**SPEC® CPU2017 Integer Speed Result**

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant ML350 Gen10  
(2.20 GHz, Intel Xeon Silver 4210)

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

<table>
<thead>
<tr>
<th>Software</th>
<th>Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS: SUSE Linux Enterprise Server 15 (x86_64)</td>
<td>CPU Name: Intel Xeon Silver 4210</td>
</tr>
<tr>
<td>Kernel 4.12.14-23-default</td>
<td>Max MHz.: 3200</td>
</tr>
<tr>
<td>Compiler: C/C++: Version 19.0.1.144 of Intel C/C++</td>
<td>Nominal: 2200</td>
</tr>
<tr>
<td>Compiler Build 20181018 for Linux; Fortran: Version 19.0.1.144 of Intel Fortran</td>
<td>Enabled: 20 cores, 2 chips</td>
</tr>
<tr>
<td>Firmware: HPE BIOS Version U41 02/02/2019 released Apr-2019</td>
<td>Orderable: 1, 2 chip(s)</td>
</tr>
<tr>
<td>File System: btrfs</td>
<td>Cache L1: 32 KB I+D on chip per core</td>
</tr>
<tr>
<td>System State: Run level 3 (multi-user)</td>
<td>L2: 1 MB I+D on chip per core</td>
</tr>
<tr>
<td>Base Pointers: 64-bit</td>
<td>L3: 13.75 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Peak Pointers: Not Applicable</td>
<td>Other: None</td>
</tr>
<tr>
<td>Other: jemalloc memory allocator V5.0.1</td>
<td>Memory: 384 GB (24 x 16 GB 2Rx8 PC4-2666V-R, running at 2400)</td>
</tr>
<tr>
<td></td>
<td>Storage: 1 x 400 GB SAS SSD, RAID 0</td>
</tr>
</tbody>
</table>

**SPECspeed2017_int_base = 7.88**  
**SPECspeed2017_int_peak = Not Run**

Test Date: Mar-2019  
Hardware Availability: Apr-2019  
Software Availability: Nov-2018
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Results Table

<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></td>
<td></td>
<td></td>
<td>Base</td>
<td></td>
<td></td>
<td>Peak</td>
<td></td>
</tr>
<tr>
<td>600.perlbench_s</td>
<td>20</td>
<td>328</td>
<td>5.41</td>
<td>325</td>
<td>5.46</td>
<td>324</td>
<td>5.48</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>20</td>
<td>518</td>
<td>7.69</td>
<td>533</td>
<td>7.47</td>
<td>534</td>
<td>7.46</td>
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<tr>
<td>605.mcf_s</td>
<td>20</td>
<td>447</td>
<td>10.6</td>
<td>457</td>
<td>10.3</td>
<td>449</td>
<td>10.5</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>20</td>
<td>311</td>
<td>5.24</td>
<td>307</td>
<td>5.31</td>
<td>312</td>
<td>5.23</td>
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<tr>
<td>623.xalancbmk_s</td>
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<td>140</td>
<td>10.1</td>
<td>140</td>
<td>10.1</td>
<td>141</td>
<td>10.0</td>
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<tr>
<td>625.x264_s</td>
<td>20</td>
<td>155</td>
<td>11.4</td>
<td>155</td>
<td>11.4</td>
<td>155</td>
<td>11.4</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>20</td>
<td>313</td>
<td>4.58</td>
<td>313</td>
<td>4.58</td>
<td>314</td>
<td>4.57</td>
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<tr>
<td>641.leela_s</td>
<td>20</td>
<td>436</td>
<td>3.91</td>
<td>436</td>
<td>3.91</td>
<td>436</td>
<td>3.91</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>20</td>
<td>256</td>
<td>11.5</td>
<td>255</td>
<td>11.5</td>
<td>255</td>
<td>11.6</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>20</td>
<td>355</td>
<td>17.4</td>
<td>355</td>
<td>17.4</td>
<td>355</td>
<td>17.4</td>
</tr>
</tbody>
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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"
Transparent Huge Pages enabled by default
Prior to runcpu invocation
Filesystem page cache synced and cleared with:
sync; echo 3> /proc/sys/vm/drop_caches

General Notes

Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/home/cpu2017_ic19_update1/lib/ia32:/home/cpu2017_ic19_update1/lib/intel64"
LD_LIBRARY_PATH = "$LD_LIBRARY_PATH:/home/cpu2017_ic19_update1/je5.0.1-32:/home/cpu2017_ic19_update1/je5.0.1-64"
OMP_STACKSIZE = "192M"
Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.5
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.
Yes: 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.
Yes: 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.
jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5
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Test Date: Mar-2019
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Software Availability: Nov-2018

Platform Notes

BIOS Configuration:
    Hyper-Threading set to Disabled
    Thermal Configuration set to Maximum Cooling
    Memory Patrol Scrubbing set to Disabled
    LLC Prefetch set to Enabled
    LLC Dead Line Allocation set to Disabled
    Enhanced Processor Performance set to Enabled
    Workload Profile set to General Peak Frequency Compute
    Minimum Processor Idle Power Core C-State set to C1E State
    Energy/Performance Bias set to Balanced Power
    Workload Profile set to Custom
    Numa Group Size Optimization set to Flat
    Sysinfo program /home/cpu2017_ic19_update1/bin/sysinfo
    Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
    running on ml350-sles15 Tue Mar 26 11:17:54 2019

