

# Demand-pull drivers for Cloud Edge IoT in the Energy Sector

Natalie Samovich  
Co-Founder Resilient Group,  
Enercoutim, Chair WG Energy AIOTI  
Chair WG Smart Grids ETIP-SNET



# EDGE in Energy



Edge Intelligence  
for energy efficiency



Edge analytics for predictive  
maintenance



Edge computing  
for smart grids



Edge devices  
for worker safety



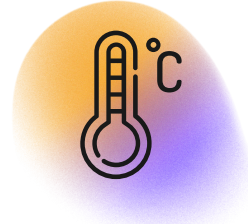
Demand Response



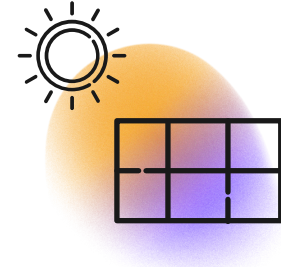
Digital Twins



Smart Meters

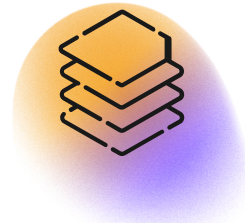


Thermostats

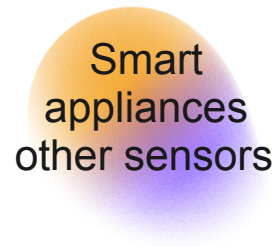


Solar panels inverters

## SMART ENERGY COMPONENTS EDGE infrastructure layer



Battery storage  
control systems



Smart  
appliances  
other sensors



Electric Vehicles  
Charging systems and  
V2G

**Leveraging IoT and Edge Computing  
Infrastructures to foster Energy Flexibilities  
through next energy sectorial integration**

**Release 1.0**

**AIOTI WG Energy**

**19 December 2022**

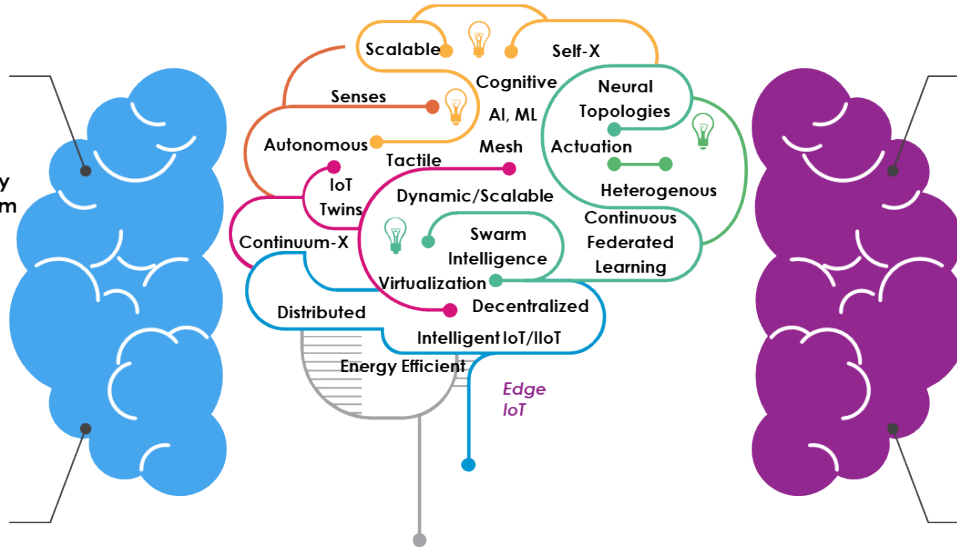


# **Leveraging IoT and Edge Computing Infrastructures to foster Energy Flexibilities through next energy sectorial integration**

# AIOTI SRIA

## Convergence of Technologies

IoT and Edge Computing Granularity  
IoT Edge and X-Continuum Paradigm  
Intelligent Connectivity  
Energy-Efficient IoT Edge Systems  
Heterogeneous IoT Edge Mesh  
IoT Digital Twins  
IoT Swarm Systems  
Internet of Things Senses

