**Lenovo Global Technology**

**ThinkSystem ST250 (3.50 GHz, Intel Xeon E-2146G)**

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
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<tr>
<td>29.0</td>
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**CPU2017 License:** 9017

**Test Sponsor:** Lenovo Global Technology

**Tested by:** Lenovo Global Technology

**Test Date:** Nov-2018

**Hardware Availability:** Nov-2018

**Software Availability:** Aug-2018

### Threads

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed2017_fp_base</th>
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<tbody>
<tr>
<td>603.bwaves_s 6</td>
<td>38.8</td>
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<tr>
<td>607.cactuBSSN_s 6</td>
<td>23.7</td>
</tr>
<tr>
<td>619.lbm_s 6</td>
<td>33.9</td>
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<tr>
<td>621.wrf_s 6</td>
<td>28.6</td>
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<tr>
<td>627.cam4_s 6</td>
<td>17.0</td>
</tr>
<tr>
<td>628.pop2_s 6</td>
<td>16.5</td>
</tr>
<tr>
<td>638.imagick_s 6</td>
<td>55.0</td>
</tr>
<tr>
<td>644.nab_s 6</td>
<td>56.2</td>
</tr>
<tr>
<td>649.fotonik3d_s 6</td>
<td>79.0</td>
</tr>
<tr>
<td>654.roms_s 6</td>
<td>78.2</td>
</tr>
</tbody>
</table>

---

### Hardware

- **CPU Name:** Intel Xeon E-2146G
- **Max MHz.:** 4500
- **Nominal:** 3500
- **Enabled:** 6 cores, 1 chip
- **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:** 12 MB I+D on chip per chip
- **Memory:** 64 GB (4 x 16 GB 2Rx8 PC4-2666V-E)
- **Storage:** 1 x 960 GB SATA SSD
- **OS:** SUSE Linux Enterprise Server 15 (x86_64)
- **Kernel:** 4.12.14-25.13-default
- **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 ISE105 E 1.01 released Oct-2018
- **File System:** btrfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** Not Applicable
- **Other:** jemalloc memory allocator V5.0.1
### Lenovo Global Technology

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(3.50 GHz, Intel Xeon E-2146G)

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<td>Software Availability:</td>
<td>Aug-2018</td>
</tr>
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### SPECspeed2017_fp_base = 29.0

### SPECspeed2017_fp_peak = Not Run

---

### Results Table

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<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>23.7</td>
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<td>504</td>
<td>28.6</td>
<td>505</td>
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</tr>
<tr>
<td>644.nab_s</td>
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<td>649.fotonik3d_s</td>
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<td>17.0</td>
<td>535</td>
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<tr>
<td>654.roms_s</td>
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<td>975</td>
<td>16.2</td>
<td>954</td>
<td>16.5</td>
</tr>
</tbody>
</table>

---

### SPECspeed2017_fp_base = 29.0

### SPECspeed2017_fp_peak = Not Run

---

### 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"
  
  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 ST250
(3.50 GHz, Intel Xeon E-2146G)

SPECspeed2017_fp_base = 29.0
SPECspeed2017_fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Nov-2018
Tested by: Lenovo Global Technology
Hardware Availability: Nov-2018
Software Availability: Aug-2018

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
Choose Operating Mode set to Custom Mode
CPU P-state Control set to Legacy
Hyper-Threading set to Disable
Sysinfo program /home/cpu2017-1.0.5-ic18.0u2/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on linux-nnmv Wed Nov 21 18:54:04 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-2146G CPU @ 3.50GHz
      1 "physical id"s (chips)
    6 "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 : 6
physical 0: cores 0 1 2 3 4 5

From lscpu:
  Architecture: x86_64
  CPU op-mode(s): 32-bit, 64-bit
  Byte Order: Little Endian
  CPU(s): 6
  On-line CPU(s) list: 0-5
  Thread(s) per core: 1
  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-2146G CPU @ 3.50GHz
  Stepping: 10
  CPU MHz: 3500.000
  CPU max MHz: 4500.0000
  CPU min MHz: 800.0000
  BogoMIPS: 7008.00
  Virtualization: VT-x
  L1d cache: 32K
  L1i cache: 32K
  L2 cache: 256K
  L3 cache: 12288K

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

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**Platform Notes (Continued)**

```
NUMA node0 CPU(s):   0-5
Flags:               fpu vme de pse tsc msr pae mce 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
                    aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3
                    sdbg fma cx16 xtpr 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 ibrs ibpb stibp tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust
                    bmi1 hle avx2 smep bmi2 erms invpcid rtm mpx rdseed adx smap clflushopt intel_pt
                    xsaveopt xsavec xgetbv1 xsaveprec dtherm ida arat pln pts hwp hwp_notify hwp_act_window
                    hwp_epp flush_l1d

/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
  node 0 size: 64366 MB
  node 0 free: 63020 MB
  node distances:
    node 0
      0:  10

From /proc/meminfo
  MemTotal:       65911288 kB
  HugePages_Total:       0
  Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
  os-release:
    NAME="SLES"
    VERSION="15"
    VERSION_ID="15"
    PRETTY_NAME="SUSE Linux Enterprise Server 15"
    ID="sles"
    ID_LIKE="suse"
    ANSI_COLOR="0;32"
    CPE_NAME="cpe:/o:suse:sles:15"

uname -a:
  x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
```

(Continued on next page)
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Platform Notes (Continued)
CVE-2017-5754 (Meltdown): Mitigation: PTI
CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation, IBPB, IBRS_FW

run-level 3 Nov 21 14:09

SPEC is set to: /home/cpu2017-1.0.5-ic18.0u2
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 btrfs 895G 18G 876G 2% /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 -[ISE105E-1.01]- 10/11/2018
Memory:
4x Micron 18ASF2G72AZ-2G6D1 16 GB 2 rank 2666

(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.

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**Compiler Version Notes (Continued)**

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

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
```
Lenovo Global Technology
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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

Fortran benchmarks:
-Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX2 -ipo -O3 -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

Benchmarks using both Fortran and C:
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -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 -O3 -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-SKL-H.xml

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

Tested with SPEC CPU2017 v1.0.5 on 2018-11-21 05:54:03-0500.
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