## Lenovo Global Technology

ThinkSystem SR590  
(2.60 GHz, Intel Xeon Silver 4112)

<table>
<thead>
<tr>
<th>SPECrate2017_int_base</th>
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<th>9017</th>
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<td>Lenovo Global Technology</td>
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<tr>
<td>Test Date:</td>
<td>Dec-2017</td>
</tr>
<tr>
<td>Hardware Availability:</td>
<td>Nov-2017</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Sep-2017</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name**: Intel Xeon Silver 4112  
  - Max MHz.: 3000  
  - Nominal: 2600  
  - Enabled: 8 cores, 2 chips, 2 threads/core  
  - Orderable: 1.2 chips
- **Cache L1**: 32 KB I + 32 KB D on chip per core  
  - L2: 1 MB I+D on chip per core  
  - L3: 8.25 MB I+D on chip per chip  
  - Other: None  
- **Memory**: 384 GB (12 x 32 GB 2Rx4 PC4-2666V-R, running at 2400)  
- **Storage**: 1 x 800 GB SAS SSD  
- **Other**: None

### Software

- **OS**: SUSE Linux Enterprise Server 12 SP3 (x86_64)  
  - Kernel 4.4.73-5-default  
- **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**: No  
- **Firmware**: Lenovo BIOS Version TEE119J 1.20 released Sep-2017  
- **File System**: btrfs  
- **System State**: Run level 3 (multi-user)  
- **Base Pointers**: 64-bit  
- **Peak Pointers**: 32/64-bit  
- **Other**: jemalloc: jemalloc memory allocator library V5.0.1;  
  - jemalloc: configured and built at default for 32bit (i686) and 64bit (x86_64) targets;  
  - jemalloc: built with the RedHat Enterprise 7.4, and the system compiler gcc 4.8.5;  
  - jemalloc: sources available from jemalloc.net or releases
## Benchmark Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</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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<tr>
<td>500.perlbench_r</td>
<td>16</td>
<td>788</td>
<td>32.3</td>
<td>781</td>
<td>32.6</td>
<td>781</td>
<td>32.6</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>16</td>
<td>585</td>
<td>38.7</td>
<td>579</td>
<td>39.1</td>
<td>578</td>
<td>39.2</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>16</td>
<td>475</td>
<td>54.4</td>
<td>463</td>
<td>55.8</td>
<td>478</td>
<td>54.1</td>
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<tr>
<td>520.omenapp_r</td>
<td>16</td>
<td>779</td>
<td>27.0</td>
<td>783</td>
<td>26.8</td>
<td>777</td>
<td>27.0</td>
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<tr>
<td>523.xalanbm_r</td>
<td>16</td>
<td>352</td>
<td>48.0</td>
<td>349</td>
<td>48.4</td>
<td>352</td>
<td>48.0</td>
</tr>
<tr>
<td>525.x264_r</td>
<td>16</td>
<td>329</td>
<td>85.2</td>
<td>323</td>
<td>86.7</td>
<td>333</td>
<td>84.1</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
<td>16</td>
<td>489</td>
<td>37.5</td>
<td>488</td>
<td>37.6</td>
<td>488</td>
<td>37.6</td>
</tr>
<tr>
<td>541.leepa_r</td>
<td>16</td>
<td>764</td>
<td>34.7</td>
<td>756</td>
<td>35.0</td>
<td>762</td>
<td>34.8</td>
</tr>
<tr>
<td>548.exchange2_r</td>
<td>16</td>
<td>512</td>
<td>81.8</td>
<td>512</td>
<td>81.9</td>
<td>511</td>
<td>82.1</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>16</td>
<td>545</td>
<td>31.7</td>
<td>545</td>
<td>31.7</td>
<td>546</td>
<td>31.6</td>
</tr>
</tbody>
</table>

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

## Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl 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/cpu2017.1.0.2.ic18.0/ia32:/home/cpu2017.1.0.2.ic18.0/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"
Binary 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
Filesystem page cache synced and cleared with:
`sync; echo 3>/proc/sys/vm/drop_caches`
Runcpu command invoked through numactl i.e.:
uactl --interleave=all runcpu <etc>
No: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)
is mitigated in the system as tested and documented.
No: 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.
No: The test sponsor attests, as of date of publication, that CVE-2017-5715 (Spectre variant 2)

(Continued on next page)
General Notes (Continued)

This benchmark result is intended to provide perspective on past performance using the historical hardware and/or software described on this result page.

The system as described on this result page was formerly generally available. At the time of this publication, it may not be shipping, and/or may not be supported, and/or may fail to meet other tests of General Availability described in the SPEC OSG Policy document, http://www.spec.org/osg/policy.html

This measured result may not be representative of the result that would be measured were this benchmark run with hardware and software available as of the publication date.

