



INSPIRE

Infrastructure for Spatial Information in Europe

Draft Technical Guidance Document for INSPIRE Discovery Services

Drafting Team “Network Services”

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1 Introduction

INSPIRE is a Directive proposed by the European Commission in July 2004 which defines the legal framework for the establishment and operation of an Infrastructure for Spatial Information in Europe. 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 INSPIRE¹ web site (http://inspire.jrc.it/directive/l_10820070425en00010014.pdf). 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. The Commission is assisted in the process of adopting such rules by a regulatory committee composed by representatives of the Member States and European Parliament. The committee is chaired by a representative of the Commission (this is known as the Comitology procedure). The committee will be established within three months from the entry in force of the Directive.

The scope of this document is to detail the INSPIRE technical requirements for **Discovery services** into 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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¹ <http://inspire.jrc.it/>

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 15836: 2003, *Information and documentation- The Dublin Core metadata element set*

ISO 19115: 2003, *Geographic information – Metadata*

ISO 19115/Cor.1:2006, *Geographic information – Metadata, Technical Corrigendum 1*

ISO 19119:2005, *Geographic information – Services*

ISO 19119:2005 PDAM 1, *Geographic information – Services*

ISO/TS 19139:2006, *Geographic information - Metadata - Implementation specification*

OGC 07-006, **OGC CSW**, OGC™ Catalogue Services Specification, version 2.0.2 (Corrigendum Release 2).

OGC 07-045, **CSW ISO AP**, OGC™ Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile for CSW 2.0, version 1.0.0 (2007).

OGC 05-008, **OGC OWS**, OGC Web Services Common Specification, version 1.0 (May 2005)

INSPIRE, **INS DIS**, D3.7 Draft Implementing Rules for Discovery Services (IR3), version 1.0

INSPIRE, **INS MD**, Draft Implementing Rules for Metadata, version 4.1

INSPIRE, **INS MD IMPL**, Metadata implementing rules based on ISO 19115 and ISO 19119 (2008-04-11)

INSPIRE, **INS ARC**, Network Services Architecture Version 2.0 (17-12-2007)

3 INSPIRE Profile of CSW ISO AP

3.1 General background

The base specification of an INSPIRE Discovery Service is [CSW ISO AP] as defined by [INS DIS].

Although this specification [CSW ISO AP] lays down the basic behaviour of an INSPIRE Discovery Service (see also Annex A) some aspects need to be extended with respect to the requirements of the INSPIRE Directive and the Implementing Rules for Metadata [INS MD]. These aspects are:

- Discovery Service Operations
- Discovery Service Queryables
- Discovery Service Multilingual aspects

The following sections specify required extensions to the given specifications.

Annex A is informative about how Discovery services work within INSPIRE and Annex B gives information regarding the use and adoption of metadata and Discovery services standards in Europe based on INSPIRE reference material analysis and metadata survey.

3.2 Discovery service operations

3.2.1 Discovery service operations

[CSW ISO AP] distinguishes between two types of catalogue services: A 'read-only' catalogue service that has to provide operations labelled 'CSW' and a transactional catalogue service that has to provide operations labelled 'CSWT'. This distinction is derived from the OGC catalogue base specification [OGC CSW].

Table 1 shows the relation between operations of an INSPIRE Discovery Service and the according catalogue service operation as defined by [OGC CSW].

Table 1: INSPIRE Discovery Services Operations

INSPIRE Discovery Services functions	INSPIRE Cardinality	OGC CSW ISO AP operations	OGC CSW ISO AP cardinality
INSPIRE.GetDiscoveryServiceMetadata	M	OGC_Service.GetCapabilities	M
INSPIRE.DiscoverMetadata	M	CSW Discovery.GetRecords	M
INSPIRE.GetMetadata	M	CSW Discovery.GetRecordById	M
INSPIRE.PublishMetadata	M,O	CSWT Manager.Transaction	O
INSPIRE.CollectMetadata	M,O	CSWT Manager.Harvest	O

An INSPIRE Discovery Service must support at least the operations indicated as "mandatory" in Table 1. Thus, an INSPIRE Discovery Service is always a "read-only" OGC Catalogues Service as defined by [OGC CSW], but not a fully "transactional" OGC Catalogues Service. Only one of both transactional operations (Manager.Transaction or Manager.Harvest) is mandatory.

3.2.2 Discovery service operations parameters

Table 1 shows the relation between functions, elements and parameters of an INSPIRE Discovery service and the according service operation as defined by [OGC CSW].

