Testbed-12 Catalogue and SPARQL Engineering Report

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Testbed-12 Catalogue and SPARQL Engineering Report (16-062)
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Abstract

This engineering report has been produced by the OGC® Testbed-12 initiative. The engineering report evaluates interoperability between a variety of catalogues. The report presents a comparison of the catalogues, with the same datasets uploaded. The catalogues discussed in the report include services conforming to Catalogue Service for Web (CSW) version 2.0.2 and 3.0, including services based on the ebRIM profile of CSW 2.0.2 and an extension of CSW 3.0 with OpenSearch and SOAP. The engineering report presents results from tests using a multi-catalogue client to interact with each service. The engineering report also provides a comparison of CSW and services based on the Data Catalogue (DCAT) specification covering functionality, expressiveness and usability of CSW and DCAT. The comparison is supported by a discussion on the implementation of a SPARQL / GeoSPARQL service.

Business Value

This engineering report discusses catalogue services, which are the primary means through which geospatial data and services are discovered. The engineering report also discusses SPARQL services and their potential for supporting geospatial data discovery within the Linked Data cloud. The contents of this report will therefore advance geospatial interoperability through:

- Improved understanding of the potential for semantic enablement of OGC catalogue services

- Greater interoperability between OGC catalogue standards and open search standards currently adopted by several general search engines

- Increased awareness of registry capabilities such as change control management, which are supported by specific profiles of OGC catalogue standards

Technology Value

This engineering report is important to the OGC Geosemantics Domain Working Group because it advances the semantic enablement of geospatial catalogues, potentially providing a bridge between the geospatial and semantic web communities. The engineering report is also important to the OGC Catalogue Standard Working Group because it advances interoperability between different geospatial catalogues.

How does this ER relate to the work of the Working Group

During a teleconference of the GeoSemantics Domain Working Group on 20th April 2016 to discuss this engineering report, participants stated that crosswalks of the use cases supported by each catalogue service would be useful. It is envisaged that the functionality and metadata crosswalks presented in this report will inform future work of the domain working group in this area.

Keywords

ogcdocs, testbed-12, CSW, eb-RIM, catalogue, metadata, SPARQL, RDF, OWL, semantic web, linked data, DCAT.

Proposed OGC Working Group for Review and Approval

This engineering report will be submitted to the Geosemantics Domain Working Group for review.

Chapter 1. Introduction

Advances in data collection and publication technologies have led to a phenomenal increase, over the past decade, in the amount of geospatial data that is available on the World Wide Web. This increase in data availability has also led to an increasing need to improve the efficiency and effectiveness of geospatial data discovery approaches. Catalogue services have been at the forefront of addressing this need by providing the means through which users can search, find and discover relevant resources. Metadata provided by catalogues presents descriptions of resource characteristics that can be assessed by both humans and software. This engineering report focuses on catalogue services based on the OGC CSW standard. The report also examines interoperability between CSW and SPARQL Services offering metadata based on the DCAT specification.

1.1. Scope

This OGC® document evaluates interoperability between the following catalogue specifications: CSW version 2.0.2, ebRIM profile of CSW version 2.0.2, and CSW version 3.0 with OpenSearch and SOAP support. The document also provides a comparison of CSW and services based on the Data Catalogue (DCAT) specification, implemented through a SPARQL Service. This OGC® document is applicable to the discovery of information resources in Spatial Data Infrastructure (SDI) and their exploitation within the Linked Data Cloud.

1.2. Document contributor contact points

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1.3. Future Work

It is expected that this document will result in editorial changes in the following documents:

- OGC Catalogue 3.0 standard - General Model
- OGC Catalogue 3.0 specification - HTTP Protocol Binding

The document also recommends that the following profiles be updated to be based on CSW 3.0 standard:

- OGC I15(ISO 19115) Extension Package of CSW-ebRIM Profile 1.0
- CSW-ebRIM Registry Service - Part 1 to 3
- FGDC CSDGM Application Profile for CSW 2.0
- OGC Catalogue Services Standard 2.0 Extension package for ebRIM Application Profile: Earth Observation Products

1.4. Foreword

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The Open Geospatial Consortium shall not be held responsible for identifying any or all such patent rights.

Recipients of this document are requested to submit, with their comments, notification of any relevant patent claims or other intellectual property rights of which they may be aware that might be infringed by any implementation of the standard set forth in this document, and to provide supporting documentation.

Chapter 2. References

The following documents are referenced in this document. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the normative document referred to applies.

1. OGC 06-121r9, OGC® Web Services Common Standard

2. OGC 07-006r1, OpenGIS Catalogue Service Implementation Specification 2.0.2, 2007

3. OGC 12-168r6, OGC® Catalogue Services 3.0 - General Model, 2016

4. OGC 13-084r2, OGC I15 (ISO19115 Metadata) Extension Package of CS-W ebRIM Profile .0, 2014

5. OGC 07-110r4, CSW-ebRIM Registry Service ebRIM profile of CSW (.0.1), 2009

6. OGC 07-045, OGC Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile (.0.0), 2007

7. OGC 06-129r1, FGDC CSDGM Application Profile for CSW 2.0 (0.0.12), 2006

8. ISO 19115:2003, Geographic information — Metadata

9. ISO 19119:2005, Geographic information — Services

10. ISO 19115:2003/Cor 1:2006, Geographic information — Metadata

11. ISO/TS 19139:2007, Geographic information — Metadata — XML schema implementation

12. ISO 19115-1:2014, Geographic information — Metadata — Part 1: Fundamentals

13. Dublin Core Metadata Initiative, last visited 12-09-2016, available from http://dublincore.org/

14. NSG Metadata Foundation (NMF) – Part 1: Core, version 2.2, 23 September 2014 https://nsgreg.nga.mil/doc/view?i=4123

15. DGIWG 114, DGIWG Metadata Foundation (DMF),last visited 12-09-2016, available from https://portal.dgiwg.org/files/?artifact_id=9189&format=pdf

16. DoD Discovery Metadata Specification (DDMS),last visited 12-09-2016, available from https://metadata.ces.mil/dse-help/DDMS/index.htm

17. SPARQL Protocol and RDF Query Language (SPARQL),last visited 12-09-2016, available from https://www.w3.org/TR/rdf-sparql-query

18. DCAT, last visited 12-09-2016, available from https://www.w3.org/TR/vocab-dcat/

19. National System for Geospatial Intelligence Metadata Implementation Specification (NMIS) – Part 2: XML Exchange Schema

20. Fellah, S., Testbed-12 Semantic Portrayal, Registry and Mediation Engineering Report (16-059), Open Geospatial Consortium, 2016

Chapter 3. Terms and definitions

For the purposes of this report, the definitions specified in Clause 4 of the OWS Common Implementation Standard [OGC 06-121r9] shall apply. In addition, the following terms and definitions apply.

3.1. metadata

data about data

3.2. model

abstraction of some aspects of a universe of discourse [ISO 19109]

3.3. interoperability

capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units [ISO 19119]

3.4. syntactic interoperability

the aspect of interoperability that assures that there is a technical connection, i.e. that the data can be transferred between systems

3.5. semantic interoperability

the aspect of interoperability that assures that the content is understood in the same way in both systems, including by those humans interacting with the systems in a given context

Chapter 4. Conventions

4.1. Abbreviated terms

- eb-RIM electronic business Registry Information Model
- CSW Catalogue Service for the Web
- DCAT Data Catalogue
- OGC Open Geospatial Consortium
- OWL Web Ontology Language
- OWS OGC Web Services
- RDF Resource Description Framework
- SDI Spatial Data Infrastructure
- UML Unified Modeling Language

Chapter 5. Overview

This engineering report includes the following major sections:

- Status Quo & New Requirements Statement: This section describes current standards of catalogues and metadata.

- Solutions: This section describes the solution architectures considered by the testbed, as well as the solution architecture implemented by the testbed.

- Appendix sections: These sections include a functionality crosswalk for catalogues, metadata crosswalk, and sample metadata encoded according to different standards.

Chapter 6. Status Quo & New Requirements Statement

6.1. Status Quo

The publish-find-bind paradigm on which much of the geospatial service architecture is based relies on the discovery of resources to enable client applications to bind to a particular service. The two most important types of technologies involved in the discovery of resources are metadata and catalogues. The following sections describe both of these concepts and provide examples to describe the status quo.

6.2. Metadata

Metadata is often defined as "data about data". It can play several roles within a Spatial Data Infrastructure (SDI), however the most important roles of metadata are to facilitate discovery, management and use of geospatial information resources such as maps, navigational charts, imagery, digital datasets and web services.

One of the oldest and most widely adopted (and adapted) metadata standards in the global computing industry is the Dublin Core specification which originally provided 15 metadata elements for describing information resources.

The most widely adopted metadata standard within the geospatial industry is the ISO 19115:2003 standard [8]. This standard specifies more than 300 metadata elements for describing geospatial datasets. A corrigendum of this standard was issued in 2006 as ISO 19115:2003/Cor 1:2006. Associated with ISO 19115 are ISO 19119:2005 which includes a specification of metadata for describing services [9] and ISO/TS 19139:2007 which provides a specification of an XML schema for encoding metadata that is based on both ISO 19115 and ISO 19119 [11]. In 2014, the ISO 19115 standard was revised to ISO 19115-1:2014 and the ISO 19119 standard was revised to ISO 19119:2014.

Several initiatives have demonstrated interoperability between the Dublin Core metadata specification and ISO 19115 through the development of crosswalks that provide mappings between the two specifications, for example Go-Geo. Whereas there are some differences in the crosswalks developed by previous initiatives, the consensus is that most of the Dublin Core elements can be mapped to an ISO 19115 metadata element that shares common meaning, even if labelled differently.

The Dublin Core and ISO 19115 metadata standards provide the foundation for all of the metadata standards that have been part of this testbed [13]. This foundation can be described in the following way:

- The NSG Metadata Foundation (NMF) defines the conceptual schema profile for specifying geospatial metadata in and for the US National System for Geospatial Intelligence (NSG) [14]. It is a profile of ISO 19115:2003/Cor 1:2006.

- The DGIWG Metadata Foundation (DMF) provides a general Defense metadata profile for the

exchange of metadata between DGIWG member nations [15]. It is a profile of ISO 19115:2003/Cor 1:2006.

- The DoD Discovery Metadata Specification (DDMS) specifies a set of metadata fields that are to be used for describing any information resource, that is to be made discoverable to the DoD Enterprise [16]. It is a profile of the Dublin Core metadata specification.

- DCAT is a vocabulary based on the Resource Description Framework (RDF) and designed to facilitate interoperability between data catalogues published on the Web. It is a profile of the Dublin Core metadata specification [18].

6.3. Catalogue Services

6.3.1. OGC Catalogue Services

The OGC Catalogue Services specification provides a general interface model that describes a set of abstract service interfaces that support the discovery, access, maintenance and organization of catalogues of geospatial information resources [2]. The interfaces are designed to enable client applications or end-users to find information that exists in distributed computing environments. Version 2.0.2 of the Catalogue service standard specified three bindings that could be used to implement a conformant catalogue service, namely HTTP, CORBA, and Z39.50. The HTTP binding, which is more commonly referred to as Catalogue Services for the Web (CSW), has seen the most uptake. Several application profiles and extensions have targeted version 2.0.2 of the CSW specification, for example:

- OGC I15 (ISO19115 Metadata) Extension Package of CS-W ebRIM Profile 1.0 [4]

- CSW-ebRIM Registry Service ebRIM profile of CSW (1.0.1) [5]

- OGC Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile (1.0.0) [6]

- FGDC CSDGM Application Profile for CSW 2.0 (0.0.12) [7]

Version 3.0 of the Catalogue service standard offers a number of additional capabilities to those offered by the current version of the standard. Version 3.0 also removes some of the capabilities offered by version of the standard. CSW 3.0 offers the following additional capabilities:

- Supports OpenSearch, thereby improving interoperability with general search engines

- Provides a comprehensive picture to support federated distributed search, addressing potential problems such as dead loop and long response time.

CSW 3.0 however removes the following capabilities:

- Removes support for stateful communication, thereby supporting only stateless request/response exchange.

- Deprecates the CORBA binding

6.3.2. DCAT/SPARQL Service

The DCAT specification is designed to facilitate the discovery of datasets between catalogues. The DCAT specification does not standardize a service interface but instead standardizes a vocabulary

for describing resources. It therefore aligns more with ISO 19115 and not ISO 19119. To understand how it relates or compares to OGC catalogue services, it is necessary to examine SPARQL services, which are the service interfaces that are recommended for delivering DCAT metadata.

The SPARQL Protocol and RDF Query Language (SPARQL) is a query language and protocol for RDF [17]. The protocol allows for querying or updating an RDF graph through an HTTP interface. An associated specification describes an additional protocol, the Graph Store protocol, which describes the management of a collection of graphs in a RESTful architectural approach.

These specifications are part of a series of standards that collectively define the SPARQL service standard which provides the interface for publishing and accessing DCAT metadata within this testbed. The complete set of SPARQL specifications includes:

1. SPARQL 1.1 Overview
2. SPARQL 1.1 Query Language
3. SPARQL 1.1 Update
4. SPARQL1.1 Service Description
5. SPARQL 1.1 Federated Query
6. SPARQL 1.1 Query Results JSON Format
7. SPARQL 1.1 Query Results CSV and TSV Formats
8. SPARQL Query Results XML Format (Second Edition)
9. SPARQL 1.1 Entailment Regimes
10. SPARQL 1.1 Protocol
11. SPARQL 1.1 Graph Store HTTP Protocol

An example of a federated query is shown below. The query is sent to the SPARQL services at the URLs specified by the SERVICE keyword. In this case, the queries sent to the remote services are for all triples that contain objects of dcat:Dataset.

SPARQL federated query

```
SELECT  ?dataset
WHERE
{
  {
    SERVICE <http://localhost/ds1/query> {
    ?dataset ?predicate <http://www.w3.org/ns/dcat#Dataset> .
  }
  }
  UNION
  {
    SERVICE <http://localhost/ds3/query> {
    ?dataset ?predicate <http://www.w3.org/ns/dcat#Dataset> .
  }
  }
}
```

6.4. Requirements Statement

Differences in capability and interfaces between services in multi-catalogue environments can at times prevent interoperability. It is therefore necessary to understand what those differences are and how best their impact can be mitigated.

Testbed-12 therefore undertook to address the following requirement:

- Advance use of the Catalogue Service for the Web (CSW) standard through evaluation of catalogue interoperability: This work item shall load the same dataset to a set of catalogues and test, using a multi-catalogue client, the interaction with each service to better understand interoperability aspects in multi-catalogue environments. The work item shall also evaluate the various DCAT contexts including RDF accessible via SPARQL endpoints, embedded in HTML pages as RDFa, or serialized as e.g. RDF/XML or Turtle and compare functionality, expressiveness and usability of CSW and DCAT. In addition, capture all discussion related to the implementation of the SPARQL / GeoSPARQL Server.

To address this requirement, the following objectives we set out.

- Evaluate interoperability aspects in multi-catalogue type environments, including CSW featuring ISO based metadata and OpenSearch, a second CSW offering a SOAP binding, and a third DCAT implementation, describing the same services and data sets using RDF.

- Evaluate how DCAT can describe the same service and data sets in RDF as the other catalog services do using XML Schema Documents (XSD) compliant to ISO 1939 and ISO 19115.

- The CSW v3.0 server shall support OpenSearch, provide a SOAP binding, consider the recommendations on PyCSW referenced and discussed in Testbed-11, and implement the NSG Metadata framework.

- The DCAT implementation shall serve as a Semantic Portrayal Catalogue. The Semantic Portrayal Catalogue uses an ontology model for managing styles and provides interfaces to

access, create, read, update, and delete styles.

- DCAT as a service shall interface with the Schema Registry which enables the discovery of XML schemas, transformation logic, and ontologies.

- Implement four different catalogues (CSW 3.0, CSW 2.0.2, CSW ebRIM, DCAT) and show how they can interact. Demonstrate what role DCAT can play.

- Consider Testbed-11 recommendations related to PyCSW.

Chapter 7. Solutions

7.1. Targeted Solutions

7.1.1. Interoperability in Multi-catalogue Environments

To evaluate interoperability aspects in multi-catalog type environments, the testbed considered a number of solution options. All of the solution options could involve various types of catalogue services, for example, CSW featuring ISO based metadata and OpenSearch, other CSW offering a SOAP binding, and support for DCAT using RDF.

There are several architectural solutions that could be used to establish a multi-catalogue environment. Four key architectural solutions were identified by the Testbed. The identified solutions differ in a variety of ways, including the entry point for client applications and the computational balance between the client application and the services.

