

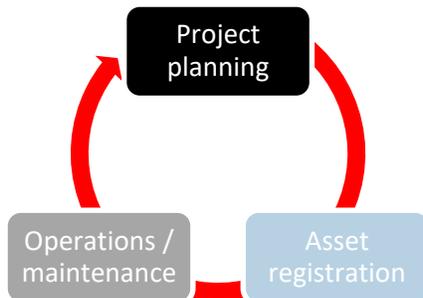


# HARNESSING DATA FOR WATER UTILITIES, SO WHAT?

Taking asset management to a new level to ensure smooth operations, using Orbi INSIGHT

When implementing a data-driven approach to asset management, it is important to consider what data can do for a modern water utility company, and how data can be exploited to optimize operations and support management decisions.

In this article, we only refer to data strictly related to the water utility infrastructure and not data on other asset types such as human assets, environmental aspects, and reputational issues (PR). Data and the usage of data will be addressed in three steps:



The construction of water utility infrastructure is very expensive, cumbersome, time-consuming, and by nature, leads to disturbance of public transportation and daily life - a situation the utility company wants to limit as much as possible. It is therefore vital to make the right decisions and provide the right data.



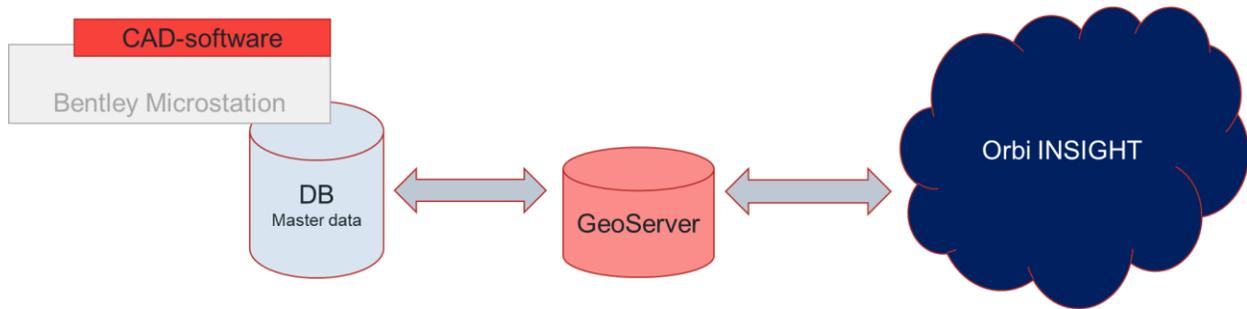
## **First Things First - Asset Registration**

This phase is seen as the “as is” registration of the assets in the network.

But before entering the world of data, an important lesson must be learned. There are fundamental rules for water flows, so we need to go back to the initial design of the infrastructure. In order to make it work, we need to base the foundation of the infrastructure on a rigorous and structured data model that supports the logic of hydraulics and gives precise geographical location of the network components. In other words, we need to take a holistic approach and make sure that the entire network design will work in the real world and we need to know where each key component is located. This approach is the foundation for asset registration.

In this article, we will present a combined solution consisting of two systems: a CAD system containing the core data model and tools for designing, and a digital twin as a mirror of the master data from the design system.

A digital twin makes the master data accessible for all relevant stakeholders in the organization. Mirroring the master data from the design system into the digital twin enables registration of data from operational tasks and, furthermore, receiving and retrieving relevant data from surrounding systems structured within the core data model.



The operational management team, the service team and the operators are given a tool with a full overview of data directly linked to the core infrastructural data model.

A presentation of the WSP digital twin – Orbi INSIGHT – will come later in this article.

### **Operations - Focus on the Digital Twin and Data Collection**

In operations, it is essential to have an overview of the infrastructure. Water always finds its way, so it is relevant to have a detailed picture of the network and where all components and objects are located. Ideally, the overview covers not only the geotagged key components, but also a detailed description of subcomponents. Such detailed data combined with data from operational actions like scheduled maintenance and SCADA-system alarms, can provide the operational management with the first set of useful data for analysis.

