# Collaboration Application Suite for Check Tracking Manufacturing Product Development

## Industry
Manufacturing

## Business Challenge
Providing integrated, global access to business processes and product data

## Technology Solution
Windchill® solution from PTC®

## Enterprise Hardware Platform
Scalable Intel® Architecture servers

## Client Processing Power
Intel® Pentium® 4 Processor-based solution

SOLUTION ARCHITECTS

PTC®

intel®

Solution Blueprint:
Collaboration Application Suite for Manufacturing Product Development

Solution Provider:
PTC®

## MEETING NEW MARKET DEMANDS

The Windchill® solution from PTC® is a robust, Web-based suite of collaborative software applications for product development within the manufacturing industry. It provides a secure environment for product lifecycle management (PLM) that allows enterprises to globally integrate business processes and product data—linking dispersed divisions, partners, and customers. Intel® Xeon™ processor family-based servers provide the scalable architecture that cost-effectively powers Windchill® installations as they ramp from pilot projects to enterprise-wide installations.

Additionally, due to the association and integration between Windchill® and a variety of mechanical computer aided design applications (MCAD) such as PTC's Pro/ENGINEER® design software, it is necessary for some users to leverage the unique power of Intel's high-end processors on their desktop. Included in this group are design engineers that rely on Intel® Pentium® 4 processor-based workstations and Mobile Intel® Pentium® 4 Processor-M-based laptops for optimal performance.

## THE BUSINESS CHALLENGE

Manufacturers of all sizes, in all industries, face customers who demand products that meet their needs at competitive price points. This pressures manufacturers to shorten time-to-market windows and provide unprecedented product diversity. They must also deal with frequently changing customer requirements that occur late in the product development process. Companies are globalizing to outsource design or manufacturing in search of the highest quality, lowest cost supply chain. Supply chains form and disband quickly, often varying by product within a company. Strategic supply chain partners who were never previously concerned with design issues need to be involved in most of the product lifecycle and have access to detailed product information, such as designs, configurations, scheduling, and engineering change processes. In today's highly competitive environment, companies need to collaborate and communicate with customers, suppliers, and partners in an increasingly complex and temporary product supply chain. Against this background, manufacturers face a number of challenges.

### INTEGRATING ISLANDS OF INFORMATION

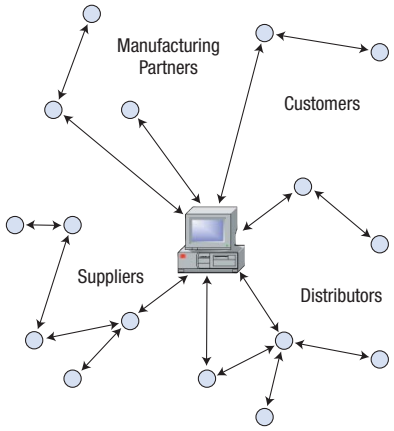
Today, a digital representation of a product is usually created before a physical product is manufactured. The digital representation is a collection of electronic records, including mechanical and electrical computer-aided design files; design, quality, and manufacturing specifications; market and technical product requirements; as well as documentation and other media that designers and engineers use to define a product before it is manufactured. The digital product is typically fragmented across organizational boundaries—from engineering to servicing—with each group having a different product definition stored across many systems with incompatible formats.

Product development is the last frontier where companies have not integrated all these systems. To address part of this problem, companies have tried to reduce the number of MCAD tools and consolidate on a primary solution. However, the need for flexible and dynamic supply chains is at odds with strict homogeneity in systems. Therefore, companies must instead embrace heterogeneous technology environments. Limited-point or homegrown solutions at the departmental level are no longer acceptable if they do not manage product configuration, change management, bill of materials (BOM) management, digital mockup, and other activities throughout the product development process. These legacy applications typically employ proprietary architectures, operate on different databases with unique data models, and use varying user interfaces. As a result, it is difficult to link them together.

Case Studies/Proof Points
http://www.ptc.com/products/windchill/index.htm

### COLLABORATING ACROSS THE EXTENDED VALUE CHAIN

Creating and rapidly delivering new products requires collaboration between many supply chain participants. Distinctions between internal and external strategic partners have been blurred thanks to the capabilities available through the Internet, but these new capabilities also bring new concerns—primarily security and efficiency. Processes vary from company to company, and within a company, from one department to the next. The supply chain has become a dynamic entity that evolves to address changing business needs. It embraces non-technical contributors who need ready access to two- and three-dimensional product information to understand the digital content and contribute effectively.




To meet time-to-market requirements, companies must quickly acclimate themselves to the processes and systems of new partners, and collaborate flexibly. Companies who rapidly and effectively manage diversity within an evolving supply chain can shorten product design cycles, strengthen supplier and customer relationships, and react to market changes faster. Embracing these market forces to create new business models and better serve the customer can allow companies to outperform those that lack flexibility in their business processes.

