



# SPEC<sup>®</sup> CFP2006 Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant ML350 Gen9

(2.30 GHz, Intel Xeon E5-2697 v4)

SPECfp<sup>®</sup>\_rate2006 = 1040

SPECfp\_rate\_base2006 = 1010

CPU2006 license: 3

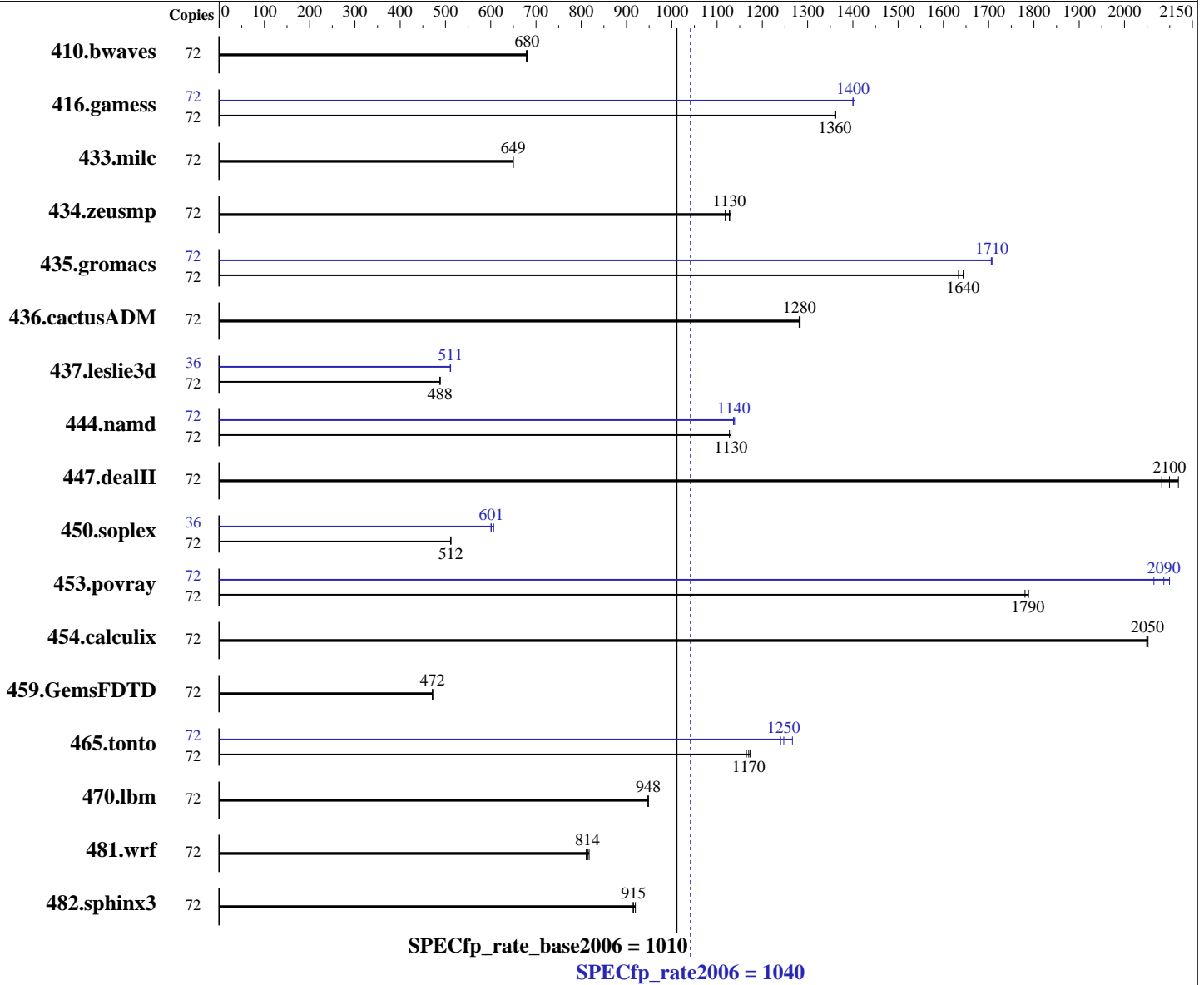
Test sponsor: HPE

Tested by: HPE

Test date: Apr-2016

Hardware Availability: Mar-2016

Software Availability: Nov-2015



## Hardware

CPU Name: Intel Xeon E5-2697 v4  
 CPU Characteristics: Intel Turbo Boost Technology up to 3.60 GHz  
 CPU MHz: 2300  
 FPU: Integrated  
 CPU(s) enabled: 36 cores, 2 chips, 18 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: No  
 File System: xfs

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L3 Cache: 45 MB I+D on chip per chip  
Other Cache: None  
Memory: 512 GB (16 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: 32/64-bit  
Peak Pointers: 32/64-bit  
Other Software: None

## Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	72	1437	681	1442	679	<b>1439</b>	<b>680</b>	72	1437	681	1442	679	<b>1439</b>	<b>680</b>
416.gamess	72	1035	1360	<b>1036</b>	<b>1360</b>	1036	1360	72	1004	1400	1007	1400	<b>1007</b>	<b>1400</b>
433.milc	72	1017	650	1018	649	<b>1018</b>	<b>649</b>	72	1017	650	1018	649	<b>1018</b>	<b>649</b>
434.zeusmp	72	586	1120	<b>581</b>	<b>1130</b>	580	1130	72	586	1120	<b>581</b>	<b>1130</b>	580	1130
435.gromacs	72	313	1640	315	1630	<b>313</b>	<b>1640</b>	72	301	1710	<b>301</b>	<b>1710</b>	301	1710
436.cactusADM	72	672	1280	<b>671</b>	<b>1280</b>	670	1280	72	672	1280	<b>671</b>	<b>1280</b>	670	1280
437.leslie3d	72	1386	488	<b>1387</b>	<b>488</b>	1387	488	36	662	511	<b>662</b>	<b>511</b>	663	511
444.namd	72	<b>511</b>	<b>1130</b>	512	1130	511	1130	72	508	1140	<b>508</b>	<b>1140</b>	507	1140
447.dealII	72	<b>392</b>	<b>2100</b>	389	2120	396	2080	72	<b>392</b>	<b>2100</b>	389	2120	396	2080
450.soplex	72	1174	512	<b>1173</b>	<b>512</b>	1173	512	36	500	601	<b>499</b>	<b>601</b>	495	606
453.povray	72	214	1790	215	1780	<b>214</b>	<b>1790</b>	72	182	2100	<b>184</b>	<b>2090</b>	185	2070
454.calculix	72	290	2050	<b>290</b>	<b>2050</b>	289	2050	72	290	2050	<b>290</b>	<b>2050</b>	289	2050
459.GemsFDTD	72	<b>1620</b>	<b>472</b>	1621	471	1620	472	72	<b>1620</b>	<b>472</b>	1621	471	1620	472
465.tonto	72	<b>606</b>	<b>1170</b>	608	1160	604	1170	72	559	1270	<b>568</b>	<b>1250</b>	571	1240
470.lbm	72	<b>1043</b>	<b>948</b>	1043	948	1044	947	72	<b>1043</b>	<b>948</b>	1043	948	1044	947
481.wrf	72	984	817	<b>988</b>	<b>814</b>	992	811	72	984	817	<b>988</b>	<b>814</b>	992	811
482.sphinx3	72	1526	920	<b>1533</b>	<b>915</b>	1537	913	72	1526	920	<b>1533</b>	<b>915</b>	1537	913

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

## Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

## 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  
Filesystem page cache cleared with:  
echo 1> /proc/sys/vm/drop\_caches  
runspec command invoked through numactl i.e.:  
numactl --interleave=all runspec <etc>



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**CPU2006 license:** 3

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**Test date:** Apr-2016

**Hardware Availability:** Mar-2016

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## 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 Cluster On Die  
 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 Sun Apr 17 09:04:22 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 E5-2697 v4 @ 2.30GHz
 2 "physical id"s (chips)
 72 "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     : 18
  siblings      : 36
  physical 0:   cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
  physical 1:   cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
cache size      : 23040 KB
```

### From /proc/meminfo

```
MemTotal:      528061228 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
```

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## Platform Notes (Continued)

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 Apr 17 08:58

SPEC is set to:

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

```
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda5        xfs   318G  242G   77G  76% /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:

8x UNKNOWN NOT AVAILABLE

16x 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 512 GB and the dmidecode description should have one line reading as: 16x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2400 MHz

## General Notes

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

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



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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 -opt-prefetch
-qopt-prefetch-issue-excl-hint -auto-p32 -ansi-alias
-opt-mem-layout-trans=3

```

C++ benchmarks:

```

-xCORE-AVX2 -ipo -O3 -no-prec-div -static -opt-prefetch
-qopt-prefetch-issue-excl-hint -auto-p32 -ansi-alias
-opt-mem-layout-trans=3

```

Fortran benchmarks:

```

-xCORE-AVX2 -ipo -O3 -no-prec-div -static -opt-prefetch
-qopt-prefetch-issue-excl-hint

```

Benchmarks using both Fortran and C:

```

-xCORE-AVX2 -ipo -O3 -no-prec-div -static -opt-prefetch
-qopt-prefetch-issue-excl-hint -auto-p32 -ansi-alias
-opt-mem-layout-trans=3

```

## Peak Compiler Invocation

C benchmarks:

```
icc -m64
```

C++ benchmarks (except as noted below):

```
icpc -m64
```

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## Peak Compiler Invocation (Continued)

450.soplex: icpc -m32 -L/opt/intel/compilers\_and\_libraries\_2016/linux/lib/ia32\_lin

Fortran benchmarks:

ifort -m64

Benchmarks using both Fortran and C:

icc -m64 ifort -m64

## Peak 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: -D\_FILE\_OFFSET\_BITS=64  
 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

## 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) -static(pass 2)  
 -opt-mem-layout-trans=3(pass 2) -prof-use(pass 2) -fno-alias  
 -auto-ilp32

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## Peak Optimization Flags (Continued)

447.dealIII: basepeak = yes

450.soplex: -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) -static(pass 2)  
-opt-mem-layout-trans=3(pass 2) -prof-use(pass 2)  
-opt-malloc-options=3

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) -static(pass 2)  
-opt-mem-layout-trans=3(pass 2) -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) -static(pass 2) -prof-use(pass 2)  
-unroll2 -inline-level=0 -scalar-rep-

434.zeusmp: basepeak = yes

437.leslie3d: -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) -static(pass 2) -prof-use(pass 2)  
-opt-malloc-options=3 -opt-prefetch

459.GemsFDTD: basepeak = yes

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) -static(pass 2) -prof-use(pass 2)  
-unroll4 -auto -inline-calloc -opt-malloc-options=3

Benchmarks using both Fortran and C:

435.gromacs: -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) -static(pass 2)  
-opt-mem-layout-trans=3(pass 2) -prof-use(pass 2)  
-opt-prefetch -auto-ilp32

436.cactusADM: basepeak = yes

454.calculix: basepeak = yes

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## Peak Optimization Flags (Continued)

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 18:00:28 2016 by SPEC CPU2006 PS/PDF formatter v6932.  
Originally published on 3 May 2016.