Standards-based Integration and Interoperability

Tier 1’s and OEM’s Streamline Data Managements to Master the Demands of Multiple PDM and CAD Systems

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PROSTEP

Company Information

- Since it's 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 to (PDM, CAD, ERP, CAE, Legacy) **product structure interchange and conversion**.
- 11 Offices including
  Detroit (Troy)

PROSTEP OWNERS

BOSCH
Continental
DAIMLERCHRYSLER
GM
DELPHI
SIEMENS
VOLKSWAGEN AG

ProSTEP iViP

ProSTEP iViP is a separate non profit organization dedicated to the advancement of open standards in various industries

Industry (Users)

IT-Companies and System Vendors

Universities, and Associations

Adam OPEL AG
Actano GmbH
Adobe Systems GmbH
Agile Software GmbH
Airbus Deutschland GmbH
Alias Systems
Altair Engineering GmbH
Aucotec AG
Audi AG
Avanion GmbH
AVL-List GmbH
Behr GmbH & Co.
Berliner Kreis e. V.
Bertrandt AG
BMW AG
Borg Warner Turbo Systems GmbH
Brose Fahrzeugteile GmbH & Co. KG
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Cadfem GmbH
Campana & Schott Realisierungsm. GmbH
cards Engineering GmbH & Co. KG
CEFE, FH Augsburg
CENIT AG Systemhaus
CIM-TEAM Techn. Informatik GmbH
Cimpa GmbH
CoCreate Software GmbH & Co. KG
COMSA Computer und Software GmbH
CONTACT Software GmbH
Conti TEMIC microelectronic GmbH
CONTINENTAL AG
Continental Teves AG & Co. oHG
CSC PLOENZKE AG
DaimlerChrysler AG
Daimler Chrysler Research India PVt. Ltd.
Dassault Systèmes
Das virtuelle Fahrzeug, Graz
DDG Dräxlmeier
DELPHI Deutschland GmbH
Delphi GmbH Mechatronic Systems
Denso Automotive Deutschland GmbH
DPS Software GmbH
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em engineering methods AG
EADS Deutschland GmbH Military Aircraft
EDAG Engineering + Design AG
Edscha AG
EPM Technology AS
Eurostep Commercial
exentra GmbH
exxcellent solutions GmbH
Faurecia Innenraumsysteme GmbH
FE-Design GmbH
fischer automotive systems GmbH
Ford-Werke AG
FhG IGD
FhG IAO
FhG IPK
FH Nordwestschweiz
-Institut für Kooperationsforschung und –entwicklung (ifk)
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
GETOQ Consulting GmbH
GETRAG Getriebe- und Zahnradfabrik
Goodyear Dunlop Tyres
Hella KG Hueck & Co.
Hengst Filterwerke GmbH & Co. KG
Hirschvogel Umformtechnik GmbH
Huf Hülsbeck & Fürst GmbH & Co. KG
IAV GmbH – IG Auto & Verkehr
IBM Deutschland GmbH
ILC PROSTEP GmbH
in-integrierte informationssysteme GmbH
IPEQ GmbH
Inalfa Roof Systems
INA Schaeffler KG
ISE Innomotive Systems Europe GmbH
ISE-Industries GmbH Werk Duisburg
ISE-Industries GmbH Werk Witten
J. Eberspächer GmbH & Co.
JAMA - Japan Automotive Manufacturer Assoc.
Japan Auto Parts Industries Association
John Deere Werke Mannheim
Johnson Controls GmbH

KTH, Woxen Centre
KUKA Schweißanlagen GmbH
KEIPER GmbH + Co. KG
KET Karosserie Entwicklung Thurner
Kiekert AG
Kisters AG
KNORR-BREMSE GmbH
KUKA Werkzeugbau GmbH
Küster Holding GmbH
Larsen & Toubro Limited
Leopold Kostal GmbH & Co. KG
Liebherr Logistk GmbH
Life Cycle Engineers GmbH
Magna Steyr Fahrzeug AG & Co. KG
Mahle International GmbH
MAN AG
MAN B&W Diesel AG
MAN Nutzfahrzeuge AG
MAN Turbomaschinen AG GHH Borsig
Matrix One GmbH
MDT Vision GmbH
Meta Motoren-/Energie-Technik GmbH
Mentor Graphics (Deutschland) GmbH
Microsoft Deutschland GmbH
Montaplast GmbH
MSC Software GmbH
MSG Systems AG
MTU Aero Engines GmbH
MTU Friedrichshafen GmbH
Mündener Gummiwerk GmbH
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Nihon Unisys, Ltd.
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SAP AG
Satyam Computer Services Ltd.
Scania AB
sd & m AG
Seeber GmbH
Siemens AG
Siemens Business Services
SmartCable e. K.
Softlab GmbH
Stellenbosch University
SupplyOn AG
S-Y Systems Technologies Europe GmbH
T-Systems International GmbH

