



# SPEC<sup>®</sup> CFP2006 Result

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## IBM Corporation

IBM System x3755 M3  
(AMD Opteron 6376, 2.30 GHz)

SPECfp<sup>®</sup>\_rate2006 = 799

SPECfp\_rate\_base2006 = 719

CPU2006 license: 11

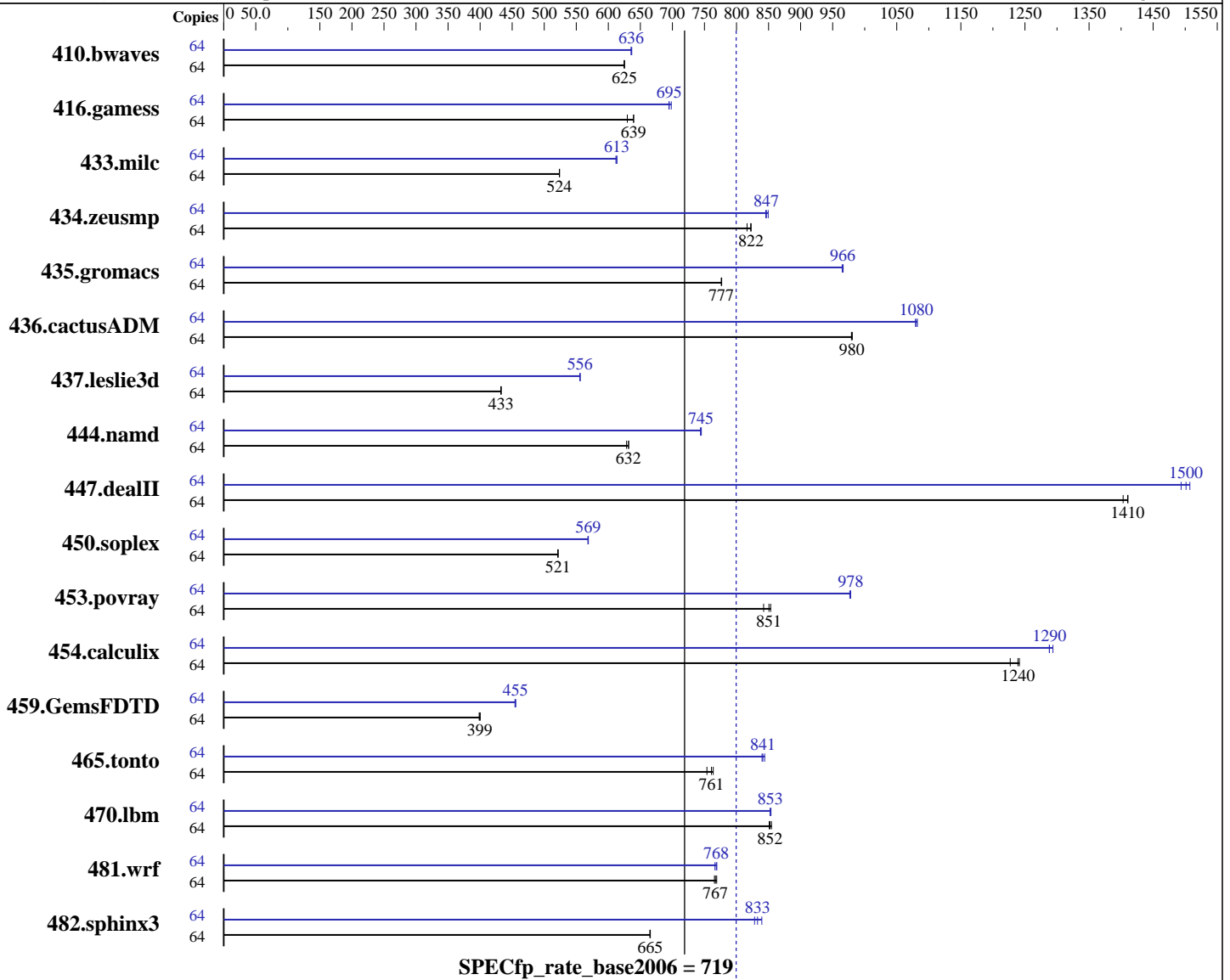
Test sponsor: IBM Corporation

Tested by: IBM Corporation

Test date: Mar-2014

Hardware Availability: Dec-2013

Software Availability: Aug-2012



### Hardware

CPU Name: AMD Opteron 6376  
 CPU Characteristics: AMD Turbo CORE technology up to 3.20 GHz  
 CPU MHz: 2300  
 FPU: Integrated  
 CPU(s) enabled: 64 cores, 4 chips, 16 cores/chip  
 CPU(s) orderable: 2,4 chips

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### Software

Operating System: Red Hat Enterprise Linux Server release 6.4 (Santiago)  
 2.6.32-358.el6.x86\_64  
 Compiler: C/C++/Fortran: Version 4.5.2 of x86 Open64 Compiler Suite (from AMD)  
 Auto Parallel: No  
 File System: ext4  
 System State: Run level 3 (Full multiuser with network)  
 Base Pointers: 64-bit

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Primary Cache: 512 KB I on chip per chip,  
64 KB I shared / 2 cores;  
16 KB D on chip per core

Secondary Cache: 16 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 / 8 cores

Other Cache: None

Memory: 512 GB (32 x 16 GB 2Rx4 PC3-14900R-13, ECC,  
running at 1600 MHz)

Disk Subsystem: 1 x 600 GB SAS, 15000 RPM

Other Hardware: None

Peak Pointers: 32/64-bit  
Other Software: None

## Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	64	1391	625	<u>1391</u>	<u>625</u>	1392	625	64	1366	637	<u>1368</u>	<u>636</u>	1368	636
