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Rollout of a JT Based Process Chain

ProSTEP iViP Symposium 2009

Berlin

Dr. Andreas Queckenberg

Daimler AG

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1.) Goals and Requirements

2.) Status

3.) Next Steps

4.) Conclusion

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History: from visualization to process data format

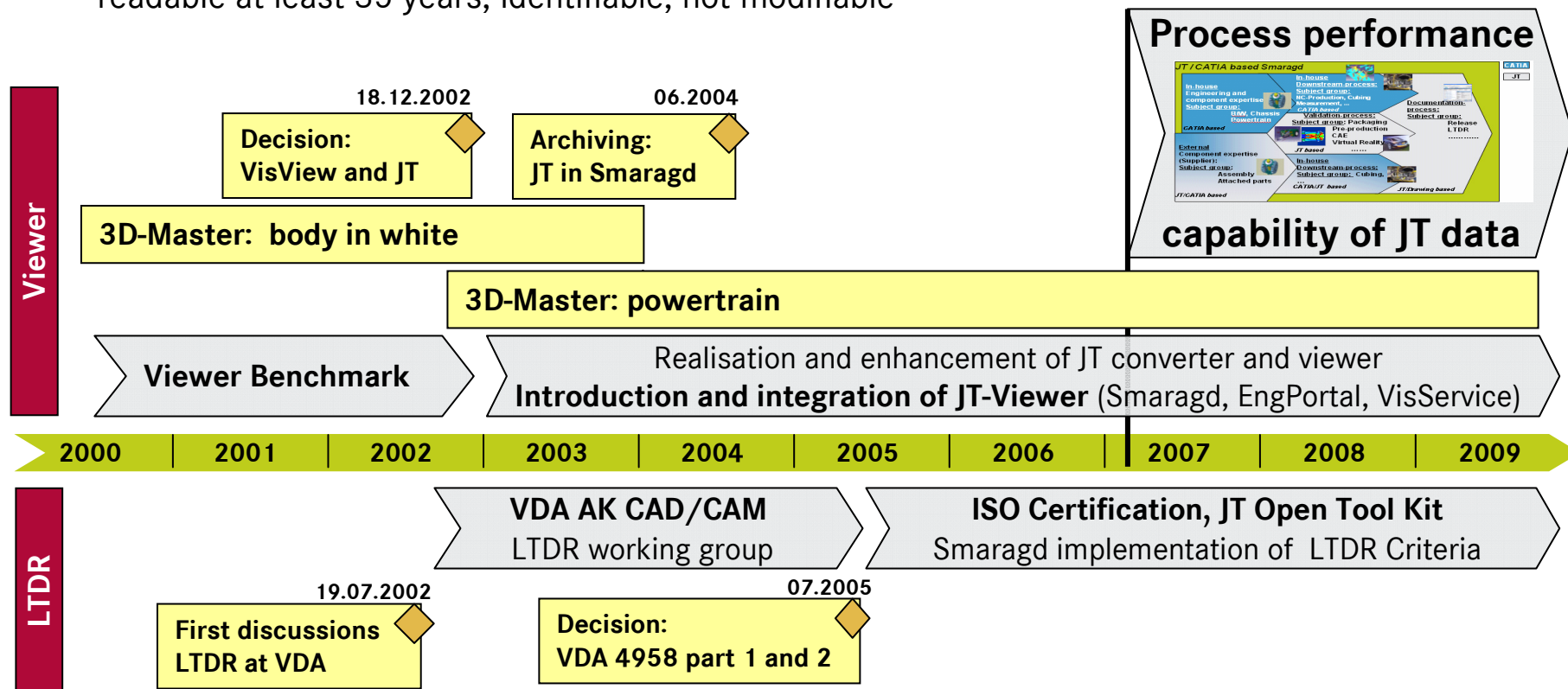**Starting point: 3D-Master project, replacement of 2D drawings**

⇨ **3D visualization especially for downstream processes**

low-end: pure geometry, simple handling, high-performance, inexpensive

high-end: geometry with all 3D-Master information (e.g. tolerances, material, ...)

⇨ **3D data retention for release process and product liability**

readable at least 35 years, identifiable, not modifiable

Process performance

capability of JT data

Viewer

18.12.2002

Decision: VisView and JT

06.2004

Archiving: JT in Smaragd

3D-Master: body in white

3D-Master: powertrain

| Viewer Benchmark | Realisation and enhancement of JT converter and viewer **Introduction and integration of JT-Viewer** (Smaragd, EngPortal, VisService) |

| 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |

VDA AK CAD/CAM
LTDR working group

ISO Certification, JT Open Tool Kit
Smaragd implementation of LTDR Criteria

LTDR

19.07.2002

First discussions LTDR at VDA

07.2005

Decision: VDA 4958 part 1 and 2

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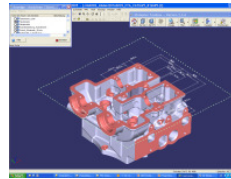# Business requirements of a JT based process chain
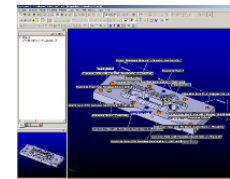
Key JT Use Cases
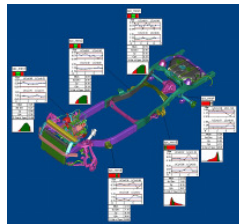

JT -> Virtual Reality

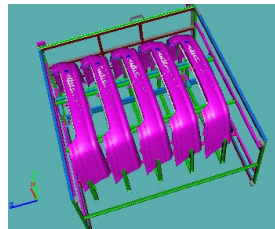Supplier Integration
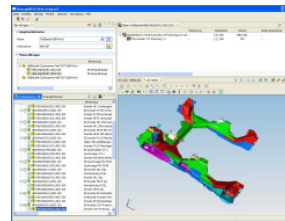

3D-Master Powertrain

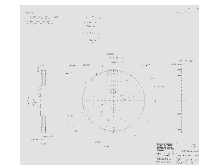Digital Manufacturing

Examples of Daimler Processes using JT
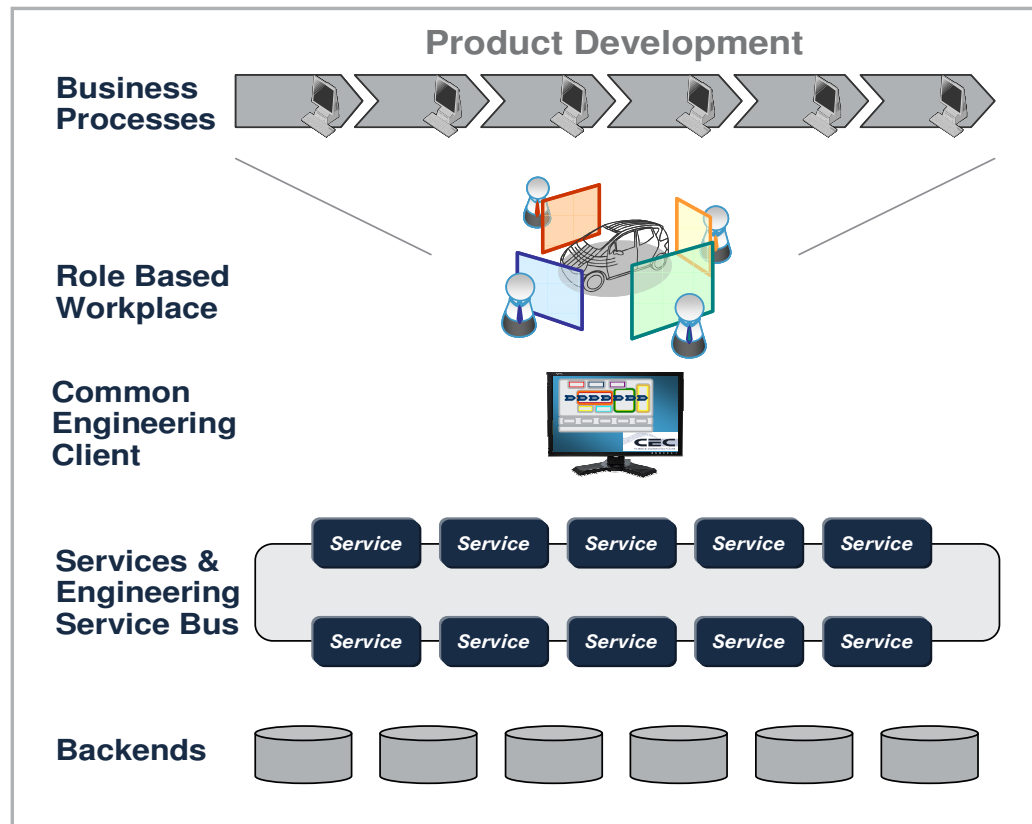

Tolerance Analysis

Logistic Planning

JT-based DMU process

LTDR

‣ Make 3D product data available in many business processes

‣ Reduction of expensive CAD licenses

‣ Allow suppliers to freely select CAD system, data exchange based on JT

Technical concept of a JT based process chain

- ‣ **Deliver JT based services to various applications and users**
- ‣ **Support role based workplaces of the "Common Engineering Client" (CEC)**
- ‣ **Ensure the availability of an open CAD and PDM architecture including APIs**

