## Lenovo Global Technology

ThinkSystem ST650 V2  
(3.10 GHz, Intel Xeon Gold 6346)

<table>
<thead>
<tr>
<th>Copies</th>
<th>SPECrate®2017_int_base = 280</th>
</tr>
</thead>
<tbody>
<tr>
<td>500isperbench_r</td>
<td>64</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>64</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>64</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>64</td>
</tr>
<tr>
<td>523.xalancbmk_r</td>
<td>64</td>
</tr>
<tr>
<td>525.x264_r</td>
<td>64</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
<td>64</td>
</tr>
<tr>
<td>541.leela_r</td>
<td>64</td>
</tr>
<tr>
<td>548.exchange2_r</td>
<td>64</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>64</td>
</tr>
</tbody>
</table>

**Hardware**

- **CPU Name:** Intel Xeon Gold 6346
- **Max MHz:** 3600
- **Nominal:** 3100
- **Enabled:** 32 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:** 36 MB I+D on chip per chip
- **Other:** None
- **Memory:** 1 TB (32 x 32 GB 2Rx8 PC4-3200AA-R)
- **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
(3.10 GHz, Intel Xeon Gold 6346)

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

SPECrate®2017_int_base = 280
SPECrate®2017_int_peak = Not Run

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>64</td>
<td>537</td>
<td>190</td>
<td>538</td>
<td>189</td>
<td>537</td>
<td>538</td>
<td>189</td>
<td>537</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>64</td>
<td>385</td>
<td>235</td>
<td>385</td>
<td>235</td>
<td>385</td>
<td>385</td>
<td>235</td>
<td>385</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>64</td>
<td>223</td>
<td>463</td>
<td>222</td>
<td>466</td>
<td>220</td>
<td>466</td>
<td>220</td>
<td>469</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>64</td>
<td>188</td>
<td>360</td>
<td>188</td>
<td>360</td>
<td>188</td>
<td>188</td>
<td>360</td>
<td>188</td>
</tr>
<tr>
<td>523.xalancbmk_r</td>
<td>64</td>
<td>196</td>
<td>570</td>
<td>196</td>
<td>571</td>
<td>196</td>
<td>196</td>
<td>571</td>
<td>196</td>
</tr>
<tr>
<td>525.x264_r</td>
<td>64</td>
<td>192</td>
<td>575</td>
<td>192</td>
<td>575</td>
<td>192</td>
<td>292</td>
<td>575</td>
<td>292</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
<td>64</td>
<td>344</td>
<td>213</td>
<td>344</td>
<td>213</td>
<td>344</td>
<td>345</td>
<td>213</td>
<td>345</td>
</tr>
<tr>
<td>541.leela_r</td>
<td>64</td>
<td>506</td>
<td>209</td>
<td>506</td>
<td>209</td>
<td>507</td>
<td>507</td>
<td>209</td>
<td>507</td>
</tr>
<tr>
<td>548.exchange2_r</td>
<td>64</td>
<td>292</td>
<td>575</td>
<td>291</td>
<td>576</td>
<td>292</td>
<td>292</td>
<td>575</td>
<td>292</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>64</td>
<td>452</td>
<td>153</td>
<td>452</td>
<td>153</td>
<td>452</td>
<td>452</td>
<td>153</td>
<td>452</td>
</tr>
</tbody>
</table>

