## SPEC CPU®2017 Integer Speed Result

**Lenovo Global Technology**  
ThinkSystem SR250  
(3.40 GHz, Intel Xeon E-2224)

**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Test Date:** Jul-2020  
**Hardware Availability:** Mar-2020  
**Software Availability:** Apr-2020

### Hardware

- **CPU Name:** Intel Xeon E-2224  
- **Max MHz:** 4600  
- **Nominal:** 3400  
- **Enabled:** 4 cores, 1 chip  
- **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 480 GB SATA SSD  
- **Other:** None

### 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  
- **Compiler Fortran:** Version 19.1.1.217 of Intel Fortran  
- **Parallel:** Yes  
- **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:** 64-bit  
- **Other:** jemalloc memory allocator V5.0.1  
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage

### Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed®2017_int_base</th>
<th>SPECspeed®2017_int_peak</th>
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<tr>
<td>perlbench_s</td>
<td>4</td>
<td>8.73</td>
<td>11.7</td>
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<td>gcc_s</td>
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<td>11.9</td>
<td>16.2</td>
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<td>mcf_s</td>
<td>4</td>
<td>8.15</td>
<td>19.3</td>
</tr>
<tr>
<td>omnetpp_s</td>
<td>4</td>
<td>5.65</td>
<td>19.9</td>
</tr>
<tr>
<td>xalancbmk_s</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>x264_s</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>deepsjeng_s</td>
<td>4</td>
<td>7.07</td>
<td>20.0</td>
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<tr>
<td>leela_s</td>
<td>4</td>
<td>9.09</td>
<td></td>
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<tr>
<td>exchange2_s</td>
<td>4</td>
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<tr>
<td>xz_s</td>
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---

**SPECspeed®2017_int_base = 11.4**  
**SPECspeed®2017_int_peak = 11.7**
Lenovo Global Technology
ThinkSystem SR250
(3.40 GHz, Intel Xeon E-2224)

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Jul-2020
Tested by: Lenovo Global Technology
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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<td>8.16</td>
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<td>8.15</td>
<td>4</td>
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<td>4</td>
<td>87.6</td>
<td>16.2</td>
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<td>16.2</td>
<td>87.3</td>
<td>16.2</td>
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<tr>
<td>625.x264_s</td>
<td>4</td>
<td>91.1</td>
<td>19.4</td>
<td>91.3</td>
<td>19.3</td>
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<td>19.3</td>
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<td>88.1</td>
<td>20.0</td>
<td>87.8</td>
<td>20.1</td>
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<td>4</td>
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<td>7.07</td>
<td>203</td>
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<td>7.07</td>
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<td>7.08</td>
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<tr>
<td>641.leela_s</td>
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<td>5.65</td>
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<td>5.65</td>
<td>302</td>
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<td>302</td>
<td>5.65</td>
<td>302</td>
<td>5.65</td>
</tr>
</tbody>
</table>

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

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:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH = "/home/cpu2017-1.1.0-ic19.1.1/lib/intel64:/home/cpu2017-1.1.0-ic19.1.1/j e5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"

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:

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

**Lenovo Global Technology**
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**CPU2017 License:** 9017  
**Test Date:** Jul-2020  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Hardware Availability:** Mar-2020  
**Software Availability:** Apr-2020

**General Notes (Continued)**

```bash
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  
Zero Output set to Advanced Mode  
Per Core P-state set to Disable

**Sysinfo program /home/cpu2017-1.1.0-ic19.1.1/bin/sysinfo**
Rev: r6365 of 2019-08-21 295195f888a3d7edbe1e6e46a485a0011 running on linux-jecn Thu Jul 2 09:37:07 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](https://www.spec.org/cpu2017/Docs/config.html#sysinfo)

From /proc/cpuinfo

```
model name : Intel(R) Xeon(R) E-2224 CPU @ 3.40GHz
 1 "physical id"s (chips)
 4 "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 : 4
physical 0: cores 0 1 2 3
```

From lscpu:

```
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): 4
On-line CPU(s) list: 0-3
Thread(s) per core: 1
Core(s) per socket: 4
Socket(s): 1
```

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

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</table>

**SPECspeed®2017_int_base = 11.4**

**SPECspeed®2017_int_peak = 11.7**

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## Platform Notes (Continued)

- **NUMA node(s):** 1
- **Vendor ID:** GenuineIntel
- **CPU family:** 6
- **Model:** 158
- **Model name:** Intel(R) Xeon(R) E-2224 CPU @ 3.40GHz
- **Stepping:** 10
- **CPU MHz:** 3400.000
- **CPU max MHz:** 4600.0000
- **CPU min MHz:** 800.0000
- **BogoMIPS:** 6816.00
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 256K
- **L3 cache:** 8192K
- **NUMA node0 CPU(s):** 0-3
- **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 aperf perfctr tscknown_freq pni pclmulqdq dtses64 monitor ds cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtriv 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 vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle ibis ibpb stibp tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle ibis ibpb stibp tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust

```
/proc/cpuinfo cache data
  cache size : 8192 KB
```

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.

