HOW TO LINK PHYSICAL AND DIGITAL WORLDS FOR WATER?

Speaker, Organisation

Date, Place

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 821036.

CONTENT

1

PROJECT DESCRIPTION

IN A NUTSHELL

- Fiware4Water consortium led by the International Office for Water (OiEau) gathers 14 partners across Europe proposing altogether a pluri-disciplinary team with expertise in different domains.Consortium

14 PARTNERS
Experts in ICT, water and social sciences, coordinated by the International Office for Water

OUTCOMES
- Smart applications for raw water supply
- Smart applications for water supply
- Smart applications for water treatment
- Smart applications customers

FUNDING AND COORDINATION
Fiware4Water is a 3 years project (2019-2022) funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 821036 coordinated by the International Office for Water

4 DEMO CASES
- Athens Water supply and sewerage (GR)
- Cannes Improving the water supply system (FR)
- Amsterdam Wastewater treatment (NL)
- Great Torrington Smart metering (UK)

3 DEMO NETWORKS
- Municipalities
- Water authorities
- Technology providers

- This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 821036.

2

NEEDS & CHALLENGES

WATER DIGITALISATION: A MAJOR CHALLENGE

- **Main current problems**
  - low level of maturity of the water sector concerning
  - integration and standardization of ICT solutions
  - the business processes of these solutions
  - the relative implementation of legislative framework

  (source: Digital Water Action Plan of the ICT4Water cluster for the EC)

- **Causes**
  - fragmentation of the water sector – no holistic vision
  - lack of integration and standardisation of the technologies

- **Existing needs**
  - exploit the value of data for the water sector
  - develop and test robust and cyber-secured systems
  - create water-smart solutions and applications
  - ensure interoperability and higher information capacity
  - design tailored solutions addressing a real need (optimisation, prediction, diagnosis, real-time monitoring, supports to water management!)

3

MAIN OBJECTIVES

WHAT IS THIS PROJECT ABOUT?

- **Main goals:** Link the water sector to FIWARE, an open and License free smart solution platform by
  - showing the potential of its interoperable and standardized interfaces
  - demonstrating a series of complementary and exemplary paradigms (4 DC)
  - promoting an EU and global wide network of users (3DN + SMEs Challenges)

In fine: create the **Fiware4Water ecosystem** and prove its innovative potential (technical, social and business)

- **Useful for who?**
  - Water sector end-users: cities, water utilities, water authorities, citizens and consumers
  - Solutions providers: private utilities, SMEs, developers

- **Concretely**
  - Modular and open APIs will be built to address water management challenges, with a seamless integration with existing legacy systems
  - Technologies will be dev., tested and deployed (multi-parameter sensors)
  - A community of adopters will be created
  - The potential of the Fiware4Water solution will be showcased

4

FIWARE ECOSYSTEM

WHAT IS FIWARE?

- **FIWARE** was funded by the EC (2011-2016) as a major flagship PPP to support SMEs and developers in creating Next Generation of Internet (NGI) services.

Free technology for all and ever

FIWARE
Open APIs for Open Minds

Curated framework of open source components

Royalty-free Common Information Models

Inclusive approach, lowering barriers to contribution

Compelling Roadmap (block chain, AI, robotics, …)

A growing Ecosystem around the technology

FIWARE FOUNDATION

Powered by FIWARE" Solutions and Platforms

"**F**IWARE-ready" Systems, IoT Devices

FIWARE Services (consultancy, training, integration, support)

FIWARE Marketplace website publishing validated offerings

A Community engaged in the success

FIWARE Mundus
FIWARE iHubs
FIWARE FOUNDATION
Members +250
FIWARE EVANGELIST PROGRAM
FIWARE TECH EXPERT PROGRAM
Powered by FIWARE Marketplace

