Architecture for Scalable, Self-*, human-centric, Intelligent, Secure, and Tactile next generation IoT

# assist-iot

## *ASSIST-IoT:* Next-generation IoT insights

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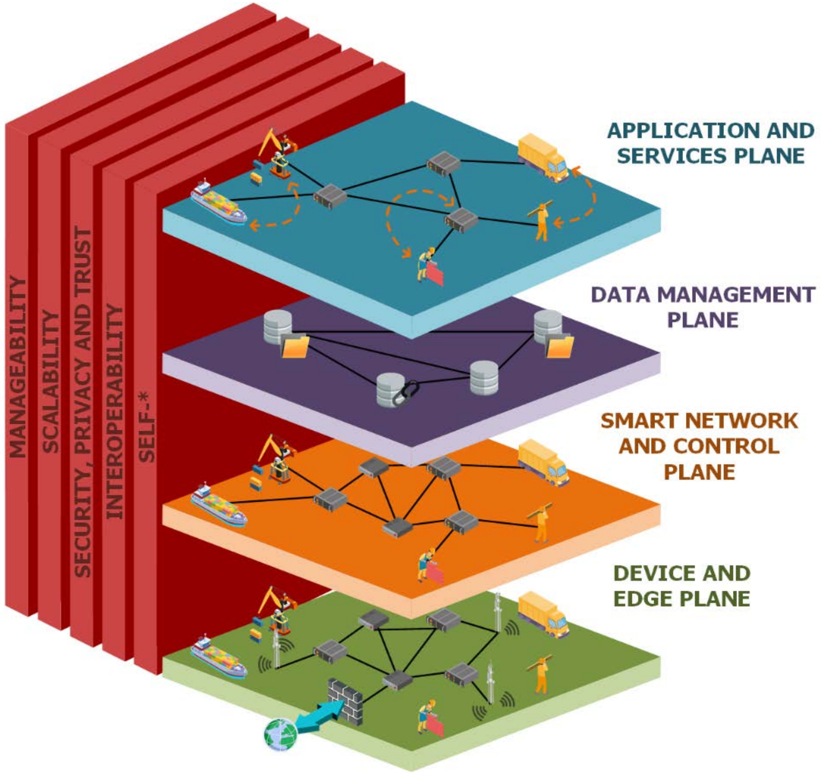
# ASSIST-IoT Partners

# ASSIST-IoT Reference architecture



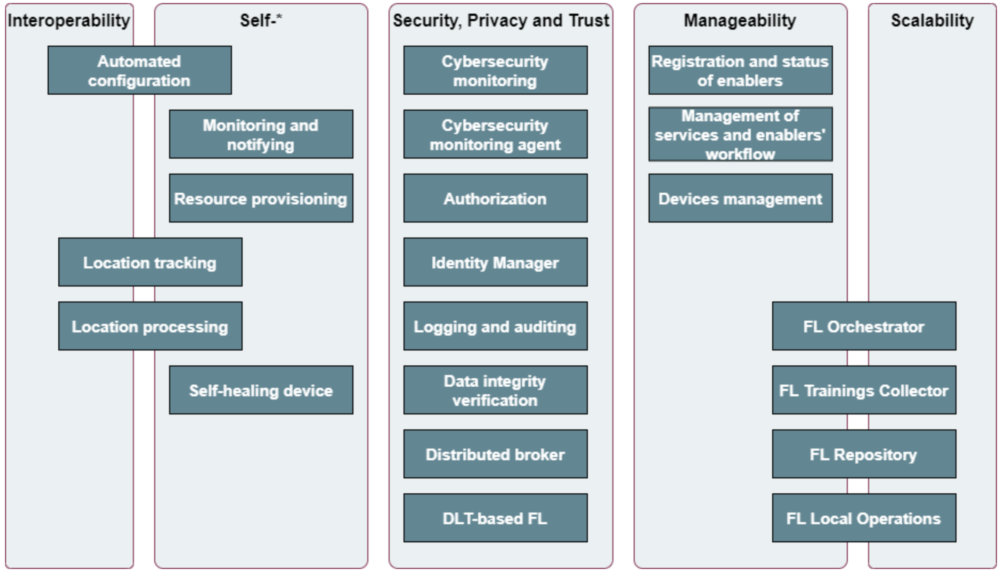

**Multidimensional approach**
**Design principles:**
- Microservices
- Containerisation
- Enablers abstraction
  (+ encapsulation concept)
- Kubernetes-centric