416.gamess	64	1959	640	<u>1961</u>	<u>639</u>	1990	630	64	1804	695	1795	698	<u>1803</u>	<u>695</u>
433.milc	64	1121	524	1122	524	<u>1122</u>	<u>524</u>	64	<u>958</u>	<u>613</u>	960	612	958	613
434.zeusmp	64	708	823	<u>708</u>	<u>822</u>	713	816	64	689	846	<u>688</u>	<u>847</u>	686	849
435.gromacs	64	589	776	<u>588</u>	<u>777</u>	588	777	64	473	966	474	965	<u>473</u>	<u>966</u>
436.cactusADM	64	<u>780</u>	<u>980</u>	781	979	780	981	64	707	1080	<u>708</u>	<u>1080</u>	709	1080
437.leslie3d	64	1392	432	1390	433	<u>1390</u>	<u>433</u>	64	1083	556	1082	556	<u>1082</u>	<u>556</u>
444.namd	64	<u>813</u>	<u>632</u>	813	632	817	628	64	690	744	689	745	<u>689</u>	<u>745</u>
447.dealII	64	<u>519</u>	<u>1410</u>	519	1410	522	1400	64	<u>488</u>	<u>1500</u>	486	1510	490	1490
450.soplex	64	1024	521	<u>1024</u>	<u>521</u>	1023	522	64	<u>939</u>	<u>569</u>	939	568	938	569
453.povray	64	404	842	399	853	<u>400</u>	<u>851</u>	64	349	977	<u>348</u>	<u>978</u>	348	978
454.calculix	64	<u>426</u>	<u>1240</u>	430	1230	425	1240	64	408	1290	410	1290	<u>410</u>	<u>1290</u>
459.GemsFDTD	64	1697	400	1704	399	<u>1700</u>	<u>399</u>	64	<u>1492</u>	<u>455</u>	1494	454	1490	456
465.tonto	64	<u>828</u>	<u>761</u>	835	754	825	764	64	<u>749</u>	<u>841</u>	746	844	750	840
470.lbm	64	1033	851	<u>1032</u>	<u>852</u>	1029	855	64	1030	854	1032	852	<u>1031</u>	<u>853</u>
481.wrf	64	929	769	<u>932</u>	<u>767</u>	934	766	64	933	766	<u>930</u>	<u>768</u>	929	769
482.sphinx3	64	1874	666	<u>1874</u>	<u>665</u>	1877	665	64	1506	828	<u>1498</u>	<u>833</u>	1486	839

