Technical Guidance to implement INSPIRE View Services
Drafting Team “Network Services”

This document defines how to implement INSPIRE View Services according to the View Services Implementing Rules.
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1 Introduction

According to Article 5(4) of the Directive, the INSPIRE Implementing Rules shall take account of relevant, existing international standards and user requirements. In the context of spatial data services, the European de jure standard EN ISO 19128:2005(E) – (WMS 1.3.0) has been identified one of the relevant standard to implement INSPIRE View Services. Any other standard or set of standards may also be used as long as it conforms with the Implementing Rules.

Two other OGC de facto standards for portraying geographic information are associated with the EN ISO 19128:2005(E):
- OGC Styled Layer Descriptor Profile of the Web Map Service Implementation Specification (05-078r4) and its corrigendum1 for OGC Implementation Specification SLD 1.1.0 (07-123r1);
- OGC Symbology Encoding Implementation Specification (05-077r4), which is a language used for styling feature and coverage data, and independent of any service interface specification.

The aim of this document is to explain how to setup an INSPIRE View Service according to the View Services Implementing Rules defined in the document “Draft Implementing Rules for View Services”.

Important: This is an initial version of this document that will be developed further in collaboration with the stakeholder community and relevant standardization organizations.

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.
2 References

This technical guidance incorporates, by dated or undated references, provisions from other publications. For dated references, subsequent amendments to or revisions of any of these publications apply to this guide only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

This technical guidance applies on the D00315201-en-00 Implementing Rule document (28th of November 2008).

These normative references are cited at the appropriate places in the text and the publications are listed hereafter:

- [1] INSPIRE Network services Architecture document;
- [2] OGC 05-077r4-Version:1.1.0 (revision 4) - Symbology Encoding Implementation Specification OGC 05-078r4 Version: 1.1.0 (revision 4) - Styled Layer Descriptor profile of the Web Map Service Implementation Specification;
- [7] WSDL for INSPIRE View and Discovery network services
- [8] INSPIRE SOAP binding primer for Discovery and View services

Other important normative references:

- ISO 19119 : 2005, Geographic information – Services;
- ISO 19119:2005 PDAM 1, Geographic information – Services;
- ISO/IEC Directives, Part 2 - Rules for the structure and drafting of International Standards;
- EUR 2012 – Map projection for Europe – Institute for environment and sustainability, JRC, Eurogeographics – 2001;
3 INSPIRE Profile of ISO 19128:2005(E)

3.1 General background

The base specification of an INSPIRE View Service may be the ISO 19128:2005(E) international standard.

Although this specification lays down the basic behaviour of an INSPIRE View Service, some aspects need to be extended or profiled with respect to the requirements of the INSPIRE Directive and the Implementing Rules for View services.

The 3.3 and subsequent sections specify required extensions to the base specification. They are laid down following the ISO 19128:2005(E) document structure, from its section 6.9.

The following items need special attention for implementation:

- WMO (World Meteorological Organization) data and services: serving WMO data through WMS is technically only feasible for end products and not for basic WMO data, far too huge and complex. These WMO end products (and corresponding CRS) handled by WMS, still have to be defined by TWG when they'll be set up;

- Use of SOAP: see [1] (section 7) and [6], relevant for HTTP POST methods. As ISO 19128:2005(E) does not define a SOAP binding, the use of SOAP according to the Architecture document is defined in [7], [8].

The Architecture document also gives important details about the rights management in INSPIRE infrastructure (section 7.2 and Annex A).

The use of ISO 19128:2005(E) de jure standard as a basis for implementing an INSPIRE View service implies that this service must comply with the "basic WMS" conformance class as defined in this de jure standard.

3.2 View service operations

The following operations are mandatory for an INSPIRE View service:

<table>
<thead>
<tr>
<th>INSPIRE View Service operations</th>
<th>ISO 19128:2005(E) WMS operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get Service Metadata</td>
<td>GetCapabilities</td>
</tr>
<tr>
<td>Get Map</td>
<td>GetMap</td>
</tr>
<tr>
<td>Link View Service</td>
<td>Use Discovery Service, &quot;Discover Metadata&quot; operation</td>
</tr>
</tbody>
</table>

Table 1 - View Service Operations

These three operations use parameters defined in the ISO 19128:2005(E) WMS standard, but this section specifies the role of some parameters in the INSPIRE context.

As stated in the ISO 19128:2005(E) standard (see section 6.3.1) support for the GET method is mandatory. NS DT recommends the use of the GET method for the view service operations.

In order to make provisions for the SOAP framework, the NS DT recommends the use of the POST method once a decision is taken on the use of the SOAP protocol, this decision is recorded in further amendments of this guide.

The following profiles are recommended for an INSPIRE-compliant View service implementation:

- **Basic profile**: support of GET method for the “Get Service Metadata”, “Get Map” and “Link View Service”;
- **Standard profile**: basic profile and support of the GetFeatureInfo operation through the GET method;
- **SOAP profile**: basic profile plus support of the SOAP/POST method for the three mandatory View service operations;
- **Advanced SOAP profile**: SOAP profile plus support of the `GetFeatureInfo` operation though the SOAP/POST method.

### 3.2.1 Common requests parameters for the View service operations

**VERSION**

The optional VERSION parameter specifies the protocol version number.

**SERVICE**

The mandatory SERVICE parameter indicates which of the available service types at a particular server is being invoked. The value "WMS" is the correct value to use.

**REQUEST**

The mandatory REQUEST parameter indicates which service operation is being invoked. The value shall be the name of one of the operations offered by the Web Map Server.

**FORMAT**

The optional FORMAT parameter specifies the output format of the response to an operation.

**EXCEPTIONS**

The optional EXCEPTIONS request parameter states the format in which to report errors.

**LANGUAGE**

The mandatory parameter LANGUAGE defines the client's preferred language. The language values are based on ISO 639-2, alpha 3 codes as used in the INSPIRE Metadata Implementing Rules.

The response documents are returned in this preferred language if it is supported. If there is no support for the requested language, the documents are returned in the service default language (generally the Member State language being one of the official 23 European languages).

However, following the European Interoperability Framework (EIF, see chapter 7.1) services should at least support parts of the service responses to be provided in English.

To identify the different languages a language extension to WMS capabilities is provided (see annex C of this document).

**Motivation**: There is not yet a standard way to deal with multilingualism when using ISO or OGC public standards specification to implement INSPIRE Network Services. According to Implementing Rule, the View Service must provide a way for a client application to specify a language when issuing requests.

Several elements are language dependent:

- the service capabilities (result of the `GetCapabilities` operation) and managed by the service provider. These capabilities describe the service itself, but also layers provided by the service (with several language dependent elements like title, abstract, keywords...);
- the map if it contains texts language dependent, and managed by the data provider;
- the dataset metadata provided for each layer, and managed by the metadata provider;
- the legend attached to each layer, and managed by the data provider;
- the information returned by a `GetFeatureInfo` operation, and managed by the data provider;
- the service exceptions, managed by the service provider.

It is worth noting that the returned documents are mono-lingual: either the specified language given by the LANGUAGE parameter or the service default language.
3.2.2 View service exceptions

The error messages (exceptions) are either expressed in the service’s default language (suppose that the request is incorrect and the LANGUAGE parameter has not been interpreted before issuing the error/exception text) or in the preferred (requested) language in other cases.

3.2.3 Get Service Metadata operation

3.2.3.1 General

According to Article 11 metadata for INSPIRE services shall be available.

a) The metadata of a View Service must be available:
   - through the service Capabilities, as defined in the WMS Standard ISO19128:2005, § 7.2.4. These capabilities are mandatory and defined when a WMS is set up. They consist of server’s information, supported operations and parameters values;
   - through the “Discover Metadata” operation of the Discovery service.

b) Metadata of the datasets represented in the layers of the View Service are available:
   - through Unique Resource Identifier corresponding to a “Discover Metadata” operation of the Discovery service. Generally, this URI is found in the coupledResource of the View service metadata.

