ISPRA
Istituto Superiore per la Protezione e la Ricerca Ambientale
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EUREGEO

Data Conversion or a wrapper mediator? The Italian example of INSPIRE implementation

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ISPRA has carried out Data Specification Test on:

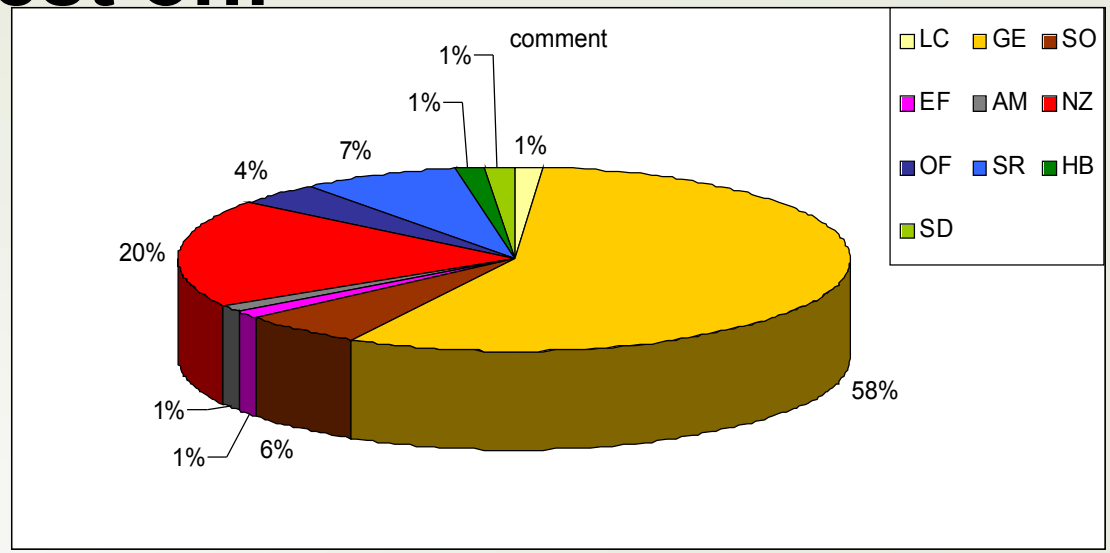
Themes analyzed 10:

1 theme Annex I,

1 theme Annex II and

8 themes Annex III

69 comments



Theme Data Model mapped 7 : ***(Geology, Habitat, Environmental monitoring Facilities, Natural risk zones, Area management/restriction, Oceanographic geographical features, Sea Regions)***

Dataset & Service application with data just conformed:

4

Major problems identify in the test

Most of the domain expert people haven't confidence with the data model and especially with UML:

Application Schema 'HabitatsAndBiotopes Implementation' (version 2.0)						
Type	Documentation	Attribute/Association role/Constraint	Attribute / Association role / Constraint documentation	Values / Enumerations	Multiplicity	Voidable / Non-Voidable
HabitatDistributionUnitFeature	--Name--Habitat distribution unit feature||| Represents individual features (units) in a distribution of habitats.|					
		inspireId	--Name--inspireId|||External object identifier of the spatial object.||An external object identifier is a unique object identifier published by the responsible body, which may be used by external applications to reference the spatial object. The identifier is an identifier of the spatial object, not an identifier of the real-world	IdentifierI	0..1	voidable
		metadata	--Name--metadata|||Source of information on habitats.||EXAMPLE Surveys, monitoring programs, etc.	SourceInformationI	0..1	
		beginLifespanVersion	--Name--begin lifespan version|||Date and time at which this version of the spatial object was inserted or changed in the spatial dataset.||NOTE This date is recorded to enable the generation of change only update files.	DateTimeI		voidable
		coverageePercentageArea	--Name--coverage percentage area|||The area (expressed in percentage) of a habitat within the geometric object that is used to collect, store and present information on the distribution of the habitat (type).||EXAMPLE Percentage of grid cell.	NumberI	0..1	voidable
		coverageePercentageLength	--Name--coverage percentage length|||The length (expressed in percentage) of a habitat within the geometric object that is used to collect, store and present information on the distribution of the habitat (type).||	PercentageI	0..1	voidable
		endLifespanVersion	--Name--end lifespan version|||Date and time at which this version of the spatial object was superseded or retired in the spatial dataset.||NOTE This date is recorded primarily for the system which "clears" an entry in the spatial dataset in the event of an attribute change.	DateTimeI		voidable
		habitat	--Name--habitat|||Identifier for habitat type using one or more classification schemes.||This Habitat may consist of only one HabitatType according to one or more classification schemes.	HabitatTypeI		
		totalArea	--Name--total area|||The area of a habitat (expressed in hectares) within the geometric object that is used to collect, store and present information on the distribution of the habitat (type).||EXAMPLE Area of grid cell.	NumberI	0..1	voidable
		totalLength	--Name--total length|||The length of a habitat (expressed in meters) within the geometric object that is used to collect, store and present information on the distribution of the habitat (type).||	NumberI	0..1	voidable
		geometry	--Name--geometry|||The geometry of each unit in a collection.||	GM_ObjectI		