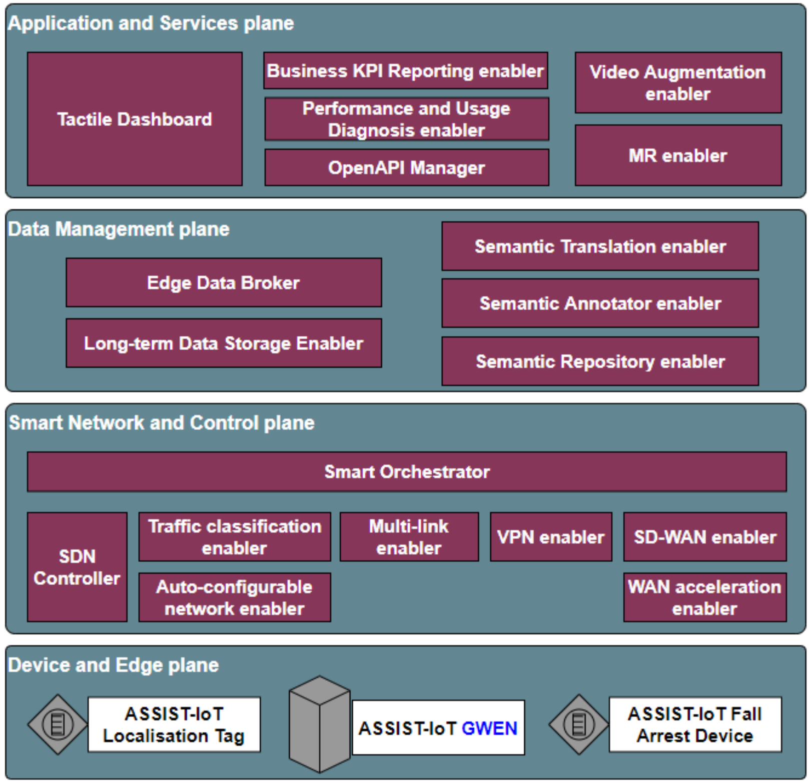
**Reference NGIoT architecture (D3.7):** Design principles, Views (functional, node, development, deployment, data), Verticals
Additional considerations: Common endpoints (/metrics, /api, /version), monitoring and logging, encapsulation exceptions
Considered: ISO/IEC/IEEE 42010, LSP programme architecture, the OpenFog consortium RA, and AIOTI HLA

# ASSIST-IoT planes & verticals

**41 enablers implemented (D4.3, D5.5)**

- Following the design concepts and the guidelines of the Reference Architecture (only 3 exceptions)
- Covering several technological domains (AR, AI – FL, Virtualization – MANO, SDN, DLT, Cybersecurity, access control, Self-* mechanisms, etc.)
- Different levels of design and development effort
- Many already public, others will be soon



