



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®_rate2006 = 568

SPECfp_rate_base2006 = 551

CPU2006 license: 3

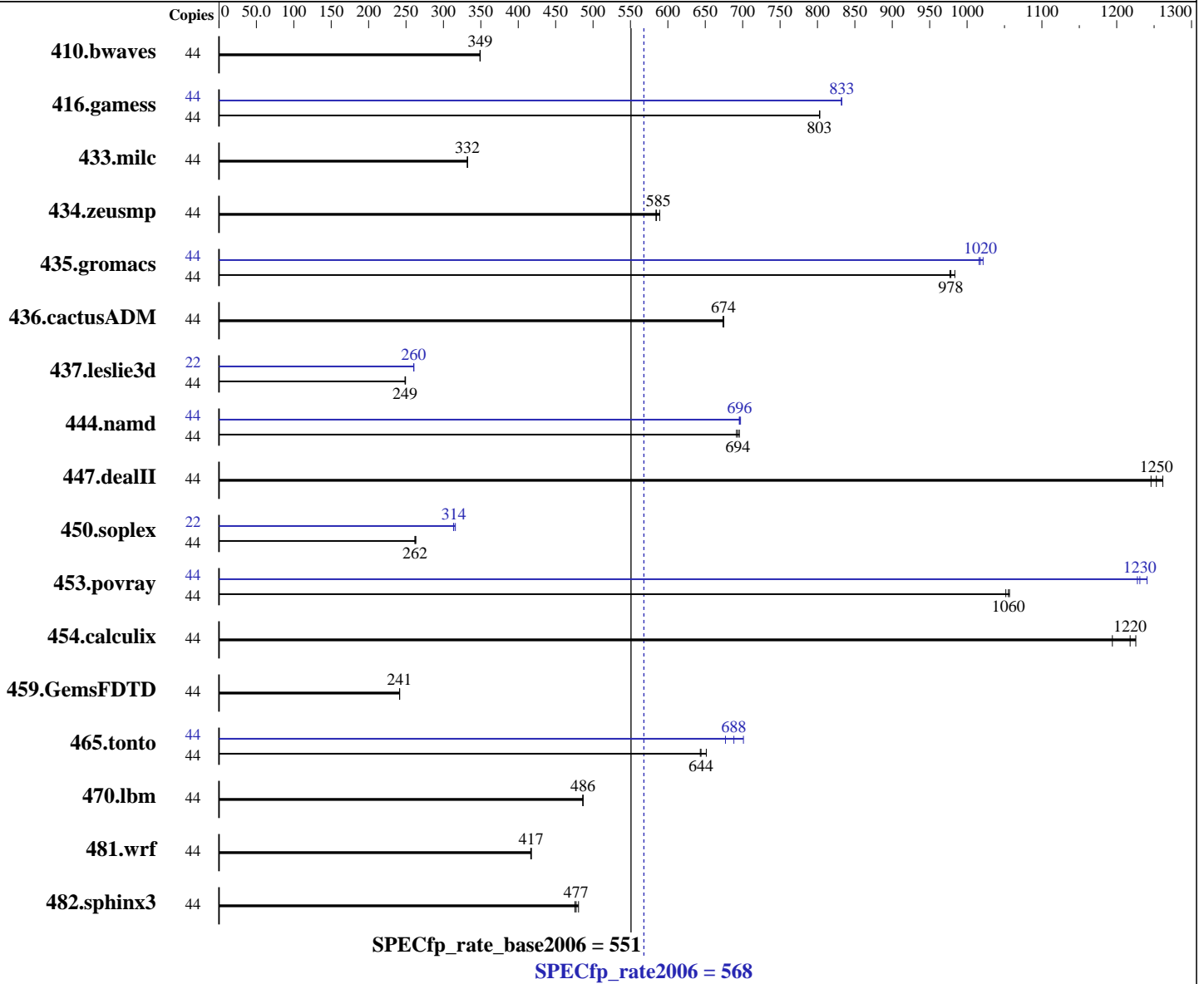
Test sponsor: HPE

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: No
 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: 2 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	44	1714	349	1712	349	<u>1714</u>	<u>349</u>	44	1714	349	1712	349	<u>1714</u>	<u>349</u>
416.gamess	44	<u>1073</u>	<u>803</u>	1073	803	1073	803	44	<u>1035</u>	<u>833</u>	1036	832	1035	833
433.milc	44	1216	332	1216	332	<u>1216</u>	<u>332</u>	44	1216	332	1216	332	<u>1216</u>	<u>332</u>
434.zeusmp	44	680	589	686	584	<u>685</u>	<u>585</u>	44	680	589	686	584	<u>685</u>	<u>585</u>
435.gromacs	44	319	984	<u>321</u>	<u>978</u>	322	977	44	309	1020	308	1020	<u>309</u>	<u>1020</u>
436.cactusADM	44	<u>780</u>	<u>674</u>	779	675	781	674	44	<u>780</u>	<u>674</u>	779	675	781	674
437.leslie3d	44	1662	249	1659	249	<u>1662</u>	<u>249</u>	22	<u>794</u>	<u>260</u>	794	260	794	260
444.namd	44	507	696	<u>509</u>	<u>694</u>	510	692	44	506	697	507	695	<u>507</u>	<u>696</u>
447.dealII	44	404	1250	399	1260	<u>402</u>	<u>1250</u>	44	404	1250	399	1260	<u>402</u>	<u>1250</u>
450.soplex	44	1394	263	<u>1399</u>	<u>262</u>	1401	262	22	585	314	581	316	<u>585</u>	<u>314</u>
453.povray	44	<u>222</u>	<u>1060</u>	222	1060	223	1050	44	<u>190</u>	<u>1230</u>	189	1240	191	1230
454.calculix	44	296	1230	<u>298</u>	<u>1220</u>	304	1190	44	296	1230	<u>298</u>	<u>1220</u>	304	1190
459.GemsFDTD	44	1935	241	1933	241	<u>1934</u>	<u>241</u>	44	1935	241	1933	241	<u>1934</u>	<u>241</u>
465.tonto	44	665	651	673	643	<u>672</u>	<u>644</u>	44	618	701	<u>629</u>	<u>688</u>	640	677
470.lbm	44	<u>1243</u>	<u>486</u>	1243	486	1242	487	44	<u>1243</u>	<u>486</u>	1243	486	1242	487
481.wrf	44	<u>1178</u>	<u>417</u>	1177	417	1179	417	44	<u>1178</u>	<u>417</u>	1177	417	1179	417
482.sphinx3	44	1784	481	1802	476	<u>1796</u>	<u>477</u>	44	1784	481	1802	476	<u>1796</u>	<u>477</u>

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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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 Thu Mar 24 11:49:14 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    : 28160 KB
```

From /proc/meminfo

```
MemTotal:      263840588 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 Mar 24 11:48

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  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:

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.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 -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.dealll: 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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