TAKATA-PETRI AG
Tata Engineering & Locomotive Co. Ltd.
TATA Consultancy Services Deutschland GmbH
Theorem Solutions Ltd.
ThyssenKrupp Fahrzeugguss
ThyssenKrupp Technologies AG
Tower Automotive GmbH & Co. KG
Toyota Motorsport GmbH
TranscenData Europe Limited
TRW Automotive Safety Systems GmbH & Co. KG
TRW Fahrwerksysteme GmbH u. Co. KG
TRW Lucas Automotive GmbH
TRW Automotive GmbH
TU Clausthal (IMW)
TU Chemnitz (IWP)
TU Darmstadt (DIK)
TU Dresden (Inst. für Masch.-elemente/-konstruktion)
TU München (IWB)
Unigraphics Solutions GmbH
Universidade Metodista de Piracicaba
Universität Dortmund, APS
Universität Duisburg-Essen
Universität Karlsruhe - RPK
Universität Paderborn – Rechnerintegr. Produktion
Universität St. Gallen
Unity AG
University Ljubljana – Faculty of Mech. Engineering
Valmet Automotive Inc.
Valtech GmbH
Valeo Wischersysteme GmbH
VDA Verband der Automobilindustrie e. V.
VDMA Verband deutscher Masch.- und Anlagenbau
Visteon Deutschland GmbH
Volkswagen AG
Volkswagen Bordnetze GmbH
WABCO Fahrzeugbremsen
Webasto AG
Wilhelm Karmann GmbH
Witzenmann GmbH
xPLM Solution GmbH & Co. KG
ZF Friedrichshafen AG
ZGDV e. V.
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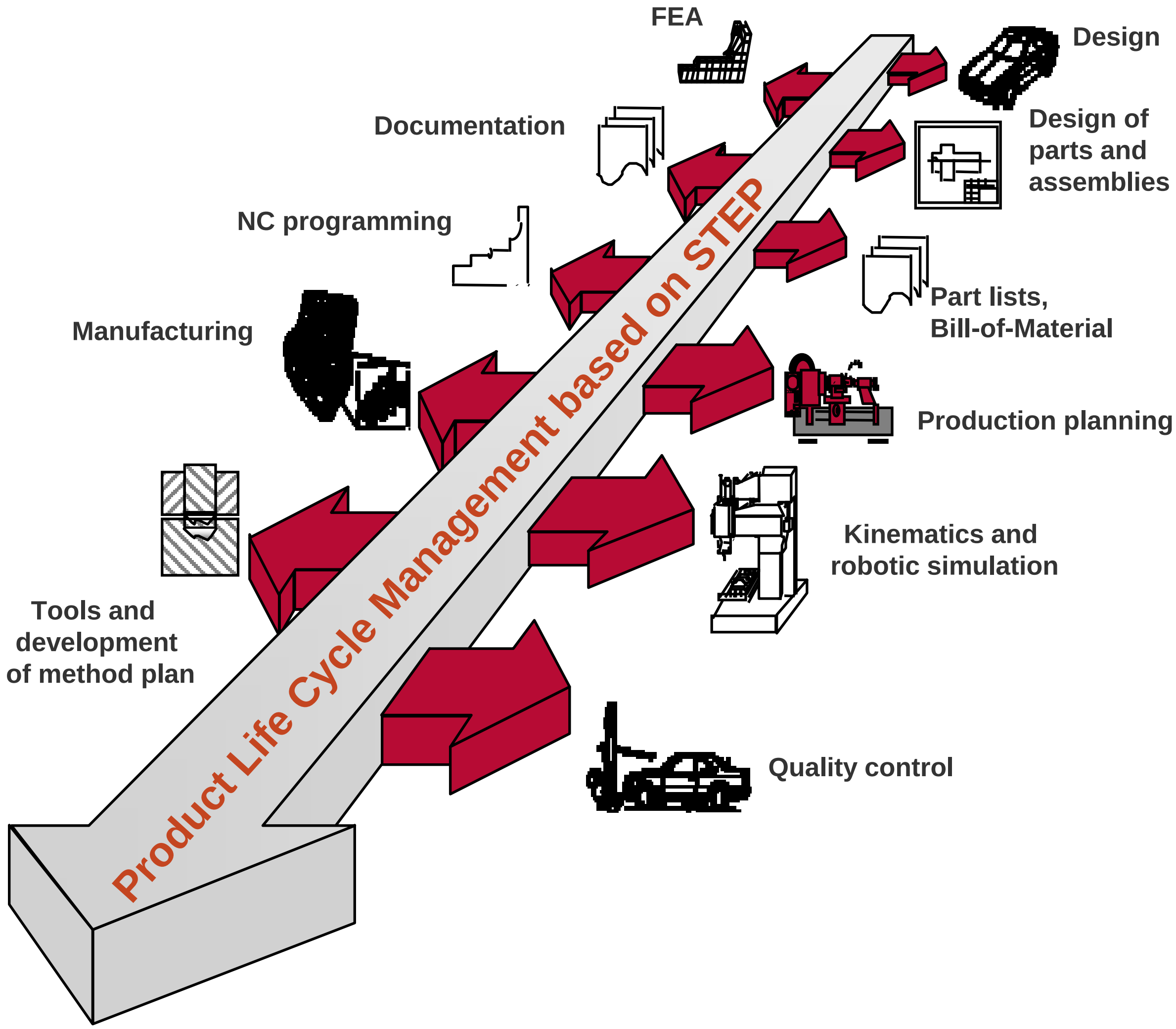
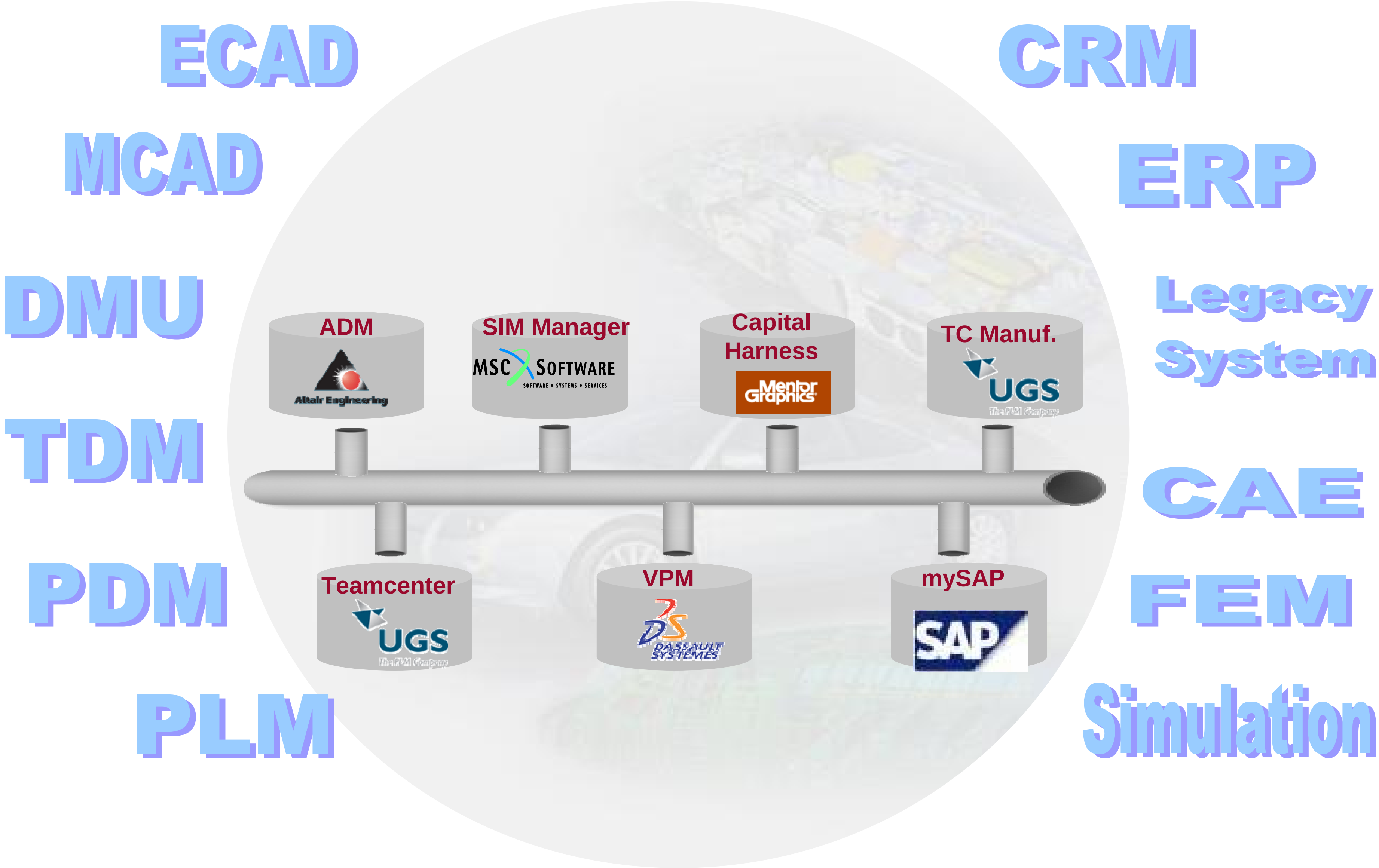
Open Standards protect investment

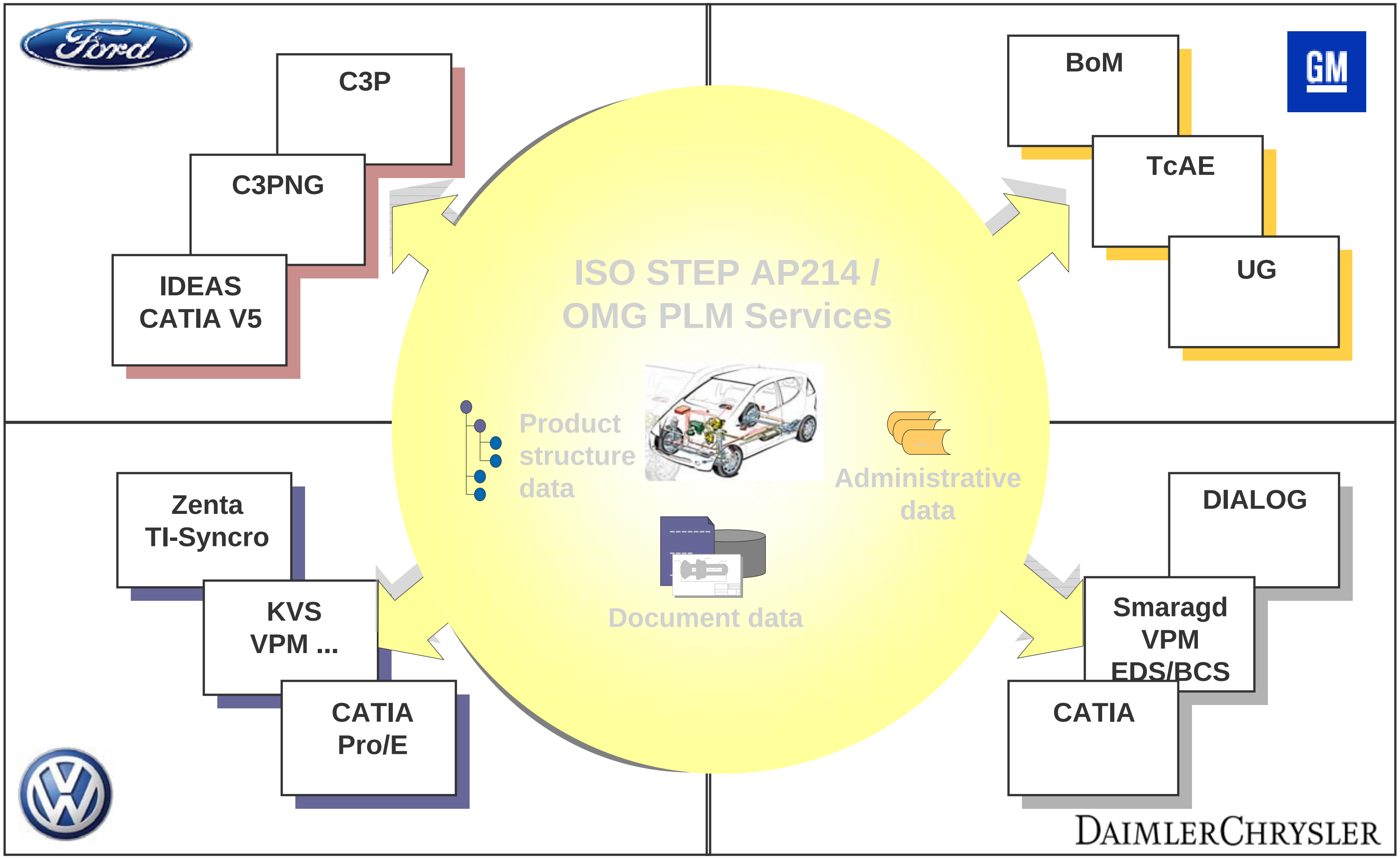
- Software and Services that are built upon **Open Standards** allow for **maximum flexibility** by providing the underlying structure required for **enterprise** availability and **scalability**.
- **Vendor neutral** policies allow for "**Best in Class**" selection of tools without being locked into a predetermined integration path.