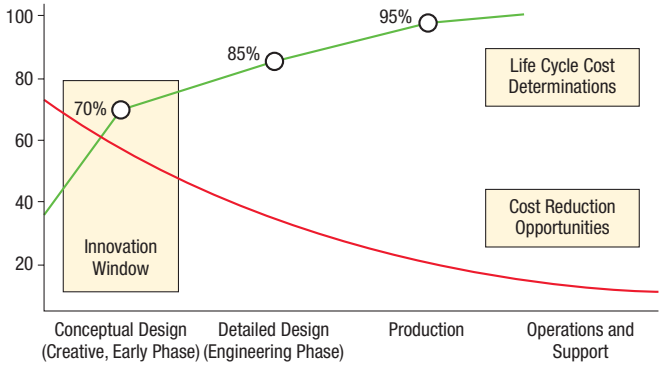
### MANAGING COSTS

Rapid globalization in today's economy makes managing product costs and simultaneously meeting customer requirements essential to an enterprise's survival. Companies must examine each point in the value chain to determine how to extract additional savings without compromising product quality. Cost is often perceived as a manufacturing process issue, however, for the average large manufacturer, approximately 60-80 percent of the cost of a product is committed during the concept and design phases of the product lifecycle.[1] Companies can minimize costs by re-using part designs, using the best sourcing relationships during the design process, incorporating manufacturing input into the design process, and making the most accurate information available to the extended product development team.



Source: [1]Giga, Total Economic Impact™ of Collaborative Product Development, 2001

No matter how efficient a manufacturer becomes using enterprise resource planning (ERP) or supply chain management (SCM) initiatives—these systems impact only a small portion of a product's total cost. Customer changes in requirements late in the development process cost manufacturers dearly. Identifying the best process to accommodate late-breaking changes, whether customer initiated or otherwise, has greater potential for reduced product costs than any downstream activities.




Source: DARPA Rapid Design Exploration and Optimization Project

### DELIVERING RETURN ON INVESTMENT

Product lifecycle problems are difficult to solve. The product exists only as sophisticated digital content with many forms, representations, and configurations—spanning multiple departments within an organization and across external manufacturers and suppliers. The product development process can involve complex processes, and is subject to rapid change.

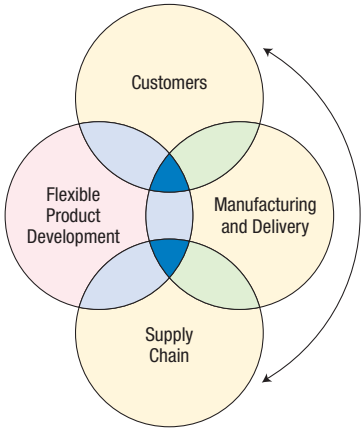
Previous attempts to address the problem have often used point solutions or physical product management systems—such as ERP—that were never designed to manage complex development processes. The return on investment (ROI) on these systems can be questionable due to uncertain deployment requirements or technology repurposing (such as Web-enabling client/server systems) and missed opportunities to improve the product development process. Common pitfalls include:

- The perception that product development is an engineering-only problem rather than an enterprise-wide issue.
- Inadequate technology (such as inefficiently shared drives, re-purposed client server systems, standalone point applications, and e-mail) or inefficient processes.
- Broadly scoped, multi-year initiatives requiring massive technology and organizational changes.

## THE SOLUTION OVERVIEW

The Windchill® solution from PTC® focuses on delivering strategic improvements to the product development process by providing a consolidated, Web-based environment for creating, managing, and evolving product and process information. Its core capabilities are inter-enterprise document management, structure management, lifecycle management, workflow management, and system administration.

Windchill® creates an environment where businesses can share product and process information, regardless of its location or format. Windchill® is based on Java* technology standards. It links the dispersed systems, applications, and processes of a company with its supply chain. Within this integrated, Web-based framework, companies have the flexibility they need for business-to-business collaboration and to take advantage of emerging Internet technologies. This accelerates the flow of critical product and process information throughout the extended enterprise and furthers a company's competitive advantage. By maximizing the use of the entire digital product asset throughout the design process, managers can minimize product iterations and development costs while accelerating the time-to-market.




The Internet allows an organization to transcend geographic, organizational, and systems barriers that have traditionally isolated engineering and the product development group from the rest of the enterprise. By leveraging the Internet through its Java*-based architecture, Windchill® is able to eliminate these traditional barriers and connect product development with all facets of the organization—while also touching the entire supply chain and customers in a real-time, collaborative environment. This allows product development to truly become an enterprise-wide exercise, involving the entire management team in product reviews. In addition, manufacturing can provide insight into whether the product can be assembled and suppliers can be provided with the latest design changes. All the while, the traditional engineering group can process this feedback and incorporate it into the product design.

To seamlessly integrate these diverse organizations requires a reliable server and workstation infrastructure that can support compute-intensive server processes and complex desktop applications such as Pro/ENGINEER®. Customers that have deployed Intel® Xeon™ processor-based servers to host their Windchill® environment have experienced this reliability while also recognizing cost savings through ease of management tools. Similarly on the desktop, Intel® Pentium® 4 processor-based workstations provide fast response times and accelerated execution of complex processes.

