CATENA-X
STANDARD

CX - 0021 ASPECT MODEL: Batch

BUSINESS DOMAIN: PLM & QUALITY

USE CASE: TRACEABILITY

Contact: standardisierung@catena-x.net

Note: Please specify the platform capability in the subject line

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RELEASE HISTORY

Version	Release Date	Description
1.0.0	30. November 2022	Initial version by Catena – X Association
1.0.1	6. March 2023	Addendum for Conformity Assessment added

Contents

INTRODUCTION AND OVERVIEW

A batch is a quantity of (semi-) finished products or (raw) material product that have been produced under the same circumstances (e.g., same production location), as specified groups or amounts, within a certain time frame. Every batch can differ in the number or amount of products. Different batches can have varied specifications, e.g., different colors, quality, etc. A batch is identified via a Batch ID.
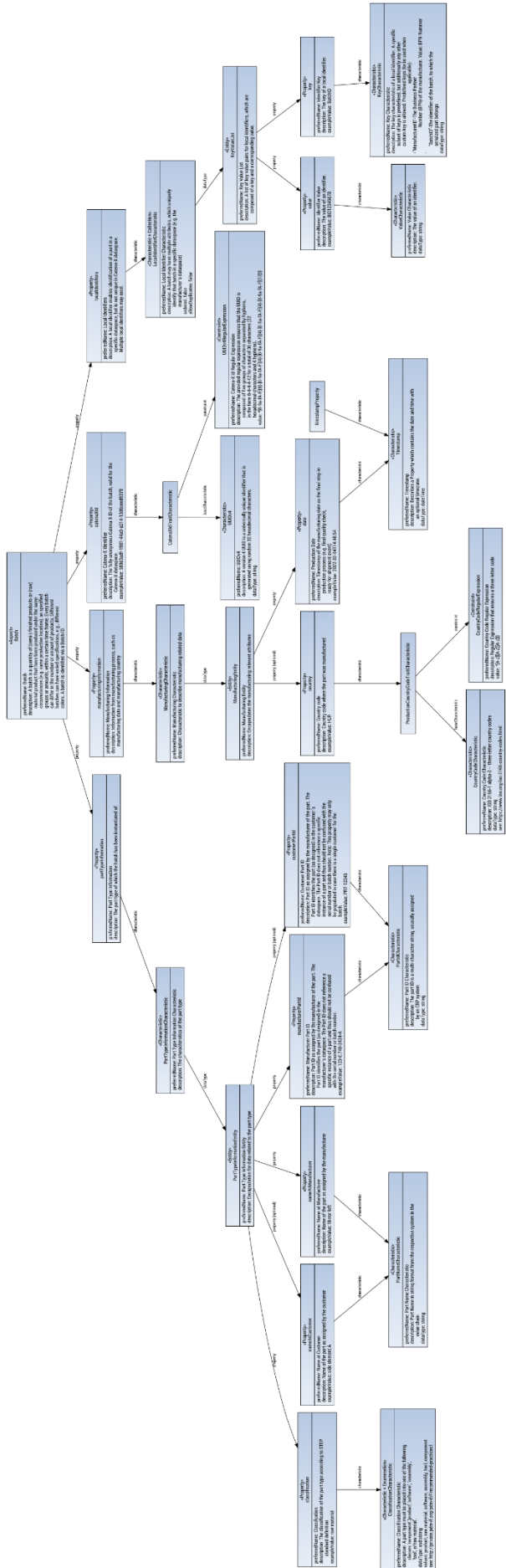
1. PURPOSE

This standardization introduces the standardized aspect model for serialized parts with corresponding JSON schemas and payloads for guidance and orientation on how to provision and exchange the corresponding data within Catena-X.

Note: The presented aspect model is in version 1.0.0.

