Performance Technology for Tera-Class Parallel Computers: Evolution of the TAU Performance System

**TAU Performance System Status**
- Platforms: IBM SP3, SGI Origin 2K/UK, Compaq Alpha Tran4Linux Cluster, Gray TIE, Linux x86/IA-64 clusters, Hewlett-Packard Superdome/Non-cluster, Hitachi SR8000, NEC SX-5
- Languages: C/C++, Fortran 77, F90, OpenMP, Java, Python
- Thread libraries: pthreads, SGI spec, OpenMP, Java, Windows
- Communications libraries: MPI, PVM, SHMEM
- Parallelism paradigms: shared memory multi-threading, distributed memory message passing, mixed-mode
- Performance technologies: Dynamic instrumentation, PAPI, and PCL, hardware counter libraries, Opari automatic, OpenMP instrumentation, EPILOG tracing library, EXPERT trace analyzer, Vampir trace visualization, Paraview trace visualization

**Performance Mapping in Uintah**
- Dr. Allen D. Malony
- Dr. Sameer Shende
- Kai Li
- Robert Bell

- Taskgraph macro
- Automatic source instrumentation
- Uses OpenMP performance tools interface
- Automatic instrumentation with Opari

**Performance Profiling of EVH1**
- Enhanced Virginia Hydrodynamics #1 benchmark
- IBM SP3, 16 processors
- Racy parallel profile display tools
- Automatic instrumentation using PDT, MPI wrapper library
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- Performance
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- Automatic

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**Mixed-Mode Performance Analysis (OpenMP + MPI)**
- 2-D Stommel model of ocean circulation
- Jacoby iteration, 5-point stencil
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**TAU Integration in SAMRAI**
- Structured Adaptive Mesh Refinement Application Infrastructure
- Group-based SAMRAI performance timers and events
- Seamless integration in routine and MPI performance measurement

**Project Goals and Recent Accomplishments**
- Dynamic performance measurement control
  - Dynamic event grouping
  - Multiple configurable counters
  - Selective instrumentation
- Application-Level Performance Access
  - Incremental profile dumping
  - Runtime profile access
- Multi-Level Performance Instrumentation and Mapping
  - Optimized instrumentation
  - Tracing library enhancement
  - Performance mapping profile display
- Software and Hardware Performance Integration
  - Callback registration for system and hardware counters
  - Trace recording of counts

**TAU Performance Database Framework**
- Raw performance data
- Performance analysis programs
  - PerfDLR data description
  - PerfDLR analysis and query toolkit
  - XUL data representation
  - Multiple experiment database

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**TAU Applications**
- SAMRAI (LLNL, Andy Wisniski). TAU is being integrated in SAMRAI framework as the main performance measurement facility, replacing hand-instrumented counters and timers. TAU is included as part of the SAMRAI distribution.
- OVERTUNE (LLNL, Brian Miller). TAU is being used in the Overture framework for object-oriented performance measurement. Miller has also integrated TAU in the adaptive mesh refinement simulator, AMRSim, and is using TAU for another (undisclosed) software development project.
- ALPS (LLNL, James Scheck). The Adaptive Linear Plasma Simulator uses SAMRAI as a software component. It gains access to TAU’s measurement support in SAMRAI as well as uses TAU directly in other ALPS code.
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