# SPEC® CFP2006 Result

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## Hewlett Packard Enterprise

(Test Sponsor: HPE)

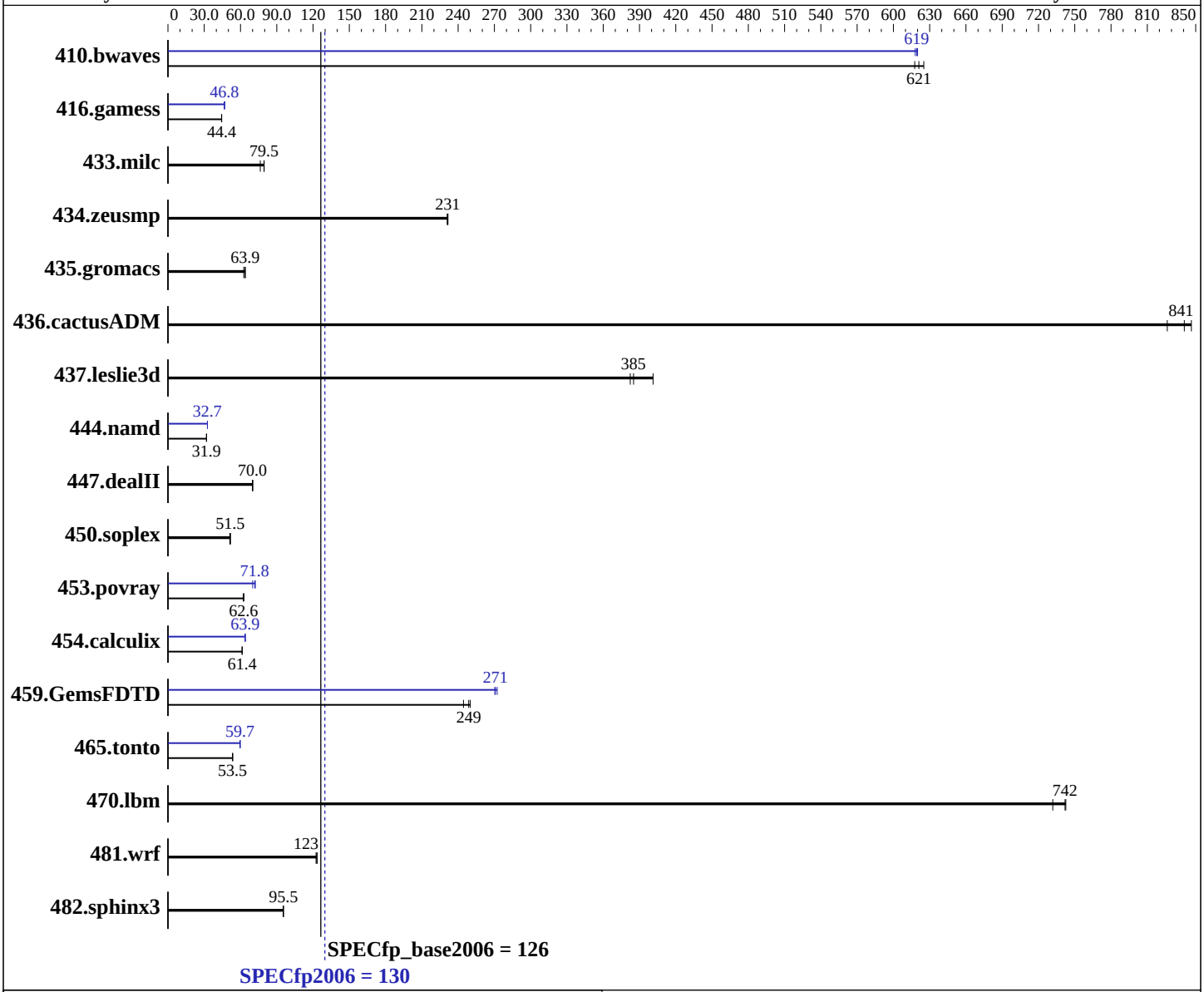
ProLiant ML350 Gen9
(3.20 GHz, Intel Xeon E5-2667 v4)

SPECfp®2006 = 130

SPECfp_base2006 = 126

**CPU2006 license:** 3
**Test sponsor:** HPE
**Tested by:** HPE

**Test date:** May-2016
**Hardware Availability:** Mar-2016
**Software Availability:** Dec-2015




## Hardware

| | |
|---|---|
| CPU Name: | Intel Xeon E5-2667 v4 |
| CPU Characteristics: | Intel Turbo Boost Technology up to 3.60 GHz |
| CPU MHz: | 3200 |
| FPU: | Integrated |
| CPU(s) enabled: | 16 cores, 2 chips, 8 cores/chip |
| CPU(s) orderable: | 1,2 chip |
| Primary Cache: | 32 KB I + 32 KB D on chip per core |
| Secondary Cache: | 256 KB I+D on chip per core |

