Lenovo Global Technology
ThinkSystem SR950
(2.70 GHz, Intel Xeon Gold 5220S)

SPECSpeed®2017_fp_base = 166
SPECSpeed®2017_fp_peak = Not Run

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

Test Date: Aug-2019
Hardware Availability: Jul-2019
Software Availability: May-2019

Threads

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base (166)</th>
</tr>
</thead>
<tbody>
<tr>
<td>145</td>
</tr>
<tr>
<td>147</td>
</tr>
<tr>
<td>136</td>
</tr>
<tr>
<td>120</td>
</tr>
<tr>
<td>173</td>
</tr>
<tr>
<td>312</td>
</tr>
<tr>
<td>105</td>
</tr>
<tr>
<td>20</td>
</tr>
</tbody>
</table>

Hardware

CPU Name: Intel Xeon Gold 5220S
Max MHz: 3900
Nominal: 2700
Enabled: 72 cores, 4 chips
Orderable: 2,3,4 chips
Cache L1: 32 KB I + 32 KB D on chip per core
L2: 1 MB I+D on chip per core
L3: 24.75 MB I+D on chip per chip
Other: None
Memory: 1536 GB (48 x 32 GB 2Rx4 PC4-2933Y-R, running at 2666)
Storage: 1 x 800 GB SATA SSD
Other: None

Software

OS: SUSE Linux Enterprise Server 15 (x86_64)
Compiler: C/C++: Version 19.0.4.227 of Intel
C/C++ Compiler for Linux;
Fortran: Version 19.0.4.227 of Intel Fortran
Compiler for Linux
Parallel: Yes
Firmware: Lenovo BIOS Version PSE122R 1.53 released Aug-2019
tested as PSE121R 1.53 Jul-2019
File System: btrfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None
Power Management: --
Lenovo Global Technology
ThinkSystem SR950
(2.70 GHz, Intel Xeon Gold 5220S)

SPECspeed®2017_fp_base = 166
SPECspeed®2017_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>
<th>Ratio</th>
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</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>72</td>
<td>79.4</td>
<td>743</td>
<td>81.7</td>
<td>722</td>
<td>80.5</td>
<td>732</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>72</td>
<td>115</td>
<td>145</td>
<td>113</td>
<td>148</td>
<td>115</td>
<td>145</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>72</td>
<td>35.6</td>
<td>147</td>
<td>35.6</td>
<td>147</td>
<td>37.8</td>
<td>139</td>
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<tr>
<td>621.wrf_s</td>
<td>72</td>
<td>97.5</td>
<td>136</td>
<td>98.8</td>
<td>134</td>
<td>96.9</td>
<td>136</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>72</td>
<td>73.9</td>
<td>120</td>
<td>73.6</td>
<td>120</td>
<td>73.7</td>
<td>120</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>72</td>
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<td>53.7</td>
<td>223</td>
<td>53.2</td>
<td>220</td>
<td>53.8</td>
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<tr>
<td>638.imagick_s</td>
<td>72</td>
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<td>173</td>
<td>83.3</td>
<td>173</td>
<td>83.7</td>
<td>172</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>72</td>
<td>56.0</td>
<td>312</td>
<td>56.0</td>
<td>312</td>
<td>56.0</td>
<td>312</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>72</td>
<td>86.8</td>
<td>105</td>
<td>86.4</td>
<td>106</td>
<td>86.8</td>
<td>105</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>72</td>
<td>78.6</td>
<td>200</td>
<td>78.8</td>
<td>200</td>
<td>78.9</td>
<td>200</td>
</tr>
</tbody>
</table>

Operating System Notes

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

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-ic19.0u4/lib/intel64"
OMP_STACKSIZE = "192M"

Binaries compiled on a system with 1x Intel Core i9-799X CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.5
Transparent Huge Pages disabled by default
echo never > /sys/kernel/mm/transparent_hugepage/enabled
echo never > /sys/kernel/mm/transparent_hugepage/defrag
Prior to runcpu invocation
Filesystem page cache synced and cleared with:
sync; echo 3>&1 /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.
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3640 (Spectre variant 3a) is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3639 (Spectre variant 4) is mitigated in the system as tested and documented.
Lenovo Global Technology
ThinkSystem SR950
(2.70 GHz, Intel Xeon Gold 5220S)

