



Teamcenter Express

“Rapid cPDM Deployment for Mid-Sized Manufacturing Companies”

May 2008

A CIMdata Program Review

Teamcenter Express
*“Rapid cPDM Deployment for Mid-Sized
Manufacturing Companies”*

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*Produced by
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CIMdata[®]

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Teamcenter Express

“Rapid cPDM Deployment for Mid-Sized Manufacturing Companies”

This CIMdata-authored Teamcenter Express Program Review describes Siemens PLM Software’s collaborative Product Definition management (cPDM) solution, the core data management component of the Velocity Series—a set of preconfigured and easy-to-deploy design and data management PLM-enabling solutions. Siemens PLM Software has designed this offering specifically to address the product design through manufacturing planning needs of small- to medium-sized companies. This paper provides an overall description as well as CIMdata’s assessment of the Teamcenter Express program for the Product Lifecycle Management (PLM) market. This program review is an assessment of the entire Teamcenter Express effort, including development, marketing, and sales, and the product itself (i.e., Teamcenter Express Version 4).

1. Executive Summary

Teamcenter Express is the core product data management component of Siemens PLM Software’s Velocity Series—a set of preconfigured and easy-to-deploy design, manufacturing, and data management solutions. Siemens PLM Software (Siemens) positions the Velocity Series as supporting a company’s move to 3D; a move that can be accomplished at a company’s own pace. Siemens has designed this offering specifically to address the product design through manufacturing planning needs of small- to medium-sized companies (i.e., mid-market companies) in the following industrial segments:

- Mechanical machinery and equipment
- Electromechanical
- Consumer electronics
- Consumer product
- Automotive components
- Tool and mold shops that support the above industries

Teamcenter Express is also being deployed within divisions and development groups of larger companies, and engineering departments of companies that are part of an Original Equipment Manufacturer (OEM) supply chain. According to Siemens’ sales data, 52% of all Teamcenter Express purchases have been made by mid-market companies and 24% have been made by divisions of larger companies. To understand the rationale used by some of these companies, a number of customer testimonials have been provided throughout this paper as sidebars. These testimonials provide a summary of why Teamcenter

Express was selected to support specific PLM requirements, what the solution is being used for, and what type of benefits the company is receiving.

According to CIMdata’s research and experience, mid-market PLM solutions, like Siemens’ Teamcenter Express and others, focus on PLM issues that affect multiple industries. Mid-market PLM solutions, and the capabilities they provide, best support small- to medium-sized manufacturing companies which generally employ fewer than 5,000 employees, of which fewer than 200 usually are engineers, (or similar-sized divisions of larger organizations) who design/engineer parts, components, and assemblies that are low to medium in complexity. Typical engineering functionality includes, at a minimum, CAD file management and basic CAD integrations (i.e., simple one-way integrations that transfer BOM information from the CAD tool to the cPDM solution); bill-of-material (BOM) and bill-of-information (BOI) creation and management; documents and CAD file visualization (usually some combination of 2D and 3D viewing is provided); and workflow management capabilities to automate various engineering processes (e.g., engineering change and configuration control), and basic one-way integrations that transfer BOM information from the data management environment to ERP (e.g., BOM release to manufacturing).

For small- to medium-sized manufacturing companies that design/engineer simple parts or components, configuration management support is not as critical. Their requirements focus on data vault management, workflow automation, and applications that support specific needs in the engineering/manufacturing process (e.g., change

implementing it can take advantage of Teamcenter's extensive list of CAD and ERP integrations, including an industry leading integration with Solid Edge as well as NX, Siemens' high-end mechanical CAD/CAM/CAE system.

Teamcenter Express is positioned by Siemens as an entry point into the Teamcenter portfolio of cPDM solutions (see Figure 2). It has been optimized for small- to medium-sized manufacturers, bridging the gap between Solid Edge Insight and Teamcenter. For companies that require more sophisticated and complex product configuration capabilities or for ones that need highly-customized and complex workflows and data models Teamcenter is the more appropriate solution. More specifically, Teamcenter Express has been designed to provide:

- Task-specific design process management
- Fast/easy-to-install, operate, and support and maintain at a low total cost of ownership
- Single CAD and multi CAD (mechanical only) support
- Single and multi-site support
- Multi-department focus

Teamcenter has been designed to provide:

- Fully configurable engineering process and knowledge management
- Fast-to-Value with high Return on Investment (ROI)
- Single CAD and multi CAD (both mechanical and electrical) support
- Single and multi-site support
- Enterprise engineering-focused processes

Since Teamcenter Express shares Teamcenter's platform, there is a built-in upgrade path from Express to Teamcenter. This ensures that an organization that chooses Teamcenter Express will be able to scale their Teamcenter implementation if, or when their business operating model or process complexity changes.

Companies that implement Teamcenter Express should receive benefits in the following business areas:

- Reduced errors and rework through single source of design data
- Accurate BOMs that ensure downstream quality

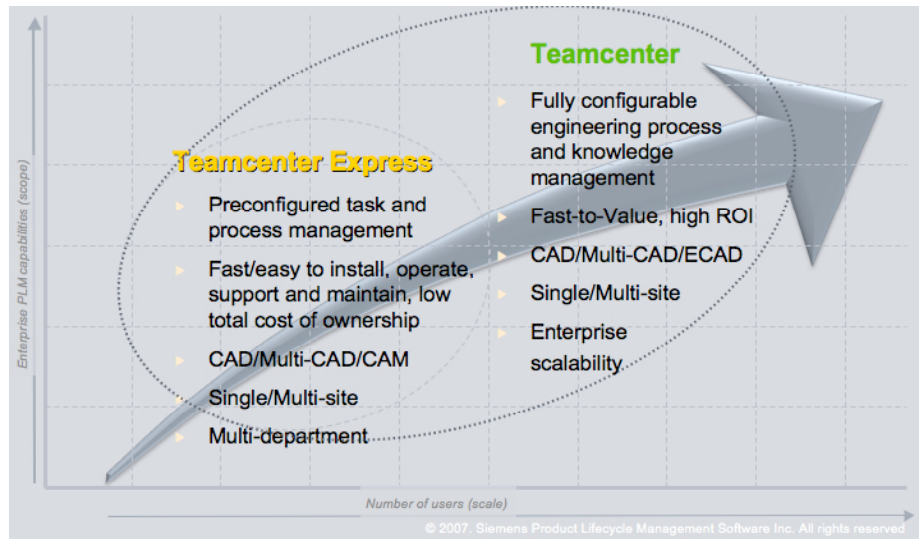


Figure 2—Teamcenter Express' Positioning

- Increased design commonality and reuse facilitated by a powerful and flexible search capability
- Streamlined completion of everyday engineering tasks with simple design release and engineering change workflows (e.g., create BOMs, initiate new projects, create specifications, review designs with suppliers, check, approve and release product information to manufacturing, etc.)
- A more streamlined move from 2D to 3D
- Support of product design, manufacturing engineering, and shop floor users
- Improved resource utilization through integrated project scheduling
- Enable basic managed design supply chain collaboration
- Secure corporate design data while facilitating access by authorized personnel

The strengths of the Teamcenter Express solution are its preconfigured and embedded best practices for a number of everyday tasks and processes, and its scaleable architecture optimized around Microsoft standards. Teamcenter Express appears to be simple and fast to install, set up, support, and operate. As a result, many companies should find Teamcenter Express to have a low total cost of ownership.

2. Assessment Summary

Teamcenter Express Version 4 represents the latest release of Siemens' mid-market cPDM solution. Teamcenter Express has proved to be a solid solution in the PLM solution space specifically focused on supporting the needs of small- to medium-sized manufacturing companies.

AKG Acoustics

AKG Acoustics is a member of the Harman International group and like all other companies within this group, AKG Acoustics is in the audio business. AKG Acoustics offers two primary products: microphones and headphones (wired and wireless). The company is located in Vienna, Austria and employs approximately 300 people. They pride themselves in their extensive know-how related to the science of acoustics, and the R & D and manufacture of audio products.

Historically, AKG Acoustics had used I-deas as their 3D CAD tool. During their investigation of a replacement system they decided to stay with the same solution provider and migrate to Solid Edge, and implement Teamcenter Express in support of their product lifecycle management requirements. PBU CAD-Systeme GmbH, a Siemens Channel Partner, provides Teamcenter Express software and support for AKG Acoustics.

AKG Acoustics is currently completing its implementation of Teamcenter Express. According to Mr. Stefan Prüller, Mechanical Engineer and CAD Administrator at AKG Acoustics, the company plans on finalizing the implementation of Teamcenter Express by mid 2008, and have their ERP integration installed in early 2009. In general, Teamcenter Express will be used to manage CAD data mainly from Solid Edge, and the diversity of other manufacturing and documentation tools used by the company. In addition, Teamcenter Express will be used to manage their product data related release and approval processes. Finally, AKG Acoustics looks to use Teamcenter Express to accurately calculate, at an early stage in the product development cycle, the cost to bring to market and the commercial price of a product being developed.

Mr. Prüller reports that the company's main driver for purchasing Teamcenter Express (i.e., implementing PLM) is to take control of the many different development solutions utilized by the organization and to manage the resulting data. Currently, most of the data takes the form of paper documents. With the implementation of Teamcenter Express much of the organization's data should migrate to a digital format that can be more easily accessed and leveraged through the Teamcenter Express solution. Mr. Prüller notes that the current paper-based product development process is time consuming and unreliable since you can never be sure that you are using the latest version of a product and component, and its associated product definition information. In their business, time-to-market is becoming critical as well as after sales support since they guarantee spares for up to 10 years, depending on the product line.

Building this cPDM solution on top of the Teamcenter platform has allowed Siemens to continue to deliver significant enhancements, including a reasonable set of customer-driven enhancements (e.g., "smart codes" and the incorporation of project management capabilities) to the market quickly while leveraging one of the world's most widely-used enterprise PLM platforms. With this most recent release, Siemens has introduced a number of notable enhancements to Teamcenter Express' capabilities, including:

- Architecture—move to new "unified" Teamcenter Service-Oriented-Architecture (SOA) based platform.
- Project/program management—addition of supporting functionality.
- Usability—user focused productivity enhancements (e.g., new "summary" tab).
- ERP integration—a higher degree of PLM to ERP process synchronization.

CIMdata continues to be impressed with Teamcenter Express and recommends that all small- to medium-sized discrete manufacturing companies in the market for an enterprise class cPDM solution seriously consider Teamcenter Express and the other Velocity Series components.

According to Siemens, Teamcenter Express has been designed to address the needs of engineering organizations which:

- Are experiencing a rapid explosion of engineering data and need to manage data from multiple CAD sources.
- Need to improve the efficiency of their design release and engineering change processes.
- Can take advantage of preconfigured processes, reducing the need to invest in customization before gaining advantage from investments.
- Use Microsoft Windows and associated Microsoft products for a common user environment.
- Need to collaborate with suppliers, customers, and partners.
- Need a growth path for advanced capabilities—scalability with built-in data protection to allow for application growth.

Teamcenter Express' robust foundation technologies and core functions have been greatly enhanced through the implementation of preconfigured best-practice-based processes, data model, and associated support items (e.g., training, documentation, services, etc.). This has allowed Siemens to truly deliver a total solution that addresses many common business needs encountered by small- to medium-

sized manufacturing companies. With Teamcenter Express at the core, this total solution includes:

- A standalone, yet integrated Windows-enabled cPDM application that is highly scalable
- A set of preconfigured embedded best-practices based on Siemens' extensive implementation and industry experience.
- A rapid implementation framework that includes a fully-configured Windows' server environment that is available for immediate use upon installation based on a typical company configuration.
- A concise training model that includes an easy-to-understand Teamcenter Express Training Guide and a Self Paced Training utility based around use cases to support everyday tasks and processes.
- A comprehensive set of documentation and online help that can be localized.

By taking this preconfigured, total solution approach, Siemens is clearly providing a sound PLM business solution focused on providing preconfigured cPDM capabilities to mid-market manufacturing enterprises. Teamcenter Express core functional capabilities include:

- A set of preconfigured best-practice-based workflows, tasks, users, and organizational model that supports the initiation of new projects, the creation, review, annotation, and markup of product data, and other key cPDM business requirements.
- Complete search and retrieval of all managed data objects, including the ability to save search criteria and report formats.
- Managed check-in/check-out revision/version control of all data objects, including CAD models generated by multiple CAD systems.
- Easy-to-use part/assembly structure creation and management, including BOM synchronization from multiple CAD systems.
- Smart Codes functionality that allows a customer to define attribute driven intelligent part numbers.
- Support for the management of NX CAM and CAM Express.
- Comprehensive product documentation management capabilities that support all types of data files, including a solid integration with Microsoft Office tools.

