

V6 PLM Solutions **Supported by IBM's Enabling Technologies**

Providing a Dynamic Infrastructure for your PLM Environment



Dynamic thinking

Today's business pressures and constant climate of change are demanding that PLM (Product Lifecycle Management) systems are architected to support flexibility, agility and increasing service levels.

What if you could enhance the infrastructure supporting your PLM applications to be just as dynamic as today's business climate, and respond to changes swiftly and effectively without missing a beat?

Now you can.

The combination of V6 PLM Solutions and IBM's enabling technologies helps you to build a dynamic infrastructure, which is designed for today's instrumented world. You will be able to integrate the growing intelligent business infrastructure in the expanding digitally interconnected world with the necessary underlying design of a flexible, secure, energy efficient and seamlessly managed IT infrastructure.

Product Lifecycle Management is a continuous process that enables an enterprise to effectively and efficiently innovate and manage its products and related services throughout the entire business lifecycle, from initial concept, creation and use through to maintenance, recycling or disposal.

PLM solutions for a smarter planet

The planet is becoming smarter as more human beings, man-made systems and natural systems become more interconnected, instrumented and intelligent. You now have the potential to link all the resources involved in your product development business operations together with unprecedented freedom. While this idea is exciting and inspirational – it can also bring with it challenges and concerns. Take the first steps by assessing your needs and understanding the key elements of a dynamic infrastructure that will support your PLM solutions.

A dynamic infrastructure integrates business and IT assets and aligns them with the overall goals of the business while taking a smarter, new and more streamlined approach to helping improve service, reduce cost and manage risk.

Not only is the planet becoming smarter but in all industries, products are becoming more innovative. Twenty years ago, a single device incorporating a phone, e-mail, music, Web access, camera, GPS, games, applications and a video recorder would have been science fiction. Today, it's yesterday's news. Developing these smarter products demand new ways of working and new product development processes. Processes that enable:

- **Innovation** – to create products and solutions that drive market demand
- **Collaboration** – to unite globally dispersed and diverse development teams
- **Efficiency** – to reduce development costs and time to market.

A Dynamic Infrastructure for V6 PLM Solutions

This document will introduce you to the architecture of V6 PLM Solutions, explain their benefits, and describe how this architecture enables the flexibility and agility provided by a dynamic infrastructure. IBM's hardware and software working in conjunction with V6 PLM Solutions can help you to:

- Optimize IT resource investment through virtualization.
- Manage and secure your environment
- Manage a complete product information infrastructure
- Enhance business resiliency
- Enable real-time product development collaboration
- Extend core PLM capabilities into systems engineering.

V6 PLM Solutions: architected for the future

V6 PLM Solutions harness the collective intelligence of CATIA®, DELMIA®, SIMULIA®, ENOVIA®, and 3DVIA® to enable the collaborative management of the entire product lifecycle. These integrated solutions allow you to easily simulate how your products will perform, be built and experienced by your customers before you make any capital investments in your production facilities.

V6 PLM Solutions are designed to extend the value of your existing PLM assets and investments. They deliver a suite of fully integrated PLM applications, built on an open Services Oriented Architecture (SOA). Its single, open and Web-based scalable platform enables V6 to be readily integrated within your existing environment by:

- Embracing SOA standards and providing a platform and data model that is open, highly extensible, customizable and rapid to deploy
- Delivering a single PLM platform for all PLM business processes, available to anybody, anywhere – reaching technical end users from different engineering disciplines, as well as executive and operational business end users
- Leveraging SOA technology to give secure access to all Intellectual Property – regardless of the data source location – to give a single view of your overall product lifecycle management business processes.

The V6 PLM Solutions architecture has been built to support global, enterprise-wide deployments and is equipped with the highest levels of performance and scalability, making it an ideal platform to support the product development process in any enterprise or in any industry.

