UK Location Programme

View Service Operational Guide

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DOCUMENT CONTROL

Change Summary

Version	Date	Author/Editor	Change Summary
1.0	January 2012	Tim Martin	First version
2.0	January 2012	Tim Martin	Second version following review across UKLP
2.1	February 2012	Tim Duffy	Clarification of scenario 1 / 2. Updates to examples.
2.2	February 2012	Ian James	Minor corrections and clarifications

References

Ref.	Title/Version/Publication Date/Author
1	INSPIRE Data Themes and Definition http://inspire.jrc.ec.europa.eu/index.cfm/pageid/2/list/7
2	UK INSPIRE Dataset report http://location.defra.gov.uk/wp-content/uploads/2011/09/UK-INSPIRE-Dataset-Report-at-20-Sept-2011-with-cover-sheet.pdf
3	INSPIRE Regulation on Network Services (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2009R0976:20101228:EN:PDF)
4	INSPIRE View Services Technical guidance (http://inspire.jrc.ec.europa.eu/documents/Network_Services/TechnicalGuidance_ViewServices_v3.1.pdf)
5	OGC Web Map Service Specification (http://www.opengeospatial.org/standards/wms)
6	UK Location Programme resources (http://location.defra.gov.uk/resources)
7	Wikipedia Web Map Service (http://en.wikipedia.org/wiki/Web_Map_Service)
8	Guide 4: Discovery and View Services (http://location.defra.gov.uk/wp-content/uploads/2010/06/UKL-Getting-Started-Guide-4-v2-0.pdf)
9	OGC Web Map Service Primer (http://www.gommap.org/gommap/docs/ogc-wms-primer.pdf)
10	Coordinate Reference Systems for UK Location - INSPIRE View Service (http://location.defra.gov.uk/wp-content/uploads/2011/11/Coordinate-Reference-Systems-for-UK-Location-INSPIRE-View-Service-v1.0.pdf)
11	UK Location Glossary (http://location.defra.gov.uk/resources/faq/technical-glossary/)

CONTENTS

1 INTRODUCTION

1.1 Background

The EU INSPIRE Directive was introduced in 2007. Its principal aim is to improve environmental policy making in Europe. Under INSPIRE, Member States must make available in a consistent format spatial datasets within the scope of the Directive, and create services for accessing these datasets. This will enable datasets to be more easily shared and the expectation is that they can be combined to benefit the development and monitoring of environmental policy and practice in all Member States and across the European Union.

1.2 Data Annexes

There are currently 34 INSPIRE data themes. You can find a full list of these and their definition on the INSPIRE website [1]:

Annex I	Annex II	Annex III
1 Coordinate reference systems	1 Elevation	1 Statistical units
2 Geographical grid systems	2 Land cover	2 Buildings
3 Geographical names	3 Orthoimagery	3 Soil
4 Administrative units	4 Geology	4 Land use
5 Addresses		5 Human health and safety
6 Cadastral parcels		6 Utility and governmental services
7 Transport networks		7 Environmental monitoring facilities
8 Hydrography		8 Production and industrial facilities
9 Protected sites		9 Agricultural and aquaculture facilities
		10 Population distribution - demography
		11 Area management/restriction/regulation zones and reporting units
		12 Natural risk zones
		13 Atmospheric conditions
		14 Meteorological geographical features
		15 Oceanographic geographical features
		16 Sea regions
		17 Bio-geographical regions
		18 Habitats and biotopes
		19 Species distribution
		20 Energy Resources
		21 Mineral Resources

UK Location Programme maintains a document on the current status of datasets being published under INSPIRE [2].

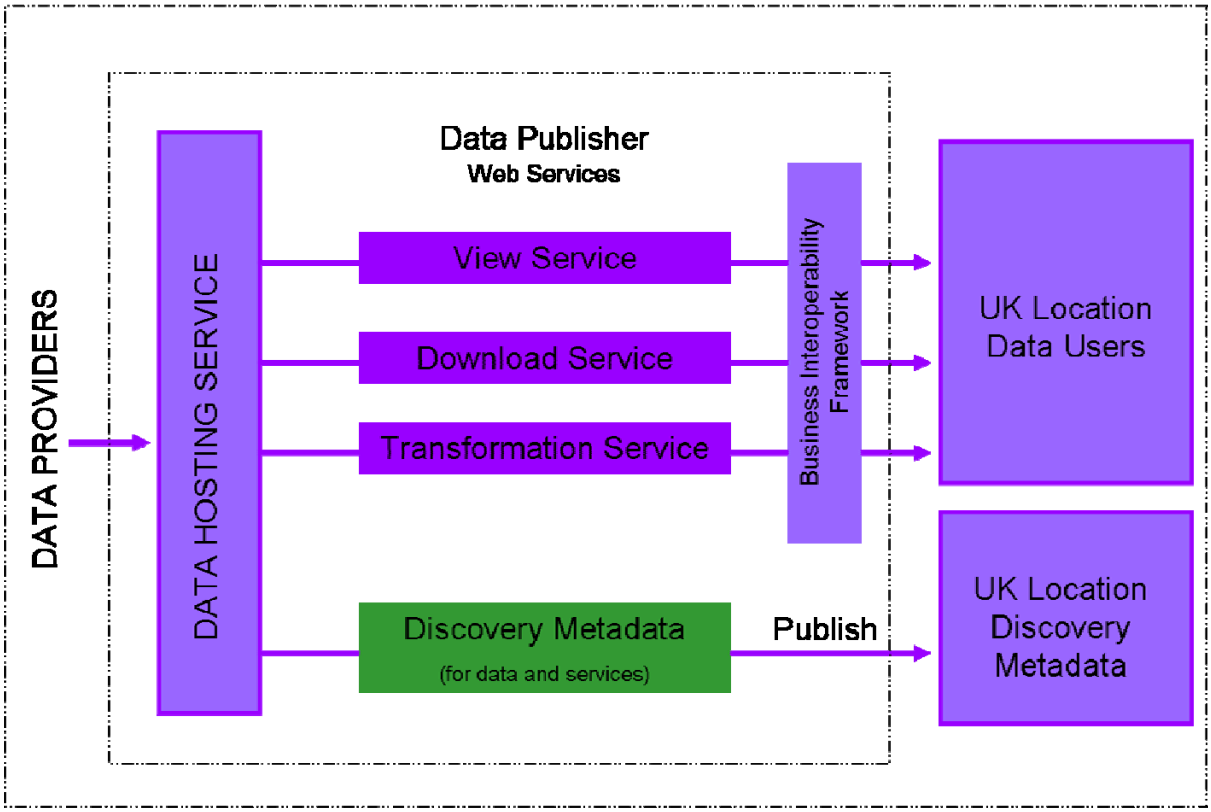
If you are a public authority and you have existing datasets that meet this criteria, then you are obliged to publish these under INSPIRE and must fully comply with the INSPIRE regulations.

1.3 Introduction

This View Service Operational Guide aims to set out the key details for a Data Publisher to understand so that they may operate an INSPIRE compliant View Service. The View Service is fundamental to evaluating and using data being made available by Data Providers.

