

# AutomationML and JT / STEP AP 242 XML

Survey and potential for cooperation

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## AutomationML and JT / STEP AP 242 XML



- Motivation
- Geometry in AutomationML
- Evolution of the formats
  - Standardization
  - Partners
  - Specification
- Summary and potential for cooperation

## 2007 decision about geometry in AutomationML

### Motivation for this presentation:

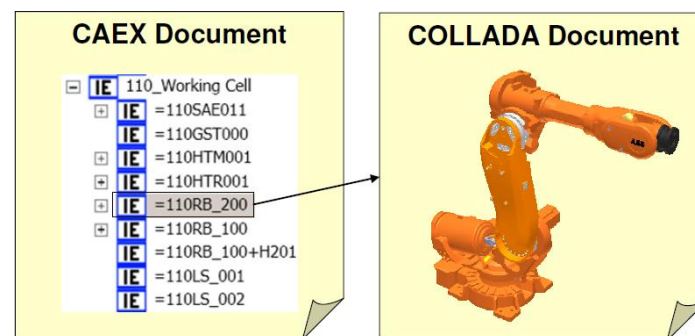
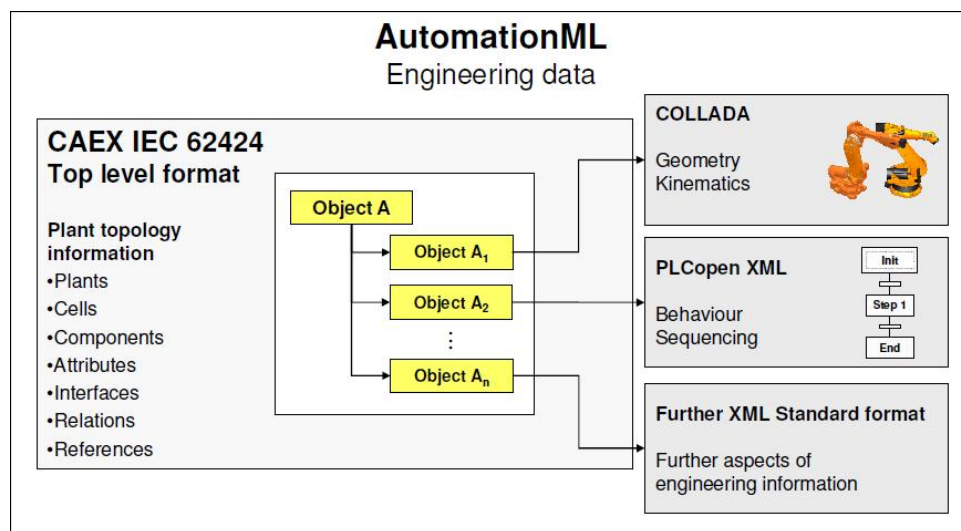
New facts and developments regarding STEP and JT lead to a discussion about an augmented view on geometry in AutomationML

Decision matrix: Base format for graphics/kinematics					2007	
	Weight	COLLADA	X3D	STEP	JT	3DXML
Open Standard (Yes/no?)	10	100%	100%	80%	68%	53%
Community	2	93%	93%	67%	27%	13%
Documentation	8	93%	93%	80%	53%	20%
Validation	8	90%	80%	100%	0%	40%
Toolintegration	10	45%	28%	41%	40%	14%
Developer Support	6	100%	100%	60%	80%	60%
Market	7	69%	71%	71%	67%	20%
Units	5	60%	60%	100%	40%	40%
Geometry	10	58%	56%	85%	76%	32%
Kinematics	8	80%	0%	80%	0%	0%
Structure	9	78%	74%	43%	51%	56%
Sequencing	10	0%	0%	20%	0%	0%
Physics	7	100%	80%	80%	60%	0%
Convex Bodies	2	100%	0%	40%	0%	0%
Primitives	2	100%	100%	100%	20%	0%
Format	8	51%	46%	29%	26%	54%
Mix with XML standards possible?	10	100%	100%	36%	24%	88%
Weighted Average		73%	62%	63%	40%	33%

# Geometry in AutomationML

## Referencing Geometry and Kinematics Information

Geometry and kinematics information is stored in separate documents according to the COLLADA data format. Modeling geometry and kinematics information is therefore split into two parts. On the one hand, the corresponding object is modeled within CAEX without any geometry or kinematics information. On the other hand, a COLLADA document has to be provided containing the geometry and kinematics information. Finally, the CAEX object stores a reference to the COLLADA document.