JT file format reference completeness & openness

Validation of Reference Documents for the JT File Format

Department of Computer Integrated Design
Faculty of Mechanical Engineering
Technische Universität Darmstadt

Head: Prof. Dr.-Ing. R. Anderl

Petersenstraße 30
D-64287 Darmstadt
Germany

- Well organized documentation
- Chapters 3 and 4 help understand the document
- Tests passed
- Expressed goals of chapter 2 have been achieved

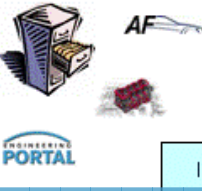→ JT File Format Reference Version 8.1 can be attested to be complete

Conclusion

Why does JT have to be open?

Lightweight visualization and 3D model characterization

Field of application:
- Long term archiving
- EngPortal
- 3D-Master
- Virtual Reality

Important Daimler strategy

Summary: JT is open

Results of the JT - evaluation:

Definition for openness:
- A correct, readable format specification

Method to test this:
- Develop readers for all relevant objects in JT (Geometry, PMI, B-Reps, Topology,...), JT Version 8.1
  Remark: Usage of Siemens API was not allowed in this study !!

Done by:
- Melanie Stiller, HdM Stuttgart, Diploma Theses 2008 (Computer Science and Media)
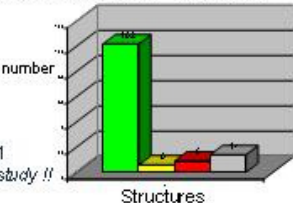
Result:
- 79,7% off all JT Objects are fully open 2/2008
- 4,7% of the issues are minor deficits but not important for openness
- 7% Remaining issues are corrected in RevB of file format reference provided Mar-30 2008

Next steps:
- Completion and correction of syntax and semantic in the specification
- Publication of Revision B of JT File Format Specification by Siemens

- current show stoppers for openness
- correct structures
- minor deficits
- not important structures

All open JT documentation issues are corrected and described by Siemens PLM
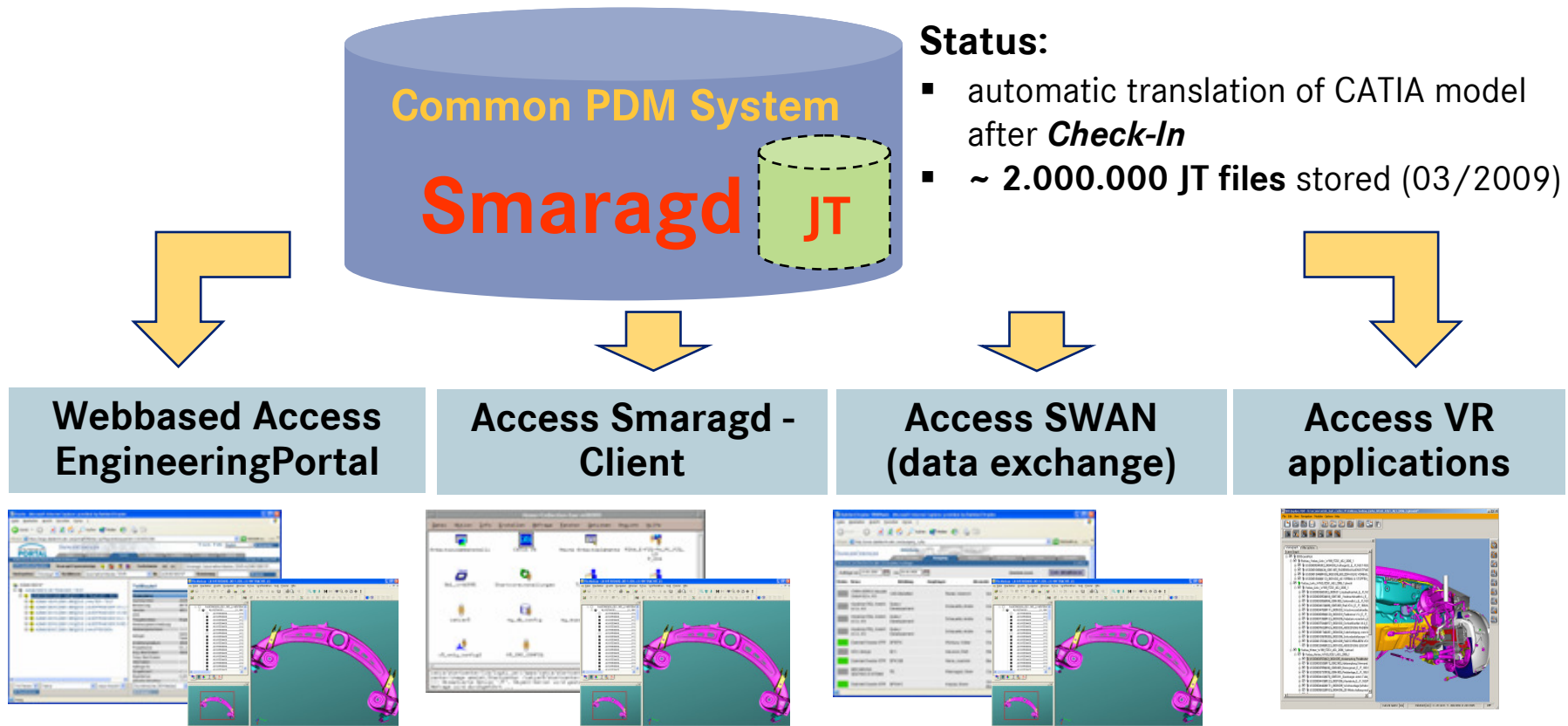**JT as a file format is open**

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Central Storage of JT Data – A Key Success Factor

Common PDM System

Smaragd JT

Status:
- automatic translation of CATIA model after *Check-In*
- ~ **2.000.000 JT files** stored (03/2009)

| Webbased Access EngineeringPortal	Access Smaragd - Client	Access SWAN (data exchange)	Access VR applications

▶ JT data is stored in the PDM system Smaragd accessible for all use cases.

Usage of JT Visualization with Engineering Portal

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 # active, different users
(at least one visualization / month)
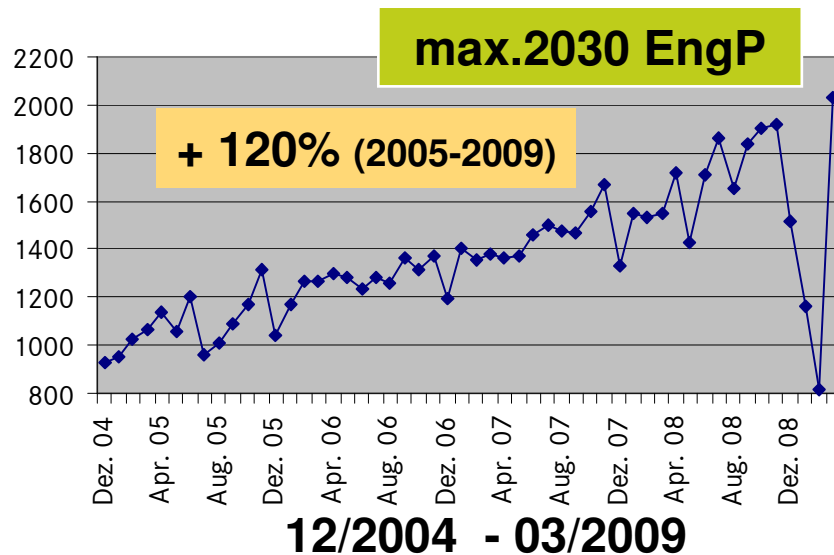
 # calls "visualization"
(user calls function "visualization")

max.2030 EngP

+ 120% (2005-2009)

