## Lenovo Global Technology

### ThinkSystem ST50 (3.60 GHz, Intel Xeon E-2144G)

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

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**Test Date:** Oct-2018  
**Hardware Availability:** Nov-2018  
**Software Availability:** Aug-2018

### Threads

<table>
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<th>Benchmark</th>
<th>Thread Count</th>
<th>SPECspeed2017_int_base</th>
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</thead>
<tbody>
<tr>
<td>600.perlb</td>
<td>8</td>
<td>9.85</td>
</tr>
<tr>
<td>602.gcc</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>605.mcf</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>620.omnetpp</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>623.xalanc</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>625.x264</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>631.deepsjeng</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>641.leela</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>648.exchange2</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>657.xz</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

### Hardware

**CPU Name:** Intel Xeon E-2144G  
**Max MHz.:** 4500  
**Nominal:** 3600  
**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 480 GB SATA SSD  
**Other:** None

### Software

**OS:** Red Hat Enterprise Linux Server release 7.5 (Maipo)  
**Kernel:** 3.10.0-862.11.6.el7.x86_64  
**Compiler:** C/C++: Version 18.0.2.199 of Intel C/C++  
**Compiler for Linux:** C/C++: Version 18.0.2.199 of Intel C/C++  
**Compiler for Linux:** Fortran: Version 18.0.2.199 of Intel Fortran  
**Compiler for Linux:** Fortran: Version 18.0.2.199 of Intel Fortran  
**Parallel:** Yes  
**Firmware:** Lenovo BIOS Version ITE101U released Sep-2018  
**File System:** xfs  
**System State:** Run level 3 (multi-user)  
**Base Pointers:** 64-bit  
**Peak Pointers:** Not Applicable  
**Other:** jemalloc memory allocator V5.0.1
**SPEC CPU2017 Integer Speed Result**

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### 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>
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<tr>
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<td>7.10</td>
<td>250</td>
<td>7.10</td>
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<td>602.gcc_s</td>
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<td>341</td>
<td>11.7</td>
<td>341</td>
<td>11.7</td>
<td>342</td>
<td>11.7</td>
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<tr>
<td>605.mcf_s</td>
<td>8</td>
<td>317</td>
<td>14.9</td>
<td>317</td>
<td>14.9</td>
<td>317</td>
<td>14.9</td>
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<tr>
<td>620.omnetpp_s</td>
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<td>6.43</td>
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<td>6.45</td>
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<tr>
<td>623.xalancbmk_s</td>
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<td>11.6</td>
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<td>11.6</td>
<td>124</td>
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<tr>
<td>625.x264_s</td>
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<td>13.7</td>
<td>129</td>
<td>13.7</td>
<td>129</td>
<td>13.7</td>
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<td>631.deepsjeng_s</td>
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<td>221</td>
<td>6.49</td>
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<tr>
<td>641.leela_s</td>
<td>8</td>
<td>326</td>
<td>5.23</td>
<td>328</td>
<td>5.21</td>
<td>326</td>
<td>5.23</td>
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<tr>
<td>648.exchange2_s</td>
<td>8</td>
<td>182</td>
<td>16.2</td>
<td>180</td>
<td>16.3</td>
<td>181</td>
<td>16.2</td>
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<tr>
<td>657.xz_s</td>
<td>8</td>
<td>503</td>
<td>12.3</td>
<td>502</td>
<td>12.3</td>
<td>502</td>
<td>12.3</td>
</tr>
</tbody>
</table>

**SPECspeed2017_int_base = 9.85**

**SPECspeed2017_int_peak = Not Run**

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"

### General Notes

Environment variables set by runcpu before the start of the run:

- `KMP_AFFINITY = "granularity=fine,scatter"
- `LD_LIBRARY_PATH = "/home/cpu2017-1.0.5-ic18.0u2/lib/ia32:/home/cpu2017-1.0.5-ic18.0u2/lib/intel64"
- `LD_LIBRARY_PATH = "$LD_LIBRARY_PATH:/home/cpu2017-1.0.5-ic18.0u2/je5.0.1-32:/home/cpu2017-1.0.5-ic18.0u2/je5.0.1-64"
- `OMP_STACKSIZE = "192M"