The first solution for a multi-catalogue environment includes a client application that can query the various catalogue services directly. This requires the client application to prepare appropriate queries for each catalogue service and to integrate the search results when they are returned by the services.
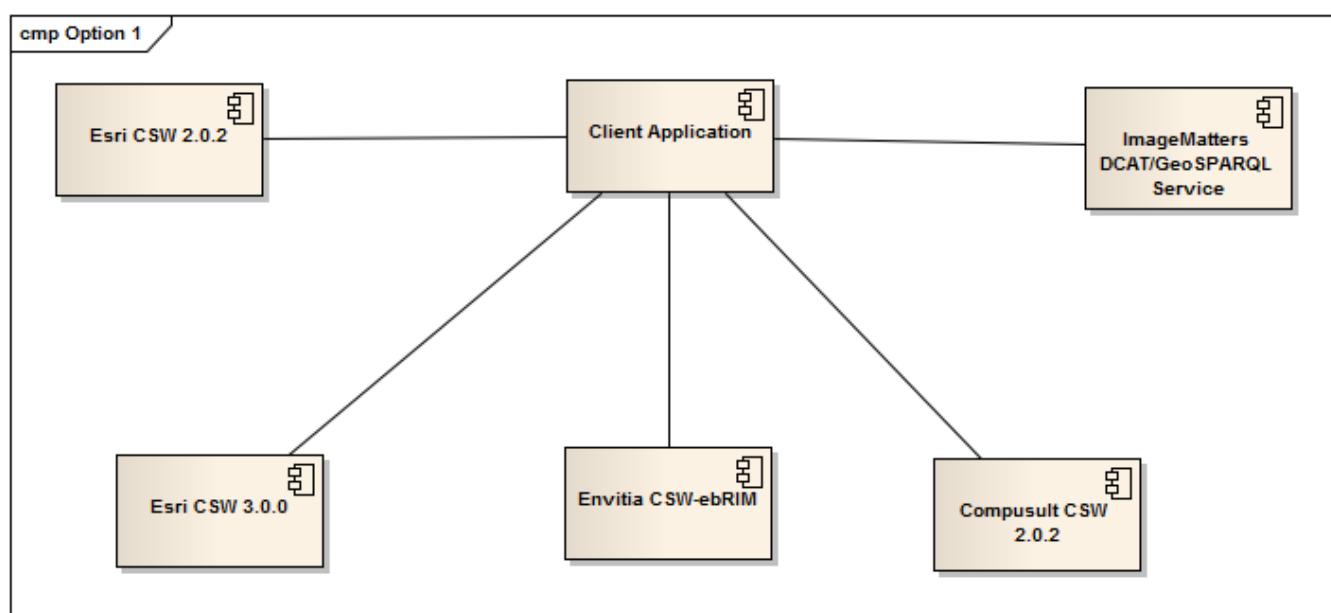
Figure 1. Multi-catalog Environment

The second solution involves the selection of one of the catalogue services to initiate a distributed search. In this case, the client application only needs to prepare queries for sending to the cascading catalogue service. Upon receiving a request from the client, the cascading catalogue service adapts the request for forwarding to other catalogue services and returns responses from the other services, as well as results from its own catalogue.
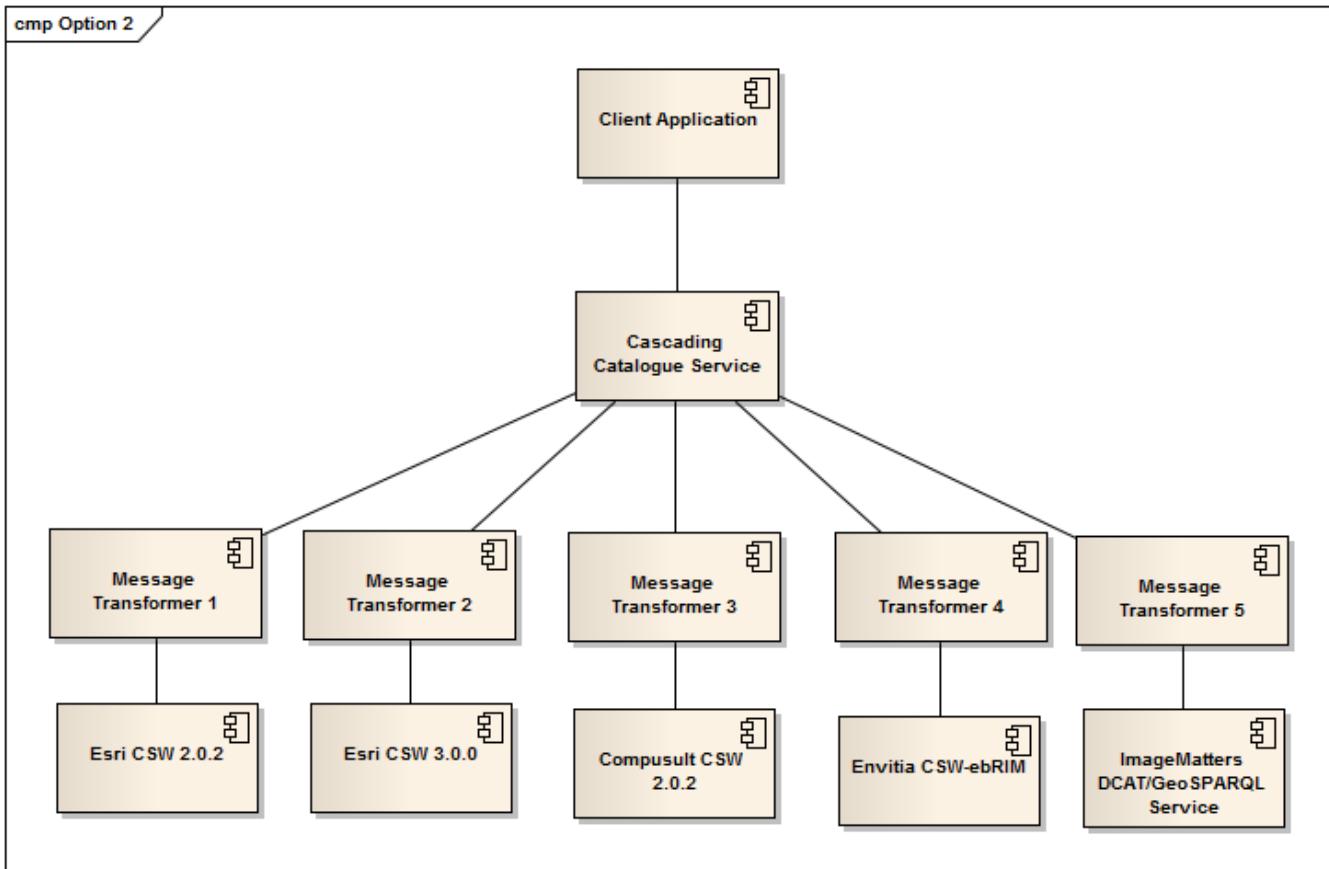
Figure 2. Catalog with distributed search

The third solution involves the harvesting of metadata into a single target catalogue service by retrieving metadata from one or more source catalogue services. Harvesting is ideally conducted at a scheduled time and not at the time of receiving a query from the client. The client application can then query the target catalogue service to discover resources published by the source and target catalogue services.
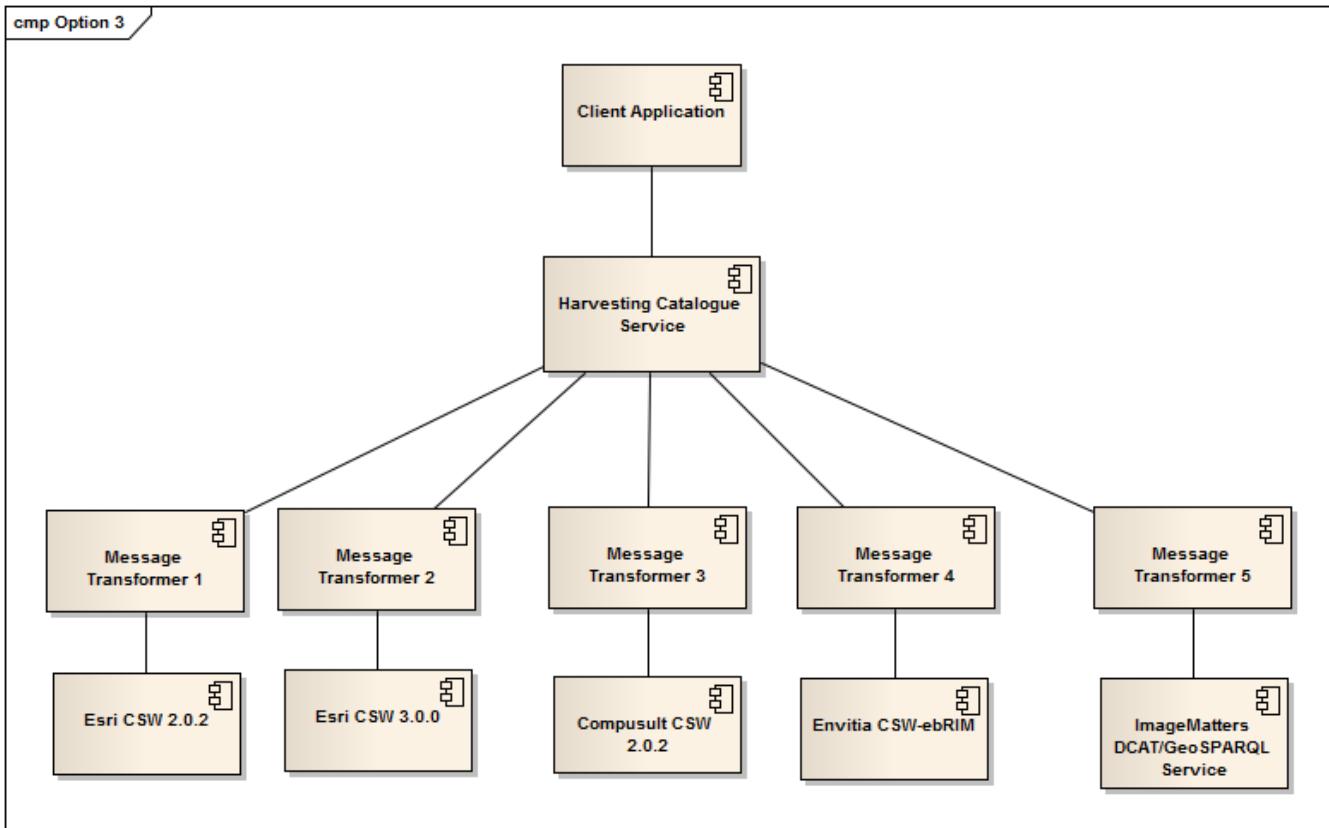
Figure 3. Harvest metadata into a single target catalog

The fourth solution involves the replication of metadata between a federation of catalogue services. Replication would ideally be conducted at a scheduled time and not at the time of receiving a query from the client. The client application can then query any of the catalogue services to discover resources published by any of the catalogue services.
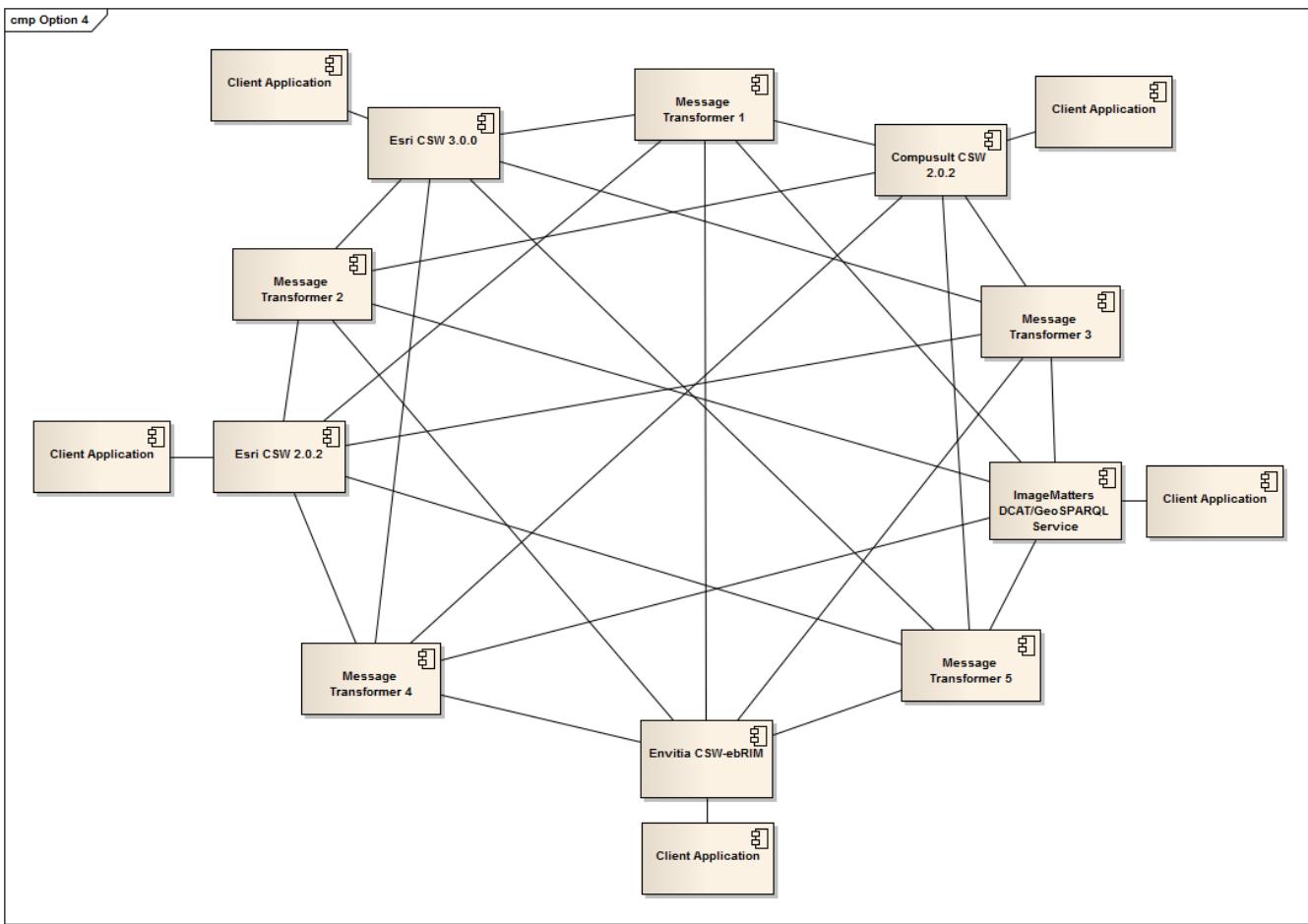
Figure 4. Replicate metadata in a federation of catalog services

The testbed also developed a crosswalk of functionality between the different catalogues. The functionality crosswalk is presented in Appendix A.

7.1.2. Describing Services and Datasets using DCAT

To evaluate how DCAT can describe the same services and datasets in RDF as the other catalogue services do using XML Schema instance documents compliant to ISO 19115, the testbed participants produced a crosswalk between ISO profiles and DCAT. The crosswalk, which is presented in Appendix B, was informed by work done by the European Commission on developing a geospatial profile for DCAT (alias GeoDCAT). The metadata model provided by DCAT includes classes and attributes for identifying and describing catalogues, datasets, catalogue records, publishing agents and distribution. The metadata model does not include any classes or attributes for identifying or describing services. The absence of classes and attributes for service metadata in DCAT meant that several ISO service metadata elements did not have equivalent fields in DCAT to map to.

The testbed also designed a Semantic Registry Information Model (SRIM) by extending the DCAT model to include concepts from ISO 19135, the international standard for procedures for item registration in geographic information systems. Engineering Report A066 Semantic Portrayal Registry Mediation Services (16-059) describes and discusses the SRIM.

7.1.3. Consideration of Testbed-11 PyCSW Recommendations

Testbed-11 implemented a CSW 3.0 with OpenSearch support using PyCSW - an open source OGC CSW implementation that allows publishing and sharing of geospatial metadata. PyCSW is a library

for enabling Python applications to offer CSW interfaces, as well as OpenSearch, OAI-PMH and SRU. A key aspect of the Testbed-11 work was enabling the CSW to advertise its service interface through an OpenSearch description document. Parameters allowed by an OpenSearch-enabled service interface are published through OpenSearch description documents. Client applications use these description documents to determine how to search the catalogue offered by the OpenSearch-enabled service.

Testbed-11 found that the web browser selected for the Testbed-11 work was not able to view the OpenSearch description document because of the document's MIME type (opensearchdescription+xml). The testbed therefore implemented a JavaScript module (AJAX specifically) to request and download the description document for viewing.

Testbed-11 recommended that "the catalog provider implements CSW 3.0 as their catalogue [service] due to CSW 3.0's advance[d] support for OpenSearch, distributed search and federated search".

