# SPEC® CFP2006 Result

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## Dell Inc.

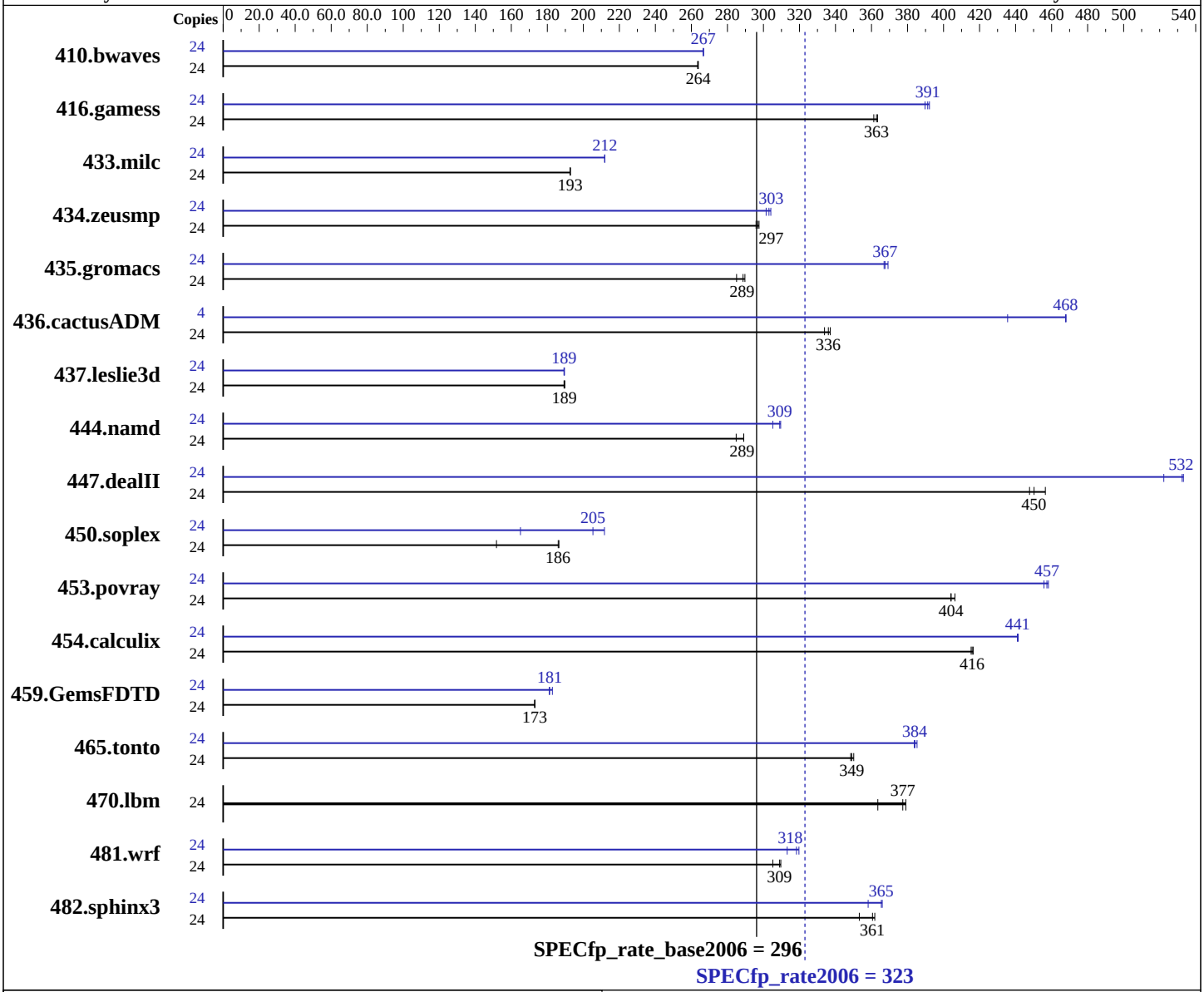
PowerEdge R715 (AMD Opteron 6176, 2.30 GHz)

SPECfp®_rate2006 = 323

SPECfp_rate_base2006 = 296

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

**Test date:** Oct-2010
**Hardware Availability:** Feb-2011
**Software Availability:** Jan-2011




### Hardware

| | |
|---|---|
| CPU Name: | AMD Opteron 6176 |
| CPU Characteristics: | |
| CPU MHz: | 2300 |
| FPU: | Integrated |
| CPU(s) enabled: | 24 cores, 2 chips, 12 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 11 (x86_64) Kernel 2.6.27.19-5-default |
| Compiler: | x86 Open64 4.2.4 Compiler Suite (from AMD) |
| Auto Parallel: | Yes |
| File System: | ext3 |
| System State: | Run level 3 (Full multiuser with network) |
| Base Pointers: | 64-bit |
| Peak Pointers: | 32/64-bit |
| Other Software: | None |

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L3 Cache: 12 MB I+D on chip per chip, 6 MB shared / 6 cores
Other Cache: None
Memory: 64 GB (16 x 4 GB 2Rx4 PC3-10600R-9, ECC)
Disk Subsystem: 1 x 146 GB SAS 10000 RPM SAS
Other Hardware: None

