# SPEC CPU® 2017 Integer Rate Result

Lenovo Global Technology  
ThinkSystem ST50 V2  
(2.80 GHz, Intel Xeon E-2378G)

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>9017</th>
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<td>Lenovo Global Technology</td>
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<tr>
<td>Tested by:</td>
<td>Lenovo Global Technology</td>
</tr>
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<td>Test Date:</td>
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**SPECrate**

- SPECrate®2017_int_base = 65.4
- SPECrate®2017_int_peak = 68.5

---

### Hardware

<table>
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<tr>
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<th>SPECrate®2017_int_peak (68.5)</th>
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<td>16</td>
<td>47.5</td>
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<td>502.gcc_r</td>
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<tr>
<td>505.mcf_r</td>
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<tr>
<td>520.omnetpp_r</td>
<td>16</td>
<td>33.7</td>
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<tr>
<td>523.xalancbmk_r</td>
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<td>84.2</td>
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<td>525.x264_r</td>
<td>16</td>
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<tr>
<td>531.deepsjeng_r</td>
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<td>541.leela_r</td>
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<td>148</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>16</td>
<td>37.9</td>
</tr>
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</table>

**OS:** Red Hat Enterprise Linux 8.4 (Ootpa)  
**Kernel:** 4.18.0-305.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 TOE101Q released Mar-2022  
**File System:** xfs  
**System State:** Run level 3 (multi-user)  
**Base Pointers:** 64-bit  
**Peak Pointers:** 32/64-bit  
**Other:** jemalloc memory allocator V5.0.1  
**Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage  

---

<table>
<thead>
<tr>
<th>CPU Name:</th>
<th>Intel Xeon E-2378G</th>
</tr>
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<tbody>
<tr>
<td>Max MHz:</td>
<td>5100</td>
</tr>
<tr>
<td>Nominal:</td>
<td>2800</td>
</tr>
<tr>
<td>Enabled:</td>
<td>8 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>512 KB I+D on chip per core</td>
</tr>
<tr>
<td>L3:</td>
<td>16 MB I+D on chip per chip</td>
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<tr>
<td>Other:</td>
<td>None</td>
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<tr>
<td>Memory:</td>
<td>64 GB (4 x 16 GB 2Rx8 PC4-3200AA-E, running at 2933)</td>
</tr>
<tr>
<td>Storage:</td>
<td>1 x 960 GB SATA SSD</td>
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<td>Other:</td>
<td>None</td>
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**Lenovo Global Technology**

ThinkSystem ST50 V2
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**SPECrate®2017_int_base = 65.4**

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---

**Results Table**

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<td>84.3</td>
<td>201</td>
<td>84.0</td>
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<td>455</td>
<td>38.0</td>
<td>457</td>
<td>37.8</td>
</tr>
</tbody>
</table>

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**Submit Notes**

The taskset mechanism was used to bind copies to processors. The config file option 'submit' was used to generate taskset 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
```

NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)

(Continued on next page)
Lenovo Global Technology
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SPEC CPU®2017 Integer Rate Result
Copyright 2017-2022 Standard Performance Evaluation Corporation

SPECrate®2017_int_base = 65.4
SPECrate®2017_int_peak = 68.5

General Notes (Continued)

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.
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:
C State Support set to C1C3C6

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revB/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on localhost.localdomain Wed May 18 18:54:56 2022

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) E-2378G CPU @ 2.80GHz
     1 "physical id"s (chips)
     16 "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

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):             16
On-line CPU(s) list: 0-15
Thread(s) per core: 2
Core(s) per socket: 8
Socket(s):          1
NUMA node(s):       1
Vendor ID:           GenuineIntel
BIOS Vendor ID:      Intel(R) Corporation
CPU family:         6
Model:              167

(Continued on next page)
### Lenovo Global Technology

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#### SPEC CPU 2017 Integer Rate Result

**SPECrate®2017_int_base = 65.4**

**SPECrate®2017_int_peak = 68.5**

---

#### Platform Notes (Continued)

- **Model name:** Intel(R) Xeon(R) E-2378G CPU @ 2.80GHz
- **BIOS Model name:** Intel(R) Xeon(R) E-2378G CPU @ 2.80GHz
- **Stepping:** 1
- **CPU MHz:** 4866.135
- **CPU max MHz:** 5100.0000
- **CPU min MHz:** 800.0000
- **BogoMIPS:** 5616.00
- **Virtualization:** VT-x
- **L1d cache:** 48K
- **L1i cache:** 32K
- **L2 cache:** 512K
- **L3 cache:** 16384K
- **NUMA node0 CPU(s):** 0-15

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 art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
- aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3
- sdbg fma cx16 xtpr pdcm pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer
- aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb invpcid_single
- ssbd ibrs ibpb stibp ibrs_enabled tpr_shadow vmmi flexpriority ept vpid ept_ad
- fsgsbase tsc_adjust bmi1 avx2 smep bmi2 erms invpcid mpx avx512f avx512dq rdseed adx
- smap avx512ifma clflushopt intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt
- xsaves xsavec xsaveopt xsaveprec dtherm ida arat pln pts hwp hwp_notify hwp_act_window hwp_epp
- hwp_pkg_req avx512vmbi umip pku ospke avx512_vmbi2 gfn vaes vpclmulqdq avx512_vnni
- avx512_bitalg avx512_vpopcntdq rdpid fsrmd_clear flush_l1d arch_capabilities

