## SWING: Smart Water Innovation Network in the city of BurGos A Real Case of an Urban SWM Setup



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### **SMARTWATER4EUROPE: THE PROJECT**

- SW4EU aims to promote innovative solutions in the challenges related to the sustainable, smart and efficient management of water.
- Spanish project is led - The by ACCIONA AGUA.
- Intelligent solutions are integrated for the determination of water quality and leakage detection.



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## OBJECTIVES

- Reduction and location of leakages
- Reduction of incident detection times
- Reduction of repair and maintenance costs
- Reduction of time without service
- Reduction of <u>unbilled water</u>
- Ensure water quality and customer satisfaction
- Optimization and prioritization of investments



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#### *"If you cannot measure it,* you cannot improve it"

William Thomson Kelvin (1824–1907)







# SWING

Smart Water Innovation Network in the city of BurGos https://sw4eu.com/

City of Burgos in numbers

#### Number of contracts

58.507 Total water supplied 25.461.692 m<sup>3</sup> Length of the water distribution network 467.315 m Water supplied for person/day 392,39 litres



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# 1502

### Water meters

24 weekly readings Connection: GPRS and RF Alarms management



### SWING

### Information





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## DMA sensors

Readings each minute (Flow, pressure and totalizer). 20160 daily readings 10 years of historic data











#### Quality sensors 6 5 Eventlab of Optiqua 1 Nano::Station of S::CAN







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#### Benefited users $\mathbf{)0}$











# +300.000 Elements from GIS

Imported elements from GIS of Aguas de Burgos

01511 - VIRGEN DEL MAN



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### Hourly weather readings

Calls each hour to online webservices of weather data









### MB of data stored each day 150

Data is stored in the Big Data Center with information from all systems







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# END

Weekly reports mation HTML and PDF reports

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about sector information

(leaks, consumption,

alarms, etc.)













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# Big Data Center

Hosted by the data center of Aguas de Burgos

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### Open source

All systems have been installed with free software

### Security

The security of data and systems is one of main objectives

### Replication

Reliability, consistency and quality of data

## Characteristics

- 2 HP Proliant Severs:
- 2 Intel Xeon processors
- 32 GB RAM
- RAID file system
- Virtualization

Network infrastructure

UPS system 3KVA

12 TB NAS Server for remote data replication with RAID system







# **Business Application Platform**

### Intelligence and Integration

luevas Alarmas 131 Jarmas Leidas 451

SW4EU 📃

SW4EL

1.502 Nuevas Alarmas 64 Alarmas Leidas 8 Alarmas Resueltas

SICAB

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Subscriber management software of Aguas de Burgos (user, billing, readings, ...)

#### ACCIONA SCADA

SCADA of Acciona for water quality sensors readings

#### Water leakage system

Connection with the records of water leakage from maintenance system of Aguas de Burgos



Before the project, each system was independent and now all of them have been integrated into a single application

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#### GIS

Geographic information for every element in the DMA

#### Smart meter network

Connection with smart meter network of Burgos (Aguas de Burgos and Arson)

#### SCADA General Electric

Connection with the telecontrol system of Aguas de Burgos















View Detailed Comparision

Detalls	
Reference	80,284,503
codigoPuntoMedida	417,128
Use	Comunidad - Comercial
Activity	
Contract Type	Normal
codSitContrato	SE
Contract Status	En Servicio
Contract Status Date	8/24/05 00:00:00
Creation Date	8/24/05 00:00:00
Client Name	C.PROP.AV.CONSTITUCION,16-B
Sector	140
Reading Order Number	000000435
Reading Type	
Town	Burgos
Street Type	Avd.
Street	Constitución
codGIsVIa	307
Building Number	16
Building bis	



#### Statistics > Current Week Analysis





# SW4EU

#### Water leaks detection

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#### smart water meters

Automatic detection of water leakage and tampering of meters.



#### Flow estimation algorithms

Water Flow estimation with historical data and external factors (holidays, ....)



#### Water balance algorithms

Control of the water network in the hours of least consumption











### SWING WATER LEAKAGE DETECTION WITH WATER METERS

The new water meters installed in Burgos can detect leakages and tamperings, then the BI application notifies the alarms to operators of Aguas de Burgos to review these events.

Fecha	Тіро	Elemento	Descripción
2017-08-22 08:33:07.0	meterAlarm	J15OA037665 G	RESIDUAL_LEAK_DETECTED
2017-08-22 08:33:09.0	meterAlarm	J15OA054983 P	RESIDUAL_LEAK_DETECTED
2017-08-22 09:03:13.0	meterAlarm	J15OA028104 D	RESIDUAL_LEAK_DETECTED
2017-08-22 09:03:13.0	meterAlarm	J15RC000142 F	BACKFLOW_DETECTED
2017-08-22 08:33:06.0	meterAlarm	J15OA054984 Q	EXTREME_LEAK_DETECTED
2017-08-22 08:33:06.0	meterAlarm	J15RA001461 H	EXTREME_LEAK_DETECTED
2017-08-22 09:03:14.0	meterAlarm	J14OA165542 A	RESIDUAL_LEAK_DETECTED
2017-08-22 08:33:01.0	meterAlarm	J15OA037702 U	RESIDUAL_LEAK_DETECTED







