

## ***PLCS and the S-Series Specifications***

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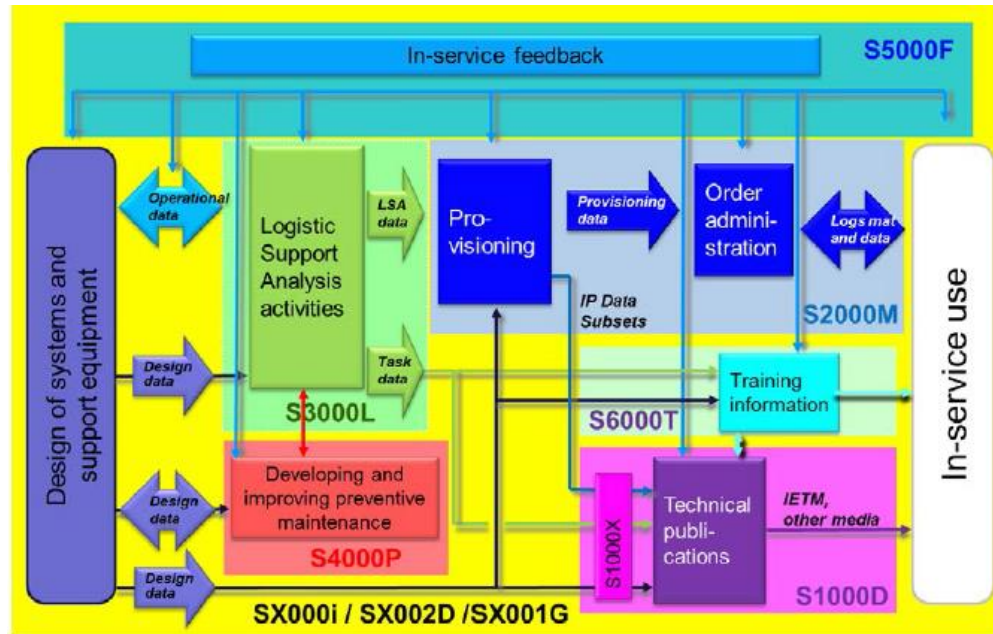
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# Content

- DMEWG: objectives and deliverables
- S-Series UML modelling style compared to PLCS
- Way forward to integrate with AP239 (PLCS) ed3

# **DMEWG: OBJECTIVES AND DELIVERABLES**

# What is the Data Modeling and Exchange Working Group (DMEWG)?



Snippets from DMEWG charter:

- Harmonize and consolidate data requirements, Data elements and business terms
- Coordinate data modeling activities
- Governance, review and publication of Aerospace and Defense Data Exchange Specifications



Whereas SX000i provides overall guidance of the S-Series of specs, the DMEWG provides the underlying technology strategy and implementation

# What does DMEWG produce?

SX001G: Glossary for the S-Series ILS specifications

- Issue 1.1 released ([www.sx000i.org](http://www.sx000i.org))

SX002D: Common data model for the S-Series ILS specifications

- Issue 1.1 released ([www.sx000i.org](http://www.sx000i.org))

SX003X: Compatibility matrix for the S-Series ILS specifications

- Development currently on hold

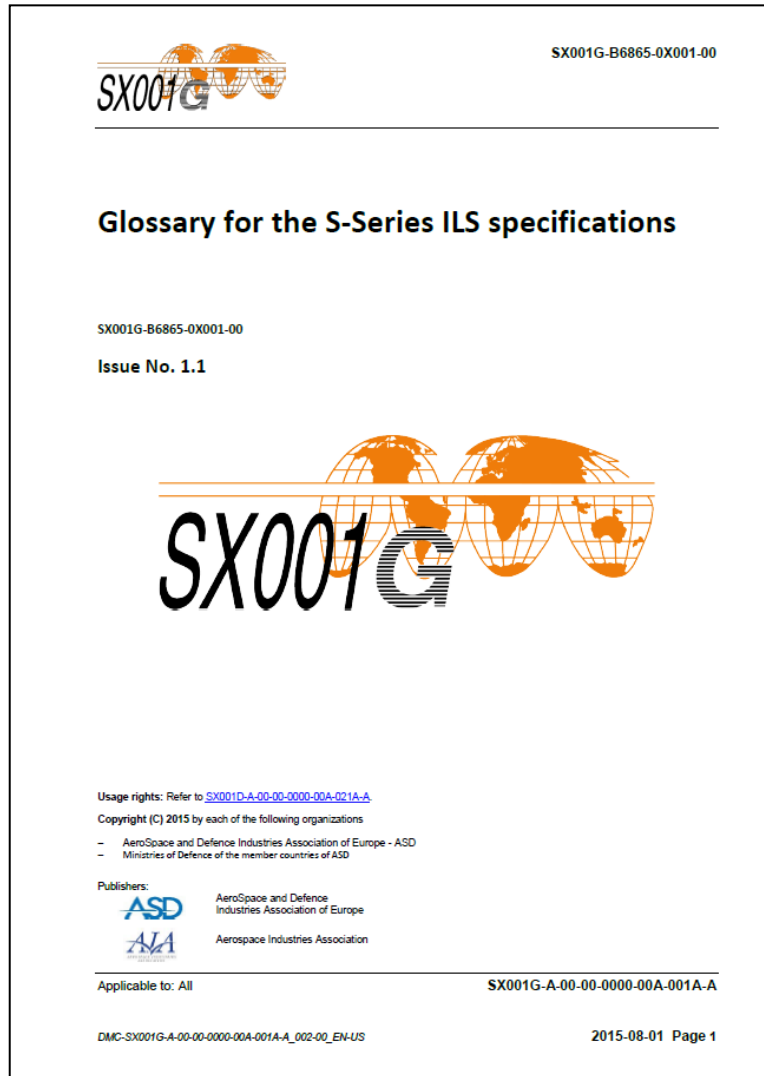
SX004G: Unified Modeling Language (UML) model reader's guidance

