



INSPIRE

Infrastructure for Spatial Information in Europe

Technical Guidance for INSPIRE Spatial Data Services and services allowing spatial data services to be invoked

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Foreword

Directive 2007/2/EC of the European Parliament and of the Council [**Directive 2007/2/EC**], adopted on 14 March 2007 aims at establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) for environmental policies, or policies and activities that have an impact on the environment. INSPIRE will make available relevant, harmonised and quality geographic information to support the formulation, implementation, monitoring and evaluation of policies and activities, which have a direct or indirect impact on the environment.

INSPIRE is based on the infrastructures for spatial information established and operated by the 27 Member States of the European Union. The Directive addresses 34 spatial data themes needed for environmental applications, with key components specified through technical implementing rules. This makes INSPIRE a unique example of a legislative “regional” approach.

To ensure that the spatial data infrastructures of the Member States are compatible and usable in a Community and trans-boundary context, the Directive requires that common Implementing Rules (IR) are adopted in the following areas.

- Metadata;
- The interoperability and harmonisation of spatial data and services for selected themes (as described in Annexes I, II, III of the Directive);
- Network Services;
- Measures on sharing spatial data and services;
- Co-ordination and monitoring measures.

The Implementing Rules are adopted as Commission Decisions or Regulations, and are binding in their entirety.

In particular with respect the Network Services, Implementing Rules are required for the following services (Article 11(1) of the Directive):

- a) *“discovery services search for spatial datasets and spatial data services on the basis of the content of corresponding metadata, and display the metadata content;*
- b) *view services as a minimum, display, navigate, zoom in/out, pan, or overlay spatial datasets and display legend information and any relevant content of metadata;*
- c) *download services enabling copies of complete spatial datasets, or of parts of such sets, to be downloaded;*
- d) *transformation services enabling spatial datasets to be transformed with a view to achieving interoperability;*
- e) *invoke spatial data services” enabling data services to be invoked.”*

In addition to the Implementing Rules, non-binding Technical Guidance documents describe detailed implementation aspects and relations with existing standards, technologies, and practices. They may need to be revised during the course of implementing the infrastructure to take into account the evolution of technology, new requirements, and cost benefit considerations.

Technical Guidance documents define how Member States might implement the Implementing Rules described in a Commission Regulation. Technical Guidance documents may include non-binding technical requirements that must be satisfied if a Member State chooses to conform to the Technical Guidance. Implementing this technical guidance will maximise the interoperability of INSPIRE services.

This Technical Guidance concerns the INSPIRE Spatial Data Services and services allowing spatial data services to be invoked. The Technical Guidance contains detailed technical documentation

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highlighting the mandatory and the recommended elements related to the implementation of INSPIRE Spatial Data Services and services allowing spatial data services to be invoked. The technical provisions and the underlying concepts are often illustrated by use case diagrams and accompanied by examples.

This document will be publicly available as a 'non-paper', as it does not represent an official position of the Commission, and as such cannot be invoked in the context of legal procedures.

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1 Introduction

Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) was published in the official Journal on the 25th April 2007. The INSPIRE Directive entered into force on the 15th May 2007.

The purpose of the infrastructure is to enable the formulation, implementation, monitoring activities and evaluation of Community environmental policies at all levels – European, national and local – and to provide public information.

INSPIRE builds on the infrastructures for spatial information that have already been created by the Member States. The components of those infrastructures include: metadata, spatial data themes (as described in Annexes I, II, III of the Directive), network services and technologies; agreements on data sharing, access and use; coordination and monitoring mechanisms, processes and procedures.

The guiding principles of INSPIRE are:

- that the infrastructures for spatial information in the Member States should be designed to ensure that spatial data are stored, made available and maintained at the most appropriate level;
- that it is possible to combine spatial data from different sources across the Community in a consistent way and share them between several users and applications;
- that it is possible for spatial data collected at one level of public authority to be shared between all the different levels of public authorities;
- that spatial data are made available under conditions that do not restrict their extensive use; and
- that it is easy to discover available spatial data, to evaluate their fitness for purpose and to know the conditions applicable to their use.

The text of the INSPIRE Directive is available from the European Union Law website (EU-LEX) <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32007L0002:EN:NOT>. The Directive identifies what needs to be achieved, and Member States have two years from the date of adoption to bring into force national legislation, regulations, and administrative procedures that define how the agreed objectives will be met taking into account the specific situation of each Member State. To ensure that the spatial data infrastructures of the Member States are compatible and usable in a Community and trans-boundary context, the Directive requires that common Implementing Rules (IR) are adopted in a number of specific areas. Implementing Rules are adopted as Commission Decisions, and are binding in their entirety.

According to Article 5(4) of the Directive, the INSPIRE Implementing Rules shall take account of relevant, existing international standards and user requirements.

The scope of this document is to detail the INSPIRE technical requirements for **Spatial Data Services and services allowing spatial data services to be invoked** from the Implementing Rules, such that these services can be implemented consistently across Europe.

These Implementing Rules are, as much as possible, in conformance with European and international standards, current practices in stakeholder communities and relevant European initiatives such as e-Government, and the EU interoperability framework.

This document will be publicly available as a 'non-paper', as it does not represent an official position of the Commission, and as such can not be invoked in the context of legal procedures.
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2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- [ISO 19115] ISO 19115:2003, Geographic information – Metadata – Part 1: Fundamentals
http://www.iso.org/iso/catalogue_detail.htm?csnumber=26020
- [ISO 19119] ISO 19119:2005, Geographic information – Services
http://www.iso.org/iso/catalogue_detail.htm?csnumber=39890
- [ISO 19139] ISO/TS 19139:2007, Geographic information – Metadata – XML schema implementation
http://www.iso.org/iso/catalogue_detail.htm?csnumber=32557
- [ISO 19108] ISO 19108:2002, Geographic information - Temporal schema
http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=26013
- [ISO 19111] ISO 19111:2007, Geographic information - Spatial referencing by coordinates
http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=41126
- [ISO 19127] ISO/TS 19127:2005, Geographic information - Geodetic codes and parameters
http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=41784
- [ISO 8601] ISO 8601:2004 Data elements and interchange formats - Information interchange - Representation of dates and times
http://www.iso.org/iso/catalogue_detail?csnumber=40874
- [ISO 19157] ISO/DIS 19157 Geographic information -- Data quality
http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=32575
- [INS SDS IR] INSPIRE Spatial Data Services and services allowing spatial data services to be invoked – Implementing Rules v 2.0
- [INS DS TG] INSPIRE Technical Guidance for the implementation of Inspire Discovery Services v 3.1
http://inspire.jrc.ec.europa.eu/documents/Network_Services/TechnicalGuidance_DiscoveryServices_v3.1.pdf
- [INS MDTG] INSPIRE Metadata Implementing Rules: Technical Guidelines based on EN ISO 19115 and EN ISO 19119 v 1.2
http://inspire.jrc.ec.europa.eu/documents/Metadata/INSPIRE_MD_IR_and_ISO_v1_2_20100616.pdf
- [OWS] OpenGIS Web Service Common Implementation Specification 1.1.0
https://portal.opengeospatial.org/modules/admin/license_agreement.php?suppressHeaders=0&access_license_id=3&target=http://portal.opengeospatial.org/files/%3fartifact_id=20040

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[INS NS] Commission Regulation (EC) No 976/2009 of 19 October 2009 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards the Network Services

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:274:0009:0018:EN:PDF>

[DST] Common document template providing for all INSPIRE Data Specifications (<http://inspire.jrc.ec.europa.eu/index.cfm/pageid/2>). See e.g. section 8 in the Data Specification on Oceanographic geographical features – Draft Guidelines (http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_OF_v3.0_rc2.pdf)

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3 Terms and abbreviations

3.1 Terms

- (1) **Spatial Data Services and services allowing spatial data services to be invoked**
allows defining both the data inputs and data outputs expected by the spatial services and a workflow or service chain combining multiple services. It also allows defining the external web service interface of the workflow or service chain [INSPIRE Directive]
- (2) **metadata**
information describing spatial datasets and spatial data services and making it possible to discover, inventory and use them [INSPIRE Directive]
- (3) **network services**
network services should make it possible to discover, transform, view and download spatial data and to invoke spatial data and e-commerce services [INSPIRE Directive]
- (4) **spatial data**
data with a direct or indirect reference to a specific location or geographic area [INSPIRE Directive]
- (5) **spatial dataset**
identifiable collection of spatial data [INSPIRE Directive]
- (6) **dataset**
short term sometimes used instead of 'spatial dataset', same meaning as 'spatial dataset'.

3.2 Abbreviations

CRS	Coordinate Reference System
FE	Filter Encoding, referring to ISO 19143
GeoRSS	GeoRSS-Simple
GET	HTTP Get Method
GML	Geography Markup Language
HTTP	Hypertext Transfer Protocol
INSPIRE	Infrastructure for Spatial Information in Europe
IR	Implementing Rule
ISO	International Organisation for Standardisation
JRC	Joint Research Centre
NS	Network Services
OGC	Open Geospatial Consortium
OWS	OGC Web Services Common Specification

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3.3 Verbal forms for the expression of provisions

In accordance with the ISO rules for drafting, the following verbal forms shall be interpreted in the given way:

- “shall” / “shall not” : a requirement, mandatory to comply with the technical guidance
- “should” / “should not” : a recommendation, but an alternative approach may be chosen for a specific case if there are reasons to do so
- “may” / “need not” : a permission

Technical Guidance Conformance Classes notation

The Technical Guidance in this document is divided into Conformance Classes, so that it is possible to declare conformance to specific parts of the Technical Guidance. *To conform to a Conformance Class it is necessary to meet all of the Requirements (see next section) in that Conformance Class.*

Conformance Classes are identified in the document as follows:

TG Conformance Class #: [TITLE] conformance classes are shown using this style

Technical Guidance Requirements and Recommendations notation

Requirements and the recommendations for INSPIRE Spatial Data Services and services allowing spatial data services to be invoked within this technical guidance are highlighted and numbered as shown below:

TG Requirement # requirements are shown using this style

TG Recommendation # recommendations are shown using this style.

It is important to note that, implementation requirements and implementation recommendations may refer to either service or client implementations. Requirements and recommendations belong to the conformance class in which they are found in this document.

Note: It is worth noting that requirements as specified in the INSPIRE Regulations and Implementing Rules are legally binding, and that requirements and recommendations as specified in INSPIRE Technical Guidance are **not** legally binding. Therefore, within this technical guidance we have used the terms ‘TG requirement’ and ‘TG recommendation’ to indicate what is technically required or recommended to conform to the Technical Guidance.

