NA Regional Summit 2008 NAFEMS
2020 Vision of Engineering Analysis and Simulation
October 29 - 31, 2008 | Hampton, Virginia

Simulation Data Management with Interoperability Across Domains

Andreas Schreiber
PROSTEP, Inc.

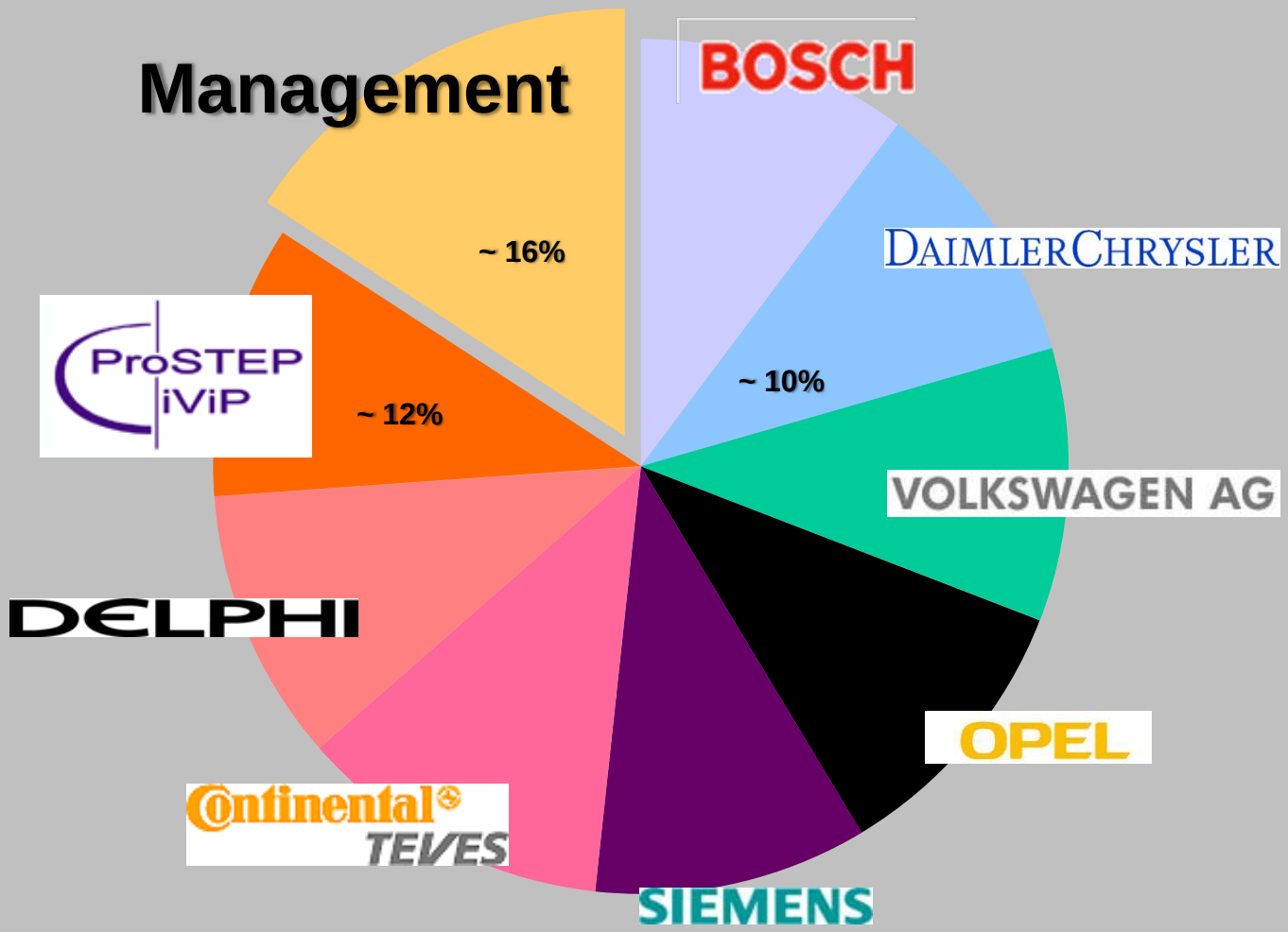
Company Overview

- Since its foundation in 1993, PROSTEP has become a leading provider of turn-key solutions for engineering processes in the areas of product data integration, data migration and supply chain communication for manufacturers and suppliers.
- Interoperability between PDM, CAD, ERP, CAE, BoM and Legacy system with product structure interchange and conversion.
- STEP Standardization

PROSTEP Owners:

ProSTEP iViP
BOSCH
Continental
DAIMLER
DELPHI
SIEMENS
VOLKSWAGEN AG
OPEL

PROSTEP's shareholder structure



ProSTEP iViP Verein – Worldwide Members

Industry (Users)

IT System Vendors

Universities, Associations

Adam OPEL AG
Agile Software GmbH
Airbus Deutschland GmbH
Alfmeier Präzision AG
Alias Systems
Arvin Meritor Emissions Techn. GmbH
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AVL-List GmbH
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CapeWare Software GmbH
cards Engineering GmbH & Co. KG
CEFE, FH Augsburg
CENIT AG Systemhaus
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Cranfield University
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CSC PLOENZKE AG
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DaimlerChrysler AG
Daimler Chrysler Research India PVt. Ltd.
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Das virtuelle Fahrzeug, Graz
DDG Dräxlmeier
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EADS Deutschland GmbH Military Aircraft
EDAG Engineering + Design AG
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em engineering methods AG
EPLAN Software & Serv. GmbH & Co. KG
EPM Technology
Eurostep Commercial
excellent solutions GmbH
Faurecia Innenraumsysteme GmbH
fischer automotive systems GmbH
Ford-Werke AG
FH Furtwangen, FB Wirtschaftsinformatik
FhG IGD
FhG IAO
FhG IPK
FHS St. Gallen, Institut für Mechatronik und IT
Forschungszentrum Karlsruhe
Freudenberg Dichtungs- und Schwingungstechnik KG
FTE Automotive GmbH
FUBA Automotive GmbH
Fujitsu Siemens Computers GmbH
GDX Automotive Rehburg
gedas Deutschland GmbH
GETRAG Getriebe- und Zahnradfabrik
Gigatronik München GmbH
Goodyear Dunlop Tyres
Hella KG Hueck & Co.
Hengst Filterwerke GmbH & Co. KG
Hewlett Packard GmbH
Hirschvogel Umformtechnik GmbH
Huf Hülsbeck & Fürst GmbH & Co. KG
IAV GmbH – IG Auto & Verkehr
IBM Business Services GmbH
IBM Deutschland GmbH
IDS Scheer AG
ILC PROSTEP GmbH
Inalfa Roof Systems
INA Schaeffler KG
ISE Innomotive Systems Europe GmbH
ISE-Industries GmbH Werk Duisburg
ISE-Industries GmbH Werk Witten
IVF - Inst. f. Verkstadsteknisk Forskning
J. Eberspächer GmbH & Co.
JAMA - Japan Automotive Manufacturer Assoc.
Japan Auto Parts Industries Association
John Deere Werke Mannheim

Johnson Controls GmbH
KEIPER GmbH + Co. KG
KET Karosserie Entwicklung Thurner
Kiekert AG
Kisters AG
KNORR-BREMSE GmbH
KTH, Woxen Centre
KUKA Schweißanlagen GmbH
KUKA Werkzeugbau GmbH
Küster Holding GmbH
Larsen & Toubro Limited
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Life Cycle Engineers GmbH
LKSoftWare GmbH
Magna Steyr Fahrzeug AG & Co. KG
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MAN AG
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MAN Nutzfahrzeuge AG
MAN Turbomaschinen AG GHH Borsig
Matrix One GmbH
MDT Vision GmbH
Meta Motoren-/Energie-Technik GmbH
Mentor Graphics (Deutschland) GmbH
Modine Europe GmbH
Montaplast GmbH
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MTU Aero Engines GmbH
MTU Friedrichshafen GmbH
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Nexolab GmbH
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PDTec GmbH
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Porsche Engineering Services GmbH
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Tecnomatix Automat.-systeme GmbH
Theorem Solutions Ltd.
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TRW Fahrwerksysteme GmbH u. Co. KG
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VDA, Verband der Automobilindustrie e. V.
VDMA, Verband deutscher Masch.- und Anlagenbau
VDO Car Communication Germany GmbH
Visteon Deutschland GmbH
Volkswagen AG
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WABCO Fahrzeugbremsen
Webasto AG
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xPLM Solution GmbH & Co. KG
ZF Friedrichshafen AG
ZGDV e. V.
Zuken GmbH

Stand: Oktober 2005

ProStep iViP Organization - Nonprofit, Standards body, Think-tank

www.prostep.org

- About us
- Project Groups
  - CPM Maintenance
  - Maintenance
  - CAx Implementor Forum
  - CPM Implementor Forum
  - ECAD Implementor Forum
  - PDM Implementor Forum
  - Collaborative Requirements Management (CoRM)
  - ECAD/MCAD-Collaboration
  - Engineering Change Management (ECM) Internationalization
  - LOng Term ARchiving - LOTAR
  - Mechatronic Process Integration (MPI)
  - PDM User Group
  - Process Chain Car Electric / AP 212
  - Secure Product Creation Processes (SP²)
  - SimPDM
  - SOA4PLM®

LOng Term ARchiving - LOTAR

Term

December 2001 till December 2009

Activities

The archiving of product data and making this data available in the event of product liability litigation poses a challenge – and not only with regard to regulatory restraints. The LOTAR project group is playing a leading role in developing a standard for the long-term archiving of digital product data in the aerospace industry. The objective of the project group is to establish methods, processes and a data model for archiving 3D geometry data and product structure information. In order to establish the results as a standard for the European aerospace industry within the EN9300 series as quickly as possible, they will be submitted to the AeroSpace and Defence Industries Association of Europe - Standardization (ASD-STAN) for publication. Publication will mean that the standard is binding for the entire European aerospace industry.

Milestones

Development of the EN9300 series:

- Basic Parts - EN9300-00x
  - Common Overview, Requirements, Fundamentals and Concepts, Methods, Authentication and Verification, Architecture Framework, Terms and References
    Q2 2008
- Common Process Parts - EN9300-01x
  - Overview Data Flow, Data Preparation, Ingest, Archival Storage, Retrieval, Removal, Test Suits, Audit

- Legal and Business Motivation
- Technical & IT Background
- Goals & Benefits
- Organization
- LOTAR Way of Working
- Fundamentals & Processes
- The LOTAR Standard
- Next Steps

Date

No News in this View

Chairman

Jean-Yves Delaunay
Airbus S.A.S.