12/2004 - 03/2009

max. 38368
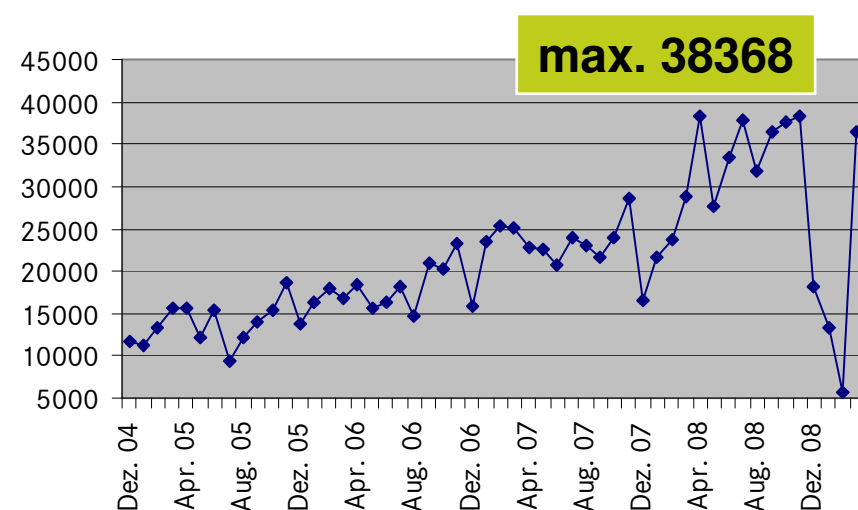
Remark: the total number is at least 50% higher if we add the JT users working in Smaragd
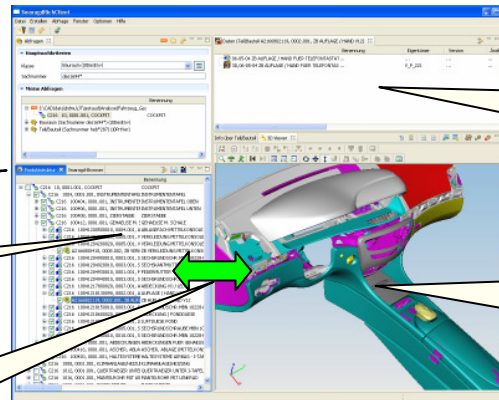
▶ **We have more than 3000 JT Users at Daimler today**
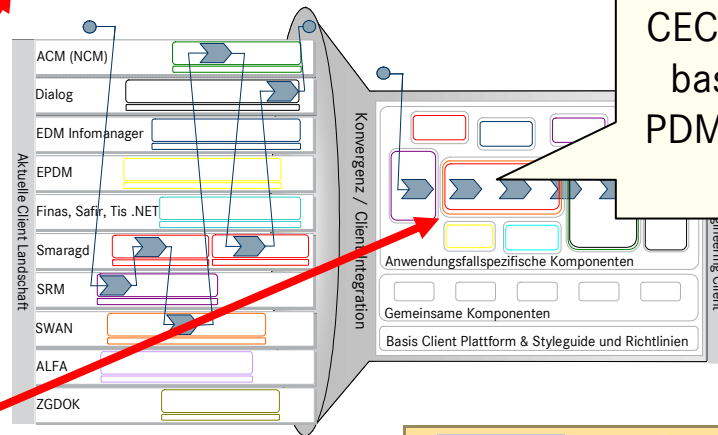
SOA Rollout

Engineering Client 8.2

Product structure and E-BOM

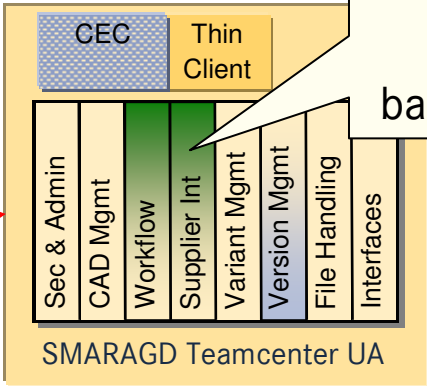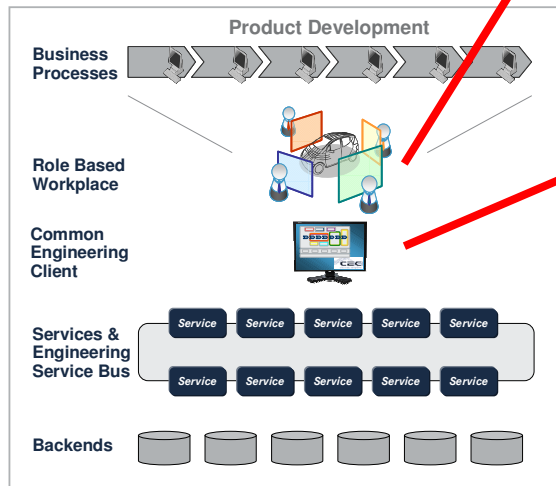Full interoperability between product structure and geometry

context sensitive part information

JT visualization and DMU functionality

CEC 9.2 will support role based work places for PDM, DMU, CM and data exchange

Orchestration of "home grown" and TC UA backend services

Aktuelle Client Landschaft

- ACM (NCM)
- Dialog
- EDM Infomanager
- EPDM
- Finas, Safir, Tis .NET
- Smaragd
- SRM
- SWAN
- ALFA
- ZGDOK

Konvergenz / Client Integration

Anwendungsfallspezifische Komponenten

Gemeinsame Komponenten

Basis Client Plattform & Styleguide und Richtlinien

Product Development

- Business Processes
- Role Based Workplace
- Common Engineering Client
- Services & Engineering Service Bus
  - Service Service Service Service Service
  - Service Service Service Service Service
- Backends

CEC | Thin Client

SMARAGD Teamcenter UA

Sec & Admin | CAD Mgmt | Workflow | Supplier Int | Variant Mgmt | Version Mgmt | File Handling | Interfaces
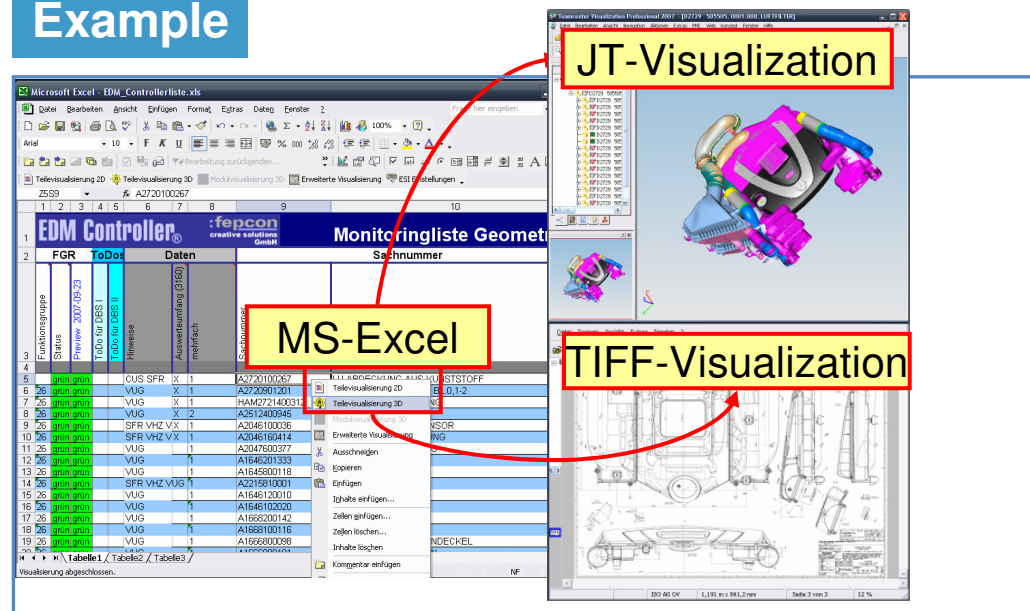
Visualization Service

Business Case

Provide an easy to use button in all relevant Daimler applications to visualize parts

