

Recommendation

ITU-T Y.3603 (05/2023)

SERIES Y: Global information infrastructure, Internet protocol aspects, next-generation networks, Internet of Things and smart cities

Big Data

Big data – Requirements and conceptual model of metadata for data catalogue

ITU-T Y-SERIES RECOMMENDATIONS

Global information infrastructure, Internet protocol aspects, next-generation networks, Internet of Things and smart cities

GLOBAL INFORMATION INFRASTRUCTURE	Y.100-Y.999
General	Y.100-Y.199
Services, applications and middleware	Y.200-Y.299
Network aspects	Y.300-Y.399
Interfaces and protocols	Y.400-Y.499
Numbering, addressing and naming	Y.500-Y.599
Operation, administration and maintenance	Y.600-Y.699
Security	Y.700-Y.799
Performances	Y.800-Y.899
INTERNET PROTOCOL ASPECTS	Y.1000-Y.1999
General	Y.1000-Y.1099
Services and applications	Y.1100-Y.1199
Architecture, access, network capabilities and resource management	Y.1200-Y.1299
Transport	Y.1300-Y.1399
Interworking	Y.1400-Y.1499
Quality of service and network performance	Y.1500-Y.1599
Signalling	Y.1600-Y.1699
Operation, administration and maintenance	Y.1700-Y.1799
Charging	Y.1800-Y.1899
IPTV over NGN	Y.1900-Y.1999
NEXT GENERATION NETWORKS	Y.2000-Y.2999
Frameworks and functional architecture models	Y.2000-Y.2099
Quality of Service and performance	Y.2100-Y.2199
Service aspects: Service capabilities and service architecture	Y.2200-Y.2249
Service aspects: Interoperability of services and networks in NGN	Y.2250-Y.2299
Enhancements to NGN	Y.2300-Y.2399
Network management	Y.2400-Y.2499
Computing power networks	Y.2500-Y.2599
Packet-based Networks	Y.2600-Y.2699
Security	Y.2700-Y.2799
Generalized mobility	Y.2800-Y.2899
Carrier grade open environment	Y.2900-Y.2999
FUTURE NETWORKS	Y.3000-Y.3499
CLOUD COMPUTING	Y.3500-Y.3599
BIG DATA	Y.3600-Y.3799
QUANTUM KEY DISTRIBUTION NETWORKS	Y.3800-Y.3999
INTERNET OF THINGS AND SMART CITIES AND COMMUNITIES	Y.4000-Y.4999
General	Y.4000-Y.4049
Definitions and terminologies	Y.4050-Y.4099
Requirements and use cases	Y.4100-Y.4249
Infrastructure, connectivity and networks	Y.4250-Y.4399
Frameworks, architectures and protocols	Y.4400-Y.4549
Services, applications, computation and data processing	Y.4550-Y.4699
Management, control and performance	Y.4700-Y.4799
Identification and security	Y.4800-Y.4899
Evaluation and assessment	Y.4900-Y.4999

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Recommendation ITU-T Y.3603

Big data – Requirements and conceptual model of metadata for data catalogue

Summary

Recommendation ITU-T Y.3603 describes the general concept of metadata and its utilization in a big data ecosystem. Also, this Recommendation provides requirements and a conceptual model of metadata for the data catalogue as well as the extensible markup language (XML) schema of metadata as an example. This metadata supports finding data easier and is used for the exchange, preservation, integration and provenance of data in a big data ecosystem.

History *

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Table of Contents

	Page
1 Scope	1
2 References.....	1
3 Definitions	1
3.1 Terms defined elsewhere	1
3.2 Terms defined in this Recommendation	1
4 Abbreviations and acronyms	2
5 Conventions	2
6 Overview of metadata	2
6.1 Introduction to metadata in the big data ecosystem	2
6.2 Introduction to big data lifecycle.....	3
7 Requirements of metadata for data catalogue.....	4
7.1 Metadata for data catalogue	4
7.2 Requirements of metadata elements.....	5
8 Conceptual model for data catalogue.....	7
8.1 Overall class diagram	7
8.2 Classes and data type.....	7
Appendix I – Examples of metadata profile for data catalogue.....	13
I.1 RDF profiles	13
I.2 Turtle profile	19
I.3 JSON-LD profile	25
Appendix II – Examples of metadata instance.....	38
II.1 UML object diagram	38
II.2 RDF instance.....	38
II.3 Turtle instance	41
II.4 JSON-LD instance.....	43
Bibliography	47

Recommendation ITU-T Y.3603

Big data – Requirements and conceptual model of metadata for data catalogue

1 Scope

This Recommendation introduces the metadata concept as well as its usage in a big data lifecycle. This Recommendation provides requirements and a conceptual model of metadata for a data catalogue to support the big data ecosystem defined in [ITU-T Y.3600]. The extensible markup language (XML) profiles based on the conceptual model described by the unified modelling language (UML) and examples of metadata are provided in the appendices.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- | | |
|----------------|---|
| [ITU-T X.680] | Recommendation ITU-T X.680 (2021), <i>Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation.</i> |
| [ITU-T Y.3600] | Recommendation ITU-T Y.3600 (2015), <i>Big data – Cloud computing based requirements and capabilities.</i> |
| [ITU-T Y.3601] | Recommendation ITU-T Y.3601 (2018), <i>Big data – Framework and requirements for data exchange.</i> |
| [ITU-T Y.3602] | Recommendation ITU-T Y.3602 (2018), <i>Big data – Functional requirements for data provenance.</i> |
| [ITU-T Z.109] | Recommendation ITU-T Z.109 (2016), <i>Specification and Description Language – Unified modeling language profile for SDL-2010.</i> |

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 data catalogue [ITU-T Y.3601]: A listing of all metadata which a data broker makes available.

3.1.2 metadata [b-ITU-T H.752]: Structured, encoded data that describe characteristics of information-bearing entities to aid in the identification, discovery, assessment and management of the described entities.

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

API	Application Programming Interface
BDC	Big Data Service Customer
BDSP	Big Data Service Provider
DCAT	Data Catalogue Vocabulary
DP	Data Provider
JSON	JavaScript Object Notation
RDF	Resource Description Framework
Turtle	Terse Resource Description Framework Triple Language
UML	Unified Modelling Language
URI	Uniform Resource Identifier
XML	extensible Markup Language

5 Conventions

The keywords "**is required to**" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this document is to be claimed.

The keywords "**is recommended**" indicate a requirement which is recommended but which is not absolutely required. Thus this requirement need not be present to claim conformance.

The keywords "**can optionally**" indicate an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with the specification.

In the body of this document and its annexes, the words shall, shall not, should, and may sometimes appear, in which case they are to be interpreted, respectively, as is required to, is prohibited from, is recommended, and can optionally. The appearance of such phrases or keywords in an appendix or in material explicitly marked as informative are to be interpreted as having no normative intent.

The unified modelling language (UML) schema used in this Recommendation follows [ITU-T Z.109].

6 Overview of metadata

6.1 Introduction to metadata in the big data ecosystem

Metadata is structured, encoded data that describe characteristics of a dataset to aid in the identification, discovery, assessment and management of the dataset. Metadata summarizes overall information about data, making finding and working with particular data easier. Typically, the metadata structure is highly dependent on data format or application. Therefore, metadata for big data is needed to provide an overarching model to cover the characteristics of big data.

Figure 6-1 illustrates metadata in the big data ecosystem defined in [ITU-T Y.3600]. Metadata is used for data publication and search among roles and sub-roles of the big data ecosystem.

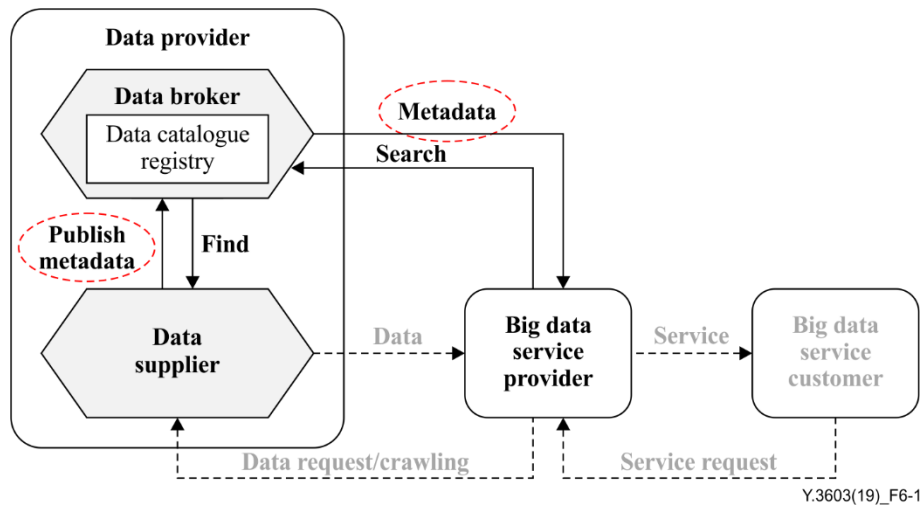


Figure 6-1 – Metadata in the big data ecosystem

Regarding the data provider (DP), DP:data broker provides a meta-information registry (e.g., data catalogue registry) to DP:data suppliers for publishing their data sources, and DP:data suppliers are creating and publishing metadata information to DP:data broker. A big data service provider (BDSP) searches information through metadata stored in the DP:data broker's data catalogue registry.

According to [ITU-T Y.3600], metadata provides:

- critical information for identification, access right to data;
- information about the creation, control, and update of data for the management purpose;
- additional information about data integration capabilities.

6.2 Introduction to big data lifecycle

Metadata is used for various purposes, such as preserving data, data distribution, data integration and data history management by continuously recording and updating. Figure 6-2 shows the usage of metadata according to the big data lifecycle.

NOTE – An example of a big data lifecycle has a main cycle with creation/capture, storage, preparation, analysis, visualization, and also has branch cycles with retirement/deletion and share/exchange.

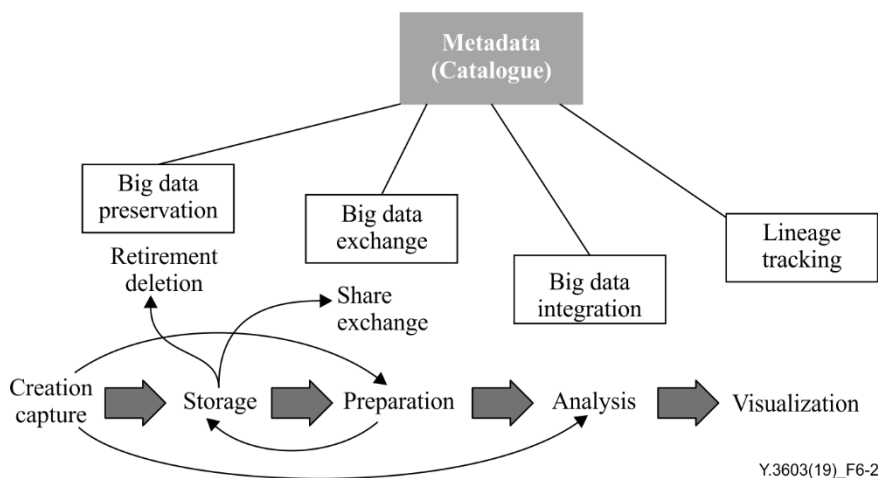


Figure 6-2 – Usage of metadata in the big data lifecycle

[ITU-T Y.3601] defines the functional requirements for big data exchange. In that Recommendation, DP:data broker provides a common data catalogue schema to exchange big data which covers various

types of data sources. DP: data broker provides meta-information (data catalogue for dataset) registry to a data source. A data source publishes metadata to an online registry for data sharing. This metadata includes:

- data type, format, size and update frequency;
- category (area of data source);
- metadata and its access information (e.g., uniform resource identifier (URI));
- delivery mechanism, and electronic access methods to data (e.g., application programming interface (API)).

And, this metadata can optionally include:

- data rights (e.g., general agreement, copyrights, patents, licenses policies and pricing policies) (e.g., the applied functions with parameter);
- usage of data;
- the quality of data (e.g., sales ranking, and data supplier's credit);
- related keywords; and
- sample data.

DP: data broker also supports data classification with commonly used data vocabulary and taxonomy, and it is recommended to support multiple data classifications by usage area.

[ITU-T Y.3602] defines the functional requirements for big data provenance. Provenance is information about the origin and creation process of data, including the metadata recording process of workflow, annotations and notes about processes. When data are imported from an outside data source and stored, the BDSP generates metadata based on the importing context, including:

- responsible party information;
- timestamp;
- size, etc.

The metadata can be used for recording provenance information according to [ITU-T Y.3602].

