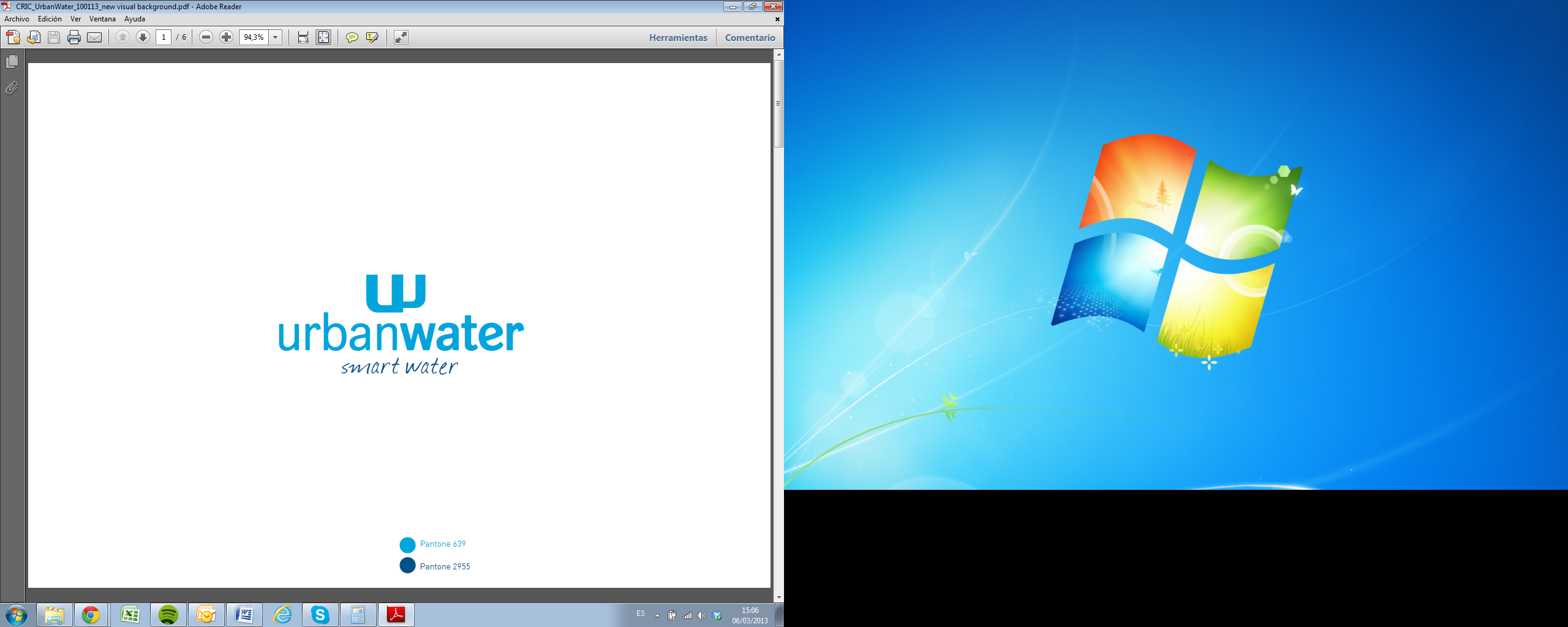
Project Title:

Intelligent Urban Water Management System

Project Acronym:

URBANWATER



**Seventh Framework Programme**

Collaborative Project

Grant Agreement Number 318602

Subject:

**D3.1 – Data management cloud platform requirements – WP3**

Dissemination Level: PUBLIC

Lead beneficiary: Red Skies Limited

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# History of Changes

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| Version | Author, Institution | Changes |
| 0.1 | Martin Kenirons | First Draft, Outline of contributors |
| 1.0 | Martin Kenirons | Partners comments added |
| 1.2 | Martin Kenirons | Re-write of document |
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# Abstract

This document describes the requirements for the Data Management Cloud Platform system in the UrbanWater research project. Therefore, it contains derived use cases and the resulting requirement analysis. These requirements will be used for specifying, designing and implementing the UrbanWater data management prototype.

# List of Acronyms

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# Introduction

## Objectives of UrbanWater

Improving the efficiency of water management in Europe is recognized as essential for overcoming the growing exposure of European countries to increasing populations and water scarcity and droughts.

The objective of the UrbanWater Project (<http://urbanwater-ict.eu/>) is to enable better end-to-end water management in developed regions, which accounts for 17% of freshwater demand in the European Union.

The project will develop an innovative Information & Communication Technology (ICT) based platform for the efficient, integrated management of water resources. The system will benefit consumers, water utilities, public authorities, the environment and the general public in terms of:

* providing consumers with comprehensive tools enabling them to use water more efficiently, thereby reducing overall consumption
* helping water utilities to meet demand at reduced costs
* fostering new partnerships between stakeholders so as to ensure the successful development of the system and the evolution of the European Water Sector as a global leader.

The UrbanWater system will likely incorporate;

* advanced metering solutions
* real-time communication of supply / demand data
* new data management technologies with real-time predictive capability
* supply / demand forecasting
* demand pattern interpretation
* decision support systems
* adaptive pricing
* user empowerment solutions

The UrbanWater consortium includes ICT companies, research organizations, water utilities and authorities with complementary capacities and know-how. Two water utilities included in the group will undertake large-scale validations on their water supply systems, thus promoting a final outcome that is close to the market and to the consumers. The final outcome of the project will remain open and interoperable with energy and water management schemes, thus positively impacting not only water consumption, but overall usage of natural resources throughout Europe.

## Objectives of WP 3 (Data management cloud platform)

This deliverable is part of the work in work package 3 – Data management cloud platform. The objectives of work package 3 are:

* Deploy a robust single cloud platform able to store and process large amounts of data meeting the needs for operating water smart meters.
* Develop the architecture and components required to be able to securely store and manage large volumes of data on behalf of the water and energy companies using the system, as well as to guarantee customers’ data privacy.