Internal Systems must work together in heterogeneous environments

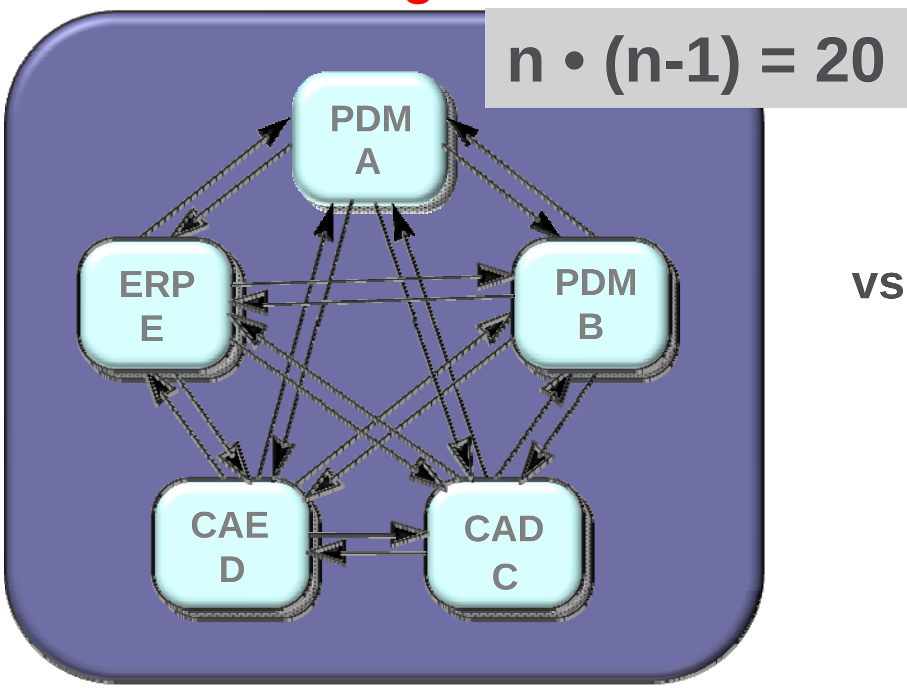


External partners require the use of standards



Enterprise Scalability requirements Indicate using an integration platform

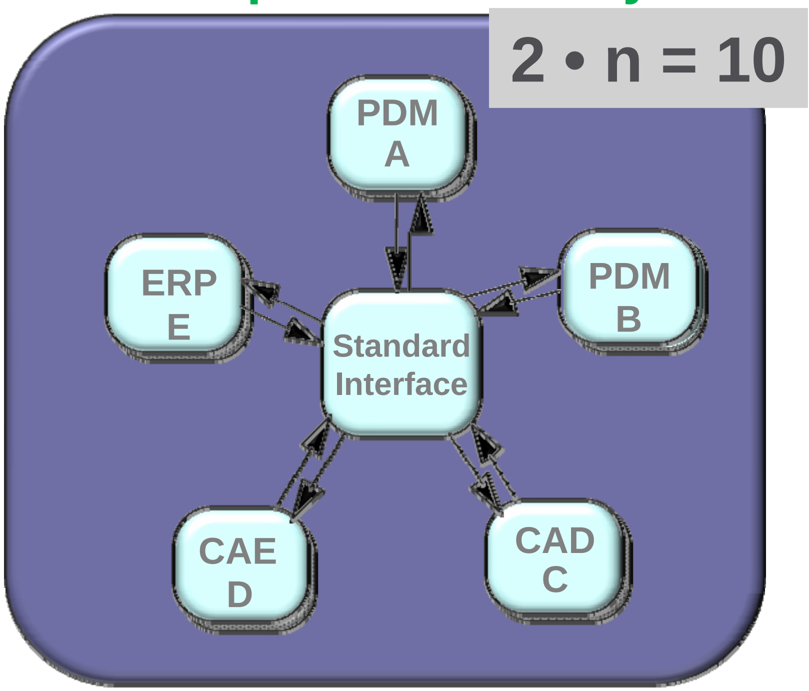
Typical custom developed point-to-point connectors are **Unmanageable**



- Exchange of information without standard interface

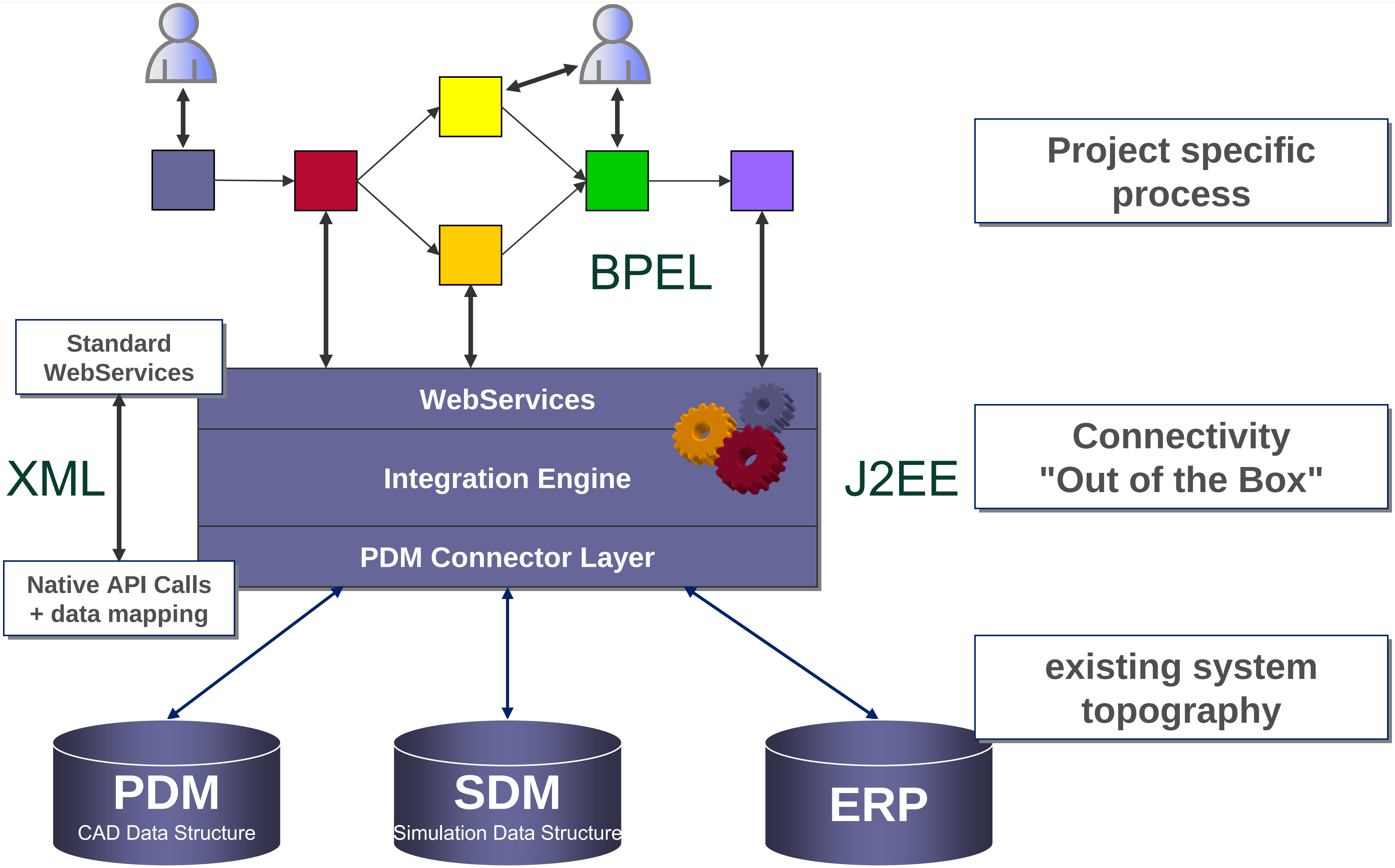
vs.

