



Comparing dual- and quad-core performance

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Outline

Benchmark hardware and software
Architectural aspects
Results

Benchmark systems



System	Model	OS	CPU	RAM
blade01	PE1955	SL4/64	Clovertown 5345, 2.33 Ghz x 4	8 x 2 GB DDR2-667 FBD
blade01.32		SL3/64	32-app	
blade02		SL3//32		
cube6.ht	Prec. 560	SL3/32	Xeon, 2.4 Ghz x 1, +HT	2 GB RD-800
cube6.noht		SL3//32		
erinye1	PE1950	SL4/64	Woodcrest 5160, 3.0 Ghz x 2	4 x 2 GB DDR2-667 FBD
galaxy30	X4100	SL4/64	Opteron 280, 2.4 Ghz x 2	4 x 2 GB DDR-400
linfini	V20z	SL4/64	Opteron 250, 2.4 Ghz x 1	4 x 1 GB DDR-400
victoria	PE1950	SL4/64	Dempsey, 3.0 Ghz x 2, +HT	4 x 512 MB DDR2-667 FBD

ROOT Stress Benchmark

ROOT: 5.08.00

n parallel stress benchmarks run in batch mode, 3000 events (stress -b 3000), 2 consecutive runs, results are from first run (2nd run is to keep load at same level during all measurements).

Test directories were created in /dev/shm (no I/O to disk). Power management (Demand Based Switching, PowerNow) was enabled on blade01, galaxy30 resp.

Athena Framework:

12.0.3 32-Bit

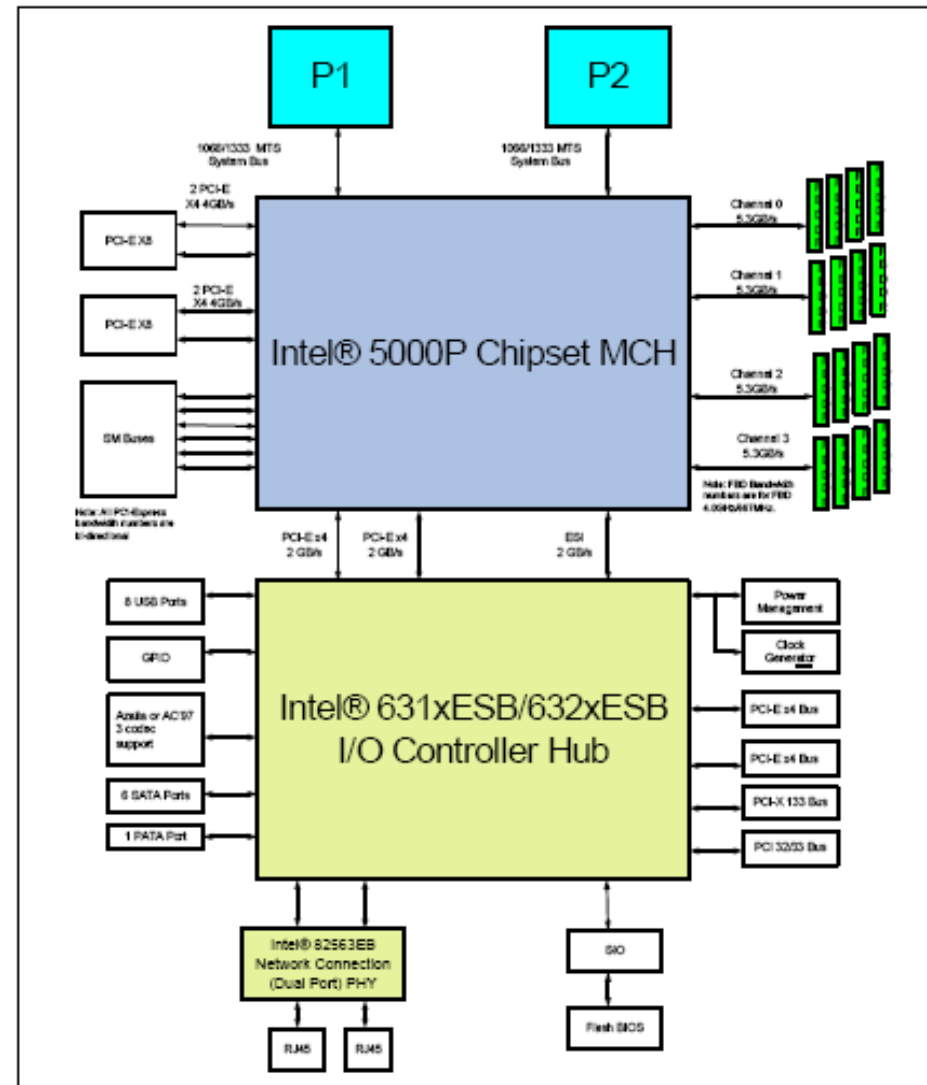
12.3.0 64-Bit (simulation only)

