Lenovo Global Technology

ThinkSystem ST250 V2
(3.20 GHz, Intel Xeon E-2388G)

SPECrate®2017_int_base = 69.6
SPECrate®2017_int_peak = 72.8

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

Lenovo Global Technology

ThinkSystem ST250 V2
(3.20 GHz, Intel Xeon E-2388G)

Test Date: Feb-2022
Hardware Availability: Apr-2022
Software Availability: Jun-2021

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
Other: None
Memory: 128 GB (4 x 32 GB 2Rx8 PC4-3200AA-E, running at 2933)
Storage: 1 x 960 GB SATA SSD
Other: None

Software
OS: SUSE Linux Enterprise Server 15 SP3 (x86_64)
Kernel 5.3.18-57-default
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 20200112 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
Lenovo Global Technology
ThinkSystem ST250 V2
(3.20 GHz, Intel Xeon E-2388G)

SPECrate®2017_int_base = 69.6
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Results Table

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

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 = 
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
ThinkSystem ST250 V2
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SPECTR®2017_int_base = 69.6
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Feb-2022
Tested by: Lenovo Global Technology
Hardware Availability: Apr-2022
Software Availability: Jun-2021

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:
C-States set to Legacy
DCA set to Enabled
Memory Power Management set to Automatic
System date/time for this result was not updated to right time and actual testing date can be referred to "spec.cpu2017.test_date"

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revB/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on node1 Thu Apr 29 21:09:12 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) 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 2.36.2:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
Address sizes: 39 bits physical, 48 bits virtual
CPU(s): 16
On-line CPU(s) list: 0-15
Thread(s) per core: 2
Core(s) per socket: 8
Socket(s): 1

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

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Platform Notes (Continued)

NUMA node(s): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 167
Model name: Intel(R) Xeon(R) E-2388G CPU @ 3.20GHz
Stepping: 1
CPU MHz: 4272.628
BogoMIPS: 6384.00
Virtualization: VT-x
L1d cache: 384 KiB
L1i cache: 256 KiB
L2 cache: 4 MiB
L3 cache: 16 MiB
NUMA node0 CPU(s): 0–15
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via
prctl and seccomp
Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user
pointer sanitation
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB
filling
Vulnerability Srbds: Not affected
Vulnerability Tsx async abort: Not affected
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr
mce pge mca cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx
mms一项rdtscp lm constant_tsc arch_perfmon pebs bts rep_good nopl x segregation
msr tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3nowprefetch cpuid fault
epb invpcid_single ssbd ibrs ibpb stibp ibrs_enhanced tpr_shadow vmmi flexpriority
ept vpid fpu vme de pse tsc msr pae mce cx8 apic sep mtrr
mce pge mca cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx
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epb invpcid_single ssbd ibrs ibpb stibp ibrs_enhanced tpr_shadow vmmi flexpriority

From lscpu --cache:
NAME ONE-SIZE ALL-SIZE WAYS TYPE LEVEL SETS PHY-LINE COHERENCY-SIZE
L1d 48K 384K 12 Data 1 64 1 64
L1i 32K 256K 8 Instruction 1 64 1 64
L2 512K 4M 8 Unified 2 1024 1 64
L3 16M 16M 16 Unified 3 16384 1 64

/proc/cpuinfo cache data

(Continued on next page)
Platform Notes (Continued)

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: 128743 MB
node 0 free: 127754 MB
node distances:
node 0
  0: 10

From /proc/meminfo
MemTotal:       131833772 kB
HugePages_Total:       0
Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
os-release:
NAME="SLES"
VERSION="15-SP3"
VERSION_ID="15.3"
PRETTY_NAME="SUSE Linux Enterprise Server 15 SP3"
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15:sp3"

uname -a:
Linux node1 5.3.18-57-default #1 SMP Wed Apr 28 10:54:41 UTC 2021 (ba3c2e9) 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): Mitigation: Speculative Store Bypass disabled via prct1 and seccomp
CVE-2018-3639 (Speculative Store Bypass): Mitigation: usercopy/swaps barriers and __user pointer sanitization
CVE-2017-5753 (Spectre variant 1): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
CVE-2017-5715 (Spectre variant 2): Not affected
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST250 V2
(3.20 GHz, Intel Xeon E-2388G)

