



Practicing Practical INSPIRE

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Practicing Practical INSPIRE

INSPIRE Conference 2017



Introduction

Architectural Overview
with examples

Implementation Issues
what went wrong - how we made it right

Discussion / Wrap-up
what to do about it



Architectural Overview

with examples



Architectural Overview with Examples

- Application to groundwater monitoring system
- Statistical Viewer
- EF - Bathing Sites Monitoring Facilities
- SYKE's experiences with GeoServer
- WFS 2.0. direct access across multiple feature types

Architectural Overview with Examples

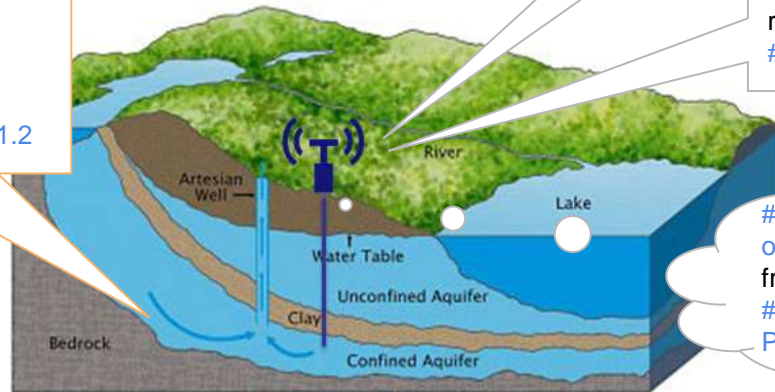
- **Application to groundwater monitoring system**
- Statistical Viewer
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Application to groundwater information network

What was the plan?

- Providing groundwater levels in their context
 - Observations/measures (groundwater levels)
 - + associated features (Boreholes and facilities)
 - + links between them and other GeoScience things

I am
[#EntiteHydroGeol/107AK01](#)
monitored by
[#Piezometre/00634X0147/PZ1.2](#)



I am
[#Piezometre/00634X0147/PZ1.2](#)
attached to
[#Borehole/00634X0147/PZ1.2](#)

I have [#GroundWater Levels](#)
observations
regarding
[#EntiteHydroGeol/107AK01](#)

[#GroundWater Levels](#)
observations
from
[#Piezometre/00634X0147/PZ1.2](#)

Application to groundwater information network

What was the technology used?

WFS AppSchema: GeoServer + Constellation + Deegree

SOS: 52°North

URLs as identifiers for features (boreholes, HydrogeologicUnits, facilities) and observations (ground water levels)

Apache resolver to manage redirections

- <http://ressource.brgm-rec.fr/obs/RawSeriePiezo/00463X0036/H1.2-622>
- > <http://192.168.6.208/52n-sos-rawdb-new/service?service=SOS&version=2.0.0&request=GetObservationById&observation=http://ressource.brgm-rec.fr/obs/RawSeriePiezo/00463X0036/H1.2-622>

Application to groundwater information network

Where were the problems

GetFeature / GetObservations with filters

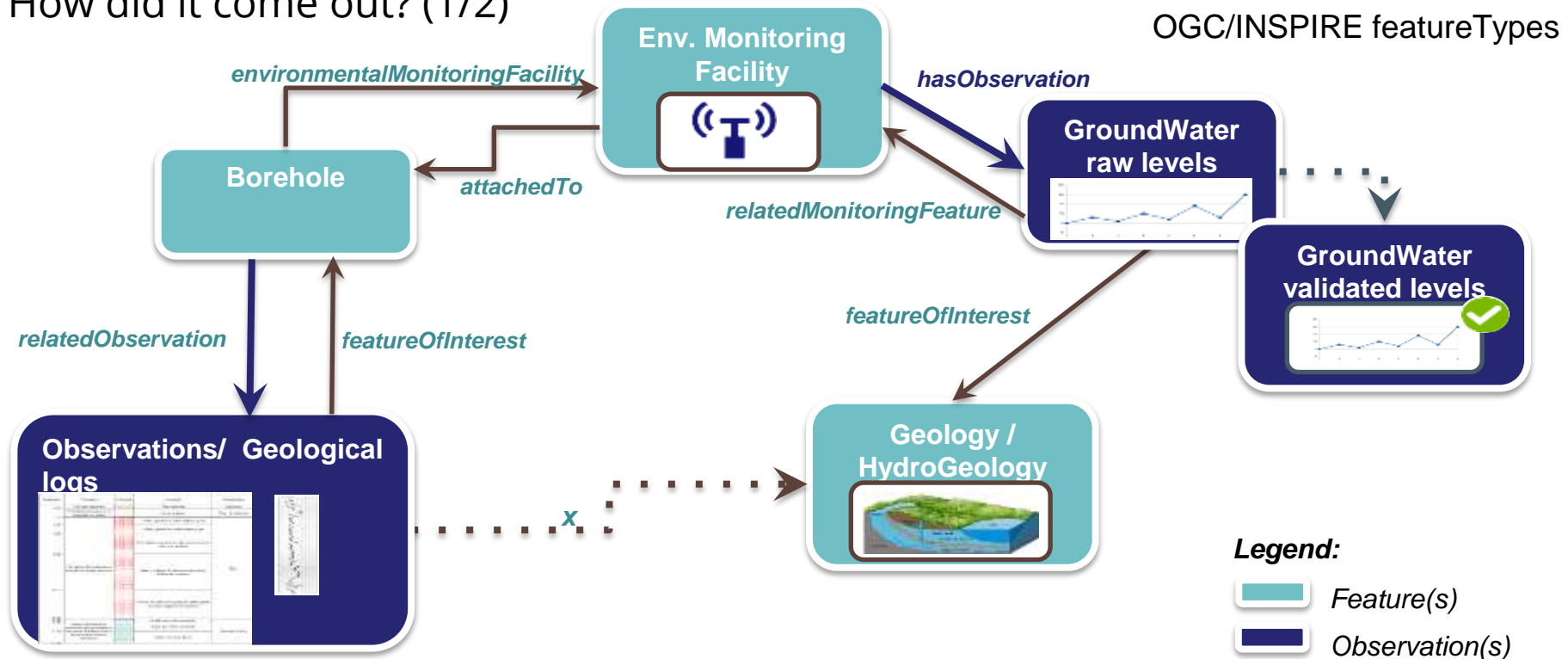
- WFS AppSchema works well with GetFeatureByID. Not so good with filters.
- Better with SOS but still have limitations (eg: not yet possible to query from result value).

Data duplication

- WFS AppSchema: CONCAT & co. are very memory consuming > you need to have database schema very close to the model to have direct mapping
- SOS: It was not possible to have mapping on the fly from raw DB to SOS > we had to build materialized views compliant with 52nSOS expected schema and tables

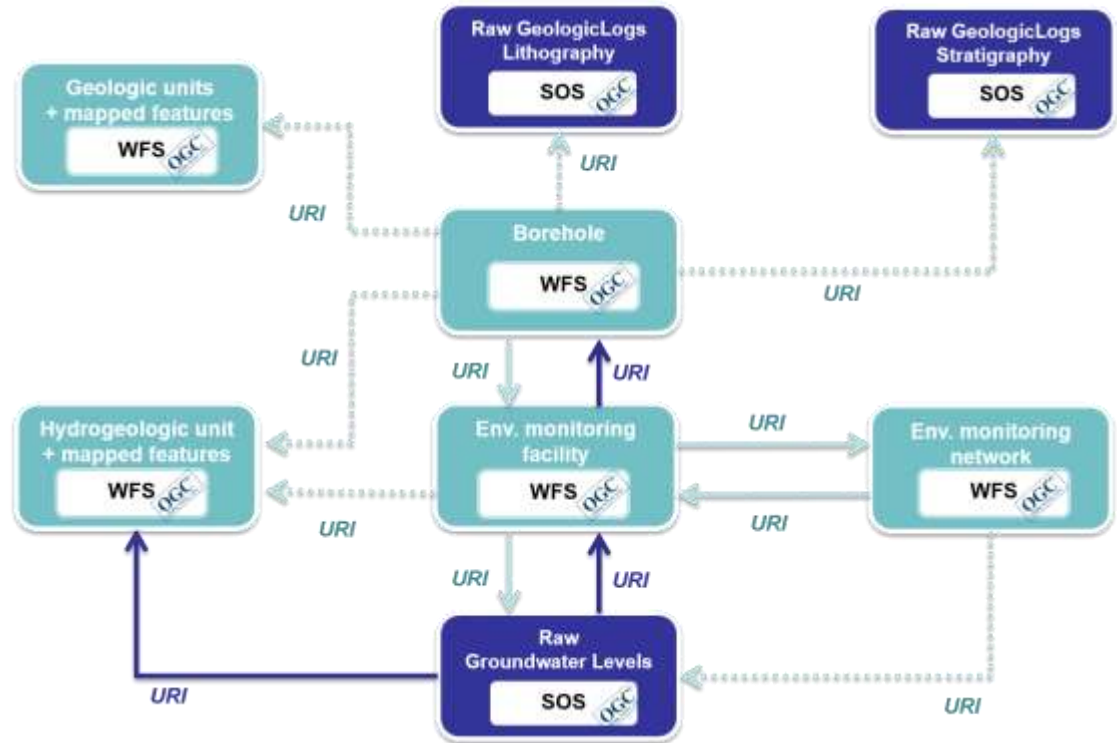
Application to groundwater information network

How did it come out? (1/2)



Application to groundwater information network

How did it come out? (2/2)



Architectural Overview with Examples

- Application to groundwater monitoring system
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Statistical Viewer

What was the plan:

Create simple viewer for statistical data:

