



# Abstract Test Suite for INSPIRE Data Specifications

Vlado Cetl, Katalin Tóth, Tomas Reznik and Robert Tomas



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# Principles of Conformance Testing

- Spatial Data Sharing
  - SDI
  - Quality of spatial data?
  - Metadata
- Evaluation and validation of spatial data – “must”
- Conformity – declaration of how well spatial data meet the corresponding standard(s) or specification(s)
- Validation - set of interim steps in conformity testing



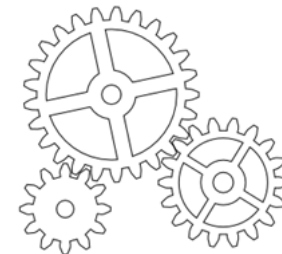
# Principles of Conformance Testing

- Compliance vs. conformance
- Compliance
  - The ability to operate in the way defined by a standard
  - An informal industry term generally accepted to mean the system provides support for some of a given standard
- Conformance
  - The ability to operate in the way defined by a specification
  - Recognition of formal testing, that prove that an operating system provides 100% support for a given standard



# Principles of Conformance Testing

- Conformance testing of spatial data
  - Limited possibilities of automation
    - encoding validation (XML Schema Definition - XSD)
      - e.g. Schematron language
  - Some conformance requirements are hardly automated
- Conformance testing of services
  - Easy automation of the whole process
  - Much easier with request-response pattern
    - e.g. OGC



# Abstract Test Suite (ATS)

- Conceptual level validation
- Already used in ISO and OGC conformance testing of spatial data
- Each requirement should have a corresponding test
  - conformance classes (grouped tests related to similar aspects)
- Set of interlinked test cases that may be grouped into classes (one-to-many)
- ATS may work with XSDs and Schematron validations



# Abstract Test Suite (ATS)

- To evaluate whether a product is compliant/conformant to a set of rules/requirements written in a form of a standard or a specification
- To be conformant to a conformance class, a data set needs to pass all the tests defined for the conformance class
- To pass an ATS a data set needs to be conformant to all conformance classes in that ATS
- The result of the ATS conformance testing process is statement "conformant/not conformant" + partial results

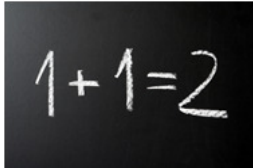


# INSPIRE Abstract Test Suite – legal framework



- Paragraph (6) of Commission Regulation as regards interoperability of spatial data sets and services:
  - *"In order to ensure interoperability and harmonisation across spatial data themes, the Member States should meet requirements for common data types, the identification of spatial objects, metadata for interoperability, generic network model and other concepts and rules that apply to all spatial data themes."*

