

Energy Industry Profile of ISO 19115-1:2014

V1.1

Energy Industry Metadata Profile	Improving efficiency of information resource discovery, evaluation, and access within the energy community through standardized content and encoding for metadata. The scope includes physical resources, digital datasets and databases, documents, and services.
Version Abstract	Version 1.1 This document contains the normative specification for the Energy Industry Profile of ISO 19115-1:2014, and implementation guidelines based on ISO 19115-3:2016. This is an ISO Conformance Level 1 profile designed to enable interoperability of structured metadata for the purpose of discovery and use of the information resources documented by those metadata. All rules and conformance criteria required for encoding metadata according to the profile are specified here. The adoption of this specification is intended to promote tool development and best practices that will reduce the overhead required for metadata creation, maintenance, and utilization.
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Amendment History		
Version	Date	Comment
1.1	July 2016	<p>Updated to reflect progression of ISO/DTS 19115-3 build 2013-06-24 to final Technical Specification ISO 19115-3:2016 in:</p> <ul style="list-style-type: none"> • §1.8, normative references; • §1.9, namespace abbreviations; • Chapter 4 and Appendix D, all XML examples; • Appendix E, Schematron code; • Appendix F, URLs which dereference to EIP and ISO codelists.
		<p>Clarified in:</p> <ul style="list-style-type: none"> • §2.2.1 usage of MD_DataIdentification for documenting data published as a web service, vs. use of SV_ServiceInformation for documenting non-data (e.g., processing) web services; • §3.3.1, §4.1.1, and other sections as appropriate, purpose of Mandatory elements which are nilable; • §4.2.1, recommendation to assign a UUID type URI per IETF STD 66/FRC 3986 as a value for metadataIdentifier; • §4.2.3.1, conditionality requirement of specifying metadata character encoding; • §4.7.3.1, that multiple instances of geographicElement may be specified per resource, and the cardinality of one (1) for each of the four bounding coordinate elements is per instance of geographicElement; • §4.8.1, and related sections, distinctions between the four types of contacts for which the EIP specifies provisions.
		<p>Altered provisions in</p> <ul style="list-style-type: none"> • §4.2.9, so metadataStandard is correctly documented as EIP v1.1; • §4.3.2.1, to allow multiple Resource Citation Dates, one each of different types; • §4.3.10, to allow multiple “reference” statements when multiple access and use constraints are documented; • §4.4.1, to allow use of “linkage” (new provision) rather than “code” to document the URL which dereferences to the online, digital product; • §4.6.1, to recommend use of OSGeo Cat-Interop developed values for service type names and namespace. • §4.7.3.1, conditionality of Spatial Extent so the element is not required for non-geospatial products (i.e., those having no spatialRepresentationType), and relaxed domain range constraint on each of the four bounding coordinate elements to “recommended.”
		<p>Added provision</p> <ul style="list-style-type: none"> • §4.4.3, to document software that produced a resource, thereby establishing a foundation for future enhancements to more fully document resource provenance; • in §4.7.2, to allow documenting a text description of Coordinate Reference System.

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Executive Summary

The energy industry continues to experience exponential growth of data and information. These information resources are crucial to the industry's work of finding, developing, and producing energy resources to support the world's economies. However, industry professionals spend a good deal of time trying to locate or verify the accuracy of information.

Metadata is "data about data" that is used to index and find data and information resources. However, metadata is typically entered manually by users, and often users are unsure of what to enter so they enter nothing.

This document presents both the normative specifications and implementation guidelines for the Energy Industry Profile (EIP) of:

- ISO 19115-1:2014, Geographic information – Metadata – Part 1: Fundamentals
- ISO 19115-3:2016, Geographic information – Metadata – Part 3: XML schema implementation of metadata fundamentals

These ISO standards are broad standards designed for the use and implementation of metadata for geographic information. The EIP is a tailoring of these standards to meet the specific needs of the energy industry. It was developed, in accordance with ISO processes, to clarify usage of ISO 19115-1 entities and elements, and practices for encoding content such that consistent content and encoding of metadata records will allow automated metadata generation and maintenance in data processing work flows.

These metadata standards and guidelines have been designed to help address widely acknowledged inefficiencies in the discovery and use of information resources, both electronic and physical. Widespread adoption of the EIP as a metadata exchange standard can enable significant improvement in the ability of energy community organizations to efficiently catalog, manage, discover, evaluate, and retrieve available information resources, regardless of whether those resources are hosted internally or externally to the organizations.

This EIP is a foundational deliverable of Energistics' Energy Industry Metadata Standards Initiative and the Energistics Metadata Work Group supporting that initiative. The Work Group is made up of representatives from the broader energy industry community and represents most of those identified as stakeholders for the EIP, including:

- Energy companies and consortia
- Data and service providers
- Software vendors
- Energy-related government and academic organizations

Key content in this document includes:

- **Chapter 2, Content Model Overview**, provides an overview of the ISO 19115-1 content model, with a focus on considerations relevant to the EIP.
- **Chapter 3, EIP Requirements Overview**, provides an overview and summary of the metadata requirements of the EIP and provides, based on resource classes derived for the EIP.
- **Chapter 4, Element Specifications**, details normative provisions of the EIP and associated XML implementation guidelines and examples.

For more information, visit the Energistics website (www.energistics.org). There you can find this document as well as other resources, such as the full position paper *Roadmap for Implementing Energy Industry Metadata Standards v1 (September 2009)*. Inquiries to the Work Group can be sent to metadata@energistics.org.

Energistics is a not-for-profit membership consortium that provides the non-competitive, vendor-neutral infrastructure for energy industry professionals to do the work required to develop, maintain, adopt, and deploy information standards.

For more information about the ISO 191xx family of standards, visit the ISO website (www.iso.org).

1 Introduction

The energy industry is experiencing exponential growth of data and information. These information resources are crucial to the energy industry's work of finding, developing, and producing energy to support the world's economies. However, industry professionals spend a good deal of time trying to locate or verify the accuracy of information.

Metadata is "data about data" that is used to index and find data and information resources. However, metadata is typically entered manually by users, and often users are unsure of what to enter so they enter nothing.

This document presents both the normative specifications and implementation guidelines for the Energy Industry Profile (EIP) of:

- ISO 19115-1:2014, Geographic information – Metadata – Part 1: Fundamentals
- ISO 19115-3:2016, Geographic information – Metadata – XML schema implementation for fundamental concepts

ISO 19115-1 is a conceptual standard which specifies only usage characteristics for each metadata element (e.g., obligation, cardinality, domain) which are independent of any implementation. Implementation of ISO 19115-1 as an XML encoding is specified by Technical Specification ISO 19115-3:2016. Together, these are broad standards designed to enable capture of metadata about geographic information. They can be applied to virtually any type of information resource, however, and the EIP exploits this potential. Specifically, the EIP was developed to clarify usage of ISO 19115-1 entity and elements, and practices for encoding content such that consistent content and encoding of metadata records will allow automated metadata generation and maintenance in data processing work flows.

The EIP is a foundational deliverable of Energistics' Energy Industry Metadata Standards Initiative and the Energistics Metadata Work Group supporting that initiative. For more information on how EIP v1.0 was developed, see [Appendix G](#), page 180.

1.1 Leveraging the ISO Standards

Instead of developing a brand new metadata standard solely for the energy industry, the Energistics Metadata Work Group (referred to from here on as the Work Group) began by searching for existing standards and found that, for more than 15 years, ISO Technical Committee 211 (Geomatics) had been working on and produced ISO 19115-1 and its associated supporting standards.

The Work Group selected the ISO 19115-1 metadata model based on its adoption by many national and international organizations including: Infrastructure for Spatial Information in the European Community (INSPIRE), U.S. Federal Geographic Data Committee (FGDC), and the U.S. National Oceanic and Atmospheric Administration (NOAA). The Metadata Work Group also determined that all necessary metadata content was accounted for in the ISO model, but that a profile was necessary to meet the requirements of energy industry stakeholders.

1.1.1 What is a "Profile"?

A profile is a document that describes how to tailor and apply a standard for a particular community, which may be a region, a country, an organization, or an industry. For maximum flexibility and application, standards are often broad and generic. A profile typically has a specific, narrow focus and clearly states mandatory explicit behaviors for applying the standard for the intended community.

A profile makes it easier for community members to consistently apply the standard and helps create interoperability between various communities that use the standard. Typically, representatives from the intended community review and interpret the broader standard for the community and then document that interpretation in a profile.

For an overview of the process used to develop the EIP v1.0, see [Appendix G](#), page 180.

1.2 Purpose

The metadata standards and guidelines in this document were designed to help address widely acknowledged inefficiencies in the discovery and use of information resources, both electronic and physical, for the energy industry. The end objective is to realize the benefits of the standardization of resource metadata content to help the industry achieve more efficient and effective search and resource evaluation.

This profile is intended to clarify usage of ISO 19115-1 entity and elements, and practices for encoding content such that consistent content and encoding of metadata records will allow automated metadata generation and maintenance in data processing work flows.

This EIP is an ISO Conformance Level 1 profile designed to enable interoperability of structured metadata for the purpose of discovery and use of the information resources documented by those metadata. All rules and conformance criteria required for encoding metadata according to the profile are specified here. The adoption of this specification is intended to promote tool development and best practices that will reduce the overhead required for metadata creation, maintenance, and use.

1.3 Business Drivers and Benefits

Two driving business factors for adoption of this standard are the growth of information resources in the industry and the need to improve operational performance while prudently managing costs. A metadata standard will help organizations in the industry meet these challenges by helping end-users:

- Locate information quickly or ensure they are working with the most current version thereby reducing wasted time (searching for or verifying information) and reducing uncertainty in technical work and decisions (because of increased reliability in information sources).
- Maximize the value of information resources by helping people to find them so they can use them whenever they are needed.

Consistent application of ISO 19115-1 will help to produce consistent metadata content and encoding that can be used productively in the energy industry, including being processed by software applications. Development of standards-based industry work flows and supporting software applications will improve the quality of metadata.

Widespread adoption of the EIP as a metadata exchange standard will enable significant improvement in the ability of energy community organizations to efficiently catalog, manage, discover, evaluate, and retrieve available information resources, regardless of whether those resources are hosted internally or externally to the organizations. The tools that build on this first, enabling step and allow efficient management and exchange of metadata content conforming to the EIP will realize the improvements actually needed by the community.

As an open standard, adoption of the EIP by the energy community will allow development of automated processes that minimize the investment required to capture and maintain metadata to the point its availability becomes the rule rather than the exception. This conclusion is based on the following expectations:

- An open standard encourages and accelerates wide adoption across industry participants including data producers, consumers, and providers of application software that handle those data.
- Adoption by data producers, including commercial and government sources as well as internal and external partner organizations, allows capture of metadata by the organization most knowledgeable about the resource being documented. This capability improves metadata accuracy, and also enables transfer of the result in a form that minimizes consumer effort to incorporate and use those metadata within the enterprise.
- Adoption by providers of application software that process and manage data will minimize time-consuming manual management of the associated metadata by integrating and automating metadata production as part of software utilization. One important scenario is sequential data processing chains, in which the metadata created by one product could be passed with the associated data to the next application used in a work flow with no or only minor intervention by

the operator. In addition, opportunities should open for products that automatically enrich the metadata, such as “geotagging” applications (*i.e.*, those capable of converting place names to geographic coordinates).

- Adoption by consumers will facilitate discovery and evaluation of, as well as access to, information resources made available by both external and internal data and service providers.
- Adoption of a standard content model and encoding scheme will promote uniform practices and promote development of metadata creation and management tools that will have wide utility, reducing the amount of training required for metadata managers and creators.

1.4 User Community/Audience

The intended user community for the EIP includes both the producers and consumers of information resources relevant to the energy community. This community includes:

- Energy companies
- Suppliers of data relevant to the energy industry
- Vendors of software applications used to process and manage data relevant to the industry
- Related government agencies and academic organizations.

This document is intended for readers who are familiar with the ISO 19115-1 metadata specification, or its predecessor ISO 19115, and assumes the reader is comfortable with the technical aspects of XML encoding and existing metadata frameworks like Dublin core and the US Federal Geographic Data Committee (FGDC).

1.5 Scope

A broad range of digital and physical resources are used within the energy community, and virtually all of them are considered targets for discovery, evaluation, and access. [Table 1](#) lists the classes and representative examples of resources considered in scope for the EIP. These are categorized into three classes shown below, grouped based on similar metadata documentation requirements.

- **Digital Product** is a static unit of content represented in a digital encoding that can be transported to different locations electronically. Digital products are intended for use by computers and are typically file-based.
- **Digital Service** is a resource that may be invoked through messaging using the internet to execute one or more operations and return appropriate response messages. Examples include OGC Web map services and OpenDAP services.
- **Physical Product** is a static unit of content that is a physical entity and can (at least conceptually) be transported to different locations. Examples include rock samples, core, facilities, and instruments.

The groups of metadata elements related to these resource classes are discussed in [Chapter 3](#), page [26](#).

Table 1. Representative Information Resources Considered in-Scope, Grouped into Three Resource Classes.

Class	Examples file types or software environments
Digital Products (File-based)	
<i>GIS & CAD Maps</i> & Layer representation	.mxd, .mxt, .lyr, .pdf, .dwg, .dxf, .dgn
<i>GIS data</i> (Vector, Raster)	Esri® shapefile, GeoDatabase, geoTiff .jpg, .sid
<i>Mapping application projects</i>	Z-MAP Plus™, PetroSys
<i>Modeling application projects</i> (Subsurface properties & structure, Simulation)	GOCAD®, Intersect™, Petrel™
<i>Seismic projects data</i> (2D, 3D/Navigation, Raw, Processed)	SeisWorks®, EPOS®, PetroBank
<i>Well logs</i> (Raw and Processed)	Geolog®, .las
<i>Text documents</i> (Publications, Reports, Bid packages)	.doc, .pdf, .ppt, .txt
<i>Images</i> (not georeferenced)	.tif, .jpg, .png, .bmp
<i>Tables</i>	spreadsheets, .dbf
<i>Websites</i>	.html
Digital Products (Database repositories)	
<i>GIS data</i> (Vector, Raster, TIN)	SDE™, Oracle® Spatial, PostGIS databases
<i>Production data</i> (Historical, Real-time)	Energy Components, TOW/cs® databases
<i>Well data</i> (Construction, Survey, Interpretation)	OpenWorks®, Finder®, SeaBed, PPDM™ databases
<i>Document Management Systems</i>	Documentum®, FileNet®, OpenText™, Share-Point®
Digital Services	
GIS data services	Open Geospatial Consortium WMS, WFS, WCS, ArcGIS REST service, Google API services
Non GIS data services	Various web APIs, WS services, WITSML™ or PRODML™ services, THREDDS, OpenDAP
Geoprocessing services	Open Geospatial Consortium WPS
Catalog search/discovery services	Open Geospatial Consortium CSW, OpenSearch
Physical Products	
Field samples & field documentation	
Printed maps, logs, cross sections	
Printed text documents	

1.6 Use Cases

Below are seven specific use cases illustrating the range of business needs that the EIP seeks to address. They are grouped according to the general functionality that the EIP is designed to support: discovery, evaluation, and access.

1.6.1 Data Discovery and Recall

1.6.1.1 Discovery

Discovery is the process of searching for new data, that is, data not already known by a user to exist. This activity is typically one of the first tasks performed during project initiation—when a user is trying to develop a data and knowledge base for the project, which will form the basis for moving it forward—but often occurs later in project as well, when questions arise for which relevant data might already exist. Standard metadata associated with data resources enables more precise, efficient use of search tools for discovery. This case is particularly so for structured data, the contents of which often have few if any terms that a user might specify when performing a discovery search that exploits resource content to determine that resource’s potential relevance to the user.

1.6.1.2 Recall of Existing Data

Recall is the process of searching for data known to exist, but the location of which is unknown. The need for recall arises frequently in the industry, for example, when users new to the organization or in “look-back” scenarios are asked to revisit old projects, prospects, or areas given only information such as the area of interest (AOI) or project name. Without the benefit of metadata and a search or cataloguing tool, users have to know where data resides, or seek help from someone who knows its location, which is generally inefficient.

1.6.2 Data Evaluation

1.6.2.1 Evaluation of Data/Fit for Purpose

Following discovery and recall, when the user is unfamiliar with the data resource, they have to assess the relevance or pertinence of the data to determine whether it should be used in processing, modeling, and analysis workflows. The knowledge worker evaluates whether the data is “fit for purpose” by evaluating criteria such as vintage, source, quality, accuracy, lineage, etc. Without metadata describing these characteristics, the user has to seek out others who may be knowledgeable about the data or make assumptions about the data that may or may not be correct.

1.6.2.2 On-going Data Updates

Data may become obsolete when one or more of its ancestral datasets is modified. If such modifications reflect an improvement that should be propagated to the descendant dataset, then the knowledge is required of the processing lineage, including the complete hierarchy of relevant ancestors, as well as the tools, methods, and parameters used to process those ancestral data.

1.6.2.3 Data Sharing

Common practices in the energy industry require users to share data externally (e.g., with joint venture (JV) partners) and internally (e.g., with other organization units). A user receiving the data should be able to determine the appropriate use of shared data and ensure that it is used properly and/or combined with other data without introducing errors. To accomplish such data integration, the receiving organization has to receive associated metadata along with the data for attributes, such as status or quality. Without appropriate metadata, the users may incorrectly use or integrate the data, resulting in erroneous results and decisions.

1.6.3 Data Access

1.6.3.1 Access and Use Constraints

Access and use of data resources in the energy community is often constrained by the data producer. To comply with such constraints, knowledge workers have to be aware of them. Access to data may be restricted because it is confidential, or use may be constrained by the nature of a license under which the data were acquired. Additionally, it now is increasingly common to find use constraints imposed by foreign governments that prohibit export of data produced to support operations within their boundaries. Metadata to standardize documentation of such use constraints would facilitate access to the information, encouraging and enabling compliance.

1.6.3.2 Appropriate Use

Although data may be useful for purposes other than those originally intended, their appropriate use (*i.e.*, suitability for other uses) requires understanding the original purpose. Examples of such metadata include scale-appropriateness and vintage. Lacking this metadata from a publisher, a user may apply the data inappropriately or combine it with other data in a manner that produces erroneous results.

1.7 Conformance

Conformance with this EIP is intended to enable interoperability of structured metadata for the purpose of discovery and use of the information resources documented by those metadata. Conformance criteria with the EIP are presented in Chapter 3, [EIP Requirements Overview](#), page 26.

Energistics will consider establishing EIP metadata testing procedures based on perceived industry needs. In addition, Energistics will consider establishing EIP compliance testing and certification programs for classes of software solutions as related to the capabilities of software products to produce and/or consume EIP conforming metadata.

1.7.1 Conformance of this Profile with Standards

In accordance with ISO 19106:2005, the EIP meets the requirements of conformance class 1 as a profile of ISO 19115-1:2014, the “base standard.”

1.7.2 Conformance to the Profile

Any metadata claiming conformance to the EIP must adhere to provisions in the standards ISO 19115-1 and ISO 19115-3:2016, the foundational standards for this profile. In addition, metadata claiming conformance to the EIP must adhere to modifications of the base standards as specified in this document. As a class 1 profile, these modifications involve only restrictions on cardinality, obligation, and domain values of metadata elements that are consistent with the base standard. Metadata conformant with ISO 19115-1 which do not violate these restrictions are thus also conformant with EIP, allowing use of all ISO 19115-1 elements for which the EIP makes no provisions.

Conformance to EIP v1.1 is verified by XML schema validation against the ISO 19115-3:2016 schema at <http://standards.iso.org/iso/19115/-3/mds/1.0/mds.xsd> and subsequent application of the Schematron rules provided in Appendix F. Changes outlined in Section 1.10, [Future Enhancements](#), page 19 that result in an updated version of the EIP will also result in changes to the schema location.

1.7.3 Extension Procedure

Currently there are no extensions to the base standard included in the EIP. Should the need for extensions be identified in the future, the EIP will adopt the provisions for extensions as specified in the base standard.

1.8 Normative References

The Energy Industry Profile is based on the following reference standards:

- ISO 19115-1:2014, Geographic information – Metadata – Part 1: Fundamentals

- ISO/TS 19115-3:2016, Geographic information – Metadata – Part 3: XML schema implementation of metadata fundamentals
- ISO 19106:2004, Geographic information — Profiles
- ISO Technical Specification 19103:2005, Geographic information — Conceptual Schema Language
- ISO 19101:2002, Geographic information — Reference model
- ISO 8601:2004, Data elements and interchange formats – Information interchange – Representation of dates and times
- ISO 639-3, Code for the representation of names of languages — Part 3: Alpha-3 code for comprehensive coverage of languages
- IETF RFC 1738, Uniform Resource Locators (URL)
- IETF RFC 3986, Uniform Resource Identifier (URI): Generic Syntax

1.8.1 Additional Reference Materials

The following additional referenced documents are considered necessary to understand previous versions of the base standards on which this profile is based. For all references, only the dated edition applies.

- ISO 19115:2003, Geographic information – Metadata
- ISO 19115:2003/Cor.1:2006, Geographic information – Metadata – Technical Corrigendum 1
- ISO 19119:2005, Geographic information – Services
- ISO 19119:2005 Amd1 2008(E), Geographic information – Services AMENDMENT 1: Extensions of the service metadata model
- ISO/TS 19139:2007, Geographic information – Metadata – XML schema implementation
- ISO 19157:2013, Geographic information — Data Quality
- ISO/DTS 19157-2, Geographic information -- Data quality -- Part 2: XML Schema Implementation
- OGC 07-045 OpenGIS® Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile

1.9 Namespace Abbreviations

For a glossary of terms used in this document, see [Appendix A, Terms and Definitions](#), page 134.

Table 2 Abbreviations for Base Namespaces for XMLSchema Referenced in this Document

lists the abbreviations used to indicate base namespaces for the XML schema referenced in this document. These namespaces differ from those defined in the ISO/DTS 19115-3:2013-06-24 XML schema referenced in the EIP v1.0 specification.

Table 2 Abbreviations for Base Namespaces for XMLSchema Referenced in this Document

Abbreviation	Description
cat	Namespace for XML elements used to construct a registry (catalogue) of items that have identifiers, names, definition and description. http://standards.iso.org/iso/19115/-3/cat/1.0
cit	Namespace for XML elements for citation, identification, and web linkage of resources. http://standards.iso.org/iso/19115/-3/cit/1.0
gco	Namespace for XML elements used to specify basic data types. http://standards.iso.org/iso/19115/-3/gco/1.0
gcx	Namespace for XML elements that extend CharacterString to support Web environments. http://standards.iso.org/iso/19115/-3/gcx/1.0
gex	Namespace for XML elements used to specify spatial and temporal extents. http://standards.iso.org/iso/19115/-3/gex/1.0
gml	Namespace defined by the Open Geospatial Consortium for XML elements constituting the Geography Markup Language (GML). For ISO 19115-3, use GML v3.2: http://www.opengis.net/gml/3.2 For ISO 19139, use GML pre-v3.2: http://www.opengis.net/ *
gss	Namespace defined by ISO 19139 for XML elements used to specify basic geometric features. http://www.isotc211.org/2005/gss
gts	Namespace defined by ISO 19139 for XML elements used to specify temporal extent and position. http://www.isotc211.org/2005/gts
gmw	namespace for XML elements that implement properties with values specified by GML classes. http://standards.iso.org/iso/19115/-3/gmw/1.0
lan	Namespace for XML elements used to implement cultural and linguistic adaptability, i.e., different character set and language encoding of metadata content. http://standards.iso.org/iso/19115/-3/lan/1.0
mas	Namespace for XML elements to specify the application schema associated with a resource. http://standards.iso.org/iso/19115/-3/mas/1.0
mcc	Namespace for XML elements that are shared across other namespaces in the ISO 19115-3 implementation. http://standards.iso.org/iso/19115/-3/mcc/1.0

Abbreviation	Description
mco	Namespace for XML elements to specify constraints on access to or usage of a resource. http://standards.iso.org/iso/19115/-3/mco/1.0
md1	Namespace that identifies conformance class that enables all optional metadata properties associated with the base MD_Metadata element and geospatial common extensions. http://standards.iso.org/iso/19115/-3/md1/1.0
md2	Namespace that identifies conformance class that enables user-defined metadata extensions in metadata records. http://standards.iso.org/iso/19115/-3/md2/1.0
mda	Namespace for XML elements for metadata applications describing aggregated resources with linked metadata records. http://standards.iso.org/iso/19115/-3/mda/1.0
mdb	Namespace for XML elements required to instantiate the minimum content for a schema-valid metadata record according to ISO19115-1. http://standards.iso.org/iso/19115/-3/mdb/1.0
dqc	Namespace for XML abstract elements used to document data quality, implements link to ISO 19157-2. http://standards.iso.org/iso/19157/-2/dqc/1.0
mds	Namespace that imports all necessary namespaces to implement a complete metadata record for a dataset or service, not including extended data types or user-defined extensions. http://standards.iso.org/iso/19115/-3/mds/1.0
mdt	Namespace for XML elements required to implement data transfer packages with bundled metadata, data files, and registries defining package content. http://standards.iso.org/iso/19115/-3/mdt/1.0
mex	Namespace for XML elements used to document user-defined metadata extensions. http://standards.iso.org/iso/19115/-3/mex/1.0
mmi	Namespace for XML elements used to document the maintenance history and scheduling for a resource. http://standards.iso.org/iso/19115/-3/mmi/1.0
mpc	Namespace for XML elements used to document a portrayal catalogue associated with a resource that specifies how to visualize the resource content. http://standards.iso.org/iso/19115/-3/mpc/1.0
mrc	Namespace for XML elements used to document schema and amount of content in a structured resource. http://standards.iso.org/iso/19115/-3/mrc/1.0
mrd	Namespace for XML elements used to specify how various representations (distributions) of a resource can be obtained. http://standards.iso.org/iso/19115/-3/mrd/1.0
mri	Namespace for XML elements used to document basic metadata properties of a described resource. http://standards.iso.org/iso/19115/-3/mri/1.0
mrl	Namespace for XML elements used to document the lineage (provenance) of a resource. http://standards.iso.org/iso/19115/-3/mrl/1.0

Abbreviation	Description
mrs	Namespace for XML elements used to document the spatial reference system used to geolocate information content of a resource. http://standards.iso.org/iso/19115/-3/mrs/1.0
msr	Namespace for XML elements used to document the encoding scheme used to represent geolocation in the content of a resource. http://standards.iso.org/iso/19115/-3/msr/1.0
srv	Namespace for XML elements used to document a service. http://standards.iso.org/iso/19115/-3/srv/2.0
xlink	Namespace for XML attributes used to specify links between resources. http://www.w3.org/1999/xlink

* The XML schema at <http://www.isotc211.org/2005/gml/gml.xsd> does not have the correct namespace URI for GML 3.2 (it uses the pre-v3.2 namespace URI, but declares the version to be 3.2.0). The GML XML schema at http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19136_Schemas/gml.xsd and at <http://standards.iso.org/iso/19136/gml.xsd> have the correct namespace URI, and declare the version to be 3.2.1. The ISO XML management group recommendation is to use <http://standards.iso.org/ittf/PubliclyAvailableStandards> as the normative schema location.

1.10 Future Enhancements

This document differs from the EIP v1.0 specification primarily in material providing XML implementation guidelines and examples. Such material has been updated to reference the XML schema specified by ISO 19115-3:2016. This document makes minimal changes to the normative provisions specified in EIP v1.0. Changes to the normative provisions which add important metadata documentation capabilities will be the primary goal of future versions of the EIP, including the three noted below:

- **Data quality:** Provisions for documenting data quality will draw on elements defined by ISO 19157, and can be incorporating into provision using ISO 19115-1 base standard using an abstract class package at the root of the new ISO 19157-2 implementation.
- **Sensor data:** ISO 19115-2:2009 is an extension to ISO 19115 that defines metadata elements designed to document instrument-based data acquisition (*i.e.*, sensor) system characteristics and associated data. These elements are implemented in ISO 19115-3 so that they can be used with ISO 19115-1. Examples of sensor data important to the energy industry include seismic, well log, and remote sensing data.
- **Provenance/Lineage:** ISO 19115-1 defines metadata elements designed to document the sources, processes, agents and timing involved in producing a resource – *i.e.*, its provenance or lineage. Additional provenance elements are defined by ISO 19115-2, and provisions for their use can be incorporated with those drawn from ISO 19115-1 as needed.

2 Content Model Overview

The full content model available for documenting EIP-conformant metadata is that of the base standard, ISO 19115-1.

2.1 Restrictions for Simplicity

Because the ISO 19115-1 metadata model was developed to account for requirements from a variety of user communities, it allows for multiple solutions to several common metadata issues. In such situations, this profile restricts the usage of metadata entities and elements to produce metadata records that will interoperate without complex client software that tests for all the various possible approaches to encoding the same metadata information.

2.2 Model Overview

Figure 1 shows a top-level UML diagram with the two core classes of the base standard model and the top-level classes for supplementary information for which the EIP specifies provisions.

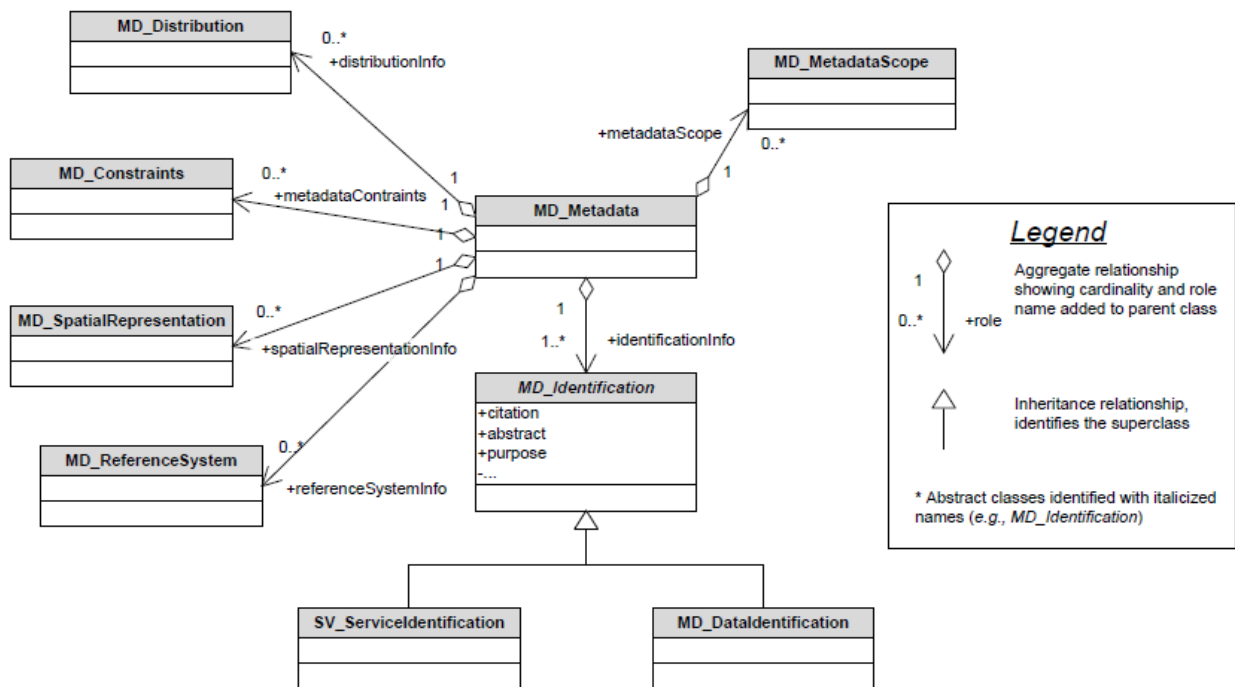


Figure 1. ISO 19115-1 top-level UML classes included in the Energy Industry Profile. Cardinalities are per ISO 19115-1.

2.2.1 Classes

The model has two core classes:

- **MD_Metadata**, to document information about the source and status of the metadata describing a single information resource.
- **MD_Identification** for information needed to identify the resource itself. This abstract class is instantiated either as **SV_ServiceInformation**, to provide information about a service, or as **MD_DataIdentification**, to provide information about a product. Note that this profile restricts the use of service metadata to what are commonly thought of as ‘processing services’—services that take input information and perform some sort of processing to produce a desired output that is returned to the client. Data access services (like OGC WMS, WFS, WCS, or OpenDAP) are treated as distributions of the datasets they offer.

Additional classes in the model enable documenting various types of supplementary information about the resource. Those specified by the EIP are:

- **MD_Constraints**, for specifying security and legal use constraints;
- **MD_Distribution**, for distribution mechanisms that enable access to the resource;
- **MD_MetadataScope**, for documenting the class of the information resource (e.g., “dataset”);
- **MD_ReferenceSystem**, for documenting the coordinate reference system of the geospatial coordinates used to specify the location of feature(s) contained in or described by the resource;
- **MD_SpatialRepresentation**, for documenting the characteristics of resources that include spatial representations of the features described by the content.

2.2.2 Cardinalities

The cardinality of relationships with **MD_Metadata** shown are those specified by ISO 19115-1. The cardinalities specified by the EIP differ, depending on the information resource being documented (see Section 2.2.4.1, page 21). The few metadata elements shown within the abstract class **MD_Identification** are presented for illustrative purposes only. The complete list of elements referenced by the EIP are summarized in Chapter 3 [EIP Requirements Overview](#) (page 26) and discussed in detail in Chapter 4, [Element Specifications](#) (page 33).

2.2.3 Minimum Model for EIP Conformance

The minimum subset of the full content model required for conformance to the EIP are those elements necessary to enable the use cases enumerated in Section 1.6 for the purpose of discovery and use of the resources documented by those metadata (see Section 1.6, [Use Cases](#), page 14).

Requirements for additional content in the ISO 19115-1 model were based on feedback collected in questionnaires distributed to the Energistics community and requirements of the U.S. Geoscience Information Network (USGIN) Project (<http://usgin.org>). Items that ranked highest in relative importance were legal and security constraints on use of the resource, information to characterize the spatial representation, and information on how to obtain the described resource (distribution).

This version of the EIP:

- Makes no provisions about usage of Lineage, Maintenance, or Data Quality content specified in ISO 19115-1 and ISO 19157 (now referenced from ISO 19115-1 for data quality characterization). This information was ranked relatively low in importance (in the community survey) and has considerable complexity; future versions of the profile will specify practices for this metadata.
- Mandates use of only one instance of **MD_Identification** (either data identification or service identification) in a given **MD_Metadata** instance (see Section 2.2.4.1, [below](#)).

2.2.4 Individual Resources vs. a Collection of Resources

ISO 19115-1—the base standard—permits documenting metadata for single information resource in a single metadata record, and for a collection of multiple information resources, either in a single metadata record or using a collection of metadata records.

This version of the EIP describes how to document only a single information resource in a single metadata record; it does not address documenting collections. For a discussion of issues associated with alternative approaches to documenting metadata for collections of information resources, see [Appendix B](#), page 136.

2.2.4.1 Metadata Configurations for Individual Information Resources

To facilitate interoperability for documenting an individual resource, the EIP mandates use of only one instance of **MD_Identification** in a given **MD_Metadata** instance, either to provide identifying metadata about a product (**MD_DataIdentification**) or about a service (**SV_ServiceIdentification**). This follows from the recommendation that service metadata is used to describe processing services only. These would be ‘loosely coupled’ services as described by ISO19119, services that take input data or arguments, perform

some processing, and return the results to the client. Data access services, which would be 'tightly coupled' per ISO19119 are considered distribution mechanisms for the data to which they are coupled, and should be documented in the distribution information section of a dataIdentification section in the metadata record.

2.2.5 Resource Distribution Metadata

The base model provides two possible paths for specifying information about how users can access described resources, and multiple paths for specifying the format of resource representations. Based on the idea that interoperability is promoted when the number of options to represent the same information is minimized, the EIP profile mandates the following conventions:

- In the common situation that a described resource is available from one distributor, with one transfer option, in a single format (the "80% solution" (Figure 2), the **MD_Distribution** entity has exactly one distributor, exactly one **transferOptions** child element, and if necessary, one **distributionFormat** child element.

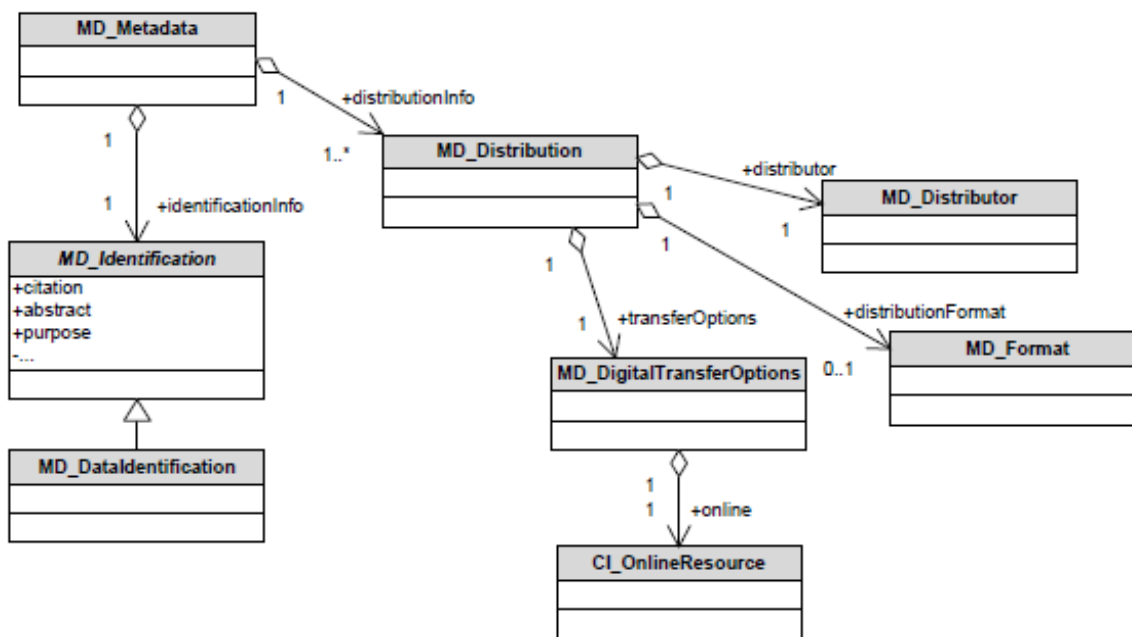


Figure 2. Simple digital online distribution encoding pattern. One transfer option, one format, and one distributor only. This profile specifies the condition that MD_Format is mandatory if metadataScope is one of {"application", "dataset", "document", "metadata", "series", "nonGeographicDataset"}

- In any more complex situation, involving multiple distributors, formats, or transfer options, each distributor is represented by a **MD_Distributor** that is a child of **MD_Distribution** element; **MD_DigitalTransferOption** child elements of the distributor(s) specify options from that distributor, and **MD_Format** child elements of **MD_DigitalTransferOption** specify formats available through that transfer option (Figure 3). This approach is referred to as the 'comprehensive' distribution information encoding, because it provides a pattern that creates a binding between a distributor, the online or offline transfer options offered by that distributor, and the formats available through the various transfer options. Parsing any given EIP metadata record will thus require a test to determine if a **MD_Distribution/transferOptions** element exists:
 - If it does exist, the record should be processed assuming the simple distribution pattern.
 - If it does not exist, the record should be processed assuming the comprehensive distribution encoding pattern.

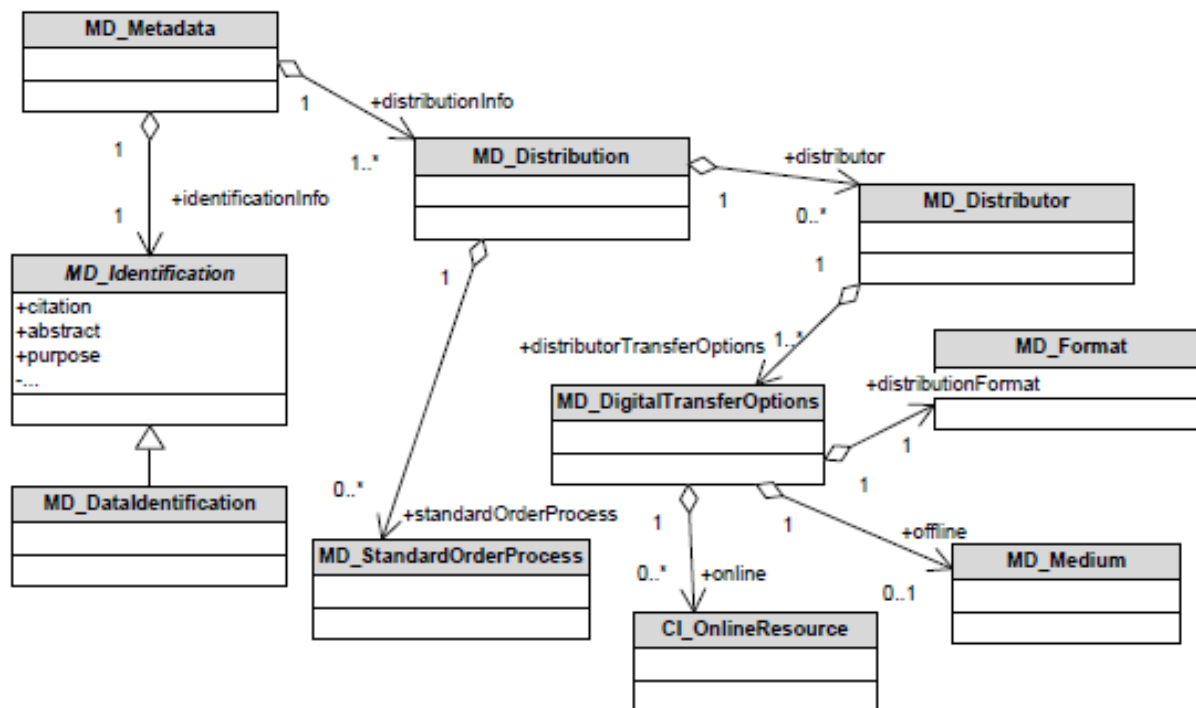


Figure 3. Comprehensive distribution implementation pattern for the EIP.

In situations where there are different format or transfer options from different distributors, or different **transferOptions** for different formats, a binding between distributor, format, and transfer options necessitates use of the **MD_Distribution/distributor/MD_Distributor** path to **distributorFormat** and **distributorTransferOptions** (and **distributionOrderProcess**) information that works together.

In the comprehensive distribution encoding pattern, a separate **MD_Distribution/distributor/MD_Distributor** instance is included for each binding between distributor, order process, format, and transfer options. Repeated **CI_Responsibility**, **MD_StandardOrderProcess**, **MD_Format** or **MD_DigitalTransferOption** elements in the **distributor/MD_Distributor** elements should be specified by internal document reference (`xlink:href` to `gml:id` of first occurrence of the element within the document). The implication is that the **distributionOrderProcess/MD_StandardOrderProcess**, **distributorFormat/MD_Format**, and **distributorTransferOptions/MD_DigitalTransferOptions** child elements of a single **MD_Distributor** are all compatible with each other.

Figure 4 and Figure 5 show possible relationships between distributors, transfer options, and formats that might be represented using the comprehensive distribution pattern.

- Figure 4 indicates the structure of an XML metadata document describing a resource that has multiple transfer options and formats from a single distributor.
- Figure 5 indicates the structure of XML metadata documents that describes a resource that has distributions from multiple distributors, with multiple transfer options and formats, representing the most complex scenario for describing access to a resource. For example XML instances implementing these patterns, see Section 4.4.2, [Digital Product Access](#), page 88.

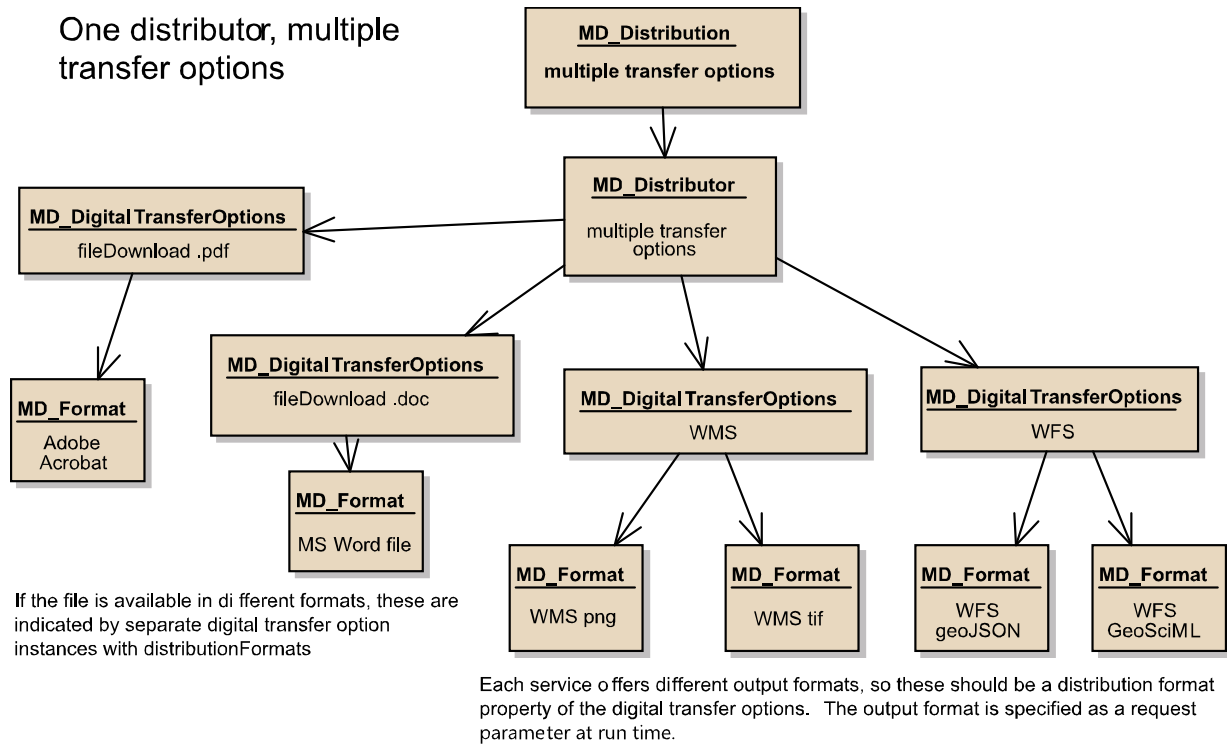


Figure 4. Example XML element graph for a single distributor, offering multiple transfer options.