7.2. Recommendations

Having considered the solution options, the testbed selected a hybrid of Option 2 and Option 3 - taking the DCAT/GeoSPARQL Service as the mediating catalogue service. This engineering report refers to the approach as a hybrid approach because the mediating DCAT/GeoSPARQL service harvested metadata from the CSW, but allowed for cascading requests to other GeoSPARQL Services.
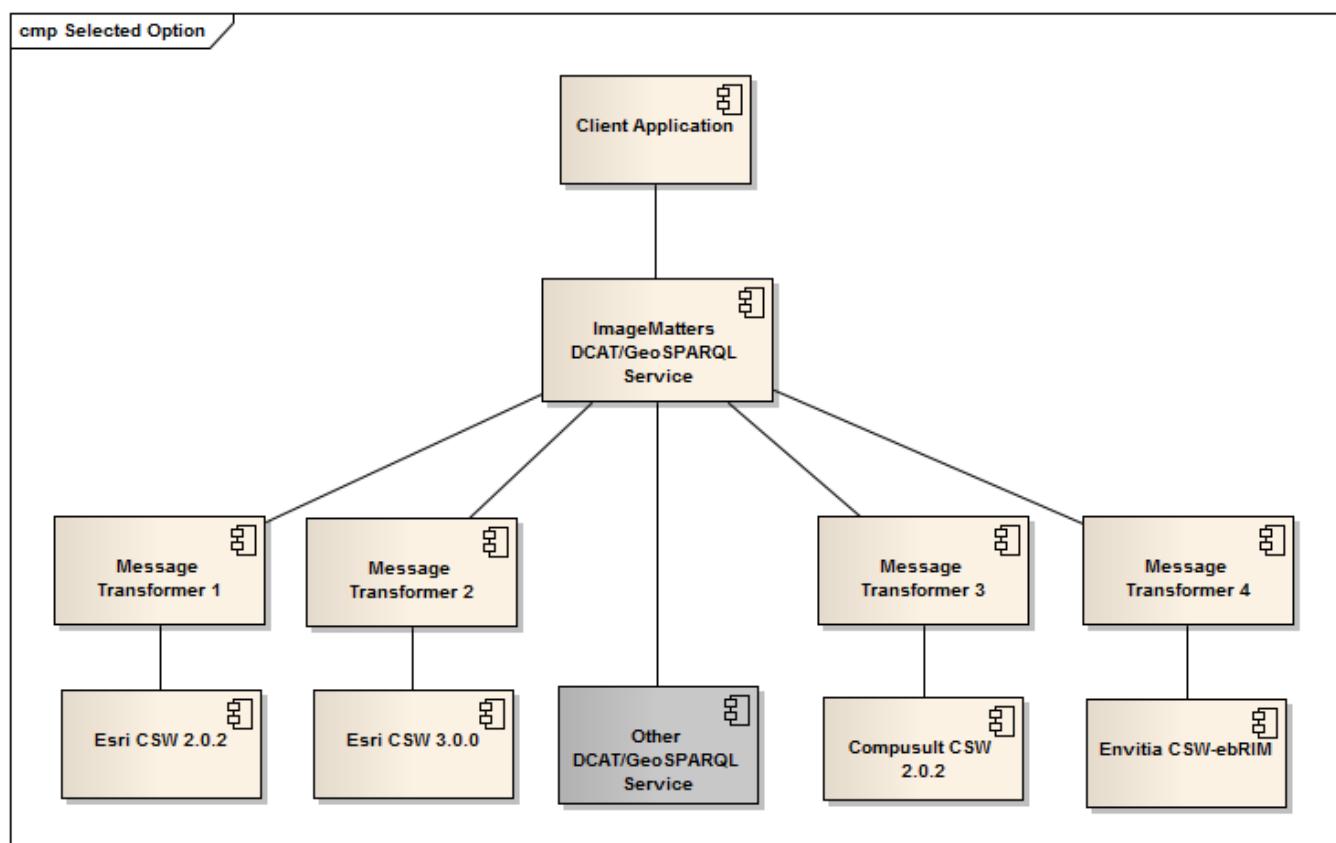
Figure 5. DCAT/GeoSPARQL service mediating catalog services

Based on this work, the testbed makes the following recommendations:

Ref.	Findings and Observations	Recommendation
1	DCAT on its own has a limited geospatial vocabulary. However, when integrated with GeoSPARQL to create GeoDCAT it provides a geospatial vocabulary capable of supporting catalogue federation	The OGC should standardize the GeoDCAT specification
2	The metadata returned by the different catalogues ranged from ISO 19139 XML, NMIS, DDMS, ebRIM ExtrisicObjects etc. There is therefore a need to allow the catalogues to return the metadata in a common language, as an alternative to recommendation 2.	The CSW services should be enabled to offer a GeoSPARQL service endpoint that publishes metadata in GeoDCAT and can receive federated SPARQL queries from other GeoSPARQL services
3	Annex G.1 of the DGIWG Metadata Foundation (DMF) identifies compatible metadata from the CIM extension of CSW ebRIM application profile. However, the I15 model supersedes the former document OGC Cataloguing of ISO Metadata (CIM) using the ebRIM profile of CSW, OGC 07-038r3 (Version: 0.1.12).	Update the DGIWG Metadata Foundation (DMF) to include a crosswalk to I15.
4	To query all of the different catalogues using the same request, the request has to be first translated into the language supported by each catalogue. In order to computationally make inferences about the metadata that is returned by the different catalogues it is necessary to convert the responses into the same language. Several of the queryable metadata fields (e.g. title, identifier, description, keywords, date and spatial elements) have mappings between DMF and DCAT. It is possible to export metadata from each catalogue into DCAT, thereby enabling a SPARQL Service to query across all of the metadata from all of the catalogues with a single query.	Include an Annex in the DMF on DCAT/GeoDCAT representation to allow DGIWG-based CSW to optionally offer SPARQL endpoints that offer DCAT-encoded metadata.

Ref.	Findings and Observations	Recommendation
5	One of the goals of DGIWG is to support geospatial interoperability between NATO member states. The NATO Interoperability Standards and Profiles (NISP) document published June 6th 2016, lists the following specifications as mandatory core enterprise services for information discovery: SPARQL 1.1 Query Language:2012 (W3C), Web Ontology Language (OWL):2009, W3C. OWL on its own does not specify the metadata elements to use to describe datasets or services. Therefore it is necessary to provide further constraints on the vocabulary (metadata elements) to use with OWL.	Any representation of dataset metadata using OWL or its publishing through SPARQL should adopt the DCAT/GeoDCAT vocabulary.
6	The NISP document lists the following specifications as emerging core enterprise services for information discovery: OpenSearch 1.1, OpenSearch; ISAF Minimum Metadata Implementation Policy (NATO:2010); OWL-S. OGC Testbed-12 observes that CSW 3.0 supports OpenSearch, implying that can support the NISP requirement.	Put CSW 3.0 forward for endorsement by the next version of NISP. This would be consistent with the current version of NISP since it lists OpenSearch support as mandatory.
7	Since CSW 3.0 is relatively new, many of the profiles that made CSW 2.0.2 a success have not yet been adapted for CSW 3.0.	Adapt profiles of CSW 2.0.2 to CSW 3.0. For example: (1) FGDC CSDGM Application Profile for CSW 2.0 ; (2) OGC® Catalogue Services Standard 2.0 Extension Package for ebRIM Application Profile: Earth Observation Products; and (3) OGC I15 (ISO19115 Metadata) Extension Package of CS-W ebRIM Profile 1.0

Appendix A: Functionality Crosswalk

The assessment carried out in Testbed-12 to determine interoperability between CSW variants and SPARQL Services is shown in Table 1.A.1. This table is intended to state whether a service supports a particular function, how it supports the function (concisely) and if support is partial which aspects are not supported.

Table 2. A.1Assessment Scheme

Function	CSW-ebRIM with I15 from NMF, DMF and DDMS	CSW 2.0.2 with DMF	CSW 3.0 with NMF, Open Search and SOAP	SPARQL Service with DCAT
Basic Query	Supported through GetRecords, GetRecordById operations	Supported through GetRecords, GetRecordById operations	Supported through GetRecords, GetRecordById operations	Supported through SELECT, CONSTRUCT queries
Geospatial Query	Supported through GetRecords, GetRecordById operations	Supported through GetRecords, GetRecordById operations	Supported through GetRecords, GetRecordById operations	Supported through a GeoSPARQL predicate in a FILTER query modifier.
Federated Query	This extension package does not support the ability to distribute a client request to other catalogues within a federation. But, an ebRIM catalogue can manage registry objects corresponding to resources managed in one or more item repositories. See OGC 13-084r2 Section 12.7	Supported through Distributed Search. See OGC 07-006r1 Section 10.8.4.13	Supported through Distributed Search. See Annex A of OGC document 12-168r6.	The SPARQL Federated Query extension allows a query author to direct a portion of a query to a particular SPARQL endpoint. Results are returned to the federated query processor and are combined with results from the rest of the query. See the W3C SPARQL Federated Query specification.

Function	CSW-ebRIM with I15 from NMF, DMF and DDMS	CSW 2.0.2 with DMF	CSW 3.0 with NMF, Open Search and SOAP	SPARQL Service with DCAT
Types of Query	GetCapabilities (maps to SPARQL DESCRIBE) DescribeRecord (maps to SPARQL DESCRIBE) GetDomain (maps to SPARQL SELECT) GetRecords (maps to SPARQL SELECT) GetRecordById (maps to SPARQL SELECT) GetRepositoryItem (no match) Transaction (maps to SPARQL UPDATE, INSERT, DELETE) Harvest (maps to SPARQL INSERT) StoredQuery (no match)	GetCapabilities (maps to SPARQL DESCRIBE) DescribeRecord (maps to SPARQL DESCRIBE) GetDomain (maps to SPARQL SELECT) GetRecords (maps to SPARQL SELECT) GetRecordById (maps to SPARQL SELECT) Transaction (maps to SPARQL UPDATE, INSERT, DELETE) Harvest (maps to SPARQL INSERT)	GetCapabilities (maps to SPARQL DESCRIBE) DescribeRecord (maps to SPARQL DESCRIBE) GetDomain (maps to SPARQL SELECT) GetRecords (maps to SPARQL SELECT) GetRecordById (maps to SPARQL SELECT) Transaction (maps to SPARQL UPDATE, INSERT, DELETE) Harvest (maps to SPARQL INSERT) UnHarvest (no match) OpenSearch query (maps to SPARQL SELECT) OpenSearch description document (maps to SPARQL DESCRIBE)	SPARQL SELECT (maps to cswGetRecords, cswGetRecordById, cswGetDomain) SPARQL CONSTRUCT (no match) SPARQL ASK (maps to cswGetRecords - Brief) SPARQL DESCRIBE (maps to cswDescribeRecord) SPARQL DELETE (maps to cswTransaction)

Function	CSW-ebRIM with I15 from NMF, DMF and DDMS	CSW 2.0.2 with DMF	CSW 3.0 with NMF, Open Search and SOAP	SPARQL Service with DCAT
Query Modifiers	SortBy (maps to SPARQL Order) startRecords (maps to SPARQL Offset) maxRecords (maps to SPARQL Limit)	SortBy (maps to SPARQL Order) startRecords (maps to SPARQL Offset) maxRecords (maps to SPARQL Limit)	SortBy (maps to SPARQL Order) distributedSearch responseHandler requestId resultType outputFormat outputSchema startPosition (maps to SPARQL Offset) maxRecords (maps to SPARQL Limit) HopCount ClientId DistributedSearchId DistrubutedSearchIdTimout FederatedCatalogues	Order (maps to cswSortBy) Projection modifier: choose certain variables Distinct (maps to filterArithmetic_Operators-DISTINCT) Reduced modifier: permit elimination of some non-unique solutions Offset (maps to cswStartRecords) Limit (maps to cswMaxRecords)
Entailment Regimes	Not Supported	Not Supported	Not Supported	Supported
Service Description	GetCapabilities	GetCapabilities	* GetCapabilities *Also by accessing the base URL of a conforming catalogue using the HTTP GET method (as specified in the OpenSearch conformance class).	SPARQL services made available via the SPARQL Protocol should return a service description document at the service endpoint when dereferenced using the HTTP GET operation without any query parameter strings provided.
Data Description	DescribeRecord	DescribeRecord	DescribeRecord	SPARQL DESCRIBE
Relations between Resources	Supported through the ebRIM Associations class	Not Supported	Supported through the Association compound element	Supported through predicates between subjects and objects

Function	CSW-ebRIM with I15 from NMF, DMF and DDMS	CSW 2.0.2 with DMF	CSW 3.0 with NMF, Open Search and SOAP	SPARQL Service with DCAT
Change Control Management	Supported	Not Supported	Not Supported	Not Supported
Repository	Supported	Not Supported	Not Supported	Not Supported

Appendix B: Metadata Crosswalk

The following crosswalk assesses interoperability between the different metadata specifications applied by CSW and SPARQL services in the testbed.

Table 3. Resource Offline Distribution Medium

Specification	Element
ID	1
I15 ebRIM	No appropriate mapping
ISO	distributionInfo//transferOptions//offLine/*
ISO XPath	/gmd:MD_Metadata/gmd:distributionInfo/gmd:MD_Distribution/gmd:transferOptions/gmd:MD_DigitalTransferOptions/gmd:offLine/gmd:MD_Medium
NMF	No appropriate mapping
DMF	Resource Offline Distribution Medium (RSOFDM)
DCAT	dcat:Distribution property dcat:mediaType
DDMS	No appropriate mapping

Table 4. Metadata Set Identifier

Specification	Element
ID	2
I15 ebRIM	/wrs:ExtrinsicObject/rim:Slot[@name="http://purl.org/dc/elements/1.1/identifier"]
ISO	fileIdentifier
ISO XPath	/gmd:MD_Metadata/gmd:fileIdentifier
NMF	fileIdentifier
DMF	Metadata Set Identifier (MDSID)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 5. Parent Metadata Set Identifier

Specification	Element
ID	3

Specification	Element
I15 ebRIM	/rim:Association[@associationType="urn:ogc:def:ebRIM-AssociationType:OGC:ParentMetadataInformation"]
ISO	parentIdentifier
ISO XPath	/gmd:MD_Metadata/gmd:parentIdentifier
NMF	parentIdentifier
DMF	Parent Metadata Set Identifier (MDPTSID)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 6. Resource Type Code

Specification	Element
ID	4
I15 ebRIM	/wrs:ExtrinsicObject[@objectType="urn:ogc:def:ebRIM-ObjectType:OGC-I15::DatasetMetadata"] /wrs:ExtrinsicObject[@objectType="urn:ogc:def:ebRIM-ObjectType:OGC-I15::ServiceMetadata"] /wrs:ExtrinsicObject[@objectType="urn:ogc:def:ebRIM-ObjectType:OGC-I15::Application"]
ISO	hierarchyLevel
ISO XPath	/gmd:MD_Metadata/gmd:hierarchyLevel
NMF	hierarchyLevel
DMF	Resource Type Code (RSTYPE)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 7. Resource Type Name

Specification	Element
ID	5
I15 ebRIM	/wrs:ExtrinsicObject/rim:Slot[@name="http://purl.org/dc/terms/type"]
ISO	hierarchyLevelName
ISO XPath	/gmd:MD_Metadata/gmd:hierarchyLevelName
NMF	hierarchyLevelName
DMF	Resource Type Name (RSTYPN)

Specification	Element
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 8. Metadata Translation

Specification	Element
ID	6
I15 ebRIM	No appropriate mapping
ISO	locale/*
ISO XPath	/gmd:MD_Metadata/gmd:locale
NMF	No appropriate mapping
DMF	Metadata Translation (MDTLOC)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 9. Metadata Responsible Party

Specification	Element
ID	7
I15 ebRIM	/rim:Organization
ISO	contact/*
ISO XPath	/gmd:MD_Metadata/gmd:contact/
NMF	contact/*
DMF	Metadata Responsible Party (MDRPTY)
DCAT	dcat:Dataset property dcat:contactPoint
DDMS	No appropriate mapping

Table 10. Metadata Date Stamp

Specification	Element
ID	8
I15 ebRIM	/wrs:ExtrinsicObject/rim:Slot[@name="http://purl.org/dc/elements/1.1/date"]
ISO	dateStamp
ISO XPath	/gmd:MD_Metadata/gmd:dateStamp
NMF	dateStamp

Specification	Element
DMF	Metadata Date Stamp (MDDATE)
DCAT	dcat:Dataset property dct:temporal
DDMS	ddms:temporalCoverage

Table 11. Metadata Security Constraint

Specification	Element
ID	9
I15 ebRIM	/wrs:ExtrinsicObject[@objectType="urn:ogc:def: ebRIM-ObjectType:OGC-I15::SecurityConstraints"]
ISO	metadataConstraints/MD_SecurityConstraints
ISO XPath	/gmd:MD_Metadata/gmd:metadataConstraints/gmd:MD_SecurityConstraints
NMF	Extended from ISO
DMF	Metadata Security Constraint (MDSCST)
DCAT	No appropriate mapping
DDMS	ddms:security

Table 12. Metadata Releasability Addressee

Specification	Element
ID	10
I15 ebRIM	No appropriate mapping
ISO	metadataConstraints/NGMP_Constraints/releasability/NGMP_Releasability/addressee/*/organisationName
ISO XPath	DMF Extension
NMF	No appropriate mapping
DMF	Metadata Releasability Addressee (MDREL)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 13. Metadata Legal Constraint

