# Lenovo Global Technology

ThinkSystem SR650 V2  
(2.40 GHz, Intel Xeon Gold 6312U)  

<table>
<thead>
<tr>
<th>SPECrate\textsuperscript{®}2017_int_base = 180</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate\textsuperscript{®}2017_int_peak = Not Run</td>
</tr>
</tbody>
</table>

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

| Copies | 0 | 20.0 | 40.0 | 60.0 | 80.0 | 100 | 115 | 130 | 145 | 160 | 175 | 190 | 205 | 220 | 235 | 250 | 265 | 280 | 295 | 310 | 325 | 340 | 355 | 380 |
|--------|---|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 500.perlbench_r | 48 | | | | | | | | 123 | | | | | | | | | | | | | | | |
| 502.gcc_r | 48 | | | | | | | | 144 | | | | | | | | | | | | | | | |
| 505.mcf_r | 48 | | | | | | | | 120 | | | | | | | | | | | | | | | |
| 520.omnetpp_r | 48 | | | | | | | | 295 | | | | | | | | | | | | | | | |
| 523.xalancbmk_r | 48 | | | | | | | | | | | | | | | | | | | | | |
| 525.x264_r | 48 | | | | | | | | | | | | | | | | | | | | | |
| 531.deepsjeng_r | 48 | | | | | | | | 139 | | | | | | | | | | | | | | | |
| 541.leela_r | 48 | | | | | | | | 136 | | | | | | | | | | | | | | | |
| 548.exchange2_r | 48 | | | | | | | | | | | | | | | | | | | | | |
| 557.xz_r | 48 | | | | | | | | 100 | | | | | | | | | | | | | | | |

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**Hardware**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name:</td>
<td>Intel Xeon Gold 6312U</td>
</tr>
<tr>
<td>Max MHz:</td>
<td>3600</td>
</tr>
<tr>
<td>Nominal:</td>
<td>2400</td>
</tr>
<tr>
<td>Enabled:</td>
<td>24 cores, 1 chip, 2 threads/core</td>
</tr>
<tr>
<td>Orderable:</td>
<td>1 chip</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>
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<tr>
<td>L3:</td>
<td>36 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 2Rx8 PC4-3200AA-R)</td>
</tr>
<tr>
<td>Storage:</td>
<td>1 x 960 GB SATA SSD</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
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</tbody>
</table>

**Software**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>OS:</td>
<td>Red Hat Enterprise Linux 8.3 (Ootpa)</td>
</tr>
<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>No</td>
</tr>
<tr>
<td>Firmware:</td>
<td>Lenovo BIOS Version AFE111A 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>Other:</td>
<td>None</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>

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**Lenovo Global Technology**

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Lenovo Global Technology
ThinkSystem SR650 V2
(2.40 GHz, Intel Xeon Gold 6312U)

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

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>
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<th>Ratio</th>
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<tr>
<td>500.perlbench_r</td>
<td>48</td>
<td>624</td>
<td>122</td>
<td>623</td>
<td>123</td>
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<td>48</td>
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<td>143</td>
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<tr>
<td>505.mcf_r</td>
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<td>541.leela_r</td>
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<td>48</td>
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<td>557.xz_r</td>
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<td></td>
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</tr>
</tbody>
</table>

SPECrates®2017_int_base = 180
SPECrates®2017_int_peak = Not Run

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 = 
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

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR650 V2
(2.40 GHz, Intel Xeon Gold 6312U)

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

CPU2017 Integer Rate Result

SPECrate®2017_int_base = 180
SPECrate®2017_int_peak = Not Run

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

General Notes (Continued)

runcpu command invoked through numactl i.e.:
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 Legacy
Adjacent Cache Prefetch set to Disabled
DCU Streamer Prefetcher set to Disabled
SNC set to Enabled

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revB/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aca6c64d
running on localhost.localdomain Fri Jun 25 18:29:09 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 6312U CPU @ 2.40GHz
  1 "physical id"s (chips)
  48 "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 : 24
  siblings : 48
  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

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): 48
On-line CPU(s) list: 0-47
Thread(s) per core: 2
Core(s) per socket: 24
Socket(s): 1
NUMA node(s): 2

(Continued on next page)
Platform Notes (Continued)

Vendor ID:           GenuineIntel
CPU family:          6
Model:               106
Model name:          Intel(R) Xeon(R) Gold 6312U CPU @ 2.40GHz
Stepping:            6
CPU MHz:             3195.678
BogoMIPS:            4800.00
Virtualization:      VT-x
L1d cache:           48K
L1i cache:           32K
L2 cache:            1280K
L3 cache:            36864K
NUMA node0 CPU(s):   0-11,24-35
NUMA node1 CPU(s):   12-23,36-47
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 pdpe1gb
                     rdtscp lm constant_tsc art arch_perfmon pebs bts rep_good ntop xtopology
                     nonstop_tsc cpuid pml4 deaf pmxs 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_ppln ssbd mba
                     ibrs ibp spmib enhanced_tpr_shadow vnmi flexpriority ept
                     vpid fsgsbase tsc_adjust bmid hle avx2 smep bmi2 erms invpcid cmq rdt_a
                     avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt
                     avx512cd sha ni
                     avx512bw avx512vl raeveopt xsaves xgetbv1 xsaveav cqm llvm cqm_occup_1l
                     cqm_mbb_mof cqm_mbb_local split_lock_detect wbinvd dtherm ida arat pni
                     pts avx512vbmi umip kpu ospe avx512_vbmi2 gfnl vaes vpclmulqd avx512
                     vnni avx512_bitalg tme
                     avx512_vpopcntdq la57 rdpid md_clear pconfig flush_lid arch_capabilities

/proc/cpuinfo cache data
  cache size : 36864 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 24 25 26 27 28 29 30 31 32 33 34 35
  node 0 size: 248387 MB
  node 0 free: 256997 MB
  node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23 36 37 38 39 40 41 42 43 44
  node 1 size: 248576 MB
  node 1 free: 257482 MB
  node distances:
    node 0 1
    0: 10 11
    1: 11 10

From /proc/meminfo
  MemTotal: 528010708 kB

(Continued on next page)
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SPECrate®2017_int_base = 180
SPECrate®2017_int_peak = Not Run

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

Platform Notes (Continued)

HugePages_Total:       0
Hugepagesize:        2048 kB

/sbin/tuned-adm active
Current active profile: throughput-performance

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 seccomp
CVE-2017-5753 (Spectre variant 1):
Mitigation: usercopy/swaps barriers and __user pointer sanitization
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 25 18:28

SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revB
Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sdb4      xfs   819G  268G  551G  33% /home

(Continued on next page)
Lenovo Global Technology
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CPU2017 License: 9017
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Test Date: Jun-2021
Hardware Availability: Jul-2021
Tested by: Lenovo Global Technology
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:
16x NO DIMM NO DIMM
16x Samsung M393A4G43AB3-CWE 32 GB 2 rank 3200

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 | 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.
==============================================================================
C++ | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base) 541.last_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)
==============================================================================
(Continued on next page)
Lenovo Global Technology

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

SPECratenumber = 180
SPECratenumber = Not Run

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.xz_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math
-ffltol -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
-1qkmalloc

C++ benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4

(Continued on next page)
## Lenovo Global Technology

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<th>SPECrate®2017_int_base</th>
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</tbody>
</table>

**CPU2017 License:** 9017  
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**Base Optimization Flags (Continued)**

C++ benchmarks (continued):
```
-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:


You can also download the XML flags sources by saving the following links:


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

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