

How Gemmo S.p.A. Used N3uron to Create a Fully Integrated Energy Management System (EMS)

[Gemmo S.p.A.](#) — founded in 1919 and based in Italy — designs, installs, and operates technological systems and provides facility management services for highly complex public and private facilities. These include buildings that have important strategic functions, buildings whose use involves significant crowding, and energy infrastructures. Gemmo’s expertise and engineering capabilities increase the value of airports, hospitals, shopping centres, roads and tunnels, railway stations, government buildings, industrial plants, and cultural heritage sites as functional and service assets.

To improve energy and environmental performance of the buildings and facilities it constructs and manages, Gemmo develops and applies technical solutions such as Energy Management Systems (EMS) and Building Automation and Control Systems (BACS). These are monitoring — data collection and analysis — systems that optimize and reduce energy use, improving energy efficiency to reduce facilities’ energy costs and environmental footprint.

EMS and BACS process a vast amount of data in real time to detect faults and enable timely, or predictive, action. These systems provide the foundation for decision making: the measurement of field data that — thanks to the IoT and data analytics — is then made available, according to the different outputs and degrees of depth, to the various company functions.

The Challenge

In late 2021, Gemmo’s Business development and Innovation Manager decided to conduct a feasibility study for the development of an advanced Energy Management System (EMS) coupled with a Business Intelligence (BI) platform for the compa-



ny’s own internal use. In early 2022, management approved the study and project implementation began, with the project code-named E.BIG (which stands for Energy Business Intelligence by Gemmo).

Gemmo aimed to make its processes more efficient through digitalization. This was essential to fulfill the commitments of its Energy Performance Contracts (EPC), whose goal is to optimize energy consumption in all its forms, such as heat, power, and other energy sources. Therefore, it was vital for the company to equip itself with an Energy Management and Business Intelligence system enabling energy consumption data collection, visualization, and analysis in real time and on a historical basis, to guide the implementation of efficiency measures and the achievement of specific energy-saving objectives both for the company and its customers.

Data collection would have to happen by means of smart metering devices, employing both industry-standard protocols and IoT protocols, so a flexible data gateway was needed. Given Gemmo’s long-standing expertise in systems integration, they decided to build their own integrated hardware/software solution, the Gemmo EMS Gateway, powered by N3uron.

Solving pain points

Gemmo chose N3uron for its flexibility, especially the modular licensing model with unlimited tags, the wide variety of communication protocols supported, its ability to run on heterogeneous hardware and, last but not least, the pricing.

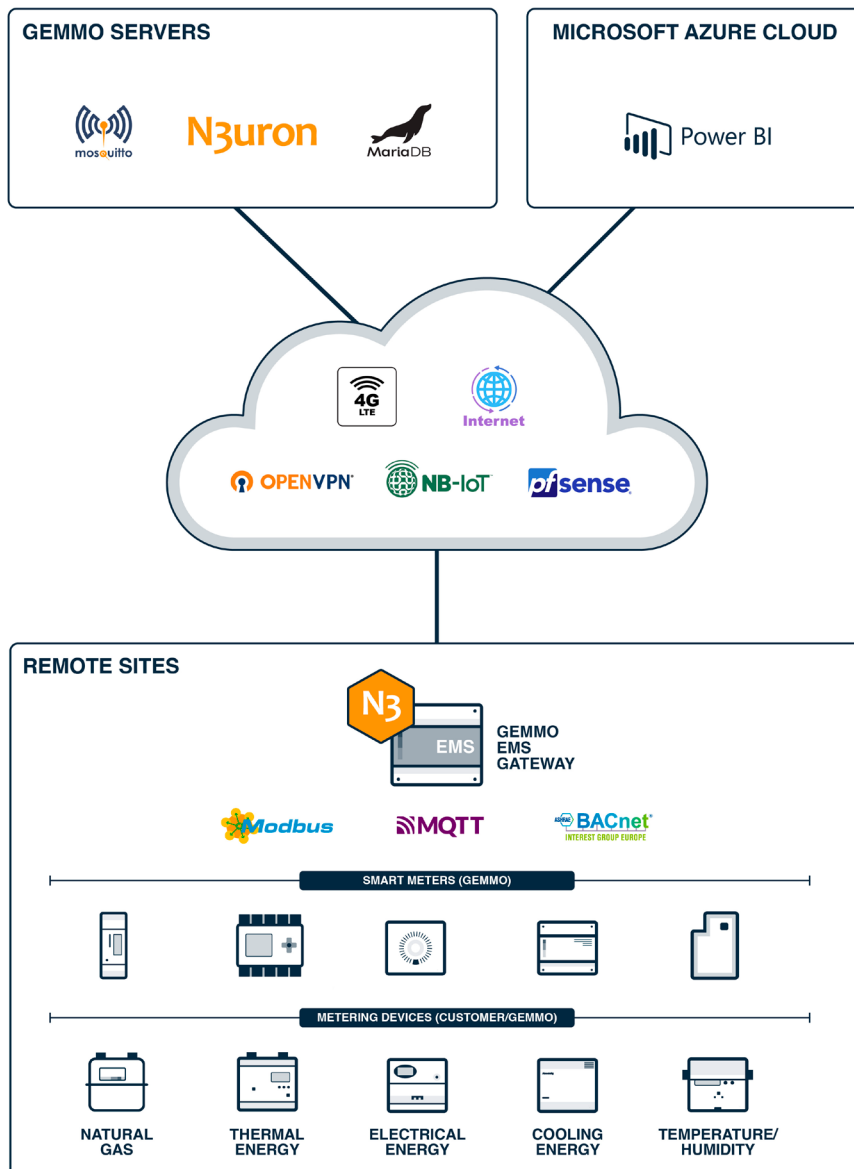
Many things may go wrong in a complex and distributed data collection system: metering devices may fail or be misconfigured, communication lines may go down, and the gateway itself could fail. So data collection needs to be constantly monitored, and data quality must be assessed before feeding it into the BI system.

