**SPEC® CFP2006 Result**

**Hewlett Packard Enterprise**
(Test Sponsor: HPE)
ProLiant DL380 Gen9
(2.10 GHz, Intel Xeon E5-2620 v4)

**SPECfp®2006 =** 106
**SPECfp_base2006 =** 100

<table>
<thead>
<tr>
<th>Software</th>
<th>Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name: Intel Xeon E5-2620 v4</td>
<td>Operating System: Red Hat Enterprise Linux Server release 7.2, (Maipo) Kernel 3.10.0-327.el7.x86_64</td>
</tr>
<tr>
<td>CPU Characteristics: Intel Turbo Boost Technology up to 3.00 GHz</td>
<td>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</td>
</tr>
<tr>
<td>CPU MHz: 2100</td>
<td>Auto Parallel: Yes</td>
</tr>
<tr>
<td>FPU: Integrated</td>
<td>File System: xfs</td>
</tr>
<tr>
<td>CPU(s) enabled: 16 cores, 2 chips, 8 cores/chip, 2 threads/core</td>
<td></td>
</tr>
<tr>
<td>CPU(s) orderable: 1.2 chip</td>
<td></td>
</tr>
<tr>
<td>Primary Cache: 32 KB I + 32 KB D on chip per core</td>
<td></td>
</tr>
<tr>
<td>Secondary Cache: 256 KB I+D on chip per core</td>
<td></td>
</tr>
</tbody>
</table>

**CPU2006 license:** 3
**Test sponsor:** HPE
**Hardware Availability:** Mar-2016
**Test date:** Apr-2016
**Software Availability:** Nov-2015

**SPECfp2006 = 106**

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CPU2006 license: 3
Test sponsor: HPE
Tested by: HPE
Test date: Apr-2016
Hardware Availability: Mar-2016
Software Availability: Nov-2015
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other Software: None

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 2133 MHz)
Disk Subsystem: 1 x 400 GB SAS SSD, RAID 0
Other Hardware: None

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Seconds Base</th>
<th>Ratio Base</th>
<th>Seconds Peak</th>
<th>Ratio Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>410.bwaves</td>
<td>25.8</td>
<td>527</td>
<td>25.7</td>
<td>529</td>
</tr>
<tr>
<td>416.gamess</td>
<td>630</td>
<td>31.1</td>
<td>629</td>
<td>31.1</td>
</tr>
<tr>
<td>433.milc</td>
<td>131</td>
<td>70.0</td>
<td>131</td>
<td>70.0</td>
</tr>
<tr>
<td>434.zeusmp</td>
<td>50.9</td>
<td>179</td>
<td>50.5</td>
<td>180</td>
</tr>
<tr>
<td>435.gromacs</td>
<td>167</td>
<td>42.8</td>
<td>166</td>
<td>42.9</td>
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<tr>
<td>436.cactusADM</td>
<td>18.5</td>
<td>645</td>
<td>18.8</td>
<td>635</td>
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<tr>
<td>437.leslie3d</td>
<td>32.5</td>
<td>289</td>
<td>32.5</td>
<td>289</td>
</tr>
<tr>
<td>444.namd</td>
<td>302</td>
<td>26.6</td>
<td>302</td>
<td>26.6</td>
</tr>
<tr>
<td>447.dealII</td>
<td>193</td>
<td>59.4</td>
<td>193</td>
<td>59.4</td>
</tr>
<tr>
<td>450.soplex</td>
<td>98.4</td>
<td>54.1</td>
<td>98.7</td>
<td>53.9</td>
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<tr>
<td>453.povray</td>
<td>194</td>
<td>43.0</td>
<td>193</td>
<td>43.2</td>
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<tr>
<td>454.calculix</td>
<td>168</td>
<td>49.1</td>
<td>168</td>
<td>49.1</td>
</tr>
<tr>
<td>459.GemsFDTD</td>
<td>49.3</td>
<td>215</td>
<td>49.0</td>
<td>216</td>
</tr>
<tr>
<td>465.tonto</td>
<td>261</td>
<td>37.7</td>
<td>260</td>
<td>37.9</td>
</tr>
<tr>
<td>470.lbm</td>
<td>21.1</td>
<td>650</td>
<td>21.8</td>
<td>629</td>
</tr>
<tr>
<td>481.wrf</td>
<td>106</td>
<td>105</td>
<td>106</td>
<td>105</td>
</tr>
<tr>
<td>482.sphinx3</td>
<td>301</td>
<td>64.7</td>
<td>301</td>
<td>64.8</td>
</tr>
</tbody>
</table>

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:
HP Power Profile set to Custom
HP Power Regulator to HP 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
QPI Snoop Configuration set to Home Snoop
Collaborative Power Control set to Disabled

Continued on next page
### Platform Notes (Continued)

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

Sysinfo program /home/new_fp/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on DL380Gen9al1bin Thu Apr 14 07:29:05 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 E5-2620 v4 @ 2.10GHz
  2 "physical id"s (chips)
  32 "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 : 16
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:       528066700 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)

uname -a:
Linux DL380Gen9allbin 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 14 07:24

SPEC is set to: /home/new_fp/cpu2006
Filesystem Type Size Used Avail Use% Mounted on
Continued on next page
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Platform Notes (Continued)
/dev/sda5 xfs 318G 81G 238G 26% /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 P89 03/23/2016
Memory:
  8x UNKNOWN NOT AVAILABLE
  16x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2400 MHz, configured at 2133 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 2133 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/cpu2006/libs/32:/home/cpu2006/libs/64:/home/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
416.gamess: -DSPEC_CPU_LP64

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Base Portability Flags (Continued)

- 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 -nofor_main
- 444.namd: -DSPEC_CPU_LP64 -nofor_main
- 447.dealII: -DSPEC_CPU_LP64
- 450.soplex: -DSPEC_CPU_LP64
- 453.povray: -DSPEC_CPU_LP64 -nofor_main
- 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

Fortran benchmarks:
- ifort -m64

Continued on next page
Peak Compiler Invocation (Continued)

Benchmarks using both Fortran and C:

```bash
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

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.dealII: 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:threads=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:threads=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: -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

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.

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