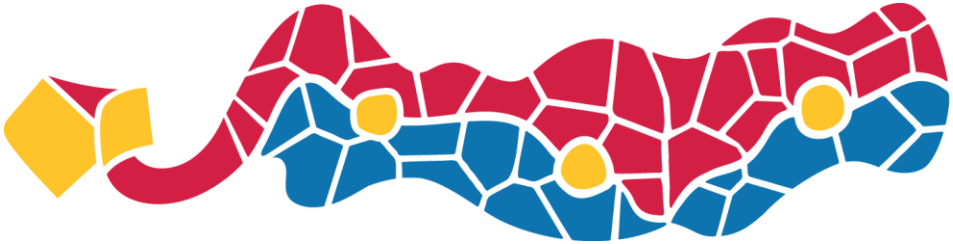


FOSS4G 2010
Barcelona

istSOS:
Sensor Observation Service in Python

Massimiliano Cannata, Milan Antonovic

Scuola universitaria professionale
della Svizzera italiana

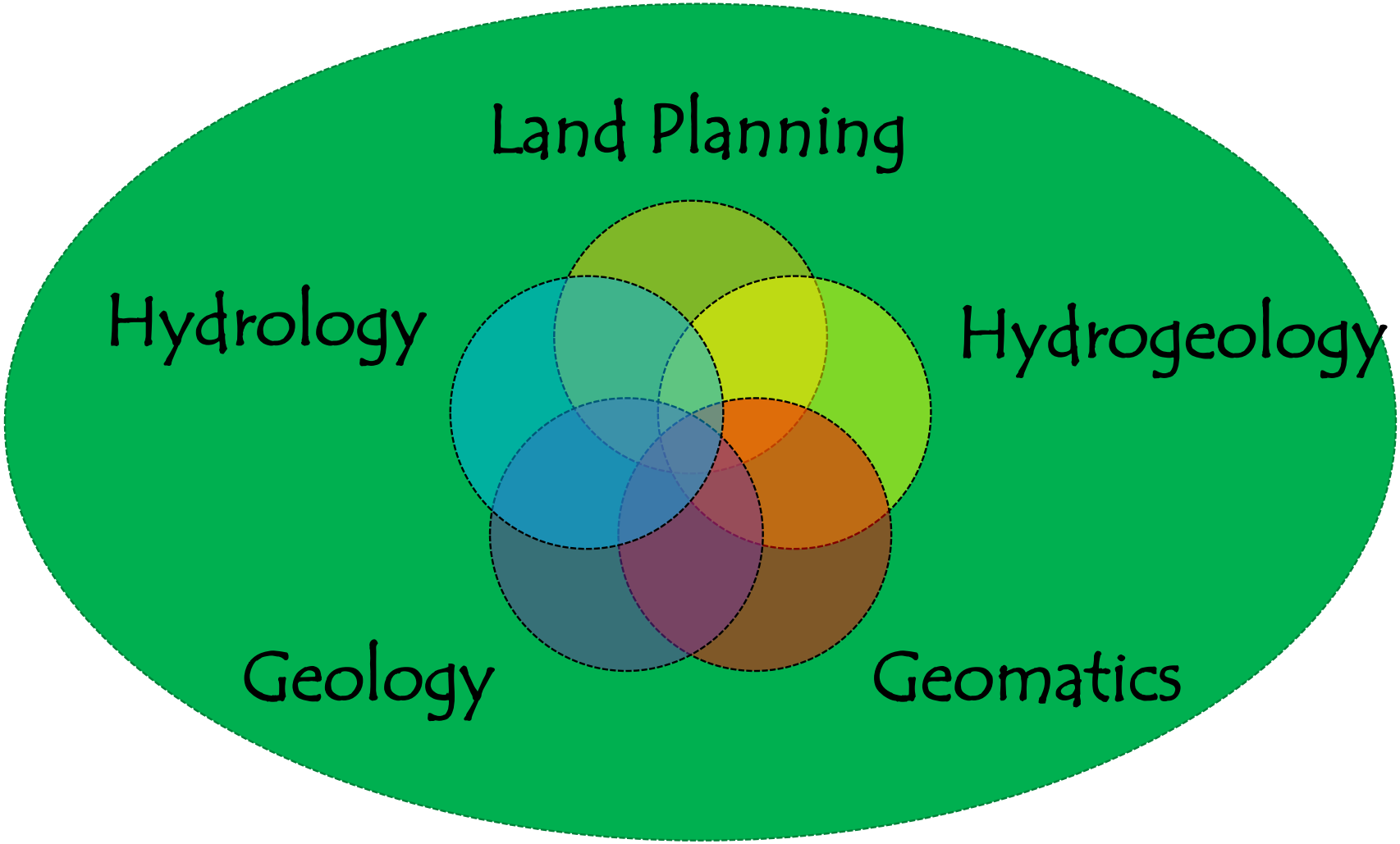
SUPSI

Istituto Scienze della Terra

IST SOS

Sensor Observation Service

Institute of Earth sciences



Scuola universitaria professionale
della Svizzera italiana
SUPSI

Istituto Scienze della Terra
SOS
Sensor Observation Service

SOS service (quick intro)

Scuola universitaria professionale
della Svizzera italiana

SUPSI

Istituto Scienze della Terra

IST

Sensor Observation Service

Sensor Observation Service

- It is a standard interface defined by the **OGC** for the management and distribution of observations. The current the version is the 1.0 as defined by the "OGC 06-009r6" document.

