**SPEC® CPU2017 Integer Speed Result**

**Lenovo Global Technology**

ThinkSystem SR650

(2.10 GHz, Intel Xeon Silver 4216)

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed2017_int_base = 8.37</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s 64</td>
<td>5.63</td>
</tr>
<tr>
<td>602.gcc_s 64</td>
<td>8.49</td>
</tr>
<tr>
<td>605.mcf_s 64</td>
<td>10.8</td>
</tr>
<tr>
<td>620.omnetpp_s 64</td>
<td>6.55</td>
</tr>
<tr>
<td>623.xalancbmk_s 64</td>
<td>10.3</td>
</tr>
<tr>
<td>625.x264_s 64</td>
<td>11.5</td>
</tr>
<tr>
<td>631.deepsjeng_s 64</td>
<td>4.40</td>
</tr>
<tr>
<td>641.leela_s 64</td>
<td>3.91</td>
</tr>
<tr>
<td>648.exchange2_s 64</td>
<td>11.5</td>
</tr>
<tr>
<td>657.xz_s 64</td>
<td>20.2</td>
</tr>
</tbody>
</table>

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**Hardware**

- **CPU Name:** Intel Xeon Silver 4216
- **Max MHz.:** 3200
- **Nominal:** 2100
- **Enabled:** 32 cores, 2 chips, 2 threads/core
- **Orderable:** 1,2 chips
- **Cache L1:** 32 KB I + 32 KB D on chip per core
- **L2:** 1 MB I+D on chip per core
- **L3:** 22 MB I+D on chip per chip
- **Other:** None
- **Memory:** 384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R, running at 2400)
- **Storage:** 1 x 800 GB SATA SSD
- **Other:** None

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**Software**

- **OS:** SUSE Linux Enterprise Server 12 SP4 (x86_64)
- **Kernel:** 4.12.14-94.41-default
- **Compiler:** C/C++: Version 19.0.1.144 of Intel C/C++ Compiler Build 20181018 for Linux;
  Fortran: Version 19.0.1.144 of Intel Fortran Compiler Build 20181018 for Linux
- **Parallel:** Yes
- **Firmware:** Lenovo BIOS Version IVE142E 2.30 released Aug-2019 tested as IVE135R 2.10 Feb-2019
- **File System:** btrfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** Not Applicable
- **Other:** jemalloc memory allocator V5.0.1
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

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>avg_perlbench_s</td>
<td>64</td>
<td>315</td>
<td>5.63</td>
<td>316</td>
<td>5.61</td>
<td>315</td>
<td>5.64</td>
</tr>
<tr>
<td>avg_gcc_s</td>
<td>64</td>
<td>466</td>
<td>8.55</td>
<td>476</td>
<td>8.37</td>
<td>469</td>
<td>8.49</td>
</tr>
<tr>
<td>avg_mcf_s</td>
<td>64</td>
<td>438</td>
<td>10.8</td>
<td>440</td>
<td>10.7</td>
<td>438</td>
<td>10.8</td>
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<tr>
<td>avg_omnetpp_s</td>
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<td>6.53</td>
<td>247</td>
<td>6.61</td>
<td>249</td>
<td>6.55</td>
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<tr>
<td>avg_xalancbmk_s</td>
<td>64</td>
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<td>10.3</td>
<td>137</td>
<td>10.3</td>
<td>137</td>
<td>10.4</td>
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<tr>
<td>avg_x264_s</td>
<td>64</td>
<td>153</td>
<td>11.5</td>
<td>153</td>
<td>11.5</td>
<td>153</td>
<td>11.5</td>
</tr>
<tr>
<td>avg_deepsjeng_s</td>
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<td>312</td>
<td>4.60</td>
<td>312</td>
<td>4.60</td>
<td>312</td>
<td>4.59</td>
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<tr>
<td>avg_leela_s</td>
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<td>436</td>
<td>3.91</td>
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<td>436</td>
<td>3.91</td>
</tr>
<tr>
<td>avg_exchange2_s</td>
<td>64</td>
<td>255</td>
<td>11.5</td>
<td>255</td>
<td>11.5</td>
<td>255</td>
<td>11.5</td>
</tr>
<tr>
<td>avg_xz_s</td>
<td>64</td>
<td>305</td>
<td>20.2</td>
<td>306</td>
<td>20.2</td>
<td>306</td>
<td>20.2</td>
</tr>
</tbody>
</table>

