Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL560 Gen10
(3.20 GHz, Intel Xeon Gold 6146)

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Threads

<table>
<thead>
<tr>
<th>SPECspeed2017_int_base</th>
<th>SPECspeed2017_int_peak</th>
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</thead>
<tbody>
<tr>
<td>9.61</td>
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</table>

Test Date: Dec-2017
Hardware Availability: Oct-2017
Software Availability: Sep-2017

Threads

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Hardware

CPU: Intel Xeon Gold 6146
Max MHz.: 4.20 GHz
Nominal: 3.20 GHz
Enabled: 48 cores, 4 chips
Orderable: 1, 2, 4 chip(s)
Cache L1: 32 KB I + 32 KB D on chip per core
L2: 1 MB I+D on chip per core
L3: 24.75 MB I+D on chip per chip
Other: None
Memory: 768 GB (48 x 16 GB 2Rx8 PC4-2666V-R)
Storage: 1 x 480 GB SATA SSD, RAID 0
Other: None

Software

OS: Red Hat Enterprise Linux Server release 7.3 (Maipo)
Kernel: 3.10.0-514.el7.x86_64
Compiler: C/C++: Version 18.0.0.128 of Intel C/C++
Compiler: Fortran: Version 18.0.0.128 of Intel Fortran Compiler for Linux
Parallel: Yes
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: jemalloc: jemalloc memory allocator library V5.0.1;
jemalloc: configured and built at default for 32bit (i686) and 64bit (x86_64) targets;
jemalloc: built with the RedHat Enterprise 7.4,
and the system compiler gcc 4.8.5;
jemalloc: sources available via jemalloc.net
**SPEC CPU2017 Integer Speed Result**