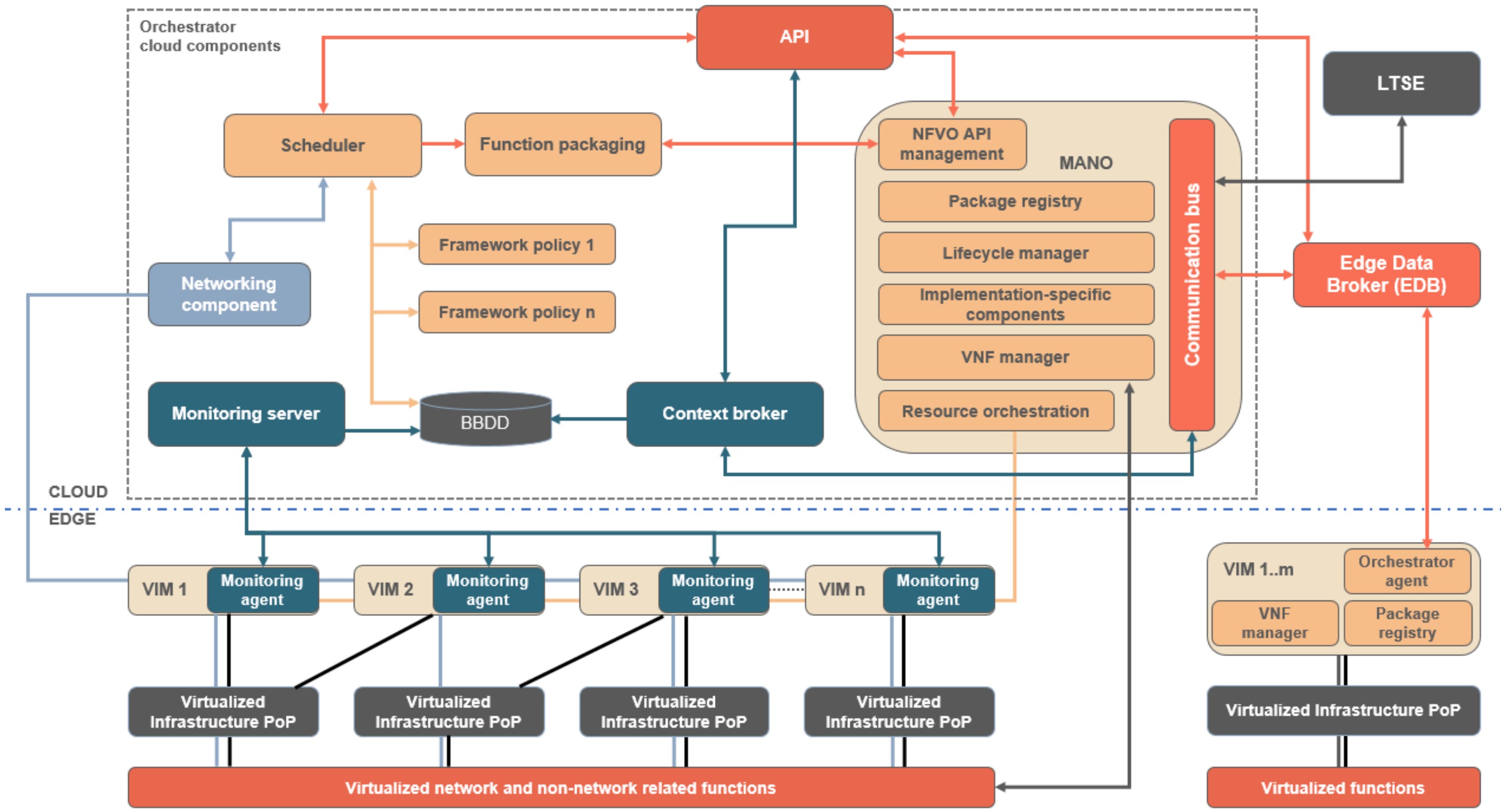
# ASSIST-IoT Orchestration

**Key outcome: Smart orchestrator**

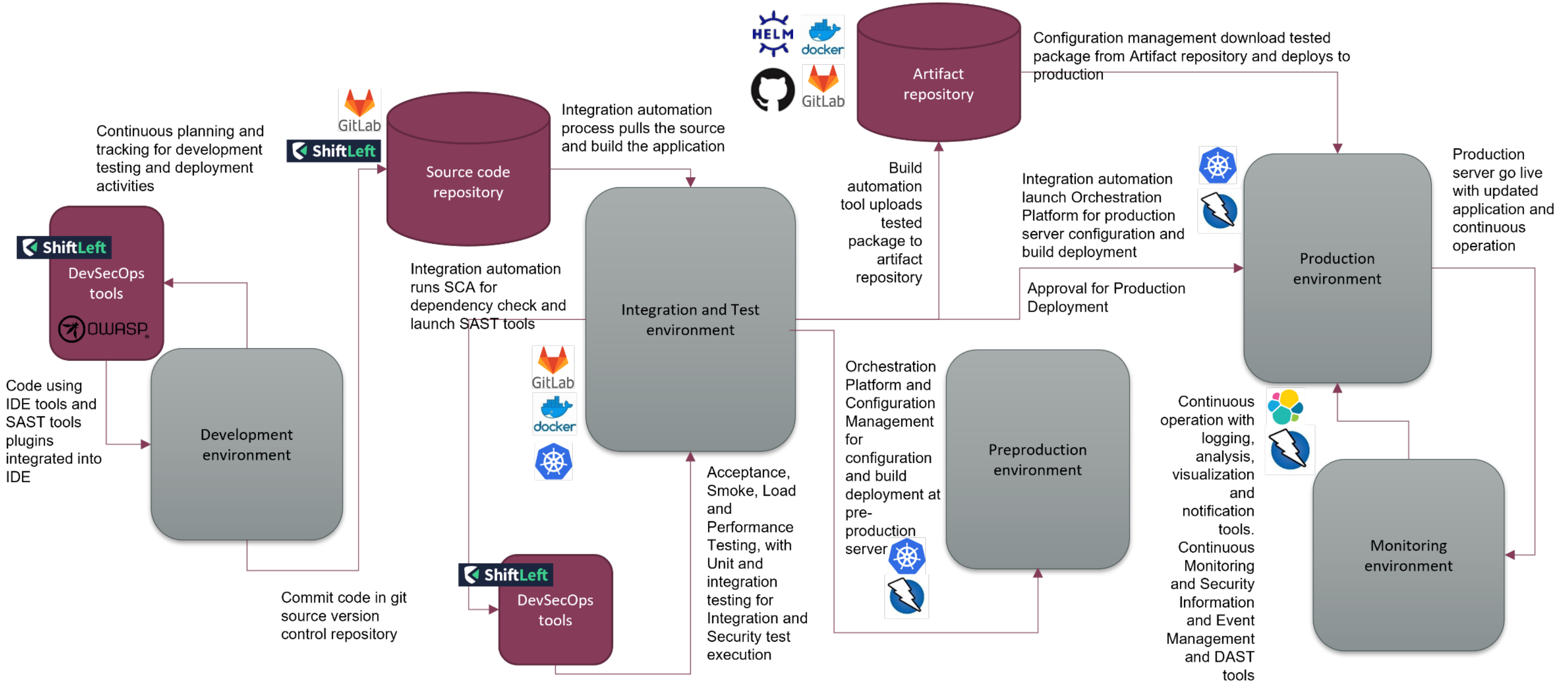
- For IoT-Edge-Fog-Cloud ecosystems
- Compatible with K8s-based (v4, v3) and Openstack-based (v3) ecosystems
- Facilitates the lifecycle management of workloads, extended to environments with private and dynamic IP addresses
- Automated networking, policy rules and telemetry
- Policies for automating deployments

**Insights:**

- Valid for many realistic NGIoT use cases, pending features for large, multi-domain ecosystems



