WHITE PAPER

Heterogeneous PLM Framework

An Innovation in PLM Data Sharing Across Enterprise

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Abstract

Intense competition in the current market scenario has made it necessary for NPD cycles to become shorter in order to shorten the time to market with low production costs. Globalization has opened the doors for OEMs to spread their R&D and supply chains to low cost regions, and encouraged acquisitions of companies in order to achieve quick inorganic growth and competencies which were lacking earlier.

This scenario has given rise to multiple issues for manufacturing industries. Acquisitions & Mergers (A&M) along with globally distributed vendors has added to heterogeneous PLM and CAD environments. This heterogeneous environment makes it virtually impossible for OEMs to share data. Industries then have to rely on concurrent engineering for faster decision making, even though collaborating and sharing correct information is a complex and costly affair.

This paper attempts to provide a solution to tackle the above issues using a low cost solution in the form of a reusable framework for migrating / sharing data between multiple PLM / Enterprise systems. This comes with a data viewer to visualize product data without any additional license and infrastructure cost. This framework concept also allows an enterprise to search for an item in multiple PLM/ Enterprise Systems. This solution can be effectively used to concurrently share data between multiple departments within a company, allowing increased usage of the PLM systems. It also provides similar data sharing opportunity with external suppliers and vendors without any additional cost.

Challenges in PLM Data Migrations & Sharing

The PLM data migrations between different PLM systems are often complex and time consuming jobs, with very unique, industry specific challenges. But we have identified some common issues which are listed below:

Schema Mapping: Mapping of schema between the source system and the target system is a challenging task, since the data model for any two PLM applications is not same.

Data Size: Data size plays a key role in data migration, and is a determining factor for deciding the time to migrate the data, as well as the effort for data cleansing.

Data Collision: Data duplicates between the source system and target system need to be identified and eliminated, since data being migrated from the source system may collide with the data in the target system.

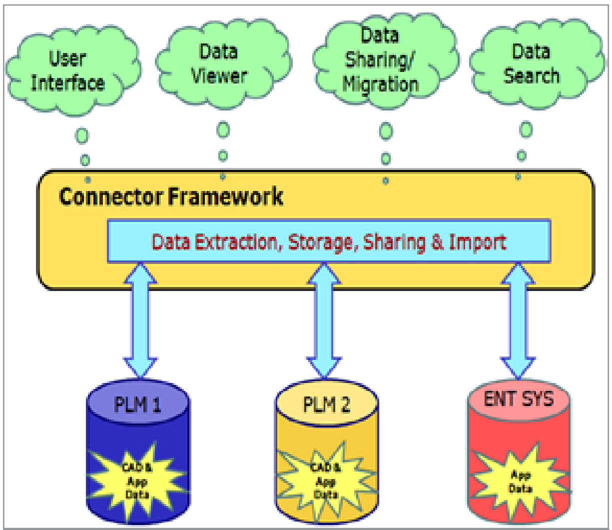
Data Cleaning: Data cleansing helps eliminate irrelevant, incomplete and duplicate data before migration to the target system. But it can be a challenging task depending on the size of data to be migrated.

Adopters: Commercially available adopters cannot work as a Plug and Play components. They need to be modified and customized as per the source and target business schemas.

Need for an Integrated Framework

- Global OEMs whose design, manufacturing and supply chain divisions spread across different geographical locations, have difficulties in implementing a single PLM and Engineering system.
- Acquisitions and mergers of various business units have multiple PLM systems for product data management, making it difficult for OEMs to have data migrated to a single platform.
- It helps avoid data redundancy and complex data management.
- It can reduce the number of users who can access the PLM System. Light weight PDM data can be shared on a common SharePoint portal for such users and vendors, saving license costs to the company.
- It allows seamless data flow across the different verticals, enabling smooth business operations.
- Data redundancy or data duplication can be avoided, making data maintenance very easy.
- Users can access any system related to the other verticals through a common framework. Thus data is available at the right time to the users and customer, increasing the usage of PLM systems beyond engineering.
- It is very easy to deploy and configure the framework, reducing application maintenance time for complex applications.

Solution



The Concept

Key Features of the Integrated Framework

The key features of the integrated framework are as follows:

1) Data extraction, storage and import from one PLM/Enterprise System to the other
2) Data Viewer functionality to view or extract neutral file data as well as metadata
3) Data sharing / Migration from one system to the other
4) All operations done through a user friendly UI
5) Item search facility to search data in multiple systems

The data migration or sharing solution has two components to it. The first and the key component is the integrated connector framework. The second component is the systematic methodology of data migration using a three phased approach - planning, design, and implementation.