XML Example notation

XML Examples are shown using Courier New on a grey background with yellow for emphasis as below:

```
<inspire:example>
  <inspire:highlight>
    Highlighted Text for emphasis
  </inspire:highlight>
```

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</inspire:example>

Note: XML Examples are informative and are provided for information only and are expressly not normative.

3.4 References

References within this document are denoted using “Section” or “Annex”. For example, Section 5.3.1 or Annex A.

References to other documents refer to the list of normative references in Section 3 and use the abbreviated title as indicated in **Bold** text. For example, [**INS NS**] uses the abbreviated title for the document as shown below:

INSPIRE Network Services Regulation, **INS NS**, COMMISSION REGULATION (EU) No 1088/2010 of 23 November 2010 amending Regulation (EC) No 976/2009 as regards download services and transformation services

References within other documents are shown as above using the abbreviated title, together with the appropriate section within the document. For example, [**INS NS**, Section 2.2.3], refers to Section 2.2.3 within the document as listed above.

3.5 Future updates of this document

There are some issues that are foreseen, but are not covered or only partially covered in this version of the Technical Guidance.

4 INSPIRE Spatial Data Services and services allowing spatial data services to be invoked

In the context of INSPIRE the broad class of Spatial Data Services is broken down to distinguish the following categories of spatial data services:

1. spatial data services being discoverable;
2. spatial data services being invocable;
3. spatial data services being compliant with Interoperability Arrangements;
4. spatial data services being compliant with Harmonisation Requirements where practicable;

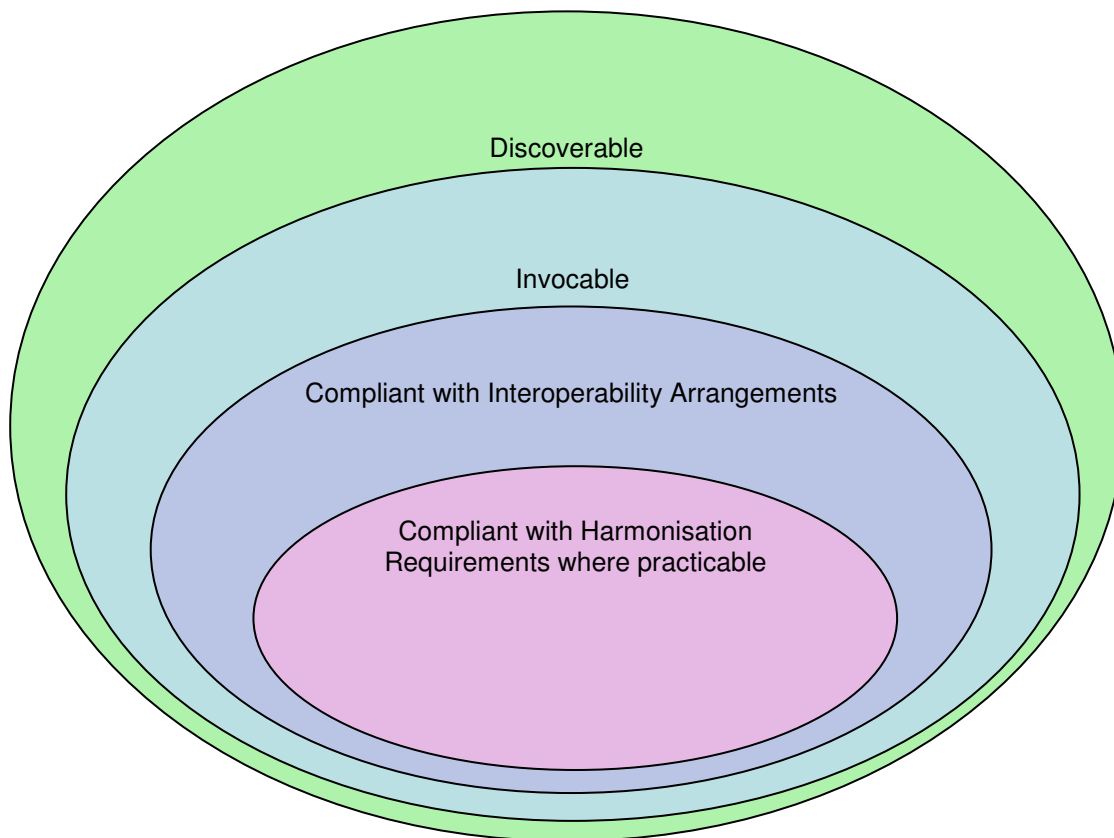


Figure 1 - INSPIRE Spatial Data Services (taken from [INS SDS IR, Section 3, Figure 3])

4.1 Discoverable spatial data services (in the INSPIRE context)

TG Conformance Class 1: Implementation of Discoverable spatial data services

This conformance class is inclusive of:

TG Requirement 1

Making spatial data services discoverable does not bring any other obligation than creation of metadata. In particular there are no quality of service requirements that have to be met and there is no obligatory quality of service information in the metadata record.

TG Requirement 1 There shall be metadata for all spatial data services and they should be provided in the Discover Metadata Response.

The metadata elements for Spatial Data Services shall be provided in the Discover Metadata Response (defined in Commission Regulation (EC) No 976/2009 in the Discovery service relevant sections).

Table 1, taken from [INS DS TG, section 4.3.1.3], shows the mapping from the INSPIRE metadata elements to the [ISO 19139].

Table 1 - Discovery service metadata

INSPIRE Metadata element	M/ C/ O	Type Field	ISO 19139 / CSW ISO AP
Resource title (B1.1)	M	String	identificationInfo[1]*/citation*/title [ISO 19139]
Resource abstract (B1.2)	M	String	identificationInfo[1]*/abstract [ISO 19139]
Resource Type (B1.3)	M		hierarchyLevel [ISO 19139]
Resource Locator (B1.4)	C	URL	istributionInfo*/transferOptions*/ onLine*/linkage [ISO 19139]
Coupled Resource (B1.6)	C	Refer to Annex A	identificationInfo[1]*/operatesOn
Spatial data service type (B2.2)	M	GenericName	identificationInfo[1]*/serviceType [CSW ISO Metadata AP]
Keyword value (B3.1) For the mandatory category or subcategory of the service	M	String	identificationInfo[1]*/descriptiveKeywords*/ keyword [ISO 19139]
Keyword value (B3.1) For any other keyword	O	String	identificationInfo[1]*/descriptiveKeywords*/ keyword [ISO 19139]
Originating controlled vocabulary (B3.2)	C		identificationInfo[1]*/descriptiveKeywords*/ thesaurusName [ISO 19139]
Temporal extent (B5.1)	C	Date	identificationInfo[1]*/extent*/temporalElem ent*/extent [ISO 19139]
Date of publication (B5.2)	C	Date	identificationInfo[1]*/citation*/date[.*/dateT

			ype/*text()='publication']*/date [ISO 19139]
Date of last revision (B5.3)	C	Date	identificationInfo[1]*/citation*/date[./*/dateT ype/*text()='revision']*/date [ISO 19139]
Date of creation (B5.4)	C	Date	identificationInfo[1]*/citation*/date[./*/dateT ype/*text()='creation']*/date [ISO 19139]
Specification (B7.1)	M	String	dataQualityInfo*/report*/result*/specificatio n [ISO 19139]
Degree (B7.2)	M	Boolean	dataQualityInfo*/report*/result*/pass [ISO 19139]
Conditions applying to access and use (B8.1)	M	String	identificationInfo[1]*/resourceConstraints*/ useLimitation [ISO 19139]
Limitations on public access (B8.2)	M	String	identificationInfo[1]*/resourceConstraints*/ accessConstraints [ISO 19139]
Responsible party (B9.1)	M	String	identificationInfo[1]*/pointOfContact*/ organisationName and identificationInfo[1]*/pointOfConta ct/address/electronicMailAddress [ISO 19139]
Responsible partyrole (B9.2)	M	String	identificationInfo[1]*/pointOfContact*/role [ISO 19139]
Metadata point of contact B10.1)	M	String	contact
Metadata Date (B10.2)	M	Date	dateStamp
MetadataLanguage (B10.3)	M	String	language

4.2 Invocable spatial data services

TG Conformance Class 2: Implementation of Invocable spatial data services

This conformance class is inclusive of:

TG Requirement 2 to TG Requirement 5

TG Recommendation 1

A spatial data service is *invocable* if sufficient machine readable metadata exist, are accessible, and are sufficient to allow for its automatic execution (invocation) by another service or an application (e.g. a Geoportal).

A spatial data service is invocable if the following conditions are satisfied:

- 1 the spatial data service is discoverable as defined in the Metadata Implementing Rule and as such fulfils TG Requirement 1;
- 2 at least one resource locator (as defined in Commission Regulation (EC) No 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the

- Council as regards metadata) for the spatial data service needs to be provided (refer to Section 4.2.1);
- 3 the resource locator defines an activation point and shall be a URL (refer to section 4.2.1);
 - 4 a spatial data service belongs into one of the categories 200, 300, 400, 500, 600, 700, 800 as defined in part D.4 of Commission Regulation (EC) No 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata;
 - 5 the spatial data service is conformant to either a standardized specification or well documented specification (e.g. ISO, OGC):
 - 5.1 thus respective metadata entry on 'conformance' (as defined in the Metadata Implementing Rule) is set to 'conformant'
 - 5.2 The cited specification (see Commission Regulation (EC) No 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata) corresponds to the implementing rules adopted under Article 7(1) of Directive 2007/2/EC or of a specification providing all necessary descriptions (human or machine readable) to allow for an automated invocation of the described service;
 - 6 the spatial data service has a well-documented and accessible description

Metadata elements that need to be provided for invocable services are described below.

4.2.1 Resource Locator – invocable level

TG Requirement 2 The Resource Locator shall contain at least one activation point of the service. The activation point shall be provided both in the Resource Locator metadata element (B1.4) and in the SV_ServiceIdentification, connectPoint metadata element.

Note: for details on SV_ServiceIdentification, connectPoint metadata element see section 4.2.2.

The table below is a subset from Table 1, section 4.1.

Table 2 - Resource locator

INSPIRE Metadata element	M/ C/ O	Type Field	ISO 19139 / CSW ISO AP	Metadata TG reference
Resource Locator (B1.4)	M	URL	istributionInfo/*/transferOptions/*/ onLine/*/linkage [ISO 19139]	2.2.4

The following table, taken from [ISO 19115, section B.3.2.5], describes the Resource Locator metadata elements.

