Data Sharing using PLCS

Enabling the Digital Thread through life

Nigel Shaw
Eurostep
My name is Nigel Shaw

• Managing Director of Eurostep Limited since 1995
• Previously with British Aerospace, Leeds University
• Degrees in Geophysics and Computation
• Involved in STEP since 1986
  • Chaired Editing Committee for first release
• Chair of ProSTEP Round Table. 1995-1998
• Technical Lead for PLCS Inc. 1999-2005
• Eurostep PM for CRESCENDO, CONGA and TOICA
• Eurostep PM for our work with SAVI

• Standards geek, believer and analyst
• Interoperability challenger
First STEP with Standards

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• Standard for the Exchange of Product Model Data
  • ISO 10303 coming from ISO TC 184/SC 4
    – Industrial automation systems and integration —
      Product data representation and exchange
  • Started in 1984, first release 1995
  • Original problem:
    – Industry’s geometric data locked into CAD Systems
  • Later problem:
    – Industry’s data locked into CAD/PDM/PLM
    and many more systems
STEP is a tried and trusted means to exchange CAD snap shots

Geometry is a small part of the bigger picture
It needs context.

AP203, AP214 provide assembly structures, as does AP242
The Key Business Problem:

How to keep the **information** needed to operate and maintain a product **aligned** with the changing product over its **life cycle**?

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**Product Definition**

**Information**

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**Product**

**ISO 10303-239**

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**Maintenance**

**Schedules**

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**Test**

**Equipment**

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**Tools**

**Support**

**Facilities**

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**Transportation**

**Consumables**

**Software**

**Spares**

**Training**

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**Storage**

**Requirements**

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A Rich and Capable Data Model – with many re-useable patterns
PLCS - Separation of design & individual + Histories

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Life cycle of the **design**

Life cycle of the **individual**

Product Definition

Support System

Support Engineering

Product Individual

Support System

Typical people

Task execution

People / Organisations

change

feedback

History
Requirements, Breakdowns and Traceability

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Requirements, Functional View, Systems View, Product View, Operation and Maintenance View

- Stakeholder requirements
- Functional requirements
- System requirements
- Product requirements

- Product Operation and Maintenance requirements

- Stakeholder requirements
- Functional System
- Sub-system
- System
- Sub-system
- System Component
- Sub-assembly
- Product

- Product Individual structure
- Operational System
- Module
- Sub-module
- Product Individual
Eurostep and Standards

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- Eurostep is committed to using standards

- ShareAspace is based on implementing standards
  - Information standards for data capabilities
    - PLCS and AP242
  - Technology standards for development
    - OAUTH, REST, HTML5

- Eurostep is currently active in standards development
  - PLCS and AP242 Harmonization
  - MoSSEC
  - LOTAR for MBSE
The problem space

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Concept | Systems Eng. | Design | Software | Manufacturing | Service

External | Internal

CAx | PDM | SW rep | ERP | TechDoc | MRO

ShareAspace
Using PLCS in practice

Aerospace & Defence
- Kongsberg
- Honeywell
- AIRBUS
- cfms
- SAFAB
- DGA
- Renault Trucks
- BAE Systems

Automotive
- Scania
- Donghee
- Volvo
- Renault
- EGIS

Energy
- Siemens
- KEPRI
- SKB
- Wärtsilä
- Royal Institute of Technology

Infrastructure
Using PLCS in practice – Renault

As presented at PDT Europe 2016

Find out more on our vehicles

Our Group sets and services vehicles all around the world and in each segment:

- Renault Europe Passenger Cars
- Renault International Passenger Cars
- Renault Commercial Vehicles
- Renault Electric Vehicles
- Renault Sport
- Dacia
- Renault Samsung Motors

45 models sold under 3 brands in 125 countries

- 2,170,644 vehicles sold in 2015
- 80,028 vehicles sold in 2015
- 550,920 vehicles sold in 2015
03 OEM COLLABORATION
DMU Data Exchange request in a complex landscape

Stakes
1. Allow fast loop between product definition and downstream applications inside Renault (less than **24 hours**)
2. Increase efficiency of collaboration with Nissan and Daimler
3. Reduce Delay and Cost to start collaboration with new OEM

NewPDM
*(DS Enovia + CV6)*

CAE / Simulation

Realistic rendering
*(Lumiscaphe)*

Manufacturing Process / BIW
*(Siemens TCM)*

Repair & After Sales
*(PTC)*

As presented at PDT Europe 2016
04 IMPLEMENTING STANDARD

Create an Exchange Workspace

- Using Common Exchange Data Model with standard
- Enabling parallel imports and parallel exports from Renault NewPDM
- Keeping track of all exchange (target, format, already sent data, …)
- Allowing easy management of exchange (delta mode, force mode, …)
- Checking incoming data against existing data in BOM and PDM system
- Enabling manual action on incoming data (error recovery)
CONCLUSION

Going to a Smart, fully Configurable Digital Mockup, created Breakthrough for Vehicle engineering.

