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Bachelor's Thesis

An Experiment to Measure the Performance Trade-off between Traditional IO and Memory-mapped Files

Linz, 12. Juni 2014

Ant Tracks is a low performance overhead tracing mechanism built into the Hotspot Java Virtual Machine, able to track object allocations as well as object moves throughout the heap. This is done incrementally, i.e., by logging an event for each allocation or move. In order to keep the overhead low, building the event as well as logging it must be done as efficiently as possible. As of now, logging an event is implemented as a combination of variable-sized thread-local buffers and asynchronous IO. This means that each thread does not log events directly but rather writes them to a thread-local buffer without any synchronization necessary. Furthermore, when the buffer is full, it is not written directly but added to a flush queue. A dedicated worker thread consumes elements from this queue and writes them to the trace file. When a buffer is flushed, it is added to the free list, from which new empty buffers can be requested by the application threads if necessary.

The goal of this thesis is to evaluate whether memory-mapped files can gain additional performance when writing data to the trace file and to implement a native prototype in order to do so. This prototype must be able to simulate the serialization mechanism and measure its performance. Thus, it must support both, traditional IO and memory-mapped files for comparison. The following properties must be configurable: type (classical IO, memory-mapped files), amount of data to be written, parallelism (i.e., how many parallel worker threads for serialization are used), and load (i.e., how many other threads are in the same process that do some independent computations). The written thesis should describe the prototype as well as results and the conclusions drawn from the experiment.

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