UK Location Programme
Download Service Operational Guide v1.1

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Document Control

Change Summary

Version	Date	Author/Editor	Change Summary
0.1	October 2012	Dominic Lowe / Ian James	Initial draft release for review
0.2	November 2012	Dominic Lowe / Ian James	Draft WFS section added for review
0.3	December 2012	Dominic Lowe / Ian James	Added Quality of Service chapter. Addressed review comments throughout.
0.4	December 2012	Dominic Lowe / Ian James	General editorial review. Clarifications following review meeting.
1.0	January 2013	Dominic Lowe / Ian James	Final text for publication
1.1	December 2015	Tim Duffy/ James Passmore	Improvements to some details and links and reference to Web Coverage Service guidance and software.

References

Ref.	Title/Version/Publication Date/Author
1	UK Location, "Getting Started" Guides, http://location.defra.gov.uk/resources/getting-started/
2	INSPIRE Network Services Architecture, http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/network/D3_5_INSPIRE_NS_Architecture_v3-0.pdf
3	UK Location Data Sharing Operational Guidance, http://location.defra.gov.uk/resources/data-sharing-operational-guidance/
4	UK Location Discovery Metadata Service Operational Guidance, http://data.gov.uk/sites/default/files/DMS%20Operational%20Guide%20v2.1.pdf
5	Discovery Metadata Service Collection Interface Specification, http://location.defra.gov.uk/wp-content/uploads/2010/10/DMS-Collection-Interface-Specification-20110204-v0-4.pdf
6	Technical Guidance for the implementation of INSPIRE Download Services v3.0 http://inspire.jrc.ec.europa.eu/documents/Network_Services/Technical_Guidance_Download_Services_3.0.pdf
7	The Atom Syndication Format http://tools.ietf.org/html/rfc4287
8	OpenSearch Specification 1.1 http://www.opensearch.org/Specifications/OpenSearch/1.1
9	GeoRSS Simple http://georss.org/simple

Ref.	Title/Version/Publication Date/Author
10	ISO 19142:2010 Geographic Information -- Web Feature Service http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=42136
11	ISO 19143:2010 Geographic Information -- Filter Encoding http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=42137
12	UKLP Coordinate Reference System – Technical Policy: Coordinate Reference Systems for UK Location - INSPIRE View Service V1.0 http://location.defra.gov.uk/2011/11/uk-location-coordinate-reference-system-technical-policy/
13	INSPIRE spatial datasets and services Regulation, COMMISSION REGULATION (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial datasets and services http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:323:0011:0102:EN:PDF
14	EC, "Commission Regulation (EC) No. 1205/2008 of 3 December 2008 Implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata", December 2008 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008R1205:EN:NOT

Glossary

Term	Definition
Data Provider	The organisation that creates the data and supplies the data for web publication, along with its metadata. For INSPIRE data, the Public Authority with the statutory obligation under the INSPIRE regulations.
Data Publisher	The organisation that publishes the data on the web and supplies data services to data users
Discovery Metadata	Information about a data or service resource, used to discover and access its suitability for sharing or re-use.
DMS	Discovery Metadata Service. One of a number of business services associated with the UK Location Information Infrastructure.
Media Type	Internet Media Type. An identifier for file formats on the internet. Formerly known, and still commonly referred to, as 'MIME type'.
OGC	Open Geospatial Consortium. An industry consortium of companies, government agencies and universities developing publicly available interface standards to geo-enable the Web, wireless, location-based services, and mainstream IT. http://www.opengeospatial.org/
UK Location Information Infrastructure (UKLII)	The UK Location Information Infrastructure. Infrastructure for the publication of Location Information as part of the implementation of the UK Location Strategy. Incorporates the UK member state implementation of INSPIRE.
UK Location Programme (UKLP)	The UK Location Programme. The programme responsible for delivering the UK Location Information Infrastructure.
UK Location Coordination Unit	Legal entity for the day-to-day coordination and management of the UK Location Information Infrastructure and the UK member state element of INSPIRE.

Contents

1 Introduction

1.1 UK Location Strategy

The UK Location Strategy was launched in 2008[1]. It aims to maximise exploitation and benefit to the public, the government and to UK Industry from geographic information and to provide a framework to assist European, national, regional and local initiatives. The Strategy creates an infrastructure for location information to assist policy, service delivery and operational decision-making.

The strategy was introduced following the recognition that:

- too few government-owned datasets which incorporate location information can be easily assembled and analysed with reliability;
- there is too much duplication;
- too little re-use;
- and too few linkages across the datasets required to support policy development and implementation.

The UK Location Strategy includes, but is not limited to, implementation of the EU INSPIRE Directive.

1.2 GI Strategies for Devolved Administrations

Each of the Devolved Administrations has their own local GI Strategy – One Scotland, One Geography[2], The Northern Ireland GI Strategy 2009-19[3] and Location Wales[4]. The aims of each of these broadly align to the UK Location Strategy, however each Devolved Administration is working closely with their local public sector organisations in order to meet both the EU INSPIRE Directive and wider GI demands.

All Devolved Administration data providers and publishers are therefore encouraged to contact their Devolved contact listed under Section 1.9 to discuss the alignment of local, national and UK-wide initiatives.

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[1] 'Place Matters: the Location Strategy for the United Kingdom', November 2008

[2] ONE SCOTLAND – ONE GEOGRAPHY; A GEOGRAPHIC INFORMATION STRATEGY FOR SCOTLAND, November 2005

[3] Northern Ireland Geographic Information Strategy 2009-2019 "Effectively using information on location", 2009

[4] Location Wales Geographic Information for Wales – Opportunities and challenges, 2009

1.3 INSPIRE

The EU INSPIRE Directive[5] 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.

The Directive was implemented through the INSPIRE Regulations which cover England, Wales and Northern Ireland[6]. Separate Regulations cover Scotland[7]. In the context of this guidance, reference to the INSPIRE Regulations should be taken to include both sets of Regulations unless otherwise specified.

1.4 INSPIRE principles

The INSPIRE principles are:

- Data should be collected only once, and kept where it can be maintained most effectively.
- It should be possible to combine spatial information from different sources seamlessly and to share it across Europe with many users and applications.
- It should be possible for information collected at one level to be shared easily with all levels.
- Geographic information needed for good governance at all levels should be readily and transparently available.

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[5] EC 2007/02

[6] UK Statutory Instrument 2009 No 3157:
http://www.legislation.gov.uk/uksi/2009/3157/contents/made

and UK Amendment Regulation:

http://www.legislation.gov.uk/uksi/2012/1672/contents/made

[7] Scottish Statutory Instrument 2009 No 40:
http://www.legislation.gov.uk/ssi/2009/440/contents/made

and Scotland Amendment Regulation:

http://www.legislation.gov.uk/ssi/2012/284/contents/made

- It should be easy to find what geographic information is available, how it may be used to meet a particular need and the conditions under which it may be acquired and used.

UK Location makes it possible to publish metadata (a 'label' which describes a dataset) into one central location which is accessible by all.

Under the INSPIRE Regulations, public authorities and third parties which publish INSPIRE datasets must establish and operate a range of services, collectively described as 'Network Services'. In addition, public authorities are required to take specific action to enable data and service sharing between public authorities (and with bodies of the EU).

1.5 UKLII and INSPIRE

The UK Location Information Infrastructure (UKLII) is the framework of standards, policies, ways of working, products and services that enable the strategic objectives of the UK Location Strategy to be fulfilled. The UKLII, being implemented by UK Location Programme (UKLP), fully supports the implementation of INSPIRE within the UK.

Whilst implementation of INSPIRE within the UK is being managed through the UKLP, the scope of UK Location, and the UKLII, both in terms of the data it publishes, and the mechanisms it uses to publish, is broader than just INSPIRE.

The scope of this Guide is thus also broader than INSPIRE and covers any Download Service implemented in support of the UK Location Strategy. Therefore this guide is intended to provide guidance to all data publishers, for all datasets (not just those within scope of INSPIRE) that are published as part of the UK Location Strategy.

1.6 Audience

The primary audience for this guide consists of business managers and information officers, located within data provider organisations and their technical partners.

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

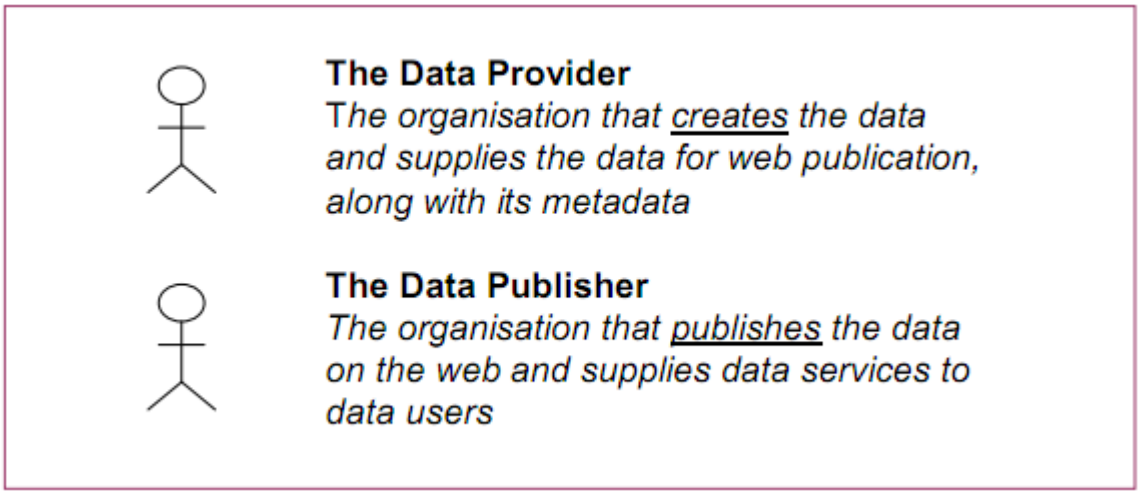
1.7 Assumed Knowledge

This is designed to enable those with very little knowledge of Download Services, and as such, provides an introduction to Network Services in general, and Download Services in particular. Those with a good knowledge of these topics may wish to skip these sections.

This guide also assumes that the reader has read the UK Location “Getting Started' series of guides [1].

1.8 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.

1.9 Where to Obtain More Information

The latest information, and additional resources, can be obtained by visiting the UK Location web site.

If you would like to contact the UK Location Coordination Unit, 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, Head of MIS, Transport Scotland

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: SpatialNI@dfpni.gov.uk or visit the NI GI Strategy website at www.gistrategyni.gov.uk/spatialni

1.10 Caveat

This guidance document is based upon version 3.0 of the INSPIRE Technical Guidance for Download Services. At the time of writing a new version of the Technical Guidance is anticipated which will contain additional guidelines on Quality of Service and also some corrections to the existing guidance.

This document therefore may be subject to change as new guidance is published by the EC.

2 AN INTRODUCTION TO UKLII NETWORK SERVICES

2.1 Network Services and UKLII

Within its technical infrastructure, UK Location and INSPIRE are implementing:

- Standard data specifications, to enable interoperability
- Standard network services, to allow access to that data
- Standard metadata, to allow data and services to be discoverable

In UK Location and INSPIRE terms, Network Services are a set of online services which provide access to datasets and metadata, and enable pre-defined operations to be carried out on that data.

Key characteristics of these services are that they are:

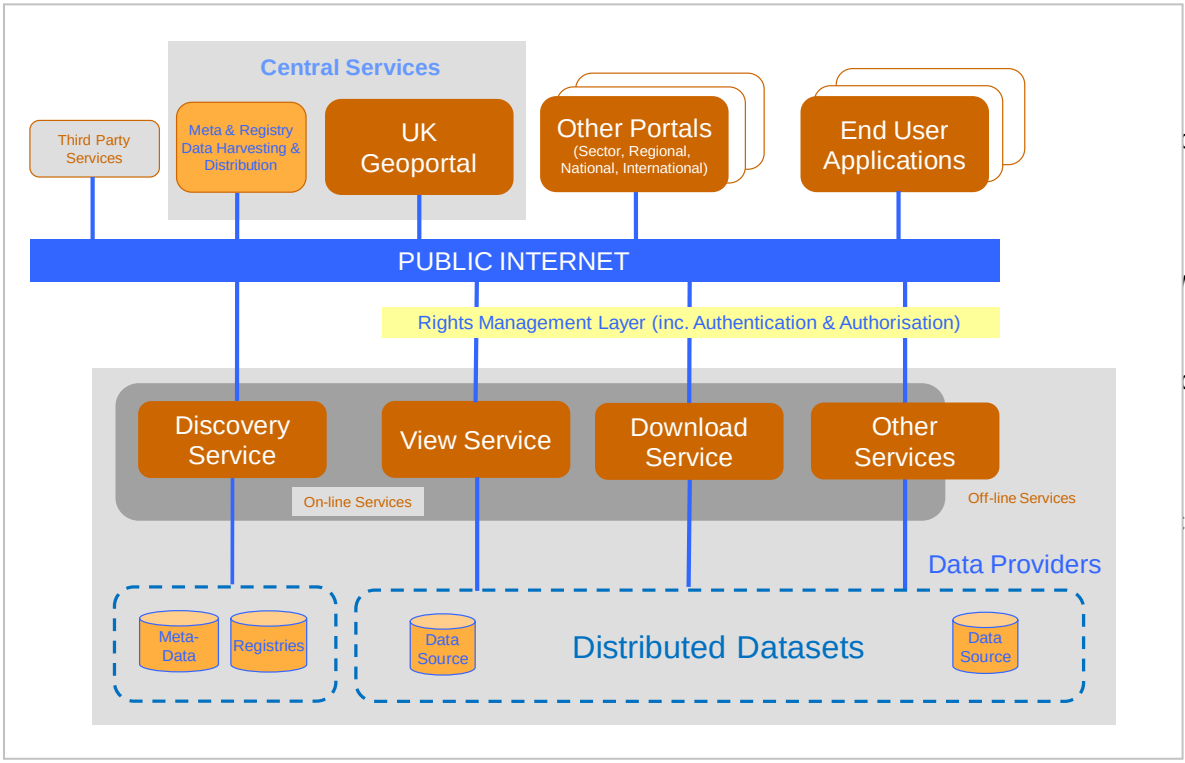
- **Online**. These services are published on the internet, and can be accessed by a suitably authorised application over the internet.
- **Interfaces**. Network services are not online applications. Rather they present a standardised interface that allows applications to request information from them, and have that information returned in a predictable way.
- **Standards-based**. All UK Location network service interfaces are based on existing standards, mostly those defined by the Open Geospatial Consortium (OGC) and ISO TC211. This maximises the opportunities to consume the service, and ensures interoperability of services.
- **Self-describing**. The services are implemented in such a way that the capabilities of the service (i.e. the functions that it supports) are advertised and can be discovered by a potential user.
- **Data access.** The services are all designed to provide access to location data, or data that describes location data (metadata), and support a specific set of actions associated with that data.

2.2 Types of Network Service

Within UKLII, based on the INSPIRE network services architecture [2], five different types of network service are supported.

- **Discovery Services.** These services enable users to search and retrieve location-based metadata, which is used to describe spatial datasets and services.
- **View Services.** These services provide a viewable image of a spatial dataset (or part thereof), enabling applications to display the contents of a dataset within an application.
- **Download Services.** These services enable users to access and download copies of a spatial dataset (or part thereof). Where practicable, they support direct access to features in a dataset.
- **Transformation Services.** These services enable users to transform spatial data from its source to a specific specification, or to a specific coordinate reference system. Transformation Services will usually be provided as part of other network services (e.g. within View or Download Services).
- **Other Services (such as Spatial Data Services).** These enable users to perform a specified set of operations on (or using) spatial datasets.

The diagram below shows these services in the context of the UKLII conceptual systems architecture.



The diagram below (Figure 2 - Relationship between metadata and services) shows these relationships.

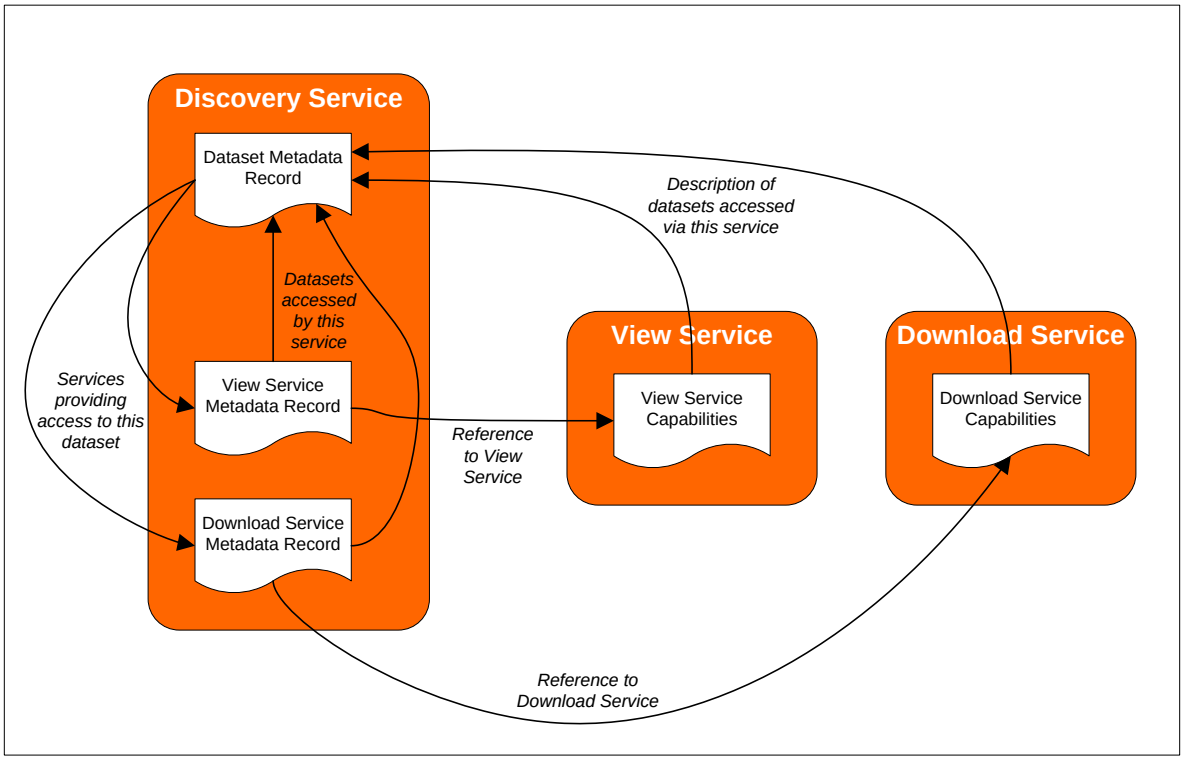


Figure 2 - Relationship between metadata and services

2.3 Download Services

In INSPIRE terms, a Download Service is a service which enables "…copies of spatial data sets, or parts of such sets, to be downloaded and, where practicable, accessed directly" *[INSPIRE Directive]*.

Whereas a View Service only provides an image of the data (e.g. as a GIF or PNG image file), a Download Service gives the user access to the data itself, either as a full dataset, or in parts. The parts may be pre-defined by the service provider or generated in response to a user query looking for a particular subset of data. There are a number of options for how Download Services can be implemented, and the format of the data that is returned, which are described later in this document.

3 Download Services in Context

3.1 INSPIRE Technical Guidance for Download Services

The European Commission has published a technical guidance document, INSPIRE Technical Guidance for Download Services v3.0 [6], which describes how to implement INSPIRE compliant Download Services that satisfy the INSPIRE Network Services regulations. UKLP recommends following this guidance when implementing UKLP Download Services, both to ensure compliance with INSPIRE and to increase interoperability between services in UKLP.

