**EPOS DATA MODEL**

**Version 1.0**

**Document Metadata**

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| --- | --- |
| Date | 22 December 2021 |
| Version | 1.0 |
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**Disclaimer:**

This specification was developed in the framework of European Plate Observing System (EPOS). This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 676564.

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**Table of contents**

[1 EXECUTIVE SUMMARY 6](#_Toc92185797)

[2 An overview of the EPOS Data Model 7](#_Toc92185798)

[3 EPOS Data Model Classes 8](#_Toc92185799)

[**3.1** **EPOS Baseline Classes for EPOS Data Model** 8](#_Toc92185800)

[**3.2** **Functional Classes for EPOS Data Model** 8](#_Toc92185801)

[4 EPOS Data Model Properties per Class 9](#_Toc92185802)

[**4.1** **Category** 9](#_Toc92185803)

[**4.2** **CategoryScheme** 9](#_Toc92185804)

[**4.3** **ContactPoint** 9](#_Toc92185805)

[**4.4** **Data Product** 9](#_Toc92185806)

[**4.5** **Equipment** 10](#_Toc92185807)

[**4.6** **Facility** 11](#_Toc92185808)

[**4.7** **Organization** 11](#_Toc92185809)

[**4.8** **Person** 12](#_Toc92185810)

[**4.9** **Publication** 12](#_Toc92185811)

[**4.10** **Service** 13](#_Toc92185812)

[**4.11** **Software Application** 13](#_Toc92185813)

[**4.12** **Software Source Code** 14](#_Toc92185814)

[**4.13** **WebService** 15](#_Toc92185815)

[**4.14** **Address** 15](#_Toc92185816)

[**4.15** **Distribution** 15](#_Toc92185817)

[**4.16** **Identifier** 16](#_Toc92185818)

[**4.17** **Location** 16](#_Toc92185819)

[**4.18** **Mapping** 16](#_Toc92185820)

[**4.19** **Operation** 17](#_Toc92185821)

[**4.20** **PeriodOfTime** 17](#_Toc92185822)

[**4.21** **QuantitativeValue** 17](#_Toc92185823)

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.

1. **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.

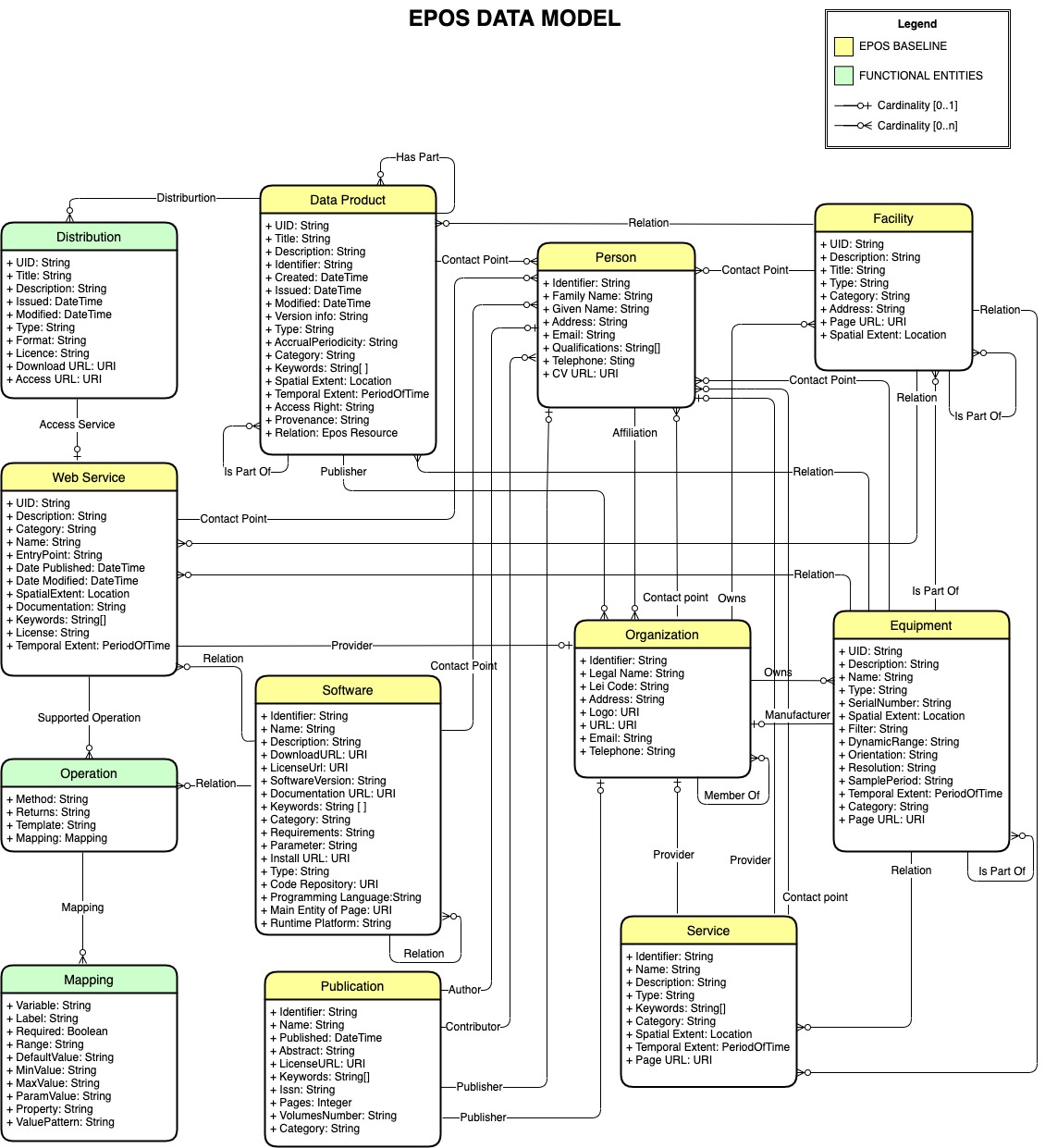


Figure 1 – The EPOS Data Model UML Class Diagram.

1. **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).

* 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. |

* 1. **Functional Classes for EPOS Data Model**

| Class Name | Usage note |
| --- | --- |
| Address | Physical address of the item. |
| 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. |
| 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. |

1. **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.

* 1. **Category**

| 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 |

* 1. **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 |

* 1. **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](https://tools.ietf.org/html/bcp47#page-1-53). | 0..n |
| Role | String | This property refers to the Contact Point role. | 0..1 |
| Telephone | String | This property refers to the Contact Point Telephone. | 0..n |

* 1. **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 |
| 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 |

* 1. **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 |
| 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 |

* 1. **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 |

* 1. **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. | 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 |

* 1. **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 |

* 1. **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 |

* 1. **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 or Person | This property refers to an Organisation or Person 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 |

* 1. **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 | Person | 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 |

* 1. **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 | Person | 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 |
| 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 |

* 1. **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 |

* 1. **Address**

*Properties for Address class*

| Name | Type | Usage Note | Card. |
| --- | --- | --- | --- |
| Country | String | The country. For example, USA. You can also provide the two-letter ISO 3166-1 alpha-2 country code. | 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 |
| Street | String | The street address. For example, 1600 Amphitheatre Pkwy. | 1..1 |

* 1. **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 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 | |

* 1. **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 |

* 1. **Location**

*Properties for Location class*

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

* 1. **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 |
| 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 |

* 1. **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 |

* 1. **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 |

* 1. **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 |