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```markdown
<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>602.gcc_s</td>
<td>48</td>
<td>406</td>
<td>9.81</td>
<td>416</td>
<td>9.57</td>
<td>412</td>
<td>9.67</td>
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<tr>
<td>605.mcf_s</td>
<td>48</td>
<td>397</td>
<td>11.9</td>
<td>400</td>
<td>11.8</td>
<td>393</td>
<td>12.0</td>
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<tr>
<td>620.omnetpp_s</td>
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<td>244</td>
<td>6.67</td>
<td>242</td>
<td>6.75</td>
<td>239</td>
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<td>623.xalancbmk_s</td>
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<td>136</td>
<td>10.4</td>
<td>135</td>
<td>10.5</td>
<td>136</td>
<td>10.4</td>
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<tr>
<td>625.x264_s</td>
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<td>11.8</td>
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<tr>
<td>631.deepsjeng_s</td>
<td>48</td>
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<td>5.64</td>
<td>254</td>
<td>5.64</td>
<td>254</td>
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<tr>
<td>641.leela_s</td>
<td>48</td>
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<td>4.87</td>
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<td>4.88</td>
<td>350</td>
<td>4.88</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>48</td>
<td>193</td>
<td>15.3</td>
<td>193</td>
<td>15.2</td>
<td>193</td>
<td>15.2</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>48</td>
<td>259</td>
<td>23.9</td>
<td>256</td>
<td>24.2</td>
<td>259</td>
<td>23.9</td>
</tr>
</tbody>
</table>
```

**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
  - Irqbalance disabled with "systemctl stop irqbalance"
  - Tuned profile set with "tuned-adm profile throughput-performance"

**General Notes**

Environment variables set by runcpu before the start of the run:
  - KMP_AFFINITY = "granularity=fine,compact"
  - LD_LIBRARY_PATH = "/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-32:/home/cpu2017/je5.0.1-64"
  - OMP_STACKSIZE = "192M"

Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM

memory using Redhat Enterprise Linux 7.4

**Platform Notes**

BIOS Configuration:
  - Intel Hyperthreading set to Disabled
  - 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 Peak Frequency Compute

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Platform Notes (Continued)

Energy/Performance Bias set to Maximum Performance
Workload Profile set to Custom
NUMA Group Size Optimization set to Flat
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on localhost.localdomain Fri Dec 1 17:42:24 2017

SUT (System Under Test) info as seen by some common utilities.
For more information on this section, see
https://www.spec.org/cpu2017/Docs/config.html#sysinfo

From /proc/cpuinfo

- model name: Intel(R) Xeon(R) Gold 6146 CPU @ 3.20GHz
- 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 9 10 16 18 19 25 26
  - physical 1: cores 0 1 2 3 4 8 9 11 17 18 19 20
  - physical 2: cores 0 1 2 3 8 9 10 11 18 19 24 27
  - physical 3: cores 0 1 2 3 4 8 9 11 17 18 19 20

From lscpu:

- Architecture: x86_64
- CPU op-mode(s): 32-bit, 64-bit
- Byte Order: Little Endian
- CPU(s): 48
- On-line CPU(s) list: 0-47
- Thread(s) per core: 1
- Core(s) per socket: 12
- Socket(s): 4
- NUMA node(s): 4
- Vendor ID: GenuineIntel
- CPU family: 6
- Model: 85
- Model name: Intel(R) Xeon(R) Gold 6146 CPU @ 3.20GHz
- Stepping: 4
- CPU MHz: 3200.000
- BogoMIPS: 6406.38
- Virtualization: VT-x
- L1d cache: 32K
- L1i cache: 32K
- L2 cache: 1024K
- L3 cache: 25344K
- NUMA node0 CPU(s): 0-11

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**SPECspeed2017_int_base = 9.61**  
**SPECspeed2017_int_peak = Not Run**

### Platform Notes (Continued)

- NUMA node1 CPU(s): 12–23  
- NUMA node2 CPU(s): 24–35  
- NUMA node3 CPU(s): 36–47

/proc/cpuinfo cache data  
cache size: 25344 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.

From /proc/meminfo  
MemTotal: 792074500 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 localhost.localdomain 3.10.0-514.el7.x86_64 #1 SMP Wed Oct 19 11:24:13 EDT 2016  
x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Dec 1 17:42

SPEC is set to: /home/cpu2017  
Filesystem Type Size Used Avail Use% Mounted on  
/dev/sdb1 xfs 447G 30G 417G 7% /

Additional information from dmidecode follows. **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: HPE U34 09/29/2017  
- Memory: 48x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2666

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Platform Notes (Continued)
(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
CC  600.perlbench_s(base) 602.gcc_s(base) 605.mcf_s(base) 625.x264_s(base)
     657.xz_s(base)
------------------------------------------------------------------------------
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
==============================================================================
CXXC 620.omnetpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base)
     641.leela_s(base)
------------------------------------------------------------------------------
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
==============================================================================
FC  648.exchange2_s(base)
------------------------------------------------------------------------------
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Base Portability Flags

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64

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### Base Portability Flags (Continued)

605.mcf_s: -DSPEC_LP64  
620.omnetpp_s: -DSPEC_LP64  
623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX  
625.x264_s: -DSPEC_LP64  
631.deepsjeng_s: -DSPEC_LP64  
641.leea_s: -DSPEC_LP64  
648.exchange2_s: -DSPEC_LP64  
657.xz_s: -DSPEC_LP64

### Base Optimization Flags

**C benchmarks:**  
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div  
-qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP  
-L/usr/local/je5.0.1-64/lib -ljemalloc

**C++ benchmarks:**  
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div  
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc

**Fortran benchmarks:**  
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div  
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte  
-L/usr/local/je5.0.1-64/lib -ljemalloc

### Base Other Flags

**C benchmarks:**  
-m64 -std=c11

**C++ benchmarks:**  
-m64

**Fortran benchmarks:**  
-m64

The flags files that were used to format this result can be browsed at  
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-SKX-revH.html
### SPEC CPU2017 Integer Speed Result

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You can also download the XML flags sources by saving the following links:

- [http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-SEX-revH.xml](http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-SEX-revH.xml)

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

Tested with SPEC CPU2017 v1.0.2 on 2017-12-01 18:42:24-0500.  