

INSPIRE: Interoperability in Practice

An On-line Executable Test Suite to Validate Annex I-II-III INSPIRE Datasets

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SUMMARY

- Service main features
- Cooperation with OGC CITE
- Data centric validation
- Examples of Schematron validation
- Guidelines to the execution of a manual test
- The eENVplus Validation Service in the context of INSPIRE MIWP5 (MIG Working Group 5 Validation and Conformity Testing)
- Providing an online framework for AQD schematron validation

Service main features

■ Purpose:

- ☐ To provide an Executable Test Suite (ETS) implementing the Abstract Test Suite (ATS) contained in the INSPIRE Data Specifications

■ Environment:

- ☐ Ubuntu operating system
- ☐ Apache Tomcat 7.0.52 web server

Service main features

■ Access:

☐ via web browser

■ http://cloud.epsilon-italia.it/eenvplus_new/

☐ via REST APIs

■ `http://cloud.epsilon-italia.it:8081/teamengine/rest/suites/gml32/3.2.1-r18/run?gml=gml filename&sch=schematron filename`

Service main features

- The eENVplus Validation Service is based on the customized use of the free testing facility GML 3.2 (ISO 19136:2007) Conformance Test Suite, developed as part of the OGC Compliance Program (CITE).

Service main features

- The Test, Evaluation, And Measurement (TEAM) Engine, the official test harness used by OGC Compliance Program, and the GML testing facility have been
 - ☐ checked out from GitHub OGC repositories
 - TEAM Engine version 4.0.5 - GML Suite release r17
 - ☐ installed on cloud server
 - ☐ customized (in terms of user interface)
 - ☐ enriched with theme-specific schematron rules provided by the eENVplus team

Cooperation with OGC

- Ongoing cooperation with OGC-CITE team to improve readability of the GML 3.2 test suite report interfaces: agreed mockups for the reporting of the validation process results.
- Testing new releases of the GML 3.2 test suite.

Cooperation with OGC

- Issues reported by eENVplus team leading to bug-fixing:
 - Remove assertion requiring metadata property value to be in application namespace: - fixed in release r16
 - Not performing assertion checking that a polygon is closed - fixed in release r20

Data-centric validation

- Abstract Test Suite (ATS) included in the Annex A of the INSPIRE Data Specifications is the starting point for the conformance testing process of datasets.
 - Annex A - Part 1 (Normative)
 - Annex A - Part 2 (Informative)

INSPIRE Data Specification ATS

Conformance Class	Tests
A.1 Application Schema Conformance Class	A.1.1 Schema element denomination test
	A.1.2 Value type test
	A.1.3 Value test
	A.1.4 Attributes/associations completeness test
	A.1.5 Abstract spatial object test
	A.1.6 Constraints test
	A.1.7 Geometry representation test
A.2 Reference Systems Conformance Class	A.2.1 Datum test
	A.2.2 Coordinate reference system test
	A.2.3 Grid test
	A.2.4 View service coordinate reference system test
	A.2.5 Temporal reference system test
	A.2.6 Units of measurements test
A.3 Data Consistency Conformance Class	A.3.1 Unique identifier persistency test
	A.3.2 Version consistency test
	A.3.3 Life cycle time sequence test
	A.3.4 Validity time sequence test
	A.3.5 Update frequency test
A.4 Data Quality Conformance Class	A.4.1 Data quality target results test
A.5 Metadata IR Conformance Class	A.5.1 Metadata for interoperability test
A.6 Information Accessibility Conformance Class	A.6.1 Code list publication test
	A.6.2 CRS publication test
	A.6.3 CRS identification test
	A.6.4 Grid identification test
A.7 Data Delivery Conformance Class	A.7.1 Encoding compliance test
A.8 Portrayal Conformance Class	A.8.1 Layer designation test
A.9 Technical Guideline Conformance Class	A.9.1 Multiplicity test
	A.9.1 CRS http URI test
	A.9.2 Metadata encoding schema validation test
	A.9.3 Metadata occurrence test
	A.9.4 Metadata consistency test
	A.9.5 Encoding schema validation test
	A.9.6 Coverage multipart representation test
	A.9.7 Coverage domain consistency test
	A.9.8 Style test

Part 1 - normative

Part 2 - informative

eENVplus Validation Service



The eENVplus Validation Service provides Executable Test Suites (ETS) implementing the Abstract Test Suites (ATS) which are included in the Annex A of the INSPIRE Data Specifications and contain a set of tests to be applied on a dataset to evaluate whether it fulfils the INSPIRE requirements.

