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A Unified Model-Driven Approach for Extracting and Generating Workload Specifications for Load Testing and Performance Prediction of Application Systems

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Abstract: This extended abstract summarizes our article on extracting probabilistic workload specifications for load testing and performance prediction of session-based application systems, which has been published recently in the Journal on Software and Systems Modeling [Vö16].

Keywords: Workload specification, model extraction, performance prediction, load testing.

In the context of software performance engineering, the notion of *workload* is used to refer to the way a system is accessed by users and other systems. Workload characteristics are one of the crucial impact factors of software performance—influencing, for instance, response times, throughput, and resource usage. Session-based systems, e.g., web-based e-commerce systems, are faced by a continuous arrival of clients that visit and use the system for a limited period of time (i.e., session), each involving a sequence of inter-related service requests to the system. Defining representative workload specifications is one of the biggest challenges for both model-based performance prediction and load testing of application systems.

Our WESSBAS approach[5] [Vö16], illustrated in Figure 1, *i.)* allows the modeling of workload specifications for session-based application systems, *ii.)* automates their extraction from operational monitoring data, and *iii.)* provides model transformations for load testing and model-based performance prediction. A system and tool agnostic domain-specific language (DSL) allows the layered modeling of probabilistic workload specifications for session-based applications. During the (optional) extraction step, clustering techniques are applied to create a set of probabilistic models (based on Markov chains)—each representing different types of sessions. The workload intensity is specified by the number of concurrent sessions at a given time. The extracted behavior and intensity models can be automatically transformed into instances of this DSL. Additional transformations generate executable workload specifications of load generation tools (e.g., JMeter) and model-based performance evaluation tools (e.g., Palladio Component Model) from the DSL instances.

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[5] WESSBAS is an acronym for *Workload Extraction and Specification for Session-Based Application Systems*.

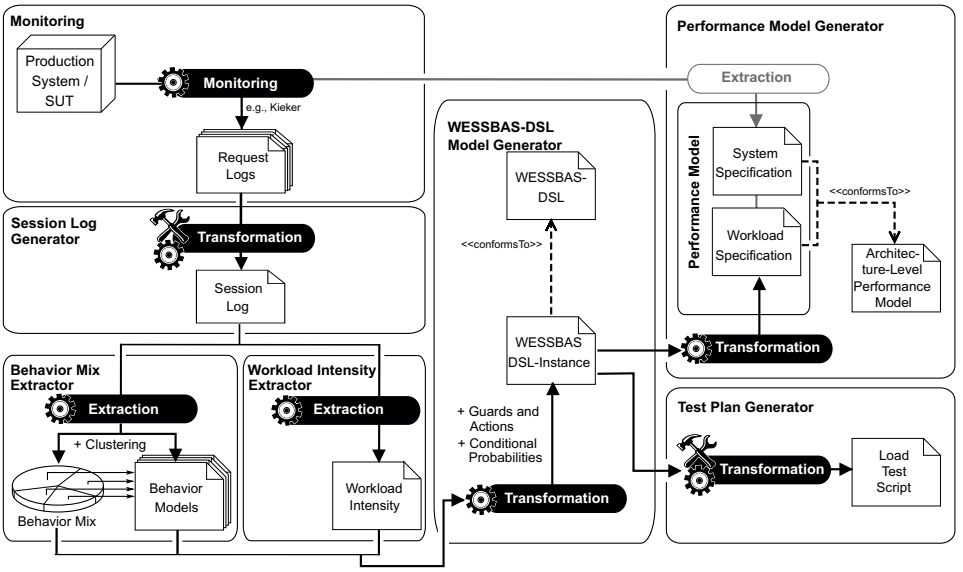

Fig. 1: Overview of the WESSBAS approach [Vö16]

Our evaluation using SPECjEnterprise2010 (an industry standard benchmark) and access logs of the FIFA World Cup 1998's web site shows that the resulting workload (e.g., session lengths and arrival rates) and performance characteristics (e.g., response times and CPU utilizations) match the original characteristics with high accuracy.

The research on WESSBAS is conducted in the context of our efforts on combining and unifying model-based and measurement-based performance evaluation techniques in continuous software engineering (including DevOps) [Br15, Wa16].

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