## Lenovo Global Technology

**ThinkSystem SN850**  
(3.30 GHz, Intel Xeon Gold 6246)

### SPEC CPU®2017 Integer Speed Result

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeak®2017_int_base</th>
<th>SPECspeak®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>96</td>
<td>10.7</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Test Date:** Sep-2019  
**Hardware Availability:** Jul-2019  
**Software Availability:** May-2019

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### Hardware

- **CPU Name:** Intel Xeon Gold 6246  
- **Max MHz:** 4200  
- **Nominal:** 3300  
- **Enabled:** 48 cores, 4 chips, 2 threads/core  
- **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:** 24.75 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 1536 GB (48 x 32 GB 2Rx4 PC4-2933Y-R)  
- **Storage:** 1 x 960 GB SATA SSD  
- **Other:** None

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### Software

- **OS:** Red Hat Enterprise Linux Server release 7.6 (Maipo)  
  - Kernel 3.10.0-957.el7.x86_64  
- **Compiler:**  
  - C/C++: Version 19.0.4.227 of Intel  
  - Fortran: Version 19.0.4.227 of Intel Fortran  
  - Compiler for Linux

- **Parallel:** Yes
- **Firmware:** Lenovo BIOS Version IVE142E 2.30 released Aug-2019  
  - tested as IVE141E 2.30 Jul-2019
- **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:** --
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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Base Threads</th>
<th>Base Seconds</th>
<th>Base Ratio</th>
<th>Base Seconds</th>
<th>Ratio</th>
<th>Base Seconds</th>
<th>Ratio</th>
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</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>96</td>
<td>243</td>
<td>7.30</td>
<td>242</td>
<td>7.32</td>
<td>244</td>
<td>7.27</td>
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<td>602.gcc_s</td>
<td>96</td>
<td>391</td>
<td>10.2</td>
<td>382</td>
<td>10.4</td>
<td>396</td>
<td>10.1</td>
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<td>605.mcf_s</td>
<td>96</td>
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<td>13.1</td>
<td>357</td>
<td>13.2</td>
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<td>623.xalancbmk_s</td>
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<td>13.2</td>
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<td>107</td>
<td>13.3</td>
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<tr>
<td>625.x264_s</td>
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<td>15.1</td>
<td>117</td>
<td>15.0</td>
<td>118</td>
<td>15.0</td>
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<tr>
<td>631.deepsjeng_s</td>
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<td>5.75</td>
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<td>5.78</td>
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<td>5.76</td>
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<tr>
<td>641.leela_s</td>
<td>96</td>
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<td>5.13</td>
<td>333</td>
<td>5.13</td>
<td>333</td>
<td>5.13</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>96</td>
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<td>17.7</td>
<td>164</td>
<td>17.9</td>
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<tr>
<td>657.xz_s</td>
<td>96</td>
<td>239</td>
<td>25.9</td>
<td>239</td>
<td>25.9</td>
<td>239</td>
<td>25.9</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:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH = "/home/cpu2017-1.0.5-ic19.0u4/lib/intel64"
LD_LIBRARY_PATH = "/home/cpu2017-1.0.5-ic19.0u4/je5.0.1-64"
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 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.
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.

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

(Continued on next page)
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SPECSpeed®2017_int_base = 10.7
SPECSpeed®2017_int_peak = Not Run

Test Date: Sep-2019
Hardware Availability: Jul-2019
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General Notes (Continued)

Platform Notes

BIOS configuration:
Choose Operating Mode set to Custom Mode
Page Policy set to Adaptive
Trusted Execution Technology set to Enable
CPU Frequency Limits set to Restrict Maximum Frequency
Sysinfo program /home/cpu2017-1.0.5-ic19.0u4/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on localhost.localdomain Wed Sep 11 19:07:20 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 6246 CPU @ 3.30GHz
 4 "physical id"s (chips)
 96 "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 : 12
siblings : 24
  physical 0: cores 0 1 2 3 4 8 10 11 17 18 25 27
  physical 1: cores 1 2 3 4 10 11 16 17 18 24 25 27
  physical 2: cores 1 2 4 8 9 10 11 16 17 19 26 27
  physical 3: cores 0 2 4 8 9 10 11 17 18 19 25 27

