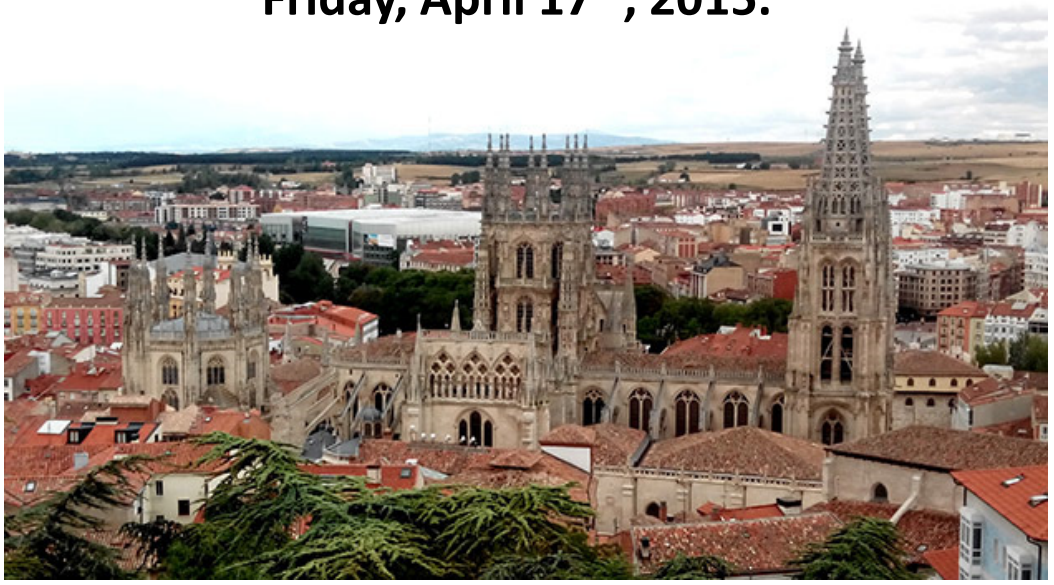
SmartWater4Europe

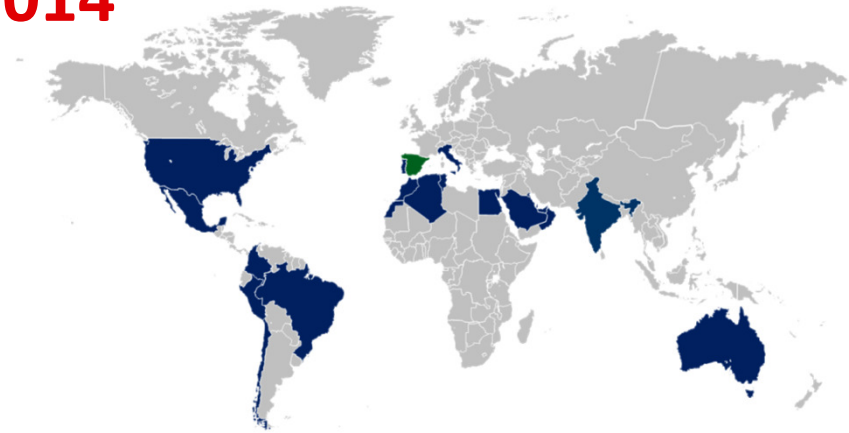
SWING: Smart Water Innovation Network in the city of BurGos

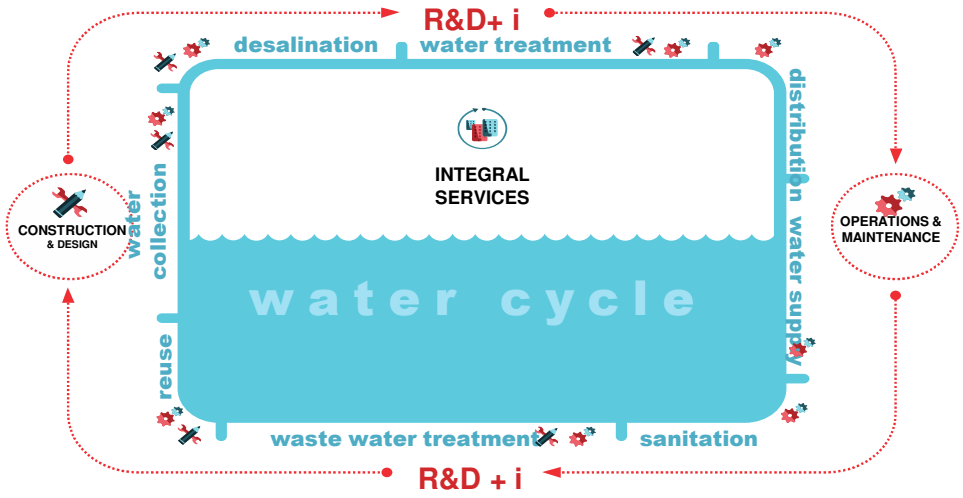
Friday, April 17th, 2015.



ACCIONA Agua, Key Figures 2014

- **Water division of ACCIONA Group.**
- **Permanent Offices** in Spain, Italy, Portugal, India, UAE, Australia, Brazil, Mexico, Colombia, India.
- **International** experience in more than 20 countries.
- Total population served (construction, O&M and services): 50 million.