1.4 Publish View Services

After creating the discovery metadata records for the data you will be publishing, the next step is to create and publish a View Service for those datasets. UK Location View Services must be compliant with the INSPIRE Regulation on Network Services [3] and conformant with the INSPIRE View Services Technical Guide [4]. The diagram below shows where these View Services fit into the big picture of Data Providers and Data Publishers.



1.5 INSPIRE View Services

The INSPIRE Regulation for View Services defines the operations that the service needs to support and the quality of service criteria that it needs to meet. These operations are based on the use of OGC standard for Web Mapping Services [5].

1.6 INSPIRE View Service Operations

There are a number of requirements of the INSPIRE View Service regulation that have a bearing on the complexity of setting up and running a View Service, which you need to factor into your initial plans, including your work and cost estimates. This guide aims to walk through each of these requirements and make it easier for a Data Publisher to understand what is required.

1.7 Target Audience

The primary audience for the Guide are business managers and information officers, located within data provider organisations, and their technical partners.

It is chiefly written for those data providers who have obligations under the INSPIRE Themes, but is also relevant to those who wish to publish location information into UK Location on a voluntary basis.

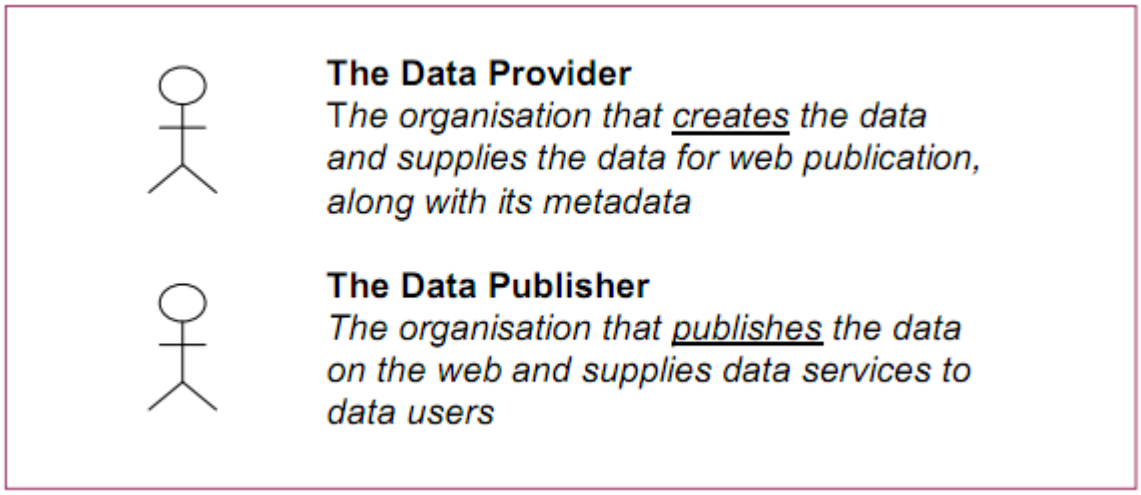
The guide will also be of interest to anyone who requires a general understanding of the UK Location View Services and how it is intended that they operate.

1.8 Assumed Knowledge

The document is set out in such a way that those who know little about View Services and INSPIRE can start from the beginning and over the subsequent chapters learn enough to know how to satisfy their INSPIRE obligations. For more advanced users they can use the specific chapters that they have interest in.

1.9 Do you know your Data Provider from your Data Publisher?

Throughout this guide we refer to “Data Providers” and “Data Publishers”. Within UK Location, the definition and distinction being made between these two roles is very important. So what is the difference?



If you as a Data Provider publish directly, then you will perform both the roles of Data Provider and Data Publisher.

1.10 View Service Resources

The latest versions of all the UK Location resources referred to in this guide can be found via the UK Location Resource Centre [6].

1.11 Status of this document

As it currently stands this document may not provide all the answers to questions which you make have about publishing a View Service. We recognise that, and intend to provide further detail and guidance in later versions. If there is specific information that you would like to see, specific areas where you are looking for guidance, or any other comments or suggestions that you might have about this document and its contents, please contact UK Location at http://location.defra.gov.uk/resources/contact-us/.

1.12 Where to obtain more information

If you would like to contact the UK Location Helpdesk, please use the contact form at: http://location.defra.gov.uk/resources/contact-us/

If you are looking to publish location information specific to Scotland, Wales or Northern Ireland, please contact:

Scotland

Alex Ramage, Transport Scotland of Scottish Government

Email: Alex.Ramage@transportscotland.gsi.gov.uk

Wales

Bill Oates, Head of Geography and Technology, Knowledge & Analytical Services, Welsh Assembly Government

E-mail: Bill.Oates@wales.gsi.gov.uk

Northern Ireland

Email: ProgrammeOffice@dfpni.gov.uk or visit the NI GI Strategy website at www.gistrategyni.gov.uk

2 WHAT ARE WEB SERVICES?

View Services are the name INSPIRE gave to the OGC standard Web Map Service (WMS) and Web Map Tile Services (WMTS).

What is a Web Map Service?

> "A WMS is an OGC standard protocol for serving geo-referenced map images over the internet that are generated by a map server using data from a GIS database"
>
> Wikipedia, 2011 [7].

A WMS essentially provides mapping to a client that requests data for a certain geographical area. Both raster and vector data can be served by a Geographic Server but all WMS Services result in a raster mapping image being delivered to the client.

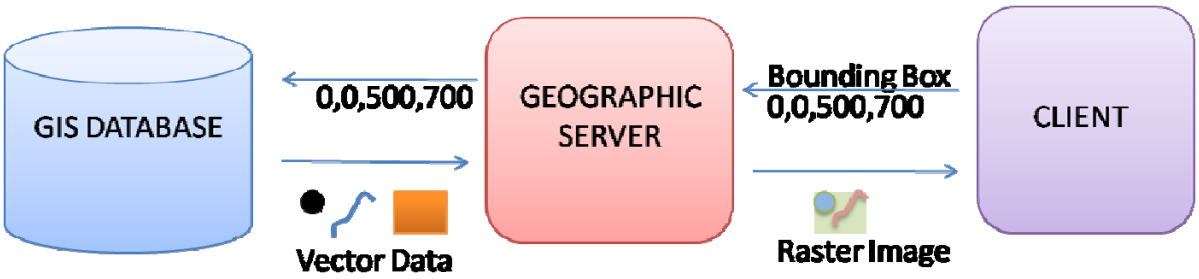


Figure 1: Showing vector data being requested from a client application

As mentioned above there is a standard for Web Map Services [5], which make it significantly easier for clients to request data in the correct manner so that a successful response can happen. There are several requests that can be handled by a Map Server:

- GetCapabilities - this is an explanation of what data sets are available from the geographic server and what services the geographic server can handle, for example WMS.
- GetMap - this is the request the application makes using a set of coordinates. It returns an image of the map based on the information supplied by the client.
- GetFeatureInfo – if the raster image has been created from vector data it is possible to make a GetFeatureInfo request that returns the vector data attribution.
- GetLegendGraphic - a raster image is often comprehended by understanding the way features have been depicted on the map (for example, blue equals water). A Legend can help a user understand what colours have been used for the data. This request will return a graphic legend for the map.

