



INSPIRE

Infrastructure for Spatial Information in Europe

# Draft Technical Guidance for INSPIRE Download Services

Drafting Team “Network Services”

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## 0 Foreword

This draft technical guidance document is a first draft that provides only a rudimentary description of the recommended way to implement INSPIRE Download Services. It is meant as minimum description to accompany the draft Implementing Rules for Download Services during the SDIC and LMO review.

This document will evolve during the implementation and experience phases of the INSPIRE programme.

The main idea of this version is thus to describe the recommended implementation of INSPIRE Download Services such that the underlying standards and specifications are clarified in a concrete way, both with respect to names and versions of the standards and specifications.

There is a difficult balance between what should be described in this document and what should be left to be found in the underlying standards and specifications themselves. There is also a challenge in the fact that the IR for download services is at a generic level (i.e. not connected to any specific INSPIRE theme), and that the detailed content of the application schemas of the different themes are not known at present, and also outside the scope of this description. This means that the guidance document cannot restrict too much of the full functionalities of the underlying standards and specifications.

This document does not detail the recommended SOAP framework for implementing the Download service, see

[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)

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| 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 Introduction

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

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

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

The guiding principles of INSPIRE are:

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

The text of the INSPIRE Directive is available from the INSPIRE<sup>1</sup> web site ([http://inspire.jrc.it/directive/\\_10820070425en00010014.pdf](http://inspire.jrc.it/directive/_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.

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

The scope of this document is to detail the INSPIRE technical requirements for **Download services** from the Implementing Rules, such that these services can be implemented consistently across Europe.

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

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<sup>1</sup> <http://inspire.jrc.it/>

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

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## 2 Normative references

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

**IETF RFC 2616** Hypertext Transfer Protocol -- HTTP/1.1

**IETF RFC 2818** HTTP Over TLS

**ISO/DIS 19142** Geographic information - Web feature service  
or, more precisely: 211N2632 Text of ISO 19142 for DIS, Geographic information - Web feature service<sup>2</sup>

**ISO/DIS 19143** Geographic information - Filter encoding  
or, more precisely: 211N2633 Text of ISO 19143 for DIS, Geographic information - Filter encoding<sup>3</sup>

**ISO 19136:2007** Geographic information -- Geography Markup Language (GML)

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

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

**ISO 19123:2005** Geographic information -- Schema for coverage geometry and functions

OGC 06-121r3 **OGC OWS** OpenGIS Web Service Common Implementation Specification 1.1.0

INSPIRE, **INS ARC**, Network Services Architecture Version 3.0

The following documents are candidate normative references if the functionality of the web coverage service is required for a given theme.

OGC 07-067r5 **OGC WCS** OpenGIS Web Coverage Service (WCS) Implementation Standard 1.1.2

OGC 07-066r5 Corrigendum 2 for the OGC Standard Web Coverage Service 1.1 (1.1.2)

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<sup>2</sup> this document 211N2632 is currently sent to ISO/Central Secretariat for publication as Draft International Standard – DIS. This document is also under a parallel voting in CEN/TC 287 to become an EN. The document is available from [www.isotc211.org](http://www.isotc211.org) as an internal (protected) document. It is also available for CT and DTs under the ISO grant permission, and it will be made available to SDICs and LMOs for the consultation of this Technical Guide. This version is only made available for the purpose of INSPIRE. As a DIS it is published by ISO and can be normatively referenced in other standards or draft standards. It is not an International Standard, IS, and the final IS may introduce changes. Latest information: The document passed the DIS vote to become a Final Draft International Standard with just one no-vote (Japan, on formal reasons). Thus it will proceed to a final vote which is then a pure formality and become an IS. There were several editorial comments that will be fixed.

<sup>3</sup> this document 211N2633 is currently sent to ISO/Central Secretariat for publication as Draft International Standard – DIS. The document is available from [www.isotc211.org](http://www.isotc211.org) as an internal (protected) document. It is also available for CT and DTs under the ISO grant permission, and it will be made available to SDICs and LMOs for the consultation of this Technical Guide. This version is only made available for the purpose of INSPIRE. As a DIS it is published by ISO and can be normatively referenced in other standards or draft standards. It is not an International Standard, IS, and the final IS may introduce changes. Latest information: The document passed the DIS vote to become a Final Draft International Standard unanimously. Thus it will proceed directly to publication as International Standard. There were several editorial comments that will be fixed.