- "XpresReview Package Exchange" capability based on Siemens' existing XpresReview and Packaged Collaboration File (PCF) technologies.
- A preconfigured generic framework for the translation of 2D, 3D, and document file types.
- Dynamic user interface with a modern Microsoft Outlook look and feel (see Figure 3).
- Industry-leading embedded visualization capabilities provided by Teamcenter Visualization product.
- A capable set of mechanical CAD and ERP out-of-the-box integrations.
- Flexible data structure to support a customer's individual needs to view data by project, product line, or document type.

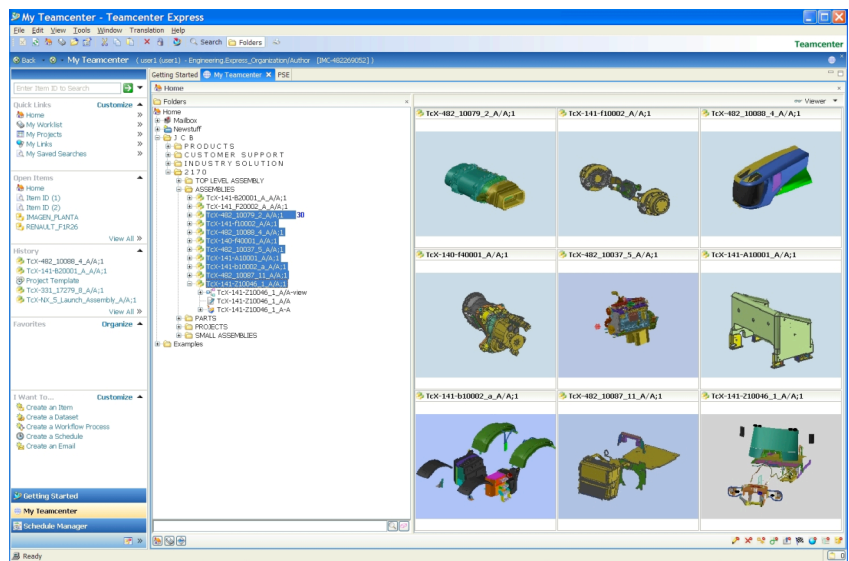


Figure 3—Teamcenter Express' Intuitive User Interface

- Comprehensive, dynamic access control based on a user's assignment to groups and roles.
- Built-in self-paced training environment that steps the user through the proper use of the solution's various out-of-the-box capabilities.

The solution's rich client requires either Windows XP or Vista; the Teamcenter Express server-based functionality runs on Windows Server 2003 and all Teamcenter Express users must license SQL Server. The solution can be purchased in four different user roles: Teamcenter Express Author, Teamcenter Express Professional, Teamcenter Express Consumer, and Teamcenter Express Shop Floor Viewer. Each of these roles is preconfigured to deliver the appropriate level of cPDM functionality for a typical mid-market organization.

3. Program Assessment

This section reviews the overall program Siemens PLM Software has put into place to support Teamcenter Express. This section includes a brief perspective of Siemens PLM Software, its overall mid-market strategy and solution offering, and a discussion of the primary objectives that are driving the program.

3.1 Company Objectives and Background

Siemens PLM Software 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 announced its intent to acquire UGS for \$3.5 billion and make it part of the company's Industry Automation in January 2007. In May 2007, Siemens' acquisition of UGS was finalized. Siemens PLM Software has a long history in the PLM market as one of the major suppliers of PLM solutions to industry. Their revenues in 2007 were just over \$1.38 billion.

According to CIMdata's research, Siemens PLM Software was the second-largest overall PLM revenue generator among the PLM Mindshare Leaders, and had the largest market presence in the cPDM sector in 2007. Siemens PLM Software continued to increase its license revenues with its greatest growth in the Teamcenter business line. Siemens PLM Software is a global supplier of PLM solutions with offices and customers around the world.

Siemens PLM Software provides one of the broadest and deepest suites of PLM offerings in the industry, and has continued an aggressive program of acquisition and partnerships to broaden their offerings even further. Additionally, they have continued to expand their business into additional industries and have established a set of key systems integrator relationships to increase their focus on various geographies and industries.

In September 2005, Siemens announced their Velocity Series portfolio for mid-sized companies. This announcement was intended to take advantage of the growing demand for PLM among mid-sized companies and Siemens' strength in the breadth of their product lines, to

expand their own coverage of PLM for industry, and enhance their own business growth. To establish an improved mechanism to take the Velocity Series to market, Siemens also launched a Global Channel Program designed to further its geographic and industry presence through a broad network of partners.

In the two plus years since Teamcenter Express' launch, market acceptance has been reasonably strong, especially in the European market and with sales to more than 300 customers, in more than 35 countries globally. It is important to note that 73% of the companies that have purchased Teamcenter Express have purchased more than five licenses and the average installation has 17 licenses.

Siemens PLM Software reports that they have 51,000 customers in 62 countries, and they have 4.6 million licensed seats of PLM software. For the seventh consecutive year, Siemens PLM Software has held the lead position in CIMdata's cPDM study. In summary, Siemens' overall PLM market position is very strong.

3.2 Marketing, Sales, and Packaging

Siemens markets and sells its full suite of PLM solutions to small, medium, and large companies primarily in the aerospace and defense, automotive, consumer products, high-tech electronics, machinery, and medical equipment industries. As mentioned earlier, Siemens has positioned Teamcenter Express as a mid-market PLM solution for manufacturers in number of different discrete industry segments. These include:

- Mechanical machinery and equipment
- Electromechanical
- Consumer electronics
- Consumer product
- Automotive components
- Tool and mold shops that support the above industries

Teamcenter Express is positioned as an easy-to-buy, install, learn, use, and manage cPDM solution for the mid-market. According to CIMdata's research, companies within the above industry segments have been very receptive to mid-market PLM solutions because they share many of the same business challenges and characteristics:

- An increased focus on design/engineering and production of primarily mechanical parts, components, and assemblies, with the need to capture and manage this product related data throughout the enterprise.
- Relatively localized engineering and design, where the Engineering Manager understands the need for data management.

- The manufacturing engineering responsibilities are within the engineering department and the relationship between product engineering and manufacturing engineering is well understood.
- The need to integrate with one or more MRP II/ERP systems to communicate product definition information but with limited design supply chain management requirements; only basic supplier access is required.
- The need to manage components and suppliers as part of the product development process, not as a separate, “after the fact” task.
- Limited Information Technology (IT) resources, so they need software at a reasonable price point, that is easy to install and maintain, is integrated in nature to reduce integration costs, and that generates a quick return on investment (i.e., months, not years).

These characteristics apply to many enterprises that supply OEMs, as well as companies that sell their products directly to consumers. Due to their limited financial and support resources, these companies are rarely early adopters of new technologies. However, as packaged solutions become available at lower price points, these organizations provide a broad market for software sales, and limited services and consulting. Over the last several years, PLM solutions for mid-market enterprises (e.g., Teamcenter Express) have become both feature-rich and price-affordable.

Teamcenter Express, along with Siemens’ other PLM solutions, is sold directly as well as through multiple global channel partners. In general, Siemens has defined a set of named accounts by industry and geography. This helps both Siemens’ direct sales organization as well as its channel partners successfully compete in the market. The program also supports an incentive-laden business development plan. Additionally, Siemens strongly encourages partners to increase their investment in the multi-level certification and training components of the program. To date, Siemens has trained sales and implementation resources from more than 400 channel partners globally.

Since the channel partner program’s inception a little over two years ago, Siemens has spent a significant amount of time, effort, and money developing and rolling out channel-supporting Web portal, material, seminars, training classes, and education. According to Siemens, over the last two years, Teamcenter Express has been sold to companies in ten languages and 35 countries across its three zones (i.e., Europe/Middle East/Africa, Americas, and Asia-Pacific). It is interesting to note that in some cases the introduction of Teamcenter Express has led to the sale of Teamcenter.

The initial need for Teamcenter Express came from the design management issues faced by today’s typical small-

to medium-sized manufacturing company. Siemens recognized these needs and chose to develop a highly-preconfigured cPDM-focused PLM solution based on their proven Teamcenter platform. By basing their solution on Teamcenter, Siemens was able to speed the solution’s development and provide a natural integration with a user’s daily Windows-based desktop environment, and a long list of engineering-centric development tools (e.g., Solid Edge, NX and NX CAM, I-deas NX Series, AutoCAD, CATIA V5, Inventor, Pro/ENGINEER, and SolidWorks) as well as a set of ERP integrations (e.g., Microsoft Dynamics and SAP).

Teamcenter Express is packaged and sold based upon named user licenses—Teamcenter Express Author, Teamcenter Express Professional, Teamcenter Express Consumer and Teamcenter Express Shop Floor Viewer represent the core licensing packages. Each of these licenses provides preconfigured access to the following specific role-based functionality:

- *Teamcenter Express Author*—primarily for CAD designers and engineers. This license provides access to PDM data creation and vaulting, workflow, and product structure management functionality. Additionally, access is provided to basic visualization capabilities and optional CAD integrations.
- *Teamcenter Express Professional*—primarily for engineering managers, manufacturing planners, and engineering system administrators. This license provides access to PDM data creation and vaulting, workflow, and product structure management functionality. In addition, access is provided to enhanced visualization capabilities (e.g., 3D navigation and markup and PMI symbols).
- *Teamcenter Express Consumer*—primarily for purchasing agents, office administrators, design office clerks, and marketing managers. This license allows users to query, view, print, and participate in workflows.
- *Teamcenter Express Shop Floor Viewer*—primarily for shop floor team leaders and machine operators to search, view, and interrogate released product data.

In addition to these core licenses, Siemens offers the following specialized named user licenses:

- *Teamcenter Express Manufacturing Author*—primarily for manufacturing engineers who use NX CAM or CAM Express to define manufacturing oriented product information as part of the product lifecycle.
- *Teamcenter Express Manufacturing Part Planner*—primarily for manufacturing engineers

responsible for defining part-oriented manufacturing plans, and associated manufacturing processes and tooling.

- *Teamcenter Express Manufacturing Resource Manager*—primarily for manufacturing engineers responsible for the definition and management of manufacturing resources (e.g., machine tools, cutting tools, tool assemblies, fixtures, etc.).
- *Teamcenter Express for SAP*—primarily for product development personnel responsible for the release or change of engineering data (e.g., parts and BOMs) to SAP. A minimum of five licenses must be purchased.
- *Teamcenter Program Execution Management*—primarily for project and program scheduling
- *Teamcenter Classification*—primarily for rigorous classification of items based on company and international standards.

Current Siemens prices for all the role-based licenses described above appear to be reasonable and competitive at the mid-market entry point being targeted.

In addition to the above licenses, the Teamcenter Express solution requires Windows XP or Windows Vista for all client machines, and assumes that the client organization has a Microsoft Windows Server infrastructure in place. Organizations implementing Teamcenter Express will also need the appropriate number of SQL Server named user licenses. These licenses can either be purchased separately or directly from Siemens.

In the area of prepackaged services, Siemens has defined a set of packaged implementation service bundles. According to Siemens, this standard set of implementation packages for Teamcenter Express results in the delivery of a production-ready cPDM environment that supports everyday tasks and processes for product design and engineering. These predefined service bundles generally include the following implementation stage components:

- *Preparation*—a site survey document and statement of work is provided and completed with the customer during this implementation stage to understand the current environment where Teamcenter Express will be implemented.
- *Software Installation*—Microsoft SQL Server, Teamcenter Express Server, and Client software components are all installed during this stage.
- *Configuration*—during this stage, customer-specific configuration using commercial off-the-shelf capabilities is performed.
- *Training*—Teamcenter Express user and administrator training is executed during this stage. Training is included in all of the implementation packages.

- *Mentoring*—Throughout the implementation, the professional implementer (i.e., Siemens PLM Software or a Siemens-certified channel partner) works closely with the customer to transfer knowledge on best practices for system installation and configuration and to resolve issues.

According to Siemens, several standard service bundles are available based on the scope of the implementation, the number of users to be trained, and the number of CAD integrations to be configured. The basic package includes software installation and configuration, training for ten users, and installation and configuring of a single CAD integration. Implementations of this scope are designed to be delivered in ten business days. Additional implementation bundles are available that address larger numbers of users, the implementation of additional CAD integrations, ERP integration, data migration, and implementation of a replicated multi-site environment.

4. Product Functional Assessment

Unless otherwise noted, this product assessment describes functions of the Siemens' Teamcenter Express Version 4 solution, scheduled for first customer shipment in June 2008. In general, this release represents and incorporates the enhancements and suggestions from Siemens' customers, partners, and internal consultants worldwide. This assessment is organized into subsections that address the major areas of CIMdata's World-Class PLM Business Solution Model (see Figure 4). These areas are consistent with product comparisons used in CIMdata's other PLM program assessments.