A standards based integration platform allows **Enterprise Scalability**



- Exchange of information with a standard interface

Integration Platform Basic Architecture



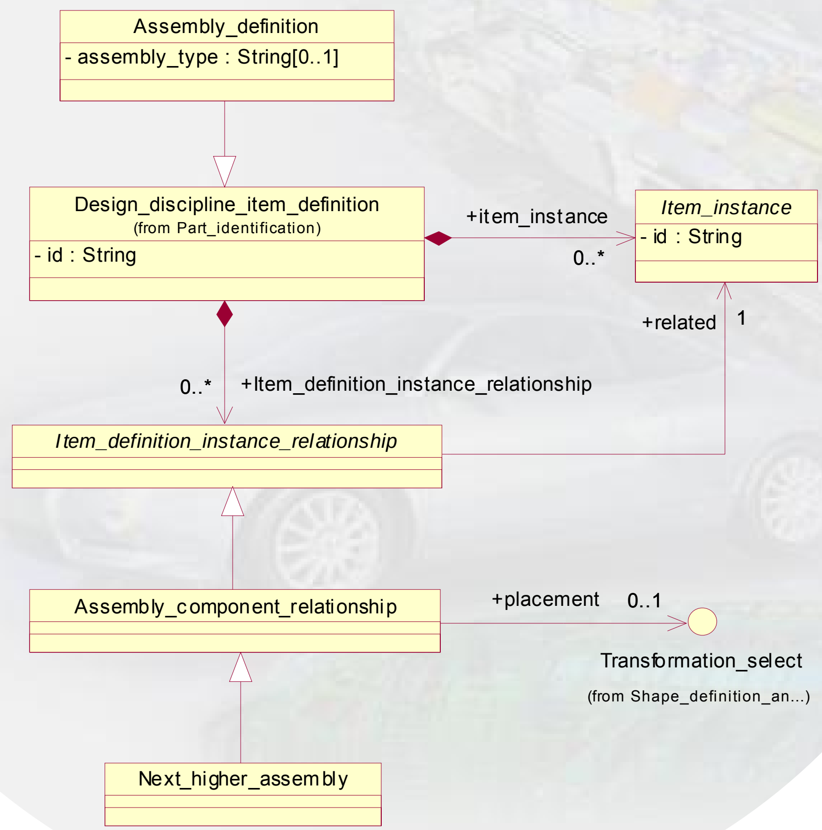
Data Types to consider

Masterdata
Properties

Documents

Product-structure

Models



M-BoM

E-BoM

Positions

Configurations

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

AP 214: Core Data for Automotive Mechanical Design Processes

Geometry
- Solids data
- Surface Data
- Wireframe
- Measured Data

Presentation
- Drawing
- Visualization

Manufacturing
- NC- Data
- Process Plans

Analysis
- Simulation

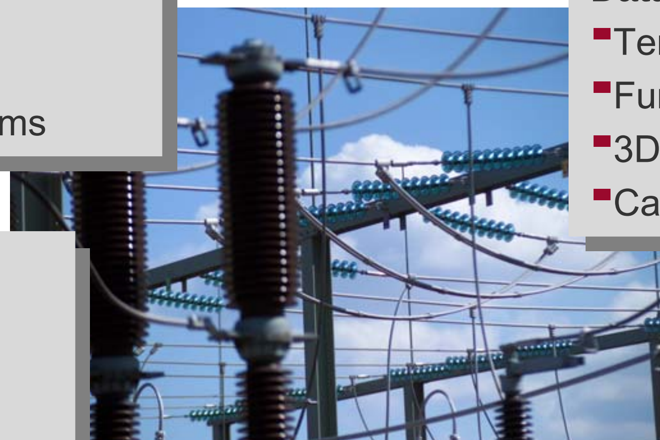
Specification / Configuration
- Product Structure Data
- Management Data

Technology Data
- Material Data
- Form Features
- Tolerance Data
- Surface Conditions

AP 212: Electrotechnical Design and Installation

Electromechanical systems
- Buildings
- Plants
- Transportation Systems

Data Supporting
- Terminals and Interfaces
- Functional Decomposition of Product
- 3D Cabling and Harnesses
- Cable Tracks and Mounting Instructions

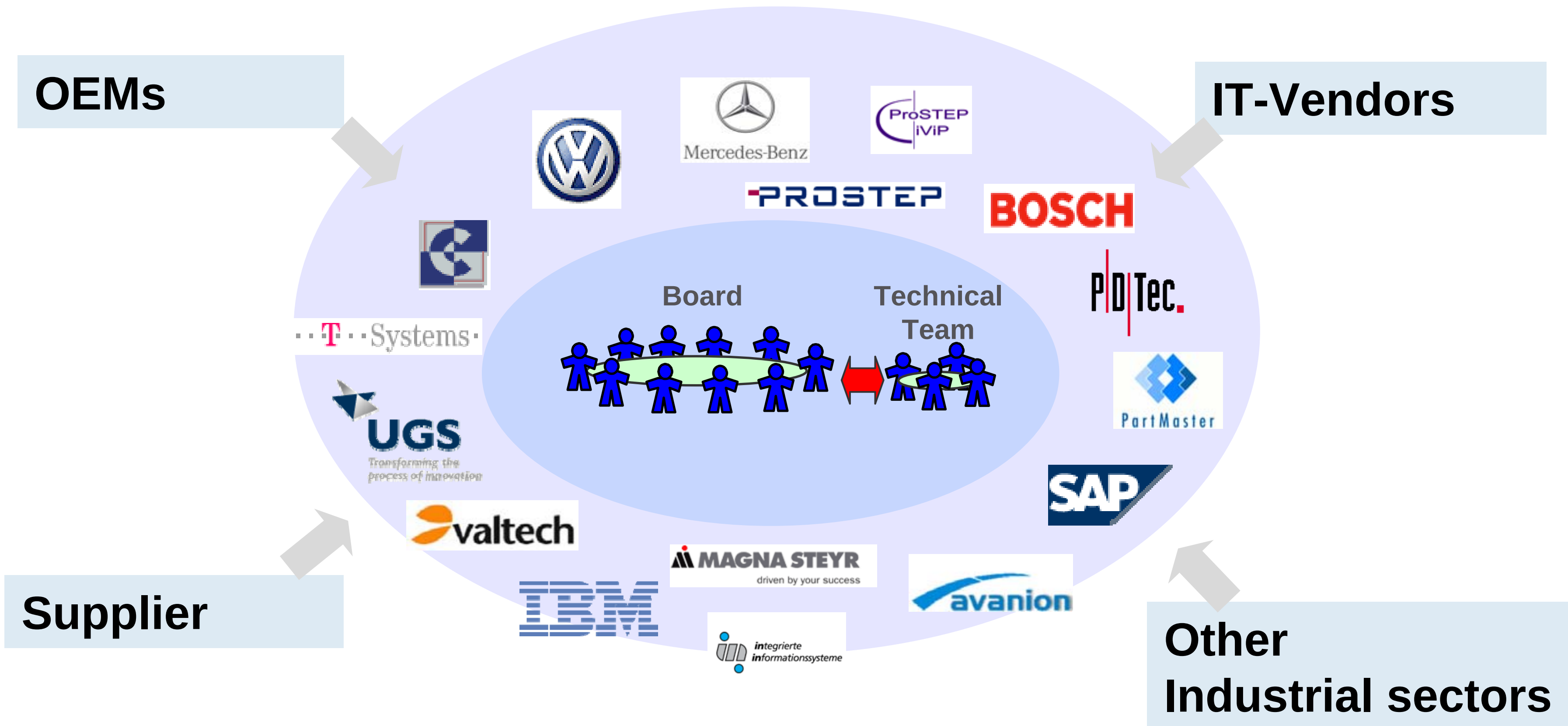


Equipment Coverage
- Buildings
- Power-transmission
- Power-distribution
- Power-generation
- Electric-Machinery
- Electric Light and Heat
- Control Systems

