



# SPEC<sup>®</sup> CFP2006 Result

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E4 Computer Engineering S.p.A.  
E-Rack 8248, AMD Opteron 6174

SPECfp<sup>®</sup>2006 = 29.6  
SPECfp\_base2006 = 22.2

CPU2006 license: 3106

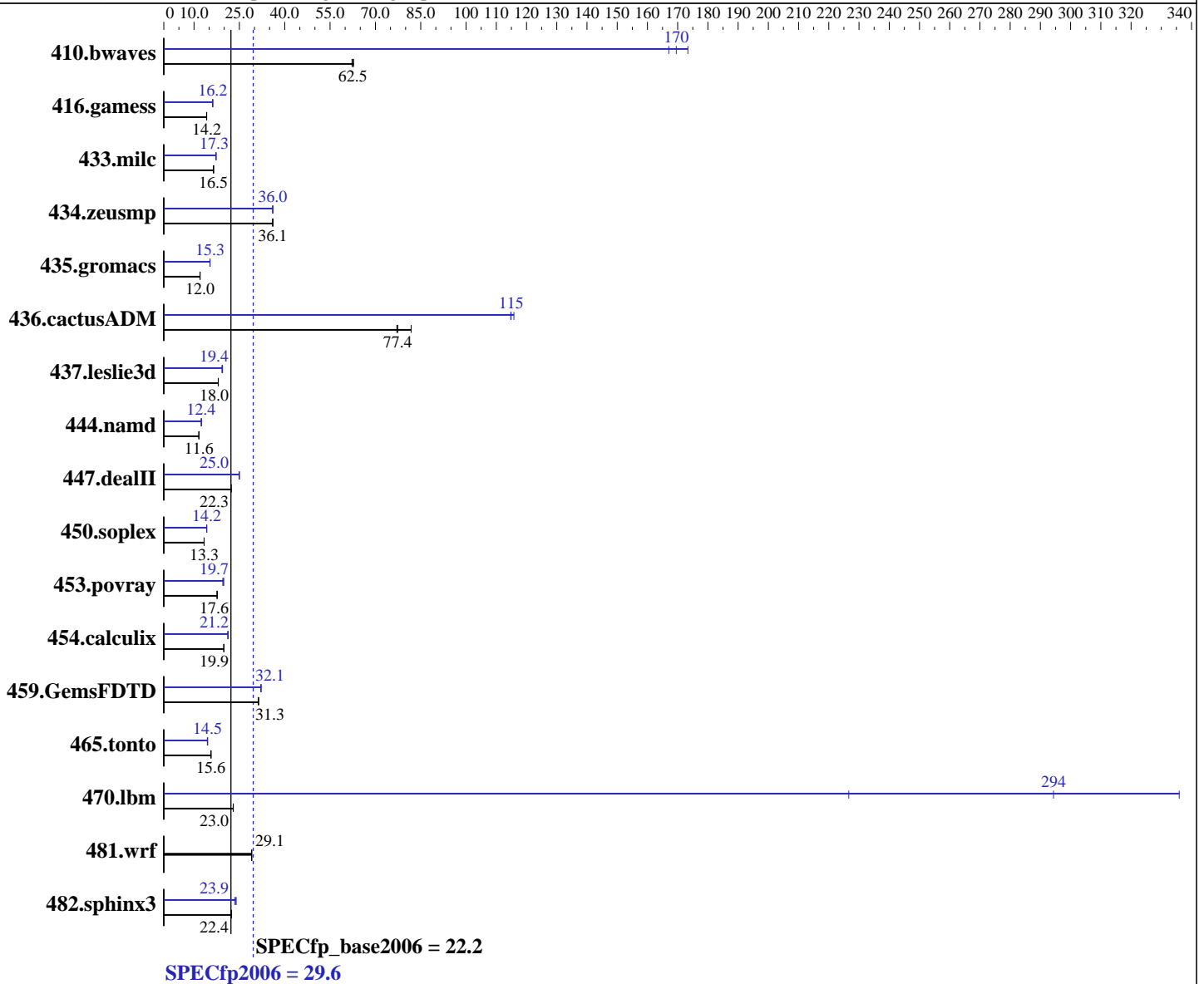
Test sponsor: E4 Computer Engineering S.p.A.

