

Transforming the process of innovation for today's
Defense services and agencies

Siemens PLM Software

www.siemens.com/plm



By applying its industry-leading digital lifecycle management and collaboration capabilities to the needs of today's defense services and agencies, Siemens PLM Software is able to deliver fully functional integrated digital environments (IDEs) capable of improving every phase in the defense acquisition management framework.

SIEMENS

Transforming the acquisition and sustainment lifecycle

Defense services and agencies use highly structured programs to manage the lifecycle they use to acquire and sustain their weapons systems, platforms and support infrastructure. These programs must effectively cope with high investment costs, global sourcing, variable production runs, highly regulated contracts, industry-standard requirements, performance-driven validation and leader-directed transformation initiatives.

Program managers need to implement responsive and innovative programs that improve:

- ▶ *Systems acquisition*, including the processes associated with concept refinement, technology development, system development/demonstration and production/deployment.
- ▶ *Systems sustainment*, including the processes for operating, maintaining, repairing, overhauling and supporting these systems.

Commercial aerospace and defense companies build *global innovation networks* to continuously improve their products and processes. The U.S. Department of Defense has introduced a similar concept called the *integrated digital environment (IDE)* initiative to improve the defense acquisition management framework and its related processes.

IDE initiatives are expected to create a “seamless, collaborative, digital-based business environment” that provides:

- On-demand data access to distributed data sources
- Ability to create information once and maintain it at its source while enabling users to access/leverage this data throughout its lifecycle
- Adherence to Department of Defense infrastructure and data standards, including DII/COE and CALS
- Ability to create and manage workflow-enabled processes
- Delivery-in-place method for CDRL data delivery
- Data management system that ensures timely and accurate configuration control
- Organizationally managed knowledge and data access
- Collaboration-related communications tools, including email, threaded discussions and other on-line capabilities
- In place security processes and procedures

IDEs play an essential role in various defense transformation initiatives, including – but not limited to – the U.S. Navy’s lean shipbuilding and ship repair initiatives, the U.S. Air Force’s lean initiatives for multiple transformation programs, and the Future Logistics Enterprise, which drives logistics transformation across all defense services.

Initiatives for defense services and agencies

Siemens PLM Software tailors its industry-leading product lifecycle management (PLM) capabilities to deliver a full range of IDE capabilities that support the entire defense acquisition management framework. These capabilities enable defense services and agencies to:

▶ *Establish a globally distributed IDE that facilitates program management by enabling acquisition and sustainment communities to capture, manage and re-use widely diverse program knowledge in workflow-driven processes that subsequently can be defined and executed across multiple acquisition and sustainment stages.*

IDEs drive the following defense-related imperatives:

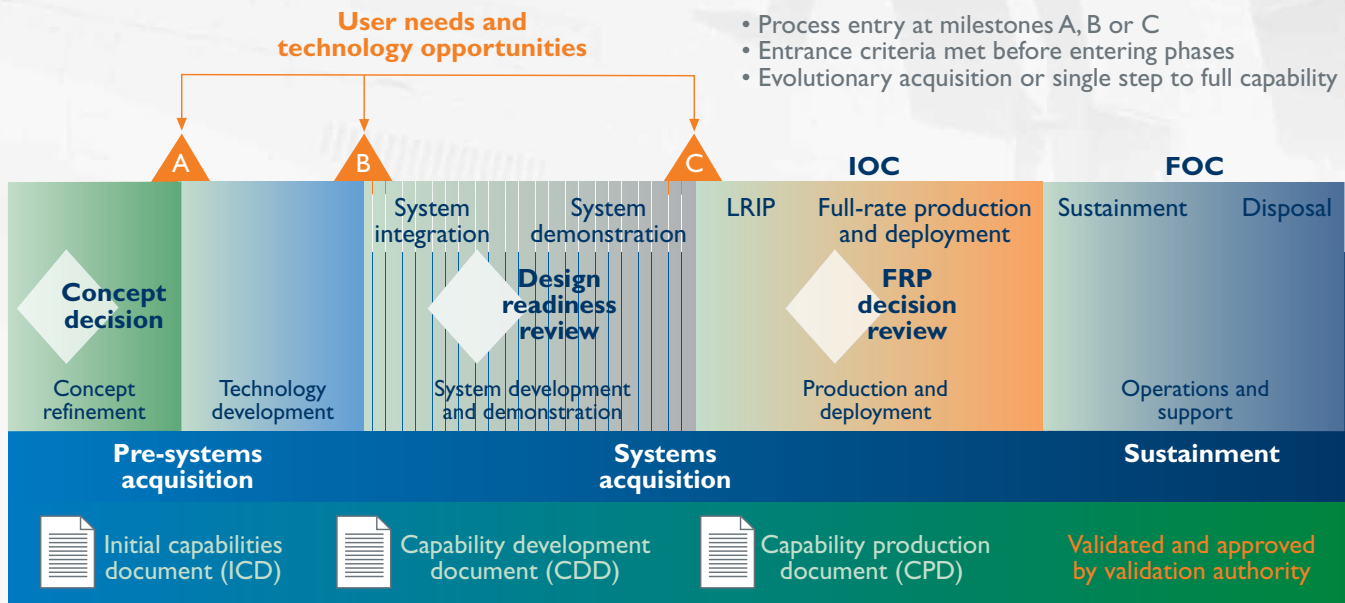
Increasing the yield of innovation. Siemens IDE solutions facilitate improvement across all stages in the defense acquisition management framework, including pre-systems acquisition, systems acquisition and sustainment.