### 3 Abbreviations

|         |  |
|---------|--|
| CRS     | Coordinate Reference System  |
| EPSG    | European Petroleum Survey Group,<br>currently OGP Surveying and Positioning Committee  |
| FE      | Filter Encoding, referring to ISO/DIS 19143  |
| GML     | Geography Markup Language  |
| INSPIRE | Infrastructure for Spatial Information in Europe                                       |
| IR      | Implementing Rule  |
| JRC     | Joint Research Centre  |
| MIME    | Multipurpose Internet Mail Extensions  |
| MS      | Member state – the set of countries in EU and EFTA where the INSPIRE Directive applies |
| OGC     | Open Geospatial Consortium   |
| URL     | Uniform Resource Locator   |
| URN     | Uniform Resource Name  |
| WFS     | Web Feature Service  |
| XML     | Extensible Markup Language   |

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## 4 INSPIRE Download Services implemented by ISO standards and OGC specifications

### 4.1 Introduction

This document gives guidelines for the technical service interfaces for the INSPIRE Download Services. The guidelines are based on the abstract model established in the INSPIRE Implementing Rule (IR) for Download Services.

The draft Implementing Rules for Download Services define the INSPIRE Download Services divided into two main types – download services for pre-defined data sets or pre-defined parts of data sets, and direct access download services including a query capability.

In addition, the concept of a query to identify a part of the data set plays a major role in download services. The functionality provided by the query mechanism is illustrated in the following diagram.

This draft guidance document will describe recommendations for how the different download service types can be implemented using ISO standards and draft standards and OGC specifications.

It will also describe recommendations for how the query mechanism can be implemented using a draft ISO standard.

### 4.2 Pre-defined data sets or pre-defined parts of data set

A pre-defined data set or a pre-defined part of a data set are characterised by two conditions:

- 1) They have a metadata record and can be discovered using an INSPIRE conformant discovery service.
- 2) The metadata contains a link (URL – uniform resource locator) whereby the data set or part of data set can be immediately downloaded by a simple HTTP-protocol GET-request. The URL can optionally link to a resource where horizontal services can be invoked prior to the simple download by use of HTTP-protocol.

A pre-defined data set or a pre-defined part of a data set represent conceptually a file stored in a data set repository, and can be downloaded as a complete unity with no possibility to change content, whether encoding, the CRS of the coordinates, etc.

This situation allows the simplest technical solution for providing access to a spatial data set. It provides, however, less functionality than other options.

The terms pre-defined data set or pre-defined part of data set are used to cover the situation that e.g. the pre-defined data set is a data set conforming to one of the INSPIRE themes covering the whole MS, while the pre-defined part of the data set can be a subset of this, covering for instance an administrative subdivision of the MS.