Tested by: E4 Computer Engineering S.p.A.

Test date: Sep-2011

Hardware Availability: Jun-2010

Software Availability: Jul-2011



## Hardware

CPU Name: AMD Opteron 6174  
 CPU Characteristics: 2200  
 CPU MHz: 2200  
 FPU: Integrated  
 CPU(s) enabled: 48 cores, 4 chips, 12 cores/chip  
 CPU(s) orderable: 2,4 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: Scientific Linux release 6.1,  
Kernel 2.6.32-131.0.15.el6  
 Compiler: C/C++/Fortran: Version 4.2.5.2 of x86 Open64  
Compiler Suite (from AMD)  
 Auto Parallel: Yes  
 File System: ext4  
 System State: Run level 3 (Full multiuser with network)  
 Base Pointers: 64-bit  
 Peak Pointers: 32/64-bit

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L3 Cache: 12 MB I+D on chip per chip, 6 MB shared / 6 cores  
Other Cache: None  
Memory: 256 GB (32 x 8 GB 2Rx4 PC3-10600R-9, ECC)  
Disk Subsystem: 2 x 1 TB SATA, 7200 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    | <b><u>217</u></b> | <b><u>62.5</u></b> | 216                | 62.8               | 218               | 62.3               | <b><u>80.2</u></b> | <b><u>170</u></b>  | 78.4               | 173                | 81.3              | 167                |
| 416.gamess    | 1384              | 14.1               | <b><u>1381</u></b> | <b><u>14.2</u></b> | 1380              | 14.2               | 1206               | 16.2               | <b><u>1209</u></b> | <b><u>16.2</u></b> | 1217              | 16.1               |
| 433.milc      | <b><u>558</u></b> | <b><u>16.5</u></b> | 556                | 16.5               | 561               | 16.4               | 531                | 17.3               | 532                | 17.3               | <b><u>531</u></b> | <b><u>17.3</u></b> |
| 434.zeusmp    | 253               | 36.0               | 252                | 36.1               | <b><u>252</u></b> | <b><u>36.1</u></b> | 252                | 36.1               | 253                | 36.0               | <b><u>253</u></b> | <b><u>36.0</u></b> |
| 435.gromacs   | 594               | 12.0               | 596                | 12.0               | <b><u>596</u></b> | <b><u>12.0</u></b> | 467                | 15.3               | <b><u>467</u></b>  | <b><u>15.3</u></b> | 467               | 15.3               |
| 436.cactusADM | 146               | 81.8               | 155                | 77.1               | <b><u>154</u></b> | <b><u>77.4</u></b> | <b><u>104</u></b>  | <b><u>115</u></b>  | 104                | 115                | 103               | 116                |
| 437.leslie3d  | 522               | 18.0               | <b><u>521</u></b>  | <b><u>18.0</u></b> | 521               | 18.0               | 489                | 19.2               | 483                | 19.5               | <b><u>485</u></b> | <b><u>19.4</u></b> |
| 444.namd      | <b><u>690</u></b> | <b><u>11.6</u></b> | 692                | 11.6               | 689               | 11.6               | 646                | 12.4               | <b><u>646</u></b>  | <b><u>12.4</u></b> | 646               | 12.4               |
| 447.dealII    | <b><u>514</u></b> | <b><u>22.3</u></b> | 514                | 22.2               | 514               | 22.3               | 458                | 25.0               | <b><u>458</u></b>  | <b><u>25.0</u></b> | 458               | 25.0               |
| 450.soplex    | 626               | 13.3               | 625                | 13.3               | <b><u>625</u></b> | <b><u>13.3</u></b> | 586                | 14.2               | <b><u>588</u></b>  | <b><u>14.2</u></b> | 588               | 14.2               |
| 453.povray    | 301               | 17.7               | <b><u>302</u></b>  | <b><u>17.6</u></b> | 302               | 17.6               | 273                | 19.5               | 269                | 19.8               | <b><u>269</u></b> | <b><u>19.7</u></b> |
| 454.calculix  | <b><u>415</u></b> | <b><u>19.9</u></b> | 414                | 19.9               | 416               | 19.8               | <b><u>389</u></b>  | <b><u>21.2</u></b> | 390                | 21.2               | 388               | 21.3               |
| 459.GemsFDTD  | 338               | 31.4               | 339                | 31.3               | <b><u>339</u></b> | <b><u>31.3</u></b> | 329                | 32.2               | <b><u>330</u></b>  | <b><u>32.1</u></b> | 330               | 32.1               |
| 465.tonto     | <b><u>630</u></b> | <b><u>15.6</u></b> | 633                | 15.6               | 629               | 15.6               | 677                | 14.5               | 683                | 14.4               | <b><u>681</u></b> | <b><u>14.5</u></b> |
| 470.lbm       | 598               | 23.0               | 597                | 23.0               | <b><u>598</u></b> | <b><u>23.0</u></b> | <b><u>46.7</u></b> | <b><u>294</u></b>  | 40.9               | 336                | 60.6              | 227                |
| 481.wrf       | 385               | 29.0               | 384                | 29.1               | <b><u>384</u></b> | <b><u>29.1</u></b> | 385                | 29.0               | 384                | 29.1               | <b><u>384</u></b> | <b><u>29.1</u></b> |
| 482.sphinx3   | <b><u>871</u></b> | <b><u>22.4</u></b> | 871                | 22.4               | 871               | 22.4               | 831                | 23.4               | <b><u>816</u></b>  | <b><u>23.9</u></b> | 815               | 23.9               |