Table 2: Mapping INSPIRE Discovery Services operation parameters with CSW ISO AP

INSPIRE Discovery Services operations and parameters	CSW ISO AP operations and parameters
INSPIRE.GetDiscoveryServiceMetadata function	OGC_Service.GetCapabilities
GetDiscoveryServiceMetadataRequest	GetCapabilities
	ServiceIdentification: Service, Request
GetDiscoveryServiceMetadataResponse	
ServiceType element	ServiceIdentification: ServiceType, ServiceTypeVersion, Title, Abstract, Keywords, Fees, AccessConstraints
ServiceProvider element	ServiceProvider: ProviderName, Providersite, ServiceContact
SupportedFunctions element	OperationsMetadata: Operation, Parameter, Constraint, ExtendedCapabilities
QueryLanguage element	Filter_Capabilities: And, Or, Not, PropertyIsEqualTo, PropertyIsNotEqualTo, PropertyIsLessThan, PropertyIsGreaterThan, PropertyIsLessThanOrEqualTo, PropertyIsGreaterThanOrEqualTo, BBOX.
SupportedMetadataLanguages element	OperationsMetadata section: ExtendedCapabilities
INSPIRE.DiscoverMetadata function	CSW Discovery.GetRecords operation
DiscoverMetadataRequest	GetRecords
QueryLanguage parameter	ConstraintLanguage
Query parameter	Constraint
SortSpec parameter	SortBy
SortOrder parameter	SortOrder
SearchType (hits, results) parameter	ResultType (hits, results, validate)
DiscoverMetadataResponse	
RequestValidity element	SearchStatus
ResultCount element	SearchResults (numberOfRecordsMatched)
ResultMetadataIDList element	SearchResults (resultSetID)
INSPIRE.GetMetadata function	CSW Discovery.GetRecordById operation
GetMetadataRequest	GetRecordById
MetadataElementList parameter	ElementSetName
MetadataIDList parameter	Id
GetMetadataResponse	
GetMetadataResponse	GetRecordByIdResponse
INSPIRE.PublishMetadata function	CSW Manager.Transaction operation
InsertMetadataRequest	Transaction Insert
Insert element	Insert
InsertMetadataResponse	Transaction
InsertResult	Transactionresponse (TransactionSymmaryType, totalInserted)
UpdateMetaDataRequest	Transaction Update
UpdateMetadata parameter	Constraint
UpdateMetadataElement parameter	RecordProperty (Name, Value)
UpdateMetaDataResponse	
UpdateResult	Transactionresponse (TransactionSymmaryType, totalUpdated)
DeleteMetaDataRequest	Transaction Delete
DeleteMetadata parameter	Constraint
DeleteMetaDataResponse	

DeleteResult	Transactionresponse (TransactionSymmaryType, totalDeleted)
INSPIRE.CollectMetadata function	CSWT Manager.Harvest operation
CollectMetadataRequest	Harvest
CollectSourceReference parameter	Source
CollectMetadataResponseHandler parameter	ResponseHandler
CollectInterval parameter	HarvestInterval
CollectMetadataResponse	
CollectResult	Harvestresponse (TransactionResponse)

3.2.3 Getcapabilities operation metadata

[CSW ISO AP] specifies a GetCapabilities operation with several service metadata sections. The service metadata in the capabilities documents should be in conformance with the INSPIRE metadata IR elements.

Table 3 gives the mapping from the INSPIRE metadata IR elements (based on the mapping to [ISO 19119]) to the capabilities as used for the implementation of the Discovery service by [CSW ISO AP].

The first three columns are from [INS MD IMPL]. In the column Capabilities CSW ISO AP of table 3 the capabilities mapping is defined. In the last column the mappings as defined in the mapping ISO 19115/ISO 19119 of the DT Metadata are shown.

Table 3: Mapping INSPIRE metadata IR elements to CSW ISO AP capabilities metadata

Section INSPIRE Metadata IR	INSPIRE Metadata element	M/C/O	Capabilities CSW ISO AP	Type Field	ISO 19139 / CSW ISO AP
2.2.1	Resource Title	M	/csw:Capabilities/Serviceidentification/Title	String	identificationInfo[1]*/citation*/title [ISO 19139]
2.2.2	Resource abstract	M	/csw:Capabilities/Serviceidentification/Abstract	String	identificationInfo[1]*/abstract [ISO 19139]
2.2.4	Resource locator	C	/csw:Capabilities/OperationsMetadata/Operation/GetCapabilities/DCP/HTTP/@xlink:href	URL	distributionInfo*/transferOptions*/onLine*/linkage [ISO 19139]
2.3.2	Spatial data service type	M	/csw:Capabilities/Serviceidentification/ServiceType	GenericName	identificationInfo[1]*/serviceType [CSW ISO Metadata AP]
2.4.1	Keyword value	M	/csw:Capabilities/Serviceidentification/Keywords/Keyword	String	identificationInfo[1]*/descriptiveKeywords*/keyword
2.9.1	AccessConstraints	M	/csw:Capabilities/Serviceidentification/AccessConstraints		identificationInfo[1]*/resourceConstraints*/accessConstraints [ISO 19139]
2.10.1	Responsible party	M	csw:Capabilities/Serviceprovider/ProviderName	string	identificationInfo[1]*/pointOfContact*/organisationName
	Responsible party e-mail	M	csw:Capabilities/Serviceprovider/ServiceContact/ContactInfo/Address/ElectronicMailAddress	string	identificationInfo[1]*/pointOfContact/address/electronicMailAddress
3.3.2	Operation Name	M	csw:Capabilities/OperationsMetadata/Operation	string	

Section INSPIRE Metadata IR	INSPIRE Metadata element	M/C/O	Capabilities CSW ISO AP	Type Field	ISO 19139 / CSW ISO AP
	DCP	M	csw:Capabilities/OperationsMetadata/Operation/GetCapabilities/DCP		identificationInfo[1]*/containsOperations/*/DCP='Web Services'

3.2.4 Harvest Operation

Within the context of INSPIRE an INSPIRE Discovery Service is at least able to harvest single metadata documents that are provided through some online location.

[CSW ISO AP] specifies a harvest operation that is based on the related operation of the underlying base specification [OGC CSW]. For an INSPIRE Discovery Service, the following settings have to be met if a resource is requested to be harvested by a catalogue service instance.

