SPEC® CFP2006 Result

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IBM Corporation

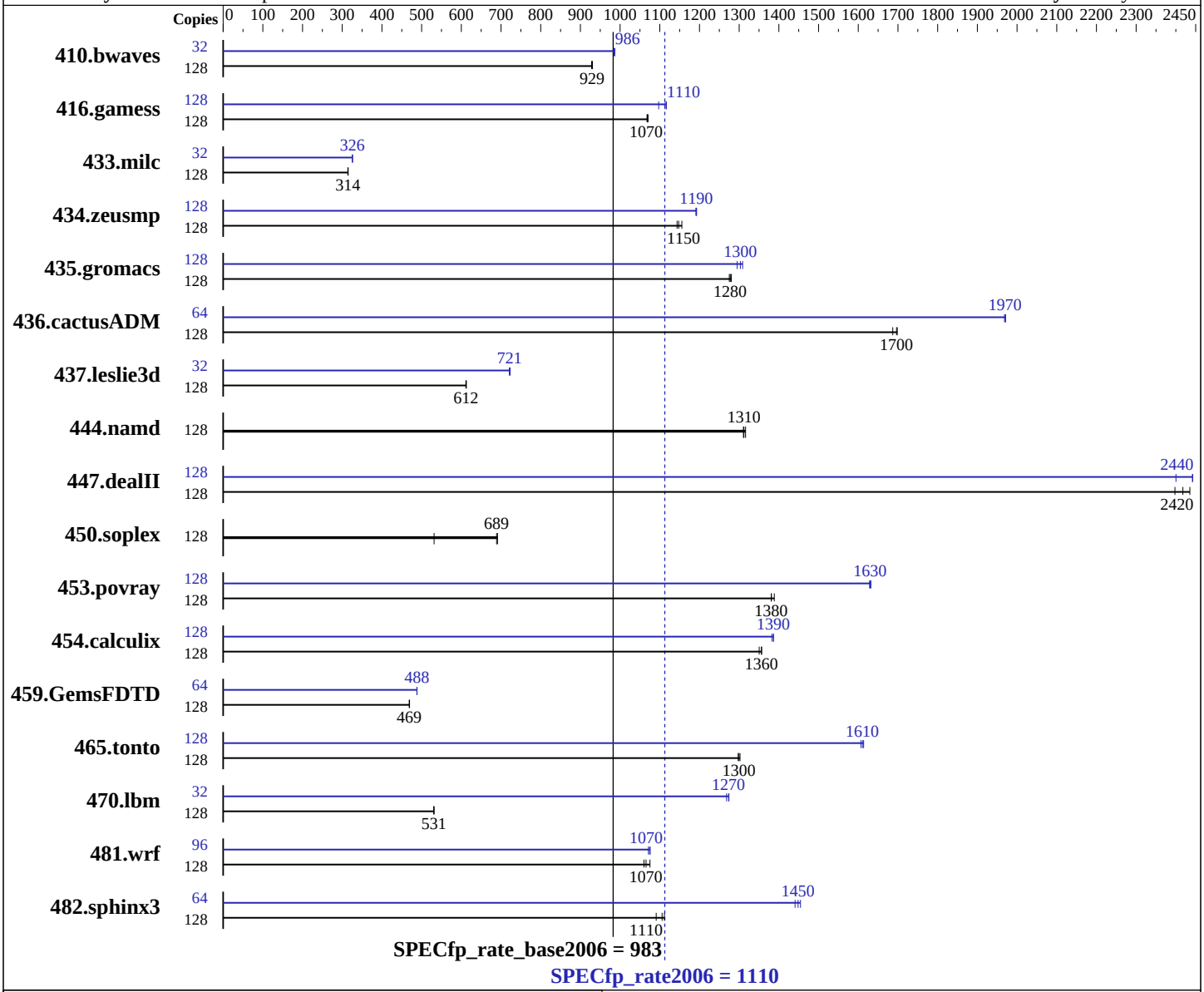
IBM PowerLinux 7R4 (4.0 GHz, 32 core, RHEL, GCC)

SPECfp®_rate2006 = 1110

SPECfp_rate_base2006 = 983

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

Test date: May-2013
Hardware Availability: Aug-2013
Software Availability: May-2013



Hardware

CPU Name:	POWER7+
CPU Characteristics:	Intelligent Energy Optimization enabled, up to 4.431 GHz
CPU MHz:	4060
FPU:	Integrated
CPU(s) enabled:	32 cores, 8 chips, 4 cores/chip, 4 threads/core
CPU(s) orderable:	16, 32 cores
Primary Cache:	32 KB I + 32 KB D on chip per core