SOS v1.0 requests

Mandatory

(core profile)

1. GetCapabilities
2. DescribeSensor
3. GetObservation

(transactional profile)

4. RegisterSensor
5. InsertObservation

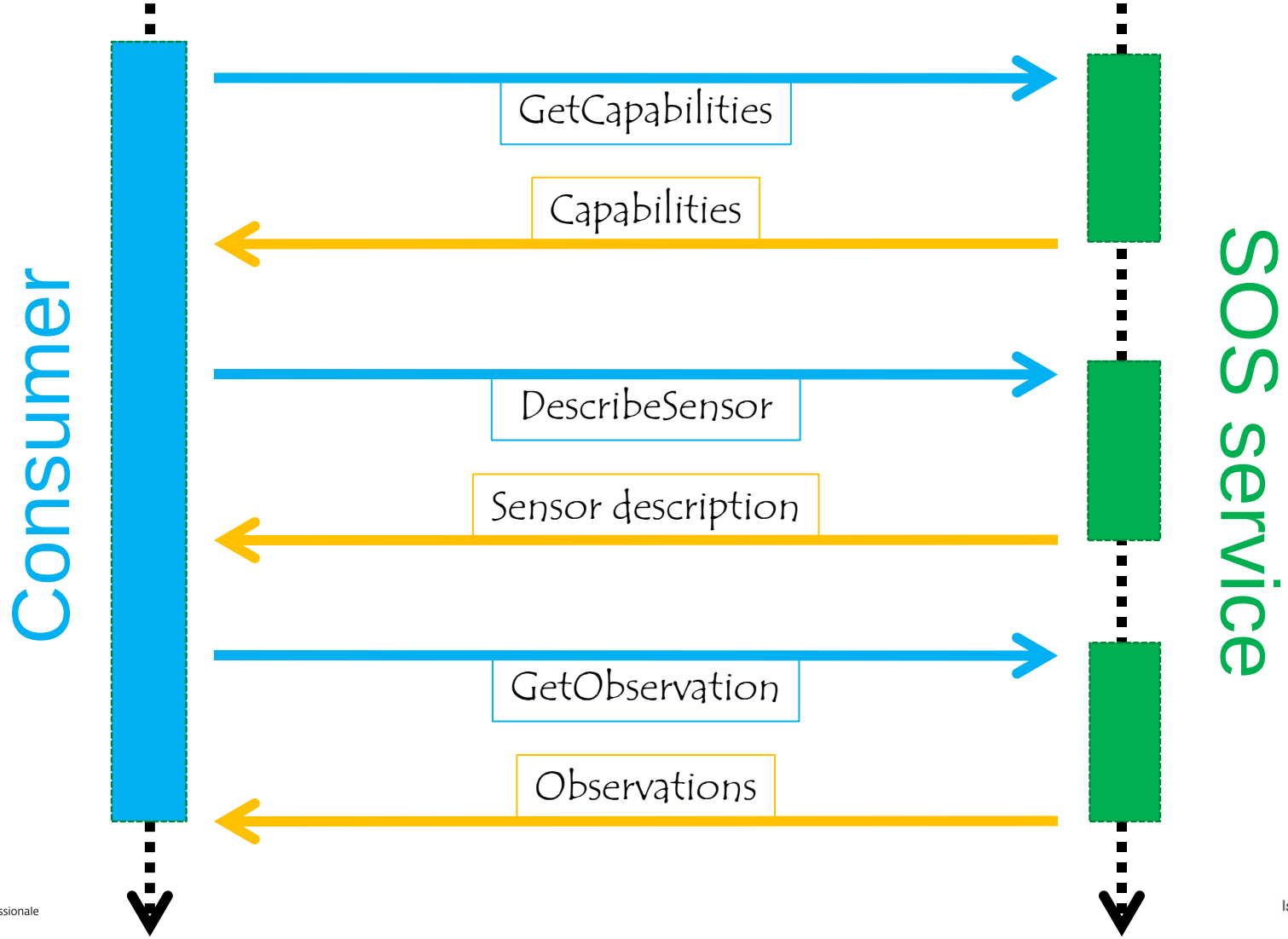
Optional

(enhanced profile)