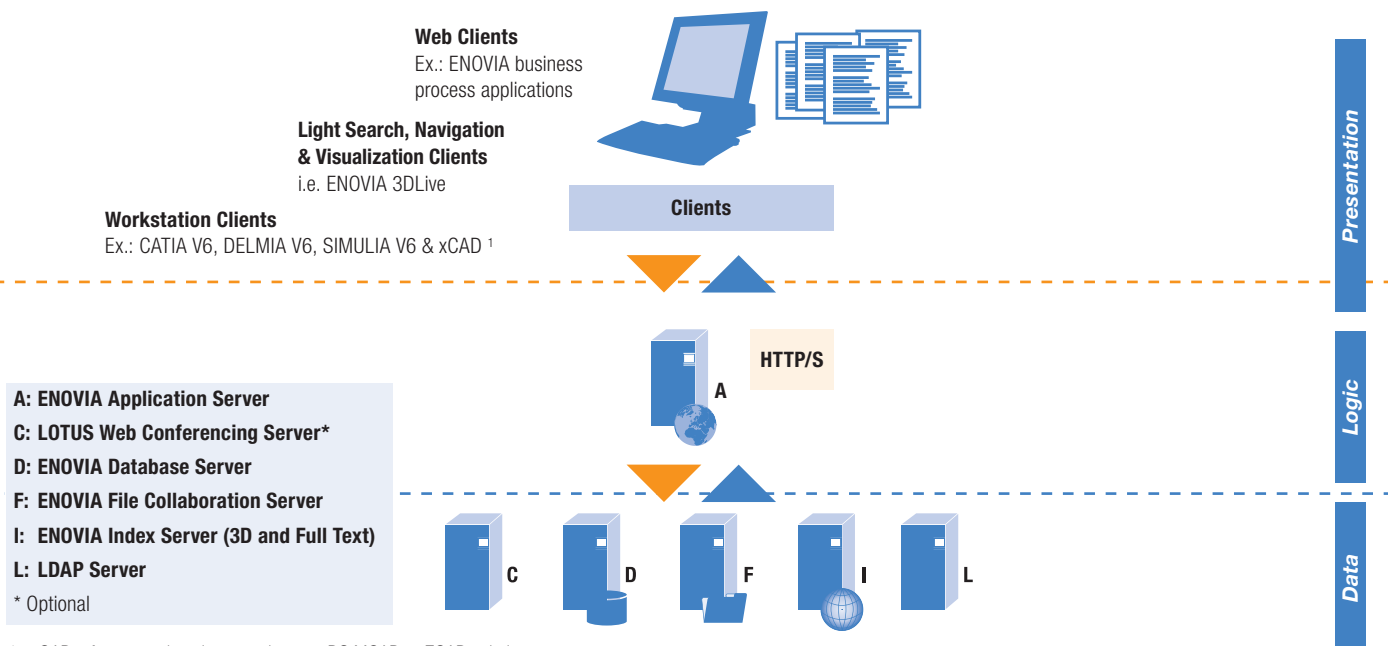
The multi-tier architecture of the V6 PLM Solutions platform provides companies with a single, secure environment that eliminates the barriers caused by geographically dispersed organizations and value chains. This architecture keeps the central database, but distributes the file stores with application servers to handle checkin/checkout of large design files at design centers throughout the world.

The distributed file storage architecture built into the V6 PLM Solutions architecture enables you to support a dynamic product development environment. Data access can be easily moved to where the development teams are located when project priorities shift or suppliers change yet central control over your intellectual property remains intact.

The main layers of the V6 PLM Solutions architecture and its constituent components are shown in Figure 1, below.

V6 Multi-tier architecture overview

Figure 1



- **Presentation layer** – manages how users interact with your PLM data. There are three distinct client types:
 - Rich clients – used by your engineering and manufacturing personnel to create and simulate your product information
 - Light visualization clients – used by anyone in your enterprise to navigate, search and collaborate around your 3D and 2D product data
 - Web clients – used by everyone to access the ENOVIA business process applications.
- **Logic layer** – manages the business logic, provides Web access for your users, and facilitates WAN deployment. The logic layer includes an ENOVIA Live Collaboration Server to manage the ENOVIA Web and application server logic that runs inside a J2EE server (such as WebSphere® Application Server).
- **Data layer** – provides a repository where your PLM data resides and services against this repository to ensure secure access and rapid searching of both 3D and textural data, and the real-time collaboration around this data. The data layer comprises:
 - ENOVIA File Collaboration Server (FCS) – provides document storage and retrieval services for your PLM data. The FCS supports file replication to improve WAN performance.
 - Database Server – used by ENOVIA V6 to store and retrieve business objects (metadata).
 - 3D Indexing Server – enables accelerated searching and retrieval of 3D Data.
 - Full-Text Indexing Server – provides a unique user experience for searching and retrieving structured ENOVIA V6 metadata and file data.
 - Real-Time Collaboration Server – provides real-time collaboration and conferencing services. IBM Lotus® Sametime® may be used to provide conferencing services for ENOVIA V6 users.
 - LDAP Server – enables the simplification of user accounts. Tivoli® Directory Server may be used for Single Sign On Integration with ENOVIA V6.

Global deployment of the V6 PLM Solutions

This is facilitated by holding a single metadata repository in a master site and distributing the file within the different remote locations. The Application Server architecture enables optimal usage of the database and scalability as the number of users increases due to its load balancing capability using IBM Power Systems™ servers and IBM System Storage™. (See Figure 2).

