

# Kodeno & Blue Wire

The Alliance of Network Engineering  
and Sovereign Edge Computing

2026 - Portfolio

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**BY**  
Blue Wire

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# Applied Expertise



## From Network Engineering to Field

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Our Applied Expertise

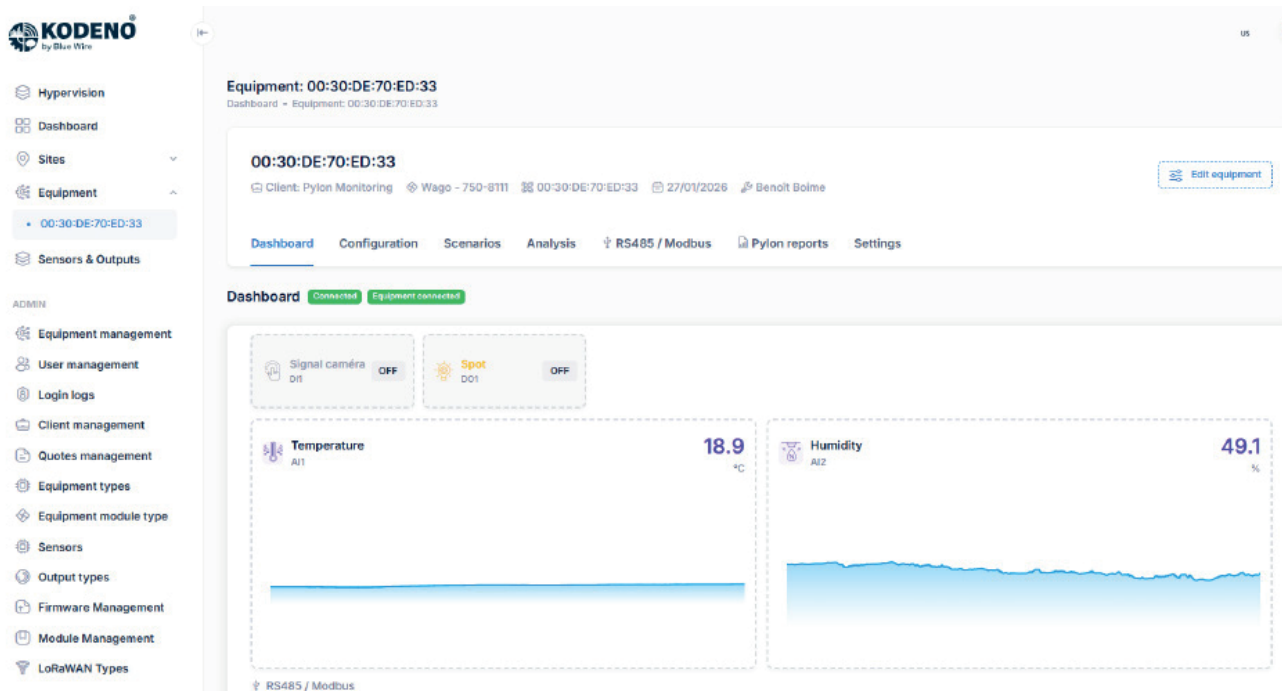
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*"True software intelligence is measured by its resilience when the network code faces the physical field."*

— Blue Wire Engineering Principle

At Blue Wire, we don't just design software — we guarantee its performance under real-world conditions. This portfolio highlights Kodeno, our proprietary Industrial IoT platform, through concrete, field-proven business applications across France and Luxembourg. From deep network audits to autonomous Edge computing and cloud-based AI, discover how we translate complex industrial challenges into reliable, everyday operational solutions.

# Strategic Vision



## The next level of Industrial IoT

In a rapidly changing industrial landscape driven by digital transformation, connectivity and real-time data availability have become critical assets. However, traditional IoT architectures suffer from a major structural vulnerability: their intelligence is entirely centralized in the Cloud. If the network connection is lost, the local facility becomes «blind» or stops altogether, generating significant operational losses.