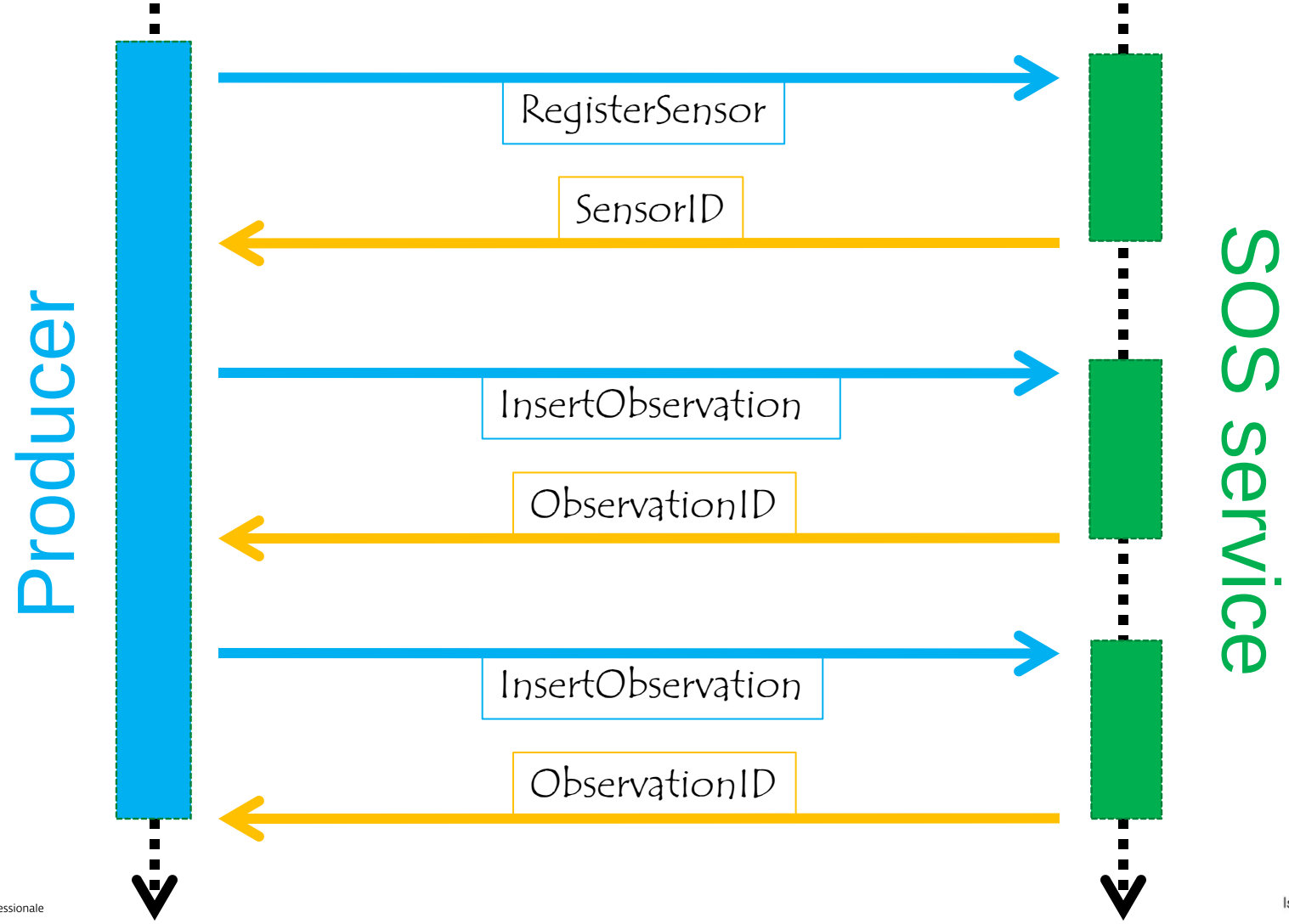
6. GetFeatureOfInterest
7. GetResult
8. GetObservationByID
9. GetFeatureOfInterestTime
10. DescribeFeatureType
11. DescribeObservationType
12. DescribeResultModel

Optional

Data consumer



Data producer



istSOS
(technology)

Scuola universitaria professionale
della Svizzera italiana

SUPSI

Istituto Scienze della Terra

IST SOS

Sensor Observation Service

istSOS

is the SOS implementation by the
Istituto scienze della Terra
(Institute of Earth sciences)