ATS

Annex A - Part 1: includes tests aiming at assessing the conformance of the dataset with the requirements of the Directive 2007/2/EC of the European Parliament and of the Council of 1253/2013 of 21 October 2013".

Annex A - Part 2: includes tests aiming at assessing the conformance of the dataset with the requirements of the INSPIRE Data Specifications.

The requirements to be tested are grouped in several Conformance Classes. Each of these classes covers a specific aspect: for example related to the requirements on the reference systems, etc. In order to be **conformant** to a specific Conformance Class, a dataset is not yet conformant with all requirements of the class.

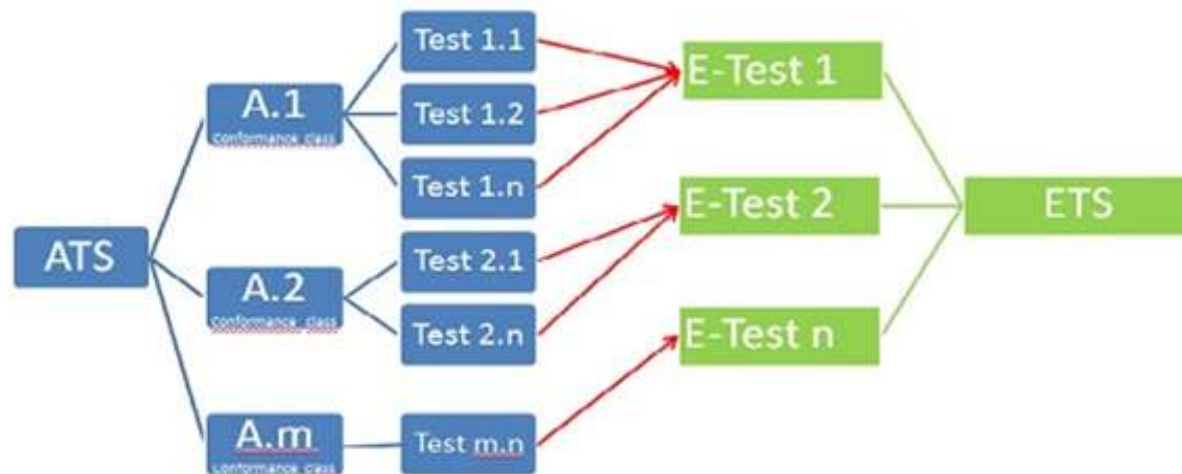
ETS

In order to execute abstract tests associated to Conformance Classes, the ETS contains a physical implementation of the abstract tests. For those tests that cannot be automated the ETS contains a manual test. A single executable test can cover different abstract tests.

Tests included in the ATS vary according to the different INSPIRE Themes. Select the INSPIRE Theme from the underlying dropdown of the relevant INSPIRE Data Specifications and have a look at the tests included in the ATS.

Select an INSPIRE Theme

- Coordinate reference systems
- Geographical grid systems
- Geographical names
- Administrative units
- Addresses
- Cadastral parcels
- Transport networks
- Hydrography
- Protected Sites



Tests included in the ATS vary according to the different data themes.

Example of implementation of ETS for the Protected Sites theme

eENVplus Validation Service



The ATS table below contains a detailed list of the abstract tests included in the **ATS** for the **Protected Sites** and relevant **Executable Tests (ET)** provided by the **eENVplus Validation Service**. Abstract tests marked by "*" make use of validation files developed by eENVplus team.

Click links in the list of Available Executable Tests of the GML Data Validation ETS to access the relevant Executable Tests or **Click** arrow icon to go back to the HOME page