**SPEC CPU 2017 Integer Rate Result**

- **CPU2017 License:** 9017
- **Test Sponsor:** Lenovo Global Technology
- **Tested by:** Lenovo Global Technology
- **Test Date:** Feb-2022
- **Hardware Availability:** Apr-2022
- **Software Availability:** Jun-2021

**SPECrate 2017**
- **SPECrate 2017 int_base = 69.6**
- **SPECrate 2017 int_peak = 72.8**

**Platform Notes (Continued)**

- CVE-2019-11135 (TSX Asynchronous Abort): Not affected
- run-level 3 Apr 29 20:00

**From /sys/devices/virtual/dmi/id**
- **Vendor:** Lenovo
- **Product:** ThinkSystem ST250 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 Micron Technology 18ASF4G72AZ-3G2B1 32 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**

```
--- 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.
```

```
--- 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.
```

(Continued on next page)
Lenovo Global Technology
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SPECrates®2017_int_base = 69.6
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
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Hardware Availability: Apr-2022
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Compiler Version Notes (Continued)

------------------------------------------------------------------------------
| C       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)                  |
|         | 525.x264_r(base, peak) 557.xz_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.
------------------------------------------------------------------------------
| 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)                  |
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Version 2021.1 Build 20201113
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------------------------------------------------------------------------------
| C       | 500.perlbench_r(peak)                                                      |
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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)                                                           |
------------------------------------------------------------------------------
(Continued on next page)
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(3.20 GHz,Intel Xeon E-2388G)

SPEC CPU®2017 Integer Rate Result
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Compiler Version Notes (Continued)

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)

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
# SPEC CPU®2017 Integer Rate Result

**Lenovo Global Technology**  
ThinkSystem ST250 V2  
(3.20 GHz, Intel Xeon E-2388G)  

| SPECrate®2017_int_base = 69.6 | SPECrate®2017_int_peak = 72.8 |

| CPU2017 License: 9017 | Test Date: Feb-2022 |
| Test Sponsor: Lenovo Global Technology | Hardware Availability: Apr-2022 |
| Tested by: Lenovo Global Technology | Software Availability: Jun-2021 |

## Base Portability Flags

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<th>Benchmark</th>
<th>Flags</th>
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<td>-DSPEC_LP64 -DSPEC_LINUX_X64</td>
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<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>
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<td>531.deepsjeng_r</td>
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</tr>
<tr>
<td>557.xz_r</td>
<td>-DSPEC_LP64</td>
</tr>
</tbody>
</table>

## Base Optimization Flags

### C benchmarks:

```bash
-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:

```bash
-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:

```bash
-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):

```bash
icx
```

```bash
500.perlbench_r: icc
```

(Continued on next page)
Peak Compiler Invocation (Continued)

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

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.leea_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-AVX512 -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
-lqkmalloc
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-AVX512 -flto
-Ofast(pass 1) -O3 -fno-fast-math -qopt-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 -Wl,-z,muldefs -xCORE-AVX512 -flto
-O3 -ffast-math -qopt-mem-layout-trans=4 -fno-alias
(Continued on next page)
Lenovo Global Technology
ThinkSystem ST250 V2
(3.20 GHz, Intel Xeon E-2388G)

SPECrate®2017_int_base = 69.6
SPECrate®2017_int_peak = 72.8

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

Test Date: Feb-2022
Hardware Availability: Apr-2022
Software Availability: Jun-2021

Peak Optimization Flags (Continued)

525.x264_r (continued):
-branches-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
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:
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-RocketB-A.xml