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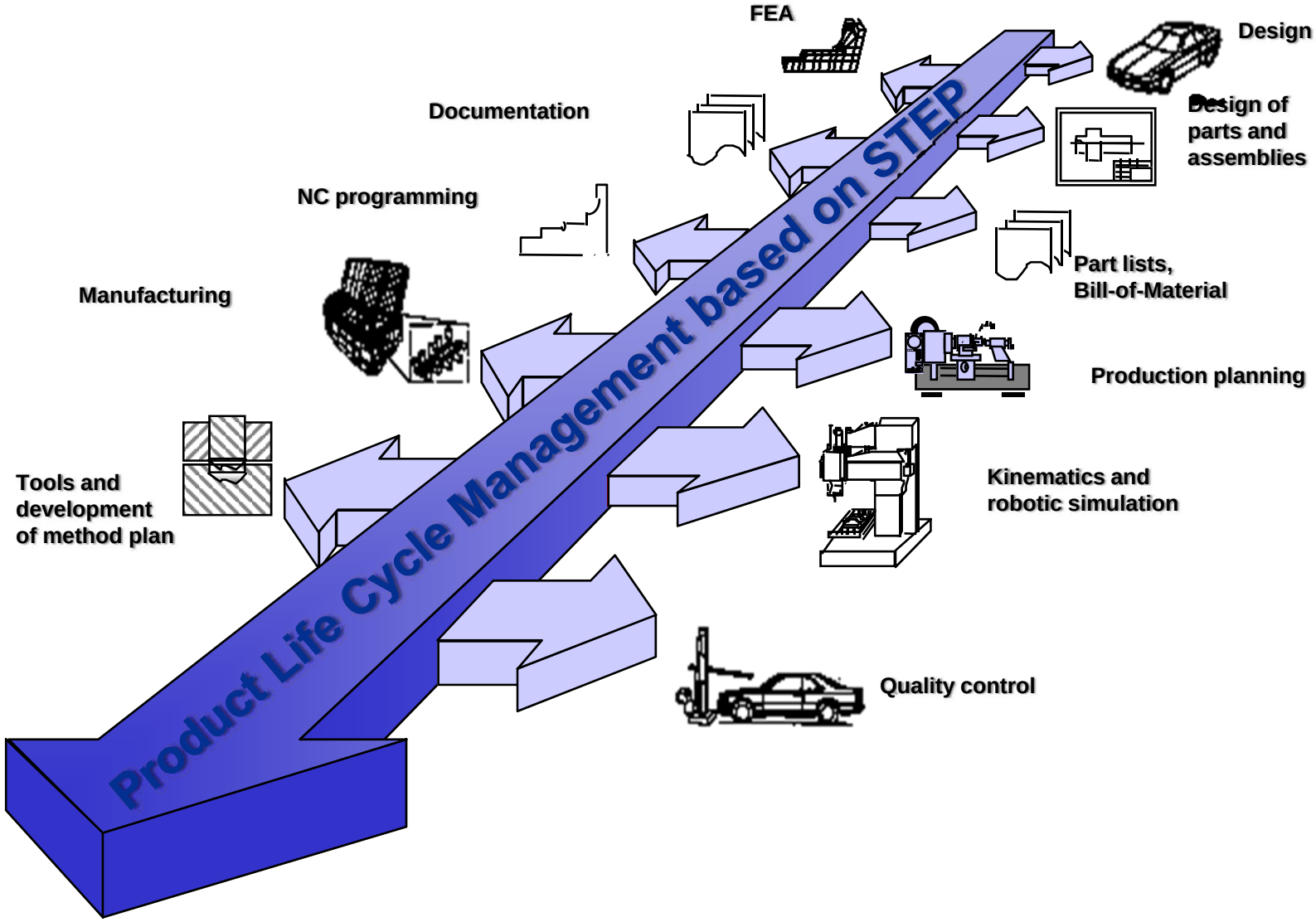
Participants

Airbus Deutschland GmbH
BAE Systems
Dassault Aviation
EADS Deutschland GmbH
MTU Aero Engines GmbH
Snecma
TranscentData Europe Limited

We are guided by Open Standards



Application and Integration of Digital Simulation Software today

- CAE today is increasingly used for initial design, simulation, verification, certification, etc.
  - including static, (fatigue) strength and vibration analysis, CFD, dynamic systems, plastic deformations (crash), ...
  - systems engineering, CAD, CAE, CAT, CAM
  - MDO, multi physics

- However ...
  - there is no common database that integrates the various digital simulation tools
  - Just using PDM for CAE can’t satisfy simulation specific requirements

Introduction

- Methods to manage CAD data and processes (PDM) are well established in todays industries

- Consequently these concepts could also be adapted for simulation and test. There are mainly two options:
  - adopting PDM systems with regards to requirements of the analysis domain
  - implementing simulation data management (SDM) tools

- The use of different data management tools across domains creates challenges regarding security, ownership, dependency and traceability

- Surveys like the NAFEMS FENet project show the importance of integration aspects, but also their undervalued representation on system level

Top Issues in the CAD/CAE Integration Domain (as identified by FENet)

- Missing Integration of tools for structural analysis and life cycle analysis
  - geometry, loads, material property databases, …

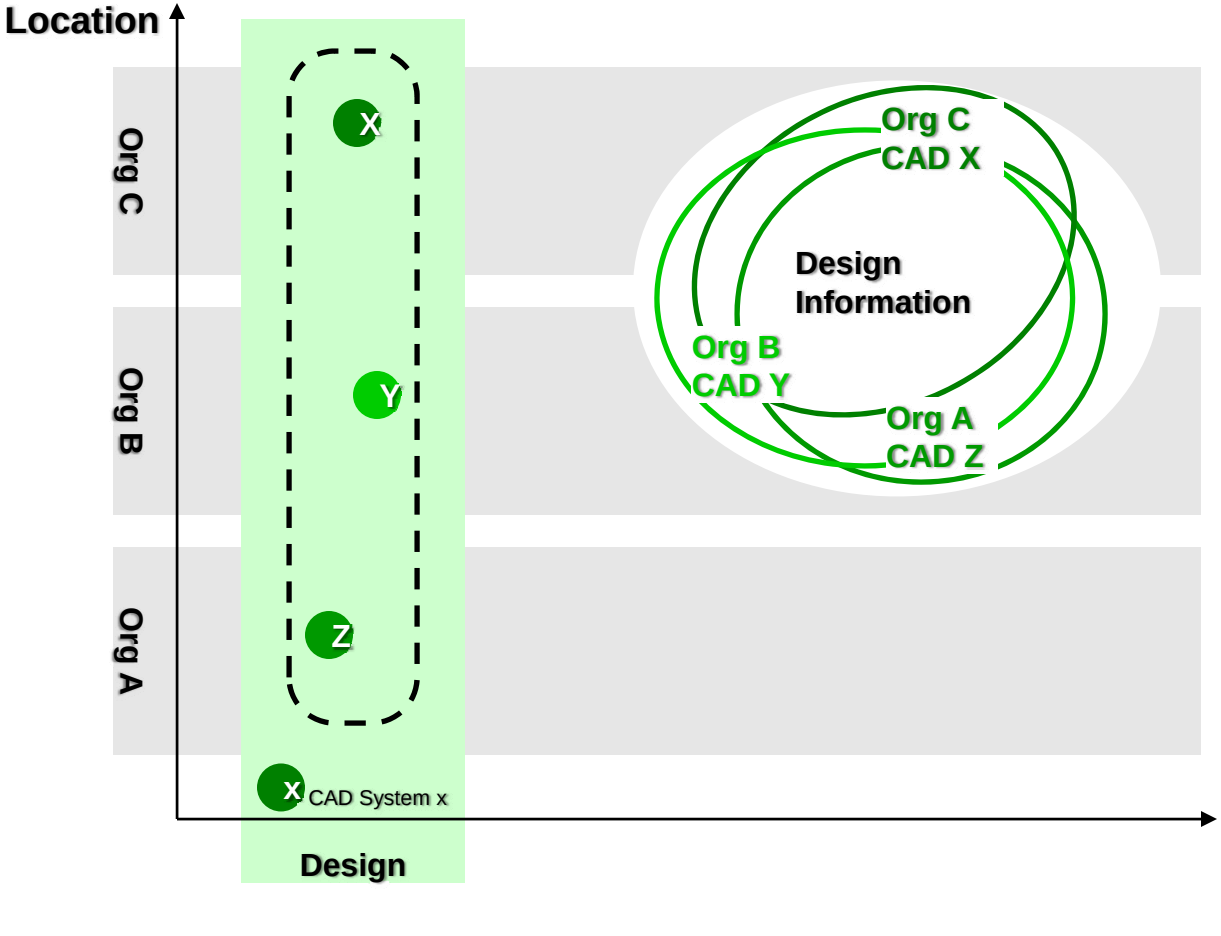
- Lack of integration of engineering analysis into design and development processes

- Use of incompatible legacy models and data
  - Need for improved data consistency
  - Missing use of standards like OMG PLM Services

- Insufficient CAE-to-CAD modification feedback

Enterprise Application Integration for Technical Product Data – Current Situation

- Design integration over different locations



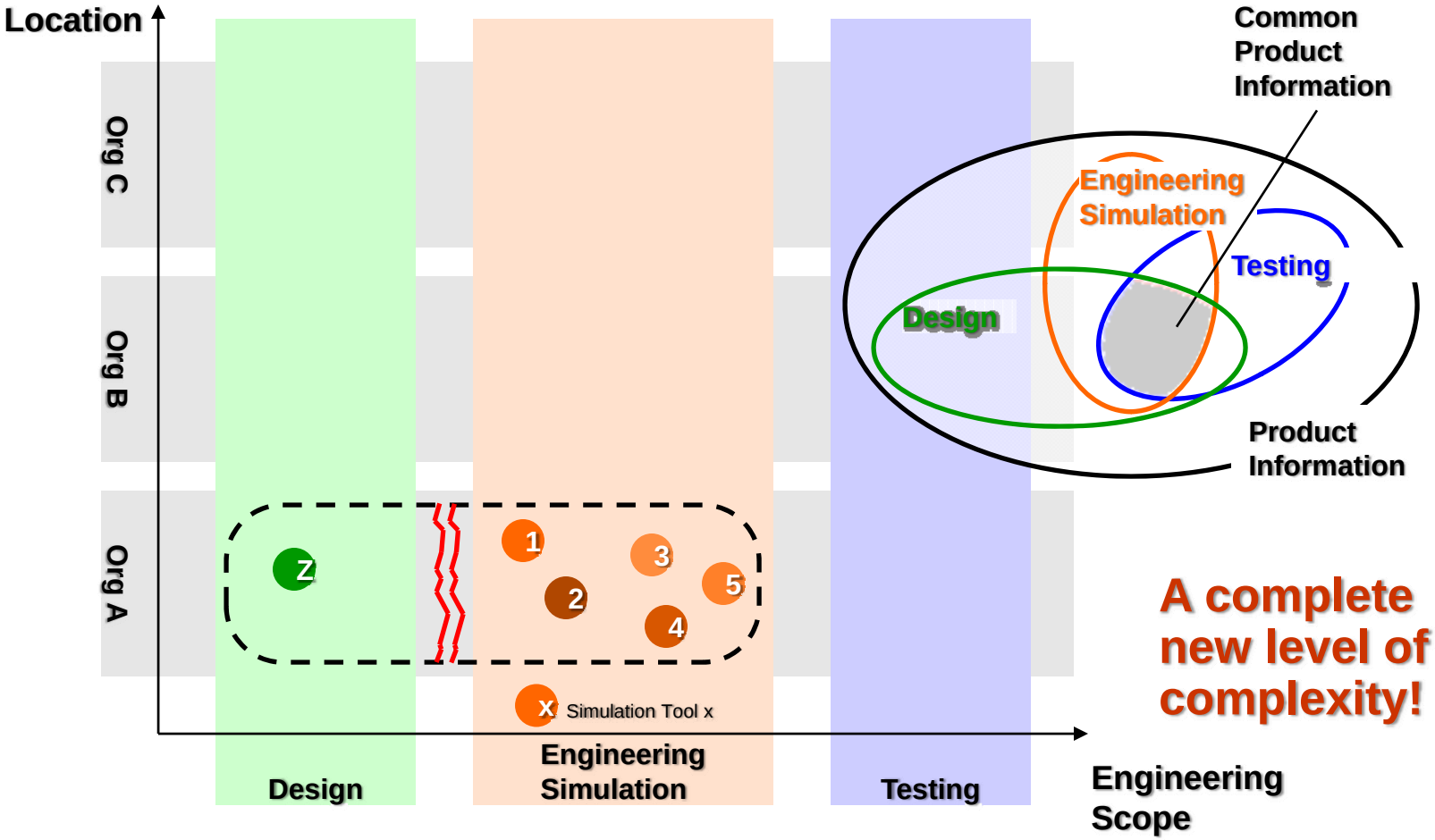
Meta information exchanged between PDM systems, but always **remains within** the **design domain**

