Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL560 Gen10
(2.10 GHz, Intel Xeon Platinum 8170)

<table>
<thead>
<tr>
<th>SPECint_rate2006</th>
<th>4450</th>
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<tbody>
<tr>
<td>SPECint_rate_base2006</td>
<td>4290</td>
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CPU2006 license: 3
Test sponsor: HPE
Tested by: HPE

Test date: Nov-2017
Hardware Availability: Oct-2017
Software Availability: Apr-2017

<table>
<thead>
<tr>
<th>Software</th>
<th>Hardware</th>
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<tbody>
<tr>
<td>Operating System: Red Hat Enterprise Linux Server release 7.3 (Maipo), Kernel 3.10.0-514.el7.x86_64</td>
<td></td>
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<tr>
<td>Compiler: C/C++: Version 17.0.3.191 of Intel C/C++ Compiler for Linux; Fortran: Version 17.0.3.191 of Intel Fortran Compiler for Linux</td>
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<tr>
<td>Auto Parallel: Yes</td>
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<tr>
<td>File System: xfs</td>
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<tr>
<td>System State: Run level 3 (multi-user)</td>
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<tr>
<td>Base Pointers: 32/64-bit</td>
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<tr>
<td>Peak Pointers: 32/64-bit</td>
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<tr>
<td>Other Software: Microquill SmartHeap V10.2</td>
<td></td>
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<tr>
<td>CPU Name: Intel Xeon Platinum 8170</td>
<td></td>
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<tr>
<td>CPU Characteristics: Intel Turbo Boost Technology up to 3.70 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: 104 cores, 4 chips, 26 cores/chip, 2 threads/core</td>
<td></td>
</tr>
<tr>
<td>CPU(s) orderable: 1, 2, 4 chip(s)</td>
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<tr>
<td>Primary Cache: 32 KB I + 32 KB D on chip per core</td>
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<td>Secondary Cache: 1 MB I+D on chip per core</td>
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<tr>
<td>L3 Cache: 35.75 MB I+D on chip per chip</td>
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<td>Other Cache: None</td>
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<td>Memory: 768 GB (48 x 16 GB 2Rx8 PC4-2666V-R)</td>
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<td>Disk Subsystem: 1 x 480 GB SATA SSD, RAID 0</td>
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<td>Other Hardware: None</td>
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<table>
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<tr>
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<td>208</td>
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<tr>
<td>473.astar</td>
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<tr>
<td>483.xalancbmk</td>
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</table>
Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
ProLiant DL560 Gen10  
(2.10 GHz, Intel Xeon Platinum 8170)  

**Results Table**

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<td>313</td>
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</tr>
</tbody>
</table>

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

**Submit Notes**

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

**Operating System Notes**

Stack size set to unlimited using "ulimit -s unlimited"  
Transparent Huge Pages enabled by default  
Filesystem page cache cleared with:  
shell invocation of 'sync; echo 3 > /proc/sys/vm/drop_caches' prior to run  
runcspec command invoked through numactl i.e.:  
umactl --interleave=all runspec <etc>  
irqbalance disabled with "service irqbalance stop"  
tuned profile set with "tuned-adm profile throughput-performance"  
VM Dirty ratio was set to 40 using "echo 40 > /proc/sys/vm/dirty_ratio"  
Numa balancing was disabled using "echo 0 > /proc/sys/kernel/numa_balancing"

**Platform Notes**

BIOS Configuration:  
Thermal Configuration set to Maximum Cooling  
LLC Prefetch set to Enabled  
LLC Dead Line Allocation set to Disabled  
Stale A to S set to Enabled  
Memory Patrol Scrubbing set to Disabled  
Workload Profile set to General Throughput Compute  
Minimum Processor Idle Power Core C-State set to C1E State

Continued on next page
SPEC CINT2006 Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL560 Gen10
(2.10 GHz, Intel Xeon Platinum 8170)

SPECint_rate2006 = 4450
SPECint_rate_base2006 = 4290

Platform Notes (Continued)

Sysinfo program /cpu2006/config/sysinfo.rev6993
Revision 6993 of 2015-11-06 (b5e8d4b4eb51ed28d7f98696cbe290c1)
running on DL560-Gen10 Wed Nov 22 13:34:51 2017

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) Platinum 8170 CPU @ 2.10GHz
4 "physical id"s (chips)
208 "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 : 26
siblings : 52
physical 0: cores 0 1 2 3 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28 29
physical 1: cores 0 1 2 3 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28 29
physical 2: cores 0 1 2 3 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28 29
physical 3: cores 0 1 2 3 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28 29