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

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## Operating System Notes (Continued)

Set transparent\_hugepage=never as a boot parameter in /boot/grub/menu.lst

Set vm/nr\_hugepages=57344 in /etc/sysctl.conf  
mount -t hugetlbfs nodev /mnt/hugepages

## Platform Notes

BIOS setting:  
Operating Mode set to Performance

## General Notes

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

HUGETLB\_LIMIT = "896"

LD\_LIBRARY\_PATH = "/cpu2006/amd1206-rate-libs-revA/32:/cpu2006/amd1206-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 6386SE chips + 128GB Memory using RHEL 6.3

## Base Compiler Invocation

C benchmarks:  
openc

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

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## Base Portability Flags (Continued)

```

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

```

## Base Optimization Flags

C benchmarks:

```

-Ofast -OPT:malloc_alg=1 -HP:bd=2m:heap=2m -IPA:plimit=8000
-IPA:small_pu=100 -mso -march=bdver1

```

C++ benchmarks:

```

-Ofast -static -CG:load_exe=0 -OPT:malloc_alg=1 -INLINE:aggressive=on
-HP:bd=2m:heap=2m -D__OPEN64_FAST_SET -march=bdver1

```

Fortran benchmarks:

```

-Ofast -LNO:blocking=off -LNO:simd_peel_align=on -OPT:rsqrt=2
-OPT:unroll_size=256 -HP:bd=2m:heap=2m -mso -march=bdver1

```

Benchmarks using both Fortran and C:

```

-Ofast -OPT:malloc_alg=1 -HP:bd=2m:heap=2m -IPA:plimit=8000
-IPA:small_pu=100 -mso -march=bdver1 -LNO:blocking=off
-LNO:simd_peel_align=on -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



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## 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_LINUX -DSPEC_CPU_CASE_FLAG -DSPEC_CPU_LP64
-fno-second-underscore

```

## Peak Optimization Flags

C benchmarks:

```

433.milc: -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
-march=bdver1

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

482.sphinx3: -fb_create fbdata(pass 1) -fb_opt fbdata(pass 2) -Ofast
-m32 -IPA:plimit=1000 -OPT:malloc_alg=2 -CG:cmp_peep=on
-CG:p2align=0 -CG:load_exe=1 -CG:dsched=on
-INLINE:aggressive=on -LNO:prefetch=2 -LNO:prefetch_ahead=4
-mso -march=bdver2

```

C++ benchmarks:

```

444.namd: -Ofast -IPA:plimit=3000 -LNO:ignore_feedback=off
-CG:local_sched_alg=0 -CG:load_exe=0 -OPT:unroll_size=256
-fno-exceptions -HP:bdt=2m:heap=2m -LNO:if_select_conv=1
-OPT:alias=disjoint -LNO:psimd_iso_unroll=ON -march=bdver1

447.dealII: -Ofast -D__OPEN64_FAST_SET -static -INLINE:aggressive=on
-LNO:opt=1 -LNO:simd=2 -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
-march=bdver1

```

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## Peak Optimization Flags (Continued)

450.soplex: -fb\_create fbdata(pass 1) -fb\_opt fbdata(pass 2) -O3  
-LNO:ignore\_feedback=off -INLINE:aggressive=on -OPT:RO=1  
-OPT:IEEE\_arith=3 -OPT:IEEE\_NaN\_Inf=off  
-OPT:fold\_unsigned\_relops=on -fno-exceptions -CG:p2align=0  
-m32 -mno-fma4 -HP:bdt=2m:heap=2m -WOPT:sib=on  
-march=bdver1

