

Keynote Address I: Model Driven Development for Distributed Real-Time and Embedded Systems

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Abstract

Despite advances in standards-based commercial-off-the-shelf (COTS) technologies, key challenges must be addressed before COTS software can be used to build mission-critical DRE systems effectively and productively. For example, developers of DRE systems continue to use ad hoc means to develop, configure, and deploy their applications and middleware due to the lack of formally analyzable and verifiable building block components.

This talk will describe how Model Driven Development (MDD) techniques and tools can be used to specify, analyze, optimize, synthesize, validate, and deploy product-line architectures (PLAs) and standards-compliant middleware platforms that can be customized for the needs of next-generation DRE systems. MDD is an emerging paradigm that combines:

- Domain-specific modeling languages (DSMLs), which provide programming notations that formalize the process of specifying application logic and quality of service (QoS)-related requirements in a PLA.
- Metamodeling, which define type systems that precisely express key characteristics and constraints associated with DSMLs for PLAs in particular application domains, such as software defined radios, avionics, vehtronics, and process automation.
- Model transformations and synthesis techniques that automate and ensure the consistency of software implementations with analysis information associated with functional and QoS requirements captured by models of PLA structure and behavior.

This talk will compare and contrast various model-based approaches (e.g., MIC, MDD, MDA, etc) to developing PLA-based DRE systems. It will also illustrate how MDD techniques and tools have been successfully integrated with standards-based QoS-enabled component middleware to develop PLAs that significantly improve the quality and productivity associated with developing next-generation mission-critical DRE systems. Concrete examples from avionics, process control, software defined radios, and warehouse management systems will be used to illustrate key points.