Table 3 - CI_OnlineResource

Attribute name / Role name	Definition	Obligation / Condition	Maximum occurrence	Attribute class or target class of role
linkage	location (address) for on-line access using a Uniform Resource Locator address or similar addressing scheme such as http://www.statkart.no/isotc211	M	1	URL

protocol	connection protocol to be used	O	1	Free Text
applicationProfile	name of an application profile that can be used with the online resource	O	1	Free Text
name	name of the online resource	O	1	Free Text
description	detailed text description of what the online resource is/does	O	1	Free Text
function	code for function performed by the online resource	O	1	CI_OnlineFunctionCode <<CodeList>>

TG Requirement 3 The Resource Locator shall be one of the following:

- A link to the capabilities document;
- A link to the service WSDL document (SOAP binding);
- A link to a web page with further instructions;
- A link to a client application that directly accesses the service;
- A link to an activation point.

The CI_OnLineFunctionCode code list shall be extended to fit all possible resource locator cases. The following table shows the possible extensions to the code list.

Table 4 - CI_OnLineFunctionCode extension to [ISO 19115, section B 5.3]

Key	Description
view	Online interface for viewing the resource (Client application interaction)
transformation	Transformation services
clientApplication	Client application that directly accesses the service
serviceTypeInfo	Online information describing the service type specified in SV_ServerIdentification serviceType element. Mandatory if serviceType is set to "other".

TG Recommendation 1 If the type of client application pointed to by the resource locator does not fit into the specific code described above, we recommend to use the "clientApplication" function code, filling the item "description" of the CI_OnlineResource with a human readable description of the service provided by that interface.

It may be useful to add also the key "machineInteraction". However, since the "machine to machine" URL are identified when placed in the connectPoint element (SV_serviceidentification, refer to 4.2.2), it is no longer necessary to have another key in this codelist for Machine to Machine interaction. So, the "machineInteraction" resource locator (capabilities, WSDL and activation point) do not need the CI_OnLineFunctionCode to be specified.

A service instance might provide more than one access points. E.g.: it is often distinguished between an access point for reading data and an access point for writing data.

TG Requirement 4 There shall be only one description per service instance, which then provides information about all possible access points to the service.

Thus, at least one Resource Locator shall be provided.

For a list of examples regarding Resource Locator element, refer to Annex A.

4.2.2 Specification – invocable level

TG Requirement 5 The specification including all necessary information (human or machine readable) to allow for an automated invocation of the described service shall be provided using the [ISO 19119] SV_ServiceIdentification metadata element.

All the access point provided in the ResourceLocator element shall be provided also in the connectPoint metadata element. The connectPoint element is described in the table below. The following tables are taken from the [ISO 19119, section C.2.2].

Table 5 – SV_ServiceIdentification from [ISO 19119, section C.2.2]

Attribute name / Role name	Definition	Oblication / Condition	Maximum occurrence	Attribute class or target class of role
serviceType	A service type name from a registry of services. For example, the Values of the nameSpace and name attributes of GeneralName may be "OGC " and "catalogue."	M	1	GenericName
serviceTypeVersion	Provides for searching based on the version of serviceType. For example, we may only be interested in OGC Catalogue V1.1 services. If version is maintained as a separate attribute, users can easily search for all services of a type regardless of the version.	O	N	CharacterString
accessProperties	Information about the availability of the service, including, - Fees - Planned available date and time - Ordering instructions - Turnaround	O	1	MD_StandardOrderProcess
restrictions	Legal and security constraints on accessing the service and distributing data generated by the service.	O	1	MD_DataConstraints

<i>Role name:</i> containsOperations	Provides information about the operations that comprise the service	M	N	SV_OperationMetadata (ref. to table 4)
<i>Role name:</i> operatesOn	Provides information on the datasets that the service operates on	O	N	MD_DataIdentification

Table 6 - SV_OperationMetadata from [ISO19119, section C.2.3]

Attribute name / Role name	Definition	Oblication / Condition	Maximum occurrence	Attribute class or target class of role
operationName	A unique identifier for this interface.	M	1	CharacterString
DCP	Distributed Computing Platforms on which the operation has been implemented.	M	N	DCPList
operationDescription	Free text description of the intent of the operation and the results of the operation.	O	1	CharacterString
invocationName	The name used to invoke this interface within the context of the DCP. The name is identical for all DCPs.	O	1	CharacterString
parameters	The parameters that are required for this interface.	O	1	sequence(SV_Parameter) (ref. to table 5)
connectPoint	Handle for accessing the service interface.	M	N	CL_OnlineResource
dependsOn	List of operations that must be completed immediately before current operation is invoked, structured as a list for capturing alternate predecessor paths and sets for capturing parallel predecessor paths.	O	1	set{sequence{operationName} set{operationName}}

Table 7 - SV_Parameter from [ISO 19119, section C.2.7]

Attribute name / Role name	Definition	Oblication / Condition	Maximum occurrence	Attribute class or target class of role
Name	The name, as used by the service for this parameter.	M	1	MemberName
Direction	Indication if the parameter is an input to the service, an output or both.	O	1	ParameterDirection
Description	A narrative explanation of the role of the parameter	O	1	CharacterString
Optionality	Indication if the parameter is required	M	1	CharacterString
Repeatability	Indication if more than one value of the parameter may be provided.	M	1	Boolean

For Examples regarding ServiceIdentification refer to Annex B and C

4.3 Interoperability arrangements for spatial data services

TG Conformance Class 3: Spatial data services compliant with interoperability arrangements

This conformance class is inclusive of:

TG Requirement 6 to TG Requirement 10

TG Recommendation 2

As defined in [ISO 19119], interoperability is the capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units.

The user requirements for the interoperability of spatial data services include the ability to reuse spatial data services in new settings, or to orchestrate services to form more complex ones.

The table below shows mandatory and conditional common metadata elements for the interoperability arrangements.

Table 8 – Mandatory and conditional common metadata elements

Metadata element	Multiplicity	Condition
Coordinate Reference System	1	
Temporal Reference System	0..*	Mandatory, if the spatial data set or one of its feature types contains temporal information that does not refer to the Gregorian Calendar or the Coordinated Universal Time.
Encoding	1..*	
Character Encoding	0..*	Mandatory, if an encoding is used that is not based on UTF-8.
Error! Reference source not found.	1..*	

4.3.1 Interoperability arrangement – coordinate reference systems

INSPIRE spatial data sets produced or modified by a spatial data service shall be made available using one of the three-dimensional, two-dimensional or compound coordinate reference systems specified below (listed from Annex II.1 of the Commission Regulation (EC) No 1089/2010):

1. Three-dimensional Coordinate Reference Systems

- Three-dimensional Cartesian coordinates
- Three-dimensional geodetic coordinates (latitude, longitude and ellipsoidal height), using the parameters of the GRS80 ellipsoid

2. Two-dimensional Coordinate Reference Systems

- Two-dimensional geodetic coordinates, using the parameters of the GRS80 ellipsoid
- Plane coordinates using the Lambert Azimuthal Equal Area projection and the parameters of the GRS80 ellipsoid (ETRS89-LAEA)
- Plane coordinates using the Lambert Conformal Conic projection and the parameters of the GRS80 ellipsoid (ETRS89-LCC)
- Plane coordinates using the Transverse Mercator projection and the parameters of the GRS80 ellipsoid (ETRS89-TMzn)

3. Compound Coordinate Reference Systems

- For the horizontal component of the compound coordinate reference system, one of the two-dimensional coordinate reference systems specified above shall be used.
- For the vertical component on land, the European Vertical Reference System (EVRS) shall be used to express gravity-related heights within its geographical scope. Other vertical reference systems related to the Earth gravity field shall be used to express gravity-related heights in areas that are outside the geographical scope of EVRS. The geodetic codes and parameters for these vertical reference systems shall be documented and an identifier shall be created, according to [ISO 19111] and [ISO 19127].
- For the vertical component in the free atmosphere, barometric pressure, converted to height using ISO 2533:1975 International Standard Atmosphere, or other linear or parametric reference systems shall be used. Where other parametric reference systems are used, these shall be described in an accessible reference using [ISO 19111-2:2012].
- For the vertical component in marine areas where there is an appreciable tidal range (tidal waters), the Lowest Astronomical Tide (LAT) shall be used as the reference surface.
- For the vertical component in marine areas without an appreciable tidal range, in open oceans and effectively in waters that are deeper than 200 meters, the Mean Sea Level (MSL) or a well-defined reference level close to the MSL shall be used as the reference surface.

Other coordinate reference systems than those listed above may only be used if specified for a specific spatial data theme and for regions outside of continental Europe. The geodetic codes and parameters for these coordinate reference systems shall be documented, and an identifier shall be created, according to [ISO 19111] and [ISO 19127].

TG Requirement 6 A spatial data service compliant with interoperability arrangement shall include ISO metadata with the coordinate reference system(s) of the spatial data set(s) on which it operates.

Table 9 - Coordinate Reference System taken from [DST]

Metadata element name	Coordinate Reference System
-----------------------	-----------------------------

Definition	Description of the coordinate reference system used in the dataset.
ISO 19115 number and name	13. referenceSystemInfo
ISO/TS 19139 path	referenceSystemInfo
INSPIRE obligation / condition	mandatory
INSPIRE multiplicity	1
Data type(and ISO 19115 no.)	186. MD_ReferenceSystem
Domain	To identify the reference system, the referenceSystemIdentifier (RS_Identifier) shall be provided. NOTE More specific instructions, in particular on pre-defined values for filling the referenceSystemIdentifier attribute should be agreed among Member States during the implementation phase to support interoperability.
Implementing instructions	
Example	referenceSystemIdentifier: code: ETRS_89 codeSpace: INSPIRE RS registry
Example XML encoding	<gmd:referenceSystemInfo> <gmd:MD_ReferenceSystem> <gmd:referenceSystemIdentifier> <gmd:RS_Identifier> <gmd:code> <gco:CharacterString>ETRS89 </gco:CharacterString> </gmd:code> <gmd:codeSpace> <gco:CharacterString>INSPIRE RS registry</gco:CharacterString> </gmd:codeSpace> </gmd:RS_Identifier> </gmd:referenceSystemIdentifier> </gmd:MD_ReferenceSystem> </gmd:referenceSystemInfo>
Comments	

Coordinate reference system parameters and identifiers shall be managed in one or several common registers for coordinate reference systems. Only identifiers contained in a common register shall be used for referring to the coordinate reference systems listed in this section.

TG Recommendation 2 It is recommended to use the http URIs provided by the Open Geospatial Consortium as coordinate reference system identifiers (see identifiers for the default CRSs in Table 7). These are based on and redirect to the definition in the EPSG Geodetic Parameter Registry (<http://www.epsg-registry.org/>).

