EUCloudEdgeIoT.eu

COGNITIVE CLOUD USE CASE OVERVIEW

EUCloudEdgeIoT- Task Force 5
May 2024

Smart Cities

Concept:

The primary goal is to integrate a light-weight traffic simulator into Granada's traffic management infrastructure. By leveraging the FaaS capabilities of COGNIT, ACISA designed the Digital Twin (DT) of several intersections that interacts with distributed simulations, so the DT assess bus priority request, and decides based on current and future traffic scenarios, paving the way for a more advanced, automated and data-driven decision-making processes in urban traffic management.

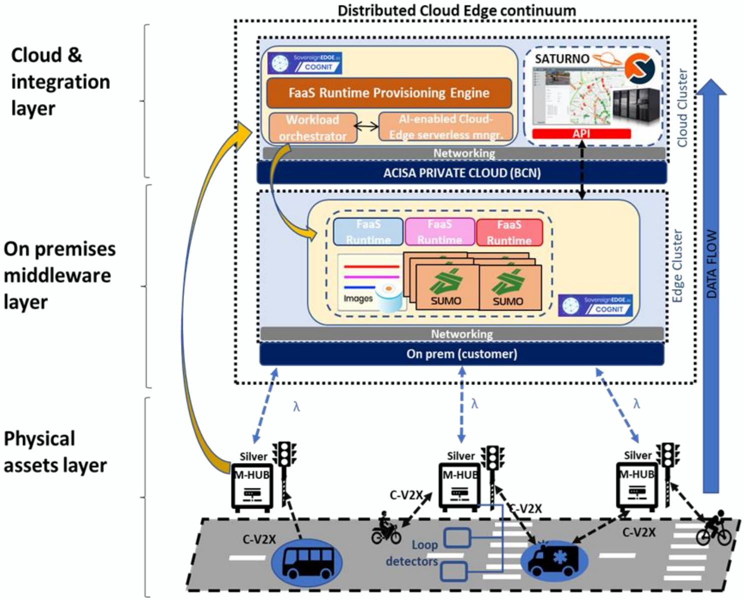
COGNIT helps in: Cloud-Edge resources and energy optimization, workload migration, IA-based scheduler

Value-proposition: Increase infrastructure utilization, resource allocation, ETSI based C-V2X services

Stakeholders: GOV (municipalities), TRA (transport company), EUS (End-user), DEV (developers)

Benefits:

- **Operational Efficiency**: Optimizes the connection between Cloud and Edge resources, improving overall system efficiency.
- **Data-Driven Decision Making**: Empowers operators with insights from an Urban Digital Twin and COGNIT FaaS functionality.
- **Standardized Technology**: Implements ETSI V2X technology in Granada's traffic infrastructure, promoting interoperability and future scalability.



Lead: ACISA

Wildfire Detection

Concept:

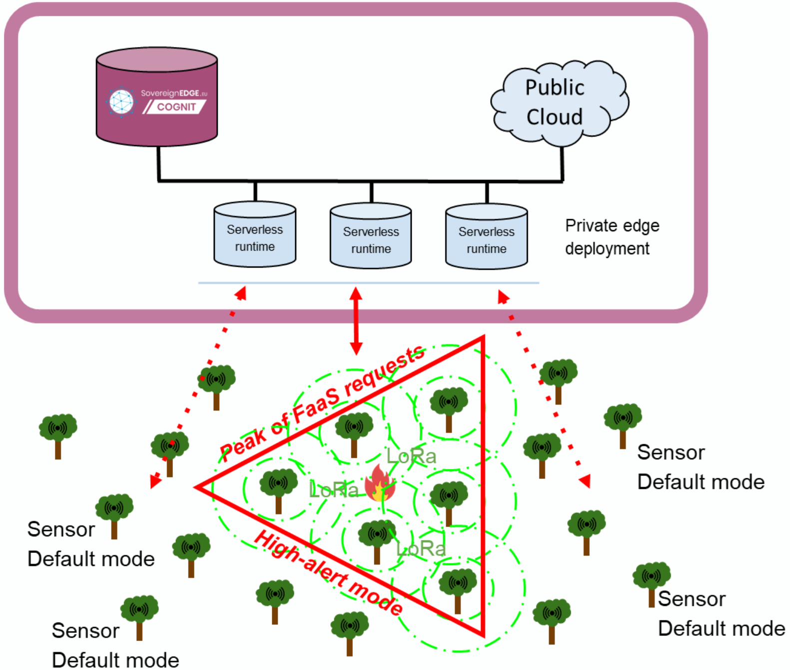
The goal of the **wildfire use case** is to test an **IoT sensor network** for early wildfire detection in **remote areas**. Data collected from different sensors are analysed, and in the event a possible fire is detected, it is confirmed through an **image** captured by the device. When a sensor detects a possible fire, a distress signal is sent to the nearby devices to extend the monitored area.

The system will help detect and monitor the evolution of wildfires to support prompt intervention, reducing the damages.

Benefits:

The computational resources demand is as sudden and unpredictable as wildfires. COGNIT brings benefits to:

- **Conserve energy of devices**, managing the resources required by the offloading of the image recognition function
- **Promptly adapt** to sudden peaks of requests
- **Optimizing the distribution of resources** based on the offloaded data and the packet priority



Lead: Nature 4.0

Energy

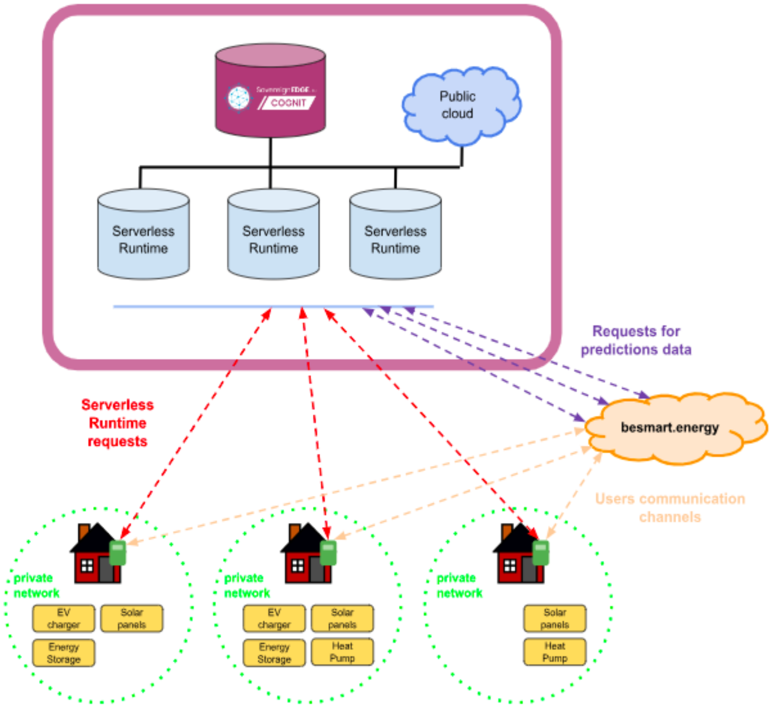
Concept:

The goal of the use case is **to use smart electricity meters to optimise green local energy usage** in a household context, in which energy consumers are also energy producers (prosumers).

In this scenario, the smart electricity meters run a number of user applications to manage important appliances and energy assets installed (from grid topology perspective) behind the meter, adjusting and optimising operation in real time, according to user preferences.

Benefits:

- **COGNIT FaaS is empowering electricity meters**. The apps can execute functions externally with use of additional resources in the cloud-edge continuum, e.g., decision-making algorithms (and eventually pre-trained AI models).
- COGNIT approach enables turning the meters into **highly personalised Energy Assistants**.
- The developed **concept will lead to cost savings** because of more effective usage of energy and lowering overall demand for coal energy, as an example.



Lead: Phoenix Systems & Atende

Cybersecurity

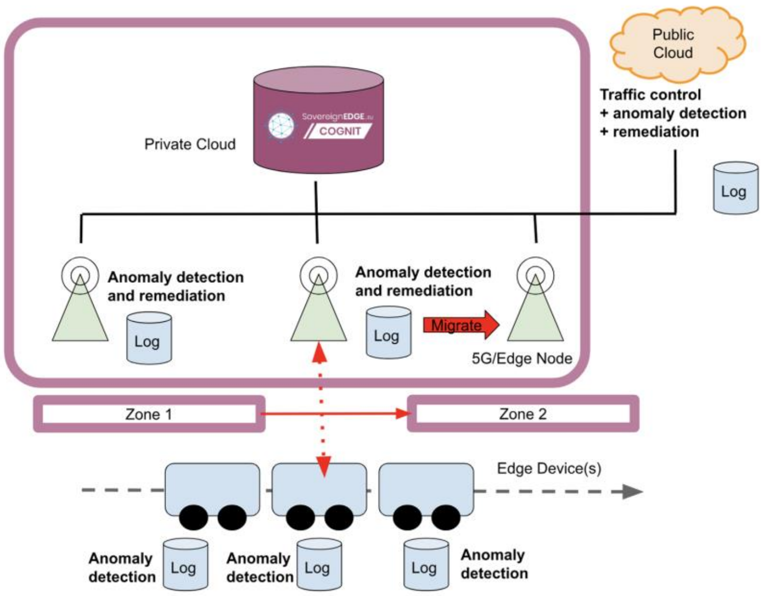
Concept:

Vehicle data collection, including system logs and metrics such as location, speed, and distance between vehicles, is transmitted to the **anomaly detection** module, which is deployed at the cluster level to ensure fast (low latency) and secure transmission of data to the detection system.