- Issue 1.0 released ([www.sx000i.org](http://www.sx000i.org))

SX005I: Implementer's guide for the S-Series messaging schemas

- Issue 1.0 released ([www.sx000i.org](http://www.sx000i.org))

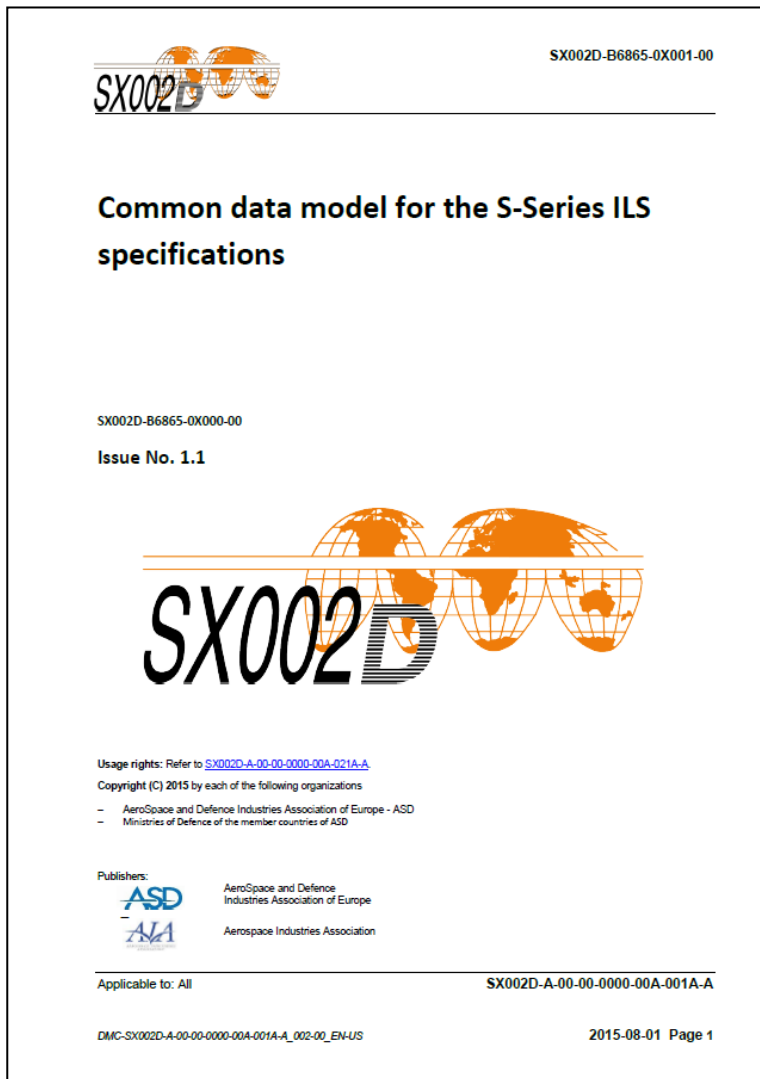
# SX001G - Glossary



Consolidated listing of terms and definitions used throughout the S-Series ILS specifications

Issue 1.1 scope is limited to the terms and definitions of the data items defined in SX002D

Envisioned to include business terms and data item terms used throughout the S-Series specs

