



# SPEC® CFP2006 Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant ML350 Gen9  
(2.20 GHz, Intel Xeon E5-2699 v4)

SPECfp®2006 = 121

SPECfp\_base2006 = 115

CPU2006 license: 3

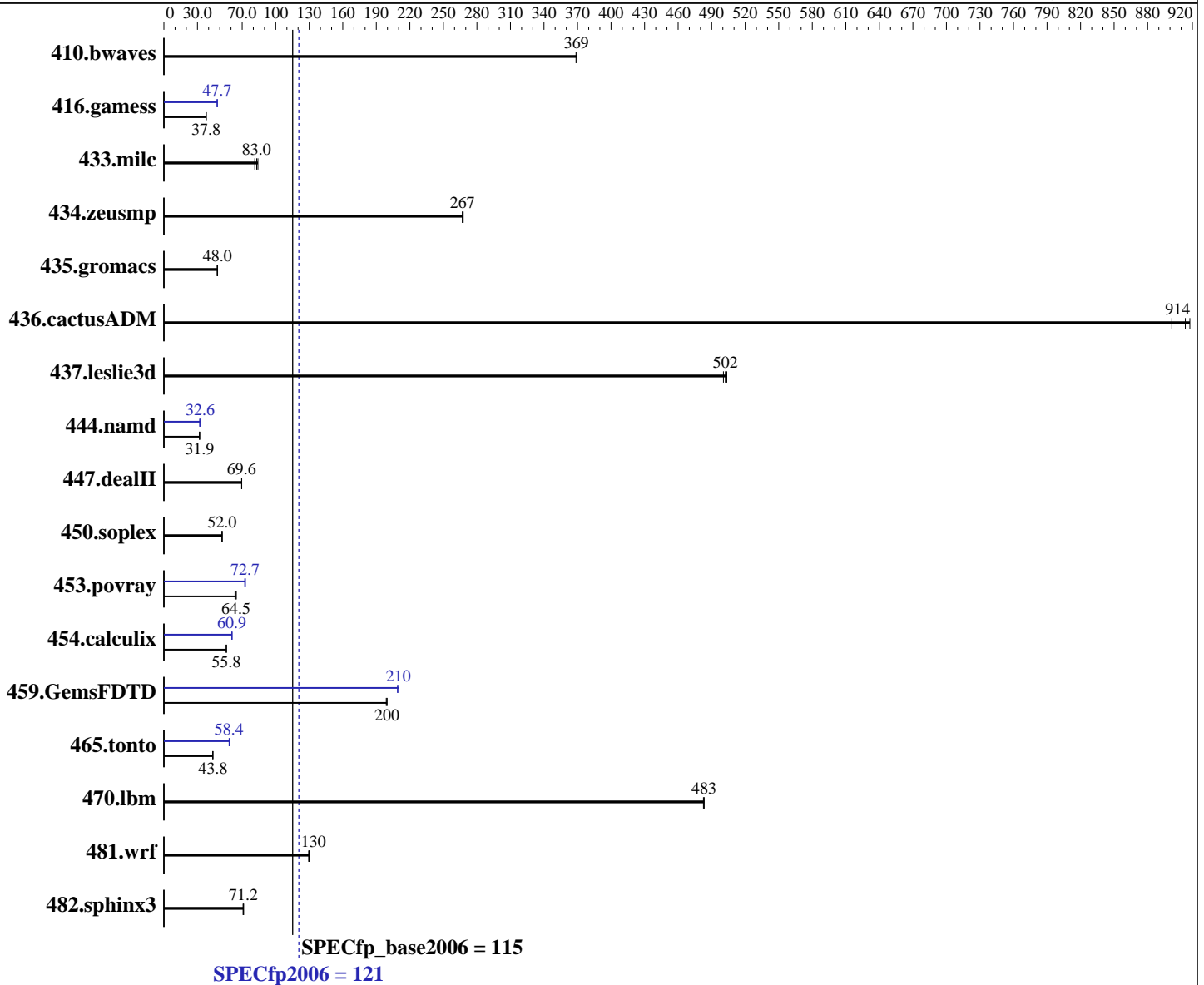
Test sponsor: HPE

Tested by: HPE

Test date: Mar-2016

Hardware Availability: Mar-2016

Software Availability: Nov-2015



## 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: 22 cores, 1 chip, 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