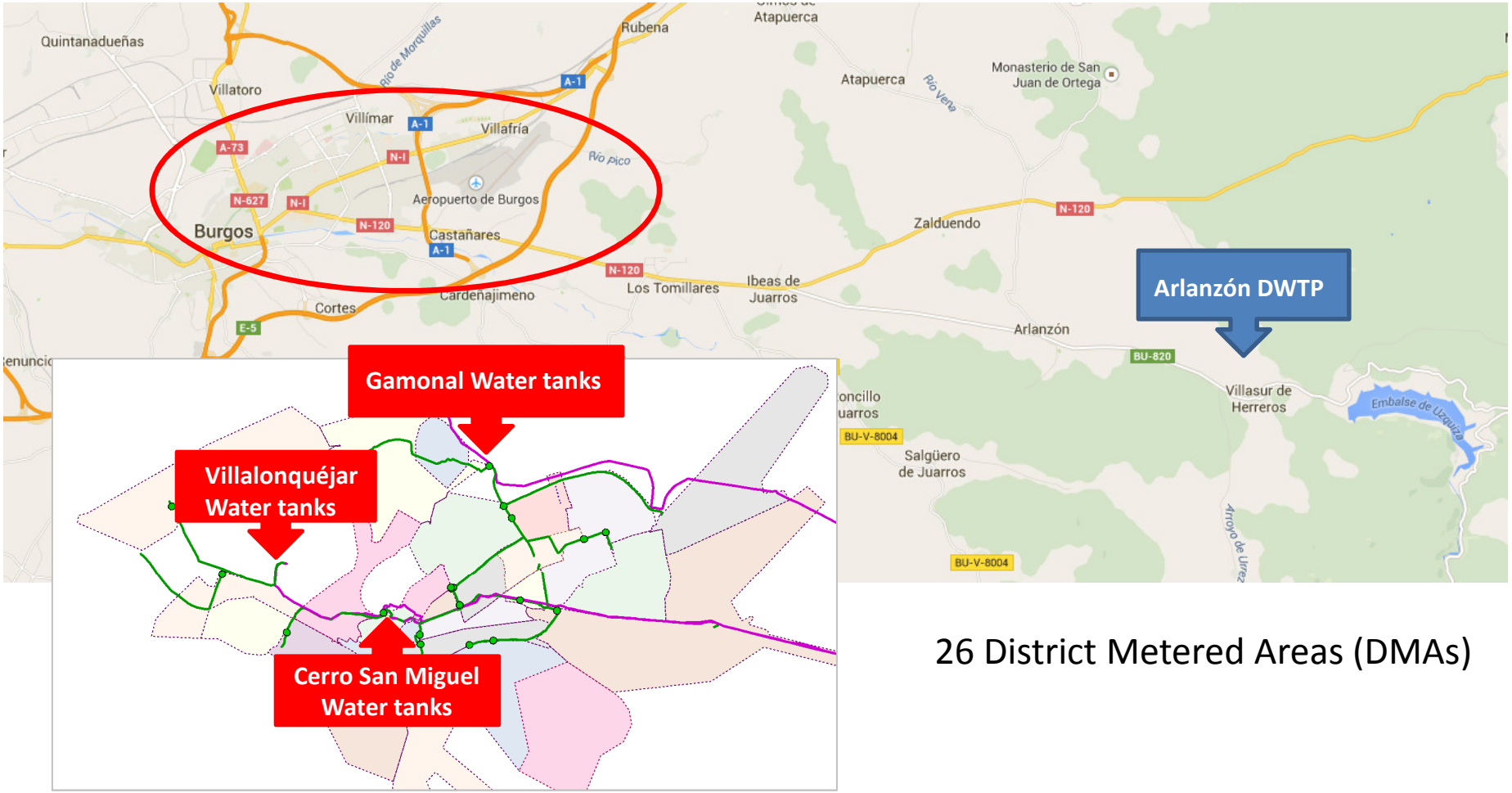
- Strong capabilities in the management of the integrated water cycle, construction, operation and commissioning.
- **Worldwide leader in Reverse Osmosis (RO) desalination**. 75 desalination plants worlwide (~1.8 million m^3/day).
- Wastewater, treatment and reuse (more than 400 plants built)
- More than 100 conventional plants operating and 40 supply services.

Revenues: € 409 million | **EBITDA: € 35 million** | **Employees: > 2,800**

Burgos, the city

- Located in the northern half of Spain, in the heart of the Castille and Leon region.
- Considered the historic capital of Castille for centuries.
- **It has many historic landmarks, some of them declared World Heritage Site by UNESCO**
- Municipality and city area of 107,08 km² (41.34 sq mi)
- 180.000 inhabitants.

Burgos, hydraulic architecture



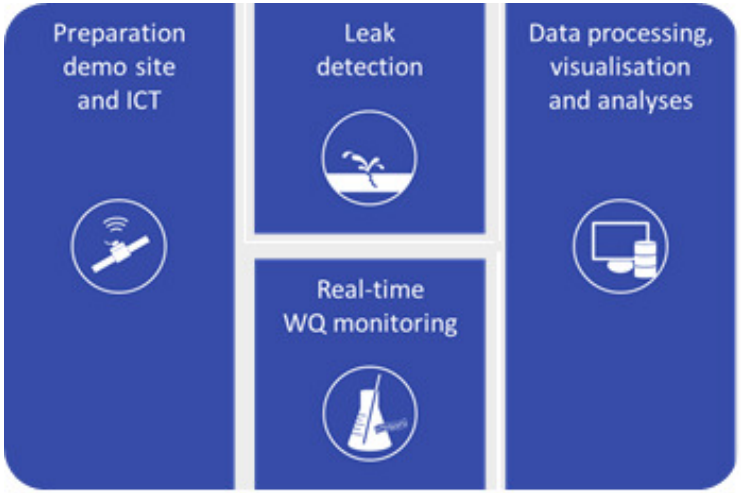
26 District Metered Areas (DMAs)

SWING, goals & objectives: an overview

- **Real-time water quality monitoring:** to detect water quality anomalies in real-time by means of generic and specific sensors.