2. ASPECT MODEL

2.1. MODEL

Furthermore, the corresponding JSON Schema is as follows:

```json
{
  "$schema": "http://json-schema.org/draft-04/schema",
  "type": "object",
  "components": {
    "schemas": {
      "urn_bamm_io.catenax.batch_1.0.0_CatenaXIdTrait": {
        "type": "string",
        "pattern": "^[0-9a-fA-F]{8}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{12}$"
      },
      "urn_bamm_io.catenax.batch_1.0.0_KeyCharacteristic": {
        "type": "string"
      },
      "urn_bamm_io.catenax.batch_1.0.0_ValueCharacteristic": {
        "type": "string"
      },
      "urn_bamm_io.catenax.batch_1.0.0_KeyValueList": {
        "type": "object",
        "properties": {
          "key": {
            "$ref": "#/components/schemas/urn_bamm_io.catenax.batch_1.0.0_KeyCharacteristic"
          },
          "value": {
            "$ref": "#/components/schemas/urn_bamm_io.catenax.batch_1.0.0_ValueCharacteristic"
          }
        },
        "required": [
          "key",
          "value"
```

```
    ]
  },
  "urn_bamm_io.catenax.batch_1.0.0_LocalIdentifierCharacteristic": {
    "type": "array",
    "items": {
      "$ref": "#/components/schemas/urn_bamm_io.catenax.batch_1.0.0_KeyValueList"
    },
    "uniqueItems": true
  },
  "urn_bamm_io.openmanufacturing_characteristic_2.0.0_Timestamp": {
    "type": "string",
    "pattern": "-?([1-9][0-9]{3,}|0[0-9]{3})-(0[1-9]|1[0-2])-(0[1-9]|[12][0-
9]|3[01])T(([01][0-9]|2[0-3]):[0-5][0-9]:[0-5][0-9](\\.[0-
9]+)?|(24:00:00(\\.0+)?))(Z|(\\+|-)((0[0-9]|1[0-3]):[0-5][0-9]|14:00))?"
  },
  "urn_bamm_io.catenax.batch_1.0.0_ProductionCountryCodeTrait": {
    "type": "string",
    "pattern": "^[A-Z][A-Z][A-Z]$"
  },
  "urn_bamm_io.catenax.batch_1.0.0_ManufacturingCharacteristic": {
    "type": "object",
    "properties": {
      "date": {
        "$ref":
"#/components/schemas/urn_bamm_io.openmanufacturing_characteristic_2.0.0_Timestam
p"
      },
      "country": {
        "$ref":
"#/components/schemas/urn_bamm_io.catenax.batch_1.0.0_ProductionCountryCodeTrait"
      }
    },
```

```json
      "required": [
        "date"
      ]
    },
    "urn_bamm_io.catenax.batch_1.0.0_PartIdCharacteristic": {
      "type": "string"
    },
    "urn_bamm_io.catenax.batch_1.0.0_PartNameCharacteristic": {
      "type": "string"
    },
    "urn_bamm_io.catenax.batch_1.0.0_ClassificationCharacteristic": {
      "type": "string",
      "enum": [
        "product",
        "raw material",
        "software",
        "assembly",
        "tool",
        "component"
      ]
    },
    "urn_bamm_io.catenax.batch_1.0.0_PartTypeInformationCharacteristic": {
      "type": "object",
      "properties": {
        "manufacturerPartId": {
          "$ref":
"#/components/schemas/urn_bamm_io.catenax.batch_1.0.0_PartIdCharacteristic"
        },
        "customerPartId": {
          "$ref":
"#/components/schemas/urn_bamm_io.catenax.batch_1.0.0_PartIdCharacteristic"
```

```
        },

        "nameAtManufacturer": {

          "$ref":
"#/components/schemas/urn_bamm_io.catenax.batch_1.0.0_PartNameCharacteristic"

        },

        "nameAtCustomer": {

          "$ref":
"#/components/schemas/urn_bamm_io.catenax.batch_1.0.0_PartNameCharacteristic"

        },

        "classification": {

          "$ref":
"#/components/schemas/urn_bamm_io.catenax.batch_1.0.0_ClassificationCharacteristic"

        }

      },

      "required": [

        "manufacturerPartId",

        "nameAtManufacturer",

        "classification"

      ]

    }

  }

},

"properties": {

  "catenaXId": {

    "$ref": "#/components/schemas/urn_bamm_io.catenax.batch_1.0.0_CatenaXIdTrait"

  },

  "localIdentifiers": {

    "$ref":
"#/components/schemas/urn_bamm_io.catenax.batch_1.0.0_LocalIdentifierCharacteristic"

  },

  "manufacturingInformation": {
```

```json
      "$ref":
"#/components/schemas/urn_bamm_io.catenax.batch_1.0.0_ManufacturingCharacteristic"
    },
    "partTypeInformation": {
      "$ref":
"#/components/schemas/urn_bamm_io.catenax.batch_1.0.0_PartTypeInformationCharacteri
stic"
    }
  },
  "required": [
    "catenaXId",
    "localIdentifiers",
    "manufacturingInformation",
    "partTypeInformation"
  ]
}
```