## Objectives of this document

This deliverable D3.1 “Data management cloud platform requirements” describes the requirements that will drive the design of the data management cloud system design. The document has requirements form all the ICT partners in the urban water project and the Utility partners.

## Structure of this document

Following this introduction, the report includes the following sections:

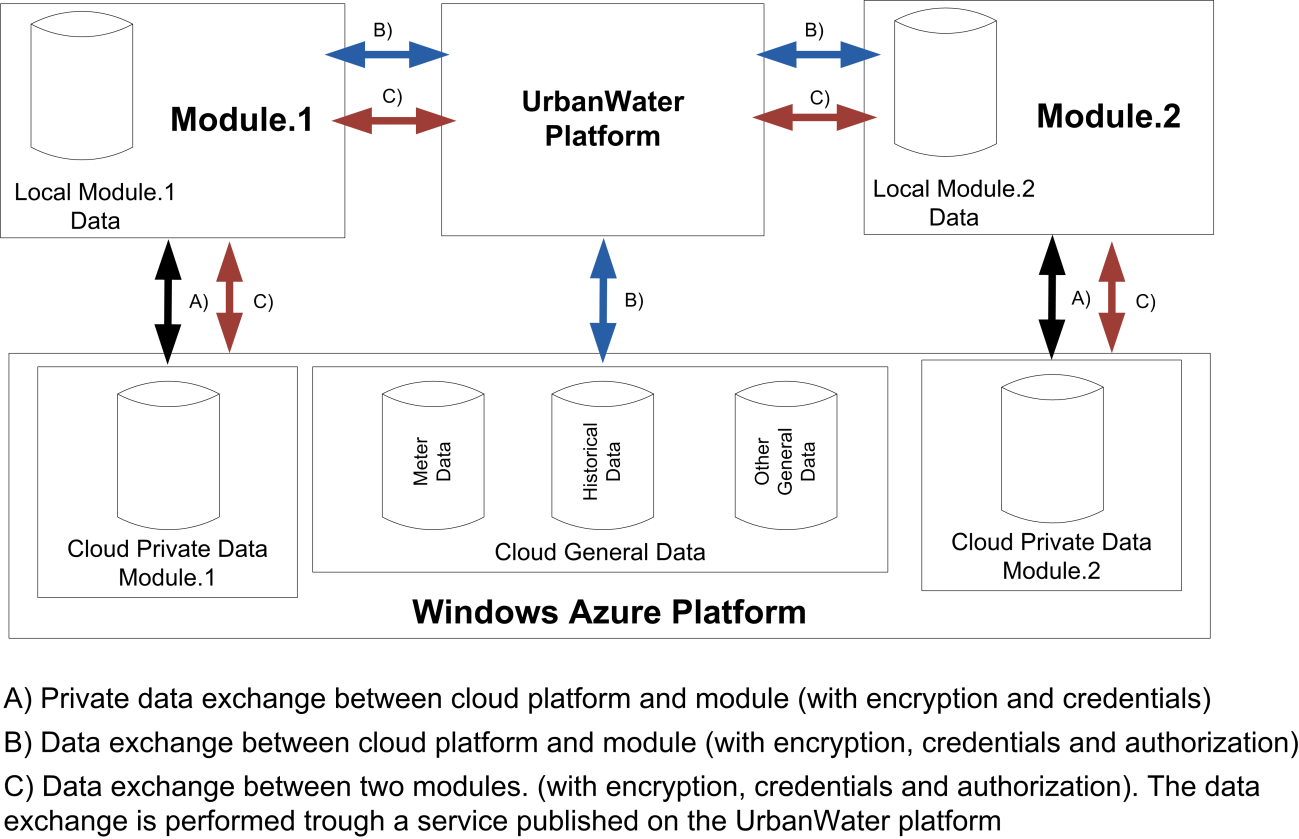
* Section 2 introduces the main actors of the data management cloud platform, which are responsible for the main interactions with the platform. This section also show the flow of data through the cloud data management platform.
* Section 3 presents a series of scenarios involving the actors of the platform which will be used to simulate the use cases of the data management platform.
* Section 4 introduces the use cases of the data management platform.
* Section 5 introduces the requirements of the platform which are driven by the scenarios and the use cases.

# Actors of the Platform & Challenges

The data management cloud platform will be required to store all data required by ICT providers providing services to the utility.

* Weather-related data
* Water treatment data
* Raw water sources data
* WDN topology data
* Metering data
* Calendar data
* Water prices data (or other economic incentives that reflect on water usage)
* Detailed water usage characterization data.

Figure 1: This figure shows the flow of data in the UrbanWater Project. The UrbanWater Platform being developed in WP6 will request/receive data from the data management cloud platform (B). (A)(C) Represent each module using private storage and coming directly to the data management platform for data respectively. (D) Represents all data provider to the data management platform.



D)

D)

Water Utility

Data Provider

## Actors

|  |  |
| --- | --- |
| Actor | Roles |
| **The water Utility staff, Utility A** | The water utility staff will be the main user of the data management platform; it will allow them to upload all historical meter readings and other data required for the project that is based at the utility. |
| **ICT Providers,**  **Software Provider B** | Software companies looking to provide services and product to the customer will need to access data form the data management cloud platform for the UrbanWater project this role will be the UrbanWater platform being developed in WP6. |
| **Customer C** | All customer data can be store in cloud platform including readings from the smart meter from the customer houses. |

The following sections describe potential challenges faced by each actor of the platform and by examining these challenges it will help drive the requirements of the data management cloud platform.



## Utility Infrastructure Damage

**Situation:**

**Utility A is concerned about the location of its servers/hardware it uses for data management, the building in which it is located is consider a fire treat and susceptible to flooding.**

**Challenge:**

The vast majority of water utilities at present do not use distributed computing for their data management. Normally all data is managed in the utility; we can lead to data loss in events fire flooding and other natural disasters. Also equipment/hardware failure at the utility can be seen as a real threat to data sustainability.

