



# INSPIRE

## Infrastructure for Spatial Information in Europe

### INSPIRE Spatial Data Services and Invoke Service – Draft Implementing Rules

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<b>Title</b>	INSPIRE Spatial Data Services and Invoke Service – Draft implementing rules
<b>Creator</b>	Network services Drafting Team
<b>Date</b>	20/01/2012
<b>Subject</b>	INSPIRE Spatial Data Services and Invoke Service Implementing Rules
<b>Status</b>	First draft version
<b>Publisher</b>	Network services Drafting Team
<b>Type</b>	Text
<b>Description</b>	This document contains the first draft implementing rules created by the Network Services Drafting team for for spatial data services and invoke services
<b>Contributor</b>	NS DT
<b>Format</b>	MS Word (doc)
<b>Source</b>	
<b>Rights</b>	Public
<b>Identifier</b>	Draft_IR_SDS_and_Invoke_1.0.doc
<b>Language</b>	EN
<b>Relation</b>	Not applicable
<b>Coverage</b>	Project duration

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## Foreword

The INSPIRE directive aims to create a European Union (EU) spatial data infrastructure. The goal of the infrastructure is to enable the sharing of environmental spatial information among public sector organisations and to better facilitate public access to spatial information across Europe.

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.

The Commission proposed the development of the spatial data services Implementing Rules to be performed in 2 phases.

In a first exploratory phase the overall framework for the development of the spatial data services implementing rules has been defined and discussed in close cooperation with the INSPIRE stakeholders. Related documents are provided on the INSPIRE website..

In the current second phase an implementing rule is drafted and provided for discussion with the INSPIRE stakeholders.

In parallel there has been work on drafting Implementing Rules for the invoke service.

This document represents the integration of these two efforts. 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 Scope

This document specifies implementing rules specifying interoperability and harmonisation requirements applicable for spatial data services as defined in the INSPIRE Directive. It also specifies the implementation rule for the service allowing spatial data services to be invoked – the invoke service.

It provides the basis for the drafting of Implementing Rules according to Article 7 (1) and Article 11 (1) (e) of the INSPIRE Directive [Directive 2007/2/EC].

These Implementing Rules define common arrangements to enable the interoperability of spatial data services. Harmonised and interoperable spatial data services will increase the use of the related spatial data sets by allowing the user to generate derived spatial data sets or derived information more easily. These Implementing Rules have been developed within the general framework of the INSPIRE, and the existing regulations and decisions. In addition, these Implementing Rules have to take into account both existing reference materials, and the current trends within this rapidly evolving field.

## 1.1 LEGAL CONTEXT

The INSPIRE Directive sets the general scene for the development of the implementing rules laying down technical arrangements for the interoperability and harmonisation of spatial data services and their invocation. It provides a generic definition of spatial data services and their invocation, their relationship with the other elements and lists the fundamental operational requirements on the Member States apart from the compliance with the implementing rules:

- metadata for all existing spatial data services must be created with the attributes and constraints listed in [2]
- spatial data services must be monitored and reported [5]
- spatial data services must be accessible by the Member States to the Community institutions and bodies under harmonised conditions [6]
- there shall be services to allow spatial data services to be invoked [4]

In addition each relevant regulation or decision provides additional elements or information such as:

- a classification of spatial services given in [2]
- the provision of a list of available spatial data services by the Member States [5]
- the provision by the Member States of additional information on the spatial data service when a Community Institution and Body requests access to a spatial data service [6]

This legal background provides important elements for scoping spatial data services and the corresponding implementing rules.

A more detailed analysis of the relevant legal acts is provided in the Annex C of this document.

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## 1.2 EXECUTIVE OVERVIEW

This document introduces a set of definitions that classifies spatial data services into a number of sub-classes. This is done in order to relate different aspects of spatial data services to the appropriate requirements. Network services are seen as a sub-class of spatial data services, and are also classified as invocable spatial data services.

Specific requirements with implications for member states relate only to new developed services relating to harmonised data, see Implementing Rule Requirement 9, and to two distinct types of harmonised services, the gazetteer service and the registry service, see chapter 3.4.

Spatial data services are, according to the Directive, the operations which may be performed, by invoking a computer application, on the spatial data contained in spatial data sets and their related metadata. This is a very wide class of services, and this document does not impose any requirement applying to the full class.

INSPIRE only impose requirements for spatial data sets and services relating to the themes in Annex I-III. The metadata regulation already impose the requirement to establish discovery metadata for spatial data services restricted to operating upon data related to Annex I-III and their related metadata. This document does not impose further requirements for this full class of INSPIRE spatial data services.

As a sub-class of the spatial data services, this document defines the set of invocable spatial data services. In short, this is the class where sufficient metadata is given and accessible to allow automatic invocation of the service. The draft implementing rule does not impose any requirement in general for this class.

The next definition of spatial data services compliant to interoperability arrangement narrows further the definition of invocable services by providing additional characteristics. The draft implementing rule requires that Member States comply with these characteristics when they develop new services (from two years after the adoption of the implementing rule) which operate upon harmonised data sets (i.e. spatial data sets in compliance with the regulation as regards interoperability of spatial data sets and services) or their metadata.

Finally, this draft implementing rule requires, where practicable, Member States to develop two services, a gazetteer service and a registry service. These two services will then be consistent – harmonised – across the MS, and can be seen as corresponding to the harmonisation of data introduced by the data specifications for themes I-III. These implementing rules do not specify criteria for ‘where practicable’, and this is thus left for the MS to decide.

It also follows from this draft implementing rule that the invoke service is a service that provides the necessary metadata to allow automatic invocation of a spatial data service when that metadata exists and is accessible, and thus is discoverable.

## 1.3 SPATIAL DATA SERVICES IN THE INFRASTRUCTURE

The need and benefits of sharing and accessing spatial data sets in the infrastructure of INSPIRE is apparent, as it largely reflects the way how spatial data infrastructures have been implemented in the last years. However, Spatial Data Services play a role in the infrastructure, that, though less well-known, is equally important.

The Network Services (discovery, view, download and transformation) already provide the basic functionality through the abstract specification in the implementing rules and their application programming interfaces (API) in the associated technical guidelines. However

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applications, if based exclusively on the Network Services, would still concentrate on the sharing and exchange of the spatial data sets. With the direct addition of harmonised spatial data services to the infrastructure the infrastructure will enable the development of significantly richer applications potentially closer for example to the decision making process.

The following list contains examples for what could be considered Spatial Data Services in the Member States.

- The Slovak OGC Web Coverage Service (WCS), hosted by the Slovak Analytical server of SEA 1, is available from the service endpoint <http://geo.sazp.sk/cgi-bin/sazp>. It provides, amongst others, download access to coverage data on hill shade. It is linked to a spatial data set related to the INSPIRE Directive Annex II "Elevation" spatial data theme.
- The gazetteer of Scotland<sup>2</sup> allows for finding place names in Scotland. It is linked to the INSPIRE Directive Annex I "Geographical names" spatial data theme.
- The postcode service of the royal mail in UK<sup>3</sup>, allows finding postcodes based on addresses and vice versa. It is linked to a spatial data set related to the INSPIRE Directive Annex I "Addresses" spatial data theme.
- The Slovak OGC Web Processing Service, hosted by the Slovak Analytical server of SEA 4<sup>5</sup>, provides GRASS visibility (Lines of Sight) analysis, based on elevation information. It is thus linked to the INSPIRE Directive Annex II "Elevation" spatial data theme.

