Dissertation

„Automatic Distribution of multi-threaded Java Applications“

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Abstract

The speed can be significantly increased by executing multithreaded Java program on several machines with skillful distribution strategies applied on the program objects at run-time. Therefor development efforts and handcraft are necessary.

The main goal is to distribute multi-threaded Java applications automatically on serveral JVMs in a cluster. All involved technical steps as well as object placement decisions are to be fully automatical and user-transparent. Significant speed-up can be reached by distributed execution.

In this work we present a new concept to distribute multi-threaded Java programs automatically and have prototypical implemented it in the JScatter system. A distribution plan is based on an abstraction of transformation and distribution strategies. Based on static and dynamic program properties which are calculated automatically using program analysis, object placement decisions in a distribution plan can be computed ahead of run-time and at run-time. In particular, the statgewise-immutable property to control object replication and the application of the hybrid analyses to determine the work-load property are counted among.

This dissertation is concluded by an comprehensive evaluation concerning capabilities of the stagewise-immutable program property as well as experimental results for some programs and benchmarks.

Keywords

Static program anaylsis, dynamic program analysis, hybride program analysis, distribution plan, object distribution function, distribution strategy, immutable, stagewise-immutable, distribution, multi-threaded Java program.