Anomaly detection is performed using a **Serverless Runtime,** with lightweight models running at the edge to reduce latency, and heavier models running in the cloud. Vehicle data analysis aims to **identify any deviations** from normal behaviour patterns.

Benefits:

- The COGNIT Framework manages the **migration of Serverless Runtimes based on the itinerary and movement of the vehicles**.
- It ensures anomaly **detection continuity** and **operational efficiency** even in dynamic and constantly evolving environments.



Lead: CETIC & SUSE

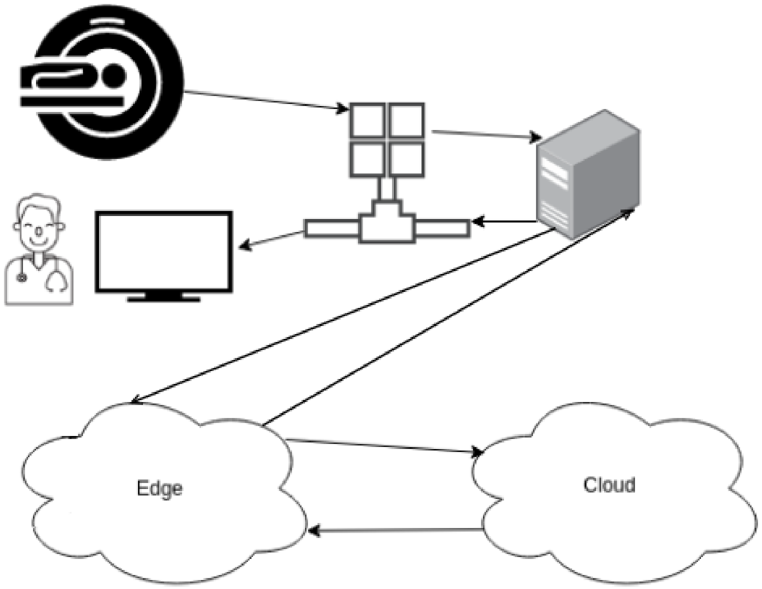
Magnetic Resonance Imaging Scans

Concept:

In future applications, doctors receive decision support via **generated quantitative analysis** of MR images. This process is **time-critical** since the analysis must be provided to the doctor along with the images within minutes. **DECICE** provides an efficient, fast processing, low-latency, energy-efficient edge and **cloud computing continuum** that also considers the load at edge nodes due to the spatiotemporal variation of the users. DECICE provides fast image analysis and preventing data storage on unregistered devices.

Benefits:

- **Productivity**
  - Easy and automatic deployment of the edge-cloud framework
  - Efficient resource management and adaptability to the varying load conditions
  - Dynamic load balancing
- **Time-critical**
  - Provide computational results in a timely fashion
  - Leverage cloud and HPC devices to decrease computational time
- **Safety**
  - Safety compliance and measures to prevent data access



Lead: University of Göttingen

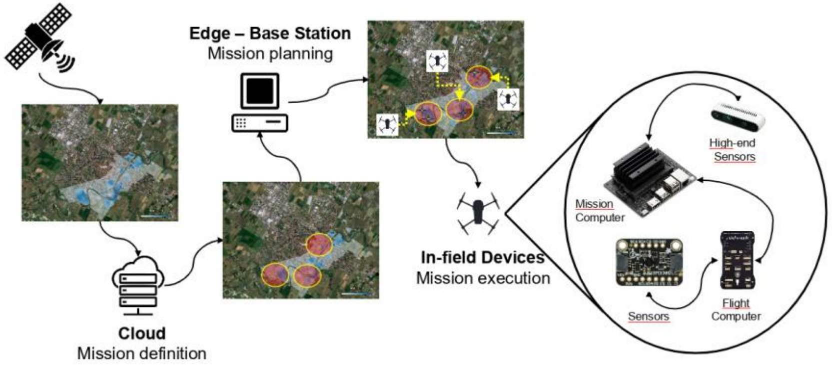
Disaster Management and Emergency Response

Concept:

This use-case develops an open digital platform to support **emergency response** operators exploiting data from drones and satellite. It brings intelligence in the operational activities in the field, by providing the computation support for **embedding ML algorithms** to support drone autonomous flight as well as mission operations

Benefits:

- **Productivity**
  - Easy and automatic deployment of the edge-cloud framework
  - Efficient resource management and adaptability to the varying load conditions
  - Dynamic load balancing
- **Mission Definition**:
  - Use cloud computing continuum for mission definition and refining of mission strategies
- **Mission Planning**
  - Use edge devices for mission planning and laying out execution
- **Mission Execution**
  - Make use of in-field devices for mission execution



Lead: University of Bologna

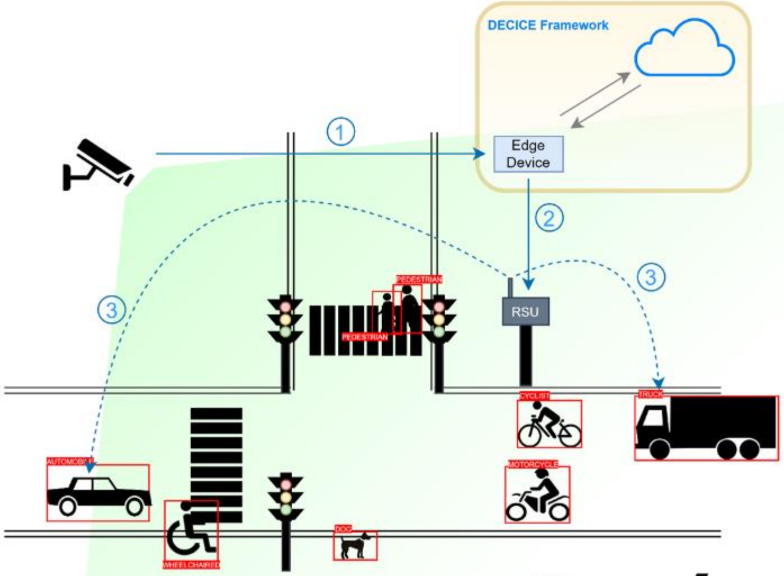
Intelligent Intersection with VRU Detection

Concept:

This use-case develops and integrates a cloud-edge platform for C-ITS and Intelligent Intersection Applications with **high accuracy** (> 95%) on object detection with inference models at cloud, **fast processing** (< 1 second), with adaptive load balancing and **energy efficiency** (>5% saving). It is based on **DECICE** solution that provides an efficient, fast processing, low-latency, energy-efficient edge and **cloud computing continuum** that also considers the load at edge nodes due to the spatiotemporal variation of the users.

Benefits:

- **Productivity**
  - Easy and automatic deployment of the edge-cloud framework
  - Efficient resource management and adaptability to the varying load conditions
  - Dynamic load balancing
- **Energy**
  - Optimization of resource use with energy-saving > 5%
- **Safety**
  - Detecting hidden/undetected objects at the edge with more than 95% accuracy
  - Detecting risky/unsafe conditions, (> 10% more than the baseline)



MARMARA UNIVERSITY

VeNIT Lab

Lead: Marmara University

Smart Monitoring of the Public Infrastructure
Smart Cities

Concept:

This use-case endeavours to enhance traffic flow and bolster pedestrian safety in the city of Göttingen. The city periphery is equipped with thermal cameras for traffic monitoring, LIDAR technology, and with CODECO Edge nodes Collected data serves as a catalyst for streamlining traffic flow and elevating pedestrian security.

