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Towards deployment of Cloud-Edge-IoT solutions across the computing continuum

From Market pathways to Large scale pilots

MetaOS Ecosystem Overview and Success Stories

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Funded by the European Union

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Smart Media/City: Cloud-Edge-IoT solutions for modern-day Media.

NEMO

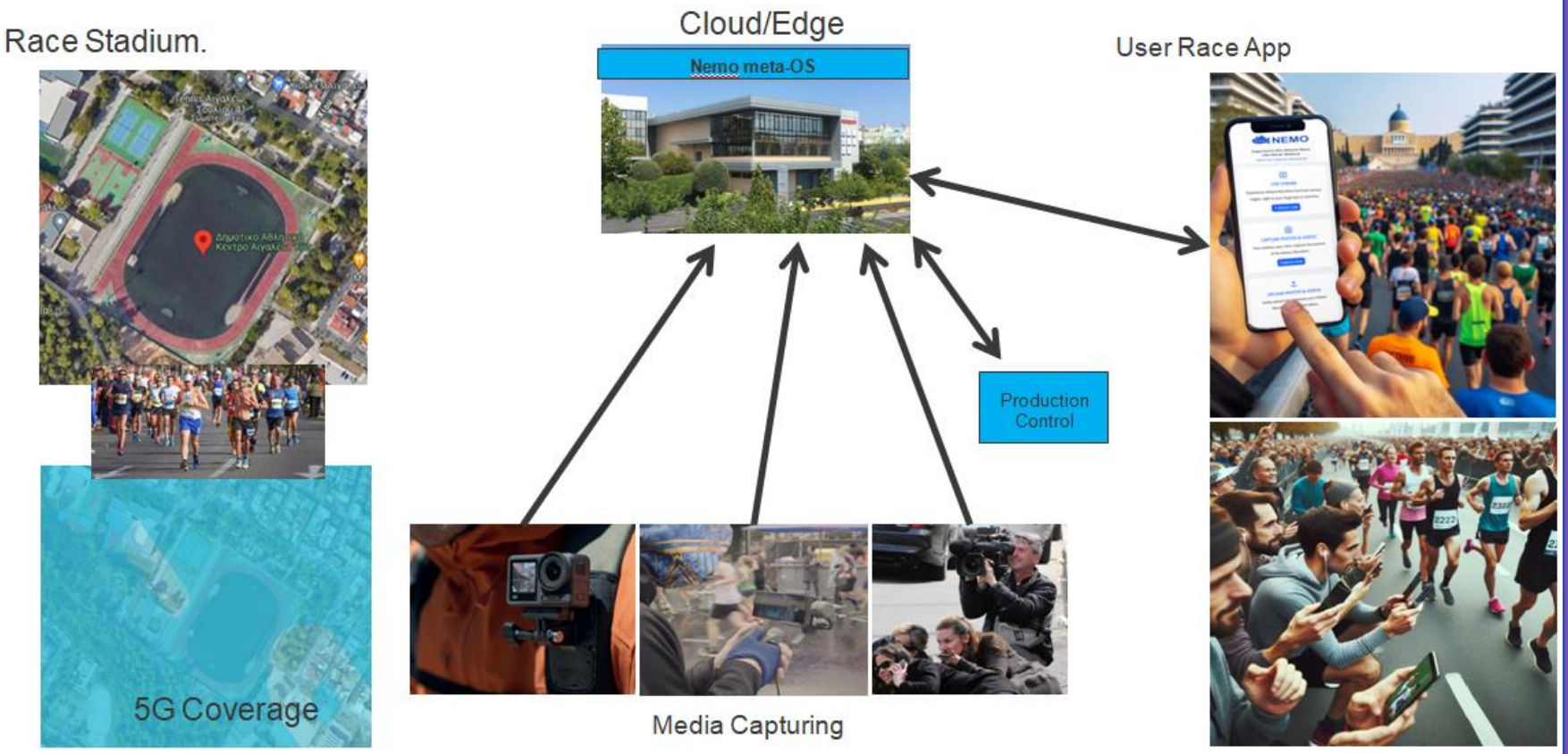
Next Generation Meta Operation System

European Union's Horizon Europe Framework Programme under Grant Agreement No. 101070118