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) Silver 4210 CPU @ 2.20GHz
        2 "physical id"s (chips)
        20 "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 : 10
        siblings : 10
        physical 0: cores 0 1 2 3 4 8 9 10 11 12
        physical 1: cores 0 1 2 3 4 8 9 10 11 12

From lscpu:
    Architecture: x86_64
    CPU op-mode(s): 32-bit, 64-bit
    Byte Order: Little Endian
    CPU(s): 20
    On-line CPU(s) list: 0-19
    Thread(s) per core: 1
    Core(s) per socket: 10
    Socket(s): 2
    NUMA node(s): 2
    Vendor ID: GenuineIntel
    CPU family: 6
    Model: 85
    Model name: Intel(R) Xeon(R) Silver 4210 CPU @ 2.20GHz
    Stepping: 6
    CPU MHz: 2200.000

(Continued on next page)
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**Software Availability:** Nov-2018

**Platform Notes (Continued)**

| BogoMIPS: | 4400.00 |
| Virtualization: | VT-x |
| L1d cache: | 32K |
| L1i cache: | 32K |
| L2 cache: | 1024K |
| L3 cache: | 14080K |
| NUMA node0 CPU(s): | 0-9 |
| NUMA node1 CPU(s): | 10-19 |
| Flags: | fpu vme de pse tsc msr pae mce cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_13 cdp_l3 invpcid_single intel_pmm mba tpr_shadow vmx flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erm invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsavec cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local ibpb ibrs dtlb dtherm ida arat pin pts pkup ospke avx512_vnni arch_capabilities ssbd |

/proc/cpuinfo cache data  
| cache size : 14080 KB |

From numactl --hardware  
WARNING: a numactl 'node' might or might not correspond to a physical chip.  
| available: 2 nodes (0-1) |
| node 0 cpus: 0 1 2 3 4 5 6 7 8 9 |
| node 0 size: 193120 MB |
| node 0 free: 192793 MB |
| node 1 cpus: 10 11 12 13 14 15 16 17 18 19 |
| node 1 size: 193504 MB |
| node 1 free: 193146 MB |
| node distances: |
| node 0 1 |
| 0: 10 21 |
| 1: 21 10 |

From /proc/meminfo  
| MemTotal: 395904228 kB |
| HugePages_Total: 0 |
| Hugepagesize: 4096 kB |

From /etc/*release* /etc/*version*  
| os-release: |
| NAME="SLES" |
| VERSION="15" |
| VERSION_ID="15" |

(Continued on next page)
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Platform Notes (Continued)

PRETTY_NAME="SUSE Linux Enterprise Server 15"
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15"

uname -a:
    Linux ml350-sles15 4.12.14-23-default #1 SMP Tue May 29 21:04:44 UTC 2018 (cd0437b)
    x86_64 x86_64 x86_64 GNU/Linux

 Kernel self-reported vulnerability status:

CVE-2017-5754 (Meltdown):          Not affected
CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation, IBPB, IBRS_FW

run-level 3 Mar 26 11:13

SPEC is set to: /home/cpu2017_ic19_update1
    Filesystem     Type   Size  Used Avail Use% Mounted on
    /dev/sdb2      btrfs  371G  191G  180G  52% /home

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 U41 02/02/2019
    Memory:
    24x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2666, configured at 2400

(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)
==============================================================================

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
CXXC 620.omnetpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base)
(Continued on next page)
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Compiler Version Notes (Continued)  

641.leela_s(base)  
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.1.144 Build 20181018  
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.  

==============================================================================  
FC 648.exchange2_s(base)  
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
64, Version 19.0.1.144 Build 20181018  
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.  
==============================================================================  

Base Compiler Invocation  

C benchmarks:  
iccc -m64 -std=c11  

C++ benchmarks:  
icpc -m64  

Fortran benchmarks:  
ifort -m64  

Base Portability Flags  

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64  
602.gcc_s: -DSPEC_LP64  
605.mcf_s: -DSPEC_LP64  
620.omnetpp_s: -DSPEC_LP64  
623.xalanchmk_s: -DSPEC_LP64 -DSPEC_LINUX  
625.x264_s: -DSPEC_LP64  
631.deepsjeng_s: -DSPEC_LP64  
641.leela_s: -DSPEC_LP64  
648.exchange2_s: -DSPEC_LP64  
657.xz_s: -DSPEC_LP64
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</table>

Base Optimization Flags

C benchmarks:
- -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
- -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
- -L/usr/local/je5.0.1-64/lib -ljemalloc

C++ benchmarks:
- -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
- -qopt-mem-layout-trans=4
- -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
- -lqkmalloc

Fortran benchmarks:
- -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4
- -nostandard-realloc-lhs

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-CLX-revA.html

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-CLX-revA.xml

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

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