– scope stays unchanged

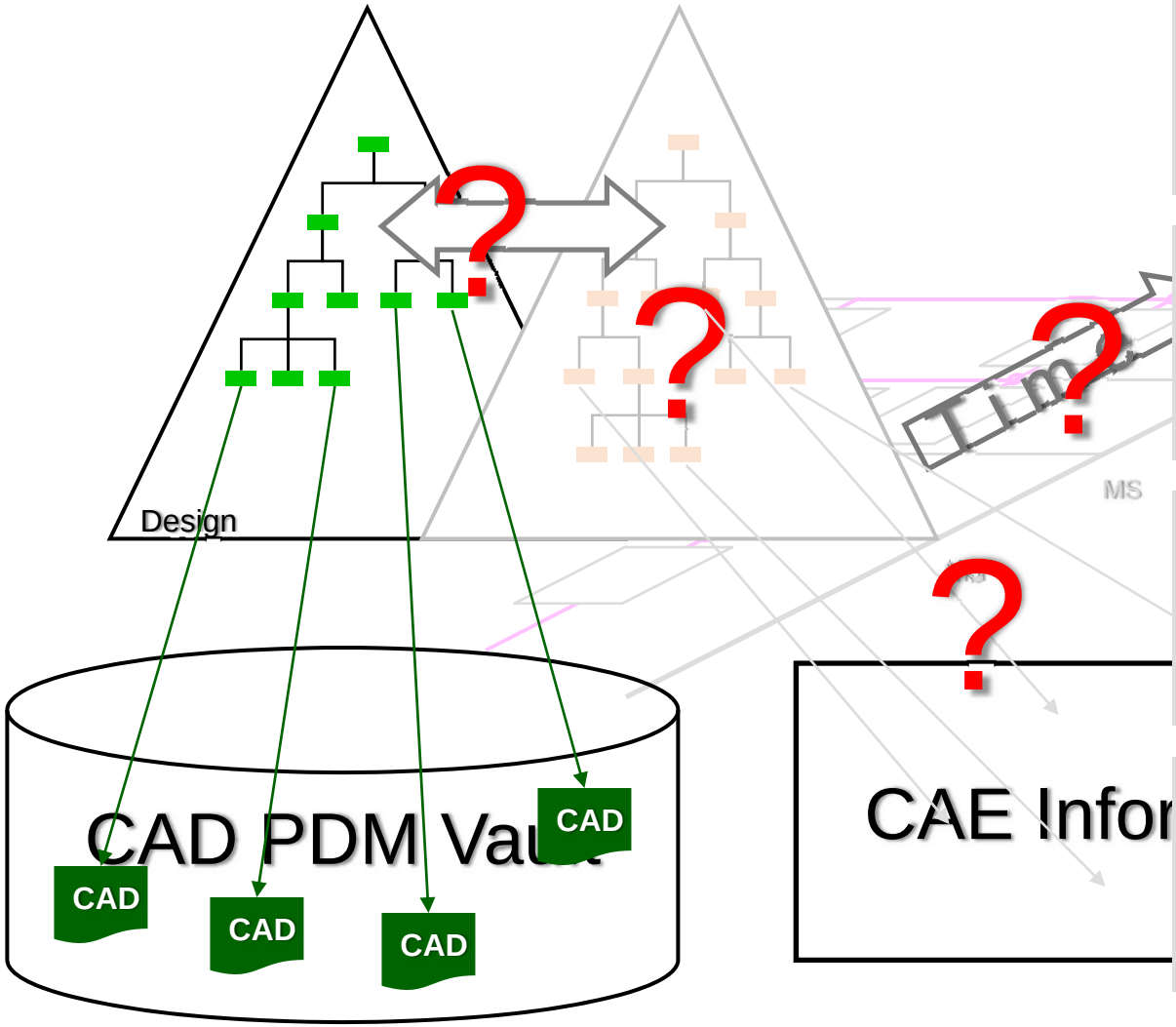
One major type of design tool: the "CAD system" – **high** information content **overlap**

Enterprise Application Integration for Technical Product Data – A new Situation

- Integration over different domains and semantic breaks



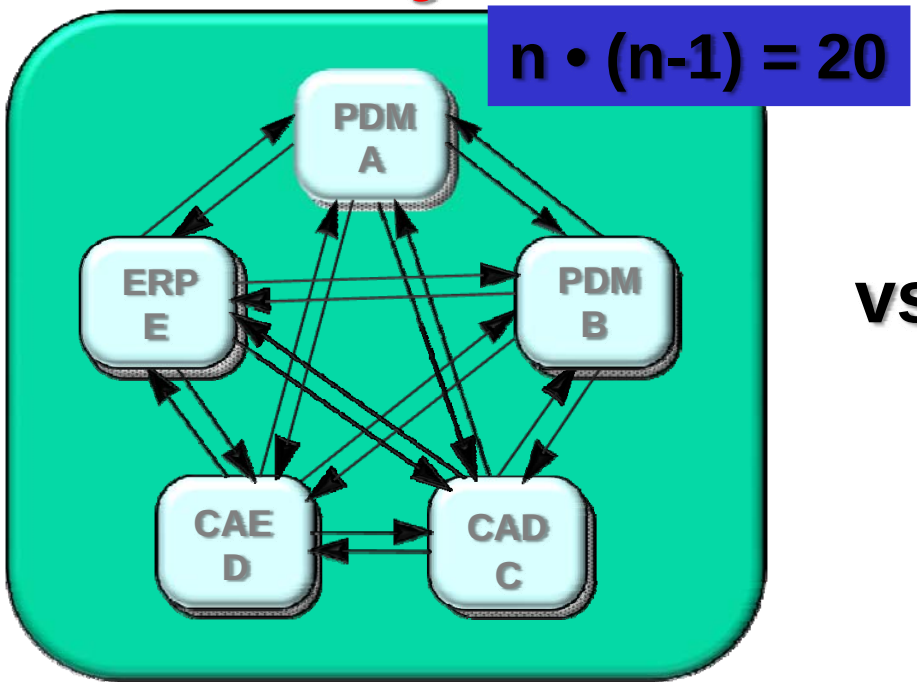
The 4 Challenges of Simulation Data Management



- Maintain product context for CAE information
- Make CAE information referable
- Keep inter-relations of CAE information with other domains
- Manage CAE information during the product lifecycle

Enterprise Scalability requirements Indicate using an integration platform

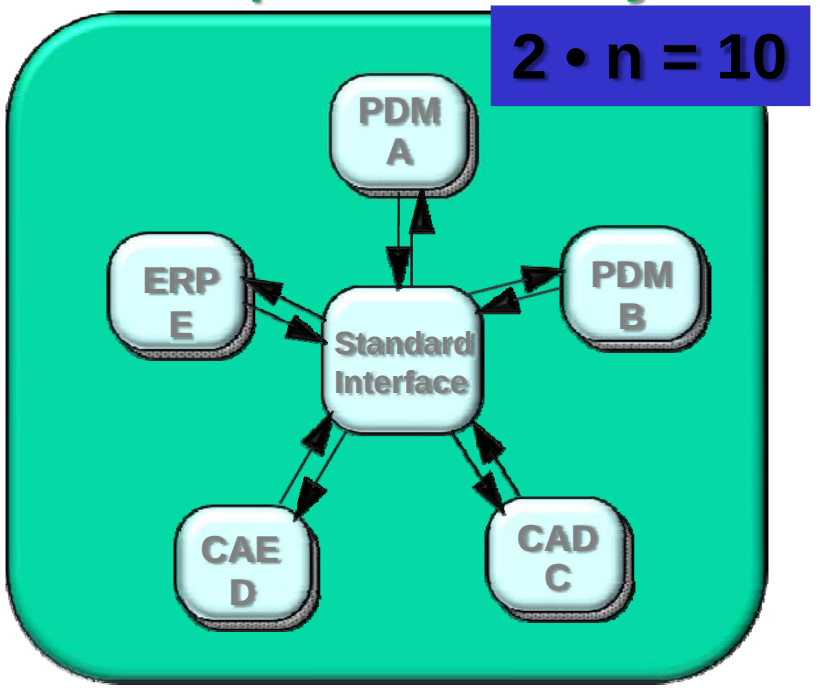
Typical custom developed point-to-point connectors are Unmanageable



- Exchange of information without standard interface

vs.

