Introduction to Digital Engineering Visualization

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Odette Sweden, Nov. 7, 2006

Content

■ Introduction

■ Examples EngineeringPortal and
Visualization & Data Exchange

■ Standards and Organisations

■ Conclusion

DEV means Digital Engineering Visualization

Digital Engineering Visualization is the ability to view, interrogate and markup engineering data, allowing non-CAD users access to 2D and 3D graphical engineering data. This can be accomplished across the extended enterprise without requiring users to learn complicated CAD software programs.

Most Visualization tools are CAD independent and allow users to view data originally created in different CAD systems.
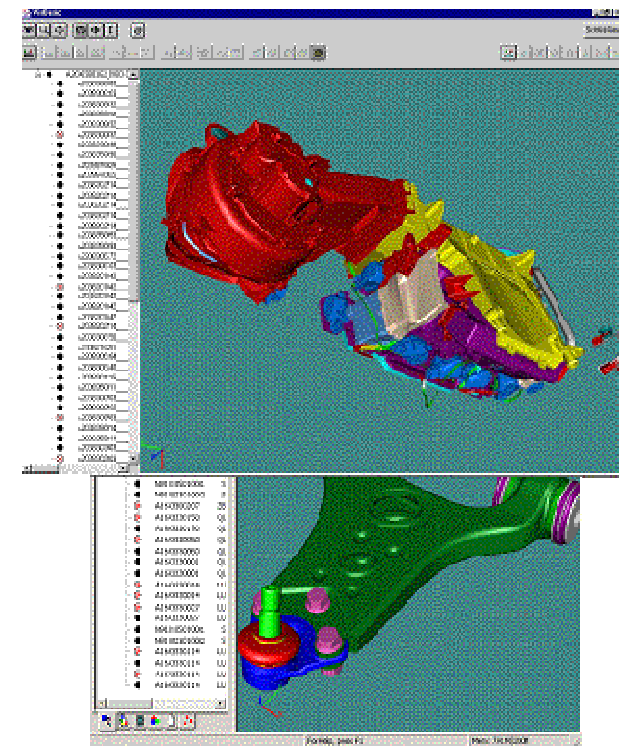
Trend: Who is the master to make decisions in the automotive industry?
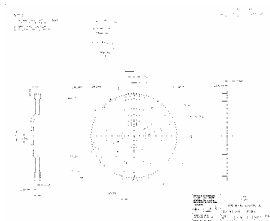
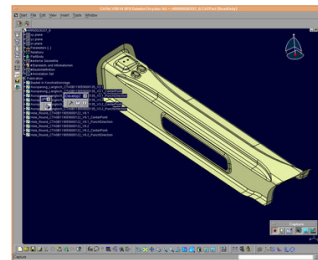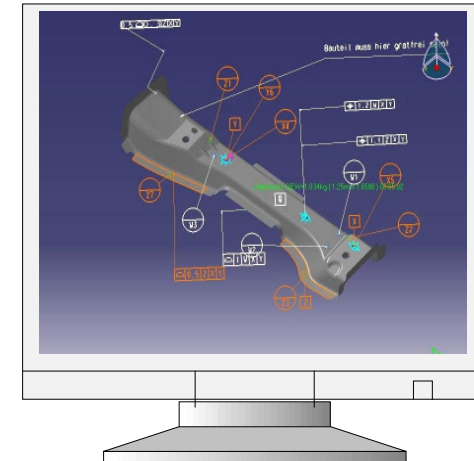| *past* **physical model**	*today* **CAD**	*future* **DEV** (Digital Engineering Visualization)

**clay models +
manual drawings**

**CAD model +
2D drawing**

**3D annotated
model**

(Source: VDA/ AIAG/ JAMA / GALIA/ SASIG in 5/2004)

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Advantages Digital Engineering Visualization

- Low cost

- Easy to use

- Enables non-CAD users to perform functionscurrently only performed by CAD operators

- Mobility using portable DEV formats on laptops

- Common tool for viewing multi-CAx data type

- Ability to view large assemblies

- Better collaboration, earlier input

- Reduction and/or elimination of drawings

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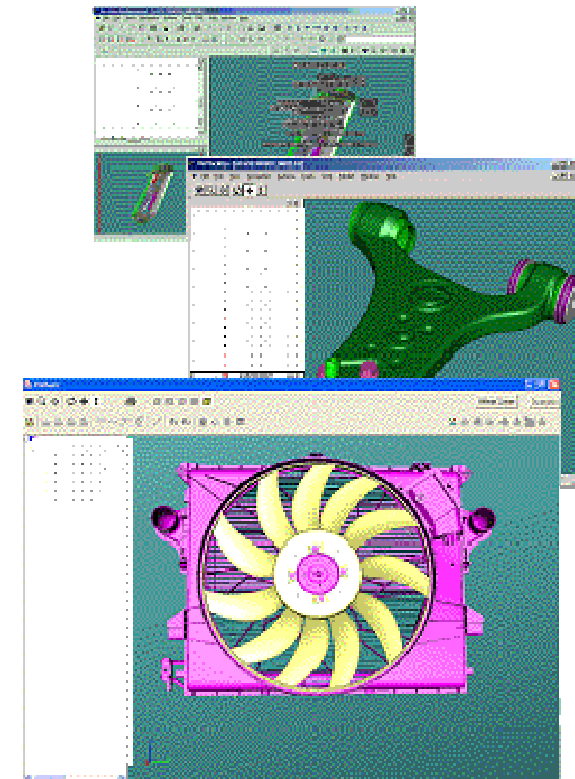
Examples for Visualization tools used at DC: V*isBasic* and *VisView Pro PMI*
(based on JT Format)

VisBasic, eVis

- lowend viewer based on **PLM Vis**
  (http://www.eds.com/products/plm/plm_vis/index.shtml)
- uses **client installation** (java application; no automatic download)
- **features:**
  - 3D navigation
  - structure view
  - Printing
  - Sectioning
  - measurement
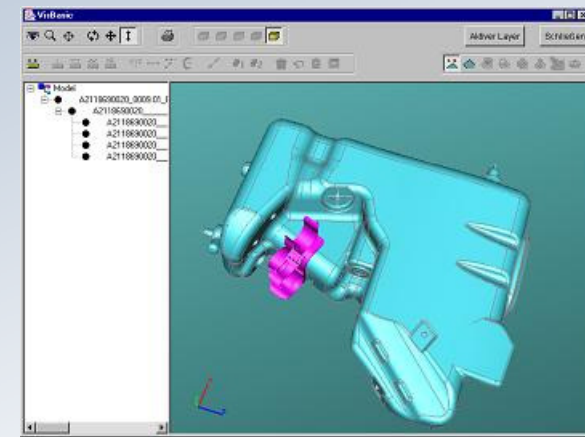
VisView Pro PMI

- **standard product**
- satisfies **3DMaster** requirements

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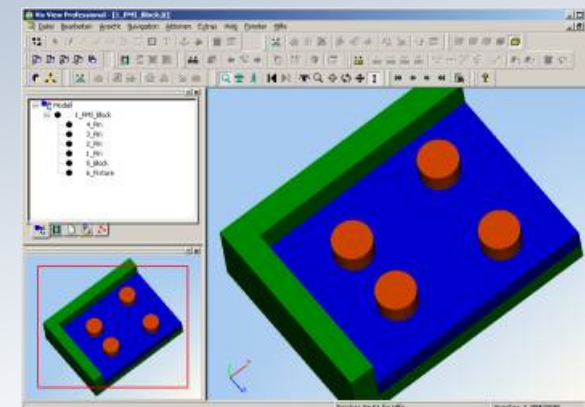
Result JT Open consortium: JT2Go