V6 Centralized Database Architecture with Distribution File Stores

Figure 2

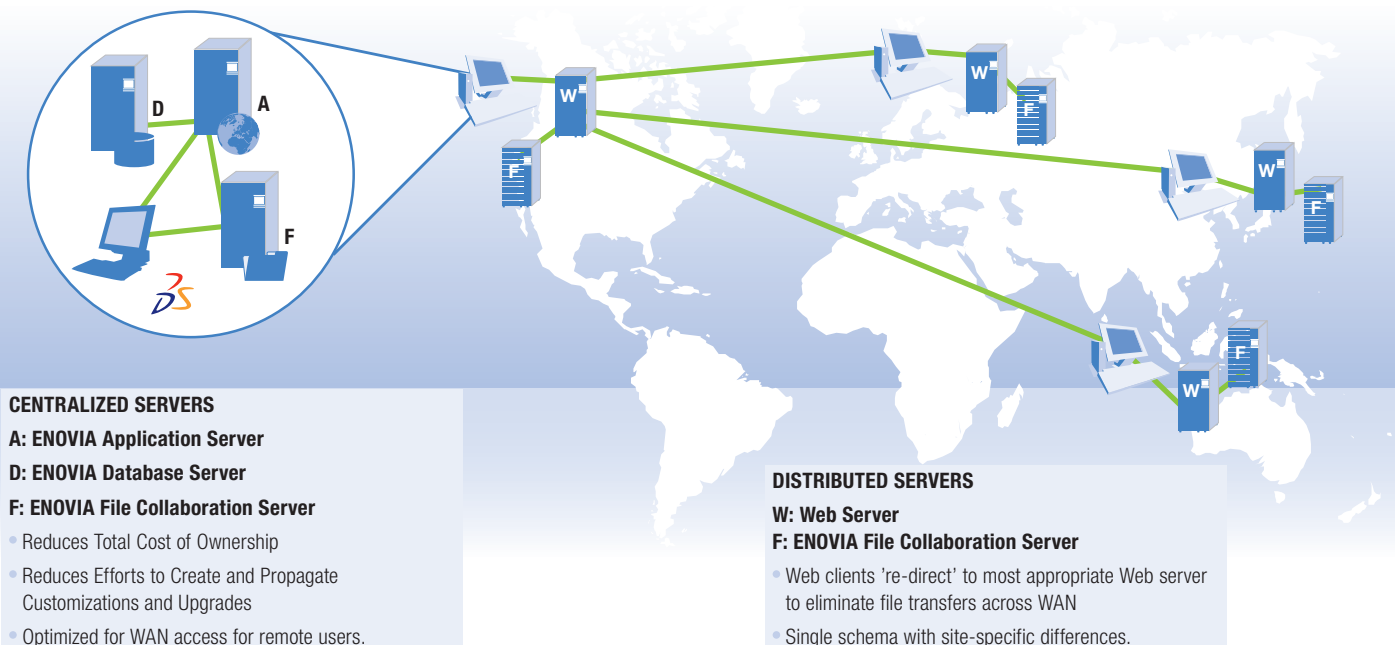


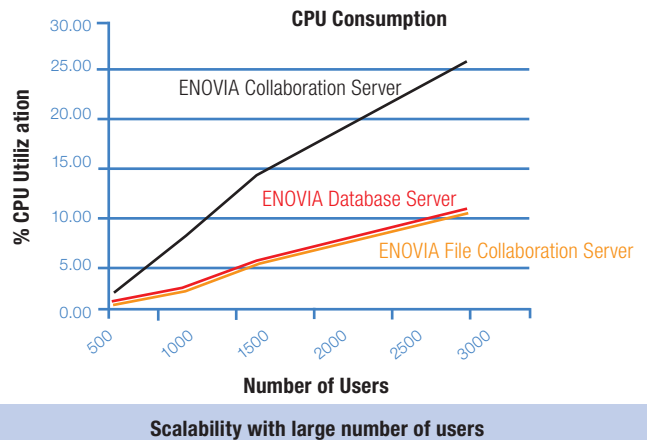
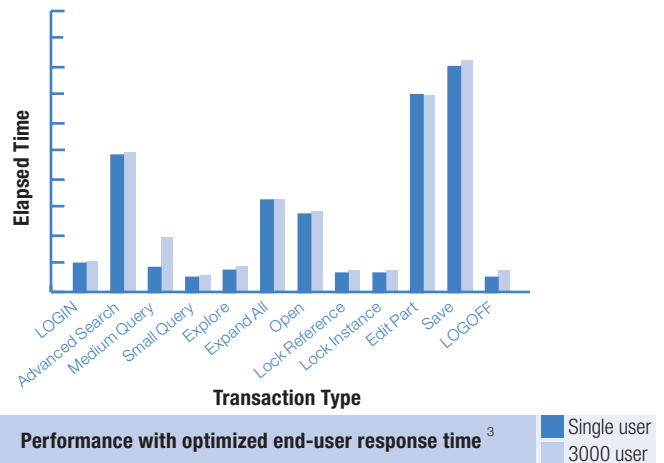
Figure 3

Scalable architecture of the V6 PLM Solutions

This enables the addition of industry standard Web application servers for load balancing and geographically dispersed deployments. In addition, file storage and replication services enable efficient file server distribution. The V6 PLM Solutions Platform includes standard centralized file storage. In addition, optional remote file collaboration servers can be deployed at work sites throughout the world. As a result, large files remain close to the users who access them most frequently, while ensuring that all users worldwide enjoy easy access to the files as needed.