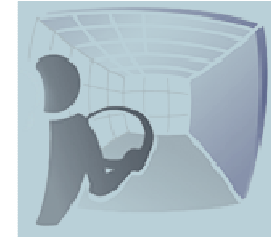## Service Oriented Architecture
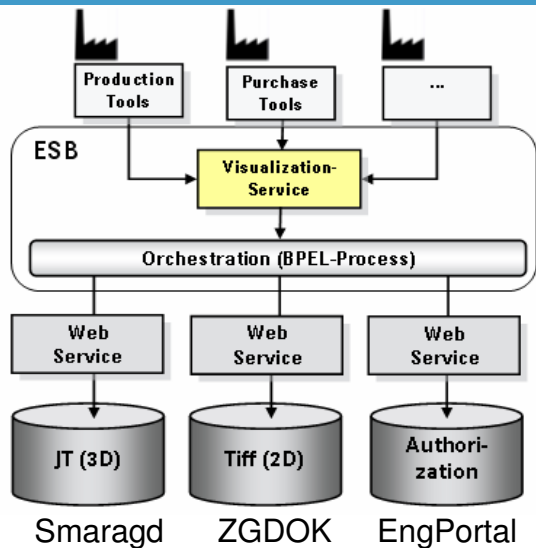
Example

Usage

- Rollout started
- Planned usage: > 1000 Users in Development, After Sales, Production, Purchase, ... in many applications)
- Uses exist. IT infrastructure and applications
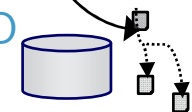
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JT for Virtual Reality

JT Use Cases at Daimler

- 3D-Master body in white
- 3D-Master powertrain
- **Virtual Reality**
- JT data exchange
- Project LTDR
- Logistics
- Tolerance analysis
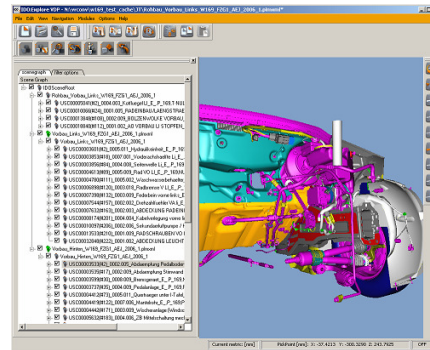- Prototype Manufacturing
- After Sales (GSP)

JT-Dataset

Smaragd JT

SMD

VR-Session

2. Scene preparation in IDO:Prepare

1. Data supply   **3.** Evaluation in VR-3D-Space (e.g. Cave or Powerwall)

▶
- Cost + time reduction by using centrally provided visual. data
- Possibility to use additional manufacturing information, e.g. as constraints for virtual packaging investigations
- Next: using VisMockup for preparing VR-Sessions on user workplace

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JT-based Shipping Note in SWAN

SWAN

JT Use Cases at Daimler

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- 3D-Master powertrain
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- Project LTDR
- Logistics
- Tolerance analysis
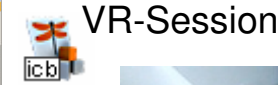- Prototype Manufacturing
- After Sales (GSP)

Supplier

Daimler

SWAN Server

CATIA-Data

CATIA-Data

JT-Translation

JT-based Shipping Note

▶ **Quick and easy checks of incoming supplier data**
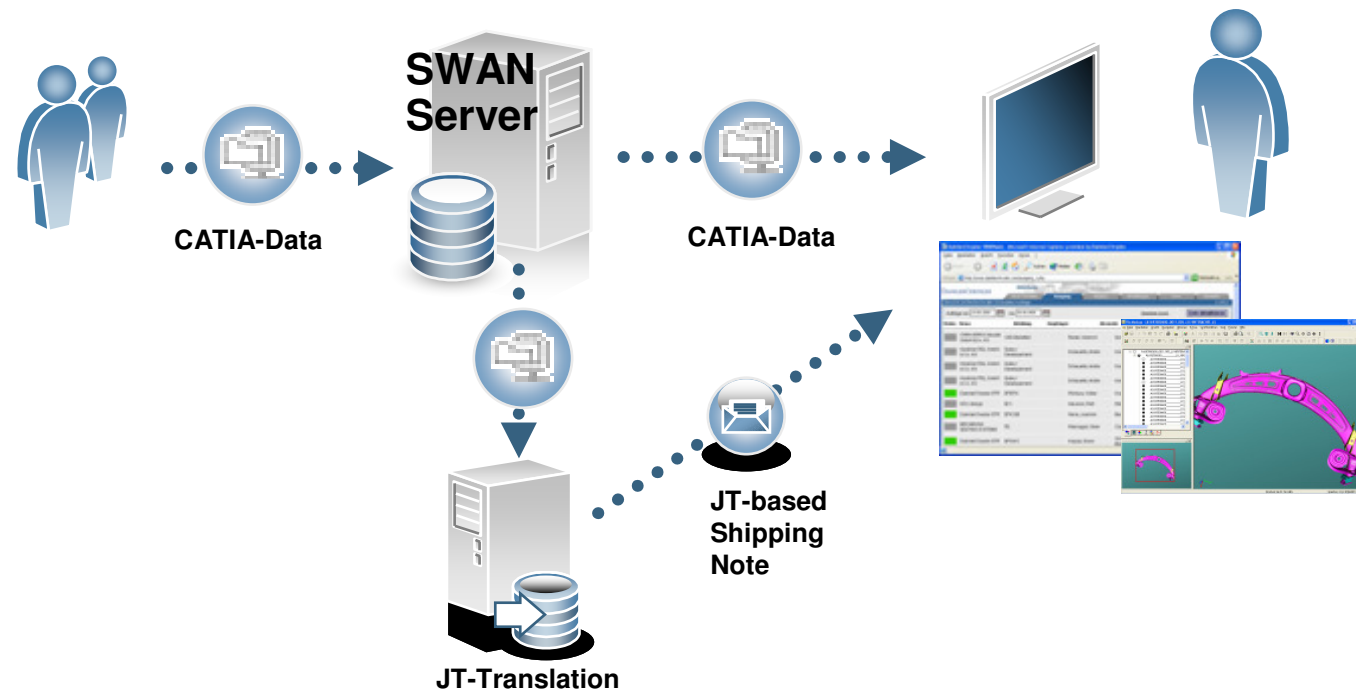
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Logistics

JT Use Cases at Daimler

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- **Logistics**
- Tolerance analysis
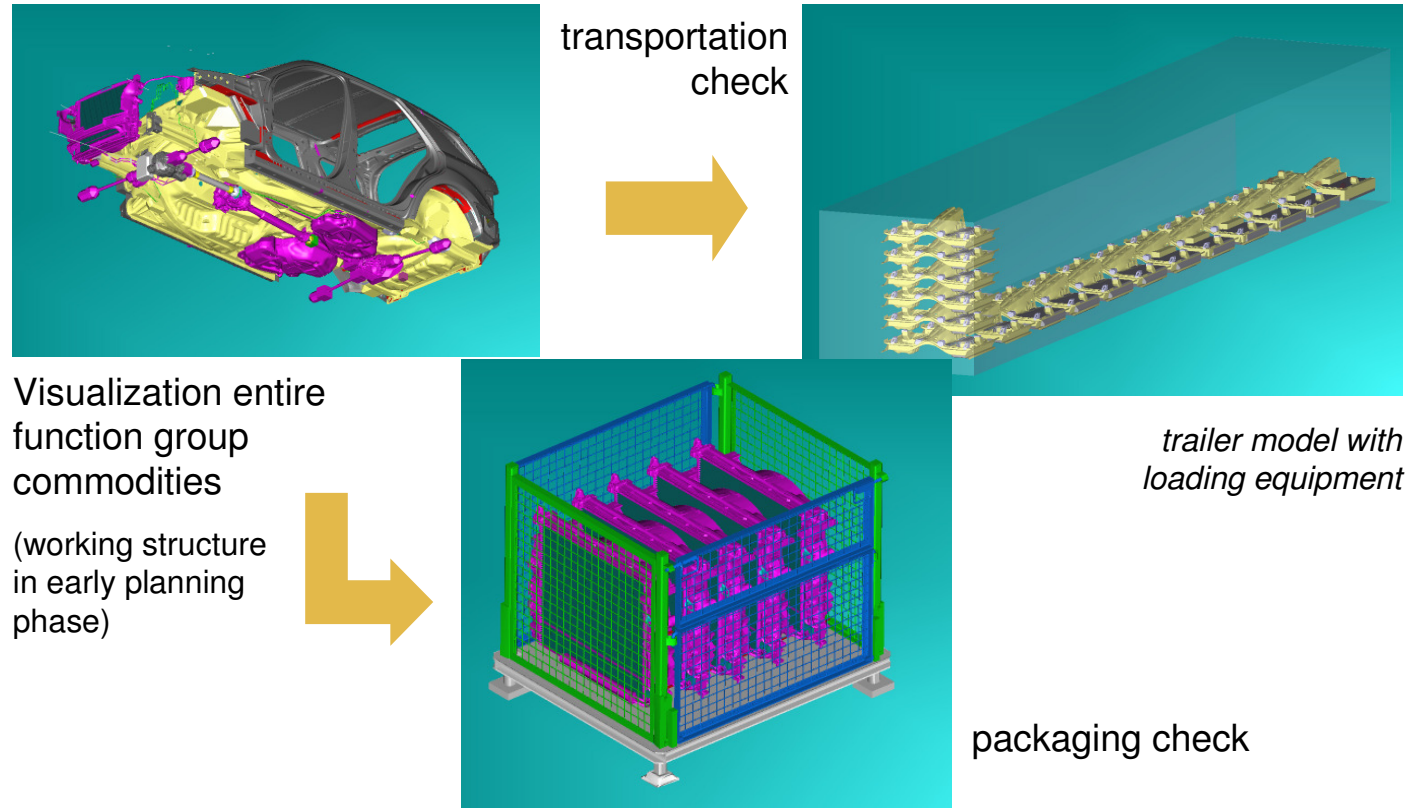- Prototype Manufacturing
- After Sales (GSP)