Application Schema <NaturaMap><Habitat evaluation>							
Type	Documentation	Attribute/Association role/Constraint	Attribute / Association role / Constraint documentation	Values / Enumerations	Multiplicity	Voidable / Non-Voidable	St
Carta degli habitat	habitat distribution unit feature - Represents						
		ID_POLY	unique object identifier	string - 3Letters identifying the region followed by a sequential number	0,,1		
		MetadataURL	relationship		0...1		
		Data_inizio					Consta
		Nat2000	N2000 Code	String	1		Known present databas
		AREA	The area of a habitat in square meters (match with the polygon total area)	Double	1		
		PERIMETER	Habitat shape perimeter	Double	1		We sup the hab polygon perimet
		SHAPE		Polygon	1		

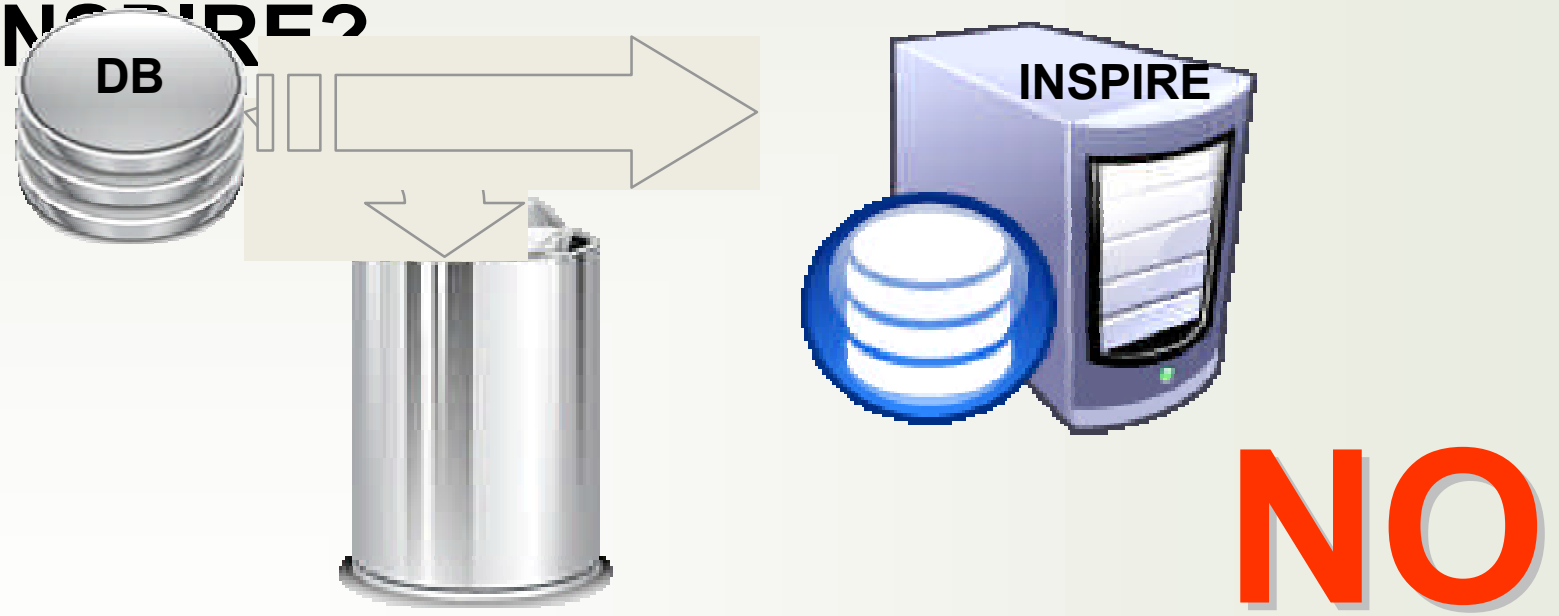
What is the impact of INSPIRE data model?

Mainly on the correspondence between local and INSPIRE attributes; but also a hard work to harmonize the terms to codelist or vocabularies.

- **Most of information required in INSPIRE Data Model are aggregated in an unique attribute (i.e. lithology);**
- **Some INSPIRE attribute aren't stored in our DB because represent a constant (i.e. data custodian all=MinSvEc);**
- **Some local informations not find a correct allocation in the INSPIRE schema.**

Main question after and during the test of Data Specification model is:

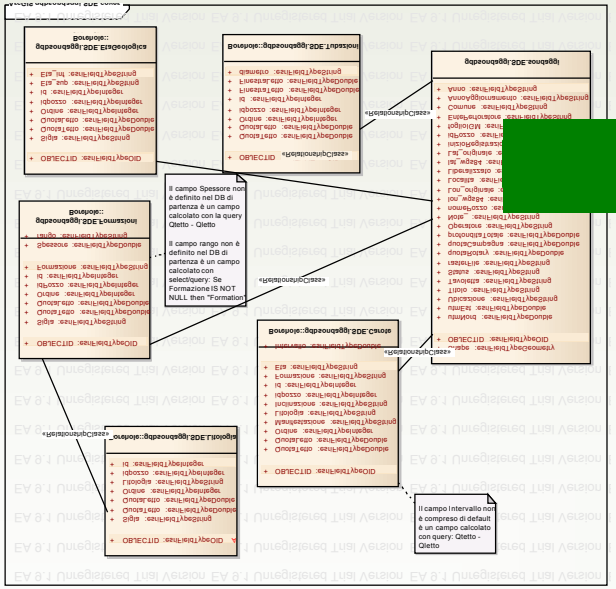
All own database should be modify for INSPIRE?