- RESOURCETYPE: The resource type of the resource being harvested has to be <http://www.isotc211.org/schemas/2005/gmd/>
- RESOURCEFORMAT: The resource format of the resource being harvested has to be "application/xml"

The following XML code fragment shows a valid Harvest request:

```
<?xml version="1.0" encoding="UTF-8"?>
<csw:Harvest service="CSW" version="2.0.2"
xmlns:csw="http://www.opengis.net/cat/csw/2.0.2">
  <csw:Source>http://www.myhost.com/metadata_dataset.xml</csw:Source>
  <csw:ResourceType>http://www.isotc211.org/schemas/2005/gmd/</csw:ResourceType>
  <csw:ResourceFormat>application/xml</csw:ResourceFormat>
  <csw:HarvestInterval>P1Y2M3DT10H30M0S</csw:HarvestInterval>
</csw:Harvest>
```

3.3 Discovery Service Queryables

3.3.1 Introduction

[CSW ISO AP] as the base specification for the INSPIRE Discovery Service is based on the ISO 19115/19119 information model. As such it is required that the abstract INSPIRE metadata elements (see [INS MD]) could be requested through the INSPIRE Discovery Service interface within a query.

The relation between ISO 19115 and ISO 19119 and the elements of the INSPIRE Metadata IR is describe in [INS MD IMPL].

Clause 3.3.2 defines the required mappings to common queryables specified by [CSW ISO AP] and [OGC CSW]. Clause 3.3.3 defines additional queryables required by [INS MD] and [INS MD IMPL].

3.3.2 Mapping common queryables

Table 2 identifies these INSPIRE elements from [INS MD] and connects them to appropriate queryables defined by OGC CSW ISO AP. Annotations are given wherever necessary.

The third column in Table 2 indicates if the queryable must be supported by an INSPIRE Discovery Service or not.

Table 2: INSPIRE queryables

INSPIRE queryable metadata elements	INSPIRE Discovery Service (CSW ISO AP) queryable properties	Is mandatory for INSPIRE Discovery Service? ²
Resource title	Title	No
Abstract	Abstract	No
Resource Type	Type	No
Unique resource identifier	ResourceIdentifier	No
Coupled resource	OperatesOn	No
Resource language	ResourceLanguage	No
Topic category	TopicCategory	Yes, if resources of type 'dataset' or 'series' are supported by the catalogue service instance
Spatial data services type	ServiceType	Yes, if resources of type 'service' are supported by the catalogue service instance.
Keyword value	Subject	Yes
Geographic bounding box	BoundingBox	Yes, if resources of type 'dataset' or 'series' are supported by the catalogue service instance
Temporal extent	TemporalExtent	No
Date of publication	PublicationDate	No
Date of last revision	RevisionDate	No
Date of creation	CreationDate	No
Spatial resolution	SpatialResolution	Yes, if resources of type 'dataset' or 'series' are supported by the discovery service instance
Responsible party	OrganisationName	Yes
Metadata date	Modified	No
Metadata language	Language	No
Degree	-	Yes
Specification	-	Yes
LimitationsOnPublicAccess	-	Yes
ConditionApplyingToAccessAndUse	-	Yes
MetadataPointOfContact	-	No
Lineage	-	Yes

Table 3 identifies the additional queryables that are not supported by [CSW ISO AP], but required by [INS MD]. X-Path expression and data types are taken from [INS MD IMPL].

Table 3: INSPIRE additional queryables

Name	Definition	Data type	Property Mapping to Information Model
Degree	This is the degree of conformity of the resource to the related specification.	Boolean	dataQualityInfo/*/report/*/result/*/pass
Specification	This is a citation of the specification to which the resource is expected to conform.	Specification, see Table 4	

² See Article 11 (2) of the directive.

LimitationsOnPublicAccess	This metadata element shall provide information on the limitations (if they exist) and the reasons for such limitations (Article 5-2(e))	LimitationsOnPublicAccess, see Table 5	
ConditionApplyingToAccessAndUse	This metadata element defines the conditions for access and use of spatial datasets and services, and where applicable, corresponding fees as required by Articles 5-2 (b) and 11-2 (f).	CharacterString	identificationInfo[1]*/resourceConstraints*/useLimitation
MetadataPointOfContact	This is the description of the organisation responsible for the creation and maintenance of the metadata. This description shall include the name of the organisation and a contact e-mail address	CharacterString	contact*/organisationName
Lineage	This is a statement on process history and/or overall quality of the spatial dataset.	CharacterString	dataQualityInfo*/lineage*/statement

Table 4: Composition of union Specification

Name	Definition	Data type	Property Mapping to Information Model
SpecificationTitle	Title of the specification	CharacterString	dataQualityInfo*/report*/result*/specification*/title
SpecificationDate	Reference date of specification	Date-8601	dataQualityInfo*/report*/result*/specification*/date*/date
SpecificationDateType	Type reference date of specification	Codelist (CI_DateTypeCode), one of: creation, revision or publication	dataQualityInfo*/report*/result*/specification*/date*/dateType

Table 5: Composition of union LimitationsOnPublicAccess

Name	Definition	Data type	Property Mapping to Information Model
AccessConstraints	Access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on obtaining the resource.	Codelist (MD_RestrictionCode), one of: copyright, patent, patentPending, trademark, license, intellectualPropertyRights, restricted, otherRestrictions	identificationInfo[1]*/resourceConstraints*/accessConstraints
OtherConstraints	other restrictions and legal prerequisites for accessing and using the resource.	CharacterString	identificationInfo[1]*/resourceConstraints*/otherConstraints
Classification	name of the handling	CodeList	identificationInfo[1]*/reso

	restrictions on the resource.	(MD_ClassificationCode), one of: unclassified, restricted, confidential, secret, topSecret	urceConstraints/*/classification
--	-------------------------------	--	----------------------------------

3.3.3 Additional queryables advertised

[CSW ISO AP] defines a mechanism to advertise additional queryables through the capabilities document of the Discovery service instance (see chapter 7.5, table 23 in [CSW ISO AP]).