Electro-technical Plant
- Plant, e.g., Automobile
- Unit, e.g., Engine Control System
- Sub-unit, e.e., Ignition System

Electromechanical Equipment in Industry

OMG PLM-Services 2.0 – XML based STEP data and services



- Standardized data models with engineering scope
- Predefined objects for metadata, structure, configuration, material …
- WebServices for data access: Read, Write, Delete and Change operations

More than data mapping

- True PDM integration also requires much more than mapping meta data between PDM systems. It also requires a firm understanding of underlying processes, and the ability to map processes between systems taking into account business requirements.

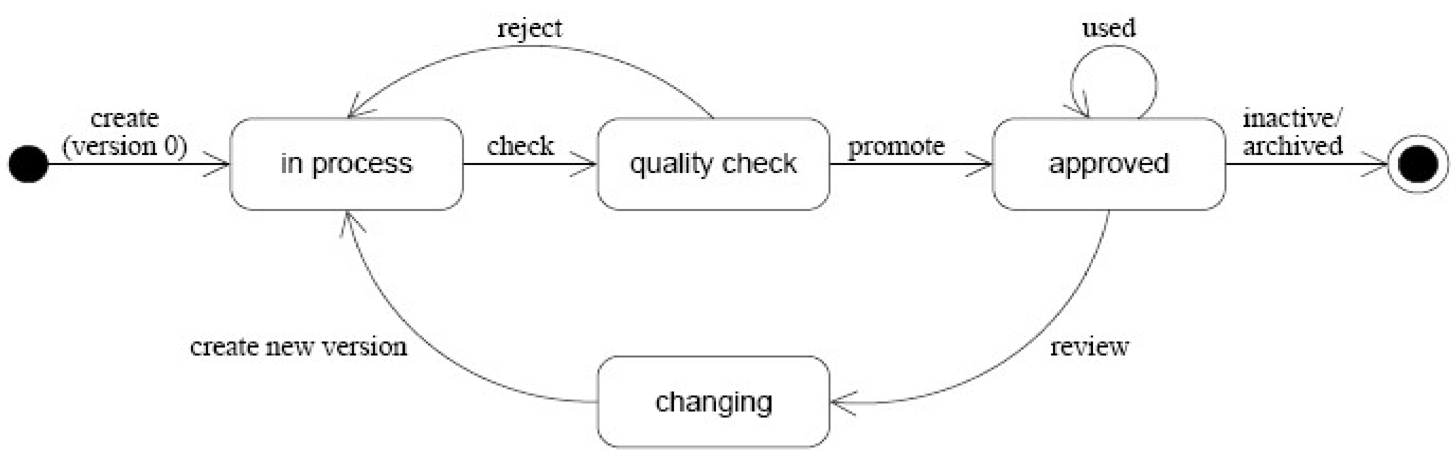


Figure 2.7: Release process modeled using UML statecharts

PDM Relationships

- PDM Integration means understanding fully the relationships that exist in product structures of both source and target PDM systems.

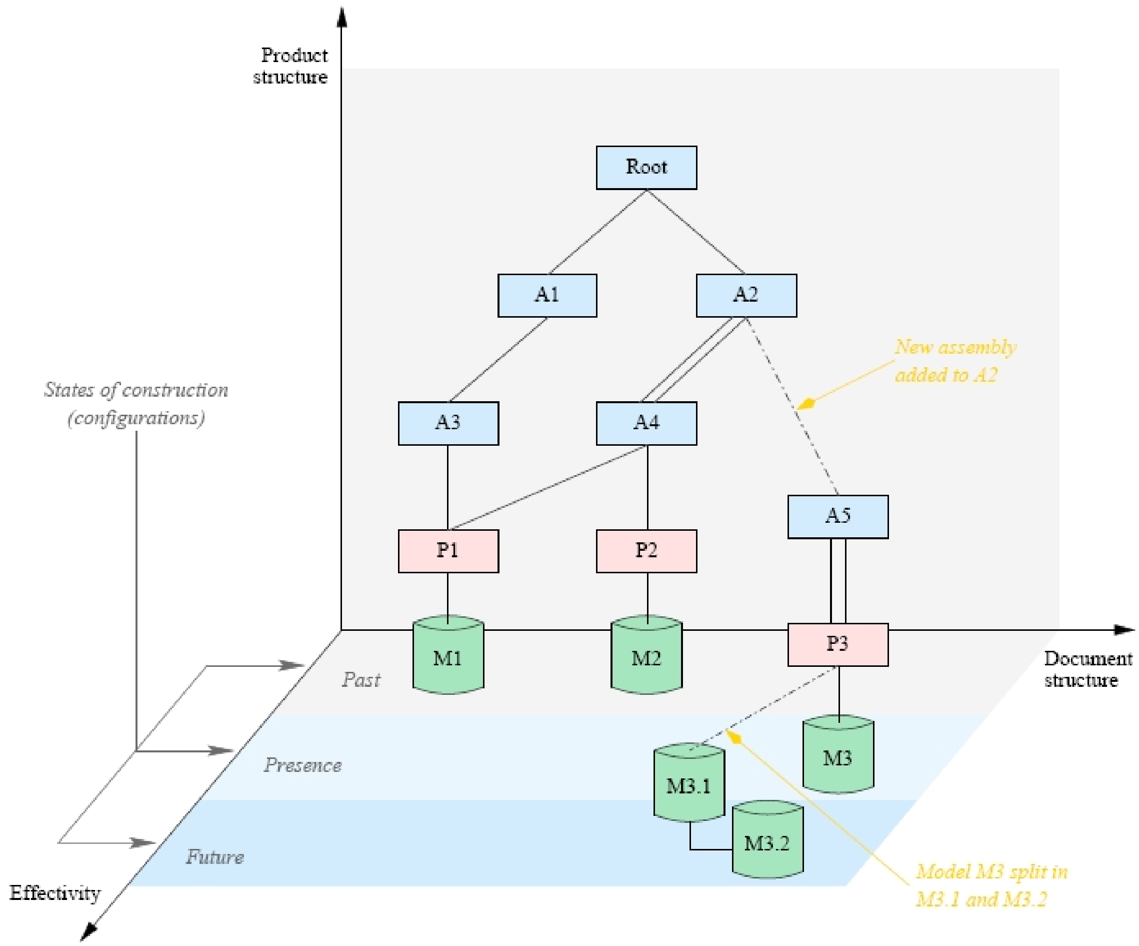


Figure 2.8: Effectivities in configuration management

Standards Play an important role

Use Case	Description
Export of assembly data	Product data (meta data and geometries) of assemblies or parts are exported as ENGDAT formatted packages (consisting of STEP PDM and/or CAD files).
Import of assembly data	Product data (meta data and geometries) of assemblies or parts as ENGDAT formatted packages (consisting of STEP PDM and/or CAD files) are imported.
Authentication/Start-Up of session	Users authenticate themselves against one or more servers.
Authorization	Validation of access rights for accessing specific product data.
Start node identification	Identification of a start node of a product structure for the purpose of browsing.
Browsing down product structure data	Defining a view on the product and document structure by defining a filter.
Browsing up product structure data	Defining a view on the product structure from a specific node to obtain information about where this node is included.
Download of product data	Defines what product data (product structure, documents, etc.) should be downloaded using which method (HTTP, FTP, etc.).
Download meta data including structures	Stream-based or file-based download of meta data with structures e.g. for import into another PLM system.
Download a single digital file	Download of a single specific file (CAD data, images, etc.) for simple viewing, local storage, etc.
Generic object query	Defining specific filter conditions to access objects or sets of objects (e.g. items, documents, etc.) generically.
Search in design space	Defining a neighborhood relation using bounding boxes around a specific part on geometry level, designers can acquire detailed meta data of all objects being element of this relation.