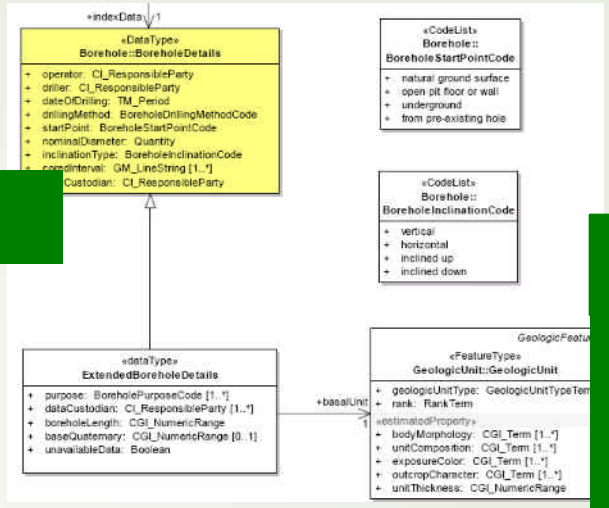
NO

In great part of the case the database to match INSPIRE model should be modify in the information distribution; most of attribute are just present in the db.

ISPRA Database



INSPIRE Data model

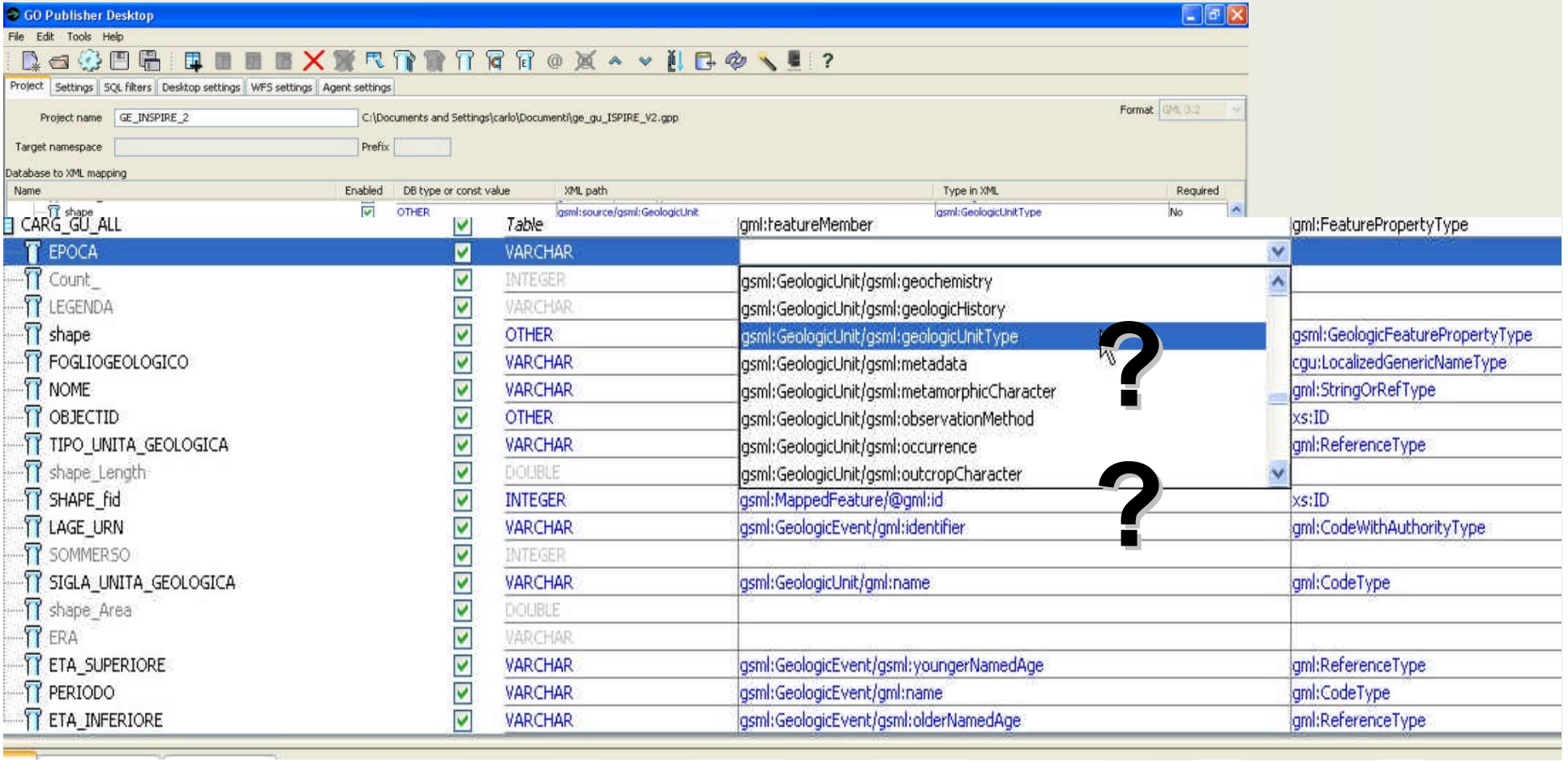


Bridge Table or DB View

As much extended to all the data models

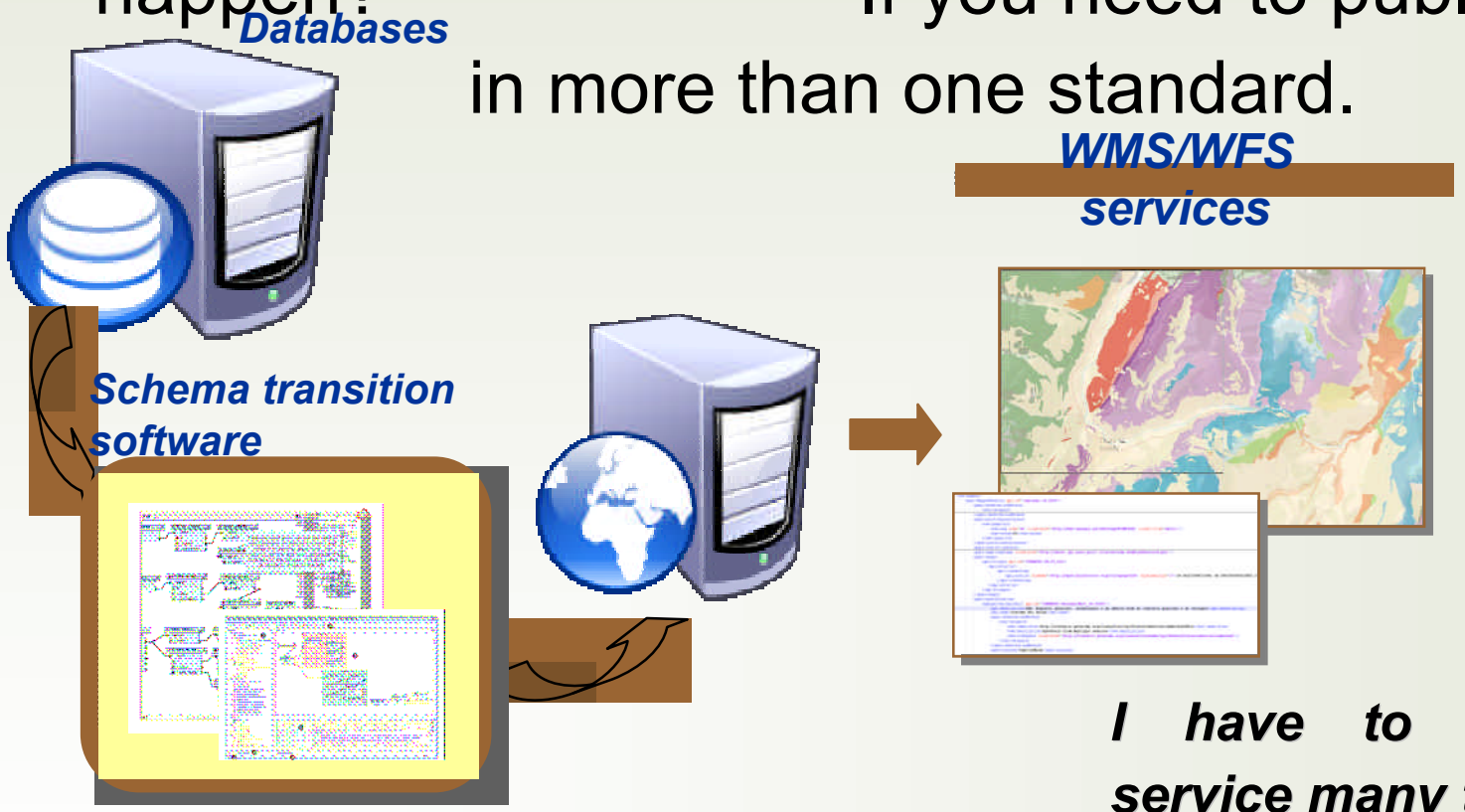
ID	TOP	BOTTOM	AGE_TOP	AGE_BOT	SIGLE	URN:UP_AGE	
1	0	865	MESSINIANO	MESSINIANO	MES0	urn:cgi:classifier:ICS:StratChart:200908:Messinian	ratChart:200908:Messinian
2	865	3730	TORTONIANO	SERRAVALLIANO	SRV0-TOR0	urn:cgi:classifier:ICS:StratChart:200908:Tortonian	urn:cgi:classifier:ICS:StratChart:200908:Serravallian
3	3730	4205	LANGHIANO	LANGHIANO	LAN0	urn:cgi:classifier:ICS:StratChart:200908:Langhian	urn:cgi:classifier:ICS:StratChart:200908:Langhian
4	4205	4250	AQUITANIANO	AQUITANIANO	AQT0	urn:cgi:classifier:ICS:StratChart:200908:Aquitanian	urn:cgi:classifier:ICS:StratChart:200908:Aquitanian
5	4250	4369	OLIGOCENE	OLIGOCENE	OLI0	urn:cgi:classifier:ICS:StratChart:200908:Oligocene	urn:cgi:classifier:ICS:StratChart:200908:Oligocene
