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Improving product and software development by integrating ALM and PLM

In today's complex development environments, organizations find themselves facing an uphill battle trying to successfully orchestrate their disparate teams. The clear demarcation of the boundary between product development and software development is blurring fast as software increasingly becomes a major component of products. Should companies be integrating the management of their product and software development? Is there a business benefit in doing so? The answer is a resounding "Yes," for reasons discussed in this publication.

Integrating product and software development is not an easy hill to climb, but companies need to begin climbing if they haven't already. This paper discusses concrete tips gleaned from actual experiences of many Global 1000 customers who are already on the on their way to the top.

A white paper issued by: Siemens PLM Software

Contents

The mountain road and the motivation

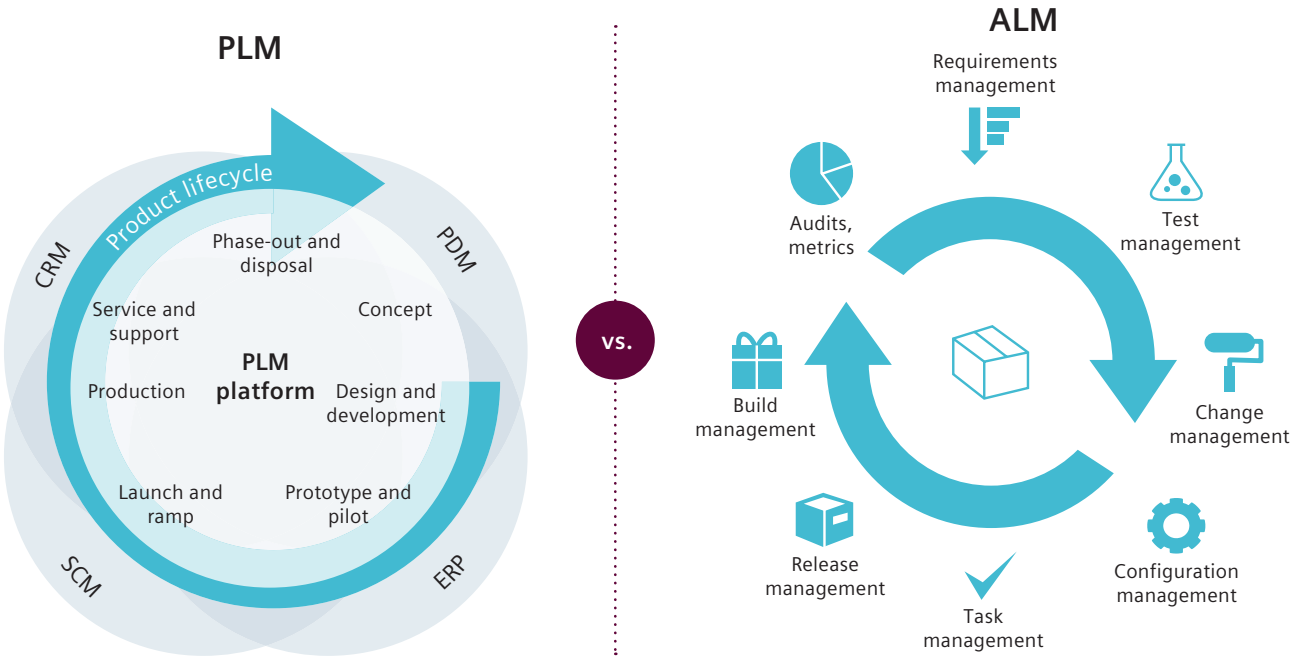
A mountain trek is a good analogy for application lifecycle management (ALM) and product lifecycle management (PLM) integration. At the summit, product and software development teams are working hand-in-hand, innovating, communicating, all on the same wavelength, with goals and objectives clearly delineated and transparent to all involved. The view from the summit is clear: your company is delivering what your customers want with efficiency and quality levels that leave your competitors behind. But as with all mountains worth climbing, the road to the summit isn't easy. There are difficult landscapes to contend with as you start for the top.

The current landscape is characterized by chasms

Almost everywhere today, the landscape is one of division. Product development teams manage hardware requirements, design, testing and production using a product lifecycle management platform. Software development teams manage software requirements, design, testing, building and deployment using an application lifecycle management platform... if they are lucky. Often as not, ALM is a cobbled-together amalgamation of office documents and point solutions that can't manage and trace artifacts and information such as requirements and test cases across functional boundaries.

