# SPEC® CFP2006 Result
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## Hewlett-Packard Company

ProLiant BL660c Gen9
(2.00 GHz, Intel Xeon E5-4620 v3)

$SPECfp^{®}2006 =$    87.5
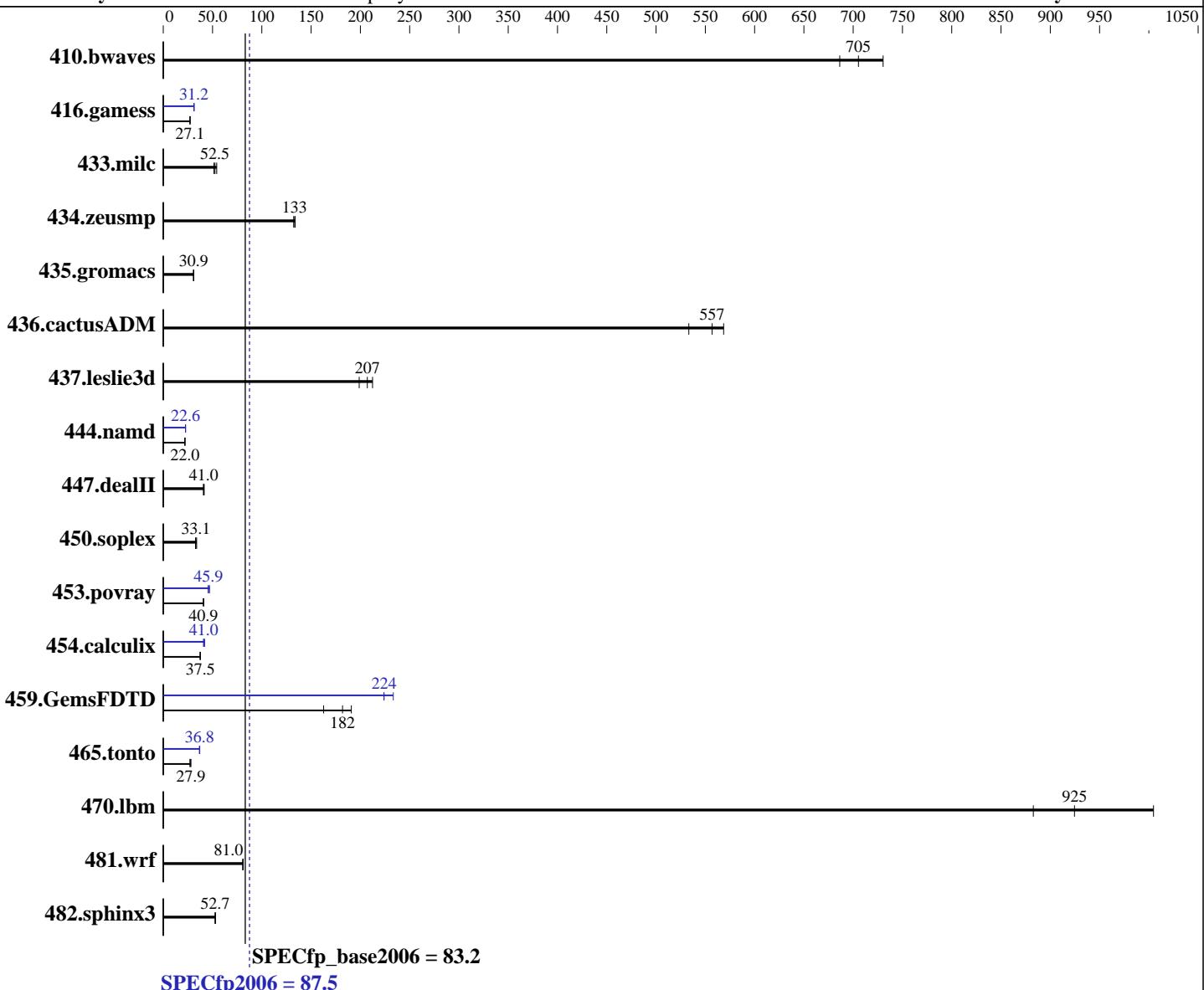
$SPECfp\_base2006 =$    83.2