JT2Go

- lowend viewer for JT files **(PLMXML)**
  www.jt2go.ugs.com

- **free** download and usage

- **features:**
    - 3D navigation
    - structure view
    - Printing
    - sectioning (for JT Open members)
    - measurement (for JT Open members)
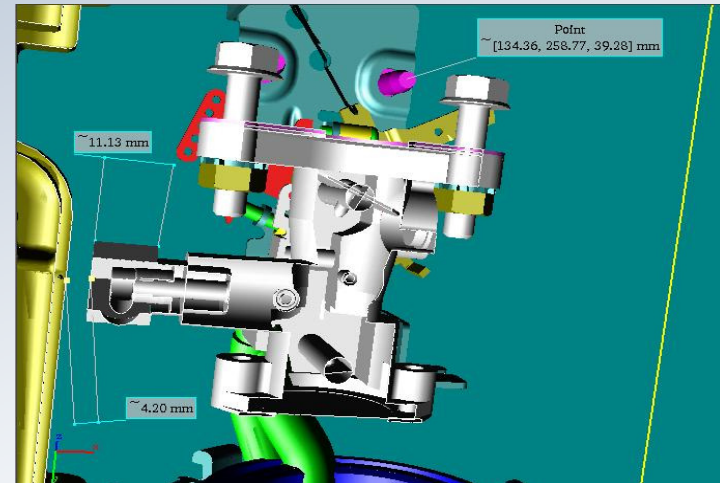
Potential Digital Engineering Visualization
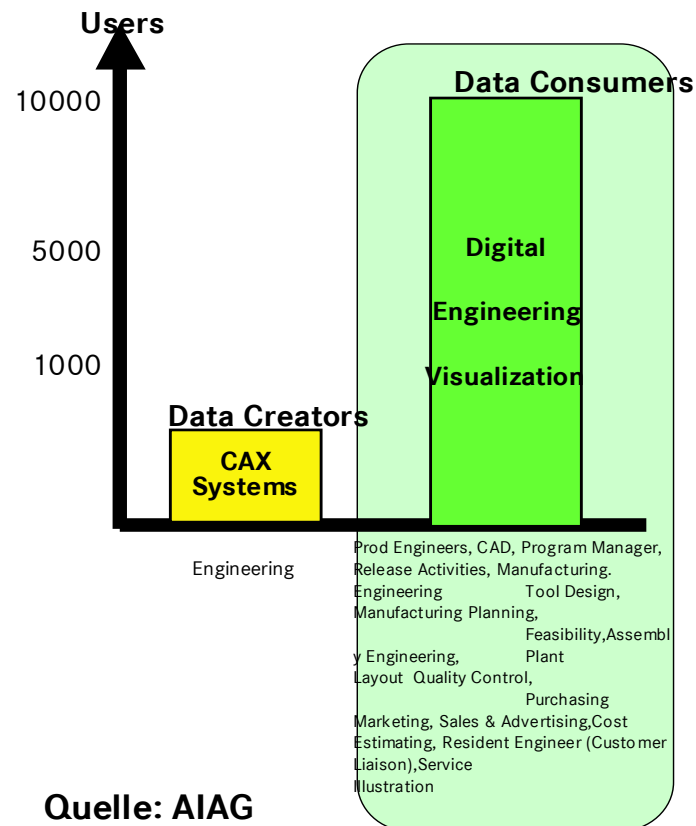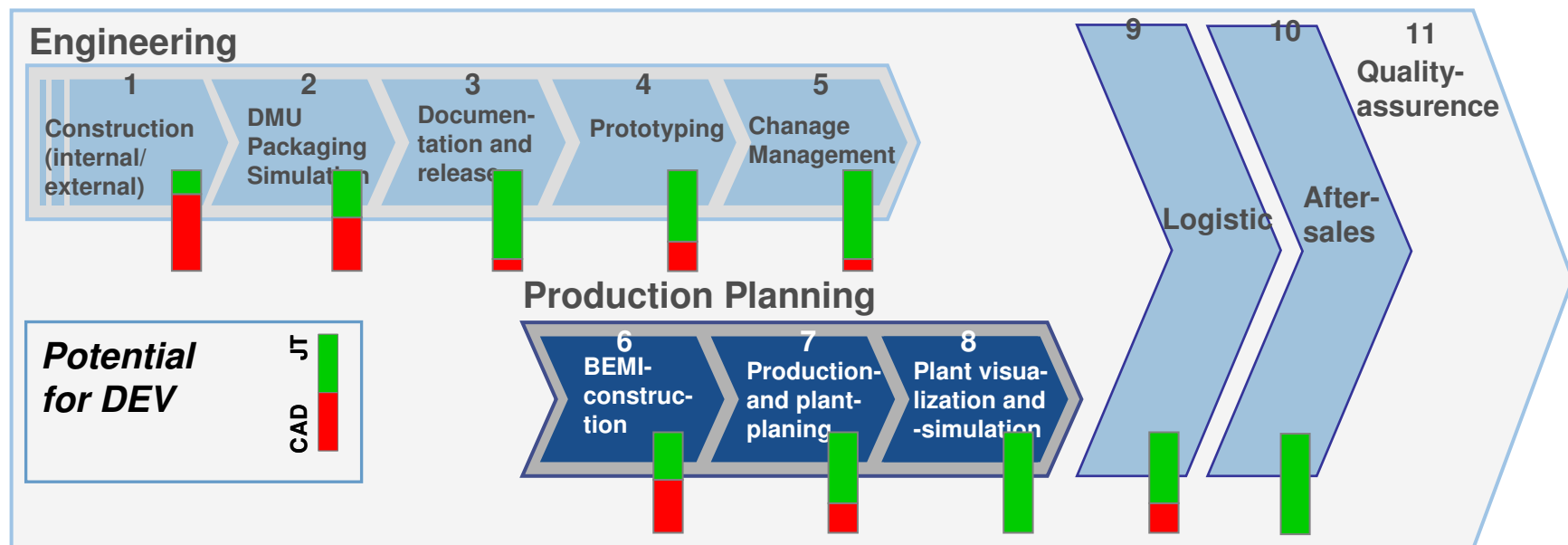
Users

10000

5000

1000

Data Consumers

Digital Engineering Visualization

Data Creators

CAX Systems

Engineering

Prod Engineers, CAD, Program Manager, Release Activities, Manufacturing. Engineering   Tool Design, Manufacturing Planning, Feasibility,Assembly Engineering,   Plant Layout Quality Control, Purchasing Marketing, Sales & Advertising,Cost Estimating, Resident Engineer (Customer Liaison),Service Illustration

Quelle: AIAG

Business Activity	Timeline		
	Definition & Planning Product & Process Verification Product/Process Design & Development Production		
Product Engineers	Visualization Tools		
CAD	Native CAD with limited Visualization		
Program Manager	Visualization Tools		
Release Activities		Visualization Tools	
Manufacturing. Engineering		Visualization Tools	
Tool Design			Visualization & CAD tools
Manufacturing Planning		Visualization Tools	
Feasibility		Visualization Tools	
Assembly Engineering		Visualization Tools	
Plant Layout			Visualization Tools & Low end CAD
Quality Control			Visualization & CMM Tools
Purchasing		Visualization Tools	
Marketing, Sales & Advertising	Visualization Tools		
Cost Estimating		Visualization Tools	
Resident Engineer (Customer Liaison)		Visualization Tools	
Service			Visualization Tools
Illustration			Visualization Tools & Low end CAD
Suppliers	Native or Local Tools & Visualization		

30-70% of all today's CAD jobs along the process chain could work with DEV Tools!