Analytics and reflections like:

- How often does this type of component break down compared to other similar components?
- How often should we do proactive maintenance to avoid breakdown – and what are the risks of not acting?
- How often do we do maintenance in this section of the network compared to other sections?
- What causes similar components to act differently in different parts of the network?
- How much power is used in one section of the network compared to another section?
- How much pressure and flow are in one section of the network compared to another section?

The answers to the above questions provide valuable operational insights and pave the way for decision-making by operational management and design engineers.

### **Operational Management - Analytics and Decision-Making**

A change in working approach from reacting to alarms and breakdowns to planned maintenance not only saves money, but also improves service level.

To move to a proactive work approach with planned maintenance, data needs to be shared among all relevant stakeholders. Tacit knowledge needs to be transferred from the heads of experienced senior operators and experts and digitized in a common accessible GIS platform or digital twin.

The aim is to have data on one platform, accessible and usable by all stakeholders within the water utility company environment. All assets and asset data are gathered in one system but are held in the relevant source systems.

The sources of data that can be access are enormous. In addition to the data stored and generated within the digital twin, SCADA systems provide current data on pumps, valves, power consumption, stress level, flow and multiple other parameters.

Using ultrasound, IoT devices can provide information on the current status of a water pipe and indicate if there is a breach or leak in the network. Sound analysis of pumps and other moving parts can indicate abrasions.



In summary, there are many different data available from multiple sources, each providing a glimpse of the current condition. We just need to put the pieces together.

The foundations for data-driven decision-making are now in place and the analyses will become stronger over time as more data is collected. The quality of the decisions and the optimization opportunities still depend on the business acumen of the operational management.

### **Projecting and Planning- The Last Stage of the Loop**

When designing a new utility network, engineers make assumptions and predictions about the asset lifetime. By using existing data, these assumptions and predictions can be corrected, and the right decisions made.

- Which components are in which state?
- How does the components do in comparison to the predictions?
- Which network section performs better?
- How are components clustered in the different sections?
- How does the surface infrastructure correspond with the subsurface components and clusters?

Using the data from the digital twin, the management team can draw better insights to support asset management decisions.

### **Orbi Insight - The Digital Twin From WSP**

Orbi INSIGHT is a multifaceted tool for all stakeholders within and around the organization and consists of two back-end systems and four applications designed to accommodate different workflows and processes among different groups of workers.

As described in the first section, the overall design is done in a CAD system and stored in a master database. Each component registered in the master database is then reflected in Orbi INSIGHT via a geoserver.

The four applications include:

1. **Orbi INSIGHT GIS:** This application gives an overview of all components and makes it possible to filter information by turning different layers on and off. In addition, it is possible to create detailed inquiries on components in the database, based on the details available in the data model. An example could be all pumps older than 5 years and made from a given manufacturer in a particular section of the network. This detailed information can then be customized by the user and stored for later use or as a base for creating scheduled maintenance.

Files (documents and/or photos) can be attached to each component and saved so that the information is pushed back to the master database<sup>1</sup>.

Finally, Orbi INSIGHT GIS offers the ability to calculate an area isolation plan and indicates which valves should be closed, to minimize water loss in case of a leak or burst. The addresses of the affected customers will be derived from the application, and the customers can be alerted about the maintenance and repair.

2. **ORBI INSIGHT CONTROL:** This application is made for the operational manager to provide an overview of all tasks and to enable delegation of tasks to operators or groups of operators to perform tasks.
3. **ORBI INSIGHT TASKS:** This application is a special application designed for the operators to receive tasks delegated by management. Orbi INSIGHT Tasks are optimized for mobile devices and the application contains specialized tools for operators to report on tasks and make photo documentation of tasks.
4. **ORBI INSIGHT SERVICE:** In order to handle requests from customers and other stakeholders, this application provides tools

