# SPEC® CFP2006 Result

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## Dell Inc.

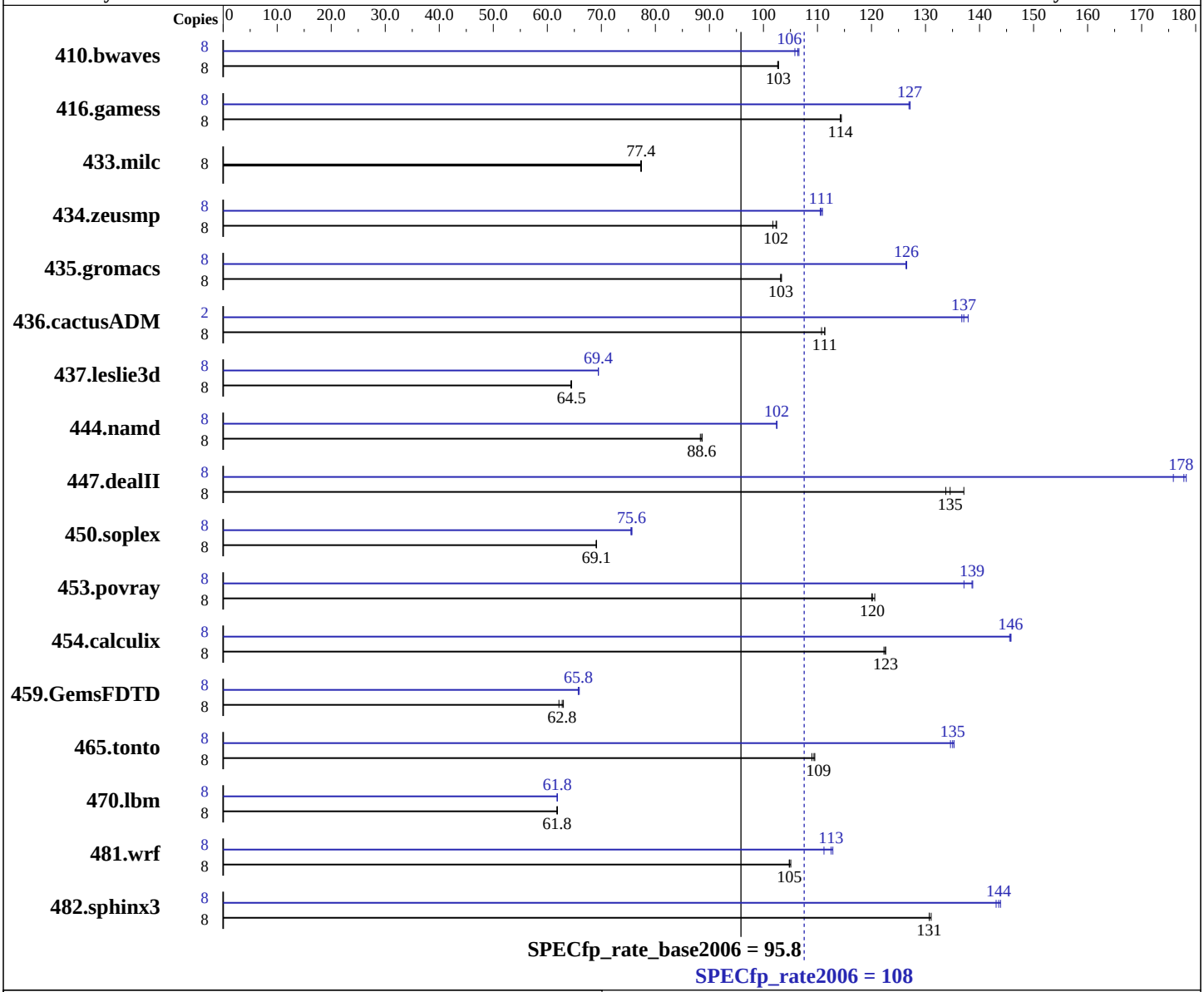
PowerEdge R805 (AMD Opteron 2376, 2.30 GHz)