**Blue Wire**, a recognized expert in network engineering and technological integration in Europe provides the answer to this critical challenge through the Kodeno concept.

# The Solution

## Edge Computing and «Survival Mode»

Our hybrid approach combines the analytical power of the Cloud with the imperative responsive

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**01**

### In Nominal Mode

Global supervision, historical data logging, and visual configuration of business scenarios are managed centrally in the Cloud.

**02**

### Survival Mode (Autonomous Edge)

Once defined, operational scenarios and logical rules are automatically provisioned and executed locally on the physical controllers (PLCs) of the facility. In the event of a complete internet outage, the local infrastructure continues to operate with 100% autonomy and safety

# Operational Synergy

## From Design to the Field

The strength of our value proposition lies in the vertical integration of software expertise (Kodeno) and physical infrastructure engineering (Blue Wire). We do not just deliver software, we guarantee its operational performance under real-world conditions.

### Blue Wire: Design Office & Custom Application R&D

While Kodeno provides the software foundation and supervision architecture, Blue Wire acts as the specialized design office to engineer and develop your specific applications:

- Specification and development of complex logical scenarios tailored to your industry
- Custom function block programming for your PLCs (Programmable Logic Controllers)
- Creation of dedicated integration scripts to interface with your ERPs, enterprise software, or third-party APIs (Enedis grid data, weather APIs, etc...)

### On-Site Deployment & Hardware Integration

A robust Edge Computing solution requires flawless physical deployment. Our Teams support you from start to finish:

- Audit & Preparation: Retrofit analysis of existing networks and validation of communication topologies
- Support for On-Site Commissioning: Installation and connection of industrial gateways, physical wiring of PLCs, electrical cabinet integration, and electromagnetic immunity testing.
- Wireless Optimization: Deployment and coverage measurement of LoRaWAN networks, industrial 4G/5G, or proprietary microwave links

