Lenovo Global Technology
ThinkSystem SR250
(4.00 GHz, Intel Xeon E-2286G)

<table>
<thead>
<tr>
<th>Software</th>
<th>Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS: SUSE Linux Enterprise Server 15 SP1 (x86_64) Kernel 4.12.14-195-default</td>
<td>CPU Name: Intel Xeon E-2286G</td>
</tr>
<tr>
<td>Parallel: Yes</td>
<td>Nominal: 4000</td>
</tr>
<tr>
<td>Firmware: Lenovo BIOS Version ISE115D 2.10 released Apr-2020</td>
<td>Enabled: 6 cores, 1 chip</td>
</tr>
<tr>
<td>File System: xfs</td>
<td>Orderable: 1 chip</td>
</tr>
<tr>
<td>System State: Run level 3 (multi-user)</td>
<td>Cache L1: 32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>Base Pointers: 64-bit</td>
<td>L2: 256 KB I+D on chip per core</td>
</tr>
<tr>
<td>Peak Pointers: 64-bit</td>
<td>L3: 12 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other: jemalloc memory allocator V5.0.1</td>
<td>Other: None</td>
</tr>
<tr>
<td>Power Management: BIOS set to prefer performance at the cost of additional power usage</td>
<td>Memory: 128 GB (4 x 32 GB 2Rx4 PC4-2666V-E)</td>
</tr>
<tr>
<td>Storage: 1 x 480 GB SATA SSD</td>
<td>Other: None</td>
</tr>
</tbody>
</table>

Test Date: May-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

---

**Tables and Figures**: The tables and figures summarize the test results for the Lenovo Global Technology system, including benchmarks such as perlbench, gcc, mcf, omnetpp, xalancbmk, x264, deepsjeng, leela, exchange2, and xz. The results are presented for both the integer base and peak speed, with detailed values for each benchmark. The hardware specifications, including CPU, memory, and storage, are also listed. The software components, such as the operating system and compiler versions, are detailed as well. The test was conducted using Lenovo Global Technology equipment, with a specification of Intel Xeon E-2286G at 4.00 GHz.
Lenovo Global Technology
ThinkSystem SR250
(4.00 GHz, Intel Xeon E-2286G)

SPECspeed®2017_int_base = 12.5
SPECspeed®2017_int_peak = 12.8

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>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>6</td>
<td>225</td>
<td>7.88</td>
<td>224</td>
<td>7.92</td>
<td>224</td>
<td>7.91</td>
<td>6</td>
<td>187</td>
<td>9.50</td>
<td>186</td>
<td>9.53</td>
<td>187</td>
<td>9.52</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>6</td>
<td>312</td>
<td>12.8</td>
<td>311</td>
<td>12.8</td>
<td>312</td>
<td>12.8</td>
<td>6</td>
<td>300</td>
<td>13.3</td>
<td>298</td>
<td>13.3</td>
<td>300</td>
<td>13.3</td>
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<tr>
<td>605.mcf_s</td>
<td>6</td>
<td>196</td>
<td>24.1</td>
<td>197</td>
<td>24.0</td>
<td>200</td>
<td>23.6</td>
<td>6</td>
<td>196</td>
<td>24.1</td>
<td>197</td>
<td>24.0</td>
<td>200</td>
<td>23.6</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>6</td>
<td>182</td>
<td>8.95</td>
<td>185</td>
<td>8.82</td>
<td>183</td>
<td>8.91</td>
<td>6</td>
<td>182</td>
<td>8.95</td>
<td>185</td>
<td>8.82</td>
<td>183</td>
<td>8.91</td>
</tr>
<tr>
<td>623.xalanchmk_s</td>
<td>6</td>
<td>82.5</td>
<td>17.2</td>
<td>83.1</td>
<td>17.1</td>
<td>82.4</td>
<td>17.2</td>
<td>6</td>
<td>82.5</td>
<td>17.2</td>
<td>83.1</td>
<td>17.1</td>
<td>82.4</td>
<td>17.2</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>6</td>
<td>85.8</td>
<td>20.6</td>
<td>85.9</td>
<td>20.5</td>
<td>86.0</td>
<td>20.5</td>
<td>6</td>
<td>82.6</td>
<td>21.4</td>
<td>83.0</td>
<td>21.2</td>
<td>82.9</td>
<td>21.3</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>6</td>
<td>191</td>
<td>7.51</td>
<td>191</td>
<td>7.51</td>
<td>191</td>
<td>7.51</td>
<td>6</td>
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<td>7.51</td>
<td>191</td>
<td>7.51</td>
<td>191</td>
<td>7.51</td>
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<tr>
<td>641.leela_s</td>
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<td>283</td>
<td>6.02</td>
<td>284</td>
<td>6.02</td>
<td>283</td>
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<td>6.02</td>
<td>284</td>
<td>6.02</td>
<td>283</td>
<td>6.02</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>6</td>
<td>139</td>
<td>21.2</td>
<td>139</td>
<td>21.2</td>
<td>140</td>
<td>21.1</td>
<td>6</td>
<td>139</td>
<td>21.2</td>
<td>139</td>
<td>21.2</td>
<td>140</td>
<td>21.1</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>6</td>
<td>498</td>
<td>12.4</td>
<td>498</td>
<td>12.4</td>
<td>497</td>
<td>12.4</td>
<td>6</td>
<td>498</td>
<td>12.4</td>
<td>498</td>
<td>12.4</td>
<td>497</td>
<td>12.4</td>
</tr>
</tbody>
</table>