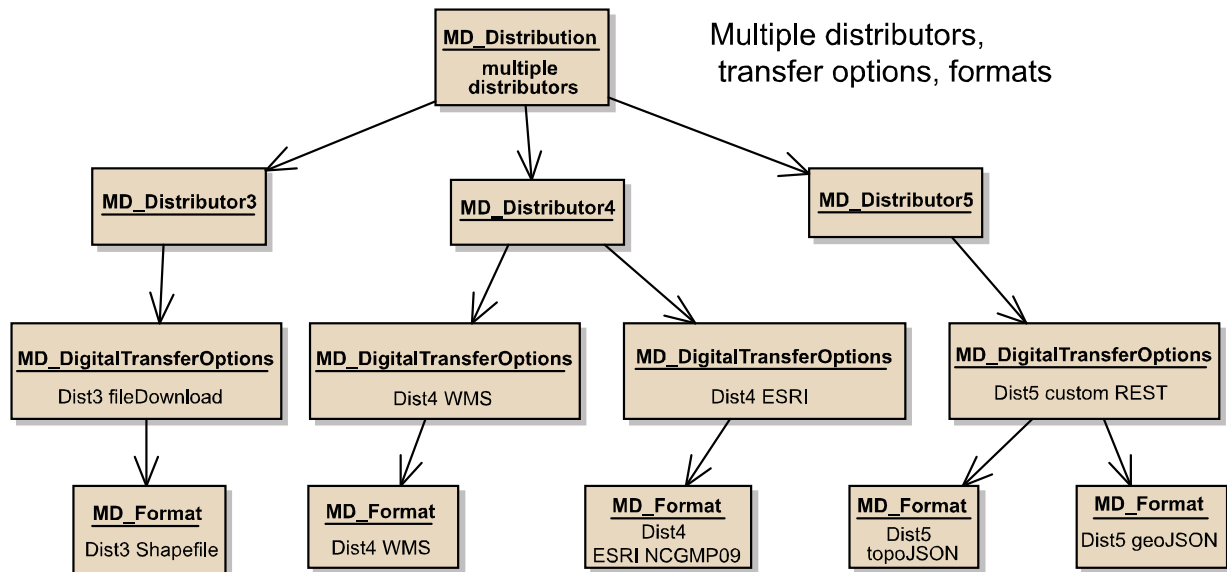


Figure 5. Example XML element graph for multiple distributors, offering multiple transfer options and formats.

2.3 XML Implementation

The ISO 19115-1 model is a content or conceptual model depicted in a collection of UML diagrams. This model could be implemented in a variety of encodings as shown in Figure 6.

An instance of the ISO 19115-1 conceptual model (lower left, Figure 6) is any representation of the content required for a metadata record (*MD_Metadata*) as indicated by the UML model. Example instances in Annex E of the ISO 19115-1 specification document use a simple indented text format, but a consistent representation might also be a paragraph of text with the necessary content, encoding in XML, JSON, or any other structured syntax schemes. For use in actual metadata catalog systems, the most common practice is to use the XML encoding specified by the XML schema implementation following the rules laid out in ISO 19115-3 (upper right). Instance documents that are exchanged by interoperable catalog services have content as specified by the ISO 19115-1 content model, encoded according to the rules in ISO 19115-3 (lower right).

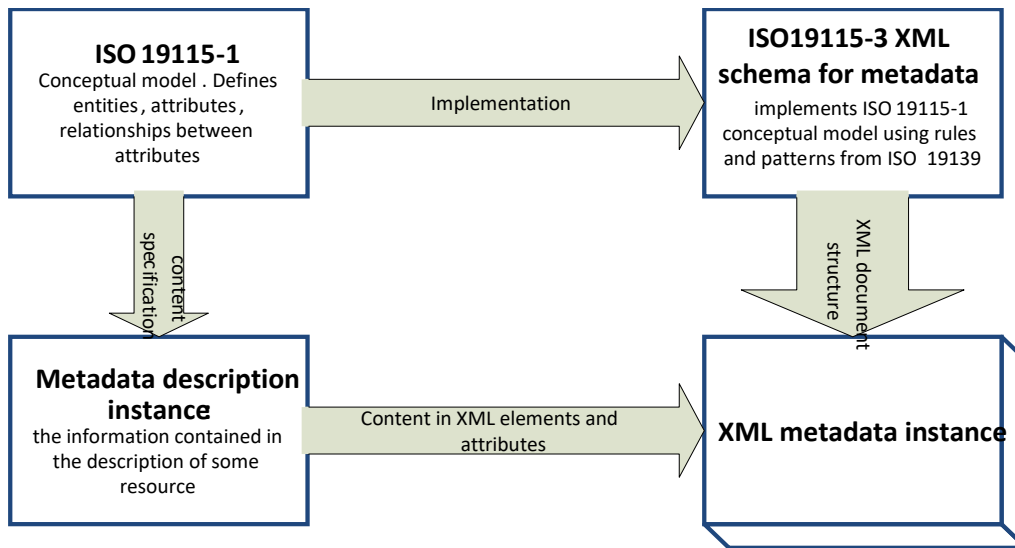


Figure 6. Relationship between conceptual (content) model, a description instance that includes content specified by the model, an XML schema that implements a conceptual model, and a metadata instance using an XML schema to encode a particular description of a resource.

3 EIP Requirements Overview

This chapter provides an overview and summary of the metadata requirements of the EIP, including:

- Use of EIP Resource Classes to categorize resources documented by a metadata record, with the intention to facilitate automation of metadata management and use.
- A summary of the minimum metadata required for conformance with the EIP.

3.1 Documenting Information Resource Class

Resource Classes, the class (or type) of information resources, addressed in this version of the EIP were defined in Section 1.5, [Scope](#), page 12, and include:

- Digital Product
- Physical Product
- Digital Service

[Table 1](#), page 13, provides some examples of these resources.

3.2 Defining Resource Class and Predicting Metadata Record Structures

For maximum flexibility, and to enable a diversity of potential applications, ISO 19115-1 (the base standard) provides numerous ways to capture the same metadata. In addition, not all metadata elements are applicable to all types of resources. Combined, these outcomes result in many diverse metadata record structures, a situation which demands complex metadata production, processing and maintenance software. The flexibility and diversity of application potential of ISO 19115-1 comes at the expense of complexity in its data model, a situation that further complicates the development of metadata production, processing and maintenance software.

The main goal of the EIP is to constrain the base standard to meet the needs of the community for significantly improved discovery and evaluation of, and access to, distributed information resources. By associating rules for metadata content integrity with different types of resources, the EIP enables the development of software that can predict basic metadata record structure. This prediction ability is expected to simplify development, implementation, and maintenance of such software, which is in turn considered critical to the successful processing of large numbers of metadata records.

Rather than consider a haphazard collection of different types of resources, the EIP provides an organizing framework of standard Resource Classes (Section 1.5, [Scope](#), page 12) to categorize different types of resources, as identified by the ISO 19115-1 [MD_ScopeCode](#) vocabulary (used to populate [MD_MetadataScope](#)). This categorization associates each [MD_ScopeCode](#) value with key, appropriate obligation rules, and maps ISO 19115-1 [MD_ScopeCode](#) values to a subset of those values used by the EIP.

3.2.1 Assignment of Base Standard Elements to Resource Classes

[Table 3](#) below shows in the left-most column four Resource Classes defined by the EIP, of which three are addressed in this version of the EIP, and one group of unassigned resources. Resource Class “collection” will be addressed in a future EIP version.

The right-most column of [Table 3](#) lists all terms from the ISO 19115-1 [MD_ScopeCode](#) vocabulary. These terms are shown grouped by terms listed in the middle column, *EIP ScopeCode Value*, which are the [MD_ScopeCode](#) values recommended for use in the EIP. In all cases but two, the recommended EIP [MD_ScopeCode](#) values are drawn from the ISO 19115-1 [MD_ScopeCode](#) values. The two exceptions are highlighted in bold, italicized font: *documentPhysical* and *seriesPhysical*. These additional two values are required to eliminate the ambiguity inherent in ISO 19115-1 [MD_ScopeCode](#) values *document* and *series*, both of which could be interpreted as either a Physical Product or a Digital Product. To remove this ambiguity, and given the expectation that most existing resources documented with *document* and *series* are Digital Products, the EIP prescribes that these values be used to identify only Digital Products. The

EIP adds *MD_ScopeCode* terms *documentPhysical* and *seriesPhysical* to enable unambiguous identification of analogous Physical Products.

ISO 19115-1 *MD_ScopeCode* values in [Table 3](#) are considered by the EIP as equivalent to the EIP *MD_ScopeCode* term by which they are grouped. Resources identified by ISO 19115-1 *MD_ScopeCode* values in the *Unassigned* group are not considered applicable to the types of information resources identified as being in scope for this version of the EIP (see [Table 1](#)).

Table 3. Assignment of EIP Resource Classes of EIP ScopeCode Values and Mapping of ISO 19115-1 MD_ScopeCode Values to EIP MD_ScopeCode Values		
EIP Resource Class	EIP ScopeCode Value	ISO 19115-1 ScopeCode Value
Collection	activity	aggregate
		collection
		collectionSession
		fieldSession
		initiative
		repository
Physical Product	collectionHardware	collectionHardware
	<i>documentPhysical</i> *	document
	sample	sample
	<i>seriesPhysical</i> *	series
Digital Product	application	application
		software
	dataset	coverage
		dataset
		tile
	document	document
	metadata	metadata
	series	series
nonGeographicDataset	nonGeographicDataset	
Digital Service	service	service
Unassigned		attribute
		attributeType
		dimensionGroup
		feature
		featureType
		model
		product
		propertyType

* EIP *MD_ScopeCode* values not included in the ISO 19115-1 *MD_ScopeCode* vocabulary.

3.2.2 Resource Classes

Each Resource Class is associated with a particular collection of validation rules, and implies obligations for combinations of metadata elements. Three of the Resource Classes listed in [Table 4](#), which are in-scope for this version of the EIP, are considered to be composed of different combinations of five different groups of metadata elements, taken two or three at a time. Five *content element groups* are defined in [Table 4](#).

Note that Physical Services (e.g., drilling, well logging, pipeline inspection) are logically possible, but they are out of scope for this version of the EIP and thus not included in this scheme.

Table 4. Content Element Groups Implied by Resource Classes	
Content Element Group	Includes elements that are applicable to Information Resources meeting this description/condition:
Common	Any information resource.
Digital Product	Static information rendered in a digital form intended to be machine readable. Such information can be transported electronically, and is typically captured in computer files.
Physical Product	Static information content existing in a physical form not intended to be machine readable. Such information can be transported to different locations. Examples include rock samples, core, facilities, and instruments.
Digital Service	A digital resource which be invoked through messaging using the internet to execute one or more operations and return appropriate response messages. Examples include OGC Web Processing Services, or a loosely-coupled OGC map service used as a portrayal service.
Geolocated Resource	Information that can be related to a specific, physical location. As such, it geographically qualifies description of the content.

3.3 Minimum Metadata

Figure 7 presents a workflow diagram that can be used to identify the combination of content element groups (Table 6 through Table 10) needed to conform to EIP minimum metadata requirements for a particular Resource Class.

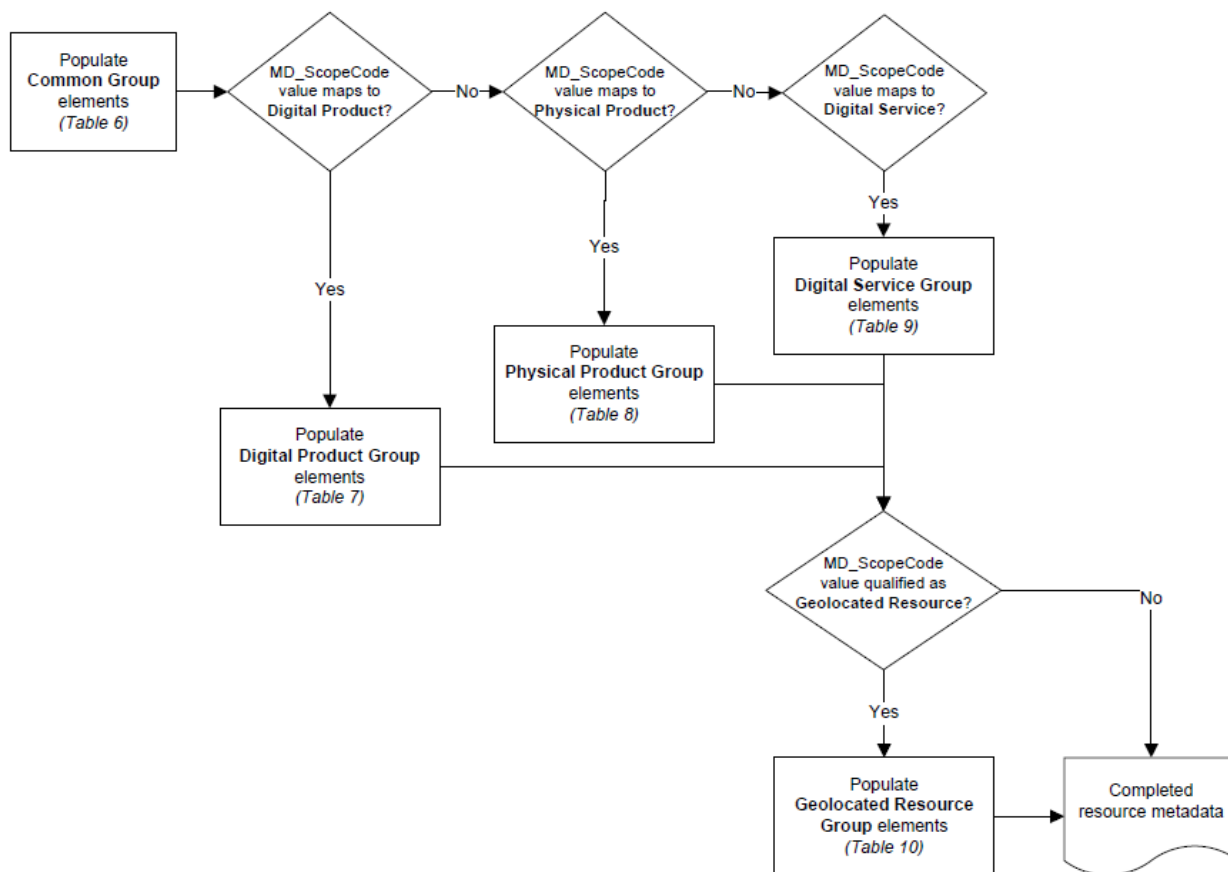


Figure 7. Workflow for metadata element group selection based on resource class and qualifiers.

3.3.1 How to Determine Required Metadata Elements

The flow chart presented in [Figure 7](#) defines the decision path to determine which requirements tables ([Table 6](#) through [Table 10](#)) apply to a particular resource class. Each table enumerates a set of metadata requirements, and provides a link to the implementation details in [Chapter 4](#), which begins on page [33](#).

Metadata entities and elements in the tables are listed in the order in which they appear in an ISO XML metadata instance. A number of the elements in [Chapter 4](#) are referenced from multiple rows in [Table 6](#) through [Table 10](#). To better understand the following content, you are encouraged to have available copies of ISO 19115-1 and ISO 19115-3, which are referred to as the base standards. [Table 5](#) explains the content of the columns in the subsequent [Tables 6](#) through [10](#).

[Table 6](#) includes elements that may be present in either a product or service metadata instance. These include direct child elements of [MD_Metadata](#) and child elements of the abstract [MD_Identification](#) class that are inherited by [MD_DataIdentification](#) and by [SV_ServiceIdentification](#) elements.

[Table 7](#) includes elements that are child elements of [MD_DataIdentification](#) and apply to description of Digital Products, as defined in [Table 5](#).

[Table 8](#) includes elements that apply to the description of Physical Products, as defined in [Table 5](#).

[Table 9](#) includes elements that are child elements of [SV_ServiceIdentification](#) and apply to description of Digital Services, as defined in [Table 5](#).

[Table 10](#) includes elements that apply to the description of Geolocated Resources, as defined in [Table 5](#).

Note that some mandatory elements are specified to be 'nilable'. By default a mandatory element is 'not-nilable'. Mandatory elements that are nilable must be included in instance documents, but if there is no value provided, a `nilReason` attribute must be present that explains why the value is missing. The logic is

that if the element is mandatory, a value exists (conceptually), and if it is not provided an explanation is useful to the metadata consumer. Valid nilReason values are { "inapplicable", "missing", "unknown", "withheld"}.

Table 5. Description of Column Headings in Each of the Requirements Tables, Table 6 through Table 10	
Table Column Heading in Tables 6–10	Description of Content in the Column
Content Name	Name of the metadata element.
Content and Implementation Details	A reference (hyperlink) to the section in this document that provides specifics on usage of the element.
Minimum M/C Element Values	The minimum number of element values that must be present (first number), and the number of values that may be required depending on some property of the resource or metadata record (conditional values, second number).
Changes to ISO 19115-1	Identifies content elements for which the EIP modifies provisions for use relative to ISO 19115-1. Valid codes include: O = Obligation: EIP changes optional to mandatory. C = Cardinality: EIP changes cardinality bounds. Do = Domain: EIP changes the domain of valid values.

3.3.1.1 Requirements Tables

For definitions of each column in this and all tables in this section, see [Table 5](#) above. For any given resource type, the number of mandatory attributes can range from 0 to 4. For notes on elements that can be automated, see detail tables in Chapter 4.

Table 6. Required EIP Content Elements Common to All Resource Classes			
Content Name	Content and Implementation Details	Minimum M/C Element Values	Changes to ISO 19115-1
Metadata identifier	4.2.1 Metadata Identifier	1/0	
Metadata language	4.2.2 Metadata Language	0/1	
Metadata character set	4.2.3 Metadata Character Set	0/1	
Metadata parent identifier	4.2.4 Parent Metadata	0/2	O
Metadata scope	4.2.5 Metadata Scope	1/0	O,Do
Metadata contact	4.2.6 Metadata Point of Contact	0/3	O,Do
Metadata create date	4.2.7 Metadata Create Date	2/0	O
Metadata update date	4.2.8 Metadata Update Date	2/0	
Metadata standard	4.2.9 Metadata Standard	1/0	
Resource citation title	4.3.1 Resource Citation Title	1/0	
Resource citation date	4.3.2 Resource Citation Date	2/0	
Resource identifier	4.3.3 Resource Identifier	1/0	O
Resource author	4.3.4 Cited Responsible Party	0/3	O
Abstract	4.3.5 Abstract	1/0	
Resource status	4.3.6 Resource Status	1/0	O
Resource owner or custodian	4.3.7 Resource Point of Contact	3/0	O
Resource content topic	4.3.8 Resource Topic Category	0/1	
Descriptive keywords	4.3.9 Descriptive Keywords	3/1	O
Legal constraints	4.3.10 Legal Constraints	1/1	O
Security constraints	4.3.11 Security Constraints	0/0	
Resource distributor	4.3.12 Resource Distributor Contact	0/3	O
Related & aggregate resources	4.3.13 Resource Relationships and Aggregation	0/0	
Total:		22/12	

Table 7. Additional Required EIP Content Elements for Resources Identified as Digital Products			
Content Name	Content and Implementation Details	Minimum M/C element values	Changes to ISO 19115-1
Digital product format	4.4.1 Digital Product Format	1/0	O
Digital product access	4.4.2 Digital Product Access	0/1	O
Digital product provenance	4.4.3 Digital Product Provenance	0/0	
Total (additional to Table 6):		+1/1	

Table 8. Additional Required EIP Content Elements for Resources Identified as Physical Products			
Content Name	Content and Implementation Details	Minimum M/C element values	Changes to ISO 19115-1
Physical product format	4.5.1 Physical Product Format	1/1	O
Product ordering process	4.5.2 Product Ordering Process	1/0	
Total (additional to Table 6):		+2/1	

Table 9. Additional Required EIP Content Elements for Resources Identified as Digital Services			
Content Name	Content and Implementation Details	Minimum M/C element values	Changes to ISO 19115-1
Basic service characteristics	4.6.1 Basic Service Characteristics	0/5	O,C
Coupled datasets	4.6.2 Coupled Datasets	0/3	
Service distribution	4.6.3 Service Distribution	0/1	O
Service operations metadata	4.6.4 Service Operations Metadata	0/3	O
Coupled operations and datasets	4.6.5 Coupled Operations and Datasets	0/4	O
Total (additional to Table 6):		+2/3	

For EIP purposes, geolocated denotes that geographic coordinates (e.g., a bounding box) are applicable and available to specify the geographic location described by or identified in the content of the resource.

Table 10. Additional Required EIP Content Elements for Resources Identified as Geolocated			
Content Name	Content and Implementation Details	Minimum M/C element values	Changes to ISO 19115-1
Spatial representation	4.7.1 Spatial Representation	2 (vector) or 6 (grid) /0	C
Spatial reference system	4.7.2 Coordinate Reference System	2/1	C
Spatial extent	4.7.3 Spatial Extent	4/0	C
Spatial resolution	4.7.4 Spatial Resolution	0/1	C
Total (additional to Tables 6-9):		+6/2	

4 Element Specifications

This section presents the normative provisions of the Energy Industry Profile for metadata entities and elements, and offers guidelines for their implementation in XML. The normative provisions include those inherited from the base standard as well as provisions that are changed in this profile, such as raising the obligation from optional to conditional or mandatory, changing conditional obligations, restricting codelists to a subset of the base standard codelist, or defining default values.

The material in this chapter is organized as follows:

Section 4.1 explains how the information in the subsequent sections are grouped and organized.

Sections 4.2 through 4.7 each presents elements that are broadly related by the type of metadata content they document. Within each section, metadata elements are presented in the order in which they appear in an ISO 19115-3 XML instance document. These sections are:

Section 4.2 [Metadata Information](#), page 35

Section 4.3 [Resource Class-independent Information](#), page 52

Section 4.4 [Digital Product-specific Information](#), page 84

Section 4.5 [Physical Product-specific Information](#), page 98

Section 4.6 [Service-specific Information](#), page 102

Section 4.7 [Spatial Information](#), page 117

Section 4.8 (page 128) presents elements related by their use within the content model. This group of elements allows capture of identical types of metadata in different contexts. They are thus re-used in the model, each time in a different context.

4.1 Element Descriptions

Within each **4.n** subsection, material describing either a single element or group of closely related elements (“element set”) is presented under headings numbered **4.n.m**. The normative specifications for each element or element are first presented, followed by implementation guidelines. Grouping closely related elements into sets, and associating both normative specifications and implementation guidelines, are intended to improve the utility of this document for readers seeking to understand and implement the EIP.

4.1.1 Normative Specifications

The normative specifications for each element or element set are presented under headings numbered **4.n.m.1**. Content Specifications are presented first, following by Normative notes.

The Content Specification material is introduced with one line identifying the UML root path for the element, and a second line identifying both the EIP obligation (“Reference Obligation”) and, using underlined font and the superscript “¹,” the specific element in the path to which that obligation applies. For example:

UML root path: MD_Metadata...

¹ **Reference Obligation:**

Additional conventions used in this material:

- Abstract elements are identified using italic font (e.g., *MD_Identification*).
- If the Reference Obligation is other than “Optional,” a statement is provided indicating whether it represents an increase to the obligation as specified by ISO 19115-1.
- The cardinality of the element associated with Reference Obligation is the same as its cardinality in ISO 19115-1 unless otherwise stated.

Below the introductory lines, one or more tables present dictionary and requirements information about the single element, or about each individual simple element comprising the element set, considered under

heading **4.n.m**. The table(s) in each section **4.n.m** take the form of the one below, which shows the organization of the information it presents. By column: element (1) line number in ISO 19115-1 Annex B, (2) name, (3) obligation, (4) datatype, and (5) domain of valid values:

Line	Name	Obligation	Cardinality	Datatype	Domain
(1)	(2)	(3)	(4)	(5)	(6)

Supplementary information – about element characteristics presented in the table, or about element constraints and relationships, is presented as superscripted notes. To facilitate understanding, these notes are presented as near the relevant element as practical.

An abstract element is identified in the normative material, and elsewhere in this document, by presenting the name in italic font (*e.g.*, *MD_Identification*).

All elements specified as mandatory are ‘not-nilable’ unless explicitly declared ‘nilable’ in column (3). Mandatory elements that are nilable must be included in instance documents, but if no value provided, a nilReason attribute must be present that explains why the value is missing. The logic for this design is that, if the element is mandatory, a value exists (conceptually), and if it is not provided an explanation is useful to the metadata consumer. Valid nilReason values are { "inapplicable", "missing", "unknown", "withheld"}.

4.1.2 XML Implementation

XML implementation guidelines follow the normative material under headings numbered **4.n.m.2**. These guidelines include a second standard table followed by one or more XML examples. The standard table identifies the XPath, either in complete form or as root and individual XML elements, and provides notes about implementing the requirement using ISO 19115:2006 / ISO 19139 for backward compatibility, and about automatically generating element content (“Automation considerations”).

4.2 Metadata Information

MD_Metadata class (ISO 19115-1, B.2.2)

This section describes elements that provide information about the metadata itself, rather than about the information resource.

4.2.1 Metadata Identifier

Definition: A unique identifier for the metadata record.

4.2.1.1 Content Specifications

UML root path: MD_Metadata.metadataIdentifier¹.MD_Identifier

¹ **Reference Obligation:** Mandatory (raised from Optional in ISO 19115-1)

Line	Name	Obligation	Cardinality	Datatype	Domain
433	code	Mandatory, not nilable	1	Character-String	Text restricted to URI (see IETF STD 66/RFC 3986) ²

² EIP restricts text to URI syntax (c.f., ISO 19115-1 restriction of CI_OnlineResource/linkage to URL).

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.2.1.1.1 Normative Notes

To avoid assignment of identical identifier values to different metadata records maintained in separate metadata repositories or registries, EIP mandates that a globally unique identifier is included in each metadata record. Recommended practice is to identify metadata records using a UUID type URI(GUID), per IETF RFC-4122 (<http://www.ietf.org/rfc/rfc4122.txt>). Recommended practice is that this identifier be maintained when metadata records are harvested.

4.2.1.2 XML Implementation

XPath root	MD_Metadata/metadataIdentifier/MD_Identifier
identifier	+/code/CharacterString
2006 specification implementation	metadataIdentifier in the ISO 19115-1 model replaces fileIdentifier in the 2006 model. The fileIdentifier string should be identical with the MD_Identifier/code/-CharacterString in metadata records ISO 19115-1 documents. The 2006 model makes no specific provision for providing a URI for the metadata record.
identifier	MD_Metadata/fileIdentifier/CharacterString
Automation considerations	Auto generate in source metadata repository or registry. The source repository or registry should create and maintain these unique identifiers with any metadata records presented for harvest.

4.2.1.2.1 Implementation Notes

The MD_Identifier/code should be a globally unique string that identifies the metadata record. This identifier will be used in harvest processes to determine if a record is already present in the destination metadata catalog. Use of a UUID (GUID) is recommended (per IETF RFC-4122, <http://www.ietf.org/rfc/rfc4122.txt>), the identifying prefix for which would be URI scheme name and URN namespace “urn:uuid:.” If the metadata record identifier is not a UUID, the EIP mandates that the identifier prefix should be specified (e.g., urn:, http:).

4.2.1.2.2 Examples

Recommended practice:

```
<mdb:metadataIdentifier>
  <fcc:MD_Identifier>
    <fcc:code>
      <gco:CharacterString>urn:uuid:16856646-4e3d-5f8f3-cde3b9fc006e4c8</gco:CharacterString>
```

```
</mcc:code>  
</mcc:MD_Identifier>  
</mdb:metadataIdentifier>
```

If no prefix is present (*i.e.*, “urn:uuid:”), identifier is assumed to be a URN:UUID type URI. If a prefix other than urn:uuid (case insensitive) is present, then it should be assumed that the identifier is unique under some other URI scheme; if the scheme is known to the parser, any appropriate processing or validation may be applied. If the prefix is simply UUID:, then the identifier should be assumed to be a URN:UUID type URI. Parsers should be relaxed about the presence or absence of hyphens in the UUID strings. If the string does not include 32 hexadecimal digits (with or without hyphens), then it should not be interpreted as a UUID (prefix or not), and parsers should assume that the string is asserted to be independent in the scope of the metadata harvest source (as indicated by the MD_Metadata/contact element content).

```
<mdb:metadataIdentifier>  
  <mcc:MD_Identifier>  
    <mcc:code>  
      <gco:CharacterString>168566464e3d5f8f3cde3b9fc006e4c8</gco:CharacterString>  
    </mcc:code>  
  </mcc:MD_Identifier>  
</mdb:metadataIdentifier>
```

```
<mdb:metadataIdentifier>  
  <mcc:MD_Identifier>  
    <mcc:code>  
      <gco:CharacterString>uuid:168566464e3d5f8f3cde3b9fc006e4c8</gco:CharacterString>  
    </mcc:code>  
  </mcc:MD_Identifier>  
</mdb:metadataIdentifier>
```

2006 example (ISO 19139):

```
<gmd:fileIdentifier>  
  <gco:CharacterString>21EC2020-3AEA-1069-A2DD-08002B30309D</gco:CharacterString>  
</gmd:fileIdentifier>
```

4.2.2 Metadata Language

Definition: A simple element that identifies the language used for content in the metadata document. For metadata that is not language localized (e.g., content is available in only one language), the metadata language is specified in the defaultLocale element.

4.2.2.1 Content Specifications

UML root path: MD_Metadata.defaultLocale¹.PT_locale

¹ **Reference Obligation:** Conditional² (unchanged from ISO 19115-1)

² Documented if language is not default (English), or if character encoding is not default (UTF-8).

Line	Name	Obligation	Cardinality	Datatype	Domain
448	language	Mandatory, not nilable	1	CodeList	languageCode ³

³ Use ISO 639-2 3-alphabetic digits codes (per ISO 19115-1).

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.2.2.1.1 Normative Notes

The EIP content specification is the same as the base standard in that the element obligation is optional. The defaultLocale element is optional, but if present, both the languageCode and characterSetCode (next section) MUST be present. Because populating this element is easily automated, providing a value is considered a trivial burden.

4.2.2.2 XML Implementation

XPath	MD_Metadata/defaultLocale/lan:PT_Locale/lan:language/lan:LanguageCode
2006 specification implementation	MD_Metadata/language/CharacterString.
Automation considerations	Default to 'eng' unless the metadata is in some other language.

4.2.2.2.1 Implementation Notes

Use ISO 639-3 three-letter language code; these are the "terminological" codes, derived from the native name for the language (see http://en.wikipedia.org/wiki/ISO_639-3).

4.2.2.2.2 Examples

```
<mdb:defaultLocale>
  <lan:PT_Locale>
    <lan:language>
      <lan:LanguageCode codeList="http://www.loc.gov/standards/iso639-2/php/code_list.php" codeListValue="eng">eng</lan:LanguageCode>
    </lan:language>
    <lan:characterEncoding>
      ....
    </lan:characterEncoding>
  </lan:PT_Locale>
</mdb:defaultLocale>
```

2006 example (ISO 19139):

```
<gmd:language>
  <gco:CharacterString>eng</gco:CharacterString>
</gmd:language>
```

4.2.3 Metadata Character Set

Definition: A simple element identifying the character coding standard used for the metadata set. ISO 19115-1 defines this as a sub element in the defaultLocale element.

4.2.3.1 Content Specifications

UML root path: MD_Metadata.defaultLocale¹.PT_Locale

¹ **Reference Obligation:** Conditional² (unchanged from ISO 19115-1)

² Documented if not UTF-8 or defined by the encoding.

Line	Name	Obligation	Cardinality	Datatype	Domain
450	characterSet	Mandatory, not nilable	1	CodeList	MD_CharacterSetCode ³

³ Use IANA register <http://www.iana.org/assignments/character-sets> (per ISO 19115-1).

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.2.3.1.1 Normative Notes

The EIP content specification is the same as the base standard in that the element obligation is optional. The defaultLocale element is optional, but if present, both the languageCode (previous section) and characterSetCode MUST be present. Because populating this element is easily automated, providing a value is considered a trivial burden.

4.2.3.2 XML Implementation

XPath	MD_Metadata/defaultLocale/lan:PT_Locale/lan:characterEncoding/lan:MD_CharacterSetCode
2006 specification implementation	MD_Metadata/characterSet/MD_CharacterSetCode
Automation considerations	Default to 'utf8' for most cases.

4.2.3.2.1 Implementation Notes

This element is not required in a standard XML document, since character encoding is identified in such documents by an attribute of the root declaration element (e.g., '`<?xml version="1.0" encoding="UTF-8" ?>`'). If its documentation is desired, however, use the ISO codelist found online at <http://www.iana.org/assignments/character-sets>.

4.2.3.2.2 Examples

```
<mdb:defaultLocale>
  <lan:PT_Locale>
    <lan:language>
      .....
    </lan:language>
    <lan:characterEncoding>
      <lan:MD_CharacterSetCode codeList="http:// www.iana.org/assignments/character-sets"
        codeListValue="utf8">UTF-8
      </lan:MD_CharacterSetCode>
    </lan:characterEncoding>
  </lan:PT_Locale>
</mdb:defaultLocale>
```

2006 example (ISO 19139):

```
<gmd:characterSet>
  <gmd:MD_CharacterSetCode codeList= "http:// www.iana.org/assignments/character-sets"
    codeListValue="utf8">UTF-8</gmd:MD_CharacterSetCode>
```

</gmd:characterSet>

4.2.4 Parent Metadata

Definition: A citation to a separate metadata record that describes a resource that contains or includes the described resource in some way.

The EIP mandates that links directly between the described resources are asserted by **associatedResource** elements (see Section 2.2.4, page 21), and provisions for encoding such relationships are specified in Section 4.3.13, **Resource Relationships and Aggregation**, page 78. For consistency and interoperability, if a link to a parent resource is to be included, it **MUST** be encoded using an **associatedResource** element and **MAY** additionally be encoded using a **parentMetadataIdentifier** element to link to the metadata record for the parent resource.

4.2.4.1 Content Specifications

UML root path: MD_Metadata.parentMetadataIdentifier¹.CI_Citation

¹ **Reference Obligation:** Conditional² (*unchanged from ISO 19115-1*)

² Per ISO 19115-1, required if there is an upper level object (i.e., a parent metadata record exists).

Line	Name	Obligation	Cardinality	Datatype	Domain
362	title	Mandatory, not nilable	1	CharacterString	Free text
406	linkage	Optional	1	CharacterString	Text restricted to URL (see IETF RFC 3986) ³

³ Per ISO 19115-1.

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.2.4.1.1 Normative Notes

Note that the name of the element indicates that the citation should be to a metadata record. It appears that the intention of this element is for metadata applications using the **DS_Aggregation** entity to bundle a collection of related metadata in which the parentMetadata links would be traversed from child records to parent records to inherit metadata description properties. The title is the only mandatory element in **CI_Citation**, and is thus mandatory in a parent metadata citation, but to implement the aggregation/inheritance use case, the required information would be the **CI_Citation/onlineResource/CI_OnlineResource/linkage** element. As noted above, this usage is optional and not recommended for EIP applications.

4.2.4.2 XML Implementation

XPath root	MD_Metadata/parentMetadataIdentifier/cit:CI_Citation
title	+/cit:title/gco:CharacterString
linkage	+/cit:onlineResource/cit:CI_OnlineResource/linkage/gco:CharacterString
2006 specification implementation	MD_Metadata/parentIdentifier/CharacterString
Automation considerations	

4.2.4.2.1 Implementation Notes

The parent metadata reference establishes a relationship between **metadata** records for resources that have parent-child relationships. In some profiles the intention appears to be that a child metadata record will inherit element values from the parent metadata record; this pattern makes the most sense in the context of series or collections. The EIP profile has not been extended to specify documentation for collections (see discussion in Appendix B, page 136); metadata records are intended to be stand-alone documentation for individual resources, and as such all information should be included inline in the record, not assumed to be inherited from some parent record. This provision might be relaxed when the profile is extended to account for collections. The EIP mandates that links directly between the described resources (see Section 2.2.4.1, page 21) are asserted using **associatedResource** elements. Provisions for encoding such relationships are specified in Section 4.3.13, **Resource Relationships and Aggregation**, page 78.

4.2.4.2.2 Examples

```

<mdb:parentMetadata>
  <cit:CI_Citation>
    <cit:title>
      <gco:CharacterString>Metadata for GIS data for Geologic map of Kentucky
    </gco:CharacterString>
    </cit:title>
    <cit:identifier> <!-- optional -->
      <mcc:MD_Identifier>
        <mcc:code>
          <gco:CharacterString>21EC2020-3AEA-1069-A2DD-08002B30309D
        </gco:CharacterString>
        </mcc:code>
      </mcc:MD_Identifier>
    </cit:identifier>
    <cit:onlineResource>
      <cit:CI_OnlineResource>
        <cit:linkage>
          <gco:CharacterString>http://catalog.usgin.org/geoportal/rest/document?id=
            {21EC2020-3AEA-1069-A2DD-08002B30309D}</gco:CharacterString>
        </cit:CI_OnlineResource>
      </cit:onlineResource>
    </cit:CI_Citation>
  </mdb:parentMetadata>

```

2006 example (ISO 19139):

```

<gmd:parentIdentifier>
  <gco:CharacterString>21EC2020-3AEA-1069-A2DD-08002B30309D</gco:CharacterString>
</gmd:parentIdentifier>

```

4.2.5 Metadata Scope

Definition: A term from a controlled vocabulary that categorizes the type of resource described by the metadata record.

EIP mandates use of the scope code to categorize the resource being described (see Chapter 3, [EIP Requirements Overview](#), page 26). The ISO 19115-1 scope code list includes a broad spectrum of resources, and for many of the terms the definitions are not sufficiently explicit to unambiguously determine how to categorize a given resource, and what metadata content the category implies. [Table 15](#), page 138 summarizes usage of scope codes in EIP metadata documents.

scopeCode: CodelistValue specifies the scope of a resource. EIP restricts the ISO code list to terms specific to resource scope.

name: Free text that names the hierarchy level specific to the kind of resource described.

4.2.5.1 Content Specifications

UML root path: MD_Metadata.metadataScope¹.MD_Scope

¹ **Reference Obligation:** Mandatory (*unchanged from ISO 19115-1*)

Line	Name	Obligation	Cardinality	Datatype	Domain
40	scopeCode	Mandatory ² , nilable	N	CodeList	MD_ScopeCode ³
41	name	Optional	1	CharacterString	Free text

² Default="dataset" (i.e., if nil, "dataset" assumed).

³ EIP requires that one ScopeCode value conforming to this profile is provided (see [Appendix C](#), page 138), but additional scope code values from other vocabularies are permitted.

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.2.5.1.1 Normative Notes

The EIP mandates that at least one **MD_MetadataScope** element with an EIP-restricted **resourceCode** value **MUST** be present. Additional **scope** values **MAY** be provided in accordance with the base standard. The metadata scope is specified by a tuple that includes a term from a codelist and zero-to-many free text names for the scope.

4.2.5.2 XML Implementation

XPath root	MD_Metadata/metadataScope/MD_Scope
scopeCode	+/resourceCode/mcc:MD_ScopeCode/@codelistValue
scopeName	+/name/CharacterString
2006 specification implementation	hierarchyLevel and hierarchyLevelName are child elements of MD_Metadata directly, so there is no binding between a given level and level name if more than one level is specified.
Automation considerations	

4.2.5.2.1 Implementation Notes

The EIP interprets the intention of metadata scope to specify the kind of resource described by the metadata record. Rather than inventing a new resource-class vocabulary to use for scope codes, the EIP restricts the valid codelist values in the ISO scope code vocabulary, and maps those codes into the resource class categories used to constrain metadata record content requirements. [Table 3](#), page 27, presents that mapping for the top level scope code terms. [Table 15](#), page 138, is a complete listing of EIP resource scope terms. Some terms in the ISO 19115-1 scope code list are deprecated for use in EIP metadata because of overlapping meaning or ambiguity.

4.2.5.2.2 Examples

```
<mdb:metadataScope>
  <mdb:MD_MetadataScope>
    <mdb:resourceCode>
      <gcc:MD_ScopeCode codeList="http://w3.energistics.org/energyml/
        files/EIP/v1.1/EIPcodelists19115-3.xml#MD_ScopeCode"
        codeListValue="series">series</gcc:MD_ScopeCode>
    </mdb:resourceCode>
    <mdb:name>
      <gco:CharacterString>digital product series</gco:CharacterString>
    </mdb:name>
  </mdb:MD_MetadataScope>
</mdb:metadataScope>
```

2006 example (ISO 19139):

```
<gmd:hierarchyLevel>
  <gmd:MD_ScopeCode codeList="http://w3.energistics.org/energyml/
    files/EIP/v1.1/EIPcodelists19115-3.xml#MD_ScopeCode"
    codeListValue="series">series</gmd:MD_ScopeCode>
</gmd:hierarchyLevel>
<gmd:hierarchyLevelName>
  <gco:CharacterString>Some hierarchy level name</gco:CharacterString>
</gmd:hierarchyLevelName>
```

4.2.6 Metadata Point of Contact

Definition: The party identified as the contact for information about the resource metadata, and to whom problems with the metadata should be reported.

This element group includes multiple simple elements included in the **CI_Responsibility** class. The EIP mandates that either an individual, organization or position name must be specified for the contact, and either an e-mail address or voice telephone number in the contactInfo. EIP restricts role codes for the metadata contact to {editor, author, pointOfContact}.

4.2.6.1 Content Specifications

UML root path: MD_Metadata.contact¹.CI_Responsibility

¹ **Reference Obligation:** Optional

For detailed normative provisions for the use of **CI_Responsibility**, see Section 4.8.1, **Contact Information**, page 128.

4.2.6.2 XML Implementation

XPath root	MD_Metadata/contact/cit:CI_Responsibility
role	+/cit:role/cit:CI_RoleCode/@codeListValue in {editor, author, pointOfContact}
individualName	+/cit:party/cit:CI_Individual/cit:name/gco:CharacterString
organisationName	+/cit:party/cit:CI_Organisation/name/gco:CharacterString
positionName	+/cit:party/cit:CI_Individual/positionName/gco:CharacterString
voiceTelephone	+/cit:party/cit:CI_Party/cit:contactInfo/cit:CI_Contact/cit:phone/cit:CI_Telephone/number/gco:CharacterString
emailAddress	+/party/CI_Party/cit:contactInfo/cit:CI_Contact/cit:address/cit:CI_Address/cit:electronicMailAddress/gco:CharacterString
2006 specification implementation	
XPath root	MD_Metadata/contact/CI_ResponsibleParty
role	+/role/CI_RoleCode
individualName	+/individualName/CharacterString
organisationName	+/organisationName/CharacterString
positionName	+/positionName/CharacterString
voiceTelephone	+/contactInfo/CI_Contact/phone/CI_Telephone/voice
emailAddress	+/contactInfo/CI_Contact/address/CI_Address/electronicMailAddress
Automation considerations	This element will be a constant for most metadata producers, and can be built into a standard template for that organization or project.

4.2.6.2.1 Implementation Notes

Note that ISO 19115-1 makes a **phone/CI_Telephone** element mandatory in **CI_Contact**. If no phone number is available, this will have to be encoded with a nil value to make metadata instance document schema valid.

4.2.6.2.2 Examples

```
<mdb:contact>
  <cit:CI_Responsibility>
    <cit:role>
      <cit:CI_RoleCode codeList= "http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#CI_RoleCode"
        codeListValue="pointOfContact">point of contact</cit:CI_RoleCode>
    </cit:role>
    <cit:party>
      <cit:CI_Individual>
        <cit:name>
```

```

    <gco:CharacterString>Joe G. Metadawizard</gco:CharacterString>
  </cit:name>
  <cit:contactInfo>
    <cit:CI_Contact>
      <cit:phone>
        <cit:CI_Telephone>
          <cit:number>
            <gco:CharacterString>520-770-3500</gco:CharacterString>
          </cit:number>
        </cit:CI_Telephone>
      </cit:phone>
      <cit:address>
        <cit:CI_Address>
          <cit:electronicMailAddress>
            <gco:CharacterString>information@azgs.az.gov
            </gco:CharacterString>
          </cit:electronicMailAddress>
        </cit:CI_Address>
      </cit:address>
    </cit:CI_Contact>
  </cit:contactInfo>
  <cit:positionName>
    <gco:CharacterString>GIS Manager</gco:CharacterString>
  </cit:positionName>
</cit:CI_Individual>
</cit:party>
</cit:CI_Responsibility>
<mdb:contact>

```

If no telephone number is available for the contact information:

```

  <cit:CI_Contact>
    <cit:phone nilreason="missing" nil="true"/>
    <cit:address>
<!-- address information here, MUST include e-mail if telephone number is missing -->
    </cit:address>
  </cit:CI_Contact>

```

Organization contact, with telephone number and type, and individual at organization:

```

<mdb:contact>
  <cit:CI_Responsibility>
    <cit:role>
      <cit:CI_RoleCode codeList= "http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#CI_RoleCode"
        codeListValue="pointOfContact">pointOfContact</cit:CI_RoleCode>
    </cit:role>
  <cit:party>
    <cit:CI_Organisation>
      <cit:name>
        <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
      </cit:name>
      <cit:contactInfo>
        <cit:CI_Contact>
          <cit:phone>
            <cit:CI_Telephone>
              <cit:number>

```

```

        <gco:CharacterString>520-777-3333</gco:CharacterString>
    </cit:number>
    <cit:numberType>
    <cit:CI_TelephoneTypeCode codeList= "http://standards.iso.org/iso/19115/re-
        sources/Codelist/cat/codelists.xml#CI_TelephoneTypeCode" codeList-
        Value="voice">voice</cit:CI_TelephoneTypeCode>
    </cit:numberType>
    </cit:CI_Telephone>
    </cit:phone>
    </cit:CI_Contact>
</cit:contactInfo>
<cit:individual>
    <cit:CI_Individual>
        <cit:positionName>
            <gco:CharacterString>Metadata Manager</gco:CharacterString>
        </cit:positionName>
    </cit:CI_Individual>
</cit:individual>
</cit:CI_Organisation>
</cit:party>

```

2006 example (ISO 19139):

```

<gmd:CI_ResponsibleParty>
    <gmd:role>
        <gmd:CI_RoleCode codeList= "http://standards.iso.org/iso/19115/resources/Codelist/cat/codel-
            ists.xml#CI_RoleCode"
            codeListValue="pointOfContact">point of contact</gmd:CI_RoleCode>
    </gmd:role>
    <gmd:positionName>
        <gco:CharacterString>Arizona Geological Survey GIS Manager</gco:CharacterString>
    </gmd:positionName>
    <gmd:contactInfo>
        <gmd:CI_Contact>
            <gmd:address>
                <gmd:CI_Address>
                    <gmd:electronicMailAddress>
                        <gco:CharacterString>information@azgs.az.gov</gco:CharacterString>
                    </gmd:electronicMailAddress>
                </gmd:CI_Address>
            </gmd:address>
        </gmd:CI_Contact>
    </gmd:contactInfo>
</gmd:CI_ResponsibleParty>

```

4.2.7 Metadata Create Date

Definition: The date on which the metadata was created.

