Knowledge Base

Smart Lighting System

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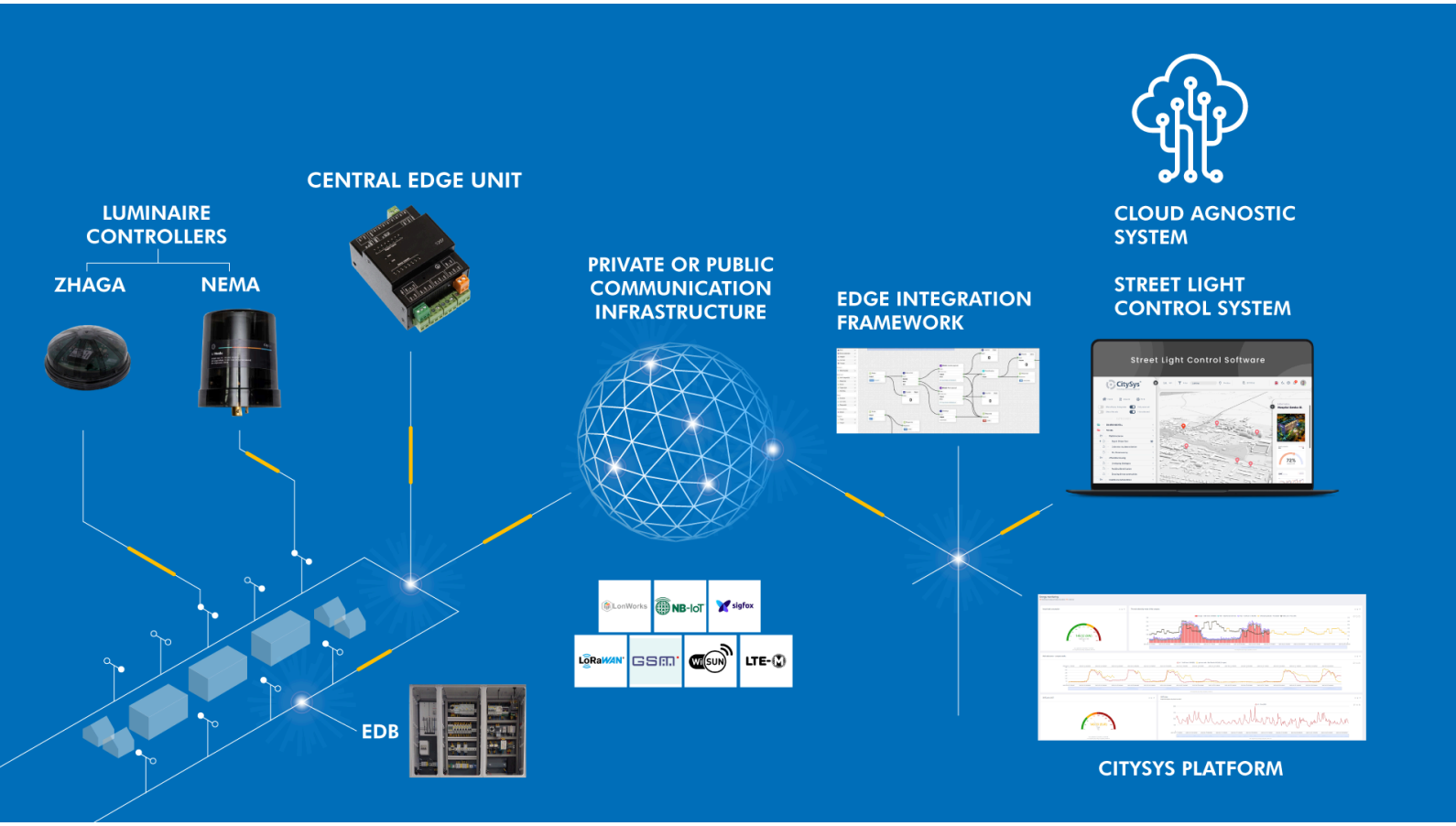
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1. Luminaire Controllers

Zhaga Sockets



Zhaga sockets with NB-IoT technology enable the creation of intelligent and economical street lighting systems that are more energy-efficient, sustainable, and cost-effective to maintain. By combining the interoperability of Zhaga sockets with the powerful connectivity of NB-IoT, cities can modernize their street lighting infrastructure, reduce energy consumption, and improve overall city management.

When considering usable SIM cards for Zhaga sockets with NB-IoT connectivity, the focus is on enabling reliable, low-power, wide-area communication for street lighting and other urban IoT applications.

Here's a breakdown of possible solutions and their difference

- *Standard Multi-Network IoT SIM Cards:*

These SIM cards provide broad coverage by connecting to multiple mobile network operators, ensuring reliable connectivity across diverse geographical areas.

They often feature flexible data plans tailored for low-bandwidth IoT applications, making them suitable for widespread deployments.

While offering excellent coverage, they may incur higher costs due to roaming charges and potential latency variations from network switching.

- *Single-Network Operator SIM Cards:*

These SIM cards are tied to a specific mobile network operator, offering stable connections within that operator's coverage area.

They can provide cost-effective solutions for high-volume deployments, especially when leveraging volume discounts.

However, their coverage is limited to the single network's footprint, making them less flexible for deployments spanning multiple regions.