For storage efficiency and performance, the BDSP provides data preservation capabilities by monitoring information (e.g., timestamps) included in the metadata. In addition, the BDSP uses metadata to retrieve the data for data preparation (e.g., data integration).

7 Requirements of metadata for data catalogue

7.1 Metadata for data catalogue

A data catalogue describes the requirements for searching a dataset. It helps the users to evaluate the data resources to determine the suitability of usage of the data. This clause provides six elements and contents of a data catalogue for big data. Figure 7-1 shows the elements of metadata for a data catalogue.

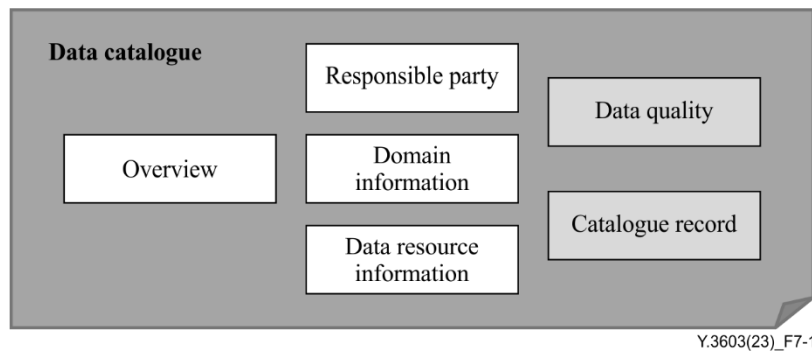


Figure 7-1 – Elements of metadata for a data catalogue

A data catalogue **is required to** include the following elements:

- overview (see clause 7.2.1);
- responsible party (see clause 7.2.2);
- data resource information (see clause 7.2.3);
- domain information (see clause 7.2.4).

A data catalogue **is recommended to** include the following elements:

- data quality (see clause 7.2.5);
- catalogue record (see clause 7.2.6).

7.2 Requirements of metadata elements

7.2.1 Overview element

The overview element provides overall information about the data catalogue and is required to include:

- information about the creation of the data catalogue;
NOTE 1 – This may include the title, the language used in the text, and the version of the data catalogue specification.
- an informal description of the data catalogue.
NOTE 2 – An informal description is intended to give a short introduction to the data catalogue and allow a human reader to better understand it.

7.2.2 Responsible party element

The responsible party element provides authoritative reference information and is required to include:

- information to identify and communicate with the person(s) and organizations associated with the data catalogue.
NOTE 1 – This may include the role or function performed by the organization, the organization name, individual name and position name.

The responsible party element is recommended to include the following:

- contact information.
NOTE 2 – This may include the phone number, address, online resources such as URI and time when individuals may contact the publisher of the data catalogue.

7.2.3 Data resource information element

A data catalogue element contains one or more data resources including dataset and data service.

The data resource information of metadata represents the actual data resource as published by the DP:data provider, and is required to include:

- the title of the data resource;
- an informal description of the data resource.

NOTE 1 – An informal description is intended to give a short introduction to the dataset or data service and allow a human reader a better understanding.

- contact point information.

NOTE 2 – Contact point information is represented with the same contents of the responsible party described in clause 7.2.2, but its target is DP:data provider.

The data resource information element is recommended to include:

- dataset distribution information;

NOTE 3 – A dataset may have multiple distribution information.

NOTE 4 – This information may include the distribution format of the dataset, type of dataset (structured, semi-structured, unstructured), access information including user's guide or its URI, size of the dataset, sample data for user's preview and data rights.

- keywords representing dataset;
- endpoint description that provides the information of data service available including data API through the endpoint.

The data resource information may also include the following information optionally:

- the frequency at which the dataset is updated;
- temporal coverage of the dataset which is described by the time.

7.2.4 Domain information element

The domain information element provides the application area of data resources and is required to include:

- source domain of the data resource for classification.

The domain information element is recommended to include:

- usage domain of the data resource.

7.2.5 Data quality element

In a big data ecosystem, there are various types and formats of data, each having different quality requirements. Therefore, different quality evaluation methods are applied to different data resources. The data quality element is required to include:

- quality requirement on the data resource;
- the unit of measure for data quality;
- quality evaluation result.

7.2.6 Catalogue record element

The catalogue record element provides date information for registration and modification for instances of the data catalogue. The catalogue record element is required to include:

- the most recent modified date of the data catalogue.

The catalogue record element of the data catalogue is recommended to include:

- the issued date of listing the data resource in the catalogue.

NOTE – The issued date of listing a data resource in a data catalogue is different than the publication date of the data resource.

8 Conceptual model for data catalogue

8.1 Overall class diagram

This clause provides a UML model based on clause 7, which describes the requirements of metadata for a data catalogue. Figure 8-1 shows the overall class diagram of the data catalogue using UML to provide the design of a concept for a data catalogue.

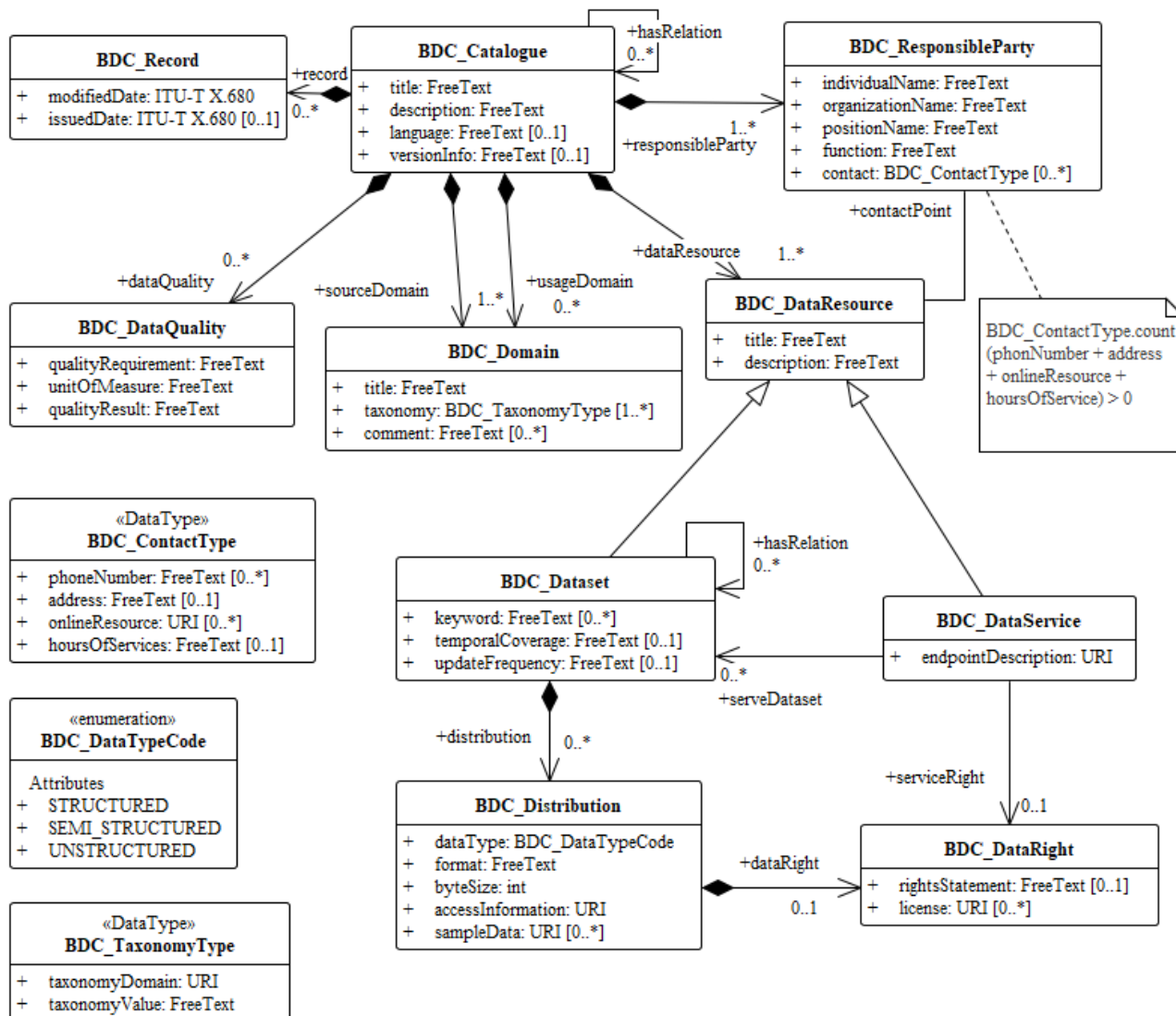


Figure 8-1 – Overall class diagram of data catalogue using UML

8.2 Classes and data type

The following descriptors are used to explain the data dictionaries in the clauses that follow.

- Name/Role name: title of class (gray colored row in the table), association (noted as role) and attribute;
- Description: a short description of 'Name/Role name';
- M/R/O: the mandatory/recommended/optional (M/R/O) necessity of each class, association and attribute;
- Cardinality: the maximum number of instances that the metadata entity or metadata element may have. Single occurrences are shown by "1"; repeating occurrences are represented by "N".

- Domain: the values allowed, or the use of free text placed on the contents of the field. "Free text" indicates that no restrictions are placed on the contents of the field. Integer-based codes shall be used to represent values for domains containing code lists.
- Domain code: designated code used in place of the concept.

8.2.1 Class: BDC_Catalogue

Table 8-1 shows the data dictionary of *BDC_Catalogue* which describes the overview element information in clause 7.2.1.

Table 8-1 – Catalogue overview

	Name/Role name	Description	M/R/O	Cardinality	Domain
1	BDC_Catalogue	root entity which defines metadata about data resource	M	1	Line 2 to 12
2	role: responsibleParty	responsible party information for the data catalogue	M	N	BDC_ResponsibleParty
3	role: dataResource	data resource information for the data catalogue	M	N	BDC_DataResource
4	role: sourceDomain	source domain information for the data catalogue	M	N	BDC_Domain
5	role: usageDomain	usage domain information for the data catalogue	R	N	BDC_Domain
6	role: dataQuality	data quality information for the data catalogue	R	N	BDC_DataQuality
7	role: record	record information for the data catalogue	R	N	BDC_Record
8	role: hasRelation	related data catalogue of the data catalogue	O	N	BDC_Catalogue
9	title	title of data catalogue	M	1	free text
10	description	a short introduction to the data catalogue	M	1	free text
11	language	the language used within the data catalogue	R	1	free text (e.g., RFC 5646 [b-RFC5646])
12	versionInfo	the version of data catalogue specification	R	1	free text (major.minor.patch)

8.2.2 Class: BDC_ResponsibleParty

Table 8-2 shows the data dictionary of *BDC_ResponsibleParty* and its data type class *BDC_ContactType* which describes the responsible party in clause 7.2.2.

Table 8-2 – Responsible party information

	Name/Role name	Description	M/R/O	Cardinality	Domain
13	BDC_ResponsibleParty	name and position information for an individual or organization that is responsible for the data catalogue or data resource	M	N	Line 14 to 18
14	individualName	name of the responsible person: surname, given name, title	M	1	free text
15	organisationName	name of the responsible organization	M	1	free text
16	positionName	role or position of the responsible person	M	1	free text
17	function	the function performed by the responsible party	M	1	free text
18	contact	information required to enable contact with the responsible person and/or organization	R	N	BDC_ContactType
19	BDC_ContactType	information required to enable contact with the responsible person and/or organization	R	N	Line 20 to 23
20	phoneNumber	telephone numbers at which the organization or individual may be contacted	R	N	free text
21	address	physical and email address at which the organization or individual may be contacted	R	1	free text
22	onlineResource	on-line information that can be used to contact the individual or organization	R	N	URI
23	hoursOfServices	time(including time zone) when individuals can contact the organization or individual	R	1	free text

8.2.3 Class: BDC_DataResource

Table 8-3 shows the data dictionary of *BDC_DataResource* and its sub-classes (*BDC_Dataset*, *BDC_DataService*, *BDC_Distribution*, *BDC_DataRight*) that describes data resource information in clause 7.2.3.