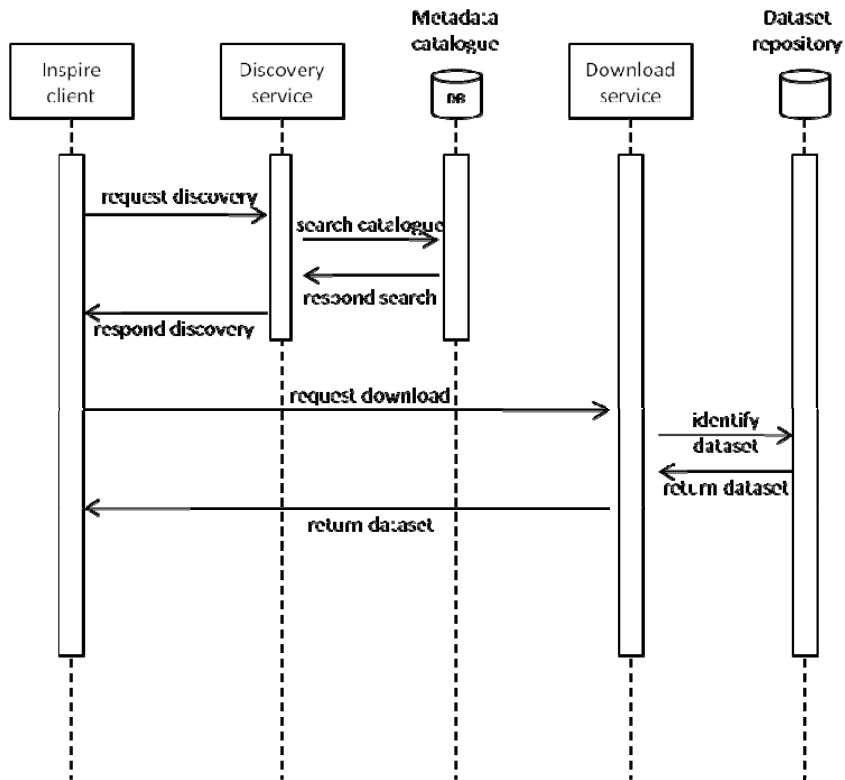


Figure 1. Simple sequence diagram of download service for pre-defined data sets or pre-defined parts of data sets

In this case the IR operations can be implemented in the following way.

| Function                      | Description in IR   | M/O/C | Recommended implementation in case of download of pre-defined data sets or pre-defined parts of data sets   |
|-------------------------------|---|-------|---|
| Get Download Service Metadata | Provides all necessary information about the service to a user (service provider, spatial objects available, access constraints ...) and describes service capabilities to enable a client application to use the service (list of supported operations). | M     | <p>The Discovery service provides directly the metadata of the pre-defined data set or pre-defined part of data set.</p> <p>Optionally the above metadata can contain a link to more extensive metadata. These metadata should conform to ISO 19115 and be encoded conformant with ISO 19139.</p> <p>Note. In this simple case of download service, the service metadata and the data set metadata will contain the same information.</p> |

|                                      |   |   |  |
|--------------------------------------|---|---|--|
| <p>Get Spatial Objects</p>           | <p>The Get Spatial Objects operation allows spatial object instances to be retrieved.</p> <p>In the case of non-direct access, the operation will retrieve a pre-defined data set or a pre-defined part of a data set.</p> <p>Correct....</p> <p>The operation shall support user requested CRS belonging to the INSPIRE defined CRSs.</p>  | <p>M</p>                                      | <p>Issuing a GET-command in HTTP-protocol with the URL to the data set as parameter initiates and completes the download.</p>  |
| <p>Describe Spatial Object Types</p> | <p>The Describe Spatial object Type operation generates a description that defines zero or more of the spatial object types that the service offers.</p> <p>In the case of download service of a pre-defined data set or pre-defined part of data set, the function shall return the description of the complete set of spatial object types contained in the data set or part of data set.</p> <p>In the case of a direct access download service, the function can have as parameter a set named spatial object types for which the description is requested.</p> | <p>C,<br/><br/>M in case of direct access</p> | <p>If applicable, the spatial data set metadata shall contain a description of the spatial object types instantiated in the data set.</p> <p>If applicable, the description of spatial object types shall conform to the specification of WFS.</p> |
| <p>Define Query</p>                  | <p>Defines a query to be used in the Get Spatial Objects operation. The query predicates, encoded using a query expression, can include spatial, temporal and non-spatial constraints.</p> <p>The predicates shall express characteristics based upon the model of the data set as defined by an INSPIRE Implementing Rule on the interoperability of spatial data sets. The general characteristics are defined by the generic conceptual model.</p> <p>This function is applicable only in the case of direct</p>   | <p>C,<br/><br/>M in case of direct access</p> | <p>Not applicable for this type of download services</p>   |

|                       |   |   |  |
|-----------------------|---|---|--|
|                       | access download service. The capability to define a query is mandatory, but a query can be omitted in a concrete Get Spatial Objects request.   |   |  |
| Link Download Service | Allows the declaration of a Download Service for downloading of its resources through the Member State Download Service while maintaining the downloading capability at the Public Authority or the Third party location. | M | To be implemented by uploading the appropriate metadata to the INSPIRE network as referred to in Article 11 using PublishMetadata function of an INSPIRE compliant discovery service |

M/O/C : Mandatory / Optional/Conditional

Table 1. Mapping of IR functions in case of non-direct access download service.

The HTTP-protocol is described in IETF RFC 2616. If a secure connection is required, then the HTTPS-protocol should be used as described in IETF RFC 2818.

