## Lenovo Global Technology

**ThinkSystem SR860**  
(3.60 GHz, Intel Xeon Gold 5122)

### SPECspeed2017_fp_base = 82.9  
### SPECspeed2017_fp_peak = 83.2

<table>
<thead>
<tr>
<th>Test Sponsor</th>
<th>Lenovo Global Technology</th>
<th>Test Date</th>
<th>May-2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested by</td>
<td>Lenovo Global Technology</td>
<td>Hardware Availability</td>
<td>Nov-2017</td>
</tr>
<tr>
<td></td>
<td>spec</td>
<td>Software Availability</td>
<td>Jan-2018</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>82.8</td>
<td>84.1</td>
</tr>
<tr>
<td>16</td>
<td>56.9</td>
<td>54.7</td>
</tr>
<tr>
<td>16</td>
<td>61.4</td>
<td>64.2</td>
</tr>
<tr>
<td>16</td>
<td>51.4</td>
<td>50.9</td>
</tr>
<tr>
<td>16</td>
<td>60.3</td>
<td>45.8</td>
</tr>
<tr>
<td>16</td>
<td>76.9</td>
<td>110</td>
</tr>
<tr>
<td>16</td>
<td>75.9</td>
<td>92.9</td>
</tr>
<tr>
<td></td>
<td>SPECspeed2017_fp_base (82.9)</td>
<td>SPECspeed2017_fp_peak (83.2)</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name**: Intel Xeon Gold 5122  
- **Max MHz.**: 3700  
- **Nominal**: 3600  
- **Enabled**: 16 cores, 4 chips  
- **Orderable**: 2,4 chips  
- **Cache L1**: 32 KB I + 32 KB D on chip per core  
- **L2**: 1 MB I+D on chip per core  
- **L3**: 16.5 MB I+D on chip per chip  
- **Other**: None  
- **Memory**: 768 GB (48 x 16 GB 2Rx8 PC4-2666V-R)  
- **Storage**: 1 x 800 GB SAS SSD  
- **Other**: None

### Software

- **OS**: Red Hat Enterprise Linux Server release 7.4 (Maipo)  
- **Kernel**: 3.10.0-693.11.6.el7.x86_64  
- **Compiler**: C/C++: Version 18.0.0.128 of Intel C/C++ Compiler for Linux; Fortran: Version 18.0.0.128 of Intel Fortran Compiler for Linux  
- **Parallel**: Yes  
- **Firmware**: Lenovo BIOS Version TEE117P 1.13 released Feb-2018  
- **File System**: xfs  
- **System State**: Run level 3 (multi-user)  
- **Base Pointers**: 64-bit  
- **Peak Pointers**: 64-bit  
- **Other**: None
Lenovo Global Technology
ThinkSystem SR860
(3.60 GHz, Intel Xeon Gold 5122)

**SPECspeed2017_fp_base = 82.9**
**SPECspeed2017_fp_peak = 83.2**

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Base</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>16</td>
<td>124</td>
<td>475</td>
<td>124</td>
<td>475</td>
<td>125</td>
<td>473</td>
<td>124</td>
<td>475</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>16</td>
<td>202</td>
<td>82.6</td>
<td>201</td>
<td>82.8</td>
<td>200</td>
<td>83.2</td>
<td>198</td>
<td>84.0</td>
</tr>
<tr>
<td>619.llvm_s</td>
<td>16</td>
<td>92.0</td>
<td>56.9</td>
<td>89.6</td>
<td>58.4</td>
<td>95.8</td>
<td>54.7</td>
<td>96.7</td>
<td>54.2</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>16</td>
<td>216</td>
<td>61.2</td>
<td>212</td>
<td>62.4</td>
<td>216</td>
<td>61.4</td>
<td>206</td>
<td>64.2</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>16</td>
<td>172</td>
<td>51.5</td>
<td>173</td>
<td>51.2</td>
<td>172</td>
<td>51.4</td>
<td>173</td>
<td>51.1</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>16</td>
<td>260</td>
<td>45.6</td>
<td>261</td>
<td>45.6</td>
<td>264</td>
<td>45.0</td>
<td>259</td>
<td>45.8</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>16</td>
<td>239</td>
<td>60.4</td>
<td>239</td>
<td>60.5</td>
<td>238</td>
<td>60.6</td>
<td>240</td>
<td>60.1</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>16</td>
<td>158</td>
<td>110</td>
<td>158</td>
<td>110</td>
<td>158</td>
<td>110</td>
<td>158</td>
<td>110</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>16</td>
<td>122</td>
<td>74.8</td>
<td>112</td>
<td>81.1</td>
<td>118</td>
<td>76.9</td>
<td>125</td>
<td>72.9</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>16</td>
<td>169</td>
<td>93.1</td>
<td>170</td>
<td>92.9</td>
<td>174</td>
<td>90.6</td>
<td>163</td>
<td>96.5</td>
</tr>
</tbody>
</table>

