COMMENTARY

Accelerating Digital Engineering via System Architecture Integration

HCLTech Enables Collaboration Across PLM & ALM Ecosystems

Takeaways

Model-Based Systems Engineering (MBSE) is critical for managing increasing product complexity across industries, and especially in regulated industries such as aerospace and medical devices It enables organizations to develop and validate multi-domain systems with greater speed and confidence.

Integration of multi-disciplinary system design IP (both data and models) across the digital engineering toolchain is essential to realize the full potential of MBSE. Seamless data exchange between system architecture models and PLM/ALM platforms ensures coherent and collaborative decision making, as well as traceability and reuse.

HCLTech's MBSE connector solutions provide robust interoperability between leading SysML-based modeling tools (e.g., Cameo, Rhapsody) and enterprise platforms (e.g., Teamcenter, Polarion), enabling cross-discipline collaboration, digital thread continuity, and architecture governance.

Enterprises across industries are achieving tangible benefits such as improved productivity, reduced rework, and compliance traceability using HCLTech's solutions, demonstrating HCLTech's leadership in enabling scalable, integrated MBSE deployments.

Industry Challenges and the Role of MBSE

Modern products are defined by increasing complexity, global collaboration, and intense competitive cycles. Organizations across aerospace, automotive, healthcare, and others are compelled to engineer systems that span software, electronics, and mechanical domains—with development distributed across dispersed teams and multiple suppliers.[1]

The legacy of fragmented, document-based engineering approaches is proving increasingly brittle. As systems evolve in scale and interconnectedness, maintaining coherence, traceability, and consistency across the product lifecycle becomes a daunting task. System architects, domain engineers, and program managers are frequently challenged by siloed data, evolving specifications, and integration delays.

[1] Research for this paper was partially supported by HCLTech

Model-Based Systems Engineering (MBSE) is emerging as the pragmatic response to these systemic pressures. Centralizing system definitions through SysML-centric modeling allows structured communication, enables digital thread continuity, and transforms the model into a single source of truth—driving early detection of design flaws and smoother transitions of data downstream.

Referencing CIMdata's recent market research, the industrial adoption of MBSE is rising dramatically, especially in contexts shaped by DoD digital engineering mandates, electrification in automotive, and AI integration in medical devices. Figure 1, from recently published research on MBSE conducted by the CIMdata Aerospace & Defense PLM Action Group (ADPAG), highlights industry's priorities while investing in MBSE.

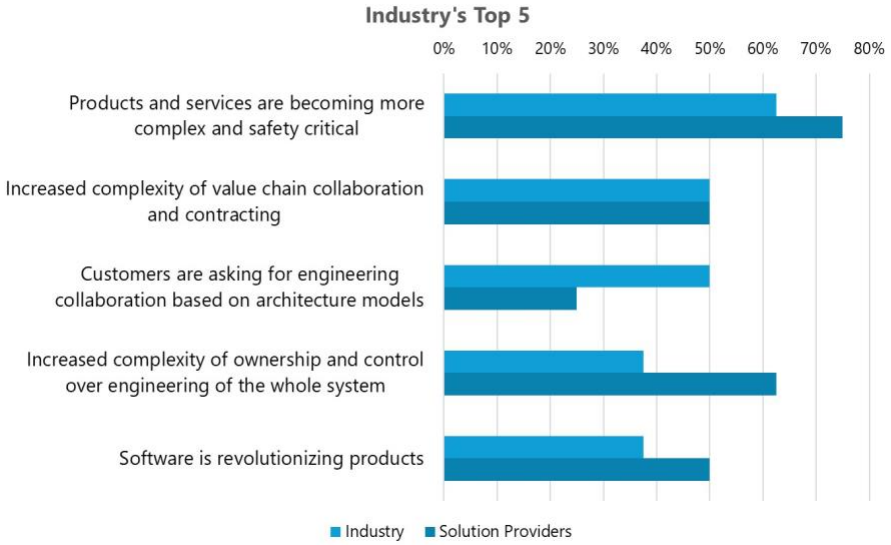

Figure 1: Changes Have Elevated Perception of Value and Investment in MBSE

HCLTech's MBSE Offerings

MBSE technology is still in its early phases—akin to the nascent CAD era (as commented by one of the survey respondents in the CIMdata ADPAG MBSE research)—leaving many organizations navigating adoption without a clear methodology, unified governance, or standardized toolchain integration. MBSE's promise is broad but enabling it requires overcoming profound challenges—chief among them, tool interoperability and integration, acceptance across engineering domains, and organizational readiness for digital transformation.

