SPEC® CFP2006 Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL560 Gen9
(2.10 GHz, Intel Xeon E5-4640 v4)

$SPECfp®\_rate2006 =$ 1510
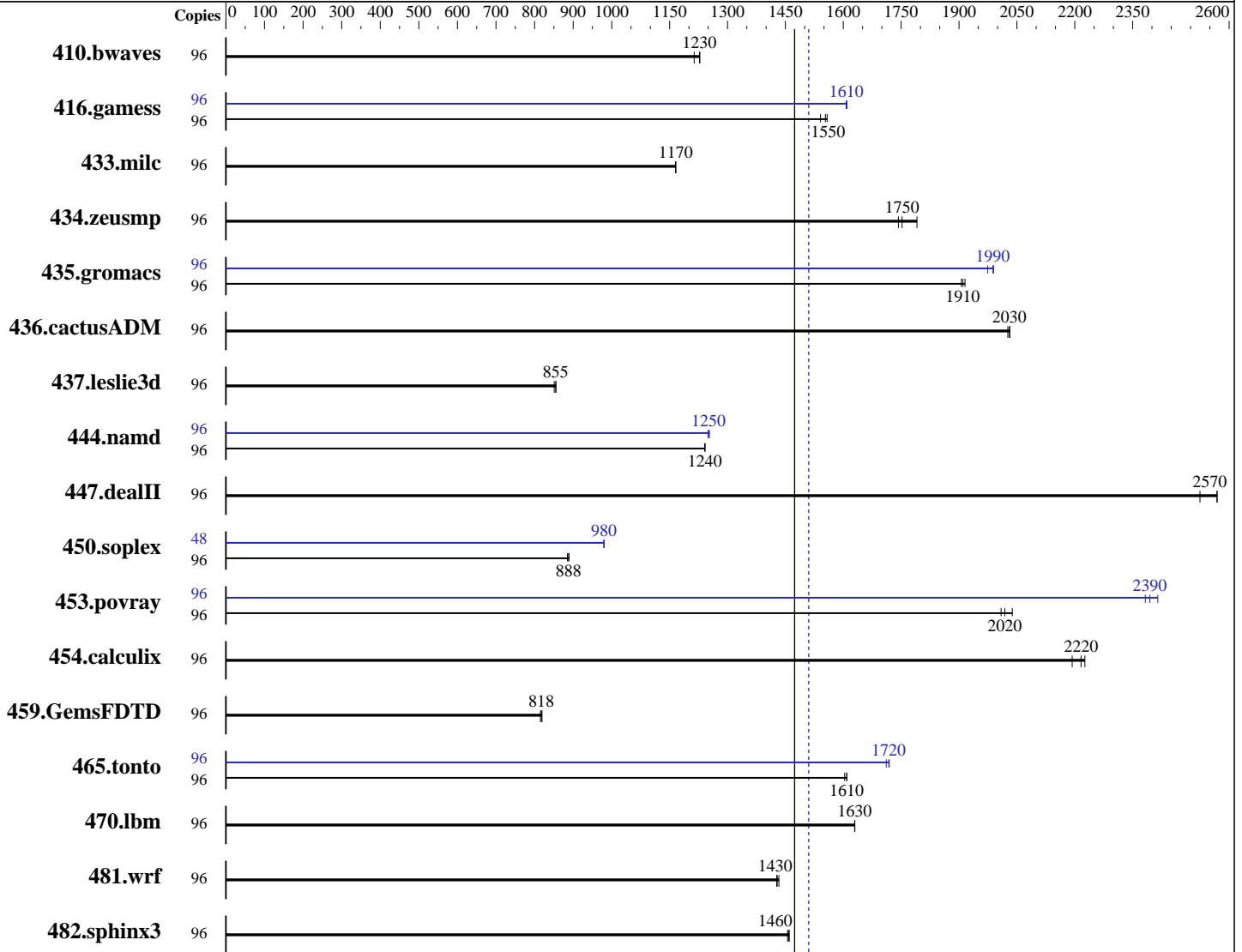
$SPECfp\_rate\_base2006 =$ 1470

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

Copies

410.bwaves	96	1230
416.gamess	96	1610
	96	1550
433.milc	96	1170
434.zeusmp	96	1750
435.gromacs	96	1990
	96	1910
436.cactusADM	96	2030
437.leslie3d	96	855
444.namd	96	1250
	96	1240
447.dealII	96	2570
450.soplex	48	980
	96	888
453.povray	96	2390
	96	2020
454.calculix	96	2220
459.GemsFDTD	96	818
465.tonto	96	1720
	96	1610
470.lbm	96	1630
481.wrf	96	1430
482.sphinx3	96	1460

