### Lenovo Global Technology

**ThinkSystem SD650**  
(2.70 GHz, Intel Xeon Gold 6226)

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>9017</th>
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<tr>
<td>Test Sponsor:</td>
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<table>
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<tr>
<th>Threads</th>
<th>SPECspeed\textsuperscript{2017_fp_base} (111)</th>
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<tbody>
<tr>
<td>603.bwaves_s 24</td>
<td></td>
</tr>
<tr>
<td>607.cactuBSSN_s 24</td>
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</tr>
<tr>
<td>619.lbm_s 24</td>
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<tr>
<td>621.wrf_s 24</td>
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<tr>
<td>627.cam4_s 24</td>
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<tr>
<td>628.pop2_s 24</td>
<td></td>
</tr>
<tr>
<td>638.imagick_s 24</td>
<td></td>
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<tr>
<td>644.nab_s 24</td>
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<tr>
<td>649.fotonik3d_s 24</td>
<td></td>
</tr>
<tr>
<td>654.roms_s 24</td>
<td></td>
</tr>
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</table>

#### Hardware

**CPU Name:** Intel Xeon Gold 6226  
**Max MHz:** 3700  
**Nominal:** 2700  
**Enabled:** 24 cores, 2 chips  
**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:** 19.25 MB I+D on chip per chip  
**Other:** None  
**Memory:** 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R)  
**Storage:** 1 x 480 GB SATA SSD  
**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 19.0.1.144 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 OTE142F 2.30 released Aug-2019 tested as OTE141F 2.30 Jul-2019  
**File System:** xfs  
**System State:** Run level 3 (multi-user)  
**Base Pointers:** 64-bit  
**Peak Pointers:** Not Applicable  
**Other:** None  
**Power Management:** --
SPEC CPU®2017 Floating Point Speed Result

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CPU2017 License: 9017
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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Base Seconds</th>
<th>Base Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak Seconds</th>
<th>Ratio</th>
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<td><strong>143</strong></td>
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<td>61.0</td>
<td>85.9</td>
<td>61.8</td>
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<td>628.pop2_s</td>
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<td>64.4</td>
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<td>64.6</td>
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<td>638.imagick_s</td>
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<tr>
<td>644.nab_s</td>
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<td><strong>168</strong></td>
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<td>104</td>
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<td>649.fotonik3d_s</td>
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<td><strong>114</strong></td>
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<tr>
<td>654.roms_s</td>
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<td>151</td>
<td>104</td>
<td>151</td>
<td>104</td>
<td>151</td>
<td>104</td>
</tr>
</tbody>
</table>

SPECspeed®2017_fp_base = 111
SPECspeed®2017_fp_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,compact"
LD_LIBRARY_PATH = "/home/cpu2017-1.0.5-ic19.0u1/lib/intel64"
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.
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| SPECspeed®2017_fp_base = 111 |
| SPECspeed®2017_fp_peak = Not Run |

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
Choose Operating Mode set to Custom Mode
C1 Enhanced Mode set to Enable
MONITOR/MWAIT set to Enable
Hyper-Threading set to Disable
Adjacent Cache Prefetch set to Disable
Sysinfo program /home/cpu2017-1.0.5-ic19.0u1/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcede8f2999c33d61f64985e4e5898a9
running on localhost.localdomain Wed Sep 11 15:00:32 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 6226 CPU @ 2.70GHz
  2 "physical id"s (chips)
  24 "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 : 12
  physical 0: cores 0 2 3 4 5 6 8 9 10 11 12 13
  physical 1: cores 0 2 3 4 5 6 8 9 10 11 12 13

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 24
On-line CPU(s) list: 0-23
Thread(s) per core: 1
Core(s) per socket: 12
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6226 CPU @ 2.70GHz
Stepping: 7
CPU MHz: 2700.000
BogoMIPS: 5400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K

(Continued on next page)
## Lenovo Global Technology

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### Platform Notes (Continued)

- L3 cache: 19712K
- NUMA node0 CPU(s): 0-11
- NUMA node1 CPU(s): 12-23
- Flags: fpu vme de pse tsc msr pae mca cx8 apic sep mtrr pge mca cmov
- L3 cache: 19712K
- NUMA node0 CPU(s): 0-11
- NUMA node1 CPU(s): 12-23

From `numactl --hardware` WARNING: a numactl 'node' might or might not correspond to a physical chip.

- available: 2 nodes (0-1)
- node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11
- node 0 size: 196281 MB
- node 0 free: 191379 MB
- node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23
- node 1 size: 196608 MB
- node 1 free: 192041 MB
- node distances:
  - node 0 1
  - 0: 10 21
  - 1: 21 10

From `/proc/meminfo`

- MemTotal: 395879720 kB
- HugePages_Total: 0
- Hugepagesize: 2048 kB

From `/etc/*release* /etc/*version*`

- os-release:
  - 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)"

(Continued on next page)
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Platform Notes (Continued)

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 14:59

SPEC is set to: /home/cpu2017-1.0.5-ic19.0u1
    /dev/mapper/rhel-root xfs 445G 53G 393G 12% /

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 -[OTE141F-2.30]- 07/02/2019
Memory:
    4x NO DIMM NO DIMM
    12x 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 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

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C++, C, Fortran | 607.cactuBSSN_s(base)
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Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018

(Continued on next page)
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Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
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.
Intel (R) Fortran Intel (R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.1.144 Build 20181018
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Compiler Version Notes (Continued)

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
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### Base Portability Flags

603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.Ibm_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

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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