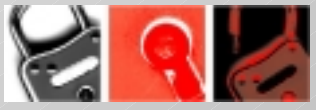
Implementing the STEP PDM Schema

PDMConnect



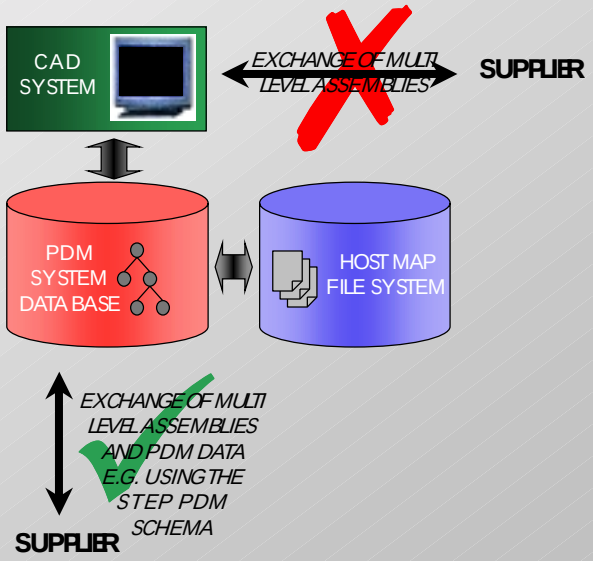
Dr.-Ing. Anna Wasmer
PDTec GmbH
D-76131 Karlsruhe, Germany
Fon: +49-721-9658-675
Fax: +49-721-9658-263
E-Mail: wasmer@pdtec.de
Web: www.pdtec.de

PDTec.
Enabling Product Data Technology

NASA STEP Workshop, Pasadena, CA, January 16/19, 2001

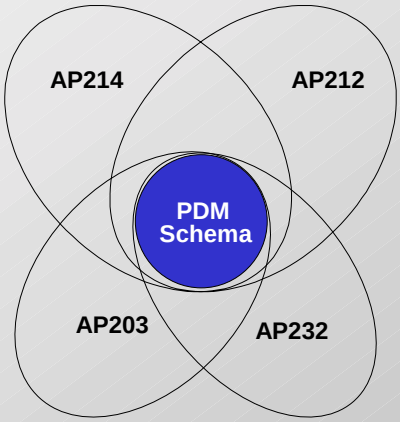
PDTec.

Exchange of PDM and Structure Data using STEP – Example Scenario



www.pdtec.de

The STEP PDM Schema



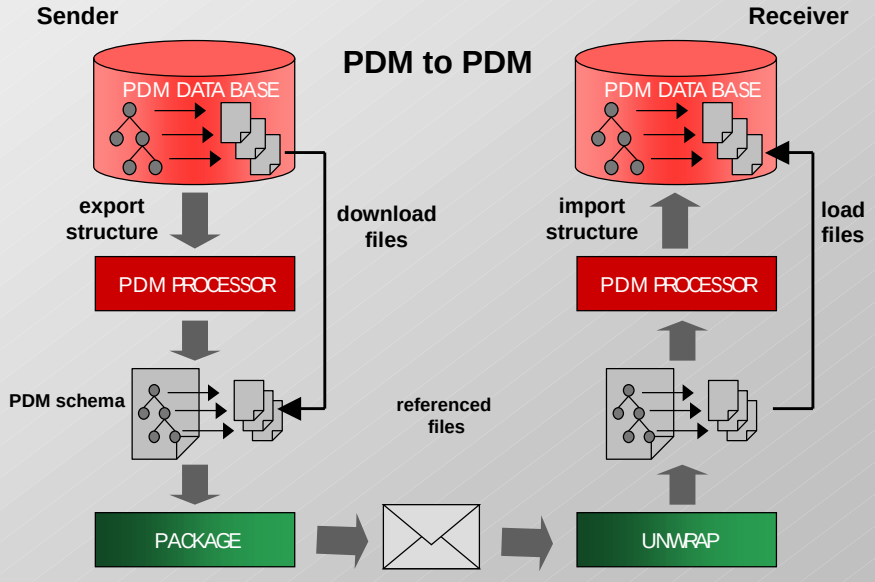
- Common PDM data schema generated and maintained by PDES, Inc., ProSTEP, and JSTEP
- Subset of PDM relevant STEP AP's (AP203, AP212, AP214, AP232)
- Fulfills main requirements for PDM data exchange
  - Main functionality for parts and documents include
    - identification and versioning
    - structures incl. transformations
    - approvals and authorization
    - project, work order, work request
    - effectivities
    - classification and properties
- Test implementations via demos, pilots, and roundtables

