

# fuelics

Edge computing technologies in water management

**Nano**  
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Conference & Exhibition

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## Speaker Info ›

Dr. Evangelos Angelopoulos is one of the first **Adjunct Industrial Researchers** in Greece

He belongs in the **Materials and Membranes for Environmental Separations Laboratory (MESL)** working closely to Dr Evangelos Favvas and Dr. Andreas Sapalidis.

His main job is to **identify ideas and turn them into industrial products.**

He is the founder, CEO and Business Development Director of a Fuelics Company and his strive is to commercialize sensors for the Internet of Things for **massive deployments.**

Fuelics has been developing Edge Computing Sensors and has made a name for developing

“Edge Computing Sensors in Constrained Devices”

Which means; the design and development of electronic circuitry that is able to take decisions under machine learning or AI methodologies while being powered only by a battery that will be able to sustain operation for 10+ years



## Introduction about Fuelics

Fuelics is a spin-off from the Institute of Nanoscience and Nanotechnology of the NCSR Demokritos, Greece.

We collectively own significant experience in **industrializing sensors** and **in connecting assets in the cloud**, with high measurement accuracy, extra low energy usage, low production cost, **AI algorithms** incorporated in microcontroller level, intrinsic **edge computing** capabilities and **Remote Device Management** and **Firmware-over-the-Air** provision.

Fuelics is utilizing Low Power Wide Area Network (**LPWAN**) technologies, mainly focusing on the design and the development of **battery operated Narrow Band (NB-IoT)** sensors and platforms for **Fuel Management & Smart City** applications.

We are continuously striving in identifying new **massive markets** for IoT sensors and produce high valuable industrial **Intellectual Property**.



## From GPRS/3G to NB-IoT and Edge Computing Devices ›

- › The most known way to get **telemetry** within a city is by using a **SIM card** from a telecommunication provider. **2G** or **3G** technologies are widespread technologies.
- › **NarrowBand Internet of Things (NB-IoT)** is a new infrastructure medium (4.5 G) that is used to pass through any type of telemetry data, mainly data from utility networks. It is a slice of 4G. A software upgrade of a base station.

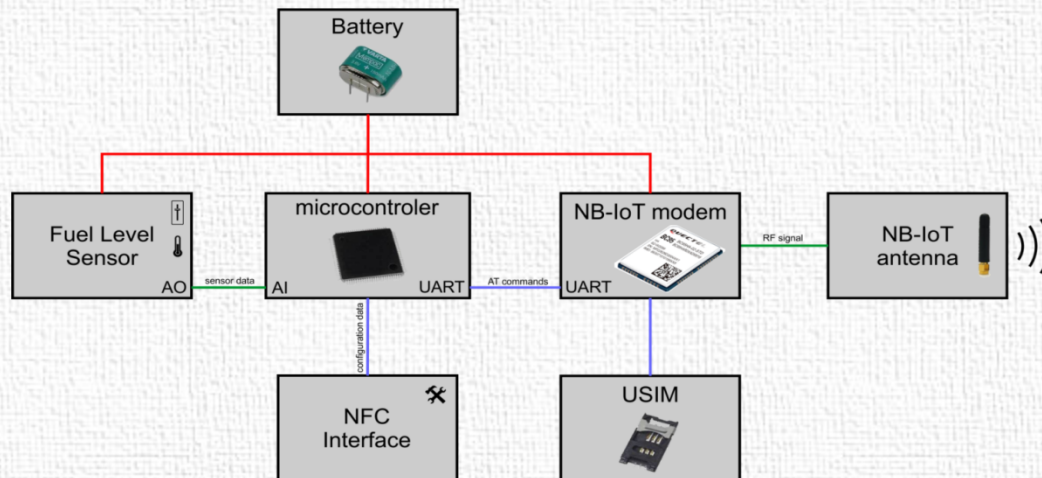
### What has changed over the past 2 years ?

- › All sensors before NB-IoT were **power-hungry**, needed a **120/240V** or **12/24V** constant power source. NB-IoT is friendly to **battery operated devices**. Imagine the potential
- › NB-IoT **battery operation: 10 years** (or more).
- › All sensors up to NB-IoT were **data-hungry** consuming **MBs** or **GBs** of data. Now they consume **KiloBYTES (KBs)** per month.
- › All sensors up to NB-IoT were **dummy**. **Measure/Connect/Send**. Zero intelligence.
- › Introduction of **edge computing in battery operated devices** moves intelligence to the edge. **Measure/Calculate & Decide/Send**. Sensors are loaded with intrinsic intelligence in order to keep the battery uptime and restrict data usage.

