Lenovo Global Technology
ThinkSystem SD650 V2
(3.60 GHz, Intel Xeon Gold 6334)

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>145</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate®2017_int_peak</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

**Copies**

<table>
<thead>
<tr>
<th>SPECrate</th>
<th>105</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copies</td>
<td></td>
</tr>
<tr>
<td>500.perlbench_r</td>
<td>32</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>32</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>32</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>32</td>
</tr>
<tr>
<td>523.xalancbmk_r</td>
<td>32</td>
</tr>
<tr>
<td>525.x264_r</td>
<td>32</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
<td>32</td>
</tr>
<tr>
<td>541.leela_r</td>
<td>32</td>
</tr>
<tr>
<td>548.exchange2_r</td>
<td>32</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>32</td>
</tr>
</tbody>
</table>

**Software**

<table>
<thead>
<tr>
<th>Software</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OS</td>
<td>Red Hat Enterprise Linux 8.3 (Ootpa)</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>Firmware</td>
<td>Lenovo BIOS Version U8E111A 1.02 released May-2021</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>Power Management</td>
<td>BIOS and OS set to prefer performance at the cost of additional power usage</td>
</tr>
</tbody>
</table>

**Hardware**

<table>
<thead>
<tr>
<th>Hardware</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name</td>
<td>Intel Xeon Gold 6334</td>
</tr>
<tr>
<td>Max MHz</td>
<td>3700</td>
</tr>
<tr>
<td>Nominal</td>
<td>3600</td>
</tr>
<tr>
<td>Enabled</td>
<td>16 cores, 2 chips, 2 threads/core</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>Cache L2</td>
<td>1.25 MB I+D on chip per core</td>
</tr>
<tr>
<td>Cache L3</td>
<td>18 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)</td>
</tr>
<tr>
<td>Storage</td>
<td>1 x 480 GB SATA SSD</td>
</tr>
<tr>
<td>Other</td>
<td>None</td>
</tr>
</tbody>
</table>
Lenovo Global Technology  
ThinkSystem SD650 V2  
(3.60 GHz, Intel Xeon Gold 6334)

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

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>32</td>
<td>528</td>
<td>96.5</td>
<td>528</td>
<td>96.5</td>
<td>528</td>
<td>96.5</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>32</td>
<td>360</td>
<td>126</td>
<td>361</td>
<td>126</td>
<td>363</td>
<td>125</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>32</td>
<td>204</td>
<td>253</td>
<td>207</td>
<td>250</td>
<td>205</td>
<td>252</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>32</td>
<td>439</td>
<td>95.7</td>
<td>442</td>
<td>95.0</td>
<td>440</td>
<td>95.5</td>
</tr>
<tr>
<td>523.xalancbmk_r</td>
<td>32</td>
<td>181</td>
<td>187</td>
<td>179</td>
<td>188</td>
<td>180</td>
<td>188</td>
</tr>
<tr>
<td>525.x264_r</td>
<td>32</td>
<td>191</td>
<td>293</td>
<td>191</td>
<td>293</td>
<td>192</td>
<td>292</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
<td>32</td>
<td>342</td>
<td>107</td>
<td>342</td>
<td>107</td>
<td>342</td>
<td>107</td>
</tr>
<tr>
<td>541.leela_r</td>
<td>32</td>
<td>506</td>
<td>105</td>
<td>506</td>
<td>105</td>
<td>507</td>
<td>105</td>
</tr>
<tr>
<td>548.exchange2_r</td>
<td>32</td>
<td>288</td>
<td>292</td>
<td>288</td>
<td>291</td>
<td>288</td>
<td>291</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>32</td>
<td>441</td>
<td>78.4</td>
<td>441</td>
<td>78.4</td>
<td>441</td>
<td>78.3</td>
</tr>
</tbody>
</table>

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

Submit Notes
The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

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:
LD_LIBRARY_PATH = "<path>
MALLOC_CONF = "retain:true"

General Notes
Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Red Hat Enterprise Linux 8.1
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
runcpu command invoked through numactl i.e.:

(Continued on next page)
Lenovo Global Technology
ThinkSystem SD650 V2
(3.60 GHz, Intel Xeon Gold 6334)

General Notes (Continued)

numactl --interleave=all runcpu <etc>
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.