Compressing acquisition and sustainment processes. IDEs enable services and agencies to analyze their processes, system requirements, system deliverables and supplier performance to determine their effectiveness in reducing acquisition and sustainment cycle times.

Complying with systems requirements. By incorporating compliance as an integral process in the acquisition and sustainment lifecycle, IDEs mitigate the risk and cost of non-compliance.

Optimizing resources. By maximizing the ability to re-use ideas, processes, resources, skills, designs, parts, documents and sourcing relationships, IDEs enable services and agencies to rapidly and cost effectively respond to leader-directed initiatives.

Maximizing globalized supply chain effectiveness. By unifying the defense services' distributed supply chain at every level, IDEs enable program managers, service depots, service teams and point-of-service technicians to implement lean maintenance, repair and overhaul operations and significantly increase systems availability.



- Process entry at milestones A, B or C
- Entrance criteria met before entering phases
- Evolutionary acquisition or single step to full capability

Relationship to joint capabilities integration and development system

Initiatives for defense services and agencies

Systems engineering

Many defense services and agencies implement transformational programs that require them to reengineer multiple acquisition and sustainment processes. For example, the U.S. Navy is implementing various initiatives (including its SHIPMAIN, “One Shipyard” concept) to build a new culture of readiness into its maintenance and modernization programs.

Several transformational improvements are common to these initiatives, including the need to:

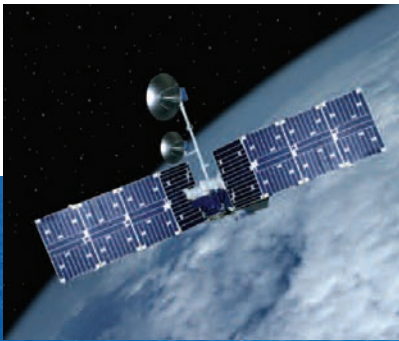
- Bridge gaps across multiple processes in a modernization program
- Reduce excessive handoffs
- Eliminate redundant work
- Lower performance variances
- Collapse the time between work identification and started work
- Deliver better first-pass results
- Facilitate objective measurement and continuous improvement

Siemens IDEs facilitate systems engineering by enabling program teams to understand the defense acquisition management framework from a holistic perspective. The end result is optimized program that balances multiple mission considerations, including systems cost, performance, manufacturability, safety, disposability, standards-based compliance, usability, maintainability and total quality.

By supporting the systems engineering model as defined by a consensus of International Council on Systems Engineering (INCOSE) fellows¹, Siemens IDE solutions enable program teams to implement key system engineering concepts.

- *Systems architecture definition* enables program teams to define the problem statement and leverage systems-level metrics to make optimized tradeoff decisions
- *Requirements management* captures all of a program’s mission-critical requirements and relates these requirements to fine-grain design decisions and performance targets that program managers can track throughout the program lifecycle
- *Systems level engineering* enables program teams to model the system from the “top down” and integrate its subsystems and components “up front” so that every discipline fully understands the impact of their decisions
- *Systems investigation, simulation, verification and validation* enables program teams to use multiple simulation, verification and optimization tools to validate system design, investigate alternative concepts and assess system performance at different stages in the program lifecycle.

