs.com

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# PANEL DISCUSSION

Maria Giuffrida (m.giuffrida@trust-itservices.com)

# PANELLISTS:

- **Geert Audenaert**, Whitesky
- **Francesco Bellesini**, eMotion
- **Rosalia Davi**, SSE Airtricity
- **Francisco Javier Martinez Borreguero**, Telefonica
- **Antonio Kung**, Trialog
- **Natalie Samovich**, AIOTI
- **Albert Seubers**, Martel Innovate
- Moderator: **Maria Giuffrida**, Trust-IT

# STRUCTURE:

3 Rounds of discussions:

- Research results
- Enhancing collaborations across the value chains
- Perspective on standards, architecture and open source

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# IMPACT AND USE CASE STORIES

Claudio de Majo (c.demajo@trust-itservices.com)

# USE CASE PRESENTERS:

- **Alissa Zaccaria**, Intellimech with **Fabrizio Mazzoleni,** SCAMM (AI REDGIO 5.0 & DIGITBRAIN)
- **Francesco Bellesini,** eMotion (NEMO project)
- **Rosalia Davi,** SSE Airtricity (ICOS project)
- Moderator: **Claudio de Majo,** Trust-IT



# SHARE YOUR SUCCESS STORY:

- Are you part of an industry use case with Cloud-Edge-IoT innovation?
- Can you shed light on value chain relations, needs addressed, impacts and solutions crafted?
- Contact us: c.demajo@trust-itservices.com and m.giuffrida@trust-itservices.com


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# MANUFACTURING CASE

AI REDGIO 5.0

# Objectives and benefits

**Motivation**

- Periodic adjustments (e.g. lubrification) are commonly required but are performed only if the operators identify quality defects in the manufactured parts.
- If defects are highlighted, the operator act only on their experience.
- Final quality of the product is linked to process parameters only through empirical evidence, not by means of a quantitative analysis.

**BENEFITS** For SCAMM as an END-USER

- Increase productivity
- Decrease waste production
- Reduce operating costs
- Improve quality by reducing variations among products

**BENEFITS** For SCAMM as a PROVIDER

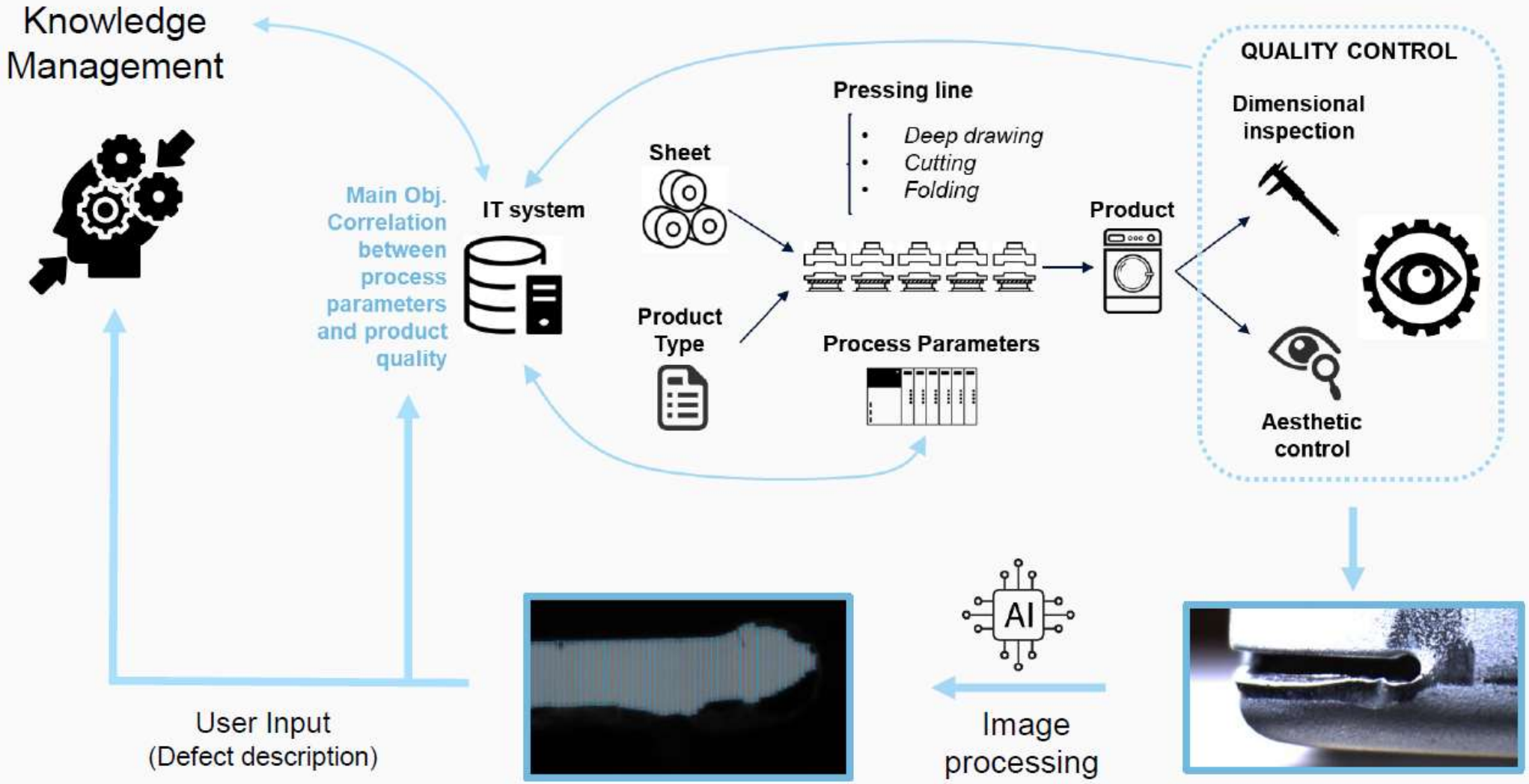
- Expand the value proposition with additional services (monitoring and anomaly detection, process parameters optimization, predictive maintenance)
- Increase market competitiveness
- Decrease maintenance costs