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:

```
LD_LIBRARY_PATH = "/home/cpu2017.1.0.2.ic18.0/lib/ia32:/home/cpu2017.1.0.2.ic18.0/lib/intel64"
LD_LIBRARY_PATH = "$LD_LIBRARY_PATH:/home/cpu2017.1.0.2.ic18.0/je5.0.1-32:/home/cpu2017.1.0.2.ic18.0/je5.0.1-64"
OMP_STACKSIZE = "192M"
```

Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM memory using Redhat Enterprise Linux 7.4

Transparent Huge Pages enabled by default

Prior to runcpu invocation

```
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.

**Platform Notes**

BIOS configuration:

Choose Operating Mode set to Maximum Performance
Hyper-Threading set to Disable

(Continued on next page)
Platform Notes (Continued)

Adjacent Cache Prefetch set to Disable
MONITORMWAIT set to Enable
Per Core P-state set to Disable
UPI Prefetcher set to Disable
StaleAtos set to Enable
LLC dead line alloc set to Disable
Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on SR860 Mon May 21 11:35:05 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) Gold 5122 CPU @ 3.60GHz
  4 "physical id"s (chips)
  16 "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 12 13
  physical 1: cores 2 3 4 10
  physical 2: cores 5 8 10 11
  physical 3: cores 1 2 5 11

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 16
On-line CPU(s) list: 0-15
Thread(s) per core: 1
Core(s) per socket: 4
Socket(s): 4
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 5122 CPU @ 3.60GHz
Stepping: 4
CPU MHz: 3600.000
BogoMIPS: 7200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K

(Continued on next page)
Lenovo Global Technology

ThinkSystem SR860
(3.60 GHz, Intel Xeon Gold 5122)

SPECspeed2017_fp_base = 82.9
SPECspeed2017_fp_peak = 83.2

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

Test Date: May-2018
Hardware Availability: Nov-2017
Software Availability: Jan-2018

Platform Notes (Continued)

L2 cache: 1024K
L3 cache: 16896K
NUMA node0 CPU(s): 0-3
NUMA node1 CPU(s): 4-7
NUMA node2 CPU(s): 8-11
NUMA node3 CPU(s): 12-15
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 apic msr pbe 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 apic msr pbe mca cmov

From /proc/cpuinfo cache data
  cache size : 16896 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
  node 0 size: 196287 MB
  node 0 free: 191533 MB
  node 1 cpus: 4 5 6 7
  node 1 size: 196608 MB
  node 1 free: 191964 MB
  node 2 cpus: 8 9 10 11
  node 2 size: 196608 MB
  node 2 free: 192018 MB
  node 3 cpus: 12 13 14 15
  node 3 size: 196608 MB
  node 3 free: 191880 MB
  node distances:
    node 0 1 2 3
    0: 10 21 21 31
    1: 21 10 31 21
    2: 21 31 10 21
    3: 31 21 21 10

From /proc/meminfo
  MemTotal: 791430224 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

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

ThinkSystem SR860  
(3.60 GHz, Intel Xeon Gold 5122)

<table>
<thead>
<tr>
<th>CPU2017 License: 9017</th>
<th>Test Date: May-2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor: Lenovo Global Technology</td>
<td>Hardware Availability: Nov-2017</td>
</tr>
<tr>
<td>Tested by: Lenovo Global Technology</td>
<td>Software Availability: Jan-2018</td>
</tr>
</tbody>
</table>

### SPEC CPU2017 Floating Point Speed Result

| SPECspeed2017_fp_base = 82.9 |
| SPECspeed2017_fp_peak = 83.2 |

### Platform Notes (Continued)

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

<table>
<thead>
<tr>
<th>os-release:</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME=&quot;Red Hat Enterprise Linux Server&quot;</td>
</tr>
<tr>
<td>VERSION=&quot;7.4 (Maipo)&quot;</td>
</tr>
<tr>
<td>ID=&quot;rhel&quot;</td>
</tr>
<tr>
<td>ID_LIKE=&quot;fedora&quot;</td>
</tr>
<tr>
<td>VARIANT=&quot;Server&quot;</td>
</tr>
<tr>
<td>VARIANT_ID=&quot;server&quot;</td>
</tr>
<tr>
<td>VERSION_ID=&quot;7.4&quot;</td>
</tr>
<tr>
<td>PRETTY_NAME=&quot;Red Hat Enterprise Linux Server 7.4 (Maipo)&quot;</td>
</tr>
<tr>
<td>redhat-release: Red Hat Enterprise Linux Server release 7.4 (Maipo)</td>
</tr>
<tr>
<td>system-release: Red Hat Enterprise Linux Server release 7.4 (Maipo)</td>
</tr>
<tr>
<td>system-release-cpe: cpe:/o:redhat:enterprise_linux:7.4:ga:server</td>
</tr>
</tbody>
</table>

uname -a:  

Linux SR860 3.10.0-693.11.6.el7.x86_64.debug #1 SMP Thu Dec 28 14:30:03 EST 2017  
x86_64 x86_64 x86_64 GNU/Linux  
run-level 3 May 21 11:29  

SPEC is set to: /home/cpu2017.1.0.2.ic18.0  

<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/sdb4</td>
<td>xfs</td>
<td>686G</td>
<td>167G</td>
<td>519G</td>
<td>25%</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 -[TEE117P-1.13]- 02/06/2018  
Memory:  
48x Samsung M393A2K43BB1-CTD 16 GB 2 rank 2666  

(End of data from sysinfo program)

### Compiler Version Notes

==============================================================================  
<table>
<thead>
<tr>
<th>CC 619.lbm_s(base) 638.imagick_s(base, peak) 644.nab_s(base, peak)</th>
</tr>
</thead>
</table>

 indictment of allowing 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 -[TEE117P-1.13]- 02/06/2018  
Memory:  
48x Samsung M393A2K43BB1-CTD 16 GB 2 rank 2666  

(End of data from sysinfo program)
Lenovo Global Technology
ThinkSystem SR860
(3.60 GHz, Intel Xeon Gold 5122)

<table>
<thead>
<tr>
<th>CPU2017 License: 9017</th>
<th>Test Date: May-2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor: Lenovo Global Technology</td>
<td>Hardware Availability: Nov-2017</td>
</tr>
<tr>
<td>Tested by: Lenovo Global Technology</td>
<td>Software Availability: Jan-2018</td>
</tr>
</tbody>
</table>

**Compiler Version Notes (Continued)**

icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

---

FC 607.cactuBSSN_s(base)

icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

---

FC 607.cactuBSSN_s(peak)

icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

---

FC 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)

ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

---

FC 603.bwaves_s(peak) 649.fotonik3d_s(peak) 654.roms_s(peak)

ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

---

CC 621.wrf_s(base) 627.cam4_s(base, peak) 628.pop2_s(base)

ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

(Continued on next page)
## Lenovo Global Technology

**ThinkSystem SR860**  
(3.60 GHz, Intel Xeon Gold 5122)

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>9017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor:</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Tested by:</td>
<td>Lenovo Global Technology</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test Date:</th>
<th>May-2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware Availability:</td>
<td>Nov-2017</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Jan-2018</td>
</tr>
</tbody>
</table>

### SPECspeed2017_fp_peak = 83.2

### SPECspeed2017_fp_base = 82.9

#### Compiler Version Notes (Continued)

