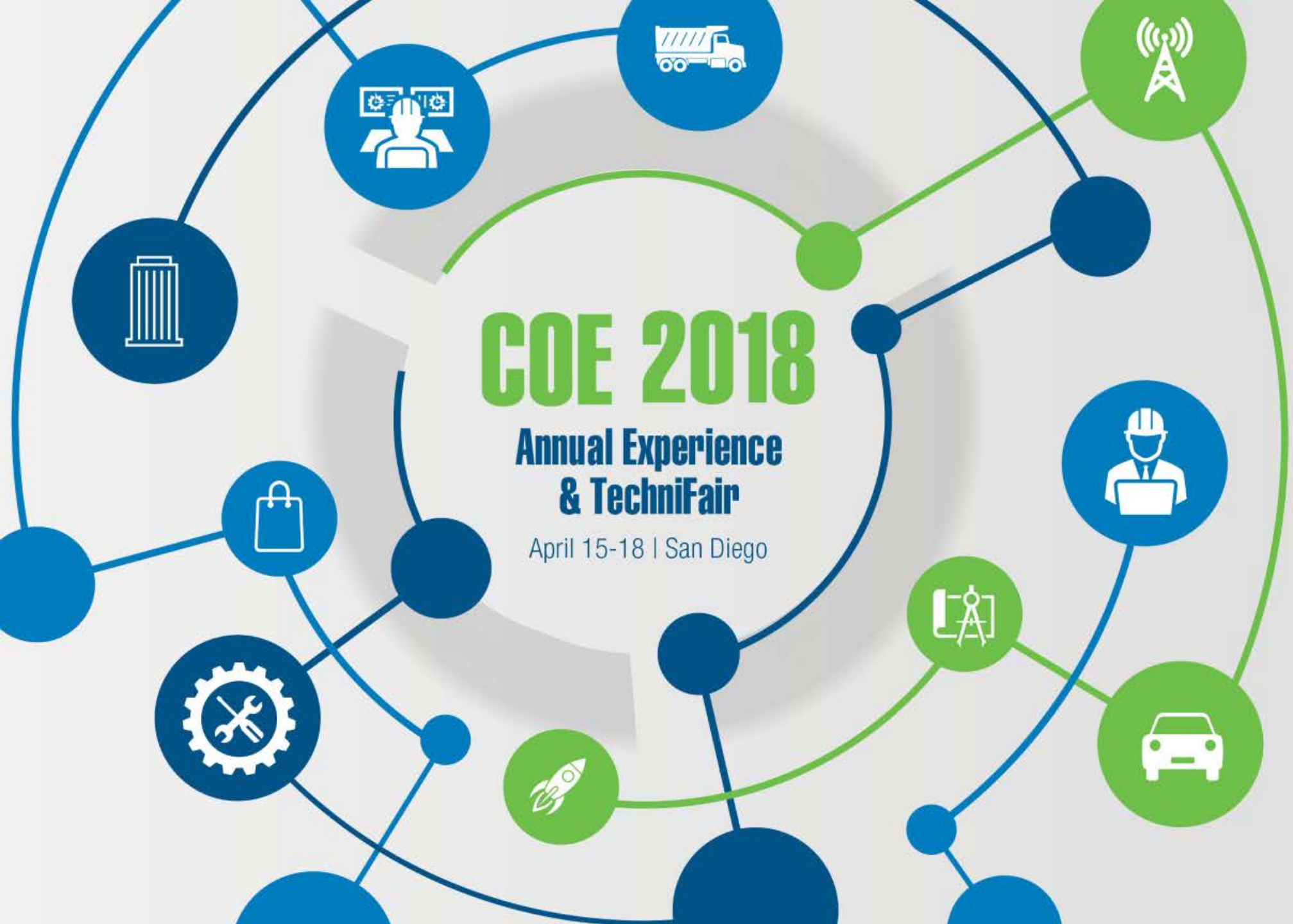

COE 2018

Annual Experience & TechniFair

April 15-18 | San Diego

COMMUNITY OF EXPERTS
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COE 2018

Annual Experience & TechniFair
April 15-18 | San Diego

6063 - (IDM) Making the Leap to 3DEXPERIENCE

Integration and Migration of CAD data in 3DEXPERIENCE

PROSTEP – Paul W. Downing – President / CEO PROSTEP INC – paul.downing@prostep.com

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PROSTEP – 100% PLM

Products and Implementation

PROSTEP Products

OPENDXM GLOBAL

Secure Data Exchange
Block Chain / Additive Mfg

OPENPDM

Migration / Integration
COTS Software

OPENDESC.COM

CAD Services
Translation / Migration

3D PDF

Server Based
TDP, DRM, Animation

Founded in 1993, we are ….

- an independent company specializing in PLM consultancy services and engineering solutions.
- experts in providing leading global manufacturing companies with the support they require for designing and optimizing their internal and cross-enterprise development processes.
- the specialist for distributed engineering processes involving heterogeneous IT systems

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Application projects

- 3D Messdatenmanagement Workflow Forum
- ALM-PLM Interoperability
- Code of PLM Openness
- JT Workflow Forum
- Manufacturing Information Model
- PDM for Vehicle Electric Systems (PDM4VES)
- Projektterminmanagement
- Smart Systems Engineering
- ReqIF Workflow Forum
- Standardization Strategy Board
- Synced Factory Twins

Implementor forums

- 3D Messdatenmanagement Implementor Forum
- PDM Implementor Forum
- ECAD Implementor Forum
- ECAD/MCAD Collaboration Implementor Forum
- JT Implementor Forum
- CAx Implementor Forum
- ReqIF Implementor Forum

Standardization

- ReqIF Benchmark
- STEP Benchmark
- STEP AP 242 Maintenance
- Long-term Archiving and Retrieval

…on cases, best …nd interoperability

Creating and improving standards in keeping wit… industry requirements.

ISO 14306	Industrial automation systems and integration - JT file format specification fo… 3D visualization
ISO 10303 Part 11	ISO Standard - Description methods: The… EXPRESS language refernce manual
ISO 10303 Part 21	ISO Standard - Implementation methods:… Clear text encoding of the exchange structure
ISO 10303 Part 22	ISO Standard - Implementation methods:… Standard data access via interface
ISO 10303 Part 28	ISO Standard - Implementation methods:… XML representations of EXPRESS schema… and data, using XML schemas
ISO 10303 Part 203	ISO Standard, STEP AP203 - Application Protocol: Configuration controlled desig…

Support

We are eager to help you with any questions

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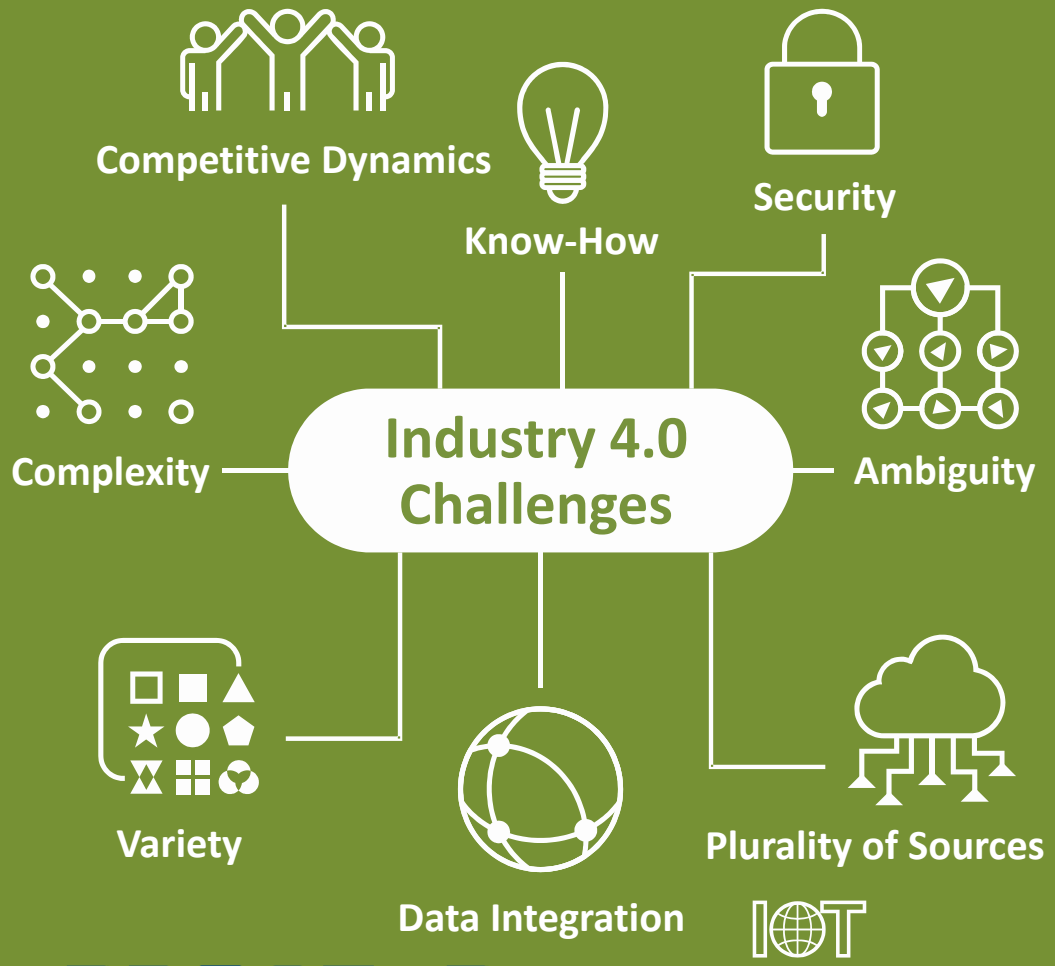
Core Focus Area

Technologies for Interoperability, Security, Visualization



Strategic PLM-Themes

- Agile Product Development
- Integration ALM – PDM – ERP
- Digital Master & Digital Twin
- Systems Engineering
- Cross-Company Collaboration
- Complexity and Variant Management
- Model Based Design

PLM Technologies

- Real-Time Collaboration
- Linked Data & Semantic Networks
- Data and Interface Standards
- Federated, Modular and Open Architecture
- Cloud and Platform Technologies
- Role-Based Functionality
- Virtual Reality

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Technology Partners

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PROSTEP – Dassault Systèmes

Technology Partnership

CAA V6 PARTNER
V6 COMMUNITY PARTNER

Products to integrate V6 with other systems: Windchill, Teamcenter, SAP, SimManager, GlobalX

Developing customer specific solutions on base of V6 CAA2 API

ENOVIA PARTNER

Products for integration and federation of meta data and CAD data with ENOVIA

since MatrixOne 10.8

CAA V5 ADOPTER

Products and extensions on base of V5 CAA API

V5 DEVELOPMENT
SERVICE PROVIDER

Developing customer specific solutions on base of V5 CAA API

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Integration Challenges

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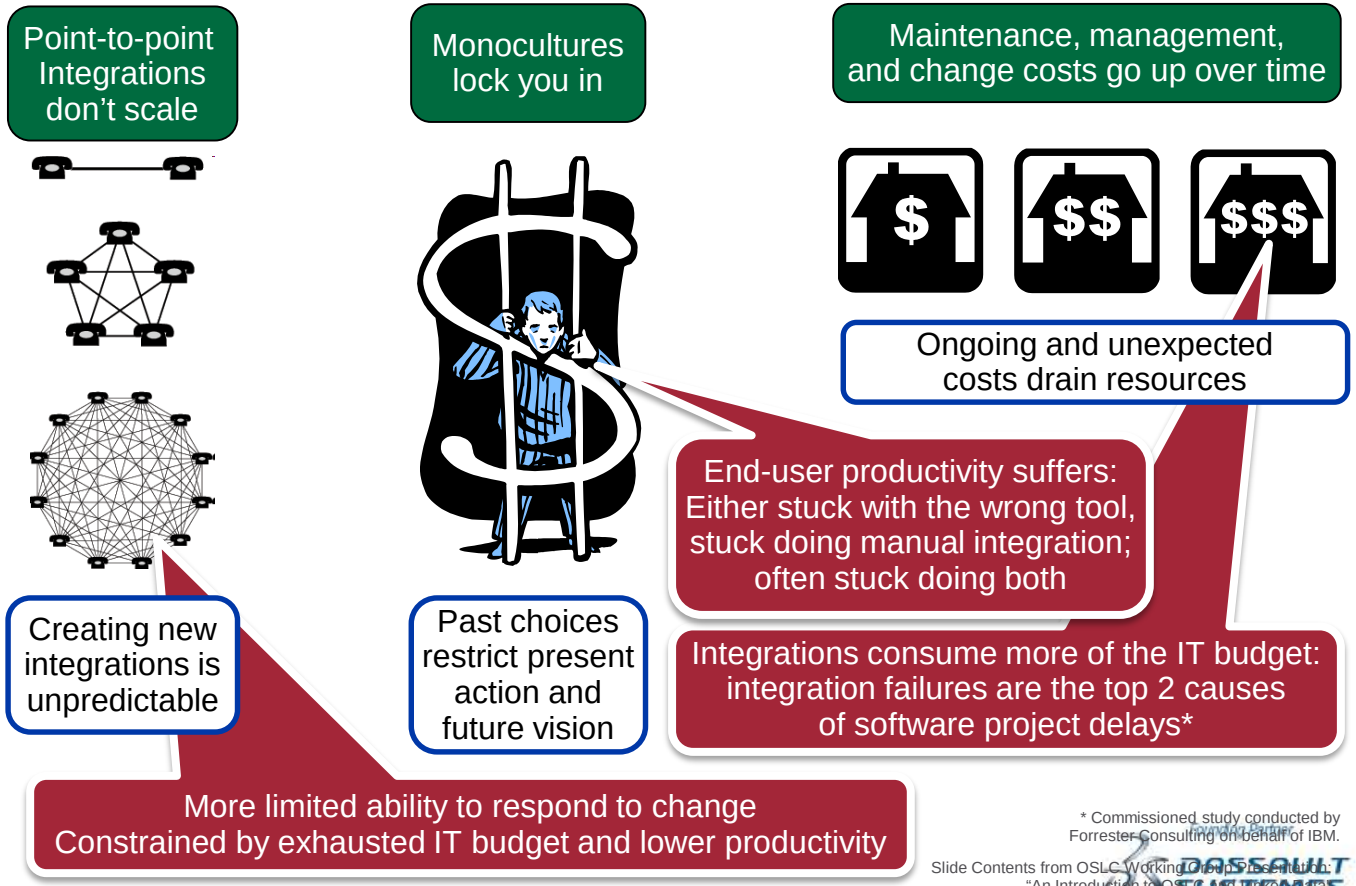
Integration Solves many Challenges

- Efficiency from Modern Engineering Practices
  - Traceability in Systems Engineering (MBSE) *[Model-based systems engineering]*
  - Configuration Lifecycle Management
  - Digital Twin / Digital Thread / Digital Master
- Manual integration of data can be quantified by the operation of synchronization
  - Speed that the data is available
  - Time the manual process takes for the data to be synchronized
  - Accuracy of the duplicated data and costs of failures (wrong production revision?)
- Elimination of software licenses for integrated systems
  - Data is available in the primary system of that user and additional license not needed
  - Duplicate functionality only needs to be utilized in one system
  - Integration can enable migration and eliminate other system entirely
- Consolidation, Quality, Training, Maintenance, Support and Knowledge
  - Less utilization of different systems means less overhead

Integration Comes With Challenges

- Point-to-point solutions do not scale and typically become unmanageable
- Full centralization is neither feasible nor desirable
- Data Duplication comes with data model compatibility issues, data mastery issues and synchronization processing time.
- Remastering data means duplication.
- MBSE only requires reference not data mastery!