## Smart Meter Deployment Scale

**Situation:**

**Utility A in order to comply with government regulations is deploying domestic meters so that customers can be billed according to consumption instead of charging them a flat fee. The Utility will have to scale up its data management systems in order to meet this challenge.**

**Challenge to the platform:**

A lot of Utilities through the world are currently planning or deploying a smart grid where they plan to install meters at domestic premises, there is a huge cost associated with this investment. The data management challenge associated in managing such project has grown exponentially.

Utilities need a data management platform that can meet the demands of such large scale projects but can also keep costs to a minimum. The platform will have to scale to cover vast amounts of information being produced by smart meter deployments. The platform will have to have implemented a cloud computing term known as rapid elasticity. (Elasticity can be defined as the degree to which a system is able to adapt to workload changes by provisioning and deprovisioning resources).

## Smart Meter Deployment Cost

**Situation:**

**Utility A is concerned about the cost associated with the new infrastructure needed to meet the data management challenges posed by the installation of domestic meters. There are look at innovative new ways to manage cost of the project.**

**Challenge to the platform:**

The data management platform is a cloud based platform that will use public resources for data management in a public cloud deployment (The public cloud is where services are not contained in house and are accessed over a public network. This is by far the most common type of deployment where an organization can access applications/resources that are hosted and maintained on a remote site. These are generally considered less secure than private clouds because a third part provider would have access to the physical resource to where the application is hosted.) The advantages are of using this approach is a complete pay as you go service where extra resources needed for periods of high through put can be leased rather than paid for up front by the utility.

The “pay as you go service” offer from using cloud computing will significantly reduce cost, when considering the staff level reduction needed to manage a large databases and the energy bill of the utility as it will not have to keep machines running for periods of high usage.

## Security of Data

**Situation:**

**Utility A has concerns about the security of the data from the domestic meters and where it will be stored, particularly if the data is not going to be managed “in-house” or on site. Customer C shares these concerns when it comes to people accessing their private data form the domestic meter at their premises.**

**Challenge to the platform:**

If the data management platform is based on a public cloud model, all data will have to be encrypted to prevent unauthorized third parties access gaining access to the data by having access to the physical machines where the data is stored. This will result in deploying a hybrid cloud where some part of the system will be encrypted while others will not need to encrypt their content. (A hybrid cloud is a combination of a public and a private cloud, the hybrid models can used for exposing existing service to wider community of user to strategies for protecting sensitive customer information as part of a wider system. Application can use a technique call cloud bursting when scaling to use public resources in times of high demand and scale back when demand is reduced).

## Access to the Data

**Situation:**

**Software Provider B wants quick and easy access to the data-set and wants to access the data set using open standards to facilitate quick development of its products. Also Software provider B would like the data management platform to be easily extensible as other data-sets become available.**

**Challenge to the platform:**

The platform will have to scale to meet demand but will also have to use open standards to enable Software providers to gain easy access to the platform and allow them to generate custom queries on the data-set. This will help not only software provider B but Customer C and Utility A make better decisions by having quick access to data.

## Redundancy in the Platform

**Situation:**

**Software Provider B wants to write an application such as a leak detection application which needs to monitor the system continuously through-out the day in order to predict where a leak has occurred, it needs the data management platform to be available to provide the data it requires.**

**Challenge to the platform:**

The data managements platforms design will have to provide redundancy in case of a machine or hardware failure in order not lose data and must implement a fault tolerance plan to avoid being down for extended periods in order facilitate Software provider B’s applications. It will also have to implement a geographic redundancy policy to ensure that if a data centre is damaged or destroyed, Utility A’s data will not be lost.

## Customer access to information

**Situation:**

**Customer C wants access their consumption information.**

**Challenge to the platform:**

The data managements platforms design will have to provide access for applications that will enable customer to review their consumption information. Utility A will have to ensure that Customers and ICT providers will only have access to the data their have permission to view.

# Scenarios

This chapter contains a list of potential scenarios that are common practise in the data management challenge faced by Water Utilities and the ICT Software providers in the Smart Water industry. A list of potential scenarios are considered each driving unique requirements from the data management cloud platform.

## Scenario involving domestic billing:

**Customer C is moving residence and wants to get its latest consumption usage bill from Utility A and change the name on the account over to the new tenant of their domestic residence.**

The following would be the flow of even using the data management platform:

1. Customer C will contact the Utility A and request a new bill and change of account.
2. Utility A will then contact Software provider B whom is responsible for it billing to generate a new bill for Customer C.
3. Software provider B will then access the data management cloud platform in order to get the domestic reading for Customers C domestic property.
4. The data management platform will authenticate the credentials of Software provider B before authorising them to gain access to the Customer C meter readings.
5. Software Provider B will ten use the meter readings to generate an up to to-date bill for Customer C and send out the bill on behalf of Utility A.

## Scenario involving supply and demand:

**Utility A is in an area that can experience extreme weather conditions, conditions can vary form droughts in summer to floods in the winter time. Utility A has enlisted the expertise of software provider B to predict when these extreme events occur.**

The following would be the flow of even using the data management platform:

1. Software Provider B will need access to lot different information in order to model conditions for Utility A, it will require access to historical/current Water Network data, Meteorological Topology data.
2. Software provider B will need to authenticate with the data management cloud platform.
3. The platform will then authorise Software provider B to access data form the platform based on the permission established.
4. Software Provider B will access all data form the platform to generate its model.
5. Software B continuously queries the platform to get results from the water network and up to-date weather information in near real time.
6. The data management platform will supply results even in times of high load such as billing and other data requests being run.
7. Software Provider B can then communicate the prediction of their model to Utility A, which will be used for further planning by Utility A.
8. As software provider B is developing a critical application to Utility A’s decision make policy the data management platform will implement geographic redundancy and a failover policy in order to support Software provider B.