Typically, product development (PD) hands software development (SD) some requirements as an office document (because SD doesn't use the PD platform). At some point SD hands PD back a software component. This is fine as long as everything works, and nothing has changed on the PD side. But in today's complex development environments it is no longer a safe way to travel. Making matters worse, as soon as there is a failure (hopefully occurring during testing and not with customers), it is extremely difficult to trace a failure caused by software back to (for example) a design requirement. When the environment is one in which functional safety and governmental regulation add to the complexity, and this kind of trace-back has to be documented, things get very complicated and difficult, very quickly.

The chasm dividing ALM and PLM is a recipe for delays to market, increased costs and reduced competitiveness. It is also a main reason for mounting recall efforts across industries. It is evident that there are real business benefits to integrating ALM and PLM.



The chasm dividing PLM and ALM.

Business benefits of ALM-PLM integration

Today the clear demarcation of the boundary between product development and software development is blurring fast as software increasingly becomes a major component of products. Companies urgently need to integrate the management of their product and software development efforts. One doesn't have to look very far to understand the potential business benefits once the trek up the mountainside is complete.

With a general understanding of why ALM-PLM integration is critical for the road ahead, we can dive in a bit deeper and explore the actual levels of integration.

Let's take a look at the main reasons for the integration, as outlined by Ovum Principal Analyst Michael Azoff:

Business benefits of ALM-PLM integration

- Visibility across all assets:
  - Improve search and locate information.
- Accurately link firmware with hardware:
  - Avoid errors, damage costs and reputation risk.
- Traceability of assets for engineers in all lifecycle phases:
  - Reduce time wasted.
  - Enable effective collaboration across globally distributed units.
- Support maintenance, repair, and operations (MRO):
  - Quickly locate parts and manage defect fixes.
  - Reduce inoperative time of broken products.

Azoff also outlines the top-level things to understand about the ALM-PLM Integration:

ALM-PLM Integration

- Manage software linked to the hardware that embeds it.
- Touch points:
  - Requirements management
  - Testing & QA management
  - Change management and version control
  - Release management
- Integration occurs at two fundamental levels:
  - Link and synchronize.
  - Live linking is challenging across a supply chain so data exchange is necessary.
  - Live linking is cheaper and easier to manage but needs a good process around it.

Five levels of ALM-PLM Integration

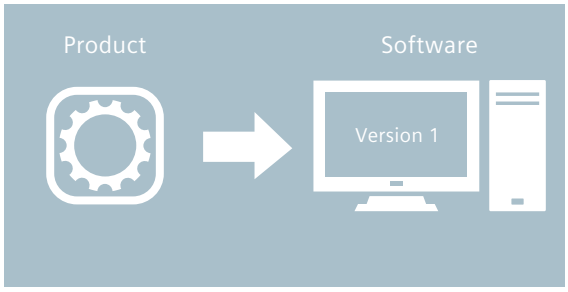
There are five main levels of ALM-PLM integration

1. Link and trace
2. Change and propagate
3. Act and communicate
4. Align and unify
5. Collaborate and report

Level 1: Link and trace

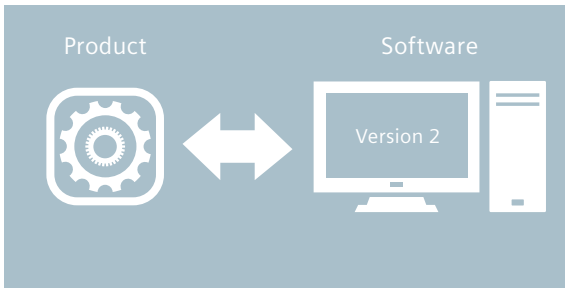
At this level companies can answer the basic question: "Where are my data assets?" The core mission of PLM is to provide a consistent and reliable environment to store and manage product data assets. Now, software assets must appear there as well by means of copies, or better, links to the ALM environment where software code is created, managed and stored. At the same time, PLM components must also be linked to software assets.

"Link" is the capability of creating a physical or logical relationship between ALM and PLM data assets. "Trace" is the ability to automatically navigate this relationship. It is important to mention that using the same part number in disparate ALM and PLM solutions and then searching for it in both environments does not constitute automated navigation of the logical link.