```
/proc/cpuinfo cache data
  cache size : 16384 KB

From numactl --hardware
WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 1 nodes (0)
  node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
  node 0 size: 63965 MB
  node 0 free: 61358 MB
  node distances:
    node 0
  0: 10

From /proc/meminfo
  MemTotal: 65500864 KB
  HugePages_Total: 0
  Hugepagesize: 2048 KB
```

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

(Continued on next page)
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SPECrate®2017_int_peak = 68.5
SPECrate®2017_int_base = 65.4

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Test Date: May-2022
Hardware Availability: Apr-2022
Software Availability: May-2021

Platform Notes (Continued)

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
performance

/usr/bin/lsb_release -d
Red Hat Enterprise Linux release 8.4 (Ootpa)

From /etc/*release* /etc/*version*
  os-release:
    NAME="Red Hat Enterprise Linux"
    VERSION="8.4 (Ootpa)"
    ID="rhel"
    ID_LIKE="fedora"
    VERSION_ID="8.4"
    PLATFORM_ID="platform:el8"
    PRETTY_NAME="Red Hat Enterprise Linux 8.4 (Ootpa)"
    ANSI_COLOR="0;31"

redhat-release: Red Hat Enterprise Linux release 8.4 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.4 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.4:ga

uname -a:
   Linux localhost.localdomain 4.18.0-305.el8.x86_64 #1 SMP Thu Apr 29 08:54:30 EDT 2021
   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 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 18 10:02

SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revB
  Filesystem Type Size Used Avail Use% Mounted on
  /dev/mapper/rhel-root xfs 889G 24G 865G 3% /

(Continued on next page)
### Lenovo Global Technology

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### Platform Notes (Continued)

From /sys/devices/virtual/dmi/id  
Vendor:         LENOVO  
Product:        7D8JCT01WW  
Product Family: Lenovo Product  
Serial:         J300ST50V2

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:**
- 4x Samsung M391A2K43DB1-CWE 16 GB 2 rank 3200, configured at 2933

**BIOS:**
- BIOS Vendor:       LENOVO
- BIOS Version:      TOE101Q
- BIOS Date:         03/16/2022
- BIOS Revision:     1.41
- Firmware Revision: 1.1

(End of data from sysinfo program)

### Compiler Version Notes

```
C | 500.perlbench_r(peak) 557.xz_r(peak)
```

Intel(R) C 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.

```
C | 502.gcc_r(peak)
```

Intel(R) oneAPI DPC+/C++ Compiler for applications running on IA-32, Version 2021.1 Build 20201113  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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

Intel(R) oneAPI DPC+/C++ Compiler for applications running on Intel(R) 64,  
Version 2021.1 Build 20201113

(Continued on next page)
### Lenovo Global Technology

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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.

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

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, peak)
==============================================================================

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

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Base Portability Flags (Continued)

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-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
-lqkmalloc

C++ benchmarks:
-w -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
-lqkmalloc

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX2 -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

Peak Compiler Invocation

C benchmarks (except as noted below):
icx

500.perlbench_r: icc
557.xz_r: icc

C++ benchmarks:
icpx

Fortran benchmarks:
ifort
Lenovo Global Technology
ThinkSystem ST50 V2
(2.80 GHz, Intel Xeon E-2378G)

SPECrate® 2017_int_base = 65.4
SPECrate® 2017_int_peak = 68.5

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

Test Date: May-2022
Hardware Availability: Apr-2022
Software Availability: May-2021

Peak Portability Flags

500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
502.gcc_r: -D_FILE_OFFSET_BITS=64
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

Peak Optimization Flags

C benchmarks:
500.perlbench_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
-xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -fno-strict-overflow
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-1qkmalloc

502.gcc_r: -m32
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/ia32_lin
-std=gnu89 -Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2 -flto
-Ofast(pass 1) -O3 -ffast-math -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc32-5.0.1/lib -1jemalloc

505.mcf_r: basepeak = yes

525.x264_r: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX2 -flto -O3
-ffast-math -qopt-mem-layout-trans=4 -fno-alias
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-1qkmalloc

557.xz_r: -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-1qkmalloc

(Continued on next page)
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Peak Optimization Flags (Continued)

C++ benchmarks:

520.omnetpp_r: basepeak = yes
523.xalancbmk_r: basepeak = yes
531.deepsjeng_r: basepeak = yes
541.leela_r: basepeak = yes

Fortran benchmarks:

548.exchange2_r: basepeak = yes

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

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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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