## Scenario bulk achieve of data

**Utility A Head End wants to back up all its historical data to the data management platform.**

1. Utility A will use a client provided to bulk upload data files.
2. The client will authenticate with the data management platform.
3. The client will be authorised by the data management platform to upload data.
4. The data management platform will facilitate quick and easy upload of data to the data from Utility A.
5. The platform will store this data so that it is easily retrievable by Utility A.

# Use Cases

The described scenario descriptions are at a high abstraction level. Therefore, in a next step it is recommendable to derive so called use cases to deduce from them the relevant requirements. Use cases show the different steps of the regarding scenarios in more detail, which makes it easier to identify main actors, dependencies to other use cases and preconditions for example. It is also a helpful documentation for interdisciplinary developing teams to have a well founded basis for discussions. This chapter contains a list of the use cases structured by the Scenarios they have been derived from.

Sometimes the use cases in one scenario are quite similar to others in another scenario. For the sake of completeness and to be able to analyze each scenario more or less on its own these are described, but the similarity is mentioned and referenced in the remark sections of the relevant use cases.

For the description of the use cases the following template has been used:

|  |  |  |
| --- | --- | --- |
| 1. **Identifier and Name** | | |
| <A unique identifier, e.g. UC1.3, and a short active verb phrase> | | |
| 1. **Scope** | | |
| <A reference to the scenario this use case belongs to and a description of the use case> | | |
| 1. **Priority** | | |
| <The priority of the use case, i.e. either ‘mandatory’, ‘expected’ or ‘optional’> | | |
| 1. **Dependencies** | | |
| <E.g.: ‘Primary Task’ without dependency or ‘Sub-function’ with dependency to another use case (in the latter case, a reference to the corresponding use case ID should be provided)> | | |
| 1. **Components & Description** | | |
| <A role name for the primary actor and a concrete actor name if applicable> | | < Put here the description and/or interest of the primary actor> |
| 1. **Pre-requisites** | | |
| < The preconditions of the use case states what is required before the use case starts > | | |
| 1. **Variables** | | |
| < Invariants that describe conditions that must not change by the execution of the use case, even in the case of failure (failures can be described in “Alternative Flows”, see item 13 below> | | |
| 1. **Post conditions** | | |
| < The post conditions of the use case state what is expected after the use case has ended> | | |
| 1. **Trigger** | | |
| <The action and/or event that is the reason for starting this use case> | | |
| 1. **Flow of Events** | | |
| **Step** | **Actor and/or System Action** | |
| 1 | <Put here one step of the use case> | |
| 2 | <Put here one step of the use case> | |
| 3 | <Put here one step of the use case> | |
| 1. **Remarks** | | |
| < Further hints or explanations to enhance the comprehensibility of the use case, e.g., open issues, still unknown aspects, references to other documents, or additional diagrams> | | |

## Data Management System

### 4.1.1 (Periodical) retrieval of meter reads

|  |  |  |
| --- | --- | --- |
| 1. **Identifier and Name** | | |
| UC4.1.1 - Retrieval of meter reads | | |
| 1. **Scope** | | |
| A meter | | |
| 1. **Priority** | | |
| Mandatory. | | |
| 1. **Dependencies** | | |
| None. | | |
| 1. **Components & Description** | | |
| Cloud Data management System | | The data management platform must store encrypted reading from Smart Metering Devices. (Periodical) retrieval of meter reads (including fast sampled water flow data and possibly their characterization concerning actuated house appliances) |
| 1. **Pre-requisites** | | |
| * The Cloud based data management system has a contract with the water Utility (and customers) to store Readings from Smart Meters. * The readings must be encrypted. | | |
| 1. **Post conditions** | | |
| All Smart Meter Readings are stored securely in the Urban-Water database. | | |
| 1. **Trigger** | | |
| Web Service call once daily | | |
| 1. **Flow of Events** | | |
| **Step** | **System Action** | |
| 1 | The Gateway system being developed in WP2 will be responsible for acquiring data from the Smart Meters. These readings will be accumulated trough out the day in the Head end System. | |
| 2 | The Head system once a day will authenticate against and call a web service provided by the Urban-Water cloud data management platform to upload data once daily. | |
| 3 | The data management platform will process and store these reading in the data base. | |
| 1. **Remarks** | | |
| None. | | |

### Access to historical Water Network data

|  |  |  |
| --- | --- | --- |
| 1. **Identifier and Name** | | |
| UC4.1.2 - Access to historical Water Network data | | |
| 1. **Scope** | | |
| Water Utility | | |
| 1. **Priority** | | |
| Mandatory. | | |
| 1. **Dependencies** | | |
| None. | | |
| 1. **Components & Description** | | |
| Cloud Data management System | | Must receive encrypted reading from Water Utilities. |
| 1. **Pre-requisites** | | |
| * The Cloud based data management system has a contract with the water Utility to store historical readings from the Water Utility. * The readings must be encrypted. | | |
| 1. **Post conditions** | | |
| All Water Network readings are stored securely in the Urban-Water database. | | |
| 1. **Trigger** | | |
| Web Service call. | | |
| 1. **Flow of Events** | | |
| **Step** | **System Action** | |
| 1 | The Utility partners will upload data to the Urban-Water platform using a client. This client will encrypt this data. | |
| 2 | The readings will then be uploaded to the data management Platform using a web service. | |
| 3 | The data management platform will process and store these reading in the data base. | |
| 1. **Remarks** | | |
| None. | | |