Simulation, Reconstruction: 10 Higgs Events, $H \rightarrow ZZ \rightarrow 4lqq$
(DC3.005305.PythiaH185zzqqll.py)

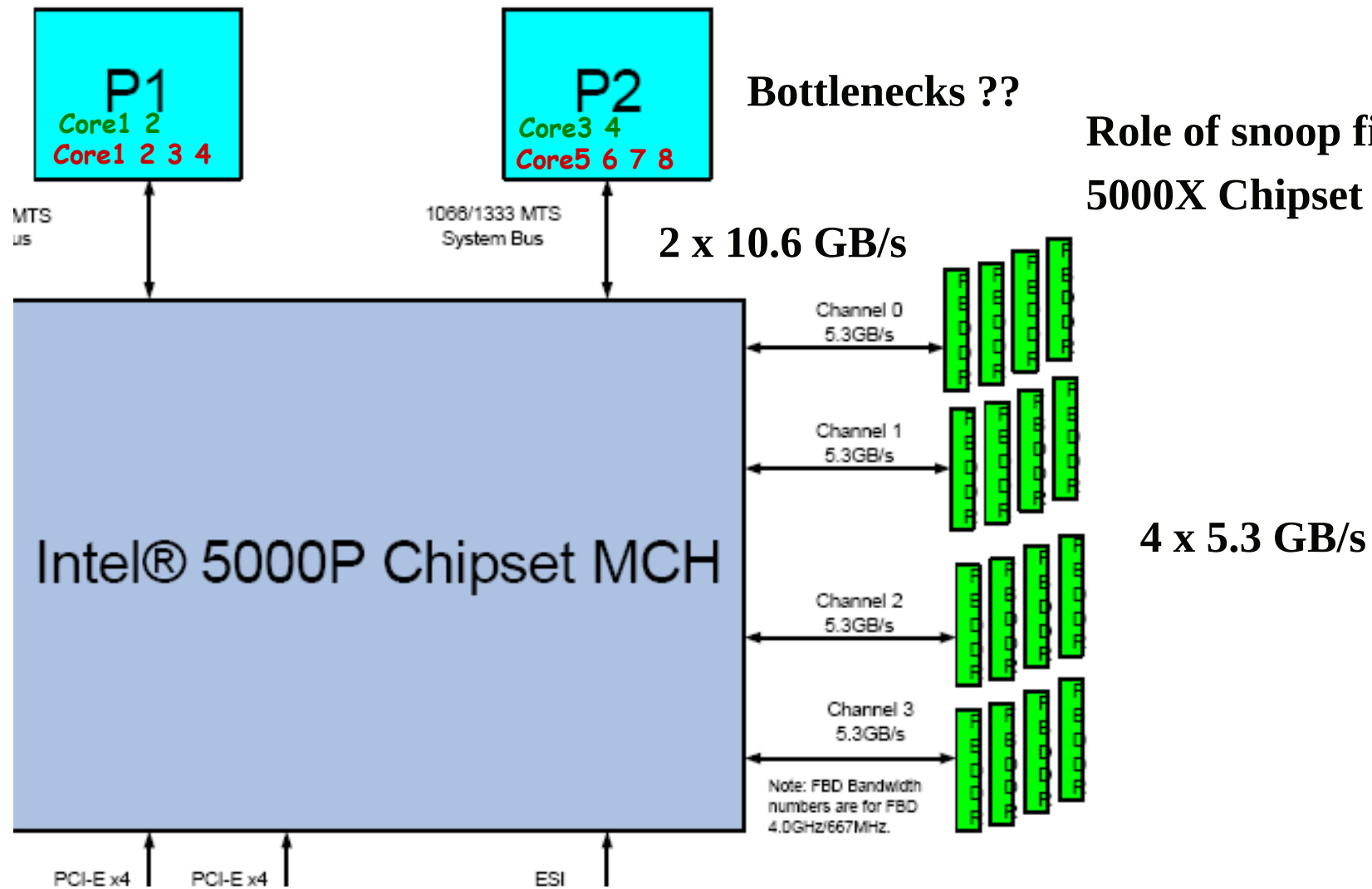
Architectural aspects - Chipset



