SPEC® CINT2006 Result

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IBM Corporation

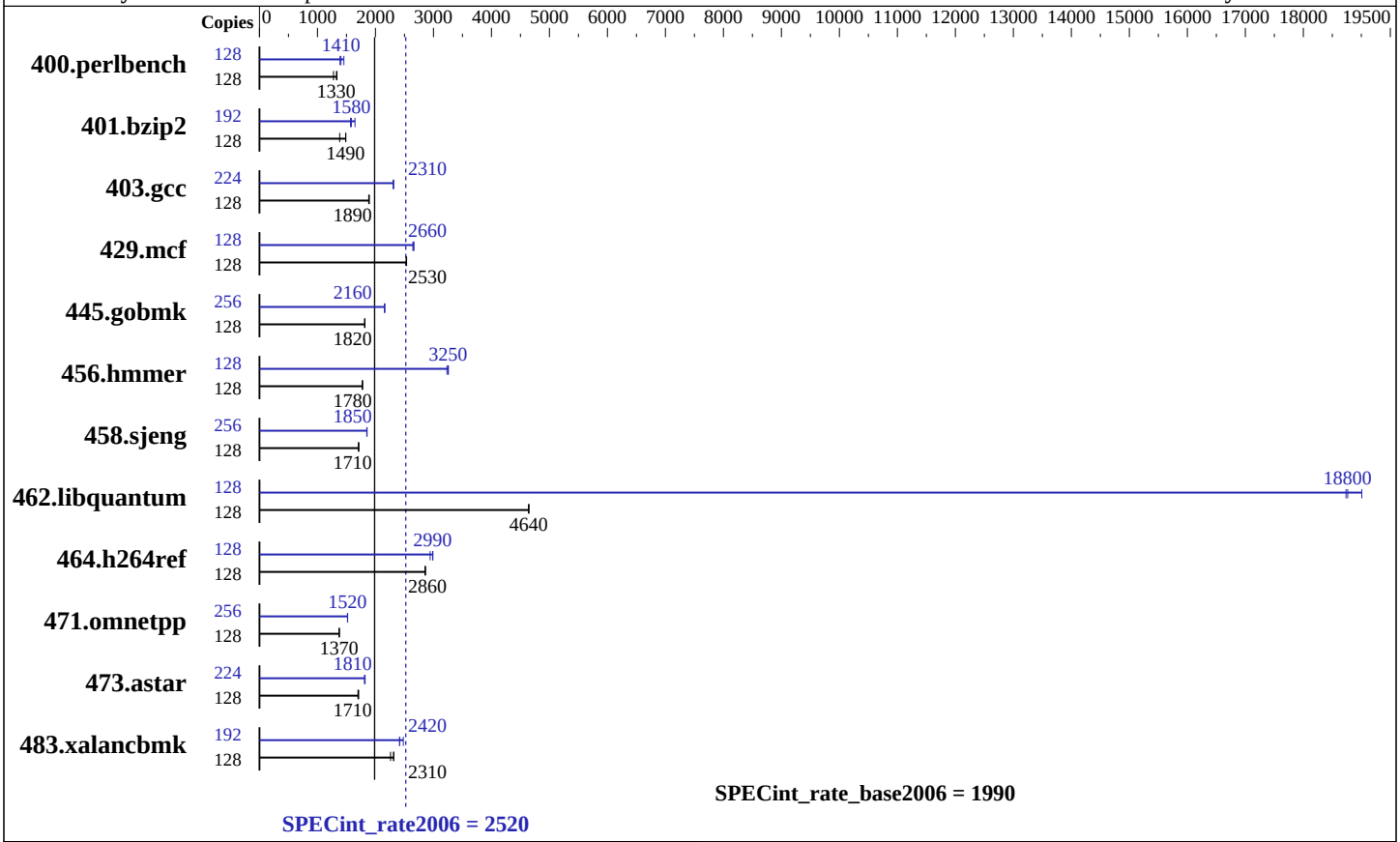
IBM Power E850C (4.22 GHz, 32 core, RHEL)

SPECint®_rate2006 = 2520

SPECint_rate_base2006 = 1990

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
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

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
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 5.6.2-7 IBM Advance Toolchain 7.0-9

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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	128	980	1280	**942**	**1330**	936	1340	128	901	1390	**889**	**1410**	859	1460
401.bzip2	128	893	1380	830	1490	**830**	**1490**	192	1180	1570	**1169**	**1580**	1125	1650
403.gcc	128	547	1880	**546**	**1890**	544	1890	224	783	2300	**781**	**2310**	779	2310
429.mcf	128	461	2530	460	2540	**461**	**2530**	128	438	2660	**439**	**2660**	441	2640
445.gobmk	128	740	1810	739	1820	**739**	**1820**	256	1246	2160	1242	2160	**1245**	**2160**
456.hmmer	128	672	1780	**672**	**1780**	674	1770	128	**367**	**3250**	369	3230	367	3260
458.sjeng	128	907	1710	906	1710	**906**	**1710**	256	**1672**	**1850**	1669	1860	1674	1850
462.libquantum	128	**571**	**4640**	571	4650	572	4640	128	140	19000	**141**	**18800**	142	18700
464.h264ref	128	**991**	**2860**	993	2850	989	2860	128	**949**	**2990**	947	2990	962	2940
471.omnetpp	128	582	1370	581	1380	**582**	**1370**	256	**1053**	**1520**	1054	1520	1053	1520
473.astar	128	**527**	**1710**	526	1710	529	1700	224	**867**	**1810**	863	1820	867	1810
483.xalancbmk	128	391	2260	382	2320	**382**	**2310**	192	549	2420	**548**	**2420**	534	2480

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

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
```

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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