TAU Performance System®

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http://tau.uoregon.edu
TAU Performance System®

- Tuning and Analysis Utilities (18+ year project)
- Comprehensive performance profiling and tracing
  - Integrated, scalable, flexible, portable
  - Targets all parallel programming/execution paradigms
- Integrated performance toolkit
  - Instrumentation, measurement, analysis, visualization
  - Widely-ported performance profiling / tracing system
  - Performance data management and data mining
  - Open source (BSD-style license)
- Easy to integrate in application frameworks

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What is TAU?

• TAU is a portable profiling and tracing tool that supports OpenSHMEM
• Profiling and tracing can measure time as well as hardware performance counters (cache misses, instructions) from your CPU
• TAU can automatically instrument your source code using a package called PDT for routines, loops, I/O, memory, phases, etc.
• TAU runs on most HPC platforms and it is free (BSD style license)
• TAU has instrumentation, measurement, and analysis tools
• TAU interfaces with other tools such as Jumpshot trace visualizer, PAPI hardware counter library, and Vampir
• It can scale to large core counts

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**TAU Performance System®**

Parallel performance framework and toolkit

- Goal: to support all HPC platforms, compilers, and runtime systems
- Provides portable instrumentation, measurement.

**TAU Architecture**

**Instrumentation**
- Source
  - C, C++, Fortran
  - Python, UPC, Java
  - Robust parsers (PDT)

- Wrapping
  - Interposition (PMPI)
  - Wrapper generation

- Linking
  - Static, dynamic
  - Preloading

- Executable
  - Dynamic (Dyninst)
  - Binary (Dyninst, MAQAO)

**Measurement**
- Events
  - static/dynamic
  - routine, basic block, loop
  - threading, communication
  - heterogeneous

- Profiling
  - flat, callpath, phase, parameter, snapshot
  - probe, sampling, hybrid

- Tracing
  - TAU / Scalasca tracing
  - Open Trace Format (OTF)

- Metadata
  - system, user-defined

**Analysis**
- Profiles
  - ParaProf parallel profile analyzer / visualizer
  - PerfDMF parallel profile database
  - PerfExplorer parallel profile data mining

- Tracing
  - TAU trace translation
    - OTF, SLOG-2
  - Trace analysis / visualizer
    - Vampir, Jumpshot

- Online
  - event unification
  - statistics calculation

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Key features of TAU

• Support for tracking one-sided communication for OpenSHMEM
• Support for outer-loop level instrumentation using both source (PDT), and binary rewriting
• Support for compiler based instrumentation (Intel, GNU…)
• Support for instrumentation of memory and I/O operations for accurate heap memory usage, memory allocation/de-allocation, and I/O volume and bandwidth computations
• Wrapping technology for instrumenting any external library
• Performance database technology to store performance data, cross experiment and data mining tool (PerfExplorer)
• Support for hybrid sampling and direct measurement
• 3D profile browser, ParaProf
• Support for debugging (Callstack, memory leak detection, and soon runtime bounds checking)
• Cross-platform and cross-language portability

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3D Communication Matrix Display

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2D Communication Matrix Display
SHMEM Barrier

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Jumpshot Trace Visualizer
3D Profile Visualization

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Support for SHMEM

- SGI SHMEM
- Cray SHMEM
- OpenSHMEM (1.0d)
- Plans for other OpenSHMEM implementations that may not support PSHMEM
  - IBM
  - HP
  - OpenSHMEM [UH] with compilers other than GNU
  - Mellanox

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Please stop by our PGAS booth (#2137) for OpenSHMEM DVDs.

Download TAU from our website:
http://tau.uoregon.edu

http://www.hpclinux.com
[LiveDVD]