![ITEA3 logo]

Project Results

WATER-M

A unified Water Information Model for secure, safe water supply

EXECUTIVE SUMMARY

The ITEA project WATER-M focused on finding solutions to the interoperability, real-time, big data and heterogeneous data challenges to be able to guarantee water supply and quality along with the stability and reliability of a smart water network.

PROJECT ORIGINS

With fresh water making up just 2.5% of the world's water supply, demand having increased six-fold and more than half the world's population living in areas with a water sustainability problem, the water industry needs novel concepts, such as GIS integration, quality management programmes or real-time data management. The WATER-M project is geared to enabling the creation of new products and services to build a unified water business model that will benefit European water stakeholders.

WATER-M proposed a distributed real-time data and service platform to enable the operation and control of smart water grids supported by enhanced data exploitation mechanisms and the interoperability of different decision support subsystems to guarantee self management capabilities. At the heart of this platform is a unified Water Information Model comprising early warning tools, real-time acquisition and processing platforms, data communication platforms and services for water suppliers and water consumers. There are also new added value services for robust and observable smart water networks with self management capabilities and resilience to cyber and physical attacks.

TECHNOLOGY APPLIED

The project's work packages and the design of an overall WATER-M platform architecture were based on a web questionnaire among the different stakeholders in the water domain along with different user stories and application scenarios.
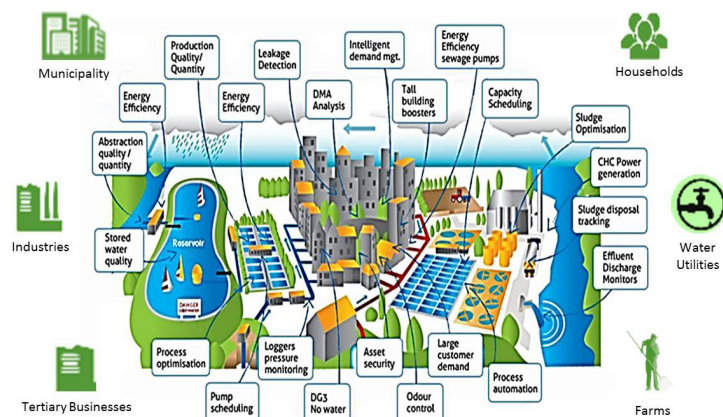
WATER-M: Many needs and many users but one Unified Water Management System

This architecture defined various components and their corresponding roles as well as a general outline of the network architecture. Legacy systems and various end services for real-time data for the distributed water network are supported. In the first version of the data model tested on WATER-M use cases, a WATER-M Big Data Analytics Platform was developed and tested on real-time data. This generated a number of benefits, including scalability (whereby system components of the WATER-M platform can be run on any amount of distributed systems) and low latency (whereby the WATER-M platform is able to process very high volumes of data in real-time with minimal delay).

Five different international pilot demonstrations were undertaken during the project: Water Network Monitoring in both Kuopio, Finland and Saint Etienne, France; Waste Water Plant

Monitoring in Turkey; River Monitoring in Romania and Urban Farming in France. During the demonstrations, real-time water distribution network (DMA) measurements were integrated with on-line data modelling and an open platform was developed for the creation of online monitoring web services. This open source platform was published in GitHub. WATER-M also made a clear connection with SEAS ontologies on energy management. Both used the same classes for sensors and devices, the same research team was involved in the work of both ontologies (Connected Intelligence, Saint-Etienne) and WATER-M contributed to the SEAS effort to produce a global ontology on resources (water, energy) management.

MAKING THE DIFFERENCE

The project partners exploited the results of their involvement in various ways. Mantis, for example,

converted the WATER-M Big Data Analytics solution to its Mind 4.0 (Mantis Industry 4.0 Intelligent Big Data Analytics Platform) product for which documentation and a website have been created and published. Initial negotiations are under way with customers for rail systems, cement and bottling sectors. Another Turkish partner, Acd, presented the results of the WATER-M project to the Board of the Industrial Zone in Eskisehir and a demo was installed in two different city industrial areas for monitoring the Waste Water process. These efforts are expected to see income boosted by 20-45% over the coming five years. Given its actual position and experience in the telemetry market, Beia in Romania expects its water telemonitoring system to outperform other water management products currently in the market and strengthen its market position at both national and international (European) level.

The French Cityzen Data company, which has sold system for water pump monitoring and Big Data & IoT /M2M Pedagogic IKEA kits, believes that smart farming will become a significant market. Cityzen Data estimates that its Indoor Farming reference design will become profitable before the end of 2018 with sales of 100 hydroponic shelves for 'young plants' at €4,000 per system. Through a value added reseller, sales are expected to reach some 300 units in 2018-2019 and 1,000 units within four years. Other highlights include the development by Evolution Energie of a simple and compact solution to collect, store, analyse and visualise data. Itron is developing business with water utilities, vendors of electronic devices and software to expand a complete IoT-based (Wireless Wi-SUN technology) water chain using the basic WATER-M principle. Approximately 500 units of Eolane's PicoGateway (Wireless LoRa technology), which transfers data from sensors to server, were sold in 2017 and sales of 1,000 units are forecast for 2018. Furthermore, Eolane is a major player in the creation of 'Cité de l'objet connecté' in Angers, France, a 100% private hub that concentrates all the equipment and skills needed to design smart objects.

MAJOR PROJECT OUTCOMES

Dissemination
- Several publications (e.g. COOPIS '16, DEBS '16, PVLDB '17, ICDM '17, EDBT '18)
- More than 10 presentations at conferences/fairs (e.g. CSCC '14 in Santorini Island, SIITME '15 in Brasov, Water resources and wetlands International Conference '14 & '16 in Tulcea, International Water Seminar '16 in Kuopio, ITEA Event '16 in Stockholm, Digital Innovation Forum '17 in Amsterdam, IEEE International Conference '17 in Milan)

Exploitation (so far)
New products:
- PicoGateway: Low cost LoRa Gateway with embedded network server
- Warp-IO: NO-SQL database to store and manipulate sensor data
- Aquamatrix: Combined flow/pressure meter
- Keyaqua: Feature integration for water quantity and quality monitoring
- MACHForce: Web application for sensor–cloud data management and data analytics
New systems:
- Metadata & Data manipulation language & Visualisation (Warp-IO + Grafana + RDF – OWL manipulation)
- SAMI: Platform for sensor data management and creating monitoring services
- Mind 4.0: Real-time data process management, data analysis & visualisation tools
- Hydraulic network modelling tool & Trend analysis tool for early warning
- Network flow and Water quality data monitoring tools & Heavy metal monitoring system
- Hydrographic, leakage detection, frost warning and pump monitoring system

Standardisation
- Enrichment proposal of SEAS ontologies
- SEAS is accepted for standardisation at ETSI by mid-2019

Spin-offs
- Meoline
- Aquamatrix
- Beia Telemetrie

WATER-M
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Partners

Finland
Econet
EHP-Tekniikka
Kajaani University of Applied Sciences
Keypro
National Institute for Health and Welfare
remoteMX
Savonia University of Applied Sciences
University of Oulu

France
Cityzen Data
Eolane
Evolution Energie
Institut Mines-Télécom
Itron
Université Jean Monnet
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Project start
September 2014

Project end
January 2018

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