Figure 1-1. Intel 5000P Chipset System Block Diagram



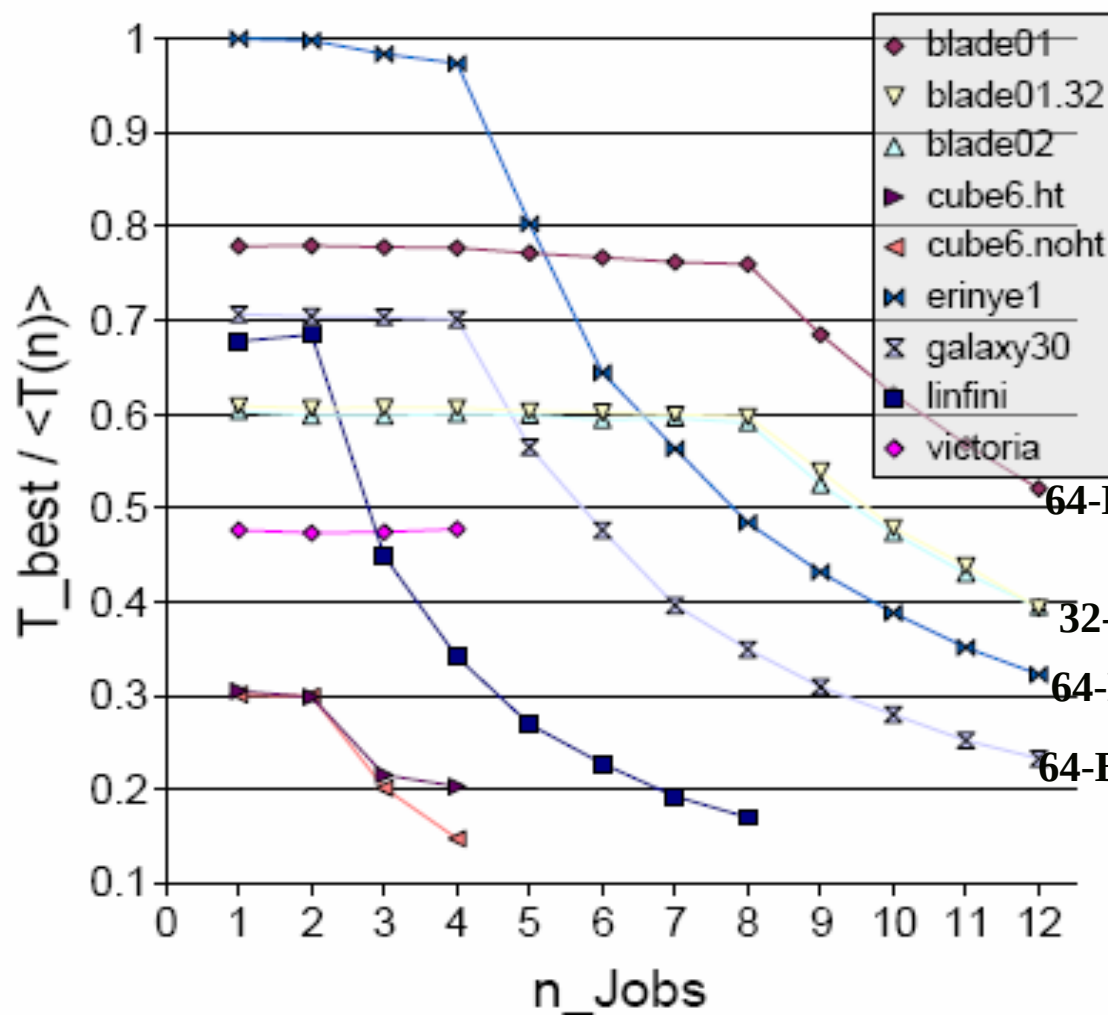
Architectural aspects – Chipset, cont.



ROOT stress test (ROOT 5.08.00)



