

# SYMPOSIUM'16

## AMERICA - EUROPE - ASIA



THE ASIAN SPEC SYMPOSIUM ON SERVER EFFICIENCY

### Comparative Compute Intensive Performance Metric

#### SPEC CPU2006

- Designed to provide a comparative measure of compute-intensive performance across the widest practical range of hardware using workloads developed from real user applications.
- Provided as source code and require compilation to have executable binaries.
- Performance is dependent on system computing elements (e.g. CPUs), system memory hierarchy and the compiler used to compile the benchmarks.

Benchmark	Language	Application Area	Brief Description
400.perlbench	C	Programming Language	Derived from Perl V5.8.7. The workload includes SpamAssassin, MHonArc (an email indexer), and specciff (SPEC's tool that checks benchmark outputs).
401.bzip2	C	Compression	Julian Seward's bzip2 version 1.0.3, modified to do most work in memory, rather than doing I/O.
403.gcc	C	C Compiler	Based on gcc Version 3.2, generates code for Opteron.
429.mcf	C	Combinatorial Optimization	Vehicle scheduling. Uses a network simplex algorithm (which is also used in commercial products) to schedule public transport.
445.gobmk	C	Artificial Intelligence: Go	Plays the game of Go, a simply described but deeply complex game.
456.hmmer	C	Search Gene Sequence	Protein sequence analysis using profile hidden Markov models (profile HMMs)
458.sjeng	C	Artificial Intelligence: chess	A highly-ranked chess program that also plays several chess variants.
462.libquantum	C	Physics / Quantum Computing	Simulates a quantum computer, running Shor's polynomial-time factorization algorithm.
464.h264ref	C	Video Compression	A reference implementation of H.264/AVC, encodes a videotream using 2 parameter sets. The H.264/AVC standard is expected to replace MPEG2
471.omnetpp	C++	Discrete Event Simulation	Uses the OMNet++ discrete event simulator to model a large Ethernet campus network.
473.astar	C++	Path-finding Algorithms	Pathfinding library for 2D maps, including the well known A* algorithm.
483.xalanbcmk	C++	XML Processing	A modified version of Xalan-C++, which transforms XML documents to other document types.