3 TECHNICAL DOCUMENTATION

The latest versions of the technical documentation can be found via the UK Location Resource Centre [6].

With regard to View Services the most important and useful document is the INSPIRE View Services Technical Guidance [4], along with the OGC Web Map Service (WMS) specification [5].

3.1 Overview and Explanation of Documentation

Document	Explanation
INSPIRE View Service Technical Guidance [4]	This document outlines all the necessary requirements for an INSPIRE compliant View Service. It walks through each requirement and gives a standard example that can be used for comparison with your own View Service. A summary of the requirements is included in Annexe 1 of this document.
Guide 4: Discovery and View Services [8]	Introduces the different stages a Data Provider will go through when setting up and publishing View Services. Useful chapters on the considerations before starting.
OGC Web Map Service Primer [9]	This provides a high level overview and links to more detailed information on setting up Web Mapping Servers and distributing data products via WMS.
Coordinate Reference Systems for UK Location - INSPIRE View Service [10]	The purpose of this document is to outline the Coordinate Reference Systems (CRS) and projections recommended for adoption within the official UK Location Information Infrastructure (UKLII) View Service.

4 SIMPLE WMS PROFILE BREAKDOWN

The intention for this chapter is to give the Data Publishers a simple WMS Profile, ie what does your service need to have in the GetCapabilities document to be INSPIRE compliant.

Firstly the service must be WMS 1.3.0 and allow GetCapabilities and GetMap requests.

The table below introduces the elements within a GetCapabilities document and gives an example for each.

The INSPIRE View Service Technical Guidance [4] describes the various GetCapabilities document 'metadata' elements that are required including describing what it calls scenario 1. Scenario 1 is where the ExtendedCapabilities elements: MetadataUrl (pointing to the full GEMINI 2.1 service metadata record) and SupportedLanguages, DefaultLanguage and ResponseLanguage (below) are to be populated with at least one official EU language code e.g. eng for the UK.

[4] also describes a scenario 2 where all the remaining service metadata elements can also be included in the GetCapabilities response document of a service. However this metadata also has to be provided in the GEMINI 2.1 service metadata record published in an INSPIRE Discovery service (as provided by UKLP). Having both versions of this part of the metadata may not be cost effective to create and maintain (to be identical in content), and also introduces the risk of the two versions getting out of step.

The UKLP only requires data providers to follow scenario 1 i.e. point to the already created GEMINI 2.1 service metadata record. Scenario 2 is optional for INSPIRE, is not required by UKLP, and to date even the Member State proposers of scenario 2 are not implementing it.

Element	Purpose	Example
Service (Root layer) level metadata		
<Name>	this must be 'WMS'	<Name>WMS</ Name >
<Title>	A short descriptive element for the benefit of humans. Provides a general short description of the service	Land Cover Map 2000 (1km dominant subclass)

Element	Purpose	Example
<Abstract>	<Abstract> Further describes the service	The 1:625k DiGMap data covering the whole of the United Kingdom is available in this OGC WMS service for all uses - including commercial use subject to the conditions in the Access Constraints section. It is being served as a contribution to the OneGeology initiative(www.onegeology.org). Separate bedrock geology and superficial deposits layers are available in this service. Layers available for bedrock are lithostratigraphy, age, and lithology. Layers available for superficial deposits layer are lithostratigraphy and lithology. A layer is also provided for the UK Continental Shelf BGS 1:1M simplified seabed sediments. For information about more of the British Geological Survey's maps that are available digitally please visit http://www.bgs.ac.uk/products/digitalmaps/digmapgb.html
<KeywordList>	Should contain one INSPIRE keyword and must include a vocabulary reference. You can add any number of other free-text keywords. Keywords that describe the service	<KeywordList> <Keyword vocabulary="GEMET - INSPIRE themes, version 1.0">Geology</Keyword> <Keyword>OneGeology</Keyword> <Keyword>geology</Keyword> <Keyword>map</Keyword> <Keyword>United Kingdom</Keyword> <Keyword>bedrock</Keyword> <Keyword>superficial</Keyword> <Keyword>lithology</Keyword> <Keyword>lithostratigraphy</Keyword> <Keyword>age</Keyword> </KeywordList>
<OnlineResource>	A link to a website where the user can find further information about the service provider	<OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href=" http://www.ordnancesurvey.co.uk/"/>

Element	Purpose	Example
<inspire_vs:ExtendedCapabilities>	This section incorporates specific INSPIRE elements. The following are mandatory • MetadataURL – this will point to the Metadata record for the service. • SupportedLanguage • Response Language Note, the MediaType must match the media type of the metadata resource listed.	<inspire_vs:ExtendedCapabilities> <inspire_common:MetadataUrl xsi:type="inspire_common:resourceLocatorType"> <inspire_common:URL> http://metadata.bgs.ac.uk/geonetwork/srv/en/csw?SERVICE=CSW&REQUEST=GetRecordById&elementSetName=full&OutputSchema=http://www.isotc211.org/2005/gmd&ID=7822e848-822d-45a5-8584-56d352fd2170& </inspire_common:URL> <inspire_common:MediaType> application/xml </inspire_common:MediaType> </inspire_common:MetadataUrl> <inspire_common:SupportedLanguages xsi:type="inspire_common:supportedLanguagesType"> <inspire_common:DefaultLanguage> <inspire_common:Language>eng</inspire_common:Language> </inspire_common:DefaultLanguage> </inspire_common:SupportedLanguages> <inspire_common:ResponseLanguage> <inspire_common:Language>eng</inspire_common:Language> </inspire_common:ResponseLanguage> </inspire_vs:ExtendedCapabilities>
<CRS>	This is the list of projections supported by the service. It is mandatory to support a CRS based on ETRS89 for datasets that cover continental Europe. Commonly this would be: EPSG:4258.	<CRS>EPSG:4326</CRS> <CRS>EPSG:3034</CRS> <CRS>EPSG:4258</CRS> <CRS>EPSG:27700</CRS> <CRS>CRS:84</CRS> <CRS>EPSG:3857</CRS>

Element	Purpose	Example
<EX_GeographicBoundingBox>	The latitude and longitude coordinates for the bounding box that covers the extent of all layers in the service	<EX_GeographicBoundingBox> <westBoundLongitude>-8.7</westBoundLongitude> <eastBoundLongitude>1.8</eastBoundLongitude> <southBoundLatitude>49.8</southBoundLatitude> <northBoundLatitude>60.9</northBoundLatitude> </EX_GeographicBoundingBox>
<BoundingBox>	This includes a BoundingBox for each of the supported projections. That covers the extent of all layers in the service	<BoundingBox CRS="EPSG:4326" minx="49.8" miny="-8.7" maxx="60.9" maxy="1.8"/> <BoundingBox CRS="EPSG:3034" minx="2.59526e+006" miny="2.71364e+006" maxx="3.88832e+006" maxy="3.56384e+006"/> <BoundingBox CRS="EPSG:4258" minx="49.8" miny="-8.7" maxx="60.9" maxy="1.8"/> <BoundingBox CRS="EPSG:27700" minx="-81892.1" miny="-11144.5" maxx="673534" maxy="1.24273e+006"/> <BoundingBox CRS="CRS:84" minx="-8.7" miny="49.8" maxx="1.8" maxy="60.9"/> <BoundingBox CRS="EPSG:3857" minx="-968480" miny="6.41171e+006" maxx="200375" maxy="8.6029e+006"/>