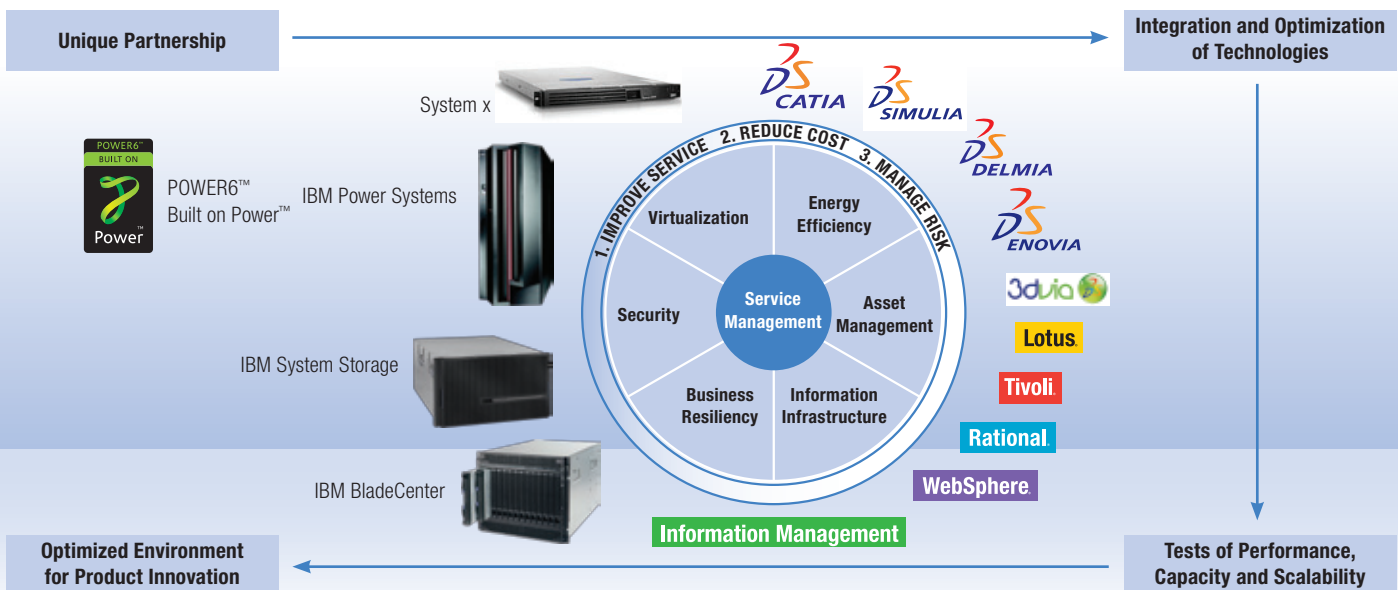
The scalability and capacity of the V6 PLM Solutions has been verified at the IBM and Dassault Systèmes International Competency Centre (IDSICC)². This involved simulating typical multi-user workloads and the roles of 3000 users against a 38 million part-instance database using IBM Power Systems Servers and IBM System Storage.

The weighting and definition of the tasks performed by the various roles has been defined in conjunction with a number of large automotive and aerospace companies. The simulated workload represents the activities performed on a daily basis in many large design organizations. The graphs in Figure 3 show that the end-user response time remains the same and that the CPU consumption grows linearly as the number of users increases.



Technology Partnership between IBM and Dassault Systèmes

Figure 4



2 In 1999, IBM and Dassault Systèmes formed an International Competency Centre (IDSICC). The role of this IDSICC is to support the integration and optimization of IBM technologies in Dassault Systèmes projects and products. One of the key aspects of this support is to perform Performance, Capacity and Scalability (PCS) testing of ENOVIA V6 by simulating typical multi-user roles and workloads running on an infrastructure made up of IBM hardware and software.

3 The infrastructure used in this test was built on IBM Information Management DB2 Version 9.1, IBM WebSphere Application Server 6.1, IBM Lotus Sametime 7.5 and a preR2009 version of ENOVIA V6

Optimize IT resource investment through virtualization

Complexity can work its way into the IT infrastructure supporting your PLM environment driven by the introduction of new applications and unanticipated growth. Adding a server each time there is new demand for a new application means additional floor or rack space, power, cooling, network interfaces, data storage and administrative resources. Such complexity leads to inefficiency, with the answer being consolidation and virtualization as a key enabler for a dynamic infrastructure.

Consolidating resources through virtualization can increase utilization far beyond the inefficient utilization rates often seen in data centers today. The IBM Power™ Systems family of servers includes proven server consolidation platforms that help you control costs while improving overall performance, availability and energy efficiency. With these servers and IBM PowerVM™ virtualization solutions, your business can consolidate applications and servers, virtualize its system resources, and provide a more flexible, dynamic IT infrastructure. IBM Power System Servers running IBM AIX® with PowerVM VIOS (Virtual I/O Server) and Micro-Partitioning technologies have been validated through the rigorous certification test process.