Specification	Element
ID	11

Specification	Element
I15 ebRIM	/wrs:ExtrinsicObject[@objectType="urn:ogc:def:ebRIM-ObjectType:OGC-I15::LegalConstraints"]
ISO	metadataConstraints/MD_LegalConstraints
ISO XPath	/gmd:MD_Metadata/gmd:metadataConstraints/gmd:MD_LegalConstraints
NMF	metadataConstraints/MD_LegalConstraints
DMF	Metadata Legal Constraint (MDLCST)
DCAT	dcat:Distribution property dct:rights
DDMS	ddms:rights

Table 14. Metadata Maintenance Frequency

Specification	Element
ID	12
I15 ebRIM	No appropriate mapping
ISO	metadataMaintenance/*/maintenanceAndUpdateFrequency
ISO XPath	/gmd:MD_Metadata/gmd:metadateMaintenance/gmd:MD_MaintenanceInformation/gmd:maintenanceAndUpdateFrequency
NMF	metadataMaintenance/*/maintenanceAndUpdateFrequency
DMF	Metadata Maintenance Frequency (MDMFRQ)
DCAT	dcat:Dataset property dcat:accrualPeriodicity
DDMS	No appropriate mapping

Table 15. Resource Title

Specification	Element
ID	13
I15 ebRIM	/wrs:ExtrinsicObject/rim:Name
ISO	identificationInfo[1]//citation//title
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_Identification/gmd:citation/gmd:CI_Citation/gmd:title
NMF	identificationInfo[1]//citation//title
DMF	Resource Title (RSTITLE)

Specification	Element
DCAT	dcat:Dataset property dct:title
DDMS	ddms:title

Table 16. Resource Alternate Title

Specification	Element
ID	14
I15 ebRIM	/wrs:ExtrinsicObject/rim:Slot[@name="http://purl.org/dc/terms/title"]
ISO	identificationInfo[1]//citation//alternateTitle
ISO XPath	/gmd:MD_Metadata/gmd:identificationInfo[n]/gmd:MD_Identification/gmd:citation/gmd:CI_Citation/gmd:alternativeTitle
NMF	identificationInfo[1]//citation//alternateTitle
DMF	Resource Alternate Title (RSALT)
DCAT	No appropriate mapping
DDMS	ddms:subtitle

Table 17. Resource Abstract

Specification	Element
ID	15
I15 ebRIM	/wrs:ExtrinsicObject/rim:Description
ISO	identificationInfo[1]/*/abstract
ISO XPath	/gmd:MD_Metadata/gmd:identificationInfo[n]/gmd:MD_Identification/gmd:abstract
NMF	identificationInfo[1]/*/abstract
DMF	Resource Abstract (RSABSTR)
DCAT	dcat:Dataset property dct:description
DDMS	ddms:description

Table 18. Resource Purpose

Specification	Element
ID	16
I15 ebRIM	No appropriate mapping
ISO	identificationInfo[1]/*/purpose

Specification	Element
ISO XPath	/gmd:MD_Metadata/gmd:identificationInfo[n]/gmd:MD_Identification/gmd:purpose
NMF	No appropriate mapping
DMF	Resource Purpose (RSPURP)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 19. Resource Edition

Specification	Element
ID	17
I15 ebRIM	No appropriate mapping
ISO	identificationInfo[1]//citation//edition
ISO XPath	/gmd:MD_Metadata/gmd:identificationInfo[n]/gmd:MD_Identification/gmd:citation/gmd:CI_Citation/gmd:edition
NMF	No appropriate mapping
DMF	Resource Edition (RSED)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 20. Resource Edition Date

Specification	Element
ID	18
I15 ebRIM	No appropriate mapping
ISO	identificationInfo[1]//citation//editionDate
ISO XPath	/gmd:MD_Metadata/gmd:identificationInfo[n]/gmd:MD_Identification/gmd:citation/gmd:CI_Citation/gmd:editionDate
NMF	No appropriate mapping
DMF	Resource Edition Date (RSEDDAT)
DCAT	dcat:Dataset property dct:issued
DDMS	No appropriate mapping

Table 21. Resource Identifier

Specification	Element
ID	19
I15 ebRIM	/wrs:ExtrinsicObject/rim:Slot[@name="http://purl.org/dc/elements/1.1/identifier"]
ISO	identificationInfo[1]//citation//identifier[not(/codeSpace=RSSERI)]/
ISO XPath	/gmd:MD_Metadata/gmd:identificationInfo[n]/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:identifier
NMF	identificationInfo[1]//citation//identifier[not(/codeSpace=RSSERI)]/
DMF	Resource Identifier (RSID)
DCAT	dcat:Dataset property dct:identifier
DDMS	ddms:identifier

Table 22. Resource Keyword Set

Specification	Element
ID	20
I15 ebRIM	/rim:ClassificationNode[@parent="urn:ogc:def:ebRIM-ClassificationScheme:OGC-I15::KeywordSchemeDiscipline"]
ISO	identificationInfo[1]//descriptiveKeywords[not(/thesaurusName//title=NGMP_GeospatialInformationTypeCode) and not(/thesaurusName//title=NGMP_GeoreferencingLevelCode) and not(/thesaurusName//title=NGMP_RepresentationFormCode) and not(/thesaurusName//title=NGMP_DataLevelCode) and not(/thesaurusName//title=NGMP_ThematicCode)]/
ISO XPath	/gmd:MD_Metadata/gmd:identificationInfo[n]/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords

Specification	Element
NMF	identificationInfo[1]//descriptiveKeywords[not(/thesaurusName//title=NGMP_GeospatialInformationTypeCode) and not(/thesaurusName//title=NGMP_GeoreferencingLevelCode) and not(/thesaurusName//title=NGMP_RepresentationFormCode) and not(/thesaurusName//title=NGMP_DataLevelCode) and not(/thesaurusName//title=NGMP_ThematicCode)]/
DMF	Resource Keyword Set (RSKWDS)
DCAT	dcat:Dataset property dcat:keyword
DDMS	ddms:keyword

Table 23. Resource Product Specification

Specification	Element
ID	21
I15 ebRIM	/wrs:ExtrinsicObject/rim:Slot[@name="urn:ogc:def:ebRIM-slot:OGC-I15::Conformance"]
ISO	dataQualityInfo//report [**/nameOfMeasure=Product specification compliancy and */measureDescription=This describes the product specification the resource is conformant to. and */result/DQ_ConformanceResult/explanation=Product specification and */result/DQ_ConformanceResult/pass=true] //result/DQ_ConformanceResult/specification/**
ISO XPath	No appropriate mapping
NMF	No appropriate mapping
DMF	Resource Product Specification (RSPSPC)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 24. Resource Thumbnail

Specification	Element
ID	22

Specification	Element
I15 ebRIM	/rim:Association[@associationType="urn:ogc:def :ebRIM- AssociationType:OGC:GraphicOverview"]
ISO	identificationInfo[1]//graphicOverview [*/fileDescription=thumbnail] //fileName
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/g md:MD_Identification/gmd:graphicOverview/gm d:MD_BrowseGraphic
NMF	No appropriate mapping
DMF	Resource Thumbnail (THUMB)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 25. Resource Graphics

Specification	Element
ID	23
I15 ebRIM	/rim:Association[@associationType="urn:ogc:def :ebRIM- AssociationType:OGC:GraphicOverview"]
ISO	identificationInfo[1]//graphicOverview[not(/file Description=thumbnail)]/*
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/g md:MD_Identification/gmd:graphicOverview/gm d:MD_BrowseGraphic
NMF	No appropriate mapping
DMF	Resource Graphics (GPHICS)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 26. Resource Equivalent Scale

Specification	Element
ID	24
I15 ebRIM	/wrs:ExtrinsicObject/rim:Slot[@name="urn:ogc:d ef:ebRIM-slot:OGC-I15::ScaleDenominator"]
ISO	identificationInfo[1]//spatialResolution//equivale ntScale/*/denominator

Specification	Element
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_DataIdentification/gmd:spatialResolution/gmd:MD_Resolution/gmd:equivalentScale/gmd:MD_RepresentativeFraction/gmd:denominator
NMF	identificationInfo[1]//spatialResolution//equivalentScale/*/denominator
DMF	Resource Equivalent Scale (RSSCALE)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 27. Resource Ground Sample Distance

Specification	Element
ID	25
I15 ebRIM	/wrs:ExtrinsicObject/rim:Slot[@name="urn:ogc:def:ebRIM-slot:OGC-I15::Resolution"]
ISO	identificationInfo[1]//spatialResolution//distance/*
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_DataIdentification/gmd:spatialResolution/gmd:MD_Resolution/gmd:distance/gco:distance
NMF	identificationInfo[1]//spatialResolution//distance/*
DMF	Resource Ground Sample Distance (RSGSD)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 28. Resource Spatial Representation Type

Specification	Element
ID	26
I15 ebRIM	/wrs:ExtrinsicObject/rim:Classification[@ClassificationScheme="urn:ogc:def:ebRIM-ClassificationScheme:OGC-I15::SpatialRepresentation"]
ISO	identificationInfo[1]/*/spatialRepresentationType
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_DataIdentification/gmd:spatialRepresentationType

Specification	Element
NMF	identificationInfo[1]/*/spatialRepresentationType e
DMF	Resource Spatial Representation Type (RSRPTP)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 29. Geospatial Information Type

Specification	Element
ID	27
I15 ebRIM	/wrs:ExtrinsicObject/rim:Classification[@ClassificationScheme="urn:ogc:def:ebRIM-ClassificationScheme:OGC-I15::KeywordSchemeTheme"]
ISO	identificationInfo[1]//descriptiveKeywords [**/thesaurusName//title=NGMP_GeospatialInformationTypeCode]** //keyword
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords
NMF	identificationInfo[1]//descriptiveKeywords [**/thesaurusName//title=NGMP_GeospatialInformationTypeCode]** //keyword
DMF	Geospatial Information Type (DGITYP)
DCAT	dcat:Dataset property dcat:keyword
DDMS	ddms:keyword

Table 30. Resource Georeferencing Level

Specification	Element
ID	28
I15 ebRIM	/wrs:ExtrinsicObject/rim:Classification[@ClassificationScheme="urn:ogc:def:ebRIM-ClassificationScheme:OGC-I15::KeywordSchemeTheme"]
ISO	identificationInfo[1]//descriptiveKeywords [**/thesaurusName//title=NGMP_GeoreferencingLevelCode]** //keyword
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords

Specification	Element
NMF	identificationInfo[1]//descriptiveKeywords [**/thesaurusName//title=NGMP_Georeferencing LevelCode]** //keyword
DMF	Resource Georeferencing Level (RSGFLV)
DCAT	dcat:Dataset property dcat:keyword
DDMS	ddms:keyword

Table 31. Resource Representation Form

Specification	Element
ID	29
I15 ebRIM	/wrs:ExtrinsicObject/rim:Classification[@ClassificationScheme="urn:ogc:def:ebRIM-ClassificationScheme:OGC-I15::KeywordSchemeTheme"]
ISO	identificationInfo[1]//descriptiveKeywords [**/thesaurusName//title=NGMP_Representation FormCode]** //keyword
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords
NMF	identificationInfo[1]//descriptiveKeywords [**/thesaurusName//title=NGMP_Representation FormCode]** //keyword
DMF	Resource Representation Form (RSPREF)
DCAT	dcat:Dataset property dcat:keyword
DDMS	ddms:keyword

Table 32. Resource Data Level

Specification	Element
ID	30
I15 ebRIM	/wrs:ExtrinsicObject/rim:Classification[@ClassificationScheme="urn:ogc:def:ebRIM-ClassificationScheme:OGC-I15::KeywordSchemeTheme"]
ISO	identificationInfo[1]//descriptiveKeywords [**/thesaurusName//title=NGMP_DataLevelCode]** //keyword

Specification	Element
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords
NMF	identificationInfo[1]//descriptiveKeywords [**/thesaurusName//title=NGMP_DataLevelCode]**//keyword
DMF	Resource Data Level (RSDTLVL)
DCAT	dcat:Dataset property dcat:keyword
DDMS	ddms:keyword

Table 33. Resource Topic Category

Specification	Element
ID	31
I15 ebRIM	/wrs:ExtrinsicObject/rim:Classification[@ClassificationScheme="urn:ogc:def:ebRIM-ClassificationScheme:OGC-I15::TopicCategory"]
ISO	identificationInfo[1]/*/topicCategory
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_DataIdentification/gmd:topicCategory
NMF	identificationInfo[1]/*/topicCategory
DMF	Resource Topic Category (RSTOPIC)
DCAT	dcat:Dataset property dcat:keyword
DDMS	ddms:category

Table 34. Resource Theme

Specification	Element
ID	32
I15 ebRIM	/wrs:ExtrinsicObject/rim:Classification[@ClassificationScheme="urn:ogc:def:ebRIM-ClassificationScheme:OGC-I15::KeywordSchemeTheme"]
ISO	identificationInfo[1]//descriptiveKeywords [**/thesaurusName//title=NGMP_ThematicCode]**//keyword
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords

Specification	Element
NMF	identificationInfo[1]//descriptiveKeywords [**/thesaurusName//title=NGMP_ThematicCode]** //keyword
DMF	Resource Theme (RSTHEME)
DCAT	dcat:Dataset property dcat:theme
DDMS	ddms:keyword

Table 35. Name of Resource Series

Specification	Element
ID	33
I15 ebRIM	rim:ExternalIdentifier
ISO	identificationInfo[1]//citation//series/*/name
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:series/gmd:CI_Series/gmd:name
NMF	No appropriate mapping
DMF	Name of Resource Series (RSSERI)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 36. Resource Sheet Name

Specification	Element
ID	34
I15 ebRIM	rim:ExternalIdentifier
ISO	identificationInfo[1]//citation//identifier [/codeSpace=RSSERI] //code
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:identifier/gmd:MD_Identifier/gmd:code
NMF	identificationInfo[1]//citation//identifier [/codeSpace=RSSERI] //code
DMF	Resource Sheet Name (RSSHNA)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 37. Resource Environment Description

Specification	Element
ID	35
I15 ebRIM	rim:ExternalIdentifier
ISO	identificationInfo[1]/*/environmentDescription
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_DataIdentification/gmd:environmentDescription
NMF	No appropriate mapping
DMF	Resource Environment Description (RSENVD)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 38. Resource Remark

Specification	Element
ID	36
I15 ebRIM	/wrs:ExtrinsicObject/rim:Slot[@name="urn:ogc:def:ebRIM-slot:OGC-I15::SupplementalInformation"]
ISO	identificationInfo[1]/*/supplementalInformation
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_DataIdentification/gmd:supplementalInformation
NMF	No appropriate mapping
DMF	Resource Remark (RSREM)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 39. Resource Format

Specification	Element
ID	37
I15 ebRIM	/wrs:ExtrinsicObject/rim:Classification[@ClassificationScheme="urn:ogc:def:ebRIM-ClassificationScheme:OGC-I15::FormatNameAndVersion"]
ISO	identificationInfo[1]//resourceFormat[1]/
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_DataIdentification/gmd:resourceFormat/gmd:MD_Format

Specification	Element
NMF	identificationInfo[1]//resourceFormat[1]/
DMF	Resource Format (RSFMT)
DCAT	dcat:Distribution property dct:format
DDMS	ddms:format

Table 40. Service Type

Specification	Element
ID	38
I15 ebRIM	rim:Classification
ISO	identificationInfo[1]/*/serviceType
ISO XPath	Not in 19139
NMF	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/srv:SV_ServiceIdentification/svr:servicetype
DMF	Service Type (SRTYPE)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 41. Service Type Version

Specification	Element
ID	39
I15 ebRIM	rim:Classification
ISO	identificationInfo[1]/*/serviceTypeVersion
ISO XPath	Not in 19139
NMF	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/srv:SV_ServiceIdentification/svr:ServiceTypeVersion
DMF	Service Type Version (SRTVER)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 42. Service Coupling Type

Specification	Element
ID	40

Specification	Element
I15 ebRIM	/wrs:ExtrinsicObject/rim:Classification[@Classification Scheme="urn:ogc:def:ebRIM-ClassificationScheme:OGC-I15::CouplingType"]
ISO	identificationInfo[1]/*/couplingType
ISO XPath	Not in 19139
NMF	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/srv:SV_ServiceIdentification/svr:couplingType
DMF	Service Coupling Type (SRCPLING)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 43. Resource Operated by the Service

Specification	Element
ID	41
I15 ebRIM	/wrs:ExtrinsicObject[@objectType=urn:ogc:def:ebRIM-ObjectType:OGC-I15::DataMetadata"]
ISO	identificationInfo[1]/*/operatesOn
ISO XPath	Not in 19139
NMF	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/srv:SV_ServiceIdentification/svr:operatesOn
DMF	Resource Operated by the Service (SROPRS)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 44. Service Operation

Specification	Element
ID	42
I15 ebRIM	/wrs:ExtrinsicObject[@objectType="urn:ogc:def:ebRIM-ObjectType:OGC-I15::ServiceOperation"]
ISO	identificationInfo[1]//containsOperation/
ISO XPath	Not in 19139
NMF	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/srv:SV_ServiceIdentification/svr:containsOperations
DMF	Service Operation (SROPER)

Specification	Element
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 45. Service Coupled Resource

