

Executive brief

MBSE Executive Summary

Siemens Digital Industries Software

With the growing complexity of development practices across industries, it is critical to integrate and manage all product development systems through a single source of truth with model-based systems engineering (MBSE). Original equipment manufacturers (OEMs) can transform their businesses through the utilization of the most comprehensive and accurate Digital Twin with MBSE practices. In doing so, the development process is thoroughly connected, and thus greatly shortened, allowing OEMs to bring new products to market faster than ever and with higher quality.

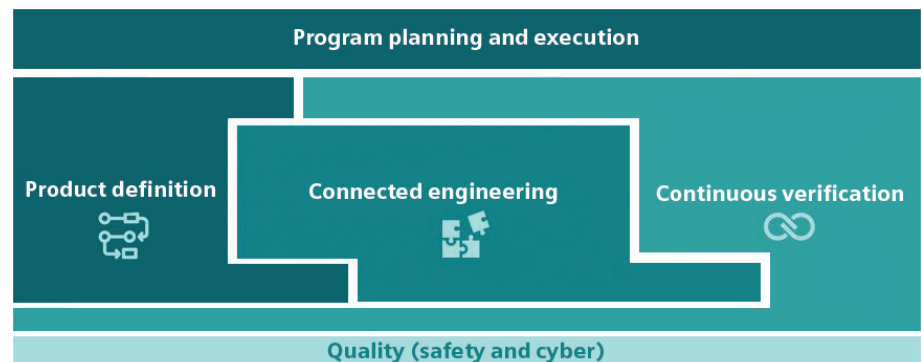
Evolving consumer and regulatory demands, as well as widespread electrification are completely changing the aerospace and automobile industries as we know them. The products, once highly mechanical, are moving ever closer to moving computers with the inclusion of more electronic subsystems for control, greater connectivity services and even electrical propulsion. But understanding the effect of this evolu-

tion means understanding each of the connections between system domains across the complete system – including other aircraft or automobiles for high-level fleet optimization or infrastructure integration.

Compounding these challenges is the fact that an entirely new, powerful, and more nimble competition is fighting for leadership in this new age of transportation. Technology companies and start-ups are all vying for the dominant position in a space still adjusting to the new demands of their respective

industry. Companies well versed in software are innovating far faster than the incumbents when it comes to connectivity and autonomy, while agile start-up teams are utilizing software and their lack of legacy practices to punch well above their weight.

MBSE is not a new approach, but much as the development process has evolved, so too have MBSE practices to handle the change. A modern MBSE solution enables continuous verification of product requirements and the management of every process in a unified



digital environment, from concept through end-of-life. A key component of the MBSE digitalization journey is to start integrated and stay integrated, not just beginning to end but among every domain working on the project (e.g. electrical, electronic, mechanical and software). The document-based systems engineering of the past few decades will not make the cut for the complex product development of tomorrow.

New processes for new complexity

There is no single solution to embracing complexity as a competitive advantage, especially as the definition of the system continues to grow to encompass more than an individual car or plane. But, there are five key points to consider while integrating any development cycle – Product Definition, Connected Engineering, Continuous Engineering, Product Planning and Quality.

- **Product Definition** (Define): Product Definition provides an integrated set of information outlining the system requirements, their allocation to functions, and the decomposition to the multi-domain architecture that defines the complete virtual product.
- **Connected Engineering** (Engineer): Connected Engineering drives cross domain development utilizing Product Definition to ensure integration across functions, optimize design decision, assess risks and impacts, expose defects, and resolve issues across the most complex of systems.
- **Continuous Engineering** (Verify): Product verification and validation occurs from the beginning of the product cycle through to the end. The action of continuous verification leverages architecture & simulation models and product context to measure achievement and compliance of requirements in closed loop testing
- **Quality** (Comply): Complying with all engineering requirements and regulations to ensure a safe, reliable and secure product. This supports the typical governmental and industry standards that measure compliance to process and compliance to measured results – for automotive that could be ISO26262 and STAMP, for aerospace it could be ARP4754A or NASA SP-2016-6105
- **Product Planning** (Manage): Manage all the interconnected digital information the helps address the massive complexities in today's product development



Start integrated, stay integrated with MBSE

Collectively, our approach provides the solutions that enable businesses to create the most comprehensive and accurate Digital Twin in an open and adaptable environment. One that ties all development activities to a single source of truth, preventing wasteful reworks stemming from out-of-date knowledge. Instead of a formal meeting between engineering domain departments to clarify interactions of the system, individuals see the connections within their regular workflow. And if a change results in a system diverging from requirements, it is caught in the moment instead of being found later in development.

When development is no longer an exercise solely of mechanical engineering, an update to common practice is needed. And for MBSE of the future, that means an integrated digital approach to embrace the growing complexities of aerospace, automotive and any systems driven industry. A comprehensive MBSE approach may be the stalwart in retaining dominance in industries increasingly innovated by start-ups and industry outsiders.

The Siemens MBSE solution is the most comprehensive one available today, spanning multiple design domains and implemented across many industries to harness the complexity of their designs. For more information on our solution, contact a Siemens sales representative or visit our [website](#).

Siemens Digital Industries Software
[siemens.com/software](https://www.siemens.com/software)

Americas +1 314 264 8499
Europe +44 (0) 1276 413200
Asia-Pacific +852 2230 3333