



Teamcenter “unified”

*“Siemens PLM Software’s Next Generation
PLM Platform”*

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A CIMdata White Paper

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*Produced by
CIMdata, Inc.*

CIMdata[®]
<http://www.CIMdata.com>

CIMdata, Inc.

3909 Research Park Drive, Ann Arbor, Michigan 48108

Tel: +1 (734) 668-9922 Fax: +1 (734) 668-1957

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This CIMdata-authored whitepaper traces the roots of Siemens PLM Software’s next generation Teamcenter “unified” platform—from a set of integrated PLM enabling applications to a new extended enterprise enabled four-tier unified architecture that incorporates the latest in technology and business functionality. The paper describes Teamcenter 8, which represents the second release of the “unified” platform, and how it is the culmination of many years of steady development and evolution of the Teamcenter suite. Additionally, the paper provides testimonials from a number of Siemens PLM Software’s customers who have already migrated to the new unified platform—customers who report that their transition to the new platform was executed with no unexpected issues, and that they have been able to reduce the level of customizations when compared to earlier implementations of Teamcenter because of its Business Modeler Integrated Development Environment.

1. Executive Summary

Siemens PLM Software’s (referred to hereafter as Siemens PLM) Teamcenter is one of the most widely-used PLM solution suites in the market. With a long and robust heritage, it is deployed by companies in many industries worldwide. Siemens reports that Teamcenter is used by more than 6,400 customers across about 9,900 operations with 5 million licensed seats. Over the years, the Teamcenter suite of solutions has consistently been a market leader and has built a very large user base in the industry. The initial versions of what has evolved into Teamcenter were first used to manage computer-aided design (CAD) data files in the mid 1980s. Since then, the Teamcenter suite has expanded to encompass many product development and service related functions.

As with any product with a long history, Teamcenter has been updated multiple times with both new technology and functionality. Siemens PLM, and its predecessor entities began a fundamental update of the various Teamcenter products in the late 1990s. By 2005, they had begun a multi-release refresh and re-architecting of the entire product suite. This was done in multiple stages so that the older product versions were updated to meet customer needs at the time while continually incorporating new technology and building on the strengths of the individual Teamcenter components and protecting customer investments in those earlier versions.

Today’s Teamcenter, starting with the release of Teamcenter 2007 in October of 2007, has a four-tier unified architecture that incorporates the latest in technology and business functionality. Since its release, Siemens PLM states that there are currently more than 2,000 installations of Teamcenter on the unified architecture (i.e., an installation of Teamcenter 2007 or later versions). Siemens estimates that this represents 30% to 40% of its customers that had implemented earlier versions of Teamcenter to provide core PDM functionality.

Siemens PLM customers interviewed by CIMdata indicated that they are happy with their transition to the unified version of Teamcenter. They stated that they have been able to reduce customizations and cost while obtaining broader and improved functionality and higher performance.

2. Introduction

Siemens PLM’s Teamcenter product suite has a long history. Its roots were founded in the 1980s with technology and products from Control Data, SDRC, and UGS such as Metaphase and iMan. Those products became the original Teamcenter applications called Teamcenter Enterprise and Teamcenter Engineering respectively. Siemens PLM also both acquired and developed additional PLM functional applications that expanded the overall Teamcenter suite over the years, with many of these solution expansions built on different architectures.

In the early 2000s, UGS PLM Solutions (now the Siemens PLM Software Group) recognized that they needed to evolve these different products into a single, unified architecture built on the latest technology and standards. This evolution took several years and many steps as Siemens PLM worked to deliver a fresh, new solution while helping their current customers continue to use solutions they already had in production.

A common misconception is that the current version of Teamcenter is just a combination of the older Teamcenter Enterprise and Teamcenter Engineering or is a continuation of one of those products. While it is true that value-added capabilities of both of these applications were brought forward into the new Teamcenter, this latest Teamcenter is built on a modern, robust architecture, and incorporates a significant level of new technology and functionality—it is definitely not the next version of an existing solution.

This paper discusses Teamcenter's evolution and the resulting product suite—built on the unified Teamcenter architecture—and how it differs from previous versions. The main intent of the paper is to provide insight into the path Teamcenter has taken and what it really is today.

The research for this paper was sponsored by Siemens PLM Software.

3. Siemens PLM Software

Siemens PLM, with headquarters in Plano, Texas, is a business unit of the Siemens Industry Automation Division. The Siemens Industry Automation Division (Nuremberg, Germany), a division of the Siemens Industry Sector, is a worldwide leader in the fields of automation systems, low-voltage switchgear, and industrial software. Its portfolio ranges from standard products for the manufacturing and process industries, to solutions for whole industries and systems that encompass the automation of entire automobile production facilities and chemical plants. Siemens AG finalized its acquisition of UGS PLM Solutions (UGS) in May 2007.