Unless specific encodings are specified by the Implementing Rule on interoperability of data sets and services or technical guidance accompanying this, the pre-defined data set or pre-defined part of data set shall be encoded in GML as described by ISO 19136, and the CRS shall be conforming to the implementing rule for Annex I Coordinate reference systems. The data set can be transformed to another CRS by applying an INSPIRE conformant transformation service if required.

### 4.3 Direct access download service

The direct access download service allows more control over the download than the simple download of a pre-defined data set or pre-defined part of a data set. It can therefore be considered to be more 'advanced' than the other download service variant.

In this case, the spatial information is typically stored in a repository (e.g. a database) and only accessible through a middleware data management system. By direct access is meant the capability of a client application or client service to interact directly with the repository, e.g. by retrieving parts of the repository based upon a query. The query can be based upon spatial or temporal criteria, or by specific properties of the instances of the spatial object types represented in the repository. The complete repository may contain spatial objects representing many themes, and be of a size that is not suited for complete download.

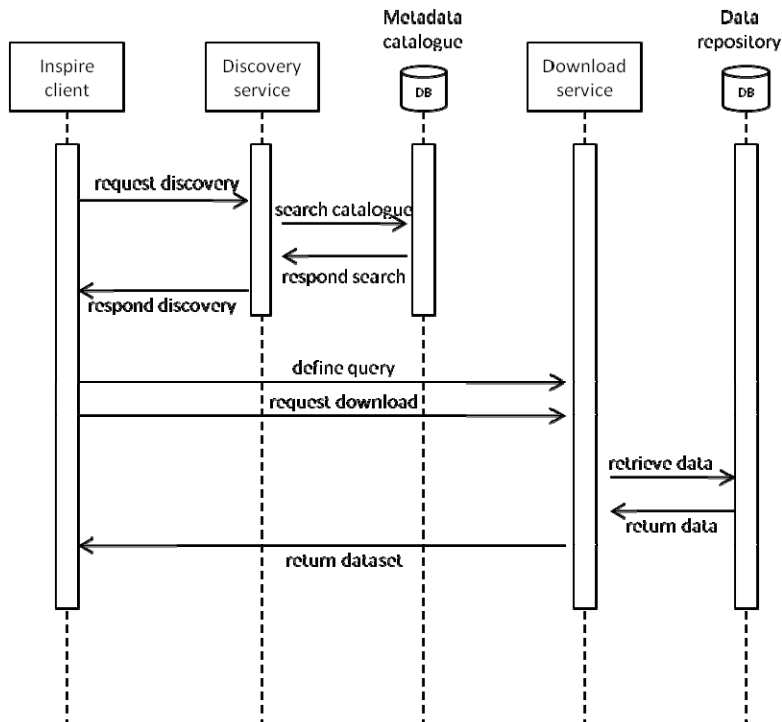


Figure 2. Simple sequence diagram illustrating direct access download service, not all operations are described in this diagram.

It is recommended to implement the direct access services using the Web feature service, WFS, as specified in ISO/DIS 19142, and with the query facility of Filter encoding, FE, as specified in ISO/DIS 19143. These versions of WFS and FE are jointly developed by OGC and ISO/TC 211, and represent the latest versions of the specifications.

An implementation of Download services using WFS, shall conform to WFS conformance classes according to the following table:

| Conformance class name | Operation or behaviour   | M/O |
|------------------------|--|-----|
| Simple WFS             | The server shall implement the following operations: GetCapabilities, DescribeFeatureType, ListStoredQueries, DescribeStoredQueries, GetFeature operation with the StoredQuery action only. One stored query, that fetches a feature by id, shall be available.<br><br>Additionally the server shall conform to at least one of the HTTP GET, HTTP POST or SOAP conformance classes. | M   |
| Basic WFS              | The server shall implement the Simple WFS conformance class and shall also implement the Query action for the GetFeature operation and the GetPropertyValue operation.<br><br>Servers that implement this conformance class shall also implement the Minimum Spatial Filter conformance class from ISO 19143.  | M   |

