# SPEC® CPU2017 Integer Speed Result

Lenovo Global Technology
ThinkSystem SR850 (2.20 GHz, Intel Xeon Platinum 8276)

<table>
<thead>
<tr>
<th>Software</th>
<th>Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name: Intel Xeon Platinum 8276</td>
<td>OS: SUSE Linux Enterprise Server 12 SP4 (x86_64)</td>
</tr>
<tr>
<td>Max MHz.: 4000</td>
<td>Kernel 4.12.14-94.41-default</td>
</tr>
<tr>
<td>Nominal: 2200</td>
<td>Compiler: C/C++: Version 19.0.1.144 of Intel C/C++</td>
</tr>
<tr>
<td>Enabled: 112 cores, 4 chips, 2 threads/core</td>
<td>Compiler Build 20181018 for Linux: Fortran: Version 19.0.1.144 of Intel Fortran</td>
</tr>
<tr>
<td>Orderable: 2,4 chips</td>
<td>Compiler Build 20181018 for Linux</td>
</tr>
<tr>
<td>Cache L1: 32 KB I + 32 KB D on chip per core</td>
<td>Parallel: Yes</td>
</tr>
<tr>
<td>L2: 1 MB I+D on chip per core</td>
<td>Firmware: Lenovo BIOS Version TEE137C 2.20 released May-2019</td>
</tr>
<tr>
<td>L3: 38.5 MB I+D on chip per chip</td>
<td>File System: tmpfs</td>
</tr>
<tr>
<td>Other: None</td>
<td>System State: Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Memory: 1536 GB (48 x 32 GB 2Rx4 PC4-2933Y-R)</td>
<td>Base Pointers: 64-bit</td>
</tr>
<tr>
<td>Storage: 800 GB tmpfs</td>
<td>Peak Pointers: Not Applicable</td>
</tr>
<tr>
<td>Other: None</td>
<td>Other: jemalloc memory allocator V5.0.1</td>
</tr>
</tbody>
</table>

SPECspeed2017_int_base = 10.4
SPECspeed2017_int_peak = Not Run
**Lenovo Global Technology**

**ThinkSystem SR850**
(2.20 GHz, Intel Xeon Platinum 8276)

---

**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>Base</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Base</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak</th>
<th>Seconds</th>
<th>Ratio</th>
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</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>224</td>
<td>257</td>
<td>6.91</td>
<td>258</td>
<td>6.89</td>
<td>256</td>
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<td>602.gcc_s</td>
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<td>10.1</td>
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<td>10.2</td>
<td>387</td>
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<td>605.mcf_s</td>
<td>224</td>
<td>366</td>
<td>12.9</td>
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<td>12.8</td>
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<tr>
<td>620.omnetpp_s</td>
<td>224</td>
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<td>9.03</td>
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<td>9.07</td>
<td>177</td>
<td>9.23</td>
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<td>623.xalancbmk_s</td>
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<td>12.8</td>
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<td>631.deepsjeng_s</td>
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<td>264</td>
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<td>641.leela_s</td>
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<td>349</td>
<td>4.88</td>
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<tr>
<td>648.exchange2_s</td>
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<td>14.4</td>
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<tr>
<td>657.xz_s</td>
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<td>238</td>
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</tbody>
</table>

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**SPECspeed2017_int_base =** 10.4
**SPECspeed2017_int_peak =** Not Run

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**Operating System Notes**

Stack size set to unlimited using "ulimit -s unlimited"
Tmpfs filesystem can be set with:
   `mount -t tmpfs -o size=800g tmpfs /home`

Process tuning setting:
   `echo 50000 > /proc/sys/kernel/sched_cfs_bandwidth_slice_us`
   `echo 240000000 > /proc/sys/kernel/sched_latency_ns`
   `echo 5000000 > /proc/sys/kernel/sched_migration_cost_ns`
   `echo 100000000 > /proc/sys/kernel/sched_min granularity_ns`
   `echo 150000000 > /proc/sys/kernel/sched_wakeup granularity ns`

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**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.
Lenovo Global Technology
ThinkSystem SR850
(2.20 GHz, Intel Xeon Platinum 8276)

SPECspeed2017_int_base = 10.4
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test Date: May-2019
Hardware Availability: Apr-2019
Software Availability: Dec-2018

General Notes (Continued)

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.