Compiler Notes

The inconsistent Compiler version information under Compiler Version section is due to a discrepancy in Intel Compiler. The correct version of C/C++ compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux

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,scatter"
LD_LIBRARY_PATH = "/home/cpu2017-1.1.0-ic19.1.1/lib/intel64:/home/cpu2017-1.1.0-ic19.1.1/jre5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"

General Notes

Binaries compiled on a system with 1x Intel Core i9–7980XE CPU + 64GB 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:

(Continued on next page)
SPEC CPU®2017 Integer Speed Result

Lenovo Global Technology
ThinkSystem SR250
(4.00 GHz, Intel Xeon E-2286G)

SPECspeed®2017_int_base = 12.5
SPECspeed®2017_int_peak = 12.8

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

Test Date: May-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

General Notes (Continued)

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.
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

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
Zero Output set to Advanced Mode
Per Core P-state set to Disable
Hyper-Threading set to Disable

Sysinfo program /home/cpu2017-1.1.0-ic19.1.1/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
running on linux-jecn Thu Feb 14 22:26:05 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) E-2286G CPU @ 4.00GHz
  1 "physical id"s (chips)
  6 "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 : 6
siblings : 6
physical 0: cores 0 1 2 3 4 5

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
Address sizes: 39 bits physical, 48 bits virtual
Lenovo Global Technology
ThinkSystem SR250
(4.00 GHz, Intel Xeon E-2286G)

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

SPECspeed®2017_int_base = 12.5
SPECspeed®2017_int_peak = 12.8

Platform Notes (Continued)

- CPU(s): 6
- On-line CPU(s) list: 0-5
- Thread(s) per core: 1
- Core(s) per socket: 6
- Socket(s): 1
- NUMA node(s): 1
- Vendor ID: GenuineIntel
- CPU family: 6
- Model: 158
- Model name: Intel(R) Xeon(R) E-2286G CPU @ 4.00GHz
- Stepping: 10
- CPU MHz: 4000.000
- CPU max MHz: 4900.0000
- CPU min MHz: 800.0000
- BogoMIPS: 8016.00
- Virtualization: VT-x
- L1d cache: 32K
- L1i cache: 32K
- L2 cache: 256K
- L3 cache: 12288K
- NUMA node0 CPU(s): 0-5
- 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 xtopology nonstop_tsc cpuid
  aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3
  sdbg fma cx16 xtpr pdcm pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer
  aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb invpcid_single
  pti ssbd ibrs ibpb stibp tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust
  bmi1 hle avx2 smep bmi2  bmi3 invpcid rtm mpx rdseed adx smap clflushopt intel_pt
  xsaves xsaveopt xgetbv1 xsave vtdm ida arat pln pts hwp hwp_notify hwp_act_window
  hwp_epp md_clear flush_l1d

/proc/cpuinfo cache data
  cache size: 12288 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.
  available: 1 nodes (0)
  node 0 cpus: 0 1 2 3 4 5
  node 0 size: 128866 MB
  node 0 free: 128376 MB
  node distances:
    node 0
      0: 10

From /proc/meminfo
  MemTotal: 131959040 KB

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR250
(4.00 GHz, Intel Xeon E-2286G)

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

SPECspeed®2017_int_base = 12.5
SPECspeed®2017_int_peak = 12.8

Test Date: May-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

Platform Notes (Continued)