The Challenge

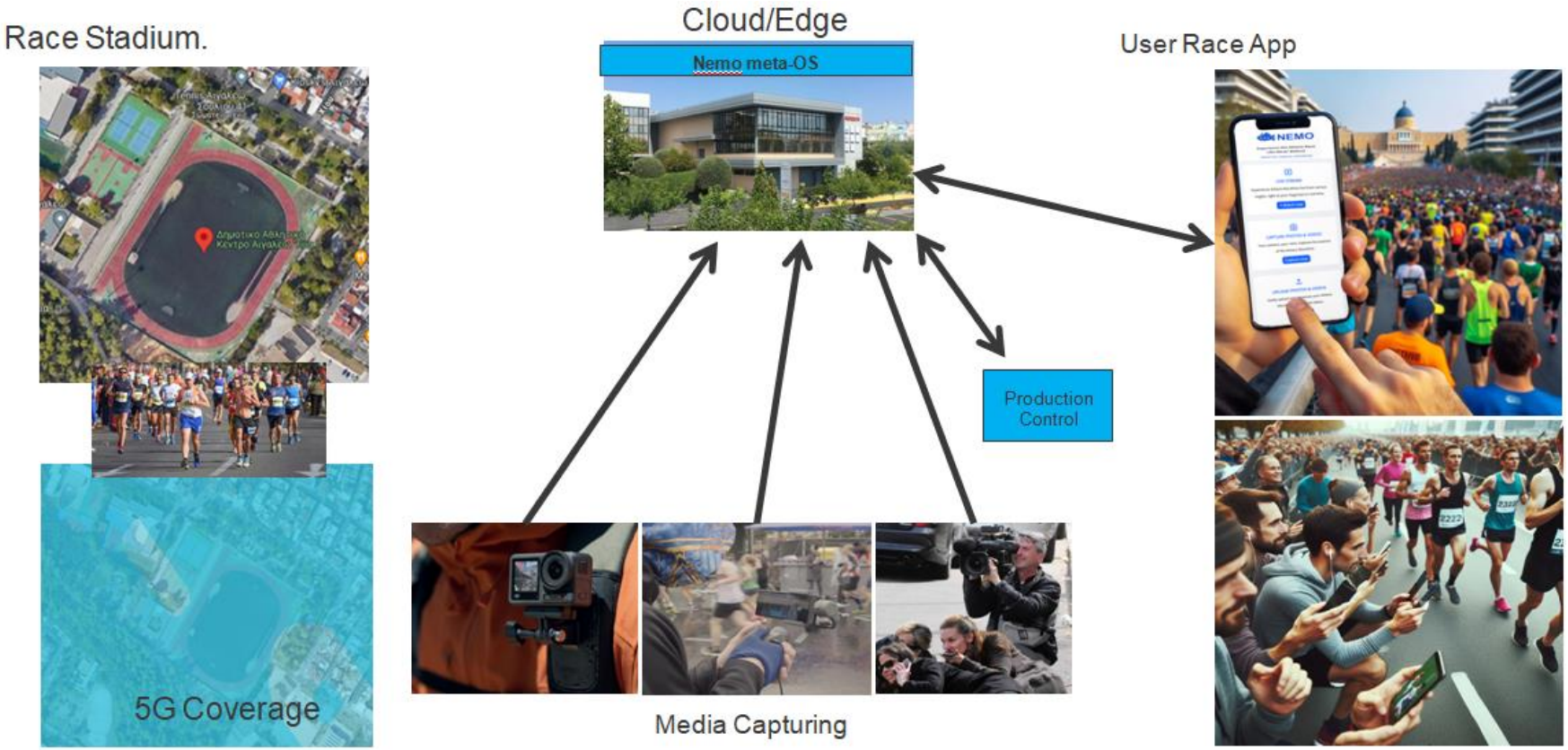
- Cloud-Edge-IoT (CEI) solutions for media and entertainment.

- Showcase Solution -
  Enhance spectator experience for
  Urban city marathons using CEI Meta-OS



Smart Media/City solution For Live Running Events

- Video feeds from multiple sources
- AI/ML processing for recognizing runners and landmarks
- New Annotated streams with Runner IDs, Landmarks, GPS
- Viewer smartphone app to view-interact be informed.



Risks:

- Computing and network resources
- High network and video latency
- Synchronization of media
- QoE optimization
- Privacy and security concerns

Nemo cloud meta-OS mitigates risks

- Resource management and Migration
- Scalable AI/ML nodes
- Advanced network management
- Cyberscecure, Safe Execution Environment
- Privacy and Data Protection
- Small IoT devices Locally

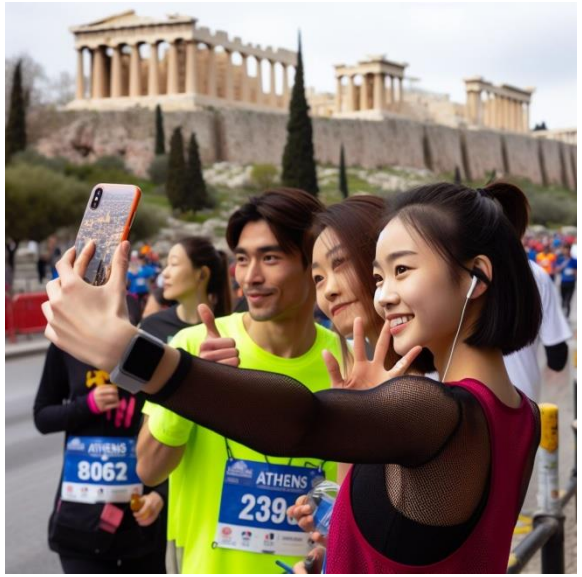
Effective broadcast, analysis and productivity solution for media oriented businesses

- Validate CEI meta-OS from citizen viewpoint for Life events
- Personalized Content Delivery solution with tailored content based on AI-driven recommendation/information
- Enhanced user engagement

Smart City solution

- Energy-aware service orchestration
- Advanced network management

https://meta-os.eu/



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nebulous

TTAnalysis

TTA, 7Bulls.com

Michał Kłosiński

7bulls.com

The Challenge

Inspection:

- Damage types
- Damage serverities
- Environmental conditions

Process:

- Data collection
- Data processing
- Report preparation

Challenges:

- Amount of data
- Efficient inspection process

https://newbedfordlight.org/concerns-mount-over-vineyard-wind-turbine-failure/

The approach

UAV on-board processing:

