SWE standards for groundwater monitoring

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BRGM in few words

- **National geological survey (France)**

- **Missions :**
  - National geological maps
  - Boreholes identification and localisation
  - Risk management in relation with geosciences
  - Industrial soil risk
  - Groundwater monitoring
  - …

- **IT service in charge of**
  - Develop software and Information Systems for scientific use
  - Disseminate the information
  - Experiment new IT technologies
  - Interoperability (OGC,GeoSciML, Orchestra,…)

- **More information : www.brgm.fr**

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Objectives of the project

> Context

- BRGM manages environmental sensors, in situ (groundwater level, quality monitoring, CO2 sensor, gravimetric, ….)

- Use of specific/different materials for acquiring (OTT,HYDRAS,…), capturing (supervisor software), storing raw data (file system, DBMS,…) and disseminate data (website, modelling input, statistical,…)

> Objectives

- Integrate all sensors in a global environmental system without creating a “big” and unique system
- Using interoperability to “federate” progressively the sensors
- Open sensor access node for BRGM use and public access node

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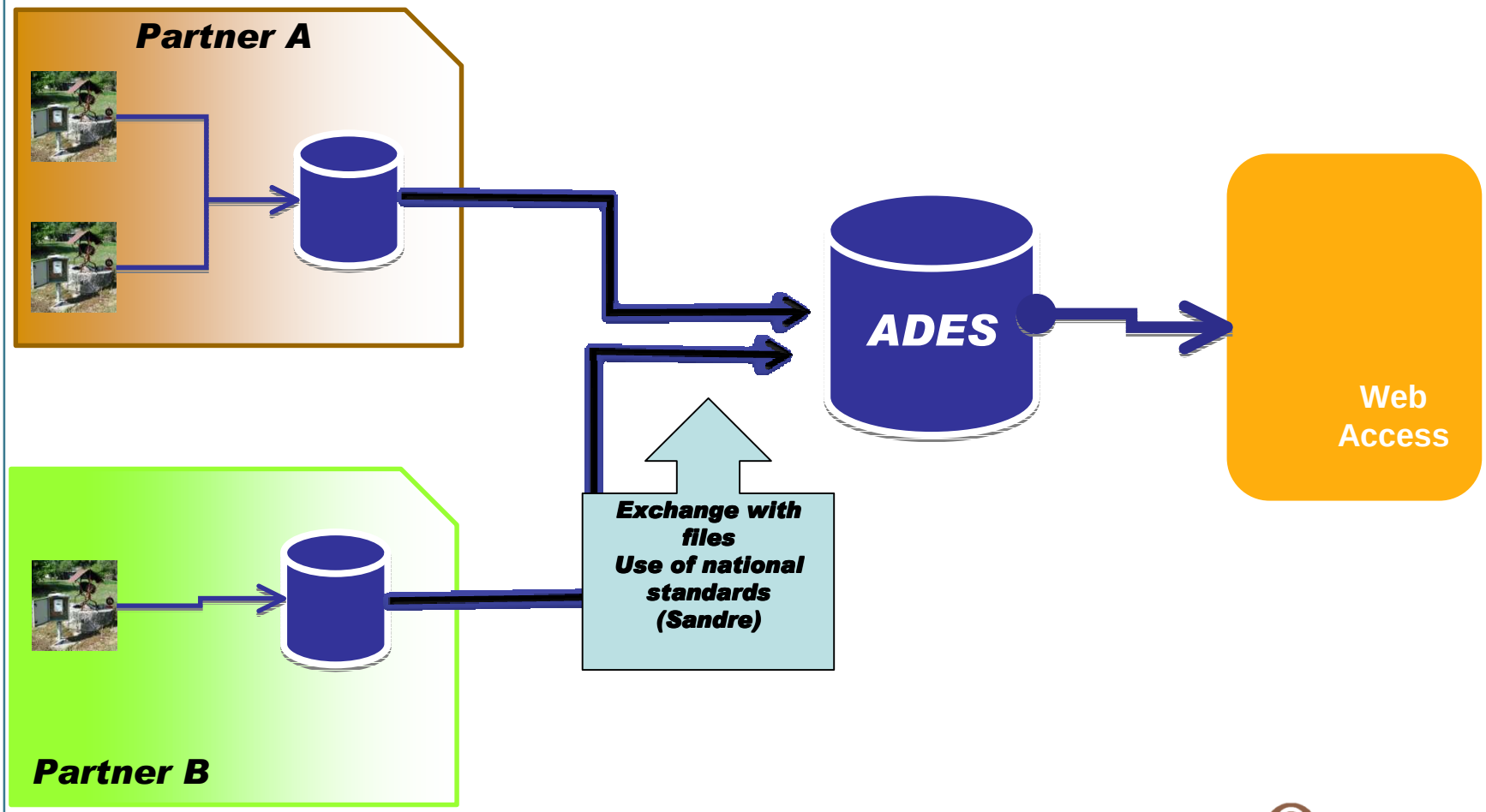
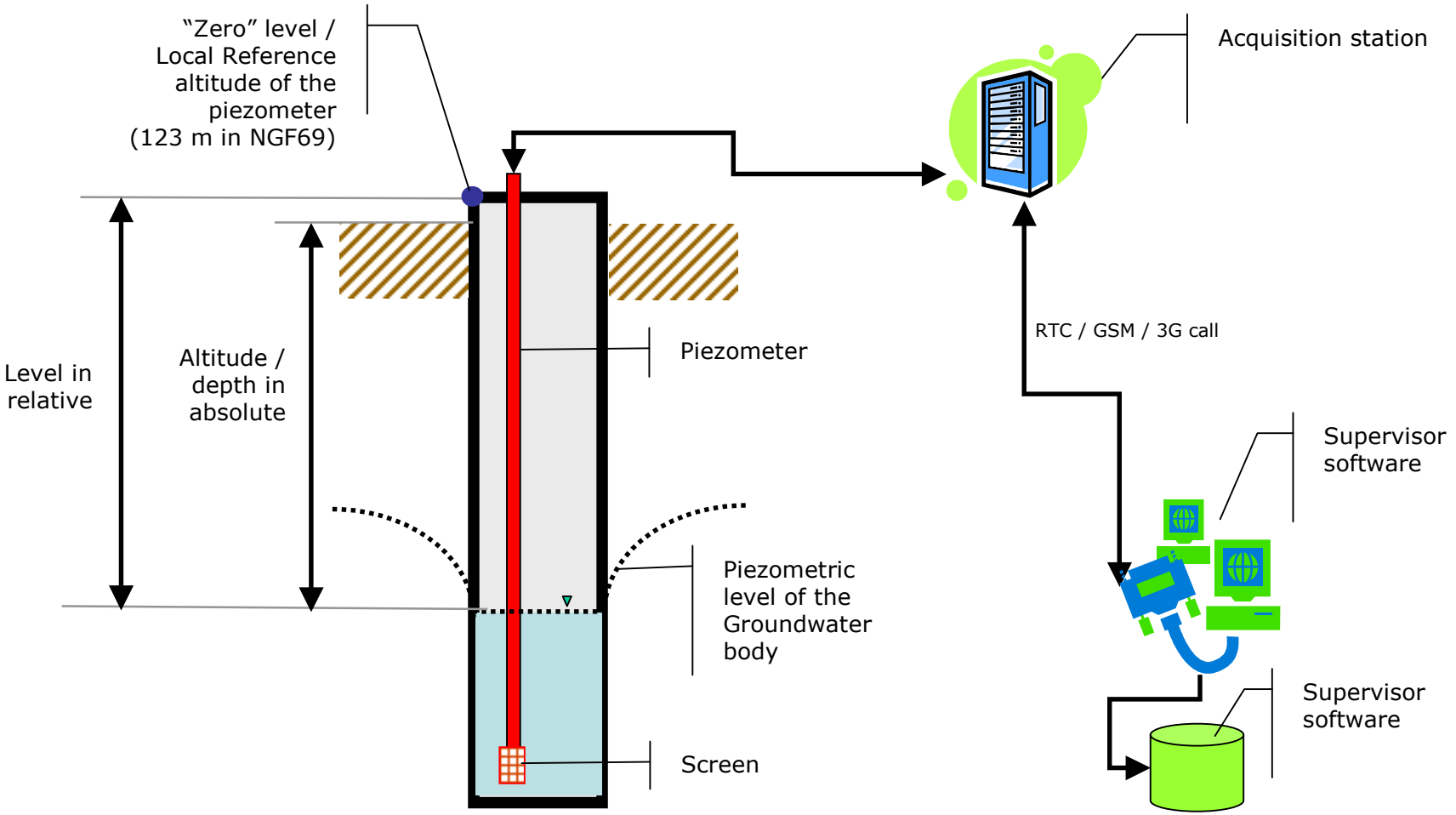
Groundwater Information System : Current approach