- Statistical Units
- Population Distribution

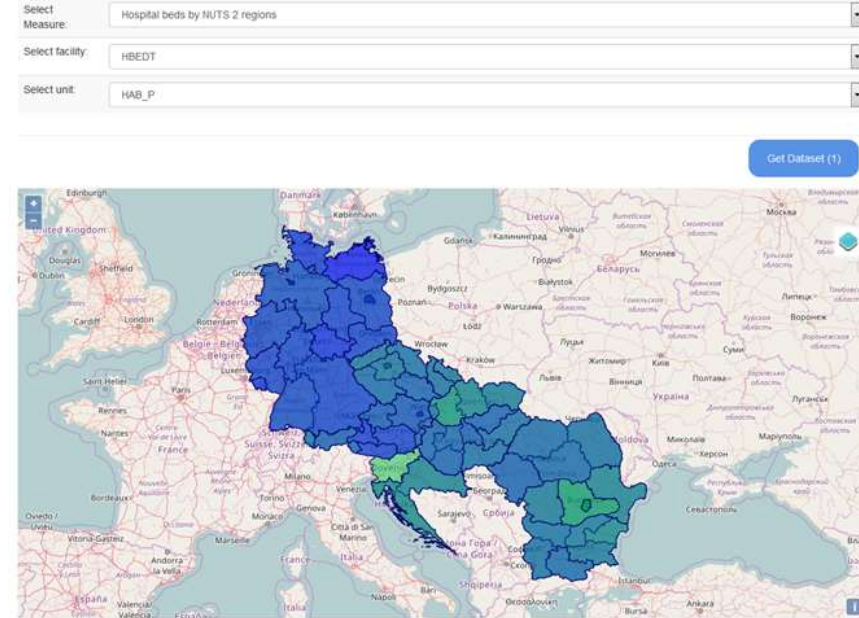
No INSPIRE compliant data services available

- Implemented utilizing open data from eurostat

What was the technology used:

- Data Transformation: Java code
- Data Provision: GeoServer AppSchema & PostGIS
- Middleware: PHP Filter module
- Web GUI: Open Layers, ajax, jquery

Statistical Data Viewer App



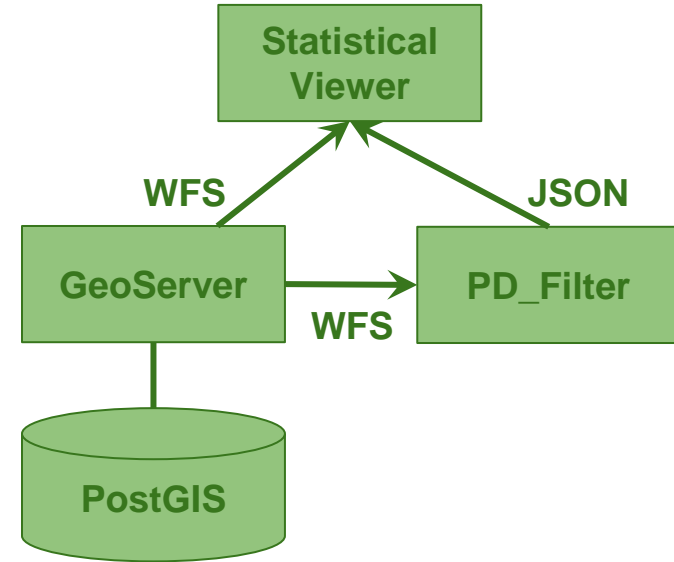
Statistical Viewer

Where were the problems:

- Stored Queries - syntax for complex features not fully documented
- Filtering of distinct values available for specific fields not possible
- Population Distribution features massive (not geo!)
- Various GeoServer bugs (i.e. quite crash after requests for multiple complex features)

How did it come out:

- <http://bolegweb.geof.unizg.hr:2017/danubehack2/pd-viewer/>



Architectural Overview with Examples

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- **EF - Bathing Sites Monitoring Facilities**
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EF - Bathing Sites Monitoring Facilities

What was the plan:

Transform bathing sites according to INSPIRE EF meeting requirements:

- Conformity of the transformed GML dataset, served by means of WFS, to INSPIRE data model and GML Specs.
- Provide both deegree and GeoServer web services

What was the technology used:

Data Transformation: hale studio

Data Provision:

- GeoServer (using hale studio *AppSchema* feature)
- deegree

EF - Bathing Sites Monitoring Facilities

degree:

Issue: Feature types `ef:ObservingCapability` and `om:OM_Observation` are not present in the feature store as “Feature types” but are present as “Feature collection type hierarchy” and not published as WFS layers.

Cause: in the INSPIRE *EnvironmentalMonitoringFacilities.xsd*, encoding of the elements (associations):

1. `"featureOfInterest"` with data type `"gml:FeaturePropertyType"`
2. `"procedure"` with data type `"om:OM_ProcessPropertyType"`

Solution:

The data types for the fields have been changed to `"gml:ReferenceType"` in the EF.xsd

EF - Bathing Sites Monitoring Facilities

Modified xsd

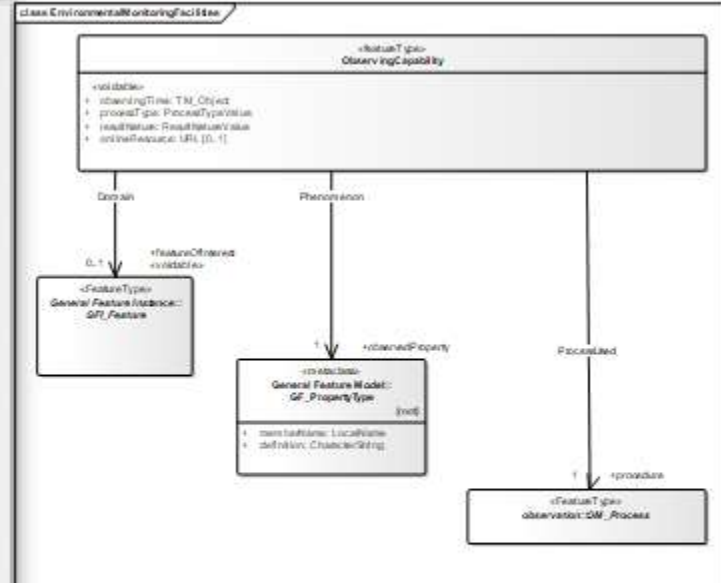
[illegible]

Original xsd

```

type of object used in describing the process.</documentation>
</annotation>
</element>
<element base="resultFeature" abstract="true" type="gml:ReferenceType">
<annotation>
<documentation>-- Definition --
of the provided result.</documentation>
</annotation>
</element>
<element base="C" base="gml:BaseType" abstract="true">
<annotation>
<documentation>-- Definition --
it to an external document providing further information about an ISO 10166 "C"
</annotation>
<complexType>
<simpleContent>
<restriction base="anyURI">
<attribute name="linkReason" type="gml:linkReasonType"/>
</restriction>
</simpleContent>
</complexType>
</element>
<element base="procedure" type="gml:ProcessPropertyType">
<annotation>
<documentation>-- Definition --
to the Process used to generate the result. The OK_Process shall be suitable f
</annotation>
</element>
<element base="featureOfInterest" type="gml:FeaturePropertyType" abstract="true">
<annotation>
<documentation>-- Definition --
Feature is the real-world object whose properties are under observation, or is
</annotation>
</element>
<element base="observedProperty" type="gml:ReferenceType">
<annotation>
<documentation>-- Definition --
property being observed or measured at this AMD.</documentation>
</annotation>
</element>
</sequence>
</restriction>
</complexType>
complexType>

```



EF - Bathing Sites Monitoring Facilities

How did it come out?



```
<ef:observingCapability xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://localhost:8080/services/BathingSites_EF_WFS2.0?SERVICE=WFS&VERSION=2.0.0&REQUEST=GetFeature&OUTPUTFORMAT=application%2Fgml%2Bxml%3B+version%3D3.2&STOREDQUERY_ID=urn:ogc:def:query:OGC-WFS::GetFeatureById&ID=OC_EC_MT0110116500000A01#OC_EC_MT0110116500000A01"/>
<ef:observingCapability xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://localhost:8080/services/BathingSites_EF_WFS2.0?SERVICE=WFS&VERSION=2.0.0&REQUEST=GetFeature&OUTPUTFORMAT=application%2Fgml%2Bxml%3B+version%3D3.2&STOREDQUERY_ID=urn:ogc:def:query:OGC-WFS::GetFeatureById&ID=OC_IE_MT0110116500000A01#OC_IE_MT0110116500000A01"/>
<ef:hasObservation xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://localhost:8080/services/BathingSites_EF_WFS2.0?SERVICE=WFS&VERSION=2.0.0&REQUEST=GetFeature&OUTPUTFORMAT=application%2Fgml%2Bxml%3B+version%3D3.2&STOREDQUERY_ID=urn:ogc:def:query:OGC-WFS::GetFeatureById&ID=MT0110116500000A01_ID_EC_6639#MT0110116500000A01_ID_EC_6639"/>
<ef:hasObservation xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://localhost:8080/services/BathingSites_EF_WFS2.0?SERVICE=WFS&VERSION=2.0.0&REQUEST=GetFeature&OUTPUTFORMAT=application%2Fgml%2Bxml%3B+version%3D3.2&STOREDQUERY_ID=urn:ogc:def:query:OGC-WFS::GetFeatureById&ID=MT0110116500000A01_ID_IE_6639#MT0110116500000A01_ID_IE_6639"/>
<ef:hasObservation xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://localhost:8080/services/BathingSites_EF_WFS2.0?SERVICE=WFS&VERSION=2.0.0&REQUEST=GetFeature&OUTPUTFORMAT=application%2Fgml%2Bxml%3B+version%3D3.2&STOREDQUERY_ID=urn:ogc:def:query:OGC-WFS::GetFeatureById&ID=MT0110116500000A01_ID_EC_1393#MT0110116500000A01_ID_EC_1393"/>
```

```
WFS::GetFeatureById&ID=MT0110116500000A01_ID_IE_6639#MT0110116500000A01_ID_IE_6639"/>
<ef:hasObservation xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://localhost:8080/services/BathingSites_EF_WFS2.0?SERVICE=WFS&VERSION=2.0.0&REQUEST=GetFeature&OUTPUTFORMAT=application%2Fgml%2Bxml%3B+version%3D3.2&STOREDQUERY_ID=urn:ogc:def:query:OGC-WFS::GetFeatureById&ID=MT0110116500000A01_ID_EC_1393#MT0110116500000A01_ID_EC_1393"/>
```