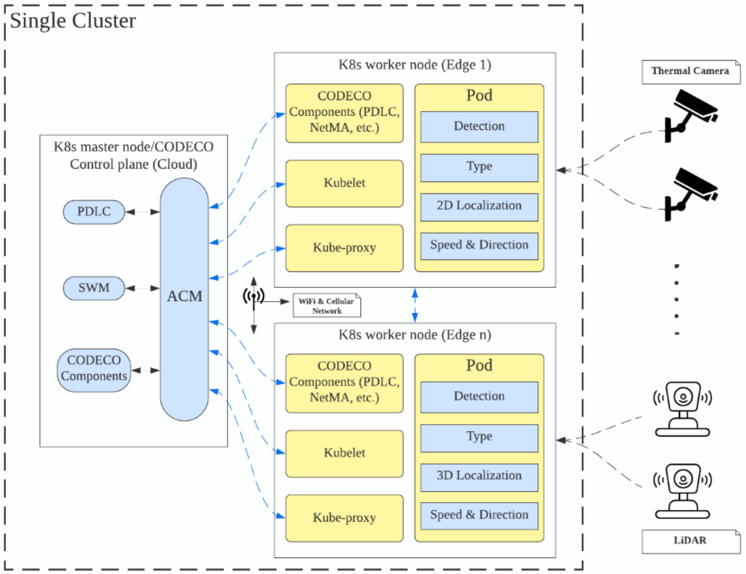
CODECO helps in: supporting federated Edge-Edge operations in an energy-efficient way

Value-proposition: Improve Quality of Experience for the Citizen in Smart Cities

Stakeholders: Municipalities (GOV), Citizen (EUS)

Benefits:

- **Scalability and Resilience**
  - Improved handling of large data volumes and variable traffic demands
  - Reduced traffic across Edge-Cloud
- **Efficient Data pre-processing and Storage**
  - Context-aware placement of workloads across Edge nodes in different locations
  - Based on specific application metrics and external conditions
- **Optimized and valuable Insights to the Citizen**
  - Optimized traffic management, reduced congestion
  - Enhanced pedestrian safety and comfort



Lead: University of Göttingen

Vehicular Digital Twin for Safe Urban Mobility
Mobility

Concept:

This use-case in Barcelona's UPC Campus Nord utilizes CODECO for orchestrating a Vehicular Digital Twin; It covers walkable pedestrian zones and car lanes, accommodating various transportation modes. Aims at improving safety for Vulnerable Road Users (VRU) in Urban Environments.

Information is fed to the vehicular Digital Twin to detect dangerous situations

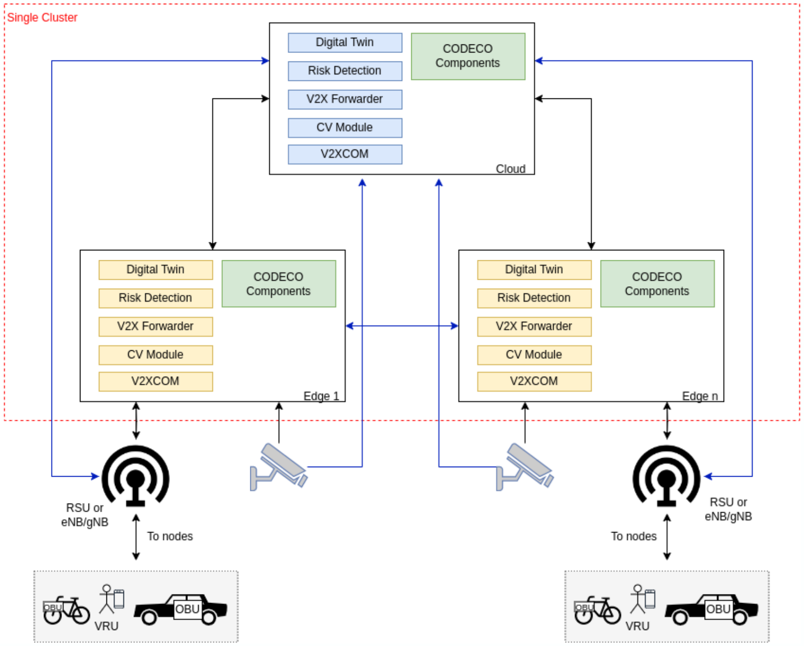
CODECO helps in: Edge-Edge mobile workload migration

Value-proposition: Increase road safety

Stakeholders: GOV (municipalities), EUS (End-user), DEV (developers)

Benefits:

- **Ultra-reliable, low-latency Services**
  - CODECO ensures processing close to V2X nodes
  - Enables efficient and responsive data exchange
- **Secure and Transparent Data Exchange**
  - At the network level, secure channels
  - During application setup and runtime, privacy-preserving and transparent operation
- **Optimal Application Workload Placement**
  - Via context-aware Edge selection
  - User, data, network, compute metrics



Lead: I2CAT

MDS across Decentralised Edge-Cloud
Smart Cities

Concept:

This use-case focuses on distributing media content efficiently across Edge-Cloud. It promotes tighter integration between computational and networking aspects.

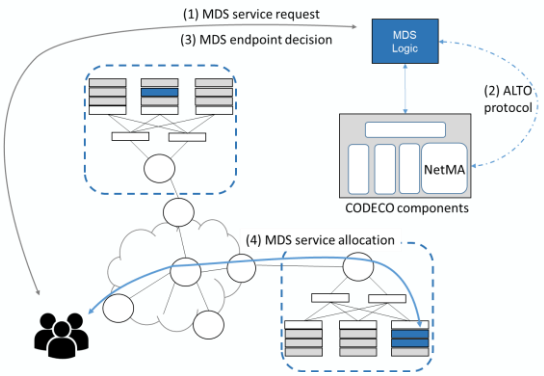
CODECO helps in: Edge selection based on user preferences and infrastructure constraints (node, network)

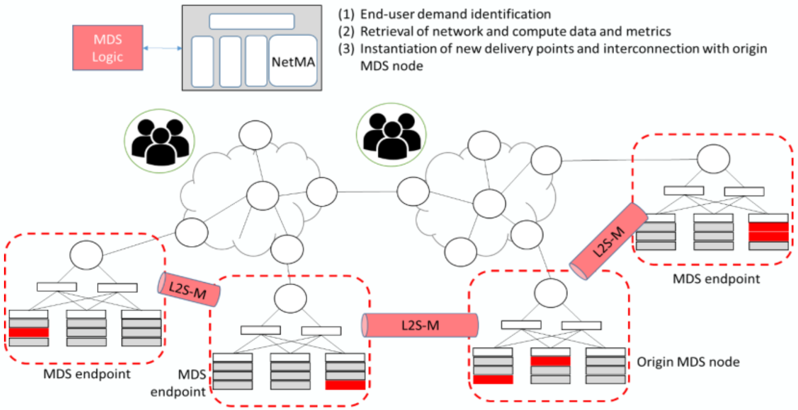
Value-proposition: Optimized Edge-Cloud infrastructure for MDS

Stakeholders: ICT (e.g., MDS providers, telcos);, EUS (End-user)

Benefits:

- **Media distribution adapted to user requirements**
  - Orchestration incorporates user recommendations
  - Optimized Quality of Experience (QoE)
- **Improved MDS performance and energy-efficiency**
  - Optimal decision making for resource usage across data-network-compute





Lead: Telefonica ID

MDS: Media Distribution System

Demand-side Management in Decentralized Grids
Energy

Concept:

This use-case provides a decentralized energy system based on the UPM campus in Madrid. Enables comprehensive monitoring, analysis, and replication of energy-related data. Aims for efficient resource utilization, scalability, resilience, and adaptability in energy management operations.

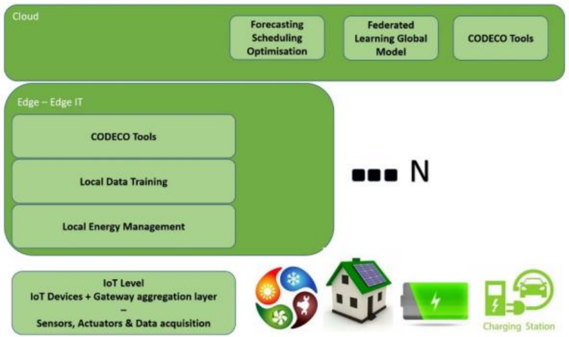
CODECO helps in: creating an optimized, user-centric decentralized energy management system

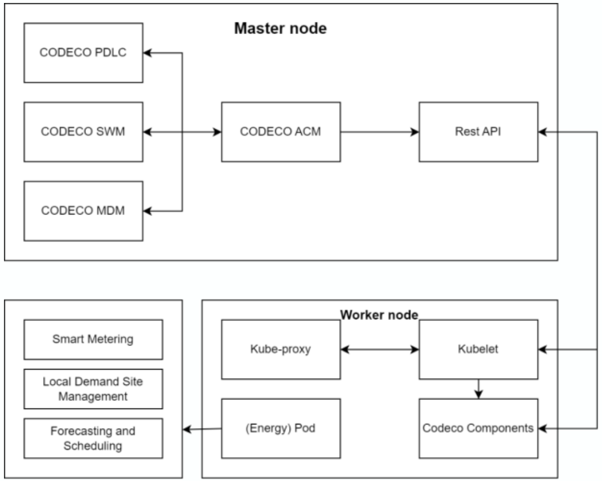
Value-proposition: Improved energy management via energy-aware orchestration

Stakeholders: GOV (municipalities), EUS (End-user), DEV (developers), ICT (energy management systems)

Benefits:

- **Optimized energy usage and improved sustainability**
  - Resources distributed and optimized based on demand response requirements, consumer preferences, grid conditions
- **Informed decision-making and proactive management of energy**
  - Efficient integration of cross-sector energy data
  - Relevant contextual information
- **Holistic view and comprehensive monitoring**
  - Better understanding of energy patterns
  - Facilitates replication and analysis





