SPEC® CFP2006 Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

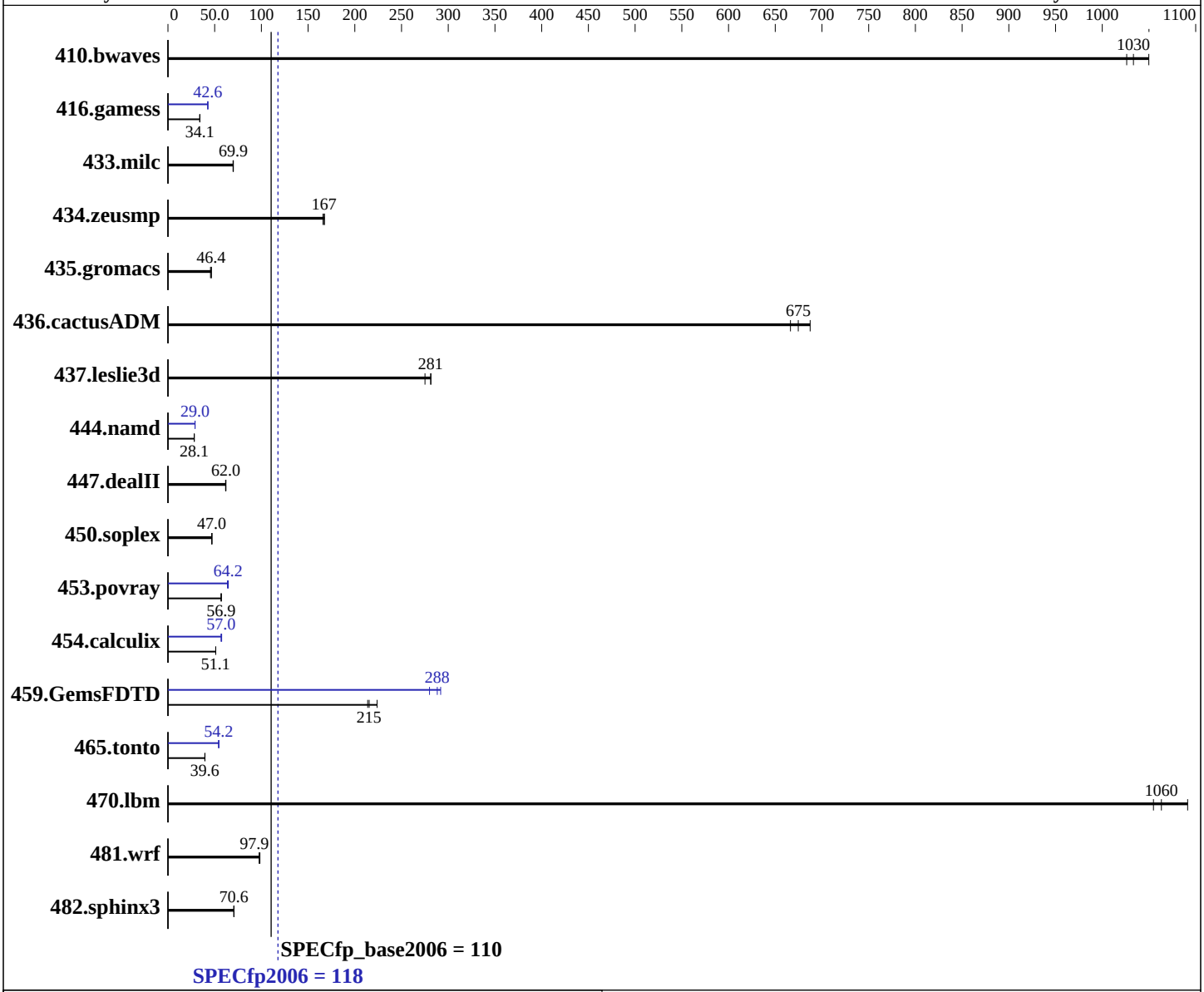
ProLiant BL660c Gen9
(2.50 GHz, Intel Xeon E5-4655 v4)