EF - Bathing Sites Monitoring Facilities

GeoServer & hale studio Appschema feature:

Issues:

- `<null>` namespaces in WFS response (`<null:OM_Observation>` even when not using virtual services)
- hale studio Appschema feature not able to correctly map multiplicity `<ef:ObservingCapability>`

Solution:

- No solution found for first issue
- Edit the appschema file

EF - Bathing Sites Monitoring Facilities

How did it come out?

```
localhost:8080/geoserver/wfs?service=WFS&version=1.0.0&request=GetFeature&typeName=ef:EnvironmentalMonitoringFacility&maxFeatures=50&outputFormat=application%2Fxml
<ef:FeatureCollection numberMatched="unknown" numberReturned="30" timeStamp="2017-09-01T16:01:55.335Z" xsi:schemaLocation="http://www.opengis.net/wfs/2.0 http://localhost:8080/geoserver/schemas/wfs/2.0/wfs.xsd http://inspire.ec.europa.eu/schemas/ef/4.0 http://inspire.ec.europa.eu/schemas/ef/4.0/EnvironmentalMonitoringFacilities.xsd http://www.opengis.net/gml/3.2 http://localhost:8080/geoserver/schemas/gml/3.2.1/gml.xsd">
  <ef:members>
    <ef:EnvironmentalMonitoringFacility gml:id="MT0110116500000A01">
      <ef:inspireId>
        <ef:baseIdentifier>
          <base:localId>MT0110116500000A01</base:localId>
          <base:namespace>MT_Bathing Water Report 2016</base:namespace>
          <base:Identifier>
            <ef:inspireId>
              <ef:name>XGHAIJA</ef:name>
              <ef:name>DAWREI IX XATT (TAN-NISA)</ef:name>
            </ef:inspireId>
            <ef:additionalDescription>
              BWType:1,Change:na,Closed:N,BWaterCat:C,SpecGeoCon:N,GroupID:na
            </ef:additionalDescription>
            <ef:mediaMonitored xlink:href="http://inspire.ec.europa.eu/codeList/MediaValue/water"/>
          </ef:geometry>
          <gml:Point srsDimension="2" srsName="http://www.opengis.net/gml/xs:tpag:xs:3045">
            <gml:pos>459078.9160527285 3971754.143844437</gml:pos>
          </gml:Point>
          <ef:geometry>
            <ef:onlineResource>
              http://health.gov.au/en/environmental/Pages/Health-Inspectorate/Environmental-Health-Risk-Management/Bathing-Water-Profiles.aspx
            </ef:onlineResource>
          </ef:observingCapability>
          <ef:ObservingCapability gml:id="OC_EC_MT0110116500000A01">
            <ef:observingTime>
              <gml:TimeIntervalInstant gml:id="OC_TI_MT0110116500000A01">
                <gml:timePosition>2016</gml:timePosition>
                <gml:TimeIntervalInstant>
                  <ef:observingTime>
                    <ef:processType xlink:href="http://inspire.ec.europa.eu/codeList/ProcessTypeValue/process"/>
                    <ef:resultNature xlink:href="http://inspire.ec.europa.eu/codeList/ResultNatureValue/primary"/>
                    <ef:procedure xlink:href="http://health.gov.au/en/environmental/Pages/Health-Inspectorate/Environmental-Health-Risk-Management/Sampling-Procedure.aspx">
                    <ef:featureOfInterest xlink:href="http://health.gov.au/en/environmental/Pages/Health-Inspectorate/Environmental-Health-Risk-Management/Bathing-Water-Profiles/Bathing-Water-Profile-1.aspx">
                    <ef:observedProperty xlink:href="http://dd.ecinet.europa.eu/datasets/latest/BWQD_2006_MonitoringResults/elements/Con:EC" xlink:title="Measured concentration of Escherichia coli per sample in <colony forming units> per 100 ml (cfu/100ml)"/>
                  </ef:observingCapability>
                </ef:observingCapability>
              </ef:broader xlink:href="MTC 106" xlink:title="IX-XGHAIJA"/>
            </ef:hasObservation>
            <ef:OM_Observation gml:id="MT0110116500000A01_ID_EC_1">
              <gml:description>GroupID:"na", Rem:"na"</gml:description>
              <ef:phenomenonTime>
```

Architectural Overview with Examples

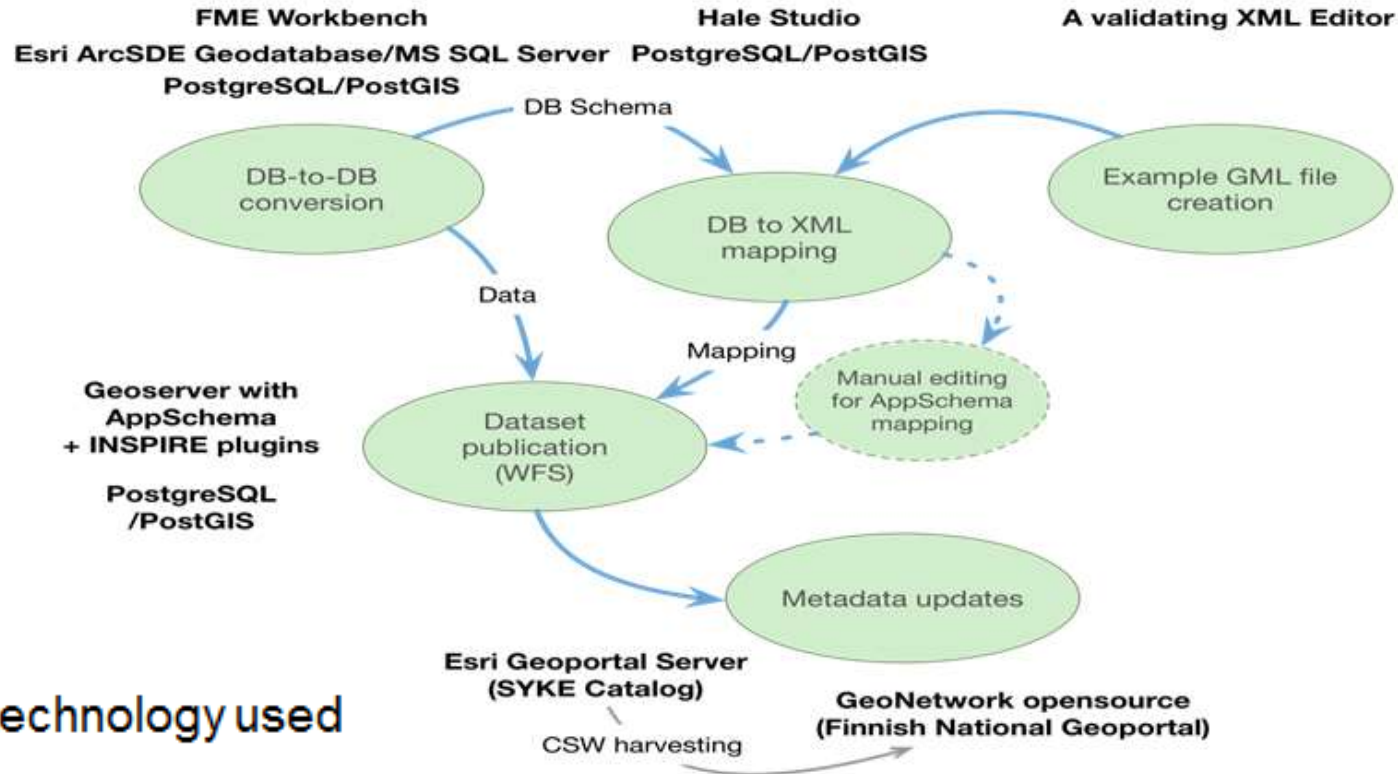
- Application to groundwater monitoring system
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- **SYKE's experiences with GeoServer**
- WFS 2.0. direct access across multiple feature types

SYKE's experiences with GeoServer

What was the plan?

- Publish a BETA WFS service providing SYKE's annex I datasets according to the appropriate *INSPIRE schemas and feature types*:
 - [Natura 2000 sites](#) = *Protected Sites: ProtectedSite feature type*. The national dataset comprise of both polygons and lines. Some spatial objects comprise of **both polygons and lines**.
 - [Nationally designated areas](#) = *Protected Sites: ProtectedSite feature type*. The national dataset comprise of polygons.
 - [River network](#) = *Hydrography: WatercourseLink & Hydronode feature types*. The national dataset comprise of lines and points.
- Publish the reported datasets using one GeoServer instance
- Create separate stored queries for the PS datasets
- Create required dataset (3) and service metadata (1)

SYKE's experiences with Geoserver



The technology used

SYKE's experiences with GeoServer

How did it come out?

