IBM and Dassault Systèmes:
Business Process Accelerators for Systems Engineering

Integrated Product Development from needs identification through to final product validation

IBM | DASSAULT SYSTEMES

The Challenge

Increased Product and Process Complexity

How can organizations manage ongoing growth in system and process complexity? How can they effectively cope with more and more stringent product regulations? How can they ensure and demonstrate traceability from customer needs to final product validation? How do they manage all these demands, and still achieve a shorter time to market?

In a global competitive environment, these questions are real challenges that new product development programs must meet, whatever the industry, in order to ensure a successful and profitable final product.

Systems Engineering is emerging as a discipline to improve control of product development and to quickly respond to the ever increasing complexity of new development projects.

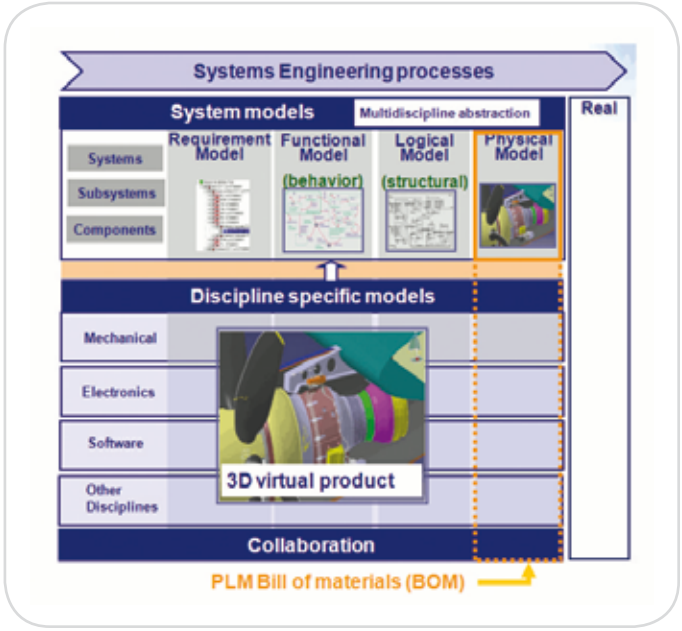
Systems Engineering is an encompassing discipline that integrates multiple domains to provide a high-level, collective view of an entire product. This collective approach to product development looks at the product as a whole, with all components working together as a single unit. To enable the realization of a successful system, engineers must consider both technical and business aspects of development such as performance, cost, schedule, sourcing, manufacturing and disposal.

RFLP Approach

This approach tackles product development through a multiple model process that includes a Requirements model, a Functional model (targeted services), a Logical model (technology) and a Physical model (implementation).
The introduction of the physical model makes the link between any system item and the Bill of Material (BOM).

This approach when leveraged can:

- *Establish requirements, features and relationships for any product*
- *Integrate product design with product definition, ensuring 'right to market' delivery through traceability between final product validation and initial customer expectations.*



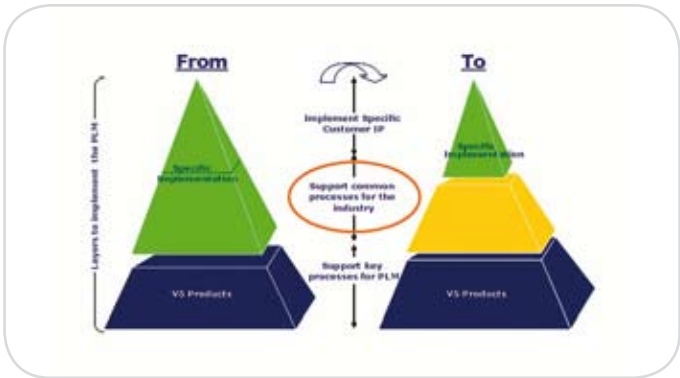
Our products and solutions enable all development efforts to be centralized on a unified product definition so that various disciplines are brought together on a common platform that fosters collaboration and innovation among all contributors. This brings many advantages such as end-to-end process optimization, cross-discipline system modeling and analysis, as well as systems level configuration management. Coupled with workflow and shared catalogs, changes specific to a configuration or across projects can be rapidly communicated to global stakeholders. The PLM platform functions as an enabler of tradeoff studies and alternatives, to evaluate product costs, quality and time standpoints.