### Access to Weather related data

|  |  |  |
| --- | --- | --- |
| 1. **Identifier and Name** | | |
| UC4.1.3 - Access to Weather related data | | |
| 1. **Scope** | | |
| Water Utility (regional MET offices) | | |
| 1. **Priority** | | |
| Mandatory. | | |
| 1. **Dependencies** | | |
| None. | | |
| 1. **Components & Description** | | |
| Cloud Data management System | | Must receive encrypted weather data from Water Utilities and/or from regional MET offices. |
| 1. **Pre-requisites** | | |
| * The Cloud based data management system has a contract with the water Utility to store weather related data from the Utility. * The readings must be encrypted. | | |
| 1. **Post conditions** | | |
| All Weather readings are stored securely in the Urban-Water database and can be accessed by the partners on demand. | | |
| 1. **Trigger** | | |
| Web Service call. | | |
| 1. **Flow of Events** | | |
| **Step** | **System Action** | |
| 1 | The Utility partners will upload data to the Urban-Water platform using a client. This client will encrypt this data. | |
| 2 | The readings will then be uploaded to the data management Platform using a web service. | |
| 3 | The data management platform will process and store this data in the data base. | |
| 1. **Remarks** | | |
| None. | | |

### Scalability under high load

|  |  |  |
| --- | --- | --- |
| 1. **Identifier and Name** | | |
| UC4.1.4 - Scalability under high load | | |
| 1. **Scope** | | |
| Urban-Water Project | | |
| 1. **Priority** | | |
| Mandatory. | | |
| 1. **Dependencies** | | |
| None. | | |
| 1. **Components & Description** | | |
| Cloud Data management System | | As the data management platform will have to cater for both upload and download requirements, at times the system will be under high load and will have to scale accordingly. |
| 1. **Pre-requisites** | | |
| * The Cloud based data management system will have to available for upload and download of data. | | |
| 1. **Post conditions** | | |
| A highly scalable platform that will scale to adjust to the needs of the platform users. | | |
| 1. **Trigger** | | |
| Increase/Decrease in activity. | | |
| 1. **Flow of Events** | | |
| **Step** | **System Action** | |
| 1 | Multiple Urban-Water modules running detailed simulations and both Utility providers uploading data to the system. | |
| 2 | The platform starts to increase the number of nodes available for upload and download of data. | |
| 3 | As the load decreases the platform is able to decrease the number of nodes available for both upload and download. | |
| 1. **Remarks** | | |
| None. | | |

### Data Redundancy

|  |  |  |
| --- | --- | --- |
| 1. **Identifier and Name** | | |
| UC4.1.5 - Data Redundancy | | |
| 1. **Scope** | | |
| Urban-Water Project | | |
| 1. **Priority** | | |
| Mandatory. | | |
| 1. **Dependencies** | | |
| None. | | |
| 1. **Components & Description** | | |
| Cloud Data management System | | As a result of potential machine failure the data management system will have to guard against data loss. |
| 1. **Pre-requisites** | | |
| * Hardware Failure | | |
| 1. **Post conditions** | | |
| A data management system that will protect data from failure even in the result of a hardware failure | | |
| 1. **Trigger** | | |
| Hardware failure | | |
| 1. **Flow of Events** | | |
| **Step** | **System Action** | |
| 1 | A hardware failure has occurred. | |
| 2 | The data is backed up in another geographic location. | |
| 3 | The data management system continues normal operation. | |
| 1. **Remarks** | | |
| None. | | |

### Data retrieval for billing

|  |  |  |
| --- | --- | --- |
| 1. **Identifier and Name** | | |
| UC4.1.6 - Automatic Billing System (ABS) | | |
| 1. **Scope** | | |
| * water utility * end customer | | |
| 1. **Priority** | | |
| Mandatory | | |
| 1. **Dependencies** | | |
| * Meter data management system: Meter data retrieved from consumer in a timed manner (provided by SAGEMCOM) * Availability of meter data in cloud data (provided by Red Skies) | | |
| 1. **Components & Description** | | |
| - Automatic billing system (ABS) as a client  - cloud platform data management as server | | Get data for billing and charging. |
| 1. **Pre-requisites** | | |
| The CDMS has collected the meter reads from the smart meters as described in UC “Retrieval of meter readings, chapter 3.1.1  Optional: The ABS may also have write access to the CDMS to store some billing related information e.g. a billing ID-String, the costs of the meter event, a status that marks this record as ‘already billed”. | | |
| 1. **Variables** | | |
| (none to be seen for now) | | |
| 1. **Post conditions** | | |
| The data is retrieved by the ABS, processed and – optional - some data is stored back at the meter event record. | | |
| 1. **Trigger** | | |
| Timed action once a day. | | |
| 1. **Flow of Events** | | |
| **Step** | **Actor and/or System Action** | |
| 1 | The ABS retrieves a list of meters which are available at the cloud management platform and meet a condition that are determined by the ABS. “Condition” may be   * 1. time range   2. “not yet billed”,   3. retrieval per meter ID   4. complete list of known meters   Or a combination of these. | |
| 2 | Access to the CDMS via Web Service in both directions. | |
| 3 | After the billing process, the results and some status information is written back to CDMS. This allows to mark meter read records to mark as ‘bill processed’ and allows to filter/retrieve for events that are not yet billed, thereby reducing load on the CDMS and increase access times. | |
| 1. **Remarks** | | |
| In order to mark event records, it would be desirable that ABS is able to set some additional attributes at the meter reading record in CDMS. These additional attributes to one meter record should be:  - State (Integer)  - costs: Float  - BillingrefID: String [20]  Nice to have: a trigger that tells ABS that new meter data has arrived. | | |

