SPEC® CFP2006 Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL560 Gen9
(2.60 GHz, Intel Xeon E5-4627 v4)

$SPECfp^{®}2006 =$ 119
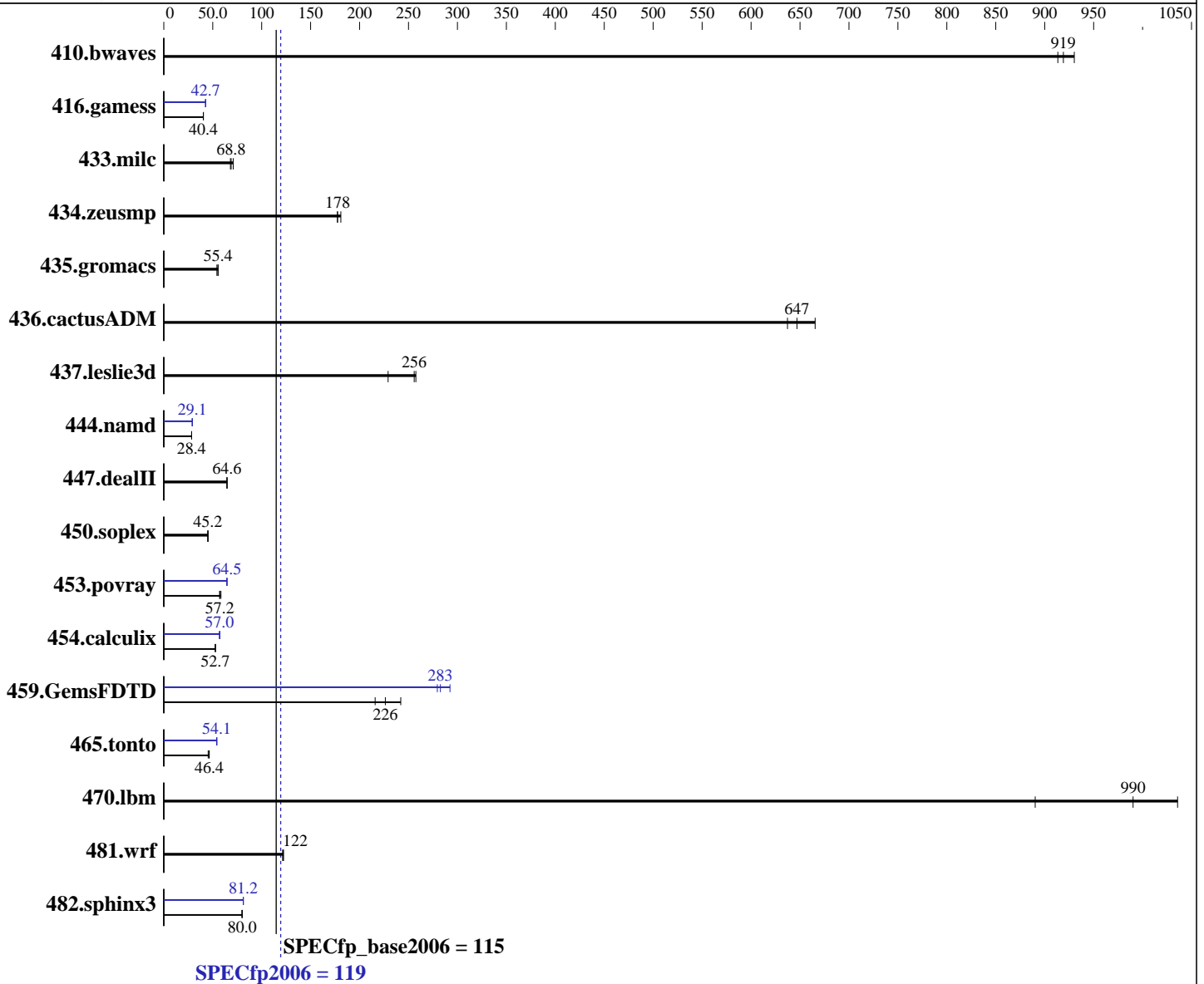
$SPECfp\_base2006 =$ 115