Where datasets are not within the scope of INSPIRE but are within the scope of UKLP, then certain aspects of the INSPIRE technical guidance may not apply. Where this is the case, it is indicated in the remainder of this document.

From this point on the abbreviation 'TG' is used as shorthand for the INSPIRE Technical Guidance for Download Services v3.0 document – the latter was updated by version 3.1 on 09/08/2013.

Work has now started on updating the 'Technical Guidance for the implementation of INSPIRE Download Services' version 3.1 document (INS_DLS) with an intended release date of April 2016. The INS_DLS document will be split into a general guidance document for INSPIRE download services with the existing Atom and Web Feature Service (WFS) sections each becoming separate documents. In addition two further documents will be created, one covering use of Web Coverage Services (WCS) and a second covering use of Sensor Observation Services (SOS). These implementation specific documents will refer to the general guidance document where required, but the intention is that they will become standalone documents holding details specific to implementation of download services using the referenced service architecture. In addition to these generic implementation technical guidance documents another document handling default and alternative encodings of coverage data to be available through INSPIRE download services such as but not limited to WCS, will be drafted. The DEFRA supported open source software for INSPIRE Download services, Geoserver, has been improved for INSPIRE WCS services adding the required INSPIRE extended capabilities functionality to the existing WCS capability. This software upgrade is completed and due to be released in v2.9 of GeoServer which is scheduled for March 2016.

Following the release of the separate INSPIRE Download guidance documents in 2016/2017 this document will need to be reviewed again.

3.2 Options for implementing Download Services

There are a range of possible ways in which INSPIRE Download Services may be implemented according to the TG. The four things to take into account are:

- **Functional scope of a Download Service:** whether it simply allows for the download of pre-defined datasets or if it provides access to any or all individual spatial objects within a dataset.

- **Technical implementation:** Atom or WFS are the two approaches defined in the INSPIRE Technical Guidance.
- **Interoperability of the data:** Whether the data served is conformant with the definitions in the INSPIRE Data Specifications or not.
- **Legislation:** Data from different INSPIRE themes have different timescales for implementation of interoperable services and data.

The following sections look at each of these issues in more detail and provide further information on how to make an informed choice.

3.2.1 Functional scope of a Download Service

The INSPIRE legislation makes a distinction between Download Services that provide access to whole or part datasets for download versus those which allow query-based access to individual spatial objects (or 'features') in a dataset. The former is termed a *pre-defined* Download Service and the later a *direct access* Download Service.

An example of a pre-defined Download Service would be a service which provides the download of a UK-wide road network in one transaction. An example of a direct access Download Service would be a service which allows queries to be made on the *properties of the objects* in the data and returns the matching data e.g. a query for all the sections of the UK road network which are classified as motorways.

Within the INSPIRE Network Services regulation, there are several operations defined that define the scope of Pre-defined and Direct Access Download Services.

For Pre-defined Download Services, the following operations must be implemented:

- Get Download Service Metadata
- Get Spatial Data Set
- Describe Spatial Data Set
- Link Download Service

Direct Access Download Services have the following additional operations/functionality:

- Get Spatial Object
- Describe Spatial Object
- Search Criteria (search by URI, key attributes, bounding box, INSPIRE theme)

Direct Access Download Services provide better functionality as a user is able to query for subsets of data based on properties of individual objects (features) in a Dataset, thus retrieving only the specific spatial objects which they are interested in.

For Datasets within the scope of INSPIRE, it is **mandatory** to provide the functions of a Pre-defined Download Service and **where practicable** also provide the functionality of a Direct Access Download Service.

The definition of what constitutes a Pre-defined Dataset is left up to the data provider, as is the definition of identifiers for Datasets. Every Pre-defined Dataset must have an associated 19139 metadata record. UKLP strongly recommends that identifiers are HTTP URIs (persistent URLs).

3.2.2 Technical implementation

The TG document presents the following two technology options for implementing Pre-defined Download Services:

- Using Atom [7] with OpenSearch [8].
- Using an ISO 19142 Web Feature Service (WFS) [10] and ISO 19143 Filter Encoding (FES) [11].

And one option for implementing the Direct Access functionality:

- Using an ISO 19142 Web Feature Service and ISO 19143 Filter Encoding.

Since the legislation states that the operations of the Pre-defined Download Service *must* be implemented for INSPIRE then in practice, if a Direct Access Download Service is implemented using WFS, it is also necessary to implement the pre-defined download operations using WFS. For a large dataset this may involve using the paging functionality of WFS.

Note that ISO 19142 WFS corresponds to the **OGC WFS 2.0** specification. Earlier versions of OGC WFS do not conform to the TG.

The following table shows how the various implementation choices map to the operations defined in the INSPIRE legislation covering Download Services for Pre-defined and Direct Access Download Services.

Operation(from legislation)	Technical Implementation		Download Service Functionality
	Atom	WFS	
Get Download Service Metadata **(M)**	✓	✓	Pre-defined
Get Spatial Data Set **(M)**	✓	✓	
Describe Spatial Data Set **(M)**	✓	✓	
Link Download Service **(M)**	✓	✓	
Get Spatial Object **(O)**	×	✓	
Describe Spatial Object Type **(O)**	×	✓	

Search criteria (search by URI, key attributes, bounding box, INSPIRE theme) **(O)**	✗	✓	Direct Access

Table 1 - Mapping INSPIRE operation types to Atom and WFS

It can be seen from Table 1 that the Atom implementation recommended in the TG can only be used to meet the mandatory operations from the legislation whereas a WFS implementation may be used to meet the mandatory requirements as well as the optional requirements that allow for direct access to spatial objects. From an overall functionality perspective, WFS is therefore preferable to Atom as it offers additional operations with finer-grained access to data objects. However Atom may be easier to implement for some data publishers who only wish to provide Pre-defined Download Services. This trade off will need to be made by each data publisher.

3.2.3 Interoperability of the data

As well as differences in technical implementation (Atom or WFS) and functional scope (Pre-defined or Direct Access) there is a distinction between interoperable services and interoperable, or 'harmonised', data (the payload of the services) i.e.it is possible to have a service that has conformant interfaces, but delivers a non-conformant data payload.

- **Interoperable INSPIRE Service:** A service which complies with the INSPIRE regulations for Network Services.
- **Harmonised INSPIRE Data:** Data which complies with the INSPIRE regulations for Data Interoperability (i.e. conforms to the Data Specifications).

Eventually, all INSPIRE Download Services must serve data which conforms to the Data Specifications, however in the short term there is a window (of several years for some themes) where data may be served "as-is".

Consideration must be therefore given to whether a particular Download Service is to provide harmonised data, i.e. compliant with the INSPIRE Data Specifications, or whether it is providing non-harmonised "as-is" data.

The INSPIRE Data Specifications define the format of harmonised data for all the INSPIRE data themes. If your data is in scope of INSPIRE there are requirements for publishing data in accordance with these specifications. For data outside the scope of INSPIRE there are no requirements on data interoperability.

For data that is within the scope of INSPIRE it is therefore important to recognise the different deadlines for implementation of Download Services providing harmonised and non-harmonised data. The next section describes these deadlines and the INSPIRE legislative roadmap.

3.2.4 Legislation

INSPIRE categorises data according to *Spatial Data Themes* which are grouped together in Annexes known as *Annex I*, *Annex II* and *Annex III*. The timeline for implementation of Download Services differs for each theme:

Annex I consists of the following spatial data themes:

- *Coordinate reference systems*
- *Geographical grid systems*
- *Geographical names*
- *Administrative units*
- *Addresses*
- *Cadastral parcels*
- *Transport networks*
- *Hydrography*
- *Protected sites*

For datasets within the scope of Annex I, the timeline for implementation of Download Services is as follows:

Non-conformant Download Services available for existing data	26 Jun 2012
Fully conformant Download Services available for existing datasets. Data does **not** need to be in INSPIRE harmonised form	28 Dec 2012
Fully conformant Download Services available for newly collected datasets. Data **must** be in INSPIRE harmonised form.	23 Nov 2012
All datasets (still in use) available via conformant Download Services and in INSPIRE harmonised form.	23 Nov 2017

Table 2 - Timeline for Annex II Download Services

Meanwhile, **Annex II** consists of the following spatial data themes:

- *Elevation*
- *Land cover*
- *Orthoimagery*
- *Geology*

For datasets within the scope of Annex II, the timeline for implementation of Download Services is as follows:

Non-conformant Download Services available for existing data	26 Jun 2012
Fully conformant Download Services available for existing datasets. Data does **not** need to be in INSPIRE harmonised form	28 Dec 2012
Fully conformant Download Services available for newly collected datasets. Data **must** be in INSPIRE harmonised form.	Oct-2015
All datasets (still in use) available via conformant Download Services and in INSPIRE harmonised form.	Oct-2020

Table 3 - Timeline for Annex II Download Services

Finally, **Annex III** consists of the following spatial data themes:

- *Statistical units*
- *Buildings*
- *Soil*
- *Land use*
- *Human health and safety*
- *Utility and government services*
- *Environmental monitoring facilities*
- *Production and industrial facilities*
- *Agriculture and aquaculture facilities*
- *Population distribution and demography*
- *Area management/restriction/regulation zones and reporting units*
- *Natural risk zones*
- *Atmospheric conditions*
- *Meteorological geographical features*
- *Oceanographic geographical features*
- *Sea regions*
- *Bio-geographical regions*
- *Habitats and biotopes*
- *Species distribution*
- *Energy resources*
- *Mineral resources*

For datasets within the scope of Annex III, the timeline for implementation of Download Services is as follows:

Non-conformant Download Services available for existing data	n/a
Fully conformant Download Services available for existing datasets. Data does **not** need to be in INSPIRE harmonised form	03-Dec-2013
Fully conformant Download Services available for newly collected datasets. Data **must** be in INSPIRE harmonised form.	Oct-2015
All datasets (still in use) available via conformant Download Services and in INSPIRE harmonised form.	Oct-2020

Table 4 - Timeline for Annex III Download Services

Note that the above deadlines only apply to UKLP datasets that are within the scope of INSPIRE. There are no such deadlines for other UKLP datasets.

The deadlines are summarised in Figure 3 below that is reproduced from the TG.

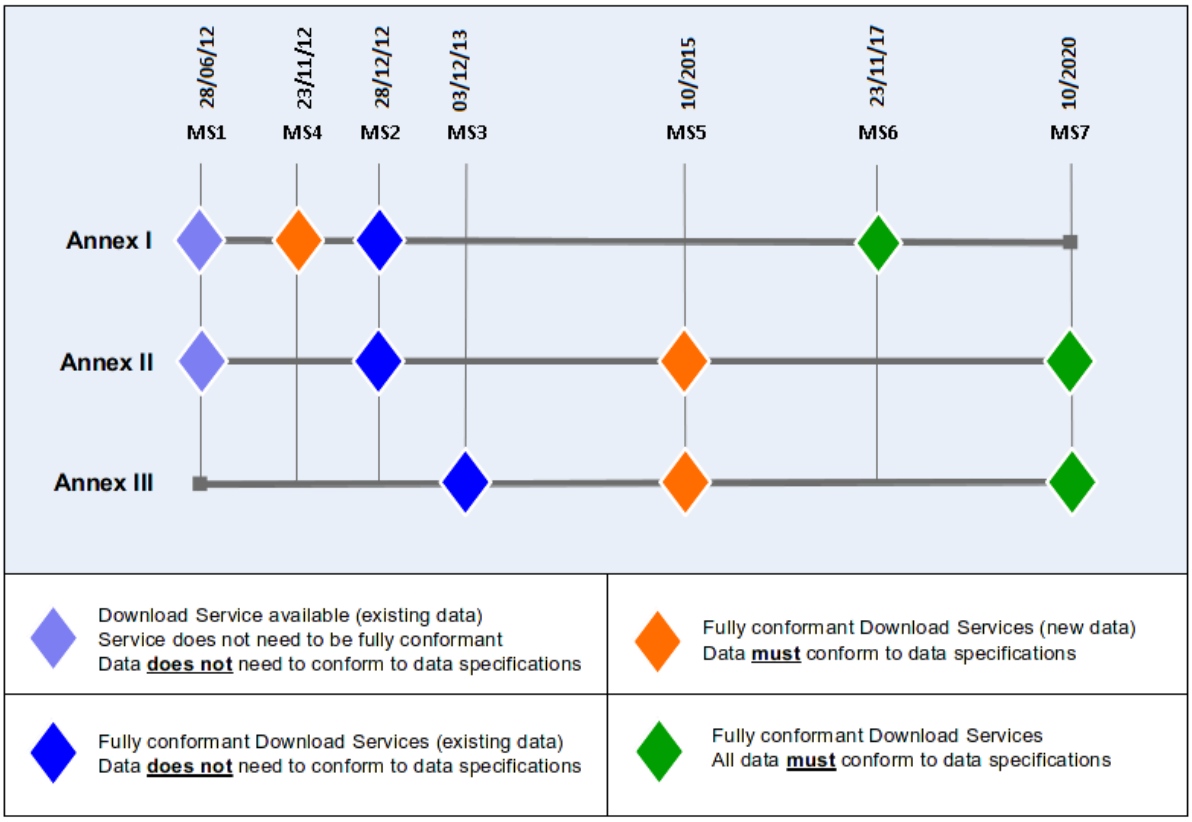


Figure 3 - INSPIRE Roadmap for Download Services (reproduced from TG)

Note that any dates in this document may be subject to change. For definitive roadmap dates, the official INSPIRE roadmap should be referred to at the following location:

http://inspire.jrc.ec.europa.eu/index.cfm/pageid/44

3.3 Summary of Implementation Options

To summarise, there are a total of six implementation possibilities for Download Services dependent on the technology choice of WFS or Atom, the functionality choice of pre-defined or direct access and the interoperability choice of harmonised or "as-is" data (Figure 4).

For harmonised data within the scope of INSPIRE the choice effectively narrows down to three choices (Atom, WFS pre-defined, WFS direct access, all with harmonised data) by the time the final INSPIRE deadlines are met.

The choice of implementation should be made within the context of the legislative roadmap (Figure 3).

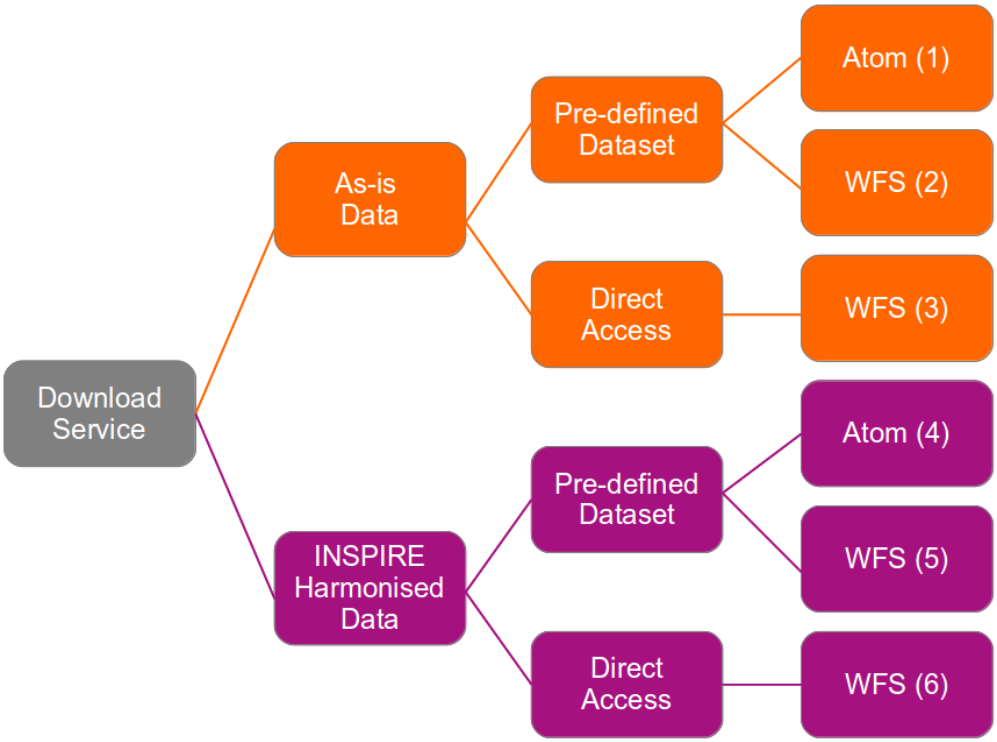


Figure 4 - Summary of Implementation Options for Download Services

These options are summarised as follows:

1. Atom pre-defined, as-is data (any format)
2. WFS pre-defined, as-is data (any GML application schema)
3. WFS direct access, as-is data (any GML application schema)
4. Atom pre-defined, INSPIRE harmonised data (compliant with Data Specifications)
5. WFS pre-defined, INSPIRE harmonised data (compliant with Data Specifications)
6. WFS direct access, INSPIRE harmonised data (compliant with Data Specifications)

Note that the TG states that other implementation options (e.g. Sensor Observation Services or Web Coverage Services) may be recommended for Download Services in future. But for now, the Technical Guidance recommends only Atom or WFS.

3.4 Levels of Interoperability

Since interoperability is a key aim of both UKLP and INSPIRE it is important to aim for the highest possible level of interoperability when deploying Download Services.

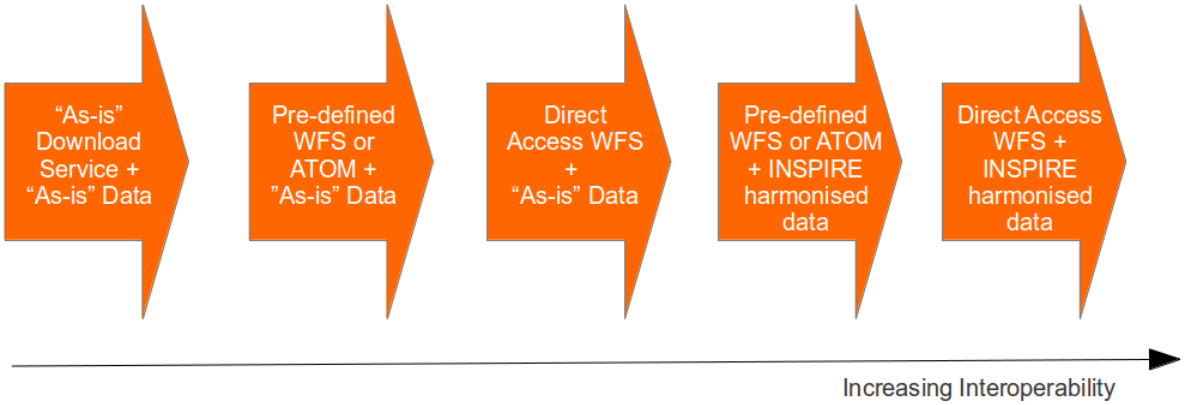


Figure 5 - Increasing Levels of Interoperability

As shown in Figure 5, the highest level of interoperability is achieved by deploying Download Services which use WFS to serve data that is formatted according to the INSPIRE Data Specifications (interoperable data). The lowest level of interoperability is achieved by deploying non-interoperable Download Services with non-interoperable data.

UKLP strongly recommends that Direct Access WFS is deployed wherever practicable, particularly for data that is conformant to INSPIRE Data Specifications.

3.5 How to decide what to implement

The decision flowchart in Figure 6 may also be helpful in deciding what to implement. It should be used in the context of the legislative timescales and legal obligations.

