Exploitable Results by Third Parties

13029

Water-M

Project details

<table>
<thead>
<tr>
<th>Project leader:</th>
<th>Jean-Jacques Busson (Eolane)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email:</td>
<td><a href="mailto:jean-jacques.busson@eolane.com">jean-jacques.busson@eolane.com</a></td>
</tr>
<tr>
<td>Website:</td>
<td><a href="https://itea3.org/project/water-m.html">https://itea3.org/project/water-m.html</a></td>
</tr>
</tbody>
</table>
## Metadata & Data manipulation language & Visualisation

<table>
<thead>
<tr>
<th>Input(s):</th>
<th>Main feature(s):</th>
<th>Output(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary to profiles</td>
<td>Spatial metadata specifying the geographic coordinates and/or the elevation of the sensors ( Indoor large farming or water management platforms )</td>
<td>Have geo-located readings without having to use four separate series and having to keep track of the reading context.</td>
</tr>
<tr>
<td>Measurement and representation method</td>
<td>Water throughput, humidity, LED brightness Monitoring, augmented measurements form what we call Geo Time Series® (GTS)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>differentiating factor of Warp 10 is that both space (location) and time</td>
<td></td>
</tr>
</tbody>
</table>

### Unique Selling Proposition(s):
- Extensible stack oriented programming language with specific Water Management possible request
- Capacity to create complex search on Big data with an easy language “find all the sensors water nodes active during last Monday in the perimeter delimited by this geo-fencing polygon of that indoor farming zone”
- Capacity for large water command control auctioneer, in indoor and outdoor farming but also in water distributed sensors to be positioned with very high efficiency.
- Capacity to managed data compression local treatment ( aka FOG computing ) for long ranged access networks (LoRA)

### Integration constraint(s):
- Use WARP IO open source package
- Grafana and its Grafana-WarpDB module for data visualisation.
- RDF OWL manipulation if SEAS ontology use

### Intended user(s):
- Water and farming programmers for information technology monitoring solution
- Programmers using time series concept

### Provider:
- Cityzen data Warp io site [http://www.warp10.io/](http://www.warp10.io/) and the specific Water-M Wiki site (Contact point will deliver access).

### Contact point:
- herve rannou <herve.rannou@cityzendata.com>
<table>
<thead>
<tr>
<th>Metadata &amp; Data manipulation language &amp; Visualisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition(s) for reuse:</td>
</tr>
<tr>
<td>- open source for Warp IO package</td>
</tr>
<tr>
<td>- + Licensing for the specific IoT Lora data Fog computing module engine</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>▪  Latest update: November 2017</td>
</tr>
</tbody>
</table>
Exploitable Results by Third Parties

13029 – Water-M

<table>
<thead>
<tr>
<th>PICOGATEWAY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input(s):</strong></td>
</tr>
<tr>
<td>Messages received in LoRa</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Unique Selling Proposition(s):**
- A ready-to-use Indoor LoRa concentrator for Small & Private Network, Smart water metering, Smart Farming, Smart Building, Smart Asset
- Low cost device
- Embedded Network & Application Server

**Integration constraint(s):**
- REST API service for data access
- Indoor only
- LoRa 868 or 433 MHz band 3 channels (LoRaWan™ default)
- 470 MHz version for China’s market

**Intended user(s):**
- Customer who wants to get data from LoRa network

**Provider:**
- Eolane

**Contact point:**
- Jean-Jacques Busson <jean-jacques.busson@eolane.com>

**Condition(s) for reuse:**
- Commercially available

*Latest update: December 15, 2017*
## Exploitable Results by Third Parties

### 13029 – Water-M

**Name:** LORA STACK

<table>
<thead>
<tr>
<th>Input(s):</th>
<th>Main feature(s):</th>
<th>Output(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor data payload</td>
<td>Software brick that decodes and encodes data using LORA protocol</td>
<td>Data over LoRa</td>
</tr>
</tbody>
</table>

**Unique Selling Proposition(s):**
- Integration in products and solutions made by éolane (Sensing Labs LoRa Transmitters for water and energies measurement, éolane vibration sensor “movee”, LORA/RS422 adapter for Alstom, …).