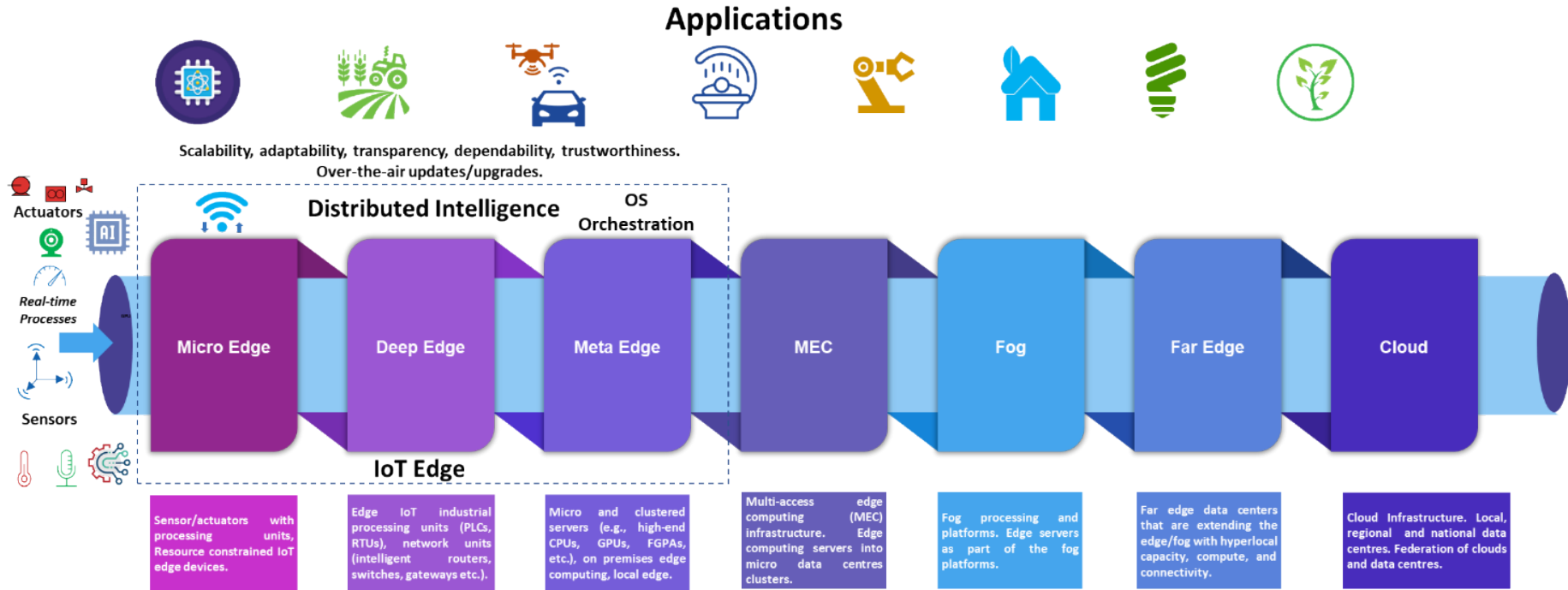


Decentralized and Distributed IoT Edge Systems  
AI for IoT Edge Systems  
OS and Autonomous Orchestration  
Dynamic Programming Tools  
Heterogenous Edge IoT Systems Integration  
Edge IoT Cross-Sectorial Open Platforms  
Edge IoT Verification, Validation and Testing  
Edge IoT Trustworthiness and Dependability

