# SPEC CPU®2017 Integer Rate Result

**Lenovo Global Technology**  
**ThinkSystem SR250 V2**  
(3.20 GHz, Intel Xeon E-2388G)  

<table>
<thead>
<tr>
<th>Test Sponsor</th>
<th>Lenovo Global Technology</th>
<th>CPU2017 License:</th>
<th>9017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested by</td>
<td>Lenovo Global Technology</td>
<td>Test Date:</td>
<td>Feb-2022</td>
</tr>
<tr>
<td>Hardware Availability:</td>
<td>Apr-2022</td>
<td>Software Availability:</td>
<td>May-2021</td>
</tr>
</tbody>
</table>

## SPECrate®2017 int base = 69.9

## SPECrate®2017 int peak = 73.2

<table>
<thead>
<tr>
<th>SPECrate®2017 int peak (73.2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate®2017 int base (69.9)</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** Intel Xeon E-2388G  
- **Max MHz:** 5100  
- **Nominal:** 3200  
- **Enabled:** 8 cores, 1 chip, 2 threads/core  
- **Orderable:** 1 chip  
- **Cache L1:** 32 KB I + 48 KB D on chip per core  
- **L2:** 512 KB I+D on chip per core  
- **L3:** 16 MB I+D on chip per chip  
- **Memory:** 64 GB (4 x 16 GB 2Rx8 PC4-3200AA-E, running at 2933)  
- **Storage:** 1 x 960 GB SATA SSD  
- **Other:** None

### Software

- **OS:** Red Hat Enterprise Linux release 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 TQE101Q 1.00 released Dec-2021  
- **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

---

**500.perlbench_r**  
- 16 copies  
- SPECrate®2017 int peak = 73.2

**502.gcc_r**  
- 16 copies  
- SPECrate®2017 int base = 69.9

**505.mcf_r**  
- 16 copies

**520.omnetpp_r**  
- 16 copies  
- SPECrate®2017 int peak = 73.2

**523.xalancbmk_r**  
- 16 copies  
- SPECrate®2017 int base = 69.9

**525.x264_r**  
- 16 copies

**531.deepsjeng_r**  
- 16 copies  
- SPECrate®2017 int peak = 73.2

**541.leela_r**  
- 16 copies  
- SPECrate®2017 int base = 69.9

**548.exchange2_r**  
- 16 copies

**557.xz_r**  
- 16 copies  
- SPECrate®2017 int base = 69.9

---

**515.5**  
- SPECrate®2017 int peak = 73.2

**108**  
- SPECrate®2017 int base = 69.9

**34.3**  
- SPECrate®2017 int base = 69.9

**91.0**  
- SPECrate®2017 int peak = 73.2

**159**  
- SPECrate®2017 int peak = 73.2

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**51.5**  
- SPECrate®2017 int peak = 73.2

**46.3**  
- SPECrate®2017 int base = 69.9

**59.7**  
- SPECrate®2017 int base = 69.9

**40.8**  
- SPECrate®2017 int base = 69.9

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**80.0**  
- SPECrate®2017 int peak = 73.2

**110**  
- SPECrate®2017 int base = 69.9

**140**  
- SPECrate®2017 int peak = 73.2

**170**  
- SPECrate®2017 int base = 69.9

---

**55.8**  
- SPECrate®2017 int peak = 73.2

**59.7**  
- SPECrate®2017 int base = 69.9

---

**54.8**  
- SPECrate®2017 int peak = 73.2

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**53.1**  
- SPECrate®2017 int peak = 73.2

**58.2**  
- SPECrate®2017 int base = 69.9

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**53.0**  
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**52.3**  
- SPECrate®2017 int base = 69.9

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**51.9**  
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**51.7**  
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**50.9**  
- SPECrate®2017 int base = 69.9
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Lenovo Global Technology
ThinkSystem SR250 V2
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SPECrate®2017_int_base = 69.9
SPECrate®2017_int_peak = 73.2

Results Table

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<td>40.7</td>
</tr>
</tbody>
</table>

SPECrate®2017_int_base = 69.9
SPECrate®2017_int_peak = 73.2

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

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 =
MALLOCONF = "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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<tr>
<th>SPECrate®2017_int_base</th>
<th>Test Date:</th>
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<tr>
<td>SPECrate®2017_int_peak</td>
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**CPU2017 License:** 9017
**Test Sponsor:** Lenovo Global Technology
**Tested by:** Lenovo Global Technology

---

**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.

---

**Platform Notes**

BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
CPU P-state Control set to Cooperative without Legacy

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revb/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d running on localhost.localdomain Thu Feb 10 00:23:27 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-2388G CPU @ 3.20GHz
  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

(Continued on next page)
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Software Availability: May-2021

Platform Notes (Continued)