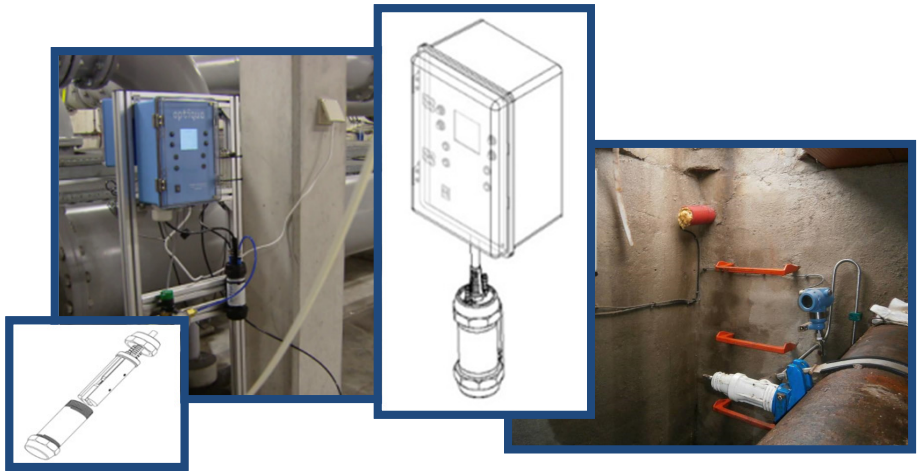
- **Leak detection:** to detect and localize leaks immediately after they occur or ultimately detecting failure mechanisms before they occur.

- **An innovative automation platform**: to automate the data collection process of water consumption, providing a different management model.



SWING, estrategy

- **Preparation demo site and ICT**: installing sensors and smart water meters



- **Data transmission leveled network, processing, visualization and analyses:** a business intelligence software will be developed.

Partners, organization and roles

acciona Agua

Integration of technologies and heterogeneous data

aguas de Burgos

In charge of the water cycle of Burgos

arson®

Communication network infrastructure

HOMERIA open solutions

Big data center development.
Data visualisation

optiqua

s::can Intelligent. Optical. Online.

Water quality sensors manufacturers

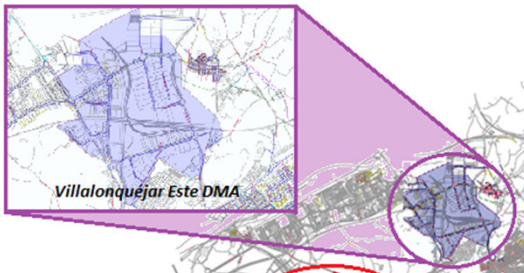
SWING, demo activities in 3 DMAs of the city

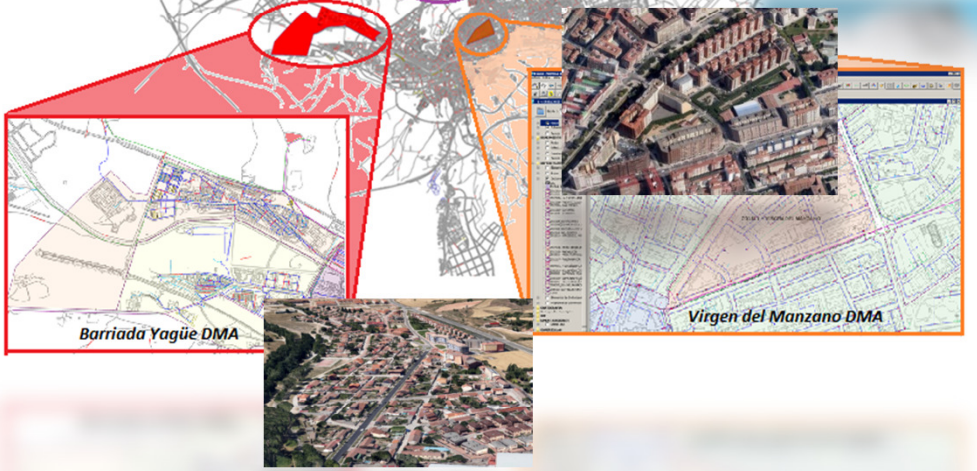
An industrial area with 177 smart water meters