# ProSTEP iViP and AutomationML – What's behind it...



**ProSTEP iViP:** „Der Verein hat sich der Entwicklung von zukunftsweisenden Lösungsansätzen und Standards für das Produktdatenmanagement und die virtuelle Produktentstehung verschrieben.“

## **Product focus**

### Aims:

- Common development of the STEP data format (ISO 10303).
- Integrated virtual product development (iViP)
- Find new ideas for seamless process-, system- and data integration
- Digital supply of data for all phases of product development
- Standardization in ISO (JT and STEP AP 242 XML)
- Focus on the interests of manufacturers and suppliers

**AutomationML:** „Vereinszweck ist die Förderung der Entwicklung und Verbreitung des standardisierten Datenaustausches im Engineering-Prozess von industriellen Automatisierungssystemen, insbesondere durch die Spezifikation allgemein kompatibler Datenschnittstellen.“

## **Production focus**

### Aims:

- Support of national and international standardization
- Cooperation with standardization organizations
- Share information and interact with all interested
- Consulting and support for manufacturers, planners and users...



## AutomationML and ProSTEP iViP: Members

### AutomationML: 25 Members

- ABB Automation GmbH
- **CENIT AG**
- **Daimler AG**
- EDAG GmbH & Co KGaA
- **Fraunhofer** IOSB
- Helmut Schmidt Universität
- Inpro Innovationsgesellschaft für fortgeschrittene Produktionssysteme in der Fahrzeugindustrie mbH
- Institut Industrial (inIT)
- Institut für Automation und Kommunikation e.V. Magdeburg
- ISI Automation GmbH & Co. KG
- kichner Soft GmbH
- **KUKA Roboter GmbH**
- Lenze Automation GmbH
- Mewes & Partner
- NetAllied Systems GmbH
- Otto-von-Guericke Universität Magdeburg
- Phoenix Contact GmbH & Co. KG
- **Rücker EKS GmbH**
- **Siemens AG**
- tarakos GmbH
- Technische Universität Dortmund
- **ThyssenKrupp** Drauz Nothelfer GmbH
- **Universität Karlsruhe**
- University of the Basque Country ETSI Bilbao
- Zühlke Engineering GmbH

### ProSTEP iViP: > 150 Members, a.o:

- Airbus
- BMW
- **CENIT AG**
- Continental
- **Daimler AG**
- Dr. Ing Porsche
- EADS
- Fern Uni Hagen
- **Fraunhofer** IAO, IGD
- FHTW Berlin, FH Gelsenkirchen
- **KUKA Roboter GmbH**
- MAN
- Microsoft
- MTU
- **Rücker EKS GmbH**
- **Siemens AG**
- Universitys: Darmstadt, Dresden, München, Wien, Kaiserslautern
- **Karlsruhe**, Ruhr Universität Bochum, Dortmund, Duisburg, Paderborn
- **Thyssen Krupp**
- VDA
- ZF Friedrichshafen
- .....

## Development of AutomationML and ProSTEP iViP

### AutomationML

**2003**

**2006**

- Kick off, start joint activities

**2007**

- AutomationML announced

**2008**

- AutomationML 1.0 released
- Collada 1.5. released
- PLCOpen XML 2.0 released
- Start of standardization in DKE

**2009**

- AutomationML e.V. founded
- AutomationML 1.1 published
- AutomationML Part 2 in DKE

**2010**

- AutomationML 2.0 published

**2011**

- Start of standardization in IEC

**9/10.5.2012** ▪ AutomationML user conference

### ProSTEP iViP JT & STEP

- STEP (ISO 10303) and integrated virtual product development
- VDA creates project group (Collaborative Product Visualization)
- VDA 4966: Harmonization of visualization based on compressed data
- Daimler confirms during ProSTEP iViP symposium: All JT objects can be read without Siemens API
- Start of ISO standard
- JT PAS V1
- JT workflow form founded
- JT 9.5 submitted for standardization
- Start: STEP AP 242 XML
- ProSTEP iViP – symposium (Hamburg)

## What is JT ? – JT contains more than 3D data

### JT contents:

- Tessellated geometry with scalable steps of visualization in a freely definable quality (without history) – “light weight”
- Absolut exact geometry as JT-BREP (former format) or XT-BREP (new format)
- Exact mathematic for measuring and simulation based on BREP geometry
- Measures and tolerances
- Base data and product structure
- CAD views (layer)
- Material, texture, light and shadow
- PMI: Product and Manufacturing Information: surfaces...