Board of Directors (BoD) providing strategic direction

Technical Steering Committee driving technical decisions

Domain Committees where members setup collaborations

Network of iHubs and Evangelists acting locally

A Foundation

Partners & Key Stakeholders

FIWARE Lab

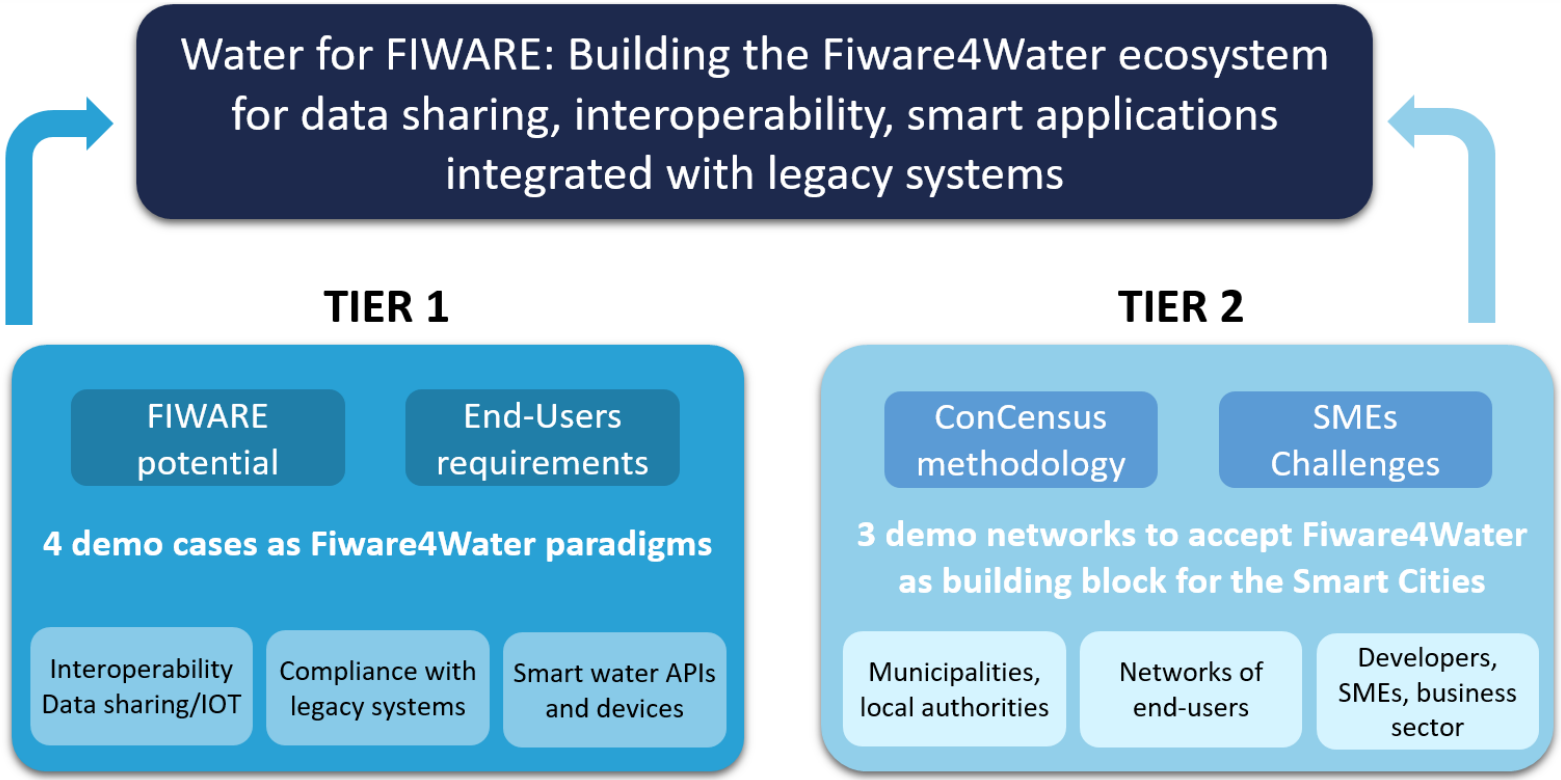
GitHub +8.000 users

Protecting the Brand and compliance with Code of Conduct
Augmenting global reach through relevant partnerships
Empowering the Community bringing support to their activities
Promoting FIWARE and recruiting new Community members
Bring means for validating FIWARE technologies and offerings

5

APPROACH & METHOD

WHAT ARE WE DOING?



