JT Application Benchmark 2022 / 2023

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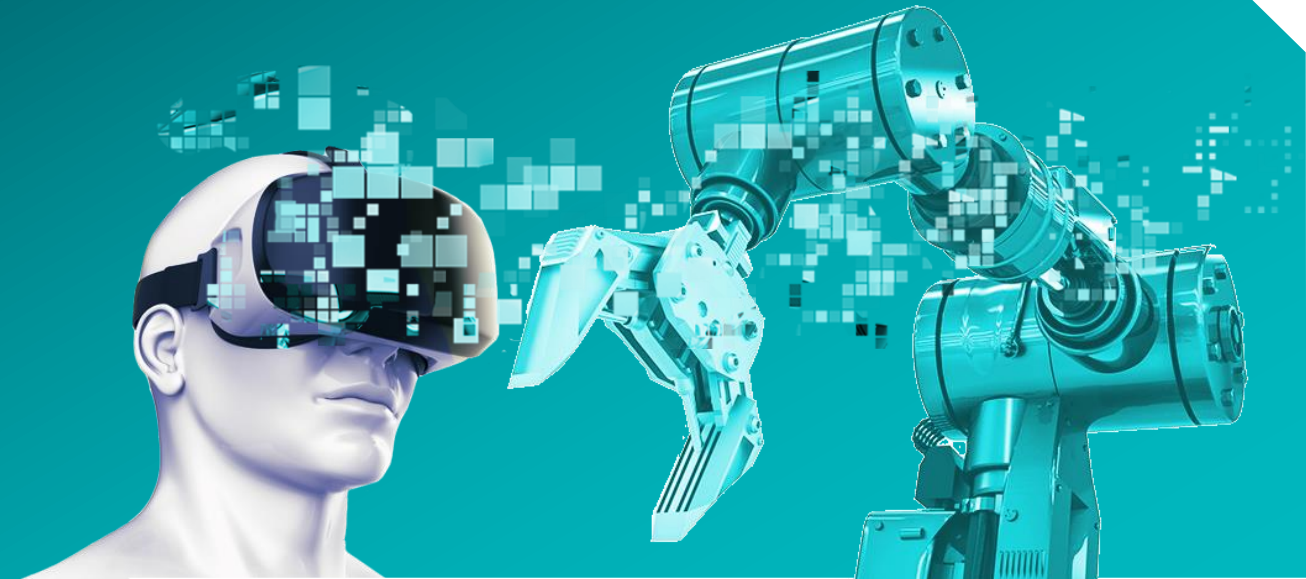

JT DAY

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JT Application Benchmark 2022/23 – Motivation

Since the previous JT Application Benchmark conducted in 2018:

- ➔ **New** versions of the underlying **standards**:
  - prostep ivip JT IAP v3
  - AP242 Edition 3

  } DIN SPEC 91383:2021
- ➔ **New capabilities**:
  - Semantic PMI
  - Validation Properties
  - Kinematic Mechanism
- ➔ **New major releases of JT applications**
  - CAD systems, JT translators, validation tools, viewers

GOAL:
Provide up-to-date neutral assessment showcasing the maturity and interoperability of the JT standard and applications

JT Application Benchmark 2022/23 – Scope & Participants

Test Case A: JT

- Basic (mandatory) scope: Geometry (XT-Brep)
- Extension 1: Semantic PMI
- Extension 2: Validation Properties

Test Case B: AP242 XML + JT

- Basic (mandatory) scope: AP242 XML Assembly Structure + JT Geometry
- Extension 1: Kinematic Mechanism
- Extension 2: Validation Properties

