



# SPEC® CFP2006 Result

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## IBM Corporation

### SPECfp®\_rate2006 = 84.1

### IBM System x3655 (AMD Opteron 2356)

### SPECfp\_rate\_base2006 = 76.8

CPU2006 license: 11

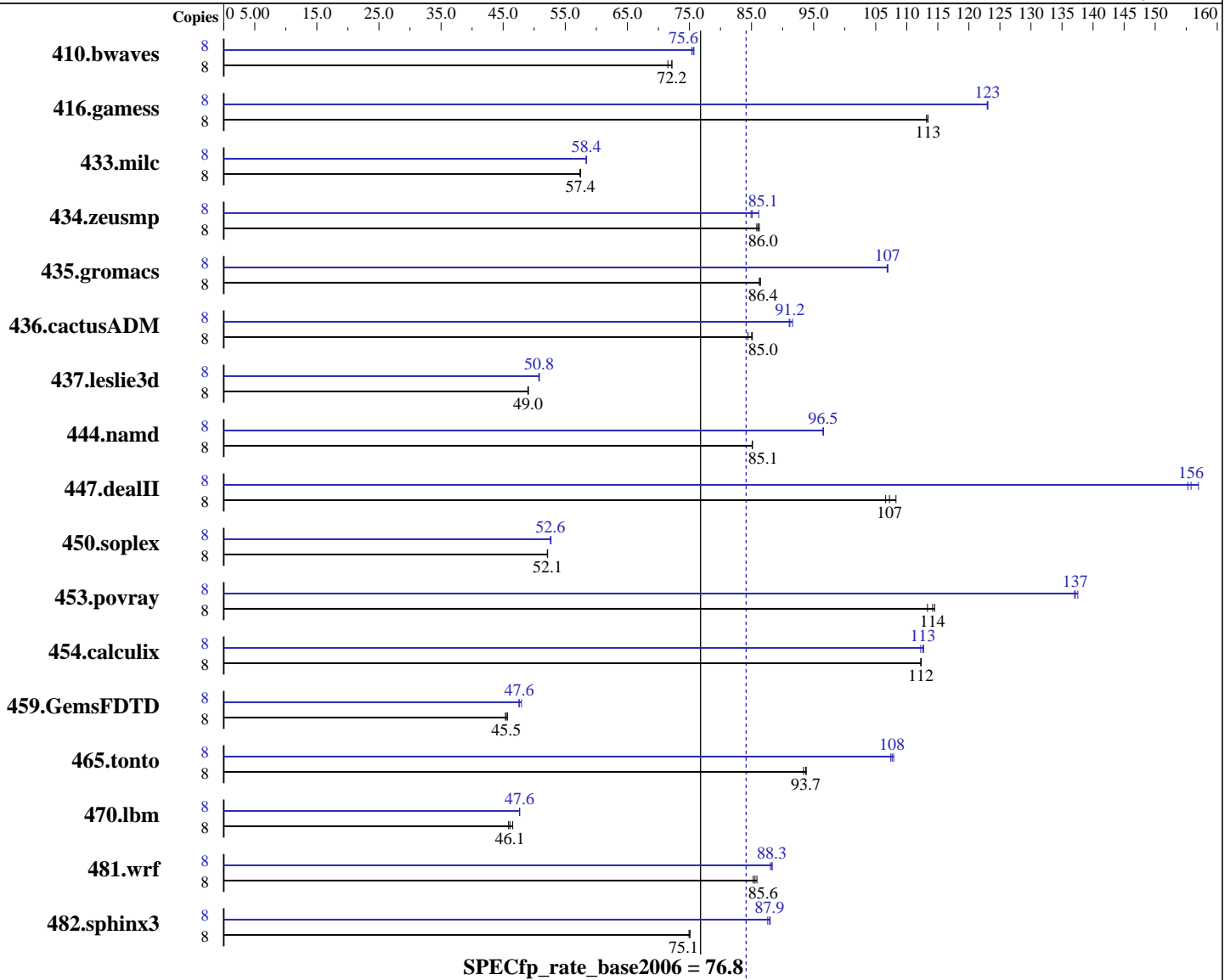
Test date: Apr-2008

Test sponsor: IBM Corporation

Hardware Availability: Jul-2008

Tested by: Advanced Micro Devices

Software Availability: May-2008



#### Hardware

CPU Name: AMD Opteron 2356  
 CPU Characteristics:  
 CPU MHz: 2300  
 FPU: Integrated  
 CPU(s) enabled: 8 cores, 2 chips, 4 cores/chip  
 CPU(s) orderable: 1,2 chips  
 Primary Cache: 64 KB I + 64 KB D on chip per core  
 Secondary Cache: 512 KB I+D on chip per core