Lead: Universidad Politecnica de Madrid

Decentralized Wireless AGV Control for Flexible Factories Manufacturing

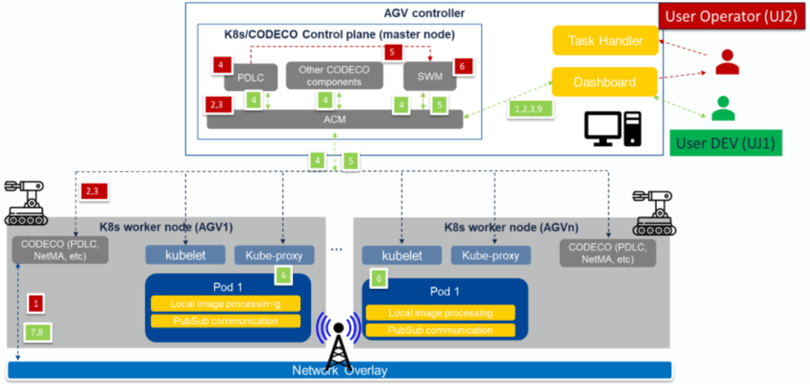
Concept:

This use-case focuses on providing a higher autonomy to mobile robots in manufacturing environments and is implemented in the open fortiss Labs. Wireless control makes AGV systems prone to interference and connectivity issues. CODECO is expected to provide adaptation to address these challenges

CODECO helps in: increased mobile robot autonomy and scalability via AI-based decentralised control

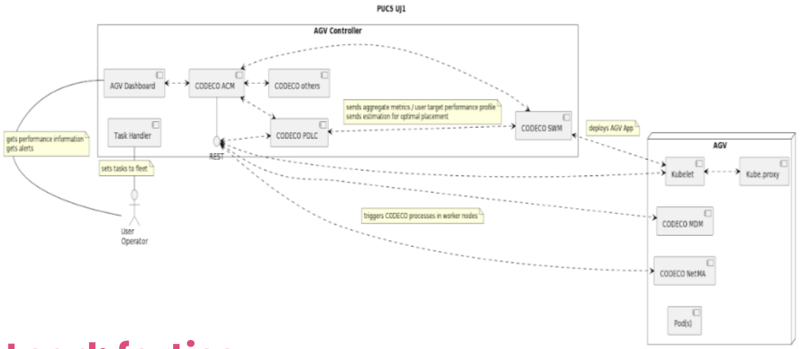
Value-proposition: Increase road safety

Stakeholders: ICT (SMEs, MAR vendors, Telcos), DEV (developers), AR (researchers)



Benefits:

- **Flexible integration in the far Edge**
  - Support for orchestration across multi-architecture robots (Raspberry PI)
  - Workload distribution based on node and network constraints
- **Wireless infrastructure optimization**
  - Interference and synchronization issues
  - Scheduling and migration with intermittent connectivity
- **Improved mobile robot coordination**
  - Different locations
  - Optimized resource allocation



Lead: fortiss

Automated Crownstone App Deployment for Smart Buildings
Energy

Concept:

This use-case focuses on automated deployments of smart office/smart building applications on the Crownstone Platform

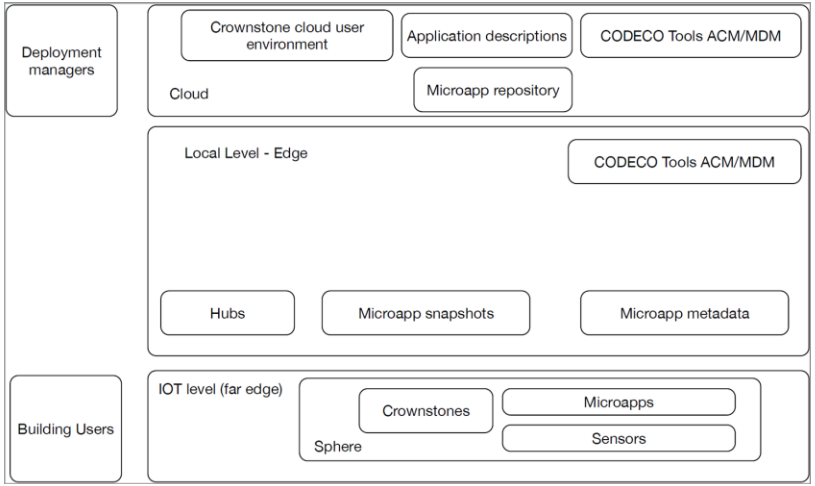
CODECO helps in: automating the deployment of multiple applications on the Crownstone platform (multi-cluster)

Value-proposition: Deployment scalability and micro-infrastructure optimization

Stakeholders: ICT (SMEs with focus on smart buildings), EUS (End-user), DEV (developers)

Benefits:

- **Scalability and efficient deployment**
  - Improved Quality of Experience (QoE)
  - Improved deployment across different clusters
- **Enhanced application performance**
  - CODECO assists the application streamline
  - Reduced complexity



Lead: Almende

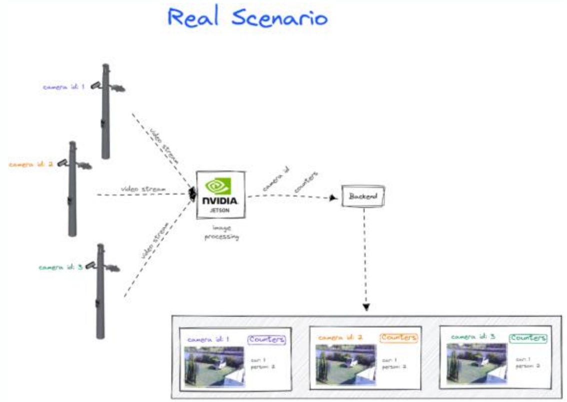
Autonomous Smart City Surveillance

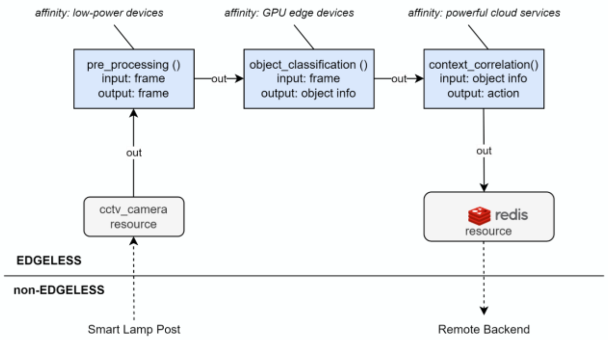
Concept:

The Autonomous Smart City Surveillance use case consists of a **complete computer vision surveillance serverless application** leveraging EDGELESS's orchestration and flexibility capabilities. The goal is to showcase the flexibility of EDGELESS in accommodating edge nodes with heterogeneous hardware capabilities. The Edge system identifies events, discerning their **severity**. In situations where events are less urgent in the context of **decision-making,** the cloud processes the information. Depending on the **necessity for an alert**, the processed data may be sent back to the Edge or retained in the cloud for display on a dashboard. Conversely, for events posing a risk to human life, Nvidia Jetson **processes the pertinent information**.

Benefits:

- **Efficient low-latency** processing and response are facilitated by eliminating the necessity to transmit sensor data to a remote server. Consequently, emergent events can be promptly detected, affording decision-makers the advantage of receiving timely information and facilitating swift actions if deemed necessary.
- The **seamless integration** of robotics and IoT devices augments **operational efficiency**, thereby diminishing occurrences of downtime and failures.
- The synchronization of real-time collaboration optimizes workflow, elevating overall **productivity** and fostering a conducive environment for **proactive decision-making**.
- EDGELESS dynamically allocates computational tasks, thereby **optimizing** resource utilization and concurrently **mitigating** operational costs.





Lead: UBIWHERE LDA

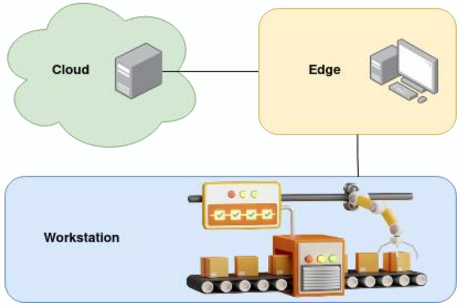
Internet of Robotic Things (IoRT) Applications

Concept:

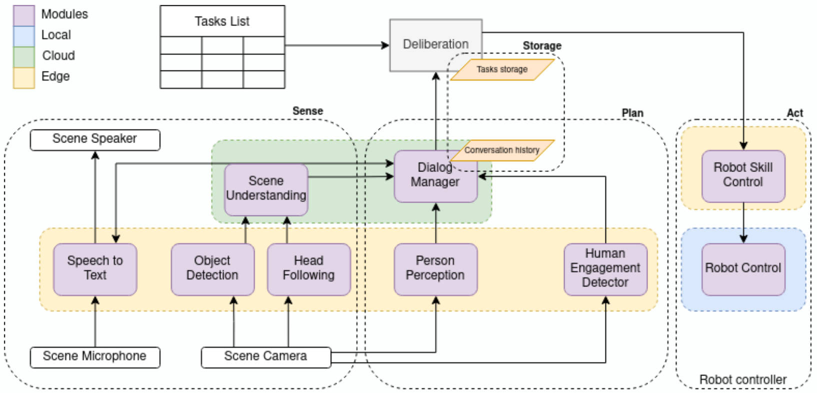
The IoRT Applications use case **validates seamless integration of autonomous robotics and IoT devices** in agile manufacturing scenarios. These systems collaborate to capture real-time data, process it, and execute tasks, demonstrating the efficiency of the project framework **in executing AI-scheduled and low-latency tasks** within the production workflow. Real-time collaboration between robots and IoT devices **promotes cognitive production environments, enhancing productivity and adaptability**.

