**Lenovo Global Technology**  
**ThinkSystem ST650 V2**  
(2.20 GHz, Intel Xeon Gold 6330N)

**Copyright 2017-2021 Standard Performance Evaluation Corporation**

**Lenovo Global Technology**  
**ThinkSystem ST650 V2**  
(2.20 GHz, Intel Xeon Gold 6330N)

**SPECrate®2017_int_base** = 358

**SPECrate®2017_int_peak** = Not Run

---

<table>
<thead>
<tr>
<th>Copies</th>
<th>SPECrate®2017_int_base (358)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perbench_r</td>
<td>112</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>286</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>592</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>232</td>
</tr>
<tr>
<td>523.xalancbmk_r</td>
<td>448</td>
</tr>
<tr>
<td>525.x264_r</td>
<td>739</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
<td>272</td>
</tr>
<tr>
<td>541.leela_r</td>
<td>266</td>
</tr>
<tr>
<td>548.exchange2_r</td>
<td>732</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>204</td>
</tr>
</tbody>
</table>

---

### Hardware

**CPU Name:** Intel Xeon Gold 6330N  
**Max MHz:** 3400  
**Nominal:** 2200  
**Enabled:** 56 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:** 42 MB I+D on chip per chip  
**Other:** None  
**Memory:** 1 TB (32 x 32 GB 2Rx8 PC4-3200AA-R, running at 2666)  
**Storage:** 1 x 960 GB SATA SSD  
**Other:** None

### Software

**OS:** Red Hat Enterprise Linux 8.3  
(Ootpa)  
**Kernel 4.18.0-240.el8.x86_64**  
**Compiler:** 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;  
**C/C++:** Version 2021.1 of Intel C/C++ Compiler Classic Build 20201112 for Linux  
**Parallel:** No  
**Firmware:** Lenovo BIOS Version U8E109PT1 1.01 released Apr-2021  
**File System:** xfs  
**System State:** Run level 3 (multi-user)  
**Base Pointers:** 64-bit  
**Peak Pointers:** Not Applicable  
**Other:** None  
**Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage
Lenovo Global Technology
ThinkSystem ST650 V2
(2.20 GHz, Intel Xeon Gold 6330N)

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>112</td>
<td>728</td>
<td>245</td>
<td>728</td>
<td>245</td>
<td>728</td>
<td>245</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>112</td>
<td>554</td>
<td>286</td>
<td>555</td>
<td>286</td>
<td>557</td>
<td>285</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>112</td>
<td>307</td>
<td>590</td>
<td>306</td>
<td>592</td>
<td>306</td>
<td>592</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>112</td>
<td>635</td>
<td>231</td>
<td>634</td>
<td>232</td>
<td>634</td>
<td>232</td>
</tr>
<tr>
<td>523.xalanbmk_r</td>
<td>112</td>
<td>264</td>
<td>448</td>
<td>264</td>
<td>448</td>
<td>264</td>
<td>447</td>
</tr>
<tr>
<td>525.x264_r</td>
<td>112</td>
<td>266</td>
<td>738</td>
<td>265</td>
<td>739</td>
<td>265</td>
<td>739</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
<td>112</td>
<td>472</td>
<td>272</td>
<td>472</td>
<td>272</td>
<td>472</td>
<td>272</td>
</tr>
<tr>
<td>541.leela_r</td>
<td>112</td>
<td>698</td>
<td>266</td>
<td>698</td>
<td>266</td>
<td>698</td>
<td>266</td>
</tr>
<tr>
<td>548.exchange2_r</td>
<td>112</td>
<td>400</td>
<td>733</td>
<td>404</td>
<td>727</td>
<td>401</td>
<td>732</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>112</td>
<td>594</td>
<td>204</td>
<td>594</td>
<td>204</td>
<td>595</td>
<td>203</td>
</tr>
</tbody>
</table>

SPECrate®2017_int_base = 358
SPECrate®2017_int_peak = Not Run

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 = "/home/cpu2017-1.1.5-ic2021.1-revB/lib/intel64:/home/cpu2017-1.1.5-ic2021.1-revB/lib/ia32:/home/cpu2017-1.1.5-ic2021.1-revB/je5.0.1-32"
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)
SPEC CPU®2017 Integer Rate Result
Copyright 2017-2021 Standard Performance Evaluation Corporation

Lenovo Global Technology
ThinkSystem ST650 V2
(2.20 GHz, Intel Xeon Gold 6330N)

SPECrater®2017_int_base = 358
SPECrater®2017_int_peak = Not Run

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
DCU Streamer Prefetcher set to Disabled
SNC set to Enabled
UPI Link Disable set to Disabled 1 Link

