



# SPEC<sup>®</sup> CFP2006 Result

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## Supermicro

(Test Sponsor: Advanced Micro Devices)

Supermicro A+ Server 2042G-6RF,  
AMD Opteron 6220

SPECfp<sup>®</sup>\_rate2006 = 542

SPECfp\_rate\_base2006 = 508

CPU2006 license: 49

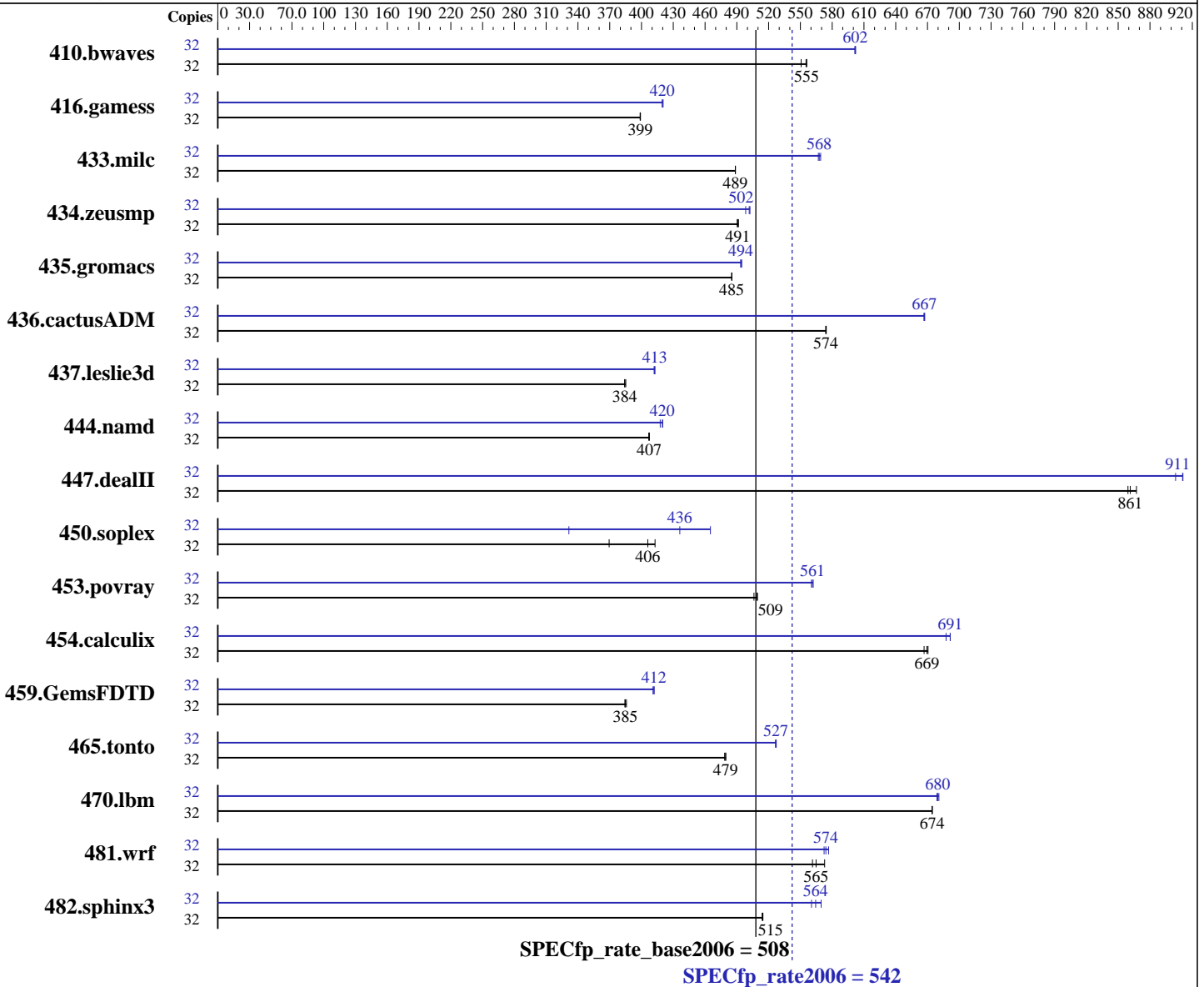
Test sponsor: Advanced Micro Devices

Tested by: Advanced Micro Devices

Test date: Sep-2011

Hardware Availability: Nov-2011

Software Availability: Jul-2011



### Hardware

CPU Name: AMD Opteron 6220  
 CPU Characteristics: AMD Turbo CORE technology up to 3.60 GHz  
 CPU MHz: 3000  
 FPU: Integrated  
 CPU(s) enabled: 32 cores, 4 chips, 8 cores/chip  
 CPU(s) orderable: 2,4 chips

