

# The SmartH2O platform: advancing residential water management by smart metering and data intensive modeling of consumers' behaviours

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## THE sH2O PROJECT

### MISSION

The mission of the SmartH2O project is developing an ICT platform to improve the management of urban and peri-urban water demand.

### CONCEPT

The SmartH2O platform ICT infrastructure will enable water managers to close the loop between actual water consumption levels and desired targets, through:

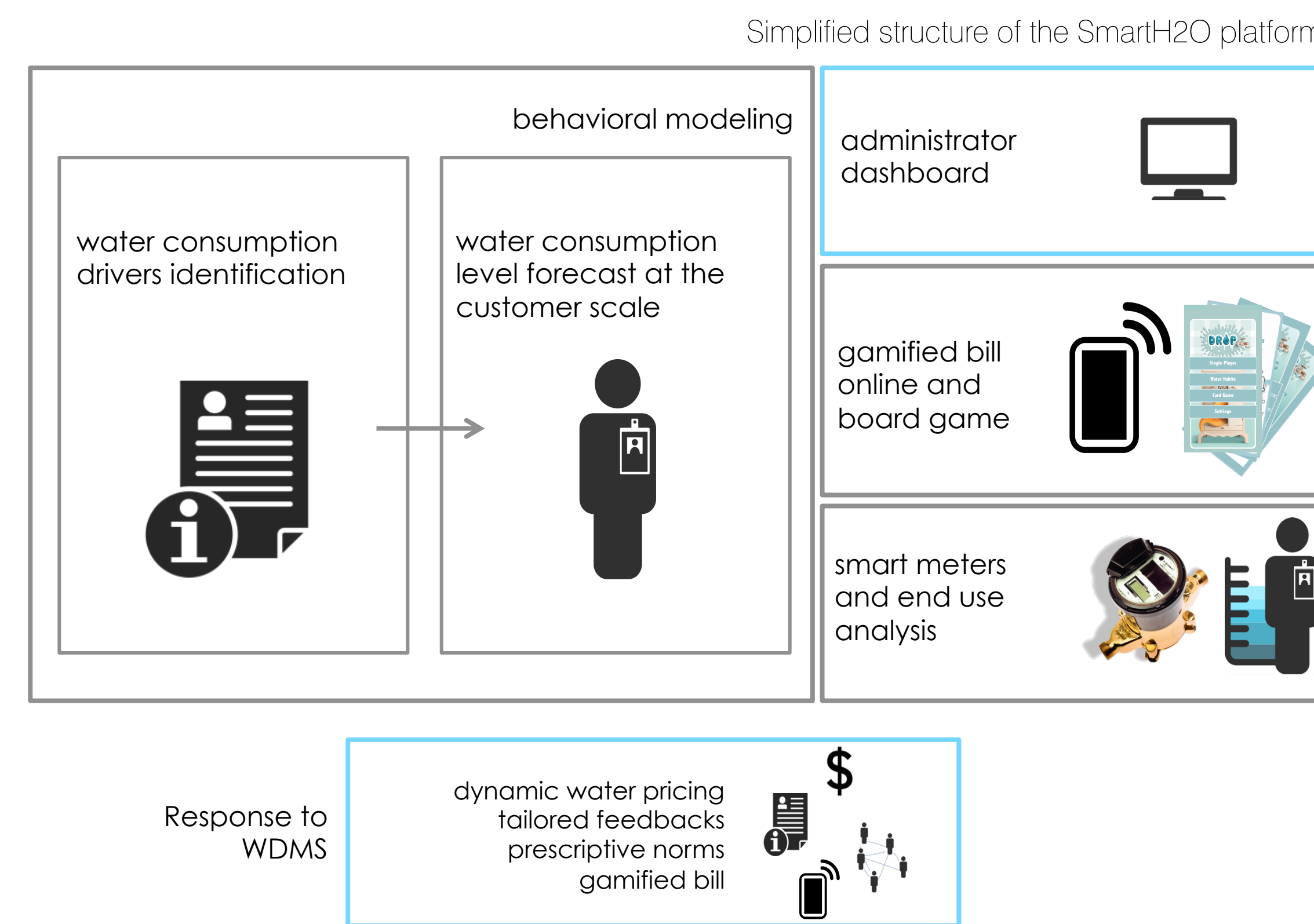
- \_ understanding and modeling water consumers' behaviour, based on historical and real-time water usage data
- \_ predicting how the consumer behaviour can be influenced by various Water Demand Management Strategies, such as customized feedbacks and different pricing schemes
- \_ raising users' awareness to pursue water reduction in the residential sector

### CORE ELEMENTS

- high-resolution water consumption data
- interaction with customers for information sharing and socio-psychographic data gathering
- innovative water demand management strategies: dynamic pricing, customized feedbacks and rewards
- gamification



