**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
**ProLiant DL560 Gen9**  
(2.20 GHz, Intel Xeon E5-4660 v4)  

| SPECint®2006 = | 64.6 |
| SPECint_base2006 = | 62.7 |

**CPU2006 license:** 3  
**Tested by:** HPE  
**Hardware Availability:** Jul-2016  
**Software Availability:** Dec-2015  
**Test date:** Jul-2016

| SPECint2006 = 64.6 |
| SPECint_base2006 = 62.7 |

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<tbody>
<tr>
<td>Hardware</td>
</tr>
<tr>
<td>CPU Name: Intel Xeon E5-4660 v4</td>
</tr>
<tr>
<td>CPU Characteristics: Intel Turbo Boost Technology up to 3.00 GHz</td>
</tr>
<tr>
<td>CPU MHz: 2200</td>
</tr>
<tr>
<td>FPU: Integrated</td>
</tr>
<tr>
<td>CPU(s) enabled: 64 cores, 4 chips, 16 cores/chip</td>
</tr>
<tr>
<td>CPU(s) orderable: 2,4 chip</td>
</tr>
<tr>
<td>Primary Cache: 32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>Secondary Cache: 256 KB I+D on chip per core</td>
</tr>
<tr>
<td>L3 Cache: 40 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other Cache: None</td>
</tr>
<tr>
<td>Memory: 512 GB (32 x 16 GB 2Rx4 PC4-2400T-R)</td>
</tr>
<tr>
<td>Disk Subsystem: 1 x 400 GB SAS SSD, RAID 0</td>
</tr>
<tr>
<td>Other Hardware: None</td>
</tr>
</tbody>
</table>

| Software |
| Operating System: SUSE Linux Enterprise Server 12 (x86_64) SP1, Kernel 3.12.49-11-default |
| 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: xfs |
| System State: Run level 3 (multi-user) |
| Base Pointers: 32/64-bit |
| Peak Pointers: 32/64-bit |
| Other Software: None |
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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<tbody>
<tr>
<td>400.perlbench</td>
<td>278</td>
<td>35.1</td>
<td>277</td>
<td>35.2</td>
<td>275</td>
<td>35.5</td>
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<tr>
<td>401.bzip2</td>
<td>446</td>
<td>21.6</td>
<td>445</td>
<td>21.7</td>
<td>450</td>
<td>21.5</td>
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<td>403.gcc</td>
<td>240</td>
<td>33.6</td>
<td>240</td>
<td>33.5</td>
<td>241</td>
<td>33.5</td>
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<tr>
<td>429.mcf</td>
<td>153</td>
<td>59.5</td>
<td>155</td>
<td>58.8</td>
<td>156</td>
<td>58.6</td>
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<tr>
<td>445.gobmk</td>
<td>405</td>
<td>25.9</td>
<td>404</td>
<td>26.0</td>
<td>404</td>
<td>26.0</td>
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<tr>
<td>456.hmmer</td>
<td>127</td>
<td>73.8</td>
<td>126</td>
<td>73.8</td>
<td>126</td>
<td>73.8</td>
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<td>458.sjeng</td>
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<td>30.1</td>
<td>401</td>
<td>30.2</td>
<td>400</td>
<td>30.2</td>
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<tr>
<td>462.libquantum</td>
<td>2.19</td>
<td>9470</td>
<td>2.21</td>
<td>9380</td>
<td>2.21</td>
<td>9380</td>
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<tr>
<td>464.h264ref</td>
<td>437</td>
<td>50.6</td>
<td>438</td>
<td>50.6</td>
<td>438</td>
<td>50.6</td>
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<tr>
<td>471.omnetpp</td>
<td>152</td>
<td>41.1</td>
<td>147</td>
<td>42.5</td>
<td>147</td>
<td>42.6</td>
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<tr>
<td>473.astar</td>
<td>221</td>
<td>31.7</td>
<td>221</td>
<td>31.7</td>
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<td>31.7</td>
</tr>
<tr>
<td>483.xalancbmk</td>
<td>103</td>
<td>66.7</td>
<td>104</td>
<td>66.5</td>
<td>104</td>
<td>66.5</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 Hyperthreading set to Disabled
Sysinfo program /home/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on sles12biswadl560 Sun Jul 31 17:55:07 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

Continued on next page
**SPEC CINT2006 Result**

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**CPU2006 license:** 3  
**Test sponsor:** HPE  
**Tested by:** HPE  
**Test date:** Jul-2016  
**Hardware Availability:** Jul-2016  
**Software Availability:** Dec-2015

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**Platform Notes (Continued)**

- **model name:** Intel(R) Xeon(R) CPU E5-4660 v4 @ 2.20GHz  
- **4 "physical id"s (chips)**  
- **64 "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 : 16**  
- **siblings : 16**  
- **physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15**  
- **physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15**  
- **physical 2: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15**  
- **physical 3: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15**  
- **cache size : 40960 KB**

---

From /proc/meminfo  
MemTotal: 529309212 kB  
HugePages_Total: 0  
Hugepagesize: 2048 kB

---

From /etc/*release* /etc/*version*  
**SuSE-release:**  
SUSE Linux Enterprise Server 12 (x86_64)  
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  
Jul 31 17:40

**SPEC is set to:** /home/cpu2006

---

**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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Continued on next page
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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

(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

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 = "64"

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
SPEC CINT2006 Result

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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.h264ref: -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
### Peak Optimization Flags

**C benchmarks:**

400.perlbench: `-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) -opt-prefetch -ansi-alias`

401.bzip2: `-xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass 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: `-xCORE-AVX2 -ipo -O3 -no-prec-div -inline-calloc -opt-malloc-options=3 -auto-ilp32`

429.mc: `basepeak = yes`

445.gobmk: `basepeak = yes`

456.hmmer: `basepeak = yes`

458.sjeng: `-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) -opt-prefetch -ansi-alias -unroll4`

462.libquantum: `basepeak = yes`

464.h264ref: `basepeak = yes`

**C++ benchmarks:**

471.omnetpp: `-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) -opt-ra-region-strategy=block -ansi-alias -Wl,-z,muldefs -L/sh -lsmartheap`

473.astar: `basepeak = yes`

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

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

Tested with SPEC CPU2006 v1.2.  
Report generated on Tue Sep  6 16:57:11 2016 by SPEC CPU2006 PS/PDF formatter v6932.  
Originally published on  6 September 2016.