

INNOVATION REPORT

An energy efficiency boost in electrical distribution



Eloy Gonzalez Ortega, INDRA Software Labs

Energy efficiency is the quickest, cheapest and cleanest way to extend global energy supplies. To sustain such an energy-management programme can cost around 1 to 2% of total energy expenditure but it can reduce overall consumption by 10 to 40%. In an innovative approach, the ITEA 2 project NEMO&CODED (NETworked MONitoring & COntrol, Diagnostic for Electrical Distribution) set out to implement and operate networked hardware/software smart devices and to develop an ecosystem of services running at device, network and enterprise level, ultimately realising an information system that focuses on the strategic and technical requirements in meter data management.

Technical challenges

Among the technical challenges were new demands for efficient management and sustainable energy, which require the development of intelligent networks (Smart Grids) whereby the information flow is integrated into a real-time platform for operation and monitoring of the network. In this context, smart meters and advanced metering management systems are the first step towards the implementation of Smart Grids.

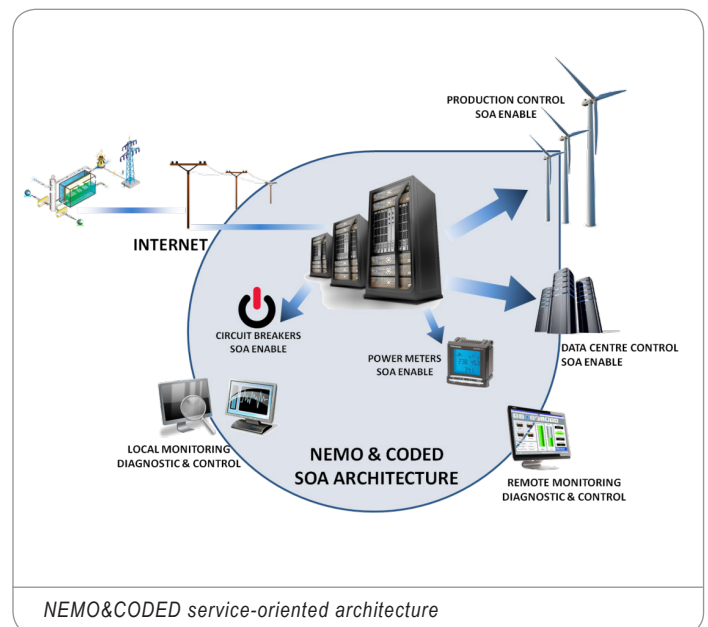
Energy monitoring and the evolution of consumption patterns is a key performance indicator for energy-management systems and requires the monitoring of energy consumption at device level, combined with a specific energy-management process. Real-time monitoring of energy consumption makes it possible to map energy consumption with respect to specific devices, activities and external conditions and is the basis for using energy consumption as a key performance indicator that can be optimised for making the best use of existing assets.

Service oriented architecture

The key to the success of this project lies to a large extent in the service-oriented, architecture-ready smart systems that are able to combine or interact with other devices and services to carry out distributed monitoring, diagnostics and control so that service suppliers can provide accurate forecasts of energy costs and potential savings.

The potential in the energy sector is huge, so the use of service-oriented architecture (SOA) ready devices in the electrical distribution domain was regarded as the most suitable approach, and resulted in:

- A distributed infrastructure enabling dynamic energy efficiency services for low-voltage electrical distribution.
- Global architecture and SOA models for dynamic control, monitoring and diagnostic of electrical distribution devices.
- Development of an acquisition platform for collecting energy data in real time.
- Extension of the classical SOA on a Extreme Transaction and Processing Platform (XTPP).