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=21600 in /etc/sysctl.conf  
mount -t hugetlbfs nodev /mnt/hugepages



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|                                |                   |      |
|--------------------------------|-------------------|------|
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| E-Rack 8248, AMD Opteron 6174  | SPECfp_base2006 = | 22.2 |

|   |  |
|---|--|
| <b>CPU2006 license:</b> 3106                        | <b>Test date:</b> Sep-2011             |
| <b>Test sponsor:</b> E4 Computer Engineering S.p.A. | <b>Hardware Availability:</b> Jun-2010 |
| <b>Tested by:</b> E4 Computer Engineering S.p.A.    | <b>Software Availability:</b> Jul-2011 |

## General Notes

Environment variables set by runspec before the start of the run:

HUGETLB\_LIMIT = "450"

LD\_LIBRARY\_PATH = "/opt/amd/lib/gcc-lib/x86\_64-open64-linux/4.2.5.2/64:/opt/amd/lib/gcc-lib/x86\_64-open64-linux/4.2.5.2/32"

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

## 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  
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 -Ofast -HP:bdt=2m:heap=2m

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## Base Optimization Flags (Continued)

### C++ benchmarks:

```
-march=barcelona -Ofast -static -INLINE:aggressive=on
-HP:bdt=2m:heap=2m
```

### Fortran benchmarks:

```
-march=barcelona -Ofast -apo -LNO:parallel_overhead=10000
-LNO:fusion_peeling_limit=0 -HP:bdt=2m:heap=2m
```

### Benchmarks using both Fortran and C:

```
-march=barcelona -Ofast -HP:bdt=2m:heap=2m -apo
-LNO:parallel_overhead=10000 -LNO:fusion_peeling_limit=0
```