Table 8-3 – Data resource information

	Name/Role name	Description	M/R/O	Cardinality	Domain
24	BDC_DataResource	a collection of data which is available for access and/or download	M	N	Line 25 to 27
25	role: contactPoint	contact point information for the data resource	R	N	BDC_Responsible Party
26	title	title of the data resource	M	1	free text
27	description	a short introduction to the data resource	M	1	free text
28	BDC_Dataset	a collection of data which is available for download	M	N	Line 29 to 33
29	role: distribution	information about the distributor of and options for obtaining the dataset	R	N	BDC_Distribution
30	role: hasRelation	related dataset of the dataset	O	N	BDC_Dataset
31	keyword	commonly used word(s) used to describe the dataset	R	N	free text
32	temporalCoverage	time (including time zone) when the dataset was captured	O	1	free text
33	updateFrequency	rate of occurrence of dataset update	O	1	free text
34	BDC_DataService	a collection of operations that provides dataset	M	N	Line 35 to 37
35	role: serveDataset	a collection of data provided by a data service	O	N	BDC_Dataset
36	Role: serviceRight	information about limitations placed upon the use of the data service	O	1	BDC_DataRight
37	endpointDescription	a description of the service available through the endpoint	M	1	URI
38	BDC_Distribution	information about the distributor of and options for obtaining the dataset	R	N	Line 39 to 44
39	role: dataRight	information about limitations placed upon the use of the dataset	R	1	BDC_DataRight
40	dataType	type of information of the dataset	M	1	BDC_DataTypeCode
41	format	format of information of the dataset including a version	M	1	free text
42	byteSize	information about the size of the dataset in bytes	M	1	int

Table 8-3 – Data resource information

	Name/Role name	Description	M/R/O	Cardinality	Domain
43	accessInformation	access information to the dataset	M	1	free text
44	sampleData	location information about a sample data described by URI	R	N	URI
45	BDC_DataRight	information about limitations placed upon the use of the dataset and data service	R	1	Line 46 to 47
46	rightStatement	information to the usage permissions being agreed to	R	1	free text
47	license	links to the license document under which the catalogue is made available and not the datasets or data service	R	N	URI

8.2.4 Class: BDC_Domain

Table 8-4 shows the data dictionary of *BDC_Domain* which describes domain information in clause 7.2.4.

Table 8-4 – Domain information

	Name/Role name	Description	M/R/O	Cardinality	Domain
48	BDC_Domain	source and/or usage information for data catalogue	M	1	Line 49 to 51
49	title	a member item of taxonomy which used for identifying the domain of source and/or usage	M	1	free text
50	taxonomy	taxonomy information including a classification system and authority	M	N	BDC_Taxonomy Type
51	comment	any additional information for the domain	O	N	free text
52	BDC_TaxonomyType	information required to describe the taxonomy and the values used within that taxonomy	R	N	Line 53 to 54
53	taxonomyDomain	location information about a taxonomy described by URI	M	1	URI
54	taxonomyValue	a value used within the taxonomy	M	1	free text

8.2.5 Class: BDC_DataQuality

Table 8-5 shows the data dictionary of *BDC_DataQuality* which describes data quality in clause 7.2.5.

Table 8-5 – Data quality information

	Name/Role name	Description	M/R/O	Cardinality	Domain
55	BDC_DataQuality	data quality information for the data catalogue	R	N	Line 56 to 58
56	qualityRequirement	requirement statement for evaluating the quality of the data resource	M	1	free text
57	unitOfMeausre	standard unit or system of units utilizing which a quantity is accounted for and expressed.	M	1	free text
58	qualityResult	the result of quality evaluation described by the unit of measure	M	1	free text

8.2.6 Class: BDC_Record

Table 8-6 shows the data dictionary of *BDC_Record* which describes the catalogue record in clause 7.2.6.

Table 8-6 – Catalogue record information

	Name/Role name	Description	M/R/O	Cardinality	Domain
59	BDC_Record	record information for the data catalogue	R	N	Line 60 to 61
60	modifiedDate	the most resent modified date of the data catalogue	M	N	ITU-T X.680
61	issuedDate	the issued date of listing the data resource in the catalogue	R	1	ITU-T X.680

8.2.6 Data type: BDC_DataTypeCode

Table 8-7 shows the data dictionary of *BDC_DataTypeCode* describing the enumerated data type for data distribution.

Table 8-7 – Data type information

Name	Domain code	Description
STRUCTURED	001	data that is organized in a format easily used by the formatted repository
SEMI_STRUCTURED	002	data that is neither raw data nor typed data in a conventional database system (e.g., XML, JavaScript Object Notation (JSON))
UNSTRUCTURED	003	data that either does not have a pre-defined data model or is not organized in a pre-defined manner

Appendix I

Examples of metadata profile for data catalogue

(This appendix does not form an integral part of this Recommendation.)

This appendix uses the W3C data catalog vocabulary (DCAT) in the XML profile and terse resource description framework triple language (Turtle) profile (see [b-W3C DCAT]). The namespace for DCAT is `http://www.w3.org/ns/dcat#`, but DCAT makes extensive use of terms from other vocabularies. The extended prefix and its namespace for this appendix are "bdc" and "`http://www.itu.int/xml-namespace/itu-t/Y.3603/bigdatacatalogue#`".

I.1 RDF profiles

This clause provides the XML schema with resource description framework (RDF) format corresponding to the UML model in clause 8.

```
<?xml version="1.0" encoding="utf-8" ?>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:bdc="http://www.itu.int/xml-namespace/itu-t/Y.3603/bigdatacatalogue#"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:dcat="http://www.w3.org/ns/dcat#"
  xmlns:dct="http://purl.org/dc/terms/"
  xmlns:owl="http://www.w3.org/2002/07/owl#"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema#">

  <rdf:Description rdf:about="dc:description">
    <rdfs:comment>short introduction to the target (i.e. catalogue or data resource)</rdfs:comment>
    <rdfs:domain rdf:resource="bdc:Catalogue"/>
    <rdfs:domain rdf:resource="bdc:DataResource"/>
    <rdfs:range rdf:resource="xsd:string"/>
  </rdf:Description>

  <rdf:Description rdf:about="dc:format">
    <rdfs:comment>format information of dataset including a version</rdfs:comment>
    <rdfs:domain rdf:resource="bdc:Distribution"/>
    <rdfs:range rdf:resource="xsd:string"/>
  </rdf:Description>

  <rdf:Property rdf:about="bdc:hasRelation">
    <rdfs:comment>related data catalogue or dataset of the data catalogue or the dataset</rdfs:comment>
    <rdfs:domain rdf:resource="bdc:Catalogue"/>
    <rdfs:domain rdf:resource="bdc:Dataset"/>
    <rdfs:range rdf:resource="bdc:Catalogue"/>
    <rdfs:range rdf:resource="bdc:Dataset"/>
  </rdf:Property>

  <rdf:Description rdf:about="dc:keyword">
    <rdfs:comment>commonly used word(s) used to describe the dataset</rdfs:comment>
    <rdfs:domain rdf:resource="bdc:Dataset"/>
    <rdfs:range rdf:resource="xsd:string"/>
  </rdf:Description>

  <rdf:Description rdf:about="dc:language">
    <rdfs:comment>language used within the data catalogue</rdfs:comment>
    <rdfs:domain rdf:resource="bdc:Catalogue"/>
    <rdfs:range rdf:resource="dct:RFC5646"/>
  </rdf:Description>

  <rdf:Property rdf:about="bdc:temporalCoverage">
```

```

<rdfs:comment> time (including time zone) when the dataset was captured</rdfs:comment>
<rdfs:domain rdf:resource="bdc:Dataset"/>
<rdfs:range rdf:resource="xsd:string"/>
</rdf:Property>

<rdf:Description rdf:about="dc:title">
<rdfs:comment>a given name to the target</rdfs:comment>
<rdfs:domain rdf:resource="bdc:Catalogue"/>
<rdfs:domain rdf:resource="bdc:DataResource"/>
<rdfs:domain rdf:resource="bdc:Domain"/>
<rdfs:range rdf:resource="xsd:string"/>
</rdf:Description>

<rdf:Property rdf:about="bdc:updateFrequency">
<rdfs:comment>rate of occurrence of dataset update</rdfs:comment>
<rdfs:domain rdf:resource="bdc:Dataset"/>
<rdfs:range rdf:resource="xsd:string"/>
</rdf:Property>

<rdfs:Class rdf:about="bdc:Catalogue">
<rdfs:comment>root entity which defines metadata about data resource</rdfs:comment>
<rdfs:subClassOf rdf:resource="owl:Thing"/>
</rdfs:Class>

<rdfs:Class rdf:about="bdc:ContactType">
<rdfs:comment>information required to enable contact with the responsible person and/or
organization</rdfs:comment>
<rdfs:subClassOf rdf:resource="owl:Thing"/>
</rdfs:Class>

<rdfs:Class rdf:about="bdc>DataQuality">
<rdfs:comment>data quality information for the data catalogue</rdfs:comment>
<rdfs:subClassOf rdf:resource="owl:Thing"/>
</rdfs:Class>

<rdfs:Class rdf:about="bdc>DataResource">
<rdfs:comment>a collection of data which is available for access and/or download</rdfs:comment>
<rdfs:subClassOf rdf:resource="owl:Thing"/>
</rdfs:Class>

<rdfs:Class rdf:about="bdc:DataRight">
<rdfs:comment>information about limitation placed upon the use of the dataset and data service</rdfs:comment>
<rdfs:subClassOf rdf:resource="owl:Thing"/>
</rdfs:Class>

<rdfs:Class rdf:about="bdc:DataService">
<rdfs:comment>a collection of operations that provides dataset</rdfs:comment>
<rdfs:subClassOf rdf:resource="bdc:DataResource"/>
</rdfs:Class>

<rdfs:Class rdf:about="bdc:DataTypeCode">
<rdfs:comment>the enumerated data type for data distribution</rdfs:comment>
<rdfs:subClassOf rdf:resource="owl:Thing"/>
</rdfs:Class>

<rdfs:Class rdf:about="bdc:Dataset">
<rdfs:comment>dataset information for the data catalogue</rdfs:comment>
<rdfs:subClassOf rdf:resource="bdc:DataResource"/>
</rdfs:Class>

<rdfs:Class rdf:about="bdc:Distribution">
<rdfs:comment>information about the distributor of and options for obtaining the dataset</rdfs:comment>
<rdfs:subClassOf rdf:resource="owl:Thing"/>

```

```

</rdfs:Class>

<rdfs:Class rdf:about="bdc:Domain">
  <rdfs:comment>source and/ or usage information for data catalogue</rdfs:comment>
  <rdfs:subClassOf rdf:resource="owl:Thing"/>
</rdfs:Class>

<rdfs:Class rdf:about="bdc:Record">
  <rdfs:comment>record information for the data catalogue</rdfs:comment>
  <rdfs:subClassOf rdf:resource="owl:Thing"/>
</rdfs:Class>

<rdfs:Class rdf:about="bdc:ResponsibleParty">
  <rdfs:comment>name and position information for an individual or organization that is responsible for the data
catalogue or data resource</rdfs:comment>
  <rdfs:subClassOf rdf:resource="owl:Thing"/>
</rdfs:Class>

<rdf:Description rdf:about="bdc:SemiStructured">
  <rdf:type rdf:resource="bdc:DataTypeCode"/>
  <rdfs:comment>data that is neither raw data, nor typed data in a conventional database system (e.g. XML,
JSON)</rdfs:comment>
  <rdfs:subClassOf rdf:resource="owl:Thing"/>
</rdf:Description>

<rdf:Description rdf:about="bdc:Structured">
  <rdf:type rdf:resource="bdc:DataTypeCode"/>
  <rdfs:comment>data that is organized in a format easily used by formatted repository</rdfs:comment>
  <rdfs:subClassOf rdf:resource="owl:Thing"/>
</rdf:Description>

<rdf:Description rdf:about="bdc:Unstructured">
  <rdf:type rdf:resource="bdc:DataTypeCode"/>
  <rdfs:comment>data that either does not have a pre-defined data model or is not organized in a pre-defined
manner</rdfs:comment>
  <rdfs:subClassOf rdf:resource="owl:Thing"/>
</rdf:Description>

<rdfs:Class rdf:about="bdc:TaxonomyType">
  <rdfs:comment>information required to describe the taxonomy and the values used within that
taxonomy</rdfs:comment>
  <rdfs:subClassOf rdf:resource="owl:Thing"/>
</rdfs:Class>

<rdf:Property rdf:about="bdc:accessInformation">
  <rdfs:comment>access information to dataset</rdfs:comment>
  <rdfs:domain rdf:resource="bdc:Distribution"/>
  <rdfs:range rdf:resource="xsd:anyURI"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:address">
  <rdfs:comment>physical and email address at which the organization or individual may be contacted</rdfs:comment>
  <rdfs:domain rdf:resource="bdc:ContactType"/>
  <rdfs:range rdf:resource="xsd:string"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:comment">
  <rdfs:comment>an additional information for domain</rdfs:comment>
  <rdfs:domain rdf:resource="bdc:Domain"/>
  <rdfs:range rdf:resource="xsd:string"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:contact">