Binaries compiled on a system with 1x Intel Core i7-6700K CPU + 32GB RAM memory using Redhat Enterprise Linux 7.5

Transparent Huge Pages enabled by default

Filesystem page cache synced and cleared with:

```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.

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Test Date: Oct-2018
Hardware Availability: Nov-2018
Software Availability: Aug-2018

Platform Notes

Sysinfo program /home/cpu2017-1.0.5-ic18.0u2/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcede8f2999c33d61f64985e45859ea9
running on st50 Mon Oct 22 23:29:50 2018

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-2144G CPU @ 3.60GHz
  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
Vendor ID: GenuineIntel
CPU family: 6
Model: 158
Model name: Intel(R) Xeon(R) E-2144G CPU @ 3.60GHz
Stepping: 10
CPU MHz: 4347.509
CPU max MHz: 4500.0000
CPU min MHz: 800.0000
BogoMIPS: 7200.00
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 rdtsdp
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc
aperfmperf eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg

(Continued on next page)
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Platform Notes (Continued)

fma cx16 xtpr pdcm pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes
xsavex f16c rdrand lahf_lm abm 3dnowprefetch epb intel_pt ssbd ibrs ibpb stibp
tpr_shadow vmmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2
erms invpcid rtm mpx rdseed adx smap clflushopt xsaveopt xsavec xgetbv1 dtherm ida
arat pln pts hwp hwp_notify hwp_act_window hwp_epp spec_ctrl intel_stibp flush_lld
d

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: 65372 MB
node 0 free: 63562 MB
node distances:
node 0
0: 10

From /proc/meminfo
MemTotal: 65809220 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
os-release:
NAME="Red Hat Enterprise Linux Server"
VERSION="7.5 (Maipo)"
ID="rhel"
ID_LIKE="fedora"
VARIANT="Server"
VARIANT_ID="server"
VERSION_ID="7.5"
PRETTY_NAME="Red Hat Enterprise Linux Server 7.5 (Maipo)"
redhat-release: Red Hat Enterprise Linux Server release 7.5 (Maipo)
system-release: Red Hat Enterprise Linux Server release 7.5 (Maipo)
system-release-cpe: cpe:/o:redhat:enterprise_linux:7.5:ga:server

uname -a:
Linux st50 3.10.0-862.11.6.el7.x86_64 #1 SMP Fri Aug 10 16:55:11 UTC 2018 x86_64
x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
CVE-2017-5754 (Meltdown): Mitigation: PTI
CVE-2017-5753 (Spectre variant 1): Mitigation: Load fences, __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: IBRS (kernel)

(Continued on next page)
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**Platform Notes (Continued)**

run-level 3 Oct 22 23:28

SPEC is set to: /home/cpu2017-1.0.5-ic18.0u2

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sda2</td>
<td>xfs</td>
<td>381G</td>
<td>14G</td>
<td>367G</td>
<td>4%</td>
<td>/home</td>
</tr>
</tbody>
</table>

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.

- BIOS LENOVO ITE101U 09/12/2018
- Memory: 4x SK Hynix HMA82GU7CJR8N-VK 16 GB 2 rank 2667

(End of data from sysinfo program)

**Compiler Version Notes**

```
==============================================================================
CC 600.perlbench_s(base) 602.gcc_s(base) 605.mcf_s(base) 625.x264_s(base)
   657.xz_s(base)
==============================================================================
icc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
==============================================================================
CXXC 620.omnetpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base)
   641.leela_s(base)
==============================================================================
icpc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
==============================================================================
FC 648.exchange2_s(base)
==============================================================================
ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
```
**Base Compiler Invocation**

C benchmarks:
```plaintext
icc -m64 -std=c11
```

C++ benchmarks:
```plaintext
icpc -m64
```

Fortran benchmarks:
```plaintext
ifort -m64
```

**Base Portability Flags**

```plaintext
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:
```plaintext
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
-L/usr/local/je5.0.1-64/lib -ljemalloc
```

C++ benchmarks:
```plaintext
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc
```

Fortran benchmarks:
```plaintext
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs
-L/usr/local/je5.0.1-64/lib -ljemalloc
```
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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-ic18.0-official-linux64.2017-12-21.xml  
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CFL-A.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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