melodies
exploiting open data

WP-10: Groundwater model service driven by open data and social networks

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Development overview

- Implementation of **web services** to obtain model data
- Implementation of **web services** to communicate new data to the model
- Zahori **Android application**
- WML1.1 & WML2
- Plans to use the technical platform to generate the RDF data and update Strabon

Technical platform – Strabon issues

- Manually uploaded more than **400** rdf files to Strabon in an Azure Virtual Machine
  - Slow upload process
  - Strabon performance **OK**
- Need process on the technical platform to convert result files to rdf and upload this files to Strabon

Technical platform – Hadoop plans

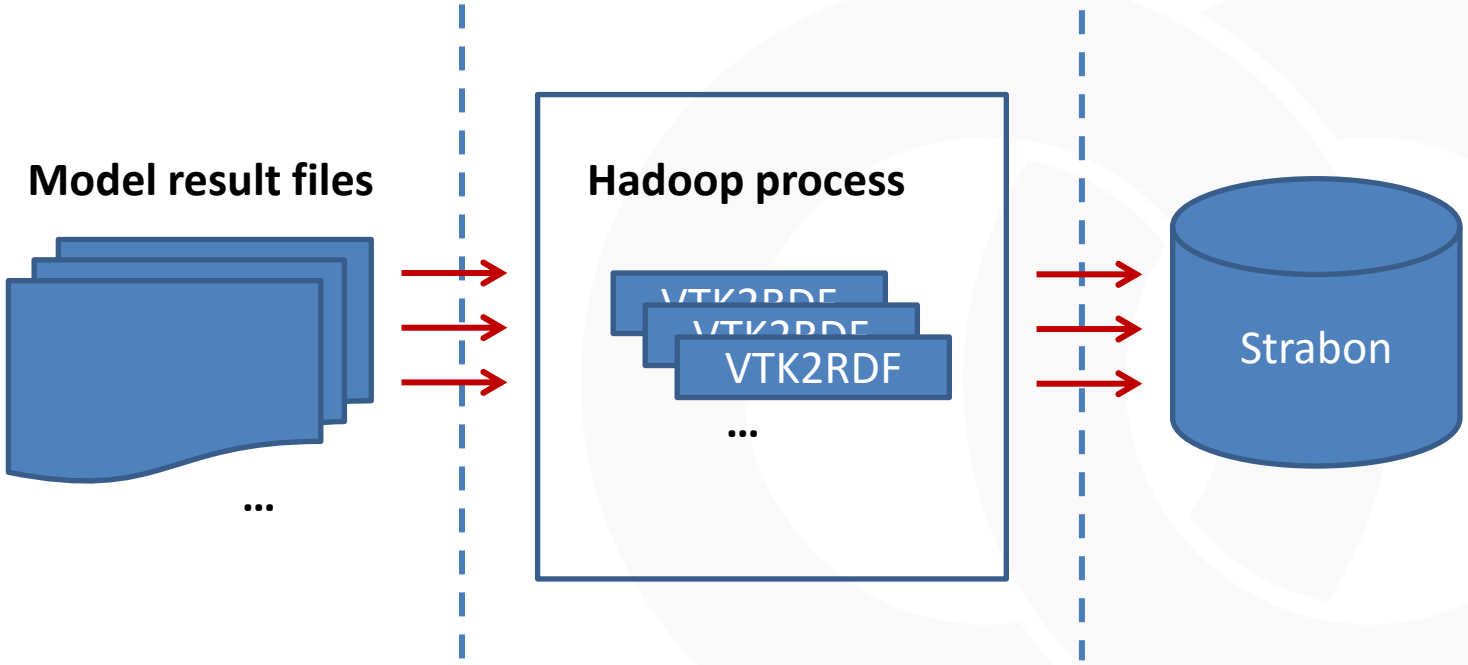
- **Parallelize** the conversion of model result files to rdf (more than 400 files for each simulation)
- Upload each of these files to Strabon?
- .NET application that converts 1 model result file to 1 RDF (runs in the Sandbox VM using Mono)

