SPEC® CFP2006 Result

IBM Corporation

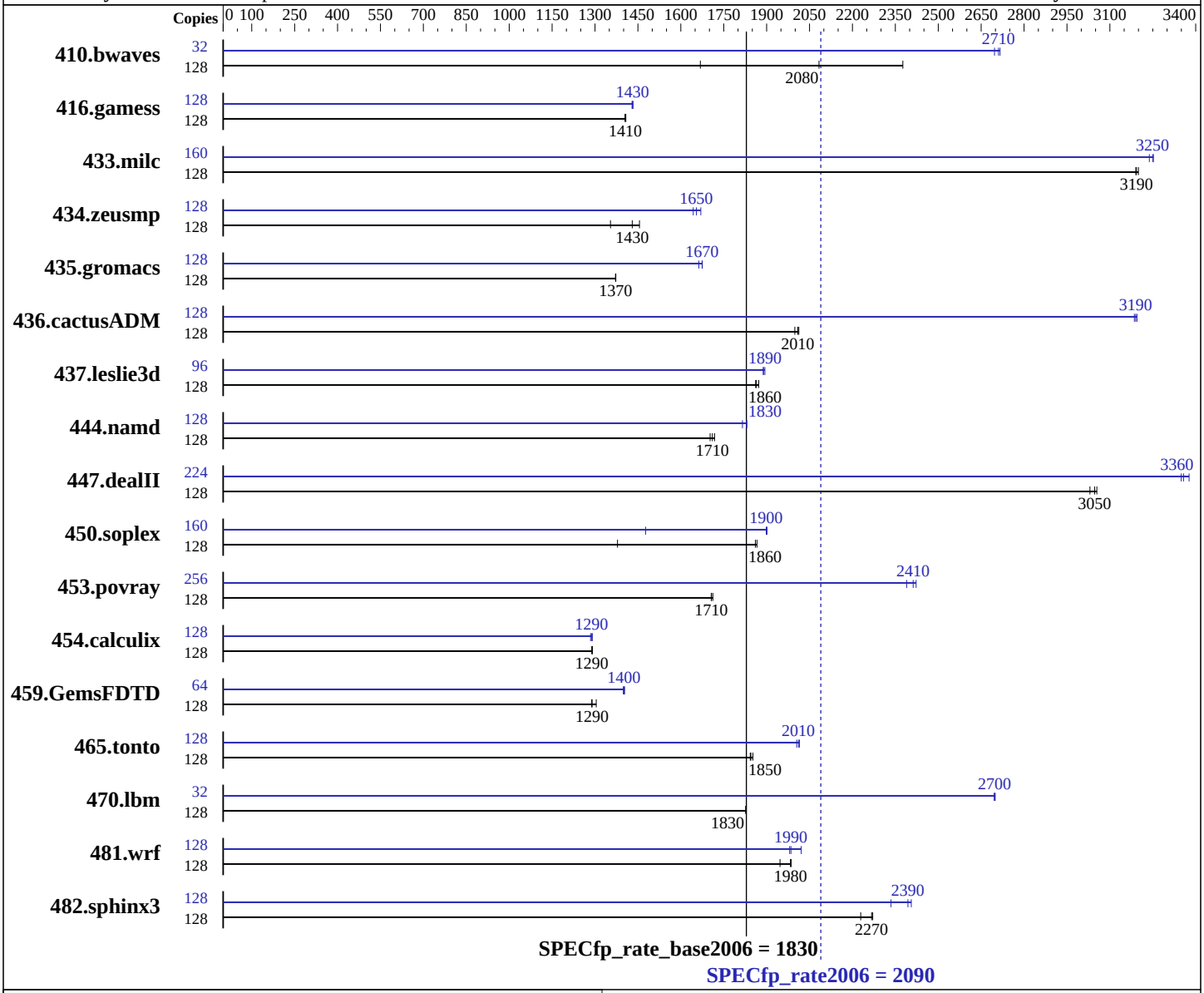
IBM Power E850C (4.22 GHz, 32 core, RHEL)

SPECfp®_rate2006 = 2090

SPECfp_rate_base2006 = 1830

CPU2006 license: 11
Test sponsor: IBM Corporation
Tested by: IBM Corporation

Test date: Sep-2016
Hardware Availability: Oct-2016
Software Availability: Oct-2015