- Open Standards, such as OMG PLM Services provide more functionality to cover more business use cases than proprietary interfaces provided by some system vendors.

Lessons Learned

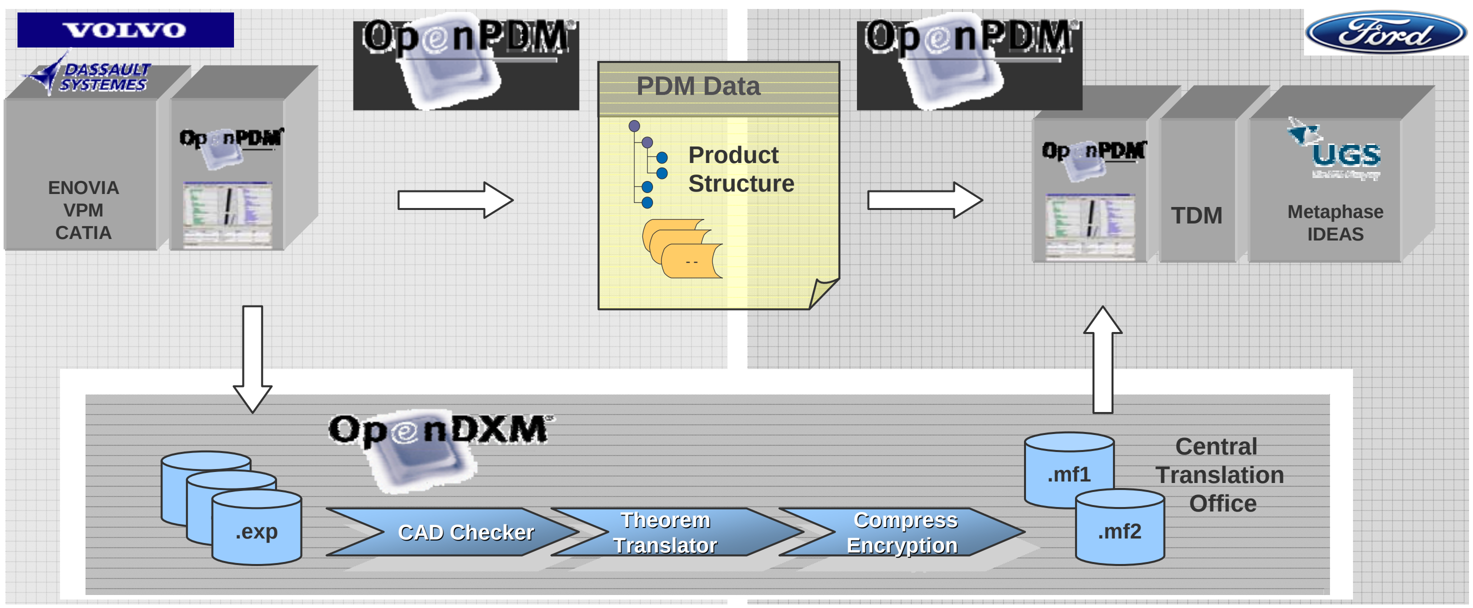
- **Upfront Planning and Understanding**
  - It is critical before the start of any project that all participants and impacted communities have a baseline understanding of system interfaces, business processes and other impacting factors.
- **Seek Active Stakeholder buy in and participation**
  - Invite "Everyone" to the project kick off meeting, get all the issues on the table. Let everyone have a chance to tell you why it won't work, and then work with them to gain understanding of their unique concerns. Gain support and communicate frequently.
- **The purpose of testing is to FAIL**
  - Embrace the failures in your early phase testing and learn from them. Keep testing until you have resolved the majority of the major issues. There will be issues some of them big and unforeseen, but a united team will find a solution more quickly than a divided team. Communicate success as well as failure…..

A few customer success stories…………………..

Ford – Volvo / Landrover
- STEP and native Geometry

„Within its European platform strategy, Ford integrates PDM and CAD data of its subsidiaries Volvo and Landrover with those of Ford of Europe. Based on OpenPDM®, VPM structure information as well as CATIA data are exported, converted and adopted in the I-DEAS/TDM/ metaphase environment at Ford. Due to this automated process, manual operations during the integration of PDM worlds can be reduced dramatically."

