### Lenovo Global Technology

**ThinkSystem SR860**  
(2.10 GHz, Intel Xeon Gold 5218T)

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<th>SPECspeed®2017_fp_base = 171</th>
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<tbody>
<tr>
<td>SPECspeed®2017_fp_peak = Not Run</td>
</tr>
</tbody>
</table>

#### Hardware

**CPU Name:** Intel Xeon Gold 5218T  
**Max MHz:** 3800  
**Nominal:** 2100  
**Enabled:** 64 cores, 4 chips  
**Orderable:** 2.4 chips  
**Cache L1:** 32 KB I + 32 KB D on chip per core  
**Cache L2:** 1 MB I+D on chip per core  
**Cache L3:** 22 MB I+D on chip per chip  
**Memory:** 1536 GB (48 x 32 GB 2Rx4 PC4-2933Y-R, running at 2666)  
**Storage:** 800 GB tmpfs  
**Other:** None

#### Software

**OS:** SUSE Linux Enterprise Server 12 SP4 (x86_64)  
**Kernel:** 4.12.14-94.41-default  
**Compiler:** C/C++: Version 19.0.4.227 of Intel  
**Compiler for Linux:**  
**Fortran:** Version 19.0.4.227 of Intel Fortran  
**Compiler for Linux:**  
**Parallel:** Yes  
**Firmware:** Lenovo BIOS Version TEE142E 2.30 released Aug-2019 tested as TEE141E 2.30 Jul-2019  
**File System:** tmpfs  
**System State:** Run level 3 (multi-user)  
**Base Pointers:** 64-bit  
**Peak Pointers:** Not Applicable  
**Other:** None  
**Power Management:** --
Lenovo Global Technology
ThinkSystem SR860
(2.10 GHz, Intel Xeon Gold 5218T)

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>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>64</td>
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<td>649.fotonik3d_s</td>
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<td>285</td>
<td>55.2</td>
<td>285</td>
<td>55.2</td>
<td>286</td>
</tr>
</tbody>
</table>

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

General Notes

Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fin,compact"
LD_LIBRARY_PATH = "/home/cpu2017-1.0.5-ic19.0u4/lib/intel64"
OMP_STACKSIZE = "192M"

Binaries compiled on a system with 1x Intel Core i9-799X CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.5
Transparent Huge Pages disabled by default
echo never > /sys/kernel/mm/transparent_hugepage/enabled
echo never > /sys/kernel/mm/transparent_hugepage/defrag
Prior to runcpu invocation
Filesyste 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.

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR860
(2.10 GHz, Intel Xeon Gold 5218T)

General Notes (Continued)

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.

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
Choose Operating Mode set to Custom Mode
Hyper-Threading set to Disable
Adjacent Cache Prefetch set to Disable
MONITOR/MWAIT set to Enable
Syinfo program /home/cpu2017-1.0.5-ic19.0u4/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcd8f2999c33d61f64495e45859ea9
running on linux-700n Thu Sep 5 05:46:44 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) Gold 5218T CPU @ 2.10GHz
   "physical id"s (chips)
4  "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 : 16
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
physical 2: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
physical 3: 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: 1
Core(s) per socket: 16

(Continued on next page)
Lenovo Global Technology

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SPECspeed®2017_fp_base = 171
SPECspeed®2017_fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test Date: Sep-2019
Hardware Availability: Jul-2019
Software Availability: May-2019

Platform Notes (Continued)

Socket(s): 4
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 5218T CPU @ 2.10GHz
Stepping: 7
CPU MHz: 2100.000
CPU max MHz: 3800.0000
CPU min MHz: 1000.0000
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 22528K
NUMA node0 CPU(s): 0-15
NUMA node1 CPU(s): 16-31
NUMA node2 CPU(s): 32-47
NUMA node3 CPU(s): 48-63
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 art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmprefl 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 ablp cpuid_fault epb cat_l3 cdp_l3
invpcid_single intel_ppn ssbd mba ibrs ibpb tpr_shadow vnmi flexpriority ept
vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cmp mpx rdt_a
avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
xsaveopt xsavec xgetbv1 xsaveas cmq_llc cmq_occum_llc cmq_mbb_total cmq_mbb_local
dtherm ida arat pls pku ospke avx512_vnni flush_lld arch_capabilities