A standards based integration platform allows Enterprise Scalability



- Exchange of information with a standard interface

ISO 10303, Application Protocols

Application Protocol	Content
201	Explicit Draughting
202	Associative Draughting
203	Configuration Controlled 3D Designs of mechanical parts and assemblies
204	Mechnical Design using Boundry Representations
205	Mechnical Design using Surface Representations
207	Sheet Metal Die Planning and Design
208	Life Cycle Product Change Process
209	Composite & Metallic Analysis & Related Design
210	Elecetronic Assembly, Interconnect and Packaging Design
212	Electrotechnical Design and Installation
213	Numerical Control (NC) Process Plans for Machined Parts
214	Core Data for Automotive Mechanical Design Processes
215	Ship Arrangement
216	Ship Moulded Forms
217	Ship Piping
218	Ship Structures
220	PCA Process Planning
221	Functional Data and their Schematic Representation for Process Plant
222	Design to Manufacturing for Composite Structures
223	Exchange of Design and Manufacturing Product Information for Cast Parts
224	Mechanical Product Definition for Process Planning using Machining Features
225	Building Elements using Explicit Shape Representation
226	Ship Mechanical Systems
227	Plant Spatial Representation
231	Process Design and Process Soecification for Major Equipment
232	Technical Data Packaging Core Information and Exchange

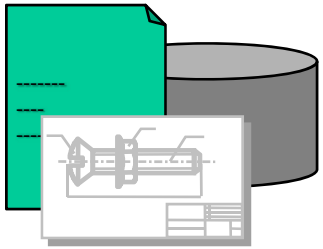
OMG PLM Services
The Standard for all PDM related Data

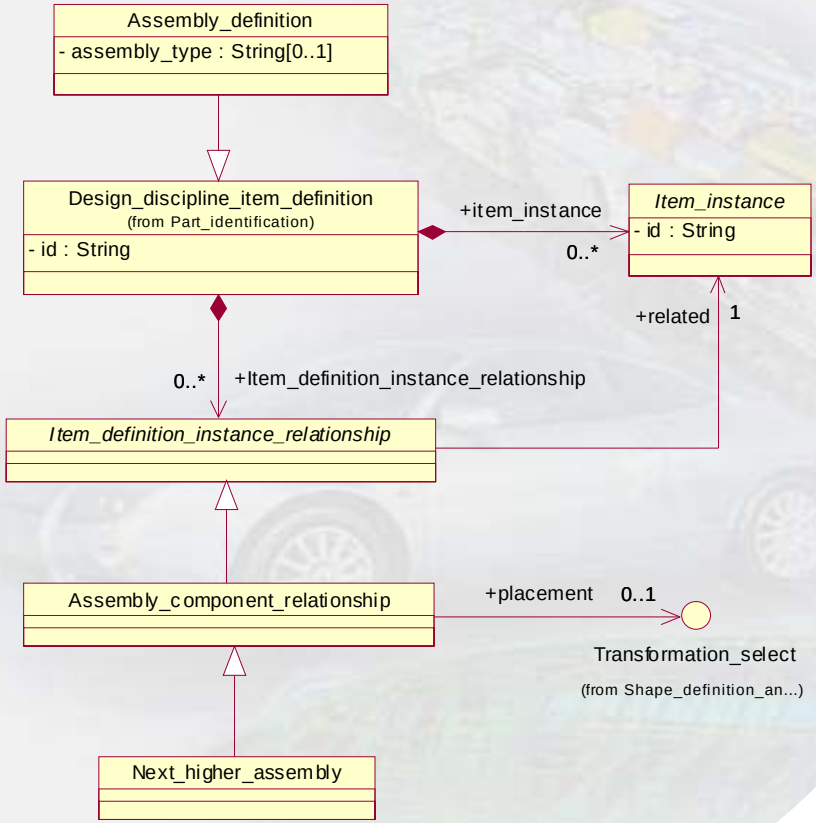
Administrative Data Properties

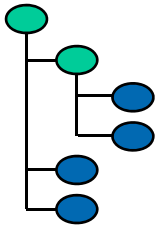
Id = ...
Name = ...
Version = ...
Creator = ...
Date = ...

Weight = ...
COG = ...
Location = ...
Rotation = ...
Material = ...

Documents Models



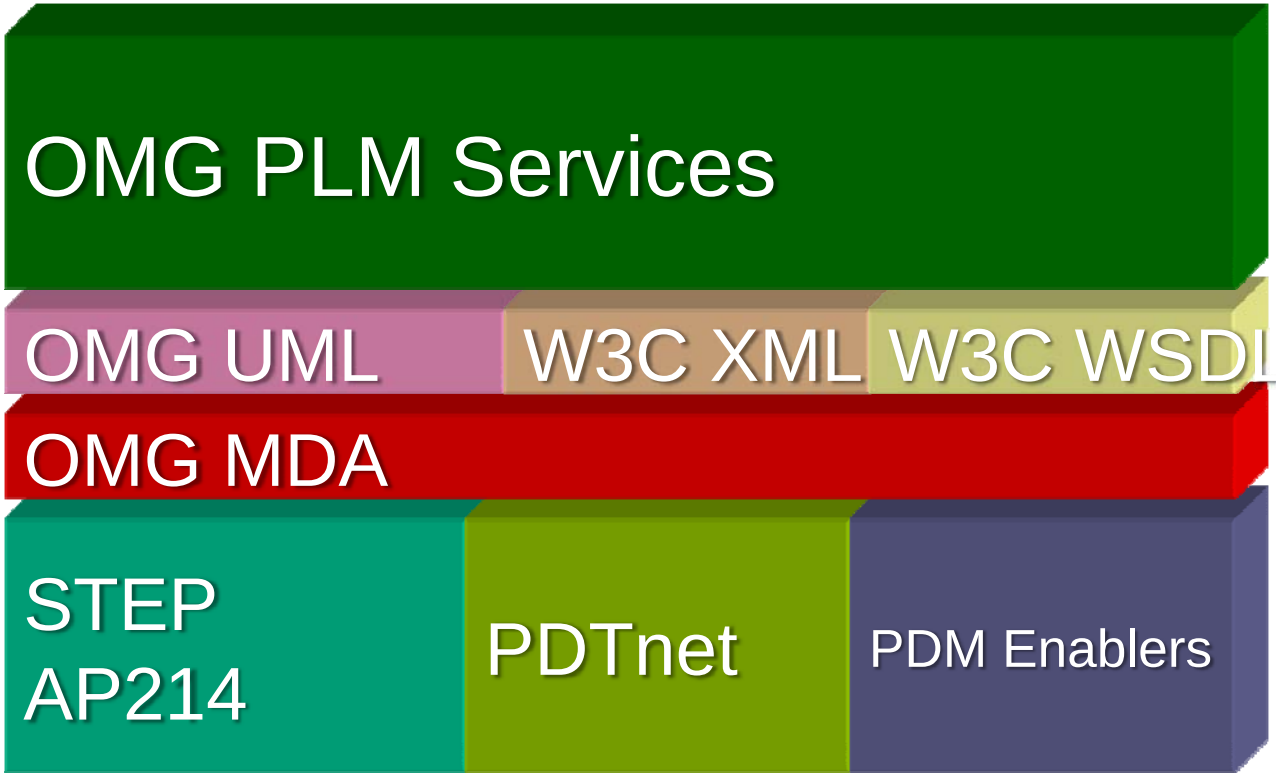




Product Structure

BoM Configuration

OMG PLM Services
A Standard based on Standards

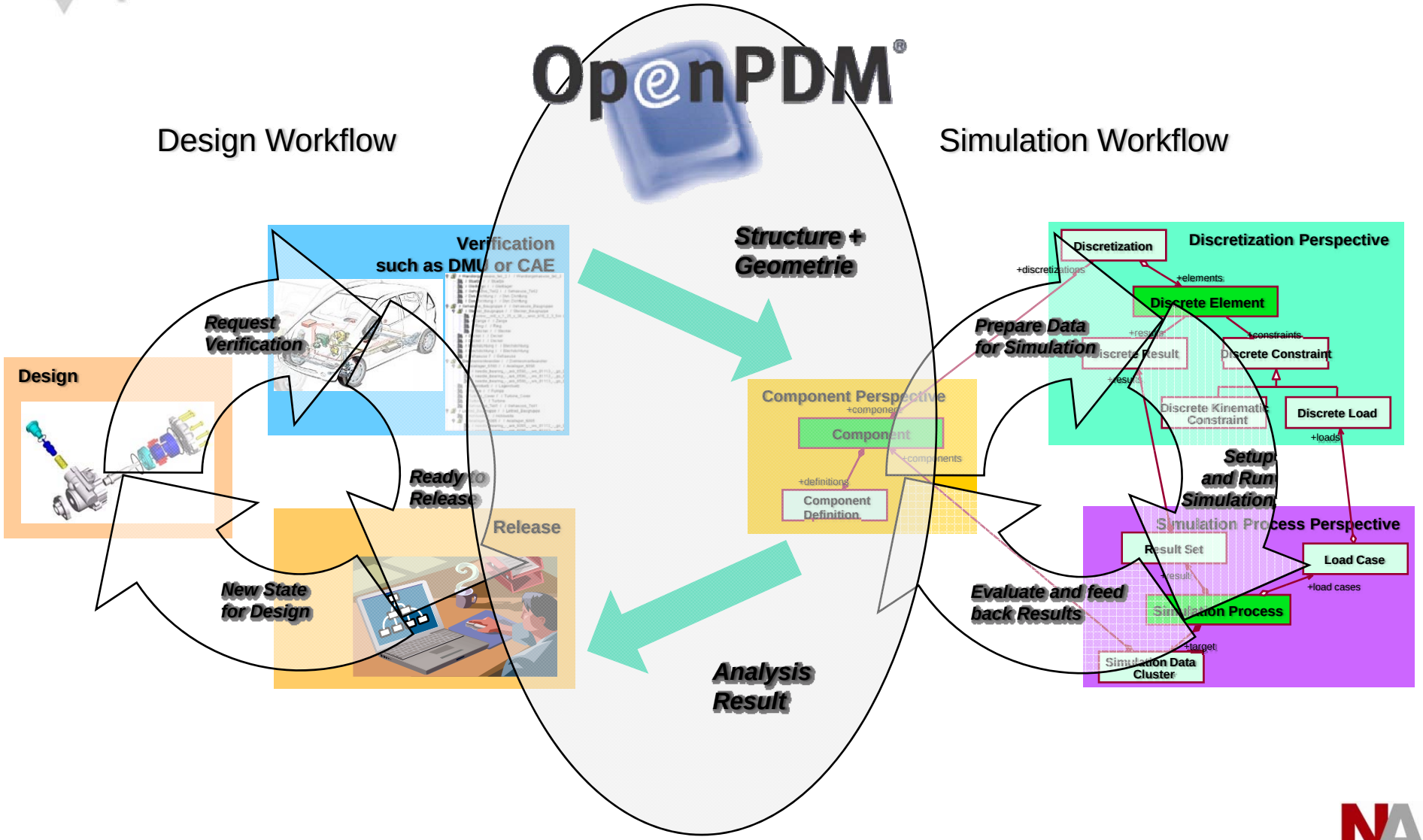


- Platform independent specification of
  - Data
  - Operations
- Usage of accepted standards like
  - XML Schema
  - WSDL

