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

ProLiant DL360 Gen9
(2.10 GHz, Intel Xeon E5-2620 v4)

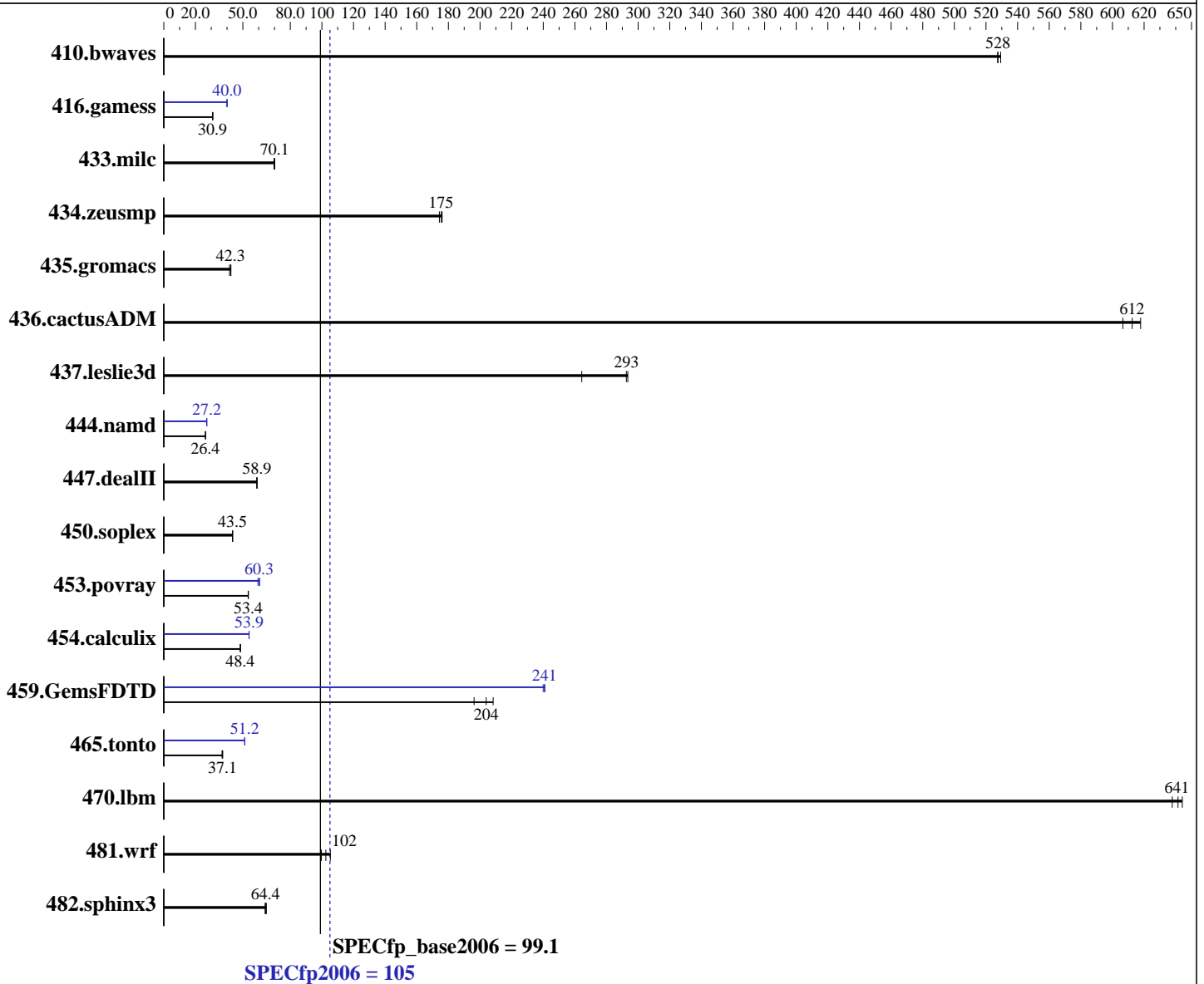$SPECfp^{®}2006 =$    105

$SPECfp\_base2006 =$    99.1

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



410.bwaves 528
416.gamess 40.0 / 30.9
433.milc 70.1
434.zeusmp 175
435.gromacs 42.3
436.cactusADM 612
437.leslie3d 293
444.namd 27.2 / 26.4
447.dealII 58.9
450.soplex 43.5
453.povray 60.3 / 53.4
454.calculix 53.9 / 48.4
459.GemsFDTD 241 / 204
465.tonto 51.2 / 37.1
470.lbm 641
481.wrf 102
482.sphinx3 64.4

**SPECfp_base2006 = 99.1**
**SPECfp2006 = 105**

## Hardware

| | |
|---|---|
| CPU Name: | Intel Xeon E5-2620 v4 |
| CPU Characteristics: | Intel Turbo Boost Technology up to 3.00 GHz |
| CPU MHz: | 2100 |
| FPU: | Integrated |
| CPU(s) enabled: | 16 cores, 2 chips, 8 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 |

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| | | | |
|---|---|---|---|
| L3 Cache: | 20 MB I+D on chip per chip | System State: | Run level 3 (multi-user) |
| Other Cache: | None | Base Pointers: | 64-bit |
| Memory: | 512 GB (16 x 32 GB 2Rx4 PC4-2400T-R, running at 2133 MHz) | Peak Pointers: | 32/64-bit |
| | | Other Software: | None |
| Disk Subsystem: | 2 x 400 GB SAS SSD, RAID 1 | | |
| Other Hardware: | None | | |