Technical platform – Hadoop plans

Model result files stored online

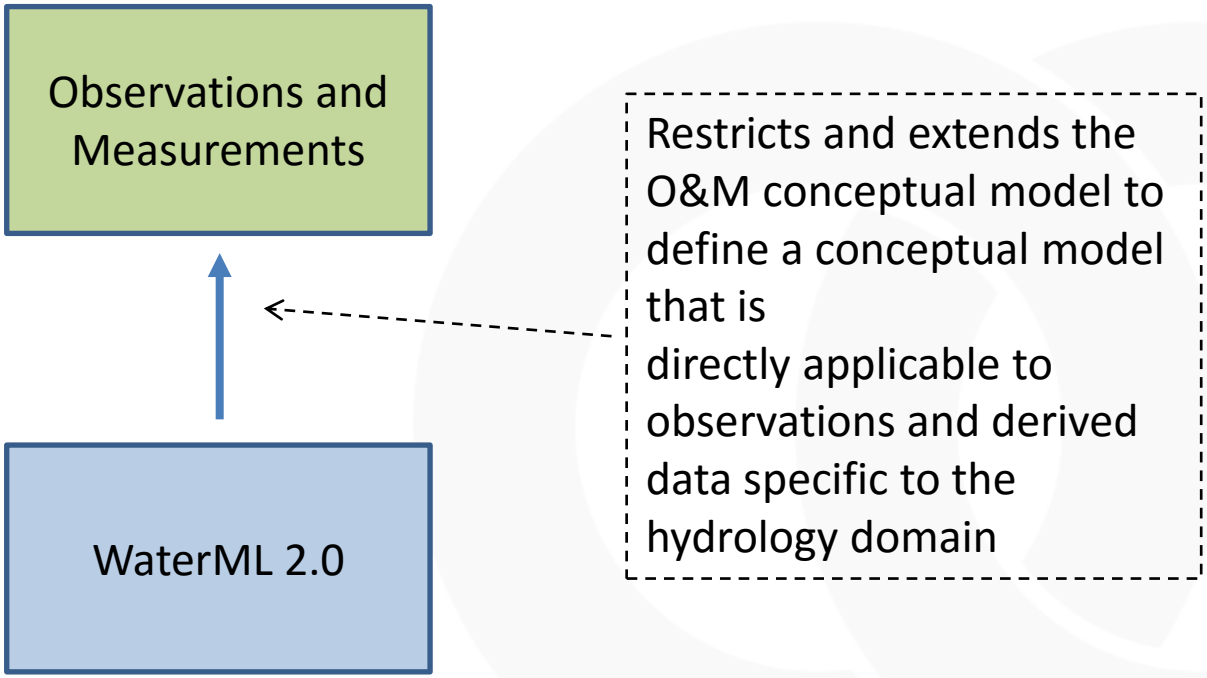
1. Download model result files
2. Launch conversion process for each of the files
3. Store results in Strabon