An exemplary payload JSON looks like this:

```json
{
  "localIdentifiers": [
    {
      "value": "BID12345678",
      "key": "BatchID"
    }
  ],
  "manufacturingInformation": {
    "date": "2022-02-04T14:48:54",
    "country": "HUR"
  },
  "catenaXId": "580d3adf-1981-44a0-a214-13d6ceed9379",
  "partTypeInformation": {
    "manufacturerPartId": "123-0.740-3434-A",
    "customerPartId": "PRT-12345",
    "classification": "product",
    "nameAtManufacturer": "Mirror left",
    "nameAtCustomer": "side element A"
  }
}
```

2.2. PROPERTIES

Catena-X Identifier		
Description	The fully anonymous Catena-X ID of the serialized part, valid for the Catena-X dataspace	
Name	catenaXId	
Characteristic	Trait Type: http://www.w3.org/2001/XMLSchema#string	
Example	DefaultScalarValue[value=580d3adf-1981-44a0-a214-13d6ceed9379, typeUri='DefaultScalar[metaModelVersion=BAMM_2_0_0, urn='http://www.w3.org/2001/XMLSchema#string']']	
Optional	No	
In Payload	Yes	
Payload Key	catenaXId	
Constraints	**Catena-X Id Regular Expression**	
	Description	The provided regular expression ensures that the UUID is composed of five groups of characters separated by hyphens, in the form 8-4-4-4-12 for a total of 36 characters (32 hexadecimal characters and 4 hyphens).
	Regular Expression	^[0-9a-fA-F]{8}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{12}$

Local Identifiers	
Description	A local identifier enables identification of a part in a specific dataspace, but is not unique in Catena-X dataspace. Multiple local identifiers may exist
Name	localIdentifiers
Characteristic	Set Has no order & Duplicates not allowed Type: urn:bamm:com.catenax.serial_part_typization:0.1.0#KeyValueList
Optional	No
In Payload	Yes
Payload Key	localIdentifiers

Manufacturing Information	
Description	Information from manufacturing process, such as manufacturing date and manufacturing country
Name	manufacturingInformation
Characteristic	SingleEntity Type: urn:bamm:com.catenax.serial_part_typization:0.1.0#ManufacturingEntity
Optional	No
In Payload	Yes
Payload Key	manufacturingInformation

Part Type Information	
Description	The part type from which the serialized part has been instantiated
Name	partTypeInformation
Characteristic	SingleEntity Type: urn:bamm:com.catenax.serial_part_typization:0.1.0#PartTypeInformationEntity
Optional	No
In Payload	Yes
Payload Key	partTypeInformation

2.3. ENTITIES

Key Value List: A list of key value pairs for local identifiers, which are composed of a key and a corresponding value.

Identifier Key	
Description	The key of a local identifier
Name	key
Characteristic	Type: http://www.w3.org/2001/XMLSchema#string
Example	DefaultScalarValue[value=com.samplecompany.serialnumber, typeUri='DefaultScalar[metaModelVersion=BAMM_2_0_0, urn='http://www.w3.org/2001/XMLSchema#string']']
Optional	No
In Payload	Yes
Payload Key	key

Identifier Value	
Description	The value of an identifier
Name	value
Characteristic	Type: http://www.w3.org/2001/XMLSchema#string
Example	DefaultScalarValue[value=SN12345678, typeUri='DefaultScalar[metaModelVersion=BAMM_2_0_0, urn='http://www.w3.org/2001/XMLSchema#string']']
Optional	No
In Payload	Yes
Payload Key	value

Manufacturing Entity: Encapsulates the manufacturing relevant attributes.

