SPEC CPU®2017 Integer Rate Result

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Lenovo Global Technology

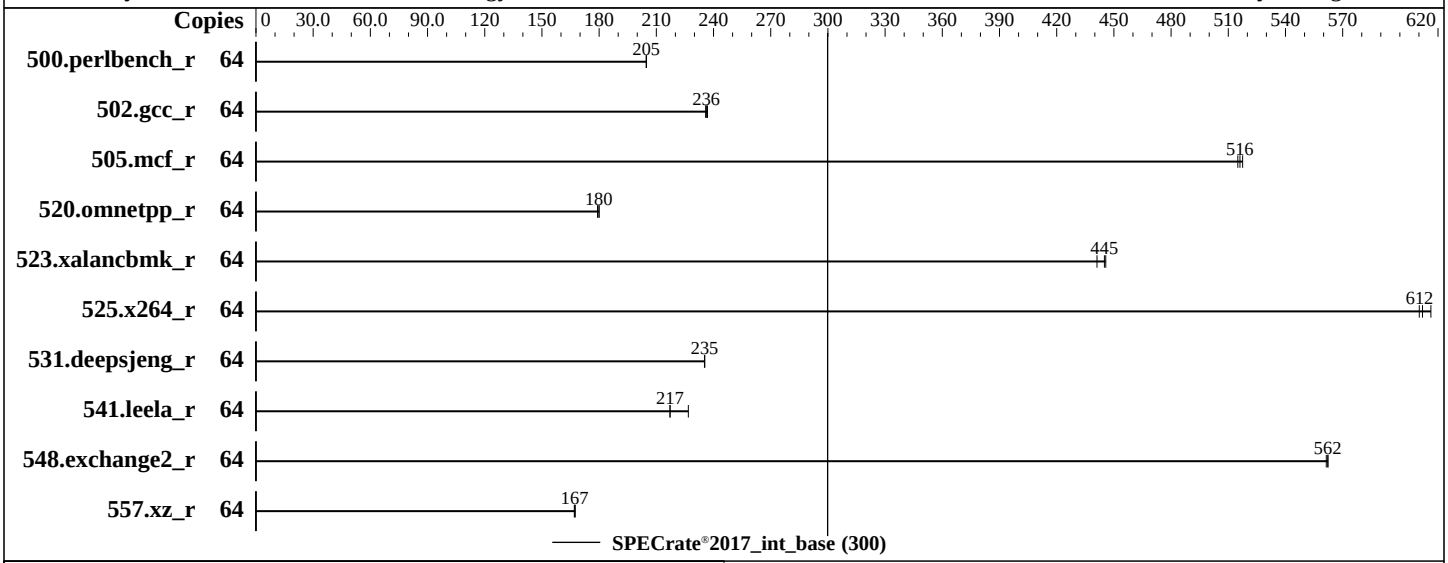
ThinkSystem SR860 V2
(3.90 GHz, Intel Xeon Platinum 8356H)

SPECrate®2017_int_base = 300

SPECrate®2017_int_peak = Not Run

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

Test Date: Dec-2020
Hardware Availability: Nov-2020
Software Availability: Aug-2020



Hardware

CPU Name:	Intel Xeon Platinum 8356H
Max MHz:	4400
Nominal:	3900
Enabled:	32 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:	35.75 MB I+D on chip per chip
Other:	None
Memory:	768 GB (48 x 16 GB 2Rx8 PC4-3200AA-R, running at 2933)
Storage:	1 x 960 GB SATA SSD
Other:	None

Software

OS:	Red Hat Enterprise Linux 8.2 (Ootpa) Kernel 4.18.0-193.el8.x86_64
Compiler:	C/C++: Version 19.1.2.275 of Intel C/C++ Compiler for Linux; Fortran: Version 19.1.2.275 of Intel Fortran Compiler for Linux
Parallel:	No
Firmware:	Lenovo BIOS Version M5E107H 1.00 released Oct-2020
File System:	xfs
System State:	Run level 3 (multi-user)
Base Pointers:	64-bit
Peak Pointers:	Not Applicable
Other:	None
Power Management:	BIOS set to prefer performance at the cost of additional power usage

