



# SPEC<sup>®</sup> CFP2006 Result

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## Dell Inc.

**SPECfp<sup>®</sup>2006 = 19.2**

PowerEdge 2970 (AMD Opteron 2372 HE, 2.10 GHz)

**SPECfp\_base2006 = 15.6**

CPU2006 license: 55

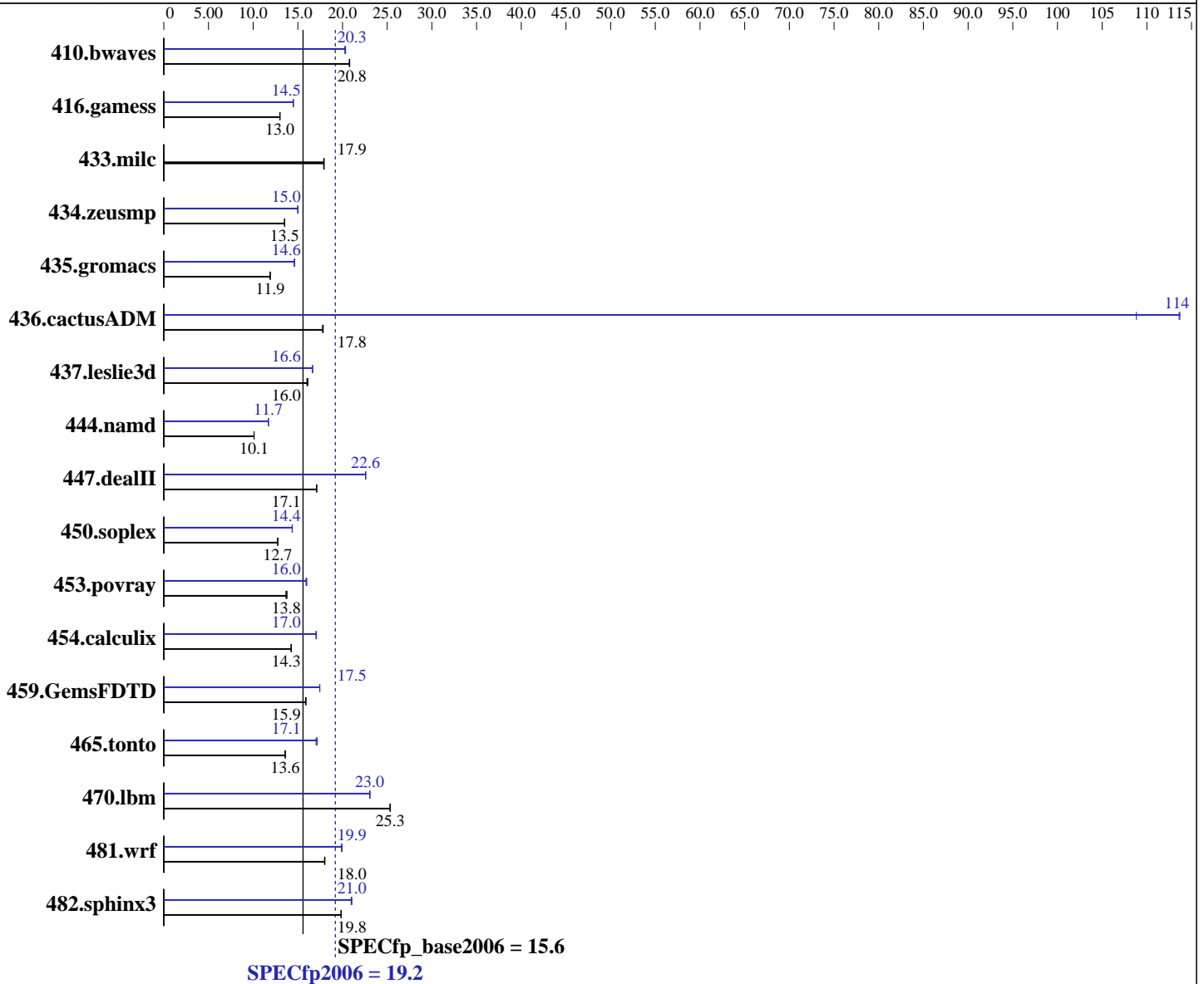
Test date: Jan-2009

Test sponsor: Dell Inc.