Manage and secure your PLM environment

IBM Service Management delivered by our Tivoli brand of software products including Maximo® Asset Management, working in conjunction with other IBM software, hardware and services delivery personnel allows you to address a broad range of challenges associated with maintaining a cost-effective secure and resilient IT infrastructure to support your PLM applications:

- *Comprehensive asset management*
- *Event and infrastructure management*
- *Security and compliance management*
- *Workload management*
- *Storage and capacity planning*
- *Data backup and recovery*
- *Long term archive and retrieval strategies.*

It provides you with the global visibility and control, and the automation necessary to respond to your dynamic service requirements in a SOA environment:

- *Understand what assets and other resources are being deployed, how these assets are used and by whom; how assets and resources relate to, and can impact, PLM environments*
- *Comprehensively monitor all assets, resources, events, performance and service levels to provide total visibility into their status as well as automation to optimize performance*
- *Keep assets (both physical and IT) protected from malicious or fraudulent use and resilient to failure*
- *Reduce costs, improve responsiveness and minimize errors by creating automated, repeatable, consistent and scalable task management*
- *Align IT planning and execution to business users and stakeholders to streamline the planning process and enable lifecycle governance.*

Manage complete product information infrastructure across the enterprise

IBM's Information on Demand (IOD) products enable you to federate and assimilate all data about a product in a central secure enterprise-wide repository that can be accessed and understood by all product development, delivery and service stakeholders. Easier access to complete and updated product information by a variety of different search criteria eases collaboration and decision making. Some of the major IOD products that can add value to the V6 PLM Solutions platform include:

- *DB2® for rapid access to product design information and unmatched performance and scalability*
- *FileNet® for enterprise wide content management, integration to technical publishing needs enabled by 3DVIA Composer and long term document archive retrieval and storage*
- *InfoSphere™ for integration with commercial aspects of your product information required by your distribution channel*
- *Cognos® for product and portfolio performance management and executive level decision making.*

In order to reach the levels of scalability demonstrated by the IDSICC, the V6 PLM Solutions platform utilized the I/O performance provided by the IBM Systems Storage products, and was critical in complementing the DB2 database transaction throughput achieved while running on IBM Power Systems servers.

Enhance Business Resiliency and Integration

There are several migration strategies and tools available to you from IBM and Dassault Systèmes to help you integrate the V6 PLM Solutions platform into your existing environment without disruption depending on your specific circumstance:

- *If you need to coexist with earlier versions of CATIA or ENOVIA, Dassault Systèmes provides out-of-the-box direct connections that enable access to earlier versions of CATIA data files from the V6 PLM Solutions platform. These connectors issue open Web services calls that can be understood by IBM WebSphere Application Server (WAS) so the data can be easily exchanged over the WebSphere Enterprise Service Bus.*
- *If you have other PLM applications in your environment or want to integrate with other enterprise systems like ERP or*

Service Management, IBM WebSphere Process Server can be used to automatically orchestrate business processes across heterogeneous systems and to federate data access from ENOVIA into these other systems. This data federation allows for access to the information without requiring the overhead of copying the data from one system into another.

- *If you have specific complex business operations you need to execute across heterogeneous systems like engineering change management or bill-of-material synchronization, IBM offers a PLM Content Pack that works with WebSphere Dynamic Process Edition (WDPE) that provides starter API's and pre-coded business process execution language modules to dramatically reduce the amount of time it takes to implement these complex integrations. IBM is working with most of the leading PLM application vendors who have agreed to support these industry standards to develop and test these interactions.*

IBM WebSphere Application Server (WAS) is at the core of all these migration and integration strategies and provides many benefits and capabilities:

- *Delivers the secure, scalable, resilient application infrastructure you need for a Service Oriented Architecture (SOA)*
- *Runs Web services in a reliable, scalable, highly available, environment to ensure transactions and productivity are not lost due to application downtime*
- *Secures applications and data with a resilient, standards-based security infrastructure that will remove vulnerable threats while maximizing developer productivity*
- *Enables reuse of software assets and extends their reach with standards-based messaging and the latest Web services standards*
- *Manages applications effortlessly with powerful, easy-to-use tools for administration and monitoring.*

Enable real-time product development collaboration across your extended value chain

IBM solutions unite the companies, activities and processes within the product development value chain, enabling all parties to collaborate in real-time. IBM provides the applications, IT environment and integration capabilities needed to enable innovation across the extended enterprise. IBM Lotus delivers security-rich collaboration software that empowers people to connect, collaborate, and innovate to drive better business outcomes. (See Figure 5).