Table 10 - Recommended http URIs for the default coordinate reference systems

Coordinate reference system	Short name	http URI identifier
3D Cartesian in ETRS89	ETRS89-XYZ	http://www.opengis.net/def/crs/EPSSG/0/4936
3D geodetic in ETRS89 on GRS80	ETRS89-GRS80h	http://www.opengis.net/def/crs/EPSSG/0/4937
2D geodetic in ETRS89 on GRS80	ETRS89-GRS80	http://www.opengis.net/def/crs/EPSSG/0/4258
2D LAEA projection in ETRS89 on GRS80	ETRS89-LAEA	http://www.opengis.net/def/crs/EPSSG/0/3035
2D LCC projection in ETRS89 on GRS80	ETRS89-LCC	http://www.opengis.net/def/crs/EPSSG/0/3034
2D TM projection in ETRS89 on GRS80, zone 26N (30°W to 24°W)	ETRS89-TM26N	http://www.opengis.net/def/crs/EPSSG/0/3038
2D TM projection in ETRS89 on GRS80, zone 27N (24°W to 18°W)	ETRS89-TM27N	http://www.opengis.net/def/crs/EPSSG/0/3039
2D TM projection in ETRS89 on GRS80, zone 28N (18°W to 12°W)	ETRS89-TM28N	http://www.opengis.net/def/crs/EPSSG/0/3040
2D TM projection in ETRS89 on GRS80, zone 29N (12°W to 6°W)	ETRS89-TM29N	http://www.opengis.net/def/crs/EPSSG/0/3041
2D TM projection in ETRS89 on GRS80, zone 30N (6°W to 0°)	ETRS89-TM30N	http://www.opengis.net/def/crs/EPSSG/0/3042
2D TM projection in ETRS89 on GRS80, zone 31N (0° to 6°E)	ETRS89-TM31N	http://www.opengis.net/def/crs/EPSSG/0/3043
2D TM projection in ETRS89 on GRS80, zone 32N (6°E to 12°E)	ETRS89-TM32N	http://www.opengis.net/def/crs/EPSSG/0/3044
2D TM projection in ETRS89 on GRS80, zone 33N (12°E to 18°E)	ETRS89-TM33N	http://www.opengis.net/def/crs/EPSSG/0/3045
2D TM projection in ETRS89 on GRS80, zone 34N (18°E to 24°E)	ETRS89-TM34N	http://www.opengis.net/def/crs/EPSSG/0/3046
2D TM projection in ETRS89 on GRS80, zone 35N (24°E to 30°E)	ETRS89-TM35N	http://www.opengis.net/def/crs/EPSSG/0/3047
2D TM projection in ETRS89 on GRS80, zone 36N (30°E to 36°E)	ETRS89-TM36N	http://www.opengis.net/def/crs/EPSSG/0/3048
2D TM projection in ETRS89 on GRS80, zone 37N (36°E to 42°E)	ETRS89-TM37N	http://www.opengis.net/def/crs/EPSSG/0/3049
2D TM projection in ETRS89 on GRS80, zone 38N (42°E to 48°E)	ETRS89-TM38N	http://www.opengis.net/def/crs/EPSSG/0/3050
2D TM projection in ETRS89 on GRS80, zone 39N (48°E to 54°E)	ETRS89-TM39N	http://www.opengis.net/def/crs/EPSSG/0/3051
Height in EVRS	EVRS	http://www.opengis.net/def/crs/EPSSG/0/5730
3D compound: 2D geodetic in ETRS89 on GRS80, and EVRS height	ETRS89-GRS80-EVRS	http://www.opengis.net/def/crs/EPSSG/0/7409

4.3.2 Interoperability arrangement - Temporal reference system

The temporal reference system is described as metadata in the [DST] document.

4.3.3 Interoperability arrangement - Performance criteria, quality of service

The metadata mandated by the following requirements need an extension of the standard metadata. This extension will be implemented using one of the solutions proposed below.

TG Requirement 7 A new metadata element shall be provided to document the Availability of the Spatial Data Service

TG Requirement 8 A new metadata element shall be provided to document the Performance of the Spatial Data Service

TG Requirement 9 A new metadata element shall be provided to document the capacity of the Spatial Data Service

The attribute for the Quality of Service Metadata extension is listed in the table below:

Table 11 - Quality of Service Metadata

Attribute name	Attribute Definition	Attribute Type
Name	Name of the QoS criteria	codelist (capacity performance and availability)
Unit	Unit of Measurement	Free Text
Value	Value of the QoS	Free Text
Measurement Context	Provides more information on the context, pre-requisites, constraints and context to understand to what the value refers to.	Free Text

The possible solutions to extend the standard metadata to fit these requirements are listed below:

Scenario 1

Extend the ISO 19115 metadata, using the MD_MetadataExtensionInformation element; This solution presents some difficulties, including the management of the workflow needed by ISO for the update of the metadata.

Scenario 2

Create a custom XML that represents the QoS metadata and pass it via resource locator (with a proper function code). Below is presented a first example of xml encoding.

```
<QoS>
  <name codeList="http://www.example.com/Codelists.xml" codeListValue="availability" ></name>
  <unit>%</unit>
```



```
<value>99</value>
<measurementContext>simple example regarding availability measurement</measurementContext>
</QoS>
```

In case this scenario is chosen, the Resource Locator codelist should be extended with the following key:

Table 12 - Extend resource locator codelist for QoS

Key	Description
qualityOfService	Online xml resource that describe the quality of service.

4.4 Harmonized spatial data services

TG Conformance Class 4: Implementation of Spatial Data Services compliant with Harmonisation Requirements where practicable

This conformance class is inclusive of:

TG Requirement 11

The Directive states that the MS implementation of these harmonised services is ‘**where practicable**’. The decision to implement them according to the Implementing Rules given here is thus left to the MS.

TG Requirement 10 Spatial data services conformant to harmonization arrangement shall include a Get Spatial Data Service Metadata operation

4.4.1 Encoding

The Encoding is described as metadata in the [DST] document.

4.4.2 Implementation example

The implementation proposed below (following OWS specifications) is only one of the possible implementations of SDS. Other examples of non-OGC implementations will be provided in subsequent versions of those TGs. Input from is more than welcome.

4.4.3 OWS Implementation

Table 13 - Mapping operations

INSPIRE Spatial Data Services Operations	OGC Web Services Operations
Get Spatial Data Service Metadata	GetCapabilities

The example reported below follow [OWS] specifications.

4.4.3.1 GetCapabilities Request

This section contains a description about the get capabilities Request, including a table specifying the parameters needed by the request.

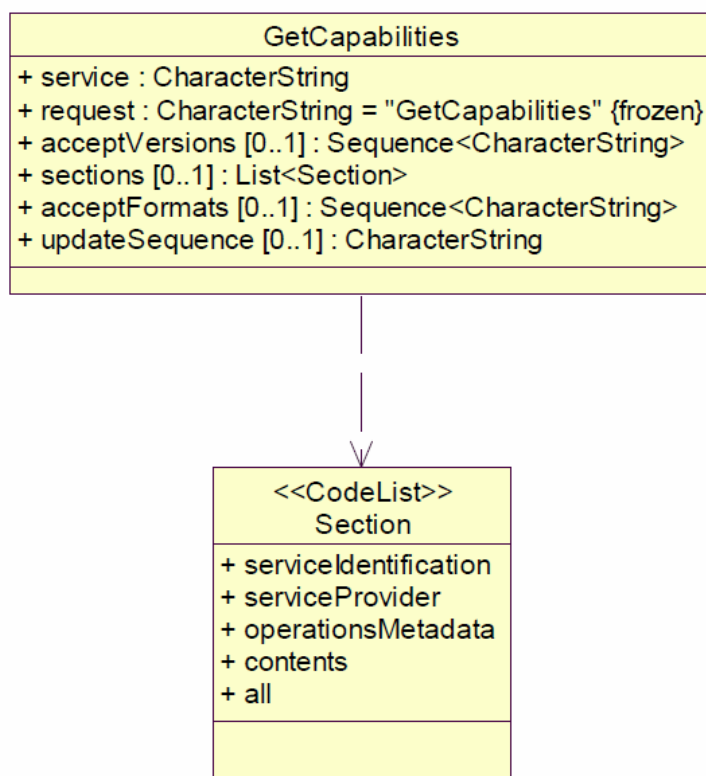


Figure 2 - GetCapabilities operation request UML class diagram taken from [OWS, section 7.2.1]

The service used (CSW) is only for example purpose; any of the OWS service could be used.

Table 14 - GetCapabilities request

Request Parameter	Mandatory / optional	Description
-------------------	----------------------	-------------

Service=code	M	Service type identifier (text). Example value: CSW,...
Request=GetCapabilities	M	Operation name (text). Fixed value: GetCapabilities.
AcceptVersions=version	O	Request version: 2.0.2

The Network Services Regulation requires that multilingual aspects for network services are supported [INS NS]. As there is no standard way to deal with multilingualism within the [OWS] specifications, the HTTP/GET binding of the GetCapabilities-Operation is extended by an additional parameter that indicates the client's preferred language.