W. Peters, Ford of Europe

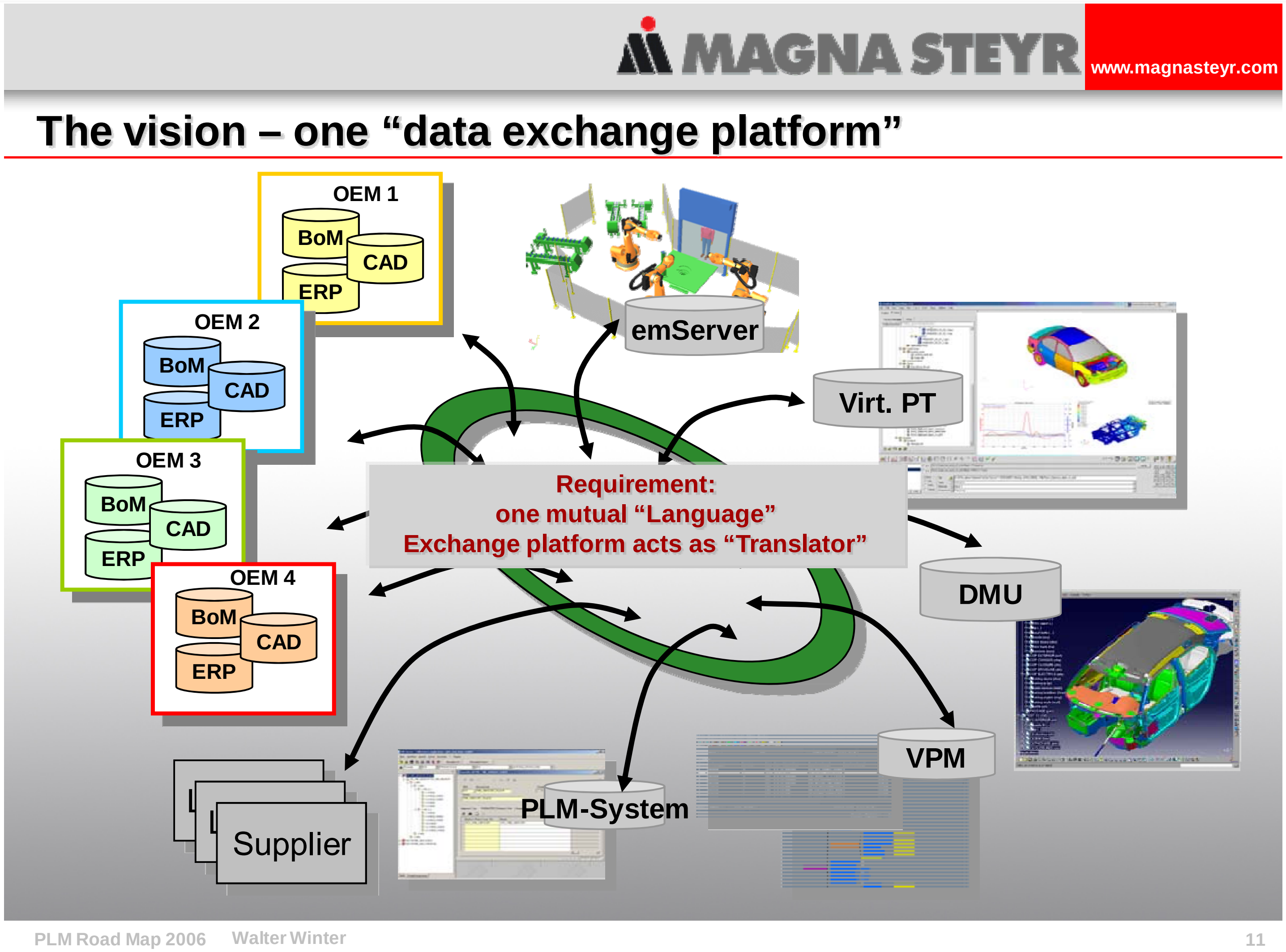


Integration Vision at Magna Steyr

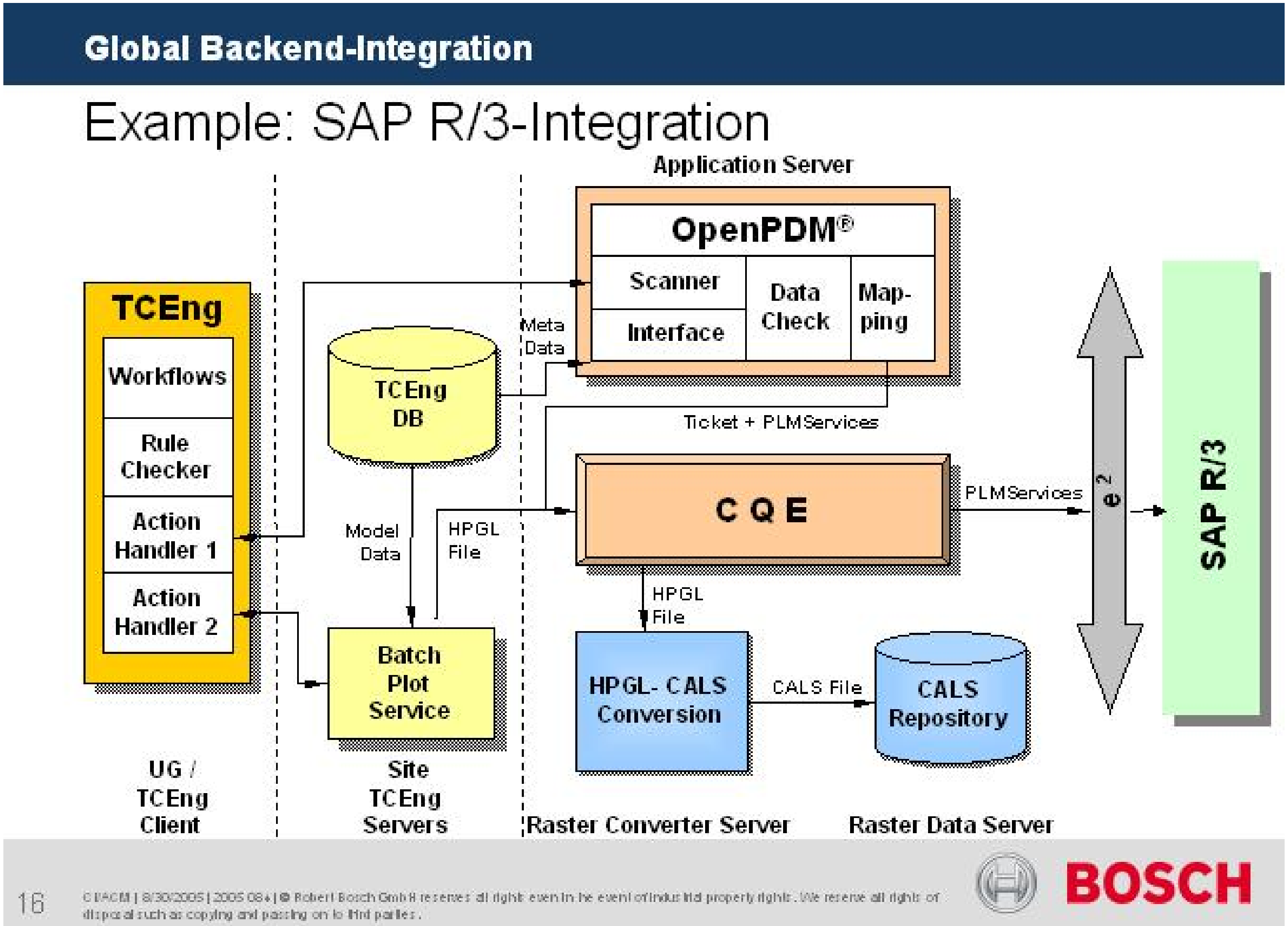
SOA architecture

PROSTEP OpenPDM

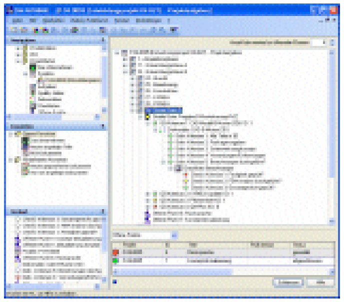
IBM Websphere Process Server



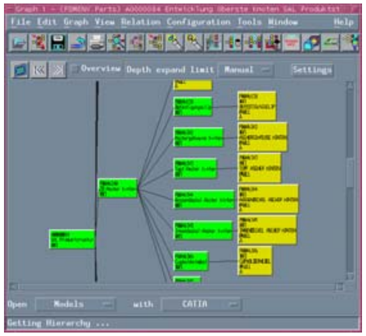
Backend Integration at BOSCH



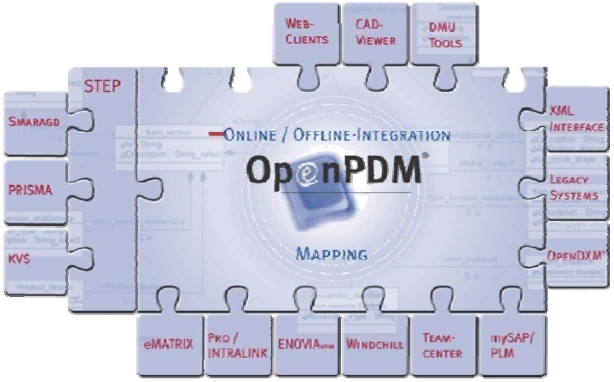
Faurecia PDM-VPM Replication and CDB–Matrix Migration