http://istgeo.ist.supsi.ch/software/istSOS

Licence

- This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

technology

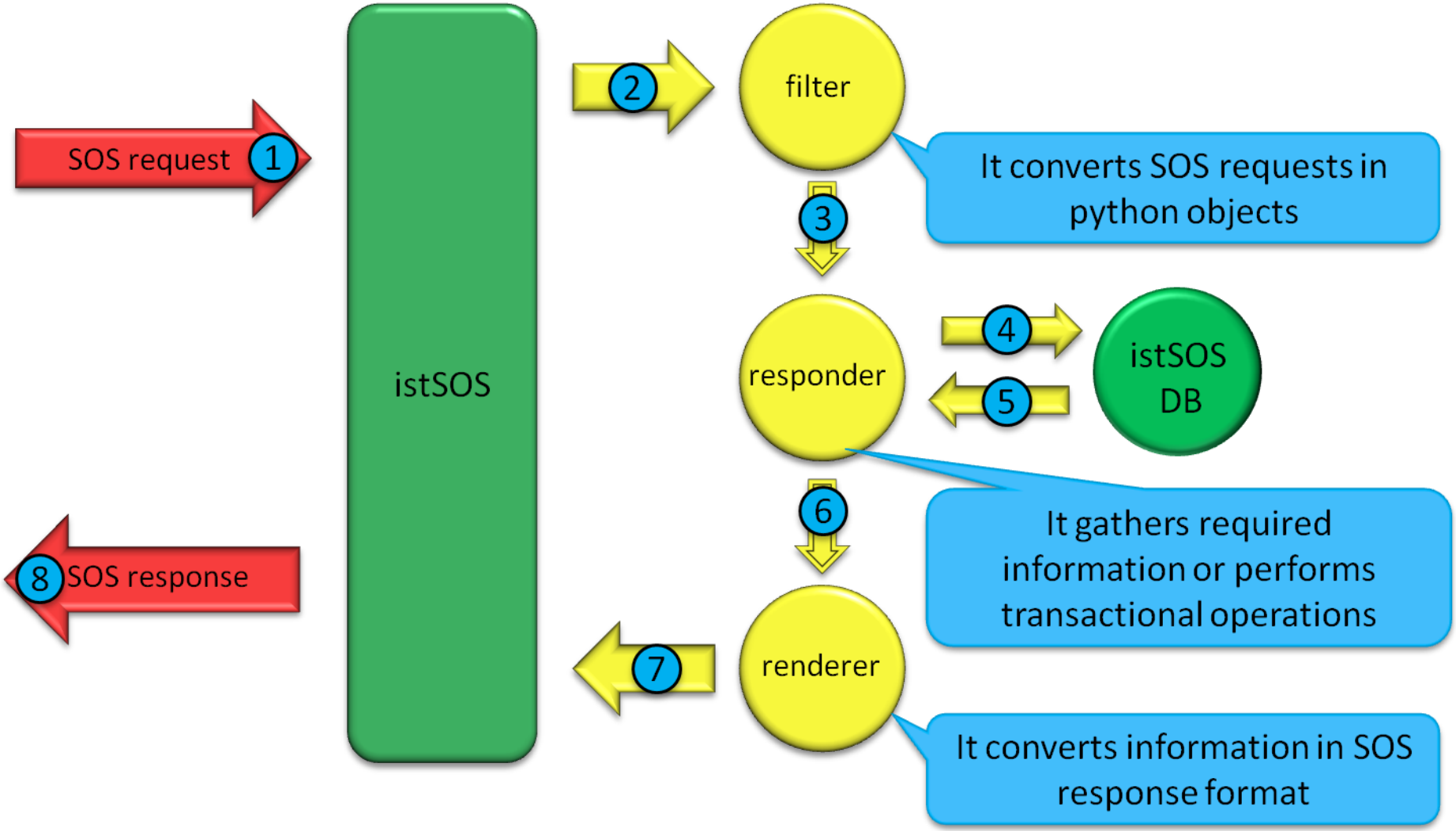
istSOS is entirely developed in Python and rely on Apache/ModPython, PostgreSQL/PostGIS and GDAL/OGR

design pattern

istSOS has been implemented with a **factory method** as design pattern

this particular pattern allows the automatic instantiation of the required objects or functions depending on the request type.

workflow


SOS request
1
istSOS
2
filter
It converts SOS requests in python objects
3
responder
4
5
istSOS DB
It gathers required information or performs transactional operations
6
8
SOS response
7
renderer
It converts information in SOS response format

istSOS
(package)

Scuola universitaria professionale
della Svizzera italiana

SUPSI

Istituto Scienze della Terra

Sensor Observation Service

package

sosConfig.py	configuration file
sos.py	Web interface
istSOS	SOS library
sos_schema.sql	PostGIS schema

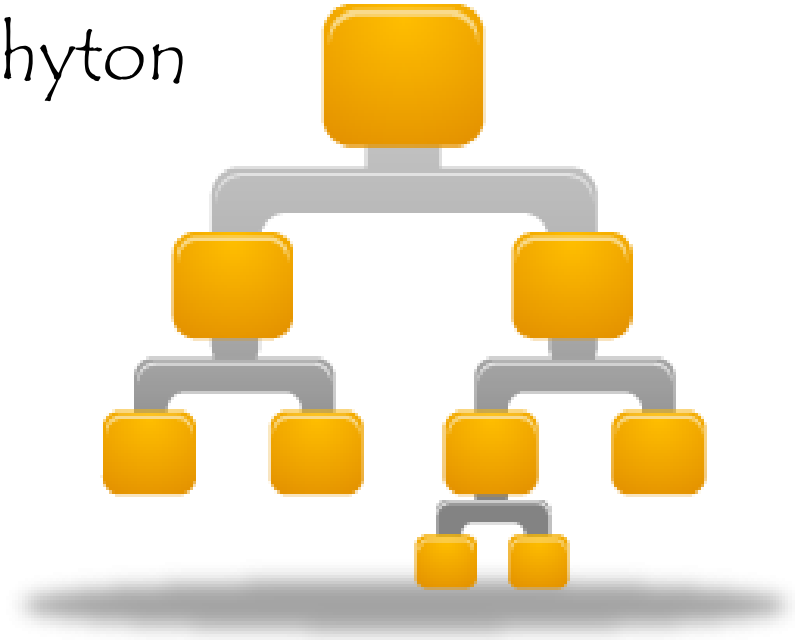
installation

1. Install dependencies
2. Install istSOS schema
3. Install istSOS libraries
4. Configure apache/mod_python
5. Configure istSOS