As shown in Figure 2, HCLTech has built a robust "Center of Excellence" for MBSE and system simulation, combining domain expertise with integration capabilities to help enterprises accelerate their digital engineering transformation. The company's portfolio spans the full MBSE lifecycle—from maturity assessments, benchmarking, and tool selection, through deployment and adoption planning, to implementation and ongoing optimization. HCLTech has taken an approach where MBSE initiatives are aligned with the strategic business objectives of their customers. It has the potential to ensure that MBSE adoption is not just a technology shift but an operational enabler.

HCLTech's capabilities include creating custom SysML profiles and project templates, developing dashboards and reports for performance tracking, and embedding digital thread methodologies that connect architecture models with downstream PLM and ALM environments. HCLTech's tool-agnostic approach, supported by partnerships with leading ISVs such as Siemens, Dassault Systèmes, PTC, and IBM, allows clients to work with their preferred platforms without compromising interoperability or governance. HCLTech also provides training programs—from Systems Engineering fundamentals to

advanced SysML modeling to help customer teams scale MBSE practices effectively across disciplines and geographies.

Figure 2: HCLTech's MBSE Offerings

HCLTech Connectors for MBSE

A critical enabler of MBSE's value realization is seamless integration between system architecture models and the broader engineering ecosystem. HCLTech has addressed this challenge through a portfolio of commercial connectors that link SysML-based tools (e.g., Dassault Systèmes Cameo Systems Modeler, IBM Rhapsody) with enterprise platforms such as Siemens Teamcenter and Polarion. These connectors allow organizations to expose architecture information to non-modelers; synchronize requirements, interfaces, and parameters; and maintain bi-directional traceability between architecture artifacts and downstream design, analysis, and verification deliverables.

For example, the HCLTech Cameo Connector for Teamcenter enables full model management within Teamcenter, architecture reviews by downstream stakeholders, and the reuse of architecture elements in CAD and other detailed design contexts. The HCLTech Cameo Connector for Polarion supports controlled bidirectional exchange of requirements, test cases, and subsystem specifications, improving alignment between architecture teams and software engineering disciplines. Equivalent integrations exist for Rhapsody with Teamcenter and Rhapsody with Polarion, extending the same principles to IBM's SysML environment.

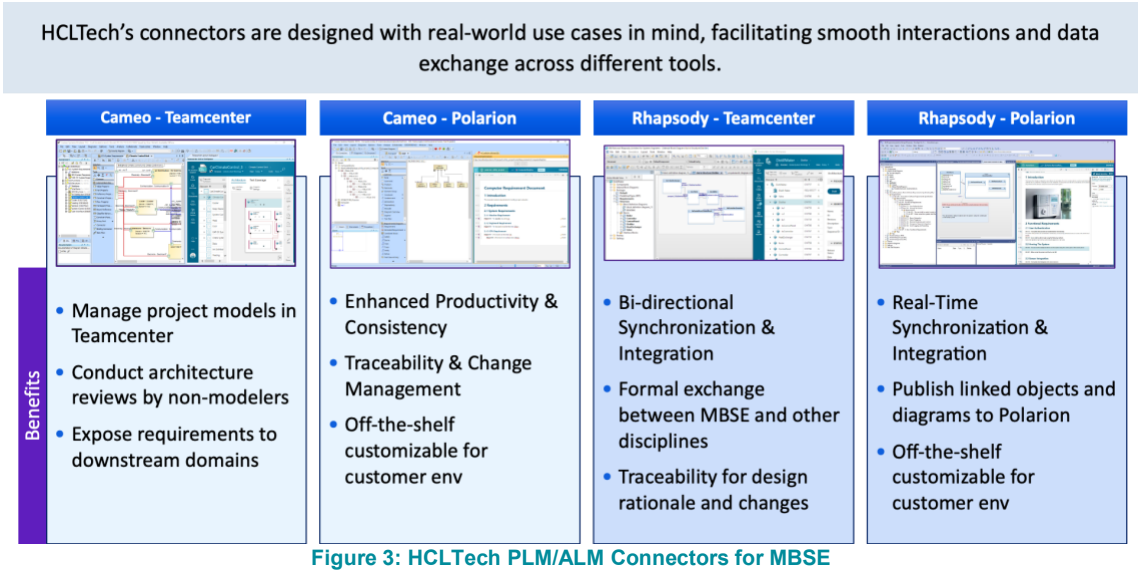

Figure 3: HCLTech PLM/ALM Connectors for MBSE

By embedding architecture data within PLM and ALM-managed digital threads, these connectors reduce engineering rework, accelerate design handoffs, improve compliance visibility, and allow organizations to leverage governance, change control, and review capabilities of their existing enterprise platforms—turning MBSE from an isolated practice into an integrated, cross-discipline driver of product development.