Element	Purpose	Example
<ContactInformation>	The following are mandatory: • ContactOrganization • ContactElectronicMailAddress • ContactPosition ContactPosition should equal 'pointOfContact' Other contact information can be included but is optional	<ContactInformation> <ContactPersonPrimary> <ContactPerson>Keith Westhead</ContactPerson> <ContactOrganization>British Geological Survey </ContactOrganization> </ContactPersonPrimary> <ContactPosition>pointOfContact </ContactPosition> <ContactAddress> <AddressType>postal</AddressType> <Address>Murchison House</Address> <City>Edinburgh</City> <StateOrProvince>West Lothian</StateOrProvince> <PostCode>EH9 3LA</PostCode> <Country>United Kingdom</Country> </ContactAddress> <ContactVoiceTelephone>+44 (0)131 667 1000</ContactVoiceTelephone> <ContactFacsimileTelephone>+44 (0)131 668 2683 </ContactFacsimileTelephone> <ContactElectronicMailAddress>enquiries@bgs.ac.uk </ContactElectronicMailAddress> </ContactInformation>
<Fees>	If any fees are chargeable or other conditions exist for using the service this are put here. If no fees are applicable you should stat this explicitly using the word 'none'.	<Fees>None</Fees>

Element	Purpose	Example
<AccessConstraints>	provides information on limitations on public access. If no limitations exist, use None If there are constraints, the value of AccessContraints MAY be set to one of the following values: • copyright • patent • patentPending • trademark • license • intellectualPropertyRights • restricted • otherRestrictions	The 1:625k DiGMap data is made available for all uses - including commercial use, however the British Geological Survey (BGS) at all times retains the copyright in this material and you are not permitted, without an appropriate licence, to set up a service selling on this material. Your own use of any information provided by the British Geological Survey (BGS) is at your own risk. Neither BGS nor the Natural Environment Research Council (NERC) gives any warranty, condition or representation as to the quality, accuracy or completeness of the information or its suitability for any use or purpose. All implied conditions relating to the quality or suitability of the information, and all liabilities arising from the supply of the information (including any liability arising in negligence) are excluded to the fullest extent permitted by law.

Element	Purpose	Example
Layer level metadata		
<Name>	The computer readable name of the layer	GBR_BGS_625k_BLT
<Title>	A short descriptive element for the benefit of humans. Provides a general short description of the layer	Land Cover Map 2000 (1km dominant subclass)
<Abstract>	<Abstract> Further describes the layer	British Geology 1:625k scale Bedrock Lithology
<KeywordList>	Must contain one INSPIRE keyword and which should include a vocabulary reference. You can add any number of other free-text keywords. Keywords specific to the layer	<KeywordList> <Keyword vocabulary="GEMET - INSPIRE themes, version 1.0">Geology</Keyword> <Keyword>OneGeology</Keyword> <Keyword>map</Keyword> <Keyword>United Kingdom</Keyword> <Keyword>bedrock</Keyword> <Keyword>superficial</Keyword> <Keyword>lithology</Keyword> <Keyword>lithostratigraphy</Keyword> <Keyword>age</Keyword> </KeywordList>
<CRS>	This is the list of projections supported by the layer. It is mandatory to support a CRS based on ETRS89 for datasets that cover continental Europe. Commonly this would be: EPSG:4258.	<CRS>EPSG:4326</CRS> <CRS>EPSG:3034</CRS> <CRS>EPSG:4258</CRS> <CRS>EPSG:27700</CRS> <CRS>CRS:84</CRS> <CRS>EPSG:3857</CRS>

Element	Purpose	Example
<EX_GeographicBoundingBox>	The latitude and longitude coordinates for the bounding box that covers the extent of the layer	<EX_GeographicBoundingBox> <westBoundLongitude>-8.7</westBoundLongitude> <eastBoundLongitude>1.8</eastBoundLongitude> <southBoundLatitude>49.8</southBoundLatitude> <northBoundLatitude>60.9</northBoundLatitude> </EX_GeographicBoundingBox>
<BoundingBox>	This includes a BoundingBox for each of the projections supported by the layer.	<BoundingBox CRS="EPSG:4326" minx="49.8" miny="-8.7" maxx="60.9" maxy="1.8"/> <BoundingBox CRS="EPSG:3034" minx="2.59526e+006" miny="2.71364e+006" maxx="3.88832e+006" maxy="3.56384e+006"/> <BoundingBox CRS="EPSG:4258" minx="49.8" miny="-8.7" maxx="60.9" maxy="1.8"/> <BoundingBox CRS="EPSG:27700" minx="-81892.1" miny="-11144.5" maxx="673534" maxy="1.24273e+006"/> <BoundingBox CRS="CRS:84" minx="-8.7" miny="49.8" maxx="1.8" maxy="60.9"/> <BoundingBox CRS="EPSG:3857" minx="-968480" miny="6.41171e+006" maxx="200375" maxy="8.6029e+006"/>
<MetadataURL>	This is the URL for the metadata record of the layer dataset . This record would have previously been created and stored in a suitable location (more details in the Discovery Metadata Service Guide [REF]). The standard states that the value "ISO 19115:2003" should be used for 'Type'	<MetadataURL type="TC211"> <Format>application/xml</Format> <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink" xlink:type="simple" xlink:href="http://metadata.bgs.ac.uk/geonetwork/srv/en/csw?SERVICE=CSW&REQUEST=GetRecordById&ID=9df8df52-d788-37a8-e044-0003ba9b0d98&elementSetName=full&OutputSchema=http://www.isotc211.org/2005/gmd&"/> </MetadataURL>

Element	Purpose	Example
DataURL	This is a URL to any other resource about the layer data.	<DataURL> <Format> text/html </Format> <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink" xlink:type="simple" xlink:href="http://www.bgs.ac.uk/products/digitalmaps/digmapgb_625.html"/> </DataURL>
<Style>	The default style name Further details on Styling are found in Section 7.	<Style> <Name>default</Name> <Title>The layer</Title> <LegendURL width="243" height="580"> <Format>image/png</Format> <OnlineResource xlink:href=" http://ogc.bgs.ac.uk/BGS_Bedrock_and_Superficial_Geology/ows.php?version=1.3.0&service=WMS&request=GetLegendGraphic&sld_version=1.1.0&layer=GBR_BGS_625k_BLS&format=image/png&STYLE=default " xlink:type="simple" xmlns:xlink="http://www.w3.org/1999/xlink" /> </LegendURL> </Style>

5 COORDINATE REFERENCE SYSTEMS

Coordinate Reference Systems have a significant impact on View Services, they can either enhance your service to a wider audience or use, or have a performance impact that results in your service being unusable.