¹ A consensus of INCOSE fellows endorses The Systems Engineering Process from A.T. Bahill and B. Gissing, “Re-evaluating Systems Engineering Concepts into Systems Thinking,” *IEEE Transactions on Systems, Man and Cybernetics, Part C: Applications and Reviews*, 1998. This model defines the systems engineering process as being comprised of eight phases that account for the problem statement, alternative investigation, system modeling, subsystem/component integration, system launch (validation), performance assessment, reevaluation and variations.



Systems compliance

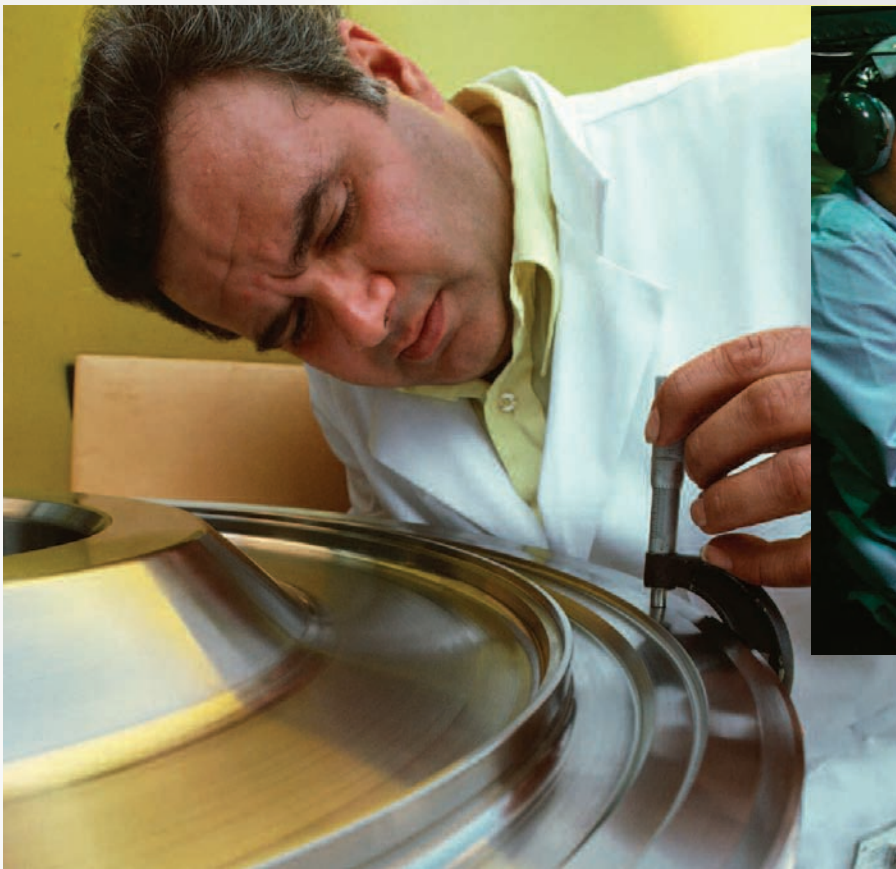
The pre-systems acquisition stages in the defense acquisition management framework begin with the selection of a concept design and proceed as the initial concept is refined and a technology development strategy is produced and reviewed. Both concept refinement and technology development are iterative processes that require integrated program teams (IPTs) to continuously refine the system's requirements and tie these requirements to design capabilities and program constraints.

Siemens PLM Software's industry-leading requirements management capabilities can be seamlessly integrated into an IDE solution to capture all of a program's documented user requirements, contract specifications and regulatory requirements. Subsequently, program teams can "connect" these requirements to specific design capabilities and program constraints.

Connected requirements enable acquisition teams to ensure that the system complies with the program's requirements as the acquisition lifecycle evolves. IDEs ensure systems compliance by enabling program managers to show requirements traceability of the program's DoD documentation from inception through disposal. Siemens IDE solutions can manage and trace both structured documents (such as contracts, purchase orders, program requirements, designs, manuals, instructions, manufacturing plans, and standard parts, materials and processes) and non-structured documents (such as built-to and buy-to packages, correspondence, impact assessments and schedule proposals).

Connected requirements are particularly valuable for evaluating program risk (e.g., determining what happens to a program's lifecycle cost if a requirement or regulation changes – or what happens to a specific requirement or the program's schedule if a proposed design change is approved).