6	4369	4450	EOCENE SUPERIORE	EOCENE MEDIO	EOC2 EOC3	urn:cgi:classifier:ICS:StratChart:200908:Bartonian	urn:cgi:classifier:ICS:StratChart:200908:Lutetian
7	4450	4475	EOCENE INFERIORE	EOCENE INFERIORE	EOC1	urn:cgi:classifier:ICS:StratChart:200908:Ypresian	urn:cgi:classifier:ICS:StratChart:200908:Ypresian
8	4475	4500	PALEOCENE	PALEOCENE	PG00	urn:cgi:classifier:ICS:StratChart:200908:Paleocene	urn:cgi:classifier:ICS:StratChart:200908:Paleocene
9	4500	4590	MAASTRICHTIANO	CAMPANIANO	CMP0 MAA0	urn:cgi:classifier:ICS:StratChart:200908:Maastrichtian	urn:cgi:classifier:ICS:StratChart:200908:Campanian
10	4590	4682	SANTONIANO	CONIACIANO	CON0 SAN0	urn:cgi:classifier:ICS:StratChart:200908:Santonian	urn:cgi:classifier:ICS:StratChart:200908:Coniacian
11	4682	4700	TURONIANO	TURONIANO	TUR0	urn:cgi:classifier:ICS:StratChart:200908:Turonian	urn:cgi:classifier:ICS:StratChart:200908:Turonian
12	4700	4747	CENOMANIANO	CENOMANIANO	CEN0	urn:cgi:classifier:ICS:StratChart:200908:Cenomanian	urn:cgi:classifier:ICS:StratChart:200908:Cenomanian
13	4747	4774	ALBIANO	APTIANO	APT0 ALB0	urn:cgi:classifier:ICS:StratChart:200908:Albian	urn:cgi:classifier:ICS:StratChart:200908:Aptian
