# SPEC® CFP2006 Result

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## Dell Inc.

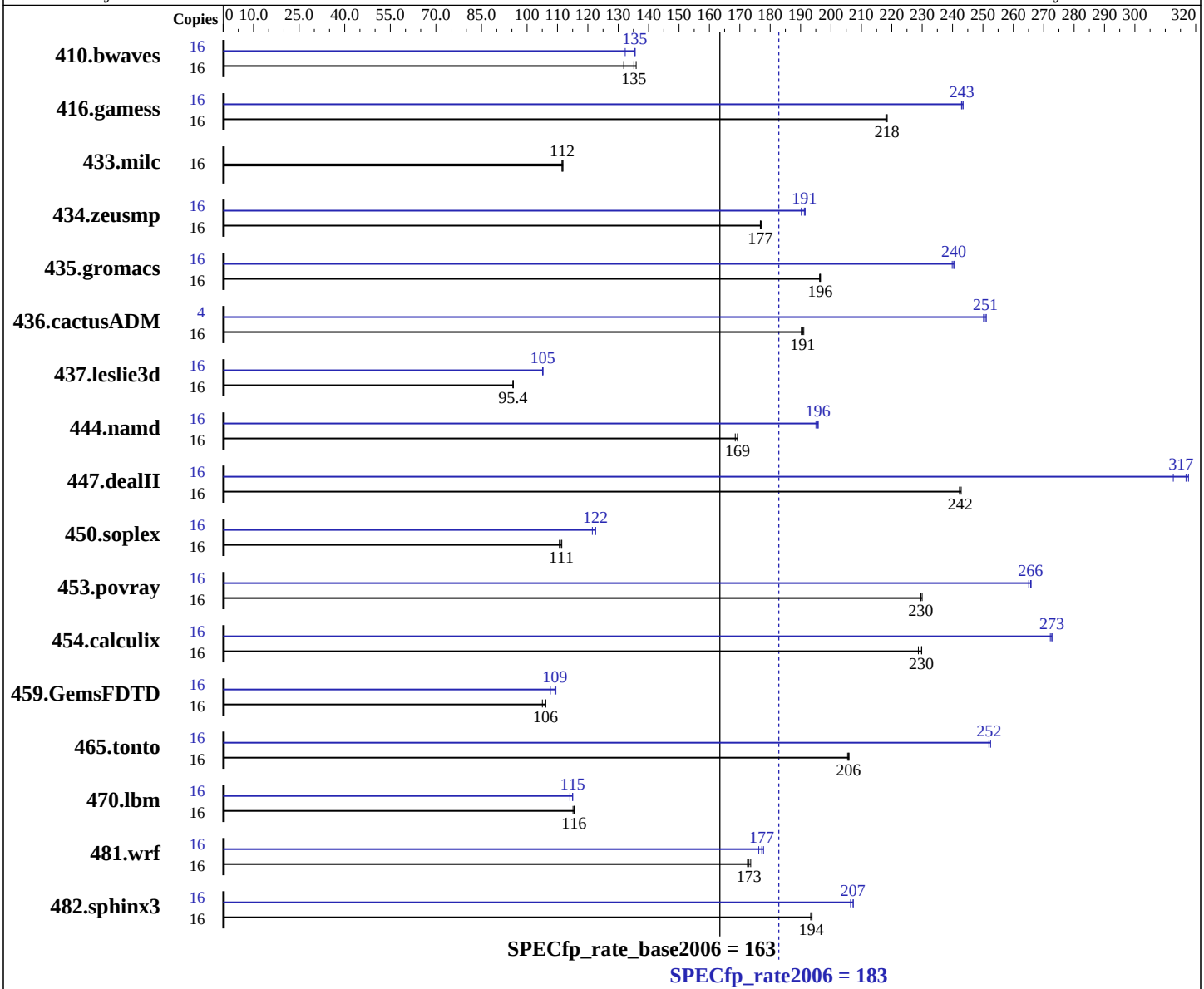
PowerEdge M905 (AMD Opteron 8374 HE, 2.20 GHz)