When viewed as a whole, Windchill® and an underlying Intel®-based Infrastructure provide customers with the tools they need to effectively create digital product information, collaborate with dispersed organizations, and control the data throughout the enterprise.

The Windchill® solution features include:

- Embedded, CAD-neutral, two- and three-dimensional visualization of product information for all users
- Role-based Web access to product and process information with event-based alerts
- Project collaboration workspaces and tools (including discussion forums and change history)
- Program management with project plans, milestones, and activity tracking
- Reporting for process and activity monitoring and improvement
- Best-practice change, configuration, and release management processes
- Parametric searching of parts and designs for optimal reuse
- Manufacturing collaboration workspaces for manufacturing design and sourcing
- Enterprise integration across mechanical CAD, electrical CAD, ERP, CRM, and other enterprise applications
- Common data model and product information repository or vaulting

## TECHNOLOGY

Windchill® is tuned and optimized for delivery on servers powered by the Intel® Xeon™ processor family. Intel® Xeon™ processor-based servers provide Windchill® with the scalable architecture this solution needs to meet the changing needs of the manufacturing community.

High-performance Intel® Pentium® 4 processor-based clients provide the quick response times and fast transfer rates needed to support a collaborative environment. With advanced Intel® NetBurst™ microarchitecture and clock speeds of 2GHz and higher, these desktops also provide the computing power to process and display the rich 3D graphics produced by MCAD applications.

Intel® Architecture provides the following advantages:

- Robust servers that provide the solution with uncompromising reliability, scalability, and performance.
- Standard building blocks for an open, layered, modular, loosely coupled infrastructure—from laptops to powerful servers.
- Compelling price performance—due to economies of scale in volume terms, an open architecture, and a competitive marketplace.
- The agility to act quickly and the flexibility to add capacity as needed.
- A continuous and steep rate of advancement, powered by Intel®'s extensive research and development investments, and leveraged by the multiplier effect of the Intel® e-Business Network.

Windchill® delivers information management using simple, everyday Web mechanisms familiar to the product development team members. Windchill® appears as Web pages within a standard Web browser. The pages provide:

- Access to Java* applets, search engines, URLs, and e-mail
- Access to upload and download services
- Integration with plug-in and helper applications
- Access to hyperlinks to navigate information across supplier and partner systems

The technologies Windchill® integrates include:

- **Servers**—The Windchill® solution is tuned and optimized for delivery on a platform composed of servers powered by 2-way Intel® Xeon™ processors and 4-way or 8-way Intel® Xeon™ processors MP.
- **Web-based Standards**—Windchill® uses the following standard Web technologies to perform common information management functions:
  - Web servers
  - Browsers
  - Java* and Java Beans*
  - Hypertext markup language (HTML) and hypertext transfer protocol (HTTP)
  - Extensible markup language (XML)
  - Web security models
  - Search engines
- **Operating Systems**—Microsoft* Windows* 2000
- **Database**—Oracle9*i**
- **Web Server**—Microsoft IIS* and Apache*
- **Browsers**—Internet Explorer*
- **Other Client Software**—Adobe* Acrobat* Reader, Java* Runtime Environment (JRE*), Java* plug-in
- **Integration**—Like the Web itself, Windchill® connects diverse information systems that have accumulated over time and logically blends the rich product content to present a complete product picture viewable through a Web browser. Seamless application integration through Windchill® Info Engine® enables employees, partners, and customers to have controlled access to the same accurate information. Windchill® provides plug-ins to various mechanical computer-aided drawing (MCAD) applications, including AutoCAD*, CATIA*, Unigraphics*, and Solidworks*. Additionally, adapters have been created for SAP* and Siebel*.

Because of its open nature, Windchill® is exceptionally portable and saleable. The server components can run on multiple versions of the Microsoft* Windows* operating system, including Windows* NT and Windows* 2000. The client is available on versions of Windows* beginning with Windows* 98 and Windows* XP.

## WHO THE SOLUTION WILL BENEFIT

The Windchill® solution was designed to assist contributors within the product development and delivery process. While it focuses on the contributions of engineers to the product development process, it includes tools that enable other groups—such as marketing and product management—to participate and collaborate in the design and delivery of products.

Additionally, Windchill® provides customized views of the digital product asset, making it easy for executives to become involved in the design process at a very high level.

## SOLUTION BENEFITS

Windchill® value propositions include:

- **Creating a Strategic Source of Product and Process Information**
  - – Connects and leverages information among business systems
  - – Enhances the value of existing IT investments
- **Facilitating Customer, Supplier, and Partner Collaboration**
  - – Facilitates customer-driven design
  - – Enables engineer and build-to-order practices
  - – Leverages supplier and partner innovation
  - – Natural, intuitive user interface and browser-based Web page
- **Improving Product and Corporate Agility**
  - – Creates new customer interaction and service opportunities
  - – Enables the rapid addition or removal of suppliers and partners
  - – Facilitates design-anywhere, build-anywhere practices
- **Lowering Total Cost of Ownership**
  - – Offers prescriptive and low risk, clear ROI deployment options
- **Enabling Rollout of Additional Functionality with Modular Architecture**[2]
  The benefits for a typical manufacturer using an enterprise PLM are:
  - – **Reduced Product Development Lifecycle time**—by as much as 40 percent. This solution accelerates information sharing between design engineers—with robust collaboration spaces aggregating required information, project timelines, and activity assignments.
  - – **Reduced Number of Process Errors**—by as much as 50 percent. This solution ensures that participants are using the most up-to-date and accurate product data.
  - – **Reduced Product Development Travel Expenses**—by as much as 65 percent. Windchill® powers collaboration spaces that aggregate all required information and include discussion forums and meeting spaces to conduct design reviews and other virtual meetings.
  - – **Reduced Engineering Change Order Processing Time**—by as much as 85 percent. This solution delivers automated, standards-based engineering change processes that span request, analysis, and notification, and contain supporting data, assignments, and activity tracking for monitoring.
  - – **Reduced Time-to-Market**—by as much as 40 percent. Windchill® bridges the communication and exchange of product data between design and manufacturing to meet time-to-market requirements.

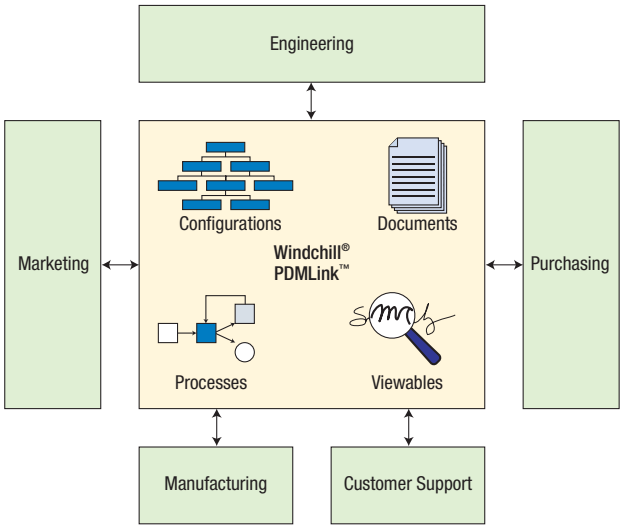


Source: [2]Giga, Total Economic Impact™ of Collaborative Product Development, 2001

## FUNCTIONAL BUSINESS CONCEPT

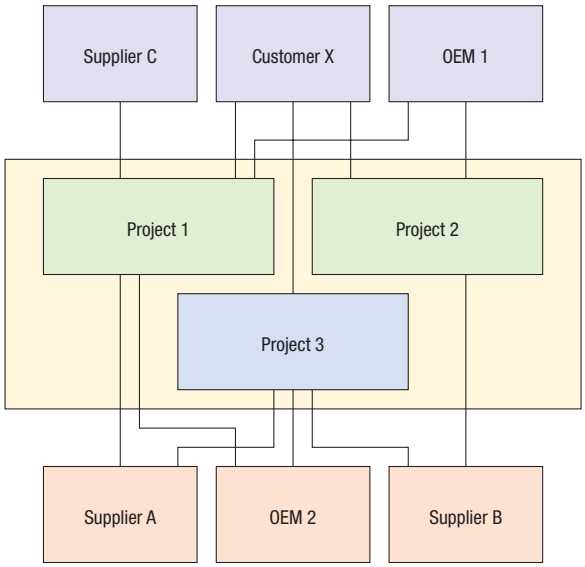
The Windchill® solution addresses three aspects of product development improvement:

- Facilitating the design and engineering of digital products
- Enabling product development process management
- Building a collaborative workspace




### LEVERAGING WINDCHILL® TO INCREASE INTERNAL PRODUCT DEVELOPMENT EFFECTIVENESS

Windchill® PDMLink™ is a comprehensive, out-of-the-box data management tool. By providing the ability to automate processes, manage product structures, and communicate with legacy and third-party applications—Windchill® PMDLink™ connects the disparate groups involved in bringing a product to market while maximizing usage of the existing assets of a corporation. As a Web-based application with an easy-to-learn user interface, the application can be deployed throughout the enterprise.