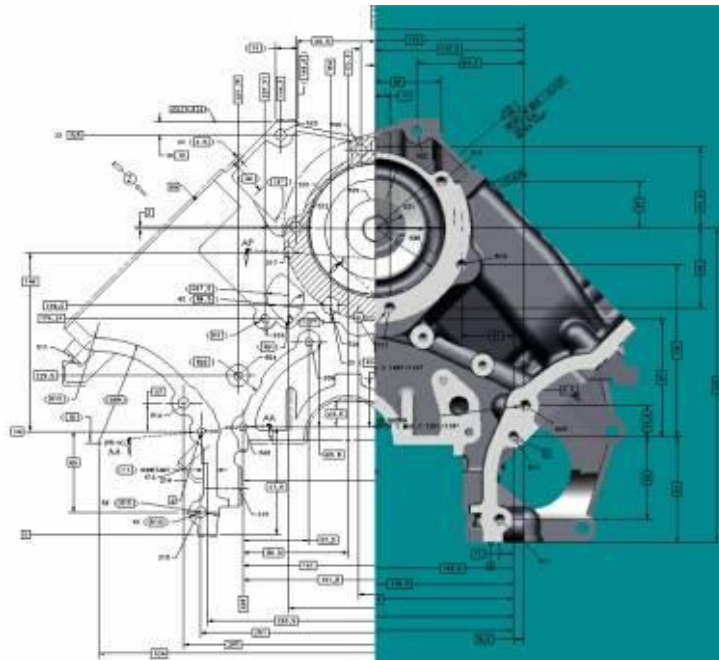
## What is PMI?

### Product and Manufacturing Information:

- Any associated annotation that can be placed in 3D space with the model, or directly on the model.

### Benefits:

- Start manufacturing planning earlier since master model is available before the drawing
- Avoid redundant data re-entry which saves time and reduces the number of errors
- Provides cost savings through earlier identification of manufacturability issues



## **Current scope of JT standardization**

### **Addressing the need of industry for standards and protect investments**

- Standardizing JT, starting with Version 9.5

### **Providing ways so JT and STEP fit together**

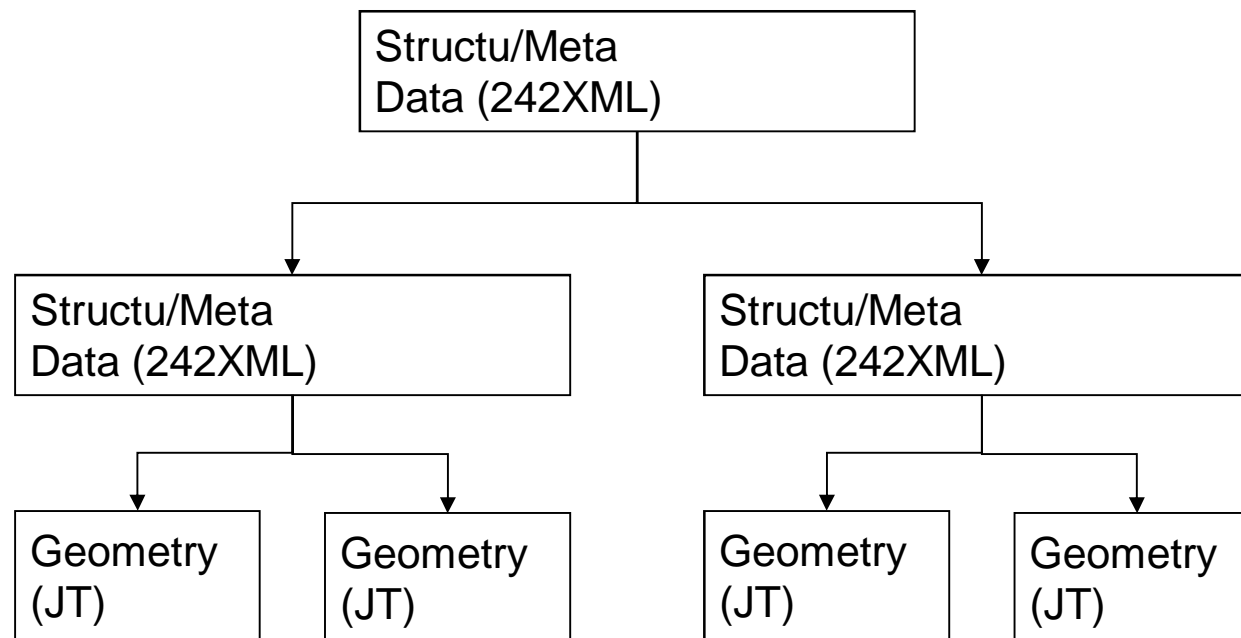
- Creating a win-win situation
- Keeping the scope and identity of each of the formats