4.2.7.1 Content Specifications

UML root path: MD_Metadata.dateInfo¹.CI_Date

¹ **Reference Obligation:** Mandatory (raised from Optional in ISO 19115-1)

Line	Name	Obligation	Cardinality	Datatype	Domain
403	date	Mandatory,not nilable	1	DateTime	ISO 8601 DateTime
404	dateType	Mandatory,not nilable	1	CodeList	CI_DateTypeCode = "creation"

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.2.7.1.1 Normative Notes

There is no difference between the EIP profile specification and that of ISO 19115-1, at least one **dateInfo/CI_Date/date/DateTime** element MUST be present with date type code = 'creation'. Additional dates may be reported, but they must have different date type codes. To foster interoperability EIP metadata MUST use the **gco:DateTime** element for all date elements i.e. 'YYYY-MM-DDTHH:MM:SS'; this restricts the base XML schema, which also allows the choice to specify dates with a **gco>Date** element.

4.2.7.2 XML Implementation

XPath root	MD_Metadata/dateInfo/cit:CI_Date
date	+/cit:date/gco:DateTime
dateType	+/cit:dateType/cit:CI_DateTypeCode/@codeListValue = "creation"
2006 specification implementation	MD_Metadata/dateStamp/DateTime
Automation considerations	Auto-generate using system timestamp.

4.2.7.2.1 Implementation Notes

Consistent formatting of dates is important to enable reliable date-based search. Since the 2006 version makes no provision for indicating the last update data for the metadata record, to enable harvesters to check for changed records the **dateStamp** element should be used to indicate data of most recent update.

4.2.7.2.2 Examples

```
<cit:CI_Date>
  <cit:date>
    <cit:dateTime>
      <gco:DateTime>2009-11-17T10:00:00</gco:DateTime>
    </cit:dateTime>
  </cit:date>
  <cit:dateType>
    <cit:CI_DateTypeCode codeList= "http://w3.energistics.org/energym/pro-
      files/EIP/v1.1/EIPcodelists19115-3.xml#CI_DateTypeCode"
      codeListValue="creation">date of metadata record creation</cit:CI_DateTypeCode>
  </cit:dateType>
</cit:CI_Date>
```

2006 example (ISO 19139):

For EIP purposes, this will be assumed to be the revision date.

```
<gmd: dateStamp>
  <gco:DateTime>2009-11-17T10:00:00</gco:DateTime>
</gmd: dateStamp >
```

4.2.8 Metadata Update Date

Definition: Date of most recent update of the metadata record

The most recent update date MUST be reported using an **MD_Metadata/dateInfo** element with date type code= 'revision', even if it is the same as the metadata create date (see Section 4.2.7, [Metadata Create Date](#), page 47).

date: Date of most recent revision of this record, encoded using ISO8601 (yyyy-mm-ddThh:mm).

dateType: Codelist value to specify what event occurred on the date provided. For a metadata update date, the value MUST be 'revision'.

4.2.8.1 Content Specifications

UML root path: MD_Metadata.dateInfo¹.CI_Date

¹ **Reference Obligation:** Mandatory (raised from Optional in ISO 19115-1)

Line	Name	Obligation	Cardinality	Datatype	Domain
394	date	Mandatory, not nilable	1	DateTime	ISO 8601 DateTime
395	dateType	Mandatory, not nilable	1	CodeList	CI_DateTypeCode="revision"

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.2.8.1.1 Normative Notes

To enable efficient harvesting of records, the update date is required. EIP restricts the date type for metadata update to a single codelist value 'revision'. To foster interoperability EIP metadata MUST use the **gco:DateTime** element for all date elements; this restricts the base XML schema, which also allows the choice to specify dates with a **gco>Date** element.

4.2.8.2 XML Implementation

XPath root	MD_Metadata/dateInfo/cit:CI_Date
date	+/cit:date/gco:DateTime
dateType	+/cit:dateType/cit:CI_DateTypeCode/@codeListValue="revision"
2006 specification implementation	Because the 2006 specification contains no provision for recording the date of most recent update, the dateStamp element should contain the update date.
Automation considerations	Automatically populated using system clock by metadata edit tool.

4.2.8.2.1 Implementation Notes

ISO 19115:2003/Cor.1:2006 makes no provision for indicating the last update data for the metadata record, so to enable harvesters to check for changed records, the **MD_Metadata/dateStamp** element must be used to indicate data of most recent update. For metadata using ISO 19115:2003/Cor.1:2006, EIP practice is to place the revision date in the **MD_Metadata/dateStamp** element.

4.2.8.2.2 Examples

```
<mdb:dateInfo>
  <cit:CI_Date>
    <cit:date>
      <gco:DateTime>2011-01-02T12:00:00</gco:DateTime>
    </cit:date>
    <cit:dateType>
      <cit:CI_DateTypeCode codeList= "http://w3.energistics.org/energym/prop-
files/EIP/v1.1/EIPcodelists19115-3.xml#CI_DateTypeCode" codeListValue="revi-
sion">date of metadata record revision</cit:CI_DateTypeCode>
    </cit:dateType>
  </cit:CI_Date>
```


`</mdb:dateInfo>`

2006 example (ISO 19139):

`<gmd: dateStamp>`

`<gco:DateTime>2009-11-17T10:00:00</gco:DateTime>`

`</gmd: dateStamp >`

4.2.9 Metadata Standard

Definition: Specification of the standard and profile to which the metadata document conforms.

metadataStandard: a human readable text string identifying this profile may be included in the citation for the metadata standard.

metadataProfile: an http URI identifying this profile MUST be included in the citation for the metadata standard.

4.2.9.1 Content Specifications

UML root path: MD_Metadata.

¹ **Reference Obligation:** Mandatory (raised from Optional in ISO 19115-1)

Line	Name	Obligation	Cardinality	Datatype	Domain
21	<u>metadataStandard</u>	Optional	0..N	xlink:href	CI_Citation
22	<u>metadataProfile</u> ¹	Mandatory, not nilable	N ²	xlink:href	http://w3.energistics.org/energyml/profiles/EIP/v1.1/metadataStandard_citation.xml

² Only one instance of metadataProfile conforming to EIP specifications must be documented.

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.2.9.1.1 Normative Notes

Metadata instance documents conforming to this profile MUST declare their conformance with this profile with an **MD_Metadata/metadataProfile/@xlink:href** element whose value is the URL "http://w3.energistics.org/energyml/profiles/EIP/v1.1/metadataStandard_citation.xml".

Metadata instance documents conforming to this profile may declare their conformance with the ISO19115-3 xml implementation of ISO19115-1 with a citation to ISO19115-3 in an **MD_Metadata/metadataStandard/CI_Citation** element. See the example in section 4.2.9.2.2 (below) for recommended encoding of this citation.

Other **metadataStandard** and **metadataProfile** elements may be present to enable interoperability with other profiles if these are compatible with the EIP.

4.2.9.2 XML Implementation

XPath root	MD_Metadata/metadataStandard
CI_Citation	@xlink:href="http://w3.energistics.org/energyml/profiles/EIP/v1.1/metadataStandard_citation.xml"
2006 specification implementation	metadataStandardName="Energy Industry Profile of ISO 19115-1:2014 v1.1 (ISO 19139:2006 encoding)" metadataStandardVersion="20160701"
Automation considerations	This element should be populated automatically by any metadata creation tool with the fixed values as indicated.

4.2.9.2.1 Implementation Notes

The EIP mandates that the **metadataStandard** element include an xlink:href attribute with the value "w3.energistics.org/energyml/profiles/EIP/v1.1/metadataStandard_citation.xml" for use by client applications parsing the metadata to determine what profile it uses. This URL will dereference to produce a CI_Citation element with a citation to this specification. A full **CI_Citation** element MAY be included inline, in which case the **Title**, **Date** and **dateType** = 'publication' are mandatory.

4.2.9.2.2 Examples

<mdb:metadataStandard>

```

<!-- specification of ISO/TS 19115-3 as the metadata standard is recommended practice for EIP metadata-->
  <cit:CI_Citation>
    <cit:title>
      <gco:CharacterString>ISO/TS 19115-3 Geographic information — Metadata — XML
schema implementation for fundamental concepts</gco:CharacterString>
    </cit:title>
  </cit:CI_Citation>
</mdb:metadataStandard>
<mdb:metadataProfile xlink:href= "http://w3.energistics.org/energymml/pro-
files/EIP/v1.1/metadataStandard_citation.xml">
  <!-- inclusion of the citation element is optional for EIP metadata -->
  <cit:CI_Citation>
    <cit:title>
      <gco:CharacterString>
Energy Industry Profile of ISO 19115-1:2014, v1.1
    </gco:CharacterString>
  </cit:title>
  <cit:date>
    <cit:CI_Date>
      <cit:date>
        <gco:DateTime>2016-07-01T00:00:00</gco:DateTime>
      </cit:date>
      <cit:dateType>
        <cit:CI_DateTypeCode codeList= " http://w3.energistics.org/energymml/pro-
files/EIP/v1.1/EIPcodelists19115-3.xml#CI_DateTypeCode" codeListValue="publication">publica-
tion</cit:CI_DateTypeCode>
      </cit:dateType>
    </cit:CI_Date>
  </cit:date>
</cit:CI_Citation>
</mdb:metadataProfile>

```

2006 example (ISO 19139):

```

<gmd:metadataStandardName>
  <gco:CharacterString>
Energy Industry Profile of ISO 19115-1:2014 v1.1 (ISO 19139:2006 encoding)
  </gco:CharacterString>
</gmd:metadataStandardName>
<gmd:metadataStandardVersion>
  <gco:CharacterString>20160701</gco:CharacterString>
</gmd:metadataStandardVersion>

```

4.3 Resource Class-independent Information

From: **MD_Identification** class (ISO 19115-1, B.2.3.1)

This section includes elements that identify and describe the resource documented by the metadata, and which are applicable regardless of the class of resource being documented.

4.3.1 Resource Citation Title

Definition: The title or name used to label the described resource.

The resource citation provides information specifying the intellectual origin of the content of the described resource. The content of this element should be used when referencing the information contained in the resource. The citation is implemented by the compound **CI_Citation** class, which is used in a variety of contexts.

4.3.1.1 Content Specifications

UML root path: MD_Metadata.identificationInfo.MD_Identification.citation.CI_Citation

¹ **Reference Obligation:** Mandatory (*unchanged from ISO 19115-1*)

Line	Name	Obligation	Cardinality	Datatype	Domain
362	<u>title</u> ¹	Mandatory, not nilable	1	CharacterString	Free text

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.3.1.1.1 Normative Notes

A meaningful title **MUST** be present.

4.3.1.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/*Identification/citation/cit:CI_Citation/cit:title/gco:CharacterString
2006 specification implementation	MD_Metadata/identificationInfo/*Identification/citation/CI_Citation/title/gco:CharacterString
Automation considerations	If resource does not have an easily extracted natural title, generate one based on resource type. If titles are not natural for the resource type, then, for example, for files, use file name; for structured database records, use harvesting app-specified string concatenated with appropriate unique content from database object (e.g., natural names or labels).

4.3.1.2.1 Implementation Notes

This title will be used by humans to identify a resource in tabular presentations of search results. It should contain enough information to uniquely identify the resource to a person reading the title.

4.3.1.2.2 Examples

```
<mri:citation>
  <cit:CI_Citation>
    <cit:title>
      <gco:CharacterString>The title of my favorite resource</gco:CharacterString>
    </cit:title>
    .. other elements...
  </cit:CI_Citation>
</mri:citation>
```

2006 example (ISO 19139):

```
<gmd:CI_Citation>
  <gmd:title>
    <gco:CharacterString>The title of my favorite resource</gco:CharacterString>
```

```
</gmd:title>  
.. other elements...  
</gmd:CI_Citation>
```

4.3.2 Resource Citation Date

Definition: Reference date for the cited resource.

Typically this is the date (or date and time) on which the resource originated, but different conventions will be used for different resources. The `dateType` element indicates the event associated with the date provided.

4.3.2.1 Content Specifications

UML root path: MD_Metadata.identificationInfo.MD_Identification.citation.CI_Citation.date¹.CI_Date

¹ **Reference Obligation:** Mandatory (raised from Optional in ISO 19115-1)

Line	Name	Obligation	Cardinality	Datatype	Domain
403	date	Mandatory, nilable	N	DateTime	ISO 8601 DateTime
404	dateType	Mandatory, nilable	N	CodeList	CI_DateTypeCode

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.3.2.1.1 Normative Notes

EIP metadata records **MUST** provide a resource citation date. If no date is available, or a citation date is inapplicable for the described resource, a nil value **MAY** be provided. To foster interoperability, EIP metadata **MUST** use the `gco:DateTime` element for all date elements, i.e., 'YYYY-MM-DDTHH:MM:SS'; this usage restricts the base XML schema, which also allows the choice to specify dates with a `gco>Date` element.

4.3.2.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/*Identification/citation/cit:CI_Citation/cit:date/cit:CI_Date
date	+/cit:date/gco:DateTime
dateType	+/cit:dateType/cit:CI_DateTypeCode
2006 specification implementation	Same (in gmd namespace)
Automation considerations	

4.3.2.2.1 Implementation Notes

None.

4.3.2.2.2 Examples

```
<cit:date>
  <cit:CI_Date>
    <cit:date>
      <gco:DateTime>2012-01-20T12:00:00Z</gco:DateTime>
    </cit:date>
    <cit:dateType>
      <cit:CI_DateTypeCode codeList= "http://w3.energistics.org/energym/profiles/EIP/v1.1/EIPcodelists19115-3.xml#CI_DateTypeCode" codeListValue="publication">publica-
tion</cit:CI_DateTypeCode>
    </cit:dateType>
  </cit:CI_Date>
</cit:date>
```

Example nil value encoding; valid nilReason values include 'missing', 'inapplicable', and 'unknown'.

```
<cit:date gco:nilReason="inapplicable"/>
```

2006 example (ISO 19139):

```
<gmd:date>
  <gmd:CI_Date>
    <gmd:date>
      <gco:DateTime>2001-12-17T09:30:47</gco:DateTime>
    </gmd:date>
    <gmd:dateType>
      <gmd:CI_DateTypeCode codeList= "http://w3.energistics.org/energym/prop-
        files/EIP/v1.1/EIPcodelists19115-3.xml#CI_DateTypeCode"
        codeListValue="publication">publication</gmd:CI_DateTypeCode>
    </gmd:dateType>
  </gmd:CI_Date>
</gmd:date>
```

4.3.3 Resource Identifier

Definition: A unique identifier string for the described resource.

The domain is Uniform Resource Identifier (URI), which implies a string with syntax conforming to that specified in IETF Request for Comment RFC-3986 (<http://www.ietf.org/rfc/rfc3986.txt>).

4.3.3.1 Content Specifications

UML root path:

MD_Metadata.identificationInfo.MD_Identification.citation.CI_Citation.identifier¹.MD_Identifier

¹ **Reference Obligation:** Mandatory (raised from Optional in ISO 19115-1)

Line	Name	Obligation	Cardinality	Datatype	Domain
433	code	Mandatory, not nilable	1	CharacterString	URI ²

² EIP restricts text to URI syntax, per IETF RFC 1738 and IETF RFC 3986.

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.3.3.1.1 Normative Notes

EIP metadata MUST include an identifier that uniquely identifies the described resource. This element is considered critical for consistent, unambiguous identification of resources of all classes. URI syntax should follow that specified in IETF Request for Comment RFC-3986 (<http://www.ietf.org/rfc/rfc3986.txt>). Recommended practice is to use http URIs that will dereference on the Web to produce one or more useful representations of the described resource determined by content negotiation (see <http://www.ietf.org/rfc/rfc2616.txt>). For physical resources (like samples or instruments), possible electronic representations include XML document summarizing properties of the resource or images showing the resource. If no identifier is available, a nilReason may be provided.

4.3.3.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/*Identification/citation/cit:CI_Citation/cit:identifier/mcc:MD_Identifier/mcc:code
2006 specification implementation	MD_Metadata/dataSetURI/CharacterString
Automation considerations	Auto generate from file names or database primary keys, with prefix for host repository.

4.3.3.2.1 Implementation Notes

None.

4.3.3.2.2 Examples

```
<cit:CI_Citation>
  ...other elements...
  <cit:identifier>
    <mcc:MD_Identifier>
      <mcc:code>
        <gco:CharacterString>http://resources.azgs.az.gov/uri-gin/borehole/3627278
        </gco:CharacterString>
      </mcc:code>
    </mcc:MD_Identifier>
  </cit:identifier>
  ...other elements
</cit:CI_Citation>
```

2006 example (ISO 19139):

```
<gmd:datasetURI>
```



```
<gco:CharacterString>http://resources.azgs.az.gov/uri-gin/borehole/3627278  
</gco:CharacterString>  
</gmd:datasetURI>
```

4.3.4 Cited Responsible Party (Resource author)

Definition: The party responsible for creating the resource content, typically identified as the author.

This element includes multiple sub-elements implemented by the **CI_Responsibility** class. The EIP mandates that either an individual, organization, or position name must be specified for the contact, and either an e-mail address or voice telephone number in the contactInfo.

4.3.4.1 Content Specifications

UML root path: MD_Metadata.identificationInfo.MD_Identification.citation.CI_Citation._citedResponsibleParty¹.CI_Responsibility

¹ **Reference Obligation:** Mandatory² (raised from Optional in ISO 19115-1)

² Element is nilable.

For detailed provisions for the use of **CI_Responsibility**, see Section 4.8.1, **Contact Information**, page 128.

4.3.4.1.1 Normative notes

The cited responsible party or a nilReason MUST be present in EIP metadata. A nilReason may be provided if a responsible party for the intellectual content is unknown or not applicable.

4.3.4.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/*Identification/citation/cit:CI_Citation/ cit:citedResponsibleParty/ cit:CI_Responsibility
role	+/ cit:role/ cit:CI_RoleCode
individualName	+/ cit:party/ cit:CI_Individual/name/gco:CharacterString
organisationName	+/ cit:party/ cit:CI_Organizaation/name/ gco:CharacterString
positionName	+/ cit:party/ cit:CI_Individual/positionName/ gco:CharacterString
voiceTelephone	+/ cit:party/ cit:CI_Party/ cit:contactInfo/ cit:CI_Contact/ cit:phone/ cit:CI_Telephone/ cit:voice/ gco:CharacterString
emailAddress	+/ cit:party/ cit:CI_Party/ cit:contactInfo/ cit:CI_Contact/address/ cit:CI_Address/ cit:electronicMailAddress/ gco:CharacterString
2006 specification implementation	
XPath root	MD_Metadata/identificationInfo/*Identification/citation/CI_Citation/citedResponsibleParty/CI_Responsibility
role	+/role/CI_RoleCode
individualName	+/individualName/ gco:CharacterString
organisationName	+/organisationName/ gco:CharacterString
positionName	+/positionName/ gco:CharacterString
voiceTelephone	+/contactInfo/CI_Contact/phone/CI_Telephone/voice
emailAddress	+/contactInfo/CI_Contact/address/CI_Address/electronicMailAddress
Automation considerations	This element will be a constant for most metadata producers, and can be built into a standard template for that organization or project.

4.3.4.2.1 Implementation Notes

If no contact information is available for the author/originator, for example if the author is no longer living, the contact information may be specified with a nilReason. Note that the resource point of contact MUST be present in EIP metadata (see Section 4.3.7, **Resource Point of Contact**, page 63) to indicate the current steward of the resource.

4.3.4.2.2 Examples

This is a relatively simple example with one individual indicated as the author. The individual is affiliated with an organization (Arizona Geological Survey). Both a telephone number an e-mail address are provided, but only one of these is mandatory.

```

<cit:CI_Responsibility>
  <cit:role>
    <cit:CI_RoleCode
codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#CI_RoleCode"
codeListValue="author">author</cit:CI_RoleCode>
  </cit:role>
  <cit:party>
    <cit:CI_Organisation>
      <cit:name>
        <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
      </cit:name>
      <cit:contactInfo>
        <cit:CI_Contact>
          <cit:phone>
            <cit:CI_Telephone>
              <cit:number>
                <gco:CharacterString>520-770-3500</gco:CharacterString>
              </cit:number>
            </cit:CI_Telephone>
          </cit:phone>
          <cit:address>
            <cit:CI_Address>
              <cit:electronicMailAddress>
                <gco:CharacterString>jgeologist@azgs.az.gov</gco:CharacterString>
              </cit:electronicMailAddress>
            </cit:CI_Address>
          </cit:address>
        </cit:CI_Contact>
      </cit:contactInfo>
      <cit:individual>
        <cit:CI_Individual>
          <cit:name>
            <gco:CharacterString>Joe Geologist</gco:CharacterString>
          </cit:name>
        </cit:CI_Individual>
      </cit:individual>
    </cit:CI_Organisation>
  </cit:party>
</cit:CI_Responsibility>

```

Example of an individual author who has passed away, so there is no contact information.

```

<cit:citedResponsibleParty>
  <cit:CI_Responsibility>
    <cit:role>
      <cit:CI_RoleCode codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#CI_RoleCode" codeListValue="originator">originator</cit:CI_RoleCode>
    </cit:role>
    <cit:party>
      <cit:CI_Individual>
        <cit:name>
          <gco:CharacterString>James Gilluly</gco:CharacterString>
        </cit:name>
        <cit:contactInfo gco:nilReason="inapplicable">
        </cit:CI_Individual>
      </cit:CI_Individual>
    </cit:party>
  </cit:CI_Responsibility>

```

```

</cit:party>
</cit:CI_Responsibility>
</cit:citedResponsibleParty>

```

2006 example (ISO 19139):

```

<gmd: citedResponsibleParty>
  <gmd:CI_Responsibility>
    <gmd:role>
      <gmd:CI_RoleCode codeList="http://standards.iso.org/iso/19115/resources/CodeList/cat/codelists.xml#CI_RoleCode"
        codeListValue="author">author</gmd:CI_RoleCode>
    </gmd:role>
    <gmd:PositionName>
      <gco:CharacterString>Chief Geologist</gco:CharacterString>
    </gmd:PositionName>
    <gmd:contactInfo>
      <gmd:CI_Contact>
        <gmd:address>
          <gmd:CI_Address>
            <gmd:electronicMailAddress>
              <gco:CharacterString>geologist@azgs.az.gov</gco:CharacterString>
            </gmd:electronicMailAddress>
          </gmd:CI_Address>
        </gmd:address>
      </gmd:CI_Contact>
    </gmd:contactInfo>
  </gmd:CI_Responsibility>
</gmd: citedResponsibleParty>

```

4.3.5 Abstract

Definition: A brief narrative summary of the content, encoding, quality, lineage, and any other useful information about the described resource.

If the resource has a content summary abstract, that may be reproduced here, but additional information describing the format and lineage of the resource should be added. Because most searches are based on free text indexing of text content in the metadata record, any information that is not in other text fields should be included here.

4.3.5.1 Content Specifications

UML root path: MD_Metadata.identificationInfo.MD_Identification

¹**Reference Obligation:** Mandatory (*unchanged from ISO 19115-1*)

Line	Name	Obligation	Cardinality	Datatype	Domain
44	<u>abstract</u> ¹	Mandatory, not nilable	1	CharacterString	Free text

NOTE: Organization of the above table is described in the introduction Section 4.1.1, page 33.

4.3.5.1.1 Normative Notes

An EIP metadata record **MUST** include a meaningful abstract. There is no difference between the above specifications and those of the base standard.

4.3.5.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/*identification/mri:abstract/gco:CharacterString
2006 specification implementation	Same.
Automation considerations	If resource has no abstract that can be easily extracted, if a repository does not have content appropriate for "abstract" available, use same approach as described for "Resource Citation Title" (above, but likely with expanded number of attributes). As last resort, duplicate value assigned to "Title".

4.3.5.2.1 Implementation Notes

None.

4.3.5.2.2 Examples

```
<mri: abstract>
  <gco:CharacterString>Everything you always wanted to know about dataset Q7531 (but were
  afraid ...) </gco:CharacterString>
</mri: abstract>
```

2006 example (ISO 19139):

```
<gmd: abstract>
  <gco:CharacterString>Everything you always wanted to know about dataset Q7531 (but were
  afraid ...) </gco:CharacterString>
</gmd: abstract>
```

4.3.6 Resource Status

Definition: A term specifying the degree of completeness or currentness of the information resource.

4.3.6.1 Content Specifications

UML root path: MD_Metadata.identificationInfo.MD_Identification

¹ **Reference Obligation:** Mandatory (raised from Optional in ISO 19115-1); nilable.

Line	Name	Obligation	Cardinality	Datatype	Domain
47	status ¹	Mandatory, nilable	1 ²	CodeList	MD_ProgressCode

² EIP reduces the cardinality of status from N in ISO 19115-1.

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.3.6.1.1 Normative Notes

An EIP metadata record **MUST** include a status element. A nilReason may be provided if the status is unknown or the property is inapplicable. The EIP restricts progress code values to {completed, obsolete, ongoing, planned, proposed, superseded, underDevelopment} to avoid ambiguity and multiple encodings for the same information.

4.3.6.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/*Identification/mri:status/mri:MD_ProgressCode
2006 specification implementation	Same, but use gmd namespace.
Automation considerations	Default value is 'completed'. This value only need be modified if the resources described by the metadata are undergoing update or new data are being developed that will supersede the described resource.

4.3.6.2.1 Implementation Notes

None.

4.3.6.2.2 Examples

```
<mri:status>
  <mri:MD_ProgressCode codeList= "http://w3.energistics.org/energym/prop-
    files/EIP/v1.1/EIPcodelists19115-
    3.xml#MD_ProgressCode"codeListValue="completed">completed</gmd:MD_ProgressCode>
</mri:status>
```

2006 example (ISO 19139):

```
<gmd:status>
  <gmd:MD_ProgressCode codeList= "http://w3.energistics.org/energym/prop-
    files/EIP/v1.1/EIPcodelists19115-3.xml#MD_ProgressCode"
    codeListValue="completed">completed</gmd:MD_ProgressCode>
</gmd:status>
```

4.3.7 Resource Point of Contact

Definition: The party filling the general -purpose role of contact for information about a described resource, including access to it or problems with it. This element often identifies the current steward for the resource, in which case it would be unusual to have a nilReason provided.

4.3.7.1 Content Specifications

UML root path: MD_Metadata.identificationInfo.MD_Identification.pointOfContact¹.CI_Responsibility

¹ **Reference Obligation:** Mandatory² (raised from Optional in ISO 19115-1)

² Element is nilable.

This element includes multiple sub elements implemented by the **CI_Responsibility** class. For detailed provisions for the use of **CI_Responsibility**, see Section 4.8.1, **Contact Information**, page 128.

4.3.7.1.1 Normative Notes

The EIP mandates that a resource point of contact or a nilReason MUST be present. If the element is not nil, either an individual, organization, or position name MUST be specified for the contact, and either an e-mail address or voice telephone number MUST be present.

4.3.7.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/*Identification/mri:pointOfContact/cit:CI_Responsibility
role	+/cit:role/cit:CI_RoleCode/@codeListValue in {editor, author, pointOfContact}
individualName	+/cit:party/cit:CI_Individual/cit:name/gco:CharacterString
organisation-Name	+/cit:party/cit:CI_Organisation/cit:name/ gco:CharacterString
positionName	+/cit:party/cit:CI_Individual/cit:positionName/ gco:CharacterString
voiceTelephone	+/cit:party/cit:CI_Party/cit:contactInfo/cit:CI_Contact/cit:phone/cit:CI_Telephone/cit:number/gco:CharacterString
emailAddress	+/cit:party/CI_Party/cit:contactInfo/cit:CI_Contact/address/cit:CI_Address/cit:electronicMail-Address/ gco:CharacterString
2006 specification implementation	In the 2006 specification, the role attribute is the last property in the CI_ResponsibleParty element, where as in the 2011 specification, it is the first because it is inherited from the abstract CI_ResponsiblePartyInfo parent class.
XPath root	MD_Metadata/identificationInfo/*Identification/pointOfContact/CI_ResponsibleParty
role	+/role/CI_RoleCode
individualName	+/individualName/gco:CharacterString
organisation-Name	+/organisationName/gco:CharacterString
positionName	+/positionName/gco:CharacterString
voiceTelephone	+/contactInfo/CI_Contact/phone/CI_Telephone/voice
emailAddress	+/contactInfo/CI_Contact/address/CI_Address/electronicMailAddress
Automation considerations	This element will be a constant for many collections of resource, and can be built into a standard template for that organization or project.

4.3.7.2.1 Implementation Notes

Note that the resource point of contact will commonly be the same as the **Citation/citedResponsibleParty/-CI_Responsibility**, and possibly also the distribution point of contact. Duplication of the content here is intended to make it easier to locate resource contact information. In XML implementations, this element could be included one time and referenced by internal document links if it is reused to avoid unnecessary text duplication.

4.3.7.2.2 Examples

Contact information with only an organization name and contact information.

```

<cit:CI_Responsibility>
  <cit:role>
    <cit:CI_RoleCode codeList= "http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#CI_RoleCode"
      codeListValue="pointOfContact">contact for resource</cit:CI_RoleCode>
  </cit:role>
  <cit:party>
    <cit:CI_Organisation>
      <cit:name>
        <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
      </cit:name>
      <cit:contactInfo>
        <cit:CI_Contact>
          <cit:phone>
            <cit:CI_Telephone>
              <cit:number>
                <gco:CharacterString>520-777-3333</gco:CharacterString>
              </cit:number>
            </cit:CI_Telephone>
          </cit:phone>
          <cit:address>
            <cit:CI_Address>
              <cit:electronicMailAddress>
                <gco:CharacterString>information@azgs.az.gov</gco:CharacterString>
              </cit:electronicMailAddress>
            </cit:CI_Address>
          </cit:address>
        </cit:CI_Contact>
      </cit:contactInfo>
    </cit:CI_Organisation>
  </cit:party>
</cit:CI_Responsibility>

```

2006 example (ISO 19139):

```

<gmd: pointOfContact>
  <gmd:CI_ResponsibleParty>
    <gmd:role>
      <gmd:CI_RoleCode codeList= "http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#CI_RoleCode"
        codeListValue="owner">Owner</gmd:CI_RoleCode>
    </gmd:role>
    <gmd:organisationName>
      <gco:CharacterString>Chevron Inc.</gco:CharacterString>
    </gmd:organisationName>
    <gmd:contactInfo>
      <gmd:CI_Contact>
        <gmd:address>
          <gmd:CI_Address>
            <gmd:electronicMailAddress>
              <gco:CharacterString>infoRequest@chevron.com</gco:CharacterString>
            </gmd:electronicMailAddress>
          </gmd:CI_Address>
        </gmd:address>
      </gmd:CI_Contact>
    </gmd:contactInfo>
  </gmd:CI_ResponsibleParty>
</gmd: pointOfContact>

```



```
</gmd:CI_ResponsibleParty>  
</gmd: pointOfContact >
```

4.3.8 Resource Topic Category

Definition: One or more terms from a controlled vocabulary characterizing the main theme(s) that describe the resource content.

4.3.8.1 Content Specifications

UML root path: MD_Metadata.identificationInfo.MD_Identification

¹ **Reference Obligation:** Conditional² (unchanged from ISO 19115-1)

Line	Name	Obligation	Cardinality	Datatype	Domain
52	<u>topicCategory</u> ¹	Conditional ²	N	CodeList	MD_TopicCategoryCode

² Required if metadataScope equals “dataset” or “series.”

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.3.8.1.1 Normative Notes

Note that this element is mandatory in European INSPIRE metadata profile.

4.3.8.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/*Identification/mri:topicCategory/mri:MD_TopicCategoryCode
2006 specification implementation	Same, but all elements are in the gmd: namespace.
Automation considerations	

4.3.8.2.1.1 Implementation Notes

None.

4.3.8.2.1.2 Examples

```
<mri: MD_TopicCategoryCode>
  <mri:MD_TopicCategoryCode>geoscientificInformation</mri:MD_TopicCategoryCode>
</mri: MD_TopicCategoryCode>
```

2006 example (ISO 19139):

```
<gmd: MD_TopicCategoryCode>
  <gmd:MD_TopicCategoryCode>geoscientificInformation</gmd:MD_TopicCategoryCode>
</gmd: MD_TopicCategoryCode>
```

4.3.9 Descriptive Keywords

Definition: Keywords descriptive of the resource content, and information about their type or class membership, including identifying information if the source is a reference vocabulary. Keywords may be grouped according to their type, or membership in an ontology or thesaurus.

keyword: terms descriptive of the resource content, not necessarily found in it.

type: controlled term used to group related keywords according to their thematic membership.

className: vocabulary term used as a label for the concept class to which the keywords belong, either as concept instances or subtypes. This term groups keywords somewhat like **type** (above), but relationships between class concepts are generally more rigorously defined and structured than **type** terms.

conceptIdentifier: URI which uniquely identifies the concept labelled as **className**.

linkage: online reference (URL) which will locate the reference vocabulary..

4.3.9.1 Content Specifications

UML root path: MD_Metadata.identificationInfo.MD_Identification.descriptiveKeywords¹.MD_Keywords

¹ **Reference Obligation:** Optional

Line	Name	Obligation	Cardinality	Datatype	Domain
69	keyword	Mandatory	N	CharacterString	Free text
70	type	Optional	1	CodeList	MD_KeywordTypeCode
74	className	Optional	1	CharacterString	Free text
75	conceptIdentifier	Optional	1	URI	URL
406	linkage	Conditional ²	1	CharacterString	Text restricted to URL (see IETF RFC 3986) ³

² Required if className exists.

³ Per ISO 19115-1.

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.3.9.1.1 Normative Notes

Each **MD_Keywords** entity contains one or more keywords which represent a group that may have assigned to either or both of two distinguishing characteristics: keyword type code, and keyword class. EIP considers EIP encourages the use of keyword class to provide reference information about terms drawn from a vocabulary collection, preferably an authoritative ontology or thesaurus published and maintained in a machine readable form like OWL.

Keyword class information about each group of keywords is provided using the **keywordClass** compound element, which allows assignment to each group of keywords a **className**, or term identifying the class in which the keywords are members, **conceptIdentifier**, which identifies the concept as an abstract resource, and **linkage** URL that will locate the ontology.

It is worth noting that use of **keywordClass** enables the implementation of semantic relationships, in which each collection of keywords grouped by **MD_Keywords** can be regarded as either instances of subtypes of a concept class which has label **className** and is defined by information in the authoritative reference vocabulary/ontology at **linkage**.

4.3.9.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/*Identification/mri:descriptiveKeywords/mri:MD_Keywords
keyword	+/mri:keyword/gco:CharacterString
type	+/mri:type/mri:MD_KeywordTypeCode/@codeListValue
className	+/mri:keywordClass/mri:MD_KeywordClass/mri:className/gco:CharacterString
conceptIdentifier	+/mri:keywordClass/mri:MD_KeywordClass/mri:conceptIdentifier/gco:URI

linkage	+/mri:keywordClass/mri:MD_KeywordClass/mri:ontology/cit:CI_Citation/ cit:onlineResource/cit:CI_OnlineResource/cit:linkage/gco:CharacterString
2006 specification implementation	className, conceptIdentifier, linkage are absent from ISO 19115:2006.
keyword	+/keyword/CharacterString
type	+/type/MD_KeywordTypeCode/@codeListValue
Automation considerations	

4.3.9.2.1 Implementation Notes

Thesaurus name provides a citation to a published reference collection of keywords..

4.3.9.2.2 Examples

Example showing assignment of an `MD_KeywordTypeCode` value to identify the appropriate “type” term (in this case, “place”) for a group of keywords:

```
<mri:descriptiveKeywords>
  <mri:MD_Keywords>
    <mri:keyword>
      <gco:CharacterString>Arizona</gco:CharacterString>
    </mri:keyword>
    <mri:keyword>
      <gco:CharacterString>Mount Lemmon</gco:CharacterString>
    </mri:keyword>
    <mri:type>
      <mri:MD_KeywordTypeCode
codeList= "http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#MD_KeywordTypeCode"
codeListValue="place">place</mri:MD_KeywordTypeCode>
      </mri:type>
    </mri:MD_Keywords>
  </mri:descriptiveKeywords>
```

Example showing use of `MD_KeywordClass` to assign to a keyword the name of the class in which it is a member and the associated concept identifier and reference ontology for that class name:

```
<mri:descriptiveKeywords>
  <mri:MD_Keywords>
    <mri:keyword>
      <gco:CharacterString>Lower Tertiary Trend</gco:CharacterString>
    </mri:keyword>
    <mri:keywordclass>
      <mri:MD_KeywordClass>
        <mri:className>
          <gco:CharacterString>Chronostratigraphic Unit</gco:CharacterString>
        </mri:className>
        <mri:conceptIdentifier>
          <mcc:URI>
urn:cgi:classifier:CGI:GeologicUnitType:200811:chronostratigraphic_unit
          </mcc:URI>
        </mri:conceptIdentifier>
        <mri:ontology>
          <cit:CI_Citation>
            <cit:title>
              <gco:CharacterString>AZGS geologic unit lexicon ontology
            </gco:CharacterString>
          </cit:title>
        </mri:ontology>
      </mri:MD_KeywordClass>
    </mri:keywordclass>
  </mri:MD_Keywords>
</mri:descriptiveKeywords>
```

```

        </cit:title>
        <cit:identifier>
            <mcc:MD_Identifier>
                <mcc:code>
                    <gco:CharacterString>http://resources.geosciml.org/vocabulary/geologicUnitType/201012
                    </gco:CharacterString>
                </mcc:code>
            </mcc:MD_Identifier>
        </cit:identifier>
    </cit:CI_Citation>
</mri:ontology>
</mri:MD_KeywordClass>
</mri:keywordClass>
</mri:MD_Keywords>
</mri:descriptiveKeywords>

```

2006 example (ISO 19139):

```

<gmd:descriptiveKeywords>
    <gmd:MD_Keywords>
        <gmd:keyword>
            <gco:CharacterString>Arizona</gco:CharacterString>
        </gmd:keyword>
        <gmd:keyword>
            <gco:CharacterString>Mount Lemmon</gco:CharacterString>
        </gmd:keyword>
        <gmd:type>
            <gmd:MD_KeywordTypeCode codeList= "http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#MD_KeywordTypeCode"
                codeListValue="place">place</gmd:MD_KeywordTypeCode>
        </gmd:type>
    </gmd:MD_Keywords>
</gmd:descriptiveKeywords>

```

4.3.10 Legal Constraints

Definition: Information indicating any legal restrictions on access or use of a resource.

Because the energy community places great importance on documenting legal constraints on the access and use of resources, the EIP mandates use of this collection of elements, two of which are populated from ISO 19115-1 code list MD_RestrictionCode.

reference: a brief statement providing information about legal constraints beyond, but consistent with, that provide by the term(s) assigned to accessConstraints and useConstraints.

linkage: online reference to additional information about the constraints (e.g., licensing terms).

accessConstraints: a controlled term identifying the type of limitation or warning on accessing the resource.

useConstraints: a controlled term identifying the type of limitation or warning on using the resource.

4.3.10.1 Content Specifications

UML root path:

MD_Metadata.identificationInfo.MD_Identification.resourceConstraints¹.MD_LegalConstraints

¹ **Reference Obligation:** Mandatory (raised from Optional in ISO 19115-1)

Line	Name	Obligation	Cardinality	Datatype	Domain
99	useLimitation	Conditional ³	N	CharacterString	Free text
362	Reference title	Mandatory, nilable	N	CharacterString	Free text
406	linkage	Optional	1	CharacterString	Text restricted to URL (see IETF RFC 3986) ²
106	accessConstraints	Conditional ³	N	CodeList	MD_RestrictionCode
107	useConstraints	Conditional ³	N	CodeList	MD_RestrictionCode

² Per ISO 19115-1.

³ Count (useLimitation + accessConstraints + useConstraints) > 0.

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.3.10.1.1 Normative Notes

Either a restriction code under accessConstraints or useConstraints, or a useLimitation statement is required.

4.3.10.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/*identification/mri:resourceConstraints/mco:MD_LegalConstraints
useLimitation	+/mco:useLimitation/gco:CharacterString
reference	+/cit:Citation/cit:title/gco:CharacterString
linkage	+/cit:Citation/cit:onlineResource/cit:CitationOnlineResource/cit:linkage/gco:CharacterString
accessConstraints	+ /mco:accessConstraints/mco:MD_RestrictionCode
useConstraints	+ /mco:useConstraints/mco:MD_RestrictionCode
2006 specification implementation	Same.
Automation considerations	Default to 'unrestricted' or 'unclassified' for most cases.

4.3.10.2.1 Implementation Notes

ISO recommends use of reference for providing additional documentation about the constraints, such as a copyright statement or license reference (e.g., GNU, Creative Commons)..

4.3.10.2.2 Examples

Unrestricted access:

```
<mri:resourceConstraints>
  <mco:MD_LegalConstraints>
    <mco:reference gco:nilReason="inapplicable"/>
    <mco:accessConstraints>
      <mco:MD_RestrictionCode codelist="http://w3.energistics.org/energyml/profiles/EIP/
        v1.1/EIPcodelists19115-3.xml#MD_RestrictionCode"
        codeListValue="unrestricted">Unrestricted access</mco:MD_RestrictionCode>
    <mco:accessConstraints>
    <mco:useConstraints>
      <mco:MD_RestrictionCode codelist="http://w3.energistics.org/energyml/profiles/EIP/
        v1.1/EIPcodelists19115-3.xml#MD_RestrictionCode"
        codeListValue="unrestricted">Unrestricted access</mco:MD_RestrictionCode>
    </mco:useConstraints>
  </mco:MD_LegalConstraints >
</mri:resourceConstraints>
```

License:

```
<mri:resourceConstraints>
  <mco:MD_LegalConstraints>
    <mco:useLimitation>
      <gco:CharacterString>You are free to:
        Share — copy and redistribute the material in any medium or format
        Adapt — remix, transform, and build upon the material
        for any purpose, even commercially.
        The licensor cannot revoke these freedoms as long as you follow the license terms.
        Under the following terms:
        Attribution — You must give appropriate credit, provide a link to the license, and
        indicate if changes were made. You may do so in any reasonable manner, but not in any way that sug-
        gests the licensor endorses you or your use.
        No additional restrictions — You may not apply legal terms or technological
        measures that legally restrict others from doing anything the license permits.
        Notices:
        You do not have to comply with the license for elements of the material in the pub-
        lic domain or where your use is permitted by an applicable exception or limitation.
        No warranties are given. The license may not give you all of the permissions nec-
        essary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit
        how you use the material.</gco:CharacterString>
    </mco:useLimitation>
    <mco:reference>
      <cit:CI_Citation>
        <cit:title>
          <gco:CharacterString>Creative Commons Attribution 4.0 International (CC BY
4.0)</gco:CharacterString>
        </cit:title>
        <cit:onlineResource>
          <cit:CI_OnlineResource>
            <cit:linkage>
              <gco:CharacterString>https://creativecommons.org/li-
censes/by/4.0/</gco:CharacterString>
            </cit:linkage>
          </cit:CI_OnlineResource>
        </cit:onlineResource>
      </cit:CI_Citation>
```

```
</mco:reference>  
</mco:MD_LegalConstraints>  
</mri:resourceConstraints>
```

2006 example (ISO 19139):

```
<gmd:resourceConstraints>  
  <gmd:MD_LegalConstraints>  
    <gmd:accessConstraints>  
      <gmd:MD_RestrictionCode codelist="http://w3.energistics.org/energyml/profiles/EIP/  
v1.1/EIPcodelists19115-3.xml#MD_RestrictionCode"  
codeListValue="unrestricted">Unrestricted access</gmd:MD_RestrictionCode>  
    </gmd:accessConstraints>  
    <gmd:useConstraints>  
      <gmd:MD_RestrictionCode codelist="http://w3.energistics.org/energyml/profiles/EIP/  
v1.1/EIPcodelists19115-3.xml#MD_RestrictionCode"  
codeListValue="unrestricted">Unrestricted access</gmd:MD_RestrictionCode>  
    </gmd:useConstraints>  
  </gmd:MD_LegalConstraints >  
</gmd:resourceConstraints>
```


4.3.11 Security Constraints

Definition: Information indicating security restrictions on access or use of a resource.

reference: a brief statement providing information about legal constraints beyond, but consistent with, that provide by the term(s) assigned to accessConstraints and useConstraints.

linkage: online reference to additional information about the constraints (e.g., licensing terms).

classification: a controlled term for the security or handling restrictions on the resource.

classificationSystem: the name of the security classification system used.

4.3.11.1 Content Specifications

UML root path: MD_Metadata.identificationInfo.MD_Identification.resourceConstraints¹

¹ **Reference Obligation:** Optional

Line	Name	Obligation	Cardinality	Datatype	Domain
362	reference	Mandatory, nilable	1	CharacterString	Free text
406	linkage	Optional	1	CharacterString	Text restricted to URL (see IETF RFC 3986) ²
110	classification	Mandatory, not nilable	1	CodeList	MD_ClassificationCode
112	classificationSystem	Optional	1	CharacterString	Free text

² Per ISO 19115-1.

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.3.11.1.1 Normative Notes

None.

4.3.11.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/*identification/mri:resourceConstraints/mco:MD_SecurityConstraints
reference	+/cit:CI_Citation/cit:title/gco:CharacterString
linkage	+/cit:CI_Citation/cit:onlineResource/cit:CI_OnlineResource/cit:linkage/gco:CharacterString
classification	+/mco:classification/mco:MD_ClassificationCode
classificationSystem	+/mco:classificationSystem/gco:CharacterString
2006 specification implementation	Same.
Automation considerations	Default to 'unrestricted' or 'unclassified' for most cases.

4.3.11.2.1 Implementation Notes

None.

4.3.11.2.2 Examples

```
<mri:resourceConstraints>
  <mco:MD_SecurityConstraints>
    <mco:classification>
      <mco:MD_ClassificationCode
        codelist= "http://standards.iso.org/iso/19115/resources/Codelist/cat/codellists.xml#MD_ClassificationCode"
        codeListValue="unclassified">unclassified</md:MD_ClassificationCode>
      </mco:classification>
    </mco:MD_SecurityConstraints >
```

```
</mri:resourceConstraints>
```

2006 example (ISO 19139):

```
<gmd:resourceConstraints>
  <gmd:MD_SecurityConstraints>
    <gmd:classification>
      <gmd:MD_ClassificationCode
        codelist= "http://standards.iso.org/iso/19115/resources/Codelist/cat/codel-
          ists.xml#MD_ClassificationCode"
        codeListValue="unclassified">unclassified</md:MD_ClassificationCode>
      <gmd:classification>
        <gmd: MD_SecurityConstraints >
      </gmd:resourceConstraints>
```

4.3.12 Resource Distributor Contact

Definition: The party responsible for distributing the described resource. This party also often may be contacted for questions or problems related to access to the resource.