Hardware

CPU Name:	POWER8
CPU Characteristics:	Intelligent Energy Optimization enabled, up to 4.32 GHz
CPU MHz:	4223
FPU:	Integrated
CPU(s) enabled:	32 cores, 8 chips, 4 cores/chip, 8 threads/core
CPU(s) orderable:	4 Modules
Primary Cache:	32 KB I + 64 KB D on chip per core

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Software

Operating System:	Red Hat Enterprise Linux Server release 7.2 (ppc64) kernel <3.10.0-327>
Compiler:	C/C++: Version 13.1 of IBM XL C/C++ for Linux; Fortran: Version 15.1 of IBM XL Fortran for Linux
Auto Parallel:	No
File System:	xfs
System State:	Run level 3 (multi-user)
Base Pointers:	32-bit
Peak Pointers:	32/64-bit

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Secondary Cache:	512 KB I+D on chip per core
L3 Cache:	8 MB I+D on chip per core
Other Cache:	16 MB I+D off chip per CDIMM
Memory:	512 GB (32 x 16 GB CDIMMs) DDR4 1600 MHz
Disk Subsystem:	8 x 600 GB 15K RPM SAS SFF-2 Raid5
Other Hardware:	None

Other Software:	Post-Link Optimization for Linux on POWER, version 5.6.2-7 IBM Advance Toolchain 7.0-9

Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	128	732	2380	**835**	**2080**	1043	1670	32	161	2700	160	2720	**160**	**2710**
416.gamess	128	1784	1400	**1782**	**1410**	1780	1410	128	1753	1430	**1751**	**1430**	1749	1430
433.milc	128	**368**	**3190**	368	3190	367	3200	160	452	3250	454	3240	**452**	**3250**
434.zeusmp	128	**814**	**1430**	800	1460	860	1350	128	709	1640	698	1670	**704**	**1650**
435.gromacs	128	**666**	**1370**	666	1370	666	1370	128	550	1660	**546**	**1670**	546	1680
436.cactusADM	128	765	2000	760	2010	**761**	**2010**	128	480	3190	**479**	**3190**	479	3190
437.leslie3d	128	643	1870	646	1860	**645**	**1860**	96	**478**	**1890**	478	1890	476	1890
444.namd	128	603	1700	598	1720	**600**	**1710**	128	565	1820	561	1830	**561**	**1830**
447.dealII	128	483	3030	479	3050	**481**	**3050**	224	759	3380	**763**	**3360**	765	3350
450.soplex	128	774	1380	**574**	**1860**	572	1870	160	903	1480	**703**	**1900**	702	1900
453.povray	128	**399**	**1710**	398	1710	399	1710	256	570	2390	**565**	**2410**	562	2420
454.calculix	128	**819**	**1290**	819	1290	818	1290	128	**820**	**1290**	822	1280	818	1290
459.GemsFDTD	128	1041	1300	**1053**	**1290**	1054	1290	64	**484**	**1400**	484	1400	485	1400
465.tonto	128	**683**	**1850**	680	1850	683	1840	128	628	2010	**626**	**2010**	625	2010
470.lbm	128	963	1830	962	1830	**962**	**1830**	32	163	2700	163	2700	**163**	**2700**
481.wrf	128	734	1950	720	1990	**721**	**1980**	128	722	1980	708	2020	**720**	**1990**
482.sphinx3	128	1119	2230	**1100**	**2270**	1099	2270	128	1068	2330	1037	2410	**1042**	**2390**

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Peak Tuning Notes

```
410.bwaves fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
416.gamess fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
433.milc fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
434.zeusmp fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
435.gromacs fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
436.cactusADM fdpr options: -O4 -m power8 -A 2 -sls -dir -vrox
437.leslie3d fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
444.namd fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
447.dealII fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
453.povray fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
454.calculix fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
459.GemsFDTD fdpr options: -O4 -m power8 -A 2 -sls -dir -vrox
465.tonto fdpr options: -O4 -m power8 -A 2 -sls -dir -vrox
```

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Peak Tuning Notes (Continued)

```
470.lbm fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
481.wrf fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
482.sphinx3 fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
```

Submit Notes

```
The config file option 'submit' was used
to assign benchmark copy to specific kernel thread using
the "numactl" command (see flags file for details).
```

Operating System Notes

```
ulimit -s (stack) set to unlimited

16000 16M large pages defined with sysctl command
Transparent huge page disabled with
echo never > /sys/kernel/mm/transparent_hugepage/enabled
sysctl vm.nr_hugepages=N and reboot to set large page pool
```