Strabon instance in another machine



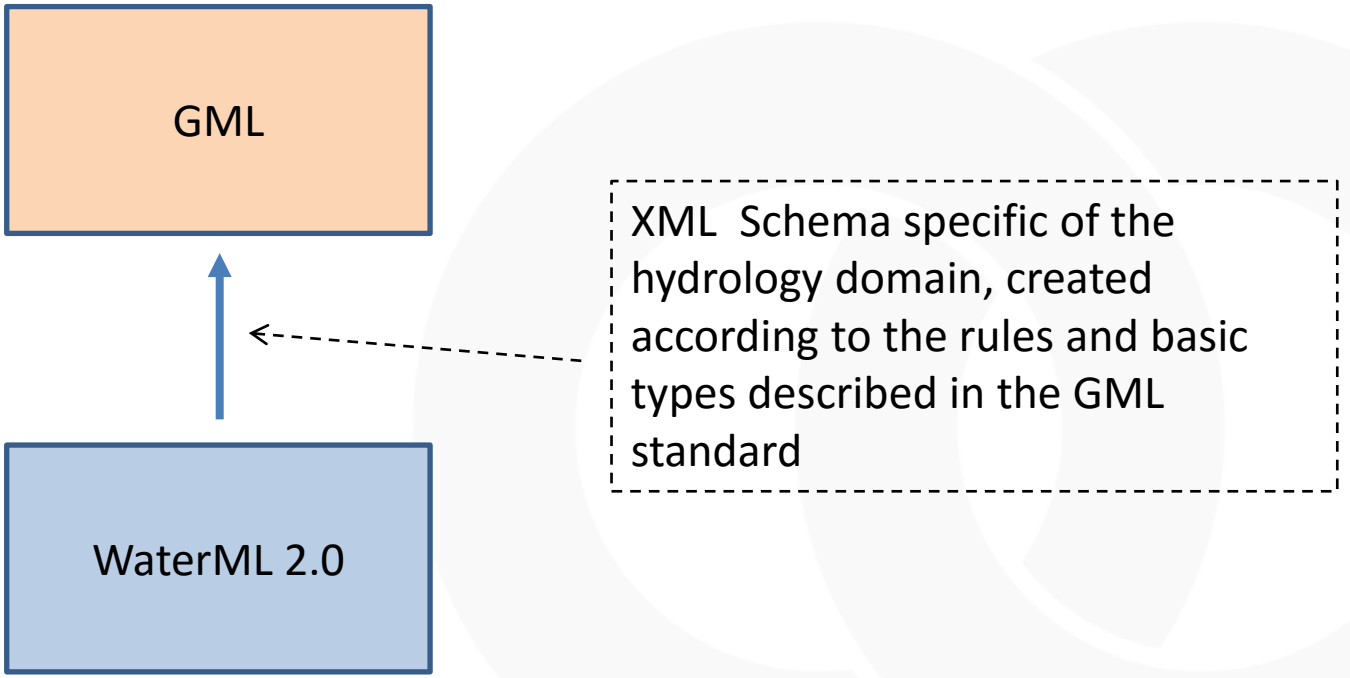
WaterML 2.0 – Conceptual Model

- Based on the OGC Observations and Measurements standard (ISO 19156)



WaterML 2.0 – Implementation

- Implemented as an application schema according to the rules of Geography Markup Language 3.2 (GML)



WaterML 1.1 -> WaterML 2.0

- WaterML2 significantly different to WaterML1.1
- No direct conversion from WaterML1.1
- Only the Time Series part is implemented
- Much larger data files

WaterML1.1

```
<value dateTime="1998-09-20">2.5313</value>
```

WaterML2

```
<wml2:point>
  <wml2:MeasurementTVP>
    <wml2:time>1998-09-20T00:00:00.0000000+02:00</wml2:time>
    <wml2:value>2.5313</wml2:value>
  </wml2:MeasurementTVP>
</wml2:point>
```

Web Services - Output

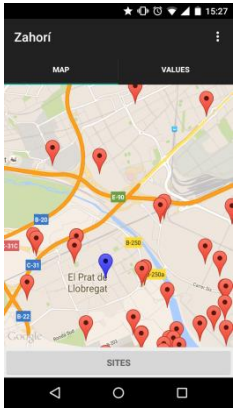
- REST Web Services
- GET requests
- Used to retrieve groundwater model data
  - Sites information (WML1.1)
  - Variables information (WML1.1)
  - Data Values (WML1.1 & WML2.0)

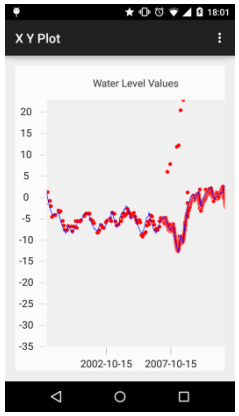
Web Services - Input

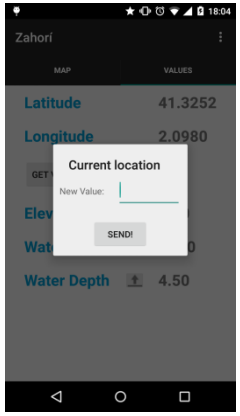
- REST Web Services
- PUT requests
- Used to send new observations to the model
  - For a particular site
  - In a location in space
- These observations need to be validated and cannot have the same weight as validated data from open data sources

Zahorí

- Android application to:
  - View groundwater model data
  - Send new observed data to the model
- Makes use of the described REST Web Services to send and obtain model data







How to incorporate crowd sensing data to the model

- Overall principles:
  - Citizen supplied absolute head levels aren't useful (no unique way to measure it).
  - Citizen supplied changes in time are meaningful.
  - Observed measures in a controlled network are more valid, both in absolute or relative terms.
  - Computed (absolute) values must be corrected for each user according to the first supplied absolute value.

Output value in a user site

$$h_{out}(x_i, t) = h(x_i, t) + \left(\overline{h_i}(t_i^1) - h(x_i, t_i^1)\right)$$

x_i Location of site i

$t_{i\,i}^{j}$ Time of j[th] measurement at site i

$h(x,t)$ Computed value in x at time t

$\overline{h_i}(t)$ Observed value in site i at time t

Objective Function

$$OF = \cdots + \sum_{i=1}^{s}\sum_{j=1}^{m_i}\left\{\overline{w_i}\left[\left(h(x_i, t_i^j) - h(x_i, t_i^1)\right) - \left(\overline{h_i}(t_i^j) - \overline{h_i}(t_i^1)\right)\right]\right\}^2$$

s Total number of sites

m_i Total number of measurements at site i

$\overline{w_i}$ Weight applied to measurements at site i

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Thank you!

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SEVENTH FRAMEWORK PROGRAMME