Participants

CORETECHNOLOGIE

ELYSIUM

SIEMENS

T-Systems

THREEDY GmbH

THEOREM SOLUTIONS

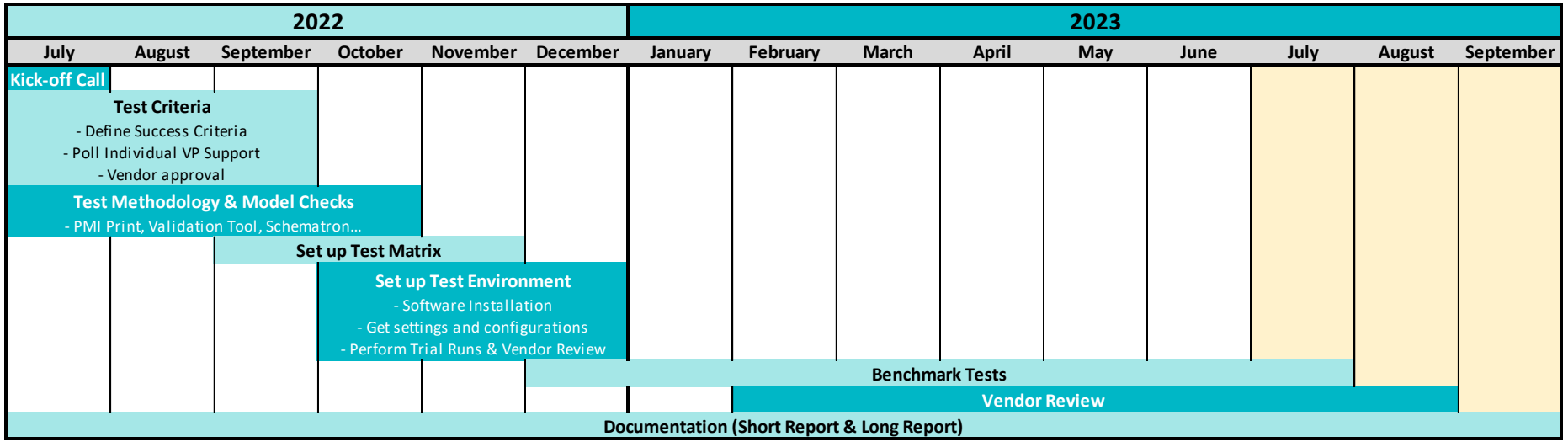
TECHNIA

Model Validation

PROSTEP

Benchmark Execution

JT Application Benchmark 2022/23 – Schedule



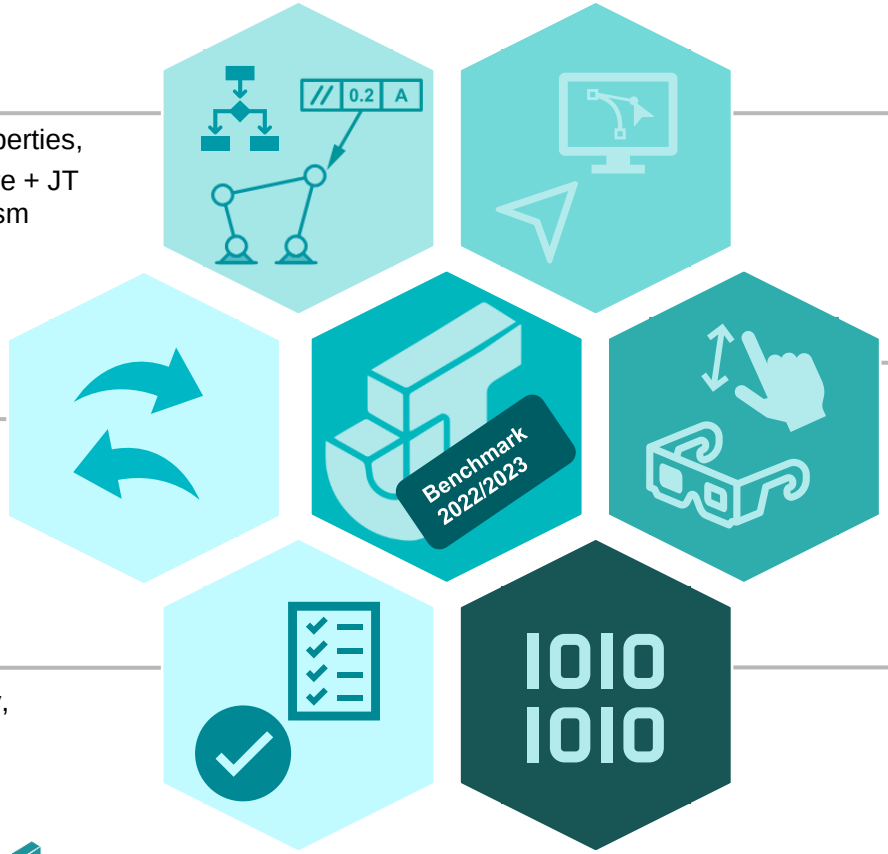
JT Application Benchmark 2022/23 – Overview