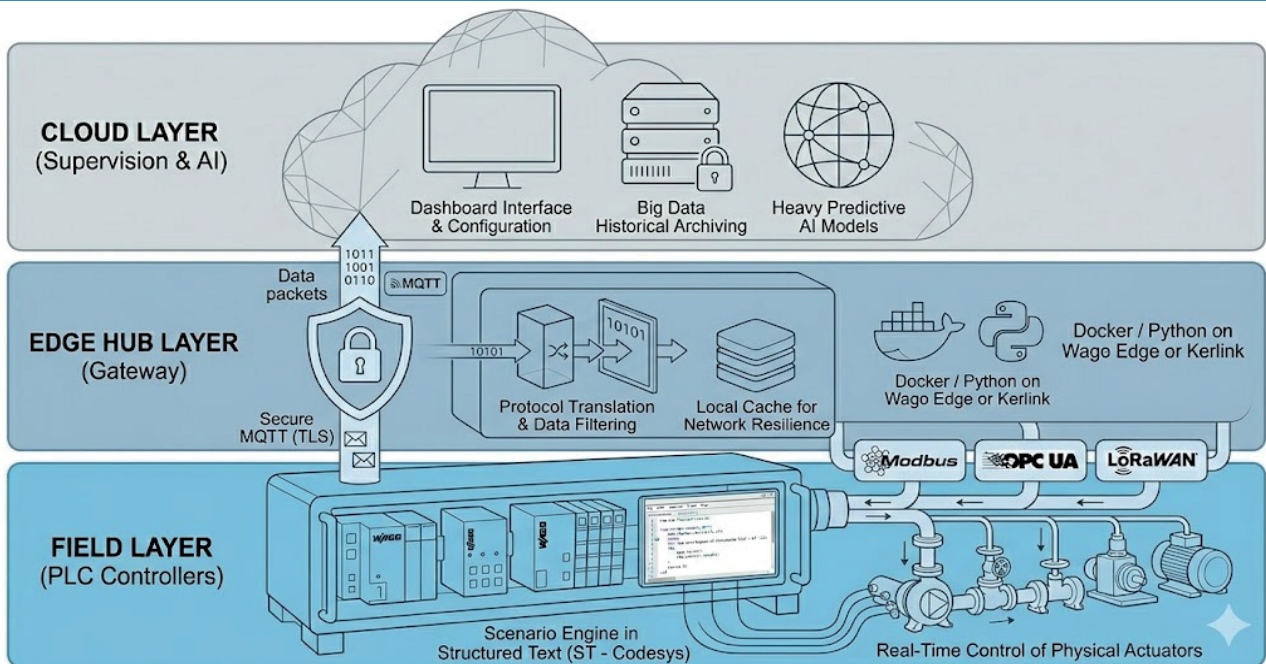
### Field-Proven Technical Support

Because industrial IT (OT) is vastly different from office IT, our support team stands out due to its dual IT/OT expertise:

- Pragmatism & Responsiveness: Our engineers and technicians are accustomed to construction sites, factories, and isolated technical facilities
- End-to-End Diagnostics: Faced with a communication failure, we can distinguish between a code anomaly, electrical noise on an RS-485 bus, or a physically damaged cable
- We speak the same language as your maintenance technicians to resolve issues quickly and minimize your downtime

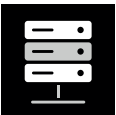
# Three-Tier Technical Architecture

The Kodeno ecosystem relies on a hardened, three-tier architecture that communicates seamlessly via the secure MQTT protocol and highly optimized JSON payloads



## The Cloud (Supervision & Macro-Analysis)

Centralizes key performance indicators (KPIs), alerting systems, and hosts the main MQTT Broker under SSL/TLS encryption. It also runs heavy artificial intelligence algorithms (preventive maintenance, weather-production correlation).



## The Edge Hub (The intelligent Gateway)

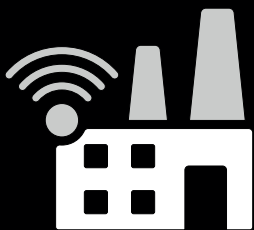
A local transit node configured on reliable industrial hardware (Wago Controller or Kerlink Gateway). It hosts a local MQTT Broker (Mosquitto), manages stream encryption, queries third-party APIs via HTTPS/OAuth2 (e.g., Enedis, weather data), and decodes heterogeneous sensor frames.



## The Field (Decentralized Execution)

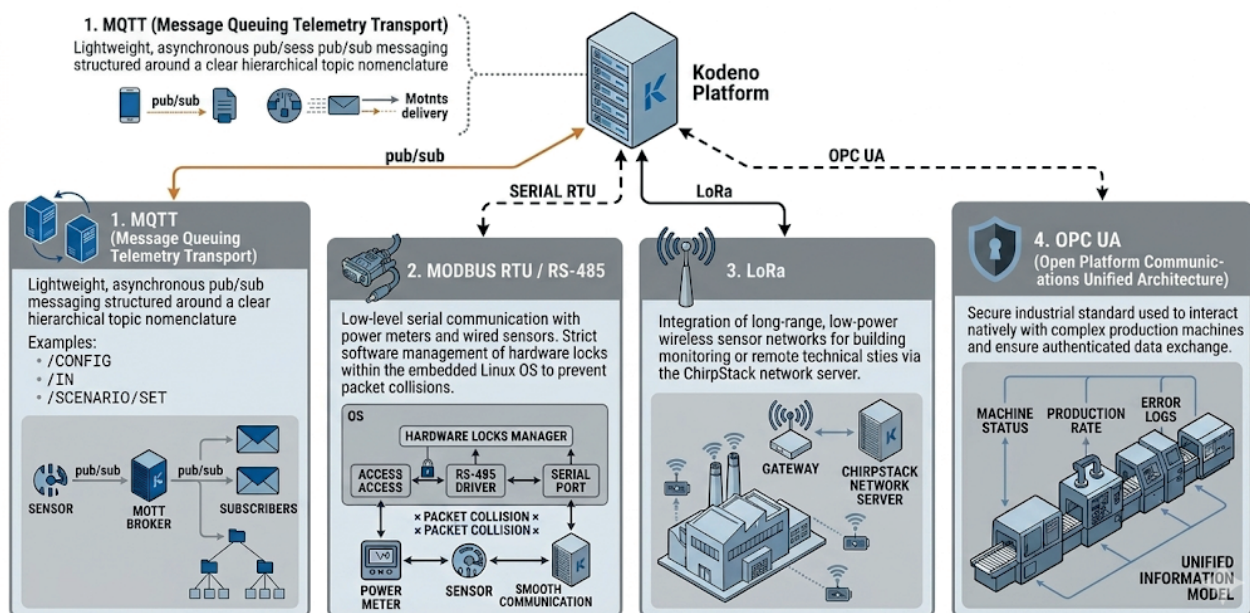
Industrial Programmable Logic Controllers (PLCs) from Wago, programmed under CoDeSys V3 (IEC 61131-3 standard). The software core relies on an exclusive function block, the FB\_ScenarioEngine, developed in Structured Text (ST). This engine parses complex JSON at each PLC cycle using an optimized SAX-type parser (preserving RAM) and can evaluate up to 50 nested logical scenarios of type: IF (A and B) Then C else D

