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ΔΕΣΜΟΙ
ΑΝΑΠΤΥΞΗΣ

Nicosia, 16/12/2019

SmartWater2020: Innovative technologies to minimize the loss of water in Cyprus and Crete

Dr. Maria N. Anastasiadou, KIOS Research Centre, UCY

Objective

Installation of innovative technologies (WB) and the development of innovative research and applications (RC) in order to upgrade the services offered by Water Organizations.

Challenges

- Background leakages which are hard to detect
- Increasing pipe bursts
- High percentage of non-revenue water
- Water quality & contamination risk
- Security and safety of the cyber/physical infrastructure
- Real-time monitoring
- Equipment and telecommunication costs
- Staff training

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Project Team

University of Cyprus

Κοῖος
Research and Innovation Center of Excellence

ΙΤΕ
ΙΝΣΤΙΤΟΥΤΟ ΠΛΗΡΟΦΟΡΙΚΗΣ

Water Board of Lemesos

WDD TAY

Δ.Ε.Υ.Α. ΜΑΛΕΒΙΖΙΟΥ

SmartWater2020: Intelligent Water Distribution Networks for Reducing Loss

Budget: € 907,000

December ‘17 – June ‘20

ΔΕΣΜΟΙ ΑΝΑΠΤΥΞΗΣ

KIOS Team

- Prof. Marios Polycarpou
- Prof. Christos Panayiotou
- Ass. Prof. Res. Demetris Eliades
- Dr Agathoklis Agathokleous
- Dr. Maria Anastasiadou
- Dr. David Ayala Cabrera
- Stelios Vrachimis
- Magdy Sayed Abdulmagued
- Marios Kyriacou
- Marilena Chrysanthou
- Pavlos Pavlou

Expected Outcomes

- Installation of smart meters at WB Larnaca, WDD, DEYAM
- Installation of pressure and quality sensors in WB Limassol and WDD
- Installation of a pressure regulation system in WB Limassol
- LoRaWAN wireless platform evaluation at WB Larnaca
- Integrate with SmartWater2020 platform at KIOS
- Development and testing of innovative methods of data analysis
- Test innovative techniques to reduce telemetry costs and energy
- Creation of digital games to promote water awareness
- Staff training on intelligent water networks topics
- Creation of simulation tools for research purposes

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Innovative Technologies

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Wireless Water-Meters

- 700 DEYAM (RF)
- 350 WBLarnaca (LoRaWAN
- 15 WDD (3G)

Ασύρματα υδρόμετρα στο Μαλεβίζι

17 ΣΕΠΤΕΜΒΡΙΟΥ 2018

Η σύμβαση για την τοποθέτηση των πρώτων 700 «έξυπνων» ασύρματων υδρομέτρων στο Δήμο Μαλεβιζίου, υπεγράφη στα κεντρικά γραφεία της Δημοτικής Επιχείρησης Ύδρευσης και Αποχέτευσης Μαλεβιζίου.

Pressure and Quality Sensors

Pressure and Quality Sensors

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Multiparametric Quality Sensors

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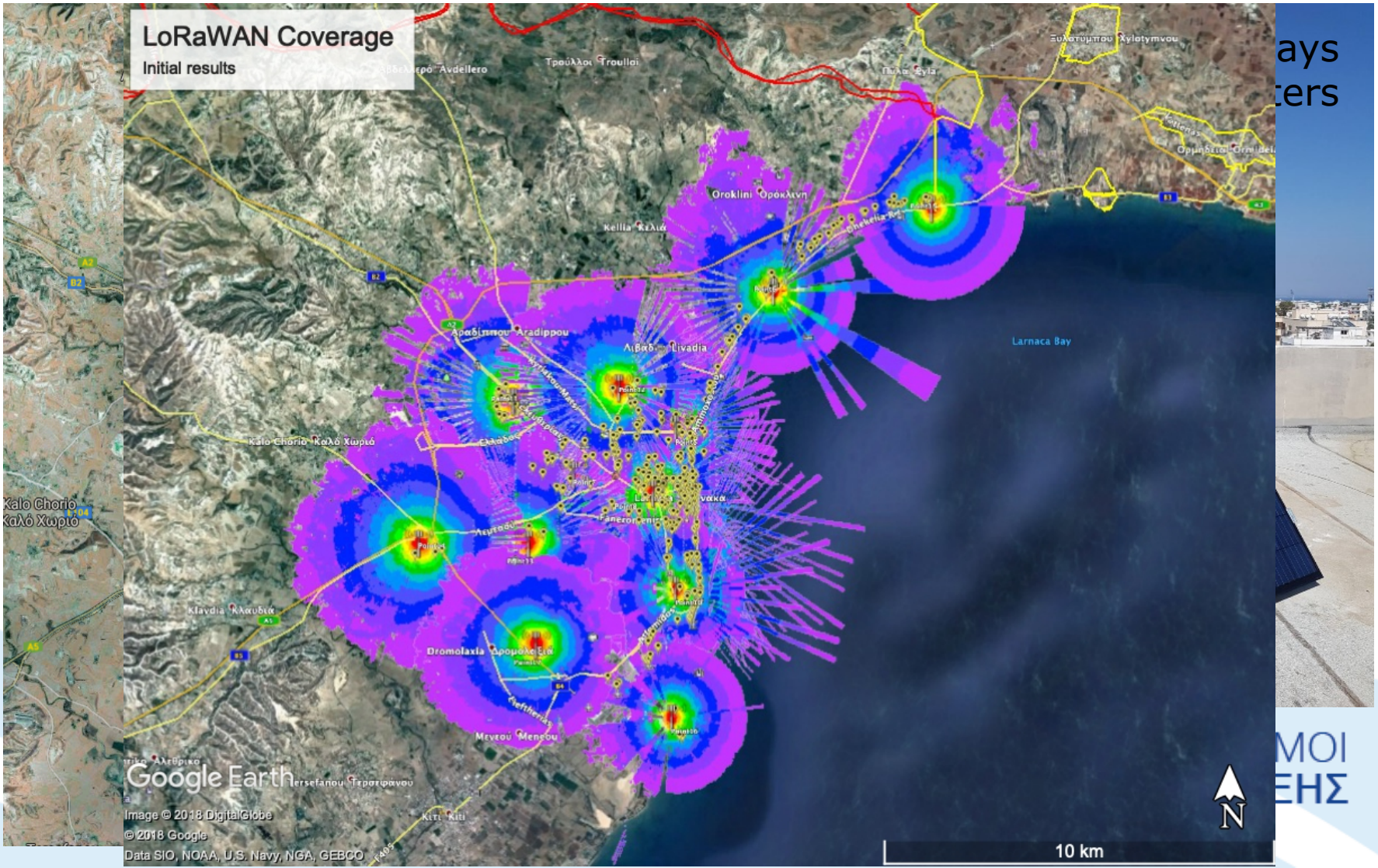
LoRaWAN @ Larnaca