Continued on next page

### Software

Operating System: Red Hat Enterprise Linux Server release 6.1,  
 Kernel 2.6.32-131.0.15.el6.x86\_64  
 Compiler: C/C++/Fortran: Version 4.2.5.2 of x86 Open64  
 Compiler Suite (from AMD)  
 Auto Parallel: No  
 File System: ext3  
 System State: Run level 3 (Full multiuser with network)  
 Base Pointers: 64-bit  
 Peak Pointers: 32/64-bit

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Primary Cache: 256 KB I on chip per chip,  
64 KB I shared / 2 cores;  
16 KB D on chip per core

Secondary Cache: 8 MB I+D on chip per chip, 2 MB shared / 2 cores

L3 Cache: 16 MB I+D on chip per chip, 8 MB shared / 4 cores

Other Cache: None

Memory: 128 GB (16 x 8 GB 2Rx4 PC3-12800R-11, ECC)

Disk Subsystem: 1 x 500 GB SATA, 7200 RPM

Other Hardware: None

Other Software: None

## Results Table

Benchmark	Base								Peak							
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio		
410.bwaves	32	790	551	<b><u>783</u></b>	<b><u>555</u></b>	782	556	32	723	601	722	602	<b><u>722</u></b>	<b><u>602</u></b>		
416.gamess	32	1570	399	1572	399	<b><u>1571</u></b>	<b><u>399</u></b>	32	1490	420	<b><u>1493</u></b>	<b><u>420</u></b>	1493	420		
433.milc	32	601	489	601	489	<b><u>601</u></b>	<b><u>489</u></b>	32	518	567	<b><u>517</u></b>	<b><u>568</u></b>	516	569		
434.zeusmp	32	594	490	592	492	<b><u>593</u></b>	<b><u>491</u></b>	32	<b><u>580</u></b>	<b><u>502</u></b>	584	498	580	502		
435.gromacs	32	<b><u>471</u></b>	<b><u>485</u></b>	471	485	471	485	32	463	494	<b><u>463</u></b>	<b><u>494</u></b>	462	495		
436.cactusADM	32	666	574	666	574	<b><u>666</u></b>	<b><u>574</u></b>	32	573	667	<b><u>573</u></b>	<b><u>667</u></b>	574	667		
437.leslie3d	32	783	384	781	385	<b><u>783</u></b>	<b><u>384</u></b>	32	730	412	729	413	<b><u>729</u></b>	<b><u>413</u></b>		
444.namd	32	<b><u>630</u></b>	<b><u>407</u></b>	631	407	630	407	32	<b><u>611</u></b>	<b><u>420</u></b>	614	418	611	420		
447.dealII	32	426	859	<b><u>425</u></b>	<b><u>861</u></b>	422	867	32	402	911	405	904	<b><u>402</u></b>	<b><u>911</u></b>		
450.soplex	32	722	369	<b><u>657</u></b>	<b><u>406</u></b>	647	413	32	805	331	<b><u>612</u></b>	<b><u>436</u></b>	574	465		
453.povray	32	336	506	334	509	<b><u>334</u></b>	<b><u>509</u></b>	32	303	562	304	560	<b><u>303</u></b>	<b><u>561</u></b>		
454.calculix	32	394	671	<b><u>394</u></b>	<b><u>669</u></b>	396	667	32	382	692	384	688	<b><u>382</u></b>	<b><u>691</u></b>		
459.GemsFDTD	32	883	384	880	386	<b><u>883</u></b>	<b><u>385</u></b>	32	824	412	<b><u>824</u></b>	<b><u>412</u></b>	826	411		
465.tonto	32	<b><u>657</u></b>	<b><u>479</u></b>	657	480	658	478	32	597	527	<b><u>598</u></b>	<b><u>527</u></b>	598	526		
470.lbm	32	<b><u>652</u></b>	<b><u>674</u></b>	652	674	652	674	32	648	679	646	681	<b><u>647</u></b>	<b><u>680</u></b>		
481.wrf	32	<b><u>633</u></b>	<b><u>565</u></b>	624	573	637	561	32	<b><u>623</u></b>	<b><u>574</u></b>	624	572	620	577		
482.sphinx3	32	<b><u>1212</u></b>	<b><u>515</u></b>	1212	515	1214	514	32	<b><u>1105</u></b>	<b><u>564</u></b>	1095	570	1113	560		