4.1 Core Functions

In general, core functions found in a PLM solution can be described under six major headings:

- Data Authoring (CAx)
- Data Vault and Document Management
- Workflow and Process Management
- Product Structure Management
- Classification Management
- Program and Project Management

Teamcenter Express provides a solid set of preconfigured product data management functionality designed to meet the requirements of today's sophisticated medium-sized manufacturing enterprises. With its focus on product data management, the Teamcenter Express solution offers a rather simple and fast-to-install set of preconfigured best-

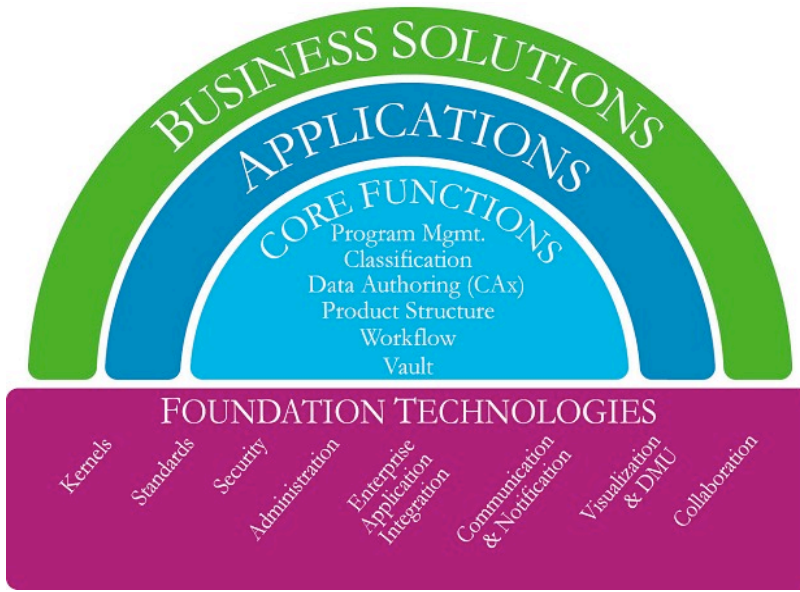


Figure 4—CIMdata’s World-Class PLM Business Solution Model

practice-based workflows and functions. Its architecture, which is based on the Teamcenter platform, is scaleable and proven.

Siemens has optimized Teamcenter Express’ architecture around Microsoft standards; thereby allowing many medium-sized companies to deploy it on their existing software platforms without additional investment. Teamcenter Express’ main capabilities include:

- Wizards that guide data creation and input
- Complete search and retrieval
- Managed check-in and check-out
- Revision and version control
- Part and assembly structure management
- Documentation management
- Embedded visualization
- Dynamic user interface
- Flexible data structure
- Dynamic access control based on user’s assignment to groups and roles

These and other capabilities provided by Teamcenter Express are described in the following sections.

4.1.1 Data Authoring (CAx)

This core PLM function usually provides a significant percent of a PLM solution’s product data authoring capabilities. These computer-aided tools (CAx) can be divided into a number of categories: CAD (both mechanical as well as electrical), CASE for Software Engineering, CAE for Engineering analysis, and document publishing, to name a few. These tools generally work in an integrated manner

with the other elements of a PLM solution to provide complete creation and control of an organization’s product definition lifecycle. In many PLM implementations, these tools come from a number of solution providers and are integrated so that product data is seamlessly transferred between the design and the data management environments.

As part of the Velocity Series, Teamcenter Express has been designed to provide preconfigured multi-CAD data management capabilities. Integrations are provided to Solid Edge, NX, and a number of third-party CAD systems. These integrations continue Siemens’ long tradition of delivering comprehensive integrations that satisfy most organizations’ needs (see the section entitled “Application Interfaces” for more detail).

Organizations that opt for the Solid Edge integration have access to Solid Edge via the Solid Edge Embedded Client (SEEC). This client provides a seamless user experience for all file operations accessible from within Solid Edge. It also supports document attribute mapping, and the display of key Teamcenter Express attribute and status data via the Solid Edge Pathfinder. SEEC enhancements that support Solid Edge with Synchronous Technology include: user interface improvements, improved integration with Solid Edge libraries, expanded support for non Solid Edge documents, and improved legacy data import capabilities. Siemens reports that this integration provides a Solid Edge user transparent access to typical product data management (PDM) related design tasks.

The NX integration provides functionality that automatically supports revision control, implicit check-in and check-out of CAD data, and the synchronization of assembly information between NX and Teamcenter Express. This last feature allows designers to use either Teamcenter Express or NX to configure complex product structures. Siemens reports that the NX integration also provides a NX user transparent access to typical PDM related design tasks.

The current integration available for NX 5 enables the NX user to work within Teamcenter from inside the NX user interface. This embedded interface provides the user access to Teamcenter’s Navigator, File Select, template-based File New, and advanced searching functionality. In addition, both of these integrations enable embedded viewing of 2D and 3D CAD data generated within the Teamcenter Express user interface.

It should be noted that these integrations provide access to two industry leading design-centric mechanical CAD solutions. Both have been built on a foundation of core modeling and process workflows that help engineers design and model parts efficiently. Solid Edge and NX utilize Siemens' Parasolid modeling kernel. Both CAD systems provide solid modeling tools that allow designers to quickly create basic shapes, and easily add common mechanical features like holes and rounds, as well as more complex geometry such as draft angles, lofts, and helical features.

Teamcenter Express also offers integrations to NX CAM and CAM Express. The Teamcenter Express integration to both NX CAM and CAM Express allows Teamcenter Express to be an organization's CAM data management solution. As part of the Teamcenter Express Manufacturing option, this integration enables CAM Express or NX CAM setups and NC files to be managed using the part planner functionality. It also allows the user to view setup information and CAM output files via a Web-based manufacturing structure viewer. In addition, it enables the management of machine tools, cutting tools, and fixtures through an integrated resource management library.

4.1.2 Data Vault and Document Management

Teamcenter Express provides a data vault that uniquely identifies every data item, stores attributes, manages relationships to other items, and maintains an audit trail of changes to that item. Teamcenter Express provides an Access Manager subsystem that controls ownership of and access to all Teamcenter Express managed items. Items are subject to both version (design increments) and revision (design changes) control. Data is managed as a unit, with full data linking capabilities provided, so that where-used and where-referenced queries are possible. Teamcenter Express can be configured on install as a single-site or multi-site solution. This allows both metadata as well as application data files to be distributed across the network so that replicated files can be maintained to reduce network overheads.

Teamcenter Express is preconfigured with five core item types—item, standard item, document, engineering order, and schedule. These item types are then used to support the various preconfigured workflows and approximately twenty reports that are provided along with the install. Items allow an organization to capture and manage almost any type of data file/document.

A.W. Chesterton Company

A.W. Chesterton, an internationally recognized manufacturer of industrial products, is headquartered in Woburn, MA and employs approximately 500 people in its Massachusetts sites. The company is one of the largest manufacturers of industrial fluid sealing, Engineered Polymer Solutions (hydraulic/pneumatic), and ARC Composite Coatings and Maintenance Products in the world. Like many mid-market companies, A.W. Chesterton found itself trying to get the most out of an old drawing management system that was no longer being supported when they came to the conclusion that they needed to replace it. As a user of Siemens PLM Software's NX 3D CAD system and visualization tools they naturally considered Siemens' other PLM enabling solutions. Over an approximate 12-month period, A.W. Chesterton studied the PLM market and analyzed Teamcenter Express as well as PLM solutions from other PLM solution providers. According to Mrs. Suzanne Shelley, A.W. Chesterton's IT PLM Manager, their investigation was quite thorough and included site visits and speaking with existing customers. Overall, the selection team felt that Siemens PLM Software provided a better solution that could be implemented quickly and expanded as they need.

Mrs. Shelley reports that their plans call for Teamcenter Express to go live in July of this year. Teamcenter Express will be used to manage A.W. Chesterton's NX and SolidWorks data as well as a number of work processes, including the organization's engineering change management process with complete change request, order, and notice support. To be fully functional, the implementation will migrate a significant number of TIFF documents stored in its current system to Teamcenter Express. During the migration the documents will be converted to PDF. Approximately 100 users will be using the system once implemented, and this number will increase in the future as usage increases and system access expands to other areas of the business.

In the important area of business benefits from implementing Teamcenter Express, Mrs. Shelley states that the company expects to reap significant and measurable financial benefits as well as being able to more quickly respond to customer queries, thereby increasing customer satisfaction. Additionally, the automation of certain key product lifecycle process should result in the reduction in cycle time and the quantity of non-valued added tasks performed. Finally, Mrs. Shelley notes that the implementation of Teamcenter Express should directly result in productivity gains since it will be much quicker to find information and share it with remote sites.

In Teamcenter Express Version 3, Siemens added “Smart Codes.” These Smart Codes, or Intelligent Part Numbers, are assigned to items (e.g., parts and products) based on predefined Lists of Values. This functionality automates the codification of product/part numbers based on preset parameters defined within a system set up file. The functionality provided supports multiple counters (including the support of predefined number ranges) and numbering schemes in a single database. Besides Lists of Values, the functionality also supports Combo boxes, Radio buttons, Logical values, and Free text fields.

Users are guided through much of Teamcenter Express via preconfigured wizards. These wizards have the look and feel of any Windows-based wizard. They have been designed to guide a user through a sequence of questions related to a specific function or task that must be accomplished. Teamcenter Express ships with a number of these predefined wizards, including a New Item Creation, New Workflow, and Report Creation wizard, to name just a few. These wizards should increase user productivity, especially for the casual user who uses the system on an infrequent basis.

Siemens’ introduced extended document management related integration capabilities to Microsoft Word and Excel (Microsoft Office 2007 editions) with the release of Teamcenter Express Version 3. The integration with these Microsoft Office applications allows Microsoft Office tasks to be associated with Teamcenter Express cPDM operations. Users can initiate a document review and approval from within Microsoft Office applications and manage Microsoft Office Template files from within Teamcenter Express. This capability supports general document users to work within their commonly used desktop environment without having to go into Teamcenter Express to perform basic document management related tasks. This is supported by the fact that the integrations make common Teamcenter Express document management functions operational from within Microsoft Word’s and Excel’s native menu paradigm. In addition, new capabilities have been introduced with Version 4 that allow MS Excel users to edit “live” (i.e., in real time) Teamcenter Express data from within MS Excel. This new functionality supports live synchronization of Teamcenter Express data, including complete product structures, while working within MS Excel. This “Excel Live” capability is impressive and it should greatly enhance the usability of Teamcenter Express’ for your typical MS Office user.

Furthermore, given the appropriate Teamcenter Express license (i.e., Author) you can create folders and other Teamcenter Express constructs within Microsoft Word and

Excel. In addition, JT lightweight 3D representations can be embedded directly into these documents. The integration also allows Microsoft Office files to be linked from within with other Microsoft Office files (standard Microsoft capabilities with the link understood by Teamcenter Express). Finally, the integration supports the new Microsoft Office file types as well as the old ones.

Teamcenter Express provides strong attribute search functionality. In addition, Teamcenter Express provides support for an integrated full text search engine. Teamcenter Express offers a “My Saved Searches” area where an individual user can save and access past search criteria for later re-use. It is important to note that searches defined by the Teamcenter Administrator are accessible to Solid Edge users within the File Open interface. This easy-to-use functionality does away with the need for a Solid Edge user to switch over to Teamcenter Express to run a standard search.

4.1.3 Workflow and Process Management

Teamcenter Express leverages Teamcenter’s extensive enterprise process management capability. Siemens has used this platform to graphically create, monitor, manage, and control a set of pre-defined best-practice workflow templates. These preconfigured workflows include: development release, engineering order, production release, status change, and obsolescence process. Siemens has used Teamcenter Express specific developed workflow handlers (i.e., logic) as well as classic workflow handlers to enable these processes. The preconfigured workflows provided allow for quicker implementations because they provide a sound starting point. A number of the workflows provide fairly extensive capabilities, e.g., the preconfigured Engineering Change capabilities include engineering order forms (Change Request and Change Notice forms with List of Values functionality) and an engineering order workflow that automatically routes obsolete parts.

A system administrator can define additional workflows. Both serial and parallel processes, as well as sub-processes are definable. Business rules can be applied to the process steps and triggers can be defined at multiple levels of user interaction, e.g., a trigger can be used to initiate Teamcenter Express’ translation services. In addition, the workflow can link to any external SMTP-compliant e-mail systems. Finally, it is worth noting that Teamcenter Express maintains a history (i.e., audit) of all actions that may occur in a defined Workflow process.

In addition, Teamcenter Express provides solid workflow integration with Microsoft Outlook. This integration provides an automatic bi-directional synchronization

between Teamcenter Express and Microsoft Outlook (see Figure 5). This synchronization allows Teamcenter Express tasks to be visible and executed from within the Microsoft Outlook user interface. Users of this integration can send/compose email with Teamcenter Express data attached and store/link important emails into Teamcenter Express. In addition, users can review and approve from within Microsoft Office applications as part of the workflow. This permits Microsoft Office users to work completely within their natural desktop applications' environment without having to go into Teamcenter Express to perform basic document management tasks. As with the document management capabilities already described, this capability has proven to be very helpful for casual users of the cPDM solution; many of which no longer need to even go into the solution to perform their day-to-day tasks.