Groundwater acquisition system



Main issues of the current system

- Manual processes to exchange data
- Loss of data (raw data)
- Hard to integrate new providers
- Re-use data provided by the web site ?

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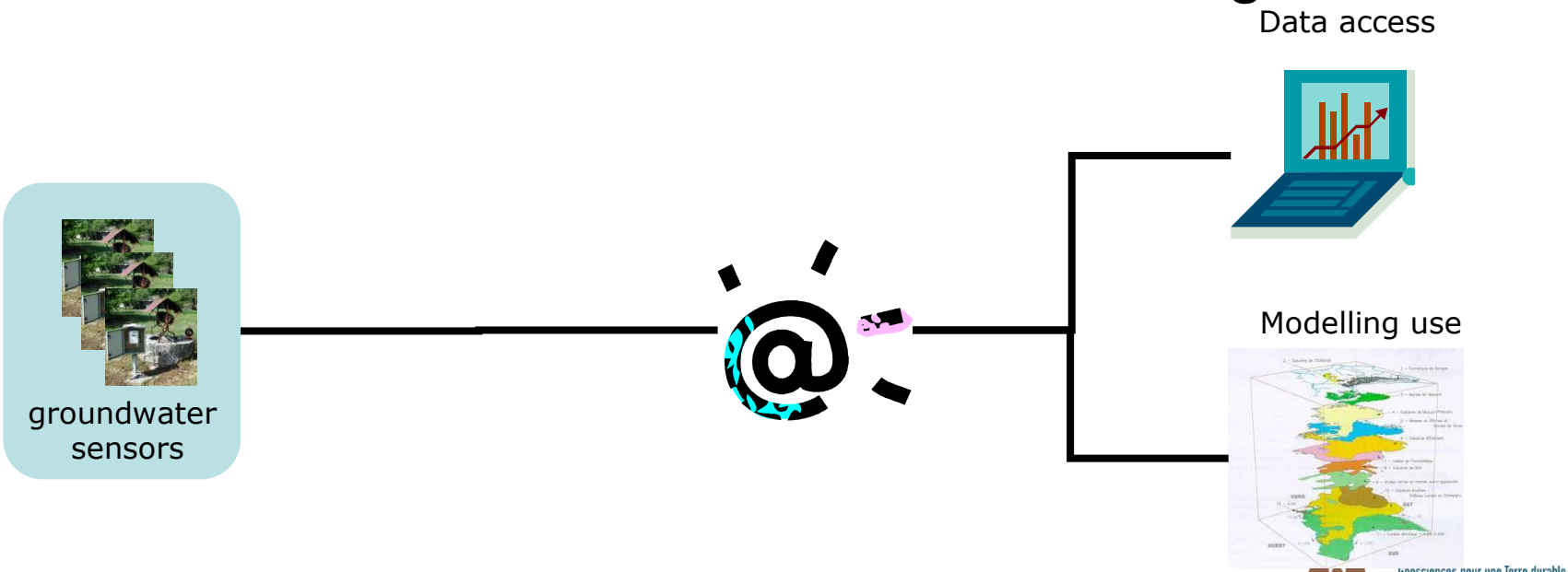
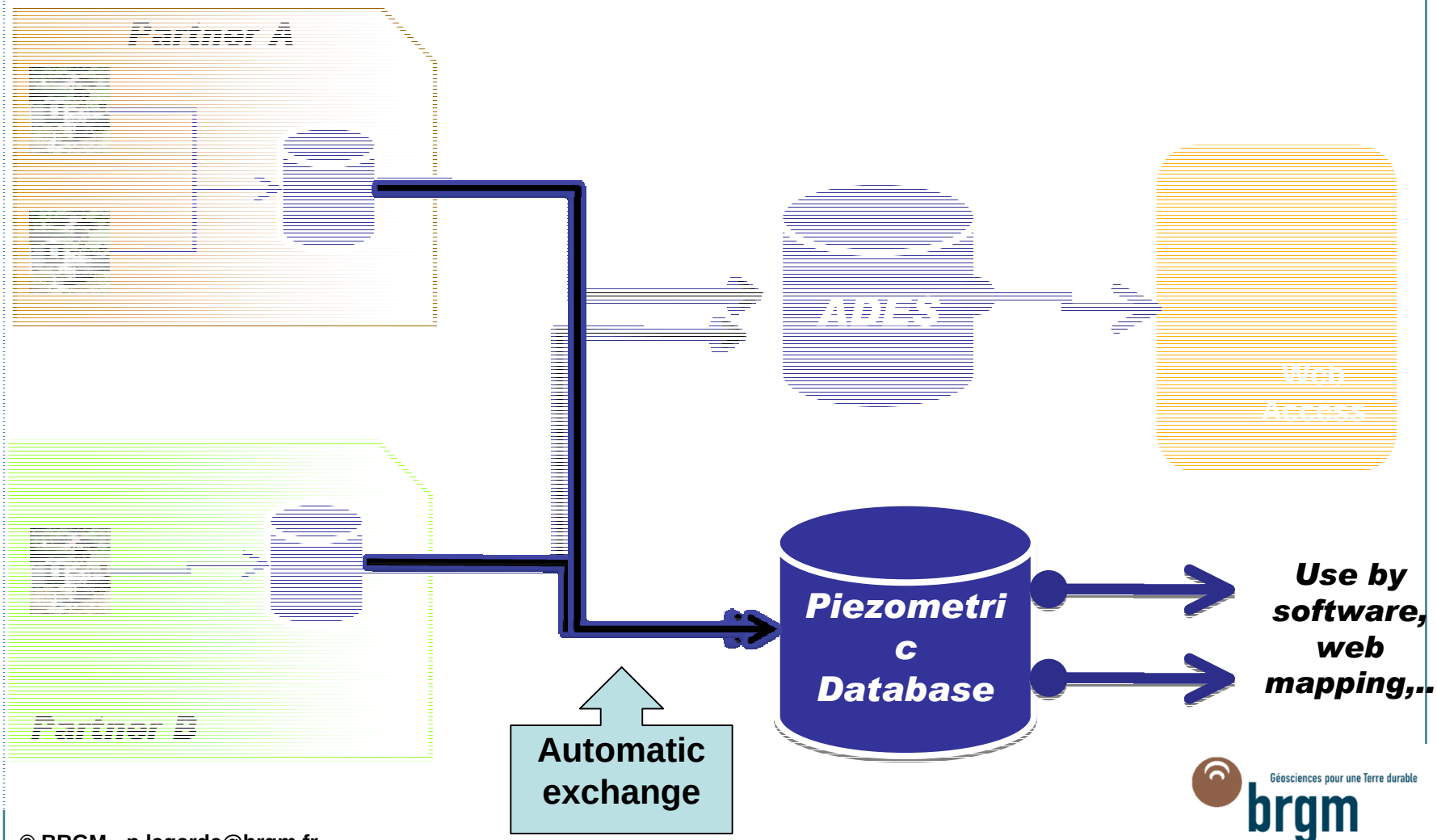
Objectives of the project : End User needs