Request Parameter	Parameter value	Description																												
LANGUAGE	<p>Codelist (See ISO/TS 19139) based on alpha-3 codes of ISO 639-2. Use only three-letter codes from in ISO 639-2/B (bibliographic codes), The list of codes for the 23 official EU languages and EFTA Countries is:</p> <table border="0"> <tr> <td>Bulgarian – bul</td> <td>Italian – ita</td> </tr> <tr> <td>Czech – cze</td> <td>Latvian – lav</td> </tr> <tr> <td>Danish – dan</td> <td>Liechtenstein – ger</td> </tr> <tr> <td>Dutch – dut</td> <td>Lithuanian – lit</td> </tr> <tr> <td>English – eng</td> <td>Maltese – mlt</td> </tr> <tr> <td>Polish – pol</td> <td>Norwegian – nor</td> </tr> <tr> <td>Estonian – est</td> <td>Portuguese – por</td> </tr> <tr> <td>Finnish – fin</td> <td>Romanian – rum</td> </tr> <tr> <td>French – fre</td> <td>Romansh - roh</td> </tr> <tr> <td>German – ger</td> <td>Slovak – slo</td> </tr> <tr> <td>Greek – gre</td> <td>Slovenian – slv</td> </tr> <tr> <td>Hungarian – hun</td> <td>Spanish – spa</td> </tr> <tr> <td>Irish – gle</td> <td>Swedish – swe</td> </tr> <tr> <td>Icelandic – ice</td> <td></td> </tr> </table> <p>The list of all the codes is defined at http://www.loc.gov/standards/iso639-2/ Regional languages also are included in this list.</p>	Bulgarian – bul	Italian – ita	Czech – cze	Latvian – lav	Danish – dan	Liechtenstein – ger	Dutch – dut	Lithuanian – lit	English – eng	Maltese – mlt	Polish – pol	Norwegian – nor	Estonian – est	Portuguese – por	Finnish – fin	Romanian – rum	French – fre	Romansh - roh	German – ger	Slovak – slo	Greek – gre	Slovenian – slv	Hungarian – hun	Spanish – spa	Irish – gle	Swedish – swe	Icelandic – ice		<p>It is optional for a Client Request.</p> <p>It is mandatory to be supported for the service and shall be processed if the parameter is present in a client's request with a supported language code. If the parameter is absent in a clients request or it requested an unsupported language the service shall response in the service default language.</p>
Bulgarian – bul	Italian – ita																													
Czech – cze	Latvian – lav																													
Danish – dan	Liechtenstein – ger																													
Dutch – dut	Lithuanian – lit																													
English – eng	Maltese – mlt																													
Polish – pol	Norwegian – nor																													
Estonian – est	Portuguese – por																													
Finnish – fin	Romanian – rum																													
French – fre	Romansh - roh																													
German – ger	Slovak – slo																													
Greek – gre	Slovenian – slv																													
Hungarian – hun	Spanish – spa																													
Irish – gle	Swedish – swe																													
Icelandic – ice																														

4.4.3.2 GetCapabilities Request Examples

GetCapabilities Request KPV Encoding Example

<http://www.example.com/srv?REQUEST=GetCapabilities&SERVICE=CSW&ACCEPTVERSIONS=2.0.2&LANGUAGE=eng>

GetCapabilities Request XML Encoding Example

```
<csw:GetCapabilities xmlns:ows="http://www.opengis.net/ows" xmlns:csw="http://www.opengis.net/cat/csw/2.0.2"
xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.opengis.net/cat/csw/2.0.2 http://schemas.opengis.net/csw/2.0.2/CSW-discovery.xsd"
service="CSW">
  <ows:AcceptVersions>
    <ows:Version>2.0.2</ows:Version>
  </ows:AcceptVersions>
</csw:GetCapabilities>
```

GetCapabilities Request SOAP Encoding Example

Specific OWS servers may implement SOAP version 1.2 transfer to the GetCapabilities operation request using the XML encoding specified above.

4.4.3.3 GetCapabilities Response

This section describes the GetCapabilities Response.

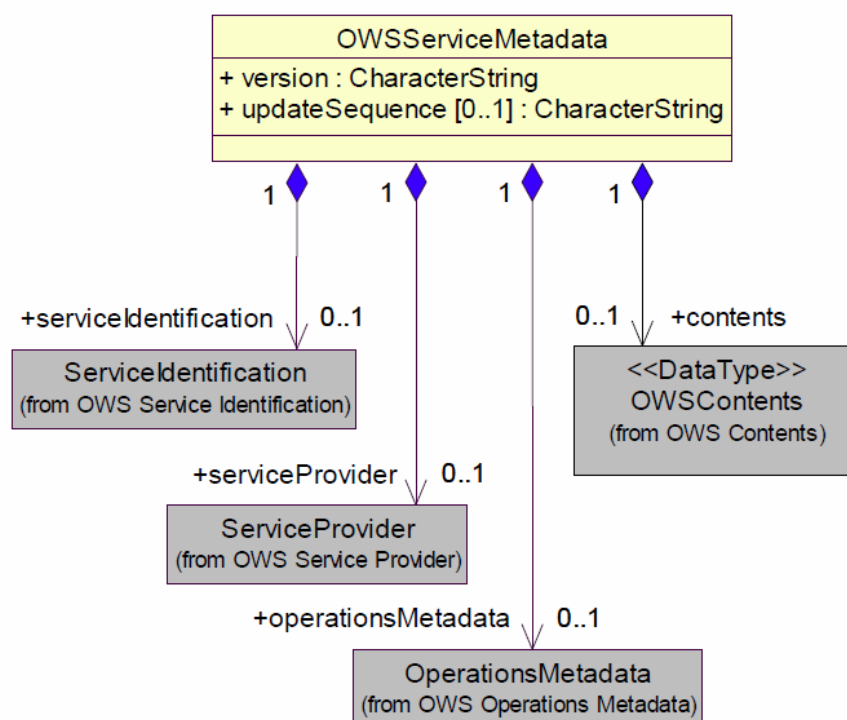


Figure 3 - GetCapabilities operation response UML class diagram taken from [OWS, section 7.4.2]

4.4.3.4 GetCapabilities Response Examples

GetCapabilities Response XML Encoding Example

```
<csw:Capabilities xmlns:csw="http://www.opengis.net/cat/csw/2.0.2" xmlns:gml="http://www.opengis.net/gml"
xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:ows="http://www.opengis.net/ows"
xmlns:ogc="http://www.opengis.net/ogc" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
```

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```

xmlns:inspire_ds="http://inspire.ec.europa.eu/schemas/inspire_ds/1.0"
xmlns:inspire_common="http://inspire.ec.europa.eu/schemas/common/1.0" version="2.0.2"
xsi:schemaLocation="http://www.opengis.net/cat/csw/2.0.2 http://schemas.opengis.net/csw/2.0.2/CSW-discovery.xsd
http://inspire.ec.europa.eu/schemas/inspire_ds/1.0 http://inspire.ec.europa.eu/schemas/inspire_ds/1.0/inspire_ds.xsd">
<ows:ServiceIdentification>
  <ows:Title>EXAMPLE CSW</ows:Title>
  <ows:Abstract>Example</ows:Abstract>
  <ows:Keywords>
    <ows:Keyword>Example KW 1</ows:Keyword>
    <ows:Keyword>Example KW 2</ows:Keyword>
    <ows:Type>theme</ows:Type>
  </ows:Keywords>
  <ows:ServiceType>CSW</ows:ServiceType>
  <ows:ServiceTypeVersion>2.0.2</ows:ServiceTypeVersion>
  <ows:Fees>no</ows:Fees>
  <ows:AccessConstraints>no</ows:AccessConstraints>
</ows:ServiceIdentification>
<ows:ServiceProvider>
  <ows:ProviderName>Example</ows:ProviderName>
  <ows:ProviderSite xlink:href="http://www.example.com/" />
  <ows:ServiceContact>
    <ows:IndividualName>Name</ows:IndividualName>
    <ows:PositionName>Administrator</ows:PositionName>
    <ows:ContactInfo>
      <ows:Phone>
        <ows:Voice />
        <ows:Facsimile />
      </ows:Phone>
      <ows:Address>
        <ows:DeliveryPoint>Example</ows:DeliveryPoint>
        <ows:City>Example</ows:City>
        <ows:AdministrativeArea>Example</ows:AdministrativeArea>
        <ows:PostalCode>12345</ows:PostalCode>
        <ows:Country>EX</ows:Country>
        <ows:ElectronicMailAddress>example@example.com</ows:ElectronicMailAddress>
      </ows:Address>
      <ows:HoursOfService />
      <ows:ContactInstructions />
    </ows:ContactInfo>
    <ows:Role>publisher</ows:Role>
  </ows:ServiceContact>
</ows:ServiceProvider>
<ows:OperationsMetadata>
  <ows:Operation name="GetCapabilities">
    <ows:DCP>
      <ows:HTTP>
        <ows:Get xlink:href="http://www.example.com:80/srv/csw" />
        <ows:Post xlink:href="http://www.example.com:80/srv/csw" />
      </ows:HTTP>
    </ows:DCP>
    <ows:Parameter name="sections">
      <ows:Value>ServiceIdentification</ows:Value>
      <ows:Value>ServiceProvider</ows:Value>
      <ows:Value>OperationsMetadata</ows:Value>
      <ows:Value>Filter_Capabilities</ows:Value>
    </ows:Parameter>
    <ows:Constraint name="PostEncoding">
      <ows:Value>XML</ows:Value>
    </ows:Constraint>
  </ows:Operation>
  <ows:Operation name="DescribeRecord">
    <ows:DCP>
      <ows:HTTP>
        <ows:Get xlink:href="http://www.example.com:80/srv/csw" />
        <ows:Post xlink:href="http://www.example.com:80/srv/csw" />
        <ows:Constraint name="PostEncoding">
          <ows:Value>XML</ows:Value>
          <ows:Value>SOAP</ows:Value>
        </ows:Constraint>
      </ows:Post>
    </ows:HTTP>
  </ows:DCP>
</ows:OperationsMetadata>

```

```

<ows:Parameter name="typeName">
  <ows:Value>csw:Record</ows:Value>
  <ows:Value>gmd:MD_Metadata</ows:Value>
</ows:Parameter>
<ows:Parameter name="outputFormat">
  <ows:Value>application/xml</ows:Value>
</ows:Parameter>
<ows:Parameter name="schemaLanguage">
  <ows:Value>http://www.w3.org/TR/xmlschema-1/</ows:Value>
</ows:Parameter>
<ows:Parameter name="typeName">
  <ows:Value>csw:Record</ows:Value>
  <ows:Value>gmd:MD_Metadata</ows:Value>
</ows:Parameter>
<ows:Constraint name="PostEncoding">
  <ows:Value>XML</ows:Value>
</ows:Constraint>
</ows:Operation>
<ows:Operation name="GetDomain">
  <ows:DCP>
    <ows:HTTP>
      <ows:Get xlink:href="http://www.example.com:80/srv/csw" />
      <ows:Post xlink:href="http://www.example.com:80/srv/csw" />
    </ows:HTTP>
  </ows:DCP>
</ows:Operation>
<ows:Operation name="GetRecords">
  <ows:DCP>
    <ows:HTTP>
      <ows:Get xlink:href="http://www.example.com:80/srv/csw" />
      <ows:Post xlink:href="http://www.example.com:80/srv/csw">
        <ows:Constraint name="PostEncoding">
          <ows:Value>XML</ows:Value>
          <ows:Value>SOAP</ows:Value>
        </ows:Constraint>
      </ows:Post>
    </ows:HTTP>
  </ows:DCP>
<ows:Parameter name="resultType">
  <ows:Value>hits</ows:Value>
  <ows:Value>results</ows:Value>
  <ows:Value>validate</ows:Value>
</ows:Parameter>
<ows:Parameter name="outputFormat">
  <ows:Value>application/xml</ows:Value>
</ows:Parameter>
<ows:Parameter name="outputSchema">
  <ows:Value>http://www.opengis.net/cat/csw/2.0.2</ows:Value>
  <ows:Value>http://www.isotc211.org/2005/gmd</ows:Value>
</ows:Parameter>
<ows:Parameter name="typeNames">
  <ows:Value>csw:Record</ows:Value>
  <ows:Value>gmd:MD_Metadata</ows:Value>
</ows:Parameter>
<ows:Parameter name="CONSTRAINTLANGUAGE">
  <ows:Value>FILTER</ows:Value>
  <ows:Value>CQL_TEXT</ows:Value>
</ows:Parameter>
<ows:Constraint name="PostEncoding">
  <ows:Value>XML</ows:Value>
</ows:Constraint>
<ows:Constraint name="SupportedISOQueryables">
  <ows:Value>Operation</ows:Value>
  <ows:Value>Format</ows:Value>
  <ows:Value>OrganisationName</ows:Value>
  <ows:Value>Type</ows:Value>
  <ows:Value>ServiceType</ows:Value>
  <ows:Value>DistanceValue</ows:Value>
  <ows:Value>ResourceLanguage</ows:Value>
  <ows:Value>RevisionDate</ows:Value>
  <ows:Value>OperatesOn</ows:Value>
  <ows:Value>GeographicDescriptionCode</ows:Value>

```

