

Good practice

OGC compliant INSPIRE Coverage data and service implementation

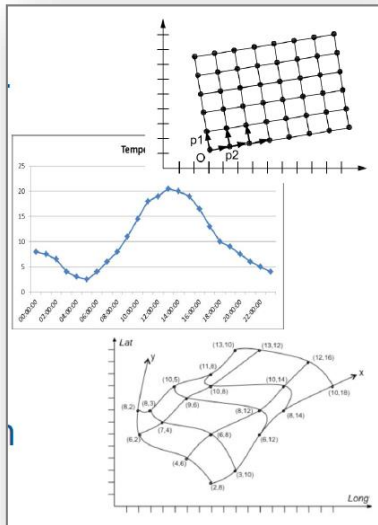
INSPIRE Community Forum

Software & Tools

Elevation, Orthoimagery, Reference systems and Geographical grids

Observations & Measurements

Jordi Escriu & Peter Baumann & Kathi Schleidt



INSPIRE Coverages

Summary

- **Coverage** – An OGC standardised way to deliver gridded (raster) data.
- **Identification of issues** (October 2014 - today)
 - Inconsistencies: INSPIRE conceptual model vs. Implementation standard (CIS 1.0).
 - Immaturity and inconsistencies of the standards for implementing coverage data (GML 3.2.1, GML 3.3, CIS 1.0).
 - Possible misinterpretations.
 - INSPIRE added additional properties and model constructs not expected in an OGC-compliant implementation (i.e. not appropriately mapped with encoding rules).
- **Scope**
 - INSPIRE Thematic Clusters (October 2014 - May 2019).
 - INSPIRE Community Forum (From June 2019).
- **Team involved**
 - Jordi Escriu (IDEC – ICGC, Catalunya).
 - Peter Baumann (Jacobs University + rasdaman, Germany).
 - Kathi Schleidt (DataCove.eu, Austria).

Implementation of INSPIRE Coverages

Main activities run till today

- **“Implementation of INSPIRE Coverages” – Webinar**
6th November 2017
<https://inspire.ec.europa.eu/forum/pages/view/159283/webinar-implementation-of-inspire-coverages>
- **“Practicing INSPIRE coverages - Enhancing your data cube implementation assets!” – Workshop**
INSPIRE Conference 2018 Antwerp:
https://inspire.ec.europa.eu/events/conferences/inspire_2018/submissions/248.doc
- **“Feel the power of INSPIRE WCS/WCPS in your hands!” – Workshop**
INSPIRE Helsinki 2019:
<https://inspire.ec.europa.eu/forum/pages/view/262985/workshop-%E2%80%9Cfeel-the-power-of-inspire-wcs-wcps-in-your-hands%E2%80%9D>
- **“INSPIRE Coverages demystified” ([Description](#)) - Dedicated session:**
Online INSPIRE Conference 2020 (10th June 2020) – Presentations + Video:
<https://inspire.ec.europa.eu/conference2020/webinars/inspire-coverages-demystified>

Use of coverages in INSPIRE

13 Data themes



- **WCS view:**
Coverages as Features
- **SOS view:**
Coverages as Observation Results

WCS view: Coverages as Features

INSPIRE FeatureTypes based on Coverage Classes



• Regular grids:

- Elevation (EL)
- Land cover (LC)
- Orthoimagery (OI)
- Soil (SO)
- Energy resources (ER).
- Species distribution (SD)
- Application schema deprecated.

• Regular or Irregular grids:

- Natural risk zones (NZ)
- Geology (GE).

SOS view: Coverages as Observation Results

Coverage based models in the observational context



- **Regular or irregular grids**
 - Environmental monitoring facilities (EF)
 - Atmospheric conditions (AC)
 - Meteorological geographic features (MF)
 - Oceanographic geographic features (OF)
 - Geology (GE)
- Provided as discrete observation coverages, i.e. gridded data specialized observation types applying the ISO 19156:2011 (O&M), following *INSPIRE D2.9 v3.0*

Implementation of INSPIRE Coverage data

The main issue: INSPIRE Extensions



OGC CIS1.0
Implementation
model

range type	metadata		
	2	7	3
	4	1	9
	0	2	8



INSPIRE
Conceptual
model

INSPIRE				
range type	metadata			Extensions
	2	7	3	
	4	1	9	
	0	2	8	



INSPIRE
Implementation
model
(Good Practice)

range type	INSPIRE Cov Metadata		
	2	7	3
	4	1	9
	0	2	8

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An interoperable solution

- Directly adopt OGC CIS 1.0 schema as default encoding (implementation model).
- Replace the existing INSPIRE coverage schemas by amended INSPIRE coverage metadata schemas (*) – obtained in a very simple way (i.e. consider INSPIRE extensions within the OGC coverage metadata element).
- Promote the use of these interoperable schemas for their widespread use by thematic communities in the scope.