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<sup>1</sup> <http://geo.sazp.sk/#>

<sup>2</sup> available at <http://www.gazetteerofscotland.org.uk>

<sup>3</sup> available at <http://postcode.royalmail.com>

<sup>4</sup> see <http://geo.sazp.sk/#>

<sup>5</sup> available from the service endpoint <http://geo.sazp.sk/cgi-bin/sazp>

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## 1.4 THE INSPIRE IMPLEMENTING RULES

To allow the exchange and access of interoperable spatial data and spatial data services, the INSPIRE directive requires Implementing Rules (IR) to be produced for the following infrastructure elements (see figure 1):

- Metadata for spatial data sets and services
- Spatial data sets (ISDS IR)
- Spatial data services (ISDS IR)
- Network Services (NS IR)

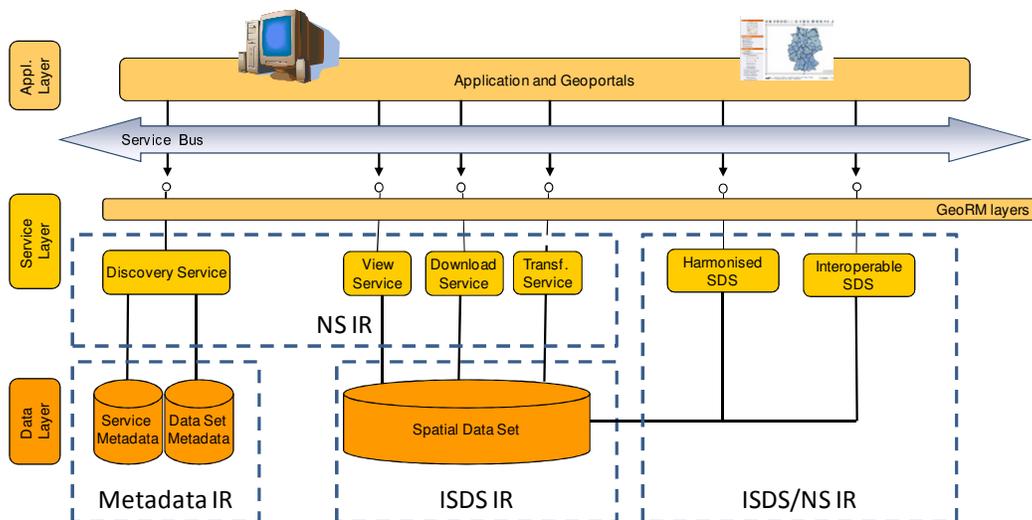


Figure 1 - Updated Infrastructure components and associated Implementing Rules

## 1.5 NORMATIVE REFERENCES

- [ISO 19119] EN ISO 19119:2005, Geographic information – Services
- [ISO 19115] ISO/DIS 19115-1, Geographic information – Metadata – Part 1: Fundamentals
- [ISO 19112] EN ISO 19112, Geographic information – Spatial referencing by geographic identifiers
- [ISO 19135] ISO 19135:2005, Geographic information -- Procedures for item registration

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## 1.6 TERMS AND DEFINITIONS

### (1) service

distinct part of the functionality that is provided by an entity through **interfaces** [ISO/IEC TR 14252]

### (2) interface

named set of **operations** that characterize the behaviour of an entity [ISO 19119:2005]

### (3) operation

specification of a transformation or query that an object may be called to execute [ISO 19119:2005]

### (4) spatial data services

the operations which may be performed, by invoking a computer application, on the spatial data contained in spatial data sets or on the related metadata [Directive 2007/2/EC]

### (5) interoperability

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 [ISO/IEC 2382-1]

### (6) gazetteer

directory of instances of a class or classes of features containing some information regarding position [ISO19112:2003]

NOTE The positional information need not be coordinates, but could be descriptive.

### (7) geographic identifier

spatial reference in the form of a label or code that identifies a location [ISO19112:2003]

EXAMPLE “Spain” is an example of a country name; “SW1P 3AD” is an example of a postcode.

### (8) location

identifiable geographic place [ISO19112:2003]

EXAMPLE “Eiffel Tower”, “Madrid”, “Jämtland”

## 1.7 SYMBOLS AND ABBREVIATIONS

MS member states

IOC TF Initial Operating Capability Task Force

## 1.8 NOTATION OF REQUIREMENTS AND RECOMMENDATIONS

To make it easier to identify the mandatory requirements and the recommendations for spatial data services in the text, they are highlighted and numbered.

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**IR Requirement X** Requirements that are reflected in the Implementing Rule on interoperability of spatial data sets and services are shown using this style.

**SDS Requirement X** Requirements that are not reflected in the Implementing Rule on interoperability of spatial data sets and services are shown using this style.

**Recommendation X** Recommendations are shown using this style.

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## 2 Introduction

The INSPIRE metadata regulation defines the following spatial data service types:

### 3. SPATIAL DATA SERVICE TYPE

#### 3.1. Discovery Service (discovery)

Services making it possible to search for spatial data sets and services on the basis of the content of the corresponding metadata and to display the content of the metadata.

#### 3.2. View Service (view)

Service that makes it possible, as a minimum, to display, navigate, zoom in and out, pan or overlay viewable spatial data sets and to display legend information and any relevant content of metadata.

#### 3.3. Download Service (download)

Service that enables copies of spatial data sets, or parts of such sets, to be downloaded and, where practicable, accessed directly.

#### 3.4. Transformation Service (transformation)

Service that enables spatial data sets to be transformed with a view to achieving interoperability.

#### 3.5. Invoke Spatial Data Service (invoke)

Service that allows defining both the data inputs and data outputs expected by the spatial service and a workflow

or service chain combining multiple services. It also allows defining the external web service interface of the workflow or service chain.

#### 3.6. Other Service (other)

The spatial data service types discovery, view, download, transformation and invoke are dealt with in the network services implementing rules. This document deals with what is defined as **other services** in this list. The metadata regulation also defines a classification of spatial data services based on the taxonomy in EN ISO 19119.

In more detail,

- **Discovery:** this service makes it possible, based on the resource metadata, to search for the resources spatial data sets and spatial data services in order to discover the ones of potential interest based on user-defined criteria. It could be considered the first step in approaching the infrastructure and its content.
- **View:** this service makes it possible to display the resource spatial data sets. It provides an additional step towards the assessment of fitness for purpose of a spatial data set based on the visualization of its content.