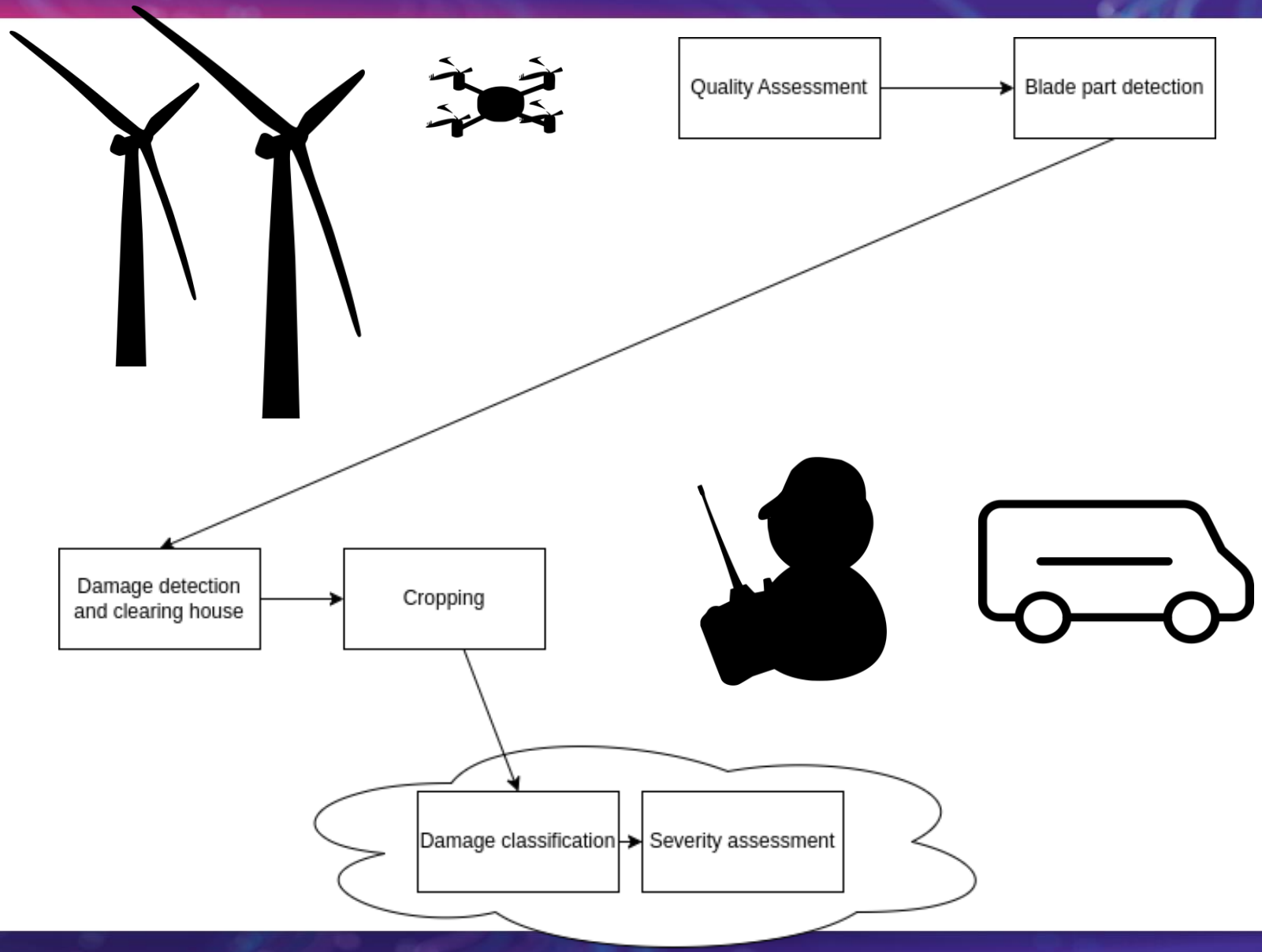
- Quality assessment
- Blade part detection

Edge:

- Damage detection
- Clearing house
- Cropping

Cloud:

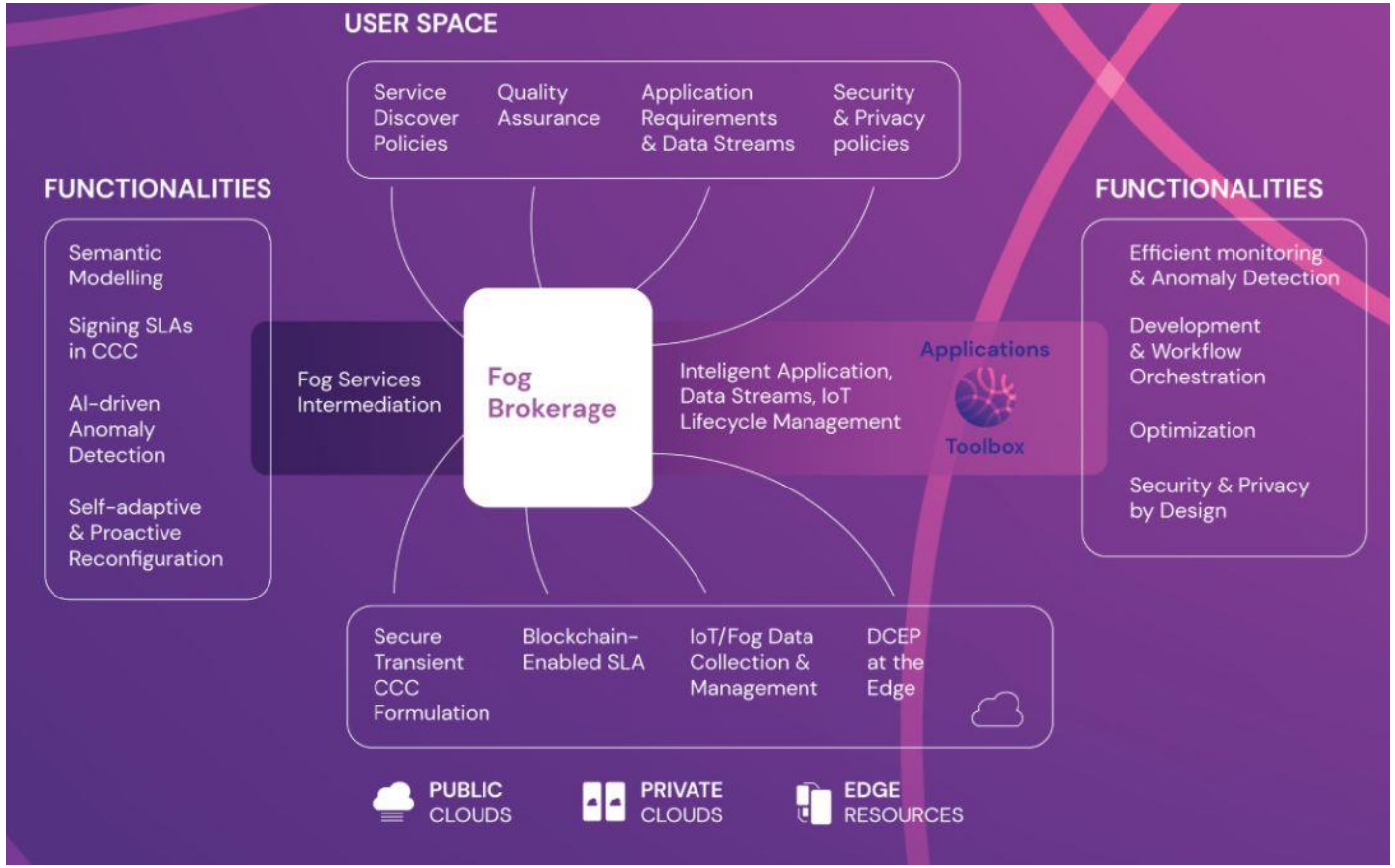
- Damage classification
- Severity assessment



The solution

NebulOuS:

- System modeling
- Deployment mechanism
- Metric collection
- Resource optimization and dynamic re-deployment
- Monitoring



Thank you.

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Poznan Supercomputing and Networking Center

Marcin Kotliński

The Challenge

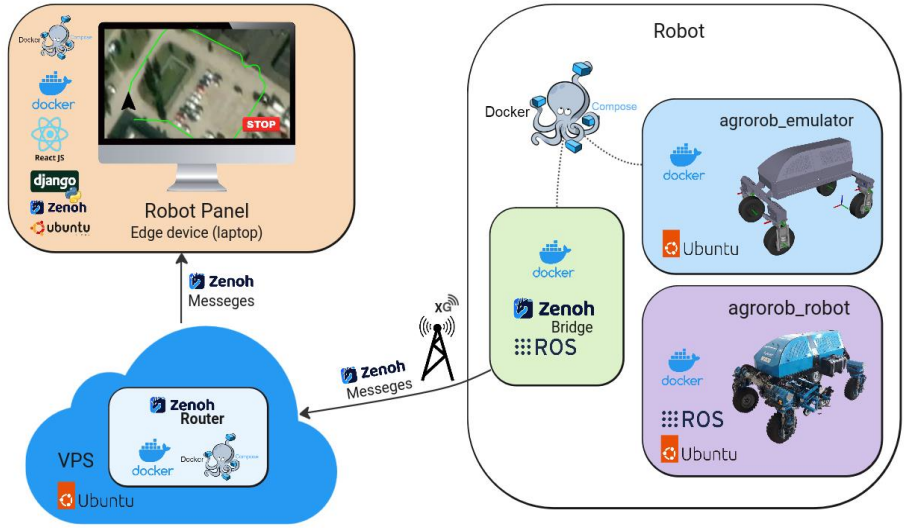
Delays in accessing data, efficient and optimal utilization of the available edge-to-cloud resources, and connectivity in real conditions.

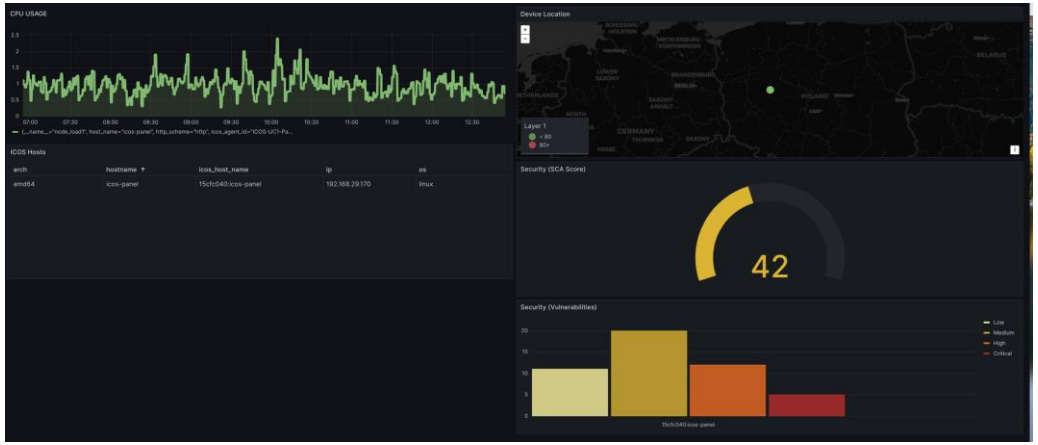
Key Actions from Vision to Impact & Demand Side Interaction

Application name	Problem	ICOS
User panel software, Real time Monitoring and commanding	Data **integrity and synchronisation** if there are connectivity problems between Edge-Cloud (Use Case is located in remote, rural area)	ICOS ensure **data synchronisation** when connectivity is recovered.
Maintenance software, Edge to cloud data transfer and storage	Data generated as the result of performing tasks in the field must be **sent and stored to the cloud**, imagery files, database, and edge device (user panel) should be able to access these data.	When connectivity is available, ICOS make sure that edge devices **upload local data to the cloud**
Robot control software	**Remote deployment**	ICOS provide tools to orchestrate the **deployment** of control software **on the edge devices**.

