SPEC® CINT2006 Result

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IBM Corporation

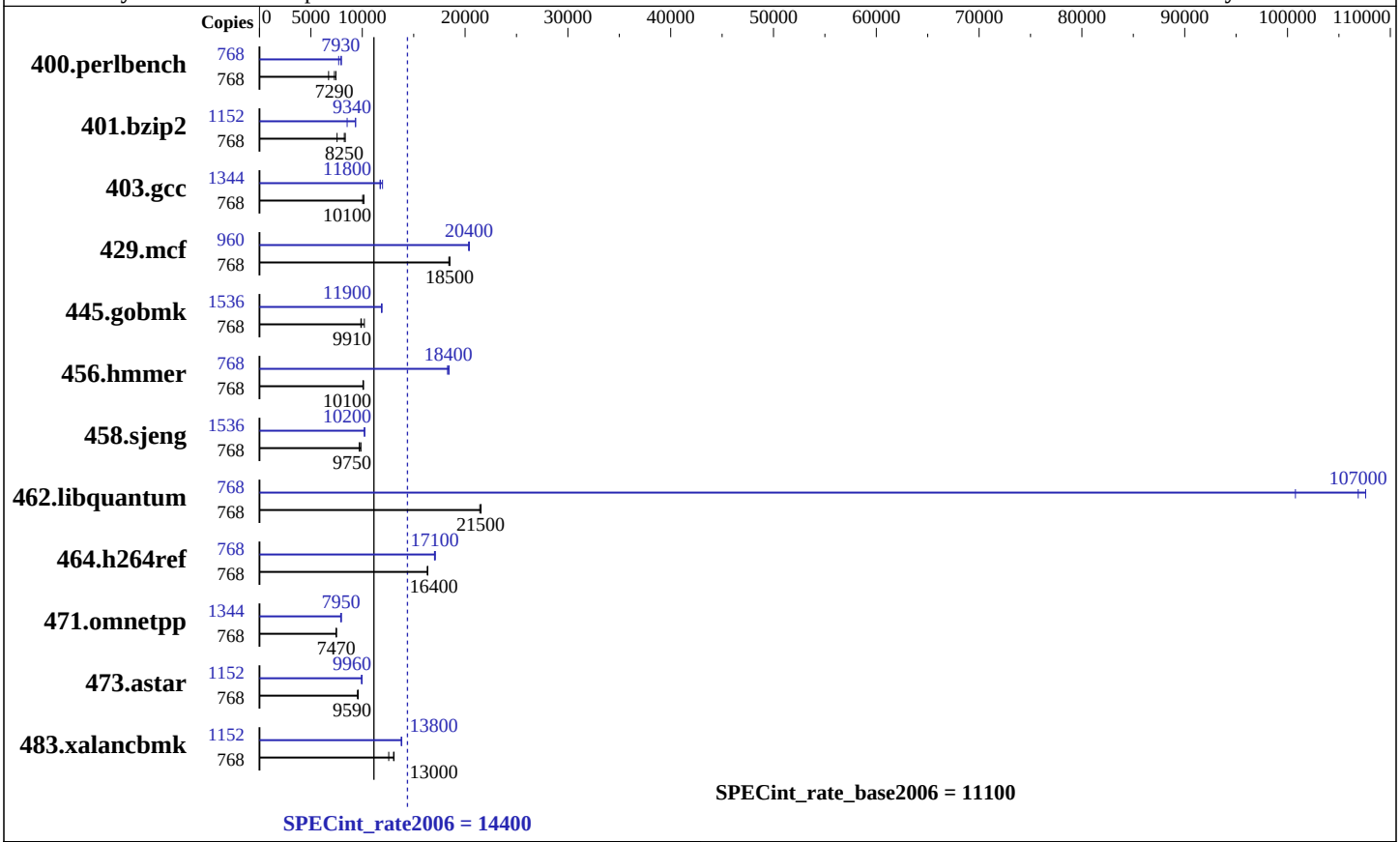
IBM Power E880 (4.0 GHz, 192 core, RHEL)

SPECint®_rate2006 = 14400

SPECint_rate_base2006 = 11100

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
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

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
Auto Parallel:	No
File System:	xfs
System State:	Run level 3 (multi-user)
Base Pointers:	32-bit
Peak Pointers:	32/64-bit
Other Software:	Post-Link Optimization for Linux on POWER, version 5.6.2 IBM Advance Toolchain 7.0-3

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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
400.perlbench	768	1116	6720	1009	7440	**1029**	**7290**	768	974	7700	941	7970	**947**	**7930**
401.bzip2	768	982	7550	**898**	**8250**	888	8350	1152	1304	8530	1189	9350	**1190**	**9340**
403.gcc	768	616	10000	**610**	**10100**	609	10100	1344	922	11700	**920**	**11800**	904	12000
429.mcf	768	**379**	**18500**	378	18500	380	18400	960	430	20300	**429**	**20400**	429	20400
445.gobmk	768	817	9860	**813**	**9910**	790	10200	1536	1358	11900	**1355**	**11900**	1353	11900
456.hmmer	768	712	10100	**710**	**10100**	708	10100	768	**390**	**18400**	392	18300	389	18400
458.sjeng	768	958	9700	941	9870	**953**	**9750**	1536	1820	10200	**1819**	**10200**	1817	10200
462.libquantum	768	742	21400	**739**	**21500**	738	21600	768	158	101000	**149**	**107000**	148	108000
464.h264ref	768	1041	16300	1038	16400	**1040**	**16400**	768	998	17000	993	17100	**997**	**17100**
471.omnetpp	768	644	7450	641	7490	**642**	**7470**	1344	1063	7900	**1056**	**7950**	1055	7960
473.astar	768	561	9600	**562**	**9590**	566	9530	1152	815	9920	**812**	**9960**	812	9960
483.xalancbmk	768	421	12600	405	13100	**406**	**13000**	1152	**576**	**13800**	576	13800	574	13800