ATS	Conformance classes	Abstract Tests	Related ET	Available Executable Tests of the GML Data Validation ETS
Part 1 (normative)	A.1 Application Schema Conformance Class	A.1.1 Schema element denomination test	E.1	E.1- Automated Validation : A.1: all tests - A.2.1: Datum test, A.2.2: Coordinate Reference System test - A.5.2: CRS publication test, A.5.3: CRS identification test - A.6.1: Encoding compliance test - A.8.1: Multiplicity test, A.8.6 Encoding schema validation test
		A.1.2 Value type test	E.1	
		A.1.3 Value test *	E.1	
		A.1.4 Attributes/Associations completeness test	E.1	
		A.1.5 Abstract spatial object test	E.1	
		A.1.6 Constraints test *	E.1	
		A.1.7 Geometry representation test*	E.1	
	A.2 Reference Systems Conformance Class	A.2.1 Datum test *	E.1	E.2- Guideline to Manual Validation : A.2.3: View service CRS test, A.2.4: Temporal reference system test, A.2.5: Units of measurements test
		A.2.2 Coordinate reference system test *	E.1	
		A.2.3 View service CRS test	E.2	
		A.2.4 Temporal reference system test	E.2	
		A.2.5 Units of measurements test	E.2	
	A.3 Data Consistency Conformance Class	A.3.1 Unique identifier persistency test	E.3	E.3- Guideline to Manual Validation : A.3: all tests
		A.3.2 Version consistency test	E.3	
		A.3.3 Update frequency test	E.3	
	A.4 Metadata IR Conformance Class	A.4.1 Metadata for interoperability test	E.4	E.4- Guideline to Manual Validation : A.4: all tests
	A.5 Information Accessibility Conformance Class	A.5.1 Code list publication test	E.5	E.5- Guideline to Manual Validation : A.5.1: Code list publication test
		A.5.2 CRS publication test *	E.1	
		A.5.3 CRS identification test *	E.1	
	A.6 Data Delivery Conformance Class	A.6.1 Encoding compliance test	E.1	E.6- Guideline to Manual Validation : A.7: all tests
	A.7 Portrayal Conformance Class	A.7.1 Layer designation test	E.6	E.7- Guideline to Manual Validation : A.8.2: CRS http URI test
				E.8- Guideline to Manual Validation : A.8.3: Metadata encoding schema validation test, A.8.4: Metadata occurrence test, A.8.5: Metadata consistency test
				E.9- Guideline to Manual Validation : A.8.7: Style test

Automated validation and Manual guidelines to validation

Not all the tests contained in the ATS can be executed automatically (by means of software tools), and for some of them the manual intervention is not avoidable. Therefore the Validation Service provides

- an automated validation (namely the E.1 Test) for those abstract tests that can be executed automatically
- guidelines to manual validation for those abstract tests that cannot be automated (namely E2 ..E9 executable tests)

Automated validation: E.1 Executable Test

Protected Sites

A.1 Application Schema Conformance Class	A.1.1 Schema element denomination test	
	A.1.2 Value type test	ance test - A.8.1 Multiplicity test, A.8.6 Encoding schema validation
	A.1.3 Value test *	oped by OGC, which verifies the conformance of GML data with respect to
	A.1.4 Attributes/associations completeness test	
	A.1.5 Abstract spatial object test	provided by the OGC GML 3.2 Test Suite used as is,
	A.1.6 Constraints test *	(namely tests A.1.3 and A.1.6), the requirements related to CRS (namely tests A.5.2 and A.5.3) and these tests will be executed only if the user selects the Protected Sites

execution of automatable tests is performed by means of

- customized **OGC** free testing facility **GML 3.2(ISO 19136:2007) Conformance Test Suite**
- schematron rules provided by the **eENVplus** team

	A.1.6 Constraints test
	A.1.7 Geometry representation test
A.2 Reference Systems Conformance Class	A.2.1 Datum test *
	A.2.2 Coordinate reference system test
A.5 Information Accessibility Conformance Class	A.5.2 CRS publication test *
	A.5.3 CRS identification test *
A.6 Data Delivery Conformance Class	A.6.1 Encoding compliance test
A.8 Technical Guideline Conformance Class	A.8.1 Multiplicity test
	A.8.6 Encoding schema validation test



Login to the eENVplus E.1 Automated Validation Test

Abstract tests covered by E.1



Login to the eENVplus E.1 Automated Validation Test

GWF – INSPIRE CONFERENCE 2015, LISBON, 26-05-2015

Automated validation: E.1 Executable Test

GML 3.2.1 (ISO 19136:2007) Conformance Test Suite

This executable test suite (ETS)

- verifies the conformance of GML dataset with respect to [ISO 19136:2007 \(GML 3.2.1\)](#)
- performs the validation of GML dataset against the INSPIRE application schema declared in the 'xsi:schemalocation' attribute of the GML file. The xsd shall be publicly available and it is strongly recommended that it is expressed as a link to the INSPIRE schema repository (<http://inspire.ec.europa.eu/schemas/>)
- performs the validation of supplementary data constraints if user selects the relevant theme-specific schematron file from underlying schematron drop down list