Siemens PLM has a long history in the PLM market and is a global supplier of PLM solutions with offices and customers around the world. Siemens PLM provides one of the broadest and deepest suites of PLM offerings in the industry today, and has continued an aggressive program of acquisition and partnership to broaden their offerings even further. Additionally, they have continued to expand their business into new areas and have established a set of key systems integrator relationships to increase their focus on various geographies and industries. Siemens PLM reports that they have 63,000 customers in 62 countries, and they have 6.7 million licensed seats of PLM software of which 5

million are Teamcenter. CIMdata estimates Siemens PLM's revenues in 2009 were over US\$1.3 billion. In 2010, CIMdata reported that, for the ninth year in a row, Siemens PLM's collaborative Product Definition management (cPDM) solution related revenues earned it a number one ranking. One factor that led Siemens AG to acquire UGS was the opportunity to better integrate UGS' design, data management, visualization, collaboration, and digital manufacturing capabilities with Siemens PLM's offerings for plant and production automation.

“PLM has become a very important part of Siemens since our acquisition of UGS and the establishment of the Siemens PLM Software business,” said Anton Huber, CEO of the Siemens Industry Automation Division. “Unparalleled technology know-how and outstanding innovations have always been the lifeblood of Siemens, and Siemens PLM Software is an excellent example of these qualities. We will continue significantly investing into our PLM business in order to provide our customers with a benchmark product design environment. In addition to that, Siemens will also continue to build on its unique ability to unify the product and production lifecycles. The customer value we can provide with this unification will go far beyond what conventional PLM environments can provide and will definitely give customers a significant competitive advantage. With the full strength of the Siemens brand and resources behind us, we will continue to advance our strong leadership position in the PLM industry.” Siemens AG has continued to invest in the development and evolution of the complete Siemens PLM Software suite including MCAD, CAE, Digital Manufacturing, and cPDM.

Given the challenges that major PLM solutions suppliers must address to guarantee long-term customer success and positive supplier-customer relationships, Siemens PLM has consistently strived to position itself as focused on enabling its customers to “relatively” easily transition forward with their PLM solutions. Siemens PLM's messages to the industry have been focused on “we leave no customer behind,” “we won't let a customer fail,” etc.

4. Teamcenter: Past, Present, and Future

4.1 Teamcenter Roots

Teamcenter has a deep heritage with a history that dates back to the mid 1980s. Elements of it started as a basic CAD file management system. Over the years, it has grown to become one of the broadest PLM solution offerings in the industry. While this expansion provided many benefits

to their customers, it also introduced a number of challenges. For example, as a suite of solutions becomes broader, it becomes more difficult to keep the entire solution set consistent. New developments that take advantage of new technologies can challenge the ability to keep data migration and applications compatibility issues minimized. Acquisitions of new applications or technologies often create the same kind of challenges. Further, customers do not typically upgrade their implemented solutions as quickly as suppliers release new versions, the implemented versions are often tailored and/or customized to some extent, and the implemented solutions usually include integrations with other enterprise-based systems. This results in the challenge of keeping an implemented set of solutions moving forward in a consistent fashion that does not cause major cost, time, and difficulty.

Siemens PLM's explanation of how they address these challenges has often focused on the use of technologies to help "bridge" and "evolve" their customer's implementations from an older technology to a newer one. Additionally, they have typically used 3-5 year product "roadmaps" to describe the evolutionary stages through which their current applications are expected to pass and how current architectures are expected to evolve during that timeframe. These have been used to communicate the implementation tracks that they recommend as the most effective for customers during the same timeframes. Siemens PLM has followed this process as they have evolved the Teamcenter suite from the mix of solutions on different architectures in the late 1990s to the unified solution of today that has a common architecture. CIMdata's observation is that Siemens PLM's public roadmaps have been quite valuable for their customers and others in the industry in establishing a level of confidence in Siemens PLM's development plans and helping customers plan the evolution of their own implementations.

Siemens PLM states they have defined openness as a key foundational element of their business strategy and technology vision—a strategy that results in their solutions being readily integrated with third-party solutions, customer-developed solutions, older versions of Siemens PLM's solution, etc. Key aspects of their "openness" approach according Siemens PLM include:

- *Open Business Model*—They provide technology and solutions to the market under their PLM Components brand, which are available to all companies, including competitors. These include Parasolid, D-Cubed, PLM Vis, NX Nastran, PLM XML SDK, and the JT & XT Toolkits.

- *Open Data Model*—The data model and associated tools are designed to enable interoperability between other business and legacy systems and help customers leverage data more effectively across their enterprise.
- *Open Architecture*—This architecture is intended to enable integration with other enterprise and legacy systems.
- *Open Applications*—This is intended to allow applications to be easily extended by customers and partners.
- *Open Communities*—Siemens PLM works with PLM communities such as user groups, JT Open, and numerous Technical Review Boards (TRB's).