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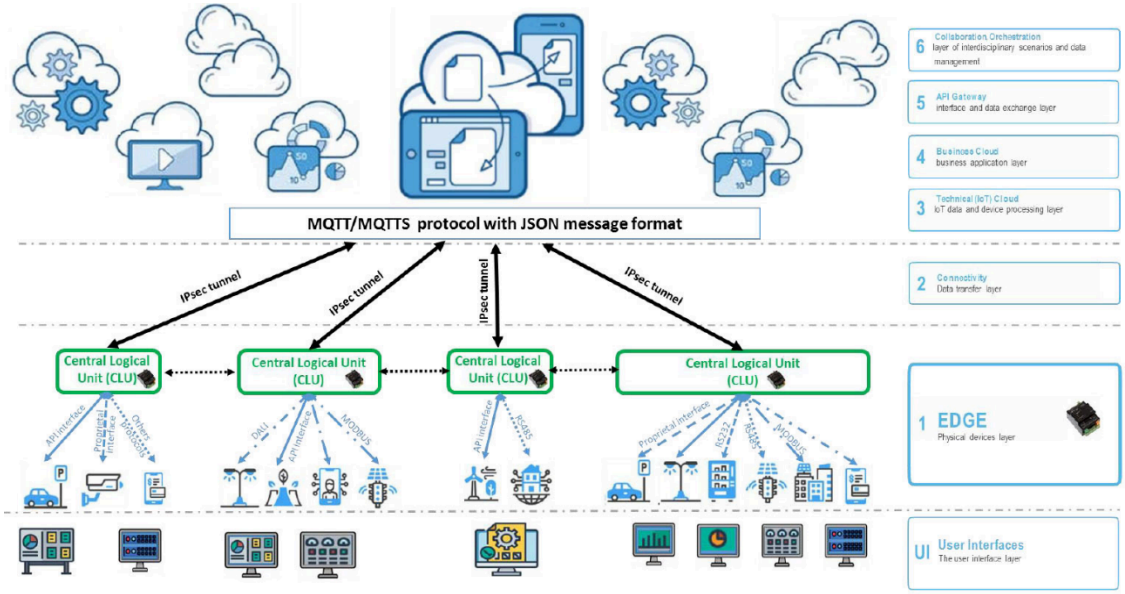
2. Central Edge Unit



The EDGE Unit S207 is a versatile programmable logic controller (PLC) and gateway designed for automation, control, and monitoring applications, allowing for a wide variety of systems to be connected to our system, enabling interoperability between multiple layers of city infrastructure. Its combination of digital inputs, relay outputs, and communication interfaces enables seamless integration with sensors, lighting fixtures, and management systems, allowing for automated and energy-efficient lighting control.

With its open-source software support and robust hardware design, the S207 provides a reliable and flexible solution for lighting automation projects.

With RS485, 1-Wire, and digital I/O, the S207 can integrate various devices like light sensors, temperature sensors, door contacts and smart lighting fixtures, creating a comprehensive control network.



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3. Electrical Distribution Boxes (EDB)

When considering electrical distribution boxes within a Smart City context, it's essential to understand their expanded role beyond basic power distribution. Here's a more detailed breakdown:

Role of Switch Boxes in Smart City Solutions:

- Centralized Control and Monitoring:
    - These boxes become hubs for gathering and transmitting data from various connected devices. In a Smart City, this could include lighting, environmental sensors, energy meters, or other IoT devices.
    - With modbus and one wire on an edge unit with back-end system integration, they can relay this data to a central management system, enabling real-time monitoring and remote control.
- Edge Computing:
    - Modern distribution boxes can house edge computing capabilities, allowing for local data processing. This reduces the load on the central server.
    - For example, a box could analyze sensor data to detect anomalies or trigger immediate responses, such as adjusting street lighting based on real-time traffic flow.
- Power Management and Optimization:
    - Smart distribution boxes can monitor and manage power consumption, optimizing energy efficiency.
- Enhanced Safety and Reliability:
    - They play a crucial role in ensuring the safety and reliability of electrical infrastructure.

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Electrical Distribution Box specifications (Construction, etc.):

- Materials:
    - they are constructed from durable materials like:
        - Polycarbonate: Offers excellent weather resistance and impact strength.
        - Stainless steel or powder-coated steel: Provides robustness and corrosion resistance.
    - The choice of material depends on the environment where the box will be installed.
- Enclosure Rating (IP Rating):
    - Crucial for outdoor applications, the IP rating indicates the level of protection against dust and water ingress.

        - For Smart City deployments, boxes with high IP ratings (e.g., IP65, IP66) are necessary to withstand harsh weather conditions.
    - Modular Design:
        - Many modern distribution boxes feature modular designs, allowing for easy installation and expansion.
        - This flexibility is essential for accommodating evolving Smart City requirements.
    - Internal Components:
        - They may contain:
            - Circuit breakers and fuses for overcurrent protection.
            - Relays and contactors for switching power.
            - Internet router and communication modules.
            - controllers for data processing and control.
            - Power supplies.
            - Lighting control MASTER NODE
- Other Considerations:
    - Security:
        - Distribution boxes may require security measures to prevent unauthorized access or tampering.
    - Standards Compliance:
        - They must comply with relevant electrical safety standards and regulations.
    - Connectivity:
        - They must have proper ports for cable entry and exit, and have the ability to house the antennas needed for the communications.

In essence, the modern electrical distribution box in a Smart City is a sophisticated device that goes far beyond simple power distribution. It's a critical component of the Smart City infrastructure, enabling data collection, control, and optimization.