Specification	Element
ID	43
I15 ebRIM	No appropriate mapping
ISO	identificationInfo[1]//coupledResource/
ISO XPath	Not in 19139
NMF	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/srv:SV_ServiceIdentification/svr:coupledResource/svr:SV_CoupledResource
DMF	Service Coupled Resource (SRCORS)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 46. Spatial Representation of a Georectified Gridded Coverage

Specification	Element
ID	44
I15 ebRIM	No appropriate mapping
ISO	spatialRepresentationInfo/MD_Georeferencable
ISO XPath	/gmd:MD_Metadata/gmd:spatialRepresentationInfo/gmd:MD_Georeferenceable/gmd:axisDimensionProperties
NMF	spatialRepresentationInfo/MD_Georeferencable
DMF	Spatial Representation of a Georectified Gridded Coverage (GRSPREP)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 47. Content Information of the Coverage

Specification	Element
ID	45
I15 ebRIM	/wrs:ExtrinsicObject/rim:Slot[@name="name="http://purl.org/dc/elements/1.1/coverage"]

Specification	Element
ISO	contentInfo/*
ISO XPath	/gmd:MD_Metadata/gmd:contentInfo/gmd:MD_CoverageDescription
NMF	contentInfo/*
DMF	Content Information of the Coverage (GRCINF)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 48. Topology Level

Specification	Element
ID	46
I15 ebRIM	No appropriate mapping
ISO	spatialRepresentationInfo/MD_VectorSpatialRepresentation/topologyLevel
ISO XPath	/gmd:MD_Metadata/gmd:spatialRepresentationInfo/gmd:MD_VectorSpatialRepresentation/gmd:topologyLevel
NMF	spatialRepresentationInfo/MD_VectorSpatialRepresentation/topologyLevel
DMF	Topology Level (VCTOLVL)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 49. Geometric Object

Specification	Element
ID	47
I15 ebRIM	No appropriate mapping
ISO	spatialRepresentationInfo/MD_VectorSpatialRepresentation/geometricObjects/*
ISO XPath	/gmd:MD_Metadata/gmd:spatialRepresentationInfo/gmd:MD_VectorSpatialRepresentation/gmd:geometricObjects
NMF	No appropriate mapping
DMF	Geometric Object (VGEOM)
DCAT	No appropriate mapping

Specification	Element
DDMS	No appropriate mapping

Table 50. Feature Catalogue Description

Specification	Element
ID	48
I15 ebRIM	No appropriate mapping
ISO	contentInfo/*
ISO XPath	/gmd:MD_Metadata/gmd:contentInfo/gmd:MD_FeatureCatalogueDescription
NMF	contentInfo/*
DMF	Feature Catalogue Description (FCDESC)
DCAT	dcat:Catalog property dct:description
DDMS	No appropriate mapping

Table 51. Resource Extent

Specification	Element
ID	49
I15 ebRIM	/wrs:ExtrinsicObject/rim:Slot[@name="urn:ogc:def:ebRIM-slot:OGC-I15::Envelope"]
ISO	identificationInfo[1]//extent/
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent
NMF	identificationInfo[1]//extent/
DMF	Resource Extent (RSEXT)
DCAT	dcat:Dataset property dct:spatial
DDMS	ddms:GeospatialExtent

Table 52. Resource Reference System

Specification	Element
ID	50
I15 ebRIM	No appropriate mapping
ISO	referenceSystemInfo//referenceSystemIdentifier//code/*

Specification	Element
ISO XPath	/gmd:MD_Metadata/gmd:referenceSystemInfo/gmd:MD_ReferenceSystem/gmd:referenceSystemIdentifier/gmd:RS_identifier
NMF	referenceSystemInfo//referenceSystemIdentifier//code/*
DMF	Resource Reference System (RSRSYS)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 53. Resource Status

Specification	Element
ID	51
I15 ebRIM	No appropriate mapping
ISO	identificationInfo[1]/*/status
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_Identification/gmd:status
NMF	No appropriate mapping
DMF	Resource Status (RSSTAT)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 54. Resource Reference Date

Specification	Element
ID	52
I15 ebRIM	No appropriate mapping
ISO	identificationInfo[1]//citation//date/*
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_Identification/gmd:citation/gmd:CI_Citation/gmd:date
NMF	identificationInfo[1]//citation//date/*
DMF	Resource Reference Date (RSDATE)
DCAT	dcat:Dataset property dct:modified
DDMS	ddms:dates

Table 55. Resource Responsible Party

Specification	Element
ID	53
I15 ebRIM	/wrs:ExtrinsicObject/rim:Classification[@ClassificationScheme="urn:ogc:def:ebRIM-ClassificationScheme:OGC-I15::CitedResponsibleParty"]
ISO	identificationInfo[1]//pointOfContact/
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_Identification/gmd:pointOfContact
NMF	identificationInfo[1]//pointOfContact/
DMF	Resource Responsible Party (RSRPTY)
DCAT	dcat:Dataset property dcat:contactPoint
DDMS	ddms:pointOfContact

Table 56. Resource Maintenance

Specification	Element
ID	54
I15 ebRIM	No appropriate mapping
ISO	identificationInfo[1]//resourceMaintenance/
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_Identification/gmd:resourceMaintenance/gmd:MD_MaintenanceInformation
NMF	identificationInfo[1]//resourceMaintenance/
DMF	Resource Maintenance (RSMTNC)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 57. Resource Security Constraint

Specification	Element
ID	55
I15 ebRIM	/rim:Association[@associationType="urn:ogc:def:ebRIM-AssociationType:OGC-I15::ResourceConstraints"]
ISO	identificationInfo[1]/*/resourceConstraints/MD_SecurityConstraints]
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_Identification/gmd:resourceConstraints/gmd:MD_SecurityConstraints

Specification	Element
NMF	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_Identification/gmd:resourceConstraints/nas:MD_SecurityConstraints
DMF	Resource Security Constraint (RSSCST)
DCAT	dcat:Distribution property dct:rights
DDMS	ddms:security

Table 58. Resource Releasability

Specification	Element
ID	56
I15 ebRIM	No appropriate mapping
ISO	identificationInfo[1]/*/resourceConstraints/NGMP_Constraints
ISO XPath	NGMP extension
NMF	No appropriate mapping
DMF	Resource Releasability (RSREL)
DCAT	dcat:Distribution property dct:rights
DDMS	No appropriate mapping

Table 59. Resource Use Limitation

Specification	Element
ID	57
I15 ebRIM	No appropriate mapping
ISO	identificationInfo[1]/*/resourceConstraints/MD_Constraints/useLimitation
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_Identification/gmd:resourceConstraints/gmd:MD_Constraints/gmd:useLimitation
NMF	No appropriate mapping
DMF	Resource Use Limitation (RSUSE)
DCAT	dcat:Distribution property dct:license
DDMS	No appropriate mapping

Table 60. Resource Legal Constraint

Specification	Element
ID	58
I15 ebRIM	/wrs:ExtrinsicObject[@objectType="urn:ogc:def:ebRIM-ObjectType:OGC-I15::LegalConstraints"]
ISO	identificationInfo[1]/*/resourceConstraints/MD_LegalConstraints
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/gmd:MD_Identification/gmd:resourceConstraints/gmd:MD_LegalConstraints
NMF	identificationInfo[1]/*/resourceConstraints/MD_LegalConstraints
DMF	Resource Legal Constraint (RSLCST)
DCAT	dcat:Distribution property dct:rights
DDMS	ddms:rights

Table 61. Resource Lineage

Specification	Element
ID	59
I15 ebRIM	/wrs:ExtrinsicObject/rim:Slot[@name="urn:ogc:def:ebRIM-slot:OGC-I15::Lineage"]
ISO	dataQualityInfo//lineage//statement
ISO XPath	/gmd:MD_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:lineage/gmd:LI_Lineage/gmd:statement
NMF	dataQualityInfo//lineage//statement
DMF	Resource Lineage (RSLING)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 62. Resource Regulated Quality Report

Specification	Element
ID	60
I15 ebRIM	/wrs:ExtrinsicObject[@objectType="urn:ogc:def:ebRIM-ObjectType:OGC-I15::DataQuality"]

Specification	Element
ISO	dataQualityInfo//report [*/measureIdentification and */result [*/valueType=xs:string and */valueUnit=unity] /DQ_QuantitativeResult/valueType=xs:string and */result [*/valueType=xs:string and */valueUnit=unity] /DQ_QuantitativeResult/valueUnit=unity] /
ISO XPath	/gmd:MD_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:report/gmd:*/
NMF	dataQualityInfo//report [*/measureIdentification and */result [*/valueType=xs:string and */valueUnit=unity] /DQ_QuantitativeResult/valueType=xs:string and */result [*/valueType=xs:string and */valueUnit=unity] /DQ_QuantitativeResult/valueUnit=unity] /
DMF	**Resource Regulated Quality Report (RSRQR)**
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 63. Resource Unspecified Quality Report

Specification	Element
ID	61
I15 ebRIM	/wrs:ExtrinsicObject[@objectType="urn:ogc:def: ebRIM-ObjectType:OGC-I15::DataQuality"]
ISO	dataQualityInfo//report[not(/measureIdentification and /result [*/valueType=xs:string and */valueUnit=unity] /DQ_QuantitativeResult/valueType=xs:string and */result [*/valueType=xs:string and */valueUnit=unity] /DQ_QuantitativeResult/valueUnit=unity)]/
ISO XPath	/gmd:MD_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:report/gmd:*/
NMF	No appropriate mapping
DMF	**Resource Unspecified Quality Report (RSUQR)**
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 64. Source of the Resource

Specification	Element
ID	62
I15 ebRIM	/wrs:ExtrinsicObject[@objectType="urn:ogc:def: ebRIM-ObjectType:OGC-I15::Lineage"]
ISO	dataQualityInfo//lineage//source/*
ISO XPath	/gmd:MD_Metadata/gmd:dataQualityInfo/gmd:D Q_DataQuality/gmd:lineage/gmd:LI_Lineage/gmd :source/gmd:LI_Source
NMF	dataQualityInfo//lineage//source/*
DMF	Source of the Resource (RSSRC)
DCAT	No appropriate mapping
DDMS	ddms:source

Table 65. Resource Process Step

Specification	Element
ID	63
I15 ebRIM	No appropriate mapping
ISO	dataQualityInfo//lineage//processStep/*
ISO XPath	/gmd:MD_Metadata/gmd:dataQualityInfo/gmd:D Q_DataQuality/gmd:lineage/gmd:LI_Lineage/gmd :processStep/gmd:LI_ProcessStep
NMF	dataQualityInfo//lineage//processStep/*
DMF	Resource Process Step (RSPRST)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 66. Resource Usage

Specification	Element
ID	64
I15 ebRIM	No appropriate mapping
ISO	identificationInfo[1]//resourceSpecificUsage/
ISO XPath	/gmd:MD_Metadata/gmd:IdentificationInfo[n]/g md:MD_Identification/gmd:resoruceSpecificUsag e/gmd:MD_Usage
NMF	No appropriate mapping
DMF	Resource Usage (RSSPUS)

Specification	Element
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 67. Resource Distribution Format

Specification	Element
ID	65
I15 ebRIM	No appropriate mapping
ISO	distributionInfo//distributionFormat/
ISO XPath	/gmd:MD_Metadata/gmd:distributionInfo/gmd:MD_Distribution/gmd:distributionFormat/gmd:MD_format
NMF	distributionInfo//distributionFormat/
DMF	Resource Distribution Format (RSDFMT)
DCAT	dcat:Distribution property dct:format
DDMS	No appropriate mapping

Table 68. Resource Online Location

Specification	Element
ID	66
I15 ebRIM	No appropriate mapping
ISO	distributionInfo//transferOptions//onLine/*
ISO XPath	/gmd:MD_Metadata/gmd:distributionInfo/gmd:MD_Distribution/gmd:transferOptions/gmd:MD_DigitalTransferOptions/gmd:online/gmd:CI_Online Resource
NMF	distributionInfo//transferOptions//onLine/*
DMF	Resource Online Location (RSONLLC)
DCAT	dcat:Distribution property dcat:downloadURL
DDMS	No appropriate mapping

Table 69. Resource Unit of Distribution

Specification	Element
ID	67
I15 ebRIM	No appropriate mapping

Specification	Element
ISO	distributionInfo//transferOptions//unitsOfDistribution[1]
ISO XPath	/gmd:MD_Metadata/gmd:distributionInfo/gmd:MD_Distribution/gmd:transferOptions/gmd:MD_DigitalTransferOptions/gmd:unitsOfDistribution
NMF	No appropriate mapping
DMF	Resource Unit of Distribution (RSUD)
DCAT	No appropriate mapping
DDMS	No appropriate mapping

Table 70. Resource Transfer Size

Specification	Element
ID	68
I15 ebRIM	No appropriate mapping
ISO	distributionInfo//transferOptions//transferSize[1]
ISO XPath	/gmd:MD_Metadata/gmd:distributionInfo/gmd:MD_Distribution/gmd:transferOptions/gmd:MD_DigitalTransferOptions/gmd:transferSize
NMF	distributionInfo//transferOptions//transferSize[1]
DMF	Resource Transfer Size (RSTS)
DCAT	dcat:Distribution property dcat:byteSize
DDMS	No appropriate mapping

Appendix C: Sample Metadata

This appendix presents sample metadata in ISO 19139, NMIS, DMF, DDMS and DCAT.