INTELLIMECH®
CONSORZIO PER LA MECCATRONICA

SCAMM
THE SHEET METAL SOLUTION

AI REDGIO 5.0

# Solution




Starting from the INTEGRABLE results, the AI REDGIO 5.0 experiment will close the loop through the quantitative characterization of the line's operating conditions and their correlation with the manufactured products' quality.

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# ENERGY CASES

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# NEMO

# NEMO

# NExt Generation Meta Operating System

## SMART ENERGY & SMART MOBILITY/CITY

**Francesco Bellesini**

*EMOTION S.r.l*

*NEMO receives funding from the EU Horizon Europe research and innovation Programme under Grant Agreement No. 101070118*

# Smart Energy and Smart Mobility/City Living Lab

## Use Case: Smart Mobility/City

- Use Case Scenario
- Background
- Narrative
- Risk/Challenges/Assumptions
- User Groups
- UC Target KPIs
- UC Functional requirements
- UC Non Functional requirements

# UC 3.2: Smart Mobility/City

## Use Case Scenario

EMOT, supported by ASM, ENG and TSG will realise driver-friendly scenarios for smart city mobility and dispatchable charging of EVs based on RES demand-response along with human-centred smart micro-contracts and micro-payments. The use case will utilize basic geography, street-level, public transportation, weather and noise data, along with historical data and analysis of CCTV/traffic cameras to model and train distributed AI models on traffic flow and parking prediction in a greedy layer wise fashion.

# UC 3.2: Smart Mobility/City

## Use Case Goals

- Improve Renewable Energy Sources (RES) load balancing via EV chargers
- Predict traffic flow/parking prediction via EV chargers and parking positions for Mobility
- Support citizens eco-mobility in a smart city scenario combining crowd sourcing info and public transportation, weather/noise data, along with historical data and analysis of CCTV/traffic

# UC 3.2: Smart Mobility/City

## Infrastructure

Following infrastructure will be exploited for UC demonstration activities:

- 4 Medium/Low Voltage substations;
- 200 kW PV plant;
- 6 electric vehicles;
- 3 charging stations.