Results

- Reduction of decision-making latency,
- Improved AI models, increased system availability,
- Predictive maintenance.





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aerOS
EUROPEAN IOT-EDGE-CLOUD

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UNIVERSITAT POLITÈCNICA DE VALÈNCIA

Universitat Politècnica de València

Industrial use case led by: SIEMENS

Florian Gramss
Amparo Sancho
Philippe Buschmann
Korbinian Pfab
Vivek Kulkarni

The Challenge

SIEMENS

- The demand for highly efficient, sustainable, and smart production lines is increasing.
- Cooperation is key, but many challenges appear: (i) accurate awareness, (ii) synchronization/orchestration of services, (iii) anticipation, (iv) sharing resources, (v) efficient algorithms, (vi) reliability and security, among others...
- All the previous requires cognitive algorithms, large testbeds and robust validation.

Key Actions from Vision to Impact & Demand Side Interaction

VISION

Autonomous decision making (smart equipment) as part of a swarm.

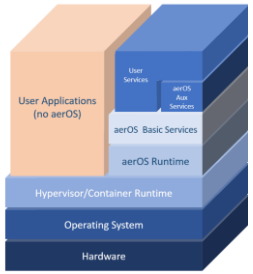
Zero-defect with minimum human interaction

Utilize all resources while keeping privacy

Modern equipment & Line testbed

aerOS technologies

Solid design & Expert team



IMPACT

Novel Level 4 autonomous production line with an open modular edge orchestration approach.

Improved data distribution and security, ensuring data integrity closer to the source

Autonomous production scheduling, reducing downtime and increasing efficiency

Always running everything

Everything running locally

Low performance and availability

It decides when to run the services

It decides where to run the services

High performance and availability

Results

- Real-time data processing and decision-making from cooperating AGVs
- Effective orchestration across these diverse systems
- Services efficiently distributed and on pace
- Active computing parameters and energy monitoring, and self-adaptive scheduling.

https://www.youtube.com/watch?v=l7-UCES6fSI

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zenodo

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the European Union

nephele

NETMODE
NETWORK MANAGEMENT & OPTIMAL DESIGN LAB

National Technical University of Athens, Network Management and Optimal Design Laboratory (https://www.netmode.ntua.gr/)

Anastasios Zafeiropoulos
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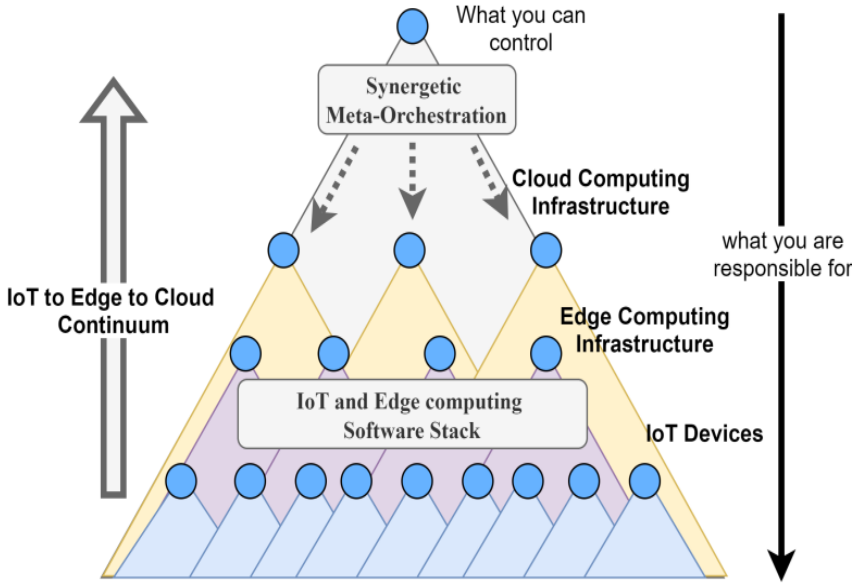
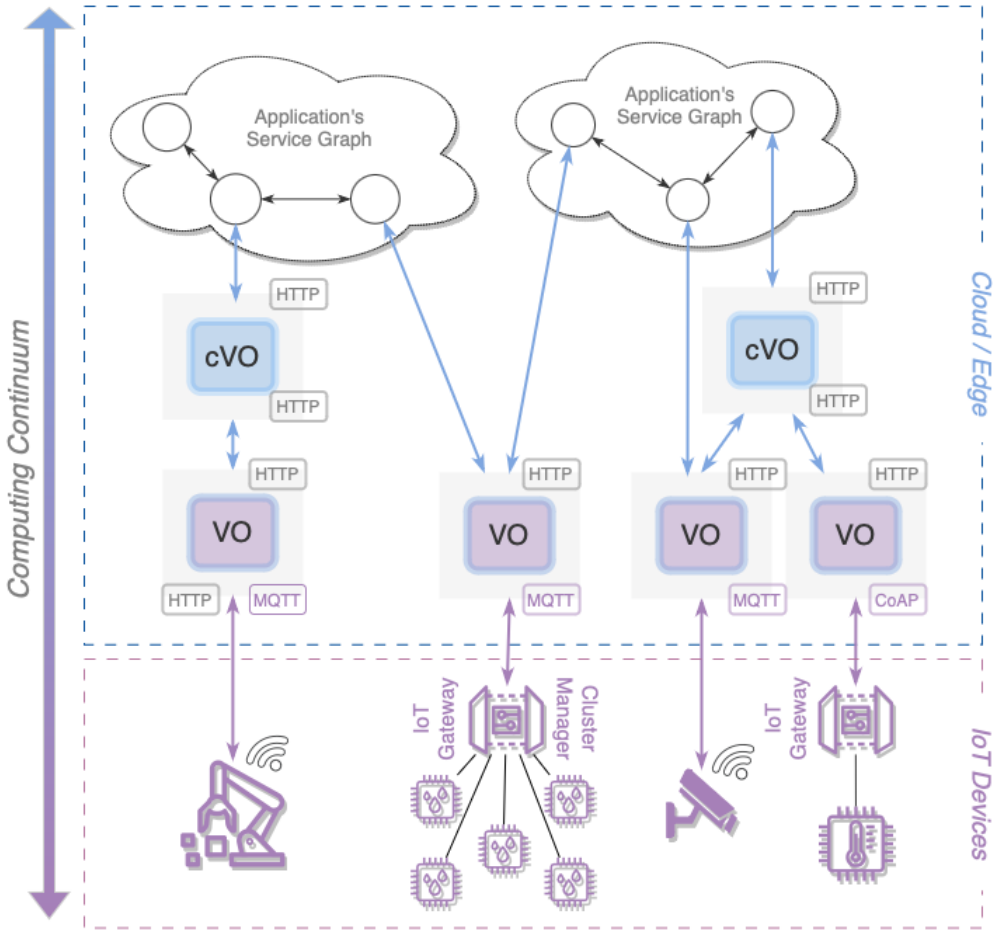
The Challenge