SPECfp_rate_base2006 = 1470

SPECfp_rate2006 = 1510

Hardware

CPU Name:	Intel Xeon E5-4640 v4
CPU Characteristics:	Intel Turbo Boost Technology up to 2.60 GHz
CPU MHz:	2100
FPU:	Integrated
CPU(s) enabled:	48 cores, 4 chips, 12 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)

Continued on next page

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L3 Cache:	30 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 2133 MHz)	Other Software:	None
Disk Subsystem:	1 x 400 GB SAS SSD, RAID 0		
Other Hardware:	None		

Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	96	1075	1210	**1063**	**1230**	1062	1230	96	1075	1210	**1063**	**1230**	1062	1230
416.gamess	96	1206	1560	1220	1540	**1210**	**1550**	96	1168	1610	**1169**	**1610**	1169	1610
433.milc	96	756	1170	756	1170	**756**	**1170**	96	756	1170	756	1170	**756**	**1170**
434.zeusmp	96	501	1740	488	1790	**499**	**1750**	96	501	1740	488	1790	**499**	**1750**
435.gromacs	96	**359**	**1910**	358	1920	360	1910	96	347	1970	**345**	**1990**	345	1990
436.cactusADM	96	**565**	**2030**	565	2030	566	2030	96	**565**	**2030**	565	2030	566	2030
437.leslie3d	96	1055	855	1061	851	**1056**	**855**	96	1055	855	1061	851	**1056**	**855**
444.namd	96	621	1240	**620**	**1240**	620	1240	96	614	1250	**615**	**1250**	616	1250
447.dealII	96	428	2570	435	2520	**428**	**2570**	96	428	2570	435	2520	**428**	**2570**
450.soplex	96	900	889	**901**	**888**	905	885	48	**409**	**980**	409	980	408	980
453.povray	96	**253**	**2020**	254	2010	251	2040	96	**213**	**2390**	214	2380	211	2420
454.calculix	96	356	2230	361	2190	**357**	**2220**	96	356	2230	361	2190	**357**	**2220**
459.GemsFDTD	96	1250	815	**1246**	**818**	1243	819	96	1250	815	**1246**	**818**	1243	819
465.tonto	96	589	1600	**587**	**1610**	587	1610	96	552	1710	**550**	**1720**	549	1720
470.lbm	96	**809**	**1630**	809	1630	809	1630	96	**809**	**1630**	809	1630	809	1630
481.wrf	96	751	1430	**751**	**1430**	748	1430	96	751	1430	**751**	**1430**	748	1430
482.sphinx3	96	**1283**	**1460**	1281	1460	1285	1460	96	**1283**	**1460**	1281	1460	1285	1460

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
Tested by: HPE

Test date: Aug-2016
Hardware Availability: Jul-2016
Software Availability: Dec-2015

Platform Notes

```
BIOS Configuration:
  HP Power Profile set to Balanced Power and Performance
  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
  Memory Refresh Rate set to 1x Refresh
Sysinfo program /home/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on sles12biswadl560 Tue Aug 23 05:02:40 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 E5-4640 v4 @ 2.10GHz
     4 "physical id"s (chips)
     96 "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 : 12
     siblings  : 24
     physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13
     physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13
     physical 2: cores 0 1 2 3 4 5 8 9 10 11 12 13
     physical 3: cores 0 1 2 3 4 5 8 9 10 11 12 13
  cache size : 15360 KB

From /proc/meminfo
  MemTotal:      529304376 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"
```

Continued on next page

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Platform Notes (Continued)

```
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 23 05:01

SPEC is set to: /home/cpu2006
   Filesystem      Type   Size   Used Avail Use% Mounted on
   /dev/sda4       xfs    331G   135G  197G  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 P85 07/01/2016
   Memory:
   16x UNKNOWN NOT AVAILABLE
   32x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2400 MHz, configured at 2133 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 2133 MHz
```

General Notes

```
Environment variables set by runspec before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2006/libs/32:/home/cpu2006/libs/64:/home/cpu2006/sh"

 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

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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 -opt-prefetch -auto-p32
-ansi-alias -opt-mem-layout-trans=3
```

C++ benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch -auto-p32
-ansi-alias -opt-mem-layout-trans=3
```

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

Benchmarks using both Fortran and C:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch -auto-p32
-ansi-alias -opt-mem-layout-trans=3
```

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/compiler/lib/ia32_lin
```

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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

      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:

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

        447.dealII: basepeak = yes

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Peak Optimization Flags (Continued)

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) -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) -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) -prof-use(pass 2) -unroll2
-inline-level=0 -scalar-rep-

434.zeusmp: basepeak = yes

437.leslie3d: basepeak = yes

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) -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) -opt-mem-layout-trans=3(pass 2)
-prof-use(pass 2) -opt-prefetch -auto-ilp32

436.cactusADM: basepeak = yes

454.calculix: basepeak = yes

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

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