Benefits:

- Integration of robotics and IoT devices enhances operational **efficiency**, reducing downtime and failures.
- Real-time collaboration streamlines workflow and enhances **productivity**, enabling proactive decision-making.
- EDGELESS dynamically allocates computing tasks, **optimizing resource utilization** and reducing costs.



Internet of Robotic Things Applications Scenario



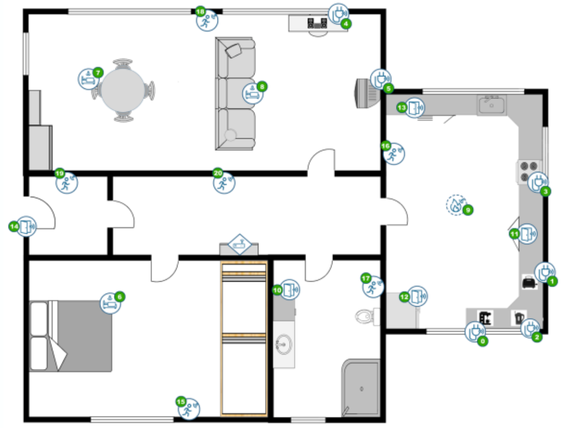
Workflow with the different modules and components of the use case

Lead: FUNDACIO EURECAT

HealthCare Assistant (HCA)

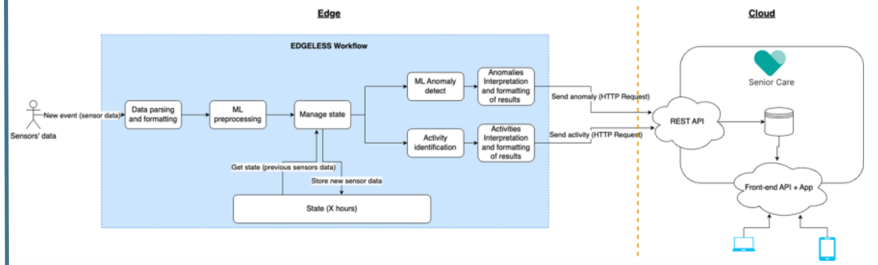
Concept:

The HealthCare Assistant (HCA) UC aims to design and develop a personal assistant with **activity identification and anomaly detection** capabilities. To achieve this goal, a system will be developed that will use **IoT devices** (several **sensors** and a gateway) located in the **homes of the elderly people** for whom the system is intended. The **identification of activities** and the **detection of anomalies** will be carried out at **edge nodes** within the **EDGELESS** system.Once the activities have been identified, this data will be sent to a component in the **Cloud**, which will be responsible for managing this information and allowing **access to caregivers and family members**.



Benefits:

- **Low-latency processing** and response since it is not necessary to send the sensor data to a remote server. Therefore, both activities and anomalies can be detected with low latency, allowing caregivers and family members to have the information and act in the shortest time possible if necessary.
- **Privacy**, as sensors' data stays within the home. This project aims to leverage this benefit to provide a secure experience for monitoring daily activities and detecting anomalies in a home environment.



Lead: WORLDLINE IBERIA SA

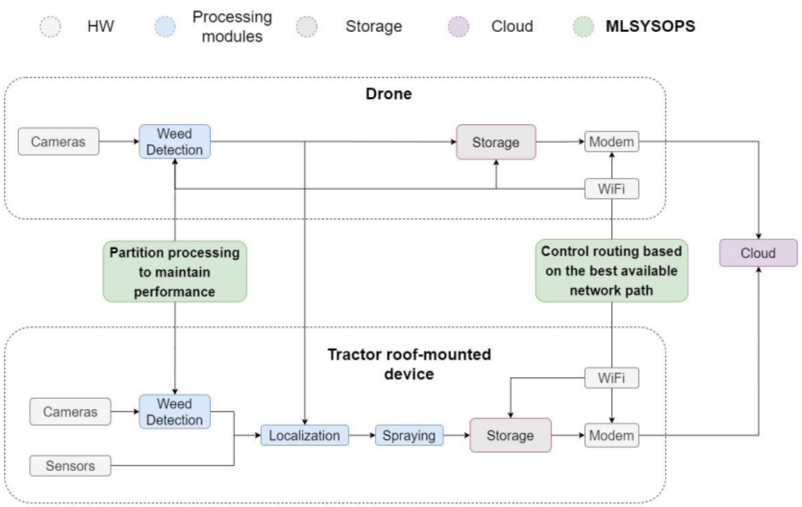
Smart Agriculture

Concept:

The **Smart Agriculture** use case utilizes a **multispectral camera system** for automated, **cost-effective** crop monitoring. Integrated with cloud analytics, it optimizes operations in **real-time**, **enhancing yield with fewer chemicals**. It features a **two-node system**, the first placed on the roof of a tractor and the second placed under a drone, both using NVIDIA Jetson Xavier. Offering **diverse field perspectives** and **AI-driven control** to manage software, **deployment**, **computational pipeline**, **connectivity**, **storage**, and **ML tasks**.

Benefits:

- **Enhanced Detection**: The synergistic operation of the dual-node system ensures high-precision weed detection using **multispectral imaging**.
- **Optimized Herbicide Use**: Accurate **weed localization** allows for targeted herbicide spraying, minimizing environmental impact.
- **Cost-effective Farming**: Precision in herbicide application translates to **cost savings** and **increased crop yield**.
- **Optimized ML Feedback Loop**: Collects application and system-level performance metrics—including **CPU and GPU utilization**—to refine ML models, enhancing **weed detection precision** and **operational efficiency.**



Lead: Augmenta

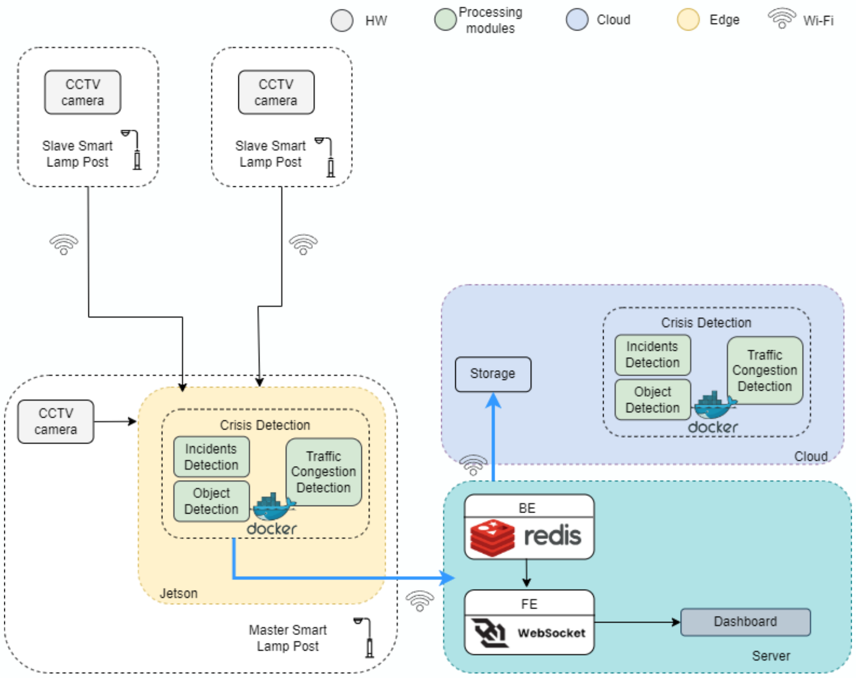
Smart Cities

Concept:

The **Smart Cities** use case aims to to integrate data collected by sensors and processed by nodes at the edge in order to support road usage, traffic monitoring and incident detection applications for **urban environments** with significant benefits for city planners, first responders, and citizens.
A real-world testbed will be used, consisting of 3 smart lamp posts equipped with cameras, noise/pollution sensors and embedded computing platforms with connectivity to additional storage and processing resources in data centers.

Benefits:

- **Low-latency and real-time** processing capacities at the edge processing, without having to transmit raw data to remote compute/data centers.
- Ability to analyse and integrate urban and road environments data with geospatial data for **correlation analysis**
- **Smart and flexible management** of video analytics and data processing pipelines, as a function of available system resources at the edge and in data centers.
- **Dynamic activation and deactivation** of sensors and processing elements to achieve energy-efficient operation.



Lead: Ubiwhere

IoT and Data

Concept:

This use-case is an **IoT-based, automation-capable, smart sensing and monitoring framework** for infrastructures that leverage the benefits of **edge AI** provided by **CECC infrastructure** to improve its performance and reliability.