Key components of the Integrated Connector framework

Client / User Interface

This component provides the presentation layer to the user where he provides his input. The UI also exposes the mapping files which ease addition/modification of configuration for new/ existing PLM system.

Application Server

This component hosts the web application and uses RMI / SOA to orchestrate requests between multiple PLM systems.
This component receives the user input and invokes respective data transfer module for data transfer between multiple PLM systems.

PLM Scripts

PLM scripts export/extract, format and import the data between multiple systems based on the Server requests. The extracted data is usually stored in a staging directory then cleaned up once data exchange is completed. The PLM scripts are usually written in the native language and are specific to each PLM or Legacy system.

Mapping Files

Mapping files provide the schema mapping details between two systems. PLM Scripts use this file to map the data to target system while importing data from another source system.

Web Server

The Web server (usually Tomcat, Weblogic or WebSphere) accepts requests from the client (web browser), routes the request to the application server, and returns the response from the application server to the client. This communication with web server is done through http / https.

Orchestration

Orchestration is made either through SOAP or Java RMI component for SOA or RMI respectively.

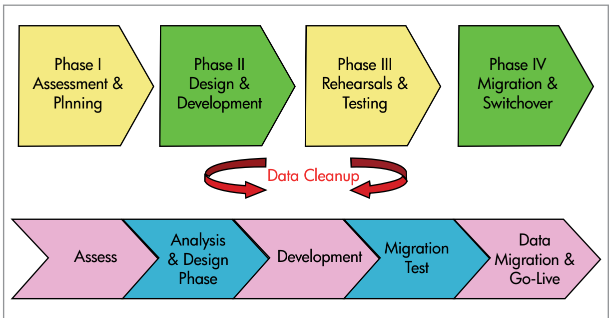
Data Viewer

Data view application provides the facility to view the details of the Parts and Bill of material. It also helps visualize/save the neutral files attached to the parts using a viewer.

Solution Methodology

Solution Methodology is critical for the success of any data migration. This frame work is derived from some of the POCs and utilities that we build. The lessons learnt and the experience we gained over multiple migration projects have helped create the best practices and these in turn define a Migration methodology / framework . It has multiple phases:

- Assesses & Plan
- Design & Build
- Rehearsal
- Switchover



The Concept

Assessment & Plan

- Initial assessment
- Requirement capture
- Understand the as-is environment
- Determine the to-be environment
- Conduct workshops
- Migration scope definition
- Create detail migration requirement document
- Efforts estimation
- Project scope and strategy
- Project plan

Design & Development
- Identify all issues requiring manual attention
- Identify the areas of automation
- Determine the schema mapping between PLM applications
- Iterative process of metadata export, Evaluation of data, manual clean up
- Evaluate/qualify all input data for migration
- Evaluate metadata processing requests (Attribute mapping, naming conventions, merge of databases)
- Design
- Test, and iteratively execute scripts/programs/valuators

Rehearsals & Testing
- Multiple migration rehearsals
- Writing automation scripts/programs
- Iteratively evaluate migration process
- Create the implementation methodology document
- Create issue log and lesson learnt document

