**Lenovo Global Technology**

ThinkSystem ST250
(4.00 GHz, Intel Xeon E-2274G)

**SPEC CPU®2017 Integer Rate Result**

**Lenovo Global Technology**

SPECrate®2017_int_base = 36.5

SPECrate®2017_int_peak = 37.8

**CPU2017 License:** 9017

**Test Sponsor:** Lenovo Global Technology

**Tested by:** Lenovo Global Technology

**Test Date:** Jun-2020

**Hardware Availability:** Mar-2020

**Software Availability:** Apr-2020

<table>
<thead>
<tr>
<th>Copies</th>
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<td>500.perlbench_r</td>
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<tr>
<td>557.xz_r</td>
<td>21.9</td>
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**Software**

- **OS:** SUSE Linux Enterprise Server 15 SP1 (x86_64)
- **Kernel:** 4.12.14-195-default
- **Compiler:** C/C++: Version 19.1.1.217 of Intel C/C++ Compiler for Linux;
  Fortran: Version 19.1.1.217 of Intel Fortran Compiler for Linux
- **Parallel:** No
- **Firmware:** Lenovo BIOS Version ISE115D 2.10 released Apr-2020
- **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 set to prefer performance at the cost of additional power usage

---

**Hardware**

- **CPU Name:** Intel Xeon E-2274G
- **Max MHz:** 4900
- **Nominal:** 4000
- **Enabled:** 4 cores, 1 chip, 2 threads/core
- **Orderable:** 1 chip
- **Cache L1:** 32 KB I + 32 KB D on chip per core
- **L2:** 256 KB I+D on chip per core
- **L3:** 8 MB I+D on chip per chip
- **Other:** None
- **Memory:** 128 GB (4 x 32 GB 2Rx4 PC4-2666V-E)
- **Storage:** 1 x 960 GB SATA SSD
- **Other:** None

---

**Lenovo Global Technology**

ThinkSystem ST250
(4.00 GHz, Intel Xeon E-2274G)

**SPEC CPU®2017 Integer Rate Result**

**Lenovo Global Technology**

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Lenovo Global Technology
ThinkSystem ST250
(4.00 GHz, Intel Xeon E-2274G)

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

SPECrate®2017_int_base = 36.5
SPECrate®2017_int_peak = 37.8

Results Table

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<td>394</td>
<td>21.9</td>
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</tr>
</tbody>
</table>

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

Compiler Notes

The inconsistent Compiler version information under Compiler Version section is due to a discrepancy in Intel Compiler. The correct version of C/C++ compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux. The correct version of Fortran compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux.

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 =
"/home/cpu2017-1.1.0-ic19.1.1/lib/intel64:/home/cpu2017-1.1.0-ic19.1.1/lib/ia32:/home/cpu2017-1.1.0-ic19.1.1/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 Redhat Enterprise Linux 8.0
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
```
Yes: 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
Energy Efficient Turbo set to Enable
Zero Output set to Advanced Mode
Intel Virtualization Technology set to Disable
Hardware Prefetcher set to Disable
Adjacent Cache Prefetch set to Disable

Sysinfo program /home/cpu2017-1.1.0-ic19.1.1/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7ebdle6e46a485a0011
running on linux-bfbk Wed Jun 10 18:45:24 2020

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-2274G CPU @ 4.00GHz
  1 "physical id"s (chips)
  8 "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 : 4
siblings : 8
physical 0: cores 0 1 2 3
```

From lscpu:
```
Architecture: x86_64
```

(Continued on next page)
## Lenovo Global Technology

### ThinkSystem ST250 (4.00 GHz, Intel Xeon E-2274G)

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<tr>
<td>Hardware Availability</td>
<td>Mar-2020</td>
</tr>
<tr>
<td>Software Availability</td>
<td>Apr-2020</td>
</tr>
</tbody>
</table>