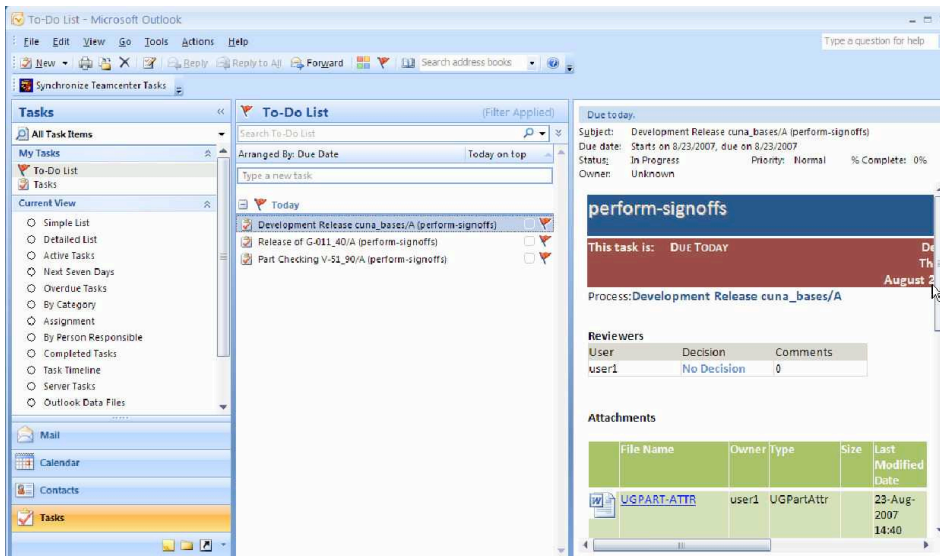


Figure 5—Viewing Teamcenter Workflow Tasks from within Microsoft Outlook

4.1.4 Product Structure Management

Teamcenter Express implements one of the best design-focused configuration modeling capabilities available. Teamcenter Express supports revision-specific parts, bills of material and related documentation, change control, and integration to several ERP/MRP systems. If an organization requires product variants and options modeling, they can upgrade to Teamcenter Engineering.

Teamcenter Express' product structure capabilities are supported through the Teamcenter Express Product Structure Management (PSM) module (see Figure 6), which provides patented product structure configuration management modeling capabilities and the ability to model

non-geometric items (e.g., grease). This module provides product designers with the ability to design in context of a preconfigured bill of material, to visualize, navigate, and find information more quickly for re-use, while better understanding the changes occurring in the product.

Teamcenter Express supports basic Configuration Management (CM) practices that enable the user to configure working or released revisions of parts or assemblies to be loaded into an active session. Users can set rules to determine which revisions are configured, and which components are effective in the Bill of Material. In an organization practicing concurrent engineering, CM secures the integrity of the assembly model by managing multiple concurrent user access, thus preventing unauthorized changes.

When the optional Teamcenter Express Manufacturing application (see "Applications" section below for additional detail) is chosen, additional CAM related items (e.g., tooling, fixtures, etc.) can be modeled as part of the complete product structure. This is enabled through a tight integration with NX CAM or CAM Express.

Teamcenter Express offers a BOM compare function that matches bills of material and highlights differences, and can be used to relate multiple or single levels of the BOM to show discrepancies.

The PSM "Where Used" function enables the user to quickly conduct an impact analysis by finding item revision locations in

all structures. Results of the search can then be displayed or printed.

In the area of usability, Siemens has embedded a number of enhancements including the ability to edit product structure elements (i.e., BOM line entries) in place via a separate Viewer pane. Siemens has also included a BOM pack and re-sequence algorithm in support of product structuring.

This comprehensive product structuring module can also be used to automatically capture and bi-directionally synchronize the product structure from a number of integrated CAD systems. Sequence numbers are automatically generated but can be manually edited. A bill-of-materials (BOMs) report can then be generated. The

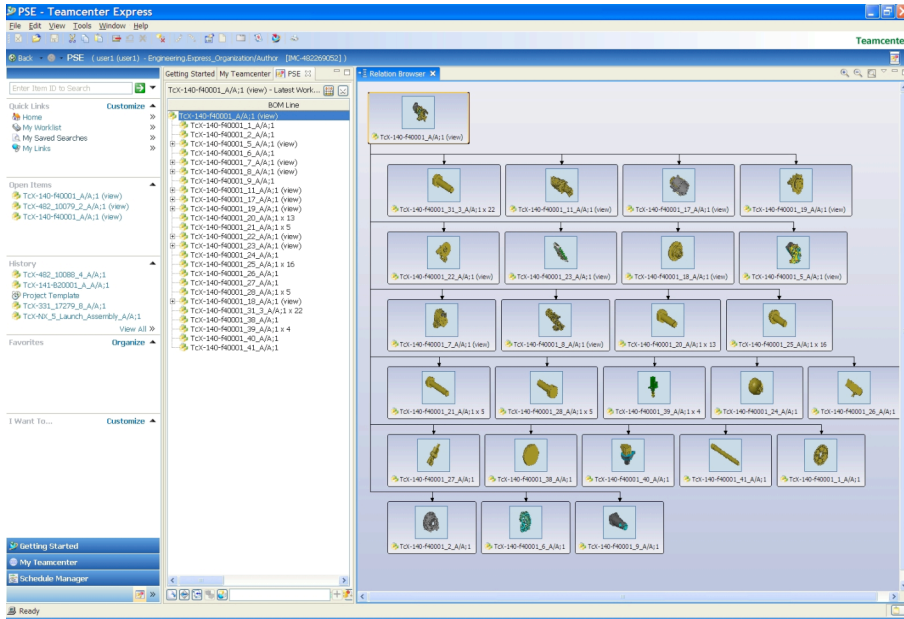


Figure 6—Teamcenter Express’ Functionality Rich Product Structure Module

product structure can be graphically viewed, navigated, and marked up.

Finally, Teamcenter Express provides a number of preconfigured part and product structure related reports (e.g., part change history, change report, and bill of material). A user, using a preconfigured wizard, can define the report’s type, subject data, and output format (e.g., Microsoft Excel format).

4.1.5 Classification Management

The Teamcenter Classification module is available as an add-on option to Teamcenter Express and provides the ability to create an unlimited number of classification schemes for capturing commodity and parameter data on parts or other specifications and documents. This tool enables users to categorize definition data on the basis of hierarchical classifications, and establish attributes for each class, including physical characteristics (e.g., length, diameter, weight, density, color, and material) that designers can use when searching the database. Parameters can be strings, floats, integers, dates, or List-of-Values. In addition, this module supports the classification of both standard and previously designed parts, with a free definition of attributes and standard search facilities for many types of users. These general capabilities enable controlled access to groups, classes, and classification instances.

Teamcenter Express’ Manufacturing Express Resource Manager leverages the built-in general classification

management application to support the setup and maintenance of a manufacturing resource classification hierarchy. Additional description of these manufacturing resource classification related capabilities can be found in the section entitled “Applications.”

4.1.6 Program Management

With the release of Teamcenter Express Version 4, Siemens has introduced a set of project and program management functionality. To provide this functionality, Siemens has made available Teamcenter’s Schedule Manager (see Figure 7) to Teamcenter Express. This schedule management tool has been configured to support the needs of a typical project manager or lead engineer, your typical manager, and an engineer or supplier working within the context of

a development program. Main functionality provided includes schedule, task, program, and calendar management. In addition, program views are enabled. These easily configured views allow authorized users to define views (i.e., groupings) of key project data across multiple projects and programs. The user also has the ability to define and/or choose tasks, milestones, sort order, colors, and summary roll-ups.

As with other capabilities provided, the newly released project and program management functionality comes with pre-configured templates (e.g., project templates) and user disciplines (e.g., Manager). Additional capabilities allow schedules defined in Teamcenter Express to be imported from and/or exported to MS Project, and specific deliverables managed in Teamcenter Express to be linked to specific project tasks. In the future Siemens plans to enable live project links between the Teamcenter Express Schedule Manager and MS Project.

The capabilities provided should prove to satisfy the project and program management requirements of most of the companies Teamcenter Express is targeted. As with previous releases of Teamcenter Express, customers with more sophisticated program management requirements can still upgrade to the Teamcenter and take advantage of additional capabilities.

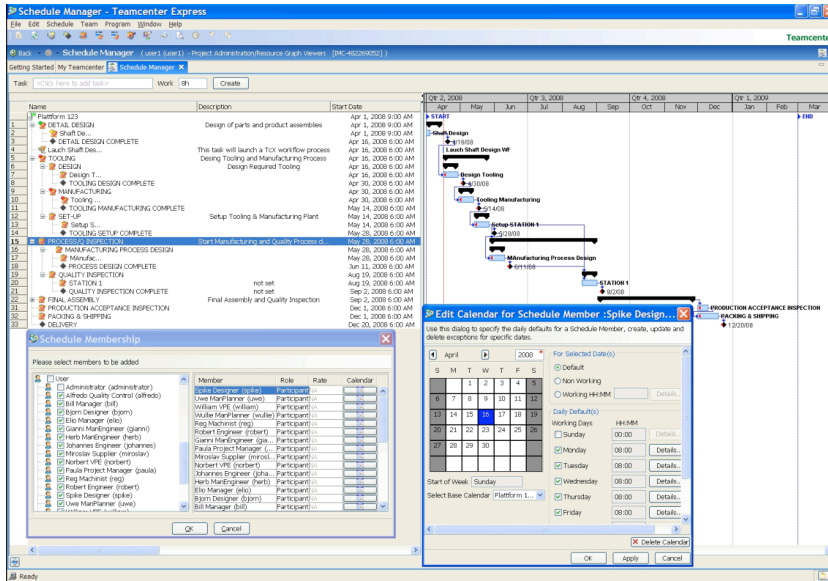


Figure 7—Teamcenter Express’ Schedule Manager

4.2 Foundation Technologies

Foundation technologies provide support to the core PLM functions. Foundation technologies interface with the operating environment and insulate the user from the low-level complexity of the solution. PLM foundation technologies include:

- Kernels
- Standards
- Security
- System Administration
- Enterprise Application Integration
- Communication and Notification
- Visualization and DMU
- Collaboration

These underlying technologies may not be visible to many users, but they are necessary to allow PLM solutions to operate efficiently. The following sections describe the PLM Foundation Technologies underlying the Teamcenter Express solution.

4.2.1 Kernels

In a typical PLM solution, the modeling kernel provides the foundation for the modeling of product geometry. Teamcenter Express does not directly provide this capability. However, Solid Edge, another major component of the Velocity Series, deploys a core-modeling environment that is based on Siemens’ Parasolid geometric modeling kernel. This is a robust, well-proven 2D/3D-

modeling environment. This kernel is one of the most widely-used 2D/3D-modeling environments in the world.

4.2.2 Standards

Standards support comes in many different forms, such as data standards like STEP and information technology (IT) standards like Java and .NET (2.0 Framework). The use of standards in a PLM solution is critical. The proper use of standards often provides greater interoperability without additional expense. In addition, many standards are backed by very large corporations which allow smaller companies to take advantage of research and development investments made by others.

In the development of Teamcenter Express, Siemens relied heavily on a number of mid-market IT standards, e.g., Microsoft SQL Server and Windows Server—Windows

being the de facto standard for most small- to medium-sized enterprises and SQL Server being one of the most widely used relational database management systems (RDBMS) in the world. By using these technologies, Siemens has allowed mid-market organizations to take advantage of tools that they probably already support within their organization thereby potentially reducing support and licensing costs.

Siemens reports that Teamcenter Express takes advantage of a number of Microsoft .NET components within its Web interface. Siemens expects to continue to leverage the platform as Microsoft delivers future technologies based on it. CIMdata is happy to see Siemens leverage this platform for its mid-market cPDM solution. This should prove beneficial for Siemens’ customers for years to come.

4.2.3 Security

Teamcenter Express provides a preconfigured access control model based on a user’s assignment to roles and groups. Access to objects is granted by the administrator via the Access Manager (AM) rule tree. This is a tree of rules and access permissions, and when processed will determine the access that each user has to any given object. The AM is responsible for interacting with the user to build, modify, and administer the AM rule tree. In addition, Teamcenter Express supports project level security.

4.2.4 System Administration

Teamcenter Express includes a comprehensive administrator’s interface that provides tools to set up and

Integrated DNA Technologies

Integrated DNA Technologies (IDT), headquartered in Coralville, Iowa, is a biotechnology-manufacturing leader in nucleic acid synthesis for research & development purposes. Since its formation in 1987, IDT has been a major force in advancing biotechnology research both as a leading supplier of custom oligonucleotides and a developer of innovative new biotechnologies.