SPECspeed2017_int_base = 8.37
SPECspeed2017_int_peak = Not Run

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"

General Notes

Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH = "/home/cpu2017-1.0.5-ic19.0u1/lib/intel64"
LD_LIBRARY_PATH = "$LD_LIBRARY_PATH:/home/cpu2017-1.0.5-ic19.0u1/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
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

NA: 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.
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3640 (Spectre variant 3a) is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3639 (Spectre variant 4) 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
(Continued on next page)
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General Notes (Continued)

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
Choose Operating Mode set to Custom Mode
C-states set to Legacy
Sysinfo program /home/cpu2017-1.0.5-ic19.0u1/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on linux-txzs Tue Apr 23 11:44:20 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 4216 CPU @ 2.10GHz
  2 "physical id"s (chips)
  64 "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 : 16
  siblings : 32
  physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
  physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

From lscpu:
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
CPU(s):                64
On-line CPU(s) list:   0-63
Thread(s) per core:    2
Core(s) per socket:    16
Socket(s):             2
NUMA node(s):          2
Vendor ID:             GenuineIntel
CPU family:            6
Model:                 85
Model name:            Intel(R) Xeon(R) Silver 4216 CPU @ 2.10GHz
Stepping:              6
CPU MHz:               2100.000
CPU max MHz:           3200.000
CPU min MHz:           800.000
BogoMIPS:              4200.00

(Continued on next page)
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SPECspeed2017_int_base = 8.37
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Platform Notes (Continued)

Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 22528K
NUMA node0 CPU(s): 0-15,32-47
NUMA node1 CPU(s): 16-31,48-63
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
taxi pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb
dtscpl constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtrp pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
avx f16c rdrand lahf_lm abm 3nowprefetch cpuid_fault epb cat_l3 cdp_l3
invpcid_single ssbd mba ibrs ibrs ibpb stibp tpr_shadow vmmi flexpriority ept vpid
fsaps base tsc_adjust bmi1 hle avx2 smep bmi2 erts invpcid rtm cqm mpx rdt_a avx512f
avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
xsaveopt xsaves xsavec xgetbv1 xsavec cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
dtherm ida arat pin pts pku ospke avx512_vnni flush_l1d arch_capabilities

/proc/cpuinfo cache data
  cache size : 22528 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
decision. A numactl 'node' might or might not correspond to a
device.
  available: 2 nodes (0-1)
  node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 32 33 34 35 36 37 38 39 40 41 42 43
  node 0 size: 193121 MB
  node 0 free: 192110 MB
  node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 48 49 50 51 52 53 54 55 56
  node 1 size: 193477 MB
  node 1 free: 193178 MB
  node distances:
    node 0 1
    0: 10 21
    1: 21 10

From /proc/meminfo
  MemTotal: 395878180 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
  SuSE-release:
    SUSE Linux Enterprise Server 12 (x86_64)
  VERSION = 12

(Continued on next page)
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Test Date: Apr-2019
Hardware Availability: Apr-2019
Software Availability: Dec-2018

Platform Notes (Continued)

PATCHLEVEL = 4
# This file is deprecated and will be removed in a future service pack or release.
# Please check /etc/os-release for details about this release.
os-release:
  NAME="SLES"
  VERSION="12-SP4"
  VERSION_ID="12.4"
  PRETTY_NAME="SUSE Linux Enterprise Server 12 SP4"
  ID="sles"
  ANSI_COLOR="0;32"
  CPE_NAME="cpe:/o:suse:sles:12:sp4"

uname -a:
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 Apr 23 11:41

SPEC is set to: /home/cpu2017-1.0.5-1c19.0u1
  Filesystem Type Size Used Avail Use% Mounted on
  /dev/sdb2 btrfs 446G 49G 398G 11% /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 Lenovo -[IVE135R-2.10]- 02/27/2019
  Memory:
    24x Samsung M393A2K43CB2-CVF 16 GB 2 rank 2933, configured at 2400

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
 CC  600.perlibench_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,

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Compiler Version Notes (Continued)

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)
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:
icc -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.xalancbmk_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

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Base Portability Flags (Continued)

657.xz_s: -DSPEC_LP64

Base Optimization Flags

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

C++ benchmarks:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-gopt-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 -gopt-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/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-D.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-D.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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