CATENA-X

STANDARD

CX - 0043 Semantic Model PartAsPlanned

BUSINESS DOMAIN: PLM & QUALITY

USE CASE. TRACEABILITY

Contact: standardisierung@catena-x.net

Note: Please specify the platform capability in the email subject line.

Version	1.0.1
Date	06.03.2023
Status	Published
Author	Catena-X Automotive Network e.V.

Version History		
Version	**Date**	**Description of Change**
1.0.0	05.03.2023	Document creation as part of release 3.0
1.0.1	06.03.2023	Addendum for Conformity Assessment added

TABLE OF CONTENTS

About this Document & Motivation 1
Disclaimer & Liability 2
Revisions & Update 3
Copyright & Trademarks 3
Management Summary 4
1 Introduction 5
2 Purpose of the Document 5
3 Scope of the Implementation 6
3.1 Preconditions and Dependencies 6
3.2 Constraints and Limitations 6
4 Data Model 7
4.1 Overview 7
4.2 Properties 7
4.3 Entities 8
4.3.1 Properties of Entity Part Type Information 8
4.3.2 Properties of Entity Validity PeriodEntity 10
5 Normative References 11
5.1 Catena-X Reference Implementations 11
5.2 Common Standards 11
Glossary 12
Abbreviations 12
Annexes 12
Figures 12

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 reference implementations 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. Defining the data model as a reference implementation enables faster information exchange and homogeneity across the Catena-X ecosystem.

DISCLAIMER & LIABILITY

The present document and its contents are provided “AS-IS” with no warranties whatsoever.

The information contained in this document is believed to be accurate and complete as of the date of publication, but may contain errors, mistakes or omissions.

The Catena-X Automotive Network e.V. (“Catena-X”) makes no express or implied warranty with respect to the present document and its contents, including any warranty of title, ownership, merchantability, or fitness for a particular purpose or use. In particular, Catena-X does not make any representation or warranty, and does not assume any liability, that the contents of the document or their use (i) are technically accurate or sufficient, (ii) conform to any law, regulation and/or regulatory requirement, or (iii) do not infringe third-party intellectual property or other rights.

No investigation regarding the essentiality of any patents or other intellectual property rights has been carried out by Catena-X or its members, and Catena-X does not make any representation or warranty, and does not assume any liability, as to the non-infringement of any intellectual property rights which are, or may be, or may become, essential to the use of the present document or its contents.

Catena-X and its members are subject to the IP Regulations of the Association Catena-X Automotive Network e.V. which govern the handling of intellectual property rights in relation to the creation, exploitation and publication of technical documentation, specifications, and standards by Catena-X.[1]

Neither Catena-X nor any of its members will be liable for any errors or omissions in this document, or for any damages resulting from use of the document or its contents, or reliance on its accuracy or completeness. In no event shall Catena-X or any of its members be held liable for any indirect, incidental or consequential damages, including loss of profits. Any liability of Catena-X or any of its members, including liability for any intellectual property rights or for non-compliance with laws or regulations, relating to the use of the document or its contents, is expressly disclaimed.

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

REVISIONS & UPDATE

The present document may be subject to revision or change of status. Catena-X reserves the right to adopt any changes or updates to the present document as it deems necessary or appropriate.[1]

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be copied or modified without the prior written authorization of Catena-X. In case of any existing or perceived difference in contents between any versions and/or in print, the prevailing version of the present document is the one made publicly available by Catena-X in PDF format.[1]

If you find any errors in the present document, please send your comments to: standardisierung@catena-x.net

COPYRIGHT & TRADEMARKS

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

MANAGEMENT SUMMARY

The semantic model described in the document is a submodel for a digital twin on material level. The model provides information about the actual part. Moreover, it is also a foundation for the BOMASPLANNED aspect, as BOMASPLANNED only contains material relationships described by anonymous UUIDs without a connection to the real Part ID or Material ID. The main and most important aspect of this submodel is the actual Manufacturer ID in order to link Catena-X Asset IDs and Catena-X Twin IDs to an actual material.

1 INTRODUCTION

This semantic model describes a Part/Material as it was planned. 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 aspect allows several identifications: of a component from a manufacturer ID and/or part type and optionally a validity period in order to determine the unique ID with which the part is identified within Catena-X at a given time.

2 PURPOSE OF THE DOCUMENT

The purpose of this document is to present the Asset Administration Shell submodel. To ensure interoperability of the data provisioned or communicated towards Catena-X, we need an appropriate model. The Asset Administration Shell submodel establishes exactly this: It is a submodel for a Part as Planned that ensures proper communication with Catena-X.

3 SCOPE OF THE IMPLEMENTATION

This chapter serves to situate the given reference implementation, to outline its prerequisites and to point out its limitations.

3.1 PRECONDITIONS AND DEPENDENCIES

Like all Catena-X data models, this model will be available in a machine-readable format on GitHub[1].