**CPU2006 license:** 3

**Test sponsor:** Hewlett-Packard Company

**Tested by:** Hewlett-Packard Company

**Test date:** May-2015

**Hardware Availability:** Jun-2015

**Software Availability:** Oct-2014

| Benchmark | Value |
|---|---|
| 410.bwaves | 705 |
| 416.gamess | 31.2 / 27.1 |
| 433.milc | 52.5 |
| 434.zeusmp | 133 |
| 435.gromacs | 30.9 |
| 436.cactusADM | 557 |
| 437.leslie3d | 207 |
| 444.namd | 22.6 / 22.0 |
| 447.dealII | 41.0 |
| 450.soplex | 33.1 |
| 453.povray | 45.9 / 40.9 |
| 454.calculix | 41.0 / 37.5 |
| 459.GemsFDTD | 224 / 182 |
| 465.tonto | 36.8 / 27.9 |
| 470.lbm | 925 |
| 481.wrf | 81.0 |
| 482.sphinx3 | 52.7 |

SPECfp_base2006 = 83.2

SPECfp2006 = 87.5

### Hardware

**CPU Name:** Intel Xeon E5-4620 v3

**CPU Characteristics:** Intel Turbo Boost Technology up to 2.60 GHz

**CPU MHz:** 2000

**FPU:** Integrated

**CPU(s) enabled:** 40 cores, 4 chips, 10 cores/chip

**CPU(s) orderable:** 2,4 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) Kernel 3.12.28-4-default

**Compiler:** C/C++: Version 15.0.0.090 of Intel C++ Studio XE for Linux; Fortran: Version 15.0.0.090 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: | 512 GB (32 x 16 GB 2Rx4 PC4-2133P-R, running at 1866 MHz) |
| Disk Subsystem: | 1 x 400 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 | 19.8 | 686 | 18.6 | 730 | **19.3** | **705** | 19.8 | 686 | 18.6 | 730 | **19.3** | **705** |
| 416.gamess | 723 | 27.1 | 719 | 27.2 | **722** | **27.1** | 627 | 31.2 | 628 | 31.2 | **627** | **31.2** |
| 433.milc | 169 | 54.2 | 178 | 51.4 | **175** | **52.5** | 169 | 54.2 | 178 | 51.4 | **175** | **52.5** |
| 434.zeusmp | 68.8 | 132 | **68.2** | **133** | 68.0 | 134 | 68.8 | 132 | **68.2** | **133** | 68.0 | 134 |
| 435.gromacs | **231** | **30.9** | 231 | 30.9 | 234 | 30.5 | **231** | **30.9** | 231 | 30.9 | 234 | 30.5 |
| 436.cactusADM | 22.4 | 533 | 21.0 | 569 | **21.5** | **557** | 22.4 | 533 | 21.0 | 569 | **21.5** | **557** |
| 437.leslie3d | **45.4** | **207** | 47.3 | 199 | 44.3 | 212 | **45.4** | **207** | 47.3 | 199 | 44.3 | 212 |
| 444.namd | 365 | 22.0 | **365** | **22.0** | 365 | 22.0 | 355 | 22.6 | 355 | 22.6 | **355** | **22.6** |
| 447.dealII | 275 | 41.5 | 280 | 40.8 | **279** | **41.0** | 275 | 41.5 | 280 | 40.8 | **279** | **41.0** |
| 450.soplex | **252** | **33.1** | 255 | 32.7 | 246 | 33.9 | **252** | **33.1** | 255 | 32.7 | 246 | 33.9 |
| 453.povray | **130** | **40.9** | 131 | 40.7 | 130 | 40.9 | 117 | 45.6 | 113 | 47.0 | **116** | **45.9** |
| 454.calculix | **220** | **37.5** | 219 | 37.7 | 221 | 37.3 | 197 | 42.0 | 201 | 40.9 | **201** | **41.0** |
| 459.GemsFDTD | 65.2 | 163 | **58.3** | **182** | 55.6 | 191 | 45.5 | 233 | **47.4** | **224** | 47.4 | 224 |
| 465.tonto | **353** | **27.9** | 352 | 27.9 | 364 | 27.0 | 268 | 36.8 | **267** | **36.8** | 266 | 37.0 |
| 470.lbm | 13.7 | 1000 | **14.9** | **925** | 15.6 | 883 | 13.7 | 1000 | **14.9** | **925** | 15.6 | 883 |
| 481.wrf | **138** | **81.0** | 139 | 80.5 | 138 | 81.1 | **138** | **81.0** | 139 | 80.5 | 138 | 81.1 |
| 482.sphinx3 | **370** | **52.7** | 371 | 52.6 | 367 | 53.1 | **370** | **52.7** | 371 | 52.6 | 367 | 53.1 |

