



EPOS DATA MODEL

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1 EXECUTIVE SUMMARY

This document contains the specification for EPOS Data Model. It includes the representation, formal naming, definition of the classes, properties, and relationships which describe the EPOS context. The Data Model is used to define the high-level interfaces of the EPOS ICS architecture.

2 An overview of the EPOS Data Model

The following UML class diagram (Figure 1) shows all classes and properties included in the EPOS Data Model.

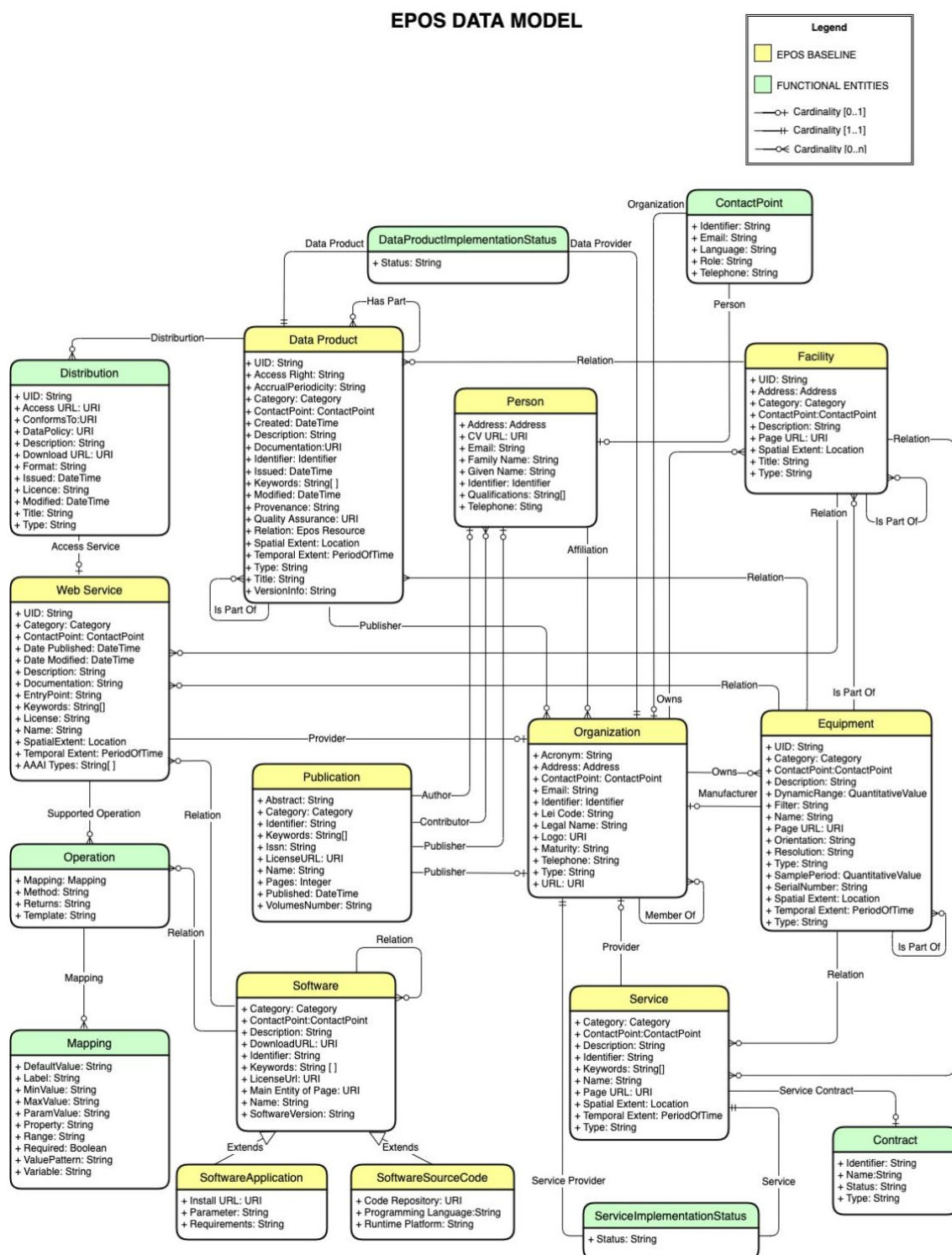


Figure 1 – The EPOS Data Model UML Class Diagram.