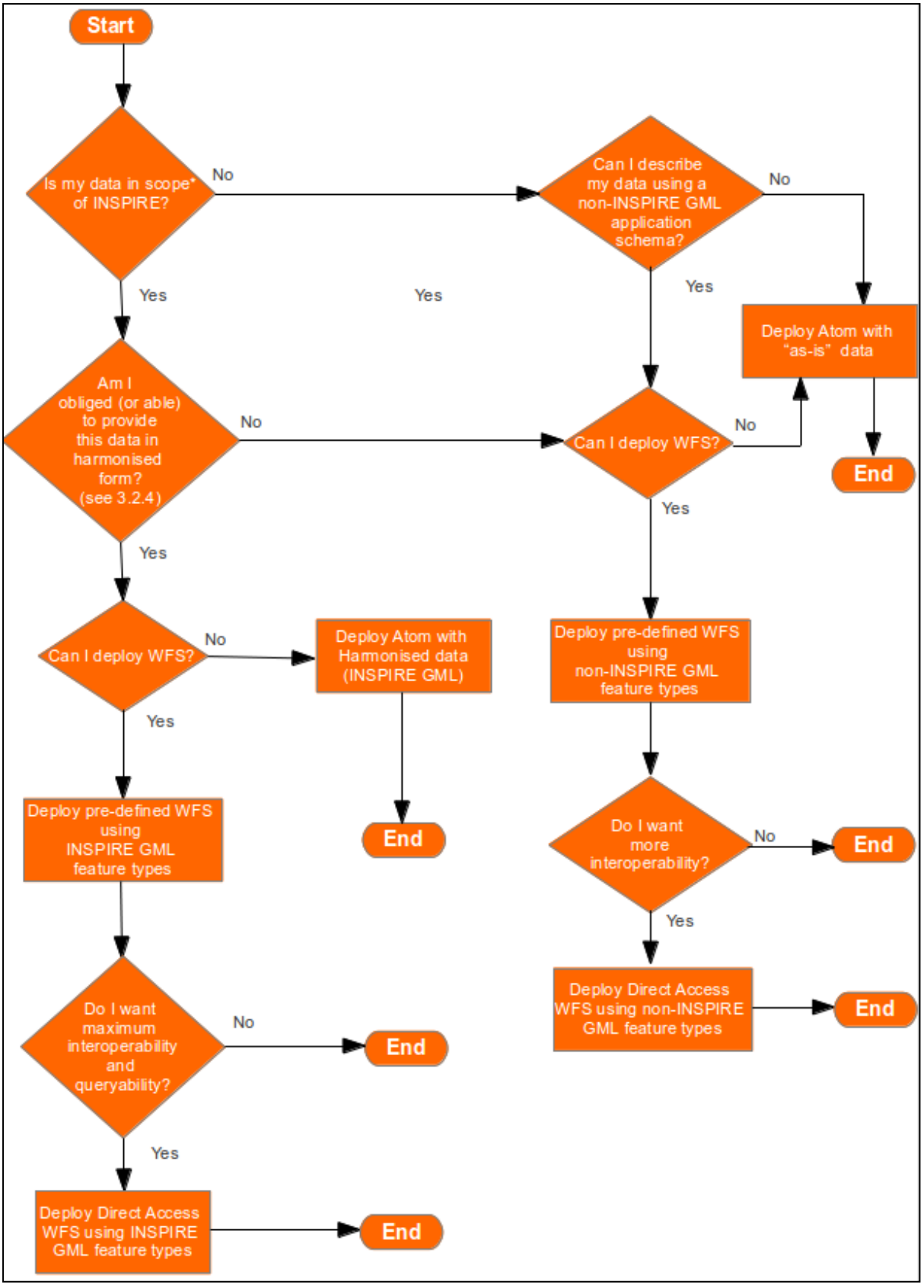


Figure 6 - Decision Flowchart - deciding what to implement

*note that in order to declare a Dataset in scope of INSPIRE, the Dataset metadata record must include one of the INSPIRE Annex-specific GEMET keywords (http://www.eionet.europa.eu/gemet/inspire_themes).

4 Implementing Download Services

As discussed in Chapter 3 there are several ways to implement Download Services. This chapter contains further technical details for implementation of the different implementations.

4.1 Atom and OpenSearch Implementation: Pre-Defined Download Service

Atom is a simple XML format which can be used for publishing information online in the form of 'feeds'. The TG recommends a profile of Atom be used for making datasets available for download. Alongside Atom, the TG recommends the use of OpenSearch to provide a service-like search interface to the information in Atom. OpenSearch is used by many search applications to query data.

The following guidance should be followed in order to set up Download Services for UKLP using Atom and OpenSearch. It is based on the INSPIRE Technical Guidance. Additionally, Annex A contains reusable XML templates and code which may be used as a basis for implementation.

4.1.1 Overview of Atom Download Service

The approach recommended for UKLP and INSPIRE Download Services using Atom is to publish a two-layer hierarchy of Atom feeds. The 'top-level' feed, in conjunction with an OpenSearch layer, represents a Download Service. This feed then contains entries which link to 'sub-feeds', one sub-feed per dataset, representing the Datasets available through the service.

For example, if you have three datasets and wish to publish them through a single Download Service you will need to define:

- 1 top-level Atom Feed (the Download Service feed)
- 1 OpenSearch description and an OpenSearch engine (the OpenSearch layer)
- 3 second-level Atom Feeds (the Dataset feeds)

As can be seen in Figure 7 reproduced from the TG, the Atom feeds also contain links to the Metadata for services and datasets.

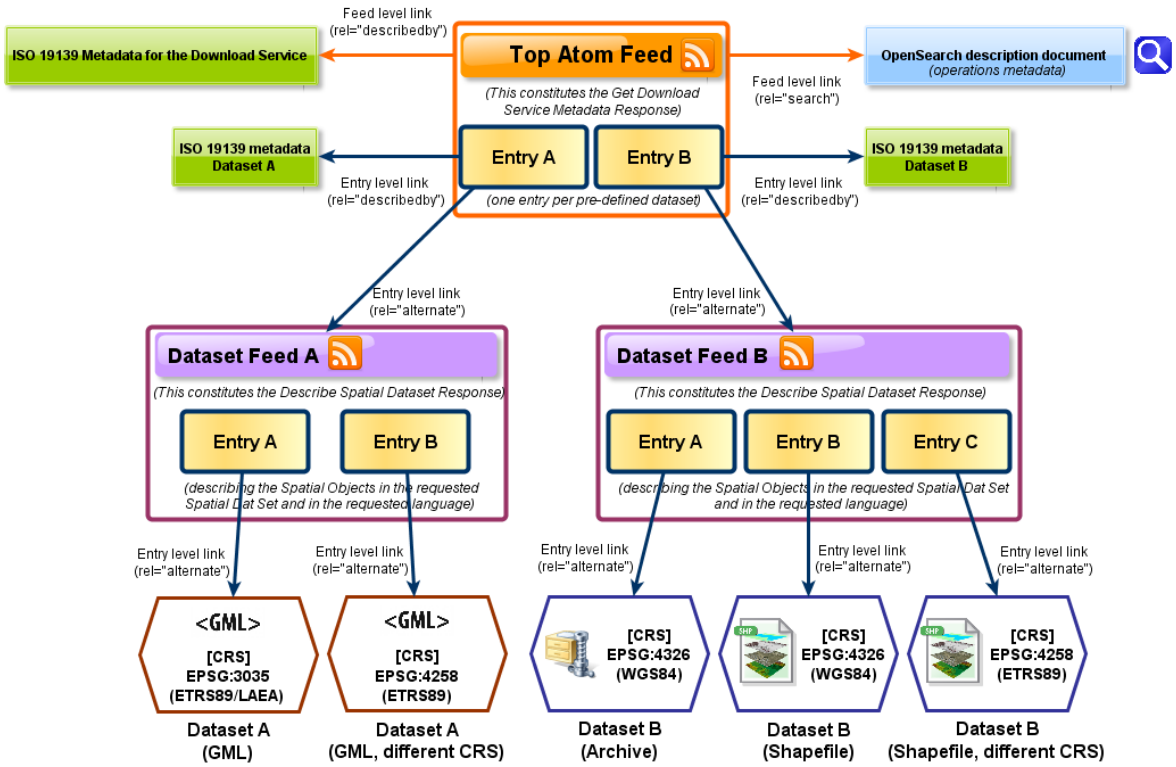


Figure 7 - Overview of Atom relations, reproduced from INSPIRE TG.

The key things to note from Figure 7 are:

- There is a top-level Download Service Feed.
- A Download Service Feed contains links to metadata for the service and for the datasets available through the service.
- A Download Service Feed contains a link to an OpenSearch Description.
- A Download Service Feed contains Atom entries which link to secondary Dataset Feeds.
- Dataset Feeds contain links to download data packaged as pre-defined datasets.

The contents of the feeds are described in more detail in the next few sections.

4.1.2 Implementing a Download Service Feed

A Download Service feed contains:

- Basic information about the Download Service, such as who owns it
- Links to the Data Publisher's Download Service Metadata record
- Links to Dataset feeds for Datasets available via the service
- Link to an OpenSearch description
- Basic Geospatial information about the Datasets (Bounding Box).

A Download Service feed must also:

- Conform to the Atom specification [7]
- Conform to the TG (for datasets within the scope of INSPIRE) [6]

Example 1 below shows a complete Download Service feed containing a single entry to a Dataset Feed.

```
<?xml version="1.0" encoding="UTF-8"?>

<feed xmlns="http://www.w3.org/2005/Atom"
xmlns:georss="http://www.georss.org/georss"
xmlns:inspire_dls="http://inspire.ec.europa.eu/schemas/inspire_dls/1
.0"

xml:lang="en">

     <title>Land Cover Map 2007 series Atom service
downloads</title>

     <subtitle>INSPIRE Download Service for the LCM 2007 series
datasets</subtitle>

     <link rel="self"
href="http://eidchub.ceh.ac.uk/atomfeeds/1300104435819.xml"
type="application/atom+xml"/>

     <link rel="describedby"
href="https://gateway.ceh.ac.uk/soapServices/CSWStartup?Service=CSW&
amp;Request=GetRecordById&amp;Version=2.0.2&amp;outputSchema=http://
www.isotc211.org/2005/gmd&amp;elementSetname=full&amp;id=363fdb32-
b7de-47a5-ba95-0f24ff46f6b5&amp;"
type="application/vnd.iso.19139+xml"/>

     <link rel="search" href="http://eidchub.ceh.ac.uk/os-
descriptions/1300104435819.xml"
type="application/opensearchdescription+xml"/>

     <id>http://eidchub.ceh.ac.uk/atomfeeds/1300104435819</id>

     <rights>CEH licence terms and conditions apply</rights>

     <updated>2012-08-02T00:00:00Z</updated>

     <author>

          <name>Centre for Ecology &amp; Hydrology</name>

          <email>enquiries@ceh.ac.uk</email>

     </author>
```

```
     <entry>
          <title>Land Cover Map 2007 Vector GB</title>

<inspire_dls:spatial_dataset_identifier_code>1300110142063
</inspire_dls:spatial_dataset_identifier_code>

<inspire_dls:spatial_dataset_identifier_namespace>CEH:EIDC:
</inspire_dls:spatial_dataset_identifier_namespace>
          <link
href="https://gateway.ceh.ac.uk/soapServices/CSWStartup?Service=CSW&
amp;Request=GetRecordById&amp;Version=2.0.2&amp;outputSchema=http://
www.isotc211.org/2005/gmd&amp;elementSetname=full&amp;id=1d78e01a-
a9c1-4371-8482-1c1b57d9661f&amp;" rel="describedby"
type="application/vnd.iso.19139+xml"/>
          <link rel="alternate"
href="http://eidchub.ceh.ac.uk/atomfeeds/1300182812058"
type="application/atom+xml" hreflang="en" title="Feed containing the
Land Cover Map 2007 Vector GB data (in one or more downloadable
formats)"/>
          <id>http://eidchub.ceh.ac.uk/atomfeeds/1300110142063</id>
          <updated>2012-07-01T00:00:00Z</updated>
          <summary>This is the entry for Land Cover Map 2007 Vector
GB</summary>
          <georss:polygon>49.83726 -9.227701 60.850441 -9.227701
60.850441 2.687637 49.83726 2.687637 49.83726 -9.227701
</georss:polygon>
          <category term="EPSG:27700" scheme="
http://www.opengis.net/def/crs/" label="British National
Grid"></category>
          <category term="EPSG:4326" scheme="
http://www.opengis.net/def/crs/" label="WGS84"></category>
     </entry>
      <!-- additional entries for other datasets may be added here -
->
</feed>
```

Example 1 - Download Service Atom Feed

Example 1 contains only a single 'entry' for a single Dataset Feed. To add more Datasets, simply add additional entry elements to the feed. A single Download Service Feed can link to any number of Dataset Feeds.

The Download Service Feed should be populated according to Table 5 and Table 6 below. Table 5 describes the requirements for the feed, while Table 6 describes the requirements for individual entry elements within the feed.

In these tables mandatory requirements for UKLP Download Services are indicated with a double tick (✓✓) symbol. This symbol means UKLP strongly recommends that these are implemented. There are some additional requirements that are only mandatory for Download Services that deliver data within the scope of INSPIRE and are otherwise optional (or not-applicable) within the scope of UKLP. These additional requirements are indicated by a single tick (✓) symbol and must be met for INSPIRE compliance. Finally, optional parts are indicated by a plus (**+**) symbol and are optional both for UKLP and INSPIRE compliance. The asterix (*) means that more than one of these elements is allowed.

The final column in Table 5 indicates how values map to the INSPIRE metadata for the Download Service (if applicable).

XML Element/ sub-element	XML Attribute	Value	UKLP (✓✓) INSPIRE (✓) Optional (+) More than one allowed (*)	INSPIRE Metadata M, Mandatory C, Conditional
Title		A human readable title for the Download Service	✓✓	Resource Title (M)
subtitle		A human readable sub-title (abstract) for the Download Service	✓✓	Resource Abstract (M)
id		An identifier for this feed. It should be an HTTP URI which dereferences to the feed itself.	✓✓	-
rights		Access rights to this feed. For INSPIRE purposes this will correspond with the value of "accessConstraints" in the corresponding service metadata record.	✓✓	Limitations on Public Access (M)
updated		Date, time and timezone feed was last updated according to ISO 8601 format.	✓✓	Metadata Date (M)
author		Author (owner) of the feed	✓✓	Responsible Organisation

				(M)
author/name		Contact name	✓✓	“
author/email		Contact email	✓✓	“
link		To self	✓✓	Resource Locator (C)
	@href	HTTP link to this feed	✓✓	“
	@rel	“self”	✓✓	“
	@type	“application/atom+xml”	✓✓	“
	@hreflang	Language code e.g. “en”. (See section 4.1.9)		Metadata Language (M)
link		To ISO 19139 metadata record	✓✓	-
	@href	HTTP link to the ISO 19139 service metadata record for this Download Service	✓✓	-
	@rel	“describedBy”	✓✓	-
	@type	“application/vnd.iso.19139+xml”	✓✓	-
link		To OpenSearch description	✓✓	-
	@href	HTTP link to the OpenSearch description for this Download Service	✓✓	-
	@rel	“search”	✓✓	-
	@type	“application/opensearchdescription+xml”	✓✓	-
entry		One entry element must be provided for each Dataset (see Table 6 below)	✓✓*	-

Table 5 - Requirements for the Download Service <feed> element

Each entry element within the feed must be completed according to Table 6. Remember that each entry corresponds to a Dataset.

XML Element/ sub-	XML Attribute	Value	UKLP (✓✓) INSPIRE (✓)	INSPIRE Metadata M, Mandatory

element			Optional (+) More than one allowed (*)	C, Conditional
title		A human readable title for the Dataset	✓✓	-
summary		A human-readable description or abstract for the Dataset	✓✓	-
id		An identifier for the Dataset	✓✓	-
rights		Access rights for the Dataset	+	-
updated		Date, time and timezone entry was last updated according to ISO 8601 format	✓✓	-
georss: polygon		Polygon defined by pairs of lat, lon coordinates (WGS84) outlining a rectangular bounding box for the Dataset. Note that the order must be **lat, lon** (not lon, lat). (Note, if the dataset is for a single location then georss:point may be used.)	✓✓	-
category		Coordinate Reference System info.	✓✓ *	-
	@term	CRS code (e.g. EPSG:4326)	✓✓	-
	@scheme	HTTP URI to scheme (e.g. http://www.opengis.net/def/crs/)	✓✓	-
	@label	Name of CRS	✓✓	-
inspire_dls: spatial_dataset_identifier_code		Code part of Unique Resource Identifier for the spatial dataset as defined in the INSPIRE Metadata Regulation [14]	✓	-
inspire_dls: spatial_dataset_identifier_namespace		Namespace part of Unique Resource Identifier for the spatial Dataset as defined in the INSPIRE Metadata Regulation [14]	✓	-

link		To ISO 19139 metadata record	✓✓	Coupled Resource (C)
	@href	HTTP link to the ISO 19139 metadata record for this Dataset	✓✓	-
	@rel	describedBy	✓✓	-
	@type	"application/vnd.iso.19139+xml"	✓✓	-
Link		To Dataset Feed	✓✓	-
	@href	HTTP link to the Dataset feed	✓✓	-
	@rel	“alternate”	✓✓	-
	@type	"application/atom+xml"	✓✓	-

Table 6 - Requirements for the Download Service <entry> element

Note that UKLP strongly recommends using GeoRSS information in feeds even though these are optional in the TG. Using GeoRSS will allow feeds to be associated with correct geo-location in mapping applications or other tools.

4.1.3 Implementing a Dataset Feed

As described earlier, each Download Service feed contains entry elements which link to Dataset Feeds which contain more detail about exactly where to download the Dataset, and which formats and CRSs the Dataset is available in.