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SmartWater2020 Platform

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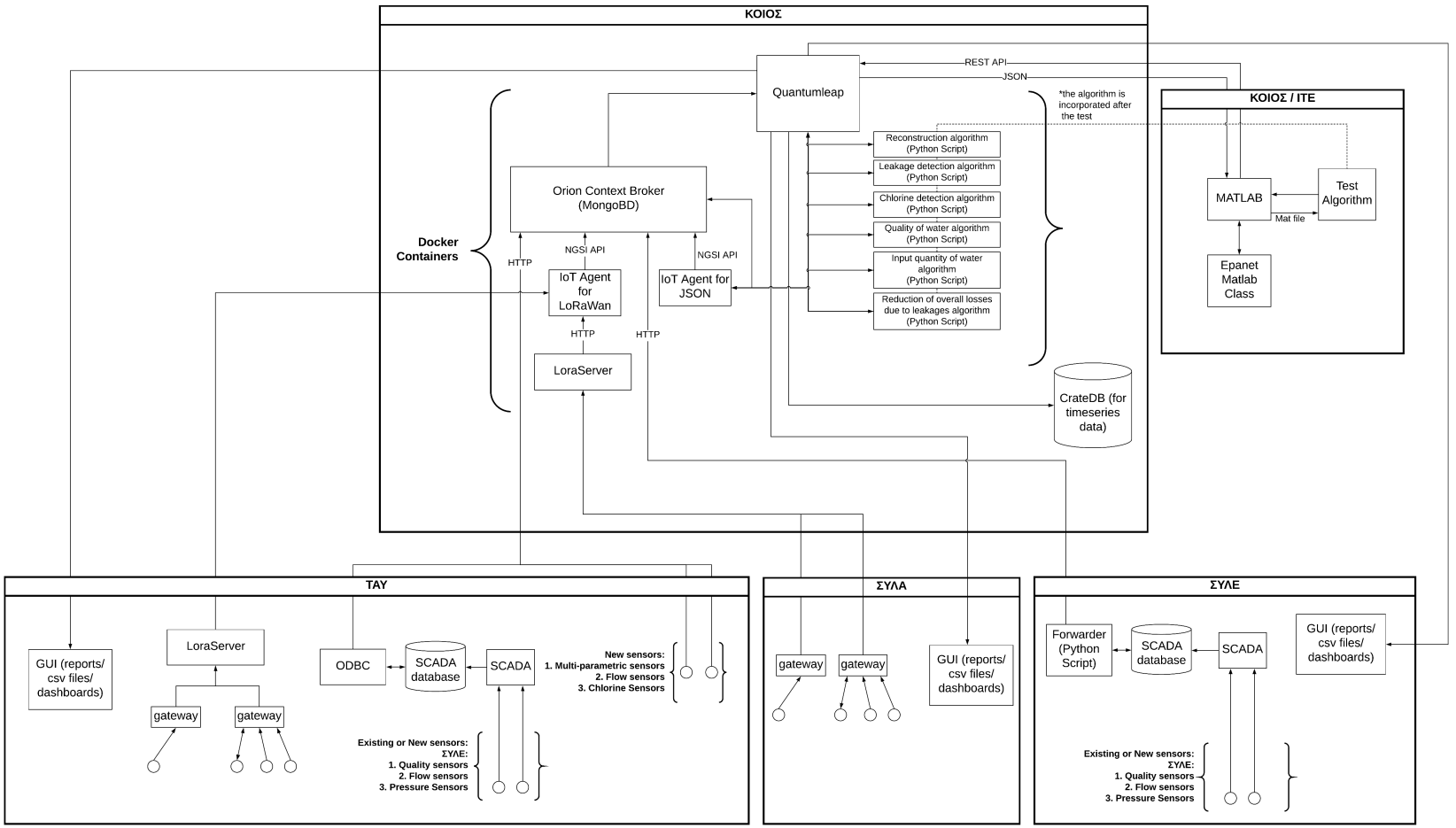
SmartWater2020 Platform



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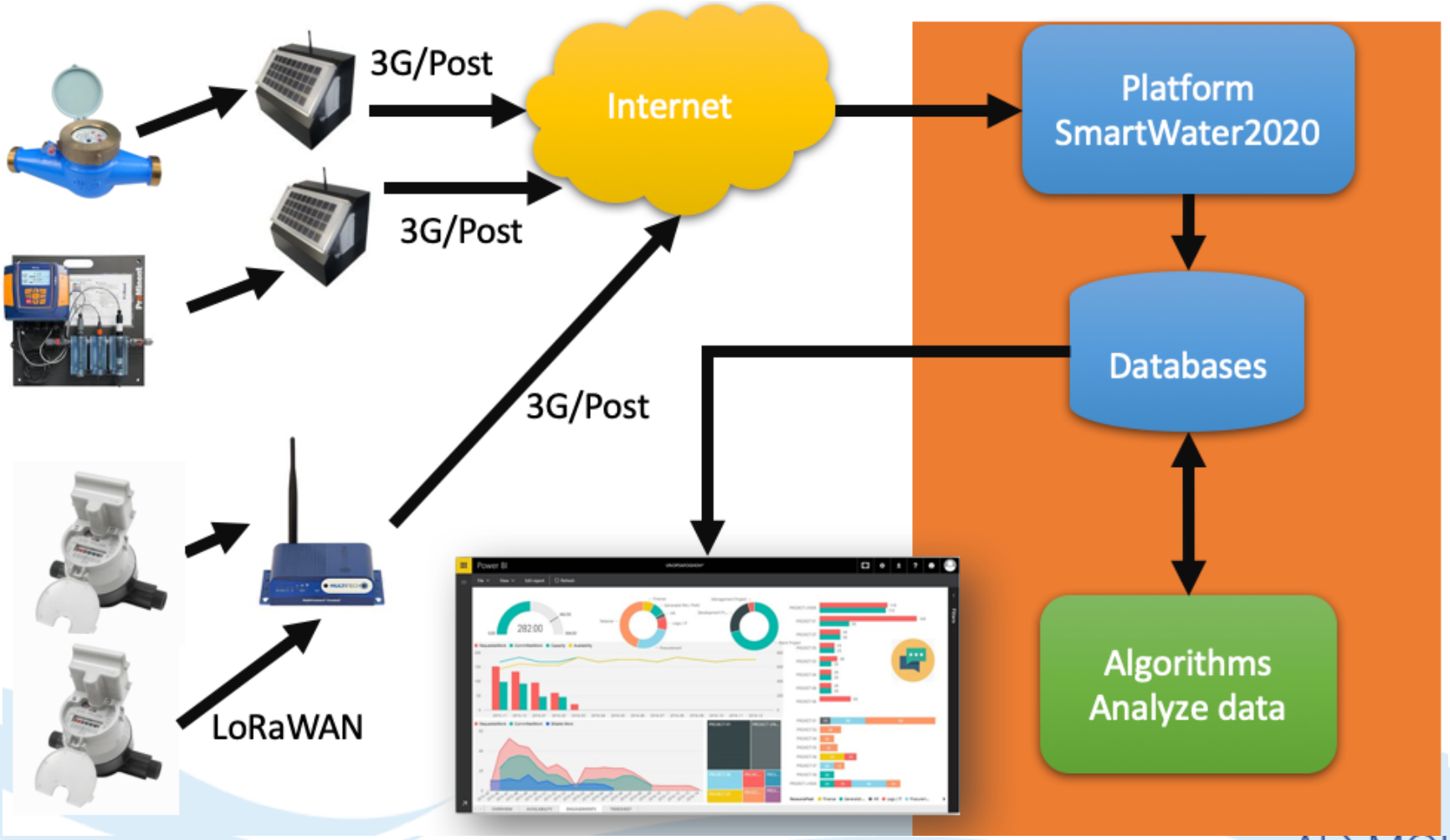
Systems Architecture