General Notes

```
Environment variables set by runspec before the start of the run:
HUGETLB_MORECORE = "yes"
HUGETLB_VERBOSE = "0"
TCMALLOC_MEMFS_MALLOC_PATH = "/dev/hugepages/"
XLFRTEOPTS = "intrinthds=1"
```

Base Compiler Invocation

C benchmarks:
```
/opt/ibm/xlC/13.1.0/bin/xlc_at -qlanglvl=extc99
```

C++ benchmarks:
```
/opt/ibm/xlC/13.1.0/bin/xlC_at
```

Fortran benchmarks:
```
/opt/ibm/xlf/15.1.0/bin/xlf95_at
```

Benchmarks using both Fortran and C:
```
/opt/ibm/xlC/13.1.0/bin/xlc_at -qlanglvl=extc99
/opt/ibm/xlf/15.1.0/bin/xlf95_at
```

Base Portability Flags

410.bwaves: -qfixed
416.gamess: -qfixed
434.zeusmp: -qfixed
435.gromacs: -qfixed -qextname
436.cactusADM: -qfixed -qextname
437.leslie3d: -qfixed
454.calculix: -qfixed -qextname
481.wrf: -DNOUNDERSCORE
482.sphinx3: -qchars=signed

Base Optimization Flags

C benchmarks:
-qinline=40 -qipa=threads -qlargepage -O5 -qsimd=noauto -lhugetlbfs

C++ benchmarks:
-qinline=40 -qipa=threads -qlargepage -O5 -qrtti -lhugetlbfs

Fortran benchmarks:
-qipa=threads -qlargepage -O5 -qalias=nostd -lhugetlbfs

Benchmarks using both Fortran and C:
-qinline=40 -qipa=threads -qlargepage -O5 -qsimd=noauto
-qalias=nostd -lhugetlbfs

Base Other Flags

C benchmarks:
-qipa=noobject -qsuppress=1500-036

C++ benchmarks:
-qipa=noobject -qsuppress=1500-036

Fortran benchmarks:
-qipa=noobject -qsuppress=1500-010 -qsuppress=cmpmsg
-qsuppress=1500-036

Benchmarks using both Fortran and C:
-qipa=noobject -qsuppress=1500-010 -qsuppress=cmpmsg
-qsuppress=1500-036

Peak Compiler Invocation

C benchmarks:
/opt/ibm/xlC/13.1.0/bin/xlc_at -qlanglvl=extc99

C++ benchmarks:
/opt/ibm/xlC/13.1.0/bin/xlC_at

Fortran benchmarks:
/opt/ibm/xlf/15.1.0/bin/xlf95_at

Benchmarks using both Fortran and C:
/opt/ibm/xlC/13.1.0/bin/xlc_at -qlanglvl=extc99
/opt/ibm/xlf/15.1.0/bin/xlf95_at

Peak Portability Flags

410.bwaves: -qfixed
416.gamess: -qfixed
434.zeusmp: -qfixed
435.gromacs: -qfixed -qextname
436.cactusADM: -DSPEC_CPU_LP64 -qfixed -qextname
437.leslie3d: -qfixed
454.calculix: -qfixed -qextname
481.wrf: -DNOUNDERSCORE
482.sphinx3: -qchars=signed

Peak Optimization Flags

C benchmarks:

433.milc: -qinline=40 -qipa=threads -qlargepage -O5 -qsimd=noauto -qfdpr -lhugetlbfs -Wl,-q

470.lbm: -qinline=40 -qipa=threads -qpdf1(pass 1) -qpdf2(pass 2) -qlargepage -O5 -qsimd=noauto -q64 -qfdpr -lhugetlbfs -Wl,-q

482.sphinx3: -qinline=40 -qipa=threads -qpdf1(pass 1) -qpdf2(pass 2) -qlargepage -O5 -qsimd=noauto -qfdpr -lhugetlbfs -Wl,-q

C++ benchmarks:

444.namd: -qinline=40 -qipa=threads -qlargepage -O4 -qfdpr -lhugetlbfs -Wl,-q

447.dealII: -qinline=40 -qipa=threads -qpdf1(pass 1) -qpdf2(pass 2) -qlargepage -O4 -qfdpr -qrtti -lhugetlbfs -Wl,-q

Continued on next page

Peak Optimization Flags (Continued)