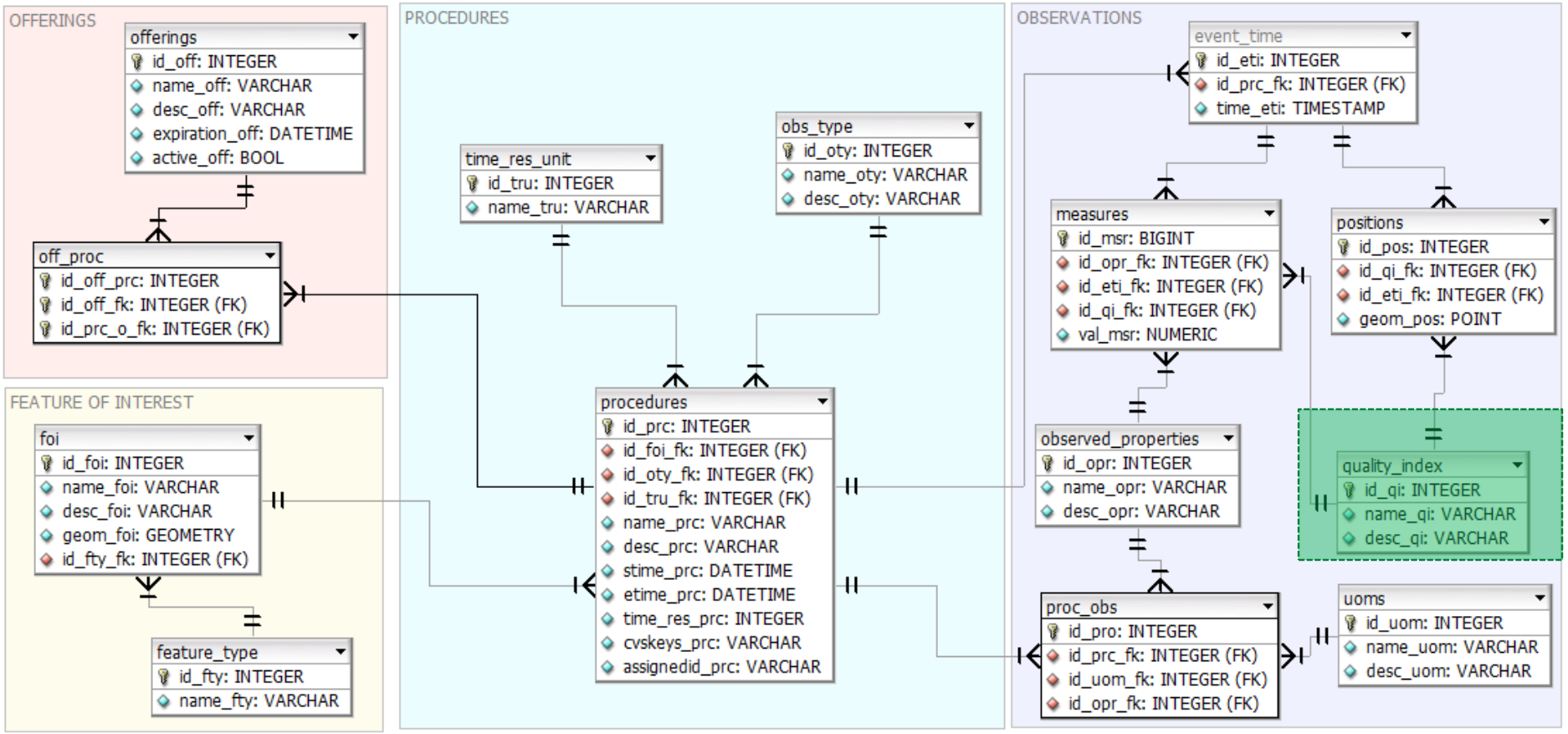
1. dependencies

- Base requirements:
  - Python (2.6 >)
  - PostgreSQL/PostGIS
  - Apache (2.x >) con mod_phyton