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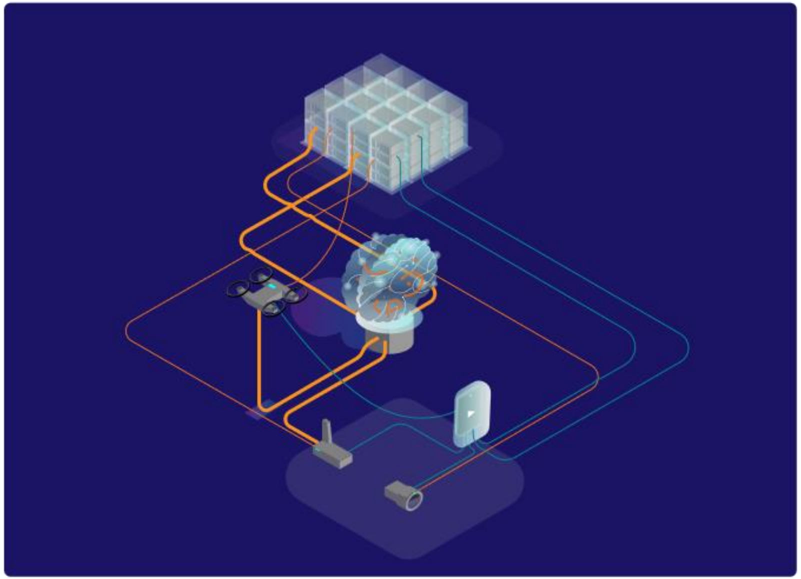
Benefits:

- Bring the physical and digital worlds to a new level of **integration**, increasing the amount of data that needs to be processed at any time to **make decisions and trigger responses to the sensed conditions**.
- Consuming the CECCM's capabilities, It **deploys and runs microservices at the edges** of the monitored infrastructure.
- Build applications that take advantage of **edge infrastructures**, providing **lower latency** in the **computation** process, as close as possible to the point of data generation, with **increased data security** and **privacy**.
- Allow developers **accelerate the development** and **distribution of their application** in all levels of the **cloud-edge continuum**.



Lead: Iquadrat – Spark Works

Smart Monitoring System using UAV

Concept:

The use-case is a **smart monitoring** system that will harness the current proliferation of **video surveillance** devices using enabling technologies and techniques, such as UAVs, far edge, AI, and ML.

Benefits:

- Demonstrate the **flexibility** that CECM offers to the application for **changing its behaviour in an easy and seamless way**; e.g., the application's behaviour can vary via a simple SOTL*-based request from object tracking, movement detection, prediction, and human activity surveillance, to unusual activity detection.
- Demonstrate the CECM's capabilities to **deploy and run micro-services on top of the far edge** (e.g., UAV) and anticipate drone unavailability by **migrating the micro-service** from one drone to another or the infrastructure edge.

*SOTL: semantic-aware and ontology templating language

Lead: Fingeletek - Eurecome

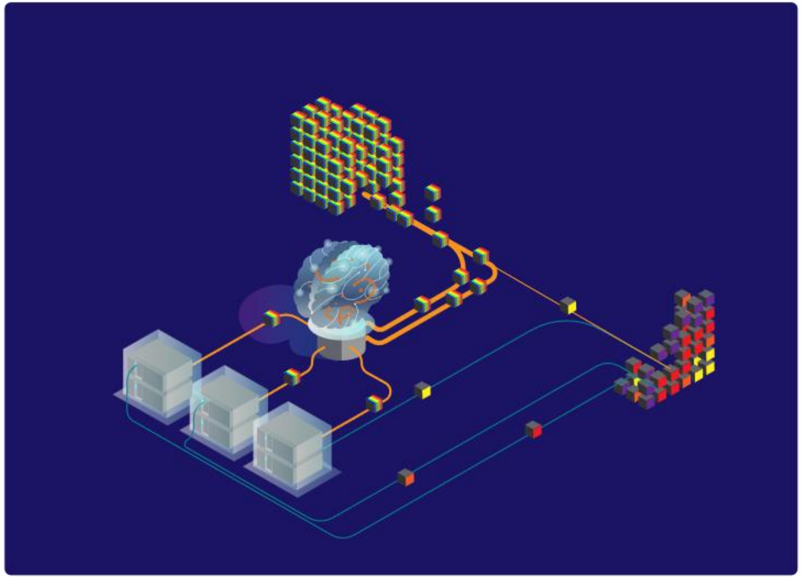
Deciphering the universe: processing hundreds of TBs of astronomy data

Concept:

This Use-case will enable the whole **astronomy community, scientific** and **research teams** to accelerate the analysis of the novel data gathered from newer and additional instruments and data sources.

Benefits:

- Demonstrate the CECCM's capabilities to **deploy and run astronomical software** to potentially process **hundreds of TBs of data cubes.** This will allow to **integrate scientific applications** that will take advantage of **hybrid cloud native infrastructures**, to **optimize the computation process** based on **smart AI algorithms**.
- Consuming the CECC capabilities, It orchestrates the data sources and applications execution.
- Consuming the infrastructure management components, it allows **optimizing data intensive applications**.
- **Reduce the end-to-end execution time** and **maximize the use of local bandwidth**.
- Develop a **micro-service-oriented application** to distribute the software and data across the federated infrastructure (such as JWST).



Lead:Universidad Complutense de Madrid, RedHat

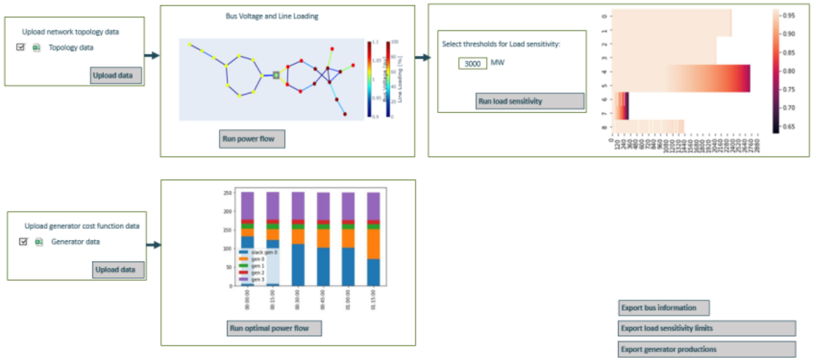
Energy Market place & distribution

Concept:

Based on the network topology, **optimal power flow** runs taking as input the generator production costs. Output will include network information (voltage in buses, current flow in lines, generator production etc.). **Market resolutions** could happen for different scenarios or every 15min intervals, aligned with the Balancing market evaluation period. **Load sensitivity** analysis identifies the maximum load that the network can withstand.

Benefits:

- **Network information** calculated based on Newton–Raphson and visualised in an **interactive graph.**
- Load sensitivity takes into account network characteristics and visualises the minimum voltage of the network for each different simulation. The operators can ensure **network stability** by keeping the load within the specified ranges.
- Market resolutions can offer insights on **generator production** for each different simulation.



Lead: Independent Power Transmission Operator (IPO)

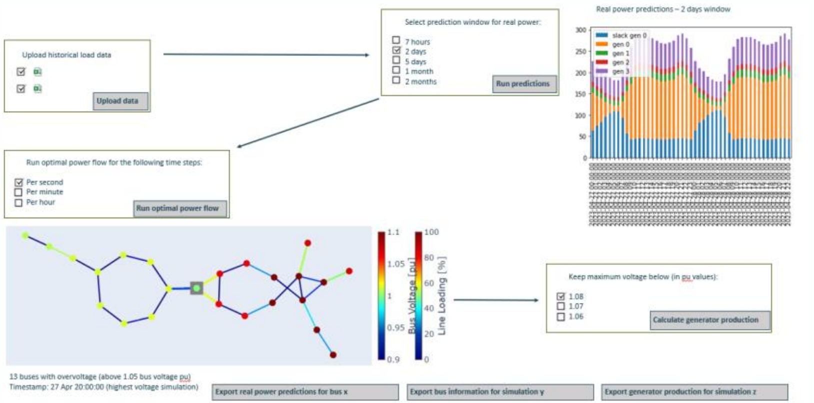
Distributed energy grid Process Management

Concept:

Demand prediction algorithms predict the expected demand in the upcoming timeframes and those predictions are used to solve the power flow ahead of time. The calculated generator contributions could be used in order to **control the generator production** ahead of time increasing the stability of the network.

Benefits:

- **Demand is predicted** for various time frames using a combination of Machine Learning algorithms.
- Proactive control of generators for ensuring network stability (**Automated Generator Control** functionality).
- **Voltage can be controlled** through adjustments to the generator production.