3 EPOS Data Model Classes

The following section describes the classes used in the EPOS Data Model. It contains classes of the EPOS Baseline (yellow tables) and classes responsible to perform the functions defined in the model (green tables).

3.1 EPOS Baseline Classes for EPOS Data Model

Class Name	Usage note
Category	A subject of a Class.
CategoryScheme	This property contains a name of the category scheme. May be repeated for different versions of the name.
ContactPoint	A Contact Point of a Class.
Data Product	It represents Data and Data Product.
Equipment	A device.
Facility	This refers to facilities with resources and related services used by the scientific community to conduct top-level research in their respective fields, ranging from social sciences to astronomy, genomics to nanotechnologies. Examples include laboratories, special habitats, libraries, databases, biological archives, etc. A type of facility could be a research infrastructure a higher aggregated entity.
Organization	Institution or International organization.
Person	Human being.
Publication	A text publication is a resource relating to a dataset, data product or other.
Service	Describes an offer of an RI to the community. It could be free or ask for something in return (money, publication of the datasets, etc.).
Software Application	This class represents software package, application and program.
Software Source Code	This class represents a computer programming source code. Example: Full (compile ready) solutions, code snippet samples, scripts, templates.
WebService	Online interfaces (APIs) enabling a user or a machine to programmatically access the given resource.

3.2 Functional Classes for EPOS Data Model

Class Name	Usage note
Address	Physical address of the item.
Contract	A service contract.
DataProductImplementationStatus	This class allow to represent the implementation status of a Data Product made available by a Data Provider.
Distribution	A physical embodiment of the Data and Data Product in a particular format.
Identifier	An identifier in a particular context, consisting of the string that is the identifier; an optional identifier for the identifier scheme; an optional identifier for the version of the identifier scheme; an optional identifier for the agency that manages the identifier scheme.
Location	A spatial region specified by using geographic coordinates.
Mapping	This class allows to map a variable used in the template to a property and may optionally specify whether that variable is required or not. The syntax of the template literal is specified by its datatype and defaults to the [RFC6570] URI Template syntax, which can be explicitly indicated by hydra:Rfc6570Template.
Operation	A description of a web service operation.



Class Name	Usage note
Period Of Time	An interval of time that is named or defined by its start and end dates.
QuantitativeValue	A point value or interval for product characteristics and other purposes.
ServiceImplementation Status	This class allow to represent the implementation status of a Service made available by a Service Provider.



4 EPOS Data Model Properties per Class

The following section describes the properties used in EPOS Data Model. *Name* column represents the property name, *Type* column represent the type of the property, *Usage note* column represents the description of the property, *Cardinality* column represents property cardinality restrictions.

4.1 Category

Properties for Category class

Name	Type	Usage Note	Card.
Description	String	This property contains a description of the category	1..1
inScheme	CategoryScheme	Relates a resource (for example a concept) to a concept scheme in which it is included.	1..1
Name	String	This property contains a preferred label of the category	1..1

4.2 CategoryScheme

Properties for CategoryScheme class

Name	Type	Usage Note	Card.
Description	String	This property contains a description of the category scheme.	1..1
Title	String	This property contains a name of the category scheme.	1..1

4.3 ContactPoint

Properties for ContactPoint class

Name	Type	Usage Note	Card.
Identifier	String	This property contains the main identifier for the Contact Point.	1..1
Email	String	This property refers to the Contact Point Email.	0..n
Language	String	This property contains information about the language used by the Contact Point. Please use one of the language codes from the IETF BCP 47 standard.	0..n
Role	String	This property refers to the Contact Point role. (E.g....)	0..1
Telephone	String	This property refers to the Contact Point Telephone.	0..n
Organization	Organization	This property refers to the related Organization which represents the contact point.	0..1
Person	Person	This property refers to the related Person which represents the contact point.	0..1

