Hewlett-Packard Company

ProLiant DL560 Gen9
(2.90 GHz, Intel Xeon E5-4655 v3)

CPU2006 license: 3
Test sponsor: Hewlett-Packard Company
Tested by: Hewlett-Packard Company

SPECfp®2006 = 113
SPECfp_base2006 = 108

Hardware

<table>
<thead>
<tr>
<th>CPU Name:</th>
<th>Intel Xeon E5-4655 v3</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Characteristics:</td>
<td>Intel Turbo Boost Technology up to 3.20 GHz</td>
</tr>
<tr>
<td>CPU MHz:</td>
<td>2900</td>
</tr>
<tr>
<td>FPU:</td>
<td>Integrated</td>
</tr>
<tr>
<td>CPU(s) enabled:</td>
<td>24 cores, 4 chips, 6 cores/chip</td>
</tr>
<tr>
<td>CPU(s) orderable:</td>
<td>2,4 chip</td>
</tr>
<tr>
<td>Primary Cache:</td>
<td>32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>Secondary Cache:</td>
<td>256 KB I+D on chip per core</td>
</tr>
</tbody>
</table>

Software

<table>
<thead>
<tr>
<th>Operating System:</th>
<th>SUSE Linux Enterprise Server 12 (x86_64)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compiler:</td>
<td>C/C++: Version 15.0.0.090 of Intel C++ Studio XE for Linux; Fortran: Version 15.0.0.090 of Intel Fortran Studio XE for Linux</td>
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<tr>
<td>Auto Parallel:</td>
<td>Yes</td>
</tr>
<tr>
<td>File System:</td>
<td>xfs</td>
</tr>
<tr>
<td>System State:</td>
<td>Run level 3 (multi-user)</td>
</tr>
</tbody>
</table>

Continued on next page
**SPEC CFP2006 Result**

**Hewlett-Packard Company**

ProLiant DL560 Gen9 (2.90 GHz, Intel Xeon E5-4655 v3)

**SPECfp2006 =** 113  
**SPECfp_base2006 =** 108

CPU2006 license: 3  
Test sponsor: Hewlett-Packard Company  
Tested by: Hewlett-Packard Company  
Test date: Apr-2015  
Hardware Availability: Jun-2015  
Software Availability: Oct-2014

| L3 Cache: | 30 MB I+D on chip per chip | Base Pointers: | 64-bit |
| Other Cache: | None | Peak Pointers: | 32/64-bit |
| Memory: | 512 GB (32 x 16 GB 2Rx4 PC4-2133P-R) | Other Software: | None |
| Disk Subsystem: | 1 x 400 GB SAS SSD, RAID 0 | Other Hardware: | None |

### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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</thead>
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<tr>
<td>410.bwaves</td>
<td>15.7</td>
<td>866</td>
<td>15.1</td>
<td>900</td>
<td>14.3</td>
<td>953</td>
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<td>900</td>
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<tr>
<td>416.gamess</td>
<td>536</td>
<td>36.5</td>
<td>535</td>
<td>36.6</td>
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<td>36.7</td>
<td>481</td>
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<td>435.gromacs</td>
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<td>694</td>
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<td>720</td>
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<td>694</td>
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<td>292</td>
<td>33.0</td>
<td>284</td>
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<td>293</td>
<td>32.2</td>
<td>292</td>
<td>33.0</td>
<td>284</td>
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<tr>
<td>444.namd</td>
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<td>71.1</td>
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<td>51.8</td>
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<td>56.5</td>
<td>147</td>
<td>56.2</td>
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<td>459.GemsFDTD</td>
<td>44.4</td>
<td>239</td>
<td>46.9</td>
<td>226</td>
<td>50.0</td>
<td>212</td>
<td>37.3</td>
<td>284</td>
<td>37.0</td>
<td>287</td>
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<tr>
<td>465.tonto</td>
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<td>39.8</td>
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<td>39.6</td>
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<td>50.8</td>
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<td>14.3</td>
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<td>88.2</td>
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<td>87.2</td>
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<td>88.1</td>
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<td>482.sphinx3</td>
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<td>76.9</td>
<td>251</td>
<td>77.5</td>
<td>255</td>
<td>76.3</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 Options set to Disabled  
HP Power Profile set to Custom  
HP Power Regulator to HP Static High Performance Mode  
Minimum Processor Idle Power Core State set to C6 State  
Minimum Processor Idle Power Package State set to Package C6 (retention) State  
Energy/Performance Bias set to Maximum Performance  
Collaborative Power Control set to Disabled

Continued on next page
**SPEC CFP2006 Result**

Hewlett-Packard Company

ProLiant DL560 Gen9
(2.90 GHz, Intel Xeon E5-4655 v3)