The IBM Lotus platform for collaboration is the most comprehensive of such platforms on the market, providing capabilities such as:

- *Messaging and Collaboration: Flexibility and choice are key to determining the right advanced messaging solution to meet your company's unique business needs. IBM provides a variety of security-rich, multi-platform messaging products that can work together to build cost-effective solutions to meet your varying requirements.*
- *Unified Communication and Collaboration: The IBM unified communications and collaboration (UC²™) vision is to make it easier for colleagues, customers and partners to find, reach and collaborate with one another through an integrated unified communications experience.*
- *Social Computing and Mashups: IBM helps makes the enterprise of the future, the enterprise of today. By providing a unique portfolio of social networking, mashups, and Web 2.0 technologies, IBM is helping organizations of all sizes become more innovative and agile.*
- *Portals and Dashboards: Performance dashboards, composite applications and other business solutions from IBM Lotus software are designed to give decision makers the real-time visibility they need to proactively monitor business performance and drive results.*

People drive better business outcomes Figure 5



The combination of ENOVIA 3DLive and IBM Lotus Sametime provides a unique solution for industry by promoting the sharing of data and ideas that can result in a faster time to market and an increase in overall product innovation. ENOVIA 3DLive supports IBM Lotus Sametime and its broad set of advanced real time collaboration capabilities.

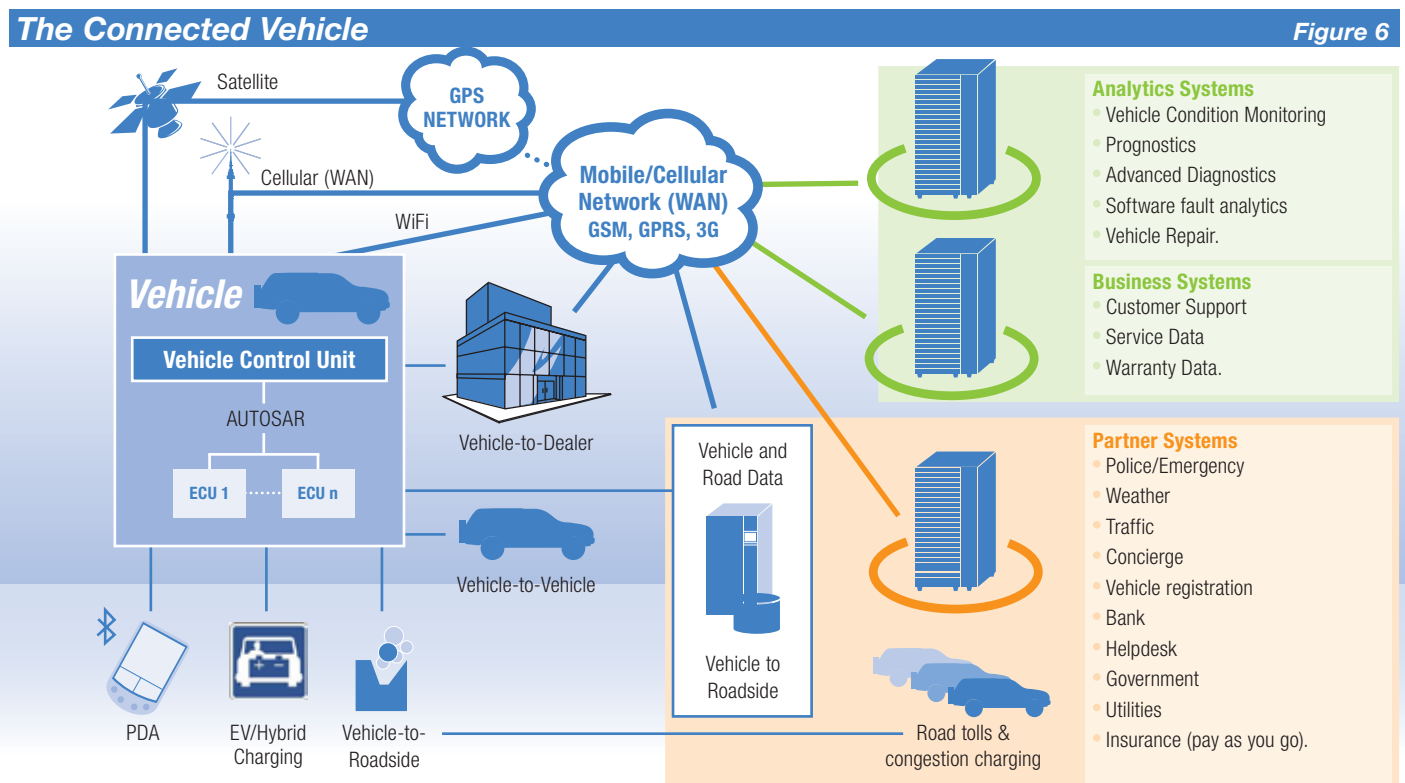
ENOVIA 3DLive facilitates collaboration between different people who need to leverage intellectual property in decision making processes. Users have the ability to be connected, at anytime, with the people relevant to their work-context. By simply clicking on a part, users are instantly aware if the part's owner is online or not and they can easily start a real-time chat session with those owners that are online. When discussing the product with other online participants, users can start dynamic 3D sharing and co-navigation with the 3D Heads-up capabilities, enabling them to share what they see and explain what they mean.