SPECfp®_rate2006 = 183

SPECfp_rate_base2006 = 163

**CPU2006 license:** 55
**Test sponsor:** Dell Inc.
**Tested by:** Dell Inc.

**Test date:** Dec-2008
**Hardware Availability:** Feb-2009
**Software Availability:** Oct-2008




## Hardware

| | |
|---|---|
| CPU Name: | AMD Opteron 8374 HE |
| CPU Characteristics: | |
| CPU MHz: | 2200 |
| FPU: | Integrated |
| CPU(s) enabled: | 16 cores, 4 chips, 4 cores/chip |
| CPU(s) orderable: | 4 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) SP2, Kernel 2.6.16.60-0.21-smp |
| Compiler: | PGI Server Complete Version 7.2<br>PathScale Compiler Suite Version 3.2 |
| Auto Parallel: | Yes |
| File System: | ReiserFS |
| System State: | Run level 3 (multi-user) |
| Base Pointers: | 64-bit |
| Peak Pointers: | 32/64-bit |

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L3 Cache: 6 MB I+D on chip per chip
Other Cache: None
Memory: 64 GB (16 x 4 GB DDR2-800)
Disk Subsystem: 1 x 73 GB 10000 RPM SAS
Other Hardware: None

Other Software: binutils 2.18
32-bit and 64-bit libhugetlbfs libraries

## Results Table

| Benchmark | Base | | | | | | | Peak | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 410.bwaves | 16 | 1600 | 136 | 1650 | 132 | **1609** | **135** | 16 | 1604 | 136 | **1605** | **135** | 1644 | 132 |
| 416.gamess | 16 | **1434** | **218** | 1437 | 218 | 1434 | 218 | 16 | **1289** | **243** | 1287 | 243 | 1290 | 243 |
| 433.milc | 16 | 1314 | 112 | **1316** | **112** | 1318 | 111 | 16 | 1314 | 112 | **1316** | **112** | 1318 | 111 |
| 434.zeusmp | 16 | 824 | 177 | 822 | 177 | **824** | **177** | 16 | 765 | 190 | 760 | 192 | **761** | **191** |
| 435.gromacs | 16 | 582 | 196 | 581 | 197 | **581** | **196** | 16 | 476 | 240 | 475 | 240 | **475** | **240** |
| 436.cactusADM | 16 | **1003** | **191** | 1005 | 190 | 1001 | 191 | 4 | 191 | 250 | 190 | 251 | **191** | **251** |
| 437.leslie3d | 16 | 1575 | 95.5 | 1578 | 95.3 | **1576** | **95.4** | 16 | 1429 | 105 | **1430** | **105** | 1431 | 105 |
| 444.namd | 16 | 762 | 168 | 758 | 169 | **758** | **169** | 16 | 658 | 195 | **656** | **196** | 655 | 196 |
| 447.dealII | 16 | 756 | 242 | 754 | 243 | **755** | **242** | 16 | 576 | 318 | 585 | 313 | **578** | **317** |
| 450.soplex | 16 | 1206 | 111 | **1199** | **111** | 1198 | 111 | 16 | 1098 | 121 | **1090** | **122** | 1089 | 123 |
| 453.povray | 16 | 370 | 230 | 371 | 230 | **371** | **230** | 16 | **320** | **266** | 321 | 265 | 320 | 266 |
| 454.calculix | 16 | 574 | 230 | **574** | **230** | 577 | 229 | 16 | **484** | **273** | 484 | 273 | 485 | 272 |
| 459.GemsFDTD | 16 | 1600 | 106 | 1616 | 105 | **1600** | **106** | 16 | 1550 | 109 | **1555** | **109** | 1577 | 108 |
| 465.tonto | 16 | 764 | 206 | **765** | **206** | 766 | 205 | 16 | 623 | 253 | 625 | 252 | **625** | **252** |
| 470.lbm | 16 | **1903** | **116** | 1903 | 116 | 1910 | 115 | 16 | **1912** | **115** | 1912 | 115 | 1927 | 114 |
| 481.wrf | 16 | **1033** | **173** | 1030 | 174 | 1036 | 173 | 16 | **1008** | **177** | 1014 | 176 | 1005 | 178 |
| 482.sphinx3 | 16 | 1609 | 194 | 1613 | 193 | **1611** | **194** | 16 | **1504** | **207** | 1511 | 206 | 1504 | 207 |

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

## Submit Notes

```
The config file option 'submit' was used.
 'numactl' was used to bind copies to the cores
```

## Operating System Notes

```
The libhugetlbfs libraries were installed using the
installation rpms that came with the distribution.

'ulimit -s unlimited' was used to set environment stack size
'ulimit -l 2097152'  was used to set environment locked pages in memory limit

Set vm/nr_hugepages=14336 in /etc/sysctl.conf
mount -t hugetlbfs nodev /mnt/hugepages
```