# ASSIST-IoT Enablers



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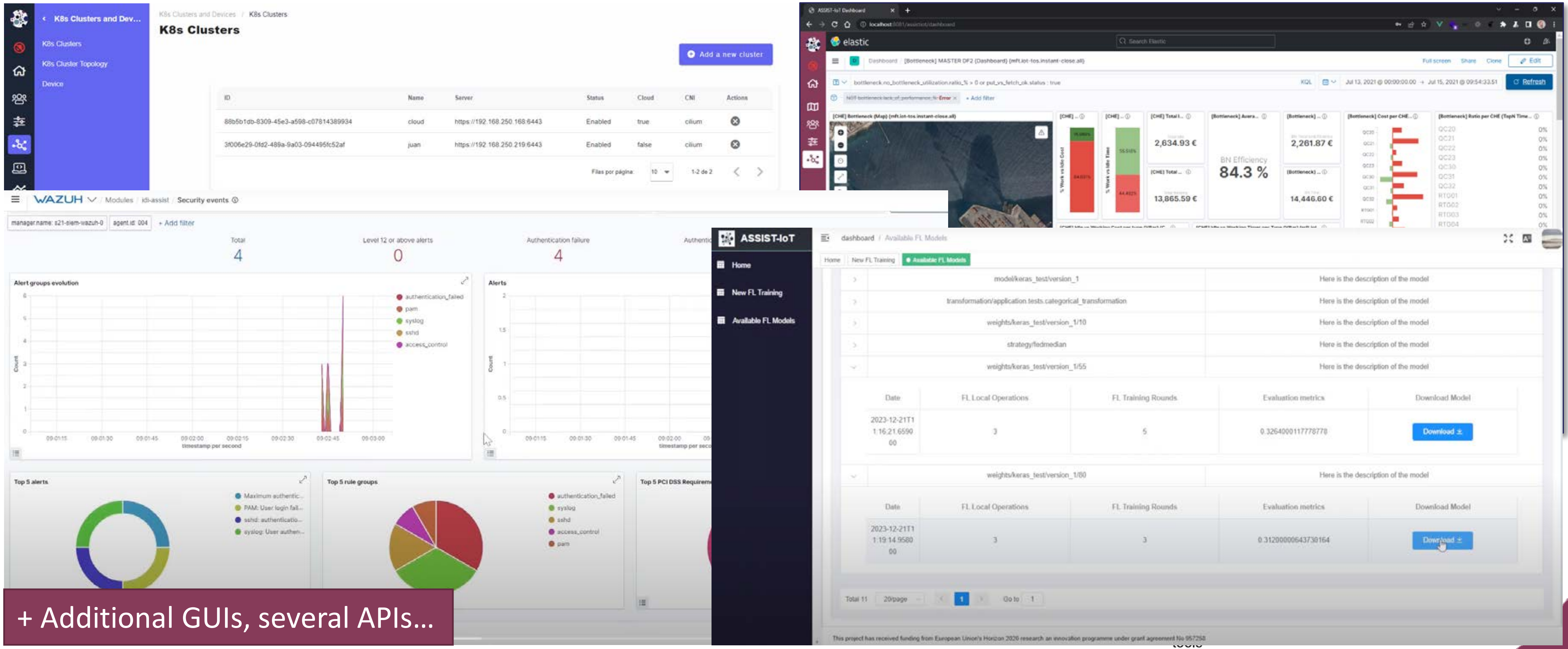
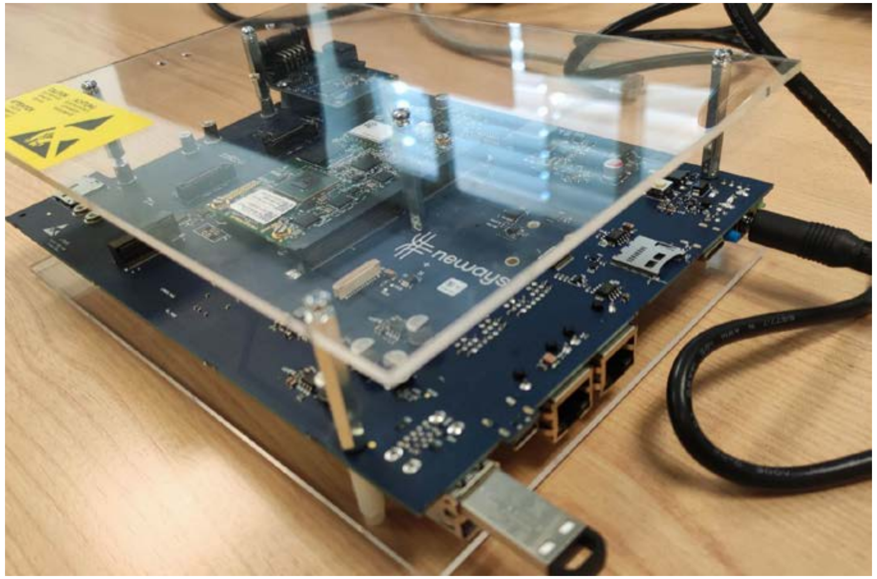



+ Additional GUIs, several APIs…

# ASSIST-IoT GWEN

- The ASSIST-IoT's Edge Node (**GWEN**) is the main hardware designed and manufactured by ASSIST-IoT:
  - It is a **multipurpose** gateway that can be adapted to several use cases, as it considers the most **typical interfaces** used in the industry (cellular – 5G, serial, WiFi, BLE, Ethernet, UWB)
  - It is based on **open software**, and jointly with the **expansion modules**, it can be **fine-tuned** to support any need at the edge (including AI and real-time capabilities)



# ASSIST-IoT pilots

Enablers tested in highly **heterogeneous environments** to ensure minimization of the risk, involving **leading industries (D7.X)**