A. Villalonquéjar Este DMA

B. Barriada Yagüe DMA

C. Virgen del Manzano DMA

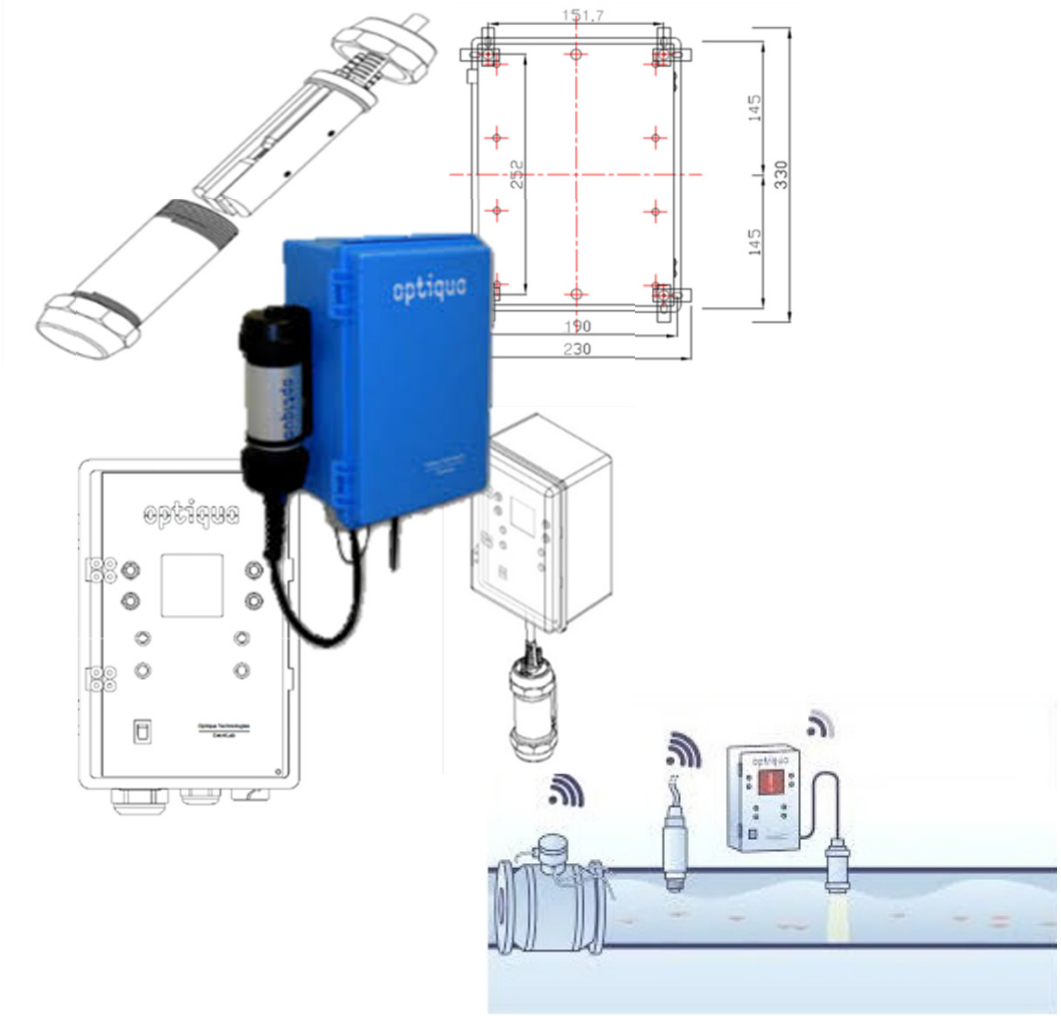




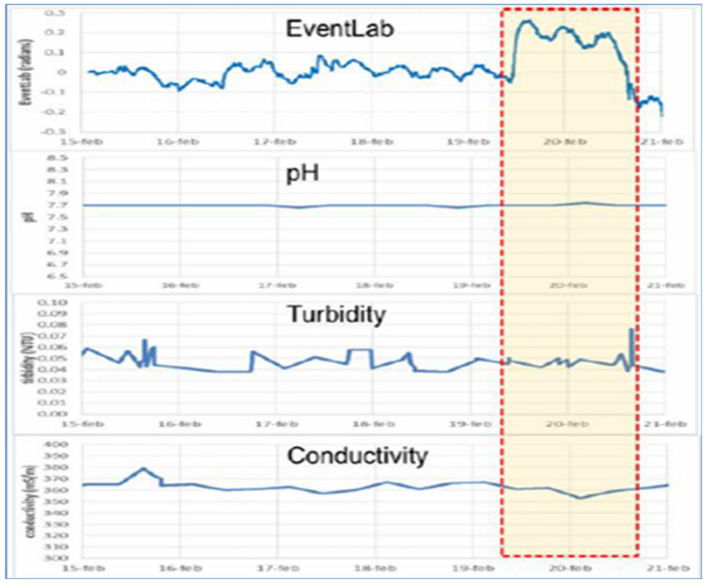
A classic residential area with 912 smart water meters