```text
   available: 1 nodes (0)
   node 0 cpus: 0 1 2 3
   node 0 size: 128867 MB
   node 0 free: 128371 MB
   node distances:
      node 0
         0: 10
```

From /proc/meminfo

```
 MemTotal:  131960244 kB
 HugePages_Total:       0
 Hugepagesize:       2048 kB
```

```
/usr/bin/lsb_release -d
 SUSE Linux Enterprise Server 15 SP1
```
### Platform Notes (Continued)

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

```bash
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"
```

```bash
uname -a:
Linux linux-jecn 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 disabled
- **Microarchitectural Data Sampling:** Mitigation: Clear CPU buffers; SMT disabled
- **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: disabled, RSB filling

```bash
run-level 3 Jul 2 09:36
```

```bash
SPEC is set to: /home/cpu2017-1.1.0-ic19.1.1
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 xfs 446G 82G 364G 19% /
```

From `/sys/devices/virtual/dmi/id`

```bash
BIOS: Lenovo -[ISE115D-2.10]- 04/24/2020
Vendor: Lenovo
Product: ThinkSystem SR250 -[7Y51CT00WW]-
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:**

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(Continued on next page)
**Lenovo Global Technology**  
ThinkSystem SR250  
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**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
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**Test Date:** Jul-2020  
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**Platform Notes (Continued)**

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

(End of data from sysinfo program)

**Compiler Version Notes**

```plaintext
<table>
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<th>C</th>
<th>600.perlbench_s(base) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_s(base, peak)</th>
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</thead>
</table>

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.

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<table>
<thead>
<tr>
<th>C</th>
<th>600.perlbench_s(peak)</th>
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</thead>
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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.

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<table>
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<th>C</th>
<th>600.perlbench_s(base) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_s(base, peak)</th>
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Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1  
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<table>
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<tr>
<th>C++</th>
<th>620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak) 631.deepsjeng_s(base, peak) 641.leela_s(base, peak)</th>
</tr>
</thead>
</table>

Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304
```

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Lenovo Global Technology
ThinkSystem SR250
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SPECspeed®2017_int_base = 11.4
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CPU2017 License: 9017
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Compiler Version Notes (Continued)
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

==============================================================================
Fortran | 648.exchange2_s(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

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX2 -O3 -ffast-math -flto -mfpmath=sse -funroll-loops

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

C benchmarks (continued):
- fuse-ld=gold -qopt-mem-layout-trans=4 -fopenmp -DSPEC_OPENMP
- L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

C++ benchmarks:
- m64 -m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
- Wl,-z,muldefs -xCORE-AVX2 -03 -ffast-math -flto -mfpmath=sse
- funroll-loops -fopenmp -fuse-ld=gold -qopt-mem-layout-trans=4
- L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
- lqkmalloc

Fortran benchmarks:
- m64 -m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -xCORE-AVX2
- 03 -ipo -no-prec-div -qopt-mem-layout-trans=4
- nostandard-realloc-lhs -align array32byte
- mbranches-within-32B-boundaries

Peak Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Peak Portability Flags

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64(*) -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

(*) Indicates a portability flag that was found in a non-portability variable.
Lenovo Global Technology
ThinkSystem SR250
(3.40 GHz, Intel Xeon E-2224)

SPECspeed®2017_int_base = 11.4
SPECspeed®2017_int_peak = 11.7

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

Peak Optimization Flags

C benchmarks:

600.perlbench_s: -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/jemalloc64-5.0.1/lib -ljemalloc

602.gcc_s: -m64 -qnextgen -std=c11 -fuse-ld=gold
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2 -flto
-Oafact(pass 1) -O3 -ffast-math -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

605.mcf_s: basepeak = yes

625.x264_s: -m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX2 -flto -O3 -ffast-math
-fuse-ld=gold -qopt-mem-layout-trans=4 -fno-alias
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

657.xz_s: basepeak = yes

C++ benchmarks:

620.omnetpp_s: basepeak = yes

623.xalancbmk_s: basepeak = yes

631.deepsjeng_s: basepeak = yes

641.leela_s: basepeak = yes

Fortran benchmarks:

648.exchange2_s: 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
### Lenovo Global Technology

**ThinkSystem SR250**  
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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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