Lenovo Global Technology
ThinkSystem SR650 V3
(2.00 GHz, Intel Xeon Platinum 8470)

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

Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>104</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>104</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>104</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>104</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>104</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>104</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>104</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>104</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>104</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>104</td>
</tr>
</tbody>
</table>

SPECspeed®2017_fp_base = 338
SPECspeed®2017_fp_peak = Not Run

Hardware

CPU Name: Intel Xeon Platinum 8470
Max MHz: 3800
Nominal: 2000
Enabled: 104 cores, 2 chips
Orderable: 1.2 chips
Cache L1: 32 KB I + 48 KB D on chip per core
L2: 2 MB I+D on chip per core
L3: 105 MB I+D on chip per chip
Other: None
Memory: 512 GB (16 x 32 GB 2Rx8 PC5-4800B-R)
Storage: 1 x 480 GB SATA SSD
Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP4 (x86_64)
Kernel 5.14.21-150400.22-default
Compiler: C/C++: Version 2022.1 of Intel oneAPI DPC++/C++
Compiler for Linux;
Fortran: Version 2022.1 of Intel Fortran Compiler for Linux;
Parallel: Yes
Firmware: Lenovo BIOS Version ESE109L 1.10 released Jan-2023
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
Power Management: BIOS and OS set to prefer performance at the cost of additional power usage
**SPEC CPU®2017 Floating Point Speed Result**

**Lenovo Global Technology**

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(2.00 GHz, Intel Xeon Platinum 8470)

| SPECspeed®2017_fp_base = 338 |
| SPECspeed®2017_fp_peak = Not Run |

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<thead>
<tr>
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<tr>
<td>Test Sponsor: Lenovo Global Technology</td>
<td>Test Date: Jan-2023</td>
</tr>
<tr>
<td>Tested by: Lenovo Global Technology</td>
<td>Hardware Availability: Feb-2023</td>
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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>
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<td>627.cam4_s</td>
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<tr>
<td>644.nab_s</td>
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<td>737</td>
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<tr>
<td>649.fotonik3d_s</td>
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<td>476</td>
<td>33.5</td>
<td>470</td>
<td>33.3</td>
<td>473</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Operating System Notes**

Stack size set to unlimited using "ulimit -s unlimited"

**Environment Variables Notes**

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

- KMP_AFFINITY = "granularity=fine,compact"
- LD_LIBRARY_PATH = "/home/cpu2017-1.1.8-ic2022.1/lib/intel64;/home/cpu2017-1.1.8-ic2022.1/j ed5.0.1-64"
- MALLOC_CONF = "retain:true"
- OMP_STACKSIZE = "192M"

**General Notes**

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM memory using Redhat Enterprise Linux 8.0