An appropriate <OperationMetadata>-section of a capabilities document is shown in the next figure (excerpt from full capabilities). All supported ISO queryables shall be advertised to be supported by an INSPIRE.GetMetadata operation; in addition, all INSPIRE queryables shall be listed in the section "AdditionalQueryables".

```
<ows:OperationsMetadata>
  <ows:Operation name="GetRecords">
    [...] (List of DCPs, parameters here)
  <ows:Constraint name="SupportedISOQueryables">
    <ows:Value>RevisionDate</ows:Value>
    <ows:Value>CreationDate</ows:Value>
    <ows:Value>PublicationDate</ows:Value>
    <ows:Value>OrganisationName</ows:Value>
    <ows:Value>ResourceIdentifier</ows:Value>
    <ows:Value>TopicCategory</ows:Value>
    <ows:Value>ResourceLanguage</ows:Value>
    <ows:Value>DistanceValue</ows:Value>
    <ows:Value>DistanceUOM</ows:Value>
    <ows:Value>TempExtent_begin</ows:Value>
    <ows:Value>TempExtent_end</ows:Value>
    <ows:Value>ServiceType</ows:Value>
    <ows:Value>OperatesOn</ows:Value>
    <ows:Value>Denominator</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>MetadataPointOfContact</ows:Value>
    <ows:Value>Lineage</ows:Value>
    <ows:Value>SpecificationTitle</ows:Value>
    <ows:Value>SpecificationDate</ows:Value>
    <ows:Value>SpecificationDateType</ows:Value>
  </ows:Constraint>
</ows:Operation>
```

3.4 Multilingual aspects

An INSPIRE Discovery Service must indicate the languages that are supported to formulation values within a query. This requires that a client application must be able to determine the supported languages of the values of the queryables.

To indicate the supported languages the following has to be supported by a capabilities document that is returned by an INSPIRE Discovery Service

- The capabilities document shall be returned in the default language
- A list of supported languages for queryable values defined by a 3-letter code as described in ISO 639-2
- The translations to other supported languages shall be referenced in the

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“ExtendedCapabilities” element, as a link to an online resource.

Service exceptions shall be returned within a “ServiceException” element, one element by supported language.

See “Annex C Capabilities extensions and examples” that defines the required extension types for INSPIRE Discovery Service.

4 Performance requirements

Three criteria (performance, availability and capacity) shall be monitored and reported as part of the INSPIRE directive. The following three criteria are recommended in the framework of the INSPIRE directive:

- Reliability;
- Security;
- Regulatory.

4.1.1 Reliability

It is recommended to check the INSPIRE metadata specifications conformity through the use of reference tests. In order to allow comparison between responses, it is also recommended to provide reference metadatasets.

4.1.2 Security

It is recommended the Discovery service to be certified with regard to security regulations.

4.1.3 Regulatory

It is recommended to check the INSPIRE Discovery service specifications through the use of reference tests.

Annex A How Discovery Services work within INSPIRE

As laid down by [INS ARC], INSPIRE Discovery Services aim to support discovery, evaluation and use of spatial data and services through their metadata properties. In addition, it should be possible to link INSPIRE Discovery Services to a network of catalogue services to enable public authorities to make their spatial datasets and services available through metadata description that are published in such a network.

The fundamental pattern for this behaviour is the publish-find-bind pattern [INS ARC, Figure 7-4]. An INSPIRE Discovery Service is targeted towards “publish” and “find” in the first place.

A.1. INSPIRE Discovery Service use cases

A user describes a resource by metadata properties and publishes the metadata document to an INSPIRE Discovery Service where it can be discovered using certain search terms.

When a metadata document has been found as the result of a query against the INSPIRE Discovery Service, specific metadata elements can aid to bind to (i.e. make use of) the formerly described resource (e.g. the resource locator, see [INS MD]).