According to Mr. Bob Schafbuch, IDT's IT Director, IDT's design engineering team, like many other teams commonly found in today's small to mid size companies, had no collaborative software four years ago. At that point in time they used manual file management techniques to store and share design information. This required a significant amount of individual discipline to ensure that consistent naming conventions were utilized and so that data would be placed in the appropriate shared network drive at the appropriate time in order to distribute their data with other enterprise participants.

As in other companies, the IDT's manufacturing team places a high demand on the design team (i.e., the team responsible for the design of IDT's propriety manufacturing platforms). This fact, coupled with the organization's desire to achieve ISO 9001 status, according to Mr. Schafbuch, lead the company to investigate and purchase tools that supported document control. This study ultimately led to the purchase and implementation of Solid Edge and Insight Connect to support Solid Edge data management requirements. Mr. Schafbuch reports that the company decided to implement Teamcenter Express (version 2) after a 6-month prototype of Insight Connect. In general, they realized that they needed more than just CAD data management functionality.

Today, IDT's Teamcenter Express solution supports 25 named users and a number of sites. The Teamcenter Express multi-site implementation currently supports the design team, a machine shop, a purchasing group, and a maintenance team all located in Iowa, and an operations group in San Diego, California. According to Mr. Schafbuch, IDT is currently using Teamcenter Express to capture, manage, and share a set of key artifacts (e.g., CAD models, specifications, draft files, testing documents, vendor specifications, etc.) generated during their design, prototype, and release process. In addition, Teamcenter Express is being used to automate a number of product lifecycle processes, including their revision, prototype, and release processes and their associated approval tasks. Mr. Schafbuch states that their long-term goal for Teamcenter Express is for it to manage their one version of the truth thereby being the organization's central product data repository, and to fully support various regulatory standards, e.g., the support of the concurrent engineering process. In the long-term, they hope to integrate Teamcenter Express to their ERP system.

As currently implemented, Teamcenter Express provides the organization a number of measurable benefits, including the support of ISO certification. It also provides its users with a reliable, repeatable, and centralized access point to look for and find product information. Mr. Schafbuch also notes that the solution has allowed them to manage a consistent part number nomenclature and to be able to have closer coordination of the design team and the various stakeholder groups. Mr. Schafbuch is quick to point out that IDT's Teamcenter Express implementation has resulted in some side benefits, including bringing the company's various groups together onto the same page, utilizing the same information. This has not come without some work in the area of organizational change.

maintain the system. In particular, the extensive access control subsystem is accessed via the administration tools. The Access Manager provides a graphical view of a person's privileges on an object. The administration area also includes a hierarchical organization chart. Backup and archive tools are also supported within the standard product.

The Teamcenter Express System Administration (SA) module provides the mechanism to create or define the organization's resources to Teamcenter Express. SA includes the basic functions to define people, users, groups, roles, tools, sites, etc. Teamcenter Express allows these definitions to be dynamically changed, thereby not

requiring recompilation after each adjustment to the data model. SA is also used to define the access control rules for data, functions, users, groups, and the enterprise, to maintain the integrity of the product information.

Teamcenter Express provides the system administrator simplified attribute mapping and data model change functionality. This functionality enables the administrator to change the data model "on the fly," e.g., attribute and form changes are automatically reflected in the database through the use of an easy-to-use interface. The administrator can also create new or change existing attributes—viewing, filtering, changing, adding, and updating the Teamcenter Express data model and making it available to the user

community in minutes has been enabled. In addition, functionality is provided that allows Teamcenter Express attributes to be synchronized with CAD or Microsoft Windows file properties.

In the spirit of providing a fully functional solution, Siemens pre-loads Teamcenter Express with a preconfigured organization and three standard types of roles: authors, managers, and consumers. As mentioned earlier, an author is usually a CAD designer or engineer. The manager is someone who usually reviews and approves data, and a data consumer is someone who usually just searches and views data, for example a user in purchasing or on the shop floor.

Teamcenter Express provides system management functions through a graphical user interface in addition to those mentioned above, such as:

- Define and maintain meta-data
- Manage user authorizations
- Manage data distribution
- Manage archives and backups
- Manage rollback/recovery after system problems or failure
- Configure and modify workflows, reports, and business rules (part numbering, etc.)
- Configure print, plot, and watermarking services

The Teamcenter Express Administrative Client is delivered as a component of the rich client and is accessible only by Administrative level users.

Teamcenter Express provides preconfigured Extensible Stylesheet Language Transformations (XSLTs). The support of this XML-based language allows Teamcenter Express to generate report formats other than XML. In addition, the solution ships with a part change history and stock list report, and the ability to select and generate out-of-the-box reports from a menu pick-list.

An automatic scheduling mechanism and priority queuing functionality are enabled by Teamcenter Express' print and plot services. The system administrator is responsible for the configuration of watermarking, scaling, multiple copy enablement, and other default settings. An administration tool is also provided to manage print and plot events. In addition, the system can be configured in a manner that it supports ad-hoc, batch, and workflow-driven print and plot event execution.

4.2.5 Enterprise Application Integration

These Enterprise Application Integration (EAI) technologies are often used to connect to databases managed and populated by other systems. Sometimes they will only reference the information and other times will

actually copy the information for internal use. EAI technologies provide a solid approach for product data access without having to replace existing systems or develop complex integrations. Many times these EAI capabilities are seen as a way to increase the usefulness of legacy systems that contain product definition information.

EAI technologies usually provide a declarative, graphical method to define and capture collaborative business processes that span multiple enterprise applications and legacy or custom systems. This integration architecture usually allows these collaborative business processes to be implemented in a modular, application-independent fashion.

At the current time, Teamcenter Express does not directly provide support for this foundation technology. However, it should be noted that Siemens does offer the Teamcenter Integrator EAI solution and customers who require this technology can implement or upgrade to Teamcenter Engineering. This solution, part of Siemens' complete PLM solution offering, takes advantage of standards-based Web technology to link various enterprise systems into a single environment.

4.2.6 Communication and Notification

Teamcenter Express provides for communication and notification both by means of e-mail and the Teamcenter Express "Inbox." A standard SMTP-compliant interface to external e-mail clients such as Microsoft Outlook is available. URLs associated with specific items managed by Teamcenter Express can be sent via e-mail. In addition, the Microsoft Outlook 2007 integration provides functionality that synchronizes Teamcenter tasks with Microsoft Outlook's task manager.

4.2.7 Visualization and DMU

Teamcenter Express fully embeds a robust set of Teamcenter Visualization components (see Figure 8). This best-in-class solution, which is part of Siemens' complete PLM solution offering, provides visualization (e.g., view and markup capabilities) and digital mock up capabilities. This functionality is delivered as an integrated viewing application that enables dynamic view and markup of 3D part/assembly as well as 2D data (e.g., drawings and Microsoft Word documents, other formats such as JT, JPEG, GIF, and PDF). Detailed visualization functionality provided includes various viewing controls, measurements, dimensioning, etc., based on the level of visualization included.

Teamcenter Express' embedded visualization functionality is common across both the Rich and Web Clients.

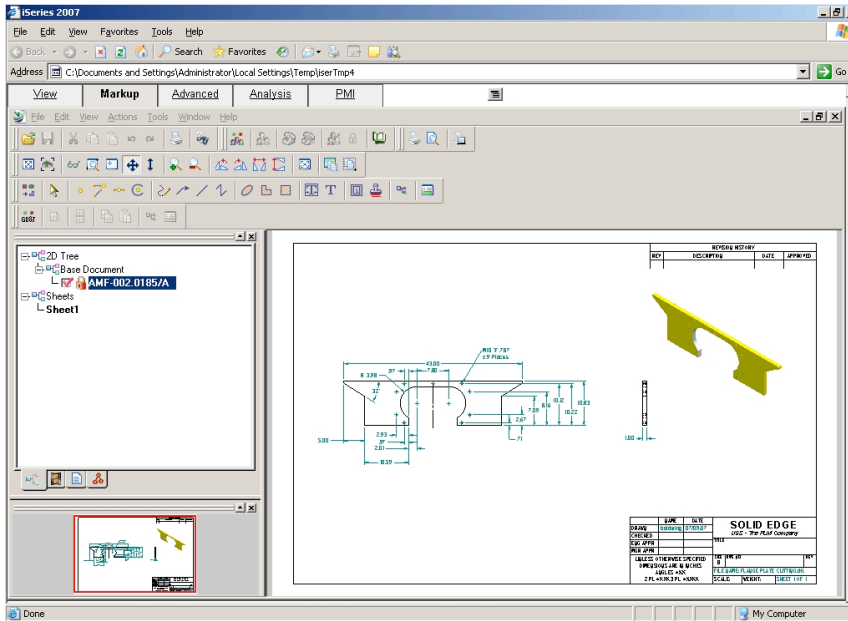


Figure 8—The Embedded Visualization Tool within the Web Client

Capabilities provided allow Web client users to view, mark-up, and print. In addition, embedded Teamcenter lifecycle visualization for View and Mark-up operations is supported. Siemens reports that users of Teamcenter Express Professional visualization licenses can view full screen, view and create snap shots, and view CAE generated images. It should be noted that Teamcenter Express' visualization capabilities auto install from within the Teamcenter Express Web Client and with a 3D Image Dataset type fully supported out-of-the-box.

Fundamentally, this visualization functionality has been designed to enable engineering users to review multi-CAD 3D assemblies without requiring access to a CAD system. If additional visualization and digital mockup capabilities are required, Teamcenter Express customers can either upgrade to higher levels of visualization or purchase Siemens' Teamcenter Visualization tool. This industry-leading visualization tool supports all the capabilities mentioned here as well as fly-through, animation, virtual mock-up, and creating process instructions, to name a few.

4.2.8 Collaboration

To support the collaboration requirements of mid-sized manufacturers, Teamcenter Express has adopted the Package Collaboration File (PCF) format as the mechanism to enable asynchronous collaboration. A PCF file can contain file markups, as well as additional data, such as CAD files of various formats (e.g., Solid Edge, DXF, DWG, STL, DGN, ME10, X_T, and NX) and non-CAD

files (e.g., Microsoft Office and PDF)). PCF handling in Teamcenter Express includes PCF import, export, viewing, and navigation. In addition, PCF files can be emailed to external users and are supported by both the Teamcenter Express Rich client and the Web client.

XpresReview Package Exchange enables the collection, packaging, and managed export and import of what Siemens calls a Review Package. This package, which can include PCF or ZIP formatted content, supports data from any Teamcenter Express supported document type and CAD system. In addition, item/revision and dataset creation as well as structure search and filter mechanism are supported by this added functionality.

XpresReview Package Exchange is basically an asynchronous collaborative mechanism, well suited for use in supply chain design review processes. In such processes, a Teamcenter Express user would define a collection of one or more files to be shared with the supplier. This package can then be emailed and tracked by Teamcenter Express to the appropriate supplier contact as defined by the user. Once received, the supplier, using the free XpresReview tool (see Figure 9), can open, view, and edit the content of the package, and add any appropriate mark-ups to the 3D and 2D product data contained in it. The supplier can then return the package for review and storage.

Synchronous collaboration capabilities (e.g., real-time conferencing) are supported within the Teamcenter Express visualization environment. Teamcenter Express users can also upgrade to Teamcenter and add Teamcenter Community for more comprehensive synchronous collaboration for document management.

4.2.9 Data Transport and Translation

Teamcenter Express manages all file transport services without user involvement. File translation (e.g., to DWG or PDF) can be performed automatically, after some configuration, by means of event triggers that execute external programs. JT file creation and transport is standard with all CAD integrations. Teamcenter Express' capabilities in this area are supported by Teamcenter Express' Translation Services. The approach taken has streamlined and simplified a rather complex process. This preconfigured functionality is relatively easy to install and operate.