Extend core PLM capabilities into Systems Engineering

Software has become a key differentiator in the marketplace. As products become smarter, the role of software embedded within products, and how this embedded software interacts with external systems, has never been so important.

CATIA Systems, coupled with the IBM Rational® Systems solutions, offer a world-class portfolio for delivering a competitive advantage. Whether you deliver embedded software for electronics, in-vehicle software for automobiles, or net-centric systems for aerospace and defense, IBM has solutions to help you develop better products more efficiently.

For example, consider the systems engineering requirements to deliver the automotive 'connected vehicle' illustrated in Figure 6. Organizations need capabilities ranging from collaborative business process support, through to modeling and simulation environments that encompasses UML, SysML, functional behavioral modeling and 3D based product definition and simulation. IBM is uniquely positioned to offer a complete portfolio of offerings to address these needs.



“Embedded software has evolved from a hidden component driving functionality to the keystone of product differentiation and end-user experience.”

VDC Research, October, 2008CATIA

The V6 PLM Solutions bring multiple engineering disciplines – including mechanical, electrical and software engineering – together in a collaborative development environment. This supports an improved understanding of the performance of the system, allowing potential errors and incompatibilities to be detected at the earliest design stages. The innovative CATIA Systems suite of products provides a single simulation platform for hybrid, multi-disciplinary systems simulation.

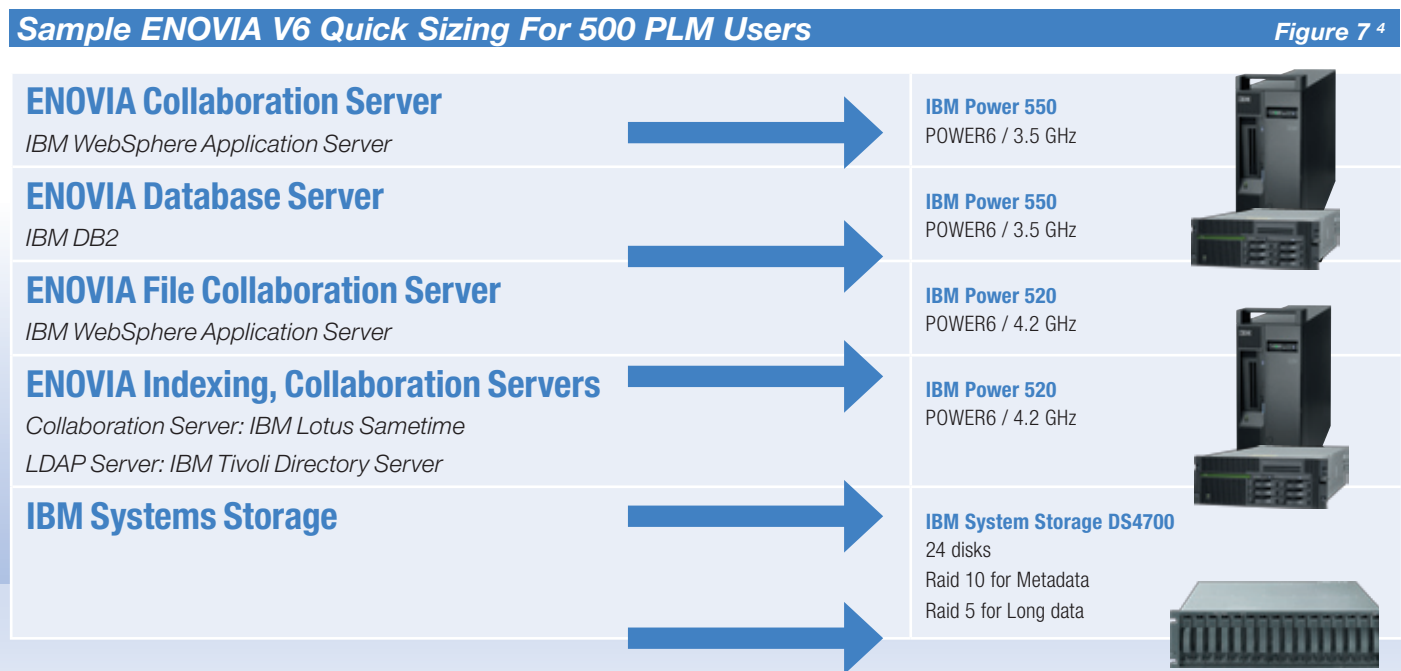
IBM offers the tools, processes, and consulting services to help you develop and deliver successful products and systems. Our market-leading offerings and deep expertise uniquely position us to help you deliver innovative software for your products, while integrating across mechanical, electronic, and software domains.