OMG PLM Services provides a **optimal schema** for generic business objects

to integrate PDM Systems in a SOA

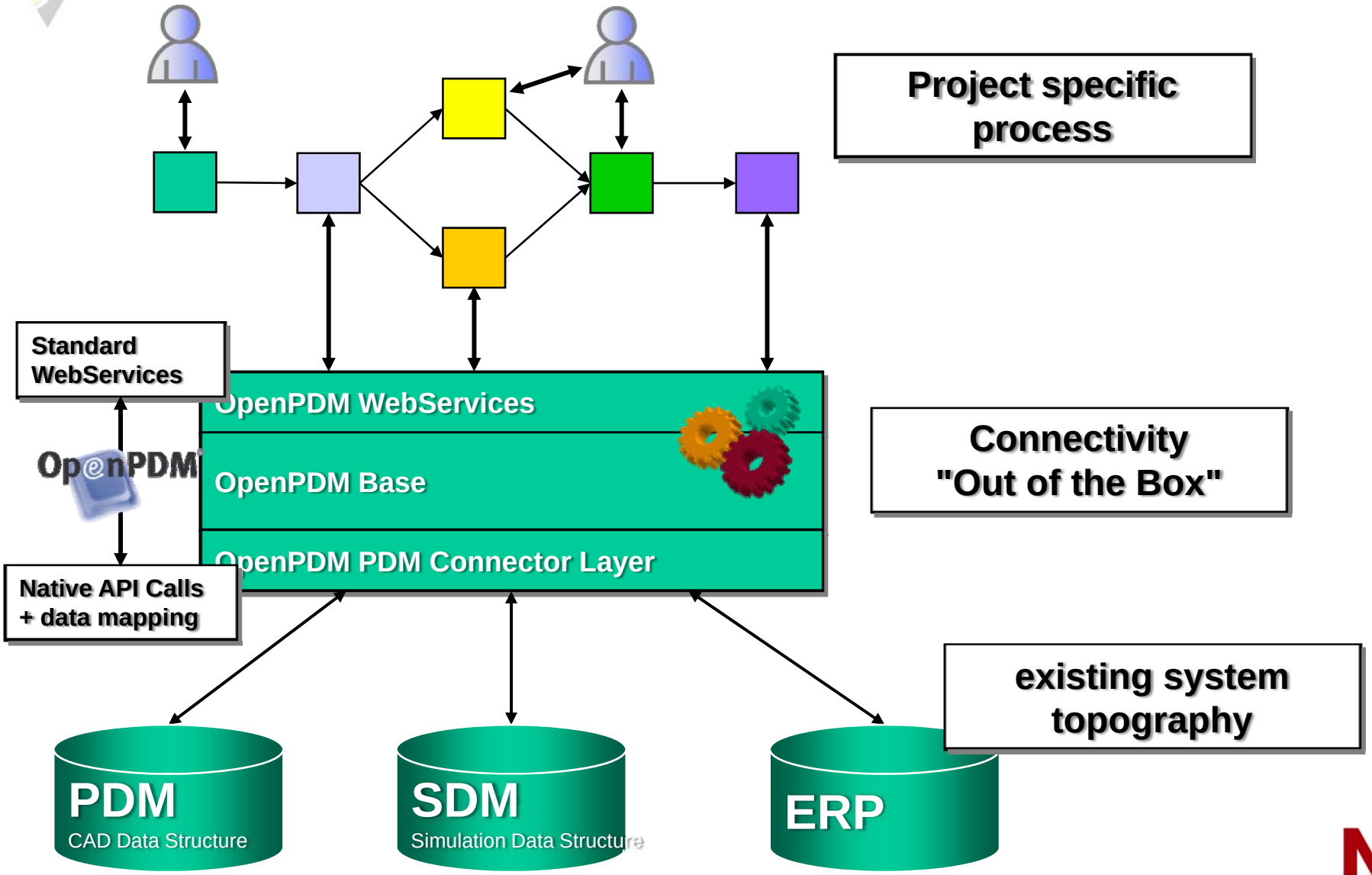
CAD - CAE Integration using OpenPDM®



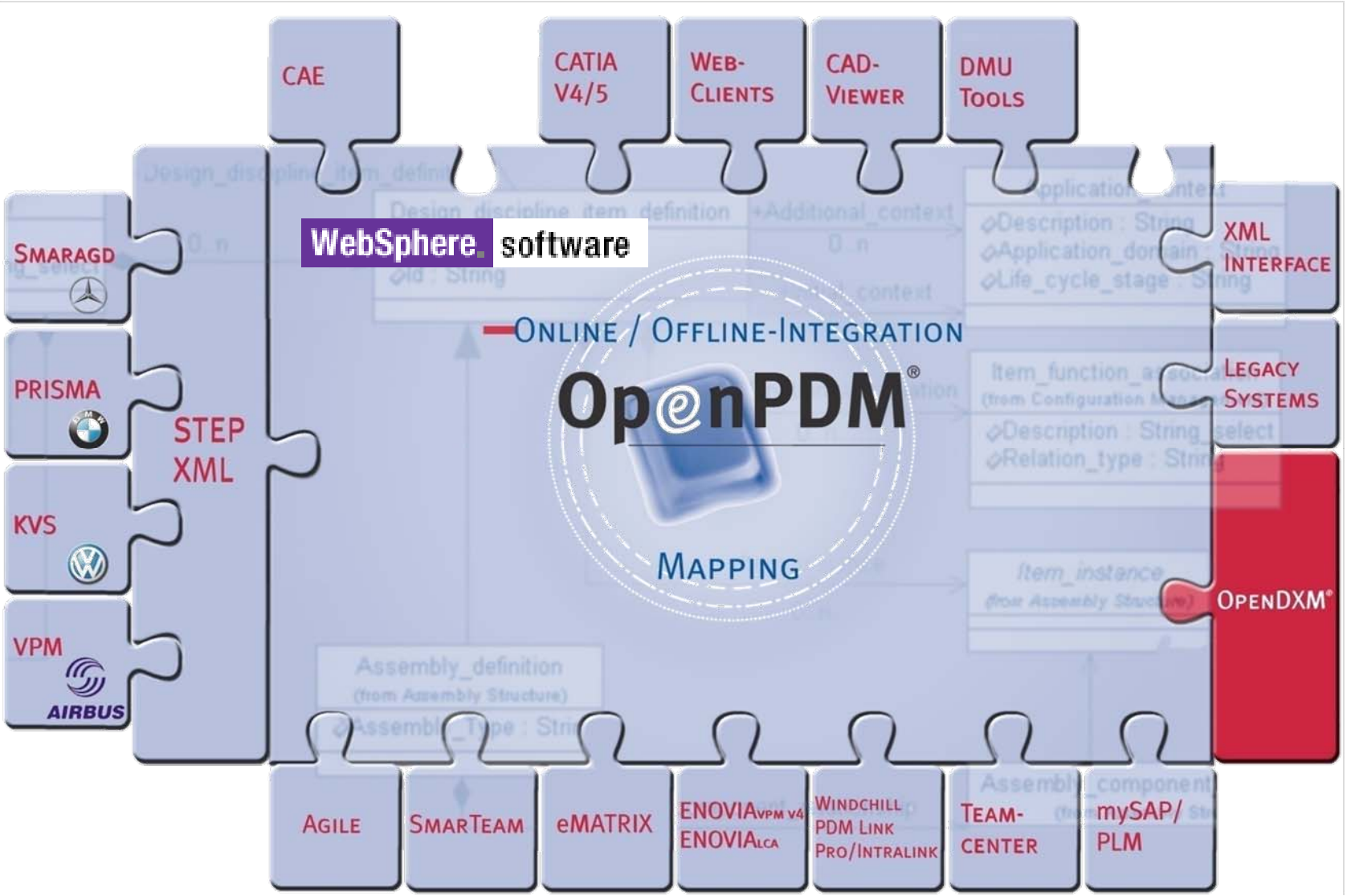
CAD - CAE Integration Use Cases

- Browsing PDM system(s) and export of metadata, structure and geometry, considering version information, last_modified, configuration and effectivities
- Structural data filtering for CAE relevance
- Import of structure/metadata and CAD models into the Simulation Data Management (SDM) system
- Export of analysis results from SDM and import into the PDM system
- Establish links between PDM and CAE
  - To make metadata, models and simulation results referable
  - Identify delta and update SDM system with changes on PDM side