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Potential DEV in Automotive Process Chains

Engineering

1	2	3	4	5
Construction (internal/ external)	DMU Packaging Simulation	Documen- tation and release	Prototyping	Change Management

Potential for DEV

JT / CAD

Production Planning

6	7	8
BEMI- construc- tion	Production- and plant- planing	Plant visua- lization and -simulation

9	10	11
Logistic	After- sales	Quality- assurance

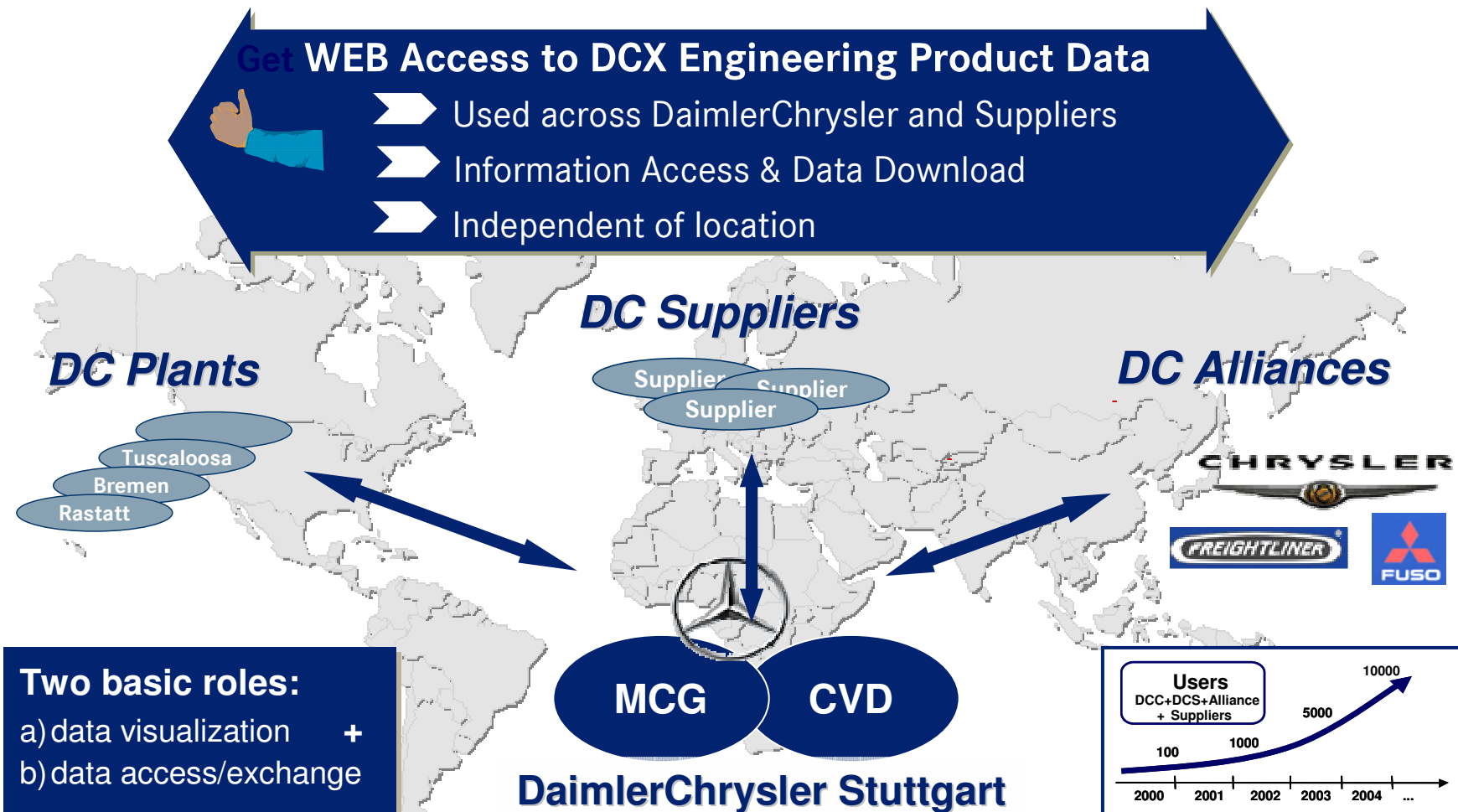> **Potential: DEV is the future technology to support the process network in the automotive product development**

Content

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Scope of EngineeringPortal

Get WEB Access to DCX Engineering Product Data

- Used across DaimlerChrysler and Suppliers
- Information Access & Data Download
- Independent of location

DC Suppliers

DC Plants

DC Alliances

Supplier
Supplier
Supplier

Tuscaloosa
Bremen
Rastatt

CHRYSLER

FREIGHTLINER

FUSO

Two basic roles:

a) data visualization **+**
b) data access/exchange

MCG **CVD**

DaimlerChrysler Stuttgart

Users
DCC+DCS+Alliance
+ Suppliers

10000

5000

1000

100

2000 2001 2002 2003 2004 ...
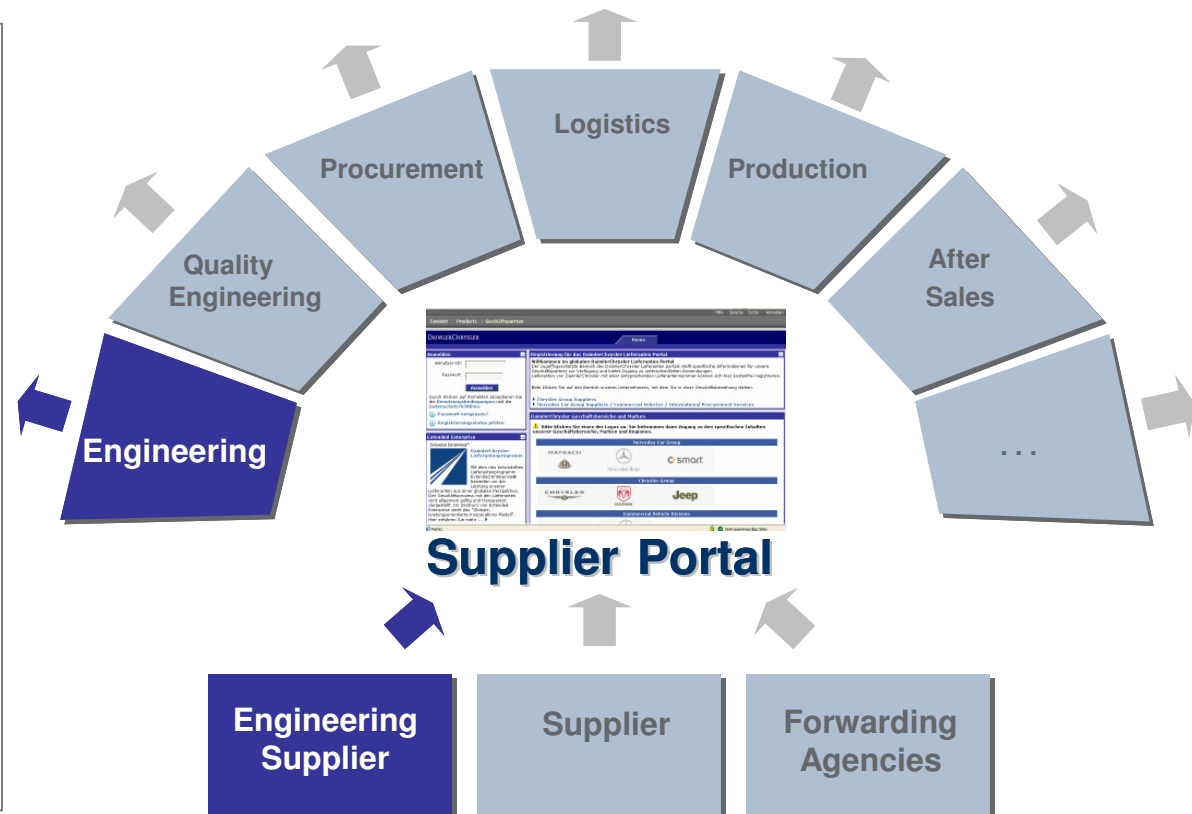
Access over DaimlerChrysler Supplier Portal

The **EngineeringPortal** provides access to the different EDM/PDM related databases and applications at DCX for employees and suppliers independent of their locations.

Logistics

Procurement

Production

Quality Engineering

After Sales

Engineering

...