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Dashboards

Data Stream

Alerts Table

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Innovative Research

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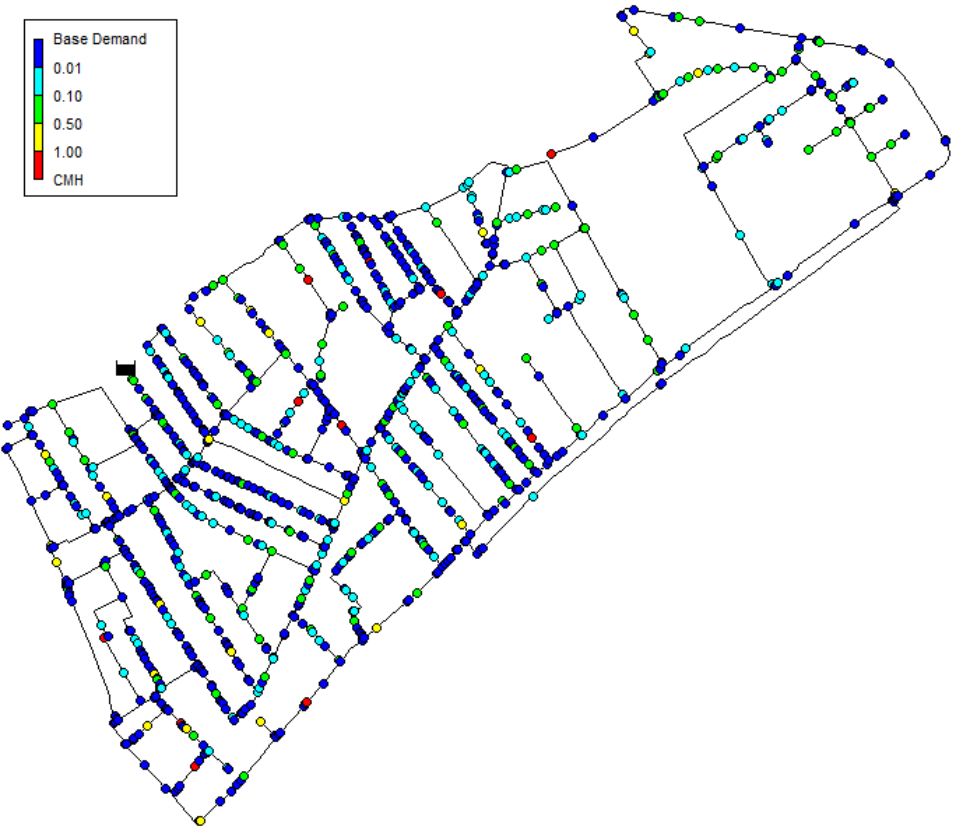
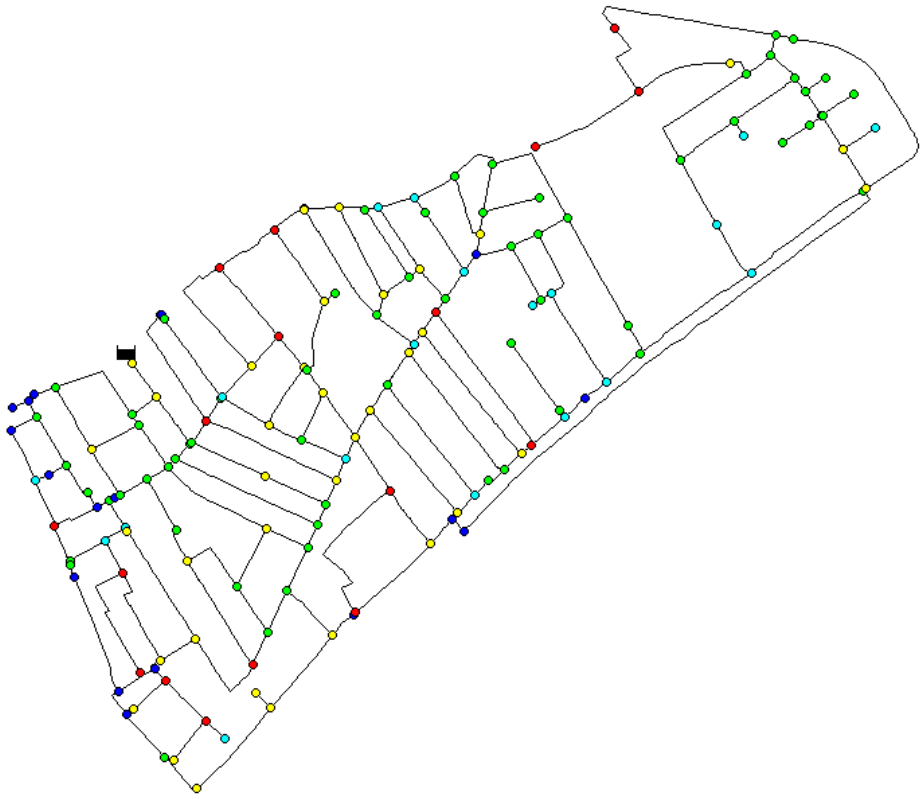
Modelling

