



# SPEC<sup>®</sup> CFP2006 Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant XL450 Gen9

(2.00 GHz, Intel Xeon E5-2660 v4)

SPECfp<sup>®</sup>2006 =

117

SPECfp\_base2006 =

111

CPU2006 license: 3

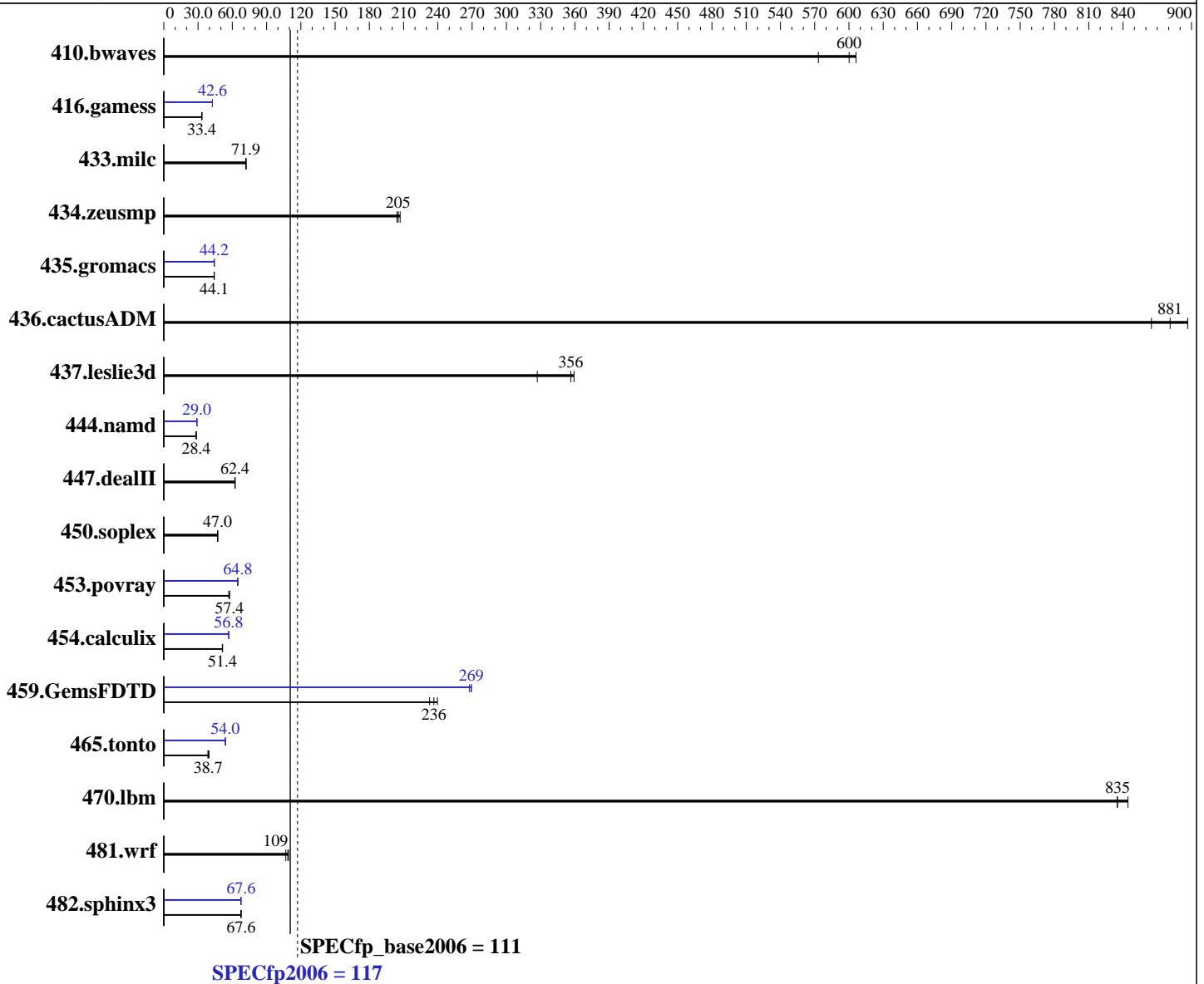
Test sponsor: HPE

Tested by: HPE

Test date: Apr-2016

Hardware Availability: Mar-2016

Software Availability: Nov-2015



## Hardware

CPU Name: Intel Xeon E5-2660 v4  
 CPU Characteristics: Intel Turbo Boost Technology up to 3.20 GHz  
 CPU MHz: 2000  
 FPU: Integrated  
 CPU(s) enabled: 28 cores, 2 chips, 14 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

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## Software

Operating System: Red Hat Enterprise Linux Server release 7.2 (Maipo), Kernel 3.10.0-229.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: 35 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 480 GB SATA SSD, RAID 1  
Other Hardware: None