It should be noted that Siemens PLM also chose to define and support a data-centric integration mechanism based on their data exchange technology—PLM XML. Siemens PLM has used this data exchange standard to streamline and facilitate the movement of PLM-related information among its various solutions for some time now. This approach allows companies to implement Siemens PLM's various solutions in a manner that enables them to interoperate without having them all on the same technology platform.

Siemens PLM has also worked to maintain an open environment. While they have developed some interchange technologies, e.g., JT for visualization and PLM XML for data exchange, they have made those technologies available to other companies, including their competitors. In 2009, JT was submitted to the International Standards Organization (ISO) for acceptance as an industry standard. While each PLM technology developer must protect their intellectual property in order to maintain a competitive difference, no PLM solution supplier has the resources to develop all possible capabilities that a customer needs. Siemens PLM uses their open strategy approach to enable them to work with both partners and competitors in order to incorporate the technologies and functionality needed to deliver PLM solutions that address a broad range of customer requirements. The Teamcenter suite includes internally-developed technology and solutions as well as technology and functionality developed by partners and some competitors.

The core of Teamcenter was developed internally by Siemens PLM. This includes core foundational capabilities such as:

- Engineering data management (MCAD, CAM, CAE, ECAD, and software)
- Document and information access, navigation and retrieval

- Change management
- Classification management
- Structure management
- Digital validation
- Design in context
- Integration with multiple MCAD tools
- Audit management
- Information security
- Issue management
- Workflow management

However, as with all comprehensive PLM solution suppliers, other capabilities were incorporated into the overall offering through the acquisition of technology or licensing/partnering to obtain the desired functionality. For Teamcenter, these areas include:

- Visualization
- Requirements Management and Systems Engineering
- End-user Requirements Management
- Project Management
- Digital Manufacturing
- Portfolio Management
- Compliance
- Maintenance, Repair and Overhaul
- Supplier Relationship Management
- Community collaboration

Initially, technology that was acquired or obtained via a partnership was integrated with the core Teamcenter functions. While this provided the needed interaction, it created a complex environment that was more difficult to

maintain and upgrade than if it were built on a common architecture. In the late 1990s, Siemens PLM (at the time SDRC and UGS) began to evolve the underlying architecture of the core solutions to address these complex issues.

The first step was called “componentization.” This step included the development of common software components and services that would be shared by all modules. This evolved into the development of a Services Oriented Architecture (SOA) in which common services are delivered via code and algorithm re-use. With each release of Teamcenter, more of the underlying code and architecture were replaced with the SOA structure.

While this began to deliver a common architecture, Siemens PLM realized that they needed to rationalize the different Teamcenter applications that used differing data models, databases, and user interfaces. In the spring of 2004, Siemens PLM developed and published a technology and product release roadmap that showed how they would evolve the many Teamcenter products into one unified solution. Over a series of synchronized product releases and updates, they would transition to a unified architecture (see Figure 1). Technology unification would include the use of common clients, web server, business logic server, and database.

Their plan was that this transition would not be just a conversion of current functionality but a new design for a single solution that embodied the strengths of current modules while adding new functionality that expanded the breadth of overall capability. At each release on the roadmap, individual products would be incrementally enhanced with elements of the new architecture in the form of common code and infrastructure—thereby laying the groundwork for the transition to the new unified architecture.

With each release, the current products would be updated and continue to be used by customers that had already deployed them. Additionally, interoperability and commonality between Teamcenter Engineering and Teamcenter Enterprise would be improved with each release. Importantly, with each release on the roadmap, Siemens PLM reviewed and compared the strengths of both Teamcenter Engineering and Enterprise. Where one provided better capability, that capability was incorporated into the other. This process has helped both Teamcenter Engineering and

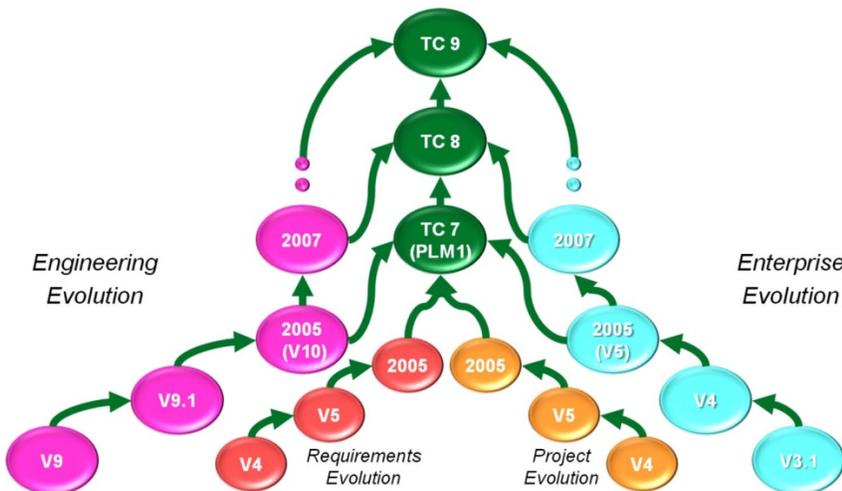


Figure 1—Siemens PLM Roadmap

Teamcenter Enterprise users improve their PLM environments while also continually reducing the differences between each and the unified platform. This also lessened the transition effort and impact.