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
C-States set to Autonomous
DCU Streamer Prefetcher set to Disabled
Adjacent Cache Prefetch set to Disabled
UPI Link Disable set to Disabled 1 Link
CPU Frequency Limits set to Restrict maximum frequency
SNC set to Enabled

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revB/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec915b55891ef0e16aca51564d
running on localhost.localdomain Tue Jun 22 11:37:53 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 6334 CPU @ 3.60GHz
  2 "physical id"s (chips)
  32 "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 : 8
  siblings : 16
  physical 0: cores 0 1 2 3 4 5 6 7
  physical 1: cores 0 1 2 3 4 5 6 7

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): 32
On-line CPU(s) list: 0-31
Thread(s) per core: 2
Core(s) per socket: 8

(Continued on next page)
## Lenovo Global Technology

**ThinkSystem SD650 V2**  
(3.60 GHz, Intel Xeon Gold 6334)

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

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>9017</th>
<th>Test Date:</th>
<th>Jun-2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor:</td>
<td>Lenovo Global Technology</td>
<td>Hardware Availability:</td>
<td>Jul-2021</td>
</tr>
<tr>
<td>Tested by:</td>
<td>Lenovo Global Technology</td>
<td>Software Availability:</td>
<td>Dec-2020</td>
</tr>
</tbody>
</table>

### SPEC CPU®2017 Integer Rate Result

**SPECraté®2017_int_base =** 145  
**SPECraté®2017_int_peak = Not Run**

### Platform Notes (Continued)

<table>
<thead>
<tr>
<th>Socket(s):</th>
<th>2</th>
<th>NUMA node(s):</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vendor ID:</td>
<td>GenuineIntel</td>
<td>CPU family:</td>
<td>6</td>
</tr>
<tr>
<td>Model:</td>
<td>106</td>
<td>Model name:</td>
<td>Intel(R) Xeon(R) Gold 6334 CPU @ 3.60GHz</td>
</tr>
<tr>
<td>Stepping:</td>
<td>6</td>
<td>CPU MHz:</td>
<td>3615.789</td>
</tr>
<tr>
<td>CPU:</td>
<td></td>
<td>BogoMIPS:</td>
<td>7200.00</td>
</tr>
<tr>
<td>Virtualization:</td>
<td>VT-x</td>
<td>L1d cache:</td>
<td>48K</td>
</tr>
<tr>
<td>L1i cache:</td>
<td>32K</td>
<td>L2 cache:</td>
<td>1280K</td>
</tr>
<tr>
<td>NUMA node0 CPU(s):</td>
<td>0-3,16-19</td>
<td>L3 cache:</td>
<td>18432K</td>
</tr>
<tr>
<td>NUMA node1 CPU(s):</td>
<td>4-7,20-23</td>
<td>NUMA node2 CPU(s):</td>
<td>8-11,24-27</td>
</tr>
<tr>
<td>NUMA node3 CPU(s):</td>
<td>12-15,28-31</td>
<td>Flags:</td>
<td>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 pdelgb rdtscp lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmerf pni pclmulqdq dtes64 ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcd pcdi 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_pinn sbbd mba ibrs ibru ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cmqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt xsaves xsaveopaque xgetbv xsaveopt xsave xsaveopt xsaveopt cqm_llc cqm_occupa1 llc cqm_mbb_total cqm_mbb_local split_lock_detect wbnoind vdt dtherm ida arat pln pts avx512vbmi umip pku ospke avx512_vbmi2 gfnl vaes vpcirmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid md_clear pconfig flush_l1d arch_capabilities</td>
</tr>
</tbody>
</table>

/proc/cpuinfo cache data  

cache size : 18432 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 16 17 18 19
node 0 size: 127636 MB
node 0 free: 128372 MB
node 1 cpus: 4 5 6 7 20 21 22 23
node 1 size: 128071 MB
node 1 free: 128285 MB
node 2 cpus: 8 9 10 11 24 25 26 27
node 2 size: 128141 MB
node 2 free: 128780 MB

