## Lenovo Global Technology

**ThinkSystem SR650 V2**  
(2.20 GHz, Intel Xeon Gold 5320)

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### Software

<table>
<thead>
<tr>
<th>OS:</th>
<th>Red Hat Enterprise Linux 8.3 (Ootpa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kernel:</td>
<td>4.18.0-240.el8.x86_64</td>
</tr>
<tr>
<td>Compiler:</td>
<td>C/C++, Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux; Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux</td>
</tr>
<tr>
<td>Parallel:</td>
<td>Yes</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 and OS set to prefer performance at the cost of additional power usage</td>
</tr>
</tbody>
</table>

### Hardware

| CPU Name: | Intel Xeon Gold 5320 |
| Max MHz: | 3400 |
| Nominal: | 2200 |
| Enabled: | 52 cores, 2 chips, 2 threads/core |
| Orderable: | 1.2 chips |
| Cache L1: | 32 KB I + 48 KB D on chip per core |
| L2: | 1.25 MB I+D on chip per core |
| L3: | 39 MB I+D on chip per chip |
| Other: | None |
| Memory: | 1 TB (32 x 32 GB 2Rx8 PC4-3200AA-R, running at 2933) |
| Storage: | 1 x 960 GB SATA SSD |
| Other: | None |

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### SPEC Speed Results

**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Hardware Availability:** Jul-2021  
**Software Availability:** Dec-2020

| SPECspeed®2017_int_base = | 11.5 |
| SPECspeed®2017_int_peak = | Not Run |

### Regression Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed®2017_int_base (11.5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>104</td>
<td>6.98</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>104</td>
<td>10.4</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>104</td>
<td>18.7</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>104</td>
<td>11.4</td>
</tr>
<tr>
<td>623.xalancbmk_s</td>
<td>104</td>
<td>13.2</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>104</td>
<td>16.7</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>104</td>
<td>5.67</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>104</td>
<td>4.63</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>104</td>
<td>19.6</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>104</td>
<td>23.4</td>
</tr>
</tbody>
</table>
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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>Base Seconds</th>
<th>Ratio</th>
<th>Peak Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>104</td>
<td>254</td>
<td>6.98</td>
<td>254</td>
<td>6.99</td>
<td>255</td>
<td>6.96</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>104</td>
<td>383</td>
<td>10.4</td>
<td>385</td>
<td>10.3</td>
<td>384</td>
<td>10.4</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>104</td>
<td>252</td>
<td>18.7</td>
<td>252</td>
<td>18.7</td>
<td>251</td>
<td>18.8</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>104</td>
<td>144</td>
<td>11.3</td>
<td>141</td>
<td>11.6</td>
<td>143</td>
<td>11.4</td>
</tr>
<tr>
<td>623.xalancbmk_s</td>
<td>104</td>
<td>107</td>
<td>13.2</td>
<td>108</td>
<td>13.2</td>
<td>109</td>
<td>13.0</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>104</td>
<td>106</td>
<td>16.7</td>
<td>105</td>
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<td>16.7</td>
</tr>
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<td>104</td>
<td>253</td>
<td>5.67</td>
<td>253</td>
<td>5.67</td>
<td>252</td>
<td>5.68</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>104</td>
<td>369</td>
<td>4.63</td>
<td>368</td>
<td>4.63</td>
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<td>4.63</td>
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<td>150</td>
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<td>23.4</td>
<td>265</td>
<td>23.4</td>
<td>265</td>
<td>23.3</td>
</tr>
</tbody>
</table>

SPECspeed®2017_int_base = 11.5
SPECspeed®2017_int_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,scatter"
LD_LIBRARY_PATH = 
"/home/cpu2017-1.1.8-ic2021.1-revB/lib/intel64:/home/cpu2017-1.1.8-ic2021.1-revB/je5.0.1-64"
MALLOCONF = "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

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<thead>
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<th>11.5</th>
</tr>
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<tbody>
<tr>
<td>SPECspeed®2017_int_peak</td>
<td>Not Run</td>
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</tbody>
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**CPU2017 License:** 9017  
**Test Date:** Jul-2021  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Hardware Availability:** Jul-2021  
**Software Availability:** Dec-2020

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#### General Notes (Continued)

jemalloc, a general purpose malloc implementation  
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5  

---

#### Platform Notes

**BIOS configuration:**  
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode  
C-States set to Legacy

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revB/bin/sysinfo  
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d  
running on localhost.localdomain Thu Jul 22 17:39:01 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 5320 CPU @ 2.20GHz  
2 "physical id"s (chips)  
104 "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 : 26  
siblings : 52  
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  
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
```

From lscpu from util-linux 2.32.1:

