In broad terms, the thesis of Vlastimil Babka is situated in the domain of software performance modeling, where the uses of performance models range from supporting decisions at design time to guiding system adaptation at run time. The models often simplify the software systems into formal abstractions such as service queues, which have been shown to faithfully capture the performance relevant behavior in many systems over the past decades. Unfortunately, the performance of contemporary systems is a result of numerous mechanisms interacting at various levels of granularity – and some of these mechanisms, such as thread level parallelism or cache coherent shared memory, are becoming increasingly difficult to model by the existing formal abstractions with sufficient accuracy.

From the mechanisms with significant performance impact, the thesis focuses on the memory caches of contemporary processors. I would like to emphasize three major contributions of the work of Vlastimil Babka:
One, a better understanding of the performance effects of cache sharing. The thesis is backed by an extensive set of experiments, which reveal often unexpected performance anomalies due to cache sharing. While it is unlikely that all of the anomalies will eventually be understood or even modeled, the design of the experiments and the overview of the effects are significant contributions by themselves.

Two, a model of the performance effects of cache sharing together with a detailed analysis of its properties and limitations. Many earlier models were only validated against the behavior of a processor simulator, but an application of a cache model in software performance modeling requires validation on a real processor. Compared to working with a simulator, validation on a processor is much hindered by the limited introspection capabilities.

Three, a method and tools for validating the accuracy of software performance models on randomly composed software systems. The method presents an alternative to the usual validation on individual case studies, which is usually too expensive to perform on a large number of systems.

The contributions were partially achieved within the framework of the international research projects that Vlastimil Babka has participated in. As a participant in the same research projects, I can attest that the work of Vlastimil Babka was instrumental in achieving the results presented in the thesis.

To conclude, I believe Vlastimil Babka has convincingly demonstrated the quality in his research, and I am honored to recommend that Vlastimil Babka be awarded the doctoral degree.

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