SPECfp®2006 = 118

SPECfp_base2006 = 110

CPU2006 license: 3
Test sponsor: HPE
Tested by: HPE

Test date: May-2016
Hardware Availability: Jun-2016
Software Availability: Nov-2015



Hardware

CPU Name:	Intel Xeon E5-4655 v4
CPU Characteristics:	Intel Turbo Boost Technology up to 3.20 GHz
CPU MHz:	2500
FPU:	Integrated
CPU(s) enabled:	32 cores, 4 chips, 8 cores/chip
CPU(s) orderable:	2,4 chip
Primary Cache:	32 KB I + 32 KB D on chip per core
Secondary Cache:	256 KB I+D on chip per core

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Software

Operating System:	Red Hat Enterprise Linux Server release 7.2, (Maipo) Kernel 3.10.0-327.el7.x86_64
Compiler:	C/C++: Version 16.0.0.101 of Intel C++ Studio XE for Linux; Fortran: Version 16.0.0.101 of Intel Fortran Studio XE for Linux
Auto Parallel:	Yes
File System:	xfs

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L3 Cache:	30 MB I+D on chip per chip	System State:	Run level 3 (multi-user)
Other Cache:	None	Base Pointers:	64-bit
Memory:	512 GB (16 x 32 GB 2Rx4 PC4-2400T-R)	Peak Pointers:	32/64-bit
Disk Subsystem:	1 x 400 GB SAS SSD, RAID 0	Other Software:	None
Other Hardware:	None		

Results Table

Benchmark	Base						Peak					
	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	13.2	1030	12.9	1050	**13.2**	**1030**	13.2	1030	12.9	1050	**13.2**	**1030**
416.gamess	573	34.2	**574**	**34.1**	574	34.1	458	42.7	**459**	**42.6**	459	42.6
433.milc	131	70.0	**131**	**69.9**	132	69.7	131	70.0	**131**	**69.9**	132	69.7
434.zeusmp	54.8	166	**54.4**	**167**	54.3	167	54.8	166	**54.4**	**167**	54.3	167
435.gromacs	157	45.5	154	46.4	**154**	**46.4**	157	45.5	154	46.4	**154**	**46.4**
436.cactusADM	17.9	666	17.4	687	**17.7**	**675**	17.9	666	17.4	687	**17.7**	**675**
437.leslie3d	**33.4**	**281**	33.4	281	34.2	275	**33.4**	**281**	33.4	281	34.2	275
444.namd	**285**	**28.1**	285	28.1	285	28.1	**277**	**29.0**	277	29.0	277	29.0
447.dealII	185	61.7	185	62.0	**185**	**62.0**	185	61.7	185	62.0	**185**	**62.0**
450.soplex	177	47.1	**178**	**47.0**	178	46.9	177	47.1	**178**	**47.0**	178	46.9
453.povray	**93.5**	**56.9**	93.5	56.9	93.1	57.1	82.3	64.6	**82.8**	**64.2**	83.5	63.7
454.calculix	**161**	**51.1**	161	51.1	161	51.2	145	57.0	**145**	**57.0**	143	57.5
459.GemsFDTD	49.6	214	**49.3**	**215**	47.4	224	37.9	280	36.4	292	**36.8**	**288**
465.tonto	248	39.7	**249**	**39.6**	250	39.4	182	54.2	**181**	**54.2**	180	54.6
470.lbm	12.6	1090	13.0	1050	**12.9**	**1060**	12.6	1090	13.0	1050	**12.9**	**1060**
481.wrf	**114**	**97.9**	114	97.7	113	98.4	**114**	**97.9**	114	97.7	113	98.4
482.sphinx3	276	70.7	**276**	**70.6**	276	70.5	276	70.7	**276**	**70.6**	276	70.5