Hardware Availability: Feb-2009

Tested by: Dell Inc.

Software Availability: Oct-2008



### Hardware

CPU Name: AMD Opteron 2372 HE  
 CPU Characteristics:  
 CPU MHz: 2100  
 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

Continued on next page

### 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 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 15000 RPM SAS  
Other Hardware: None

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

## Results Table

Benchmark	Base						Peak					
	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	653	20.8	655	20.8	<b>654</b>	<b>20.8</b>	<b>670</b>	<b>20.3</b>	668	20.4	671	20.3
416.gamess	1504	13.0	1509	13.0	<b>1508</b>	<b>13.0</b>	<b>1350</b>	<b>14.5</b>	1350	14.5	1352	14.5
433.milc	512	17.9	513	17.9	<b>512</b>	<b>17.9</b>	512	17.9	513	17.9	<b>512</b>	<b>17.9</b>
434.zeusmp	<b>673</b>	<b>13.5</b>	673	13.5	674	13.5	607	15.0	<b>607</b>	<b>15.0</b>	606	15.0
435.gromacs	<b>600</b>	<b>11.9</b>	599	11.9	600	11.9	<b>488</b>	<b>14.6</b>	488	14.6	489	14.6
436.cactusADM	<b>671</b>	<b>17.8</b>	673	17.8	670	17.8	<b>105</b>	<b>114</b>	105	114	110	109
437.leslie3d	<b>586</b>	<b>16.0</b>	586	16.0	583	16.1	565	16.6	565	16.6	<b>565</b>	<b>16.6</b>
444.namd	<b>794</b>	<b>10.1</b>	794	10.1	794	10.1	<b>686</b>	<b>11.7</b>	687	11.7	685	11.7
447.dealII	669	17.1	669	17.1	<b>669</b>	<b>17.1</b>	506	22.6	507	22.6	<b>507</b>	<b>22.6</b>
450.soplex	653	12.8	<b>654</b>	<b>12.7</b>	655	12.7	580	14.4	<b>580</b>	<b>14.4</b>	581	14.4
453.povray	390	13.7	<b>387</b>	<b>13.8</b>	386	13.8	334	15.9	<b>333</b>	<b>16.0</b>	333	16.0
454.calculix	578	14.3	<b>579</b>	<b>14.3</b>	579	14.2	484	17.1	484	17.0	<b>484</b>	<b>17.0</b>
459.GemsFDTD	<b>668</b>	<b>15.9</b>	669	15.9	666	15.9	<b>608</b>	<b>17.5</b>	608	17.4	608	17.5
465.tonto	725	13.6	<b>724</b>	<b>13.6</b>	724	13.6	574	17.2	578	17.0	<b>574</b>	<b>17.1</b>
470.lbm	542	25.4	<b>542</b>	<b>25.3</b>	543	25.3	<b>596</b>	<b>23.0</b>	595	23.1	596	23.0
481.wrf	<b>620</b>	<b>18.0</b>	621	18.0	619	18.0	562	19.9	560	19.9	<b>561</b>	<b>19.9</b>
482.sphinx3	982	19.8	<b>982</b>	<b>19.8</b>	982	19.8	<b>928</b>	<b>21.0</b>	930	21.0	926	21.0

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=7146 in /etc/sysctl.conf  
mount -t hugetlbfs nodev /mnt/hugepages



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## 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 = "8"

## 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.deall: -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 -Mnodepch  
-Mfprelaxed --zc\_eh -tp barcelona-64 -Bstatic\_pgi

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## Peak Optimization Flags (Continued)

447.dealIII: -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 -Mfpelaxed -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 -Mfpelaxed  
-Mprefetch=distance:8 -Mprefetch=t0 -Msmartalloc=huge  
-Msmartalloc=hugebss -Mipa=fast -Mipa=inline  
-tp barcelona-64 -Bstatic\_pgi

437.leslie3d: -Mphi=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  
-Mfpelaxed -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:

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## 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



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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/pgi72_linux_flags.20090713.html)
- [http://www.spec.org/cpu2006/flags/CPU2006\\_flags.20090710.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/pgi72_linux_flags.20090713.xml)
- [http://www.spec.org/cpu2006/flags/CPU2006\\_flags.20090710.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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