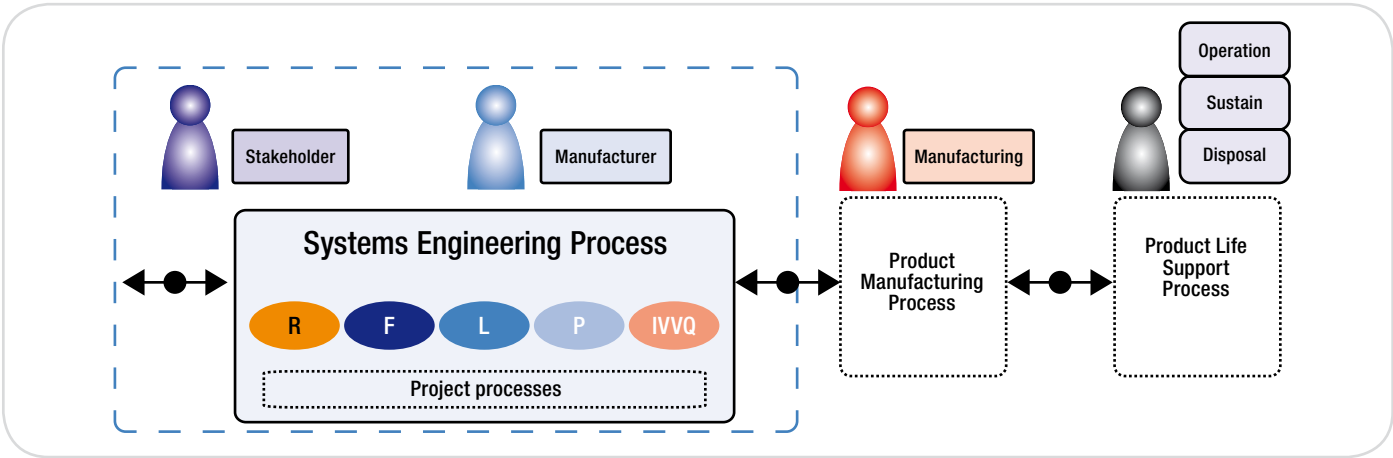
The Solution

Business Process Accelerators for Systems Engineering

Following many years of PLM market leadership with leading global product development organizations, IBM and Dassault Systèmes have introduced a number of Business Process Accelerators (BPAs) developed with the insight of industrial customers.

These Accelerators are flexible software assets that enable customers to implement and adapt industry solutions to meet their specific needs without the cost of tailor-made software. BPAs are designed to be easily implemented and allow customers to customize and adapt the solution, leading to increased productivity, profitability and rapid return on investment. BPAs are developed by identifying customers' specific needs in the context of their associated industrial processes. Where appropriate, preconfigured solutions are developed, which can be reused by multiple customers from the same industry or who share the same processes.





Systems Engineering Process within the product life cycle.

Collaborative Systems Engineering

Collaborative Systems Engineering (CSE) enables companies to master their complex systems process development, from needs identification through to final product verification. It supports the systems engineering process, leveraging PLM native foundations to formalize, control and share system development objectives, to analyze requirement changes and propagate impacts.

CSE, based on ENOVIA SmarTeam, facilitates systems engineering traceability across disciplines and domains from needs capture through to final product validation. It also provides a complete environment for requirements authoring. CSE benefits from global accelerated performance for document generation and from several major enhancements to capture data from any source document. This facilitates document publishing and enhances Microsoft InfoPath interoperability for document edition.