Demonstrate specific smart Applications and Devices across the entire water cycle in large scale demo cases

Engage a wide audience of key water stakeholders in understanding, developing and adopting Fiware4water ecosystem and applications

4 DEMO CASES

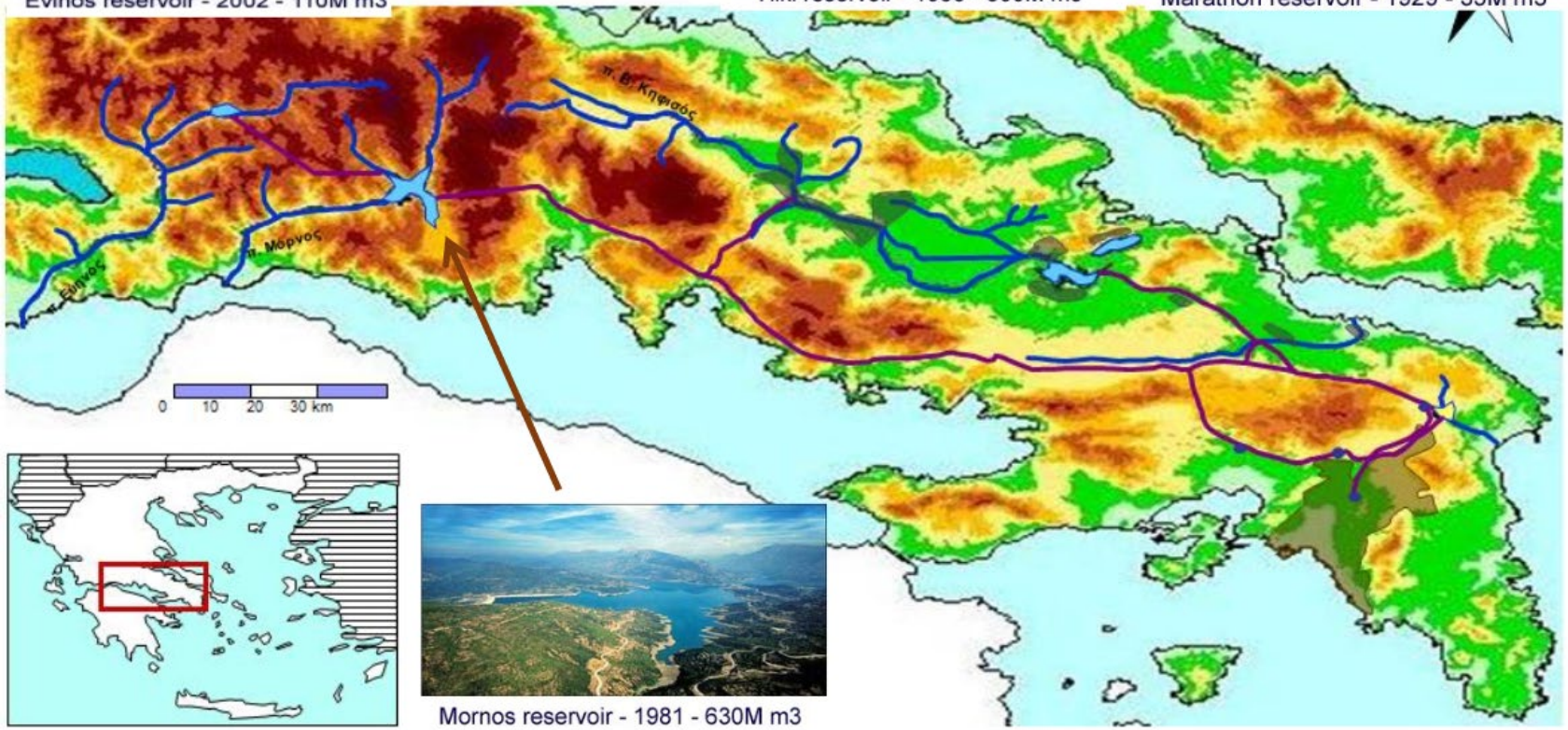
REAL WORLD APPLICATIONS -TIER 1

Demo Case #1: raw water supply optimization in Athens (GR)