```

```

    <rdfs:comment>information required to enable contact with the responsible person and/or
organization</rdfs:comment>
    <rdfs:domain rdf:resource="bdc:ResponsibleParty"/>
    <rdfs:range rdf:resource="bdc:ContactType"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:contactPoint">
    <rdfs:comment>contact point information for the dataset</rdfs:comment>
    <rdfs:domain rdf:resource="bdc:DataResource"/>
    <rdfs:range rdf:resource="bdc:ResponsibleParty"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:dataQuality">
    <rdfs:comment>data quality information for the data catalogue</rdfs:comment>
    <rdfs:domain rdf:resource="bdc:Catalogue"/>
    <rdfs:range rdf:resource="bdc:DataQuality"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:dataResource">
    <rdfs:comment>data resource information for the data catalogue</rdfs:comment>
    <rdfs:domain rdf:resource="bdc:Catalogue"/>
    <rdfs:range rdf:resource="bdc:DataResource"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:dataRight">
    <rdfs:comment>Information about limitation placed upon the use of the dataset</rdfs:comment>
    <rdfs:domain rdf:resource="bdc:Distribution"/>
    <rdfs:range rdf:resource="bdc:DataRight"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:dataType">
    <rdfs:comment>the type information of the dataset</rdfs:comment>
    <rdfs:domain rdf:resource="bdc:Distribution"/>
    <rdfs:range rdf:resource="bdc:DataTypeCode"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:distribution">
    <rdfs:comment>information about the distributor of and options for obtaining the dataset</rdfs:comment>
    <rdfs:domain rdf:resource="bdc:Dataset"/>
    <rdfs:range rdf:resource="bdc:Distribution"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:endpointDescription">
    <rdfs:comment>a description of the service available through the endpoint</rdfs:comment>
    <rdfs:domain rdf:resource="bdc:DataService"/>
    <rdfs:range rdf:resource="xsd:anyURI"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:function">
    <rdfs:comment>function performed by the responsible party</rdfs:comment>
    <rdfs:domain rdf:resource="bdc:ResponsibleParty"/>
    <rdfs:range rdf:resource="xsd:string"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:hoursOfServices">
    <rdfs:comment> time (including time zone) when individuals can contact the organization or
individual</rdfs:comment>
    <rdfs:domain rdf:resource="bdc:ContactType"/>
    <rdfs:range rdf:resource="xsd:string"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:individualName">
    <rdfs:comment>name of the responsible person- surname, given name, title</rdfs:comment>

```

```

<rdfs:domain rdf:resource="bdc:ResponsibleParty"/>
<rdfs:range rdf:resource="xsd:string"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:issuedDate">
<rdfs:comment>the issued date of listing the data resource in the catalogue</rdfs:comment>
<rdfs:domain rdf:resource="bdc:Record"/>
<rdfs:range rdf:resource="dct:W3CDTF"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:license">
<rdfs:comment>This links to the license document under which the catalog is made available and not the datasets or
data service</rdfs:comment>
<rdfs:domain rdf:resource="bdc:DataRight"/>
<rdfs:range rdf:resource="xsd:anyURI"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:modifiedDate">
<rdfs:comment>the most recent modified date of data catalogue</rdfs:comment>
<rdfs:domain rdf:resource="bdc:Record"/>
<rdfs:range rdf:resource="dct:W3CDTF"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:onlineResource">
<rdfs:comment>online information that can be used to contact the individual or organization</rdfs:comment>
<rdfs:domain rdf:resource="bdc:ContactType"/>
<rdfs:range rdf:resource="xsd:anyURI"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:organizationName">
<rdfs:comment>name of the responsible organization</rdfs:comment>
<rdfs:domain rdf:resource="bdc:ResponsibleParty"/>
<rdfs:range rdf:resource="xsd:string"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:phoneNumber">
<rdfs:comment>telephone numbers at which the organization or individual may be contacted</rdfs:comment>
<rdfs:domain rdf:resource="bdc:ContactType"/>
<rdfs:range rdf:resource="xsd:string"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:positionName">
<rdfs:comment>role or position of the responsible person</rdfs:comment>
<rdfs:domain rdf:resource="bdc:ResponsibleParty"/>
<rdfs:range rdf:resource="xsd:string"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:qualityRequirements">
<rdfs:comment>requirement statement for evaluating quality of data resource</rdfs:comment>
<rdfs:domain rdf:resource="bdc:DataQuality"/>
<rdfs:range rdf:resource="xsd:string"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:record">
<rdfs:comment>record information for the data catalogue</rdfs:comment>
<rdfs:domain rdf:resource="bdc:Catalogue"/>
<rdfs:range rdf:resource="bdc:Record"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:responsibleParty">
<rdfs:comment>responsible party information for the data catalogue</rdfs:comment>
<rdfs:domain rdf:resource="bdc:Catalogue"/>
<rdfs:range rdf:resource="bdc:ResponsibleParty"/>

```

```

</rdf:Property>

<rdf:Property rdf:about="bdc:rightsStatement">
  <rdfs:comment>information to the usage permissions being agreed to</rdfs:comment>
  <rdfs:domain rdf:resource="bdc:DataRight"/>
  <rdfs:range rdf:resource="xsd:string"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:sampleData">
  <rdfs:comment>location information about a sample data described by URI</rdfs:comment>
  <rdfs:domain rdf:resource="bdc:Distribution"/>
  <rdfs:range rdf:resource="xsd:anyURI"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:serveDataset">
  <rdfs:comment>a collection of data provided by data service</rdfs:comment>
  <rdfs:domain rdf:resource="bdc:DataService"/>
  <rdfs:range rdf:resource="bdc:Dataset"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:serviceRight">
  <rdfs:comment>information about limitation placed upon the use of the data service</rdfs:comment>
  <rdfs:domain rdf:resource="bdc:DataService"/>
  <rdfs:range rdf:resource="bdc:DataRight"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:sourceDomain">
  <rdfs:comment>source domain information for the data catalogue</rdfs:comment>
  <rdfs:domain rdf:resource="bdc:Catalogue"/>
  <rdfs:range rdf:resource="bdc:Domain"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:taxonomy">
  <rdfs:comment>taxonomy information including classification system and authority</rdfs:comment>
  <rdfs:domain rdf:resource="bdc:Domain"/>
  <rdfs:range rdf:resource="bdc:TaxonomyType"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:taxonomyDomain">
  <rdfs:comment>location information about a taxonomy described by URI</rdfs:comment>
  <rdfs:domain rdf:resource="bdc:TaxonomyType"/>
  <rdfs:range rdf:resource="xsd:anyURI"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:taxonomyValue">
  <rdfs:comment>a value used within the taxonomy</rdfs:comment>
  <rdfs:domain rdf:resource="bdc:TaxonomyType"/>
  <rdfs:range rdf:resource="xsd:string"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:unitOfMeasure">
  <rdfs:comment>standard unit or system of units utilizing which a quantity is accounted for and
expressed</rdfs:comment>
  <rdfs:domain rdf:resource="bdc:DataQuality"/>
  <rdfs:range rdf:resource="xsd:string"/>
</rdf:Property>

<rdf:Property rdf:about="bdc:usageDomain">
  <rdfs:comment>usage domain information for the data catalogue</rdfs:comment>
  <rdfs:domain rdf:resource="bdc:Catalogue"/>
  <rdfs:range rdf:resource="bdc:Domain"/>
</rdf:Property>

```

```

<rdf:Property rdf:about="bdc:qualityResult">
  <rdfs:comment>the result of quality evaluation described by the unit of measure</rdfs:comment>
  <rdfs:domain rdf:resource="bdc:DataQuality"/>
  <rdfs:range rdf:resource="xsd:string"/>
</rdf:Property>

<rdf:Description rdf:about="owl:versionInfo">
  <rdfs:comment>version of data catalogue specification</rdfs:comment>
  <rdfs:domain rdf:resource="bdc:Catalogue"/>
  <rdfs:range rdf:resource="xsd:string"/>
</rdf:Description>

<rdf:Description rdf:about="dcat:byteSize">
  <rdfs:comment>information about the size of the dataset in bytes</rdfs:comment>
  <rdfs:domain rdf:resource="bdc:Distribution"/>
  <rdfs:range rdf:resource="xsd:unsignedLong"/>
</rdf:Description>

</rdf:RDF>

```

1.2 Turtle profile

This clause provides the XML schema with Turtle format corresponding to the UML model in clause 8.

```

# baseURI: http://www.itu.int/xml-namespace/itu-t/Y.3603/bigdatacatalogue
# imports: http://purl.org/dc/elements/1.1/
# imports: http://purl.org/dc/terms/
# imports: http://www.w3.org/ns/dcat#
# imports: https://www.w3.org/2002/07/owl#
# prefix: bdc

@prefix bdc: <http://www.itu.int/xml-namespace/itu-t/Y.3603/bigdatacatalogue#> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
@prefix dc: <http://purl.org/dc/elements/1.1/> .
@prefix dct: <http://purl.org/dc/terms/> .
@prefix dcat: <http://www.w3.org/ns/dcat#> .

dc:description
  rdfs:comment "short introduction to the target (i.e. catalogue or data resource)" ;
  rdfs:domain bdc:Catalogue ;
  rdfs:domain bdc:DataResource ;
  rdfs:range xsd:string ;
.

dc:format
  rdfs:comment "format information of dataset including a version" ;
  rdfs:domain bdc:Distribution ;
  rdfs:range xsd:string ;
.

bdc:hasRelation
  rdfs:comment "related data catalogue or dataset of the data catalogue or the dataset" ;
  rdf:type rdf:Property ;
  rdfs:domain bdc:Catalogue ;
  rdfs:domain bdc:Dataset ;
  rdfs:range bdc:Catalogue ;
  rdfs:range bdc:Dataset ;
.

```

```

dc:keyword
  rdfs:comment "commonly used word(s) used to describe the dataset" ;
  rdfs:domain bdc:Dataset ;
  rdfs:range xsd:string ;
.
dc:language
  rdfs:comment "language used within the data catalogue" ;
  rdfs:domain bdc:Catalogue ;
  rdfs:range dct:RFC5646 ;
.
bdc:temporalCoverage
  rdf:type rdf:Property ;
  rdfs:comment "time (including time zone) when the dataset was captured" ;
  rdfs:domain bdc:Dataset ;
  rdfs:range xsd:string ;
.
dc:title
  rdfs:comment "a given name to the target" ;
  rdfs:domain bdc:Catalogue ;
  rdfs:domain bdc:DataResource ;
  rdfs:domain bdc:Domain ;
  rdfs:range xsd:string ;
.
bdc:updateFrequency
  rdf:type rdf:Property ;
  rdfs:comment "rate of occurrence of dataset update" ;
  rdfs:domain bdc:Dataset ;
  rdfs:range xsd:string ;
.
bdc:Catalogue
  rdf:type rdfs:Class ;
  rdfs:comment "root entity which defines metadata about data resource" ;
  rdfs:subClassOf owl:Thing ;
.
bdc:ContactType
  rdf:type rdfs:Class ;
  rdfs:comment "information required to enable contact with the responsible person and/or organization" ;
  rdfs:subClassOf owl:Thing ;
.
bdc:DataQuality
  rdf:type rdfs:Class ;
  rdfs:comment "data quality information for the data catalogue" ;
  rdfs:subClassOf owl:Thing ;
.
bdc:DataResource
  rdf:type rdfs:Class ;
  rdfs:comment "a collection of data which is available for access and/or download" ;
  rdfs:subClassOf owl:Thing ;
.
bdc:DataRight
  rdf:type rdfs:Class ;
  rdfs:comment "information about limitation placed upon the use of the dataset and data service" ;
  rdfs:subClassOf owl:Thing ;
.
bdc:DataService
  rdf:type rdfs:Class ;
  rdfs:comment "a collection of operations that provides dataset" ;
  rdfs:subClassOf bdc:DataResource ;
.
bdc:DataTypeCode