transportation check

trailer model with loading equipment

Visualization entire function group commodities

(working structure in early planning phase)

packaging check

▶ **Quick and easy checks for early logistic planning phase**

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Tolerance Analysis with VisVSA

JT Use Cases at Daimler

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- Virtual Reality
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- Project LTDR
- Logistics
- **Tolerance analysis**
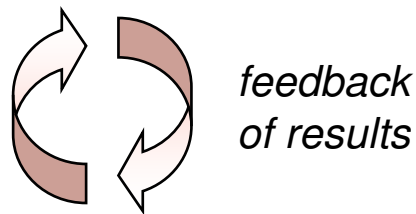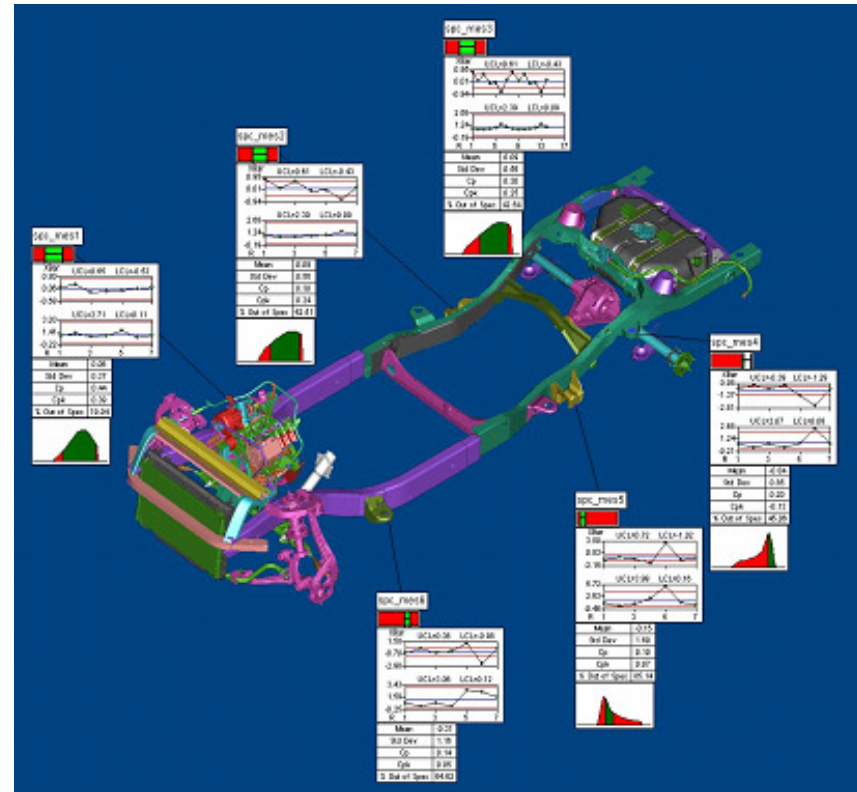- Prototype Manufacturing
- After Sales (GSP)

Validation of construction feasibility by **simulation of component tolerances** taking manufacturing and process effects into account.

feedback of results

Designer **optimizes virtual prototype** to meet tolerance criteria.

Example: Statistical distribution of tolerances

▶ **Part optimization 9 months before manufacturing of prototype parts.**
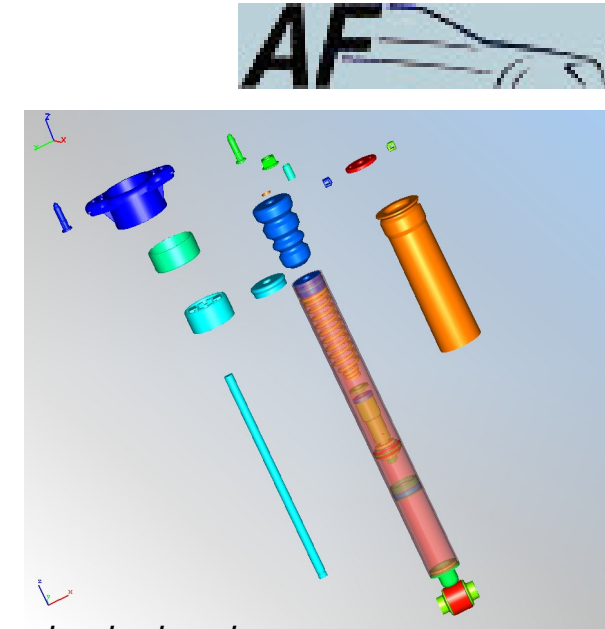
Prototype Manufacturing

JT Use Cases at Daimler

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- **Prototype Manufacturing**
- After Sales (GSP)
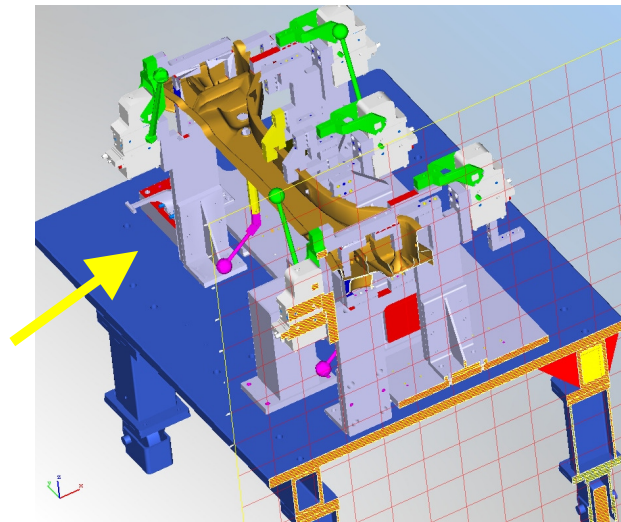
shock absorber

