Introduction to Digital Engineering Visualization

Dr. Reinhold Klass, DaimlerChrysler AG, Stuttgart
Odette Sweden, Nov. 7, 2006
Introduction

Examples Engineering Portal 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)

- *past*
clay models + manual drawings

- *today*
CAD model + 2D drawing

- *future*
3D annotated model
Advantages Digital Engineering Visualization

- Low cost
- Easy to use
- Enables non-CAD users to perform functions currently 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
Examples for Visualization tools used at DC: VisBasic 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
Result JT Open consortium: JT2Go

**JT2Go**

- lowend viewer for JT files (**PLMXXML**)
  [www.jt2go.ugs.com](http://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

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

Quelle: AIAG

Potential Digital Engineering Visualization

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

Quelle: AIAG
Potential DEV in Automotive Process Chains

Potential: DEV is the future technology to support the process network in the automotive product development.
Introduction

Examples EngineeringPortal and Visualization & Data Exchange

Standards and Organisations

Conclusion
Scope of EngineeringPortal

Get WEB Access to DCX Engineering Product Data
- Used across DaimlerChrysler and Suppliers
- Information Access & Data Download
- Independent of location

Two basic roles:
a) data visualization
b) data access/exchange

DaimlerChrysler Stuttgart

DC Plants
- Tuscaloosa
- Bremen
- Rastatt

DC Suppliers
- Supplier
- Supplier

DC Alliances

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

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

**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.

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EngineeringPortal
DaimlerChrysler Stuttgart
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
- e.g. CATIA V5 Part Master Data

**Exact Geometry (NURBS)**
- Exact mathematical representation of surfaces and solids
- e.g. welding points, FD&T,...

JT Content

**Productstructure / Part Master Data**

**Production Manufacturing Information**
JT usage EngineeringPortal

# number of Visviewclients worldwide

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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
(minimum one Visualization / Month)

max. 1360

# function “visualize”
(user hits button “visualize” per month)

max. 21043

only EngP-User (Server Stuttgart + Tuscaloosa); additionally Visualization by the „Smaragd-Way“

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Central Provision of JT Data – A Key Success Factor

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)

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

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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
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

For the external visualization over the EngineeringPortal access rights have been agreed by DaimlerChrysler!
SWAN Data Exchange backbone

**SWAN Data exchange:**
- Complete CAD Data Exchange DC - Suppliers
- SWAN used DCX wide (Fuso, FTL, CG,..)
- Integrated with EngPortal (SWANdirect)
- 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

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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- Introduction
- Examples EngineeringPortal & Visualization & Dataexchange
- Standards and Organizations
- Conclusion
SASIG Mission:
Ensure Global Collaboration in the Automotive Industry

SASIG
Strategic Automotive Product Data Standards Industry Group

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Strategic Automotive product data Standards Industry Group
Example Usage SASIG Results at DC: STEP strategy

powered by SASIG

DaimlerChrysler

SAM
STEP
Assembly Manager

Supplier

PDM System
GIS/Smaragd

CATIA

Model 1
Model 2
Model 3

PDM System

AP214 Processor

ENGDAT package

Model 1
Model 2

... AP214 CC6
Native or CC1/2

EDT Tool

CAD System

PDM System

AP214 Processor

ENGDAT package

Model 1
Model 2

...
SASIG Digital Engineering Visualization Workgroup

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**

"... 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, Caterpillar, PTC, Actify, ...

**SASIG Working Group**

"Digital Engineering Visualization, (DEV)"

“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*
Strategic initiatives and jt working groups (2/2)

**JT User Group, Germany**

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

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

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**ProSTEP iViP Vereins-Projektgruppe**

"Collaborative Product Visualization“

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

*Lead: Prof. Anderl (DIK)*

*Members: BMW, Bosch, DaimlerChrysler, Delphi, Keiper, Siemens, Audi, Behr, Continental Teves, Ford, Opel, Visteon, VW und Airbus*
### Results of cooperation in international organisations (1/2)

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

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<th>SASIG</th>
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6 years ago
Results of cooperation in international organisations (2/2)

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

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*today*  

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- Standards and Organisations

Conclusion
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

6. Collaboration marketplaces are still small, but growing.
7. Sundown UNIX
Thank you for your attention!

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

- 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

**Key Results:**

*DC saves time and money!*

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