Geographic Server software generally can support many thousands of different projections, the mandatory CRS for INSPIRE compliant View Services is ETRS89.

Coordinates can be geodetic (lat/long) or projected using one of 3 projections:

- Lambert Azimuthal Equal Area
- Lambert Conformal Conic
- Transverse Mercator.

However, other projections that could be considered to be useful are the following;

- OSGB 1936/National Grid EPSG:27700
- WGS84 EPSG:4326
- CRS:84
- Spherical ‘pseudo’ Mercator EPSG:3857

6 STYLING

Styling your data is an important part of setting up a View Service and there are two benefits for doing it correctly. The first, it makes your data useful and understandable by the end user, the second styling data can have a significant impact on performance of your service.

Styling your data can be accomplished in several ways, within your Map Server software or as an external style sheet. When a user makes a request to your service they can include a specific STYLE if it is available, if it is not it will use the DEFAULT style that you added to the data within your Map Server software.

For example

> http://serveraddress/wms?bbox=-130,24,-66,50&styles=population&Format=image/png&request=GetMap&layers=topp:states&width=550&height=250&srs=EPSG:4326

This would return the data as a WMS using the Default style for Topp:states

> http://serveraddress/wms?bbox=-130,24,-66,50&styles=population&Format=image/png&STYLES=green&request=GetMap&layers=topp:states&width=550&height=250&srs=EPSG:4326

The above request would return a WMS using the stylesheet 'green' that had been attributed to the dataset.

The name give to the STYLE appears in the GetCapabilities document. If you have looked the examples towards the end of the Technical Guidance you will notice that all the STYLE names are <inspire_common:DEFAULT>. This is a placeholder and does not mean that all your STYLEs have to be named like this. In fact some software and operating systems will not allow this name for a file anyway.

The best advice would be to use a common sense name that links to the dataset.

The only time where this is different is when you have a specific INSPIRE dataset where you will need to use the specific dataset name also as the STYLE name.

At present this is not a requirement but will be in later stages of INSPIRE.

7 WEB MAP TILE SERVICE (WMTS)

In later versions of the Technical Guidance an extra section was added on Web Map Tile Services. This essentially means that Data Publishers can use WMTS as their View Service. For those who are new to WMTS please read the next section, What is a WMTS?

7.1 What is a WMTS?

A Web Map Tile Service is now an OGC standard that delivers map tiles in a standard method to a client. It is best seen in the following diagrams.

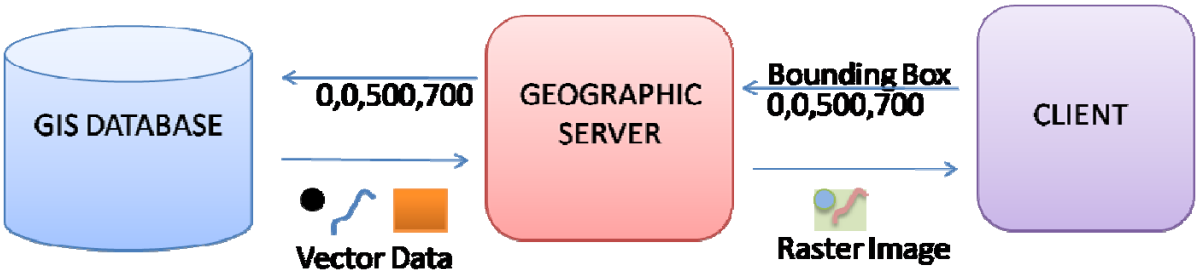


Figure 2: A WMS request

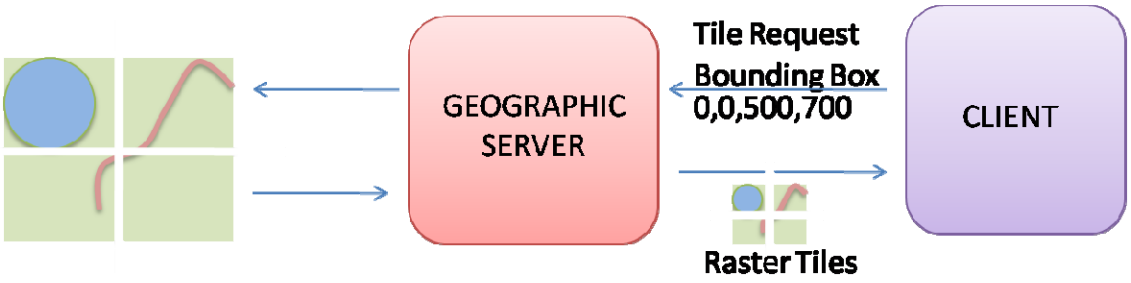


Figure 3: A WMTS Request

As seen from the above picture the client request results in a number of raster tiles being returned that cover the bounding box of interest.

For this to be achieved the tile cache must be created up front, this is often referred to as pre-seeding.

There is an obvious difference between the two requests shown above. The standard WMS request requires data to be pulled out of the database, styled and the sent to the client. Often on high load View Services, this process can take to long. This is where the WMTS comes in. Due to the tiles having been created earlier the Web Map Server only needs to return the pre-seeded tiles. This is significantly faster.

There are two methodologies for using WMTS.

1) Pre-seed the cache – this method requires you to create the cache of tiles in advance and then enables a client application to request complete tiles with no delay of rendering times. This is obviously useful but creating a cache can be time consuming and hardware

expensive. For example to create a tile cache from 1:3 000 000 to 1: 3125 scale with 10 zoom levels and a tile size of 250 pixels by 250 pixels, you are looking at creating approximately 30 million tiles. Not only does this take a considerable time to create there is also a large overhead on management of the tile cache.

2) Seed-on-the-fly – this option does not create the tile cache in advance but populates the tile cache as a client application requests the tiles. The result of this is that the first request for the tiles may be slightly slower (<1-2 seconds) but any subsequent client application requests for that area would request the now created tiles.

Either one of these methods can be used to satisfy the INSPIRE obligations.

8 QUALITY OF SERVICE

Within the Technical Guidance document Section 9 Quality of Services outlines the non-functional requirements of the View Service. This includes

8.1 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.

Evaluation and assessment criteria:

- The response of the service shall be valid according to the source data of the service and to the parameters in the capabilities for the requested area, i.e. min-max scale.
- A blank image is not valid if data is present for the given request parameters (BBOX, scale, etc.)
- The initial response time of 5 seconds refer to first byte returned by the service to the internet.
- A minimum of 90% of the initial services responses have to comply with the mandated 5 seconds response time, thus, a normal situation is identified by the 90% best performing sample reference requests.

8.2 Capacity

Capacity shall be measured consistently based on sample reference request packages to a given service. The amount of request per package shall be 20 per second and shall be issued every second during a measurement timeframe of 1 min. A measurement shall take place at least once before launching the service in a production environment and monitored at regular intervals thereof to ensure that the compliance with the capacity requirement is still ensured.