This URI points at the "qualified" INSPIRE dataset metadata represented by each layer exposed in the service. The layer metadata can be different from the "qualified" INSPIRE dataset, whilst still linked with.

Example:

The view service expose an TRANSPORTNETWORKS.ROADS layer (say it is an harmonized name constructed from the INSPIRE name and the INSPIRE featureType). This layer points through the Uniform Resource Identifier property at the INSPIRE metadata for the roads dataset. These metadata say nothing about the rendering and selection of featureType. The view service metadata contain the layer description for this layer along with explanation on generalization, styles and attributes selection for rendering. The layer's metadata and dataset metadata are as such different. The layer's metadata use dataset metadata in its genealogy (quality).

3.2.3.2 GetCapabilities operation

The operation for implementing INSPIRE “Get Service Metadata” operation is the GetCapabilities operation. The parameters defined within the ISO 19128:2005(E) standard can be used to convey relevant information in order to get the expected responses as described in Annex III, section 2.2 of the Implementing Rules:

<table>
<thead>
<tr>
<th>Request parameter</th>
<th>Mandatory / optional</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERSION=version</td>
<td>O</td>
<td>Request version: 1.3.0</td>
</tr>
<tr>
<td>SERVICE=WMS</td>
<td>M</td>
<td>Service type. Fixed value: WMS</td>
</tr>
<tr>
<td>REQUEST=GetCapabilities</td>
<td>M</td>
<td>Request name. Fixed value: GetCapabilities</td>
</tr>
<tr>
<td>FORMAT=MIME_type</td>
<td>O</td>
<td>Output format of service metadata. Defaults to text/xml.</td>
</tr>
</tbody>
</table>

Table 2 - GetCapabilities core parameters

3.2.3.3 GetCapabilities response

3.2.3.3.1 View service metadata

The View service metadata shall be advertised through the Discovery service.
This section is mapped with the `<WMS_Capabilities>` element of the GetCapabilities response. The Implementing Rule states that it shall contain INSPIRE Metadata elements.

### 3.2.3.3.1.1 Identification

A proper identification of the spatial dataset, spatial dataset series and spatial data services is necessary to the implementation of the Directive.

#### 3.2.3.3.1.1.1 RESOURCE TITLE

This is a characteristic and often-unique name by which the resource is known. It is mapped with the `<wms:Title>` element.

**Example:**

```xml
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
    <wms:Name>WMS</wms:Name>
    <wms:Title>MS INSPIRE View Service</wms:Title>
  </wms:Service>
</wms:WMS_Capabilities>
```

#### 3.2.3.3.1.1.2 ABSTRACT

This is a brief narrative summary of the content of the resource. It is mapped with the `<wms:Abstract>` element.

**Example:**

```xml
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
    <wms:Name>WMS</wms:Name>
    <wms:Title>MS INSPIRE View Service</wms:Title>
    <wms:Abstract>
      Service for making available INSPIRE themes
    </wms:Abstract>
  </wms:Service>
</wms:WMS_Capabilities>
```

#### 3.2.3.3.1.1.3 RESOURCE TYPE

The NS DT recommends the use of “INSPIRE:ViewService” (Note: while awaiting for the final code list for the type of service) in `<wms:KeywordList>` element to indicate the type of the service with regards to INSPIRE Directive.

**Example:**

```xml
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
    <wms:Name>WMS</wms:Name>
    <wms:Title>MS INSPIRE View Service</wms:Title>
    <wms:Abstract>
      Service for making available INSPIRE themes
    </wms:Abstract>
    <wms:KeywordList>
      <wms:Keyword>INSPIRE:ViewService</wms:Keyword>
      ...<wms:KeywordList>
  </wms:Service>
</wms:WMS_Capabilities>
```

3.2.3.3.1.2 RESOURCE LOCATOR

The locator defines the link, commonly expressed as a Uniform Resource Locator(s) (URL) to the service. It is mapped with the <wms:OnlineResource> element.

Example:
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
    <wms:Name>WMS</wms:Name>
    <wms:Title>MS INSPIRE View Service</wms:Title>
    <wms:Abstract>
      Service for making available INSPIRE themes
    </wms:Abstract>
    <wms:OnlineResource
      xmlns:xlink="http://www.w3.org/1999/xlink"
      xlink:type="simple"
      xlink:href="URL to the WMS"
    />
  </wms:Service>
</wms:WMS_Capabilities>

3.2.3.3.1.3 CLASSIFICATION OF SPATIAL DATA SERVICE

Not available in the current proposed standard.

3.2.3.3.1.4 KEYWORDS

Commonly used word(s), formalized word(s) or phrase(s) used to describe the subject. It is mapped with the <wms:KeywordList> element.

Example:
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
    <wms:Name>WMS</wms:Name>
    <wms:Title>MS INSPIRE View Service</wms:Title>
    <wms:Abstract>
      Service for making available INSPIRE themes
    </wms:Abstract>
    <wms:KeywordList>
      <wms:Keyword>INSPIRE:ViewService</wms:Keyword>
      <wms:Keyword>GEMET keyword</wms:Keyword>
      ...
    </wms:KeywordList>
    <wms:OnlineResource
      xmlns:xlink="http://www.w3.org/1999/xlink"
      xlink:type="simple"
      xlink:href="URL to the WMS"
    />
  </wms:Service>
</wms:WMS_Capabilities>

3.2.3.3.1.5 CONFORMITY

Not available in the current proposed standard.

3.2.3.3.1.6 CONDITION FOR ACCESS AND USE
It defines the conditions for access and use of spatial datasets and services, and where applicable, corresponding fees. It is mapped with the `<wms:Fees>` element.

NS DT recommends the use of "None" when the service is free of charge.

**Example:**
```xml
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
    <wms:Name>WMS</wms:Name>
    <wms:Title>MS INSPIRE View Service</wms:Title>
    <wms:Abstract>
      Service for making available INSPIRE themes
    </wms:Abstract>
    <wms:KeywordList>
      <wms:Keyword>INSPIRE:ViewService</wms:Keyword> ...
    </wms:KeywordList>
    <wms:OnlineResource
      xmlns:xlink="http://www.w3.org/1999/xlink"
      xlink:type="simple"
      xlink:href="URL to the WMS" />
    ...
    <wms:Fees>None</wms:Fees>
  </wms:Service>
</wms:WMS_Capabilities>
```

3.2.3.3.1.7 LIMITATIONS ON PUBLIC ACCESS

This metadata element shall provide information on the limitations (if they exist) and the reasons for such limitations. It is mapped with `<wms:AccessConstraints>` element.

NS DT recommends the use of "None" when no limitations on public access apply.

**Example:**
```xml
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
    <wms:Name>WMS</wms:Name>
    <wms:Title>MS INSPIRE View Service</wms:Title>
    <wms:Abstract>
      Service for making available INSPIRE themes
    </wms:Abstract>
    <wms:KeywordList>
      <wms:Keyword>INSPIRE:ViewService</wms:Keyword> ...
    </wms:KeywordList>
    <wms:OnlineResource
      xmlns:xlink="http://www.w3.org/1999/xlink"
      xlink:type="simple"
      xlink:href="URL to the WMS" />
    ...
    <wms:Fees>None</wms:Fees>
    <wms:AccessConstraints>None</wms:AccessConstraints>
  </wms:Service>
</wms:WMS_Capabilities>
```

Based on performances issue, NS DT recommends the use of `<wms:LayerLimit>` for indicating the maximum number of layers a client is permitted to include in a single GetMap request. Furthermore, as the INSPIRE Directive requires the ability to overlay layers, the returned map should contain only one layer.