While the IDE's requirements management capabilities provide significant value during pre-systems acquisition, they are equally useful in systems acquisition, where they facilitate requirements-driven design – and during sustainment, where they can be used to improve defense logistical operations and tie service teams into the early stages of requirements definition.



▶ **Technology
development**

▶ **Concept
refinement**

▶ **Concept
decision**

Acquisition and sustainment lifecycle

► System development and demonstration

► Production and deployment

► Operations and support

Enterprise data management

Systems development and demonstration is a central element in the systems acquisition cycle. During system development and demonstration, all of the system's subsystems and capabilities are developed, integrated into a full configuration and demonstrated in operational tests that validate the integrated system's ability to meet key program requirements.

System development starts when the program's suppliers develop individual subsystems and capabilities. Typically, these development efforts involve the use of multiple digital product development tools (e.g., MCAD, ECAD and CASE systems), as well as authoring systems that facilitate publication of the subsystems' related documentation.

Siemens PLM Software's enterprise data management capabilities allow the system's suppliers to develop program definition materials once and maintain this information at its source (i.e., on their CAD or authoring system of choice). In turn, system integrators can capture these multi-CAD definitions in a Siemens IDE and leverage its configuration management and visualization capabilities to integrate these definitions into system configurations and virtual prototypes that can be validated, tracked, synchronized and changed as they evolve from one stage in the acquisition lifecycle to another.

Once these definitions and their related configurations and prototypes are "published" in the IDE, entitled users in the acquisition and sustainment communities can access this information on demand – without using a CAD system or any authoring tool. Siemens' configuration management capabilities enable program managers to identify, control, assess and audit an integrated system as it moves across its as-required, as-planned, as-built and as-maintained states.

Siemens IDEs are especially adept at facilitating repeatable digital validation – which enables demonstration teams to access an "always on" digital model of the integrated system and all of its variations and test/evaluate the system for manufacturability, serviceability, cost, function and human factors engineering – as well as for overall design and performance.



Synchronizing the sustainment value chain

Effective sustainment requires globally distributed operational and support teams to synchronize their activities as they maintain, supply, train, transport and protect the in-service use of weapons systems, platforms and support infrastructures. Siemens IDEs can manage all processes associated with system maintenance, repair and overhaul by facilitating system maintenance and production scheduling, configuration management, work status control, quality assurance and work planning/execution/completion management.

Effective sustainment begins with the development of reliable and maintainable systems. Siemens IDEs enable systems developers to design usability, serviceability and human factor engineering into the system while allowing program managers to continually assess and evaluate these requirements across the entire acquisition cycle. Siemens IDEs enable program managers to establish feedback loops between development teams and sustainment teams to make certain that the concerns of field-based technicians are actively considered in the earliest phases of the acquisition cycle.

Managers can use the IDE's workflow capabilities to assign service tasks to team members and its project management capabilities to establish and monitor service budgets and scheduling requirements. Operational and depot locations can track serialized lots, as well as serialized parts/components, through the use of as-maintained BOM configurations that can be linked to as-designed, as-planned and as-built BOM configurations.

By rapidly delivering configuration and operational knowledge to service teams at their point of need, Siemens IDEs provide service technicians with rapid access to operating procedures, technical manuals, compliance standards, safety procedures, preventive maintenance specifications, time-critical technical orders, training materials, animated simulations and engineering drawings/models – all through a single web portal.

Access is available to all locations, from depot-level centers to battlefield locations and remote assignments. Service rules and role definitions can be leveraged to ensure that the most recent information is delivered in a format commensurate with the task at hand and each technician's level of experience and entitlement.



Enhancing PMO performance

Integrated program teams (IPTs) play a crucial role in facilitating the U.S. Department of Defense's acquisition reform initiative. Chartered with helping program managers ensure the efficient delivery of complex systems, these cross-discipline teams leverage the techniques of integrated process and product development and concurrent engineering.

IPTs typically make recommendations by assessing information generated by program management, engineering, manufacturing, test, logistics, financial management, procurement and contract administration – as well as input from participating contractors/ suppliers.

Siemens IDEs provide a robust series of cost, scheduling and performance monitoring capabilities specifically tailored for program management offices (PMOs) and IPTs.

