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String Optimizations for Graal

Bachelor / Master thesis for ...
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Graal [1] is an effort to create a new just-in-time compiler for Java that is itself written in Java. It is based on a port of the HotSpot client compiler from C++ to Java.

Strings are one of the basic building blocks used by almost every application and benchmark. The efficiency of the String handling often has a significant influence on the overall performance of an application, both in terms of run time and memory efficiency.

Most compilers therefore include a certain amount of special-purpose optimizations for strings, for example:

- Concatenation of constant strings
- Merging of hierarchical StringBuilders (e.g., builder.append(a + b))
- Replacing StringBuffers with StringBuilders
- Intrinsification of functions like getChars, getBytes, ...
- More efficient copying of strings
- ...

The scope of this project is as follows:

- Research into existing high-performance Java JIT compilers, especially the HotSpot server compiler, to determine the state of the art in string optimizations
- Document these optimizations and implement a certain subset of them for the Graal compiler
- Write tests that ensure that these optimizations are performed and that they are performed correctly.

The work's progress should be discussed with the supervisor at least every 2 weeks. Please note the guidelines of the Institute for System Software when preparing the written thesis.

Supervisor: Dipl.-Ing. Lukas Stadler

[1] http://openjdk.java.net/projects/graal/