GIS



EPANET



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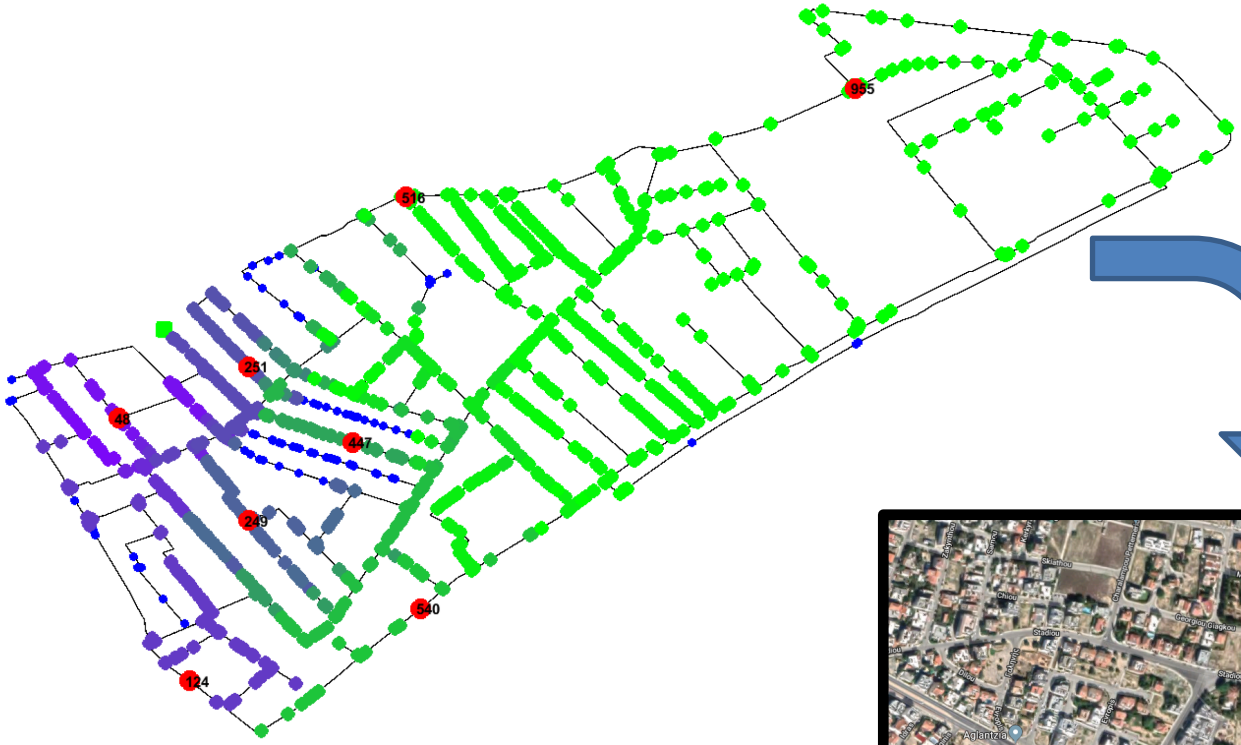
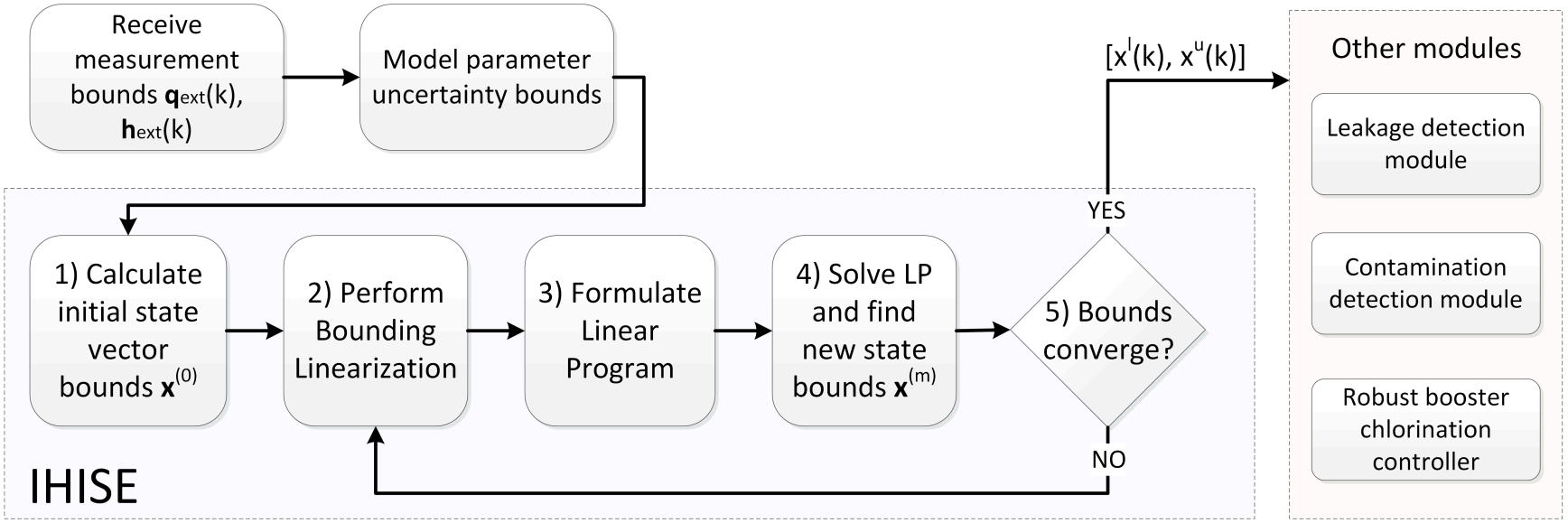
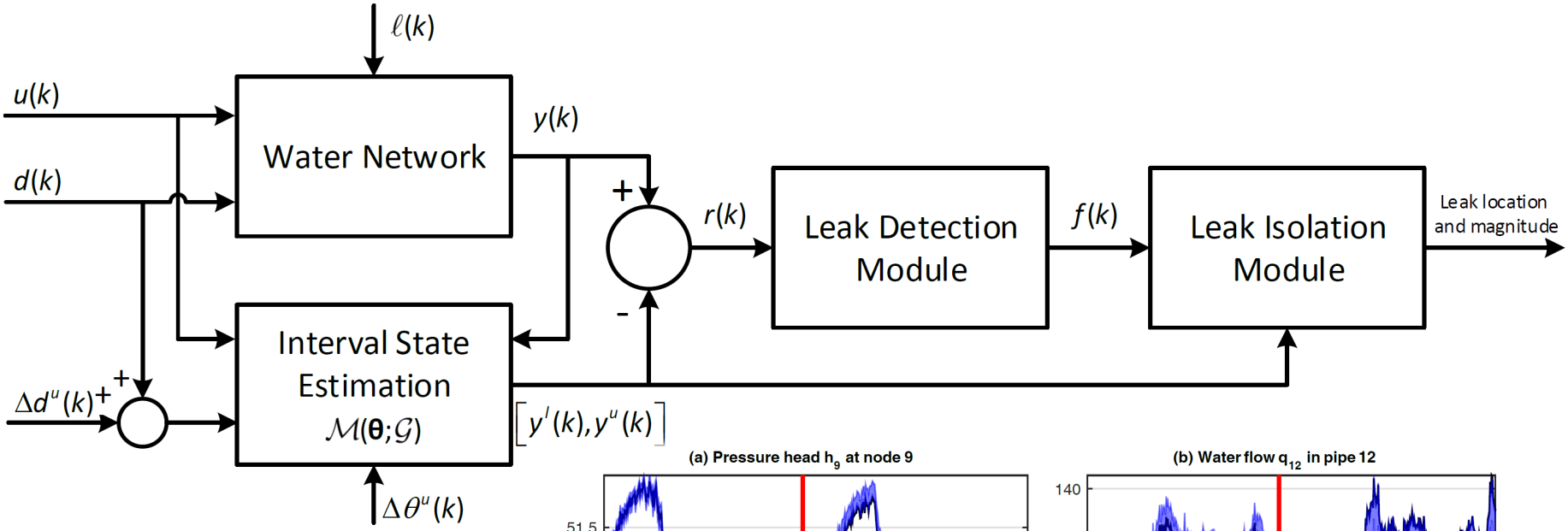
Pressure sensors placement