- INSPIRE WFS service published (BETA)

<http://geoserver.ymparisto.fi/geoserver/wfs?service=wfs&version=2.0.0&request=GetCapabilities>

- One Stored Query per PS dataset

<http://geoserver.ymparisto.fi/geoserver/wfs?service=WFS&version=2.0.0&request=getfeature&storedqueryid=http://inspire.ec.europa.eu/operation/download/getspatialdataset/&DataSetIdCode=http://paikkatiedot.fi/so/1002201/ps/ProtectedSite/> (Natura 2000)

<http://geoserver.ymparisto.fi/geoserver/wfs?service=WFS&version=2.0.0&request=getfeature&storedqueryid=http://inspire.ec.europa.eu/operation/download/getspatialdataset/&DataSetIdCode=http://paikkatiedot.fi/so/1002200/ps/ProtectedSite/> (Nationally Designated Areas)

- List of issues encountered, see later slides

Architectural Overview with Examples

- Application to groundwater monitoring system
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- **WFS 2.0. direct access across multiple feature types**

WFS 2.0. direct access across multiple feature types

The plan?

Taking one data set, spanning many INSPIRE data themes, and transforming it for homogenized WFS download service

Going from a GIS-centric DB (topologically-correct layers organized in a single coherent GIS dataset) transposing it as INSPIRE GML datasets (4 INSPIRE data themes) & appropriate download services

Have everything validated (3*Metadata Files, 2*GetCapabilities Files, 4*GML datasets): using existing public tools;

Make everything work!

WFS 2.0. direct access across multiple feature types

Technology used?

| | |
|---|--|
| Desktop GIS (ArcGIS + QGIS) + RDBMS (Microsoft SQL Server) + ArcGIS SDE | Consolidating & preparing the data |
| Proprietary: Snowflake Go Publisher - Desktop Open source: Humboldt Alignment Editor | Transforming the data + GML predefined datasets |
| Proprietary: Snowflake Go Publisher Server Open source: Geoserver 2.xx + AppSchema + pgSQL | Serving the data as WFS Download Service |
| GML validation: ENVplus, OGC TeamEngine validator; MD validation: INSPIRE validator | Validating everything: MD + GML + WFS |
| Notepad++, Python scripting, OS-GEO bug-tracker, uncountable technical discussion forums | Misc tools |

WFS 2.0. direct access across multiple feature types

Outcome - WFS access to homogeneous data: ps:PS, gn:NP, au:AU, br:BR

The best implementation solution seems to be based around a hybrid open-source and proprietary software:

- proprietary SW usually has less bugs and better SW management features
- there is little that can be done in the way of fixing bugs and issues
- open-source solutions require more work and documentation to get going

Geoserver based solution requires quite the customization and bug-fixing, but it is 100% percent achievable

- some technical issues regarding TG implementation still exist
- has great Stored Query capabilities allowing for very interesting URL rewrites
- has come a long way since the early days of INSPIRE and is now a recommendable alternative to proprietary SW such as ArcGIS, Snowflake or others.



Implementation Issues

what went wrong –
how we made it right



Implementation Issues (Overview)

- Data Provision

- from the perspective of the data provider the problems faced in creation and provision of the data to the public

- Data Access

- from the perspective of the user the problems encountered in downloading the data

- Data Usage

- from the perspective of the user the problems encountered in using the data

Implementation Issues (Overview)

Intro to the following issues:

- Data Provision
 - Issues providing download services (GeoServer, DeeGree)
 - Simplification Options
- Data Access
 - Identifier Management and Referencing
 - Stored queries
- Data Usage
 - Available client libraries
 - Bits&Pieces

Implementation Issues (Overview)

Intro to the following issues:

- **Data Provision**

- **Issues providing download services (GeoServer, DeeGree)**
- **Simplification Options**

- **Data Access**

- Identifier Management and Referencing
- Stored queries

- **Data Usage**

- Available client libraries
- Bits&Pieces

Data Provision: Issues providing download services

- Various technologies being utilized for the provision of INSPIRE Services
- Most have some deficiencies pertaining to INSPIRE
- Knowing about these issues can save a great deal of effort and frustration!
- Workarounds can help to mitigate some of these issues
- Joint funding (crowd-funding among institutions) would be ideal (but politically difficult)
- Knowing who has contracted fixes would be valuable for coordination of efforts

Main issues encountered by BRGM

- GeoServer WFS AppSchema

- One namespace is linked to one xsd (e.g. gml is associated to GML3.1.1 or GML3.2.1 for all the app schemas based data) > If you have data based on both, then you must have several GeoServer.
- AppSchemaCache is not automatically updated when XSD change > You have to (think that you will have to) do it manually.
- AppSchema is mostly reduced to one to one mapping (CONCAT cannot be used for performance reasons).

Main issues encountered in SYKE implementation I

- Hard to meet the „one endpoint per dataset“ Download Services TG requirement 52 with GeoServer
 - Strictly speaking, if you want to publish two INSPIRE datasets you need to set up two GeoServer instances and publish them as separate endpoints
 - **You can only publish the same feature types having the same namespace once.** In order to provide our PS datasets (Natura, NDA) separately, we would need to set up and one GeoServer instance for each.
- When you publish WFS you automatically also generate WMS (workaround: have a separate GeoServer instance for publishing WFS services only.)
- Solution for these issues: workspace isolation (next page)

Geoserver/AppSchema Improvement: Isolated Workspaces

- Allow publishing the same (complex/simple) feature types (with the same namespace) more than once using a different data source.
- Break the connection with namespaces and the workspaces:
 - Isolated workspace could have an arbitrary prefix.
 - Namespaces and feature types added to an isolated workspace would not conflict with or be visible in other workspaces or in the global services.
- Extend AppSchema to allow more than one complex feature mapping per feature type:
 - Restriction: feature types used for feature chaining can only be mapped once or must be mapped again for each using data store (OK).
- Contractor: GeoSolutions (funded by SYKE/Envibase project) -> benefit to all



Other issues encountered in SYKE implementation II

- AppSchema restricted the HALE mapping (workaround: editing of mapping documenting by hand, for example SWE/FI names)
- We could not create optimal GMLs with the GeoServer solution, only with Atom for PS using FME or HALE alone, as AppSchema cannot handle MultiGeometry objects (workaround: lines and polygons were split up into separate spatial objects)
- GDAL interpreted the CRS in incorrectly when providing them in an INSPIRE compliant way, that is in URI-form, not URN. This has been reported and fixed.
- Open search support in GeoNetwork is not fully working
- ESRI Geoportal Server INSPIRE metadata templates are not fully according to INSPIRE requirements
- WMS Portrayal issue: according to IR code list values should be used in WMS layer names, however if we use our national code list extensions, then we fail in the name validations...

D a

Geoserver known issues

Date: Bearbeiten Ansicht Einfügen Format Daten Tools Add-ons Hilfe Alle Änderungen in OWS gespeichert

Kommentare Veröffentlichen

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 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Deegree excel

| ID | Problem | Description | Workaround | INSPIRE Theme impacted | Version | Issue Link on the Forum |
|----|---|--|-----------------------------------|------------------------|---------|--|
| 1 | Support not provide dx OGC HTTP URI CRS references | the http URI encoding for CRS in GML to be long string is currently not supported by deegree. https://github.com/deegree/deegree3/issues/711 | | * | 3.3.18 | claimed solved in v3.4.1: Enhanced CRS configuration by CRS identifier in OGC HTTP URI syntax #840 · https://github.com/deegree/deegree3/pull/840 |
| 2 | omission of deeply nested fields | when creating the tables in the DB from application schema, deegree does not include 'deeply' nested field i.e. when the element structures extend a certain complexity (with nesting and recursion) deegree simply omits them | manually edit configuration files | * | 3.3.18 | https://sourceforge.net/p/deegree/mailman/message/32578671/ |
| 3 | WFS response does not show those application schema properties corresponding to empty fields in the data source | WFS response does not show those application schema properties corresponding to empty fields in the data source tables (derived of course from relevant empty elements in the GML file which fed the DB). This behaviour turns into an issue when no relevant information exists in the source data (because the provider does not have or simply does not want to share) for target application schema elements which are mandatory and not voidable (e.g. <ps:geometry>). | | * | 3.3.18 | |
| 4 | xlink:title is being removed on WFS (using a memory store from GML 3.2) | Using Deegree 3.3.20 server with an in-memory storage (GML 3.2 file), there is a problem when a request for the feature is made using the WFS request. The response is translated correctly in the WFS format, but all the xlink:title are removed. | | | 3.3.20 | https://github.com/deegree/deegree3/issues/841 |

Data Provision: Issues providing download services - examples GeoServer

| Problem | Workaround | Funding |
|--|---|---------|
| Unique Endpoint per Dataset | Utilize Apache's rewriting functionality | SYKE |
| Stored Queries on Complex Features | Documentation Issue, works, not properly documented | |
| WMS doesn't work on gml:MultiSurface | Create simple feature | |
| WFS-T doesn't work with complex features | | |
| Requests for multiple complex features crashes Geoserver | Request features individually | |
| ... | ... | ... |

Data Provision: Issues providing download services

- Extend approach for other technologies:
 - Deegree (in progress)
 - GeoNetwork
 - ...
- Options for formalizing current excel sheet solution
 - Current approach quite “fragile”
 - Open to general edits
- Integrate content into existing INSPIRE platform?

Data provision: the pushy idea (BRGM)

- Do we (really) need data servers?
- What about building and storing all possible requests results, store them and expose them?
- Hub'EAU approach with solR



Data Provision: Simplification Options

Problems:

- Complexity of common INSPIRE types (i.e. Geographical Names, Addresses, Related Party...) causes implementation and usage issues
- Workarounds can be dangerous; lead to unstandardized standardization (i.e. putting the entire geographical name into the GN delivery point element)

(Currently also being discussed in MIG)

Options:

- Software driven flattening vs. community driven schema simplifications (GeoSciML Lite, EarthResourceML Lite,...).
- Simple Feature Representations/Mapping
 - Potential of APIs exposing simplified features as an alternative solution
- Simplification through alternative encodings (JSON, RDF)
 - Also as a way towards more INSPIRE based linked open data, Idproxy, Sensor Things

Keep it simple - nordic view

GDI-DE Data Specification Analysis

Results and Recommendations

Implementation Issues (Overview)

Intro to the following issues:

- Data Provision
 - Issues providing download services (GeoServer, DeeGree)
 - Simplification Options
- **Data Access**
 - **Identifier Management and Referencing**
 - **Stored queries**
- Data Usage
 - Available client libraries
 - Bits&Pieces

Data Access: Identifier Management and Referencing

There are no requirements/recommendations for INSPIRE identifiers of the data provided.