## General Notes

```
Environment variables set by runspec before the start of the run:
HUGETLB_MORECORE = "yes"
LD_LIBRARY_PATH = "/root/cpu2006-1.1/amd909gh-libs/64:/root/cpu2006-1.1/amd909gh-libs/32"
NCPUS = "4"
```

## 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:
-Mvect=cachesize:6291456 -fastsse -Msmartalloc=huge -Mfprelaxed
-Mipa=fast -Mipa=inline -tp barcelona-64 -Bstatic_pgi

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## Base Optimization Flags (Continued)

C++ benchmarks:
`-Mvect=cachesize:6291456 -fastsse -Msmartalloc=huge -Mfprelaxed --zc_eh -Mipa=fast -Mipa=inline -tp barcelona-64 -Bstatic_pgi`

Fortran benchmarks:
`-Mvect=cachesize:6291456 -fastsse -Mfprelaxed -Msmartalloc=huge -Mipa=fast -Mipa=inline -tp barcelona-64 -Bstatic_pgi`

Benchmarks using both Fortran and C:
`-Mvect=cachesize:6291456 -fastsse -Msmartalloc=huge -Mfprelaxed -Mipa=fast -Mipa=inline -tp barcelona-64 -Bstatic_pgi`

## Base Other Flags

C benchmarks:
`-Mipa=jobs:4`

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

Fortran benchmarks:
`-Mipa=jobs:4`

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

## Peak Compiler Invocation

C benchmarks:
`pgcc`

C++ benchmarks (except as noted below):
`pathCC`

444.namd: `pgcpp`

Fortran benchmarks (except as noted below):
`pathf95`

410.bwaves: `pgf95`

434.zeusmp: `pgf95`

437.leslie3d: `pgf95`

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## Peak Compiler Invocation (Continued)

Benchmarks using both Fortran and C (except as noted below):
pgcc pgf95

435.gromacs: 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
436.cactusADM: -DSPEC_CPU_LP64 -Mnomain
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: basepeak = yes

470.lbm: -Mvect=cachesize:6291456 -fastsse -Msmartalloc=huge
-Mprefetch=t0 -Mloop32 -Mfprelaxed -Mipa=fast -Mipa=inline
-tp barcelona-64 -Bstatic_pgi

482.sphinx3: -Mpfi=indirect(pass 1) -Mpfo=indirect(pass 2)
-Mipa=fast(pass 2) -Mipa=inline(pass 2)
-Mvect=cachesize:6291456 -fastsse -Mfprelaxed -Msmartalloc
-tp barcelona-64 -Bstatic_pgi

C++ benchmarks:

444.namd: -Mpfi(pass 1) -Mpfo(pass 2) -Mipa=fast(pass 2)
-Mipa=inline(pass 2) -Mvect=cachesize:6291456 -fastsse
-Munroll=n:4 -Munroll=m:8 -Msmartalloc=huge -Mnodepchk
-Mfprelaxed --zc_eh -tp barcelona-64 -Bstatic_pgi

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## Peak Optimization Flags (Continued)

447.dealII: -march=barcelona -Ofast -static -INLINE:aggressive=on
-fno-exceptions -m32

450.soplex: -march=barcelona -fb_create fbdata(pass 1)
-fb_opt fbdata(pass 2) -L/usr/lib -lhugetlbfs(pass 2) -O3
-INLINE:aggressive=on -OPT:IEEE_arith=3
-OPT:IEEE_NaN_Inf=off -OPT:fold_unsigned_relops=on
-OPT:malloc_alg=1 -CG:load_exe=0 -fno-exceptions -m32

453.povray: -march=barcelona -fb_create fbdata(pass 1)
-fb_opt fbdata(pass 2) -Ofast -INLINE:aggressive=on

Fortran benchmarks:

410.bwaves: -Mvect=cachesize:6291456 -fastsse -Msmartalloc
-Mprefetch=nta -Mfprelaxed -Mipa=fast -Mipa=inline
-tp barcelona-64 -Bstatic_pgi

416.gamess: -march=barcelona -fb_create fbdata(pass 1)
-fb_opt fbdata(pass 2)
-Wl,-T/usr/share/libhugetlbfs/ldscripts/elf_x86_64.xBDT(pass 2)
-L/usr/lib64 -lhugetlbfs(pass 2) -O2 -OPT:Ofast -OPT:ro=3
-OPT:unroll_size=256