Evinos reservoir - 2002 - 110M m3

Yliki reservoir - 1956 - 600M m3

Marathon reservoir - 1929 - 35M m3



Mornos reservoir - 1981 - 630M m3

REAL WORLD APPLICATIONS -TIER 1

Demo Case #1: Raw water supply optimization in Athens (GR)

Context

- The Water Company of Athens's (EYDAP) external raw water supply system serves the city of Athens (5.000.000 inhabitants) with 420 hm3/y.
- The system comprises of around 500 km of aqueducts, and 4 major water reservoirs
- The hydro-system's operation relies on a network of water quantity and quality sensors and related hydraulic and resource management calculations to select the optimal reservoirs to extract water from and the optimal route to follow for the water to reach Water Treatment Plants in Athens (5 open channel flowmeters, more than 10 close pipe flow meters, more than 50 open channel water level meters and 12 water quality meters (turbidity, conductivity, temperature).

Challenge: Upgrade of the supervisory system and digital water strategy

- Integration of different sensors from different vendors into a common system
- Development of different applications (models, analytics) on the data available
- Interface seamlessly with and provide added value to legacy systems (sensors and online control systems)

Role of Fiware4Water

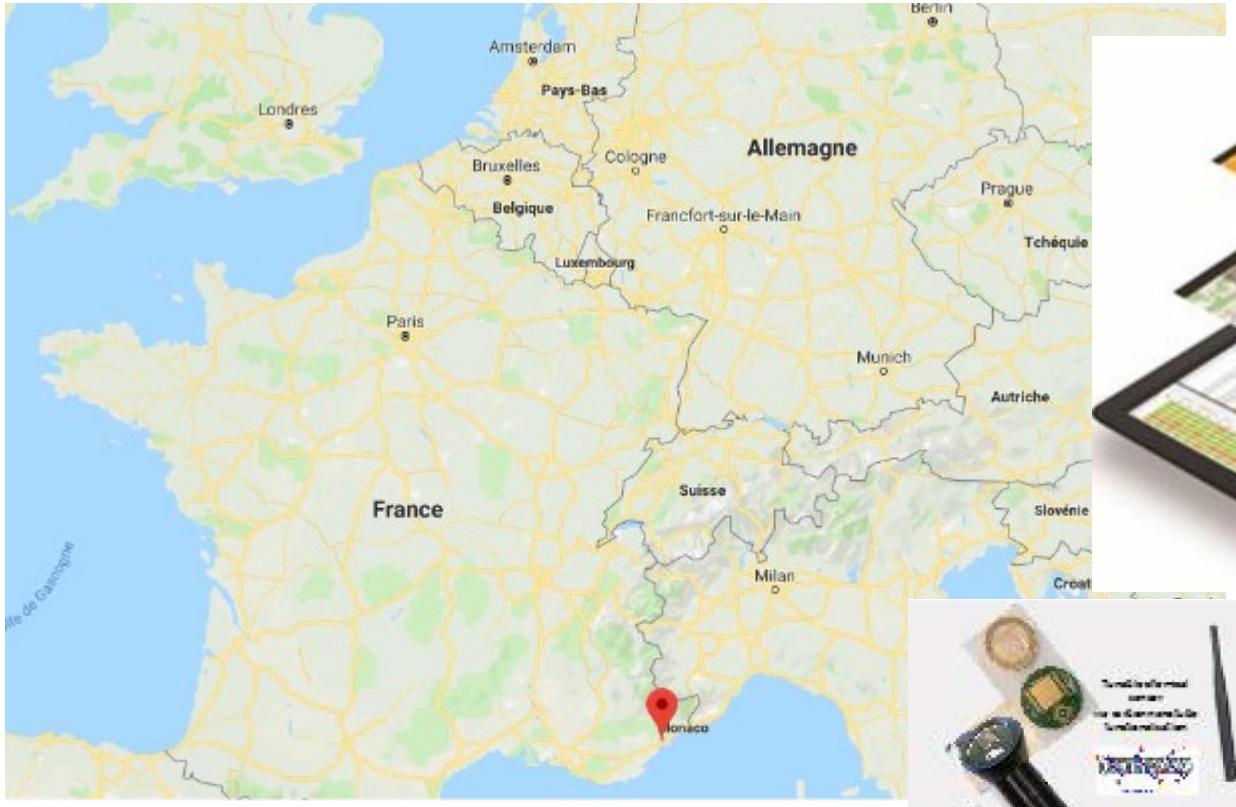
- Integrate operational sensors and other new real-time surveillance methods
- Develop FIWARE compliant analytics and models to analyze data and provide operational decision support for:

  1) Optimization of water conveyance from sources to treatment plants → Development of a water quantity routing application providing (offline) what-if hydraulic scenario

  2) Early warning systems for turbidity, to allow the treatment plants processes customization → Development of a real time water quality early warning application providing a medium-term (1-2 d) forecast of high turbidity and subsequently alert treatment plants (3-5h in advance)

REAL WORLD APPLICATIONS -TIER 1

Demo Case #2: Water distribution system management in Cannes (FR)



REAL WORLD APPLICATIONS -TIER 1

Demo Case #2: Water distribution system management in Cannes (FR)

Context

- Cannes = touristic city: sunny climate, beaches and its famous Film Festival
- Population: 181,000 permanent inhabitants but 500,000 during the peak season-Operation
- Water management very challenging in this water scarce environment
- Total production capacity: 31 hm3 / year (26 hm3 / year on average), Distribution network : 987 km long
- SUEZ Eau France = Private operator providing Drinking Water to SICASIL (8 municipalities, including Cannes)

Challenge: Improve the water distribution system

- Efficient and proactive water management during summer to better anticipate water availability
- Improve monitoring and medium-term forecast of water demand
- Monitor water quality parameters all along the distribution network
- Detect and reduce leakages

Role of Fiware4Water

Water quantity

- Develop IT connectors for exchanging data between the FIWARE platform and SUEZ legacy softwares
- Improve the short-term water demand forecast (several days ahead)
- Develop control modules for managing the water supply system in real time
- Build-up a model forecasting the capacity of water resources (4 months ahead)
- Improve the leak detection

Water quality

- Evaluate the anomaly detection module
- Install and evaluate the PROTEUS probe In lab and then in full scale on the SICASIL network

REAL WORLD APPLICATIONS -TIER 1

Demo Case #3: Intelligent control of WWT in Amsterdam (NL)

REAL WORLD APPLICATIONS -TIER 1

Demo Case #3: Intelligent control of WWT in Amsterdam (NL)

Context

- Waternet's WWTP West has a capacity of 1 Million population and serves the city of Amsterdam
- Amsterdam is a FIWARE supporter city as part of the Open and Agile Smart Cities Initiative
- The process automation will be renewed and the IT architecture of WNT is in fast development
- The target is to optimally benefit from implementation of upcoming technologies such as Artificial Intelligence (AI), Internet of Things (IoT), Business Intelligence (BI)
- Currently the control loops of WWTP West are largely dedicated to a single process.
- With the use of real-time plant data, process models and external data sources a more optimal plant-wide control can be achieved.

Challenge: Optimise WWT operations thanks to ICT

- Reduction of N2O emission and energy demand to achieve climate neutral, which can be largely overcome via a more stable operation.
- Increase the capacity of the current treatment plant, to support the ever-increasing influent flow, with a more stable operation

Role of Fiware4Water

- Use historical data analytics from real(time sensing to predict the dynamic behavior of the treatments
- Installation of new sensors
- Development of tools to determine oxygen set points, nitrification capacity or in-situ respiration.
- Creation of robust and transferable control algorithms to reduce N2O emissions, to reduce energy demand and to improve overall treatment efficiency

REAL WORLD APPLICATIONS -TIER 1

Demo Case #4: Smart metering & citizen engagement in UK

REAL WORLD APPLICATIONS -TIER 1

Demo Case #4: Smart metering & citizen engagement in UK

Context

- Site: Great Torrington, North Devon, UK
- The area consists of approximately 3200 properties with community schools, social clubs and local shops
- Large number of vulnerable customers who are mostly unmeasured,
- Signe feed DMA with a confined water network and close to SWW assets

