SPEC® CFP2006 Result

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IBM Corporation

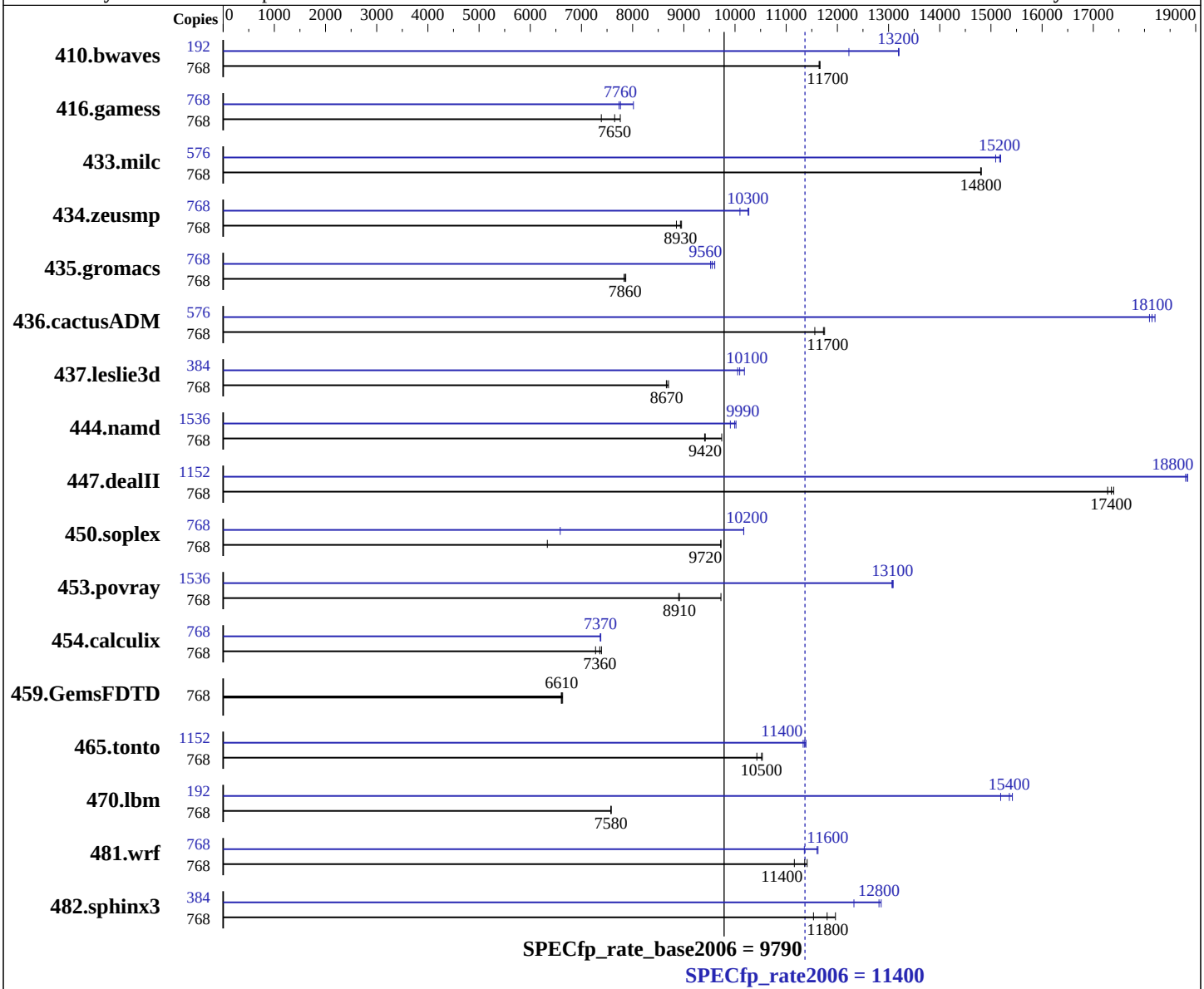
IBM Power E880 (4.0 GHz, 192 core, RHEL)