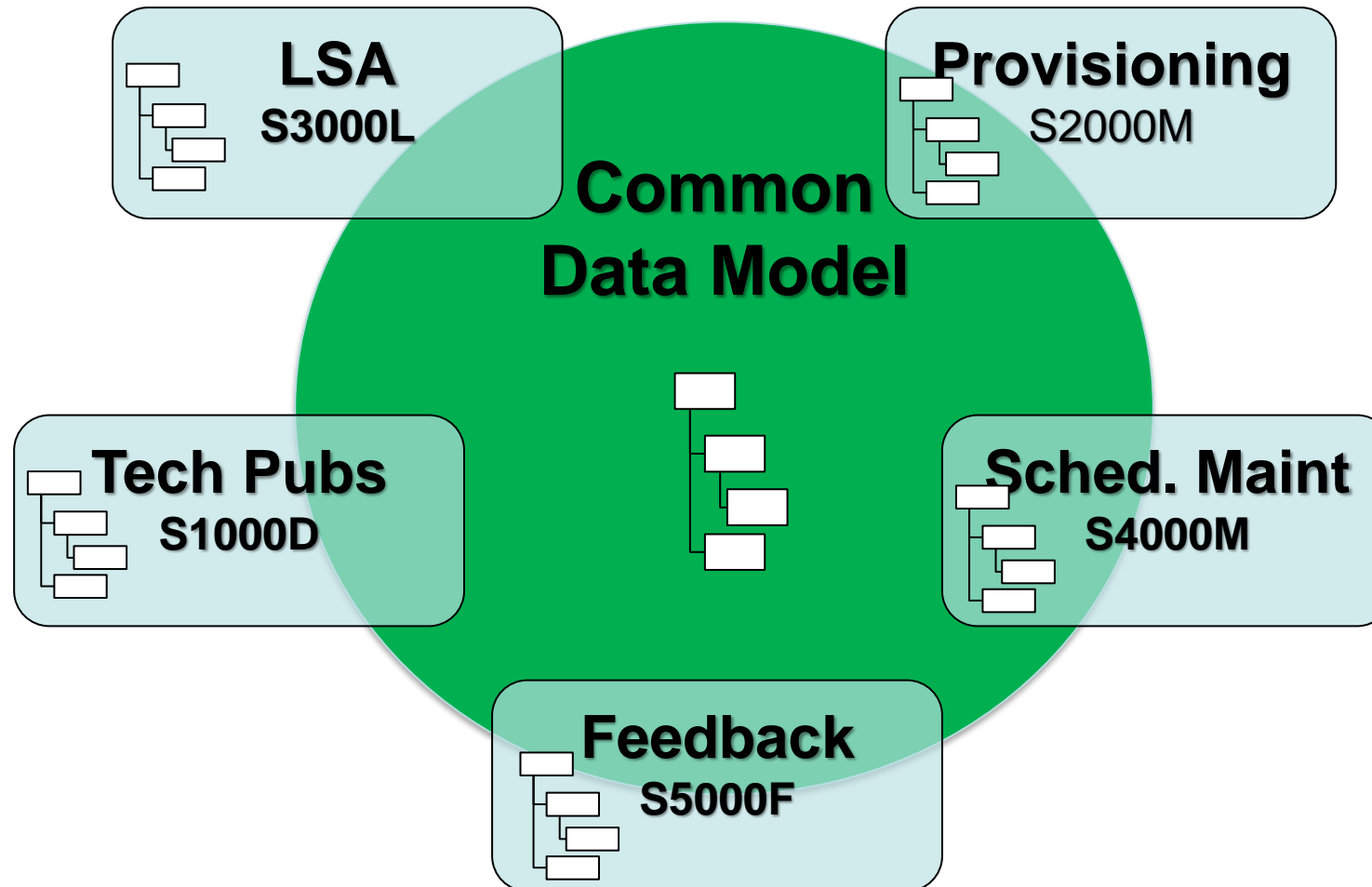


## SX002D – Common Data Model

Provides a harmonized information model for information that is common to more than one spec

Provides a framework for future development and extensions

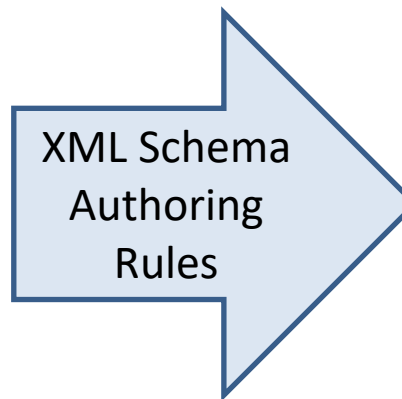
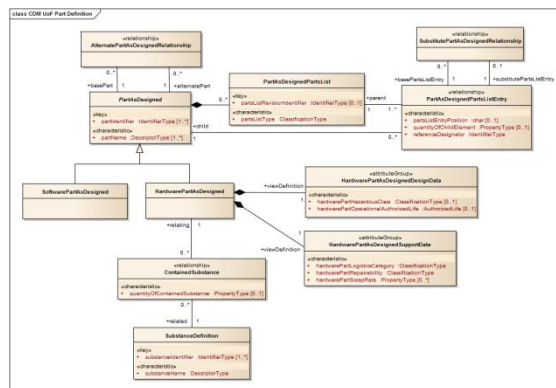
# Common Data Model





# Development of CDM

- Data model (UML)
  - Defines information requirements
- XML Schema
  - Defines exchange format



```
<?xml version="1.0" encoding="UTF-8"?>
<!-- Schema for CDM -->
<xs:schema xmlns:cdm="http://www.afnet.org/2018/05/17/cdm" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.afnet.org/2018/05/17/cdm http://www.afnet.org/2018/05/17/cdm.xsd" >
  <xs:element base="cdm:PartDesignPart" type="cdm:PartDesignPartListEntry" minOccurs="1" maxOccurs="1" />
  <xs:element base="cdm:PartDesignPartList" type="cdm:PartDesignPartListEntry" minOccurs="1" maxOccurs="1" />
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  <xs:element base="cdm:SoftwarePartDesign" type="cdm:HardwarePartDesign" minOccurs="1" maxOccurs="1" />
  <xs:element base="cdm:HardwarePartDesign" type="cdm:HardwarePartDesignData" minOccurs="1" maxOccurs="1" />
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  </xs:complexType>
</xs:schema>
```