14	4774	4995	BARREMIANO	BARREMIANO	BRM0	urn:cgi:classifier:ICS:StratChart:200908:Barremian	urn:cgi:classifier:ICS:StratChart:200908:Barremian
15	4995	5040	NEOCOMIANO	NEOCOMIANO	NEO0	urn:cgi:classifier:ICS:StratChart:200908:LowerCretaceous	urn:cgi:classifier:ICS:StratChart:200908:LowerCretaceous
16	5040	5130	TITONICO SUPERIORE	TITONICO SUPERIORE		urn:cgi:classifier:ICS:StratChart:200908:Tithonian	urn:cgi:classifier:ICS:StratChart:200908:Tithonian
17	5130	5374	MALM	DOGGER	J012 J013	urn:cgi:classifier:ICS:StratChart:200908:UpperJurassic	urn:cgi:classifier:ICS:StratChart:200908:LowerJurassic
18	5374	5438	LIAS SUPERIORE	LIAS SUPERIORE	J001	urn:cgi:classifier:ICS:StratChart:200908:LowerJurassic	urn:cgi:classifier:ICS:StratChart:200908:LowerJurassic
19	5438	5747	LIAS MEDIO	LIAS MEDIO	J001	urn:cgi:classifier:ICS:StratChart:200908:UpperTriassic	urn:cgi:classifier:ICS:StratChart:200908:UpperTriassic
20	5747	5772	LIAS INFERIORE	LIAS INFERIORE	J001	urn:cgi:classifier:ICS:StratChart:200908:UpperTriassic	urn:cgi:classifier:ICS:StratChart:200908:UpperTriassic