A Dataset Feed therefore contains:

- Basic metadata about the Dataset
- Links to download a particular Dataset
- Possibly different formats, CRSs or languages
- Links to the Dataset metadata record

A Dataset Feed must:

- Conform to the Atom specification [7]
- Conform the TG (for datasets within the scope of INSPIRE) [6]

Example 2 below shows a complete Dataset Feed example:

```
<?xml version="1.0" encoding="UTF-8"?>

<feed xmlns="http://www.w3.org/2005/Atom"
xmlns:georss="http://www.georss.org/georss"
xmlns:inspire_dls="http://inspire.ec.europa.eu/schemas/inspire_dls/1
.0" xml:lang="en">
```

```
      <title>Land Cover Map 2007 1km Raster, Percentage Target Class
GB download</title>

      <subtitle>INSPIRE Download Service for the dataset Land Cover
Map 2007 1km Raster Percentage Target Class GB</subtitle>

      <id>http://eidchub.ceh.ac.uk/atomfeeds/1300182812058</id>

      <rights>CEH licence terms and conditions apply. See also
'useLimitation' element in dataset 19139 metadata record</rights>

      <updated>2012-07-01T00:00:00Z</updated>

      <author>

            <name>Centre for Ecology &amp;amp; Hydrology</name>

            <email>enquiries@ceh.ac.uk</email>

      </author>

<link rel="self"
href="http://eidchub.ceh.ac.uk/atomfeeds/1300182812058.xml"
type="application/atom+xml" hreflang="en" title="This dataset
feed"/>

      <link rel="up"
href="http://eidchub.ceh.ac.uk/atomfeeds/1300104435819.xml"
type="application/atom+xml" hreflang="en" title="The parent service
feed"/>

      <entry>

            <title>Land Cover Map 2007 1km Raster Percentage Target
Class GB in CRS EPSG:4326 (geo-referenced TIFF)</title>

             <summary>This entry provides links to download Land
Cover Map 2007 Vector GB in geo-referenced TIFF format</summary>

      <id>http://eidchub.ceh.ac.uk/downloads/inpire_predefined/
67911cf1b-9202-441e-99e1-f9c90358337f</id>

      <updated>2012-07-01T00:00:00Z</updated>

      <category term="EPSG:4326" scheme="
http://www.opengis.net/def/crs/" label="WGS84"></category>

   <link rel="alternate"
href="http://gateway.ceh.ac.uk/download?namespace=CEH:EIDC:&amp;code
=1300182812058&amp;crs=EPSG:4326&amp;language=en" type="application"
hreflang="en" title="Land Cover Map 2007 1km Raster Percentage
Target Class GB in CRS EPSG:4326 (geo-referenced TIFF)"
length="45287"/>
```

```
    <link rel="describedby"
href=”http://eidchub.ceh.ac.uk/metadata/1d78e01a-a9c1-4371-8482-
1c1b57d9661f/lcm2007-dataset-documentation-version-1/view”
title=”Spatial object type definitions for Land Cover Map 2007 1km”
hreflang="en"/>

     </entry>

</feed>
```

Example 2 - Dataset Feed, containing a link to the pre-defined dataset

XML Element/sub-element	XML Attribute	Value	UKLP (✓✓) INSPIRE (✓) Optional (+) More than one allowed (*)
title		A human readable title for the Dataset	✓✓
subtitle		A human readable sub-title (abstract) for the Dataset	✓✓
id		An identifier for this feed. It should be an HTTP URI which dereferences to the feed itself.	✓✓
rights		Access rights to this feed. For INSPIRE purposes. This corresponds with the value of “accessConstraints” in the corresponding service metadata record. If a useLimitation element is also present in the metadata record UKLP recommends mentioning this (as in the example above).	+
updated		Date and time feed was last updated.	✓✓
author		Author (owner) of the feed	✓✓
author/name		Contact name	✓✓
author/email		Contact email	✓✓
Link		To self	✓✓
	@href	HTTP link to this feed	✓✓

	@rel	"self"	✓✓
	@type	"application/atom+xml"	✓✓
link		To Download Service Feed	✓✓
	@href	HTTP link to the "parent" Download Service feed for this Dataset	✓✓
	@rel	"up"	✓✓
	@type	"application/atom+xml"	✓✓
link		To Spatial Object Type definition	✓*
	@href	HTTP link to spatial object type definition. (see Section 4.1.5)	✓*
	@rel	"describedby"	✓*
	@type	Appropriate media type ("text/html" for links to the INSPIRE Registry).	✓*
entry		One entry element must be provided for each Format/CRS combination (see Table 8 below)	✓✓*

Table 7 - Requirements for the Dataset <feed> element

Each entry element within the feed must be completed according to Table 8. Remember a separate entry must be given for each format/CRS combination in which the Dataset is available. This is discussed in more detail in the following sections.

XML Element/sub-element	XML Attribute	Value	UKLP (✓✓) INSPIRE (✓) Optional (+) More than one allowed (*)
Title		A human readable title for the Dataset download (this particular format/CRS combination)	✓✓
summary		A human-readable description or abstract for the Dataset download (this particular format/CRS combination)	✓✓
Id		An identifier for the Dataset download (this particular format/CRS combination)	✓✓

Rights		Access rights for the Dataset download (this particular format/CRS combination) if different to the rights for the feed.	+
Updated		Date and time entry was last updated.	✓✓
category		Coordinate Reference System info.	✓✓ *
	@term	URI to definition of CRS	✓✓
	@scheme		✓✓
	@label	Name of CRS	✓✓
Link		To Dataset download	✓✓
	@href	HTTP link to the data download	✓✓
	@rel	"alternate"	✓✓
	@length	Size of download file in octets. (1 octet usually equals 1 byte in modern systems).	
	@type	appropriate media type (see Section4.1.4)	✓✓

Table 8 - Requirements for the Dataset <entry> element

4.1.4 Dataset Formats and Media[8] Types

For "as-is" data (i.e. data that does not attempt to comply with the INSPIRE data specifications), the dataset may be provided in ANY format. For example GML, Shapefile, GeoTiff, NetCDF or any other appropriate format for the data.

In all cases a suitable Media Type must be given for the 'type' attribute of the download link (see the final row in Table 8 above). For INSPIRE compliance, this media type should be taken from the INSPIRE Media Type register available at the following URL.

http://inspire.ec.europa.eu/media-types/

Media types that do not appear in the register may be proposed as new additions to the register. Please contact UKLP for assistance in proposing new media types.

For INSPIRE compliant data, the default encoding is a GML application schema as defined in the relevant thematic Data Specification. If desired other formats may be provided in addition – e.g. "as-is" data could be published in addition to INSPIRE compliant format.

[8] Media types are often referred to using their former name, MIME types.

4.1.5 Spatial Object Type definitions

Within the Dataset feeds there are links to 'Spatial Object Type' definitions. For INSPIRE harmonised data, these Spatial Object Types are defined type (feature types) in the INSPIRE registry. Links should therefore link to the INSPIRE registry as in the following example which links to the definition for a 'WaterCourse' Spatial Object Type.

```
http://inspire.ec.europa.eu/featureconcept/Watercourse
```

Example 3 Link to a Spatial Object Type definition in the INSPIRE registry

For Datasets that are not INSPIRE harmonised datasets, the link(s) to Spatial Object Type definitions should be links to some existing definition of the data type(s) in the Dataset, for example a specification document or schema.

4.1.6 Presenting Datasets in Multiple CRSs

If your dataset is available in multiple CRSs, then simply add a separate entry for each CRS containing a download link for the data in that CRS.

For example, if you have a Download Service which serves two Datasets which are both available in three CRSs:

- Create one Download Service feed
- Add two entries in the Download Service feed: one for each Dataset
- Create two Dataset Feeds: one for each Dataset
- Add three entries in each Dataset Feed: one for each CRS, each entry with its own download link element

Example 4 shows a Dataset that is available for download in two CRSs; British National Grid and WGS84.

```
<?xml version="1.0" encoding="UTF-8"?>

<feed>

     <!—namespace declarations and other elements removed for
brevity -->

     <entry>

          <title>Land Cover Map 2007 1km Raster Percentage Target
Class GB in CRS EPSG:27700 (geo-referenced TIFF)</title>


<id>http://eidchub.ceh.ac.uk/downloads/inpire_predefined/ e12b32fg8
- f34f-4df7-2d3d-d3a34341f13d</id>

          <updated>2012-07-01T00:00:00Z</updated>
```

```
          <category term="EPSG:27700" scheme="
http://www.opengis.net/def/crs/" label="British National
Grid"></category>

          <link rel="alternate"
href="http://gateway.ceh.ac.uk/download?namespace=CEH:EIDC:&amp;code
=1300182812058&amp;crs=EPSG:27700&amp;language=en"
type="application" hreflang="en" title="Land Cover Map 2007 1km
Raster Percentage Target Class GB in CRS EPSG:27700 (geo-referenced
TIFF)"/>

     </entry>

     <entry>

          <title>Land Cover Map 2007 1km Raster Percentage Target
Class GB in CRS EPSG:4326 (geo-referenced TIFF)</title>

          <updated>2012-07-01T00:00:00Z</updated>

          <category term="EPSG:4326" scheme="
http://www.opengis.net/def/crs/" label="WGS84"></category>

          <link rel="alternate"
href="http://gateway.ceh.ac.uk/download?namespace=CEH:EIDC:&amp;code
=1300182812058&amp;crs=EPSG:4326&amp;language=en" type="application"
hreflang="en" title="Land Cover Map 2007 1km Raster Percentage
Target Class GB in CRS EPSG:4326 (geo-referenced TIFF)"/>

     <id>http://eidchub.ceh.ac.uk/downloads/inpire_predefined/67911
cf1b-9202-441e-99e1-f9c90358337f</id>

     </entry>

</feed>
```

Example 4 A feed containing two entries, one for each CRS.

For information on which coordinate reference systems are appropriate, please see Chapter 5 on Coordinate Reference Systems.

4.1.7 Presenting Datasets in Multiple Formats

If your dataset is available in multiple formats, for example GML and ShapeFile, then simply add a separate entry for each format containing a download link for that format.

The 'type' attribute of the link element must show the correct media type for the format.

For example, if you have a Download Service which serves two Datasets which are both available in three formats:

- Create one Download Service feed

- Add two entries in the Download Service feed: one for each Dataset
- Create two Dataset Feeds: one for each Dataset

Add three entries in each Dataset Feed: one for each format, each entry with its own download link element with an appropriate Media Type specified (see Section 4.1.4 for guidance on Media Types).

The following example shows a dataset feed with three entries; providing the same dataset in three different formats:

```
<feed>

 <!-- namespace declarations and other elements removed for brevity
-->

    <entry>

      <title>Example dataset in GML format</title>

       <link rel="alternate" href="http://my.org/data/gmlfile.gml"
type="application/gml+xml;version=3.2" hreflang="en" length=”12345”
title="Example file encoded in GML 3.2"/>

      <id>http://http://my.org/data/file1.gml</id>

      <updated>2012-12-14T12:00:00Z</updated>

     <category term="http://www.opengis.net/def/crs/EPSG/0/4258"
label="ETRS89"/>

    </entry>

    <entry>

      <title>Example dataset in Shapefile format</title>

       <link rel="alternate" href="http://my.org/data/shapefile.zip"
type="application/x-shapefile" hreflang="en" length=”45678”
title="Example file encoded as Shapefile in zip archive"/>

      <id>http://http://my.org/data/file1.shp</id>

      <updated>2012-12-14T12:00:00Z</updated>

     <category
term="http://www.opengis.net/def/crs/EPSG/0/4258"label="ETRS89"/>

    </entry>

    <entry>

      <title>Example dataset in ESRI geodatabase format</title>

       <link rel="alternate"
href="http://my.org/data/geodatabase.zip" type="application/x-
```

```
filegdb" hreflang="en" length=”34567” title="Example file encoded in
ESRI geodatabase format in zip archive"/>

      <id>http://http://my.org/data/file1.shp</id>

      <updated>2012-12-14T12:00:00Z</updated>

     <category
term="http://www.opengis.net/def/crs/EPSG/0/4258"label="ETRS89"/>

    </entry>

</feed>
```

4.1.8 Presenting Datasets in multiple formats and multiple CRS

In the case that you have a dataset in both multiple formats and multiple CRSs then you simply create a new entry element in the Dataset Feed for each format/CRS combination that is available.

For example, if you have a Download Service which serves two Datasets which are both available in three formats and two CRSs then you would do the following:

- Create one Download Service feed
- Add two entries in the Download Service feed: one for each Dataset
- Create two Dataset Feeds: one for each Dataset
- Add six entries in each Dataset Feed: **one for each format/crs combination**, each entry with its own download link element

```
<feed>

 <!-- namespace declarations and other elements removed for brevity
-->

    <entry>

     <title>Example dataset in GML format, CRS EPSG:4258</title>

      <link rel="alternate" href="http://my.org/data/gmlfile.gml"
type="application/gml+xml;version=3.2" hreflang="en" length=”12345”
title="Example file encoded in GML 3.2"/>

      <id>http://http://my.org/data/file1.gml</id>

      <updated>2012-12-14T12:00:00Z</updated>

     <category term="http://www.opengis.net/def/crs/EPSG/0/4258"
label="ETRS89"/>

    </entry>
```

```
    <entry>
      <title>Example dataset in Shapefile format, CRS
EPSG:4258</title>
      <link rel="alternate" href="http://my.org/data/shapefile.zip"
type="application/x-shapefile" hreflang="en" length=”45678”
title="Example file encoded as Shapefile in zip archive"/>
      <id>http://http://my.org/data/file1.shp</id>
      <updated>2012-12-14T12:00:00Z</updated>
     <category
term="http://www.opengis.net/def/crs/EPSG/0/4258"label="ETRS89"/>
    </entry>
    <entry>
      <title>Example dataset in ESRI geodatabase format, CRS
EPSG:4258</title>
      <link rel="alternate"
href="http://my.org/data/geodatabase.zip" type="application/x-
filegdb" hreflang="en" length=”34567” title="Example file encoded in
ESRI geodatabase format in zip archive"/>
      <id>http://http://my.org/data/file1.shp</id>
      <updated>2012-12-14T12:00:00Z</updated>
     <category
term="http://www.opengis.net/def/crs/EPSG/0/4258"label="ETRS89"/>
    </entry>
    <entry>
      <title>Example dataset in GML format, CRS ETRS89 UTM zone 32N
</title>
      <link rel="alternate" href="http://my.org/data/gmlfile.gml"
type="application/gml+xml;version=3.2" hreflang="en" length=”12345”
title="Example file encoded in GML 3.2"/>
      <id>http://http://my.org/data/file1.gml</id>
      <updated>2012-12-14T12:00:00Z</updated>
     <category term="http://www.opengis.net/def/crs/EPSG/0/4258"
label="ETRS89 / UTM zone 32N"/>
    </entry>
```

```
    <entry>
      <title>Example dataset in Shapefile format, CRS ETRS89 UTM
zone 32N </title>
      <link rel="alternate" href="http://my.org/data/shapefile.zip"
type="application/x-shapefile" hreflang="en" length=”45678”
title="Example file encoded as Shapefile in zip archive"/>
      <id>http://http://my.org/data/file1.shp</id>
      <updated>2012-12-14T12:00:00Z</updated>
     <category term="
http://www.opengis.net/def/crs/EPSG/0/25832"label="ETRS89"
label="ETRS89 / UTM zone 32N"/>
    </entry>
    <entry>
      <title>Example dataset in ESRI geodatabase format, CRS ETRS89
UTM zone 32N </title>
      <link rel="alternate"
href="http://my.org/data/geodatabase.zip" type="application/x-
filegdb" hreflang="en" length=”34567” title="Example file encoded in
ESRI geodatabase format in zip archive"/>
      <id>http://http://my.org/data/file1.shp</id>
      <updated>2012-12-14T12:00:00Z</updated>
     <category term=”http://www.opengis.net/def/crs/EPSG/0/25832"
label="ETRS89 / UTM zone 32N"/>
    </entry>
</feed>
```

4.1.9 Presenting feeds in multiple languages

Atom feeds may be presented in more than one language. However each individual feed shall only be in one language, with links to alternative representations in other languages.

This is done by adding Atom ‘link’ elements that provide links to the alternative version.

Here is an example from of an English language feed that is also available in Irish.

```
<link href="http://mydownloadservice.com/en.xml" rel="self"
type="application/atom+xml"
```

```
hreflang="en" title="This document"/>

<link href="mydownloadservice.com/ga.xml" rel="alternate"

type="application/atom+xml" hreflang="ga" title=”Eolas faoin
tseirbhís íoslódála i nGaeilge” />
```

Example 5 Example link to alternative feed in Irish (from an English feed)

Note that the value of the ‘rel’ attribute for this link is “alternate”.

Conversely, the Gaelic Irish version of the feed should contain a reciprocal link to the English version:

```
<link href="http://mydownloadservice.com/ga.xml" rel="self"

type="application/atom+xml"

hreflang="cy" title=”An doiciméad seo”/>

<link href="mydownloadservice.com/en.xml" rel="alternate"

type="application/atom+xml" hreflang="ga" title="The download

service information in English"/>
```

Example 6 Example link to alternative feed in English (from an Irish feed)

The ‘hreflang’ attributes must be used to indicate the language of the linked resource. Since Atom adopts the IETF language tags, the language codes used for the ‘hreflang’ attribute must be taken from the IANA Subtag Registry of language codes which is available here:

http://www.iana.org/assignments/language-subtag-registry

So for the UK Gemini languages the codes to use in the Atom feed are:

Language	Code
Cornish	Kw
English	En
Irish (Gaelic)	Ga
Gaelic Scots	Gd
Ulster Scots	Sco
Welsh	Cy

Table 9 - Language codes to be used in Atom implementation

In most cases the language codes are two-letter codes from ISO 639-1, however Ulster Scots is a three letter code from ISO 639-2 as there is no equivalent two letter code so the three letter code is registered in the IANA Subtag Registry instead.

Note that these codes differ from the language codes used in the ISO 19139 metadata, which are all three letter codes.

For an INSPIRE compliant feed, one of the official EU languages must be provided. English (en) and Gaelic Irish (ga) are the only UK Gemini languages that are also official EU languages.

4.1.10 Presenting Datasets in multiple files for pre-defined download

There may be cases where a dataset cannot be made available for download within a single file.

Two typical scenarios where this applies are:

- A UK wide Dataset is managed as separate logical parts for England, Northern Ireland, Scotland and Wales as in Figure 8.
- A UK wide dataset is split into sections such as tiles for practical purposes (usually to do with data volumes) as in Figure 9.

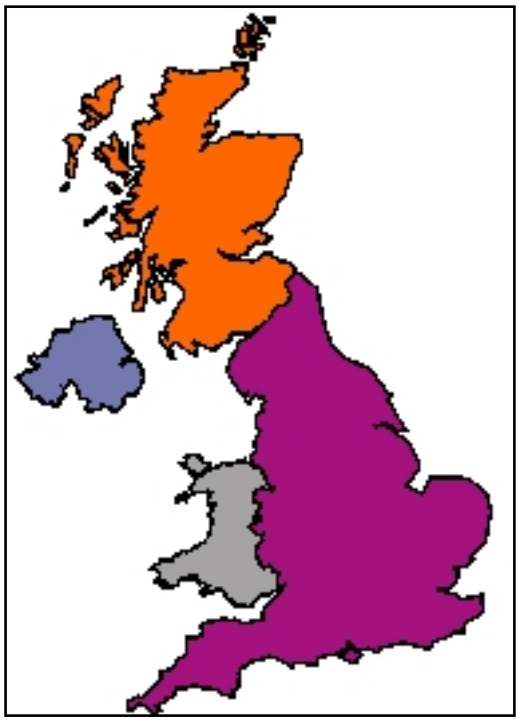


Figure 8 - Separate logical datasets

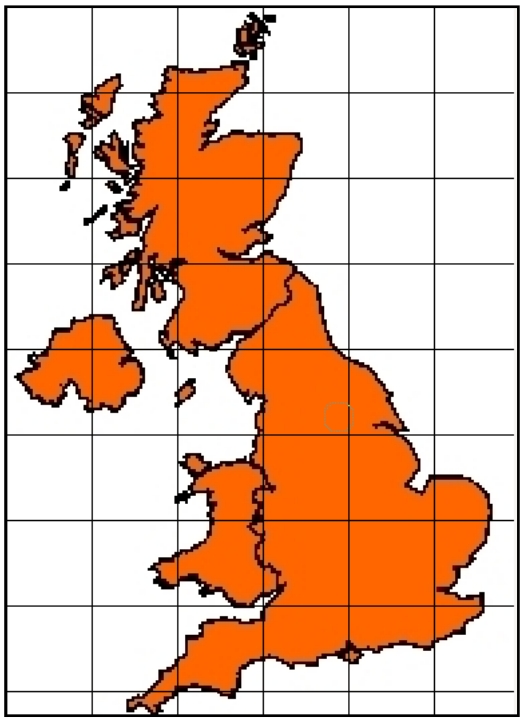


Figure 9 - Single dataset split up into multiple physical parts

The first case is an example of a dataset being split into logical parts. In this case, each part-dataset should be treated as a Dataset in its own right and should have its own Dataset metadata record. *In this case the guidance for these part datasets is the same as that for whole Datasets.* This is what the legislation means by "parts" when it says pre-defined datasets or parts of datasets. So in the example shown in Figure 8 there would be separate Dataset metadata records for England, Scotland and Wales.