Features

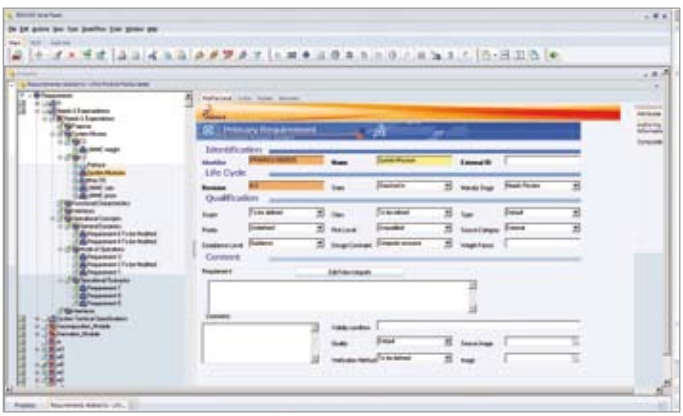
- *Leverages a V5 ENOVIA PLM product to enable a collaborative platform for systems engineers*
- *WYSIWYG environment based on Microsoft InfoPath*
- *Full traceability from requirements to Validation and Verification (V&V) data through functions and logical objects*
- *Traceability matrices to validate specifications and allocations*
- *Impact analysis reports to identify and scope risk*
- *Specification reports generation, including requirements, functions, logical components V&V data and rational.*

The Business Process Accelerators associated with Collaborative Systems Engineering are:

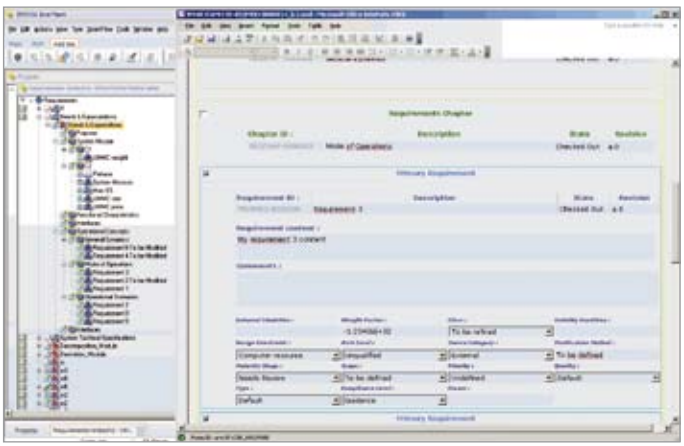
- *Composite Document Generation (5672-CD9)*
- *Collaborative Systems Lifecycle Management and Traceability (5672-CS9)*
- *Requirements Management (5672-RM9)*
- *Requirements XML Edition (5672-RX9).*

There are also two configurations associated with Collaborative Systems Engineering. These are:

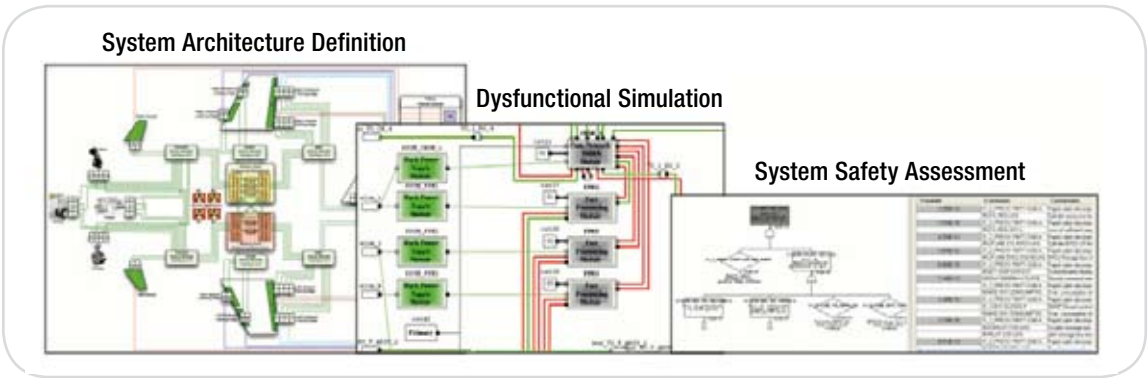
- *Collaborative Systems Engineering Configuration (5672-CE9)*
- *Collaborative Systems Engineering Premium Configuration (5672- CP9).*



Requirements are exposed in a tree to facilitate navigation and manipulate them directly in a database.



Users can employ the Microsoft InfoPath integration to edit and author requirements.



