Lenovo Global Technology
ThinkSystem ST250
(3.40 GHz, Intel Xeon E-2124G)

**CPU2017 License:** 9017

**Test Sponsor:** Lenovo Global Technology
**Hardware Availability:** Nov-2018

**Tested by:** Lenovo Global Technology
**Software Availability:** Aug-2018

**Test Date:** Nov-2018

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**Hardware**

**CPU Name:** Intel Xeon E-2124G
**Max MHz.:** 4500
**Nominal:** 3400
**Enabled:** 4 cores, 1 chip
**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

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**Software**

**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 ISE105E 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
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SPECspeed2017_fp_base = 24.5
SPECspeed2017_fp_peak = Not Run

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>
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<tr>
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<td>19.5</td>
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<td>654.roms_s</td>
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<td>15.5</td>
<td>1014</td>
<td>15.5</td>
</tr>
</tbody>
</table>

SPECspeed2017_fp_base = 24.5
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"
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.

jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5
**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

Sysinfo program /home/cpu2017-1.0.5-ic18.0u2/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on linux-nnmv Fri Nov 23 18:40:10 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-2124G CPU @ 3.40GHz
- 1 "physical id"s (chips)
- 4 "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 : 4
  - 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):             4
- On-line CPU(s) list: 0-3
- Thread(s) per core: 1
- 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-2124G CPU @ 3.40GHz
- Stepping:           10
- CPU MHz:            3400.000
- CPU max MHz:        4500.0000
- CPU min MHz:        800.0000
- BogoMIPS:           6816.00
- Virtualization:     VT-x
- L1d cache:          32K
- L1i cache:          32K
- L2 cache:           256K
- L3 cache:           8192K
- NUMA node0 CPU(s): 0-3

(Continued on next page)
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Hardware Availability: Nov-2018
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Platform Notes (Continued)

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 rdtscp
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmpref 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 vmmi flexpriority ept vpid fsgsbase tsc_adjust
bmi1 hle avx2 smep bmi2 erms invpcid rtm mpx rdseed adx smap clflushopt intel_pt
xsaveopt xsavec xgetbv1 xsaves dtherm ida arat pln pts hwp hwp_notify hwp_act_window
hwp_epp 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
   node 0 size: 64367 MB
   node 0 free: 62133 MB
   node distances:

From /proc/meminfo

| MemTotal:       | 65912688 kB |
| MemFree:       | 0           |
| HugePages_Total: | 0           |
| Hugepagesize:  | 2048 kB     |

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

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:

CVE-2017-5754 (Meltdown): Mitigation: PTI

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

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 23 09:51

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>btrfs</td>
<td>895G</td>
<td>18G</td>
<td>876G</td>
<td>2%</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 -[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.
* ifort (IFORT) 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)**

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

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

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

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

Benchmarks using Fortran, C, and C++:
```plaintext
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
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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:

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