```

```

rdfs:type rdfs:Class ;
rdfs:comment "the enumerated data type for data distribution" ;
rdfs:subClassOf owl:Thing ;
.
bdc:Dataset
rdfs:type rdfs:Class ;
rdfs:comment "dataset information for the data catalogue" ;
rdfs:subClassOf bdc:DataResource ;
.
bdc:Distribution
rdfs:type rdfs:Class ;
rdfs:comment "information about the distributor of and options for obtaining the dataset" ;
rdfs:subClassOf owl:Thing ;
.
bdc:Domain
rdfs:type rdfs:Class ;
rdfs:comment "source and/ or usage information for data catalogue" ;
rdfs:subClassOf owl:Thing ;
.
bdc:Record
rdfs:type rdfs:Class ;
rdfs:comment "record information for the data catalogue" ;
rdfs:subClassOf owl:Thing ;
.
bdc:ResponsibleParty
rdfs:type rdfs:Class ;
rdfs:comment "name and position information for an individual or organization that is responsible for the data catalogue
or data resource" ;
rdfs:subClassOf owl:Thing ;
.
bdc:SemiStructured
rdfs:type bdc:DataTypeCode ;
rdfs:comment "data that is neither raw data, nor typed data in a conventional database system (e.g. XML, JSON)" ;
rdfs:subClassOf owl:Thing ;
.
bdc:Structured
rdfs:type bdc:DataTypeCode ;
rdfs:comment "data that is organized in a format easily used by formatted repository" ;
rdfs:subClassOf owl:Thing ;
.
bdc:Unstructured
rdfs:type bdc:DataTypeCode ;
rdfs:comment "data that either does not have a pre-defined data model or is not organized in a pre-defined manner" ;
rdfs:subClassOf owl:Thing ;
.
bdc:TaxonomyType
rdfs:type rdfs:Class ;
rdfs:comment "information required to describe the taxonomy and the values used within that taxonomy" ;
rdfs:subClassOf owl:Thing ;
.
bdc:accessInformation
rdfs:type rdf:Property ;
rdfs:comment "access information to dataset" ;
rdfs:domain bdc:Distribution ;
rdfs:range xsd:anyURI ;
.
bdc:address
rdfs:type rdf:Property ;
rdfs:comment "physical and email address at which the organization or individual may be contacted" ;
rdfs:domain bdc:ContactType ;

```

```

rdfs:range xsd:string ;
.
bdc:comment
rdfs:type rdf:Property ;
rdfs:comment "an additional information for domain" ;
rdfs:domain bdc:Domain ;
rdfs:range xsd:string ;
.
bdc:contact
rdfs:type rdf:Property ;
rdfs:comment "information required to enable contact with the responsible person and/or organization" ;
rdfs:domain bdc:ResponsibleParty ;
rdfs:range bdc:ContactType ;
.
bdc:contactPoint
rdfs:type rdf:Property ;
rdfs:comment "contact point information for the dataset" ;
rdfs:domain bdc:DataResource ;
rdfs:range bdc:ResponsibleParty ;
.
bdc:dataQuality
rdfs:type rdf:Property ;
rdfs:comment "data quality information for the data catalogue" ;
rdfs:domain bdc:Catalogue ;
rdfs:range bdc:DataQuality ;
.
bdc:dataResource
rdfs:type rdf:Property ;
rdfs:comment "data resource information for the data catalogue" ;
rdfs:domain bdc:Catalogue ;
rdfs:range bdc:DataResource ;
.
bdc:dataRight
rdfs:type rdf:Property ;
rdfs:comment "Information about limitation placed upon the use of the dataset" ;
rdfs:domain bdc:Distribution ;
rdfs:range bdc:DataRight ;
.
bdc:dataType
rdfs:type rdf:Property ;
rdfs:comment "the type information of the dataset" ;
rdfs:domain bdc:Distribution ;
rdfs:range bdc:DataTypeCode ;
.
bdc:distribution
rdfs:type rdf:Property ;
rdfs:comment "information about the distributor of and options for obtaining the dataset" ;
rdfs:domain bdc:Dataset ;
rdfs:range bdc:Distribution ;
.
bdc:endpointDescription
rdfs:type rdf:Property ;
rdfs:comment "a description of the service available through the endpoint" ;
rdfs:domain bdc:DataService ;
rdfs:range xsd:anyURI ;
.
bdc:function
rdfs:type rdf:Property ;
rdfs:comment "function performed by the responsible party" ;
rdfs:domain bdc:ResponsibleParty ;

```

```

    rdfs:range xsd:string ;
.
    bdc:hoursOfServices
    rdf:type rdf:Property ;
    rdfs:comment "time period (including time zone) when individuals can contact the organization or individual" ;
    rdfs:domain bdc:ContactType ;
    rdfs:range xsd:string ;
.
    bdc:individualName
    rdf:type rdf:Property ;
    rdfs:comment "name of the responsible person- surname, given name, title" ;
    rdfs:domain bdc:ResponsibleParty ;
    rdfs:range xsd:string ;
.
    bdc:issuedDate
    rdf:type rdf:Property ;
    rdfs:comment "the issued date of listing the data resource in the catalogue" ;
    rdfs:domain bdc:Record ;
    rdfs:range dct:W3CDTF ;
.
    bdc:license
    rdf:type rdf:Property ;
    rdfs:comment "This links to the license document under which the catalog is made available and not the datasets or data
service" ;
    rdfs:domain bdc:DataRight ;
    rdfs:range xsd:anyURI ;
.
    bdc:modifiedDate
    rdf:type rdf:Property ;
    rdfs:comment "the most recent modified date of data catalogue" ;
    rdfs:domain bdc:Record ;
    rdfs:range dct:W3CDTF ;
.
    bdc:onlineResource
    rdf:type rdf:Property ;
    rdfs:comment "online information that can be used to contact the individual or organization" ;
    rdfs:domain bdc:ContactType ;
    rdfs:range xsd:anyURI ;
.
    bdc:organizationName
    rdf:type rdf:Property ;
    rdfs:comment "name of the responsible organization" ;
    rdfs:domain bdc:ResponsibleParty ;
    rdfs:range xsd:string ;
.
    bdc:phoneNumber
    rdf:type rdf:Property ;
    rdfs:comment "telephone numbers at which the organization or individual may be contacted" ;
    rdfs:domain bdc:ContactType ;
    rdfs:range xsd:string ;
.
    bdc:positionName
    rdf:type rdf:Property ;
    rdfs:comment "role or position of the responsible person" ;
    rdfs:domain bdc:ResponsibleParty ;
    rdfs:range xsd:string ;
.
    bdc:qualityRequirements
    rdf:type rdf:Property ;
    rdfs:comment "requirement statement for evaluating quality of data resource" ;

```

```

rdfs:domain bdc:DataQuality ;
rdfs:range xsd:string ;
.
bdc:record
rdf:type rdf:Property ;
rdfs:comment "record information for the data catalogue" ;
rdfs:domain bdc:Catalogue ;
rdfs:range bdc:Record ;
.
bdc:responsibleParty
rdf:type rdf:Property ;
rdfs:comment "responsible party information for the data catalogue" ;
rdfs:domain bdc:Catalogue ;
rdfs:range bdc:ResponsibleParty ;
.
bdc:rightsStatement
rdf:type rdf:Property ;
rdfs:comment "information to the usage permissions being agreed to" ;
rdfs:domain bdc:DataRight ;
rdfs:range xsd:string ;
.
bdc:sampleData
rdf:type rdf:Property ;
rdfs:comment "location information about a sample data described by URI" ;
rdfs:domain bdc:Distribution ;
rdfs:range xsd:anyURI ;
.
bdc:serveDataset
rdf:type rdf:Property ;
rdfs:comment "a collection of data provided by data service" ;
rdfs:domain bdc:DataService ;
rdfs:range bdc:Dataset ;
.
bdc:serviceRight
rdf:type rdf:Property ;
rdfs:comment "information about limitation placed upon the use of the data service" ;
rdfs:domain bdc:DataService ;
rdfs:range bdc:DataRight ;
.
bdc:sourceDomain
rdf:type rdf:Property ;
rdfs:comment "source domain information for the data catalogue" ;
rdfs:domain bdc:Catalogue ;
rdfs:range bdc:Domain ;
.
bdc:taxonomy
rdf:type rdf:Property ;
rdfs:comment "taxonomy information including classification system and authority" ;
rdfs:domain bdc:Domain ;
rdfs:range bdc:TaxonomyType ;
.
bdc:taxonomyDomain
rdf:type rdf:Property ;
rdfs:comment "location information about a taxonomy described by URI" ;
rdfs:domain bdc:TaxonomyType ;
rdfs:range xsd:anyURI ;
.
bdc:taxonomyValue
rdf:type rdf:Property ;
rdfs:comment "a value used within the taxonomy" ;

```

```

rdfs:domain bdc:TaxonomyType ;
rdfs:range xsd:string ;
.
bdc:unitOfMeasure
rdf:type rdf:Property ;
rdfs:comment "standard unit or system of units by means of which a quantity is accounted for and expressed" ;
rdfs:domain bdc:DataQuality ;
rdfs:range xsd:string ;
.
bdc:usageDomain
rdf:type rdf:Property ;
rdfs:comment "usage domain information for the data catalogue" ;
rdfs:domain bdc:Catalogue ;
rdfs:range bdc:Domain ;
.
bdc:qualityResult
rdf:type rdf:Property ;
rdfs:comment "the result of quality evaluation described by the unit of measure" ;
rdfs:domain bdc:DataQuality ;
rdfs:range xsd:string ;
.
owl:versionInfo
rdfs:comment "version of data catalogue specification" ;
rdfs:domain bdc:Catalogue ;
rdfs:range xsd:string ;
.
dcat:byteSize
rdfs:comment "information about the size of the dataset in bytes" ;
rdfs:domain bdc:Distribution ;
rdfs:range xsd:unsignedLong ;
.

```

I.3 JSON-LD profile

This clause provides a JSON-based Serialization for Linked Data (JSON-LD) format corresponding to the UML model in clause 8.

```

{
  "@context": {
    "bdc": "http://www.itu.int/xml-namespace/itu-t/Y.3603/bigdatacatalogue#",
    "dc": "http://purl.org/dc/elements/1.1/",
    "dcat": "http://www.w3.org/ns/dcat#",
    "dct": "http://purl.org/dc/terms/",
    "owl": "http://www.w3.org/2002/07/owl#",
    "rdf": "http://www.w3.org/1999/02/22-rdf-syntax-ns#",
    "rdfs": "http://www.w3.org/2000/01/rdf-schema#",
    "xsd": "http://www.w3.org/2001/XMLSchema#"
  },
  "@graph": [
    {
      "@id": "dc:description",
      "rdfs:comment": "short introduction to the target (i.e. catalogue or data resource)",
      "rdfs:domain": [
        {
          "@id": "bdc:Catalogue"
        },
        {
          "@id": "bdc:DataResource"
        }
      ],
      "rdfs:range": {

```

```

    "@id": "xsd:string"
  }
},
{
  "@id": "dc:format",
  "rdfs:comment": "format information of dataset including a version",
  "rdfs:domain": {
    "@id": "bdc:Distribution"
  },
  "rdfs:range": {
    "@id": "xsd:string"
  }
},
{
  "@id": "bdc:hasRelation",
  "rdfs:comment": "related data catalogue or dataset of the data catalogue or the dataset",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:domain": [
    {
      "@id": "bdc:Catalogue"
    },
    {
      "@id": "bdc:Dataset"
    }
  ],
  "rdfs:range": [
    {
      "@id": "bdc:Catalogue"
    },
    {
      "@id": "bdc:Dataset"
    }
  ]
},
{
  "@id": "dc:keyword",
  "rdfs:comment": "commonly used word(s) used to describe the dataset",
  "rdfs:domain": {
    "@id": "bdc:Dataset"
  },
  "rdfs:range": {
    "@id": "xsd:string"
  }
},
{
  "@id": "dc:language",
  "rdfs:comment": "language used within the data catalogue",
  "rdfs:domain": {
    "@id": "bdc:Catalogue"
  },
  "rdfs:range": {
    "@id": "dct:RFC5646"
  }
},
{
  "@id": "bdc:temporalCoverage",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "time (including time zone) when the dataset was captured",
  "rdfs:domain": {

```

```

    "@id": "bdc:Dataset"
  },
  "rdfs:range": {
    "@id": "xsd:string"
  }
},
{
  "@id": "dc:title",
  "rdfs:comment": "a given name to the target",
  "rdfs:domain": [
    {
      "@id": "bdc:Catalogue"
    },
    {
      "@id": "bdc:DataResource"
    },
    {
      "@id": "bdc:Domain"
    }
  ],
  "rdfs:range": {
    "@id": "xsd:string"
  }
},
{
  "@id": "bdc:updateFrequency",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "rate of occurrence of dataset update",
  "rdfs:domain": {
    "@id": "bdc:Dataset"
  },
  "rdfs:range": {
    "@id": "xsd:string"
  }
},
{
  "@id": "bdc:Catalogue",
  "rdf:type": {
    "@id": "rdfs:Class"
  },
  "rdfs:comment": "root entity which defines metadata about data resource",
  "rdfs:subClassOf": {
    "@id": "owl:Thing"
  }
},
{
  "@id": "bdc:ContactType",
  "rdf:type": {
    "@id": "rdfs:Class"
  },
  "rdfs:comment": "information required to enable contact with the responsible person and/or organization",
  "rdfs:subClassOf": {
    "@id": "owl:Thing"
  }
},
{
  "@id": "bdc:DataQuality",
  "rdf:type": {
    "@id": "rdfs:Class"
  },
  "rdfs:comment": "data quality information for the data catalogue",