### Port automation

Improve operational efficiency, safety and profitability of port processes

**BS:** Management of assets; automated cooperation; remote control of cranes with AR

### Smart Safety of workers

Make provisions for predicting potentially dangerous situations in construction

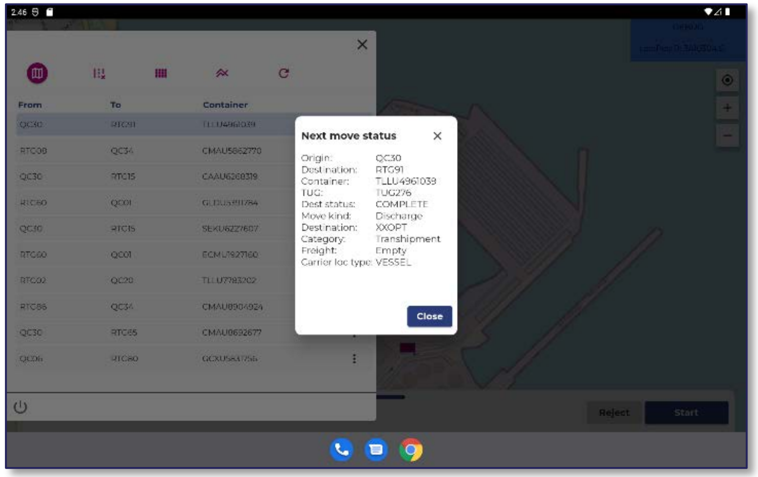
**BS:** Occupational safety (workers' health, geofencing, site control); fall arrest detection; safe navigation and healthy inspection with MR support

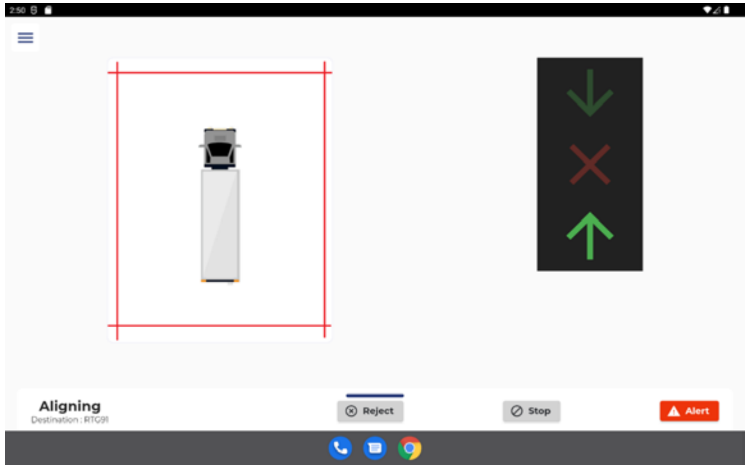
### Cohesive vehicle monitoring and diagnostics

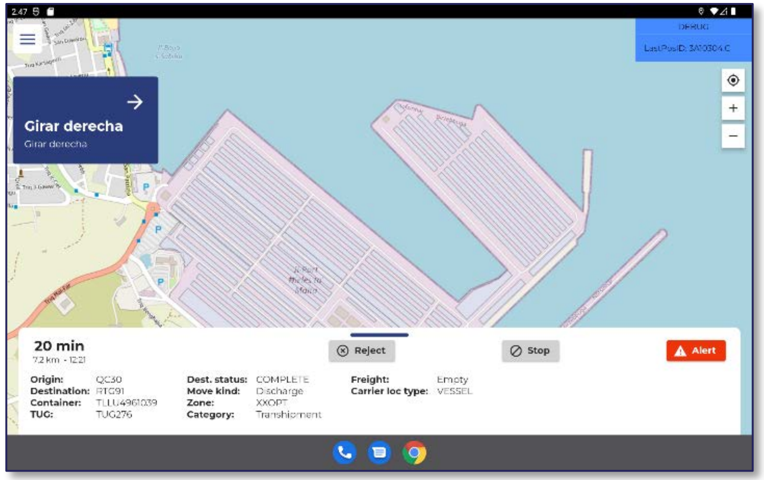
Increase monitoring capabilities in individual cars and at a fleet scale

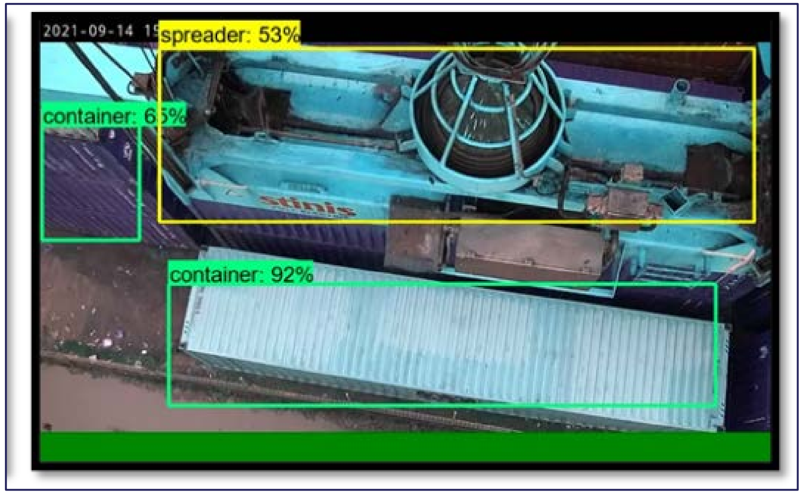
**BS:** Fleet in-service emissions verification and diagnostics; exterior condition AI-based inspection and documentation