```

<ows:Value>AnyText</ows:Value>
<ows:Value>Modified</ows:Value>
<ows:Value>PublicationDate</ows:Value>
<ows:Value>ResourceIdentifier</ows:Value>
<ows:Value>ParentIdentifier</ows:Value>
<ows:Value>Identifier</ows:Value>
<ows:Value>CouplingType</ows:Value>
<ows:Value>TopicCategory</ows:Value>
<ows:Value>OperatesOnIdentifier</ows:Value>
<ows:Value>ServiceTypeVersion</ows:Value>
<ows:Value>TempExtent_end</ows:Value>
<ows:Value>Subject</ows:Value>
<ows:Value>CreationDate</ows:Value>
<ows:Value>OperatesOnName</ows:Value>
<ows:Value>Title</ows:Value>
<ows:Value>DistanceUOM</ows:Value>
<ows:Value>Denominator</ows:Value>
<ows:Value>AlternateTitle</ows:Value>
<ows:Value>Language</ows:Value>
<ows:Value>TempExtent_begin</ows:Value>
<ows:Value>HasSecurityConstraints</ows:Value>
<ows:Value>KeywordType</ows:Value>
<ows:Value>Abstract</ows:Value>
</ows:Constraint>
<ows:Constraint name="AdditionalQueryable">
  <ows:Value>AccessConstraints</ows:Value>
  <ows:Value>ResponsiblePartyRole</ows:Value>
  <ows:Value>OnlineResourceMimeType</ows:Value>
  <ows:Value>OnlineResourceType</ows:Value>
  <ows:Value>Lineage</ows:Value>
  <ows:Value>SpecificationDate</ows:Value>
  <ows:Value>ConditionApplyingToAccessAndUse</ows:Value>
  <ows:Value>SpecificationDateType</ows:Value>
  <ows:Value>MetadataPointOfContact</ows:Value>
  <ows:Value>Classification</ows:Value>
  <ows:Value>OtherConstraints</ows:Value>
  <ows:Value>Degree</ows:Value>
  <ows:Value>SpecificationTitle</ows:Value>
</ows:Constraint>
</ows:Operation>
<ows:Operation name="GetRecordById">
  <ows:DCP>
    <ows:HTTP>
      <ows:Get xlink:href="http://www.example.com:80/srv/csw" />
      <ows:Post xlink:href="http://www.example.com:80/srv/csw">
        <ows:Constraint name="PostEncoding">
          <ows:Value>XML</ows:Value>
          <ows:Value>SOAP</ows:Value>
        </ows:Constraint>
      </ows:Post>
    </ows:HTTP>
  </ows:DCP>
  <ows:Parameter name="outputSchema">
    <ows:Value>http://www.opengis.net/cat/csw/2.0.2</ows:Value>
    <ows:Value>http://www.isotc211.org/2005/gmd</ows:Value>
  </ows:Parameter>
  <ows:Parameter name="outputFormat">
    <ows:Value>application/xml</ows:Value>
  </ows:Parameter>
  <ows:Parameter name="resultType">
    <ows:Value>hits</ows:Value>
    <ows:Value>results</ows:Value>
    <ows:Value>validate</ows:Value>
  </ows:Parameter>
  <ows:Parameter name="ElementSetName">
    <ows:Value>brief</ows:Value>
    <ows:Value>summary</ows:Value>
    <ows:Value>full</ows:Value>
  </ows:Parameter>
  <ows:Constraint name="PostEncoding">
    <ows:Value>XML</ows:Value>
  </ows:Constraint>

```

```

<ows:Constraint name="AdditionalQueryables">
  <ows:Value>Degree</ows:Value>
  <ows:Value>AccessConstraints</ows:Value>
  <ows:Value>OtherConstraints</ows:Value>
  <ows:Value>Classification</ows:Value>
  <ows:Value>ConditionApplyingToAccessAndUse</ows:Value>
  <ows:Value>Lineage</ows:Value>
  <ows:Value>ResponsiblePartyRole</ows:Value>
  <ows:Value>SpecificationTitle</ows:Value>
  <ows:Value>SpecificationDate</ows:Value>
  <ows:Value>SpecificationDateType</ows:Value>
</ows:Constraint>
</ows:Operation>
<ows:Operation name="Transaction">
  <ows:DCP>
    <ows:HTTP>
      <ows:Get xlink:href="http://www.example.com:80/srv/csw" />
      <ows:Post xlink:href="http://www.example.com:80/srv/csw" />
    </ows:HTTP>
  </ows:DCP>
</ows:Operation>
<ows:Parameter name="service">
  <ows:Value>http://www.opengis.net/cat/csw/2.0.2</ows:Value>
</ows:Parameter>
<ows:Parameter name="version">
  <ows:Value>2.0.2</ows:Value>
</ows:Parameter>
<ows:Constraint name="IsoProfiles">
  <ows:Value>http://www.isotc211.org/2005/gmd</ows:Value>
</ows:Constraint>
<ows:Constraint name="PostEncoding">
  <ows:Value>SOAP</ows:Value>
</ows:Constraint>
<inspire_ds:ExtendedCapabilities>
  <inspire_common:ResourceLocator>
<inspire_common:URL>http://www.example.com/srv?REQUEST=GetCapabilities&SERVICE=CSW&ACCEPTVERSION=2.0.2&
outputFormat=application/xml</inspire_common:URL>
  <inspire_common:MediaType>application/vnd.ogc.wms_xml</inspire_common:MediaType>
</inspire_common:ResourceLocator>
<inspire_common:ResourceLocator>
  <inspire_common:URL>http://www.example.com:80/geonetwork</inspire_common:URL>
  <inspire_common:MediaType>text/html</inspire_common:MediaType>
</inspire_common:ResourceLocator>
<inspire_common:ResourceType>service</inspire_common:ResourceType>
<inspire_common:TemporalReference>
  <inspire_common:TemporalExtent>
    <inspire_common:IntervalOfDates>
      <inspire_common:StartingDate>2010-07-01T00:00:00</inspire_common:StartingDate>
      <inspire_common:EndDate>2011-07-01T00:00:00</inspire_common:EndDate>
    </inspire_common:IntervalOfDates>
  </inspire_common:TemporalExtent>
</inspire_common:TemporalReference>
<inspire_common:Conformity>
  <inspire_common:Specification xsi:type="inspire_common:citationInspireInteroperabilityRegulation_ger">
    <inspire_common:Title>Example</inspire_common:Title>
    <inspire_common:DateOfPublication>2010-12-08</inspire_common:DateOfPublication>
    <inspire_common:URI>OJ:L:2010:323:0011:0102:DE:PDF</inspire_common:URI>
    <inspire_common:ResourceLocator>
      <inspire_common:URL>http://eur-
lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:323:0011:0102:DE:PDF</inspire_common:URL>
    <inspire_common:MediaType>application/pdf</inspire_common:MediaType>
  </inspire_common:ResourceLocator>
  </inspire_common:Specification>
  <inspire_common:Degree>notEvaluated</inspire_common:Degree>
</inspire_common:Conformity>
<inspire_common:MetadataPointOfContact>
  <inspire_common:OrganisationName>Example</inspire_common:OrganisationName>
  <inspire_common:EmailAddress>example@example.com</inspire_common:EmailAddress>
</inspire_common:MetadataPointOfContact>
<inspire_common:MetadataDate>2010-07-15</inspire_common:MetadataDate>
<inspire_common:SpatialDataServiceType>discovery</inspire_common:SpatialDataServiceType>

```


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```

<inspire_common:MandatoryKeyword xsi:type="inspire_common:classificationOfSpatialDataService">
  <inspire_common:KeywordValue>humanCatalogueViewer</inspire_common:KeywordValue>
</inspire_common:MandatoryKeyword>
<inspire_common:Keyword xsi:type="inspire_common:inspireTheme_eng">
  <inspire_common:OriginatingControlledVocabulary>
    <inspire_common:Title>GEMET - INSPIRE themes</inspire_common:Title>
    <inspire_common:DateOfPublication>2008-06-01</inspire_common:DateOfPublication>
  </inspire_common:OriginatingControlledVocabulary>
  <inspire_common:KeywordValue>Orthoimagery</inspire_common:KeywordValue>
</inspire_common:Keyword>
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  <inspire_common:DefaultLanguage>
    <inspire_common:Language>eng</inspire_common:Language>
  </inspire_common:DefaultLanguage>
  <inspire_common:SupportedLanguage>
    <inspire_common:Language>ger</inspire_common:Language>
  </inspire_common:SupportedLanguage>
  <inspire_common:SupportedLanguage>
    <inspire_common:Language>por</inspire_common:Language>
  </inspire_common:SupportedLanguage>
  <inspire_common:SupportedLanguage>
    <inspire_common:Language>fre</inspire_common:Language>
  </inspire_common:SupportedLanguage>
  <inspire_common:SupportedLanguage>
    <inspire_common:Language>spa</inspire_common:Language>
  </inspire_common:SupportedLanguage>
  <inspire_common:SupportedLanguage>
    <inspire_common:Language>dut</inspire_common:Language>
  </inspire_common:SupportedLanguage>
</inspire_common:SupportedLanguages>
<inspire_common:ResponseLanguage>
  <inspire_common:Language>ger</inspire_common:Language>
</inspire_common:ResponseLanguage>
</inspire_ds:ExtendedCapabilities>
</ows:OperationsMetadata>
<ogc:Filter_Capabilities>
<ogc:Spatial_Capabilities>
  <ogc:GeometryOperands>
    <ogc:GeometryOperand>gml:Envelope</ogc:GeometryOperand>
    <ogc:GeometryOperand>gml:Point</ogc:GeometryOperand>
    <ogc:GeometryOperand>gml:LineString</ogc:GeometryOperand>
    <ogc:GeometryOperand>gml:Polygon</ogc:GeometryOperand>
  </ogc:GeometryOperands>
  <ogc:SpatialOperators>
    <ogc:SpatialOperator name="BBOX" />
    <ogc:SpatialOperator name="Equals" />
    <ogc:SpatialOperator name="Overlaps" />
    <ogc:SpatialOperator name="Disjoint" />
    <ogc:SpatialOperator name="Intersects" />
    <ogc:SpatialOperator name="Touches" />
    <ogc:SpatialOperator name="Crosses" />
    <ogc:SpatialOperator name="Within" />
    <ogc:SpatialOperator name="Contains" />
  </ogc:SpatialOperators>
</ogc:Spatial_Capabilities>
<ogc:Scalar_Capabilities>
  <ogc:LogicalOperators />
  <ogc:ComparisonOperators>
    <ogc:ComparisonOperator>EqualTo</ogc:ComparisonOperator>
    <ogc:ComparisonOperator>Like</ogc:ComparisonOperator>
    <ogc:ComparisonOperator>LessThan</ogc:ComparisonOperator>
    <ogc:ComparisonOperator>GreaterThan</ogc:ComparisonOperator>
    <ogc:ComparisonOperator>LessThanEqualTo</ogc:ComparisonOperator>
    <ogc:ComparisonOperator>GreaterThanEqualTo</ogc:ComparisonOperator>
    <ogc:ComparisonOperator>NotEqualTo</ogc:ComparisonOperator>
    <ogc:ComparisonOperator>Between</ogc:ComparisonOperator>
  </ogc:ComparisonOperators>
</ogc:Scalar_Capabilities>
<ogc:Id_Capabilities>
  <ogc:EID />
  <ogc:FID />
</ogc:Id_Capabilities>