|                       |  |   |
|-----------------------|--|---|
| Transactional WFS     | The server shall implement the Basic WFS conformance class and also implemented the Transaction operation.   | O |
| Locking WFS           | The server shall implement the Transactional WFS conformance class and shall implement at least one of the GetFeatureWithLock or LockFeature operations. | O |
| HTTP GET              | The server shall implement the Key-value pair encoding for the operations that the server offers.  | O |
| HTTP POST             | The server shall implement the XML encoding for the operations that the server implements.   | O |
| SOAP                  | The server shall implement XML encoded requests and results within SOAP Envelopes.   | M |
| Inheritance           | The server shall implement the schema-element() function in Xpath expressions.   | O |
| Remote resolve        | The server shall implement the ability to resolve remote resource references.  | O |
| Response paging       | The server shall implement the ability to page through the response features or values.  | O |
| Standard joins        | The server shall implement join predicates using all Filter operators except the spatial and temporal operators.   | O |
| Spatial joins         | The server shall implement join predicates using spatial operators.  | O |
| Temporal joins        | The server shall implement join predicates using temporal operators.   | O |
| Feature versions      | The server shall implement the ability to navigate feature versions.   | O |
| Manage stored queries | The server shall implement the CreateStoredQuery and the DropStoredQuery operations.   | O |

Table 2. Conformance classes of WFS and INSPIRE Download service requirements.

It is not required that the Download service shall implement the CreateStoredQuery operation, but one stored query, that fetches a feature by id, shall be available. WFS and FE will have the capability of serving all download service requirements for Annex I themes. If later data specifications relating to Annex II or Annex III themes should require additional functionality, like those covered by the OGC Web coverage service (WCS), this Technical Guidance document will be extended accordingly.

The functions of the draft IR shall in the case of direct access download service be implemented in the following way:

| Function                      | Description in IR   | M/O/C | Recommended implementation in WFS and FE |
|-------------------------------|---|-------|--|
| Get Download Service Metadata | Provides all necessary information about the service to a user (service provider, spatial objects available, access constraints ...) and describes service capabilities to enable a client application to use the service (list of supported operations). | M     | GetCapabilities operation of WFS         |

|                                      |   |  |   |
|--------------------------------------|---|--|---|
| <p>Get Spatial Objects</p>           | <p>The Get Spatial Objects operation allows spatial object instances to be retrieved.</p> <p>In the case of direct access, the retrieval can be based on an optional query defined by the Define Query operation.</p> <p>In the case of non-direct access, the operation will retrieve a pre-defined data set or a pre-defined part of a data set.</p> <p>The operation shall support user requested CRS belonging to the INSPIRE defined CRSs.</p>   | <p>M</p>                                 | <p>GetFeature operation of WFS</p> <p>Any query shall be submitted to the service by a CreateStoredQuery operation and the query name passed as a parameter to the GetFeature operation, or submitted directly as a parameter to the GetFeatures operation (adhoc query). In both cases, the query shall conform to FE.</p> |
| <p>Describe Spatial Object Types</p> | <p>The Describe Spatial object Type operation generates a description that defines zero or more of the spatial object types that the service offers.</p> <p>In the case of download service of a pre-defined data set or pre-defined part of data set, the function shall return the description of the complete set of spatial object types contained in the data set or part of data set.</p> <p>In the case of a direct access download service, the function can have as parameter a set named spatial object types for which the description is requested.</p>   | <p>C,<br/>M in case of direct access</p> | <p>DescribeFeatureType operation of WFS.</p> <p>The typeName parameter encodes the names of one or more features types that shall be described by the DescribeFeatureType operation.</p>  |
| <p>Define Query</p>                  | <p>Defines a query to be used in the Get Spatial Objects operation. The query predicates, encoded using a query expression, can include spatial, temporal and non-spatial constraints.</p> <p>The predicates shall express characteristics based upon the model of the data set as defined by an INSPIRE Implementing Rule on the interoperability of spatial data sets. The general characteristics are defined by the generic conceptual model.</p> <p>This function is applicable only in the case of direct access download service. The capability to define a query is mandatory, but a query can be omitted in a concrete Get Spatial Objects request.</p> | <p>C,<br/>M in case of direct access</p> | <p>Adhoc query of WFS conforming to FE and passed as a parameter to GetFeature.</p> <p>optionally as a CreateStoredQuery operation of WFS, with query expression conforming to FE.</p>  |
| <p>Link Download Service</p>         | <p>Allows the declaration of a Download Service for downloading of its resources through the Member State Download Service while maintaining the downloading capability at the Public Authority</p>   | <p>M</p>                                 | <p>To be implemented by uploading the appropriate metadata to the INSPIRE network using PublishMetadata function of an INSPIRE compliant discovery service.</p>   |