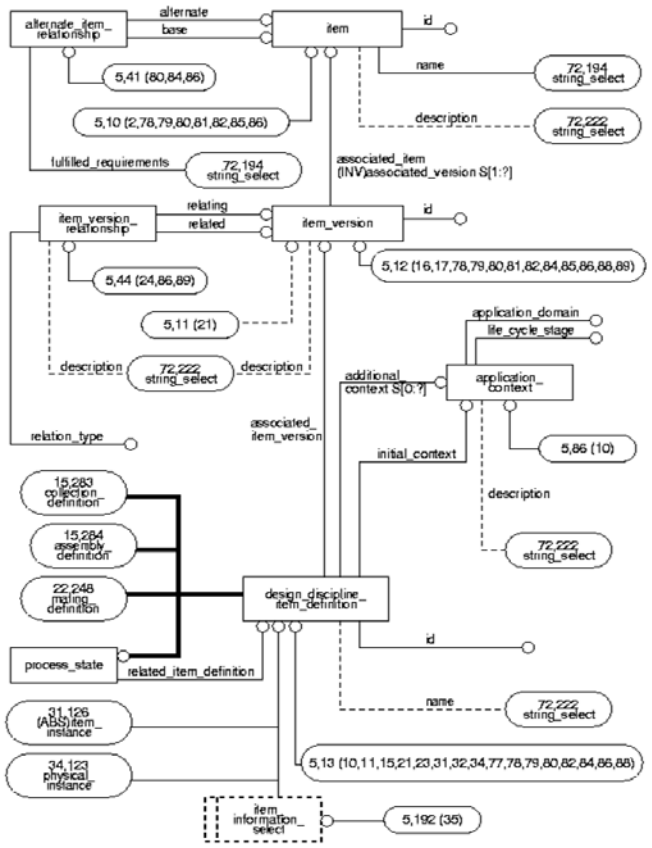


* Commissioned study conducted by Forrester Consulting on behalf of IBM.

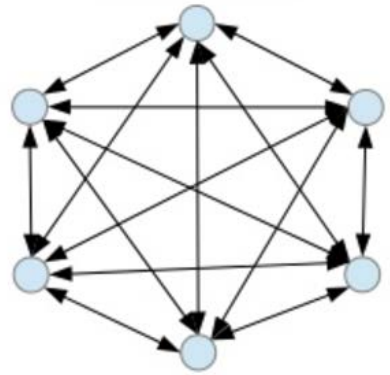
Slide Contents from OSLC Working Group Presentation: "An Introduction to OSLC and Linked Data"

Standards Enable Integration

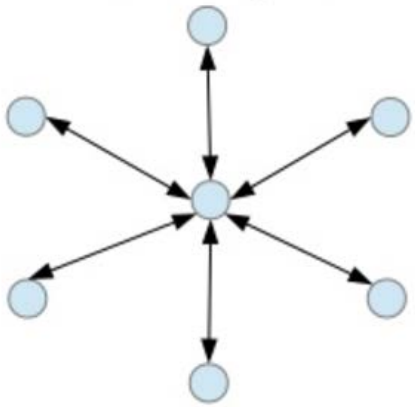
- **Point-to-Point Integration** at MBSE scale **is unmaintainable**
- Standards are introduced to have a "**neutral format**" to read from and write to
- Many need to **pre-define all semantics beforehand** in a **closed world approach** (like STEP 10303 AP 214)
- **Traditional standards** everything is known ahead of time.
- **OSLC** *[Open Services for Lifecycle Collaboration]* allows for a standard **simplified** interface (mix of both)



Point-to-Point



Hub-and-Spoke



Integration Scenarios

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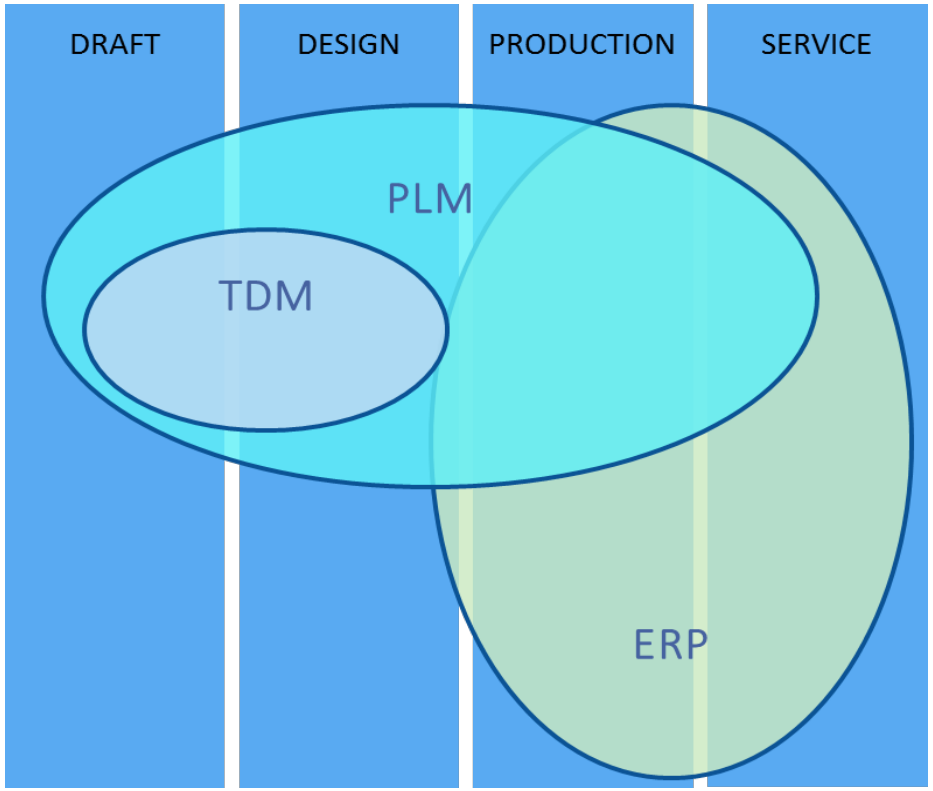
Engineering System Definitions

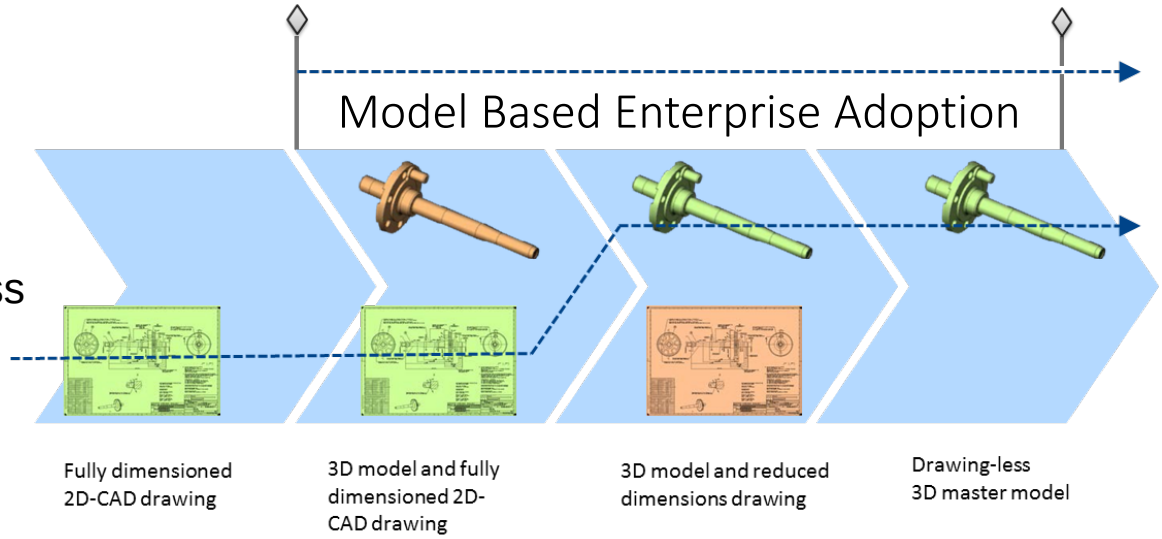
- **TDM** *[Team Data Manager]*: Primary document management repository for CAD.
  - Example could be a system specifically designed for this such as VPM, Pro/Intralink, EPDM, NX Manager or a PDM or PLM system that is used for CAD management (Enovia for CATIA, Windchill for CREO, Teamcenter for NX), ECAD manager
  - Would include functionality for CAD document control such as numbering, versioning, revisioning, and state
- **PLM** *[Product Lifecycle Management]*: Primary system for maintaining all engineering product data.
  - Can typically manage all functionality of the TDM
  - Handles Engineering Change, Release, Part(s), BOM(s), Classification, Requirements, Collaboration
- **ERP** *[Enterprise Resource Planning]*: Resource planning for manufacturing, managing manufacturing process, materials, supply chain, inventory, accounting, logistics.



Leveraging Design Through Enterprise

- MBE *[Model Based Enterprise]* is an integrated and collaborative environment, founded on 3D product definition shared across the enterprise, enabling rapid, seamless, and affordable deployment of products from concept to disposal.
  - Consumable 3D Engineering data for all parts of manufacturing and business eliminating drawing prints

- Digital Thread - To collect information in the design, manufacturing, service, supply-chain setup and provide access to and intelligent analytics for industrial manufacturing and performance data, to identify the root cause easier. Such insights can improve not only service and owner/operator productivity, but also provide critical feedback to the design engineering and manufacturing operations teams for continuous improvement.
  - Integration of product data from all systems to get exceptional performance, cost and issues visibility throughout the enterprise.



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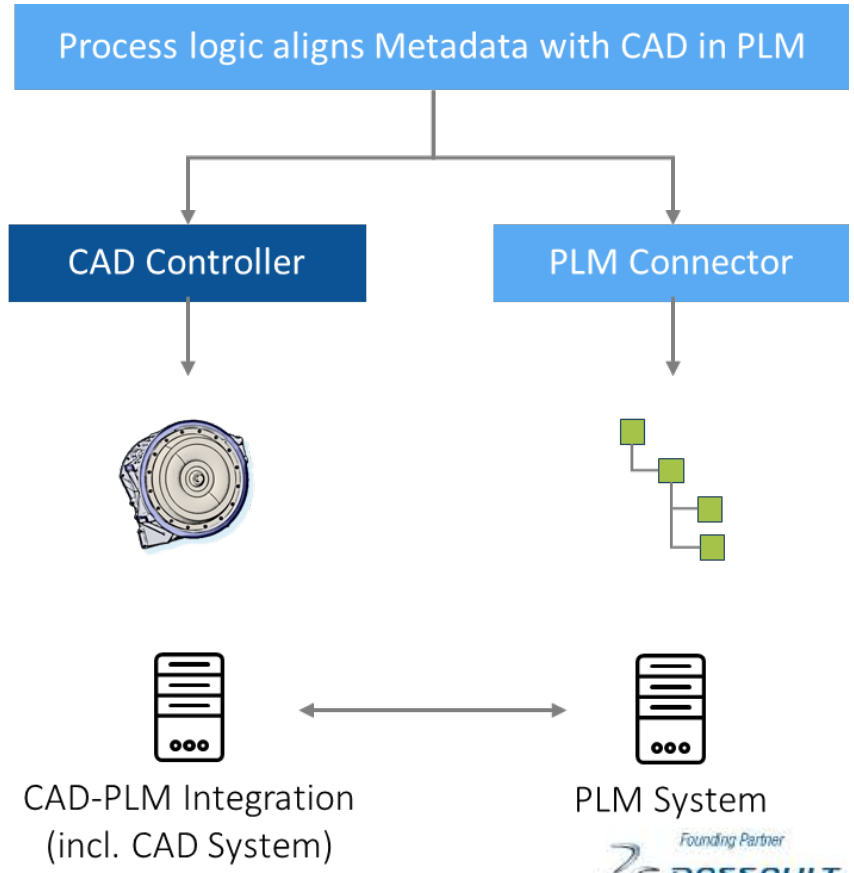
Synchronizing Native CAD TDM to PLM