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#### Software

Operating System: SuSE Linux Enterprise Server 10 (x86\_64) SP1, Kernel 2.6.16.46-0.12-smp  
 Compiler: PGI Server Complete Version 7.2  
 PathScale Compiler Suite Version 3.1  
 Auto Parallel: No  
 File System: ext3  
 System State: Runlevel 3 (Full multiuser with network)  
 Base Pointers: 64-bit  
 Peak Pointers: 32/64-bit

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L3 Cache: 2 MB I+D on chip per chip  
 Other Cache: None  
 Memory: 16 GB (8 x 2 GB, DDR2-667, CL5, Reg, Dual Rank)  
 Disk Subsystem: 1 x 73.4 GB SAS, 15000 RPM  
 Other Hardware: None

Other Software: None

## Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	8	1520	71.5	<u>1507</u>	<u>72.2</u>	1506	72.2	8	1436	75.7	<u>1438</u>	<u>75.6</u>	1442	75.4
416.gamess	8	<u>1381</u>	<u>113</u>	1384	113	1381	113	8	1274	123	1273	123	<u>1273</u>	<u>123</u>
433.milc	8	1279	57.4	<u>1279</u>	<u>57.4</u>	1279	57.4	8	1257	58.4	<u>1258</u>	<u>58.4</u>	1258	58.4
434.zeusmp	8	<u>846</u>	<u>86.0</u>	844	86.3	848	85.8	8	857	84.9	845	86.2	<u>856</u>	<u>85.1</u>
435.gromacs	8	662	86.3	<u>661</u>	<u>86.4</u>	661	86.4	8	<u>534</u>	<u>107</u>	534	107	535	107
436.cactusADM	8	1123	85.1	<u>1124</u>	<u>85.0</u>	1132	84.4	8	1050	91.1	<u>1049</u>	<u>91.2</u>	1044	91.6
437.leslie3d	8	1533	49.1	1534	49.0	<u>1534</u>	<u>49.0</u>	8	1482	50.7	<u>1481</u>	<u>50.8</u>	1479	50.8
444.namd	8	<u>754</u>	<u>85.1</u>	754	85.1	753	85.2	8	<u>665</u>	<u>96.5</u>	665	96.5	664	96.6
447.dealII	8	859	107	<u>854</u>	<u>107</u>	845	108	8	<u>587</u>	<u>156</u>	589	155	583	157
450.soplex	8	1280	52.1	<u>1279</u>	<u>52.1</u>	1279	52.2	8	<u>1268</u>	<u>52.6</u>	1268	52.6	1266	52.7
453.povray	8	376	113	<u>373</u>	<u>114</u>	372	114	8	311	137	<u>310</u>	<u>137</u>	309	138
454.calculix	8	<u>588</u>	<u>112</u>	588	112	588	112	8	588	112	586	113	<u>586</u>	<u>113</u>
459.GemsFDTD	8	1858	45.7	1871	45.4	<u>1865</u>	<u>45.5</u>	8	1770	48.0	1786	47.5	<u>1783</u>	<u>47.6</u>
465.tonto	8	<u>840</u>	<u>93.7</u>	839	93.8	843	93.4	8	733	107	<u>731</u>	<u>108</u>	730	108
470.lbm	8	2362	46.5	2397	45.9	<u>2385</u>	<u>46.1</u>	8	<u>2307</u>	<u>47.6</u>	2307	47.7	2307	47.6
481.wrf	8	1048	85.3	1041	85.9	<u>1044</u>	<u>85.6</u>	8	1012	88.3	1015	88.0	<u>1012</u>	<u>88.3</u>
482.sphinx3	8	2081	74.9	<u>2077</u>	<u>75.1</u>	2076	75.1	8	1772	88.0	<u>1774</u>	<u>87.9</u>	1780	87.6