In 2005, Siemens PLM released Teamcenter Engineering V10 and Teamcenter Enterprise V5 as Teamcenter 2005. Teamcenter 2005 was the first key delivery of the technology unification that was announced in 2004 and provided the foundation for delivering a unified solution. Teamcenter 2005 also incorporated a four-tier architecture to allow customer flexibility in their choice of deployment. In 2007, Siemens PLM released updates to both Teamcenter Engineering and Teamcenter Enterprise and also released Teamcenter 2007—the first release of their unified solution. While Teamcenter 2007 included the strengths of both Teamcenter Engineering and Teamcenter Enterprise, it was essentially a new solution built on the latest technology platform and standards with a significant level of new capability. Teamcenter 2007 incorporated a SOA and included the new Business Modeler Integrated Development Environment (BMIDE). The BMIDE supports custom templates and allows data model and business logic extensions without coding. It provides the ability for multiple users to collaborate on the system definition, and to deploy it as a merged set so that IT professionals can collaboratively define and evolve a Teamcenter deployment. It also supports the ability to deploy from Test directly to Production.

At the same time that Teamcenter Engineering and Teamcenter Enterprise were being updated, other Teamcenter products were also undergoing a similar evolution. Requirements and project management solutions (and other functional solutions) that had been acquired or obtained via partnerships were also being migrated on a step by step basis to the common set of technology being used in Teamcenter Engineering and Teamcenter Enterprise. With the release of Teamcenter 2007, these modules were also included as part of the unified architecture and no longer required separate installations.

While Teamcenter 2007 delivered a unified architecture, as with any initial release, not all the functionality of some older Teamcenter modules was fully supported. With Teamcenter 8 Siemens PLM reports that virtually 100% equivalency of the previous functionality of Teamcenter Engineering and 80%-90% of Teamcenter Enterprise are now part of the Teamcenter unified platform, with the remaining move of the intended functionality expected to be completed by Teamcenter 10 in 2012. New customers that would have implemented either Teamcenter Engineering or Teamcenter Enterprise in the past can begin directly on Teamcenter unified today. With upcoming

releases of Teamcenter unified, the remaining capabilities of Teamcenter Enterprise will be delivered incrementally.

4.2 Teamcenter Today

Teamcenter 8, first released in March of 2009, is the culmination of many years of steady development and evolution of the Teamcenter suite by Siemens PLM. It is built on the latest IT technology with a unified SOA and all modules share a common data model and database. It is designed to enable Siemens PLM and its customers to configure and more easily expand Teamcenter's functionality today and in the coming years.

Teamcenter includes three foundational areas:

- Enterprise Knowledge Foundation
- Platform Extensibility Services
- Lifecycle Visualization

Teamcenter also contains fourteen functional areas:

- Supplier Relationship Management
- Systems Engineering and Requirements Management
- Manufacturing Process Management
- Simulation Process Management
- Maintenance, Repair, and Overhaul
- Reporting and Analytics
- Community Collaboration
- Mechatronics Process Management
- Engineering Process Management
- BOM Management
- Compliance Management
- Content and Document Management
- Formula, Package, and Brand Management
- Portfolio Program Management

Figure 2 illustrates Teamcenter's functional structure.

Because each module built on the unified architecture shares a common data model and uses a common set of application services, information entered or modified in one module is immediately available in all other modules.

The following paragraphs briefly describe the seventeen components of today's Teamcenter unified platform.

Enterprise Knowledge Foundation provides the ability to capture and manage an extended enterprise's product definition information (i.e., the extended enterprise's intellectual assets)—integrating the organization's people, processes, systems, and data in a manner that enables all to collaboratively work together to define products and the

TEAMCENTER



Figure 2—Teamcenter Functional Structure

processes necessary to define, build and/or assembly, maintain, and decommission and/or recycle.

Platform Extensibility Services deliver the ability to quickly and easily configure Teamcenter to support specific business and system integration requirements—not just when the solution is first implemented, but also in support of upgrades and general continuous improvement projects. The embedded Business Modeler Integrated Development Environment (BMIDE) is used to configure Teamcenter without having to write and support customized code. It can also be used to develop customer-specific integrations with other business systems that can be automatically upgraded as new Teamcenter releases are deployed.

Lifecycle Visualization enables people to view and work with both 2D and 3D product information. This capability is provided to users throughout the enterprise, suppliers, partners, and customers without the need for these people to own or know how to use the information authoring tools such as CAD.