Identifiers are critical for feature referencing, and in reporting activities of MS.

INSPIRE data is usually reference data which belongs in European-wide registries of features.

We don't call the 8490 km-long **E40** road, by it's id: **27C59F82-5208-4C70-AEAC-6A8E172D95CD**

We also call addresses, admin. units, rivers, geographical places by their names/abbreviations

Identifiers in INSPIRE should mirror this, since it makes working with data much easier/natural

Identifiers allow users to pin-point from very a very large data-pool the exact feature they need

In short, we need intelligent identifiers, since they make sure the data is not a mess, and make it work for everyone.

Data Access: Identifier Management and Referencing

- Identifier management loosely specified in INSPIRE, various non-aligned options available:
 - base:inspireId (which provides the local identifier inside a namespace, and versioning)
 - gml:id (default for WFS, useful for getting just the exact feature needed, restrictions++)
 - doesn't allow a number of characters, many SW generate IDs randomly
 - gml:identifier (alt. identifier in GML, freer version of gml:id, not useful in feature filtering)
- Standard WFS **GetFeatureById** stored query (SQ) references **gml:id**
 - filtering the data is based on an identifier element that has many restrictions

Data Access: Identifier Management and Referencing

- What does INSPIRE TG mandatory **GetSpatialDataSet** SQ reference ???
 - unclear if this SQ is anything else than an alternative way of getting ALL the features from a WFS, or something more
- How to access a specific feature by the inspireId?
 - Where is **GetFeatureByInspireID** SQ? What about versioned data (dataset time series)?

Data Access: Identifier Management and Referencing

- How to reference specific features? First try: WFS URI including query
Problems:
 - URI changes with SW versions
 - Long and ugly URI
- Rewriter approach - provider level:
 - Configure Apache to rewrite simple URIs to current WFS
 - Simple URI used for referencing and in xlink
- <http://ressource.brgm-rec.fr/data/Piezometre/06512X0037/STREMY.2>
vs.
- https://wfspoc.brgm-rec.fr/geoserver/ows?service=wfs&version=2.0.0&request=GetFeature&StoredQuery_ID=GetEnvironmentalMonitoringFacilityById&ID=Piezometre.06512X0037.STREMY.2

Data Access: Identifier Management and Referencing

- Redirect + rewrite approach - European Level (nginx):
 - URI1: RO - Ministry of Environment - Protected Areas Data Set - nat. prot. areas :
<http://inspire.biodiversity.ro/geoserver/ows?service=wfs&version=2.0.0&request=GetFeature&typename=ps:ProtectedSite&featureid=ROSCI0135>
 - <http://gmlid.eu/RO/ENV/PADS/PS/ROSCI0135>
 - URI2: RO - National Cadaster Agency - Administrative Units Dataset - admin. units:
http://geoportal.ancpi.ro/arcgis/rest/services/AU/AU_Download/GeoDataServer/exts/InspireFeatureDownload/service?VERSION=2.0.0&SERVICE=WFS&REQUEST=GetFeature&typename=au:AdministrativeUnit&featureID=1.29.11940
 - <http://gmlid.eu/RO/ANCPI/UAT/AU/1.29.11940>

Where MS authority abbreviated come from INSPIRE registries, dataset abbreviations are MD namespaces for that dataset, and identifiers make human readable sense

Data Access: Stored queries

- Syntax for stored queries on complex features slightly different from simple features, not very well documented.
 - For simple features element name in the fes:ValueReference sufficient
 - For complex features relative XPath must be provided, examples:
 - `gml:name` doesn't work
 - `./gml:name` works
 - `./ps:DesignationType/ps:designationScheme/@xlink:href`
 - `/cdda:DesignatedArea/ps:siteDesignation/ps:DesignationType/ps:designationScheme/@xlink:href`

Data Access: Stored queries

Implementations must keep track of the following **RECs** and **REQs**:

- Req 49: Predefined SQ available for predefined datasets
- Req 50: All combinations of CRS/DataSetIdCode/
DataSetIdNamespace/language available as Predefined SQ
- Req 51: Following parameter names must be used: CRS, DataSetIdCode,
DataSetIdNamespace and Language
- Rec 13: Name of Predefined SQ for predefined datasets:
<http://inspire.ec.europa.eu/operation/download/GetSpatialDataSet>
- These do not really apply for WFS-based GML features

Data Access: Stored queries

- Standardized theme specific stored queries would be valuable for data users
 - Most systems will not allow users to specify their own stored queries, so dependent on existing ones
 - A good complement to data specifications
 - Alignment across systems essential for cross-border applications
 - Discussion of potential stored query types/options for standardization
- Deficit of WFS Filters - no select distinct!
 - Essential for GUI development, which features to select
 - Otherwise App must first access all features using GetPropertyValue, filter redundancies
- Security issue
 - It seems we can delete them while not connected (need configuration to avoid that)

Implementation Issues (Overview)

Intro to the following issues:

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 - Stored queries
- **Data Usage**
 - **Available client libraries**
 - **Bits&Pieces**

Data Usage: Available client libraries

- Various libraries are available for the implementation of client software. These will be discussed, together with their strengths and weaknesses
 - GDAL GMLAS driver (http://www.gdal.org/drv_gmlas.html)
 - QGIS GML application schema toolbox
 - QGIS V3 - will anything ever work again since V3 will make existing vital plugins unusable?
 - Resolving xlink

In January 2017 the “application/gml+xml; version=3.2” MIME Type was registered at IANA, and WFS changed text/xml into this new MIME type, making WFS response not readable in the the browser anymore.

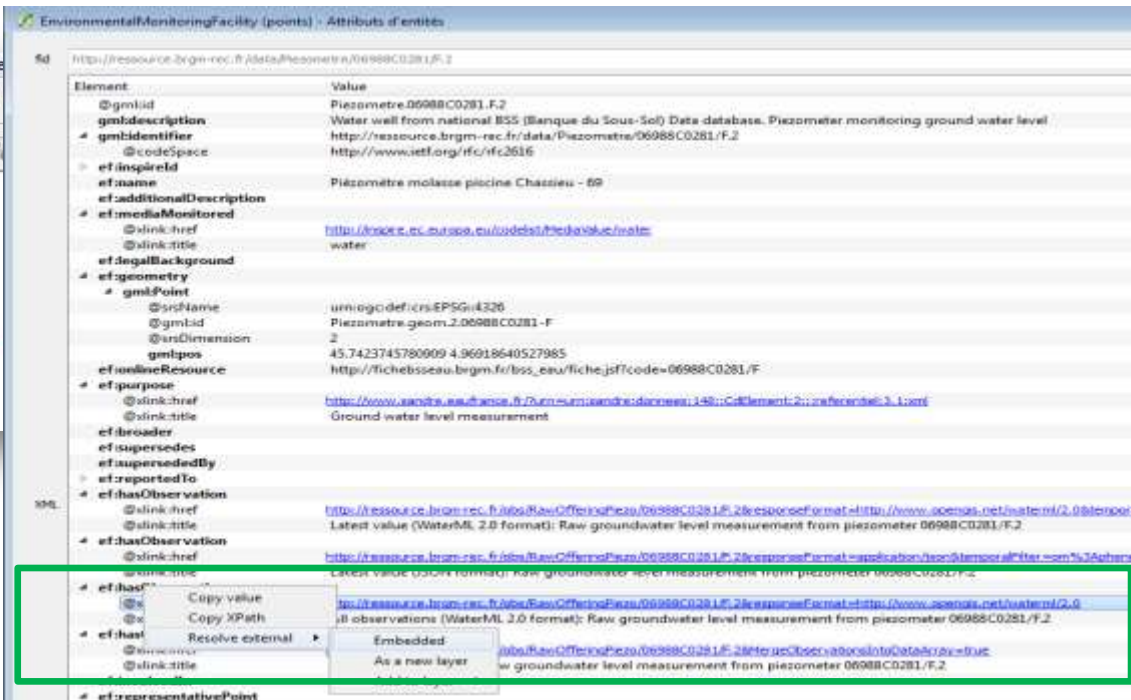
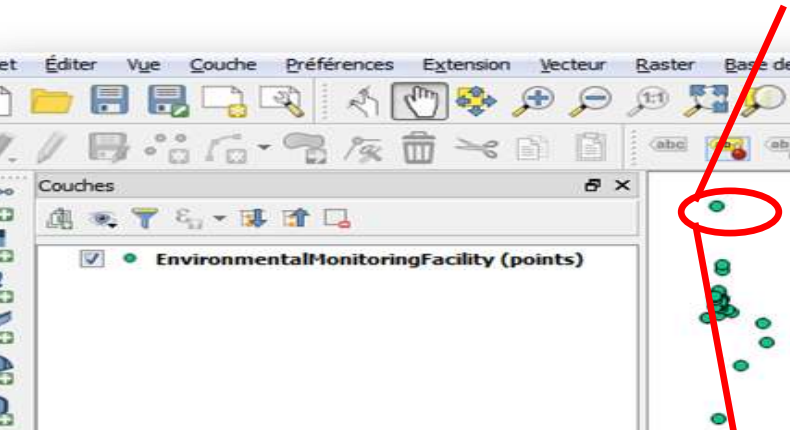
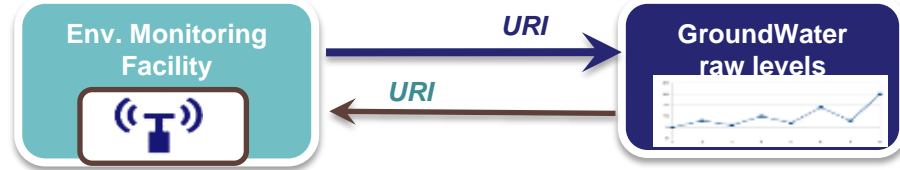
Clients - QGIS GML Application Schema Toolbox