Case Studies

HCLTech Cameo Connector for Teamcenter for an Aerospace & Defense Leader

A major Japanese aerospace and defense manufacturer needed to achieve mandated SysML model traceability within their Siemens Teamcenter PLM environment. The company uses Dassault Systèmes Cameo Systems Modeler for MBSE, but architecture data was siloed from downstream engineering workflows. HCLTech's Cameo Connector for Teamcenter enabled seamless exchange of architecture artifacts, requirements, and parameters between Cameo and Teamcenter, allowing the PLM platform to serve as the single source of truth for the digital thread. The results were improved productivity, accelerated review cycles, and enhanced compliance visibility, with two production go-live stages completed successfully and performance optimized for large data sets.

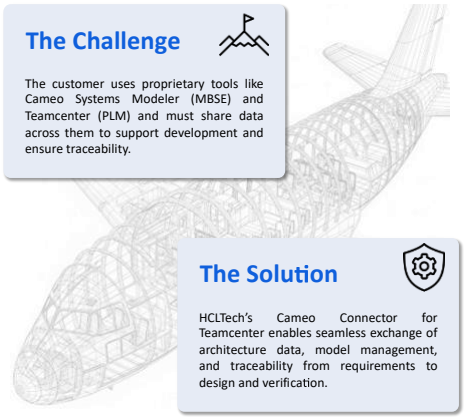

Figure 4: A&D Industry Case Study with HCLTech MBSE Connector

HCLTech Cameo Connector for Polarion for a Global Manufacturing Enterprise

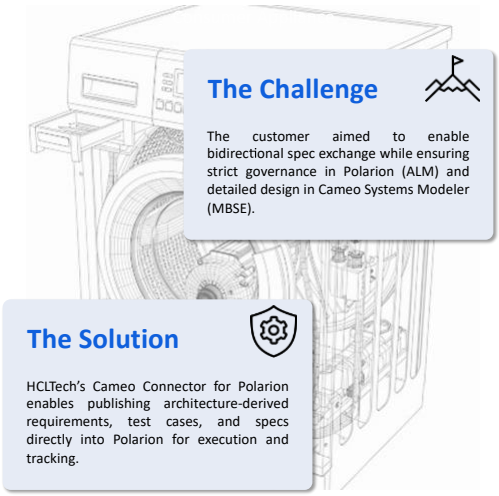

Figure 5: Consumer Appliance Industry Case Study with HCLTech MBSE Connector

A leading German consumer appliance manufacturer sought to connect architecture development with software requirements management in Siemens Polarion. Their goal was to enable bidirectional exchange of specifications while maintaining strict requirements governance in Polarion and detailed architecture design in Cameo. HCLTech's Cameo Connector for Polarion delivered this capability, allowing architecture derived requirements, test cases, and subsystem specifications to be published directly into Polarion for execution and tracking. The integration reduced rework, improved alignment between hardware and software teams, and established a governed, traceable process for specification updates. A limited production pilot rollout with only a few users proved successful, with a full enterprise deployment planned for mid-2025.

Summary

As products become more complex, connected, and software-driven, MBSE has moved from an aspirational concept to a critical enabler of competitive advantage. The key to unlocking its full value lies not only in creating rich system architecture models but in integrating them into the enterprise digital thread so they can inform, and be informed by, downstream disciplines.

HCLTech's MBSE portfolio anchored by its Center of Excellence and a growing suite of enterprise-grade connectors, has the potential to deliver this integration. These solutions enable traceable, interoperable, and reusable system architectures, allowing organizations to leverage PLM and ALM governance, streamline cross-discipline collaboration, and accelerate product realization.

Across industries, from aerospace and defense to manufacturing and medical devices, customers can achieve measurable benefits: reduced rework, faster design handoffs, and improved compliance tracking. With its deep PLM/ALM expertise, strategic ISV partnerships, and domain-focused innovation, HCLTech is well positioned to help enterprises operationalize MBSE at scale, turning system architecture from a siloed activity into a connected driver of engineering excellence.

About CIMdata

CIMdata, a global strategic management consulting firm, provides services designed to maximize an enterprise's ability to design, deliver, and support innovative products and services. For more than forty years, CIMdata has provided industrial organizations, providers of digital technologies and services, and investment firms with world-class insight, expertise, and best-practice methods on a broad set of product lifecycle management (PLM) topics and the digital transformation they enable. CIMdata also offers research, subscription services, publications, and education through certificate programs and international conferences. To learn more, visit www.CIMdata.com or email info@CIMdata.com.