Lead: Independent Power Transmission Operator (IPO)

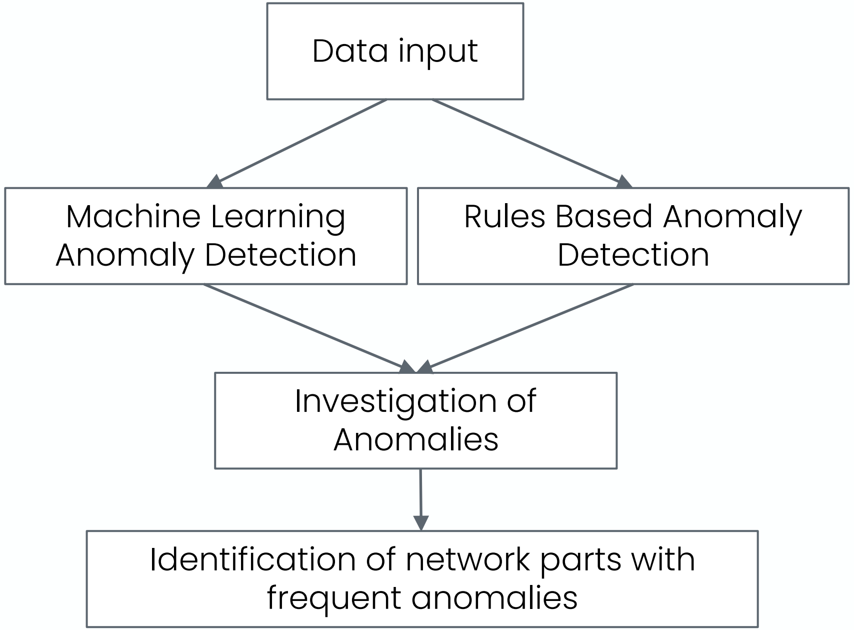
IoT based Asset Monitoring and Management

Concept:

Taking as input SCADA data, the **Anomaly Detection algorithm** will run in order to identify anomalies such as cases of low / high reactive power, high voltage instance etc. Anomalies could be used by the operators to analyse unexpected instances and design mitigation actions for the future, improving the **health of the grid**.

Benefits:

- **ML Grid Health algorithms** increase confidence in the network and provide to the operators the opportunity to analyse the root cause of anomalies.
- Parts of the network that regularly showcase anomalies might require **Predictive Maintenance** actions for improving network stability.



Lead: Independent Power Transmission Operator (IPO)

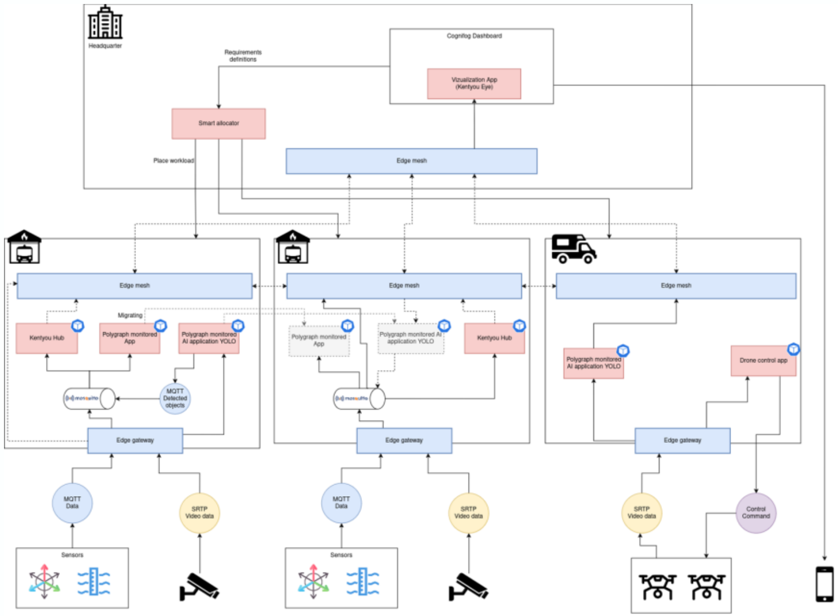
Collaborative Missions in urban areas

Concept:

Collaborative missions in urban areas during floods involves deploying **drones** and **IoT sensors** to gather real-time data despite **intermittent connectivity** challenges. Data collected is processed in the edge-cloud continuum using accelerators for timely decision-making and effective flood management.

Benefits:

- Optimize workload placement based on criteria such as geographical positioning, hardware computing capabilities, accelerators, and **energy consumption**.
- Additionally, it effectively manages **connectivity challenges**, ensuring uninterrupted data transmission for **timely decision-making** during rescue operations.



Lead: THALES

E-health services in the Edge-Cloud Continuum

Concept:

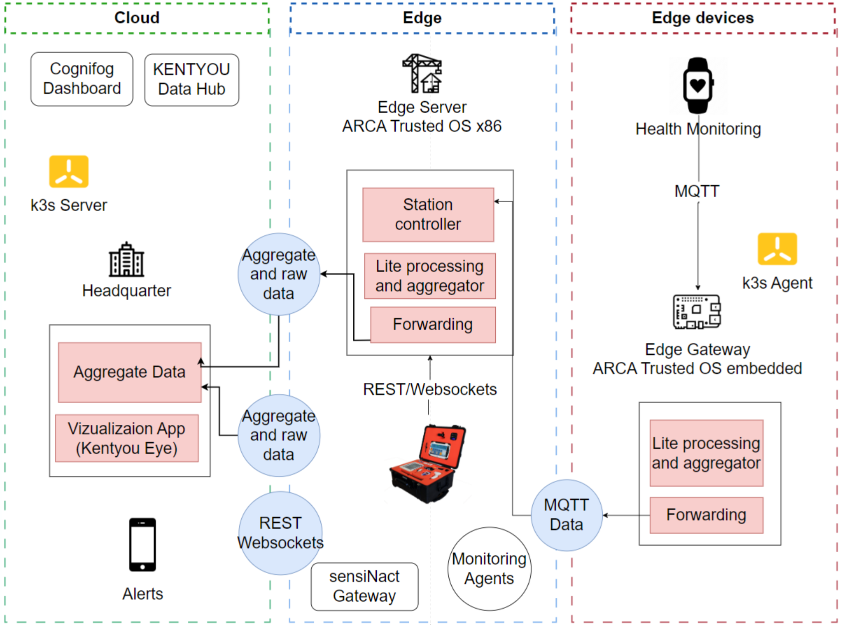
This use-case aims at decentralizing server-side medical applications.

Telemedicine stations (MIOT – Medical IoT) devices and smartwatches instead of connecting to a centralized server, are smartly distributed with a federated architecture.

Vital signs are monitored on the edge and health incidents can be created on-site, allowing health professionals to service remote locations.

Benefits:

- **Low latency and performance predictability**, as medical applications that run on edge resources face real-time constraints.
- **Self-adaptability** to cope with limited bandwidth, not only between IoT medical devices and edge servers, but also between edge servers and cloud datacenters (NoAH e-health).
- **Increased security/privacy**, thanks to the limited data movement/exchange between different platforms and layers.



Lead: TMA

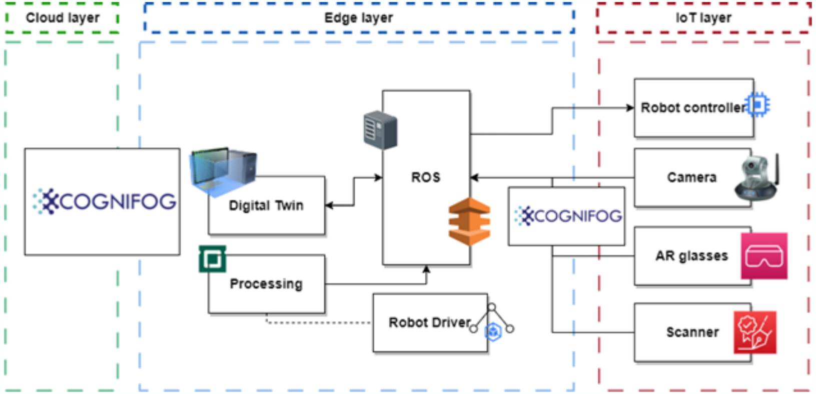
Automated Edge-Cloud Continuum for smart manufacturing

Concept:

This use-case aims at providing flexible mobile dual arm robots that are managed by **flexible IT infrastructure** that **maximizes the use of computing resources** in multiple dimensions, including throughput, prices, and energy savings, in order to construct shopfloors that can be dynamically reconfigured.