- Value
  - High value for strategically decommissioning the legacy TDM system
  - One solution for supplier collaboration of engineering data
  - Stronger integration into the product lifecycle workflows and system features
- Challenges
  - Handling of integrations / version may be different between systems
  - Very suitable for released data as one-per-revision always fits
  - Performance intensive, plan for time and processing power as well as licenses to open CAD
  - Typically only data that opens in the CAD can be moved
  - Data cleanup can be required for CAD that does not open properly



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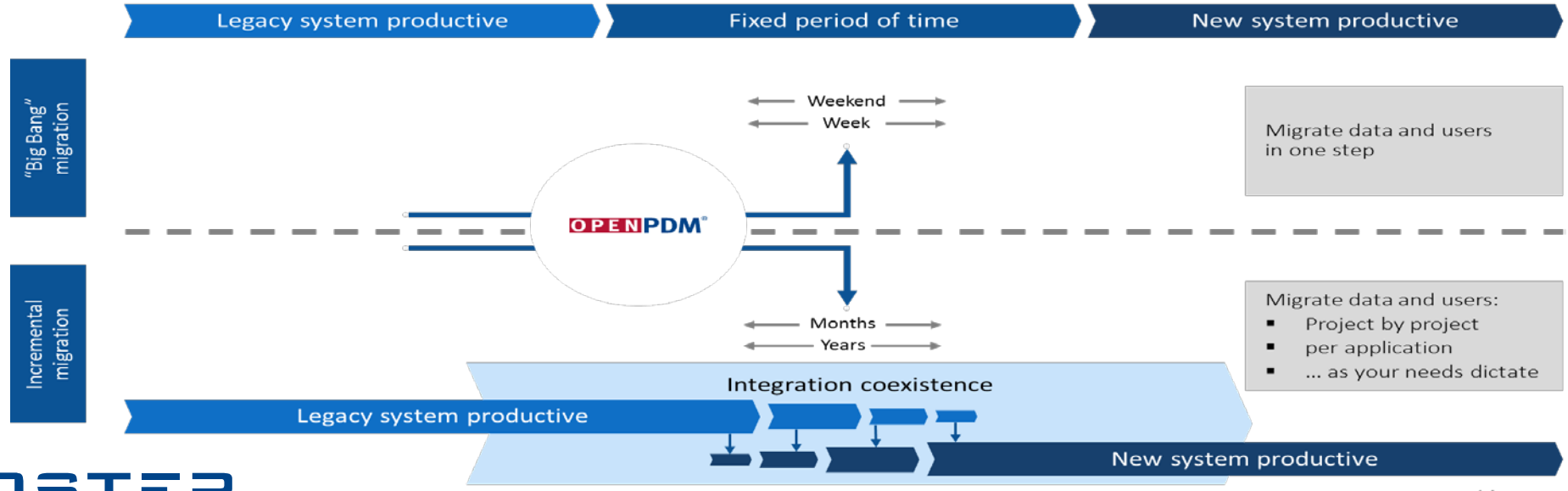
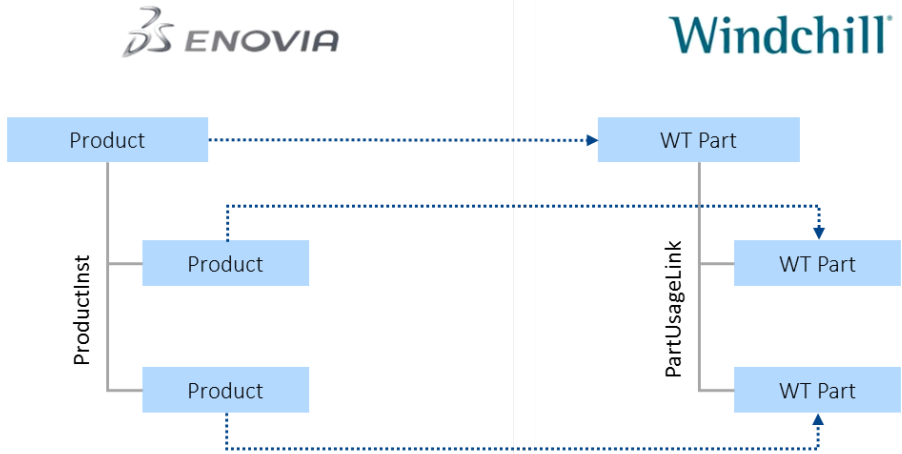
Strategic Decommissioning

- Build a synchronization from one system to another with the intention of decommissioning that source system after all required data has been synched and users are transitioned for new projects.



ENOVIA as TDM - Integration with PLM

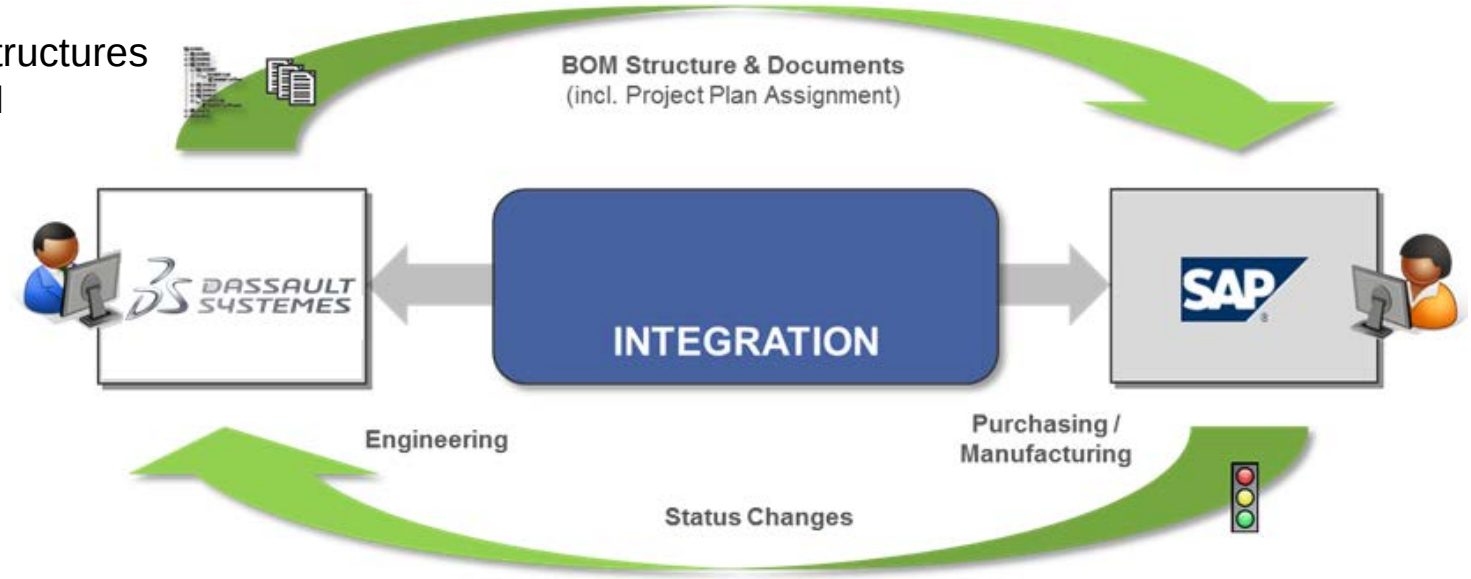
- For Metadata -
  - PLM to TDM for initial BOM structure
  - Or TDM to PLM Structure for initial design BOM
  - TDM Revision Control from PLM
  - TDM Status control from PLM
  - TDM Change Control from PLM
  - Synchronize structures and documents
  - Synchronize Configuration Structures
- For CAD data -
  - CAD data natively synchronized on release to PLM
  - CAD derived output generated in TDM synched to PLM
  - CAD Native data exported and derived output generated to be synched to PLM



PLM Integration with ERP

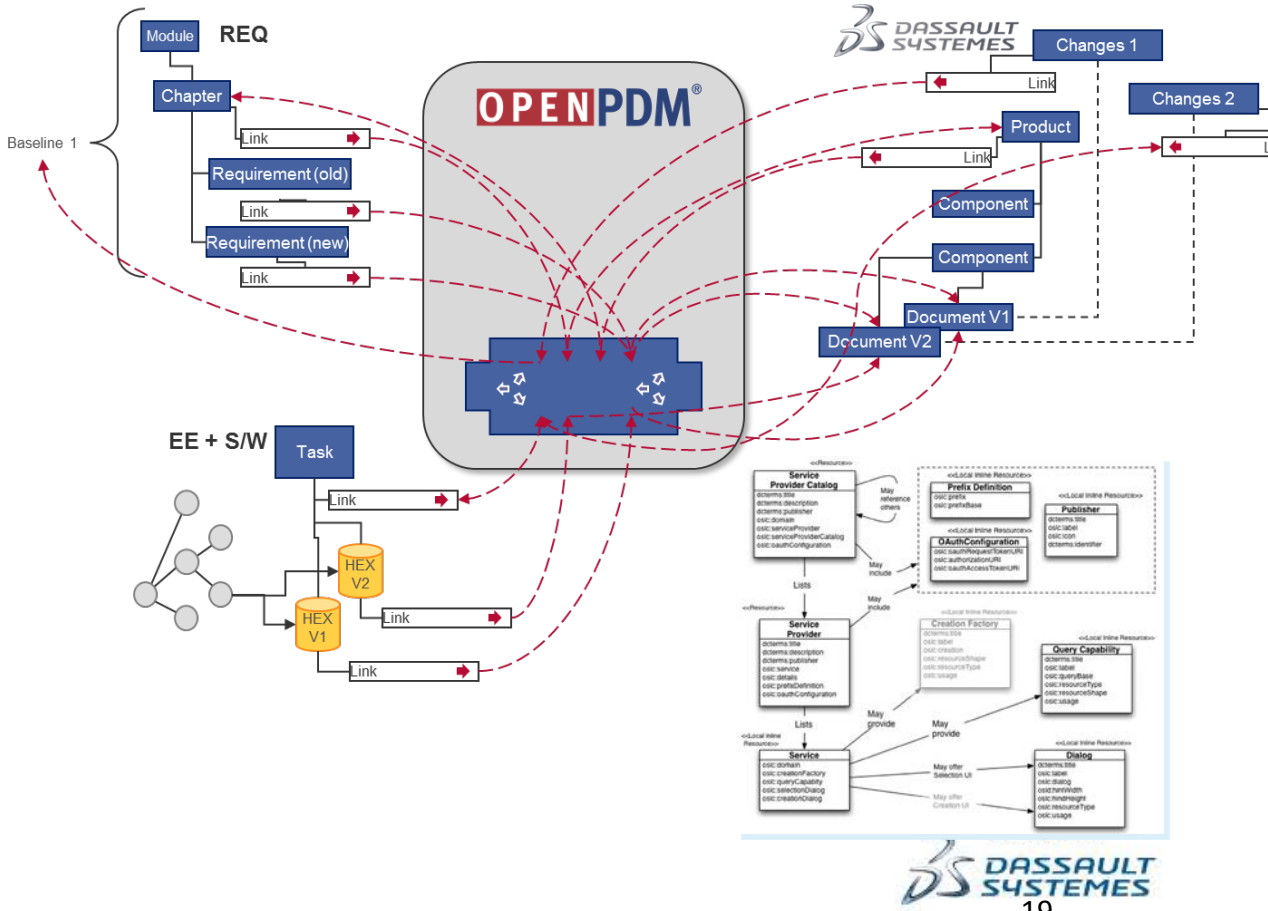
- PLM to ERP
  - PLM to ERP of engineering part and BOM structures
  - PLM to ERP of manufacturing part and BOM structures
  - PLM to ERP Engineering Change
  - PLM Design Record to ERP
  - PLM Planning & Documentation

- ERP to PLM
  - ERP to PLM Cost Visibility
  - ERP to PLM Process Sync
  - ERP to PLM Manufacturing Change
  - ERP to PLM Vendor / Supplier information
  - ERP to PLM Support / Manufacturing part and BOM structures



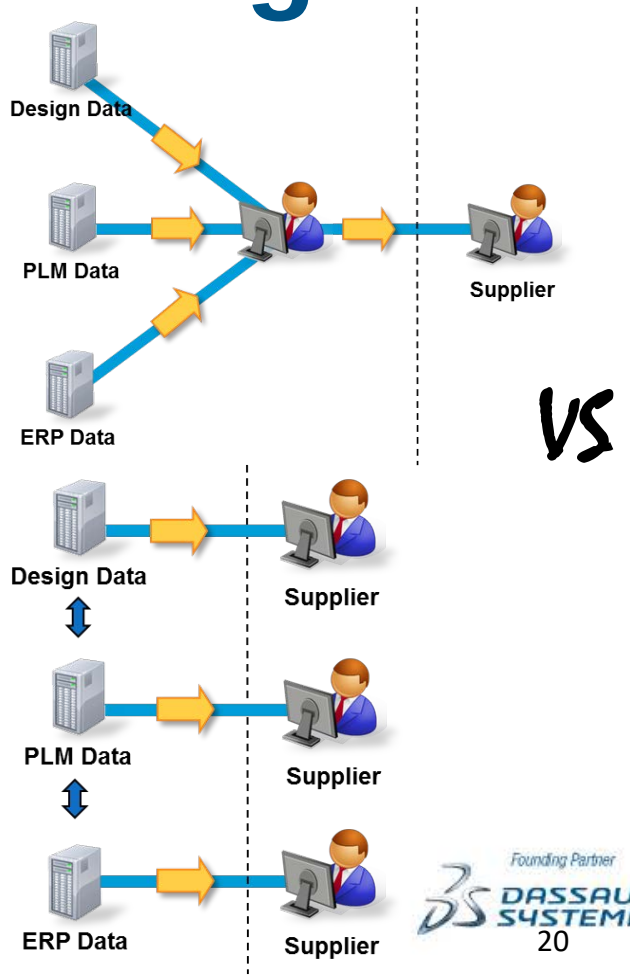
PLM Integration with ALM

- ALM
  [Application lifecycle management]
  - Align DOORS or other requirements tools with Requirements Central
  - Align RTC *[Rational Team Concert]* or MKS *[PTC Integrity]* with PLM data to provide real traceability
  - Get complete product visibility within PLM
- OSLC
  [Open Services for Lifecycle Collaboration]
  - Connectivity standardization in ALM system interoperability
  - Strong URI *[Uniform Resource Identifier]* for effective linking to ALM