A wide urban area with 452 smart water meters

SWING, Eventlab© quality sensor systems

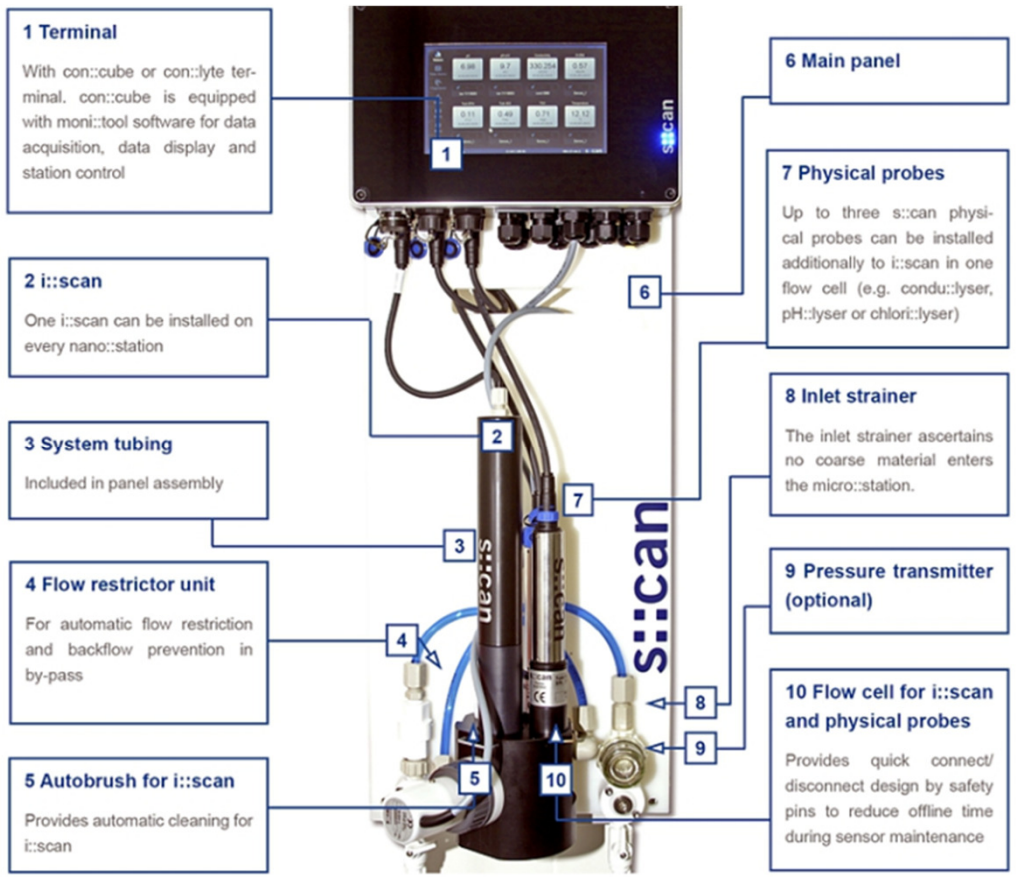


Property	Value
Generated data	**Changes in the refractive index**
Postprocessing	Several algorithms
Flow requirement	100 ml/min
Max. inlet pressure	15 bar
Operating temp. Install./probe	5 to 45 °C/10 to 35 °C air temperature

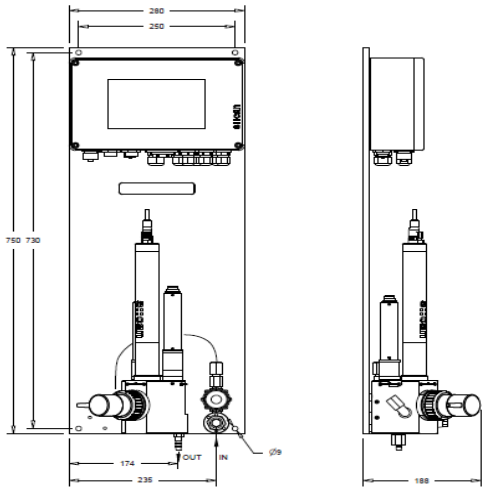


Only EventLab™ detects WQ event!

SWING, Nano::station© sensor systems

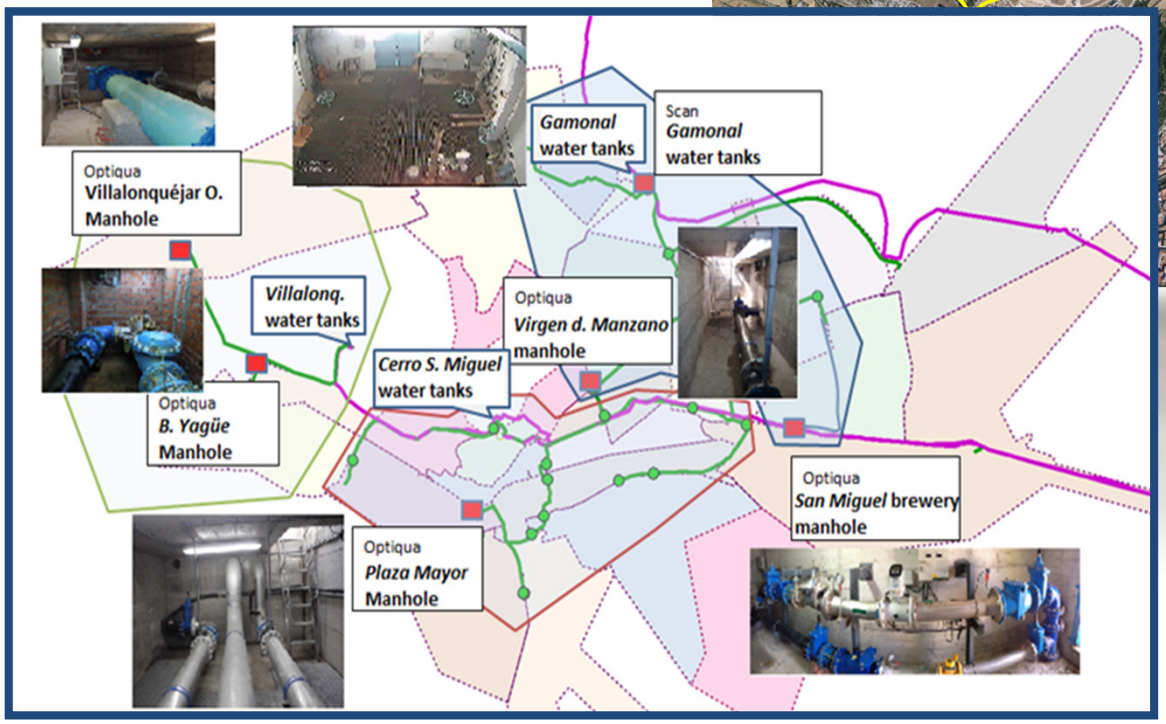


Property	Value
Generated data	Absorption of light
Monitored Parameters	Turbidity, Nitrate, Colour and organic parameters (Total Organic Carbon and Dissolved Organic Carbon)
Postprocessing	Several algorithms
Frequency	Once per 5 minutes
Inlet pressure (min./max.)	-0.2Bar – 6Bar
Operating temp. install.	0 to 45 °C air temperature