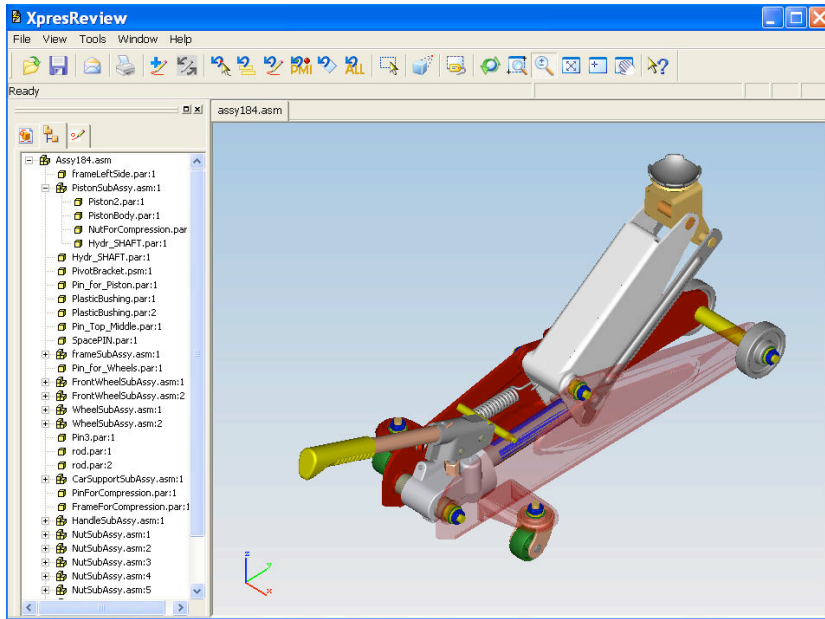


Figure 9—The Free XpresReview Viewer

Teamcenter Express Translation Services is comprised of three main components: Teamcenter Express Rich client, Engineering Translation Services (ETS), and Translation Server Toolkit (TSTK). Combined, these components enable a process that automatically generates visualization files (e.g., JT, CGM, DXF, PDF, etc.). It also enables a mechanism to manually, or via a predefined workflow trigger, submit a request to execute a translation and return the generated data and status. This service operates in an asynchronous mode. Extract, translate, and load operations are all done offline so that the user can continue using the Teamcenter Express without waiting.

Installation of this service is accomplished without any user interaction. According to Siemens, all the required data (i.e., user, host, port, and staging directory) are preconfigured during the installation process. In addition, the service ships with preloaded NX and Solid Edge translators; other CAD translators are supported and can be added at any time. These services can be used to automatically translate native Solid Edge and NX models so that they can be viewed using Teamcenter Express' visualization functionality. The service-based approach taken has allowed Siemens to deliver this capability in an easily supported and open form.

4.3 Applications

In CIMdata's world-class PLM business solution model, applications build upon core functions and foundation

technologies to provide a packaged template that addresses a specific problem. Common applications include change control and configuration management, component management, product configurators, design collaboration, and requirements management.

Teamcenter Express is fundamentally a preconfigured cPDM solution. Unlike most cPDM solutions, Teamcenter Express has already been configured as an out-of-the-box application that performs a reasonable set of preconfigured tasks. These include:

- Create CAD models and BOMs
- Initiate new projects
- Initiate Engineering Change
- Assign manufacturing resources
- Initiate workflow processes
- Conduct design reviews
- Create specifications
- Download images
- Review designs with suppliers
- Review, annotate, mark-up
- Check, approve, release

This list is quite reasonable and over time, CIMdata expects Siemens to extend this list to include other tasks and templates commonly required by today's mid-market manufacturing companies in the standard Teamcenter Express offering.

It is important to note that Siemens continues to enhance the applications included in the Teamcenter Express solution offering. The latest release includes a new Shop Floor Viewer. This application has been designed to provide shop floor users, at relatively low price point, with a simplified user interface that is used to access released product data. A user of this application can search, filter results, and view single parts, documents, manufacturing data, and assemblies. The visualization capabilities include measure and sectioning, but not mark up. The complete set of capabilities is enabled on the rich as well as on the Teamcenter Express Web client. It should also be noted that Siemens has added a new Shop Floor user group to Teamcenter Express' predefined organizational structure. This allows an organization to quickly provide access and an appropriate level of necessary functionality to an important user community.

Teamcenter Express Manufacturing is basically a preconfigured implementation of Teamcenter Manufacturing focused on the main manufacturing engineering capabilities required by today's mid-market manufacturing companies. This optional application is sold in three different bundles—Teamcenter Express

Manufacturing Author, Part Planner, and Resource Manager. The Part Planner user interface is shown in Figure 10. At its core, Teamcenter Express Manufacturing implements preconfigured CAM data management through a built-in interface with Solid Edge, NX CAM, CAM Express (a Velocity Series component). This manufacturing information management system manages parts, operations, and manufacturing resources, and the relationships to NC programs, and validation and manufacturing release processes.

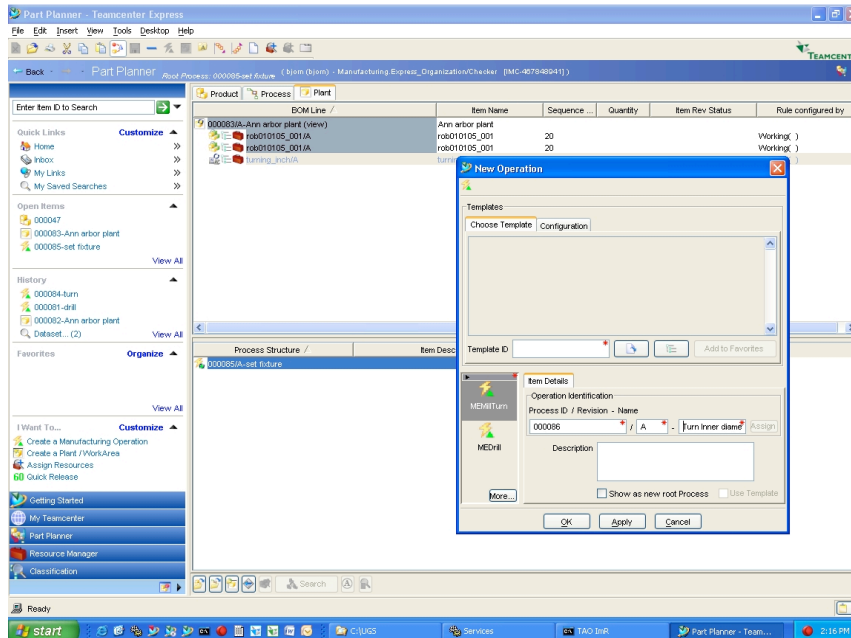


Figure 10—Teamcenter Express Manufacturing’s Part Planner Module

The integration between Teamcenter Express and CAM Express utilizes a bi-directional and associative interface to perform the following tasks:

- Store CAM Express setups
- Access and retrieve library resources
- Manage the CAM Express session in a secure and structured environment
- Store the associated NC files and shop floor documentation with the relevant setup
- Manage the CAD setup and documentation templates

The goal of this integration has been to allow a CAM Express user to seamlessly interoperate with Teamcenter Express when performing typical NC programming tasks.

Teamcenter Express Manufacturing Part Planner package capabilities include the ability to retrieve parts, and review part/setup(s) relationships and associated resources. Users of this application can also review NC output files and shop

floor documentation, and generate a number of manufacturing oriented reports. This package also provides functionality that enables a release to manufacturing process and the management of engineering changes and related impact analysis. In addition, the launching of CAM related authoring applications from within Teamcenter Express is supported.

Teamcenter Express Manufacturing Resources Manager (see Figure 11) provides a set of manufacturing resource management capabilities that are supported by resource classification functionality. Resource management capabilities provided allow users to create manufacturing resource components and resource assemblies, and attach Teamcenter Express-managed documents to the defined resources. In addition, the package provides automated routines for reporting, change control, and basic workflow. The classification management capabilities provided allows users to define a classified manufacturing resource library. A separate application is provided to setup and maintain the classification hierarchy.

Teamcenter Express Manufacturing delivers the following set of preconfigured CAM Data management functionality:

- An associative interface with Solid Edge, CAM Express, or NX CAM.
- Manage CAM Express or NX CAM setups and NC files using Part Planner.
- Create/View manufacturing process structures.

- View setup information and CAM output files in Web-based Manufacturing Structure Viewer.
- Manage machine tools, cutting tools, and fixtures in the integrated Resource Manager library.

4.4 Business Solutions

Business solutions are delivered through a combination of PLM-enabling applications, foundation technologies, established methods and processes, pre-developed data model extensions, and implementation approaches that are focused on solving specific business problems. These total solutions are the means by which solution providers are able to offer “best practice” approaches to solving specific business problems, and provide tremendous value to companies implementing PLM-based business

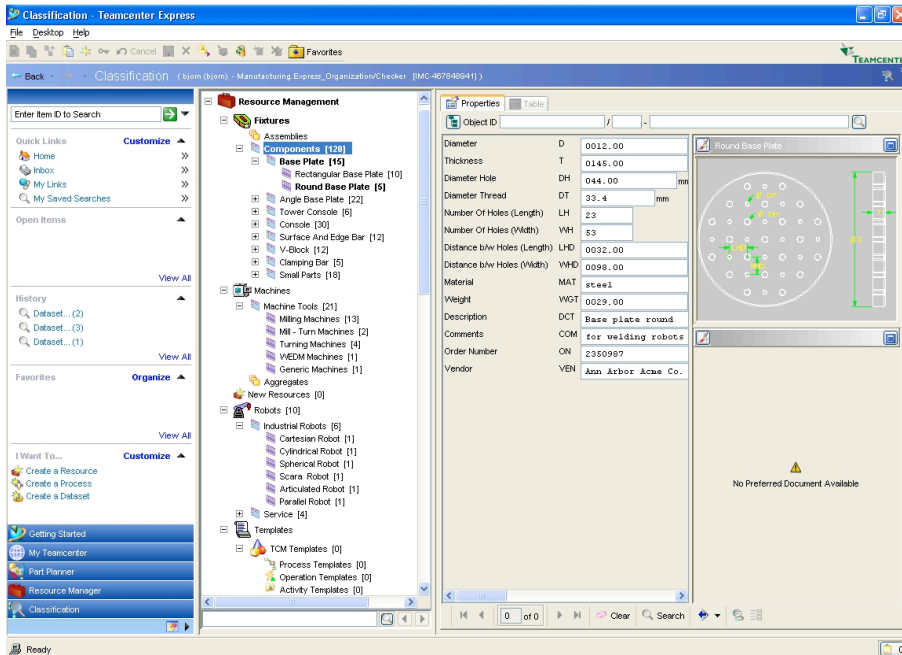


Figure 11—Teamcenter Express Manufacturing’s Resource Manager Module

improvements. They offer a way for industrial organizations to achieve success and benefits more quickly.

To provide a total “solution” to a business problem, it is not sufficient to merely provide technology that can be adapted to solving the problem. Total solutions include a combination of the right technology, appropriate processes, implementation tools, “best practices” approaches, focused implementation support, etc. Essentially, a total solution must include all of the necessary components to get the solution implemented and into productive operation quickly and efficiently. Typically, the solution will be based upon pre-developed and adapted versions of the base product, with a specific data model, focused processes, and purpose-built applications to ensure that the total technology package is sufficient to meet the targeted business problem. With Teamcenter at the core, Siemens has delivered a total solution to the mid-market that includes:

- A standalone, yet integrated, Windows-enabled cPDM application that is highly scaleable (e.g., an organization can easily upgrade to Teamcenter Engineering if and when required).
- A set of preconfigured and embedded best-practice defined workflows, wizards, and data and organization model.
- A rapid implementation framework and prepackaged set of implementation service bundles that include a fully-configured server environment that is available for immediate use upon installation, based on a typical company

configuration. If a company already has Microsoft SQL Server and Microsoft Windows Server installed, the installation of Teamcenter Express should take approximately one hour.

- A self-paced training environment, which is automatically installed with the Rich Client, allows users to learn the system by doing. This tool, which is in English, is accessible directly within Teamcenter Express’s Rich Client applications and features (a link is provided from the Web Client). The self paced activities and demonstration capabilities include automatic feature demonstration and guided feature activities. This

appears to be well-executed enhancement, one that should shorten the typical learning curve.

- A concise traditional training model that includes an easy-to-understand Teamcenter Express Training Guide that walks a user through a set of use cases and scenarios; and helps them get up and running quickly.
- A comprehensive set of documentation and online help, which includes a Getting Started Guide, Installation Guide, and Reference TDOC.

By taking this preconfigured, total solution approach, Siemens is clearly providing a sound PLM business solution focused on providing out-of-the-box cPDM capabilities to mid-market manufacturing enterprises. CIMdata expects Siemens to continue to focus the solution on specific industries and their associated data management problems.

4.5 User Environment

4.5.1 User Interface

Teamcenter Express implements a familiar user interface (UI) that has been configured to meet the needs of the target market. It utilizes a Microsoft Outlook look and feel with multiple dynamic user interface functions. Teamcenter Express’ UI is a full-featured Java-based client. Two versions are available: (1) a Rich client for data authors and

users who need to access one or more CAD integrations; and (2) a Web client for all other users (see Figure 12). Version 4 supports Internet Explorer 7, Windows XP, and Windows Vista clients.

Siemens has preconfigured Teamcenter Express' UI so that it dynamically adapts to the task being executed. This is not only true for wizards but also for standard interface panels. This should greatly reduce the time it takes for users to get up and running on the system. Teamcenter Express also offers a "My Teamcenter" UI. This easy to use UI comes preconfigured to support "I Want to ..." and other easy-to-use UI functions. Another easy-to-use function is the quick menu functionality. This functionality is accessible via the right mouse button (e.g., an assembly can be opened in the Product Structure Manager module by right-clicking on it and using the "send to" command).