Continued on next page

Software

Operating System:	Red Hat Enterprise Linux Server release 6.4 (ppc64) kernel 2.6.32-358.6.1.el6.ppc64
Compiler:	C/C++/Fortran: Version 4.7.3 of IBM Advance Toolchain 6.0-4 gcc/g++/gfortran compiler
Auto Parallel:	No
File System:	ext4
System State:	Run level 3 (multi-user)
Base Pointers:	32-bit
Peak Pointers:	32/64-bit

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Secondary Cache: 256 KB I+D on chip per core
L3 Cache: 10 MB I+D on chip per core
Other Cache: None
Memory: 256 GB (64 x 4 GB) DDR3 1066 MHz
Disk Subsystem: 1 x 300 GB SAS SFF 15K RPM
Other Hardware: None

Other Software: -IBM Advance Toolchain 6.0-4 -IBM Mathematical Acceleration Subsystem (MASS) libraries 7.1.0.2 -Post-Link Optimization for Linux on POWER, version 5.6.2-1

Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	128	1874	928	1870	930	**1872**	**929**	32	**441**	**986**	441	987	441	985
416.gamess	128	**2346**	**1070**	2341	1070	2347	1070	128	2284	1100	2244	1120	**2251**	**1110**
433.milc	128	3739	314	3730	315	**3738**	**314**	32	**902**	**326**	903	325	901	326
434.zeusmp	128	1019	1140	1008	1160	**1015**	**1150**	128	977	1190	978	1190	**977**	**1190**
435.gromacs	128	717	1280	714	1280	**715**	**1280**	128	698	1310	**701**	**1300**	706	1290
436.cactusADM	128	901	1700	907	1690	**902**	**1700**	64	389	1970	**388**	**1970**	388	1970
437.leslie3d	128	1964	613	**1966**	**612**	1968	611	32	417	721	416	723	**417**	**721**
444.namd	128	783	1310	780	1320	**782**	**1310**	128	783	1310	780	1320	**782**	**1310**
447.dealII	128	**606**	**2420**	611	2400	601	2440	128	610	2400	599	2440	**600**	**2440**
450.soplex	128	2009	531	1545	691	**1550**	**689**	128	2009	531	1545	691	**1550**	**689**
453.povray	128	490	1390	493	1380	**493**	**1380**	128	417	1630	**418**	**1630**	418	1630
454.calculix	128	778	1360	**779**	**1360**	782	1350	128	762	1390	764	1380	**762**	**1390**
459.GemsFDTD	128	2892	470	**2895**	**469**	2896	469	64	1391	488	1390	488	**1391**	**488**
465.tonto	128	971	1300	**969**	**1300**	967	1300	128	781	1610	784	1610	**782**	**1610**
470.lbm	128	3314	531	**3314**	**531**	3310	531	32	**345**	**1270**	347	1270	345	1270
481.wrf	128	1348	1060	1330	1080	**1342**	**1070**	96	997	1080	**998**	**1070**	1001	1070
482.sphinx3	128	2244	1110	2287	1090	**2256**	**1110**	64	858	1450	**861**	**1450**	866	1440

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

Compiler Invocation Notes

For more information about IBM Advance Toolchain, including support, see
ftp://ftp.unicamp.br/pub/linuxpatch/toolchain/at/redhat/RHEL6/at6.0/release_notes.at6.0-6.0-4.html

Peak Tuning Notes

Post-Link optimization tool used for:
410.bwaves
with options -O4 -omullX for optimization phase,
and -imullX for instrumentation phase
416.gamess
with options -O4 -omullX for optimization phase,
and -imullX for instrumentation phase
429.mcf

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Peak Tuning Notes (Continued)

```
     with options -O4 -omullX for optimization phase,
     and -imullX for instrumentation phase
433.milc
     with options -O4 -omullX for optimization phase,
     and -imullX for instrumentation phase
434.zeusmp
     with options -O4 -omullX for optimization phase,
     and -imullX for instrumentation phase
437.leslie3d
     with options -O4 -omullX for optimization phase,
     and -imullX for instrumentation phase
453.povray
     with options -O4 -omullX for optimization phase,
     and -imullX for instrumentation phase
454.calculix
     with options -O4 -omullX for optimization phase,
     and -imullX for instrumentation phase
459.GemsFDTD
     with options -O4 -omullX for optimization phase,
     and -imullX for instrumentation phase
465.tonto
     with options -O4 -omullX for optimization phase,
     and -imullX for instrumentation phase
470.lbm
     with options -O4 -omullX for optimization phase,
     and -imullX for instrumentation phase
481.wrf
     with options -O4 -omullX for optimization phase,
     and -imullX for instrumentation phase
```

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 1048576.