### Platform Notes (Continued)

```
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
Address sizes:         39 bits physical, 48 bits virtual
CPU(s):                8
On-line CPU(s) list:   0-7
Thread(s) per core:    2
Core(s) per socket:    4
Socket(s):             1
NUMA node(s):          1
Vendor ID:             GenuineIntel
CPU family:            6
Model:                 158
Model name:            Intel(R) Xeon(R) E-2274G CPU @ 4.00GHz
Stepping:              10
CPU MHz:               4000.000
CPU max MHz:           4900.0000
CPU min MHz:           800.0000
BogoMIPS:              8016.00
Virtualization:        VT-x
L1d cache:             32K
L1i cache:             32K
L2 cache:              256K
L3 cache:              8192K
NUMA node0 CPU(s):     0-7
Flags:                 fpu vme de pse tsc msr pae 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 3nowprefetch cpuid_fault epb invpcid_single pti ssbd ibrs ibpb stibp tpr_shadow vmvi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm mpx rdseed adx smap clflushopt intel_pt xsaveopt xsavec xgetbv1 xsaves dtherm ida arat pln pts hwp hwp_notify hwp_act_window hwp_epp md_clear flush_l1d
```

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
node 0 size: 128866 MB
node 0 free: 128266 MB
node distances:
  node 0
0: 10
```

(Continued on next page)
## Lenovo Global Technology

**ThinkSystem ST250**  
(4.00 GHz, Intel Xeon E-2274G)

| SPECrate®2017_int_base = 36.5 | SPECrate®2017_int_peak = 37.8 |

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

| Test Date: | Jun-2020 |
| Hardware Availability: | Mar-2020 |
| Software Availability: | Apr-2020 |

### Platform Notes (Continued)

From `/proc/meminfo`  
MemTotal: 131959284 kB  
HugePages_Total: 0  
Hugepagesize: 2048 kB

From `/etc/*release* /etc/*version*`  
**os-release:**  
NAME="SLES"  
VERSION="15-SP1"  
VERSION_ID="15.1"  
PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"  
ID="sles"  
ID_LIKE="suse"  
ANSI_COLOR="0;32"  
CPE_NAME="cpe:/o:suse:sles:15:sp1"

uname -a:  
Linux linux-bfbk 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)  
x86_64 x86_64 x86_64 GNU/Linux

**Kernel self-reported vulnerability status:**  
**CVE-2018-3620 (L1 Terminal Fault):** Mitigation: PTE Inversion; VMX: conditional cache flushes, SMT vulnerable  
**Microarchitectural Data Sampling:** Mitigation: Clear CPU buffers; SMT vulnerable  
**CVE-2017-5754 (Meltdown):** Mitigation: PTI  
**CVE-2018-3639 (Speculative Store Bypass):** Mitigation: Speculative Store Bypass disabled via prctl and seccomp  
**CVE-2017-5753 (Spectre variant 1):** Mitigation: __user pointer sanitization  
**CVE-2017-5715 (Spectre variant 2):** Mitigation: Indirect Branch Restricted Speculation, IBPB: conditional, IBRS_FW, STIBP: conditional, RSB filling  

`run-level 3 Jun 10 18:42`

**SPEC is set to:**  
`/home/cpu2017-1.1.0-ic19.1.1`

**Filesystem**  
<table>
<thead>
<tr>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
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<tbody>
<tr>
<td>xfs</td>
<td>893G</td>
<td>63G</td>
<td>830G</td>
<td>8%</td>
<td>/</td>
</tr>
</tbody>
</table>

From `/sys/devices/virtual/dmi/id`  
**BIOS:** Lenovo -[ISE115D-2.10]- 04/24/2020  
**Vendor:** Lenovo  
**Product:** ThinkSystem ST250 -[7Y45CT00WW]-  
**Product Family:** ThinkSystem  
**Serial:** 1234567890

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST250
(4.00 GHz, Intel Xeon E-2274G)

SPECrate®2017_int_base = 36.5
SPECrate®2017_int_peak = 37.8

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

Test Date: Jun-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

Platform Notes (Continued)

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:
4x SK Hynix HMAA4GU7AJR8N-VK 32767 MB 2 rank 2666

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C | 502.gcc_r(peak)
-----------------------------------------------------------------------------
Intel(R) C Compiler for applications running on IA-32, Version 2021.1 NextGen
Build 20200304
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) C Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
-----------------------------------------------------------------------------

==============================================================================
C | 500.perlbench_r(peak) 557.xz_r(peak)
-----------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
-----------------------------------------------------------------------------

==============================================================================
C | 502.gcc_r(peak)
-----------------------------------------------------------------------------
Intel(R) C Compiler for applications running on IA-32, Version 2021.1 NextGen
Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
-----------------------------------------------------------------------------

==============================================================================
C | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
(Continued on next page)
**Compiler Version Notes (Continued)**

<table>
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Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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

Intel(R) C Compiler for applications running on IA-32, Version 2021.1 NextGen
Build 20200304
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) C Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306
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) C++ Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST250
(4.00 GHz, Intel Xeon E-2274G)

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

SPECrates
SPECrate®2017_int_base = 36.5
SPECrate®2017_int_peak = 37.8

Test Date: Jun-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

Compiler Version Notes (Continued)

------------------------------------------------------------------------------
Fortran | 548.exchange2_r(base, peak)
------------------------------------------------------------------------------
Intel (R) Fortran Intel (R) 64 Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Base Portability Flags

500.perlb benchmark_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:
-m64 -mnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX2 -O3 -ffast-math -flto -mfpmath=sse -funroll-loops
-fuse-ld=gold -qopt-mem-layout=trans=4

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

## Lenovo Global Technology

**ThinkSystem ST250**  
(4.00 GHz, Intel Xeon E-2274G)

### CPU2017 License: 9017

### Test Sponsor: Lenovo Global Technology

### Tested by: Lenovo Global Technology

---

### SPECrate®2017_int_base = 36.5

### SPECrate®2017_int_peak = 37.8

---

### Base Optimization Flags (Continued)

**C benchmarks** (continued):

- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin`
- `-lqkmalloc`

**C++ benchmarks**:

- `-m64`
- `-gnextgen`
- `-Wl,-plugin-opt=-x86-branches-within-32B-boundaries`
- `-Wl,-z,muldefs`
- `-xCORE-AVX2`
- `-O3`
- `-ffast-math`
- `-flto`
- `-mfpmath=sse`
- `-funroll-loops`
- `-fuse-ld=gold`
- `-Wl,-z,muldefs`
- `-xCORE-AVX2`
- `-O3`
- `-ipo`
- `-no-prec-div`
- `-Wl,-z,muldefs`
- `-xCORE-AVX2`
- `-O3`
- `-ipo`
- `-no-prec-div`
- `-Wl,-z,muldefs`
- `-x86-branches-within-32B-boundaries`
- `-Wl,-z,muldefs`
- `-x86-branches-within-32B-boundaries`
- `-Wl,-z,muldefs`
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- `-Wl,-z,muldefs`

---

### Peak Compiler Invocation

**C benchmarks**:

- `icc`

**C++ benchmarks**:

- `icpc`

**Fortran benchmarks**:

- `ifort`

---

### Peak Portability Flags

- `501.perlbmk_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`

---

*(Continued on next page)*
Lenovo Global Technology
ThinkSystem ST250
(4.00 GHz, Intel Xeon E-2274G)

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

SPECrate®2017_int_base = 36.5
SPECrate®2017_int_peak = 37.8

Test Date: Jun-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

Peak Portability Flags (Continued)

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/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

502.gcc_r: -m32
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/ia32_lin
-std=gnu89
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2 -fllto
-Ofast(pass 1) -O3 -ffast-math -qnextgen -fuse-ld=gold
-qopt-mem-layout-trans=4 -L/usr/local/jemalloc32-5.0.1/lib
-ljemalloc

505.mcf_r: basepeak = yes

525.x264_r: -m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX2 -fllto -O3 -ffast-math
-fuse-ld=gold -qopt-mem-layout-trans=4 -fno-alias
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

557.xz_r: -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: basepeak = yes

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST250
(4.00 GHz, Intel Xeon E-2274G)

**SPECrate®2017_int_base = 36.5**
**SPECrate®2017_int_peak = 37.8**

<table>
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<td>Software Availability: Apr-2020</td>
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</table>

**Peak Optimization Flags (Continued)**

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-SKL-J.html

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

http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.xml

http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-J.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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