SPECspeed®2017_fp_base = 166
SPECspeed®2017_fp_peak = Not Run

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
Choose Operating Mode set to Custom Mode
CPU P-state Control set to Autonomous
Hyper-Threading set to Disable
Trusted Execution Technology set to Enable
dCU Streamer Prefetcher set to Disable
MONITOR/MWAIT set to Enable
 Sysinfo program /home/cpu2017-1.0.5-ic19.0u4/bin/sysinfo
 Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
 running on linux-i7o2 Wed Aug 21 02:21:21 2019

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) Gold 5220S CPU @ 2.70GHz
  4 "physical id"s (chips)
  72 "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 : 18
    siblings : 18
    physical 0: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
    physical 1: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
    physical 2: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
    physical 3: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

From lscpu:
  Architecture: x86_64
  CPU op-mode(s): 32-bit, 64-bit
  Byte Order: Little Endian
  CPU(s): 72
  On-line CPU(s) list: 0-71
  Thread(s) per core: 1
  Core(s) per socket: 18
  Socket(s): 4
  NUMA node(s): 4
  Vendor ID: GenuineIntel
  CPU family: 6
  Model: 85
  Model name: Intel(R) Xeon(R) Gold 5220S CPU @ 2.70GHz
  Stepping: 7
  CPU MHz: 2700.000
  BogoMIPS: 5400.00
  Virtualization: VT-x

(Continued on next page)
Lenovo Global Technology  
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**SPECspeed®2017_fp_base = 166**  
**SPECspeed®2017_fp_peak = Not Run**

**Platform Notes (Continued)**

- **L1d cache:** 32K  
- **L1i cache:** 32K  
- **L2 cache:** 1024K  
- **L3 cache:** 25344K  
- **NUMA node0 CPU(s):** 0-17  
- **NUMA node1 CPU(s):** 18-35  
- **NUMA node2 CPU(s):** 36-53  
- **NUMA node3 CPU(s):** 54-71  
- **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 pdczldgb rdtscp lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmpref pni pclmulqdq dtst64 monitor ds cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtrm pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3nowprefetch cpuid_fault epb cat_13 cpud_node

From `/proc/cpuinfo` cache data  
 cache size : 25344 KB

From `numactl --hardware` WARNING: a numactl 'node' might or might not correspond to a physical chip.  
 available: 4 nodes (0-3)  
 node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17  
 node 0 size: 386639 MB  
 node 0 free: 383151 MB  
 node 1 cpus: 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35  
 node 1 size: 387051 MB  
 node 1 free: 386434 MB  
 node 2 cpus: 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53  
 node 2 size: 387051 MB  
 node 2 free: 386453 MB  
 node 3 cpus: 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71  
 node 3 size: 387019 MB  
 node 3 free: 386146 MB  
 node distances:
  node 0 1 2 3  
  0: 10 31 21 21  
  1: 31 10 21 21  
  2: 21 21 10 31  
  3: 21 21 31 10  

From `/proc/meminfo`  
MemTotal: 1584907636 KB

(Continued on next page)
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<table>
<thead>
<tr>
<th>Platform Notes (Continued)</th>
</tr>
</thead>
</table>

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:
  Linux linux-i7o2 4.12.14-25.13-default #1 SMP Tue Aug 14 15:07:35 UTC 2018 (947aa51)
  x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2017-5754 (Meltdown): Not affected
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 Aug 20 23:58

SPEC is set to: /home/cpu2017-1.0.5-ic19.0u4

<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>742G</td>
<td>57G</td>
<td>685G</td>
<td>8%</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 -[PSE121R-1.53]- 07/03/2019
Memory:
  48x NO DIMM NO DIMM
  48x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933, configured at 2666

(End of data from sysinfo program)

Compiler Version Notes

C               | 619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base)

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR950
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Compiler Version Notes (Continued)

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

C++, C, Fortran | 607.cactuBSSN_s(base)

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Fortran         | 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Fortran, C      | 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

Fortran benchmarks:
ifort -m64
SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

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Software Availability: May-2019

Base Compiler Invocation (Continued)

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:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

Fortran benchmarks:
-DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-nostandard-realloc-lhs

Benchmarks using both Fortran and C:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs

Benchmarks using Fortran, C, and C++:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs
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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-CLX-D.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-CLX-D.xml

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