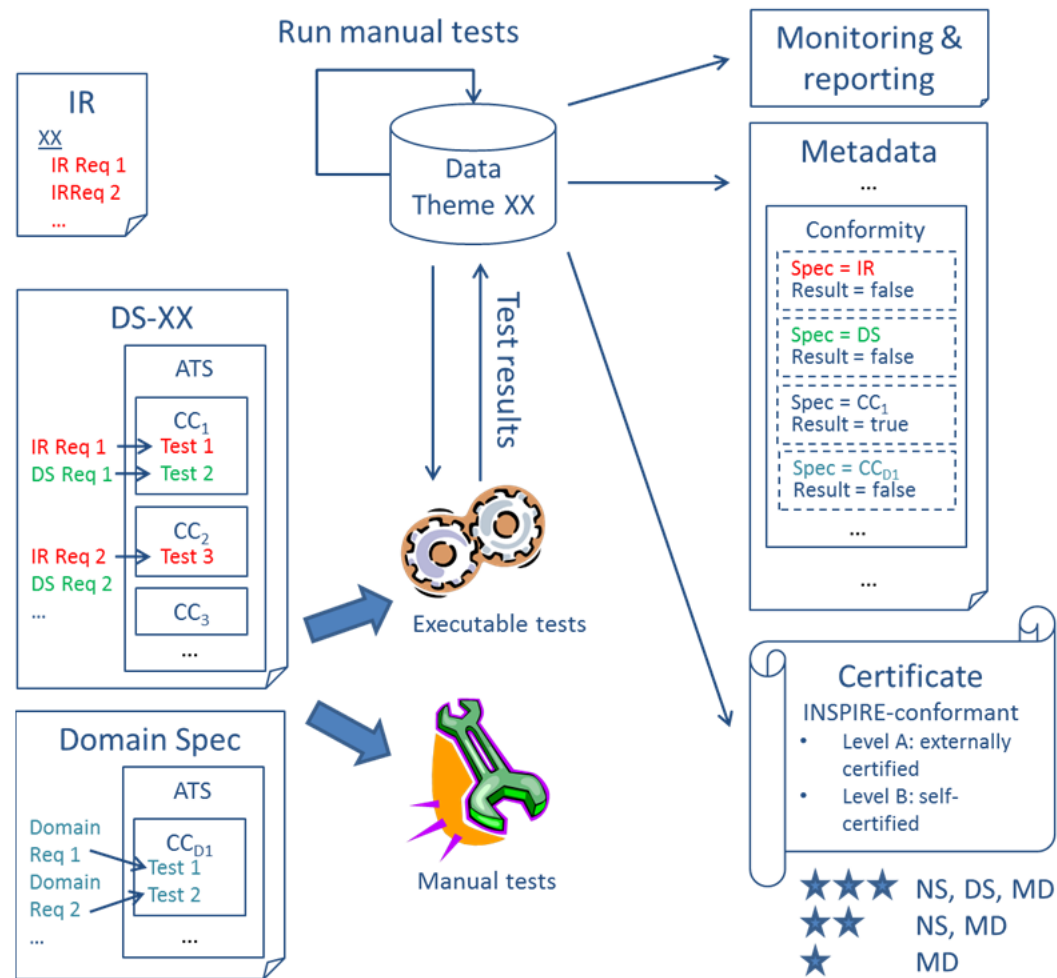
# INSPIRE ATS - basics



- *“Any data set claiming conformance to this INSPIRE data specification shall pass the requirements described in the abstract test suite presented in Annex A to this specification.”*
- Set of tests including their structure to verify conformity with INSPIRE Data Specifications
- Purpose of the ATS is to primarily help to data providers to deal with the requirements
- ATS may be used for the whole data set, as well as for any piece of it



# INSPIRE ATS - overview



# INSPIRE ATS - establishment



- Identification of common requirements to all spatial data themes (i.e. Application schema, Reference systems, Metadata, Data availability for a viewing, Encoding, Portrayal)
- Theme specific requirements
- Additional issues (Extended Application Schema, Conformity of a metadata and the conformity of data quality, other specific issues)

# INSPIRE ATS – proposed structure



- The basic structure of the conformance classes of the common Abstract Test Suite for INSPIRE data specifications:
  - Application schema – Spatial object types, data types, constraints (Logical consistency DQ)
  - Application schema – Extended application schema
  - Reference systems
  - Data Quality (DQ requirements)
  - Metadata
  - Delivery
  - Portrayal

# INSPIRE ATS – proposed structure



Conformance class / test	Test type
<b>A.1 Application Schema Conformance Class</b>	
A.1.1 Test case identifier: Attributes/associations completeness test	IR
A.1.2 Test case identifier: Name test	IR
A.1.3 Test case identifier: Abstract feature type test	IR
A.1.4 Test case identifier: Multiplicity test	IR
A.1.5 Test case identifier: Value type test	IR
A.1.6 Test case identifier: Constraints test	IR
A.1.7 Test case identifier: External object identifier test	IR
A.1.8 Test case identifier: Life cycle info test	IR
A.1.9 Test case identifier: Enumeration test	IR
A.1.10 Test case identifier: Code list test	IR
A.1.11 Test case identifier: ISO Simple Feature test	IR
A.1.12 Test case identifier: OGC Simple Feature test	IR
<b>A.2 Reference Systems Conformance Class</b>	
A.2.1 Test case identifier: Datum test	IR
A.2.2 Test case identifier: Two- and three-dimensional coordinate reference system test	IR
A.2.3 Test case identifier: Compound coordinate reference system test	IR
A.2.4 Test case identifier: View service coordinate reference system test	IR
A.2.5 Test case identifier: Coordinate reference system identifier test	IR
A.2.6 Test case identifier: Temporal reference system test	IR
A.2.7 Test case identifier: Units test	IR
A.2.8 Test case identifier: Grid definition test	IR
A.2.9 Test case identifier: Grid coordinate reference system test	IR
A.2.10 Test case identifier: Grid availability test	IR