Challenge: Upgrade of the supervisory system and digital water strategy

- Improve water efficiency through customer engagement: drive behavior change and demonstrate to customers the link between water efficiency and lower household bills
- Propose affordable bills and tackle water poverty: re-engage vulnerable customers with their water bills and save them money by installing smart meters
- Develop a scalable solution: test the possibility to use FIWARE to quickly move from R & D to a business wide, sustainable solution

Role of Fiware4Water

- Installation of ~1500 smart meters in the area
- Transmission of 15 minute flow data at chosen intervals throughout the day to the FIWARE platform
- Big data analytics and development of 3D high visualisation techniques to show data from the smart meters at household level
- Development of modular applications giving feedback to individual customers (and customer groups) about their water use and encouraging behavioral change and water savings

3 DEMO NETWORKS

AWARENESS RAISING-TIER 2

Demo Network #1: Municipalities

Targeted audience

Lower Danube (Romania, Bulgaria, Hungary, Croatia, Serbia and Moldova), the Middle East (Jordan, Israel and Palestine) and North Africa (Tunisia and Morocco)

Context

- Weak economic conditions of these regions → affect their water sector capacity to implement water, wastewater and ecosystem innovations.
- Investments in water networks are a priority but implementation of smart devices and services is lagging behind
- Low funding availability → low capacity of development and implementation of new solutions by water companies and authorities have little capacity

Approach

- Select several (4-7) countries
- Assess the potential for uptake of theFiware4Water portfolio of Smart Devices and APIs
- Analyse of the development stage of digitalisation of their water sectors
- Consider existing institutional and legal frameworks enabling IT innovation in water sector
- Identify potential technical gaps that could delay application of Fiware4Water services

For the most promising markets: selection of the most relevant *Fiware4Water* solutions in the local context to be adopted and further developed (*ConCensus*)

AWARENESS RAISING-TIER 2

Demo Network #2: Water authorities

Targeted audience

International Network of Basin Organisations (INBO):

- Basin Organizations entrusted by relevant public administrations with IWRM at the level of river basins, lakes or aquifers, either national, federal or transboundary
- 192 full Members or Permanent Observers from 88 countries worldwide

Context

- INBO has a role of support to its members, to facilitate the implementation of tools suitable for institutional and financial management, programming, organization of databanks and information systems

Approach

- Organisation of 6 workshops (2022) linked to events driven by its regional branches (Europe, Africa, Mediterranean, South America, North America, Central Asia)
- Showcase the benefits of Fiware4Water smart applications and devices for managing water in an integrated way

AWARENESS RAISING-TIER 2

Demo Network #3: Technologies providers

Targeted audience

- FIWARE Innovation Hubs: European Manufacturing SMEs, Cities and water managers

Context

- Lack of access to advance ICT solutions → decrease in SMEs agility and higher cost → productivity affected
- Smart water management solutions require SME architecture that embraces convergence of many systems at once
- “Smart” implies challenges: data security implications, innovation relying on the combination of technical knowledge and access to finance…

Approach

- Build on the FIWARE Mundus programme and approach to create an inclusive and continuously growing network of water management innovation hubs
- Contribute to a rapid commercialization of those smart water management solutions through the Fiware4Water platform for smart water management

7

EXPECTED IMPACTS

EXPECTED IMPACTS

EI#1: **Interoperability** of decision support systems through the identification and use of ICT/water vocabularies and **ontologies** in view of developing or improving ICT/water standards

EI#2: Improved decision making on water management, related risks and resource efficiency through increased **real-time** data

EI#3: Maximizing return on investments through i) reduced operational costs for water utilities, ii) **improved performance of water infrastructures**, and iii) enhanced access to and interoperability of data

EI#4: Enhanced public **awareness** on water consumption and usage savings

EI#5: **Market development** of integrated and cyber-resilient ICT solutions and systems for smart water management, and opening up of a digital single market for water services

EI#6: Implementation of the **objectives of the EIP Water**, especially, reducing the environmental footprint of the main water-dependent activities and improve their resilience to climate changes and other environmental changes

Thank you for your attention

Speakers, Organisation, contact

FIWARE 4 WATER

@Fiware4Water

@Fiware4Water

www.fiware4water.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 821036.