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
      Power Profile set to Custom
      Power Regulator set to Static High Performance Mode
      Minimum Processor Idle Power Core C-State set to C6 State
      Minimum Processor Idle Power Package C-State set to Package C6 (retention) State
      Energy/Performance Bias set to Maximum Performance
      Collaborative Power Control set to Disabled
```

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(2.00 GHz, Intel Xeon E5-4620 v3)

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$SPECfp\_base2006 =$ 83.2

**CPU2006 license:** 3
**Test sponsor:** Hewlett-Packard Company
**Tested by:** Hewlett-Packard Company

**Test date:** May-2015
**Hardware Availability:** Jun-2015
**Software Availability:** Oct-2014

## Platform Notes (Continued)

```
    Thermal Configuration set to Maximum Cooling
    Processor Power and Utilization Monitoring set to Disabled
    Memory Refresh Rate set to 1x Refresh
    Intel Hyperthreading Options set to Disabled
  Sysinfo program /root/cpu2006/config/sysinfo.rev6914
  $Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
  running on linux-wzg5 Fri May 29 00:21:24 2015

  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 E5-4620 v3 @ 2.00GHz
       4 "physical id"s (chips)
       40 "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 : 10
       siblings  : 10
       physical 0: cores 0 2 3 4 8 9 10 11 12
       physical 1: cores 0 2 3 4 8 9 10 11 12
       physical 2: cores 0 2 3 4 8 9 10 11 12
       physical 3: cores 0 2 3 4 8 9 10 11 12
    cache size : 25600 KB

  From /proc/meminfo
    MemTotal:       529179512 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

  From /etc/*release* /etc/*version*
    SuSE-release:
       SUSE Linux Enterprise Server 12 (x86_64)
       VERSION = 12
       PATCHLEVEL = 0
       # 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"
       VERSION_ID="12"
       PRETTY_NAME="SUSE Linux Enterprise Server 12"
       ID="sles"
       ANSI_COLOR="0;32"
       CPE_NAME="cpe:/o:suse:sles:12"

  uname -a:
    Linux linux-wzg5 3.12.28-4-default #1 SMP Thu Sep 25 17:02:34 UTC 2014
    (9879bd4) x86_64 x86_64 x86_64 GNU/Linux
```

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## Platform Notes (Continued)

```
run-level 3 May 29 00:20

SPEC is set to: /root/cpu2006
   Filesystem      Type  Size  Used Avail Use% Mounted on
   /dev/sdb4       xfs   300G  8.7G  292G   3% /
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 I38 03/05/2015
   Memory:
   32x HP 752369-081 16 GB 2 rank 2133 MHz, configured at 1866 MHz

(End of data from sysinfo program)
```

## General Notes

```
Environment variables set by runspec before the start of the run:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/root/cpu2006/libs/32:/root/cpu2006/libs/64:/root/cpu2006/sh"
OMP_NUM_THREADS = "40"

 Binaries compiled on a system with 1x Core i5-4670K CPU + 16GB
 memory using RedHat EL 7.0
```

## 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
```

Continued on next page

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| **Test sponsor:** | Hewlett-Packard Company | **Hardware Availability:** | Jun-2015 |
| **Tested by:** | Hewlett-Packard Company | **Software Availability:** | Oct-2014 |

## Base Portability Flags (Continued)

```
     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 -parallel -opt-prefetch
-ansi-alias
```

C++ benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch -ansi-alias
```

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

Benchmarks using both Fortran and C:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -parallel -opt-prefetch
-ansi-alias
```

## Peak 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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## 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(pass 1) -ipo(pass 2)
          -O3(pass 2) -no-prec-div(pass 2) -prof-use(pass 2)
          -fno-alias -auto-ilp32

     447.dealII: basepeak = yes

     450.soplex: basepeak = yes

     453.povray: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
          -O3(pass 2) -no-prec-div(pass 2) -prof-use(pass 2) -unroll4
          -ansi-alias

Fortran benchmarks:

     410.bwaves: basepeak = yes

     416.gamess: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
          -O3(pass 2) -no-prec-div(pass 2) -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(pass 1) -ipo(pass 2)
          -O3(pass 2) -no-prec-div(pass 2) -prof-use(pass 2) -unroll2
          -inline-level=0 -opt-prefetch -parallel

     465.tonto: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
          -O3(pass 2) -no-prec-div(pass 2) -prof-use(pass 2)
          -inline-calloc -opt-malloc-options=3 -auto -unroll4

Benchmarks using both Fortran and C:

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# Peak Optimization Flags (Continued)

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/Intel-ic15.0-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-ic15.0-official-linux64.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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