CPU2006 license: 3	**Test date:** Aug-2016
Test sponsor: HPE	**Hardware Availability:** Jul-2016
Tested by: HPE	**Software Availability:** Dec-2015

Results by benchmark (seconds):

- 410.bwaves: 919
- 416.gamess: 42.7 / 40.4
- 433.milc: 68.8
- 434.zeusmp: 178
- 435.gromacs: 55.4
- 436.cactusADM: 647
- 437.leslie3d: 256
- 444.namd: 29.1 / 28.4
- 447.dealII: 64.6
- 450.soplex: 45.2
- 453.povray: 64.5 / 57.2
- 454.calculix: 57.0 / 52.7
- 459.GemsFDTD: 283 / 226
- 465.tonto: 54.1 / 46.4
- 470.lbm: 990
- 481.wrf: 122
- 482.sphinx3: 81.2 / 80.0

SPECfp_base2006 = 115
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Hardware

CPU Name:	Intel Xeon E5-4627 v4
CPU Characteristics:	Intel Turbo Boost Technology up to 3.20 GHz
CPU MHz:	2600
FPU:	Integrated
CPU(s) enabled:	40 cores, 4 chips, 10 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

Continued on next page

Software

Operating System:	SUSE Linux Enterprise Server 12 (x86_64) SP1, Kernel 3.12.49-11-default
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
System State:	Run level 3 (multi-user)

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L3 Cache:	25 MB I+D on chip per chip	Base Pointers:	32/64-bit
Other Cache:	None	Peak Pointers:	32/64-bit
Memory:	512 GB (32 x 16 GB 2Rx4 PC4-2400T-R)	Other Software:	None
Disk Subsystem:	1 x 400 GB SAS SSD, RAID 0		
Other Hardware:	None		

Results Table

Benchmark	Base						Peak					
	Seconds	**Ratio**	**Seconds**	**Ratio**	**Seconds**	**Ratio**	**Seconds**	**Ratio**	**Seconds**	**Ratio**	**Seconds**	**Ratio**
410.bwaves	14.6	930	**14.8**	**919**	14.9	913	14.6	930	**14.8**	**919**	14.9	913
416.gamess	**485**	**40.4**	484	40.4	485	40.4	458	42.7	459	42.7	**459**	**42.7**
433.milc	**133**	**68.8**	135	68.1	129	70.9	**133**	**68.8**	135	68.1	129	70.9
434.zeusmp	51.3	177	50.3	181	**51.3**	**178**	51.3	177	50.3	181	**51.3**	**178**
435.gromacs	132	54.2	**129**	**55.4**	129	55.4	132	54.2	**129**	**55.4**	129	55.4
436.cactusADM	18.0	665	**18.5**	**647**	18.8	637	18.0	665	**18.5**	**647**	18.8	637
437.leslie3d	41.0	229	36.5	258	**36.7**	**256**	41.0	229	36.5	258	**36.7**	**256**
444.namd	282	28.4	**282**	**28.4**	282	28.4	**276**	**29.1**	275	29.1	276	29.1
447.dealII	**177**	**64.6**	177	64.6	177	64.6	**177**	**64.6**	177	64.6	177	64.6
450.soplex	186	44.9	**185**	**45.2**	185	45.2	186	44.9	**185**	**45.2**	185	45.2
453.povray	93.2	57.1	**93.0**	**57.2**	91.1	58.4	82.5	64.5	**82.4**	**64.5**	82.4	64.5
454.calculix	156	52.7	157	52.6	**157**	**52.7**	144	57.4	145	56.9	**145**	**57.0**
459.GemsFDTD	49.1	216	**46.9**	**226**	43.8	242	38.0	279	36.3	292	**37.5**	**283**
465.tonto	**212**	**46.4**	217	45.3	212	46.4	**182**	**54.1**	181	54.2	182	54.0
470.lbm	15.4	890	13.3	1040	**13.9**	**990**	15.4	890	13.3	1040	**13.9**	**990**
481.wrf	91.9	121	**91.8**	**122**	91.3	122	91.9	121	**91.8**	**122**	91.3	122
482.sphinx3	244	79.8	**244**	**80.0**	243	80.3	240	81.3	240	81.1	**240**	**81.2**