#### Algoritmo de estimación de caudales



#### Posibles fugas detectadas

- Fecha de Inicio 7 ago. 2017 03:01:00 Fecha de Fin 7 ago. 2017 04:00:00 Alias Virgen del Manzano Ver
  - Estado Pendiente de confirmación
- > Fecha de Inicio 17 ago. 2017 00:48:00 Fecha de Fin 17 ago. 2017 02:42:00 Alias Virgen del Manzano Ver
  - Estado Pendiente de confirmación
- Fecha de Inicio 21 ago. 2017 03:01:00 Fecha de Fin 21 ago. 2017 04:01:00 Alias Virgen del Manzano Ver
  - Estado Pendiente de confirmación



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## FLOW ESTIMATION C' VATER LEAKAGES DETECTION

Acciona together with Homeria and researchers from Universidad de Extremadura, Universidad Politécnica de Valencia and l'Escola d'Enginyeria d'Igualada have designed and implemented a configurable algorithm of water flow estimation based on historical data and special dates (holidays, weekends, ...)

The algorithm is implemented with R and gives back the results quickly.





acciona



### WATER BALANCE AI GORI JANTIFY THE WATER LEAKAGES

For this calculation, BI application uses DMA readings, real water meter readings and also an estimation of consumption (for water meters that can not be read, implemented in Cobol).





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#### Sector



#### Sector

	Día	Contadores Leidos	Contadores AdB Totales	Lecturas Estimadas	Consumo Totalizador Sector	Consumo Contadores	Lecturas Contadores + Estimaciones	Pérdidas	Pérdidas (con estimación)	% Pérdidas	% Pérdidas (con estimación)
>	3/14/2016	176/176		0		0 m³	0 m³				
>	3/21/2016	176/176		0	12.504 m <sup>3</sup>	6.735 m³	6.735 m³	5.769 m³	5.769 m³	46,13724 %	46,13724 %
>	3/28/2016	176/176	177	0	10.557 m <sup>3</sup>	2.179 m <sup>3</sup>	2.179 m³	8.378 m³	8.378 m³	79,35967 %	79,35967 %
>	4/4/2016	175/176	177	0	13.386 m³	2.065 m <sup>3</sup>	2.065 m³	11.321 m <sup>3</sup>	11.321 m³	84,57343 %	84,57343 %
>	4/11/2016	175/176	177	0	13.131 m³	12.865 m <sup>3</sup>	12.865 m³	266 m³	266 m³	2,02574 %	2,02574 %
>	4/18/2016	176/176	177	0	13.529 m <sup>3</sup>	12.988 m <sup>3</sup>	12.988 m <sup>3</sup>	541 m³	541 m³	3,99882 %	3,99882 %
>	4/25/2016	175/176	177	0	13.475 m <sup>a</sup>	13.207 m <sup>a</sup>	13.207 m <sup>a</sup>	268 m³	268 m³	1,98887 %	1,98887 %
>	5/2/2016	176/176	177	0	11.998 m³	11.299 m <sup>3</sup>	11.299 m³	699 m³	699 m³	5,82597 %	5,82597 %
>	5/9/2016	175/176	177	0	13.499 m³	12.719 m³	12.719 m³	780 m³	780 m³	5,77821 %	5,77821 %
>	5/16/2016	176/176	177	0	13.767 m³	13.120 m³	13.120 m³	647 m³	647 m³	4,69964 %	4,69964 %
>	5/23/2016	176/176	177	0	13.737 m³	13.131 m³	13.131 m³	606 m <sup>3</sup>	606 m³	4,41144 %	4,41144 %
>	5/30/2016	176/176	178	1	12.87° m³	12.441 m <sup>3</sup>	12.469,004 m <sup>3</sup>	436 m <sup>3</sup>	408 m³	3,38596 %	3,17593 %
>	6/6/201	76/176	177		35 m³	12.344 m <sup>3</sup>	12.371,874 m³	390 m³	363 m³	3,06379 %	2,8514 %





68/177 les: 177 10 : Sector: 13.617 m <sup>3</sup> :: 12.479 m <sup>3</sup> + Estimaciones:	•
aciones): 1.056 m³ % maciones): 7,75785 %	
67/177 les: 177 11 sector: 15.444 m <sup>a</sup> s: 14.269 m <sup>a</sup> + Estimaciones:	
· \ 4.6679	Ŧ

Comentarios



## WATER QUALITY MONITORING

Monitoring the water quality is very important in a water network, in real time, the system can detect:

- Possible intrusions in the water network ullet
- Alterations in water composition •
- Adequacy of water quality for consumption ullet

6 quality sensors:

- 5 Eventlab (Optiqua)
- 1 Nano::station (S::CAN) •







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#### Real time monitoring

Connected with quality sensors with 3G (Eventlab) or Aguas de Burgos's network (nano::station)



#### Alerts system

Real time alarms notifications. User can select the way of notification (email, web)



#### Data historical storage

This information can be used to study the behaviour of water quality











# THANK YOU FOR YOUR ATTENTION





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