> **Provide access to near-real time piezometer measurements**

> **Use of webmapping interface to publish characteristics of sensors and data diagrams**



Groundwater Information System : New System



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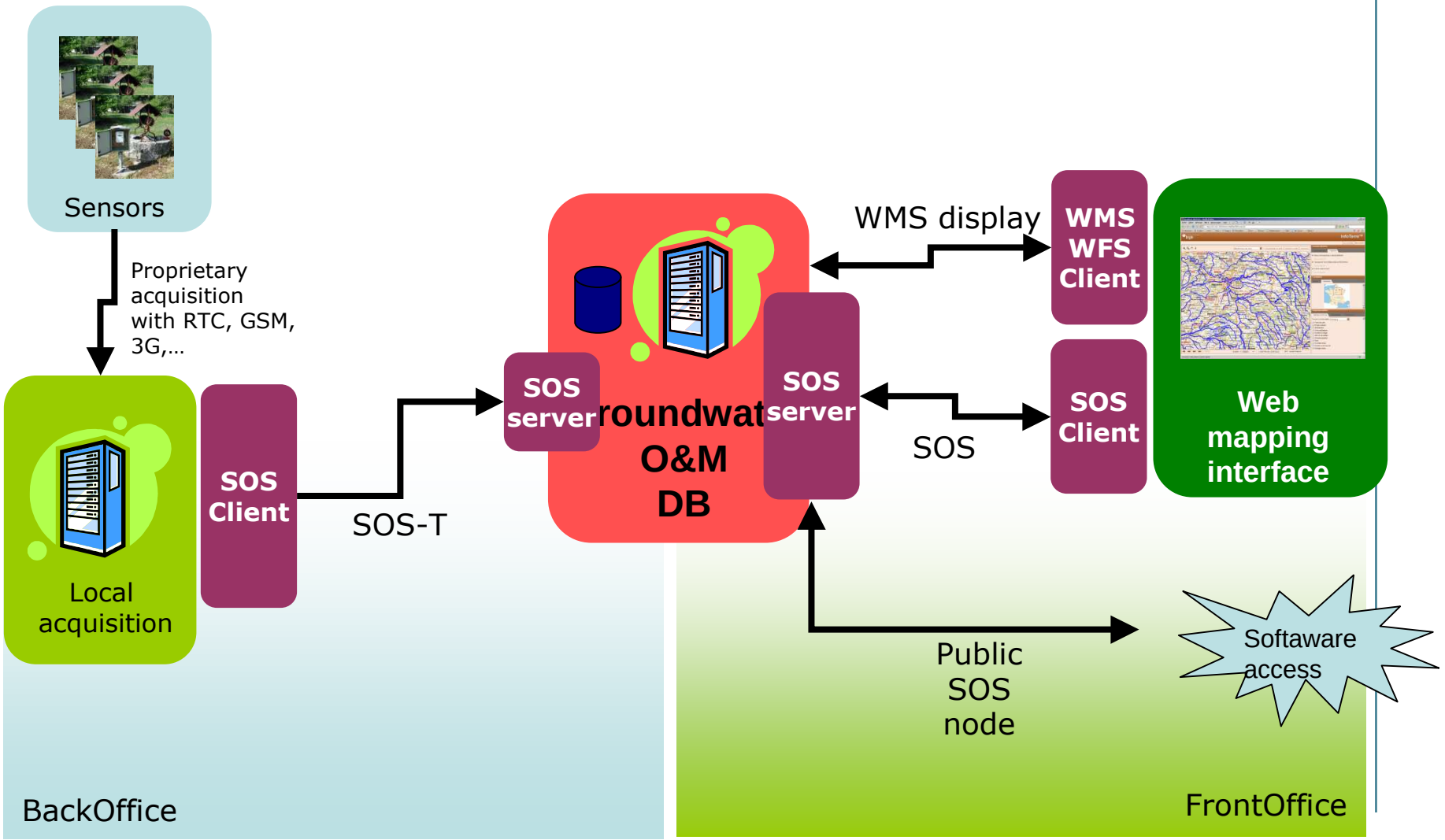
Use case – OGC Standard viewpoint