```

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</ogc:Filter_Capabilities>
</csw:Capabilities>

Annex B – Resource Locator examples

If the resourceLocator represents a machine to machine interaction, there is no need to specify the function code (see 4.2.2 for details).

Resource Locator: a link to the capabilities document;

```
<gmd:MD_Metadata ...
...
<gmd:distributionInfo>
  <gmd:MD_Distribution>
    ...
    <gmd:transferOptions>
      <gmd:MD_DigitalTransferOptions>
        <gmd:onLine>
          <gmd:CI_OnlineResource>
            <gmd:linkage>
              <gmd:URL>http://example.com/server?CAPABILITIES</gmd:URL>
            </gmd:linkage>
            <gmd:name>
              <gco:CharacterString>INSPIRE</gco:CharacterString>
            </gmd:name>
          </gmd:CI_OnlineResource>
        </gmd:onLine>
      </gmd:MD_DigitalTransferOptions>
    </gmd:transferOptions>
  </gmd:MD_Distribution>
</gmd:distributionInfo>
...
</gmd:MD_Metadata>
```

Resource Locator: a link to the service WSDL document (SOAP binding);

```
<gmd:MD_Metadata ...
...
<gmd:distributionInfo>
  <gmd:MD_Distribution>
    ...
    <gmd:transferOptions>
      <gmd:MD_DigitalTransferOptions>
        <gmd:onLine>
          <gmd:CI_OnlineResource>
            <gmd:linkage>
              <gmd:URL>http://example.com/server?WSDL</gmd:URL>
            </gmd:linkage>
            <gmd:name>
              <gco:CharacterString>INSPIRE</gco:CharacterString>
            </gmd:name>
          </gmd:CI_OnlineResource>
        </gmd:onLine>
      </gmd:MD_DigitalTransferOptions>
    </gmd:transferOptions>
  </gmd:MD_Distribution>
</gmd:distributionInfo>
...
</gmd:MD_Metadata>
```

Resource Locator: a link to a web page with further instructions;

```
<gmd:MD_Metadata ...
...
<gmd:distributionInfo>
  <gmd:MD_Distribution>
    ...
    <gmd:transferOptions>
```

```

    <gmd:MD_DigitalTransferOptions>
      <gmd:onLine>
        <gmd:CI_OnlineResource>
          <gmd:linkage>
            <gmd:URL>http://inspire-geoportal.ec.europa.eu/discovery/</gmd:URL>
          </gmd:linkage>
          <gmd:name>
            <gco:CharacterString>INSPIRE</gco:CharacterString>
          </gmd:name>
          <gmd:function>
            <gmd:CI_OnlineFunctionCode
              codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodellists.xml"
              codeListValue="information" />
          </gmd:function>
        </gmd:CI_OnlineResource>
      </gmd:onLine>
    </gmd:MD_DigitalTransferOptions>
  </gmd:transferOptions>
</gmd:MD_Distribution>
</gmd:distributionInfo>
...
</gmd:MD_Metadata>

```

Resource Locator: a link to a client application that directly accesses the service;

```

<gmd:MD_Metadata ...
...
<gmd:distributionInfo>
  <gmd:MD_Distribution>
    ...
    <gmd:transferOptions>
      <gmd:MD_DigitalTransferOptions>
        <gmd:onLine>
          <gmd:CI_OnlineResource>
            <gmd:linkage>
              <gmd:URL>http://inspire-geoportal.ec.europa.eu/discovery/</gmd:URL>
            </gmd:linkage>
            <gmd:name>
              <gco:CharacterString>INSPIRE</gco:CharacterString>
            </gmd:name>
            <gmd:function>
              <gmd:CI_OnlineFunctionCode
                codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodellists.xml"
                codeListValue="view" />
            </gmd:function>
          </gmd:CI_OnlineResource>
        </gmd:onLine>
      </gmd:MD_DigitalTransferOptions>
    </gmd:transferOptions>
  </gmd:MD_Distribution>
</gmd:distributionInfo>
...
</gmd:MD_Metadata>

```

Resource Locator: a link to an activation point.

```

<gmd:MD_Metadata ...
...
<gmd:distributionInfo>
  <gmd:MD_Distribution>
    ...
    <gmd:transferOptions>
      <gmd:MD_DigitalTransferOptions>
        <gmd:onLine>
          <gmd:CI_OnlineResource>
            <gmd:linkage>
              <gmd:URL>http://example.com/do?</gmd:URL>
            </gmd:linkage>
            <gmd:name>

```

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```
<gco:CharacterString>INSPIRE</gco:CharacterString>
</gmd:name>
</gmd:CI_OnlineResource>
</gmd:onLine>
</gmd:MD_DigitalTransferOptions>
</gmd:transferOptions>
</gmd:MD_Distribution>
</gmd:distributionInfo>
...
</gmd:MD_Metadata>
```

Annex B – ServiceIdentification Example

```

<srv:SV_ServiceIdentification uuid="ingrid#26472b27-50d2-32da-8d59-1d8b155e4ff8">
  <gmd:citation>
    <gmd:CI_Citation>
      <gmd:title>
        <gco:CharacterString>Service Identification DEMO</gco:CharacterString>
      </gmd:title>
      <gmd:date>
        <gmd:CI_Date>
          <gmd:date>
            <gco:DateTime>2012-07-09T00:00:00</gco:DateTime>
          </gmd:date>
          <gmd:dateType>
            <gmd:CI_DateTypeCode
codeList="http://www.tc211.org/ISO19139/resources/codeList.xml#CI_DateTypeCode" codeListValue="publication"/>
            </gmd:dateType>
          </gmd:CI_Date>
        </gmd:date>
      </gmd:CI_Citation>
    </gmd:citation>
    <gmd:abstract>
      <gco:CharacterString>Service abstract should go here</gco:CharacterString>
    </gmd:abstract>
    <gmd:status>
      <gmd:MD_ProgressCode
codeList="http://www.tc211.org/ISO19139/resources/codeList.xml#MD_ProgressCode" codeListValue="inOperation"/>
    </gmd:status>
    <gmd:pointOfContact>
      <gmd:CI_ResponsibleParty>
        <gmd:individualName>
          <gco:CharacterString>Name Surname</gco:CharacterString>
        </gmd:individualName>
        <gmd:organisationName>
          <gco:CharacterString>Organisation Name</gco:CharacterString>
        </gmd:organisationName>
        <gmd:contactInfo>
          <gmd:CI_Contact>
            <gmd:phone>
              <gmd:CI_Telephone>
                <gmd:voice>
                  <gco:CharacterString>+39 123 456
789</gco:CharacterString>
                </gmd:voice>
              </gmd:CI_Telephone>
            </gmd:phone>
            <gmd:address>
              <gmd:CI_Address>
                <gmd:electronicMailAddress>
                  <gco:CharacterString>test@example.eu</gco:CharacterString>
                </gmd:electronicMailAddress>
              </gmd:CI_Address>
            </gmd:address>
          </gmd:CI_Contact>
        </gmd:contactInfo>
        <gmd:role>
          <gmd:CI_RoleCode
codeList="http://www.tc211.org/ISO19139/resources/codeList.xml#CI_RoleCode" codeListValue="custodian"/>
        </gmd:role>
      </gmd:CI_ResponsibleParty>
    </gmd:pointOfContact>
    <gmd:descriptiveKeywords>
      <gmd:MD_Keywords>
        <gmd:keyword>
          <gco:CharacterString>Hydrography</gco:CharacterString>
        </gmd:keyword>
        <gmd:type>
          <gmd:MD_KeywordTypeCode
codeList="http://www.tc211.org/ISO19139/resources/codeList.xml#MD_KeywordTypeCode" codeListValue="theme"/>
        </gmd:MD_KeywordTypeCode>
      </gmd:MD_Keywords>
    </gmd:descriptiveKeywords>
  </gmd:SV_ServiceIdentification>

```