# Mastered Protocols & Connectivity



To guarantee total interoperability with brand-new and legacy equipment (Retrofit), the Kodeno platform natively supports standard industry 4.0 protocols

## GUARANTEEING TOTAL INTEROPERABILITY WITH LEGACY & BRAND-NEW EQUIPMENT (RETROFIT)



# Code Rigor & Industrial Standards

To guarantee the reliability of our deployments, software development at Blue Wire & Kodeno rejects generic IT practices in favor of critical industrial standards:

## ⦿ Zero Dynamic Allocation

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To prevent runtime crashes or memory leaks, the PLC code is entirely static. Array sizes and data structures are pre-allocated at startup.

## ⦿ Watchdog Supervision

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All communication scripts and routines (Python, Bash) integrate hardware and software Watchdog. If a process hangs, the system restarts securely without affecting the PLC's core control logic.

## ⦿ Local Storage & Data Continuity (Anti-Outage Backup)

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To eliminate the risk of data loss during offline phases (Survival Mode), all field-acquired data is saved to an on-board memory card. Depending on data density and collection to the Cloud once the connection is restored.

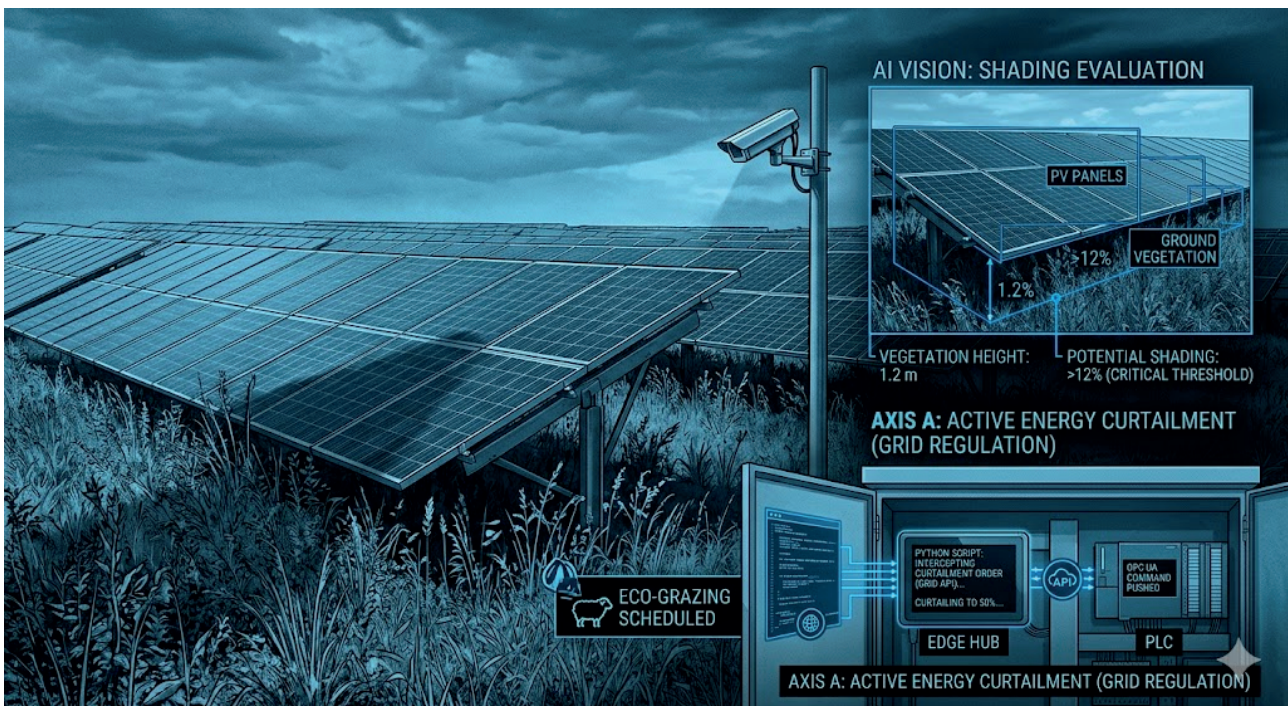
## ⦿ Strict Separation of Concerns

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Hardened modular architecture under IEC 61131-3, isolating physical input acquisition (Kbus Scan), logical decision execution (Scenario Engine), and network communication layers (MQTT/Modbus).

# Smart Grid & Solar

## Network Regulation & AI-Powered Yield Optimisation



This vertical consists of two complementary axes designed to maximize production efficiency and compliance

### Axis A - Active Energy Curtailment (Feed-in Tariff Compliance)

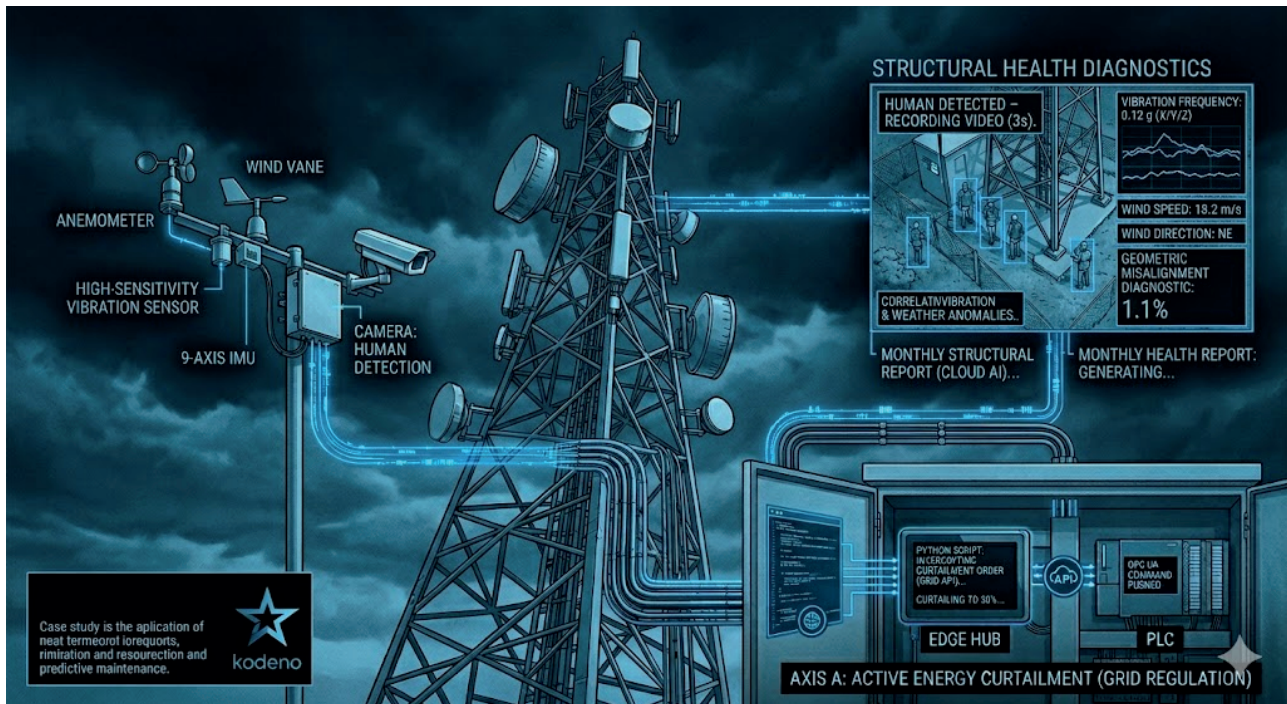
- Challenge: Adjust the generation output of a commercial solar or wind site in real-time according to emergency curtailment signals sent by the national transmission grid (e.g., Enedis)
- Solution: A secure Python script hosted on the Edge Hub authenticates via OAuth2 with the grid API to intercept curtailment orders.
- Intelligence: The Edge Hub instantly pushes a secure OPC UA command to the PLC, modulating production to ensure strict regulatory compliance and financial optimization.

