Thesis Proposal

Institute for Software Research
Software Engineering

White-box Analysis for Modeling and Debugging the Performance of Configurable Systems

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Zoom

Most software systems today are configurable. The flexibility to customize these systems, however, comes with the cost of increased complexity. The large number of configuration options makes tracking how options and their interactions affect performance, in terms of execution time, and often directly correlated energy consumption and operational costs, a difficult task. For this reason, users often struggle to configure their systems to run them efficiently and developers often have difficulty debugging surprising performance behaviors.

Several approaches existing to understand how options and their interactions affect the performance of configurable systems. The approaches, however, treat systems as black-boxes, combining different sampling and machine learning techniques, resulting in tradeoffs between measurement effort, accuracy, and interpretability of the analysis results. Additionally, the techniques only analyze the end-to-end performance of the systems, whereas developers debugging unexpected performance behaviors usually need to understand how options affect the performance in the implementation.

In this thesis, we aim to analyze the performance of configurable systems using white-box techniques. By analyzing the implementation of configurable systems, we efficiently and accurately model the end-to-end performance of the systems, which allows users to make informed tradeoff and configuration decisions to run systems efficiently and helps developers understand how options affect the performance of their systems.

To further help developers debug the performance of their systems in the implementation, we efficiently and accurately model the local performance of regions and aid developers to trace how options affect the performance of those regions. This information helps developers locate where options affect the performance of a system and how options are used in the implementation to affect the performance.

The contributions in this thesis help reduce the energy consumption and operational costs of running configurable systems by helping (1) users to make informed configurations decisions and (2) developers to debug performance behavior issues in their systems.

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