Supplier Relationship Management (SRM) enables an enterprise to effectively manage and engage its supply chain to manage product costs and quality including supplier performance. It includes a disciplined and systematic process for reducing the total costs of externally-purchased materials, goods, and services while maintaining and improving levels of quality, service, and technology and to evaluate, prioritize, and manage preferences for supplier utilization.

Mechatronics Process Management provides mechanisms that support coordinated management of centralized data, workflow, authoring tools, and process management for the integrated development of mechanical, electrical, electronic, and software components and systems as part of a single product, and to communicate this information appropriately throughout the organization.

Systems Engineering and Requirements Management (SERM) provides a mechanism to facilitate the capture and analysis of customer needs and then associate those needs with formal requirements (e.g., performance, maintainability, reliability, manufacturability, usability, and ergonomics characteristics) that the product and/or product-related processes must deliver. These requirements may be associated with the product across potentially all stages of the product lifecycle. SERM also provides mechanisms to outline and organize systems designs, in association with multiple product decompositions, and associate product requirements into the designs as appropriate for both initial product development and further enhancements and change process support.

Manufacturing Process Management (MPM) provides a mechanism to describe, simulate, optimize, and release manufacturing process plans and related definitions in collaboration with product design activities, and to communicate this information appropriately throughout the organization.

Simulation Process Management (SPM) provides mechanisms to integrate the creation, utilization, and management of simulation data and processes into the context of the full product definition and PLM environment. This also includes the ability to capture and utilize best-practice analysis processes to provide consistency and effective simulation support to product development.

Maintenance, Repair, and Overhaul (MRO) enables companies to manage the maintenance, repair, and overhaul of complex products such as aircraft, ships, and plants throughout their lifecycle—from concept through to end-of-life (e.g., decommissioning). It provides knowledge of a product’s configuration, its maintenance and repair history, how it can be serviced, and what spares, test, and service equipment must be used to maintain the product or system as well as capabilities to define, schedule, and track maintenance activities. Additionally, MRO supports claims and warranty management by providing capabilities necessary to define and manage processes specifically focused at handling those activities.

Reporting and Analytics includes the tools to collate, analyze, and produce data through pre-defined and ad-hoc reports, digital dashboards, and email for real-time sharing of business intelligence. It provides a basis for companies to establish, measure, and analyze key product related performance metrics to drive decisions and processes throughout the product lifecycle.

Community Collaboration provides a platform for sharing information and working together across the product lifecycle. Real-time collaboration and application sharing can be used to create an environment for product and process information to be communicated among all key participants in the product lifecycle. It provides capabilities to securely integrate product lifecycle management data from many different sources into one interface.

Engineering Process Management enables the overall management of the product design process and the resulting product definition information including the collaborative manage of all design process tasks and the process interaction with internal as well as external design supply chain partners. It supports the consolidation of product design and related information from multiple distributed sources within a single product data management (PDM) system and automation of engineering change, validation and approval processes. It supports multi-CAD data and the ability to aggregate design changes continuously.

Bill of Material (BOM) Management provides the ability to create and manage product structures and their multiple logical constructs. These products structures include part-

to-part, part-to-document, and document-to-document relationships so that a complete bill of information (BOI) can be defined and managed throughout a product’s and its associated information’s lifecycles.

Compliance Management enables the definition, tracking, and reporting of all product-related information and activities required to confirm that a product meets regulatory compliance metrics. It is generally implemented with industry-specific solutions, e.g., Food and Drug Administration (FDA) compliance for pharmaceuticals or medical devices. Compliance Management is also used to support tracking and managing export controlled product related information, e.g., International Traffic in Arms Regulations (ITAR).

Content and Document Management provides the ability to define, author, illustrate, manage, and deliver exact product information in the reader’s preferred language and media. It supports and can be integrated with multiple authoring environments including Microsoft Office and CAD design applications. It can automatically update documents and other content when components of those items are changed. Content and document management provides full configuration management and change control of all elements, components and full documents.

Formula, Package, and Brand Management supports the ability to define and introduce to the market formula-based products, including their packaging, artwork, labels, claims, and other package and brand-related content. This includes the ability to manage formulas and configurations of formulas, specifications, mixing instructions, etc. that describe specific recipes and how they are to be produced. It includes the ability to define and manage a set of intelligent specifications that are interrelated and that describe the various components of a formula-based product including management of the physical package definition, its artwork, labels, claims, etc. For brand management it supports the management of logos, product and package photos, marketing material, etc.