### Axis B - Photovoltaic Yield Optimization (AI Vision)

- Challenge: Excessive vegetation growth (weeds, wild grass) around ground-mounted solar panel structures can cast shadows, reducing plant yield by over 10% and causing destructive thermal hotspots on solar cells.
- Solution: Automated image analysis using industrial cameras strategically positioned and triggered by the field PLC.
- Intelligence: The image is captured locally, and a computer vision (AI) model evaluates vegetation height and potential shading on the PV modules. If a critical threshold is breached, the Koden system automatically triggers a targeted alert and schedules maintenance (e.g., mechanical mowing or notifying partner livestock farmers for eco-grazing), optimizing both power output and landscape maintenance costs.

# Telecoms

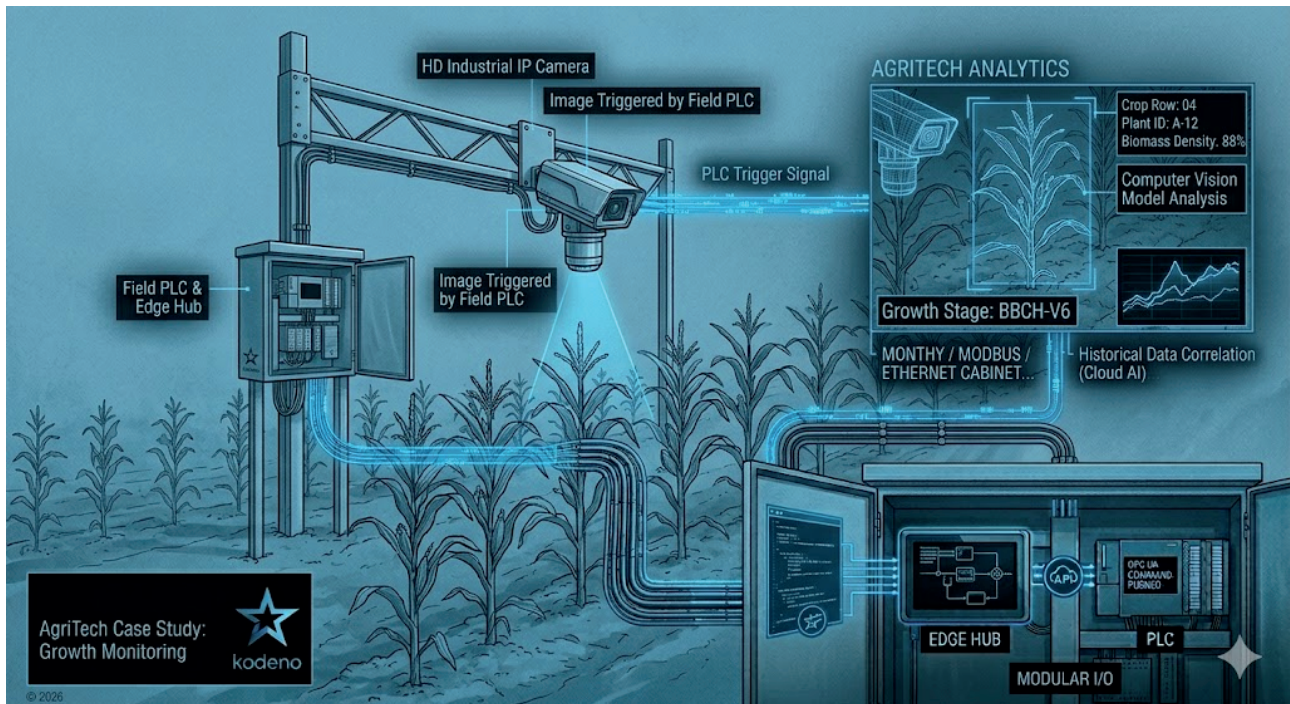
## Structural Health Monitoring of Towers



