# SPEC CPU®2017 Integer Speed Result

## Lenovo Global Technology

ThinkSystem ST50
(4.00 GHz, Intel Xeon E-2286G)

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base</th>
<th>SPECspeed®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.3</td>
<td>11.5</td>
</tr>
</tbody>
</table>

---

### CPU2017 License:
9017

### Test Sponsor:
Lenovo Global Technology

### Tested by:
Lenovo Global Technology

### Test Date:
Jan-2020

### Hardware Availability:
Mar-2020

### Software Availability:
Nov-2019

---

### Hardware

**CPU Name:** Intel Xeon E-2286G  
**Max MHz:** 4900  
**Nominal:** 4000  
**Enabled:** 6 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:** 12 MB I+D on chip per core  
**Other:** None  
**Memory:** 64 GB (4 x 16 GB 2Rx8 PC4-2666V-E)  
**Storage:** 1 x 960 GB SATA SSD  
**Other:** None

### Software

**OS:** Red Hat Enterprise Linux release 8.1 (Ootpa)  
**Kernel:** 4.18.0-147.el8.x86_64  
**Compiler:** C/C++: Version 19.0.4.227 of Intel C/C++  
**Compiler for Linux:** Compiler for Linux;  
**Fortran:** Version 19.0.4.227 of Intel Fortran  
**Compiler for Linux:** Compiler for Linux  
**Parallel:** Yes  
**Firmware:** Lenovo BIOS Version ITE107G released Dec-2019  
**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:** Default

---

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>Threads</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>12</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>12</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>12</td>
</tr>
<tr>
<td>623.xalancbmk_s</td>
<td>12</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>12</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>12</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>12</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>12</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>12</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>8.90</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>12.1</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>15.4</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>7.58</td>
</tr>
<tr>
<td>623.xalancbmk_s</td>
<td>15.3</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>18.2</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>6.81</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>5.66</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>13.9</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>19.9</td>
</tr>
</tbody>
</table>

---

**SPECspeed®2017_int_base** (11.3)  
**SPECspeed®2017_int_peak** (11.5)
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>12</td>
<td>224</td>
<td>7.94</td>
<td>226</td>
<td>7.84</td>
<td>226</td>
<td>7.87</td>
<td>12</td>
<td>200</td>
<td>8.88</td>
<td>199</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>12</td>
<td>330</td>
<td>12.1</td>
<td>330</td>
<td>12.1</td>
<td>328</td>
<td>12.1</td>
<td>12</td>
<td>327</td>
<td>12.2</td>
<td>330</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>12</td>
<td>307</td>
<td>15.4</td>
<td>306</td>
<td>15.4</td>
<td>301</td>
<td>15.7</td>
<td>12</td>
<td>296</td>
<td>16.0</td>
<td>297</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>12</td>
<td>215</td>
<td>7.59</td>
<td>215</td>
<td>7.58</td>
<td>215</td>
<td>7.58</td>
<td>12</td>
<td>214</td>
<td>7.63</td>
<td>217</td>
</tr>
<tr>
<td>623.xalanchmk_s</td>
<td>12</td>
<td>92.7</td>
<td>15.3</td>
<td>92.8</td>
<td>15.3</td>
<td>91.8</td>
<td>15.4</td>
<td>12</td>
<td>93.1</td>
<td>15.2</td>
<td>92.2</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>12</td>
<td>96.9</td>
<td>18.2</td>
<td>96.7</td>
<td>18.2</td>
<td>96.1</td>
<td>18.4</td>
<td>12</td>
<td>96.2</td>
<td>18.3</td>
<td>96.1</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>12</td>
<td>211</td>
<td>6.79</td>
<td>210</td>
<td>6.81</td>
<td>210</td>
<td>6.81</td>
<td>12</td>
<td>210</td>
<td>6.83</td>
<td>210</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>12</td>
<td>302</td>
<td>5.66</td>
<td>301</td>
<td>5.66</td>
<td>301</td>
<td>5.66</td>
<td>12</td>
<td>301</td>
<td>5.66</td>
<td>301</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>12</td>
<td>147</td>
<td>19.9</td>
<td>148</td>
<td>19.8</td>
<td>148</td>
<td>19.9</td>
<td>12</td>
<td>148</td>
<td>19.8</td>
<td>148</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>12</td>
<td>445</td>
<td>13.9</td>
<td>445</td>
<td>13.9</td>
<td>445</td>
<td>13.9</td>
<td>12</td>
<td>434</td>
<td>14.2</td>
<td>434</td>
</tr>
</tbody>
</table>