4.4 Data Product

Properties for Data Product class

Name	Type	Usage Note	Card.
UID	String	This property contains the main identifier for the Data Product, e.g. the URI or other unique identifier in the context of the Catalogue.	1..1
Access Right	String	This property refers to information that indicates whether the Data Product is open data, has access restrictions or is not public.	0..1

Name	Type	Usage Note	Card.
Accrual Periodicity	String	This property refers to the frequency at which the Data Product is updated.	0..1
Category	Category	This property refers to a category of the Data Product. A Data Product may be associated with multiple categories.	0..n
Contact Point	ContactPoint	This property contains contact information (i.e. Role) that can be used for sending comments about the Data Product.	0..n
Created	DateTime	This property contains the date on which the Data Product was created.	0..1
Description	String	This property contains a free-text account of the Data Product. This property can be repeated for parallel language versions of the description.	1..n
Distribution	Distribution	This property links the Data Product to an available Distribution.	0..n
Has Part	Data Product	This property refers to a related Data Product that is part of the described Data Product.	0..n
Identifier	Identifier	This property refers to a secondary identifier of the Data Product, such as MAST/ADS, DataCite, DOI, EZID or W3ID.	0..n
Is Part Of	Data Product	This property refers to a related Data Product in which the described Data Product is physically or logically included.	0..n
Issued	DateTime	This property contains the date of formal issuance (e.g., publication) of the Data Product.	0..1
Keywords	Array [String]	This property contains a keyword or tag describing the Data Product. Multiple entries in a keywords list are typically delimited by commas.	0..1
Modified	DateTime	This property contains the most recent date on which the Data Product was changed or modified.	0..1
Provenance	String	This property contains a statement about the lineage of a Data Product	0..n
Publisher	Organization	This property refers to an entity (organisation) responsible for making the Data Product available.	0..n
Relation	Epos Resource	It represents the link to another Epos resource.	0..n
Spatial Extent	Location	This property refers to a geographic region that is covered by the Data Product.	0..n
Temporal Extent	PeriodOfTime	This property refers to a temporal period (i.e. startDate, endDate) that the Data Product covers.	0..n
Title	String	This property contains a name given to the Data Product. This property can be repeated for parallel language versions of the name.	1..n
Type	String	This property refers to the type of the Data Product. A controlled vocabulary for the values has not been established.	0..1
Version info	String	This property contains a version number or other version designation of the Data Product.	0..1
Documentation	URI	This property refers to the Data Product documentation.	0..1
Quality Assurance	URI	This property refers to the URI which make available information about quality assurance of the Data Product.	0..1

4.5 Equipment

Properties for Equipment class

Name	Type	Usage Note	Card.
UID	String	This property contains the main identifier for the Equipment.	1..1
Category	Category	This property refers to a category of the Equipment. An Equipment may be associated with multiple categories.	0..n
Contact Point	ContactPoint	This property contains contact information (i.e. Role) that can be used for sending comments about the Equipment.	0..n
Description	String	This property contains a free-text description of the Equipment.	1..1
Dynamic range	QuantitativeValue	This property contains the full-scale measuring ability, in nT (unit and value).	0..1



Name	Type	Usage Note	Card.
Filter	String	This property describes the filter that the instrument uses to produce data.	0..1
Is Part Of	Equipment or Facility	This property refers to an Equipment or a Facility in which the described Equipment is included.	0..n
Manufacturer	Organization	This property refers to an Organization responsible for manufacturing the Equipment.	0..1
Name	String	This property contains a name given to the Equipment.	1..1
Page URL	URI	This property refers to a page or document about the Equipment	0..1
Orientation	String	This property describes how the instrument is oriented.	0..1
Relation	Data Product or Webservice or Service	It represents the link to another Epos resource. e.g., Dataset, WebService, Service	0..n
Resolution	String	This property contains the resolution in nT.	0..1
Sample Period	QuantitativeValue	This property contains the sample period in mS (unit and value)	0..1
Serial number	String	This property contains the serial number for the Equipment.	0..1
Spatial Extent	Location	This property refers to a geographical location of the Equipment.	0..n
Temporal Extent	PeriodOfTime	This property refers to a temporal period (i.e. startDate, endDate) that the Web Service covers.	0..n
Type	String	This property refers to the type of the Equipment.	0..1