From /proc/meminfo
MemTotal: 792052752 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
NAME="Red Hat Enterprise Linux Server"
VERSION="7.3 (Maipo)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="7.3"
PRETTY_NAME="Red Hat Enterprise Linux Server 7.3 (Maipo)"
ANSI_COLOR="0;31"
CPE_NAME="cpe:/o:redhat:enterprise_linux:7.3:GA:server"
redhat-release: Red Hat Enterprise Linux Server release 7.3 (Maipo)
system-release: Red Hat Enterprise Linux Server release 7.3 (Maipo)

uname -a:
Linux DL560-Gen10 3.10.0-514.e17.x86_64 #1 SMP Wed Oct 19 11:24:13 EDT 2016
x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Nov 22 13:32

Continued on next page
**SPEC CINT2006 Result**

**Hewlett Packard Enterprise**
*Test Sponsor: HPE*
ProLiant DL560 Gen10
*(2.10 GHz, Intel Xeon Platinum 8170)*

<table>
<thead>
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<th>CPU2006 license: 3</th>
<th>Test date: Nov-2017</th>
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<tbody>
<tr>
<td>Test sponsor:</td>
<td>HPE</td>
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<td>Tested by:</td>
<td>HPE</td>
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<td>Hardware Availability:</td>
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<td>Software Availability:</td>
<td>Apr-2017</td>
</tr>
<tr>
<td>SPECint_rate2006 =</td>
<td>4450</td>
</tr>
<tr>
<td>SPECint_rate_base2006 =</td>
<td>4290</td>
</tr>
</tbody>
</table>

**SPEC is set to: /cpu2006**

**Environment variables set by runspec before the start of the run:**
LD_LIBRARY_PATH = "/cpu2006/lib/ia32:/cpu2006/lib/intel64:/cpu2006/sh10.2"

Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.2

No: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented. 

No: The test sponsor attests, as of date of publication, that CVE-2017-5753 (Spectre variant 1) is mitigated in the system as tested and documented. 

No: The test sponsor attests, as of date of publication, that CVE-2017-5715 (Spectre variant 2) is mitigated in the system as tested and documented. 

This benchmark result is intended to provide perspective on past performance using the historical hardware and/or software described on this result page. 

The system as described on this result page was formerly generally available. At the time of this publication, it may not be shipping, and/or may not be supported, and/or may fail to meet other tests of General Availability described in the SPEC OSG Policy document, http://www.spec.org/osg/policy.htm. 

This measured result may not be representative of the result that would be measured were this benchmark run with hardware and software available as of the publication date.

**General Notes**

**Base Compiler Invocation**

C benchmarks:

```bash
icc -m32 -L/opt/intel/compilers_and_libraries_2017/linux/lib/ia32
```

Continued on next page
SPEC CINT2006 Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL560 Gen10
(2.10 GHz, Intel Xeon Platinum 8170)

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<thead>
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<td>Test sponsor: HPE</td>
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<tr>
<td>Tested by: HPE</td>
<td>Software Availability: Apr-2017</td>
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</tbody>
</table>

**SPECint_rate2006 = 4450**

**SPECint_rate_base2006 = 4290**

Base Compiler Invocation (Continued)

C++ benchmarks:
```
icpc -m32 -L/opt/intel/compilers_and_libraries_2017/linux/lib/ia32
```

Base Portability Flags

| 400.perlbench: -D_FILE_OFFSET_BITS=64 | -DSPEC_CPU_LINUX_IA32 |
| 401.bzip2: -D_FILE_OFFSET_BITS=64 |
| 403.gcc: -D_FILE_OFFSET_BITS=64 |
| 429.mcf: -D_FILE_OFFSET_BITS=64 |
| 445.gobmk: -D_FILE_OFFSET_BITS=64 |
| 456.hmmer: -D_FILE_OFFSET_BITS=64 |
| 458.sjeng: -D_FILE_OFFSET_BITS=64 |
| 462.libquantum: -D_FILE_OFFSET_BITS=64 | -DSPEC_CPU_LINUX |
| 464.h264ref: -D_FILE_OFFSET_BITS=64 |
| 471.omnetpp: -D_FILE_OFFSET_BITS=64 |
| 473.astar: -D_FILE_OFFSET_BITS=64 |
| 483.xalancbmk: -D_FILE_OFFSET_BITS=64 | -DSPEC_CPU_LINUX |

Base Optimization Flags

C benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-qopt-mem-layout-trans=3
```

C++ benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-qopt-mem-layout-trans=3 -Wl,-z,muldefs -L/sh10.2 -lsmartheap
```

Base Other Flags

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

Peak Compiler Invocation

C benchmarks (except as noted below):
```
icc -m32 -L/opt/intel/compilers_and_libraries_2017/linux/lib/ia32
400.perlbench: icc -m64
```

Continued on next page
Hewlett Packard Enterprise  
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ProLiant DL560 Gen10  
(2.10 GHz, Intel Xeon Platinum 8170)  

SPECint\textsubscript{rate}2006 = \textbf{4450}  
SPECint\textsubscript{rate\_base}2006 = \textbf{4290}

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

Test date: Nov-2017  
Hardware Availability: Oct-2017  
Software Availability: Apr-2017