8.3 Availability

Availability shall be measured consistently based on sample reference requests to a given service. Minimum 10 reference requests per hour shall be issued to the service continuously during its lifetime. The probability of a Network Service to be available shall be 99% of the time.

9 ANNEXES

9.1 Annexe 1: Full outline of INSPIRE View Service WMS requirements

No.	Scenario	Inspire Requirement	Explanation
1		An INSPIRE View Service shall implement the minimal mandatory behaviour from an [ISO 19128] service, extended with the extensions required by the INSPIRE Directive and the Implementing Rules for View services.	You must meet all the mandatory/implementation requirements
2		The use of [ISO 19128] de jure standard as a basis for implementing an INSPIRE View service means that this service shall comply with the “basic WMS” conformance class as defined in this de jure standard.	Comply to 'Basic WMS' as defined in the de jure standard
3		The following ISO 19128 operations shall be implemented for an INSPIRE View service: GetCapabilities; GetMap.	Make sure your service has GetCapabilities and GetMap
4		The metadata response parameters shall be provided through the service Capabilities, as defined in the WMS Standard [ISO 19128, Section 7.2.4]. These capabilities are mandatory and defined when a WMS is set up. They consist of service information, supported operations and parameters values. The extended capabilities section shall be used to fully comply with the INSPIRE View Service metadata requirements (see section 4.2.3.3.1).	Service metadata must contain the following parameters: 1) Service information 2) Supported operations 3) Parameter values
5		The operation for implementing INSPIRE “Get View Service Metadata” operation is the GetCapabilities operation. The parameters defined within the [ISO 19128] standard shall be used to convey relevant information in order to get the expected responses as described in [INS NS, Annex III, Section 2.2] of the Regulation on INSPIRE Network Services.	You must have a GetCapabilities document that contains the relevant information
6		The <inspire_common:MetadataURL> element within the extended INSPIRE capabilities of an [ISO 19128] – WMS 1.3.0 <wms:Capability> element shall be used to reference the INSPIRE service metadata available through an INSPIRE Discovery Service. Mandatory [ISO 19128] – WMS 1.3.0 metadata elements shall be mapped to INSPIRE metadata elements to implement a consistent interface.	<inspire_common:metadataURL> should be used to point to your metadata record about your service which either exists in a CSW or a Web Accessible Folder (WAF)
7		INSPIRE metadata are mapped to WMS capabilities elements to its full extent. It is mandatory to use the mapping provided in this Technical Guideline (described in Section 4.2.3.3.1.1 to 4.2.3.3.1.16. INSPIRE metadata elements that cannot be mapped to available [ISO 19128] – WMS1.3.0 elements are implemented as Extended Capabilities. Metadata are published through a service's capabilities document and can be harvested by an INSPIRE Discovery service.	INSPIRE metadata elements should map to those found within the service GetCapabilities

No.	Scenario	Inspire Requirement	Explanation
8		Regardless of the scenario chosen to be implemented, a language section shall be added in the extended capability of the service to fulfil the language requirements of the Network Services Regulation	You must pick a language for your service.
9		Regardless of the scenario chosen to be implemented View Service Metadata shall be published in an INSPIRE Discovery Service. This is required to support a) the INSPIRE View Link service operation and b) discovery of View services by client applications such as the INSPIRE geoportal	States that metadata should be published in accordance with the INSPIRE Discovery Service.
10		An INSPIRE View service shall contain the INSPIRE metadata elements set out in the Metadata Regulation [INS MD] as shown in Table 3.	Look at Table 3 on page 21 of the Technical Guidance and make sure all the required metadata elements are populated.
11	2	Within the scope defined by the INSPIRE directive the value of the Resource Type shall be fixed to ‘service’ for spatial data services. As the Resource Type is not supported by [ISO 19128] – WMS 1.3.0, an extension shall be used to map this to an <inspire_common:ResourceType> element within an <inspire_vs:ExtendedCapabilities> element.	Resource type should be in <inspire_vs:ExtendedCapabilities> and the attribute should be 'service'
12	2	An extension shall be used to map Resource Locator to an <inspire_common:ResourceLocator> element within an <inspire_vs:ExtendedCapabilities> element.	Resource Locator should be placed within <inspire_vs:ExtendedCapabilities>
13		Coupled Resource shall be mapped to the <MetadataURL> elements of the Layer elements of the service capabilities. If linkage to the data sets or series on which the service operates are available, then the linkage to these resources shall be provided as stated by the INSPIRE Metadata Technical Guidance	MetadataURL must be used to map to metadata record for the datasets
14		Each of the <MetadataURL> elements shall be populated with a URL that allows access to an unambiguous metadata record. The URL shall be either an HTTP/GET call on the GetRecordById operation of the Discovery Service or a direct link to the ISO 19139 metadata document.	MetadataURL must be used to map to metadata record for the datasets
15	2	For the Spatial Data Service Type as defined by the INSPIRE Metadata Regulation [INS MD] (‘view’) an extension shall be used to map this to an <inspire_common:SpatialDataServiceType> element within an <inspire_vs:ExtendedCapabilities> element. For an INSPIRE View Service the Spatial Data Service Type shall have a fixed value “view” according to INSPIRE Metadata Regulation [INS MD Part 3].	Must specify a <inspire_common:SpatialDataServiceType> element and should have an attribute of 'view'
16	2	The INSPIRE Metadata Regulation [INS MD] mandates that in the case of spatial data services at least one keyword from the "Classification of Spatial data Services" (Part D.4 from INS MD] shall be provided.	A keyword from the Classification Spatial Data services should be provided

No.	Scenario	Inspire Requirement	Explanation
17		If additional keywords are provided they shall be mapped with the <wms:KeywordList> element, the individual keywords shall be mapped to the <wms:Keyword> element, the referenced vocabulary shall be mapped to the 'vocabulary' attribute of the <wms:Keyword> element.	Extra keywords can be added to the Keyword list
18	2	The keywords shall be mapped to the capabilities extension <inspire_common:Keyword> and <inspire_common:MandatoryKeyword> within an <inspire_vs:ExtendedCapabilities> element.	Keywords that appear in wms:Keyword must also appear in <inspire_common:Keyword> and <inspire_common:MandatoryKeyword> within an <inspire_vs:ExtendedCapabilities> element
19		Geographic Bounding Box shall be mapped to the EX_GeographicBoundingBox element of Layer elements.	
20	2	To be compliant with the INSPIRE Metadata Regulation [INS MD] and with [ISO 19115] one of following dates shall be used: date of publication, date of last revision, or the date of creation. Date of last revision is preferred. The date shall be expressed in conformity with the [INS MD]	
21	2	As the Temporal Reference is not directly supported by [ISO 19128] – WMS 1.3.0 an extension shall be used to map this to an <inspire_common:TemporalReference> element within an <inspire_vs:ExtendedCapabilities> element.	an <inspire_common:TemporalReference> element within an <inspire_vs:ExtendedCapabilities> element should be provided
22	2	The INSPIRE Metadata Regulation [INS MD] requires that metadata shall include information on the degree of conformity with the implementing rules provided in Art. 7.1 (Interoperability of spatial data sets and services) of the INSPIRE Directive [Directive 2007/2/EC].	
23	2	An extension shall be used to map this to an <inspire_common:Conformity> element within an <inspire_vs:ExtendedCapabilities> element.	
24		This metadata element shall be mapped to the <wms:Fees> element of the capabilities. If no conditions apply to the access and use of the resource, "no conditions apply" shall be used. If conditions are unknown "conditions unknown" shall be used.	