Support for Fixture Validation

- Visualization of assemblies
- Tracing of changes, delta comparisons

Component Validation in Assembly Process

- Analysis tasks e.g. measurement, section cuts, explosion view, procedure documentation for shop floor, …
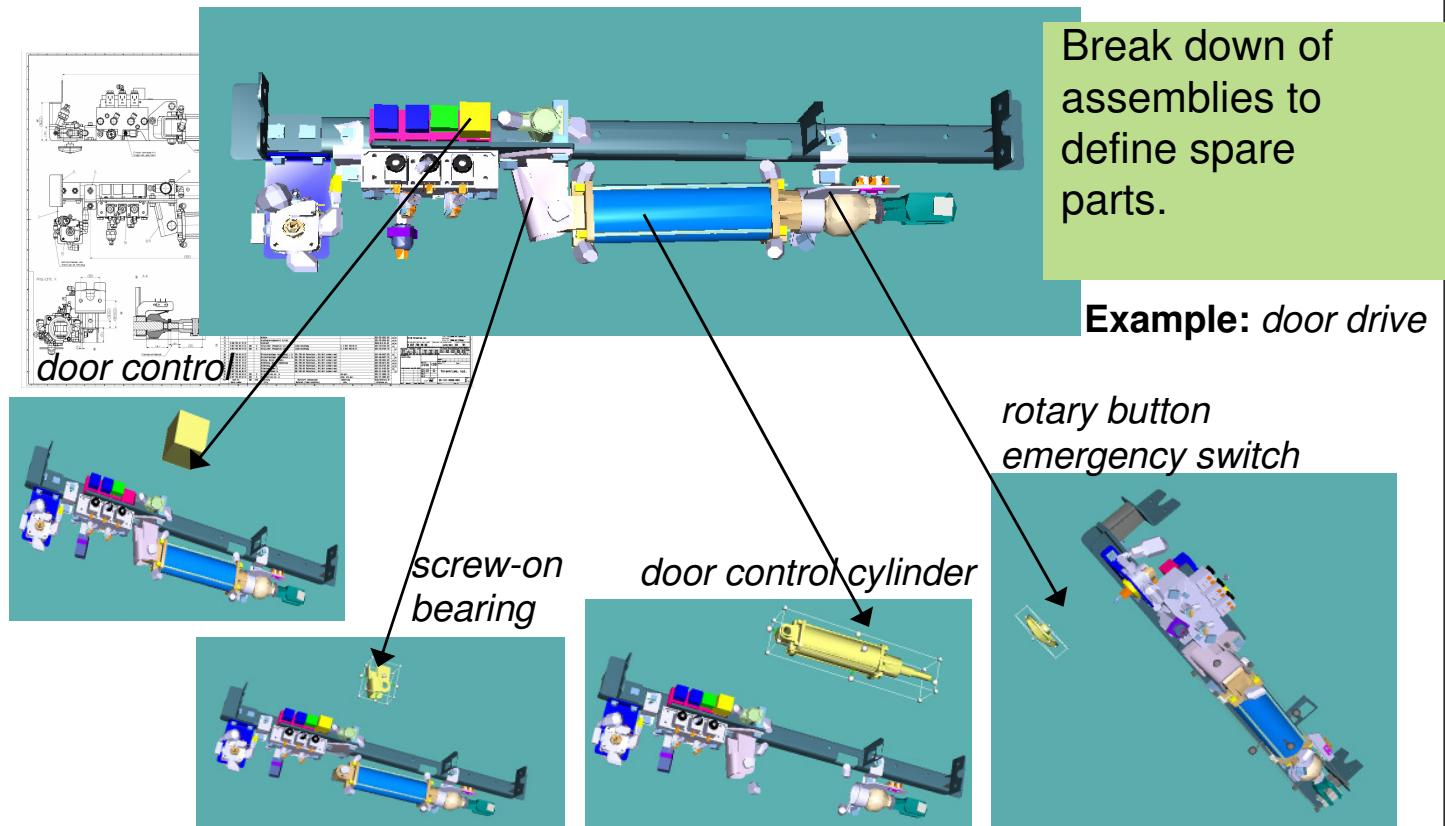
▶ **Fast and simple analysis of CAD data in Smaragd**

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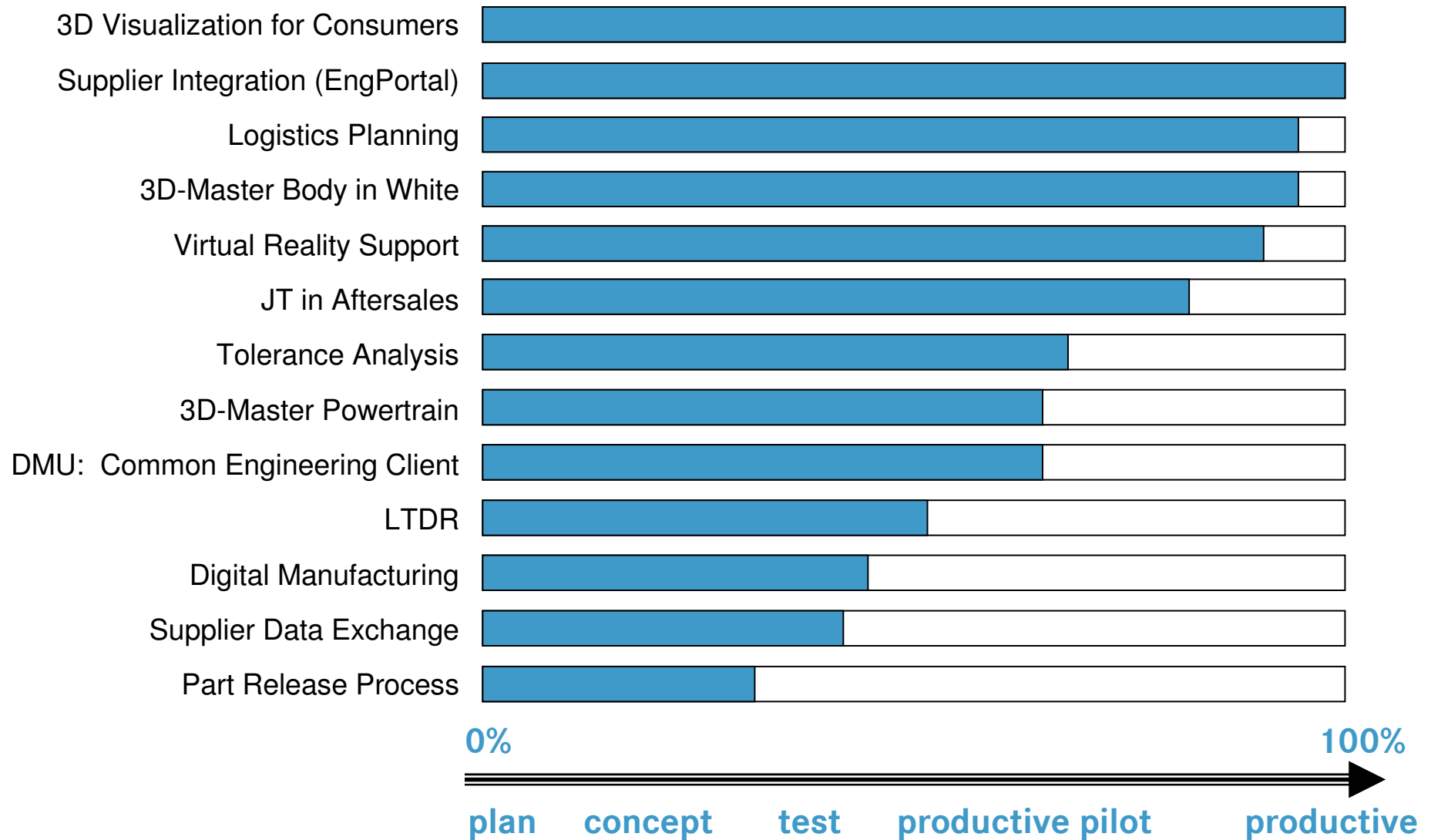## After Sales (Global Services & Parts)

JT Use Cases at Daimler

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- Virtual Reality
- JT data exchange
- Project LTDR
- Logistics
- Tolerance analysis
- Prototype Manufacturing
- After Sales (GSP)

Break down of assemblies to define spare parts.