However the second case (and perhaps the more common case) is that a Dataset is split into different physical parts for practical purposes, even though logically they belong together as a whole Dataset. An example would be tiled orthoimagery of the UK. In this case there is no need to produce metadata records for the individual parts, only for the Dataset as a whole. So in the example shown in Figure 9 there would be a single Dataset record but the dataset may be delivered in multiple parts. *The guidance in this section deals with this second case, where a Dataset is split into multiple parts for practical purposes.*

In this case a single Atom entry (in the Dataset Feed) can contain any number of link elements to link to the separate files for download. Each of these link elements must have a 'rel' value equal to "section".

In addition, a description must be provided that states how the parts fit together. This can be provided inline using a 'content' element, or it can be as another 'link' element, in which case this 'link' element must have a 'rel' value equal to "alternate".

The TG places no restriction on the form of this description – it could be a link to a website or document providing more information about the Dataset.

The following two examples illustrate the two options for providing this information.

```
<entry>
```

```
     <content> Inline description of how parts fit together
</content>

     <link rel=”section”... ></link> <!-- link to 1st file -->

     <link rel=”section”... ></link> <!-- link to 2nd file -->

     <link rel=”section”... ></link> <!-- link to 3rd file -->

          ...

</entry>
```

Example 7 Using a content element to provide an inline description for multifile datasets

Or:

```
<entry>

     <link rel=”alternate”... ></link> <!-- link to external
document -->

     <link rel=”section”... ></link> <!-- link to 1st file -->

     <link rel=”section”... ></link> <!-- link to 2nd file -->

     <link rel=”section”... ></link> <!-- link to 3rd file -->

          ...

</entry>
```

Example 8 Using a link element to provide a linked description for multifile datasets

In addition it is strongly recommended by UKLP that, where appropriate, geospatial bounding box and temporal information is added to these link elements using the attributes ‘bbox’ and ‘time’. The geospatial bounding box is encoded using the same format as a georss:box i.e. minlat, minlon, maxlat, maxlon in WGS84 and the temporal information is encoded using ISO 8601 time string.

i.e.

```
<link rel="section" href="http://linktofile" bbox=”52.0, 6.0, 53.9,
6.9”

time=”2012-10-24T12:00:00Z” type="image/tiff" hreflang="en"

title="Download for 24 Oct 2012"/>
```

Example 9 Using bbox and time attributes to encode geospatial and temporal information

4.1.11 Implementing the OpenSearch layer

The purpose of using an OpenSearch layer as well as Atom is to provide a service-like query interface on top of the static Atom feeds and in doing so meet the requirements of the INSPIRE legislation to provide service interfaces.

In order to provide this layer, two things are needed:

1. An OpenSearch Description document:

   This is a static document describing the type of queries that can be made.

2. An OpenSearch engine which responds to these queries:

   This is a web-based service which responds to query requests formulated according to the templates in the OpenSearch Description document.

These two components are used to facilitate the following operations from the INSPIRE Network Services regulation.

- Describe Spatial Data Set
- Get Spatial Data Set

It is important to note that the INSPIRE implementation of OpenSearch does not provide full search capabilities; it just uses the OpenSearch framework as a convenient mechanism for defining and fulfilling operations.

The OpenSearch Description Document

The OpenSearch description document contains a set of URL 'templates' these define the key/value pairs that can be used to make a query against the OpenSearch engine.

For a typical OpenSearch application (e.g. to search a particular web site) this might just be a free text search. However the INSPIRE OpenSearch description defines some very specific queries that can be made in order to implement the Describe Spatial Data Set and Get Spatial Data Set operations.

The following example shows the OpenSearch Description document that is outlined in the TG. It contains a link to the search engine and outlines the parameters that the search engine expects when queried.

```
<OpenSearchDescription xmlns="http://a9.com/-/spec/opensearch/1.1/"
xmlns:inspire_dls="http://inspire.ec.europa.eu/schemas/inspire_dls/1
.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://a9.com/-/spec/opensearch/1.1/
OpenSearch.xsd">

     <ShortName>CCM2-JRC</ShortName>

     <Description>CCM River and Catchment Database, version 2.1
(CCM2) -    Demo INSPIRE Download Service - Joint Research
Center</Description>

     <Url type="application/opensearchdescription+xml" rel="self"
template="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/opensearchdescription.x
ml" />
```

```
     <Url type="text/html" rel="results" template="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/search.php?q={searchTer
ms}" />

     <Url type="application/zip" rel="results"
template="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/search.php?uri_code={in
spire_dls:spatial_dataset_identifier_code?}&uri_namespace={inspire_d
ls:spatial_dataset_identifier_namespace?}&crs={inspire_dl:crs?}&lang
uage={language?}&q={searchTerms?}" />

     <Url type="application/atom+xml" rel="describedby"
template="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/search.php?uri_code={in
spire_dls:spatial_dataset_identifier_code?}&uri_namespace={inspire_d
ls:spatial_dataset_identifier_namespace?}&language={language?}&q={se
archTerms?}" />

     <Contact>dummy@email.eu</Contact>

     <Tags>ccm</Tags>

     <LongName>CCM River and Catchment Database, version
2.1</LongName>

     <Image height="16" width="16" type="image/png">http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/CCM2_Windows2b.png</Ima
ge>

     <Query role="example"
inspire_dls:spatial_dataset_identifier_namespace="http://ccm.jrc.ec.
europa.eu/"
inspire_dls:spatial_dataset_identifier_code="ccm2.1_2000"
inspire_dls:crs="http://www.opengis.net/def/crs/EPSG/0/4326"
language="en" title="CCM2 Window 2000 (North)" count="1" />

     <Query role="example"
inspire_dls:spatial_dataset_identifier_namespace="http://ccm.jrc.ec.
europa.eu/"
inspire_dls:spatial_dataset_identifier_code="ccm2.1_2001"
inspire_dls:crs="http://www.opengis.net/def/crs/EPSG/0/4326"
language="en" title="CCM2 Window 2001 (Western Islands)" count="1"
/>

     <Query role="example"
inspire_dls:spatial_dataset_identifier_namespace="http://ccm.jrc.ec.
europa.eu/"
inspire_dls:spatial_dataset_identifier_code="ccm2.1_2002"
inspire_dls:crs="http://www.opengis.net/def/crs/EPSG/0/4326"
language="en" title="CCM2 Window 2002 (South)" count="1" />
```

```
     <Query role="example"
inspire_dls:spatial_dataset_identifier_namespace="http://ccm.jrc.ec.
europa.eu/"
inspire_dls:spatial_dataset_identifier_code="ccm2.1_2003"
inspire_dls:crs="http://www.opengis.net/def/crs/EPSG/0/4326"
language="en" title="CCM2 Window 2003 (West)" count="1" />

     <Developer>European Commission - Joint Research
Center</Developer>

     <Language>en-us</Language>

     <Language>it-it</Language>

</OpenSearchDescription>
```

The table below outlines how this OpenSearch Description document should be completed.

XML Element/sub-element	XML Attribute	Value	UKLP (✓✓) INSPIRE (✓) Optional (+) More than one allowed (*)
ShortName		A human readable title for the Download Service	✓✓
Description		A human-readable description or abstract for the Download Service	✓✓
Url			✓✓
	@type	“application/opensearchdescription+xml”	✓✓
	@rel	“self”	✓✓
	@template	http link to this opensearch description document	✓✓
Url		generic search template (for browser integration)	✓✓
	@type	“application/atom+xml”	✓✓
	@rel	“results”	✓✓
	@template	“[search_engine_http_path]?q={searchTerms}”	✓✓
Url		Template for Describe Spatial Data Set	✓✓

		operation	
	@type	“application/atom+xml”	✓✓
	@rel	“describedby”	✓✓
	@template	“[search_engine_http_path]?spatial_dataset_identifier_code={inspir e_dls:spatial_dataset_identifier_code?}&spatial_dataset_identifier_name space={inspire_dls:spatial_dataset_identifier_namespace?}&language={language?}&q={searchTerms?}"	✓✓
Url		Template for Get Spatial Data Set operation	✓✓
	@type	Media type appropriate for the download data format	✓✓
	@rel	“results”	✓✓
	@template	?spatial_dataset_identifier_code={inspire_dls:spatial_dataset_identifier_code?}&spatial_dataset_identifier_namespace={inspire_dls:spatial_dataset_identifier_namespace?}&crs={inspire_dls:crs?}&language={language?}&q={searchTerms?}"	✓✓
Contact		Basic contact information	✓✓
Tags		Keywords for the dataset	✓
LongName		A longer human readable title for the dataset	✓✓
Image		An image can be supplied that is associated with the dataset. This will be used as an icon in some client applications. Ideally a 16x16 pixel image of type "image/x-icon" or "image/vnd.microsoft.icon" and a 64x64 pixel image of type "image/jpeg" or "image/png.	✓*
	@height	Height of the image in pixels e.g. 16	✓

	@width	Width of the image in pixels e.g. 16	✓
	@type	Media type of the image	✓
Query		Example of an HTTP Query to the OpenSearch engine according to one of the query templates. More than one example can be given.	✓*
	@role	"example"	✓
	@[other]	Other attributes should correspond to the query template e.g. `inspire_dls:spatial_dataset_identifier_code`="ccm2.1_2003"	✓

As described above, in addition to the OpenSearch Description, it is necessary to implement and deploy an OpenSearch engine to respond to queries for Describe and Get Spatial Data Set. This engine may be implemented using any programming language or software. The development of this software is beyond the scope of this document but Annex B shows an example implementation of such a search engine implemented in PHP.

The Describe Spatial Data Set operation

The query template for Describe Spatial Data Set operation is defined in the OpenSearch document as follows:

```
...

template="http://download.myorg.org/search?spatial_dataset_identifier_code={inspire_dls:spatial_dataset_identifier_code?}&amp;spatial_dataset_identifier_namespace={inspire_dls:spatial_dataset_identifier_namespace?}&amp;crs={inspire_dls:crs?}&amp;language={language?}&amp;q={searchTerms?}"
```

Example 10 OpenSearch Template for Describe Spatial Data Set operation

An example of a query request following this template would look like:

```
http://download.myorg.org/search?spatial_dataset_identifier_code=abc123&spatial_dataset_identifier_namespace=provider.com&language=en
```

Example 11 Example query to OpenSearch service

The response to this operation from the engine must be the atom feed containing information about the Pre-defined Dataset.

The Get Spatial Data Set operation

And similarly for the Get Spatial Data Set operation, the template looks like this

```
...
```

```
template="http://download.myorg.org/search?spatial_dataset_identifier_code={inspire_dls:spatial_dataset_identifier_code?}&amp;spatial_dataset_identifier_namespace={inspire_dls:spatial_dataset_identifier_namespace?}&amp;crs={inspire_dls:crs?}&amp;language={language?}&amp;q={searchTerms?}"
```

Example 12 OpenSearch template for Get Spatial Data Set operation

And a corresponding query request looks like this:

```
http://download.myorg.org/search?spatial_dataset_identifier_code=abc123&spatial_dataset_identifier_namespace=provider.com&crs=http://www.opengis.net/def/crs/EPSG/0/4326&language=en
```

Example 13 Example query to OpenSearch service

The response to this operation from the engine must be the Pre-defined Dataset itself e.g. in a zip file.

Note that where a Pre-defined Dataset is available in multiple parts (Section 4.1.10) then it is deemed acceptable to return the Atom Dataset feed which contains the links to the multiple parts. In this case the "`type`" of the URL template must indicate that the response will be of type "`application/atom+xml`"

4.1.12 Using HTML content to Improve the Appearance of Atom Feeds

One of the benefits of using Atom is that it integrates with existing tools on the web, such as browsers and feed-readers. Atom feeds can be created that contain HTML or XHTML content instead of just plain text and these feeds are then rendered in the client. This can be used to make atom feeds visually attractive to end users and allows for the inclusion of normal HTML elements such as images etc.

The example below shows a feed (from JRC) that contains HTML content for the `atom:summary` element as viewed in a web browser. The feed itself is reproduced in Annex C.

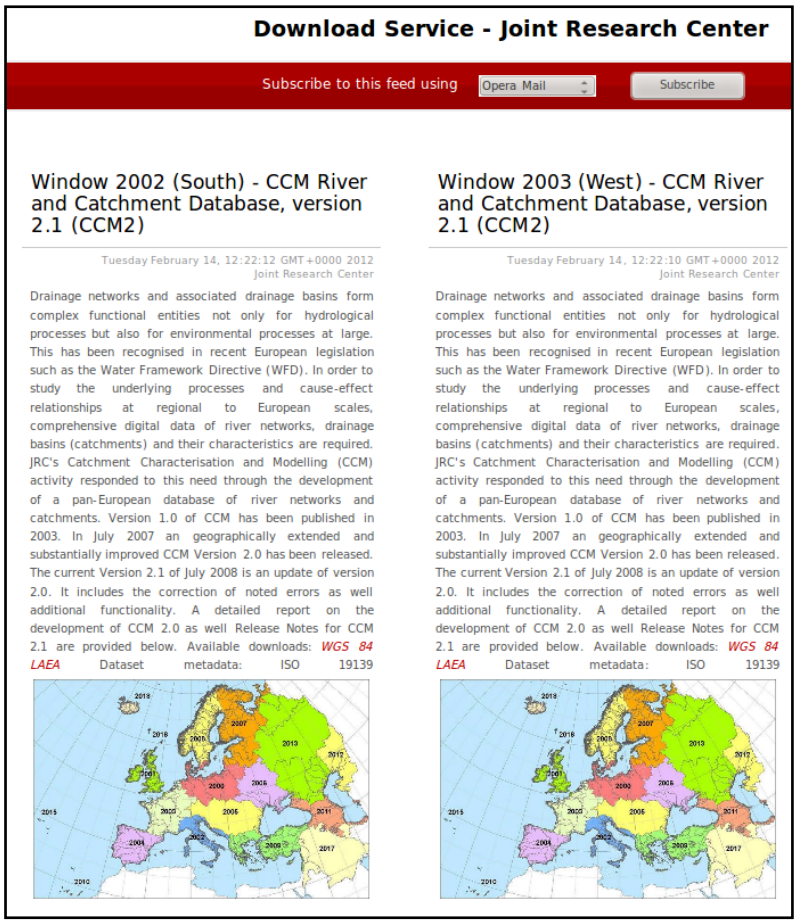


Figure 10 - Atom Feed supplemented with HTML content, viewed in a browser

HTML or XHTML markup can be used in `atom:content` elements and in any Atom "Text constructs".

The list of Text constructs used in this guidance are:

- `atom:rights`
- `atom:subtitle`
- `atom:summary`
- `atom:title`

Therefore any of these elements may contain HTML or XHTML. For example the following shows a `atom:summary` element containing some html:

```
<summary type="html">
     <![CDATA[
         <div> <b>here is a a summary in bold text </b></div>
     ]]>
</summary>
```

Example 14 Embedded HTML with a CDATA section

In this example the HTML `<div>` element is within a CDATA section. This is so that the html is not parsed by an XML parser.

An alternative approach would be to use escape characters within the HTML:

```
<summary type="html"> &lt;div&gt; &lt;b&gt;here is a a summary in bold text &lt;/b&gt;&lt;/div&gt; </summary>
```

Example 15 Embedded HTML using escape characters

The Atom specification states that the HTML must be escaped and does not mention the use of CDATA as an alternative way to avoid parsing problems. However the TG uses CDATA so for consistency UKLP also recommends the use of CDATA sections as an alternative to escaping inline content.

To include HTML or XHTML content within an Atom element the `type` attribute of the element must be set appropriately to “html” or “xhtml”.

4.1.13 Reusable Templates for Atom and OpenSearch Implementation

Annex A contains templates which may be used as the basis for implementation for Atom Feeds and OpenSearch Download Services.

4.2 WFS Implementation: Pre-Defined Download Service

The WFS implementation of an INSPIRE Pre-Defined Download Service is based on the ISO 19142 Web Feature Service standard for a Web Feature Service along with the ISO 19143 Filter Encoding Specification.

WFS is designed to serve ‘features’ in response to queries for those features. Using WFS to serve pre-defined datasets essentially involves serving pre-defined collections of features in response to pre-canned stored queries.

In order to meet the requirements of the Network Services Implementing Rules several WFS and FES conformance classes must be implemented as well as specific extensions for INSPIRE.

The INSPIRE extensions for Pre-defined Download Services are:

- Extended Capabilities – more information in the capabilities response
- Pre-canned Stored Queries to return datasets
- Extensions for multi-lingual support

The follow sections define in more detail what must be implemented for a Pre-defined Download Service.

Note that ISO 19142 is the same specification as OGC Web Feature Service 2.0. Earlier versions of WFS do not meet the requirements for INSPIRE Download Services.

Likewise, ISO 19143 is the same specification as OGC Filter Encoding 2.0, and previous versions of the Filter Encoding specification do not meet the INSPIRE requirements for Download Services.

4.2.1 WFS and FES Conformance Classes

Before implementing the INSPIRE extensions for WFS, it is first necessary to implement some basic WFS functionality. According to the TG, the following conformance classes from ISO 19142/19143 must be implemented.

- ISO 19142 'Simple WFS'
- ISO 19142 'HTTP GET' Conformance Class
- ISO 19143 'Query'

These conformance classes are described in full detail in the respective standards however a brief overview of each is given here.

19142 'Simple WFS' Conformance Class

The 'Simple WFS' Conformance Class is described in the ISO 19142 standard as follows:

> *The server shall implement the following operations: GetCapabilities, DescribeFeatureType, ListStoredQueries, DescribeStoredQueries, GetFeature operation with at least the StoredQuery action. One stored query, that fetches a feature using its id, shall be available, but the server may also offer additional stored queries. Additionally, the server shall conform to at least one of the HTTP GET, HTTP POST or SOAP conformance classes.*

On the last point, we will see in the next section that the HTTP GET conformance class is mandatory, so while SOAP and HTTP POST may be implemented the logical choice is to prioritise the implementation of HTTP GET.

The ISO 19142/19143 specifications must be followed when implementing the Simple WFS conformance class which provides the basic functionality of a WFS using the following request types.

GetCapabilities Operation

Request: Requests general information about the service.

Response: Describes the contents of the WFS; who runs it, what feature types are available, spatial and temporal range. This is the usual entry point to a WFS and the starting point for querying an unknown WFS.

Reference for Implementation: ISO 19142, Section 8

DescribeFeatureType Operation

Request: Request for specific information about a feature type.

Response: Describes the types of features available from the WFS. Returns XML Schema describing the feature types.

Reference for Implementation: ISO 19142, Section 9

ListStoredQueries Operation

Request: Ask which stored queries are defined.

Response: Lists the stored queries that are available on the server. For the SimpleWFS Conformance Class it is mandatory to provide a stored query that fetches a feature using its ID. This is described in ISO 19142.

Reference for Implementation: ISO 19142, Section 14.3

DescribeStoredQueries Operation

Request: Ask for more detail about one or more pre-canned stored queries.

Response: Describes one or more stored queries in more detail.

Reference for Implementation: ISO 19142, Section 14.4

GetFeature Operation

Request: Ask for features (spatial objects) which meet particular query criteria.

Response: Returns one or more features (spatial objects) according to any query parameters passed with the GetFeature request. A GetFeature request may be used in conjunction with a stored query or an ad-hoc query (although the latter is not part of the Simple WFS conformance class).

Reference for Implementation: ISO 19142, Section 11

19142 'HTTP GET' Conformance Class

The 'HTTP GET' Conformance Class is described in the ISO 19142 standard as follows:

> *The server shall implement the Key-value pair encoding for the operations that the server offers.*

This simply means that the WFS shall respond to HTTP Get queries taking key/value pairs as defined in 19142, e.g.

```
http://...mywfs?request=GetCapabilities&service=WFS&version=2.0
```

Example 16 Example HTTP GET request to WFS.