Supplier Collaboration Engineering Data

- Integration with engineering enterprise can put the right data together to eliminate duplication and manual construction costs of combining this data. For example:
  - Prevent errors and redesigns from changes in CAD from suppliers by integrating existing designs with up to date design space
  - Supplier Parts and BOM product information can be directly input with alignment to manufacturing and design data
  - Data from model based definitions can be used for quote packages



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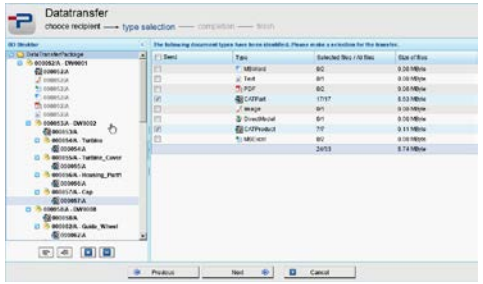
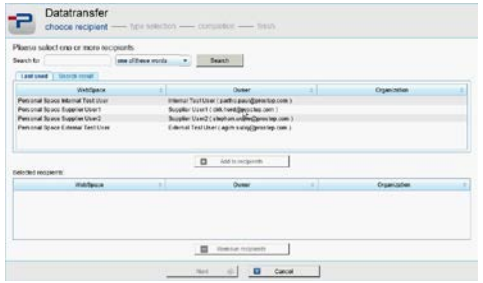
Sending from PLM to External Suppliers

Sender Workflow

Search and Select in PLM system → Select receiver → Select document types → Submit job



Optional Model Simplification



Systems Workflow

Background Process Exports Desired Data from PLM and other Systems → Workflow Submits Job for Model Simplification (removes IP) based on Receiver Profile → Data Package is Encrypted and uploaded to secure partner portal → Partner is Notified

Downloads and Access are fully tracked

Demo:
Supplier Data Exchange from 3DExperience

Click to watch video or visit
https://youtu.be/993fA1joy2I

Possibilities for Design Integration Strategies Beyond Native CAD

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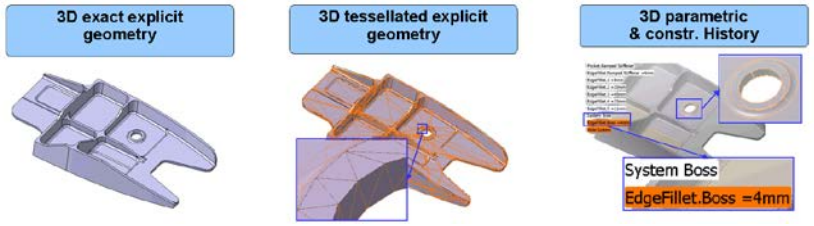
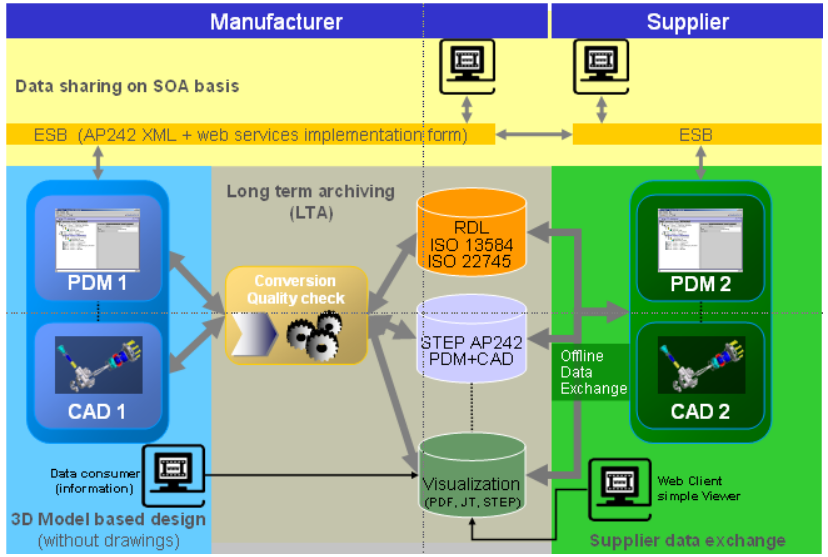
Using Neutral Formats

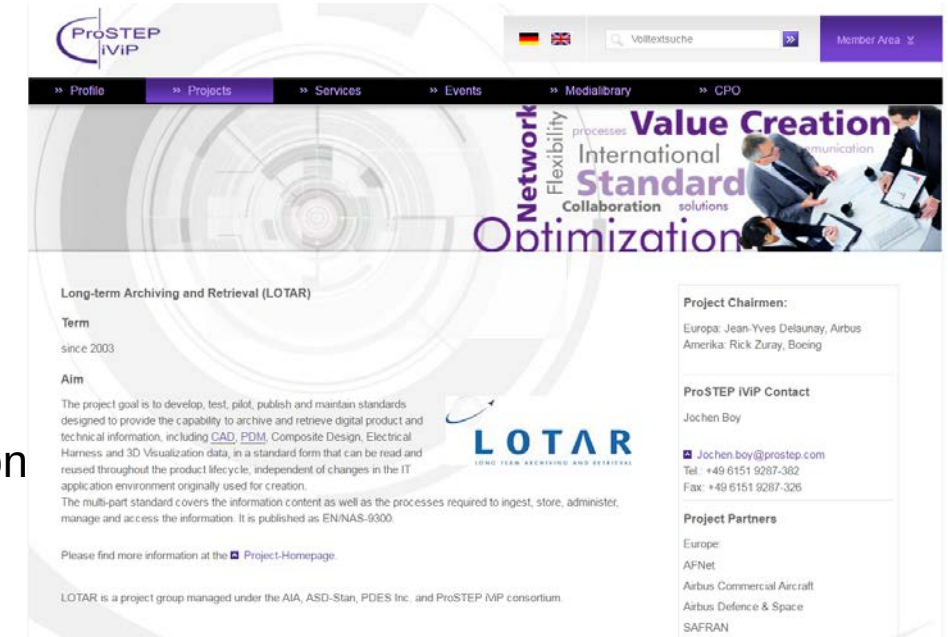
- PROSTEP iViP leads the definition of many engineering neutral formats and processes
  - ISO STEP 10303 AP 214, 239, 242
  - PLM Services, 3D XML
  - Open JT, LOTAR, 3D PDF and other working groups
- Neutral Formats are beneficial for more than one party that agree on the standard (for partner collaboration)
  - Exchanging standards based data give good definition to all parties
- Lightweight Formats can assist in short term co-existence as they are easier to integrate
- Neutral formats may complicate migrations where a strong independent semantic definition is not needed
  - Point to point solutions generally do not require neutral formats
  - Neutral formats add a layer of transformation
  - Maybe useful for more than two interfaced systems





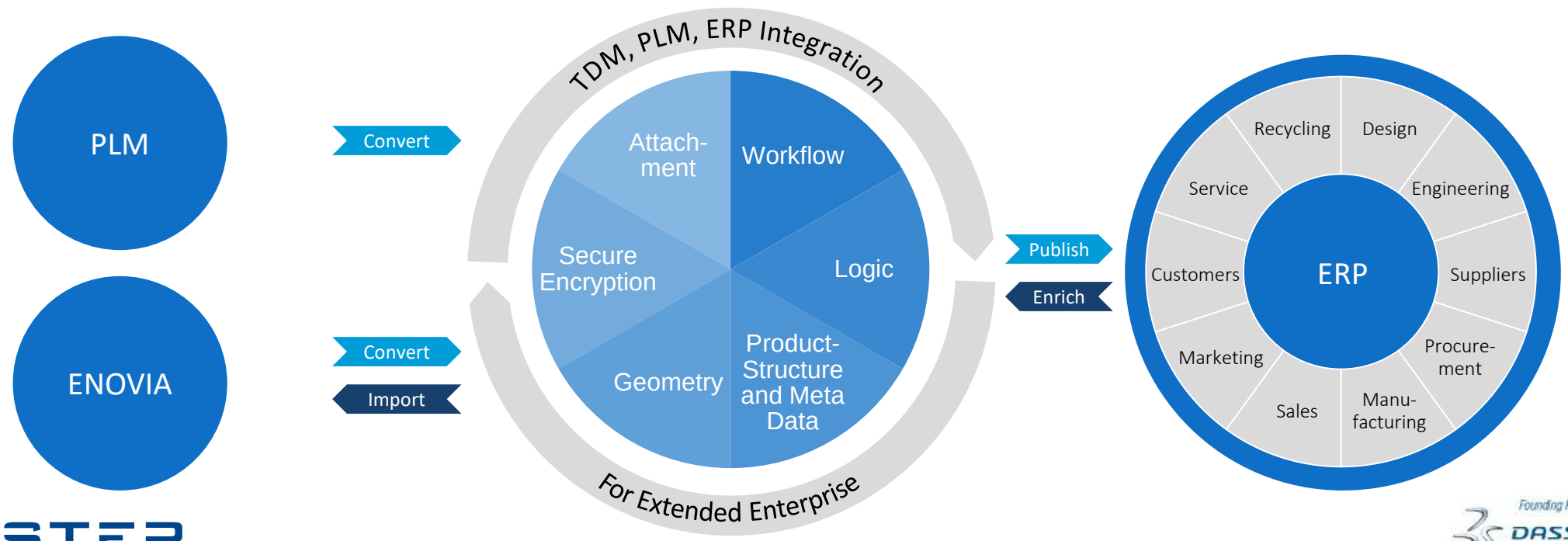
Archiving Strategy

- Remember Decommissioning Requirements!
- LOTAR – (LO)ng (T)erm (A)rchiving and (R)etrieval
  - Many industries require CAD data for 50+ years
  - CAD and PDM formats and versions cannot be supported indefinitely.
  - Your data in those formats needs to be accessible forever.
  - Using standards-based CAD Formats (like STEP 242) and repository you can archive this data
  - This partitioning of old data and archiving is natural at migration when you may not want to carry over all data
  - Aerospace and Automotive have standard practices for archiving. Look into workgroup best practices and recommendations.
  - Manage your data so that you don't need to keep every all versions of CAD that you have used (ever) with unsupported software and hardware!



CAD Derived Outputs

- Generate derived outputs for intended usage
  - 3DPDF / drawings for non-CAD consumers
  - JT, Creo View, 3DXML for solution integration visualization
  - ISO STEP 10303 - 203, 242 for archiving and collaboration



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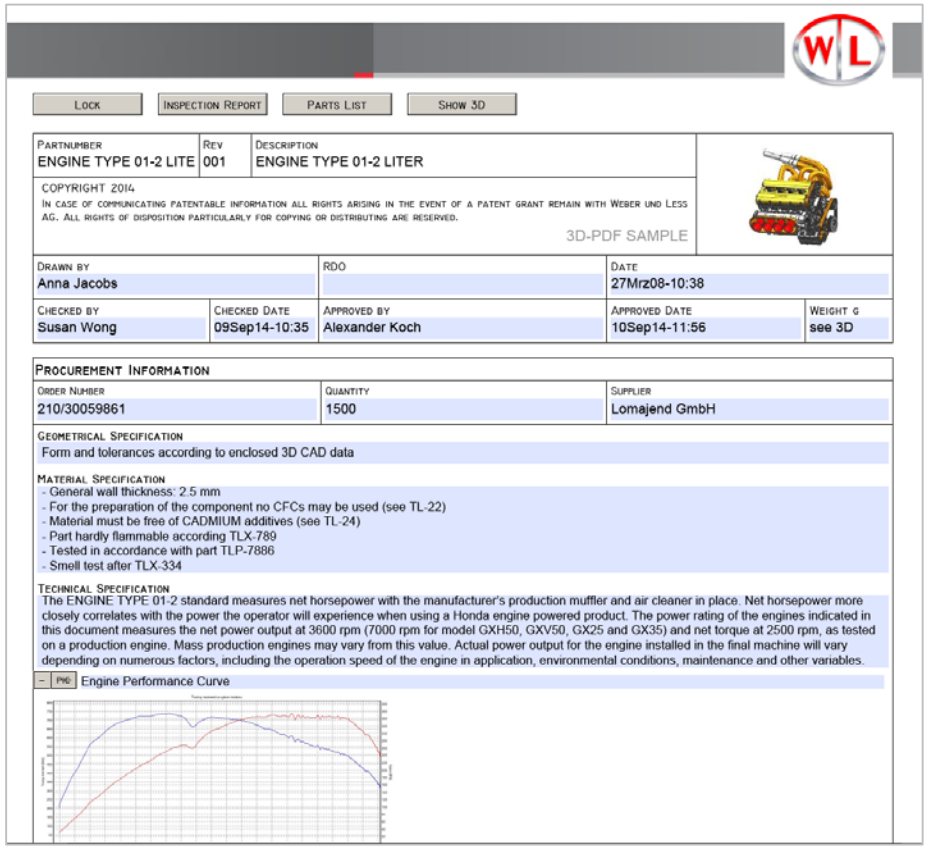
Technical Data Package Example



LOCK | INSPECTION REPORT | PARTS LIST | SHOW 3D

PARTNUMBER	REV	DESCRIPTION
ENGINE TYPE 01-2 LITE	001	ENGINE TYPE 01-2 LITER

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3D-PDF SAMPLE

DRAWN BY	RDO	DATE
Anna Jacobs		27Mrz08-10:38

CHECKED BY	CHECKED DATE	APPROVED BY	APPROVED DATE	WEIGHT G
Susan Wong	09Sep14-10:35	Alexander Koch	10Sep14-11:56	see 3D