The IBM PLM and Rational Systems software solutions can help your systems development teams to:

- Innovate and differentiate your products and systems
- Develop software-intensive systems faster and more efficiently
- Reduce systems development costs
- Ensure compliance with standards and regulations
- Improve visibility and collaboration because teams are using a central repository
- Perform realistic simulation very early on in the design phase.

Pulling it all together

IBM can help you assess your current PLM and supporting IT environment and decide which V6 PLM Solutions benefits will deliver the most value in your organization. Next, IBM can help you to determine how to integrate ENOVIA into your current environment without disruption ensuring you have the right hardware and software in place to deliver maximum performance on a secure and stable platform. IBM's hardware and software has been thoroughly tested with the V6 PLM Solutions platform in the IDSICC which gives you peace of mind that all these components will work in your environment. See the sample configuration in Figure 7 for an illustration of how all the pieces fit together to enable you to build smarter products for a smarter



⁴ This is a representative sample configuration to support 500 PLM users with average workload. Precise hardware requirements will vary depending on individual client workload characteristics.

planet. This reference hardware configuration supporting the V6 PLM Solutions was thoroughly tested in the IDSICC, but your specific performance characteristics need to be well understood in order to develop the optimal hardware configuration to support your environment. With the expertise we have developed in the IDSICC, IBM stands ready to help you do that.

Choose IBM – the PLM leader

IBM's PLM expertise and leadership continues to be valued by our clients. In addition to providing industry-specific skills and expertise on Dassault Systèmes' PLM solutions, we excel in providing systems integration expertise to help you manage the complexities of the entire value chain.

IBM is the only company that can deliver the complete PLM solution. Our unmatched combination of consulting, applications, middleware, hardware and services, coupled with a broad knowledge of industries and IT solutions, equips us to build complete PLM solutions to fit every business – large and small. This is the IBM difference.

When you choose IBM as your PLM partner, you are choosing:

A PLM leader

IBM leads the development of PLM. Our value proposition is built on a foundation of decades of world-class IBM technology expertise, supported by thousands of IBM engineers and developers in 40 different countries.

Our unmatched annual investment in Research and Development – the key to innovation – stands at approximately \$6.3 billion in 2008. This is testament to our commitment to helping your organization succeed in a world of change. For the past 16 years IBM has been awarded the most U.S. patents in a single year. In 2008 the company earned 4,186 patents – the first company ever to win more than 4,000 U.S. patents in a single year.

A world-class manufacturer

IBM possesses deep industry experience and knowledge of the challenges you face. As a primary user of PLM, we understand your business processes and have the support of a global team of engineers to help tackle your real world issues – and keep you ahead of your competition.

Breadth of offerings

We can impartially recommend PLM offerings to suit your organization, and deploy and integrate the solution throughout your extended enterprise.

Dynamic Infrastructure Leadership

As for our leadership in equipping you with the world's leading dynamic infrastructure to support your PLM applications environment, here are just a few highlights:

According to IDC, IBM is ranked number 1 in systems management, enterprise asset management, archive and hierarchical storage management, identity and access management, telecommunication assurance, network availability and in server provisioning.

The OSS Observer ranks IBM number 1 in service assurance.

Gartner, Forrester and Frost & Sullivan all rank IBM as the number 1 identity management provider.

IBM has been the winner of Information Security Magazine's Reader's Choice award for Application Security for the past two years in a row.



How to get started

IBM can help you get started in your planning for ENOVIA V6 and the required supporting dynamic infrastructure in a variety of ways depending on your specific priorities.

We offer Collaborative Product Innovation (CPI) assessments which will help you identify and prioritize your business challenges, set improvement initiatives and quantify the benefits of investing in V6.

We can also help you plan for your migration to V6 by assessing your current environment, data, methods and process so you can develop an adapted coexistence strategy or a complete migration strategy to a V6 platform. Or we can help you with a V6 architecture study which will define the physical architecture required to deploy V6 given your specific data and user requirements.

Please contact your IBM sales representative or visit one of the many other resource Web sites to learn more:

ENOVIA V6:

ibm.com/software/plm/products/v6/enovia/

IBM's Strategy for a Dynamic Infrastructure:

ibm.com/dynamicinfrastructure/

IBM Power Systems Advantages:

ibm.com/systems/power/advantages.html

Service Management with IBM

Tivoli Solutions:

ibm.com/software/tivoli/

Data management with IBM

Information

Management Solutions:

www-01.ibm.com/software/data/information-on-demand/

Integration and Orchestration with

IBM WebSphere:

ibm.com/solutions/plm/soa

Collaboration with IBM Lotus

Solutions:

ibm.com/software/lotus/

Hybrid, Multi-Discipline Systems Engineering

Solutions with CATIA Systems:

ibm.com/software/plm/products/v6/catia/systems.html

Systems Engineering with IBM

Rational

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