FEPA – Ein flexibles Framework zur Energie- und Performanceanalyse hochparalleler Applikationen

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ZKI AK Supercomputing

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Agenda

- LIKWID & Benchmarking
- FEPA and its help for acquisition
Overview of LIKWID tools

- **Topology and Affinity:**
  - likwid-topology
  - likwid-pin

- **Performance Profiling:**
  - likwid-perfctr & likwid-perfscope
  - likwid-powermeter

- **Benchmarking:**
  - likwid-bench
  - likwid-setFrequencies
  - likwid-memsweeper

- **Misc.**
  - likwid-mpirun, likwid-agent (4.0)
BENCHMARKING WITH LIKWID

- Get system layout
- Pin processes and threads
- Handle NUMA memory policies
- Purges memory and LLC
- Manage CPU core frequencies
- Measure energy consumption

If you encounter problems with benchmarks: profile performance with HPM
LIKWID’s own benchmark suite

- Data and thread placement and pinning
- Test kernels in (abstracted) assembly
  - SSE, AVX, nt-stores, …
- Measure real hardware capabilities
- Kernels cover common workloads
  - Load, store, copy, ddot, daxpy,…
- Integrated LIKWID MarkerAPI
Comparing game (Bandwidth/Price)

Comparison for level L3, 1 CPU cores

Which one is better? E5-2660v2 or E52695v3?
Comparing game (Bandwidth/Watts)

Comparison for level L3, 1 CPU cores

Which one is better? E5-2660v2 or E52695v3?
And now?

- For single cores:
  - Common price or energy related measurements not working
  - Are newer architectures really better?
- For multicore:
Job analysis using FEPA tools in respect of acquisition of new systems

Thomas Roehl (HPC Team, RRZE Erlangen)
FEPA infrastructure

- Project founded by BMBF
- Monitoring infrastructure for HPC systems & apps

Backend

Middleware

Frontend

HPM Speicher Netzwerk

Knoten Agent

Diamond + LIKWID

Group Node

AggMon + TokuMX

Group Node

Web-Frontend

Liferay

Thomas Roehl (HPC Team, RRZE Erlangen)
Central component AggMon

Tagger: adds a key-value to message, based on match condition
Subscribe: based on match condition (key-value, key-value regex)

Diamond + LIKWID
ZMQ PUSH

O(50k) msg/s

O(10k) msg/s
What FEPA offers

- Application/Job-specific monitoring
- Documentation of application mix
- System monitoring for admins
- Application run comparison
- „Big“ data for further analysis
Job analysis

63 Occurrences (98.43%) / 92.95% of Cores
avg Value: 240.50906e+6 1/s
avg Severity: 0.6350

Mon Mar 07 2016
10:00 11:00 12:00 13:00 14:00
Job analysis
Discussion

*What do we want from a new machine?*

- Max. hardware vs. testing benchmarking departments?
- Specialized vs. generally applicable system?
- Do the benchmarks represent the application mix?
- HPL, STREAM, HPCG, HPCCG: How to weight them?
- Why synthetic benchmarks and not only user-given applications?
Conclusion

- LIKWID tools help to benchmark properly
- Creates controled benchmark environment

- Many benchmarks create false implications!

- Job analysis using FEPA tool for users
- Insight in application mix
- Long-term documentation of usage
- Overhead dependent of granularity
- Similar stack already in use @ LRZ
Thanks for your attention

Questions?

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