This aspect model is written in BAMM 2.0 as a modeling language, which is a separate industry standard from the open manufacturing platform, see Open Manufacturing[2].

The data contained in this Catena-X data model is requested and exchanged via Catena-X using an Eclipse Dataspace Connector (EDC), which is a separate Catena-X standard and an implementation of the IDSA standard.

Asset Administration Shell submodels are attached to digital twins in the form of an Asset Administration Shell, which is a separate Catena-X standard. Digital twins and their submodels are registered in a Digital Twin Registry, which is a separate Catena-X standard.

3.2 CONSTRAINTS AND LIMITATIONS

There are no constraints and limitations to this reference implementation document.

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

[2] https://openmanufacturingplatform.github.io/

4 DATA MODEL

The data model is described in BAMM and is available in the semantic hub from which the following description originates.

4.1 OVERVIEW

The data model can be described in different formats. The graphical representation of the data model can be found in the annex.

PartAsPlanned	
Description	A Part AsPlanned represents an item in the Catena-X Bill of Material (BOM) in As-Planned lifecycle status.
Name	Part AsPlanned

4.2 PROPERTIES

A property of a BAMM Aspect Meta Model represents a named value. The following are the properties that refer to the aspect of the model.

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	
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}$

Part Type Information	
Description	The part type from which the serialized part has been instantiated
Name	partTypeInformation
Characteristic	SingleEntity Type urn:bamm:io.catenax.part_as_planned:1.0.0#PartTypeInformationEntity
Optional	No
In Payload	Yes
Payload Key	partTypeInformation

Validity Period	
Description	The period of time during which the Part is offered by the manufacturer and can be purchased by customers
Name	validityPeriod
Characteristic	SingleEntity Type urn:bamm:io.catenax.part_as_planned:1.0.0#ValidityPeriodEntity
Optional	Yes
In Payload	Yes
Payload Key	validityPeriod

4.3 ENTITIES

An entity is a logical encapsulation of multiple values. It has a number of properties, which are described in the following, starting with the entity, followed by its properties.

4.3.1 Properties of Entity Part Type Information

Part Type Information	
Description	Encapsulation for data related to the part type
Name	Part Type Information

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
Optional	No
In Payload	Yes
Payload Key	manufacturerPartId

Name at Manufacturer	
Description	Name of the part as assigned by the manufacturer
Name	nameAtManufacturer
Characteristic	Type http://www.w3.org/2001/XMLSchema#string
Optional	No
In Payload	Yes
Payload Key	nameAtManufacturer

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
Optional	No
In Payload	Yes
Payload Key	classification

4.3.2 Properties of Entity Validity PeriodEntity

Validity Period Entity	
Description	Start date of validity period
Name	ValidityPeriodEntity

Valid From	
Description	Start date of validity period
Name	validFrom
Characteristic	Type http://www.w3.org/2001/XMLSchema#dateTime
Optional	Yes
In Payload	Yes
Payload Key	validFrom

Valid To	
Description	End of validity period
Name	validTo
Characteristic	Type http://www.w3.org/2001/XMLSchema#dateTime
Optional	Yes
In Payload	Yes
Payload Key	validTo

5 NORMATIVE REFERENCES

The following references refer to related Catena-X reference implementation and external standards. This is intended to place the present reference implementation in the context of existing references.

5.1 CATENA-X REFERENCE IMPLEMENTATIONS

CATENA-X REFERENCE IMPLEMENTATIONS	
SC-009	Catena-X standardized models
CX - 0003	BAMM Aspect Meta Model
CX - 0010	Business Partner Number
SC-002	Catena-X Eclipse Dataspace Connector (EDC)
SC-012	Semantic Hub

5.2 COMMON STANDARDS

Common Standards	
IDSA	International Data Spaces Association[1]

[1] https://internationaldataspaces.org/we/the-association/

GLOSSARY

ABBREVIATIONS

Abbreviations	Description
BAMM	BAMM Aspect Meta Model
BOM	Bill of Material
AAS	Asset Administration Shell
UUID	Universally Unique Identifier
IDSA	International Data Space Association
EDC	Eclipse Dataspace Connector

ADDENDUM FOR CONFORMITY ASSESSMENT

DISCLAIMER

The following pages are not part of the standard documentation.

CATENA-X

ADDENDUM FOR CONFORMITY ASSESSMENT

CX – 0043 ASPECT MODEL: PART AS PLANNED

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 1
Disclaimer & Liability 2
Revisions & Update 3
Copyright & Trademarks 3
Abstract 4
1 Introduction 5
1.1 Audience & Scope 5
1.2 Context 5
1.3 Conformance 5
1.4 Proof of conformity 6
1.5 Examples 6
1.6 Terminology 6
2 Aspect Model serialparttypization 8
2.1 Introduction 8
2.2 Specification Artifacts 8
2.3 License 9
2.4 Identifer of Semantic Model 9
2.5 Formats of Semantic Model 9
2.5.1 RDF Turtle 9
2.5.2 JSON Schema 10
2.5.3 aasx 10
3 References 11
3.1 Normative References 11
3.2 Non-Normative References 11

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.

