Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant XL420 Gen9
(2.60 GHz, Intel Xeon E5-2690 v4)

CPU2006 license: 3
Test sponsor: HPE
Tested by: HPE

CPU Name: Intel Xeon E5-2690 v4
CPU Characteristics: Intel Turbo Boost Technology up to 3.50 GHz
CPU MHz: 2600
FPU: Integrated
CPU(s) enabled: 28 cores, 2 chips, 14 cores/chip
CPU(s) orderable: 1.2 chips
Primary Cache: 32 KB I + 32 KB D on chip per core
Secondary Cache: 256 KB I+D on chip per core

Software
Operating System: Red Hat Enterprise Linux Server release 7.2 (Maipo)
Kernel 3.10.0-229.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: Yes
File System: ext4

Hardware

SPECfp®2006 = 125
SPECfp_base2006 = 119

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SPEC CFP2006 Result
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L3 Cache: 35 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: 64-bit
Peak Pointers: 32/64-bit
Other Software: None

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Base Seconds</th>
<th>Base Ratio</th>
<th>Peak Seconds</th>
<th>Peak Ratio</th>
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<td>410.bwaves</td>
<td>22.7 600</td>
<td>23.2 587</td>
<td>23.0 591</td>
<td>22.7 600</td>
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<tr>
<td>416.games</td>
<td>514 38.1</td>
<td>515 38.0</td>
<td>514 38.1</td>
<td>421 46.5</td>
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<td>433.milc</td>
<td>122 75.3</td>
<td>123 74.9</td>
<td>122 75.3</td>
<td>122 75.3</td>
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<tr>
<td>434.zeusmp</td>
<td>41.7 218</td>
<td>42.0 217</td>
<td>41.7 218</td>
<td>41.7 218</td>
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<tr>
<td>435.gromacs</td>
<td>136 52.5</td>
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<td>136 52.4</td>
</tr>
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<td>436.cactusADM</td>
<td>12.6 949</td>
<td>12.8 933</td>
<td>12.4 967</td>
<td>12.6 949</td>
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<tr>
<td>437.leslie3d</td>
<td>25.1 374</td>
<td>27.7 340</td>
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<tr>
<td>444.namd</td>
<td>258 31.0</td>
<td>258 31.0</td>
<td>259 31.0</td>
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<td>447.dealII</td>
<td>170 67.2</td>
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<td>450.soplex</td>
<td>167 50.0</td>
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<td>167 50.1</td>
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<td>453.povray</td>
<td>84.9 62.6</td>
<td>85.2 62.4</td>
<td>85.3 62.4</td>
<td>75.5 70.5</td>
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<tr>
<td>454.calculix</td>
<td>146 56.5</td>
<td>146 56.4</td>
<td>146 56.7</td>
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<tr>
<td>459.GemsFDTD</td>
<td>44.2 240</td>
<td>46.6 228</td>
<td>42.3 251</td>
<td>38.1 279</td>
</tr>
<tr>
<td>465.tonto</td>
<td>217 45.2</td>
<td>219 44.9</td>
<td>215 45.7</td>
<td>167 58.8</td>
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<tr>
<td>470.lbm</td>
<td>16.4 837</td>
<td>16.7 822</td>
<td>16.9 811</td>
<td>16.4 837</td>
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<tr>
<td>481.wrf</td>
<td>89.3 125</td>
<td>93.9 119</td>
<td>94.5 118</td>
<td>89.3 125</td>
</tr>
<tr>
<td>482.sphinx3</td>
<td>247 79.0</td>
<td>245 79.6</td>
<td>246 79.2</td>
<td>246 79.3</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:
Intel Hyperthreading set to Disabled
Power Profile set to Maximum Performance
QPI Snoop Configuration set to Home Snoop
Collaborative Power Control set to Disabled
Thermal Configuration set to Maximum Cooling
Processor Power and Utilization Monitoring set to Disabled
Memory Refresh Rate set to 1x Refresh

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Platform Notes (Continued)

Sysinfo program /home/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 $ e3fbb8e667b5a285932ceab81e282196

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 E5-2690 v4@ 2.60GHz
  2 "physical id"s (chips)
  28 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The
following excerpts from /proc/cpuinfo might not be reliable. Use with
cautions.)
  cpu cores : 14
  siblings : 14
  physical 0: cores 0 2 4 5 6 8 9 10 11 12 13 14
  physical 1: cores 0 2 4 5 6 8 9 10 11 12 13 14
  cache size : 35840 KB

From /proc/meminfo
MemTotal: 263891508 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 Pilot-XL420-G9 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 May 24 13:29

SPEC is set to: /home/cpu2006
  Filesystem Type Size Used Avail Use% Mounted on
  /dev/sda3 ext4 361G 18G 326G 6% /

Additional information from dmidecode:

Continued on next page
Platform Notes (Continued)

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 U19 03/10/2016
Memory:
8x 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:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/home/cpu2006/libs/32:/home/cpu2006/libs/64:/home/cpu2006/sh"
OMP_NUM_THREADS = "28"

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
433.milc: -DSPEC_CPU_LP64
434.zeusmp: -DSPEC_CPU_LP64
435.gromacs: -DSPEC_CPU_LP64 -nofor_main

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Test date: May-2016
Hardware Availability: Mar-2016
Software Availability: Nov-2015

Base Portability Flags (Continued)

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

Fortran benchmarks:
ifort -m64

Benchmarks using both Fortran and C:
icc -m64 ifort -m64
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Test date: May-2016
Tested by: HPE
Hardware Availability: Mar-2016
Software Availability: Nov-2015

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.game5: -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

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## Peak Optimization Flags (Continued)

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-calloc`  
`-opt-malloc-options=3 -auto -unroll4`

Benchmarks using both Fortran and C:

- **435.gromacs**: `basepeak = yes`
- **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-Compiler-Flags-Intel-V1.2-HSW-revF.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-Compiler-Flags-Intel-V1.2-HSW-revF.xml)
- [http://www.spec.org/cpu2006/flags/HP-Platform-Flags-Intel-V1.2-HSW-revE.xml](http://www.spec.org/cpu2006/flags/HP-Platform-Flags-Intel-V1.2-HSW-revE.xml)

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