### **Specifying a mapping between JT and related STEP entities (data correspondence)**

## STEP AP 242 XML “External References”

### Metadata is shared via STEP

- Visualization data / geometry just like “leaves on a tree”
- Also native geometry information and STEP geometry possible

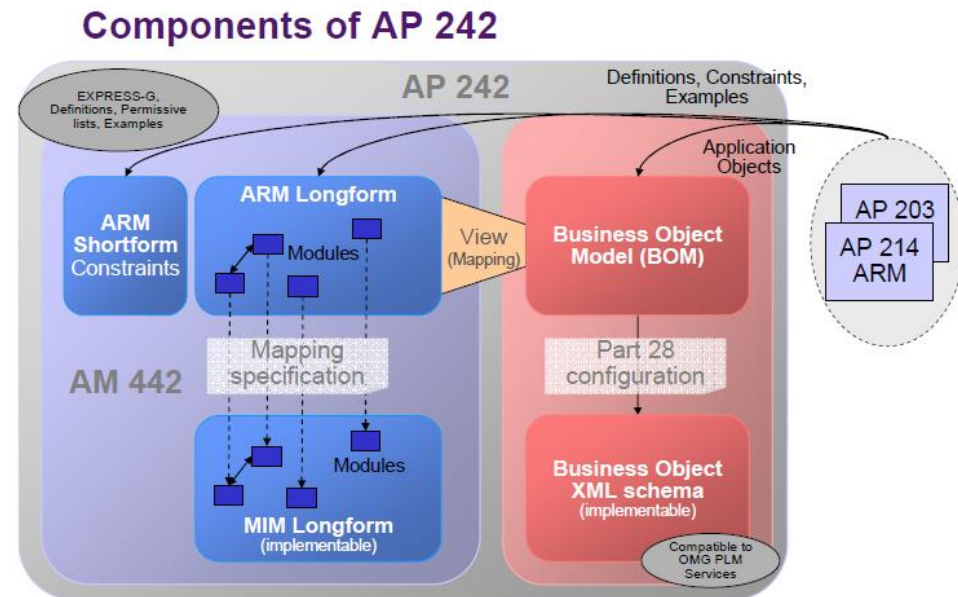


# STEP AP 242 (ISO 10303-242) – Merger of AP 203 and AP 214

SIEMENS

## Project aims:

- Specification of unified standard backbone for aerospace and automotive, globally accepted
  - Merge AP203 and AP214 and assure compatibility to these specifications
- Provide a solid basis for efficient extensions (e.g. PDQ)
- Provide a Business Object Model (BOM), which is additionally specified in UML, and XML scheme will be derived (AP 242 XML)



**Siemens PLM has made a commitment to support the STEP AP 242 initiative**

## STEP AP 242 XML covers the PLM relevant requirements



### STEP AP 242 XML has been available since 2011 July

- Joins AP 203 and AP 214
- Consideration of Product Data Quality (PDQ)
- Allocation of a Business Object Model (BOM) in XML
- Consideration of kinematic functions
- Exchange of metadata in XML
- Exchange of structured data in XML
- Exchange of process data in XML
- Exchange of kinematic data in XML
- Connection of other data as “external references”

### Aim

- Worldwide accepted user protocol for automotive and aircraft industry

# JT standardization – Compliant with the ISO process

**SIEMENS**

**Working through ISO TC 184 / SC4,  
Siemens PLM software has complied with  
the ISO process to submit the JT format  
for ballot as an International standard**

**Compliance with ISO directives for  
document creation was required**

- Completed by working as a team, including Siemens, Pro STEP iViP, ITI and University of Darmstadt