Benefits:

- **Flexible and reconfigurable** production
- **Safe coexistence** and collaboration of humans, cooperative robots, mobile robots
- **Dynamic work balancing** and resources redirection
- **Precise edge computing** and data monitoring
- **Scalability potential** with cloud infrastructure
- **Reduction in latency** of response
- Network **optimization**



Lead: PANEPISTIMIO PATRON (LMS)

Edge orchestration and video analytics

Concept:

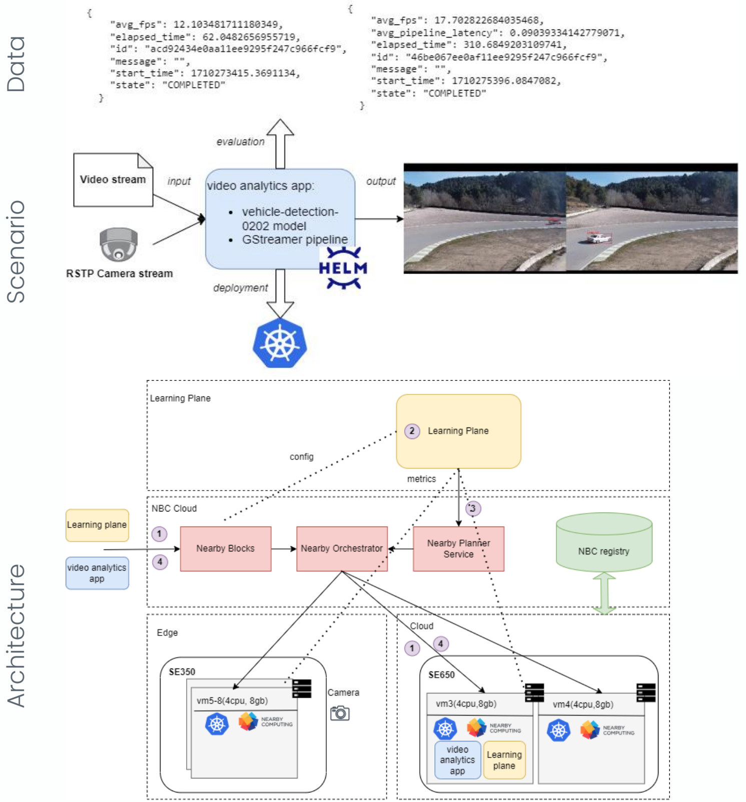
The use-case aims at providing **Smart Placement of Workloads** on Cloud-Edge infrastructure. It is focused on **distribution of video analytics load across Cloud-Edge** environments, on computing nodes with different capabilities and properties, such as high-performance vs. low-power, proximity to data and users vs. close to computing power in the Cloud, scalability through nodes vs. distribution across devices, etc.

It envisions a **learning-based smart orchestrator** to optimise resource usage for AI data and applications, on a transversal Edge environment or across Edge and Cloud.

Benefits:

This use-case provides benefits by advancing towards smart management of large-scale distributed computing systems:

- Optimize video analytics **application placement** based on the system and application metrics such as geographical latency, hardware computing capabilities, accelerators, and energy consumption.
- **Dynamically decision-making** for managing and migrating the application to achieve resource efficiency, energy efficiency or cost efficiency.



Lead: Barcelona Supercomputing Center

Metabolomics

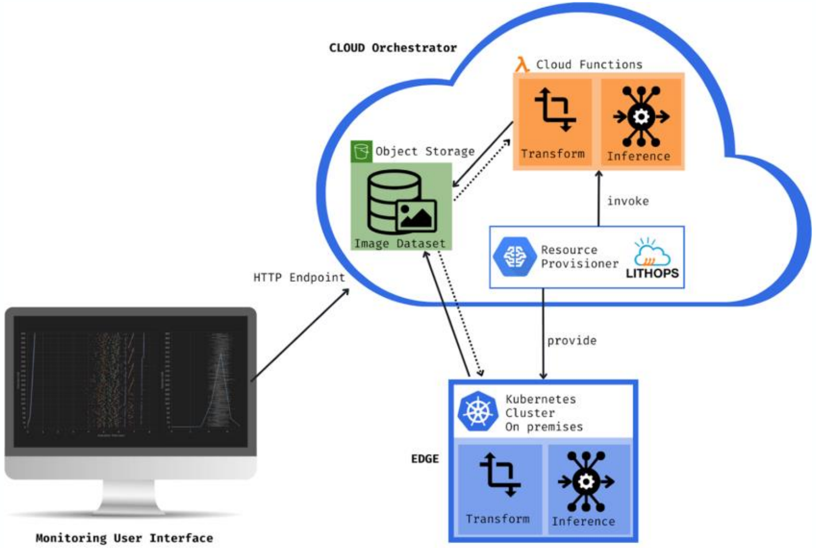
Concept:

This use-case aims at Integration of **serverless** cloud-edge processing to the off-sample service from the METASPACE platform. The new system manages the complete DL pipeline for image classification: load, transformation, and prediction, by finding the ``sweet spot" between the **cloud** and **edge** resources. An **AI-enabled orchestrator** provisions the right number of resources, either **cloud functions** or containers on an on-premise **Kubernetes cluster** equipped with GPUs.

Benefits:

The orchestrator leverages the best of the cloud continuum resources to achieve:

- **Elasticity:** The intelligent split between the cloud and edge enables the elastic processing of workloads by adjusting the pool of resources.
- **Cost-efficiency**: The solution is cost-effective by tapping into the pay-per-use model of serverless functions and the available resources on the edge, with or without hardware acceleration (e.g., GPU).



Lead: Universitat Rovira

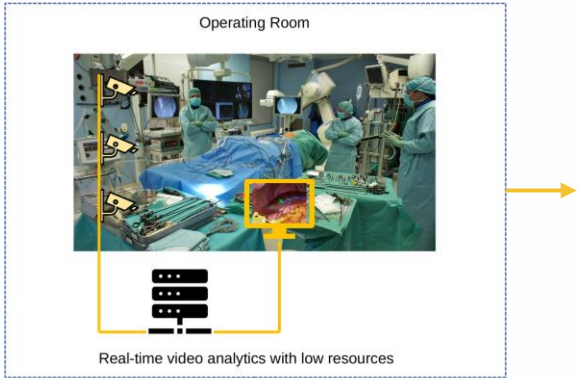
Surgery

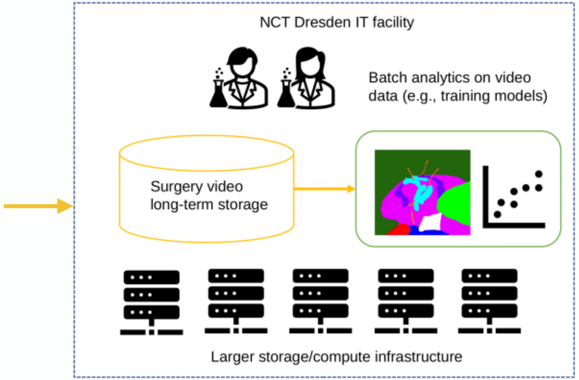
Concept:

This use-case harnesses the power of Pravega and GStreamer to revolutionize Computer-Guided Surgery (CGS) by optimizing **real-time data streaming** and management in **surgical environments**. By integrating these technologies, the system efficiently handles **high-resolution video** and **sensor data**, facilitating seamless and secure data flow between **cloud resources** and **edge devices** tailored for the demands of modern surgery.

Benefits:

- Leveraging Pravega and GStreamer ensures **highly scalable** and **efficient** data processing, capable of managing **extensive surgical data volumes** without sacrificing performance.
- It supports **dynamic resource scaling** and **minimal latency** in data handling, enhancing the operational efficiency of CGS systems.
- The technological synergy improves surgical outcomes by providing surgeons with **uninterrupted access** to critical **data-driven insights** and **real-time guidance**, ensuring a higher level of patient care and safety.





Lead: DELL Technologies

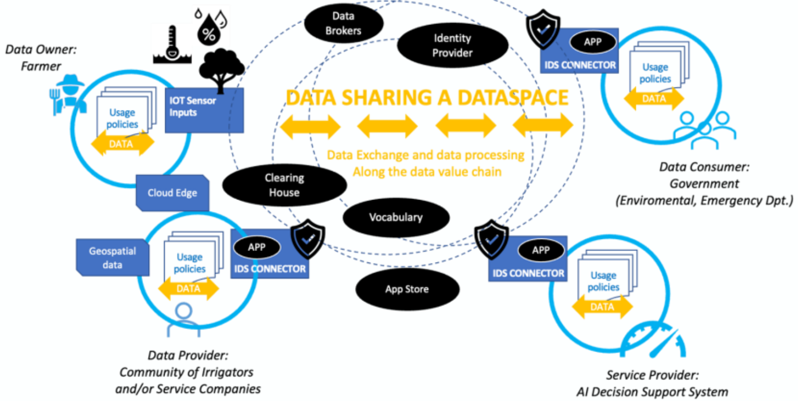
Agriculture IoT

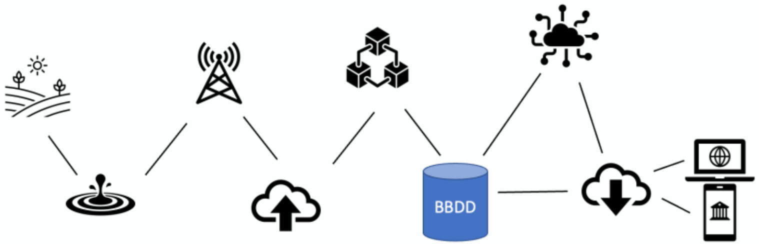
Concept:

Smart Agriculture seeks to standardize the use and sharing of **agricultural and environmental sensorization data**, through a data search and use platform for farmers, companies and governments. To achieve this objective, a **Cloudspace** will be developed capable of, on the one hand, integrating and understanding data that comes from sensors or edge services, and, on the other, offering access to them to third parties.

Benefits:

- **Internationalization of information**, through the use of data dictionaries
- Guarantees and **facilities for the search and use of data**
- **Independence** from sensor manufacturers
- **Promotion of the development of sector solutions** for the analysis and processing of information
- Ability to **analyze and integrate** agricultural and environmental information with external systems, including geospatial analysis.





Lead: Alterna Technologies

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