Topics

Geometry, PMI, Validation properties,
AP242 XML Assembly Structure + JT Geometry, Kinematic Mechanism

CAD Formats

CATIA V5-6R2022, Creo7, NX2206, 3DExperience



144 JT Exchanges

81 AP242 Exchanges

Consuming Applications

3D Analyzer, JT2Go, Teamcenter Visualization, Threedy instant3Dhub

Check Tools

TECHNIA, Notepad++, XML Spy, PMI Print

Translators

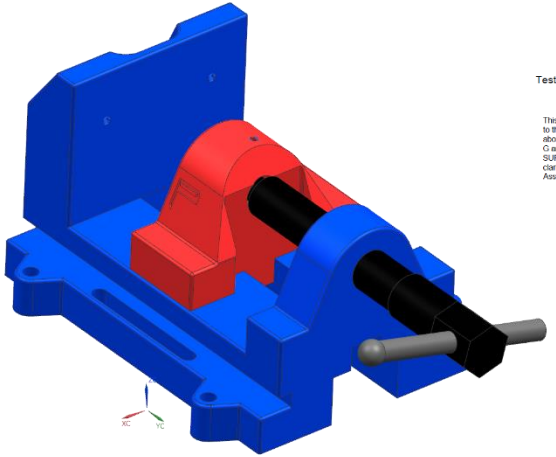
CT CoreTechnologie, Elysium, Siemens, T-Systems, Theorem

Test Case Details: Test case A

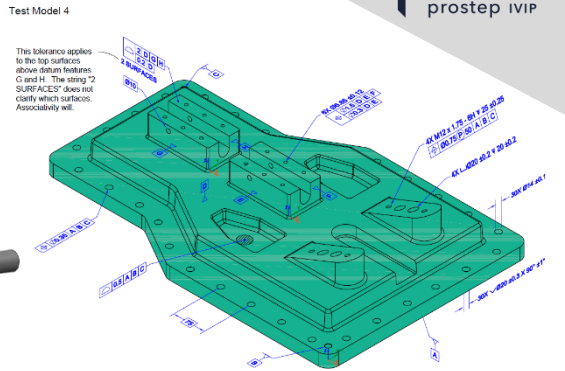
Test models used for this test case:

Criteria tested in this test case:

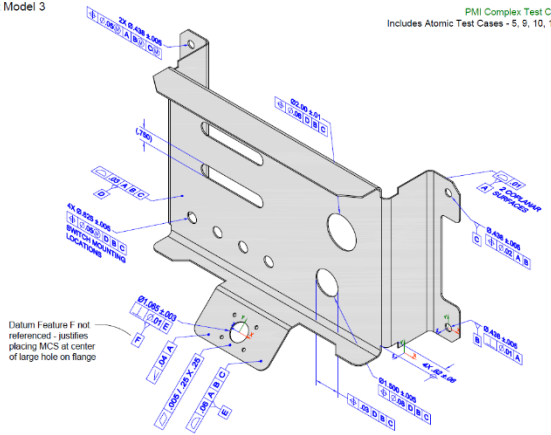
- **Geometry:**
  - Check with check tool, deviation was set to 0.01 mm
- **PMI:**
  - All annotations converted
  - Annotation presentation
  - Model Views: All MVs available
  - Model Views: Correct annotation association
  - Model View: Correct Perspective and Zoom
- **Validation properties:**
  - GVP for Solid and Surface Geometry exist
  - Bounding Box exists
  - Part-level PMI Validation Properties exist
  - View-level PMI Validation Properties exist
  - Calculated Properties exist
  - Element-level PMI Validation Properties exist