Now Renault is on the way to adapt all downstream applications to this new capability, keeping digital continuity.

Alliance and strong partnership makes mandatory to exchange fast and reliably

This will be achieved using Standard in all our exchanges.
Using PLCS in practice – French Ministry of Defence

A standards based solution for the French Ministry of Defence to share Land Systems product data with manufacturers

PENCIL : Plateforme D'Exchange Normalisée et Centralisée d'Information Logistique

LECLERC

VBCI

CAESAR

PPT

VHM
Généralisation de PENCIL & intégration dans SIM@T

MINISTÈRE DE LA DÉFENSE

SIMMT - DTE Focal point | PDT Europe 2014 - 15 October 2014 | Slide N° 18 / 32
### DEX SIMMT, messages and associated workflow

<table>
<thead>
<tr>
<th>N°</th>
<th>Title</th>
<th>Message</th>
<th>OEM</th>
<th>SIMMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ProductConfigurationDelivery</td>
<td>Composed by 5 messages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>InServiceProductStructureUpdate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>ProductLifeRecordUpdate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>SparePartOrder</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>TechnicalEvent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>MissionStock</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. ProductConfigurationDelivery
2. InServiceProductStructureUpdate
3. ProductLifeRecordUpdate
4. SparePartOrder
5. TechnicalEvent
6. MissionStock

- DEX
- OEM
- SIMMT
Benefits of PENCIL

- **On data to be exchanged**
  - Today
    - No global vision of exchanged data
    - Differences between visions (manufacturers / Administration)
  - PLCS:
    - forces to define in a clarified way all exchanged data
    - offers a generic and precise frame for data identification
    - quickly allows to identify the missing data and to converge on a common definition for all the actors

- **On contracts**
  - Nowadays, every contract is specific
  - PLCS allows to manage programs uniformly:
    - by using generic business processes
    - by handling contracts specificities
Collaboration needs more than a rich data model
Volvo – As presented PDT Europe 2016

Handling Complexity of Product Data Across Companies

Volvo Cars - Irene Gustavsson
## External cooperation – historical view

<table>
<thead>
<tr>
<th>Year</th>
<th>Owner</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1927</td>
<td>Owner: Volvo AB</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td><strong>Owner:</strong> Ford Motor Company</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td><strong>Owner:</strong> Zhejiang Geely Holding Group, Daqing and Jiading Province</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>VDL Nedcar</td>
<td></td>
</tr>
<tr>
<td>2001–2008</td>
<td><strong>C1</strong> Common prod dev; Common plant</td>
<td></td>
</tr>
<tr>
<td>2004–2008</td>
<td><strong>EUCD</strong> Common prod dev, Common plant</td>
<td></td>
</tr>
<tr>
<td>2013–2015</td>
<td><strong>CMA</strong> CEVT Common prod dev, Common plant</td>
<td></td>
</tr>
<tr>
<td><strong>Future – Need for flexibility</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>o More connections within Geely and its subsidiaries.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o Complex outsourcing of larger assignments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o Technology sharing with other OEM:s and system suppliers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o Time to market - new joint ventures must be given a quick start-up based on relevant product data.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o Maintain flexibility, decommission of Ford dependencies was a huge IT-project.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Technical principles

- **One interface** to Volvo Cars system means that step 1 in any new collaboration is done.

- The cloud service can handle the **flexibility** needed in terms of capacity in line with projects.

- The cloud service (or separate installation outside the firewall) creates a **safe area for data sharing** as there are no risk for partners accidently being able to access other Volvo Cars internal resources.
Summary

• Experience has proved the importance of integration at an early stage in larger project.
• Integration should not be built into the internal structure, it takes away flexibility.
• A large portion of collaborative data is important here and now. Long term only a limited part of that data will need to be saved.
• Building brick by brick from the ground is proven to be the best foundation.
Siemens Collaboration with Suppliers and Customers
External collaboration

Product related information

SIEMENS

share space

EXTERNAL PARTNER

Product related information
Overall Current State Process

Information via documents in Mail
Change process via Mail
Information stored in several site/project DBs
Future Process Jaco

Information published in the HUB
Change process logged by the HUB
Common Information stored in the HUB
Levels of Information – a path way to support and follow

Share Information

Functionality
- System-hub-system integration that enables suppliers to develop and own information

Main Benefits
- Lean information handling of development
- Lean information handling of spare part info
- Functionality can be reused for customer integrations

Share BOM

Functionality
- System-hub-system integration that enables OEM to publish info

Main Benefits
- Lean information handling for suppliers
- Detailed item and component info
- Change control on detailed level
- Spare part info will be available

Share Documents

Functionality
- Web portal that enables suppliers to retrieve and upload docs

Main Benefits
- Easy to introduce a new supplier
- Single point for supplier information management
- Change control and transparency

Share Files

Functionality
- Web portal that enables users to retrieve and upload files

Main Benefits
- Easy to introduce a new supplier
- Single point for supplier information management
Eurostep’s current largest project – for

WHAT IS ANDA?