|  |                              |          |                       |
|--|------------------------------|----------|-----------------------|
|  | or the Third party location. |          |                       |
| Additional operations of WFS that may not be required by the Implementing rule for download services, some will anyway be mandatory according to this Technical Guidance as they belong to a mandatory conformance class. Added here for completeness. |                              |          |                       |
|  |                              | <b>M</b> | GetPropertyValue      |
|  |                              | <b>O</b> | GetFeatureWithLock    |
|  |                              | <b>O</b> | LockFeature           |
|  |                              | <b>O</b> | Transaction           |
|  |                              | <b>O</b> | DropStoredQuery       |
|  |                              | <b>M</b> | ListStoredQueries     |
|  |                              | <b>M</b> | DescribeStoredQueries |

M/O/C : Mandatory / Optional/Conditional

Table 3. Mapping of IR functions in case of direct access download service.

More details are to be found in 4.5.

#### 4.4 Query implementation for Direct access download services

The query mechanism as described here, shall be implemented using the ISO/DIS 19143 Geographic information - Filter encoding. This standard is a joint work of ISO and OGC and supersedes the OpenGIS Filter Encoding Implementation Specification 1.1 (04-095).

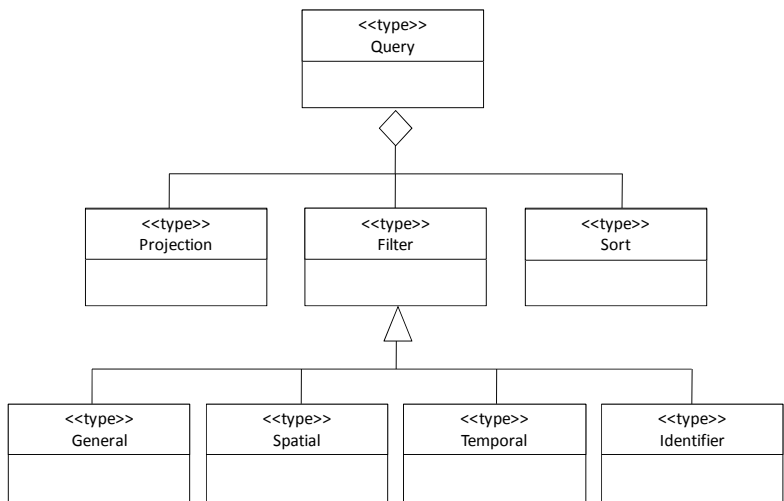


Figure 3. Simplified UML model of Query

A query in the abstract sense is a system neutral syntax for expressing projection, filter and sorting clauses collectively called a query and defined by a query expression.

Note. A query can be compared to the well known SQL type query :

"SELECT ... (*projection clause*) ... FROM ... (*application schema*) ... WHERE ... (*filter clause*) ... ORDER BY ... (*sorting clause*)"

The term *projection clause* is used to describe an encoding for specifying which subset of resource properties are presented in the response to a query.

The term *filter* or *selection clause* is used to identify a subset of resources from a collection of resources whose property values satisfy a set of logically connected predicates. If the property values of a resource satisfy all the predicates in a filter then that resource is considered to be part of the resulting subset.

In the case of geographic information the collection of resources is a feature collection. A filter will specify conditions based on the feature types and their attributes. The result of applying the filter to a feature collection, will thus result in a subset of the features in the collection. The projection clause will possibly define a subset of the feature types represented in the data set, and possibly also a subset of the attributes for a given feature type.

The term *sorting clause* is used to describe an encoding for specifying how the data in a response is ordered prior to begin presented.