- Python packages:
  - psycopg2
  - isodate
  - GDAL



2. istSOS schema



3. istSOS libraries

Submodules

- istSOS.filters
  - istSOS.filters.DS_filter
  - istSOS.filters.GC_filter
  - istSOS.filters.GF_filter
  - istSOS.filters.GO_filter
  - istSOS.filters.IO_filter
  - istSOS.filters.RS_filter
  - istSOS.filters.USD_filter
  - istSOS.filters.factory_filters
  - istSOS.filters.filter
- istSOS.renderers
  - istSOS.renderers.DSresponseRender
  - istSOS.renderers.GCresponseRender
  - istSOS.renderers.GFresponseRender
  - istSOS.renderers.GOresponseRender
  - istSOS.renderers.IOresponseRender
  - istSOS.renderers.RSresponseRender
  - istSOS.renderers.USDresponseRender
  - istSOS.renderers.factory_render
- istSOS.responders
  - istSOS.responders.DSresponse
  - istSOS.responders.GCresponse
  - istSOS.responders.GFresponse
  - istSOS.responders.GOresponse
  - istSOS.responders.IOresponse
  - istSOS.responders.RSresponse
  - istSOS.responders.USDresponse
  - istSOS.responders.factory_response
- istSOS.sosDatabase
- istSOS.sosException

python setup.py install

4. configure mod_python


```
<Directory "/var/www/sos">
        AddHandler mod_python py
        DirectoryIndex sos.py
        PythonHandler mod_python.publisher
        PythonDebug On
        PythonPath "['//var/www/sos/istSOSconfig']+sys.path"
</Directory>
```

5. configure istSOS

```
#database properties
connection = {
              "user" : “postgres",
              "password" : “1234",
              "host" : "localhost",
              "dbname" : "sos",
              "port" : "5432"
             }
schema="istsos“

#define the authority and version of your institution
#x- denote a not registered authority
authority="x-ist"
version=""
```

istSOS (features & characteristics)

Scuola universitaria professionale
della Svizzera italiana

SUPSI

Istituto Scienze della Terra

IST SOS

Sensor Observation Service

Supported requests

- **CoreProfile:**
  - GetCapabilities
  - DescribeSensor
  - GetObservation
- **Transactional Profile:**
  - RegisterSensor
  - InsertObservation
- **Enhanced profile:**
  - GetFeatureOfInterest

Not yet ☺

- **Enhanced profile:**
  - GetResult
  - GetObservationByID
  - GetFeatureOfInterestTime
  - DescribeFeatureType
  - DescribeObservationType
  - DescribeResultModel

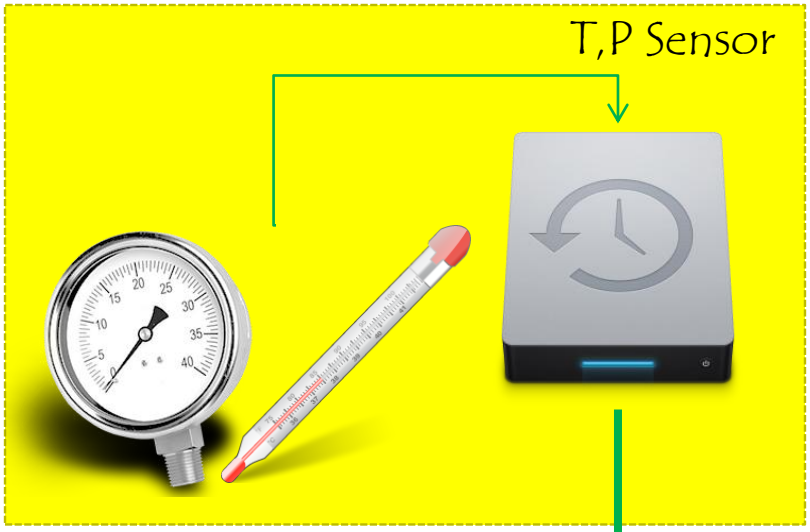
sensor

For istSOS the

sensor == time serie

thus it is:

"one set of values at one time"



Istituto Scienze della Terra

IST SOS

Sensor Observation Service

Istituto Scienze della Terra

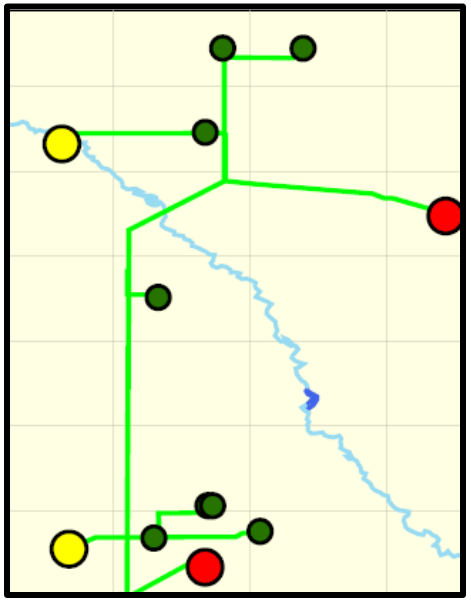
IST SOS

Sensor Observation Service

FOI: featureOfInterest

- According the SOS it may be whatever you want but for istSOS it is the **observed geometry** and **not the medium** (e.g.: a point, a network, a region)