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/jre5.0.1-32"
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)
## 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
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 Jun  3 17:37:18 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 6346 CPU @ 3.10GHz
  2  "physical id"s (chips)
  64 "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 : 16
  siblings : 32
  physical 0 : cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
  physical 1 : cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
```

### From lscpu:
```
Architecture:        x86_64
CPU op-mode(s):      32-bit, 64-bit
Byte Order:          Little Endian
CPU(s):              64
On-line CPU(s) list: 0-63
Thread(s) per core:  2
Core(s) per socket:  16
Socket(s):           2
NUMA node(s):        4
Vendor ID:           GenuineIntel
```

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST650 V2
(3.10 GHz, Intel Xeon Gold 6346)

SPECrates®2017_int_base = 280
SPECrates®2017_int_peak = Not Run

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

CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Gold 6346 CPU @ 3.10GHz
Stepping: 6
CPU MHz: 3600.000
BogoMIPS: 6200.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 36864K
NUMA node0 CPU(s): 0-7,32-39
NUMA node1 CPU(s): 8-15,40-47
NUMA node2 CPU(s): 16-23,48-55
NUMA node3 CPU(s): 24-31,56-63

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 arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aarch64 kclflush dtes64 ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm
pcid dca sse4_1_p sse4_1_l ssse3 sse3 sse3d fma cx16 xtpr pdcm

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 arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aarch64 kclflush dtes64 ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm
pcid dca sse4_1_p sse4_1_l ssse3 sse3 sse3d fma cx16 xtpr pdcm

Platform Notes (Continued)

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 2 3 4 5 6 7 32 33 34 35 36 37 38 39
Node 0 size: 252959 MB
Node 0 free: 257265 MB
Node 1 cpus: 8 9 10 11 12 13 14 15 40 41 42 43 44 45 46 47
Node 1 size: 252831 MB
Node 1 free: 257618 MB
Node 2 cpus: 16 17 18 19 20 21 22 23 48 49 50 51 52 53 54 55
Node 2 size: 253683 MB
Node 2 free: 257644 MB
Node 3 cpus: 24 25 26 27 28 29 30 31 56 57 58 59 60 61 62 63
Node 3 size: 253803 MB
Node 3 free: 257749 MB

(Continued on next page)
SPEC CPU®2017 Integer Rate Result
Copyright 2017-2021 Standard Performance Evaluation Corporation

Lenovo Global Technology
ThinkSystem ST650 V2
(3.10 GHz, Intel Xeon Gold 6346)

SPECRate®2017_int_base = 280
SPECRate®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
Software Availability: Feb-2021

Platform Notes (Continued)

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: 1056488064 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

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

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

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

(Continued on next page)
SPEC CPU®2017 Integer Rate Result

Lenovo Global Technology
ThinkSystem ST650 V2
(3.10 GHz, Intel Xeon Gold 6346)

SPECrate®2017_int_base = 280
SPECrate®2017_int_peak = Not Run

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

Platform Notes (Continued)

CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Jun 3 17:35

SPEC is set to: /home/cpu2017-1.1.5-ic2021.1-revB
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 818G 50G 768G 7% /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

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.

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

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

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

<table>
<thead>
<tr>
<th>Benchmark Type</th>
<th>Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>C benchmarks</td>
<td>icx</td>
</tr>
<tr>
<td>C++ benchmarks</td>
<td>icpx</td>
</tr>
<tr>
<td>Fortran benchmarks</td>
<td>ifort</td>
</tr>
</tbody>
</table>

## Base Portability Flags

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>-DSPEC_LP64 -DSPEC_LINUX_X64</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>523.xalancbmk_r</td>
<td>-DSPEC_LP64 -DSPEC_LINUX</td>
</tr>
<tr>
<td>525.x264_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>541.leela_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>548.exchange2_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>-DSPEC_LP64</td>
</tr>
</tbody>
</table>

## Base Optimization Flags

<table>
<thead>
<tr>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math</td>
</tr>
</tbody>
</table>

(Continued on next page)
## Lenovo Global Technology

**ThinkSystem ST650 V2**

(3.10 GHz, Intel Xeon Gold 6346)

### SPEC CPU®2017 Integer Rate Result

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>9017</th>
</tr>
</thead>
<tbody>
<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>Jun-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>

**SPECrate®2017_int_base = 280**

**SPECrate®2017_int_peak = Not Run**

---

### Base Optimization Flags (Continued)

**C benchmarks (continued):**
- `-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 2021-06-03 05:37:17-0400.

Report generated on 2021-06-22 17:05:03 by CPU2017 PDF formatter v6442.

Originally published on 2021-06-22.