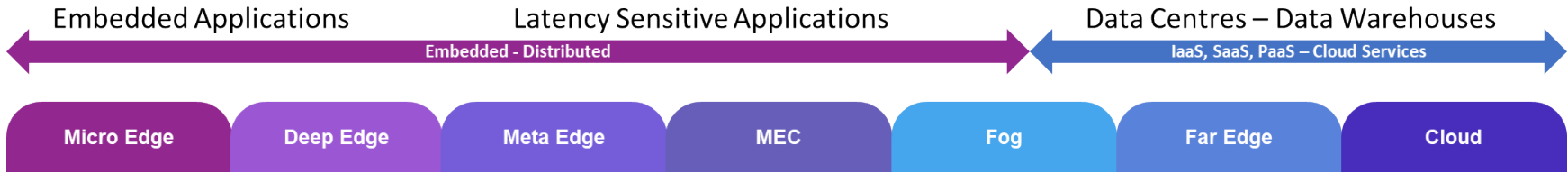
Pre-normative and standardisation

## Convergence of Infrastructure

# IoT and Edge Computing Granularity

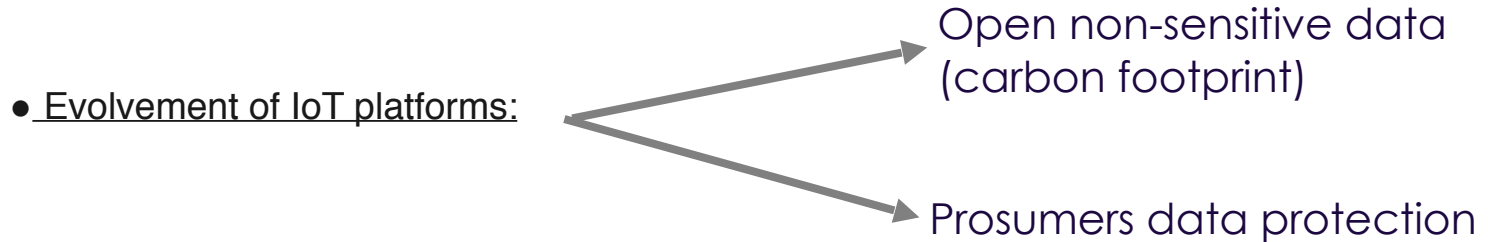


# IoT and Edge Computing Granularity



- **Meta Edge:** Servers and clustered servers (e.g., high-end CPUs, GPUs, FPGAs), on premises edge computing servers, local edge servers, high performance embedded edge computing.
- **Deep Edge:** IoT gateways and processing units, network computing units and intelligent controllers (e.g., PLCs, RTUs, DCS).
- **Micro Edge:** IoT devices including sensing and actuating, connectivity, intelligent processing (e.g., CPUs, GPUs, TPUs). Resource and energy-constrained IoT and edge processing units.
- Micro-edge latency below 1 ms, range from mm to 15 m.
- Deep-edge latency below 2-5 ms, range up to 1 km.
- Meta-edge latency below 10 ms, range up to 50 km.
- MEC latency 10-5 ms, range up to 75 km.
- Fog latency 10-20 ms, range up to 100 km.
- Far-edge latency 20-50 ms, range up to 200 km.
- Cloud and data centres latency 50-100 ms, range up to 1000 km.

# IoT and Edge Computing use cases



## Data exchange across key actors:

**Prosumers and Energy Communities**

→ investments decision

**Energy System Infrastructure Planners**

→ long-term cross-sector plan

**Energy system infrastructure operators and service providers** → Energy supply and DER contracts

**Cities**

→ Deployment of Energy and Mobility infrastructures



# IoT and Edge Computing use cases

## Control Room Architecture for Future Grids

Larger volume of data

Inertia reduction

Overcome traditional SCADA systems

### Ingredients:

Observability:  
location and time  
(granularity close  
to real time)

DER  
management

Artificial  
Intelligence

Cybersecurity

# Large scale flexibility

## Challenges and Alignment on Flexibility regulatory framework:

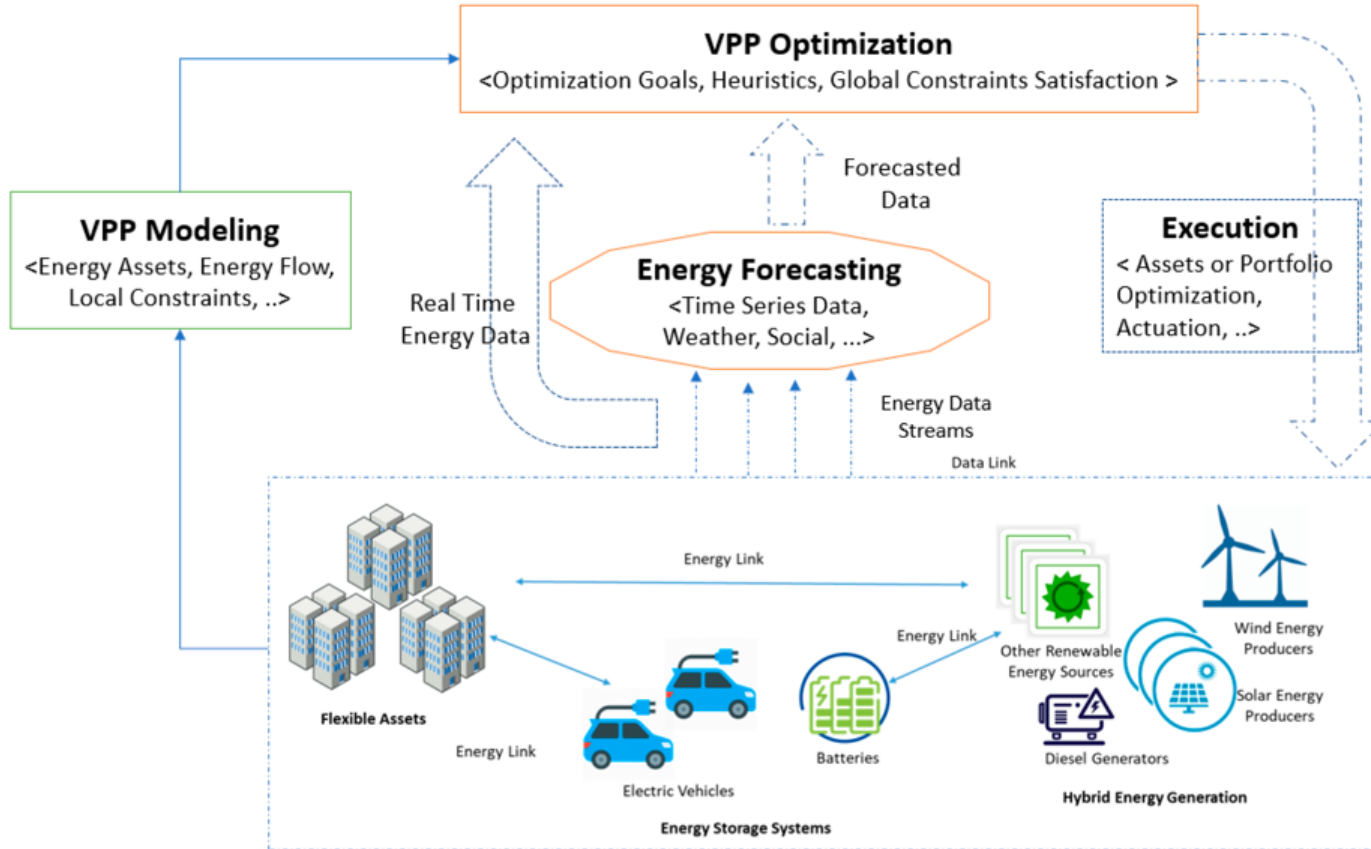
Definition of independent aggregator model, particularly for smaller cases at residential level