Supplier Portal

Engineering Supplier

Supplier

Forwarding Agencies

The EngineeringPortal is the Single Point of Access to DCX Engineering Data

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EngineeringPortal DaimlerChrysler

is Managing Complexity

Goal:

The EngineeringPortal is a **web-based application** which enables the integrated and simple access to multiple data stored in different EDM relevant systems.
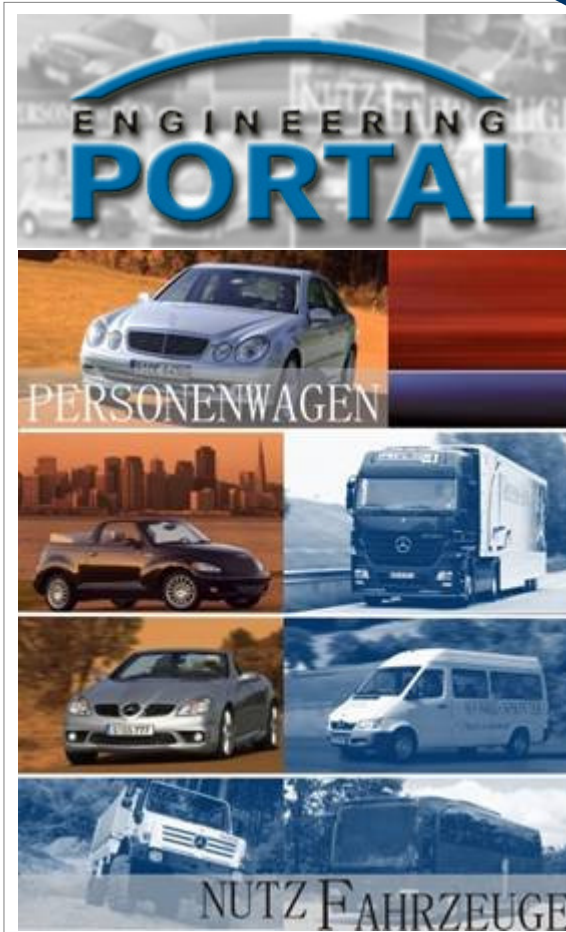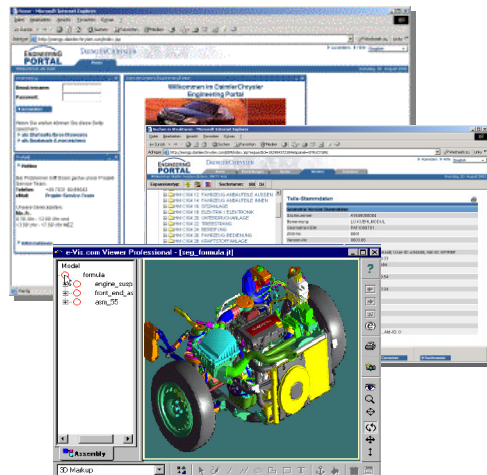
Basic Components:

- **Data access**
  to global EDM data by using web technologies (DCX-wide and for suppliers)

- **Visualization**
  of 2D- and 3D geometries by web-based viewing tools (Vis View Pro, ZGVIEW...)

- **Single Login and personalization**
  Access to various applications with one login (CD-UserID)

- **Data exchange**
  STEP-based data exchange between different EDM systems. Usage of tools for online collaboration with development partners.

EngineeringPortal
DaimlerChrysler Stuttgart

Integrated access to
/PDM information

HighEnd
visualization

VisView Pro
PMI (EDS)

Visualization of CAD including PMI
(Production Manufacturing Information)

■ All product information are available in the 3D model (3D-Master) and are linked with manufacturing information (digital plant)

■ Drawings are omitted ⇨ necessity to visualize the 3D model

views

features

jig and fixture concept

fasteners (weld points, …)

FTA: Functional Tolerances & Annotations

master data

hybrid models
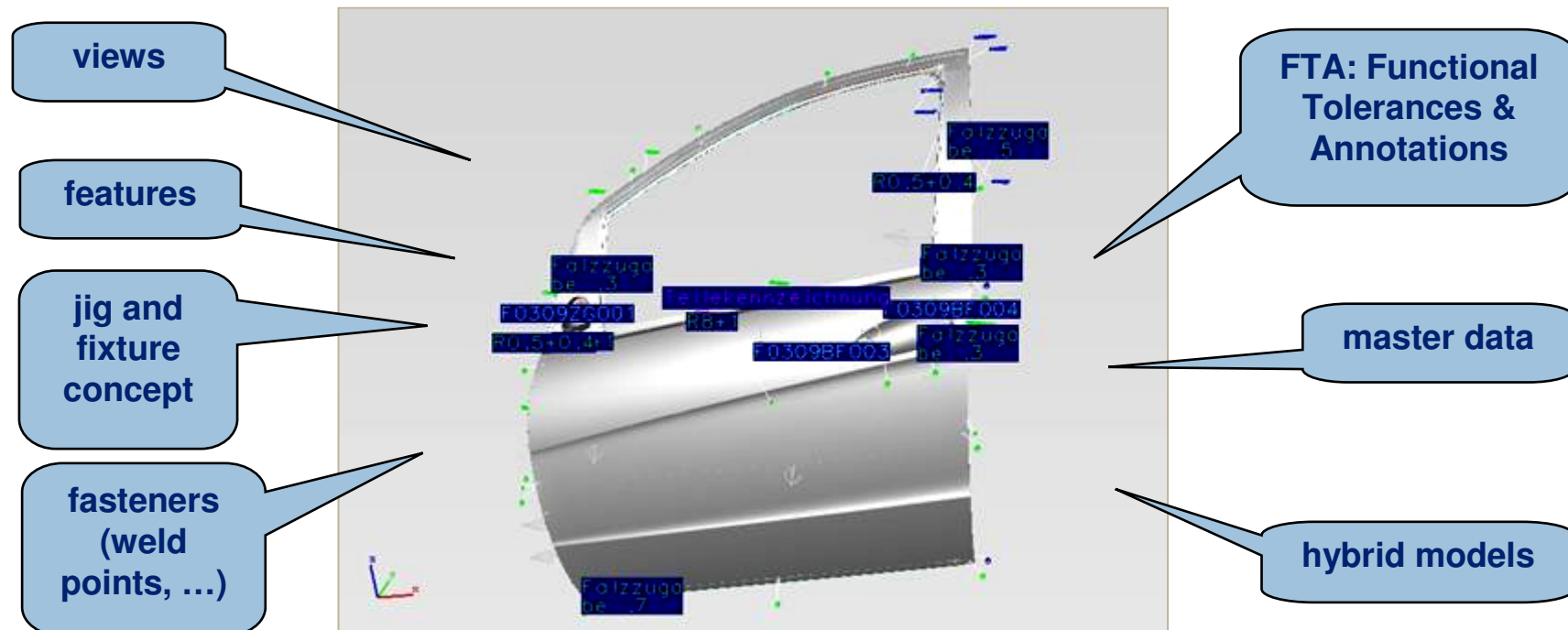
What is JT ?

JT is a 3D Visualization Format for CAD Data (today owned by UGS, published 2007)
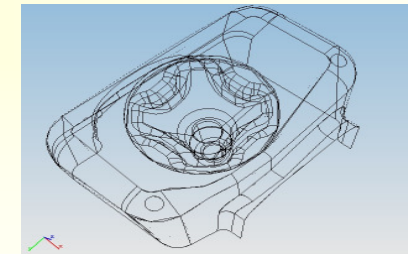
Tessellated Data

„Levels of Detail" (LOD) for performant Visualization
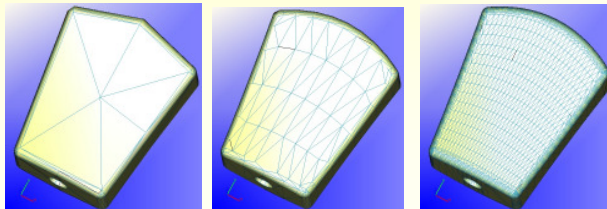
Exact Geometry (NURBS)

Exact mathematical representation of surfaces and solids

1 2

JT Content

3 4
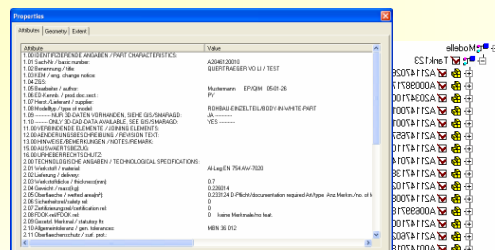
e.g.. CATIA V5 Part Master Data

e.g. welding points, FD&T,...