**Integration constraint(s):**
- Hardware: STM32 microcontroller with FreeRTOS

**Intended user(s):**
- Internally used by eolane for customer product development.

**Provider:**
- Eolane

**Contact point:**
- Jean-Jacques Busson <jean-jacques.busson@eolane.com>

**Condition(s) for reuse:**
- Internal reuse only

*Latest update: December 15, 2017*
## Exploitable Results by Third Parties

### 13029 – Water-M

### High Performance on ARM cortex solution: WARP IO adapted solution

<table>
<thead>
<tr>
<th>Input(s):</th>
<th>Main feature(s)</th>
<th>Output(s):</th>
</tr>
</thead>
</table>
| - Processors characteristics and instruction set | - manipulate sensor data on very small embedded CPU solutions (ARM cortex)  
- Improved efficiency for analytics and storage on such small package solutions (could be open hardware raspberry Pi solutions) | - Collect, store and manipulate sensor data.  
- Very open and extendable data model |

### Unique Selling Proposition(s):
- Able to represent any Sequence Data  
- Could manage millions of series (10 million of data point and around 10 K data points/s)  
- Afterwards, the same Warp Script could run on Standalone or distributed hosting solution to reach very high performance and scalability  
- Creation of dynamical presentation or data visualization with Apache Zeppelin.

### Integration constraint(s):
- Knowing time series concept and ideally tools such as  
  - Spark, FLINK batch solution  
  - Real time existing tool such as apache storm (open source).  
  - Apache Zeppelin

### Intended user(s):
- Programmers searching High Performance on small CPU packages  
- Performance evaluation expert

### Provider:
- Cityzen data Warp io site [http://www.warp10.io/](http://www.warp10.io/) and the specific WaterM Wiki site (Contact point will deliver access).

### Contact point:
herve rannou <herve.rannou@cityzendata.com>

### Condition(s) for reuse:
- open source

*Latest update: November 2017*
### Keyaqua novel features (Communication with EHP, SAMI and RemoteMX)

<table>
<thead>
<tr>
<th>Input(s):</th>
<th>Main feature(s)</th>
<th>Output(s):</th>
</tr>
</thead>
</table>
| • Water quantity monitoring  
• Water quality monitoring | • Graphical interface  
• Location info  
• Novel features: adapting EHP data provision and SAMI predictive tool as a part in Keyaqua, RemoteMX | • Visual management tool for water supply network |

**Unique Selling Proposition(s):**
- Easy-to use visual layout integrating several information sources with location info
- Easy access via browser

**Integration constraint(s):**
- Usable via Web browser
- Network data in database format like Oracle, PostGIS, ESRI Shape or georeferenced vector (DWG, DGN)

**Intended user(s):**
- Water utilities, industrial water operators

**Provider:**
- Keypro Oy

**Contact point:**
- CEO Toni Paila <toni.paila@keypro.fi>

**Condition(s) for reuse:**
- Available as a commercial service product

*Latest update: December 2017*
### SAMI: Platform for measurement data management and creating monitoring services

<table>
<thead>
<tr>
<th>Input(s):</th>
<th>Main feature(s):</th>
<th>Output(s):</th>
</tr>
</thead>
</table>
| ▪ Real-time measurements in water distribution network  
▪ For example pressure and flow measurements | ▪ Sensor data management and availability  
▪ Data sharing via open WCF and JSON interfaces  
▪ Platform for creating online monitoring web services | ▪ Open source platform  
▪ Demo version of online web service for monitoring hydraulic state of a water distribution network |

<table>
<thead>
<tr>
<th>Unique Selling Proposition(s):</th>
<th>Integration constraint(s):</th>
<th>Intended user(s):</th>
</tr>
</thead>
</table>
| ▪ Open source platform for sensor data management  
▪ Documented API for getting data and building up third party solutions | ▪ Sensors in water distribution network with data available via internet  
▪ Building up server environment | ▪ Water utilities, water distribution network operators and managers |

<table>
<thead>
<tr>
<th>Provider:</th>
<th>Contact point:</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Savonia UAS</td>
<td>▪ Eero Antikainen &lt; <a href="mailto:eero.antikainen@savonia.fi">eero.antikainen@savonia.fi</a>&gt;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition(s) for reuse:</th>
<th></th>
</tr>
</thead>
</table>
| ▪ Open source, released in Github [https://github.com/SavoniaUAS/SaMi](https://github.com/SavoniaUAS/SaMi)  
▪ Demo version of monitoring web service is not public |