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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	64	**498**	**205**	498	205	497	205							
502.gcc_r	64	384	236	383	237	**384**	**236**							
505.mcf_r	64	**200**	**516**	201	515	200	518							
520.omnetpp_r	64	**467**	**180**	469	179	467	180							
523.xalancbmk_r	64	153	441	152	446	**152**	**445**							
525.x264_r	64	184	610	**183**	**612**	182	616							
531.deepsjeng_r	64	312	235	**312**	**235**	312	235							
541.leela_r	64	467	227	488	217	**488**	**217**							
548.exchange2_r	64	298	562	**298**	**562**	299	561							
557.xz_r	64	**413**	**167**	413	167	414	167							

SPECrate®2017_int_base = 300

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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"
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
     "/home/cpu2017-1.1.0-ic19.1u2/lib/intel64:/home/cpu2017-1.1.0-ic19.1u2/l
     ib/ia32:/home/cpu2017-1.1.0-ic19.1u2/je5.0.1-32"
MALLOC_CONF = "retain:true"
```

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:
sync; echo 3>       /proc/sys/vm/drop_caches
```

(Continued on next page)

General Notes (Continued)

```
 runcpu command invoked through numactl i.e.:
 numactl --interleave=all runcpu <etc>
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.
```

Platform Notes

```
BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
MONITOR/MWAIT set to Enabled
DCU Streamer Prefetcher set to Disabled
SNC set to Enabled
LLC dead line alloc set to Disable

 Sysinfo program /home/cpu2017-1.1.0-ic19.1u2/bin/sysinfo
 Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
 running on localhost.localdomain Thu Dec  3 08:05:34 2020

 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) Platinum 8356H CPU @ 3.90GHz
       4  "physical id"s (chips)
       64 "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 : 8
       siblings  : 16
       physical 0: cores 2 6 8 10 12 17 19 28
       physical 1: cores 1 2 3 6 13 18 28 29
       physical 2: cores 3 6 10 13 17 18 28 29
       physical 3: cores 1 2 3 5 6 10 20 29

 From lscpu:
      Architecture:        x86_64
      CPU op-mode(s):      32-bit, 64-bit
      Byte Order:          Little Endian
      CPU(s):              64
      On-line CPU(s) list: 0-63
      Thread(s) per core:  2
```

(Continued on next page)

Platform Notes (Continued)

```
      Core(s) per socket:  8
      Socket(s):           4
      NUMA node(s):        8
      Vendor ID:           GenuineIntel
      CPU family:          6
      Model:               85
      Model name:          Intel(R) Xeon(R) Platinum 8356H CPU @ 3.90GHz
      Stepping:            11
      CPU MHz:             3891.699
      CPU max MHz:         4400.0000
      CPU min MHz:         1200.0000
      BogoMIPS:            7800.00
      Virtualization:      VT-x
      L1d cache:           32K
      L1i cache:           32K
      L2 cache:            1024K
      L3 cache:            36608K
      NUMA node0 CPU(s):   0,2,3,5,32,34,35,37
      NUMA node1 CPU(s):   1,4,6,7,33,36,38,39
      NUMA node2 CPU(s):   8-10,13,40-42,45
      NUMA node3 CPU(s):   11,12,14,15,43,44,46,47
      NUMA node4 CPU(s):   16,18,20,21,48,50,52,53
      NUMA node5 CPU(s):   17,19,22,23,49,51,54,55
      NUMA node6 CPU(s):   24-26,29,56-58,61
      NUMA node7 CPU(s):   27,28,30,31,59,60,62,63
      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 pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
      xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
      avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cdp_l3
      invpcid_single intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi
      flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm
      cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
      avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
      cqm_mbm_local avx512_bf16 dtherm ida arat pln pts pku ospke avx512_vnni md_clear
      flush_l1d arch_capabilities

  /proc/cpuinfo cache data
     cache size : 36608 KB

  From numactl --hardware  WARNING: a numactl 'node' might or might not correspond to a
  physical chip.
    available: 8 nodes (0-7)
    node 0 cpus: 0 2 3 5 32 34 35 37
    node 0 size: 96355 MB
    node 0 free: 96152 MB
```

(Continued on next page)