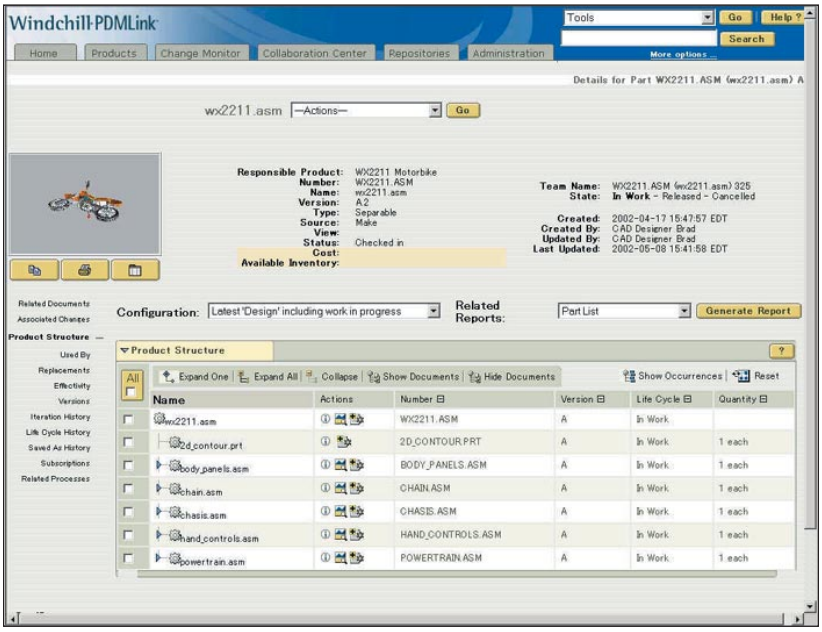

Companies using Windchill® can fold outside partners and team members into the product development process through a secure portal.

Windchill® ProjectLink™ provides project teams with a virtual collaborative workspace for product design and development. The portal can reside either outside or within the firewall—connecting other equipment manufacturers, suppliers, and customers in a portal that acts as the central repository for project data. Additional capabilities include visualization of information from many engineering authoring tools, self-service project setup, and administration and automated process management for key business-to-business design chain processes.

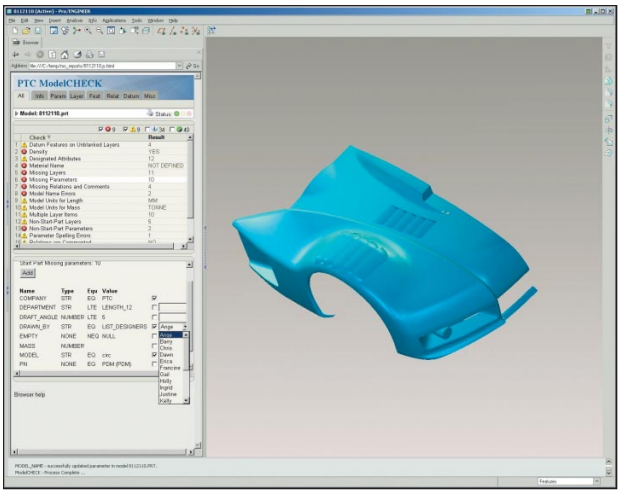
Windchill® ProjectLink™ allows product development team members to participate in the development process remotely by accessing collaborative workspace using a mobile laptop, such as a Mobile Intel® Pentium® 4 Processor-M-based laptop.

## USER EXPERIENCE

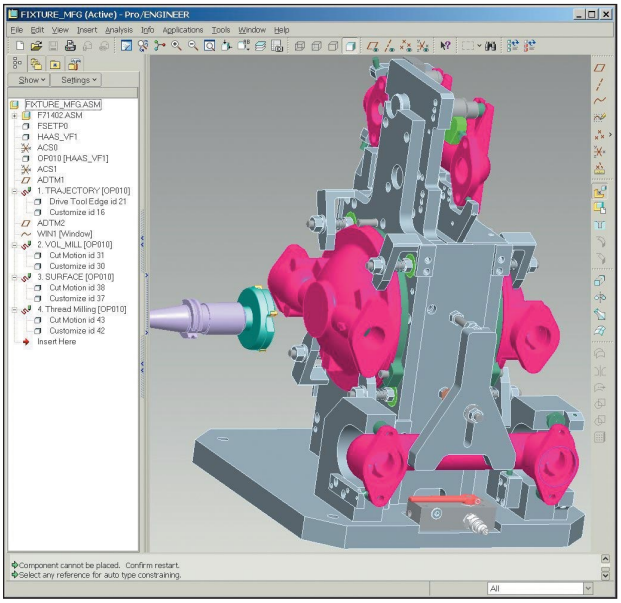
Windchill® weaves visualization throughout the interface so team members can quickly see and use all of the information, including the product structure, pending changes, effectiveness, and version history.



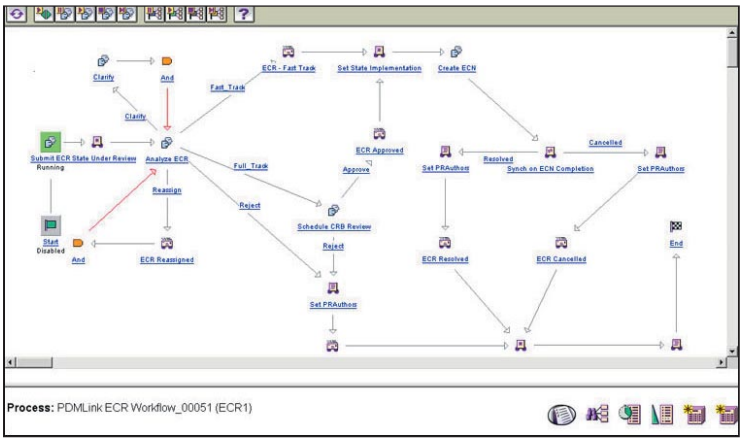

The Windchill® change monitor displays the status of problem reports, change requests, and change notices.




This solution allows designers to create, visualize, and easily manipulate product components.

