



# SPEC® CINT2006 Result

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## IBM Corporation

SPECint®\_rate2006 = 2520

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

SPECint\_rate\_base2006 = 1990

CPU2006 license: 11

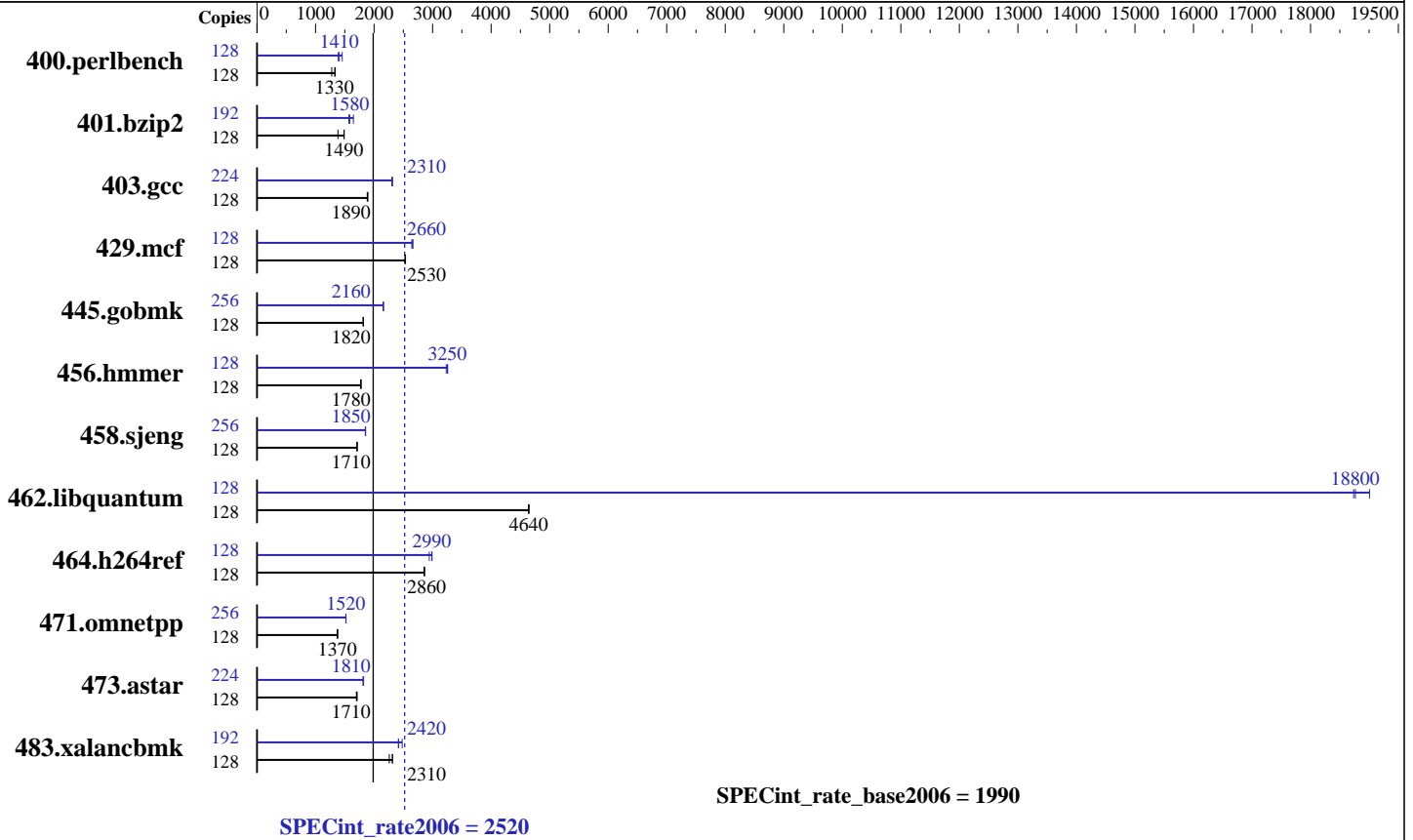
Test sponsor: IBM Corporation

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



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## General Notes

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

```
HUGETLB_MORECORE = "yes"
HUGETLB_VERBOSE = "0"
TCMALLOC_MEMFS_MALLOCPATH = "/dev/hugepages/"
XLFRTOPTIONS = "intrinths=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
```



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## 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

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## 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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