Portfolio, Program and Project Management encompasses three areas—idea and concept, product portfolio, and project management. *Idea and Concept Management* enables organizations to capture ideas for new products or services, study their market potential and technical constraints, evaluate if, when, and how to efficiently produce them and then develop a short list of promising product concepts that match a company’s strategy. *Product Portfolio Management* focuses on identifying, evaluating, and managing the “family” or portfolio of products that a company offers and maintains. It includes capabilities to compare product investment alternatives according to market demand, competitive pressures, macro-level cost

rollups, project sales and profitability estimates, overall resource needs, status reporting (including visual dashboards), and other information and processes needed to enable a company to determine the best ideas and products in which to invest, build, and sustain. It combines and gives visibility into the financial, strategic, and operative aspects across the entire project portfolio to enforce governance, make fact-based decisions and maximize return on existing assets. *Project Management* enables project managers to control project structures, schedules, costs, and resources. This includes network planning techniques and aggregative tools that support cross-project cost, revenue, margin, schedule, and resource management.

4.3 Teamcenter Going Forward

As with all technology suppliers, Siemens PLM will continue to develop and expand Teamcenter and state that they plan major releases on a twelve-month cycle. While this means that Teamcenter will remain one of the industry's broadest solution suites, it also means that customers (as with any supplier) will periodically want to upgrade their operational environment.

Teamcenter's four-tier SOA and common data model, coupled with the BMIDE facility, should enable Siemens PLM and its customers to more easily configure and expand Teamcenter's functionality. It is designed to reduce the effort and cost of expansion and evolution as well as to make it easier to integrate Teamcenter functionality with other business systems. Teamcenter's user clients are now based on the Eclipse multi-language software development environment and can be extended using standard and customer developed plug-ins.

Siemens PLM will continue to support Teamcenter Engineering and Enterprise for those customers that have them in production. Importantly, with each release of these older products, they have updated the underlying architecture and technology so that when a customer decides to change, the transition to the unified Teamcenter solutions will be easier. They have also developed a robust suite of migration tools that can be used when moving from earlier versions of Teamcenter products to the unified platform.

Siemens PLM has recently announced a new technology framework for decision-making called High Definition Product Lifecycle Management (HD-PLM). Early Siemens PLM published information indicates that this technology has been designed to enable cross-domain decision making by uniting Teamcenter users with people, tools, and product-related information needed to evaluate decision alternatives intelligently. According the Siemens PLM, HD-

PLM functionality is planned to be incorporated in future Teamcenter releases. As this functionality becomes part of Teamcenter, we will be evaluating it in further detail and plan to report its impact on Teamcenter's overall roadmap.

5. Customer Examples

This section presents the results of CIMdata's discussions with three Siemens customers who have experienced and benefited from the implementation of Siemens PLM's Teamcenter unified solution (version 2007 or later). The descriptions of each interviewed customer will provide an overview of the company, their relationship and history with Siemens, the focus of their Teamcenter unified implementation, and their overall perceptions of Siemens PLM's Teamcenter unified solution and its direction.

5.1 Ford Motor Company

CIMdata interviewed Dr. Richard Riff, Ford's Technical Fellow, and Mr. Peter Lamoureux, Global PMTI Manager, of the Ford Motor Company (Ford). Ford is a global automotive industry leader based in the United States that manufactures and sells automobiles across six continents. Ford has approximately 176,000 employees and 80 plants distributed worldwide.

Ford was an early adopter of PLM technology and solutions and had used Metaphase and then Teamcenter Enterprise for a number of years. They replaced Teamcenter Enterprise with Teamcenter Engineering in 2004 in support of their global distributed development footprint and their rapidly-developing vehicle platform strategy. In 2008, they transitioned from Teamcenter Engineering 9.1.3 to Teamcenter 2007—the first release of the unified platform. After preparation, Ford executed a global switchover from Teamcenter Engineering over a four-day period. Ford reports that they currently have nine sites in production on Teamcenter 2007.1 with more than 10,000 active users. While current car platform development is supported by Teamcenter 2007.1, older car platform data, which was managed in Teamcenter Enterprise, can be brought forward and used on an as-required basis.

Dr. Riff stated that drivers for the transition to the unified platform were to improve the performance of the environment, better share common data globally, integrate virtual manufacturing applications, and to move users from UNIX-based workstations to PCs. Dr. Riff also stated that Teamcenter's multi-CAD support was a critical factor in the deployment of Siemens PLM's new PLM platform.

Mr. Lamoureux stated that Ford had received good transition support and tools from Siemens PLM. The main

transition issues were data cleansing and the introduction of the PC client to the user community. He also stated that after the initial introduction, the user community is very happy with the new client.

Ultimately, Ford is creating a broader management environment, according to Dr. Riff, built on the unified Teamcenter platform. They now have CAE management under control of Teamcenter 7 and he stated that they have a better environment for requirements and simulation management. Additionally, they are looking at placing in-vehicle software management under Teamcenter control. He also indicated that one area for further development is continued harmonization of the multi-site environment to better manage their supply base and global programs. They have begun to reduce the number of sites using the distributed capabilities of Teamcenter and plan to continue that reduction.

