MBSynergy: Improve Your MBSE and Digital Engineering Workflows

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

Introduction

DOD Instruction 5000.97 postulates that Model-Based Systems Engineering (MBSE) and Digital Engineering (DE) would "enable faster, smarter, data-driven decisions through the system life cycle." Yet, reproducing MBSE and DE benefits at scale remains a challenge.

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.

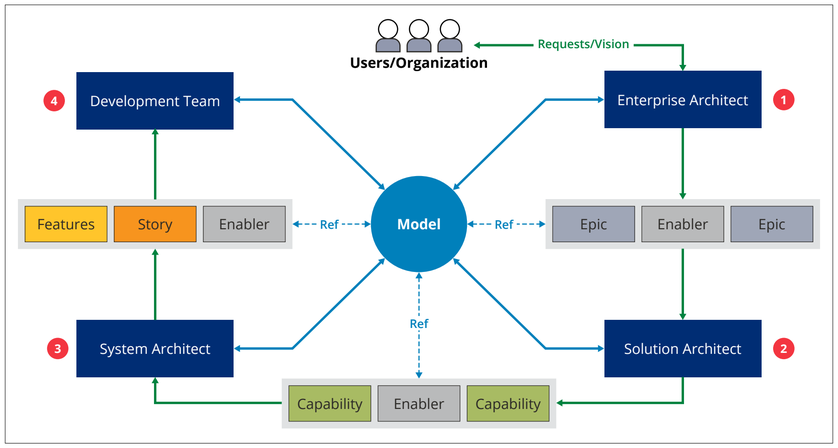
Approach

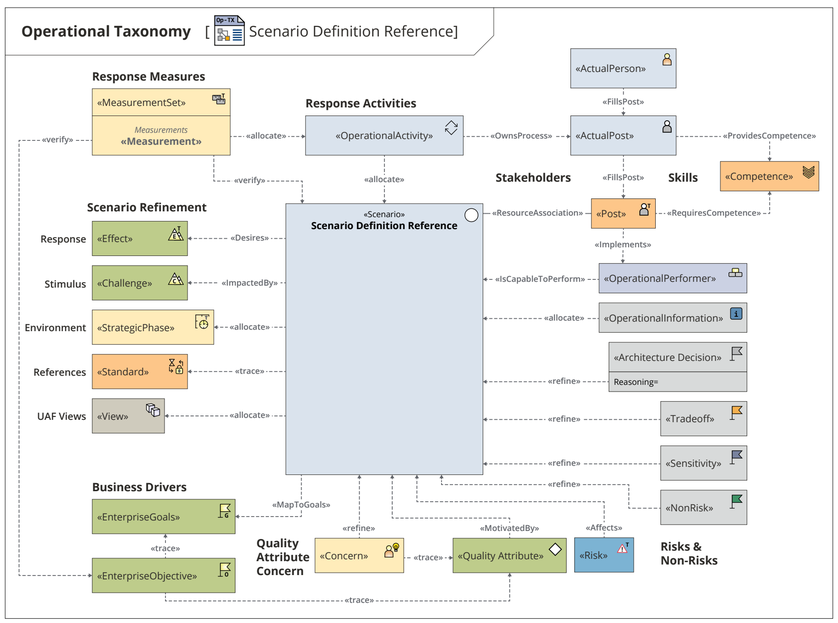
Recognizing the interwoven nature of modeling and engineering activities, our approach balances the desire for agile velocity with the need for carefully designed capabilities using MBSE modeling.

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. We claim that the advancement sought with engineering agility cannot be fully realized without a sufficient understanding of enterprise architecture.

Our project models and **analyzes MBSE** processes to **optimize the value of MBSE** within an organization.

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.

Synergies

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 processes: 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 into Unified Architecture Framework (UAF) 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 review, 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.

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.

Carnegie Mellon University
Software Engineering Institute

Jerome Hugues | jjhugues@sei.cmu.edu
Natasha Shevchenko, Colin Dempsey, Moira Southern, Peter Capell, Will Hayes.

[DISTRIBUTION STATEMENT A]
Approved for public release and unlimited distribution.
DM24-1358

Copyright 2024 Carnegie Mellon University.

This material is based upon work funded and supported by the Department of Defense under Contract No. FA8702-15-D-0002 with Carnegie Mellon University for the operation of the Software Engineering Institute, a federally funded research and development center.

The view, opinions, and/or findings contained in this material are those of the author(s) and should not be construed as an official Government position, policy, or decision, unless designated by other documentation.

References herein to any specific entity, product, process, or service by trade name, trade mark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by Carnegie Mellon University or its Software Engineering Institute nor of Carnegie Mellon University - Software Engineering Institute by any such named or represented entity.

NO WARRANTY. THIS CARNEGIE MELLON UNIVERSITY AND SOFTWARE ENGINEERING INSTITUTE MATERIAL IS FURNISHED ON AN “AS-IS” BASIS. CARNEGIE MELLON UNIVERSITY MAKES NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED, AS TO ANY MATTER INCLUDING, BUT NOT LIMITED TO, WARRANTY OF FITNESS FOR PURPOSE OR MERCHANTABILITY, EXCLUSIVITY, OR RESULTS OBTAINED FROM USE OF THE MATERIAL. CARNEGIE MELLON UNIVERSITY DOES NOT MAKE ANY WARRANTY OF ANY KIND WITH RESPECT TO FREEDOM FROM PATENT, TRADEMARK, OR COPYRIGHT INFRINGEMENT.

[DISTRIBUTION STATEMENT A] This material has been approved for public release and unlimited distribution. Please see Copyright notice for non-US Government use and distribution.

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License. Requests for permission for non-licensed uses should be directed to the Software Engineering Institute at permission@sei.cmu.edu.

DM24-1358