SPEC® CFP2006 Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL580 Gen9
(2.20 GHz, Intel Xeon E7-8860 v4)

$SPECfp^®\_rate2006 =$ 2140
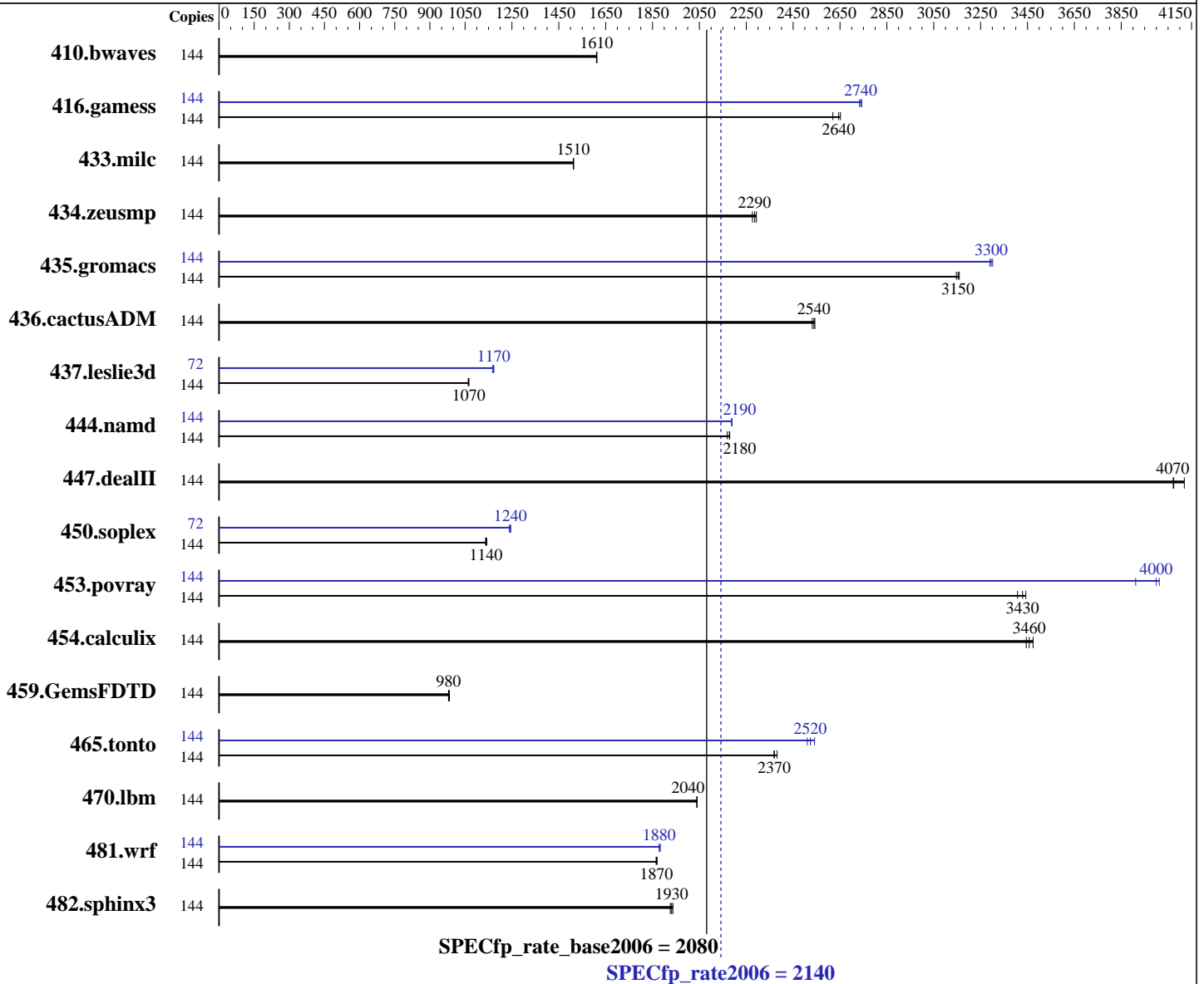
$SPECfp\_rate\_base2006 =$ 2080

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

SPECfp_rate_base2006 = 2080

SPECfp_rate2006 = 2140

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, 2 threads/core
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:	No
File System:	xfs
System State:	Run level 3 (multi-user)