# ASSIST-IoT pilot demonstrations



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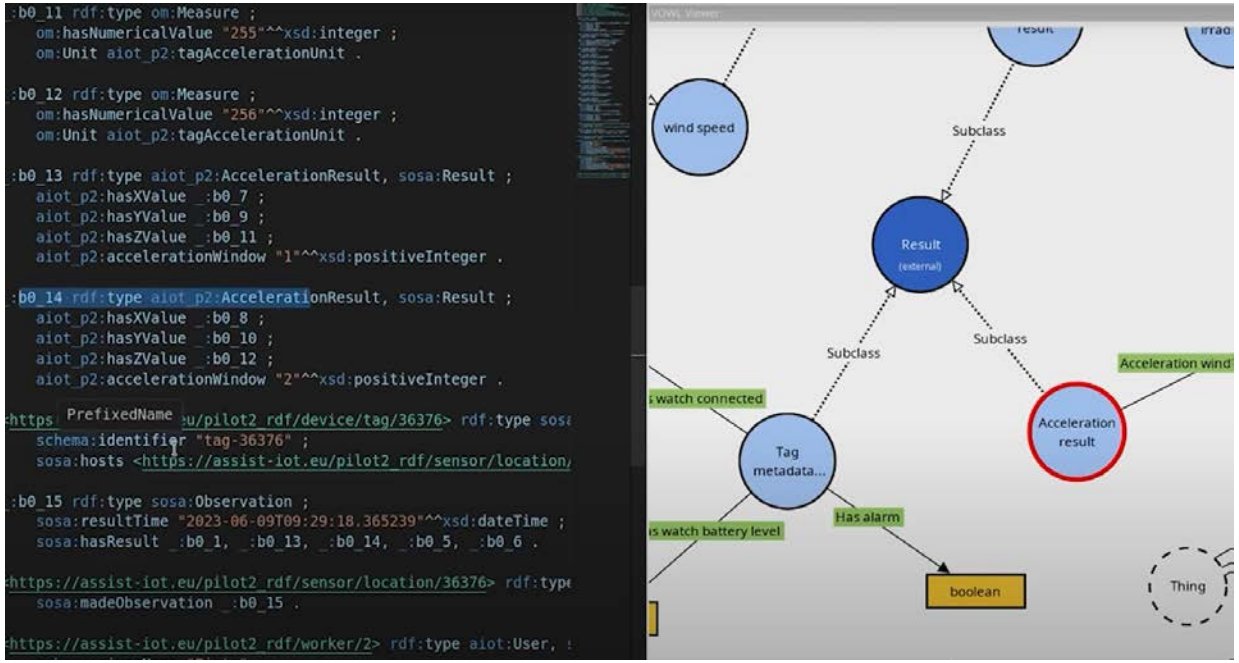