Users can model, simulate and assess the system architecture to ensure its compliance with safety requirements.

The Collaborative Systems Engineering Configuration (CE9) is designed to meet the specific needs of systems engineers. It enables companies to integrate product design with product definition, ensuring 'right to market' delivery through requirements management and traceability between final product validation and initial customer expectations.

The Collaborative Systems Engineering Premium Configuration (CP9) extends the capabilities of CE9 by providing systems engineers with a full WYSIWYG environment in order to engineer and author requirements as well as Verification and Validation data (test plans, test procedures etc.).

Dysfunctional Analysis and Simulation

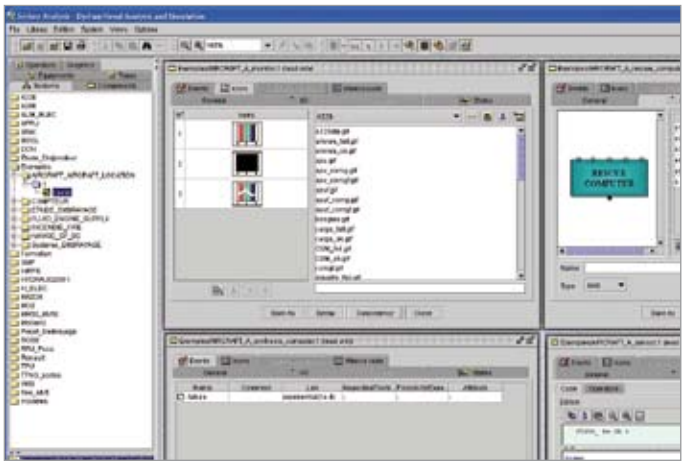
Systems are becoming more and more complex. As a consequence, it becomes harder to manage all the aspects of safety assessment, and to maintain the safety levels required by certification authorities and enterprise standards.

To meet constantly increasing safety requirements in industry as well as the complexity of new systems, design and safety assessment methods were developed.

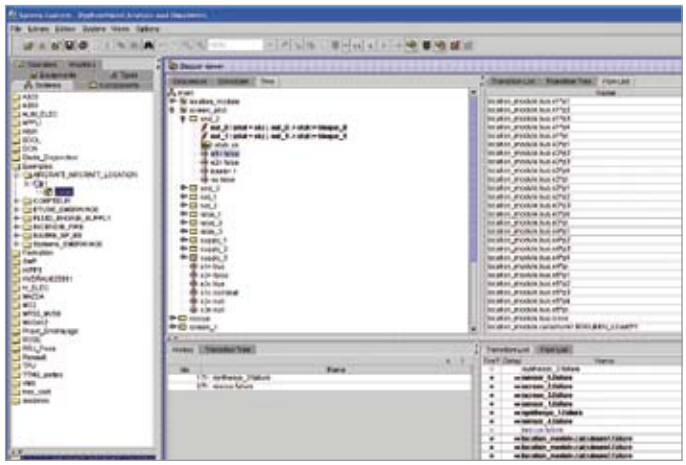
This increasing complexity makes it increasingly difficult to comprehend system capabilities and manage all aspects for safety analysis purposes.

This implies that there must be a suitable increase in the capability of the safety engineers to maintain safety levels.

Dysfunctional Analysis & Simulation (DAS) BPA is a Systems Engineering solution aiming at the improvement of safety activities and their early integration during the design phase.



A view of the modelling tool



A view of the resulting fault tree

DAS answers the following questions:

- *How are 'design tools' used to define a common reference model describing both functional (design aspect) and dysfunctional (safety aspect) modes?*
- *How can formal verification techniques be used to specify and assess system safety properties?*

BPA DAS enables the designer to perform the validation/verification-analysis. At the same time, DAS provides the safety engineer with new means for performing his work more effectively during the System design phase.

