Model Driven Engineering (MDE)

Course Overview

MDE is becoming increasing popular as an approach for formalizing complex systems information required by customers, system engineers, and software groups to improve lifecycle analysis, development, and verification and validation (V&V). KnowledgeBytes is offering an introductory series to help people evaluate MDE practices and tools and adopt an MDE approach that aligns with their engineering and business needs. There are nice sessions. They are:

- What's MDE and Why Should I Care?
- How does MDE impact my process?
- What's happening with MDE Tools?
- System-Level Modeling of Customer-Needed Capabilities
- Leveraging System-Level Models
- Modeling Tool Survey
- Tool Chains for Simulink
- Model Adoption Practices
- What's Next to Come with MDE?

Each session is about one-hour and can be delivered in as a webinar. The sessions provide a spectrum of information related to modeling concepts, approaches, process and organization implication, benefits, limitations, risks, and state of the tools. Information is provided on how to select an appropriate first project.

Although architectural models are frequently used to create operational and system views at the system of systems (SoS) and systems levels, there is still much confusion as to how to generate these architectural models and use them to expedite the engineering lifecycle. The series provides an overall context for the remainder of the webinars and provides guidance for creation of SOS and systems level architectural models. Systems Modeling Language (SML) is emerging as an industry best practice for developing operational and system architectural views. A session describes how to develop SysML architectural views and how to leverage modeling information for the purpose of planning and performing verification and validation (V&V). It also introduces the need for developing methods and practices to address ways to represent system

engineering information such as tradeoff and hazard analysis not formalized by the modeling standards and tools.

Tools are an essential part of MDE as they formalize structural information such as architectural elements, interfaces and connections, behavioral information (e.g. functions), and other system properties. The formalization permits tools to analyze, transform, trace and simulate model information, as well as synthesize and generate other artifacts such as code, tests, documentation, and reports. The Modeling Tool Survey session describes the approach and results of the modeling tool survey conducted in 2009 and builds on the perspectives given in the first two sessions. Another session provides a detailed perspective on a specific MDE tool chain implementation using the Mathworks Simulink®/Stateflow® tool suite.

Most of the modeling tools are process agnostic allowing organizations to align the tool support with their defined processes. However, this requires clients to define their own methods and map the modeling practices and resulting artifacts to the existing processes. There are some adoption practices that should be applied at the start of any project to best leverage the modeling tools. This Model Adoption Practices session builds on perspectives given in other sessions of the MDE series by providing recommended modeling adoption practices.

Advanced topics such as domain-specific modeling, customizable code generation, the need for integration of modeling and some predictions of where MDE is going in the future.

Learning Objectives: Upon completion of this series, attendees will be able to:

- Modeling terminology and concepts
- Key distinctions and benefits
- Limitations and risks
- Different types of modeling approaches
- Describe the scope of the webinar series, which covers the modeling tool survey results, modeling tool chains, and modeling adoption practices
- Understand key views in modeling customer and user needed capabilities at the SoS and systems level
- Understand the role of standards such as Department of Defense Architectural Framework (DoDAF), Unified Profile for DoDAF and MODAF (UPDM), and System Modeling Language (SysML)
- Understand the need for modeling capabilities from both the operational and system architectural views
- Compare traditional systems engineering with model-driven systems engineering
- Understand scenarios for using SysML and how to map SysML allocated requirements onto software and hardware subsystems

- Describe how modeling artifacts developed early can support planning, estimation, and performing V&V
- Understand some limitations of SysML and alternatives for modeling "ilities" and tradeoff analysis that must be addressed with project-specific guidelines
- Understand the tool capabilities classification scheme driven by standards for modeling, commercial tool capabilities, open source tool capabilities, and member company interest
- Understand how to assess tools that suit an organizations' intended purpose such as system-level modeling, targeted domain, and transformation or generation capabilities targeted to a specific platform or programming language
- Understand life cycle coverage and tool chain integration support
- Understand how tool chain integration can support design modeling, code generation, test vector generation, test driver generation, test execution, test coverage analysis and result analysis
- Understand model analysis and defect identification using a seeded model defect
- See an end-to-end tool chain demonstration with a tool comparison to illustrate different tool capabilities and value
- Describe process-related considerations that can be impacted by the use of MDE
- Understand how to relate traditional process activities to modeling practices and modeling artifacts
- Understand the need incorporate modeling methods and standards
- Understand alternatives for representing and structuring the modeling information as well as the domain and context of the target system including interfaces to test, simulation, environmental models, and external systems
- Discuss gaps (e.g., tradeoff analysis) in modeling tools where members need to institute or align their practices with the way they plan to produce artifacts using models
- Discuss in general terms how different members have approached assessing their adoption of MDE
- Understand potential changes to lifecycle schedule and deliverables that can impacts proposals or traditional deliverables
- Describe how and why to conduct pilot projects to reduce the risk of adoption

Who Should Attend

This sessions are intended for Program and Project Leads, and System and Software Engineers, including architects, developers, and integration and test personnel. It may also be of interest to Directors and Managers, Capture Manager & Team, process developers and customers that are interested in technical details of tool chain capabilities for Simulink and Stateflow.

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