Location of GML dataset file

To upload the GML dataset file as web resource, insert here the **http URL** OR the relevant **WFS GetFeature request**

To upload the GML dataset from a **local resource** Click the button below

PS_Test_valid.gml

Select relevant theme-specific Schematron file:

Skip schematron test ▼
Skip schematron test
Protected Sites

Automated Validation of tests that lay beyond the reach of an XML Schema grammar is implemented by means of schematron rules developed by **eENVplus team**. Therefore these tests will be executed only if the user selects theme-specific schematron file from the dropdown list when required.

Schematron validation: simple feature requirement

```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <sch:schema xmlns:sch="http://purl.oclc.org/dsdl/schematron" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:xlink="http://www.w3.org/1999/xlink" xml:lang="en">
3
4  <!-- this schematron includes also assertion from https://github.com/32North/common-wal/blob/master/32n-ogc-schema/src/main/resources/META-INF/xml/gmlsfProfile/2.0/gmlsf1.2.sch
5  -->
6  <sch:title>Schematron for testing simple geometry - CRS - code list values </sch:title>
7  <sch:include href="sch" uri="http://purl.oclc.org/dsdl/schematron"/>

```

10

11

12 <!-- IR Requirement Article 12 - Other Requirements & Rules

13 The value domain of spatial properties defined in this Regulation shall be restricted to the Simple Feature spatial schema
 14 as defined in Herring, John R. -OpenGIS® Implementation Standard for Geographic information -->

15

```

18 [OGC 06-103r3] specification. -->
19
20 <sch:pattern name="Non-linearly interpolated curves not included">
21
22   <sch:rule context="/" />
23
24   <sch:assert
25     test="not(self::gml:Node|self::gml:Edge|self::gml:Face|self::gml:TopoSolid|self::gml:TopoPoint|self::gml:TopoCurve|self::gml:TopoSurface|self::gml:TopoVolume)"
26     Spatial properties are limited to the set of geometric
27     types consisting of point, curve with linear and/or
28     circular arc interpolation, planar surface, or aggregates
29     thereof. Spatial topology is excluded.
30   </sch:assert>
31
32
33   <sch:assert
34     test="not(self::gml:Curve) or self::gml:Curve/gml:segments[gml:LineStringSegment]"
35     ERROR DESCRIPTION: Curves (standalone or within surfaces) must have linear
36     interpolation (LineString)
37   </sch:assert>
38
39
40   <!-- Rule for constraints on planar surfaces -->
41   <sch:assert
42     test="not(self::gml:OrientableSurface|self::gml:CompositeSurface|self::gml:PolyhedralSurface|self::gml:Tin|self::gml:TriangulatedSurface)"
43     ERROR DESCRIPTION: Planar surface types are restricted to Polygon or MultiSurface
44     elements.
45   </sch:assert>
46   <!-- Rule for constraints on GeometryPropertyType -->
47   <sch:assert
48     test="not(self::gml:Solid|self::gml:MultiSolid|self::gml:CompositeSolid|self::gml:CompositeCurve|self::gml:Grid)"
49     ERROR DESCRIPTION: Supported geometry types are restricted to point, curve with
50     linear and/or circular arc interpolation, planar surface,
51     or aggregates thereof.
52   </sch:assert>
53   <!-- Rule for geometry coordinates of points and circles by