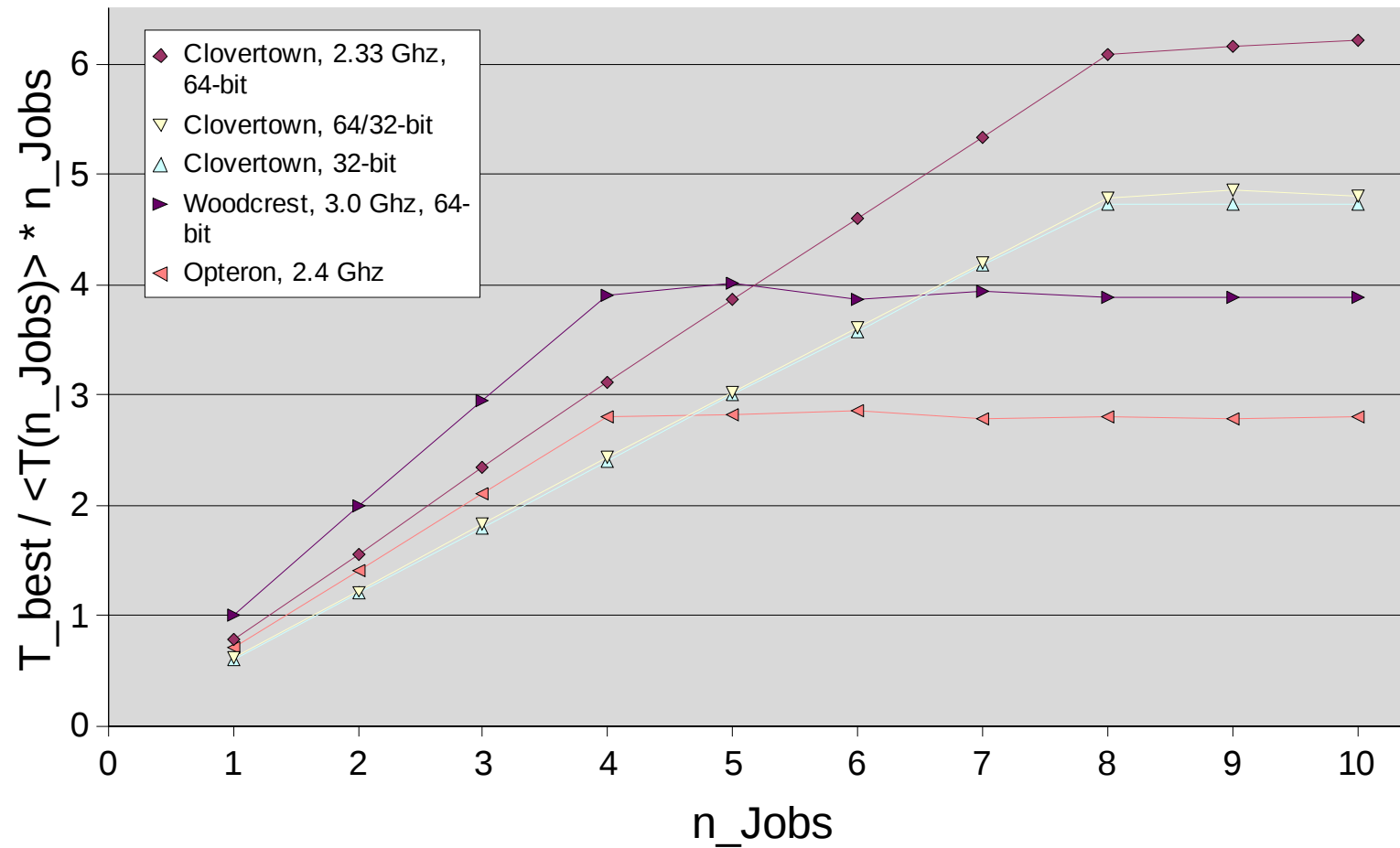
Relative Performance per Core



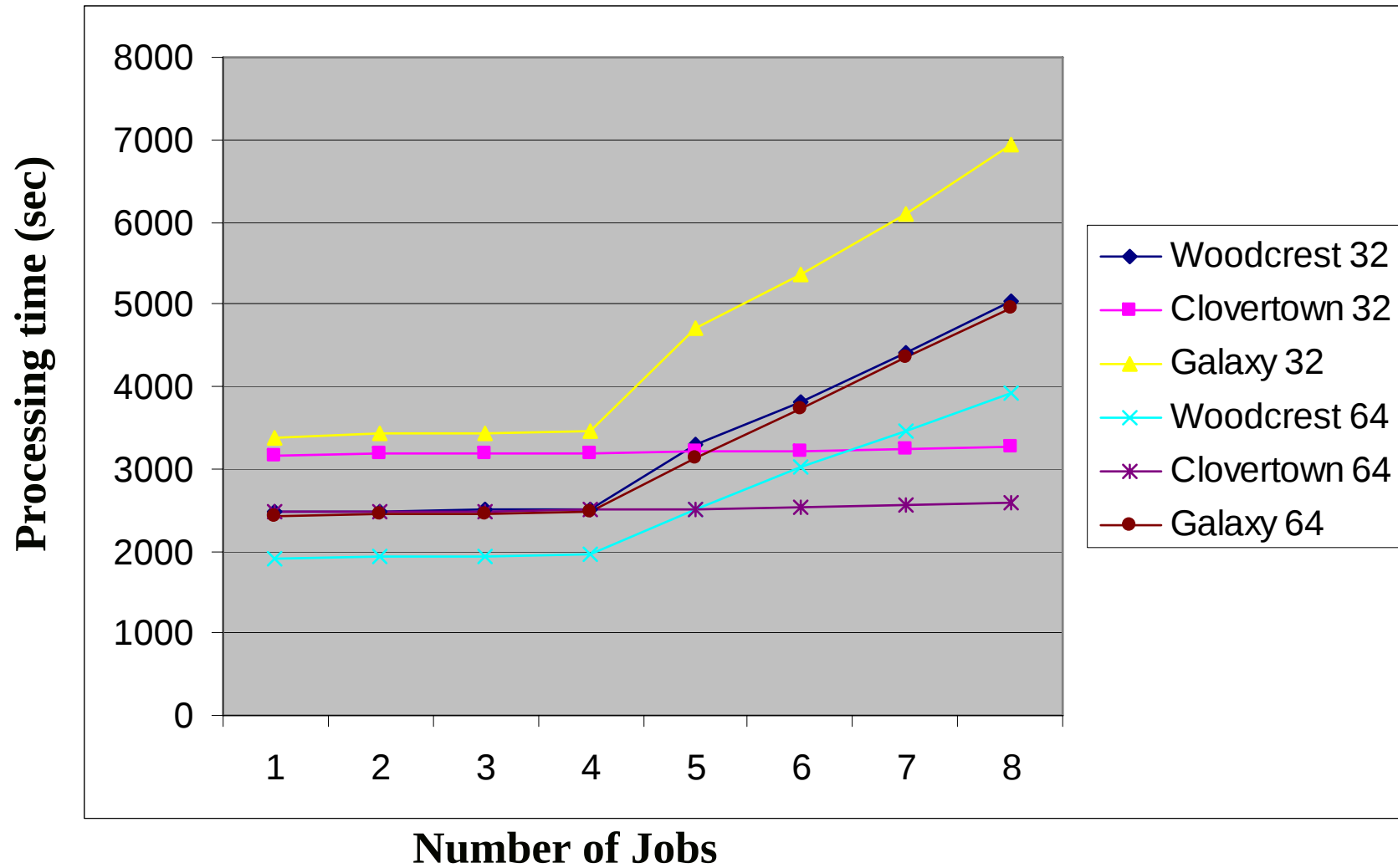
ROOT stress test (ROOT 5.08.00)