Productstructure / Part Master Data

Production Manufactoring Information

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JT usage EngineeringPortal

number of Visviewclients worldwide

2006

Plant	VisView-Clients
00	75
06	40
10	490
19	234
30	20
34	66
37	61
50	455
54	182
59	262
65	163
66	180
67	128
68	14
138	275
155	10
175	7
Total:	**2482**

Production / Planning/ QM	38%
Engineering	32 %
After sales	20%
Procurement	10%

▶ **used in > 20 plants worldwide, started from EIM + Smaragd (since 10/2005)**

JT usage EngineeringPortal

active, different User
(minimun one Visualization / Month)

max. 1360

2006
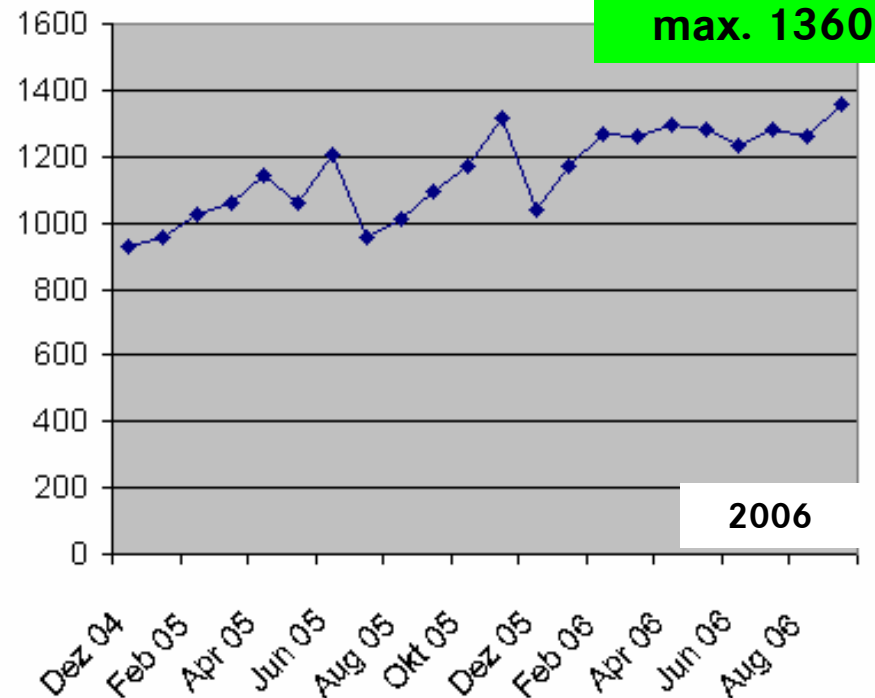
function "visualize"
(user hits button "visualize" per month)

max. 21043

2006
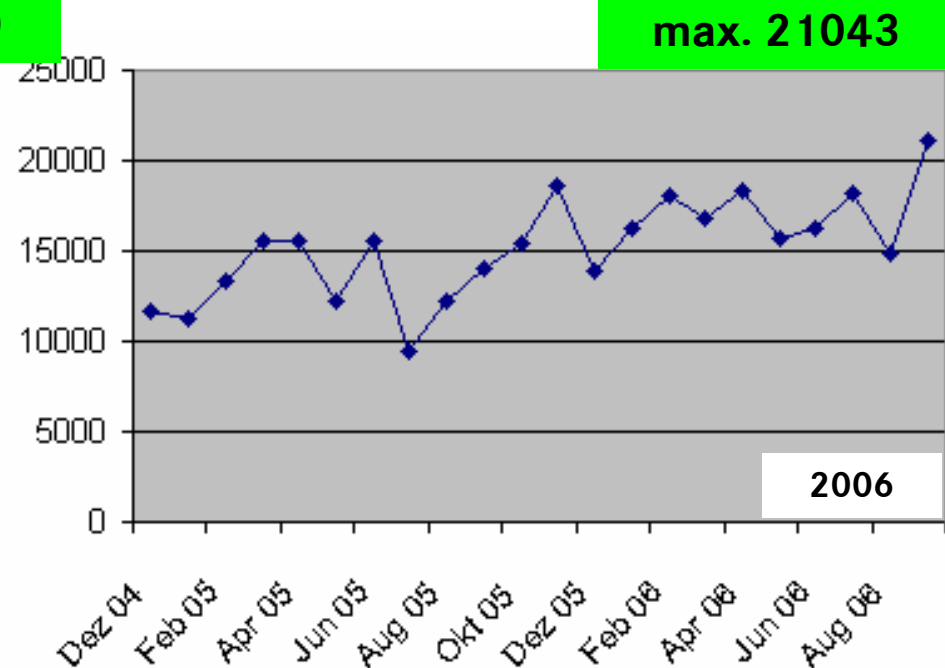
only EngP-User (Server Stuttgart + Tuscaloosa); addytionally Visualization by the „Smaragd-Way"

Central Provision of JT Data – A Key Success Factor

Common EDM System DC

Smaragd

JT

Status:
- translation after Check In of CATIA-V4/V5 model ✓
- > 200.000 older V4/V5 models translated in 08/2005 ✓
- > 450.000 JT files stored (05/2006)

Access EngineeringPortal	Access Smaragd - Client	Access SWAN	Access Virtual Reality

(SMD-DL)

