Lenovo Global Technology
ThinkSystem SN850
(3.30 GHz, Intel Xeon Gold 6246)

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

Hardware
CPU Name: Intel Xeon Gold 6246
Max MHz: 4200
Nominal: 3300
Enabled: 48 cores, 4 chips, 2 threads/core
Orderable: 2,4 chips
Cache L1: 32 KB I + 32 KB D on chip per core
L2: 1 MB I+D on chip per core
L3: 24.75 MB I+D on chip per chip
Other: None
Memory: 1536 GB (48 x 32 GB 2Rx4 PC4-2933Y-R)
Storage: 800 GB tmpfs
Other: None

Software
OS: Red Hat Enterprise Linux Server release 7.6 (Maipo)
Kernel 3.10.0-957.el7.x86_64
Compiler: C/C++: Version 19.0.4.227 of Intel C/C++
Compiler for Linux;
Fortran: Version 19.0.4.227 of Intel Fortran
Compiler for Linux
Parallel: Yes
Firmware: Lenovo BIOS Version IVE142E 2.30 released Aug-2019 tested as IVE141E 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: --

SPECs2017_fp_base = 177
SPECs2017_fp_peak = Not Run
Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
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</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

General Notes

Environment variables set by runcpu before the start of the run:
   KMP_AFFINITY = "granularity=fine,compact,1,0"
   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 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.
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<tr>
<th>SPECspeed®2017_fp_base</th>
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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

General Notes (Continued)

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 Custom Mode  
Memory Power Management set to Automatic  
Energy Efficient Turbo set to Disable  
C-States set to Disable  
Page Policy set to Adaptive  
Trusted Execution Technology set to Enable  
Stale AtoS set to Enable

Sysinfo program /home/cpu2017-1.0.5-ic19.0u4/bin/sysinfo  
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9  
runtime on localhost.localdomain Wed Sep 11 21:25:53 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 6246 CPU @ 3.30GHz  
4 "physical id”s (chips)  
96 "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 : 12  
siblings : 24  
physical 0: cores 0 1 2 3 4 8 10 11 17 18 25 27  
physical 1: cores 1 2 3 4 10 11 16 17 18 24 25 27  
physical 2: cores 1 2 4 8 9 10 11 16 17 19 26 27  
physical 3: cores 0 2 4 8 9 10 11 17 18 19 25 27

From lscpu:  
Architecture: x86_64  
CPU op-mode(s): 32-bit, 64-bit  
Byte Order: Little Endian  
CPU(s): 96  
On-line CPU(s) list: 0-95  
Thread(s) per core: 2  
Core(s) per socket: 12  
Socket(s): 4  
NUMA node(s): 4  
Vendor ID: GenuineIntel  
CPU family: 6

(Continued on next page)
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### Platform Notes (Continued)

```plaintext
Model: 85  
Model name: Intel(R) Xeon(R) Gold 6246 CPU @ 3.30GHz  
Stepping: 7  
CPU MHz: 3300.000  
BogoMIPS: 6600.00  
Virtualization: VT-x  
L1d cache: 32K  
L1i cache: 32K  
L2 cache: 1024K  
L3 cache: 25344K  
NUMA node0 CPU(s): 0-11,48-59  
NUMA node1 CPU(s): 12-23,60-71  
NUMA node2 CPU(s): 24-35,72-83  
NUMA node3 CPU(s): 36-47,84-95  
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 pdpesgb rdtscp lm constant_tsc art arch_perfmon pebs bts rep_good nopl x86cap msr xsaveCumhfs xsave八个xsave_xstate xsaveopt xsavec xgetbv1 cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local dtherm ida arat pln pts hwp_epp pku ospke avx512_vnni spec_ctrl intel_stibp flush_l1d arch_capabilities
```

```plaintext
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 48 49 50 51 52 53 54 55 56 57 58 59  
node 0 size: 39288 MB  
node 0 free: 384031 MB  
node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23 60 61 62 63 64 65 66 67 68 69 70 71  
node 1 size: 393216 MB  
node 1 free: 380231 MB  
node 2 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 72 73 74 75 76 77 78 79 80 81 82 83  
node 2 size: 393216 MB  
node 2 free: 384491 MB  
node 3 cpus: 36 37 38 39 40 41 42 43 44 45 46 47 84 85 86 87 88 89 90 91 92 93 94 95  
node 3 size: 393216 MB  
node 3 free: 375139 MB  
node distances:  
node 0 1 2 3  
0: 10 21 21 21
```

(Continued on next page)
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SPECspeed®2017_fp_base = 177
SPECspeed®2017_fp_peak = Not Run

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Platform Notes (Continued)

1: 21 10 21 21
2: 21 21 10 21
3: 21 21 21 10

From /proc/meminfo
MemTotal: 1584959312 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
NAME="Red Hat Enterprise Linux Server"
VERSION="7.6 (Maipo)"
ID=rhel
ID_LIKE="fedora"
VARIANT="Server"
VARIANT_ID="server"
VERSION_ID="7.6"
PRETTY_NAME="Red Hat Enterprise Linux Server 7.6 (Maipo)"
redhat-release: Red Hat Enterprise Linux Server release 7.6 (Maipo)
system-release: Red Hat Enterprise Linux Server release 7.6 (Maipo)

uname -a:
Linux localhost.localdomain 3.10.0-957.el7.x86_64 #1 SMP Thu Oct 4 20:48:51 UTC 2018
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: Load fences, __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS

run-level 3 Sep 11 21:23

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

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 -[IVE141E-2.30]- 07/02/2019
Memory:
  48x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

(Continued on next page)
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**Platform Notes (Continued)**

(End of data from sysinfo program)

**Compiler Version Notes**

-------------------------------------
C  | 619.ibm_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.
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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.
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Fortran, C  | 621.wrf_s(base) 627.cam4_s(base) 628.pop2_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.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
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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

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

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

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Base Optimization Flags (Continued)

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

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