450.soplex: -qinline=40 -qipa=threads -qpdf1(pass 1) -qpdf2(pass 2) -qlargepage -O3 -qarch=auto -qtune=auto -qsimd -qnoprefetch -lhugetlbfs

453.povray: -qinline=40 -qipa=threads -qpdf1(pass 1) -qpdf2(pass 2) -qlargepage -O3 -qarch=auto -qtune=auto -qprefetch=dscr=0x93 -qfdpr -lhugetlbfs -Wl,-q

Fortran benchmarks:

410.bwaves: -qipa=threads -qlargepage -O5 -qsimd=noauto -qfdpr -qsmallstack=dynlenonheap -lhugetlbfs -Wl,-q

416.gamess: -qipa=threads -qlargepage -O5 -qsimd=noauto -qprefetch=dscr=0x54 -qipa=partition=large -qfdpr -qalias=nostd -lhugetlbfs -Wl,-q

434.zeusmp: -qipa=threads -qlargepage -O4 -qsimd=noauto -q64 -qfdpr -qxlf90=nosignedzero -lhugetlbfs -Wl,-q

437.leslie3d: -qipa=threads -qpdf1(pass 1) -qpdf2(pass 2) -qlargepage -O5 -q64 -qfdpr -lhugetlbfs -Wl,-q -B/opt/at7.0/share/libhugetlbfs/ -tl -Wl,--hugetlbfs-align

459.GemsFDTD: -qipa=threads -qpdf1(pass 1) -qpdf2(pass 2) -qlargepage -O5 -q64 -qipa=partition=large -qfdpr -lhugetlbfs -Wl,-q

465.tonto: Same as 459.GemsFDTD

Benchmarks using both Fortran and C:

435.gromacs: -qinline=40 -qipa=threads -qpdf1(pass 1) -qpdf2(pass 2) -qlargepage -O4 -qipa=partition=large -qfdpr -lhugetlbfs -Wl,-q

436.cactusADM: -qinline=40 -qipa=threads -qpdf1(pass 1) -qpdf2(pass 2) -qlargepage -O4 -qarch=pwr7 -qtune=pwr7 -qipa=partition=large -q64 -qfdpr -lhugetlbfs -Wl,-q

454.calculix: -qinline=40 -qipa=threads -O5 -qsimd=noauto -qfdpr -lhugetlbfs -Wl,-q

481.wrf: -qinline=40 -qipa=threads -qlargepage -O5 -qipa=partition=large -qfdpr -lhugetlbfs -Wl,-q

Peak Other Flags

C benchmarks (except as noted below):
`-qsuppress=1586-476`(pass 2) `-qipa=noobject -qsuppress=1500-036`

433.milc: `-qipa=noobject -qsuppress=1500-036`

C++ benchmarks (except as noted below):
`-qsuppress=1586-476`(pass 2) `-qipa=noobject -qsuppress=1500-036`

444.namd: `-qipa=noobject -qsuppress=1500-036`

Fortran benchmarks (except as noted below):
`-qipa=noobject -qsuppress=1500-010 -qsuppress=cmpmsg`
`-qsuppress=1500-036`

437.leslie3d: `-qsuppress=1586-476`(pass 2) `-qipa=noobject`
`-qsuppress=1500-010 -qsuppress=cmpmsg -qsuppress=1500-036`

459.GemsFDTD: `-qsuppress=1586-476`(pass 2) `-qipa=noobject`
`-qsuppress=1500-010 -qsuppress=cmpmsg -qsuppress=1500-036`

465.tonto: `-qsuppress=1586-476`(pass 2) `-qipa=noobject`
`-qsuppress=1500-010 -qsuppress=cmpmsg -qsuppress=1500-036`

Benchmarks using both Fortran and C (except as noted below):
`-qsuppress=1586-476`(pass 2) `-qipa=noobject -qsuppress=1500-010`
`-qsuppress=cmpmsg -qsuppress=1500-036`

454.calculix: `-qsuppress=1500-010 -qsuppress=cmpmsg -qsuppress=1500-036`

481.wrf: `-qipa=noobject -qsuppress=1500-010 -qsuppress=cmpmsg`
`-qsuppress=1500-036`

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2006/flags/IBM-XL.V13La.html
http://www.spec.org/cpu2006/flags/IBM-Linux-V7.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2006/flags/IBM-XL.V13La.xml
http://www.spec.org/cpu2006/flags/IBM-Linux-V7.xml

For questions about this result, please contact the tester.
For other inquiries, please contact webmaster@spec.org.

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