Reference for Implementation: ISO 19142, Annex D.2

19143 'Query' Conformance Class

The 'Query' Conformance Class is described in the ISO 19143 standard as follows:

> *Service that references this International Standard materializes a concrete query element that is substitutable for fes:AbstractQueryElement.*

The meaning of a 'query' is described elsewhere in 19143 as:

A query expression is an action that performs a search over some set of resources and returns a subset of those resources.

In fact, the earlier conformance class 'Simple WFS' depends on this one, so if you have implemented everything in 'Simple WFS' correctly your implementation will conform to the 19143 'Query' conformance class i.e. it will be possible to make queries to the WFS.

Reference for Implementation: ISO 19143, Section 6.2

4.2.2 Stored Queries

Stored Queries are pre-defined queries that may be targeted at a WFS. They are used in conjunction with the GetFeature operation.

To make such a request the pattern is:

```
GetFeature request + Stored Query ID + Stored Query parameters
```

e.g. The following example requests the feature with the ID 'f97' using the GetFeatureById stored query.

```
http://myINSPIREwfs.org/wfs?service=WFS&version=2.0.0&request=GetFeature&STOREDQUERY_ID=urn:ogc:def:query:OGC-WFS::GetFeatureById&ID=f87
```

Example 17 GetFeature request using the GetFeatureById stored query.

In order to use a predefined stored query the usual interaction with the WFS would be:

Issue a ListStoredQueries request to find out which stored queries are available

Issue a DescribeStoredQueries request for the stored query of interest to find out which arguments the query accepts.

Issue a GetFeature request with a STOREDQUERY_ID key/value pair and appropriate query arguments for that query.

The 'Simple WFS' conformance class mandates the implementation of the GetFeatureById stored query. This is normal for all WFS implementations and the 19142 specification should be followed.

In addition, the TG mandates the implementation of an additional stored query to retrieve pre-defined datasets by the following query parameters:

- DataSet Id
- CRS

The TG also makes reference to a 'Language' parameter to align with the legal implementing rules, but then later says that this serves no purpose for a WFS GetFeature operation since WFS features are language independent.

This stored query should be advertised in the response to a ListStoredQueries request as follows:

```
<?xml version="1.0" encoding="UTF-8"?>

<wfs:ListStoredQueriesResponse
xmlns:wfs="http://www.opengis.net/wfs/2.0" xmlns:ps="urn:x-
inspire:specification:gmlas:ProtectedSites:3.0">

     <!—GetFeatureById stored query -->

     <wfs:StoredQuery id="urn:ogc:def:query:OGC-
WFS::GetFeatureById">

          <wfs:Title xml:lang="en">Get Feature By ID</wfs:Title>


     <wfs:ReturnFeatureType>ps:ProtectedSite</wfs:ReturnFeatureType
>

     </wfs:StoredQuery>

     <!-- GetDatasetById stored query – INSPIRE extension.-->

     <wfs:StoredQuery
id="urnx:wfs:StoredQueryId:INSPIRE:GetDataSetByID">

          <wfs:Title xml:lang="en">Get Spatial Dataset By
ID</wfs:Title>


     <wfs:ReturnFeatureType>ps:ProtectedSite</wfs:ReturnFeatureType
>

     </wfs:StoredQuery>

</wfs:ListStoredQueriesResponse>
```

Example 18 Typical response from a ListStoredQueries request

Note that the value of the wfs:ReturnFeatureType will depend on the type of features available in the WFS. In this case the WFS serves 'ProtectedSite' features.

In order to find out which parameters the stored query takes a DescribeStoredQueries request can be made as follows:

```
http://myINSPIREwfs.org/wfs?service=WFS&version=2.0.0&request=Descri
beStoredQueries&STOREDQUERY_ID=urnx:wfs:StoredQueryId:INSPIRE:GetDat
aSetByID
```

Example 19 Typical DescribeStoredQueries request

The parameters DataSetId and CRS must be accepted as follows.

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<wfs:DescribeStoredQueriesResponse
xmlns:wfs="http://www.opengis.net/wfs/2.0" xmlns:ps="urn:x-
inspire:specification:gmlas:ProtectedSites:3.0">

     <wfs:StoredQueryDescription
     id="urnx:wfs:StoredQueryId:INSPIRE:GetDataSetByID">

          <wfs:Title>Get Spatial Dataset By ID</wfs:Title>

          <wfs:Abstract>This Stored Query request shall retrieve a
pre-defined spatial dataset by its identifier containing the INSPIRE
Spatial Objects defined for the specified CRS </wfs:Abstract>

          <wfs:Parameter name="DataSetId" type="xsd:string">

               <wfs:Title>Get pre-defined dataset by id</wfs:Title>

               <wfs:Abstract/>

          </wfs:Parameter>

          <wfs:Parameter name="CRS" type="xsd:string">

               <wfs:Title>Coordinate Reference System</wfs:Title>

               <wfs:Abstract/>

          </wfs:Parameter>

     </wfs:StoredQueryDescription>

</wfs:DescribeStoredQueriesResponse>
```

Example 20 Typical response from a DescribeStoredQueries request

This stored query can then be used in conjunction with the GetFeature operation. i.e.

```
http://mywfs.org/wfs?service=WFS&version=2.0.0&request=GetFeature&ST
OREDQUERY_ID=urnx:wfs:StoredQueryId:INSPIRE:GetDataSetByID&DataSetID
={DatasetID}&CRS={CRS}
```

Example 21 Using a stored query with a GetFeature operation

The response to which is a WFS FeatureCollection containing all the features in the dataset identified by DatasetId parameter in the CRS requested by the CRS parameter.

i.e. this satisfies the INSPIRE legal requirement for the Get Spatial Dataset operation.

4.2.3 Extended Capabilities

ISO 19142 WFS provides an extension mechanism whereby additional metadata can be included in a GetCapabilities response using the ows:ExtendedCapabilities element. This element acts as an extension point where custom capabilities elements can be added.

Within the scope of INSPIRE, the ows:ExtendedCapabilities mechanism is used to provide metadata about the Download Service.

There are two options given:

- Use extended capabilities to link to an external metadata record
- Use extended capabilities to provide the metadata inline

In the context of UKLP we require that the first option is used and that the extended capabilities simply links to an external metadata record for the Download Service as follows.

```
<ows:ExtendedCapabilities>
   <inspire_dls:ExtendedCapabilities>
      <inspire_common:MetadataURL>
      <inspire_common:URL>{link to metadata record for Download
      Service}</inspire_common:URL>
      <inspire_common:MediaType>application/vnd.ogc.csw.GetRecordByI
dResponse_xml</inspire_common:MediaType>
      </inspire_common:MetadataUrl>
   </inspire_dls:ExtendedCapabilities>
</ows:ExtendedCapabilities>
```

Example 22 Extended capabilities section

Note the XML namespaces *inspire_dls* and *inspire_common.* These namespaces refer to schemas defined in the following locations.

http://inspire.ec.europa.eu/schemas/common/1.0/common.xsd

- http://inspire.ec.europa.eu/schemas/inspire_dls/1.0/inspire_dls.xsd

These namespaces should therefore be declared in the header sections of the GetCapabilities response as follows.

```
<?xml version="1.0" encoding="UTF-8"?>
<WFS_Capabilities version="2.0.0"
xmlns="http://www.opengis.net/wfs/2.0"
xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:fes="http://www.opengis.net/fes/2.0"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:ows="http://www.opengis.net/ows/1.1"
```

```
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:inspire_common="http://inspire.ec.europa.eu/schemas/common/1.0
"
xmlns:inspire_dls="http://inspire.ec.europa.eu/schemas/inspire_dls/1
.0" xsi:schemaLocation="

http://www.opengis.net/wfs/2.0
http://schemas.opengis.net/wfs/2.0/wfs.xsd

http://www.opengis.net/ows/1.1
http://schemas.opengis.net/ows/1.1.0/owsAll.xsd

http://inspire.ec.europa.eu/schemas/inspire_dls/1.0
http://inspire.ec.europa.eu/schemas/1.0/inspire_dls.xsd">
```

Example 23 WFS namespace declarations

The Extended Capabilities section shall also contain information about the supported languages. This is detailed in the following section.

4.2.4 Language Requirements

To conform to the TG, the WFS must also provide multi-lingual support by adding the following extensions to the ISO 19142 standard:

- An additional parameter 'Language' is added to the GetCapabilities operation.
- The GetCapabilities response advertises the default and supported languages.
- Elements in the GetCapabilities response, specifically *Title* and *Abstract*, must be returned in the requested language (where the language is supported).
- The extended capabilities section must include information about supported and default languages.

Note that it is acceptable to provide mono-lingual services but they must still follow the requirements for multi-lingual support, i.e. they must accept the 'Language' parameter and advertise which language they support.

Most existing WFS software will simply ignore the 'Language' parameter and return the default language declared in the extended capabilities. In order to provide multi-lingual services some people deploy a wrapper around the WFS that intercepts the incoming language parameter and sends it to different underlying services depending on the requested language.

The requirements for multilingual support must be implemented as follows in the next sections.

Additional Language Parameter

The GetCapabilities HTTP GET request must take another parameter called 'LANGUAGE'. This parameter takes three letter language codes from ISO 639-2.

For example:

```
http://myINSPIREwfs.org/wfs?REQUEST=GetCapabilities&VERSION=2.0.0&SERVICE=WFS&LANGUAGE=eng
```

Example 24 WFS request with LANGUAGE parameter

The full list of available language codes is here:

- http://www.loc.gov/standards/iso639-2/php/code_list.php

For the six UK Gemini languages the relevant codes are as shown in Table 10.

Language	Code
Cornish	cor
English	eng
Irish (Gaelic)	gle
Gaelic Scots	gla
Ulster Scots	sco
Welsh	wel

Table 10 - Gemini Language codes for use in WFS

As with the Atom approach, for WFS Download Services within the scope of INSPIRE at least one of the official EU languages must be used. English (eng) and Irish (gla) are the only UK Gemini languages that are also official EU languages.

Languages in GetCapabilities Response

In response to a GetCapabilities request, the content of any *Title* or *Abstract* elements must be populated using text written in the requested language.

The only exception to this is if the requested language is unsupported, in which case the default language is used.

The GetCapabilities response itself advertises which languages are available using extended capabilities as described in the next section.

Extended Capabilities requirements for Languages

There are three language elements that must be added to the Extended Capabilities section. These elements indicate:

The ‘default’ language – the language the server defaults to.

The ‘supported’ languages – other languages that are supported.

The ‘response’ language – the language used for *this particular* GetCapabilities response.

For example, a server that supports all six Gemini languages would contain the following elements in the extended capabilities section (assuming the requested language was Ulster Scots and the default language English).

```
<inspire_dls:ExtendedCapabilities>
...
      <inspire_common:SupportedLanguages>
            <inspire_common:DefaultLanguage>
            <inspire_common:Language>eng</inspire_common:Language>
            </inspire_common:DefaultLanguage>
            <inspire_common:SupportedLanguage>
            <inspire_common:Language>cor</inspire_common:Language>
            </inspire_common:SupportedLanguage>
            <inspire_common:SupportedLanguage>
            <inspire_common:Language>eng</inspire_common:Language>
            </inspire_common:SupportedLanguage>
            <inspire_common:SupportedLanguage>
            <inspire_common:Language>gle</inspire_common:Language>
            </inspire_common:SupportedLanguage>
            <inspire_common:SupportedLanguage>
            <inspire_common:Language>gla</inspire_common:Language>
            </inspire_common:SupportedLanguage>
            <inspire_common:SupportedLanguage>
            <inspire_common:Language>sco</inspire_common:Language>
            </inspire_common:SupportedLanguage>
            <inspire_common:SupportedLanguage>
            <inspire_common:Language>wel</inspire_common:Language>
            </inspire_common:SupportedLanguage>
      </inspire_common:SupportedLanguages>
      <inspire_common:ResponseLanguage>
            <inspire_common:Language>sco</inspire_common:Language>
```