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

## Operating System Notes

```
'numactl' was used to bind copies to the cores
Environment variable PGI_HUGE_PAGES set to 150
'ulimit -s unlimited' was used to set environment stack size
'ulimit -l 2457600' was used to set environment locked pages in memory quantity
Set vm/nr_hugepages=1200 in /etc/sysctl.conf
mount -t hugetlbfs nodev /mnt/hugepages
```

## Base Compiler Invocation

C benchmarks:  
pgcc

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## Base Compiler Invocation (Continued)

C++ benchmarks:

pgcpp

Fortran benchmarks:

pgf95

Benchmarks using both Fortran and C:

pgcc pgf95

## Base Portability Flags

410.bwaves: -DSPEC\_CPU\_LP64  
 416.gamess: -DSPEC\_CPU\_LP64  
 433.milc: -DSPEC\_CPU\_LP64  
 434.zeusmp: -DSPEC\_CPU\_LP64  
 435.gromacs: -DSPEC\_CPU\_LP64 -Mnomain  
 436.cactusADM: -DSPEC\_CPU\_LP64 -Mnomain  
 437.leslie3d: -DSPEC\_CPU\_LP64  
 444.namd: -DSPEC\_CPU\_LP64  
 447.dealII: -DSPEC\_CPU\_LP64  
 450.soplex: -DSPEC\_CPU\_LP64  
 453.povray: -DSPEC\_CPU\_LP64  
 454.calculix: -DSPEC\_CPU\_LP64 -Mnomain  
 459.GemsFDTD: -DSPEC\_CPU\_LP64  
 465.tonto: -DSPEC\_CPU\_LP64  
 470.lbm: -DSPEC\_CPU\_LP64  
 481.wrf: -DSPEC\_CPU\_LP64 -DSPEC\_CPU\_CASE\_FLAG -DSPEC\_CPU\_LINUX  
 482.sphinx3: -DSPEC\_CPU\_LP64

## Base Optimization Flags

C benchmarks:

-fast -Mipa=jobs:4 -Mipa=fast -Mipa=inline -Mfprelaxed  
-Msmartalloc=huge:150 -tp barcelona-64 -Bstatic\_pgi

C++ benchmarks:

-fast -Mipa=jobs:4 -Mipa=fast -Mipa=inline -Mfprelaxed  
-Msmartalloc=huge:150 --zc\_eh -tp barcelona-64 -Bstatic\_pgi

Fortran benchmarks:

-fast -Mipa=jobs:4 -Mipa=fast -Mipa=inline -Mfprelaxed  
-Msmartalloc=huge:150 -tp barcelona-64 -Bstatic\_pgi

Benchmarks using both Fortran and C:

-fast -Mipa=jobs:4 -Mipa=fast -Mipa=inline -Mfprelaxed  
-Msmartalloc=huge:150 -tp barcelona-64 -Bstatic\_pgi



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## Base Other Flags

C benchmarks:

-w

C++ benchmarks:

-w

Fortran benchmarks:

-w

Benchmarks using both Fortran and C:

-w

## Peak Compiler Invocation

C benchmarks (except as noted below):

pathcc

433.milc: pgcc

C++ benchmarks (except as noted below):

pathCC

444.namd: pgcpp

Fortran benchmarks (except as noted below):

pathf95

410.bwaves: pgf95

434.zeusmp: pgf95

Benchmarks using both Fortran and C (except as noted below):

pgcc pgf95

436.cactusADM: pathcc pathf95

481.wrf: pathcc pathf95

## Peak Portability Flags

410.bwaves: -DSPEC\_CPU\_LP64

416.gamess: -DSPEC\_CPU\_LP64

433.milc: -DSPEC\_CPU\_LP64

434.zeusmp: -DSPEC\_CPU\_LP64

435.gromacs: -DSPEC\_CPU\_LP64 -Mnomain

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## Peak Portability Flags (Continued)

```

436.cactusADM: -DSPEC_CPU_LP64 -fno-second-underscore
437.leslie3d: -DSPEC_CPU_LP64
444.namd: -DSPEC_CPU_LP64
453.povray: -DSPEC_CPU_LP64
454.calculix: -DSPEC_CPU_LP64 -Mnomain
459.GemsFDTD: -DSPEC_CPU_LP64
465.tonto: -DSPEC_CPU_LP64
470.lbm: -DSPEC_CPU_LP64
481.wrf: -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX -fno-second-underscore
482.sphinx3: -DSPEC_CPU_LP64