**Example:**
3.2.3.3.1.8 RESPONSIBLE ORGANISATION

The public authority or any other citation to the organization most responsible for the resource and the corresponding role(s). There are several ways to fulfill this metadata element. It is mapped with <wms:ContactInformation> element:

1. **Contact address**: postal address;
2. **Phone, fax**;
3. **Email**: NS DT recommends the use organization level email address. Personal email address are not recommended.

**Example**:

```xml
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
    <wms:Name>WMS</wms:Name>
    <wms:Title>MS INSPIRE View Service</wms:Title>
    <wms:Abstract>
      Service for making available INSPIRE themes
    </wms:Abstract>
    <wms:KeywordList>
      <wms:Keyword>INSPIRE:ViewService</wms:Keyword>
      ...
    </wms:KeywordList>
    <wms:OnlineResource
      xmlns:xlink="http://www.w3.org/1999/xlink"
      xlink:type="simple"
      xlink:href="URL to the WMS"
    />
    ...
    <wms:Fees>None</wms:Fees>
    <wms:AccessConstraints>None</wms:AccessConstraints>
    <wms:LayerLimit>1</wms:LayerLimit>
  </wms:Service>
</wms:WMS_Capabilities>

<wms:ContactInformation>
  <wms:ContactAddress>
    <wms:AddressType/>
    <wms:Address>Street nbr., Street name</wms:Address>
    <wms:City/><wms:City>
    <wms:StateOrProvince>if relevant or empty</wms:StateOrProvince>
    <wms:PostCode>postal code</wms:PostCode>
    <wms:Country>MS name</wms:Country>
  </wms:ContactAddress>
  <wms:ContactVoiceTelephone>tel number</wms:ContactVoiceTelephone>
  <wms:ContactFacsimileTelephone>fax number</wms:ContactFacsimileTelephone>
</wms:ContactInformation>
```
3.2.3.3.1.9 METADATA POINT OF CONTACT

Not available in the current proposed standard.

3.2.3.3.1.10 METADATA DATE

Not available in the current proposed standard.

3.2.3.3.1.11 METADATA LANGUAGE

This is the language in which the metadata elements are expressed. It is mapped with the element <wms:_ExtendedCapabilities>. See Annex B of this document.

Example:

```xml
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
    <wms:Name>WMS</wms:Name>
    <wms:Title>MS INSPIRE View Service</wms:Title>
    <wms:Abstract>
      Service for making available INSPIRE themes
    </wms:Abstract>
    <wms:KeywordList>
      <wms:Keyword>INSPIRE:ViewService</wms:Keyword>
      ... (continued)
    </wms:KeywordList>
    <wms:OnlineResource
      xmlns:xlink="http://www.w3.org/1999/xlink"
      xlink:type="simple"
      xlink:href="URL to the WMS"/>
    ...
    
    <wms:ContactInformation>
      <wms:ContactAddress>
        <wms:AddressType/>
        <wms:Address>Street nbr., Street name</wms:Address>
        <wms:City>City</wms:City>
        <wms:StateOrProvince>if relevant or empty</wms:StateOrProvince>
        <wms:PostCode>postal code</wms:PostCode>
        <wms:Country>MS name</wms:Country>
      </wms:ContactAddress>
      <wms:ContactVoiceTelephone>tel number</wms:ContactVoiceTelephone>
      <wms:ContactFacsimileTelephone>fax number</wms:ContactFacsimileTelephone>
      <wms:ContactElectronicMailAddress>contactPoint@organisation.country</wms:ContactElectronicMailAddress>
    </wms:ContactInformation>
    <wms:Fees>None</wms:Fees>
    <wms:AccessConstraints>None</wms:AccessConstraints>
  </wms:Service>
  ...
</wms:WMS_Capabilities>
<wms:ViewCapabilities>
  <wms:Languages>
    <wms:Language>ENG</wms:Language>
  </wms:Languages>
</wms:ViewCapabilities>
```


3.2.3.3.2 Operations Metadata

The operation metadata are mapped with the <wms:Request> element. There are three mandatory operations to be defined in the Operation Metadata: “Get Service Metadata” implemented with the GetCapabilities WMS operation, “Get Map” implemented with the GetMap WMS operation and “Link View Service” implemented through the “Discover Metadata” operation of Discovery Service.

It is worth noting that ISO 19128:2005(E) standard only support HTTP as distributed computing platform type. It is mandatory to advertise the HTTP GET method according to the ISO standard1.

3.2.3.3.2.1 GetCapabilities operation metadata

These metadata are mapped with the <wms:GetCapabilities> element.

Example:

```
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
    ...
  </wms:Service>
  <wms:Capability>
    <wms:Request>
      <wms:GetCapabilities>
        <wms:Format>text/xml</wms:Format>
        ...<wms:DCPType>
          <wms:HTTP>
            <wms:Get>
              <wms:OnlineResource
                xmlns:xlink="http://www.w3.org/1999/xlink"
                xlink:type="simple"
                xlink:href="URL?SERVICE=WMS&REQUEST=GetCapabilities"
              />
            </wms:Get>
          </wms:HTTP>
        </wms:DCPType>
      </wms:GetCapabilities>
    </wms:Request>
    ...
  </wms:Capability>
</wms:WMS_Capabilities>
```

3.2.3.3.2.2 GetMap operation metadata

These metadata are mapped with the <wms:GetMap> element. The PNG and GIF format shall be supported by the View service (Annex III, Part B of the Implementing Rules).

Example:

```
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
    ...
  </wms:Service>
  <wms:Capability>
    <wms:Request>
      <wms:GetMap>
      ...
    </wms:Request>
    ...
  </wms:Capability>
</wms:WMS_Capabilities>
```

1 There are, as of writing of this document, on-going works on OGC’s OWS to support SOAP in DCPType.
3.2.3.3.2.3 Link View Service operation metadata

NS DT recommends the use of “Discover Metadata” operation of INSPIRE Discovery service for implementing the Link View Service operation.

3.2.3.3.3 Languages

Refer to METADATA LANGUAGE section.

3.2.3.3.4 Layers Metadata

These metadata are mapped with the <wms:Layer> element.

Example:
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
    ...
  </wms:Service>
  <wms:Capability>
    ...
  </wms:Capability>
  <wms:Layer>
    ...
  </wms:Layer>
</wms:WMS_Capabilities>
The description of a layer shall use elements defined for the service capabilities in the ISO19128:2005(E) standard. This paragraph specifies the role of some parameters for the INSPIRE View Service as stated in the Implementing Rules:

<table>
<thead>
<tr>
<th>Metadata elements</th>
<th>ISO19128:2005(E) standard elements of</th>
<th><a href="">wms:Layer</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource Title</td>
<td>wms:Title</td>
<td></td>
</tr>
<tr>
<td>Resource Abstract</td>
<td>wms:Abstract</td>
<td></td>
</tr>
<tr>
<td>Keyword</td>
<td>wms:KeywordList</td>
<td></td>
</tr>
<tr>
<td>Geographic Bounding Box</td>
<td>wms:EX_GeographicBoundingBox</td>
<td></td>
</tr>
<tr>
<td>Unique Resource Identifier</td>
<td>wms:Identifier</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>wms:Name</td>
<td></td>
</tr>
<tr>
<td>Coordinate Reference Systems</td>
<td>wms:CRS</td>
<td></td>
</tr>
<tr>
<td>Styles</td>
<td>wms:Style</td>
<td></td>
</tr>
<tr>
<td>Legend URL</td>
<td>wms:Style/wms:LegendURL</td>
<td></td>
</tr>
<tr>
<td>Dimension Pairs</td>
<td>wms:Dimension[@name,@units]</td>
<td></td>
</tr>
</tbody>
</table>

Table 3 – Mapping between INSPIRE elements and ISO19128:2005(E) WMS elements

3.2.3.3.4.1 RESOURCE TITLE

The title of the layer, used for human communication, for presentation of the layer e.g. in a menu. It is mapped with <wms:Title>. Subject to multilingualism (translations will appear in each mono-lingual capabilities localized documents).