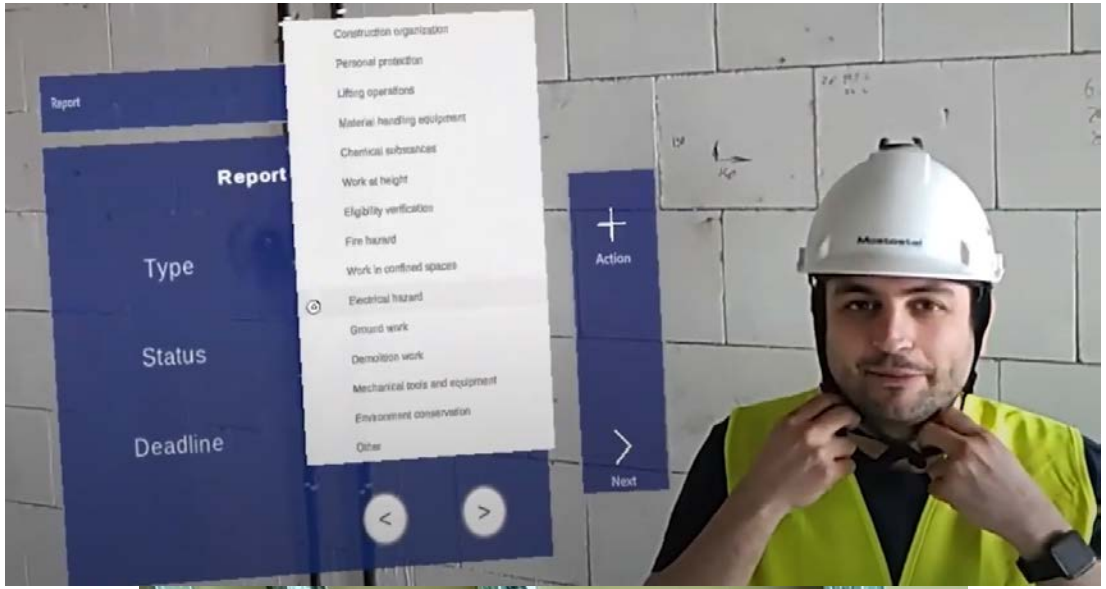


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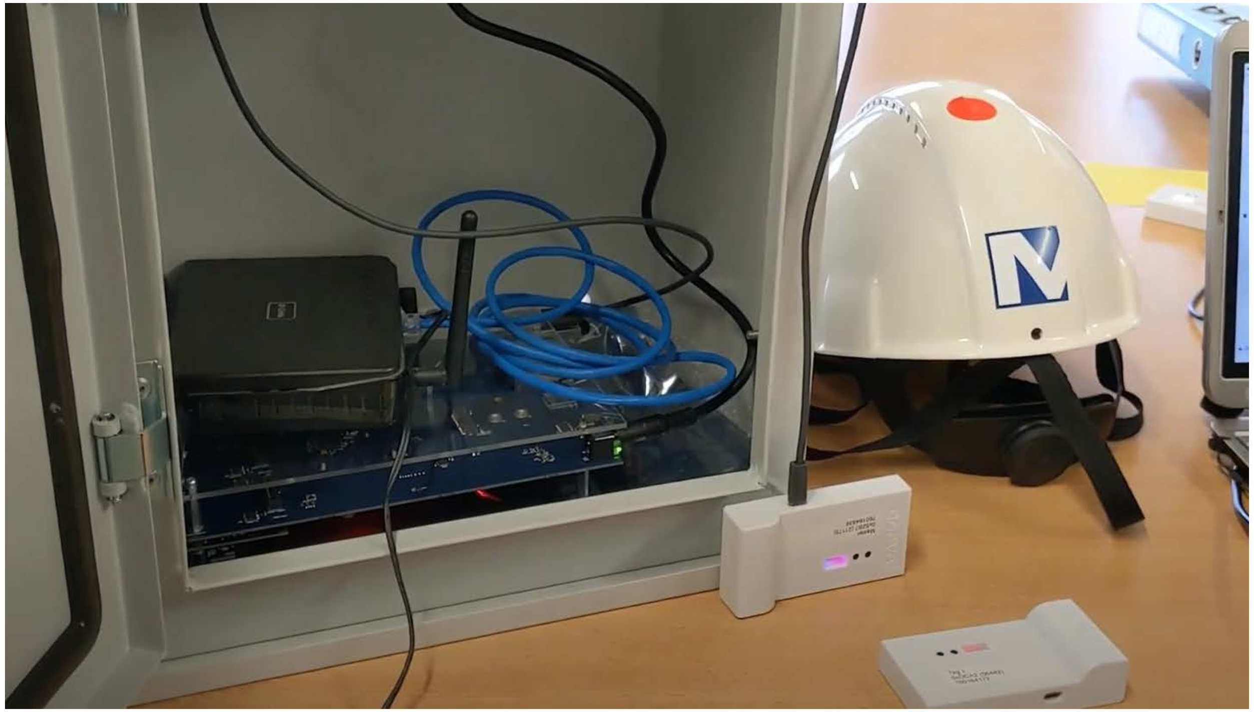

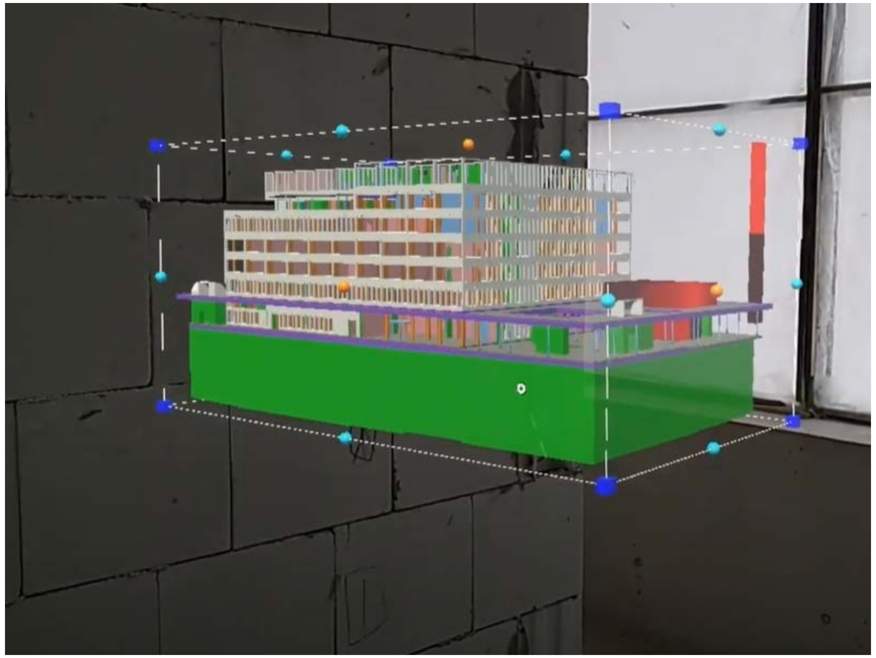

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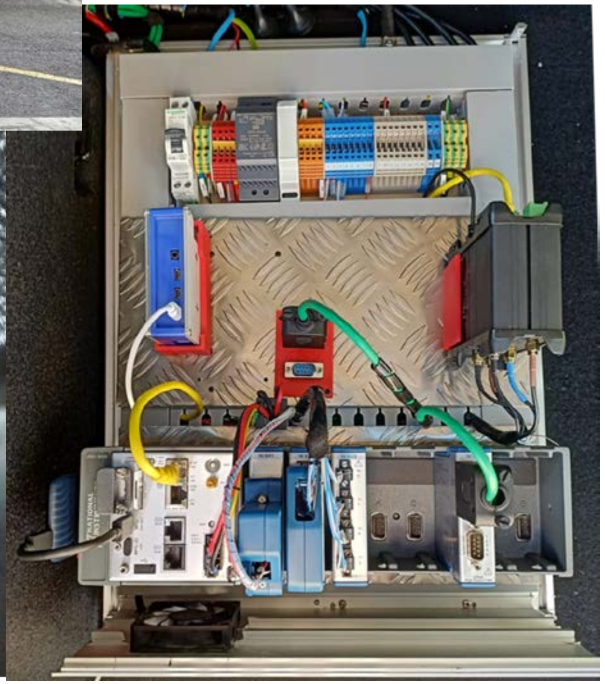