- **A web-native PMO-specific portal** enables program managers and IPT members to define/administer repeatable and ad hoc workflows, track action items, manage documents and data records, trace program requirements, establish/monitor integrated project schedules, query the status of assigned tasks and conduct real-time team conferences
- **Rollup capabilities** enable program managers and IPTs to generate integrated reports gleaned from multiple disciplines
- **Digital dashboard capabilities** enable program managers to continuously monitor – and communicate – the metrics associated with delivering an integrated system on schedule – as well as flagging potentially troublesome milestones and bottlenecks

Siemens PLM Software's PMO-specific capabilities provide various advantages. Task status and action item assignment capabilities ensure the successful, on-schedule completion of program milestones. The IDE's ability to deliver team conferencing, real-time visualization and status updating capabilities through commercial off the shelf (COTS) collaboration technology allows IPTs to drastically reduce their meeting and travel costs.

Siemens IDEs also enable PMOs to manage disparate forms of program information in a single web-enabled source and index this knowledge so that it can be presented through a portal to individual users on the basis of their roles, experience level and entitlements. This feature is particularly well suited to environments with high rates of personnel turnover.



Facilitating logistics enterprise transformation

All defense services are chartered with implementing the “future logistics enterprise” – the Department of Defense’s plan to transform the U.S. military’s operations into the most synergistic supply chain in the world. The U.S. Air Force is implementing eLog21 – a series of logistics transformation initiatives tasked with increasing weapons systems availability by 20 percent over a three year period.

To drive eLog21, the Air Force has defined a need for total lifecycle system management (TLCSM) – the ability to manage all of its weapons systems from womb to tomb. Siemens IDEs provide the TLCSM capabilities for delivering logistics enterprise transformation and meeting its metrics.

Siemens IDEs ensure weapon system health and manage the composition of the fleet across an entire lifecycle by supporting:

- Serialized part tracking
- Near real-time mortality information capture
- Real-time change management
- Integrated financial and resource tracking/control
- Collaborative sourcing and supply chain management
- Collaborative engineering and configuration management

Siemens IDEs improve supply chain performance by managing inventory requirements derived from configuration changes and establishing feedback loops between suppliers and service teams. Siemens IDEs excel at managing future state operations – by automatically providing planning/resource systems with new execution data whenever requirements change (e.g., customer orders increase, delivery locations change).

Siemens IDEs improve system maintainability by providing all sources of repair with instantly accessible bills of materials (BOMs). Service organizations can update BOMs on a near real-time basis with new information about replacement parts, engineering changes, substitute components and supply sources.

Technicians can query the IDE at the point-of-service to access online catalogs, graphical images and digitized tech data. They can instantaneously ascertain what parts pertain to a given repair, their availability and order status. This functionality is driven by the IDE’s ability to integrate the ordering process with interactive tech manuals and bills of material.



About Siemens PLM Software

Siemens PLM Software, a business unit of the Siemens Industry Automation Division, is a leading global provider of product lifecycle management (PLM) software and services with nearly six million licensed seats and 56,000 customers worldwide. Headquartered in Plano, Texas, Siemens PLM Software works collaboratively with companies to deliver open solutions that help them turn more ideas into successful products. For more information on Siemens PLM Software products and services, visit www.siemens.com/plm.

Siemens PLM Software

Headquarters

Granite Park One
5800 Granite Parkway
Suite 600
Plano, TX 75024
USA
972 987 3000
Fax 972 987 3398

Americas

Granite Park One
5800 Granite Parkway
Suite 600
Plano, TX 75024
USA
800 498 5351
Fax 972 987 3398

Europe

3 Knoll Road
Camberley
Surrey GU15 3SY
United Kingdom
44 (0) 1276 702000
Fax 44 (0) 1276 702130

Asia-Pacific

Suites 6804-8, 68/F
Central Plaza
18 Harbour Road
WanChai
Hong Kong
852 2230 3333
Fax 852 2230 3210

www.siemens.com/plm

© 2009 Siemens Product Lifecycle Management Software Inc. All rights reserved. Siemens and the Siemens logo are registered trademarks of Siemens AG. Teamcenter, NX, Solid Edge, Tecnomatix, Parasolid, Femap, I-deas and Velocity Series are trademarks or registered trademarks of Siemens Product Lifecycle Management Software Inc. or its subsidiaries in the United States and in other countries. All other logos, trademarks, registered trademarks or service marks used herein are the property of their respective holders.

1012-W 6 8/09