Production Date	
Description	Timestamp of the manufacturing date as the final step in production process (e.g. final quality check, ready-for-shipment event)
Name	date
Characteristic	Type: http://www.w3.org/2001/XMLSchema#dateTime
Example	DefaultScalarValue[value=2022-02-04T14:48:54, typeUri='DefaultScalar[metaModelVersion=BAMM_2_0_0, urn='http://www.w3.org/2001/XMLSchema#dateTime']']
Optional	No
In Payload	Yes
Payload Key	date

Country Code		
Description	Country code where the part was manufactured	
Name	country	
Characteristic	Trait Type: http://www.w3.org/2001/XMLSchema#string	
Example	DefaultScalarValue[value=HUR, typeUri='DefaultScalar[metaModelVersion=BAMM_2_0_0, urn='http://www.w3.org/2001/XMLSchema#string']']	
Optional	Yes	
In Payload	Yes	
Payload Key	country	
Constraints	Description	**Country Code Regular Expression** Regular Expression that ensures a three-letter code
	Regular Expression	^[A-Z][A-Z][A-Z]$

Part Type Information Entity: Encapsulation for data related to the part type.

Manufacturer Part ID	
Description	Part ID as assigned by the manufacturer of the part. The Part ID identifies the part (as designed) in the manufacturer`s dataspace. The Part ID does not reference a specific instance of a part and thus should not be confused with the serial number
Name	manufacturerPartId
Characteristic	Type: http://www.w3.org/2001/XMLSchema#string
Example	DefaultScalarValue[value=123-0.740-3434-A, typeUri='DefaultScalar[metaModelVersion=BAMM_2_0_0, urn='http://www.w3.org/2001/XMLSchema#string']']
Optional	No
In Payload	Yes
Payload Key	manufacturerPartId

Customer Part ID	
Description	Part ID as assigned by the manufacturer of the part. The Part ID identifies the part (as designed) in the customer`s dataspace. The Part ID does not reference a specific instance of a part and thus should not be confused with the serial number or batch number. Note: This property may only be populated in case there is a single customer for the batch.
Name	customerPartId
Characteristic	Type: http://www.w3.org/2001/XMLSchema#string
Example	DefaultScalarValue[value=PRT-12345, typeUri='DefaultScalar[metaModelVersion=BAMM_2_0_0, urn='http://www.w3.org/2001/XMLSchema#string']']
Optional	Yes
In Payload	Yes
Payload Key	customerPartId

Name at Manufacturer	
Description	Name of the part as assigned by the manufacturer
Name	nameAtManufacturer
Characteristic	Type: http://www.w3.org/2001/XMLSchema#string
Example	DefaultScalarValue[value=Mirror left, typeUri='DefaultScalar[metaModelVersion=BAMM_2_0_0, urn='http://www.w3.org/2001/XMLSchema#string']']
Optional	No
In Payload	Yes
Payload Key	nameAtManufacturer

Name at Customer	
Description	Name of the part as assigned by the customer
Name	nameAtCustomer
Characteristic	Type: http://www.w3.org/2001/XMLSchema#string
Example	DefaultScalarValue[value=side element A, typeUri='DefaultScalar[metaModelVersion=BAMM_2_0_0, urn='http://www.w3.org/2001/XMLSchema#string']']
Optional	Yes
In Payload	Yes
Payload Key	nameAtCustomer

Classification	
Description	The classification of the part type according to STEP standard definition
Name	classification
Characteristic	Enumeration Values: • product • raw material • software • assembly • tool • component Reference: http://private.pdm-if.org/web/pdm-if/recommended-practices1 Type: http://www.w3.org/2001/XMLSchema#string
Example	DefaultScalarValue[value=software, typeUri='DefaultScalar[metaModelVersion=BAMM_2_0_0, urn='http://www.w3.org/2001/XMLSchema#string']']
Optional	No
In Payload	Yes
Payload Key	classification

ADDENDUM FOR CONFORMITY ASSESSMENT

DISCLAIMER

The following pages are not part of the standard documentation.