4.6 Facility

Properties for Facility class

Name	Type	Usage Note	Card.
UID	String	This property contains the main identifier for the Facility.	1..1
Address	Address	This property contains the physical address of the Facility.	0..1
Category	Category	This property refers to a category of the Facility. A Facility may be associated with multiple categories.	0..n
Contact Point	ContactPoint	This property contains contact information (i.e. Role) that can be used for sending comments about the Facility	0..n
Description	String	This property contains a free-text description of the Facility.	1..1
Is Part Of	Facility	This property refers to a Facility in which the described Facility is included.	0..n
Page URL	URI	This property refers to a page or document about this Facility.	0..n
Relation	Data Product or WebService or Service	It represents the link to another Epos resource. e.g., Dataset, WebService, Service	0..n
Spatial Extent	Location	This property refers to a geographical location of the Facility.	0..1
Title	String	This property contains a name given to the Facility.	1..1
Type	String	This property refers to the type of the Facility.	0..1



4.7 Organization

Properties for Organization class

Name	Type	Usage Note	Card.
Address	Address	This property contains the physical address of the Organization.	0..1
Contact Point	ContactPoint	This property refers to the Contact Point (i.e. Role) defined for the Organization	0..n
Email	String	This property contains the email address of the Organization.	0..n
Identifier	Identifier	This property contains an identifier for the Organization (e.g., PIC, ISNI, etc.).	1..n
Legal Name	String	This property contains the official name of the Organization. This property can be repeated for parallel language versions of the name (e.g., "European Environment Agency"@en).	0..n
Acronym	String	This property contains the Organization acronym (e.g., INGV).	0..1
Lei Code	String	This property contains the Organization identifier that uniquely identifies a legal entity as defined in ISO 17442.	0..1
Logo	URI	This property contains the URL of the Organization logo.	0..1
Member Of	Organization	This property refers to an Organization to which this Organization belongs.	0..n
Owns	Equipment or Facility	This property refers to a Facility or Equipment of which it is the owner.	0..n
Telephone	String	This property contains the telephone number of the Organization.	0..n
URL	URI	This property contains the URL of the Organization website.	0..1
Type	String	This property refers to the type of Organization (e.g., TCS, TCS internal consortia, independent (INTERMAGNET), national EPOS consortia). A controlled list for the values should be established.	0..1
Maturity	String	This property contains information about the status of the Organization with respect to EPOS (e.g., existing TCS, candidate TCS, external service). A controlled list for the values should be established.	0..1

4.8 Person

Properties for Person class

Name	Type	Usage Note	Card.
Address	Address	This property contains the physical address of the Person.	0..1
Affiliation	Organization	This property refers to the organization to which the person is affiliated.	0..n
CV URL	URI	This property refers to the URL of the Person curriculum vitae.	0..1
Email	String	This property contains the email address of the Person.	0..n
Family Name	String	This property contains the last name of the Person.	1..1
Given Name	String	This property contains the first name of the Person.	1..1
Identifier	Identifier	This property contains an identifier for the Person (e.g., ORCID, ScopusID, etc.).	1..n
Qualifications	Array [String]	This property contains the specific qualifications of the Person.	0..1
Telephone	String	This property contains the telephone number of the Person.	0..n