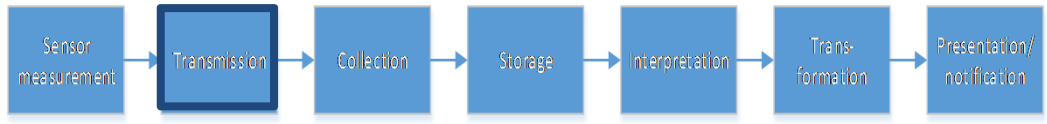
SWING, sensors location

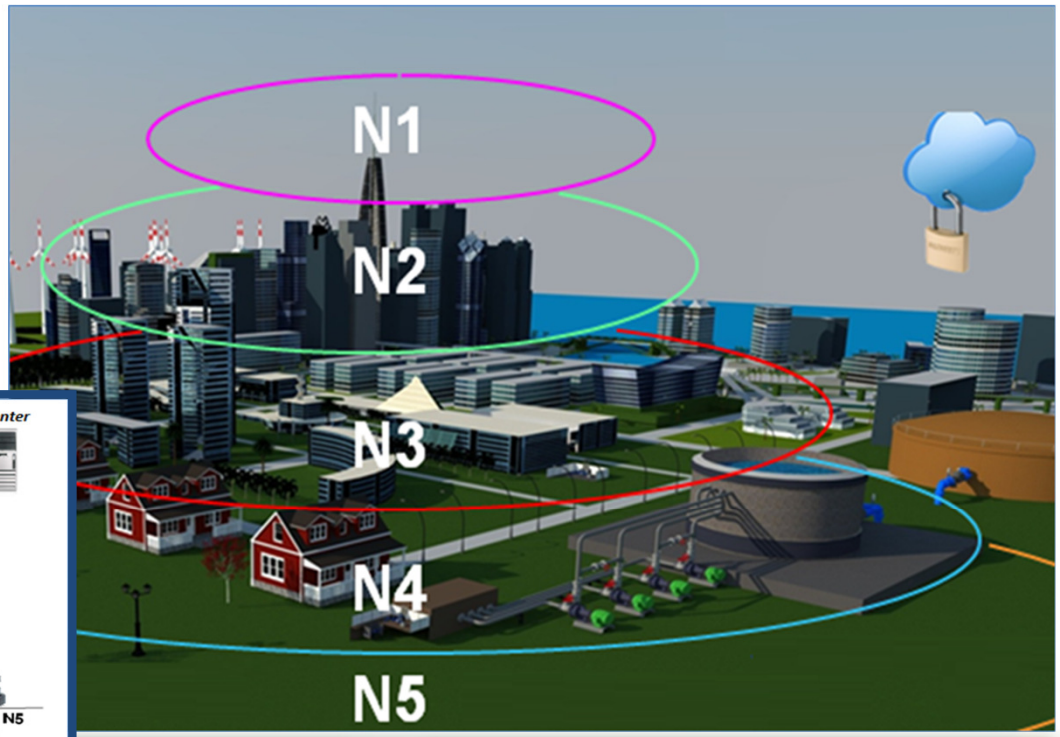
- DMA entries
- key artery points
- main tanks

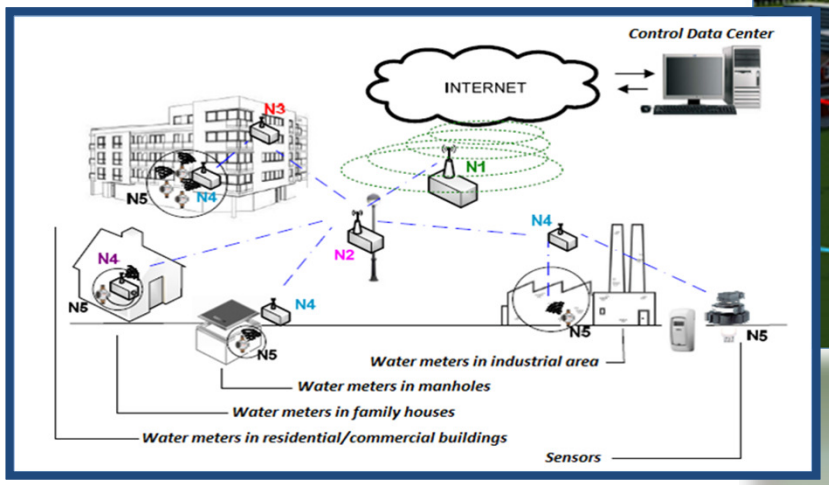


SWING, the communication architecture

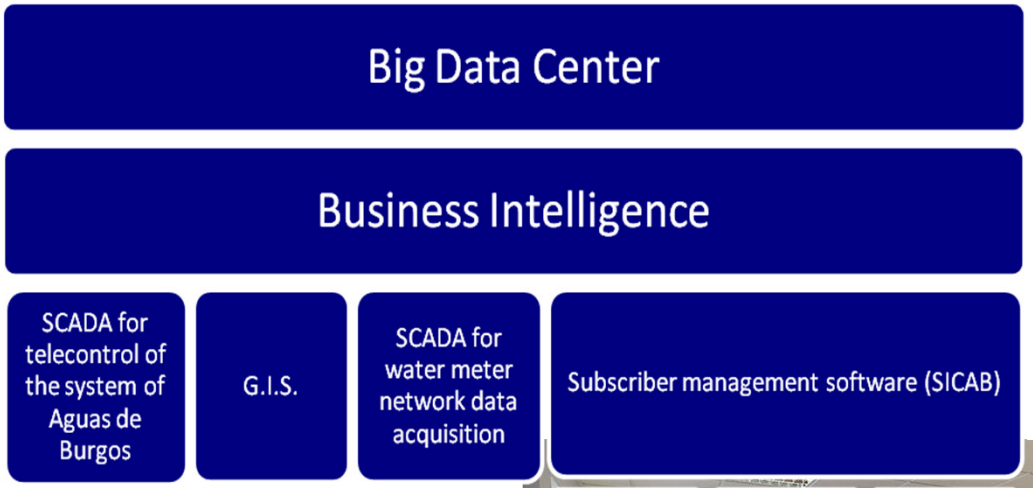
- **Structured in six levels (N5 to N0)** to detect water quality anomalies in real-time, in which **N5** refers to sensors and remote water meters.
- **N4 to N1 are router/concentration devices** and transmit data via radiofrequency (**868 MHz**).
- **N1** transmit data via radiofrequency (**868 MHz**) to minor levels and via **GPRS** to the **N0** (Control Data Center).