Example:
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
    ...
  </wms:Service>
  <wms:Capability>
    ...
    <wms:Layer>
      ...
      <wms:Title>The transport networks theme : roads</wms:Title>
    ...
  </wms:Layer>
  <wms:Capability>
</wms:WMS_Capabilities>

3.2.3.3.4.2 RESOURCE ABSTRACT

Layer abstract: text describing the layer. Subject to multilingualism. It is mapped with the <wms:Abstract> element.

Example:
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
3.2.3.3.4.3 KEYWORD

Additional Keywords: list of keywords describing the layer, to support catalog search (to be harmonized the INSPIRE metadata element Keyword Value, see [5] §3.2.3). It is mapped with the <wms:KeywordList> element.

Example:
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
  ...
  </wms:Service>
  <wms:Capability>
  ...
  <wms:Layer>
  ...<wms:Title>The transport networks theme : roads</wms:Title>
  <wms:Abstract>As defined by TWG</wms:Abstract>
  <wms:KeywordList>
    <wms:Keyword>GEMET keyword</wms:Keyword>
    ...
  </wms:KeywordList>
  ...
  </wms:Layer>
  </wms:Capability>
</wms:WMS_Capabilities>

3.2.3.3.4.4 GEOGRAPHIC BOUNDING BOX

The minimum bounding rectangle in all supported Coordinate Reference Systems of the area covered by the Layer: <wms:westBoundLongitude>, <wms:eastBoundLongitude>, <wms:southBoundLatitude>, and <wms:northBoundLatitude> are expressed in decimal degrees and use CRS:84 as Coordinate Reference System. Element used to facilitate geographic searches. It is mapped with the <wms:EX_GeographicBoundBox> element.

Example:
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
  ...
  </wms:Service>
  <wms:Capability>
  ...
  <wms:Layer>
  ...<wms:Title>The transport networks theme : roads</wms:Title>
  <wms:Abstract>As defined by TWG</wms:Abstract>
  <wms:KeywordList>
    <wms:Keyword>GEMET keyword</wms:Keyword>
    ...
  </wms:KeywordList>
  ...
  </wms:Layer>
  </wms:Capability>
</wms:WMS_Capabilities>
3.2.3.3.4.5 UNIQUE RESOURCE IDENTIFIER

The Unique Resource Identifier of the resource used to create the layer: link to metadata about the data corresponding to the layer. It is mapped with `<wms:Identifier>` to describe the authority’s identifier of the layer.

Metadata provided for each layer shall follow the INSPIRE Metadata Implementing Rules. The relationship between ISO 19128 and ISO 19115 metadata fields may be found in table 5 of [4]. Metadata records are stored in an INSPIRE catalogue (so that it is possible to discover datasets and services via the discovery service).

Example:

```xml
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
    ...
  </wms:Service>
  <wms:Capability>
    ...
    <wms:Layer>
      ...
      <wms:Title>The transport networks theme: roads</wms:Title>
      <wms:Abstract>As defined by TWG</wms:Abstract>
      <wms:KeywordList>
        <wms:Keyword>GEMET keyword</wms:Keyword>
        ...
      </wms:KeywordList>
      ...
      <wms:EX_GeographicBoundingBox>
        <wms:westBoundLongitude>-31.2</wms:westBoundLongitude>
        <wms:eastBoundLongitude>69.1</wms:eastBoundLongitude>
        <wms:southBoundLatitude>27.2</wms:southBoundLatitude>
        <wms:northBoundLatitude>90</wms:northBoundLatitude>
      </wms:EX_GeographicBoundingBox>
      ...
      <wms:Identifier authority="IGNF">TR_ROUTE</wms:Identifier>
      ...
    </wms:Layer>
  </wms:Capability>
</wms:WMS_Capabilities>
```

3.2.3.3.4.6 NAME

Harmonized name of the layer: for machine-to-machine communication, used in the `getMap` request. (see also [3] §7.2.2.2). To be harmonized by INSPIRE TWG. The NS DT recommends `THEME.FEATURETYPE` in uppercase without spaces as a rule for writing the layers’ harmonized name. For instance, for annexes I and II themes, one could have:

<table>
<thead>
<tr>
<th>Theme</th>
<th>Examples of layer names</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geographical grid systems</td>
<td>GEOGRAPHICALGRIDSYSTEMS.UTM for UTM grid</td>
</tr>
<tr>
<td>Geographical names</td>
<td>GEOGRAPHICALNAMES.TOPYNMS for toponyms</td>
</tr>
</tbody>
</table>
Administrative units | ADMINISTRATIVEUNITS.NUTS1 for Member States
Addresses | ADDRESSES.POSTAL for postal addresses
Cadastral parcels | CADASTRALPARCELS.PARCELS for parcels
Transport networks | TRANSPORTNETWORKS.ROADS for roads
Hydrography | HYDROGRAPHY.RIVERS for river courses
Protected sites | PROTECTEDSITES.NATURA2000 for Natura2000 zones
Elevation | ELEVATION.COUREN_LINES for the contours lines
Land cover | LANDCOVER.ALL for land cover coverage
Orthoimagery | ORTHOIMAGERY.ORTHOPHOTOS for aerial ortho-photos
Geology | GEOLOGY.HOLES for holes

Table 4 – Annexes I&II harmonized name examples

It is mapped with the `<wms:Name>` element.

Example:

```xml
<wms:WMS_Capabilities version="1.3.0">  
  <wms:Service>
  ...
  </wms:Service>
  <wms:Capability>
  ...
  <wms:Layer>
    <wms:Name>TRANSPORTNETWORKS.ROADS</wms:Name>
    <wms:Title>The transport networks theme : roads</wms:Title>
    <wms:Abstract>As defined by TWG</wms:Abstract>
    <wms:KeywordList>
      <wms:Keyword>GEMET keyword</wms:Keyword>
      ...
    </wms:KeywordList>
    ...
    <wms:EX_GeographicBoundingBox>
      <wms:westBoundLongitude>-31.2</wms:westBoundLongitude>
      <wms:eastBoundLongitude>69.1</wms:eastBoundLongitude>
      <wms:southBoundLatitude>27.2</wms:southBoundLatitude>
      <wms:northBoundLatitude>90</wms:northBoundLatitude>
    </wms:EX_GeographicBoundingBox>
    ...
    <wms:Identifier authority="IGNF">TR_ROUTE</wms:Identifier>
    ...
  </wms:Layer>
  </wms:Capability>
</wms:WMS_Capabilities>
```

3.2.3.3.4.7 COORDINATE REFERENCE SYSTEMS

List of Coordinate Reference Systems in which the layer is available: Coordinate reference system as defined in Annex I of the INSPIRE Directive, Geodesy TWG. It is mandatory to use geographical coordinate system based on ETRS89 in continental Europe and ITRS outside continental Europe.

The value of the CRS parameter depends on the coordinate reference systems catalogue being used. The NS DT is encouraging setting up such a catalogue for the INSPIRE framework.

