Lenovo Global Technology

ThinkSystem SR850P
(2.10 GHz, Intel Xeon Gold 6238)

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

Test Date: Nov-2020
Hardware Availability: Jun-2020
Software Availability: Sep-2019

CPU Name: Intel Xeon Gold 6238
Max MHz: 3700
Nominal: 2100
Enabled: 88 cores, 4 chips
Orderable: 4 chips
Cache L1: 32 KB I + 32 KB D on chip per core
L2: 1 MB I+D on chip per core
L3: 30.25 MB I+D on chip per chip
Other: None
Memory: 1536 GB (48 x 32 GB 2Rx4 PC4-2933Y-R)
Storage: 1 x 960 GB SATA SSD
Other: None

OS: Red Hat Enterprise Linux 8.0
(Ootpa)
Compiler: C/C++: Version 19.0.5.281 of Intel

Compiler for Linux;
Fortran: Version 19.0.5.281 of
Intel Fortran

Parallel: Yes
Firmware: Lenovo BIOS Version TEE156L 2.61 released May-2020
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None
Power Management: BIOS set to prefer performance at the cost of additional power usage
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### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Base</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak</th>
<th>Ratio</th>
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<tbody>
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</tbody>
</table>

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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### Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"

---

### Environment Variables Notes

- Environment variables set by runcpu before the start of the run:
  - KMP_AFFINITY = "granularity=fine,compact"
  - LD_LIBRARY_PATH = "'/home/cpu2017-1.1.0-ic19.0u5-2/lib/intel64"
  - OMP_STACKSIZE = "192M"

---

### General Notes

- Binaries compiled on a system with 1x Intel Core i9-9900K CPU + 64GB RAM memory using Redhat Enterprise Linux 8.0
- 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.
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<th>SPECspeed®2017_fp_base = 201</th>
</tr>
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<tbody>
<tr>
<td>SPECspeed®2017_fp_peak = Not Run</td>
</tr>
</tbody>
</table>

**Platform Notes**

BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
MONITOR/MWAIT set to Enable
Hyper-Threading set to Disable

Sysinfo program /home/cpu2017-1.1.0-ic19.0u5-2/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edeb1e6e46a485a0011
running on localhost.localdomain Fri Nov 6 19:44:00 2020

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

```plaintext
model name : Intel(R) Xeon(R) Gold 6238 CPU @ 2.10GHz
  4 "physical id"s (chips)
  88 "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 : 22
siblings : 22
physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28
physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28
physical 2: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28
physical 3: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28
```

From lscpu:

```plaintext
Architecture:        x86_64
CPU op-mode(s):      32-bit, 64-bit
Byte Order:          Little Endian
CPU(s):              88
On-line CPU(s) list: 0-87
Thread(s) per core:  1
Core(s) per socket:  22
Socket(s):           4
NUMA node(s):        4
Vendor ID:           GenuineIntel
CPU family:          6
Model:               85
Model name:          Intel(R) Xeon(R) Gold 6238 CPU @ 2.10GHz
Stepping:            7
CPU MHz:             2414.358
CPU max MHz:         3700.0000
CPU min MHz:         1000.0000
BogoMIPS:            4200.00
Virtualization:      VT-x
L1d cache:           32K
```

(Continued on next page)
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SPECspeed®2017_fp_base = 201
SPECspeed®2017_fp_peak = Not Run

Platform Notes (Continued)

L1i cache: 32K
L2 cache: 1024K
L3 cache: 30976K
NUMA node0 CPU(s): 0-21
NUMA node1 CPU(s): 22-43
NUMA node2 CPU(s): 44-65
NUMA node3 CPU(s): 66-87
Flags: fpu vme de pse tsc msr pae 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
aperfmpref pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtrr 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 cd_t3
invpcid_single intel_puin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi
flexpriority ept fsgsbase tsc_adjust bni hle avx2 smep bmi2 erms invpcid rtm
cqmx mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup LLC cqm_mbm_total
cqm_mbm_local dtherm ida arat p11 pts pku ospke avx512_vnni flush_lld
arch_capabilities

From /proc/cpuinfo cache data

    cache size : 30976 KB

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
node 0 size: 386683 MB
node 0 free: 386082 MB
node 1 cpus: 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43
node 1 size: 387042 MB
node 1 free: 386643 MB
node 2 cpus: 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65
node 2 size: 387067 MB
node 2 free: 385034 MB
node 3 cpus: 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87
node 3 size: 387066 MB
node 3 free: 386654 MB
node distances:

node 0 1 2 3
0: 10 21 21 21
1: 10 21 21 21
2: 21 21 10 21
3: 21 21 21 10

From /proc/meminfo

MemTotal: 1585009152 kB

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SPECspeed®2017_fp_base = 201
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Platform Notes (Continued)

HugePages_Total:       0
Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
  os-release:
    NAME="Red Hat Enterprise Linux"
    VERSION="8.0 (Ootpa)"
    ID="rhel"
    ID_LIKE="fedora"
    VERSION_ID="8.0"
    PLATFORM_ID="platform:el8"
    PRETTY_NAME="Red Hat Enterprise Linux 8.0 (Ootpa)"
    ANSI_COLOR="0;31"
  redhat-release: Red Hat Enterprise Linux release 8.0 (Ootpa)
  system-release: Red Hat Enterprise Linux release 8.0 (Ootpa)
  system-release-cpe: cpe:/o:redhat:enterprise_linux:8.0:ga

uname -a:
Linux localhost.localdomain 4.18.0-80.el8.x86_64 #1 SMP Wed Mar 13 12:02:46 UTC 2019
x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: No status reported
CVE-2017-5754 (Meltdown): Not affected
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled
    via prctl and seccomp
CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional,
    RSB filling

run-level 3 Nov 6 17:46

SPEC is set to: /home/cpu2017-1.1.0-ic19.0u5-2
Filesystem   Type  Size  Used Avail Use% Mounted on
/dev/sda4    xfs   839G  52G  787G   7%  /home

From /sys/devices/virtual/dmi/id
  BIOS: Lenovo -[TEE156L-2.61]- 05/20/2020
  Vendor: Lenovo
  Product: ThinkSystem SR850P -[7D2HCT01WW]-
  Product Family: ThinkSystem
  Serial: 1234567890

Additional information from dmidecode follows. WARNING: Use caution when you interpret
this section. The 'dmidecode' program reads system data which is "intended to allow

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Platform Notes (Continued)

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.
Memory:
48x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

(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 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
==============================================================================

Compiler Version Notes (Continued)

C++, C, Fortran | 607.cactuBSSN_s(base)
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.5.281 Build 20190815
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 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Fortran, C      | 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base)
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Compiler Version Notes (Continued)

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Base Compiler Invocation

C benchmarks:

icc

Fortran benchmarks:

ifort

Benchmarks using both Fortran and C:

ifort icc

Benchmarks using Fortran, C, and C++:

icpc icc ifort

Base Portability Flags

603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
   -assume byterecl
638.imagick_s: -DSPEC_LP64
644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:

-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

Fortran benchmarks:

-m64 -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div
 -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp

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Base Optimization Flags (Continued)

Fortran benchmarks (continued):
-nostandard-realloc-lhs

Benchmarks using both Fortran and C:
-m64 -std=c11 -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++:
-m64 -std=c11 -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-I.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-I.xml

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Tested with SPEC CPU®2017 v1.1.0 on 2020-11-06 06:43:59-0500.