

### WAVES

#### **BIG DATA PLATFORM FOR REAL-TIME SEMANTIC STREAM MANAGEMENT**

### USE CASE Water Network Management











## **ABOUT WAVES**

**Big Data Platform for Real-time Semantic Stream Management** 







### From Heterogeneous Sensor Data to Anomaly Detection

- RDF-ization: From heterogeneous sensor data to Linked sensor data
- Compression: From Linked sensor data to compressed streams of RDF events
- Distributed Processing: Real-time distributed SPARQL querying over streaming and static RDF graphs
- Anomaly Detection: Analyzing SPARQL output to detect anomalies in real-time





### Architecture based on Modern Big Data Frameworks

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## Use Case WHY Water Resource Management?

Addressing an environmental issue on a global scale











### **Non-revenue water**

Multiple factors cause NRW



### Non-revenue water

NRW, a globalocal challenge

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Water demand is projected to increase by 55% globally between 2000 and 2050

Demand will mainly come from:

- Manufacturing: +400%
- Electricity: +140%
- Domestic use: +130%



→The NRW global issue can only be solved locally thanks to a holistic water network management





### **Smart Water and Wastewater systems for cities**

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Source: http://www.ondeosystems.com/en/smart-water-2/



## HOW WAVES?

How to detect water network anomalies with WAVES?





### Use-case Scenario: Anomaly Detection in Water Network

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#### Threshold-based anomaly detection per sector

Computing real-time water consumption  $C_s$  at time t for each sector belonging to the network topology:

 $C_s(t)$  = sum of values of input flow sensors – sum of values of input flow sensors



Potential anomaly if  $C_s(t) > \Theta(t)$ 







# Use-case Scenario: Anomaly Detection in Water Network







### **Composing the scenario workflow in WAVES UI**

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#### Create a Reasoning Workflow







# **Use-case Scenario: Example of results of one sector**

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**Future Perspectives** 

- Enrichment with Linked Data and Social Media to determine the cause of anomalies (e.g., very high or low consumption, etc.) :
  - Is there something happened in social networks: natural disaster, etc.
  - Special events: holidays, festivals, marathon, etc.
- Decision making: a potential anomaly could be considered as a real anomaly or not:
  - Invoking background context to make decision
  - Extending reasoning capabilities in WAVES















### Feel free to contact us!

#### We are friendly and social

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