



# SPEC<sup>®</sup> CFP2006 Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant ML350 Gen9

(1.70 GHz, Intel Xeon E5-2603 v4)

SPECfp<sup>®</sup>\_rate2006 = 355

SPECfp\_rate\_base2006 = 347

CPU2006 license: 3

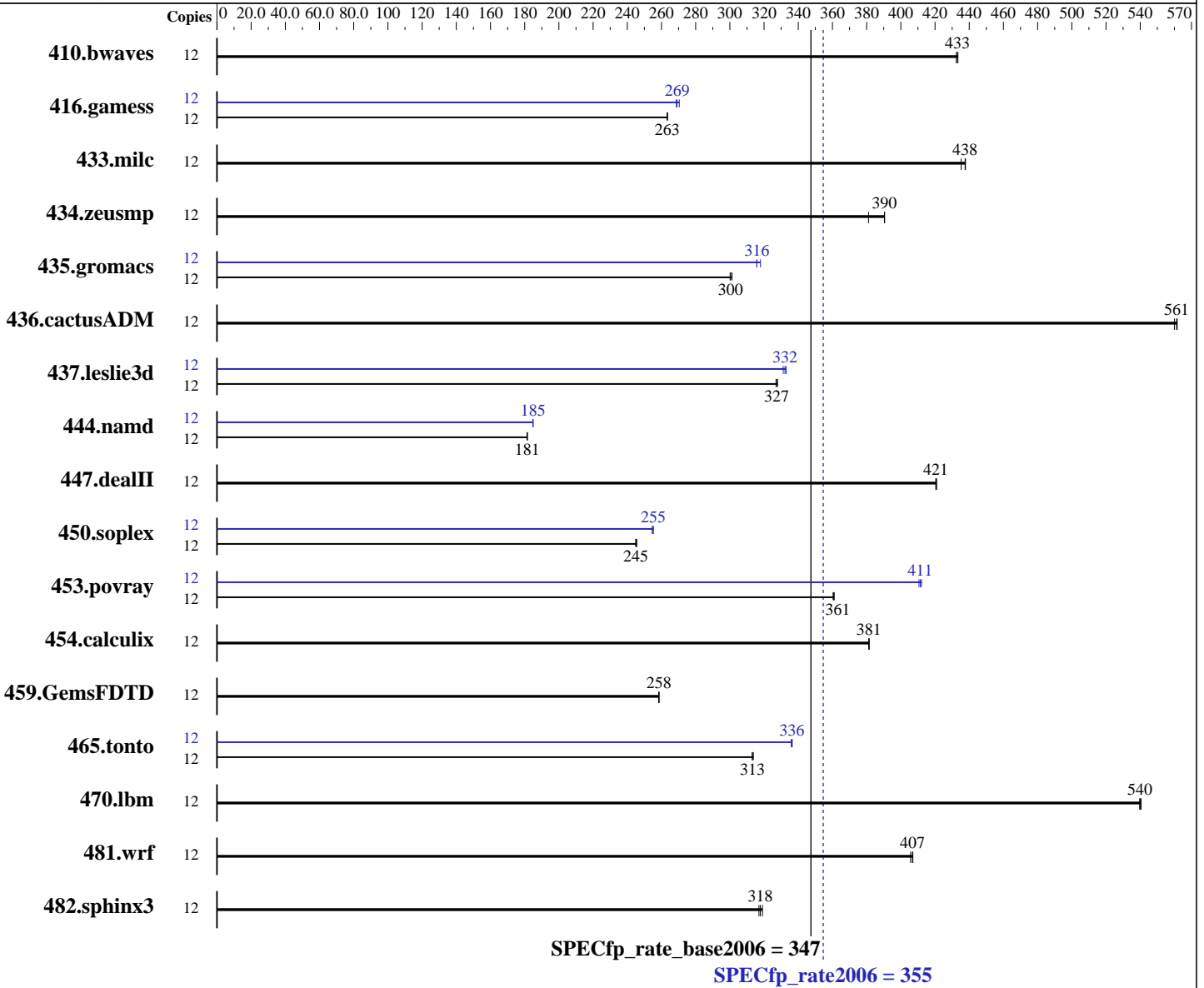
Test sponsor: HPE

Tested by: HPE

Test date: Jun-2016

Hardware Availability: Mar-2016

Software Availability: Nov-2015



## Hardware

CPU Name: Intel Xeon E5-2603 v4  
 CPU Characteristics:  
 CPU MHz: 1700  
 FPU: Integrated  
 CPU(s) enabled: 12 cores, 2 chips, 6 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: 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: 15 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 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	12	377	432	<u>377</u>	<u>433</u>	376	433	12	377	432	<u>377</u>	<u>433</u>	376	433		
416.gamess	12	893	263	<u>892</u>	<u>263</u>	892	264	12	869	270	875	269	<u>873</u>	<u>269</u>		
433.milc	12	<u>252</u>	<u>438</u>	253	435	252	438	12	<u>252</u>	<u>438</u>	253	435	252	438		
434.zeusmp	12	287	381	280	391	<u>280</u>	<u>390</u>	12	287	381	280	391	<u>280</u>	<u>390</u>		
435.gromacs	12	<u>285</u>	<u>300</u>	284	301	285	300	12	269	318	271	316	<u>271</u>	<u>316</u>		
436.cactusADM	12	256	560	<u>256</u>	<u>561</u>	255	562	12	256	560	<u>256</u>	<u>561</u>	255	562		
437.leslie3d	12	345	327	<u>345</u>	<u>327</u>	344	328	12	339	333	341	331	<u>340</u>	<u>332</u>		
444.namd	12	530	181	530	182	<u>530</u>	<u>181</u>	12	521	185	<u>521</u>	<u>185</u>	521	185		
447.dealII	12	326	421	326	421	<u>326</u>	<u>421</u>	12	326	421	326	421	<u>326</u>	<u>421</u>		
450.soplex	12	408	246	409	245	<u>408</u>	<u>245</u>	12	<u>392</u>	<u>255</u>	393	255	392	255		
453.povray	12	177	360	177	361	<u>177</u>	<u>361</u>	12	<u>155</u>	<u>411</u>	155	411	155	412		
454.calculix	12	<u>260</u>	<u>381</u>	260	381	260	381	12	<u>260</u>	<u>381</u>	260	381	260	381		
459.GemsFDTD	12	492	259	<u>493</u>	<u>258</u>	493	258	12	492	259	<u>493</u>	<u>258</u>	493	258		