Electrical Distribution Box types:

CitySys SMART Electrical Distribution Box

(6 outputs), ground mounted



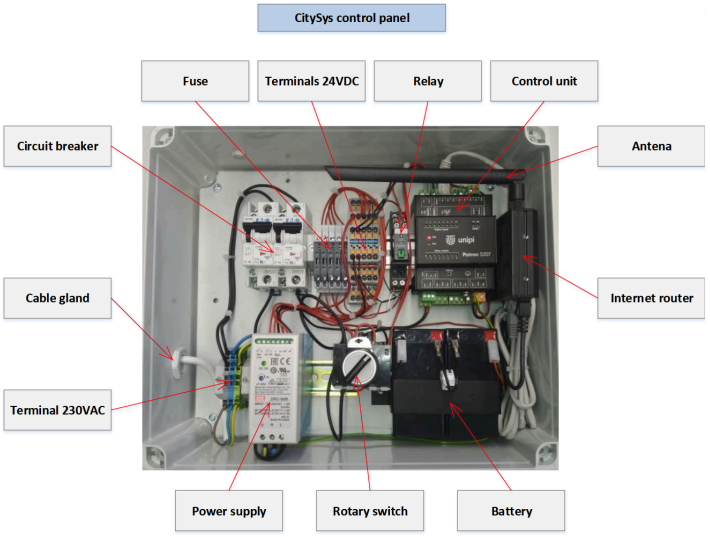
(2 outputs), ground mounted



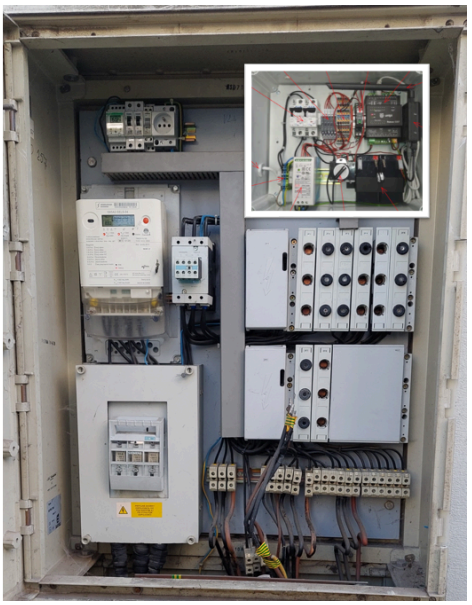
(4 outputs), recessed into the wall



CitySys Control Panel

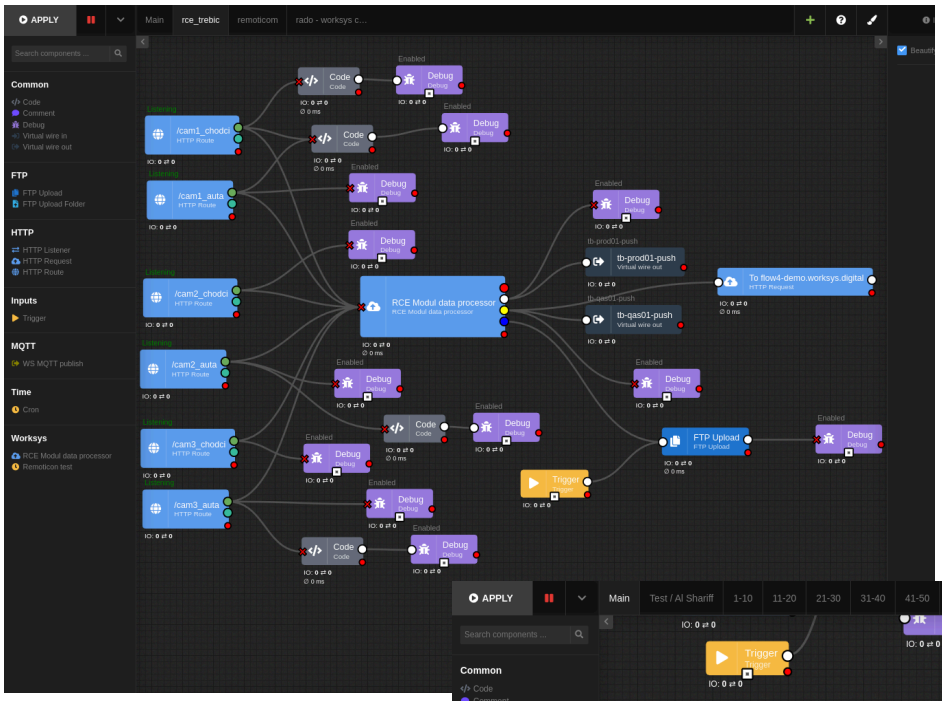


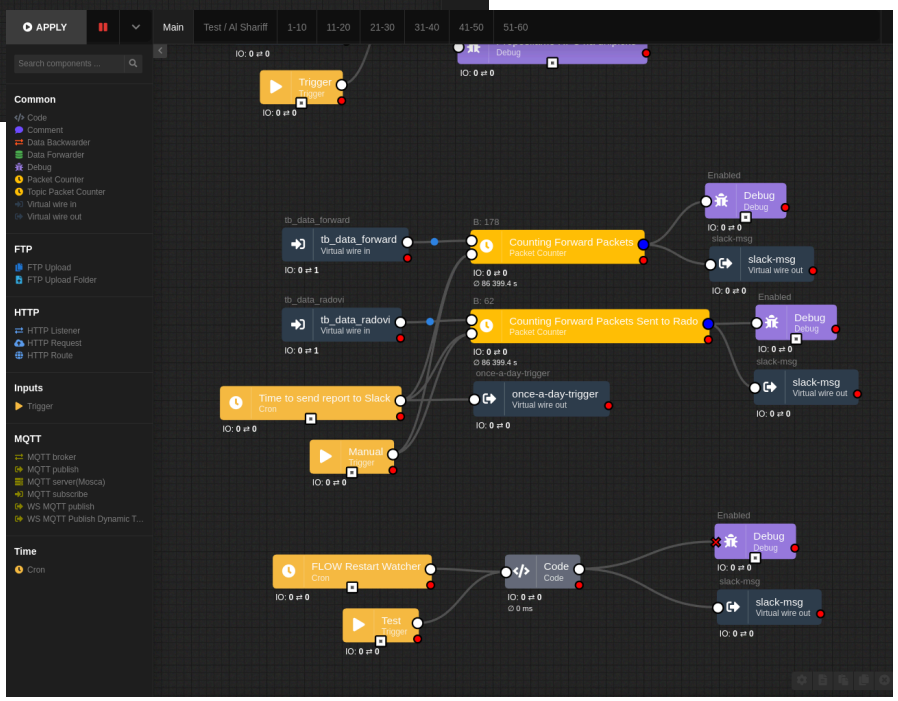
Control Panel installed inside the Electrical Distribution



4. CitySys EDGE integration framework

Integration backend is a set of services, programs and databases taking care of fast, reliable and proper data collection and processing. This framework excels in device integration by offering a visual, environment that simplifies complex data routing and protocol translation between diverse hardware. Its node-based structure allows for rapid prototyping and deployment, enabling seamless connectivity with IoT devices and various communication protocols. Furthermore, its real-time data processing capabilities and robust error handling ensure reliable and efficient integration within complex IoT ecosystems.