### Platform fault tolerance

|  |  |  |
| --- | --- | --- |
| 1. **Identifier and Name** | | |
| UC 4.1.7 - Platform fault tolerance after hardware failure | | |
| 1. **Scope** | | |
| Water Utility | | |
| 1. **Priority** | | |
| Mandatory. | | |
| 1. **Dependencies** | | |
| None. | | |
| 1. **Components & Description** | | |
| Cloud Data management System | | The data management platform must recover after a hardware failure or any other event that could the system to crash or be made unavailable. |
| 1. **Pre-requisites** | | |
| * The Cloud based data management system has a contract with the water Utility to store data for the utility. * The readings must be encrypted and stored in the data management cloud platform. | | |
| 1. **Post conditions** | | |
| The System is available to receive request for data and able to process data that is being sent up to the platform. | | |
| 1. **Trigger** | | |
| Hardware failure at the data centre. | | |
| 1. **Flow of Events** | | |
| **Step** | **System Action** | |
| 1 | At the catastrophic failure at the data centre or a simple hardware failure | |
| 2 | The data management platform will implement a fault tolerance program and being to recover the crashed role or data. | |
| 3 | The system should recover and continue to work as expected. | |
| 1. **Remarks** | | |
| None. | | |

### Reduce the cost to the Utility

|  |  |  |
| --- | --- | --- |
| 1. **Identifier and Name** | | |
| UC4.1.8 - Reduce cost | | |
| 1. **Scope** | | |
| Water Utility | | |
| 1. **Priority** | | |
| Mandatory. | | |
| 1. **Dependencies** | | |
| None. | | |
| 1. **Components & Description** | | |
| Cloud Data management System | | The data management cloud system will have help utilities reduce the cost of data management for large scale grid deployments while also providing an effective solution. |
| 1. **Pre-requisites** | | |
|  | | |
| 1. **Post conditions** | | |
| A cost effective data management solution that will meet all the utility needs. | | |
| 1. **Trigger** | | |
|  | | |
| 1. **Flow of Events** | | |
| **Step** | **System Action** | |
| 1 | Utility is faced with a very large bill to implement an “in house” data management solution | |
| 2 | The data management platform will avail of cost effective cloud storage | |
| 3 | The data management cloud platform will provide a cost effective solution that will meet all the Utilities and vested interested party’s needs. | |
| 1. **Remarks** | | |
| None. | | |

### Open Standards on the platform

|  |  |  |
| --- | --- | --- |
| 1. **Identifier and Name** | | |
| UC4.1.9 - Open standards | | |
| 1. **Scope** | | |
| Water Utility | | |
| 1. **Priority** | | |
| Mandatory. | | |
| 1. **Dependencies** | | |
| None. | | |
| 1. **Components & Description** | | |
| Cloud Data management System | | The platform must support open standards in order to facilitate quick and easy integration with third party software supplier wish to sell their services or products to the Utility. |
| 1. **Pre-requisites** | | |
|  | | |
| 1. **Post conditions** | | |
| A working prototype of the platform must support open standards in order to facilitate software providers. | | |
| 1. **Trigger** | | |
|  | | |
| 1. **Flow of Events** | | |
| **Step** | **System Action** | |
| 1 | The platform should allow easy integration with third party software suppliers. | |
| 2 | The platforms web role or web service will use open technology or standards to facilitate easy integration. | |
|  |  | |
| 1. **Remarks** | | |
| None. | | |

### Security

|  |  |  |
| --- | --- | --- |
| 1. **Identifier and Name** | | |
| UC4.1.10 - Security of the platform | | |
| 1. **Scope** | | |
| Water Utility, ICT provider, Customers | | |
| 1. **Priority** | | |
| Mandatory. | | |
| 1. **Dependencies** | | |
| None. | | |
| 1. **Components & Description** | | |
| Cloud Data management System | | The platform must ensure that all information stored on the platform and its delivery to ICT providers is secure. |
| 1. **Pre-requisites** | | |
|  | | |
| 1. **Post conditions** | | |
| A working prototype of the platform must implement a high level of security and intrusion prevention. | | |
| 1. **Trigger** | | |
|  | | |
| 1. **Flow of Events** | | |
| **Step** | **System Action** | |
| 1 | An unknown service attempts to access data from the platform. | |
| 2 | The service attempts to initiate a brute force attack against the credential of one of the platform web service. | |
| 3 | The platform recognises such an attack and blocks all traffic for such service and alert the platform administrator. | |
| 1. **Remarks** | | |
| None. | | |

# Requirements



## Data Management Requirements



### 5.1.1 Requirement RS-1: Storing all data related to the UrbanWater Project

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | RS-1 | **Priority** | Mandontory | **Conflicts** | - |
| **Requirement** | Storing all data required for the UrbanWater project | | | | |
| **Component** | Data Management Platform | | **Use Cases** | All use cases | |
| **Remark** | This task is vital to the success of the UrbanWater Project, the following two tables introduce a list of all the applications of the project and the data they require. These are the most significant requirements for the success of the UrbanWater project.  Rather than write a requirement for all 11 applications being developed by the UrbanWater project we have include two tables detailing their data requirements. | | | | |

**Table Key information – list of applications and partner responsible**

* **WDPS: Water Demand Prediction System (UNIZG-FER)**
* **DICM: Detailed Indoor consumption model (UNIZG-FER)**
* **WAPS: Water Availability Prediction System (HYDS)**
* **DSS: Decision Support System (HYDS)**
* **MBT: Mass Balance Tool (AQUA)**
* **NFA: Nightly Flow Analysis (AQUA)**
* **HMB: Hydraulic Model Builder (AQUA)**
* **AM: Alert Module (AQUA)**
* **ABS: Automatic Billing system (ORGA)**
* **TWM: The Water Mansion (SGI)**
* **TLD: The Last Drop (SGI)**

Table 1: Calendar, Hydrological and Water Distribution Network Data requirements for each partner in the UrbanWater project