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## 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: 55 MB I+D on chip per chip  
Other Cache: None  
Memory: 256 GB (8 x 32 GB 2Rx4 PC4-2400T-R)  
Disk Subsystem: 1 x 400 GB SAS 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	36.9	369	<b>36.8</b>	<b>369</b>	36.8	370	36.9	369	<b>36.8</b>	<b>369</b>	36.8	370
416.gamess	<b>518</b>	<b>37.8</b>	517	37.8	519	37.7	410	47.7	<b>411</b>	<b>47.7</b>	411	47.7
433.milc	113	81.3	109	84.1	<b>111</b>	<b>83.0</b>	113	81.3	109	84.1	<b>111</b>	<b>83.0</b>
434.zeusmp	34.0	268	34.1	267	<b>34.1</b>	<b>267</b>	34.0	268	34.1	267	<b>34.1</b>	<b>267</b>
435.gromacs	149	48.0	152	47.0	<b>149</b>	<b>48.0</b>	149	48.0	152	47.0	<b>149</b>	<b>48.0</b>
436.cactusADM	13.3	902	<b>13.1</b>	<b>914</b>	13.0	918	13.3	902	<b>13.1</b>	<b>914</b>	13.0	918
437.leslie3d	18.7	504	18.8	501	<b>18.7</b>	<b>502</b>	18.7	504	18.8	501	<b>18.7</b>	<b>502</b>
444.namd	252	31.9	<b>251</b>	<b>31.9</b>	251	31.9	<b>246</b>	<b>32.6</b>	246	32.6	251	31.9
447.dealII	<b>164</b>	<b>69.6</b>	164	69.6	165	69.5	<b>164</b>	<b>69.6</b>	164	69.6	165	69.5
450.soplex	161	51.9	160	52.2	<b>160</b>	<b>52.0</b>	161	51.9	160	52.2	<b>160</b>	<b>52.0</b>
453.povray	83.7	63.6	82.2	64.7	<b>82.5</b>	<b>64.5</b>	73.1	72.8	73.6	72.3	<b>73.1</b>	<b>72.7</b>
454.calculix	<b>148</b>	<b>55.8</b>	148	55.8	148	55.9	136	60.9	<b>136</b>	<b>60.9</b>	135	60.9
459.GemsFDTD	53.2	200	<b>53.2</b>	<b>200</b>	53.3	199	50.8	209	50.5	210	<b>50.6</b>	<b>210</b>
465.tonto	225	43.7	<b>225</b>	<b>43.8</b>	225	43.8	166	59.2	169	58.4	<b>169</b>	<b>58.4</b>
470.lbm	<b>28.4</b>	<b>483</b>	28.5	483	28.4	483	<b>28.4</b>	<b>483</b>	28.5	483	28.4	483
481.wrf	86.0	130	86.3	129	<b>86.0</b>	<b>130</b>	86.0	130	86.3	129	<b>86.0</b>	<b>130</b>
482.sphinx3	274	71.2	275	70.8	<b>274</b>	<b>71.2</b>	274	71.2	275	70.8	<b>274</b>	<b>71.2</b>

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

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## Platform Notes (Continued)

Thermal Configuration set to Maximum Cooling  
Processor Power and Utilization Monitoring set to Disabled  
Memory Double Refresh Rate set to 1x Refresh  
Energy Performance Bias set to Maximum Performance

Sysinfo program

```
/home/specuser/specsuite/HP_build_ic16_suite_corrected_int_bins/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on ml350bdwspec Sat Mar 19 00:48:55 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
 1 "physical id"s (chips)
 44 "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
 cache size : 56320 KB
```

From /proc/meminfo

```
MemTotal:      263840840 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 ml350bdwspec 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 Mar 19 00:41

SPEC is set to:

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## Platform Notes (Continued)

/home/specuser/specsuite/HP\_build\_ic16\_suite\_corrected\_int\_bins/cpu2006

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/sda5	xfs	318G	303G	16G	96%	/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 02/22/2016

Memory:

16x 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 = "22"

ID\_LIBRARY\_PATH = \*/home/specuser/specsuite/HP\_build\_ic16\_suite\_corrected\_int\_bins/cpu2006/libs/32:/home/specuser/specsuite/HP\_build\_ic16\_suite\_corrected\_int\_bins/cpu2006/libs/64:/home/specuser/specsuite/HP\_build\_ic16\_suite\_corrected\_int\_bins/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

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## 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 -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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## 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.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: 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/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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For other inquiries, please contact [webmaster@spec.org](mailto:webmaster@spec.org).

Tested with SPEC CPU2006 v1.2.

Report generated on Tue May 3 18:00:59 2016 by SPEC CPU2006 PS/PDF formatter v6932.

Originally published on 3 May 2016.