The EIP mandates that information describing how to access or obtain a resource is included in the distributionInfo section of the metadata record. For any resource, this section will include contact information specifying how to contact the party responsible for distribution of a resource. In some cases, the distribution contact may be the same as the resource contact but this will not in general be true. This element includes multiple sub-elements implemented by the **CI_Responsibility** class.

4.3.12.1 Content Specifications

UML root path: MD_Metadata.distributionInfo.MD_Distribution.distributor.MD_Distributor._distributorContact¹.CI_Responsibility

¹ **Reference Obligation:** Mandatory² (raised from Optional in ISO 19115-1)

² Element is nilable.

For details of the content specifications, see Section 4.8.1, [Contact Information](#), page 128.

4.3.12.1.1 Normative Notes

The EIP mandates that either an individual, organization, or position name **MUST** be specified for the contact, and either an e-mail address or voice telephone number **MUST** be specified in the **contactInfo**.

4.3.12.2 XML Implementation

XPath root	MD_Metadata/distributionInfo/mrd:MD_Distribution/mrd:distributor/mrd:MD_Distributor/mrd:distributorContact/cit:CI_Responsibility
role	+/cit:role/cit:CI_RoleCode/@codeListValue in {editor, author, pointOfContact}
individualName	+/cit:party/cit:CI_Individual/cit:name/gco:CharacterString
organisationName	+/cit:party/cit:CI_Organisation/cit:name/gco:CharacterString
positionName	+/cit:party/cit:CI_Individual/cit:positionName/gco:CharacterString
voiceTelephone	+/cit:party/cit:CI_Party/cit:contactInfo/cit:CI_Contact/cit:phone/cit:CI_Telephone/cit:number/gco:CharacterString
emailAddress	+/cit:party/cit:CI_Party/cit:contactInfo/cit:CI_Contact/cit:address/cit:CI_Address/cit:electronicMailAddress/gco:CharacterString
2006 specification implementation	In the 2006 specification, the role attribute is the last property in the CI_ResponsibleParty element, where as in the 2011 specification, it is the first because it is inherited from the abstract CI_ResponsiblePartyInfo parent class.
XPath root	MD_Metadata/distributionInfo/MD_Distribution/distributor/MD_Distributor/-distributorContact/CI_ResponsibleParty
role	+/role/CI_RoleCode
individualName	+/individualName/gco:CharacterString
organisationName	+/organisationName/gco:CharacterString
positionName	+/positionName/gco:CharacterString
voiceTelephone	+/contactInfo/CI_Contact/phone/CI_Telephone/voice
emailAddress	+/contactInfo/CI_Contact/address/CI_Address/electronicMailAddress
Automation considerations	This element will be a constant for most metadata producers, and can be built into a standard template for that organization or project.

4.3.12.2.1 Implementation Notes

None.

4.3.12.2.2 Examples

```
<mrd:MD_Distributor>
  <mrd:distributorContact>
    <cit:CI_Responsibility>
```

```

<cit:role>
  <cit:CI_RoleCode codeList="http://standards.iso.org/iso/19115/resources/Codel-
    ist/cat/codelists.xml#CI_RoleCode" codeListValue="pointOfContact">contact for
    resource distribution
  </cit:CI_RoleCode>
</cit:role>
<cit:party>
  <cit:CI_Individual>
    <cit:name>
      <gco:CharacterString>Arizona Geological Survey WebMaster
    </gco:CharacterString>
    </cit:name>
    <cit:contactInfo>
      <cit:CI_Contact>
        <cit:phone>
          <cit:CI_Telephone>
            <cit:number>
              <gco:CharacterString>520-770-3500
            </gco:CharacterString>
            </cit:number>
          </cit:CI_Telephone>
        </cit:phone>
        <cit:address>
          <cit:CI_Address>
            <cit:electronicMailAddress>
              <gco:CharacterString>
                webServices@azgs.az.gov</gco:CharacterString>
            </cit:electronicMailAddress>
          </cit:CI_Address>
        </cit:address>
      </cit:CI_Contact>
    </cit:contactInfo>
    <cit:positionName>
      <gco:CharacterString>webmaster</gco:CharacterString>
    </cit:positionName>
  </cit:CI_Individual>
</cit:party>
</cit:CI_Responsibility>
</mrd:distributorContact>
</mrd:MD_Distributor>

```

2006 example (ISO 19139):

```

<gmd:MD_Distributor>
  <gmd:distributorContact>
    <gmd:CI_ResponsibleParty>
      <gmd:positionName>
        <gco:CharacterString>Arizona Geological Survey Librarian</gco:CharacterString>
      </gmd:positionName>
      <gmd:contactInfo>
        <gmd:CI_Contact>
          <gmd:address>
            <gmd:CI_Address>
              <gmd:electronicMailAddress>
                <gco:CharacterString>library@azgs.az.gov</gco:CharacterString>
              </gmd:electronicMailAddress>
            </gmd:CI_Address>
          </gmd:address>
        </gmd:CI_Contact>
      </gmd:contactInfo>
    </gmd:CI_ResponsibleParty>
  </gmd:distributorContact>
</gmd:MD_Distributor>

```

```
        </gmd:CI_Address>
      </gmd:address>
    </gmd:CI_Contact>
  </gmd:contactInfo>
<gmd:role>
  <gmd:CI_RoleCode codeList = "http://standards.iso.org/iso/19115/resources/Code-
    list/cat/codelists.xml#CI_RoleCode"
    codeListValue="pointOfContact">pointOfContact</gmd:CI_RoleCode>
</gmd:role>
</gmd:CI_ResponsibleParty>
</gmd:distributorContact>
</gmd:MD_Distributor>
```

4.3.13 Resource Relationships and Aggregation

Definition: Information identifying resources that are related to the described resource and specifying the nature of the relationship.

The EIP mandates that links to metadata describing related resources use the associatedResource element to specify these associations. Detailed specification for aggregation relationships between resources is out of scope for this version of the profile. The associatedResource resource element is used to assert any relationships to other resources that are considered useful. Semantics of relationships is limited by the association type codelist values. The target of the association is a metadata record for the related resource.

4.3.13.1 Content Specifications

UML root path:

MD_Metadata.identificationInfo.MD_Identification.associatedResource¹.MD_AssociatedResource

¹ **Reference Obligation:** Optional

Line	Name	Obligation	Cardinality	Datatype	Domain
433	title	Mandatory	1	CharacterString	Free text
362	code	Mandatory, nilable	1	CharacterString	URI ²
95	associationType	Mandatory	1	CodeList	DS_AssociationTypeCode
362	metadataTitle	Optional	1	CharacterString	Free text
406	metadataLinkage	Optional	1	CharacterString	Text restricted to URL (see IETF RFC 3986) ³

² EIP restricts text to URI syntax, per IETF RFC 1738 and IETF RFC 3986.

³ Per ISO 19115-1.

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.3.13.1.1 Normative Notes

The EIP mandates links to related resources in metadata records **MUST** provide a title for the related resource, an association type code to indicate the semantics of the link, and an identifier for the related resource (nilable if not available). A URL for the metadata record describing the linked dataset or service **SHOULD** be provided. The base standard makes an association type code mandatory to assign semantics to the relationship.

4.3.13.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/*Identification/mri:associatedResource/ mri:MD_AssociatedResource
title	+/ mri:name/cit:CI_Citation/cit:title/gco:CharacterString
code	+/ mri:name/cit:CI_Citation/cit:identifier/mcc:MD_Identifier/mcc:code/ gco:Character-String
associationType	+/ mri:associationType/ mri:DS_AssociationTypeCode/@codeListValue
metadataTitle	+/ mri:metadataReference/cit:CI_Citation/cit:title/gco:CharacterString
metadataLinkage	+/ mri:metadataReference/cit:CI_Citation/cit:onlineResource/cit:CI_Online-Resource/cit:linkage/gco:CharacterString
2006 specification implementation	In the 2006 specification the root XPath is the same. The metadata reference is not included, so the CI_Citation entity identifier should be a URL that will access the metadata for the linked resource
code	+/aggregateDataSetIdentifier/MD_Identifier/code/gco:CharacterString
associationType	+/associationType/DS_AssociationTypeCode/@code
metadataReference	+/aggregateDataSetName/CI_Citation/identifier/MD_Identifier/code/ gco:Character-String
Automation considerations	The framework for a collection of linked metadata describing a database with a collection of tables could be spun up automatically, similar to how existing software currently builds most of the entity-attribute content for databases in FGDC metadata

4.3.13.2.1 Implementation Notes

Reference to the related resource is through `name/CI_Citation`, which requires that a `title/CharacterString` is present. Linkage to a metadata record for the related resource is through `metadataReference/CI_Citation/onlineResource`, the `CI_Citation` element here requires that a `title/CharacterString` is provided for the metadata record. Recommended practice is to make the title for the metadata record "Metadata for {resource title}", using the same resource title as in the `name/CI_Citation/title` element.

The association type code list in the base specification is very generalized. EIP mandates use of the four association types listed in Table 11 below. The association type code is in the substitution group for `CharacterString` in the XML implementation, with the actual code values assigned in element attributes; EIP recommends that the `DS_AssociationTypeCode` element value character string be used to express the nature of the asserted association in more detail.

Table 11. EIP Usage of ISO19115-1 Association Type Codes	
DS_AssociationTypeCode	EIP Usage Guidance
crossReference	Reference from one resource to another. This is the most generic type of association and is used if the more specific association types (below) do not apply. The text value of the DS_AssociationTypeCode.
largerWorkCitation	Reference to a master resource of which this one is a part. Used for part-whole linkages that are not explicitly tables in a database.
partOfSeamlessDatabase	Part of same structured set of data held in a computer. Use to link tables to a containing database.
isComposedOf	Reference to resources that are parts of this dataset, inverse of largerWorkCitation

4.3.13.2.2 Examples

Cross reference to a related dataset.

```
<mri:associatedResource>
  <mri:MD_AssociatedResource>
    <mri:name>
      <cit:CI_Citation>
        <cit:title>
```

```

        <gco:CharacterString>Texas Borehole Temperatures
                                </gco:CharacterString>
    </cit:title>
<!-- If an identifier (ideally a URI) is available for the resource, include it in the cit:identifier element.
     If no identifier is available, include a nilReason-->
    <cit:identifier gco:nilReason="missing"/>
<!-- If an online linkage can be provided for the resource include a cit:CI_OnlineResource element -->
    </cit:CI_Citation>
    </mri:name>
    <mri:associationType>
    <mri:DS_AssociationTypeCode codeList= "http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#ClassificationCode" codeListValue="crossReference">crossReference</mri:DS_AssociationTypeCode>
    </mri:associationType>
    <mri:metadataReference>
    <cit:CI_Citation>
    <cit:title>
    <gco:CharacterString>Metadata for Texas Borehole Temperatures
    </gco:CharacterString>
    </cit:title>
    <cit:identifier>
    <mcc:MD_Identifier>
    <mcc:code>
    <!-- optional, this identifies the metadata record, not the resource it describes -->
    <gco:CharacterString>uuid:168566464e3d5f8f3cde3b9fc006b2bb
    </gco:CharacterString>
    </mcc:code>
    </mcc:MD_Identifier>
    </cit:identifier>
    <cit:onlineResource>
    <cit:CI_OnlineResource>
    <cit:linkage>
    <!-- linkage to metadata for related resource SHOULD be provided -->
    <gco:CharacterString>http://catalog.stategeothermaldata.org/geoportal/csw?request=GetRecordById%26id=168566464e3d5f8f3cde3b9fc006b2bb%26service=CSW%26version=2.0.2%26outputSchema=http%3A%2F%2Fwww.isotc211.org%2F2005%2Fgmd%26elementSetName=full
    </gco:CharacterString>
    </cit:linkage>
    </cit:CI_OnlineResource>
    </cit:onlineResource>
    </cit:CI_Citation>
    </mri:metadataReference>
    </mri:MD_AssociatedResource>
</mri:associatedResource>

```

2006 example (ISO 19139):

Association from metadata record for a database to a table contained in a database

```

<gmd:MD_Metadata>
  <gmd:metadataScope>
    <gmd:MD_Scope>
      <gmd:resourceCode>
        <gmd:MD_ScopeCode

```



```

codeList="http://w3.energistics.org/energym/profiles/EIP/v1.1/EIPcodelists19115-
3.xml.xml#CI_ScopeCode"
codeListValue="series">Database</gmd:MD_ScopeCode>
</gmd:resourceCode>
</gmd:MD_Scope>
</gmd:metadataScope>
...additional metadata elements...
<gmd:identificationInfo>
<gmd:MD_DatasetIdentification>
...other metadata elements...
<gmd:associatedResource>
<gmd:MD_AssociatedResource>
<gmd:name>
<gmd:CI_Citation>
<gmd:title>GeologicUnitDescription</gmd:title>
<gmd:identifier>
<gmd:MD_Identifier>
<gmd:code>
<gmd:CharacterString>http://resource.usgin.org/uri-gin/da-
taset/table/2643677</gmd:CharacterString>
</gmd:code>
</gmd:MD_Identifier>
</gmd:identifier>
</gmd:CI_Citation>
</gmd:name>
<gmd:associationType>
<gmd:DS_AssociationTypeCode codeList="http://stand-
ards.iso.org/iso/19115/resources/Codelist/cat/codel-
ists.xml#DS_AssociationTypeCode"
codeListValue="partOfSeamlessDatabase">database table
</gmd:DS_AssociationTypeCode>
</gmd:associationType>
<gmd:metadataReference>
<gmd:CI_Citation>
<gmd:title>
<gco:CharacterString>Metadata for GeologicUnitDescription table
</gco:CharacterString>
</gmd:title>
<gmd:onlineResource>
<gmd:CI_OnlineResource>
<gmd:linkage>
<gmd:URI>http://resource.usgin.org/uri-
gin/dataset/table/2643677/metadata</gmd:URI>
</gmd:linkage>
</gmd:CI_OnlineResource>
</gmd:onlineResource>
</gmd:CI_Citation>
</gmd:metadataReference>
</gmd:MD_AssociatedResource>
</gmd:associatedResource>
...other metadata elements
</gmd:MD_DatasetIdentification>
</gmd:identificationInfo>
...other metadata elements
</gmd:MD_Metadata>

```

Association from a metadata record for a collection of project information to a seismic dataset acquired for the project.

```

<gmd:MD_Metadata>
...other elements...
  <gmd:metadataScope>
    <gmd:MD_Scope>
      <gmd:resourceCode>
        <gmd:MD_ScopeCode codeList= "http://w3.energistics.org/energyml/pro-
          files/EIP/v1.1/EIPcodelists19115-3.xml.xml#MD_ScopeCode" codeListValue="col-
            lection">oil prospect development
        </gmd:MD_ScopeCode>
      <gmd:resourceCode>
        <gmd:MD_Scope>
      <gmd:metadataScope>
    ...other elements...
  <gmd:identificationInfo>
    <gmd:MD_DatasetIdentification>
    ...other elements. The abstract describes the exploration activity...
      <gmd:associatedResource>
        <gmd:MD_AssociatedResource>
          <gmd:name>
            <gmd:CI_Citation>
              <gmd:title>Raw data for seismic line K20644</gmd:title>
              <gmd:identifier>
                <gmd:MD_Identifier>
                  <gmd:code>
                    <gmd:CharacterString>http://resource.chevron.com/uri-
gin/dataset/seismic/raw/K20644</gmd:CharacterString>
                  </gmd:code>
                </gmd:MD_Identifier>
              </gmd:identifier>
            </gmd:CI_Citation>
          </gmd:name>
          <gmd:associationType>
            <gmd:DS_AssociationTypeCode codeList= "http://stand-
              ards.iso.org/iso/19115/resources/Codelist/cat/codel-
                ists.xml#DS_AssociationTypeCode" codeListValue="crossReference">ac-
                quired dataset
            </gmd:DS_AssociationTypeCode>
          </gmd:associationType>
          <gmd:metadataReference>
            <gmd:CI_Citation>
              <gmd:title>
                <gco:CharacterString>Metadata for raw data acquisition, line
K20644</gco:CharacterString>
              </gmd:title>
            <gmd:onlineResource>
              <gmd:CI_OnlineResource>
                <gmd:linkage>
                  <gmd:URI>http://resource.chevron.com/uri-
gin/dataset/seismic/raw/K20644/metadata</gmd:URI>
                </gmd:linkage>
              </gmd:CI_OnlineResource>
            </gmd:onlineResource>
          </gmd:CI_Citation>
        </gmd:MD_AssociatedResource>
      </gmd:associatedResource>
    </gmd:MD_DatasetIdentification>
  </gmd:identificationInfo>
</gmd:MD_Metadata>

```

```
        </gmd:metadataReference>
      </gmd:MD_AssociatedResource>
    </gmd:associatedResource>
    ...other aggregationInfo elements providing links to other datasets, documents, etc. that are part of the
    information package associated with this activity....
    ...other elements
      <gmd:MD_DatasetIdentification>
        <gmd:identificationInfo>
        ...other elements...
      <gmd:MD_Metadata>
```

4.4 Digital Product-specific Information

Elements in this section are used to document metadata for information resources in digital form representing static units of content that can be transported to different locations electronically. Digital products are intended for use by computers and are typically file-based. See the general discussion of resource distribution metadata in Section 2.2.5, [Resource Distribution Metadata](#), page 22.

4.4.1 Digital Product Format

Definition: Specification of the type of digital representation of a resource.

name: Name of the information transfer format.

version: Version of the format.

code: MIME media-type code or, if not registered with IANA, a formatted string identifying the application vendor, application name, and file type

linkage: URL which dereferences to the online, digital product

Content in digital products is by necessity encoded in some format that must be known by client software to be used. Format names might be documented public domain formats like TIFF, JPG, SHP, or proprietary formats specific to some application software. Name and version conventions are dictated by the specifications for each format.

4.4.1.1 Content Specifications

UML root path: MD_Metadata.distributionInfo.MD_Format¹

¹ **Reference Obligation:** Conditional² (raised from Optional in ISO 19115-1)

² *Required if metadataScope is one of {"application", "dataset", "document", "metadata", "series", "nonGeographicDataset"}*

Line	Name	Obligation	Cardinality	Datatype	Domain
362	name	Mandatory, not nilable	1	CharacterString	Free text
256	version	Optional	1	CharacterString	Free text ³
433	code	Optional	N	CharacterString	Text, see implementation notes (4.4.1.2.1)
406	linkage	Optional	N	CharacterString	Text restricted to URL (see IETF RFC 3986) ⁴

³ *If format is not versioned, use nilReason='not applicable'.*

⁴ *per ISO 19115-1.*

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.4.1.1.1 Normative Notes

Resource format information MAY be specified as child of MD_Distribution for a simple distribution with one digital transfer option and one distributor. If the distribution includes multiple distributors or multiple transfer options, the format MUST be specified as a child of MD_DigitalTransferOptions (see Section 2.2.5, [Resource Distribution Metadata](#), page 22). If an MD_Format element is present, The format name MUST be specified using the formatSpecificationCitation/CI_Citation/title/CharacterString element. This string SHOULD be a standard, registered string like a MIME type (see implementation notes below).

4.4.1.2 XML Implementation

XPath root	MD_Metadata/distributionInfo/mrd:MD_Distribution/mrd:distributionFormat/mrd:MD_Format
-------------------	---

name	+/mrd:formatSpecificationCitation/cit:CI_Citation/cit:title/gco:CharacterString
version	+/mrd:amendmentNumber/gco:CharacterString
code	+/mrd:formatSpecificationCitation/cit:CI_Citation/cit:identifier/mcc:MD_Identifier/mcc:code/gco:CharacterString
linkage	+/mrd:formatSpecificationCitation/cit:CI_Citation/cit:onlineResource/cit:CI_OnlineResource/cit:linkage
2006 specification implementation	MD_Metadata/distributionInfo/MD_Distribution/distributionFormat/MD_Format
name	+/name/gco:CharacterString
version	+/version/gco:CharacterString
Automation considerations	MIME types can be determined automatically for most kinds of files. MD_Format elements for standard file types can be pre-constructed as 'components' for insertion as a unit into metadata records.

4.4.1.2.1 Implementation Notes

File format for digital resources is specified by a **formatSpecificationCitation/CI_Citation** element. If a MIME format (<http://www.iana.org/assignments/media-types/>) is defined for a digital file format, the **CI_Citation/title/CharacterString** should be the IANA registered MIME-type string (e.g. text/SGML). Although it would be technically more correct to include the registered string only as an identifier code, this profile recommends use of the citation title because it is the only required element in the citation, simplifying the document encoding. The MIME type string can also be repeated as a **CI_Citation/identifier/-MD_Identifier/code/CharacterString**. For IANA registered MIME types, it is recommended to include a **CI_Citation/onlineResource/CI_OnlineResource/linkage** URL for the defining reference, e.g. <http://www.rfc-editor.org/rfc/rfc1874.txt>).

If no appropriate MIME type is registered with IANA, the EIP recommends that the **formatSpecificationCitation/CI_Citation/title/CharacterString** for digital resources specifies the file format using a string value that includes vendor, application name, and file extension. If the format is versioned, use the **amendmentNumber/CharacterString** to encode a version identifier. Example metadata instances using the ISO19139 XML schema that have been reviewed (INCITS 453, INSPIRE 19115/19, and ANZLIC 2007 ISO profiles) populate **MD_Format/name** with values like 'ESRI ARC/INFO Coverage', 'ESRI shapefile', 'ESRI ARC/INFO Export e00', and 'MapInfo MID/MIF'. Formally, the EIP recommends this format-title string pattern for digital resources:

[vendor:applicationName]/fileExtension.

The vendor and application names may not be applicable and could be omitted, but the '/' and file extension should always be present. See examples in [Table 12](#) below, which are to be used only if an appropriate MIME type is not defined.

Table 12. Example Format Strings for Digital Files
ESRI:ARCINFO/Coverage
/shapefile
ESRI:ARCINFO/e00
PitneyBowes:MapInfo/mid
ESRI:ArcGIS/mdb
ESRI:ArcGIS/fileGeodatabase

Microsoft:Access/mdb

- If the format consists of a single file, the file extension is a three-letter file-type abbreviation assigned by the vendor.
- If the format consists of a package of files (e.g., an ArcGIS file geodatabase), the file extension is a name that in most cases should be obvious from vendor usage. The accompanying **MD_Format/amendmentNumber** value should indicate the version of application software if the format is specific to some version.

Some datasets may be distributed through multiple services that offer different format options. For example OGC services commonly allow specification of different output formats, and the formats offered are listed in the OGC capabilities document. The EIP recommendation is to list the output formats specific to a particular service distribution in **distributionInfo//MD_DigitalTransferOptions/distributionFormat** elements for that service distribution. Encoding of the format **CI_Citation/title/CharacterString** string should use whatever convention is used by the service to specify that output format in requests made to the service.

In some cases, different applications will produce incompatible or not completely compatible versions of a digital product encoded using the same registered file format. In the rare cases for which multiple distributions are offered in the same format generated by different applications, the application that produced the file can be noted in an **formatSpecificationCitation/CI_Citation/otherCitationDetails/CharacterString** element. In the more likely scenario of distribution via a single file format for which knowledge of the generating software is important, this information should be encoded in an **MD_Metadata/resourceLineage/-LI_Lineage/processStep/LE_ProcessStep/processingInformation/LE_Processing/softwareReference/-CI_Citation** element. Note that in this situation, the binding between the processing step and the production of the distribution file format must be inferred.

4.4.1.2.2 Examples

Distribution via a Microsoft Access 2007 database file.

```

<mrd:distributionFormat>
  <mrd:MD_Format>
    <mrd:formatSpecificationCitation>
      <cit:CI_Citation>
        <cit:title>
          <gco:CharacterString>Microsoft:Access/mdb</gco:CharacterString>
        </cit:title>
        <cit:identifier>
          <mcc:MD_Identifier>
            <mcc:code>Microsoft:Access/mdb</mcc:code >
          </mcc:MD_Identifier>
        </cit:identifier>
        <cit:onlineResource>
          <cit:CI_OnlineResource>
            <cit:linkage>http://office.microsoft.com/en-us/access-help/mdb_for-
              mat</cit:linkage>
          </cit:CI_OnlineResource>
        </cit:onlineResource>
      </cit:CI_Citation>
    </mrd:formatSpecificationCitation>
    <mrd:amendmentNumber>
      <gco:CharacterString>2007</gco:CharacterString>
    </mrd:amendmentNumber>
  </mrd:MD_Format>
</mrd:distributionFormat>

```

Distribution via an Adobe Acrobat file, created by pdfArchitect:

```
<mrd:distributionFormat>
  <mrd:MD_Format>
    <mrd:formatSpecificationCitation>
      <cit:CI_Citation>
        <cit:title>
          <gco:CharacterString>application/pdf</gco:CharacterString>
        </cit:title>
        <cit:otherCitationDetails>
          <gco:CharacterString>created using pdfArchitect v3.0 by pdfforge
(http://www.pdfforge.org/pdfarchitect)</gco:CharacterString>
        </cit:otherCitationDetails>
      </cit:CI_Citation>
    </mrd:formatSpecificationCitation>
  </mrd:MD_Format>
</mrd:distributionFormat>
```

2006 example (ISO 19139):

```
<gmd:distributionFormat>
  <gmd:MD_Format>
    <gmd:name>
      <gco:CharacterString>Microsoft:Access/mdb</gco:CharacterString>
    </gmd:name>
    <gmd:version>
      <gco:CharacterString>2007</gco:CharacterString>
    </gmd:version>
  </gmd:MD_Format>
</gmd:distributionFormat>
```

4.4.2 Digital Product Access

Definition: The technical means by which the described electronic resource is obtained.

Which specific elements are used depends on whether the resource is obtained off line through a distributor on some physical media, or on line either through a service or by file download. Note that obtaining analog electronic resources (recordings, videotape) would also be described using these elements. For physical (non-electronic) resources, access to the resource is specified using [distributionOrderProcess/orderingInstructions](#) (see Section 4.5.2, [Product Ordering Process](#), page 100).

Online:

The [MD_Distribution/transferOptions/MD_DigitalTransferOptions/onLine/CI_OnlineResource](#) element is used to provide the necessary access information if there is a single distributor. If there are multiple distributors with different transfer options, then use [MD_Distribution/distributor/MD_Distributor/distributor-TransferOptions/MD_DigitalTransferOptions/onLine/CI_OnlineResource](#). The [linkage](#) element is an http URI that will provide online access. The [function](#) element indicates what will be accessed when the [linkage](#) URI is dereferenced.

Offline:

Distribution of digital product resources by offline acquisition of physical media (e.g. CDROM, DVD) is described with [MD_DigitalTransferOptions/offLine/MD_Medium](#) entity content that specifies the kind of media used to deliver the information. The associated [MD_Distributor/distributionOrderProcess/-MD_StandardOrderProcess](#) entity is used to provide instructions for obtaining the physical media containing the resource. For a discussion of the relationship between formats, distributors, and transfer options in the context of [MD_Distribution](#), see Section 2.2.5 [Resource Distribution Metadata](#), page 22.

4.4.2.1 Content Specifications

UML root path: [MD_Metadata.distributionInfo](#)¹..[MD_DigitalTransferOptions](#).

¹ **Reference Obligation:** Conditional² (raised from Optional in ISO 19115-1)

² *Required if metadataScope is one of {"application", "dataset", "document", "metadata", "series", "nonGeographicDataset"}*

Line	Name	Obligation	Cardinality	Datatype	Domain
245	onLine	Conditional ³	1	Class	CI_OnlineResource (see §4.3.2.1.1)
246	offLine	Conditional ³	1	Class	MD_Medium (see §4.3.2.1.2)

³ *Count (onLine + offLine) > 0.*

4.4.2.1.1 CI_OnlineResource (for online access)

Line	Name	Obligation	Cardinality	Datatype	Domain
406	linkage	Conditional ⁴	1	CharacterString	Text restricted to URL (see IETF RFC 3986) ⁵
411	functionCode	Conditional ⁴	1	CodeList	CI_OnlineFunctionCode ⁶
412	protocol	Conditional ⁷	1	CharacterString	FreeText

⁴ *Required if onLine exists.* ⁵ *Per ISO 19115-1.*

⁶ *Domain restricted to one of {"download", "fileAccess", "order", "search", "emailService", "browsing", "information"}*

⁷ *Required if CI_OnlineFunctionCode="information" (identifies download via a service interface).*

4.4.2.1.2 MD_Medium (for offline access)

Line	Name	Obligation	Cardinality	Datatype	Domain
362	mediumName	Conditional ⁸	1	CharacterString	Free text
271	orderingInstructions	Conditional ⁸	1	CharacterString	Free text

⁸ Required if offLine exists.

NOTE: Organization of the above tables are described in the introduction of Section 4.1.1, page 33.

4.4.2.1.3 Normative Notes

Note that the MD_DigitalTransferOptions element is a child of MD_Distribution if the simple distribution pattern (Figure 2) is used, or it will be a child of MD_Distributor if the comprehensive distribution pattern (Figure 3) is used.

4.4.2.1.3.1 Offline Access

When parsing a metadata document, the presence of an MD_Distribution/transferOptions/MD_DigitalTransferOptions/offline/MD_Medium element will denote that the primary distribution of the resource is by offline delivery on physical media. In this case, the EIP profile mandates that a valid medium name MUST be present in the MD_Medium/name/CI_Citation/title/CharacterString element, and that MD_Distributor/-distributionOrderProcess/MD_StandardOrderProcess/orderingInstructions MUST be present.

4.4.2.1.3.2 Online Access

Resources that are accessible online may be distributed using a wide variety of approaches. The resource representation that is accessed when dereferencing the provided linkage/CharacterString must be indicated by the function/CI_OnlineFunctionCode. The values of this code list are restricted in this context by the EIP and usage is summarized in Table 13.

Table 13. Usage of Online Function Codes for Online Access to Resources Using the Web	
CI_OnlineFunctionCode	EIP Usage Guidance
download	Linkage will directly access the described resource packaged in a file that can be downloaded by actuating the link. For web-service-based distribution, this might be an example data request that will return a data package.
fileAccess	Linkage is to a file directory that contains one or more files containing the described resource. User will have to determine which file to acquire from the directory. This function is reserved for situations in which the link requires direct access into a file system, typically only useful for intranets.
order	Linkage is to a Web page that requires user input to request access to the resource. Typically this will be some sort of registration or ordering process that will result in a direct link to download the resource.
search	Linkage is to a Web page that allows users to search described data and extract subsets or individual records/features/granules.
emailService	Linkage is a mailto: URI that provides an e-mail address to send request for resource. Intention is that the response to this mail would be a link to directly access the requested resource.
browsing	Linkage is to a website that allows users to browse the described dataset online through one or more Web pages.
information	Linkage is to a service-specific self-description document (e.g. OGC getCapabilities). Denotes that the distribution is via a Web service, and the client accessing this description document knows how to interpret its content to use the service.

4.4.2.2 XML Implementation

Note the XPath roots in this table include '/' because the **MD_DigitalTransferOptions** element is a child of **MD_Distribution** if the simple distribution pattern (Figure 2) is used, or it will be a child of **MD_Distributor** if the comprehensive distribution pattern (Figure 3) is used.

XPath root	MD_Metadata/distributionInfo//
<i>Online access</i>	
linkage	+ /mrd:MD_DigitalTransferOptions/mrd:online/cit:CI_OnlineResource/-cit:linkage/gco:CharacterString
functionCode	+ /mrd:MD_DigitalTransferOptions/mrd:online/cit:CI_OnlineResource/-cit:function/cit:CI_OnlineFunctionCode/@code
protocol	+ /mrd:MD_DigitalTransferOptions/mrd:online/cit:CI_OnlineResource/-cit:protocol/gco:CharacterString
<i>Offline access</i>	
mediumName	+//MD_DigitalTransferOptions/offLine/MD_Medium/CI_Citation/title/gco:CharacterString
orderingInstructions	+ /distributor/MD_Distributor/distributionOrderProcess/orderingInstructions/gco:CharacterString
2006 specification implementation	service type should be encoded in protocol/gco:CharacterString
Automation considerations	

4.4.2.2.1 Implementation Notes

Offline distribution will in general require some action on the part of a user, so the **orderingInstructions** element should contain sufficient information to communicate how a user can obtain the resource. Other elements in the **MD_Medium** entity are optional in ISO 19115-1. For a discussion of the binding between distributors and transfer options, see Section 2.2.5, **Resource Distribution Metadata**, page 22. Note that the **MD_DigitalTransferOptions** entity that contains the offline element may optionally include an online element with a linkage to an instructions page, but this does not replace inclusion of the **MD_StandardOrderProcess/orderingInstructions**. If such a linkage is included, the **CI_OnlineResource/function/-CI_OnlineFunctionCode** associated with the **linkage/CharacterString** must be 'offlineAccess'.

If multiple distributor-format-transfer options are required, then substitute **distributor/MD_Distributor/-distributorTransferOptions** for **transferOptions** (See Section 2.2.5 **Resource Distribution Metadata**, page 22).

For service-based distribution via a data access service like OpenDAP or OGC WMS, WFS, WCS, the EIP profile specifies the following conventions. The **CI_OnlineResource/protocol/CharacterString** must identify the service type in a distribution information section to allow clients to identify distribution via a particular service type without having to parse the **linkage/CharacterString** to infer the service type. Recommended practice is to provide a link to the service self-description document (e.g. OGC capabilities, openSearch description, etc.). If such a linkage is included, the **CI_OnlineResource/function/CI_OnlineFunctionCode** associated with the **linkage/CharacterString** must be 'information'. An example data request linkage may also be provided in a different **CI_OnlineResource** element with the same **protocol** property value. The **CI_OnlineResource/function/CI_OnlineFunctionCode** associated with the **linkage/CharacterString** must be 'download' in that case. If it is important to specify a profile that a service implements, which typically specifies the information model used for data content, and may also specify vocabularies used, or other restrictions on the behavior of the service to access the particular resource; this information should be placed in the **CI_OnlineResource/applicationProfile/CharacterString** element. Finally In some cases the protocol, applicationProfile and name properties may be insufficient to enable machine access to the resource through the provided link. The **CI_OnlineResource/description** element may include key values pairs to provide additional necessary information. EIP follows the USGIN recommendation to encode these in a 'parameter' object using JSON syntax. The parameters value is a list of

key:value pairs enclosed in curly brackets ('{key:"value", key1:"value1"...}'). The keys should be the exact string that is required for the data access request parameter. For example, a dataset distributed through a particular layer in a multi-layer WMS:

```
<gmd:description>
  <gco:CharacterString>
    Whatever descriptive text you want.
    parameters:{layers:"gtp_datagap_well_data_collection"}
  </gco:CharacterString>
</gmd:description>
```

In the case of a dataset distributed through a particular feature type in a multi-feature WFS:

```
<gmd:description>
  <gco:CharacterString>
    Whatever descriptive text you want.
    parameters:{ typeName:"BoreholeLithInterval2.0"}
  </gco:CharacterString>
</gmd:description>
```

See <https://github.com/OSGeo/Cat-Interop/blob/master/LinkPropertyLookupTable.csv> for a community-developed set of recommended strings to identify service types or applicationProfiles.

4.4.2.2.2 Examples

Digital Product Distribution Offline Using Physical Media using the simple distribution pattern (Figure 2, page 22).

```
<mrd:distributionInfo>
  <mrd:MD_Distribution>
    <mrd:distributorFormat>
      <mrd:MD_Format>
        <mrd:formatSpecificationCitation>
          <cit:CI_Citation>
            <cit:title>image/tiff</cit:title>
            <cit:identifier>
              <mcc:MD_Identifier>
                <mcc:code>
                  <gco:CharacterString>image/tiff</gco:CharacterString>
                </mcc:code>
              </mcc:MD_Identifier>
            </cit:identifier>
          </cit:CI_Citation>
        </mrd:formatSpecificationCitation>
      </mrd:MD_Format>
    </mrd:distributorFormat>
    <mrd:distributor>
      <mrd:MD_Distributor>
        <mrd:distributorContact>
          ...DistributorContact content here...
        </mrd:distributorContact>
        <mrd:distributionOrderProcess>
          <mrd:MD_StandardOrderProcess>
            <mrd:orderingInstructions>
              <gco:CharacterString>Call 660-882-4132 and we'll get the necessary information to mail you a CDROM containing the file
              <gco:CharacterString>
            </mrd:orderingInstructions>
          </mrd:MD_StandardOrderProcess>
        </mrd:distributionOrderProcess>
      </mrd:MD_Distributor>
    </mrd:distributor>
  </mrd:MD_Distribution>
</mrd:distributionInfo>
```

```

        </mrd:distributionOrderProcess>
    </mrd:MD_Distributor>
</mrd:distributor>
<mrd:transferOptions>
    <mrd:MD_DigitalTransferOptions>
        <mrd:offline>
            <mrd:MD_Medium>
                <mrd:name>
                    <cit:CI_Citation>
                        <cit:title>
                            <gco:CharacterString>
                                CDROM specification
                            </gco:CharacterString>
                        </cit:title>
                    </cit:CI_Citation>
                </mrd:name>
                <mrd:mediumFormat> <!-- mediumFormat is optional --!>
                    <mrd:MD_MediumFormatCode codeList="http://stand-
                        ards.iso.org/iso/19115/resources/Codelist/cat/codel-
                        ists.xml#CI_MediumFormatCode" codeListValue="Iso9660">ISO9660
                    </mrd:MD_MediumFormatCode >
                </mrd:mediumFormat>
            </mrd:MD_Medium>
        </mrd:offline>
    </ mrd:MD_DigitalTransferOptions>
</ mrd:transferOptions>
</mrd:MD_Distribution>
</mrd:distributionInfo>

```

Distribution by Online File Access for Download using the simple distribution pattern (Figure 2, page 22). No file format is specified.

```

<mrd:distributionInfo>
    <mrd:MD_Distribution>
... distribution information for distributor and format...
    <mrd:transferOptions>
        <mrd:MD_DigitalTransferOptions>
            <mrd:online>
                <cit:CI_OnlineResource>
                    <cit:linkage>
                        <gco:CharacterSting>
                            http://azgs.az.gov/resources/2346547
                        </gco:CharacterSting>
                    </cit:linkage>
                    <cit:function>
                        <cit:CI_OnlineFunctionCode codeList="http://w3.energistics.org/ener-
                            gyml/profiles/EIP/ISO-.xml#CI_OnlineFunctionCode codeList-
                            Value="download">file download</cit:CI_OnlineFunctionCode>
                    </cit:function>
                </cit:CI_OnlineResource>
            </mrd:online>
        </ mrd:MD_DigitalTransferOptions>
    </ mrd:transferOptions>
</mrd:MD_Distribution>
</mrd:distributionInfo>

```

Distribution by Web Service

```

<mrddistributionInfo>
  <mrddMD_Distribution>
    <mrddtransferOptions>
      <mrddMD_DigitalTransferOptions>
        <mrddonline>
          <cit:CI_OnlineResource>
            <cit:linkage>
              <gco:CharacterSting>
                http://azgs.az.gov/webServices?service=WMS&request=Get-
                Capabilities
              </gco:CharacterSting>
            </cit:linkage>
            <cit:protocol>
              <gco:CharacterSting>ogc:WMS</gco:CharacterSting>
            </cit:protocol>
            <cit:description>
              <gco:CharacterSting>
                parameters:{layers:"geologicUnitPolygon"}
              </gco:CharacterSting>
            </cit:description>
            <cit:function>
              <cit:CI_OnlineFunctionCode codeList= "http://stand-
                ards.iso.org/iso/19115/resources/Codelist/cat/codel-
                ists.xml#CI_OnlineFunctionCode codeListValue='information'>service
                description document download</cit:CI_OnlineFunctionCode>
            </cit:function>
          </cit:CI_OnlineResource>
        </mrddonline>
      </mrddMD_DigitalTransferOptions>
    </mrddtransferOptions>
    ...other distribution information for distributor and format...
  </mrddMD_Distribution>
</mrdddistributionInfo>

```

2006 examples (ISO 19139):

Digital Product Distribution Offline Using Physical Media

```

<gmd:distributionInfo>
  <gmd:MD_Distribution>
    <gmd:distributor>
      <gmd:MD_Distributor>
        <gmd:distributorContact>
          ...DistributorContact content here...
        </gmd:distributorContact>
        <gmd:distributionOrderProcess>
          <gmd:MD_StandardOrderProcess>
            <gmd:orderingInstructions>
              <gco:CharacterSting>Call 660-882-4132 and we'll get the necessary in-
              formation to mail you a CDROM containing the file</gco:Charac-
              terSting>
            </gmd:orderingInstructions>
          </gmd:MD_StandardOrderProcess>
        </gmd:distributionOrderProcess>
      </gmd:MD_Distributor>
    </gmd:distributor>
  </gmd:MD_Distribution>
</gmd:distributionInfo>

```

```

</gmd:distributor>
<gmd:transferOptions>
  <gmd:MD_DigitalTransferOptions>
    <gmd:offline>
      <gmd:MD_Medium>
        <gmd:name>
          <gmd:CI_MediumNameCode codeList= "http://stand-
            ards.iso.org/iso/19115/resources/Codelist/cat/codel-
            ists.xml#CI_MediumNameCode" codeListValue="CDROM">CDROM
          </gmd:CI_MediumNameCode>
        </gmd:name>
      </gmd:MD_Medium>
    </gmd:offline>
  </ gmd:MD_DigitalTransferOptions>
</ gmd:transferOptions>
</gmd:MD_Distribution>
</gmd:distributionInfo>

```

Distribution by Online File Access for Download (2006 schema)

```

<gmd:distributionInfo>
  <gmd:MD_Distribution>
    <gmd:transferOptions>
      <gmd:MD_DigitalTransferOptions>
        <gmd:online>
          <gmd:CI_OnlineResource>
            <gmd:linkage>
              <gmd:URL>
                http://azgs.az.gov/resources/2346547
              </gmd:URL>
            </gmd:linkage>
            <gmd:function>
              <gmd:CI_OnlineFunctionCode codeList= "http://stand-
                ards.iso.org/iso/19115/resources/Codelist/cat/codel-
                ists.xml#CI_OnlineFunctionCode" codeListValue="file
                download">file
                download</gmd:CI_OnlineFunctionCode>
            </gmd:function>
          </gmd:CI_OnlineResource>
        </gmd:online>
      </ gmd:MD_DigitalTransferOptions>
    </ gmd:transferOptions>
    ...other distribution information for distributor and format...
  </gmd:MD_Distribution>
</gmd:distributionInfo>

```

Distribution by Web Service (2006 schema)

```

<gmd:distributionInfo>
  <gmd:MD_Distribution>
    <gmd:transferOptions>
      <gmd:MD_DigitalTransferOptions>
        <gmd:online>
          <gmd:CI_OnlineResource>
            <gmd:linkage>
              <gmd:URL>
                http://azgs.az.gov/webServices?service=WMS&re-
                quest=GetCapabilities
              </gmd:URL>
            </gmd:linkage>
          </gmd:CI_OnlineResource>
        </gmd:online>
      </ gmd:MD_DigitalTransferOptions>
    </ gmd:transferOptions>
  </gmd:MD_Distribution>
</gmd:distributionInfo>

```

```
</gmd:linkage>
<gmd:protocol>
  <gco:CharacterString>
    ogc:WMS
  </gco:CharacterString>
</gmd:protocol>
<gmd:description>
  <gco:CharacterString>
parameters:{layers:"geologicUnitPolygon"}
  </gco:CharacterString>
</gmd:description>
<gmd:function>
  <gmd:CI_OnlineFunctionCode codeList= "http://stand-
    ards.iso.org/iso/19115/resources/Codelist/cat/codel-
    ists.xml#CI_OnlineFunctionCode" codeListValue='information'>service
description document download</gmd:CI_OnlineFunctionCode>
  </gmd:function>
</gmd:CI_OnlineResource>
</gmd:online>
</ gmd:MD_DigitalTransferOptions>
</ gmd:transferOptions>
</gmd:MD_Distribution>
</gmd:distributionInfo>
```

4.4.3 Digital Product Provenance

Definition: Specification of information documenting the provenance of the digital resource, limited in this version of the EIP to the software name and version.

name: Name of the software.

version: Version of the software.

4.4.3.1 Content Specifications

UML root path:

MD_Metadata.resourceLineage.LI_Lineage.processStep.LE_ProcessStep.processingInformation.LE_Processing.softwareReference.CI_Citation¹

¹ **Reference Obligation:** Optional

Line	Name	Obligation	Cardinality	Datatype	Domain
362	name	Mandatory	1	CharacterString	Free text
256	version	Optional	1	CharacterString	Free text

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.4.3.1.1 Normative Notes

The formal name of the software used to generate the digital product is listed in the `CI_Citation/title/CharacterString`. If the software is versioned, the version should be specified in the `CI_Citation/edition/CharacterString` element.

4.4.3.2 XML Implementation

XPath root	MD_Metadata/resourceLineage/mrl:LI_Lineage/mrl:processStep/mrl:LE_ProcessStep/mrl:processingInformation/mrl:LE_Processing/mrl:softwareReference/cit:CI_Citation
name	+/cit:title/gco:CharacterString
version	+/cit:edition/gco:CharacterString
2006 specification implementation	MD_Metadata/dataQualityInfo/DQ_DataQuality/lineage/LI_Lineage/processStep/LI_ProcessStep
name + version	+/description/gco:CharacterString
Automation considerations	

4.4.3.2.1 Implementation Notes

If a URI is available to identify the software, it should be included in the `CI_Citation/identifier/MD_Identifier/code/CharacterString` element. If a web page is available describing the software, the URL should be provided in the `CI_Citation/onlineResource/CI_OnlineResource/linkage/CharacterString` element. ISO19115 (2006) does not provide an element to specify processing software used to generate a resource documented by the metadata record. This profile recommends include the name and version in the `gmd:LI_ProcessStep/gmd:description/CharacterString`.