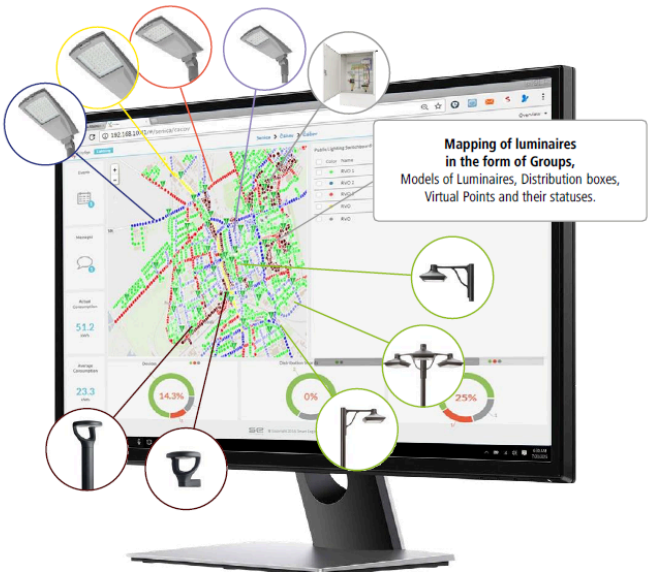


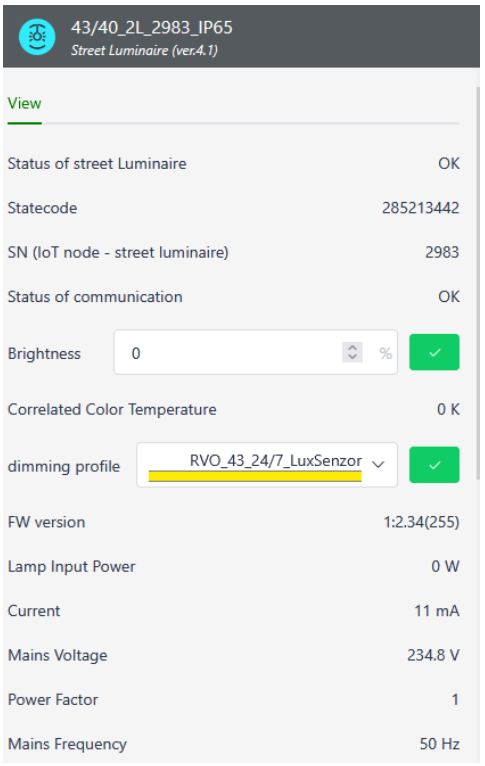
As practice has shown us for a long time, a well-constructed and efficient integration brings its indisputable benefits. Thanks to a well-chosen development environment, it will provide a fast, cost-effective software solution that can be applied directly near production facilities or through the connection of cloud solutions. However, the most important benefits are:

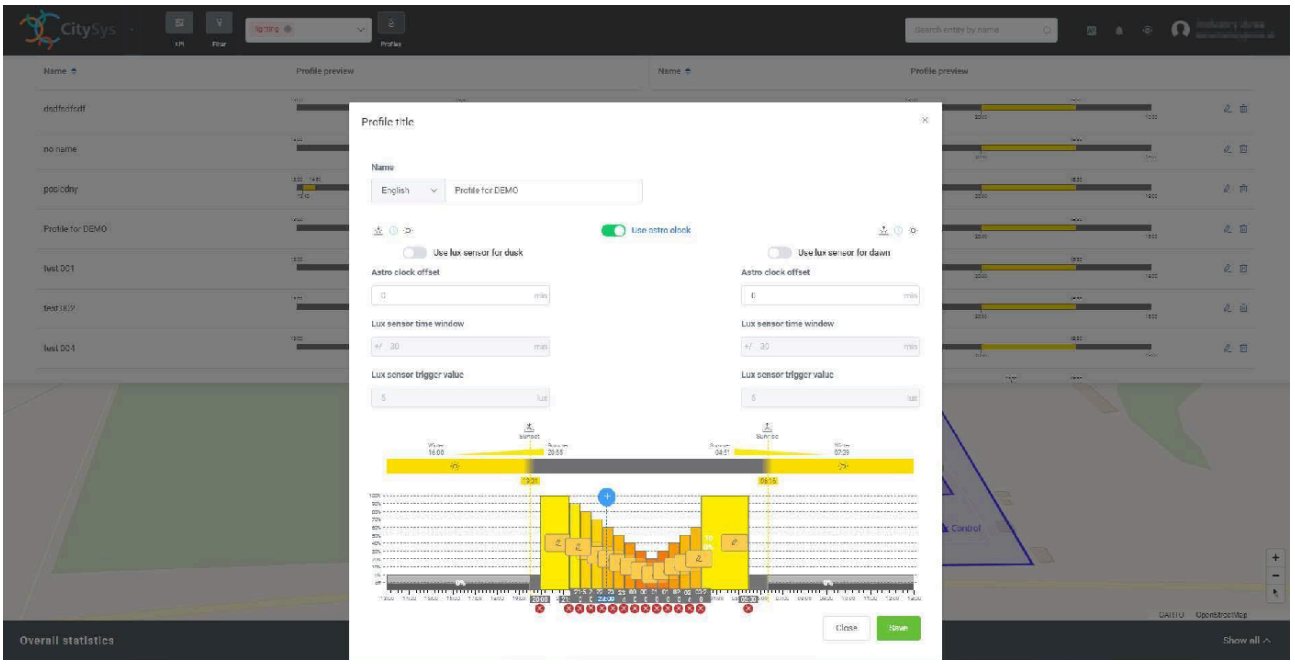
- It helps connect separate applications on one platform regardless of vendor or brand
- It helps connected (integrated) applications to mutually enrich each other with data and functionality
- It helps to quickly integrate and adapt all HW and SW news and thus leave the freedom of supplier choice to the user of the solution
- It helps integrated applications use more complex standards
- It allows maintaining the principle of replaceability of the component, hardware or software, without losing the overall functionality of the solution