Thus, DAS allows design engineers:

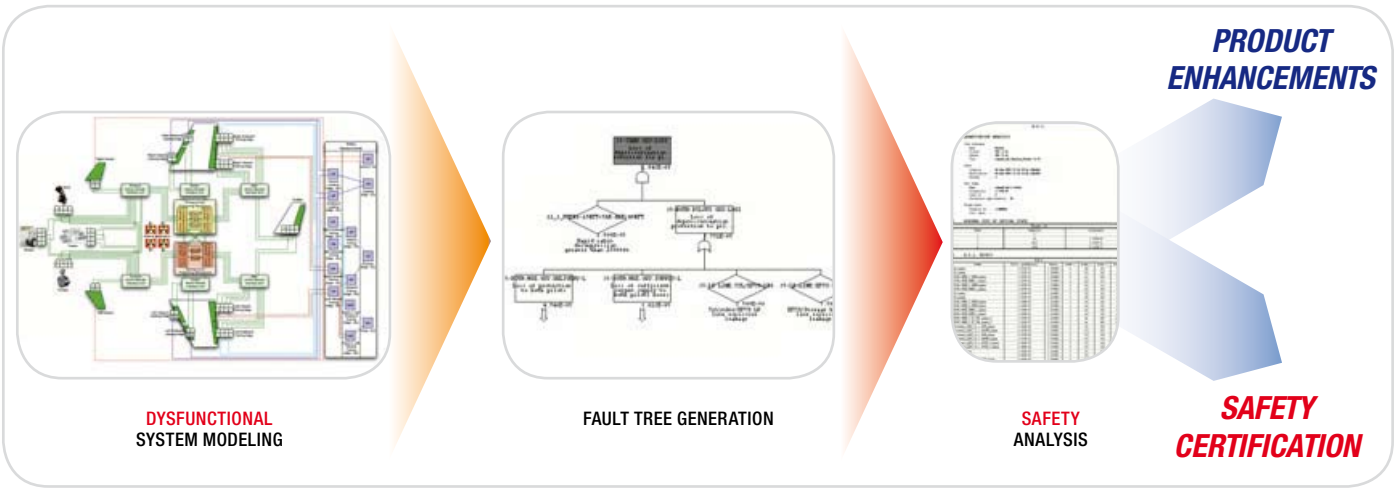
- *To formalize system safety requirements*
- *To assess them during each phase of the development process by building and simulating a Formal System Model in AltaRica Language*
- *To automatically generate the dependability models (Fault Tree, Event Sequences, System Failure Mode Event Analysis, Common Cause Analysis, …) in order to perform System Analysis Studies to verify that safety objectives are met for a given system during early design phase for certification authorities.*

Safety assessment based on a unique view of the system improves integration of system design and safety analysis in the early phases of System development.

Features

- *Modeling environment to define System Architecture and functional/dysfunctional behavior of each component*
- *Based on the open system modeling language AltaRica dedicated to System Assessment*
- *Graphical simulation of system behavior*
- *Verification of architecture robustness by faults injection*
- *Generates dependability models (such as Fault Tree Analysis, System-FMEA, Event Sequences) to verify safety objectives are met (System dependability assessment)*
- *Verification and traceability of change impacts vs RAMS Requirements. Capitalizes on systems knowledge within components libraries.*

The Dysfunctional Analysis and Simulation BPA is a stand-alone application—Dysfunctional Analysis and Simulation (5672-SD9).



Benefits

Cost and risk reduction

Supports a comprehensive product definition phase, helping companies to optimize the product cost versus function trade-off.

Time to market

Integrates product design with product definition to ensure right-first-time product delivery through traceability between final product design and initial customer requirements. It also advances the re-use of corporate assets, enabling a much shorter development cycle.

Innovation

Supports a cross-discipline (electronic, mechanical, software) modular design strategy to integrate and take advantage of rapid technology changes and foster in-house creativity.

Agility and 'right to market'

Provides the appropriate level of design abstraction for efficient communication to manage increasingly complex products and comply with industry standards and regulations.

Why choose IBM?

IBM, in partnership with Dassault Systèmes, provides thought leadership for reliable, high-performance, integrated systems engineering. IBM offers unique experience with more than 10,000 successful PLM implementations across all industries and a dedicated team of more than 150,000 services professionals in 160 countries, including more than 1,000 professionals dedicated specifically to PLM.

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