## Lenovo Global Technology

**ThinkSystem SD650 V2**

**CPU2017 License:** 9017  
**Test Date:** May-2021  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Hardware Availability:** Jul-2021  
**Software Availability:** Feb-2021

### Software

<table>
<thead>
<tr>
<th>OS:</th>
<th>Red Hat Enterprise Linux 8.3 (Ootpa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parallel:</td>
<td>Yes</td>
</tr>
<tr>
<td>Firmware:</td>
<td>Lenovo BIOS Version U8E109PT1 1.01 released Apr-2021</td>
</tr>
<tr>
<td>File System:</td>
<td>xfs</td>
</tr>
<tr>
<td>System State:</td>
<td>Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers:</td>
<td>64-bit</td>
</tr>
<tr>
<td>Peak Pointers:</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Other:</td>
<td>jemalloc memory allocator V5.0.1</td>
</tr>
<tr>
<td>Power Management:</td>
<td>BIOS set to prefer performance at the cost of additional power usage</td>
</tr>
</tbody>
</table>

### Hardware

<table>
<thead>
<tr>
<th>CPU Name:</th>
<th>Intel Xeon Gold 6330</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max MHz:</td>
<td>3100</td>
</tr>
<tr>
<td>Nominal:</td>
<td>2000</td>
</tr>
<tr>
<td>Enabled:</td>
<td>56 cores, 2 chips</td>
</tr>
<tr>
<td>Orderable:</td>
<td>2 chips</td>
</tr>
<tr>
<td>Cache L1:</td>
<td>32 KB I + 48 KB D on chip per core</td>
</tr>
<tr>
<td>L2:</td>
<td>1.25 MB I+D on chip per core</td>
</tr>
<tr>
<td>L3:</td>
<td>42 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
</tr>
<tr>
<td>Memory:</td>
<td>512 GB (16 x 32 GB 2Rx4 PC4-3200AA-R, running at 2933)</td>
</tr>
<tr>
<td>Storage:</td>
<td>1 x 480 GB SATA SSD</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
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</tbody>
</table>

### Benchmark Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed\textsuperscript{2017_fp_base}</th>
<th>SPECspeed\textsuperscript{2017_fp_peak}</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>56</td>
<td>182</td>
<td>Not Run</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>56</td>
<td>240</td>
<td></td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>56</td>
<td>73.0</td>
<td></td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>56</td>
<td>202</td>
<td></td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>56</td>
<td>323</td>
<td></td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>56</td>
<td>109</td>
<td></td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>56</td>
<td>212</td>
<td></td>
</tr>
<tr>
<td>644.nab_s</td>
<td>56</td>
<td>30.0</td>
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<tr>
<td>649.fotonik3d_s</td>
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<td>60.0</td>
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<tr>
<td>654.roms_s</td>
<td>56</td>
<td>90.0</td>
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</tr>
</tbody>
</table>
SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

Lenovo Global Technology
ThinkSystem SD650 V2
(2.00 GHz, Intel Xeon Gold 6330)

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
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Test Date: May-2021
Hardware Availability: Jul-2021
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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>56</td>
<td>94.2</td>
<td>626</td>
<td>94.3</td>
<td>625</td>
<td>94.1</td>
<td>627</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>56</td>
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<td>238</td>
<td>69.4</td>
<td>240</td>
<td>69.2</td>
<td>241</td>
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<tr>
<td>619.lbm_s</td>
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<td>39.0</td>
<td>134</td>
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<td>137</td>
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<td>137</td>
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<td>137</td>
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<td></td>
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<tr>
<td>627.cam4_s</td>
<td>56</td>
<td>66.9</td>
<td>133</td>
<td>67.4</td>
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<td>56</td>
<td>166</td>
<td>71.6</td>
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<td>56</td>
<td>71.3</td>
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<td>71.5</td>
<td>202</td>
<td>71.3</td>
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<tr>
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<td>54.1</td>
<td>323</td>
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<tr>
<td>649.fotonik3d_s</td>
<td>56</td>
<td>84.6</td>
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<tr>
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<td>56</td>
<td>74.4</td>
<td>212</td>
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<td>204</td>
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</tr>
</tbody>
</table>

SPECspeed®2017_fp_base = 182
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"

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/home/cpu2017-1.1.5-ic2021.1-revB/lib/intel64:/home/cpu2017-1.1.5-ic2021.1-revB/je5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE 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.

(Continued on next page)
## Lenovo Global Technology

**ThinkSystem SD650 V2**  
(2.00 GHz, Intel Xeon Gold 6330)

**SPECspeed®2017_fp_base = 182**  
**SPECspeed®2017_fp_peak = Not Run**

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>9017</th>
<th>Test Date:</th>
<th>May-2021</th>
</tr>
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<tbody>
<tr>
<td>Test Sponsor:</td>
<td>Lenovo Global Technology</td>
<td>Hardware Availability:</td>
<td>Jul-2021</td>
</tr>
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<td>Lenovo Global Technology</td>
<td>Software Availability:</td>
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</tbody>
</table>

### General Notes (Continued)

jemalloc, a general purpose malloc implementation  
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5  
resources available from jemalloc.net or https://github.com/jemalloc/jemalloc/releases

### Platform Notes

**BIOS configuration:**  
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode  
C-States set to Legacy  
LLC Prefetch set to Enable  
Hyper-Threading set to Disabled  
Adjacent Cache Prefetch set to Disabled