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- **Download:** this service makes it possible to get copies of spatial data sets or to access their content directly. It could be considered the final step in getting access to copies of spatial data sets or parts of spatial data sets.
- **Transformation:** taking into account the wide diversity of formats and structures of the resource spatial data sets, it makes it possible to transform them with a view of achieving interoperability (i.e. be compliant with the *data and services Regulation*). The decision to make transformation services available as Network Services is left to each Member State to decide. Alternatively a Member State could provide access to harmonised spatial data sets directly through the network service of type download, while the transformation into the required format and structure is being done behind the scenes (see for example *draft implementing rules* from the NS DT for different scenarios)
- **“Invoke”:** taking into account the potentially wide diversity of interfaces and protocols, invoke services are services that allow access to sufficient service metadata to enable the activation or execution of the spatial data service.

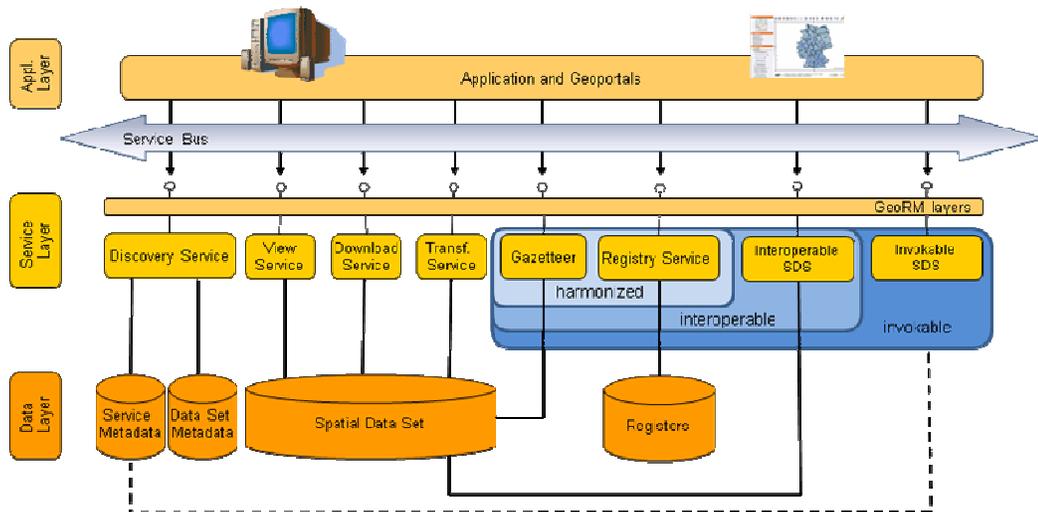


Figure 2 - Updated INSPIRE Architecture

In addition, and where practicable, some spatial data services would be harmonised to allow their direct invocation.

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### 3 Spatial data services

In the context of the INSPIRE implementing rule the broad class of Spatial Data Services is broken down to distinguish the following categories the spatial data services as being of relevance for the INSPIRE implementing rule:

1. spatial data services being discoverable
2. spatial data service being invocable
3. spatial data services being compliant with Interoperability arrangements
4. spatial data services being compliant with harmonisation requirements

Spatial data services are any services operating on spatial data contained in spatial data sets or their related metadata. Given that network services obviously operate on spatial data sets, they can be considered as special subclass of spatial data services (see Figure 3)

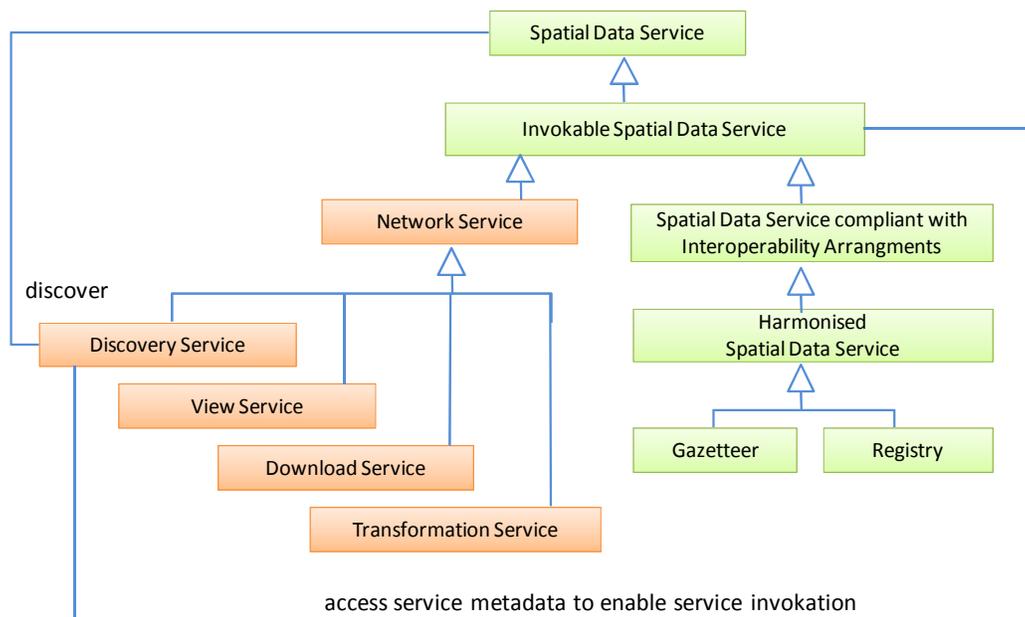


Figure 3 - The conceptual model of INSPIRE services

Figure 3 illustrates how the different service types relate to each other. Network services are clearly invocable according to the definition given in this document. According to the INSPIRE Directive, network services apply to both harmonised and non-harmonised spatial data sets, e.g. it is required to establish network services for all data sets for which the metadata regulation applies. Since the definition of interoperability arrangements include the requirement to operate upon harmonised spatial data sets, the network services cannot be a sub-class of neither the class of services compliant with interoperability arrangements nor the class of harmonised spatial data services.

**SDS Requirement 1** Network services are a subset of spatial data services. Network services are also a subset of invocable spatial data services.

The INSPIRE Directive requires that Member States shall ensure that metadata are created for the spatial data sets and services corresponding to the themes listed in Annexes I, II and

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III. Article 7 (4) restricts the scope of the implementing rule to the spatial data services related to those themes. Thus, this will be the domain for the spatial data services in the rest of this document.

**IR Requirement 1** The implementing rules are restricted to spatial data services that relate to spatial data sets in themes in Annex I-III, or their related metadata.

From an INSPIRE Implementing Rules applicability point of view, a Spatial Data Service must be *discoverable* (Metadata Regulation). In following ISO 19119 the INSPIRE Metadata Regulation does also define the general categories which apply for spatial data services being made discoverable.