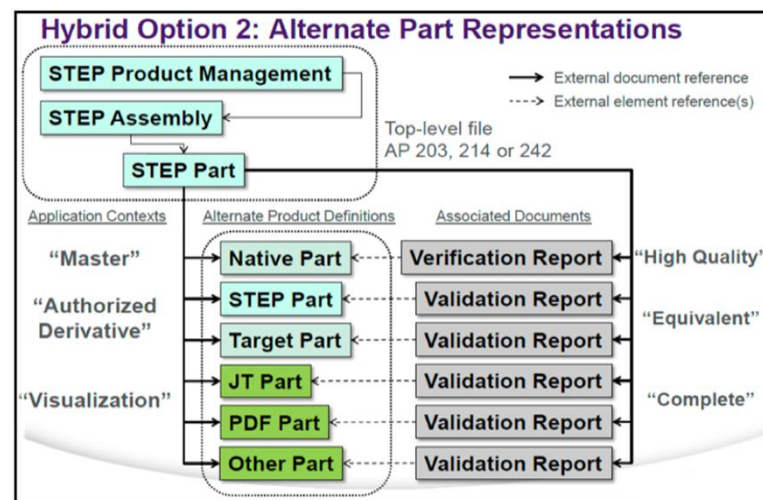
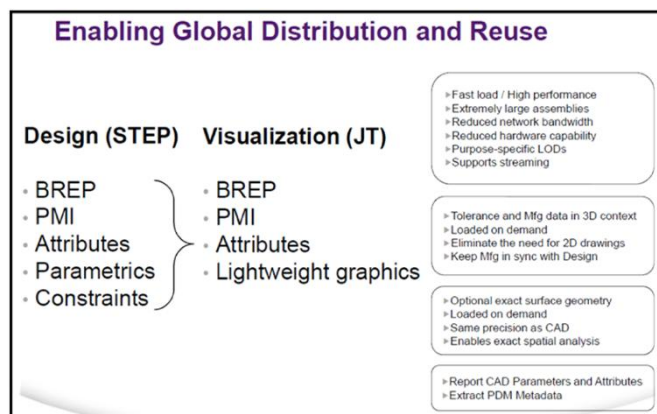
ISO/DIS 14306	
ISO TC184/SC4/WG12 N7311	Date: 2011-06-28
ISO/IS 14306 First Edition	
Industrial automation systems and integration — JT file format specification for 3D visualisation	
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<b>ABSTRACT:</b> ISO 14306 provides the description of the structure and content for a binary file having the extension of .jt. A binary file with the .jt extension is generally referred to as a JT file. The JT format described in this International Standard is used primarily in industrial use cases as the means for capturing and repurposing lightweight 3D product definition data.	
<b>KEYWORDS:</b> lightweight 3D data, advanced compression, visualisation, product structure, product manufacturing information, tessellation, levels of detail, lighting, colors, textures, layers, facet information	
<b>COMMENTS TO READER:</b> This is the first edition of ISO 14306	
<b>Project Leader:</b> Steven Vettermann <b>Address:</b> ProSTEP iViP e.V., Dolivostr. 11 64293 Darmstadt Germany <b>Telephone:</b> +49 (0)6151 9287 405 <b>Telefacsimile:</b> +49 (0)6151 9287 326 <b>Electronic mail:</b> <a href="mailto:Steven.Vettermann@prostep.de">Steven.Vettermann@prostep.de</a>	<b>Project Editor:</b> Johann Habakuk Israel <b>Address:</b> Fraunhofer Institute for Production Systems and Design Technology IPK Pascalstrasse 8-9 10587 Berlin <b>Telephone:</b> +49 (0) 30 39006 109 <b>Telefacsimile:</b> +49 (0) 30 3930 246 <b>Electronic mail:</b> <a href="mailto:johann.habakuk.israel@ipk.fraunhofer.de">johann.habakuk.israel@ipk.fraunhofer.de</a>
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## Resolving concerns of the STEP community

### Concerns in the ISO community with regard to STEP and JT working together had to be resolved

- JT / STEP best practices proposal has been created
- Siemens PLM software worked closely with ITI and ProSTEP iViP on the proposed solution content
- The proposal has been delivered at JT Open Program meetings and the JT Implementer Forum Workshop