Sysinfo program /home/cpu2017-1.1.5-ic2021.1-revB/bin/sysinfo  
Rev: r6538 of 2020-09-24 e8664e66d2d7080aefeaa89d4b38e2f1c  
running on localhost.localdomain Sat May  8 08:32:58 2021

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 6330 CPU @ 2.00GHz  
  2 "physical id"s (chips)  
  56 "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 : 28  
  physical 0: cores 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  
  physical 1: cores 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

From lscpu:

- **Architecture:** x86_64  
- **CPU op-mode(s):** 32-bit, 64-bit  
- **Byte Order:** Little Endian  
- **CPU(s):** 56  
- **On-line CPU(s) list:** 0-55  
- **Thread(s) per core:** 1  
- **Core(s) per socket:** 28  
- **Socket(s):** 2  
- **NUMA node(s):** 2  
- **Vendor ID:** GenuineIntel  
- **CPU family:** 6

(Continued on next page)
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<td>Lenovo Global Technology</td>
</tr>
</tbody>
</table>

**SPEC**CPU®2017 Floating Point Speed Result

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base =</th>
<th>182</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_fp_peak =</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

**Platform Notes (Continued)**

Model: 106
Model name: Intel(R) Xeon(R) Gold 6330 CPU @ 2.00GHz
Stepping: 6
CPU MHz: 1543.677
BogoMIPS: 4000.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 43008K
NUMA node0 CPU(s): 0-27
NUMA node1 CPU(s): 28-55
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
aperfmonf 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 3nowprefetch cpuid_fault epb cat_l3 invpcid_single
intel_pinn ssbd mba ibrs intel ibpb stibp ibrs Enhanced tpr_shadow vmx flexpriority ept
vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 1erms invpcid cmqm rdt_a
avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha_ni
avx512bw avx512vl xsaveopt xsaesc xgetbv1 xsavec cmqm_llc cmqm_occump llc cmqm_mbb_total
cmq_mbb_local split_lock_detect wbnoinvd dtherm ida arat pfn pts avx512vbmi umip pkt
ospke avx512 vbmi2 gfn vaes vpclmulqdq avx512_vnni avx512_bitalg tme
avx512_vpopcntdq la57 rdpid md_clear pconfign flushlld arch_capabilities

/proc/cpuinfo cache data

cache size : 43048 KB

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 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
node 0 size: 246642 MB
node 0 free: 256461 MB
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
node 1 size: 246424 MB
node 1 free: 257426 MB
node distances:

node 0 1
0: 10 20
1: 20 10

From /proc/meminfo

MemTotal: 528008980 kB
HugePages_Total: 0

(Continued on next page)
Lenovo Global Technology
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SPECsmoot2017_fp_base = 182
SPECsmoot2017_fp_peak = Not Run

CPU2017 License: 9017
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Platform Notes (Continued)

Hugepagesize: 2048 kB

/sbin/tuned-adm active
No current active profile.

/usr/bin/lsb_release -d
Red Hat Enterprise Linux release 8.3 (Ootpa)

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

os-release:
NAME="Red Hat Enterprise Linux"
VERSION="8.3 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.3"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

uname -a:
Linux localhost.localdomain 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020
x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
CVE-2018-12207 (iTLB Multihit): Not affected
CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected
CVE-2017-5754 (Meltdown): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2018-3639 (Speculative Store Bypass): Mitigation: usercopy/swapsgs barriers and __user pointer sanitization
CVE-2017-5753 (Spectre variant 1): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
CVE-2017-5715 (Spectre variant 2): Not affected
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 May 8 08:30

SPEC is set to: /home/cpu2017-1.1.5-ic2021.1-revB

Filesystem Type Size Used Avail Use% Mounted on

(Continued on next page)
## Lenovo Global Technology
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<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>182</th>
</tr>
</thead>
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<tr>
<td>SPECspeed®2017_fp_peak</td>
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### Platform Notes (Continued)

```
/dev/sda4      xfs   372G  113G  259G  31% /home
```

From /sys/devices/virtual/dmi/id
```text
Vendor:         Lenovo
Product:        ThinkSystem SD650 V2
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 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:**  
16x Samsung M393A4K40DB3-CWE 32 GB 2 rank 3200, configured at 2933

**BIOS:**  
```text
BIOS Vendor:       Lenovo
BIOS Version:      U8E109PT1-1.01
BIOS Date:         04/28/2021
BIOS Revision:     1.1
Firmware Revision: 1.40
```

(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 Classic for applications running on Intel(R)  
64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
---------------------------------------------
```

```
C++, C, Fortran | 607.cactuBSSN_s(base)
---------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler Classic for applications running on  
Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
---------------------------------------------
```

(Continued on next page)
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Compiler Version Notes (Continued)

Fortran         | 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)
------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------

Fortran, C      | 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base)
------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------

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

(Continued on next page)
Lenovo Global Technology

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**SPEC CPU®2017 Floating Point Speed Result**

**Base Portability Flags (Continued)**

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-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-mbranches-within-32B-boundaries

Fortran benchmarks:
-m64 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-nostandard-realloc-lhs -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Benchmarks using both Fortran and C:
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-DSPEC_OPENMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Benchmarks using Fortran, C, and C++:
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-DSPEC_OPENMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

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-ICElake-D.xml](http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-ICElake-D.xml)

The flags files that were used to format this result can be browsed at
# Lenovo Global Technology

ThinkSystem SD650 V2  
(2.00 GHz, Intel Xeon Gold 6330)  

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU®2017 v1.1.5 on 2021-05-07 20:32:58-0400.  