```
      </inspire_common:ResponseLanguage>
</inspire_dls:ExtendedCapabilities>
```

Example 25 Declaring languages in WFS

4.3 WFS Implementation: Direct Access Download Services

The final implementation option recommended by the INSPIRE TG is WFS "Direct Access". This is the 'classic' WFS implementation providing ad-hoc query capabilities over collections of features and their property values.

For example imagine a feature type with a property 'colour'. You could query the WFS for all instances of this feature type that have the attribute value *colour* = "RED". Clearly this is a simplistic example, but the ability to get back features based on property is a key concept in geospatial information systems.

In order to support this approach in INSPIRE the TG states that the pre-defined functionality must be implemented, along with the following additional WFS/FE conformance classes:

- ISO 19142 Basic WFS
- ISO 19143 Ad hoc Query
- ISO 19143 Resource Identification
- ISO 19143 Minimum Standard Filter
- ISO 19143 Minimum Spatial Filter
- ISO 19143 Minimum Temporal Filter
- ISO 19143 Minimum XPath

As for the pre-defined WFS, the ISO standards should be referred to for complete implementation details. The encoding of query elements is the subject of the Filter Encoding specification (ISO 19143) and can support very complex queries.

The following sections provide a very high-level overview of each of the additional conformance classes.

4.3.1 Basic WFS

This extends the 'Simple WFS' conformance class with the following functionality

GetFeature with 'Query', **Reference**: ISO 19142, Section 11.2.4.3

GetPropertyValue Operation, **Reference**: ISO 19142, Section 10

4.3.2 Ad hoc Query

An ad hoc query is one which is not known beforehand. This contrasts with the stored query approach where the parameters of the query are defined in advance (e.g. DataSetID, CRS, Language). With the ad hoc query it is possible to query on any properties of a feature. Supporting

ad hoc querying is the main distinguisher between the Direct Access WFS and the Pre-defined WFS solutions.

Reference: ISO 19143, Section 7

4.3.3 Resource Identification

Implementing this conformance class allows specific resources (i.e. specific spatial objects) to be addressed directly. This may be used to retrieve a spatial object by ID or some property values from that spatial object.

Reference: ISO 19143, Section 7.14.3

4.3.4 Minimum Standard Filter

The Minimum Standard Filter conformance class specifies a set of operators that must be implemented and useable within query expressions to enable a GetFeature or GetPropertyValue request to be made based on some properties of a feature.

These operators are:

- PropertyIsEqualTo
- PropertyIsNotEqualTo
- PropertyIsLessThan
- PropertyIsGreaterThan
- PropertyIsLessThanOrEqualTo
- PropertyIsGreaterThanOrEqualTo

Using these properties it is possible to make simple comparison queries on spatial object property values.

References: ISO 19143, Sections 7.7.3.4 to 7.7.3.7, Section 7.14.4

4.3.5 Minimum Spatial Filter

This conformance class adds support for spatial bounding boxes in query expressions.

Reference: ISO 19143, Sections 7.8.2, 7.8.3, 7.8.4, 7.14.5

4.3.6 Minimum Temporal Filter

This conformance class adds support for temporal expressions in query expressions.

References: ISO 19143, Sections 7.9.2, 7.9.3, 7.14.6

4.3.7 Minimum XPath

This conformance class add support for querying using XPath to navigate feature instances directly.

Reference: ISO 19143, Sections 7.4.4

4.4 Additional notes on WFS implementations

4.4.1 Features and Datasets

Web Feature Services do not have the concept of a 'dataset'. A WFS can only serve features, grouped together in feature collections. However the INSPIRE implementing rules do have the concept of a dataset. In order to meet requirements for delivering datasets it is necessary to artificially construct datasets from sets of features and deliver them using pre-defined using stored queries (as described in section 4.2.2).

For Direct-Access WFS a separate endpoint must be provided for each dataset, thus providing one dataset per GetCapabilities response.

4.4.2 Conformance Testing

At the time of writing (2012) there are no known automatic tools available for determining whether a WFS implementation meets the requirements of the WFS and FE conformance classes. However there is a planned activity under OWS-9 (the Open Geospatial Consortium Web Services Testbed – Phase 9) to develop Compliance & Interoperability Testing & Evaluation (CITE) tests for WFS 2.0.

5 Coordinate Reference Systems

Another important aspect of interoperability for Download Services is the need to make data available in agreed coordinate reference systems (CRS). The following sections contain guidelines on the use of CRSs for the Atom and WFS implementations.

For Download Services implemented in the context of UKLP, the previously published UK Location policy paper for Coordinate Reference Systems [12] applies.

In summary, for 2D data, this means that the Download Service will support the INSPIRE-mandated systems. There are two geographical CRS, one for regions of continental Europe (ETRS89), and one for regions outside of continental Europe (ITRS);

- 2d Geographical coordinate system based on ETRS89 in continental Europe (including the United Kingdom)
    - **http://www.opengis.net/def/crs/EPSG/0/4258**
- 2d Geographical coordinate system based on ITRS outside of continental Europe
    - **http://www.opengis.net/def/crs/EPSG/0/4326** (WGS 84 2D)

Additionally, the UK will also adopt the current national grid systems used in Great Britain and Northern Ireland for the land area. It is recommended that a Download Service provides support for at least one of these projections, as appropriate:

- OSGB 1936 / British National Grid
    - **http://www.opengis.net/def/crs/EPSG/0/27700**
- TM 75 / Irish Grid
    - **http://www.opengis.net/def/crs/EPSG/0/29903**
- ETRS89 / Irish Transverse Mercator
    - **http://www.opengis.net/def/crs/EPSG/0/2157**

For pan-European spatial analysis and reporting where true area representation is required, a regional authalic (equal area) projection is recommended;

- ETRS89 Lambert Azimuthal Equal Area (ETRS89-LAEA) projection
    - **http://www.opengis.net/def/crs/EPSG/0/3035**

Note also that in some cases the INSPIRE Data Specifications contain additional theme-specific guidance for CRSs. In this case, the thematic guidance should also be followed for data in that theme.

For example the Data Specification for the theme *Atmospheric Conditions and Meteorological Geographical Feature*s contains additional guidance about using CRSs defined by WMO (World Meteorological Organization).

When deciding which CRS to use when that data is not being published in conformance with the INSPIRE Data Specifications, data publishers should consider:

- the use cases associated with that service
- how the published data is likely to be used
- with what other data it is likely to be combined
- which CRS(s) will maximise interoperability of the dataset

In such situations, it is recommended that at least one of the CRS defined above be adopted for publication. As with INSPIRE conformant data, multiple CRS may be supported, with separate links being provided for each CRS.

5.1 CRS and Atom Download Services

Data published using Atom that is conformant to INSPIRE thematic Data Specifications [13], must follow the general guidance above. Multiple CRS may be supported, with separate links being provided for each CRS (as described in section 4.1.5).

5.2 CRS and WFS Download Services

Data published using the WFS option must also follow the general guidance above. As with a WMS view service, good WFS 2.0 compliant software will be able to declare support for feature requests in a variety of CRS' and if that multiple CRS functionality is available there will be no need to provide a CRS 'Transformation Service' for INSPIRE services.

6 Managing Digital Rights

Whilst the UK Location Strategy has a preference for ensuring that as much data is published in an open way, free from any restrictions on use, it is also recognised that, for a variety of reasons, this may not be possible for all data providers and/or datasets.

UK Location has produced a set of Operational Guidance for Data Sharing [3] which provides advice, guidance and policy in this area. This includes guidance on principles for sharing information between public authorities, data licensing, and Intellectual Property Rights (IPR).

Dealing with these issues may require some data publishers to implement technical measures that provide a degree of control over who can access their services. Currently neither INSPIRE nor UK Location provide any guidance on how this might be implemented. However, through the Business Interoperability Working Group (BIWG) UK Location is actively looking at defining a consistent approach that will enable an interoperable solution to digital rights management across UK Location.

Once this work is completed, this guidance will be updated to provide a clear steer on how to implement a digital rights management solution for Download Services. In the meantime, Data Publishers are free to implement their own mechanisms to manage access to their data, but should check with UK Location (see 1.9 above) first as to the current status of the BIWG work.

7 Registering a Download Service with UK Location

In order for a Download Service to be incorporated into the UK Location Infrastructure, the following steps need to be followed:

Implement the Download Service. The Download Services needs to be implemented and made visible on the internet, in accordance with the guidance within this document. The Download Services needs to be conformant with one of the Download Service options.

Create Service Metadata. A metadata record should be created describing the Download Service. Guidance for creating these records is in the UK Location Discovery Metadata Service Operational Guidance [4], including options of tools for creating metadata records.

Update Dataset Metadata. The metadata for the dataset which are being published through the Download Service should be updated to include a "Resource Locator" referencing the Download Service. The UK Location Discovery Metadata Service Operational Guidance [4], particularly the "Data and Service Linking" section, describes how this should be done.

Publish Service and updated Dataset Metadata. Once the metadata has been created, it should be published for harvesting to the UK Location Central Services. The process for doing this is described in UK Location Discovery Metadata Service Operational Guidance [4], in the section "Registering Discovery Metadata records". The mechanism used to harvest these records is described in "Discovery Metadata Service Collection Interface Specification" [5]

Maintain Download Service. The Download Service must be maintained and kept up to date. Any changes to the Download Service should be reflected in the service capabilities (for WFS) or atom feeds (for Atom).

Maintain Download Service Metadata. Metadata for the service should be updated in-line with changes to the service and data delivered via the service.

The metadata records will be harvested and incorporated into the data.gov.uk portal. Once included in data.gov.uk the service can be discovered using the standard search tools, and the metadata will be presented in a way that will enable a potential user to access the Download Service.

7.1 Registering a Download Service – Devolved Administrations

Data providers within Scotland, Northern Ireland and Wales should also refer to any specific guidance (see Sections 1.2 and 1.9) that is applicable.

For example, Scotland has implemented their own Spatial Data Infrastructure (metadata records from which are harvested by data.gov.uk). To register a download service in the Scottish SDI, a new service metadata record that describes the Download Service must be published to the Scottish SDI, in the same way that View Service metadata records are currently published.

Advice on how to upload your metadata to the Scottish SDI is available in guidance on using the Scottish SDI Discovery Metadata catalogue http://scotgovsdi.edina.ac.uk.

8 Quality of Service

The INSPIRE legislation and TG describes the Quality of Service that must be met by an INSPIRE compliant Download Service and also describes specific testing procedures that must be followed to determine whether a particular Download Service meets the expected Quality of Service.

The three criteria that must be measured to evaluate the Quality of Service are:

- **Service Performance**

- The response time to requests for data, both for spatial datasets and spatial objects.

- **Service Capacity**
  - The number of requests that can be made at any one time.

- **Service Availability**
  - The amount of time the Download Service is accessible for use.

In order to evaluate and monitor these criteria for a Download Service it will be necessary to create or deploy some sort of automated tool or script which can send requests (via http) to the service on an ongoing basis and monitor the responses.

The following sections outline, for each criterion above, the specific quality of service requirements that must be met according to the legislation, and the normalised testing procedure for evaluating whether these requirements have been met.

8.1 Requirements for Service Performance

The INSPIRE legislation states the following requirements for **performance** of Download Services:

- *For the Get Download Service Metadata operation, the response time for sending the initial response shall be maximum 10 seconds in normal situation.*

- *For the Get Spatial Data Set operation and for the Get Spatial Object operation, and for a query consisting exclusively of a bounding box, the response time for sending the initial response shall be maximum 30 seconds in normal situation then, and still in normal situation, the download service shall maintain a sustained response greater than 0.5 Megabytes per second or greater than 500 Spatial Objects per second.*

- *For the Describe Spatial Data Set operation and for the Describe Spatial Object Type operation, the response time for sending the initial response shall be maximum 10 seconds in normal situation then, and still in normal situation, the download service shall maintain a sustained response greater than 0.5 Megabytes per second or greater than 500 descriptions of Spatial Objects per second.*

  […]

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

For all these requirements the normalised testing and evaluation procedures in Sections 8.2 to 8.9 must be followed.

Testing of these requirements may be done either on the “service side which is exposed to the internet” e.g. from another machine on the same internal network, or from a “central network node within the infrastructure” e.g. from a remote machine outside the internal network of the service. In the later case, network latency should be considered in the testing and evaluation procedure. UKLP recommends that testing is done on the *service side*. The following procedures therefore assume the testing is being done on the service side and do not take network latency into account. The official

guidance from the EC does provide formulae which take into account network latency and should be used if testing from outside the internal network of the service.

8.2 Testing Procedure for Service Performance

In order to test the service performance, regular sample requests must be made to the service on an ongoing basis (throughout the lifetime of the service). In practice this involves setting up an automated tool or job to regularly send requests to the Download Service.

At least 10 requests per hour must be made and these requests should be of mixed type.

The following mix must be used:

- **10%** of the requests **must** be Get Download Service Metadata requests
    - i.e. requests for the 19139 Download Service Metadata record
- **10%** of the requests **must** be Describe Spatial Data Set requests
    - i.e. requests for the 19139 Dataset Metadata record
- **80%** of the requests must be Get Spatial Dataset **or** Get Spatial Object requests
    - i.e. requests for pre-defined datasets or for sets of features
- At least **2%** of the requests **must** be Get Spatial Dataset requests

For any Get Spatial Dataset operations, only **one** pre-defined dataset shall be requested per request.

For the Get Spatial Object operations, the requests must be a query for a single feature type, with a BBOX parameter. The BBOX parameter shall be set so that the response size is at least 1 MB (or if the BBOX is random, the response size shall be on average greater than 1MB based on the last 100 requests)

If requests take a long time to run (e.g. if the response is very large), then the minimum 10 requests per hour limit *may be reduced*. In such cases a new request must be issued **no longer than 6 minutes after** the response from the previous one has been returned.

As part of the testing procedure it is necessary to collect the following information for **each test request** that is sent to the service.

- The request type
- The time between initiating each request and receiving the *initial* byte of the response (hereafter known as ***tFirst***)
- The time between initiating each request and receiving the *last* byte of the response (hereafter known as ***tLast***)
- The size of the response in MB (hereafter known as ***responseSize***)
- The number of data objects or object descriptions returned (hereafter known as ***responseCount***)

This information can then be used to evaluate the service performance.

8.3 Evaluation of Service Performance

The service performance is evaluated by taking the results of the testing procedures (above) and comparing them against the requirements of the legislation using set formulae which are described in the next two sections.

8.3.1 Evaluating Performance of Get Download Service Metadata requests

The requirement from the legislation that must be met is:

- *For the Get Download Service Metadata operation, the response time for sending the initial response shall be maximum 10 seconds in normal situation.*

For testing done on the service side (i.e. on an internal network) this corresponds to the time between initiating each request and receiving the *initial* byte of the response shall be no more than 10 seconds, i.e.

- For each request, ***tFirst*** shall be no more than 10 seconds

8.3.2 Evaluating Performance of Get Spatial Dataset and Get Spatial Object requests

The requirement from the legislation that must be met is:

- *For the Get Spatial Data Set operation and for the Get Spatial Object operation, and for a query consisting exclusively of a bounding box, the response time for sending the initial response shall be maximum 30 seconds in normal situation then, and still in normal situation, the download service shall maintain a sustained response greater than 0,5 Megabytes per second or greater than 500 Spatial Objects per second.*

For service side testing, this corresponds to the time between initiating each request and receiving the *initial* byte of the response shall be no more than 30 seconds, i.e.

- For each request, ***tFirst*** shall be less than 30 seconds

Then, an evaluation must be made of the throughput of the service. Throughput can be measured as either the data volume per second (MB/s) or the number of spatial objects or descriptions per second.

The throughput must exceed 0.5MB/s or it must exceed 500 spatial objects/descriptions per second. It does not have to meet both these criteria.

To measure the throughput in terms of data volume the following formula is used:

$$\frac{responseSize}{tLast - initialTime} \geq 0.5[MB/s]$$

Where initialTime is the time required to send the initial response at service side and is set at 10 seconds for the Get Download Service Metadata, Describe Spatial Data Set, Describe Spatial Object Type operations or 30 seconds for the Get Spatial Data Set and Get Spatial Object operations.

And to measure the throughput in terms of spatial objects/descriptions the following formula is used:

$$\frac{responseCount}{tLast - initialTime} \geq 500[Objects, Descriptions / s]$$

8.4 Requirements for Service Capacity

For service **capacity** the following requirement is made in the legislation:

- *The minimum number of simultaneous requests to a download service to be served in accordance with the quality of service performance criteria shall be 10 requests per second. The number of requests processed in parallel may be limited to 50.*

8.5 Testing Procedure for Service Capacity

Since capacity testing is designed to test the ability of a system to cope with load, it is noted in the TG that capacity testing on a production system shall be done only during **maintenance** time frames. This is to avoid over-stressing a production system and to provide a more accurate evaluation of the service capacity.

It is recommended, although not mandatory, to perform this testing monthly e.g. during regular systems maintenance. However the testing must be done at least once before launching the system and must be regularly performed afterwards.

In order to test capacity the same type of sample requests should be used that were used for testing service performance (Section 8.2).

The procedure for testing service capacity is to send requests to the service at a **rate of 10 new requests per second for a one minute period** in order to put a high load on the system. The system shall also be restricted so that no more than 50 requests are being processed at any one time.

Performance information for each request made during the service capability test must be collected as per the ongoing service performance tests (Section 8.2).

8.6 Evaluation of Service Capacity

The evaluation of the service capacity is actually an evaluation of whether a service can maintain service *performance* levels during a sustained period of high volume traffic.

Therefore to evaluate service capacity the service performance (Section 8.3) shall be evaluated for the one minute high load test period. If all the requirements for service performance are met during this high load period then the service capacity test is passed.

8.7 Requirements for Service Availability

For service **availability** the legislation makes the following requirement:

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

It is important to note that this requirement is intended to refer to availability during **normal service uptime**. Or in other words, planned downtime for maintenance etc. is not taken in account when measuring this availability.

However in addition to this 99% requirement during periods of normal service it is also recommended that planned downtime is less than 10 hours per month (i.e. less than 120 hours per year).

8.8 Testing Procedure for Service Availability

The same request packages that are made on an ongoing basis to test service performance may also be used to test service availability, i.e. whether the service was up and working or not.

Therefore in addition to the information captured while testing service performance (Section 8.2), such as response times, it is also necessary to capture, for each request, whether the service was available or not. Since these requests are ongoing this information can be used to determine the amount of time during which there is unplanned downtime.

Note that if the downtime is **planned** then this time must not be counted, so it is important to account for this when collecting performance data.

8.9 Evaluation of Service Availability

In order to evaluate service availability a time frame of 1 year has been established as the measurement period over with service availability is evaluated.

In order to meet the target of 99.9% the amount of **unplanned** downtime must be no more than **3.63 days per year**.

Annex A: Templates for Atom and OpenSearch

This annex contains XML templates which may be used to form the basis of Atom and OpenSearch documents. They should be populated in accordance with the guidance already given in this document. Whitespace may need to be removed if templates are copied directly from this document.

Download Service Feed Template

```
<?xml version="1.0" encoding="UTF-8"?>

<feed xmlns="http://www.w3.org/2005/Atom"
xmlns:georss="http://www.georss.org/georss"
xmlns:inspire_dls="http://inspire.ec.europa.eu/schemas/inspire_dls/1
.0"

xml:lang="en">

     <title>INSERT TITLE</title>

     <subtitle>INSERT SUBTITLE</subtitle>

     <link rel="self" href="INSERT HTTP LINK TO THIS FEED"
type="application/atom+xml"/>

     <link rel="describedby" href="INSERT HTTP LINK TO SERVICE
METADATA RECORD" type="application/vnd.iso.19139+xml"/>

     <link rel="search" href="INSERT HTTP LINK TO OPENSEARCH
DESCRIPTION" type="application/opensearchdescription+xml"/>

     <id>INSERT HTTP URI FOR THIS FEED</id>

     <rights>INSERT ACCESS CONTRAINTS</rights>

     <updated>INSERT LAST UPDATED DATE/TIME</updated>

     <author>

          <name>INSERT ORGANISATION NAME</name>

          <email>INSERT ORGANISATION EMAIL</email>

     </author>

     <entry>

          <title>INSERT TITLE FOR DATASET</title>

           <inspire_dls:spatial_dataset_identifier_code>INSERT
IDENTIFIER            CODE FOR
DATASET</inspire_dls:spatial_dataset_identifier_code>
<inspire_dls:spatial_dataset_identifier_namespace>INSERT
```

```
      IDENTIFIER NAMESPACE FOR DATASET
            </inspire_dls:spatial_dataset_identifier_namespace>

            <link href="INSERT HTTP LINK TO DATASET METADATA RECORD"
                  rel="describedby"
type="application/vnd.iso.19139+xml"/>

            <link rel="alternate" href="INSERT HTTP LINK TO
ALTERNATIVE           LANGUAGE DATASET FEED"
type="application/atom+xml"                          hreflang="INSERT
LANGUAGE CODE FOR ALTERNATIVE DATASET FEED"            title="INSERT
TITLE OF ALTERNATIVE DATASET FEED (IN ALTERNATIVE
      LANGUAGE)"/>

            <id>INSERT HTTP URI FOR DATASET FEED</id>

            <updated>INSERT TIME ENTRY WAS LAST UPDATED</updated>

            <summary>INSERT TITLE FOR ENTRY</summary>

            <georss:polygon>INSERT GEORSS POLYGON (5 PAIRS: LAT, LON
                  BOUNDING BOX)</georss:polygon>

            <category term="INSERT CODE FOR CRS (e.g. EPSG:4326)"
            scheme="INSERT HTTP URI SCHEME FOR CRS (e.g.
                  “http://www.opengis.net/def/crs/”) label="INSERT
LABEL FOR CRS         (e.g. WGS 84 2d"></category>

            <category term="INSERT CODE FOR 2nd CRS" scheme="INSERT
HTTP       URI SCHEME FOR 2nd CRS" label="INSERT LABEL FOR 2nd
                  CRS"></category>

      </entry>

      <entry>ADD MORE ENTRIES FOR ADDITIONAL DATASET FEEDS</entry>

</feed>
```

Dataset Feed Template

```
<?xml version="1.0" encoding="UTF-8"?>

<feed xmlns="http://www.w3.org/2005/Atom"
xmlns:georss="http://www.georss.org/georss"
xmlns:inspire_dls="http://inspire.ec.europa.eu/schemas/inspire_dls/1
.0" xml:lang="en">

      <title>INSERT TITLE FOR THE DATASET FEED</title>

      <subtitle>INSERT SUBTITLE FOR THE DATASET FEED</subtitle>

      <id>INSERT HTTP URI FOR THE DATASET FEED</id>
```

```
      <rights>INSERT ACCESS CONTRAINTS FOR THE DATASET</rights>

      <updated>INSERT LAST UPDATED DATE/TIME</updated>

      <author>

            <name>INSERT ORGANISATION NAME</name>

            <email>INSERT ORGANISATION EMAIL</email>

      </author>

      <link rel="self" href=”INSERT HTTP URI TO FEED"
      type="application/atom+xml" hreflang="INSERT LANGAUGE CODE FOR
FEED"      title="INSERT TITLE FOR FEED"/>

      <link rel="up" href="INSERT HTTP URI FOR THE PARENT FEED
(DOWNLOAD  SERVICE FEED)" type="application/atom+xml"
hreflang="INSERT LANGUAGE  CODE FOR TARGET PARENT FEED"
title="INSERT TITLE OF PARENT FEED"/>

      <entry>

            <title>INSERT DATASET TITLE, SPECIFIC TO FORMAT/CRS
                  COMBINATION</title>

             <summary> INSERT DATASET SUMMARY, SPECIFIC TO FORMAT/CRS
                  COMBINATION </summary>

       <id>INSERT HTTP URI FOR DATASET</id>

       <updated>INSERT LAST UPDATED DATE/TIME</updated>

       <category term=" INSERT CODE FOR CRS " scheme=" INSERT HTTP
URI   SCHEME FOR CRS " label=" INSERT LABEL FOR CRS "></category>

       <link rel="alternate" href=" INSERT HTTP LINK TO DOWNLOAD
DATASEST"  hreflang=" INSERT LANGUAGE CODE" title="INSERT TITLE OF
DATASET"/>

      </entry>

</feed>
```

OpenSearch Description Template

```
<OpenSearchDescription xmlns="http://a9.com/-/spec/opensearch/1.1/"

xmlns:inspire_dls="http://inspire.ec.europa.eu/schemas/inspire_dls/1
.0"

xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
```

```
xsi:schemaLocation="http://a9.com/-/spec/opensearch/1.1/
OpenSearch.xsd">

     <ShortName>INSERT SHORT NAME HERE</ShortName>

     <Description>INSERT TITLE HERE</Description>

     <Url type="application/opensearchdescription+xml" rel="self"

     template="INSERT LINK TO THIS DOCUMENT HERE"/>

     <Url type="application/atom+xml" rel="results"

     template="http://[INSERT BASE URL HERE]q={searchTerms}"/>

     <Url type="application/atom+xml" rel="describedby"

     template="http://[INSERT BASE URL
     HERE]?spatial_dataset_identifier_code={inspir

     e_dls:spatial_dataset_identifier_code?}&amp;spatial_dataset_id
entifie    r_name
     space={inspire_dls:spatial_dataset_identifier_namespace?}&amp;
languag    e={language?}&amp;q={searchTerms?}"/>

     <Url type="INSERT MEDIA TYPE FOR RESULTS HERE" rel="results"

     template=”http://[INSERT BASE URL HERE]
     ?spatial_dataset_identifier_code={inspir

     e_dls:spatial_dataset_identifier_code?}&amp;spatial_dataset_id
entifie
     r_namespace={inspire_dls:spatial_dataset_identifier_namespace?
}&amp;c
     rs={inspire_dls:crs?}&amp;language={language?}&amp;q={searchTe
rms?}"/    >

     <Contact>INSERT CONTACT (e.g. email) HERE) </Contact>

     <Tags>INSERT TAGS/KEYWORDS HERE</Tags>

     <LongName>INSERT LONG TITLE HERE</LongName>

     <Image height="INSERT IMAGE HEIGHT IN PIXELS" width="INSERT
IMAGE      WIDTH IN PIXELS"

     type=" INSERT MEDIA TYPE FOR IMAGE HERE "> INSERT HTTP LINK TO
IMAGE      (e.g. icon) HERE </Image>

     <Query role="example"

     inspire_dls:spatial_dataset_identifier_namespace="INSERT
NAMESPACE  HERE"
```

```
     inspire_dls:spatial_dataset_identifier_code="INSERT SPATIAL
DATASET    IDENTIFIER (example of) HERE"

     inspire_dls:crs="INSERT DATASET CRS (example of) HERE"
     language="INSERT HREF LANGUAGE HERE" title="INSERT DATASET
(example   of) TITLE HERE"

     count="1"/>

     <Developer>INSERT NAME OF ORGANISATION</Developer>

     <Language>INSERT LANGUAGE IN WHICH DESCRIPTION IS
     AVAILABLE</Language>

</OpenSearchDescription>
```

Annex B: Sample code for OpenSearch engine

This annex contains a simple implementation of an OpenSearch engine for PHP. Please note that this example has been reproduced verbatim from the INSPIRE Technical Guidance for Download Services (where it is an informative section of the document).