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 transparent\_hugepage=never as a boot parameter in /boot/grub/menu.lst  
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## Operating System Notes (Continued)

Set kernel/randomize\_va\_space=0 in /etc/sysctl.conf

Set vm/nr\_hugepages=28672 in /etc/sysctl.conf  
mount -t hugetlbfs nodev /mnt/hugepages

## General Notes

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

HUGETLB\_LIMIT = "896"

LD\_LIBRARY\_PATH = "/root/work/cpu2006v1.1/amd1104-rate-libs-revA/32:/root/work/cpu2006v1.1/amd1104-rate-libs-revA/64"

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

Binaries were compiled on a system with 2x AMD Opteron 6276 chips + 128GB Memory using RHEL 6.1

## 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

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## Base Portability Flags (Continued)

470.lbm: -DSPEC\_CPU\_LP64  
481.wrf: -DSPEC\_CPU\_LINUX -DSPEC\_CPU\_CASE\_FLAG -DSPEC\_CPU\_LP64  
-fno-second-underscore  
482.sphinx3: -DSPEC\_CPU\_LP64

## Base Optimization Flags

### C benchmarks:

-march=bdver1 -Ofast -OPT:malloc\_alg=1 -HP:bd=2m:heap=2m  
-IPA:plimit=8000 -IPA:small\_pu=100 -mso

### C++ benchmarks:

-march=bdver1 -Ofast -static -CG:load\_exe=0 -OPT:malloc\_alg=1  
-INLINE:aggressive=on -HP:bd=2m:heap=2m -D\_\_OPEN64\_FAST\_SET

### Fortran benchmarks:

-march=bdver1 -Ofast -LNO:blocking=off -OPT:rsqrt=2  
-OPT:unroll\_size=256 -HP:bd=2m:heap=2m -mso

### Benchmarks using both Fortran and C:

-march=bdver1 -Ofast -OPT:malloc\_alg=1 -HP:bd=2m:heap=2m  
-IPA:plimit=8000 -IPA:small\_pu=100 -mso -LNO:blocking=off  
-OPT:rsqrt=2 -OPT:unroll\_size=256

## Peak Compiler Invocation

### C benchmarks:

openc

### C++ benchmarks:

openCC

### Fortran benchmarks:

openf95

### Benchmarks using both Fortran and C:

openc openf95

## Peak Portability Flags

410.bwaves: -DSPEC\_CPU\_LP64  
416.gamess: -DSPEC\_CPU\_LP64  
433.milc: -DSPEC\_CPU\_LP64

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## Peak Portability Flags (Continued)

```

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_LINUX -DSPEC_CPU_CASE_FLAG -DSPEC_CPU_LP64
      -fno-second-underscore
482.sphinx3: -DSPEC_CPU_LP64

```

## Peak Optimization Flags

### C benchmarks:

```

433.milc: -march=bdver1 -Ofast -CG:movnti=1 -CG:locs_best=on
      -HP:bdt=2m:heap=2m -IPA:plimit=7000 -IPA:callee_limit=1200
      -OPT:struct_array_copy=2 -OPT:alias=field_sensitive -mso

470.lbm: -march=bdver1 -Ofast -CG:cmp_peep=on
      -OPT:unroll_times_max=8 -OPT:unroll_size=256
      -OPT:unroll_level=2 -OPT:keep_ext=on -HP:bdt=2m:heap=2m
      -IPA:plimit=8000 -IPA:small_pu=100 -mso

482.sphinx3: -march=bdver1 -fb_create fbdata(pass 1)
      -fb_opt fbdata(pass 2) -Ofast -OPT:malloc_alg=2
      -CG:cmp_peep=on -CG:local_sched_alg=2 -INLINE:aggressive=on
      -LNO:prefetch=2 -LNO:prefetch_ahead=4 -mso

