ACQUAOUNT WEB OF THINGS (WOT) PLATFORM

The central infrastructure integrating real-time data from IoT sensors with external data sources offers real-time irrigation advice, water demand projections, and climate impact simulations through user-friendly dashboards

ACQUAOUNT has developed a suite of innovative tools covering monitoring and control (IoT), interoperability and standardization (WoT), efficient operation and recommendations for water and production efficiency (weather and complex dynamic modelling tools combined with data analytics and a decision-support tool) and smart visualization and data exploration (KPIs-based visualization). The combination of these tools has permit to simulate complex interactions and feedbacks across several time horizons and multiple related environmental and socio-economic dimensions, leading to policy recommendations and CC adaptation strategies. All these innovations have been demonstrated at large scale in basins of four Mediterranean countries (Italy, Jordan, Lebanon, and Tunisia) where water efficiency is a must to cope with water scarcity and climate change.

Web Of Things (WoT) is a series of standards used to define interoperability between Internet Of Things (IoT) platforms and devices. In WoT, an element that participates in the ecosystem is considered a Thing. A Thing has 3 main ways of interacting with the environment:

- The Thing has some properties, which can be of the Thing itself (for example, the battery level) or properties of the physical world being observed by the Thing through a sensor.
- The Thing has some actions that it can perform on the physical world, such as turning on a valve.
- The Thing has some events that can occur at any time, like a detected sudden increase in temperature.

ARCHITECTURE

The ACQUAOUNT WoT platform is where all data from different sensors and stations are stored. It is implemented as 4 different services, which are made available using Docker.

The ACQUAOUNT platform is a "smart hub" for water, structured in two main parts:

1. Data Collection

All measurements (soil moisture, weather, water flows) arrive here from three different sources—field sensors, external platforms, and standalone instruments. They are labeled (type, location, timestamp) and stored in a single digital "warehouse" compliant with the SensorThings standard.

2. Modeling

The collected data are fetched by hydrological and agronomic models (HEC-DSS format) running in isolated containers. Here, forecasts and irrigation plans are elaborated and the results are saved in a second database dedicated to model outputs.

THE PLATFORM

The ACQUAOUNT platform is a web server that exposes "Things" following the W3C Web of Things (WoT) standard. Each Thing represents a real-world location (either a Field or a Weather Station) and is defined by a JSON "Thing Description," which always has three parts:

- Properties – Data points you can read (e.g. soil moisture, temperature).
- Actions – Commands you can invoke (e.g. start irrigation).
- Events – Alerts you can subscribe to (e.g. sensor threshold exceeded).

Although Fields and Weather Stations share the same structure, their available properties differ. A Field Thing typically lets you:

- Get static fieldInformation (location, size, crop type).
- List all sensorsList and see each sensorInformation.
- List all observed propertiesList (e.g. moisture, flow) and get each propertyInformation.
- Browse datastreamsList (the data channels combining Thing + Sensor + Property).
- Fetch datastreamInformation, the latest measure (datastreamLastMeasure), full history (datastreamMeasures), or simply all latest readings at once (lastMeasures).

In this way, any client can discover what data is available, read it, trigger actions, or listen for events—all through a single, standards-based interface.

STRUCTURE

In the ACQUAOUNT platform everything—data ingestion, storage, modelling and user interfaces—lives behind one URL. You don't juggle multiple logins or formats: you feed in raw sensor readings, the platform provide forecasts, and you see it all in one place.

The architecture is composed by:

Data Inputs:

- External Systems (e.g. general weather forecasts or third-party platforms)

- Independent IoT Networks (existing field stations with their own gateways)
- LoRaWAN Sensor Networks (project-deployed, low-power field sensors)

WoT Core Platform

- WoT Gateways translate each input into a common "Thing" format.
- WoT Server hosts all "Things" (Fields, Weather Stations, Basins...) and exposes them via a single Web-of-Things API.
- Sensor Database stores every observation in a SensorThings-compliant way.

Models Backend

- Runs hydrological/agronomic models (HEC-DSS) in Docker containers.
- Pulls raw sensor data, computes forecasts and irrigation plans, and writes results into a separate Models Database.

Dashboard & Front-Ends

- A back-end service and database serve user accounts, farm info and irrigation settings.
- Two front-ends—one for Farmers and one for Water Managers—allow users to view live data, run actions, and subscribe to alerts, all through the same web portal.
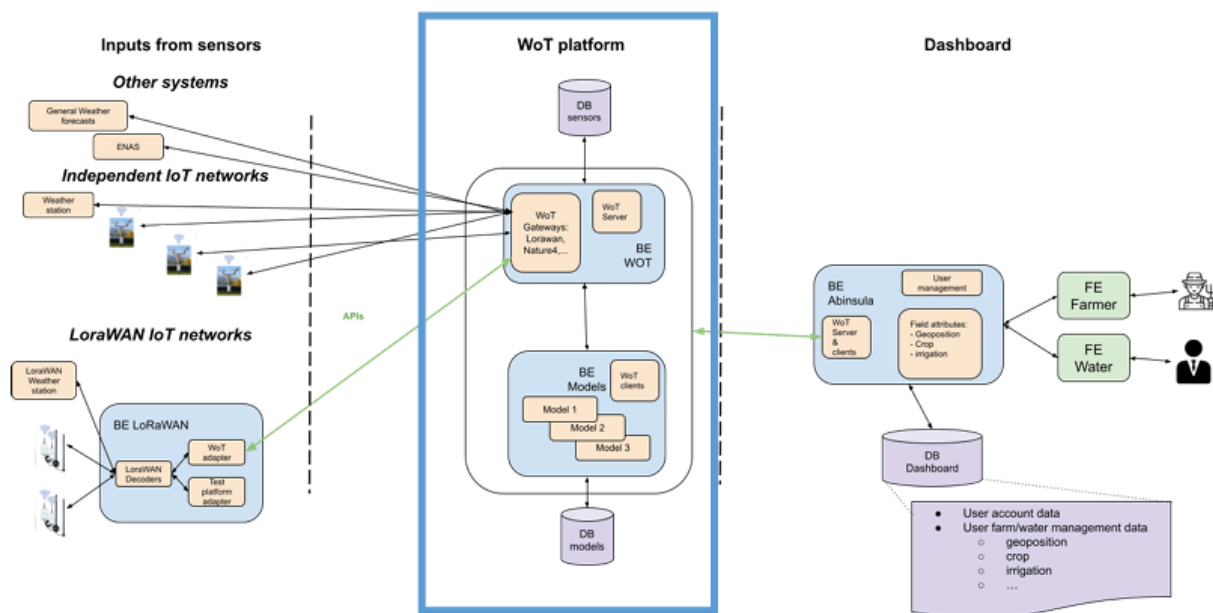

Figure 1. WoT platform architecture from the updated ACQUOUNT architecture presented in D3.2