```

```

"rdfs:subClassOf": {
  "@id": "owl:Thing"
},
{
  "@id": "bdc:DataResource",
  "rdf:type": {
    "@id": "rdfs:Class"
  },
  "rdfs:comment": "a collection of data which is available for access and/or download",
  "rdfs:subClassOf": {
    "@id": "owl:Thing"
  }
},
{
  "@id": "bdc:DataRight",
  "rdf:type": {
    "@id": "rdfs:Class"
  },
  "rdfs:comment": "information about limitation placed upon the use of the dataset and data service",
  "rdfs:subClassOf": {
    "@id": "owl:Thing"
  }
},
{
  "@id": "bdc:DataService",
  "rdf:type": {
    "@id": "rdfs:Class"
  },
  "rdfs:comment": "a collection of operations that provides dataset",
  "rdfs:subClassOf": {
    "@id": "bdc:DataResource"
  }
},
{
  "@id": "bdc:DataTypeCode",
  "rdf:type": {
    "@id": "rdfs:Class"
  },
  "rdfs:comment": "the enumerated data type for data distribution",
  "rdfs:subClassOf": {
    "@id": "owl:Thing"
  }
},
{
  "@id": "bdc:Dataset",
  "rdf:type": {
    "@id": "rdfs:Class"
  },
  "rdfs:comment": "dataset information for the data catalogue",
  "rdfs:subClassOf": {
    "@id": "bdc:DataResource"
  }
},
{
  "@id": "bdc:Distribution",
  "rdf:type": {
    "@id": "rdfs:Class"
  },
  "rdfs:comment": "information about the distributor of and options for obtaining the dataset",
  "rdfs:subClassOf": {
    "@id": "owl:Thing"
  }
}

```

```

},
{
  "@id": "bdc:Domain",
  "rdf:type": {
    "@id": "rdfs:Class"
  },
  "rdfs:comment": "source and/ or usage information for data catalogue",
  "rdfs:subClassOf": {
    "@id": "owl:Thing"
  }
},
{
  "@id": "bdc:Record",
  "rdf:type": {
    "@id": "rdfs:Class"
  },
  "rdfs:comment": "record information for the data catalogue",
  "rdfs:subClassOf": {
    "@id": "owl:Thing"
  }
},
{
  "@id": "bdc:ResponsibleParty",
  "rdf:type": {
    "@id": "rdfs:Class"
  },
  "rdfs:comment": "name and position information for an individual or organization that is responsible for the data catalogue or data resource",
  "rdfs:subClassOf": {
    "@id": "owl:Thing"
  }
},
{
  "@id": "bdc:SemiStructured",
  "rdf:type": {
    "@id": "bdc:DataTypeCode"
  },
  "rdfs:comment": "data that is neither raw data, nor typed data in a conventional database system (e.g. XML, JSON)",
  "rdfs:subClassOf": {
    "@id": "owl:Thing"
  }
},
{
  "@id": "bdc:Structured",
  "rdf:type": {
    "@id": "bdc:DataTypeCode"
  },
  "rdfs:comment": "data that is organized in a format easily used by formatted repository",
  "rdfs:subClassOf": {
    "@id": "owl:Thing"
  }
},
{
  "@id": "bdc:Unstructured",
  "rdf:type": {
    "@id": "bdc:DataTypeCode"
  },
  "rdfs:comment": "data that either does not have a pre-defined data model or is not organized in a pre-defined manner",
  "rdfs:subClassOf": {
    "@id": "owl:Thing"
  }
},
{

```

```

"@id": "bdc:TaxonomyType",
"rdf:type": {
  "@id": "rdfs:Class"
},
"rdfs:comment": "information required to describe the taxonomy and the values used within that taxonomy",
"rdfs:subClassOf": {
  "@id": "owl:Thing"
}
},
{
  "@id": "bdc:accessInformation",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "access information to dataset",
  "rdfs:domain": {
    "@id": "bdc:Distribution"
  },
  "rdfs:range": {
    "@id": "xsd:anyURI"
  }
},
{
  "@id": "bdc:address",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "physical and email address at which the organization or individual may be contacted",
  "rdfs:domain": {
    "@id": "bdc:ContactType"
  },
  "rdfs:range": {
    "@id": "xsd:string"
  }
},
{
  "@id": "bdc:comment",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "an additional information for domain",
  "rdfs:domain": {
    "@id": "bdc:Domain"
  },
  "rdfs:range": {
    "@id": "xsd:string"
  }
},
{
  "@id": "bdc:contact",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "information required to enable contact with the responsible person and/or organization",
  "rdfs:domain": {
    "@id": "bdc:ResponsibleParty"
  },
  "rdfs:range": {
    "@id": "bdc:ContactType"
  }
},
{
  "@id": "bdc:contactPoint",

```

```

"rdf:type": {
  "@id": "rdf:Property"
},
"rdfs:comment": "contact point information for the dataset",
"rdfs:domain": {
  "@id": "bdc:DataResource"
},
"rdfs:range": {
  "@id": "bdc:ResponsibleParty"
}
},
{
  "@id": "bdc:dataQuality",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "data quality information for the data catalogue",
  "rdfs:domain": {
    "@id": "bdc:Catalogue"
  },
  "rdfs:range": {
    "@id": "bdc:DataQuality"
  }
},
{
  "@id": "bdc:dataResource",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "data resource information for the data catalogue",
  "rdfs:domain": {
    "@id": "bdc:Catalogue"
  },
  "rdfs:range": {
    "@id": "bdc:DataResource"
  }
},
{
  "@id": "bdc:dataRight",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "Information about limitation placed upon the use of the dataset",
  "rdfs:domain": {
    "@id": "bdc:Distribution"
  },
  "rdfs:range": {
    "@id": "bdc:DataRight"
  }
},
{
  "@id": "bdc:dataType",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "the type information of the dataset",
  "rdfs:domain": {
    "@id": "bdc:Distribution"
  },
  "rdfs:range": {
    "@id": "bdc:DataTypeCode"
  }
},

```

```

{
  "@id": "bdc:distribution",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "information about the distributor of and options for obtaining the dataset",
  "rdfs:domain": {
    "@id": "bdc:Dataset"
  },
  "rdfs:range": {
    "@id": "bdc:Distribution"
  }
},
{
  "@id": "bdc:endpointDescription",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "a description of the service available through the endpoint",
  "rdfs:domain": {
    "@id": "bdc:DataService"
  },
  "rdfs:range": {
    "@id": "xsd:anyURI"
  }
},
{
  "@id": "bdc:function",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "function performed by the responsible party",
  "rdfs:domain": {
    "@id": "bdc:ResponsibleParty"
  },
  "rdfs:range": {
    "@id": "xsd:string"
  }
},
{
  "@id": "bdc:hoursOfServices",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "time period (including time zone) when individuals can contact the organization or individual",
  "rdfs:domain": {
    "@id": "bdc:ContactType"
  },
  "rdfs:range": {
    "@id": "xsd:string"
  }
},
{
  "@id": "bdc:individualName",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "name of the responsible person- surname, given name, title",
  "rdfs:domain": {
    "@id": "bdc:ResponsibleParty"
  },
  "rdfs:range": {
    "@id": "xsd:string"
  }
}

```

```

    }
  },
  {
    "@id": "bdc:issuedDate",
    "rdf:type": {
      "@id": "rdf:Property"
    },
    "rdfs:comment": "the issued date of listing the data resource in the catalogue",
    "rdfs:domain": {
      "@id": "bdc:Record"
    },
    "rdfs:range": {
      "@id": "dct:W3CDTF"
    }
  },
  {
    "@id": "bdc:license",
    "rdf:type": {
      "@id": "rdf:Property"
    },
    "rdfs:comment": "This links to the license document under which the catalog is made available and not the datasets or data service",
    "rdfs:domain": {
      "@id": "bdc:DataRight"
    },
    "rdfs:range": {
      "@id": "xsd:anyURI"
    }
  },
  {
    "@id": "bdc:modifiedDate",
    "rdf:type": {
      "@id": "rdf:Property"
    },
    "rdfs:comment": "the most resent modified date of data catalogue",
    "rdfs:domain": {
      "@id": "bdc:Record"
    },
    "rdfs:range": {
      "@id": "dct:W3CDTF"
    }
  },
  {
    "@id": "bdc:onlineResource",
    "rdf:type": {
      "@id": "rdf:Property"
    },
    "rdfs:comment": "online information that can be used to contact the individual or organization",
    "rdfs:domain": {
      "@id": "bdc:ContactType"
    },
    "rdfs:range": {
      "@id": "xsd:anyURI"
    }
  },
  {
    "@id": "bdc:organizationName",
    "rdf:type": {
      "@id": "rdf:Property"
    },
    "rdfs:comment": "name of the responsible organization",
    "rdfs:domain": {
      "@id": "bdc:ResponsibleParty"
    }
  }
}

```

```

    },
    "rdfs:range": {
      "@id": "xsd:string"
    }
  },
  {
    "@id": "bdc:phoneNumber",
    "rdf:type": {
      "@id": "rdf:Property"
    },
    "rdfs:comment": "telephone numbers at which the organization or individual may be contacted",
    "rdfs:domain": {
      "@id": "bdc:ContactType"
    },
    "rdfs:range": {
      "@id": "xsd:string"
    }
  },
  {
    "@id": "bdc:positionName",
    "rdf:type": {
      "@id": "rdf:Property"
    },
    "rdfs:comment": "role or position of the responsible person",
    "rdfs:domain": {
      "@id": "bdc:ResponsibleParty"
    },
    "rdfs:range": {
      "@id": "xsd:string"
    }
  },
  {
    "@id": "bdc:qualityRequirements",
    "rdf:type": {
      "@id": "rdf:Property"
    },
    "rdfs:comment": "requirement statement for evaluating quality of data resource",
    "rdfs:domain": {
      "@id": "bdc:DataQuality"
    },
    "rdfs:range": {
      "@id": "xsd:string"
    }
  },
  {
    "@id": "bdc:record",
    "rdf:type": {
      "@id": "rdf:Property"
    },
    "rdfs:comment": "record information for the data catalogue",
    "rdfs:domain": {
      "@id": "bdc:Catalogue"
    },
    "rdfs:range": {
      "@id": "bdc:Record"
    }
  },
  {
    "@id": "bdc:responsibleParty",
    "rdf:type": {
      "@id": "rdf:Property"
    },
    "rdfs:comment": "responsible party information for the data catalogue",

```

```

"rdfs:domain": {
  "@id": "bdc:Catalogue"
},
"rdfs:range": {
  "@id": "bdc:ResponsibleParty"
}
},
{
  "@id": "bdc:rightsStatement",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "information to the usage permissions being agreed to",
  "rdfs:domain": {
    "@id": "bdc:DataRight"
  },
  "rdfs:range": {
    "@id": "xsd:string"
  }
},
{
  "@id": "bdc:sampleData",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "location information about a sample data described by URI",
  "rdfs:domain": {
    "@id": "bdc:Distribution"
  },
  "rdfs:range": {
    "@id": "xsd:anyURI"
  }
},
{
  "@id": "bdc:serveDataset",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "a collection of data provided by data service",
  "rdfs:domain": {
    "@id": "bdc:DataService"
  },
  "rdfs:range": {
    "@id": "bdc:Dataset"
  }
},
{
  "@id": "bdc:serviceRight",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "information about limitation placed upon the use of the data service",
  "rdfs:domain": {
    "@id": "bdc:DataService"
  },
  "rdfs:range": {
    "@id": "bdc:DataRight"
  }
},
{
  "@id": "bdc:sourceDomain",
  "rdf:type": {
    "@id": "rdf:Property"
  }
}