465.tonto	12	<u>377</u>	<u>313</u>	377	313	376	314	12	<u>351</u>	<u>336</u>	351	336	352	336		
470.lbm	12	305	541	<u>305</u>	<u>540</u>	306	540	12	305	541	<u>305</u>	<u>540</u>	306	540		
481.wrf	12	330	406	<u>330</u>	<u>407</u>	329	407	12	330	406	<u>330</u>	<u>407</u>	329	407		
482.sphinx3	12	<u>736</u>	<u>318</u>	733	319	738	317	12	<u>736</u>	<u>318</u>	733	319	738	317		

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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**Tested by:** HPE

**Test date:** Jun-2016

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## 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  
 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 Jun 5 08:02:20 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 E5-2603 v4 @ 1.70GHz
 2 "physical id"s (chips)
 12 "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 : 6
  siblings  : 6
  physical 0: cores 0 1 2 3 4 5
  physical 1: cores 0 1 2 3 4 5
cache size : 15360 KB
```

### From /proc/meminfo

```
MemTotal:      528069176 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 Jun 5 08:02

SPEC is set to:

/home/specuser/specsuite/HP\_build\_icl6\_suite\_corrected\_int\_bins/cpu2006

```
Filesystem      Type      Size  Used Avail Use% Mounted on
/dev/sda5        xfs       318G  163G  156G  52% /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:

ID\_LIBRARY\_PATH = "/home/specuser/specsuite/HP\_build\_icl6\_suite\_corrected\_int\_bins/cpu2006/libs/32:/home/specuser/specsuite/HP\_build\_icl6\_suite\_corrected\_int\_bins/cpu2006/libs/64:/home/specuser/specsuite/HP\_build\_icl6\_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.deall: -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-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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For other inquiries, please contact [webmaster@spec.org](mailto:webmaster@spec.org).

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