As indicated by figure 3 and 4 all further categories defined for spatial data services establish a stepwise more and more precise defined subset of spatial data services:

- *invocable spatial data services* are services being *discoverable* and services which can be invoked by another service or application (see chapter 3.2)
- *spatial data services compliant with interoperability arrangements* are services being discoverable, invocable and follow specific requirements for instance on the applied spatial data sets as been laid down in the INSPIRE spatial data services implementing rule (chapter 3.3)
- *harmonised spatial data services* are discoverable, invocable, compliant with interoperability arrangements and do fulfil additional requirements been laid down in the INSPIRE spatial data services implementing rule (see chapter 3.4)

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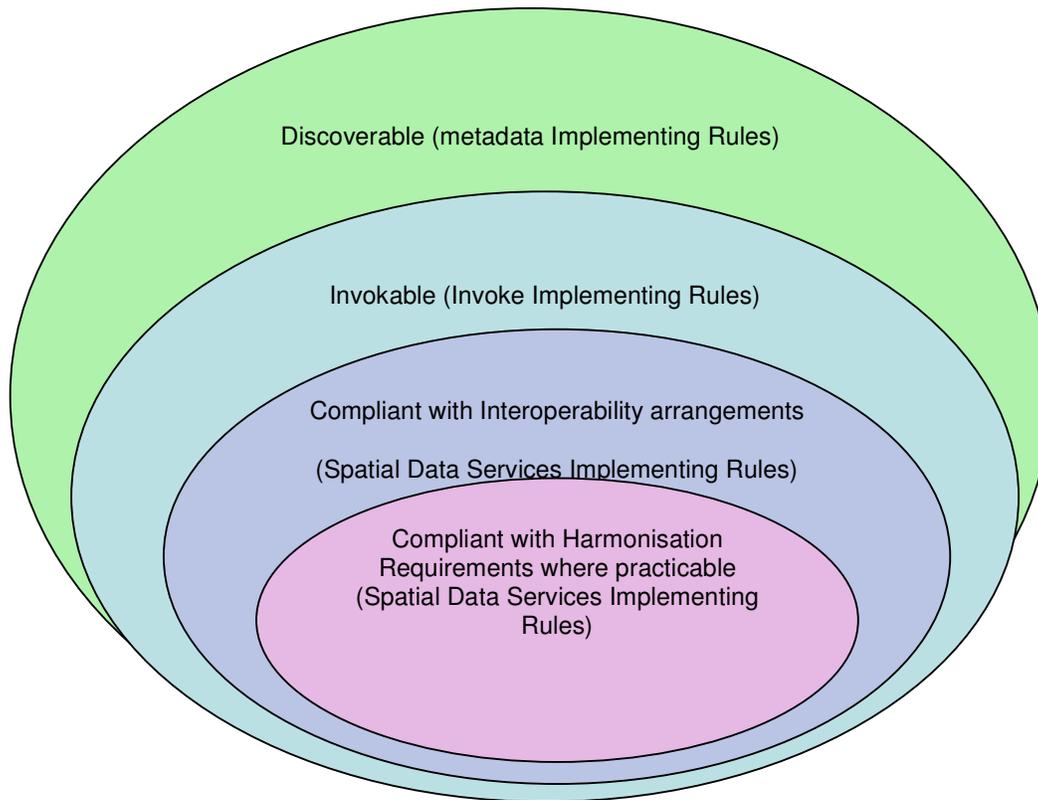


Figure 4 - INSPIRE Spatial Data Services and applicable Implementing Rules

### 3.1 DISCOVERABLE SPATIAL DATA SERVICES (IN THE INSPIRE CONTEXT)

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.

**Recommendation 1** There shall be no other requirements applicable to ALL spatial data services than the establishment of discovery metadata.

### 3.2 INVOCATION OF SPATIAL DATA SERVICES

A spatial data service is *invocable* if there exists and is accessible sufficient machine readable metadata for the service 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:

- the spatial data service is discoverable as defined in the Metadata Implementing Rule

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- at least one resource locator (as defined in the Metadata Implementing Rule) for the service needs to be provided
- the resource locator defines an activation point and shall be a URL
- the service type of the service belongs into one of the categories 200, 300, 400, 500, 600, 700, 800 as defined in the Metadata Implementing Rule
- the service is conformant to a commonly agreed or standardised specification (e.g. ISO, OGC)
  - thus respective metadata entry on ‘conformance’ (as defined in the Metadata Implementing Rule) is set to ‘conformant’
  - The cited specification (see Metadata Implementing Rule) 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
- the service has a well-documented and accessible description (e.g. SOAP/WSDL)
- the service has well documented and accessible quality of service characteristics:
  - availability,
  - capacity,
  - performance.

This would also require a well-documented set of cited specifications, this could potentially be realised by a specific registry service, thus providing an online accessible and citable list of commonly agreed or standardised interface specifications and specific specification profiles there off.

Therefore, the DT NS asks NCPs and DTs reviewers for input on the conformance of SDS, especially regarding the “Specification” metadata element of conformance which requires a well-documented set of cited specifications. DCPs and DTs reviewers are invited to bring forward the well documented set of cited specifications, based on existing and/or planned implementations of Spatial Data Services in the MS.

**Recommendation 2** A spatial data service in this context shall have clearly defined interfaces for machine-to-machine communication.

A Geographic Information System or other systems, understood as a set of tools for collecting, processing and storing spatial data should not be considered an invocable spatial data service from the perspective of the relevant Implementing Rules. But any specific functionality included in it and with a well-defined and exposed interface could be an invocable spatial data service.

Should there be requirements for the format of the description of parameters as defined above, e.g. a WSDL?

### 3.3 INTEROPERABILITY ARRANGEMENTS FOR SPATIAL DATA SERVICES

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.

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Two components X and Y (see Figure n) can interoperate (are interoperable) if X can send requests R for services to Y, based on a mutual understanding of R by X and Y, and if Y can similarly return mutually understandable responses S to X.

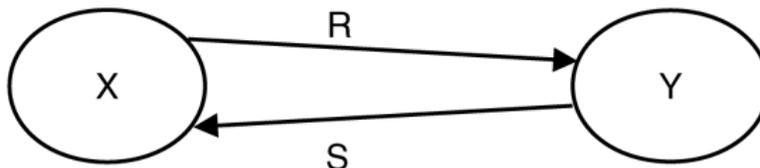


Figure 5 - Interoperability [ISO 19119]

This means that two interoperable systems can interact jointly to execute tasks. For the geographic domain, the following description of the term “geographic interoperability” is applicable:

In this context (INSPIRE and restricted to spatial data relating to Annex i-III), *spatial interoperability* is the ability of information systems and services to 1) freely exchange all kinds of spatial information about the Earth and about the objects and phenomena on, above, and below the Earth’s surface; and 2) cooperatively, over networks, being capable of manipulating such information.

The INSPIRE Directive requires implementing rules to lay down technical arrangement for the interoperability of spatial data services. The user requirements for the interoperability of spatial data services include the ability to reuse spatial data services in new settings (e.g. in another MS), or to orchestrate services to form more complex ones.

Interoperability arrangements consist of set of requirements:

- data sets that the service relate to
- coordinate reference systems
- performance criteria, quality of service
- encoding
- metadata

These requirements are described below.

**IR Requirement 2** Interoperability arrangements in the INSPIRE context shall be related to invocable spatial data services.

### 3.3.1 Interoperability arrangement – data sets and series

The interoperability arrangements in INSPIRE should go beyond just technical interoperability of the spatial data service itself. The real usefulness and re-usability is connected to the application of spatial data services to harmonised data.

**IR Requirement 3** Requirements for interoperability arrangements are only mandatory for spatial data services operating upon harmonised data (i.e. spatial data sets conformant to the regulation for IDSS).