Large pages reserved as follows by root user:
echo 8448 > /proc/sys/vm/nr_hugepages

The Mathematical Acceleration Subsystem libraries
are shipped with IBM XL C/C++ version 12.1 and
IBM XL Fortran version 14.1 compiler products.

crashkernel was set to 256 MB in /etc/yaboot.conf file.
```

General Notes

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

Base Compiler Invocation

C benchmarks:
```
/opt/at6.0/bin/gcc
```

C++ benchmarks:
```
/opt/at6.0/bin/g++
```

Fortran benchmarks:
```
/opt/at6.0/bin/gfortran
```

Benchmarks using both Fortran and C:
```
/opt/at6.0/bin/gcc /opt/at6.0/bin/gfortran
```

Base Portability Flags

447.dealII: `-DSPEC_CPU_LINUX`
481.wrf: `-DSPEC_CPU_CASE_FLAG -DSPEC_CPU_LINUX_PPC`
482.sphinx3: `-fsigned-char`

Base Optimization Flags

C benchmarks:
```
-ffast-math -O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt
-fpeel-loops -funroll-loops -mpopcntd -m32 -fvect-cost-model
-mveclibabi=mass -Wl,-q -Wl,-Map=link.map,--cref -L /opt/at6.0/lib
-L /opt/ibmcmp/xlmass/7.1/lib -Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass
```

C++ benchmarks:
```
-ffast-math -O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt
-fpeel-loops -funroll-loops -mpopcntd -m32 -fvect-cost-model
-mveclibabi=mass --param max-inline-insns-auto=200
-fno-associative-math -flto -fwhole-program -fuse-linker-plugin
-Wl,-q -Wl,-Map=link.map,--cref -L /opt/at6.0/lib
-L /opt/ibmcmp/xlmass/7.1/lib -Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass
```

Continued on next page

Base Optimization Flags (Continued)

Fortran benchmarks:
-ffast-math -O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt
-fpeel-loops -funroll-loops -mpopcntd -m32 -fvect-cost-model
-mveclibabi=mass -Wl,-q -Wl,-Map=link.map,--cref -L /opt/at6.0/lib
-L /opt/ibmcmp/xlmass/7.1/lib -Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass

Benchmarks using both Fortran and C:
-ffast-math -O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt
-fpeel-loops -funroll-loops -mpopcntd -m32 -fvect-cost-model
-mveclibabi=mass -Wl,-q -Wl,-Map=link.map,--cref -L /opt/at6.0/lib
-L /opt/ibmcmp/xlmass/7.1/lib -Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass

Peak Compiler Invocation

C benchmarks:
/opt/at6.0/bin/gcc

C++ benchmarks:
/opt/at6.0/bin/g++

Fortran benchmarks:
/opt/at6.0/bin/gfortran

Benchmarks using both Fortran and C:
/opt/at6.0/bin/gcc /opt/at6.0/bin/gfortran

Peak Portability Flags

436.cactusADM: -DSPEC_CPU_LP64
447.dealII: -DSPEC_CPU_LINUX
459.GemsFDTD: -DSPEC_CPU_LP64
470.lbm: -DSPEC_CPU_LP64
481.wrf: -DSPEC_CPU_CASE_FLAG -DSPEC_CPU_LINUX_PPC -DSPEC_CPU_LP64
482.sphinx3: -fsigned-char

Peak Optimization Flags

C benchmarks:

433.milc: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m32 -fvect-cost-model
-mveclibabi=mass -flto -fwhole-program -fuse-linker-plugin
-Wl,-q -Wl,-Map=link.map,--cref -L /opt/at6.0/lib
-L /opt/ibmcmp/xlmass/7.1/lib -Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass

470.lbm: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m64 -mcmodel=medium
-fvect-cost-model -mveclibabi=mass -flto -fwhole-program
-fuse-linker-plugin -Wl,-q -Wl,-Map=link.map,--cref
-L /opt/at6.0/lib64 -L /opt/ibmcmp/xlmass/7.1/lib64
-Wl,-rpath,/opt/at6.0/lib64
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib64
-Wl,-dynamic-linker,/opt/at6.0/lib64/ld64.so.1 -lhugetlbfs
-lmassvp7_64 -lmass_simdp7_64 -lmass_64

482.sphinx3: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m32 -fvect-cost-model
-mveclibabi=mass -Wl,-q -Wl,-Map=link.map,--cref
-L /opt/at6.0/lib -L /opt/ibmcmp/xlmass/7.1/lib
-Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass

C++ benchmarks:

444.namd: basepeak = yes

447.dealII: -ffast-math -O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt
-fpeel-loops -funroll-loops -mpopcntd -m32
-fvect-cost-model -mveclibabi=mass -flto -fwhole-program
-fuse-linker-plugin --param max-inline-insns-auto=200
-fno-associative-math -Wl,-q -Wl,-Map=link.map,--cref
-L /opt/at6.0/lib -L /opt/ibmcmp/xlmass/7.1/lib
-Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass -ltcmalloc -lstdc++ -lpthread

450.soplex: basepeak = yes

453.povray: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m32 -fvect-cost-model