C.1Example ISO 19139 Listing

ISO19139 Sample

```xml
<gmd:MD_Metadata xmlns:gmd="http://www.isotc211.org/2005/gmd"
xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:gts="http://www.isotc211.org/2005/gts"
xmlns:srv="http://www.isotc211.org/2005/srv" xmlns:gml="http://www.opengis.net/gml"
xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:geonet="http://www.fao.org/catalogue"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.isotc211.org/2005/gmd
http://www.isotc211.org/2005/gmd/gmd.xsd http://www.isotc211.org/2005/gmx
http://www.isotc211.org/2005/gmx/gmx.xsd http://www.isotc211.org/2005/srv
http://schemas.opengis.net/iso/19139/20060504/service/srv.xsd">
  <gmd:fileIdentifier>
    <gco:CharacterString>3dc7f9b6-b573-445a-a8a3-a0ece544e8ce</gco:CharacterString>
  </gmd:fileIdentifier>
  <gmd:language>
    <gmd:LanguageCode codeList="http://www.loc.gov/standards/iso639-2/"
codeListValue="eng" codeSpace="ISO639-2" />
  </gmd:language>
  <gmd:characterSet>
    <gmd:MD_CharacterSetCode
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/r
esources/codelist/ML_gmxCodelists.xml#MD_CharacterSetCode" codeListValue="utf16"
codeSpace="ISOTC211/19115" />
  </gmd:characterSet>
  <gmd:hierarchyLevel>
    <gmd:MD_ScopeCode
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/r
esources/codelist/ML_gmxCodelists.xml#MD_ScopeCode" codeListValue="dataset"
codeSpace="ISOTC211/19115" />
  </gmd:hierarchyLevel>
  <gmd:contact>
    <gmd:CI_ResponsibleParty>
      <gmd:individualName gco:nilReason="missing">
        <gco:CharacterString />
      </gmd:individualName>
      <gmd:organisationName>
        <gco:CharacterString>Envitia</gco:CharacterString>
      </gmd:organisationName>
      <gmd:role>
        <gmd:CI_RoleCode
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/r
esources/codelist/ML_gmxCodelists.xml#CI_RoleCode" codeListValue="pointOfContact" />
      </gmd:role>
    </gmd:CI_ResponsibleParty>
  </gmd:contact>
  <gmd:dateStamp>
    <gco:DateTime>2016-05-05T10:03:32</gco:DateTime>
```

```xml
        </gmd:dateStamp>
        <gmd:metadataStandardName>
          <gco:CharacterString>ISO19115</gco:CharacterString>
        </gmd:metadataStandardName>
        <gmd:metadataStandardVersion>
          <gco:CharacterString>2003/Cor.1:2006</gco:CharacterString>
        </gmd:metadataStandardVersion>
        <gmd:identificationInfo>
          <gmd:MD_DataIdentification>
            <gmd:citation>
              <gmd:CI_Citation>
                <gmd:title>
                  <gco:CharacterString>Distribution of Arctic char species of complex
Salvelinus alpinus around or within the polar regions</gco:CharacterString>
                </gmd:title>
                <gmd:date>
                  <gmd:CI_Date>
                    <gmd:date>
                      <gco:Date>2016-01-01</gco:Date>
                    </gmd:date>
                    <gmd:dateType>
                      <gmd:CI_DateTypeCode
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/r
esources/codelist/ML_gmxCodelists.xml#CI_DateTypeCode" codeListValue="publication" />
                    </gmd:dateType>
                  </gmd:CI_Date>
                </gmd:date>
                <gmd:identifier>
                  <gmd:MD_Identifier>
                    <gmd:code>
                      <gco:CharacterString>http://server/catalogue/3dc7f9b6-b573-445a-a8a3-
a0ece544e8ce</gco:CharacterString>
                    </gmd:code>
                  </gmd:MD_Identifier>
                </gmd:identifier>
                <gmd:citedResponsibleParty>
                  <gmd:CI_ResponsibleParty>
                    <gmd:organisationName>
                      <gco:CharacterString>Conservation of Arctic Flora and Fauna
(CAFF)</gco:CharacterString>
                    </gmd:organisationName>
                    <gmd:role>
                      <gmd:CI_RoleCode
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/r
esources/codelist/ML_gmxCodelists.xml#CI_RoleCode" codeListValue="pointOfContact" />
                    </gmd:role>
                  </gmd:CI_ResponsibleParty>
                </gmd:citedResponsibleParty>
              </gmd:CI_Citation>
            </gmd:citation>
            <gmd:abstract>
```

```
        <gco:CharacterString>Circumpolar distribution of arctic char species complex
Salvelinus alpinus, and related species.
-  &lt;a href="http://www.caff.is/assessment-series/10-arctic-biodiversity-
assessment/211-arctic-biodiversity-assessment-2013-chapter-6-fishes"
target="_blank"&gt; Arctic Biodiversity Assessment, Chapter 6:
Fishes&lt;/a&gt;</gco:CharacterString>
      </gmd:abstract>
      <gmd:credit>
        <gco:CharacterString>Adapted from
http://geo.abds.is/geonetwork/srv/eng/xml.metadata.get?id=497 for OGC Testbed 12
demonstration</gco:CharacterString>
      </gmd:credit>
      <gmd:status gco:nilReason="missing" />
      <gmd:resourceMaintenance>
        <gmd:MD_MaintenanceInformation>
          <gmd:maintenanceAndUpdateFrequency>
            <gmd:MD_MaintenanceFrequencyCode
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/r
esources/codelist/ML_gmxCodelists.xml#MD_MaintenanceFrequencyCode"
codeListValue="irregular" codeSpace="ISOTC211/19115" />
          </gmd:maintenanceAndUpdateFrequency>
        </gmd:MD_MaintenanceInformation>
      </gmd:resourceMaintenance>
      <gmd:descriptiveKeywords>
        <gmd:MD_Keywords>
          <gmd:keyword>
            <gco:CharacterString>Arctic Char</gco:CharacterString>
          </gmd:keyword>
          <gmd:keyword>
            <gco:CharacterString>distribution</gco:CharacterString>
          </gmd:keyword>
          <gmd:keyword>
            <gco:CharacterString>CAFF</gco:CharacterString>
          </gmd:keyword>
          <gmd:keyword>
            <gco:CharacterString>ABA</gco:CharacterString>
          </gmd:keyword>
          <gmd:keyword>
            <gco:CharacterString>Arctic Biodiversity Assessment</gco:CharacterString>
          </gmd:keyword>
          <gmd:keyword>
            <gco:CharacterString>fishes</gco:CharacterString>
          </gmd:keyword>
          <gmd:keyword>
            <gco:CharacterString>species</gco:CharacterString>
          </gmd:keyword>
          <gmd:keyword>
            <gco:CharacterString>marine</gco:CharacterString>
          </gmd:keyword>
        </gmd:MD_Keywords>
      </gmd:descriptiveKeywords>
```

```xml
<gmd:language>
  <gmd:LanguageCode codeList="http://www.loc.gov/standards/iso639-2/"
codeListValue="eng" codeSpace="ISO639-2" />
</gmd:language>
<gmd:topicCategory>
  <gmd:MD_TopicCategoryCode>biota</gmd:MD_TopicCategoryCode>
</gmd:topicCategory>
<gmd:topicCategory>
  <gmd:MD_TopicCategoryCode>oceans</gmd:MD_TopicCategoryCode>
</gmd:topicCategory>
<gmd:topicCategory>
  <gmd:MD_TopicCategoryCode>inlandWaters</gmd:MD_TopicCategoryCode>
</gmd:topicCategory>
<gmd:extent>
  <gmd:EX_Extent>
    <gmd:geographicElement>
      <gmd:EX_GeographicBoundingBox>
        <gmd:extentTypeCode>
          <gco:Boolean>true</gco:Boolean>
        </gmd:extentTypeCode>
        <gmd:westBoundLongitude>
          <gco:Decimal>-180</gco:Decimal>
        </gmd:westBoundLongitude>
        <gmd:eastBoundLongitude>
          <gco:Decimal>180</gco:Decimal>
        </gmd:eastBoundLongitude>
        <gmd:southBoundLatitude>
          <gco:Decimal>33.263444</gco:Decimal>
        </gmd:southBoundLatitude>
        <gmd:northBoundLatitude>
          <gco:Decimal>89</gco:Decimal>
        </gmd:northBoundLatitude>
      </gmd:EX_GeographicBoundingBox>
    </gmd:geographicElement>
  </gmd:EX_Extent>
</gmd:extent>
    </gmd:MD_DataIdentification>
  </gmd:identificationInfo>
  <gmd:distributionInfo xmlns:date="http://exslt.org/dates-and-times">
    <gmd:MD_Distribution>
      <gmd:transferOptions>
        <gmd:MD_DigitalTransferOptions>
          <gmd:onLine>
            <gmd:CI_OnlineResource>
              <gmd:linkage>
                <gmd:URL>http://server/geoserver/Species/wms?</gmd:URL>
              </gmd:linkage>
              <gmd:protocol>
                <gco:CharacterString>OGC:WMS</gco:CharacterString>
              </gmd:protocol>
              <gmd:name>
```

```
              <gco:CharacterString>Arctic_Char</gco:CharacterString>
            </gmd:name>
            <gmd:description>
              <gco:CharacterString>Circumpolar distribution of Arctic
Char</gco:CharacterString>
            </gmd:description>
          </gmd:CI_OnlineResource>
        </gmd:onLine>
      </gmd:MD_DigitalTransferOptions>
    </gmd:transferOptions>
    <gmd:transferOptions>
      <gmd:MD_DigitalTransferOptions>
        <gmd:onLine />
      </gmd:MD_DigitalTransferOptions>
    </gmd:transferOptions>
    <gmd:transferOptions>
      <gmd:MD_DigitalTransferOptions>
        <gmd:onLine>
          <gmd:CI_OnlineResource>
            <gmd:linkage>

<gmd:URL>http://arcticbiodiversity.is/abt2010/index.php/en/species/arctic-
char</gmd:URL>
            </gmd:linkage>
            <gmd:protocol>
              <gco:CharacterString>http-download</gco:CharacterString>
            </gmd:protocol>
            <gmd:name gco:nilReason="missing">
              <gco:CharacterString />
            </gmd:name>
            <gmd:description>
              <gco:CharacterString>Arctic Biodiversity Trends 2010: Selected
indicators of change - Arctic Char</gco:CharacterString>
            </gmd:description>
          </gmd:CI_OnlineResource>
        </gmd:onLine>
      </gmd:MD_DigitalTransferOptions>
    </gmd:transferOptions>
    <gmd:transferOptions>
      <gmd:MD_DigitalTransferOptions>
        <gmd:onLine>
          <gmd:CI_OnlineResource>
            <gmd:linkage>
              <gmd:URL>http://server/catalogue/service/eng/resources.get?3dc7f9b6-
b573-445a-a8a3-a0ece544e8ce&amp;fname=Figure-6.3.jpg&amp;access=public</gmd:URL>
            </gmd:linkage>
            <gmd:protocol>
              <gco:CharacterString>Http-download</gco:CharacterString>
            </gmd:protocol>
            <gmd:name>
              <gmx:MimeFileType xmlns:gmx="http://www.isotc211.org/2005/gmx"
```

```xml
type="image/pjpeg">Figure-6.3.jpg</gmx:MimeFileType>
                </gmd:name>
                <gmd:description>
                  <gco:CharacterString>Figure 6.3 (PNG)</gco:CharacterString>
                </gmd:description>
              </gmd:CI_OnlineResource>
            </gmd:onLine>
          </gmd:MD_DigitalTransferOptions>
        </gmd:transferOptions>
        <gmd:transferOptions>
          <gmd:MD_DigitalTransferOptions>
            <gmd:onLine>
              <gmd:CI_OnlineResource>
                <gmd:linkage>
                  <gmd:URL>http://server/catalogue/service/eng/resources.get?3dc7f9b6-b573-445a-a8a3-a0ece544e8ce&amp;fname=Arctic_Char_2010.zip&amp;access=public</gmd:URL>
                </gmd:linkage>
                <gmd:protocol>
                  <gco:CharacterString>http-download</gco:CharacterString>
                </gmd:protocol>
                <gmd:name>
                  <gmx:MimeFileType xmlns:gmx="http://www.isotc211.org/2005/gmx"
type="application/x-compressed">Arctic_Char_2010.zip</gmx:MimeFileType>
                </gmd:name>
                <gmd:description>
                  <gco:CharacterString>Download spatial data for Circumpolar
distribution of Arctic Char</gco:CharacterString>
                </gmd:description>
              </gmd:CI_OnlineResource>
            </gmd:onLine>
          </gmd:MD_DigitalTransferOptions>
        </gmd:transferOptions>
      </gmd:MD_Distribution>
    </gmd:distributionInfo>
    <gmd:metadataMaintenance>
      <gmd:MD_MaintenanceInformation>
        <gmd:maintenanceAndUpdateFrequency>
          <gmd:MD_MaintenanceFrequencyCode
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/r
esources/codelist/ML_gmxCodelists.xml#MD_MaintenanceFrequencyCode"
codeListValue="asNeeded" codeSpace="ISOTC211/19115" />
        </gmd:maintenanceAndUpdateFrequency>
      </gmd:MD_MaintenanceInformation>
    </gmd:metadataMaintenance>
</gmd:MD_Metadata>
```

C.2 Example NMF/NMIS Listing

NMF/NMIS Sample

```xml
<nas:MD_Metadata xmlns:srv="http://www.isotc211.org/2005/srv"
xmlns:nas="http://metadata.ces.mil/dse/ns/GSIP/5.0/nas"
xmlns:gmd="http://www.isotc211.org/2005/gmd"
xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:ism="urn:us:gov:ic:ism" xmlns:ntk="urn:us:gov:ic:ntk"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://metadata.ces.mil/dse/ns/GSIP/5.0/nas ./nas/nmis.xsd"
ism:DESVersion="9" ntk:DESVersion="7" ism:resourceElement="true" ism:createDate="2010-
09-21" ism:classification="U" ism:ownerProducer="USA">
    <gmd:hierarchyLevel>
        <gmd:MD_ScopeCode codeList="http://api.nsgreg.nga.mil/codelist/ScopeCode"
codeListValue="service"/>
    </gmd:hierarchyLevel>
    <gmd:hierarchyLevelName>
        <nas:ScopeAmplificationCode
codeList="http://api.nsgreg.nga.mil/codelist/ScopeAmplificationCode"
codeListValue="cell"/>
    </gmd:hierarchyLevelName>
    <gmd:contact>
        <gmd:CI_ResponsibleParty>
            <gmd:organisationName>
                <gco:CharacterString>Envitia</gco:CharacterString>
            </gmd:organisationName>
            <gmd:role>
                <gmd:CI_RoleCode
codeList="http://api.nsgreg.nga.mil/codelist/RoleCode" codeListValue="publisher"/>
            </gmd:role>
        </gmd:CI_ResponsibleParty>
    </gmd:contact>
    <gmd:dateStamp>
        <gco:Date>2010-09-21</gco:Date>
    </gmd:dateStamp>
    <gmd:metadataStandardName>
        <nas:MetadataStandardNameCode
codeList="http://api.nsgreg.nga.mil/codelist/MetadataStandardNameCode"
codeListValue="nsgMetadataFoundation"/>
    </gmd:metadataStandardName>
    <gmd:metadataStandardVersion>
        <nas:MetadataStandardVersion>2.2.0</nas:MetadataStandardVersion>
    </gmd:metadataStandardVersion>
    <gmd:locale>
        <gmd:PT_Locale>
            <gmd:languageCode>
                <gmd:LanguageCode codeList="http://api.nsgreg.nga.mil/codelist/ISO639-
2" codeListValue="eng"/>
```

```xml
            </gmd:languageCode>
            <gmd:country>
                <gmd:Country codeList="http://api.nsgreg.nga.mil/geo-
political/GENC/3/2-1" codeListValue="USA"/>
            </gmd:country>
            <gmd:characterEncoding>
                <gmd:MD_CharacterSetCode
codeList="http://api.nsgreg.nga.mil/codelist/CharacterSetCode" codeListValue="utf8"/>
            </gmd:characterEncoding>
        </gmd:PT_Locale>
    </gmd:locale>
    <gmd:referenceSystemInfo>
        <gmd:MD_ReferenceSystem>
            <gmd:referenceSystemIdentifier>
                <gmd:RS_Identifier>
                    <gmd:code>
                        <gco:CharacterString>WGS84E_2D</gco:CharacterString>
                    </gmd:code>
                    <gmd:codeSpace>
                        <gco:CharacterString>http://api.nsgreg.nga.mil/coord-ref-
system</gco:CharacterString>
                    </gmd:codeSpace>
                </gmd:RS_Identifier>
            </gmd:referenceSystemIdentifier>
        </gmd:MD_ReferenceSystem>
    </gmd:referenceSystemInfo>
    <gmd:identificationInfo>
        <nas:MD_DataIdentification>
            <gmd:citation>
                <gmd:CI_Citation>
                    <gmd:title>
                        <gco:CharacterString>Ecological Restoration of Abandoned Oil
Field Facilities and Exploration Well Sites in North Slope,
Alaska</gco:CharacterString>
                    </gmd:title>
                    <gmd:date>
                        <gmd:CI_Date>
                            <gmd:date>
                                <gco:Date>2016-04-30</gco:Date>
                            </gmd:date>
                            <gmd:dateType>
                                <gmd:CI_DateTypeCode
codeList="http://api.nsgreg.nga.mil/codelist/DateTypeCode"
codeListValue="distribution"/>
                            </gmd:dateType>
                        </gmd:CI_Date>
                    </gmd:date>
                </gmd:CI_Citation>
            </gmd:citation>
            <gmd:abstract>
                <gco:CharacterString>The program involves developing revegetation
```

```
performance standards; providing recommendations for enhancing the wildlife
characteristics of rehabilitated areas; identifying and applying appropriate plant
materials; monitoring soil and vegetation response; and monitoring the surface and
thermal stability of rehabilitated sites.</gco:CharacterString>
            </gmd:abstract>
            <gmd:pointOfContact>
            <gmd:CI_ResponsibleParty>
                <gmd:organisationName>
                    <gco:CharacterString></gco:CharacterString>
                </gmd:organisationName>
                <gmd:role>
                    <gmd:CI_RoleCode
codeList="http://api.nsgreg.nga.mil/codelist/RoleCode" codeListValue="originator"/>
                </gmd:role>
            </gmd:CI_ResponsibleParty>
            </gmd:pointOfContact>
            <gmd:descriptiveKeywords>
                <gmd:MD_Keywords>
                    <gmd:keyword>
                        <gco:CharacterString>environmental
information</gco:CharacterString>
                    </gmd:keyword>
                    <gmd:type>
                        <gmd:MD_KeywordTypeCode
codeList="http://api.nsgreg.nga.mil/codelist/KeywordTypeCode" codeListValue="theme"/>
                    </gmd:type>
                    <gmd:thesaurusName>
                        <gmd:CI_Citation>
                            <gmd:title>
                                <gco:CharacterString>GEMET
Thesaurus</gco:CharacterString>
                            </gmd:title>
                            <gmd:date>
                                <gmd:CI_Date>
                                    <gmd:date>
                                        <gco:Date>2016-04-30</gco:Date>
                                    </gmd:date>
                                    <gmd:dateType>
                                        <gmd:CI_DateTypeCode
codeList="http://api.nsgreg.nga.mil/codelist/DateTypeCode" codeListValue=
"publication"/>
                                    </gmd:dateType>
                                </gmd:CI_Date>
                            </gmd:date>
                        </gmd:CI_Citation>
                    </gmd:thesaurusName>
                </gmd:MD_Keywords>
            </gmd:descriptiveKeywords>
            <gmd:resourceConstraints>
                <nas:MD_SecurityConstraints>
                    <gmd:classification>
```

```xml
                    <gmd:MD_ClassificationCode
codeList="http://api.nsgreg.nga.mil/codelist/ClassificationCode"
codeListValue="unclassified"/>
                </gmd:classification>
                <gmd:classificationSystem>
                    <nas:ClassificationSystem>US CAPCO</nas:ClassificationSystem>
                </gmd:classificationSystem>
                <nas:capcoMarking ism:classification="U" ism:ownerProducer="USA"/>
            </nas:MD_SecurityConstraints>
        </gmd:resourceConstraints>
        <gmd:language>
            <gmd:LanguageCode codeList="http://api.nsgreg.nga.mil/codelist/ISO639-2" codeListValue="eng"/>
        </gmd:language>
        <gmd:characterSet>
            <gmd:MD_CharacterSetCode
codeList="http://api.nsgreg.nga.mil/codelist/CharacterSetCode" codeListValue="utf8"/>
        </gmd:characterSet>
        <gmd:topicCategory>
            <gmd:MD_TopicCategoryCode>
intelligenceMilitary</gmd:MD_TopicCategoryCode>
        </gmd:topicCategory>
        <gmd:extent>
            <gmd:EX_Extent>
                <gmd:geographicElement>
                    <gmd:EX_GeographicBoundingBox>
                        <gmd:westBoundLongitude>
                            <gco:Decimal>-166.75</gco:Decimal>
                        </gmd:westBoundLongitude>
                        <gmd:eastBoundLongitude>
                            <gco:Decimal>-141</gco:Decimal>
                        </gmd:eastBoundLongitude>
                        <gmd:southBoundLatitude>
                            <gco:Decimal>67</gco:Decimal>
                        </gmd:southBoundLatitude>
                        <gmd:northBoundLatitude>
                            <gco:Decimal>71.25</gco:Decimal>
                        </gmd:northBoundLatitude>
                    </gmd:EX_GeographicBoundingBox>
                </gmd:geographicElement>
            </gmd:EX_Extent>
        </gmd:extent>
        <nas:languageCountry>
            <nas:LanguageCountryCode codeList="http://api.nsgreg.nga.mil/geo-political/GENC/3/2-1" codeListValue="USA"/>
        </nas:languageCountry>
        <nas:resourceCategory>
            <nas:ResourceCategoryCode
codeList="http://api.nsgreg.nga.mil/codelist/ResourceCategoryCode"
codeListValue="topographicFeatures"/>
        </nas:resourceCategory>
```

```xml
            </nas:MD_DataIdentification>
        </gmd:identificationInfo>
        <gmd:metadataConstraints>
            <nas:MD_SecurityConstraints>
                <gmd:classification>
                    <gmd:MD_ClassificationCode
codeList="http://api.nsgreg.nga.mil/codelist/ClassificationCode"
codeListValue="unclassified"/>
                </gmd:classification>
                <gmd:classificationSystem>
                    <nas:ClassificationSystem>US CAPCO</nas:ClassificationSystem>
                </gmd:classificationSystem>
                <nas:capcoMarking ism:classification="U" ism:ownerProducer="USA"/>
                <nas:needToKnow>
                    <ntk:Access ism:classification="U" ism:ownerProducer="USA">
                        <ntk:AccessGroupList>
                            <ntk:AccessGroup ism:classification="U"
ism:ownerProducer="USA">
                                <ntk:AccessSystemName ism:classification="U"
ism:ownerProducer="USA">NSG</ntk:AccessSystemName>
                                <ntk:AccessGroupValue ism:classification="U"
ism:ownerProducer="USA">User</ntk:AccessGroupValue>
                            </ntk:AccessGroup>
                        </ntk:AccessGroupList>
                    </ntk:Access>
                </nas:needToKnow>
            </nas:MD_SecurityConstraints>
        </gmd:metadataConstraints>
</nas:MD_Metadata>
```

