Lenovo Global Technology
ThinkSystem ST50
(3.80 GHz, Intel Xeon E-2244G)

SPECspeed®2017_int_base = 12.2
SPECspeed®2017_int_peak = 12.5

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

Threads

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base (12.2)</th>
<th>SPECspeed®2017_int_peak (12.5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s 8</td>
<td>602.gcc_s 8</td>
</tr>
<tr>
<td>7.52</td>
<td>8.98</td>
</tr>
<tr>
<td>12.3</td>
<td>12.9</td>
</tr>
<tr>
<td>19.9</td>
<td>20.7</td>
</tr>
<tr>
<td>20.7</td>
<td></td>
</tr>
<tr>
<td>20.7</td>
<td></td>
</tr>
</tbody>
</table>

Hardware

CPU Name: Intel Xeon E-2244G
Max MHz: 4800
Nominal: 3800
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: 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 8.1 (Ootpa)
Kernel 4.18.0-147.el8.x86_64
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: Yes
Firmware: Lenovo BIOS Version ITEi09B 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
## SPEC CPU®2017 Integer Speed Result

**Lenovo Global Technology**  
ThinkSystem ST50  
(3.80 GHz, Intel Xeon E-2244G)

### SPECspeed®2017_int_base = 12.2
### SPECspeed®2017_int_peak = 12.5

---

**Results Table**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds Base</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>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>8</td>
<td>236</td>
<td>7.52</td>
<td>235</td>
<td>7.55</td>
<td>236</td>
<td>7.52</td>
<td>8</td>
<td>198</td>
<td>8.95</td>
<td>198</td>
<td>8.98</td>
<td>197</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>8</td>
<td>321</td>
<td>12.4</td>
<td>323</td>
<td>12.3</td>
<td>322</td>
<td>12.3</td>
<td>8</td>
<td>310</td>
<td>12.9</td>
<td>308</td>
<td>12.9</td>
<td>309</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>8</td>
<td>200</td>
<td>23.6</td>
<td>202</td>
<td>23.4</td>
<td>203</td>
<td>23.3</td>
<td>8</td>
<td>200</td>
<td>23.6</td>
<td>202</td>
<td>23.4</td>
<td>203</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>8</td>
<td>193</td>
<td>8.45</td>
<td>192</td>
<td>8.48</td>
<td>193</td>
<td>8.45</td>
<td>8</td>
<td>193</td>
<td>8.45</td>
<td>192</td>
<td>8.48</td>
<td>193</td>
</tr>
<tr>
<td>623.xalancmk_s</td>
<td>8</td>
<td>84.5</td>
<td>16.8</td>
<td>84.6</td>
<td>16.7</td>
<td>84.0</td>
<td>16.9</td>
<td>8</td>
<td>84.5</td>
<td>16.8</td>
<td>84.6</td>
<td>16.7</td>
<td>84.0</td>
</tr>
<tr>
<td>625.xmls264_s</td>
<td>8</td>
<td>88.6</td>
<td>19.9</td>
<td>88.6</td>
<td>19.9</td>
<td>88.5</td>
<td>19.9</td>
<td>8</td>
<td>85.3</td>
<td>20.7</td>
<td>85.5</td>
<td>20.6</td>
<td>85.4</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>8</td>
<td>195</td>
<td>7.35</td>
<td>195</td>
<td>7.35</td>
<td>195</td>
<td>7.35</td>
<td>8</td>
<td>195</td>
<td>7.35</td>
<td>195</td>
<td>7.35</td>
<td>195</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>8</td>
<td>290</td>
<td>5.88</td>
<td>290</td>
<td>5.88</td>
<td>290</td>
<td>5.88</td>
<td>8</td>
<td>290</td>
<td>5.88</td>
<td>290</td>
<td>5.88</td>
<td>290</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>8</td>
<td>143</td>
<td>20.6</td>
<td>142</td>
<td>20.8</td>
<td>142</td>
<td>20.7</td>
<td>8</td>
<td>143</td>
<td>20.6</td>
<td>142</td>
<td>20.8</td>
<td>142</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>8</td>
<td>476</td>
<td>13.0</td>
<td>476</td>
<td>13.0</td>
<td>476</td>
<td>13.0</td>
<td>8</td>
<td>476</td>
<td>13.0</td>
<td>476</td>
<td>13.0</td>
<td>476</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)
Lenovo Global Technology
ThinkSystem ST50
(3.80 GHz, Intel Xeon E-2244G)

SPEC CPU®2017 Integer Speed Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

SPECspeed®2017_int_base = 12.2
SPECspeed®2017_int_peak = 12.5

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

General Notes (Continued)

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) 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.