```

## Peak Optimization Flags

### C benchmarks:

```

433.milc: -fastsse -Msmartalloc=huge:150 -Msafeptr -Mfprelaxed
-Mipa=jobs:4 -Mipa=inline -Mipa=arg -Mipa=const -Mipa=ptr
-Mipa=shape -tp barcelona-64 -Bstatic_pgi

470.lbm: -march=barcelona -Ofast -m3dnow

482.sphinx3: -march=barcelona -Ofast

```

### C++ benchmarks:

```

444.namd: -Mphi(pass 1) -Mipa=jobs:4(pass 2) -Mipa=fast(pass 2)
-Mipa=inline(pass 2) -Mpfo(pass 2) -fast -Mfprelaxed
-Msmartalloc=huge:150 --zc_eh -Mnodepchk -Munroll=n:4
-Munroll=m:8 -tp barcelona-64 -Bstatic_pgi

447.deallI: -march=barcelona -Ofast -static -INLINE:aggressive=on
-OPT:malloc_alg=1 -m32 -fno-exceptions

450.soplex: -march=barcelona -fb_create fbdata(pass 1)
-fb_opt fbdata(pass 2) -m32 -O3 -TENV:frame_pointer=off
-LNO:prefetch=1

453.povray: -march=barcelona -fb_create fbdata(pass 1)
-fb_opt fbdata(pass 2) -Ofast -CG:load_exe=0

```

### Fortran benchmarks:

```

410.bwaves: -Mphi(pass 1) -Mipa=jobs:4(pass 2) -Mipa=fast(pass 2)
-Mipa=inline(pass 2) -Mpfo(pass 2) -fastsse -Mfprelaxed
-Msmartalloc -Mprefetch=distance:12 -Mprefetch=nta
-tp barcelona-64 -Bstatic_pgi

```

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## Peak Optimization Flags (Continued)

416.gamess: -march=barcelona -fb\_create fbdata(pass 1)  
-fb\_opt fbdata(pass 2) -O2 -OPT:Ofast -OPT:ro=3  
-OPT:unroll\_size=256

434.zeusmp: -fastsse -Mfprelaxed -Msmartalloc=huge:150 -Mipa=jobs:4  
-Mipa=fast -Mipa=inline -tp barcelona-64 -Bstatic\_pgi

437.leslie3d: -march=barcelona -Ofast -m3dnow -OPT:unroll\_size=256  
-CG:load\_exe=0 -OPT:malloc\_alg=1

459.GemsFDTD: -march=barcelona -Ofast -LNO:fission=2 -LNO:simd=2  
-OPT:malloc\_alg=1

465.tonto: -march=barcelona -Ofast -OPT:malloc\_alg=1  
-OPT:alias=no\_f90\_pointer\_alias -LNO:blocking=off  
-CG:load\_exe=1 -IPA:plimit=525

Benchmarks using both Fortran and C:

435.gromacs: -fast -Mfpapprox=rsqrt -Mipa=jobs:4 -Mipa=fast  
-Mipa=inline -Mfprelaxed -Msmartalloc=huge:150  
-tp barcelona-64 -Bstatic\_pgi

436.cactusADM: -march=barcelona -fb\_create fbdata(pass 1)  
-fb\_opt fbdata(pass 2) -Ofast -WOPT:aggstr=0

454.calculix: -fastsse -Mfprelaxed -Msmartalloc=huge:150 -Mipa=jobs:4  
-Mipa=fast -Mipa=inline -tp barcelona-64 -Bstatic\_pgi

481.wrf: -march=barcelona -Ofast -LNO:blocking=off  
-LNO:prefetch\_ahead=10 -OPT:malloc\_alg=1 -m3dnow  
-LANG:copyinout=off -IPA:callee\_limit=5000

## Peak Other Flags

C benchmarks:

433.milc: -w

C++ benchmarks:

444.namd: -w

Fortran benchmarks:

410.bwaves: -w

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## Peak Other Flags (Continued)

434.zeusmp: -w

Benchmarks using both Fortran and C:

435.gromacs: -w

454.calculix: -w

The flags file that was used to format this result can be browsed at  
<http://www.spec.org/cpu2006/flags/amd123GH-flags.20090714.03.html>

You can also download the XML flags source by saving the following link:  
<http://www.spec.org/cpu2006/flags/amd123GH-flags.20090714.03.xml>

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