We have use some specific software (Go Publisher) to transform the geologic database in INSPIRE to provide WFS and WMS in INSPIRE compatible format:



Publish data in a INSPIRE format, but what it's happen?

If you need to publish data in more than one standard.



I have to replicate the service many times.

Each service should be replicate x times as much is the standard to serve!

```
- <wfs:FeatureCollection xsi:schemaLocation="http://xmlns.geosciml.org/GeoSciML-Core/3.0 file:/F:/DataSpecification/TestInspire/INSPIRE_GML_application_schemas_v2.0.2/xsd/GeologyCore.xsd
  http://www.opengis.net/wfs/2.0 http://schemas.opengis.net/wfs/2.0/wfs.xsd http://www.opengis.net/gml http://schemas.opengis.net/gml/3.1.1/base/gml.xsd" timeStamp="2011-11-11T12:00:00"
  numberMatched="1" numberReturned="1">
  + <wfs:boundedBy></wfs:boundedBy>
  - <wfs:member>
    - <gsml:MappedFeature ns1:id="isprasgi.gmf.354">
      + <gsml:observationMethod></gsml:observationMethod>
      + <gsml:positionalAccuracy></gsml:positionalAccuracy>
      + <gsml:resolutionScale></gsml:resolutionScale>
        <gsml:samplingFrame ns1:type="simple"/>
      + <gsml:shape></gsml:shape>
      - <gsml:specification>
        - <gsml:GeologicUnit ns1:id="isprasgi1">
          - <ns1:description>
              Mixed alluvional deposits due to alternation between fluvial and debris-flow process; maily composed by alternation of sand-gravel and clay. Partialy cemented.
            </ns1:description>
          - <gsml:observationMethod>
            - <CGI_Term>
                <qualifier xsi:nil="true" nilReason="missing"/>
                <value xlink:href="http://resource.geosciml.org/classifier/cgi/featureobservationmethod/0014" xlink:title="Synthesis from multiple sources"/>
              </CGI_Term>
            </gsml:observationMethod>
            <gsml:purpose>typicalNorm</gsml:purpose>
          - <gsml:geologicHistory>
            - <gsml:GeologicEvent ns1:id="isprasgi.event.1">
                <gsml:eventProcess xlink:href="http://resource.geosciml.org/classifier/cgi/eventprocess/0016" xlink:title="deposition"/>
                <gsml:numericAgeDate xsi:nil="true" nilReason="missing"/>
                <gsml:olderNamedAge xlink:href="urn:cgi:classifier:ICS:StratChart:200908:Holocene" xlink:title="Holocene"/>
                <gsml:youngerNamedAge xlink:href="urn:cgi:classifier:ICS:StratChart:200908:Holocene" xlink:title="Holocene"/>
                <gsml:eventEnvironment xsi:nil="true" nilReason="missing"/>
                <gsml:incrementalDisplacement xsi:nil="true" nilReason="missing"/>
```

Technologies solutions?

There is another solution?

YES

<u>Re-build our database</u> in INSPIRE conformant format.

Disadvantages:

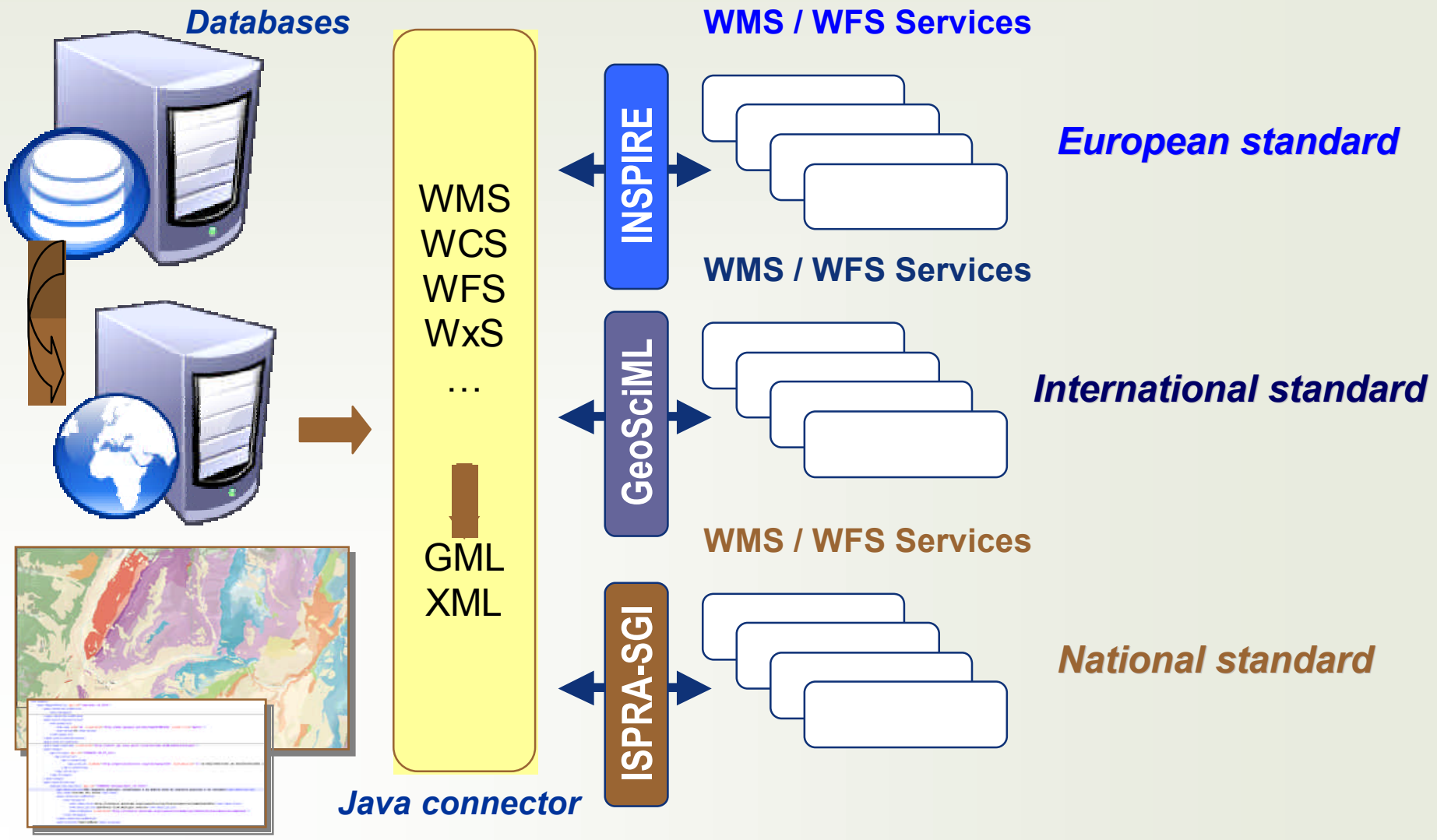
- *High impact on the own system;*
- *Just one way to publish data – INSPIRE format, if not create a data model more extended;*
- *Not flexible on the future modification;*
- *Maybe not conformant with the National and/or other*