# **S-SERIES UML MODELING STYLE COMPARED TO PLCS**

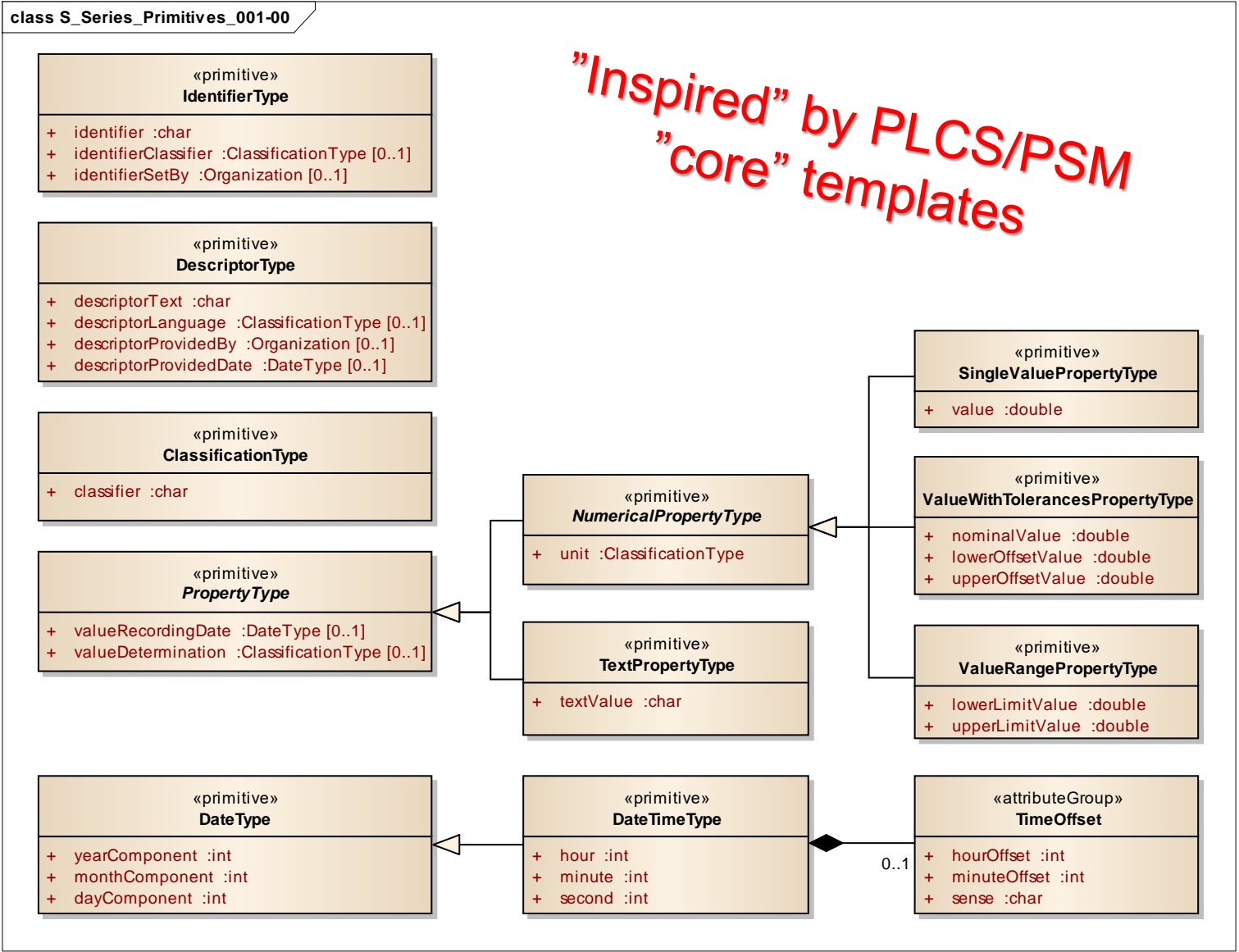
# "Patterns" In PLCS (PSM)

- Basic "patterns", eg:
  - Identification assignment (Identifier)
  - Property assignment (PropertyDefinitionAssignment)
  - Classification assignment (Classification)
  - Descriptor assignment (Descriptor)
  - State definition assignment (StateDefinitionAssignment)
- Core model "patterns", eg:
  - Product -> Product version -> Product view definition
  - View definition usage (assembly structures)
  - Breakdown element context (product breakdowns)
  - Task vs Activity