# NEMO Partners


*NEMO receives funding from the EU Horizon Europe research and innovation Programme under Grant Agreement No. 101070118*

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# ICOS

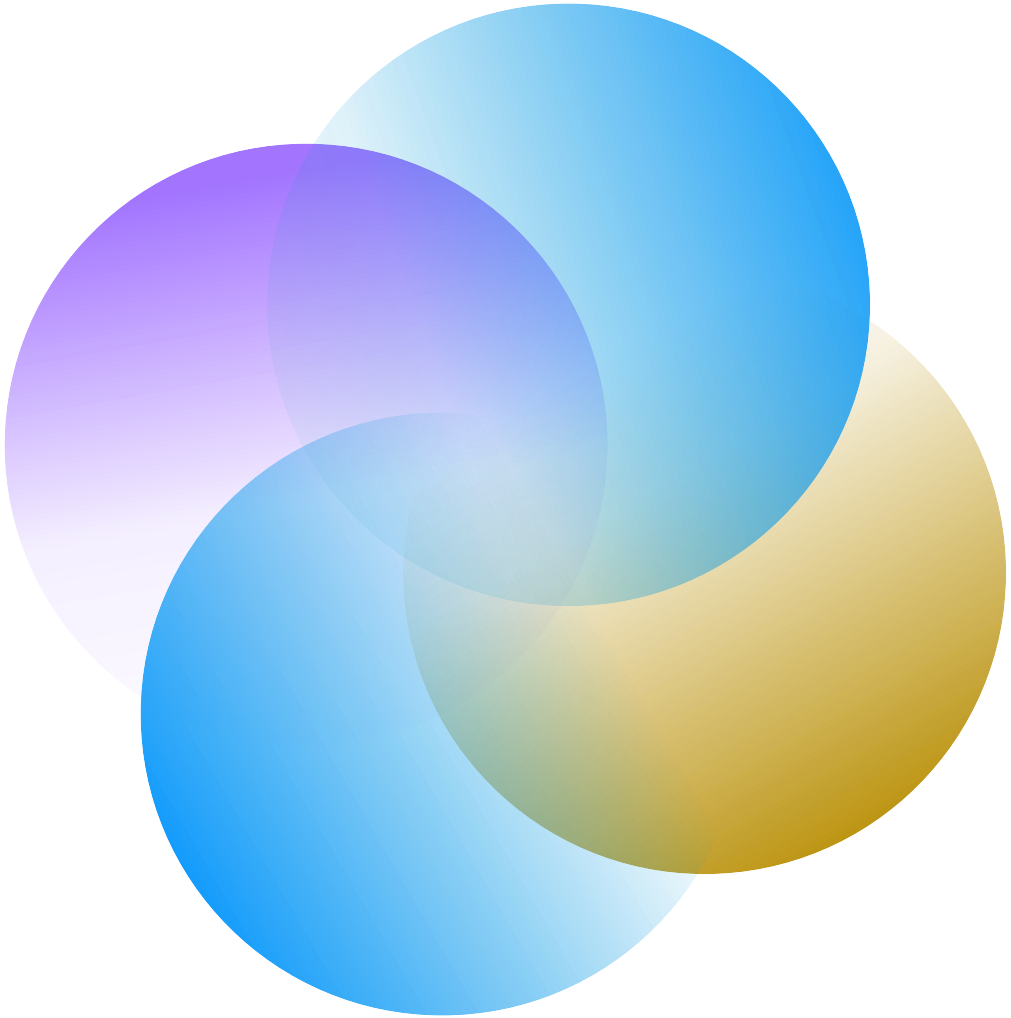
ICOS

Towards a functional continuum operating system

# UC4 - Energy Management and Decision Support system (EMDS)

25 Sept 2023

Rosi Davi
(SSE Airtricity)



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# Energy Management and Decision Support system (EMDS)

HORIZON-CL4-2021-DATA-01-05 - Future European platforms for the Edge: Meta Operating Systems (RIA); Project: ICOS 101070177;

ICOS (IoT2Cloud Operating System) aims to develop a meta operating system exploiting edging capabilities linked with IoT devices and Cloud scalability.