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vices (such as our own EMS gateways) and larger, more powerful servers, and which could seamlessly scale from tens to hundreds of thousands of tags. N3uron’s flexibility allowed us to use the same product on both the remote EMS gateways and the central servers, greatly simplifying licensing and configuration management,” said Alessandro Sala, Senior Software Engineer at Gemmo S.p.A.

Energy Business Intelligence by Gemmo (E.BIG) architecture

The project scope encompassed one relational database server; 106 sites and some 250 devices (with more sites and devices to come); and 14 nodes with 10-1000 tags/node. The architecture is multi-layered as shown below.



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At the lowest level, on each site there are several metering devices (both smart and “dumb”) and one or more N3uron-powered Gemmo EMS Gateways.

Metering devices are constantly measuring energy flows, while Gemmo Gateways connect to the devices and collect the measurements.

The collected data is then sent via [N3uron Links](#) (the communications mechanism between N3uron nodes to exchange data) to the central N3uron gateway, located in Gemmo’s Head Offices in Vicenza. There, data is further processed (e.g. normalized, interpolated, aggregated) before being finally stored in the central historical database for subsequent analysis by the BI system, which runs on Microsoft Azure Cloud.

Comprehensive monitoring and alerting

Gemmo made use of specific N3uron features and modules to build its solution. These include:

Support for industrial protocols: Gemmo used N3uron’s [Siemens Client](#), a module designed to connect N3uron platform to S7 Siemens PLCs easily via TCP/IP using the S7 protocol. Gemmo also used [Modbus Client](#), a N3uron module which connects the platform to any Modbus-compatible device and which supports TCP, serial communications, and more.

BACnet Client: Gemmo deployed N3uron’s [BACnet Client](#), to connect the platform to BACnet devices easily. Because this real-time monitor and control solution consolidates all building data in one place and comes with discovery and browser functionalities, BACnet proved instrumental for Gemmo’s E.BIG project.

Support for IoT protocols (MQTT): N3uron’s [MQTT Client](#) connects to MQTT brokers to send and receive events. Through MQTT, this module made it easy for Gemmo to connect its devices and applications to its industrial IoT infrastructure.

N3uron Links: [N3uron Links](#) are secure tunnels that enable seamless, secure communication between nodes. Links allow data to be exchanged in real-time, displaying the current value of tags in both the source and destination node. Firewall-friendly by design, N3uron Links require only an outbound connection from the node initiating the communication, eliminating the need for inbound ports in the network’s firewall. Data is time-stamped at the origin, ensuring time consistency across the entire fleet of nodes. Additionally, N3uron Links include a built-in Store & Forward mechanism to preserve data integrity even when the system experiences intermittent connectivity.

Integration with SQL databases: To integrate its platform with SQL databases, Gemmo used [SQL Client](#), a N3uron module designed to easily connect virtually any relational database to the platform. SQL Client enabled Gemmo to bidirectionally synchronize industrial data with SQL databases, execute Stored Procedures, build complex queries, and store historical data in any SQL database.

Scripting: [Scripting](#) is a N3uron module that allows the execution of custom logic within the current N3uron node in response to various triggers, such as events like timers, tag changes, tag conditions, system start-up, and system shutdown.

The tag quality property, coupled with the Scripting and SQL modules, allowed Gemmo to monitor the whole data collection chain and raise alarms to the maintenance personnel in case of problems.

Real-time data collection, cross-site analysis, accelerated decision making

N3uron has transformed the way Gemmo collects and analyzes data, enabling faster decision making and timely insights to reduce clients' Total Cost of Ownership (TCO). For the past two years since project implementation, Gemmo has witnessed excellent results. Before deploying E.BIG, Gemmo accessed energy consumption data by reading the displays of dumb meters once a day, where possible, or by manually extracting them from the bills they got from utility companies every one or two months. All data was collected and handled using separate Excel files from each site.

This manual process, besides being time-consuming and error-prone, allowed Gemmo's energy managers to only receive energy consumption data with a daily resolution (in the best case) or monthly resolution (and one- or two-months' delay) in the worst case. This limited their ability to do in-depth analysis and effectively plan efficiency measures.

"Now, we collect energy consumption data in real-time, and measurements are made available through E.BIG with a maximum delay of 15 minutes, which allows us to do much more detailed analysis (and also cross-site analysis, which was previously rather difficult to do) and better understand how plants are working, so we can plan better efficiency measures in a timely fashion," said Alessandro Sala.

Future plans for N3uron

Gemmo, according to Sala, plans to continue using N3uron for the foreseeable future because of its quality, flexibility, and the great support team behind the product.

"I have been really impressed with the technical support team service. They have been really responsive and supportive," said Alessandro Sala.

The Gemmo EMS, powered by N3uron, has been operating seamlessly since its launch. By providing real-time and historical visibility into energy consumption and enabling trend detection, the Energy

Management System has significantly enhanced the company's control over its energy monitoring and decision-making processes. With N3uron's modular and fully customizable platform, Gemmo can easily adapt and scale as its needs continue to evolve.