# INSPIRE ATS – proposed structure



Conformance class / test	Test type
<b>A.3 Data Quality Conformance Class</b>	
A.3.1 Test case identifier: Data quality target results test	IR
<b>A.4 Metadata Conformance Class</b>	
A.4.1 Test case identifier: Metadata completeness test	IR
A.4.2 Test case identifier: Metadata maximum occurrence test	IR
A.4.3 Test case identifier: Metadata domain test	TG
A.4.4 Test case identifier: Minimum data quality requirements reporting test	TG
A.4.5 Test case identifier: Overall conformance reporting test	TG
<b>A.5 Delivery Conformance Class</b>	
A.5.1 Test case identifier: Update test	IR
A.5.2 Test case identifier: Encoding test	TG
A.5.3 Test case identifier: Coverage multipart representation test	TG
A.5.4 Test case identifier: Coverage JPEG 2000 test	TG
A.5.5 Test case identifier: Coverage domain test	TG
A.5.6 Test case identifier: Data publication test	TG
A.5.7 Test case identifier: Calling application test	TG
<b>A.6 Portrayal Conformance Class</b>	
A.6.1 Test case identifier: Layer test	IR
A.6.2 Test case identifier: Style test	TG

# INSPIRE ATS



- Tests of the ATS follow Implementing Rule (**IR**) and Technical Guidelines (**TG**) requirements that are common to all INSPIRE data specifications and if relevant theme specific requirements
- Each conformance class comprises 1..N (one to many) tests
- Each test follows the same structure:
  - Test purpose: definition of intended scope of the test;
  - Test method: description of the testing procedure;
  - Reference: link to any material that may be useful;
  - Test type: explicit designation whether this test reflects the IR or the TG requirement

# Abstract Test Suite – Examples

**IR Requirement** For the coordinate reference systems used for making available the INSPIRE spatial data sets, the datum shall be the datum of the European Terrestrial Reference System 1989 (ETRS89) in areas within its geographical scope, and the datum of the International Terrestrial Reference System (ITRS) or other geodetic coordinate reference systems compliant with ITRS in areas that are outside the geographical scope of ETRS89. Compliant with the ITRS means that the system definition is based on the definition of the ITRS and there is a well-established and described relationship between both systems, according to EN ISO 19111.

## **A.2.1 Test case identifier: Datum test**

a) Test Purpose: to ensure that each instance of a spatial object type is given with reference to one of the (geodetic) datums specified in section 6.

b) Test Method: to ensure that each instance of a spatial object type specified in the application schema(s) in section 5.2 has been expressed using:

- the European Terrestrial Reference System 1989 (ETRS89) within its geographical scope;
- the International Terrestrial Reference System (ITRS) for areas beyond the ETRS89 geographical scope;
- other geodetic coordinate reference systems compliant with the ITRS. Compliant with the ITRS means that the system definition is based on the definition of ITRS and there is a well-established and described relationship between both systems, according to the EN ISO 19111.

c) Reference: section 6.

d) Test Type: IR Requirement test.

# Abstract Test Suite – Examples

**TG Requirement** Data conformant to this INSPIRE data specification shall be made available through an INSPIRE network service.

## **A.5.6 Test case identifier: Data publication test**

- a) Test Purpose: to verify that data conformant to this INSPIRE data specification have been made available through an INSPIRE network service.
- b) Test Method: inspect whether data conformant to this INSPIRE data specification is available through an INSPIRE network service.
- c) Reference: Implementing Rules on INSPIRE network services.
- d) Test Type: TG Requirement test.

NOTE This test is a bridge between spatial data and network services. It has to be assured that data are published within the INSPIRE network services, which is the primary aim of the requirement above as well as this A.5.6 test. Therefore this test appears on the Abstract Test Suite for data specifications, although it is closely related to the network services.



# INSPIRE Metadata Element Conformity

- The INSPIRE Directive defines in Article 7(3):
  - “[...] all [...] spatial data sets and the corresponding spatial data services are available in conformity with the implementing rules [...]”
- The Implementing Rules on INSPIRE metadata define a metadata element ‘Conformity’, which is **mandatory**
  - “Specification” i.e. a citation of the implementing rules or other specification
  - “Degree”
    - **Conformant** – the resource is fully conformant with the cited specification.
    - **Not conformant** – the resource does not conform to the cited specification.
    - **Not evaluated** – conformance has not been evaluated

# INSPIRE Metadata Element Conformity

- The “Conformity” metadata element has multiplicity 1..N (one to many)
  - At least one conformity statement is mandatory
  - Other conformity statements ...
    - i.e. conformity with international and national standards
- To report not only the overall conformity, but also the conformity to each conformance class
- Allows more detailed view on a dataset
- If and only if a data set passes each test in each conformance class, it may be designated in INSPIRE metadata as conformant to this data specification

# Conformity – how to...



## Conformity

The *Conformity* metadata element defined in Regulation 1205/2008/EC requires to report the conformance with the Implementing Rule for interoperability of spatial data sets and services. In addition, it may be used also to document the conformance to another specification.

**Recommendation 1** The *Conformity* metadata element should be used to document conformance with this data specification (as a whole), a specific conformance class defined in the Abstract Test Suite in Annex A and/or another specification.

