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

ProLiant XL420 Gen9
(2.30 GHz, Intel Xeon E5-2697 v4)

$SPECfp^{®}2006 =$ 127
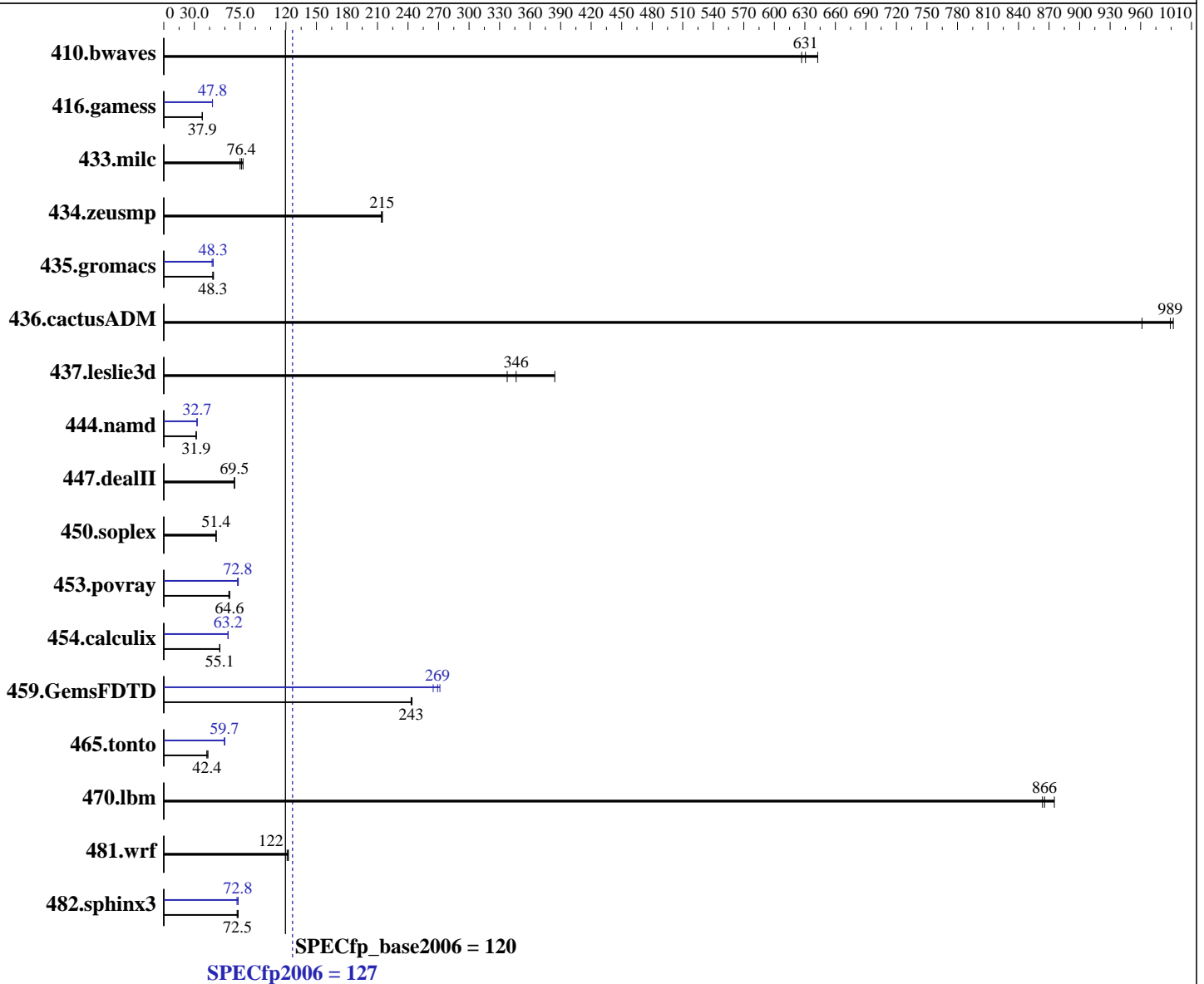
$SPECfp\_base2006 =$ 120

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

0 30.0 75.0 120 150 180 210 240 270 300 330 360 390 420 450 480 510 540 570 600 630 660 690 720 750 780 810 840 870 900 930 960 1010

- **410.bwaves** 631
- **416.gamess** 47.8 / 37.9
- **433.milc** 76.4
- **434.zeusmp** 215
- **435.gromacs** 48.3 / 48.3
- **436.cactusADM** 989
- **437.leslie3d** 346
- **444.namd** 32.7 / 31.9
- **447.dealII** 69.5
- **450.soplex** 51.4
- **453.povray** 72.8 / 64.6
- **454.calculix** 63.2 / 55.1
- **459.GemsFDTD** 269 / 243
- **465.tonto** 59.7 / 42.4
- **470.lbm** 866
- **481.wrf** 122
- **482.sphinx3** 72.8 / 72.5

