# SPEC® CFP2006 Result

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## IBM Corporation

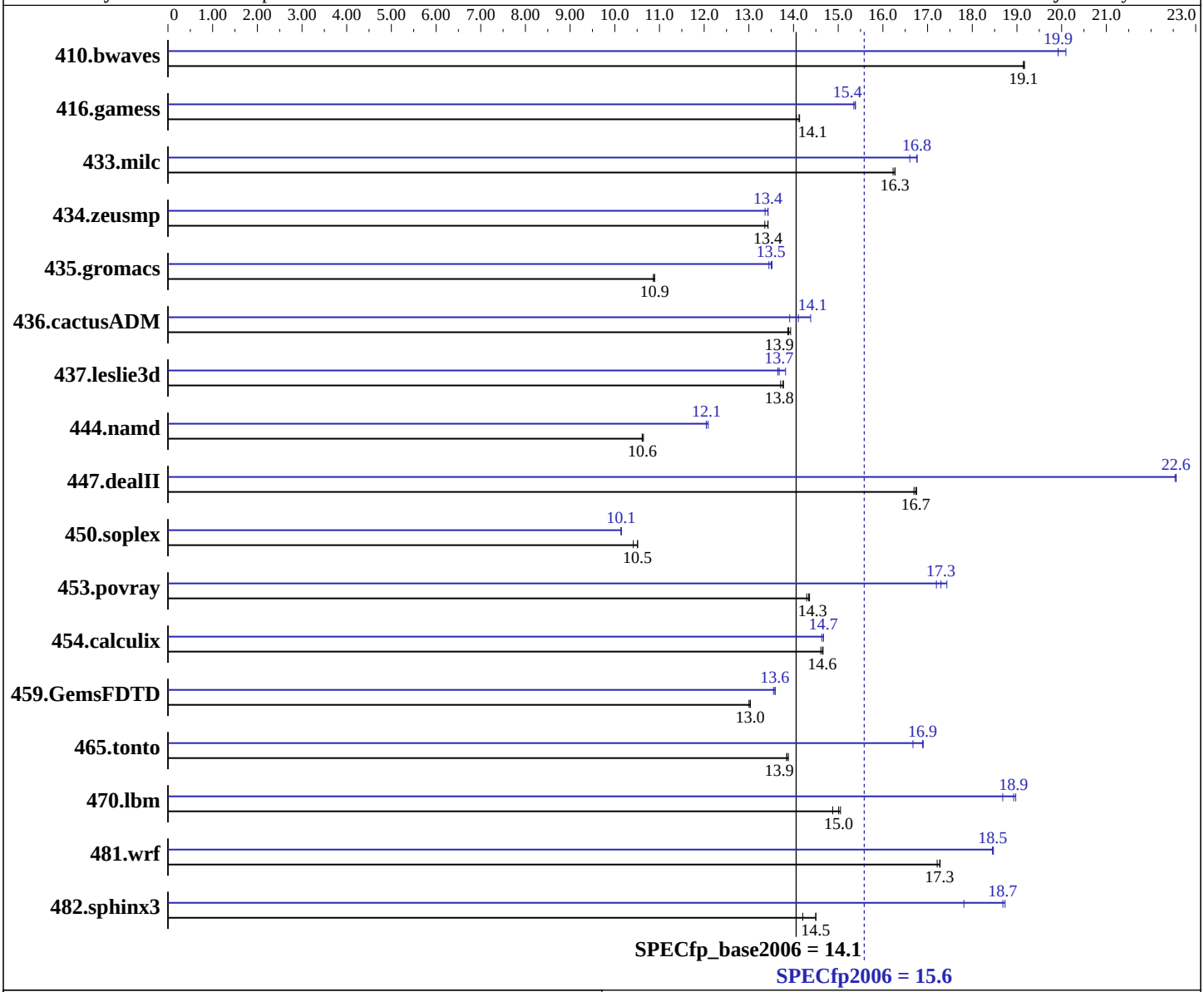
## IBM BladeCenter LS22 (AMD Opteron 2356)

SPECfp®2006 = 15.6

SPECfp_base2006 = 14.1

**CPU2006 license:** 11
**Test sponsor:** IBM Corporation
**Tested by:** IBM Corporation

**Test date:** Jun-2008
**Hardware Availability:** Sep-2008
**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<br>PathScale Compiler Suite Version 3.1 |
| Auto Parallel: | No |
| File System: | ext2 |
| 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: 32 GB (8 x 4 GB DDR2-6400 ECC)
Disk Subsystem: 1 x 73 GB SAS, 10000 RPM
Other Hardware: None