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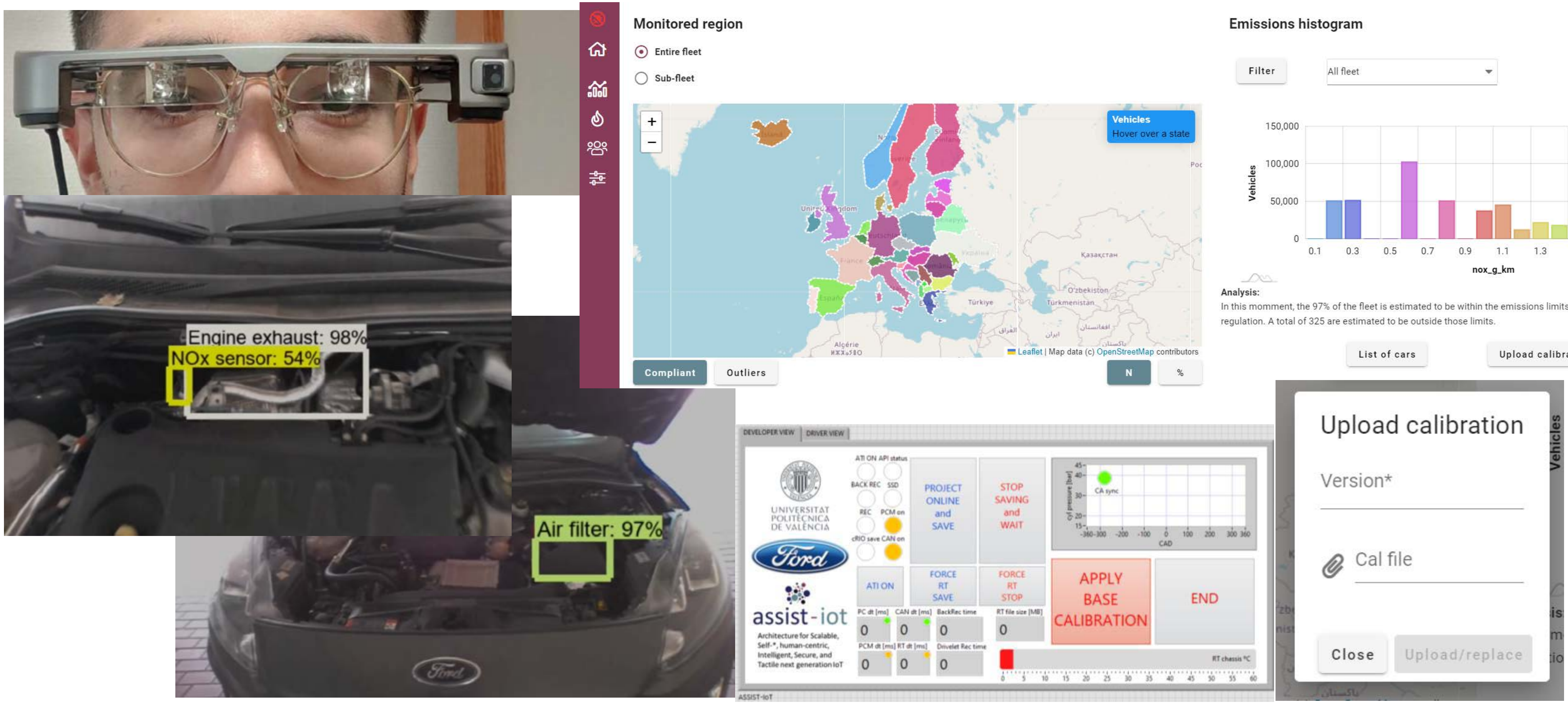

# ASSIST-IoT lessons learnt: now

- The **design principles** used are pillars of recently-started related initiatives
- The **multi-cluster service mesh strategy** applied has proved very useful to:
  - Ease the communication of different types of services, and along distributed environments
  - Secure the communication by using uTLS, and by allowing only exposed interfaces to communicate
- The primary packaging technology selected (**Helm**) is very flexible also for distributed ecosystems, still:
  - The **values.yaml manifest**, that modifies configuration parameters at deployment at all Helm charts, should be powerful and well-documented so that solutions can be truly effective
  - For more powerful, live configuration updates, the use of custom **operators** are one good practice
  - Other technologies with similar approaches could have been used, towards **deployment flexibility**
- However, there are **exceptions** in which virtualization is not possible or desired
  - Cybersecurity tools should be installed at host level to monitor possible threats
  - Some 5G functions, like UPF, show lower performance if deployed as containers
  - Some devices, like tiny edge devices, AR glasses etc., are not powerful enough to enable virtualization

# ASSIST-IoT lessons learnt: next

- **Edge native** is still a field to further evolve. Basically, applications belonging to this category should *leverage cloud-native principles while taking into account the unique characteristics of the edge in areas such as resource constraints, security, latency and autonomy*
- The Cloud-Edge-IoT ecosystem is very heterogeneous and several implementations are available. Coordinated work is needed to work towards a common *taxonomy, glossary, and ontology of continuum orchestration*
- That heterogeneity prevents a one-solution-fits solution for the overall continuum. *Open platforms, marketplaces, reference implementations* for particular use cases are demanded
- Research, integrators, industry, EC... all the *actors of the innovation chain must be aligned* so the effort is actually transferred to the real world. Characterizing the real needs is key to translate the effort of the project outcomes into next actions, upscaling their TRL and influence standardization

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# Thank You

# Questions?

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