# SPEC® CFP2006 Result

## Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant BL460c Gen9
(2.20 GHz, Intel Xeon E5-2699 v4)

$SPECfp^{®}2006 =$ 125
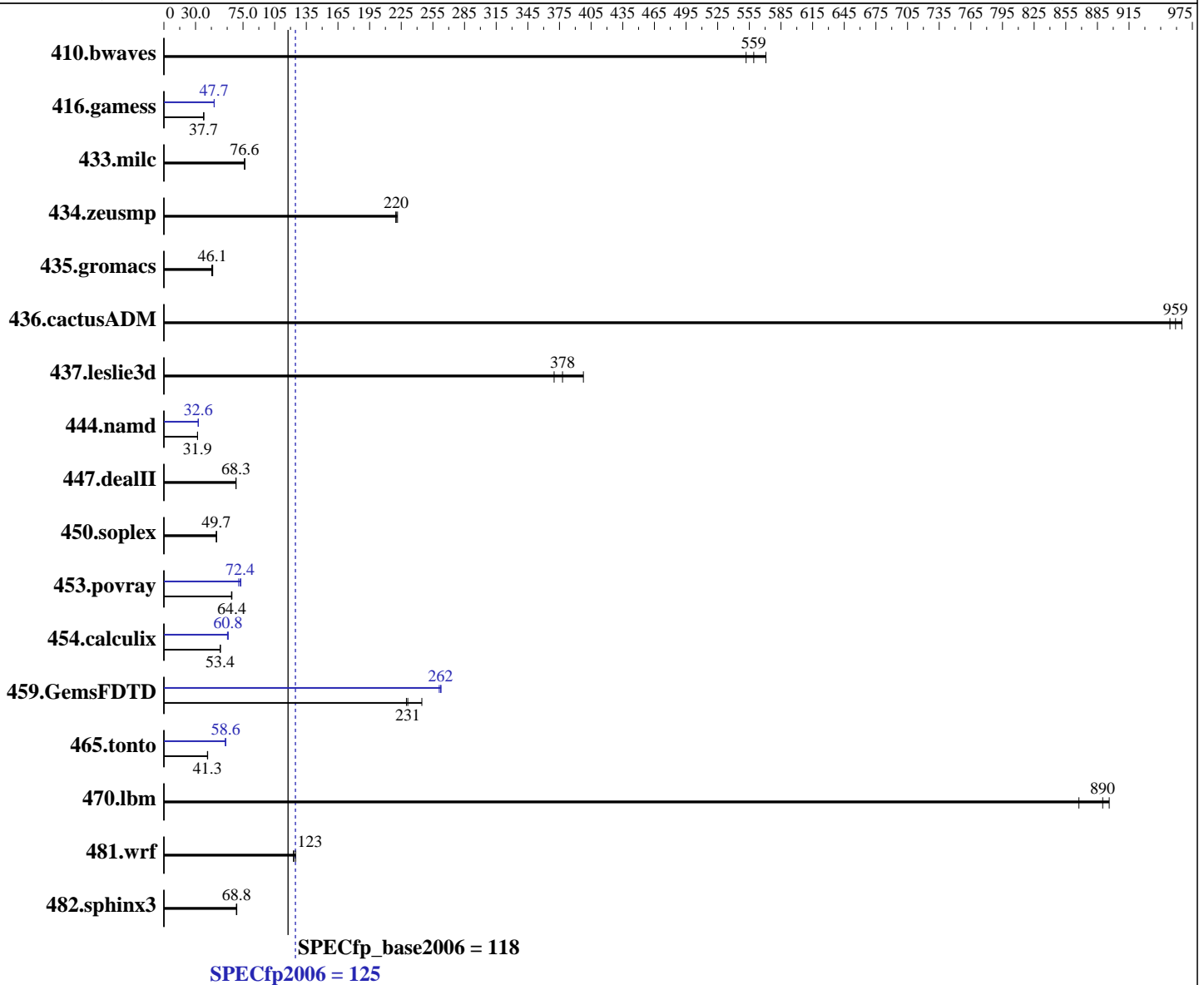
$SPECfp\_base2006 =$ 118

