

# Improve Your MBSE and Digital Engineering Workflows

## A Model-Based Approach for Evaluating and Optimizing Processes

### **ACCORDING TO DOD 5000.97, MODEL-BASED SYSTEMS ENGINEERING (MBSE) AND DIGITAL ENGINEERING (DE)**

“enable faster, smarter, data-driven decisions through the system life cycle.”

U.S. Department of Defense (DoD) developments are often ambitious in scope and scale, requiring projects to adjust and adapt engineering processes to incorporate MBSE and DE to deliver the greatest value. The Carnegie Mellon University (CMU) Software Engineering Institute (SEI) is developing approaches and processes to document, assess, and optimize MBSE methodology, assisting DoD stakeholders to select better systems engineering pathways for large mission-critical programs.

The SEI supports the DoD and the IC community in their MBSE journey, developing modeling approaches and tools to analyze systems' models for performance, safety, and security, and, in general support, to understanding non-functional requirements. In parallel, we help teams and organizations to evolve towards greater agility, leveraging enterprise architecture to align operational needs and engineering to system capabilities.

Recognizing the interwoven nature of modeling and engineering activities, our approach balances the desire for agile velocity with the need for carefully designed capabilities using MBSE modeling. The advancement sought with engineering agility cannot be fully realized without a sufficient understanding of enterprise architecture. Model-based techniques help by addressing scalability challenges for complex DoD systems. Integrating these two facets together in synergy yields a wholly different order of value.

### **What is MBSynergy?**

MBSynergy is a project sponsored and funded by the Office of the Under Secretary of Defense, Research and Engineering (OUSD(R&E)) and executed by Carnegie Mellon University's Software Engineering Institute. This work involves a range of modelling views encompassing engineering processes and analytical capabilities, providing the ability to conjecture among prospective pathways to support programs in delivering value. In this way, MBSE becomes an asset critically linked to operational priorities that govern a program. Our team seeks DoD partners to provide case studies and feedback on the contributions that we develop. If you choose to participate in this project, you will have the opportunity to benchmark your processes against our modeling and analysis approach.

### **What is the MBSynergy approach?**

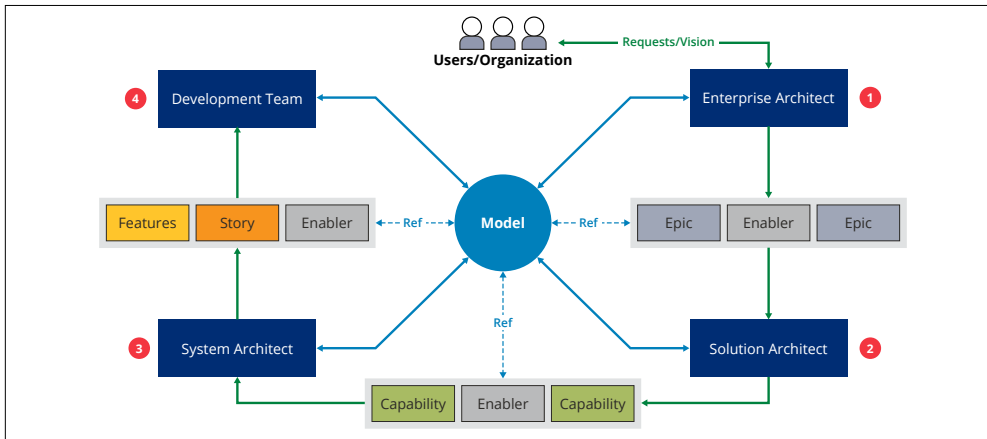
MBSynergy contributions combine approaches from agile, model-based, and enterprise architecture disciplines:

- Leveraging the agile toolbox, we develop a scenario-based approach to capture MBSE encompassing processes: their business goals, stakeholders, assumptions, inputs/ outputs, and associated quality metrics. Success criteria and failure conditions are also carefully captured to guide the execution of these scenarios.
- Applying model-based techniques, we refine these text-based scenarios to models and evaluate their merit (e.g., for time or resource budgeting, risks in execution or lack of skills). In addition, models allow for process comparison and composition.
- Applying enterprise architecture concepts, we connect these models to value streams and assess the benefits the scenarios deliver to an organization, and how to implement them.