An opensource solution Constellation

- **Based on the Java Constellation project (http://constellation.codehaus.org/)**
- **Developed by Geomatys (http://www.geomatys.fr/)**
- **SensorML**
  - Metadata catalog
- **O&M database**
  - PostgreSQL based
  - Object database
- **ISO 19* compliance**
- **OGC Web services**
  - WMS - WFS
  - SOS
  - WCS

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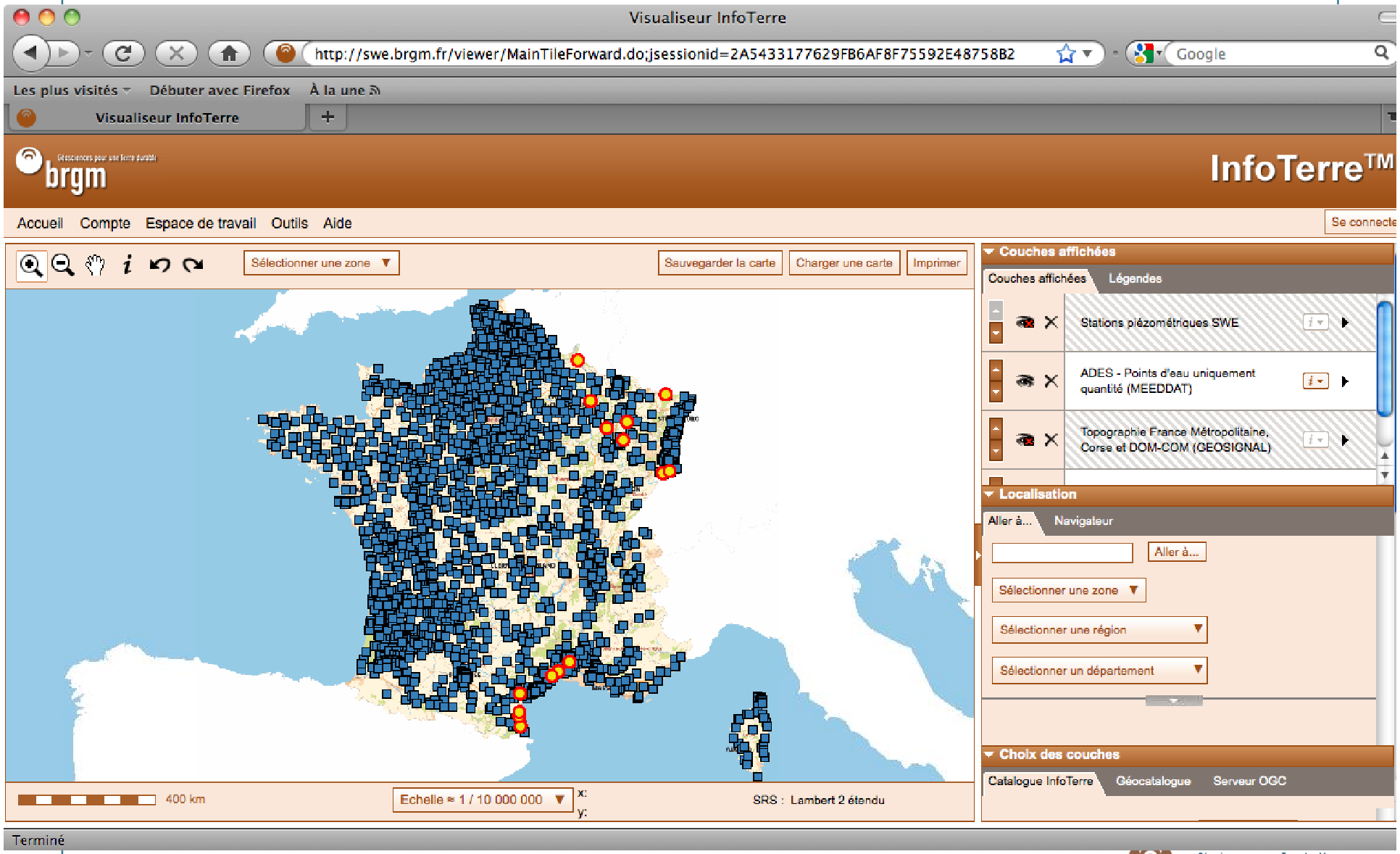