Predicates in a filter expressions shall be applied to appropriate attributes or properties of the feature types. E.g. a temporal predicate shall only be applied to a property of a temporal type, a spatial predicate shall only be applied to a spatial datatype. General predicates can be applied other datatypes or between predicates of any kind. A filter expression shall support the following functionality:

| Function                      | Description  | M/O |
|-------------------------------|--|-----|
| General operators             | Shall consist of:<br>- logical predicates: and, or and not<br>- comparison predicates: equal to, not equal to, less than, less than or equal to, greater than, greater than or equal to, like, is null and between | M   |
| Identifier filter             | Shall consist of predicate to check whether a resource identifier matches a specified value  | M   |
| Spatial filter – Bounding box | Shall only include BBOX (bounding box)   | M   |
| Complex spatial filter        | Shall consist of spatial predicates: Equals, Disjoin, Touches, Within, Overlaps, Crosses, Intersects, Contains, Dwithin (a specified distance), Beyond (a specified distance), and BBOX                            | O   |
| Temporal filter               | Shall consist of temporal predicates: after, before, begins, begunby, Tcontains, during, Tequals, Toverlaps, Meets, OverlappedBy, MetBy, EndedBy, and Ends   | M   |

Table 4. Query operators.

The bounding box BBOX defines a spatial extension based upon two opposite corners in a geometry (i.e. a 'rectangle' in the associated CRS). The bounding box filter shall return all features that interact spatially with the bounding box.

In the case where an application schema describes feature identifiers, and/or attributes that designate versions or updating information, it shall be possible to filter on the basis of this information. E.g. in the case that a feature has a unique identifier, the download service shall support a filter that allows access to exactly this feature.

A query mechanism as used in INSPIRE Download services (where appropriate) shall support all mandatory parts of ISO/DIS 19143 with any exception concretely defined below.

#### 4.4.1 Conformance classes for query

All query elements *projection clause*, *filter clause*, and *sorting clause* are optional to use in a specific case. This paragraph defines which capabilities that shall be supported by the direct download service.

ISO/DIS 19143 defines 8 test conformance classes, listed here as:

|   | Conformance classes    | M/O/C to be supported in Direct download services |
|---|------------------------|---|
| 1 | Query                  | M   |
| 2 | Ad-hoc Query           | M   |
| 3 | Standard Filter        | M   |
| 4 | Minimum Spatial Filter | M   |
| 5 | Spatial Filter         | O   |
| 6 | Temporal Filter        | M   |
| 7 | Version navigation     | O   |
| 8 | Sorting                | O   |

M/O/C : Mandatory / Optional/Conditional

Table 5. Query conformance classes and recommended INSPIRE Download service requirements.

A query used in connection with Direct access download service shall comply with the QueryExpression as defined in ISO/DIS 19143 and additional descriptions in ISO/DIS 19142, and conform to all conformance classes 1, 2, 3, 4, 6, and 7 (conditional).

#### 4.4.2 Additional capabilities of FE

A projection clause encodes a list of optional resource properties that shall be available in a query response. This is a powerful function and it is highly recommended to support it in any INSPIRE Direct access download service.

A sorting clause is used to describe an encoding for specifying how the data in a response is ordered prior to begin presented. This technical guidance document does not require an INSPIRE Direct access download service to support the sorting capability.

#### 4.4.3 Query capabilities in service metadata

A Direct access download service implemented on the basis of WFS, shall declare its querying capabilities as described in both FE and WFS.

#### 4.4.4 Stored queries

A stored query expression may be used in several WFS operations, `GetPropertyValue`, `GetFeature`, `GetFeatureWithLock`, or `LockFeature` operation to identify a set of features to be operated upon.

A stored query expressions is a persistent, parameterized, identifiable query expression. A stored query can be repeatedly invoked using its identifier with different values bound to its parameters each time.

Stored query functionality is an optional functionality in the context of INSPIRE.

### 4.5 *Direct access download service operations*

#### 4.5.1 **Get Download Service Metadata implemented by the GetCapabilities operation of WFS**

This operation shall return all required metadata elements from OWS Common. In addition the capabilities response document shall contain the following sections:

1. WSDL section (mandatory)

This section allows a server to reference an optional WSDL document that describes the operations that the service offers (see Annex F in ISO 19143). This section may be included in addition to the `OperationsMetadata` section for tools that know how to use the WSDL.

2. FeatureType list section (mandatory)

This section defines the list of feature types that are offered by a web feature service. Lightweight metadata is provided about each feature type as described in Table 11 in ISO 19143 — Elements to describe feature types.

3. Filter capabilities section (mandatory)

The schema of the Filter Capabilities Section is defined in ISO 19143 and is used to advertise the expressions that may be used to form query predicates.