DROP! The SmartH2O game



## THE sH2O ADVANCES ON END-USES CHARACTERIZATION

### THE FHMM-ISDTW END-USE DISAGGREGATION ALGORITHM

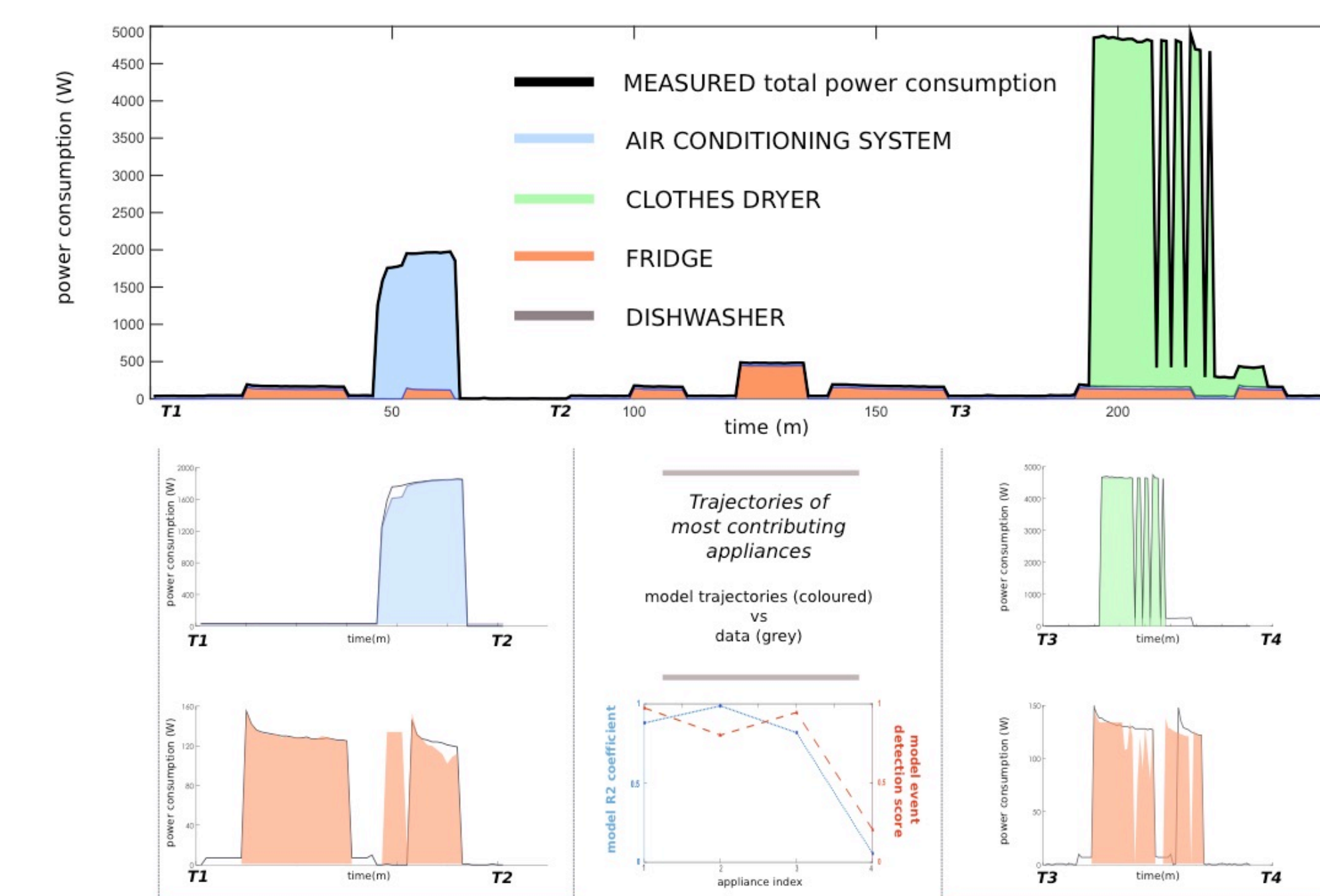
An new algorithm to perform household energy and water consumption trace disaggregation into end-uses (e.g., washing machine, toilet, tap, etc...) has been developed, with the purpose of profiling users' consumption habits based on the total single-point smart metered consumption.