SSE Airtricity's involvement in the project is to help design and provide an Energy Management and Decision Support System (EMDS) based on Advanced and Reliable Machine Learning techniques for energy forecasting.

The EMDS will be tested in five Irish households equipped with SMART technologies such as:

- Micro-generation systems: PhotoVoltaics (PV) or Wind Turbines
- Electric Vehicles (EV)
- Heat pumps
- Home energy storage
- Smart meters

Consortium <20 orgs




# Energy Management and Decision Support system (EMDS)

HORIZON-CL4-2021-DATA-01-05 - Future European platforms for the Edge: Meta Operating Systems (RIA); Project: ICOS 101070177;

## Use Case focus and Benefit:

The ICOS operating system will leverage Cloud and Edge capabilities for latency reduction, increased security and real time solutions to reduce energy waste and costs, flattening the demand curve by removing demand on the grid at peak time and boosting energy usage at night-time.

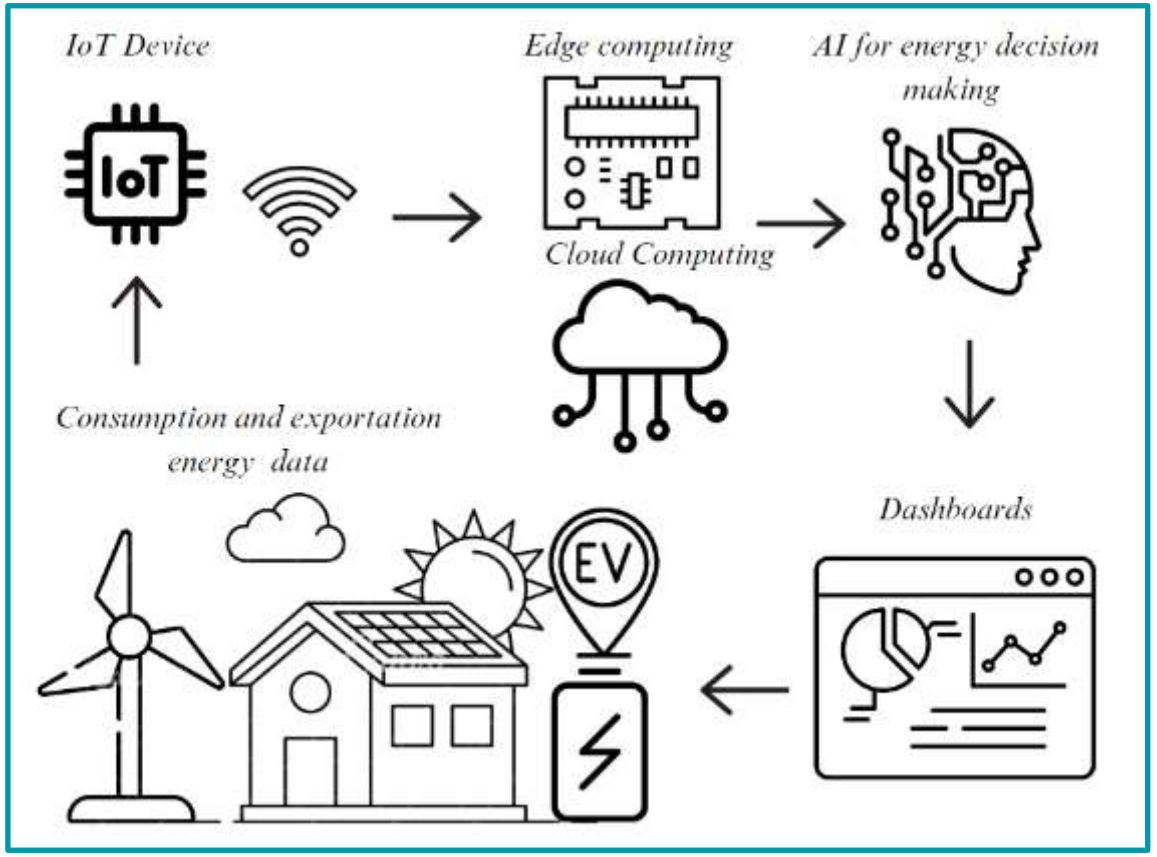
- **Business needs:**

Implement flexible energy solutions tailored to customer needs and sustainability targets.