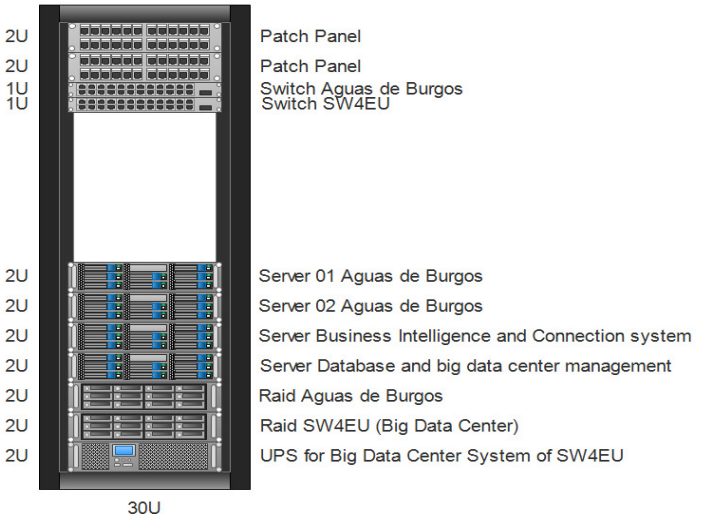




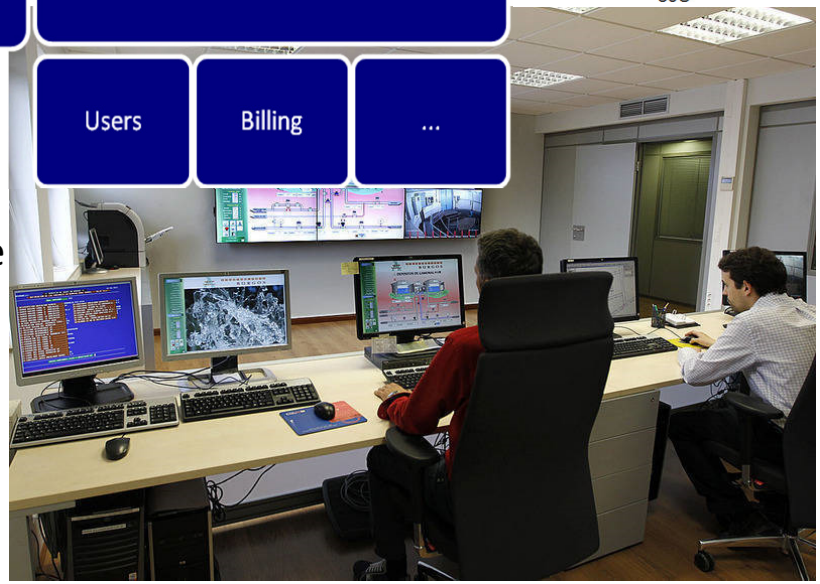


SWING, software architecture



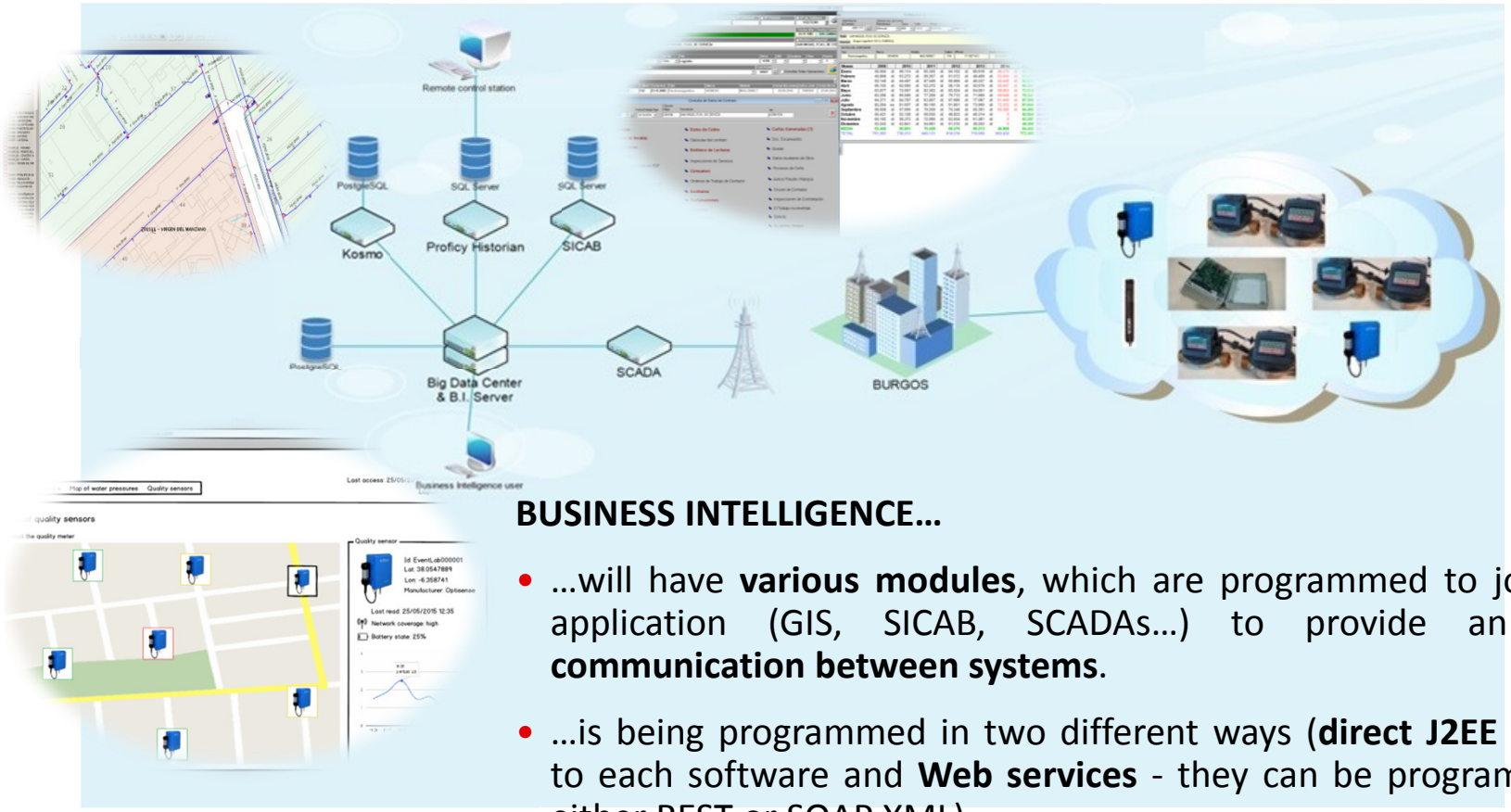


- This structure interconnects several independent **heterogeneous** systems.
- There is a nexus between the current applications and the new ones; that union happens within the **Business Intelligence** application, which manages communication and provides extra functionality at the same time.



- There are software applications that already exist and work correctly, but need some modifications to allow communication with the other systems and other **software programs that will be implemented from scratch**.

SWING, software interfaces

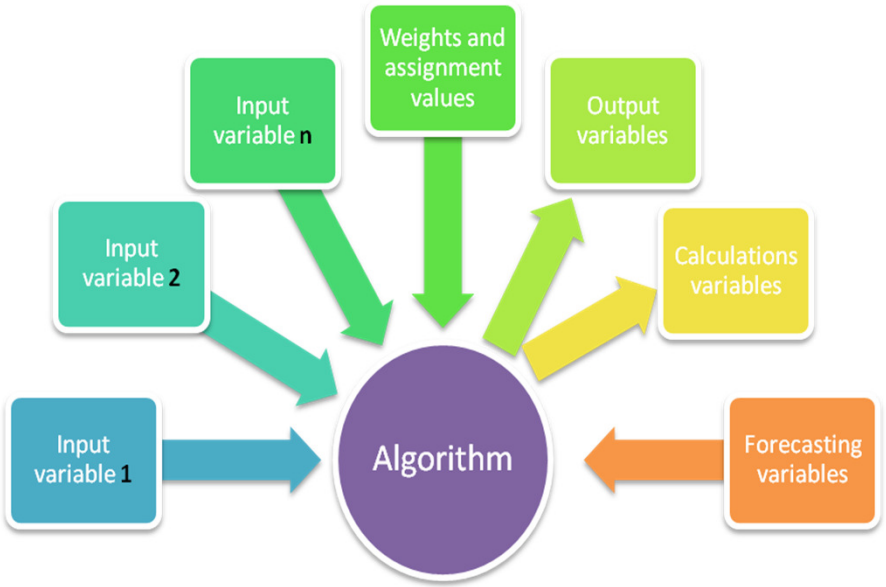


BUSINESS INTELLIGENCE…

- …will have **various modules**, which are programmed to join to each application (GIS, SICAB, SCADAs…) to provide an **interface communication between systems**.
- …is being programmed in two different ways (**direct J2EE connection** to each software and **Web services** - they can be programmed using either REST or SOAP XML).
- …must collect **real time data through web services**, while data collected in batch processes can be implemented by Jobs which extract information from the data base through JDBC drivers operations.

SWING, leak management algorithms

	Direct input variables	Description
1	DMA input volume	In the reading period
2	DMA output volume	Sum of all meter readings belonging to one particular DMA in the period
3	Conductivity parameter	Value taken at the sampling point.
