### SPECint2006 Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
**ProLiant ML350 Gen9**  
(1.70 GHz, Intel Xeon E5-2609 v4)  

<table>
<thead>
<tr>
<th>SPECint2006 =</th>
<th>37.1</th>
<th>SPECint_base2006 =</th>
<th>35.7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hardware</strong></td>
<td></td>
<td><strong>Software</strong></td>
<td></td>
</tr>
<tr>
<td>CPU Name:</td>
<td>Intel Xeon E5-2609 v4</td>
<td>Operating System:</td>
<td>SUSE Linux Enterprise Server 12 (x86_64) SP1 Kernel 3.12.49-11-default</td>
</tr>
<tr>
<td>CPU Characteristics:</td>
<td>1700</td>
<td>Compiler:</td>
<td>C/C++: Version 16.0.0.101 of Intel C++ Studio XE for Linux</td>
</tr>
<tr>
<td>CPU MHz:</td>
<td>1700</td>
<td>Auto Parallel:</td>
<td>Yes</td>
</tr>
<tr>
<td>FPU:</td>
<td>Integrated</td>
<td>File System:</td>
<td>xfs</td>
</tr>
<tr>
<td>CPU(s) enabled:</td>
<td>16 cores, 2 chips, 8 cores/chip</td>
<td>System State:</td>
<td>Run level 3 (multi-user)</td>
</tr>
<tr>
<td>CPU(s) orderable:</td>
<td>1, 2 chips</td>
<td>Base Pointers:</td>
<td>32/64-bit</td>
</tr>
<tr>
<td>Primary Cache:</td>
<td>32 KB I + 32 KB D on chip per core</td>
<td>Peak Pointers:</td>
<td>32/64-bit</td>
</tr>
<tr>
<td>Secondary Cache:</td>
<td>256 KB I+D on chip per core</td>
<td>Other Software:</td>
<td>Microquill SmartHeap V10.2</td>
</tr>
<tr>
<td>L3 Cache:</td>
<td>20 MB I+D on chip per chip</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Cache:</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory:</td>
<td>512 GB (16 x 32 GB 2Rx4 PC4-2400T-R, running at 1866 MHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disk Subsystem:</td>
<td>1 x 800 GB SAS SSD, RAID 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Hardware:</td>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CPU2006 license:** 3  
**Test date:** Jun-2016  
**Test sponsor:** HPE  
**Hardware Availability:** Mar-2016  
**Tested by:** HPE  
**Software Availability:** Dec-2015
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(Test Sponsor: HPE)
ProLiant ML350 Gen9
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SPECint2006 = 37.1
SPECint_base2006 = 35.7