4. Support for languages (mandatory)

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Language of the current capabilities response (see annex A of this document).

Supported languages for the service operations (see annex A of this document).

#### **4.5.2 Get Spatial Objects implemented by the GetFeature operation of WFS**

The GetFeature operation shall be implemented as described in ISO/DIS 19142.

The request shall support ad-hoc queries and at least the GetFeatureById stored query.

The response shall support a clients request for CRS as long as the requested CRS is defined in the INSPIRE Annex I theme for coordinate reference systems.

#### **4.5.3 Describe Spatial Object Types implemented by the DescribeFeatureType operation of WFS**

The mandatory DescribeFeatureType operation returns a schema description of feature types offered by a WFS instance. The schema descriptions define how feature instances shall be encoded on output of the GetFeature operation.

The DescribeFeatureType operation shall be implemented by all web feature services.

The operation shall support parameters describing which feature types to be described. If this parameter is not submitted, the complete application schemas supported by the service shall be described.

#### **4.5.4 Define Query implemented by the Adhoc query expression**

Adhoc query expressions are encoded in XML using the element wfs:Query. They are called "adhoc" because the query is not stored by the server and is only known at runtime.

The CreateStoredQuery operation is optional. Stored query expressions are encoded in XML using the wfs:StoredQuery element. A stored query expression is a query that has been previously saved in the server's repository and can be executed at any time using the query's identifier. The CreateStoredQuery operation allows clients to create stored query expressions. The StoredQueryDefinition parameter shall contain the definition of a stored query expression. Multiple stored queries can be created in a single request by specifying multiple StoredQueryDefinition parameters for the CreateStoredQuery operation. In this case, each stored query shall be independent of the others.

Only the GetFeatureById stored query is mandatory.

The query expression is defined in ISO/DIS 19142 and ISO/DIS 19143.

An INSPIRE direct access download service shall also support the following operations related to stored queries: ListStoredQueries and DescribeStoredQueries.

#### **4.5.5 Link Download Service**

To be implemented by uploading the appropriate metadata to the INSPIRE network using PublishMetadata function of an INSPIRE compliant discovery service.

#### 4.5.6 Additional operations of WFS

These operations are not required by the Implementing rule for download services, but some will anyway be mandatory according to this Technical Guidance as they belong to a mandatory conformance class

- M    GetPropertyValue
- O    GetFeatureWithLock
- O    LockFeature
- O    Transaction
- O    DropStoredQuery
- M    ListStoredQueries
- M    DescribeStoredQueries

M – mandatory, O - optional

The descriptions of these operations are to be found in ISO/DIS 19142.

## Annex A – 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 Download Service.

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

The description is adopted from the TG for View services.

*NB! The namespaces and URLs may change as the ISO/DIS 19142 is finalized.*

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema
  targetNamespace="http://www.inspire.org"
  xmlns:INSPIRE='http://www.inspire.org'
  xmlns:wms="http://www.opengis.net/wfs"
  xmlns="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified"
  attributeFormDefault="unqualified">
  <xs:import
    namespace="http://www.opengis.net/wfs"
    schemaLocation="http://schemas.opengis.net/wfs/" />
  </xs:import>
  <xs:complexType name="DownloadCapabilitiesType">
    <xs:annotation>
      <xs:documentation>Additional capabilities for INSPIRE Download
service</xs:documentation>
    </xs:annotation>
    <xs:extension base="wms:_ExtendedCapabilities">
      <xs:sequence>
        <xs:element name="Languages" type="INSPIRE:LanguagesType" minOccurs="0"/>
        <xs:element name="CurrentLanguage" type="INSPIRE:LanguageType"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexType>
  <xs:element name="DownloadCapabilities" type="INSPIRE:DownloadCapabilitiesType"
substitutionGroup="wms:_ExtendedCapabilities">
  </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="INSPIRE:LanguageType" minOccurs="1"
maxOccurs="unbounded">
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="LanguageType">
    <xs:simpleContent>
      <xs:extension base="xs:string">
        <xs:attribute name="default" type="xs:boolean" use="optional"
default="false"/>
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>
</xs:schema>
```

- Deleted:** 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 View Service.¶  
The XML Elements that comply with the following shall be applied in the <ExtendedCapabilities> section of the capabilities document.¶
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