# DMEWG UML Writing Rules and Style Guide & DMEWG CDM

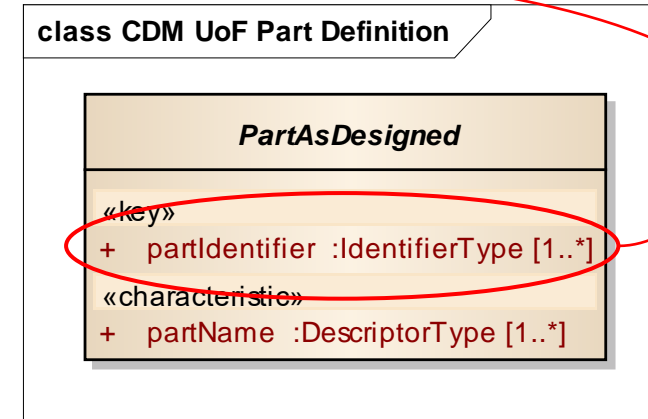
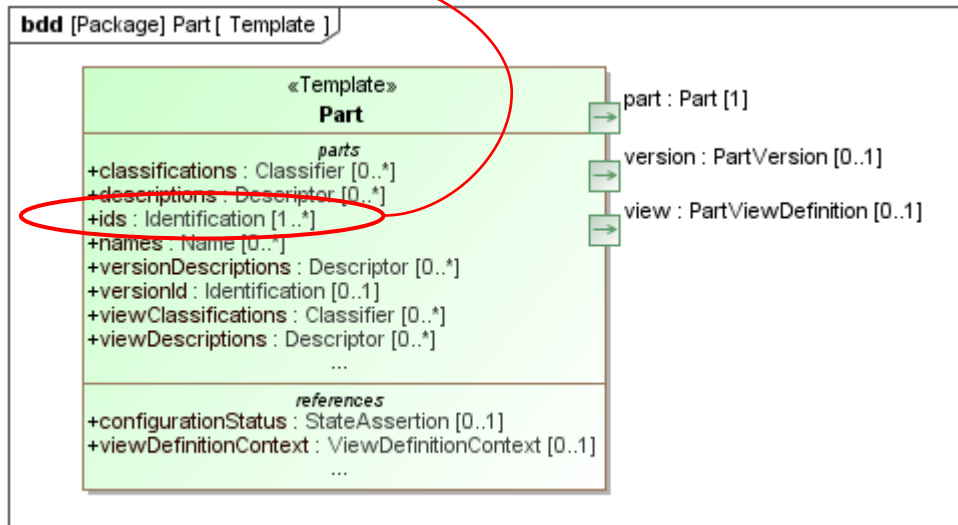
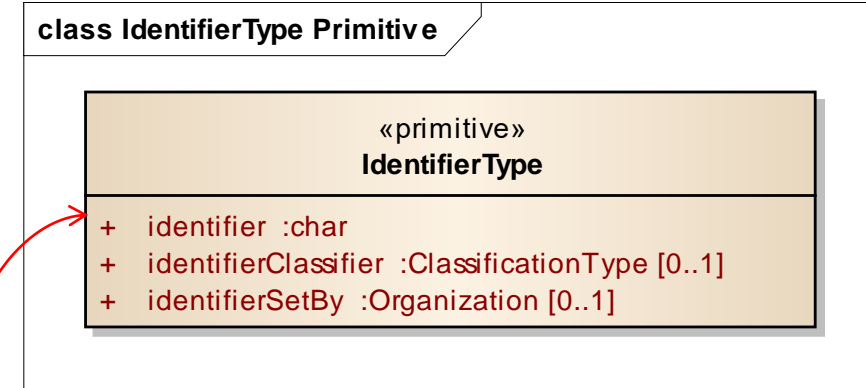
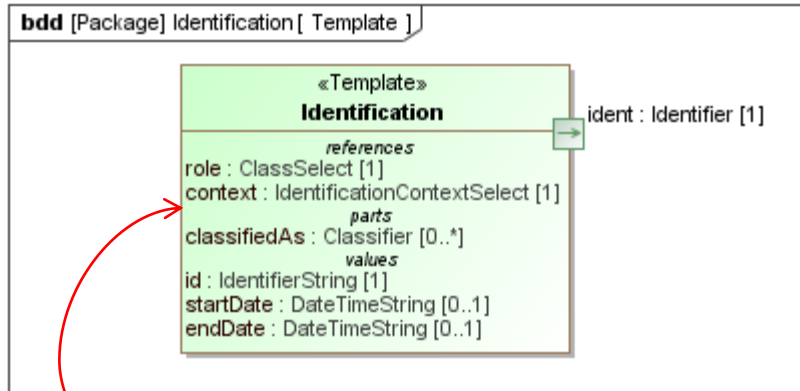
- UML model <<primitives>>
  - IdentifierType
  - PropertyType
  - ClassificationType
  - DescriptorType
- Common Data Model - Core Classes
  - PartAsDesigned, PartAsDesignedPartsList
  - Breakdown, BreakdownRevision, BreakdownElementUsageInBreakdown etc
  - Task and TaskRevision

# CDM <<primitives>>



# Examples on use of "Patterns"

## Templates in PLCS vs <<primitives>> in CDM



# DMEWG Bespoke Approach (Similarities with PSM XML Schema)

- Integrated life cycle approach (but limited to Integrated Product Support)
- Hide PLCS complexity eg:
  - Representation of different types of property representation
  - Different property entities for eg product, resource, activity and document
  - Etc
- Efficient navigation in an exchanged data set (encapsulation instead of references)

# DMEWG Approach

## (Differences from PSM XML Schema)

- More explicit representations of data that is still determined by classification in PLCS like:
  - Identifier, Properties etc
  - Condition, State, Activity etc (same entity used for many different purposes)
- Short names for eg, :
  - XML Elements
  - XML Enumerations (Codes)