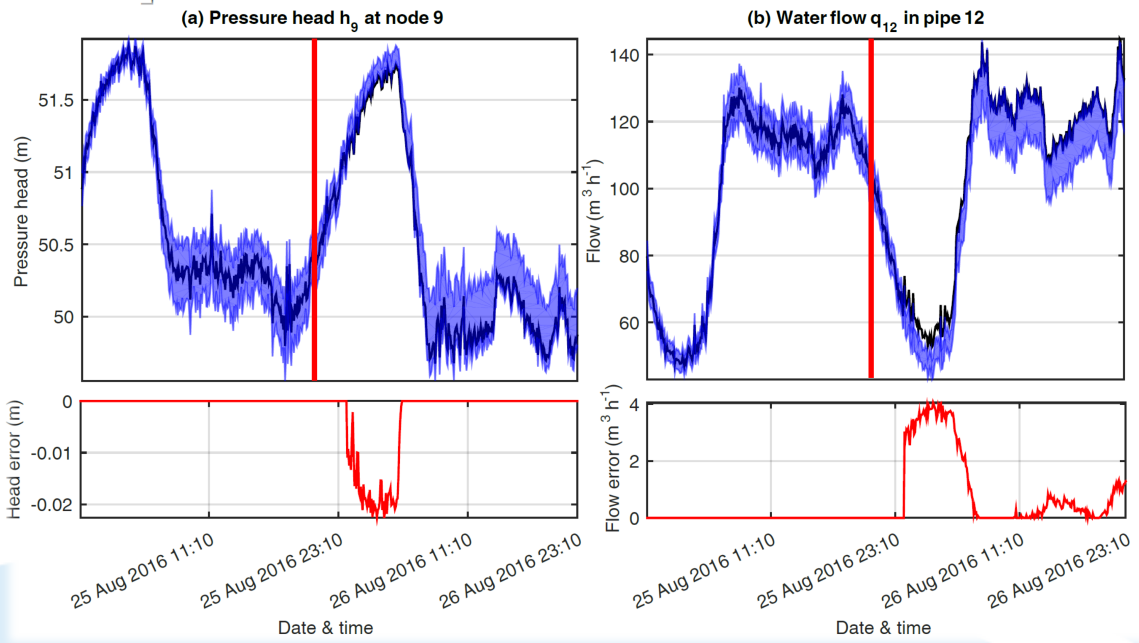


Hydraulic / quality state estimation

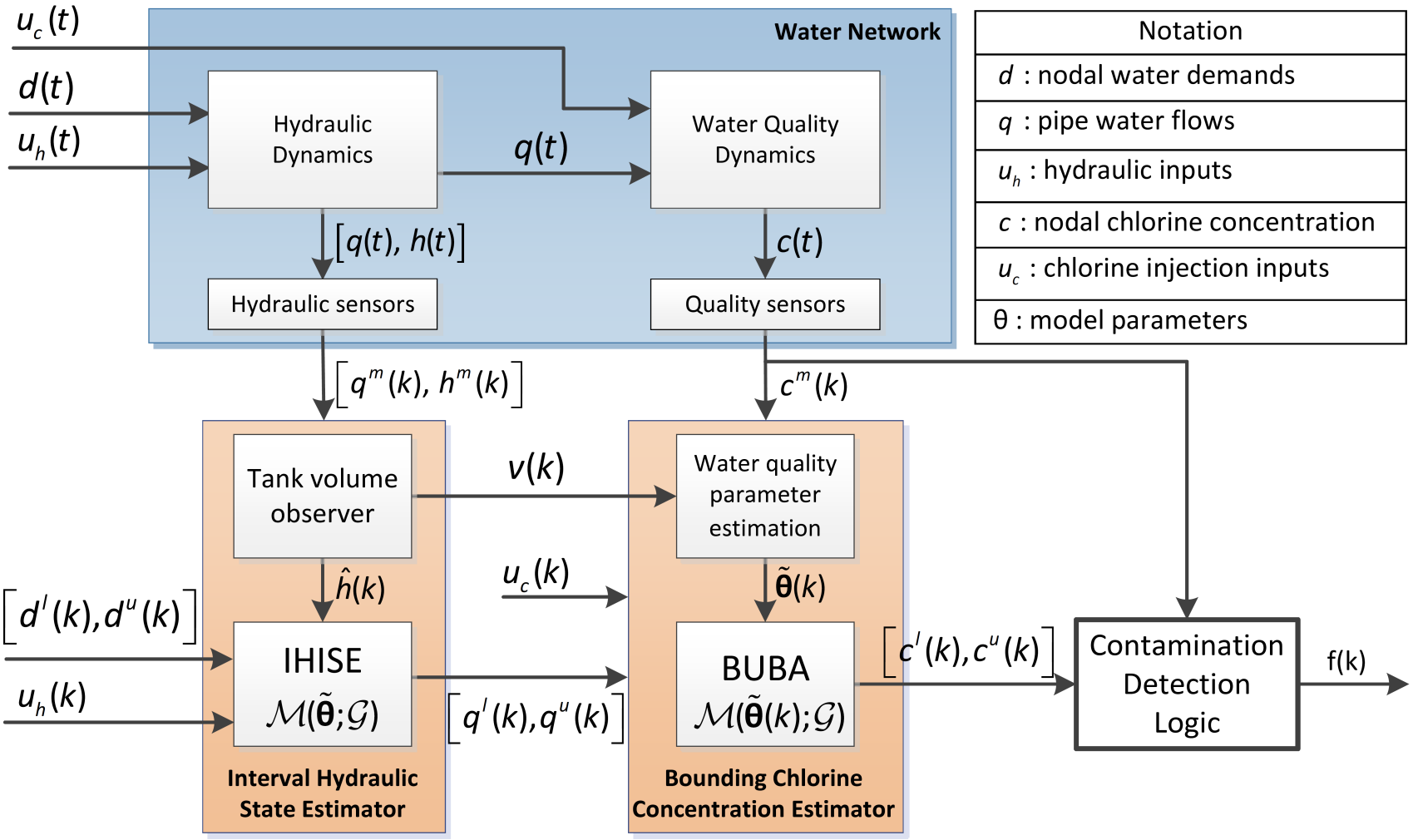


Leakage Detection



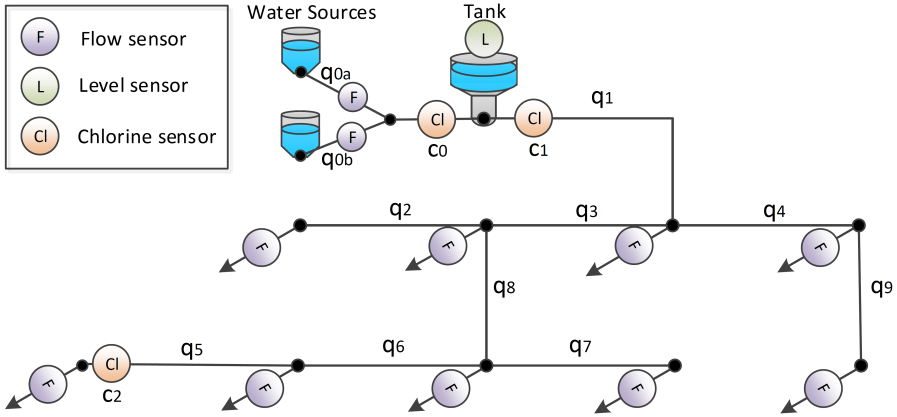


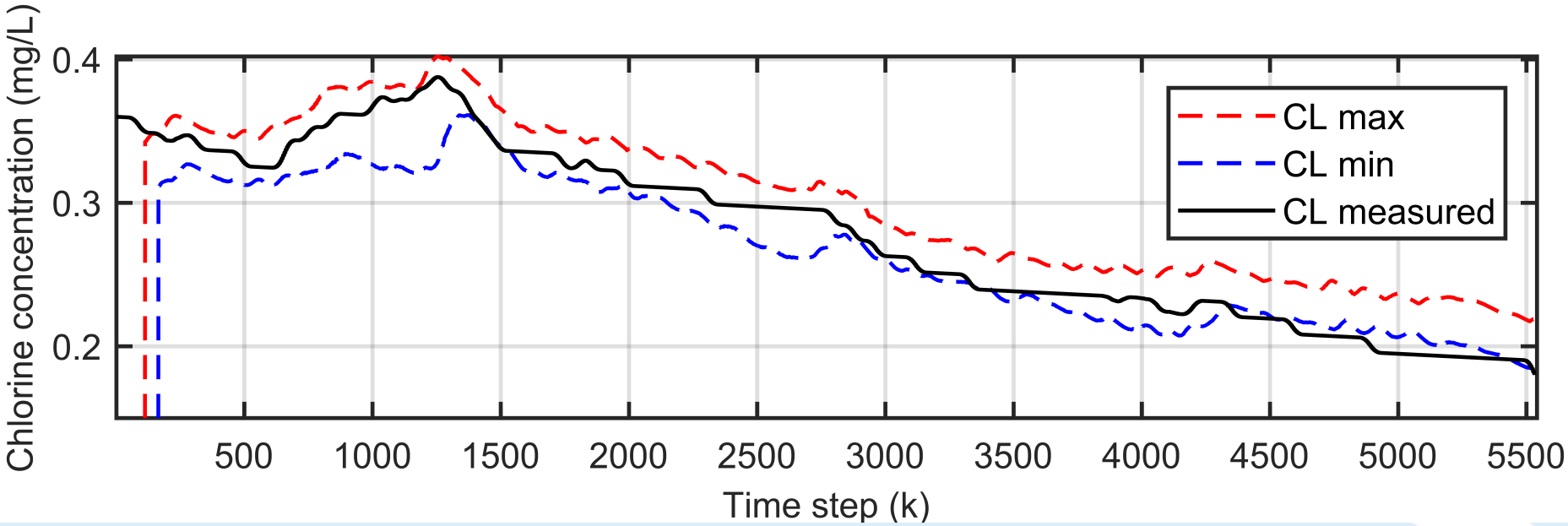