DISCLAIMER & LIABILITY

The present document and its contents are provided “AS-IS” with no warranties whatsoever.

The information contained in this document is believed to be accurate and complete as of the date of publication, but may contain errors, mistakes or omissions.

The Catena-X Automotive Network e.V. (“Catena-X”) makes no express or implied warranty with respect to the present document and its contents, including any warranty of title, ownership, merchantability, or fitness for a particular purpose or use. In particular, Catena-X does not make any representation or warranty, and does not assume any liability, that the contents of the document or their use (i) are technically accurate or sufficient, (ii) conform to any law, regulation and/or regulatory requirement, or (iii) do not infringe third-party intellectual property or other rights.

No investigation regarding the essentiality of any patents or other intellectual property rights has been carried out by Catena-X or its members, and Catena-X does not make any representation or warranty, and does not assume any liability, as to the non-infringement of any intellectual property rights which are, or may be, or may become, essential to the use of the present document or its contents.

Catena-X and its members are subject to the IP Regulations of the Association Catena-X Automotive Network e.V. which govern the handling of intellectual property rights in relation to the creation, exploitation and publication of technical documentation, specifications, and standards by Catena-X.[1]

Neither Catena-X nor any of its members will be liable for any errors or omissions in this document, or for any damages resulting from use of the document or its contents, or reliance on its accuracy or completeness. In no event shall Catena-X or any of its members be held liable for any indirect, incidental or consequential damages, including loss of profits. Any liability of Catena-X or any of its members, including liability for any intellectual property rights or for non-compliance with laws or regulations, relating to the use of the document or its contents, is expressly disclaimed.

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

REVISIONS & UPDATE

The present document may be subject to revision or change of status. Catena-X reserves the right to adopt any changes or updates to the present document as it deems necessary or appropriate.[1]

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be copied or modified without the prior written authorization of Catena-X. In case of any existing or perceived difference in contents between any versions and/or in print, the prevailing version of the present document is the one made publicly available by Catena-X in PDF format.[1]

If you find any errors in the present document, please send your comments to: standardisierung@catena-x.net

COPYRIGHT & TRADEMARKS

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

ABSTRACT

A serialized part is an instance of a (design-) part, where the particular instance can be uniquely identified by means of a serial number or a similar identifier (e.g. VAN) or a combination of multiple identifiers (e.g. combination of manufacturer, date and number).
The aspect will be attached to a material-level digital twin and links the physical part and its identification to its IDs within Catena-X.

1 INTRODUCTION

This semantic model describes a Part/Material as it was planned. 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 aspect allows several identifications: of a component from a manufacturer ID and/or part type and optionally a validity period in order to determine the unique ID with which the part is identified within Catena-X at a given time.
Note: The presented aspect model is in version 1.0.0.

1.1 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 followed for applications that want to participate in the BomAsPlanned lifecycle phases within Catena-X.

1.2 CONTEXT

This section is non-normative

This submodel template or aspect model is required to identify a part/material within Catena-X.
It links the manufacturer part identification to the actual Catena-X ID.

Therefore by accessing this aspect you can link an internal material number to its representation within the BomAsPlanned-lifecycle in Catena-X.

1.3 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.

1.4 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 needs to prove the expected results.

1.5 EXAMPLES

Example JSON payload:


```
{
"partTypeInformation":
        {
        "classification":"product",
        "manufacturerPartId":"123-0.740-3434-A",
        "nameAtManufacturer":"Mirror left"
        },
"validityPeriod":
        {
        "validFrom":"2023-02-10T15:18:13.815Z","
        validTo":"2023-02-10T15:18:13.815Z"
        },
"catenaXId":"580d3adf-1981-44a0-a214-13d6ceed9379"
}
```


1.6 TERMINOLOGY

This section is non-normative

The following terms are especially relevant for the understanding of the standard:

EXAMPLE:

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 SERIALPARTTYPIZATION

2.1 INTRODUCTION

This submodel template or aspect model is required to identify a part/material within Traceability in Catena-X.

It links manufacturerPartId to the Catena-X identifier.
This allows decoupling of the Catena-X identifiers from the actual business process.

By accessing this aspect you can link a material/part to its representation within the BomAsPlanned lifecycle in Catena-X.

Every data provider of partAsplanned 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 partAsPlanned 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 partAsPlanned 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 a material/part level.
The JSON Payload of data providers MUST be conformant to the JSON Schema as specified in this document.

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 SAMM 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 GitHub[1] conformant to CX-0003.

2.3 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.

2.4 IDENTIFER OF SEMANTIC MODEL

The semantic model has the unique identifier

urn:bamm:io.catenax.part_as_planned:1.0.0

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.part_as_planned/1.0.0/PartAsPlanned.ttl

[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.

2.5.2 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].

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

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

3 REFERENCES

3.1 NORMATIVE REFERENCES

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

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