Source: PDM schema usage guide@www.pdm-if.org

PDM schema - Units of Functionality

- Part Identification,
- Part Classification,
- Part Properties,
- Part Structure and Relationships
- Document Identification,
- Document Classification,
- External Files,
- Relationships Between Documents and Constituent Files
- Document and File Properties,
- Document and File Association to Product Data,
- Document and File Relationships,
- Alias Identification,
- Authorization,
- Configuration and Effectivity Information,
- Work Management Data.

Exchange of PDM and Structure Data using the STEP PDM Schema



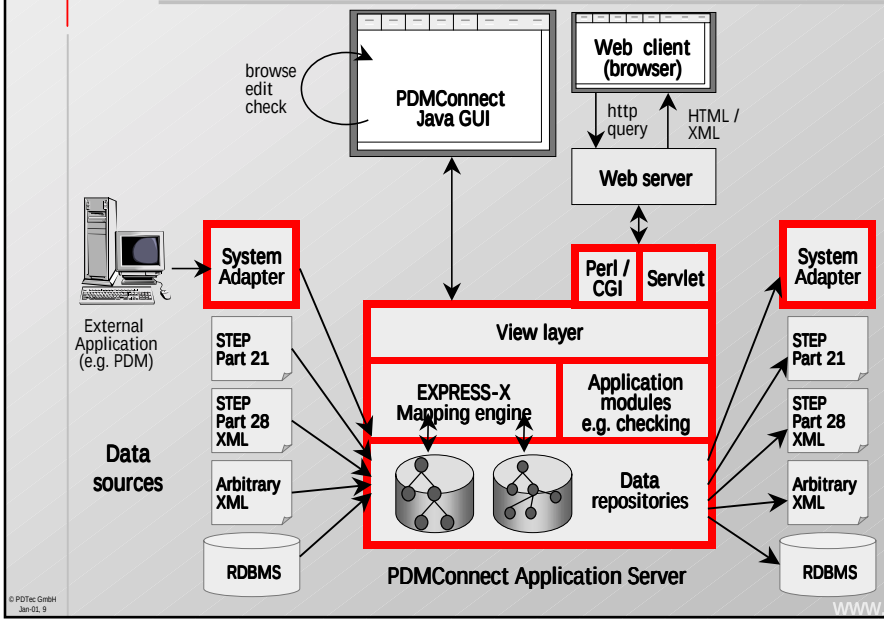
Challenges

- **PDM systems are usually customized**
  - Customer specific data model
  - Customer specific scope and constraints
    - structural requirements
    - attribute value domains
  - Customer specific business practices and processes
  - Continuous evolution and change
- **Continuous evolution and change of implementations and surrounding IT-environments**
  - Integration with packaging tool for data exchange
  - Migration to web-based technology
- **Data management issues**
  - Danger of checking 'trash data' into system
  - No possibility to check what happens during the mapping/ check-in process
  - Data may get lost or be invalid

PDMConnect

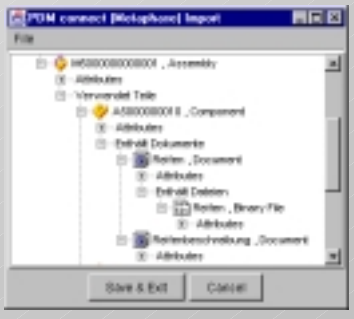
- Flexible framework for PDM-related communication
- Communication platform to integrate development partners, OEMs and suppliers
- Easily customizable due to flexible combination of modules and underlying mapping technology
- System specific PDM- and ERP-Adapters
- Database adapter for direct access to objects in relational databases
- Current standards and implementation technologies
  - XML
  - STEP
  - Java