4.4.3.2.2 Examples

Processing software citation with URL to download the software.

```
<mrd:processingInformation>
  <mrd:LE_Processing>
    <mrd:softwareReference>
      <cit:CI_Citation>
        <cit:title>
          <gco:CharacterString>
            OTSoft: Optimality Theory Software
```



```

    </gco:CharacterString>
  </cit:title>
  <cit:edition>
    <gco:CharacterString>Version 2.1</gco:CharacterString>
  </cit:edition>
  <cit:onlineResource>
    <cit:CI_OnlineResource>
      <cit:linkage>
        <gco:CharacterString>
          http://www.linguistics.ucla.edu/people/hayes/otsoft
        </gco:CharacterString>
      </cit:linkage>
      <cit:function>
        <cit:CI_OnlineFunctionCode codeList= "http://stand-
          ards.iso.org/iso/19115/resources/Codelist/cat/codel-
          ists.xml#CI_OnlineFunctionCode" codeListValue= 'download'>down-
          load</cit:CI_OnlineFunctionCode>
      </cit:function>
    </cit: CI_OnlineResource >
  </cit: onlineResource >
</cit:CI_Citation>
</mrd: softwareReference>
</mrd: LE_Processing>
</mrd: processingInformation>

```

2006 example

```

<dataQualityInfo>
  <DQ_DataQuality >
    <lineage>
      <LI_Lineage>
        <processStep>
          <LI_ProcessStep>
            <description>
              <gco:CharacterString>
                Software: OTSoft: Optimality Theory Software, version 2.1, down-
                load at http://www.linguistics.ucla.edu/people/hayes/otsoft
              </gco:CharacterString>
            </description>
          </LI_ProcessStep>
        </processStep>
      </LI_Lineage>
    </lineage>
  </DQ_DataQuality >
</dataQualityInfo>

```

4.5 Physical Product-specific Information

Elements in this section are used to document resources that are Physical Products, e.g. rock samples or paper manuscript maps. Note that Physical Products do not include copies of Digital Products that reside on physical media.

4.5.1 Physical Product Format

Definition: Specification of the container for information conveyed by a physical resource.

Name: Term that specifies a physical format type.

Because **DigitalTransferOptions** do not apply to physical products, the format element must convey information about the physical format. The **MD_Format** element is the only format information for resources that do not have digital transfer options, and EIP proposes [Table 14](#) (adopted from USGIN metadata recommendations) as a vocabulary for use to specify format of non-digital resources.

4.5.1.1 Content specification

UML root path: MD_Metadata.distributionInfo.MD_Distribution.distributionFormat¹.MD_Format.-formatSpecificationCitation.CI_Citation

¹ **Reference Obligation:** Conditional² (raised from Optional in ISO 19115-1)

² *Required if metadataScope is one of {"collectionHardware", "documentPhysical", "sample", "seriesPhysical"}*

Line	Name	Obligation	Cardinality	Datatype	Domain
362	name	Mandatory, not nilable	1	CharacterString	Use or extend USGIN codelist (Table 14).

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.5.1.1.1 Normative Notes

Physical product formats should specify the nature of the physical resource. [Table 14](#) presents an example vocabulary for some physical product formats. Version is not applicable for physical product format.

Table 14. Example Vocabulary for Physical Product Formats			
Format term	Name	Parent format	Scope
physicalArtifact	Physical artifact		Described resource is a physical object
sample	Sample	physicalArtifact	Use for uncategorized sample.
sample:core	Core	sample	Cylindrical rock sample extracted from Earth with a coring drill
sample:cuttings	Cuttings	sample	Small rock fragments recovered from drilling process as sample of material being drilled
sample:fluid	Fluid	sample	Sample of a fluid
sample:handSample	Hand sample	sample	Single piece or pieces of material
hardCopy	Hard copy manuscript	physicalArtifact	A physical copy of a document on paper, film, or other similar material
hardCopy:book	Book	hardcopy	Manuscript printed on paper, bound into a single volume
hardCopy:manuscript	Manuscript	hardCopy	Other printed or written representation on physical media, usually paper or mylar, includes unbound books, index cards, loose notes, file folders of papers
hardCopy:printedImage	Printed image	hardCopy	Image on paper or other opaque or semi-opaque media
printedImage:paperMap	Paper map	printedImage	Map image on a single sheet

hardCopy:filmImage	Film image	hardCopy	Image on film, viewed by passing light through the film. Includes single still images and collections of connected images for a movie.
--------------------	------------	----------	--

4.5.1.2 XML Implementation

XPath	MD_Metadata/distributionInfo/mrd:MD_Distribution/mrd:distributionFormat/mrd:MD_Format/mrd:formatSpecificationCitation/cit:CI_Citation/cit:title/gco:CharacterString
2006 specification implementation	MD_Metadata/distributionInfo/MD_Distribution/distributionFormat/MD_Format
formatName	+/name/gco:CharacterString
Automation considerations	

4.5.1.2.1 Implementation Notes

The values in the 'Format term' column in Table 14 above should appear verbatim in the formatSpecificationCitation/CI_Citation/title/CharacterString for ISO 19115-1 metadata (MD_Format/name/CharacterString for ISO 19115:2003/Cor.1:2006 metadata) to allow filtering for particular physical format types.

4.5.1.2.2 Examples

```

<mrd:MD_Distribution>
  <mrd:distributionFormat>
    <mrd:MD_Format>
      <mrd:formatSpecificationCitation>
        <cit:CI_Citation>
          <cit:title>
            <gco:CharacterString>hardcopy:book</gco:CharacterString>
          </cit:title>
        </cit:CI_Citation>
      </mrd:formatSpecificationCitation>
    </mrd:MD_Format>
  </mrd:distributionFormat>
</mrd:MD_Distribution>

```

2006 example (ISO 19139):

```

<gmd:MD_Distribution>
  <gmd:distributionFormat>
    <gmd:MD_Format>
      <gmd:name>
        <gco:CharacterString>hardcopy:book</gco:CharacterString>
      </gmd:name>
    </gmd:MD_Format>
  </gmd:distributionFormat>
</gmd:MD_Distribution>

```

4.5.2 Product Ordering Process

This element provides a text description of ways in which the resource may be obtained or received, along with related instructions and fee information. The ordering instructions are necessary for any resource distribution that does not use standard Web protocols for online resource access. This includes physical samples, library documents, and digital products that are distributed on physical media (CDROM, DVD) and must be ordered from the distributor.

4.5.2.1 Content Specifications

UML root path: MD_Metadata.distributionInfo.MD_Distribution.distributor.MD_Distributor.distributionOrderProcess¹.MD_StandardOrderProcess

¹ **Reference Obligation:** Conditional² (raised from Optional in ISO 19115-1)

² *Required if metadataScope is one of {"collectionHardware", "documentPhysical", "sample", "seriesPhysical"}*

Line	Name	Obligation	Cardinality	Datatype	Domain
271	orderingInstructions	Mandatory, not nilable	1	CharacterString	Free text

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.5.2.1.1 Normative Notes

Because digital transfer options do not apply to physical products or digital products distributed on physical media, the ordering instructions must convey all necessary information to inform a user how to obtain or access the described resource. EIP changes obligation from optional to conditional.

4.5.2.2 XML Implementation

XPath	MD_Metadata/distributionInfo/mrd:MD_Distribution/mrd:distributor/mrd:MD_Distributor/mrd:distributionOrderProcess/mrd:MD_StandardOrderProcess/mrd:orderingInstructions/gco:CharacterString
2006 specification implementation	Same.
Automation considerations	If distributor contact information documented, specify "Contact distributor for ordering options, and instructions for each."

4.5.2.2.1 Implementation Notes

None.

4.5.2.2.2 Example

```

<mrd:MD_Distribution>
...other elements...
  <mrd:distributor>
    <mrd:MD_Distributor>
      < mrd:distributorContact>
...other elements...
    </mrd:distributorContact>
  </mrd:distributor>
  <mrd:distributionOrderProcess>
    <mrd:MD_StandardOrderProcess>
      <mrd:orderingInstructions>
        <gco:CharacterString>Call the distributor contact to make an appointment to visit the core repository, indicate which samples you would like to see, and whether you wish to remove any material</gco:CharacterString>
      </mrd:orderingInstructions>
    </mrd:MD_StandardOrderProcess>
  </mrd:distributionOrderProcess>

```

```
    </mrd:distributionOrderProcess>  
  </mrd:MD_Distributor>  
</mrd:distributor>  
...other elements...  
</mrd:MD_Distribution >
```

4.6 Service-specific Information

From: SV_ServiceIdentification class (ISO 19115-1, B.2.14)

The EIP profile restricts the use of service metadata to what are commonly thought of as ‘processing services’—services that take input information and perform some sort of processing to produce a desired output that is returned to the client or causes a change in some resource on the server. Read-only data access services (like OGC WMS, WFS, WCS, or OpenDAP, as commonly used) are treated as distributions of the datasets they offer. A data access service offers the equivalent of http GET operations, typically with some filtering capability to subset the data that are returned. If these services also offer create, delete, update or other operations on a set of resources, then the use of service metadata to document these capabilities is warranted. Metadata records describing a service resource must, at a minimum, specify the service type and a service end point URL. In most cases, providing the service protocol version and a citation to the applicable service profile will be useful or necessary for client applications to use the service. The recommended practice for EIP service metadata is that if only one end point URL is provided using distributionInfo, the URL retrieves a service-specific, self-description document like OGC GetCapabilities, a [Swagger](#) document, a WSDL document, or THREDDS catalog document.

SV_OperationMetadata elements can be used to describe operations offered by the service if there is no self-description request and document type defined by the service.

4.6.1 Basic Service Characteristics

Definition: Elements specifying the service protocol type, version of the protocol, and if necessary the profile to which a service conforms.

The service type must be specified using the specific strings defined in a service protocol specification as well as the service profile version, if applicable. In practice, specification of a base service specification and version (e.g., WFS 1.1.1) may be insufficient to provide client software enough information to use a service offering, and a specific profile of the service may need to be specified using a citation in the profile element. For instance, the service may utilize WaterML 2.0 as the query schema, and for xml encoding of response documents. Individual service profile specification documents should mandate the exact profile title and identifier string value that must be used in the citation to the profile for client software parsing the metadata to identify a particular service profile implementation.

4.6.1.1 Content Specifications

UML root path: MD_Metadata.identificationInfo.SV_ServiceIdentification¹

¹ **Reference Obligation:** Conditional² (raised from Optional in ISO 19115-1)

² Required if metadataScope is “service”.

Line	Name	Obligation	Cardinality	Datatype	Domain
301	serviceType name	Mandatory	1	GenericName	Free text ³
301	serviceType nameSpace	Mandatory	1	GenericName	Free text ³
302	serviceTypeVersion	Conditional ⁴	N	CharacterString	Free text
362	profileTitle	Conditional ⁴	1	CharacterString	Free text
433	profileIdentifier	Conditional ⁴	1	CharacterString	URI ⁵

³ See *Implementation Notes* below for source of recommended strings to use in these elements.

⁴ If multiple versions of the base service type and applicable profile are defined.

⁵ EIP restricts text to URI syntax, per IETF RFC 1738 and IETF RFC 3986.

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.6.1.1.1 Normative Notes

Obligation of **serviceTypeVersion** was raised from optional in ISO 19115-1 to conditional in the EIP; if multiple versions of the service type and profile are defined, then **serviceTypeVersion** must be provided.

Obligation of **profile/CI_Citation** was raised from optional to conditional to require that a citation to a service profile is provided if the service conforms to a particular profile.

4.6.1.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/srv:SV_ServiceIdentification
serviceType name	+/srv:serviceType/gco:ScopedName
serviceType namespace	+/srv:serviceType/ gco:ScopedName /@namespace
serviceTypeVersion	+/srv:serviceTypeVersion/gco:CharacterString
profileTitle	+/srv:profile/cit:CI_Citation/cit:title/gco:CharacterString
profileIdentifier	+/srv:profile/cit:CI_Citation/cit:identifier/mcc:MD_Identifier/mcc:code/gco:CharacterString
2006 specification implementation	<i>Note that service metadata in this version requires use of the APISO schema from OGC</i>
service type name	+/serviceType/LocalName
namespace	+/serviceType/LocalName/@codespace
version	+/serviceTypeVersion/gco:CharacterString
Automation considerations	

4.6.1.2.1 Implementation Notes

See <https://github.com/OSGeo/Cat-Interop/blob/master/LinkPropertyLookupTable.csv> for a community-developed set of recommended strings for use to specify service Type name in metadata documents. The value in the ‘identifier’ column of that table is the string that should appear in the **serviceType/Generic-Name/name** element. If these values are used, the recommended serviceType namespace value is “https://github.com/OSGeo/Cat-Interop”.

In the 2006 version, the profile citation is not available, so the service type name must encode profile identification as well as base service protocol identification.

4.6.1.2.2 Examples

```

<srv:SV_ServiceInformation>
  ...other elements
  <srv:serviceType>
    <!--note that gco:ScopedName is the only element defined in the substitution group for gco:AbstractGeneric-
    Name, which is the data type specified for the serviceType property value. -->
    <gco:ScopedName codeSpace="https://github.com/OSGeo/Cat-Interop">
      OGC:WPS
    </gco:ScopedName>
  </srv:serviceType>
  <srv:serviceTypeVersion>
    <gco:CharacterString>1.0.0</gco:CharacterString>
  </srv:serviceTypeVersion>
  ...other elements...
  <srv:profile>
    <cit:CI_Citation>
      <cit:title>USGIN transformation service profile</cit:title>
      <cit:identifier>
        <mcc:MD_Identifier>
          <mcc:code>
            <gco:CharacterString>http://resource.usgin.org/uri-gin/profile
            /WPS648</gco:CharacterString>
          </mcc:code>
        </mcc:MD_Identifier>
      </cit:identifier>
    </cit:CI_Citation>
  </srv:profile>
</srv:SV_ServiceInformation>

```

```
</srv:profile>  
</srv:SV_ServiceInformation>
```

2006 example (ISO 19139, APISO schema):

```
<gmd:SV_ServiceInformation>  
  ...other elements...  
  <srv:serviceType>  
    <gco:LocalName codeSpace="http://resources.usgin.org/registry/service-  
      Type201001">OGC:WPS USGIN Transaction WPS profile </gco:LocalName>  
  </srv:serviceType>  
  <srv:serviceTypeVersion>  
    <gco:CharacterString>1.0.0</gco:CharacterString>  
  </srv:serviceTypeVersion>  
  ...other elements...  
</gmd:SV_ServiceInformation>
```


4.6.2 Coupled Datasets

Definition: The `couplingType` and `operatedDataset` properties are used in conjunction to document datasets that are coupled to a particular service. Coupling may be ‘tight’, ‘loose’, or ‘mixed’; these terms specify the degree to which the service is bound to one or more particular datasets.

4.6.2.1 Content Specifications

UML root path: MD_Metadata.identificationInfo.SV_ServiceIdentification¹

¹ **Reference Obligation:** Conditional² (unchanged from ISO 19115-1)

² Required if coupled resource exists.

Line	Name	Obligation	Cardinality	Datatype	Domain
304	<code>couplingType</code> ¹	Mandatory	1	CodeList	SV_CouplingType
362	<code>datasetTitle</code>	Conditional ³	N	CharacterString	Free text
433	<code>datasetIdentifier</code>	Conditional ³	N	CharacterString	URI ⁴

³ Required if `SV_CouplingType` = “tight” or “mixed”.

⁴ EIP restricts text to URI syntax, per IETF RFC 1738 and IETF RFC 3986.

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.6.2.1.1 Normative Notes

ISO 19115-1 enables two different approaches to documenting coupling between a service and a dataset. The `operatedDataset` property can be used to specify a `CI_Citation` element citing the coupled dataset, or the `operatesOn` property can be used to provide a separate `MD_DataIdentification` element describing the coupled dataset. One of the basic provisions of the EIP profile is that a metadata record is about a single resource, and that resource is identified by a single `MD_Identifier`–substitution group element. This precludes the inclusion of `SV_ServiceIdentification` and `MD_DataIdentification` instances in the same metadata record and is incompatible with the `operatesOn` approach; thus, this profile mandates that documentation of service-dataset coupling must use `operatedDataset/CI_Citation`. Any tightly coupled datasets associated with the service should be documented inline by an `operatedDataset/CI_Citation` element. If particular service operations are coupled to particular datasets, these association are specified as described in section 4.6.5 Coupled Operations and Datasets.

EIP makes the `couplingType` element mandatory and, if coupling is tight or mixed, requires at least one `operatedDataset/CI_Citation`.

4.6.2.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/srv:SV_ServiceIdentification
<code>coupling type</code>	<code>+/srv:couplingType/srv:SV_CouplingType/@codelistValue</code>
<code>datasetTitle</code>	<code>+/srv:operatedDataset/cit:CI_Citation/cit:title/gco:CharacterString</code>
<code>datasetIdentifier</code>	<code>+/srv:operatedDataset /cit:CI_Citation/cit:identifier/mcc:MD_Identifier/mcc:code/gco:CharacterString</code>
2006 specification implementation	Coupling type element is the same, but mandatory in all cases. If operated dataset citation is not available, link must be through coupledResource identifier, which requires exactly one identifier and operationName character string for each instance.
<code>datasetIdentifier</code>	<code>+/coupledResource/SV_CoupledResource/identifier/gco:CharacterString</code>
<code>operationName</code>	<code>+/coupledResource/SV_CoupledResource/operationName/gco:CharacterString</code>
Automation considerations	Default to ‘loose’ unless there are tightly coupled datasets that are useful to describe.

4.6.2.2.1 Implementation Notes

Tightly coupled datasets participate in all service operations, and the implication is that the service does not operate with any other data. Loose coupling implies that service invocation may include specification of a dataset provided by the client that the service will operate on. Mixed coupling implies that one or more datasets are internally available for service operation, but the client may provide their own data as

well. Note that many tightly coupled services are data access services that provide read-only access to one or more datasets. The EIP profile mandates that such services should be documented as distributions of the dataset in a metadata records documenting the dataset (having a single **MD_DataIdentification** element). If a service offers operations besides 'read', (e.g. 'update', 'delete', 'create'...) on a tightly coupled dataset, then documentation via a service metadata record is warranted. Even in this case the service 'read' operations should be documented in the **distributionInformation** section of the (separate) metadata record that documents the coupled dataset.

For services with tightly coupled datasets, the **operatedDataset/CI_Citation/title/CharacterString** element must provide the title of the dataset exactly as it appears in the **MD_DataIdentification/citation/CI_Citation/title/CharacterString** of metadata records documenting the dataset. The **operatedDataset/CI_Citation/identifier/MD_Identifier/code/CharacterString** should be identical with the **code/CharacterString** value of in metadata records documenting the dataset. Ideally this identifier string can be de-referenced to obtain either a metadata record for the dataset or the content of the dataset. A link to the metadata record for the dataset may be provided using the **operatedDataset/CI_Citation/onlineResource** as well.

Examples

```

<srv:SV_ServiceIdentification>
...other elements...
  <srv:couplingType>
    <srv:SV_CouplingType codeList= "http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#SV_CouplingType"
      codeListValue="tight">tight</srv:SV_CouplingType>
    </srv:couplingType>
...citation to a coupled resource...
  <srv:operatedDataset>
    <cit:CI_Citation>
      <cit:title>Digital geologic data for White Tank Mountains</cit:title>
      <cit:identifier>
        <mcc:MD_Identifier>
          <mcc:code>
            <gco:CharacterString>http://resource.usgin.org/urigin/data/WT4667
            </gco:CharacterString>
          </mcc:code>
        </mcc:MD_Identifier>
      </cit:identifier>
      <cit:onlineResource>
        <cit:CI_OnlineResource>
          <cit:linkage>
            <gco:CharacterString>http://metadata.usgin.org/record/a43q42ulri
            </gco:CharacterString>
          </cit:linkage>
          <cit:name>
            <gco:CharacterString> metadata record for linked resource; content negotiation
            should provide different formats.</gco:CharacterString>
          </cit:name>
          <cit:function>
            <cit:CI_OnLineFunctionCode codeList="" codeListValue="information">
              Information</cit:CI_OnLineFunctionCode>
            </cit:function>
          </cit:CI_OnlineResource>
        </cit:onlineResource>
      </cit:CI_Citation>
    </srv:operatedDataset>

```

... other coupled datasets may be indicated. Citation online resource should be a URI that identifies the dataset, and ideally should be dereferenceable to obtain dataset metadata or to access the data...

...other metadata elements (including profile if applicable)...

<sv:SV_ServiceIdentification>

2006 example (ISO 19139):

Service metadata is not implemented by ISO 19139.

4.6.3 Service Distribution

Definition: Information to access service-specific description documents typically provided as a starting point for use of the service.

For the purposes of service metadata, EIP considers ‘distribution’ to consist of information that will allow a user to access the service, ideally encoded in a structured fashion such that access to the service can be implemented by software with a minimum of user input. Virtually all existing service implementations include some basic operation to provide a response document that describes the service (e.g., WSDL, OGC GetCapabilities, openSearchDescription). Client applications that use the service will typically know how to interpret and use information in the service description document, so a URL that will access this resource is normally sufficient to allow a client to automate access to the service. Both **SV_Service-Identification/containsOperations/SV_OperationMetadata/connectPoint** and **MD_Metadata/distribution-Information/./MD_DigitalTransferOptions/onLine** elements in service metadata have been used by existing ISO-metadata implementations to provide linkage information to access service self-description information like OGC Capabilities, WSDL, or openSearchDescription. For maximum compatibility with existing implementations, the EIP mandates inclusion of such linkage information in both parts of the service metadata record. Because the same **CI_OnlineResource** element content may be used in both locations in a metadata document, this introduces no additional data entry requirements, and the additional "fat" in the metadata document will be invisible to users in any user-friendly interface, while making life easier for application developers (fewer places to look for required information in the xml). In addition, because the EIP implements associations from a dataset to a service providing that dataset using the same **MD_Metadata/distributionInformation/./MD_DigitalTransferOptions/onLine** elements, these same client components can be used to navigate from a dataset metadata record to a service providing the data.

4.6.3.1 Content Specifications

UML root path: MD_Metadata.distributionInfo.MD_Distribution¹

¹ **Reference Obligation:** Conditional² (raised from Optional in ISO 19115-1)

² Required if metadataScope is “service”.

Line	Name	Obligation	Cardinality	Datatype	Domain
406	linkage	Mandatory	1	CharacterString	Text restricted to URL (see IETF RFC 3986) ³
409	linkageName	Optional	1	CharacterString	Free text

³ Per ISO 19115-1.

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.6.3.1.1 Normative Notes

EIP proposes to follow the INSPIRE (INSPIRE 19115/119, 2009) guideline to use a **distribution-Info/./transferOptions/./online/./linkage** element to point to a service-defined, self-description document.

To identify the linkage element that locates the service description document, EIP strongly recommends including **CI_OnlineResource/name/CharacterString = "Service description"** and **cit:function/cit:CI_OnlineResource/@codeListValue="information"** in the **CI_OnlineResource** element with the linkage to the service description.

4.6.3.2 XML Implementation

XPath root	/MD_Metadata/distributionInfo/mrd:MD_Distribution/
linkage	+/mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:onLine/cit:CI_OnlineResource/cit:linkage/gco:CharacterString
linkageName	+/mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:onLine/cit:CI_OnlineResource/cit:name/gco:CharacterString

2006 specification implementation	Same.
Automation considerations	Duplicates content that should also appear in <code>srv:SV_OperationMetadata/srv:connectPoint/cit:CI_OnlineResource/</code> where the <code>operationName</code> is the request used to retrieve the service description document.

4.6.3.2.1 Implementation Notes

WSDL and `getCapabilities` documents were designed to describe service operation according to specific service architectures (WS and OGC), and it seems counterproductive to invent another scheme to do the same thing. Because of the difficulty in creating and using a generic abstract model that accounts for any and all possible service protocols and configurations, it makes more sense to use service description documents specific to different service frameworks defined by the developers of those frameworks. It may also be useful to provide a mapping between `ServiceType` and the kinds of document the `CI_OnlineResource/linkage` URL locates.

4.6.3.2.2 Example

```

<mdb:distributionInfo>
  <mrd:MD_Distribution>
    <mrd:transferOptions>
      <mrd:MD_DigitalTransferOptions>
        <mrd:onLine>
          <cit:CI_OnlineResource>
            <cit:linkage>
              <cit:CharacterString>http://services.azgs.az.gov/arcgis/services/aasg-
                geothermal/WellHeaders/MapServer/WMSServer?request=
                GetCapabilities&service=WMS</cit:CharacterString>
            </cit:linkage>
            <cit:name>
              <gco:CharacterString>Service description</gco:CharacterString>
            </cit:name>
            <cit:function>
              <cit:CI_OnLineFunctionCode codeList=" http://stand-
                ards.iso.org/iso/19115/resources/Codelist/cat/codel-
                ists.xml#CI_OnlineFunctionCode" codeListValue="information">
                Information</cit:CI_OnLineFunctionCode>
            </cit:function>
          </cit:CI_OnlineResource>
        </mrd:onLine>
      </mrd:MD_DigitalTransferOptions>
    </mrd:transferOptions>
  </mrd:MD_Distribution>
</mdb:distributionInfo>

```

4.6.4 Service Operations Metadata

Definition: Description of service operations, and information necessary to invoke them.

Each service operation element describes the signature of one and only one method provided by the service. The signature includes a minimum of three elements:

operationName: A unique identifier for the service interface.

DCP: One or more Distributed Computing Platforms (DCP) on which the interface has been implemented

Linkage: URL for accessing the service interface.

4.6.4.1 Content Specifications

UML root path: MD_Metadata.identificationInfo.SV_ServiceIdentification.containsOperations¹.
SV_OperationMetadata

¹ **Reference Obligation:** Conditional² (raised from Optional in ISO 19115-1)

² Required if metadataScope is "service".

Line	Name	Obligation	Cardinality	Datatype	Domain
313	operationName	Mandatory	1	CharacterString	Free text
314	DCP	Mandatory	N	CodeList	DCPlist
406	linkage	Mandatory	1	CharacterString	Text restricted to URL (see IETF RFC 3986) ³

³ Per ISO 19115-1.

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.6.4.1.1 Normative Notes

The EIP requires at least one **SV_OperationMetadata** element in service identification metadata, which requires exactly one **operationName**, at least one **distributedComputingPlatform/DCPlist** codelist value and at least one **connectPoint/CI_OnlineResource**; each online resource element requires exactly one **linkage/CharacterString**, with the provision that if only one operation is described in the metadata, it must be the service's self-description operation, e.g., GetCapabilities for an OGC service, and the associated linkage must be a valid URL that will retrieve the self-description document (e.g., capabilities, wsdl...) for the service. This one operation description is made mandatory for better interoperability with existing applications designed with the assumption that the service description end point will be specified in an operation metadata element.

4.6.4.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/srv:SV_ServiceIdentification/srv:containsOperations / srv:SV_OperationMetadata
operationName	+/srv:operationName/gco:CharacterString
DCP	+/srv:distributedComputingPlatform/srv:DCPlist/@codelistValue
linkage	+/srv:connectPoint/cit:CI_OnlineResource/cit:linkage/gco:CharacterString
2006 specification implementation	Same, except linkage element is 'URL', not 'URI'
linkage	+/connectPoint/CI_OnlineResource/linkage/gco:CharacterString
Automation considerations	Necessary information should be obtainable by parsing the service self-description document.

4.6.4.2.1 Implementation Notes

To identify the linkage element that locates the service description document, EIP strongly recommends including **CI_OnlineResource/name/CharacterString = "Service description"** and **cit:function/cit:CI_OnlineResource/@codeListValue="information"** in the **CI_OnlineResource** element with the linkage to the service description.

EIP recommendation is that service-specific, self-description documents are a better approach to operation metadata than attempting a full, generic abstract model in the metadata standard. Some of the issues with using `srv:SV_OperationMetadata` for describing services are noted in the comments in the example in the next section.

4.6.4.2.2 Example

Example documentation of a service self-description document.

```
<srv:containsOperations>
  <srv:SV_OperationMetadata id="kj4w5378">
    <srv:operationName>
      <gco:CharacterString>getCapabilities</gco:CharacterString>
    </srv:operationName>
    <srv:distributedComputingPlatform>
      <srv:DCPList codeList="" codeListValue="HTTP"/>
    </srv:distributedComputingPlatform>
    <srv:invocationName>
      <gco:CharacterString>getCapabilities</gco:CharacterString>
    </srv:invocationName>
    <srv:connectPoint>
      <cit:CI_OnlineResource>
        <cit:linkage>
          <cit:CharacterString>http://services.azgs.az.gov/arcgis/services/aasg-geothermal/WellHeaders/MapServer/WMServer?request=GetCapabilities&service=WMS</cit:CharacterString>
        </cit:linkage>
        <cit:name>
          <gco:CharacterString>Service description</gco:CharacterString>
        </cit:name>
        <cit:function>
          <cit:CI_OnLineFunctionCode codeList=" http://standards.iso.org/iso/19115/resources/Codelist/cat/codellists.xml#CI_OnlineFunctionCode" codeListValue="information">
            Information</cit:CI_OnLineFunctionCode>
          </cit:function>
        </cit:CI_OnlineResource>
      </srv:connectPoint>
    </srv:SV_OperationMetadata>
  </srv:containsOperations>
```

Example documentation of a specific operation with parameters.

```
<srv:containsOperations>
  <srv:SV_OperationMetadata id="kj4w0369">
    <srv:operationName>
      <gco:CharacterString>CreateStoredQuery</gco:CharacterString>
    </srv:operationName>
    <srv:distributedComputingPlatform>
      <srv:DCPList codeList="" codeListValue="HTTP"/>
    </srv:distributedComputingPlatform>
    <srv:invocationName>
      <gco:CharacterString>CreateStoredQuery</gco:CharacterString>
    </srv:invocationName>
    <srv:connectPoint>
      <cit:CI_OnlineResource>
        <cit:linkage>http://Energistics.org/empty/WPS</cit:linkage>
        <cit:name>
          <gco:CharacterString>Energistics demo OGC web processing service

```

```

        </gco:CharacterString>
    </cit:name>
    <cit:protocolRequest>
        <gco:CharacterString>POST</gco:CharacterString>
    </cit:protocolRequest>
</cit:CI_OnlineResource>
</srv:connectPoint>
<srv:parameter>
    <srv:SV_Parameter>
        <srv:name>
            <gco:MemberName>
                <gco:aName>
                    <gco:CharacterString>title</gco:CharacterString>
                </gco:aName>
                <gco:attributeType gco:nilReason="inapplicable"/>
            </gco:MemberName>
        </srv:name>
        <srv:direction>
            <srv:SV_ParameterDirection>in</srv:SV_ParameterDirection>
        </srv:direction>
<!-- The ISO 19119 model does not include fields for specifying the parameter domain-->
        <srv:description>
            <gco:CharacterString>other important information for understanding the parame-
ter.</gco:CharacterString>
        </srv:description>

<!-- the ISO19119 documentation does not make it clear how the true and false values are supposed to be inter-
prete. For the EIP profile, we recommend that 'false' indicate that the parameter is not optional, i.e. its minimum
cardinality is 1. -->
        <srv:optionality>
            <gco:Boolean>>true</gco:Boolean>
        </srv:optionality>

<!-- the ISO19119 documentation does not make it clear how the true and false values are supposed to be inter-
prete. For the EIP profile, we recommend that 'false' indicate that the parameter is not repeatable, i.e. its maxi-
mum cardinality is 1. Based on these conventions, the cardinality of the parameter in this example is 0..1-->
        <srv:repeatability>
            <gco:Boolean>>false</gco:Boolean>
        </srv:repeatability>
    </srv:SV_Parameter>
</srv:parameter>
<!-- other parameters of the WPS CreateStoredQuery operation are not included in this example ....-->
</srv:SV_OperationMetadata>
</srv:containsOperations>

```


4.6.5 Coupled Operations and Datasets

Definition: Specification of a dependency between one or more datasets and a specific operation in the service implementation.

If the service `couplingType/SV_CouplingType` is 'tight' or 'mixed', the implication is that there are specific datasets used by the service. These are specified by `operatedDataset/CI_Citation` elements (see section 4.5.2 Coupled Datasets). If one or more of these datasets are accessed only through one or more specific service operations, or if a dataset is accessed using a name that is different from the dataset name (e.g. feature type name in an OGC:WFS, specific process in an OGC:WPS), explicit binding of a name, operation, and dataset are documented using `SV_CoupledResource`. EIP mandates that operations that are so coupled be identified using in-line content in `SV_ServiceIdentification/containsOperations/SV_OperationMetadata` and the coupled datasets identified using in-line content in `SV_ServiceIdentification/operatedDataset/CI_Citation` elements. The `SV_CoupledResource/resourceReference` elements should use an internal document href to link to the dataset `CI_Citation`. The `SV_CoupledResource/operation` element should use an internal document reference to link to the appropriate `SV_OperationMetadata` element. Figure 8 shows this implementation pattern graphically.

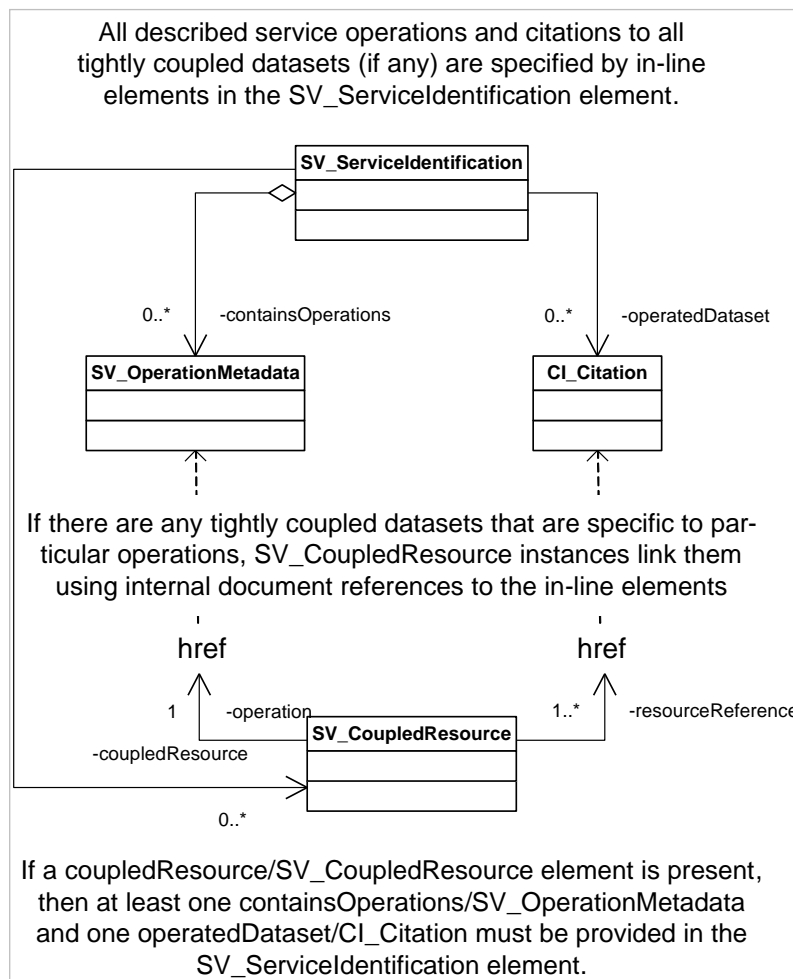


Figure 8. Implementation pattern for coupled resources.

4.6.5.1 Content Specifications

UML root path: MD_Metadata.identificationInfo.SV_ServiceIdentification.coupledResource¹.-SV_CoupledResource

¹ **Reference Obligation:** Conditional² (unchanged from ISO 19115-1)

² Required if metadataScope is “service” and a coupled resource exists.

Line	Name	Obligation	Cardinality	Datatype	Domain
331	scopedName	Optional	1	ScopedName	Free text
332	resourceReference	Mandatory	N	xlink:href	CI_Citation
334	operation	Mandatory	1	xlink:href	SV_OperationMetadata

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.6.5.1.1 Normative Notes

EIP changes optionality of **SV_CoupledResource** from optional to conditional, required if tight coupling with a resource is specific to a particular service operation. To enable some interoperable functionality, EIP mandates that at least one identifier for a target resource (**resourceReference**) must be present in a **SV_CoupledResource** element. Reference to this resource under the specified operation uses a specific name in the scope of the service, specified by the **scopedName**. If resources that the service operates on are not specific to particular operations, then **SV_CoupledResource** elements are unnecessary.

Each **SV_CoupledResource** element is required to have exactly one service operation element, and the EIP mandates that each **SV_CoupledResource** element identify at least one dataset acted on by the operation through a **resourceReference/@xlink:href** attribute that is an internal document reference to an **operatedDataset/CI_Citation** element. The operation associated with the coupled resource must already be identified through a **SV_ServiceIdentification/containsOperations/SV_OperationMetadata** element, and the **SV_CoupledResource/operation/@xlink:href** attribute is an internal document reference to this element.

4.6.5.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/srv:SV_ServiceIdentification/srv:coupledResource/-srv:SV_CoupledResource
scopedName	+ /srv:scopedName/ScopedName
resourceReference	+ /srv:resourceReference/@xlink:href
operation	+ /srv:operation/@xlink:href
2006 specification implementation	MD_Metadata/identificationInfo/SV_ServiceIdentification/coupledResource/-SV_CoupledResource
scopedName	+ /ScopedName
resourceReference	+ /identifier/gco:CharacterString
operation	+ /operationName/gco:CharacterString
Automation considerations	

4.6.5.2.1 Implementation Notes

For tightly coupled or mixed coupling services, the datasets operated on by the service should all be identified using **operatedDataset/CI_Citation**. The **CI_Citation/identifier** should be the same string as the **MD_Information/citation/CI_Citation/identifier** in the metadata record for the dataset. These identifiers are the basis for linking the resources, allowing navigation from the service metadata record to metadata records for the datasets provided by the service. If there is concern that client applications might not be xlink-aware, the **SV_CoupledResource/operation** element may duplicate the existing **SV_Operation-Metadata** entity, and the **SV_CoupledResource/resourceReference** may duplicate the existing **SV_ServiceInformation/operatedDataset/CI_Citation** element.

The identification of the related dataset is specified by a **CI_Citation/identifier/MD_Identifier/code/-CharacterString** element. Multiple dataset associations may be specified in a single **SV_Coupled-**

Resource to specify a binding of multiple datasets under a single service operation. The provided identifier for each dataset should identify the coupled dataset, not a metadata record describing the dataset. The **CI_Citation/onlineResource** property of the dataset citation may provide a link to a metadata record for the coupled dataset.

In the 2006 version, each **SV_CoupledResource** element may only have one operation name and one dataset identifier. Thus, if there are multiple dataset-operation bindings, each requires a separate **SV_CoupledResource** element. The OGC 07-045 application profile for ISO metadata using CSW 2.0.2 extends **SV_CoupledResource** with a **ScopedName**, defined as a scoped identifier of the resource in the context of the given service instance (e.g., featureTypeName) if the use of a scoped (service-operation specific) name is necessary for users to generate service requests based on ISO service metadata.

4.6.5.2.2 Examples

```

<srv:SV_ServiceIdentification>
.... Other service metadata elements...
  <srv:coupledResource>
    <srv:SV_CoupledResource>
      <srv:scopedName>
        <gco:ScopedName codeSpace="http://resources.azgs.az.gov/term/wmslayer/">
          azgs:faults</gco:ScopedName>
        </srv:scopedName >
<!-- the href's in the following elements link to operatedDataset/CI_Citation and to containsOperations/SV_OperationMetadata entities in the same metadata document --!>
        <srv:resourceReference xlink:href="#T63464"/>
        <srv:operation xlink:href="#O436754" >
      </srv:SV_CoupledResource >
    </srv:coupledResource >
.... Other service metadata elements...
  </srv:SV_ServiceIdentification>

...coupled resource in line is also allowed (see 4.6.5 Coupled Operations and Datasets)...
<srv:coupledResource>
  <srv:SV_CoupledResource>
    <srv:resourceReference>
      <cit:CI_Citation>
        <cit:title>
          <gco:CharacterString>Digital geologic data for White Tank Mountains
          </gco:CharacterString>
        </cit:title>
        <cit:identifier>
          <mcc:MD_Identifier>
            <mcc:code>
              <gco:CharacterString>http://resource.usgin.org/urigin/data/WT4667
              </gco:CharacterString>
            </mcc:code>
          </mcc:MD_Identifier>
        </cit:identifier>
      </cit:CI_Citation>
    <srv:resourceReference>
<!--operation may be specified in line as well, but this example uses the internal document reference -->
    <srv:operation xlink:href="#O436754" >
  <srv:SV_CoupledResource>
<srv:coupledResource>

```

2006 example (ISO 19139):

```
<srv:coupledResource>
  <srv:SV_CoupledResource>
    <srv:operationName>
      <!-- the CharacterString MUST match the operationName/CharacterString for an SV_OperationMetadata ele-
      ment in the same metadata instance --!>
      <gco:CharacterString>GetMap</gco:CharacterString>
    </srv:operationName>
    <srv:identifier>
      <!-- URI for coupled dataset. This MUST match the CI_Citation/identifier code for the coupled dataset.--!>
      <gco:CharacterString>http://resource.usgin.org/data/246327765</gco:CharacterString>
    </srv:identifier>
    <gco:ScopedName>azgs:earthfissures</gco:ScopedName>
  </srv:SV_CoupledResource>
</srv:coupledResource>
```

4.7 Spatial Information

The EIP increases some requirements of ISO 19115-1 for metadata documenting the spatial characteristics of resources identified as “geolocated,” but retains the obligation of the base standard that such metadata are only mandatory for resources identified with scopeCode “dataset.” The characteristics included in the EIP are those related to spatial extent, representation, reference system, and resolution.

Note that some resources may include component resources with different spatial characteristics. Consider, for example, an Esri ArcGIS Geodatabase containing point, line, polygon and grid feature classes. Because ISO 19115-1 makes no provision for documenting the content and spatial representation characteristics of each feature type, these would need to be described in multiple **MD_Metadata** instances using **MD_AssociatedResource** elements to link them to the geodatabase as an aggregated resource. To be interoperable, such an approach would need a detailed profile description, which is not provided here. As an interim measure, the EIP profile recommends that the aggregated resource (e.g., Esri ArcGIS Geodatabase) SHOULD be described by documentation identified by a **contentInfo/MD_FeatureCatalogue-Description/featureCatalogueCitation/CI_Citation** element.

4.7.1 Spatial Representation

Definition: Information specifying how data items are associated with location.

The EIP requires, if dataset objects are gridded, **MD_GridSpatialRepresentation** or one of its sub-types (**MD_Georectified** or **MD_Georeferenceable**). If point or vector objects exist in the dataset, then **MD_VectorSpatialRepresentation** is required. If **MD_VectorSpatialRepresentation** is used, then **spatialRepresentationInfo/MD_VectorSpatialRepresentation/geometricObjects** shall be provided. Spatial data representation content is derived from ISO 19107.

4.7.1.1 Content Specification

UML root path: MD_Metadata.identificationInfo.MD_Identification

¹ **Reference Obligation:** Conditional² (raised from Optional in ISO 19115-1)

² Required if metadataScope is “dataset”.

4.7.1.1.1 Content required for Geolocated Data Represented in Any Form

Line	Name	Obligation	Cardinality	Datatype	Domain
49	<u>spatialRepresentation-Type</u> ¹	Mandatory	N	CodeList	MD_SpatialRepresentation-TypeCode
148	gridRepresentation ³	Conditional ⁴	N	Class	MD_GridSpatialRepresentation (see §4.6.1.1.2)
167	vectorRepresentation ³	Conditional ⁵	N	Class	MD_VectorSpatialRepresentation (see §4.6.1.1.3)

³ For UML root path to this element, see section below for corresponding Domain.

⁴ Required if Count(SpatialRepresentationType=“grid”) > 0.

⁵ Required if Count(SpatialRepresentationType=“vector”) > 0.

4.7.1.1.2 Content for Geolocated Data Represented in Grid Form

UML root path: MD_Metadata.spatialRepresentationInfo.MD_GridSpatialRepresentation

Line	Name	Obligation	Cardinality	Datatype	Domain
176	numberOfDimensions	Mandatory	1	Integer	Integer
198	axisDimensionName	Mandatory	N	CodeList	MD_DimensionNameTypeCode
199	axisDimensionSize	Mandatory	N	Integer	Integer
178	cellGeometry	Mandatory	1	CodeList	MD_CellGeometryCode
179	transformation-Parameter-Availability	Mandatory	1	Boolean	1 = yes; 0 = no

4.7.1.1.3 Content for Geolocated Data Represented in Vector Form

UML root path: MD_Metadata.spatialRepresentationInfo.MD_VectorSpatialRepresentation

Line	Name	Obligation	Cardinality	Datatype	Domain
204	geometricObjectType	Mandatory	1	CodeList	MD_Geometric-ObjectTypeCode

NOTE: Organization of the tables above is described in the introduction of Section 4.1.1, page 33.

4.7.1.1.4 Normative Notes

Obligation for attributes in the various spatial representation element types is the same as in the base standard. EIP adds condition that if the described resource is geolocated, then spatial representation metadata is mandatory. Content documenting data in grid form requires a paired instance of (**axisDimensionName**, **axisDimensionSize**) for each grid dimension as indicated by the **numberOfDimensions** property. If the resource is a dataset that is not geolocated, the **spatialRepresentationType** must be populated with **gco:nilReason="inapplicable"**.

4.7.1.2 XML Implementation

XPath root	MD_Metadata
spatialRepresentation-Type	+/identificationInfo/*identification/mri:spatialRepresentationType/mcc:MD_SpatialRepresentationTypeCode
Grid Representation	+/spatialRepresentationInfo/msr:MD_GridSpatialRepresentation
numberOfDimensions	+/msr:numberOfDimensions/gco:Integer
axisDimensionName	+/msr:axisDimensionProperties/msr:MD_Dimension/msr:dimensionName/-msr:MD_DimensionNameTypeCode
axisDimensionSize	+/msr:axisDimensionProperties/msr:MD_Dimension/msr:dimensionSize/-gco:Integer
cellGeometry	+/msr:cellGeometry/msr:MD_CellGeometryCode
transformation-ParameterAvailability	+/msr:transformationParameterAvailability/gco:Boolean
Vector Representation	+/spatialRepresentationInfo/msr:MD_VectorSpatialRepresentation
geometricObjectType	+/msr:geometricObjects/msr:MD_GeometricObjects/msr:geometricObjectType/msr:MD_GeometricObjectTypeCode
2006 specification implementation	Same.
Automation considerations	Automatically populated by GIS or image-management software.

Either the grid or vector representation properties will be used in a particular **MD_SpatialRepresentation** instance. Other subtypes of grid spatial representation (**MD_Georectified**, or **MD_Georeferenceable**) inherit the required elements and may be used.

4.7.1.2.1 Implementation Notes

ISO 19115-1 includes numerous other properties that may be used to further specify the geometric representation. The EIP required content is the minimum considered necessary to provide a metadata consumer a useful means to evaluate the nature of a spatial dataset.