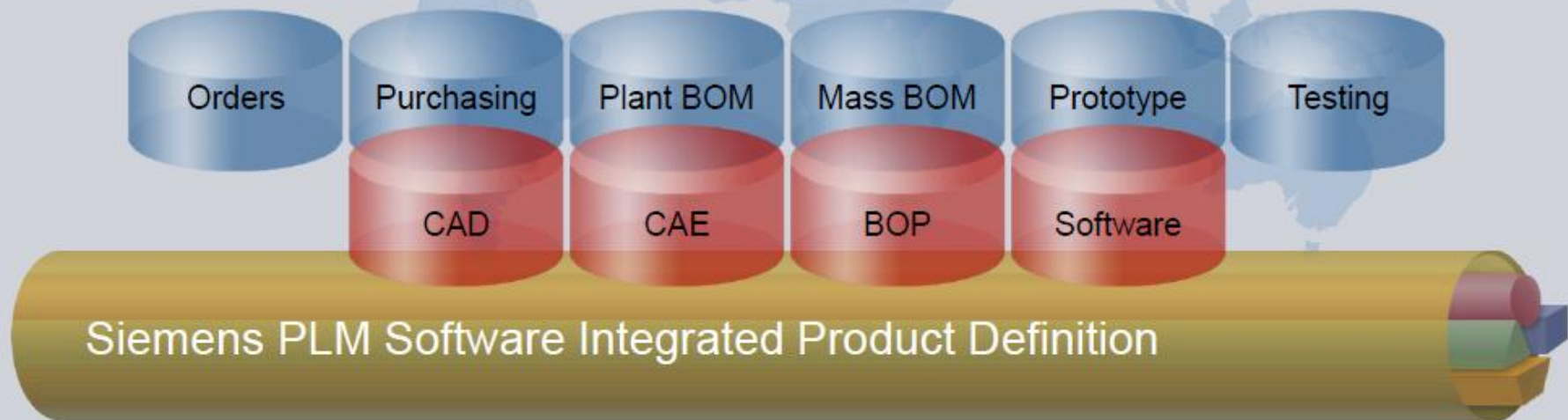


## Siemens PLM is committed to support ISO JT



### Siemens PLM software will support ISO JT with all JT-enabled products

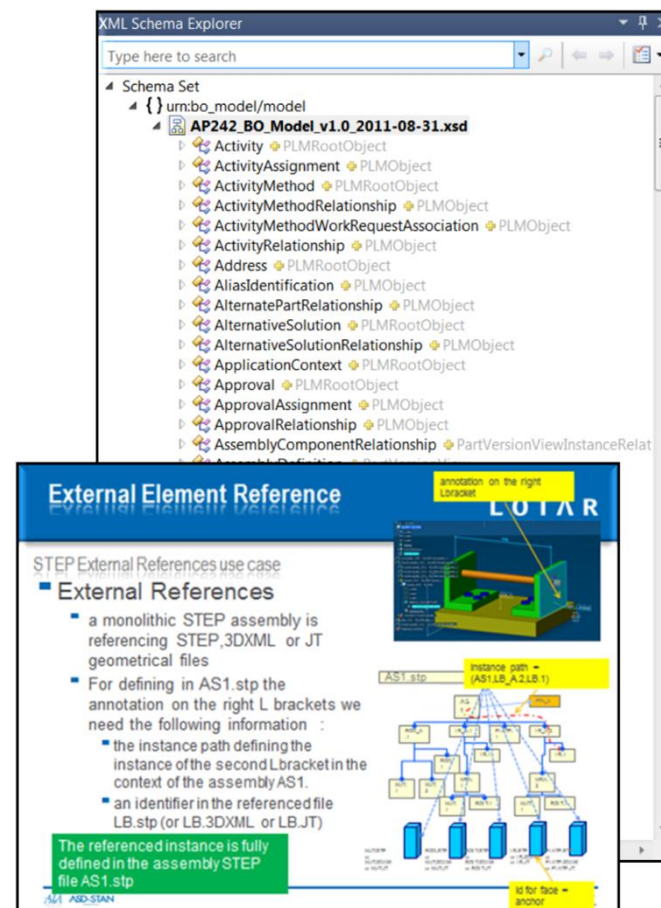
- Support for the V9.5 JT format is now available in released products
- Planning is underway to provide full product support for V9.5 JT