PROCUREMENT INFORMATION

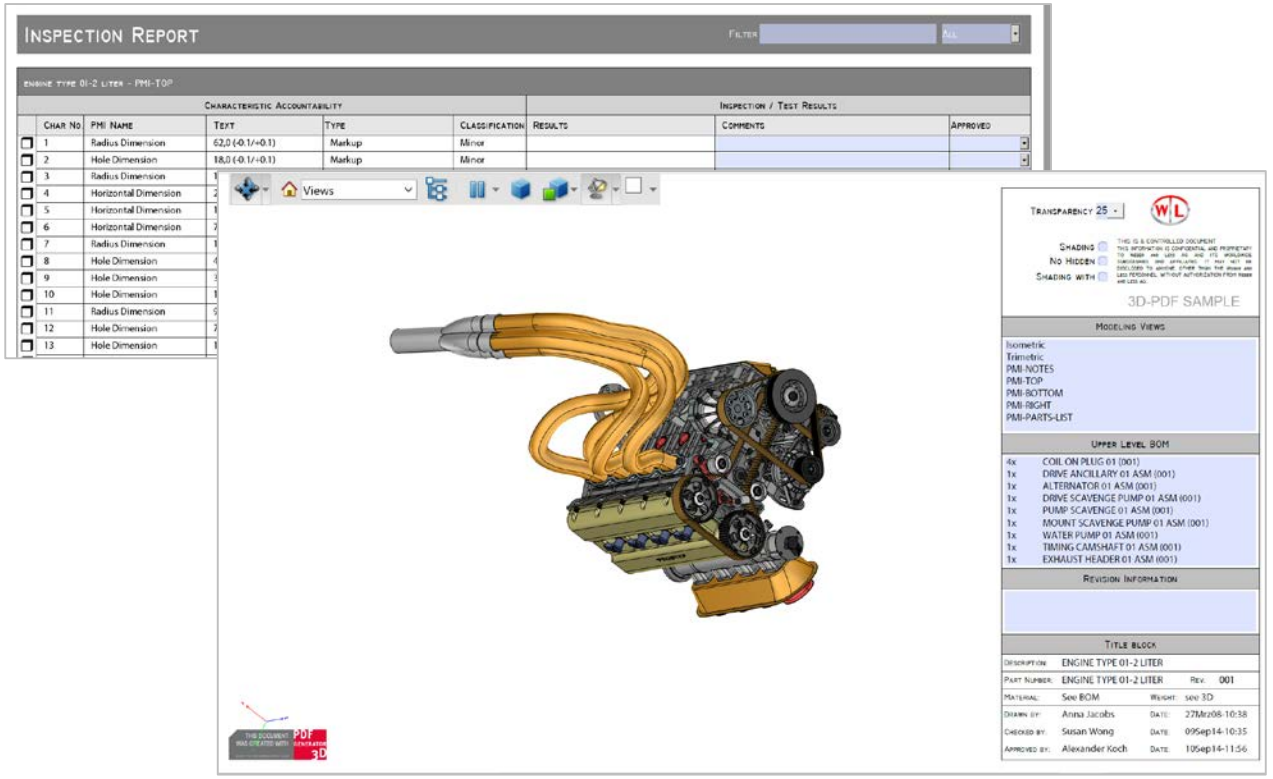
ORDER NUMBER	QUANTITY	SUPPLIER
210/30059861	1500	Lomajend GmbH

GEOMETRICAL SPECIFICATION
Form and tolerances according to enclosed 3D CAD data

MATERIAL SPECIFICATION
- General wall thickness: 2.5 mm
- For the preparation of the component no CFCs may be used (see TL-22)
- Material must be free of CADMIUM additives (see TL-24)
- Part hardly flammable according TLX-789
- Tested in accordance with part TLP-7886
- Smell test after TLX-334

TECHNICAL SPECIFICATION
The ENGINE TYPE 01-2 standard measures net horsepower with the manufacturer's production muffler and air cleaner in place. Net horsepower more closely correlates with the power the operator will experience when using a Honda engine powered product. The power rating of the engines indicated in this document measures the net power output at 3600 rpm (7000 rpm for model GXH50, GXV50, GX25 and GX35) and net torque at 2500 rpm, as tested on a production engine. Mass production engines may vary from this value. Actual power output for the engine installed in the final machine will vary depending on numerous factors, including the operation speed of the engine in application, environmental conditions, maintenance and other variables.

Engine Performance Curve



INSPECTION REPORT

ENGINE TYPE 01-2 LITER - PMI-TOP

	CHAR NO.	PMI NAME	TEXT	TYPE	CLASSIFICATION	RESULTS	COMMENTS	APPROVED
	1	Radius Dimension	62,0 (-0.1/+0.1)	Markup	Minor			
	2	Hole Dimension	18,0 (-0.1/+0.1)	Markup	Minor			
	3	Radius Dimension						
	4	Horizontal Dimension						
	5	Horizontal Dimension						
	6	Horizontal Dimension						
	7	Radius Dimension						
	8	Hole Dimension						
	9	Hole Dimension						
	10	Hole Dimension						
	11	Radius Dimension						
	12	Hole Dimension						
	13	Hole Dimension						

Views

TRANSPARENCY 25

SHADING
NO HIDDEN
SHADING WITH

3D-PDF SAMPLE

MODELING VIEWS
Isometric
Trimetric
PMI-NOTES
PMI-TOP
PMI-BOTTOM
PMI-RIGHT
PMI-PARTS-LIST

UPPER LEVEL BOM

4x	COIL ON PLUG 01 (001)
1x	DRIVE ANCILLARY 01 ASM (001)
1x	ALTERNATOR 01 ASM (001)
1x	DRIVE SCAVENGE PUMP 01 ASM (001)
1x	PUMP SCAVENGE 01 ASM (001)
1x	MOUNT SCAVENGE PUMP 01 ASM (001)
1x	WATER PUMP 01 ASM (001)
1x	TIMING CAMSHAFT 01 ASM (001)
1x	EXHAUST HEADER 01 ASM (001)

REVISION INFORMATION

TITLE BLOCK

DESCRIPTION:	ENGINE TYPE 01-2 LITER		
PART NUMBER:	ENGINE TYPE 01-2 LITER	REV.	001
MATERIAL:	See BOM	WEIGHT:	see 3D
DRAWN BY:	Anna Jacobs	DATE:	27Mrz08-10:38
CHECKED BY:	Susan Wong	DATE:	09Sep14-10:35
APPROVED BY:	Alexander Koch	DATE:	10Sep14-11:56

[Open 3D PDF File]

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Integration Requirements and Planning

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Business Cases for Engineering System Integration

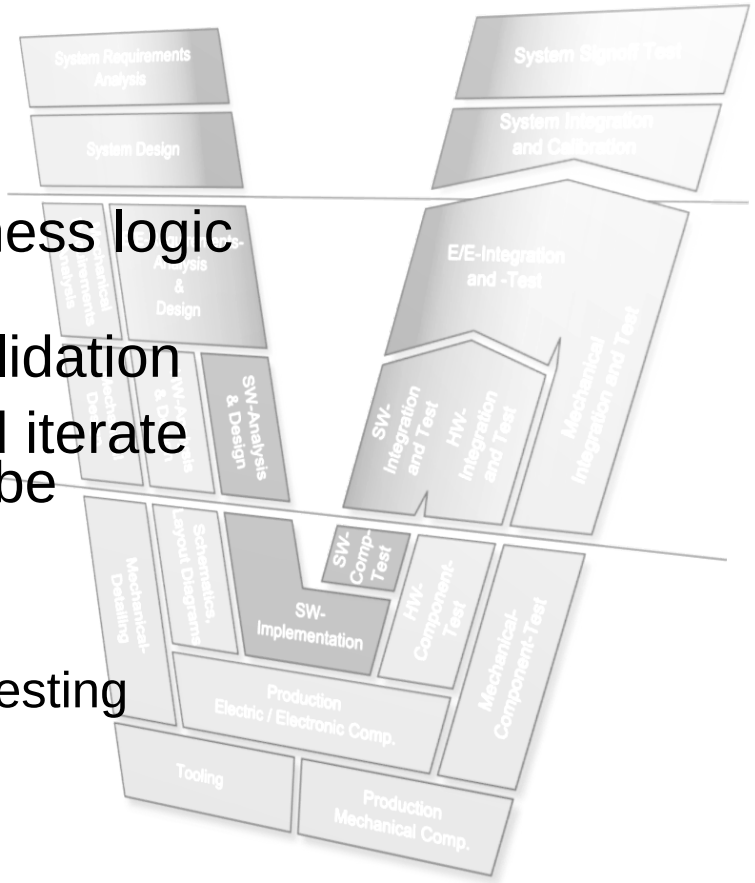
- Manual duplication of data can be quantified by operation synchronization
  - Speed that the data is available
  - Time the manual process takes for the data to be duplicated
  - Accuracy of the duplicated data and costs of failures (wrong production revision?)
- Elimination of software licenses for integrated systems
  - Data is available in the primary system of that user and additional license not needed
  - Duplicate functionality only needs to be utilized in one system
  - Integration can enable migration and eliminate other system entirely
- Data Efficiency from modern practices
  - Model Based Enterprise
  - Digital Thread
  - Data visibility
- Consolidation, Quality, Training, Maintenance, Support and Knowledge
  - Less utilization of different systems means less overhead

Integration Requirements

- Differentiate the requirements for decommissioning your legacy PLM from the requirements for introducing the new PLM
- Strategy and Requirements Workshop resulting requirements and implementation plans should be done first and not short changed.
- Execute a phase project and build on knowledge and success. (Start Small)
- Implementation of integration use cases and unit and integration testing
- Business and User acceptance testing

Advice on Project Planning

- Phase project and build on knowledge and success.
- Initial integrations for Parts, BOM contain mapping and business logic will be re-utilized for other use cases
- Integration must cascade after releases of PLM to ensure validation
- Target 3-5 integration use cases per development period and iterate in a standard software development pattern. Sprints should be between 2 to 4 weeks.
  - Strategy and Requirements Workshop resulting requirements and implementation plan
  - Implementation of integration use cases and unit and integration testing
  - Business and User acceptance testing
  - Production application
- Utilize the same development and business team to build understanding and core competence.

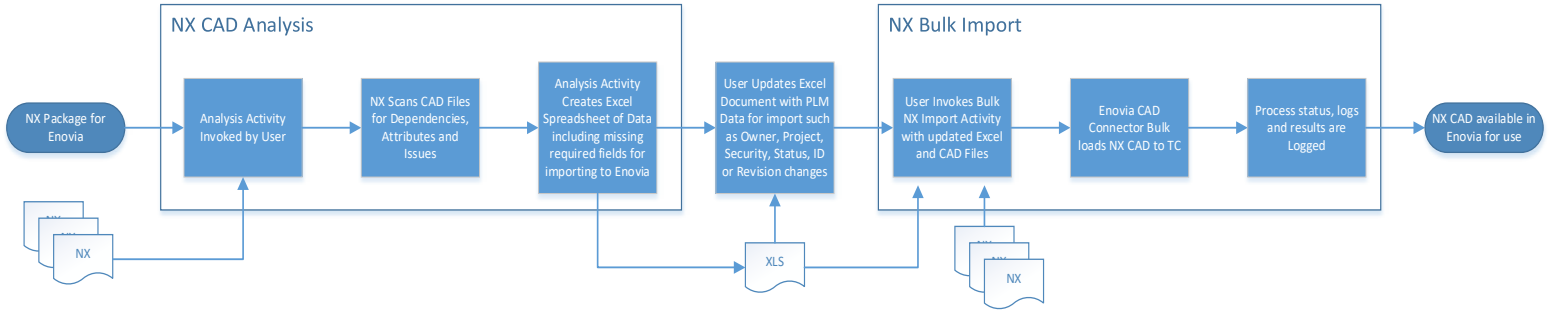


Overall Integration Risks

- Controlling “Master Model” / “Source of Truth”
  - Too much replication can make it difficult to manage divergent iterations.
  - Clearly indicate what is the master and what is reference only data
- The “VHS Problem”
  - Beware of “copy of a copy” and make sure appropriate quality checking programs and processes are in place.
- Don’t use Integration as permanent band-aid
  - May enable “old” systems or “bad practices” to hang around too long.