Platform Notes (Continued)

```
   node 1 cpus: 1 4 6 7 33 36 38 39
   node 1 size: 96765 MB
   node 1 free: 96616 MB
   node 2 cpus: 8 9 10 13 40 41 42 45
   node 2 size: 96738 MB
   node 2 free: 96605 MB
   node 3 cpus: 11 12 14 15 43 44 46 47
   node 3 size: 96765 MB
   node 3 free: 96626 MB
   node 4 cpus: 16 18 20 21 48 50 52 53
   node 4 size: 96765 MB
   node 4 free: 96609 MB
   node 5 cpus: 17 19 22 23 49 51 54 55
   node 5 size: 96765 MB
   node 5 free: 96634 MB
   node 6 cpus: 24 25 26 29 56 57 58 61
   node 6 size: 96765 MB
   node 6 free: 96590 MB
   node 7 cpus: 27 28 30 31 59 60 62 63
   node 7 size: 96765 MB
   node 7 free: 96626 MB
   node distances:
   node   0   1   2   3   4   5   6   7
     0:  10  11  20  20  20  20  20  20
     1:  11  10  20  20  20  20  20  20
     2:  20  20  10  11  20  20  20  20
     3:  20  20  11  10  20  20  20  20
     4:  20  20  20  20  10  11  20  20
     5:  20  20  20  20  11  10  20  20
     6:  20  20  20  20  20  20  10  11
     7:  20  20  20  20  20  20  11  10

 From /proc/meminfo
    MemTotal:       792257536 kB
    HugePages_Total:       0
    Hugepagesize:       2048 kB

 /usr/bin/lsb_release -d
    Red Hat Enterprise Linux release 8.2 (Ootpa)

 From /etc/*release* /etc/*version*
    os-release:
       NAME="Red Hat Enterprise Linux"
       VERSION="8.2 (Ootpa)"
       ID="rhel"
       ID_LIKE="fedora"
       VERSION_ID="8.2"
```

(Continued on next page)

Platform Notes (Continued)

```
       PLATFORM_ID="platform:el8"
       PRETTY_NAME="Red Hat Enterprise Linux 8.2 (Ootpa)"
       ANSI_COLOR="0;31"
    redhat-release: Red Hat Enterprise Linux release 8.2 (Ootpa)
    system-release: Red Hat Enterprise Linux release 8.2 (Ootpa)
    system-release-cpe: cpe:/o:redhat:enterprise_linux:8.2:ga

  uname -a:
     Linux localhost.localdomain 4.18.0-193.el8.x86_64 #1 SMP Fri Mar 27 14:35:58 UTC 2020
     x86_64 x86_64 x86_64 GNU/Linux

  Kernel self-reported vulnerability status:

  itlb_multihit:                            Not affected
  CVE-2018-3620 (L1 Terminal Fault):        Not affected
  Microarchitectural Data Sampling:         Not affected
  CVE-2017-5754 (Meltdown):                 Not affected
  CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled
                                            via prctl and seccomp
  CVE-2017-5753 (Spectre variant 1):        Mitigation: usercopy/swapgs barriers and __user
                                            pointer sanitization
  CVE-2017-5715 (Spectre variant 2):        Mitigation: Enhanced IBRS, IBPB: conditional,
                                            RSB filling
  tsx_async_abort:                          Not affected

  run-level 3 Dec 3 08:02

  SPEC is set to: /home/cpu2017-1.1.0-ic19.1u2
     Filesystem     Type  Size  Used Avail Use% Mounted on
     /dev/sda3      xfs   892G   36G  856G   5% /

  From /sys/devices/virtual/dmi/id
      BIOS:    Lenovo M5E107H-1.00 10/18/2020
      Vendor:  Lenovo
      Product: ThinkSystem SR860 V2
      Product Family: ThinkSystem
      Serial:  none

  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:
      48x SK Hynix HMA82GR7CJR8N-XN 16 GB 2 rank 3200

  (End of data from sysinfo program)
 Memory on this system run at 2933 MHz due to CPU limitation.
```

Compiler Version Notes

```
==============================================================================
C       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base)
        | 525.x264_r(base) 557.xz_r(base)
------------------------------------------------------------------------------
Intel(R) C Compiler for applications running on Intel(R) 64, Version
  19.1.2.275 Build 20200604
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C++     | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
        | 541.leela_r(base)
------------------------------------------------------------------------------
Intel(R) C++ Compiler for applications running on Intel(R) 64, Version
  19.1.2.275 Build 20200604
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
Fortran | 548.exchange2_r(base)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.1.2.275 Build 20200623
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

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

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Base Portability Flags (Continued)

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:
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX512 -O3 -ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/intel64_lin
-lqkmalloc

C++ benchmarks:
-m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/intel64_lin
-lqkmalloc

Fortran benchmarks:
-m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-mbranches-within-32B-boundaries
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/intel64_lin
-lqkmalloc

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.html
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Cooperlake-A.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-Cooperlake-A.xml

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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