- istSOS schema allows only **one FOI for each Procedure**



sensor types

- Data are different for different sensor, so istSOS decided to distinguish sensors based on :
  - observation type:
    - Discrete (point, arc, area) – distributed
  - sensor stationary:
    - fixed – mobile
  - sampling mode:
    - in situ - remote

sensor types

Up to now **two** supported sensor types

"fixpoint"

=

in situ – fixed – discrete point

sampling location
is given by the FOI

[2010-09-05T12:10+02:00,
127,0.44]

"mobilepoint"

=

in situ – mobile- discrete point

sampling location
is given by x,y,z triplet
with the SRS adv in field description

[2010-09-05T12:10+02:00,
697812,78562,873.23,12.7]

Scuola universitaria professionale
della Svizzera italiana
SUPSI

Istituto Scienze della Terra
SOS
Sensor Observation Service

getObservation

1. In the response the time has **the same timezone** of the first element of the requested eventTime, (if missing it is assumed to be UTC)

2. If no eventTime is requested only the **latest available observation** is returned

getObservation

3. Result parameter (filters on values) **is not supported yet**! ☹

4. featureOfInterest does **not yet support spatial constrains**! ☹

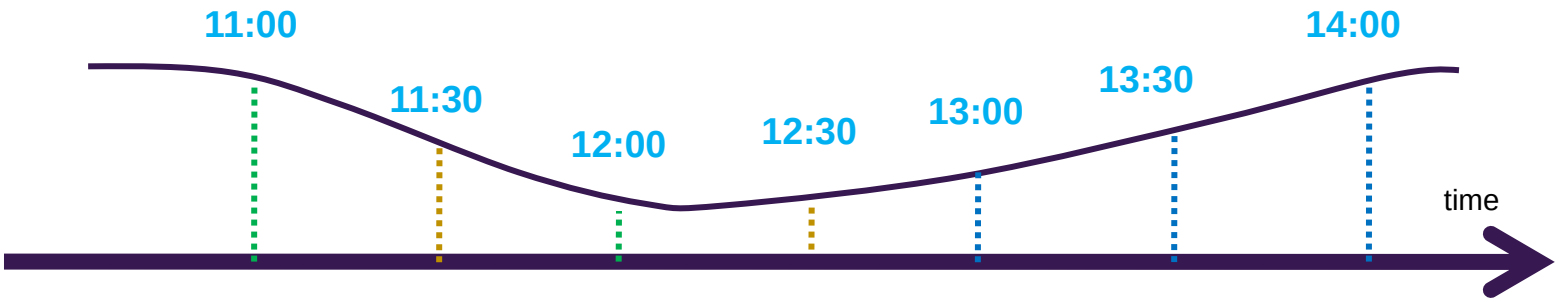
5. Non standard **aggragateInterval** and **aggregateFunction parameters** allow for data aggregation requests

regular time series

- istSOS uses **backward, open lower bound** intervals with frequency defined by <gml:timeInterval>

`<gml:timeInterval > PT1H </gml:timeInterval>`

] ----------] = open lower bound



?