PDMConnect Components



PDMConnect Java GUI

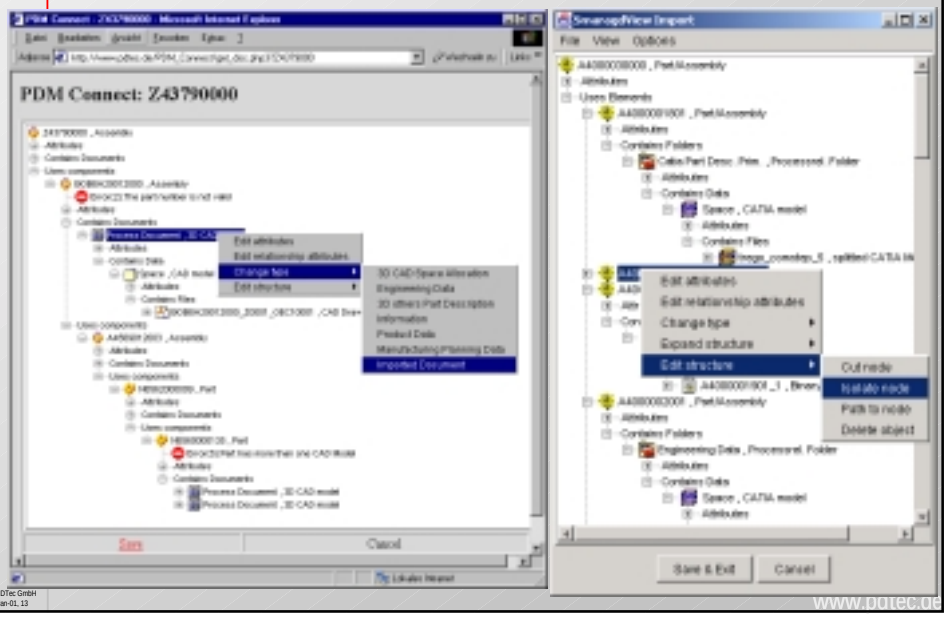
- **Visualization of Data**
  - Configurable tree views on data
  - Different tree views on same data set
  - PDM like presentation format
- **Editing Data**
  - Attribute Value Changes
  - Structural Changes
- **Customizable**
  - Configuration files
  - API of application server/Mapping Engine
- **Standalone or web-browser**
  - Alternative use of JNI or RMI for communication with application server



PDMConnect Java GUI - Editing Data

- **Editing of Node and Relation Attributes**
- **Various Configuration Options**
  - Selection of Attributes
  - Object and Attribute Names
  - Read-Only Attributes
  - Attribute Values
  - Language
- **Structural Editing**
  - Cut Node
  - Delete Node
  - Isolate Node
  - Path to Node
  - Merge objects (e.g. folders) and their contents

Customizable Java GUI - Examples



PDM Connect Application Server

- Implementation of all methods available in the Java GUI
- EXPRESS-X mapping engine to execute mapping between PDM data structures
- Additional methods, e.g.
  - Adapt attribute values, change types and structures
  - Check and edit data to be exported
    - » Adapt to specific restrictions applying at receiver side
  - Built-in check-functions specific for particular PDM installation
    - » Restrictions on data structures and formats
    - » Restrictions on attribute values
  - Analysis mode to simulate data import
- Automatically generated from the ECCO development environment
- Can be linked to other applications through API (Java, C, C++, Tcl, Perl, ..)