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



| | |
|---|---|
| 410.bwaves | 559 |
| 416.gamess | 47.7 / 37.7 |
| 433.milc | 76.6 |
| 434.zeusmp | 220 |
| 435.gromacs | 46.1 |
| 436.cactusADM | 959 |
| 437.leslie3d | 378 |
| 444.namd | 32.6 / 31.9 |
| 447.dealII | 68.3 |
| 450.soplex | 49.7 |
| 453.povray | 72.4 / 64.4 |
| 454.calculix | 60.8 / 53.4 |
| 459.GemsFDTD | 262 / 231 |
| 465.tonto | 58.6 / 41.3 |
| 470.lbm | 890 |
| 481.wrf | 123 |
| 482.sphinx3 | 68.8 |

SPECfp_base2006 = 118

SPECfp2006 = 125

## Hardware

| | |
|---|---|
| CPU Name: | Intel Xeon E5-2699 v4 |
| CPU Characteristics: | Intel Turbo Boost Technology up to 3.60 GHz |
| CPU MHz: | 2200 |
| FPU: | Integrated |
| CPU(s) enabled: | 44 cores, 2 chips, 22 cores/chip, 2 threads/core |
| 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 |

**Continued on next page**

## Software

| | |
|---|---|
| Operating System: | Red Hat Enterprise Linux Server release 7.2 (Maipo) |
| | Kernel 3.10.0-327.el7.x86_64 |
| 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: | xfs |

**Continued on next page**

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| | | | |
|---|---|---|---|
| L3 Cache: | 55 MB I+D on chip per chip | System State: | Run level 3 (multi-user) |
| Other Cache: | None | Base Pointers: | 64-bit |
| Memory: | 256 GB (8 x 32 GB 2Rx4 PC4-2400T-R) | Peak Pointers: | 32/64-bit |
| Disk Subsystem: | 1 x 400 GB SAS SSD, RAID 0 | Other Software: | None |
| Other Hardware: | None | | |

## Results Table

| Benchmark | Base | | | | | | Peak | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 410.bwaves | **24.3** | **559** | 24.6 | 552 | 23.8 | 571 | **24.3** | **559** | 24.6 | 552 | 23.8 | 571 |
| 416.gamess | 519 | 37.7 | **519** | **37.7** | 519 | 37.7 | 411 | 47.7 | 411 | 47.6 | **411** | **47.7** |
| 433.milc | **120** | **76.6** | 120 | 76.7 | 120 | 76.4 | **120** | **76.6** | 120 | 76.7 | 120 | 76.4 |
| 434.zeusmp | 41.1 | 221 | 41.4 | 220 | **41.3** | **220** | 41.1 | 221 | 41.4 | 220 | **41.3** | **220** |
| 435.gromacs | 157 | 45.3 | **155** | **46.1** | 154 | 46.3 | 157 | 45.3 | **155** | **46.1** | 154 | 46.3 |
| 436.cactusADM | 12.5 | 954 | **12.5** | **959** | 12.4 | 965 | 12.5 | 954 | **12.5** | **959** | 12.4 | 965 |
| 437.leslie3d | **24.9** | **378** | 23.6 | 398 | 25.4 | 370 | **24.9** | **378** | 23.6 | 398 | 25.4 | 370 |
| 444.namd | 251 | 31.9 | 251 | 31.9 | **251** | **31.9** | **246** | **32.6** | 246 | 32.6 | 246 | 32.6 |
| 447.dealII | 167 | 68.4 | 168 | 68.3 | **167** | **68.3** | 167 | 68.4 | 168 | 68.3 | **167** | **68.3** |
| 450.soplex | **168** | **49.7** | 167 | 50.0 | 168 | 49.7 | **168** | **49.7** | 167 | 50.0 | 168 | 49.7 |
| 453.povray | **82.6** | **64.4** | 82.6 | 64.4 | 83.1 | 64.0 | **73.5** | **72.4** | 72.9 | 73.0 | 75.1 | 70.9 |
| 454.calculix | **154** | **53.4** | 154 | 53.4 | 154 | 53.5 | 137 | 60.2 | **136** | **60.8** | 136 | 60.9 |
| 459.GemsFDTD | 46.1 | 230 | **45.9** | **231** | 43.4 | 245 | 40.4 | 263 | 40.6 | 261 | **40.5** | **262** |
| 465.tonto | 238 | 41.3 | 237 | 41.5 | **238** | **41.3** | 169 | 58.2 | 168 | 58.6 | **168** | **58.6** |
| 470.lbm | 15.8 | 867 | **15.4** | **890** | 15.3 | 896 | 15.8 | 867 | **15.4** | **890** | 15.3 | 896 |
| 481.wrf | 89.5 | 125 | 91.0 | 123 | **90.6** | **123** | 89.5 | 125 | 91.0 | 123 | **90.6** | **123** |
| 482.sphinx3 | 283 | 68.8 | 282 | 69.1 | **283** | **68.8** | 283 | 68.8 | 282 | 69.1 | **283** | **68.8** |