## STEP AP 242 XML and JT

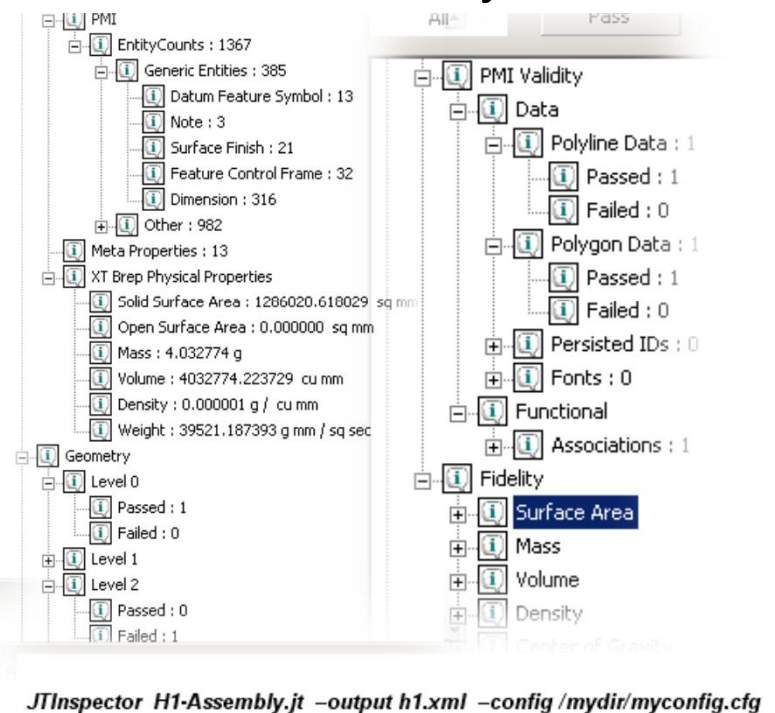
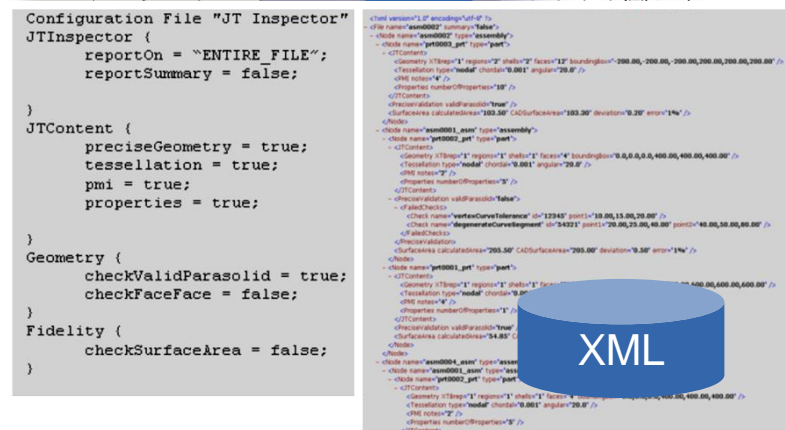
### Siemens will support AP 242 XML + JT

- Examination of AP 242 Business Object Model and PLM XML is being completed to create a quality mapping capability
- The intention is to provide a document that assists users of PLM XML to transition to AP 242 XML+JT
- External element references are a key technology to ensure the success of AP 242 XML + JT
- Siemens is working with the team to define external element references to ensure success