C.3Example DMF Listing

DMF Sample

```xml
<gmd:MD_Metadata xmlns:gmd="http://www.isotc211.org/2005/gmd"
xmlns:ngmp="urn:int:nato:geometoc:geo:metadata:ngmp:1.0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:gco="http://www.isotc211.org/2005/gco" xmlns:gml="http://www.opengis.net/gml"
xmlns:xlink="http://www.w3.org/1999/xlink"
xsi:schemaLocation="http://www.isotc211.org/2005/gmd
http://127.0.0.1:9080/examples/dgiwg/xmlns/dmf/1.0/iso-g1/profile/all/all.xsd"
uuid="OGC_TB12_MAP0" id="MAP0">
    <gmd:fileIdentifier>
        <gco:CharacterString>1470659450170</gco:CharacterString>
    </gmd:fileIdentifier>
    <gmd:language>
        <gco:CharacterString>eng</gco:CharacterString>
    </gmd:language>
    <gmd:hierarchyLevel>
        <gmd:MD_ScopeCode
codeList="http://www.isotc211.org/2005/resources/codeList.xml#MD_ScopeCode"
codeListValue="dataset"/>
    </gmd:hierarchyLevel>
    <gmd:contact>
        <gmd:CI_ResponsibleParty>
            <gmd:organisationName>
                <gco:CharacterString>Envitia</gco:CharacterString>
            </gmd:organisationName>
            <gmd:role>
                <gmd:CI_RoleCode
codeList="http://www.isotc211.org/2005/resources/codeList.xml#CI_RoleCode"
codeListValue="publisher"/>
            </gmd:role>
        </gmd:CI_ResponsibleParty>
    </gmd:contact>
    <!-- Date the metadata was created -->
    <gmd:dateStamp>
        <gco:Date>2016-05-08</gco:Date>
    </gmd:dateStamp>
    <!-- IDENTIFICATION INFORMATION -->
    <gmd:identificationInfo>
        <gmd:MD_DataIdentification>
            <gmd:citation>
                <gmd:CI_Citation>
                    <gmd:title>
                        <gco:CharacterString>Ecological Restoration of Abandoned Oil
Field Facilities and Exploration Well Sites in North Slope,
Alaska</gco:CharacterString>
                    </gmd:title>
                    <gmd:date>
```

```xml
                    <gmd:CI_Date>
                        <gmd:date>
                            <gco:Date>2016-03-03</gco:Date>
                        </gmd:date>
                        <gmd:dateType>
                            <gmd:CI_DateTypeCode
codeList="http://www.isotc211.org/2005/resources/codeList.xml#CI_DateTypeCode"
codeListValue="revision"/>
                        </gmd:dateType>
                    </gmd:CI_Date>
                </gmd:date>
            </gmd:CI_Citation>
        </gmd:citation>
        <gmd:abstract>
            <gco:CharacterString>The program involves developing revegetation
performance standards; providing recommendations for enhancing the wildlife
characteristics of rehabilitated areas; identifying and applying appropriate plant
materials; monitoring soil and vegetation response; and monitoring the surface and
thermal stability of rehabilitated sites.</gco:CharacterString>
        </gmd:abstract>
        <gmd:pointOfContact>
            <gmd:CI_ResponsibleParty>
                <gmd:organisationName>
                    <gco:CharacterString></gco:CharacterString>
                </gmd:organisationName>
                <gmd:role>
                    <gmd:CI_RoleCode
codeList="http://www.isotc211.org/2005/resources/codeList.xml#CI_RoleCode"
codeListValue="originator"/>
                </gmd:role>
            </gmd:CI_ResponsibleParty>
        </gmd:pointOfContact>
        <gmd:descriptiveKeywords>
            <gmd:MD_Keywords>
                <gmd:keyword>
                    <gco:CharacterString>imageCoverage</gco:CharacterString>
                </gmd:keyword>
                <gmd:type>
                    <gmd:MD_KeywordTypeCode
codeList="http://www.isotc211.org/2005/resources/codeList.xml#MD_KeywordTypeCode"
codeListValue="discipline"/>
                </gmd:type>
                <gmd:thesaurusName>
                    <gmd:CI_Citation>
                        <gmd:title>

<gco:CharacterString>NGMP_GeospatialInformationTypeCode</gco:CharacterString>
                        </gmd:title>
                        <gmd:date/>
                    </gmd:CI_Citation>
                </gmd:thesaurusName>
```

```xml
                    </gmd:MD_Keywords>
                </gmd:descriptiveKeywords>
                <gmd:descriptiveKeywords>
                    <gmd:MD_Keywords>
                        <gmd:keyword>
                            <gco:CharacterString>georeferenced</gco:CharacterString>
                        </gmd:keyword>
                        <gmd:type>
                            <gmd:MD_KeywordTypeCode
codeList="http://www.isotc211.org/2005/resources/codeList.xml#MD_KeywordTypeCode"
codeListValue="discipline"/>
                        </gmd:type>
                        <gmd:thesaurusName>
                            <gmd:CI_Citation>
                                <gmd:title>
                                    <gco:CharacterString>
NGMP_GeoreferencingLevelCode</gco:CharacterString>
                                </gmd:title>
                                <gmd:date/>
                            </gmd:CI_Citation>
                        </gmd:thesaurusName>
                    </gmd:MD_Keywords>
                </gmd:descriptiveKeywords>
                <gmd:descriptiveKeywords>
                    <gmd:MD_Keywords>
                        <gmd:keyword>
                            <gco:CharacterString>digital</gco:CharacterString>
                        </gmd:keyword>
                        <gmd:type>
                            <gmd:MD_KeywordTypeCode
codeList="http://www.isotc211.org/2005/resources/codeList.xml#MD_KeywordTypeCode"
codeListValue="theme"/>
                        </gmd:type>
                        <gmd:thesaurusName>
                            <gmd:CI_Citation>
                                <gmd:title>
                                    <gco:CharacterString>
NGMP_RepresentationFormCode</gco:CharacterString>
                                </gmd:title>
                                <gmd:date/>
                            </gmd:CI_Citation>
                        </gmd:thesaurusName>
                    </gmd:MD_Keywords>
                </gmd:descriptiveKeywords>
                <gmd:descriptiveKeywords>
                    <gmd:MD_Keywords>
                        <gmd:keyword>
                            <gco:CharacterString>L0</gco:CharacterString>
                        </gmd:keyword>
                        <gmd:type>
                            <gmd:MD_KeywordTypeCode
```

```
                        codeList="http://www.isotc211.org/2005/resources/codeList.xml#MD_KeywordTypeCode"
codeListValue="theme"/>
                            </gmd:type>
                            <gmd:thesaurusName>
                                <gmd:CI_Citation>
                                    <gmd:title>
                                        <gco:CharacterString>
NGMP_DataLevelCode</gco:CharacterString>
                                    </gmd:title>
                                    <gmd:date/>
                                </gmd:CI_Citation>
                            </gmd:thesaurusName>
                        </gmd:MD_Keywords>
                    </gmd:descriptiveKeywords>
                    <gmd:descriptiveKeywords>
                        <gmd:MD_Keywords>
                            <gmd:keyword>
                                <gco:CharacterString>OperationsEvents</gco:CharacterString>
                            </gmd:keyword>
                            <gmd:type>
                                <gmd:MD_KeywordTypeCode
codeList="http://www.isotc211.org/2005/resources/codeList.xml#MD_KeywordTypeCode"
codeListValue="theme"/>
                            </gmd:type>
                            <gmd:thesaurusName>
                                <gmd:CI_Citation>
                                    <gmd:title>
                                        <gco:CharacterString>
NGMP_ThematicCode</gco:CharacterString>
                                    </gmd:title>
                                    <gmd:date/>
                                </gmd:CI_Citation>
                            </gmd:thesaurusName>
                        </gmd:MD_Keywords>
                    </gmd:descriptiveKeywords>
                    <gmd:resourceConstraints>
                        <gmd:MD_SecurityConstraints>
                            <gmd:classification>
                                <gmd:MD_ClassificationCode
codeList="http://www.isotc211.org/2005/resources/codeList.xml#MD_ClassificationCode"
codeListValue="unclassified"/>
                            </gmd:classification>
                        </gmd:MD_SecurityConstraints>
                    </gmd:resourceConstraints>
                    <gmd:resourceConstraints>
                        <ngmp:NGMP_Constraints>
                            <ngmp:releasibility>
                                <ngmp:NGMP_Releasibility>
                                    <ngmp:addressee>
                                        <gmd:CI_ResponsibleParty>
                                            <gmd:organisationName>
```

```xml
                                                <gco:CharacterString>OGC Testbed
12</gco:CharacterString>
                                        </gmd:organisationName>
                                        <gmd:role>
                                            <gmd:CI_RoleCode
codeList="http://www.isotc211.org/2005/resources/codeList.xml#CI_RoleCode"
codeListValue="user"/>
                                        </gmd:role>
                                    </gmd:CI_ResponsibleParty>
                                </ngmp:addressee>
                            </ngmp:NGMP_Releasibility>
                        </ngmp:releasibility>
                    </ngmp:NGMP_Constraints>
                </gmd:resourceConstraints>
                <gmd:language>
                    <gco:CharacterString>eng</gco:CharacterString>
                </gmd:language>
                <gmd:topicCategory>
                    <gmd:MD_TopicCategoryCode>environment</gmd:MD_TopicCategoryCode>
                </gmd:topicCategory>
                <gmd:extent>
                    <gmd:EX_Extent>
                        <gmd:geographicElement>
                            <gmd:EX_GeographicBoundingBox>
                                <gmd:westBoundLongitude>
                                    <gco:Decimal>-166.75</gco:Decimal>
                                </gmd:westBoundLongitude>
                                <gmd:eastBoundLongitude>
                                    <gco:Decimal>-141</gco:Decimal>
                                </gmd:eastBoundLongitude>
                                <gmd:southBoundLatitude>
                                    <gco:Decimal>67</gco:Decimal>
                                </gmd:southBoundLatitude>
                                <gmd:northBoundLatitude>
                                    <gco:Decimal>71.25</gco:Decimal>
                                </gmd:northBoundLatitude>
                            </gmd:EX_GeographicBoundingBox>
                        </gmd:geographicElement>
                    </gmd:EX_Extent>
                </gmd:extent>
            </gmd:MD_DataIdentification>
        </gmd:identificationInfo>
        <gmd:metadataConstraints>
                <gmd:MD_SecurityConstraints>
                    <gmd:classification>
                        <gmd:MD_ClassificationCode
codeList="http://www.isotc211.org/2005/resources/codeList.xml#MD_ClassificationCode"
codeListValue="unclassified"/>
                    </gmd:classification>
                </gmd:MD_SecurityConstraints>
        </gmd:metadataConstraints>
```

```xml
	<gmd:metadataConstraints>
		<ngmp:NGMP_Constraints>
			<ngmp:releasibility>
				<ngmp:NGMP_Releasibility>
					<ngmp:addressee>
						<gmd:CI_ResponsibleParty>
							<gmd:organisationName>
								<gco:CharacterString>OGC Testbed
12</gco:CharacterString>
							</gmd:organisationName>
							<gmd:role>
								<gmd:CI_RoleCode
codeList="http://www.isotc211.org/2005/resources/codeList.xml#CI_RoleCode"
codeListValue="user"/>
							</gmd:role>
						</gmd:CI_ResponsibleParty>
					</ngmp:addressee>
				</ngmp:NGMP_Releasibility>
			</ngmp:releasibility>
		</ngmp:NGMP_Constraints>
	</gmd:metadataConstraints>
</gmd:MD_Metadata>
```

C.4 Example DDMS Listing

DDMS Sample

```xml
<ddms:Resource xmlns:ddms="http://metadata.dod.mil/mdr/ns/DDMS/2.0/">
    <ddms:identifier ddms:qualifier="OGC Testbed 12"
                     ddms:value="DZB1216-500499L001001"/>
    <ddms:title xmlns:ICISM="urn:us:gov:ic:ism:v2" ICISM:classification="U"
                ICISM:ownerProducer="USA">Ecological Restoration of Abandoned Oil Field
Facilities and Exploration Well Sites in North Slope, Alaska</ddms:title>
    <ddms:description xmlns:ICISM="urn:us:gov:ic:ism:v2" ICISM:classification="U"
                      ICISM:ownerProducer="USA">The program involves developing
revegetation performance standards; providing recommendations for enhancing the
wildlife characteristics of rehabilitated areas; identifying and applying appropriate
plant materials; monitoring soil and vegetation response; and monitoring the surface
and thermal stability of rehabilitated sites.</ddms:description>
    <ddms:dates ddms:created="2016-03-03" ddms:posted="2016-03-03"/>
    <ddms:rights ddms:privacyAct="true" ddms:intellectualProperty="true"/>
    <ddms:source ddms:qualifier="" ddms:value=""/>
    <ddms:type ddms:qualifier="http://api.nsgreg.nga.mil/codelist/ScopeCode"
               ddms:value="dataset"/>
    <ddms:creator>
        <ddms:Organization>
            <ddms:name></ddms:name>
        </ddms:Organization>
    </ddms:creator>
    <ddms:format>
        <ddms:Media>
            <ddms:mimeType/>
            <ddms:extent ddms:qualifier="sizeBytes" ddms:value="NaN"/>
            <ddms:medium/>
        </ddms:Media>
    </ddms:format>
    <ddms:subjectCoverage>
        <ddms:Subject>
            <ddms:category ddms:qualifier="GCMD Location Keywords" ddms:code="GLOBAL"
ddms:label="GLOBAL"/>
        </ddms:Subject>
    </ddms:subjectCoverage>
    <ddms:temporalCoverage>
        <ddms:TimePeriod>
            <ddms:start>2016-03-03</ddms:start>
            <ddms:end>2016-03-03</ddms:end>
        </ddms:TimePeriod>
    </ddms:temporalCoverage>
    <ddms:geospatialCoverage>
        <ddms:GeospatialExtent>
            <ddms:geographicIdentifier>
                <ddms:name>GLOBAL</ddms:name>
            </ddms:geographicIdentifier>
```

```
<ddms:boundingBox>
    <ddms:WestBL>-166.75</ddms:WestBL>
    <ddms:EastBL>-141</ddms:EastBL>
    <ddms:SouthBL>67</ddms:SouthBL>
    <ddms:NorthBL>71.25</ddms:NorthBL>
</ddms:boundingBox>
<ddms:boundingGeometry xmlns:gml="http://www.opengis.net/gml">
    <gml:Polygon gml:id="ResourceExtentPolygon"
                 srsName="http://api.nsgreg.nga.mil/coord-ref-
system/WGS84E_2D">
        <gml:exterior>
            <gml:LinearRing>
                <gml:pos>71.25 -141</gml:pos>
                <gml:pos>71.25 -166.75</gml:pos>
                <gml:pos>67 -166.75</gml:pos>
                <gml:pos>67 -141</gml:pos>
            </gml:LinearRing>
        </gml:exterior>
    </gml:Polygon>
</ddms:boundingGeometry>
<ddms:verticalExtent ddms:unitOfMeasure="Foot" ddms:datum="MSL">
    <ddms:MinVerticalExtent>0.0</ddms:MinVerticalExtent>
    <ddms:MaxVerticalExtent>100.0</ddms:MaxVerticalExtent>
</ddms:verticalExtent>
        </ddms:GeospatialExtent>
    </ddms:geospatialCoverage>
    <ddms:relatedResources ddms:relationship="aggregation">
        <ddms:RelatedResource ddms:qualifier="Envitia GeoRegistry"
                         ddms:value="urn:uuid:e9129b4b-ea21-4531-9a1c-
471565521c21">
        <ddms:link xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:href="http://www.envitia.com"
                   xlink:title="Envitia GeoRegistry for OGC Testbed 12"/>
    </ddms:RelatedResource>
    </ddms:relatedResources>
    <ddms:security xmlns:ICISM="urn:us:gov:ic:ism:v2" ICISM:classification="U"
              ICISM:ownerProducer="USA"/>
</ddms:Resource>
```