## Results Table

| Benchmark | Base Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Peak Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 410.bwaves | **25.8** | **528** | 25.7 | 529 | 25.8 | 527 | **25.8** | **528** | 25.7 | 529 | 25.8 | 527 |
| 416.gamess | **633** | **30.9** | 634 | 30.9 | 632 | 31.0 | **489** | **40.0** | 490 | 40.0 | 489 | 40.0 |
| 433.milc | 132 | 69.7 | 131 | 70.2 | **131** | **70.1** | 132 | 69.7 | 131 | 70.2 | **131** | **70.1** |
| 434.zeusmp | **51.9** | **175** | 51.7 | 176 | 52.2 | 174 | **51.9** | **175** | 51.7 | 176 | 52.2 | 174 |
| 435.gromacs | **169** | **42.3** | 168 | 42.5 | 172 | 41.6 | **169** | **42.3** | 168 | 42.5 | 172 | 41.6 |
| 436.cactusADM | 19.3 | 618 | 19.7 | 607 | **19.5** | **612** | 19.3 | 618 | 19.7 | 607 | **19.5** | **612** |
| 437.leslie3d | 35.6 | 264 | **32.1** | **293** | 32.0 | 293 | 35.6 | 264 | **32.1** | **293** | 32.0 | 293 |
| 444.namd | 304 | 26.4 | **304** | **26.4** | 304 | 26.4 | 295 | 27.2 | **295** | **27.2** | 295 | 27.2 |
| 447.dealII | **194** | **58.9** | 194 | 59.0 | 194 | 58.9 | **194** | **58.9** | 194 | 59.0 | 194 | 58.9 |
| 450.soplex | 191 | 43.6 | **192** | **43.5** | 192 | 43.4 | 191 | 43.6 | **192** | **43.5** | 192 | 43.4 |
| 453.povray | 99.5 | 53.5 | **99.6** | **53.4** | 99.7 | 53.4 | 87.8 | 60.6 | 89.4 | 59.5 | **88.2** | **60.3** |
| 454.calculix | **170** | **48.4** | 170 | 48.4 | 170 | 48.5 | 153 | 54.0 | **153** | **53.9** | 153 | 53.9 |
| 459.GemsFDTD | **52.0** | **204** | 54.1 | 196 | 50.9 | 208 | **44.1** | **241** | 44.0 | 241 | 44.2 | 240 |
| 465.tonto | 264 | 37.3 | 267 | 36.8 | **265** | **37.1** | 192 | 51.3 | **192** | **51.2** | 192 | 51.1 |
| 470.lbm | 21.3 | 644 | 21.5 | 638 | **21.4** | **641** | 21.3 | 644 | 21.5 | 638 | **21.4** | **641** |
| 481.wrf | 112 | 99.6 | 106 | 105 | **109** | **102** | 112 | 99.6 | 106 | 105 | **109** | **102** |
| 482.sphinx3 | 304 | 64.1 | 300 | 64.9 | **303** | **64.4** | 304 | 64.1 | 300 | 64.9 | **303** | **64.4** |

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:
  HP Power Profile set to Custom
  HP Power Regulator to HP 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
  QPI Snoop Configuration set to Home Snoop
  Collaborative Power Control set to Disabled
```

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

$SPECfp2006 =$     105

ProLiant DL360 Gen9
(2.10 GHz, Intel Xeon E5-2620 v4)

$SPECfp\_base2006 =$     99.1

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

**Test date:** Jun-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
  Intel Hyperthreading set to Enabled
Sysinfo program /cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on localhost.localdomain Thu Jun 16 17:47:10 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 E5-2620 v4 @ 2.10GHz
     2 "physical id"s (chips)
     32 "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  : 16
     physical 0: cores 0 1 2 3 4 5 6 7
     physical 1: cores 0 1 2 3 4 5 6 7
  cache size : 20480 KB

From /proc/meminfo
  MemTotal:       528066716 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 localhost.localdomain 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 Jun 16 12:11

SPEC is set to: /cpu2006
  Filesystem     Type  Size  Used Avail Use% Mounted on
```

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## Platform Notes (Continued)

```
    /dev/sda4     xfs   368G  125G  243G  35% /
 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 P89 02/22/2016
    Memory:
     8x UNKNOWN NOT AVAILABLE
     16x UNKNOWN NOT AVAILABLE 32 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:
 16x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2400 MHz, configured at 2133 MHz
```

## General Notes

```
 Environment variables set by runspec before the start of the run:
 KMP_AFFINITY = "granularity=fine,compact,1,0"
 LD_LIBRARY_PATH = "/cpu2006/libs/32:/cpu2006/libs/64:/cpu2006/sh"
 OMP_NUM_THREADS = "16"

  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
```

## 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 -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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**Tested by:**    HPE

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

## 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-

     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

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# Peak Optimization Flags (Continued)

465.tonto (continued):
```
-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-Platform-Flags-Intel-V1.2-HSW-revE.html
http://www.spec.org/cpu2006/flags/Intel-ic16.0-official-linux64.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2006/flags/HP-Platform-Flags-Intel-V1.2-HSW-revE.xml
http://www.spec.org/cpu2006/flags/Intel-ic16.0-official-linux64.xml

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

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