CX – 0021 ASPECT MODEL: BATCH

BUSINESS DOMAIN: PLM & QUALITY
USE-CASE: TRACEABILITY

Contact: standardisierung@catena-x.net
Note: Please specify the platform capability in the subject line.

TABLE OF CONTENTS

ABOUT THIS DOCUMENT & MOTIVATION

The **standards of the Catena-X data ecosystem** define how the exchange of data and information in our network works. They are the basis for ensuring that the technologies, components, and processes used are developed and operated according to uniform rules.

The addendum for conformity assessment clarifies the requirements and scope for each standard. It contains conformity assessment criteria (CAC) that specify how a participant can receive a certificate for the correct application of the standard.

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[1] https://catena-x.net/fileadmin/user_upload/Vereinsdokumente/Catena-X_IP_Regelwerk_IP_Regulations.pdf

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[1] https://catena-x.net/de/standard-library

ABSTRACT

A batch is a quantity of (semi-) finished products or (raw) material product that have been produced under the same circumstances (e.g., same production location), as specified groups or amounts, within a certain time frame. Every batch can differ in the number or amount of products. Different batches can have varied specifications, e.g., different colors, quality, etc. A batch is identified via a Batch ID.

1 INTRODUCTION

This standardization introduces the standardized aspect model for batch with corresponding JSON schemas and payloads for guidance and orientation on how to provision and exchange the corresponding data within Catena-X.
Note: The presented aspect model is in version 1.0.2.

1.0 AUDIENCE & SCOPE
This section is non-normative

This standard applies to the roles:
- Data Provider / Consumer
- Business Application Provider

The described semantic model or submodel template MUST be provided by Traceability applications provisioning data as well as all data providers in the traceability use-case.

1.1 CONTEXT
This section is non-normative

This submodel template or aspect model is required to identify a batch of materials/parts within Catena-X.
It links local identifiers like to the actual Catena-X ID.

Therefore by accessing this aspect you can link a batch of physical parts to their representation within the Traceability Use-Case in Catena-X.

1.2 CONFORMANCE

As well as sections marked as non-normative, all authoring guidelines, diagrams, examples, and notes in this specification are non-normative. Everything else in this specification is normative.

The key words MAY, MUST, MUST NOT, OPTIONAL, RECOMMENDED, REQUIRED, SHOULD and SHOULD NOT in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

1.3 PROOF OF CONFORMITY

This section is non-normative

All participants and their solutions MUST prove they conform with the Catena-X standards. To validate that the standards are applied correctly, Catena-X employs Conformity Assessment Bodies (CABs).

A model validator MUST be created, to prove the correctness of the data model. A generic test set created for the model MUST prove the expected results.

1.4 EXAMPLES

Example JSON payload:

```
{
  "localIdentifiers": [
    {
      "value": "BID12345678",
      "key": "BatchID"
    }
  ],
  "manufacturingInformation": {
    "date": "2022-02-04T14:48:54",
    "country": "HUR"
  },
  "catenaXId": "580d3adf-1981-44a0-a214-13d6ceed9379",
  "partTypeInformation": {
    "manufacturerPartId": "123-0.740-3434-A",
    "customerPartId": "PRT-12345",
    "classification": "product",
    "nameAtManufacturer": "Mirror left",
    "nameAtCustomer": "side element A"
  }
}
```

1.5 TERMINOLOGY

This section is non-normative

Business Partner Number (BPN)
A BPN is the unique identifier of a partner within Catena-x.

Aspect Model

a formal, machine-readable semantic description (expressed with RDF/turtle) of data accessible from an **Aspect.**

> Note 1 to entry: An Aspect Model must adhere to the Semantic Aspect Meta Model (SAMM), i.e., it utilizes elements and relations defined in the Semantic Aspect Meta Model and is compliant to the validity rules defined by the Semantic Aspect Meta Model.
> Note 2 to entry: Aspect model are logical data models which can be used to detail a conceptual model in order to describe the semantics of runtime data related to a concept. Further, elements of an Aspect model can/should refer to terms of a standardized Business Glossary (if existing).

[Source: Catena-X, SEM-002, note 3 removed]

Additional terminology used in this standard can be looked up in the glossary on the association homepage.

