

CPU Benchmarking at GridKa (Update 10/2011)

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Outline

- News on CPU hardware
- SPEC CPU2006 V1.2

News on CPU Hardware

New Generations of Processors

■ AMD:

- Interlagos ("Bulldozer" microarchitecture)
- Core multithreading:
 - 2 chips per module
 - Common L2 cache + FPU
- TurboCore 2
- Up to 16 cores per chip
- Up to 2.6 GHz (3.5 GHz turbo frequency) *
- Introduction date: Q4/2011

■ Intel:

- Sandy Bridge
- Up to 8 cores per chip
- Up to 2.9 GHz (? GHz turbo frequency) *
- Introduction date: Q1/2012

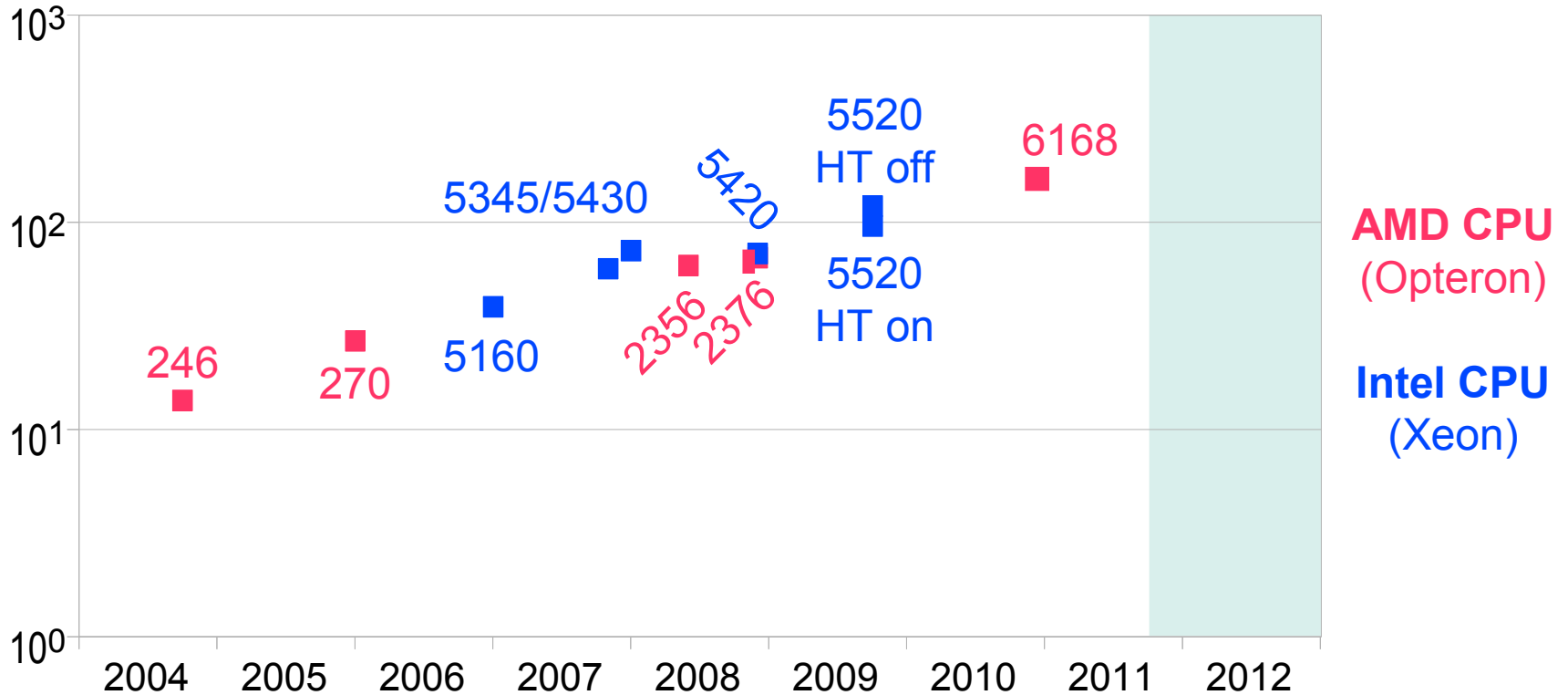
* <http://www.cpu-world.com>

Performance per Box

- Investigations:
Performance of worker node class machines at GridKa 2004-2011

Performance per Box

Performance (HS06) per System



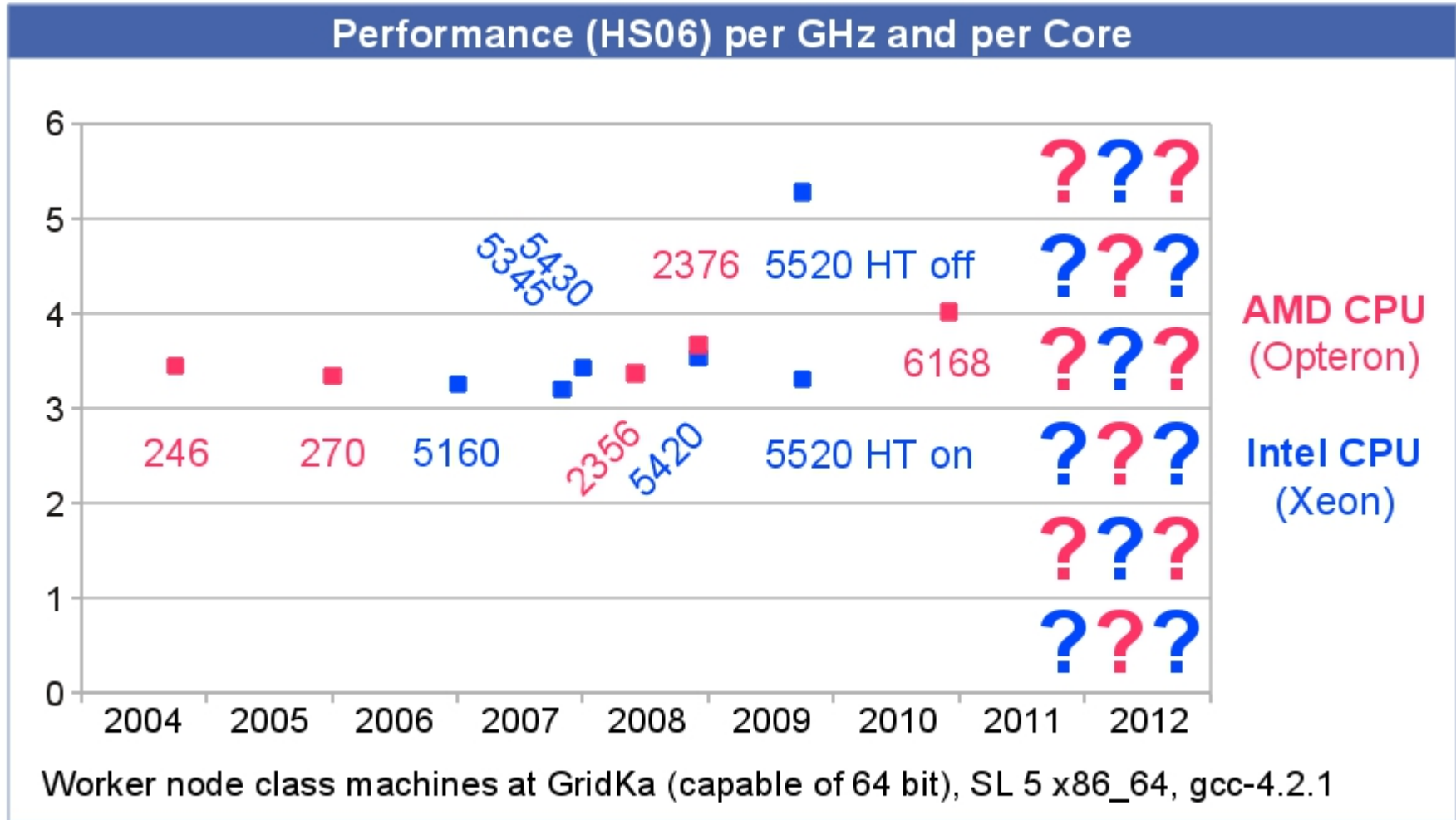
Worker node class machines at GridKa (capable of 64 bit), SL 5 x86_64, gcc-4.2.1