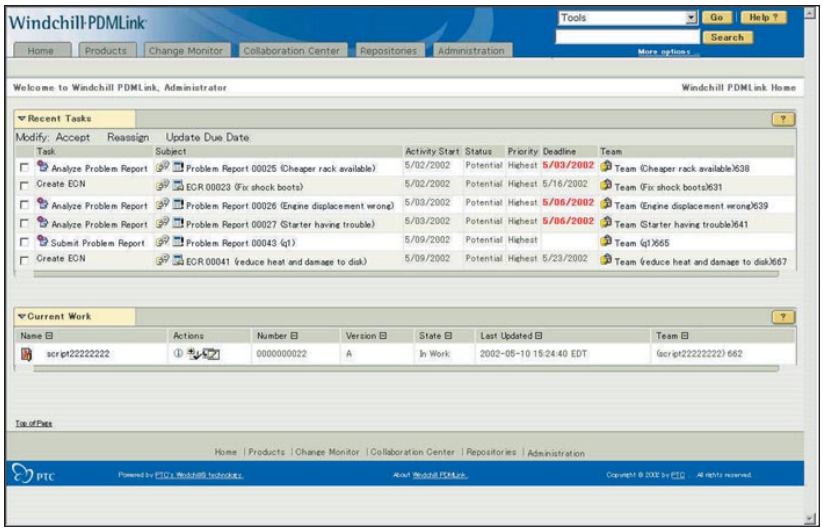



Components can be examined alone or as part of an assembly or sub-assembly.

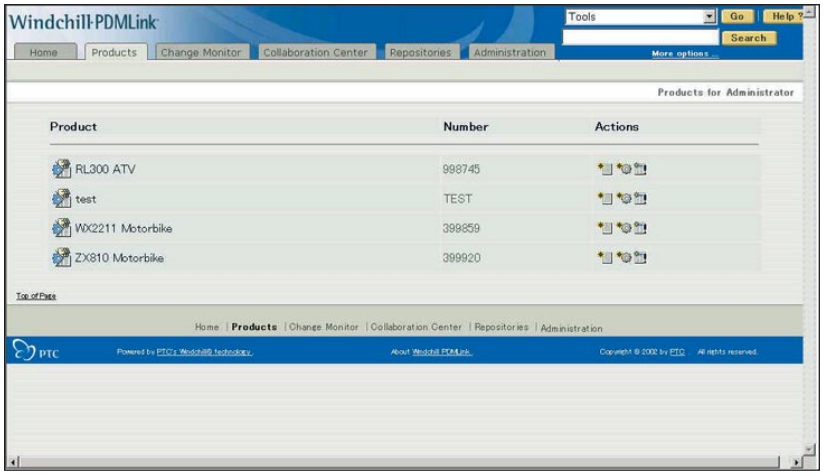



Using an out-of-the-box, CMII-certified change management process, manufacturers can adopt best practices quickly.

The home page provides an up-to-date view of tasks, current work, and subscription so users can manage their day more effectively.




Personalized product workspaces offer information and functionality relevant to each user—organized in a product-centric, logical way.