Quality estimation



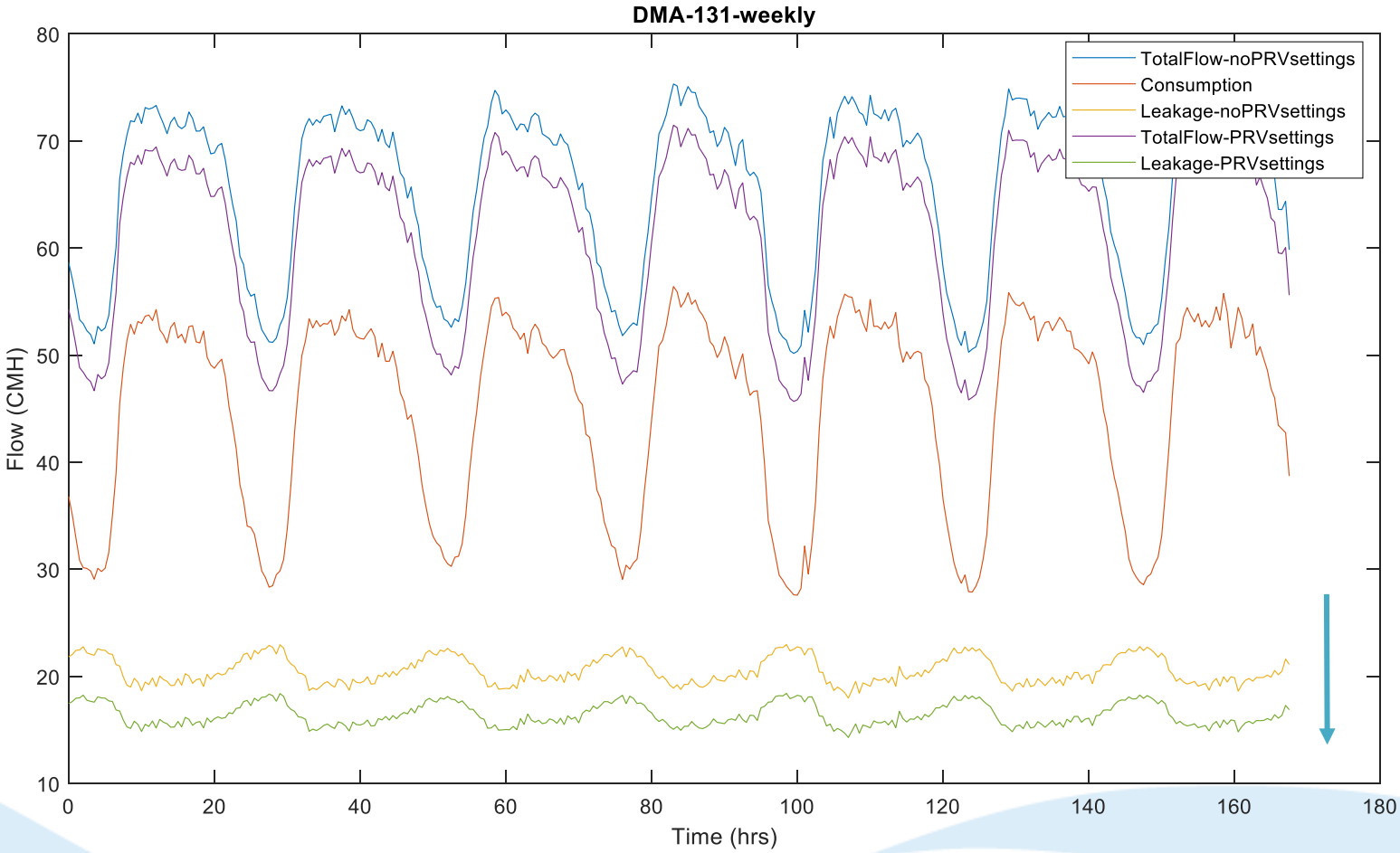
Notation
d : nodal water demands
q : pipe water flows
u_h : hydraulic inputs
c : nodal chlorine concentration
u_c : chlorine injection inputs
θ : model parameters