## Validating JT Geometry and PMI with JT Inspector

## Part of Teamcenter Lifecycle Viewer



```
JTInspector H1-Assembly.jt -output h1.xml -config /mydir/myconfig.cfg
```

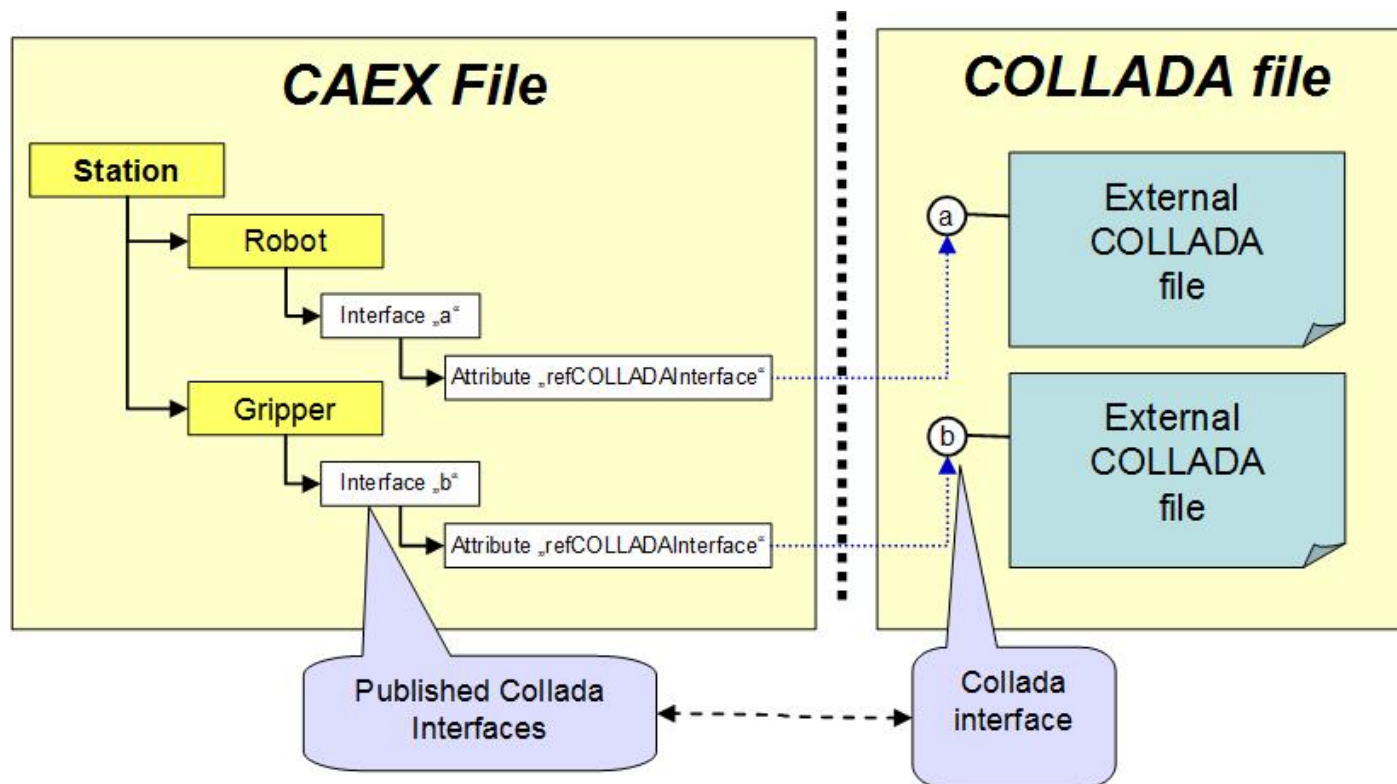


# AutomationML and JT / AP 242 XML

## Possible synergies 1/2

### State of the art: Embedding Collada as external XML document:

- “refURI”: Geometry and kinematics of the object in the Collada-Documents

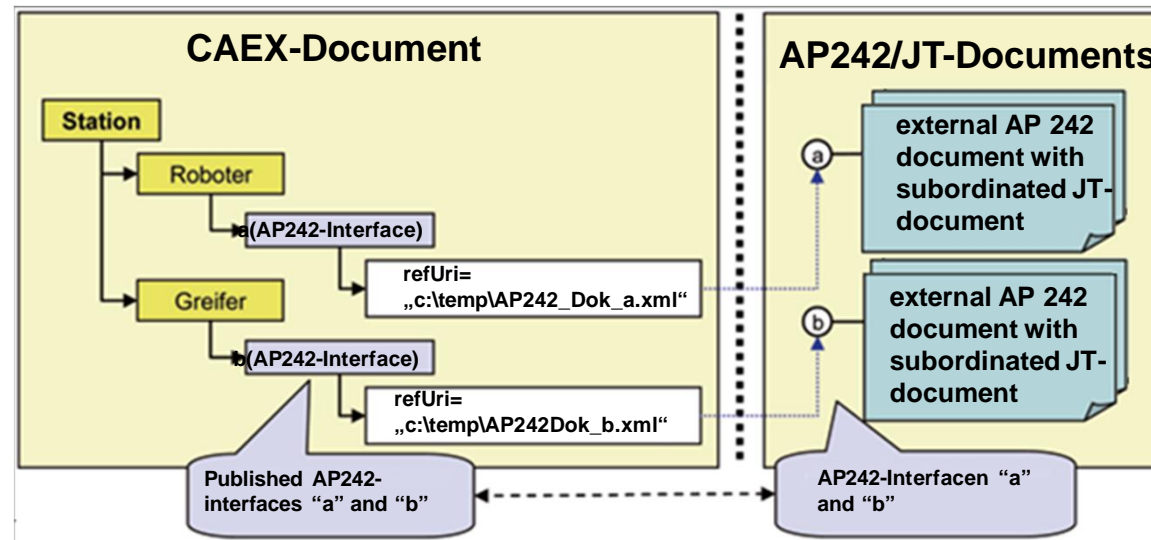


# AutomationML and JT / AP 242 XML

## Possible synergies 2/2

### Possible similar implementation of JT / AP 242 XML:

- “refURI”: XML-based AP 242 document
- From AP 242-dokument to the JT document
- JT documents are kept “light weight” and without kinematics information





# AutomationML and JT / STEP AP 242 XML– Summary and potential for cooperation



## JT / STEP AP 242 XML

- Have a production industry focus (automotive, aerospace)
- Are going to become ISO standards
- Can be integrated via XML
- Can be validated
- Have several community members that are also active in AutomationML

### Next steps:

- Meeting of representatives of both communities until summer 2012
- Discuss and decide about potential cooperation

**Stay tuned for further updates!**