## Edge Computing Devices ›

- › Sensors under battery operation should have the ability to:
  - › Measure
  - › Calculate & Decide
  - › Send

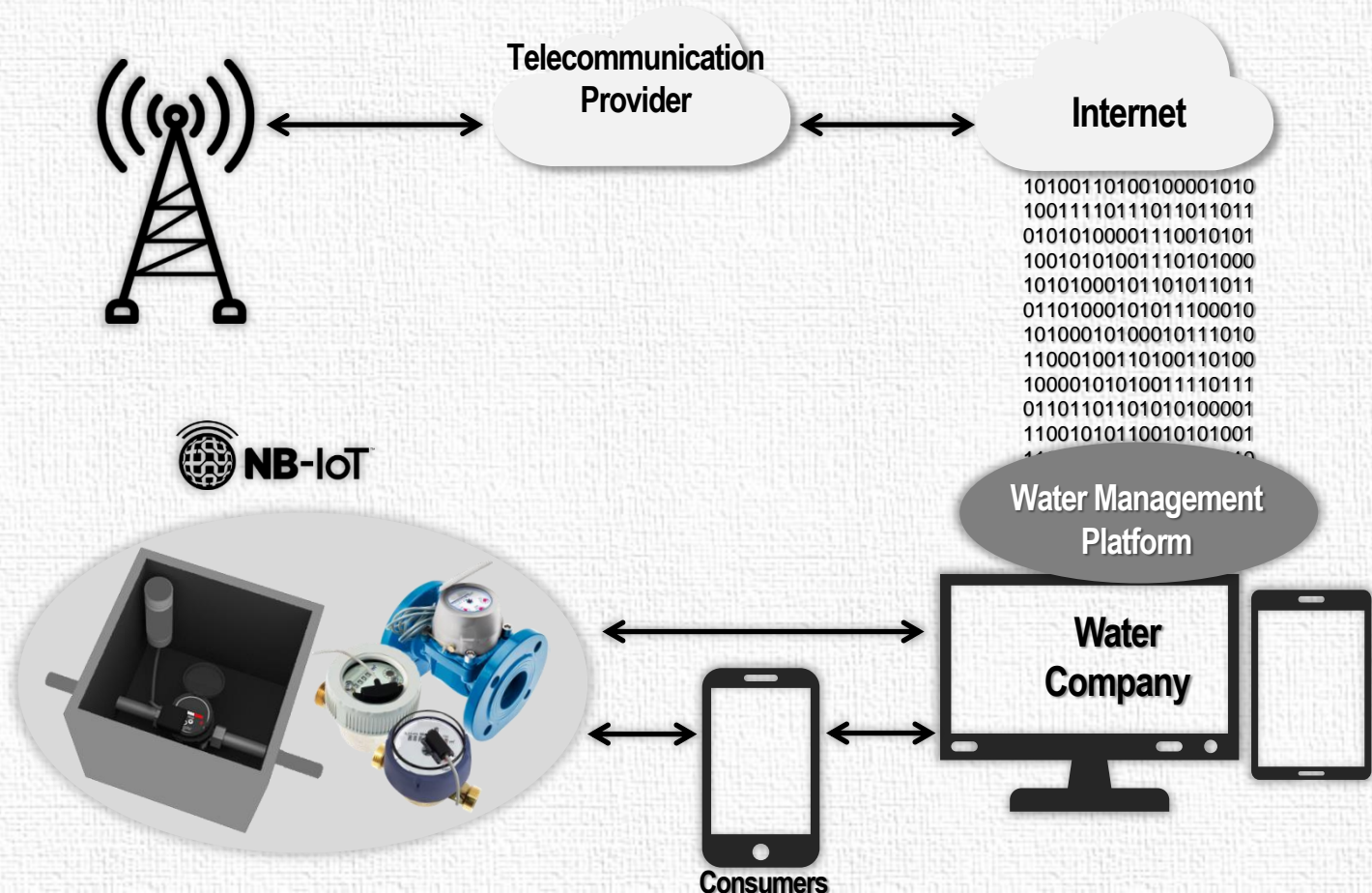
Edge computing sensors are the next generation of sensors that utilize machine learning algorithms. The intelligence is inserted in the “brain” of a sensor, the microcontroller. The “brain” of the sensor is called **firmware**.