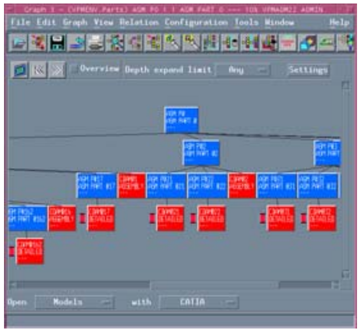
CIM DATABASE



VPM München

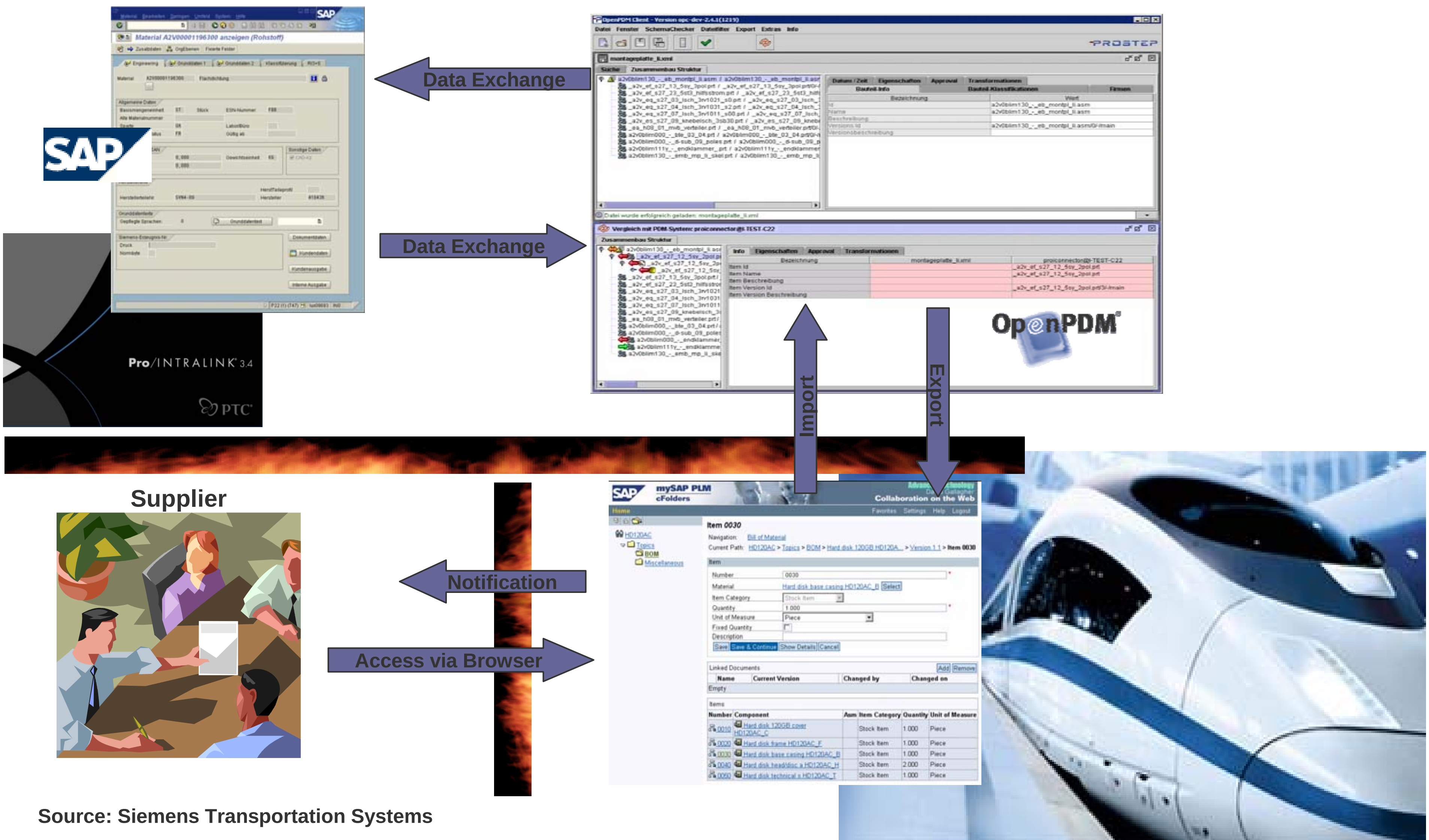


eMatrix



VPM Hagenbach

Supplier collaboration at Siemens TS based on STEP AP214 (PLM Services)



Source: Siemens Transportation Systems

Siemens (UGS) Synergy

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

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, now offers UGS Synergy™ – a complete change in the way the automotive industry collaborates on vehicle design and manufacturing. UGS Synergy™ provides OEMs and suppliers at all levels of the supply chain with a single optimized process for exchanging vehicle design and manufacturing information.

With UGS Synergy™ suppliers can now set up their own product lifecycle management (PLM) environment and leverage its power to optimize the entire enterprise.

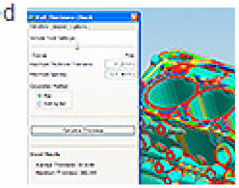
- Leverage your overall size and marshal all of your available resources
- Easily and securely share information across multiple OEM program teams
- Develop product development best practices across the entire company
- Optimizing your expertise and business savvy on an enterprise basis

JT Leverage

UGS Synergy™ leverages **JT** which has emerged as a standard for 3D visual collaboration in the automotive 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)

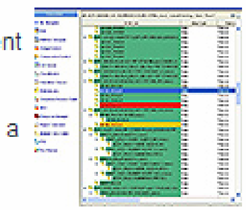
Exchange Manager

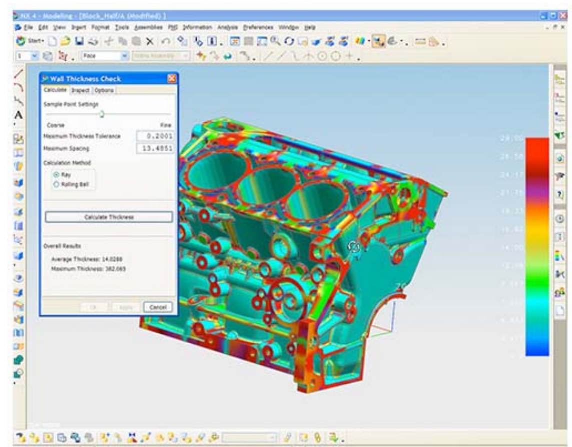
UGS Synergy™ includes the **Exchange Manager**, powered by PROSTEP™, which enables suppliers to pull the specific design context from their customers managed environment and maps it into the suppliers local Teamcenter where it can be made available to the entire team. Returning the suppliers deliverable is just as simple. (Select image to enlarge)



Optimized Design Environment

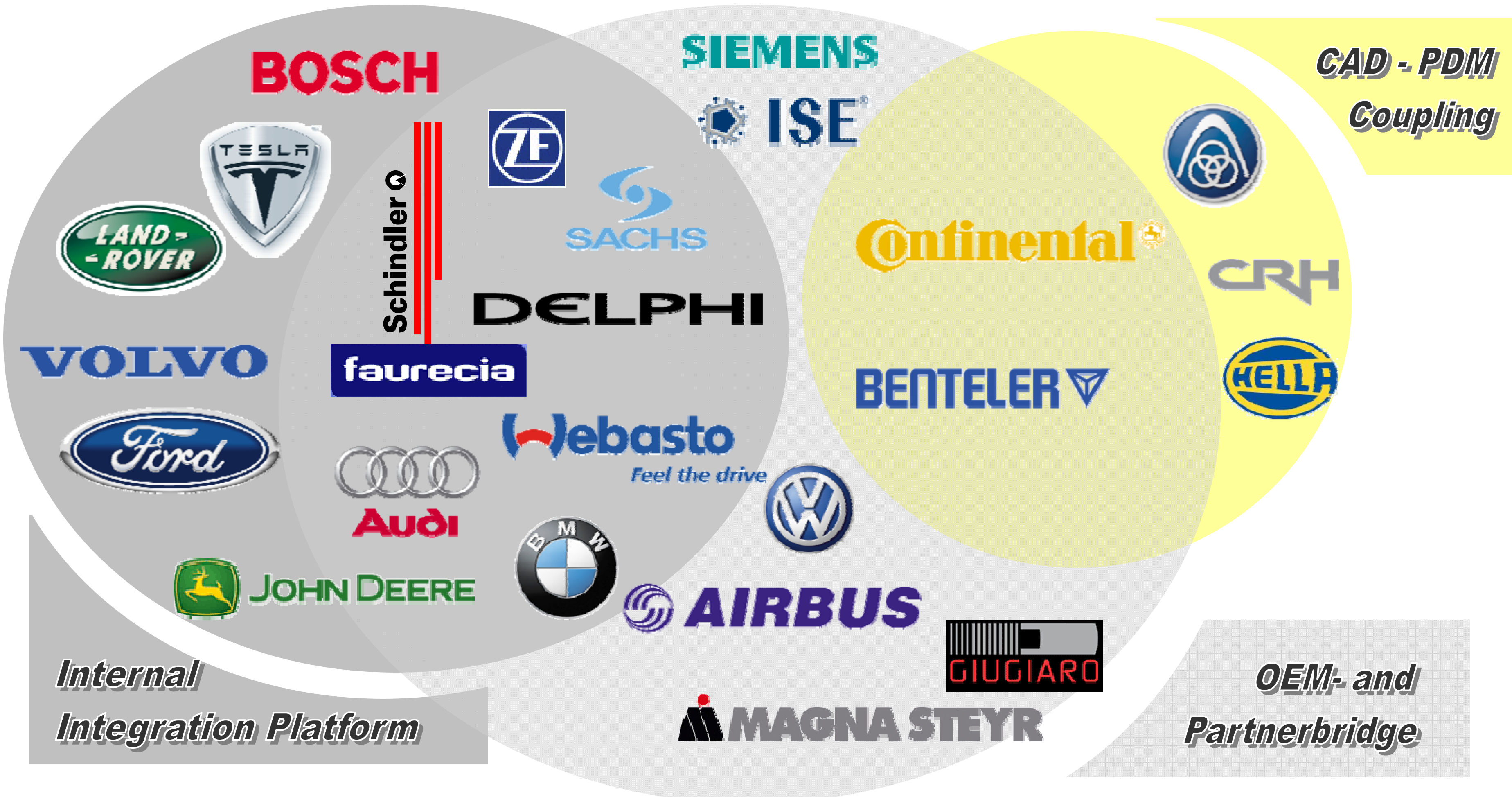
UGS Synergy™ enables an **optimized design environment.** A single, enterprise-wide data management environment managing all of a supplier's product information, enforcing proper part nomenclature, and encouraging best practice work processes together with a single, best-in-class, latest generation design system. (Select image to enlarge)





Exchange Manager CLOSE ✕

Available Technolgy is being used today. Are you ready ?



Technology Partners

IBM

UGS
Transforming the process of innovation

DASSAULT SYSTEMES

Altair Engineering

MSC Software

MatrixOne

PTC
The Product Development Company

Adobe

RIGHT HEMISPHERE

SAP

agile
How Products Become Profits

integrate the future

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