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Master's Thesis

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Lightweight Allocation Sensor

Managed memory, i.e., garbage collected memory, has gained wide-spread use because it relieves the programmer from freeing heap objects manually and allows for fast allocations. However, these advantages come at the cost of a difficult to understand memory manager and garbage collector. Therefore, searching for memory-related performance degradations is a tedious task because the reasons for slow allocations, a large garbage collection pause, or a high garbage collection frequency might not be obvious.

The goal of this thesis is to build a Java agent that is able to instrument all allocations of any Java application. Allocations must be counted per allocation site and reported to an external monitoring tool in a regular interval.

To keep the overhead as low as possible, the agent must detect hot paths and reduce the number of counters in these paths. For example, a method with linear control flow should only contain one instrumentation, i.e., one counter, representing all allocations at once. Whenever the control flow branches, the agent has to „guess“ the hot branch and instrument all the other branches. Consequently, there is always just one counter representing all allocations in the hot path of the method, and one counter for every cold branch representing the difference in the allocations there.

The master thesis must be submitted not later than 3.2.2017.

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