PLMXML

IC:IDO
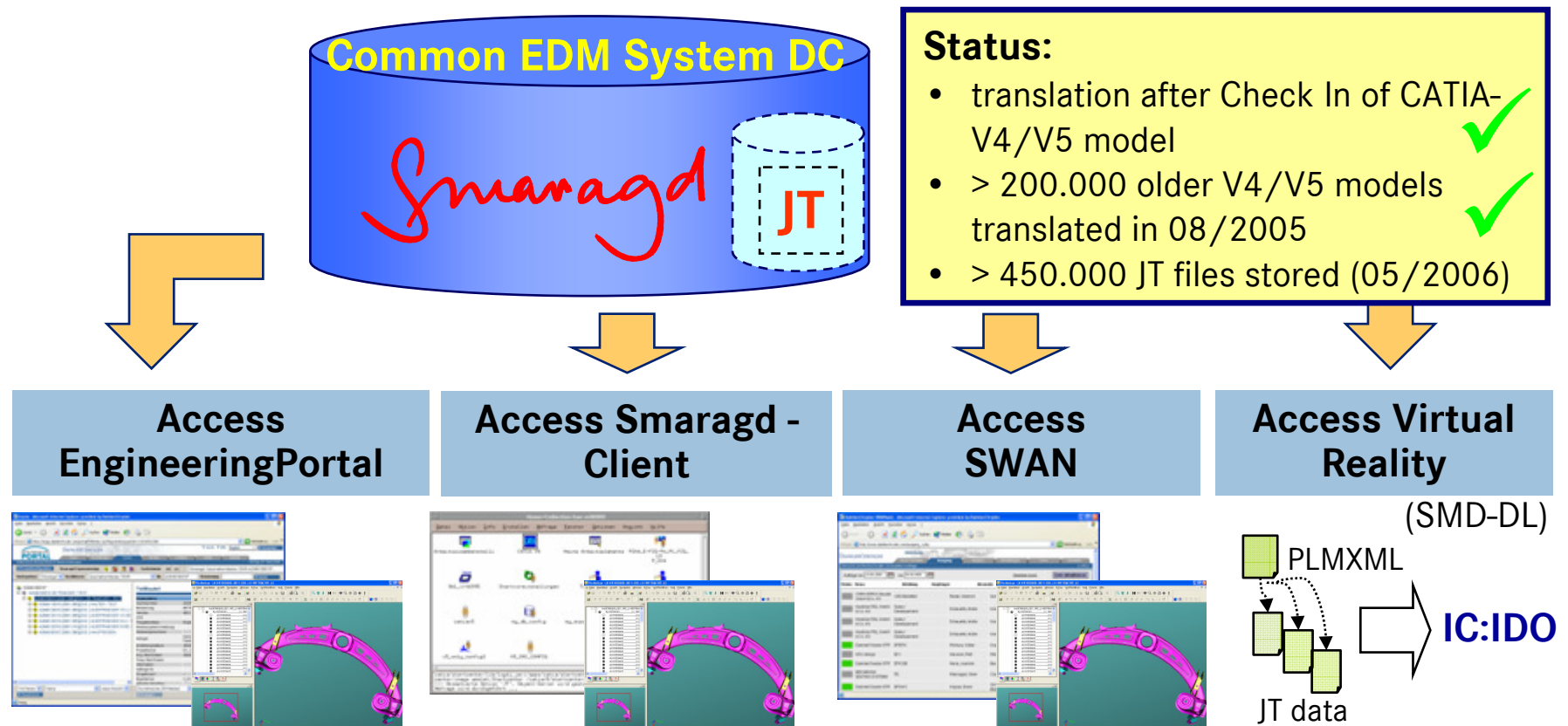
JT data

▶ **JT data is stored in the EDM system Smaragd _accessible for all use cases_.**

CATIA V5 R14 – AddIn:
Save Document As ... (JT etc.)
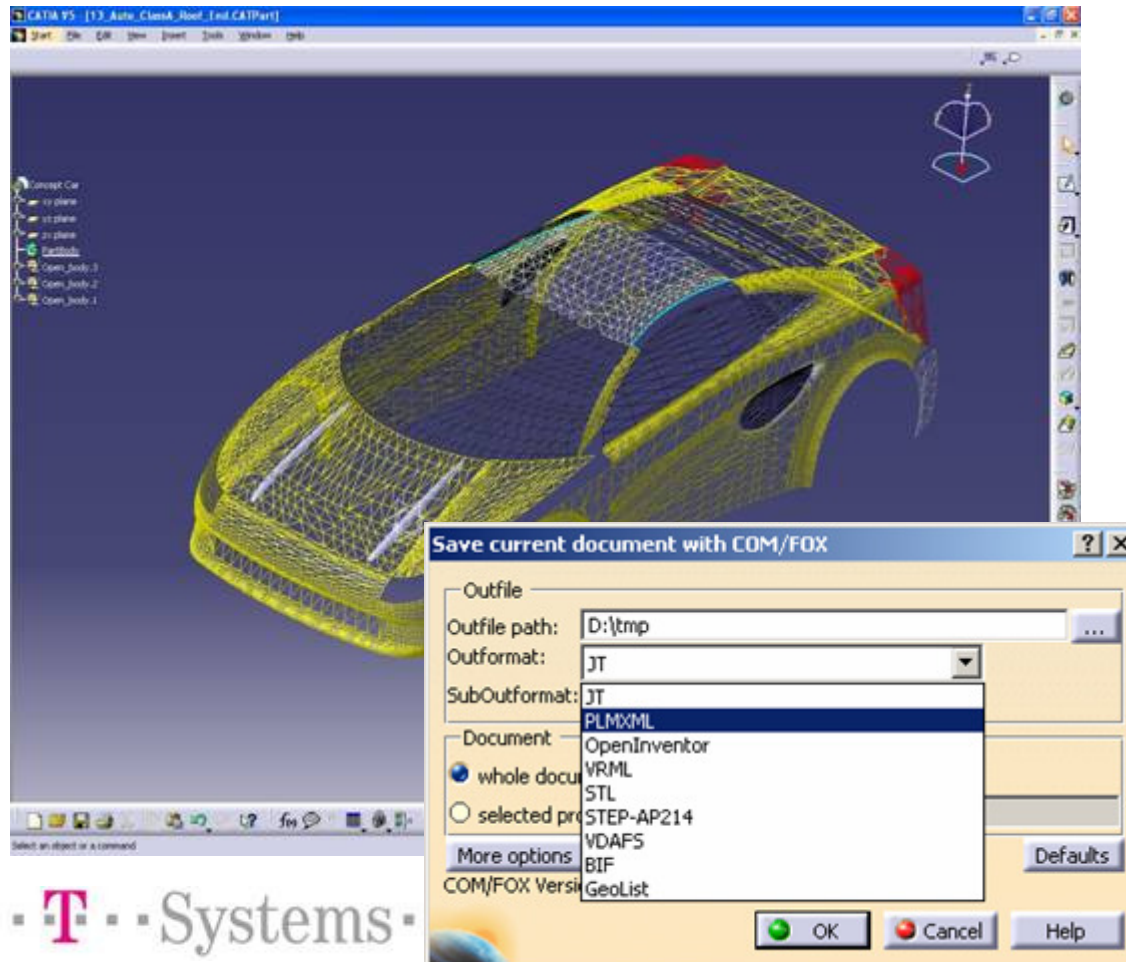
Allows the translation from CATIA to:

Engineering Visualization
- JT
- PLMXML

Virtual Reality / Digital Factory
- OpenInventor
- VRML
- STL

Data Exchange
- STEP AP214
- VDAFS
- BIF
- GeoList

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Visualization with the EngP
for Suppliers

- **Search for part or assembly in the EDM-InfoManager**

- **Start the visualization of the part or assembly with JT based Viewers**
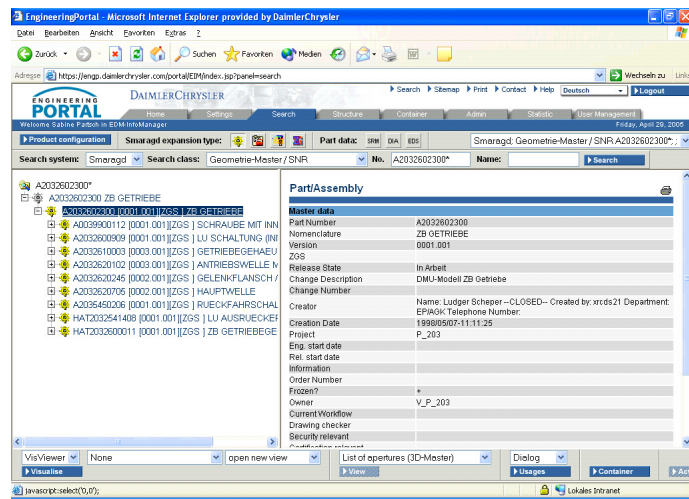
start visualization
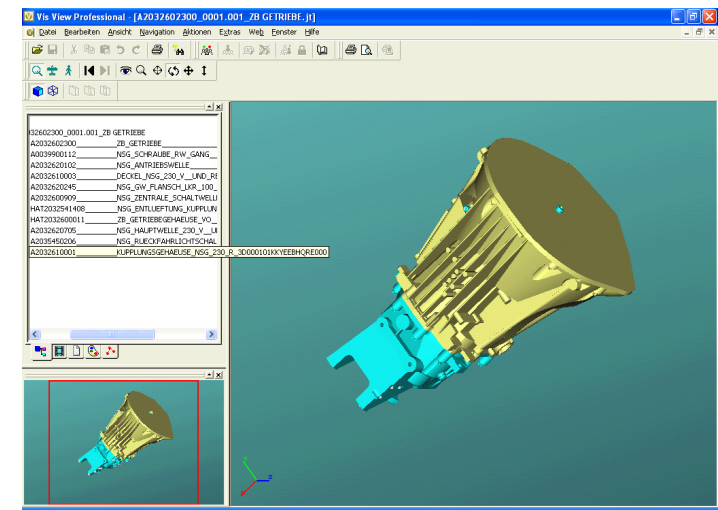
For the external visualization over the EngineeringPortal access rights have been agreed by DaimlerChrysler!