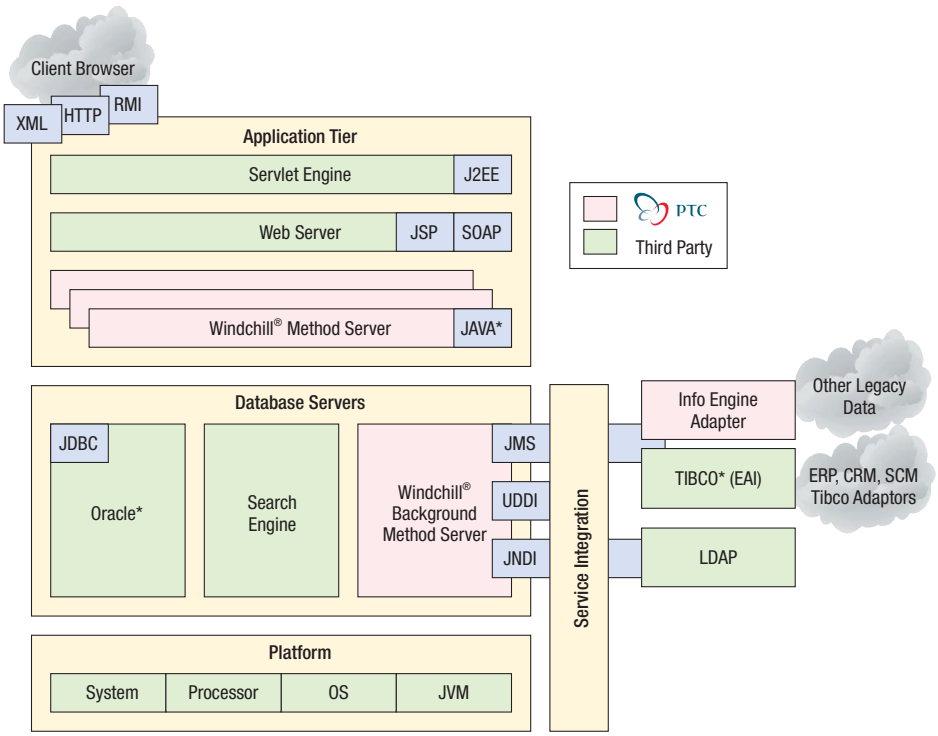



## SOFTWARE ARCHITECTURE

### APPLICATION

At the application level, Windchill® provides an open, Java*-based environment for easy deployment and solution customization. Proprietary workgroup managers are used to integrate with CAD applications (such as Pro/ENGINEER®, CATIA*, AutoCAD*, Solidworks*, and UniGraphics*). Enterprise application integrations built by TIBCO* interface with Oracle*, JD Edwards*, and other enterprise applications. These interfaces allow Windchill® to integrate all relevant information necessary to bring a product to market.

Additionally, by supporting multiple Web servers and servlet engines, Windchill® can be deployed using the software and middleware that customers have already deployed—including Tomcat*, J-Run*, and Apache*.




### DATABASE

Windchill® relies on Oracle9*i** to provide a scalable, object relational database management system that ensures access to current information in a dynamic and highly distributed environment.

The high-level software products that this solution supports are listed below. The list describes all of the products used and provides alternate products where applicable.

- **Windchill®**—The latest version of Windchill®.
- **Windows* 2000 Advanced Server Operating System**—Offers improved performance, scalability, and security on Intel® Architecture.
- **User Authentication**—Authenticates users using either the built-in authentication capabilities of the operating system, the built-in capabilities of the Web server, or a third-party application, such as the lightweight directory access protocol (LDAP). This solution uses the built-in authentication capabilities of the Window* 2000 Active Directory* services
- **Oracle* Database Enterprise Edition**—Uses Oracle* to store all information.
- **Java* Developer Kit and Java* Runtime Environment**—Windchill® components are written in Java*. To develop new Windchill® components, the Java* developer kit (JDK) must be installed. To execute the Windchill® components, the Java* run-time environment (JRE) must be installed.
- **Java* Servlet**—Helps to improve performance by accelerating Java* applet down-load times. Windchill® supports the use of either the Jrun* servlet engine or the Tomcat* servlet engine.

- **Web Server**—Since Windchill® provides Web-based access to all users, it requires a Web server. Windchill® supports the use of Microsoft* IIS*, iPlanet* (formerly Netscape*), and Apache* Web servers. This solution was accomplished using Microsoft* IIS*.
- **Web Browser**—Clients access Windchill® through a browser on their local machine.
- **Mail Server**—The mail server is a software server that is responsible for the delivery and receipt of e-mail. Windchill® can send users e-mail notifications of events occurring in the system.
- **Network Protocols**—As a Web-based application, Windchill® supports TCP/IP.
- **Development Tools**—Windchill® is highly customizable and extensible. To customize Windchill®, Rational* Rose* 2000 and Symantec* Visual Café* must be installed.
- **Enterprise Search**—Windchill® can perform either local or enterprise searches. Enterprise searches involve searching other Windchill® servers or legacy data systems. To perform enterprise searches, the retrieval search engine must be installed.

