Lenovo Global Technology
ThinkSystem ST50
(3.70 GHz, Intel Xeon E-2176G)

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

SPECrate2017_fp_base = 37.3
SPECrate2017_fp_peak = Not Run

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

Hardware
CPU Name: Intel Xeon E-2176G
Max MHz.: 4700
Nominal: 3700
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 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: No
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: None
SPECCPU2017 Floating Point Rate Result

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Results Table

<table>
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</tr>
</tbody>
</table>

SPECrate2017_fp_base = 37.3

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

Submit Notes
The taskset mechanism was used to bind copies to processors. The config file option 'submit' was used to generate taskset commands to bind each copy to a specific processor. For details, please see the config file.

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:
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"

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.

(Continued on next page)
## General Notes (Continued)

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.

## Platform Notes

BIOS configuration:
ICE Performance Mode set to 4HD Cooling Mode
Sysinfo program /home/cpu2017-1.0.5-ic18.0u2/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on st50 Sat Nov 3 02:33:13 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-2176G CPU @ 3.70GHz
- 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 lscpu:

- 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-2176G CPU @ 3.70GHz
- Stepping: 10
- CPU MHz: 1225.579
- CPU max MHz: 4700.0000
- CPU min MHz: 800.0000
- BogoMIPS: 7392.00
- Virtualization: VT-x
Platform Notes (Continued)

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 mca 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 aperfmperf eagerfpu 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 epb intel_pt ssbd ibpb stibp tpr_shadow vmx flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm mpx rdseed adx smap clflushopt xsaveopt xsavevc xgetbv1 dtherm ida arat pln pts hwp hwp_notify hwp_act_window hwp_epp spec_ctrl intel_stibp flush_l1d

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: 65371 MB
  node 0 free: 61637 MB
  node distances:
    node 0
    0: 10

From /proc/meminfo
  MemTotal: 65807636 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

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

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**Platform Notes (Continued)**

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)

run-level 3 Nov 2 16:03

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

Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sda2      xfs   381G  338G   43G  89% /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  519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)
------------------------------------------------------------------------------
icc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
==============================================================================
CXXC 508.namd_r(base) 510.parest_r(base)
------------------------------------------------------------------------------
icpc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
==============================================================================
 CC  511.povray_r(base) 526.blender_r(base)
------------------------------------------------------------------------------
icpc (ICC) 18.0.2 20180210
```

(Continued on next page)
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Compiler Version Notes (Continued)
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icc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

FC  507.cactuBSSN_r(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  503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)

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

CC  521.wrf_r(base) 527.cam4_r(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

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

Benchmarks using both Fortran and C:
ifort -m64 icc -m64 -std=c11

(Continued on next page)
**SPEC CPU2017 Floating Point Rate Result**

**Lenovo Global Technology**

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<thead>
<tr>
<th>CPU2017 License: 9017</th>
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<tbody>
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<td>Test Sponsor: Lenovo Global Technology</td>
<td>Hardware Availability: Nov-2018</td>
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<tr>
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<td>Software Availability: Aug-2018</td>
</tr>
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</table>

**SPECrate2017_fp_base = 37.3**  
**SPECrate2017_fp_peak = Not Run**

### Base Compiler Invocation (Continued)

Benchmarks using both C and C++:
```
icpc -m64 icc -m64 -std=c11
```

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

### Base Portability Flags

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Flags</th>
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<tbody>
<tr>
<td>503.bwaves_r</td>
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<tr>
<td>507.cactuBSSN_r</td>
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<td>519.lbm_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>521.wrf_r</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian</td>
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<td>526.blender_r</td>
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<td>527.cam4_r</td>
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<tr>
<td>554.roms_r</td>
<td>-DSPEC_LP64</td>
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</table>

### Base Optimization Flags

**C benchmarks:**
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3
```

**C++ benchmarks:**
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3
```

**Fortran benchmarks:**
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -auto -nostandard-realloc-lhs
```

**Benchmarks using both Fortran and C:**
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -auto -nostandard-realloc-lhs
```

**Benchmarks using both C and C++:**
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
```

(Continued on next page)
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**Base Optimization Flags (Continued)**

Benchmarks using both C and C++ (continued):
- `-qopt-mem-layout-trans=3`

Benchmarks using Fortran, C, and C++:
- `xCORE-AVX2` `-ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only`
- `-qopt-mem-layout-trans=3` `-auto -nostandard-realloc-lhs`

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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