```

Schematron validation: codelist values requirement

```
13
14 <!-- ATS test
15 A.1.3 Value test
16 Purpose: Verify whether all attributes or association rules whose value type is a code list or enumeration take the values set out therein.
17 A.1.6 Constraints test
18 Purpose: Verification whether the instances of spatial object and/or data types provided in the dataset adhere to the constraints specified
19 in the target application scheme(s).
20 Designation constraint : Sites must use designations from an appropriate designation scheme, and the designation code value must agree with the designation scheme. -->
21
22
23 <sch:cp>The value of the designation code shall be contained in the relevant designation scheme codelist.</sch:cp>
24
25 <sch:rule context="ps:DesignationType">
26   <sch:let name="designationscheme_name" value="ps:designationscheme"/>
27   <sch:let name="designation_name" value="ps:designation"/>
28   <sch:assert test="
29     not ( (ps:designationscheme='IUCN' and ((ps:designation='managedResourceProtectedArea') or (ps:designation='nationalPark') or (ps:designation='naturalMonument') or (ps:design
30     or
31     (ps:designationscheme='IUCN' and ((ps:designation='managedResourceProtectedArea') or (ps:designation='nationalPark') or (ps:designation='naturalMonument') or (ps:design
32     or (ps:designation='habitatSpeciesManagementArea') or (ps:designation='protectedLandscapeOrSeascape')
33     or (ps:designation='wildernessArea'))))
34     (ps:designationscheme='natura2000' and ((ps:designation='proposedSiteOfCommunityImportance') or (ps:designation='proposedSpecialProtectionArea') or (ps:designation='
35     or
36     (ps:designationscheme='UNESCOWorldHeritage' and ((ps:designation='cultural') or (ps:designation='mixed') or (ps:designation='natural'))))
37     or
38     (ps:designationscheme='raesar' and ((ps:designation='raesar'))))
39     or
40     (ps:designationscheme='UNESCOManAndBiosphereProgramme' and ((ps:designation='BiosphereReserve'))))
41     or
42     (ps:designationscheme='nationalMonumentsRecord' and ((ps:designation='agricultureAndSubsistence') or (ps:designation='civil') or (ps:designation='commemorative') or (
43     "
44     "
45     "
46     "
47     "
48     "
49     "
50     "
51     "
52     "
53     "
54     ERROR DESCRIPTION:
55     Protected sites must be labeled according to codelists !
56     Erroneous designation value ' <sch:value-of select="$designation_name"/> ' found for the <sch:value-of select="$designationscheme_name"/> designation scheme.
57   </sch:assert>
58 </sch:rule>
59 </sch:pattern>
```


Example of Guidelines to manual validation: ATS test A.4.1

eENVplus Validation Service



Protected sites

E.4 Guideline to Manual Validation

A.4.1 - Metadata for interoperability Test

Purpose of A.4.1 test is "Verify whether the metadata for interoperability of spatial data sets and services described in 1089/2010 Commission Regulation have been created and published for each dataset related to the PS data theme".

Figure below lists the **Metadata for interoperability of spatial data sets and services** described in Commission Regulation 1089/2010 and its successive amendment Commission Regulation 1253/2013.

IR Requirement

Article 13

Metadata required for Interoperability

The metadata describing a spatial data set shall include the following metadata elements required for interoperability:

1. Coordinate Reference System: Description of the coordinate reference system(s) used in the data set.
2. Temporal Reference System: Description of the temporal reference system(s) used in the data set.

This element is mandatory only if the spatial data set contains temporal information that does not refer to the default temporal reference system.

3. Encoding: Description of the computer language construct(s) specifying the representation of data objects in a record, file, message, storage device or transmission channel.
4. Topological Consistency: Correctness of the explicitly encoded topological characteristics of the data set as described by the scope.

This element is mandatory only if the data set includes types from the Generic Network Model and does not assure centreline topology (connectivity of centrelines) for the network.

5. Character Encoding: The character encoding used in the data set.

This element is mandatory only if an encoding is used that is not based on UTF-8.

6. Spatial Representation Type: The method used to spatially represent geographic information.

To pass the test, at least the following three mandatory metadata for interoperability elements must be available in a published metadata file for your dataset

- coordinate reference systems
- encoding
- spatial representation type

Moreover if your dataset contains temporal information that does not refer to the default temporal reference system, also the metadata describing the **temporal reference system** must be present. If an encoding is used that is not based on UTF-8, also the metadata describing the **character encoding** must be present.

While not explicitly required by any of the INSPIRE Implementing Rules, making all metadata of a dataset available together and through one service simplifies implementation and usability. So it is recommended you create and publish a single metadata file containing both discovery metadata file (required by INSPIRE Metadata Regulation 1205/2008) and the metadata for interoperability.

It's noteworthy to mention here the **eENVplus Metadata Editor** which helps the creation of INSPIRE compliant metadata file containing both **discovery metadata** and **metadata for interoperability**. Moreover it allows the publication of your metadata on the GeoNetwork Catalogue

Should test A.4.1 be successfully passed, conformance to **A.4 Metadata IR Conformance Class** can be claimed.