* Example schemas for EL, OI, LC available at DataCove.EU:

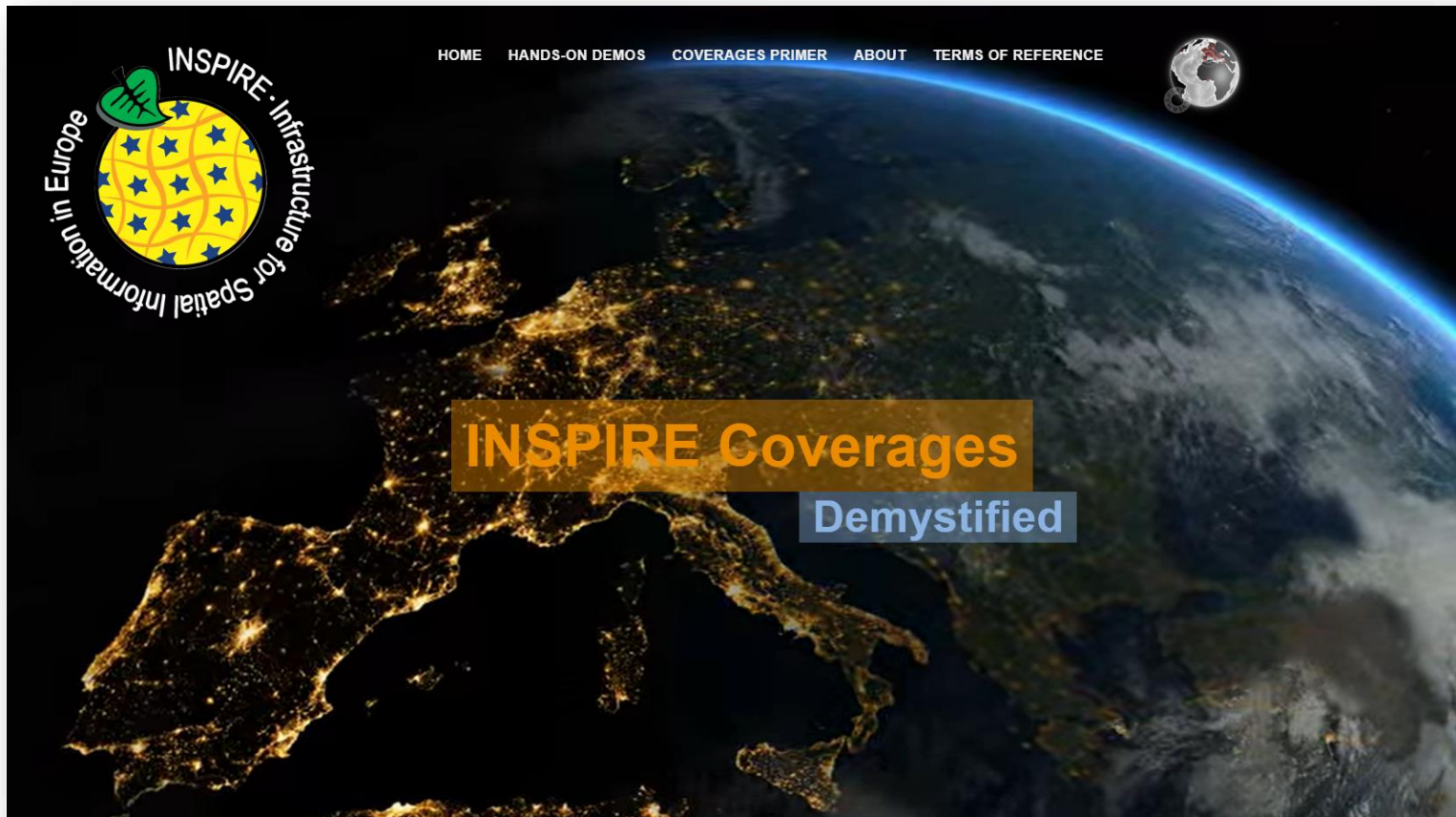
<https://schema.datacove.eu/ElevationGridCoverageMetadata.xsd>