4.9 Publication

Properties for Publication class

Name	Type	Usage Note	Card.
Identifier	String	This property contains an identifier for the Publication.	1..n
Name	String	This property contains the name of the Publication.	1..1
Published	DateTime	This property contains the date of first Publication.	0..1
Publisher	Person or Organization	This property refers to an organization or person or agent which is the publisher of the Publication.	0..1
Abstract	String	This property contains the abstract of the Publication.	0..1
Author	Person	This property refers to a Person which is the author of the Publication.	0..1
Contributor	Person	This property refers to a Person which is a contributor of the Publication.	0..n
License URL	URI	This property contains the URL of the license document that applies to the Publication.	0..1
Keywords	Array [String]	This property contains the keywords used to describe the Publication. Multiple entries in a keywords list are typically delimited by commas.	0..1
Issn	String	This property contains the International Standard Serial Number (ISSN) that identifies the Publication.	0..1
Pages	Integer	This property contains the number of pages of the Publication.	0..1
Volumes Number	String	This property contains the volume identifier of the Publication.	0..1
Category	Category	This property refers to a category of the Publication. A Publication may be associated with multiple categories.	0..n

4.10 Service

Properties for Service class

Name	Type	Usage Note	Card.
Category	Category	This property refers to a category of the Service. A Service may be associated with multiple categories.	0..n
Contact Point	ContactPoint	This property refers to the Contact Point (i.e. Role) defined for the Service.	0..n
Description	String	This property contains the description of the Service.	0..1
Identifier	String	This property contains an identifier for the Service.	1..n
Keywords	Array [String]	This property contains the keywords used to describe the Service. Multiple entries in a keywords list are typically delimited by commas.	0..1
Name	String	This property contains the name of the Service.	0..1
Page URL	URI	This property refers to a page about the Service.	0..1
Provider	Organization	This property refers to an Organisation responsible for making the Service available.	0..1
Spatial Extent	Location	This property refers to a geographical area covered by the Service.	0..n
Temporal Extent	PeriodOfTime	This property refers to a temporal period (i.e. startDate, endDate) that the Service covers.	0..n
Type	String	This property contains the type of service being offered.	0..1
Service Contract	Contract	This property refers to the Service Contract.	0..1

4.11 Software Application

Properties for Software Application class

Name	Type	Usage Note	Card.
Category	String	This property refers to a category of the Software Application. A Software Application may be associated with multiple categories.	0..n
Contact Point	ContactPoint	This property refers to the Contact Point (i.e. Role) defined for the Software Application.	0..n
Description	String	This property contains the description of the Software Application.	0..1
Download URL	URI	If the Software can be downloaded this property contains the URL to download it.	0..1
Identifier	String	This property contains an identifier for the Software Application.	1..n
Install URL	URI	This property contains the URL at which the application may be installed.	0..1
Keywords	Array [String]	This property contains the keywords used to describe the Software Application. Multiple entries in a keywords list are typically delimited by commas.	0..1
License URL	URI	This property contains the URL of the license document that applies to the Software Application.	0..1
Main Entity of Page	URI	This property refers to the web page URL which describes the Software Application.	0..1
Name	String	This property contains the name of the Software Application	0..1
Parameter	String	This property represents an input or output parameters of the Software Application	0..n
Relation	Epos Resource	It represents the link to another Epos resource. e.g. Software, WebService, Operation linked to this software.	0..n
Requirements	String	Component dependency requirements for application. This includes runtime environments and shared libraries that are not included in the application distribution package, but required to run the application.	0..1
Software Version	String	This property contains the version of the Software instance.	0..1

4.12 Software Source Code

Properties for Software Source Code class

Name	Type	Usage Note	Card.
Category	String	This property refers to a category of the Software Source Code. A Software may be associated with multiple categories.	0..n
Code Repository	URI	This property contains the link to the repository where the un-compiled, human readable code and related code is located (SVN, GitHub, CodePlex)	0..1
Contact Point	ContactPoint	This property refers to the Contact Point (i.e. Role) defined for the Software Source Code.	0..n
Description	String	This property contains the description of the Software Source Code.	0..1
Download URL	URI	If the Software can be downloaded this property contains the URL to download it.	0..1
Identifier	String	This property contains an identifier for the Software Source Code.	1..n
Keywords	Array [String]	This property contains the keywords used to describe the Software Source Code. Multiple entries in a keywords list are typically delimited by commas.	0..1
License URL	URI	This property contains the URL of the license document that applies to the Software Source Code.	0..1
Main Entity of Page	URI	This property refers to the web page URL which describes the Software.	0..1
Name	String	This property contains the name of the Software Source Code.	0..1
Programming Language	String	This property contains the computer programming language used to develop the Software Source Code.	0..n