Quality estimation





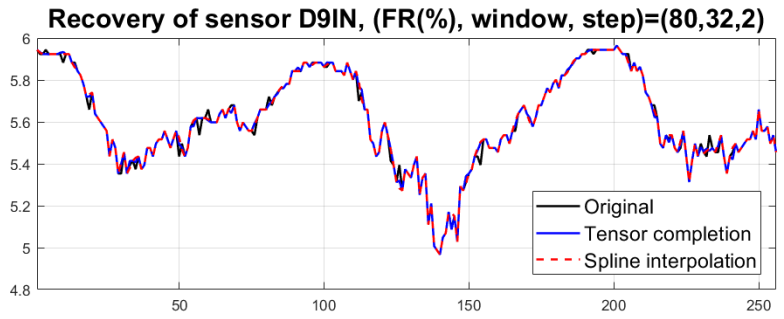
Pressure control with automated reduction valves

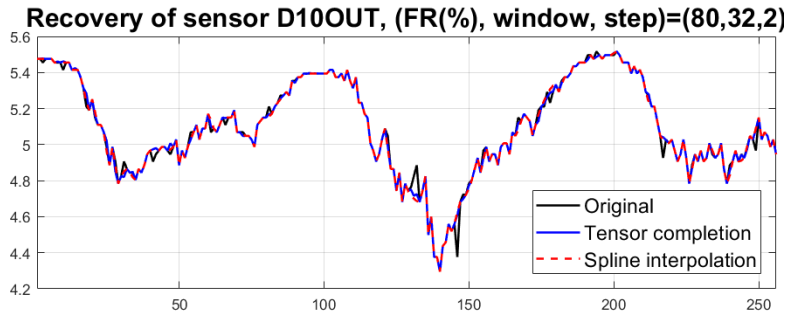


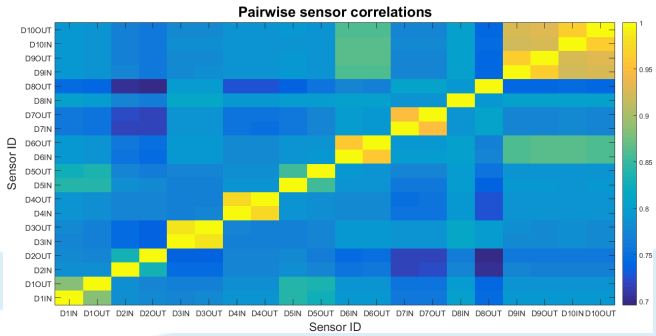
Δυναμική ρύθμιση των PRVs στις εισόδους των DMAs με στόχο την μείωση των απωλειών βάσης

Intelligent Telemetry to reduce costs and energy

- Compressed sampling and data reconstruction
- Sensor correlation
- Missing-data recovery
- Super-resolution of sparse measurements
- Anomaly detection in sensor signals

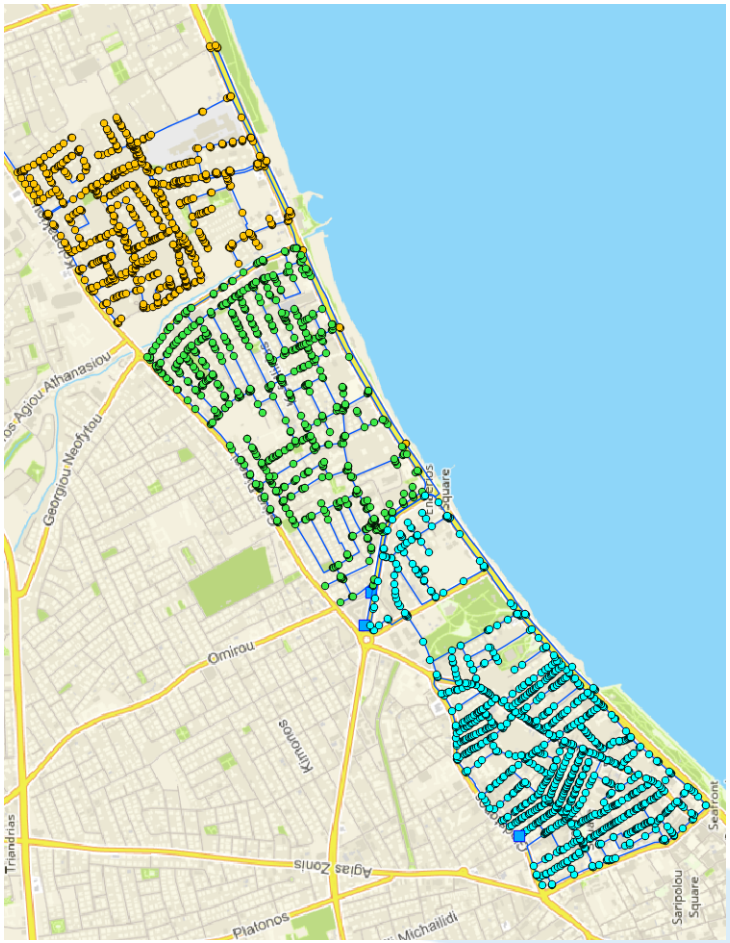






Pilots

- Limassol center
- Artificial Leakages
- Real Leakages
- Pressure control
- Quality monitoring



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Exploitation / Dissemination