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *Data* | Special Events | Sunrise/ Sunshine | *Volume* | Flow | Flow Meters | Smart Meter Data | Topology |
| *Section* | *Calendar* | *Calendar* | *Hydrological Data* | *Hydrological Data* | *Water Distribution Network Data* | *Water Distribution Network Data* | *Water Distribution Network Data* |
| *WDPS* | *X* | *X* |  |  | *X* | *X* |  |
| *DICM* |  |  |  |  |  | *X* |  |
| *WAPS* |  |  | *X* | *X* |  |  |  |
| *DSS* |  |  | *X* | *X* |  |  |  |
| *MBT* |  |  |  |  | *X* | *X* | *X* |
| *NFA* |  |  |  |  | *X* | *X* | *X* |
| *HMB* |  |  |  |  | *X* | *X* | *X* |
| *AM* |  |  |  |  |  |  |  |
| *ABS* |  |  |  |  |  | *X* |  |
| *TWM* |  |  |  |  |  | *X* |  |
| *TLD* |  |  |  |  |  |  |  |

Table 2: Meteorological data requirements for each partner in the UrbanWater project

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Data* | Min temperature | Max temperature | Mean temperature | 1h precip. accum. | 1h precip. accum. field | 1h precip. accum. field prediction |
| *Section* | Meteorological Data | Meteorological Data | Meteorological Data | Meteorological Data | Meteorological Data | Meteorological Data |
| *WDPS* | *X* | *X* | *X* | *X* |  |  |
| *DICM* |  |  |  |  |  |  |
| *WAPS* |  |  |  | *X* | *X* | *X* |
| *DSS* | *X* | *X* | *X* | *X* |  |  |
| *MBT* |  |  |  |  |  |  |
| *NFA* |  |  |  |  |  |  |
| *HMB* |  |  |  |  |  |  |
| *AM* |  |  |  |  |  |  |
| *ABS* |  |  |  |  |  |  |
| *TWM* |  |  |  |  |  |  |
| *TLD* |  |  | *X* | *X* |  |  |

### 5.1.2 Requirement RS-2: Secure data Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | RS-2 | **Priority** | Mandontory | **Conflicts** | - |
| **Requirement** | Guarantee Secure data storage and access | | | | |
| **Component** | Data Management Platform | | **Use Cases** | All use cases | |
| **Remark** | Commercial and non-commercial sensitive data must be protected. | | | | |

### 5.1.3 Requirement RS-3: Access Control

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | RS-3 | **Priority** | Mandontory | **Conflicts** | - |
| **Requirement** | Restricts access to software providers based on access control. | | | | |
| **Component** | Data Management Platform | | **Use Cases** | All use cases | |
| **Remark** | User rules and groups will restrict access to data | | | | |

### Requirement RS-4: Integrate with existing systems on water Utilities.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | RS-4 | **Priority** | Mandatory | **Conflicts** | - |
| **Requirement** | Able to receive data from the Utility | | | | |
| **Component** | Data Management Platform | | **Use Cases** | All use cases | |
| **Remark** | The ability of utility partners to upload data necessary for the UrbanWater modules is vital for the project success. | | | | |

### 5.1.5 Requirement AP-1: Store past daily water price profiles

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | AP-1 | **Priority** | Mandatory | **Conflicts** | - |
| **Requirement** | Store past daily water price profiles | | | | |
| **Component** | Data Management Platform | | **Use Cases** | All use cases | |
| **Remark** | Critical for Adaptive Pricing System | | | | |

### Requirement CE-1: Store past sampled water flow data

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | CE-1 | **Priority** | Mandatory | **Conflicts** | - |
| **Requirement** | Store past sampled water flow data and usage characterization by individual appliances needed for Detailed Indoor Consumption model | | | | |
| **Component** | Data Management Platform | | **Use Cases** | All use cases | |
| **Remark** | Critical for (serious) gaming service | | | | |

### Requirement AP-ABS-1: Billing System must have read access to CDMS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | AP-ABS-1 | **Priority** | Mandatory | **Conflicts** | - |
| **Requirement** | Allow Partners to access to data stored on the platform. | | | | |
| **Component** | Data Management Platform | | **Use Cases** | All use cases | |
| **Remark** | Critical for billing process | | | | |



### Requirement AP-ABS-1.2: Billing System must have write access to CDMS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | AP-ABS-1.2 | **Priority** | Optional | **Conflicts** | - |
| **Requirement** | Allow ABS to update data into on the platform. | | | | |
| **Component** | Data Management Platform | | **Use Cases** |  | |
| **Remark** | Optional, not essential, but eases flow. | | | | |

### Requirement AP-ABS-1.3: Billing System is informed when new meter data records are present in CDMS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | AP-ABS-1.3 | **Priority** | Nice to have | **Conflicts** | - |
| **Requirement** | Allow ABS to fast react on new meter data records available. | | | | |
| **Component** | Data Management Platform | | **Use Cases** |  | |
| **Remark** | Replaces the necessity for a timed run once day. | | | | |

### Requirement RS-3: Integrate with new Gateway system being developed



|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | RS-3 | **Priority** | Mandontory | **Conflicts** | - |
| **Requirement** | Acquire smart meter readings from SagemComs new Gateway system | | | | |
| **Component** | Data Management Platform | | **Use Cases** | All use cases | |
| **Remark** |  | | | | |



### Requirement SP-1: Back up for Modules

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | SP-1 | **Priority** | Mandontory | **Conflicts** | - |
| **Requirement** | Provide storage to all modules that want to store results or outputs on the data management platform | | | | |
| **Component** | Data Management Platform/Software providers | | **Use Cases** | All use cases | |
| **Remark** | This will have to support BLOB object uploads. | | | | |

## Utility Requirements

### Requirement UT-1: Scalability

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | UT-1 | **Priority** | Mandator | **Conflicts** | - |
| **Requirement** | Support Elasticity in the Data management system | | | | |
| **Component** | Data Management Platform | | **Use Cases** | Scalability under high load | |
| **Remark** | The platform must be able to scale up and down in periods of high and low demand. | | | | |

