Piloting a Water Data Management Ecosystem to Enable an Efficient and Resilient Decision Support System for the IJsselmeer

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Background

Water utilities are increasingly adopting a digital transformation, to achieve more resilient and sustainable water services while conducting more data-driven decisions. To tackle challenges such as cybersecurity, data ownership and poor quality of data, the European Commission propose the creation of Data Spaces, as part of the European strategy for data. Within the Horizon Europe project called WATERVERSE, an holistic approach is being developed to drive the development of data spaces for water utilities. The project involves the development of a Water Data Management Ecosystem (WDME) to enhance the adoption of data management practices that are affordable, accessible, secure, fair and easy to use, while improving the usability of data.

Water Data Management Ecosystem (WDME)

- The WATERVERSE WDME comprises of independent tools and methods that are systematically used to provide ready-to-use means for data management.
- It aims to provide solutions throughout the data's lifecycle including data collection, data preparation and data discovery.
- The WDME will align with initiatives such as FIWARE that will ensure full compatibility with European data spaces by utilising open standards and specifications.

Netherlands Pilot Case – IJsselmeer

- The IJsselmeer water body is a crucial source of water supply for PWN in the North-West region.
- Due to increase in population and climate change, it faces future challenges of increasing water demand and extreme variability in water availability.
- Ijsselmeer is the drainage point of the Rhine (IJssel) river and therefore faces varying water quality challenges.
- A digital twin to predict the chloride (Cl^-) concentration levels is being developed to enable an efficient and resilient decision support system.

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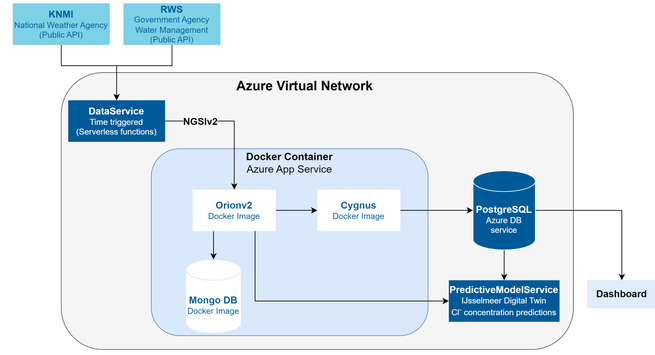
Materials and Methods

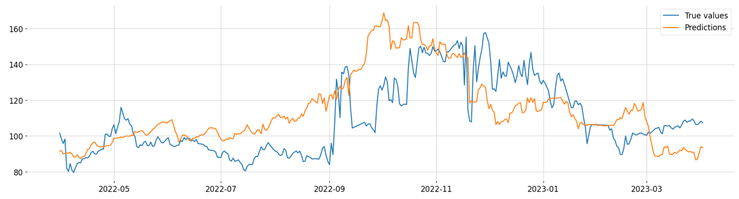
- Data-driven model to predict the Cl^- concentrations at the source water location at the IJsselmeer is piloted within the WDME.
- Building blocks of the open source data exchange system called FIWARE are deployed.
- Open-source contextual information models curated by FIWARE based on the Next Generation Service Interfaces (NGSI) specifications are used.
- Crucial raw data from various sources are accessed in real-time through API calls within serverless functions to trigger time-based functionalities.
- Data includes – wind speed and direction from the national weather agency, and water flowrate and Cl^- concentration levels of the IJssel river.
- Microsoft® Azure environment used for backend services.

Results

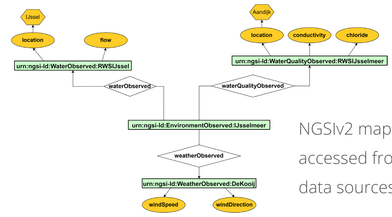
- An innovation environment on the Azure platform was setup.
- Deployment of *context broker* called Orion (v2) along with *generic enabler* Cygnus to enable storage of historical data.
- Common data models such as WeatherObserved and WaterQualityObserved NGSIv2 models are used to ensure standardised communication and data exchange between components.
- Deployment of first version of digital twin conducting predictions for the Cl^- concentration levels for the source water.
- Deployment of a dashboard to enable advanced visualisation in the future.



Current WDME setup for the Netherlands pilot



Current predictions by digital twin for Cl^- concentrations levels



NGSIv2 mapping of input data accessed from heterogenous data sources.

Expected Impacts

- Improved data provision and flow to optimise PWN's technical and business processes.
- Enhancing decision making of operators, process technologists and management by provisioning tools that harmonise and analyse heterogenous data.
- Better control on the interaction between different parts of the water supply chain.
- Improved external data exchange to better anticipate changes in water availability and quality at different time scales.