Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL380 Gen9
(2.20 GHz, Intel Xeon E5-2650 v4)

SPECint®2006 = 59.9
SPECint_base2006 = 57.3

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

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

Hardware

<table>
<thead>
<tr>
<th>CPU Name:</th>
<th>Intel Xeon E5-2650 v4</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Characteristics:</td>
<td>Intel Turbo Boost Technology up to 2.90 GHz</td>
</tr>
<tr>
<td>CPU MHz:</td>
<td>2200</td>
</tr>
<tr>
<td>FPU:</td>
<td>Integrated</td>
</tr>
<tr>
<td>CPU(s) enabled:</td>
<td>24 cores, 2 chips, 12 cores/chip</td>
</tr>
<tr>
<td>CPU(s) orderable:</td>
<td>1.2 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>
<tr>
<td>L3 Cache:</td>
<td>30 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other Cache:</td>
<td>None</td>
</tr>
<tr>
<td>Memory:</td>
<td>512 GB (16 x 32 GB 2Rx4 PC4-2400T-R)</td>
</tr>
<tr>
<td>Disk Subsystem:</td>
<td>1 x 400 GB SAS SSD, RAID 0</td>
</tr>
<tr>
<td>Other Hardware:</td>
<td>None</td>
</tr>
</tbody>
</table>

Software

<table>
<thead>
<tr>
<th>Operating System:</th>
<th>Red Hat Enterprise Linux Server release 7.2, (Maipo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compiler:</td>
<td>C/C++: Version 16.0.0.101 of Intel C++ Studio XE for Linux</td>
</tr>
<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>
<tr>
<td>Base Pointers:</td>
<td>32-bit</td>
</tr>
<tr>
<td>Peak Pointers:</td>
<td>32/64-bit</td>
</tr>
<tr>
<td>Other Software:</td>
<td>Microquill SmartHeap V10.2</td>
</tr>
</tbody>
</table>
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CPU2006 license: 3
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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>
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</thead>
<tbody>
<tr>
<td>400.perlbench</td>
<td>288</td>
<td>33.9</td>
<td>286</td>
<td>34.1</td>
<td>287</td>
<td>34.1</td>
<td>263</td>
<td>37.2</td>
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<tr>
<td>401.bzip2</td>
<td>459</td>
<td>21.0</td>
<td>460</td>
<td>21.0</td>
<td>460</td>
<td>21.0</td>
<td>452</td>
<td>21.3</td>
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<tr>
<td>403.gcc</td>
<td>247</td>
<td>32.5</td>
<td>248</td>
<td>32.5</td>
<td>248</td>
<td>32.5</td>
<td>247</td>
<td>32.6</td>
</tr>
<tr>
<td>429.mcf</td>
<td>161</td>
<td>56.7</td>
<td>161</td>
<td>56.6</td>
<td>162</td>
<td>56.5</td>
<td>160</td>
<td>57.1</td>
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<tr>
<td>445.gobmk</td>
<td>419</td>
<td>25.0</td>
<td>420</td>
<td>25.0</td>
<td>419</td>
<td>25.1</td>
<td>419</td>
<td>25.0</td>
</tr>
<tr>
<td>456.hmmer</td>
<td>131</td>
<td>71.2</td>
<td>131</td>
<td>71.3</td>
<td>131</td>
<td>71.1</td>
<td>131</td>
<td>71.2</td>
</tr>
<tr>
<td>458.sjeng</td>
<td>418</td>
<td>29.0</td>
<td>418</td>
<td>28.9</td>
<td>418</td>
<td>29.0</td>
<td>413</td>
<td>29.3</td>
</tr>
<tr>
<td>462.libquantum</td>
<td>3.72</td>
<td>5580</td>
<td>3.73</td>
<td>5550</td>
<td>3.66</td>
<td>5660</td>
<td>3.72</td>
<td>5580</td>
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<tr>
<td>464.h264ref</td>
<td>457</td>
<td>48.4</td>
<td>457</td>
<td>48.5</td>
<td>458</td>
<td>48.3</td>
<td>457</td>
<td>48.4</td>
</tr>
<tr>
<td>471.omnetpp</td>
<td>180</td>
<td>34.7</td>
<td>176</td>
<td>35.5</td>
<td>180</td>
<td>34.7</td>
<td>134</td>
<td>46.8</td>
</tr>
<tr>
<td>473.astar</td>
<td>227</td>
<td>30.9</td>
<td>229</td>
<td>30.6</td>
<td>228</td>
<td>30.8</td>
<td>227</td>
<td>30.9</td>
</tr>
<tr>
<td>483.xalancbmk</td>
<td>107</td>
<td>64.4</td>
<td>107</td>
<td>64.4</td>
<td>108</td>
<td>64.2</td>
<td>95.9</td>
<td>71.9</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 Custom
HP Power Regulator to HP 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
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/intel_binary/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 $ e3fbb8667b5a285932ceab81e28219e1

This section contains SUT (System Under Test) info as seen by
Continued on next page
Platform Notes (Continued)

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 E5-2650 v4@ 2.20GHz
  2  "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 : 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
  cache size : 30720 KB

From /proc/meminfo
  MemTotal:       528067692 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 DL380Gen9allbin 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 4 20 06

  SPEC is set to: /home/intel_binary/cpu2006
  Filesystem     Type  Size  Used Avail Use% Mounted on
  /dev/sda5      xfs   318G  147G  172G  47% /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 P89 03/23/2016

Continued on next page
**SPEC CINT2006 Result**

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**CPU2006 license:** 3  
**Test date:** May-2016  
**Test sponsor:** HPE  
**Hardware Availability:** Mar-2016  
**Tested by:** HPE  
**Software Availability:** Nov-2015

### Platform Notes (Continued)

Memory:
- 8x UNKNOWN NOT AVAILABLE
- 16x 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 512 GB and the dmidecode description should have one line reading as:
- 16x 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,scatter"
- LD_LIBRARY_PATH = "/home/intel_binary/cpu2006/libs/32:/home/intel_binary/cpu2006/libs/64:/home/intel_binary/cpu2006/sh"
- OMP_NUM_THREADS = "24"

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.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
    -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:

Continued on next page
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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/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

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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.
Originally published on 14 June 2016.