**SPECspeed®2017_int_base = 11.3**  
**SPECspeed®2017_int_peak = 11.5**  

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

### 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-ic19.0u4/lib/intel64:/home/cpu2017-1.1.0-ic19.0u4/j e5.0.1-64"  
OMP_STACKSIZE = "192M"

### General Notes

Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM  
memory using Redhat Enterprise Linux 7.5  
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.  
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3640 (Spectre variant 3a)
General Notes (Continued)

is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3639 (Spectre variant 4)
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

Sysinfo program /home/cpu2017-1.1.0-ic19.0u4/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7eddb1e6e46a485a0011
running on localhost.localdomain Wed Jan 8 09:32:38 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-2286G CPU @ 4.00GHz
  1 "physical id"s (chips)
  12 "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 : 6
siblings : 12
physical 0: cores 0 1 2 3 4 5

From lsmpu:

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 12
On-line CPU(s) list: 0-11
Thread(s) per core: 2
Core(s) per socket: 6
Socket(s): 1
NUMA node(s): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 158
Model name: Intel(R) Xeon(R) E-2286G CPU @ 4.00GHz
Stepping: 10
CPU MHz: 4745.645
CPU max MHz: 4900.0000
CPU min MHz: 800.0000

(Continued on next page)
Lenovo Global Technology

ThinkSystem ST50
(4.00 GHz, Intel Xeon E-2286G)

SPEC CPU®2017 Integer Speed Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

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

SPECspeed®2017_int_base = 11.3
SPECspeed®2017_int_peak = 11.5

Platform Notes (Continued)

BogoMIPS: 8016.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 256K
L3 cache: 12288K
NUMA node0 CPU(s): 0-11
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clfflush 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 runperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3
sdbg fma cx16 xtrr 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
pti ssbd ibs ibpb stibp tpr_shadow vmmi flexpriority ept vpid fsgsbase tsc_adjust
bmi1 hle avx2 smep bmi2 erness invpcid rtm mpx rdseed adx smap clflushopt intel_pt
xsaveopt xsave xsaveopt xsaveopt xsaves dtherm ida arat pinn pts hwp hwp_notify hwp_act_window
hwp_epp md_clear flush_lld

/proc/cpuinfo cache data
- cache size: 12288 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
- node 0 size: 64253 MB
- node 0 free: 63542 MB
- node distances:
- node 0
- 0: 10

From /proc/meminfo
- MemTotal: 65795764 kB
- HugePages_Total: 0
- Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
- os-release:
  - NAME="Red Hat Enterprise Linux"
  - VERSION="8.1 (Ootpa)"
  - ID="rhel"
  - ID_LIKE="fedora"
  - VERSION_ID="8.1"
  - PLATFORM_ID="platform:el8"
  - PRETTY_NAME="Red Hat Enterprise Linux 8.1 (Ootpa)"
  - ANSI_COLOR="0;31"
- redhat-release: Red Hat Enterprise Linux release 8.1 (Ootpa)

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST50
(4.00 GHz, Intel Xeon E-2286G)

SPECspeed®2017_int_base = 11.3
SPECspeed®2017_int_peak = 11.5

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

Test Date: Jan-2020
Hardware Availability: Mar-2020
Software Availability: Nov-2019

Platform Notes (Continued)

system-release: Red Hat Enterprise Linux release 8.1 (Ootpa)

system-release-cpe: cpe:/o:redhat:enterprise_linux:8.1:ga

uname -a:
    Linux localhost.localdomain 4.18.0-147.el8.x86_64 #1 SMP Thu Sep 26 15:52:44 UTC 2019
    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
    Mitigation: PTI
CVE-2017-5754 (Meltdown): Mitigation: Speculative Store Bypass disabled
    via prctl and seccomp
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled
    via prctl and seccomp
CVE-2017-5753 (Spectre variant 1): Mitigation: usercopy/swapgs barriers and __user
    pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full generic retpoline, IBPB:
    conditional, IBRS_FW, STIBP: conditional, RSB
    filling

run-level 3 Jan 8 09:23

SPEC is set to: /home/cpu2017-1.1.0-ic19.0u4

Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sdb3      xfs   812G   22G  791G   3% /home

From /sys/devices/virtual/dmi/id
    BIOS:    LENOVO ITE107G 12/28/2019
    Vendor:  LENOVO
    Product: INVALID
    Product Family: Lenovo Product
    Serial:  INVALID

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 HMA82GU7CJR8N-VK 16 GB 2 rank 2666