Example: *door drive*

door control

rotary button emergency switch

screw-on bearing

door control cylinder

▶ **Spare parts determination w/o need for prototype parts or 2D drawings.**

Current Status JT Use Cases

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3D Visualization for Consumers

Supplier Integration (EngPortal)

Logistics Planning

3D-Master Body in White

Virtual Reality Support

JT in Aftersales

Tolerance Analysis

3D-Master Powertrain

DMU: Common Engineering Client

LTDR

Digital Manufacturing

Supplier Data Exchange

Part Release Process

0%   100%

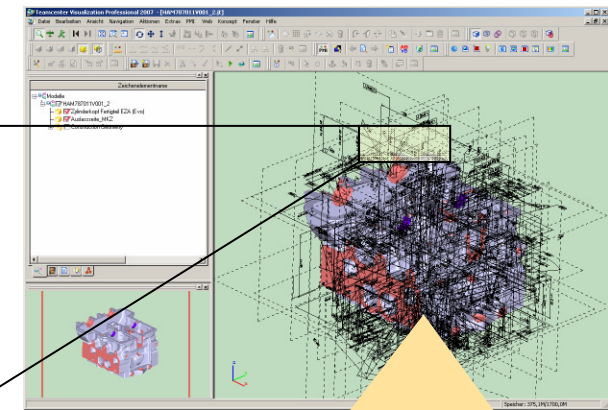plan   concept   test   productive pilot   productive
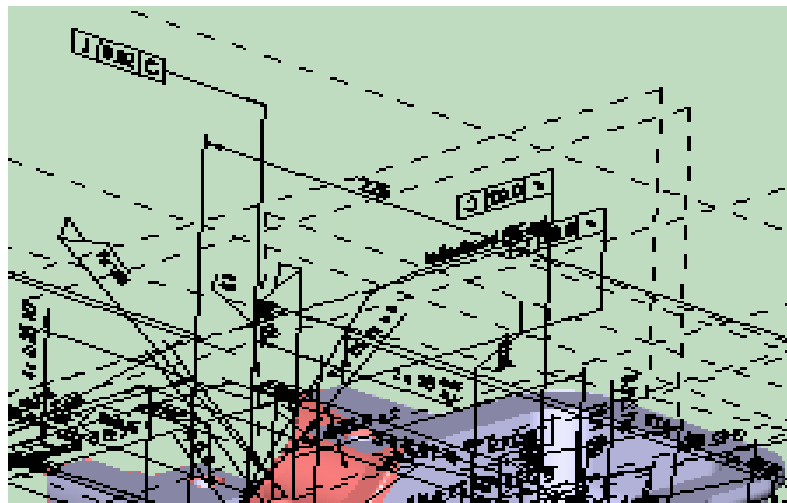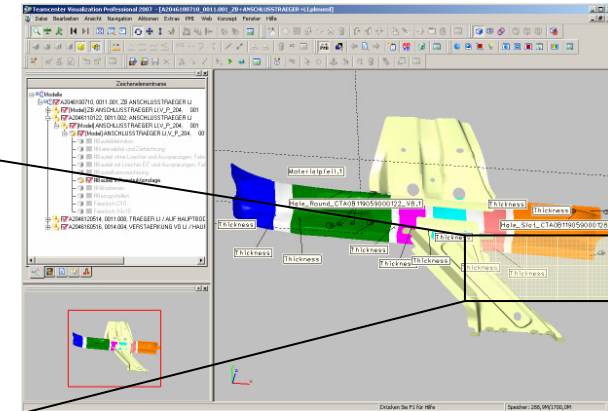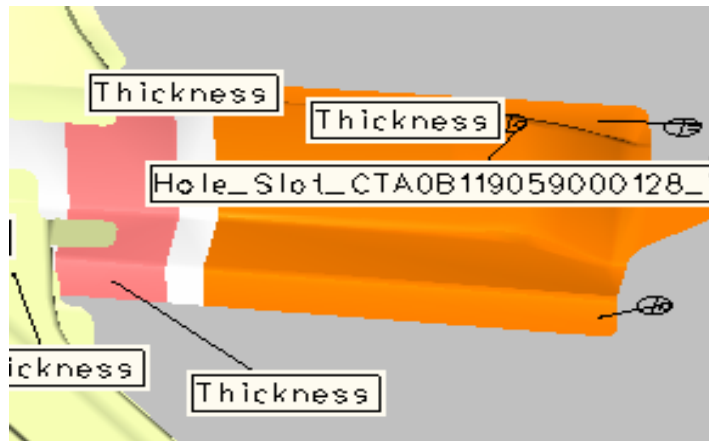
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Role of PMI Data

Powertrain models contain thousands of PMI elements managed using model views and 3D-Master Toolbox
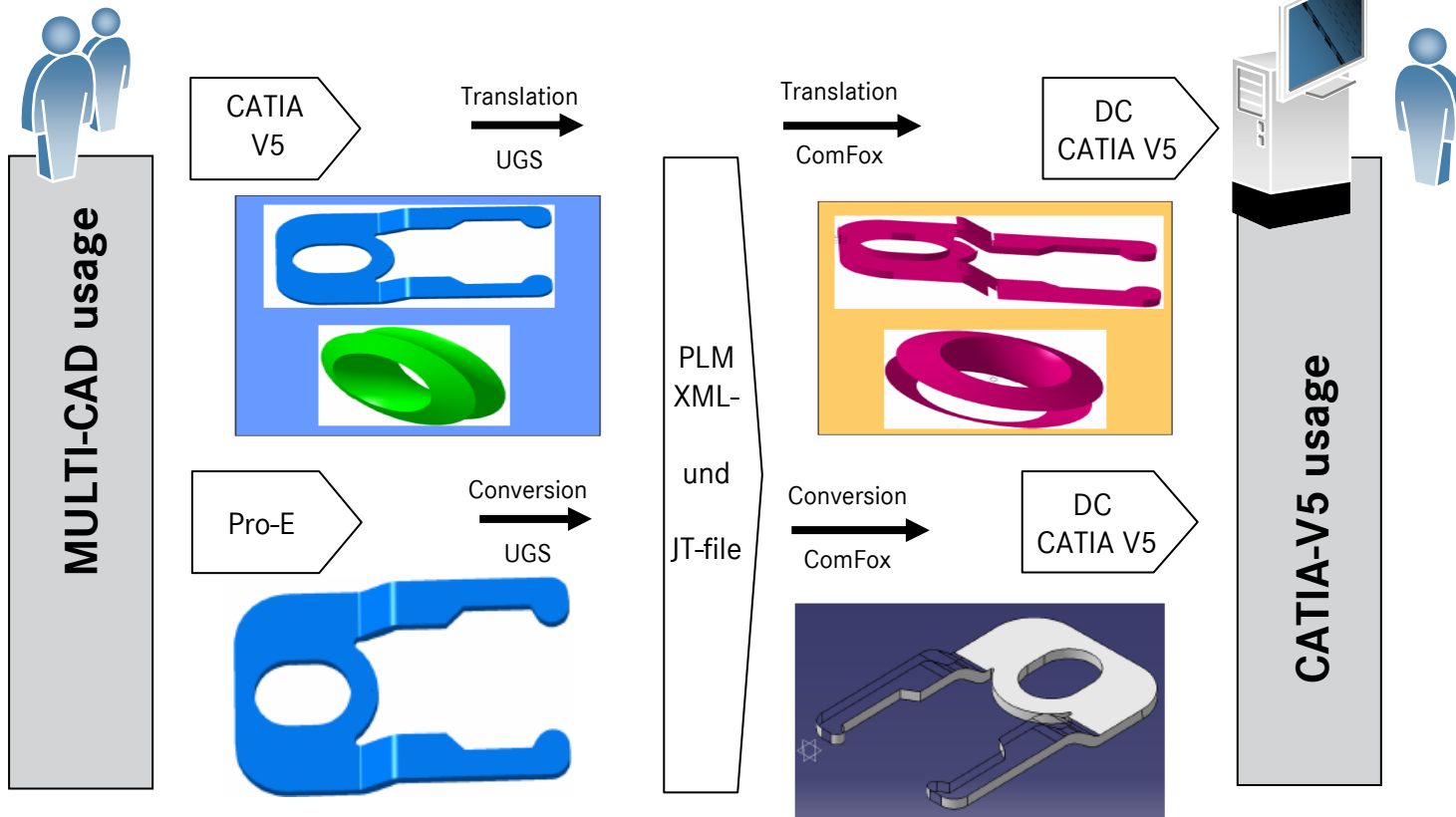
▶ **Complex PMIs are important especially for 3D-Master and Release Process**

Data Quality Optimization

Examples: CAD ➔JT ➔ CATIA V5

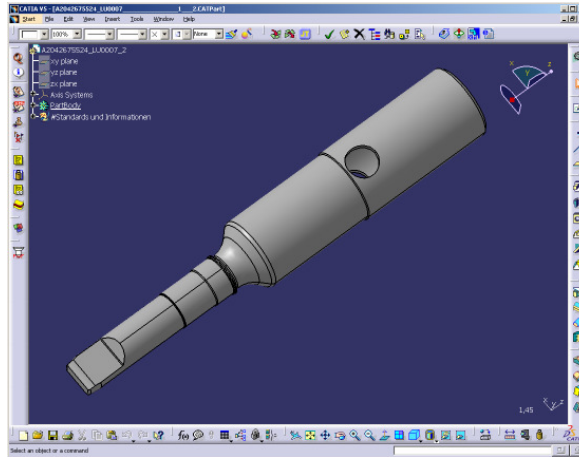topological interpretation of JT-file depends on CAD system and translator
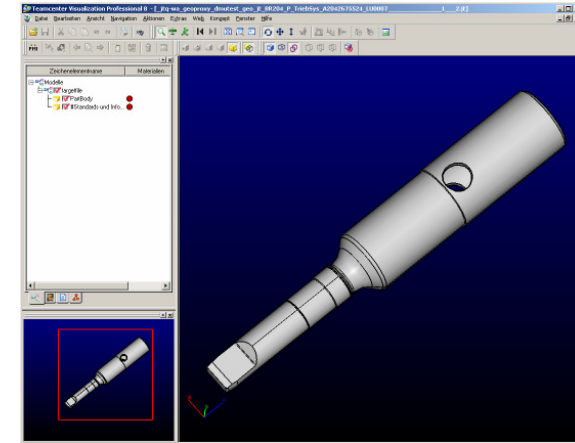
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JT Validation Tool: Q-Compare