SPECfp2006 = 113
SPECfp_base2006 = 108

<table>
<thead>
<tr>
<th>CPU2006 license:</th>
<th>3</th>
<th>Test date:</th>
<th>Apr-2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test sponsor:</td>
<td>Hewlett-Packard Company</td>
<td>Hardware Availability:</td>
<td>Jun-2015</td>
</tr>
<tr>
<td>Tested by:</td>
<td>Hewlett-Packard Company</td>
<td>Software Availability:</td>
<td>Oct-2014</td>
</tr>
</tbody>
</table>

**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/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on dl560cgen9sles12 Wed Apr 29 16:14:55 2015

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 E5-4655 v3 @ 2.90GHz
4 "physical id"s (chips)
24 "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 1 3 5 9 11 12
physical 1: cores 1 3 5 9 11 12
physical 2: cores 1 3 5 9 11 12
physical 3: cores 1 3 5 9 11 12
cache size : 30720 KB

From /proc/meminfo
MemTotal: 529314924 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
SuSE-release:
SUSE Linux Enterprise Server 12 (x86_64)
VERSION = 12
PATCHLEVEL = 0
# This file is deprecated and will be removed in a future service pack or release.
# Please check /etc/os-release for details about this release.
os-release:
NAME="SLES"
VERSION="12"
VERSION_ID="12"
PRETTY_NAME="SUSE Linux Enterprise Server 12"
ID="sles"
ANSI_COLOR=0;32
CPE_NAME=cpe:/o:suse:sles:12

uname -a:
Linux dl560cgen9sles12 3.12.28-4-default #1 SMP Thu Sep 25 17:02:34 UTC 2014
(9879bd4) x86_64 x86_64 x86_64 GNU/Linux

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Test by: Hewlett-Packard Company
Hardware Availability: Jun-2015
Software Availability: Oct-2014

Platform Notes (Continued)

run-level 3 Apr 29 10:39

SPEC is set to: /home/cpu2006
Filesystem           Type  Size  Used Avail Use% Mounted on
/dev/mapper/rhel-home xfs   320G  3.9G  316G   2% /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 P85 03/05/2015
Memory:
32x HP 752369-081 16 GB 2 rank 2133 MHz
16x UNKNOWN NOT AVAILABLE

(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:
32x HP 752369-081 16 GB 2 rank 2133 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 = "24"

Binaries compiled on a system with 1x Core i5-4670K CPU + 16GB
memory using RedHat EL 7.0

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
Hewlett-Packard Company

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Cpu2006 license: 3
Test sponsor: Hewlett-Packard Company
Tested by: Hewlett-Packard Company

Base Portability Flags

410.bwaves: -DSPEC_CPU_LP64
416.games: -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 -parallel -opt-prefetch
-ansi-alias

C++ benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch -ansi-alias

Fortran benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -parallel -opt-prefetch

Benchmarks using both Fortran and C:
-xCORE-AVX2 -ipo -O3 -no-prec-div -parallel -opt-prefetch
-ansi-alias

Peak Compiler Invocation

C benchmarks:
icc -m64

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

Test date: Apr-2015
Hardware Availability: Jun-2015
Software Availability: Oct-2014

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Tested by: Hewlett-Packard Company

Test date: Apr-2015
Hardware Availability: Jun-2015
Software Availability: Oct-2014

Peak Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
icc -m64 ifort -m64

Peak Portability Flags
Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
433.milc: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
-03(pass 2) -no-prec-div(pass 2) -prof-use(pass 2)
-auto-ilp32 -ansi-alias

470.lbm: basepeak = yes

482.sphinx3: basepeak = yes

C++ benchmarks:
444.namd: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
-03(pass 2) -no-prec-div(pass 2) -prof-use(pass 2)
-fno-alias -auto-ilp32

447.dealII: basepeak = yes

450.soplex: basepeak = yes

453.povray: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
-03(pass 2) -no-prec-div(pass 2) -prof-use(pass 2) -unroll4
-ansi-alias

Fortran benchmarks:
410.bwaves: basepeak = yes

416.gamess: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
-03(pass 2) -no-prec-div(pass 2) -prof-use(pass 2) -unroll2
-inline-level=0 -scalar-rep-

434.zeusmp: basepeak = yes

437.leslie3d: basepeak = yes

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Peak Optimization Flags (Continued)

459.GemsFDTD: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
-03(pass 2) -no-prec-div(pass 2) -prof-use(pass 2) -unroll2
-inline-level=0 -opt-prefetch -parallel

465.tonto: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
-03(pass 2) -no-prec-div(pass 2) -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 -03 -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/Intel-ic15.0-official-linux64.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/Intel-ic15.0-official-linux64.xml
http://www.spec.org/cpu2006/flags/HP-Platform-Flags-Intel-V1.2-HSW-revE.xml

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For questions about this result, please contact the tester.
For other inquiries, please contact webmaster@spec.org.

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