- QGIS Plugin for WFS with complex features
- Can download GML from WFS2 services
- Convert GML App Schema files in PostGIS and SQLite format
- Works with QGIS3+
- github : https://github.com/BRGM/gml_application_schema_toolbox

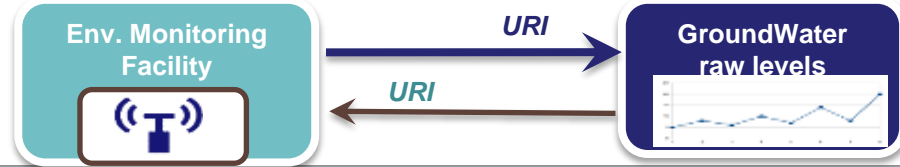
Developed by:

- BRGM - BRGM is involved for a long time in the definition of interoperability standards especially linked to OGC and the European INSPIRE directive initiatives.
- European Union's Earth observation programme Copernicus, as part of the tasks delegated to the European Environment Agency

Clients - QGIS GML Application Schema Toolbox



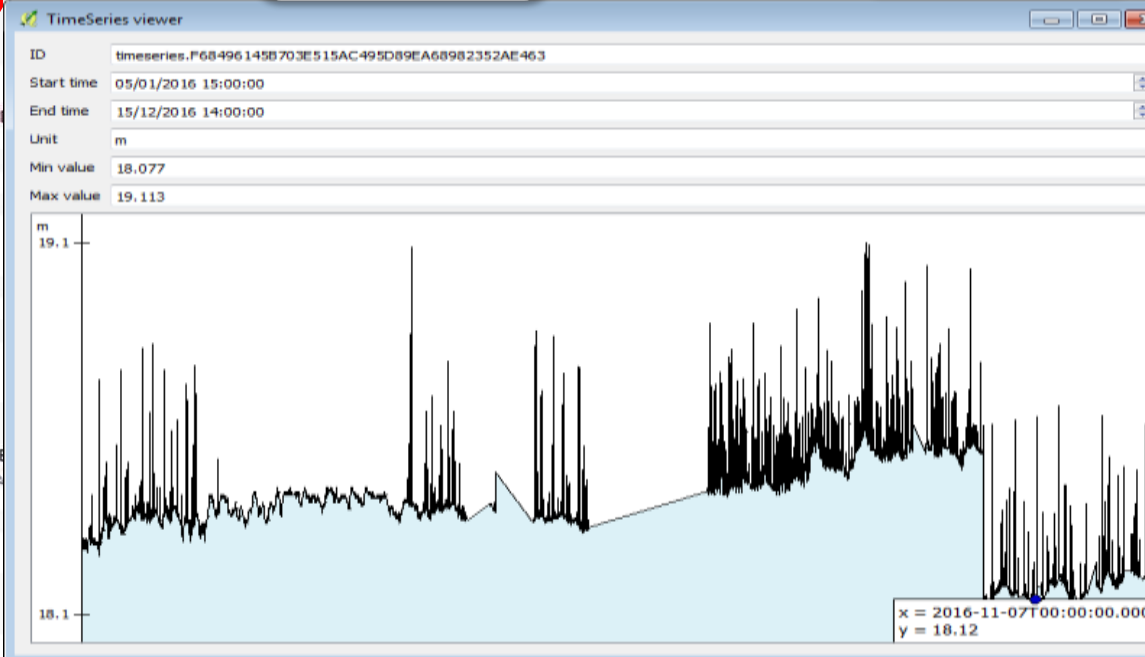
Clients - QGIS GML Application Schema Toolbox



XML Schema snippet showing GML elements:

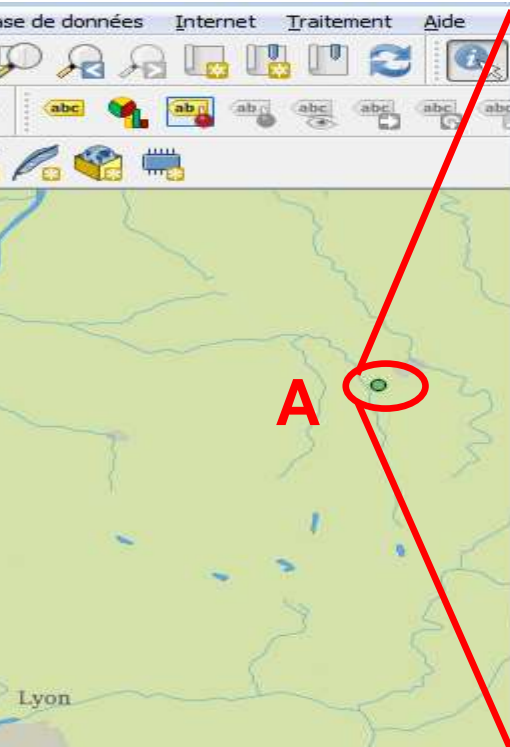
```
<om:resultTime>
  <gml:TimeInstant>
    @gml:id="ti_A5B605235028277DAC699731065C3965E0F1"
    gml:timePosition="2016-12-15T14:00:00.000Z"
  </gml:TimeInstant>
  <om:procedure>
    @xlink:href="http://id.eaufrance.fr/met/403.xml"
    @xlink:title="Electronic piezometric probe"
  </om:procedure>
  <om:parameter>
    <om:observedProperty>
      @xlink:href="http://id.eaufrance.fr/par/1649.xml"
      @xlink:title="GroundWaterLevel"
    </om:observedProperty>
    <om:featureOfInterest>
      <wml2:MonitoringPoint>
        @gml:id="mp_4C6129829FFC1C2DE4A2FB853F56C5B1A8"
        gml:identifier="http://ressources.brgm-rec.fr/data/Piezometrie"
        gml:name="Piezo 06988C0281/F.2"
        sf:sampledFeature="..."
        sams:shape="..."
      </wml2:MonitoringPoint>
    </om:featureOfInterest>
  </om:parameter>
</om:resultTime>
```

A red box highlights the "wml2:MonitoringPoint" element, with a red line connecting it to the "TimeSeries viewer" window on the right. A red box with the number "3" is also present near the bottom of the XML snippet.



Clients - QGIS GML Application Schema Toolbox

Borehole



BoreholeView (points) - Attributs d'entités

fid <http://ressource.brgm-rec.fr/data/BoreholeView/BSS001REWW>

| Element | Value |
|--|---|
| @gml:id | BSS001REWW |
| gml:description | Borehole description |
| gml:identifier | http://ressource.brgm-rec.fr/data/BoreholeView/BSS001REWW |
| @codeSpace | http://www.ietf.org/rfc/rfc2616 |
| gml:name | Forage BSS001REWW |
| gsmlp:identifier | http://ressource.brgm-rec.fr/data/Borehole/BSS001REWW |
| gsmlp:purpose | http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/hydrogeologicalSurvey |
| @xlink:href | levÃ© hydrogÃ©ologique, gestion de lâ€™eau |
| @xlink:title | |
| gsmlp:status | http://resource.europe-geology.eu/vocabs/BoreholeStatus/drillingCompleted |
| @xlink:href | drilling completed |
| @xlink:title | |
| gsmlp:drillingMethod | http://resource.europe-geology.eu/vocabs/DrillingMethod/hydraulic_rotary_drilling |
| @xlink:href | hydraulic rotary drilling |
| @xlink:title | |
| gsmlp:operator | BRGM (PIEZOMETRIE) |
| gsmlp:driller | INTRAFOR-COFOR |
| gsmlp:drillEndDate | 1974-11-30Z |
| gsmlp:startPoint | http://resource.europe-geology.eu/vocabs/BoreholeStartPoint/naturalLandSurface |
| @xlink:href | natural land surface |
| @xlink:title | |
| gsmlp:inclinationType | http://resource.europe-geology.eu/vocabs/BoreholeInclinationType/vertical |
| @xlink:href | vertical |
| @xlink:title | |
| gsmlp:boreholeMaterialCustodian | unknown |
| gsmlp:boreholeLength_m | 23.0 |
| @uom | http://qudt.org/vocab/unit/M |