The NS DT recommends using CRSs from [http://crs.bkg.bund.de/crs-eu/](http://crs.bkg.bund.de/crs-eu/). The ETRS89 default geographic reference system would then be “CRS-EU:ETRS89”.

The NS DT recommends using “CRS:84” for non-continental European areas.
As an alternative to CRS-EU repository and as already widely implemented, the use of EPSG codes (See [http://www.epsg.org/](http://www.epsg.org/)) is recommended when the CRS-EU register is not implemented:

<table>
<thead>
<tr>
<th>EPSG CRS value</th>
<th>Coordinate Referenced System designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPSG:4258</td>
<td>ETRS89 geographic (recommended by NS DT (check with 4937))</td>
</tr>
<tr>
<td>EPSG:3034</td>
<td>ETRS89 / ETRS-LCC</td>
</tr>
<tr>
<td>EPSG:3035</td>
<td>ETRS89 / ETRS-LAEA</td>
</tr>
<tr>
<td>EPSG:3038</td>
<td>ETRS89 / ETRS-TM26</td>
</tr>
<tr>
<td>EPSG:3039</td>
<td>ETRS89 / ETRS-TM27</td>
</tr>
<tr>
<td>EPSG:3040</td>
<td>ETRS89 / ETRS-TM28</td>
</tr>
<tr>
<td>EPSG:3041</td>
<td>ETRS89 / ETRS-TM29</td>
</tr>
<tr>
<td>EPSG:3042</td>
<td>ETRS89 / ETRS-TM30</td>
</tr>
<tr>
<td>EPSG:3043</td>
<td>ETRS89 / ETRS-TM31</td>
</tr>
<tr>
<td>EPSG:3044</td>
<td>ETRS89 / ETRS-TM32</td>
</tr>
<tr>
<td>EPSG:3045</td>
<td>ETRS89 / ETRS-TM33</td>
</tr>
<tr>
<td>EPSG:3046</td>
<td>ETRS89 / ETRS-TM34</td>
</tr>
<tr>
<td>EPSG:3047</td>
<td>ETRS89 / ETRS-TM35</td>
</tr>
<tr>
<td>EPSG:3048</td>
<td>ETRS89 / ETRS-TM36</td>
</tr>
<tr>
<td>EPSG:3049</td>
<td>ETRS89 / ETRS-TM37</td>
</tr>
<tr>
<td>EPSG:3050</td>
<td>ETRS89 / ETRS-TM38</td>
</tr>
</tbody>
</table>

Table 5 – Some EPSG code examples compliant with INSPIRE Annex I, theme 1 Geodesy

Example:

```xml
<wms:WMS_Capabilities version="1.3.0">  
  <wms:Service>
    ...
  </wms:Service>
  <wms:Capability>
    ...
    <wms:Layer>
      <wms:Name>TRANSPORTNETWORKS.ROADS</wms:Name>
      <wms:Title>The transport networks theme : roads</wms:Title>
      <wms:Abstract>As defined by TWG</wms:Abstract>
      <wms:KeywordList>
        <wms:Keyword>GEMET keyword</wms:Keyword>
        ...
      </wms:KeywordList>
      <wms:CRS>EPSG:4258</wms:CRS>
      <wms:CRS>EPSG:3034</wms:CRS>
      <wms:CRS>EPSG:3042</wms:CRS>
      <wms:CRS>EPSG:3043</wms:CRS>
      <wms:CRS>EPSG:3044</wms:CRS>
      ...
      <wms:EX_GeographicBoundingBox>
        <wms:westBoundLongitude>-31.2</wms:westBoundLongitude>
        <wms:eastBoundLongitude>69.1</wms:eastBoundLongitude>
        <wms:southBoundLatitude>27.2</wms:southBoundLatitude>
        <wms:northBoundLatitude>90</wms:northBoundLatitude>
      </wms:EX_GeographicBoundingBox>
      ...
      <wms:Identifier authority="IGNF">TR_ROUTE</wms:Identifier>
    ...
  </wms:Layer>
</wms:Capability>
```
3.2.3.4.8 STYLES

List of the rendering styles available for the layer: a style shall be composed of a title and a Unique Identifier. While there is no requirement in the Directive about portrayal, in order to guarantee that maps are presented consistently from the different MS some rules are then necessary.

For the styling for features, the thematic working group set up by the European Commission to draft the Implementing Rules for laying down technical arrangements for the interoperability and, where practicable, harmonisation of spatial data sets and services, are also in charge of the provision of feature styling whenever a European/International solution exist for the specific spatial data theme and is assessed as fit for purpose.

It is then recommended:

1. A very minimum default style must be defined for INSPIRE themes (at least to be able to see something on a map): this is the "INSPIRE:DEFAULT" style name (black point, line or polygon on a transparent background, 1 pixel width). When an "harmonised" style is defined across Europe for a spatial object type, then this style becomes the default style, encoded in SE 1.1 or later. (see the OGC documents [2]. Its name is still "INSPIRE:DEFAULT". Its content reflects the harmonised name of the layer. Its definition is out of the scope of NS DT. TWGs should managed definitions. All definitions should be handled in a shared location and managed as a register. It should be possible to simply reference from a data specification existing portrayal rules and symbols, where appropriate. INSPIRE data specification may already include more than the default style, too (in case several styles are known and used for different purposes). Such additional styles have to be named as part of the INSPIRE data specification. All SE-based definitions are to be managed as a register;

2. Waiting these "harmonised" styles, and if providers do not want to use the too poor "INSPIRE:DEFAULT" style, they may use their available national or thematic styles (for example : IGNF:TRANSPORTNETWORKS.ROADS)

**Relationships of Spatial Data Sets, Layers and Styles**

If spatial data sets are offered by a view service, they are mapped to layers, for which different styles can be defined. The following rules apply:

- One layer can be created based on several data sets (aggregation of layers);
- One data set can be used to create (parts of) several layers;
- A layer can be associated with a layer type specified in a data specification/IR appendix;
- A data set may only provide parts of a layer, even if the layer is associated with a layer type specified in a data specification/IR appendix;
- The view service should offer at least one layer for every layer type that is defined for a non-abstract spatial object type with a geometry that one of its spatial data sets refers to;
• For each of these layers there has to be at least one style that corresponds to the default style **INSPIRE:DEFAULT** specified for the layer type in a data specification/IR appendix;
• In addition further styles can be offered for each layer.

It is mapped with the `<wms:Style>` element. The name is mapped with the `<wms:Title>` element and the Unique Identifier is mapped with the `<wms:Name>`.

**Example:**
```xml
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
    ...
  </wms:Service>
  <wms:Capability>
    ...
    <wms:Layer>
      <wms:Name>TRANSPORTNETWORKS.ROADS</wms:Name>
      <wms:Title>The transport networks theme : roads</wms:Title>
      <wms:Abstract>As defined by TWG</wms:Abstract>
      <wms:KeywordList>
        <wms:Keyword>GEMET keyword</wms:Keyword>
        ...
      </wms:KeywordList>
      <wms:CRS>EPSG:4258</wms:CRS>
      <wms:CRS>EPSG:3034</wms:CRS>
      <wms:CRS>EPSG:3042</wms:CRS>
      <wms:CRS>EPSG:3043</wms:CRS>
      <wms:CRS>EPSG:3044</wms:CRS>
      <wms:EX_GeographicBoundingBox>
        <wms:westBoundLongitude>-31.2</wms:westBoundLongitude>
        <wms:eastBoundLongitude>69.1</wms:eastBoundLongitude>
        <wms:southBoundLatitude>27.2</wms:southBoundLatitude>
        <wms:northBoundLatitude>90</wms:northBoundLatitude>
      </wms:EX_GeographicBoundingBox>
      <wms:Identifier authority="IGNF">TR_ROUTE</wms:Identifier>
      <wms:Style>
        <wms:Name>INSPIRE:DEFAULT</wms:Name>
        <wms:Title>Style for roads</wms:Title>
        ...
      </wms:Style>
    </wms:Layer>
    ...
  </wms:Capability>
</wms:WMS_Capabilities>
```

### 3.2.3.3.4.9 LEGEND URL

Location of the legend for each style. As the capabilities document is a mono-lingual document, internationalized legend may placed in different capabilities document for each value of the `LANGUAGE` parameter. It is mapped with the `<wms:LegendURL>` element.