Sysinfo program /home/cpu2017-1.1.5-ic2021.1-revB/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost.localdomain Thu May 20 00:28:54 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 6330N CPU @ 2.20GHz
  2 "physical id"s (chips)
  112 "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 : 56
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): 112
On-line CPU(s) list: 0-111
Thread(s) per core: 2
Core(s) per socket: 28

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST650 V2
(2.20 GHz, Intel Xeon Gold 6330N)

SPECrate®2017_int_base = 358
SPECrate®2017_int_peak = Not Run

Platform Notes (Continued)

Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Gold 6330N CPU @ 2.20GHz
Stepping: 6
CPU MHz: 2599.913
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 43008K
NUMA node0 CPU(s): 0-13,56-69
NUMA node1 CPU(s): 14-27,70-83
NUMA node2 CPU(s): 28-41,84-97
NUMA node3 CPU(s): 42-55,98-111
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 nopl xtopology nonstop_tsc cpuid aperf perfctr pni pclmulqdq dtes64 aes 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 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single intel_pdpin ssbd mba ibrs ibrs_enabled ibrs ibm ssm mtrr ms rdtscp msr aarch64 fpagrange vmpid vsnmi fmarith idt_dta idt_tsa ivtsel tm tsc_couple smep bmi1 bmi2 erms invpcid cqm rdtscp clflushopt clwb intel_pstate NODE local apicbfa abm ms rdtscp msr aarch64 fpagrange vmpid vsnmi fmarith idt_dta idt_tsa ivtsel tm tsc_couple smep bmi1 bmi2 erms invpcid cqm rdtscp clflushopt clwb intel_pstate NODE local apicbfa

cache size : 43008 KB

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

/proc/cpuinfo cache data

81 82 83
node 1 size: 252657 MB
node 1 free: 257575 MB
node 2 cpus: 28 29 30 31 32 33 34 35 36 37 38 39 40 41 84 85 86 87 88 89 90 91 92 93 94 95 96 97

(Continued on next page)
Platform Notes (Continued)

node 2 size: 252647 MB
node 2 free: 257794 MB
node 3 cpus: 42 43 44 45 46 47 48 49 50 51 52 53 54 55 98 99 100 101 102 103 104 105
106 107 108 109 110 111
node 3 size: 253081 MB
node 3 free: 257694 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:       1056477680 kB
HugePages_Total:       0
Hugepagesize:       2048 kB
/sbin/tuned-adm active
Current active profile: balanced

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
Lenovo Global Technology
ThinkSystem ST650 V2
(2.20 GHz, Intel Xeon Gold 6330N)

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

SPECrate®2017_int_base = 358
SPECrate®2017_int_peak = Not Run

Test Date: May-2021
Hardware Availability: Jul-2021
Software Availability: Feb-2021

Platform Notes (Continued)

CVE-2017-5753 (Spectre variant 1):
Mitigation: seccomp
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 May 20 00:27

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

Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sda4      xfs   818G   89G  729G  11% /home

From /sys/devices/virtual/dmi/id
Vendor:         Lenovo
Product:        ThinkSystem ST650V2
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:
32x Samsung M393A4G43AB3-CWE 32 GB 2 rank 3200, configured at 2666

BIOS:
BIOS Vendor:       Lenovo
BIOS Version:      U8E109PT1-1.01
BIOS Date:         04/28/2021
BIOS Revision:     1.1
Firmware Revision: 1.20

(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

### Test Details

<table>
<thead>
<tr>
<th>Specification</th>
<th>Lenovo Global Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU2017 License</td>
<td>9017</td>
</tr>
<tr>
<td>Test Sponsor</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Tested by</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Test Date</td>
<td>May-2021</td>
</tr>
<tr>
<td>Hardware Availability</td>
<td>Jul-2021</td>
</tr>
<tr>
<td>Software Availability</td>
<td>Feb-2021</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.xz_r: -DSPEC_LP64
```
## Lenovo Global Technology

ThinkSystem ST650 V2  
(2.20 GHz, Intel Xeon Gold 6330N)  

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

### SPECrate®2017_int_base = 358

### SPECrate®2017_int_peak = Not Run

---

### 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:


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)

---

SPEC CPU and SPECrate 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.

Tested with SPEC CPU®2017 v1.1.5 on 2021-05-19 12:28:54-0400.  
Report generated on 2021-06-08 20:03:48 by CPU2017 PDF formatter v6442.  
Originally published on 2021-06-08.