Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL560 Gen9
(2.10 GHz, Intel Xeon E5-4640 v4)

| SPECint®2006 | 56.2 |
| SPECint_base2006 | 53.6 |

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

Test date: Aug-2016
Hardware Availability: Jul-2016
Software Availability: Dec-2015

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Score</th>
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<tr>
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<tr>
<td>403.gcc</td>
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<td>64.0</td>
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<tr>
<td>456.hmmer</td>
<td>26.6</td>
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<tr>
<td>458.sjeng</td>
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</tr>
<tr>
<td>462.libquantum</td>
<td>6400</td>
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<tr>
<td>464.h264ref</td>
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<tr>
<td>471.omnetpp</td>
<td>44.5</td>
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<tr>
<td>473.astar</td>
<td>31.5</td>
</tr>
<tr>
<td>483.xalancbmk</td>
<td>58.5</td>
</tr>
</tbody>
</table>

SPECint2006 = 56.2
SPECint_base2006 = 53.6

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Software</th>
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<tbody>
<tr>
<td>CPU Name: Intel Xeon E5-4640 v4</td>
<td></td>
</tr>
<tr>
<td>CPU Characteristics: Intel Turbo Boost Technology up to 2.60 GHz</td>
<td></td>
</tr>
<tr>
<td>CPU MHz: 2100</td>
<td></td>
</tr>
<tr>
<td>FPU: Integrated</td>
<td></td>
</tr>
<tr>
<td>CPU(s) enabled: 48 cores, 4 chips, 12 cores/chip</td>
<td></td>
</tr>
<tr>
<td>CPU(s) orderable: 2,4 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>
<tr>
<td>L3 Cache: 30 MB I+D on chip per chip</td>
<td></td>
</tr>
<tr>
<td>Other Cache: None</td>
<td></td>
</tr>
<tr>
<td>Memory: 512 GB (32 x 16 GB 2Rx4 PC4-2400T-R, running at 2133 MHz)</td>
<td></td>
</tr>
<tr>
<td>Disk Subsystem: 1 x 400 GB SAS SSD, RAID 0</td>
<td></td>
</tr>
<tr>
<td>Other Hardware: None</td>
<td></td>
</tr>
<tr>
<td>Operating System: SUSE Linux Enterprise Server 12 (x86_64) SP1, Kernel 3.12.49-11-default</td>
<td></td>
</tr>
<tr>
<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>
<td></td>
</tr>
<tr>
<td>Auto Parallel: Yes</td>
<td></td>
</tr>
<tr>
<td>File System: xfs</td>
<td></td>
</tr>
<tr>
<td>System State: Run level 3 (multi-user)</td>
<td></td>
</tr>
<tr>
<td>Base Pointers: 32/64-bit</td>
<td></td>
</tr>
<tr>
<td>Peak Pointers: 32/64-bit</td>
<td></td>
</tr>
<tr>
<td>Other Software: None</td>
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Results Table

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<tr>
<th>Benchmark</th>
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<td>30.9</td>
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<td>30.9</td>
<td>289</td>
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<tr>
<td>401.bzip2</td>
<td>503</td>
<td>19.2</td>
<td>499</td>
<td>19.3</td>
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<td>264</td>
<td>30.5</td>
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<tr>
<td>429.mcf</td>
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<td>54.3</td>
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<td>54.7</td>
<td>173</td>
<td>52.8</td>
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<td>54.3</td>
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<tr>
<td>445.gobmk</td>
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<td>64.0</td>
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<td>471.omnetpp</td>
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<td>199</td>
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<td>473.astar</td>
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<td>28.1</td>
<td>249</td>
<td>28.2</td>
<td>251</td>
<td>28.0</td>
<td>250</td>
<td>28.1</td>
<td>249</td>
<td>28.2</td>
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<tr>
<td>483.xalancbmk</td>
<td>117</td>
<td>59.0</td>
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<td>58.5</td>
<td>106</td>
<td>65.0</td>
<td>106</td>
<td>64.9</td>
</tr>
</tbody>
</table>

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Submit Notes
The config file option 'submit' was used.

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 Balanced Power and 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
   Intel Hyper Threading set to Disabled
Sysinfo program /home/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 $$ e3fbb8667b5a285932ceab81e28219e1

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

Continued on next page
SPEC CINT2006 Result

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Platform Notes (Continued)

model name : Intel(R) Xeon(R) CPU E5-4640 v4 @ 2.10GHz
4 "physical id"s (chips)
48 "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 : 12
siblings : 12
physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13
physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13
physical 2: cores 0 1 2 3 4 5 8 9 10 11 12 13
physical 3: cores 0 1 2 3 4 5 8 9 10 11 12 13
cache size : 30720 KB

From /proc/meminfo
MemTotal: 529310876 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
SuSE-release:
VERSION = 12
PATCHLEVEL = 1
# 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-SP1"
VERSION_ID="12.1"
PRETTY_NAME="SUSE Linux Enterprise Server 12 SP1"
ID="sles"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:12:sp1"

uname -a:
(8d714a0) x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Aug 24 14:28

SPEC is set to: /home/cpu2006
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 331G 220G 111G 67% /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.