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
Choose Operating Mode set to Custom Mode
C-states set to Legacy
Trusted Execution Technology set to Enable
Sysinfo program /home/cpu2017-1.0.5-ic19.0ul/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on linux-hxhl Tue May 21 16:30:26 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) Platinum 8276 CPU @ 2.20GHz
  4 "physical id"s (chips)
  224 "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 : 28
siblings : 56
physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
physical 2: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
physical 3: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian

(Continued on next page)
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SPECspeed2017_int_peak = Not Run

CPU(s): 224
On-line CPU(s) list: 0-223
Thread per core: 2
Core(s) per socket: 28
Socket(s): 4
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Platinum 8276 CPU @ 2.20GHz
Stepping: 6
CPU MHz: 2200.000
CPU max MHz: 4000.0000
CPU min MHz: 1000.0000
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 39424K
NUMA node0 CPU(s): 0-27,112-139
NUMA node1 CPU(s): 28-55,140-167
NUMA node2 CPU(s): 56-83,168-195
NUMA node3 CPU(s): 84-111,196-223
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm 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 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_l3 cdp_l3 invpcid_single ssbd mba ibrs ibpb stibp tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512vd avx512bw avx512vl xsaveopt xsave xsavec xgetbv1 xsavec qcm_llc qcm_occup_llc qcm_mbm_total qcm_mbm_local dtherm ida arat pln pts pkp ospke avx512_vnni flush_l1d arch_capabilities

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 4 nodes (0-3)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133
134 135 136 137 138 139
node 0 size: 386658 MB
node 0 free: 386100 MB

(Continued on next page)
### Lenovo Global Technology

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**CPU2017 License:** 9017  
**Test Date:** May-2019  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Hardware Availability:** Apr-2019  
**Software Availability:** Dec-2018

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#### Platform Notes (Continued)

```plaintext
node 1 cpus: 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167
node 1 size: 387022 MB
node 1 free: 386724 MB
node 2 cpus: 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195
node 2 size: 387051 MB
node 2 free: 386757 MB
node 3 cpus: 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 116 119 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223
node 3 size: 387048 MB
node 3 free: 373806 MB
node distances:
node 0 1 2 3
0: 10 21 21 31
1: 21 10 31 21
2: 21 31 10 21
3: 31 21 21 10
```

From `/proc/meminfo`
- **MemTotal:** 1584926756 kB
- **HugePages_Total:** 0
- **Hugepagesize:** 2048 kB

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

```bash
uname -a:
Linux linux-hxhl 4.12.14-94.41-default #1 SMP Wed Oct 31 12:25:04 UTC 2018 (3090901) x86_64 x86_64 x86_64 GNU/Linux
```

(Continued on next page)
# Lenovo Global Technology

**ThinkSystem SR850**  
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<table>
<thead>
<tr>
<th>SPECspeed2017_int_base =</th>
<th>10.4</th>
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</thead>
<tbody>
<tr>
<td>SPECspeed2017_int_peak =</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

---

**Platform Notes (Continued)**

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 May 21 16:02**

**SPEC is set to:**  
/home/cpu2017-1.0.5-ic19.0u1

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>tmpfs</td>
<td>tmpfs</td>
<td>800G</td>
<td>8.3G</td>
<td>792G</td>
<td>2%</td>
<td>/home</td>
</tr>
</tbody>
</table>

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 -[TEE137C-2.20]- 05/14/2019
- Memory: 48x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

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**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) 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)
```

(Continued on next page)
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Tested by: Lenovo Global Technology
Test Date: May-2019
Hardware Availability: Apr-2019
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Compiler Version Notes (Continued)

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
657.xz_s: -DSPEC_LP64

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 -lkmalloc
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ThinkSystem SR850
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