Technical Considerations for File Based CAD Import

- CAD Data does not have enough information to import on it's own. PLM data should be added to the process
- Unmanaged data is generally "dirtier" with considerably more issues than PLM managed data
- Recommended Process Steps –
  - Scan directories with CAD interrogation tool (CAA, etc) and get all data attributes and file dependencies
  - Move all data to staging database or Excel file(s) with attributes and:
    - Determine which file is the master between multiple instances
    - Add PLM metadata (owner, group, projects, status, etc)
  - Transform metadata into import packages
  - Execute bulk import with appropriate PLM interface tool



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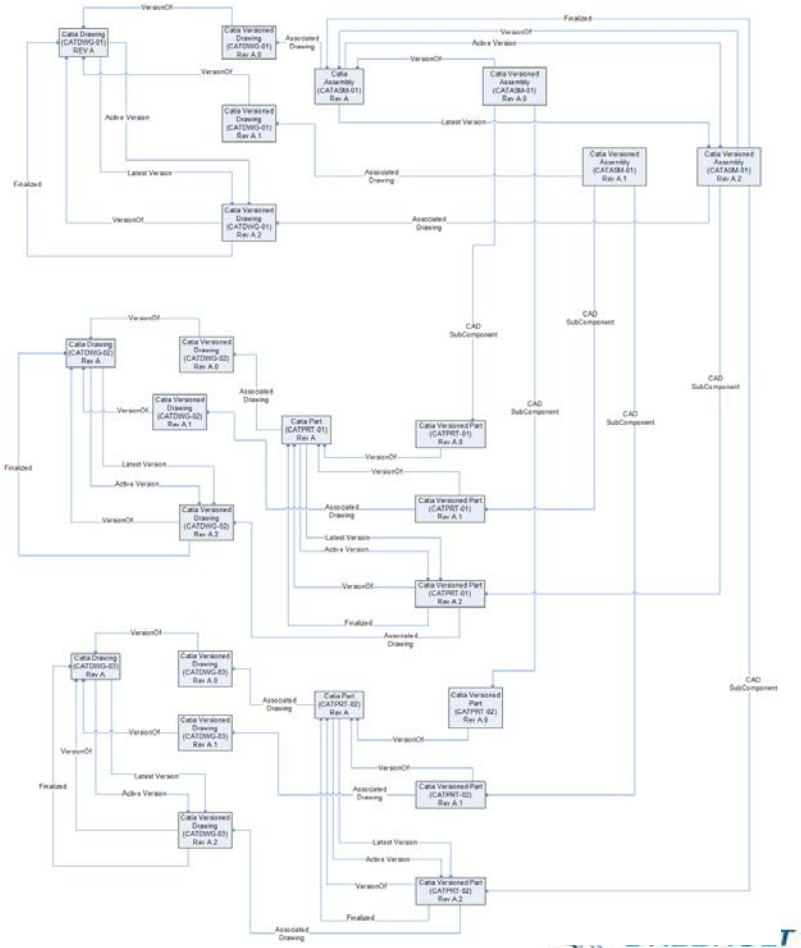
Technical Considerations for Enovia / 3D Experience

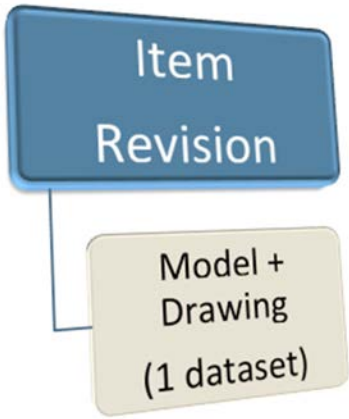
- RMI API for Enovia V6
- Separate CATIA (V5) API for export / import to Enovia provides sufficient functionality for many tasks
- XPDM adapter for VPM Central CATIA V6
- Modern Enovia has a lot of object model dependencies! Test your UI for everything!
- Understand the object models in the database
- Dependency order is important
- Can support relatively fast export / import



Technical Considerations for Teamcenter

- Tools for interfacing with Teamcenter:
  - Teamcenter Portal Client API (Legacy ITK)
  - Teamcenter SOA API
  - IPS CSV loading tool for metadata
  - PLM XML for metadata and document export / import
  - Global Services for limited data in legacy Teamcenter
- CAD Import/Export For Teamcenter
  - UGClone for NX data export / import
  - TCIC bulk spreadsheet for export / import for CATIA
  - Creo IPEM Command line for export / import
- API performance in Teamcenter may require alternative methods depending on use-case
- CAD and Parts are historically built on the same BOM in Teamcenter - meaning CAD Document and Part 1:1

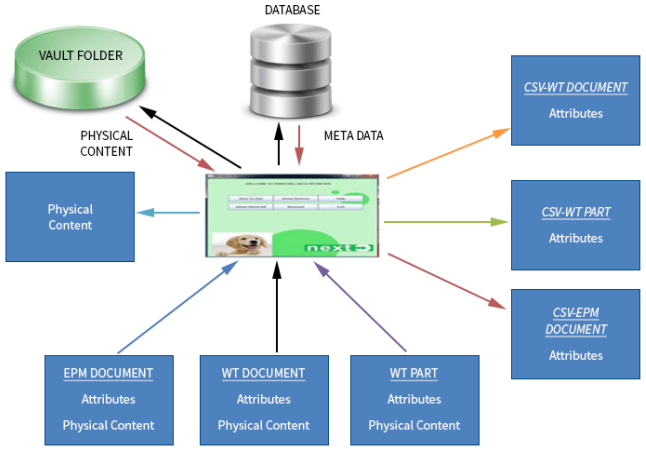
TEAMCENTER



Technical Considerations for Windchill

- Tools for interfacing with Windchill
  - RMI API for integration export / import
  - Windchill Bulk Migrator for import Creo, Metadata & Document
  - Work Group Manager Batch Import / Export for other CAD
  - Pro/Toolkit + Jlink for Import / Export of CREO
- Pro/Toolkit for Import / Export for legacy Pro/Intralink (3.x)
- Scripted Interface for Pro/E export
- Family Tables can be tricky

Windchill®
A PTC Product



xPDM Adapters for CATIA V6

*) The transfer process can be started via menu items, automated triggers or other arbitrary events

1 Transfer start via menu item in CATIA V6

3 Data model mapping between CATIA V6 and Windchill

CATIA

Export 2

PROSTEP V6 XPDM Windchill Adapter

Import 5

PTC Windchill

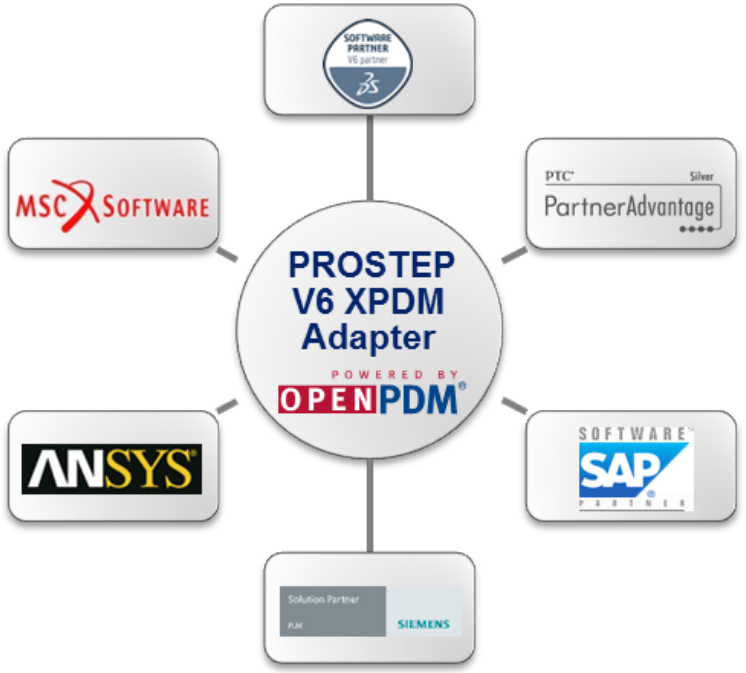
File transfer between CATIA V6 and Windchill 4

*) CAD converters can be integrated on XPDM side, which are provided by Dassault or third party vendors

User can start the process very simply

Transfer is completely processed in the background

User can work with the transferred data



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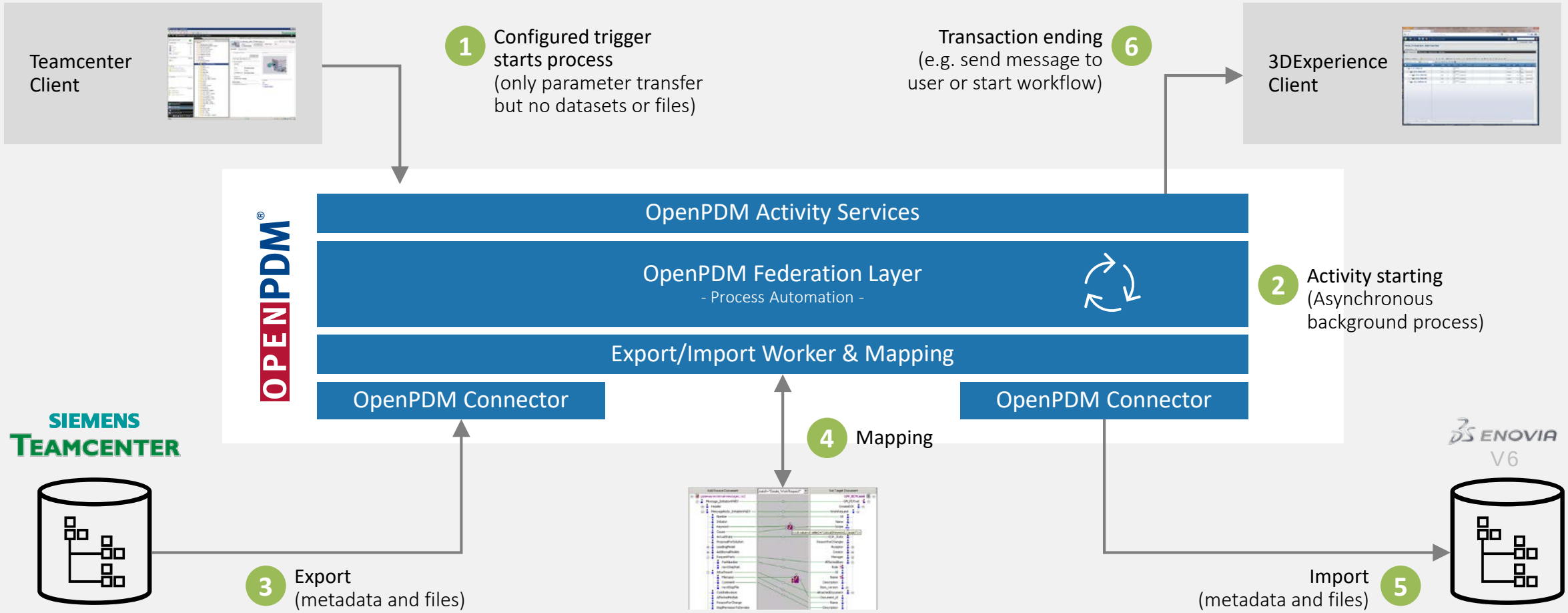
OpenPDM Integration Process

Example: Teamcenter – 3DExperience Integration



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Demo:
Moving Data between PLM / 3DX

Click to watch video or visit
https://youtu.be/F_Xnr5Sot9M

Final Thoughts

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Integration Final Thoughts *Don't Panic !*

- Many companies have successfully implemented their own PLM integrations with varying degrees of success.
  - Allocate enough time
  - Allocate enough resources
  - Do what you can, but know when to get extra help
  - Plan Hard
  - Test Hard
  - Document Success Criteria
  - Over Communicate with Everyone (success and failures)
  - Consider using commercial tools where available instead of reinventing the wheel each time

PROSTEP is Here to Help

- 100's of skilled PLM and CAD consultants
- More than 20 years of experience since 1993
- Global Reach
- Part of the ProSTEP iViP non profit consortium
- Standards based software
- Best in class processes methodologies
- Field Tested Commercial grade Software
- Flexible Rental or Purchase Options
- Certified and Maintained Connectors to most popular systems

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OpenPDM Customers

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Questions ?

COMMUNITY OF EXPERTS
OF DASSAULT SYSTÈMES SOLUTIONS

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THANK YOU!

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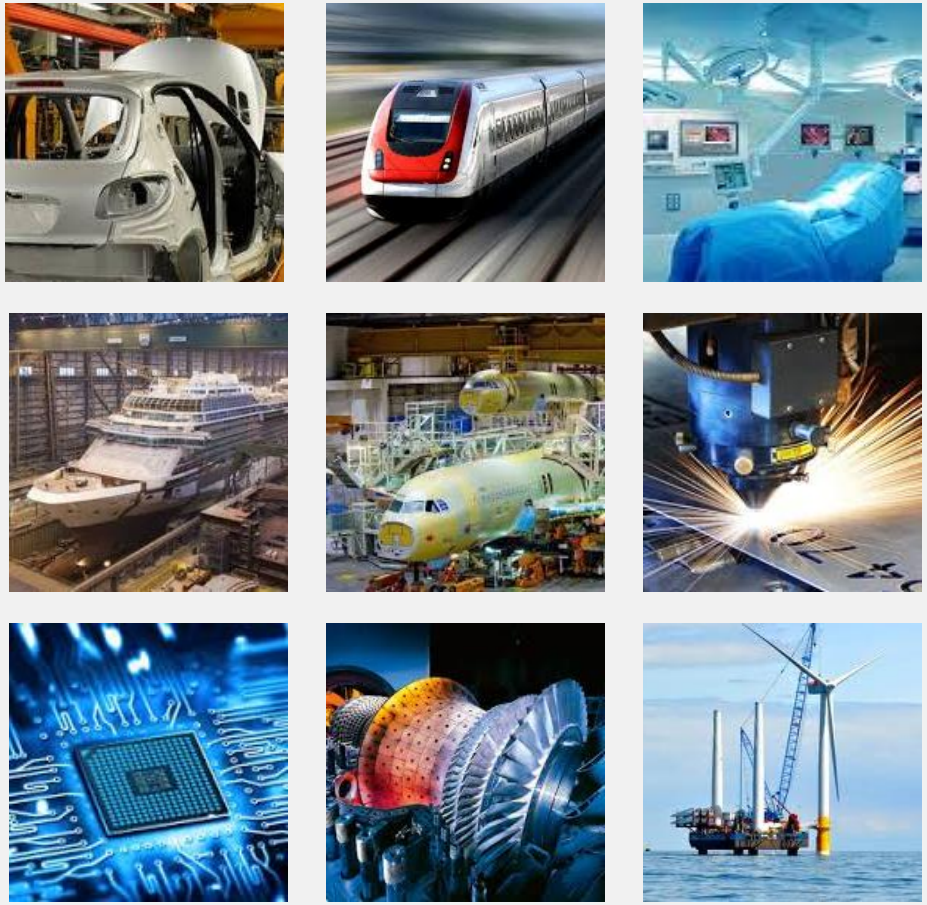
OpenPDM COLLABORATE

The PLM Collaboration Framework

Do you use PLM data together with external partners?

OpenPDM COLLABORATE offers tailor-made solutions for making data available that are geared to the collaboration model in question

- Automatic extraction of PLM and CAD structures as well as metadata from backend systems
- Generation of partner-specific data formats (PLM XML, STEP, JT, 3D PDF, etc.) and structures
- Automatic and partially automatic PLM to PLM provision
- Import prognosis for PLM and CAD structures
- Delta synchronization of PLM data
- Efficient setup and termination of partner connections



Collaboration made easy with OpenPDM COLLABORATE!