Test Model 3



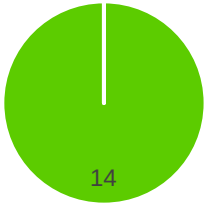
PMI Complex Test Case 4
Includes Atomic Test Cases - 5, 9, 10, 12, 15, 16, 22, 30, 40, 49
Rev D



PMI Complex Test Case 3
Includes Atomic Test Cases - 6, 13, 14, 20, 27, 32, 36, 39, 45, 46
Rev C

Detailed Results Test Case A, CAD → JT-Export

Geometry



PMI

All annotations converted

Annotation presentation

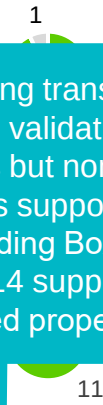
Model views: All MVs available

Model Views: Correct annotation association

Model View: Correct Perspective and Zoom

Validation Properties

GVP for Solid and Surface Geometry exist



Bounding Box exist

All exporting translators supported validation properties but none of the translators supports the VP „Bounding Box“, and only 1 of 14 supports “Calculated properties”

View-level PMI Validation Properties exist

Calculated Properties exist

Element-level PMI Validation Properties

Legend: OK Failed Not supported/tested

Detailed Results Test case A, JT → CAD/Consuming Application Import

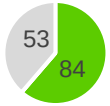
Geometry

Legend:

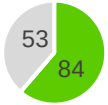
OK Failed Not supported/tested

PMI

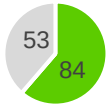
All annotations converted



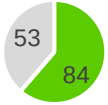
Annotation presentation



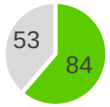
Model Views: All MVs available



Model Views: Correct annotation association



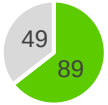
Model View: Correct Perspective and Zoom



Not all participants took part in the import of semantic PMI or validation properties

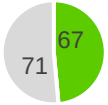
Validation Properties

GVP for Solid and Surface Geometry exist

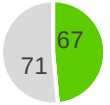


Bounding Box exist

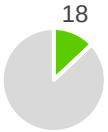
Part-level PMI Validation Properties exist



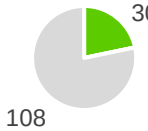
View-level PMI Validation Properties exist



Calculated Properties exist

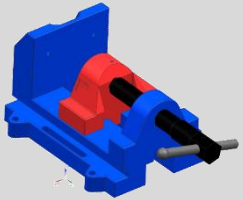


Element-level PMI Validation Properties



Results Summary Test case A

Geometry



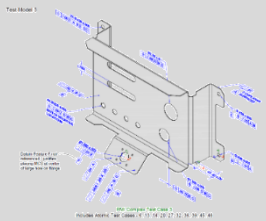
Functionalities tested:
- Geometry

Overall Success Rate:

100%

Participation:
- JT converter: 14
- CAD/JT Imports: 138

PMI



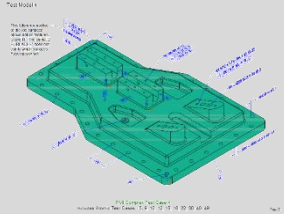
Functionalities tested:
- PMI completeness
- PMI visualization
- Model Views

Overall Success Rate:

100%

Participation:
- JT converter: 14
- CAD/JT Imports: 85

Validation Properties



Functionalities tested:
- Validation properties completeness per category

Overall Success Rate:

100%

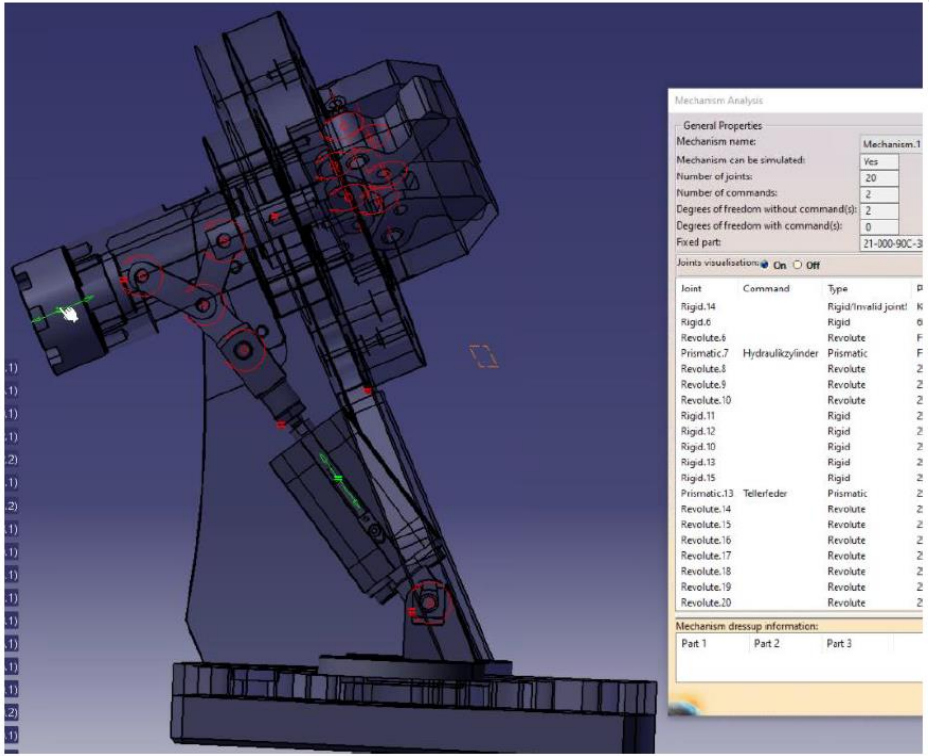
Participation:
- JT converter: 13
- CAD/JT Imports: 88

Test case Details: Test case B

Test model used for this test case:

Criteria tested in this test case:

- **STEP AP242 Assembly Structure:**
  - Equivalent Assembly Structure
  - Transformation of components
  - Instantiation of components
- **Kinematics:**
  - Kinematic Mechanism Association exist
  - Kinematic Link exist
  - Kinematic Pair exist
  - Mechanism exist
- **Validation properties:**
  - Number of children
  - Notional solids centroid
  - Number of kinematic mechanism
  - Number of kinematic pairs per mechanism
  - Number of moving parts per mechanism
  - Number of kinematic pairs for each kind of kinematic pair



Detailed Results Test Case B, CAD → JT + AP242 XML Export

AP242 Assembly Structure

Schema conformity

Equivalent Assembly Structure

Instantiation of Components

Transformation of Components

Legend: OK Failed Not supported/tested

Kinematics

Kinematic mechanism with kinematic pairs & links

Kinematic actuation

Kinematic Link to Occurence Association on assembly level

Kinematic Link to Occurence Association on part level

Kinematic Link to occurence Asssociation on single occurence

Not all translators participated in the extension kinematic, 4 of 10 systems participated in this test case extension

Validation Properties

Number of children

Notional solids centroid

Number of Kinematic Mechanism

Number of Kinematic Pairs per Mechanism

Number of Moving Parts per Mechanism

Number of Actuations per Mechanism

Number of Kinematic Pairs for each kind of Kinematic Pair

Detailed Results Test Case B, JT + AP242 XML → CAD/Consuming Application Import

Assembly Structure

Equivalent Assembly Structure

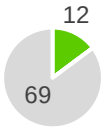
Transformation of Components

Instantiation of Components

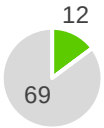
Legend: ▪ OK ▪ Failed ▪ Not supported/tested