- **Client needs:**

Benefit from an energy management system where decisions are automated to:

1. Decrease costs
2. Maximise Consumption
3. Maximise usage of renewable energy



ICOS

Towards a functional continuum operating system

# Thank you!

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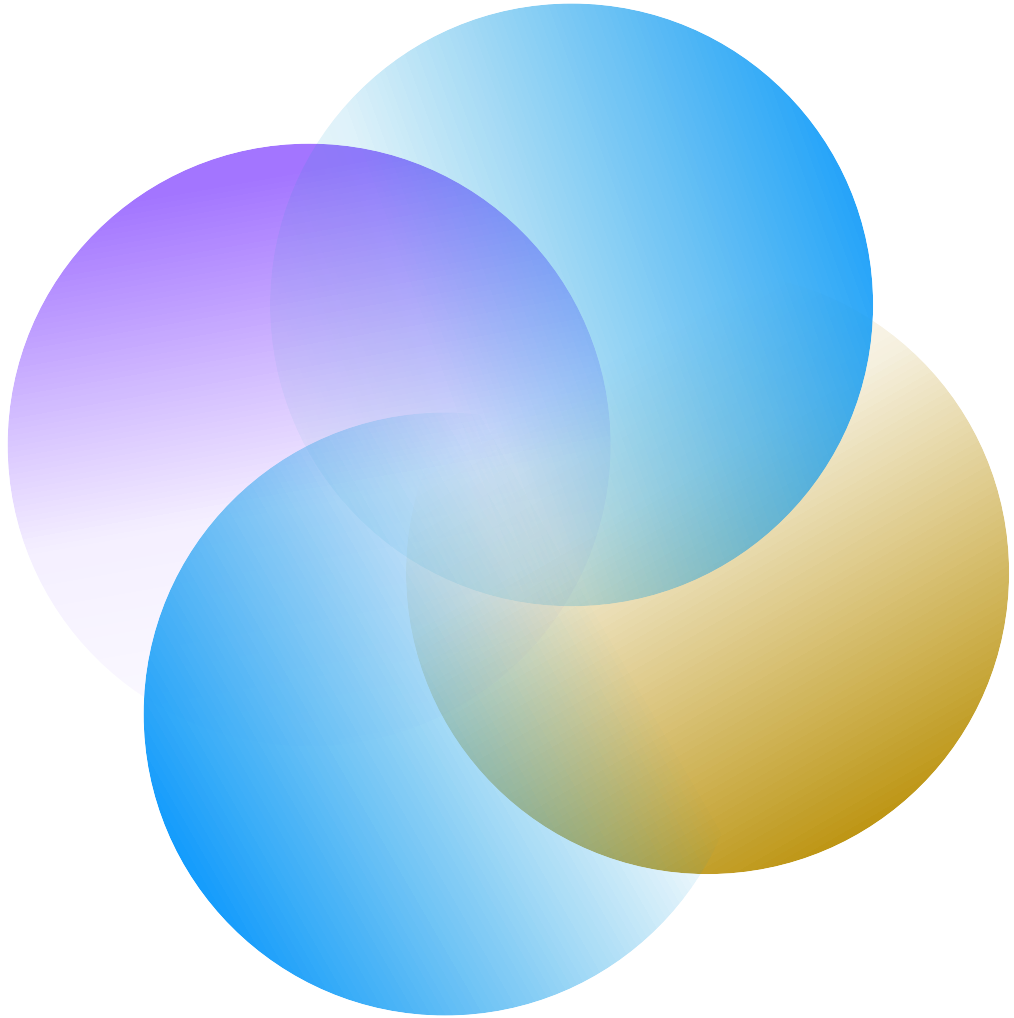
ICOS project has received funding from the European Union's Horizon Europe Framework Programme under the Grant Agreement N° 101070177.
Views and opinions expressed in this presentation are however those of the ICOS Consortium only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them



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# WRAP-UP AND CONCLUSIONS

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# ADVANCING TOWARDS THE CLOUD, EDGE, AND IOT CONTINUUM: INSIGHTS AND IMPACTS

25 September 2023