## Results Table

| Benchmark | Base | | | | | | | Peak | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 410.bwaves | 24 | **1237** | **264** | 1236 | 264 | 1238 | 263 | 24 | 1224 | 267 | **1224** | **267** | 1223 | 267 |
| 416.gamess | 24 | **1295** | **363** | 1293 | 363 | 1301 | 361 | 24 | **1201** | **391** | 1206 | 390 | 1198 | 392 |
| 433.milc | 24 | 1143 | 193 | 1143 | 193 | **1143** | **193** | 24 | 1040 | 212 | **1040** | **212** | 1040 | 212 |
| 434.zeusmp | 24 | 738 | 296 | 734 | 298 | **736** | **297** | 24 | 718 | 304 | 724 | 301 | **721** | **303** |
| 435.gromacs | 24 | 601 | 285 | **594** | **289** | 591 | 290 | 24 | 467 | 367 | **466** | **367** | 464 | 369 |
| 436.cactusADM | 24 | 859 | 334 | **853** | **336** | 851 | 337 | 4 | 102 | 468 | 110 | 436 | **102** | **468** |
| 437.leslie3d | 24 | 1192 | 189 | 1189 | 190 | **1191** | **189** | 24 | 1191 | 189 | 1192 | 189 | **1191** | **189** |
| 444.namd | 24 | 676 | 285 | 666 | 289 | **666** | **289** | 24 | 631 | 305 | **623** | **309** | 622 | 310 |
| 447.dealII | 24 | 613 | 448 | 601 | 457 | **610** | **450** | 24 | **516** | **532** | 526 | 522 | 515 | 533 |
| 450.soplex | 24 | 1319 | 152 | 1074 | 186 | **1076** | **186** | 24 | 1213 | 165 | **975** | **205** | 945 | 212 |
| 453.povray | 24 | **316** | **404** | 314 | 406 | 316 | 404 | 24 | 280 | 456 | **279** | **457** | 279 | 458 |
| 454.calculix | 24 | 475 | 416 | 477 | 415 | **476** | **416** | 24 | **449** | **441** | 449 | 441 | 448 | 441 |
| 459.GemsFDTD | 24 | 1471 | 173 | 1473 | 173 | **1471** | **173** | 24 | 1393 | 183 | **1404** | **181** | 1407 | 181 |
| 465.tonto | 24 | **677** | **349** | 678 | 348 | 674 | 350 | 24 | 615 | 384 | **615** | **384** | 613 | 385 |
| 470.lbm | 24 | 907 | 364 | **874** | **377** | 870 | 379 | 24 | 907 | 364 | **874** | **377** | 870 | 379 |
| 481.wrf | 24 | 878 | 305 | **868** | **309** | 866 | 310 | 24 | 856 | 313 | **842** | **318** | 839 | 320 |
| 482.sphinx3 | 24 | 1324 | 353 | 1293 | 362 | **1297** | **361** | 24 | 1306 | 358 | 1278 | 366 | **1280** | **365** |

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.
See the configuration file for details.
```

## Operating System Notes

```
'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=10800 in /etc/sysctl.conf
mount -t hugetlbfs nodev /mnt/hugepages
```

## Platform Notes

```
BIOS Settings:
Power Management = Maximum Performance (Default = Active Power Controller)
```

## General Notes

```
Environment variables set by runspec before the start of the run:
HUGETLB_LIMIT = "450"
LD_LIBRARY_PATH = "/cpu2006/amd1002-rate-libs-revC/64:/cpu2006/amd1002-rate-libs-revC/32"
OMP_NUM_THREADS = "6"

The x86 Open64 Compiler Suite is only available from (and supported by) AMD at
http://developer.amd.com/cpu/open64

