CATENA-X

STANDARD

CX - 0042 Aspect Model SingleLevelBomAsPlanned v.1.1.2

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ABOUT THIS DOCUMENT & MOTIVATION

Catena-X is the first open and collaborative data ecosystem. The goal is to provide an environment for the creation, operation, and joint use of end-to-end data chains along the entire automotive value chain. All partners are on an equal ground, have sovereign control over their data and no lock-in effects occur. This situation provides a sustainable solution for the digitalization of supply chains, especially for medium-sized and small companies, and supports the cooperation and collaboration of market participants and competitors.

The ever-growing Catena-X ecosystem will enable enormous amounts of data to be integrated and collaboratively harnessed. To ensure that these complex data volumes can be sent, received, and processed smoothly across all stages of the value chain, one language for all players: common standards. 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.

Common standards create added value for all partners: Within our network, data flows more smoothly through interfaces. In addition, we avoid cumbersome individual IT solutions for sharing data with other partners. In the field of international standardization, Catena-X follows the proven international standardization institutions: ISO/IEC/ITU and CEN-CENELC/ETSI.

For users and data providers, implementation of standards will reduce the costs that would arise from adapting different systems. In addition, no important data is lost. On the contrary, it even becomes easier to collect data across companies. For operators and developers, standards will create a framework that provides reliable orientation and planning security.

The following document describes one of the standards used in the Catena-X ecosystem and the requirements needed to implement it. Here, it serves as main resource to illustrate the following data model. It contains information starting from the format of the model, up to the conceptual and physical model. The standardisation of the data model will enable faster information sharing and homogeneity throughout the entire Catena-X ecosystem.

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ABSTRACT

The semantic model described below describes a submodel for a digital twin on material or part level providing information on its assembly. The single-level Bill of Material represents one sub-level of an assembly and does not include any lower-level subassemblies. The Digital Twin as planned lifecycle stage refers to the linkage of parts on a material/part number level. Currently, it is anticipated that these parts can be linked between two partners once the sourcing is complete.

1. INTRODUCTION

The aspect SingleLevelBomAsPlanned provides information on the child parts (one structural level down) from which the given object is assembled. It describes the relationship of parts/materials in a planned stage. It does not hold serial number or batch specific information, but supports navigation through the potential supply chains for a given material/part number.

Note: The presented aspect model is in version 1.1.0

1.1 AUDIENCE & SCOPE

> *This section is non-normative*

This standard applies to the roles:

1. Data Provider / Consumer
2. Business Application Provider

The described semantic model or submodel template MUST only be made available by applications, as well as all data providers provisioning data for the Digital Twin AsPlanned lifecycle.

1.2 CONTEXT

> *This section is non-normative*

This submodel template or aspect model is required to identify child part numbers for a given part. It links the Catena-X IDs of the parent material/part with the Catena-X IDs of its ingredients or components materials.

Therefore this aspect allows navigation throughout the supply chain in the Digital Twin AsPlanned lifecycle.

1.3 ARCHITECTURE OVERVIEW

> *This section is non-normative*

1.4 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 document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

1.5 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).

The proof of conformity for a single semantic model is done according to the general rules for proving the conformity of data provided to a semantic model or the ability to consume the corresponding data.

**Disclaimer: The operating model released by the Catena-X association will define the roadmap, content and scope for the certification process. This will include the roles, certification and further assessment procedures as well as the rollout phases.*

1.6 EXAMPLES

Example JSON payload:

```
{
  "catenaXId": "urn:uuid:055c1128-0375-47c8-98de-7cf802c3241d",
  "childParts": [
    {
      "quantity": {
        "quantityNumber": 2.5,
        "measurementUnit": "unit:litre"
      },
      "createdOn": "2022-02-03T14:48:54.709Z",
      "lastModifiedOn": "2022-02-03T14:48:54.709Z",
      "childCatenaXId": "urn:uuid:5daB938E-Cafa-92B3-7ca1-9aD7885e9dC8"
    }
  ]
}
```

1.7 TERMINOLOGY

> *This section is non-normative*

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 “SingleLevelBomAsPlanned”

> *This section is normative*

This semantic model describes Part/Material relationships. The original intent is to attach this aspect to a material specific twin in an Asset Administration Shell but is not limited to that use case. The single-level Bill of Material represents one sub-level of an assembly and does not include any lower-level subassemblies. In the As-Planned lifecycle state all variants are covered ("120% BOM"). Every data provider of SingleLevelBomAsPlanned 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 SingleLevelBomAsPlanned 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 SingleLevelBoMAsPlanned data MUST be requested and exchanged via Eclipse Dataspace Connector (EDC) conformant to CX-0018 and CX-0002. Data providers MUST provide the data as part of a digital twin of the asset for a material/plant conformant to CX-0002. The JSON Payload of data providers MUST be conformant to the JSON Schema as specified in this document.

2.1 INTRODUCTION

The aspect SingleLevelBomAsPlanned provides information on the child parts (one structural level down) from which the given object is assembled. It describes the relationship of parts/materials in a planned stage. It does not hold serial number or batch specific information, but supports navigation through the potential supply chains for a given material number.

2.2 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 BAMM 2.0.0 as a modeling language conformant to CX-0003 as input for the semantic deriven workflow.

Like all Catena-X data models, this model is available in a machine-readable format on GitHub2F2F conformant to CX-0003.

2.3 LICENSE

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.

2.4 IDENTIFER OF SEMANTIC MODEL

The semantic model has the unique identifier:

```
urn:bamm:io.catenax.single_level_bom_as_planned:1.1.0
```

This identifier MUST be used by the data provider to define the semantics of the data being transferred.

2.5 FORMATS OF SEMANTIC MODEL

2.5.1 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.single_level_bom_as_planned/1.1.0/SingleLevelBomAsPlanned.ttl
```

The open source command line tool of the Eclipse Semantic Modeling Framework 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.

2.5.2 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".

2.5.3 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].

3 REFERENCES

3.1 NORMATIVE REFERENCES

CX-0002 DIGITAL TWINS IN CATENA-X

CX-0003 BAMM ASPECT META MODEL

CX-0004 GOVERNANCE PROCESS FOR SEMANTIC MODELS

CX-0018 ECLIPSE DATA SPACE CONNECTOR (EDC)

3.2 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

3.3 REFERENCE IMPLEMENTATIONS

> *This section is non-normative*

ANNEXES

FIGURES

> *This section is non-normative*

TABLES

> *This section is non-normative*