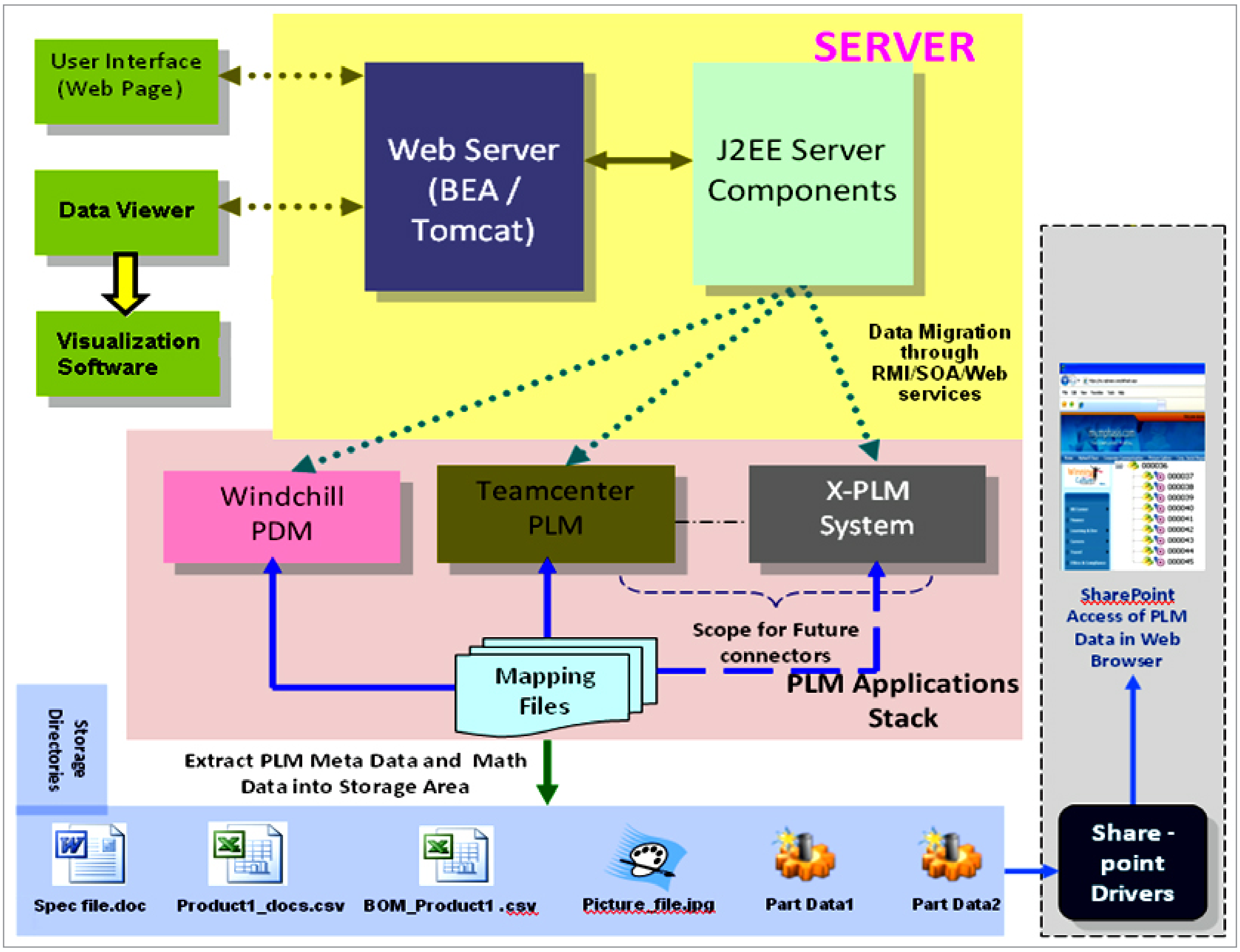
Migration & Switchover
- Production cut-over schedule
- Production migration
- Issue resolution if any last minute issues
- User acceptance testing
- Go-live
- Final sign off

Framework Implementation & Configuration
- All the components of the frame work are loosely coupled and key parameters are schema mapping files and the PLM scripts and GUI. These mapping files are simple ACII or xml files.
- Since the architecture of the framework is web based, the software developed using this framework can be deployed and accessed globally.
- The framework provides a mechanism for migration of BOM data with its dependencies as well as metadata and math data (Physical files). The physical files are moved to a secure staging location before moving to another PLM system.
- The framework is capable of performing single as well as batch migrations.
- Log files are generated for every operation with time stamps, allowing easier analysis and troubleshooting of migration issues.
- Error logs are generated for every failed operation to ensure errors fixing.

