**IBM Corporation**

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

<table>
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<th>Program</th>
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<th>SPECfp_rate2006</th>
<th>SPECfp_rate_base2006</th>
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</table>

**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:** 32, 32 cores
- **Primary Cache:** 32 KB I + 32 KB D on chip per core

**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
IBM Corporation
IBM PowerLinux 7R4 (4.0 GHz, 32 core, RHEL, GCC)  
SPEC CFP2006 Result

SPECfp_rate2006 = 1110
SPECfp_rate_base2006 = 983

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

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

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</table>

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

Continued on next page
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

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.
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

General Notes

Environment variables set by runspec before the start of the run:
HUGETLB_ELFIN = "RW"
HUGETLB_MORECORE = "yes"
HUGETLB_VERBOSE = 0
TCMALLOCMEMFS_MALLOCPATH = "/libhugetlbfs"
XLFRTEOPTS = "intrinthsds=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
-llmass_simdp7 -llmass

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
-llmass_simdp7 -llmass

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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

### 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\_simd7p7 -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\_simd7p7 -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
IBM Corporation
IBM PowerLinux 7R4 (4.0 GHz, 32 core, RHEL, GCC)

SPEC CFP2006 Result

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

SPECfp_rate2006 = 1110
SPECfp_rate_base2006 = 983

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

Peak Optimization Flags

C benchmarks:

433.milc: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-o3 -mcupo=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m32 -fvector-cost-model
-mveclibabi=mass -f1to -fwhole-program -fuse-linker-plugin
-WI,-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.ibm: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-o3 -mcupo=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m64 -mcmmodel=medium
-fvect-cost-model -mveclibabi=mass -f1to -fwhole-program
-fuse-linker-plugin -W1,-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 -mcupo=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m32 -fvector-cost-model
-mveclibabi=mass -W1,-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 -mcupo=power7 -mtune=power7 -mrecip=rsqrt
-fpeel-loops -funroll-loops -mpopcntd -m32
-fvect-cost-model -mveclibabi=mass -f1to -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 -mcupo=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m32 -fvector-cost-model
-mveclibabi=mass -f1to -fwhole-program -fuse-linker-plugin

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

CPU2006 license: 11
Test sponsor: IBM Corporation
Tested by: IBM Corporation
Test date: May-2013
Hardware Availability: Aug-2013
Software Availability: May-2013

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 -mrecep=rsqrt -fpeel-loops
- -funroll-loops -mpopcntd -m64 -mcmodel=medium
- -fveclibabi=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 -mrecep=rsqrt -fpeel-loops
- -funroll-loops -mpopcntd -m32 -fveclibabi=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
- -Wl,-dynamic-linker,/opt/at6.0/lib64/ld64.so.1 -lhugetlbfs
- -lmassvp7_64 -lmass_simdp7_64 -lmass_64

434.zeusmp: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
- -O3 -mcpu=power7 -mtune=power7 -mrecep=rsqrt -fpeel-loops
- -fpopcntd -mveclibabi=mass -flto -fwhole-program
- -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
- -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 -mrecep=rsqrt -fpeel-loops
- -fpopcntd -mveclibabi=mass -flto -fwhole-program
- -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
- -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 -mrecep=rsqrt -fpeel-loops
- -fpopcntd -mveclibabi=mass -flto -q

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

SPEC CFP2006 Result

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

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 -lugetlbfs
- lmassvp7_64 -lmass_simdp7_64 -lmass_64

465.tonto: Same as 416.gamess

Benchmarks using both Fortran and C:

435.gromacs: -ffast-math
- O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
- funroll-loops -mpopcntd -m32 -fvect-cost-model
- mveclibrary=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 -lugetlbfs -lmassvp7
- lmass_simdp7 -lmass

436.cactusADM: -ffast-math
- O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
- funroll-loops -mpopcntd -m64 -mcmodel=medium
- fvect-cost-model -mveclibrary=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 -lugetlbfs
- 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 -mveclibrary=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 -lugetlbfs
- 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 -mveclibrary=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 -lugetlbfs
- lmassvp7_64 -lmass_simdp7_64 -lmass_64
IBM Corporation
IBM PowerLinux 7R4 (4.0 GHz, 32 core, RHEL, GCC)

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The flags file that was used to format this result can be browsed at

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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