



# SPEC<sup>®</sup> CFP2006 Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant ML350 Gen9

(1.70 GHz, Intel Xeon E5-2609 v4)

SPECfp<sup>®</sup>2006 =

71.5

SPECfp\_base2006 =

69.8

CPU2006 license: 3

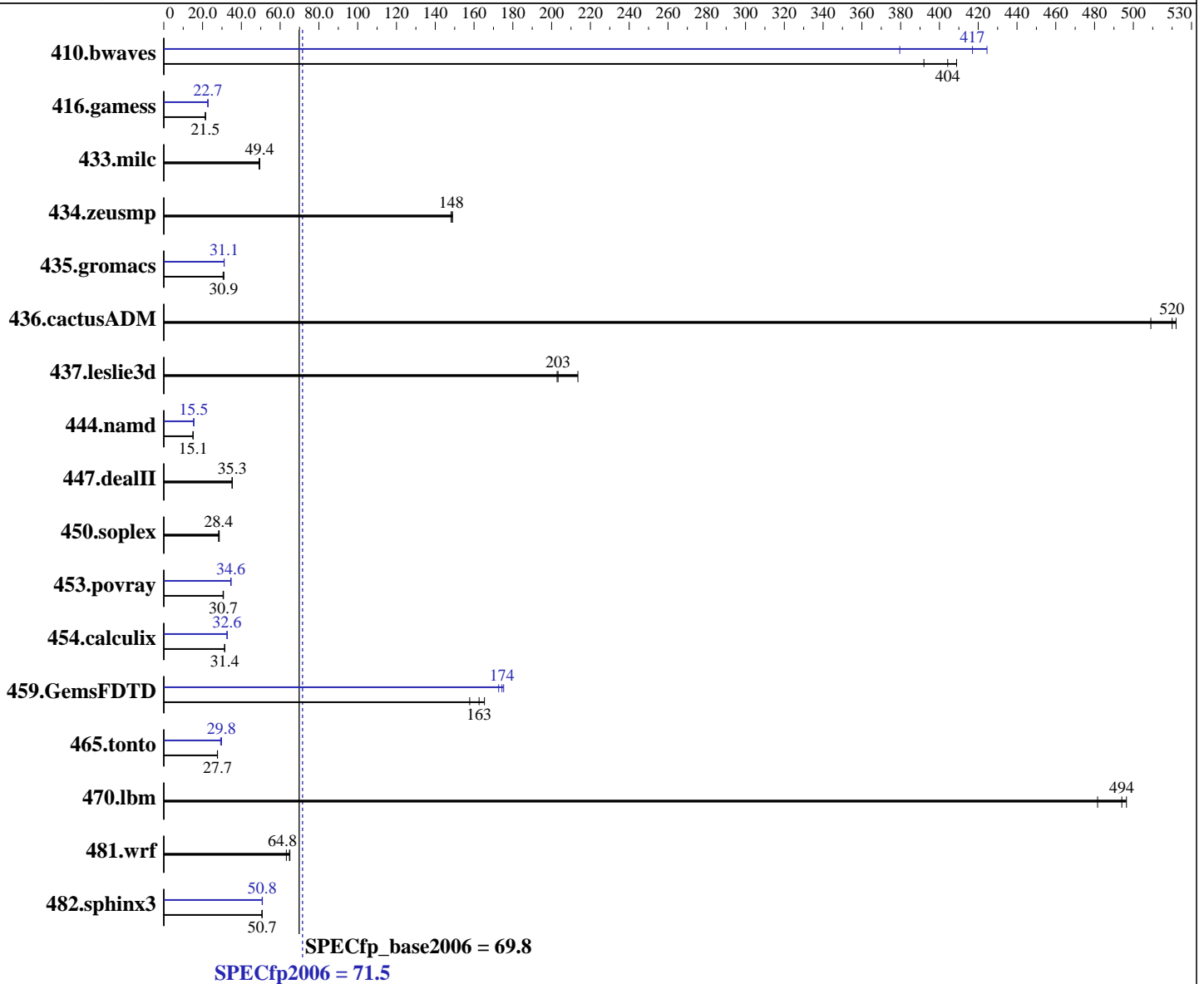
Test sponsor: HPE

Tested by: HPE

Test date: Jun-2016

Hardware Availability: Mar-2016

Software Availability: Dec-2015



## Hardware

CPU Name: Intel Xeon E5-2609 v4  
 CPU Characteristics:  
 CPU MHz: 1700  
 FPU: Integrated  
 CPU(s) enabled: 16 cores, 2 chips, 8 cores/chip  
 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: SUSE Linux Enterprise Server 12 (x86\_64) SP1  
 Kernel 3.12.49-11-default  
 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  
 System State: Run level 3 (multi-user)