Sub-metering IoT Data: trusted exchange and protection of IoT sensors and edge computing data

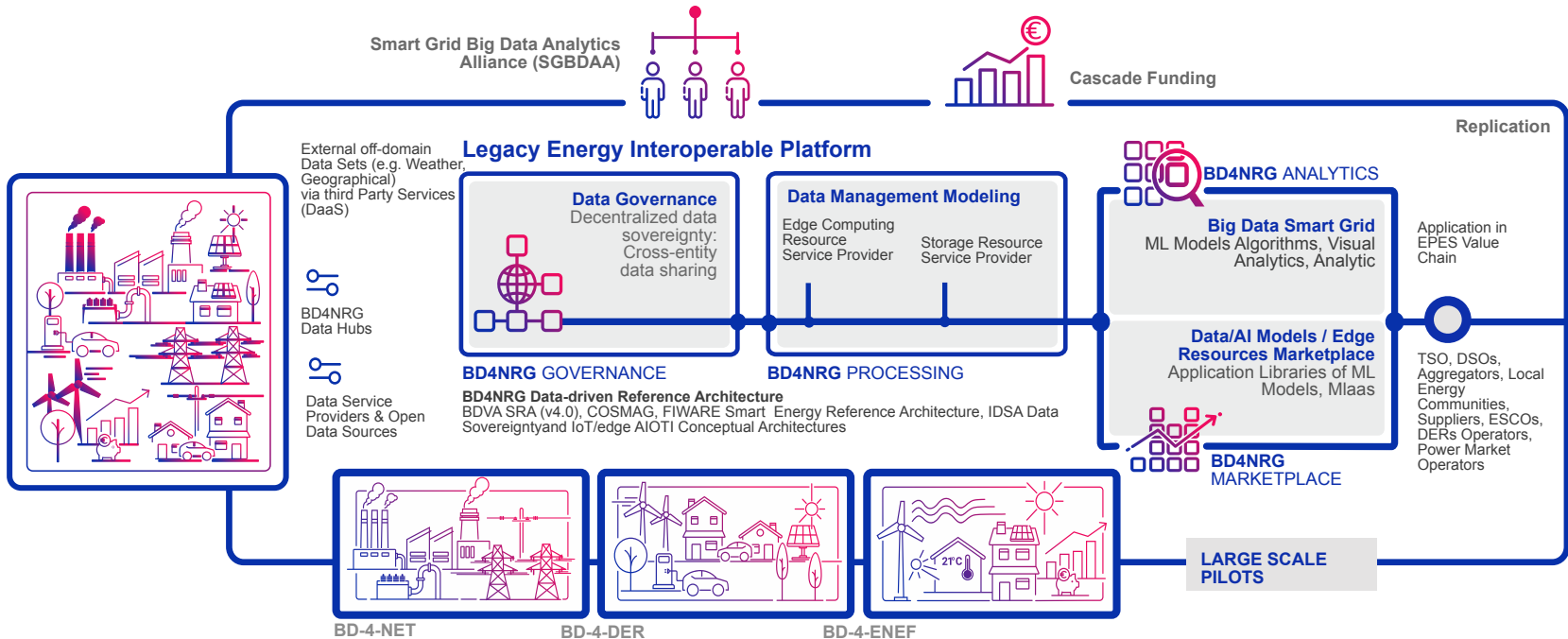
Regulatory harmonization for flexibility across EU countries

Incentives: Considering flexibility during grid planning stages

# Virtual Power Plant (VPP) role



# Analytics resources marketplace





1. Energy-oriented Digital Twin for Buildings
2. Forecasts of power generation for renewable energy plants on plant level
3. Predictive Fault Monitoring
4. Optimal scheduling of maintenance operations



Natalie Samovich  
n.samovich@enercoutim.eu



**ENERCOUTIM**

ALCOUTIM SOLAR ENERGY ASSOCIATION