Binaries were compiled on SLES10 SP2 with binutils 2.18
```

## Base Compiler Invocation

C benchmarks:
opencc

C++ benchmarks:
openCC

Fortran benchmarks:
openf95

Benchmarks using both Fortran and C:
opencc openf95

## 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
436.cactusADM: -DSPEC_CPU_LP64 -fno-second-underscore
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
459.GemsFDTD: -DSPEC_CPU_LP64
465.tonto: -DSPEC_CPU_LP64
470.lbm: -DSPEC_CPU_LP64

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## Base Portability Flags (Continued)

481.wrf: -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX -DSPEC_CPU_CASE_FLAG -fno-second-underscore
482.sphinx3: -DSPEC_CPU_LP64

## Base Optimization Flags

C benchmarks:
-march=barcelona -mso -Ofast -OPT:malloc_alg=1 -HP:bdt=2m

C++ benchmarks:
-march=barcelona -mso -Ofast -static -INLINE:aggressive=on -OPT:malloc_alg=1 -HP:bdt=2m

Fortran benchmarks:
-march=barcelona -mso -Ofast -HP

Benchmarks using both Fortran and C:
-march=barcelona -mso -Ofast -OPT:malloc_alg=1 -HP:bdt=2m -HP

## Peak Compiler Invocation

C benchmarks:
opencc

C++ benchmarks:
openCC

Fortran benchmarks:
openf95

Benchmarks using both Fortran and C:
opencc openf95

## 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 -fno-second-underscore
437.leslie3d: -DSPEC_CPU_LP64
444.namd: -DSPEC_CPU_LP64

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## Peak Portability Flags (Continued)

453.povray: -DSPEC_CPU_LP64
454.calculix: -DSPEC_CPU_LP64
459.GemsFDTD: -DSPEC_CPU_LP64
465.tonto: -DSPEC_CPU_LP64
470.lbm: -DSPEC_CPU_LP64
481.wrf: -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX -DSPEC_CPU_CASE_FLAG
-fno-second-underscore
482.sphinx3: -DSPEC_CPU_LP64

## Peak Optimization Flags

C benchmarks:

433.milc: -march=barcelona -mso -Ofast -CG:movnti=1
-CG:local_sched_alg=1 -CG:locs_shallow_depth=1
-HP:bdt=2m:heap=2m -LNO:prefetch=3

470.lbm: basepeak = yes

482.sphinx3: -march=barcelona -mso -fb_create fbdata(pass 1)
-fb_opt fbdata(pass 2) -Ofast -OPT:malloc_alg=2
-CG:sse_cse_regs=0 -CG:locs_shallow_depth=1 -CG:cmp_peep=on
-CG:local_sched_alg=1 -INLINE:aggressive=on

C++ benchmarks:

444.namd: -march=barcelona -mso -fb_create fbdata(pass 1)
-fb_opt fbdata(pass 2) -Ofast -LNO:ignore_feedback=off
-CG:local_sched_alg=2 -CG:load_exe=0 -CG:compute_to=on
-OPT:unroll_size=256 -fno-exceptions -HP:bdt=2m:heap=2m

447.dealII: -march=barcelona -mso -Ofast -static -INLINE:aggressive=on
-LNO:opt=0 -fno-emit-exceptions -m32
-OPT:unroll_times_max=8 -OPT:unroll_size=256
-OPT:unroll_level=2 -HP:bdt=2m:heap=2m -GRA:unspill=on
-CG:cmp_peep=on -TENV:frame_pointer=off

450.soplex: -march=barcelona -mso -fb_create fbdata(pass 1)
-fb_opt fbdata(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 -HP:bdt=2m

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

Fortran benchmarks:

Continued on next page

# Peak Optimization Flags (Continued)

410.bwaves: -march=barcelona -mso -O3 -OPT:Ofast -OPT:treeheight=on
-LNO:blocking=off -LNO:prefetch_ahead=5
-LNO:ignore_feedback=off -WOPT:aggstr=0 -HP:bdt=2m:heap=2m
-CG:cmp_peep=on

416.gamess: -march=barcelona -mso -fb_create fbdata(pass 1)
-fb_opt fbdata(pass 2) -O3 -LNO:fu=6 -LNO:blocking=0
-LNO:prefetch=0 -OPT:Ofast -OPT:ro=3 -OPT:unroll_size=256
-HP:bdt=2m:heap=2m

434.zeusmp: -march=barcelona -mso -Ofast -LNO:blocking=off
-LNO:interchange=off -OPT:treeheight=on -OPT:unroll_size=256
-CG:cmp_peep=on -GRA:prioritize_by_density=on -HP

437.leslie3d: -march=barcelona -mso -Ofast -HP:bdt=2m:heap=2m

459.GemsFDTD: -march=barcelona -mso -Ofast -LNO:fission=2
-LNO:prefetch_ahead=1 -CG:load_exe=0 -CG:local_sched_alg=1
-HP

465.tonto: -march=barcelona -mso -Ofast
-OPT:alias=no_f90_pointer_alias -LNO:blocking=off
-CG:load_exe=1 -IPA:plimit=525 -HP

Benchmarks using both Fortran and C:

435.gromacs: -march=barcelona -mso -Ofast -OPT:rsqrt=2
-HP:bdt=2m:heap=2m

436.cactusADM: -march=barcelona -mso -fb_create fbdata(pass 1)
-fb_opt fbdata(pass 2) -Ofast -apo -LNO:prefetch_ahead=1
-HP:bdt=2m:heap=2m -LANG:heap_allocation_threshold=100

454.calculix: -march=barcelona -mso -Ofast -CG:load_exe=0
-CG:ptr_load_use=0 -CG:local_sched_alg=2 -CG:compute_to=on
-LNO:prefetch_ahead=30 -WOPT:unroll=2
-GRA:optimize_boundary=on -HP:bdt=2m:heap=2m

481.wrf: -march=barcelona -mso -Ofast -LNO:blocking=off
-LNO:prefetch_ahead=10 -LANG:copyinout=off
-IPA:callee_limit=5000 -GRA:prioritize_by_density=on -m3dnow
-HP

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2006/flags/x86-open64-424-flags-rate-revC.20100901.html
http://www.spec.org/cpu2006/flags/amd-platform-rate-revC.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2006/flags/x86-open64-424-flags-rate-revC.20100901.xml
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