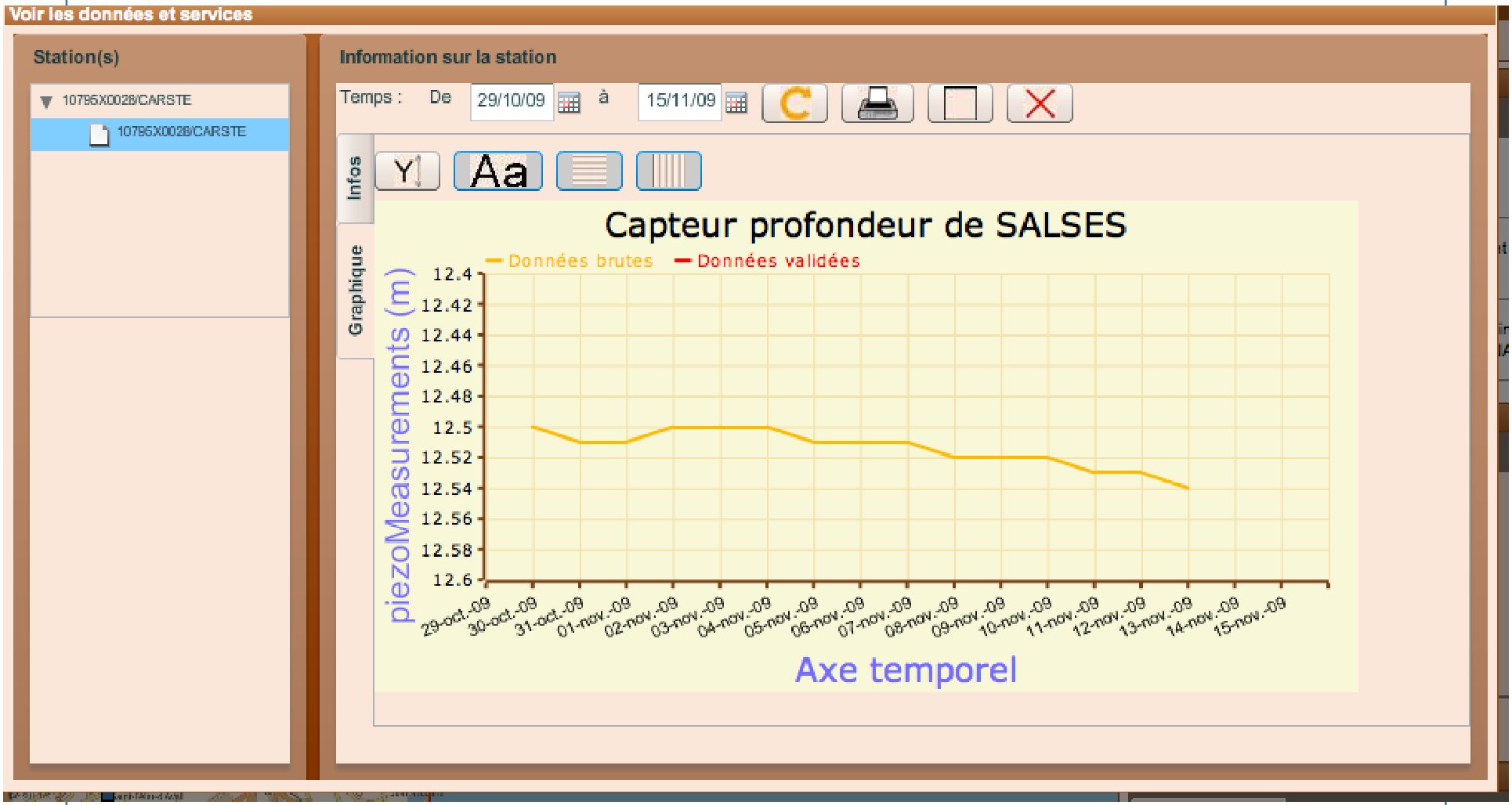

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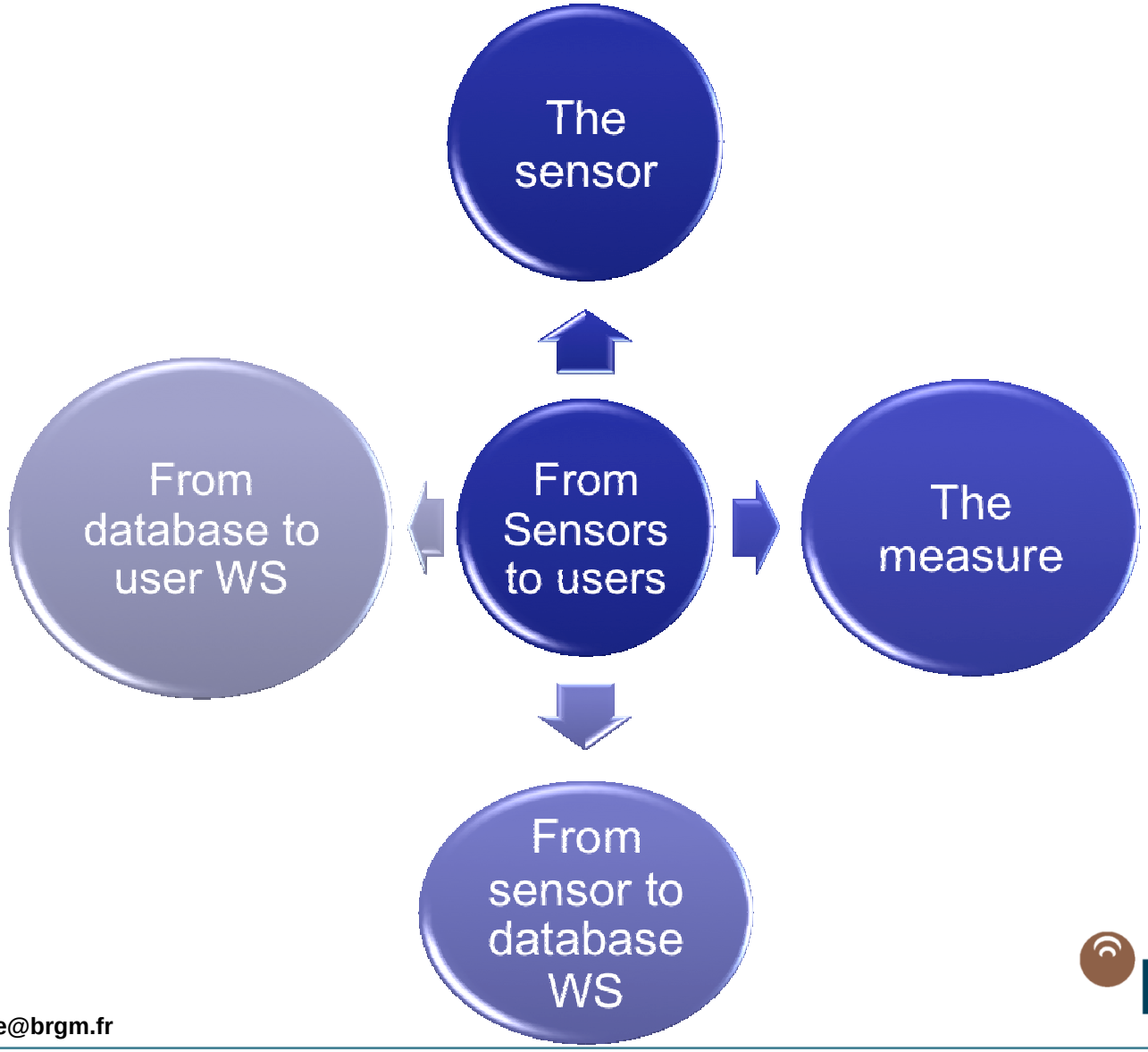
The conceptual approach of the system