SPECfp®_rate2006 = 11400

SPECfp_rate_base2006 = 9790

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

Test date: Apr-2015
Hardware Availability: Jun-2015
Software Availability: Mar-2015



Hardware

CPU Name:	POWER8
CPU Characteristics:	Intelligent Energy Optimization enabled, up to 4.256 GHz
CPU MHz:	4000
FPU:	Integrated
CPU(s) enabled:	192 cores, 16 chips, 12 cores/chip, 8 threads/core
CPU(s) orderable:	4,8,12,16 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 7.1 (ppc64) kernel <3.10.0-229.1.2.el7.ppc64>
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: 4 TB (128 x 32 GB CDIMMs) DDR3 1600 MHz
Disk Subsystem: 16 x 300 GB 15K RPM SAS SFF-2 Raid5
Other Hardware: None

Other Software: Post-Link Optimization for Linux on POWER, version 5.6.2
IBM Advance Toolchain 7.0-3

Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	768	896	11600	895	11700	**896**	**11700**	192	**198**	**13200**	198	13200	213	12200
416.gamess	768	1938	7760	**1966**	**7650**	2035	7390	768	**1937**	**7760**	1944	7730	1876	8020
433.milc	768	476	14800	**476**	**14800**	476	14800	576	348	15200	350	15100	**349**	**15200**
434.zeusmp	768	789	8850	**782**	**8930**	780	8960	768	692	10100	**682**	**10300**	680	10300
435.gromacs	768	700	7830	697	7870	**698**	**7860**	768	576	9520	571	9600	**574**	**9560**
436.cactusADM	768	794	11600	781	11800	**783**	**11700**	576	378	18200	380	18100	**379**	**18100**
437.leslie3d	768	830	8700	834	8660	**833**	**8670**	384	354	10200	359	10100	**358**	**10100**
444.namd	768	**654**	**9420**	632	9740	655	9410	1536	1243	9910	1229	10000	**1233**	**9990**
447.dealII	768	**506**	**17400**	508	17300	505	17400	1152	701	18800	**700**	**18800**	699	18800
450.soplex	768	1011	6330	659	9730	**659**	**9720**	768	973	6580	**630**	**10200**	630	10200
453.povray	768	**458**	**8910**	459	8900	420	9730	1536	**625**	**13100**	624	13100	625	13100
454.calculix	768	871	7280	857	7390	**861**	**7360**	768	**859**	**7370**	859	7380	860	7370
459.GemsFDTD	768	1233	6610	**1233**	**6610**	1229	6630	768	1233	6610	**1233**	**6610**	1229	6630
465.tonto	768	717	10500	725	10400	**718**	**10500**	1152	996	11400	1000	11300	**998**	**11400**
470.lbm	768	**1392**	**7580**	1392	7580	1393	7580	192	**172**	**15400**	171	15400	174	15200
481.wrf	768	769	11200	**755**	**11400**	752	11400	768	756	11400	**739**	**11600**	738	11600
482.sphinx3	768	1298	11500	1251	12000	**1269**	**11800**	384	607	12300	**584**	**12800**	582	12900

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

59520 16M large pages defined with
echo 59520 > /proc/sys/vm/nr_hugepages
echo 129600 > /proc/sys/vm/nr_overcommit_hugepages
Transparent huge page enabled with
echo always > /sys/kernel/mm/transparent_hugepage/enabled
```

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"

This result uses the post_setup and/or bench_post_setup to drop caches. SPEC has
determined that although the effect may have been negligible for this run, future
submissions will not be considered rule compliant if the post_setup actions drop
caches (e.g. : "echo 3 > /proc/sys/vm/drop_caches").
```

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

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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: basepeak = yes

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

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`

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

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