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
```

NA: 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.
General Notes (Continued)

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:
Operating Mode set to Custom Mode
CPU P-State Control set to Legacy
Hyper-Threading set to Disabled
DCU IP Prefetcher set to Disabled

Sysinfo program /home/cpu2017-1.1.8-ic2022.1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on localhost Thu Jan 12 18:33:39 2023

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) Platinum 8470
  2 "physical id"s (chips)
  104 "processors"
core, siblings (Caution: counting these is hw and system dependent. The following
excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
cpu cores : 52
siblings : 52
  physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
  25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
  25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51

From lscpu from util-linux 2.37.2:
  Architecture: x86_64
  CPU op-mode(s): 32-bit, 64-bit
  Address sizes: 46 bits physical, 57 bits virtual
  Byte Order: Little Endian
  CPU(s): 104
  On-line CPU(s) list: 0-103
  Vendor ID: GenuineIntel
  Model name: Intel(R) Xeon(R) Platinum 8470
  CPU family: 6
  Model: 143
  Thread(s) per core: 1
  Core(s) per socket: 52

(Continued on next page)
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SPECspeed®2017_fp_base = 338
SPECspeed®2017_fp_peak = Not Run

Platform Notes (Continued)

Socket(s): 2
Stepping: 8
Frequency boost: enabled
CPU max MHz: 2001.0000
CPU min MHz: 800.0000
BogoMIPS: 4000.00
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr
pg e mca cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx
pdcm pb tsc dtes64 monitor ds cpl vmx
smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt
tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuboard
epb cat_l3 cat_l2 cd l3 invpcid_single intel_paging_perms cdp l2 ssbd mb ibrs ibpb stibp
ibrs enhanced tpr_shadow vmni flexpriority ept vpid ept_ad fsqbase tsc_adjust bmid
hle avx2 smep bmi2 erms invpcid rt m q cm qm rdt_a avx512f avx512dq rdseed adx smap
avx512fma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt
xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
split lock detect avx_vnni avx512 lf16 wbnoinv dtherm ida arat pln pts avx512vbmi
umip pk u ospke waitpkg avx512 vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512 bitalg
tme avx512_vpopcntdq la57 rdpid bus_lock_detect cldemote movdir movdir64b enqcmd
fsrm md clear serialize txslndtrk pconfi g arch lbr avx512_fp16 amx_tile flush ldld
arch capabilities
Virtualization: VT-x
L1d cache: 4.9 MiB (104 instances)
L1l cache: 3.3 MiB (104 instances)
L2 cache: 208 MiB (104 instances)
L3 cache: 210 MiB (2 instances)
NUMA node(s): 2
NUMA node0 CPU(s): 0-51
NUMA node1 CPU(s): 52-103
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Spec store bypass: Mitigation; speculative Store Bypass disabled via
prct and seccomp
Vulnerability Spectre v1: Mitigation; usenode_copy swapgs barriers and __user
pointers sanitzation
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB
filling
Vulnerability Srbds: Not affected
Vulnerability Tsx async abort: Not affected

From lscpu --cache:
NAME ONE-SIZE ALL-SIZE WAYS TYPE LEVEL SETS PHY-LINE COHERENCY-SIZE
L1d 48K 4.9M 12 Data 1 64 1 64
L1l 32K 3.3M 8 Instruction 1 64 1 64

(Continued on next page)
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SPECcpu®2017 Floating Point Speed Result
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Lenovo Global Technology

SPECspeed®2017_fp_base = 338
SPECspeed®2017_fp_peak = Not Run

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Tested by: Lenovo Global Technology

Test Date: Jan-2023
Hardware Availability: Feb-2023
Software Availability: Jun-2022

Platform Notes (Continued)

<table>
<thead>
<tr>
<th>L2</th>
<th>2M</th>
<th>208M</th>
<th>16 Unified</th>
<th>2</th>
<th>2048</th>
<th>1</th>
<th>64</th>
</tr>
</thead>
<tbody>
<tr>
<td>L3</td>
<td>105M</td>
<td>210M</td>
<td>15 Unified</td>
<td>3</td>
<td>114688</td>
<td>1</td>
<td>64</td>
</tr>
</tbody>
</table>

/proc/cpuinfo cache data
  cache size : 107520 KB

From numactl --hardware
  WARNING: a numactl 'node' might or might not correspond to a physical chip.
  available: 2 nodes (0-1)
  node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
  28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51
  node 0 size: 257664 MB
  node 0 free: 256507 MB
  node 1 cpus: 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76
  77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103
  node 1 size: 258006 MB
  node 1 free: 257587 MB
  node distances:
  node  0   1
  0: 10  21
  1: 21  10

From /proc/meminfo
  MemTotal: 528046592 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has ondemand

From /etc/*release*/etc/*version*
  os-release:
    NAME="SLES"
    VERSION="15-SP4"
    VERSION_ID="15.4"
    PRETTY_NAME="SUSE Linux Enterprise Server 15 SP4"
    ID=sles
    ID_LIKE="suse"
    ANSI_COLOR=0;32
    CPE_NAME=cpe:/o:suse:sles:15:sp4"

uname -a:
  Linux localhost 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18
  UTC 2022 (49db222) 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-2018-12207 (iTLB Multihit): Not affected
CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected
CVE-2017-5754 (Meltdown): Not affected
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2017-5753 (Spectre variant 1): Mitigation: usercopy/swapgs barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Jan 12 18:31
SPEC is set to: /home/cpu2017-1.1.8-ic2022.1
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 xfs 446G 29G 418G 7% /

From /sys/devices/virtual/dmi/id
Vendor: Lenovo
Product: ThinkSystem SR650 V3, EGS, DDR5, SH, 2U
Product Family: ThinkSystem
Serial: 1234567890

Additional information from dmidecode 3.2 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 SMIOS" standard.

Memory:
9x Samsung M321R4GA3BB0-CQKEG 32 GB 2 rank 4800
7x Samsung M321R4GA3BB0-CQKVG 32 GB 2 rank 4800

BIOS:
BIOS Vendor: Lenovo
BIOS Version: ESE109L-1.10
BIOS Date: 01/07/2023
BIOS Revision: 1.10
Firmware Revision: 1.0

(End of data from sysinfo program)
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Compiler Version Notes
==============================================================================
| C               | 619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base) |
-----------------------------------------------------------------------------
| Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, |
| Version 2022.1.0 Build 20220316 |
| Copyright (C) 1985-2022 Intel Corporation. All rights reserved. |
|--|--|--|

==============================================================================
| C++, C, Fortran | 607.cactuBSSN_s(base) |
-----------------------------------------------------------------------------
| Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, |
| Version 2022.1.0 Build 20220316 |
| Copyright (C) 1985-2022 Intel Corporation. All rights reserved. |
| Intel(R) Fortran Compiler for applications running on Intel(R) 64, |
| Version 2022.1.0 Build 20220316 |
| Copyright (C) 1985-2022 Intel Corporation. All rights reserved. |
|--|--|--|

==============================================================================
| Fortran         | 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base) |
-----------------------------------------------------------------------------
| Intel(R) Fortran Compiler for applications running on Intel(R) 64, |
| Version 2022.1.0 Build 20220316 |
| Copyright (C) 1985-2022 Intel Corporation. All rights reserved. |
|--|--|--|

==============================================================================
| Fortran, C      | 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base) |
-----------------------------------------------------------------------------
| Intel(R) Fortran Compiler for applications running on Intel(R) 64, |
| Version 2022.1.0 Build 20220316 |
| Copyright (C) 1985-2022 Intel Corporation. All rights reserved. |
| Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, |
| Version 2022.1.0 Build 20220316 |
| Copyright (C) 1985-2022 Intel Corporation. All rights reserved. |
|--|--|--|

Base Compiler Invocation
C benchmarks:
icx

(Continued on next page)
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Base Compiler Invocation (Continued)

Fortran benchmarks:
ifx

Benchmarks using both Fortran and C:
ifx icx

Benchmarks using Fortran, C, and C++:
icpx icx ifx

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:
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Fortran benchmarks:
-m64 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Benchmarks using both Fortran and C:
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
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Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++:
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -gopt-mem-layout-trans=4 -flopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Eaglestream-N.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Eaglestream-N.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 CPU®2017 v1.1.8 on 2023-01-12 05:33:39-0500.
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