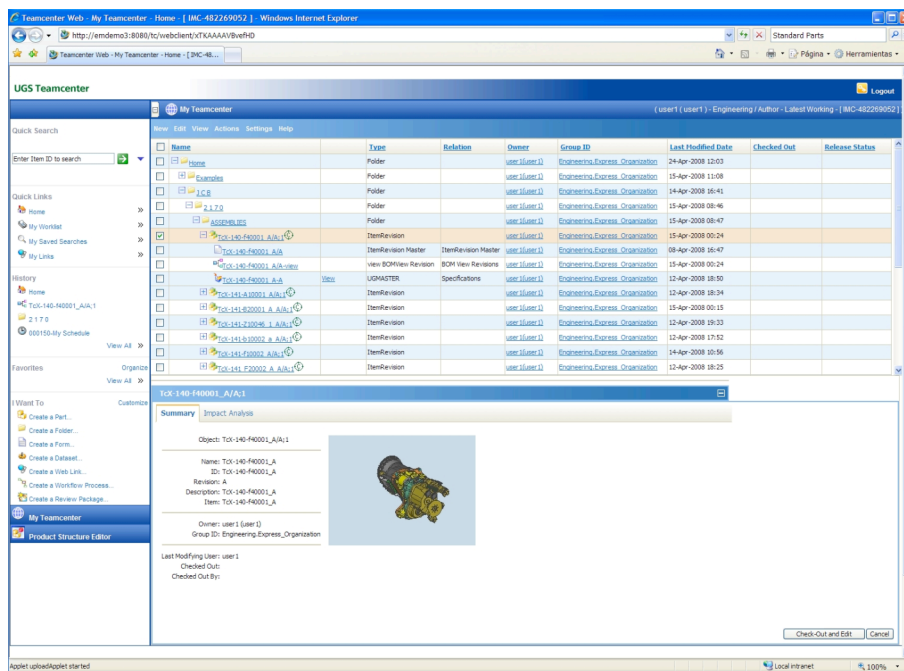


Figure 12—Teamcenter Express' Web Client

As a result of moving to the new Teamcenter "unified" platform, Teamcenter Express' UI is now developed on the Eclipse UI platform (a component from the Eclipse open source community). This has enabled a number of new easy to use UI features including the ability to hide and show panels, define a summary tab for each item type using an XML definition, more easily navigate across information sets via UI tabs, utilize user definable perspectives (i.e., the user can format their UI, the placement of panels, etc.), access an embedded MS Internet Explorer panel, fully drag and drop objects between panels and the MS Windows

environment (including multiple files), and customizable "I Want to..." support. The "I Want to..." support functionality now allows users to create their own shortcuts to Teamcenter Express capabilities. To assist this, the system provides a list of selectable actions, which are usually defined by the system administrator and/or the user, that are used by the user to define the desired "I Want to..." actions.

Another significant UI feature now available is the Relation Browser. This browser (see Figure 1) allows the user to navigate graphically via managed relationships between Teamcenter Express objects. It provides a simple and intuitive way to find information and understand how information is interrelated. It is not just a statistic set of pictures, but rather a dynamic view of Teamcenter Express' managed data and their associated relationships.

Teamcenter Express also provides a full set of localization support in ten different languages, including English, German, French, Italian, Spanish, Japanese, Korean, Simplified Chinese, Traditional Chinese, and Russian. Siemens reports that all menus, panels, etc. are available for localization. Siemens reports that all ten languages supported are available at the same time upon a new version release. A Polish version is available through a local Siemens' channel partner.

As mentioned previously, Teamcenter Express provides the user with additional print and plot services. These common services enable print, plot, and watermark operations to be executed. The user can choose from the Teamcenter Express UI between printing and plotting locally or from a network server device. This functionality also allows users to

select and send to the out device multiple items (e.g., the user can select "Print all BOM documents..." and "Print all Project documents..."). This functionality also enables automatic server print and plot device configuration and detection. In addition, print as well as translation services are available as pre-configured tasks that can be added into any workflow.

As introduced in Version 3, Teamcenter Express' UI includes the enablement of a right mouse button menu on the Web Client. This menu gives the user access to Cut,

Copy, Paste, Check-In, Check-Out, and other commonly used functions.

4.5.2 Application Interfaces

In many ways, application interfaces are just another part of Teamcenter Express' overall user interface. With this in mind, Siemens offers a number of well-thought-out office automation (e.g., to various e-mail systems, Microsoft Office applications, PDF viewers, etc.), CAD, and ERP application integrations.

Siemens employs a two-level CAD data management approach for CAD integrations—one that is CAD-centric and the other that is PDM-centric. The CAD-centric approach is defined in such a manner that CAD users can work from within their native environment while accessing Teamcenter managed data. In the PDM-centric approach, non-CAD users access CAD data from within the Teamcenter native environment. This two-level approach places a significant emphasis on the CAD to Teamcenter interface and it allows the user community to work with product information from within their commonly used environment.

Teamcenter Express' integration with NX, NX CAM, CAM Express, and Solid Edge, as previously described, are impressive. They have been designed to provide an almost seamless user experience. Other CAD integrations (e.g., those to CATIA V5, AutoCAD, Pro/ENGINEER, Inventor, SolidWorks, I-deas NX, etc.), some of which are internally developed and others which are externally developed by third-party partners, all provide basic check-in and check-out functionality, search and retrieval, and product structure synchronization and management. These application interfaces have been designed to provide the flexibility needed to manage legacy CAD data and product-related data from customers, suppliers, and acquisitions. The implementation of these integrations within a Teamcenter Express environment is meant to enable common processes across different CAD systems and to facilitate various CAD translation strategies.

Siemens continues to update and extend the capabilities related to the CAD integrations it offers. Some past enhancements include the automatic creation and vaulting of JT files for most of the CAD systems supported, and the ability to save Pro/ENGINEER family tables via the Teamcenter Express to Pro/ENGINEER integration. More recent enhancements to these CAD integrations include:

- For CATIA V5 users—multiple CATIA Environment and CGR Vault/Deliver support.
- For Pro/ENGINEER users—two-way BOM synchronization and remote transfer of ownership.

- For Inventor users—version and revision control of Inventor assemblies, parts, drawings, and presentation files; automated product structure transfer to Teamcenter; integrated Teamcenter access from inside Inventor; and two-way attribute transfer.

Beyond these key improvements, Siemens continues to implement a series of performance enhancements on many of its CAD integrations. CIMdata is impressed with both the depth and breadth of mechanical CAD integrations offered and the rate to which enhancements are being released. CIMdata expects Siemens to continue to enhance the current integrations as well as develop new ones that support the most common electronic CAD systems (e.g., those offered by Cadence, Mentor Graphics, Zuken, etc.).

In the area of ERP integration, Teamcenter Express includes a built-in interface that generates XML files of product data. The generation of these files, which can contain both part and BOM data, is triggered by certain events in the preconfigured workflows processes. Microsoft BizTalk or other middleware can be used to process this data for integration with a large number of ERP systems. The interface has been designed to ensure error-free and consistent transfer of BOM data to ERP.

Siemens has used this generic approach together with key partners to construct and deliver a number of out-of-the-box ERP integrations. Each of these integrations have been designed to synchronize parts and BOMs, and enable, via automated workflow, the release and change processes that commonly interact between a PLM environment and ERP. This approach supports the unidirectional push of data to ERP in order to create part masters and BOMs, and update part masters and BOMs. Currently, Siemens offers two Teamcenter Express to ERP paths: one that supports Microsoft Dynamics and the other that supports SAP.

The Dynamics integration leverages a new partnership with To-Increase B.V., a Microsoft ISV and Gold partner, to deliver an XML-based integration. This new connector, which can be purchased from Microsoft Dynamics channel partners, handles the communication of Teamcenter Express's XML output and the notification to Teamcenter Express that the data was properly received by the ERP system. The focus of this integration is Microsoft Dynamics AX (formerly Axapta) as well as the IEM Solution for project-based manufacturers, a Microsoft vertical solution within their "Industry Builder" initiative. Additional discussion related to Teamcenter Express' ERP integration approach can be reviewed in the sidebar entitled "PLM to ERP Integration Discussion."

The Teamcenter Express SAP integration, sold by Siemens, supports SAP R/3 4.6C, 4.7 Enterprise, mySAP ERP 2004 and 2005. It has been designed to be a preconfigured SAP interface implementation, and it has been merged into Teamcenter Express' data model, processes, and user interface. It is a simplified version of the TESIS PLMware-developed Teamcenter SAP Gateway solution that is based on the Open XML standard. The integration supports part master create, part master update, BOM create, and BOM update functions.

Siemens has done a good job selecting and developing mid-market appropriate CAD and ERP integration targets and use cases that define typical mid-market requirements. Each integration appears to provide what most mid-market manufacturers require in a PLM to CAD and PLM to ERP connection (see PLM to ERP sidebar for additional

discussion related to this topic). In addition, they have been designed to be easily-implemented and maintained, and support automatic error handling and reporting.

4.6 System Architecture

The Teamcenter Express System Architecture is a scaled-down version of the Teamcenter architecture (Siemens' "unified" platform), optimized for quick and easy deployment of those components needed to support Teamcenter Express functionality. The release of Teamcenter's "unified" platform is an important event in the evolution of the Siemens' core cPDM platform. Siemens focused on the following six main elements during the development of this new architecture:

- Platform Unification—convergence of Siemens

PLM to ERP Integration Discussion

Often companies make the mistake and believe that a PLM strategy should be enabled by a standalone solution that doesn't need to integrate with any other data and process management environment. This is usually not the case. At minimum, your typical PLM solution (e.g., Teamcenter Express) needs to be integrated with one or more data creation tools (e.g., MS Word and a CAD system) and one or more downstream systems (e.g., ERP). Integrating these various data creation and use systems is becoming increasingly important for both large and mid-market companies within multiple industrial sectors. To maximize the benefits of PLM, a company must understand that an integrated and collaborative effort is required to create the seamless product lifecycle needed to bring innovative products to market effectively. This usually means data and process integration between their PLM solution and their ERP system.

Management of the product definition lifecycle, as managed by a company's PLM solution, and its close integration with other major lifecycles (e.g., the product production lifecycle managed by ERP) is not a new concept, but it is one with which companies have struggled for many years. Over the last several years, industry's ability to achieve this concept has improved dramatically with the availability of a wide range of new PLM enabling technologies and approaches that facilitate collaborative work efforts across extended enterprises and their supporting systems.

In today's PLM market, it is common to find out-of-the-box PLM to ERP integrations that use PLM managed process triggers to pass data from PLM to ERP. A number even provide the ability for PLM users to view from within the PLM UI data that is managed by ERP. These represent the most standard PLM to ERP integrations on the market today and Teamcenter Express' offering in this area is reasonable. In many ways the integrations that just push data to ERP can be considered as 1st generation integrations. Integrations that also provide visibility into the ERP system can be considered to be 2nd generation integrations. The next natural step in PLM to ERP integration is to bring the two worlds even closer together. The integrations need to allow each environment to do what they do best, while at the same time they need to provide an even higher level of process synchronization. This is the approach that Siemens' partner, To-Increase (a Microsoft Gold Certified Partner based in The Netherlands) took as they developed a process-centric Teamcenter Express integration with Microsoft Dynamics AX. This 3rd generation PLM to ERP integration approach appears to be on the right path and holds significant promise for those companies that use Teamcenter Express and Microsoft Dynamics AX.

To-Increase's goal in the development of this next generation integration was to bring product data into a vertical environment specific for the industrial machinery and high-tech industries (target industries for the AX solution). To-Increase's solution is provided in three levels: standard, professional, and enterprise. At the standard level, items, BOMs and other Teamcenter Express managed product data is pushed to AX and certain AX data can be retrieved from AX. The professional level extends that capability by also allowing documents to be pushed to AX and for obsolete parts to be handled within the proper process context. Finally, the enterprise level builds on top of the professional, in addition to the capabilities already described, it synchronizes the change process between the two solutions.

various cPDM solutions (e.g., Teamcenter Enterprise, Teamcenter Engineering, etc.) into one architecture.

- Usability / Client Technology—improved user focused productivity enhancements.
- Service Oriented Architecture (SOA)—full enablement of this new application architecture.
- Deployment Flexibility—the ability to deploy in a 4-tier, 2-tier, or federated model.
- Performance / Scalability—improvements in various single user and multi-user usability measurements.
- Behavior Modification—utilizing a new Business Modeler Integrated Development Environment (BMIDE), Teamcenter can be configured without the need to customize.

The extent of work undertaken to bring this new platform to market is impressive and it should prove to be a solid platform for years to come. For existing Teamcenter Express customers (i.e., customers that have implemented Version 1, 2, or 3), according to Siemens, should be able to easily migrate to this new platform in the same manner as moving from one version release to the next.