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

Peak Tuning Notes

```
400.perlbench fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
401.bzip2 fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
403.gcc fdpr options: -O4 -m power8 -A 2 -sls -dir -vrox
429.mcf fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
456.hmmer fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
458.sjeng fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
462.libquantum fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
464.h264ref fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
471.omnetpp fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
473.astar fdpr options: -O4 -m power8 -A 2 -rcl 2 -sls -dir -vrox
483.xalancbmk 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 115200 > /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
```

Base Portability Flags

400.perlbench: `-DSPEC_CPU_LINUX_PPC`
462.libquantum: `-DSPEC_CPU_LINUX`
464.h264ref: `-qchars=signed`
483.xalancbmk: `-DSPEC_CPU_LINUX`

Base Optimization Flags

C benchmarks:
```
-qinline=40 -qipa=threads -qlargepage -O5 -qalias=noansi -qalloca
-lhugetlbfs
```

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

Base Other Flags

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

C++ benchmarks:
```
-qipa=noobject -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

Peak Portability Flags

400.perlbench: -DSPEC_CPU_LINUX_PPC
403.gcc: -DSPEC_CPU_LP64
462.libquantum: -DSPEC_CPU_LINUX
464.h264ref: -qchars=signed
483.xalancbmk: -DSPEC_CPU_LINUX

Peak Optimization Flags

C benchmarks:

400.perlbench: -qinline=40 -qpdf1(pass 1) -qpdf2(pass 2) -O3 -qarch=auto
-qtune=auto -qfdpr -qalias=noansi -lhugetlbfs -Wl,-q

401.bzip2: -qinline=40 -qipa=threads -qpdf1(pass 1) -qpdf2(pass 2)
-O4 -qsimd=noauto -qlargepage -qfdpr -lhugetlbfs -Wl,-q

403.gcc: -qinline=40 -qipa=threads -qpdf1(pass 1) -qpdf2(pass 2)
-O4 -q64 -qlargepage -qfdpr -qalloca -lhugetlbfs -Wl,-q

429.mcf: -qinline=40 -qipa=threads -qpdf1(pass 1) -qpdf2(pass 2)
-O5 -qlargepage -qnoprefetch -qfdpr -lhugetlbfs -Wl,-q

445.gobmk: -qinline=40 -qipa=threads -qpdf1(pass 1) -qpdf2(pass 2)
-O5 -qlargepage -lhugetlbfs

456.hmmer: -qinline=40 -qipa=threads -O5 -qlargepage
-qassert=refalign -qfdpr -lhugetlbfs -Wl,-q

458.sjeng: -qinline=40 -qipa=threads -qpdf1(pass 1) -qpdf2(pass 2)
-O3 -qarch=auto -qtune=auto -qprefetch=dscr=0x54 -qfdpr
-lhugetlbfs -Wl,-q

462.libquantum: -qinline=40 -qipa=threads -qpdf1(pass 1) -qpdf2(pass 2)
-O5 -qsimd=noauto -qinline=400 -q64 -qlargepage -qfdpr
-lhugetlbfs -Wl,-q

464.h264ref: -qinline=40 -qipa=threads -qpdf1(pass 1) -qpdf2(pass 2)
-O5 -qfdpr -lhugetlbfs -Wl,-q

Continued on next page

Peak Optimization Flags (Continued)

C++ benchmarks:

471.omnetpp: `-qinline=40 -qipa=threads -qpdf1`(pass 1) `-qpdf2`(pass 2)
`-O5 -qsimd=noauto -qarch=pwr7 -qtune=pwr7`
`-qprefetch=dscr=0x54 -qfdpr -qrtti -lhugetlbfs -Wl,-q`
`-ltcmalloc`

473.astar: `-qinline=40 -qipa=threads -qpdf1`(pass 1) `-qpdf2`(pass 2)
`-O5 -qlargepage -qprefetch=dscr=0x93 -qfdpr -lhugetlbfs`
`-Wl,-q -ltcmalloc`

483.xalancbmk: `-qinline=40 -qipa=threads -qpdf1`(pass 1) `-qpdf2`(pass 2)
`-O3 -qarch=auto -qtune=auto -qsimd -qlargepage`
`-qprefetch=dscr=0x93 -qipa=partition=large -qfdpr`
`-lhugetlbfs -Wl,-q -ltcmalloc`

Peak Other Flags

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

400.perlbench: `-qsuppress=1586-476`(pass 2) `-qsuppress=1500-036`

456.hmmer: `-qipa=noobject -qsuppress=1500-036`

C++ benchmarks:
`-qsuppress=1586-476`(pass 2) `-qipa=noobject -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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