## 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
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
```



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## Peak Optimization Flags

### C benchmarks:

433.milc: -march=barcelona -Ofast -apo -CG:movnti=1  
 -CG:local\_sched\_alg=1 -CG:locs\_shallow\_depth=1  
 -CG:compute\_to=on -HP:bdt=2m:heap=2m -LNO:prefetch=3

470.lbm: -march=barcelona -Ofast -mso -apo -CG:sse\_cse\_regs=0  
 -LNO:prefetch\_ahead=4 -CG:locs\_shallow\_depth=1  
 -CG:cmp\_peep=on -CG:compute\_to=on -OPT:unroll\_times\_max=8  
 -OPT:unroll\_size=256 -OPT:unroll\_level=2 -OPT:keep\_ext=on  
 -OPT:alias=restricted -m3dnow -IPA:inline=off

482.sphinx3: -march=barcelona -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 -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.dealIII: -march=barcelona -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 -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 -CG:load\_exe=0 -fno-exceptions  
 -m32 -HP:bdt=2m:heap=2m

453.povray: -march=barcelona -fb\_create fbdata(pass 1)  
 -fb\_opt fbdata(pass 2) -Ofast -INLINE:aggressive=on  
 -HP:bdt=2m:heap=2m

### Fortran benchmarks:

410.bwaves: -march=barcelona -Ofast -apo -OPT:malloc\_alg=2  
 -CG:use\_prefetchnta=on -CG:cmp\_peep=on -LNO:blocking=off  
 -LNO:prefetch=3 -LNO:prefetch\_ahead=5  
 -LNO:ignore\_feedback=off -LNO:apo\_use\_feedback=on  
 -WOPT:aggstr=0

416.gamess: -march=barcelona -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

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## Peak Optimization Flags (Continued)

416.gamess (continued):

-HP:bdt=2m:heap=2m

434.zeusmp:

-march=barcelona -Ofast -apo -LNO:blocking=off  
-LNO:interchange=off -LNO:fusion\_peeling\_limit=0  
-OPT:treeheight=on -OPT:unroll\_size=256 -CG:cmp\_peep=on  
-CG:compute\_to=on -GRA:prioritize\_by\_density=on  
-HP:bdt=2m:heap=2m

437.leslie3d:

-march=barcelona -Ofast -apo -OPT:unroll\_size=256  
-LNO:prefetch\_ahead=4 -LNO:parallel\_overhead=32768  
-GRA:prioritize\_by\_density=on -m3dnow -HP:bdt=2m:heap=2m

459.GemsFDTD:

-march=barcelona -Ofast -apo -LNO:fission=2  
-LNO:prefetch\_ahead=1 -CG:load\_exe=0 -CG:local\_sched\_alg=1  
-HP

465.tonto:

-march=barcelona -Ofast -apo  
-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 -Ofast -apo -OPT:rsqrt=2  
-HP:bdt=2m:heap=2m

436.cactusADM:

-march=barcelona -fb\_create fbdata(pass 1)  
-fb\_opt fbdata(pass 2) -Ofast -apo  
-LANG:heap\_allocation\_threshold=1000 -LNO:prefetch\_ahead=1  
-HP:bdt=2m:heap=2m

454.calculix:

-march=barcelona -Ofast -LNO:prefetch\_ahead=30  
-CG:load\_exe=0 -CG:ptr\_load\_use=0 -CG:local\_sched\_alg=2  
-CG:compute\_to=on -WOPT:unroll=2 -GRA:optimize\_boundary=on  
-HP:bdt=2m:heap=2m -apo

481.wrf: basepeak = yes

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

<http://www.spec.org/cpu2006/flags/x86-open64-423-flags-speed-revA.20101207.html>  
<http://www.spec.org/cpu2006/flags/E4ComputerEngineering-amd-platform.html>

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

<http://www.spec.org/cpu2006/flags/x86-open64-423-flags-speed-revA.20101207.xml>  
<http://www.spec.org/cpu2006/flags/E4ComputerEngineering-amd-platform.xml>



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For questions about this result, please contact the tester.  
For other inquiries, please contact [webmaster@spec.org](mailto:webmaster@spec.org).

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