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:
  HP Power Profile set to Custom
  HP Power Regulator to HP 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
  QPI Snoop Configuration set to Home Snoop
  Collaborative Power Control set to Disabled
  Thermal Configuration set to Maximum Cooling
```

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Platform Notes (Continued)

```
   Processor Power and Utilization Monitoring set to Disabled
   Memory Refresh Rate set to 1x Refresh
Sysinfo program /home/custom/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on sles12biswadl560 Wed Aug 31 15:38:57 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 E5-4627 v4 @ 2.60GHz
      4 "physical id"s (chips)
      40 "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 : 10
      siblings  : 10
      physical 0: cores 0 2 3 4 8 9 10 11 12
      physical 1: cores 0 2 3 4 8 9 10 11 12
      physical 2: cores 0 2 3 4 8 9 10 11 12
      physical 3: cores 0 2 3 4 8 9 10 11 12
   cache size : 25600 KB

From /proc/meminfo
   MemTotal:       529311708 kB
   HugePages_Total:        0
   Hugepagesize:        2048 kB

From /etc/*release* /etc/*version*
   SuSE-release:
      SUSE Linux Enterprise Server 12 (x86_64)
      VERSION = 12
      PATCHLEVEL = 1
      # This file is deprecated and will be removed in a future service pack or
      release.
      # Please check /etc/os-release for details about this release.
   os-release:
      NAME="SLES"
      VERSION="12-SP1"
      VERSION_ID="12.1"
      PRETTY_NAME="SUSE Linux Enterprise Server 12 SP1"
      ID="sles"
      ANSI_COLOR="0;32"
      CPE_NAME="cpe:/o:suse:sles:12:sp1"

uname -a:
   Linux sles12biswadl560 3.12.49-11-default #1 SMP Wed Nov 11 20:52:43 UTC 2015
   (8d714a0) x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Aug 31 15:37
```

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Platform Notes (Continued)

```
SPEC is set to: /home/custom/cpu2006
   Filesystem      Type  Size  Used Avail Use% Mounted on
   /dev/sda4       xfs   331G  131G  200G  40% /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 P85 07/01/2016
   Memory:
    16x UNKNOWN NOT AVAILABLE
    32x UNKNOWN NOT AVAILABLE 16 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"
OMP_NUM_THREADS = "40"
LD_LIBRARY_PATH = "/home/custom/cpu2006/libs/32:/home/custom/cpu2006/libs/64:/home/custom/cpu2006/sh"

 Binaries compiled on a system with 1x Intel Xeon E5-2260 v4 CPU + 128GB
 memory using RedHat EL 7.2
```

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

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Base Portability Flags

```
   410.bwaves: -DSPEC_CPU_LP64
   416.gamess: -DSPEC_CPU_LP64
     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 -static -parallel -opt-prefetch
-ansi-alias -qopt-prefetch-issue-excl-hint -auto-ilp32
```

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

Fortran benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -static -parallel -opt-prefetch
-qopt-prefetch-issue-excl-hint
```

Benchmarks using both Fortran and C:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -static -parallel -opt-prefetch
-ansi-alias -qopt-prefetch-issue-excl-hint -auto-ilp32
```

Peak Compiler Invocation

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

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

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

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Test sponsor:	HPE	**Hardware Availability:**	Jul-2016
Tested by:	HPE	**Software Availability:**	Dec-2015

Peak Compiler Invocation (Continued)

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: -xCORE-AVX2 -ipo -O3 -no-prec-div -static -parallel
             -opt-prefetch -ansi-alias
             -fp-model                                          -nofor-main
             -qopt-prefetch-issue-excl-hint -funroll-all-loops
```

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-
```

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Peak Optimization Flags (Continued)

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`
`-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/HP-Compiler-Flags-Intel-V1.2-HSW-revF.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/HP-Compiler-Flags-Intel-V1.2-HSW-revF.xml
http://www.spec.org/cpu2006/flags/HP-Platform-Flags-Intel-V1.2-HSW-revE.xml

For questions about this result, please contact the tester.
For other inquiries, please contact webmaster@spec.org.

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