SPEC® CFP2006 Result
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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL580 Gen9
(2.20 GHz, Intel Xeon E7-8860 v4)
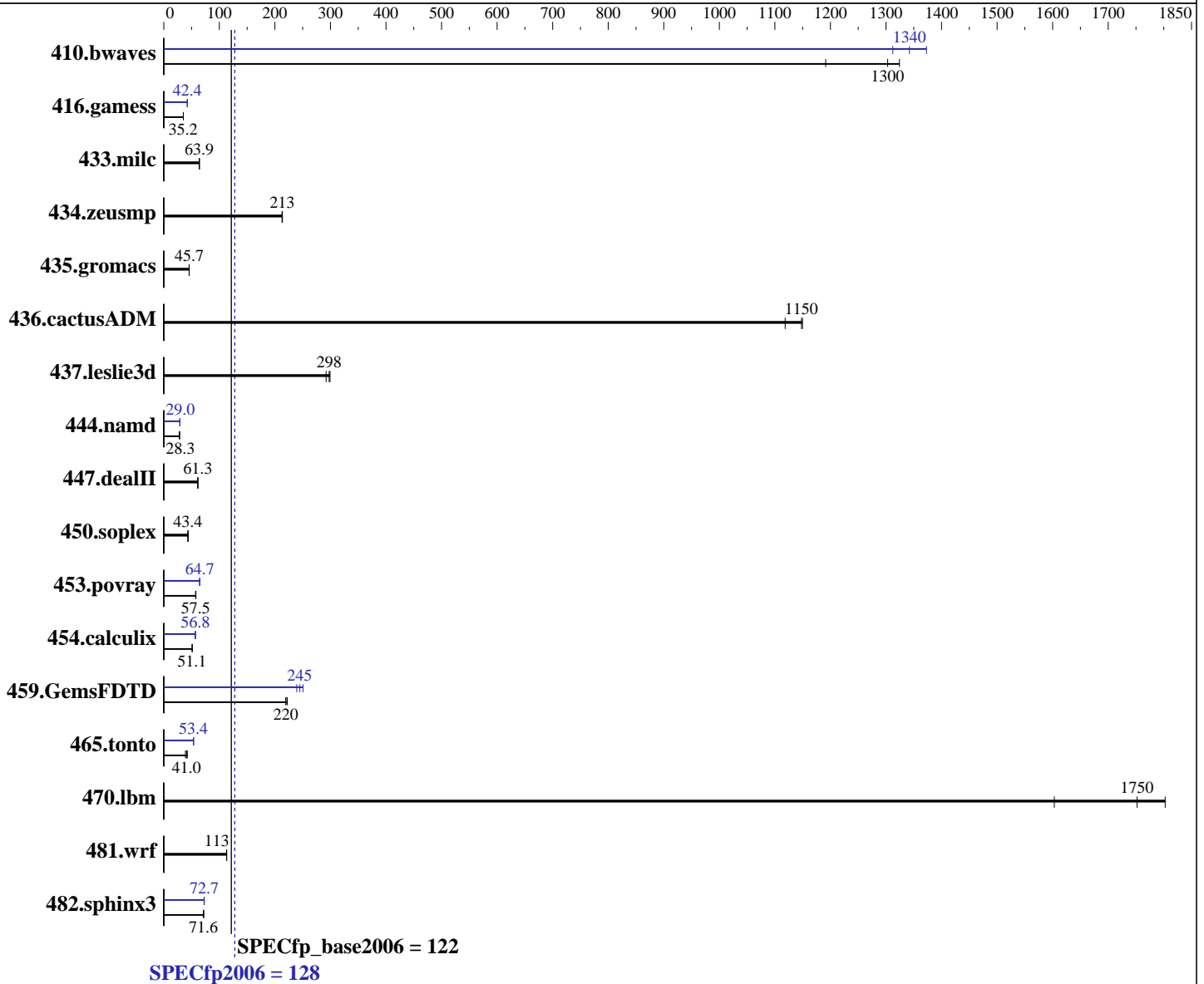
$SPECfp^{®}2006 =$ **128**

$SPECfp\_base2006 =$ **122**

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

410.bwaves 1340 / 1300
416.gamess 42.4 / 35.2
433.milc 63.9
434.zeusmp 213
435.gromacs 45.7
436.cactusADM 1150
437.leslie3d 298
444.namd 29.0 / 28.3
447.dealII 61.3
450.soplex 43.4
453.povray 64.7 / 57.5
454.calculix 56.8 / 51.1
459.GemsFDTD 245 / 220
465.tonto 53.4 / 41.0
470.lbm 1750
481.wrf 113
482.sphinx3 72.7 / 71.6

SPECfp_base2006 = 122

SPECfp2006 = 128

Hardware

CPU Name:	Intel Xeon E7-8860 v4
CPU Characteristics:	Intel Turbo Boost Technology up to 3.20 GHz
CPU MHz:	2200
FPU:	Integrated
CPU(s) enabled:	72 cores, 4 chips, 18 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)