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 Option set to Enabled
Power Profile set to Custom
Power Regulator set to Static High Performance Mode
Minimum Processor Idle Power Core C-State set to C1E State
Minimum Processor Idle Power Package C-State set to No Package State
Collaborative Power Control set to Disabled
QPI Snoop Configuration set to Home Snoop
```

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant BL460c Gen9
(2.20 GHz, Intel Xeon E5-2699 v4)

**SPECfp2006 =** 125

**SPECfp_base2006 =** 118

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

**Test date:** Mar-2016
**Hardware Availability:** Mar-2016
**Software Availability:** Nov-2015

## Platform Notes (Continued)

```
Thermal Configuration set to Maximum Cooling
Processor Power and Utilization Monitoring set to Disabled
Memory Refresh Rate set to 1x Refresh
Sysinfo program /home/cpuv1.3/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on BL460c-Gen9-B Mon Feb 29 12:10:43 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 E5-2699 v4 @ 2.20GHz
      2 "physical id"s (chips)
      88 "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 : 22
      siblings  : 44
      physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27
      28
      physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27
      28
   cache size : 56320 KB

From /proc/meminfo
   MemTotal:       263834576 kB
   HugePages_Total:        0
   Hugepagesize:        2048 kB

From /etc/*release* /etc/*version*
   os-release:
      NAME="Red Hat Enterprise Linux Server"
      VERSION="7.2 (Maipo)"
      ID="rhel"
      ID_LIKE="fedora"
      VERSION_ID="7.2"
      PRETTY_NAME="Red Hat Enterprise Linux Server 7.2 (Maipo)"
      ANSI_COLOR="0;31"
      CPE_NAME="cpe:/o:redhat:enterprise_linux:7.2:GA:server"
   redhat-release: Red Hat Enterprise Linux Server release 7.2 (Maipo)
   system-release: Red Hat Enterprise Linux Server release 7.2 (Maipo)
   system-release-cpe: cpe:/o:redhat:enterprise_linux:7.2:ga:server

uname -a:
   Linux BL460c-Gen9-B 3.10.0-327.el7.x86_64 #1 SMP Thu Oct 29 17:29:29 EDT 2015
   x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Feb 29 12:05

SPEC is set to: /home/cpuv1.3/cpu2006
```

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## Platform Notes (Continued)

```
    Filesystem      Type   Size  Used Avail Use% Mounted on
    /dev/sda5       xfs    314G   96G  219G  31% /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 I36 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,1,0"
OMP_NUM_THREADS = "44"
LD_LIBRARY_PATH = "/home/cpuv1.3/cpu2006/libs/32:/home/cpuv1.3/cpu2006/libs/64:/home/cpuv1.3/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

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## Base Portability Flags (Continued)

```
    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 -fp-model fast=2
-qopt-prefetch-issue-excl-hint
```

C++ benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -static -opt-prefetch -ansi-alias
-fp-model fast=2
-qopt-prefetch-issue-excl-hint
```

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 -fp-model fast=2
-qopt-prefetch-issue-excl-hint
```

## Peak Compiler Invocation

C benchmarks:
```
icc    -m64
```

C++ benchmarks:
```
icpc   -m64
```

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**Test date:**                Mar-2016
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**Software Availability:**    Nov-2015

# 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: 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: basepeak = yes

436.cactusADM: basepeak = yes

454.calculix: `-xCORE-AVX2 -ipo -O3 -no-prec-div -auto-ilp32 -ansi-alias`

481.wrf: basepeak = yes

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

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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-revE.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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