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### 3.3.2 Interoperability arrangement – coordinate reference systems

**IR Requirement 4** A spatial data service conformant to interoperability arrangement shall support coordinate reference systems according to Annex II.1 of the Commission Regulation (EC) No 1089/2010 .

### 3.3.3 Temporal reference system

**IR Requirement 5** The default temporal reference system referred to in point 5 of part B of the Annex to Commission Regulation (EC) No 1205/2008 shall be used, unless other temporal reference systems are specified for a specific spatial data theme in Annex I-III.

### 3.3.4 Interoperability arrangement – performance criteria, quality of service

Spatial data services constitute a very wide class of services and functionalities. It is impossible to set requirements on capacity and response time independent upon these characteristics.

Therefore, we restrict the requirements in this field to the availability. In order to comply with the general requirements for the infrastructure defined by INSPIRE, spatial data services should follow the same requirements as for network services, i.e. availability 99% of time.

Since all spatial data services, compliant to interoperability arrangements, are also invocable spatial data services, the rest of quality of service information shall be documented in the respective metadata.

**IR Requirement 6** A spatial data service conformant to the interoperability arrangement shall be available 99% of time.

**Recommendation 3** No further requirements shall be mandatory for the performance or quality of spatial data services in general.

### 3.3.5 Interoperability arrangement – encoding

**IR Requirement 7** A spatial data service conforming to interoperability arrangement returning spatial objects as part of the output, shall encode those spatial objects according to Article 7 of Commission Regulation (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services.

This means that the rules defined in EN ISO 19118:2011 shall be followed.

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**Recommendation 4** It is recommended that encoding shall follow more concrete specifications for the different themes if given in the corresponding technical guidelines.

### 3.3.6 Interoperability arrangement – metadata

**IR Requirement 8** All spatial data services conformant to the interoperability arrangements shall include a Get Service Metadata operation.

### 3.3.7 Requirement on MS

**IR Requirement 9** Newly developed spatial data services operating upon harmonised data or their metadata shall be conformant with interoperability arrangements.  
This requirement enters into force two years after the adoption of this implementing rule.

## 3.4 HARMONISED SPATIAL DATA SERVICES

One of the major challenges of every infrastructure for spatial information is to ensure harmonised spatial data and to provide interoperable services. Harmonisation plays a key role with regard to services invocation and sharing of spatial information from heterogeneous sources. Taking into consideration the importance of harmonisation for spatial data services the following general spatial data services requirements are defined:

**IR Requirement 10** Any harmonised spatial data service shall follow the interoperability arrangements.

Harmonised spatial data services are important components of the infrastructure as the Network Services are. They should therefore be conforming to similar SLA arrangements.

**IR Requirement 11** Any harmonised spatial data service shall have minimal performance criteria defined in the same way as network services, i.e. performance, capacity, and availability. The values will depend upon the character of the type of service.

Two potential harmonised spatial data services are identified. Each must be supported by a set of use cases.

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.

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### 3.4.1 Gazetteer service

It is proposed that the INSPIRE harmonised gazetteer service shall relate to more than one theme. Several themes relates to a kind of location types, e.g. geographical names (GN), Addresses (AD), and Administrative boundaries (AB). These are all very important basis for look-up functions and positioning.

The general model for gazetteers is given in [ISO 191112]:

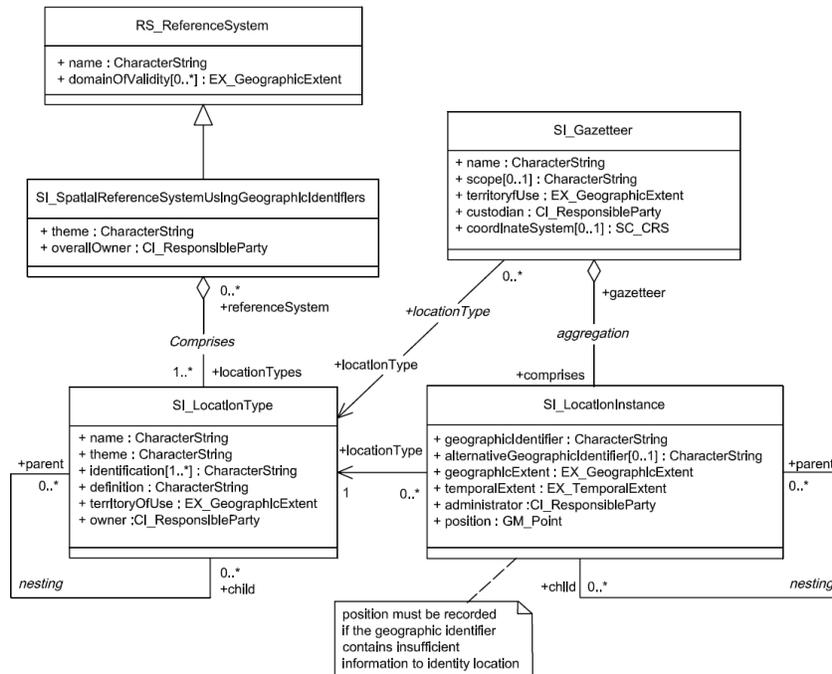


Figure 6 - UML model from [ISO 191112]

The discussion here is preliminary based upon this model.

**Recommendation 5** The gazetteer service should be related to harmonised datasets conforming to Addresses, Geographical names and Administrative boundaries.

i.e. Location instances should be fetched from these three themes, and correspondingly the Location type should be either an address, a geographical name, or an administrative polygon.

Note: There may be more relevant candidates among the INSPIRE themes.

Operation	Input Output	Role
Get Gazetteer Service Metadata	Input: none	Provides all necessary information about the service, and describes the service capabilities.

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	Output: Metadata document	
Get Location Instance Position	Input: geographicIdentifier, LocationType  Output: full LocationInstance including position	Provides the location instances and their positions of a specified type
Get Location Instance	Input: position, LocationType  Output: LocationInstance	Provides the closest location instances of a specified type to a specified position
Link Gazetteer Service		Allows the declaration, by a Public Authority or a Third Party, of the availability of a Gazetteer Service while maintaining the gazetteer capability at the Public Authority or the Third Party location.

#### 3.4.1.1 Implementation

In the next version it is intended to include a more fully developed model for the service taking the data specification for the underlying harmonised data (e.g. addresses, geographical names, and administrative boundaries) into account.

It is further the intention to provide a WSDL for the service and additional description. This will then constitute the basis for harmonised implementations.

It is thus suggested that this service will be a SOAP-based service.

#### 3.4.1.2 Quality of service

Third party network services linked pursuant to Article 12 of Directive 2007/2/EC shall not be taken into account in the quality of service appraisal to avoid any deterioration which may result from cascading effects.

The following Quality of Service criteria relating to performance, capacity and availability shall apply.

##### PERFORMANCE

The normal situation represents periods out of peak load. It is set at 90 % of the time.

The response time for sending the initial response to a gazetteer service request shall be maximum 3 s in normal situation.

##### CAPACITY

The minimum number of simultaneous requests to a gazetteer service to be served in accordance with the quality of service performance criteria shall be 10 requests per second.

##### AVAILABILITY

The probability of a gazetteer service to be available shall be 99 % of the time.