```

### C++ benchmarks:

```

444.namd: -march=bdver1 -fb_create fbdata(pass 1)
      -fb_opt fbdata(pass 2) -Ofast -LNO:ignore_feedback=off
      -CG:local_sched_alg=2 -CG:load_exe=0 -OPT:unroll_size=256
      -fno-exceptions -HP:bdt=2m:heap=2m

447.dealII: -march=bdver1 -Ofast -D__OPEN64_FAST_SET -static
      -INLINE:aggressive=on -LNO:opt=0 -LNO:simd=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 -CG:movext_icmp=off
      -TENV:frame_pointer=off

450.soplex: -march=bdver1 -fb_create fbdata(pass 1)
      -fb_opt fbdata(pass 2) -O3 -INLINE:aggressive=on -OPT:RO=1
      -OPT:IEEE_arith=3 -OPT:IEEE_NaN_Inf=off

```

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## Peak Optimization Flags (Continued)

450.soplex (continued):

```
-OPT:fold_unsigned_relops=on -fno-exceptions -m32
-HP:bd=2m:heap=2m -WOPT:sib=on
```

453.povray:

```
-march=bdver1 -fb_create fbdata(pass 1)
-fb_opt fbdata(pass 2) -Ofast -CG:pre_local_sched=off
-INLINE:aggressive=on -HP:bd=2m:heap=2m -OPT:transform=2
-OPT:alias=disjoint -WOPT:aggcm=0
```

Fortran benchmarks:

410.bwaves:

```
-march=bdver1 -fb_create fbdata(pass 1)
-fb_opt fbdata(pass 2) -Ofast -OPT:Ofast -OPT:treeheight=on
-LNO:blocking=off -LNO:ignore_feedback=off -LNO:fu=4
-LNO:loop_model_simd=on -LNO:simd_rm_unity_remainder=on
-WOPT:aggstr=0 -HP:bd=2m:heap=2m -CG:cmp_peep=on
```

416.gamess:

```
-march=bdver1 -fb_create fbdata(pass 1)
-fb_opt fbdata(pass 2) -O3 -LNO:fu=6 -LNO:blocking=0
-LNO:simd=0 -OPT:Ofast -OPT:ro=3 -OPT:unroll_size=256
-OPT:unroll_times_max=2 -CG:local_sched_alg=1
-HP:bd=2m:heap=2m -WOPT:sib=on
```

434.zeusmp:

```
-march=bdver1 -Ofast -LNO:blocking=off -LNO:interchange=off
-HP:bd=2m:heap=2m
```

437.leslie3d:

```
-march=bdver1 -Ofast -CG:pre_minreg_level=2 -LNO:simd=0
-LNO:fusion=2 -HP:bd=2m:heap=2m -mso
```

459.GemsFDTD:

```
-march=bdver1 -Ofast -OPT:unroll_size=0 -LNO:fission=2
-CG:load_exe=0 -CG:local_sched_alg=2 -HP
```

465.tonto:

```
-march=bdver1 -Ofast -OPT:alias=no_f90_pointer_alias
-LNO:blocking=off -CG:load_exe=1 -IPA:plimit=525
-HP:bd=2m:heap=2m
```

Benchmarks using both Fortran and C:

435.gromacs:

```
-march=bdver1 -fb_create fbdata(pass 1)
-fb_opt fbdata(pass 2) -Ofast -OPT:rsqrt=2
-HP:bd=2m:heap=2m
```

436.cactusADM:

```
-march=bdver1 -fb_create fbdata(pass 1)
-fb_opt fbdata(pass 2) -Ofast -LNO:blocking=off
-LNO:prefetch=2 -HP -CG:locs_shallow_depth=1 -CG:load_exe=0
-WOPT:sib=on
```

454.calculix:

```
-march=bdver1 -Ofast -OPT:unroll_size=256
-GRA:optimize_boundary=on -HP:bd=2m:heap=2m
```

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## Peak Optimization Flags (Continued)

```
481.wrf: -march=bdver1 -Ofast -LNO:blocking=off -LANG:copyinout=off  
-IPA:callee_limit=5000 -GRA:prioritize_by_density=on  
-CG:load_exe=1 -HP -WOPT:sib=on
```

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

<http://www.spec.org/cpu2006/flags/x86-open64-425-flags-rate-revA.html>  
<http://www.spec.org/cpu2006/flags/amd1104-platform-rate-revA.html>

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

<http://www.spec.org/cpu2006/flags/x86-open64-425-flags-rate-revA.xml>  
<http://www.spec.org/cpu2006/flags/amd1104-platform-rate-revA.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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