Performance per CPU Core

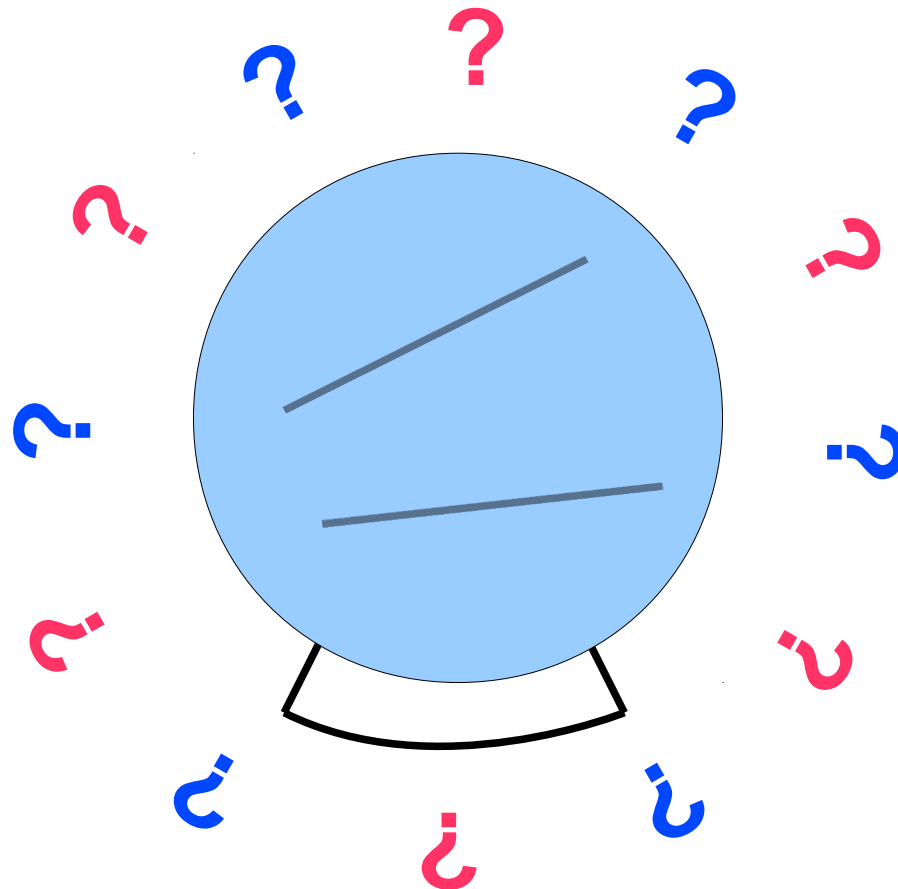
- Not only the performance per box is important, but also the performance per job slot
 - Costs of RAM, local disk increase with number of cores (see VO ID cards)
 - Batch licenses are charged per core, not per CPU or per box
- Compare performance of cores per clock cycle
 - In general, it's a bad idea to use clock speed as a performance indicator :-(
 - In 2004, the performance of an AMD Opteron 246 (2.0 GHz) based cluster node was much better than an 3.06 GHz Intel Xeon machine *
 - Nevertheless, recent series of worker node class machines at GridKa feature a more balanced ratio of performance and clock speed (per core)

* <http://hepixon.caspar.it/processors/spec-cpu2000.html>

Performance per CPU Core



Performance per CPU Core



Heads-up: OS Compatibility

- Experiences from recent tendering process at GridKa:
 - Strong requirements:
 - Hardware must be compatible with SL 5.6 (latest official kernel release)
 - Benchmarks to be run by vendor
 - Operating system: SL 5.6
 - Compiler: gcc-4.2.1 (default)
 - Several vendors stated that at least SL 6.1 would be needed to run their Interlagos servers
 - Nevertheless tests by vendors with the required OS setup succeeded, at least with kernel update
 - However ...

Heads-up: Performance Issues

- Experiences from recent tendering process at GridKa:
 - ... the performance was worse than expected

Heads-up: Performance Issues

- More investigations at GridKa with Interlagos server
 - Test system: DELL C6145
4-way AMD Opteron 6276 (2.3 GHz 16-core)
64 cores → 64 benchmark copies
 - 32-bit applications, according to HS06 rules
(flags: -O2 -fPIC -pthread -m32)

OS	SL 5	SL 5	SL 6.1
GCC	4.2.1 (default)	4.6.1 (latest)	4.4.5 (default)
Performance	100%	105...110%	110...115%

Thanks to DELL for providing the C6145 hardware!

Heads-up: Performance Issues

- More investigations at GridKa with Interlagos server
 - Second series of benchmark runs with 64-bit applications:

OS	SL 5	SL 5	SL 6.1
GCC	4.2.1 (default)	4.6.1 (latest)	4.4.5 (default)
Performance	100%	105...110%	110...115%
Performance (64-bit apps)	120%	120%	n.a.

Heads-up: Performance Issues

- More investigations at GridKa with Interlagos server
 - No cpuspeed issue!
- Investigations of other cluster hardware (SL 5, gcc-4.2.1 ↔ gcc-4.6.1):
 - AMD 6168 node: 5% improvement with latest compiler release
 - Intel E5520 node: no differences found
- **Certification and deployment of SL 6 may become urgent in the near future!**

News on SPEC CPU2006

News on SPEC CPU2006

- New release SPEC CPU2006 V1.2 as of Sep 7

News on SPEC CPU2006

- Major improvements in SPEC CPU2006 V1.2 include:
 - New automation — A program called sysinfo automatically captures information about many systems under test and includes that information in reports generated by the benchmark.
 - Greater compatibility — Operating system support has been extended to the current versions of AIX, HP-UX, Irix, Mac OS X, Solaris, Windows and 2011 Linux distributions. SPEC has also updated the toolset for compatibility with recent CPUs ...
 - Response to user feedback — Improvements have been made to code and documentation in response to user suggestions and bug reports. Open source components used by SPEC tools have been updated to the latest versions for increased compatibility.
 - Better utilities — Key utilities have been upgraded to eliminate common errors, provide more information, and enable greater selectivity and control.
 - Easier maintenance for submissions

www.spec.org/cpu2006/press/V1.2release.html

News on SPEC CPU2006

- Benchmarks kept untouched – results generated by SPEC CPU2006 V1.2 are compatible to results from V1.1 and V1.0.
- **No influence on HS06 benchmarking or reporting!**

Thank you for your attention!