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 96
Online CPU(s) list: 0-95
Thread(s) per core: 2
Core(s) per socket: 12
Socket(s): 4
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6246 CPU @ 3.30GHz
Stepping: 7
CPU MHz: 3300.000

(Continued on next page)
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Platform Notes (Continued)

BogoMIPS: 6600.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 25344K
NUMA node0 CPU(s): 0-11, 48-59
NUMA node1 CPU(s): 12-23, 60-71
NUMA node2 CPU(s): 24-35, 72-83
NUMA node3 CPU(s): 36-47, 84-95
Flags: fpu vme de pse tsc msr pae mca cmov
pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtsscp
lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc
aperfmpref eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg
fma cx16 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe populated tsc_deadline_timer aes
xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpb cat_l3 cdte_l3 intel_pt ssbd mba ibrs ibp ibrs enhanced tpr shadow vmmi flexpriority ept
vpid fsgsbase tsc_adjust bsmi hle avx2 smep bmi2 erms invpcid rtm cmq mpx rdt_a
avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt
xsave vgetbv1 cmq_llc cmq_occup_llc cmq_mbm_total cmq_mbm_local dtherm ida arat pln
pts hwp epp pkx ospke avx512_vnni spec_ctrl intel_stibp flush_l1d arch_capabilities

/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 18 19 20 21 22 23 60 61 62 63 64 65 66 67 68 69 70 71
node 0 size: 392885 MB
node 0 free: 383215 MB
node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23 60 61 62 63 64 65 66 67 68 69 70 71
node 1 size: 392885 MB
node 1 free: 383215 MB
node 2 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 72 73 74 75 76 77 78 79 80 81 82 83
node 2 size: 392885 MB
node 2 free: 3834450 MB
node 3 cpus: 36 37 38 39 40 41 42 43 44 45 46 47 84 85 86 87 88 89 90 91 92 93 94 95
node 3 size: 392885 MB
node 3 free: 384428 MB
node distances:
node 0 1 2 3
0: 10 21 21 21
1: 21 11 21 21
2: 21 21 10 21
3: 21 21 21 10

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Platform Notes (Continued)

From /proc/meminfo
MemTotal: 1584959312 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
  os-release:
    NAME="Red Hat Enterprise Linux Server"
    VERSION="7.6 (Maipo)"
    ID="rhel"
    ID_LIKE="fedora"
    VARIANT="Server"
    VARIANT_ID="server"
    VERSION_ID="7.6"
    PRETTY_NAME="Red Hat Enterprise Linux Server 7.6 (Maipo)"
redhat-release: Red Hat Enterprise Linux Server release 7.6 (Maipo)
system-release: Red Hat Enterprise Linux Server release 7.6 (Maipo)

uname -a:
  Linux localhost.localdomain 3.10.0-957.el7.x86_64 #1 SMP Thu Oct 4 20:48:51 UTC 2018
  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: Load fences, __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS

run-level 3 Sep 11 19:05

SPEC is set to: /home/cpu2017-1.0.5-ic19.0u4
  Filesystem Type Size Used Avail Use% Mounted on
  /dev/sda2 xfs 839G 24G 815G 3% /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 -[IVE141E-2.30]- 07/02/2019
  Memory:
    48x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

(End of data from sysinfo program)
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</table>

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**Compiler Version Notes**

```plaintext
==============================================================================
C       | 600.perlbench_s(base) 602.gcc_s(base) 605.mcf_s(base) 625.x264_s(base) 657.xz_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.
------------------------------------------------------------------------------

==============================================================================
C++     | 620.omnetpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base) 641.leela_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.
------------------------------------------------------------------------------

==============================================================================
Fortran | 648.exchange2_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.
------------------------------------------------------------------------------
```

---

**Base Compiler Invocation**

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

C++ benchmarks:
```plaintext
icpc -m64
```

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

---

**Base Portability Flags**

```plaintext
600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64  
602.gcc_s: -DSPEC_LP64  
605.mcf_s: -DSPEC_LP64  
620.omnetpp_s: -DSPEC_LP64
```

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623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

---

Base Optimization Flags

C benchmarks:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-L/usr/local/je5.0.1-64/lib -ljemalloc

C++ benchmarks:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64 -lqkmalloc

Fortran benchmarks:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4
-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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