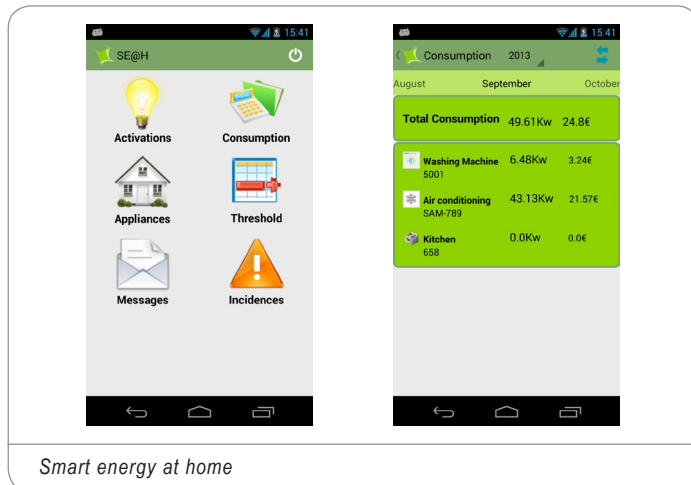


Ecosystem of services

NEMO&CODED focused on the low-voltage electrical distribution domain targeting mainly commercial and industrial buildings. The concepts developed in the project were validated for environments using a SOA approach and provided open interfaces that enable interoperability by realising an ecosystem of services running at device, network and enterprise level and through the seamless composition of more sophisticated services from generic ones.

INNOVATION REPORT

Field tests and prototypes helped demonstrate the practicality of the project goals, such as a field test in a home setting where the different sensors, electric analysers and concentrators were installed and the data acquired.



More affordable approach

The results of the project will also contribute to global standardisation on energy efficiency and will ensure the proper implementation of Smart Grids. Introducing a SOA solution to the low-voltage electrical distribution domain makes energy-management systems more affordable as well as cuts set-up time, simplifies data exploitation and reduces efforts to support the evolution for new uses that are essential to transform the energy-efficiency concept into reality for many professional consumers.

Among the key benefits of this approach are:

- The ability of facility managers to get the right solution to master their energy consumption.
- The ability of performance-contracting companies to give their customers competitive systems.
- Market share acquisition by electrical equipment and tool providers.
- The ability of utilities to provide new services, taking advantage of the information systems deployed.

The real winner, however, will be the environment: by mastering energy consumption on a large scale, energy needs will be cut with the result that CO₂ emissions will be drastically reduced. The knock-on effect of this, of course, will ultimately be felt by society as a whole. Greater security will be gained not only in

terms of a reliable energy supply able to meet demand in a sustainable way but also in respect of a cleaner, greener and healthier environment for people to live and work in.

Enabling dynamic energy-efficiency services

The distributed infrastructure developed in the course of this project enables dynamic energy-efficiency services for low-voltage electrical distribution. This is fundamental to the support and implementation of the new energy paradigms being researched throughout Europe in response to global energy and environmental challenges. NEMO&CODED has elaborated a global architecture model and a SOA model for dynamic control, monitoring and diagnosis of electrical distribution devices as well as method specifications at device and aggregation levels.

From vertical to horizontal

The NEMO&CODED project has generated a number of important innovations, such as enhancement of current Web Service technologies, the independence of equipment and extensive use of several communication technologies, a communication paradigm – publish/subscribe SOA – and a novel implementation of semantic SOA. Furthermore, by transforming the closed vertical business layers into a horizontal layer through the global architecture, establishing a real-time platform by means of a high-performance Data Distribution Service middleware and developing algorithms to more accurately predict energy consumption, not only innovative but also highly practical solutions have been made ready for market application.

Innovation for market impact

So, in terms of translating innovation into real application, this project has seized the high ground and made innovation a tangible vehicle for improving the quality of life through advancing the global objective of a more sustainable as well as affordable energy supply. This is evident in, for instance, the Eco Hub – energy efficiency data concentrators – that INDRA already supplies along with the considerable interest being shown around the world, from South America to Southeast Asia. Furthermore, a technology pilot is in place and includes a web portal for a thousand users of ENDESA, one of the largest electricity companies in Spain. This starts operating at the beginning of 2014 while there are also plans for a more ambitious solution, offering energy efficiency services to four million customers.