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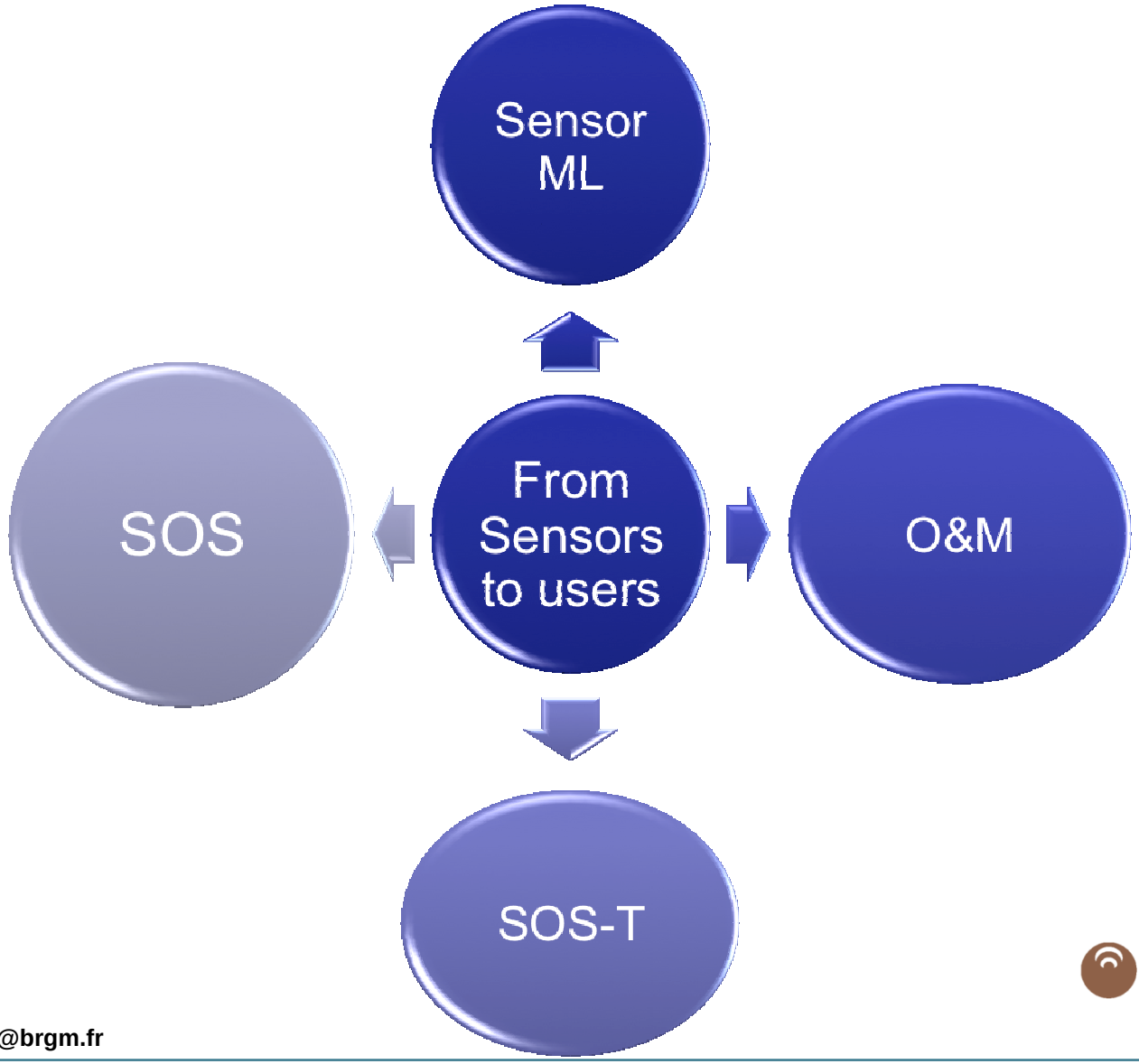
The OGC standards of the system : SWE



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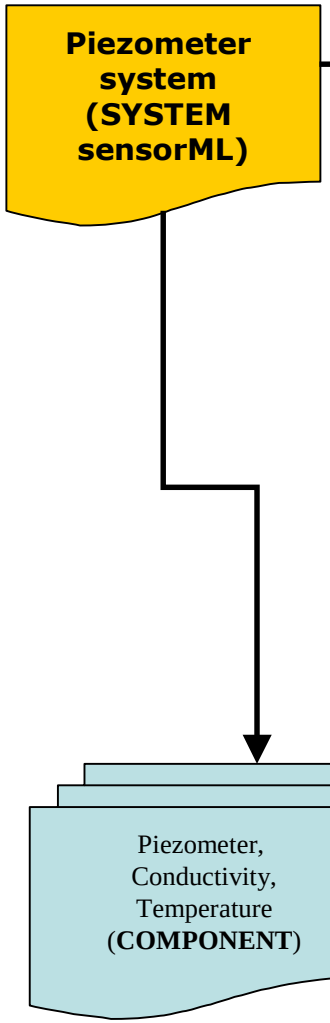
The description of a well / piezometer with SensorML



Keywords :(Inspire themes, BRGM classification)

Identifications (national, internal, supervisor,…) and naming

Classification : waterbody, monitoring network, administrative area,…

Constraints and contacts :rights, organisation/role

Characteristics : maxdepth

Location : approximate location of the system

Position : precise position of the "zero" reference level with X, Y and Z position

Temporal Reference : Winter / summer/ GMT Universal Time used

Interfaces : exchange protocol,…

Inputs / outputs : O&M data organisation

Keywords :(Inspire themes, BRGM classification)

Identification : number of the sensor

validTime : Installation of the sensor with system

capabilities : period of available data

Parameters : frequency of acquisition for the sensor

Inputs / outputs : O&M data organisation

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Description of ⊥ a piezometer