*Latest update: December 2017*
### Water distribution optimization and management using hydraulic network modelling

<table>
<thead>
<tr>
<th>Input(s):</th>
<th>Main feature(s)</th>
<th>Output(s):</th>
</tr>
</thead>
</table>
| ▪ Spatial data for distribution network (pipes, water sources, storage, pumps, …)  
▪ Basic data about water demands, pressure, … | ▪ Hydraulic model for planning, optimizing and management of water distribution in a geographical information system (GIS) | ▪ Calibrated hydraulic model for Vehmersalmi distribution network (Kuopio Waterworks Ltd) |

| Unique Selling Proposition(s): | ▪ Documented methods for hydraulic network model creation  
▪ Documented methods for hydraulic network model calibration |
| Integration constraint(s): | ▪ Basic data for hydraulic network model creation  
▪ EPANET modelling tool (open source) |

| Intended user(s): | Water utilities, supply network managers, design consultants |
| Provider: | Savonia UAS |
| Contact point: | Eero Antikainen < eero.antikainen@savonia.fi > |

| Condition(s) for reuse: | EPANET tool available for free ([www.epa.gov/water-research/epanet](http://www.epa.gov/water-research/epanet))  
▪ Results of this part is available for free (Thesis, Jari Puurunen) |

*Latest update: December 2017*
## Network flow monitoring

<table>
<thead>
<tr>
<th>Input(s):</th>
<th>Main feature(s):</th>
<th>Output(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor data from various quality monitoring station</td>
<td>Water balance monitoring service based on clamp-on flow meters and supportive data enrichments</td>
<td>Information service; processed data via EHP data service, Raw data</td>
</tr>
</tbody>
</table>

### Unique Selling Proposition(s):`
- Clamp-on sensors for easy installation
- Early warning for possible disruptions in water flow balance
- Low maintenance costs

### Integration constraint(s):`
- EHP-data.com internet user interface, Rest API interface for data delivery to other systems
- The standard Rest API user interface can be send for any server to get the monitoring data from the EHP-data.com server

### Intended user(s):`
- Water Utility operators

### Provider:`
- EHP Environment

### Contact point:`
- Jaakko Seppälä, chairman of board <jaakko.seppala@ehp-tekniikka.fi>

### Condition(s) for reuse:`
- Information is also available via Keyaqua by Keypro

*Latest update: December 2017*
## Water quality data monitoring

<table>
<thead>
<tr>
<th>Input(s):</th>
<th>Main feature(s)</th>
<th>Output(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Sensor data from various quality monitoring station</td>
<td>▪ Novel features for information provision, eg. integration with Keyaqua</td>
<td>▪ Processed quality data</td>
</tr>
<tr>
<td></td>
<td>▪ Algorithms to process the quality parameter info</td>
<td>▪ Raw data</td>
</tr>
</tbody>
</table>

### Unique Selling Proposition(s):
- Real-time quality monitoring for various parameters
- No need for external energy supply, solar panels
- Low maintenance costs

### Integration constraint(s):
- EHP-data.com internet user interface, Rest API interface for data delivery to other systems
- The standard Rest API user interface can be send for any server to get the monitoring data from the EHP-data.com server

### Intended user(s):
Industrial operators, environmental permit authorities

### Provider:
EHP Environment

### Contact point:
Jaakko Seppälä, chairman of board <jaakko.seppala@ehp-teknikka.fi>

### Condition(s) for reuse:
- Available as an information service via EHP
- Information is also available via Keyaqua by Keypro

*Latest update: November 2017*
# MACHForc - Web application for data solution and computing

<table>
<thead>
<tr>
<th>Input(s):</th>
<th>Main feature(s)</th>
<th>Output(s):</th>
</tr>
</thead>
</table>
| ▪ Device data with analog/digital inputs  
▪ Manual lab/process inputs | ▪ Sensor-cloud data solution for remote data management  
▪ Data analytic applicable | ▪ Advanced reporting  
▪ Process improvement |