5. Lighting Control system

An NB-IoT public lighting control system utilizes narrowband internet of things technology to remotely manage and optimize streetlights across a city. It enables precise control over lights, adjusting brightness based on time, traffic, or environmental factors, resulting in significant energy savings.







NB-IoT Technology

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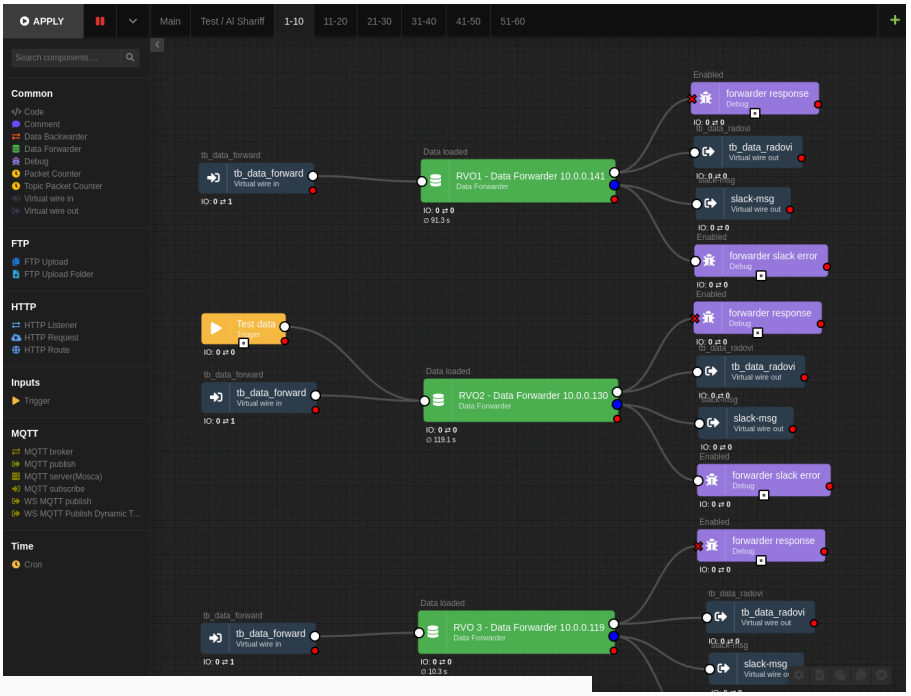
Our lighting control system also utilizes the Integration framework for:

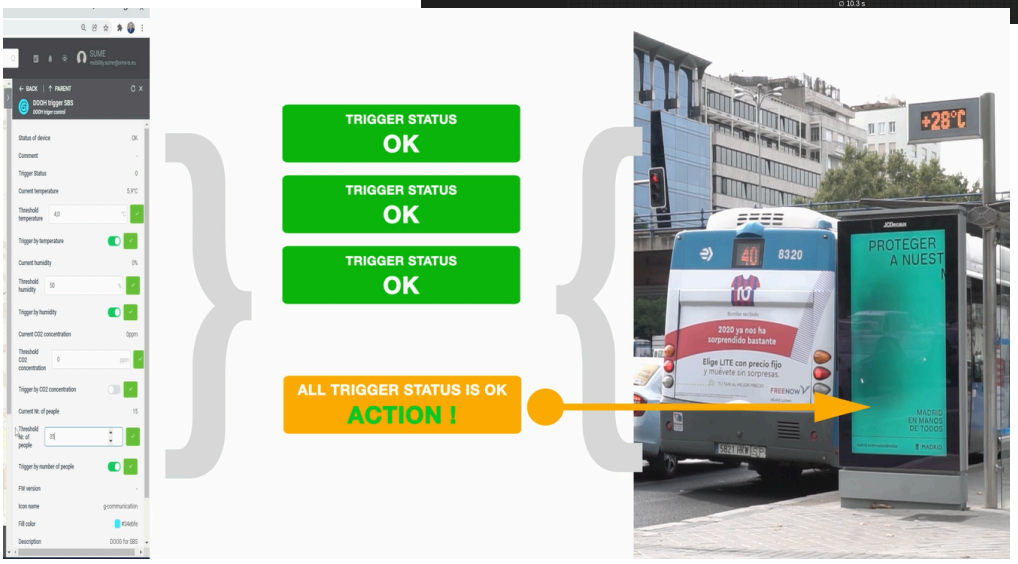
- **Triggers:** We use time-based triggers (e.g., sunset/sunrise) and sensor inputs (e.g., light level sensors) to control luminaires.

- **Data Processing:** Logic nodes evaluate the conditions for turning the lamps on or off. This can involve combining data from multiple sources, applying thresholds, and implementing custom logic. As well as processes all error states and reports them to the user immediately.

- **Actions:** Edge Computing unit communicates with the street lamp controllers to switch them on or off. This involves sending commands via a network protocol (e.g., MQTT, HTTP) or directly interacting with hardware.