AN IT SYSTEM FOR ASSET AND TRANSPORT NETWORK DATA FOR THE SWEDISH ROAD AND RAILROADS

PARTLY REPLACES OLD SYSTEMS AND ADDS ADDITIONAL FUNCTIONALITY FOR MORE EFFICIENT INFORMATION HANDLING

ENABLES NEW PLANNING, MAINTENANCE AND TRAFFIC CONTROL PROCESSES
THE GOAL OF ANDA IS TO IMPROVE DATA QUALITY, INFORMATION HANDLING AND INFORMATION MANAGEMENT ACROSS THE ORGANIZATION

CURRENT SITUATION

- Lack of control in regards to asset- and reference network data
- Unclear roles and responsibilities regarding the handling of asset- and reference network data
- Lack of joint structure and standardized naming convention
- Silo systems solutions resulting in a silo oriented organization

VISION & GOAL

DATA AS A KNOWN AND COMMON RESOURCE FOR THE ENTIRE ORGANIZATION

BENEFITS OF ANDA

- Immediate access to high quality information
- Improved information management and way of working
- Understanding of the past, present and future
- Unified and efficient data handling
Logical Architecture

GLOBAL VIEW OF THE SYSTEM

Legend
- Scope of ANDA

- Reference Metadata

- Virtual Asset Register
  - ANDA Asset Register
  - Existing Asset Register

- Network And Net Properties

- Maintenance Asset Register
  - Maintenance Network And Net Properties

- ANDA Information Hub
  - Service 1
  - Service 2
  - Service 3
  - ... Service n

- Consolidated Data
  - Geodatabase + Network Model

- System Planning
- System Construction Projects
- System Asset Management
- System Use
- System Traffic Control/Info
- System External

- Data Warehouse
- API Service
Sharing data across AEC projects

- EGIS is an international Engineering & Facilities Management company
- 1Billion € Turnover – 13K employees
Challenges to manage large infrastructure projects

• The infrastructure is designed and built in parallel with several other distinct projects – which depend from different builders and customers.
• These projects interfere each other and may conflict – necessitating to adapt designs, to postpone tasks, … and may generate delays, extra costs and even legal action.
• The challenge is to detect these conflicting projects as soon as possible, to assess the potential impact, to identify action to fix the conflicts, and to monitor the actions up to end of each action.

The solution developed by Eurostep is to support the collaboration process between all the stakeholders to agree on the issues, to fix an action plan, to share all the data and documents needed to fulfill tasks and to monitor process till the closure.
What is the Digital Thread

- Digital thread is a communication framework that connects traditionally siloed elements in manufacturing processes and provides an integrated view of an asset throughout the manufacturing lifecycle.
  [http://searchmanufacturingerp.techtarget.com/definition/digital-thread]

- The digital thread refers to the communication framework that allows a connected data flow and integrated view of the asset’s data throughout its lifecycle across traditionally siloed functional perspectives.
The Key Business Problem:
How to keep the information needed to operate and maintain a product aligned with the changing product over its life cycle?

ISO 10303-239

Product

Product Definition
Information

Maintenance
Schedules

Support
Facilities

Storage
Requirements

Test
Equipment

Tools

Transportation

Consumables

Software

Spares

Training
PLCS Objective – Digital thread through the life cycle

The Key Business Problem:
How to keep the information needed to operate and manufacture and simulate a product aligned with the changing product over its life cycle?

Product Definition Information
including models for MB(S)E

ISO 10303-239

Feedback
Needed for a Digital Thread

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- Distinguish between designs and actuals (individuals).
- Different BOM views (such as as-designed, as-manufactured and as-maintained) of a product, including the actuals, and link/trace between them.
- Different breakdown views (such as physical and functional breakdowns) of a product and link between them and to different BOM views.
- Different properties and record their values over time or against different views.
- Requirements, their allocation, tracing, Verification and Validation.
- Recording of processes and other actions applied to the product (or done by the product).
- Handling subsidiary products such as tools and equipment and their use and properties.
- Associated documents and other information, such as CAD and simulation models, related to the product and any subsidiary products.
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A Dog is for Life, not just for Christmas

In 1987 the Dogs Trust, a UK Charity, came up with the slogan: A dog is for life, not just for Christmas. It has been very successful...
Success breeds Imitation
Who am I to break the trend…

A Digital Thread is for Life, not just for Manufacturing

Aircraft data is for Life + 10, not just for Life
And yes… you’re gonna have to use standards!
Contact

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  • nigel.shaw@eurostep.com