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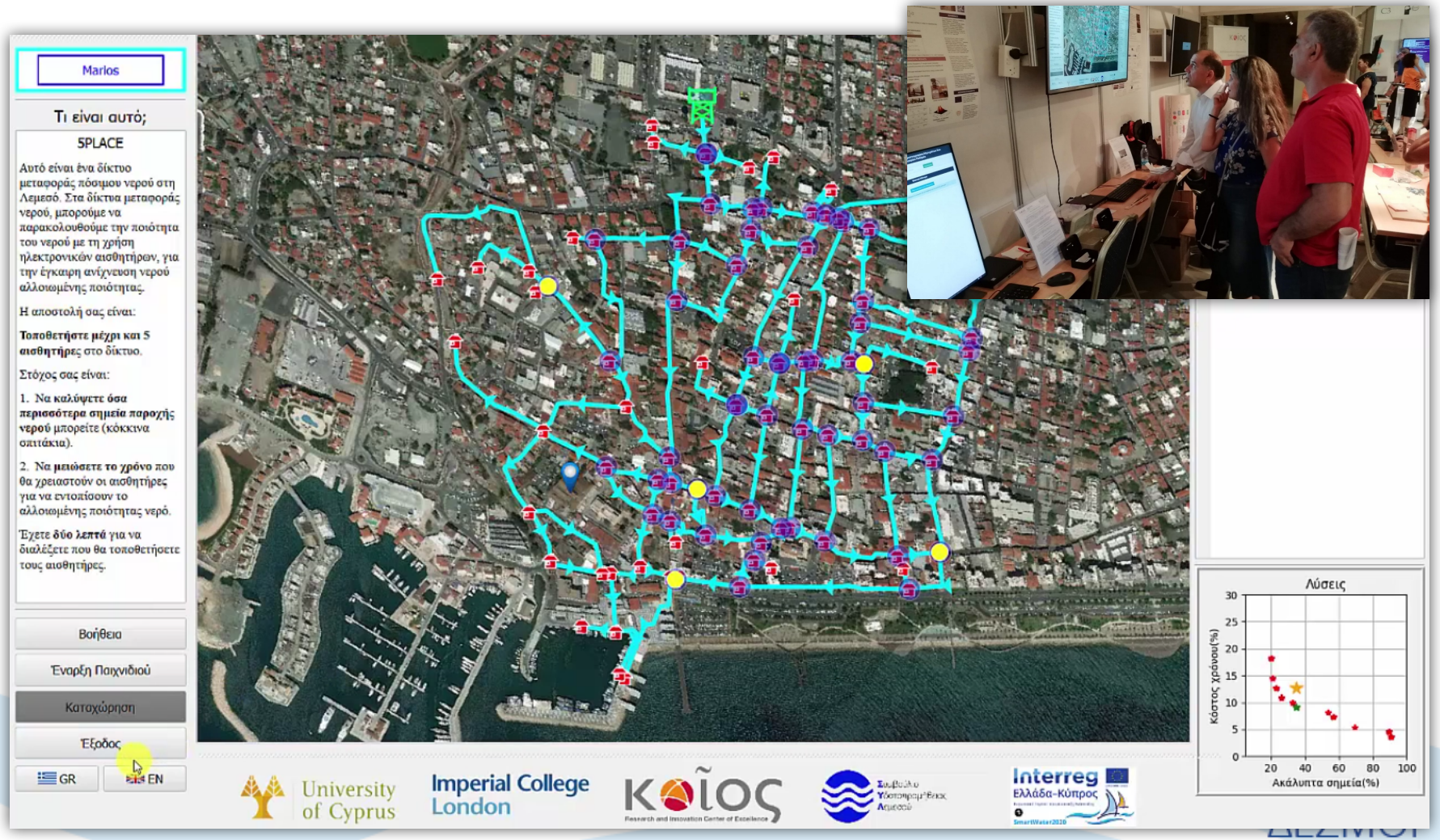
Digital Games



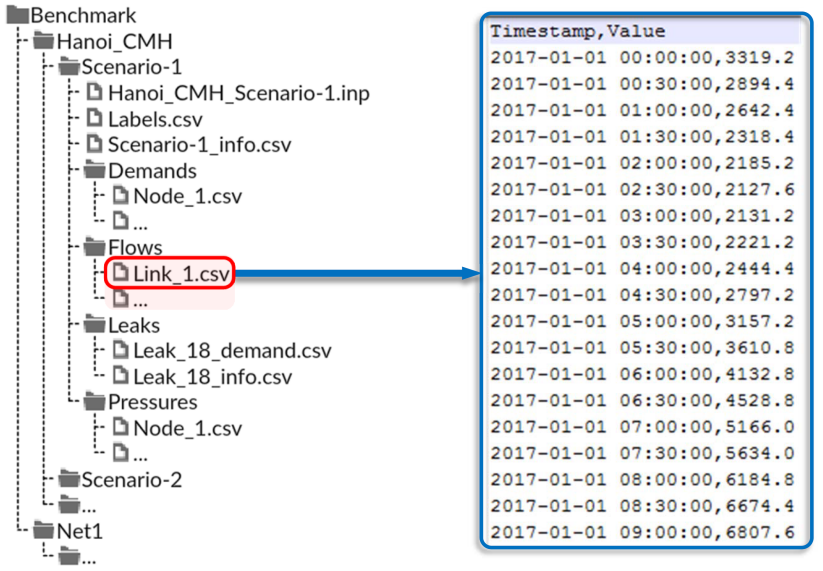
ΔΙΕΘΝΗΣ ΑΝΑΠΤΥΞΗΣ

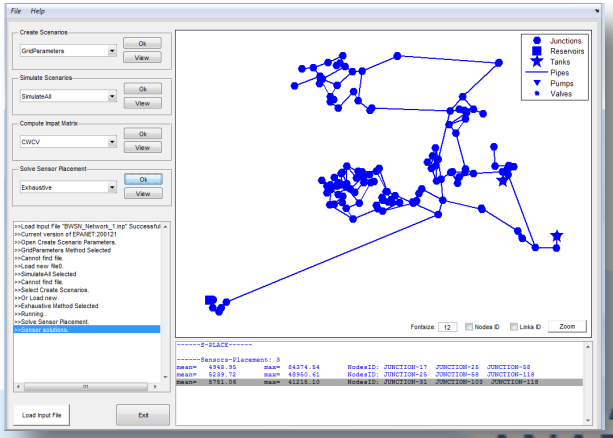
Staff Training

- Development of educational material
- Modeling and simulation of water networks using EPANET
- Training seminar (Q1, 2020)
- Open for engineers / technicians that are interested in delving into how to use EPANET to make decisions

Simulation Platform

- A virtual network based on open data
- A benchmark of virtual leaks
- Tool for verifying leak detection and localization
- The goal is to launch a world competition using this benchmark





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Conclusions

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Benefits

- Real-time monitoring of the water network for leakage detection.
- Dynamic pressure control of water network to reduce water losses.
- Real-time monitoring of water quality through sensors.
- Use of innovative wireless communication systems to reduce telemetry costs.
- Interfacing existing systems with intelligent software that analyzes large databases.

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Thank you

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