Mime type for legend is "image/png" (8 bits) (one image, for simple legends, when the legend may be displayed on one image) or HTML (for complex legends, when the legend needs several pages for example).

**Example:**
```xml
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
    ...
  </wms:Service>
  <wms:Capability>
    ...
    <wms:Layer>
      ...
      <wms:Capability>
        ...
      </wms:Capability>
    </wms:Layer>
  </wms:Capability>
</wms:WMS_Capabilities>
```
3.2.3.3.4.10 DIMENSION PAIRS

Indicates the supported two dimensional axis pairs for multi dimensional spatial data sets and spatial data sets series: some geographic information may be available at other dimensions (for example, satellite images in different wavelength bands). The mandatory <wms:Dimension> element is used in service metadata to declare that one or more dimensional parameters are relevant to a layer or group of layers.

For more information, refer the Annex C of ISO 19128:2005(E) standard.

When the map fully defined by its two-dimensional axis as defined in the SRS, NS DT considers this metadata element as not available for current standard.

In other cases such as time and elevation, the use of <wms:Dimension> is mandatory according to Implementing Rules.

Example:
<wms:WMS_Capabilities version="1.3.0">
  <wms:Service>
    ...  
  </wms:Service>
  <wms:Capability>
    ...
    <wms:Layer>
      <wms:Name>TRANSPORTNETWORKS.HIGHWAYS</wms:Name>
      <wms:Style>
        <wms:Name>INSPIRE:DEFAULT</wms:Name>
        <wms:Title>Style for roads</wms:Title>
        <wms:LegendURL width="100" height="100">
          <wms:Format>image/png</wms:Format>
          <wms:OnlineResource
            xmlns:xlink="http://www.w3.org/1999/xlink"
            xlink:type="simple"
            xlink:href="URL"/>
        </wms:LegendURL>
    </wms:Style>
    ...
  </wms:Layer>
</wms:WMS_Capabilities>
3.2.4 Get Map Operation

3.2.4.1 GetMap operation

The GetMap operation returns a map. Upon receiving a GetMap request, a WMS shall either satisfy the request or issue a service exception.

Implementing Rules state that “this map is an image spatially referenced”: the GetMap request is geo-referencing the returned image at least by the use of the Bounding box and Coordinate Reference System parameters.

The following table show INSPIRE parameters that shall be used within the WMS GetMap operation according to the Implementing Rules:

<table>
<thead>
<tr>
<th>INSPIRE parameters</th>
<th>ISO19128:2005(E) parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layers</td>
<td>LAYERS</td>
</tr>
<tr>
<td>Styles</td>
<td>STYLES</td>
</tr>
<tr>
<td>Coordinate Reference System</td>
<td>CRS</td>
</tr>
</tbody>
</table>
### GetMap request parameters

<table>
<thead>
<tr>
<th>Request parameter</th>
<th>Mandatory/optional</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERSION=1.3.0</td>
<td>M</td>
<td>Request version</td>
</tr>
<tr>
<td>REQUEST=GetMap</td>
<td>M</td>
<td>Request name</td>
</tr>
<tr>
<td>LAYERS=name, name</td>
<td>M</td>
<td>Comma-separated list of one or more map layers names. Names are harmonized INSPIRE layers names.</td>
</tr>
<tr>
<td>STYLES=name,name</td>
<td>M</td>
<td>Comma-separated list of one rendering style per requested. When the STYLE parameter is left blank in the GetMap request, the INSPIRE default styling applies in the GetMap response to all layers (INSPIRE:DEFAULT)</td>
</tr>
<tr>
<td>CRS=namespace:identifier</td>
<td>M</td>
<td>Coordinate reference system</td>
</tr>
<tr>
<td>BBOX=minx,miny,maxx,maxy</td>
<td>M</td>
<td>Bounding box corners (lower left, upper right) in CRS units</td>
</tr>
<tr>
<td>WIDTH=output_width</td>
<td>M</td>
<td>Width in pixels of map picture</td>
</tr>
<tr>
<td>HEIGHT=output_height</td>
<td>M</td>
<td>Height in pixels of map picture</td>
</tr>
<tr>
<td>FORMAT=output_format</td>
<td>M</td>
<td>Output format of map. At least supported: Portable Network Graphics format (PNG; MIME type &quot;image/png&quot;) and the GIF (Graphics Interchange Format) without LZW compression (MIME type &quot;image/gif&quot;)</td>
</tr>
<tr>
<td>LANGUAGE=code</td>
<td>M</td>
<td>Request language (INSPIRE extension)</td>
</tr>
<tr>
<td>TRANSPARENT=TRUE</td>
<td>FALSE</td>
<td>M</td>
</tr>
<tr>
<td>BGCOLORM=colorme_value</td>
<td>O</td>
<td>Hexadecimal red-green-blue colour value for the background color (default=0xFFFFFF)</td>
</tr>
<tr>
<td>EXCEPTIONS=error_format</td>
<td>O</td>
<td>The format in which exceptions are to be reported by the WMS (default=XML)</td>
</tr>
<tr>
<td>Request parameter</td>
<td>Mandatory/optional</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>TIME=time</td>
<td>C</td>
<td>Time value of layer desired</td>
</tr>
<tr>
<td>ELEVATION=elevation</td>
<td>C</td>
<td>Elevation of layer desired</td>
</tr>
<tr>
<td>Other sample dimension(s)</td>
<td>C</td>
<td>Value of other dimensions as appropriate</td>
</tr>
</tbody>
</table>

Table 6 - GetMap core parameters

3.2.4.1.1.1 VERSION

The mandatory VERSION parameter. The value "1.3.0" shall be used for GetMap requests that comply with the ISO19128:2005(E) standard.

3.2.4.1.1.2 REQUEST

The mandatory REQUEST parameter is defined in 6.9.2. To invoke the GetMap operation, the value "GetMap" shall be used to comply with the ISO19128:2005(E) standard.

3.2.4.1.1.3 LAYERS

The mandatory LAYERS parameter lists the map layer(s) to be returned by this GetMap request. The value of the LAYERS parameter is a comma-separated list of one or more valid INSPIRE harmonized layer names.

NS DT recommends for performances and for easying overlaying of datasets to use only one harmonized layer name as the LAYERS parameter value. See <wms:LayerLimit> in GetCapabilities operation.

3.2.4.1.1.4 STYLES

The mandatory STYLES parameter lists the style in which each layer is to be rendered. The value of the STYLES parameter is a comma-separated list of one or more valid INSPIRE style names. A client may request the default Style using a null value (as in "STYLES="). This has the same effect of putting "STYLES=INSPIRE:DEFAULT" for each layer in the GetMap request.

3.2.4.1.1.5 CRS

The CRS request parameter states what Layer CRS applies to the BBOX request parameter. Values must be CRS that are defined in the INSPIRE Annex I, theme 1, Geodesy.

NS DT recommends the use of geographic coordinate reference system.