SWAN
Data Exchange backbone

DaimlerChrysler

Supplier

Clients:

SWAN *X11*

SWAN *web*

SWAN *batch*

SWAN *integration*

SWAN Server

Internet

OFTP

Internet +OFTP

SWAN *xs*

SWAN Server

SWAN*X11*

SWAN*web*

SWAN*batch*

SWAN*integration*

SWAN *direct*

CATIA native

STEP

JT

SWAN Data exchange:

- **Complete CAD Data Exchange DC - Suppliers**
- **SWAN used DCX wide (Fuso, FTL, CG,..)**
- **Integrated with EngPortal (SWAN*direct*)**
- **Access to PDM data and information**
- **Batch processes**
- **Data Exchange/ Dataconversion in**
  - **a) Native Formats**
  - **b) Neutral Format (e.g. STEP)**
  - **c) JT Format**

JT Data Exchange with Suppliers

DaimlerChrysler

Supplier

PLMXML

JT data

OpenDXM
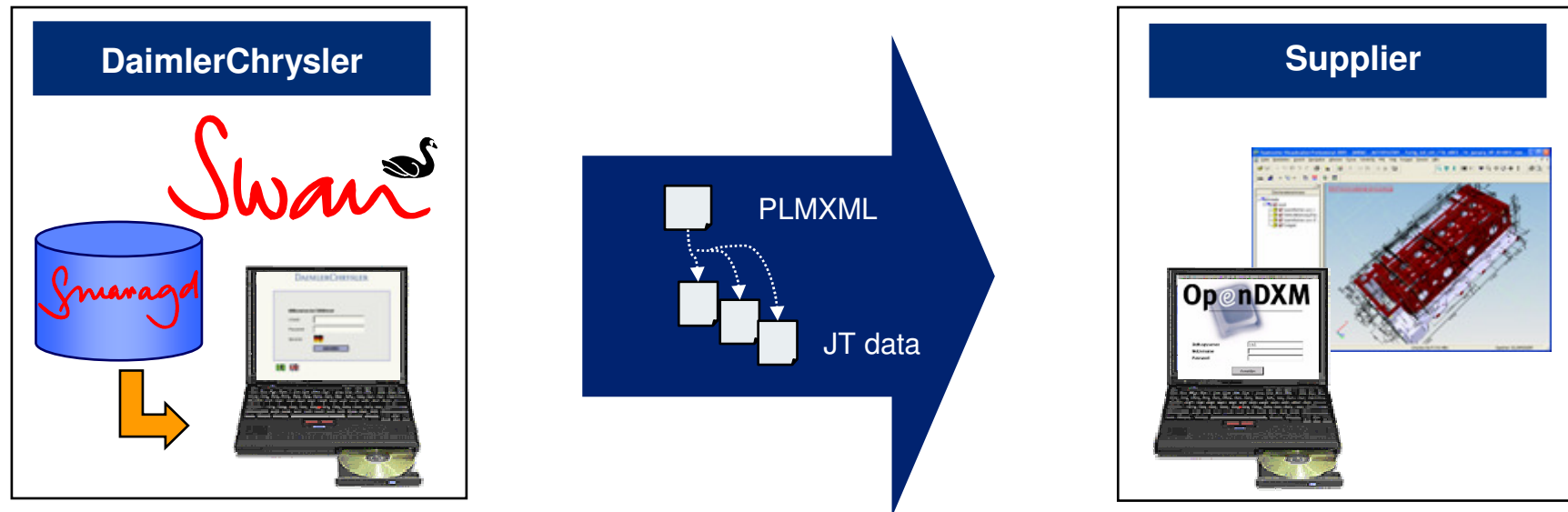
Use Cases, e.g:

- **3D information for offer invitation process**

- **part supplier needs only visualization information know-how protection (no CATIA V5 parametrization)**

JT data exchange saves costs, if visualization information is sufficient.

Pilot project DaimlerChrysler – DELPHI: Exchange of jt/plmxml

Exchange scenario:

DC: Export of **structure** (STEP or plmxml) **and geometry** (jt) from Smaragd (complete assembly information)

DELPHI: Decision which data is needed as CATIA native

DC: Export of **structure** (STEP) and **geometry** as CATIA native for sub-assemblies
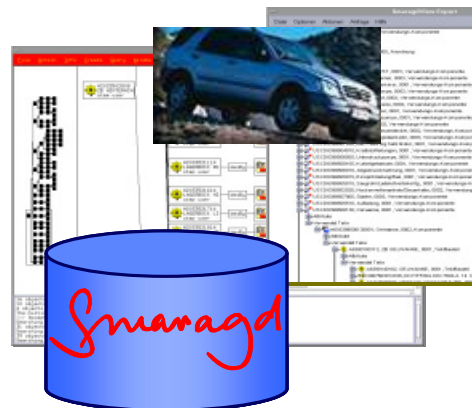
Field of application for jt + plmxml at DELPHI:
- acquisition
- design
- packaging

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- plmxml-file
- jt-files

export

- STEP CC6
- CATIA 2D/3D

import

DELPHI

iMAN

18114564/000-A1646800387 LU IP upper LHD (EBOM)
18114567/000-A1646800387 Spruehaut IT ob LL (EBOM) x 1 F
0M101584/000-ISOCYNAT - Material
0M101585/000-POLYOL - Material
16897774/000-A1646800387 Subassembly upr (EBOM) x 1 F
18114321/000-A1646800387 Retainer IP upr LHD (EBOM
0M101612/000-Plastic Material - PPGF 30%
18114324/000-A1646800387 Barcode Label Retai
18114325/000-A1646800387 Metal Insert LHD x 1
18111812/000-A1646800387 Niet DIN 6791 x 9
16876953/000-A1646800387 Stud Plate LHD x 1
18111945/000-Nut M5 (x 9