2 ASPECT MODEL BATCH

2.0 INTRODUCTION

This submodel template or aspect model is required to identify a batch of materials within Traceability in Catena-X.

It links local identifiers like manufacturerPartId, CustomerPartId to the actual Catena-X ID.

This allows decoupling of the Catena-X identifiers from the actual business process.

By accessing this aspect you can link a physical batch of parts to its representation within the Traceability Use-Case in Catena-X.

Every data provider of batch data MUST provide the data conformant to the semantic model specified in this document.

The unique identifier of the semantic model specified in this document MUST be used by the data provider to define the semantics of the data being transferred.

Every certified business application relying on batch data MUST be able to consume data conformant to the semantic model specified in this document.

This semantic model MUST be made available in the central Semantic Hub.

Data consumers and data provider MUST comply with the license of the semantic model.

In the Catena-X data space batch data MUST be requested and exchanged via Eclipse Dataspace Connector (EDC) conformant to **Error! Reference source not found.** and **Error! Reference source not found.**.

Data providers MUST provide the data as part of a digital twin of the asset for batches conformant to **Error! Reference source not found.**.
The JSON Payload of data providers MUST be conformant to the JSON Schema as specified in this document.

2.1 SPECIFICATION ARTIFACTS

The modeling of the semantic model specified in this document was done in accordance to the "semantic driven workflow" to create a submodel template specification [SMT].

This aspect model is written in SAMM 2.0.0 as a modeling language conformant to <mark>Error! Reference source not found.</mark> as input for the semantic deriven workflow.

Like all Catena-X data models, this model is available in a machine-readable format on GitHub.[1] conformant to <mark>Error! Reference source not found.</mark>.

2.2 LICENSE

This Catena-X data model is an outcome of Catena-X use case group Traceability. This Catena-X data model is made available under the terms of the Creative Commons Attribution 4.0 International (CC-BY-4.0) license, which is available at Creative Commons.[2].

The license information is available in github.

In case of doubt the license, copyright and authors information in github overwrites the information in this specification document.

2.3 IDENTIFER OF SEMANTIC MODEL

The semantic model has the unique identifier

urn:bamm:com.catenax.batch:1.0.2#Batch

2.4 FORMATS OF SEMANTIC MODEL

2.4.1 RDF Turtle

The rdf turtle file, an instance of the Semantic Aspect Meta Model, is the master for generating additional file formats and serializations.

https://github.com/eclipse-tractusx/sldt-semantic-models/blob/main/io.catenax.batch/1.0.2/Batch.ttl

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[1] https://github.com/eclipse-tractusx/sldt-semantic-models.

[2] https://creativecommons.org/licenses/by/4.0/legalcode

[4] https://parquet.apache.org/

The open source command line tool of the Eclipse Semantic Modeling Framework[1] is used for generation of other file formats like for example a JSON Schema, aasx for Asset Administration Shell Submodel Template or a HTML documentation.

2.4.2 JSON Schema

A JSON Schema can be generated from the RDF Turtle file. The JSON Schema defines the Value-Only payload of the Asset Administration Shell for the API operation "GetSubmodel".

2.4.3 aasx

A AASX file can be generated from the RDF Turtle file. The AASX file defines one of the requested artifacts for a Submodel Template Specification conformant to [SMT].

Note: As soon as the specification V3.0 of the Asset Administration Shell specfication is available and update will be provided.

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[1] https://github.com/eclipse-esmf/esmf-sdk

3 REFERENCES

3.0 NORMATIVE REFERENCES

- CX-0002 DIGITAL TWINS IN CATENA-X
- CX-0003 SEMANTIC ASPECT META MODEL
- CX-0004 GOVERNANCE PROCESS FOR SEMANTIC MODELS
- CX-0018 ECLIPSE DATA SPACE CONNECTOR (EDC)
- CX-0001 EDC DISCOVERY API

3.1 NON-NORMATIVE REFERENCES

This section is non-normative

[SMT]   How to create a submodel template specification. Guideline. Download from: https://industrialdigitaltwin.org/wp-content/uploads/2022/12/I40-IDTA-WS-Process-How-to-write-a-SMT-FINAL-.pdf