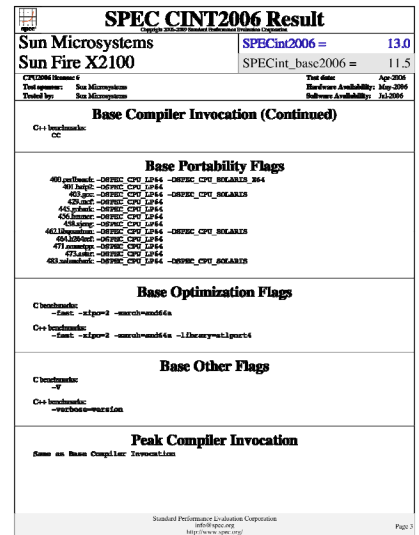
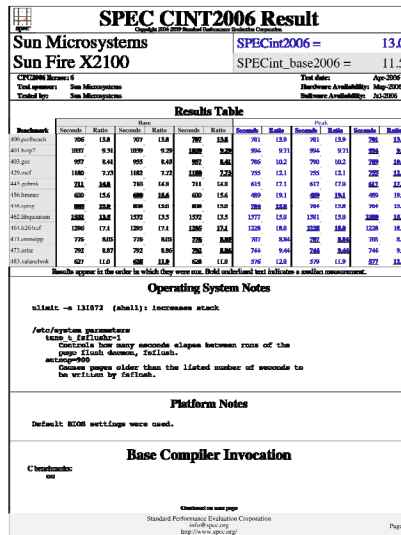
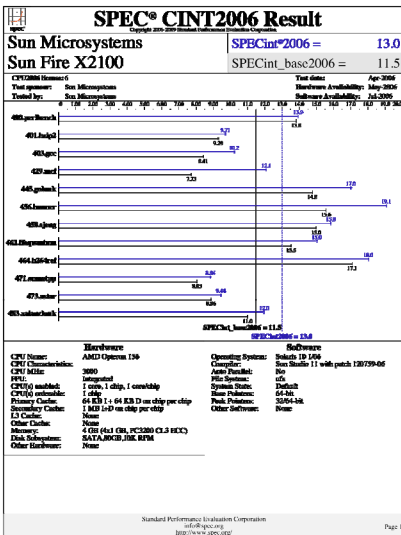
Benchmark	Language	Application Area	Brief Description
410.bwaves	Fortran	Fluid Dynamics	Computes 3D transonic transient laminar viscous flow.
416.gamess	Fortran	Quantum Chemistry	Gamess implements a wide range of quantum chemical computations. For the SPEC workload, self-consistent field calculations are performed using the Restricted Hartree Fock method, Restricted open-shell Hartree-Fock, and Multi-Configuration Self-Consistent Field
433.milc	C	Physics / Quantum Chromodynamics	A gauge field generating program for lattice gauge theory programs with dynamical quarks.
434.zeusmp	Fortran	Physics / CFD	ZEUS-MP is a computational fluid dynamics code developed at the Laboratory for Computational Astrophysics (NCSA, University of Illinois at Urbana-Champaign) for the simulation of astrophysical phenomena.
435.gromacs	C, Fortran	Biochemistry / Molecular Dynamics	Molecular dynamics, i.e. simulate Newtonian equations of motion for hundreds to millions of particles. The test case simulates protein Lysozyme in a solution.
436.cactusADM	C, Fortran	Physics / General Relativity	Solves the Einstein evolution equations using a staggered-leaffrog numerical method
437.leslie3d	Fortran	Fluid Dynamics	Computational Fluid Dynamics (CFD) using Large-Eddy Simulations with Linear-Eddy Model in 3D. Uses the MacCormack Predictor-Corrector time integration scheme.
444.namd	C++	Biology / Molecular Dynamics	Simulates large biomolecular systems. The test case has 92,224 atoms of apolipoprotein A-I.
447.dealII	C++	Finite Element Analysis	deal.II is a C++ program library targeted at adaptive finite elements and error estimation. The testcase solves a Helmholtz-type equation with non-constant coefficients.
450.soplex	C++	Linear Programming, Optimization	Solves a linear program using a simplex algorithm and sparse linear algebra. Test cases include railroad planning and military airlift models.
453.povray	C++	Image Ray-tracing	Image rendering. The testcase is a 1280x1024 anti-aliased image of a landscape with some abstract objects with textures using a Perlin noise function.
454.calculix	C, Fortran	Structural Mechanics	Finite element code for linear and nonlinear 3D structural applications. Uses the SPOLES solver library.
459.GemsFDTD	Fortran	Computational Electromagnetics	Solves the Maxwell equations in 3D using the finite-difference time-domain (FDTD) method.
465.tonto	Fortran	Quantum Chemistry	An open source quantum chemistry package, using an object-oriented design in Fortran 95. The test case places a constraint on a molecular Hartree-Fock wavefunction calculation to better match experimental X-ray diffraction data.
470.lbm	C	Fluid Dynamics	Implements the "Lattice-Boltzmann Method" to simulate incompressible fluids in 3D
481.wrf	C, Fortran	Weather	Weather modeling from scales of meters to thousands of kilometers. The test case is from a 30km area over 2 days.
482.sphinx3	C	Speech recognition	A widely-known speech recognition system from Carnegie Mellon University

#### CINT2006: Integer Benchmarks

Metric	INT / FP	Speed Rate/Throughput	Baseline Peak
SPECint2006	integer	Speed	Peak
SPECint_base2006	integer	Speed	Baseline
SPECint_rate2006	integer	Rate/Throughput	Peak
SPECint_rate_base2006	integer	Rate/Throughput	Baseline
SPECfp2006	floating point	Speed	Peak
SPECfp_base2006	floating point	Speed	Baseline
SPECfp_rate2006	floating point	Rate/Throughput	Peak
SPECfp_rate_base2006	floating point	Rate/Throughput	Baseline

#### Eight SPEC CPU2006 Metrics

#### CFP2006: Floating Point Benchmarks



#### Example of one of the initial submissions to SPEC