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L3 Cache: 20 MB I+D on chip per chip  
Other Cache: None  
Memory: 512 GB (16 x 32 GB 2Rx4 PC4-2400T-R, running at 1866 MHz)  
Disk Subsystem: 1 x 800 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	34.7	392	33.2	409	<b><u>33.6</u></b>	<b><u>404</u></b>	32.0	425	<b><u>32.6</u></b>	<b><u>417</u></b>	35.8	380
416.gamess	911	21.5	<b><u>911</u></b>	<b><u>21.5</u></b>	915	21.4	<b><u>861</u></b>	<b><u>22.7</u></b>	860	22.8	861	22.7
433.milc	187	49.1	186	49.5	<b><u>186</u></b>	<b><u>49.4</u></b>	187	49.1	186	49.5	<b><u>186</u></b>	<b><u>49.4</u></b>
434.zeusmp	61.1	149	61.4	148	<b><u>61.3</u></b>	<b><u>148</u></b>	61.1	149	61.4	148	<b><u>61.3</u></b>	<b><u>148</u></b>
435.gromacs	<b><u>231</u></b>	<b><u>30.9</u></b>	231	31.0	234	30.6	229	31.1	<b><u>229</u></b>	<b><u>31.1</u></b>	230	31.1
436.cactusADM	22.9	522	23.5	509	<b><u>23.0</u></b>	<b><u>520</u></b>	22.9	522	23.5	509	<b><u>23.0</u></b>	<b><u>520</u></b>
437.leslie3d	<b><u>46.2</u></b>	<b><u>203</u></b>	46.3	203	44.0	214	<b><u>46.2</u></b>	<b><u>203</u></b>	46.3	203	44.0	214
444.namd	531	15.1	<b><u>531</u></b>	<b><u>15.1</u></b>	531	15.1	<b><u>519</u></b>	<b><u>15.5</u></b>	520	15.4	518	15.5
447.dealII	<b><u>324</u></b>	<b><u>35.3</u></b>	324	35.3	325	35.2	<b><u>324</u></b>	<b><u>35.3</u></b>	324	35.3	325	35.2
450.soplex	291	28.6	<b><u>294</u></b>	<b><u>28.4</u></b>	295	28.3	291	28.6	<b><u>294</u></b>	<b><u>28.4</u></b>	295	28.3
453.povray	<b><u>173</u></b>	<b><u>30.7</u></b>	174	30.6	173	30.7	154	34.6	<b><u>154</u></b>	<b><u>34.6</u></b>	153	34.7
454.calculix	263	31.4	263	31.4	<b><u>263</u></b>	<b><u>31.4</u></b>	<b><u>253</u></b>	<b><u>32.6</u></b>	253	32.6	252	32.7
459.GemsFDTD	67.3	158	<b><u>65.3</u></b>	<b><u>163</u></b>	64.2	165	61.4	173	<b><u>60.8</u></b>	<b><u>174</u></b>	60.5	175
465.tonto	356	27.6	<b><u>356</u></b>	<b><u>27.7</u></b>	355	27.7	330	29.8	<b><u>331</u></b>	<b><u>29.8</u></b>	336	29.3
470.lbm	27.7	496	28.5	482	<b><u>27.8</u></b>	<b><u>494</u></b>	27.7	496	28.5	482	<b><u>27.8</u></b>	<b><u>494</u></b>
481.wrf	172	65.0	177	63.2	<b><u>172</u></b>	<b><u>64.8</u></b>	172	65.0	177	63.2	<b><u>172</u></b>	<b><u>64.8</u></b>
482.sphinx3	<b><u>384</u></b>	<b><u>50.7</u></b>	384	50.7	385	50.6	383	50.9	384	50.7	<b><u>384</u></b>	<b><u>50.8</u></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:  
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/cpu2006/HP_compiled_binaries_latest/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on linux-7m51 Sat Jun 4 04:58:35 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 E5-2609 v4 @ 1.70GHz
 2 "physical id"s (chips)
 16 "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  : 8
  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:      529095464 kB
HugePages_Total:       0
Hugepagesize:       2048 kB
```

/usr/bin/lsb\_release -d

```
SUSE Linux Enterprise Server 12 SP1
```

From /etc/\*release\* /etc/\*version\*

```
SuSE-release:
 SUSE Linux Enterprise Server 12 (x86_64)
 VERSION = 12
 PATCHLEVEL = 1
 # 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-SP1"
 VERSION_ID="12.1"
 PRETTY_NAME="SUSE Linux Enterprise Server 12 SP1"
 ID="sles"
 ANSI_COLOR="0;32"
 CPE_NAME="cpe:/o:suse:sles:12:sp1"
```

uname -a:

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## Platform Notes (Continued)

```
Linux linux-7m51 3.12.49-11-default #1 SMP Wed Nov 11 20:52:43 UTC 2015
(8d714a0) x86_64 x86_64 x86_64 GNU/Linux
```

```
run-level 3 Jun 4 04:56
```

```
SPEC is set to: /home/specuser/cpu2006/HP_compiled_binaries_latest/cpu2006
```

```
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda4       xfs   703G  236G  468G  34% /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 04/12/2016
```

```
Memory:
```

```
8x UNKNOWN NOT AVAILABLE
```

```
16x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2400 MHz, configured at 1866 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 1866 MHz

## General Notes

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

```
KMP_AFFINITY = "granularity=fine,compact,1,0"
```

```
OMP_NUM_THREADS = "16"
```

```
LD_LIBRARY_PATH = "/home/specuser/cpu2006/HP_compiled_binaries_latest/cpu2006/libs/32:/home/specuser/cpu2006/HP_compiled_binaries_latest/cpu2006/libs/64:/home/specuser/cpu2006/HP_compiled_binaries_latest/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.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 -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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## 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: -xCORE-AVX2 -ipo -O3 -no-prec-div -static -parallel  
-opt-prefetch  
-fp-model fast=2  
-qopt-prefetch-issue-excl-hint -funroll-all-loops

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## Peak Optimization Flags (Continued)

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-alloc  
-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-Compiler-Flags-Intel-V1.2-HSW-revF.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/HP-Compiler-Flags-Intel-V1.2-HSW-revF.xml>

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



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