-mveclibabi=mass -flto -fwhole-program -fuse-linker-plugin

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Peak Optimization Flags (Continued)

453.povray (continued):
--param max-inline-insns-auto=200 -fno-associative-math
-Wl,-q -Wl,-Map=link.map,--cref -L /opt/at6.0/lib
-L /opt/ibmcmp/xlmass/7.1/lib -Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass -ltcmalloc -lstdc++ -lpthread

Fortran benchmarks:

410.bwaves: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m64 -mcmodel=medium
-fvect-cost-model -mveclibabi=mass -flto -fwhole-program
-fuse-linker-plugin -Wl,-q -Wl,-Map=link.map,--cref
-L /opt/at6.0/lib64 -L /opt/ibmcmp/xlmass/7.1/lib64
-Wl,-rpath,/opt/at6.0/lib64
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib64
-Wl,-dynamic-linker,/opt/at6.0/lib64/ld64.so.1 -lhugetlbfs
-lmassvp7_64 -lmass_simdp7_64 -lmass_64

416.gamess: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m32 -fvect-cost-model
-mveclibabi=mass -Wl,-q -Wl,-Map=link.map,--cref
-L /opt/at6.0/lib -L /opt/ibmcmp/xlmass/7.1/lib
-Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass -ltcmalloc -lstdc++ -lpthread

434.zeusmp: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m32 -fvect-cost-model
-mveclibabi=mass -flto -fwhole-program -fuse-linker-plugin
-Wl,-q -Wl,-Map=link.map,--cref -L /opt/at6.0/lib
-L /opt/ibmcmp/xlmass/7.1/lib -Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass -ltcmalloc -lstdc++ -lpthread

437.leslie3d: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m32 -fvect-cost-model
-mveclibabi=mass -flto -fwhole-program -fuse-linker-plugin
-Wl,-q -Wl,-Map=link.map,--cref -L /opt/at6.0/lib
-L /opt/ibmcmp/xlmass/7.1/lib -Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass

459.GemsFDTD: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m64 -mcmodel=medium
-fvect-cost-model -mveclibabi=mass -Wl,-q

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Peak Optimization Flags (Continued)

459.GemsFDTD (continued):
-Wl,-Map=link.map,--cref -L /opt/at6.0/lib64
-L /opt/ibmcmp/xlmass/7.1/lib64 -Wl,-rpath,/opt/at6.0/lib64
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib64
-Wl,-dynamic-linker,/opt/at6.0/lib64/ld64.so.1 -lhugetlbfs
-lmassvp7_64 -lmass_simdp7_64 -lmass_64

465.tonto: Same as 416.gamess

Benchmarks using both Fortran and C:

435.gromacs: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m32 -fvect-cost-model
-mveclibabi=mass -Wl,-q -Wl,-Map=link.map,--cref
-L /opt/at6.0/lib -L /opt/ibmcmp/xlmass/7.1/lib
-Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass

436.cactusADM: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m64 -mcmodel=medium
-fvect-cost-model -mveclibabi=mass -Wl,-q
-Wl,-Map=link.map,--cref -L /opt/at6.0/lib64
-L /opt/ibmcmp/xlmass/7.1/lib64 -Wl,-rpath,/opt/at6.0/lib64
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib64
-Wl,-dynamic-linker,/opt/at6.0/lib64/ld64.so.1 -lhugetlbfs
-lmassvp7_64 -lmass_simdp7_64 -lmass_64

454.calculix: -ffast-math -O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt
-fpeel-loops -funroll-loops -mpopcntd -m32
-fvect-cost-model -mveclibabi=mass -flto -fwhole-program
-fuse-linker-plugin -Wl,-q -Wl,-Map=link.map,--cref
-L /opt/at6.0/lib -L /opt/ibmcmp/xlmass/7.1/lib
-Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass -ltcmalloc -lstdc++ -lpthread

481.wrf: -ffast-math -O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt
-fpeel-loops -funroll-loops -mpopcntd -m64 -mcmodel=medium
-fvect-cost-model -mveclibabi=mass -Wl,-q
-Wl,-Map=link.map,--cref -L /opt/at6.0/lib64
-L /opt/ibmcmp/xlmass/7.1/lib64 -Wl,-rpath,/opt/at6.0/lib64
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib64
-Wl,-dynamic-linker,/opt/at6.0/lib64/ld64.so.1 -lhugetlbfs
-lmassvp7_64 -lmass_simdp7_64 -lmass_64

The flags file that was used to format this result can be browsed at
http://www.spec.org/cpu2006/flags/IBM-Linux-AT.20130813.html

You can also download the XML flags source by saving the following link:
http://www.spec.org/cpu2006/flags/IBM-Linux-AT.20130813.xml

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For other inquiries, please contact webmaster@spec.org.

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