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L3 Cache:	45 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, 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						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	144	1213	1610	1215	1610	**1215**	**1610**	144	1213	1610	1215	1610	**1215**	**1610**
416.gamess	144	1063	2650	**1066**	**2640**	1076	2620	144	1028	2740	**1030**	**2740**	1032	2730
433.milc	144	873	1510	**874**	**1510**	874	1510	144	873	1510	**874**	**1510**	874	1510
434.zeusmp	144	576	2280	**573**	**2290**	571	2290	144	576	2280	**573**	**2290**	571	2290
435.gromacs	144	**326**	**3150**	325	3160	327	3150	144	311	3300	313	3290	**312**	**3300**
436.cactusADM	144	680	2530	677	2540	**678**	**2540**	144	680	2530	677	2540	**678**	**2540**
437.leslie3d	144	**1270**	**1070**	1270	1070	1273	1060	72	577	1170	**577**	**1170**	580	1170
444.namd	144	530	2180	**530**	**2180**	533	2170	144	528	2190	**528**	**2190**	528	2190
447.dealII	144	400	4120	405	4070	**404**	**4070**	144	400	4120	405	4070	**404**	**4070**
450.soplex	144	1051	1140	**1054**	**1140**	1056	1140	72	482	1250	**483**	**1240**	485	1240
453.povray	144	223	3440	**223**	**3430**	225	3410	144	**192**	**4000**	191	4010	196	3910
454.calculix	144	**344**	**3460**	342	3470	345	3440	144	**344**	**3460**	342	3470	345	3440
459.GemsFDTD	144	1554	983	1560	979	**1560**	**980**	144	1554	983	1560	979	**1560**	**980**
465.tonto	144	595	2380	598	2370	**598**	**2370**	144	**561**	**2520**	558	2540	564	2510
470.lbm	144	971	2040	**970**	**2040**	970	2040	144	971	2040	**970**	**2040**	970	2040
481.wrf	144	862	1870	**862**	**1870**	860	1870	144	**856**	**1880**	854	1880	856	1880
482.sphinx3	144	1457	1930	1449	1940	**1453**	**1930**	144	1457	1930	1449	1940	**1453**	**1930**

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

Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

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
Filesystem page cache cleared with:
echo 1>   /proc/sys/vm/drop_caches
runspec command invoked through numactl i.e.:
numactl --interleave=all runspec <etc>

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

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 Cluster On Die
  Collaborative Power Control set to Disabled
  Thermal Configuration set to Maximum Cooling
  Processor Power and Utilization Monitoring set to Disabled

Sysinfo program /home/hp_binary/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on linux-vi0i Sun Jun  5 22:45:07 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)
      144 "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  : 36
      physical 0: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
      physical 1: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
      physical 2: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
      physical 3: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
   cache size : 23040 KB

From /proc/meminfo
   MemTotal:       529308980 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"
```

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Platform Notes (Continued)

```
       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

  run-level 3 Jun 4 22:59

  SPEC is set to: /home/hp_binary/cpu2006
     Filesystem      Type   Size   Used Avail Use% Mounted on
     /dev/nvme0n1p4 xfs    703G   158G  546G  23% /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:
 LD_LIBRARY_PATH = "/home/hp_binary/cpu2006/libs/32:/home/hp_binary/cpu2006/libs/64:/home/hp_binary/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

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Software Availability: Dec-2015

Base Compiler Invocation (Continued)

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

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 -opt-prefetch -auto-ilp32
-ansi-alias -opt-mem-layout-trans=3 -qopt-prefetch-issue-excl-hint
```

C++ benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -static -opt-prefetch
-fp-model fast=2                        -auto-ilp32 -ansi-alias
```

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

Benchmarks using both Fortran and C:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -static -opt-prefetch -auto-ilp32
-ansi-alias -opt-mem-layout-trans=3 -qopt-prefetch-issue-excl-hint
```

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Peak Compiler Invocation

C benchmarks:
     icc   -m64

C++ benchmarks (except as noted below):
     icpc   -m64

      450.soplex: icpc -m32 -L/opt/intel/compilers_and_libraries_2016/linux/lib/ia32_lin

Fortran benchmarks:
     ifort -m64

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

Peak 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: -D_FILE_OFFSET_BITS=64
        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

Peak Optimization Flags

C benchmarks:

      433.milc: basepeak = yes

      470.lbm: basepeak = yes

     482.sphinx3: basepeak = yes

C++ benchmarks:

Continued on next page

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Peak Optimization Flags (Continued)

```
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) -static(pass 2)
          -opt-mem-layout-trans=3(pass 2) -prof-use(pass 2) -fno-alias
          -auto-ilp32
```

447.dealII: basepeak = yes

```
450.soplex: -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) -static(pass 2)
            -opt-mem-layout-trans=3(pass 2) -prof-use(pass 2)
            -opt-malloc-options=3
```

```
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) -static(pass 2)
            -opt-mem-layout-trans=3(pass 2) -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) -static(pass 2) -prof-use(pass 2)
            -unroll2 -inline-level=0 -scalar-rep-
```

434.zeusmp: basepeak = yes

```
437.leslie3d: -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) -static(pass 2) -prof-use(pass 2)
              -opt-malloc-options=3 -opt-prefetch
```

459.GemsFDTD: basepeak = yes

```
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) -static(pass 2) -prof-use(pass 2)
           -unroll4 -auto -inline-calloc -opt-malloc-options=3
```

Benchmarks using both Fortran and C:

```
435.gromacs: -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) -static(pass 2)
             -opt-mem-layout-trans=3(pass 2) -prof-use(pass 2)
             -opt-prefetch -auto-ilp32
```

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Peak Optimization Flags (Continued)

436.cactusADM: basepeak = yes

454.calculix: basepeak = yes

481.wrf: -xCORE-AVX2 -ipo -O3 -no-prec-div -static -auto-ilp32

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

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