A Dynamic Instrumentation Plugin for Score-P

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Applicable for students as Bachelor Thesis
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SC SCIENTIFIC COMPUTING

Introduction

Score-P [1] is a widely used measurement infrastructure for profiling performance of high-performance computing (HPC) applications. The default measurement paradigm uses static code instrumentation to insert measurement probes into the code. These probes interact with the Score-P runtime library to record performance metrics.

Code instrumentation can introduce high runtime overheads, perturbing the characteristics of the original function. For this reason, the initial instrumentation configuration (IC) may have to be adjusted. In this regard, static instrumentation has the disadvantage of requiring a recompilation of the code, if the IC changes.

XRay [2] is a dynamic instrumentation feature of the LLVM compiler infrastructure. It has the advantage of allowing the user to enable/disable measurement points at runtime. This enables switching out configurations without recompling the code. Currently, there is not XRay interface for Score-P.

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Thesis Project

This thesis involves the following tasks:

- Develop an extension of Score-P that uses XRay as an alternative instrumentation method.

- Investigate and evaluate differences between the two methods.

- Compare the induced measurement overhead with the static instrumentation approach and the existing runtime filtering feature.

Qualification

The following items are recommendations. Feel free to reach out if you are not sure if you meet the criteria.

- Basic knowledge of compilers (required)

- Experience programming in C++ (required)

- Familiarity with HPC profiling tools, e.g. by having attended our Performance Engineering seminar (required)

- Experience working on GNU/Linux systems (required)

- Experience with Clang/LLVM (recommended)

References

[1] https://www.vi-hps.org/projects/score-p/

[2] Berris, Dean Michael, et al. "XRay: A function call tracing system." (2016). https://research.google/pubs/pub45287/

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