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### 3.4.2 Registry service

This whole section is an open issue.

Its content will depend upon further discussions in IOC TF. In the TF a long list of registries is discussed. If a registry service is found to be relevant for harmonisation at MS level, it will probably be at a generic level, i.e. a registry service capable of handling different concrete services. There are several candidates, both generic ICT and more specific “GI-flavoured”, to base the INSPIRE registry service upon.

Registries will support the management of a wide variety of digital artefacts that arise in geographic information systems and SDI's, including coordinate reference systems, units of measure, geographic entities, application schemas, dataset and service descriptions, sensors, access control policies, feature concepts and feature catalogue entries.

A long list of registries is discussed in IOC TF, see Annex B.

There is also a discussion on functionalities (brief outline, list of operations taken from discussion within IOC TF):

Operation	Input Output	Role
Get Registry Service Metadata	Input: none Output: Metadata document	Provides all necessary information about the service, and describes the service capabilities.
<input type="checkbox"/> validCode (code : String, codeListId : Integer) : Boolean <input type="checkbox"/> getCodes (codeListId : Integer) : List<String> <input type="checkbox"/> getLabel (codeId : Integer, lang : Language) : String <input type="checkbox"/> getDefinition (codeId : Integer, lang : Language) : String <input type="checkbox"/> getDescription (codeId : Integer, lang : Language) : String <input type="checkbox"/> getDescendants (codeId : Integer) : List<codeId> ...		
Link Registry Service		Allows the declaration, by a Public Authority or a Third Party, of the availability of a Registry Service while maintaining the registry service capability at the Public Authority or the Third Party location.

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**IR Requirement 12** A registry service shall be compliant with ISO 19135:2005, Geographic information -- Procedures for item registration.

NOTE: A draft new work item proposal for a Universal Registry Service is circulated within ISO/TC 211. This proposal is authored by the National Body of Canada and contains an extensive text. The proposal is based upon OGC CSW-ebRIM v1.01 published by the OGC as OGC 07-110r4, and extends it with additional components and requirements.

The following Quality of Service criteria relating to performance, capacity and availability shall apply.

#### PERFORMANCE

The normal situation represents periods out of peak load. It is set at 90 % of the time.

The response time for sending the initial response to a registry service request shall be maximum 2 seconds in normal situation.

#### CAPACITY

The minimum number of simultaneous requests to a registry service to be served in accordance with the quality of service performance criteria shall be 5 requests per second.

#### AVAILABILITY

The probability of a registry service to be available shall be 99 % of the time.

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## 4 Annex A Use cases

### 4.1 USE CASES – GAZETTEER SERVICE

... to be completed ...

Text generalised from address use cases in EURADIN – should be revised.

#### 4.1.1 User Case: Locate a location instance

This case is very common when users want to search for any address, maybe a place to go, its house, a point of interest, a service location, etc. and watch it in a representative map. That process or operation is called geocoding. So given a specific location instance, the system must be capable of determining the position for the specified location instance.

Sometimes the user knows all components of the location instances and writes it well-formed. It is what is called a structured format. But in the same way, a user can write free text, sometimes it uses an unstructured location instances or only knows a few parts of it, it is called Free-Format, and the system must be capable of returning the complete set of location instance information (e.g., a normalized address). It means it may provide information on the quality of the result using a 'match code' (a match score).

The system must be able to indicate the number of matches in the response (possibly zero) for a particular location instances supplied in the geocoding request. Additionally, it may provide information about match score of each.

Sometimes a user wishes to find one or more location instances. The system must be capable of processing one or more location instances in a single geocoding request.

#### 4.1.2 Use Case: Get the location instance from position

A user needs an answer to the question "Where am I?" based on their current location. They desire expanded "location context", e.g., street, place, jurisdiction but they don't know any part of the location instance. So given a Position, the system sends the Position by point and must be able to return one or more location instances (e.g., Address with associated Point geometries).

That process is called the ReverseGeocode operation and returns a list of found locations, that is, a complete and normalized location instance based upon the location type, along with geometry (point), based on an input point, and optionally, specifies the ranges or distances of these locations from the given position sorted by the distance (ascending) of the returned location from the input point.

The form of the returned location instance(s) must be based upon the user's preference, as stated in the request.

Additionally, the system may be capable of returning all location information of a preferred type within an area of interest (i.e. a Circle, Polygon or Box) and indicate the number of matches in the response (possibly zero) or a given request.

### 4.2 USE CASES – REGISTRY SERVICE

... to be completed ...

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### 4.3 CANDIDATE REGISTRIES (AS DISCUSSED IN IOC TF)

This list has been devised by the registers Working Group of the IOC TF for planning and prioritization purposes and is still work in progress. It is given to illustrate:

- the potential need for an harmonized registry service
- The diversity of content

Finally It cannot be considered in any way as a final list of registers that will be implemented.

Register	Source of proposal	Existing INSPIRE registry implementation?	Relevance for	
			IR development	INSPIRE implementation
INSPIRE Glossary	GCM (Generic Conceptual Model)	INSPIRE registry ( <i>GLOSSARY</i> )	Support usage of consistent terminology in IR and TG development.	Support understanding of terminology and consistent usage in national legislation and guidelines.
Feature Concept Dictionary	GCM	INSPIRE registry ( <i>FCD</i> )	Avoid duplications and inconsistencies in feature definitions Support understanding of feature definitions during testing and consultation	Support understanding of feature definitions and consistent usage in national legislation and guidelines.
Feature Catalogue Register	GCM	no	Essential to support human understanding of the data specifications (during development, consultation and testing)	Essential to support human understanding of the data specifications (during implementation)
Application Schema Register	GCM	no	TBD	TBD
XML Schema repository/register	Comments to v1.0 of discussion paper	no	Location and version metadata are needed for testing Support version management for XML schemas during data specification development	Clear structure (similar to OGC schema repository) essential for implementation of Annex I data sets and download NS Required for validation of provided data against schemas
Consolidated UML Model	GCM	Subversion repository ( <i>inspire-model</i> )	Required for development of Annex I-III data specifications and IR	Essential for the implementation of the data specifications; also important for maintenance of data specifications and IR
Code List Register	GCM	no	Register may be referred to from Annex II+III data specifications and possibly IR → it should be implemented in some form by the time the IR is voted	Required for Annex I-III data encoding Enable automatic validation of code list values used in data sets
Coordinate Reference System Register	GCM, IR-ISDSS	no (but several existing external candidate implementations)		Without CRS identifiers and associated resources, spatial data cannot be exchanged
Units of Measurement	GCM	no		Since a CRS register requires a UoM register the entries have to