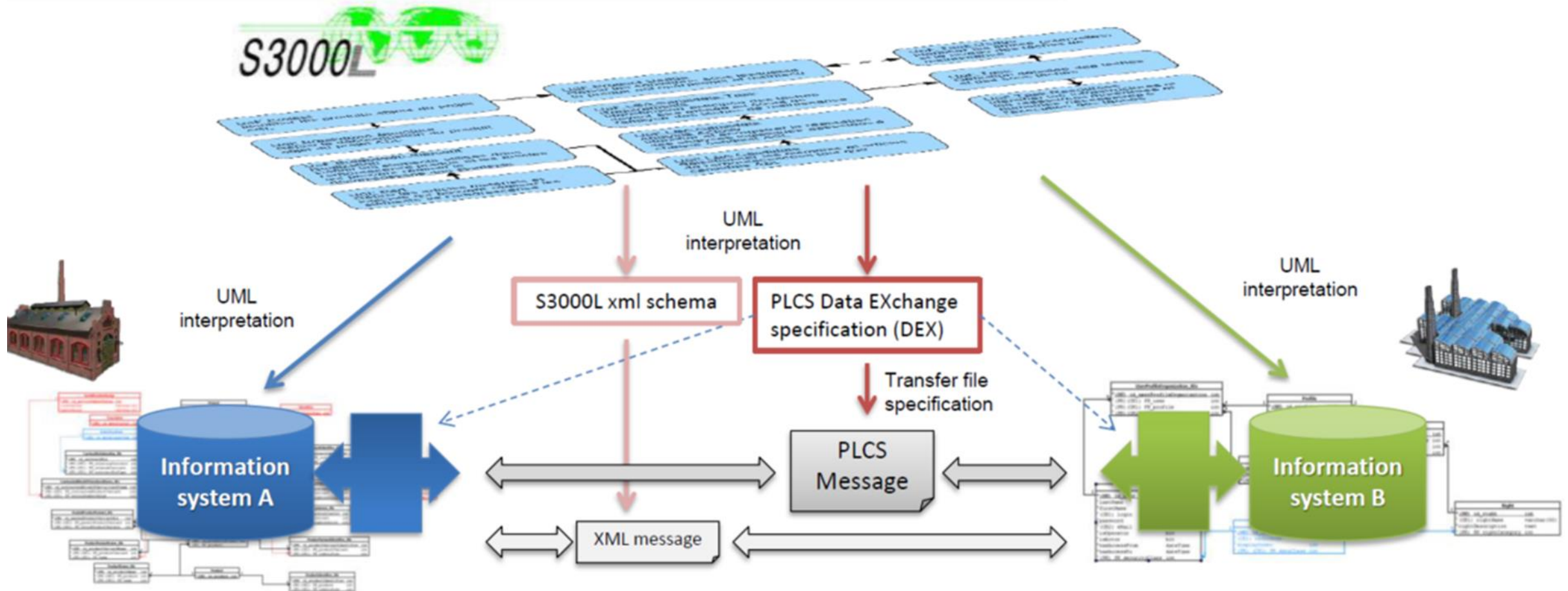


# **WAY FORWARD TO INTEGRATE WITH AP239 (PLCS) ED3**

# DMEWG objective is to fully adopt PLCS ed3 and STEP Future Architecture

- Adopting
  - SysML templates
  - SysML parametric diagrams
- Publish subsets of the PLCS XML Schemas along with DEXs and OWL reference data

# Illustration



S-Series-level semantic for exchanging within a given ILS discipline.  
PLCS semantic needed to exchange between ILS disciplines and out of the ILS world.

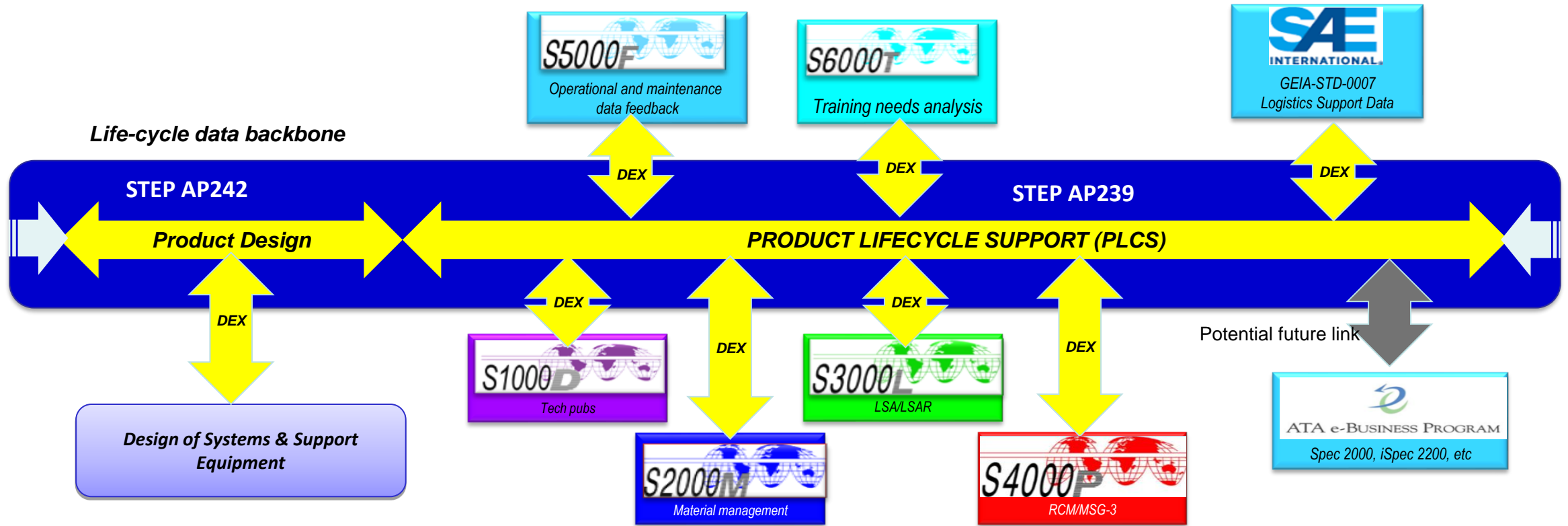
# Critical requirements

- Defining an XML Schema based on the use of business terms (early bidding) is the most critical aspect for a wider adoption of XML schemas
- Improving PLCS ed1 (and ed2) capabilities for:
  - Product Variants and Product Configurations
  - Tasks. The current Task model hard to adopt especially applying templates against unknown Task structures

These requirements should be fulfilled through:

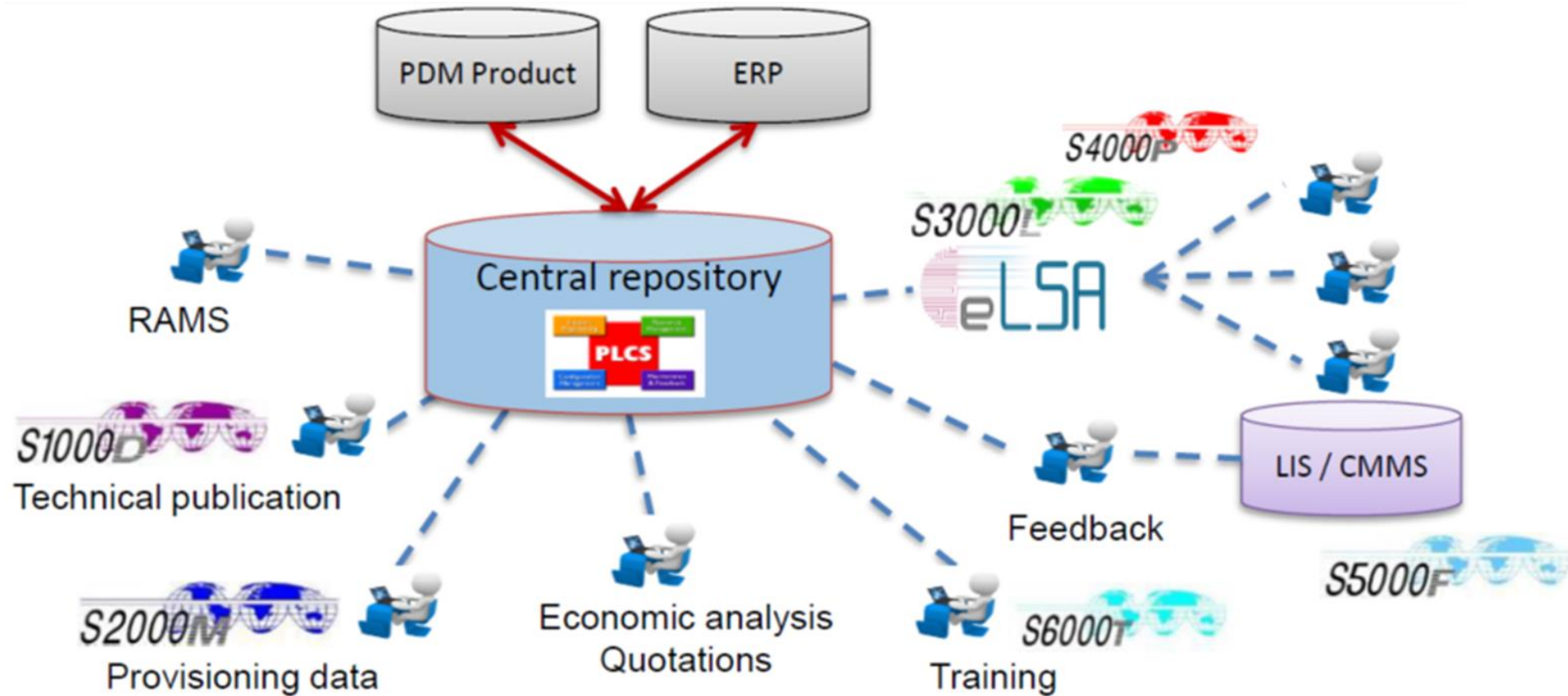
1. The active participation of DMEWG members in AP239 ed3 development
2. Publically-available formal mappings between S-Series and AP239 PLCS (future step – DGA to publish an S3000L mapping in 2018)

# Targeted architecture



**Goal: a coherent set of standards**

# Example implementation



eLSA developed by LGM Group:

- DGA/French land forces have chosen eLSA for validation of industrial S3000L analyses for Griffon and Jaguar Programs.
- Airbus Defence and Space will use eLSA to produce LSA for satellite programs.

Contacts: LGM Group: [Alexandre.Touchot@lgm.fr](mailto:Alexandre.Touchot@lgm.fr), DGA: [sebastien-j.olivier@intradef.gouv.fr](mailto:sebastien-j.olivier@intradef.gouv.fr)

**Thank you**  
for your attention!

Questions?

Contacts:

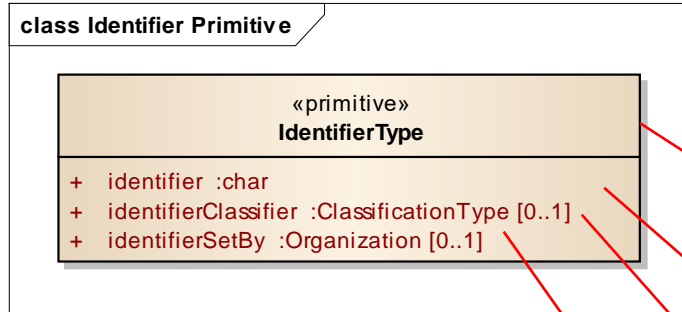
[Leif.gyllstroem@saabgroup.com](mailto:Leif.gyllstroem@saabgroup.com)

[Yves.baudier@airbus.com](mailto:Yves.baudier@airbus.com)