(End of data from sysinfo program)
## Lenovo Global Technology

ThinkSystem ST50
(4.00 GHz, Intel Xeon E-2286G)

| SPECspeed²017_int_base = 11.3 |
| SPECspeed²017_int_peak = 11.5 |

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

| Test Date: | Jan-2020 |
| Hardware Availability: | Mar-2020 |
| Software Availability: | Nov-2019 |

### Compiler Version Notes

<table>
<thead>
<tr>
<th>Language</th>
<th>Version</th>
<th>Notes</th>
</tr>
</thead>
</table>
| C        |         | Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved. |
| C++      |         | Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved. |
| Fortran  |         | Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved. |

### Base Compiler Invocation

**C benchmarks:**  
```bash  
icc -m64 -std=c11  
```

**C++ benchmarks:**  
```bash  
icpc -m64  
```

**Fortran benchmarks:**  
```bash  
ifort -m64  
```

### Base Portability Flags

- 600.perlbench_s: -DSPEC_LP64  
- 602.gcc_s: -DSPEC_LP64  
- 605.mcf_s: -DSPEC_LP64  
- 620.omnetpp_s: -DSPEC_LP64  
- 657.xz_s: -DSPEC_LP64

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

ThinkSystem ST50

(4.00 GHz, Intel Xeon E-2286G)

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

**SPEC CPU®2017 Integer Speed Result**

| SPECspeed®2017_int_base = 11.3 |
| SPECspeed®2017_int_peak = 11.5 |

**Base Portability Flags (Continued)**

<table>
<thead>
<tr>
<th>Base Portability Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>623.xalancbk_s:</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>625.x264_s:</td>
</tr>
<tr>
<td>631.deepsjeng_s:</td>
</tr>
<tr>
<td>641.leela_s:</td>
</tr>
<tr>
<td>648.exchange2_s:</td>
</tr>
<tr>
<td>657.xz_s:</td>
</tr>
</tbody>
</table>

**Base Optimization Flags**

**C benchmarks:**

-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-L/usr/local/je5.0.1-64/lib -ljemalloc

**C++ benchmarks:**

-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc

**Fortran benchmarks:**

-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs

**Peak Compiler Invocation**

**C benchmarks:**

icc -m64 -std=c11

**C++ benchmarks:**

icpc -m64

**Fortran benchmarks:**

ifort -m64

**Peak Portability Flags**

Same as Base Portability Flags
Peak Optimization Flags

C benchmarks:

600.perlb Benchmark: -Wl, -z, muldefs -prof-gen(pass 1) -prof-use(pass 2) -O2
-xCORE-AVX2 -qopt-mem-layout-trans=4 -ipo -O3
-no-prec-div -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP -fno-strict-overflow
-L/usr/local/jemalloc

602.gcc_s: -Wl, -z, muldefs -prof-gen(pass 1) -prof-use(pass 2) -O2
-xCORE-AVX2 -qopt-mem-layout-trans=4 -ipo -O3
-no-prec-div -DSPEC_SUPPRESS_OPENMP
-L/usr/local/jemalloc

605.mcf_s: -Wl, -z, muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=4
-DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP
-L/usr/local/jemalloc

625.x264_s: -Wl, -z, muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-L/usr/local/jemalloc

657.xz_s: -Wl, -z, muldefs -prof-gen(pass 1) -prof-use(pass 2) -O2
-xCORE-AVX2 -qopt-mem-layout-trans=4 -ipo -O3
-no-prec-div -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP -L/usr/local/jemalloc

C++ benchmarks:

620.omnetpp: Benchmark: -Wl, -z, muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=4
-DSPEC_SUPPRESS_OPENMP
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64

623.xalancbmk_s: Benchmark: -Wl, -z, muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64

631.deepsjeng_s: Same as 623.xalancbmk_s

641.leela_s: Same as 623.xalancbmk_s

Fortran benchmarks:

-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST50
(4.00 GHz, Intel Xeon E-2286G)

SPECspeed®2017_int_base = 11.3
SPECspeed®2017_int_peak = 11.5

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

Peak Optimization Flags (Continued)

Fortran benchmarks (continued):
- nostandard-realloc-lhs

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-CFL-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-CFL-B.xml

SPEC CPU and SPECspeed are registered trademarks of the Standard Performance Evaluation Corporation. All other brand and product names appearing in this result are trademarks or registered trademarks of their respective holders.

For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU®2017 v1.1.0 on 2020-01-07 20:32:38-0500.
Report generated on 2020-02-11 10:03:26 by CPU2017 PDF formatter v6255.
Originally published on 2020-02-11.