### Requirement UT-2: Fault tolerance support

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | UT-2 | **Priority** | Mandator | **Conflicts** | - |
| **Requirement** | Fault tolerance Support | | | | |
| **Component** | Data Management Platform | | **Use Cases** | Platform fault tolerance after hardware failure | |
| **Remark** | The platform must be able to recover after a power outage/hardware failure or any reason for system failure. | | | | |

### Requirement UT-3: Support open standards

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | UT-3 | **Priority** | Mandator | **Conflicts** | - |
| **Requirement** | Support Open Standards | | | | |
| **Component** | Data Management Platform | | **Use Cases** | Open Standards on the platform | |
| **Remark** | The platform must be able to facilitate quick easy access for third party software providers to the Utility by supporting open standards. | | | | |

### Requirement UT-4: Speed

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | UT-4 | **Priority** | Mandator | **Conflicts** | - |
| **Requirement** | Speed of response | | | | |
| **Component** | Data Management Platform | | **Use Cases** | Scalability under high load | |
| **Remark** | Speed of response to queries to facilitate Software providers running simulations | | | | |

### Requirement UT-5: Reduce costs of data management

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | UT-5 | **Priority** | Mandator | **Conflicts** | - |
| **Requirement** | Reduce cost to the utility | | | | |
| **Component** | Data Management Platform | | **Use Cases** | Reduce the cost to the Utility | |
| **Remark** | New innovations to reduce the cost of data management to the Utility | | | | |

### Requirement UT-6: Secure data Storage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | UT-6 | **Priority** | Mandator | **Conflicts** | - |
| **Requirement** | Secure storage | | | | |
| **Component** | Data Management Platform | | **Use Cases** | All use cases | |
| **Remark** | Ensure data is not compromised or changed when store on off-site resources. Platform must be able to respond to unauthorised attempts to access data | | | | |

### Requirement UT-7: Centralised Repository

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | UT-7 | **Priority** | Mandator | **Conflicts** | - |
| **Requirement** | Provide centralised repository for all non-sensitive Utility data | | | | |
| **Component** | Data Management Platform | | **Use Cases** | All use cases | |
| **Remark** |  | | | | |

### Requirement UT-8: Back Up service to Utilities

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | UT-8 | **Priority** | Mandator | **Conflicts** | - |
| **Requirement** | Provide back up functional to the Utility Partners for non-sensitive data | | | | |
| **Component** | Data Management Platform | | **Use Cases** | All use cases | |
| **Remark** |  | | | | |

### Requirement UT-9: Resources usage statistics

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | UT-9 | **Priority** | Mandator | **Conflicts** | - |
| **Requirement** | Generate usage statistic in order to support requirement UT-1 | | | | |
| **Component** | Data Management Platform | | **Use Cases** | Scalability under high load | |
| **Remark** | The platform must be able to scale up and down in periods of high and low demand. | | | | |

## Customer Requirements

### Requirement CR-1: Access to personal meter reading

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | CR-1 | **Priority** | Mandator | **Conflicts** | - |
| **Requirement** | Customer would like to access their consumption data using an application developed by an ICT Software provider. | | | | |
| **Component** | Data Management Platform | | **Use Cases** | Secure data access | |
| **Remark** |  | | | | |

### Requirement CR-2: Support customer information

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | CR-2 | **Priority** | Mandator | **Conflicts** | - |
| **Requirement** | Customer would like know cheapest time for water consumption | | | | |
| **Component** | Data Management Platform | | **Use Cases** | Secure data access | |
| **Remark** | Data management platform will provide data for adaptive pricing models. | | | | |

## Documentation Requirements

### Requirement DR-1: Completer documentation of Web services for data providers

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | DR-1 | **Priority** | Mandator | **Conflicts** | - |
| **Requirement** | Complete documentation for data providers how user and call web service required to upload data to the data management platform | | | | |
| **Component** | Data Management Platform / Utilty existing infrastructure / Other data Providers | | **Use Cases** | UC4.1.9 - Open standards | |
| **Remark** |  | | | | |

### Requirement DR-2: Complete documentation of Web service for Software Providers

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | DR-2 | **Priority** | Mandator | **Conflicts** | - |
| **Requirement** | Complete documentation for software providers how user and call web service required to retrieve data from the data management platform | | | | |
| **Component** | Data Management Platform / Software Providers | | **Use Cases** | UC4.1.9 - Open standards | |
| **Remark** |  | | | | |

### Requirement DR-2: Complete documentation to authenticate with the platform

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Requirement #** | DR-3 | **Priority** | Mandator | **Conflicts** | - |
| **Requirement** | Complete documentation for software providers how to authenticate with the data management platform | | | | |
| **Component** | Data Management Platform / Software Providers | | **Use Cases** | UC4.1.9 - Open standards | |
| **Remark** |  | | | | |

# Conclusion and Outlook

The requirements gathered as part of this document will be used to drive the design of the data management cloud platform. This document contains a list of all applications that will require data from the UrbanWater data management platform and identifies what data they require. This is a vital task for integration of the project and can pull the work being carried out in WP2, WP3 and WP6 into a single powerful platform.

# References

# Annex

*Reviewers Comments:*

*The document seems incomplete, Pdf saved in draft mode.– does not adhere to template, and contains comments (this is not acceptable especially that D3.1 is a public document). The number of use cases and requirements presented are surprisingly small for a complex system that is under development. Use cases and requirements refer to “scenarios” but it is not clear what scenarios are and where they are defined*

Solution - Amendment

* Due to a miss-communication comments were include in the construction of the PDF. We have fix issue this by inspecting the final pdf before it is sent along with other deliverable.
* We have added two new chapters, “Actors of the platform” and “Scenarios” to be more in-line with the template provided by project partners and to address Scenario reference concern.
* Tables containing a full list of all applications in the UrbanWater Project have been added along with the data requirements for each application.
* The requirements section will be extended along with the use case section of the document.
* The document template has been changed to adhere to the new template provided by Ateknea.