<table>
<thead>
<tr>
<th>Unique Selling Proposition(s):</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Application with supercomputing capacity</td>
<td></td>
</tr>
<tr>
<td>▪ Highly scalable for customized analytics deployment</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Integration constraint(s):</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Areas with possible data transmission to internet</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intended user(s):</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Chemical processing industries, smart water technology providers, and their clients</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Provider:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ RemoteMX Oy</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact point:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ <a href="mailto:yingchan.lin@remoteMX.com">yingchan.lin@remoteMX.com</a></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition(s) for reuse:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ System upkeep</td>
<td></td>
</tr>
</tbody>
</table>

*Latest update: Dec 15th, 2017*
### Aquamatrix: Flow/Pressure Meter

<table>
<thead>
<tr>
<th>Input(s):</th>
<th>Main feature(s)</th>
<th>Output(s):</th>
</tr>
</thead>
</table>
| - Flow data  
- Pressure data  
- Dynamic pressure  
- Temperature data  
- Water network information | - Combined flow, static and dynamic pressures meters  
- Integrated data exchange  
- LoRa/Sigfox/GPRS/NB-IoT interfaces | - Accurate consumption data to any browser  
- Leakage detection  
- Network condition data |

| Unique Selling Proposition(s): | First combination meter with accurate flow, static and dynamic pressure measurement  
Data algorithms for precise water flow management and leak detection |
| Integration constraint(s): | Aquamatrix.fi user interface  
GPRS/Sigfox/LoRa/NB-IoT network |
| Intended user(s): | Water utilities and housing estates/property owners |
| Provider: | Aquamatrix Oy (Novel Econet Spin-off company released during Water-M) |
| Contact point: | Antti Herlevi <antti.herlevi@econetgroup.fi> |
| Condition(s) for reuse: | Available as an information service via Aquamatrix  
Information is also available via Keyaqua by Keypro |

*Latest update: December 2017*
## Heavy metal monitoring

<table>
<thead>
<tr>
<th>Input(s):</th>
<th>Main feature(s)</th>
<th>Output(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrochemical sensors (EHP)</td>
<td>Real-time monitoring for low concentrations of heavy metals</td>
<td>Monitoring result as numerical value</td>
</tr>
</tbody>
</table>

### Unique Selling Proposition(s):  
- Real-time monitoring for low concentrations of heavy metals  
- No need for external energy supply (possible to use solar panels)

### Integration constraint(s):  
- Data transfer via internet connection, GPRS or LoRa

### Intended user(s):  
- Industrial operators, water utilities, environmental permit authorities

### Provider:  
- MEOLINE Oy (a spinoff company released during the Water-M Project)

### Contact point:  
- Jarkko Räty, Meoline Oy

### Condition(s) for reuse:  
- Available via EHP data service, which is further integrated with Keyaqua

*Latest update: December 2017*
## Trend analysis tool

<table>
<thead>
<tr>
<th>Input(s):</th>
<th>Main feature(s)</th>
<th>Output(s):</th>
</tr>
</thead>
</table>
| - Water data monitoring | - Shows the direction, the speed and the severity of the change  
- Graphical output information | - Early warning for critical variables |

### Unique Selling Proposition(s):
- Easily exploitable for any data  
- Tool for condition monitoring, risk assessment, early warning and prediction

### Integration constraint(s):
- Matlab based algorithm, can be transformed to self-executable.  
- Requires low computational capacity

### Intended user(s):
Research engineers, water utilities, supply network managers

### Provider:
University of Oulu / Control Engineering

### Contact point:
- Esko Juuso, Jani Tomperi

### Condition(s) for reuse:
- Available from University of Oulu / Control Engineering

*Latest update: November 2016*
<table>
<thead>
<tr>
<th><strong>Input(s):</strong></th>
<th><strong>Main feature(s):</strong></th>
<th><strong>Output(s):</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Any kind of data produced from Scada, IoT, Sensors or Databases (on finalized form)</td>
<td>Real-time data process management</td>
<td>Reports which include filtered data content on csv, pdf or xls format</td>
</tr>
<tr>
<td></td>
<td>Near-real time index performance for big scale data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flexible and scalable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Includes visualization components</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Machine Learning Algorithms to extract new meanings from data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rule based event processing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Report and notification ability on selected data</td>
<td></td>
</tr>
</tbody>
</table>