Name	Type	Usage Note	Card.
Relation	Epos Resource	It represents the link to another Epos resource. e.g. Software, Webservice, Operation linked to this software.	0..n
Runtime Platform	String	This property refers to the runtime platform or script interpreter dependencies (Example - Java v1, Python2.3, .Net Framework 3.0).	0..1
Software Version	String	This property contains the version of the Software instance.	0..1

4.13 Webservice

Properties for Webservice class

Name	Type	Usage Note	Card.
UID	String	This property contains the main identifier for the Web Service.	1..1
Category	Category	This property refers to a category of the Web Service. A Web Service may be associated with multiple categories.	0..n
Contact Point	ContactPoint	This property contains contact information (i.e. Role) that can be used for sending comments about the Web Service.	0..n
Date Modified	DateTime	This property contains the most recent date on which the Web Service was modified.	0..1
Date Published	DateTime	This property contains the date of publication of the Web Service.	0..1
Description	String	This property contains a free-text description of the Web Service.	0..1
Documentation	String	This property refers to the API documentation.	0..n
Entry Point	String	This property refers to the API definitions (e.g., WSDL, WADL)	0..1
Keywords	Array [String]	This property contains the keywords used to describe the Web Service. Multiple entries in a keywords list are typically delimited by commas.	0..1
License	String	This property refers to the licence under which the Web Service can be used or reused.	0..1
Name	String	This property contains a name given to the Web Service.	0..1
Provider	Organization	This property refers to an Organisation responsible for making the Web Service available.	0..1
Spatial Extent	Location	This property refers to a geographical area covered by the Web Service.	0..n
Supported Operation	Operation	This property refers to a web service operation supported by the Web Service.	0..n
Temporal Extent	PeriodOfTime	This property refers to a temporal period (i.e. startDate, endDate) that the Web Service covers.	0..n
AAAI Types	Array [String]	List of possible authentication/authorization methods supported.	0..1

4.14 Address

Properties for Address class

Name	Type	Usage Note	Card.
Country	String	The country.	1..1
Country code	String	The two-letter ISO 3166-1 alpha-2 country code (e.g., IT, UK).	1..1
Locality	String	The locality in which the street address is, and which is in the region. For example, Mountain View.	1..1
Postal code	String	The postal code. For example, 94043.	1..1





Name	Type	Usage Note	Card.
Street	String	The street address. For example, 1600 Amphitheatre Pkwy.	1..1

4.15 Contract

Properties for Contract class

Name	Type	Usage Note	Card.
Identifier	String	This property contains the main identifier for the Contract.	1..1
Status	String	This property contains information about the status of the Contract (e.g., signed, not signed).	1..1
Name	String	This property contains the name of the Contract (e.g., signed, not signed).	1..1
Type	String	This property contains the type of the Contract (e.g., MoU, CA).	1..1

