Automated Performance Analysis

Working Group Outbrief

Scalable Tools Workshop 2025

Current State of Performance Analysis Tools

- Multiple tools exist but face barriers to adoption and usability
- Users struggle with instrumenting code and extracting actionable insights
- Tools excel at data collection but leave interpretation to users
- Need to shift from just presenting data to providing actionable recommendations

Runtime Analysis Capabilities

- Tau supports plugin architecture for real-time performance analysis
- Can register events of interest with start/stop triggers
- Provides recommendations through metadata entries in profile files
- Example: Evaluates MPI collective operations performance
- Supports runtime parameter tuning through MPI Tools interface

Data Storage & Format Challenges

- Tools currently use different storage approaches:
  - TAU: TAUDB with import/export capabilities
  - Caliper: custom database format
  - Multiple proprietary formats across different tools
- Need for standardized format across tools
- Suggestion: Consider 3 SQL standards for:
  - Profiling data
  - Detailed traces
  - Sampling data

Funding & Industry Collaboration

- Need for congressional line item in presidential request (~$50M level)
- NGSST program requires stronger support
- Challenge: Proposal writing takes 6-12 months with uncertain outcomes
- Opportunity: Partnership with companies like AMD/HPE
- Need industry executives to advocate for national labs/university collaboration

Future Directions

- Consider MLPerf-style benchmark framework for tools comparison
- Need automated analysis for increasingly complex systems
- Opportunity for GitHub actions to automate performance analysis
- Growing need for out-of-process profiling for long-running services
- eBPF emerging as potential solution for real-time profiling

Action Items & Next Steps

- Explore potential funding through AMD channels
- Consider developing standardized data streaming format
- Investigate collaboration opportunities with other tool developers
- Research eBPF integration possibilities
- Look into automated analysis framework development

Resources

- PerfExplorer: https://ieeexplore.ieee.org/document/1559993
- PerfExplorer 2: https://dl.acm.org/doi/abs/10.1155/2008/985194
- https://software.llnl.gov/benchpark
- https://mlcommons.org/benchmarks/training-hpc

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