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Platform Notes (Continued)

BIOS HP P85 07/01/2016
Memory:
16x UNKNOWN NOT AVAILABLE
32x UNKNOWN NOT AVAILABLE 16 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:
32x UNKNOWN NOT AVAILABLE 16 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"
LD_LIBRARY_PATH = "/home/cpu2006/libs/32:/home/cpu2006/libs/64:/home/cpu2006/sh"
OMP_NUM_THREADS = "48"

Binaries compiled on a system with 1x Intel Core i5-4670K CPU + 32GB memory using RedHat EL 7.1

Base Compiler Invocation

C benchmarks:
  icc -m64

C++ benchmarks:
  icpc -m64

Base Portability Flags

400.perlbench: -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX_X64
401.bzip2: -DSPEC_CPU_LP64
403.gcc: -DSPEC_CPU_LP64
429.mcf: -DSPEC_CPU_LP64
445.gobmk: -DSPEC_CPU_LP64
456.hmmer: -DSPEC_CPU_LP64
458.sjeng: -DSPEC_CPU_LP64
462.libquantum: -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX
464.h264ref: -DSPEC_CPU_LP64
471.omnetpp: -DSPEC_CPU_LP64
473.astar: -DSPEC_CPU_LP64
483.xalancbmk: -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX
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### Base Optimization Flags

- **C benchmarks:**  
  -xCORE-AVX2  
  -ipo  
  -O3  
  -no-prec-div  
  -parallel  
  -opt-prefetch  
  -auto-p32

- **C++ benchmarks:**  
  -xCORE-AVX2  
  -ipo  
  -O3  
  -no-prec-div  
  -opt-prefetch  
  -auto-p32  
  -Wl,-z,muldefs -L/sh -lsmartheap64

### Base Other Flags

- **C benchmarks:**  
  403.gcc: -Dalloca=_alloca

### Peak Compiler Invocation

- **C benchmarks (except as noted below):**  
  -icc -m64

  400.perlbench: icc -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin

- **C++ benchmarks (except as noted below):**  
  -icpc -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin

  473.astar: icpc -m64

### Peak Portability Flags

- **400.perlbench:**  
  -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX_IA32

- **401.bzip2:**  
  -DSPEC_CPU_LP64

- **403.gcc:**  
  -DSPEC_CPU_LP64

- **429.mcf:**  
  -DSPEC_CPU_LP64

- **445.gobmk:**  
  -DSPEC_CPU_LP64

- **456.hmmer:**  
  -DSPEC_CPU_LP64

- **458.sjeng:**  
  -DSPEC_CPU_LP64

- **462.libquantum:**  
  -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX

- **464.hmmerref:**  
  -DSPEC_CPU_LP64

- **471.omnetpp:**  
  -D_FILE_OFFSET_BITS=64

- **473.astar:**  
  -DSPEC_CPU_LP64

- **483.xalancbmk:**  
  -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX
**SPEC CINT2006 Result**

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**Peak Optimization Flags**

C benchmarks:

400.perlbench: -xCORE-AVX2 (pass 2) -prof-gen:threadsafepass 1)  
-ipo (pass 2) -O3 (pass 2) -no-prec-div (pass 2)  
-par-num-threads=1 (pass 1) -prof-use (pass 2) -opt-prefetch  
-ansi-alias

401.bzip2: -xCORE-AVX2 (pass 2) -prof-gen:threadsafepass 1)  
-ipo (pass 2) -O3 (pass 2) -no-prec-div  
-par-num-threads=1 (pass 1) -prof-use (pass 2) -auto-ilp32  
-opt-prefetch -ansi-alias

403.gcc: basepeak = yes

429.mcf: basepeak = yes

445.gobmk: basepeak = yes

456.hmmer: basepeak = yes

458.sjeng: -xCORE-AVX2 (pass 2) -prof-gen:threadsafepass 1)  
-ipo (pass 2) -O3 (pass 2) -no-prec-div (pass 2)  
-par-num-threads=1 (pass 1) -prof-use (pass 2) -unroll4

462.libquantum: basepeak = yes

464.h264ref: basepeak = yes

C++ benchmarks:

471.omnetpp: -xCORE-AVX2 (pass 2) -prof-gen:threadsafepass 1)  
-ipo (pass 2) -O3 (pass 2) -no-prec-div (pass 2)  
-par-num-threads=1 (pass 1) -prof-use (pass 2)  
-opt-ra-region-strategy=block -ansi-alias  
-Wl,-z,muldefs -L/sh -lsmartheap

473.astar: -xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch  
-auto-p32 -Wl,-z,muldefs -L/sh -lsmartheap64

483.xalancbmk: -xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch  
-ansi-alias -Wl,-z,muldefs -L/sh -lsmartheap

**Peak Other Flags**

C benchmarks:

403.gcc: -Dalloca=_alloca
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The flags files that were used to format this result can be browsed at

http://www.spec.org/cpu2006/flags/Intel-ic16.0-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-ic16.0-official-linux64.xml
http://www.spec.org/cpu2006/flags/HP-Platform-Flags-Intel-V1.2-HSW-revE.xml

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

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