Model: 167
Model name: Intel(R) Xeon(R) E-2388G CPU @ 3.20GHz
BIOS Model name: Intel(R) Xeon(R) E-2388G CPU @ 3.20GHz
Stepping: 1
CPU MHz: 4565.413
CPU max MHz: 5100.0000
CPU min MHz: 800.0000
BogoMIPS: 6384.00
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 arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmpref tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtrm pclid 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 vnumi flexpriority ept vpid ept_ad
fs.gsbase tsc_adjust bmi1 avx2 smep bmi2  erms invpcid mxp avx512f avx512dq rdseed adx
smap avx512ifma clflushopt intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt
xsave xstate xsaves dtherm ida arat pln pts hwp hwp_notify hwp_act_window hwp_epp
hwp_pkg_req avx512vbm1 umip pkru ospe avx512_vbmi2 gfni vaes vpcmldqd avx512_vnni
avx512_bitalg avx512_vpopcntdq rdpid fsrm md_clear flush_l1d arch_capabilities

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: 64325 MB
node 0 free: 63609 MB
node distances:
node 0
0: 10

From /proc/meminfo
MemTotal: 65868960 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

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

(Continued on next page)
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</tr>
</tbody>
</table>

## Platform Notes (Continued)

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

From /etc/*release* /etc/*version*  
```bash
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
```

```bash
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 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 Feb 10 00:20

SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revB

```
<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
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<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
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</thead>
<tbody>
<tr>
<td>/dev/sda4</td>
<td>xfs</td>
<td>790G</td>
<td>103G</td>
<td>688G</td>
<td>13%</td>
<td>/home</td>
</tr>
</tbody>
</table>
```

From /sys/devices/virtual/dmi/id  
Vendor: Lenovo

(Continued on next page)
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Platform Notes (Continued)

Product: ThinkSystem SR250 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:
4x SK Hynix HMA82GU7DJR8N-XN 16 GB 2 rank 3200, configured at 2933

BIOS:
BIOS Vendor: Lenovo
BIOS Version: TQE101Q-1.00
BIOS Date: 12/29/2021
BIOS Revision: 1.0
Firmware Revision: 0.90

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C   | 500.perlbench_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, peak)
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
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SPECrates

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Compiler Version Notes (Continued)

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C      | 502.gcc_r(peak)
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SPEC CPU®2017 Integer Rate Result

Copyright 2017-2022 Standard Performance Evaluation Corporation

Lenovo Global Technology

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Compiler Version Notes (Continued)

Version 2021.1 Build 20201113
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C++

520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak)
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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.

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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.

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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

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

**Lenovo Global Technology**  
ThinkSystem SR250 V2  
(3.20 GHz, Intel Xeon E-2388G)

**SPECrate®2017_int_base** = 69.9  
**SPECrate®2017_int_peak** = 73.2

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<tr>
<th>CPU2017 License: 9017</th>
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<td>Software Availability: May-2021</td>
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</table>

### Base Portability Flags (Continued)

557.xz_r: -DSPEC_LP64

### 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`

### Peak Compiler Invocation

**C benchmarks (except as noted below):**
- `icx`
  
500.perlbench_r: `icc`

**C++ benchmarks:**
- `icpx`

**Fortran benchmarks:**
- `ifort`
## Lenovo Global Technology

**ThinkSystem SR250 V2**  
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### SPEC CPU 2017 Integer Rate Result

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<tr>
<td>500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64</td>
</tr>
<tr>
<td>502.gcc_r: -D_FILE_OFFSET_BITS=64</td>
</tr>
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</table>

### Peak Optimization Flags

#### C benchmarks:

500.perlbench_r: -W1, -z, muldefs -prof-gen(pass 1) -prof-use(pass 2)  
-xCORE-AVX512 -ipo -O3 -no-prec-div  
-gopt-mem-layout-trans=4 -fno-strict-overflow  
-mbranches-within-32B-boundaries  
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin  
-lqkmalloc

502.gcc_r: -m32  
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/ia32_lin  
-std=gnu89 -W1, -z, muldefs -fprofile-generate(pass 1)  
-fprofile-use=default.profdelta(pass 2) -xCORE-AVX512 -flto  
-Ofast(pass 1) -O3 -ffast-math -gopt-mem-layout-trans=4  
-mbranches-within-32B-boundaries  
-L/usr/local/jemalloc32-5.0.1/lib -ljemalloc

505.mcf_r: basepeak = yes

525.x264_r: -w -std=c11 -m64 -W1, -z, muldefs -xCORE-AVX512 -flto  
-O3 -ffast-math -gopt-mem-layout-trans=4 -fno-alias  
-mbranches-within-32B-boundaries  
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin  
-lqkmalloc

557.xz_r: basepeak = yes

#### C++ benchmarks:

520.omnetpp_r: basepeak = yes

(Continued on next page)
## Lenovo Global Technology

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### Peak Optimization Flags (Continued)

- 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:

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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