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

Operating System Notes

```
Stack size set to unlimited using "ulimit -s unlimited"
Transparent Huge Pages enabled with:
 echo always > /sys/kernel/mm/transparent_hugepage/enabled
```

Platform Notes

```
BIOS Configuration:
Intel Hyperthreading Option set to Disabled
Power Profile set to Custom
Power Regulator set to Static High Performance Mode
Minimum Processor Idle Power Core C-State set to C1E State
Minimum Processor Idle Power Package C-State set to No Package state
Collaborative Power Control set to Disabled
QPI Snoop Configuration set to Home Snoop
```

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Platform Notes (Continued)

```
Thermal Configuration set to Maximum Cooling
Processor Power and Utilization Monitoring set to Disabled
Sysinfo program /home/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on BL660-Gen9-B Mon May 23 10:48:12 2016

This section contains SUT (System Under Test) info as seen by
some common utilities.  To remove or add to this section, see:
  http://www.spec.org/cpu2006/Docs/config.html#sysinfo

From /proc/cpuinfo
   model name : Intel(R) Xeon(R) CPU E5-4655 v4 @ 2.50GHz
      4 "physical id"s (chips)
      32 "processors"
   cores, siblings (Caution: counting these is hw and system dependent.  The
   following excerpts from /proc/cpuinfo might not be reliable.  Use with
   caution.)
      cpu cores : 8
      siblings  : 8
      physical 0: cores 0 1 3 5 8 10 12 13
      physical 1: cores 0 1 3 5 8 10 12 13
      physical 2: cores 0 1 3 5 8 10 12 13
      physical 3: cores 0 1 2 4 9 11 12 13
   cache size : 30720 KB

From /proc/meminfo
   MemTotal:       528064256 kB
   HugePages_Total:       0
   Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
   os-release:
      NAME="Red Hat Enterprise Linux Server"
      VERSION="7.2 (Maipo)"
      ID="rhel"
      ID_LIKE="fedora"
      VERSION_ID="7.2"
      PRETTY_NAME="Red Hat Enterprise Linux Server 7.2 (Maipo)"
      ANSI_COLOR="0;31"
      CPE_NAME="cpe:/o:redhat:enterprise_linux:7.2:GA:server"
   redhat-release: Red Hat Enterprise Linux Server release 7.2 (Maipo)
   system-release: Red Hat Enterprise Linux Server release 7.2 (Maipo)
   system-release-cpe: cpe:/o:redhat:enterprise_linux:7.2:ga:server

uname -a:
   Linux BL660-Gen9-B 3.10.0-327.el7.x86_64 #1 SMP Thu Oct 29 17:29:29 EDT 2015
   x86_64 x86_64 x86_64 GNU/Linux

run-level 3 May 23 09:35

SPEC is set to: /home/cpu2006
   Filesystem     Type  Size  Used Avail Use% Mounted on
```

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Platform Notes (Continued)

```
    /dev/sda5      xfs   318G  171G  148G  54% /home
 Additional information from dmidecode:

    Warning: Use caution when you interpret this section. The 'dmidecode' program
    reads system data which is "intended to allow hardware to be accurately
    determined", but the intent may not be met, as there are frequent changes to
    hardware, firmware, and the "DMTF SMBIOS" standard.

   BIOS HP I38 05/05/2016
   Memory:
    16x UNKNOWN NOT AVAILABLE
    16x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2400 MHz

 (End of data from sysinfo program)
 Regarding the sysinfo display about the memory installed, the correct amount of
 memory is 512 GB and the dmidecode description should have one line reading as:
 32x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2400 MHz
```

General Notes

```
Environment variables set by runspec before the start of the run:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/home/cpu2006/libs/32:/home/cpu2006/libs/64:/home/cpu2006/sh"
OMP_NUM_THREADS = "32"

 Binaries compiled on a system with 1x Intel Core i5-4670K CPU + 32GB
 memory using RedHat EL 7.1
```