PDM Connect Mapping Engine

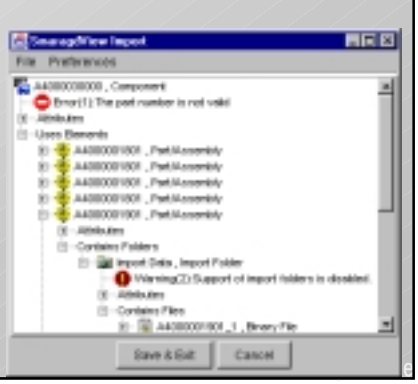
- **Based on latest version (CD) of the EXPRESS-X mapping language**
  - Declarative approach
    - » Readability
    - » Same level of abstraction as mapped data models
    - » Independence of execution order
  - Procedural extensions allow easy integration of additional methods
  - Multiple source and target schemata
- **Easy development and customization**
- **Support of different mapping „variations“ and target data models**
  - Dynamic loading of mapping libraries
  - Dynamically loading of configuration files

PDM Connect – Handling of Data Model Constraints

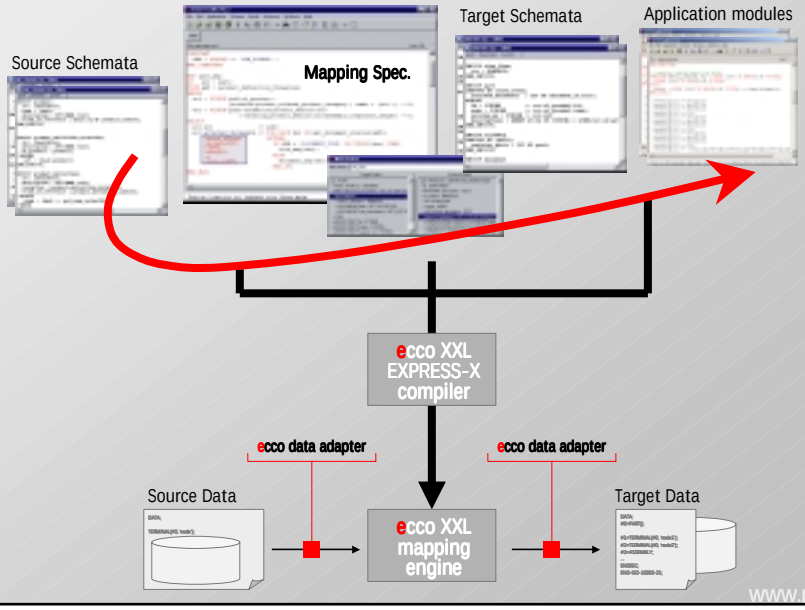
- **A (customized) PDM system data model usually defines specific constraints**
  - Constraints on attribute values, e.g. context dependent part numbers
  - Structural constraints, e.g. max. depth of document structure
  - Lifecycles and approval processes
- **Strategies how to deal with constraints**
  - Mapping engine creates only target data which are conformant with PDM system constraints
    - danger of loss or misinterpretation of data
  - Mapping engine creates target data which might violate PDM system constraints
    + loss/misinterpretation of data can be avoided in many cases
    + problem is displayed in user interface
    + user can fix the problem

PDMConnect – Checking Modules

- Automatic or interactive checking of data according to PDM system constraints
- Problems are displayed as errors or warnings
- Errors are displayed when the check-in process will fail due to system constrains violations
  - Data cannot be saved until all errors are fixed
- Warnings are displayed
  - if data will get lost during the check-in process
  - if „strange“ data has been detected



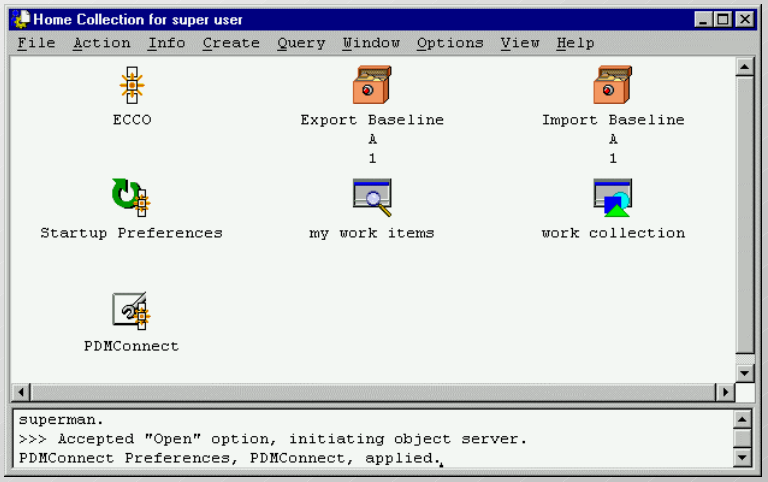
Application Server Generation using ECCO XXL