System Performance vs. # of Jobs



ATLAS Athena Simulation – processing time



ATLAS Athena Simulation – scaling behavior

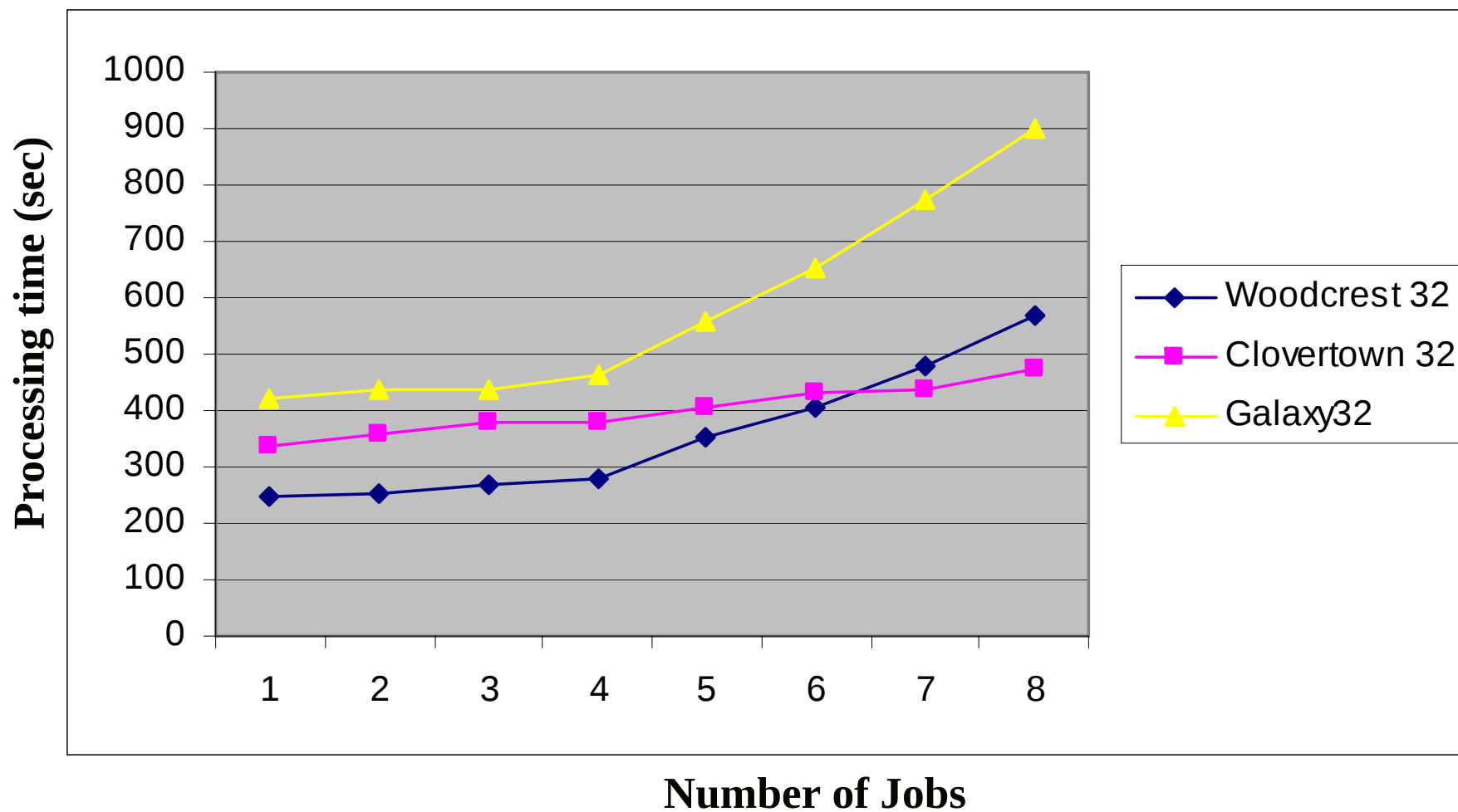