3.2.4.1.1.6 BBOX

The mandatory BBOX parameter allows a Client to request a particular Bounding Box. The value of the BBOX parameter in a GetMap request is a list of comma-separated real numbers in the form "minx,miny,maxx,maxy". These values specify the minimum X, minimum Y, maximum X, and maximum Y values of a region in the Layer CRS of the request. The units, ordering and direction of increment of the X and Y axes are as defined by the Layer CRS. The four bounding box values indicate the outside limits of the region.

3.2.4.1.1.7 WIDTH and HEIGHT

The mandatory WIDTH and HEIGHT parameters specify the size in integer pixels of the map to be produced.

3.2.4.1.1.8 FORMAT

The mandatory FORMAT parameter states the desired format of the map. The implementing rules Annex III, Part B, section 2 Image format states that at least one of "image/png" or "image/gif" must be supported and therefore advertised in the GetCapabilities operation.
3.2.4.1.1.9 LANGUAGE

The INSPIRE mandatory LANGUAGE parameter states the desired language to be used when exceptions are returned upon issuing the GetMap request. A client may request the default Language using a null value (as in "LANGUAGE=") in which case the service uses the service default language as stated in the GetCapabilities operation.

3.2.4.1.1.10 TRANSPARENT

The mandatory TRANSPARENT parameter specifies whether the map background is to be made transparent or not.

3.2.4.1.1.11 BGCOLOR

The optional BGCOLOR parameter is a string that specifies the color to be used as the background (non-date) pixels of the map.

3.2.4.1.1.12 EXCEPTIONS

The default value is "XML" if this parameter is absent from the request. Other values are IMAGE and BLANK.

3.2.4.1.1.13 TIME, ELEVATION and other sample dimension(s)

Used when issuing request using Temporal coordinate system, height coordinate system or other dimensions. For more information, see Annexes C and D of the ISO19128:2005(E) standard.

In case of 2D request, the standard does not request this parameter.

3.2.5 Link View Service operation

This operation allows a Public Authority or a Third Party to declare a view Service for the viewing of its resources through the Member State View Service while maintaining the viewing capability at the Public Authority or the Third party location.

NS DT recommends this operation is to be implemented via Discovery Service, Discover Metadata operation.

How a Link View Service operation works?

How to implement Link View Service operation in a WMS service?
4 Quality of Services

4.1 Performance

For a 470 Kilobytes image (e.g. 800x600 pixels with a colour depth of 8 bits), the response time for sending the initial response to a Get Map Request to a view service shall be maximum 5 seconds in normal situation.

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

4.2 Capacity

The minimum number of served simultaneous service requests to a view service according to the performance quality of service shall be 20 per second.

4.3 Availability

The probability of a Network Service to be available shall be 99% of the time.

As there are 24 hours a day, 7 days a week are worth 168 hours.

There are 4.33 weeks per month (average) which is approximately 727.44 hours per month.

The following table shows the maximum downtime according to the implementing rules:

<table>
<thead>
<tr>
<th>%Uptime</th>
<th>Max. Downtime/week</th>
<th>Max. Downtime/month</th>
<th>Max. Downtime/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>98%</td>
<td>3.4 hours</td>
<td>14.55 hours</td>
<td>7.27 days</td>
</tr>
<tr>
<td>98.6%</td>
<td>2.4 hours</td>
<td>10.19 hours</td>
<td>5.09 days</td>
</tr>
<tr>
<td>99%</td>
<td>1.7 hours</td>
<td>7.27 hours</td>
<td>3.63 days</td>
</tr>
<tr>
<td>99.5%</td>
<td>0.8 hours</td>
<td>3.64 hours</td>
<td>1.82 days</td>
</tr>
<tr>
<td>99.9%</td>
<td>10 minutes</td>
<td>0.73 hours</td>
<td>8.73 hours</td>
</tr>
<tr>
<td>99.99%</td>
<td>1 minute</td>
<td>4 minutes</td>
<td>52 minutes</td>
</tr>
<tr>
<td>99.999%</td>
<td>6 seconds</td>
<td>26 seconds</td>
<td>5 minutes</td>
</tr>
</tbody>
</table>

Table 7 – Downtime per week, month, year

The NS DT recommends to use the year as time frame.
Annex A – INSPIRE Profile of Tiling WMS

This annex is to be considered for future work.

Operating a WMS can be stressing for a MS infrastructure when MS datasets are large and the INSPIRE performances have to be met. A lightweight profile of WMS can be used to lower the initial effort to bring datasets to the network.

Whilst OGC has published a request for comments on its public web site (http://www.opengeospatial.org/standards/requests/54), there is still publicly available standard. It is worth noting that this public request for comments document holds both the GetMap() operation (standard WMS) and GetTile() operation (for tile access).

As a result of FOSS4G 2007 and based on OGC’s WMS 1.1.1, it is possible to use a Tile caching service as defined in http://wiki.osgeo.org/wiki/Tile_Map_Service_Specification or a Cache WMS as defined in http://wiki.osgeo.org/wiki/WMS_Tiling_Client_Recommendation.

The main differences with the ISO 19128:2005(E) are in the GetCapabilities and GetMap operations:

1. The GetMap operation supports a new parameter called TILED whose value is always TRUE;
2. The CRS parameter of GetMap operation is now named SRS, but values for the INSPIRE view service are still relevant. It is worth noting that WMS 1.1.1 allows only EPSG and AUTO namespaces;

It is recommended to use ETRS89 ellipsoidal coordinate reference system when using a tile cache map service: “EPSG:4258”.

The most important point bound to the SRS is the tiling scheme definition (TODO).
Annex B – 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 View Service.

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

```xml
<?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/wms"
xmlns="http://www.w3.org/2001/XMLSchema"
elementFormDefault="qualified"
attributeFormDefault="unqualified">
<xs:import
namespace="http://www.opengis.net/wms"
schemaLocation="http://schemas.opengis.net/wms/">
</xs:import>
<xs:complexType name="ViewCapabilitiesType">
<xs:annotation>
<xs:documentation>Additional capabilities for INSPIRE View 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="ViewCapabilities" type="INSPIRE:ViewCapabilitiesType" substitutionGroup="wms:_ExtendedCapabilities">
<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: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:element>
</xs:complexType>
</xs:element>
</xs:complexType>
</xs:schema>
```
Annex C– Examples of SLD usage

The following XML description is an example of SLD (Styled Layer Descriptor) to define a symbol for a point representing a borehole (FeatureType: BSS_Sondage). Three rules are used to define this symbol according to values of some properties.

```
<StyledLayerDescriptor version="1.1.0" xmlns:ogc="http://www.opengis.net/ogc"
xmlns:xlink="http://www.w3.org/1999/xlink">
  <NamedLayer>
    <Name>BSS_Sondages</Name>
    <UserStyle>
      <FeatureTypeStyle>
        <FeatureTypeName>BSS_Sondage</FeatureTypeName>
        <Rule>
          <ogc:Filter>
            <ogc:PropertyIsGreaterThan>
              <ogc:PropertyName>NB_IMAGES</ogc:PropertyName>
              <ogc:Literal>0</ogc:Literal>
            </ogc:PropertyIsGreaterThan>
          </ogc:Filter>
          <PointSymbolizer>
            <Graphic>
              <ExternalGraphic>
                <OnlineResource xlink:type="simple" xlink:href="http://.../images/bss/bordure.gif"/>
                <Format>image/gif</Format>
              </ExternalGraphic>
              <Size>15</Size>
            </Graphic>
          </PointSymbolizer>
        </Rule>
      </FeatureTypeStyle>
    </UserStyle>
  </NamedLayer>
</StyledLayerDescriptor>
```