Content

SASIG Mission:
Ensure Global Collaboration in the Automotive Industry

SASIG

Strategic Automotive Product Data Standards Industry Group

JAMA

Japan Automobile Manufacturer's Association

JAPIA

Japan Auto Parts Industries Association

Example Usage SASIG Results at DC: STEP strategy

STEP
Dataexchange

System zum
weltweiten
Austausch von
Nutzdaten

SAM
STEP
Assembly
Manager

STEP

powered by SASIG

DaimlerChrysler

Supplier

PDM System
GIS/Smaragd

CATIA

Model 1

Model 2

Model 3

PDM System

ystem

el 1

el 2

CAD System

selection

AP214
Processor

conversion

Swan

packaging

transfer

AP214
Processor

EDI-Tool

ENGDAT
package

ENGDAT
package

Model 1 Model 2 •••

AP214 CC6   Native or CC1/2

•••

DEV Workgroup Vision

Digital Engineering Visualization Workgroup
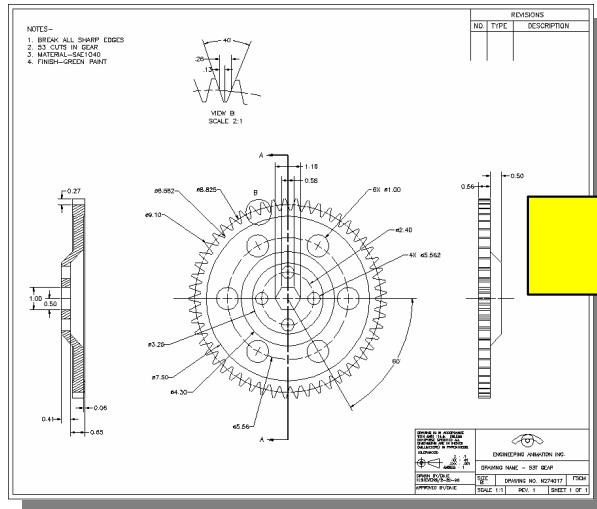
Today:
2D Drawing
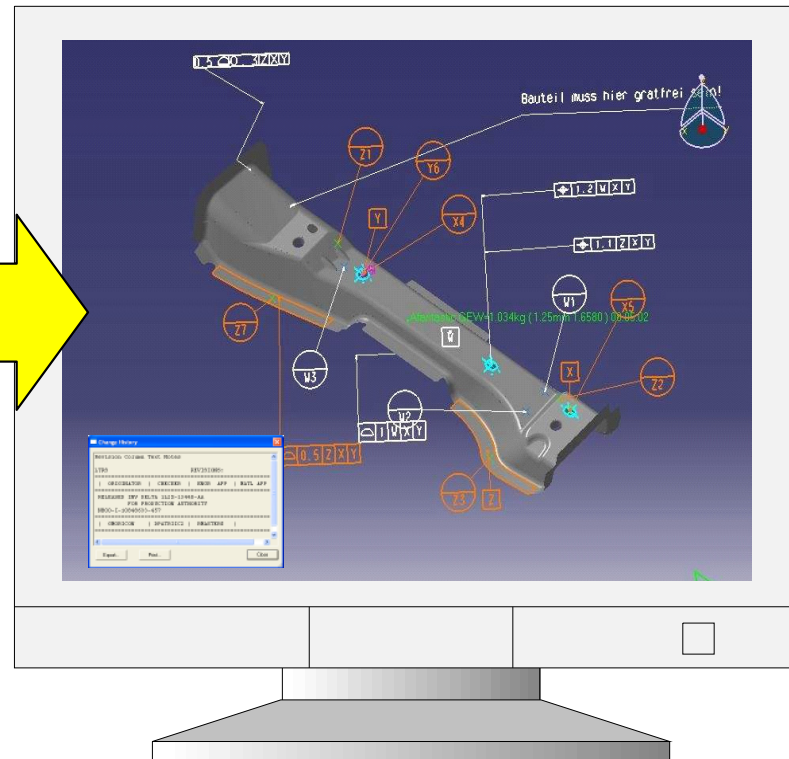
Future:
3D Annotated Model

Strategic Initiatives and DEV working groups (1/2)

JT Open Initiative UGS
The PLM Company
MRB + TRB
www.jtopen.com

"... community of users, software vendors, and interested parties; ... open distribution of JT technology to be able to exchange 3D data for the purposes of visualization, collaboration and data-sharing."

Members: UGS PLM, Ford, Renault, General Motors, DaimlerChrysler, Boeing, Caterpilar, PTC, Actify,...

SASIG Working Group
"Digital Engineering Visualization„ (DEV)

www.SASIG.com

"establish globally accepted practices, guidelines, technologies and standards that facilitate implementation of Digital Engineering Visualization, enabling collaboration within or between OEM's and suppliers"

Members: Honda, Siemens VDO, Delphi, Daihatsu, Visteon, **DaimlerChrysler**, Renault...

SASIG DEV is independent of special Viewer or format vendors

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Strategic initiatives and jt working groups (2/2)

JT User Group, Germany

„exchange of know how, improve data exchange between OEMs & suppliers, common epresentation to the software vendor"

Members: Bosch, Siemens, Delphi, Johnson Controls, **DaimlerChrysler,** ...

ProSTEP iViP Vereins-Projektgruppe "Collaborative Product Visualization"

Main Focus: Define the Standard way to exchange Digital EngIneering Visualization Data

VDA | Verband der Automobilindustrie

ProSTEP iViP

Lead: Prof. Anderl (DIK)
Members: BMW, Bosch, DaimlerChrysler, Delphi, Keiper, Siemens, Audi, Behr, Continental Teves, Ford, Opel, Visteon, VW und Airbus

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Results of cooperation in international organisations (1/2)

Goal: Support + optimize international collaboration beween Automotive OEMs and suppliers concerning CAD/PDM/EDM

		VDA/AIAG/GALIA/ Jama, OdetteSweden… national	ODETTE european	SASIG international
STEP AP214 Standardization	*starting*			
STEP Usage	*unknown*			
PDQ (Product data Quality)	*National*			
ENGDAT/ ENGPART	*European*			
PDM Recommendation	*unknown*			
Digital Engineering Visualization - DEV	*unknown*			
ECM	*company specific*			

6 years ago

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Results of cooperation in international organisations (2/2)

**Goal:** Support + optimize international collaboration beween Automotive OEMs and suppliers concerning CAD/PDM/EDM

		VDA/AIAG/GALIA/ Jama, OdetteSweden… *national*	ODETTE *european*	SASIG *international*
STEP AP214 Standardization	✓			
STEP Usage	✓			**today**
PDQ (Product data Quality)	✓			
ENGDAT/ ENGPART	(✓)			→
PDM Recommendation	✓			
Digital Engineering Visualization - DEV	*in work*	→ ←	↑	
ECM	*in work*		↑	→

Content

- Introduction

- Examples EngineeringPortal & Visualization

- Standards and Organisations

- **Conclusion**

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Experiences and Trends in DEV (Digital Engineering Visualization)

1. **Visualization is more than nice 3D pictures, it is the new way to define products (Digital Engineering Visualization)**

2. **DEV makes CAD Collaboration easier**

3. **Standards and international WGs are slow, but they bring the experts together and are key enablers for global collaboration**

4. **JT is on the way to become an open standard for DEV**

5. **JT -> 3D PDF translators will play a key role to document and spread 3D DEV results**

JT   PDF

Engineering   **Enterprise**
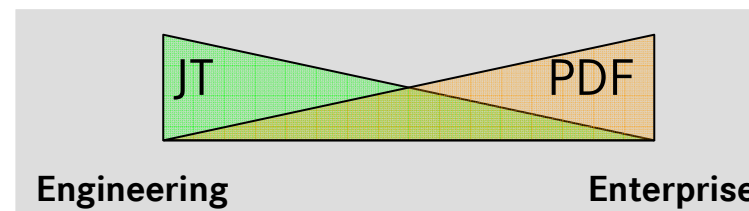
6. **Collaboration marketplaces are still small, but growing.**

7. **Sundown UNIX**

Thank you for your attention!
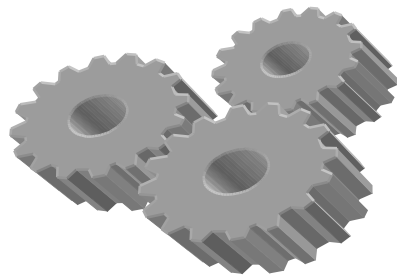
Dr. Reinhold Klass
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Data Management/EDM (EP/QIE)
+49 (0) 7031 90-79595
reinhold.klass@daimlerchrysler.com

STEP is the DC strategy for the exchange of structured data and used productively !

STEP
Dataexchange

- **Exchange of structured data** is crucial for DC development processes

- **STEP** proved to be reliable for the exchange of structured data

- Challenges occur due to differences in methodology/organization mainly - **solutions have been developed** by DC and its partners
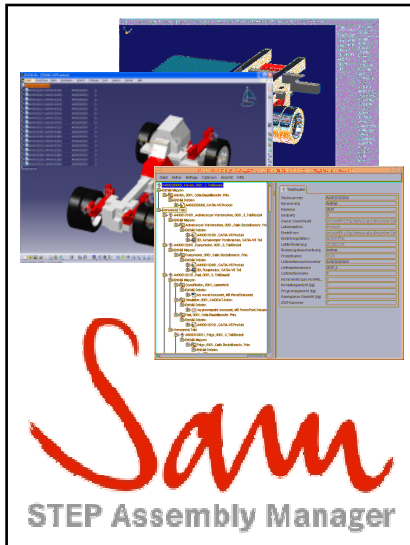
STEP

Key Results:

DC saves time and money !

Example:
Dataexchange big assembly (Engine) Smaragd - VPM
Manual: 1 Week   STEP: 1 h

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SAM – STEP Assembly Manager

STEP
Dataexchange

What is SAM?

SAM (STEP Assembly Manager) is a tool for the **administration and handling of assemblies** in the respective CATIA environment of the development partner.

Why SAM?

Suppliers can import, process and export Smaragd-Assemblies in their **CATIA V4/V5 environment**.

SAM Community:

- Common project of **DaimlerChrysler, Renault** and **MAGNA Steyr Fahrzeugtechnik**
- **T-Systems** and **PDTec** are development partners
- SAM development is completely funded by **OEMs**
- SAM is available for suppliers for a **service fee of € 690,- €**