4.7.1.2.2 Examples

For gridded data:

```
<msr:MD_GridSpatialRepresentation>
  <msr:numberOfDimensions>
    <gco:Integer>2</gco:Integer>
  </msr:numberOfDimensions>
  <msr:axisDimensionProperties>
    <msr:MD_Dimension>
      <msr:dimensionName>
```

```

        <msr:MD_DimensionNameTypeCode codeList= " http://standards.iso.org/iso/19115/re-
            sources/Codelist/cat/codelists.xml#MD_DimensionNameTypeCode"
            codeListValue="row">row</msr:MD_DimensionNameTypeCode>
    </msr:dimensionName>
    <msr:dimensionSize>2148</msr:dimensionSize>
</msr:MD_Dimension>
</msr:axisDimensionProperties>
<msr:axisDimensionProperties>
    <msr:MD_Dimension>
        <msr:dimensionName>
            <msr:MD_DimensionNameTypeCode codeList=" http://standards.iso.org/iso/19115/re-
                sources/Codelist/cat/codelists.xml#MD_DimensionNameTypeCode"
                codeListValue="column">column</msr:MD_DimensionNameTypeCode>
        </msr:dimensionName>
        <msr:dimensionSize>1024</msr:dimensionSize>
    </msr:MD_Dimension>
</msr:axisDimensionProperties>
<msr:cellGeometry>
    <msr:MD_CellGeometryCode codeList="http://standards.iso.org/iso/19115/resources/Codel-
        ist/cat/codelists.xml#MD_CellGeometryCode"
        codeListValue="point">point</msr:MD_CellGeometryCode>
</msr:cellGeometry>
<msr:transformationParameterAvailability>
    <gco:Boolean>true</gco:Boolean>
</msr:transformationParameterAvailability>
</msr:MD_GridSpatialRepresentation>
For vector data:
<msr:MD_VectorSpatialRepresentation>
    <msr:geometricObjects>
        <msr:MD_GeometricObjects>
            <msr:geometricObjectType>
                <msr:MD_GeometricObjectTypeCode codeList="http://standards.iso.org/iso/19115/re-
                    sources/Codelist/cat/codelists.xml#MD_DimensionNameTypeCode"
                    codeListValue="surface">surface</msr:MD_GeometricObjectTypeCode>
            </msr:geometricObjectType>
        </msr:geometricObjects>
    </msr:geometricObjects>
</msr:MD_VectorSpatialRepresentation>

```

4.7.2 Coordinate Reference System

Definition: Specification of the coordinate reference system (CRS) which is the basis of the coordinates used in the spatial representation of the data. Examples of such coordinates include latitude and longitude, or easting and northing.

The following definitions apply to the individual, simple elements:

code: An alphanumeric value identifying an instance in the Code Space.

code Space: An identifier or namespace in which the Code is valid, analogous to an OGC namespace authority.

version: A version identifier for the Code Space.

referenceSystemType: Type of spatial reference system identified.

4.7.2.1 Content Specification

UML root path: MD_Metadata.referenceSystemInfo¹.MD_ReferenceSystem

¹ **Reference Obligation:** Conditional² (raised from Optional in ISO 19115-1); multiple values allowed

² Required if Count(spatialRepresentationInfo) > 0.

Line	Name	Obligation	Cardinality	Datatype	Domain
433	code	Mandatory	1	CharacterString	Free text
434	codeSpace	Mandatory	1	CharacterString	Free text
435	version	Conditional ³	1	CharacterString	Free text
436	description	Optional	1	CharacterString	Free text
181	referenceSystemType	Optional	1	CodeList	MD_ReferenceSystemType Code

³ If multiple versions of Code exist within the specified Code Space.

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.7.2.1.1 Normative Notes

The coordinate reference system (CRS) used to represent coordinate locations in the documented resource. Multiple referenceSystemInfo values may be provided in a metadata instance to enumerate available CRS options.

4.7.2.2 XML Implementation

XPath root	MD_Metadata/referenceSystemInfo/mrs:MD_ReferenceSystem
code	+/mrs:referenceSystemIdentifier/mrs:MD_ReferenceSystemIdentifier/mcc:MD_Identifier/mcc:code/gco:CharacterString
codeSpace	+/mrs:referenceSystemIdentifier/mrs:MD_ReferenceSystemIdentifier/mcc:MD_Identifier/mcc:codeSpace/gco:CharacterString
version	+/mrs:referenceSystemIdentifier/mrs:MD_ReferenceSystemIdentifier/mcc:MD_Identifier/mcc:version/gco:CharacterString
description	+/mrs:referenceSystemIdentifier/mrs:MD_ReferenceSystemIdentifier/mcc:MD_Identifier/mcc:description/gco:CharacterString
referenceSystemType	+/mrs:referenceSystemType/mrs:MD_ReferenceSystemTypeCode
2006 specification implementation	Same for Mandatory elements. Optional elements referenceSystemType and referenceSystemName not available in 2006.
Automation considerations	Automatically populated by GIS or image-management software.

4.7.2.2.1 Implementation Notes

The coordinate reference system documented by this element indicates the system to which coordinates in the resource are referenced. It may be different from the WGS 84 CRS which is mandatory in the specification of EX_Extent/geographicElement/EX_GeographicBoundingBox (see 4.7.3 below).

4.7.2.2.2 Examples

The following example documents the WGS 84 geographic 2D (latitude and longitude) CRS. Concatenation of the values assigned in the example to the `codeSpace` and `code` elements produces a URN conformant with the OGC URN Policy (www.opengeospatial.org/ogcUrnPolicy) and in which the OGC-recognized authority is EPSG Geodetic Parameter Dataset maintained by IOGP, abbreviated "EPSG":

```
<mdb:referenceSystemInfo>
  <mrs:MD_ReferenceSystem>
    <mrs:referenceSystemIdentifier>
      <mcc:MD_Identifier>
        <mcc:code>
          <gco:CharacterString>4326</gco:CharacterString>
        </mcc:code>
        <mcc:codeSpace>
          <gco:CharacterString>urn:ogc:def:crs:EPSG::</gco:CharacterString>
        </mcc:codeSpace>
        <mcc:version gco:nilReason="inapplicable">
        <mcc:description>
          <gco:CharacterString>WGS 84</gco:CharacterString>
        </mcc:description>
      </mcc:MD_Identifier>
    </mrs:referenceSystemIdentifier>
    <mrs:referenceSystemType>
      <mrs:MD_ReferenceSystemTypeCode codeList= "http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#MD_ReferenceSystemTypeCode" codeListValue="geodeticGeographic2D ">
      </mrs:MD_ReferenceSystemTypeCode>
    </mrs:referenceSystemType>
  </mrs:MD_ReferenceSystem>
</mdb:referenceSystemInfo>
```

2006 example (ISO 19139):

```
<gmd:referenceSystemInfo>
  <gmd:MD_ReferenceSystem>
    <gmd:referenceSystemIdentifier>
      <gmd:RS_Identifier>
        <gmd:code>
          <gco:CharacterString>4979</gco:CharacterString>
        </gmd:code>
        <gmd:codeSpace>
          <gco:CharacterString>urn:ogc:def:crs:EPSG::</gco:CharacterString>
        </gmd:codeSpace>
      </gmd:RS_Identifier>
    </gmd:referenceSystemIdentifier>
  </gmd:MD_ReferenceSystem>
  <gmd:referenceSystemType>
    <gmd:MD_ReferenceSystemTypeCode codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml-#MD_ReferenceSystemTypeCode" codeListValue="geodeticGeographic3D ">
    </gmd:MD_ReferenceSystemTypeCode>
  </gmd:referenceSystemType>
</gmd:referenceSystemInfo>
```

</gmd:referenceSystemInfo>

4.7.3 Spatial Extent

Definition: Specification of the horizontal geographic extent of the resource content using one or more bounding boxes specified by four bounding coordinates expressed in decimal degrees based on the WGS 84 geodetic datum:

westBoundLongitude: Western-most longitude coordinate of the limit of the resource extent (positive east).

eastBoundLongitude: Eastern-most longitude coordinate of the limit of the resource extent (positive east).

southBoundLatitude: Southern-most latitude coordinate of the limit of the resource extent (positive north).

northBoundLatitude: Northern-most latitude coordinate of the limit of the resource extent (positive north).

4.7.3.1 Content Specifications

UML root path: MD_Metadata.identificationInfo.MD_Identification.extent¹.EX_Extent.geographicElement.EX_GeographicBoundingBox

¹ **Reference Obligation:** Conditional² (modified version of Conditionality in ISO 19115-1)

² Required if metadataScope is "dataset" and identificationInfo.spatialRepresentationType is not nil with gco:nilReason="inapplicable".

Line	Name	Obligation	Cardinality	Datatype	Domain
345	westBoundLongitude	Mandatory	1	Decimal	[-180.0, 180.0] ³
346	eastBoundLongitude	Mandatory	1	Decimal	[-180.0, 180.0] ³
347	southBoundLatitude	Mandatory	1	Decimal	[-90.0, 90.0] ³
348	northBoundLatitude	Mandatory	1	Decimal	[-90.0, 90.0] ³

³ EIP recommends but does not require use of these domain ranges.

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.7.3.1.1 Normative Notes

EIP mandates that, for geolocated resources, at least one bounding box be provided that completely contains the geographic extent of the described resource projected to the Earth's surface as accurately as possible. Use of a single bounding box is recommended, though two bounding boxes may be preferred if the resource spans the international dateline (*i.e.*, longitude $\pm 180^\circ$). The CRS used for these coordinates must be WGS 84 (EPSG::4326). Use of the same CRS for the required bounding box in EIP metadata greatly facilitates simple search for resources in a particular area.

Per ISO 19115-1:2014, multiple bounding boxes (*i.e.*, instances of element geographicElement) may be specified per resource. The cardinality of one (1) specified for each element in the table above is per bounding box.

If place names are available to identify the geographic location of the described resource, rather than using EX_GeographicDescription element, EIP recommends use of descriptiveKeywords with KeywordTypeCode="Place". For an example, see 4.3.9.2.2, page 68.

4.7.3.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/*Identification/mri:extent/gex:EX_Extent/gex:geographicElement/gex:EX_GeographicBoundingBox/
westBoundLongitude	+/gex:westBoundLongitude/gco:Decimal
eastBoundLongitude	+/gex:eastBoundLongitude/gco:Decimal
southBoundLatitude	+/gex:southBoundLatitude/gco:Decimal
northBoundLatitude	+/gex:northBoundLatitude/gco:Decimal

2006 specification implementation	Same.
Automation considerations	Automatically populated by GIS or image-management software.

4.7.3.2.1 Implementation Notes

It is a requirement that bounding box coordinates are given in the WGS 84 coordinate reference system (EPSG CRS code 4326). The CRS to which coordinates in a resource are referenced (identified in clause 4.7.2 above) may be different. Bounding box is used for data discovery and for this purpose a resolution of two, at most three, decimal places of a degree is adequate. At this resolution the bounding latitude and longitude of the resource, whatever its CRS, may be cited without coordinate transformation as bounding box values in approximate WGS 84 terms.

Bounding boxes that cross 180 E. longitude create problems because of the domain restriction on the longitude values to [-180.0, 180.0]. In order to follow this provision, the bounding box must be truncated if only one box can be provided, or should be broken into two bounding boxes, one east and one west of 180E. If more than one bounding box is provided, each must follow the domain restrictions in section 4.7.3.1. Although the schema allows multiple bounding boxes, it is a known problem that some catalog software will only index the first one in metadata instance documents.

4.7.3.2.2 Examples

```
<gex:EX_Extent>
  <gex:geographicElement>
    <gex:EX_GeographicBoundingBox>
      <gex:westBoundLongitude>
        <gco:Decimal>-107.336</gco:Decimal>
      </gex:westBoundLongitude>
      <gex:eastBoundLongitude>
        <gco:Decimal>-92.658</gco:Decimal>
      </gex:eastBoundLongitude>
      <gex:southBoundLatitude>
        <gco:Decimal>25.490</gco:Decimal>
      </gex:southBoundLatitude>
      <gex:northBoundLatitude>
        <gco:Decimal>37.237</gco:Decimal>
      </gex:northBoundLatitude>
    </gex:EX_GeographicBoundingBox>
  </gex:geographicElement>
</gex:EX_Extent>
```

2006 example (ISO 19139):

```
<gmd:EX_Extent>
  <gmd:geographicElement>
    <gmd:EX_GeographicBoundingBox>
      <gmd:westBoundLongitude>
        <gco:Decimal>-114.815</gco:Decimal>
      </gmd:westBoundLongitude>
      <gmd:eastBoundLongitude>
        <gco:Decimal>-108.984</gco:Decimal>
      </gmd:eastBoundLongitude>
      <gmd:southBoundLatitude>
        <gco:Decimal>31.25</gco:Decimal>
      </gmd:southBoundLatitude>
      <gmd:northBoundLatitude>
```

```
<gco:Decimal>37.004</gco:Decimal>  
</gmd:northBoundLatitude>  
</gmd:EX_GeographicBoundingBox>  
</gmd:geographicElement>  
</gmd:EX_Extent>
```

4.7.4 Spatial Resolution

Definition: Information to specify the detail of the mapping between information provided by a resource and locations in the Earth.

Higher resolution allows distinction between locations that are spatially closer together than locations that are distinct at lower resolution. Resolution is specified in terms of grid cell dimensions (length, width, height) for gridded data, or by the minimum resolvable distance (in actual Earth distance units like meters) between points defining paths in vector data.

4.7.4.1 Content Specifications

UML root path: MD_Metadata.identificationInfo.MD_Identification.spatialResolution¹.MD_Resolution

¹ **Reference Obligation:** Conditional² (raised from Optional in ISO 19115-1)

² Required if Count (spatialRepresentationType="grid") > 0 (see §4.6.1).

Line	Name	Obligation	Cardinality	Datatype	Domain
80	equivalentScale	Conditional ³	1	Integer	>0
81	horizontalDistance	Conditional ³	1	Double	>0
81	horizontalDistanceUnits	Conditional ⁴	1	Identifier	UOM, per ISO/TS 19103
82	verticalDistance	Conditional ³	1	Double	>0
82	verticalDistanceUnits	Conditional ⁵	1	Identifier	UOM, per ISO/TS 19103

³ For gridded resources, either equivalent scale or sample distance is mandatory.

⁴ Required if horizontalDistance is documented.

⁵ Required if verticalDistance is documented.

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.7.4.1.1 Normative Notes

None.

4.7.4.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/*Identification/mri:spatialResolution/-mri:MD_Resolution
equivalentScale	+/mri:equivalentScale/mri:MD_RepresentativeFraction/mri:denominator/gco:Integer
horizontalDistance	+/mri:distance/gco:Distance
horizontalDistanceUnits	+/mri:distance/gco:Distance/@uom
verticalDistance	+/mri:vertical/gco:Distance
verticalDistanceUnits	+/mri:vertical/gco:Distance/@uom
2006 specification implementation	Same.
Automation considerations	

4.7.4.2.1 Implementation Notes

Recommended practice for interoperability is to use horizontalDistance only, defining a table that maps equivalentScale to horizontalDistance to establish equivalences between the two metrics. A description of this table should be referenced in the resource abstract.

4.7.4.2.2 Examples

```
<mri:spatialResolution>
  <mri:MD_Resolution>
    <mri:equivalentScale>
```

```

    <mri:MD_RepresentativeFraction>
      <mri:denominator>
        <gco:Integer>100000</gco:Integer>
      </mri:denominator>
    </mri:MD_RepresentativeFraction>
  </mri:equivalentScale>
</mri:MD_Resolution>
</mri:spatialResolution>

```

Or

```

<mri:spatialResolution>
  <mri:MD_Resolution>
    <mri:distance>
      <!-- note uom (units of measurement) is required -->
      <gco:Distance uom="m">5</gco:Distance>
    </mri:distance>
  </mri:MD_Resolution>
</mri:spatialResolution>

```

2006 example (ISO 19139):

```

<gmd:spatialResolution>
  <gmd:MD_Resolution>
    <gmd:equivalentScale>
      <gmd:MD_RepresentativeFraction>
        <gmd:denominator>
          <gco:Integer>100000</gco:Integer>
        </gmd:denominator>
      </gmd:MD_RepresentativeFraction>
    </gmd:equivalentScale>
  </gmd:MD_Resolution>
</gmd:spatialResolution>

```

Or

```

<gmd:spatialResolution>
  <gmd:MD_Resolution>
    <gmd:distance>
      <!-- note uom (units of measurement) is required -->
      <gco:Distance uom="m">5</gco:Distance>
    </gmd:distance>
  </gmd:MD_Resolution>
</gmd:spatialResolution>

```

4.8 Normalized Elements

Elements in this section are templates, which allow capture of identical types of metadata in different contexts. Contact Information, for example, is captured in four different contexts, as noted below.

4.8.1 Contact Information

From: CI_Responsibility class (ISO 19115-1, B.3.2.2)

This compound element is used to specify contact information in the EIP for the responsible party filling each of four different roles:

- **Metadata contact:** The party identified as the contact for information about the resource metadata.
- **Resource author (Cited Responsible Party):** The party responsible for creating the resource content.
- **Resource contact:** The party filling the general-purpose role of contact for information about the resource.
- **Resource distributor:** The party responsible for distributing the resource.

Definition: A party associated with a resource and how to contact that party. Information required includes:

- **role:** Function performed by the responsible party (not nilable).
- The name of at least one type of contact entity, which may include:
 - name:** Name that designates the responsible party, whether it is a person (CI_Individual) or an organization (CI_Organisation). Recommended formatting for a name associated with an individual person is surname, given name, title separated by a delimiter, e.g. Richard, Stephen, Dr. For organizations, it is recommended to provide the name in full, followed by any relevant acronyms or abbreviations in parenthesis.
 - positionName:** If the party is an individual, a designation may be associated that specifies the role or position that person plays in an organization instead of an individual person name. This is useful to provide a contact name that is less likely to change over time.
- One contact mechanism, which may include:
 - voiceTelephone:** Telephone numbers at which the organization or individual may be contacted.
 - emailAddress:** Address of the electronic mailbox of the responsible organization or individual.

For the metadata contact, resource contact and resource distributor, an e-mail address or telephone number must be provided (not nilable). The contact information is nilable for the resource author (they might be deceased), but the individual or organization name is not nilable. Note that if the party is an organization, the base standard allows that a logo graphic may be provided in place of a name string, but the EIP requires that an organization name is provided as well.

4.8.1.1 Content Specifications

UML root path: [various]¹.CI_Responsibility

¹**Reference Obligation:** [dependent upon contact role]

Line	Name	Obligation	Cardinality	Datatype	Domain
375	name	Conditional ¹	1	CharacterString	Free text
377	positionName		0..1	CharacterString	Free text
408	voiceTelephone	Conditional ²	N	CharacterString	Free text
386	emailAddress		N	CharacterString	Free text
379	role	Mandatory	1	CodeList	CI_RoleCode

¹ *Count (name + positionName) > 0. At least one value must be not nil.*

² *Count (voice phone + eMail address) > 0. At least one value must be not nil.*

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.8.1.1.1 Normative Notes

ISO 19115-1 replaces **CI_ResponsibleParty** of ISO 19115:2003 with **CI_Responsibility**, and provides a new model for binding the party's role, an optional party name, a position name for an individual or a logo for an organization, and the contact information. The new model accounts better for multiple-party 'responsibility' in which the various parties may be different individuals associated with different organizations.

ISO 19115-1 allows for a variety of element-agent name paths from **CI_Responsibility** to the contact name. EIP requires that at least one of **CI_Organisation/name**, **CI_Individual/name**, or **CI_Individual/positionName** have a value that is not nil. The values in each of these elements should be restricted to a person name in **CI_Individual/name**, a role or position name in **CI_Individual/positionName**, and an organisation name in **CI_Organisation/name**. EIP mandates that contact information contains at minimum an e-mail or voice telephone number.

4.8.1.2 XML Implementation

For information about the XML implementation of each contact type, see the following sections:

- Metadata contact: Section 4.2.6, [Metadata Point of Contact](#), page 44
- Resource author: Section 4.3.4, [Cited Responsible Party](#), page 58
- 1. Resource contact: Section 4.3.7, [Resource Point of Contact](#), page 63
- Resource distributor: Section 4.3.12, [Resource Distributor Contact](#), page 75

4.8.2 Resource Language

Definition: Specification of the language used in text content in the described resource.

4.8.2.1 Content Specifications

UML root path: MD_Metadata.identificationInfo.MD_DataIdentification.defaultLocale¹.PT_locale

¹ **Reference Obligation:** Conditional² (*unchanged from ISO 19115-1*)

² Required if not defined by encoding and UTF-8 not used.

Line	Name	Obligation	Cardinality	Datatype	Domain
448	language	Mandatory, not nilable	1	CodeList	languageCode

³ Use ISO 639-2 3-alphabetic digits codes at http://www.loc.gov/standards/iso639-2/php/code_list.php (per ISO 19115-1).

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.8.2.1.1 Normative Notes

The above content specifications differ from the base standard in that the element obligation in the base standard is optional rather than mandatory. The value of always knowing the natural language associated with a resource outweighs the minor cost of ensuring that the value is coded into every metadata record. In many cases, this can be automated.

4.8.2.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/mri:MD_DataIdentification/mri:defaultLocale/lan:PT_Locale
language	../lan:language/lan:LanguageCode
2006 specification implementation	MD_Metadata/identificationInfo/MD_DataIdentification/language
Automation considerations	Default to 'eng' for most cases.

4.8.2.2.1 Implementation Notes

Use ISO 639-3 three-letter language code; these are the "terminological" codes, derived from the native name for the language (see http://en.wikipedia.org/wiki/ISO_639-3).

4.8.2.2.2 Examples

For resources that contain language-based content, the language of the resource content should be encoded as follows (ISO 19115-3).

```
<mri:MD_DataIdentification>
  ...other elements...
  ...defaultLocale or otherLocale property element.
  <lan:PT_Locale>
    <lan:language>
      <lan:LanguageCode codeList="codeListLocation#LanguageCode" codeList-
        Value="eng">eng</lan:LanguageCode>
    </lan:language>
    <lan:characterEncoding>
      ....
    </lan:characterEncoding>
  </lan:PT_Locale>
  ...other elements...
</mri:MD_DataIdentification>
```

2006 example (ISO 19139):

```
<gmd:language>
  <gco:CharacterString>eng</gco:CharacterString>
</gmd:language>
```

For resources that do not contain language-based content (e.g. physical samples) language (and character encoding) is not applicable, and the locale element should be encoded as follows. The nilReason="inapplicable" will only be recognized by some clients; other clients may not validate if a language is not supplied, so a dummy value is provided.

```
<mri:MD_DataIdentification>
...other elements...
  <mri:defaultLocale>
    <lan:PT_Locale>
      <lan:language gco:nilReason="inapplicable">
        <lan:LanguageCode codeList="http://www.loc.gov/standards/iso639-
2/php/code_list.php" codeListValue="eng">eng</lan:LanguageCode>
      </lan:language>
      <lan:characterEncoding gco:nilReason="inapplicable">
        ....
      </lan:characterEncoding>
    </lan:PT_Locale>
  </mri:defaultLocale>
...other elements...
</mri:MD_DataIdentification>
```

2006 example (ISO 19139) for a physical resource:

```
<gmd:language gco:nilReason="inapplicable">
  <gco:CharacterString>eng</gco:CharacterString>
</gmd:language>
```

4.8.3 Resource Character Set

Definition: Specification of the character coding standard used for text content in the described resource.

4.8.3.1 Content Specifications

UML root path: MD_Metadata.identificationInfo.MD_DataIdentification.defaultLocale¹.PT_locale

¹ **Reference Obligation:** Conditional² (unchanged from ISO 19115-1)

² Required if not defined by encoding and UTF-8 not used.

Line	Name	Obligation	Cardinality	Datatype	Domain
450	characterEncoding	Mandatory, not nilable	1	CodeList	MD_CharacterSetCode ³

³ Use IANA register <http://www.iana.org/assignments/character-sets> (per ISO 19115-1).

NOTE: Organization of the above table is described in the introduction of Section 4.1.1, page 33.

4.8.3.1.1 Normative Notes

Obligation raised from optional in ISO 19115-1 to mandatory in the EIP.

4.8.3.2 XML Implementation

XPath root	MD_Metadata/identificationInfo/mri:MD_DataIdentification/mri:defaultLocale/lan:PT_Locale
characterEncoding	../lan:characterEncoding/lan:MD_CharacterSetCode
2006 specification implementation	MD_Metadata/identificationInfo/MD_DataIdentification/characterSet
Automation considerations	Default to 'UTF-8' for most cases.

4.8.3.2.1 Implementation Notes

Use ISO codelist found online at <http://www.iana.org/assignments/character-sets>.

4.8.3.2.2 Examples

For non-digital or non-text resources, characterSet is not applicable and the element may be encoded as:

```
<lan:characterEncoding gco:nilReason="inapplicable"/>
```

Otherwise the character set should be encoded as follows:

```
<mri:MD_DataIdentification>
...other elements...
  <mri:defaultLocale>
    <lan:PT_Locale>
      ...language element
        <lan:characterEncoding>
          <lan:MD_CharacterSetCode codeList="http://www.iana.org/assignments/character-sets
            codeListValue="utf8">UTF-8</lan:MD_CharacterSetCode>
        </lan:characterEncoding>
      </lan:PT_Locale>
    </mri:defaultLocale>
  ...other elements...
</mri:MD_DataIdentification>
```

2006 example (ISO 19139) for physical resource:

```
<gmd:characterSet gco:nilReason="inapplicable"/>
```

Otherwise the character set should be encoded as follows:

```
<gmd:characterSet>  
  <gmd:MD_CharacterSetCode codeList="http://www.iana.org/assignments/character-sets"  
    codeListValue="utf8">UTF-8</gmd:MD_CharacterSetCode>  
</gmd:characterSet>
```

Appendix A. Terms and Definitions

This appendix lists and defines key terms used in this document.

Term	Definition
activity	An event that involves one or more agents participating in some process(es) with some intended purpose. Examples include projects, drilling a well, meetings, conferences, execution of a service request, production of oil from a well.
attribute	A characteristic associated with some entity that takes a particular value for each instance of the entity. For example, eye color is an attribute of people, and location is an attribute of information resources.
base standard	A standard that is used as a source from which a profile is constructed.
conceptual model	Model of a domain that describes the domain as a collection of conceptual entities, the attributes that inhere in those entities, and relationships between the entities. Similar to ontology but not necessarily formal.
content model	A model that specifies the information that is associated with an entity for the purpose of describing that entity. Each entity in a conceptual model has an associated content model.
dataset	An identifiable collection of data. A hard copy map or chart may be considered a dataset. May include one to many data items. The dataset may be a part of a larger dataset.
domain	1) The content of a particular field of knowledge. 2) The set of valid values assignable to a particular metadata attribute.
feature	An abstraction of a real world phenomenon [ISO 19101:2003].
geographic	Located with respect to the Earth; geospatial.
GIS	Geographic Information System. A system of hardware and software used for storage, retrieval, mapping, and analysis of geographic data.
information resource	An identifiable resource with some information content of interest. The term is used in a general sense here to include entities that can be transmitted electronically, that are abstract like concepts or organizations, or that are physical like books, people, or rock specimens.
interoperability	"The 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/IEC 2382-01 (SC36 Secretariat, 2003)
ISO ®	Registered short name for the International Organization for Standardization (www.iso.org).
keyword	A term significant enough as a descriptor for a particular information resource that it is appropriate for use in discovery and evaluation of that resource.
lineage	The succession of information resources and processes applied to them that lead to and produced the particular information resource in question.
metadata	Information that describes an information resource for the purpose of locating and evaluating that resource.
metadata element	A granule of metadata content, represented in the model by a class or property of a class.
OPeNDAP	Open-source Project for a Network Data Access Protocol. An organization and data transport architecture based on HTTP, which is widely used by earth scientists. Current specification is OPeNDAP v2.0 draft. See www.opendap.org .

Term	Definition
product	A static resource considered as a unit of content that can (at least conceptually) be transported to different locations. Examples include any file-based resource, or physical objects like books, rock samples, and facilities.
profile	In the context of a standard specification, a customized version of that standard tailored to suit the needs of a particular community. A set of one or more base standards or subsets of base standards, and, where applicable, the identification of chosen clauses, classes, options and parameters of those base standards, that are necessary for accomplishing a particular function [ISO 19106:2005].
resource	An identifiable thing that fulfills a requirement. Usage is generalized from ISO19115, which defines resource as an 'asset or means that fulfills a requirement' without defining asset or means. Essentially, a resource is a thing (entity) that can be identified and is of interest to someone.
service	A resource that performs a function; utilization involves an agent making a request through some kind of message, which may include some input information. The request invokes an operation by the service, with some predictable result. A service type is defined by a collection of operations and the messages used to invoke the operations and to output the results of the operation. A service instance is defined by a service type and an end point that receives messages and invokes the required operations.
structured data	Digital data stored in a precise format that enables association of specific, known meaning with each data element to enable processing of the data by computer algorithms. Data elements may be defined by fixed fields in a record or file, or by machine-interpretable tags. Relational databases, spreadsheets, and XML documents are examples of structured data.
theme	A general term for the subject or topic of a communication or information resource.
unstructured data	Digital data not stored in structured format, which therefore require additional information to elucidate the meaning of each data element. A typical example is free-form text in a word processing document.
value	A numeric or qualitative quantity associated with an attribute.
XML	(Extensible Markup Language) is a general-purpose specification for creating custom markup languages. XML's purpose is to aid information systems in sharing structured data, to encode documents, and to serialize data.

Appendix B. Metadata Configurations for Collections of Resources

This version of the EIP does not include provisions for use of the metadata application entities (DS_Dataset, DS_Aggregate, etc.) defined in ISO 19115-1 for documenting collections of resources. Thus, for metadata that conforms to the EIP, aggregations of resources are described with a collection of separate, standalone MD_Metadata entities. This appendix describes EIP recommended practice for the use of **MD_AssociatedResource** to represent such aggregation relationships.

B.1 Aggregating Dataset Parts

Recommended practice is to represent an aggregation of related resources into a series or other group using MD_AssociatedResource entities to link resources (using **name/CI_Citation/identifier** element) and metadata records describing the resources (**metadataReference/CI_Citation/linkage**). The **parentMetadataIdentifier/CI_Citation** element on MD_Metadata provides another approach to asserting hierarchical relationships between metadata records, but use of **associationType** in MD_AssociatedResource provides a clearer and more semantically explicit approach to expressing the asserted relationship between resources.

B.2 Current EIP Recommendations for Compound Resources

Note that the ISO 19115-1 model allows for entity-attribute documentation of a composite dataset to be constructed using ISO 19110 FeatureCatalogue through the **MD_Metadata/contentInfo/MD_FeatureCatalogue** association; in this model features are analogous to entities or tables. Some communities have also approached entity-attribute type metadata using the **contentInfo/MD_coverageDescription/dimension** part of the ISO 19115-1 model. We recognize that further experimentation with actual data will be necessary to define experience-based best practices.

Until such practices have been tested, EIP recommends using a consistent pattern for representing compound resources using the **associatedResource** element to establish links between resources, because this seems most likely to enable software development with a minimum of complexity introduced by testing for other encoding approaches. For example, an MD_Metadata record with **scope=series** should be used to describe an entire database, and each table in the database could be described by an MD_Metadata record with **scope=dataset**, each with **associatedResource** elements linking the tables to the database. Metadata at a more granular level could be constructed for detailed documentation of a database. Metadata might be scoped to individual records in a table with **scope=featureInstance** (e.g., an individual chemical analysis), scoped to all information in a particular column in the table with **scope=attributeType** (e.g., for the "CO₂ ppm" column in a table representing a collection of chemical analyses), or even scoped to an individual attribute value in an individual record with **scope=attributeInstance** (e.g., a particular "CO₂ ppm" value...). All of these MD_Metadata records should have **associatedResource** elements linking them to the containing table or database.

A similar pattern could be applied to other kinds of resource aggregations like collections of imagery, seismic surveys, or project data using an MD_Metadata record with **scope** like **collectionSession**, **fieldSession**, or **activity** to describe the unifying resource for the aggregation. To allow navigation between the related resources, metadata for components in the aggregation would have **associatedResource** associations to the aggregated resource and vice versa.

B.3 Tightly Coupled Datasets and Services

Another composite resource situation that presents various alternatives for metadata description is tightly coupled datasets and services. Situations of interest include 1) metadata describing a dataset that is tightly coupled to one or more services through which the data are accessed, and 2) metadata describing a service that serves multiple datasets. The ISO 19115-1 model allows the inclusion of any number of **MD_DataIdentification** and **SV_ServiceIdentification** entities within a single MD_Metadata instance. In tightly coupled situations, a single MD_Metadata might include 1) a single MD_DataIdentification object with multiple SV_ServiceIdentification objects, or 2) a single SV_ServiceIdentification object with multiple

MD_DataIdentification objects. This approach is currently used by some catalogs to document datasets accessed by Thematic Realtime Environmental Distributed Data Services (THREDDS).

Records that include multiple **MD_Identification** objects allow ambiguity about what metadata in the record is associated with various objects. This ambiguity is introduced because the model associates portrayal, spatial representation, data acquisition, content information (entity-attribute), and distribution (access) information directly with the **MD_Metadata** root entity (Figure 1), but in an aggregate situation, these content items might actually apply to different dataset or service instances that are represented by **MD_Identification** entities. The elements that are associated with the **MD_Metadata** object must be assumed to apply to all **MD_Identification** objects included in the record. This pattern is likely to break down in the case of a single service serving multiple datasets (except in the unlikely case that all of the datasets shared content, acquisition, and distribution information).

The EIP mandates use of a single, consistent pattern for different combinations of coupled datasets and services delivering the data. This pattern is to create separate **MD_Metadata** instances describing each dataset and each service instance. Dataset metadata indicates services that distribute the data using **CI_OnlineResource** content in the **MD_Distribution** section of the metadata. If more than one service provides the data, multiple **distributionInfo/./MD_DigitalTransferOptions** elements are included in the record. This approach requires restrictions on the use of the **CI_OnlineResource** content elements included in **distributionInfo/./MD_DigitalTransferOptions** for service distribution of a dataset, such that the content provides basic connection information for the service, typically linking to service descriptions documents like WSDL, WADL, OGC GetCapabilities, OpenSearchDescription, etc., which are defined by each service protocol (see section 4.6.3, [Service Distribution](#)). The logic is that clients designed for a given service specification are more likely to be able to parse and interpret the service-specific self-description than a generic ISO 19115-1 description of the service. This approach is in use for metadata describing Open Geospatial Consortium spatial data services like WMS, WFS, WCS services (INSPIRE, CSW ArcMap Client) serving single features or layers. The limitations for describing non-standard or more complex resource-based services with a wide variety of data and request options was the motivation for development of ISO 19119 (Geographic information – Services) to provide a more robust model for describing services. The metadata content sections of ISO 19119 are now incorporated into ISO 19115-1. If the information in **MD_Distribution/./MD_DigitalTransferOptions/./CI_OnlineResource** is insufficient to describe access to the data through the service interface, then it is important to provide an additional link from the dataset metadata to a complete service metadata record for the service providing the dataset using the **associatedResource** element.

The service metadata record has links to datasets coupled with the service through **operatedDataset/CI_Citation** elements. The **operatedDataset/CI_Citation/identifier/MD_Identifier/code/CharacterString** in the reference must be the dataset identifier for the dataset exposed by the service, which must match the **MD_DataIdentification/citation/CI_Citation/identifier/MD_Identifier/code/CharacterString** in the metadata record for the dataset. The **operatedDataset/CI_Citation/onlineResource/./linkage/CharacterString** element should be a URL that accesses the metadata record for the dataset. If particular service operations are coupled with particular datasets, these may be represented through **SV_ServiceIdentification/coupledResource/SV_CoupledResource** (see Section 4.6.5, [Coupled Operations and Datasets](#), page 113).

Appendix C. EIP-modified ISO 19115-1 codelists

This appendix contains four tables, each presenting values for an ISO 19115-1 codelist modified by EIP:

1. MD_ScopeCode
2. CI_DateTypeCode
3. MD_ProgressCode
4. MD_RestrictionCode

These tables are designed to clearly identify changes made to each ISO 10115-1 codelist to arrive at the corresponding EIP codelist.

- Terms greyed out in the tables below either are deprecated for use in EIP metadata—reasons for deprecation are indicated in the Discussion column—or are excluded because EIP v1.0 makes no provisions for the implications of their use.
- Terms identified in the Codelist Value column with “<<EIP addition.>>” represent values added to the ISO codelists by EIP. Changes to the ISO 19115-1 codelist values are the result of both stakeholder input and understanding gained from the 2012 EIP Prototype Implementation Project.

C.1 MD_ScopeCode

ScopeCode values are used by EIP for resource categorization. Because the ISO 19115-1 ScopeCode vocabulary is not constructed with the intention of developing a coherent system of resource categories, ISO 19115-1 values are further qualified here with the intention that they have non-overlapping meanings. These restricted meanings are then used for determining what metadata should be included in the MD_Metadata instance to which the scope applies. Mapping to EIP content element groups is through the ScopeCode value listed in [Table 3](#), page 27.

Table 15. ISO 19115-1 Scope Code Terms as Modified by EIP	
Codelist Value	Discussion
activity <<EIP addition.>>	This value is added by EIP in anticipation of need for it, but no provisions for the content implications are included in EIP v1.0. This value identifies information describing the characteristics of a specific process of finite duration. Metadata for an activity provides descriptive information that is the basis for discovery of products, and services associated with an event based on purpose, location, duration, and responsible agents. Examples include projects, drilling a well, meetings, conferences, execution of a service request, a data collection session, a ship cruise, and production of oil from a well. ISO collectionSession is a kind of activity. Particular kind of activity should be categorized using keywords. Examples include an exhibition, webcast, conference, workshop, open day, performance, battle, trial, wedding, tea party, and conflagration.
aggregate <<EIP deprecate. Use collection.>>	<<Distinction between “aggregate” and “collection” is not clear, so potential for inconsistent use motivates exclusion of “aggregate” from EIP – “collection” could easily be used instead.>>
application	Information resource defined by a collection of functional capabilities implemented using computer software, input and output requirements, and authorship. The same application may be packaged in different file formats to run in different software/hardware environments; thus, an application may have one or more associated software resources instantiated in particular files, which would be considered different distributions for the same resource.

Table 15. ISO 19115-1 Scope Code Terms as Modified by EIP	
Codelist Value	Discussion
	For the purposes of this catalog scheme, stand-alone applications are software that can be packaged in a single file that can be transferred between machines, unpackaged and compiled or installed on a computer meeting specified hardware and software environment conditions, to execute the described function on that computer.
<i>attribute</i> <<No EIP usage provisions.>>	<<EIP makes no provisions for the content implications of this scopeCode value.>>
<i>attributeType</i> << No EIP usage provisions.>>	<<EIP makes no provisions for the content implications of this scopeCode value.>>
collection	<p>Information applies to an unstructured set of resources described as a group; its parts may also be separately described.</p> <p>(From http://www.ukoln.ac.uk/metadata/dcmi/collection-application-profile/): The term "collection" can be applied to any aggregation of physical or digital items. Those items may be of any type, so examples might include aggregations of natural objects, created objects, "born-digital" items, digital surrogates of physical items, and the catalogs of such collections (as aggregations of metadata records).</p> <p>The criteria for aggregation may vary: e.g., by location, by type or form of the items, by provenance of the items, by source or ownership, and so on.</p> <p>Collections may contain any number of items and may have varying levels of permanence. A "collection-level description" provides a description of the collection as a unit: the resource described by a collection-level description is the collection, rather than the individual items within that collection (see http://www.ukoln.ac.uk/nof/support/help/papers/coll-description).</p>
collectionHardware	Information applies to description of instruments and platforms used to collect data. Metadata for collection hardware should describe quality information that is specifically related to that hardware. If instruments or platform have a fixed geographic location (which may change over time), they are considered a geolocated resource.
<i>collectionSession</i> <<EIP deprecate. Use activity.>>	<p><i>Information applies to a specific collection event in a laboratory or in the field. This is a sub-type of activity that has the specific purpose of acquiring data.</i></p> <p><i>CollectionSession metadata serves to document the activity and as a finding aid to locate results from the data acquisition activity. The data acquisition activity takes place in a location.</i></p> <p><<Potential for inconsistent use motivates exclusion of "collectionSession" from EIP – "activity" could be used instead.>></p>
<i>coverage</i> <<EIP deprecate. Use dataset.>>	<p><i>Coverage is considered by some as a kind of dataset that assigns values for one or more properties at each location in a georeferenced grid.</i></p> <p><<Potential for inconsistent use motivates exclusion of "coverage" from EIP – "dataset" could be used instead.>></p>
dataset	<p>Information applies to a structured collection of data items considered as a distinct identifiable product.</p> <p>Individual data items are identified and accessible, and include a defined set of attribute types. DCMI definition is "Data encoded in a defined structure..." with additional comment, "Examples include lists, tables, and databases. A dataset may be useful for direct machine processing."</p> <p>The container may be a stand-alone digital file (mdb, spreadsheet, table in a Word document), a web service, or an enterprise database. Metadata for the collection is a different type than metadata for individual items in the collection (scope=feature). Criteria for what unifies the collection are variable (topic, area, author, etc.). Synonym: structured data collection.</p>

Table 15. ISO 19115-1 Scope Code Terms as Modified by EIP	
Codelist Value	Discussion
	This resource type represents the intellectual artifact—the information content and organization; the dataset may have more than one manifestation (format)—as a list, a table, databases, using different software implementation, and different formats may be distributed separately.
<i>dimensionGroup</i> << No EIP usage provisions.>>	<<EIP makes no provisions for the content implications of this scopeCode value.>>
document	Information applies to a packaged body of intellectual work that has an author, title, and some status with respect to review/authority/quality. This category includes gray literature, unpublished documents, etc. A document may have a variety of physical or digital manifestations (pdf file, hardbound book, tiff scan, Word processor document, etc.), and versions may exist as the document is traced through some publication process. May be map, vector graphics, or text. Sound and moving images are included as document types. Document is distinguished from dataset in that a document is inherently unstructured (individual granules of information are not addressable), whereas a dataset is inherently structured.
documentPhysical <<EIP addition.>>	Added by EIP to differentiate between documents which are digital products, considered the predominant sense in which the value “document” has been applied to date, and documents which are physical products.
<i>feature</i> << No EIP usage provisions.>>	<<EIP makes no provisions for the content implications of this scopeCode value.>>
<i>featureType</i> << No EIP usage provisions.>>	<<EIP makes no provisions for the content implications of this scopeCode value.>>
<i>fieldSession</i> <<EIP deprecate. Use activity.>>	<<Potential for inconsistent use motivates exclusion of “fieldSession” from EIP – “activity” could be used instead.>> <i>Information applies to data acquisition event in the field..</i>
<i>initiative</i> <<EIP deprecate. Use collection.>>	<<Broad and ambiguous term with potential for inconsistent use motivates exclusion of “initiative” from EIP – “collection” could be used instead.>>
metadata	Usage of this value expected to be rare; metadata about the metadata usually should be in the MD_Metadata section of the metadata record.
<i>model</i> << No EIP usage provisions.>>	<<Broad ambiguous term. As a functional process it is represented by “application,” as an instance of an implementation of a model by “software.”>>
nonGeographicDataset	Information applies to a dataset that contains no geolocation information.
<i>product</i> << No EIP usage provisions.>>	<<Very broad and ambiguous term describing the output of any process. EIP makes no provisions for the content implications when used.>>
<i>propertyType</i> << No EIP usage provisions.>>	<<EIP makes no provisions for the content implications of this scopeCode value.>>
<i>repository</i> <<EIP deprecate. Use collection.>>	<i>Information applies to a facility that contains a collection of resources.</i> <i>Metadata for a data repository could include contact information and broad descriptions of the data types held in the repository. It may also include quality information about conformance of the repository with various standards and practices. (Haberman, 2011, written</i>

Table 15. ISO 19115-1 Scope Code Terms as Modified by EIP	
Codelist Value	Discussion
	<p><i>comm.</i>). A catalog is a searchable repository of metadata, so a metadata record for catalog would get this scope.</p> <p><<Potential for inconsistent use motivates exclusion of “repository” from EIP – “collection” could easily be used instead.>></p>
sample	Information applies to a physical artifact that is identified and considered representative of some feature of interest.
series	<p>Information applies to a generic collection of digital resources that share similar characteristics of theme, source date, resolution, and/or methodology. The exact definition of what constitutes a series entry will be determined by the data provider. Some specific examples include (Haberman, 2011, email communication):</p> <ul style="list-style-type: none"> • productionSeries: A collection of resources produced using the same processes. Members of a productionSeries are assumed to share lineage and processing histories. • platformSeries: A collection of resources observed from a single platform. Members of a platformSeries are assumed to share the same geospatial geometry. Metadata for a platform that house several sensors can contain multiple subsets, each of which is a sensorSeries. • sensorSeries: A collection of resources observed using a single sensor. • transferAggregate: A set of resources collected for the purpose of transfer. Members could be associated as the results of an ad hoc query or for any other reason determined by the data provider or the user. <p>These more specific categories of series could be indicated using the text value in the MD_ScopeCode element.</p>
seriesPhysical <<EIP addition.>>	Added by EIP to differentiate between series which are collections of digital products, considered the predominant sense in which the value “series” has been applied to date, and series which are collections of physical products.
service	<p>Information applies to a resources that may be invoked through messaging using the internet to execute one or more operations and return appropriate response messages.</p> <p>For EIP, this scope implies a resource designed for machine interaction. Includes 'pull' type services in which a client requests some content from the service and receives that content in a single response message,; 'push' type services in which client establishes connection and monitors for change events (update, new data, etc.) from service; and continuous (possible as some some sampling interval) data feeds of some sort of data that might be provided from a sensor.</p>
software <<EIP deprecate. Use application.>>	<p>Information applies to a computer program in source or compiled form. Examples include a C source file, Microsoft Windows .exe executable, or Perl script. A particular software resource implements one or more applications.</p> <p><<Potential for inconsistent use motivates exclusion of “software” from EIP – “application” could be used instead.>></p>
tile <<EIP deprecate. Use dataset.>>	<p>Information applies to a spatial subset of a larger geographic dataset.</p> <p>Typically these are coverages, with subsets defined on a standardized grid such that each tile is approximately similar in size and its location is indexed in the context of the defining grid.</p> <p><<Potential for inconsistent use motivates exclusion of “tile” from EIP – “dataset” could be used instead.>></p>

C.2 CI_DateTypeCode

This codelist is referenced by Section 4.2.7, [Metadata Create Date](#), page 47, Section 4.2.8, [Metadata Update Date](#), page 48, and Section 4.3.2, [Resource Citation Date](#), page 54.