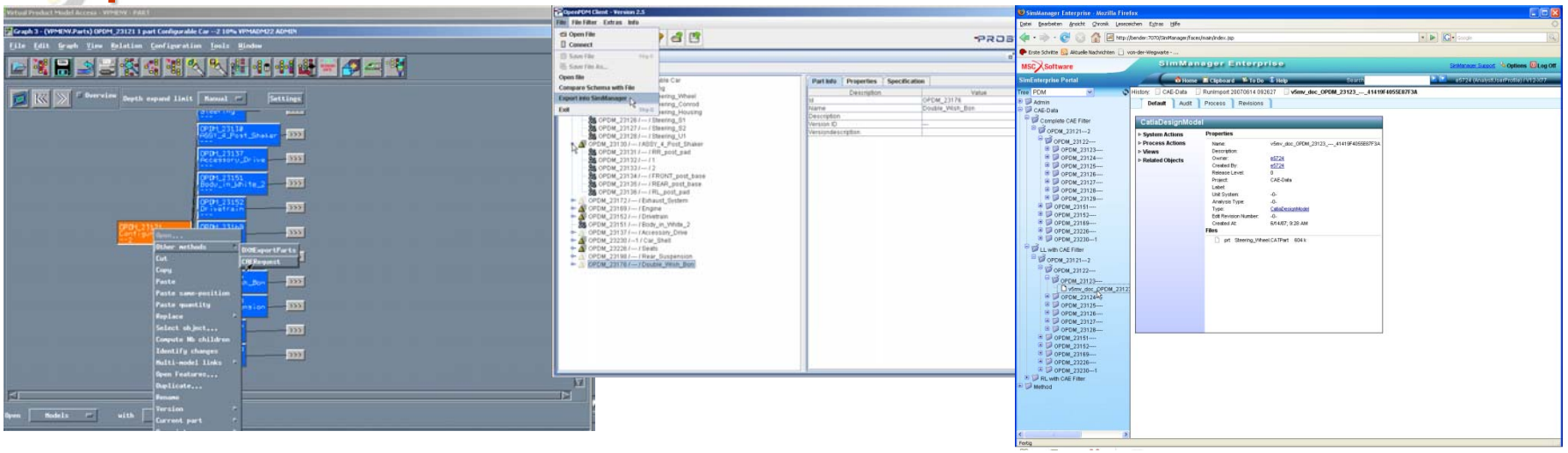
OpenPDM® Basic Architecture



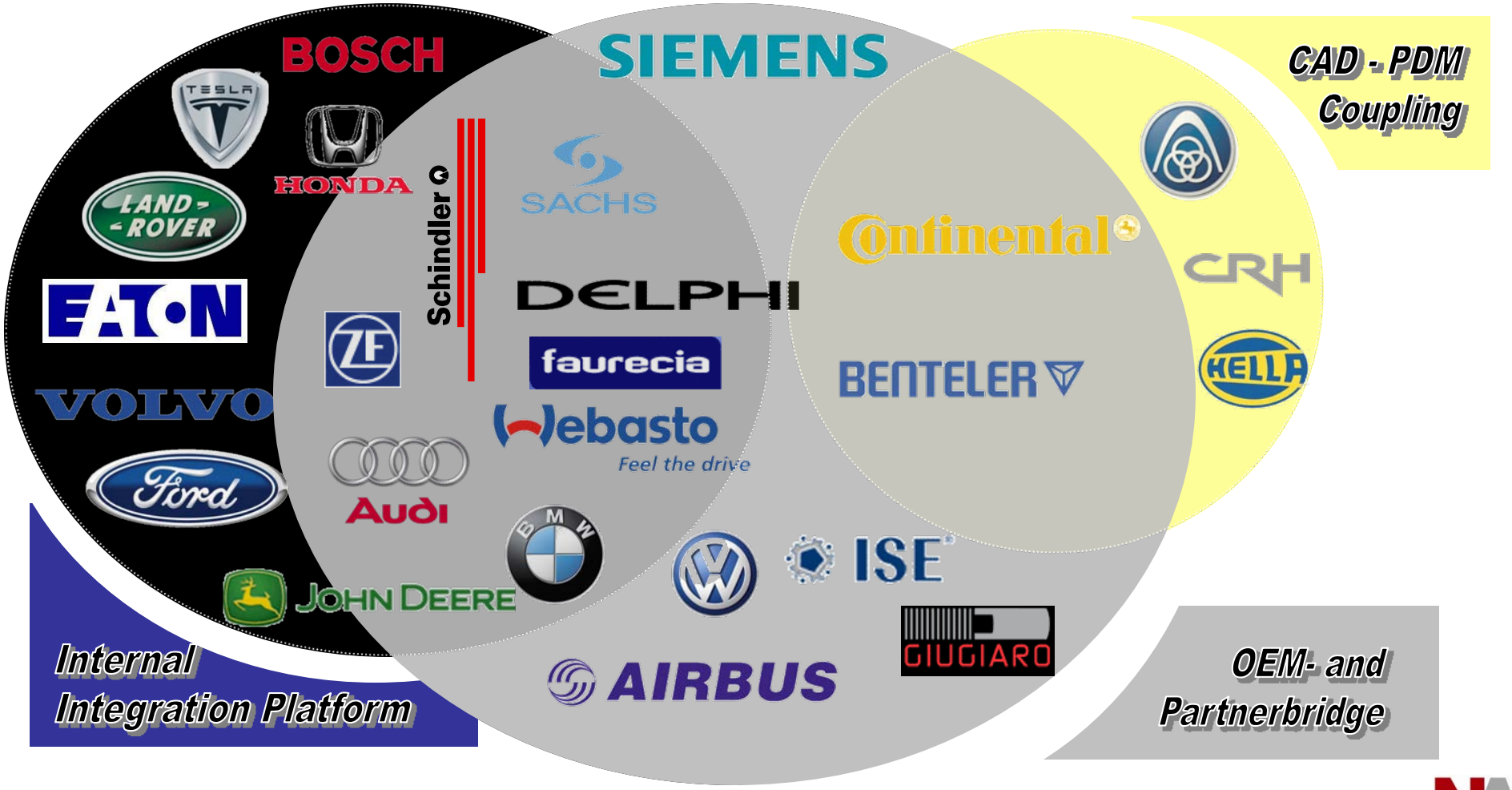
OpenPDM® - ONE solution for internal and external integration projects



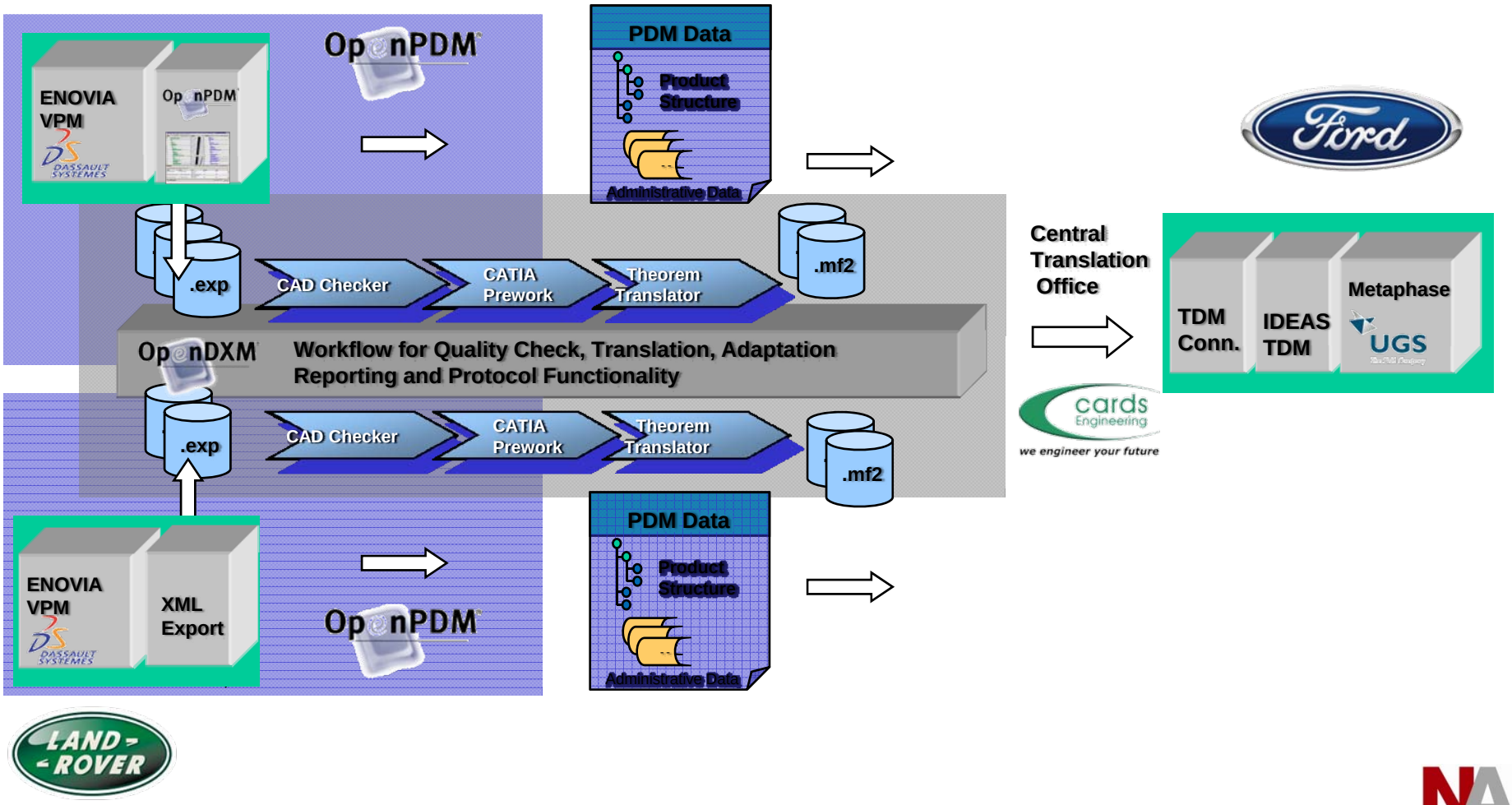
PDM CAE Integration by using OpenPDM®



Available Technolgy is being used today.



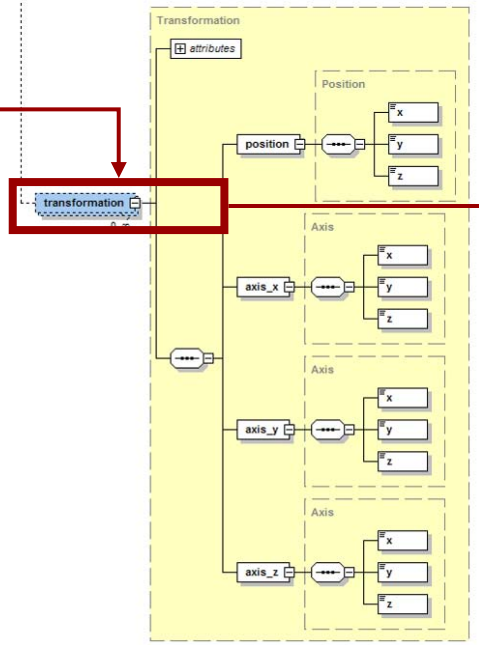
Enterprise-wide Integration at Ford



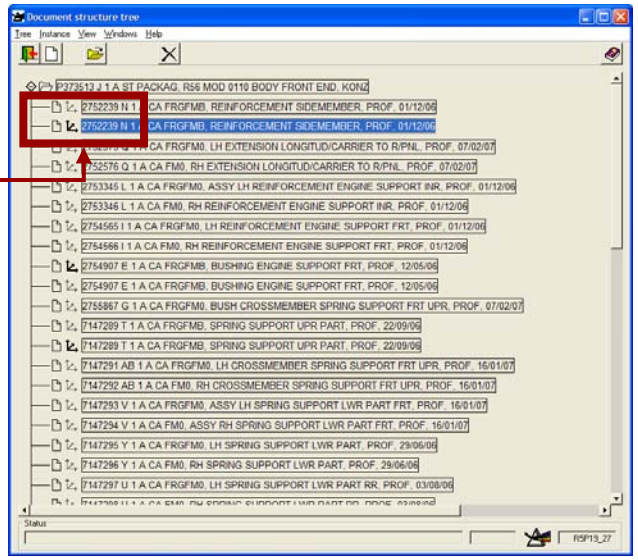
BMW / ITALDESIGN GIUGIARO
Structure Mapping

KBOM

Mapping



PRISMA



Source: Giugiario presentation at ProSTEP iViP Symposium 2007

Volkswagen
e2e-Integration platform

OpenPDM®

„... PROSTEP is a strategic consulting- and development-services partner for for further development and web-based integration of VW Group standard solutions like HyperKVS und TI-Syncro...“ Dr. Trac Tang, Director Engineering IT

VOLKSWAGEN AG

http://www.volkswagen.com/

The Volkswagen Group with its headquarters in Wolfsburg is one of the world’s leading automobile manufacturers and the largest car producer in Europe.

OpenPDM® usage at Eaton Results

Use of OpenPDM® at Eaton:

Use Case:	**Data Migration of ProE CA Data**
Source System:	**Product Center**
Target System:	**Matrix (incl. Pro/E Integration)**
61,042	**Data Packages (each incl. 1 Meta File + 1 Pro/E Documents)**
55	**GByte of Pro/E CA Data imported to Matrix**
196,000	**Pro/E Objects created in Matrix**
25,000+	**Matrix Parts created**
80	**Hours to perform the Data Migration**
15	**Failed Packages which needed manual Interaction**