```ini
CC 621.wrf_s(peak) 628.pop2_s(peak)
```

---

#### Base Compiler Invocation

**C benchmarks:**

- `icc`

**Fortran benchmarks:**

- `ifort`

**Benchmarks using both Fortran and C:**

- `ifort icc`

**Benchmarks using Fortran, C, and C++:**

- `icpc icc ifort`

#### 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
ThinkSystem SR860
(3.60 GHz, Intel Xeon Gold 5122)

SPECspeed2017_fp_base = 82.9
SPECspeed2017_fp_peak = 83.2

Base Optimization Flags

C benchmarks:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP

Fortran benchmarks:
-DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-nostandard-realloc-lhs -align array32byte

Benchmarks using both Fortran and C:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs -align array32byte

Benchmarks using Fortran, C, and C++:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs -align array32byte

Base Other Flags

C benchmarks:
-m64 -std=c11

Fortran benchmarks:
-m64

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

Benchmarks using Fortran, C, and C++:
-m64 -std=c11

Peak Compiler Invocation

C benchmarks:
icc

Fortran benchmarks:
ifort

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR860
(3.60 GHz, Intel Xeon Gold 5122)

SPECspeed2017_fp_base = 82.9
SPECspeed2017_fp_peak = 83.2

Peak Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using Fortran, C, and C++:
icpc icc ifort

Peak Portability Flags
Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
619.lbm_s: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX512
-qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div
-qopt-mem-layout-trans=3 -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP

638.imagick_s: -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-DSPEC_OPENMP

644.nab_s: Same as 638.imagick_s

Fortran benchmarks:
-prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMP
-DSPEC_OPENMP -O2 -xCORE-AVX512 -qopt-prefetch -ipo -O3
-ffinite-math-only -no-prec-div -qopt-mem-layout-trans=3 -qopenmp
-nostandard-realloc-lhs -align array32byte

Benchmarks using both Fortran and C:
621.wrf_s: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX512
-qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div
-qopt-mem-layout-trans=3 -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte

627.cam4_s: -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte

(Continued on next page)
Peak Optimization Flags (Continued)

628.pop2_s: Same as 621.wrf_s

Benchmarks using Fortran, C, and C++:
- prof-gen (pass 1) -prof-use (pass 2) -O2 -xCORE-AVX512 -qopt-prefetch
- ipo -O3 -ffinite-math-only -no-prec-div -qopt-mem-layout-trans=3
- DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP -nostandard-realloc-lhs
- align array32byte

Peak Other Flags

C benchmarks:
- m64 - std=c11

Fortran benchmarks:
- m64

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

Benchmarks using Fortran, C, and C++:
- m64 - std=c11

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.html
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-C.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-C.xml