(Continued on next page)
Lenovo Global Technology
ThinkSystem SD650 V2
(3.60 GHz, Intel Xeon Gold 6334)

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

SPECrater®2017_int_base = 145
SPECrater®2017_int_peak = Not Run

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

Platform Notes (Continued)

node 3 cpus: 12 13 14 15 28 29 30 31
node 3 size: 128163 MB
node 3 free: 128692 MB
node distances:
  node 0 1 2 3
  0: 10 11 20 20
  1: 11 10 20 20
  2: 20 20 10 11
  3: 20 20 11 10

From /proc/meminfo
  MemTotal: 528013500 kB
  HugePages_Total: 0
  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): Not affected
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and

(Continued on next page)
Lenovo Global Technology
ThinkSystem SD650 V2
(3.60 GHz, Intel Xeon Gold 6334)

SPECrater®2017_int_base = 145
SPECrater®2017_int_peak = Not Run

Platform Notes (Continued)

CVE-2017-5753 (Spectre variant 1):
Mitigation: usercopy/swapgs barriers and __user pointer sanitation

CVE-2017-5715 (Spectre variant 2):
Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

CVE-2020-0543 (Special Register Buffer Data Sampling):
Not affected

CVE-2019-11135 (TSX Asynchronous Abort):
Not affected

run-level 3 Jun 22 11:33
SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revB

filesystem     type    size  used  avail  use% mounted on
/dev/sda4      xfs      372G  125G  247G  34% /home

From /sys/devices/virtual/dmi/id
Vendor: Lenovo
Product: ThinkSystem SD650 V2
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:
16x Samsung M393A4K40DB3-CWE 32 GB 2 rank 3200

BIOS:
BIOS Vendor: Lenovo
BIOS Version: U8E111A-1.02
BIOS Date: 05/07/2021
BIOS Revision: 1.2
Firmware Revision: 1.40

(End of data from sysinfo program)

Compiler Version Notes

================================================================================
C       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base)
| 525.x264_r(base) 557.xz_r(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.

(Continued on next page)
## Lenovo Global Technology

**ThinkSystem SD650 V2**  
(3.60 GHz, Intel Xeon Gold 6334)

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base = 145</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate®2017_int_peak = Not Run</td>
</tr>
</tbody>
</table>

### Compiler Version Notes (Continued)

-------------

C++ | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base) 541.leela_r(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 | 548.exchange2_r(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.

-------------

### Base Compiler Invocation

C benchmarks:  
icx

C++ benchmarks:  
icpx

Fortran benchmarks:  
ifort

### Base Portability Flags

500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64  
502.gcc_r: -DSPEC_LP64  
505.mcf_r: -DSPEC_LP64  
520.omnetpp_r: -DSPEC_LP64  
523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX  
525.x264_r: -DSPEC_LP64  
531.deepsjeng_r: -DSPEC_LP64  
541.leela_r: -DSPEC_LP64  
548.exchange2_r: -DSPEC_LP64  
557.zx_r: -DSPEC_LP64
Lenovo Global Technology
ThinkSystem SD650 V2
(3.60 GHz, Intel Xeon Gold 6334)

SPEC®2017 Integer Rate Result
Copyright 2017-2021 Standard Performance Evaluation Corporation

SPECr®2017_int_base = 145
SPECr®2017_int_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology
Test Date: Jun-2021
Hardware Availability: Jul-2021
Tested with SPEC CPU®2017 v1.1.8 on 2021-06-21 23:37:53-0400.
Originally published on 2021-07-20.

Base Optimization Flags

C benchmarks:
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -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
-lqkmalloc

C++ benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -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
-lqkmalloc

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-auto -mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc

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

SPEC CPU and SPECr are registered trademarks of the Standard Performance Evaluation Corporation. All other brand and product names appearing in this result are trademarks or registered trademarks of their respective holders.

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