Platform Notes

Sysinfo program /home/cpu2017-1.1.0-ic19.1.1/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7ed1b1e6e46a485a001

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-2244G CPU @ 3.80GHz
  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
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
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

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST50
(3.80 GHz, Intel Xeon E-2244G)

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

SPECspeed®2017_int_base = 12.2
SPECspeed®2017_int_peak = 12.5

Brand: Lenovo Global Technology
Test Date: Jun-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

Platform Notes (Continued)

Vendor ID: GenuineIntel
CPU family: 6
Model: 158
Model name: Intel(R) Xeon(R) E-2244G CPU @ 3.80GHz
Stepping: 10
CPU MHz: 3479.950
CPU max MHz: 4800.0000
CPU min MHz: 800.0000
BogoMIPS: 7584.00
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 mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtsscp lm constant_tsc art arch_perfmon pebs bts rep_good mce cx8 apic cpuid msr pae mce cx8 apic cpuid msr pae mce

From /proc/cpuinfo

cache size : 8192 KB

/proc/cpuinfo cache data

cache size : 8192 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
node 0 size: 64255 MB
node 0 free: 63571 MB
node distances:
node 0

From /proc/meminfo

MemTotal: 65797544 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

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

os-release:
NAME="Red Hat Enterprise Linux"

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

Lenovo Global Technology
ThinkSystem ST50
(3.80 GHz, Intel Xeon E-2244G)

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

SPECspeed®2017_int_base = 12.2
SPECspeed®2017_int_peak = 12.5

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

Platform Notes (Continued)

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"

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
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: 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 Jun 3 13:25

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

Memory:
## Lenovo Global Technology

ThinkSystem ST50  
(3.80 GHz, Intel Xeon E-2244G)

### SPEC CPU®2017 Integer Speed Result

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base</th>
<th>SPECspeed®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.2</td>
<td>12.5</td>
</tr>
</tbody>
</table>

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

### Platform Notes (Continued)

4x SK Hynix HMA82GU7CJR8N-VK 16 GB 2 rank 2666

(End of data from sysinfo program)

### Compiler Version Notes

---

#### C

- `600.perlbench_s(base)`  
- `602.gcc_s(base, peak)`  
- `605.mcf_s(base, peak)`  
- `625.x264_s(base, peak)`  
- `657.xz_s(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.

---

#### C

- `600.perlbench_s(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

- `600.perlbench_s(base)`  
- `602.gcc_s(base, peak)`  
- `605.mcf_s(base, peak)`  
- `625.x264_s(base, peak)`  
- `657.xz_s(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.

---

#### C

- `600.perlbench_s(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++

- `620.omnetpp_s(base, peak)`  
- `623.xalancbmk_s(base, peak)`  
- `631.deepsjeng_s(base, peak)`  
- `641.leela_s(base, peak)`

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

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

**Lenovo Global Technology**

ThinkSystem ST50  
(3.80 GHz, Intel Xeon E-2244G)

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base</th>
<th>12.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_int_peak</td>
<td>12.5</td>
</tr>
</tbody>
</table>

**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

---

**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)
**Lenovo Global Technology**

ThinkSystem ST50
(3.80 GHz, Intel Xeon E-2244G)

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base = 12.2</th>
<th>Test Date: Jun-2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_int_peak = 12.5</td>
<td>Hardware Availability: Mar-2020</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CPU2017 License: 9017</th>
<th>Software Availability: Apr-2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor: Lenovo Global Technology</td>
<td></td>
</tr>
<tr>
<td>Tested by: Lenovo Global Technology</td>
<td></td>
</tr>
</tbody>
</table>

### Base Optimization Flags (Continued)

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

C++ benchmarks:
- `-m64` `-qnextgen` `-Wl,-plugin-opt=-x86-branches-within-32B-boundaries`
- `-Wl,-z,muldefs` `-xCORE-AVX2` `-O3` `-ffast-math` `-flto` `-mfpmath=sse`
- `-funroll-loops` `-fused-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` `-Wl,-plugin-opt=-x86-branches-within-32B-boundaries` `-xCORE-AVX2`
- `-O3` `-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 ST50
(3.80 GHz, Intel Xeon E-2244G)

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

SPECspeed®2017_int_base = 12.2
SPECspeed®2017_int_peak = 12.5

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

Peak Optimization Flags

C benchmarks:

600.perlbench_s: -Wl, -z, multidefs -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

625.x264_s: -m64 -qnextgen -std=c11 -fuse-ld=gold
-Wl, -plugin-opt=-x86-branches-within-32B-boundaries
-Wl, -z, multidefs -fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2 -flto
-Os(pass 1) -O3 -ffast-math -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

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/Intel-ic19.1u1-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CFL-B.xml
## SPEC CPU®2017 Integer Speed Result

**Lenovo Global Technology**
ThinkSystem ST50  
(3.80 GHz, Intel Xeon E-2244G)  

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base</th>
<th>12.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_int_peak</td>
<td>12.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CPU2017 License</th>
<th>9017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Tested by</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Test Date</td>
<td>Jun-2020</td>
</tr>
<tr>
<td>Hardware Availability</td>
<td>Mar-2020</td>
</tr>
<tr>
<td>Software Availability</td>
<td>Apr-2020</td>
</tr>
</tbody>
</table>

---

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 2020-06-03 01:27:38-0400.  
Originally published on 2020-06-23.