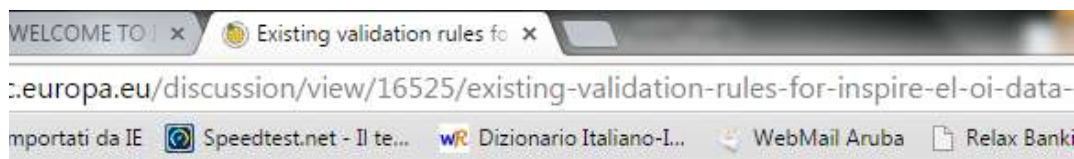
NOTE:

[Guidelines to the creation of INSPIRE compliant metadata](#) can also be retrieved in the [smeSpire](#) Best Practice Catalogue.

MIWP5 context

- INSPIRE Maintenance and Implementation Group (MIG), as part of INSPIRE Maintenance and Implementation Framework (MIF)
(<http://inspire.ec.europa.eu/index.cfm/pageid/5160>)
- Working Group (or sub-project) 5: Validation and Conformity Testing
- Pool of experts
- Contributions from activities of the EU Member States and from EU funded projects (e.g. eENVplus www.eenvplus.eu)

- One of the MIG WG5 task is to identify a «certification process» to be applied to the INSPIRE components
- Regarding datasets, the eENVplus validation service is one of the “candidate implementations”
- Focus on a pilot case in cooperation with EEA
- JRC-OGC MoU



Thanks Peter,

I will have a look at the links you provided - This is for sure interesting for implementers thinking of starting with schema validation.



By Giacomo MARTIRANO 8 hours ago

Public

Hi Jordi, Peter and all,

In the context of the European project eENVplus (the "project hosted in Italy" mentioned by Peter) we developed a Validation Service consisting of an implementation for the ATS (Abstract Test Suite) included in the Annex A of INSPIRE Data Specifications. This service makes use of the OGC free testing facility GML 3.2 (ISO 19136:2007).

This executable test suite (ETS) verifies the conformance of GML datasets with respect to INSPIRE application schemas and also with respect to ISO 19136:2007 (GML 3.2.1).

Supplementary INSPIRE constraints can be verified making use of theme specific schematron files.

For those tests that cannot be automated, the ETS contains guidelines to manual execution.

For the time being the full ETS (including schematron file and guidelines) is available for PS theme.

The validation against the application schema is available on-line for all the other data themes and for most of them interfaces explaining the INSPIRE ATS context in which the validation is performed are provided.

Exploiting the Team Engine functionalities, apart from a local resource, it is possible to upload the GML dataset file as web resource, inserting the http URL or the relevant WFS GetFeature request.

The Test, Evaluation, And Measurement (TEAM) Engine, the official test harness used by OGC Compliance Program, and the GML testing facility have been:

- checked out from GitHub OGC repositories ((TEAM Engine version 4.0.5 – GML Suite release r17)
- installed on cloud server
- customized (in terms of user interface)
- enriched with theme-specific schematron rules provided by the eENVplus team