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
table 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
node 0 size: 38669 MB
node 0 free: 386302 MB
node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
node 1 size: 387058 MB
node 1 free: 382556 MB
node 2 cpus: 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
node 2 size: 387029 MB
node 2 free: 386848 MB

(Continued on next page)
Lenovo Global Technology
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SPECspeed®2017_fp_base = 171
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Platform Notes (Continued)

node 3 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
node 3 size: 387055 MB
node 3 free: 378192 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: 1584961216 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"

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 Sep 5 03:16

SPEC is set to: /home/cpu2017-1.0.5-ic19.0u4

Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 800G 8.3G 792G 2% /home
Platform Notes (Continued)

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 -TEE:141E-2.30- 07/02/2019
Memory:
48x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933, configured at 2666

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
| C               | 619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base) |
|------------------------------------------------------------------------------
| Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,     |
| Version 19.0.4.227 Build 20190416                                           |
| Copyright (C) 1985-2019 Intel Corporation. All rights reserved.              |
|------------------------------------------------------------------------------

==============================================================================
| C++, C, Fortran | 607.cactuBSSN_s(base) |
|------------------------------------------------------------------------------
| Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,    |
| Version 19.0.4.227 Build 20190416                                           |
| Copyright (C) 1985-2019 Intel Corporation. All rights reserved.              |
| Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,     |
| Version 19.0.4.227 Build 20190416                                           |
| Copyright (C) 1985-2019 Intel Corporation. All rights reserved.              |
| Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  |
| 64, Version 19.0.4.227 Build 20190416                                       |
| Copyright (C) 1985-2019 Intel Corporation. All rights reserved.              |
|------------------------------------------------------------------------------

==============================================================================
| Fortran         | 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base) |
|------------------------------------------------------------------------------
| Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  |
| 64, Version 19.0.4.227 Build 20190416                                       |
| Copyright (C) 1985-2019 Intel Corporation. All rights reserved.              |
|------------------------------------------------------------------------------

==============================================================================
| Fortran, C      | 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base) |
|------------------------------------------------------------------------------

(Continued on next page)
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**Test Date:** Sep-2019  
**Hardware Availability:** Jul-2019  
**Software Availability:** May-2019

**Compiler Version Notes (Continued)**

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416

Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416

Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

---

**Base Compiler Invocation**

C benchmarks:
```
icc -m64 -std=c11
```

Fortran benchmarks:
```
ifort -m64
```

Benchmarks using both Fortran and C:
```
ifort -m64 icc -m64 -std=c11
```

Benchmarks using Fortran, C, and C++:
```
icpc -m64 icc -m64 -std=c11 ifort -m64
```

**Base Portability Flags**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Flags</th>
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<tr>
<td>603.bwaves_s</td>
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<tr>
<td>607.cactussn_s</td>
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</tr>
<tr>
<td>619.lbm_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian</td>
</tr>
<tr>
<td></td>
<td>-assume byterecl</td>
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<tr>
<td>638.imagick_s</td>
<td>-DSPEC_LP64</td>
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<td>644.nab_s</td>
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<td>-DSPEC_LP64</td>
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</table>

**Base Optimization Flags**

C benchmarks:
```
-xCORE-AVX512 -ipo -03 -no-prec-div -gopt-prefetch  
-ffinite-math-only -gopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
```

(Continued on next page)
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Test Date: Sep-2019
Hardware Availability: Jul-2019
Software Availability: May-2019

Base Optimization Flags (Continued)

Fortran benchmarks:
-DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-nostandard-realloc-lhs

Benchmarks using both Fortran and C:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs

Benchmarks using Fortran, C, and C++:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-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