System State: Run level 3 (multi-user)  
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	22.4	606	<b><u>22.6</u></b>	<b><u>600</u></b>	23.7	573	22.4	606	<b><u>22.6</u></b>	<b><u>600</u></b>	23.7	573
416.gamess	<b><u>587</u></b>	<b><u>33.4</u></b>	589	33.2	587	33.4	461	42.5	<b><u>459</u></b>	<b><u>42.6</u></b>	459	42.6
433.milc	127	72.2	<b><u>128</u></b>	<b><u>71.9</u></b>	128	71.8	127	72.2	<b><u>128</u></b>	<b><u>71.9</u></b>	128	71.8
434.zeusmp	44.6	204	<b><u>44.3</u></b>	<b><u>205</u></b>	44.0	207	44.6	204	<b><u>44.3</u></b>	<b><u>205</u></b>	44.0	207
435.gromacs	162	44.2	<b><u>162</u></b>	<b><u>44.1</u></b>	162	44.1	161	44.2	<b><u>162</u></b>	<b><u>44.2</u></b>	162	44.2
436.cactusADM	13.8	865	13.3	897	<b><u>13.6</u></b>	<b><u>881</u></b>	13.8	865	13.3	897	<b><u>13.6</u></b>	<b><u>881</u></b>
437.leslie3d	26.2	359	28.7	327	<b><u>26.4</u></b>	<b><u>356</u></b>	26.2	359	28.7	327	<b><u>26.4</u></b>	<b><u>356</u></b>
444.namd	<b><u>283</u></b>	<b><u>28.4</u></b>	283	28.4	283	28.4	277	29.0	<b><u>277</u></b>	<b><u>29.0</u></b>	276	29.0
447.dealII	183	62.5	184	62.3	<b><u>183</u></b>	<b><u>62.4</u></b>	183	62.5	184	62.3	<b><u>183</u></b>	<b><u>62.4</u></b>
450.soplex	177	47.0	<b><u>177</u></b>	<b><u>47.0</u></b>	176	47.4	177	47.0	<b><u>177</u></b>	<b><u>47.0</u></b>	176	47.4
453.povray	93.5	56.9	<b><u>92.6</u></b>	<b><u>57.4</u></b>	92.5	57.5	<b><u>82.1</u></b>	<b><u>64.8</u></b>	81.9	64.9	82.5	64.5
454.calculix	160	51.5	<b><u>161</u></b>	<b><u>51.4</u></b>	161	51.2	145	56.9	<b><u>145</u></b>	<b><u>56.8</u></b>	145	56.8
459.GemsFDTD	44.3	240	45.6	233	<b><u>44.9</u></b>	<b><u>236</u></b>	<b><u>39.4</u></b>	<b><u>269</u></b>	39.7	268	39.4	269
465.tonto	<b><u>254</u></b>	<b><u>38.7</u></b>	254	38.7	248	39.6	<b><u>182</u></b>	<b><u>54.0</u></b>	183	53.8	182	54.1
470.lbm	<b><u>16.5</u></b>	<b><u>835</u></b>	16.3	844	16.5	835	<b><u>16.5</u></b>	<b><u>835</u></b>	16.3	844	16.5	835
481.wrf	<b><u>103</u></b>	<b><u>109</u></b>	102	109	105	107	<b><u>103</u></b>	<b><u>109</u></b>	102	109	105	107
482.sphinx3	288	67.7	<b><u>288</u></b>	<b><u>67.6</u></b>	288	67.6	<b><u>288</u></b>	<b><u>67.6</u></b>	289	67.5	288	67.6

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 HP Static High Performance Mode  
Minimum Processor Idle Power Core C-State set to C6 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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## 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/cpu2006/config/sysinfo.rev6914  
\$Rev: 6914 \$ \$Date:: 2014-06-25 # \$ e3fbb8667b5a285932ceab81e28219e1  
running on No1-xl450-g9 Thu Apr 28 11:54:16 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 E5-2660 v4@ 2.00GHz
 2 "physical id"s (chips)
 28 "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     : 14
  siblings      : 14
  physical 0:   cores 0 2 4 5 6 8 9 10 11 12 13 14
  physical 1:   cores 0 2 4 5 6 8 9 10 11 12 13 14
cache size     : 35840 KB
```

From /proc/meminfo

```
MemTotal:      263711164 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 No1-xl450-g9 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 Apr 28 11:42

SPEC is set to: /home/cpu2006

```
Filesystem      Type  Size  Used Avail Use% Mounted on
Continued on next page
```



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## Platform Notes (Continued)

/dev/sda4 xfs 439G 20G 419G 5% /  
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 U21 03/10/2016

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 = "28"

Environment variables set by runspec before the start of the run:

LD\_LIBRARY\_PATH = "/cpu2006/libs/32:/cpu2006/libs/64:/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



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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.deallI: -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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Test sponsor: HPE

Tested by: HPE

Test date: Apr-2016

Hardware Availability: Mar-2016

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: -xCORE-AVX2 -ipo -O3 -no-prec-div -static -parallel  
-opt-prefetch -ansi-alias  
-fp-model fast=2  
-qopt-prefetch-issue-excl-hint -funroll-all-loops

-nofor-main

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.dealIII: 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  
-qopt-prefetch-issue-excl-hint -funroll-all-loops  
-auto-ilp32

-nofor-main

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/HP-Compiler-Flags-Intel-V1.2-BDW-revE.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/HP-Compiler-Flags-Intel-V1.2-BDW-revE.xml>

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