The *Conformity* element includes two sub-elements, the *Specification* (a citation of the Implementing Rule for interoperability of spatial data sets and services or other specification), and the *Degree* of conformity. The *Degree* can be *Conformant* (if the dataset is fully conformant with the cited specification), *Not Conformant* (if the dataset does not conform to the cited specification) or *Not Evaluated* (if the conformance has not been evaluated).

# Conformity – how to...



**TG Requirement 1** Dataset metadata shall include a statement on the overall conformance of the dataset with this data specification (i.e. conformance with all requirements).

**Recommendation 2** If a dataset is not yet conformant with all requirements of this data specification, it is recommended to include information on the conformance with the individual conformance classes specified in the Abstract Test Suite in Annex A.

**Recommendation 3** If a dataset is produced or transformed according to an external specification that includes specific quality assurance procedures, the conformity with this specification should be documented using the *Conformity* metadata element.

# Conformity – how to...



**IR Requirement 1** If minimum data quality requirements are defined then the statement on the conformity with these requirements shall be included using the *Conformity* metadata element and referring to the relevant data quality conformance class in the Abstract Test Suite.

**Recommendation 4** When documenting conformance with this data specification or one of the conformance classes defined in the Abstract Test Suite, the *Specification* sub-element should be given using the http URI identifier of the conformance class or using a citation including the following elements:

- title: "INSPIRE Data Specification on <Theme Name> – Draft Guidelines – <name of the conformance class>"
- date:
  - dateType: publication
  - date: 2012-06-24

# Conformity – how to...



EXAMPLE 1: The XML snippets below show how to fill the *Specification* sub-element for documenting conformance with the whole data specification on Addresses v3.0.1.

```
<gmd:DQ_ConformanceResult>
  <gmd:specification href="http://inspire.ec.europa.eu/conformanceClass/ad/3.0.1/tg" />
  <gmd:explanation> (...) </gmd:explanation>
  <gmd:pass> (...) </gmd:pass>
</gmd:DQ_ConformanceResult>
```

or (using a citation):

```
<gmd:DQ_ConformanceResult>
  <gmd:specification>
    <gmd:CI_Citation>
      <gmd:title>
        <gco:CharacterString>INSPIRE Data Specification on <Theme Name> – Draft Guide-
lines</gco:CharacterString>
      </gmd:title>
      <gmd:date>
        <gmd:date>
          <gco:Date>2012-06-24</gco:Date>
        </gmd:date>
      </gmd:dateType>
      <gmd:CI_DateTypeCode code-
List="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resou
rces/Codelist/ML_gmxCodetlists.xml#CI_DateTypeCode" codeListVa-
lue="publication">publication</gmd:CI_DateTypeCode>
    </gmd:CI_Citation>
  </gmd:specification>
  <gmd:explanation> (...) </gmd:explanation>
  <gmd:pass> (...) </gmd:pass>
</gmd:DQ_ConformanceResult>
```

# Conformity – how to...



EXAMPLE 2: The XML snippets below show how to fill the *Specification* sub-element for documenting conformance with the CRS conformance class of the data specification on Addresses v3.0.1.

```
<gmd:DQ_ConformanceResult>
  <gmd:specification href="http://inspire.ec.europa.eu/conformanceClass/ad/3.0.1/crs" />
  <gmd:explanation> (...) </gmd:explanation>
  <gmd:pass> (...) </gmd:pass>
</gmd:DQ_ConformanceResult>
```

or (using a citation):

```
<gmd:DQ_ConformanceResult>
  <gmd:specification>
    <gmd:CI_Citation>
      <gmd:title>
        <gco:CharacterString>INSPIRE Data Specification on <Theme Name> – Draft Guidelines –
        CRS</gco:CharacterString>
      </gmd:title>
      <gmd:date>
        <gmd:date>
          <gco:Date>2012-06-24</gco:Date>
        </gmd:date>
      </gmd:dateType>
      <gmd:CI_DateTypeCode code-
      List="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resou
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      lue="publication">publication</gmd:CI_DateTypeCode>
    </gmd:CI_Citation>
  </gmd:specification>
  <gmd:explanation> (...) </gmd:explanation>
  <gmd:pass> (...) </gmd:pass>
</gmd:DQ_ConformanceResult>
```

# Abstract Test Suite – Open issues



- Extensions based on INSPIRE datasets?
- Additional elements (attributes, features etc..) in a datasets?
- Conformance on the object level only?
- Certification – “INSPIRE Label” – like Geo-label initiative?
- Summary of testing (Report with comments and other relevant information)?
- ...





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# Thank you for your attention!

## Questions?

## discussion...