ATLAS Athena Simulation – memory usage per core, 8 cores (top)



	Virt	Res	Shr
32-Bit	608m	498m	79m
64-Bit	1221m (2.0)	719m (1.44)	85m

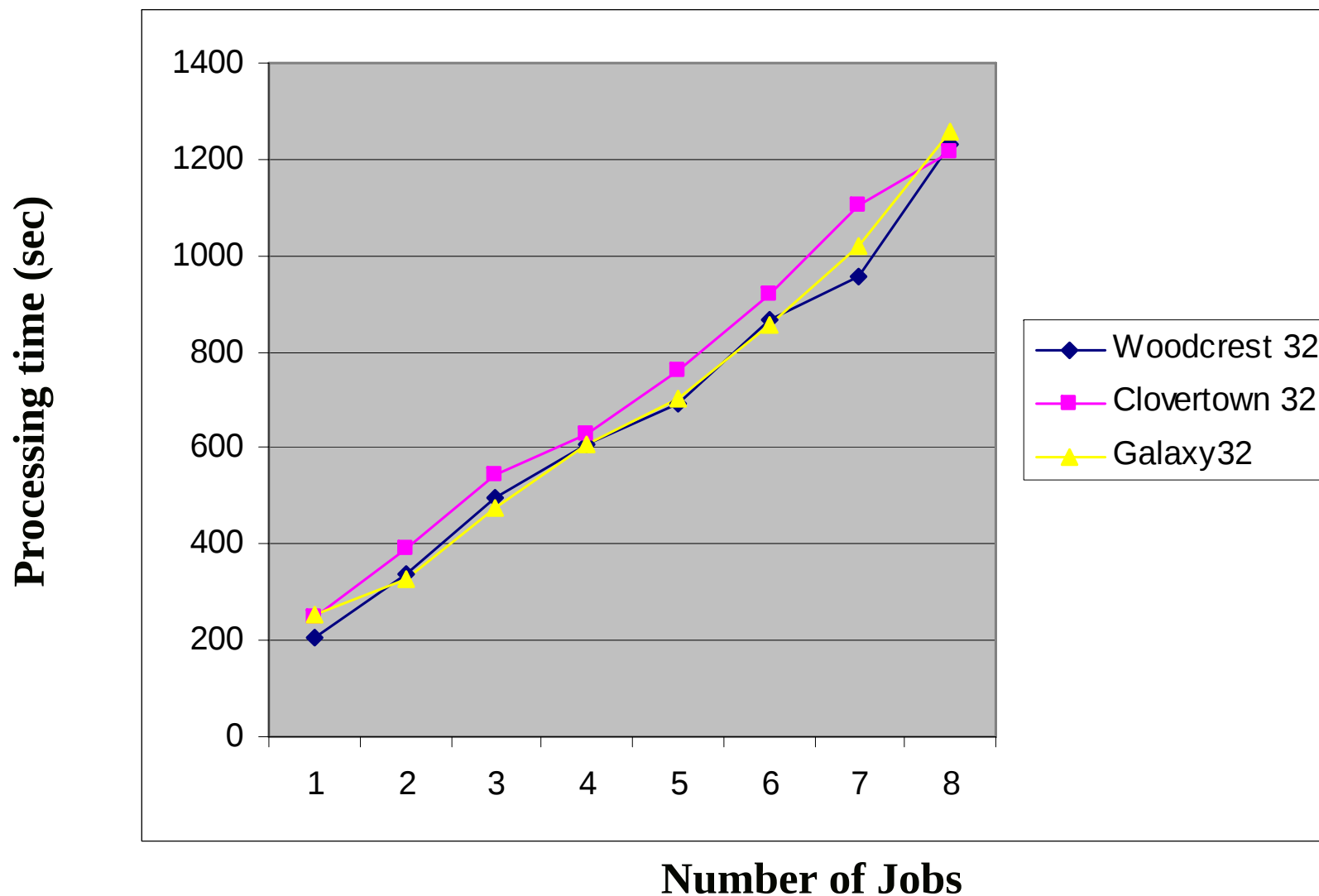
ATLAS Athena Reconstruction – processing time