A complete sensor to owner data stream



## Edge Computing Technology on Water Flow Management ›

- › Water sensors measure and produce information that we capture for:
  - › Billing purposes (water is expensive)
  - › For providing new services to the owners such as:
    - › Alarming for excessive consumption
    - › Water Leakage (e.g. your pipe has a small hole)
    - › Pipe Breakage (e.g. your house is about to get ruined)

### DECISION MAKING AT THE EDGE

- › Firmware understands that consumption is **higher than normal** -> Alarm the owner
- › A specific profile of consumption is being detected -> Alarm the owner & call the plumber
- › A specific profile of consumption is being detected -> **Emergency alarm** to the owner or the neighbors or the insurance company

All of the above decision making is being utilized at the edge. Sensor is taking decisions.

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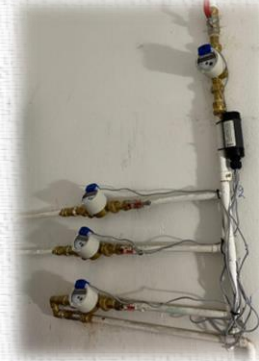


# Water Flow Management

## Pulse & Wired M-Bus NB-IoT sensor for water flow sensing

### Water flow sensing ›

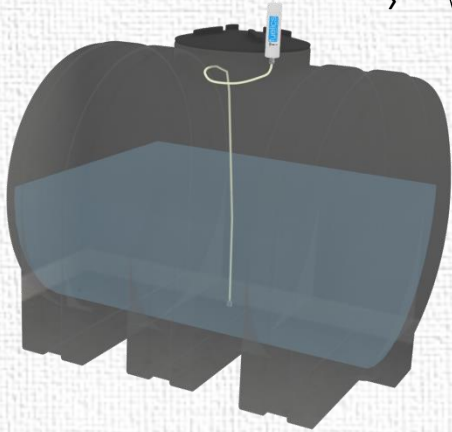
- › **Water** Flow Management utilizing NB-IoT technology for **Pulse & Wired M-Bus** water meters. Pulse registration is provided regardless of pulse output characteristics. Wired M-Bus, integration may be required, depending on the protocol version used by the water meter manufacturer.





# Edge Computing Technology on Water Level Management ›

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- › Water level sensing is used to monitor the level of the inners of:
  - › **Water Tanks** (any type of water)
  - › For providing new services to the owners such as:
    - › **Alarming for excessive consumption**
    - › **Water Threshold excitation**



## DECISION MAKING AT THE EDGE

- › Firmware understands that consumption that level reduction is higher than normal -> Alarm the owner for **excessive water use**
- › The water level is below a threshold -> Alarm the owner about upcoming water shortage in a specific period of time
- › The water bed is rising faster -> Sound the alarm immediately and alarm the citizens

All of the above decision making is being utilized at the edge. Sensor is taking decisions.



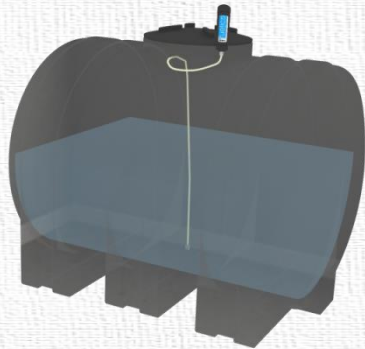
# Water Level Management



Water pressure & ultrasonic NB-IoT sensors for any type of industrial water reservoirs and natural water collection points

Water level sensing ›

› Water Tank Management utilizing NB-IoT differential pressure & ultrasonic sensors.







## Next to Edge Computing ›

- › Device Management & Delta Firmware Upgrade Over The Air (DFOTA). Sensors once deployed have to be monitored and operationally adjusted according to various field needs. Remote management is a must.
- › Install and Play design expertise. Massive installations have to be as cheap as possible. Our mechanical parts are designed for plug & play use with **zero installation burden**. Commercialization should induce flexibility and ease of usage.

## Use of this Knowhow for EU projects›

- › Edge computing sensor technologies will be used in Interwatt Project that is about to kick off within the next months.



Thank you for your attention!



Questions please...