Since Teamcenter Express is optimized for the Microsoft platform, it requires Windows Server 2003 and Microsoft SQL Server 2005. While Teamcenter Express may deploy on a single machine, it is broken into the four logical components described below:

- The *Client Tier* generally contains the CAD client software, a rich application client, and the core components that allow the CAD clients and rich client to interact with the Teamcenter database. A user without a CAD client will typically use the embedded visualization application in the rich client for 3D model measurement and markup. A user that does not have the CAD or rich client software may also access the Teamcenter platform through a web browser on their desktop.
- The *Web Tier* runs on the Teamcenter Express Server as an application under the IIS web server. The web tier provides a web interface for the most commonly-used Teamcenter tasks that are generally performed by a consumer or non-engineering user of Teamcenter Express.
- The *Business Logic Tier* contains the core business logic for Teamcenter and provides the data model abstraction to data stored in the SQL Server database. The web tier and business logic tier are optimized for simple deployment on a single server machine. The machine that contains the web tier and business logic is also configured as a file or volume server by default, but Teamcenter Express supports the ability to deploy multiple file servers to distribute file access so

that files can reside physically closer to different groups of users. The Teamcenter Express installation also configures the server machine with the appropriate license server and Windows services to perform background tasks and processing as necessary, based on components chosen during installation.

- The *Database Tier* is built on Microsoft SQL Server and may be deployed either on the same machine as the web and business logic tier or it may be deployed on a separate database server machine. The Teamcenter Express installation creates and configures a default database instance that is populated with all of the necessary workflows, groups, roles, security settings, user interface settings, and other options that make up the Teamcenter Express application.

In addition, this 4-tier client support can be preconfigured.

The basic installation of Teamcenter Express includes the Teamcenter foundation, and the addition of Teamcenter Express-specific applications and configuration files. These configuration files, which have been defined in the newest PLMXML syntax, contain all the configuration detail related to groups, roles and users, user preferences, data model extensions, predefined queries, reports and workflows, business model definition (e.g., revision rules), and standard integrations. Siemens provides these files in each of the ten languages supported, so that an implementation is localized immediately upon installation.

Though Teamcenter Express may be deployed in a very simple off-the-shelf configuration as defined in the configuration files described above, it is possible to grow the solution into a fully-scaled and distributed Teamcenter installation by adding and configuring additional components and servers as the needs of a company grow over time.

The preconfigured nature of Teamcenter Express has allowed Siemens to design an installation procedure that includes the automatic creation of a Teamcenter SQL database instance. In addition, the Teamcenter Express web application, file vaults, administrator client, and license server are all installed in a single session. The automatic installation of optional CAD and ERP integrations is also supported.

4.6.1 Hardware Platforms

The Teamcenter Express client requires Windows XP or Windows Vista. Based on Siemens' experience, desktop upgrades are not generally required to use Teamcenter Express because it runs within the standard Web environments that are found in most organizations and for

the rich client, on platforms typically used to support CAD applications.

4.6.2 Database Management Systems

Microsoft SQL Server 2005 is used to store all Teamcenter Express-managed content, i.e., all metadata, including attributes, file properties, part properties, relationships, etc.

4.6.3 Distributed Architecture

A distributed architecture enables sites that wish to cooperate in a business partnership to form loosely-coupled federations of managed data. Federation allows flexibility and freedom to form and break connections with suppliers, sub-contractors, and customers as required.

Teamcenter Express' Multi-Site Collaboration Option supports the distribution of file as well as meta-data. Files are stored in administrator-defined areas called Volumes that are secure directories accessible only to Teamcenter Express. File names may be encrypted. This multi-site

option supports mechanisms for meta-data sharing, publishing, and synchronization.

The Teamcenter Express Multi-Site Collaboration option provides semi-automated real time data sharing across an extended enterprise. It uses a special Teamcenter Express site called an Object Directory Services (ODS) site. The ODS site maintains a record of each object in the entire global Teamcenter Express network. The ODS does not store files, but rather maintains a record that is similar to a library card—it keeps track of which Teamcenter Express site is the master.

Teamcenter Express' Multi-Site Option uses a replication-based distribution solution. When the master object is modified, a Teamcenter Express system administrator via a synchronization utility can automatically update replicas. This option also offers Publishing and Unpublishing services. Publishing an object makes that object available to user-specified Teamcenter Express sites. Publishing creates a publication record in the ODS which can then be searched for and read, by other Teamcenter Express sites. Until you

Eurotech Benelux

Eurotech Benelux, a producer of machines for application in the printing, mailroom, food, and packaging industries, harbor equipment and various steel components (e.g., bollards, rope sheaves, recessed moorings, and mooring components for road and water works), was formed as a result of a management buy-out from the Eurotech Group. Currently they have locations in The Netherlands and China. The company currently employs approximately 25 and has an annual turn over of approximately 20 Million Euros.

Historically, Eurotech Benelux has used 2D drawings as their design basis, but realized the need and potential benefits of moving to a 3D CAD solution. This resulted in the purchase of Solid Edge from Siemens PLM Software in the mid 1990's. More recently, Eurotech Benelux chose to purchase and implement Teamcenter Express to support its PLM requirements, namely to support its distributed design environment and the management of its 3D data. Bosch Engineering BV, a Siemens Channel Partner, provides Teamcenter Express software and support for Eurotech Benelux.

According to Mr. Marc Boom, Eurotech Benelux's Engineering Manager, Teamcenter Express was selected because the company had a very good relationship and experience with Siemens PLM Software through its implementation of Solid Edge. Additionally, they felt that the fact that Teamcenter Express is a component of a very broad suite of PLM enabling solutions will allow Eurotech Benelux to expand their PLM implementation in the future as needed without having to search out other partners and integrate their solutions into their IT environment. Mr. Boom also notes that Siemens PLM Software is a very well respected company in the PLM market, which they believe limits the risk of the investment.

Eurotech Benelux is currently implementing Teamcenter Express in a well-managed step-by-step approach. The first step, which they are currently completing, will support the management of Solid Edge CAD data. Eurotech Benelux envisions later steps to support engineering and design collaboration with their clients, and to enable their transition to a knowledge company where Eurotech Benelux holds all the intellectual knowledge about their products, and partners do manufacturing.

Mr. Boom reports that the implementation and subsequent use of Teamcenter Express within Eurotech Benelux is being pursued for two primary reasons: (1) Eurotech Benelux wants to strategically evolve into a design and engineering company that employs partners to manufacture and assemble. The company recognizes that in order to realize this strategic objective they need to implement PLM; and (2) they need to manage parts and components, know their status and revisions, and find them in an easy and timely manner. Eurotech Benelux believes that the first reason stated will ultimately provide them the most benefit.

publish an object, it can only be seen by the local site. “Unpublishing” reverses the procedure.

These multi-site capabilities allow users to take advantage of Teamcenter’s proven multi-site collaboration technology. Capabilities are generally used by organizations that need to support geographically dispersed product teams and have requirements that call for the federation of dispersed databases into a single logical system.

4.6.4 Tailoring and Customization

From the outset, Siemens has designed Teamcenter Express to be a preconfigured cPDM-focused PLM business solution. As a result, Siemens has extensively preconfigured its workflows, user interface, organizational and user definitions, and associated installation, training, and documentation guides and practices. Siemens has focused on enabling codeless customization through the use of wizards and a well-executed dynamic user interface. Teamcenter Express is meant to be a preconfigured entry point for mid-market manufacturing companies that have single or multiple development sites and CAD systems.

Siemens provides a toolkit to be used by partners and systems integrators to build additional workflows and integrations. If additional customer-defined customization is required, Siemens offers an upgrade path to Teamcenter. This cPDM solution provides additional customization support via its Integrated Development Environment, which supports Java based development tools such as JBuilder, Visual Age, and Visual Café on the client side, and the ITK (i.e., the Teamcenter tool kit) on the server side.

5. Summary

Teamcenter Express is the core data management component of the Velocity Series—a set of preconfigured and easy-to-deploy, design and data management PLM-enabling solutions. Siemens PLM Software has designed this offering specifically to address the product design through manufacturing planning needs of small- to medium-sized companies. CIMdata is impressed with the comprehensive approach Siemens has taken. The Velocity Series, which has been designed by Siemens to leverage industry best practices to provide significant improvements in ease-of-use and deployment speed,

clearly illustrates Siemens’ commitment to the mid-market. What is particularly impressive and beneficial for small- to mid-sized companies is that the various components of the offering are quick and easy-to-install, and completely scalable to the full range of Siemens’ enterprise-level PLM solutions.

According to CIMdata’s research and experience, the key to success in this mid-market PLM space is the development and delivery of out-of-the-box applications and business solutions based on best practices that support an enterprise’s product definition information management requirements. Siemens’ Teamcenter Express and the rest of the Velocity Series’ components deliver to this model. Teamcenter Express is basically a preconfigured, mid-market focused configuration of Teamcenter 2007 (i.e., Siemens’ “unified” platform). It leverages Teamcenter’s product development-focused capabilities and enhances them by enabling a dynamic Microsoft Outlook look and feel user interface and a set of preconfigured workflows, reports, wizards, organizational structures, and user roles. Siemens has done an excellent job packaging Teamcenter Express into a very capable mid-market cPDM business solution.

With the release of Teamcenter Express Version 4, Siemens continues to strengthen the solution’s usability and scalability. With the introduction of the new Shop Floor Viewer (see Figure 13) accessibility to Teamcenter Express’ managed data is extended well beyond the

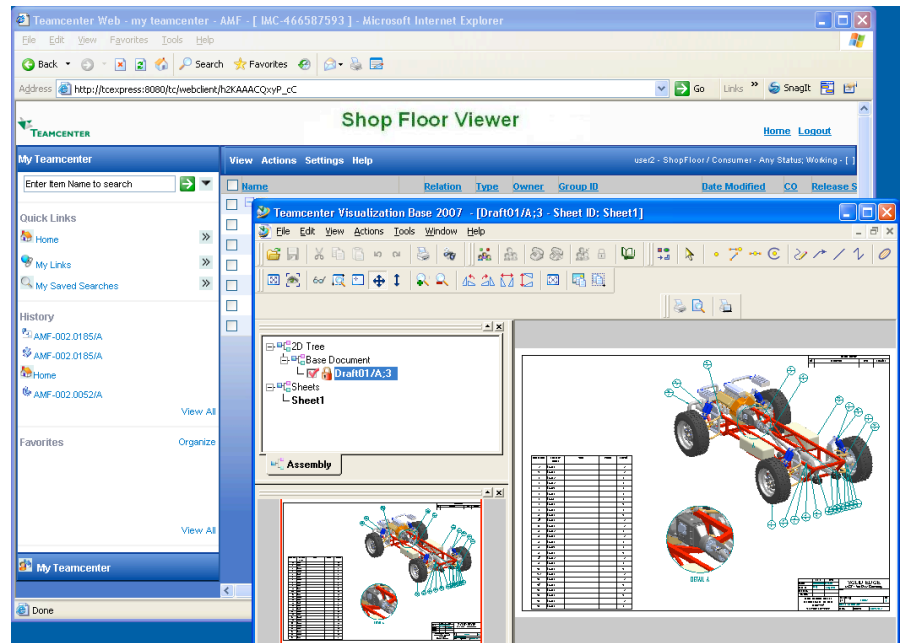


Figure 13—Teamcenter Express’ Shop Floor Viewer

traditional areas of engineering. New program and project management functionality further extends Teamcenter Express' usefulness in managing mid-market companies' product development and other key product lifecycle management related processes. In addition, new MS Excel Live capabilities, coupled with previously released MS Office integration functionality continue to enhance and streamline the usability of Teamcenter within the context of your typical product lifecycle knowledge worker.

Furthermore, it is important to note that Teamcenter Express makes available a solid set of manufacturing engineering applications that allow Teamcenter Express to support the manufacturing planning requirements of most mid-market companies targeted by the Velocity Series. This functionality is fairly unique and should prove to be valuable to companies that implement it.

In conclusion, Siemens' Teamcenter Express solution is a strong mid-market cPDM solution. Building this cPDM solution on top of the Teamcenter platform has allowed Siemens to get to market quickly and leverage one of the world's most widely-used enterprise PLM platforms. The capabilities it delivers are extensive. Teamcenter Express' preconfigured nature has proven its capabilities that allow companies to implement quickly with minimum effort and expense. As a result, companies that choose Teamcenter Express have begun to realize their potential PLM benefits quickly. CIMdata recommends that all small- to medium-sized discrete manufacturing companies or divisions of larger ones, in the market for an enterprise-class cPDM solution, seriously consider Teamcenter Express and the other Velocity Series components.

About CIMdata

CIMdata, an 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. CIMdata offers 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 by providing world-class knowledge, expertise, and best-practice methods on PLM solutions.

In addition to consulting, CIMdata conducts research, provides PLM-focused subscription services, and produces several commercial publications. The company also provides industry education through international conferences in the US, Europe, and Japan that focus on PLM. CIMdata serves clients worldwide from locations in North America, Europe, and Asia Pacific.

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