

**Title of position presentation:** Tool infrastructure for hardware performance counters

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**Abstract:**

An interesting problem faced by performance tools is how to relate low-level, detailed performance information provided by hardware counters back to high-level language constructs. A popular trend in HPC computing is to enhance user productivity by designing languages with high levels of abstraction, as evidenced by the HPCS effort [1]. Paradoxically, as the semantic gap between source-level and hardware-level operations widens, experimental performance data (such as data provided by hardware performance counters) becomes even more important for the performance tuning process.

The UPC group at the University of Florida is currently conducting research and building a performance tool named "Parallel Performance Wizard" (PPW) [2] to support partitioned global address space programming models. PPW currently deals with the source correlation problem by using the PAPI library [3] in conjunction with source information provided by the GASP tool interface [4]. This approach requires that a user recompile their application with GASP support enabled, which unfortunately may have secondary effects that affect program performance.

Ideally, a user should be able to use a tool with an optimized binary and have performance data reported in terms of language-level operations and not hardware-level operations (which may look nothing like the language-level operations they resulted from). What is needed is a standardized and portable infrastructure for performing source line correlation, even in the face of aggressive compiler restructuring at all levels of compilation. Tools such as DynInst [5] and HPCToolkit's BLOOP [6] have made impressive gains in this area, but there still is much room for improvement.

A generic, portable (to both new platforms and new languages) library with a simple interface for accurately correlating source information would be an extremely valuable addition to the infrastructure for building performance tools. In this short (5-10 minute) position presentation, I wish to start a discussion with the hardware counter community about how best to tackle this problem. A solid tool infrastructure would allow more tools to take advantage of hardware counter information and present it in ways normal users can understand, potentially helping spread user adoption of performance tools based on hardware counters and driving these tools into the mainstream.

**References:**

- [1] HPCS website, <http://www.highproductivity.org/>
- [2] PPW website, <http://ppw.hcs.ufl.edu>
- [3] PAPI website, <http://icl.cs.utk.edu/papi/>
- [4] GASP website, <http://gasp.hcs.ufl.edu>
- [5] DynInst website, <http://www.dyninst.org/>

[6] HPCToolkit website, <http://www.hipersoft.rice.edu/hpctoolkit/>