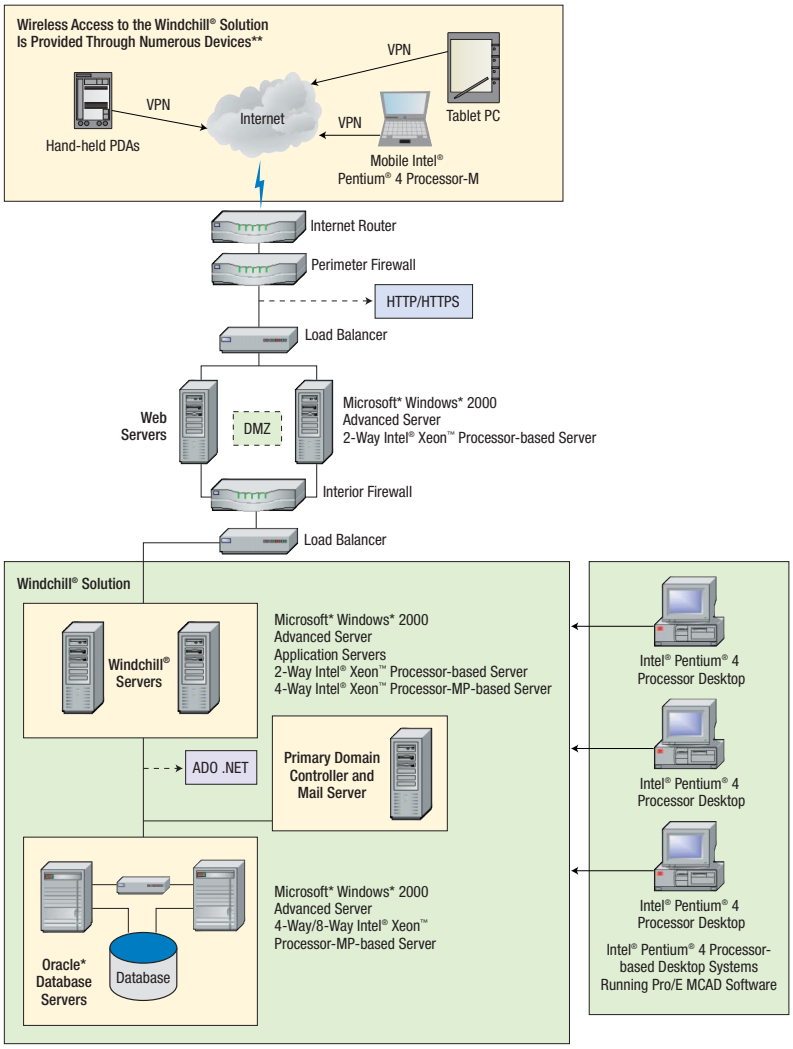
## SYSTEMS ARCHITECTURE

Windchill® running on Intel® Xeon™ processor family-based servers employs the Microsoft* Windows* operating environments. Intel® Xeon™ processors enable data center reliability, availability, serviceability, and manageability.

Each of the Windchill® system components is described below:

- **Windchill® Server**—The Windchill® server is composed of two servers: the Windchill® method server and the Windchill® server manager. These servers are used to process requests from the clients and deliver Java* applets and HTML to the clients.
- **Primary Domain Controller**—The primary domain controller is used to authenticate users into the Windchill® system. Once authenticated, the user is given the rights and privileges within Windchill® associated to that user.
- **Database Server**—Windchill® uses the database server to store all of the information that is generated by the users. In addition, the database server stores information about the user's data.
- **Web Server**—Since Windchill® provides Web-based access to all users, it requires the Web server to act as the gateway to Windchill® for the client.
- **Mail Server**—The mail server is a software server that is responsible for the delivery and receipt of e-mail. Windchill® can send users e-mail notifications of events occurring in the system.

Additionally, there are system requirements for Windchill® users that are also engineers, designing products using MCAD applications such as Pro/ENGINEER®. These users require incremental processor power on their desktop to build, manipulate, and display complex three-dimensional models. The performance capacity of the Intel® Pentium® 4 processor enables this sort of design work to occur efficiently.




## PROCESSING POWER

The Intel® Pentium® 4 processor-based desktop systems used as clients in PTC's PLM solution enhance collaboration among product development team members by providing the fast response times and high transfer rates needed for quick storage and retrieval of large, graphics-rich documents across a network. At the same time, the performance headroom provided by these systems enables efficient execution of compute-intensive MCAD applications. With 2GHz and higher clock speeds and innovative Intel® NetBurst™ microarchitecture, the Intel® Pentium® 4 processor-based desktop system presents a versatile, reliable, high-performance foundation for this collaborative solution. Intel® NetBurst™ microarchitecture offers the following features and benefits:

- 400MHz Processor System Bus—Moves data faster between memory, graphics, and bus devices to enhance performance.
- Hyper-Pipelined Technology—Increases processor performance and frequency scalability.
- Rapid Execution Engine—Reduces execution time for calculation-intensive applications by increasing execution throughput.
- Hyper-Threading Technology—Improves system performance and efficiency by enabling a single processor to handle multiple processing tasks simultaneously.

## MOBILE INTEL® PENTIUM® 4 PROCESSOR-M

Wireless connectivity enhances the productivity, efficiency, and flexibility of the product development team by enabling team members to collaborate at any time from any place. Wireless connectivity is achieved in the PTC PLM solution using the following technologies:

- Mobile Laptops—Mobile Intel® Pentium® 4 Processor-M-based laptops are designed for high-performance and low power consumption.
- Wireless PDAs—Intel® XScale™ technology-based microprocessors allow PDAs and other handheld devices to be designed for low power consumption and high-performance processing.



** Because of Windchill's unique Java*-based architecture, devices such as PDA's and Tablet PC's that run Web browsers have been Windchill-enabled by customers in the past. Windchill is currently supported by PTC on client devices running Windows* 95, 98, 2000, and XP.

## SUMMARY

The Windchill® solution from PTC® is an integrated, Web-based suite of software applications designed to improve product development processes within the manufacturing industry—where the majority of costs and competitive characteristics are locked in. By providing a Web-based environment for PLM that allows enterprises to globally integrate business processes and product data for dispersed divisions, partners, and customers—Windchill® helps companies bring new products to market faster than their competitors while still maintaining product quality. Intel® Xeon™ processor family-based servers provide the saleable architecture that cost-effectively powers Windchill® installations as they ramp from pilot projects to enterprise-wide installations.

Similarly, Intel® Pentium® 4 processor-based desktops and laptops have the performance capacity to meet the intensive graphics and processing requirements of MCAD applications while supporting collaboration through enhanced network and wireless access to shared data.

## LEARN MORE ABOUT THIS INNOVATIVE SOLUTION

For general information about the products described in this solution blueprint, visit:

www.ptc.com

www.intel.com/go/solutionblueprints

If you have a specific question about implementing this solution within your organization, contact your Intel representative or e-mail us at: **solutionblueprints@intel.com**

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