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OpenPDM COLLABORATE

Features and Benefits

KEY PERFORMANCE FEATURES

- Selective data transfer
- No separate management of data
- Transaction security
- Process automation
- End-to-end logging
- Delta data synchronization
- Individual data formats
- Support of standards
- Can be adapted to enterprise processes
- COTS - ongoing software maintenance

BENEFITS

- Optimum know-how protection
- Fast on- and off-boarding
- Robust operation
- No pre- or postprocessing
- Transparency and traceability
- Efficient data processing
- High level of flexibility
- High level of compatibility
- Seamless partner integration
- High level of investment protection

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Connect Anything to Anything

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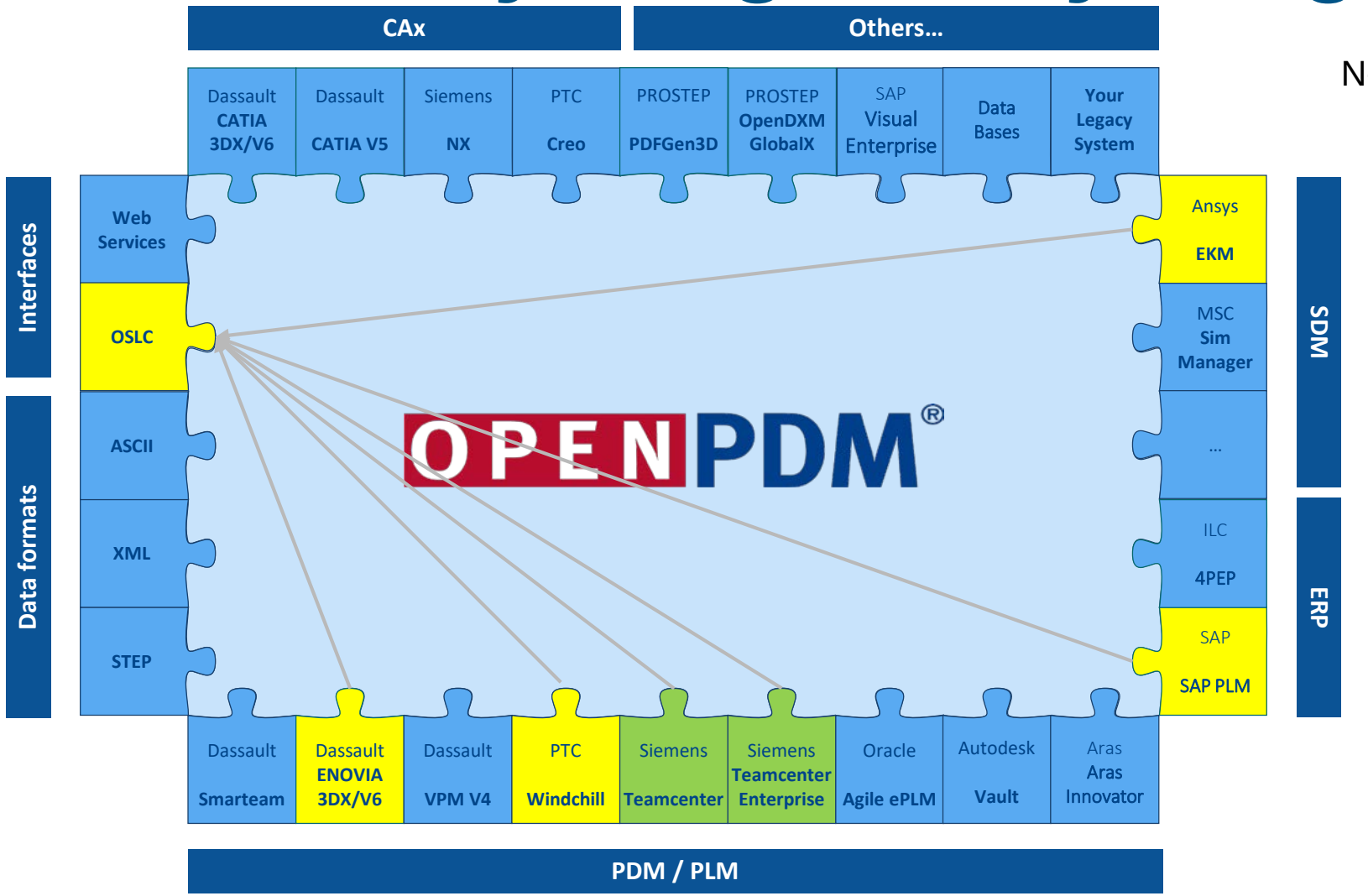
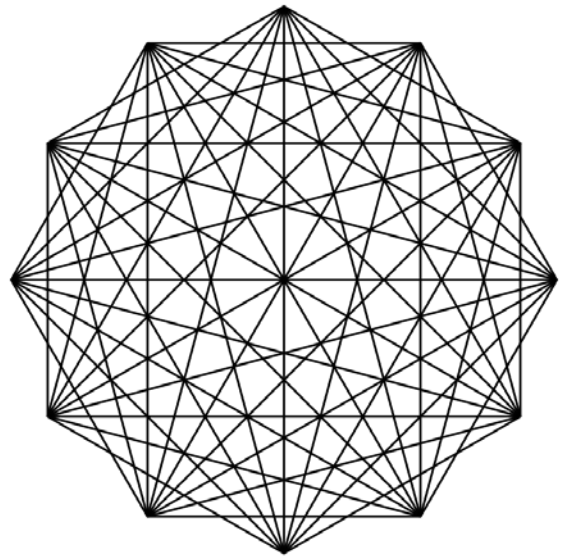


N-N solution vs. Point to Point Connectors



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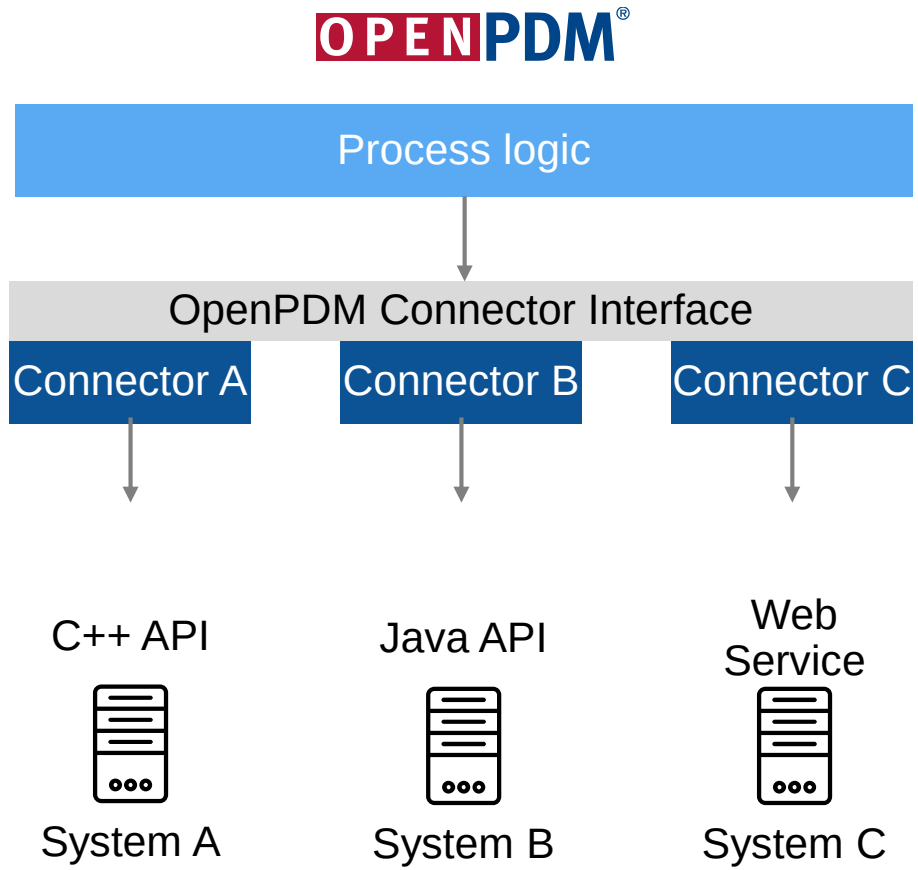
OpenPDM Connectors

SIMPLIFICATION

- All connectors offer the same interface
- System specific technologies are encapsulated
- System upgrades are decoupled
- Only external and official standard interfaces of the systems are used
- Configuration via OpenPDM administration GUI

FLEXIBILITY

- Huge range of well-proven standard connectors is “out-of-the-box” available
- New connectors of legacy systems may be easily implemented and integrated



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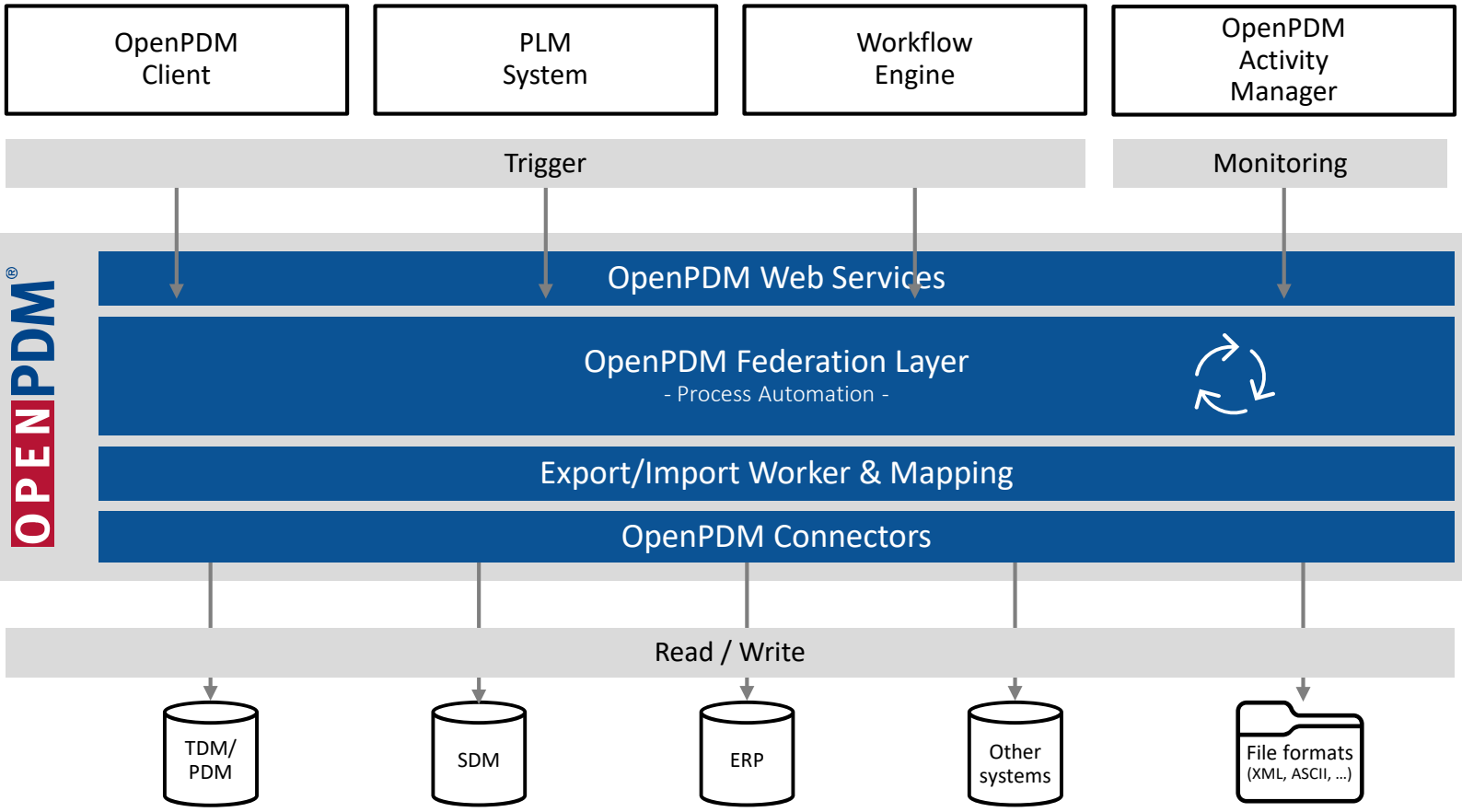
OpenPDM Framework Overview



Client Application

Various systems and tools

OpenPDM Platform

Standard services, background processing and connectors

PLM Systems

Variety of connectors for standard systems, proprietary systems and file formats available

SAMPL Project on a page

Secure Additive Manufacturing Platform (www.SAMPL-3D.de)

Challenges

- Copy- and product liability law
- Distinction of original parts from counterfeits
- Support licensing and printing rights
- Support of new value added and business models

Objectives

- Trusted 3D printers and Chain of Trust
- Marking and traceability by RFID-chips
- Development of a reference platform
- Blockchain-Technology for the supply of licence information

Partner

3D micro PRINT
TUHH Technische Universität Hamburg
Universität Hamburg DER FORSCHUNG | DER LEHRE | DER BILDUNG
universität ulm
NXP
DAIMLER EvoBus GmbH
Fraunhofer
AIRBUS
consider it
PROSTEP

Supported by:

Federal Ministry for Economic Affairs and Energy

on the basis of a decision by the German Bundestag

Term: Nov 1st, 2016 - Oct 31th, 2019 **Volume: ca. 4 mio €** **Project leader: PROSTEP AG:**