Clients - QGIS GML Application Schema Toolbox

Borehole

http://ressource.brgm-rec.fr/data/BoreholeView/BSS001REWW

| Element | Value |
|--|---|
| gsmlp:drillEndDate | 1974-11-30Z |
| gsmlp:startPoint | |
| @xlink:href | http://resource.europe-geology.eu/vocabs/BoreholeStartPoint/naturalLandSurface |
| @xlink:title | natural land surface |
| gsmlp:inclinationType | |
| @xlink:href | http://resource.europe-geology.eu/vocabs/BoreholeInclinationType/vertical |
| @xlink:title | vertical |
| gsmlp:boreholeMaterialCustodian | unknown |
| gsmlp:boreholeLength_m | 23.0 |
| @uom | http://qudt.org/vocab/unit/M |
| gsmlp:elevation_m | 223.87 |
| @uom | http://qudt.org/vocab/unit/M |
| gsmlp:elevation_srs | http://www.opengis.net/def/crs/EPSSG/0/5720 |
| gsmlp:source | http://ficheinfoterre.brgm.fr/InfoterreFiche/ficheBss.action?id=06512X0037/STREMY |
| gsmlp:metadata_uri | http://www.geocatalogue.fr/Detail.do?fileIdentifier=BR_BSS_BAA |
| gsmlp:genericSymbolizer | Not provided |
| gsmlp:shape | |
| gml:Point | |
| @srsDimension | 2 |
| @srsName | urn:ogc:def:crs:EPSG:::4326 |
| @gml:id | gsmlp.shape.BSS001REWW |
| gml:pos | 46.1909541655103 5.18713262971692 |
| gsmlp:cored | false |
| gsmlp:accessToPhysicalDrillCore | false |
| gsmlp:boreholeUse | |
| @xlink:href | http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/groundwaterLevelMonitoring |
| @xlink:title | surveillance du niveau de la nappe phrÃ©atique |
| gsmlp:detailedDescription | |
| @xlink:href | http://www.opengis.net/def/nil/OGC/0/template |
| @xlink:title | template |
| gsmlp:geophysicalLogs | |
| @xlink:href | http://www.opengis.net/def/nil/OGC/0/unknown |
| @xlink:title | unknown |
| gsmlp:geologicalDescription | |
| @xlink:href | http://ressource.brgm-rec.fr/obs/RawGeologicLogs/BSS001REWW |
| @xlink:title | Borehole BSS001REWW geologic log available. |
| gsmlp:groundWaterLevel | |
| @xlink:href | http://ressource.brgm-rec.fr/data/Piezometre/06512X0037/STREMY.2 |
| @xlink:title | Description of Piezometer attached to BSS001REWW. Provides link to SensorObservationService offering |

Clients - QGIS GML Application Schema Toolbox

B

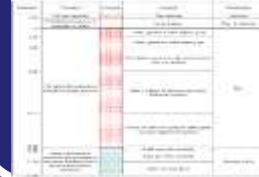
| | | |
|---------------------------------|---|--|
| gsmlp:shape | | |
| gml:Point | | |
| @srsDimension | 2 | |
| @srsName | urn:ogc:def:crs:EPSG::4326 | |
| @gml:id | gsmlp.shape.BSS001REWW | |
| gml:pos | 46.1909541655103 5.18713262971692 | |
| gsmlp:cored | false | |
| gsmlp:accessToPhysicalDrillCore | false | |
| gsmlp:boreholeUse | | |
| @xlink:href | http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/groundwaterLevelMonitoring | |
| @xlink:title | surveillance du niveau de la nappe phrÃ©atique | |
| gsmlp:detailedDescription | | |
| @xlink:href | http://www.openqgis.net/def/nil/OGC/0/template | |
| @xlink:title | template | |
| gsmlp:geophysicalLogs | | |
| @xlink:href | http://www.openqgis.net/def/nil/OGC/0/unknown | |
| @xlink:title | unknown | |
| gsmlp:geolo | | |
| @xlink:href | /ressource.brgm-rec.fr/obs/RawGeologicLogs/BSS001REWW | |
| @xlink:title | hole BSS001REWW geologic log available. | |
| gsmlp:grou | | |
| @xlink:href | http://ressource.brgm-rec.fr/obs/Piezometre/06512X0037/STREMY.2 | |
| @xlink:title | Des | |
| gsmlp:groundWaterChemistry | | |
| @xlink:href | http://www.openqgis.net/def/nil/OGC/0/unknown | |
| @xlink:title | unknown | |
| gsmlp:rockGeochemistry | | |
| @xlink:href | http://www.openqgis.net/def/nil/OGC/0/unknown | |
| @xlink:title | unknown | |
| gsmlp:poreGasChemistry | | |
| @xlink:href | http://www.openqgis.net/def/nil/OGC/0/inapplicable | |
| @xlink:title | inapplicable | |
| gsmlp:geoTechnicalInfo | | |
| @xlink:href | http://www.openqgis.net/def/nil/OGC/0/unknown | |
| @xlink:title | unknown | |

Borehole

URI

URI

Observations/ Geological logs



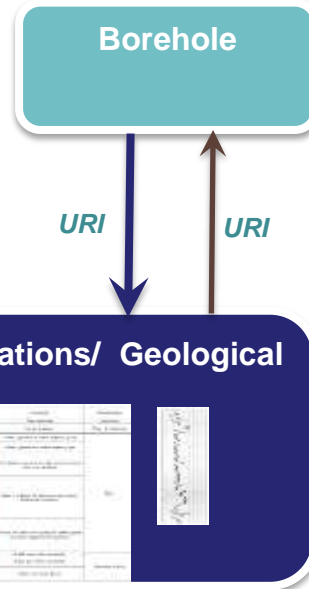
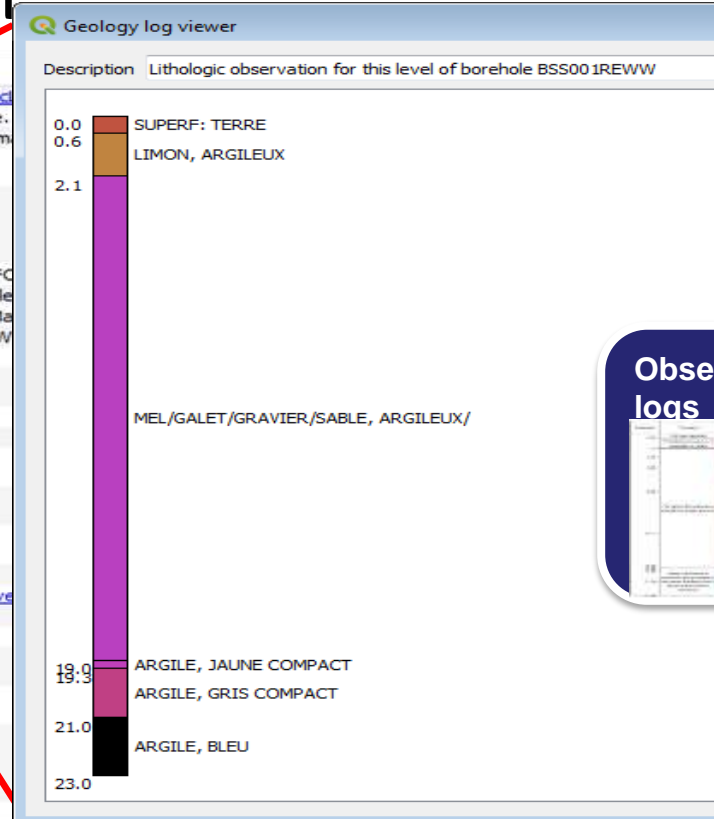
Clients - QGIS GML Application Schema Toolbox

sos:GetObservationResponse

- @xlink:href <http://ressource.brgm-rec.fr/obs/RawGeologic>
- @xlink:title Borehole BSS001REWW geologic log available.
- @xsi:schemaLocation http://www.opengis.net/sos/2.0 http://schemas

sos:observationData

- om:OM_Observation**
 - @gml:id o_B8A579CD13F439A702FBAD713F09AA17FC
 - gml:description Lithologic observation for this level of borehole
 - gml:identifier <http://ressource.brgm-rec.fr/obs/RawEarthMa>
 - gml:name RawEarthMaterialLogObservation BSS001REWW
 - om:type
 - om:phenomenonTime
 - om:resultTime
 - om:procedure
 - om:parameter
 - om:parameter
 - om:parameter
 - om:observedProperty
 - @xlink:href <http://www.opengis.net/def/qwml/2.0/observe>
 - @xlink:title Earth Material
 - om:featureOfInterest
 - om:result

- sos:observationData**
- om:OM_Observation
- gsmip:groundWaterLevel**
- @xlink:href <http://ressource.brgm-rec.fr/data/Piezometre/06512X0037/STREMY.2>
- @xlink:title Description of Piezometer attached to BSS001REWW. Provides link to SensorObservationService offering


Data Usage: Codelist Registry & Content Negotiation

Background: codelist contents provided in various formats:

- HTML (Human readable)
- Re3gistry XML
- ISO 19135 XML
- RDF/XML
- JSON
- Atom

Within data, agnostic URI is provided, resolves to human readable HTML page. Example:

<http://inspire.ec.europa.eu/codelist/AdministrativeHierarchyLevel/1stOrder>

Two options for retrieving specific formats & languages:

- INSPIRE Specific URI extensions, Example:
<http://inspire.ec.europa.eu/codelist/AdministrativeHierarchyLevel/1stOrder/1stOrder.en.iso19135.xml>
- Content Negotiation

Data Usage: Codelist Registry & Content Negotiation

State of the Art in Informatics is Content Negotiation via Mime Types

| Format | URI Suffix | Mime Type | Response |
|---------------|----------------|----------------------------|------------------------|
| HTML | | text/html | HTML Page |
| Re3gistry XML | en.xml | application/xml | Re3gistry Encoding |
| ISO 19135 XML | en.iso19135xml | application/x-iso19135+xml | ISO 19135 XML Encoding |
| RDF/XML | en.rdf | application/rdf+xml | RDF Encoding |
| JSON | en.json | application/json | JSON Encoding |
| Atom | en.atom | application/atom+xml | Atom Encoding |

Data Usage: Content Negotiation - New Gotcha!

A further bit to Content Negotiation:

A new Content Type has been defined for gml (2017-01-09):

- application/gml+xml

Effect: Browsers no longer display the GML provided, instead make it available as a downloaded file, eg: **requesteddata.application** file.

No problem if you're aware of this, but good to know!

Data Usage: Portrayal

Portrayal rules lead to ugly WMS data services, not really usable

- The least amount of effort went into designing the portrayals of layers
- Some portrayals are just not usable: AU is just a yellow patch
- Labels and scale-dependent styling?