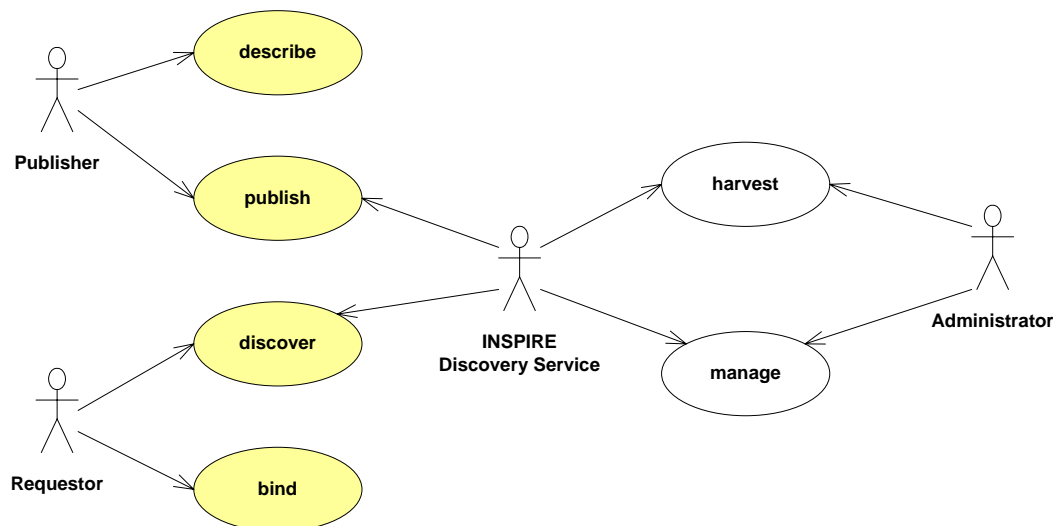


Figure 1: INSPIRE Discovery Service use cases

Figure 1 gives an overview about actors, use cases and interactions in the context of INSPIRE Discovery Services. The use cases marked in yellow are directly related to INSPIRE Implementing Rules.

- Describe use case: A publisher (might be the owner of the resource or a broker) describes resources by metadata properties. The *Describe* use case is not therefore within the scope of the IR Discovery Services but an essential use case for the Implementing Rules for Metadata [INS MD].
- Publish use case: A publisher publishes metadata documents (as whole or part) to a catalogue.
- Discovery use case: A requestor discovers metadata documents in a catalogue either by browsing the content of the catalogue or by placing certain query terms using a client application.
- Bind use case: If a spatial resource is discovered that fits the search terms, the requestor can bind to this spatial resource to e.g. view or download in accordance with the information in the result sets of the Discovery Service.

- **Harvest use case:** A Discovery Service may harvest metadata documents from distributed catalogue service(s) or other accessible resources, e.g. file systems, XML resources. The harvesting has to be set up by an administrator.
- **Manage use case:** This is the responsibility of administrators, i.e. a wide range of actors involved in the establishment and maintenance of the Discovery Service using metadata management tools.

A.2. INSPIRE Distributed search

A special case of search within the discovery use case is the distributed search. The idea of a distributed search (also known as federated search) is to start a search from a known catalogue service node and search transitively other specified or as many catalogues as possible with the same set of metadata search elements (“queryables”).

Distributed search allows a user to query distributed collections of spatial data through their metadata descriptions. Figure 2 shows the basic interactions of a requestor (individuals or organisations) involved in discovery of spatial data and services.

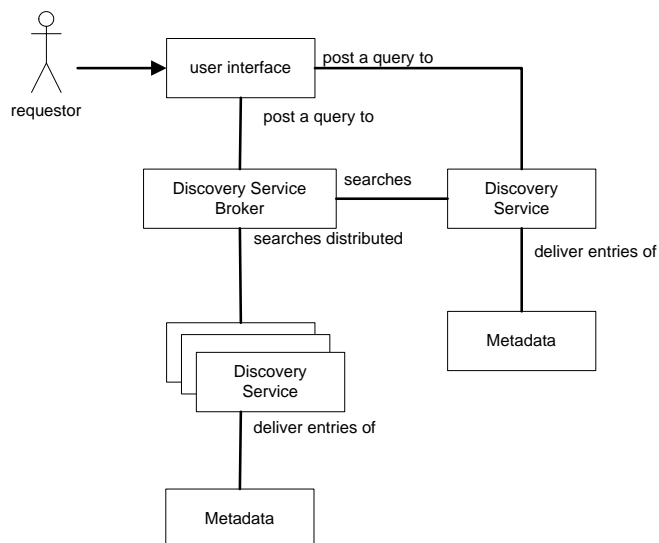


Figure 2: Interaction diagram of distributed INSPIRE Discovery Services

Distributed search means that a user-driven query is routed by the Broker to one or more distributed Discovery Services. The results of these distributed queries are added to the result list (together with an identifier where the specific metadata record is originated) and send to the user.

The catalogue service that distributes the query to federated catalogues acts in that case as a catalogue service broker.

Therefore the main focus of the catalogue service broker is to integrate one or more external (remote, federated or distributed) catalogue services and their repositories in its distributed search. The catalogue service broker merges the results coming from the distributed query, including the aggregation of the different result sets and sorting (or ranking) of search results.

Metadata documents provided by a distributed catalogue service in a real-time distributed search are not permanently stored on disk, but are kept in memory for the sole purpose of the display of the results to the user.

A.3. INSPIRE Discovery Service network

With distributed search it is possible to set up a network of catalogue services through the European Union. Each catalogue node can be connected to a broker and thus be part of a distributed query. Although, the INSPIRE Discovery Services topology of distributed EU and MS Discovery Services is out of scope of the INSPIRE Directive, some insight here is informative.

The main entry point into the network of distributed catalogue service is the INSPIRE Geoportal (although it has not to be the only available entry point). The INSPIRE Geoportal acts as a broker to associated catalogue services provided by the European member states.

All of the catalogue service in this network comply with the IR for INSPIRE Discovery Services and IR for Metadata. As such, the different catalogue service nodes could be technically connected within a distributed search.

The INSPIRE Geoportal is a catalogue service that has all required information about federated catalogue service that might be part of a distributed query: it is the first level service registry for INSPIRE Discovery Services. Which of these well known catalogue service shall be part of a concrete distributed query might be selected by the user of the Geoportal.

The MS Discovery Services in return can be considered as MS Discovery Service Brokers that have access to the Discovery Services of national data providers. The Discovery Services of national data providers may support other catalogue protocols as well. In this case the metadata of the data provider is harvested in the local repository of the MS Discovery Service Broker.