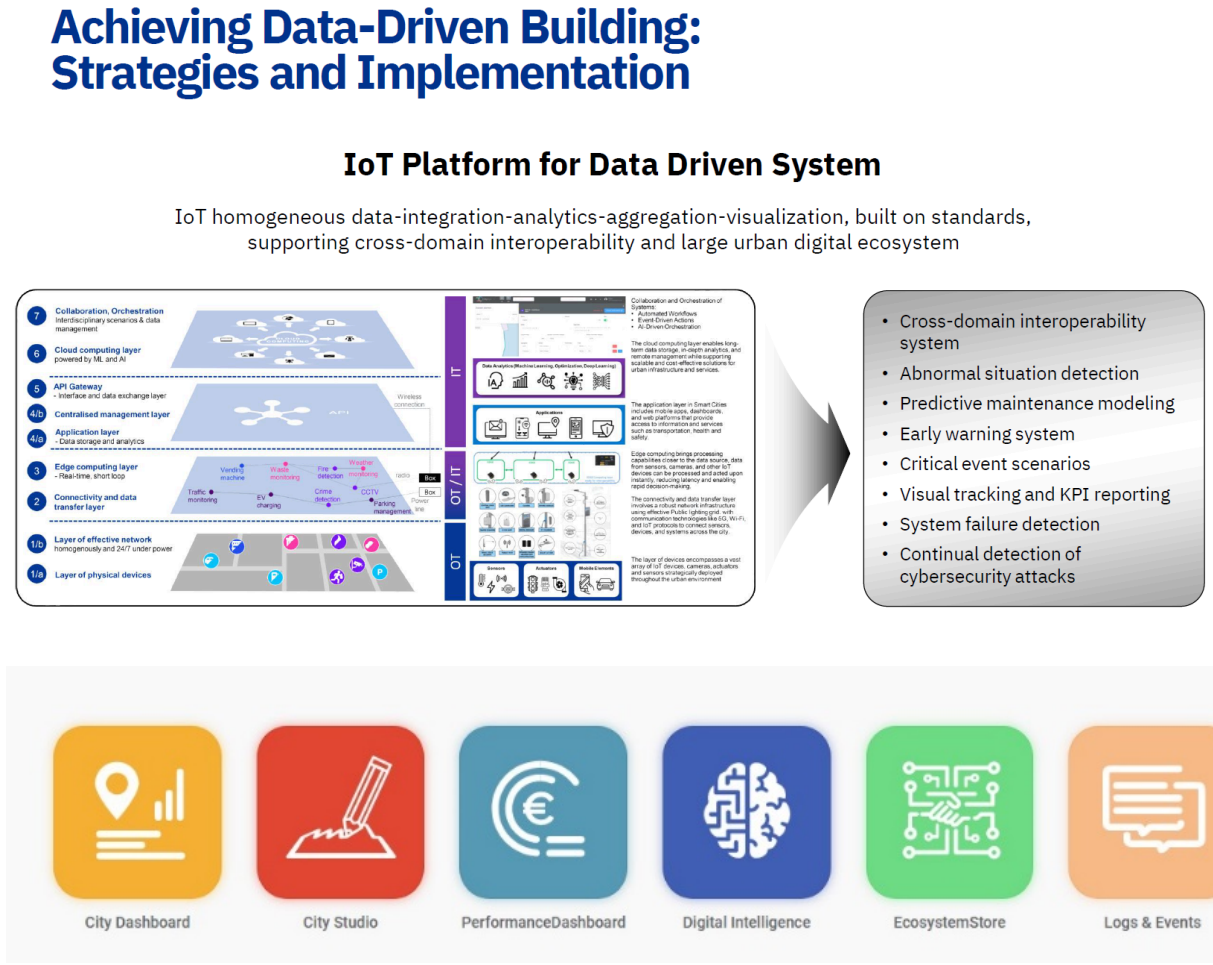
- **Monitoring and Management:** The framework seamlessly integrates with our system, sending real-time data to our database. This data fuels our website's comprehensive monitoring and management dashboard. From here, we gain complete visibility into the status of our flows and streetlight network. We can easily track performance, identify and diagnose any issues, and even implement remote control actions directly through the website interface. This centralized approach simplifies management and ensures efficient operation of our smart lighting infrastructure.



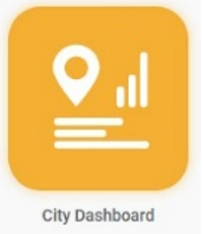


6. CitySys platform

CitySys is a smart city platform designed to centralize and manage urban data, enabling cities to optimize operations and improve citizen services. It integrates various city systems, such as lighting and waste management, into a single interface for efficient monitoring and control. CitySys aims to enhance sustainability and quality of life through data-driven decision-making.