```

```

    },
    "rdfs:comment": "source domain information for the data catalogue",
    "rdfs:domain": {
      "@id": "bdc:Catalogue"
    },
    "rdfs:range": {
      "@id": "bdc:Domain"
    }
  },
  {
    "@id": "bdc:taxonomy",
    "rdf:type": {
      "@id": "rdf:Property"
    },
    "rdfs:comment": "taxonomy information including classification system and authority",
    "rdfs:domain": {
      "@id": "bdc:Domain"
    },
    "rdfs:range": {
      "@id": "bdc:TaxonomyType"
    }
  },
  {
    "@id": "bdc:taxonomyDomain",
    "rdf:type": {
      "@id": "rdf:Property"
    },
    "rdfs:comment": "location information about a taxonomy described by URI",
    "rdfs:domain": {
      "@id": "bdc:TaxonomyType"
    },
    "rdfs:range": {
      "@id": "xsd:anyURI"
    }
  },
  {
    "@id": "bdc:taxonomyValue",
    "rdf:type": {
      "@id": "rdf:Property"
    },
    "rdfs:comment": "a value used within the taxonomy",
    "rdfs:domain": {
      "@id": "bdc:TaxonomyType"
    },
    "rdfs:range": {
      "@id": "xsd:string"
    }
  },
  {
    "@id": "bdc:unitOfMeasure",
    "rdf:type": {
      "@id": "rdf:Property"
    },
    "rdfs:comment": "standard unit or system of units utilizing which a quantity is accounted for and expressed",
    "rdfs:domain": {
      "@id": "bdc:DataQuality"
    },
    "rdfs:range": {
      "@id": "xsd:string"
    }
  },
  {
    "@id": "bdc:usageDomain",

```

```

"rdf:type": {
  "@id": "rdf:Property"
},
"rdfs:comment": "usage domain information for the data catalogue",
"rdfs:domain": {
  "@id": "bdc:Catalogue"
},
"rdfs:range": {
  "@id": "bdc:Domain"
}
},
{
  "@id": "bdc:qualityResult",
  "rdf:type": {
    "@id": "rdf:Property"
  },
  "rdfs:comment": "the result of quality evaluation described by the unit of measure",
  "rdfs:domain": {
    "@id": "bdc:DataQuality"
  },
  "rdfs:range": {
    "@id": "xsd:string"
  }
},
{
  "@id": "owl:versionInfo",
  "rdfs:comment": "version of data catalogue specification",
  "rdfs:domain": {
    "@id": "bdc:Catalogue"
  },
  "rdfs:range": {
    "@id": "xsd:string"
  }
},
{
  "@id": "dcat:byteSize",
  "rdfs:comment": "information about the size of the dataset in bytes",
  "rdfs:domain": {
    "@id": "bdc:Distribution"
  },
  "rdfs:range": {
    "@id": "xsd:unsignedLong"
  }
}
]
}

```

Appendix II

Examples of metadata instance

(This appendix does not form an integral part of this Recommendation.)

For a better understanding of the conceptual model, this appendix provides examples of metadata instances about healthcare data [b-NHIS]. The UML object diagram, RDF instance and Turtle instances follow the UML and XML models in clause 8 and Appendix I, and these examples provide information on a dataset about 'Health Insurance'.

II.1 UML object diagram

An object diagram represents an instance of a class diagram. Figure II.1 is an object diagram derived from the class diagram presented in Figure 8-1. This example describes an air quality data catalogue. A *BDC_Catalogue* instance named *airCatalog* contains three *BDC_DataResource* instances of *pmSet*, *ozoneSet*, and *pmService*. The *pmSet* instance is a dataset for fine dust. The *ozoneSet* instance indicates ozone density. The *pmService* instance serves the data service for the *pmSet* instance via API. In the case of *distOzone*, it is responsible for the actual distribution of the *ozoneSet* instance in CSV format.

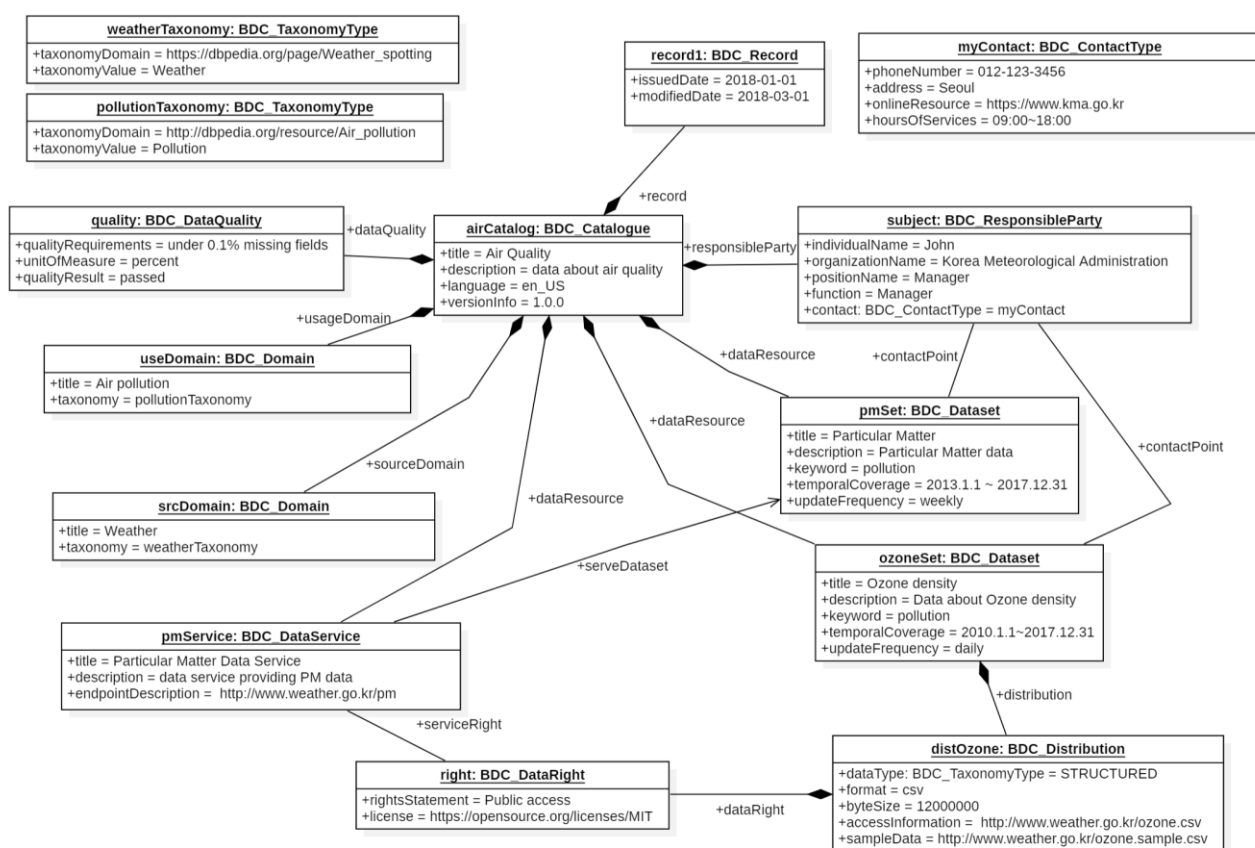


Figure II.1 – UML object diagram of metadata

II.2 RDF instance

This clause provides an example of metadata instance based on the RDF schema which is described in clause I.1.

<rdf:RDF

```

xmlns:dct="http://purl.org/dc/terms/"
xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
xmlns:dc="http://purl.org/dc/elements/1.1/"
xmlns:owl="http://www.w3.org/2002/07/owl#"
xmlns:bdc="http://www.itu.int/xml-names/itu-t/Y.3603/bigdatacatalogue#"
xmlns:dcat="http://www.w3.org/ns/dcat#"
xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
xmlns:xsd="http://www.w3.org/2001/XMLSchema#" >

<rdf:Description rdf:about="bdc:distOzone">
  <dcat:byteSize rdf:datatype="xsd:unsignedLong">12000000</dcat:byteSize>
  <bdc:sampleData rdf:datatype="xsd:anyURI">http://www.weather.go.kr/ozone.sample.csv</bdc:sampleData>
  <bdc:dataType rdf:resource="bdc:Structured"/>
  <bdc:dataRight rdf:resource="bdc:right"/>
  <bdc:accessInformation rdf:datatype="xsd:anyURI">http://www.weather.go.kr/ozone.csv</bdc:accessInformation>
  <dc:format>csv</dc:format>
  <rdf:type rdf:resource="bdc:Distribution"/>
</rdf:Description>

<rdf:Description rdf:about="bdc:weatherTaxonomy">
  <bdc:taxonomyValue>Weather</bdc:taxonomyValue>
  <bdc:taxonomyDomain
rdf:datatype="xsd:anyURI">https://dbpedia.org/page/Weather_spotting</bdc:taxonomyDomain>
  <rdf:type rdf:resource="bdc:TaxonomyType"/>
</rdf:Description>

<rdf:Description rdf:about="bdc:pollutionTaxonomy">
  <bdc:taxonomyValue>Pollution</bdc:taxonomyValue>
  <bdc:taxonomyDomain
rdf:datatype="xsd:anyURI">http://dbpedia.org/resource/Air_pollution</bdc:taxonomyDomain>
  <rdf:type rdf:resource="bdc:TaxonomyType"/>
</rdf:Description>

<rdf:Description rdf:about="bdc:airCatalog">
  <bdc:dataResource rdf:resource="bdc:ozonSet"/>
  <owl:versionInfo>1.0.0</owl:versionInfo>
  <dc:description>data about air quality</dc:description>
  <bdc:sourceDomain rdf:resource="bdc:srcDomain"/>
  <bdc:dataResource rdf:resource="bdc:pmSet"/>
  <dc:language rdf:datatype="dct:RFC5646">en_US</dc:language>
  <bdc:usageDomain rdf:resource="bdc:useDomain"/>
  <bdc:responsibleParty rdf:resource="bdc:subject"/>
  <dc:title>Air Quality</dc:title>
  <rdf:type rdf:resource="bdc:Catalogue"/>
  <bdc:record rdf:resource="bdc:record1"/>
  <bdc:dataResource rdf:resource="bdc:pmService"/>
  <bdc:dataQuality rdf:resource="bdc:quality"/>
</rdf:Description>

<rdf:Description rdf:about="bdc:pmSet">
  <bdc:updateFrequency>weekly</bdc:updateFrequency>
  <bdc:temporalCoverage>2013.1.1 ~ 2017.12.31</bdc:temporalCoverage>
  <bdc:contactPoint rdf:resource="bdc:subject"/>
  <dc:title>Particular Matter</dc:title>
  <dc:keyword>pollution</dc:keyword>
  <dc:description>Particular Matter data</dc:description>
  <rdf:type rdf:resource="bdc:Dataset"/>
</rdf:Description>

<rdf:Description rdf:about="bdc:record1">

```

```

<bdc:modifiedDate rdf:datatype="dct:W3CDTF">2018-03-01</bdc:modifiedDate>
<bdc:issuedDate rdf:datatype="dct:W3CDTF">2018-01-01</bdc:issuedDate>
<rdf:type rdf:resource="bdc:Record"/>
</rdf:Description>
<rdf:Description rdf:about="bdc:myContact">
  <bdc:phoneNumber>012-123-3456</bdc:phoneNumber>
  <bdc:onlineResource rdf:datatype="xsd:anyURI">https://www.kma.go.kr</bdc:onlineResource>
  <bdc:hoursOfServices>09:00~18:00</bdc:hoursOfServices>
  <bdc:address>Seoul</bdc:address>
  <rdf:type rdf:resource="bdc:ContactType"/>
</rdf:Description>

<rdf:Description rdf:about="bdc:quality">
  <bdc:unitOfMeasure>percent</bdc:unitOfMeasure>
  <bdc:qualityResult>passed</bdc:qualityResult>
  <bdc:qualityRequirements>under 0.1% missing fields</bdc:qualityRequirements>
  <rdf:type rdf:resource="bdc:DataQuality"/>
</rdf:Description>

<rdf:Description rdf:about="bdc:subject">
  <bdc:positionName>Manager</bdc:positionName>
  <bdc:organizationName>Korea Meteorological Administration</bdc:organizationName>
  <bdc:individualName>John</bdc:individualName>
  <bdc:function>Manager</bdc:function>
  <bdc:contact rdf:resource="bdc:myContact"/>
  <rdf:type rdf:resource="bdc:ResponsibleParty"/>
</rdf:Description>

<rdf:Description rdf:about="bdc:right">
  <bdc:rightsStatement>Public access</bdc:rightsStatement>
  <bdc:license rdf:datatype="xsd:anyURI">https://opensource.org/licenses/MIT</bdc:license>
  <rdf:type rdf:resource="bdc:DataRight"/>
</rdf:Description>

<rdf:Description rdf:about="bdc:useDomain">
  <bdc:taxonomy rdf:resource="bdc:pollutionTaxonomy"/>
  <dc:title>Air pollution</dc:title>
  <rdf:type rdf:resource="bdc:Domain"/>
</rdf:Description>

<rdf:Description rdf:about="bdc:srcDomain">
  <bdc:taxonomy rdf:resource="bdc:weatherTaxonomy"/>
  <dc:title>Weather</dc:title>
  <rdf:type rdf:resource="bdc:Domain"/>
</rdf:Description>

<rdf:Description rdf:about="bdc:pmService">
  <bdc:endpointDescription rdf:datatype="xsd:anyURI">http://www.weather.go.kr/pm</bdc:endpointDescription>
  <dc:title>Particular Matter Data Service</dc:title>
  <dc:description>data service providing PM data </dc:description>
  <rdf:type rdf:resource="bdc:DataService"/>
</rdf:Description>

<rdf:Description rdf:about="bdc:ozonSet">
  <bdc:updateFrequency>daily</bdc:updateFrequency>
  <bdc:temporalCoverage>2010.1.1~2017.12.31</bdc:temporalCoverage>
  <bdc:distribution rdf:resource="bdc:distOzone"/>
  <bdc:contactPoint rdf:resource="bdc:subject"/>
  <dc:title>Ozone density</dc:title>
  <dc:keyword>pollution</dc:keyword>

```

```

    <dc:description>Data about Ozone density</dc:description>
    <rdf:type rdf:resource="bdc:Dataset"/>
  </rdf:Description>
</rdf:RDF>

```

II.3 Turtle instance

This clause provides an example of a metadata instance based on the Turtle format schema which is described in Appendix I.2.

```

# baseURI: http://www.itu.int/xml-namespace/itu-t/Y.3603/bigdatacatalogue
# imports: http://purl.org/dc/elements/1.1/
# prefix: bdc

```

```

@prefix bdc: <http://www.itu.int/xml-namespace/itu-t/Y.3603/bigdatacatalogue#> .
@prefix dc: <http://purl.org/dc/elements/1.1/> .
@prefix dcat: <http://www.w3.org/ns/dcat#> .
@prefix dct: <http://purl.org/dc/terms/> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .

```

```

bdc:airCatalog
  rdf:type bdc:Catalogue ;
  dc:description "data about air quality" ;
  dc:language "en_US"^^dct:RFC5646 ;
  dc:title "Air Quality" ;
  bdc:dataQuality bdc:quality ;
  bdc:dataResource bdc:ozonSet ;
  bdc:dataResource bdc:pmService ;
  bdc:dataResource bdc:pmSet ;
  bdc:record bdc:record1 ;
  bdc:responsibleParty bdc:subject ;
  bdc:sourceDomain bdc:srcDomain ;
  bdc:usageDomain bdc:useDomain ;
  owl:versionInfo "1.0.0" ;
.

bdc:distOzone
  rdf:type bdc:Distribution ;
  dc:format "csv" ;
  bdc:accessInformation "http://www.weather.go.kr/ozon.csv"^^xsd:anyURI ;
  bdc:dataRight bdc:right ;
  bdc:dataType bdc:Structured ;
  bdc:sampleData "http://www.weather.go.kr/ozon.sample.csv"^^xsd:anyURI ;
  dcat:byteSize "12000000"^^xsd:unsignedLong ;
.

bdc:ozonSet
  rdf:type bdc:Dataset ;
  dc:description "Data about Ozone density" ;
  dc:keyword "pollution" ;
  dc:title "Ozone density" ;
  bdc:contactPoint bdc:subject ;
  bdc:distribution bdc:distOzone ;
  bdc:temporalCoverage "2010.1.1~2017.12.31" ;
  bdc:updateFrequency "daily" ;
.

bdc:pmService
  rdf:type bdc:DataService ;
  dc:description "data service providing PM data " ;
  dc:title "Particular Matter Data Service" ;

```

```

    bdc:endpointDescription "http://www.weather.go.kr/pm"^^xsd:anyURI ;
.
bdc:pmSet
  rdf:type bdc:Dataset ;
  dc:description "Particular Matter data" ;
  dc:keyword "pollution" ;
  dc:title "Particular Matter" ;
  bdc:contactPoint bdc:subject ;
  bdc:temporalCoverage "2013.1.1 ~ 2017.12.31" ;
  bdc:updateFrequency "weekly" ;
.
bdc:right
  rdf:type bdc:DataRight ;
  bdc:license "https://opensource.org/licenses/MIT"^^xsd:anyURI ;
  bdc:rightsStatement "Public access" ;
.
bdc:record1
  rdf:type bdc:Record ;
  bdc:issuedDate "2018-01-01"^^dct:W3CDTF ;
  bdc:modifiedDate "2018-03-01"^^dct:W3CDTF ;
.
bdc:myContact
  rdf:type bdc:ContactType ;
  bdc:address "Seoul" ;
  bdc:hoursOfServices "09:00~18:00" ;
  bdc:onlineResource "https://www.kma.go.kr"^^xsd:anyURI ;
  bdc:phoneNumber "012-123-3456" ;
.
bdc:subject
  rdf:type bdc:ResponsibleParty ;
  bdc:contact bdc:myContact ;
  bdc:function "Manager" ;
  bdc:individualName "John" ;
  bdc:organizationName "Korea Meteorological Administration" ;
  bdc:positionName "Manager" ;
.
bdc:srcDomain
  rdf:type bdc:Domain ;
  dc:title "Weather" ;
  bdc:taxonomy bdc:weatherTaxonomy ;
.
bdc:useDomain
  rdf:type bdc:Domain ;
  dc:title "Air pollution" ;
  bdc:taxonomy bdc:pollutionTaxonomy ;
.
bdc:quality
  rdf:type bdc:DataQuality ;
  bdc:qualityRequirements "under 0.1% missing fields" ;
  bdc:qualityResult "passed" ;
  bdc:unitOfMeasure "percent" ;
.
bdc:pollutionTaxonomy
  rdf:type bdc:TaxonomyType ;
  bdc:taxonomyDomain "http://dbpedia.org/resource/Air_pollution"^^xsd:anyURI ;
  bdc:taxonomyValue "Pollution" ;
.
bdc:weatherTaxonomy
  rdf:type bdc:TaxonomyType ;
  bdc:taxonomyDomain "https://dbpedia.org/page/Weather_spotting"^^xsd:anyURI ;

```

bdc:taxonomyValue "Weather" ;

II.4 JSON-LD instance

This clause provides an example of a metadata instance based on the JSON-LD is described in Appendix I.3.

```
{
  "@context": {
    "bdc": "http://www.itu.int/xml-namespace/itu-t/Y.3603/bigdatacatalogue#",
    "dc": "http://purl.org/dc/elements/1.1/",
    "dcat": "http://www.w3.org/ns/dcat#",
    "dct": "http://purl.org/dc/terms/",
    "owl": "http://www.w3.org/2002/07/owl#",
    "rdf": "http://www.w3.org/1999/02/22-rdf-syntax-ns#",
    "rdfs": "http://www.w3.org/2000/01/rdf-schema#",
    "xsd": "http://www.w3.org/2001/XMLSchema#"
  },
  "@graph": [
    {
      "@id": "bdc:airCatalog",
      "rdf:type": {
        "@id": "bdc:Catalogue"
      },
      "dc:description": "data about air quality",
      "dc:language": {
        "@value": "en_US",
        "@type": "dct:RFC5646"
      },
      "dc:title": "Air Quality",
      "bdc:dataQuality": {
        "@id": "bdc:quality"
      },
      "bdc:dataResource": [
        {
          "@id": "bdc:ozonSet"
        },
        {
          "@id": "bdc:pmService"
        },
        {
          "@id": "bdc:pmSet"
        }
      ],
      "bdc:record": {
        "@id": "bdc:record1"
      },
      "bdc:responsibleParty": {
        "@id": "bdc:subject"
      },
      "bdc:sourceDomain": {
        "@id": "bdc:srcDomain"
      },
      "bdc:usageDomain": {
        "@id": "bdc:useDomain"
      },
      "owl:versionInfo": "1.0.0"
    },
    {
      "@id": "bdc:distOzone",
```

```

"rdf:type": {
  "@id": "bdc:Distribution"
},
"dc:format": "csv",
"bdc:accessInformation": {
  "@value": "http://www.weather.go.kr/ozone.csv",
  "@type": "xsd:anyURI"
},
"bdc:dataRight": {
  "@id": "bdc:right"
},
"bdc:dataType": {
  "@id": "bdc:Structured"
},
"bdc:sampleData": {
  "@value": "http://www.weather.go.kr/ozone.sample.csv",
  "@type": "xsd:anyURI"
},
"dc:byteSize": {
  "@value": "12000000",
  "@type": "xsd:unsignedLong"
}
},
{
  "@id": "bdc:ozoneSet",
  "rdf:type": {
    "@id": "bdc:Dataset"
  },
  "dc:description": "Data about Ozone density",
  "dc:keyword": "pollution",
  "dc:title": "Ozone density",
  "bdc:contactPoint": {
    "@id": "bdc:subject"
  },
  "bdc:distribution": {
    "@id": "bdc:distOzone"
  },
  "bdc:temporalCoverage": "2010.1.1~2017.12.31",
  "bdc:updateFrequency": "daily"
},
{
  "@id": "bdc:pmService",
  "rdf:type": {
    "@id": "bdc:DataService"
  },
  "dc:description": "data service providing PM data ",
  "dc:title": "Particular Matter Data Service",
  "bdc:endpointDescription": {
    "@value": "http://www.weather.go.kr/pm",
    "@type": "xsd:anyURI"
  }
},
{
  "@id": "bdc:pmSet",
  "rdf:type": {
    "@id": "bdc:Dataset"
  },
  "dc:description": "Particular Matter data",
  "dc:keyword": "pollution",
  "dc:title": "Particular Matter",

```

```

"bdc:contactPoint": {
  "@id": "bdc:subject"
},
"bdc:temporalCoverage": "2013.1.1 ~ 2017.12.31",
"bdc:updateFrequency": "weekly"
},
{
  "@id": "bdc:right",
  "rdf:type": {
    "@id": "bdc:DataRight"
  },
  "bdc:license": {
    "@value": "https://opensource.org/licenses/MIT",
    "@type": "xsd:anyURI"
  },
  "bdc:rightsStatement": "Public access"
},
{
  "@id": "bdc:record1",
  "rdf:type": {
    "@id": "bdc:Record"
  },
  "bdc:issuedDate": {
    "@value": "2018-01-01",
    "@type": "dct:W3CDTF"
  },
  "bdc:modifiedDate": {
    "@value": "2018-03-01",
    "@type": "dct:W3CDTF"
  }
},
{
  "@id": "bdc:myContact",
  "rdf:type": {
    "@id": "bdc:ContactType"
  },
  "bdc:address": "Seoul",
  "bdc:hoursOfServices": "09:00~18:00",
  "bdc:onlineResource": {
    "@value": "https://www.kma.go.kr",
    "@type": "xsd:anyURI"
  },
  "bdc:phoneNumber": "012-123-3456"
},
{
  "@id": "bdc:subject",
  "rdf:type": {
    "@id": "bdc:ResponsibleParty"
  },
  "bdc:contact": {
    "@id": "bdc:myContact"
  },
  "bdc:function": "Manager",
  "bdc:individualName": "John",
  "bdc:organizationName": "Korea Meteorological Administration",
  "bdc:positionName": "Manager"
},
{
  "@id": "bdc:srcDomain",
  "rdf:type": {

```

```

    "@id": "bdc:Domain"
  },
  "dc:title": "Weather",
  "bdc:taxonomy": {
    "@id": "bdc:weatherTaxonomy"
  }
},
{
  "@id": "bdc:useDomain",
  "rdf:type": {
    "@id": "bdc:Domain"
  },
  "dc:title": "Air pollution",
  "bdc:taxonomy": {
    "@id": "bdc:pollutionTaxonomy"
  }
},
{
  "@id": "bdc:quality",
  "rdf:type": {
    "@id": "bdc:DataQuality"
  },
  "bdc:qualityRequirements": "under 0.1% missing fields",
  "bdc:qualityResult": "passed",
  "bdc:unitOfMeasure": "percent"
},
{
  "@id": "bdc:pollutionTaxonomy",
  "rdf:type": {
    "@id": "bdc:TaxonomyType"
  },
  "bdc:taxonomyDomain": {
    "@value": "http://dbpedia.org/resource/Air_pollution",
    "@type": "xsd:anyURI"
  },
  "bdc:taxonomyValue": "Pollution"
},
{
  "@id": "bdc:weatherTaxonomy",
  "rdf:type": {
    "@id": "bdc:TaxonomyType"
  },
  "bdc:taxonomyDomain": {
    "@value": "https://dbpedia.org/page/Weather_spotting",
    "@type": "xsd:anyURI"
  },
  "bdc:taxonomyValue": "Weather"
}
]
}

```

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