http://www.eaton.com/

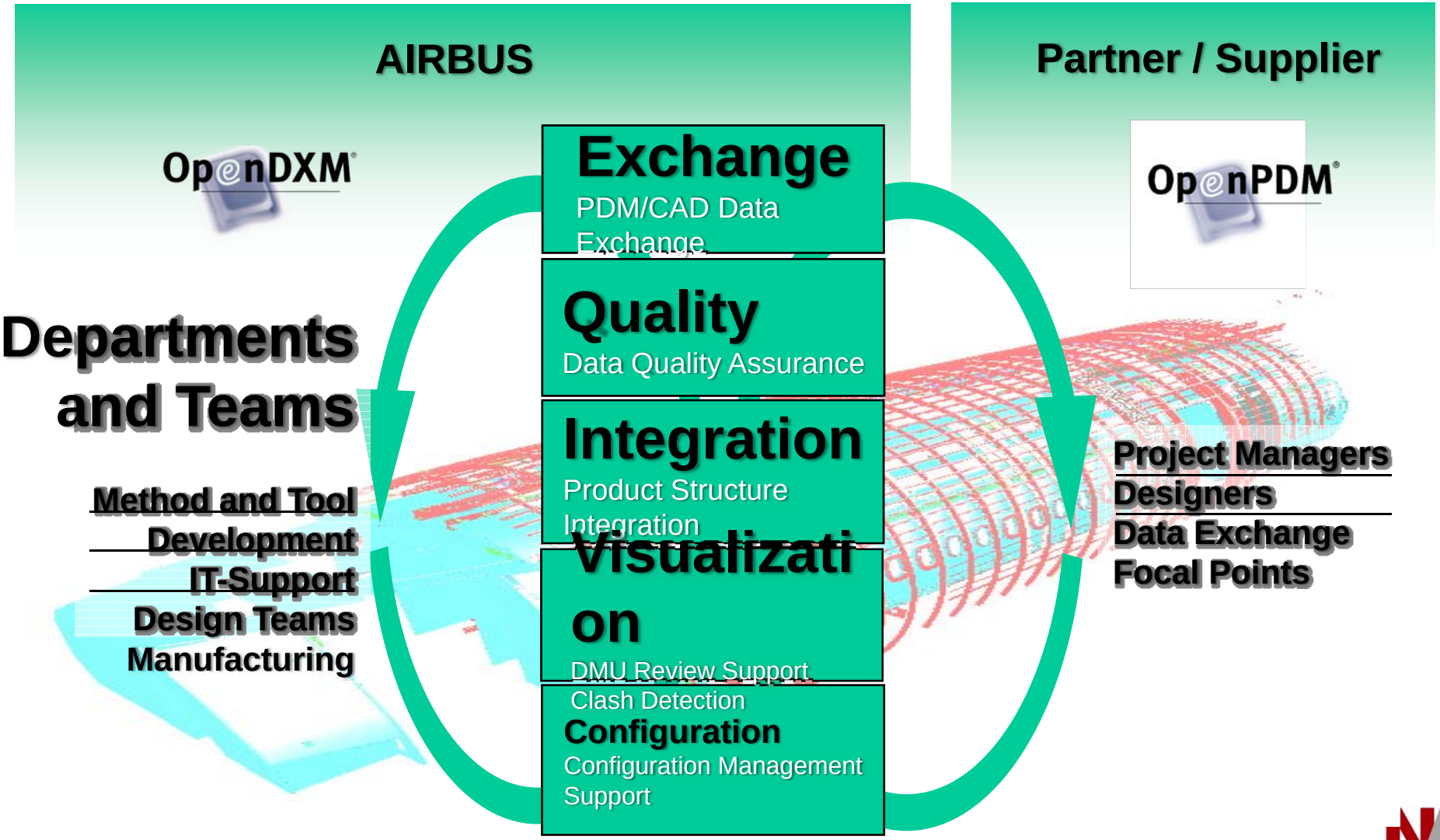
TESLA Engineering Integration

TESLA MOTORS

- Tesla designs High Performance Electric Cars using a heterogeneous engineering infrastructure
- SAP (ERP) and Arena (small PDM) are integrated via OpenDPM

- www.teslamotors.com

DMU Integration at Airbus Deutschland



PROSTEP Partnerships

IBM Partnership

Service oriented architecture
To support your business objectives

IBM

Intelligent solutions that put SOA to work for automotive and aerospace companies.

Companies in the automotive and aerospace industries must develop highly complex products with a wide variety of versions. Developing these products is a collaborative task that demands a high level of communication.

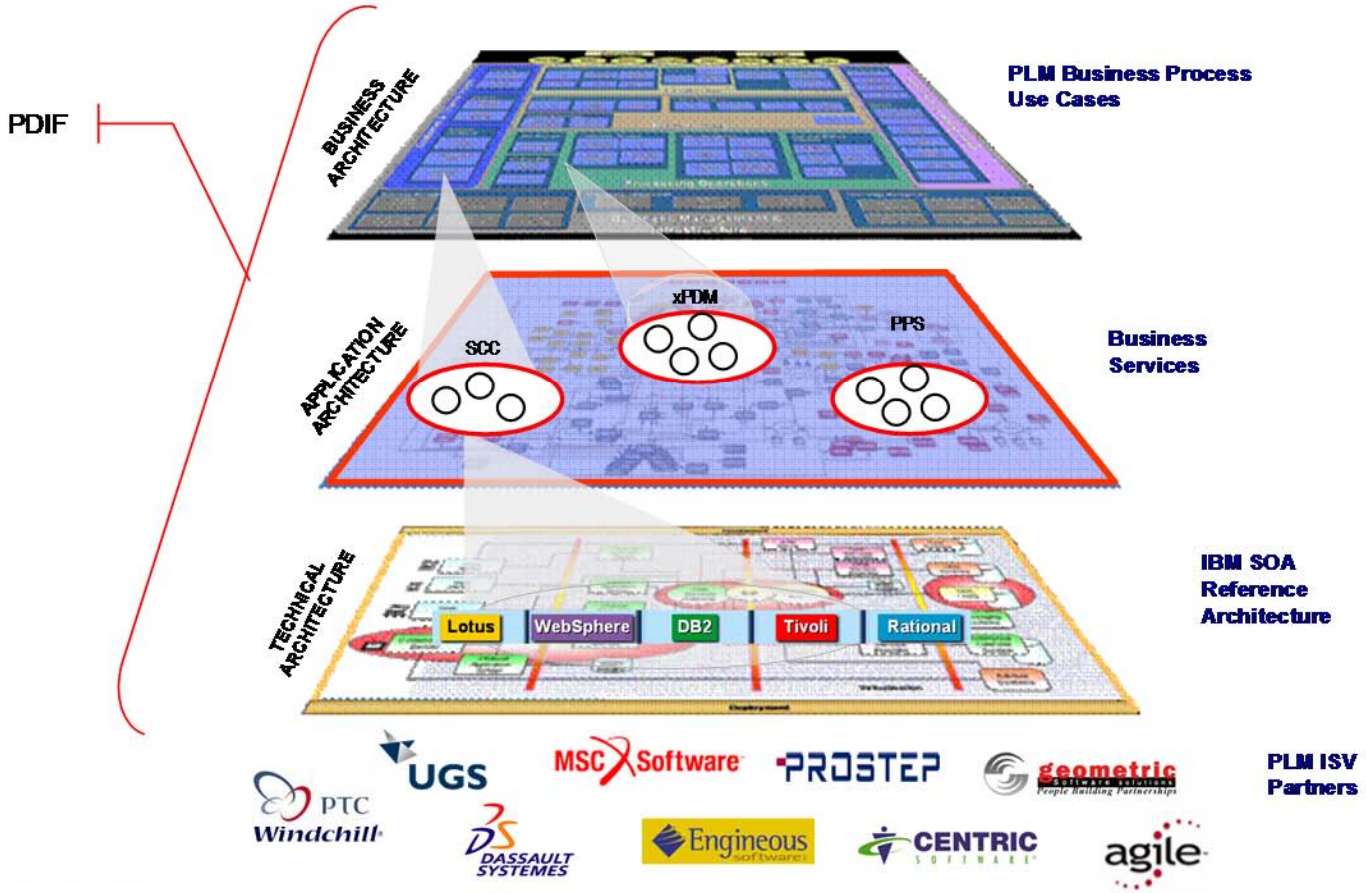
An SOA solution lets you create a common platform

IBM and IBM Business Partner PROSTEP are working together to offer a service oriented architecture (SOA)-based solution. Now, companies in the automotive and aerospace industries

Because OpenPDM software is based on open standards, it can be deployed in an SOA and is compatible with the latest generation of business-process automation software, such as IBM WebSphere Process Server.

IBM and PROSTEP - PDIF

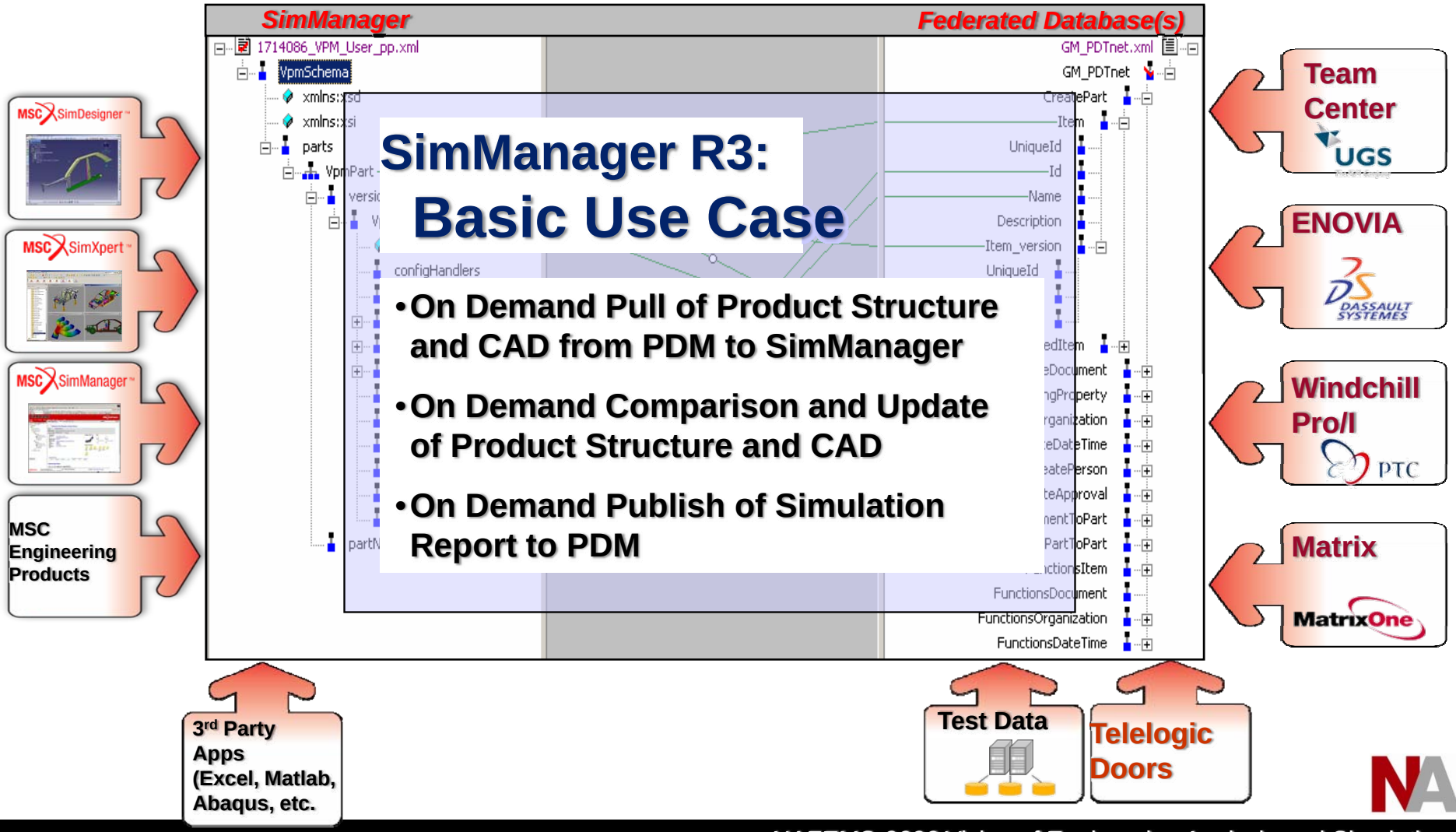
The Product Development Integration Framework



innovation that matters

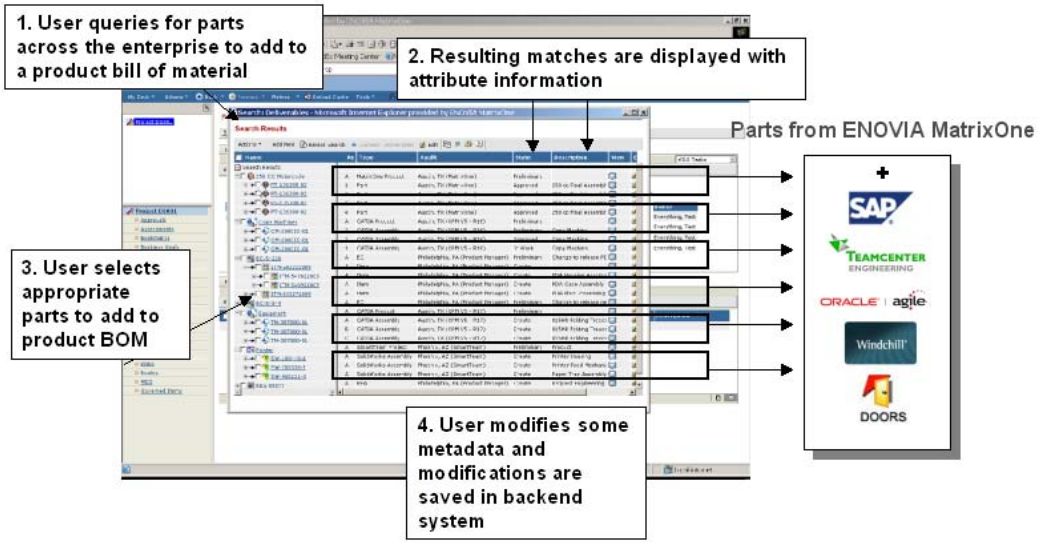
SimManager "Enterprise Connect"