City Dashboard



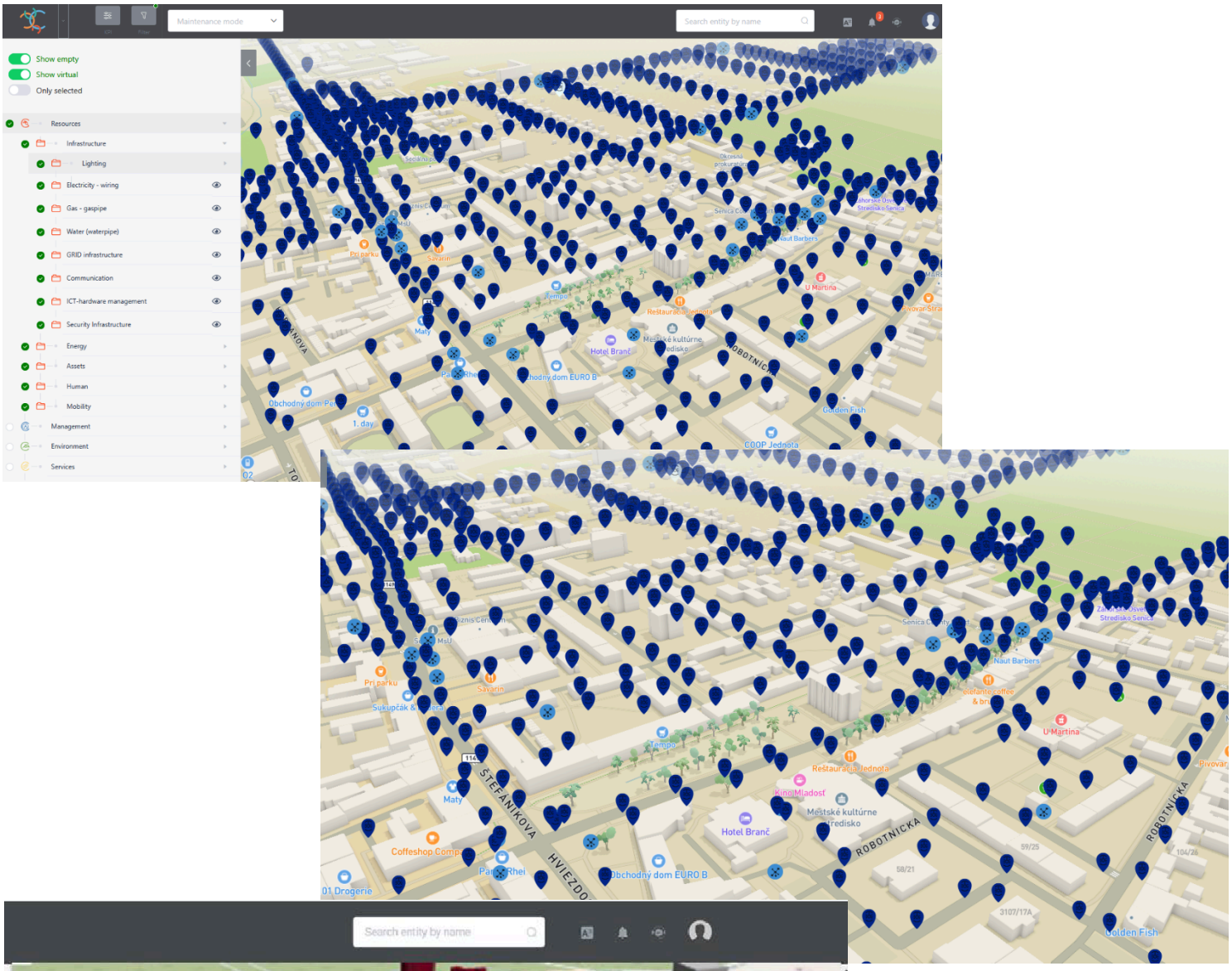
CityDashboard brings a living digital replica of a city that is continuously updated with real-time data and analytics on interactions between humans, infrastructure, and technology — offers a holistic view of the changes that take place in a city. By generating feedback loops of human-infrastructure interactions, CityDashboard as a Smart City Digital Twin enables city governments and planners to make hyperlocal data-driven decisions, incorporate community and stakeholder priorities, and evaluate policies and initiatives through early scenario analysis and prediction. Planners and city officials can benefit from integrating data through CityDashboard to ensure that smart technology investments will return maximum benefits.

City Dashboard - Basic overview of the system





Citysys Dashboard – dynamic 3D Digital Twin option



Performance Dashboard

The Performance Dashboard analytics interface is used to create graphs and statistics for the analysis of data collected from devices. The interface consists of individual boards that group graphs according to user preferences (typically they can be boards for different applications, different buildings, sections of the system). Boards can also be connected to the KPI statistics interface on the City Dashboard and shared with other users. It provides an overview of the operation of the entire lighting system in real time.