Rule #1: If there is more than one image (NB_IMAGES>1) then a border is drawn (border.gif)
Rule #2: If a « COUPE » (borehole description or drawing) is available then the symbol is filled with the « remp.gif » background

```
<Rule>
  <ogc:Filter>
    <ogc:Or>
      <ogc:PropertyIsEqualTo>
        <ogc:PropertyName>COUPE_GEOLOGIQUE</ogc:PropertyName>
        <ogc:Literal>Presente</ogc:Literal>
      </ogc:PropertyIsEqualTo>
      <ogc:PropertyIsEqualTo>
        <ogc:PropertyName>COUPE_SIMPLIFIEE</ogc:PropertyName>
        <ogc:Literal>Presente</ogc:Literal>
      </ogc:PropertyIsEqualTo>
    </ogc:Or>
  </ogc:Filter>
  <PointSymbolizer>
    <Graphic>
      <ExternalGraphic>
        <OnlineResource xlink:type="simple" xlink:href="http://.../images/bss/remp.gif"/>
        <Format>image/gif</Format>
      </ExternalGraphic>
    </Graphic>
  </PointSymbolizer>
</Rule>
```

Rule #3: If the borehole is an « OUVRAGE » then the symbol « croix.gif » is drawn

```
<Rule>
  <ogc:Filter>
    <ogc:PropertyIsEqualTo>
      <ogc:PropertyName>OUVRAGE</ogc:PropertyName>
      <ogc:Literal>OUI</ogc:Literal>
    </ogc:PropertyIsEqualTo>
  </ogc:Filter>
  <PointSymbolizer>
    <Graphic>
      <ExternalGraphic>
        <OnlineResource xlink:type="simple" xlink:href="http://.../images/bss/croix.gif"/>
        <Format>image/gif</Format>
      </ExternalGraphic>
    </Graphic>
  </PointSymbolizer>
</Rule>
```
Annex D – Tests

1 – IGNF tests with Geoserver 1.6.4 (large scale vector database)

The French National Mapping Agency (IGNF) has conducted benchmarks on a multi-scales vector databases. The aim of these benchmarks was to find out the expected architecture for meeting INSPIRE quality of services requirements.

The first benchmark has been made on three (3) instances of Geoserver, running on one 4 dual-core processors, 4Gbytes of RAM server, running under Linux, each instance with 512Mbytes of RAM. The second one was conducted on seven (7) instances of Geoserver, running on two 4 dual-core processors, 4Gbytes of RAM server, running under Linux (3 on one, 4 on the other), each instance with 512Mbytes of RAM.

Both benchmarks used a 1.6.4 release of Geoserver application that exposes a WMS 1.1.1. The Java runtime was a 1.6.0_07 release. It is worth noting that the lastest release of Geoserver is faster than the one used. More benchmarks will be made with this 1.7.x releases.

The vector database was made up by a collection of tables from EuroGlobalMap covering France down to 1meter resolution vector entirely covering France mainland (around 20 millions of objects). The data were stored on postgresQL 8.1 running on a different dedicated server.

There were half a thousand pre-prepared requests randomly played to simulate incoming requests. The target SRS was the same as the source SRS, no coordinate transformation applied during the test.

The benchmarks have been done on different time slices to measure the overall stress of the infrastructure.

The styling was not the INSPIRE default styling, but also not a very complex cartography (rules applied on the values of one property combined with scale rules).

<table>
<thead>
<tr>
<th>Image 800x600 pixels</th>
<th>Performance for full capacities in seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 instances</td>
</tr>
<tr>
<td></td>
<td>GIF</td>
</tr>
<tr>
<td>1/5,000</td>
<td>3.0</td>
</tr>
<tr>
<td>1/10,000</td>
<td>7.5</td>
</tr>
<tr>
<td>1/15,000</td>
<td>12.4</td>
</tr>
<tr>
<td>1/20,000</td>
<td>46.3</td>
</tr>
</tbody>
</table>

Table 8.a- Tests on Geoserver 1.6.4 for roads vector datasets

<table>
<thead>
<tr>
<th>Image 800x600 pixels</th>
<th>Performance for full capacities in seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 instances</td>
</tr>
<tr>
<td></td>
<td>GIF</td>
</tr>
<tr>
<td>1/5,000</td>
<td>1.3</td>
</tr>
<tr>
<td>1/10,000</td>
<td>7.2</td>
</tr>
<tr>
<td>1/15,000</td>
<td>13.9</td>
</tr>
<tr>
<td>1/20,000</td>
<td>21.0</td>
</tr>
</tbody>
</table>

Table 8.b- Tests on Geoserver 1.6.4 for bulding vector datasets
Table 8.c- Tests on Geoserver 1.6.4 for all themes (1 request per theme) vector datasets

<table>
<thead>
<tr>
<th>Image 800x600 pixels</th>
<th>Performance for full capacities in seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 instances</td>
</tr>
<tr>
<td></td>
<td>GIF</td>
</tr>
<tr>
<td>1/5,000</td>
<td>0.6</td>
</tr>
<tr>
<td>1/10,000</td>
<td>6.0</td>
</tr>
<tr>
<td>1/15,000</td>
<td>16.9</td>
</tr>
<tr>
<td>1/20,000</td>
<td>N/A</td>
</tr>
</tbody>
</table>

The test suite used HTTP GET requests, generated by the command line tool “wget”. Logs of the mod_jk apache module used in front of the instances were processed in order to compute meaningful values of performances.

The duration of each test didn’t exceed 10 minutes. Tests on a longer term (up to 2 hours) are currently carried out. They underline the stability of the performance measured on shorter term tests. The performance results exposed here were assessed on a large scale database (1 meter resolution), because we assumed it would be the “bottleneck” in term of scale. One has to be particularly careful on using the right database at the right scale.

Another remark is on the targeted format: GIF images are worst to view than PNG, but the latter seems to be consuming more resources on server side.

The last table shows that when requesting several INSPIRE layers the performances are better due to the fact that the replies come back faster on some layers whilst the capacity remains the same!
Roads at 1:20,000 scale
Annex E – How View services work within INSPIRE

This section describes essential use cases of View Services. These use cases show interactions between providers, users, as well as services. Figure 5 shows the overall system that contains major interactions between the actors. An actor is a person, organization or external system that plays a role in one or more interactions with the system. Four actors are identified:

Publisher: A publisher publishes layers through a View Service. This actor may also be the owner of the resource that is described. It is assumed that the organisation or individual performing the publisher role has the owners permission to publish the metadata. A layer is basic unit of geographic information that may be requested as a map from a server; this set of features makes up a basic unit of geographic information that may be requested as a map.

1. Viewer: This actor asks for layers and uses their visualization;
2. View Service: This is a system that allows the viewing of one or more layers;
3. Administrator: This actor manages the establishment and maintenance of the View Service.

Figure 5: View Services use cases

Within the domain of View Service five use cases are essential: publish, discover, request map, request info on a feature, and manage. The discover use case is not in the View Service scope but in the Discovery Service scope, and it is essential because to view a layer (representing features) it must have been discovered first. The discover use case is described in the Discovery Services chapter (Paragraph 6.3.2.).

Publish use case

A publisher publishes layers and owns the resource. As an alternative, the publisher might be a broker that does not own the resource, but publishes layers on behalf of a publisher. A layer is a well-defined set of INSPIRE features portrayed according to portrayal rules.

Request capabilities use case

A viewer, searches for data, and therefore requests a View service to send him its capabilities on itself and the data it serves.

Request map use case

A viewer, having discovered data that satisfies his or her requirements (through the discover use case) requests those layer(s) to be returned as a map (visualisation, view) of that data within a defined geographic extent.
Figure 6: Request Map result in a client application

Request feature info use case

Once the View Service has sent the map to the client application, a viewer may ask for information on a feature he points out on the map.

Manage use case

An administrator manages the View Service including the data (layers) available from this service.