Base Compiler Invocation

C benchmarks:
```
icc   -m64
```

C++ benchmarks:
```
icpc  -m64
```

Fortran benchmarks:
```
ifort -m64
```

Benchmarks using both Fortran and C:
```
icc   -m64 ifort -m64
```

Base Portability Flags

410.bwaves: -DSPEC_CPU_LP64
416.gamess: -DSPEC_CPU_LP64

Continued on next page

Base Portability Flags (Continued)

433.milc: -DSPEC_CPU_LP64
434.zeusmp: -DSPEC_CPU_LP64
435.gromacs: -DSPEC_CPU_LP64 -nofor_main
436.cactusADM: -DSPEC_CPU_LP64 -nofor_main
437.leslie3d: -DSPEC_CPU_LP64
444.namd: -DSPEC_CPU_LP64
447.dealII: -DSPEC_CPU_LP64
450.soplex: -DSPEC_CPU_LP64
453.povray: -DSPEC_CPU_LP64
454.calculix: -DSPEC_CPU_LP64 -nofor_main
459.GemsFDTD: -DSPEC_CPU_LP64
465.tonto: -DSPEC_CPU_LP64
470.lbm: -DSPEC_CPU_LP64
481.wrf: -DSPEC_CPU_LP64 -DSPEC_CPU_CASE_FLAG -DSPEC_CPU_LINUX
482.sphinx3: -DSPEC_CPU_LP64

Base Optimization Flags

C benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -parallel -opt-prefetch -ansi-alias

C++ benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch -ansi-alias

Fortran benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -parallel -opt-prefetch

Benchmarks using both Fortran and C:
-xCORE-AVX2 -ipo -O3 -no-prec-div -parallel -opt-prefetch -ansi-alias

Peak Compiler Invocation

C benchmarks:
icc -m64

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

Benchmarks using both Fortran and C:
icc -m64 ifort -m64

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

433.milc: basepeak = yes

470.lbm: basepeak = yes

482.sphinx3: basepeak = yes

C++ benchmarks:

444.namd: -xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -par-num-threads=1(pass 1) -prof-use(pass 2) -fno-alias -auto-ilp32

447.dealII: basepeak = yes

450.soplex: basepeak = yes

453.povray: -xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -par-num-threads=1(pass 1) -prof-use(pass 2) -unroll4 -ansi-alias

Fortran benchmarks:

410.bwaves: basepeak = yes

416.gamess: -xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -par-num-threads=1(pass 1) -prof-use(pass 2) -unroll2 -inline-level=0 -scalar-rep-

434.zeusmp: basepeak = yes

437.leslie3d: basepeak = yes

459.GemsFDTD: -xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -par-num-threads=1(pass 1) -prof-use(pass 2) -unroll2 -inline-level=0 -opt-prefetch -parallel

465.tonto: -xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -par-num-threads=1(pass 1) -prof-use(pass 2) -inline-calloc

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Peak Optimization Flags (Continued)

465.tonto (continued):
`-opt-malloc-options=3 -auto -unroll4`

Benchmarks using both Fortran and C:

435.gromacs: `basepeak = yes`

436.cactusADM: `basepeak = yes`

454.calculix: `-xCORE-AVX2 -ipo -O3 -no-prec-div -auto-ilp32 -ansi-alias`

481.wrf: `basepeak = yes`

The flags files that were used to format this result can be browsed at
`http://www.spec.org/cpu2006/flags/Intel-ic16.0-official-linux64.html`
`http://www.spec.org/cpu2006/flags/HP-Platform-Flags-Intel-V1.2-HSW-revE.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2006/flags/Intel-ic16.0-official-linux64.xml`
`http://www.spec.org/cpu2006/flags/HP-Platform-Flags-Intel-V1.2-HSW-revE.xml`

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