```
Architecture: x86_64  
CPU op-mode(s): 32-bit, 64-bit  
Byte Order: Little Endian  
CPU(s): 104  
On-line CPU(s) list: 0-103  
Thread(s) per core: 2  
Core(s) per socket: 26  
Socket(s): 2  
NUMA node(s): 2  
Vendor ID: GenuineIntel  
CPU family: 6  
Model: 106  
Model name: Intel(R) Xeon(R) Gold 5320 CPU @ 2.20GHz  
Stepping: 6
```

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Test Date: Jul-2021
Hardware Availability: Jul-2021
Software Availability: Dec-2020

SPECspeed®2017_int_base = 11.5
SPECspeed®2017_int_peak = Not Run

Platform Notes (Continued)

CPU MHz: 2843.925
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 39936K
NUMA node0 CPU(s): 0-25,52-77
NUMA node1 CPU(s): 26-51,78-103
Flags: fpu vme de pse tsc msr pae mce cmov
pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdelgb rdtsscp
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_l3 invpcid_single
intel_pni ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept
vpid ept_ad fs.gsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqm rdrd
avx512f avx512dq rdseed adx smap avx512cfma clflushopt clwb intel_pt avx512cd sha_ni
avx512bw avx512vl xsaveset xsaveopt xsaveopt xsaveve xgetbv1 xsaev cqm_llc cqm_occld llc
cqm_mb_total cqm_mb_local split_lock_detect wbtioind dbhid ida arat pln pts avx512vbmi umip pk
ospke avx512_vbmi2 gfni vaes vcp1muldq avx512_vnni avx512_bitalg tme
avx512_vpopcntdq la57 rdrd md_clear pconf create flush_lld arch_capabilities

/proc/cpuinfo cache data
   cache size : 39936 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 52 53
   node 1 cpus: 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
   node 0 size: 483607 MB
   node 0 free: 514949 MB
   node 1 size: 485221 MB
   node 1 free: 515271 MB
   node distances:
   node 0 1
   0: 10 20
   1: 20 10

From /proc/meminfo
   MemTotal: 1056480240 KB
   HugePages_Total: 0
   Hugepagesize: 2048 KB

(Continued on next page)
Platform Notes (Continued)

/sbin/tuned-adm active
  Current active profile: balanced

/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="rhe1"
  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/swaps barriers and __user pointer sanitization
CVE-2017-5753 (Spectre variant 1): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
CVE-2017-5715 (Spectre variant 2):
CVE-2020-0543 (Special Register Buffer Data Sampling):
CVE-2019-11135 (TSX Asynchronous Abort):

run-level 3 Jul 22 17:38

SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revB
  Filesystem  Type Size Used Avail Use% Mounted on
  /dev/sda4   xfs   818G  160G  658G  20%  /home
Lenovo Global Technology
ThinkSystem SR650 V2
(2.20 GHz, Intel Xeon Gold 5320)

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

SPECspeed®2017_int_base = 11.5
SPECspeed®2017_int_peak = Not Run

Test Date: Jul-2021
Hardware Availability: Jul-2021
Software Availability: Dec-2020

Platform Notes (Continued)

From /sys/devices/virtual/dmi/id
Vendor: Lenovo
Product: ThinkSystem SR650 V2 MB
Product Family: ThinkSystem
Serial: 1234567890

Additional information from dmidecode 3.2 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:
32x Samsung M393A4G43AB3-CWE 32 GB 2 rank 3200, configured at 2933

BIOS:
  BIOS Vendor: Lenovo
  BIOS Version: AFE111A-1.02
  BIOS Date: 05/07/2021
  BIOS Revision: 1.2
  Firmware Revision: 1.10

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
| C       | 600.perlbench_s(base) 602.gcc_s(base) 605.mcf_s(base) 625.x264_s(base) 657.xz_s(base) |
==============================================================================

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

==============================================================================
| C++     | 620.omnetpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base) 641.leea_s(base) |
==============================================================================

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

==============================================================================
| Fortran | 648.exchange2_s(base) |
==============================================================================

Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on

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Compiler Version Notes (Continued)

Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

Base Portability Flags

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-DSPEC_OPENMP -std=c11 -m64 -fiopenmp -Wl,-z,muldefs -xCORE-AVX2
-O3 -ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

C++ benchmarks:
-DSPEC_OPENMP -m64 -Wl,-z,muldefs -xCORE-AVX2 -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin/

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SPECspeed\textsuperscript{\textregistered}2017\_int\_base = 11.5
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C++ benchmarks (continued):
-\texttt{lqkmalloc}

Fortran benchmarks:
-\texttt{-m64 -xCORE-AVX2 -O3 -ipo -no-prec-div -qopt-mem-layout-trans=4}
-\texttt{-nostandard-realloc-lhs -align array32byte -auto}
-\texttt{-mbranches-within-32B-boundaries}

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-ICElake-F.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-ICElake-F.xml
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml

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

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