Figure 3 depicts the basic relationships of INSPIRE Discovery Services,

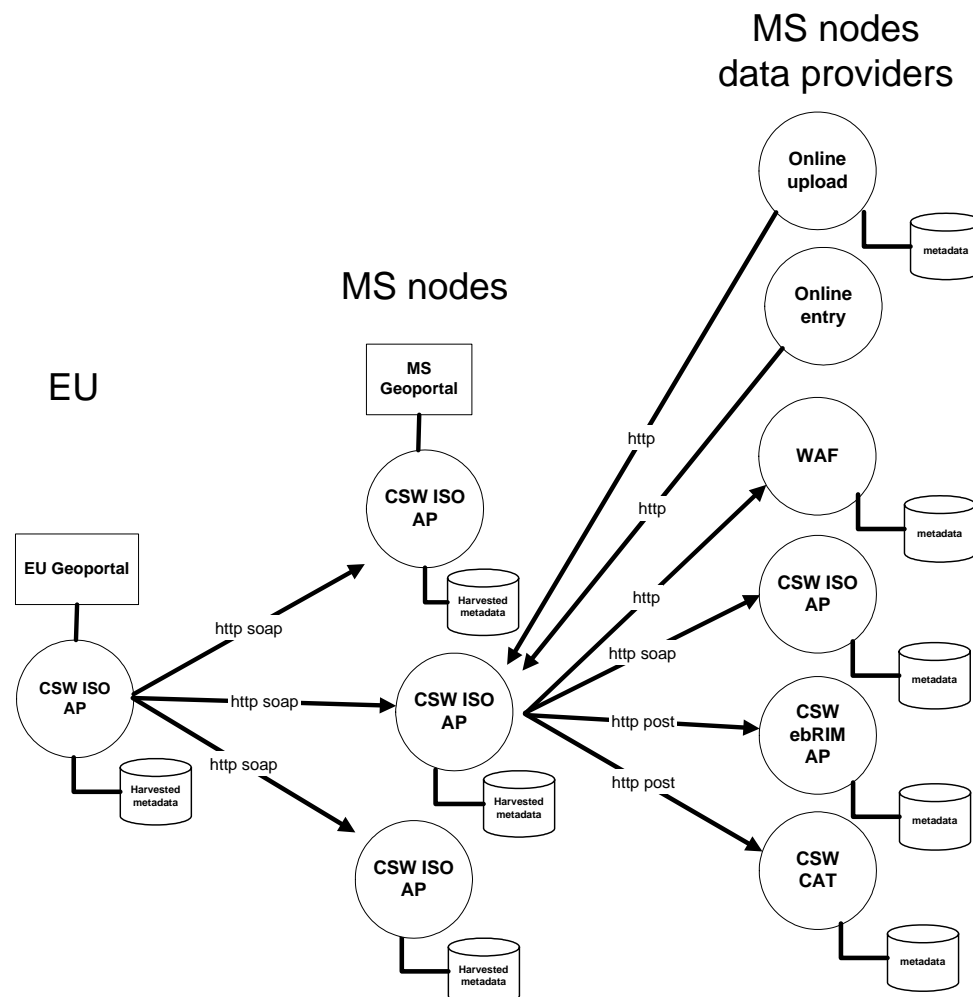


Figure 3: Network of INSPIRE Discovery Services

The performance of a distributed search is dependant on the slowest catalogue service that is requested by the broker. As an alternative, harvesting of distributed catalogue service is

recommended. It has to be clear, that this is entirely an implementation issues to overcome possible performance obstacles of a real-time distributed search.

Harvesting catalogue services means to store the content of a federated catalogue services (entirely or partially) to the local repository of the Discovery Service Broker. The harvesting process is asynchronous and can be repeated periodically, depending on the given harvesting interval.

Note that harvesting of catalogue services is different from resource harvesting that is described in chapter 3.2.3. Harvesting a catalogue service does not use the Harvest operation; instead, it is simple requesting metadata document through a normal query and storing the resulting document to the local storage of the requesting catalogue service.

Thus, this implementation approach is more a caching of metadata documents.

The disadvantage is that cached metadata sets may not be up to date, as the caching intervals may be longer than the update interval of the metadata set stored at the distributed provider's side.

Annex B INSPIRE reference material analysis and metadata survey

One of the requirements that is stressed within the preamble of the INSPIRE Directive (5)³ and (16)⁴ and in article 1 (2) of the INSPIRE Directive is the use of international standards for catalogue implementations and their deployment in order to prevent excessive investments within Member States (see also section 4.4.1). This is outlined in article 1 (2): *INSPIRE shall build upon infrastructures for spatial information established and operated by the Member States*. From this perspective it is necessary to have insight into the deployment of catalogue standards in the EU.

As far as the deployment of the catalogue standards in the EU is concerned, three sources of information were available:

1. INSPIRE reference material analysis on metadata (INSPIRE DT Metadata, 2006);
2. INSPIRE reference material analysis on Network Services; and
3. INSPIRE metadata survey by Novak and Craglia - Nowak, J. and M. Craglia (2006), INSPIRE metadata survey. Report of INSPIRE metadata survey results. EU JRC.

INSPIRE reference material analysis

From the INSPIRE reference material analysis the following conclusions on the use of metadata content standards and catalogue standards are drawn.