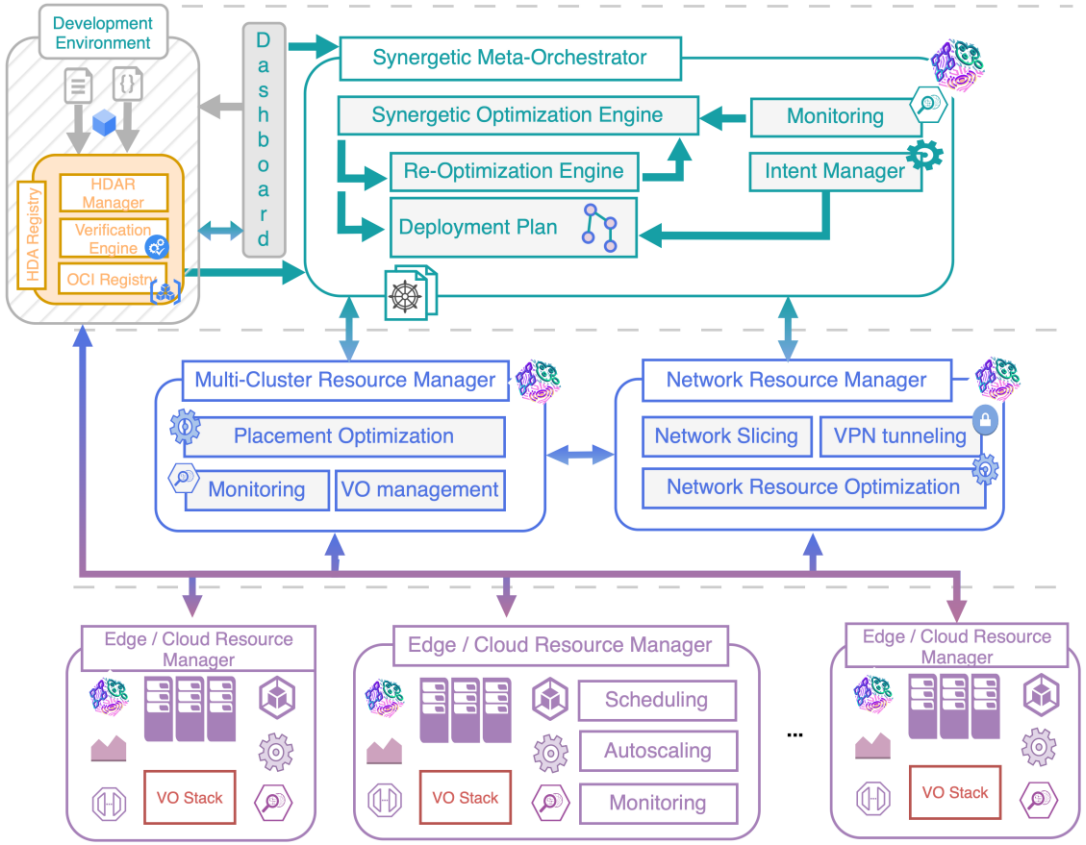
- how to improve interoperability in the IoT domain and enable convergence with edge and cloud computing technologies?
- how to efficiently manage deployment of distributed applications over resources in the computing continuum?