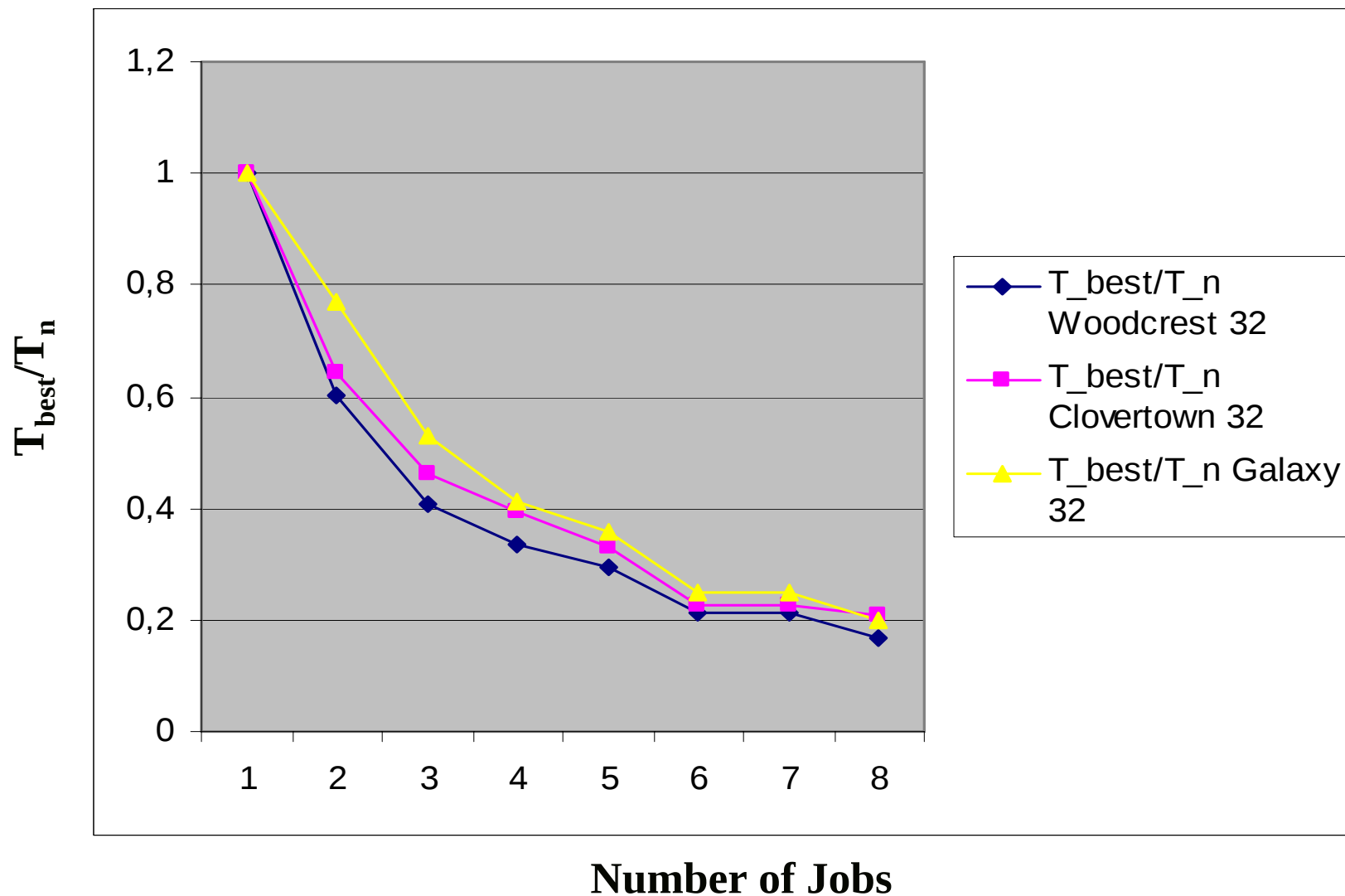
ATLAS Athena Reconstruction – scaling behavior