# Backup slides



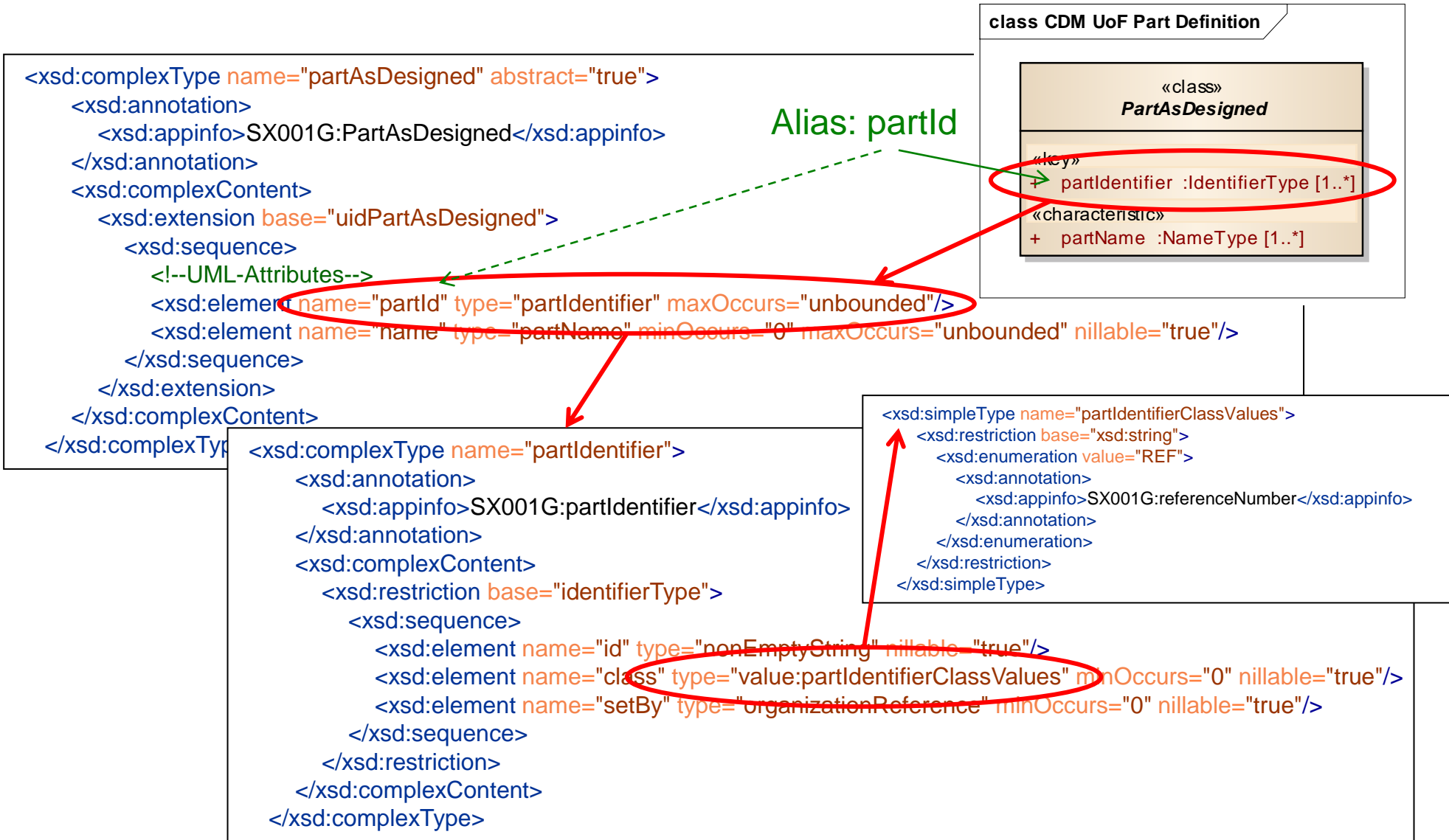
# <<primitives>> XML Schema representation



```
<xsd:complexType name="identifierType">  
  <xsd:annotation>  
    <xsd:appinfo>SX001G:IdentifierType</xsd:appinfo>  
  </xsd:annotation>  
  <xsd:sequence>  
    <xsd:element name="id" type="nonEmptyString" nillable="true">  
      <xsd:annotation>  
        <xsd:appinfo>SX001G:identifier</xsd:appinfo>  
      </xsd:annotation>  
    </xsd:element>  
    <xsd:element name="class" type="nonEmptyString" minOccurs="0" nillable="true">  
      <xsd:annotation>  
        <xsd:appinfo>SX001G:identifierClassifier</xsd:appinfo>  
      </xsd:annotation>  
    </xsd:element>  
    <xsd:element name="setBy" type="organizationReference" minOccurs="0" nillable="true">  
      <xsd:annotation>  
        <xsd:appinfo>SX001G:identifierSetBy</xsd:appinfo>  
      </xsd:annotation>  
    </xsd:element>  
  </xsd:sequence>  
</xsd:complexType>
```

# Use of <<primitives>>

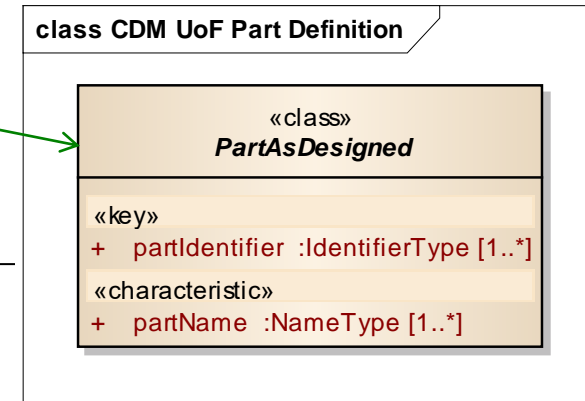
## Early binding XML Schema representation



# XML Example

XSD short name for PartAsDesigned: part

```
.....  
<part uid="part1">  
  <partId>  
    <id>9301345-501</id>  
    <class>REF</class>  
    <setBy uidRef="org1"></setBy>  
  </partId>  
</part>  
<org uid="org1">  
  <orgId>  
    <id>C01234</id>  
    <class>CAGE</class>  
  </orgId>  
</org>  
.....
```



# XML Example

Using Key Ref instead of UID Ref (Not available in PSM)

class CDM UoF Part Definition



```
.....  
<part>  
  <partId>  
    <id>9301345-501</id>  
    <class>REF</class>  
    <setBy><orgId><id>C01234</id><class>CAGE</class></orgId></setBy>  
  </partId>  
</part>  
.....
```