SPECfp_base2006 = 120

SPECfp2006 = 127

Hardware

CPU Name: Intel Xeon E5-2697 v4
CPU Characteristics: Intel Turbo Boost Technology up to 3.60 GHz
CPU MHz: 2300
FPU: Integrated
CPU(s) enabled: 36 cores, 2 chips, 18 cores/chip
CPU(s) orderable: 1,2 chips
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 3.10.49-11-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: btrfs
System State: Run level 5 (multi-user, w/GUI)

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L3 Cache:	45 MB I+D on chip per chip
Other Cache:	None
Memory:	256 GB (8 x 32 GB 2Rx4 PC4-2400T-R)
Disk Subsystem:	2 x 400 GB SAS SSD, RAID 1
Other Hardware:	None

Base Pointers:	64-bit
Peak Pointers:	32/64-bit
Other Software:	None

Results Table

Benchmark	Base						Peak					
	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	**21.6**	**631**	21.7	627	21.1	643	**21.6**	**631**	21.7	627	21.1	643
416.gamess	518	37.8	517	37.9	**517**	**37.9**	**410**	**47.8**	410	47.8	409	47.9
433.milc	**120**	**76.4**	118	77.9	122	75.0	**120**	**76.4**	118	77.9	122	75.0
434.zeusmp	42.6	214	**42.4**	**215**	42.4	215	42.6	214	**42.4**	**215**	42.4	215
435.gromacs	146	48.9	**148**	**48.3**	148	48.2	151	47.4	**148**	**48.3**	147	48.6
436.cactusADM	12.4	961	12.0	992	**12.1**	**989**	12.4	961	12.0	992	**12.1**	**989**
437.leslie3d	**27.1**	**346**	27.9	337	24.5	384	**27.1**	**346**	27.9	337	24.5	384
444.namd	251	31.9	**252**	**31.9**	252	31.9	246	32.7	**245**	**32.7**	245	32.7
447.dealII	**165**	**69.5**	165	69.3	165	69.5	**165**	**69.5**	165	69.3	165	69.5
450.soplex	163	51.3	**162**	**51.4**	162	51.4	163	51.3	**162**	**51.4**	162	51.4
453.povray	**82.4**	**64.6**	83.3	63.9	82.1	64.8	72.6	73.2	**73.0**	**72.8**	73.4	72.5
454.calculix	**150**	**55.1**	150	55.1	150	54.9	130	63.2	**131**	**63.2**	131	63.1
459.GemsFDTD	43.5	244	43.7	243	**43.6**	**243**	39.1	271	40.1	265	**39.4**	**269**
465.tonto	232	42.4	**232**	**42.4**	227	43.4	**165**	**59.7**	165	59.6	164	59.9
470.lbm	15.9	863	15.7	875	**15.9**	**866**	15.9	863	15.7	875	**15.9**	**866**
481.wrf	92.2	121	91.3	122	**91.3**	**122**	92.2	121	91.3	122	**91.3**	**122**
482.sphinx3	267	73.1	271	72.0	**269**	**72.5**	267	73.1	271	71.9	**268**	**72.8**

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 set to Disabled
    Power Profile set to Custom
    Power Regulator set to Static High Performance Mode
    Minimum Processor Idle Power Package C-State set to Package C6 (retention) State
    Energy/Performance Bias set to Balance Performance
    QPI Snoop Configuration set to Home Snoop
    Collaborative Power Control set to Disabled
```
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$SPECfp\_base2006 =$ 120

CPU2006 license: 3
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Tested by: HPE

Test date: Jun-2016
Hardware Availability: Mar-2016
Software Availability: Dec-2015

Platform Notes (Continued)

```
    Thermal Configuration set to Maximum Cooling
    Processor Power and Utilization Monitoring set to Disabled
    Memory Double Refresh Rate set to 1x Refresh
    Memory Patrol Scrubbing set to Disabled

  Sysinfo program /home/cpu2006/config/sysinfo.rev6914
  $Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
  running on linux-s40o Thu Jun  9 20:53:19 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 E5-2697 v4 @ 2.30GHz
       2 "physical id"s (chips)
       36 "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
    cache size : 46080 KB

  From /proc/meminfo
    MemTotal:       264217796 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

  /usr/bin/lsb_release -d
    SUSE Linux Enterprise Server 12 SP1

  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:
```

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Platform Notes (Continued)

```
    Linux linux-s40o 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 5 Jun 9 20:42

  SPEC is set to: /home/cpu2006
    Filesystem      Type   Size  Used Avail Use% Mounted on
    /dev/sda3       btrfs  370G   15G  354G   4% /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 U19 02/22/2016
    Memory:
    8x UNKNOWN NOT AVAILABLE
    8x 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 256 GB and the dmidecode description should have one line reading as:
  8x UNKNOWN NOT AVAILABLE 32 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 = "36"

 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
```

C++ benchmarks:

```
    -xCORE-AVX2 -ipo -O3 -no-prec-div -static -opt-prefetch -ansi-alias
```

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
    -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: 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: -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
               -auto-ilp32

  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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