> Some challenges

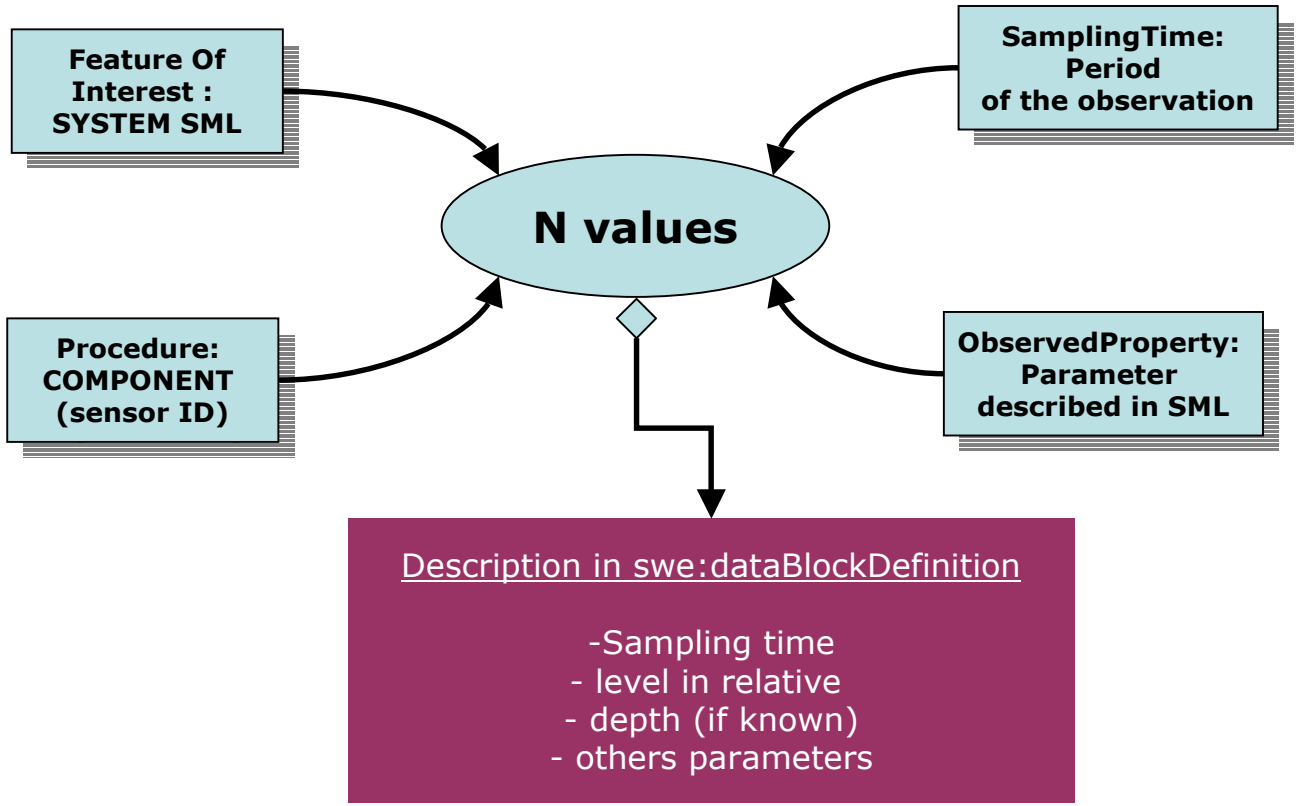
- Description of the evolution of the “zero” reference level (local reference system and change in time)

> Integration in a SOS database

- Use of “RegisterSensor” operation
- Issues to integrate system / components with the use of automatic identifier (component before system)
- Issues to “create” a samplingPoint [FeatureOfInterest class in SWE] with the rule COMPONENT = FEATUREOFINTEREST
- Use of “Classification” sensorML to create “observationOffering”

Description of a groundwater level data with O&M

> A data level is a observation [om:Observation]



Description of a groundwater level data with O&M

- **Description of the quality of the data**
  - Use of DQ_Quality is complex
  - Use of datablock flag not relevant for user (difficulties to store raw data and validate data)

- **Solution : Creation of “virtual” sensor, a copy of the sensor**

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SOS : Integration and publication of a “piezometric” web service

> Implementation of SOS in frontOffice

- GetCapabilities → XML description
- DescribeSensor → sensorML system and components
- GetObservation → O&M
  - getObservation operation returns too rich (heavy) an XML file→ use getResult
- GetResult → template O&M
  - Comprehensive use of getResult in the specification

> Implementation of SOS-T in backOffice

- RegisterSensor → sensorML system and components
- InsertObservation → O&M

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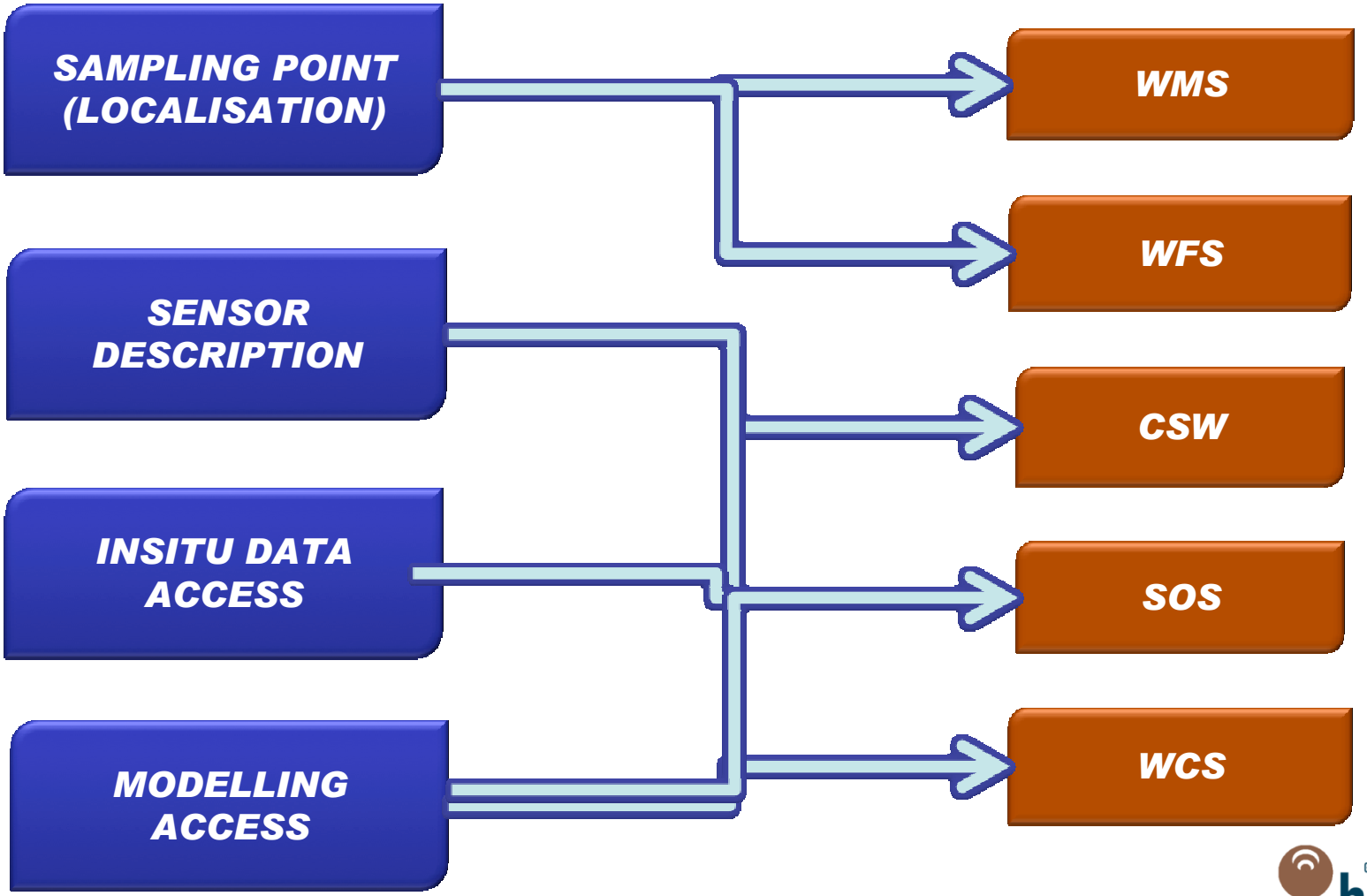
SOS Web services in BRGM