Table 16. ISO 19115-1 Date Type Terms as Modified by EIP	
Codelist Value	Discussion
<i>adopted</i> <<EIP deprecate. Use validityBegins.>>	<i>date identifies when resource was adopted</i> <<Potential for inconsistent use motivates exclusion of “adopted” from EIP – use “validityBegins,” with past date assigned instead.>>
creation	date identifies when the resource was brought into existence. Expectation is that “publication” and “creation” are the most commonly used date type codes. When neither applies, one of the remaining codes will suffice.
<i>deprecated</i> <<EIP deprecate. Use validityExpires.>>	<i>date identifies when resource was deprecated</i> <<Potential for inconsistent use motivates exclusion of “deprecated” from EIP – use “validityExpires” with past date assigned instead.>>
<i>distribution</i> <<EIP deprecate. Use publication or validityBegins.>>	<i>date identifies when an instance of the resource was distributed</i> <<Potential for inconsistent use motivates exclusion of “distribution” from EIP – use “publication” or “validityBegins” instead.>>
<i>expiry</i> <<EIP deprecate. Use validityExpires.>>	<i>date identifies when resource expires</i> <<Potential for inconsistent use motivates exclusion of “expiry” from EIP – use “validityExpires” with appropriate date assigned instead.>>
<i>inForce</i> <<EIP deprecate. Use validityBegins.>>	<i>date identifies when resource became in force</i> <<Potential for inconsistent use motivates exclusion of “inForce” from EIP – use “validityBegins” with past date assigned instead.>>
<i>lastRevision</i> <<EIP deprecate. Use lastUpdate.>>	<i>date identifies when resource was last reviewed</i> <<Potential for inconsistent use motivates exclusion of “lastRevision” from EIP – use “lastUpdate” instead.>>
lastUpdate	date identifies when resource was last updated
nextUpdate	date identifies when resource will be next updated
publication	date identifies when the resource was issued. Expectation is that “publication” and “creation” are the most commonly used date type codes. When neither applies, one of the remaining codes will suffice.
<i>released</i> <<EIP deprecate. Use publication or validityBegins.>>	<i>the date that the resource shall be released for public access</i> <<Potential for inconsistent use motivates exclusion of “released” from EIP – use “publication” or “validityBegins” instead.>>
revision	date identifies when the resource was examined or re-examined and improved or amended
<i>superseded</i> <<EIP deprecate. Use validityExpires.>>	<i>date identifies when resource was superseded or replaced by another resource</i> <<Potential for inconsistent use motivates exclusion of “superseded” from EIP – use “validityExpires” with past date assigned instead.>>
unavailable	date identifies when resource became not available or obtainable
validityBegins	time at which the data are considered to become valid. NOTE: There could be quite a delay between creation and validity begins
validityExpires	time at which the data are no longer considered to be valid

C.3 MD_ProgressCode

This codelist is referenced in Section 4.3.6, Resource Status, page 62.

Table 17. ISO 19115-1 Progress Code Terms as Modified by EIP	
Codelist Value	Discussion
<i>accepted</i> <i><<EIP deprecate. Use completed.>></i>	<i>agreed to by sponsor</i> <i><<Potential for inconsistent use motivates exclusion of “accepted” from EIP – use “completed” instead.>></i>
completed	has been completed
<i>deprecated</i> <i><<EIP deprecate. Use obsolete.>></i>	<i>resource superseded and will become obsolete, use only for historical purposes</i> <i><<Potential for inconsistent use motivates exclusion of “deprecated” from EIP – use “obsolete” instead.>></i>
<i>final</i> <i><<EIP deprecate. Use completed.>></i>	<i>progress concluded and no changes will be accepted</i> <i><<Potential for inconsistent use motivates exclusion of “final” from EIP – use “completed” instead.>></i>
<i>historicalArchive</i> <i><<EIP deprecate. Use completed.>></i>	<i>stored in an offline storage facility</i> <i><<Potential for inconsistent use motivates exclusion of “historicalArchive” from EIP – use “completed” instead, and identify archive location using MD_Distribution.>></i>
<i>notAccepted</i> <i><<EIP deprecate. Use obsolete.>></i>	<i>rejected by sponsor</i> <i><<Potential for inconsistent use motivates exclusion of “notAccepted” from EIP – use “obsolete” instead.>></i>
obsolete	no longer relevant
onGoing	continually being updated
<i>pending</i> <i><<EIP deprecate. Use planned or proposed.>></i>	<i>committed to, but not yet addressed</i> <i><<Potential for inconsistent use motivates exclusion of “pending” from EIP – use “planned” or “proposed” instead.>></i>
planned	fixed date has been established upon or by which the resource will be created or updated
proposed	suggested that development needs to be undertaken
<i>required</i> <i><<EIP deprecate. Use underdevelopment.>></i>	<i>needs to be generated or updated</i> <i><<Potential for inconsistent use motivates exclusion of “required” from EIP – ISO definition suggests “underdevelopment” could be used instead .>></i>
<i>retired</i> <i><<EIP deprecate. Use obsolete.>></i>	<i>item is no longer recommended for use. It has not been superseded by another item</i> <i><<Potential for inconsistent use motivates exclusion of “retired” from EIP – use “obsolete” instead.>></i>
superseded	replaced by new
<i>tentative</i> <i><<EIP deprecate. Use underDevelopment.>></i>	<i>provisional changes likely before resource becomes final or complete</i> <i><<Potential for inconsistent use motivates exclusion of “tentative” from EIP – use “underDevelopment” instead.>></i>
underDevelopment	currently in the process of being created
<i>valid</i> <i><<EIP deprecate. Use completed.>></i>	<i>acceptable under specific conditions</i> <i><<Potential for inconsistent use motivates exclusion of “valid” from EIP – use “completed” instead.>></i>
<i>withdrawn</i>	<i>removed from consideration</i>

Table 17. ISO 19115-1 Progress Code Terms as Modified by EIP

Codelist Value	Discussion
<i><<EIP deprecate. Use obsolete.>></i>	<i><<Potential for inconsistent use motivates exclusion of “withdrawn” from EIP – use “obsolete” instead.>></i>

C.4 MD_RestrictionCode

This codelist is referenced by Section 4.3.10, [Legal Constraints](#), page 70.

Table 18. ISO 19115-1 Restriction Code Terms as Modified by EIP

Codelist Value	Discussion
confidential	not available to the public contains information that could be prejudicial to a commercial, industrial, or national interest
copyright	exclusive right to the publication, production, or sale of the rights to a literary, dramatic, musical, or artistic work, or to the use of a commercial print or label, granted by law for a specified period of time to an author, composer, artist, distributor
<i>in-confidence</i> <i><<EIP deprecate. Use confidential.>></i>	<i>with trust</i> <i><<Potential for inconsistent use motivates exclusion of “in-confidence” from EIP – use “confidential” instead.>></i>
intellectualPropertyRights	rights to financial benefit from and control of distribution of non-tangible property that is a result of creativity
licence	formal permission to do something
<i>licenceDistributor</i> <i><<EIP deprecate. Use licence.>></i>	<i>formal permission required for a person or an entity to commercialize or distribute the resource</i> <i><<Potential for inconsistent use, and inability of term to convey all necessary information, motivates exclusion of “licenceDistributor” from EIP – use “licence” instead. >></i>
<i>licenceEndUser</i> <i><<EIP deprecate. Use licence.>></i>	<i>formal permission required for a person or an entity to use the resource and that may differ from the person that orders or purchases it</i> <i><<Potential for inconsistent use, and inability of term to convey all necessary information, motivates exclusion of “licenceEndUser” from EIP – use “licence” instead.>></i>
<i>licenceUnrestricted</i> <i><<EIP deprecate. Use licence.>></i>	<i>formal permission not required to use the resource</i> <i><<Potential for inconsistent use motivates exclusion of “licenceUnrestricted” from EIP – use “licence” or “unrestricted” instead.>></i>
otherRestrictions	limitation not listed
patent	government has granted exclusive right to make, sell, use or license an invention or discovery
patentPending	produced or sold information awaiting a patent
<i>private</i> <i><<EIP deprecate. Use confidential.>></i>	<i>protects rights of individual or organisations from observation, intrusion, or attention of others</i> <i><<Potential for inconsistent use motivates exclusion of “private” from EIP – use “confidential” instead.>></i>
<i>restricted</i> <i><<EIP deprecate. Use otherRestrictions.>></i>	<i>withheld from general circulation or disclosure</i> <i><<Potential for inconsistent use motivates exclusion of “restricted” from EIP – use “confidential” or “otherRestrictions” instead.>></i>
<i>SBU</i> <i><<EIP deprecate.>></i>	<i>although unclassified, requires strict controls over its distribution.</i> <i><<Organization-specific usage considered inappropriate for public definition - exclude “SBU” from EIP, but expect that each organization will use it as necessary and appropriate.>></i>

Table 18. ISO 19115-1 Restriction Code Terms as Modified by EIP

Codelist Value	Discussion
<i>statutory</i> <<EIP deprecate.>>	<i>prescribed by law</i> <<Vague and very general term demanding additional informational motivates exclusion of "statutory" from EIP – appropriate, specific term should be used instead, or "otherRestrictions".>>
trademark	a name, symbol, or other device identifying a product, officially registered and legally restricted to the use of the owner or manufacturer
unrestricted	no constraints exist
acknowledge <<EIP addition.>>	Permission not required but must acknowledge source

Appendix D. XML Examples

This appendix provides two XML examples: the first presents a complete EIP metadata record for a Digital Product (MD_ScopeCode value="dataset"), and the second presents a complete EIP metadata record for a Digital Service (MD_ScopeCode value="service").

D.1 Example 1 – Digital Product

```
<?xml version="1.0" encoding="UTF-8"?>
<mdb:MD_Metadata xmlns:xlink="http://www.w3.org/1999/xlink"
  xmlns:cit="http://standards.iso.org/iso/19115/-3/cit/1.0"
  xmlns:gco="http://standards.iso.org/iso/19115/-3/gco/1.0"
  xmlns:gex="http://standards.iso.org/iso/19115/-3/gex/1.0"
  xmlns:lan="http://standards.iso.org/iso/19115/-3/lan/1.0"
  xmlns:mac="http://standards.iso.org/iso/19115/-3/mac/1.0"
  xmlns:mas="http://standards.iso.org/iso/19115/-3/mas/1.0"
  xmlns:mdb="http://standards.iso.org/iso/19115/-3/mdb/1.0"
  xmlns:mcc="http://standards.iso.org/iso/19115/-3/mcc/1.0"
  xmlns:mco="http://standards.iso.org/iso/19115/-3/mco/1.0"
  xmlns:mdq="http://standards.iso.org/iso/19157/-2/mdq/1.0"
  xmlns:mmi="http://standards.iso.org/iso/19115/-3/mmi/1.0"
  xmlns:mpc="http://standards.iso.org/iso/19115/-3/mpc/1.0"
  xmlns:mrc="http://standards.iso.org/iso/19115/-3/mrc/1.0"
  xmlns:mrd="http://standards.iso.org/iso/19115/-3/mrd/1.0"
  xmlns:mri="http://standards.iso.org/iso/19115/-3/mri/1.0"
  xmlns:mrl="http://standards.iso.org/iso/19115/-3/mrl/1.0"
  xmlns:mrs="http://standards.iso.org/iso/19115/-3/mrs/1.0"
  xmlns:msr="http://standards.iso.org/iso/19115/-3/msr/1.0"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://standards.iso.org/iso/19115/-3/mds/1.0 http://standards.iso.org/iso/19115/-3/mds/1.0/mds.xsd">
  <mdb:metadataIdentifier>
    <mcc:MD_Identifier>
      <mcc:code>
        <gco:CharacterString>ba2f0b9d21f71acfe10609f76e32db87
        </gco:CharacterString>
      </mcc:code>
    </mcc:MD_Identifier>
  </mdb:metadataIdentifier>
  <mdb:defaultLocale>
    <lan:PT_Locale>
      <lan:language>
        <lan:LanguageCode codeList="http://www.loc.gov/standards/iso639-2/php/code_list.php"
          codeListValue="eng">eng</lan:LanguageCode>
        </lan:language>
      <lan:characterEncoding>
        <lan:MD_CharacterSetCode codeList="http://www.iana.org/assignments/character-sets"
          codeListValue="utf8">UTF-8</lan:MD_CharacterSetCode>
        </lan:characterEncoding>
      </lan:PT_Locale>
    </mdb:defaultLocale>
  <mdb:metadataScope>
    <mdb:MD_MetadataScope>
      <mdb:resourceScope>
```

```

    <mcc:MD_ScopeCode
codeList="http://w3.energistics.org/energymf/profiles/EIP/v1.1/EIPcodelists19115-3.xml#MD_ScopeCode"
codeListValue="Dataset">Dataset</mcc:MD_ScopeCode>
    </mdb:resourceScope>
    <mdb:name>
    <gco:CharacterString>Dataset</gco:CharacterString>
    </mdb:name>
</mdb:MD_MetadataScope>
</mdb:metadataScope>
<mdb:contact>
<cit:CI_Responsibility>
    <cit:role>
    <cit:CI_RoleCode codeList="
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#CI_RoleCode"
codeListValue="pointOfContact">pointOfContact</cit:CI_RoleCode>
    </cit:role>
<cit:party>
    <cit:CI_Organisation>
    <cit:name>
    <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
    </cit:name>
    <cit:contactInfo>
    <cit:CI_Contact>
    <cit:phone>
    <cit:CI_Telephone>
    <cit:number>
    <gco:CharacterString>520-770-3500</gco:CharacterString>
    </cit:number>
    <cit:numberType>
    <cit:CI_TelephoneTypeCode codeList="
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#CI_Tele
phoneTypeCode" codeListValue="voice">voice</cit:CI_TelephoneTypeCode>
    </cit:numberType>
    </cit:CI_Telephone>
    </cit:phone>
    <cit:address>
    <cit:CI_Address>
    <cit:deliveryPoint>
    <gco:CharacterString>416 W. Congress St. Ste. 100</gco:CharacterString>
    </cit:deliveryPoint>
    <cit:city>
    <gco:CharacterString>Tucson</gco:CharacterString>
    </cit:city>
    <cit:administrativeArea>
    <gco:CharacterString>Arizona</gco:CharacterString>
    </cit:administrativeArea>
    <cit:postalCode>
    <gco:CharacterString>85701</gco:CharacterString>
    </cit:postalCode>
    <cit:electronicMailAddress>
    <gco:CharacterString>metadata@azgs.az.gov</gco:CharacterString>
    </cit:electronicMailAddress>
    </cit:CI_Address>
    </cit:address>
    </cit:CI_Contact>
</cit:contactInfo>

```

```

        <cit:individual>
          <cit:CI_Individual>
            <cit:name>
              <gco:CharacterString>No Name Was Given</gco:CharacterString>
            </cit:name>
          </cit:CI_Individual>
        </cit:individual>
      </cit:CI_Organisation>
    </cit:party>
  </cit:CI_Responsibility>
</mdb:contact>
<mdb:dateInfo>
  <cit:CI_Date>
    <cit:date>
      <gco:DateTime>2012-09-21T18:51:37Z</gco:DateTime>
    </cit:date>
    <cit:dateType>
      <cit:CI_DateTypeCode
codeList="http://w3.energistics.org/energym/profiles/EIP/v1.1/EIPcodelists19115-
3.xml#CI_DateTypeCode" codeListValue="creation">creation</cit:CI_DateTypeCode>
      </cit:dateType>
    </cit:CI_Date>
  </mdb:dateInfo>
<mdb:metadataStandard>
  <!-- specification of ISO/TS 19115-3 as the metadata standard is recommended practice for EIP metadata-->
  <cit:CI_Citation>
    <cit:title>
      <gco:CharacterString>ISO/TS 19115-3 Geographic information — Metadata — XML schema
implementation for fundamental concepts</gco:CharacterString>
    </cit:title>
  </cit:CI_Citation>
</mdb:metadataStandard>
<mdb:metadataProfile xlink:href=
http://w3.energistics.org/energym/profiles/EIP/v1.1/metadataStandard_citation.xml/>
<mdb:identificationInfo>
  <mri:MD_DataIdentification>
    <mri:citation>
      <cit:CI_Citation>
        <cit:title>
          <gco:CharacterString>Geothermal Hotline Newsletter Vol. 4 No. 2</gco:CharacterString>
        </cit:title>
        <cit:date>
          <cit:CI_Date>
            <cit:date>
              <gco:DateTime>1974-01-01T12:00:00</gco:DateTime>
            </cit:date>
            <cit:dateType>
              <cit:CI_DateTypeCode codeList=
"http://w3.energistics.org/energym/profiles/EIP/v1.1/EIPcodelists19115-3.xml#CI_DateTypeCode"
codeListValue="publication">publication</cit:CI_DateTypeCode>
            </cit:dateType>
          </cit:CI_Date>
        </cit:date>
        <cit:identifier>
          <mcc:MD_Identifier>
            <mcc:code>

```

```

    <gco:CharacterString>
http://resources.usgin.org/uri_gin/dlio/325</gco:CharacterString>
    </mcc:code>
    </mcc:MD_Identifier>
  </cit:identifier>
  <cit:citedResponsibleParty>
    <cit:CI_Responsibility>
      <cit:role>
        <cit:CI_RoleCode codeList=
"http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#CI_RoleCode"
codeListValue="originator">originator</cit:CI_RoleCode>
      </cit:role>
      <cit:party>
        <cit:CI_Organisation>
          <cit:name>
            <gco:CharacterString>California Division of Oil and Gas</gco:CharacterString>
          </cit:name>
          <cit:contactInfo>
            <cit:CI_Contact>
              <cit:phone>
                <cit:CI_Telephone>
                  <cit:number>
                    <gco:CharacterString>(916) 445-9686</gco:CharacterString>
                  </cit:number>
                  <cit:numberType>
                    <cit:CI_TelephoneTypeCode
codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#CI_TelephoneTypeCod
e" codeListValue="voice">voice</cit:CI_TelephoneTypeCode>
                  </cit:numberType>
                </cit:CI_Telephone>
              </cit:phone>
              <cit:address>
                <cit:CI_Address>
                  <cit:deliveryPoint>
                    <gco:CharacterString>801 K Street, MS 20-21</gco:CharacterString>
                  </cit:deliveryPoint>
                  <cit:city>
                    <gco:CharacterString>Sacramento </gco:CharacterString>
                  </cit:city>
                  <cit:administrativeArea>
                    <gco:CharacterString>CA</gco:CharacterString>
                  </cit:administrativeArea>
                  <cit:postalCode>
                    <gco:CharacterString>95814-5512</gco:CharacterString>
                  </cit:postalCode>
                  <cit:electronicMailAddress>
                    <gco:CharacterString>renew-
able@energy.state.ca.us</gco:CharacterString>
                  </cit:electronicMailAddress>
                </cit:CI_Address>
              </cit:address>
            </cit:CI_Contact>
          </cit:contactInfo>
        <cit:individual>
          <cit:CI_Individual>
            <cit:name>

```

```

        <gco:CharacterString>No name provided</gco:CharacterString>
      </cit:name>
    </cit:CI_Individual>
  </cit:individual>
</cit:CI_Organisation>
</cit:party>
</cit:CI_Responsibility>
</cit:citedResponsibleParty>
</cit:CI_Citation>
</mri:citation>
<mri:abstract>
  <gco:CharacterString>Geothermal Hotline Newsletter, published in 1974 by the Oil and Gas
  Division for the state of California. Geothermal news for California, surrounding states, and Mexico. This
  resource is available online as a downloadable file. For more information see links
  provided.</gco:CharacterString>
</mri:abstract>
<mri:status>
  <mcc:MD_ProgressCode
codeList="http://w3.energistics.org/energymf/profiles/EIP/v1.1/EIPcodelists19115-
3.xml#MD_ProgressCode"
codeListValue="completed">completed</mcc:MD_ProgressCode>
</mri:status>
<mri:topicCategory>
  <mri:MD_TopicCategoryCode>geoscientificInformation</mri:MD_TopicCategoryCode>
</mri:topicCategory>
<mri:extent>
  <gex:EX_Extent>
    <gex:geographicElement>
      <gex:EX_GeographicBoundingBox>
        <gex:westBoundLongitude>
          <gco:Decimal>-124.629</gco:Decimal>
        </gex:westBoundLongitude>
        <gex:eastBoundLongitude>
          <gco:Decimal>-113.555</gco:Decimal>
        </gex:eastBoundLongitude>
        <gex:southBoundLatitude>
          <gco:Decimal>30.101</gco:Decimal>
        </gex:southBoundLatitude>
        <gex:northBoundLatitude>
          <gco:Decimal>42.5155</gco:Decimal>
        </gex:northBoundLatitude>
      </gex:EX_GeographicBoundingBox>
    </gex:geographicElement>
  </gex:EX_Extent>
</mri:extent>
<mri:descriptiveKeywords>
  <mri:MD_Keywords>
    <mri:keyword>
      <gco:CharacterString>Geothermal</gco:CharacterString>
    </mri:keyword>
    <mri:keyword>
      <gco:CharacterString>newsletter</gco:CharacterString>
    </mri:keyword>
  </mri:type>
  <mri:MD_KeywordTypeCode
codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#MD_KeywordTypeCode

```

```

" codeListValue="theme">theme</mri:MD_KeywordTypeCode>
  </mri:type>
  </mri:MD_Keywords>
</mri:descriptiveKeywords>
<mri:descriptiveKeywords>
  <mri:MD_Keywords>
    <mri:keyword>
      <gco:CharacterString>California</gco:CharacterString>
    </mri:keyword>
    <mri:keyword>
      <gco:CharacterString>Downloadable Files</gco:CharacterString>
    </mri:keyword>
    <mri:keyword>
      <gco:CharacterString>California Division of Oil, Gas, and Geothermal
Resources</gco:CharacterString>
    </mri:keyword>
    <mri:thesaurusName xlink:href="/metadata/collection/">
      <cit:CI_Citation>
        <cit:title>
          <gco:CharacterString>Server Collections</gco:CharacterString>
        </cit:title>
        <cit:date>
          <cit:CI_Date>
            <cit:date>
              <gco:DateTime>2012-06-06T00:00:00</gco:DateTime>
            </cit:date>
            <cit:dateType>
              <cit:CI_DateTypeCode codeList=
"http://w3.energistics.org/energym/profiles/EIP/v1.1/EIPcodelists19115-3.xml#CI_DateTypeCode"
codeListValue="" />
            </cit:dateType>
          </cit:CI_Date>
        </cit:date>
      </cit:CI_Citation>
    </mri:thesaurusName>
  </mri:MD_Keywords>
</mri:descriptiveKeywords>
<mri:defaultLocale>
  <lan:PT_Locale>
    <lan:language>
      <lan:LanguageCode codeList= "http://www.loc.gov/standards/iso639-2/php/code_list.php"
codeListValue="eng">eng</lan:LanguageCode>
    </lan:language>
    <lan:characterEncoding gco:nilReason="unknown" />
  </lan:PT_Locale>
</mri:defaultLocale>
</mri:MD_DataIdentification>
</mdb:identificationInfo>
<mdb:distributionInfo>
  <mrd:MD_Distribution>
    <mrd:distributor>
      <mrd:MD_Distributor>
        <mrd:distributorContact>
          <cit:CI_Responsibility>
            <cit:role>
              <cit:CI_RoleCode codeList=

```



```

"http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#CI_RoleCode"
codeListValue="distributor">distributor</cit:CI_RoleCode>
  </cit:role>
  <cit:party>
    <cit:CI_Organisation>
      <cit:name>
        <gco:CharacterString>California Geological Survey</gco:CharacterString>
      </cit:name>
      <cit:contactInfo>
        <cit:CI_Contact>
          <cit:phone>
            <cit:CI_Telephone>
              <cit:number>
                <gco:CharacterString>(916) 445-9686</gco:CharacterString>
              </cit:number>
              <cit:numberType>
                <cit:CI_TelephoneTypeCode codeList=
"http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#CI_TelephoneTypeCode"
codeListValue="voice">voice</cit:CI_TelephoneTypeCode>
              </cit:numberType>
            </cit:CI_Telephone>
          </cit:phone>
          <cit:address>
            <cit:CI_Address>
              <cit:deliveryPoint>
                <gco:CharacterString>801 K Street, MS 20-21</gco:CharacterString>
              </cit:deliveryPoint>
              <cit:city>
                <gco:CharacterString>Sacramento</gco:CharacterString>
              </cit:city>
              <cit:administrativeArea>
                <gco:CharacterString>CA</gco:CharacterString>
              </cit:administrativeArea>
              <cit:postalCode>
                <gco:CharacterString>95814-5512</gco:CharacterString>
              </cit:postalCode>
              <cit:electronicMailAddress>
                <gco:CharacterString>
                  renewable@energy.state.ca.us
                </gco:CharacterString>
              </cit:electronicMailAddress>
            </cit:CI_Address>
          </cit:address>
        </cit:CI_Contact>
      </cit:contactInfo>
    </cit:CI_Organisation>
  </cit:party>
  <cit:CI_Responsibility>
    </mrd:distributorContact>
  </mrd:MD_Distributor>
</mrd:distributor>
<mrd:transferOptions>
  <mrd:MD_DigitalTransferOptions id="ftp201974pdf">
    <mrd:onLine>
      <cit:CI_OnlineResource>
        <cit:linkage>

```

```

                <gco:CharacterString>
ftp://ftp.consrv.ca.gov/pub/oil/geothermal/TR02-GeothermalHotLine/Vol.%204%20No.%202%20-
%20April%201974.pdf
                </gco:CharacterString>
            </cit:linkage>
            <cit:name>
                <gco:CharacterString>downloadableFile</gco:CharacterString>
            </cit:name>
            <cit:description>
                <gco:CharacterString>Geothermal Hotline Newsletter Vol. 4 No.
2</gco:CharacterString>
            </cit:description>
            <cit:function>
                <cit:CI_OnLineFunctionCode codeList=
"http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#CI_OnlineFunctionCode"
codeListValue="download">download</cit:CI_OnLineFunctionCode>
            </cit:function>
            </cit:CI_OnlineResource>
        </mrd:onLine>
    </mrd:MD_DigitalTransferOptions>
</mrd:transferOptions>
</mrd:MD_Distribution>
</mdb:distributionInfo>
</mdb:MD_Metadata>

```

D.2 Example 2 – Digital Service

```

<?xml version="1.0" encoding="UTF-8"?>
<mdb:MD_Metadata xmlns:xlink="http://www.w3.org/1999/xlink"
  xmlns:cit="http://standards.iso.org/iso/19115/-3/cit/1.0"
  xmlns:gco="http://standards.iso.org/iso/19115/-3/gco/1.0"
  xmlns:gex="http://standards.iso.org/iso/19115/-3/gex/1.0"
  xmlns:lan="http://standards.iso.org/iso/19115/-3/lan/1.0"
  xmlns:mac="http://standards.iso.org/iso/19115/-3/mac/1.0"
  xmlns:mas="http://standards.iso.org/iso/19115/-3/mas/1.0"
  xmlns:mdb="http://standards.iso.org/iso/19115/-3/mdb/1.0"
  xmlns:mcc="http://standards.iso.org/iso/19115/-3/mcc/1.0"
  xmlns:mco="http://standards.iso.org/iso/19115/-3/mco/1.0"
  xmlns:mdq="http://standards.iso.org/iso/19157/-2/mdq/1.0"
  xmlns:mmi="http://standards.iso.org/iso/19115/-3/mmi/1.0"
  xmlns:mpc="http://standards.iso.org/iso/19115/-3/mpc/1.0"
  xmlns:mrc="http://standards.iso.org/iso/19115/-3/mrc/1.0"
  xmlns:mrd="http://standards.iso.org/iso/19115/-3/mrd/1.0"
  xmlns:mri="http://standards.iso.org/iso/19115/-3/mri/1.0"
  xmlns:mrl="http://standards.iso.org/iso/19115/-3/mrl/1.0"
  xmlns:mrs="http://standards.iso.org/iso/19115/-3/mrs/1.0"
  xmlns:msr="http://standards.iso.org/iso/19115/-3/msr/1.0"
  xmlns:srv="http://standards.iso.org/iso/19115/-3/srv/2.0"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://standards.iso.org/iso/19115/-3/mds/1.0 http://standards.iso.org/iso/19115/-
3/mds/1.0/mds.xsd">
  <mdb:metadataIdentifier>
    <mcc:MD_Identifier>
      <mcc:code>
        <gco:CharacterString>38d590f2-a392-42d2-891a-8ada98e23f2b</gco:CharacterString>
      </mcc:code>
    </mcc:MD_Identifier>
  </mdb:metadataIdentifier>

```

```

    </mcc:code>
  </mcc:MD_Identifier>
</mdb:metadataIdentifier>
<mdb:defaultLocale>
  <lan:PT_Locale>
    <lan:language>
      <lan:LanguageCode codeList="http://www.loc.gov/standards/iso639-2/php/code_list.php"
codeListValue="eng">eng</lan:LanguageCode>
    </lan:language>
    <lan:characterEncoding>
      <lan:MD_CharacterSetCode codeList="http://www.iana.org/assignments/character-sets"
codeListValue="utf8">UTF-8</lan:MD_CharacterSetCode>
    </lan:characterEncoding>
  </lan:PT_Locale>
</mdb:defaultLocale>
<mdb:metadataScope>
  <mdb:MD_MetadataScope>
    <mdb:resourceScope>
      <mcc:MD_ScopeCode codeList= "http://w3.energistics.org/energym/prop-
files/EIP/v1.0/EIPcodelists19115-3.xml#MD_ScopeCode" codeListValue="service">ser-
vice</mcc:MD_ScopeCode>
    </mdb:resourceScope>
  </mdb:MD_MetadataScope>
</mdb:metadataScope>
<mdb:contact>
  <cit:CI_Responsibility>
    <cit:role>
      <cit:CI_RoleCode codeList= "http://standards.iso.org/iso/19115/resources/Codelist/cat/codel-
ists.xml#CI_RoleCode" codeListValue="pointOfContact">metadata point of contact</cit:CI_RoleCode>
    </cit:role>
    <cit:party>
      <cit:CI_Organisation>
        <cit:name>
          <gco:CharacterString>Energistics</gco:CharacterString>
        </cit:name>
        <cit:contactInfo>
          <cit:CI_Contact>
            <cit:address>
              <cit:CI_Address>
                <cit:electronicMailAddress>
                  <gco:CharacterString>metadata@energistics.org</gco:CharacterString>
                </cit:electronicMailAddress>
              </cit:CI_Address>
            </cit:address>
          </cit:CI_Contact>
        </cit:contactInfo>
        <cit:individual>
          <cit:CI_Individual>
            <cit:positionName>
              <gco:CharacterString>Metadata catalog manager</gco:CharacterString>
            </cit:positionName>
          </cit:CI_Individual>
        </cit:individual>
      </cit:CI_Organisation>
    </cit:party>
  </cit:CI_Responsibility>

```

```

</mdb:contact>
<mdb:dateInfo>
  <cit:CI_Date>
    <cit:date>
      <gco:DateTime>2015-10-10T04:00:44</gco:DateTime>
    </cit:date>
    <cit:dateType>
      <cit:CI_DateTypeCode codeList= "http://w3.energistics.org/energym/prop-
files/EIP/v1.0/EIPcodelists19115-3.xml#CI_DateTypeCode" codeListValue="creation">crea-
tion</cit:CI_DateTypeCode>
    </cit:dateType>
  </cit:CI_Date>
</mdb:dateInfo>
<mdb:metadataStandard>
  <!-- specification of ISO/TS 19115-3 as the metadata standard is recommended practice for EIP metadata-->
  <cit:CI_Citation>
    <cit:title>
      <gco:CharacterString>ISO/TS 19115-3 Geographic information — Metadata — XML
schema implementation for fundamental concepts</gco:CharacterString>
    </cit:title>
  </cit:CI_Citation>
</mdb:metadataStandard>
<mdb:metadataProfile xlink:href= "http://w3.energistics.org/energym/prop-
files/EIP/v1.1/metadataStandard_citation.xml">
  <!-- inclusion of the citation element is optional for EIP metadata -->
  <cit:CI_Citation>
    <cit:title>
      <gco:CharacterString>Energy Industry Profile of ISO 19115-1:2014, v1.1 </gco:Character-
String>
    </cit:title>
  </cit:CI_Citation>
</mdb:metadataProfile>
<mdb:spatialRepresentationInfo gco:nilReason="missing"/>
<mdb:identificationInfo>
  <srv:SV_ServiceIdentification>
    <mri:citation>
      <cit:CI_Citation>
        <cit:title>
          <gco:CharacterString>Example web processing service</gco:CharacterString>
        </cit:title>
        <cit:date gco:nilReason="missing"/>
        <cit:citedResponsibleParty>
          <cit:CI_Responsibility>
            <cit:role>
              <cit:CI_RoleCode codeList= "http://standards.iso.org/iso/19115/resources/Codel-
ist/cat/codelists.xml#CI_RoleCode" codeListValue="originator">originator</cit:CI_RoleCode>
            </cit:role>
            <cit:party>
              <cit:CI_Organisation>
                <cit:name>
                  <gco:CharacterString>Energistics</gco:CharacterString>
                </cit:name>
                <cit:contactInfo>
                  <cit:CI_Contact>
                    <cit:address>
                      <cit:CI_Address>

```

```

        <cit:electronicMailAddress>
        <gco:CharacterString>servicemanager@energistics.org
        </gco:CharacterString>
        </cit:electronicMailAddress>
        </cit:CI_Address>
        </cit:address>
        </cit:CI_Contact>
        </cit:contactInfo>
        </cit:CI_Organisation>
        </cit:party>
        </cit:CI_Responsibility>
        </cit:citedResponsibleParty>
        </cit:CI_Citation>
    </mri:citation>
    <mri:abstract>
        <gco:CharacterString>Simple OGC web processing service for testing
        </gco:CharacterString>
    </mri:abstract>
    <srv:serviceType>
        <gco:ScopedName codeSpace="https://github.com/OSGeo/Cat-In-
terop">OGC:WPS</gco:ScopedName>
    </srv:serviceType>
    <srv:serviceTypeVersion>
        <gco:CharacterString>2.0.0</gco:CharacterString>
    </srv:serviceTypeVersion>
    <srv:couplingType>
        <srv:SV_CouplingType codeList= "http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#SV_CouplingType" codeListValue="loose">loose</srv:SV_CouplingType>
    </srv:couplingType>
    <srv:containsOperations>
        <srv:SV_OperationMetadata>
            <srv:operationName>
                <gco:CharacterString>GetCapabilities</gco:CharacterString>
            </srv:operationName>
            <srv:distributedComputingPlatform>
                <srv:DCPList codeListValue="HTTP" codeList=" http://standards.iso.org/iso/19115/re-
sources/Codelist/cat/codelists.xml#DCPList "/>
            </srv:distributedComputingPlatform>
            <srv:connectPoint>
                <cit:CI_OnlineResource>
                    <cit:linkage>
                        <gco:CharacterString> http://service.energistics.org/processing?ser-
vice=WPS&amp;version=2.0.0&amp;request=GetCapabilities
                    </gco:CharacterString>
                    </cit:linkage>
                    <cit:protocol>
                        <gco:CharacterString>OGC-WPS</gco:CharacterString>
                    </cit:protocol>
                    <cit:description>
                        <gco:CharacterString>Demo Open Geospatial Consortium Web processing,
getCapabilities link</gco:CharacterString>
                    </cit:description>
                    <cit:function>
                        <cit:CI_OnLineFunctionCode codeList="http://standards.iso.org/iso/19115/re-
sources/Codelist/cat/codelists.xml#CI_OnlineFunctionCode"

```

```

codeListValue="information">information</cit:CI_OnLineFunctionCode>
  </cit:function>
  </cit:CI_OnlineResource>
  </srv:connectPoint>
</srv:SV_OperationMetadata>
</srv:containsOperations>
<srv:containsOperations>
  <srv:SV_OperationMetadata>
    <srv:operationName>
      <gco:CharacterString>Execute</gco:CharacterString>
    </srv:operationName>
    <srv:distributedComputingPlatform>
      <srv:DCPList codeListValue="HTTP" codeList= "http://standards.iso.org/iso/19115/re-
sources/Codelist/cat/codellists.xml#DCPList"/>
    </srv:distributedComputingPlatform>
    <srv:connectPoint>
      <cit:CI_OnlineResource>
        <cit:linkage>
          <gco:CharacterString> http://service.energistics.org/processing</gco:Character-
String>
        </cit:linkage>
        <cit:protocol>
          <gco:CharacterString>OGC-WPS</gco:CharacterString>
        </cit:protocol>
        <cit:name>
          <gco:CharacterString>End point URL for post requests</gco:CharacterString>
        </cit:name>
        <cit:description>
          <gco:CharacterString>operation to execute a processing workflow; the func-
tion is specified by the request parameters</gco:CharacterString>
        </cit:description>
        <cit:protocolRequest>
          <gco:CharacterString>POST</gco:CharacterString>
        </cit:protocolRequest>
      </cit:CI_OnlineResource>
    </srv:connectPoint>
  <srv:parameter>
    <srv:SV_Parameter>
      <srv:name>
        <gco:MemberName>
          <gco:aName>
            <gco:CharacterString> http://www.opengis.net/ows/2.0/Identi-
fier</gco:CharacterString>
          </gco:aName>
          <gco:attributeType>
            <gco:TypeName>
              <gco:aName>
                <gco:CharacterString>URI</gco:CharacterString>
              </gco:aName>
            </gco:TypeName>
          </gco:attributeType>
        </gco:MemberName>
      </srv:name>
      <srv:direction>
        <srv:SV_ParameterDirection>in</srv:SV_ParameterDirection>
      </srv:direction>

```

```

        <srv:description>
          <gco:CharacterString>A URI that identifies the operation to execute; this URI
must be defined in the GetCapabilities document</gco:CharacterString>
        </srv:description>
        <srv:optionality>
          <gco:Boolean>false</gco:Boolean>
        </srv:optionality>
        <srv:repeatability>
          <gco:Boolean>false</gco:Boolean>
        </srv:repeatability>
      </srv:SV_Parameter>
    </srv:parameter>
    <srv:parameter>
      <srv:SV_Parameter>
        <srv:name>
          <gco:MemberName>
            <gco:aName>
              <gco:CharacterString> http://www.opengis.net/ows/2.0/Input</gco:Charac-
terString>
            </gco:aName>
          <gco:attributeType>
            <gco:TypeName>
              <gco:aName>
                <gco:CharacterString> http://www.opengis.net/wps/2.0.0/Refer-
ence</gco:CharacterString>
              </gco:aName>
            </gco:TypeName>
          </gco:attributeType>
          <gco:MemberName>
            </gco:MemberName>
          </srv:name>
          <srv:direction>
            <srv:SV_ParameterDirection>in</srv:SV_ParameterDirection>
          </srv:direction>
          <srv:description>
            <gco:CharacterString>an xlink:href that provides a URL that will get the input
resource</gco:CharacterString>
          </srv:description>
          <srv:optionality>
            <gco:Boolean>true</gco:Boolean>
          </srv:optionality>
          <srv:repeatability>
            <gco:Boolean>true</gco:Boolean>
          </srv:repeatability>
        </srv:SV_Parameter>
      </srv:parameter>
    </srv:parameter>
    <srv:SV_Parameter>
      <srv:name>
        <gco:MemberName>
          <gco:aName>
            <gco:CharacterString> http://www.opengis.net/ows/2.0/Output</gco:Char-
acterString>
          </gco:aName>
        <gco:attributeType>
          <gco:TypeName>
            <gco:aName>

```

```

        <gco:CharacterString> http://www.opengis.net/wps/2.0.0/dataTrans-
missionMode</gco:CharacterString>
        </gco:aName>
        </gco:TypeName>
        </gco:attributeType>
        </gco:MemberName>
    </srv:name>
    <srv:direction>
        <srv:SV_ParameterDirection>in</srv:SV_ParameterDirection>
    </srv:direction>
    <srv:description>
        <gco:CharacterString>specification of how the output from the process should
be returned; enumeration either 'value' or 'reference'</gco:CharacterString>
    </srv:description>
    <srv:optionality>
        <gco:Boolean>>false</gco:Boolean>
    </srv:optionality>
    <srv:repeatability>
        <gco:Boolean>>false</gco:Boolean>
    </srv:repeatability>
    </srv:SV_Parameter>
</srv:parameter>
</srv:SV_OperationMetadata>
</srv:containsOperations>
</srv:SV_ServiceIdentification>
</mdb:identificationInfo>
<mdb:distributionInfo>
    <mrd:MD_Distribution>
        <mrd:distributor>
            <mrd:MD_Distributor>
                <mrd:distributorContact>
                    <cit:CI_Responsibility>
                        <cit:role>
                            <cit:CI_RoleCode codeList= "http://standards.iso.org/iso/19115/resources/Codel-
ist/cat/codelists.xml#CI_RoleCode" codeListValue="pointOfContact">service point of con-
tact</cit:CI_RoleCode>
                        </cit:role>
                    <cit:party>
                        <cit:CI_Organisation>
                            <cit:name>
                                <gco:CharacterString>Energistics</gco:CharacterString>
                            </cit:name>
                            <cit:contactInfo>
                                <cit:CI_Contact>
                                    <cit:address>
                                        <cit:CI_Address>
                                            <cit:electronicMailAddress>
                                                <gco:CharacterString> webservice@energistics.org </gco:Char-
acterString>
                                            </cit:electronicMailAddress>
                                        </cit:CI_Address>
                                    </cit:address>
                                </cit:CI_Contact>
                            </cit:contactInfo>
                        </cit:individual>
                    </cit:CI_Individual>
                </mrd:distributorContact>
            </mrd:MD_Distributor>
        </mrd:distributor>
    </mrd:MD_Distribution>
</mdb:distributionInfo>
</mdb:identificationInfo>
</srv:SV_ServiceIdentification>
</srv:containsOperations>
</srv:SV_OperationMetadata>
</srv:parameter>
</srv:SV_Parameter>
</srv:repeatability>
</srv:optionality>
</gco:Boolean>
</gco:Boolean>
</gco:CharacterString>
</srv:description>
</srv:direction>
</srv:SV_ParameterDirection>
</srv:direction>
</gco:MemberName>
</gco:attributeType>
</gco:TypeName>
</gco:aName>
</gco:CharacterString>

```



```
        <cit:positionName>
          <gco:CharacterString>Web services manager</gco:CharacterString>
        </cit:positionName>
      </cit:CI_Individual>
    </cit:individual>
  </cit:CI_Organisation>
</cit:party>
</cit:CI_Responsibility>
</mrd:distributorContact>
</mrd:MD_Distributor>
</mrd:distributor>
</mrd:MD_Distribution>
</mdb:distributionInfo>
</mdb:MD_Metadata>
```

Appendix E.Schematron Validation

Conformance to EIP XML schema validation is insufficient to thoroughly validate conformance to the EIP. The Schematron rules presented here may be used to validate requirements not testable by XML schema validation. A Schematron file containing these rules is available at

http://w3.energistics.org/energyml/profiles/EIP/v1.1/EIP_Schematron.sch

```
<?xml version="1.0" encoding="UTF-8" ?>
<sch:schema xmlns:sch="http://purl.oclc.org/dsdl/schematron" schemaVersion="ISO19757-3"
  queryBinding="xslt">
  <sch:ns prefix="cit" uri="http://standards.iso.org/iso/19115/-3/cit/1.0"/>
  <sch:ns prefix="gcx" uri="http://standards.iso.org/iso/19115/-3/gcx/1.0"/>
  <sch:ns prefix="gex" uri="http://standards.iso.org/iso/19115/-3/gex/1.0"/>
  <sch:ns prefix="lan" uri="http://standards.iso.org/iso/19115/-3/lan/1.0"/>
  <sch:ns prefix="srv" uri="http://standards.iso.org/iso/19115/-3/srv/2.0"/>
  <sch:ns prefix="mas" uri="http://standards.iso.org/iso/19115/-3/mas/1.0"/>
  <sch:ns prefix="mcc" uri="http://standards.iso.org/iso/19115/-3/mcc/1.0"/>
  <sch:ns prefix="mco" uri="http://standards.iso.org/iso/19115/-3/mco/1.0"/>
  <sch:ns prefix="mda" uri="http://standards.iso.org/iso/19115/-3/mda/1.0"/>
  <sch:ns prefix="mdb" uri="http://standards.iso.org/iso/19115/-3/mdb/1.0"/>
  <sch:ns prefix="mds" uri="http://standards.iso.org/iso/19115/-3/mds/1.0"/>
  <sch:ns prefix="mdt" uri="http://standards.iso.org/iso/19115/-3/mdt/1.0"/>
  <sch:ns prefix="mex" uri="http://standards.iso.org/iso/19115/-3/mex/1.0"/>
  <sch:ns prefix="mmi" uri="http://standards.iso.org/iso/19115/-3/mmi/1.0"/>
  <sch:ns prefix="mmd" uri="http://standards.iso.org/iso/19115/-3/mmd/1.0"/>
  <sch:ns prefix="mpc" uri="http://standards.iso.org/iso/19115/-3/mpc/1.0"/>
  <sch:ns prefix="mrc" uri="http://standards.iso.org/iso/19115/-3/mrc/1.0"/>
  <sch:ns prefix="mrd" uri="http://standards.iso.org/iso/19115/-3/mrd/1.0"/>
  <sch:ns prefix="mri" uri="http://standards.iso.org/iso/19115/-3/mri/1.0"/>
  <sch:ns prefix="mrl" uri="http://standards.iso.org/iso/19115/-3/mrl/1.0"/>
  <sch:ns prefix="mrs" uri="http://standards.iso.org/iso/19115/-3/mrs/1.0"/>
  <sch:ns prefix="msr" uri="http://standards.iso.org/iso/19115/-3/msr/1.0"/>
  <sch:ns prefix="gco" uri="http://standards.iso.org/iso/19115/-3/gco/1.0"/>
  <sch:ns prefix="xlink" uri="http://www.w3.org/1999/xlink"/>
  <!-- Author: John.Kozimor@noaa.gov -->
  <!-- Date: February 27, 2014 -->
  <!-- updated by Stephen Richard 2016-01-13-->
  <!-- update namespace URI, remove unused namespaces, update CI_Responsibility tests
  to include positionName, update some error notes.-->
  <!-- Common rules: These rules are applied to all EIP metadata records -->
  <sch:pattern id="b2f3a061-0984-11e2-892e-0800200c9a66">
    <sch:title>Check for metadata language element</sch:title>
    <sch:rule context="*/mdb:defaultLocale">
      <sch:assert test="./lan:PT_Locale/lan:language/lan:LanguageCode !="">Add and/or
      populate metadata language element</sch:assert>
    </sch:rule>
  </sch:pattern>
  <sch:pattern id="b2f3a062-0984-11e2-892e-0800200c9a66">
    <sch:title>Check for metadata characterSet element</sch:title>
    <sch:rule context="*/mdb:defaultLocale">
      <sch:assert test="./lan:PT_Locale/lan:characterEncoding/lan:MD_CharacterSetCode !=""
      >Add and/or populate metadata characterSet element</sch:assert>
    </sch:rule>
  </sch:pattern>
```

```

<sch:pattern id="a2f3a063-0984-11e2-892e-0800200c9a66">
  <sch:title>Checks for metadata contact</sch:title>
  <sch:rule context="*/mdb:contact">
    <sch:assert test="./cit:CI_Responsibility/cit:party">Add metadata contact
      element</sch:assert>
    <sch:assert
      test="(./cit:CI_Responsibility/cit:party/cit:CI_Organisation/cit:name/gco:CharacterString != " or
./cit:CI_Responsibility/cit:party/cit:CI_Individual/cit:name/gco:CharacterString != " or
./cit:CI_Responsibility/cit:party/cit:CI_Individual/cit:positionName/gco:CharacterString != ") >= 1"
      >Add and/or populate CI_Organisation/name, CI_Individual/name, or
CI_Individual/positionName element in metadata
      contact.</sch:assert>
    <sch:assert
      test="(./*/cit:con-
tactInfo/cit:CI_Contact/cit:phone/cit:CI_Telephone/cit:number/gco:CharacterString != " or ./*/cit:con-
tactInfo/cit:CI_Contact/cit:address/cit:CI_Address/cit:electronicMailAddress/gco:CharacterString != ")"
      >Add and/or populate the phone or email element in metadata contact</sch:assert>
    <sch:assert
      test="(./cit:CI_Responsibility/cit:role/cit:CI_RoleCode !=" or
./cit:CI_Responsibility/cit:role[@gco:nilReason = 'missing' or @gco:nilReason = 'inapplicable' or @gco:nil-
Reason = 'template' or @gco:nilReason = 'unknown' or @gco:nilReason = 'withheld'])"
      >Populate the role element in metadata contact or add attribute 'gco:nilReason' to
      the role element and populate with one of the following valid values: 'missing',
      'inapplicable', 'template', 'unknown', or 'withheld'</sch:assert>
    </sch:rule>
  </sch:pattern>

<sch:pattern id="a0653ca0-1252-11e2-892e-0800200c9a66">
  <sch:title>Check that metadata creation/update date element exists and is
  populated</sch:title>
  <sch:rule context="*/mdb:dateInfo">
    <sch:assert test="./cit:CI_Date/cit:date/gco:DateTime != "">Add and/or populate
      metadata creation/update date element</sch:assert>
    </sch:rule>
  </sch:pattern>

<sch:pattern id="a0653ca0-1253-11e2-892e-0800200c9a66">
  <sch:title>Check that metadata creation/update dateTypeCode is 'creation' or
  'revision'</sch:title>
  <sch:rule context="*/mdb:dateInfo">
    <sch:assert
      test="./cit:CI_Date[cit:dateType/cit:CI_DateTypeCode='creation'] or
./cit:CI_Date[cit:dateType/cit:CI_DateTypeCode='revision']"
      >Set metadata date dateTypeCode to 'creation' if record is new. Set metadata date
      dateTypeCode to 'revision' if record is being updated. If updating, modify the
      DateTime element value to the current date and time.</sch:assert>
    </sch:rule>
  </sch:pattern>

<sch:pattern id="b2f3a060-0984-11e2-892e-0800200c9a66">
  <sch:title>Check for populated metadata identifier</sch:title>
  <sch:rule context="*/mdb:metadataIdentifier">
    <sch:assert test="./mcc:MD_Identifier/mcc:code/gco:CharacterString != "">Add and/or
      populate metadata Identifier element</sch:assert>
  </sch:rule>
</sch:pattern>