Kinematics

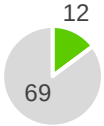
Kinematic Mechanism Association exist



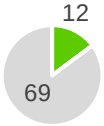
Kinematic Link exist



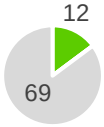
Kinematic Pair exist



Low Order Kinematic Pair exist



Mechanism exist



12 of 81 imports included evaluation of the Kinematics

Validation Properties

Number of Kinematic Mechanism

Notional solids centroid

Number of Kinematic Pairs per Mechanism

Number of children

Number of Moving Parts per Mechanism

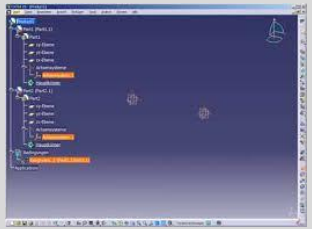
Number of Actuations per Mechanism

Number of Kinematic Pairs for each kind of Kinematic Pair

46 of 81 imports evaluated the Validation Properties

Results Summary Test Case B

Assembly Structure



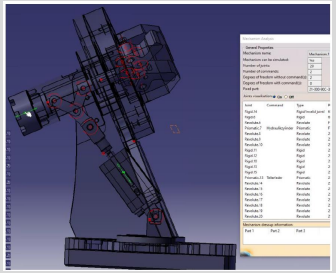
Functionalities tested:
- Equivalent assembly structure

Overall Success Rate:

100%

Participation:
- JT translators: 10
- CAD/JT Imports: 81

Kinematics



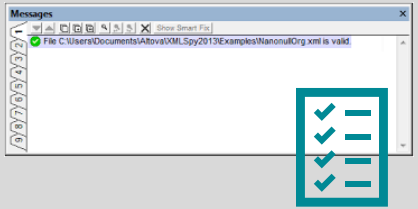
Functionalities tested:
- Kinematics completeness

Overall Success Rate:

100%

Participation:
- JT translators: 4
- CAD/JT Imports: 12

Validation properties



Functionalities tested:
- Validation properties completeness per category

Overall Success Rate:

100%

Participation:
- JT translators: 9
- CAD/JT Imports: 46

JT Application Benchmark Reports

Short Report

- Publicly available
- High-Level Summary

Long Report

- Exclusively for prostep ivip / VDA members
- Detailed Results

The reports have been finalized and handed over to prostep ivip for review and layout

→ Publication before end of 2023

JT Application Benchmark 2022/23 – Conclusions

The **high level of JT data exchange quality** seen in JT Implementor Forum test rounds **was confirmed independently**, using production versions of the involved tools.

→ JT, and the interfaces available for it, provide a **robust and reliable foundation** for 3D-oriented processes.

Kinematic Mechanism sets things in motion.

→ The concept has been proven. The **initial scope** covering basic joint types **can be exchanged successfully** with AP242 XML + JT.

→ First commercial solutions will become generally available in 2024.

Validation Properties have arrived in JT.

→ The proven concept has been successfully carried over to JT.

→ The growing tool support will **increase the robustness** of JT-based processes.

JT Application Benchmark – Outlook

When does the next Benchmark take place?

- **New** versions of the relevant **standards** are available and supported
  - JT Version 10.x
  - AP242 Edition 4 planned for end of 2024
- **New and extended capabilities** are implemented
  - Assembly-level PMI
  - Advanced Kinematic Mechanism
  - Broader range of Validation Properties
- Sufficient **enhancements in JT Applications**

➔ **Evaluation end of 2024 for a possible next Benchmark 2025/26**

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Thank you for your Attention

Questions?

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