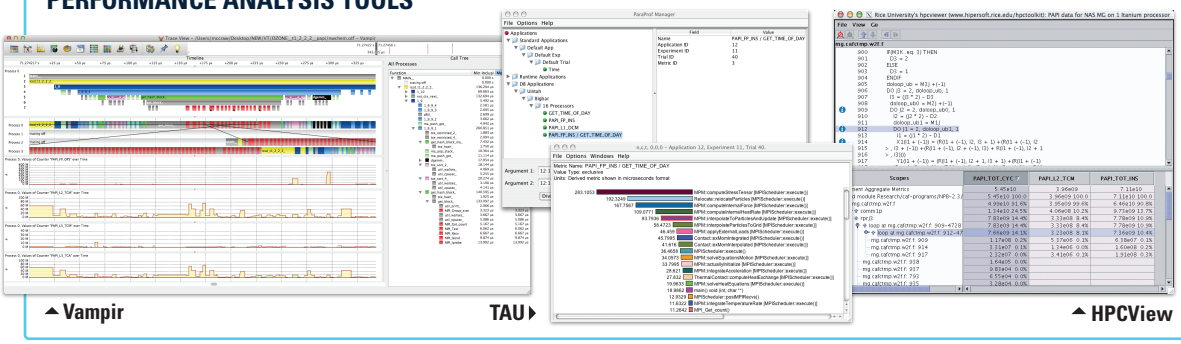
INNOVATIVE COMPUTING LABORATORY

PAPI

PAPI (Performance Application Programming Interface) provides the tool designer and application engineer with a consistent interface and methodology for use of the performance counter hardware found across the system (i. e., CPUs, GPUs, on-/off-chip Memory, Interconnects, I/O system, File System, Energy/Power, etc.). PAPI enables software engineers to see, in near real time, the relation between SW performance and HW events across the entire compute system.

PERFORMANCE ANALYSIS TOOLS



Vampir | TAU | HPCView

MORE

- HPCToolkit
- Open|SpeedShop
- PaRSEC
- PerfSuite
- Scalasca
- SCORE-P

STANDARD FEATURES

- Standardized Performance Metrics
- Easy Access to Platform-Specific Metrics
- Multiplexed Event Measurement
- Dispatch on Overflow
- Overflow & Profiling on Multiple Simultaneous Events
- Bindings for C, Fortran and Matlab
- User Definable Metrics derived from Platform-Specific Metrics
- Support for Virtual Computing Environments
- Performance counter monitoring at task granularity for dataflow runtime PaRSEC

PAPI

Vendor HW/ Kernel Extension

OS/Kernel

SUPPORTED ARCHITECTURES

AMD	X86
ARM	Cortex A7, A8, A9, A15, X-Gene (ARM64), Raspberry Pi
CRAY	Gemini and Aries interconnects RAPL power
IBM	Blue Gene Series, Q: 5D-Torus, I/O system, EMON power on BG/Q Power Series
Infiniband	
Intel	Nehalem, Westmere, Sandy Bridge, Ivy Bridge, Haswell, Haswell-EP, Broadwell, Skylake, Knights Corner, Knights Landing RAPL; power capping, Power on Xeon Phi
NVIDIA	Tesla, Kepler, NVML Cuda 8, PC Sampling

FutureGrid provided resources for testing and development of PAPI-V

R&D100 WINNER

ICL INNOVATIVE COMPUTING LABORATORY

WITH SUPPORT FROM AMD, CRAY, IBM, intel, NVIDIA

SPONSORED BY U.S. Department of Defense, U.S. DEPARTMENT OF ENERGY, ECP, National Science Foundation SILAS Award

CITR CENTER FOR INFORMATION TECHNOLOGY RESEARCH

FIND OUT MORE AT http://icl.cs.utk.edu/papi

INNOVATIVE COMPUTING LABORATORY

PAPI-EX

WORKING TO BUILD MEASUREMENT TOOLS FOR CHANGING HARDWARE AND SOFTWARE PARADIGMS

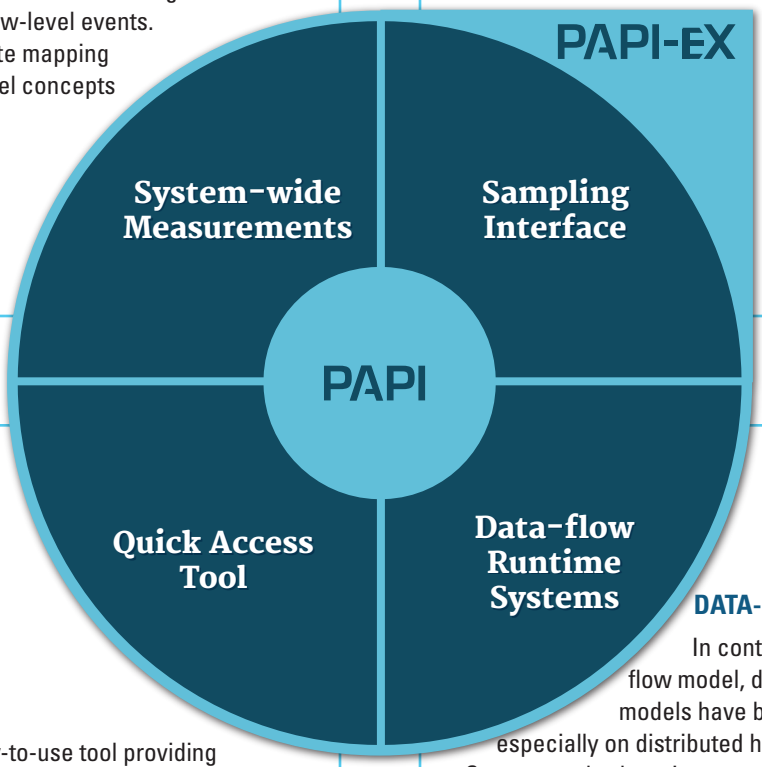
AN IN-PROGRESS PROJECT WHICH WILL EXTEND THE PAPI PARADIGM FOR THE NEAR FUTURE

SYSTEM-WIDE MEASUREMENTS

The ability to measure inter-core resource counters (e.g., memory hierarchy, network, GPUs, PCI bus, power) with PAPI will greatly broaden the understanding of application performance on modern hardware. In addition, PAPI will incorporate a counter inspection toolkit designed to improve understanding of low-level events. We aim to define an accurate mapping between particular high-level concepts of performance metrics and underlying low- level hardware events.

SAMPLING INTERFACE

PAPI-Ex is being extended to provide a portable, easy-to-use interface to sampling data, enabling the tools community to provide advanced performance analysis and optimization capabilities to the user.



QUICK ACCESS TOOL

PAPI-EX will develop a easy-to-use tool providing quick access to PAPI measurements by building on an open source version of a performance measurement and testing tool—papiex— created by an industry collaborator, An updated high-level API containing community requested improvements will support this tool.

DATA-FLOW RUNTIME SYSTEMS

In contrast to the traditional control flow model, dataflow-based programming models have become increasingly popular, especially on distributed heterogeneous architectures. Consequently, there is a growing demand on performance measurement tools for task-based, dataflow-driven runtimes. PAPI-EX will support integration with task-based runtime systems, enabling hardware performance counter measurements at true task granularity, as opposed to the thread/process granularity achievable today.

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