```

```

</sch:rule>
</sch:pattern>

<sch:pattern id="b2f3a064-0984-11e2-892e-0800200c9a66">
  <sch:title>Check for metadataProfile online reference to EIP profile v1.1 specification
  document</sch:title>
  <sch:rule context="/*">
    <sch:assert test="/mdb:metadataProfile/@xlink:href">Add xlink:href element to
    metadataStandard citation element</sch:assert>
    <sch:assert test="/mdb:metadataProfile/@xlink:href !="">Populate the xlink:href
    attribute in metadataStandard citation element with url to EIP profile specification
    ('http://w3.energistics.org/energym/Profiles/EIP/v1.1/metadataStandard_citation.xml')</sch:assert>
  </sch:rule>
</sch:pattern>

<sch:pattern id="b7f3a064-0984-11e2-892e-0800200c9a66">
  <sch:title>Check for populated metadataStandard citation elements</sch:title>
  <sch:rule context="//mdb:metadataStandard/cit:CI_Citation">
    <sch:assert test="/cit:title/gco:CharacterString !="">Populate the metadataStandard
    title/CharacterString element</sch:assert>
    <sch:assert test="/cit:date/cit:CI_Date/cit:date/gco:DateTime !="">Populate the
    metadataStandard DateTime element</sch:assert>
    <sch:assert
    test="/cit:date/cit:CI_Date/cit:dateType/cit:CI_DateTypeCode[text()='publication']"
    >Populate the metadataStandard CI_DateTypeCode element with
    'publication'</sch:assert>
  </sch:rule>
</sch:pattern>

<sch:pattern id="a0654ca2-1252-11e2-892e-0800200c9a66">
  <sch:title>Check that metadata scope element exists</sch:title>
  <sch:rule context="/mdb:MD_Metadata">
    <sch:assert
    test="/mdb:metadataScope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode"
    >Add the metadataScope element</sch:assert>
  </sch:rule>
</sch:pattern>

<sch:pattern id="a0653ca2-1252-11e2-892e-0800200c9a66">
  <sch:title>Check that metadata scope element is populated</sch:title>
  <sch:rule context="/*/mdb:metadataScope">
    <sch:assert
    test="(./mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='activity' or
    text()='application' or text()='collection' or text()='collectionHardware' or text()='dataset' or text()='docu-
    ment' or text()='documentPhysical' or text()='metadata' or text()='nonGeographicDataset' or text()='sam-
    ple' or text()='series' or text()='seriesPhysical' or text()='service']) or (./@gco:nilReason)"
    >Populate the resource scope code with one of the following EIP ScopeCode values:
    'activity', 'application', 'collection', 'collectionHardware', 'dataset',
    'document', 'documentPhysical', 'metadata', 'nonGeographicDataset', 'sample',
    'series', 'seriesPhysical', 'service'</sch:assert>
  </sch:rule>
</sch:pattern>

<sch:pattern id="f0653ca0-1252-11e2-892e-0800200c9a66">
  <sch:title>Resource citation checks</sch:title>
  <sch:rule context="/*/mdb:identificationInfo/mri:MD_DataIdentification">

```

```

<sch:assert test="/mri:citation/cit:CI_Citation/cit:title/gco:CharacterString !="">Add
and/or populate resource citation title</sch:assert>
<sch:assert
test="/mri:citation/cit:CI_Citation/cit:date/cit:CI_Date//cit:date/gco:DateTime !=""
>Add and/or populate resource citation DateTime element</sch:assert>
<sch:assert
test="/mri:citation/cit:CI_Citation/cit:date/cit:CI_Date//cit:dateType/cit:CI_DateTypeCode != ""
>Add and/or populate resource citation DateTypeCode element</sch:assert>
</sch:rule>
</sch:pattern>

<sch:pattern id="ba761f10-14ac-11e2-892e-0800200c9a66">
<sch:title>Check for populated resource identifier</sch:title>
<sch:rule context="*/mdb:identificationInfo/mri:MD_DataIdentification">
<sch:assert
test="/mri:citation/cit:CI_Citation/cit:identifier/mcc:MD_Identifier/mcc:code/gco:CharacterString
!= " or ./mri:citation/cit:CI_Citation/cit:identifier/@gco:nilReason"
>Add and/or populate the resource identifier code element or add the gco:nilReason
attribute to the identifier element and populate with one of the following valid
values: 'missing', 'inapplicable', 'template', 'unknown', or 'withheld'</sch:assert>
</sch:rule>
</sch:pattern>

<sch:pattern id="d2c3a062-0984-11e2-892e-0800200c9a66">
<sch:title>Checks for resource citedResponsibleParty</sch:title>
<sch:rule
context="*/mdb:identificationInfo/mri:MD_DataIdentification/mri:citation/cit:CI_Citation">
<sch:assert
test="(./cit:citedRespon-
sibleParty/cit:CI_Responsibility/cit:party/cit:CI_Organisation/cit:name/gco:CharacterString != " or ./cit:cit-
edResponsibleParty/cit:CI_Responsibility/cit:party/cit:CI_Individual/cit:name/gco:CharacterString != ")
>Add an CI_Organisation/name or CI_Individual/name element or a nilReason attribute to cited
responsible
party.</sch:assert>
<sch:assert
test="(./cit:citedResponsibleParty//cit:con-
tactInfo/cit:CI_Contact/cit:phone/cit:CI_Telephone/cit:number/gco:CharacterString != " or ./cit:cit-
edResponsibleParty//cit:con-
tactInfo/cit:CI_Contact/cit:address/cit:CI_Address/cit:electronicMailAddress/gco:CharacterString != ")
>Populate the phone or email element in cited responsible party. If the
party has no contact information (e.g. deceased) use nilReason="inapplicable"
on the containing contactInfo element</sch:assert>
<sch:assert
test="(./cit:citedResponsibleParty/cit:CI_Responsibility/cit:role/cit:CI_RoleCode !=" or ./cit:cit-
edResponsibleParty/cit:CI_Responsibility/cit:role[@gco:nilReason = 'missing' or @gco:nilReason = 'inap-
plicable' or @gco:nilReason = 'template' or @gco:nilReason = 'unknown' or @gco:nilReason = 'with-
held'])"
>Populate the role element in cited responsible party or add attribute 'gco:nilReason' to
the role element and populate with one of the following valid values: 'missing',
'inapplicable', 'template', 'unknown', or 'withheld'</sch:assert>
</sch:rule>
</sch:pattern>

<sch:pattern id="b2f3a061-0934-11e2-892x-0800200c9a66">
<sch:title>Check for data resource abstract</sch:title>
<sch:rule context="*/mdb:identificationInfo/mri:MD_DataIdentification">

```

```

    <sch:assert test="./mri:abstract/gco:CharacterString !="">Provide a useful description of the re-
source in the
    identificationInfo abstract element</sch:assert>
  </sch:rule>
</sch:pattern>

<sch:pattern id="b2f3a061-0984-11e2-892x-0800200c9a66">
  <sch:title>Check for resource status progress code</sch:title>
  <sch:rule context="/*/mdb:identificationInfo/mri:MD_DataIdentification">
    <sch:assert test="./mri:status/mri:MD_ProgressCode !=" or ./mri:status/@gco:nilReason"
    >Populate the data identification status/progressCode element or add the
    gco:nilReason attribute to the status element</sch:assert>
  </sch:rule>
</sch:pattern>

<sch:pattern id="d2c3a062-7984-11e2-892e-0800200c9a66">
  <sch:title>Checks for resource point of contact</sch:title>
  <sch:rule context="/*/mdb:identificationInfo/mri:MD_DataIdentification">
    <sch:assert
      test="(./mri:pointOfCon-
tact/cit:CI_Responsibility/cit:party/cit:CI_Organisation/cit:name/gco:CharacterString != " or ./mri:poin-
tOfContact/cit:CI_Responsibility/cit:party/cit:CI_Individual/cit:name/gco:CharacterString != " or
      ./cit:CI_Responsibility/cit:party/cit:CI_Individual/cit:positionName/gco:CharacterString != ") >=
1"
      >Add and/or populate CI_Organisation/name, CI_Individual/name, CI_Individual/positionName
element
      or a gco:nilReason attribute in resource pointOfContact</sch:assert>
    <sch:assert
      test="(./mri:pointOfCon-
tact/cit:CI_Responsibility/cit:party/*/cit:contactInfo/cit:CI_Contact/cit:phone/cit:CI_Telephone/cit:number/gc-
o:CharacterString !=" or ./mri:pointOfCon-
tact/cit:CI_Responsibility/cit:party/*/cit:contactInfo/cit:CI_Contact/cit:address/cit:CI_Address/cit:electronic
MailAddress/gco:CharacterString !=)"
      >Populate phone or email element or provide gco:nilReason in resource pointOfCon-
tact</sch:assert>
    <sch:assert
      test="./mri:pointOfContact/cit:CI_Responsibility/cit:role/cit:CI_RoleCode !=" or ./mri:pointOfCon-
tact/cit:CI_Responsibility/cit:role/@gco:nilReason"
      >Populate role code element in resource pointOfContact or add the gco:nilReason
      attribute to the role element</sch:assert>
    </sch:rule>
  </sch:pattern>

<sch:pattern id="b2f3a061-0944-11e2-892x-0800200c9a66">
  <sch:title>Check for resource content topic</sch:title>
  <sch:rule context="/*">
    <sch:report
      test="./mdb:metada-
taScope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='dataset' or
text()='series'] and ./mdb:identification-
Info/mri:MD_DataIdentification/mri:topicCategory/mri:MD_TopicCategoryCode =""
      >Topic Category code is mandatory in identificationInfo element</sch:report>
    </sch:rule>
  </sch:pattern>

<sch:pattern id="b2f3a061-0933-11e2-492x-0800200c9a66">

```

```

<sch:title>Check for resource constraints</sch:title>
<sch:rule context="*/mdb:identificationInfo/mri:MD_DataIdentification">
  <sch:assert
    test="./mri:resourceConstraints/mco:reference/cit:CI_Citation/cit:title/gco:CharacterString !=""
    >Add and/or populate the reference title for a resource constraint citation</sch:assert>
  <sch:assert
    test="(./mri:resourceCon-
strains/mco:MD_LegalConstraints/mco:accessConstraints/mco:MD_RestrictionCode[text()='acknowledge'
' or text()='confidential' or text()='copyright' or text()='intellectualPropertyRights' or text()='licence' or
text()='patent' or text()='patentPending' or text()='trademark' or text()='unrestricted' or text()='otherRe-
strictions']) or (./mri:resourceCon-
strains/mco:MD_LegalConstraints/mco:useConstraints/mco:MD_RestrictionCode[text()='acknowledge' or
text()='confidential' or text()='copyright' or text()='intellectualPropertyRights' or text()='licence' or
text()='patent' or text()='patentPending' or text()='trademark' or text()='unrestricted' or text()='otherRe-
strictions'])"
    >Add and/or populate the accessConstraints RestrictionCode or the useConstraint
RestrictionCode. Valid RestrictionCode values include: 'acknowledge',
'confidential', 'copyright', 'intellectualPropertyRights', 'licence', 'patent',
'patentPending', 'trademark', 'unrestricted', 'otherRestrictions'</sch:assert>
  </sch:rule>
</sch:pattern>

<sch:pattern id="d2c3v062-7984-11e2-892e-0800200c9a66">
  <sch:title>Checks for resource distributor contact</sch:title>
  <sch:rule
    context="*/mdb:distributionInfo/mrd:MD_Distribution/mrd:distributor/mrd:MD_Distributor">
    <sch:assert
      test="(./mrd:distributorCon-
tact/cit:CI_Responsibility/cit:party/cit:CI_Organisation/cit:name/gco:CharacterString !=" or ./mrd:distribu-
torContact/cit:CI_Responsibility/cit:party/cit:CI_Individual/cit:name/gco:CharacterString != " or
./cit:CI_Responsibility/cit:party/cit:CI_Individual/cit:positionName/gco:CharacterString != ") >=
1) or ./mrd:distributorContact/@gco:nilReason"
      >Populate CI_Organisation/name or CI_Individual/name or CI_Individual/positionName element
in
      distributor Contact</sch:assert>
    <sch:assert
      test="(./mrd:distributorCon-
tact/cit:CI_Responsibility/cit:party*/cit:contactInfo/cit:CI_Contact/cit:phone/cit:CI_Telephone/cit:number/gc
o:CharacterString !=" or ./mrd:distributorCon-
tact/cit:CI_Responsibility/cit:party*/cit:contactInfo/cit:CI_Contact/cit:address/cit:CI_Address/cit:electronic
MailAddress/gco:CharacterString !=")"
      >Populate phone or email element or add gco:nilReason attribute in distributor Con-
tact</sch:assert>
    <sch:assert
      test="./mrd:distributorContact/cit:CI_Responsibility/cit:role/cit:CI_RoleCode !=" or ./mrd:distribu-
torContact/cit:CI_Responsibility/cit:role/@gco:nilReason"
      >Populate role code element in distributorContact or add gco:nilReason attribute to
role.</sch:assert>
    </sch:rule>
  </sch:pattern>

<!-- Digital Product Rules - These rules are applied when the metadata scope code is 'metadata', 'nonGe-
ographicDataset', 'application', 'series', 'software', 'dataset' or document -->
<sch:pattern id="b3f3a061-0984-11e2-892x-0800200c9a66">
  <sch:title>Check for digital product format name</sch:title>
  <sch:rule

```

```

    context="/*/mdb:metada-
taScope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='metadata' or
text()='nonGeographicDataset' or text()='application' or text()='series' or text()='dataset' or text()='docu-
ment']">
    <sch:assert
      test="//mdb:distribution-
Info/mrd:MD_Distribution/mrd:distributionFormat/mrd:MD_Format/mrd:formatSpecificationCitation/cit:CI_
Citation/cit:title/gco:CharacterString !=""
      >Add and/or populate the title element in the
      '/MD_Distribution/distributionFormat/MD_Format/formatSpecificationCitation/CI_Citation'
      object</sch:assert>
    </sch:rule>
  </sch:pattern>

  <sch:pattern id="b3f3a061-1984-11e2-892x-0800200c9a66">
    <sch:title>Check for digital product version</sch:title>
    <sch:rule
      context="/*/mdb:metada-
taScope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='metadata' or
text()='nonGeographicDataset' or text()='application' or text()='series' or text()='dataset' or text()='docu-
ment']">
      <sch:assert
        test="//mdb:distribution-
Info/mrd:MD_Distribution/mrd:distributionFormat/mrd:MD_Format/mrd:amendmentNumber/gco:Character
String !=""
        >Add and/or populate the amendmentNumber element in the
        '/MD_Distribution/distributionFormat/MD_Format' object or add gco:nilReason
        attribute to amendmentNumber element.</sch:assert>
      </sch:rule>
    </sch:pattern>

    <sch:pattern id="b4f3a071-0984-11e2-892x-0800200c9a66">
      <sch:title>Check for the existence of an onLine or offLine access object</sch:title>
      <sch:rule
        context="/*/mdb:metada-
taScope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='metadata' or
text()='nonGeographicDataset' or text()='application' or text()='series' or text()='dataset' or text()='docu-
ment']">
        <sch:assert
          test="count(//mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:onLine) +
count(//mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:offLine) >= 1"
          >An offline or online element is required in the
          '/MD_Distribution/transferOptions/MD_DigitalTransferOptions' object. Add an onLine
          element for products accessed via a URL. Add an offLine element for products not
          directly accessed via the internet.</sch:assert>
        </sch:rule>
      </sch:pattern>

      <sch:pattern id="b3f3a071-0984-11e2-892x-0800200c9a66">
        <sch:title>Checks for offLine digital product access</sch:title>
        <sch:rule
          context="/*/mdb:metada-
taScope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='metadata' or
text()='nonGeographicDataset' or text()='application' or text()='series' or text()='dataset' or text()='docu-
ment']">
          <sch:report

```



```

    test="//mrd:MD_Distribution/mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:offLine
and
not(//mrd:MD_Distribution/mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:offLine/mrd:MD_Medi
um/mrd:name/cit:CI_Citation/cit:title)"
    >Add a title element to the

```

```

'/MD_Distribution/transferOptions/MD_DigitalTransferOptions/offLine/MD_Medium/name/CI_Citation'
object. This title is used to specify the offline access medium type, such as
cdROM.</sch:report>

```

```

<sch:report
    test="//mrd:MD_Distribution/mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:offLine
and
//mrd:MD_Distribution/mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:offLine/mrd:MD_Medium/
mrd:name/cit:CI_Citation/cit:title/gco:CharacterString =""
    >Populate the title/gco:CharacterString element in the

```

```

'/MD_Distribution/transferOptions/MD_DigitalTransferOptions/offLine/MD_Medium/name/CI_Citation'
object.</sch:report>

```

```

<sch:report
    test="//mrd:MD_Distribution/mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:offLine
and not(//mrd:distribu-
tor/mrd:MD_Distributor/mrd:distributionOrderProcess/mrd:MD_StandardOrderProcess/mrd:orderingInstru
ctions)"

```

```

    >Add a orderingInstructions element to the
    '/MD_Distribution/distributor/./MD_StandardOrderProcess'
    object. Ordering instruction are required to describe the process steps for
    accessing offline digital products.</sch:report>

```

```

<sch:report
    test="//mrd:MD_Distribution/mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:offLine
and //mrd:distribu-
tor/mrd:MD_Distributor/mrd:distributionOrderProcess/mrd:MD_StandardOrderProcess/mrd:orderingInstru
ctions/gco:CharacterString =""
    >Populate the orderingInstructions/gco:CharacterString element in the

```

```

'/MD_Distribution/distributor/MD_Distributor/distributionOrderProcess/MD_StandardOrderProcess'
object.</sch:report>

```

```

</sch:rule>
</sch:pattern>

```

```

<sch:pattern id="b3f3a071-0984-11e2-872x-0800200c9a66">
    <sch:title>Checks for onLine digital product access</sch:title>
    <sch:rule
        context="*/mdb:metada-
taScope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='metadata' or
text()='nonGeographicDataset' or text()='application' or text()='series' or text()='dataset' or text()='docu-
ment']">

```

```

    <sch:assert
        test="//mrd:MD_Distribution/mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:onLine
and
//mrd:MD_Distribution/mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:onLine/cit:CI_OnlineReso
urce/cit:linkage/gco:CharacterString !=""
    >Add and/or populate the linkage element in the

```

```

    '/MD_Distribution/transferOptions/MD_DigitalTransferOptions/onLine/CI_OnlineResource'
    object. The linkage element contains the URL for accessing the online
    resource.</sch:assert>

```

```

<sch:assert

```

```

    test="//mrd:MD_Distribution/mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:onLine
and
//mrd:MD_Distribution/mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:onLine/cit:CI_OnlineResource/cit:function/cit:CI_OnLineFunctionCode !=""

```

>Add and/or populate the function code element in the

```

'/MD_Distribution/transferOptions/MD_DigitalTransferOptions/onLine/CI_OnlineResource/function'
object.</sch:assert>
<sch:report
  test="not
(//mrd:MD_Distribution/mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:onLine/cit:CI_OnlineResource/cit:protocol ) and
//mrd:MD_Distribution/mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:onLine/cit:CI_OnlineResource/cit:function/cit:CI_OnLineFunctionCode[text()='information']"
  >Add and populate the protocol/gco:CharacterString element to the
  '/MD_Distribution/transferOptions/MD_DigitalTransferOptions
  /onLine/CI_OnlineResource' object.</sch:report>
</sch:rule>
</sch:pattern>

```

<!-- Physical Product Rules - These rules are applied when the metadata scope code is 'collectionHardware', 'sample', 'documentPhysical' and 'seriesPhysical' -->

```

<sch:pattern id="b3c3a061-0984-11e2-892x-0800200c9a66">
  <sch:title>Check for physical product format name</sch:title>
  <sch:rule
    context="*/mdb:metadataScope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='collectionHardware'
or text()='sample' or text()='documentPhysical' or text()='seriesPhysical']">
    <sch:assert
      test="//mdb:distributionInfo/mrd:MD_Distribution/mrd:distributionFormat/mrd:MD_Format/mrd:formatSpecificationCitation/cit:CI_Citation/cit:title/gco:CharacterString !=""
      >Add the physical product format name to the format citation title
      element</sch:assert>
    </sch:rule>
  </sch:pattern>

```

```

<sch:pattern id="b3f3a071-0984-11e8-892x-0800200c9a66">
  <sch:title>Check for physical product ordering instructions</sch:title>
  <sch:rule
    context="*/mdb:metadataScope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='collectionHardware'
or text()='sample' or text()='documentPhysical' or text()='seriesPhysical']">
    <sch:assert
      test="//mrd:distributor/mrd:MD_Distributor/mrd:distributionOrderProcess/mrd:MD_StandardOrderProcess/mrd:orderingInstructions/gco:CharacterString !=""
      >Add orderingInstructions to the StandardOrderProcess object. Ordering instruction
      are required to describe the process steps for acquiring physical
      products</sch:assert>
    </sch:rule>
  </sch:pattern>

```

<!-- Digital Service Rules - These rules are applied when the metadata scope code is 'service' -->

```

<sch:pattern id="b2f3a061-1984-11e2-892x-0800200d9a66">
  <sch:title>Checks for service identification section</sch:title>

```

```

<sch:rule
  context="/*/mdb:meta-
taScope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='service']">
  <sch:assert test="//srv:SV_ServiceIdentification">Add a 'ServiceIdentification' object.
  ServiceIdentification is required when MD_ScopeCode is 'service'</sch:assert>
</sch:rule>
</sch:pattern>

<sch:pattern id="b2f3a061-1984-11e2-892x-0800200c9a66">
  <sch:title>Checks for service type</sch:title>
  <sch:rule
    context="/*/mdb:meta-
taScope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='service']">
    <sch:report test="not(//srv:serviceType/gco:LocalName)">Add a local name element to the
    'ServiceIdentification/serviceType' object</sch:report>
    <sch:report test="//srv:serviceType/gco:LocalName =""">Populate the local name element
    in the 'ServiceIdentification/serviceType' object</sch:report>
    <sch:report test="not(//srv:serviceType/gco:LocalName/@codeSpace)">Add the namespace
    attribute to the 'ServiceIdentification/serviceType' element</sch:report>
    <sch:report test="//srv:serviceType/gco:LocalName/@codeSpace =""">Populate the namespace
    attribute in the 'ServiceIdentification/serviceType' element with a service type
    identifier</sch:report>
  </sch:rule>
</sch:pattern>

<sch:pattern id="b2f4a061-1984-11e2-892x-0810200c9a66">
  <sch:title>Checks for coupled datasets</sch:title>
  <sch:rule
    context="/*/mdb:meta-
taScope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='service']">
    <sch:report
      test="not(//srv:SV_ServiceIdentification/srv:couplingType/srv:SV_CouplingType)">Add
      a couplingType element to the 'SV_ServiceIdentification' object</sch:report>
    <sch:report
      test="//srv:SV_ServiceIdentification/srv:couplingType/srv:SV_CouplingType =""
      >Populate the couplingType element in the 'SV_ServiceIdentification'
      object</sch:report>
    <sch:report
      test="//srv:SV_ServiceIdentification/srv:couplingType/srv:SV_CouplingType[text()='tight' or
text()='mixed'] and
not(//srv:SV_ServiceIdentification/srv:operatesOn/mri:MD_DataIdentification/mri:citation/cit:CI_Citation/cit:
title)"
      >Add a title element to the
      'SV_ServiceIdentification/operatesOn/MD_DataIdentification/citation/CI_Citation'
      object</sch:report>
    <sch:report
      test="//srv:SV_ServiceIdentification/srv:couplingType/srv:SV_CouplingType[text()='tight' or
text()='mixed'] and
//srv:SV_ServiceIdentification/srv:operatesOn/mri:MD_DataIdentification/mri:citation/cit:CI_Citation/cit:title
/gco:CharacterString =""
      >Populate the title element in the
      'SV_ServiceIdentification/operatesOn/MD_DataIdentification/citation/CI_Citation'
      object</sch:report>
    <sch:report
      test="//srv:SV_ServiceIdentification/srv:couplingType/srv:SV_CouplingType[text()='tight' or
text()='mixed'] and

```

```
not(/srv:SV_ServiceIdentification/srv:operatesOn/mri:MD_DataIdentification/mri:citation/cit:CI_Citation/cit:
identifier/mcc:MD_Identifier/mcc:code)"
  >Add a code element to the
```

```
'SV_ServiceIdentification/operatesOn/MD_DataIdentification/rmd:citation/CI_Citation/identifier/MD_Identifi
er'
```

```
  object</sch:report>
  <sch:report
    test="//srv:SV_ServiceIdentification/srv:couplingType/srv:SV_CouplingType[text()='tight' or
text()='mixed'] and
//srv:SV_ServiceIdentification/srv:operatesOn/mri:MD_DataIdentification/mri:citation/cit:CI_Citation/cit:ide
ntifier/mcc:MD_Identifier/mcc:code/gco:CharacterString =""
  >Populate the code element in the
```

```
'SV_ServiceIdentification/operatesOn/MD_DataIdentification/rmd:citation/CI_Citation/identifier/MD_Identifi
er'
```

```
  object</sch:report>
  </sch:rule>
</sch:pattern>

  <sch:pattern id="b2f3a061-1984-11e2-892x-0810200c9a66">
    <sch:title>Check for service distribution linkage</sch:title>
    <sch:rule
      context="*/mdb:metada-
taScope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='service']">
      <sch:report
```

```
test="not(/mrd:MD_Distribution/mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:onLine/cit:CI_O
nlineResource/cit:linkage/gco:CharacterString)"
  >Add a linkage element to the
  '/MD_Distribution/transferOptions/MD_DigitalTransferOptions/onLine/CI_OnlineResource'
  object</sch:report>
  <sch:assert
```

```
test="//mrd:MD_Distribution/mrd:transferOptions/mrd:MD_DigitalTransferOptions/mrd:onLine/cit:CI_Onlin
eResource/cit:linkage/gco:CharacterString !=""
  >Populate the linkage element in the
  '/MD_Distribution/transferOptions/MD_DigitalTransferOptions/onLine/CI_OnlineResource'
  object</sch:assert>
</sch:rule>
</sch:pattern>
```

```
  <sch:pattern id="b2f3a061-1964-11e2-892x-0810200c9a66">
    <sch:title>Checks for service operations</sch:title>
    <sch:rule
      context="*/mdb:metada-
taScope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='service']">
      <sch:report
        test="not(/srv:containsOperations/srv:SV_OperationMetadata/srv:operationName)">Add
        the operationName element to the
        '/SV_ServiceIdentification/containsOperations/SV_OperationMetadata'
        object</sch:report>
      <sch:report
        test="//srv:containsOpera-
tions/srv:SV_OperationMetadata/srv:operationName/gco:CharacterString =""
        >Populate the operationName element in the
```

```

'/SV_ServiceIdentification/containsOperations/SV_OperationMetadata'
  object</sch:report>
<sch:report
  test="//srv:containsOperations/srv:SV_OperationMetadata/srv:distributedComputingPlatform/srv:DCPList"
  >Add a DCPList element to the
  '/SV_ServiceIdentification/containsOperations/SV_OperationMetadata/DCP'
  object</sch:report>
<sch:report
  test="//srv:containsOperations/srv:SV_OperationMetadata/srv:distributedComputingPlatform/srv:DCPList =""
  >Populate the DCPList element in the
  '/SV_ServiceIdentification/containsOperations/SV_OperationMetadata/DCP'
  object</sch:report>
<sch:report
  test="//srv:containsOperations/srv:SV_OperationMetadata/srv:connectPoint/cit:CI_OnlineResource/cit:linkage)"
  >Add a linkage element to the

'/SV_ServiceIdentification/containsOperations/SV_OperationMetadata/connectPoint/CI_OnlineResource'
  object</sch:report>
<sch:report
  test="//srv:containsOperations/srv:SV_OperationMetadata/srv:connectPoint/cit:CI_OnlineResource/cit:linkage/gco:CharacterString
=""
  >Populate the linkage element in the

'/SV_ServiceIdentification/containsOperations/SV_OperationMetadata/connectPoint/CI_OnlineResource/
URL'
  object</sch:report>
</sch:rule>
</sch:pattern>

<sch:pattern id="b2f3a061-1967-11e2-892x-0810200c9a66">
  <sch:title>Checks for coupled resource references</sch:title>
  <sch:rule context="//srv:SV_ServiceIdentification/srv:coupledResource">
    <sch:assert test="srv:SV_CoupledResource/srv:resourceReference/@xlink:href">Add and or
    populate the srv:SV_CoupledResource/srv:resourceReference/@xlink:href
    attribute</sch:assert>
    <sch:assert test="srv:SV_CoupledResource/srv:operation/@xlink:href">Add and or populate
    the srv:SV_CoupledResource/srv:operation/@xlink:href attribute</sch:assert>
  </sch:rule>
</sch:pattern>

<!-- Collection Rules (formally Activity) - These rules are applied when the metadata scope code is
'collection' -->
<sch:pattern id="b2f3a061-1964-11e2-892x-0810200c9a67">
  <sch:title>Check for DataIdentification or ServiceIdentification</sch:title>
  <sch:rule
    context="*/mdb:metaDataScope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='collection']">
    <sch:assert test="//mri:MD_DataIdentification or //srv:SV_ServiceIdentification">Add an
    MD_DataIdentification object or SV_ServiceIdentification object. DataIdentification
    or ServiceIdentification is required when MD_ScopeCode is 'collection'</sch:assert>
  </sch:rule>
</sch:pattern>

```

```

<!-- Geographic Rules - These rules are applied when the metadata scope code is dataset or nonGeographicDataset -->
<sch:pattern id="b2f3a061-1963-11e2-892x-0810200c9a67">
  <sch:title>Check for geographic bounding box when scope code is 'dataset'</sch:title>
  <sch:rule
    context="/*/mdb:meta-
taScope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='dataset']">
    <sch:assert test="//gex:geographicElement/gex:EX_GeographicBoundingBox">Add an
      EX_GeographicBoundingBox object to
      /mri:MD_DataIdentification/mri:extent/gex:EX_Extent/gex:geographicElement. A
      GeographicBoundingBox is required when the ScopeCode is dataset</sch:assert>
    </sch:rule>
  </sch:pattern>

  <sch:pattern id="b2f3a061-1963-11e2-892x-0810200f9a67">
    <sch:title>Check for geographic bounding box when scope code is
      'nonGeographicDataset'</sch:title>
    <sch:rule
      context="/*/mdb:meta-
ta-
Scope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='nonGeographicDataset']">
      <sch:report test="//gex:geographicElement/gex:EX_GeographicBoundingBox">Remove the
        EX_GeographicBoundingBox object in MD_DataIdentification or modify the scopeCode
        value. A GeographicBoundingBox is not permitted when the ScopeCode is
        nonGeographicDataset</sch:report>
      </sch:rule>
    </sch:pattern>
    <sch:pattern id="b38aad90-29fb-11e2-81c1-0800200c9a66">
      <sch:title>Check for spatial reference specification</sch:title>
      <sch:rule context="//mdb:MD_Metadata/mdb:spatialRepresentationInfo">
        <sch:assert
          test="//mdb:referenceSystem-
Info/mrs:MD_ReferenceSystem/mrs:referenceSystemIdentifier/mcc:MD_Identifier/mcc:code/gco:CharacterString !=""
          >Add and/or populate the code element in referenceSystemIdentifier
          object</sch:assert>
        <sch:assert
          test="//mdb:referenceSystem-
Info/mrs:MD_ReferenceSystem/mrs:referenceSystemIdentifier/mcc:MD_Identifier/mcc:codeSpace/gco:CharacterString !=""
          >Add and/or populate the codeSpace element in referenceSystemIdentifier
          object</sch:assert>
        <sch:report
          test="//mdb:referenceSystem-
Info/mrs:MD_ReferenceSystem/mrs:referenceSystemIdentifier/mcc:MD_Identifier/mcc:codeSpace) and
          not(//mdb:referenceSystem-
Info/mrs:MD_ReferenceSystem/mrs:referenceSystemIdentifier/mcc:MD_Identifier/mcc:version)"
          >Add the version element in referenceSystemIdentifier object. A version numbers
          should exist for each reference system codeSpace</sch:report>
        <sch:report
          test="//mdb:referenceSystem-
Info/mrs:MD_ReferenceSystem/mrs:referenceSystemIdentifier/mcc:MD_Identifier/mcc:version/gco:CharacterString =""
          >Populate the version element in referenceSystemIdentifier object.</sch:report>
      </sch:rule>
    </sch:pattern>
  </sch:rule>
</sch:pattern>

```

```

</sch:rule>
</sch:pattern>

<sch:pattern id="c38aad90-29fb-11e2-81c1-0800200c9a66">
  <sch:title>checks for spatial extent</sch:title>
  <sch:rule
    context="/*/mdb:meta-
taScope/mdb:MD_MetadataScope/mdb:resourceScope/mcc:MD_ScopeCode[text()='dataset']">
    <sch:assert
      test="//gex:ge-
ographicElement/gex:EX_GeographicBoundingBox/gex:westBoundLongitude/gco:Decimal !=""
      >Add and/or populate the westBoundLongitude element in the GeographicBoundingBox
      object</sch:assert>
    <sch:assert
      test="//gex:ge-
ographicElement/gex:EX_GeographicBoundingBox/gex:eastBoundLongitude/gco:Decimal !=""
      >Add and/or populate the eastBoundLongitude element in the GeographicBoundingBox
      object</sch:assert>
    <sch:assert
      test="//gex:ge-
ographicElement/gex:EX_GeographicBoundingBox/gex:northBoundLongitude/gco:Decimal !=""
      >Add and/or populate the southBoundLongitude element in the GeographicBoundingBox
      object</sch:assert>
    <sch:assert
      test="//gex:ge-
ographicElement/gex:EX_GeographicBoundingBox/gex:southBoundLongitude/gco:Decimal !=""
      >Add and/or populate the northBoundLongitude element in the GeographicBoundingBox
      object</sch:assert>
  </sch:rule>
</sch:pattern>

<sch:pattern id="d38aad90-29fb-11e2-81c1-0800200c9a66">
  <sch:title>checks for spatial resolution</sch:title>
  <sch:rule context="/*/mdb:spatialRepresentationInfo/msr:MD_GridSpatialRepresentation">
    <sch:report
      test="(//mri:MD_SpatialRepresentationTypeCode = 'vector') and (not(//mri:spatialResolu-
tion/mri:MD_Resolution/mri:distance/gco:Distance))"
      >Add and populate the
      MD_DataIdentification/mri:spatialResolution/mri:MD_Resolution/mri:distance/gco:Distance
      element. The gco:Distance element must be populated when the
      mri:MD_SpatialRepresentationTypeCode is 'vector'.</sch:report>
    <sch:report
      test="(//mri:MD_SpatialRepresentationTypeCode = 'grid') and (not(//mri:spatialResolu-
tion/mri:MD_Resolution/mri:equivalentScale/mri:MD_RepresentativeFraction/mri:denominator/gco:Integer
))"
      >Add and populate the MD_DataIdentification/mri:spatialResolution/mri:MD_Resolution/
      mri:equivalentScale/
      mri:MD_RepresentativeFraction/ mri:denominator/gco:Integer element. The gco:Integer ele-
      ment must be populated
      when the mri:MD_SpatialRepresentationTypeCode is 'grid'.</sch:report>
    <sch:report
      test="//mri:spatialResolution/mri:MD_Resolution/mri:distance/gco:Distance/@uom ="
      >Add and populate the 'uom' attribute (unit of measure) in the MD_Resolution
      Distance element</sch:report>
  </sch:rule>
</sch:pattern>

```

</sch:schema>

Appendix F. Codelists and Enumerations

This appendix contains an alphabetically ordered listing of codelists and enumerations referenced by the EIP, use of which insures Level 1 Conformance with the ISO 19115-1. The EIP has added terms to codelists for Date Type Code, Progress Code, Restriction Code, and Scope Code, so the codespace URLs for the EIP vocabularies are specific to EIP, hosted at w3.energistics.org. Other codespace URLs use the standard ISO codelist location.

F.1 CI_DateTypeCode

- **Description:** Type of event which occurred at the documented date and time.
- **URL:** http://w3.energistics.org/energym/profiles/EIP/v1.1/EIPcodelists19115-3.xml#CI_DateTypeCode
- **Referencing elements:** Section 4.2.7, [Metadata Create Date](#), page 47; Section 4.2.8, [Metadata Update Date](#), page 48; Section 4.3.2, [Resource Citation Date](#), page 54

F.2 CI_RoleCode

- **Description:** Function performed by the responsible party.
- **URL:** http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#CI_RoleCode
- **Referencing elements:** Section 4.8.1, [Contact Information](#), page 128.

F.3 DCPList

- **Description:** Distributed Computing Platform list.
- **URL:** <http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#DCPList>
- **Referencing elements:** Section 4.6.4, [Service Operations Metadata](#), page 110

F.4 EPSG codes

- **Description:** EPSG (European Petroleum Survey Group) code identifying the coordinate reference system applicable to the spatial coordinates. The normative registry for the EPSG codes is accessible at <http://www.epsg-registry.org>.
- **URL:** The normative registry allows searching for appropriate reference system codes by name, type, or location, and will provide a gml (XML) representation of the CRS using URLs like <http://www.epsg-registry.org/export.htm?gml=urn:ogc:def:crs:EPSG::NNNN> where 'NNNN' is the 4 numeral code value.
- **Referencing elements:** Section 4.7.2, [Coordinate Reference System](#), page 120

F.5 LanguageCode (ISO 639-3)

- **Description:** Code representing the name of the natural language used.
- **URL:** http://www.loc.gov/standards/iso639-2/php/code_list.php
- **Referencing elements:** Section 4.2.2 [Metadata Language](#), page 37

F.6 MD_CellGeometryCode

- **Description:** Code indicating the type of geometry represented by grid cell values.
- **URL:** http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#MD_CellGeometryCode
- **Referencing elements:** Section 4.7.1, [Spatial Representation](#), page 117

F.7 MD_CharacterSetCode

- **Description:** Name of the character coding standard used for the resource.

- **URL:** <http://www.iana.org/assignments/character-sets>
- **Referencing elements:** Section 4.2.3, [Metadata Character Set](#), page 38; Section 4.8.3, [Resource Character Set](#), page 132

F.8 MD_ClassificationCode

- **Description:** Name of the handling restrictions on the resource.
- **URL:**
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#MD_ClassificationCode
- **Referencing elements:** Section 4.3.10, [Legal Constraints](#), page 70

F.9 MD_DimensionNameTypeCode

- **Description:** Name of the dimension.
- **URL:**
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#MD_DimensionNameTypeCode
- **Referencing elements:** Section 4.7.1, [Spatial Representation](#), page 117

F.10 MD_GeometricObjectTypeCode

- **Description:** Name of point or vector objects used to locate zero-, one-, two-, or three-dimensional spatial locations in the dataset.
- **URL:**
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#MD_GeometricObjectTypeCode
- **Referencing elements:** Section 4.7.1, [Spatial Representation](#), page 117

F.11 MD_KeywordTypeCode

- **Description:** Category of the associated keywords. Used as a method to group similar keywords.
- **URL:**
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#MD_KeywordTypeCode
- **Referencing elements:** Section 4.3.9, [Descriptive Keywords](#), page 67

F.12 MD_MediumFormatCode

- **Description:** Name of the medium.
- **URL:**
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#MD_MediumFormatCode
- **Referencing elements:** Section 4.4.2, [Digital Product Access](#), page 88

F.13 MD_ProgressCode

- **Description:** Status of the resource.
- **URL:** http://w3.energistics.org/energyml/profiles/EIP/v1.1/EIPcodelists19115-3.xml#MD_ProgressCode
- **Referencing elements:** Section 4.3.6, [Resource Status](#), page 62

F.14 MD_ReferenceSystemTypeCode

- **Description:** Type of coordinate reference system applicable to the spatial coordinates. Note that this code list is used to populate the referenceSystemInfo property of a spatial dataset, specifically to specify the coordinate reference system used. The ISO19115-1 codelist includes the values "temporal" and "geographicIdentifier" that are not applicable to spatial coordinate reference systems, and thus should not be used in EIP metadata. Geographic identifiers should be included in keywords with keyword type = 'place'.

- **URL:**
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#MD_ReferenceSystemTypeCode
- **Referencing elements:** Section 4.7.2, [Coordinate Reference System](#), page 120

F.15 MD_RestrictionCode

- **Description:** Limitation(s) placed upon the access or use of the data.
- **URL:** http://w3.energistics.org/energym/profiles/EIP/v1.10/EIPcodelists19115-3.xml#MD_RestrictionCode
- **Referencing elements:** Section 4.3.10, [Legal Constraints](#), page 70

F.16 MD_ScopeCode

- **Description:** Class of information to which the referencing entity applies.
- **URL:** http://w3.energistics.org/energym/profiles/EIP/v1.1/EIPcodelists19115-3.xml#MD_ScopeCode
- **Referencing elements:** Section 4.2.5, [Metadata Scope](#), page 42

F.17 MD_SpatialRepresentationTypeCode

- **Description:** Method used to represent geographic information in the resource.
- **URL:**
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#MD_SpatialRepresentationTypeCode
- **Referencing elements:** Section 4.7.1, [Spatial Representation](#), page 117

F.18 MD_TopicCategoryCode

- **Description:** High-level geographic data thematic classification to assist in the grouping and search of available geographic datasets. Can be used to group keywords as well. Provided values are not exhaustive.
NOTE It is understood there are overlaps between general categories and the user is encouraged to select the one most appropriate.
- **URL:**
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#MD_TopicCategoryCode
- **Referencing elements:** Section 4.3.8, [Resource Topic Category](#), page 66

F.19 SV_CouplingType

- **Description:** list of terms specifying the level of dependency between a service and dataset(s) provided by that service.
- **URL:** http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#SV_CouplingType
- **Referencing elements:** Section 4.6.2, [Coupled Datasets](#), page 105

Appendix G. Development Process

The EIP was developed by the Energistics Metadata Work Group, which is composed of members of the energy community, all of whom recognize the need to address the exponential growth of information resources and their increasingly diverse and distributed nature. These participants, and the community at large, represent most of those identified as stakeholder groups for the EIP, which include:

- Energy companies and consortia
- Data and service providers
- Software vendors
- Energy-related government and academic organizations.

This effort began with the shared experiences of industry professionals working in and around GIS data and supporting technologies. Their experience demonstrated to them that geographic significance is not a characteristic reserved for traditional maps and field surveys. A vast range of data, information, and physical resources have geographic references, and, even more importantly, the geographic pedigree of a resource is very often used as a primary criteria for determining the relevance of the resource to work activities. Therefore, a foundation standard for the way the industry characterizes resources for subsequent search and assessment of relevance is needed.

As described in Section 1.1, the work began with the ISO Technical Committee 211 (Geomatics) and ISO 19115 and its associated supporting standards. The intent of this initiative is to create the conditions that will permit and encourage the adoption of ISO 19115 by the industry. The founders of this initiative recognized that to accomplish this objective, two things would be required: to bring awareness and tangible support to the industry and to promulgate guidelines for the best practice use of the foundation ISO standard.

The vehicle used to achieve industry awareness and support was to create a formal standards work group in Energistics, a global consortium that facilitates the development, management and adoption of oil & gas industry information exchange standards, such as WITSML, PRODML, and RESQML. In 2009, the Metadata Work Group was formed by Energistics as part of its Asset & Data Management Special Interest Group.

The means for expressing the best practices associated with ISO 19115 is the development of this profile. The Work Group participants joined together to study ISO 19115 in light of industry needs as a vanguard for wider use by the industry going forward.

Producing V1.0 Draft 1 of the Energy Industry Profile is an important first step on a continuing journey. To maintain a strong link with the foundation standard, Energistics requested and was granted formal liaison status with ISO TC 211, and the Work Group is actively contributing to the current revision work effort of ISO 19115.