```
Sample PHP script for the search engine

<?php

$returnFile = false;

foreach (apache_request_headers() as $name => $value) {

    //echo("$name: $value\n");

    if ($name=="Accept" && $value=="application/zip"){

       $returnFile = true;

    }

}

echo ("returnFile: $returnFile");



   $q= $_GET['q'];


   $uriCode = $_GET['spatial_dataset_identifier_code'];

   if (!$uriCode)

   {

      if (!$q)

      {

      header("Location: democcmdownloadservice.atom.en.xml");

      exit;

      }

      $uriCode = $q;

   }
```

```
$uriNamespace= $_GET['spatial_dataset_identifier_namespace'];
$crs= $_GET['crs'];

$language= $_GET['language'];
if (!$language || $language == "*"){
   $language = "en";
}

if ($language != 'en' && $language != 'it'){
   die( "Only en and it languages are supported" );
}

if ($uriCode == "ccm2.1_2000"){
   if ($returnFile){
      header("Location: files/CCM21_WGS84_window2000.zip");
   } else{
      header("Location: subfeed2000.atom.en.xml");
   }
   exit;
}
if ($uriCode == "ccm2.1_2001"){
   if ($returnFile){
      header("Location: files/CCM21_WGS84_window2001.zip");
   } else{
      header("Location: subfeed2001.atom.en.xml");
   }
   exit;
}
if ($uriCode == "ccm2.1_2002"){
```

```
      if ($returnFile){
         header("Location: files/CCM21_WGS84_window2002.zip");
      } else{
         header("Location: subfeed2002.atom.en.xml");
      }
      exit;
   }
   if ($uriCode == "ccm2.1_2003"){
      if ($returnFile){
         header("Location: files/CCM21_WGS84_window2003.zip");
      } else{
         header("Location: subfeed2003.atom.en.xml");
      }
      exit;
   }



   echo 'Not found';
?>
```

Annex C: HTML embedded in Atom feed

This example is republished verbatim from the JRC sample atom feed. It shows how HTML can be used to augment feeds for display purposes.

```
<!-- Response language is the value of xml:lang -->

<feed xmlns="http://www.w3.org/2005/Atom"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:georss="http://www.georss.org/georss"
xmlns:gml="http://www.opengis.net/gml"
xmlns:opensearch="http://a9.com/-/spec/opensearch/1.1/"
xmlns:opensearchextensions="http://example.com/opensearchextensions/
1.0/"
xmlns:inspire_dls="http://inspire.ec.europa.eu/schemas/inspire_dls/1
.0" xsi:schemaLocation="http://www.w3.org/2005/Atom
E:\schemas\inspire\atom\1.0\atom.xsd" xml:lang="en"
xml:base="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/">

<!--

xml:base="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/"

-->

<!-- feed title -->

<title>

CCM River and Catchment Database, version 2.1 (CCM2) - Demo INSPIRE
Download Service - Joint Research Center

</title>

<!-- feed subtitle -->

<subtitle>

demonstrates the use of the Atom standard for implementing an
INSPIRE Download Service for the CCM database. Drainage networks and
associated drainage basins form complex functional entities not only
for hydrological processes but also for environmental processes at
large. This has been recognised in recent European legislation such
as the Water Framework Directive (WFD). In order to study the
underlying processes and cause-effect relationships at regional to
European scales, comprehensive digital data of river networks,
drainage basins (catchments) and their characteristics are required.
JRC's Catchment Characterisation and Modelling (CCM) activity
responded to this need through the development of a pan-European
database of river networks and catchments. Version 1.0 of CCM has
```

```
been published in 2003. In July 2007 an geographically extended and
substantially improved CCM Version 2.0 has been released. The
current Version 2.1 of July 2008 is an update of version 2.0. It
includes the correction of noted errors as well additional
functionality. A detailed report on the development of CCM 2.0 as
well Release Notes for CCM 2.1 are provided on the CCM website.

</subtitle>

<!-- link to this feed -->

<link href="democcmdownloadservice.atom.en.xml" rel="self"
type="application/atom+xml" hreflang="en" title="This document"/>

<!-- links to this feed in other languages -->

<link href="democcmdownloadservice.atom.it.xml" rel="alternate"
type="application/atom+xml" hreflang="it" title="Questo file in
lingua italiana" xml:lang="it"/>

<!-- links to Download Service ISO 19139 metadata -->

<link href="ccmdemodownloadservice.iso19139.xml" rel="describedby"
type="application/vnd.iso.19139+xml"/>

<!-- links to Open Search definition file -->

<link rel="search" href="opensearchdescription.xml"
type="application/opensearchdescription+xml" title="Open Search
Description"/>

<!-- identifier -->

<id>

http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/democcmdownloadservice.
atom.en.xml

</id>

<!--

we might want to include this
<opensearch:totalResults>3</opensearch:totalResults>
<opensearch:startIndex>1</opensearch:startIndex>
<opensearch:itemsPerPage>10</opensearch:itemsPerPage>

-->

<!-- rights, access restrictions -->

<rights>
```

```
User registration and agreement on not sub distributing and
commercial use

</rights>

<!-- date/time of last update of feed -->

<updated>2011-09-24T13:45:03Z</updated>

<!-- descriptive summary -->

<!--

<summary xml:lang="en">More text about the data sets offered by this
service</summary>

-->

<!-- author info -->

<author>

<name>Joint Research Centre</name>

<email>alfred.de-jager@jrc.ec.europa.eu</email>

</author>

<!-- List of pre-defined datasets -->

<entry>

<!--

Window 2000 (North) - CCM River and Catchment Database, version 2.1
(CCM2)

-->

<!-- Spatial Data Set Unique Resource Identifier -->

<inspire_dls:spatial_dataset_identifier_code>ccm2.1_2000</inspire_dl
s:spatial_dataset_identifier_code>

<inspire_dls:spatial_dataset_identifier_namespace>http://ccm.jrc.ec.
europa.eu/</inspire_dls:spatial_dataset_identifier_namespace>

<!-- List of avaiable CRS -->

<category term="http://www.opengis.net/def/crs/EPSG/0/4326"
label="WGS84"/>

<category term="http://www.opengis.net/def/crs/EPSG/0/4258"
label="ETRS89"/>

<!--
```

```
INSPIRE Spatial Object Types contained in the pre-defined dataset
are specified in the subfeed

-->

<author>

<name>Joint Research Center</name>

<email>alfred.de-jager@jrc.ec.europa.eu</email>

</author>

<id>

http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/subfeeds/2000/subfeed20
00.atom.en.xml

</id>

<!-- link to subfeed for the dataset -->

<link rel="alternate" href="subfeeds/2000/subfeed2000.atom.en.xml"
type="application/atom+xml" hreflang="en" title="Feed containing the
dataset in several formats"/>

<!-- links to dataset ISO 19139 metadata -->

<link rel="describedby" href="ccmseriesmetadata_2000.iso19139.xml"
type="application/vnd.iso.19139+xml"/>

<summary type="html">

<![CDATA[

<div> Drainage networks and associated drainage basins form complex
functional entities not only for hydrological processes but also for
environmental processes at large. This has been recognised in recent
European legislation such as the Water Framework Directive (WFD). In
order to study the underlying processes and cause-effect
relationships at regional to European scales, comprehensive digital
data of river networks, drainage basins (catchments) and their
characteristics are required. JRC's Catchment Characterisation and
Modelling (CCM) activity responded to this need through the
development of a pan-European database of river networks and
catchments. Version 1.0 of CCM has been published in 2003. In July
2007 an geographically extended and substantially improved CCM
Version 2.0 has been released. The current Version 2.1 of July 2008
is an update of version 2.0. It includes the correction of noted
errors as well additional functionality. A detailed report on the
development of CCM 2.0 as well Release Notes for CCM 2.1 are
provided below. </div> <div> Available downloads: <span><a
```

```
href="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/files/CCM21_WGS84_windo
w2000.zip"> WGS 84</a> </span> <span><a href="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/files/CCM21_LAEA_window
2000.zip"> LAEA</a> </span> </div> <div> Dataset metadata: <span><a
href="ccmseriesmetadata_2000.iso19139.xml"> ISO 19139</a> </span>
</div> <img width="500px" vspace="0" hspace="0" border="0" alt="CCM
2 Processing Window Distribution" src="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/CCM2_Windows2b.JPG"
usemap="#Sel" />

]]>

</summary>

<title>

Window 2000 (North) - CCM River and Catchment Database, version 2.1
(CCM2)

</title>

<updated>2011-02-27T00:00:00Z</updated>

<georss:polygon>

48.478784 6.7015 57.474479 6.7015 57.474479 27.993059 48.478784
27.993059 48.478784 6.7015

</georss:polygon>

</entry>

<entry>

<!--

Window 2001 (Western Islands) - CCM River and Catchment Database,
version 2.1 (CCM2)

-->

<!-- Spatial Data Set Unique Resource Identifier -->

<inspire_dls:spatial_dataset_identifier_code>ccm2.1_2001</inspire_dl
s:spatial_dataset_identifier_code>

<inspire_dls:spatial_dataset_identifier_namespace>http://ccm.jrc.ec.
europa.eu/</inspire_dls:spatial_dataset_identifier_namespace>

<!-- List of avaiable CRS -->

<category term="http://www.opengis.net/def/crs/EPSG/0/4326"
label="WGS84"/>
```

```
<category term="http://www.opengis.net/def/crs/EPSG/0/4258"
label="ETRS89"/>

<!--

INSPIRE Spatial Object Types contained in the pre-defined dataset
are specified in the subfeed

-->

<author>

<name>Joint Research Center</name>

<email>alfred.de-jager@jrc.ec.europa.eu</email>

</author>

<id>

http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/subfeeds/2001/subfeed20
01.atom.en.xml

</id>

<!-- link to ISO MD of the dataset -->

<link rel="describedby" href="ccmseriesmetadata_2001.iso19139.xml"
type="application/vnd.iso.19139+xml" hreflang="en"
title="Metadata"/>

<!-- pre-defined dataset link to subfeed -->

<link rel="alternate" href="subfeeds/2001/subfeed2001.atom.en.xml"
type="application/atom+xml" hreflang="en" title="Feed containing the
dataset in several formats"/>

<published>2011-01-01T00:00:00Z</published>

<!-- human readable summary of the pre-defined dataset -->

<summary type="html">

<![CDATA[

<div> Drainage networks and associated drainage basins form complex
functional entities not only for hydrological processes but also for
environmental processes at large. This has been recognised in recent
European legislation such as the Water Framework Directive (WFD). In
order to study the underlying processes and cause-effect
relationships at regional to European scales, comprehensive digital
data of river networks, drainage basins (catchments) and their
characteristics are required. JRC's Catchment Characterisation and
```

```
Modelling (CCM) activity responded to this need through the
development of a pan-European database of river networks and
catchments. Version 1.0 of CCM has been published in 2003. In July
2007 an geographically extended and substantially improved CCM
Version 2.0 has been released. The current Version 2.1 of July 2008
is an update of version 2.0. It includes the correction of noted
errors as well additional functionality. A detailed report on the
development of CCM 2.0 as well Release Notes for CCM 2.1 are
provided below. </div> <div> Available downloads: <span><a
href="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/files/CCM21_WGS84_windo
w2001.zip"> WGS 84</a> </span> <span><a href="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/files/CCM21_LAEA_window
2001.zip"> LAEA</a> </span> </div> <div> Dataset metadata: <span><a
href="ccmseriesmetadata_2001.iso19139.xml"> ISO 19139</a> </span>
</div> <img width="500px" vspace="0" hspace="0" border="0" alt="CCM
2 Processing Window Distribution" src="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/CCM2_Windows2b.JPG"
usemap="#Sel" />

]]>

</summary>

<!-- title for pre-defined dataset -->

<title>

Window 2001 (Western Islands) - CCM River and Catchment Database,
version 2.1 (CCM2)

</title>

<!-- last date/time pre-defined dataset was updated -->

<updated>2012-02-14T12:22:09Z</updated>

<!--

optional GeoRSS bounding box of the pre-defined dataset. Must be lat
lon

-->

<georss:polygon>

49.674457 -10.660751 60.278073 -10.660751 60.278073 2.670939
49.674457 2.670939 49.674457 -10.660751

</georss:polygon>

<!--
```

```
<georss:where><gml:LineString 42.943 -71.032 43.039 -
69.856</georss:where>

-->

</entry>

<entry>

<!--

Window 2002 (South) - CCM River and Catchment Database, version 2.1
(CCM2)

-->

<!-- Spatial Data Set Unique Resource Identifier -->

<inspire_dls:spatial_dataset_identifier_code>ccm2.1_2002</inspire_dl
s:spatial_dataset_identifier_code>

<inspire_dls:spatial_dataset_identifier_namespace>http://ccm.jrc.ec.
europa.eu/</inspire_dls:spatial_dataset_identifier_namespace>

<!-- List of avaiable CRS -->

<category term="http://www.opengis.net/def/crs/EPSG/0/4326"
label="WGS84"/>

<category term="http://www.opengis.net/def/crs/EPSG/0/4258"
label="ETRS89"/>

<!--

INSPIRE Spatial Object Types contained in the pre-defined dataset
are specified in the subfeed

-->

<author>

<name>Joint Research Center</name>

<email>alfred.de-jager@jrc.ec.europa.eu</email>

</author>

<id>

http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/subfeeds/2002/subfeed20
02.atom.en.xml

</id>
```

```
<!-- link to ISO MD of the dataset -->

<link rel="describedby" href="ccmseriesmetadata_2002.iso19139.xml"
type="application/vnd.iso.19139+xml" hreflang="en"
title="Metadata"/>

<!-- pre-defined dataset link to subfeed -->

<link rel="alternate" href="subfeeds/2002/subfeed2002.atom.en.xml"
type="application/atom+xml" hreflang="en" title="Feed containing the
dataset in several formats"/>

<published>2011-01-01T00:00:00Z</published>

<!-- human readable summary of the pre-defined dataset -->

<summary type="html">

<![CDATA[

<div> Drainage networks and associated drainage basins form complex
functional entities not only for hydrological processes but also for
environmental processes at large. This has been recognised in recent
European legislation such as the Water Framework Directive (WFD). In
order to study the underlying processes and cause-effect
relationships at regional to European scales, comprehensive digital
data of river networks, drainage basins (catchments) and their
characteristics are required. JRC's Catchment Characterisation and
Modelling (CCM) activity responded to this need through the
development of a pan-European database of river networks and
catchments. Version 1.0 of CCM has been published in 2003. In July
2007 an geographically extended and substantially improved CCM
Version 2.0 has been released. The current Version 2.1 of July 2008
is an update of version 2.0. It includes the correction of noted
errors as well additional functionality. A detailed report on the
development of CCM 2.0 as well Release Notes for CCM 2.1 are
provided below. </div> <div> Available downloads: <span><a
href="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/files/CCM21_WGS84_windo
w2002.zip"> WGS 84</a> </span> <span><a href="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/files/CCM21_LAEA_window
2002.zip"> LAEA</a> </span> </div> <div> Dataset metadata: <span><a
href="ccmseriesmetadata_2002.iso19139.xml"> ISO 19139</a> </span>
</div> <img width="500px" vspace="0" hspace="0" border="0" alt="CCM
2 Processing Window Distribution" src="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/CCM2_Windows2b.JPG"
usemap="#Sel" />

]]>

</summary>
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<!-- title for pre-defined dataset -->

<title>

Window 2002 (South) - CCM River and Catchment Database, version 2.1
(CCM2)

</title>

<!-- last date/time pre-defined dataset was updated -->

<updated>2012-02-14T12:22:12Z</updated>

<!--

optional GeoRSS bounding box of the pre-defined dataset. Must be lat
lon

-->

<georss:polygon>

35.492812 5.836237 47.092703 5.836237 47.092703 19.793929 35.492812
19.793929 35.492812 5.836237

</georss:polygon>

<!--

<georss:where><gml:LineString 42.943 -71.032 43.039 -
69.856</georss:where>

-->

</entry>

<entry>

<!--

Window 2003 (West) - CCM River and Catchment Database, version 2.1
(CCM2)

-->

<!-- Spatial Data Set Unique Resource Identifier -->

<inspire_dls:spatial_dataset_identifier_code>ccm2.1_2003</inspire_dl
s:spatial_dataset_identifier_code>

<inspire_dls:spatial_dataset_identifier_namespace>http://ccm.jrc.ec.
europa.eu/</inspire_dls:spatial_dataset_identifier_namespace>

<!-- List of avaiable CRS -->
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<category term="http://www.opengis.net/def/crs/EPSG/0/4326"
label="WGS84"/>

<category term="http://www.opengis.net/def/crs/EPSG/0/4258"
label="ETRS89"/>

<!--

INSPIRE Spatial Object Types contained in the pre-defined dataset
are specified in the subfeed

-->

<author>

<name>Joint Research Center</name>

<email>alfred.de-jager@jrc.ec.europa.eu</email>

</author>

<id>

http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/subfeeds/2003/subfeed20
03.atom.en.xml

</id>

<!-- link to ISO MD of the dataset -->

<link rel="describedby" href="ccmseriesmetadata_2003.iso19139.xml"
type="application/vnd.iso.19139+xml" hreflang="en"
title="Metadata"/>

<!-- pre-defined dataset link to subfeed -->

<link rel="alternate" href="subfeeds/2003/subfeed2003.atom.en.xml"
type="application/atom+xml" hreflang="en" title="Feed containing the
dataset in several formats"/>

<published>2011-01-01T00:00:00Z</published>

<!-- human readable summary of the pre-defined dataset -->

<summary type="html">

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<div> Drainage networks and associated drainage basins form complex
functional entities not only for hydrological processes but also for
environmental processes at large. This has been recognised in recent
European legislation such as the Water Framework Directive (WFD). In
order to study the underlying processes and cause-effect
```

```
relationships at regional to European scales, comprehensive digital
data of river networks, drainage basins (catchments) and their
characteristics are required. JRC's Catchment Characterisation and
Modelling (CCM) activity responded to this need through the
development of a pan-European database of river networks and
catchments. Version 1.0 of CCM has been published in 2003. In July
2007 an geographically extended and substantially improved CCM
Version 2.0 has been released. The current Version 2.1 of July 2008
is an update of version 2.0. It includes the correction of noted
errors as well additional functionality. A detailed report on the
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href="http://inspire-
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w2003.zip"> WGS 84</a> </span> <span><a href="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/files/CCM21_LAEA_window
2003.zip"> LAEA</a> </span> </div> <div> Dataset metadata: <span><a
href="ccmseriesmetadata_2003.iso19139.xml"> ISO 19139</a> </span>
</div> <img width="500px" vspace="0" hspace="0" border="0" alt="CCM
2 Processing Window Distribution" src="http://inspire-
geoportal.ec.europa.eu/resources/sandbox/ccm/CCM2_Windows2b.JPG"
usemap="#Sel" />

]]>

</summary>

<!-- title for pre-defined dataset -->

<title>

Window 2003 (West) - CCM River and Catchment Database, version 2.1
(CCM2)

</title>

<!-- last date/time pre-defined dataset was updated -->

<updated>2012-02-14T12:22:10Z</updated>

<!--

optional GeoRSS bounding box of the pre-defined dataset. Must be lat
lon

-->

<georss:polygon>

42.500667 -5.142445 53.6178 -5.142445 53.6178 11.875902 42.500667
11.875902 42.500667 -5.142445

</georss:polygon>
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```
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<georss:where><gml:LineString 42.943 -71.032 43.039 -
69.856</georss:where>

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</entry>

</feed>
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