Purpose

Check automatically, if translation is correct and complete.
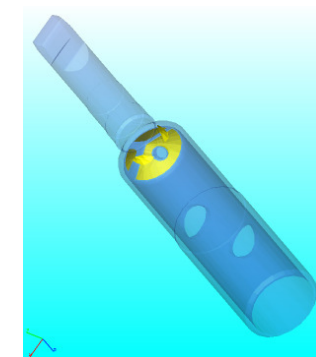

CATIA

?
=

JT

Available checks

• Compare CATIA BREP with JT BREP

• Compare Tessellation with BREP

Planned checks

• Compare 3D Master Views

• Compare PMI count and attributes

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Long Term Data Retention (LTDR)

Hard-ware

Operating System

Application Software

Product Data

5   10   15   20   25   30   35   40

"Data Consumer" World
read

read
+
write

"Data Creator" world

Tiff   JT

CAD Native 2D CAD Native 3D

Smaragd
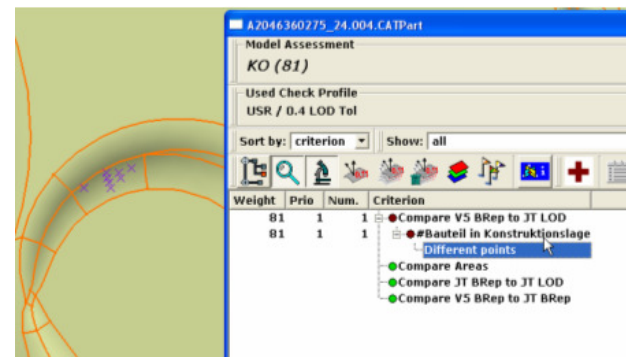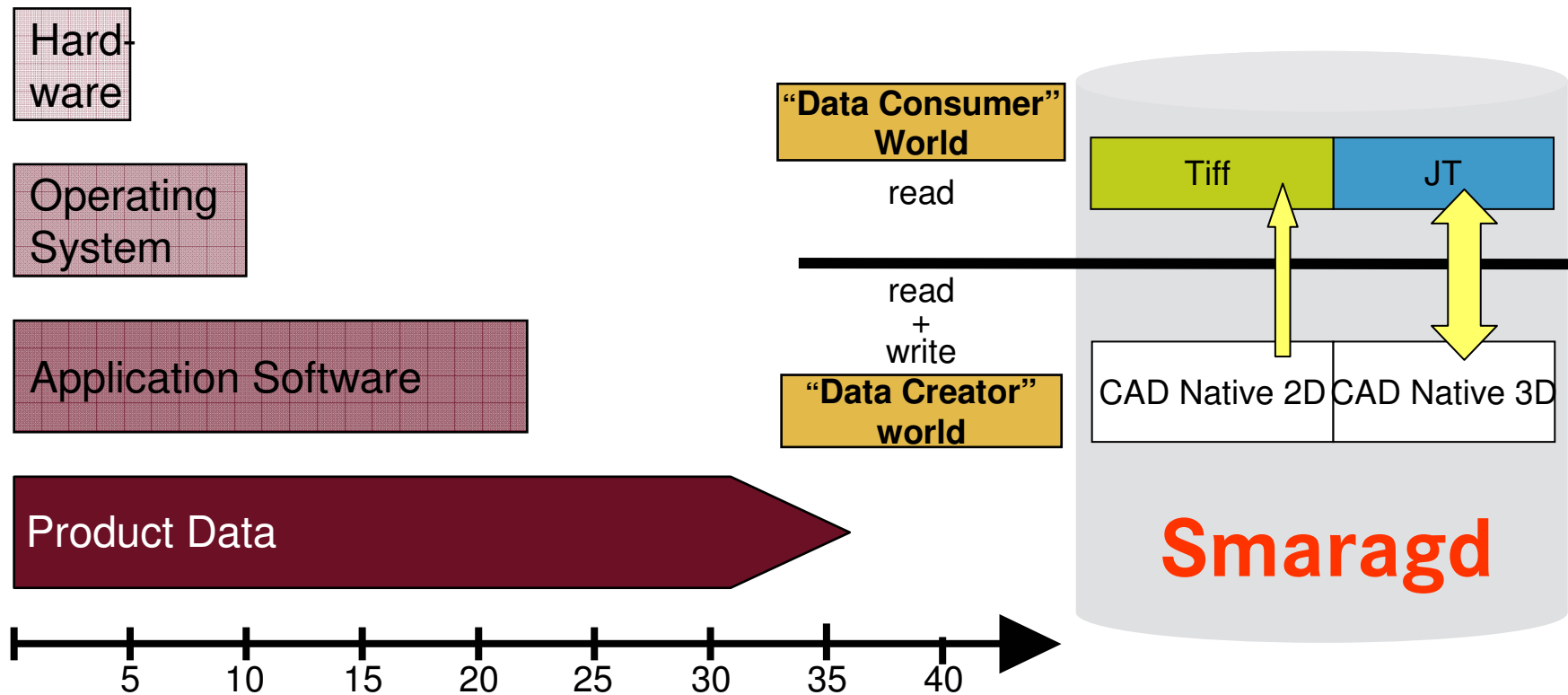
▶ **Long Term Data Retention at Daimler will be based on JT**

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Daimler supports the JT Workflow Forum: **Driving JT**

JT Data Quality
JT Data Exchange
JT ISO Standardization

JT Workflow Forum: Current Project Partners

Users:	Vendors:	Service Providers:
• Airbus	• Siemens PLM	• casolute
• Audi	• Transcat	• :em
• Behr		• PROSTEP
• BMW	• tbc:	
• Continental	• Dassault	
• Daimler	• PTC	
• Johnson Controls	• T-Systems	
• Siemens		
• Volkswagen		

JT Workflow Forum: Status

- Up to now 22 Use Cases identified and documented; e.g.
  - Mechanical Design
  - Digital Factory
  - DMU
  - Cross-functional Use Cases (assembly / meta data exchange, security)
- Until 05/09:
  - Deriving requirements on format, translators and applications
  - Prioritizing and weighting of requirements
  - List of test criteria for benchmark
- Publication of results, after harmonization with JT-Benchmark, in 12/09
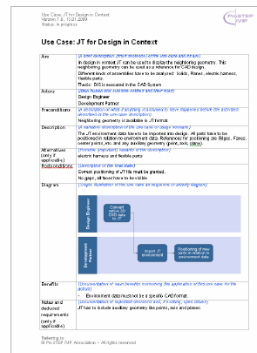
Quelle: VDA und ProSTEP iViP

Quelle: VDA und ProSTEP iViP

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Experiences

- JT/PLMXML is a powerful and affordable standard which is evolving from Digital Engineering Visualization to a Process Data Format

- JT based visualization is a pillar of Daimler´s SOA Strategy including the "Common Engineering Client"

- The number of JT users and use cases at Daimler is constantly growing

- JT Quality Management and Translation Validation is needed

- JT files must be easily available for everybody. Key prerequisites to enable this are:

  - JT Viewers (JT2Go) on every PC and easy to access by everybody (VisService)

  - Direct access to JT data in various applications (SOA)

  - Every CAD file is converted to JT and stored in Smaragd

Future Challenges and Next Steps

- Further extensions to the JT format (e.g. kinematics)

- JT Data exchange with suppliers and storage of primary JT files in Smaragd

- JT based parts release process

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Thank you for your attention !

All things arise from a
small beginning

Marcus Tullius Cicero
(106 - 43 v. Chr.)