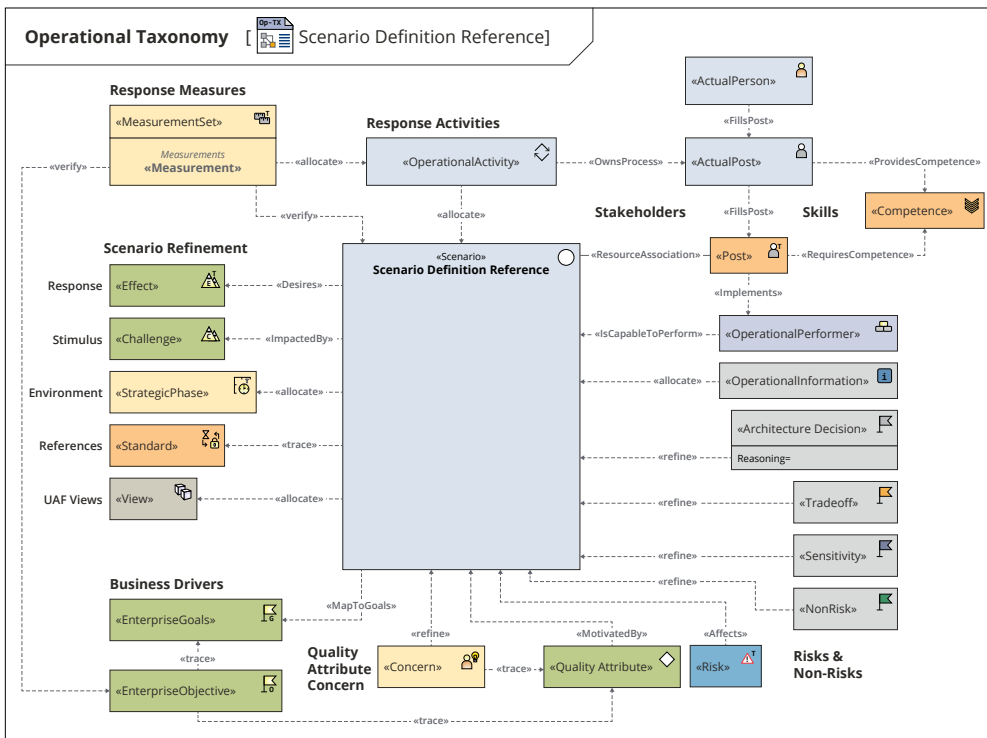
In the field of chemistry, synergy occurs when the effect of a combination of two or more chemicals produces an efficacy greater than either single chemical by itself. In the case of MBSynergy, our approach combines otherwise “silo’ed” domains in a holistic way to describe, predict, and ultimately prescribe processes that deliver the greatest benefit to DoD program stakeholders.

### Collaborating for Success

We are looking for DoD collaborators to use and provide feedback on our approach. As a participant, you may propose challenges in the form of processes to be captured and analyzed by our team or exercise the approach within your organization using our templates. We are interested in collecting metrics on our approach: applicability, relevance to your organization’s goal, and more.



**MBSE processes in support of System Development Lifecycle are complex:** models are created, edited, or reviewed by different stakeholders, with different needs and goals. Synchronizing these activities is a challenge.



MBSynergy defines a **UAF profile for capturing MBSE scenarios:** stakeholders, their goals, actions, along with synchronization interfaces: triggers, inputs, outputs. These scenarios supports organizational missions and refines Enterprise Architecture goals.

### About the SEI

Always focused on the future, the Software Engineering Institute (SEI) advances software as a strategic advantage for national security. We lead research and direct transition of software engineering, cybersecurity, and artificial intelligence technologies at the intersection of academia, industry, and government. We serve the nation as a federally funded research and development center (FFRDC) sponsored by the U.S. Department of Defense (DoD) and are based at Carnegie Mellon University, a global research university annually rated among the best for its programs in computer science and engineering.

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