WMS allows for so much more styling to be done, and have really nice **maps**

There are suggestions on thematic cluster, but not according to INSPIRE Reqs

Data Usage: Bits&Pieces

Many tasks required in implementation of INSPIRE server and client solutions are being duplicated across Europe. Examples:

- Generic - Codelist Resolution: at the end of the day, the developer requires a human readable label for the concept URI
- Specific - Filtering Middleware: a PD feature provides many values for each spatial object; only one can be displayed. For the creation of a viewer for this data, filtering down to the relevant data via middleware can greatly improve viewer performance
- ...? (brainstorming)

Data Usage: Bits&Pieces

Ideas of what can be done:

- “Map of the state of the INSPIRE implementation puzzle”
 - List existing projects: finished/on the run, technology inside.
 - List people involved in the projects (thus contact points).
 - List past/current issues, tips, workarounds faced and found in the projects.
 - To build a cross-project vision of common objectives, tools, issues
 - To organize action to overcome them

How to make available:

- GitHub: hard to see the forest for all the trees!
- INSPIRE-in-Practice: currently only complete tools, not bits&pieces of helper code
- Could we merge this?

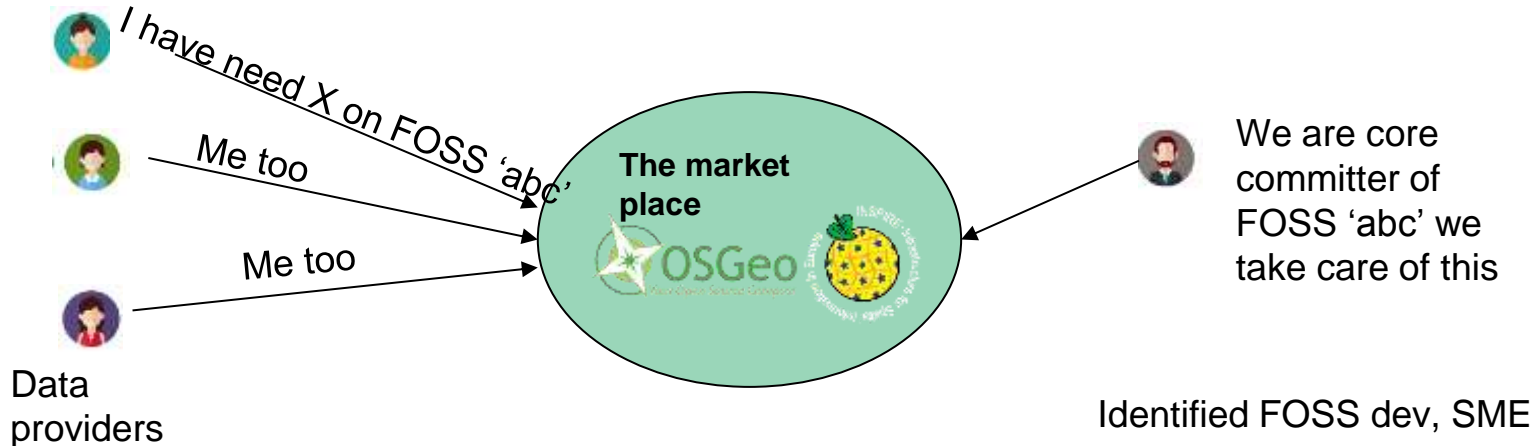
Also see: "Designing a new functionality to help to fill the INSPIRE technical gaps"

Wednesday 14:15h, Room: Amsterdam

Data Usage: Bits&Pieces

Ideas of what can be done:

- We need a way to liaise/link
 - people expressing their IT need (bug-fix, enhancement, ...)
 - and people having the knowledge to solve it (often being paid)
- Some sort of 'marketplace' like



Data Usage: Bits&Pieces

Ideas of what can be done:

- The pieces of the puzzle are here, no need for more advanced extra-layer
- Facilitator could be via OsGeo and/or INSPIRE cluster
 - List of know issues already shared (see previous slides)
- The 'market place' itself
 - could be another an INSPIRE cluster (tool oriented) and/or the 'INSPIRE in Practice platform'
 - that should point to FOSS OsGeo mailing list / GitHubs / OGC Europe forum list / ...

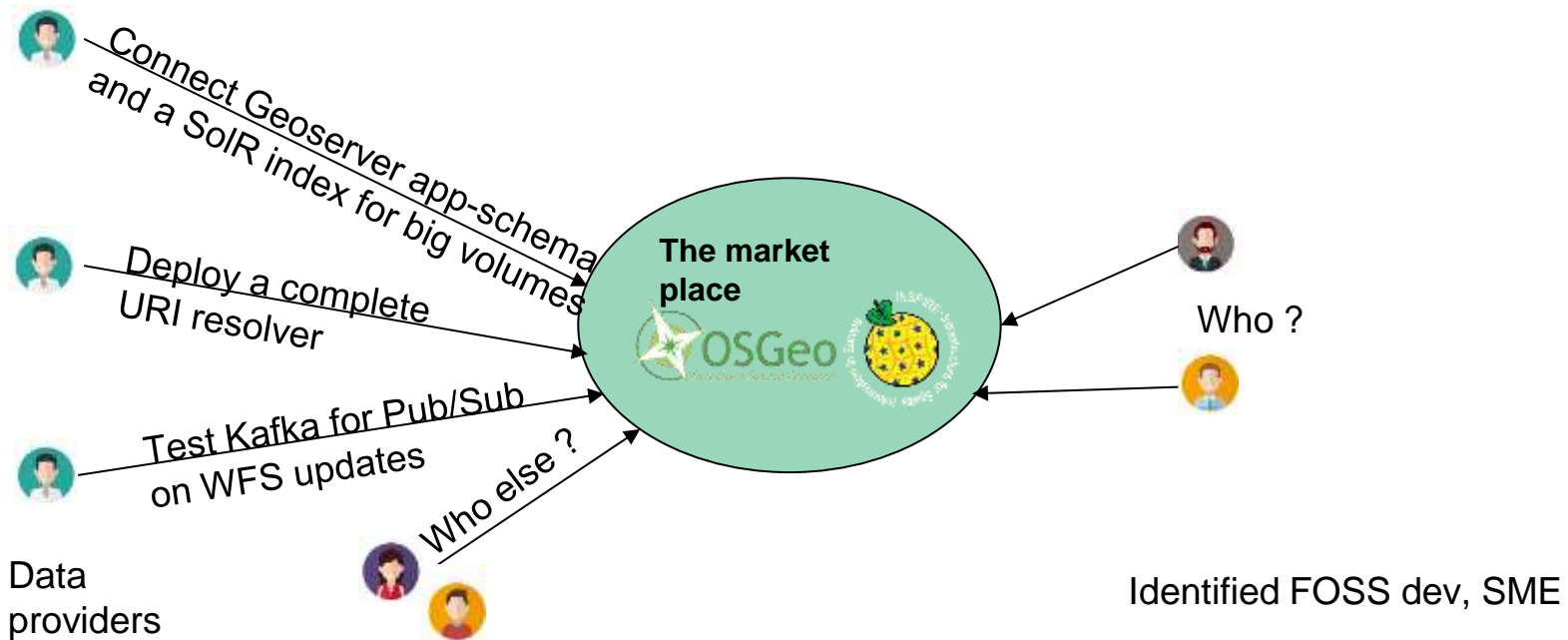
⇒ Data providers IT needs solved

⇒ FOSS companies will be more visible and have more contracts

Data Usage: Bits&Pieces

Ideas of what can be done:

- BRGM issues for the MarketPlace from the French Groundwater Information Network





Discussion / Wrap-up

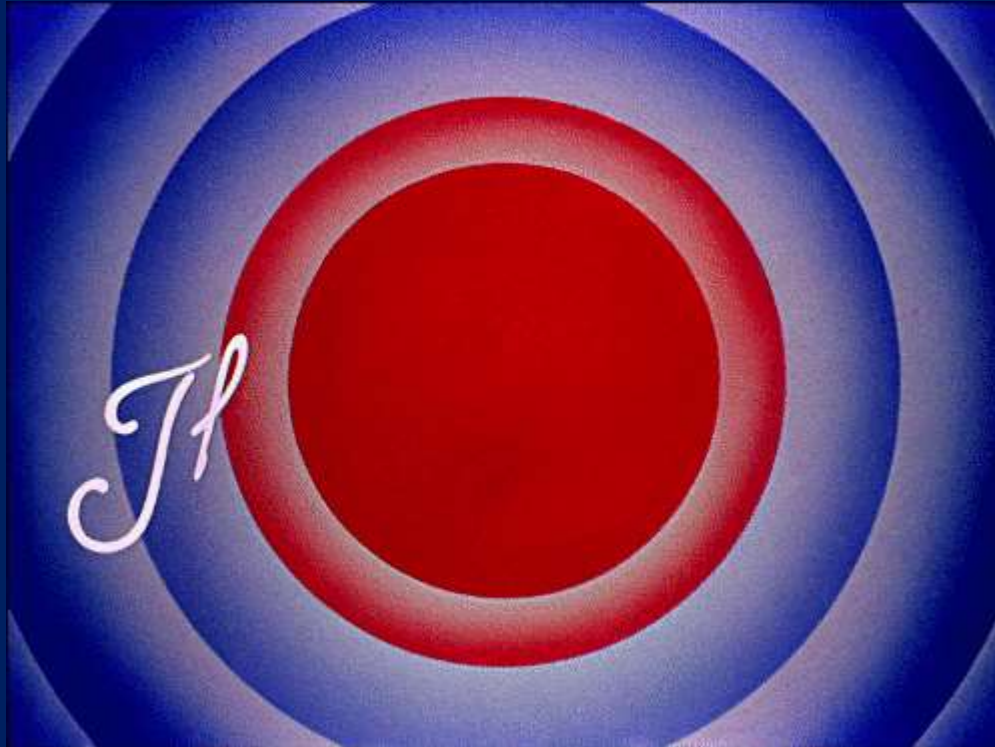
what to do about it



Discussion...



Thanks for your attention



© Disney

Providing INSPIRE measurement data

Thanks for your attention!



Nordic INSPIRE
Network