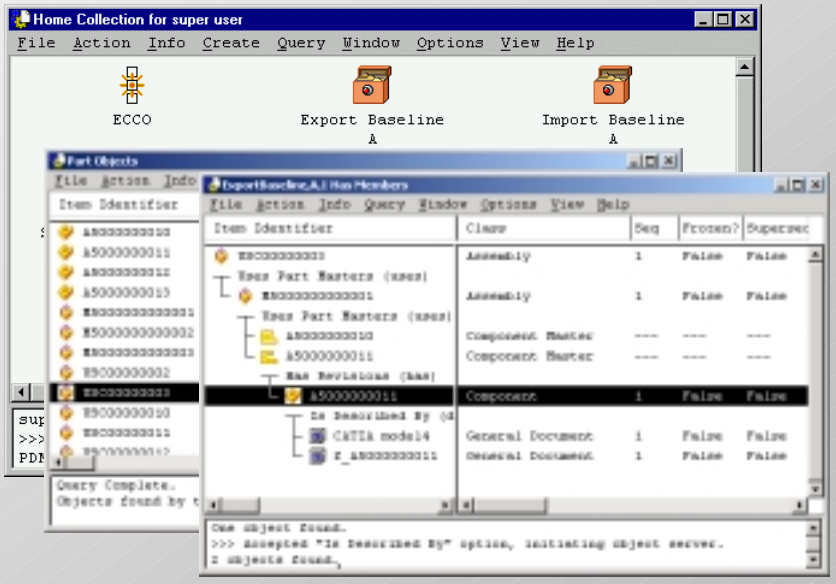
PDMConnect System Adapters

- **Adaptable to support**
  - Specific data and structure requirements / restrictions
  - Specific coding of attribute values
  - Specific system environment, e.g. Network, Client-Server
  - Specific functionality of user interface
- **Automatic generation of customized PDM data model**
- **EXPRESS-X mappings to/from standard data models**
- **Ability to use and support different exchange scenarios**
  - Support of different business practices
  - Flexibility to perform certain actions on import and export (e.g. check-in/-out, replace, add, etc.) depending on specific user settings
- **Easy integration with packaging tool or web based mechanism for external file transfer**

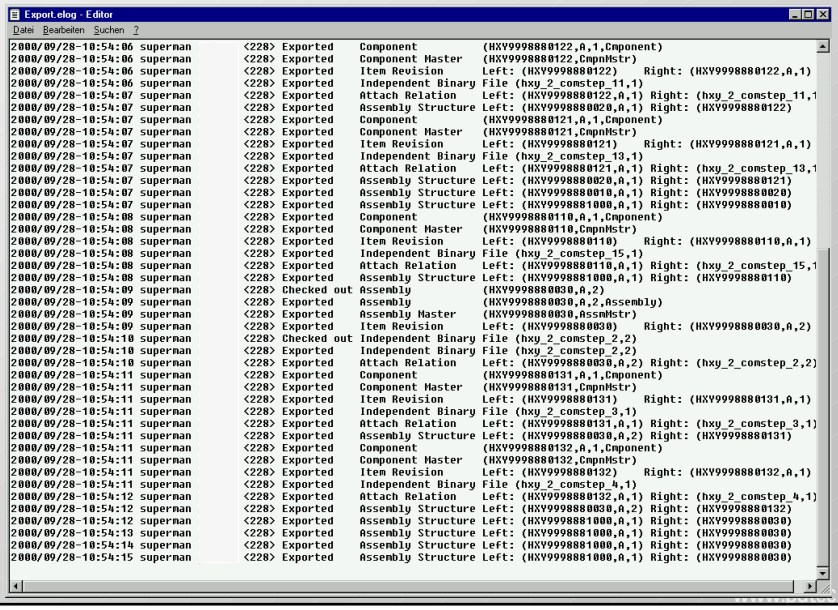
Example for a PDMConnect System Adapter (1)