The analysis of the INSPIRE Metadata reference material analysis shows that here is a clear perspective on the use of Dublin Core and ISO 19115/19119 (INSPIRE DT Metadata, 2006):

- Nearly all reference materials address the use of ISO19115
 - Several profiles
 - No radical changes identified
- Metadata for data well developed, metadata for services is starting
- Metadata for services seems only well developed (based on the reference material) in Germany
- ISO19119 is used for services
- Dublin Core (DC) is often used
 - Useful for connection between geo and e-government (general search)
 - Always an addition to ISO19115 implementation (no DC-only implementations of metadata)
- Other standards: mainly ISO/TS19139 (XML encoding of ISO19115)

Reference material analysis on Network Services show only a few references regarding the use of Discovery Service standards in use at SDICs and LMOs. No further conclusions are drawn from this. In 2006 an additional INSPIRE survey by Nowak and Craglia (2006) gives a more detailed insight in the use of metadata content standards and catalogue standards at INSPIRE SDICs and LMOs⁵. Herewith the results of the INSPIRE metadata survey regarding the use of metadata content

³ INSPIRE Directive preamble (5) INSPIRE should be based on the infrastructures for spatial information that are created by the Member States and that are made compatible with common implementing rules, and are supplemented with measures at Community level. These measures should ensure that the infrastructures for spatial information created by the Member States are compatible and usable in a Community and trans-boundary context.

⁴ INSPIRE Directive preamble (16) Since the wide diversity of formats and structures in which spatial data are organized and accessed in the Community hampers the efficient formulation, implementation, monitoring and evaluation of Community legislation that directly or indirectly affects the environment, implementing measures should be provided for in order to facilitate the use of spatial data from different sources across the Member States. Those measures should be designed to make the spatial datasets interoperable, and Member States should ensure that any data or information needed for the purposes of achieving interoperability are available on conditions that do not restrict their use for that purpose. Implementing rules should be based, where possible, on international standards and should not result in excessive costs for Member States.

⁵ The nominated person for each SDIC and LMO was contacted by email and asked to distribute the survey forms to each member organisation. In total, 68 SDICs and LMOs responded to the survey providing information on 120 metadata holdings. The response rate for the survey was therefore 26%. The completed questionnaires included free text answers that required some degree of harmonization for the analysis. In the case of questions where the names of standards (for MD content, or MD encoding, or catalogue service) were required, the answers were harmonized according to the official names of the standards. The same applied to the question concerning the protocol used for catalogue search.

standards, encoding, catalogue standards and service protocols used (from Nowak and Craglia, 2006).

Metadata content standards followed

The question regarding the standards followed to document the contents of the MD holding provided a range of different answers. The pie diagram illustrates that in total, 65% of metadata holding follow ISO standards (19115, 19119, 15836) with some internal differentiation:

- ISO 19115 (32%)
- both ISO 19115 and ISO15836-Dublin Core (5%)
- both ISO 19119 and ISO19115 (28%)

The survey also revealed that 3% of metadata holding follow the CEN1 standards, 4% follow national standards, while 6% follow other standards (namely: AACR2, CEOS/CIP, XML/OIOXML, Content Standard for Digital Geospatial Metadata - FGDC, CSDGM, proprietary standards). In 8% of the cases the metadata holdings was indicated as using standards – but the name was missing (NSI). In 14% of the cases the data was lacking (LOI).

Standard for encoding MD

For the metadata encoding purposes the following standards are being applied: ISO 19139 (30%), ISO 191152 (14%), and GM03-INTERLIS (3%). The 'other standards' class (5%) encompasses the answers as follows: UKMARC, CEOS/CIP, ISO 9001, DIF, MS 1250. 5% of respondents use HTML, which was considered to be a 'no standards' answer. In a great number of instances (31%) we received no information about standards, which can be assumed as lack of standards but we classified such responses as a LOI. To sum up, more than half of the respondents follow some standards to encode MD, of which the majority are ISO standards (19139, 19115).

Catalogue Service Standards

The analysis shows that OGC standards are applied to 39% of all metadata holdings. This number includes also 6% of the instances when metadata holdings did not sufficiently describe the standard's name (OGC NSI), and 3% of OGC CS-W 1.0. The GM03 (INTERLIS) is applied to 3% of metadata holdings. The category 'other standards' (8%) encompasses the standards not mentioned before, mainly national or proprietary ones (i.e. FGDC, OLIB, CEOS/CIP, ISO 19139-DEProfile, NOKIS-Schema, CERA / html GUI, DIF, DC). A total of 6% of the forms included information that was not sufficient (NSI), while voids appeared in 44% of instances.

Protocols used for Search

In case of catalogue existence, the following protocols are used for search: SOAP (20%), HTTP (3%), HTTP/SOAP (3%), Z39.50 (2%), others protocols (6%). In 60% of all responses the protocol used for search was not specified (LOI).

Deployment of catalogue standards in the EU

The INSPIRE reference material analysis on Metadata and Network Services gives almost no insight on the deployment of Catalogue Service standards in Europe. The INSPIRE survey of Nowak and Craglia shows the deployment of Catalogue Service standards by the INSPIRE SDICs and LMOs. OGC CSW standards are applied to 39% of all metadata holdings⁶ (see figure 3). The GM03 (INTERLIS) is applied to 3% of metadata holdings. The category "other standards" (8%) encompasses the standards not mentioned before, mainly national or proprietary ones (i.e. FGDC, OLIB, CEOS/CIP, ISO 19139-DEProfile, NOKIS-Schema, CERA / html GUI, DIF, DC). A total of 6% of the forms included information that was not sufficient (NSI), while voids appeared in 44% of instances.