<https://schema.datacove.eu/OrthoimageryMetadata.xsd>

<http://test.datacove.eu/LandCoverRasterMDExt.xsd>

INSPIRE Coverages Demystified

Website and Demonstrator



<https://inspire-wcs.eu>

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Evidence of implementation and support

- Available through the demonstration service: <https://inspire-wcs.eu>
- Reusing a common endpoint: <https://inspire.rasdaman.org/rasdaman/ows?>
- Based on the rasdaman.com WCS/WCPS engine.
- Sample INSPIRE coverages in the scope of the EL, OI and LC themes:
 - [Institut Cartogràfic i Geològic de Catalunya \(ICGC\)](#) , Spain.
INSPIRE Themes covered: EL, OI and LC.
 - [Landesamt für Vermessung und Geoinformation Schleswig-Holstein \(SH\)](#), Germany.
INSPIRE Themes covered: EL.
 - [Finnish Environment Institute \(SYKE\)](#), Finland.
INSPIRE Themes covered: LC.
- Other data providers have additionally expressed their interest in implementing the good practice, looking forward for its endorsement by INSPIRE MIG-T to invest resources in a comprehensive implementation.

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Intended outcomes (if endorsed)

- Interoperable provision of INSPIRE coverage data according OGC CIS 1.0, naturally to be offered through WCS services for at least 9 of the 13 Annex II & III themes involved.
 - Amended INSPIRE coverage application schemas.
- Facilitation of the tasks for the implementation of coverage data and services, providing the INSPIRE community with a common, clear implementation path to be reused by many.
- Underpinning of WCPS data analytics based on the availability of INSPIRE coverage data (i.e. data cubes), cornerstone for boosting big data technologies across EU.
- Optionally, update of the INSPIRE Framework documents.

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Conclusions: Relevance & Expected benefits

- Reuse this solution for boosting an efficient and interoperable provision of (raster) coverage data for the ample list of thematic domains referred.
- Assure compliance of INSPIRE coverage data to OGC CIS 1.0.
- Establish a common, agreed basis for achieving interoperability of data served by INSPIRE WCS/WCPS services, avoiding disparate data encodings.
- Allow users to experience the potential of coverage data and WCS/WCPS services, playing a crucial role in raster data analytics.

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Conclusions: Limitations

- Currently existing sample implementations are limited to the EL, OI and LC themes (demonstration service), although potentially applicable up to 13 INSPIRE themes.
- Some theme-specific issues and gaps require further analysis and attention (e.g. concretions and generation of amended application schemas for the rest of themes, coverage & SOS).
- Adoption of this good practice by a wide range of software vendors, apart from the rasdaman WCS/WCPS engine.

These aspects need further attention and should be tackled by MIG-T in an eventual endorsement of the good practice.

Good practice: OGC compliant INSPIRE Coverage data and service implementation References

- **This Good Practice document:**

<https://webgate.ec.europa.eu/fpfis/wikis/download/attachments/559350289/GP3.%20Coverage%20data%20and%20service%20implementation.pdf?version=1&modificationDate=1602060517975&api=v2>

- **Discussion document:**

<https://inspire.ec.europa.eu/forum/file/view/266799/discussion-document-good-practice-for-providing-raster-inspire-coverage-data-and-services>

- **Dedicated page:**

<https://inspire.ec.europa.eu/forum/pages/view/265454/an-effective-good-practice-to-boost-interoperable-provision-of-raster-inspire-coverage-data-and-services>

INSPIRE Good Practice:

OGC compliant INSPIRE Coverage data and service implementation

Name of the GP

OGC compliant INSPIRE Coverage data and service implementation.

Description of the GP

Raster data appear across many INSPIRE themes from Annex II (4 themes) and Annex III (9 themes), specifically in the form of coverage, a format standardised by the Open Geospatial Consortium (OGC) and offered using different types of geospatial services.

The different INSPIRE themes in the scope use two different approaches to serve coverage data to the user, either offered by a Web Coverage Service (WCS) as features, or by a Sensor Observation Service (SOS) as observation results. Each of these types of services provides, as a default encoding option, coverage data as features according to the OGC CIS 1.0 standard, or as discrete observations based on ISO 19156:2011 (OB&M) according to INSPIRE D2.9 v3.0, respectively.

Over the last years the community of implementers has identified issues on making this data interoperable in the context of the INSPIRE Directive, being them mainly due to immaturity of the underlying coverage standards in force, which introduced some inconsistencies in the INSPIRE framework at conceptual level - possibly because misinterpretation - and lack of definition at implementation level. This situation led to application schemas incompatible with OGC CIS 1.0, having elements not foreseen by the implementation standard. Additionally, the INSPIRE Technical Guidance documents are not concrete enough to clarify how to implement interoperable INSPIRE coverage data and services.