**Unique Selling Proposition(s):**
- In Real-Time Data Analysis Tool
- Dynamic Dashboard to visualize custom created graphics
- Anomaly Detection
- Industry 4.0 Compatible
- Scalability, low latency, fault tolerance, high availability
- [http://mind40.com/](http://mind40.com/)

**Integration constraint(s):**
- Linux based system cluster. Machine amount of this cluster is highly dependent on live coming data size.
- ElasticSearch and Kibana Platform

**Intended user(s):**
- System Analyzers, Performance Analyzers
- Device Operators, End Users

**Provider:** MANTIS

**Contact point:** Aydin Can POLATKAN – [aydincanpolatkan@mantis.com.tr](mailto:aydincanpolatkan@mantis.com.tr)

**Condition(s) for reuse:** Software licensing per company, per year

*Latest update: 12.12.2017*
### Name: Water telemonitoring system

<table>
<thead>
<tr>
<th>Input(s):</th>
<th>Main feature(s):</th>
<th>Output(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Any kind of data produced from Scada, IoT, Sensors or Databases (on finalized form)</td>
<td>▪ Real-time data process management ▪ Near-real time index performance for big scale data ▪ Flexible and scalable ▪ Includes visualization components ▪ Machine Learning Algorithms to extract new meanings from data ▪ Rule based event processing ▪ Report and notification ability on selected data</td>
<td>▪ Reports which include filtered data content on csv, pdf or xls format ▪ Actions that trigger web services ▪ Alerts or notifications via e-mail or messages</td>
</tr>
</tbody>
</table>

| Unique Selling Proposition(s):                                             | Ideal tool for hydrographic, leakage detection, frost warning and pump monitoring                                       | Integrate disease and irrigation models ▪ In Real-Time Data Analysis Tool ▪ Dynamic Dashboard to visualize custom created graphics ▪ Anomaly Detection ▪ Industry 4.0 Compatible ▪ Scalability (500-1000 live sensors), low latency, fault tolerance, high availability (uptime 99%) ▪ Error rates lower than 1% ▪ Lower price than competing professional solutions ▪ Past and current collaboration with public institutions in the field of water administration ▪ Easy services customization based on customer’s needs |

| Integration constraint(s):                                                 | Linux based system cluster. Machine amount of this cluster is highly dependent on live coming data size. | ElastichSearch and Kibana Platform |

<p>| Intended user(s):                                                         | Government agencies for emergencies (flood, fire, draught); Regional and national public water administration organizations (National Administration “Romanian Waters”; National Marine Research and Development Institute “Grigore Antipa”, Constanța; National Institute for Hydrology &amp; WM, with its water directorates, etc.). Other stakeholders affected by urban water (underground tunnels, metro, micro-hydropowerplants, PV parks, urban agriculture, industry, fishing, water transport, etc.) ▪ System Analyzers, Performance Analyzers ▪ Device Operators, End Users |</p>
<table>
<thead>
<tr>
<th><strong>Name:</strong> Water telemonitoring system</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Provider:</strong> BEIA</td>
</tr>
<tr>
<td><strong>Contact point:</strong> GEORGE SUCIU – <a href="mailto:george@beia.ro">george@beia.ro</a></td>
</tr>
<tr>
<td><strong>Condition(s) for reuse:</strong> Software licensing per beneficiary, per year</td>
</tr>
</tbody>
</table>

*Latest update: 12.12.2017*
### WiSUN Stack

<table>
<thead>
<tr>
<th>Input(s):</th>
<th>Main feature(s)</th>
<th>Output(s):</th>
</tr>
</thead>
</table>
| • Water application data  
• IPv6 packet          | • Gateway which transfers data from a node to server  
• Exposes a web server with the messages received | • IPv6 packet  
• Water application data |

<table>
<thead>
<tr>
<th>Unique Selling Proposition(s):</th>
<th>Integration constraint(s):</th>
<th>Intended user(s):</th>
<th>Provider:</th>
<th>Contact point:</th>
<th>Condition(s) for reuse:</th>
</tr>
</thead>
</table>
| • Long range (up to 10 km) and meshed high speed  
• Low consumption (battery life time 20 years) | • ARM Cortex X platforms | • Industries, utilities | • Itron | • Mehdi.mani@itron.com | • Licensed prototype available |

*Latest update: December 15, 2017*