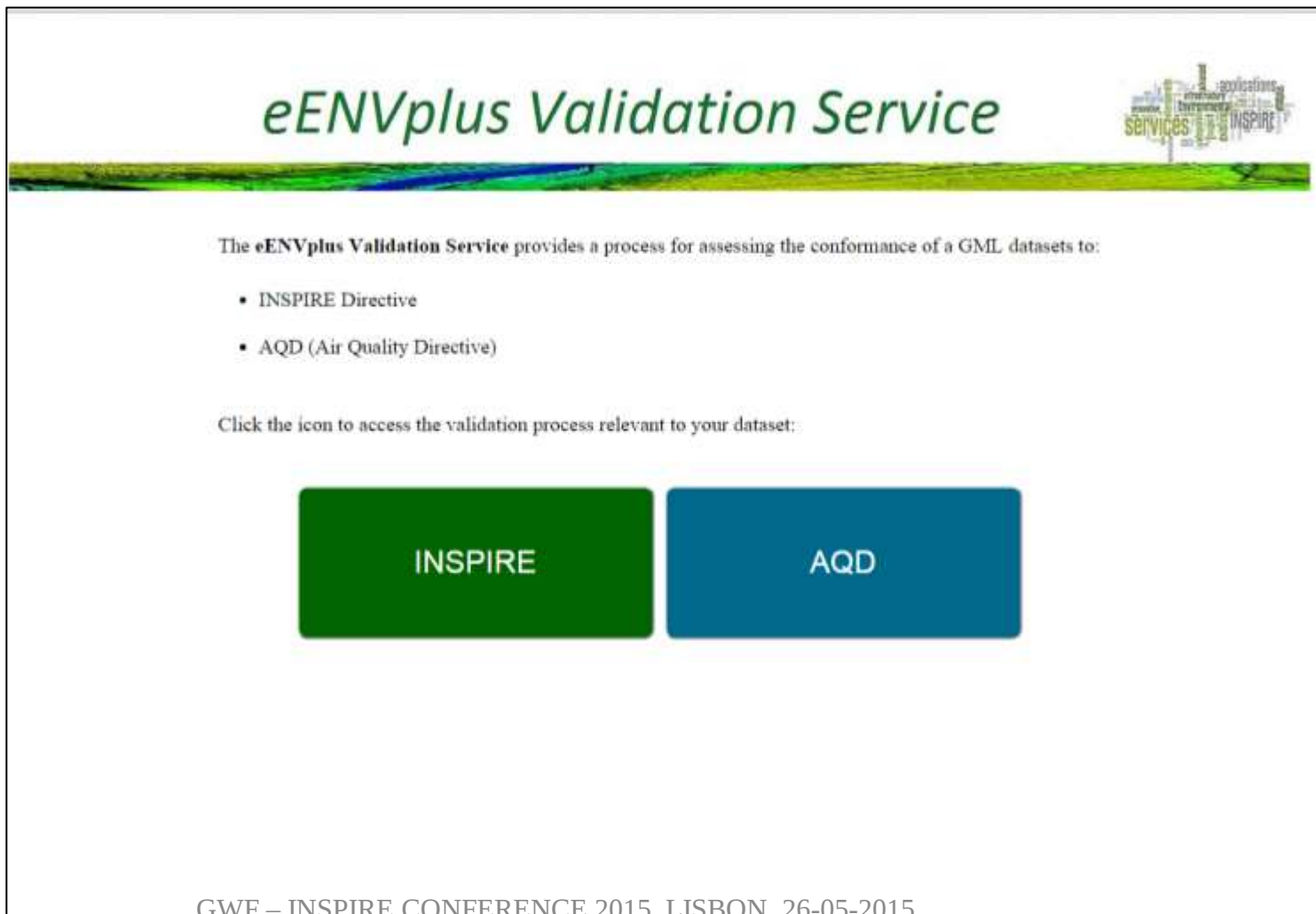
The work, still in progress, is reported within the MIG WG5.

Access the service:

- via web browser: http://cloud.epsilon-italia.it/eenvplus_new/
- via REST APIs: <http://cloud.epsilon-italia.it:8081/teamengine/rest/suites/gml32/3.2.1-r18/run?gml=gmlfilename&sch=schematron filename>

Grateful to those of you willing to send any feedback.

More than just INSPIRE validation



eENVplus Validation Service

The **eENVplus Validation Service** provides a process for assessing the conformance of a GML datasets to:

- INSPIRE Directive
- AQD (Air Quality Directive)

Click the icon to access the validation process relevant to your dataset:

INSPIRE **AQD**

GWF – INSPIRE CONFERENCE 2015, LISBON, 26-05-2015

Providing an online testing facility for AQD schematron validation

eENVplus Validation Service



The eENVplus Validation Service, based on the use of the free testing facility [GML 3.2 \(ISO 19136:2007\) Conformance Test Suite](#) developed by [OGC](#) verifies the conformance of GML data with respect to

- ISO 19136:2007 (GML 3.2.1)
- AQD xsd application schema declared in the '`xsi:schemalocation`' attribute of the GML file.
- Constraints encoded as schematron rules by Katharina Schleidt under *Service Contract CCR.IES.C389733.X0*, and made available by JRC.

More details about AQD validation by means of schematron rules can be found at <http://inspireaq.jrc.ec.europa.eu/wiki/index.php/Schematron>

This validation process partially covers the AQD quality assurance and control (QA/QC) rules defined in the document ["Quality Assurance and Control rules for e-reporting"](#)

Wednesday 27th - 9.00 am - Pavillon 3A

From the INSPIRE Engine Room

 Login to the AQD Validation Test

Schematron Validation for INSPIRE Air Quality Data by Katharina Schleidt

Thank you!

Questions?

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