4	DMA piping material	Related to the probability of failure.
5	Piping age	Related to the probability of failure.
6	Season	Season of the year we are in at the moment of taking readings.
7	Water meter deviation	Measuring adjustment values (particularly in water inlet meters (of DMAs) and water outlet meters (of tanks)
8	Water physical-chemical pattern	Analysis of comparative patterns to warn about pollutants or changes in piping profiles.
9	Turbidity pattern	
10	Damages because of work	Possibility of piping rupture



	Calculated variables	Description
1	Flow deviation average	Average value for the flow deviation variable
2	DMA water meter value	Average value for each entry DMA meter
3	Seasonal measure	Average value for each season (spring, summer…) of each of the flow deviation variables
4	Piping Rupture probability	
5	Piping Rupture probability by age	
6	Minimum nighttime	
7	Water characterization parameter	Water quality pattern. Comparison pattern.
8	Measurement for each water meter	
9	Consumption pattern	Consumption function (by DMAs or water meter. They may contain weekly or seasonal weighted values)
10	Statistic values for each reading or parameter	

SWING, looking forward

- **A different management model** which takes into account optimization of both decision making and investments.

- *SWING* (SW4EU) continues one particular stream of research into **software standardization**.

- Optimization algorithms should be customized to **improve the water sector efficiency**.

THANK YOU FOR YOUR ATTENTION