- **SOS-T is not public (private and allowed network)**

- **SOS is public / protected**
  - Protected for no-checked data
  - Public for checked data

- **SOS ADES :SOAP : http://bdesgraph.brgm.fr/swe-kit-service-ades-1.0.0/SOService**
- **SWE - SOS ADES :REST: http://bdesgraph.brgm.fr/swe-kit-service-ades-1.0.0/REST**

One OGC standards for One use…



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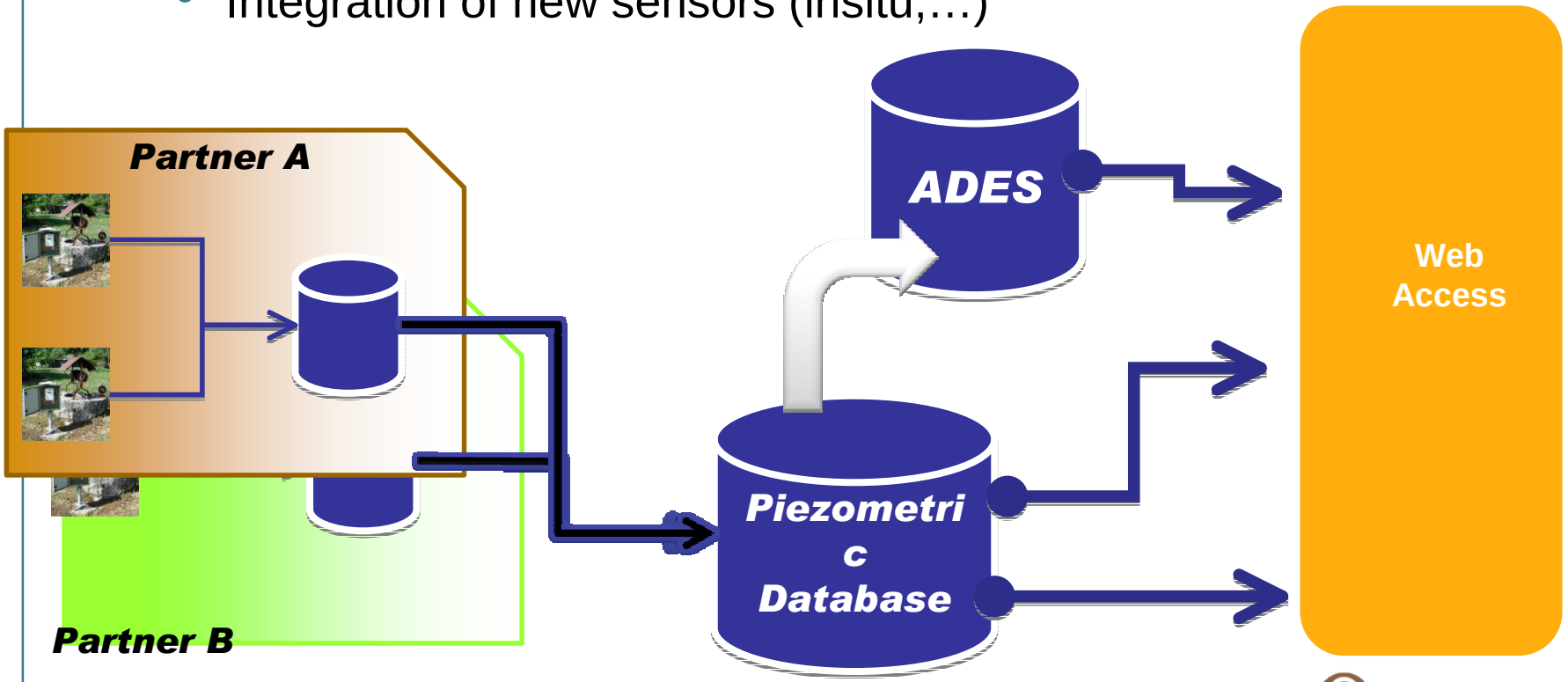
The next step of the project

- **Test the scalability of the implementation to replace the current architecture**
  - Integration of all piezometers managed by BRGM (+100)
  - Integration of new sensors (insitu,…)



The next step of the project

- **Connect directly to the sensor**

- **Test the cross-domain sensors**
  - Hydrographic sensors
  - Meteorological sensors ?

- **Publish an global catalog of in situ sensors for geosciences in France (2010)**

- **Use access nodes as an input for the modelling and creation of “virtual” sensor nodes**

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Thanks

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