What it's happen if we use a wrapper solutions?

What it's a <u>wrapper</u>: it's a mediator uniform user interface that queries the integrated view of heterogeneous information sources in a global data model.

In this case the wrapper represent a mediator frontend JAVA Connector (Exows developed by BRGM) to map the local WFS/WMS that are including all of the INSPIRE information in: INSPIRE compliant services; OneGeology compliant services and in national or other kind of standard.

Publish data in multiple formats



Exows example for INSPIRE

INSPIRE TEST Data Specification Web Service

Debug is disabled by eXows configuration

View the configuration file

WMS

getCapabilities

Service	Version	Language	Test
WMS	1.1.1	eng	[Link]
WMS	1.3.0	eng	[Link]

getMap

Service	Version	LayerName	Language	Style	Full Extent Test	Partial Extent Test
WMS	1.1.1	GE_CARG_GU_Age	eng	default	[Full]	[Partial]
WMS	1.1.1	GE_CARG_GEOMORPHOLOGY	ita	default	[Full]	[Partial]

getFeatureInfo

Service	Version	LayerName	Format	Language	Test
WMS	1.1.1	GE_CARG_GU_Age	GSML	N.A.	[Link]
WMS	1.1.1	GE_CARG_GU_Age	HTML	eng	[Link]
WMS	1.1.1	GE_CARG_GEOMORPHOLOGY	GSML	N.A.	[Link]
WMS	1.1.1	GE_CARG_GEOMORPHOLOGY	HTML	eng	[Link]

WFS

getCapabilities

Service	Version	Language	Test
WFS	1.0.0	eng	[Link]

getFeature

Service	Version	TypeName	Parameters	Test
WFS	1.0.0	INSPIRE_GE_GeologicUnit:GE_CARG_GU_Age	MAXFEATURES=10	[Link]

Wfs response standard with INSPIRE


```
− <wfs:FeatureCollection xsi:schemaLocation="http://xmlns.geosciml.org/GeoSciML-Core/3.0 file:/F:/DataSpecification/TestInspire/INSPIRE_GML_application_schemas_v2.0.2/xsd/GeologyCore.xsd
  http://www.opengis.net/wfs/2.0 http://schemas.opengis.net/wfs/2.0/wfs.xsd http://www.opengis.net/gml http://schemas.opengis.net/gml/3.1.1/base/gml.xsd" timeStamp="2011-11-11T12:00:00"
  numberMatched="1" numberReturned="1">
  + <wfs:boundedBy></wfs:boundedBy>
  − <wfs:member>
    − <gsml:MappedFeature ns1:id="isprasgi.gmf.354">
      + <gsml:observationMethod></gsml:observationMethod>
      + <gsml:positionalAccuracy></gsml:positionalAccuracy>
      + <gsml:resolutionScale></gsml:resolutionScale>
        <gsml:samplingFrame ns1:type="simple"/>
      + <gsml:shape></gsml:shape>
      − <gsml:specification>
        − <ge-core:NaturalGeomorphologicFeature ns1:id="isprasgi.gm.354">
          − <gsml:observationMethod>
            − <CGI_Term>
                <qualifier/>
                <value/>
              </CGI_Term>
            </gsml:observationMethod>
            <gsml:purpose>instance</gsml:purpose>
          − <gsml:geologicHistory>
            − <gsml:GeologicEvent ns1:id="isprasgi.history.gm.354">
                <gsml:eventProcess/>
                <gsml:numericAgeDate xsi:nil="true" nilReason="missing"/>
                <gsml:olderNamedAge xlink:href="urn:cgi:classifier:ICS:StratChart:200908:Holocene" xlink:title="Holocene"/>
                <gsml:youngerNamedAge xlink:href="urn:cgi:classifier:ICS:StratChart:200908:Holocene" xlink:title="Holocene"/>
                <gsml:eventEnvironment xsi:nil="true" nilReason="missing"/>
                <gsml:incrementalDisplacement xsi:nil="true" nilReason="missing"/>
              </gsml:GeologicEvent>
            </gsml:geologicHistory>
          − <ge-core:relatedUnit>
```