No.	Scenario	Inspire Requirement	Explanation
25		Responsible Party as described in the INSPIRE Metadata Regulation [INS MD] shall be mapped to the <wms:ContactOrganization> element of the <wms:ContactPersonPrimary> within the <wms:ContactInformation> element.	
26		The value domain of the Responsible Party role shall comply with the INSPIRE Metadata Regulation [INS MD, Part D6]. The Responsible Party Role shall be mapped to the <wms:ContactPosition> of the <wms:ContactInformation> element.	
27		INSPIRE is more demanding than [ISO 19115] by mandating both the name of the organisation, and a contact e-mail address. The role of the responsible party serving as a metadata point of contact is out of scope of the Metadata Regulation [INS MD], but this property is mandated by [ISO 19115]. Its value shall be defaulted to “pointOfContact”.	
28	2	Since only one <wms:ContactInformation> element is allowed in [ISO 19128] – WMS 1.3.0 (to which Responsible Organisation is mapped), an extension shall be used to map this to an <inspire_common:MetadataPointOfContact> element within an <inspire_vs:ExtendedCapabilities> element.	
29	2	As the Metadata Date is not supported by [ISO 19128] – WMS 1.3.0, an extension shall be used to map this to an <inspire_common:MetadataDate> element within an <inspire_vs:ExtendedCapabilities> element. The date shall be expressed in conformity with the [INS MD].	
30		GetCapabilities operation metadata shall be mapped to the <wms:GetCapabilities> element.	
31		GetMap operation metadata shall be mapped to the <wms:GetMap> element. Either PNG or GIF format (without LZW compression) with transparency shall be supported by the View service [INS NS, Annex III, Part B].	
32		The description of a layer shall use elements defined for the service capabilities in the [ISO 19128] standard. This description shall specify the role of some parameters for the INSPIRE View Service as stated in the Regulation on INSPIRE Network Services [INS NS].	A layer should have the elements required for the ISO19128 standard
33		It is mapped with <wms:Title>. The harmonised title of a layer for an INSPIRE spatial data theme is defined by [INS DS] and shall be subject to multilingualism (translations shall appear in each mono-lingual capabilities localised documents).	
34		Text describing the layer. Subject to multilingualism. It shall be mapped with the <wms:Abstract> element.	
35		It shall be mapped to the <wms:KeywordList> element.	Additional keywords should go into the keyword list

No.	Scenario	Inspire Requirement	Explanation
36		This Layer metadata element shall be mapped to the <wms:BoundingBox> element. The minimum bounding rectangle of the area covered by the Layer in all supported CRS shall be given.	
37		The [INS MD] Regulation defines a Unique Resource Identifier as a value uniquely identifying an object within a namespace. The code property shall be specified at a minimum, and a codeSpace (namespace) property may be provided.	
38		To be able to map the concept of a responsible body/codeSpace and local identifier/code to [ISO 19128]), AuthorityURL and Identifier elements shall be used. The authority name and explanatory URL shall be defined in a separate AuthorityURL element, which may be defined once and inherited by subsidiary layers. Identifiers themselves are not inherited.	
39		Name shall be mapped with the <wms:Name> element. The harmonised name of a layer shall comply with the Layer requirements of the [INS DS, Article 14]	
40		It is mandatory to use geographical coordinate system based on ETRS89 in continental Europe and ITRS outside continental Europe.	
41		A Style shall be composed of a Title and a Unique Identifier.	Style is mapped to <wms:Style> and should have a title <wms:Title> and a unique identifier <wms:Name>
42		An <inspire_common:DEFAULT> style for each theme shall be as defined in the "Portrayal" section of the [INS DS, Article 14].	An inspire_common:DEFAULT style is defined in the Potrayal section of the guidelines
43		For layers with no associated default style, the INSPIRE Generic Conceptual Model [INS GCM] defines simple styles shall be used in data portrayal, derived from Symbology Encoding Implementation Specification [OGC SEIS]: Point: grey square, 6 pixels; Curve: black solid line, 1 pixel; Surface: black solid line, 1 pixel, grey fill.	If publisher does not have their own style sheet then the default should be used
44		If no style is specified in the request or the style parameter is empty, the <inspire_common:DEFAULT> style shall be used in layer rendering.	
45		A legend shall be provided for each style and supported language defined in the View Service.	
46		Style shall be mapped to the <wms:Style> element. The human readable name shall be mapped to the <wms:Title> element and the Unique Identifier shall be mapped to the <wms:Name> element.	

No.	Scenario	Inspire Requirement	Explanation
47		As the capabilities document is a mono-lingual document, internationalized legend may be placed in a different capabilities document for each value of the LANGUAGE parameter. It shall be mapped with the <wms:LegendURL> element.	If a different language is used a different legend can be used and specified using <wms:LegendURL>
48		In other cases such as time and elevation, <wms:Dimension> shall be used according to [INS NS].	
49		A containing Category Layer itself includes a Name by which a map portraying all of the nested layers can be requested at once. If a metadata description of this category composition exists then the MetadataURL for the Category Layer shall be provided.	Can use layer groups but the MetadataURL must point to a metadata record for the group.
50		The mandatory VERSION parameter. The value "1.3.0" shall be used for GetMap requests that comply with the [ISO 19128] standard.	
51		The mandatory REQUEST parameter is defined in [ISO 19128, Section 6.9.2]. To invoke the GetMap operation, the value "GetMap" shall be used to comply with the [ISO 19128] standard.	
52		The mandatory LAYERS parameter lists the map layer(s) to be returned by this GetMap request. The value of the LAYERS parameter shall be a comma-separated list of one or more valid INSPIRE harmonized layer names.	
53		The mandatory STYLES parameter lists the style in which each layer is to be rendered. The value of the STYLES parameter shall be 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=").	
54		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, Coordinate Reference System.	
55		The mandatory BBOX parameter allows a Client to request a particular Bounding Box. The value of the BBOX parameter in a GetMap request shall be 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 shall be as defined by the Layer CRS. The four bounding box values indicate the outside limits of the region.	
56		The mandatory WIDTH and HEIGHT parameters specify the size in integer pixels of the map to be produced.	