453.povray: -fb\_create fbdata(pass 1) -fb\_opt fbdata(pass 2) -Ofast  
-CG:pre\_local\_sched=off -CG:p2align=0 -CG:p2align\_split=on  
-CG:dsched=on -INLINE:aggressive=on -HP:bd=2m:heap=2m  
-OPT:transform=2 -OPT:alias=disjoint -WOPT:aggcm=0  
-march=bdver2

### Fortran benchmarks:

410.bwaves: -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:bdt=2m:heap=2m -CG:cmp\_peep=on -march=bdver1

416.gamess: -fb\_create fbdata(pass 1) -fb\_opt fbdata(pass 2) -Ofast  
-LNO:fu=6 -LNO:blocking=0 -LNO:simd=2 -OPT:ro=3  
-OPT:recip=on -CG:local\_sched\_alg=1 -HP:bdt=2m:heap=2m  
-WOPT:sib=on -march=bdver1

434.zeusmp: -fb\_create fbdata(pass 1) -fb\_opt fbdata(pass 2) -Ofast  
-LNO:blocking=off -LNO:interchange=off -IPA:plimit=1500  
-HP:bdt=2m:heap=2m -march=bdver1

437.leslie3d: -Ofast -CG:pre\_minreg\_level=2 -LNO:simd=0 -LNO:fusion=2  
-HP:bdt=2m:heap=2m -mso -march=bdver1

459.GemsFDTD: -Ofast -IPA:plimit=1500 -OPT:unroll\_size=1024  
-OPT:unroll\_times\_max=16 -LNO:fission=2  
-CG:local\_sched\_alg=2 -HP -march=bdver1

465.tonto: -Ofast -OPT:alias=no\_f90\_pointer\_alias -LNO:blocking=off  
-CG:load\_exe=1 -CG:local\_sched\_alg=3 -IPA:plimit=525  
-HP:bdt=2m:heap=2m -march=bdver1

### Benchmarks using both Fortran and C:

435.gromacs: -Ofast -OPT:rsqrt=2 -HP:bdt=2m:heap=2m  
-CG:local\_sched\_alg=2 -CG:load\_exe=3 -GRA:unspill=on  
-march=bdver1 -LNO:simd=3

436.cactusADM: -fb\_create fbdata(pass 1) -fb\_opt fbdata(pass 2) -Ofast  
-LNO:blocking=off -LNO:prefetch=2 -LNO:pf2=0  
-LNO:prefetch\_ahead=4 -HP -CG:locs\_shallow\_depth=1  
-CG:load\_exe=0 -CG:dsched=on -WOPT:sib=on -march=bdver1

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## Peak Optimization Flags (Continued)

454.calculix: -Ofast -OPT:unroll\_size=256 -OPT:alias=disjoint  
-GRA:optimize\_boundary=on -CG:dsched=on -HP:bdtd=2m:heap=2m  
-march=bdver1

481.wrf: -Ofast -LNO:blocking=off -LANG:copyinout=off  
-IPA:callee\_limit=5000 -GRA:prioritize\_by\_density=on -HP  
-WOPT:sib=on -march=bdver1

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

<http://www.spec.org/cpu2006/flags/x86-open64-452-flags-rate-revA-III.html>  
<http://www.spec.org/cpu2006/flags/IBM-Platform-Flags-V1.2-AMD-A.html>

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

<http://www.spec.org/cpu2006/flags/x86-open64-452-flags-rate-revA-III.xml>  
<http://www.spec.org/cpu2006/flags/IBM-Platform-Flags-V1.2-AMD-A.xml>

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Tested with SPEC CPU2006 v1.2.  
Report generated on Thu Jul 24 22:17:31 2014 by SPEC CPU2006 PS/PDF formatter v6932.  
Originally published on 6 May 2014.