```

</gmd:type>
<gmd:thesaurusName>
  <gmd:CI_Citation>
    <gmd:title>
      <gco:CharacterString>GEMET - INSPIRE themes, version
1.0</gco:CharacterString>
    </gmd:title>
    <gmd:date>
      <gmd:CI_Date>
        <gmd:date>
          <gco:Date>2008-06-01</gco:Date>
        </gmd:date>
        <gmd:dateType>
          <gmd:CI_DateTypeCode
codeList="http://www.isotc211.org/2005/resources/codeList.xml#CI_DateTypeCode" codeListValue="publication"/>
          </gmd:dateType>
        </gmd:CI_Date>
      </gmd:date>
    </gmd:CI_Citation>
  </gmd:thesaurusName>
</gmd:MD_Keywords>
</gmd:descriptiveKeywords>
<gmd:descriptiveKeywords>
  <gmd:MD_Keywords>
    <gmd:keyword>
      <gco:CharacterString>river basin development</gco:CharacterString>
    </gmd:keyword>
    <gmd:keyword>
      <gco:CharacterString>river management</gco:CharacterString>
    </gmd:keyword>
    <gmd:thesaurusName>
      <gmd:CI_Citation>
        <gmd:title>
          <gco:CharacterString>GEMET - Concepts, version
2.3</gco:CharacterString>
        </gmd:title>
        <gmd:date>
          <gmd:CI_Date>
            <gmd:date>
              <gco:Date>2009-07-13</gco:Date>
            </gmd:date>
            <gmd:dateType>
              <gmd:CI_DateTypeCode
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/ML_gmxCodetlists.x
ml#CI_DateTypeCode" codeListValue="publication">publication</gmd:CI_DateTypeCode>
              </gmd:dateType>
            </gmd:CI_Date>
          </gmd:date>
        </gmd:CI_Citation>
      </gmd:thesaurusName>
</gmd:MD_Keywords>
</gmd:descriptiveKeywords>
<gmd:descriptiveKeywords>
  <gmd:MD_Keywords>
    <gmd:keyword>
      <gco:CharacterString>infoFeatureAccessService</gco:CharacterString>
    </gmd:keyword>
    <gmd:type>
      <gmd:MD_KeywordTypeCode
codeList="http://www.tc211.org/ISO19139/resources/codeList.xml#MD_KeywordTypeCode" codeListValue="theme"/>
    </gmd:type>
    <gmd:thesaurusName>
      <gmd:CI_Citation>
        <gmd:title>
          <gco:CharacterString>Service Classification, version
1.0</gco:CharacterString>
        </gmd:title>
        <gmd:date>
          <gmd:CI_Date>
            <gmd:date>
              <gco:Date>2008-06-01</gco:Date>
            </gmd:date>
          </gmd:CI_Date>
        </gmd:date>
      </gmd:CI_Citation>
    </gmd:thesaurusName>
  </gmd:MD_Keywords>
</gmd:descriptiveKeywords>
</gmd:descriptiveKeywords>

```

```

                                <gmd:dateType>
                                    <gmd:CI_DateTypeCode
codeList="http://www.isotc211.org/2005/resources/codeList.xml#CI_DateTypeCode" codeListValue="publication"/>
                                    </gmd:dateType>
                                </gmd:CI_Date>
                            </gmd:date>
                        </gmd:CI_Citation>
                    </gmd:thesaurusName>
                </gmd:MD_Keywords>
            </gmd:descriptiveKeywords>
        </gmd:resourceConstraints>
        <gmd:MD_LegalConstraints>
            <gmd:useLimitation>
                <gco:CharacterString>no limitations</gco:CharacterString>
            </gmd:useLimitation>
        </gmd:MD_LegalConstraints>
    </gmd:resourceConstraints>
    <gmd:resourceConstraints>
        <gmd:MD_LegalConstraints>
            <gmd:accessConstraints>
                <gmd:MD_RestrictionCode
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/gmxCodellists.xml#M
D_RestrictionCode" codeListValue="otherRestrictions">otherRestrictions</gmd:MD_RestrictionCode>
                </gmd:accessConstraints>
                <gmd:otherConstraints>
                    <gco:CharacterString>no conditions apply</gco:CharacterString>
                </gmd:otherConstraints>
            </gmd:MD_LegalConstraints>
        </gmd:resourceConstraints>
    </srv:serviceType>
    <gco:LocalName>download</gco:LocalName>
</srv:serviceType>
<srv:extent>
    <gmd:EX_Extent>
        <gmd:geographicElement>
            <gmd:EX_GeographicBoundingBox>
                <gmd:westBoundLongitude>
                    <gco:Decimal>-32.0</gco:Decimal>
                </gmd:westBoundLongitude>
                <gmd:eastBoundLongitude>
                    <gco:Decimal>61.0</gco:Decimal>
                </gmd:eastBoundLongitude>
                <gmd:southBoundLatitude>
                    <gco:Decimal>27.0</gco:Decimal>
                </gmd:southBoundLatitude>
                <gmd:northBoundLatitude>
                    <gco:Decimal>72.0</gco:Decimal>
                </gmd:northBoundLatitude>
            </gmd:EX_GeographicBoundingBox>
        </gmd:geographicElement>
    </gmd:EX_Extent>
</srv:extent>
<srv:couplingType gco:nilReason="missing"/>
<srv:containsOperations>
    <srv:SV_OperationMetadata>
        <srv:operationName>
            <gco:CharacterString>test</gco:CharacterString>
        </srv:operationName>
        <srv:DCP>
            <srv:DCPList codeList="http://someurl#DCPList" codeListValue="HTTPGet"/>
        </srv:DCP>
        <srv:operationDescription>
            <gco:CharacterString>Descriptive text about the operation</gco:CharacterString>
        </srv:operationDescription>
        <srv:parameters>
            <srv:SV_Parameter>
                <srv:name>
                    <gco:aName>
                        <gco:CharacterString>test
parameter</gco:CharacterString>
                    </gco:aName>
                </gco:attributeType>
            </gco:attributeType>
        </gco:attributeType>
    </gco:attributeType>

```



```

                <gco:TypeName>
                    <gco:aName>
</gco:CharacterString>string</gco:CharacterString>
                </gco:aName>
                </gco:TypeName>
                </gco:attributeType>
            </srv:name>
            <srv:optionality>
                <gco:CharacterString>mandatory</gco:CharacterString>
            </srv:optionality>
            <srv:repeatability>
                <gco:Boolean>>false</gco:Boolean>
            </srv:repeatability>
            <srv:valueType>
                <gco:TypeName>
                    <gco:aName>
</gco:CharacterString>string</gco:CharacterString>
                </gco:aName>
                </gco:TypeName>
            </srv:valueType>
        </srv:SV_Parameter>
    </srv:parameters>
    <srv:connectPoint>
        <gmd:CI_OnlineResource>
            <gmd:linkage>
                <gmd:URL>http://www.example.com/service.jsp</gmd:URL>
            </gmd:linkage>
        </gmd:CI_OnlineResource>
    </srv:connectPoint>
</srv:SV_OperationMetadata>
</srv:containsOperations>
<srv:operatesOn xlink:href="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/ccmseriesmetadata_2000.iso19139.xml#ccm2.1_2000"/>
<srv:operatesOn xlink:href="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/ccmseriesmetadata_2001.iso19139.xml#ccm2.1_2001"/>
<srv:operatesOn xlink:href="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/ccmseriesmetadata_2002.iso19139.xml#ccm2.1_2002"/>
<srv:operatesOn xlink:href="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/ccmseriesmetadata_2003.iso19139.xml#ccm2.1_2003"/>
</srv:SV_ServiceIdentification>

```

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Annex C – Coupled Resource (operatesOn) implementation

Implementation of the operatesOn (Coupled Resource) element of ISO 19139 metadata documents for services. Here is the schema definition of the operatesOn element in the ISO 19139 implementation:

```
<xs:element name="operatesOn" type="gmd:MD_DataIdentification_PropertyType" minOccurs="0"
maxOccurs="unbounded"/>
```

In XML this means that you can EITHER:

- include inside the operatesOn element an MD_DataIdentification fragment of the coupled resource:

```
<srv:operatesOn>
  <gmd:MD_DataIdentification>
    ...
  </gmd:MD_DataIdentification>
</srv:operatesOn>
```
- or leave the element empty and use XLink, which is the approach recommended by the MD Guidelines as it avoids replication of metadata:

```
<srv:operatesOn xlink:href="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/ccmseriesmetadata_2000.iso19139.xml#ccm2.1_2000"/>
```

The fragment notation #ccm2.1_2000 identifies the MD_DataIdentification element having id="ccm2.1_2000" and that resides inside the document available at the specified url (i.e. http://inspire-geoportal.ec.europa.eu/resources/sandbox/ccm/ccmseriesmetadata_2000.iso19139.xml).

NOTE: the fragment notation is something that is interpreted by clients not by the server (ref. <http://www.w3.org/TR/webarch/#media-type-fragid>). As far as the server is concerned, only the first part of the url (i.e. the one without the fragment) is relevant.

The gmd:MD_DataIdentification_PropertyType is the same type of element gmd:identificationInfo inside the ISO 19139 documents for datasets and series.

As such, the content of srv:operatesOn must be the same of gmd:identificationInfo, in other words it must be a gmd:MD_DataIdentification element, like for example:

```
<?xml version="1.0" encoding="UTF-8"?>
<gmd:MD_Metadata xsi:schemaLocation="http://www.isotc211.org/2005/gmd
http://schemas.opengis.net/iso/19139/20060504/gmd/gmd.xsd"
xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:gml="http://www.opengis.net/gml"
xmlns:xlink="http://www.w3.org/1999/xlink">
  <gmd:fileIdentifier>
    <gco:CharacterString>18ad1e85-8527-4629-8405-f3db0c0561cf</gco:CharacterString>
  </gmd:fileIdentifier>
  ...
  <gmd:identificationInfo>
    <gmd:MD_DataIdentification>
      ...
    </gmd:MD_DataIdentification>
  </gmd:identificationInfo>
</gmd:MD_Metadata>
```

Note:

In the case of a Unique Resource Identifier having a codespace in addition to the mandatory code, the Metadata Technical Guidelines recommend to use RS_Identifier that is not mentioned in the figure.

```
<gmd:identifier>
  <gmd:RS_Identifier>
    <gmd:code>
      <gco:CharacterString>ccm2.1_2000</gco:CharacterString>
    </gmd:code>
    <gmd:codeSpace>
```

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```
<gco:CharacterString>http://ccm.jrc.ec.europa.eu/</gco:CharacterString>
</gmd:codeSpace>
</gmd:RS_Identifier>
</gmd:identifier>
```

The corresponding mapping in the Layer element inside the WMS capabilities document, needs to make use of the optional Authority attribute, like this:

```
<Identifier authority="http://ccm.jrc.ec.europa.eu/">ccm2.1_2000</Identifier>
```

XLink specification:

<http://www.w3.org/TR/xlink/#link-types>