

Project Results

IMPONET

Taking a smart approach to power system management

The development of intelligent networks (Smart Grids) is essential to efficient management and sustainable energy. The introduction of smart meters and Advanced Metering Management (AMM) systems signal the first step towards the implementation of Smart Grids, from distributed generation to demand management, whereby the information flow is integrated into a real-time platform for the operation and monitoring of the network. With issues such as smart metering and real-time monitoring becoming crucial, the ITEA 2 IMPONET project addressed the modelling, design and implementation of a comprehensive, flexible and configurable information system to meet the most complex and advanced requirements in electrical energy management.

SMART GRIDS AND SMART SOLUTIONS

IMPONET investigated the business challenges and opportunities in the electrical distribution domain, identifying and describing the requirements for advanced metering and power quality monitoring. The system architecture was elaborated focusing on the ability to process massive amounts of information in real-time while maintaining bi-directional communications through the use of several communication technologies and common standards, such as IEC 61850 and CIM. Following the development of a prototype concentrator and meter device, a high processing power, storage capable concentrator was developed to enable the hosting of a middleware for bi-directional communications in real-time.

Significant research was carried out on methods and technologies for collecting, storing and processing residential meter data, with a special focus on extreme-processing middlewares and large, non-SQL storage architectures. Extensive use of the storage and processing architecture for handling massive amounts of information was made in implementing several advanced metering use cases while several platforms were developed for the visualisation of customer energy data according to the needs of different stakeholders.

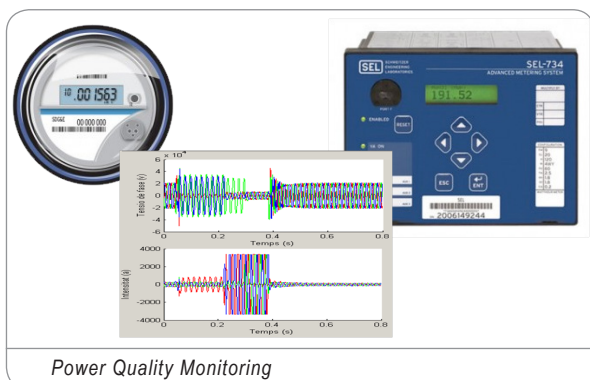
Power Quality (PQ) concepts and use cases were defined geared to short duration disturbances in four main sub-areas (processing, modelling, management and reporting) and the corresponding methods and tools for power quality monitoring in the electrical distribution domain were developed further. Integration of the IMPONET ecosystem of services and devices for data acquisition and processing aimed to deliver an advanced metering platform for residential customers on the one hand and a powerful framework for power quality monitoring on the other.

INNOVATIVE RESULTS

The state-of-the-art has been enhanced with the production of top-quality SotA documents and the project has also defined a clear standardisation strategy whereby active participation in standardisation committees and working groups in communication, billing, quality monitoring, smart grids and smart metering along with strong involvement in IEC 61850 consolidated the project's impact.

The central innovation of the IMPONET project lies in the advanced real-time architecture that contains a dual model of publish/subscribe and request/response in which data access allows interoperability between the different data models for big data.

Ultimately, therefore, managing the unpredictability of energy sources as well as smart metering can reduce our consumption footprint and boost the efficiency of energy distribution.



IMPONET (ITEA 2 ~ 09030)

Partners

Answare
 DeustoTech
 Indra Sistemas
 Indra Software Labs
 Innova
 Kapion
 Kema Energy
 LNL
 Prodevelop
 Technical University of Madrid (UPM)
 Tecnalia
 Unión Fenosa Distribución
 University of Girona
 University of Ljubljana
 Woom

Countries involved

Slovenia
 South Korea
 Spain
 Turkey

Project start

December 2010

Project end

February 2013

Contact

Project Leader :
 Eloy Gonzalez Ortega,
 Indra Software Labs
Email :
 egonzalezort@indra.es

Project website :
www.innovationenergy.org/imponet/

Project Results

In brief, the project's results include:

- A concentrator and a meter design whose processing capabilities could prompt even more innovation possibilities
- Impressive detailed advanced system architecture
- Dual architecture mechanism (publish/subscribe and request/response)
- Data platform based on SQL and non-SQL databases, Hadoop and Oracle engines among others
- Reduced processing time from 24 hours to 1 hour for the billing process of 200,000 customers
- Web portal for customer, distributor and retailer
- Forecasting energy consumption to within 2% precision
- Geo-Portal for power quality monitoring
- Impressive integration management tool

IMPACT

The IMPONET results are set to be demonstrated in the near future in several technology pilot projects and consortium members have actively promoted the standards that are relevant to the IMPONET project through the appropriate bodies. In addition, the dissemination activities included conference papers, journal and magazine articles, the chapter of a book and three PhD theses as

well as incorporation in academic courses and websites.

This business-driven technology project has resulted in a huge amount of deliverables and an impressive architecture to master a complex system. The market potential – impact on the market and market exploitation – is significant and there is already considerable interest in commercial development, from Serbia, Spain and Malaysia. For instance, INDRA has launched a technology pilot for gathering and processing residential customers energy data for Endesa (distribution company) based on the results obtained in IMPONET. Several products resulting from IMPONET are likely to be commercialised in the short to mid-term, including a communication and smart metering device platform INDRA and LNL.

Smart grids are the key element to ensuring the efficient management of energy in a new, advanced, reliable and sustainable energy model. IMPONET provides the essential cornerstones to achieving a comprehensive, flexible and configurable information system to support the most complex and advanced requirements in energy management. This will bring important economic and environmental benefits and have a significant social impact.

Major project outcomes

DISSEMINATION

- 4 journals
- 12 conferences and presentations
- 1 book chapter
- 2 magazines
- 3 PhD theses
- 1 Capstone project
- 1 academic work

EXPLOITATION (SO FAR)

- High processing and storage-capable concentrator prototype
- Real-Time Data and Services platform based on DDS standard and integrated with SQL and non-SQL databases
- Residential customers energy data use cases developed with big data technologies
- Web portal for customer, distributor and retailer
- Forecasting energy consumption algorithms
- Real-Time Forecasting visualisation website
- Geo-Portal for power quality monitoring
- Android customer energy data and power quality application
- In-home device for customer consumption and power quality information

STANDARDISATION

- Participation in standardisation committees and working groups in the following fields:
 - Communication (IEC IEEE TC BACM, CEN-CENELEC, IEC 61850)
 - Billing (TM Forum, IPDR)
 - Quality Monitoring (CIGRE)
 - Smart Grids (CNE)
 - Smart Metering (CNE)

ITEA 2 Office

High Tech Campus 69 - 3
5656 AG Eindhoven

The Netherlands

Tel : +31 88 003 6136

Fax : +31 88 003 6130

Email : info@itea2.org

Web : www.itea2.org

■ ITEA 2 – Information Technology for European Advancement – is Europe's premier co-operative R&D programme driving pre-competitive research on embedded and distributed software-intensive systems and services. As a EUREKA strategic Cluster, we support co-ordinated national funding submissions and provide the link between those who provide finance, technology and software engineering. Our aim is to mobilise a total of 20,000 person-years over the full eight-year period of our programme from 2006 to 2013.

■ ITEA 2-labelled projects are industry-driven initiatives building vital middleware and preparing standards to lay the foundations for the next generation of products, systems, appliances and services. Our programme results in real product innovation that boosts European competitiveness in a wide range of industries. Specifically, we play a key role in crucial application domains where software dominates, such as aerospace, automotive, consumer electronics, healthcare/medical systems and telecommunications.

■ ITEA 2 projects involve complementary R&D from at least two companies in two countries. We issue annual Calls for Projects, evaluate projects and help bring research partners together. Our projects are open to partners from large industrial companies and small and medium-sized enterprises (SMEs) as well as public research institutes and universities.



IMPONET
(ITEA 2 - 09030)

December 2013