- Challenge: Continuously monitor micro-movements, vibrations, and physical stress on telecom towers without installing invasive and complex measurement devices.
- Solution: Deployment of a specialized sensor chain mounted and connected via an industrial RS-485 serial link:
  - A wind vane and anemometer to acquire instantaneous wind speed and direction.
  - A 9-Axis Inertial Measurement Unit (IMU with embedded accelerometers, magnetometers, and gyroscopes).
  - High-sensitivity vibration sensors coupled with accelerometers.
  - A hardened, high-definition outdoor IP camera with night vision.
- Intelligence & Reporting:
  - Automated Monthly Report: Field data is historicalized and analyzed by a Cloud-based AI to output a monthly structural health report. This process correlates global vibration activity with weather anomalies to identify exact geometric misalignments (and subsequent signal loss) of microwave communication links.
  - Intrusion Detection & Intervention Monitoring (Edge AI): The video stream is processed locally on the Edge Hub using an AI model trained for human recognition. The system triggers immediate alerts in the event of an unauthorized intrusion near or on the tower, while providing remote operators with real-time visual verification to monitor and secure technical interventions by authorized field crews.
  - Predictive Maintenance (R&D): A third AI model is currently being trained with historical field data to predict structural impacts and critical deformations on towers during extreme storms or high-wind events.