C.5 Example DCAT Listing in RDF/XML

DCAT Sample

```xml
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
xmlns:adms="http://www.w3.org/ns/adms#" xmlns:cnt="http://www.w3.org/2011/content#"
xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:dcat="http://www.w3.org/ns/dcat#"
xmlns:dct="http://purl.org/dc/terms/" xmlns:dctype="http://purl.org/dc/dcmitype/"
xmlns:foaf="http://xmlns.com/foaf/0.1/"
xmlns:gsp="http://www.opengis.net/ont/geosparql#"
xmlns:locn="http://www.w3.org/ns/locn#" xmlns:owl="http://www.w3.org/2002/07/owl#"
xmlns:org="http://www.w3.org/ns/org#" xmlns:prov="http://www.w3.org/ns/prov#"
xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#" xmlns:schema="http://schema.org/"
xmlns:skos="http://www.w3.org/2004/02/skos/core#"
xmlns:vcard="http://www.w3.org/2006/vcard/ns#">
  <rdf:Description>
    <foaf:isPrimaryTopicOf>
      <rdf:Description>
        <rdf:type rdf:resource="http://www.w3.org/ns/dcat#CatalogRecord"/>
        <dct:language
rdf:resource="http://publications.europa.eu/resource/authority/language/ENG"/>
        <dct:modified rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2016-05-
08</dct:modified>
        <dct:publisher>
          <rdf:Description>
            <rdf:type rdf:resource="http://xmlns.com/foaf/0.1/Organization"/>
          </rdf:Description>
        </dct:publisher>
        <prov:qualifiedAttribution>
          <prov:Attribution>
            <prov:agent>
              <rdf:Description>
                <rdf:type rdf:resource=
"http://www.w3.org/2006/vcard/ns#Organization"/>
                <vcard:fn xml:lang="en">Envitia</vcard:fn>
              </rdf:Description>
            </prov:agent>
            <dct:type rdf:resource="http://inspire.ec.europa.eu/metadata-
codelist/ResponsiblePartyRole/publisher"/>
          </prov:Attribution>
        </prov:qualifiedAttribution>
        <dct:identifier rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>1470659450170</dct:identifier>
      </rdf:Description>
    </foaf:isPrimaryTopicOf>
    <rdf:type rdf:resource="http://www.w3.org/ns/dcat#Dataset"/>
    <dct:type rdf:resource="http://inspire.ec.europa.eu/metadata-
codelist/ResourceType/dataset"/>
    <dct:title xml:lang="en">Ecological Restoration of Abandoned Oil Field Facilities
and Exploration Well Sites in North Slope, Alaska</dct:title>
```

```xml
    <dct:description xml:lang="en">The program involves developing revegetation
performance standards; providing recommendations for enhancing the wildlife
characteristics of rehabilitated areas; identifying and applying appropriate plant
materials; monitoring soil and vegetation response; and monitoring the surface and
thermal stability of rehabilitated sites.</dct:description>
    <dct:subject rdf:resource="http://inspire.ec.europa.eu/metadata-
codelist/TopicCategory/environment"/>
    <dcat:theme rdf:parseType="Resource">
      <skos:prefLabel xml:lang="en">imageCoverage</skos:prefLabel>
      <skos:inScheme>
        <skos:ConceptScheme>
          <dct:title xml:lang="en">NGMP_GeospatialInformationTypeCode</dct:title>
        </skos:ConceptScheme>
      </skos:inScheme>
    </dcat:theme>
    <dcat:theme rdf:parseType="Resource">
      <skos:prefLabel xml:lang="en">georeferenced</skos:prefLabel>
      <skos:inScheme>
        <skos:ConceptScheme>
          <dct:title xml:lang="en">NGMP_GeoreferencingLevelCode</dct:title>
        </skos:ConceptScheme>
      </skos:inScheme>
    </dcat:theme>
    <dcat:theme rdf:parseType="Resource">
      <skos:prefLabel xml:lang="en">digital</skos:prefLabel>
      <skos:inScheme>
        <skos:ConceptScheme>
          <dct:title xml:lang="en">NGMP_RepresentationFormCode</dct:title>
        </skos:ConceptScheme>
      </skos:inScheme>
    </dcat:theme>
    <dcat:theme rdf:parseType="Resource">
      <skos:prefLabel xml:lang="en">L0</skos:prefLabel>
      <skos:inScheme>
        <skos:ConceptScheme>
          <dct:title xml:lang="en">NGMP_DataLevelCode</dct:title>
        </skos:ConceptScheme>
      </skos:inScheme>
    </dcat:theme>
    <dcat:theme rdf:parseType="Resource">
      <skos:prefLabel xml:lang="en">OperationsEvents</skos:prefLabel>
      <skos:inScheme>
        <skos:ConceptScheme>
          <dct:title xml:lang="en">NGMP_ThematicCode</dct:title>
        </skos:ConceptScheme>
      </skos:inScheme>
    </dcat:theme>
    <dct:language
rdf:resource="http://publications.europa.eu/resource/authority/language/ENG"/>
    <dct:spatial rdf:parseType="Resource">
      <locn:geometry rdf:datatype="http://www.opengis.net/ont/geosparql#wktLiteral"
```

```xml
><![CDATA[POLYGON((-166.75 71.25,-141 71.25,-141 67,-166.75 67,-166.75
71.25))]]></locn:geometry>
      <locn:geometry rdf:datatype="http://www.opengis.net/ont/geosparql#gmlLiteral"
><![CDATA[<gml:Envelope
srsName="http://www.opengis.net/def/crs/OGC/1.3/CRS84"><gml:lowerCorner>-166.75
67</gml:lowerCorner><gml:upperCorner>-141
71.25</gml:upperCorner></gml:Envelope>]]></locn:geometry>
      <locn:geometry rdf:datatype="https://www.iana.org/assignments/media-
types/application/vnd.geo+json"><![CDATA[{"type":"Polygon","crs":{"type":"name","prope
rties":{"name":"urn:ogc:def:crs:OGC:1.3:CRS84"}},"coordinates":[[[-166.75,71.25],[-
141,71.25],[-141,67],[-166.75,67],[-166.75,71.25]]]}]]></locn:geometry>
    </dct:spatial>
    <dct:modified rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2016-03-
03</dct:modified>
    <prov:qualifiedAttribution>
      <prov:Attribution>
        <prov:agent>
          <rdf:Description>
            <rdf:type rdf:resource="http://www.w3.org/2006/vcard/ns#Organization"/>
            <vcard:fn xml:lang="en"></vcard:fn>
          </rdf:Description>
        </prov:agent>
        <dct:type rdf:resource="http://inspire.ec.europa.eu/metadata-
codelist/ResponsiblePartyRole/originator"/>
      </prov:Attribution>
    </prov:qualifiedAttribution>
  </rdf:Description>
</rdf:RDF>
```

C.6Example DCAT Listing in RDF Turtle

RDF Turtle Sample

```
@prefix dc:    <http://purl.org/dc/elements/1.1/> .
@prefix dcat:  <http://www.w3.org/ns/dcat#> .
@prefix foaf:  <http://xmlns.com/foaf/0.1/> .
@prefix dct:   <http://purl.org/dc/terms/> .
@prefix rdf:   <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
<http://example.com/data/G1470659298021>  <http://www.w3.org/1999/02/22-rdf-syntax-
ns#type>  <http://www.w3.org/ns/dcat#Dataset>.
<http://example.com/data/G1470659298021>  <http://www.w3.org/1999/02/22-rdf-syntax-
ns#type>  <http://www.opengis.net/ont/testbed12/srim#Item>.
<http://example.com/data/G1470659298021>  <http://purl.org/dc/terms/description>
"This Web Feature Service is established for the testing of OGC Testbed-12 WFS SOAP
server project." .
<http://example.com/data/G1470659298021>  <http://purl.org/dc/terms/identifier>
"urn:x-envitia:TB12:NMF:nmf-G1470659298021" .
<http://example.com/data/G1470659298021>  <http://purl.org/dc/terms/title>
"My GeoServer WFS" .
<http://example.com/data/G1470659298021>  <http://purl.org/dc/terms/spatial>        [
<http://www.w3.org/ns/locn#geometry>  "<gml:Envelope
xmlns:gml=\"http://www.opengis.net/gml\"
srsName=\"http://www.opengis.net/def/crs/OGC/1.3/CRS84\"><gml:lowerCorner>37.709678335
119676 -122.50391472739219</gml:lowerCorner><gml:upperCorner>37.82624490757897
-122.36699051452052</gml:upperCorner></gml:Envelope>"^^<http://www.opengis.net/ont/geo
sparql#gmlLiteral> ] .
<http://example.com/data/G1470659298021>  <http://purl.org/dc/terms/distribution>  [
<http://www.w3.org/1999/02/22-rdf-syntax-ns#type>
<http://www.w3.org/ns/dcat#Distribution> ;
                        <http://purl.org/dc/terms/title>         "NMF metadata for
urn:x-envitia:TB12:NMF:nmf-G1470659298021" ;
                        <http://www.w3.org/ns/dcat#downloadURL>
"http://myserver.com/RegistryService/registry?service=CSW&request=GetRepositoryItem&ve
rsion=2.0.2&id=urn:x-envitia:TB12:NMF:nmf-G1470659298021:DS"
                        ] ;
    <http://www.w3.org/ns/dcat#distribution>  [ <http://www.w3.org/1999/02/22-rdf-
syntax-ns#type>                <http://www.w3.org/ns/dcat#Distribution> ;
                        <http://purl.org/dc/terms/title>         "DGIWG metadata for
urn:x-envitia:TB12:NMF:nmf-G1470659298021" ;
                        <http://www.w3.org/ns/dcat#downloadURL>
"http://myserver.com/RegistryService/registry?service=CSW&request=GetRepositoryItem&ve
rsion=2.0.2&id=urn:x-envitia:TB12:DGIWG:dgiwg-G1470659298021:DS"
                        ] ;
    <http://www.w3.org/ns/dcat#distribution>  [ <http://www.w3.org/1999/02/22-rdf-
syntax-ns#type>                <http://www.w3.org/ns/dcat#Distribution> ;
                        <http://purl.org/dc/terms/title>         "DDMS metadata for
urn:x-envitia:TB12:NMF:nmf-G1470659298021" ;
                        <http://www.w3.org/ns/dcat#downloadURL>
"http://myserver.com/RegistryService/registry?service=CSW&request=GetRepositoryItem&ve
```

```
rsion=2.0.2&id=urn:x-envitia:TB12:DDMS:ddms-G1470659298021:DS"
                        ] ;
    <http://www.w3.org/ns/dcat#distribution>  [ <http://www.w3.org/1999/02/22-rdf-
syntax-ns#type>              <http://www.w3.org/ns/dcat#Distribution> ;
                        <http://purl.org/dc/terms/title>          "DCAT metadata for
urn:x-envitia:TB12:NMF:nmf-G1470659298021" ;
                        <http://www.w3.org/ns/dcat#downloadURL>
"http://myserver.com/RegistryService/registry?service=CSW&request=GetRepositoryItem&ve
rsion=2.0.2&id=urn:x-envitia:TB12:DCAT:dcat-G1470659298021:DS"
                        ] ;
    <http://www.w3.org/ns/dcat#keyword>        "testbed" , "OGC".
```

Appendix D: Change Requests

CR 397: DCAT/GeoSPARQL service endpoint for CSW

This section presents a series of Change Requests resulting from the Testbed-12 activities reported in this document.

CSW services should be enabled to offer a GeoSPARQL service endpoint that publishes metadata in W3C DCAT standard (using OGC GeoSPARQL for location attributes as demonstrated by GeoDCAT) and can receive federated SPARQL queries from other SPARQL services. This change request is a recommendation from OGC Testbed 12 and discussed in the "OGC Testbed 12 Catalogue and SPARQL Engineering Report".

The justification for this change request is the need to provide an encoding that all profiles of CSW can support and use to make inferences about metadata from different catalogues. Other benefits demonstrated by Testbed-12: Improved ability to search multiple heterogeneous catalogues; Reduction in the time it takes to discover resources from multiple catalogues; Improved ability to determine associations between metadata encoded in different specifications; and Greater interoperability with the W3C and Linked Data community.

This change request also applies to OGC 12-168r8.

Testbed-12 found that the metadata returned by catalogues implemented by the wider OGC membership ranged from ISO 19139 XML, NMIS(XML encoding of NGA profile of ISO 19115), DDMS, ebRIM ExtrinsicObjects based on OGC I15 profile of CSW-ebRIM etc. There is therefore a need to allow catalogues to return the metadata in a common language. The use of W3C DCAT with OGC GeoSPARQL offers that solution. Note that use of DCAT would also enable federated search across different CSW versions and profiles.

The change request can be found at the following location:

http://ogc.standardstracker.org/show_request.cgi?id=397

CR 398: Adapt profiles of CSW 2.0.2 to CSW 3.0

OGC Testbed 12 found that, since CSW 3.0 is relatively new, many of the profiles that made CSW 2.0.2 a success have not yet been adapted for CSW 3.0. The testbed recommended that OGC adapts profiles of CSW 2.0.2 to CSW 3.0. For example: (1) FGDC CSDGM Application Profile for CSW 2.0 ; (2) OGC® Catalogue Services Standard 2.0 Extension Package for ebRIM Application Profile: Earth Observation Products; and (3) OGC I15 (ISO19115 Metadata) Extension Package of CS-W ebRIM Profile 1.0. This change request is a recommendation from OGC Testbed 12 and discussed in the "OGC Testbed 12 Catalogue and SPARQL Engineering Report".

The change request can be found at the following location:

http://ogc.standardstracker.org/show_request.cgi?id=398

CR 399: Duplicated Annex headings and broken links in Catalogue 3.0

Testbed 12 found the following problems on both the HTML and PDF versions of OGC 12-168r6 Catalogue Service Version 3.0.

Problem 1: Both Annex A and Annex B have the same title "BNF Definition of OGC CommonQL (Normative)". However, Annex A appears to describe Federation and not the OGC CommonQL language. This must be a copy-and-paste error. The title of Annex A should be corrected.

Problem 2: The table of contents of the HTML version does not include Annex B.

The following problem was found only in the PDF version.

Problem 3: There are at least five instanced of "Error! Reference source not found" or "Error! Bookmark not defined". References should be updated and the PDF regenerated.

Problem 4: The last paragraph of section 6.3.1 says "Service metadata elements should be consistent with ISO 19119 or 19115:2014". This should be updated to say ISO 19115-1:2014. That is, append "dash minus one".

The problems were reported in the "OGC Testbed 12 Catalogue and SPARQL Engineering Report".

http://ogc.standardstracker.org/show_request.cgi?id=399

CR 400: The Catalogue Service 3.0 standard uses a CSW 2.0.2 GetRecords example

Testbed 12 found the following problem on the PDF and HTML version of OGC 12-168r6 Catalogue 3.0.

The same GetRecords request in section 6.3.3 is for CSW 2.0.2. The version attribute in the GetRecords element is version="2.0.2". This should be updated to version="3.0.0"

The problem was reported in the "OGC Testbed 12 Catalogue and SPARQL Engineering Report".

http://ogc.standardstracker.org/show_request.cgi?id=400

Appendix E: Revision History

Table 71. Revision History

Date	Release	Editor	Primary clauses modified	Descriptions
September 30, 2016	G. Hobona	1.1	various	first complete draft
October 31, 2016	G. Hobona	1.2	various	final complete draft. Addresses comments from OGC IP team.