Continued on next page

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L3 Cache:	45 MB I+D on chip per chip	Base Pointers:	64-bit
Other Cache:	None	Peak Pointers:	32/64-bit
Memory:	512 GB (32 x 16 GB 2Rx4 PC4-2400T-R, running at 1600 MHz)	Other Software:	None
Disk Subsystem:	1 x 800 GB NVMe PCIe SSD, RAID 0		
Other Hardware:	DL580 Gen9 NVMe SSD Express Bay Enablement Kit		

Results Table

Benchmark	Base						Peak					
	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	**10.4**	**1300**	10.3	1320	11.4	1190	9.90	1370	10.4	1310	**10.1**	**1340**
416.gamess	**557**	**35.2**	557	35.1	556	35.2	**462**	**42.4**	463	42.3	462	42.4
433.milc	143	64.1	**144**	**63.9**	144	63.9	143	64.1	**144**	**63.9**	144	63.9
434.zeusmp	**42.7**	**213**	42.6	214	42.7	213	**42.7**	**213**	42.6	214	42.7	213
435.gromacs	157	45.5	156	45.8	**156**	**45.7**	157	45.5	156	45.8	**156**	**45.7**
436.cactusADM	10.4	1150	**10.4**	**1150**	10.7	1120	10.4	1150	**10.4**	**1150**	10.7	1120
437.leslie3d	**31.6**	**298**	31.4	299	32.2	292	**31.6**	**298**	31.4	299	32.2	292
444.namd	283	28.4	**283**	**28.3**	283	28.3	277	29.0	277	29.0	**277**	**29.0**
447.dealII	186	61.4	**187**	**61.3**	187	61.2	186	61.4	**187**	**61.3**	187	61.2
450.soplex	192	43.3	**192**	**43.4**	190	43.8	192	43.3	**192**	**43.4**	190	43.8
453.povray	**92.5**	**57.5**	92.0	57.8	92.9	57.3	**82.2**	**64.7**	82.1	64.8	82.4	64.5
454.calculix	162	51.1	161	51.2	**161**	**51.1**	145	56.9	**145**	**56.8**	146	56.6
459.GemsFDTD	48.3	220	47.7	222	**48.3**	**220**	42.3	251	44.3	239	**43.3**	**245**
465.tonto	233	42.3	253	38.9	**240**	**41.0**	184	53.5	184	53.4	**184**	**53.4**
470.lbm	**7.84**	**1750**	8.57	1600	7.62	1800	**7.84**	**1750**	8.57	1600	7.62	1800
481.wrf	98.8	113	98.6	113	**98.8**	**113**	98.8	113	98.6	113	**98.8**	**113**
482.sphinx3	271	71.8	**272**	**71.6**	273	71.5	269	72.5	267	72.9	**268**	**72.7**

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 C6 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
```

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Platform Notes (Continued)

```
   Thermal Configuration set to Maximum Cooling
   Processor Power and Utilization Monitoring set to Disabled
   Intel Hyperthreading set to Disabled

Sysinfo program /home/experiment/fp/new/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on linux-vi0i Mon Jun  6 23:04:51 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 E7-8860 v4 @ 2.20GHz
      4 "physical id"s (chips)
      72 "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 : 18
      siblings  : 18
      physical 0: cores 0 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
      physical 1: cores 0 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
      physical 2: cores 0 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
      physical 3: cores 0 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
   cache size : 46080 KB

From /proc/meminfo
   MemTotal:       529317464 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 linux-vi0i 3.12.49-11-default #1 SMP Wed Nov 11 20:52:43 UTC 2015
   (8d714a0) x86_64 x86_64 x86_64 GNU/Linux
```

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Platform Notes (Continued)

```
  run-level 3 Jun 6 22:46

  SPEC is set to: /home/experiment/fp/new/cpu2006
     Filesystem      Type  Size  Used Avail Use% Mounted on
     /dev/nvme0n1p4 xfs   703G  286G  418G  41% /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 U17 05/16/2016
   Memory:
    64x UNKNOWN NOT AVAILABLE
    32x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2400 MHz, configured at 1600 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, configured at 1600 MHz
```

General Notes

```
Environment variables set by runspec before the start of the run:
KMP_AFFINITY = "granularity=fine,compact"
OMP_NUM_THREADS = "72"
LD_LIBRARY_PATH = "/home/experiment/fp/new/cpu2006/libs/32:/home/experiment/fp/new/cpu2006/libs/64:/home/experiment/fp/new/cpu2006/sh"

 Binaries compiled on a system with 1x Intel Xeon E5-2660 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
-fp-model fast=2
-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
-fp-model fast=2
```

Peak Compiler Invocation

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

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

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Peak Compiler Invocation (Continued)

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: -xCORE-AVX2 -ipo -O3 -no-prec-div -static -parallel
             -opt-prefetch -ansi-alias
             -fp-model fast=2                                        -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: -xCORE-AVX2 -ipo -O3 -no-prec-div -static -parallel
             -opt-prefetch
             -fp-model fast=2
             -qopt-prefetch-issue-excl-hint -funroll-all-loops
```

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Peak Optimization Flags (Continued)

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`
`-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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