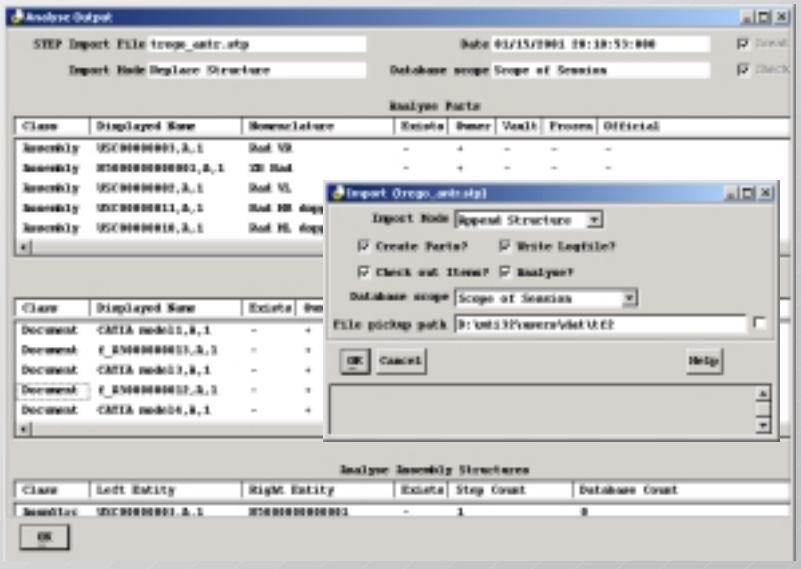
Example for a PDMConnect System Adapter (2)



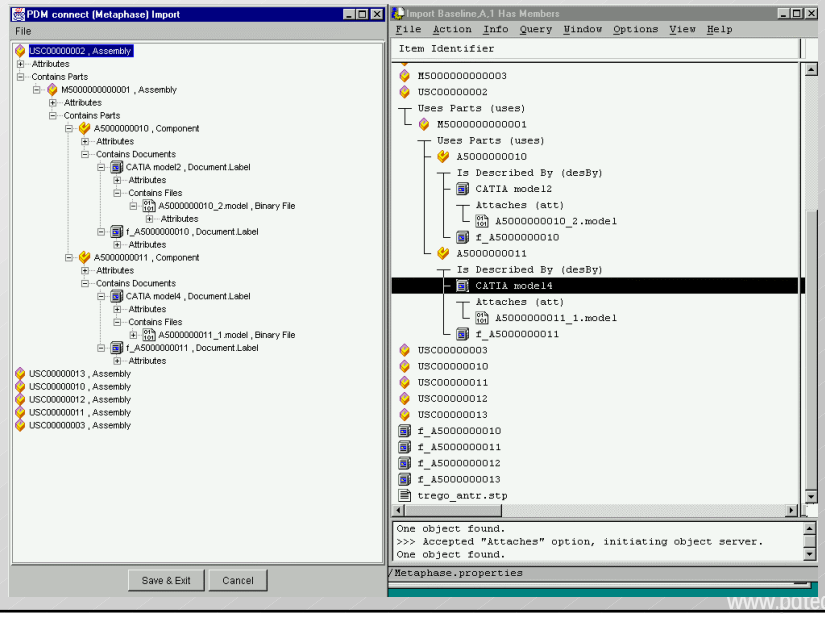
Example for a PDMConnect System Adapter (3)



Example for a PDMConnect System Adapter (4)



Example for a PDMConnect System Adapter (5)



Conclusions

- **PDM Connect is a framework to connect arbitrary data sources**
- **Components are highly configurable and customizable**
  - By external configuration files
  - EXPRESS-X mapping configuration
  - New methods on the data (e.g. checking, structural editing) can be easily added
- **The PDM Connect user interface is a powerful tool to**
  - Control data exchange
  - Select data
  - Detect and correct invalid data