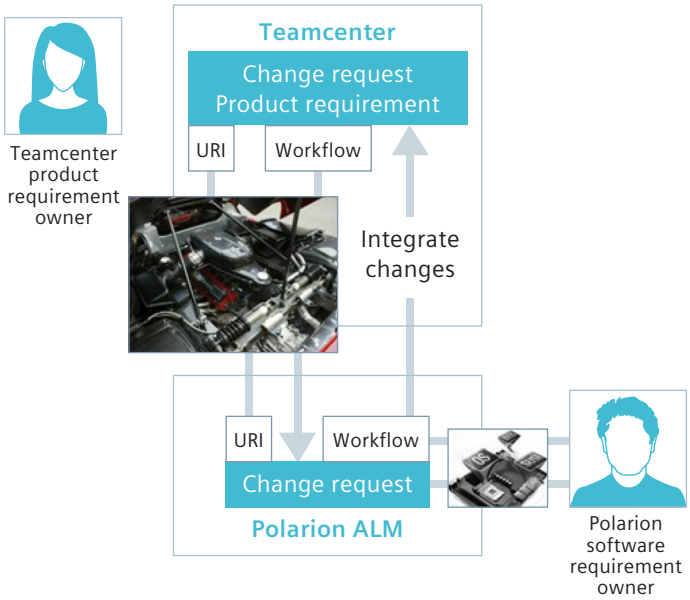
Level 2: Change and propagate

At this level companies manage the impact of changes. Changes happen and companies need to ensure that they are properly managed. Typical questions answered at this level are related to the ability to assess the downstream impact of any change in design on the development and production chain, and vice versa, as well as to determine the related hardware or software components involved in a product issue or failure.



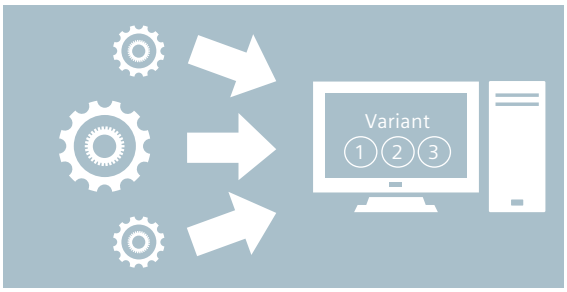
Level 3: Act and communicate

After data is available in both environments, connected and traceable, and change can be governed, companies must be able to orchestrate the different activities in product and software development. In other words, at this level companies achieve the integration of processes. Examples of this integration include task assignment, progress control and project management scenarios.



Level 4: Align and unify

Level 4 addresses the need of aligning product versions, configurations and variants to software versions, configurations and variants. In complex product development, a product is segmented into different versions. Each version can be produced as different variants or configurations allowed by all the possible combinations of options. Software concepts like releases, branches, baselines and parameters must be aligned to product-specific variants, configurations and versions. Such alignment of concepts allows the unification of hardware and software parts into unique configurations. The result is a single snapshot containing all the hardware and software data assets of each single item that is produced. This step also paves the way for the unification of the user experience. Good usability can be achieved by eliminating the need for users to switch from one tool to another. An example of the unification of the user experience (UX) at this level is the "delegated user interface." With a delegated UI, specific ALM panels will appear in the PLM toolset and vice versa, allowing, for example, editing of a software requirement directly in the PLM tool, or changing the status of a part without leaving the ALM interface.



Level 5: Collaborate and report

At this level, software and product engineers are able to collaborate (joining their skills in creating a solution); the toolset embeds the process knowledge; and process improvements happen by means of reconfiguring the tool instead of changing the habits of people. The alignment of concepts and the unification of the UX at this level are complete. Users access every software and product artifact through the same user interface.

Process improvements are driven by analytical dashboards that, besides providing status reports on projects, allow the identification of process bottlenecks, shortfalls, etc.

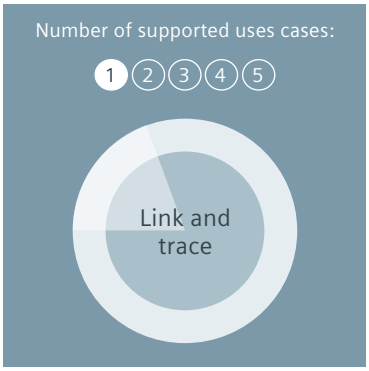
The next section drills down yet farther and explores the actual use cases involved in these levels. This will sort out the timid and the brave on the mountain climb, and provides a good foundation to begin analyzing and planning how the integration of ALM and PLM can happen in your organization.

Bravery: trekking through the ALM-PLM integration use cases

Closing the chasm and unifying ALM and PLM is difficult, but the payoff will richly repay the effort. Companies find it useful to consider their limitations as they explore the basics of use-case driven integration for each of the five levels.