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## Software

| | |
|---|---|
| Operating System: | SUSE Linux Enterprise Server 12 (x86_64) SP1<br>Kernel 3.12.49-11-default |
| Compiler: | C/C++: Version 16.0.0.101 of Intel C++ Studio XE for Linux;<br>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
Other Cache: None
Memory: 256 GB (16 x 16 GB 2Rx4 PC4-2400T-R)
Disk Subsystem: 1 x 800 GB SAS SSD, RAID 0
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 | 21.7 | 625 | **21.9** | **621** | 22.0 | 618 | **21.9** | **619** | 22.0 | 618 | 21.9 | 620 |
| 416.gamess | 442 | 44.3 | **441** | **44.4** | 441 | 44.4 | 420 | 46.6 | 418 | 46.9 | **419** | **46.8** |
| 433.milc | 120 | 76.4 | 115 | 79.5 | **115** | **79.5** | 120 | 76.4 | 115 | 79.5 | **115** | **79.5** |
| 434.zeusmp | 39.4 | 231 | 39.3 | 232 | **39.3** | **231** | 39.4 | 231 | 39.3 | 232 | **39.3** | **231** |
| 435.gromacs | 112 | 63.9 | **112** | **63.9** | 114 | 62.7 | 112 | 63.9 | **112** | **63.9** | 114 | 62.7 |
| 436.cactusADM | 14.1 | 846 | 14.5 | 827 | **14.2** | **841** | 14.1 | 846 | 14.5 | 827 | **14.2** | **841** |
| 437.leslie3d | 23.4 | 401 | **24.4** | **385** | 24.6 | 382 | 23.4 | 401 | **24.4** | **385** | 24.6 | 382 |
| 444.namd | 251 | 31.9 | 251 | 31.9 | **251** | **31.9** | 245 | 32.7 | 246 | 32.6 | **246** | **32.7** |
| 447.dealII | 163 | 70.1 | 164 | 69.9 | **163** | **70.0** | 163 | 70.1 | 164 | 69.9 | **163** | **70.0** |
| 450.soplex | 161 | 51.7 | 163 | 51.2 | **162** | **51.5** | 161 | 51.7 | 163 | 51.2 | **162** | **51.5** |
| 453.povray | 84.7 | 62.8 | 85.5 | 62.2 | **85.0** | **62.6** | 76.0 | 70.0 | **74.1** | **71.8** | 73.6 | 72.3 |
| 454.calculix | 134 | 61.5 | 135 | 61.3 | **134** | **61.4** | **129** | **63.9** | 129 | 63.9 | 129 | 63.8 |
| 459.GemsFDTD | 42.4 | 250 | **42.7** | **249** | 43.4 | 244 | 39.3 | 270 | **39.2** | **271** | 39.0 | 272 |
| 465.tonto | 185 | 53.3 | **184** | **53.5** | 184 | 53.6 | 165 | 59.7 | 165 | 59.6 | **165** | **59.7** |
| 470.lbm | 18.8 | 732 | 18.5 | 743 | **18.5** | **742** | 18.8 | 732 | 18.5 | 743 | **18.5** | **742** |
| 481.wrf | 91.2 | 122 | 90.5 | 123 | **90.7** | **123** | 91.2 | 122 | 90.5 | 123 | **90.7** | **123** |
| 482.sphinx3 | 205 | 95.2 | **204** | **95.5** | 204 | 95.5 | 205 | 95.2 | **204** | **95.5** | 204 | 95.5 |

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 Option set to Disabled
  Power Profile set to Balanced Power and Performance
  QPI Snoop Configuration set to Home Snoop
  Thermal Configuration set to Maximum Cooling
  Processor Power and Utilization Monitoring set to Disabled
  Memory Double Refresh Rate set to 1x Refresh
  Collaborative Power Control set to Disabled
```

Continued on next page

## Platform Notes (Continued)

```
Sysinfo program
/home/specuser/cpu2006/HP_build_ic16_suite_corrected_int_bins_round_2/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on linux-szds Tue May 17 20:43:58 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 E5-2667 v4 @ 3.20GHz
      2 "physical id"s (chips)
      16 "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 : 8
      siblings  : 8
      physical 0: cores 0 2 3 4 8 10 11 12
      physical 1: cores 0 2 3 4 8 10 11 12
   cache size : 25600 KB

From /proc/meminfo
   MemTotal:       264330168 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:
   Linux linux-szds 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 May 17 20:22
```

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## Platform Notes (Continued)

```
SPEC is set to:
/home/specuser/cpu2006/HP_build_ic16_suite_corrected_int_bins_round_2/cpu2006
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/sda4      xfs   703G  290G  413G  42% /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 P92 03/23/2016
  Memory:
   8x UNKNOWN NOT AVAILABLE
   16x 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 256 GB and the dmidecode description should have one line reading as:
 16x 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 = "16"
LD_LIBRARY_PATH = "/home/specuser/cpu2006/HP_build_ic16_suite_corrected_int_bins_round_2/cpu2006/libs/32:/home/specuser/cpu2006/HP_build_ic16_suite_corrected_int_bins_round_2/cpu2006/libs/64:/home/specuser/cpu2006/HP_build_ic16_suite_corrected_int_bins_round_2/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
```

## 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

Continued on next page

## 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: 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) -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

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


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