⁶ This number includes also 6% of the instances when metadata holdings did not sufficiently describe the standard's name (OGC NSI), and 3% of OGC CSW 1.0.

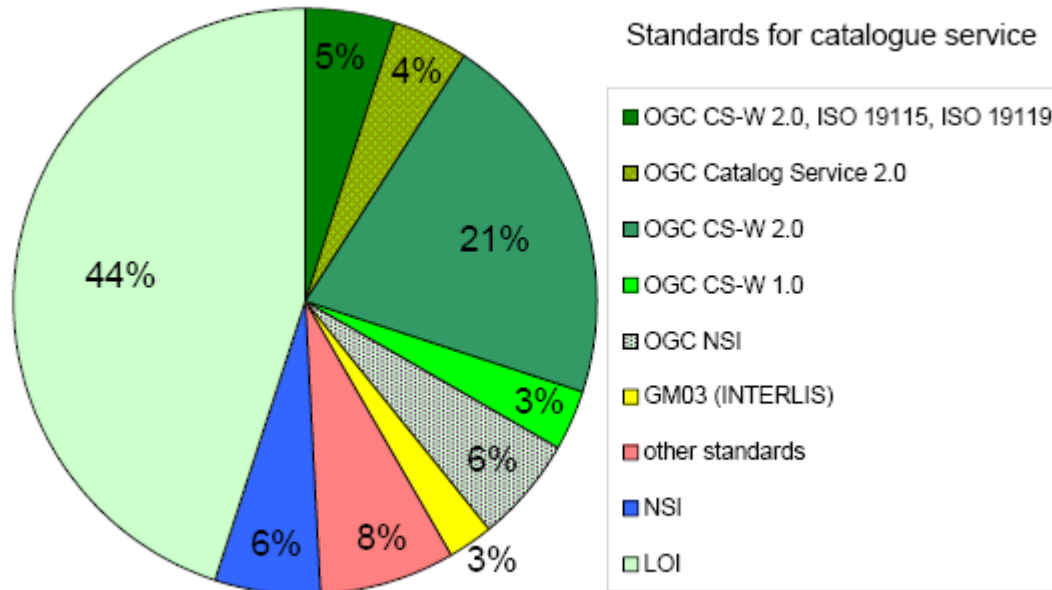


Figure 3: Catalogue Service standards adopted in Europe (source: Novak and Craglia, 2006; LOI = Lack of Information)

Annex C Capabilities extensions and examples

Capabilities extension for multilingualism

The following XSD Schema defines the XSD Types that are needed to provide additional information on multilingual aspects. This information has to be provided in a capabilities documents that is returned by an INSPIRE Discovery Service (see [OGC WS]).

The XML Elements that comply with the following shall be applied in the <ExtendedCapabilities> section of the capabilities document.

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema targetNamespace="http://www.inspire.org"
xmlns:xs="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified"
attributeFormDefault="unqualified" xmlns="http://www.inspire.org"
xmlns:ows="http://www.opengis.net/ows" >
  <xs:import namespace="http://www.opengis.net/ows"
schemaLocation="http://schemas.opengis.net/ows/1.0.0/ows19115subset.xsd"></
xs:import>
  <xs:complexType name="InspireCapabilitiesType">
    <xs:annotation>
      <xs:documentation>Additional capabilities for
INSPIRE</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="Languages" type="LanguagesType"
minOccurs="0"/>
      <xs:element name="TranslatedCapabilities"
type="TranslatedCapabilitiesType" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>
  <xs:element name="MultiligualCapabilities"
type="InspireCapabilitiesType"></xs:element>
  <xs:complexType name="LanguagesType">
    <xs:annotation>
      <xs:documentation>List of languages defined by a 3-letter
code as described in ISO 639-2 that are supported by this service instance.
</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="Language" type="xs:string"
minOccurs="0" maxOccurs="unbounded"></xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="TranslatedCapabilitiesType">
    <xs:annotation>
      <xs:documentation>List of URLs that give access to
translation of capabilities document at hand.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="Document" type="DocumentType"
minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="DocumentType">
    <xs:annotation>
      <xs:documentation>Connect point URL to translated
capabilities document. The language attribute shall be defined by a 3-
letter code as described in ISO 639-2.</xs:documentation>
    </xs:annotation>
```

```

        <xs:complexContent>
          <xs:extension base="ows:OnlineResourceType">
            <xs:attribute name="language"
use="required"></xs:attribute>
          </xs:extension>
        </xs:complexContent>
      </xs:complexType>
</xs:schema>

```

XML Example for extended capabilities

```

<ows:OperationsMetadata xmlns:ows="http://www.opengis.net/ows">
  [...]
  <ows:ExtendedCapabilities>
    <MultilingualCapabilities xmlns="http://www.inspire.org"
xmlns:xlink="http://www.w3.org/1999/xlink" >
      <Languages>
        <Language>GER</Language>
        <Language>DUT</Language>
      </Languages>
      <TranslatedCapabilities>
        <Document
xlink:href="http://www.somehost.com/capabilities_german.xml"
language="GER"/>
        <Document
xlink:href="http://www.somehost.com/capabilities_dutch.xml"
language="DUT"/>
      </TranslatedCapabilities>
    </MultilingualCapabilities>
  </ows:ExtendedCapabilities>
</ows:OperationsMetadata>

```