#### ALGORITHM TECHNOLOGIES

- Factorial Hidden Markov Models
- Iterative Subsequence Dynamic Time Warping

#### CHALLENGES

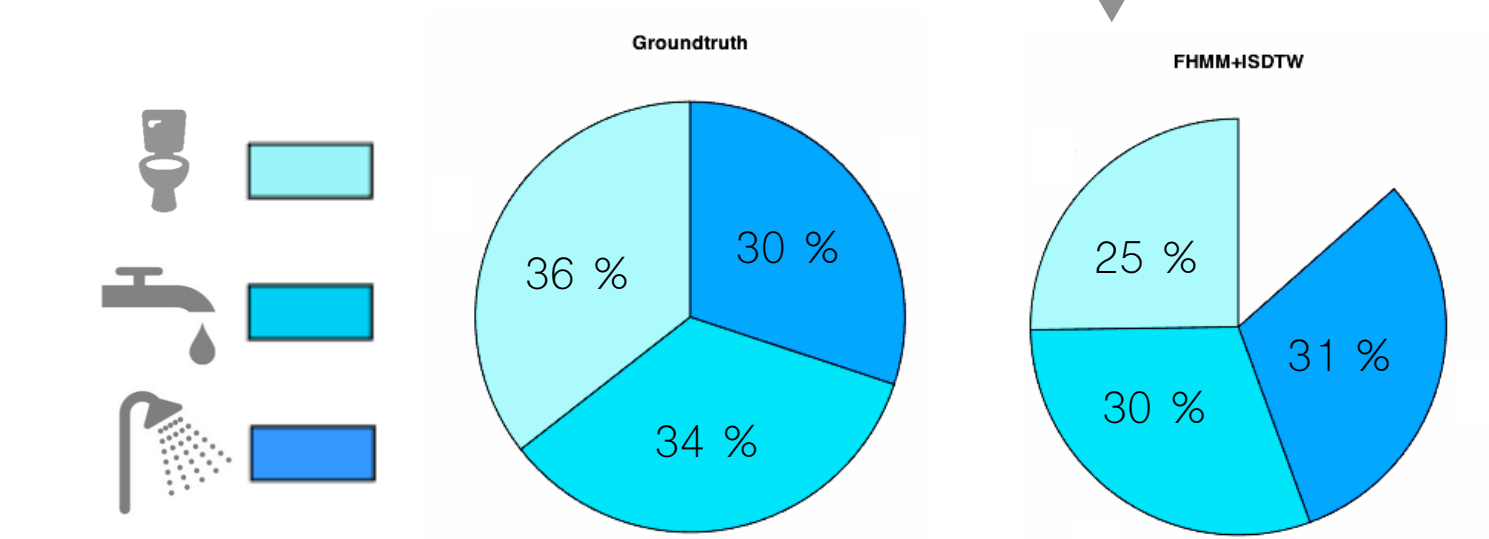
- Accurately reproducing the consumption trajectory of different end-uses, not only their operating system (i.e., on/off status)
- Performing disaggregation for a number of appliances simultaneously operating.



#### APPLICATION OUTCOMES

Experiments on POWER data (1 min resolution) show high accuracy in reproducing the consumption trajectory of many end-uses simultaneously working

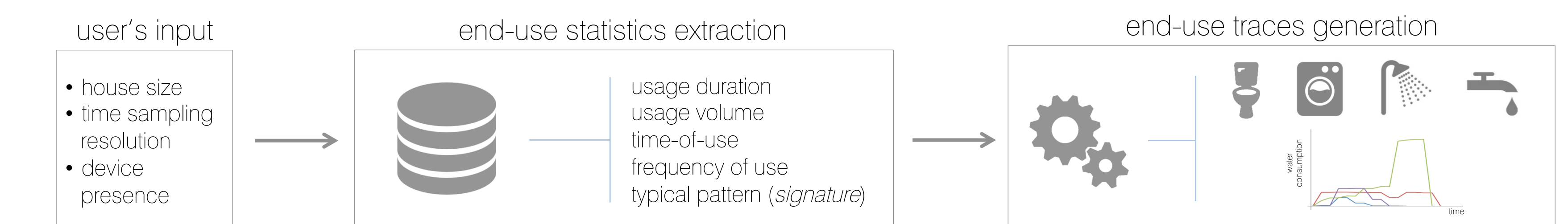
Preliminary experiments on WATER data (1 min resolution) show suitability in reproducing the contribution of each operating appliance to the total measured household consumption.



### DEVELOPMENT OF A SYNTHETIC WATER END-USE PATTERNS GENERATOR

An algorithm to generate synthetic water end-use patterns has been developed within the SmartH2O project, with the double purpose of:

- building end-use water consumption datasets to feed disaggregation algorithms and to provide benchmark datasets for community testing;
- allowing for the generation of end-use patterns under different demographic and technological scenarios.



#### CURRENT FEATURES

- Trained on high-resolutions (1 second) consumption data from 9 cities across USA
- Performance validated with a two-sample Kolmogorov-Smirnov test
- Flexible for synthetic generation at multi-scale resolutions.

#### DEVELOPMENT PLAN

- User-friendly interface
- Web portal to contribute with new datasets from different case studies

### OUR USE CASES



#### LONDON | UK

Thames Water water supply utility  
15 million customers served

2.6 GJ/day drinking water distributed

Development plan: 3 Million smart meters installed by 2030

#### LOCARNO | CH

Società Elettrica Sopracenerina power supply utility, 80 thousand customers served

Interested in multi-utility smart metering (water, energy, gas)

Almost 400 smart water meters installed

#### VALENCIA | ES

EMVASA water supply utility  
2 million customers served

490,000 water smart meters currently installed

Development plan: 650,000 water smart meters installed by end 015.