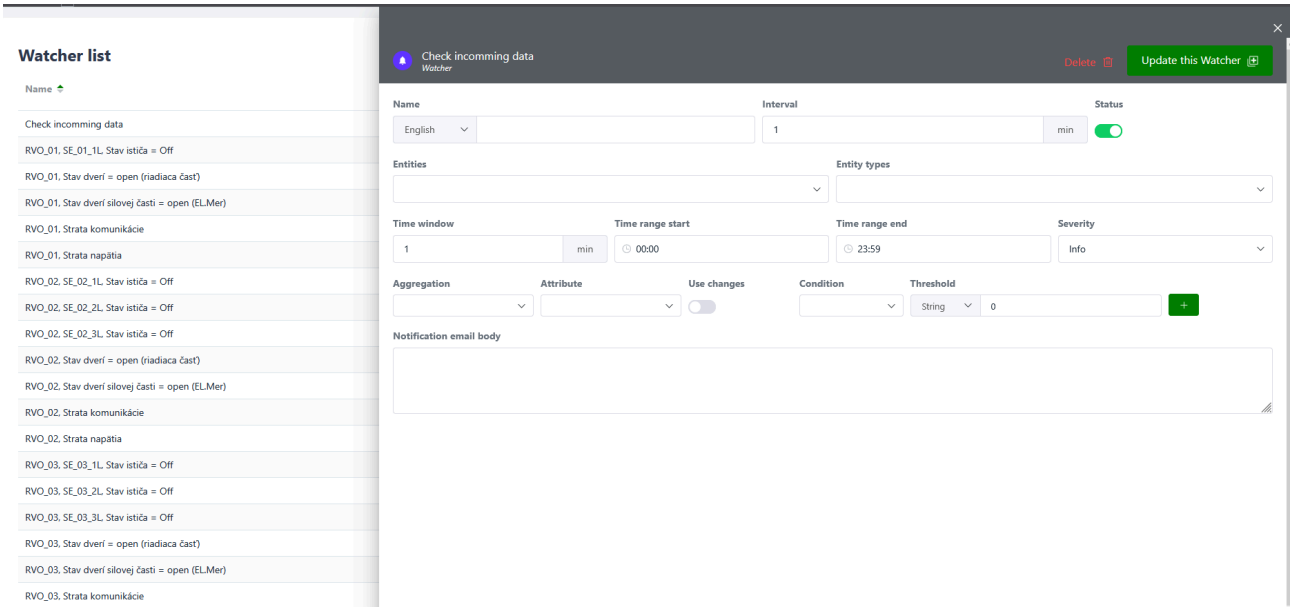






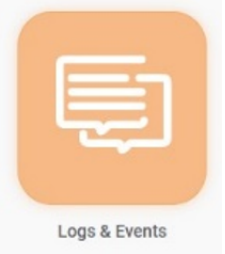
Watchers, Early warning systems

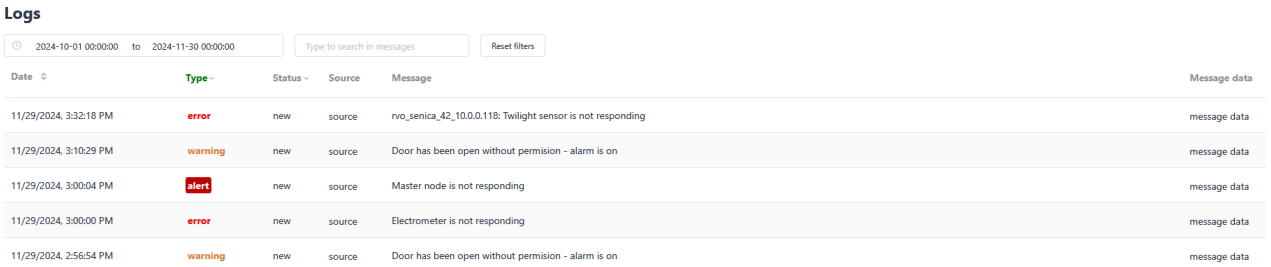
Within CitySys, "Watchers" are used to create alarms and early warning systems. When a Watcher is triggered, it initiates interoperable scenarios, activating other systems for automated responses. This enables cities to address anomalies and prevent negative impacts.



The Logs & Events

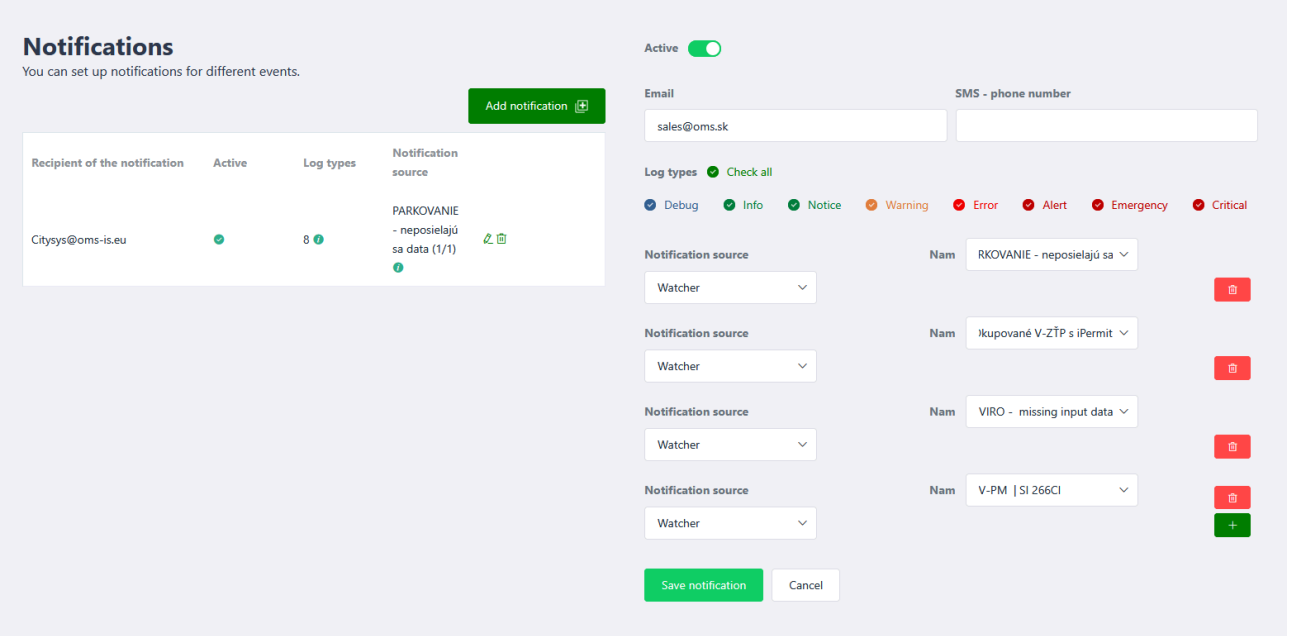
Application is used to collect notifications from the platform and devices. The application includes a tabular overview of notifications with a filter. Displayed notifications can be filtered by date (range from / to) and it is also possible to search for text in notifications.





Notifications

In this section you can setup alarms to a defined e-mail address or via SMS to a given telephone number to receive a notification on watcher trigger. The introductory view shows an overview of the set notifications. A new notification can be added via the Add notification button.



For more information about platform please check the links bellow:

Citysys platform – User manual

https://help.iotsys.space/citysys/en/user-manual-citysys-3/#logs-and-events

CitySys platform benefits and differentiators

https://drive.google.com/file/d/1KgdT25e_Cv5_T2w9UPQ7QmXKIWDhxccH/view?usp=sharing

CitySys web

https://online.citysys.space/