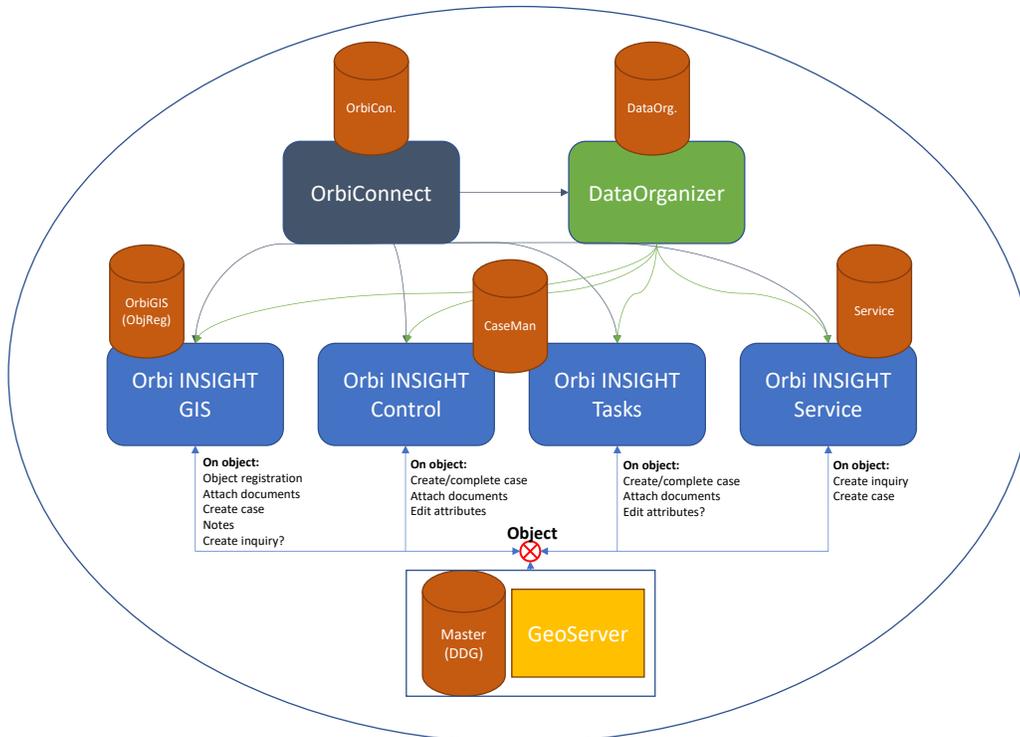
---

<sup>1</sup> The ability to push data back to the master database depends on company policies. Some companies would like all staff to be able to make adjustments to the master database and others prefer to protect the master database

by having an assessment procedure before changes can be accepted. This will be clarified before the configuration of the system.

for creating tasks based on requests and inquiries.

Two back-end systems control the user permission and the data flow between the applications.



Data usage, creation and enhancement on one network component using Orbi INSIGHT as Digital Twin

## Lessons Learned

A data-driven approach provides useful insights to the organization and requires the organization to be able to use the data. Data provision and organizational adaptation must be balanced and go hand in hand for a data-driven approach to succeed.

Ensure the basic data model in the master database is robust enough to hold and handle the data provided. Most commonly used designing systems (CAD) facilitate topological checks to clarify if the design is compliant with the data model and the fundamental rules of water (built into the CAD systems). Ultimately, the data model needs to include all network

components and water flow rules, and connect them correctly.

As the digital twin mirrors the core data, it is essential to draw on the knowledge of experienced specialists from the onset to ensure the data model is compliant and properly reflects the water network. If the data in the digital twin needs to be processed and adjusted manually, the transition to big data will be difficult or even impossible.

Be prepared to take two steps back and fix the fundamentals before entering the world of big data, and make sure that the entire organization is trained and prepared to harness data for efficient and timely asset management.



### **Author**

Morten Engedal Sørensen  
Business Development  
Manager, Informatics



WSP in Denmark

[morten.engedal@wsp.com](mailto:morten.engedal@wsp.com)

### **About WSP**

WSP is one of the world's leading professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisors including engineers, technicians, scientists, architects, planners, surveyors and environmental specialists, as well as other design, program and construction management professionals. We design lasting solutions in the Transportation & Infrastructure, Property & Buildings, Environment, Power & Energy, Resources and Industry sectors, as well as offering strategic advisory services. Our talented people around the globe engineer projects that will help societies grow for lifetimes to come. [wsp.com](http://wsp.com)