

Measuring Hardware Counters for HPC Application Phase Detection

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Introduction

Motivation:

- Reducing the power consumption of parallel applications;
- Fine-granularity to identify the memory-bound regions of parallel application several timestamps;
- Lower overhead of measurement.

Objective:

- Measure hardware counters at every given time interval to discover memory-bound regions

Related Works

Spiliopoulos et al [1]:

- Tool that analyzes the behavior of sequential application (the concept of phases);
- Based on cache misses of different caches' levels.

Laurenzano et al [2]:

- Finer granularity for each application loop.

Related Works

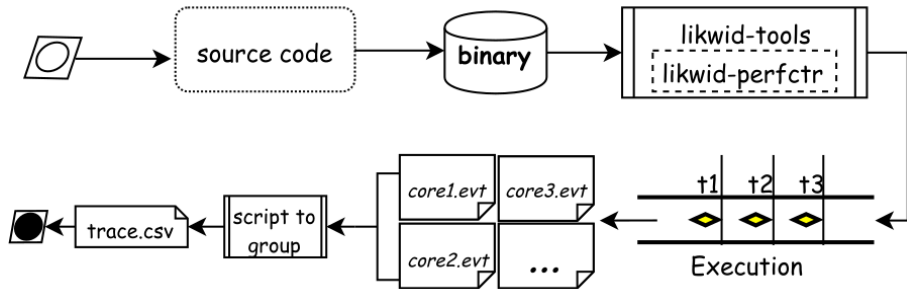
Freeh et al. [3]:

- Define the most suitable frequency for each phase of MPI applications;
- Analyse of the best frequency for each node.

Millani and Schnorr [4]:

- OpenMP applications
- Analyse of parallel regions of programs
- Manual instrumentation of code to identify

Methodology



Preliminary Results : NPB-FT, B Class

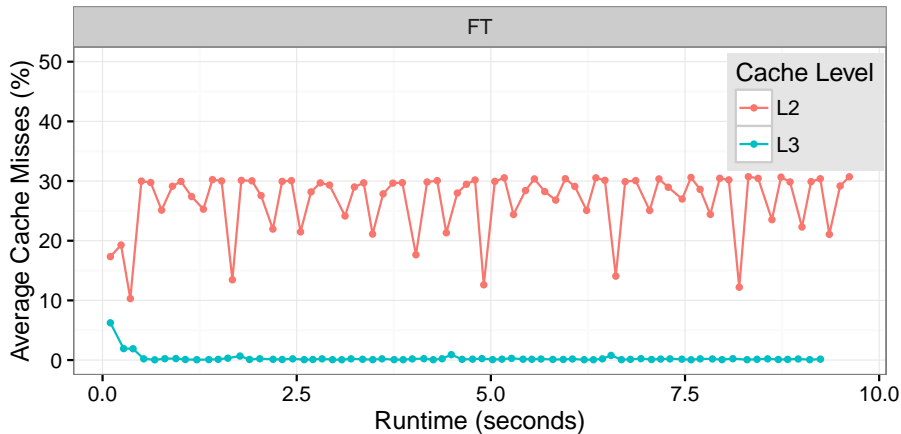


Figure : When measuring metrics every 100 milliseconds.

Preliminary Results : NPB-LU, B Class

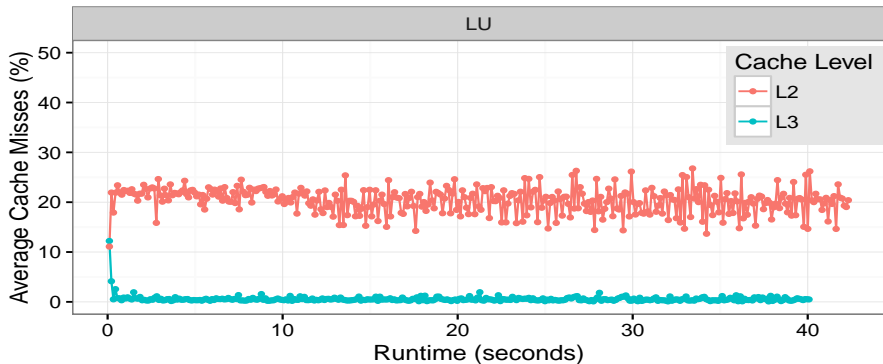


Figure : When measuring metrics every 100 milliseconds.

Preliminary Results : NPB-CG, B Class

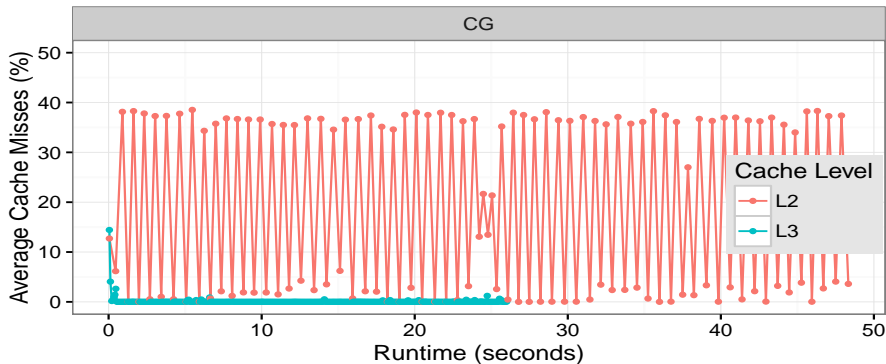


Figure : When measuring metrics every 50 milliseconds.

Conclusion

- The main contribution of this work is its methodology: steps and tools necessary that should be used to identify memory-bound portions of parallel application.
- Future work:
 - Automatically identify the memory-bound regions based on the hardware counters

References



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- Thank you for your attention!