2010-05-10T12:00, 0.6

2010-05-10T12:00, 0.6

2010-05-10T12:00, 0.6

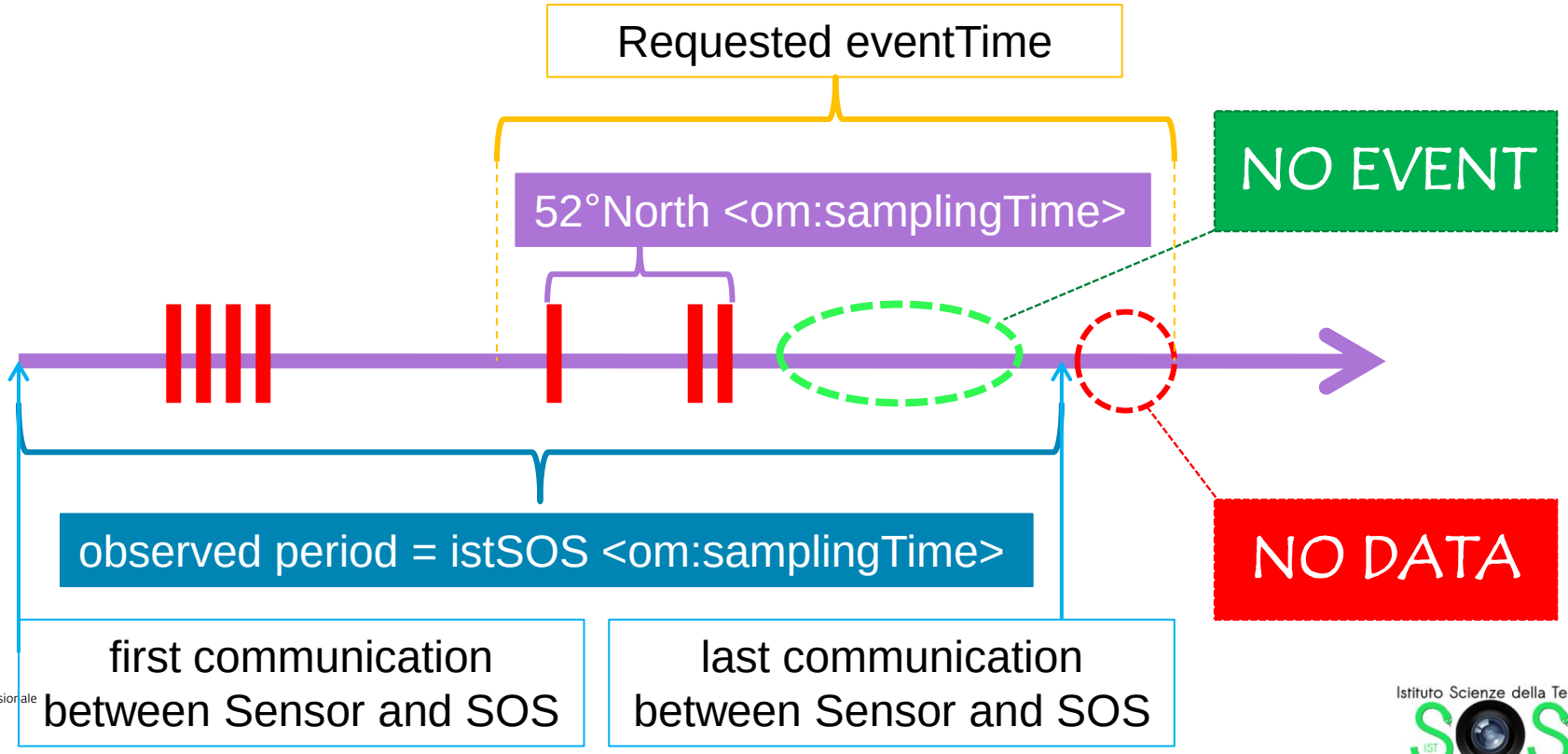
getObservation

6. responseFormat support also **text/csv** and **application/Json** formats

7. Support of **irregular time series** ("ad eventum" observation) and discrimination of no data and no event!

Irregular time series

- istSOS uses <om:samplingTime> to communicate the observed period, not the returned observations interval (min-max)



registerSensor

1. **Automatically detect the sensor type** (fixpoint or mobilepoint) depending on the presence of fields x,y,z in the provided observation template.
2. All new procedures are registered to a **temporary offering**
3. Return the **sensorID**: this is the only time this value is accessible trough internet!

insertObservation

1. Allows to **insert multiple values** and returns as a response an identifier that is the concatenation of observation id with the @ symbol. (1@2@3@4@5..)

2. **Time-value constrain**: one procedure has one property with one value for each instant

3. In case of **error no observation is registered** and the service answers with an exception (following the SOS specifications).

insertObservation

4. **Observed period is updated** accounting for submitted <om:samplingTime> (time of observation of submitted data)

5. **forceInsert: non standard** parameter for data management; in this case the insertObservation substitutes all the observation within the <om:samplingTime> with the new observations (if any provided)

UpdateSensorDescription

- **NON standard request**: allows for submission of a new sensor description that substitutes the current one

- this is to account for **historical changes of instruments** or particular maintenance tasks

virtual process

- istSOS allows to define virtual procedures extending the base class virtualProcess that has a method for retrieving of classic procedure data based on submitted filters parameters.

→ data may reside wherever you want, just read the filter, get the data and return the record in a few lines of code !!

virtual process

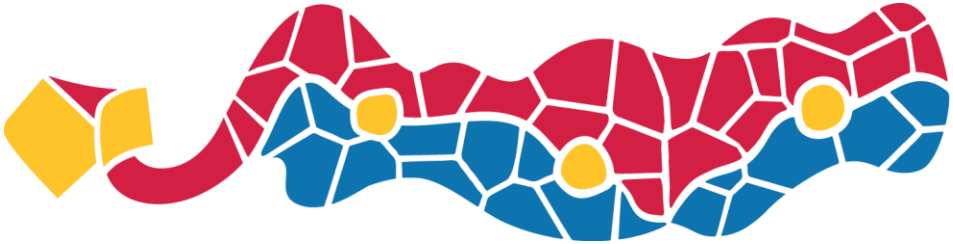
FILENAME == PROCEDURE NAME in reserved FOLDER


```
from istSOS.responders.GOresponse import VirtualProcess
 import datetime, decimal


class istvp(VirtualProcess):
  def __init__(self,filter,pgdb):
     VirtualProcess.__init__(self,filter,pgdb)

     #SET THE INPUTS
     self.h = self.setSOSobservationVar("A_BRB","riverheight")


  def execute(self):
     data_out=[]
     for rec in self.h:
       newdata = rec[1]*0.25 + 124
       data_out.append( rec[0], newdata)
     return data_out
```



FOSS4G 2010
Barcelona

…Try it out …

http://istgeo.ist.supsi.ch/software/istsos/

…and join to the development

Scuola universitaria professionale
della Svizzera italiana

SUPSI

Istituto Scienze della Terra

Sensor Observation Service