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
DCU Streamer Prefetcher set to Disable
MONITORMWAIT set to Enable
XPT Prefetcher set to Enable
Stale AtoS set to Enable
LLC Deadline Alloc set to Disable
Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618b5e09c0f
running on SR590-1 Fri Dec 29 21:16:14 2017

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) Silver 4112 CPU @ 2.60GHz
	 2 "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 : 8
physical 0: cores 1 2 3 4
physical 1: cores 1 2 4 5

From lscpu:
	Architecture: x86_64

(Continued on next page)
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SPECrate2017_int_base = 43.8
SPECrate2017_int_peak = 46.4

Platform Notes (Continued)

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: 2
Core(s) per socket: 4
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Silver 4112 CPU @ 2.60GHz
Stepping: 4
CPU MHz: 2593.897
BogoMIPS: 5187.79
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 8448K
NUMA node0 CPU(s): 0-3, 8-11
NUMA node1 CPU(s): 4-7, 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 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 pcd dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes
xsave avx f16c rdrand lahf_lm abm 3dnowprefetch ida arat epb pln pts dtherm intel_pt
tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2
erms invpcid rtm cqm mpx avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd
avx512bw avx512v1 xsaveopt xsavec xgetbv1 cqm_llc cqm_occup_llc pku ospke

/proc/cpuinfo cache data
cache size : 8448 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 8 9 10 11
node 0 size: 193124 MB
node 0 free: 192711 MB
node 1 cpus: 4 5 6 7 12 13 14 15
node 1 size: 193517 MB
node 1 free: 193141 MB
node distances:
node 0 1
0: 10 21

(Continued on next page)
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Platform Notes (Continued)

From /proc/meminfo
   MemTotal:       395921940 kB
   HugePages_Total:       0
   Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
   SuSE-release:
      SUSE Linux Enterprise Server 12 (x86_64)
      VERSION = 12
      PATCHLEVEL = 3
      # This file is deprecated and will be removed in a future service pack or release.
      # Please check /etc/os-release for details about this release.
   os-release:
      NAME="SLES"
      VERSION="12-SP3"
      VERSION_ID="12.3"
      PRETTY_NAME="SUSE Linux Enterprise Server 12 SP3"
      ID="sles"
      ANSI_COLOR="0;32"
      CPE_NAME="cpe:/o:suse:sles:12:sp3"

uname -a:
   Linux SR590-1 4.4.73-5-default #1 SMP Tue Jul 4 15:33:39 UTC 2017 (b7ce4e4) x86_64
   x86_64 x86_64 GNU/Linux

run-level 3 Dec 29 21:14

SPEC is set to: /home/cpu2017.1.0.2.ic18.0
   Filesystem  Type Size Used Avail Use% Mounted on
   /dev/sdb2  btrfs  744G 109G 635G 15% /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 -[TEE119J-1.20]- 09/06/2017
   Memory:
      12x Hynix HMA84GR7AFR4N-VK 32 GB 2 rank 2666, configured at 2400
      4x NO DIMM NO DIMM

(End of data from sysinfo program)
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Compiler Version Notes

==============================================================================
CC 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)  
525.x264_r(base, peak) 557.xz_r(base, peak)
==============================================================================
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
==============================================================================
CC 500.perlbench_r(peak) 502.gcc_r(peak)
==============================================================================
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
==============================================================================
CXXC 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)  
541.leela_r(base)
==============================================================================
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
==============================================================================
CXXC 520.omnetpp_r(peak) 523.xalancbmk_r(peak) 531.deepsjeng_r(peak)  
541.leela_r(peak)
==============================================================================
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
==============================================================================
FC 548.exchange2_r(base, peak)
==============================================================================
ifort (IFORT) 18.0.0 20170811
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Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

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**Base Compiler Invocation (Continued)**

Fortran benchmarks:

```
ifort
```

---

**Base Portability Flags**

- 500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
- 502.gcc_r: -DSPEC_LP64
- 505.mcf_r: -DSPEC_LP64
- 520.omnetpp_r: -DSPEC_LP64
- 523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX
- 525.x264_r: -DSPEC_LP64
- 531.deepsjeng_r: -DSPEC_LP64
- 541.leela_r: -DSPEC_LP64
- 548.exchange2_r: -DSPEC_LP64
- 557.xz_r: -DSPEC_LP64

---

**Base Optimization Flags**

**C benchmarks:**

```
-W1,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc
```

**C++ benchmarks:**

```
-W1,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc
```

**Fortran benchmarks:**

```
-W1,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte
-L/usr/local/je5.0.1-64/lib -ljemalloc
```

---

**Base Other Flags**

**C benchmarks:**

```
-m64 -std=c11
```

**C++ benchmarks:**

```
-m64
```

---

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

Fortran benchmarks:
-m64

Peak Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Peak Portability Flags

500.perlbash_r: -DSPEC_LP64 -DSPEC_LINUX_X64
502.gcc_r: -D_FILE_OFFSET_BITS=64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -D_FILE_OFFSET_BITS=64 -DSPEC_LINUX
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leelaw_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64

Peak Optimization Flags

C benchmarks:

500.perlbash_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3
-fno-strict-overflow -L/usr/local/je5.0.1-64/lib
-ljemalloc

502.gcc_r: -L/opt/intel/compilers_and_libraries_2018/linux/lib/ia32
-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3
-L/usr/local/je5.0.1-32/lib -ljemalloc

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

505.mcf_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc

525.x264_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=3 -fno-alias -L/usr/local/je5.0.1-64/lib -ljemalloc

557.xz_r: Same as 505.mcf_r

C++ benchmarks:

520.omnetpp_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc


531.deepsjeng_r: Same as 520.omnetpp_r

541.leela_r: Same as 520.omnetpp_r

Fortran benchmarks:


Peak Other Flags

C benchmarks (except as noted below):

-m64 -std=c11

502.gcc_r: -m32 -std=c11

C++ benchmarks (except as noted below):

-m64

523.xalancbmk_r: -m32

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### Peak Other Flags (Continued)

Fortran benchmarks:

-`-m64`

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/Intel-ic18.0-official-linux64.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/Intel-ic18.0-official-linux64.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 CPU2017 v1.0.2 on 2017-12-29 08:16:13-0500.  
Originally published on 2018-03-06.