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Register	Source of proposal	Existing INSPIRE registry implementation?	Relevance for	
			IR development	INSPIRE implementation
ent Register		(but several existing external candidate implementations)		be aligned Required for Annex I-III data encoding
External Object Identifier Namespace Register	GCM, IOC-TF	no		Required to guarantee uniqueness of object identifiers
(Discovery) Service Register	IOC-TF	no		Required by INSPIRE geo-portal (to know which discovery services to access)
Locale Register	DT DS	no		As long as the PT_Locale representations of locales has to be used in the encoding of spatial data instead of the generally accepted xml:lang mechanism, such a register is needed to exchange spatial data.
Portrayal Rule Register	IOC-TF, x-TWG meetings	Subversion repository ( <i>ds_twg</i> )	Register may be referred to from Annex II+III data specifications → important to agree general principles for its set-up and operation	Could support configuration of View services and sharing of user-defined styles
Data Specification Guidance Register (& IRs)	MD DT, INSPIRE Geoportal development team	no	Could support version management of DS documents	Unique identification of DS documents for specifying compliance metadata
Licenses Register		no	TBD	TBD
M&R register		yes	TBD	TBD

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## 5 Annex B References

[1] 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), OJ L 108, 24.4.2007, p. 1

[2] 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 (Text with EEA relevance) OJ L 326, 4.12.2008, p. 12

[3] Commission Regulation (EU) No 1089/2010 of 23 November 2010 Implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services

[4] Commission Regulation (EU) 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. OJ L 274, 20.10.2009, p. 9

[5] Commission Decision 2009/442/EC of 5 June 2009 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards monitoring and reporting, OJ L 148, 11.6.2009, p. 18

[6] Commission Regulation (EC) No 268/2010 of 29 March 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards the access to spatial data sets and services by the Member States to the Community institutions and bodies under harmonised conditions

[7] G. Di Matteo, M. Villa “status of Interoperability Arrangements and harmonisation for INSPIRE Spatial Data Services”, TXT e-Solutions S.p.A, 10.05.2010  
([http://inspire.jrc.ec.europa.eu/documents/Network\\_Services/STATUS\\_OF\\_INTEROPERABILITY\\_ARRANGEMENTS.pdf](http://inspire.jrc.ec.europa.eu/documents/Network_Services/STATUS_OF_INTEROPERABILITY_ARRANGEMENTS.pdf) )

[8] Open Geospatial Consortium “OGC Web Services Common Standard” OGC Implementation Standard, Date 2010-0-07, version 2.0.0, Reference Number OGC 06-121r9.

[9] Open Geospatial Consortium “OGC Best Practices Document: Gazetteer Service – Application Profile of the Web Feature Service Implementation Specification” OGC Candidate Implementation Specification, Date 2006-06-05, version 0.9.3, Reference Number OGC 05-035r2.

[10] International Organization for Standardization (ISO) “Geographic information – Location-based services – Multimodal routing and navigation” ISO 19134:2007

[11] M. Villa et al. “INSPIRE Network Services SOAP Framework” EUR 23635-2008  
([http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/network/INSPIRE\\_NETWORK\\_SERVICES\\_SOAP\\_Framework.pdf](http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/network/INSPIRE_NETWORK_SERVICES_SOAP_Framework.pdf) )

[12] INSPIRE Network Services performance Guidelines  
([http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/network/Network\\_Services\\_Performance\\_Guidelines\\_%20v1.0.pdf](http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/network/Network_Services_Performance_Guidelines_%20v1.0.pdf) )

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## 6 ANNEX C the legal background

This section provides the reader with the legal background for the spatial data services. For each legal act it highlights the most relevant items in the legal acts,

### 6.1 INSPIRE DIRECTIVE

#### *Recital (3)*

[...] Solving these problems requires measures that address exchange, sharing, access and use of interoperable spatial data and spatial data services [...].

#### *Recital (22)*

Public authorities need to have smooth access to relevant spatial data sets and services during the execution of their public tasks.

#### *Article 3 (1)*

Infrastructure for spatial information' means metadata, spatial data sets and spatial data services; network services and technologies; [...].

#### *Article 3 (4)*

'spatial data services' means the operations which may be performed, by invoking a computer application, on the spatial data contained in spatial data sets or on the related metadata;

#### *Article 3 (7)*

'interoperability' means the possibility for spatial data sets to be combined, and for services to interact, without repetitive manual intervention, in such a way that the result is coherent and the added value of the data sets and services is enhanced;

#### *Article 4 (3)*

This Directive shall also cover the spatial data services relating to the data contained in the spatial data sets referred to in paragraph 1.

#### *Article 5 (1)*

Member States shall ensure that metadata are created for the spatial data sets and services corresponding to the themes listed in Annexes I, II and III, and that those metadata are kept up to date.

#### *Article 6*

Member States shall create the metadata referred to in Article 5 in accordance with the following timetable:

not later than two years after the date of adoption of implementing rules in accordance with Article 5(4) in the case of the spatial data sets corresponding to the themes listed in Annexes I and II;

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not later than five years after the date of adoption of implementing rules in accordance with Article 5(4) in the case of the spatial data sets corresponding to the themes listed in Annex III.

*Article 7 (1)*

Implementing rules laying down technical arrangements for the interoperability and, where practicable, harmonisation of spatial data sets and services, designed to amend non-essential elements of this Directive by supplementing it, shall be adopted [...].

*Article 7 (2)*

2. As a basis for developing the implementing rules provided for in paragraph 1, the Commission shall undertake analyses to ensure that the rules are feasible and proportionate in terms of their likely costs and benefits and shall share the results of such analyses with the committee referred to in Article 22(1). Member States shall, on request, provide the Commission with the information necessary to enable it to undertake such analyses.

*Article 7 (3)*

Member States shall ensure that all newly collected and extensively restructured spatial data sets and the corresponding spatial data services are available in conformity with the implementing rules referred to in paragraph 1 within two years of their adoption, and that other spatial data sets and services still in use are available in conformity with the implementing rules within seven years of their adoption.

*Article 7 (5)*

Representatives of Member States at national, regional and local level as well as other natural or legal persons with an interest in the spatial data concerned by virtue of their role in the infrastructure for spatial information, including users, producers, added value service providers or any coordinating body shall be given the opportunity to participate in preparatory discussions on the content of the implementing rules referred to in paragraph 1, prior to consideration by the Committee referred to in Article 22(1).

*Article 11 (1)*

Member States shall establish and operate a network of the following services for the spatial data sets and services for which metadata have been created in accordance with this Directive:

(...)

(e) services allowing spatial data services to be invoked.

*Article 12*

Member States shall ensure that public authorities are given the technical possibility to link their spatial data sets and services to the network referred to in Article 11(1). This service shall also be made available upon request to third parties whose spatial data sets and services comply with implementing rules laying down obligations with regard, in particular, to metadata, network services and interoperability.

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*Article 13 (1)*

By way of derogation from Article 11(1), Member States may limit public access to spatial data sets and services

*Article 17 (1)*

Each Member State shall adopt measures for the sharing of spatial data sets and services between its public authorities referred to in point (9)(a) and (b) of Article 3. Those measures shall enable those public authorities to gain access to spatial data sets and services, and to exchange and use those sets and services, for the purposes of public tasks that may have an impact on the environment.

*Article 18 (4)*

The arrangements for the sharing of spatial data sets and services provided for in paragraphs 1, 2 and 3 shall be open to public authorities referred to in point (9)(a) and (b) of

Article 3 of other Member States and to the institutions and bodies of the Community, for the purposes of public tasks that may have an impact on the environment

*Article 18 (8)*

Member States shall provide the institutions and bodies of the Community with access to spatial data sets and services in accordance with harmonised conditions.

