Introduction to the theme issue on performance modeling

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1 Introduction

The increasing complexity of modern computer systems demands new and efficient *performance modeling* techniques to aid developers in producing the most efficient system for a desired task. *Performance evaluation* seeks to understand and explain system performance. It should be an integral component of the development process from the beginning to reduce the costs required to fix problems late in the development cycle. Indeed, decisions made early in the process will directly impact the quality of the final product. The *model-based development* paradigm, in contrast, advocates developing systems starting from models—at multiple levels of abstraction—that express domain-specific concepts precisely and intuitively while supporting automated manipulation and transformation.

The goal of this theme issue is to illuminate the deep relationship between computer systems performance evaluation and system modeling. The papers presented in this issue help to answer such questions as—How can model-driven techniques that are used to understand a system’s behavior be used to improve its performance? Can modeling languages and tools be adapted for improving performance? What are the connections between modeling tool environments and performance evaluation tools and environments? The papers in this theme issue are a step towards bridging the gap between the theory and practice of performance evaluation and system modeling.

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2 In this issue

The idea for this theme issue arose from conversations with the organizing committee of the Second ACM/SPEC International Conference on Performance Engineering (ICPE), which was held in March, 2011, in Karlsruhe, Germany. ICPE developed from a merger of the ACM Workshop on Software and Performance (WOSP) and the SPEC International Performance Evaluation Workshop (SIPEW). With this rich history, ICPE blends together the topics of performance evaluation and model-driven techniques. The call for papers for this theme issue drew heavily from the ICPE/WOSP/SIPEW communities, but also attracted submissions more broadly. We received a total of 14 submissions for this theme issue. These papers were rigorously reviewed by an international group of experts in the fields of performance evaluation and model-based techniques. Based on these reviews, we were able to recommend the following five papers for publication.

The first paper, “Performance Models of Storage Contention in Cloud Environments” by Kraft, Casale, Krishnamurthy, Greer, and Kilpatrick, introduces models for helping to understand the interaction of storage systems in the increasingly important field of cloud computing. Sachs, Kounev, and Buchmann present a deeply examined performance modeling experience in their paper, “Performance Modeling and Analysis of Message-oriented Event-driven Systems.” Altevogt, Kiss, Kistler, and Rangan study the potential simulation improvements that can be obtained using different levels of abstraction in their paper, “Mesoscale Performance Simulation of Multicore Processor Systems.” The paper by Nguyen and Apon, “A Component-Based End-to-End Simulation of the Linux File System”, demonstrates a technique for simulating a large and sophisticated operating system. Finally, “Experience with Model-based Performance, Reliability and Adaptability Assessment of a

Complex Industrial Architecture” by Avritzer et al., presents a detailed industrial-scale case study using a model-based technique. Taken together, we hope that these papers will help provide you with a greater appreciation and understanding of how performance evaluation and model-based techniques both enhance and complement each other in the development and analysis of complex computing systems.

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Author Biographies

David J. Lilja is the Louis John Schnell Professor of Electrical and Computer Engineering at the University of Minnesota in Minneapolis, where he also serves as the head of the department, and a member of the graduate faculties in Computer Science and Scientific Computation. His main research interests include computer systems performance analysis, parallel processing, high-performance storage systems, and the interaction of software and compilers with computer architecture.

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