Contact Person: Dr. Martin Holland; holland@prostep.com; 0511-54058100

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Example Projects

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Opel / GM

Opel-PSA Data Exchange Pipeline

Data is send from PSA to GM

Data exchange is based on STEP AP214

CAD data is translated to NX by GM standard STEP2NX converter

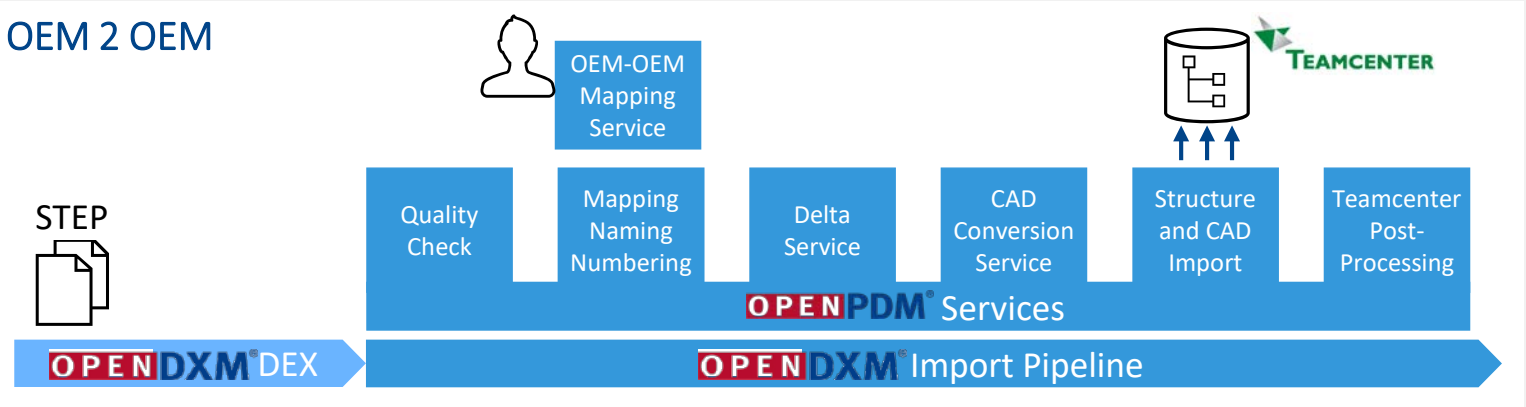
GM is running a special TC instance for OEM2OEM data exchange

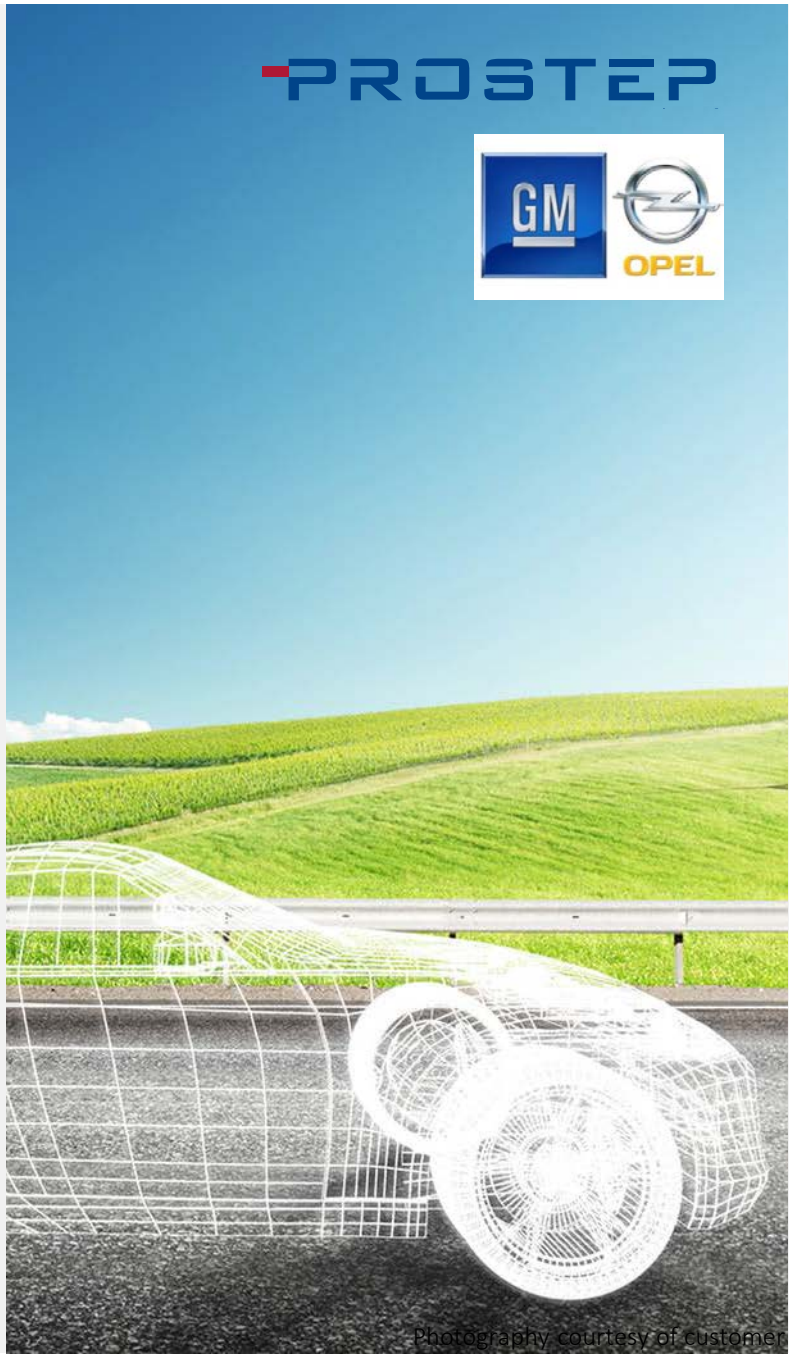
Data Transfer controlled by OpenDXM

Import Pipeline controlled by OpenDXM

STEP files are checked and mapped by OpenPDM

Teamcenter structure and geometry import is managed by OpenPDM





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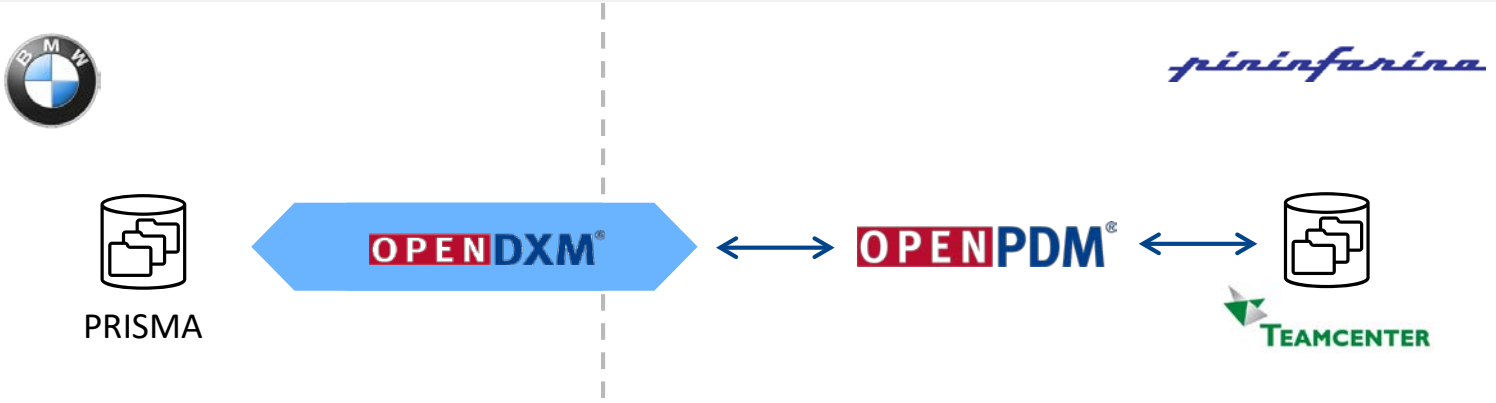
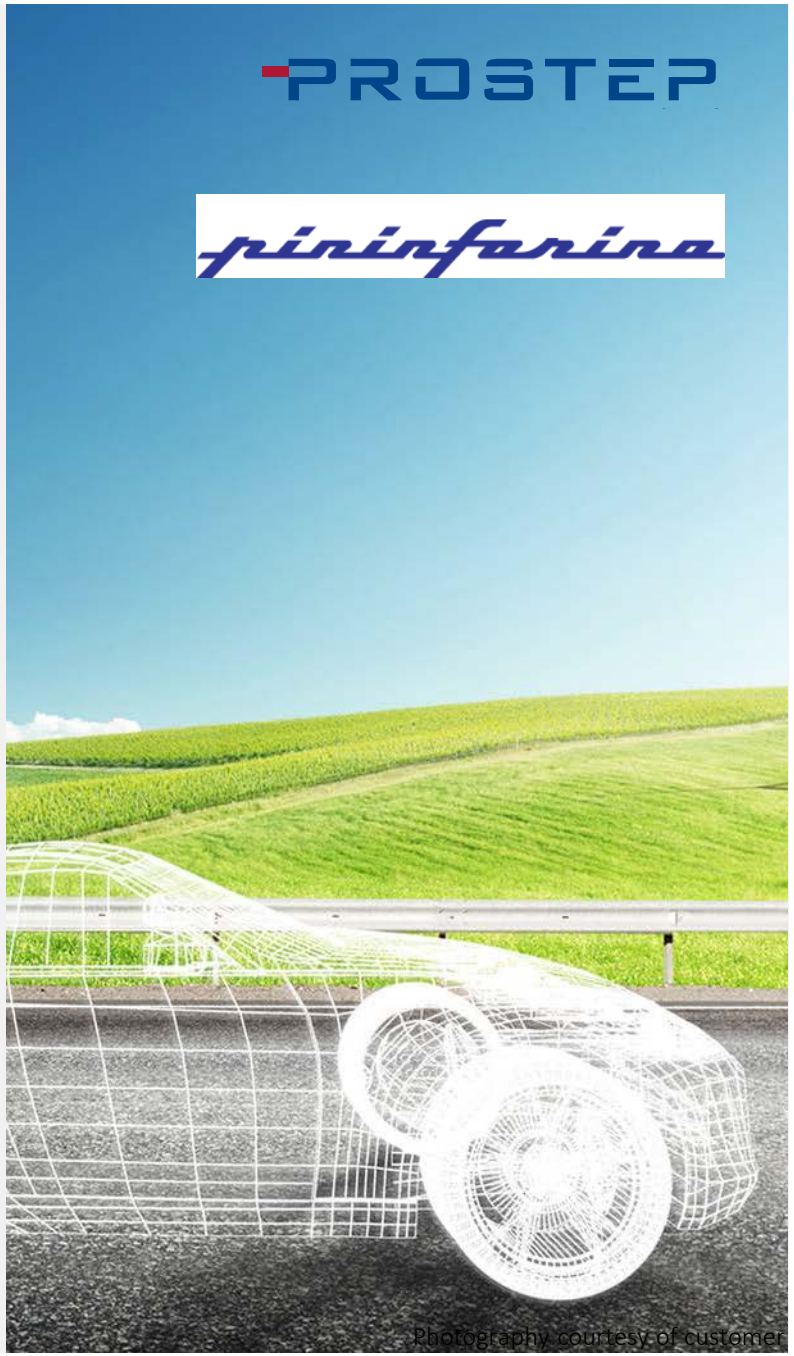
Pininfarina

Engineering Data Exchange with BMW

- Continuous data exchange with BMW
- Integrate in BMW standard exchange („Regelversorgung“)“
- Work in own system and deliver actual data to customer system
- Receive actual data from customer

- Receive and Pre-Process BMW data
- Import BMW data into Pininfarina Teamcenter
  - Structure and Metadata
  - CATIA V5 CAD data
- Deliver changed data back to BMW





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TVS Motors

Continuous Data Exchange with BMW Motorcycle

BMW and TVS build together new motorcycles.

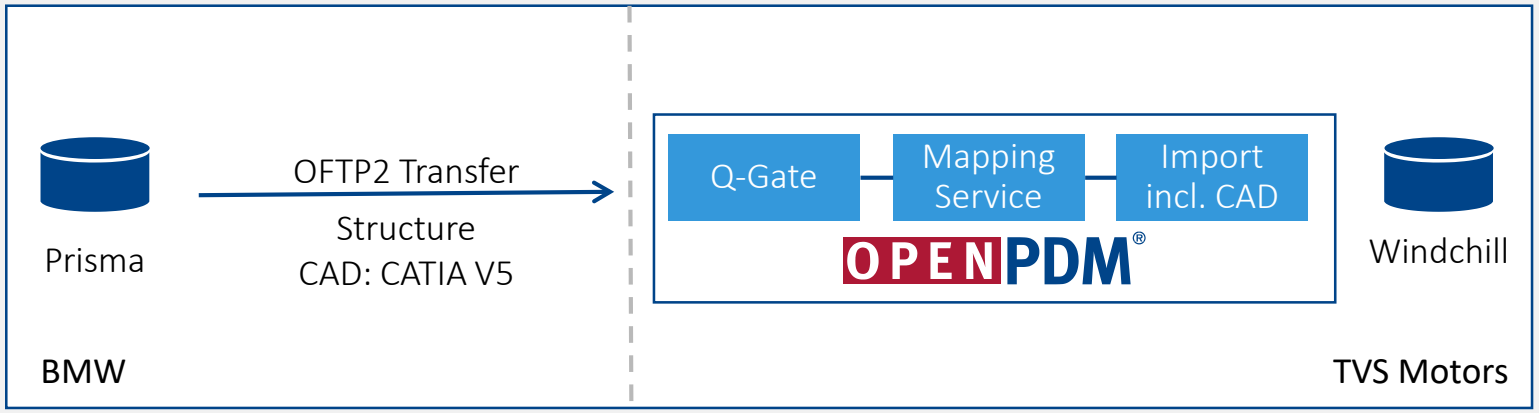
BMW is responsible for design and release management.

TVS is responsible for production and supplier management.

PROSTEP develops a continuous data exchange from BMW to TVS.

Data will be processed according defined (quality) rules.

Naming and numbering mapping between both companies.



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