Since 2014 a number of OGC, ISO and INSPIRE experts have teamed up in the scope of the activities of the INSPIRE Community Forum to identify the related issues and overcome the drawbacks by establish best practices, evaluated and demonstrated through sample services.

The good practice achieved as a result of these work constitutes a functional solution to align INSPIRE coverages to OGC standards, amending in a simple way the existing INSPIRE XSD coverage schemas by moving any INSPIRE extensions to the coverage metadata bucket, being it one of the components of an OGC compliant CIS 1.0 coverage.

The solution is aimed to clarify how INSPIRE (raster) coverage data have to be implemented for assuring an interoperable data provision for a wide list of Annex II and III themes.

This INSPIRE Good Practice has emerged in the first half of 2020, being officially presented in a [dedicated workshop at the INSPIRE 2020 Online Conference](#) as well as during the [62nd IMC-T meeting on 2nd July 2020](#).

INSPIRE component(s)

INSPIRE Data (raster spatial representation type)

INSPIRE Network Services

Discussion document:

Good practice for providing (raster) INSPIRE Coverage data and services

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Target audience:

Raster data communities; INSPIRE implementers; INSPIRE data providers from EU Member States; INSPIRE MS-T

1. Purpose of this document

This document explains a good practice for the provision of interoperable (raster) INSPIRE Coverage data and services, used for a large list of Annex II and Annex III data themes.

It is the result of a number of activities organised in the scope of the INSPIRE Community Forum (formerly, INSPIRE Thematic Clusters) from October 2014 till nowadays, including related discussion topics in the platform, webinars, workshop, and even an article.

Moreover, it is expected to overcome the current situation of having inconsistent schemas for INSPIRE coverage data which are not properly aligned with the OGC standards which are identified as adopted as default encoding.

This drawback is clearly preventing the interoperable provision of raster data themes in the form of coverage data and related services (WCS / WCSF). Such services have a huge potential for users willing to exploit raster data analytics utilising INSPIRE coverage data, being one of the most interesting and beneficial use cases for big data.

The main objectives of this document are:

- Getting feedback from the community on this functional good practice to align INSPIRE coverages to OGC standards.
- Promote the interoperable schemas identified in Section 5.2 for their widespread use by the thematic communities which have to provide coverage data for INSPIRE purposes.
- Spread the word through INSPIRE IMC-T for the consideration and promotion as an interoperable solution for a large list of INSPIRE themes dealing with (raster) coverage data.

Section 2 introduces in a plain way the concept of coverage, identifies the applicable standards and provides an insight on the current use of coverage data across a large list of different INSPIRE themes from Annex II and Annex III.

Section 3 explains the main issue affecting the interoperable provision of coverage data in INSPIRE. Section 4 explains the good practice proposed as a solution to overcome the existing situation, with low efforts to be invested.

Section 5 exemplifies the good practice for INSPIRE Elevation and Orthorectification themes, while establishing both, the mapping between the elements of such thematic coverages and the OGC CIS 1.0 implementation standard, and the associated sample schemas for its implementation.

Section 6 provides more details about the final purposes of this document and identifies related descriptive resources and discussion topics in the INSPIRE Community Forum platform.

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References

- **Discussion topic** (for providing feedback):

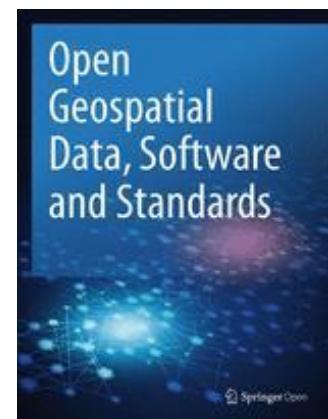
<https://inspire.ec.europa.eu/forum/discussion/view/265095/inspire-coverages-demo-service>

- **Results & Demos from the “INSPIRE Coverages demystified” session (Online INSPIRE Conference 2020), focused on OI, EL, LC:**

<https://inspire.ec.europa.eu/conference2020/webinars/inspire-coverages-demystified>

- INSPIRE coverage (metadata) schemas.
 - Examples of WCS/WCPS services.
 - Examples of INSPIRE coverage metadata.
- **“INSPIRE coverages: an analysis and some suggestions” - Article** with first suggestions:

<https://link.springer.com/article/10.1186%2Fs40965-019-0059-x>



Thanks for your attention!

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