Other Software: None

## Results Table

| Benchmark | Base | | | | | | Peak | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 410.bwaves | 709 | 19.2 | **710** | **19.1** | 710 | 19.1 | **682** | **19.9** | 676 | 20.1 | 682 | 19.9 |
| 416.gamess | **1386** | **14.1** | 1385 | 14.1 | 1392 | 14.1 | 1276 | 15.3 | **1273** | **15.4** | 1273 | 15.4 |
| 433.milc | 564 | 16.3 | **564** | **16.3** | 566 | 16.2 | 547 | 16.8 | 553 | 16.6 | **548** | **16.8** |
| 434.zeusmp | 678 | 13.4 | **678** | **13.4** | 681 | 13.4 | **678** | **13.4** | 681 | 13.4 | 678 | 13.4 |
| 435.gromacs | **656** | **10.9** | 656 | 10.9 | 657 | 10.9 | 528 | 13.5 | 531 | 13.4 | **529** | **13.5** |
| 436.cactusADM | 861 | 13.9 | 858 | 13.9 | **860** | **13.9** | 859 | 13.9 | 831 | 14.4 | **847** | **14.1** |
| 437.leslie3d | 682 | 13.8 | 686 | 13.7 | **683** | **13.8** | 680 | 13.8 | **687** | **13.7** | 689 | 13.6 |
| 444.namd | 754 | 10.6 | 756 | 10.6 | **755** | **10.6** | 663 | 12.1 | 666 | 12.0 | **665** | **12.1** |
| 447.dealII | **684** | **16.7** | 685 | 16.7 | 683 | 16.8 | 508 | 22.5 | **507** | **22.6** | 507 | 22.6 |
| 450.soplex | **794** | **10.5** | 801 | 10.4 | 793 | 10.5 | **822** | **10.1** | 822 | 10.1 | 823 | 10.1 |
| 453.povray | 371 | 14.4 | **371** | **14.3** | 372 | 14.3 | **308** | **17.3** | 305 | 17.4 | 309 | 17.2 |
| 454.calculix | **563** | **14.6** | 565 | 14.6 | 563 | 14.7 | 564 | 14.6 | **562** | **14.7** | 562 | 14.7 |
| 459.GemsFDTD | **814** | **13.0** | 816 | 13.0 | 814 | 13.0 | **781** | **13.6** | 781 | 13.6 | 783 | 13.6 |
| 465.tonto | **710** | **13.9** | 711 | 13.8 | 709 | 13.9 | **583** | **16.9** | 582 | 16.9 | 590 | 16.7 |
| 470.lbm | 913 | 15.1 | 924 | 14.9 | **915** | **15.0** | 724 | 19.0 | **726** | **18.9** | 735 | 18.7 |
| 481.wrf | 646 | 17.3 | 649 | 17.2 | **647** | **17.3** | **605** | **18.5** | 605 | 18.5 | 605 | 18.5 |
| 482.sphinx3 | 1344 | 14.5 | 1372 | 14.2 | **1345** | **14.5** | 1040 | 18.7 | **1043** | **18.7** | 1094 | 17.8 |

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
'ulimit -s unlimited' was used to set environment stack size
'ulimit -l 2457600'  was used to set environment locked pages in memory limit
Environment variable PGI_HUGE_PAGES set to 896
Set vm/nr_hugepages=7168 in /etc/sysctl.conf
mount -t hugetlbfs nodev /mnt/hugepages
Processor Performance States Disabled in BIOS
Memory ChipKill Disabled in BIOS
```

## Base Compiler Invocation

C benchmarks:
pgcc

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=fast -Mipa=inline -Mfprelaxed -Msmartalloc=huge:150
-tp barcelona-64 -Bstatic_pgi

C++ benchmarks:
-fast -Mipa=fast -Mipa=inline -Mfprelaxed -Msmartalloc=huge:150
--zc_eh -tp barcelona-64 -Bstatic_pgi

Fortran benchmarks:
-fast -Mipa=fast -Mipa=inline -Mfprelaxed -Msmartalloc=huge:150
-tp barcelona-64 -Bstatic_pgi

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## Base Optimization Flags (Continued)

Benchmarks using both Fortran and C:
`-fast -Mipa=fast -Mipa=inline -Mfprelaxed -Msmartalloc=huge:150 -tp barcelona-64 -Bstatic_pgi`

## Base Other Flags

C benchmarks:
`-w -Mipa=jobs:4`

C++ benchmarks:
`-w -Mipa=jobs:4`

Fortran benchmarks:
`-w -Mipa=jobs:4`

Benchmarks using both Fortran and C:
`-w -Mipa=jobs:4`

## 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
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=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: -Mpfi(pass 1) -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.dealII: -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:

Continued on next page

# Peak Optimization Flags (Continued)

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

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=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=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=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 -Mipa=jobs:4`

C++ benchmarks:

444.namd: `-w -Mipa=jobs:4`(pass 2)

Continued on next page

# Peak Other Flags (Continued)

Fortran benchmarks:

410.bwaves: `-w -Mipa=jobs:4`(pass 2)

434.zeusmp: `-w -Mipa=jobs:4`

Benchmarks using both Fortran and C:

435.gromacs: `-w -Mipa=jobs:4`

454.calculix: `-w -Mipa=jobs:4`

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

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


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