**Lenovo Global Technology**

**ThinkSystem ST50**

(3.80 GHz, Intel Xeon E-2174G)

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base = 25.1</th>
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<tbody>
<tr>
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**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Test Date:** Oct-2018  
**Hardware Availability:** Nov-2018  
**Software Availability:** Aug-2018

### Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
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<tr>
<td>603.bwaves_s</td>
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</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>4</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>4</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>4</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>4</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>4</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>4</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>4</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>4</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>4</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** Intel Xeon E-2174G  
- **Max MHz.:** 4700  
- **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  
- **Cache L2:** 256 KB I+D on chip per core  
- **Cache 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; Fortran: Version 18.0.2.199 of Intel Fortran Compiler for Linux  
- **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
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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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<td>7.29</td>
<td>719</td>
<td>7.28</td>
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<td>621.wrf_s</td>
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<tr>
<td>627.cam4_s</td>
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<tr>
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<td>20.5</td>
<td>704</td>
<td>20.5</td>
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<tr>
<td>644.nab_s</td>
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<td>455</td>
<td>38.4</td>
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<td>38.4</td>
<td>455</td>
<td>38.4</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
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<td>508</td>
<td>17.9</td>
<td>508</td>
<td>17.9</td>
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<tr>
<td>654.roms_s</td>
<td>4</td>
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<td>15.5</td>
<td>1015</td>
<td>15.5</td>
<td>1013</td>
<td>15.5</td>
</tr>
</tbody>
</table>

SPECspeed2017_fp_base = 25.1
SPECspeed2017_fp_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,compact,1,0"
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
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.
Lenovo Global Technology
ThinkSystem ST50
(3.80 GHz, Intel Xeon E-2174G)

SPECspeed2017_fp_base = 25.1
SPECspeed2017_fp_peak = Not Run

Platform Notes
Sysinfo program /home/cpu2017-1.0.5-ic18.0u2/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on st50 Wed Oct 24 21:54:31 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-2174G 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
Vendor ID: GenuineIntel
CPU family: 6
Model: 158
Model name: Intel(R) Xeon(R) E-2174G CPU @ 3.80GHz
Stepping: 10
CPU MHz: 4389.575
CPU max MHz: 4700.0000
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 rdscp
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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Test Date: Oct-2018
Hardware Availability: Nov-2018
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Platform Notes (Continued)

fma cx16 xtpr pdcm pcid sse4_1 sse4_2 x2apic movcnt tsc_deadline_timer aes
xsaves avx f16c rdrand lahf_lm abm 3dnowprefetch epb intel_pt ssbd ibrs ibpb stibp
tpr_shadow vnni flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2
ermes invpcid rtm mpx rdseed clflushopt xsaveopt xsaves xsaveopt xsaveopt xgetbv1 dtherm ida
arat pln pts hwp hwp_notify hwp_act_window hwp_epp spec_ctrl intel_stibp flush_lld

From /proc/cpuinfo

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: 65372 MB
node 0 free: 62875 MB
node distances:
node 0
0: 10

From /proc/meminfo

MemTotal: 65809220 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

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

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)

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)

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Platform Notes (Continued)

run-level 3 Oct 24 19:34

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

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 xfs 381G 14G 367G 4% /home

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 619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base)
==============================================================================
icc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
==============================================================================
FC 607.cactuBSSN_s(base)
==============================================================================
icpc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
icc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
FC 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)
==============================================================================
ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
CC 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base)

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Compiler Version Notes (Continued)

ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
icc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11
Fortran benchmarks:
ifort -m64
Benchmarks using both Fortran and C:
ifort -m64 icc -m64 -std=c11
Benchmarks using Fortran, C, and C++:
icpc -m64 icc -m64 -std=c11 ifort -m64

Base Portability Flags

603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
-assume byterecl
638.imagick_s: -DSPEC_LP64
644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
-L/usr/local/je5.0.1-64/lib -ljemalloc

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SPEC CPU2017 Floating Point Speed Result
Copyright 2017-2018 Standard Performance Evaluation Corporation

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Base Optimization Flags (Continued)

Fortran benchmarks:
- Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX2 -ipo -03 -no-prec-div
- qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
- nostandard-realloc-lhs -L/usr/local/je5.0.1-64/lib -ljemalloc

Benmarks using both Fortran and C:
- Wl,-z,muldefs -xCORE-AVX2 -ipo -03 -no-prec-div
- qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
- nostandard-realloc-lhs -L/usr/local/je5.0.1-64/lib -ljemalloc

Benchmarks using Fortran, C, and C++:
- Wl,-z,muldefs -xCORE-AVX2 -ipo -03 -no-prec-div
- qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
- nostandard-realloc-lhs -L/usr/local/je5.0.1-64/lib -ljemalloc

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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