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

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Base</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>400.perlbench</td>
<td>474</td>
<td>20.6</td>
<td>473</td>
<td>20.7</td>
<td>474</td>
<td>20.6</td>
<td>436</td>
<td>22.4</td>
<td>436</td>
</tr>
<tr>
<td>401.bzip2</td>
<td>742</td>
<td>13.0</td>
<td>746</td>
<td>12.9</td>
<td>739</td>
<td>13.1</td>
<td>729</td>
<td>13.2</td>
<td>729</td>
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<tr>
<td>429.mcf</td>
<td>224</td>
<td>40.7</td>
<td>223</td>
<td>40.8</td>
<td>223</td>
<td>40.8</td>
<td>225</td>
<td>40.6</td>
<td>222</td>
</tr>
<tr>
<td>445.gobmk</td>
<td>702</td>
<td>15.0</td>
<td>702</td>
<td>14.9</td>
<td>702</td>
<td>14.9</td>
<td>702</td>
<td>14.9</td>
<td>702</td>
</tr>
<tr>
<td>456.hmmer</td>
<td>222</td>
<td>42.0</td>
<td>222</td>
<td>42.1</td>
<td>223</td>
<td>41.9</td>
<td>222</td>
<td>42.0</td>
<td>222</td>
</tr>
<tr>
<td>458.sjeng</td>
<td>691</td>
<td>17.5</td>
<td>690</td>
<td>17.5</td>
<td>690</td>
<td>17.5</td>
<td>683</td>
<td>17.7</td>
<td>683</td>
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<tr>
<td>462.libquantum</td>
<td>6.04</td>
<td>3430</td>
<td>6.06</td>
<td>3420</td>
<td>6.43</td>
<td>3220</td>
<td>6.04</td>
<td>3430</td>
<td>6.06</td>
</tr>
<tr>
<td>464.h264ref</td>
<td>735</td>
<td>30.1</td>
<td>736</td>
<td>30.1</td>
<td>731</td>
<td>30.3</td>
<td>735</td>
<td>30.1</td>
<td>736</td>
</tr>
<tr>
<td>471.omnetpp</td>
<td>298</td>
<td>21.0</td>
<td>291</td>
<td>21.5</td>
<td>299</td>
<td>20.9</td>
<td>224</td>
<td>27.9</td>
<td>224</td>
</tr>
<tr>
<td>473.astar</td>
<td>371</td>
<td>18.9</td>
<td>370</td>
<td>19.0</td>
<td>373</td>
<td>18.8</td>
<td>372</td>
<td>18.9</td>
<td>372</td>
</tr>
<tr>
<td>483.xalancbmk</td>
<td>170</td>
<td>40.7</td>
<td>169</td>
<td>40.8</td>
<td>171</td>
<td>40.5</td>
<td>160</td>
<td>43.1</td>
<td>160</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:
   Power Profile set to Custom
   Power Regulator set to 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
   Collaborative Power Control set to Disabled
   QPI Snoop Configuration set to Home Snoop
   Thermal Configuration set to Maximum Cooling
   Processor Power and Utilization Monitoring set to Disabled
   Memory Double Refresh Rate set to 1x Refresh
   Energy Performance Bias set to Maximum Performance
Sysinfo program /home/specuser/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on linux-7m51 Fri Jun 3 13:47:22 2016

This section contains SUT (System Under Test) info as seen by some common utilities. To remove or add to this section, see:
Continued on next page
SPEC CINT2006 Result

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Software Availability: Dec-2015

Platform Notes (Continued)

http://www.spec.org/cpu2006/Docs/config.html#sysinfo

From /proc/cpuinfo
model name : Intel(R) Xeon(R) CPU E5-2609 v4 @ 1.70GHz
  2 "physical id"s (chips)
  16 "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 : 8
siblings : 8
  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: 529095464 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/usr/bin/lsb_release -d
SUSE Linux Enterprise Server 12 SP1

From /etc/*release* /etc/*version*
SuSE-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:
Linux linux-7m51 3.12.49-11-default #1 SMP Wed Nov 11 20:52:43 UTC 2015
(8d714a0) x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Jun 3 13:23

SPEC is set to: /home/specuser/cpu2006

Additional information from dmidecode:
Warning: Use caution when you interpret this section. The 'dmidecode' program
Continued on next page
Platform Notes (Continued)

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 P92 04/12/2016
Memory:
  8x UNKNOWN NOT AVAILABLE
  16x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2400 MHz, configured at 1866 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 1866 MHz

General Notes

Environment variables set by runspec before the start of the run:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH = "/home/specuser/cpu2006/libs/32:/home/specuser/cpu2006/libs/64:/home/specuser/cpu2006/sh"
OMP_NUM_THREADS = "16"

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
### 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.mcf: -xCORE-AVX2 -ipo -O3 -no-prec-div -parallel
-opt-prefetch -auto-p32

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) -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: -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:

Continued on next page
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| Test date: | Jun-2016 |
| Hardware Availability: | Mar-2016 |
| Software Availability: | Dec-2015 |

**Peak Other Flags (Continued)**

403.gcc: -Dalloca=_alloca

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.

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