434.zeusmp: -Mvect=cachesize:6291456 -fastsse -Mfprelaxed
-Mprefetch=distance:8 -Mprefetch=t0 -Msmartalloc=huge
-Msmartalloc=hugebss -Mipa=fast -Mipa=inline
-tp barcelona-64 -Bstatic_pgi

437.leslie3d: -Mpfi=indirect(pass 1) -Mpfo=indirect(pass 2)
-Mipa=fast(pass 2) -Mipa=inline(pass 2)
-Mvect=cachesize:6291456 -fastsse -Mvect=fuse
-Msmartalloc=huge -Mprefetch=distance:8 -Mprefetch=t0
-Mfprelaxed -tp barcelona-64 -Bstatic_pgi

459.GemsFDTD: -march=barcelona -Ofast -LNO:fission=2 -LNO:simd=2
-LNO:prefetch_ahead=1 -CG:load_exe=0 -CG:prefer_lru_reg=off
-OPT:malloc_alg=1
-Wl,-T/usr/share/libhugetlbfs/ldscripts/elf_x86_64.xBDT
-L/usr/lib64 -lhugetlbfs

465.tonto: -march=barcelona -Ofast -OPT:alias=no_f90_pointer_alias
-LNO:blocking=off -CG:load_exe=1 -IPA:plimit=525
-OPT:malloc_alg=1
-Wl,-T/usr/share/libhugetlbfs/ldscripts/elf_x86_64.xBDT
-L/usr/lib64 -lhugetlbfs

Benchmarks using both Fortran and C:

Continued on next page

## Peak Optimization Flags (Continued)

435.gromacs: `-march=barcelona -Ofast -OPT:rsqrt=2 -OPT:malloc_alg=1 -Wl,-T/usr/share/libhugetlbfs/ldscripts/elf_x86_64.xBDT -L/usr/lib64 -lhugetlbfs`

436.cactusADM: `-Mvect=cachesize:6291456 -fastsse -Mconcur -Msmartalloc=huge -Mfprelaxed -Mipa=fast -Mipa=inline -tp barcelona-64 -Bstatic_pgi`

454.calculix: `-Mpfi=indirect`(pass 1) `-Mpfo=indirect`(pass 2) `-Mipa=fast`(pass 2) `-Mipa=inline`(pass 2) `-Mvect=cachesize:6291456 -fastsse -Msmartalloc=huge -Mprefetch=t0 -Mpre -Mfprelaxed -tp barcelona-64 -Bstatic_pgi`

481.wrf: `-march=barcelona -Ofast -LNO:blocking=off -LNO:prefetch_ahead=10 -LANG:copyinout=off -IPA:callee_limit=5000 -GRA:prioritize_by_density=on -OPT:malloc_alg=1 -m3dnow -Wl,-T/usr/share/libhugetlbfs/ldscripts/elf_x86_64.xBDT -L/usr/lib64 -lhugetlbfs`

## Peak Other Flags

C benchmarks:
`-Mipa=jobs:4`(pass 2)

C++ benchmarks:

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

Fortran benchmarks (except as noted below):
`-Mipa=jobs:4`(pass 2)

416.gamess: `No flags used`

459.GemsFDTD: `No flags used`

465.tonto: `No flags used`

Benchmarks using both Fortran and C (except as noted below):
`-Mipa=jobs:4`(pass 2)

435.gromacs: `No flags used`

481.wrf: `No flags used`

The flags files that were used to format this result can be browsed at

http://www.spec.org/cpu2006/flags/pgi72_linux_flags.20090713.html
http://www.spec.org/cpu2006/flags/CPU2006_flags.20090710.html
http://www.spec.org/cpu2006/flags/amd-platform-amd909gh.html

You can also download the XML flags sources by saving the following links:

http://www.spec.org/cpu2006/flags/pgi72_linux_flags.20090713.xml
http://www.spec.org/cpu2006/flags/CPU2006_flags.20090710.xml
http://www.spec.org/cpu2006/flags/amd-platform-amd909gh.xml


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Tested with SPEC CPU2006 v1.1.
Report generated on Tue Jul 22 23:09:33 2014 by SPEC CPU2006 PS/PDF formatter v6932.
Originally published on 3 March 2009.