ATLAS Athena event generation – processing time



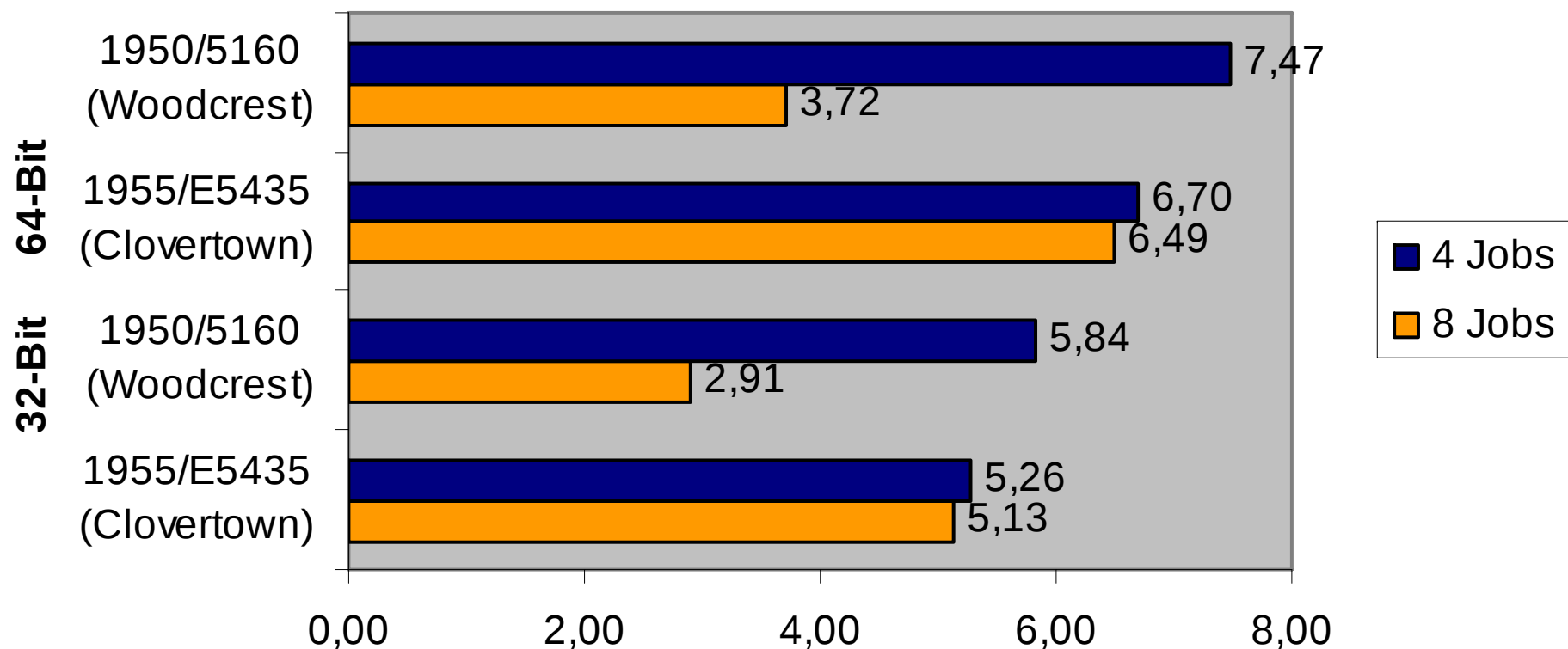
ATLAS Athena event generation – scaling behavior



Performance per Watt



ATLAS Athena Simulation: Performance per Watt



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Conclusions

With more than 4 Jobs per system quad-cores are scaling extremely good for simulation and good for reconstruction compared to dual-cores – even when quad-core CPUs with lower clock frequency are used

64-Bit Appl. result in approx. 20% performance gain against 32-Bit

Open issues: Particle Astrophysics-, LQCD-Benchmarks

References

<http://root.cern.ch/root/Benchmark.html>

Atlas Athena framework:

<https://twiki.cern.ch/twiki/bin/view/Atlas/WorkBookAthenaFramework>

Christian Vilsbeck (<http://www.tecchannel.de>, 14.11.2006)