Architecture

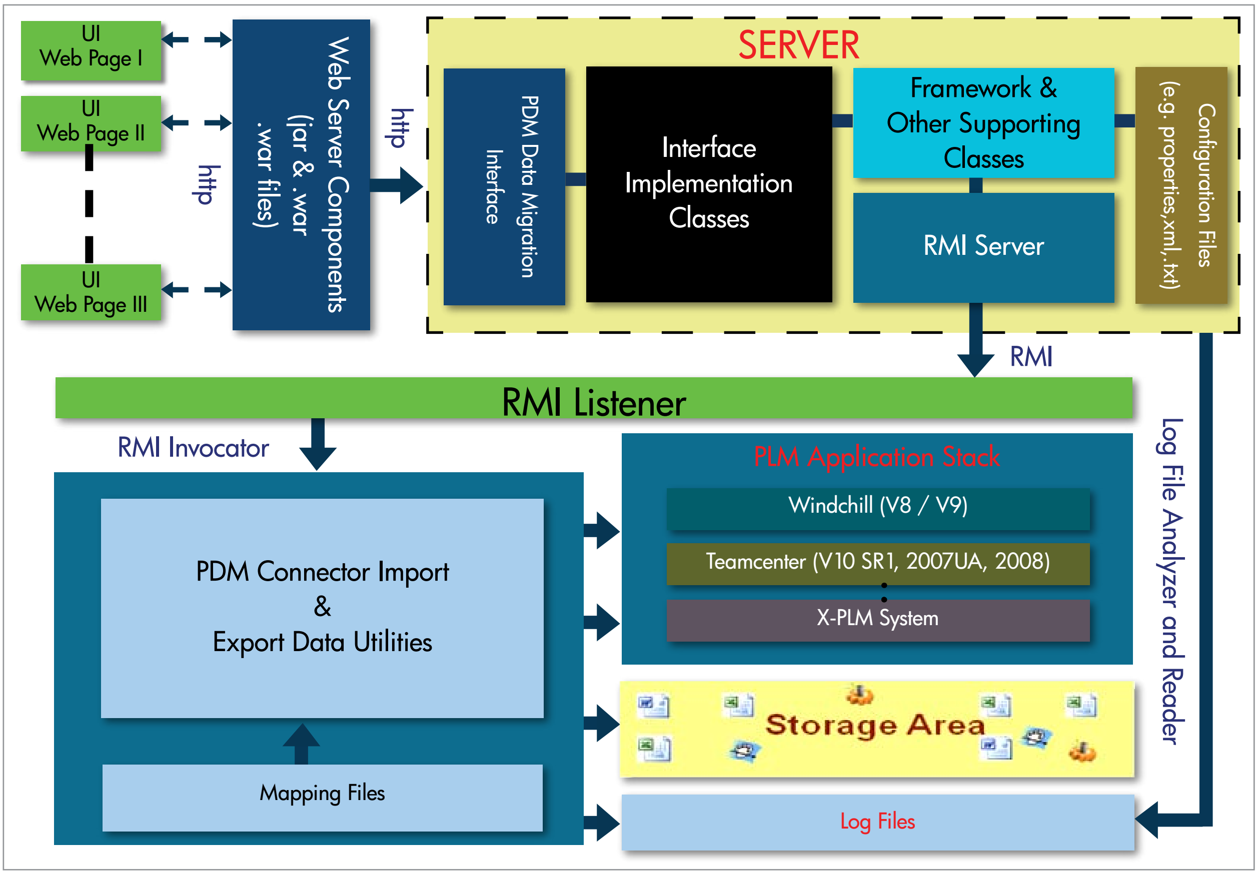
Overall Design

An overview of design is shown below; all the functionalities that are implemented follow the same or similar components.



Detailed Server Design

All the components are loose coupled and their communication channel is depicted below.



User Interface Design

- This framework has a Graphical User interface (GUI) through which the user can provide inputs to functionalities. This GUI layer is a separate component and it can be modified as per change in the server components. Typical screen shots of the UI are shown below.
- The left frame displays the actions that can be performed in the PDM Connectors Migration.
- The actions corresponding screen will be displayed in the right frame.
- A similar frame structure will be followed for the remaining screens.

Benefits

- The evolution of newer systems and phase-out of legacy/ proprietary PLM systems across different business units helps reduce the cost of building a new homogeneous system.
- The concept of a Heterogeneous framework is to reuse the existing tools / utilities by creating wrappers that can plug in to the application.
- Heterogeneous PLM frameworks are very user friendly and the end user does not require specific PLM e software or process for developing the application.
- This framework serves multiple purposes, that of data migration, data sharing and data viewing between multiple PLM / Enterprise systems. It allows enterprises to continue using heterogeneous systems and yet get the benefits of data availability at all the times.
- This framework can also be used to view the metadata / neutral files from any PLM/Enterprise system without any additional user licensing cost.
- Enterprise item search enables users to get information about any part from any PLM / Enterprise system without having to know which system the part resides in.

Conclusion

The Heterogeneous PLM framework can help overcome the hurdles of data migration/sharing and data viewing in enterprise. The product data that is residing in PLM systems is not often used by non-engineering departments. This kind of framework will help increase the reach of the product data in an organization. They will help the IT departments to strategize the PLM and downstream applications to consolidate and phase out effectively. There are multiple tools available for supplier collaboration and sharing, but in SMB segment the investment on these tools and their integration with OEMs is a burden to the suppliers. Under this situation, this kind of framework will help the OEMs to share necessary product data Without any additional cost.

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