HugePages_Total:       0
Hugepagesize:       2048 kB

/usr/bin/lsb_release -d
SUSE Linux Enterprise Server 15 SP1

From /etc/*release*/etc/*version*/
os-release:
   NAME="SLES"
   VERSION="15-SP1"
   VERSION_ID="15.1"
   PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
   ID="sles"
   ID_LIKE="suse"
   ANSI_COLOR="0;32"
   CPE_NAME="cpe:/o:suse:sles:15:sp1"

uname -a:
Linux linux-jecn 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-3620 (L1 Terminal Fault): Mitigation: PTE Inversion; VMX: conditional cache flushes, SMT disabled
Microarchitectural Data Sampling: Mitigation: Clear CPU buffers; SMT disabled
CVE-2017-5754 (Meltdown): Mitigation: PTI
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation, IBPB: conditional, IBRS_FW, RSB filling

run-level 3 Feb 14 22:21

SPEC is set to: /home/cpu2017-1.1.0-ic19.1.1
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 xfs 446G 80G 367G 18% /

From /sys/devices/virtual/dmi/id
BIOS: Lenovo -[ISE115D-2.10]- 04/24/2020
Vendor: Lenovo
Product: ThinkSystem SR250 -[7Y51CT00WW]-
Product Family: ThinkSystem
Serial: 1234567890

(Continued on next page)
**Platform Notes (Continued)**
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.
Memory:
4x SK Hynix HMAA4GU7AJR8N-VK 32767 MB 2 rank 2666

(End of data from sysinfo program)

**Compiler Version Notes**

==============================================================================
| C  | 600.perlbench_s(base) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_s(base, peak) |
|----------------------------------|
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

==============================================================================

| C  | 600.perlbench_s(peak) |
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

==============================================================================
| C  | 600.perlbench_s(base) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_s(base, peak) |
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

==============================================================================

| C  | 600.perlbench_s(peak) |
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

==============================================================================

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR250
(4.00 GHz, Intel Xeon E-2286G)

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

SPECspeed®2017_int_base = 12.5
SPECspeed®2017_int_peak = 12.8

Test Date: May-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

Compiler Version Notes (Continued)

C++
620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak)
631.deepsjeng_s(base, peak) 641.leela_s(base, peak)

-----------------------------------------------------------------------------------------------
Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
-----------------------------------------------------------------------------------------------

Fortran | 648.exchange2_s(base, peak)
-----------------------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
-----------------------------------------------------------------------------------------------

Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Base Portability Flags

600.perlbench_s: -DSPEC_LP64   -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
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
Lenovo Global Technology
ThinkSystem SR250
(4.00 GHz, Intel Xeon E-2286G)

SPECspeed®2017_int_base = 12.5
SPECspeed®2017_int_peak = 12.8

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

Test Date: May-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

Base Optimization Flags

C benchmarks:
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX2 -O3 -ffast-math -flto -mfpmath=sse -funroll-loops
-fuse-ld=gold -qopt-mem-layout-trans=4 -fopenmp -DSPEC_OPENMP
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

C++ benchmarks:
-m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX2 -O3 -ffast-math -flto -mfpmath=sse
-funroll-loops -fuse-ld=gold -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

Fortran benchmarks:
-m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -xCORE-AVX2
-O3 -ipo -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte
-mbranches-within-32B-boundaries

Peak Compiler Invocation

C benchmarks:
iccc
C++ benchmarks:
icpc
Fortran benchmarks:
ifort

Peak Portability Flags

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64(*) -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64

(Continued on next page)
Lenovo Global Technology

ThinkSystem SR250
(4.00 GHz, Intel Xeon E-2286G)

SPECspeed®2017_int_base = 12.5
SPECspeed®2017_int_peak = 12.8

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology
Test Date: May-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

Peak Portability Flags (Continued)

648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

(*) Indicates a portability flag that was found in a non-portability variable.

Peak Optimization Flags

C benchmarks:

600.perlbench_s: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
-xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -fno-strict-overflow
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

602.gcc_s: -m64 -g -nextgen -std=c11 -fuse-ld=gold
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2 -flto
-Ofast(pass 1) -O3 -ffast-math -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

605.mcf_s: basepeak = yes

625.x264_s: -m64 -g -nextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX2 -flto -O3 -ffast-math
-fuse-ld=gold -qopt-mem-layout-trans=4 -fno-alias
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

657.xz_s: basepeak = yes

C++ benchmarks:

620.omnetpp_s: basepeak = yes

Fortran benchmarks:
Lenovo Global Technology
ThinkSystem SR250
(4.00 GHz, Intel Xeon E-2286G)

SPECspeed®2017_int_base = 12.5
SPECspeed®2017_int_peak = 12.8

Peak Optimization Flags (Continued)

648.exchange2_s: basepeak = yes

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-SKL-J.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-J.xml