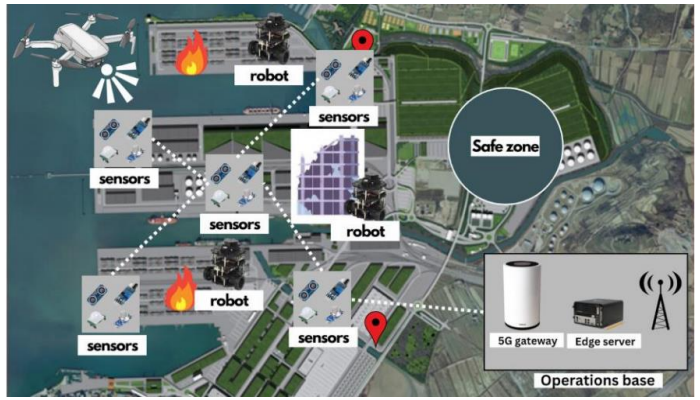
Key Actions from Vision to Impact & Demand Side Interaction

- Open, interoperable and extensible architectural approach
- Open-source software release
- Compatibility with standards (e.g., W3C Web of Things)
- Validation and evaluation activities in the use cases and the open calls

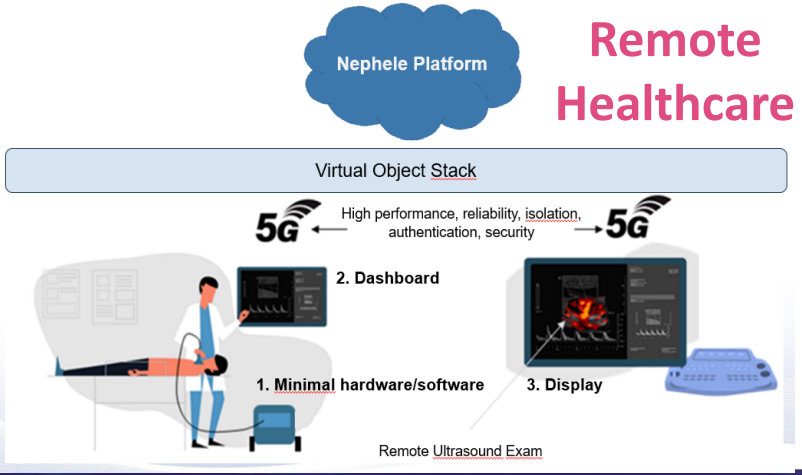


Results

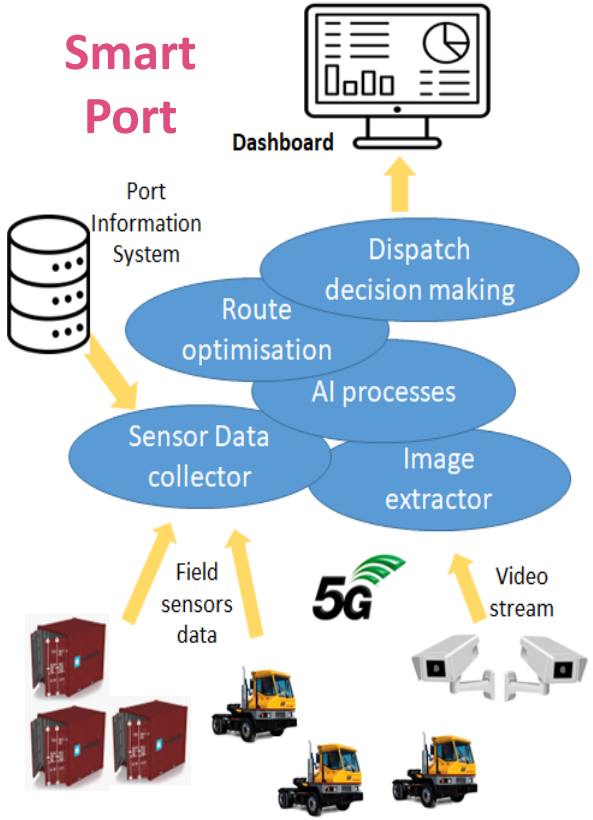
Disaster Recovery



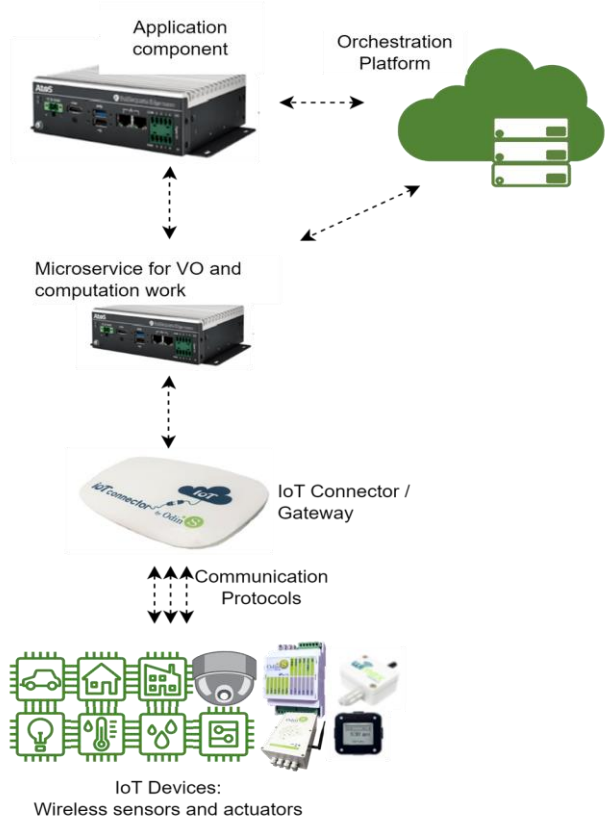
Remote Healthcare



Smart Port



Energy Management in Smart Buildings



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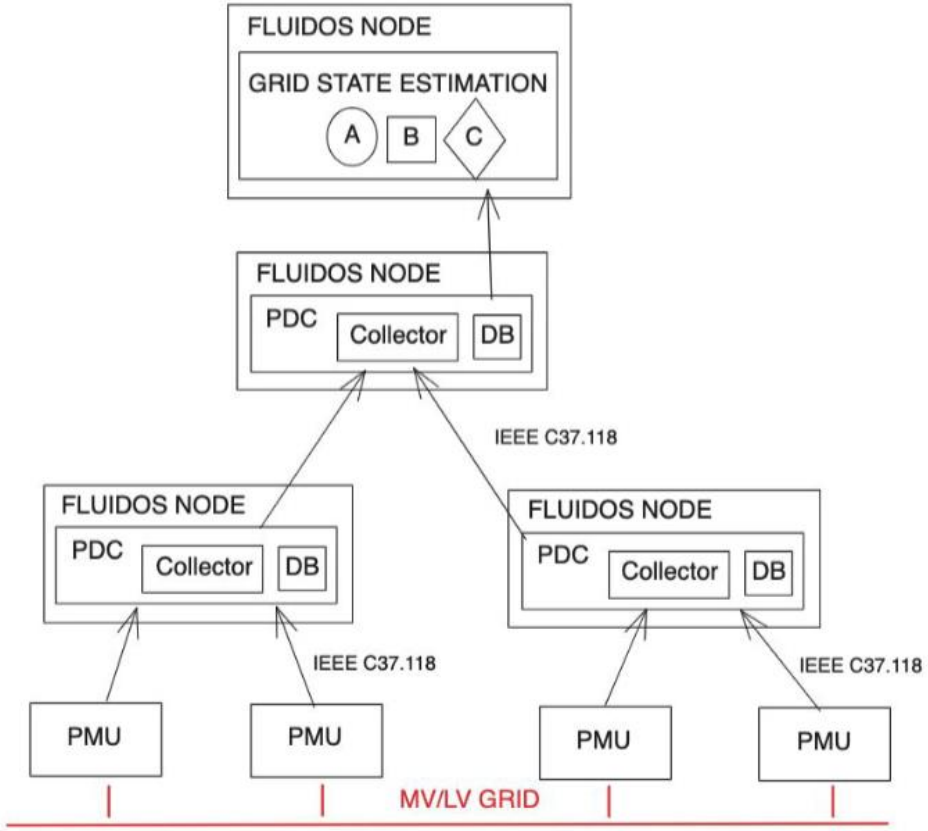
Ir Albert H Seubers
Martel Innovate BV

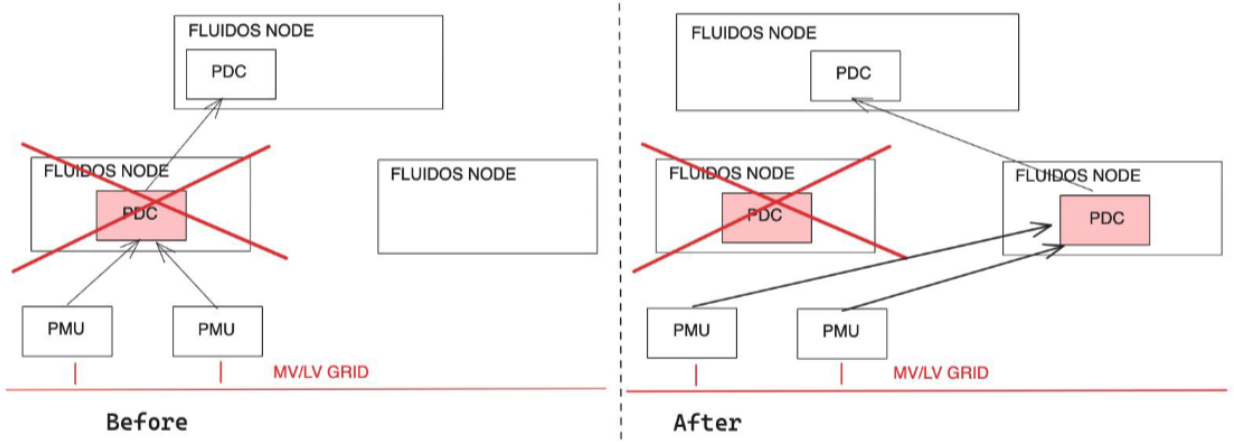
The Challenge

- Massive number of additional energy sources
- Distribution grid relies on PMU's to measure and collect data for PDC
- Traditionally PMU were used in the Transmission Grid
- Scalability: Introducing PMU's in the Distribution grid
- Resilience: consistent data collection is crucial for managing the grid



Key Actions from Vision to Impact & Demand Side Interaction

- Virtualize applications for orchestrating deployment of PDC's and real-time data analysis at the edge
- Reduce latency and improve resiliency avoiding the need of operator physical assistance in case of outages



Results

- FLUIDOS enables PDCs and analysis applications to continue functioning even if communication with control centres is interrupted by migrating PDC services to an adjacent node in case of fault.
- FLUIDOS can automatically orchestrate PDCs based on the latency between the node and PMUs, thereby improving the power grid state estimate or responding to faults.
- FLUIDOS ensures service isolation from other applications on the hosting node with different usage permissions. It also provides logging and anomaly detection capabilities and *survival* capabilities in case a portion of the grid is disconnected from the main network, hence preserving its operations in case of a cyberattack.