Exows example for OneGeology

WMS	1.1.1	ita	[Link]
WMS	1.3.0	ita	[Link]

getMap

Service	Version	LayerName	Language	Style	Full Extent Test	Partial Extent Test
WMS	1.1.1	OGE_1M_surface_GeologicUnit	eng	default	[Full]	[Partial]
WMS	1.1.1	OGE_1M_surface_GeologicUnit	ita	default	[Full]	[Partial]
WMS	1.1.1	OGE_1M_surface_GeologicUnit	eng	age	[Full]	[Partial]
WMS	1.1.1	OGE_1M_surface_GeologicUnit	ita	age	[Full]	[Partial]
WMS	1.1.1	OGE_1M_Surface_GeologicStructure	eng	default	[Full]	[Partial]
WMS	1.1.1	OGE_1M_Surface_GeologicStructure	ita	default	[Full]	[Partial]

getFeatureInfo

Service	Version	LayerName	Format	Language	Test
WMS	1.1.1	OGE_1M_surface_GeologicUnit	GSML	N.A.	[Link]
WMS	1.1.1	OGE_1M_surface_GeologicUnit	HTML	eng	[Link]
WMS	1.1.1	OGE_1M_surface_GeologicUnit	HTML	ita	[Link]
WMS	1.1.1	OGE_1M_Surface_GeologicStructure	GSML	N.A.	[Link]
WMS	1.1.1	OGE_1M_Surface_GeologicStructure	HTML	eng	[Link]
WMS	1.1.1	OGE_1M_Surface_GeologicStructure	HTML	ita	[Link]

WFS

getCapabilities

Service	Version	Language	Test
WFS	1.0.0	eng	[Link]
WFS	1.0.0	ita	[Link]

getFeature

Service	Version	TypeName	Parameters	Test
WFS	1.0.0	OGE_1M_surface_GeologicUnit	MAXFEATURES=10	[Link]
WFS	1.0.0	OGE_1M_Surface_GeologicStructure	MAXFEATURES=10	[Link]

Wfs response standard with OneGeology


```
- <wfs:FeatureCollection xsi:schemaLocation="http://www.opengis.net/wfs http://schemas.opengis.net/wfs/1.1.0/wfs.xsd http://www.opengis.net/gml http://schemas.opengis.net/gml/3.1.1/base/gml.xsd
  urn:cgi:xmlns:CGI:GeoSciML:2.1 http://www.geosciml.org/geosciml/2.1/xsd/geosciml.xsd http://www.opengis.net/om/1.0 http://schemas.opengis.net/om/1.0.0/om.xsd http://www.opengis.net/sampling/1.0
  http://schemas.opengis.net/sampling/1.0.0/sampling.xsd">
  - <gml:featureMember>
    - <gsml:MappedFeature gml:id="1">
      + <gsml:observationMethod></gsml:observationMethod>
      + <gsml:positionalAccuracy></gsml:positionalAccuracy>
        <gsml:samplingFrame xlink:href="$feature.getGmlValueFromGSMLxpath('gsml:MappedFeature/gsml:samplingFrame@xlink:href')"/>
      - <gsml:specification>
        - <gsml:GeologicUnit gml:id="1">
            <gml:name>1</gml:name>
          - <gml:description>
              Deltaic, alluvial and coastal plain deposits; aeolian deposits
            </gml:description>
            <gsml:geologicUnitType xlink:href="lithostratigraphic_unit"/>
          - <gsml:observationMethod>
            - <gsml:CGI_TermValue>
                <gsml:value codeSpace="http://www.cgi-iugs.org/uri">synthesis_of_multiple_published_descriptions</gsml:value>
              </gsml:CGI_TermValue>
            </gsml:observationMethod>
            <gsml:purpose>typicalNorm</gsml:purpose>
          - <gsml:preferredAge>
            - <gsml:GeologicEvent>
              - <gsml:eventAge>
                - <gsml:CGI_TermRange>
                  - <gsml:lower>
                    - <gsml:CGI_TermValue>
                        <gsml:value codeSpace="http://www.cgi-iugs.org/uri">urn:cgi:classifier:ICS:StratChart:200908:Holocene</gsml:value>
                      </gsml:CGI_TermValue>
                    </gsml:lower>
                  - <gsml:upper>
```

Remarks on data conversion solution

Advantages:

- *Not need to build more than one Database view*
- *Publish the data as INSPIRE format in a direct way without framework (i.e. ArcGIS for INSPIRE tool or Snowflake)*

Disadvantages:

- *Multiple management of the services (at least one for standard) - require more resources;*
- *Acquire new pieces of software – commercial and/or open-source*

Remarks on wrapper solution

Advantages:

- *Not need to build a spoecific Database*
- *Publish the data in multiple formats (INSPIRE, International, National) using the connectors*
- *Flexible to the future modification of the models;*
- *Not need to modify the SDI architecture*

Disadvantages:

- *Need of a training course to configure the multiple connectors.*

In the end is better data conversion or a wrapper mediator?

???????

Thank you for the attention! Please questions???