SPECfp®_rate2006 = 108

SPECfp_rate_base2006 = 95.8

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

**Test date:** Nov-2008
**Hardware Availability:** Nov-2008
**Software Availability:** Oct-2008




### Hardware

| | |
|---|---|
| CPU Name: | AMD Opteron 2376 |
| CPU Characteristics: | |
| CPU MHz: | 2300 |
| FPU: | Integrated |
| CPU(s) enabled: | 8 cores, 2 chips, 4 cores/chip |
| CPU(s) orderable: | 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) 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: 32 GB (8 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 | 8 | **1058** | **103** | 1058 | 103 | 1059 | 103 | 8 | 1020 | 107 | **1022** | **106** | 1027 | 106 |
| 416.gamess | 8 | 1371 | 114 | **1371** | **114** | 1369 | 114 | 8 | 1234 | 127 | 1232 | 127 | **1232** | **127** |
| 433.milc | 8 | **949** | **77.4** | 949 | 77.4 | 950 | 77.3 | 8 | **949** | **77.4** | 949 | 77.4 | 950 | 77.3 |
| 434.zeusmp | 8 | 715 | 102 | 711 | 102 | **711** | **102** | 8 | 659 | 111 | 656 | 111 | **658** | **111** |
| 435.gromacs | 8 | 553 | 103 | **553** | **103** | 554 | 103 | 8 | 452 | 126 | **452** | **126** | 452 | 127 |
| 436.cactusADM | 8 | 863 | 111 | 859 | 111 | **859** | **111** | 2 | 173 | 138 | 175 | 137 | **174** | **137** |
| 437.leslie3d | 8 | 1168 | 64.4 | **1167** | **64.5** | 1166 | 64.5 | 8 | **1083** | **69.4** | 1083 | 69.5 | 1083 | 69.4 |
| 444.namd | 8 | 724 | 88.6 | 726 | 88.3 | **724** | **88.6** | 8 | 626 | 102 | **626** | **102** | 626 | 103 |
| 447.dealII | 8 | 684 | 134 | **680** | **135** | 668 | 137 | 8 | **515** | **178** | 513 | 178 | 520 | 176 |
| 450.soplex | 8 | 967 | 69.0 | **965** | **69.1** | 965 | 69.1 | 8 | **883** | **75.6** | 884 | 75.5 | 882 | 75.7 |
| 453.povray | 8 | 355 | 120 | **354** | **120** | 353 | 121 | 8 | 307 | 139 | 310 | 137 | **307** | **139** |
| 454.calculix | 8 | 540 | 122 | **538** | **123** | 538 | 123 | 8 | **453** | **146** | 453 | 146 | 453 | 146 |
| 459.GemsFDTD | 8 | **1353** | **62.8** | 1366 | 62.1 | 1348 | 63.0 | 8 | 1291 | 65.7 | **1291** | **65.8** | 1288 | 65.9 |
| 465.tonto | 8 | **720** | **109** | 719 | 110 | 722 | 109 | 8 | 585 | 135 | **583** | **135** | 582 | 135 |
| 470.lbm | 8 | 1776 | 61.9 | **1779** | **61.8** | 1779 | 61.8 | 8 | **1777** | **61.8** | 1777 | 61.9 | 1778 | 61.8 |
| 481.wrf | 8 | 853 | 105 | **852** | **105** | 851 | 105 | 8 | 792 | 113 | **794** | **113** | 804 | 111 |
| 482.sphinx3 | 8 | 1193 | 131 | 1190 | 131 | **1193** | **131** | 8 | 1084 | 144 | **1086** | **144** | 1090 | 143 |

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=7168 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 = "/usr/local/cpu2006-1.1/amd909gh-libs/64:/usr/local/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.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.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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