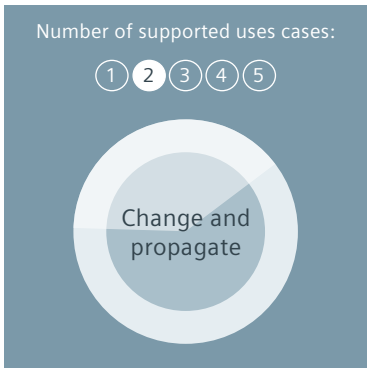
Level 1: Link and trace use cases

- Link a product test case to a software test case.
- Find all software test cases connected to a product test case.
- Link a product defect to a software defect.
- Find the product component(s) impacted by a software defect.



Level 2: Change and propagate use cases

- Change a product test case and propagate the change to the software test cases.
- Change a product requirement and propagate the change to the impacted software user stories.
- Fix a software bug and update the product Bill of Materials (BOM).

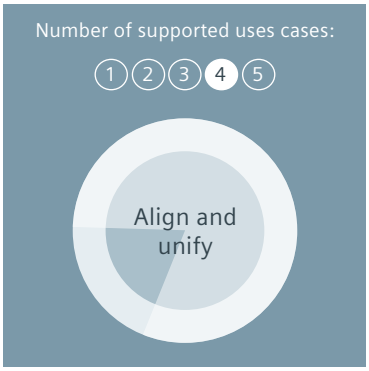


Level 3: Act and communicate use cases

- Change the status of a software change request into “analyze” when a product change request gets into the “evaluate” state.
- Automatically create a product defect when a software bug is discovered.
- Assign a test run task to a software tester when a new product test round begins.

Level 4: Align and unify use cases

- Find the software source code running on a specific product version or variant.
- Find the software variants that can be installed on a product.
- Navigate the full BOM (with product and software artifacts) in the context of a product configuration, without leaving the PLM environment.



Level 5: Collaborate and report use cases

- Define and monitor unified product and software key performance indicators (KPIs).
- Co-engineer a product.
- Implement and measure product and software process improvements.
- Software and hardware engineers are part of the same Scrum team.

What next?

Siemens PLM Software is working to bridge the ALM and PLM chasm. On the ALM side, many companies rely on the Polarion ALM solution. Polarion is engineered with an open architecture that facilitates exactly the kind of integration discussed in this paper. Software development teams gain unparalleled end-to-end efficiency and productivity, from software requirements, through implementation, building and testing, on into change management and deployment, all in a cost-effective web-based solution, hosted in the company's network infrastructure or securely in the cloud.

On the PLM side, many companies rely on the Teamcenter solution for product lifecycle management. The Polarion ALM and Teamcenter integration enables multi-directional linking of ALM and PLM data and processes via a seamless ALM-PLM interchange. The Polarion Connector for Teamcenter was initially released in 2015 and addresses key requirements and change management use cases. On-going development of the integration provides support for additional use cases.

The interoperability and data federation at the core of the ALM-PLM integration extends the traceability and transparency from software engineering workflows to systems-driven product development (SDPD) processes. Stakeholders work in their familiar environments, with embedded user interfaces enabling the seamless coordination of interrelated workflows in real-time. When binaries are produced and tested in Polarion, they can be published to the Teamcenter bill of material, thus providing a truly integrated mechanical, electrical and software BOM for the product.

ALM also streamlines integration with other systems as well. Polarion ALM works with MATLAB® and Simulink® software for systems design and simulation via a fully supported connector that provides bi-directional traceability between the two systems.

For more information download this white paper:

Accelerating Innovation with Unified Application Lifecycle Management (ALM)

The white paper outlines industry best practices of Siemens PLM Software's Polarion customers and the resulting business value they derive from using Polarion ALM to unlock synergies across disparate development teams and empower all stakeholders with the capabilities and information they need to accelerate innovation while safeguarding their companies.

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About Siemens PLM Software

Siemens PLM Software, a business unit of the Siemens Digital Factory Division, is a leading global provider of product lifecycle management (PLM) and manufacturing operations management (MOM) software, systems and services with over 15 million licensed seats and more than 140,000 customers worldwide. Headquartered in Plano, Texas, Siemens PLM Software works collaboratively with its customers to provide industry software solutions that help companies everywhere achieve a sustainable competitive advantage by making real the innovations that matter. For more information on Siemens PLM Software products and services, visit www.siemens.com/plm.

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