5.2 ELTA Systems Ltd.

CIMdata interviewed Mr. Sharon Levi, PLM Implementation Manager for ELTA Systems Ltd. (ELTA) a subsidiary of Israel Aerospace Industries. ELTA is one of Israel's leading defense electronics firms with products focused on electromagnetic sensors (e.g., radar, electronic warfare and communication) and integrated solutions. ELTA's products include systems, subsystems, and critical technological sub-assemblies and components, designed and produced in-house.

ELTA stated using iMAN 6.0 for PDM and CAD data management. They had migrated to Teamcenter Engineering Version 8 and then to Teamcenter Engineering 2005. In 2006, they also began to use Teamcenter Systems Engineering. Additionally, they have transitioned from UG to NX for MCAD.

ELTA's transition to the unified architecture is being executed in phases. Today, they are already using the Teamcenter 2007 unified platform for Mechanical Engineering and NX data management, along with Teamcenter Engineering for PDM and Teamcenter Systems Engineering for requirements management.

Today, with three applications, Mr. Levi stated that it is difficult to find all the related information when requirements change. According to ELTA, they plan to migrate to Teamcenter 8.3 in 2011 and at that time will discontinue use of Teamcenter Engineering and Teamcenter System Engineering. This will enable them to have defined relationships between requirements, parts, and documents in one data model and database so that change and impacts can be immediately identified.

Furthermore, Mr. Levi stated that Teamcenter 2007 has all the required functionality ELTA needs for NX management. It has enabled them to move everything to one platform and to reduce the number of servers used to support that environment. It has also enabled them to reduce the customizations they had previously needed. These factors have enabled ELTA to reduce their overall cost of support for the current PLM environment when compared to the previous architecture. They have also seen a performance improvement.

Mr. Levi reported that they encountered no unexpected issues during the transition to the Teamcenter 2007 unified platform. Using the BMIDE simplified upgrading their customizations and that more than 60% of them were a simple recompile. They expect to continue to reduce or eliminate customizations as they continue to implement the unified platform and take advantage of its out-of-the-box capabilities.

Going forward, they plan to use Teamcenter unified to integrate their CASE and Mentor Graphics applications to address their mechatronics needs and to use the Teamcenter Content Management module for technical publishing.

Mr. Levi indicated that ELTA is pleased with Teamcenter unified. It is meeting their needs and is easy to use. They can define business logic as required using the BMIDE and they can do their own tailoring of the environment. He stated that Teamcenter unified has well-developed functionality and has enabled ELTA to do everything they have wanted. He also stated that Siemens has provided good support for ELTA throughout the transition process and that they had no surprises during the transition.

5.3 LM Wind Power

CIMdata interviewed Mr. Henrik Nielsen, Manager, Global IT CAD/PDM of LM Wind Power, a long time user of Siemens PLM CAD and cPDM solutions. LM Wind Power is the world's leading component supplier to the wind turbine industry. The company is headquartered in Kolding, Denmark and has a global manufacturing footprint with factories located on three continents in thirteen locations—Canada, USA, Spain, Poland, Denmark, India, and China. They are the world's leading supplier of rotor solutions as well as braking systems for rotors and heavy industry.

LM Wind Power began using Siemens PLM MCAD solutions in 2000 and implemented iMAN for data management in 2003. Over the past four years they migrated to NX 6 for MCAD and from iMAN to Teamcenter Engineering 9 and then to Teamcenter 2005. In 2009 they migrated from Teamcenter 2005 to Teamcenter 2007—the unified platform. The transition to the unified

platform was driven by their need to better manage their global research and development environment and operations.

Mr. Nielsen reported that the transition to Teamcenter 2007 went smoothly; they encountered no unexpected issues, and overall it was a positive experience. He reported that LM Wind Power has achieved several benefits and he expects that these will grow as they move forward to Teamcenter 8 later this year. The most important benefit is that they are better able to work together as a single, global team—sharing information and processes across multiple development locations.

One of the infrastructure issues that they have is that sites in India and China have very high network latency. Since all information is maintained and served worldwide from a single Oracle database located in Europe, high network latency severely impacted performance. They report that with Teamcenter 2007's architecture and the new File Management System (FMS) they have achieved a 90+% reduction in time to open large assemblies in Asian sites versus that of three years earlier. The performance for Asian users is now considered acceptable. This has improved their overall productivity and user satisfaction.

LM Wind Power had developed and implemented several customizations to Teamcenter Engineering. They report that more than 50% of those customizations are no longer needed as the required functionality is standard within Teamcenter 2007. They expect that they will be able to eliminate the majority of all customizations as they upgrade to Teamcenter 8. One of the major transition efforts was to remove customizations. Mr. Nielsen indicated that eliminating customizations has reduced the time, effort, and cost to upgrade to new releases of Teamcenter.

Teamcenter unified's expanded integration with Microsoft products, such as MS Word, will also enable them to eliminate several custom integrations and that the standard integrations are better and work more effectively than their in-house-developed solutions.