4.16 Distribution

Properties for Distribution class

Name	Type	Usage Note	Card.
UID	String	This property contains the main identifier for the Distribution.	1..1
Access Service	WebService	This property refers to the WebService which supports selection of an extract, sub-set, or combination of data	0..1
Access URL	URI or Operation	This property contains a URL that gives access to a Distribution of the Data Product. The resource at the access URL may contain information about how to get the Data Product. If the type of Distribution is WEB SERVICE, this property refers to the Operation of the Web Service to which the Distribution conforms.	1..n
Description	String	This property contains a free-text account of the Distribution. This property can be repeated for parallel language versions of the description.	0..n
Download URL	URI	This property contains a URL that is a direct link to a downloadable file in a given format.	0..n
Format	String	This property refers to the file encoding format of the Distribution.	0..1
Issued	DateTime	This property contains the date of formal issuance (e.g., publication) of the Distribution.	0..1
Licence	String	This property refers to the licence under which the Distribution is made available.	0..1
Modified	DateTime	This property contains the most recent date on which the Distribution was changed or modified.	0..1
Title	String	This property contains a name given to the Distribution. This property can be repeated for parallel language versions of the description.	0..n
Type	String	This property refers to the type of the Distribution.	0..1
DataPolicy	URI	This property refers to the Data Policy URI.	0..1
ConformsTo	URI	This property is used to indicate the model, schema, ontology, view or profile that this representation of a dataset conforms to (e.g., xsd, json schema).	0..1



4.17 Identifier

Properties for Identifier class

Name	Type	Usage Note	Card.
Identifier	String	This property contains a string that is an identifier in the context of the identifier scheme referenced by its datatype	0..1
Type	String	This property refers the identifier scheme referenced by its datatype (e.g., DDSS-ID, DOI, etc.).	0..1

4.18 DataProductImplementationStatus

Properties for DataProductImplementationStatus class

Name	Type	Usage Note	Card.
Data Provider	Organization	This property refers to the Data Provider (Organization) which is responsible to implement and make available a Data Product.	1..1
Data Product	Data Product	This property refers to the Data Product implemented by a specific Data Provider.	1..1
Status	String	Level of implementation (implemented/design phase/not ready) of a Data Product implemented by a Data Provider.	1..1

4.19 ServiceImplementationStatus

Properties for ServiceImplementationStatus class

Name	Type	Usage Note	Card.
Service Provider	Organization	This property refers to the Service Provider (Organization) which is responsible to implement and make available a Service.	1..1
Service	Service	This property refers to the Service implemented by a specific Service Provider.	1..1
Status	String	Level of implementation (implemented/design phase/not ready) of a Service implemented by a Service Provider.	1..1

4.20 Location

Properties for Location class

Name	Type	Usage Note	Card.
Geometry	String	This property associates any resource with the corresponding geometry.	0..1

4.21 Mapping

Properties for Mapping class

Name	Type	Usage Note	Card.
Default Value	String	This property contains the default value of the parameter.	0..1
Label	String	This property contains a short string used to describe the meaning of the parameter.	1..1
Max Value	String	This property contains the maximum value of the parameter.	0..1
Min Value	String	This property contains the minimum value of the parameter.	0..1
Param Value	String	This property contains one of the possible values which should be used in the web service query. It could be repeated as many times as needed.	0..n



Name	Type	Usage Note	Card.
Property	String	This property contains the vocabulary term which indicates the semantic description of parameter.	0..1
Range	String	This property contains the type of parameter	1..1
Required	Boolean	This property contains true if the property is required, false otherwise.	1..1
Value Pattern	String	This property contains the regular expression for testing values according to the parameter's specification.	0..1
Variable	String	This property contains the name of the parameter as required by web service specifications.	1..1

4.22 Operation

Properties for Operation class

Name	Type	Usage Note	Card.
Mapping	Mapping	A variable-to-property mapping of the IRI template.	0..n
Method	String	The HTTP method	0..1
Returns	String	This property is used to specify the output format of the Operation. The possible values are listed here: https://www.iana.org/assignments/media-types/media-types.xhtml	0..n
Template	String	The syntax of the template literal is specified by the [RFC6570] URI Template syntax.	1..1

4.23 PeriodOfTime

Properties for PeriodOfTime class

Name	Type	Usage Note	Card.
Start date	String	This property contains the start of the period	0..1
End date	String	This property contains the end of the period	0..1

4.24 QuantitativeValue

Properties for QuantitativeValue class

Name	Type	Usage Note	Card.
Unit	String	The unit of measurement given using the UN/CEFACT Common Code (3 characters) or a URL	1..1
Value	String	The unit of measurement given using the UN/CEFACT Common Code (3 characters) or a URL	1..1