No.	Scenario	Inspire Requirement	Explanation
57		The mandatory FORMAT parameter states the desired format of the map. The [INS NS, 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.	
58		The optional TRANSPARENT parameter specifies whether the map background is to be made transparent or not. The service is required to implement this.	
59		The default value shall be "XML" if this parameter is absent from the request. Other valid values are INIMAGE and BLANK.	
60		As stated in INS NS, the Link View Service 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. Furthermore, the Link View Service parameter shall provide all information about the Public Authority’s or Third Party’s View Service compliant with this regulation, enabling the Member State View Service to get a map from the Public Authority’s or Third Party’s View Service and to collate it with other maps.	Link View parameter shall provide information about the Public Authority's View Service
61		This operation shall be implemented with the Discover Metadata operation of the Discovery Service.	
62		In the case where it is more preferable to collate maps in a View Service (for example: the Member State View Service collates maps that are served locally with maps that are served remote by a Third Party), the Member State’s View Service shall include the service’s layer metadata in his own service metadata (capabilities document).	
63		The “cascaded” attribute of the <wms:Layer> element shall be used to indicate that the layer is hosted by a remote View Service.	
64		Every time a map from a View Service is cascaded through another View Service the value of the “cascaded” attribute shall be incremented by 1. The actual collation of maps is out-of-scope for this Technical Guideline.	
65		To support collation with other maps for both supported image formats (GIF and PNG), the transparency parameter (TRANSPARENT) of the WMS GetMap request shall be set to “true” and the background parameter (BGCOLOR) for all layers shall be set to the same colour.	
66		A network service metadata response shall contain a list of the natural languages supported by the service. This list shall contain one or more languages that are supported.	

No.	Scenario	Inspire Requirement	Explanation
67		A client may specify a specific language in a request. If the requested language is contained in the list of supported languages, the natural language fields of the service response shall be in the requested language. It the requested language is not supported by the service, then this parameter shall be ignored.	
68		The name of this parameter shall be “LANGUAGE”. The parameter values are based on ISO 639-2/B alpha 3 codes as used in [INS MDTG].	Use correct language code from list in Table 9 page 53
69		If a client request specifies an unsupported language, or the parameter is absent in the request, the above fields shall be provided in the service default language.	
70		The Extended Capabilities shall indicate the response language used for the GetCapabilities-Response: Depending on the requested language the value of the <inspire_common:ResponseLanguage> corresponds to the current used language. If a supported language was requested, <inspire_common:ResponseLanguage> shall correspond to that requested language. If an unsupported language was requested or if no specific language was requested <inspire_common:ResponseLanguage> shall correspond to the service default language <inspire_common:DefaultLanguage>	
71		The Extended Capabilities shall contain the list of supported languages indicated in <inspire_common:SupportedLanguages>. This list of supported languages shall consist of 1. exact one element <inspire_common:DefaultLanguage> indicating the service default language, and 2. zero or more elements <inspire_common:SupportedLanguage> to indicate all additional supported languages. Regardless of the response language, the list of supported languages is invariant for each GetCapabilities-Response.	
72		The Extended Capabilities shall use the XML Schema as defined in the INSPIRE online schema repository.	
73		If any portrayal rules require language support for rendered text - e.g. by further amendments for Annex II or Annex III - INSPIRE View Services shall implement the common concept as stated in Section 4.3.2.	

9.2 Annexe 2: Full outline of INSPIRE View Service WMTS requirements

No.	INSPIRE Requirement	Explanation
74	An INSPIRE View Service shall implement the mandatory behaviour from an **[OGC 07-057r7]** service, extended with the extensions required by the INSPIRE Directive and the Implementing Rules for View Services.	
75	The following **[OGC 07-057r7]** operations shall be implemented for an INSPIRE View service: GetCapabilities; GetTile.	
76	The Link View Service operation shall be handled by the INSPIRE Discovery Service [**INS DSTG**].	
77	Common request parameters for the View Service operations: **SERVICE** The SERVICE parameter is the service type identifier. The value shall be "WMTS". **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 Tile Service. **LANGUAGE** See Section 0 Language Requirements (INSPIRE extension)	
78	The following metadata response parameters shall be contained in a Get View Service Metadata response: - View Service Metadata; - Operations Metadata; - Layers Metadata; - Languages. Most of the necessary metadata can be provided through the service Capabilities, as defined in the WMTS Standard [**OGC 07-057r7**, Section 7.1.1]. These capabilities are mandatory and defined when a WMTS is set up. They consist of server's information, supported operations and parameters values.	

No.	INSPIRE Requirement	Explanation
79	Layers shall provide a link to the metadata description of the spatial dataset using the “ows:Metadata” element as part of the layer metadata. This element shall be populated with a URL that allows access to an unambiguous metadata record. The URL may be either: A HTTP/GET call on the GetRecordById operation of the Discovery Service using the identifier of the metadata document; or a direct link to the metadata document.	
80	The third mandatory operation “Link View Service”, which 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, shall be implemented through the “Discover Metadata” operation of the Discovery Service which allows for View service metadata to be retrieved.	
81	GetCapabilities operation metadata shall be mapped to the <ows:Operation name="GetCapabilities"> element.	
82	GetTile operation metadata shall be mapped to the <ows:Operation name="GetTile"> element. Either PNG or GIF format (without LZW compression) shall be supported by the View service [**INS NS**, Annex III, Part B].	
83	The use of the “Discover Metadata” operation of the INSPIRE Discovery service is recommended for implementing the Link View Service operation.	
84	The description of a layer shall use elements defined for the service capabilities in the [**OGC 07-057r7**] standard. This description shall specify the role of some parameters for the INSPIRE View Service as stated in the Regulation on INSPIRE Network Services [**INS NS**]:	

No.	INSPIRE Requirement	Explanation
85	The Resource title of the layer, used for human communication, for example presentation of the layer in a menu. It is mapped with <ows:Title>. The harmonised title of a layer for an INSPIRE spatial data theme is defined by [**Directive 2007/2/EC**] and shall be subject to multilingualism (translations shall appear in each mono-lingual capabilities localized documents).	
86	Layer abstract: text describing the layer. Subject to multilingualism. It shall be mapped with the <ows:Abstract> element.	
87	Additional Keywords: list of keywords describing the layer, to support catalogue search (to be harmonised the INSPIRE metadata element Keyword Value, see [**INS DSTG,** Section 3.2.3] It shall be mapped to the <ows:Keywords> element.	
88	Geographic Bounding Box element is used to facilitate geographic searches. It shall be mapped to the <ows:WGS84BoundingBox> element. The minimum bounding rectangle in decimal degrees of the area covered by the Layer shall be supplied regardless of what CRS the tileMatrixSet may define and shall use WGS:84 as Coordinate Reference System.	
89	It is mandatory to use geographical coordinate system based on ETRS89 in continental Europe and ITRS outside continental Europe.	
90	Style shall be mapped to the <Style> element. The human readable name shall be mapped to the <ows:Title> element and the Unique Identifier shall be mapped to the <ows:Identifier> element.	
91	As the capabilities document is a mono-lingual document, internationalized legend may be placed in different capabilities document for each value of the LANGUAGE parameter. It shall be mapped with the <ows:LegendURL> element.	
92	Table 15 shows INSPIRE parameters that shall be used within the WMTS GetTile operation according to the [**INS NS**]:	