Powered by OpenPDM



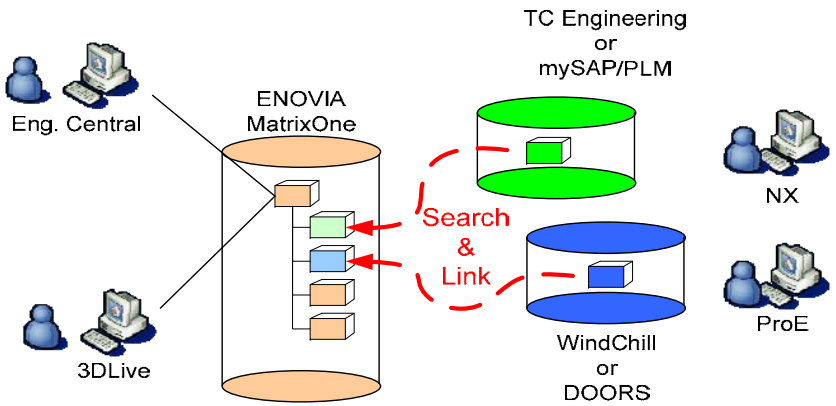
PROSTEP – Dassault Partnership

Federated eBOM for ENOVIA MatrixOne



Target Use Cases:

- Federated 3D Product Access
- Program Dashboard Review
- Federated Enterprise BOM
- Incremental Migration
- Federated Enterprise Change Management
- Federated Enterprise Requirements Management



Synergy: Ford Supplier Integration

http://www.ugs.com/industries/automotive/synergy.shtml

SIEMENS

Customer-Supplier Data Exchange

Finally, a New JT Based, Asynchronous Data Sharing Program

Experience the future and touch it now.

UGS PLM Software, in collaboration with HP, complete change in the way the automotive in design and manufacturing. UGS Synergy™ pr levels of the supply chain with a single optimi design and manufacturing information.

With UGS Synergy™ suppliers can now set u management (PLM) environment and leverag enterprise.

- Leverage your overall size and marshal
- Easily and securely share information a teams
- Develop product development best prac
- Optimizing your expertise and business

JT Leverage

UGS Synergy™ leverages **JT** which has eme standard for 3D visual collaboration in the aut industry. Both OEMs and suppliers alike use JT in its native format for many of their downstream applications from purchasing to manufacturing. It's smaller in file size and protects intellectual property. (Select image to enlarge)

Exchange Manager

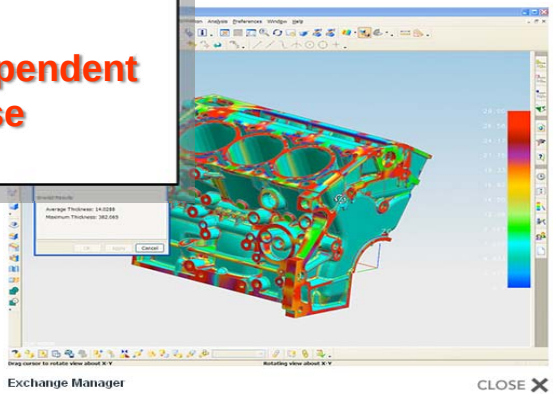
UGS Synergy™ includes the **Exchange Manager**,powered by PROSTEP™, which enables suppliers to pull the specific design context from their customers managed e suppliers local de available to the entire deliverable is just as rge)

timized design
se-wide data management
supplier's product
art nomenclature, and
processes together with a
neration design system.

Target Use Cases:

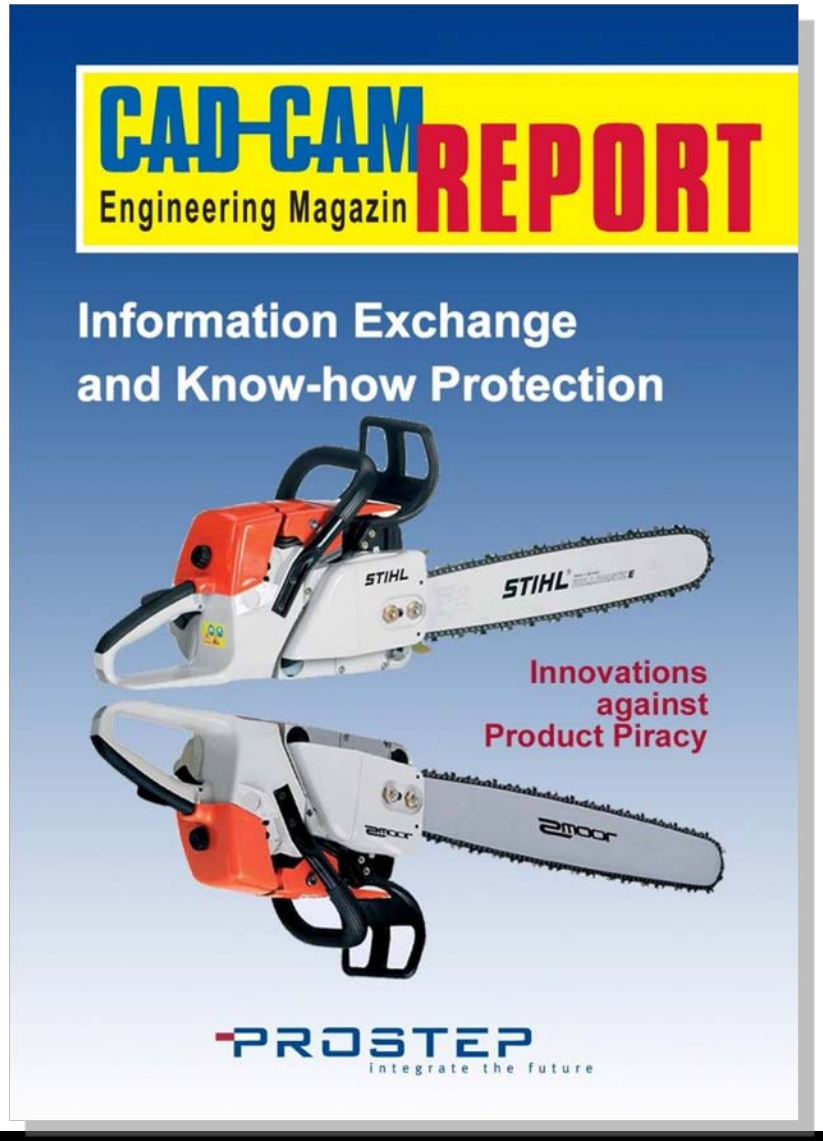
- **Integration Ford C3PNG with Suppliers TCe 10 and higher**
- **Synchronization of metadata, product structure and geometry**
- **Geometry transfer using JT**

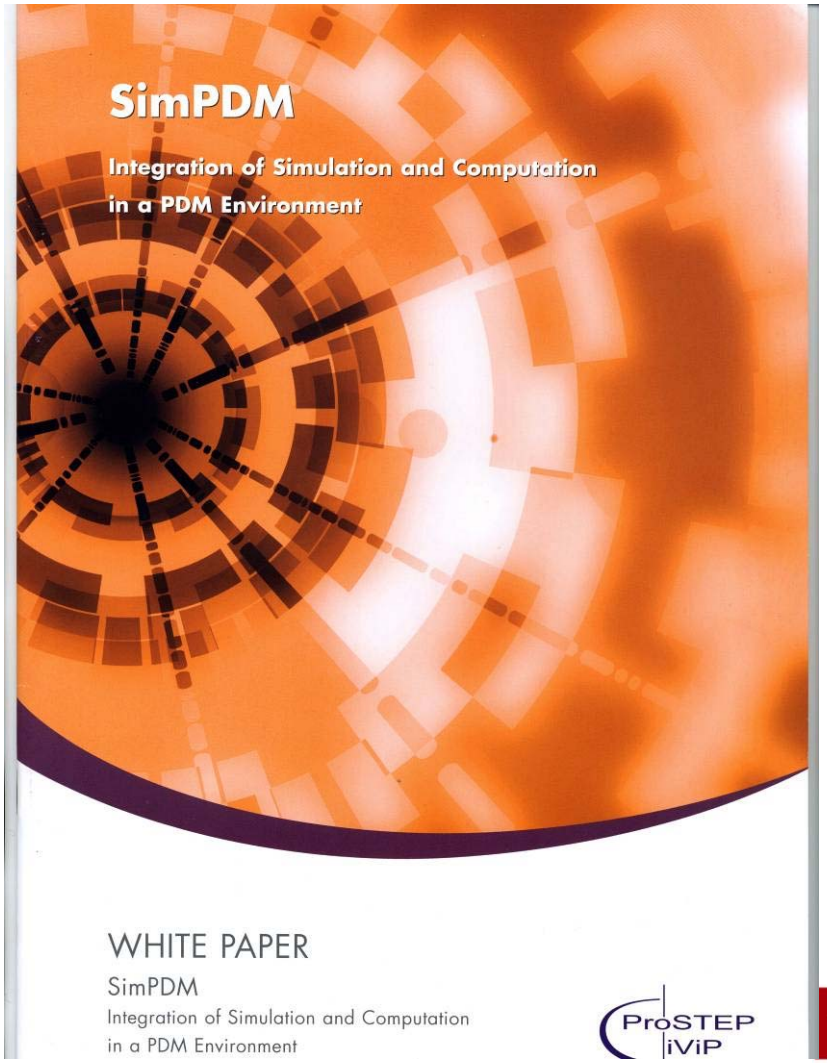
Makes Ford and Suppliers independent from their CATIA and TC Release



Ask us about ....

Integration of Simulation and Computation in PDM





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