*Article 21 (2)*

No later than 15 May 2010 Member States shall send to the Commission a report including summary descriptions of:

(a) how public sector providers and users of spatial data sets and services and intermediary bodies are coordinated, and of the relationship with the third parties and of the organisation of quality assurance;

(...)

## 6.2 METADATA REGULATION

*Article 1*

**Subject matter**

This Regulation sets out the requirements for the creation and maintenance of metadata for spatial data sets, spatial data set series and spatial data services corresponding to the themes listed in Annexes I, II and III to Directive 2007/2/EC.

*Article 3*

**Creation and maintenance of metadata**

The metadata describing a spatial data set, a spatial data set series or a spatial data service shall comprise the metadata elements or groups of metadata elements set out in Part B of the

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Annex and shall be created and maintained in accordance with the rules set out in Parts C and D thereof.

*Annex part B 1.6. Coupled resource*

If the resource is a spatial data service, this metadata element identifies, where relevant, the target spatial data set(s) of the service through their unique resource identifiers (URI).

*Annex part B 2.2. Spatial data service type*

This is a classification to assist in the search of available spatial data services. A specific service shall be categorised in only one category.

The value domain of this metadata element is defined in Part D.3.

*Annex part B 3. KEYWORD*

If the resource is a spatial data service, at least one keyword from Part D.4 shall be provided

*Annex part B 8.1. Conditions applying to access and use*

This metadata element defines the conditions for access and use of spatial data sets and services, and where applicable, corresponding fees as required by Article 5(2)(b) and Article 11(2)(f) of Directive 2007/2/EC.

*Annex Part C Table 2 Metadata for spatial data services*

Reference	Metadata element	Multiplicity	Condition
1.1	Resource title	1	
1.2	Resource abstract	1	
1.3	Resource type	1	
1.4	Resource locator	0..*	Mandatory if linkage to the service is available.
1.6	Coupled resource	0..*	Mandatory if linkage to data sets on which the service operates are available.
2.2	Spatial data service type	1	
3	Keyword	1..*	
4.1	Geographic bounding box	0...*	Mandatory for services with an explicit geographic extent.
5	Temporal reference	1..*	
6.2	Spatial resolution	0..*	Mandatory when there is a restriction on the spatial resolution for this service.
7	Conformity	1..*	
8.1	Conditions for access and	1..*	

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Reference	Metadata element	Multiplicity	Condition
	use		
8.2	Limitations on public access	1..*	
9	Responsible organization	1..*	
10.1	Metadata point of contact	1..*	
10.2	Metadata date	1	
10.3	Metadata language	1	

### 6.3 NETWORK SERVICES REGULATION

No additional elements compared to the INSPIRE Directive

### 6.4 MONITORING AND REPORTING DECISION

#### *Article 2*

##### **Common provisions for monitoring and reporting**

1. Member States shall establish a list of the spatial data sets and spatial data services corresponding to the themes listed in Annexes I, II and III to Directive 2007/2/EC, grouped by theme and Annex, and of the network services referred to in Article 11(1) of that Directive, grouped by service type.

#### *Article 3*

##### **Monitoring of the existence of metadata**

1. The following indicators shall be used to measure the existence of metadata for the spatial data sets and services corresponding to the themes listed in Annexes I, II and III to Directive 2007/2/EC:

#### *Article 4*

##### **Monitoring of the conformity of metadata**

1. The following indicators shall be used to measure the conformity of metadata for spatial data sets and services corresponding to the themes listed in Annexes I, II and III to Directive 2007/2/EC with the implementing rules referred to in Article 5(4) of that Directive [...]

2. Member States shall determine, for each spatial data set and service mentioned on the list referred to in Article 2(1) of this Decision, whether the corresponding metadata are in conformity with the implementing rules referred to in Article 5(4) of Directive 2007/2/EC and shall attribute to the data set or service the following values [...]

#### *Article 13*

##### **Contribution to the functioning and coordination of the infrastructure**

The summary description referred to in Article 21(2)(b) of Directive 2007/2/EC shall contain the following:

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(b) A description of the role of the various stakeholders in the development and maintenance of the infrastructure for spatial information, including their role in the coordination of tasks, in the provision of data and metadata, and in the management, development and hosting of services;

(c) a general description of the main measures taken to facilitate the sharing of spatial data sets and services between public authorities and a description of how sharing has improved as a result;

#### *Article 14*

##### **Use of the infrastructure for spatial information**

The information on the use of the infrastructure for spatial information referred to in Article 21(2)(c) of Directive 2007/2/EC shall cover the following:

The use of the spatial data services of the infrastructure for spatial information, taking into account the general and specific indicators;

#### *Article 15*

##### **Data sharing arrangements**

The summary description referred to in Article 21(2)(d) of Directive 2007/2/EC shall contain the following:

(c) a list of barriers to the sharing of spatial data sets and services between public authorities and between public authorities and the Community institutions and bodies, as well as a description of the actions which are taken to overcome those barriers.

## **6.5 DATA SHARING REGULATION**

#### *Article 1*

##### **Subject matter**

This Regulation establishes harmonised conditions of access to spatial data sets and services in accordance with Article 17 of Directive 2007/2/EC.

#### *Article 3*

##### **Arrangements**

Any arrangements concerning access to spatial data sets and services shall be fully compatible with the requirements of this Regulation.

#### *Article 4*

##### **Use of spatial data sets and services**

Institutions or bodies of the Community may make spatial data sets or services available to contractors acting on their behalf.

Where spatial data sets and services are made available in accordance with paragraph 1, Community institutions and bodies shall make every possible effort to avoid unauthorised use of spatial data sets and services.

INSPIRE	Reference: Draft_IR_SDS_and_Invoke_1.0.doc		
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*Article 6*

**Transparency**

Where an institution or body of the Community requests the provision of access to a spatial data set or service, the Member States shall also make available, upon request, information for evaluation and use, on the mechanisms for collecting, processing, producing, quality control and obtaining access to the spatial data sets and services, where that additional information is available and it is reasonable to extract and deliver it.

Where requested, offers for the provision of access to spatial data sets and services to the Community institutions and bodies made by Member States shall include the basis for charges and the factors taken into account.

*Article 7*

**Response Times**

Member States shall provide access to spatial data sets and services without delay and at the latest within 20 days after receipt of a written request, unless otherwise agreed by mutual agreement between the Member State and the institution or body of the Community.

**6.6 INTEROPERABILITY OF SPATIAL DATA SETS AND SERVICES REGULATION**

*Recital (1):*

Directive 2007/2/EC lays down general rules for the establishment of the Infrastructure for Spatial Information in the European Community. Within this infrastructure, Member States are required to make available data sets related to one or several of the Annexes in Directive 2007/2/EC and the corresponding spatial data services in conformity with the technical arrangements for the interoperability and, where practicable, harmonisation of spatial data sets and services.

*Article 1*

This Regulation sets out the requirements for technical arrangements for the interoperability and, where practicable, harmonisation of spatial data sets and spatial data services corresponding to the themes listed in Annexes I, II and III to Directive 2007/2/EC.