Mr. Nielsen reported the LM Wind Power has had good support from Siemens PLM and they expect to leverage more solutions from Siemens going forward. Today, Teamcenter is primarily used to manage the design environment and change management. Today, they use Siemens PLM's Tecnomatix in a standalone mode but when they transition to Teamcenter 8 and Tecnomatix 9 they will have a unified environment managed by Teamcenter. They will also integrate their robotics solutions management on the unified platform.

5.4 Overall Observations

Siemens PLM provided their customers and prospects with a well-defined roadmap as to how that transition would occur and customers were able to plan their transition based on that roadmap.

Customers that have transitioned to Teamcenter unified versions (Teamcenter 2007 or later) have indicated that the transitions have proceeded with no unexpected problems. They have been satisfied with both the tools and support provided by Siemens PLM. They all indicated that they have been able to simplify their environment by eliminating many customizations required to use earlier versions of Teamcenter. They also indicated that the unified versions of Teamcenter are delivering more functionality and better overall performance. Each expects to continue to expand the use of Teamcenter to deliver additional, integrated functionality.

6. Summary and Concluding Comments

Many years ago Siemens PLM recognized that they needed to migrate their product suite to a more advanced, unified architecture. They wanted to eliminate the multiple data models, databases, and user interfaces to improve the user experience and reduce the cost of development, support, and operation of PLM environments for their customers and themselves. To support this transition, Siemens PLM developed and published a multi-year, multi-release roadmap that described how they planned to proceed.

By articulating and effectively executing their long-term roadmap and describing each product release and its functionality, Siemens PLM has enabled its customers to better align their deployment and upgrade plans with the evolving Teamcenter platform.

The first version of the unified Teamcenter was released in 2007 and Siemens PLM reports there are more than 2,000 installations that have already either transitioned from earlier versions of Teamcenter or have deployed on the unified architecture. Additionally, there are currently approximately 400 transition projects underway. Siemens PLM estimates that this combination represents 30%-40% of its customers that have implemented earlier versions of Teamcenter to provide core PDM functionality. Teamcenter continues to be one of the leading PLM solution suites in the market.

Customers interviewed by CIMdata for this paper reported that transitions to Teamcenter unified versions were executed with no unexpected issues and that Siemens PLM

provided good transition tools and support. These customers also reported that they have been able to reduce their level of customizations when compared to earlier implementations of Teamcenter and that they expect to see a reduction in both the complexity and cost of support of their new PLM environments.

These benefits reflect what CIMdata projected in a white paper released in August of 2008 titled, “The Value of Unified Architectures for PLM.” This paper discussed the potential benefits of unified PLM platforms to reduce the complexity of the product development environment and enable companies to put more of their resources into developing and delivering products instead of supporting the IT infrastructure. Architectures, such as that of Teamcenter unified, offer companies an opportunity to establish a more flexible, comprehensive PLM environment while reducing the overall cost of maintenance, support, and enhancement.

Finally, it is important to note that Siemens PLM has a lot at stake with this transition. The Teamcenter product suite has been a leading PLM solution for years and as a result, its very large base of production users is counting on Siemens PLM to deliver on their roadmap. Early indications are very positive and CIMdata expects this to continue.

About CIMdata

CIMdata, a leading independent worldwide firm, provides strategic consulting to maximize an enterprise’s ability to design and deliver innovative products and services through the application of Product Lifecycle Management (PLM) solutions. Since its founding more than 25 years ago, CIMdata has delivered world-class knowledge, expertise,

and best-practice methods on PLM solutions. These solutions incorporate both business processes and a wide-ranging set of PLM enabling technologies.

CIMdata works with both industrial organizations and suppliers of technologies and services seeking competitive advantage in the global economy. CIMdata helps industrial organizations establish effective PLM strategies, assists in the identification of requirements and selection of PLM technologies, helps organizations optimize their operational structure and processes to implement solutions, and assists in the deployment of these solutions. For PLM solution suppliers, CIMdata helps define business and market strategies, delivers worldwide market information and analyses, provides education and support for internal sales and marketing teams, as well as overall support at all stages of business and product programs to make them optimally effective in their markets.

In addition to consulting, CIMdata conducts research, provides PLM-focused subscription services, and produces several commercial publications. The company also provides industry education through PLM certificate programs, seminars, and conferences worldwide. CIMdata serves clients around the world from offices in North America, Europe, and Asia Pacific.

To learn more about CIMdata’s services, visit our website at www.CIMdata.com or contact CIMdata at: 3909 Research Park Drive, Ann Arbor, MI 48108, USA. Tel: +1 (734) 668-9922. Fax: +1 (734) 668-1957; or at Siriusdreef 17-27, 2132 WT Hoofddorp, The Netherlands. Tel: +31 (0) 23 568-9385. Fax: +31 (0) 23 568-9111.

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