# Agritech

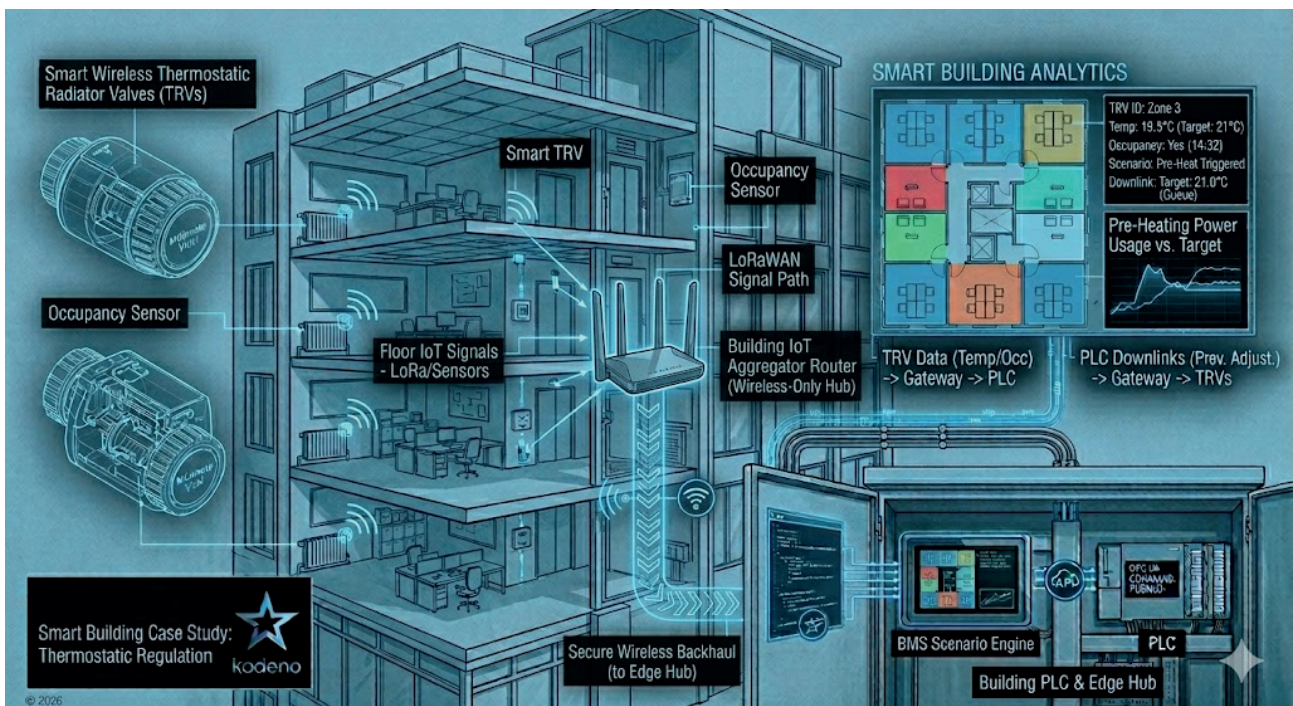
## Automated Growth Monitoring via Computer Vision



- Challenge: Remotely and accurately assess biological crop development, biomass density, and microclimatic soil health to optimize irrigation, water management, and fertilizers without requiring frequent, time-consuming field visits by agronomic experts
- Solution: A hybrid field telemetry and imaging station deployed and integrated by Blue Wire:
  - An industrial high-definition IP camera synchronized and triggered directly by the field PLC.
  - A complete physical sensor array connected directly to the PLC: Pyranometers (measuring solar insolation and radiation), Volumetric Soil Moisture sensors (FDR technology), Soil Temperature sensors, Leaf Wetness sensors (to predict pathogen risks), and Soil NPK sensors (Nitrogen, Phosphorus, Potassium).
- Intelligence & Deep Analysis:
  - Visual Phenological Analysis: On a specific schedule or upon precise meteorological triggers, the PLC captures a high-resolution snapshot. The image is encrypted and pushed to the Cloud via the Edge Hub, where a Computer Vision model automatically determines the crop growth stage on the international BBCH agronomic scale.
  - Advanced Sensor Fusion: The Kodeno platform correlates the plant's visual growth stage with real-time soil dynamics (humidity, temperature, nutrient levels) and atmospheric parameters (insolation, leaf wetness). This deep data fusion allows for highly precise agronomic diagnostics.
  - Closed-Loop Automation: Based on this analysis, the PLC dynamically adjusts localized drip irrigation and schedules custom fertilization inputs, maximizing crop yields while minimizing environmental impact.

# Smart Building

## Intelligent Thermostatic Regulation via LoRaWAN



- ⦿ Challenge: Optimize heating consumption across large office complexes or logistics warehouses while maintaining perfect thermal comfort for occupants.
- ⦿ Solution: Integration of smart wireless Thermostatic Radiator Valves (TRVs, e.g., MClimate Vicki) over a local LoRaWAN gateway.
- ⦿ Intelligence: Temperature and occupancy data are continuously transmitted to the PLC. The controller processes these inputs via its local scenario engine and dynamically issues preventive temperature adjustments (Downlinks) to each individual zone.

**What can Kodeno  
do for you?**

**Your contact**

[kodeno.fr](http://kodeno.fr)



Bridging the gap between complex  
network engineering and the field  
reality

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