Peak Compiler Invocation (Continued)

\begin{itemize}
  \item 401.bzip2:icc -m64
  \item 456.hmmer:icc -m64
  \item 458.sjeng:icc -m64
\end{itemize}

C++ benchmarks:
\begin{itemize}
  \item icpc -m32 -L/opt/intel/compilers_and_libraries_2017/linux/lib/ia32
\end{itemize}

Peak Portability Flags

\begin{itemize}
  \item 400.perlbench: -DSPEC\_CPU\_LP64 -DSPEC\_CPU\_LINUX\_X64
  \item 401.bzip2: -DSPEC\_CPU\_LP64
  \item 403.gcc: -D\_FILE\_OFFSET\_BITS=64
  \item 429.mcf: -D\_FILE\_OFFSET\_BITS=64
  \item 445.gobmk: -D\_FILE\_OFFSET\_BITS=64
  \item 456.hmmer: -DSPEC\_CPU\_LP64
  \item 458.sjeng: -DSPEC\_CPU\_LP64
  \item 462.libquantum: -D\_FILE\_OFFSET\_BITS=64 -DSPEC\_CPU\_LINUX
  \item 464.h264ref: -D\_FILE\_OFFSET\_BITS=64
  \item 471.omnetpp: -D\_FILE\_OFFSET\_BITS=64
  \item 473.astar: -D\_FILE\_OFFSET\_BITS=64
  \item 483.xalancbmk: -D\_FILE\_OFFSET\_BITS=64 -DSPEC\_CPU\_LINUX
\end{itemize}

Peak Optimization Flags

C benchmarks:
\begin{itemize}
  \item 400.perlbench: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)  
  \hspace{1cm} -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2)  
  \hspace{1cm} -no-prec-div(pass 2) -auto-ilp32 -qopt-mem-layout-trans=3
  \item 401.bzip2: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)  
  \hspace{1cm} -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2)  
  \hspace{1cm} -no-prec-div(pass 2) -qopt-prefetch -auto-ilp32  
  \hspace{1cm} -qopt-mem-layout-trans=3
  \item 403.gcc: -xCORE-AVX2 -ipo -O3 -no-prec-div  
  \hspace{1cm} -qopt-mem-layout-trans=3
  \item 429.mcf: basepeak = yes
  \item 445.gobmk: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)  
  \hspace{1cm} -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2)  
  \hspace{1cm} -no-prec-div(pass 2) -qopt-mem-layout-trans=3
\end{itemize}

Continued on next page
**SPEC CINT2006 Result**

Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
ProLiant DL560 Gen10  
(2.10 GHz, Intel Xeon Platinum 8170)  

**SPECint_rate2006** = 4450  
**SPECint_rate_base2006** = 4290

**Peak Optimization Flags (Continued)**

456.hmmer:  
-xCORE-AVX2  
-ipo  
-O3  
-no-prec-div  
-unroll2  
-auto-ilp32  
-qopt-mem-layout-trans=3

458.sjeng:  
-prof-gen(pass 1)  
-prof-use(pass 2)  
-xCORE-AVX2(pass 2)  
-par-num-threads=1(pass 1)  
-ipo(pass 2)  
-O3(pass 2)  
-no-prec-div(pass 2)  
-unroll4  
-auto-ilp32  
-qopt-mem-layout-trans=3

462.libquantum:  
-basepeak = yes

464.h264ref:  
-prof-gen(pass 1)  
-prof-use(pass 2)  
-xCORE-AVX2(pass 2)  
-par-num-threads=1(pass 1)  
-ipo(pass 2)  
-O3(pass 2)  
-no-prec-div(pass 2)  
-unroll2  
-qopt-mem-layout-trans=3

C++ benchmarks:

471.omnetpp:  
-prof-gen(pass 1)  
-prof-use(pass 2)  
-xCORE-AVX2(pass 2)  
-par-num-threads=1(pass 1)  
-ipo(pass 2)  
-O3(pass 2)  
-no-prec-div(pass 2)  
-qopt-ra-region-strategy=block  
-qopt-mem-layout-trans=3 -Wl,-z,muldefs  
-L/sh10.2 -lsmartheap

473.astar:  
-basepeak = yes

483.xalancbmk:  
-basepeak = yes

**Peak Other Flags**

C benchmarks:

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-ic17.0-official-linux64-revF.html  
http://www.spec.org/cpu2006/flags/HPE-Platform-Flags-Intel-V1.2-SKX-revH.html

You can also download the XML flags sources by saving the following links:  
http://www.spec.org/cpu2006/flags/Intel-ic17.0-official-linux64-revF.xml  
http://www.spec.org/cpu2006/flags/HPE-Platform-Flags-Intel-V1.2-SKX-revH.xml
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Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL560 Gen10
(2.10 GHz, Intel Xeon Platinum 8170)

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Test date: Nov-2017
Hardware Availability: Oct-2017
Software Availability: Apr-2017

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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.
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