SPEC CPU®2017 Integer Rate Result

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Lenovo Global Technology

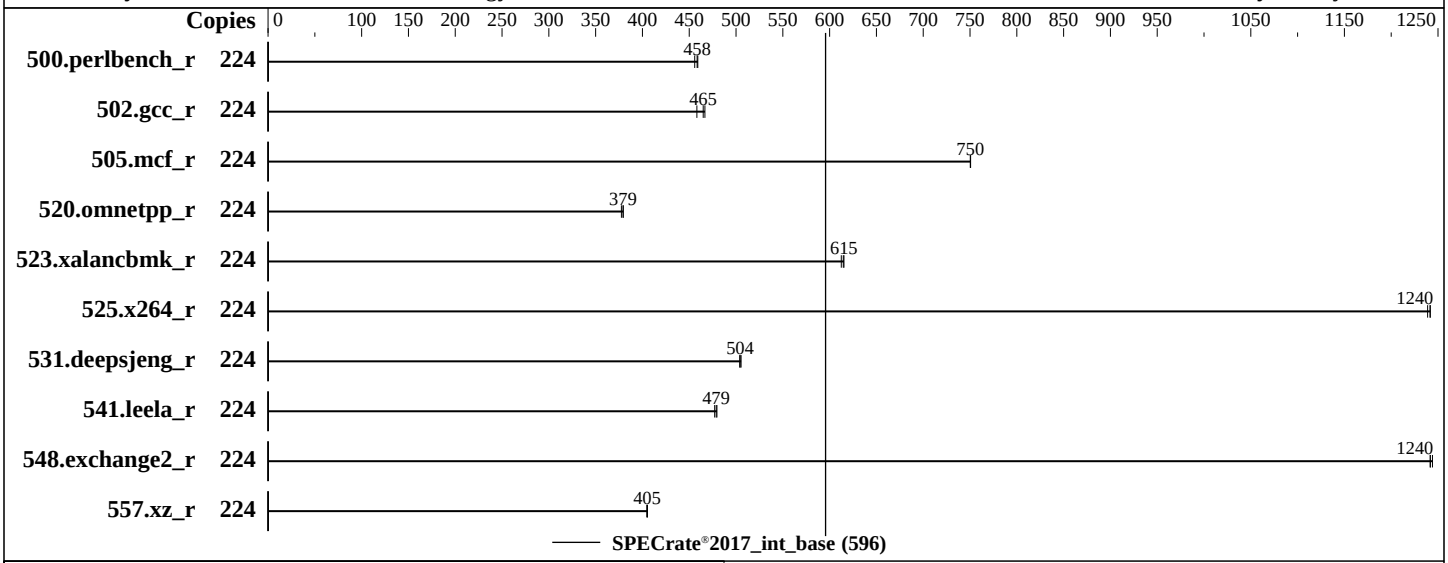
ThinkSystem SN850
(2.20 GHz, Intel Xeon Platinum 8276)

SPECrate®2017_int_base = 596

SPECrate®2017_int_peak = Not Run

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

Test Date: Sep-2019
Hardware Availability: Apr-2019
Software Availability: May-2019



Hardware

CPU Name:	Intel Xeon Platinum 8276
Max MHz:	4000
Nominal:	2200
Enabled:	112 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:	38.5 MB I+D on chip per chip
Other:	None
Memory:	1536 GB (48 x 32 GB 2Rx4 PC4-2933Y-R)
Storage:	800 GB tmpfs
Other:	None

Software

OS:	SUSE Linux Enterprise Server 12 SP4 (x86_64) Kernel 4.12.14-94.41-default
Compiler:	C/C++: Version 19.0.4.227 of Intel C/C++ Compiler for Linux; Fortran: Version 19.0.4.227 of Intel Fortran Compiler for Linux
Parallel:	No
Firmware:	Lenovo BIOS Version IVE142E 2.30 released Aug-2019 tested as IVE141E 2.30 Jul-2019
File System:	tmpfs
System State:	Run level 3 (multi-user)
Base Pointers:	64-bit
Peak Pointers:	Not Applicable
Other:	None
Power Management:	--

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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	224	777	459	**778**	**458**	782	456							
502.gcc_r	224	692	458	680	467	**682**	**465**							
505.mcf_r	224	**482**	**750**	482	750	482	751							
520.omnetpp_r	224	778	378	**775**	**379**	774	379							
523.xalancbmk_r	224	384	615	**385**	**615**	386	612							
525.x264_r	224	316	1240	**316**	**1240**	317	1240							
531.deepsjeng_r	224	509	504	**509**	**504**	508	505							
541.leela_r	224	**775**	**479**	773	480	777	477							
548.exchange2_r	224	473	1240	**473**	**1240**	472	1240							
557.xz_r	224	597	405	598	405	**597**	**405**							

SPECrate®2017_int_base = 596

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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"
Tmpfs filesystem can be set with:
 mount -t tmpfs -o size=800g tmpfs /home
Process tuning setting:
 echo 50000     > /proc/sys/kernel/sched_cfs_bandwidth_slice_us
 echo 240000000 > /proc/sys/kernel/sched_latency_ns
 echo 5000000   > /proc/sys/kernel/sched_migration_cost_ns
 echo 100000000 > /proc/sys/kernel/sched_min_granularity_ns
 echo 150000000 > /proc/sys/kernel/sched_wakeup_granularity_ns
 echo 0 > /proc/sys/kernel/numa_balancing
```

General Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017-1.0.5-ic19.0u4/lib/intel64"

 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
```

(Continued on next page)

General Notes (Continued)

```
 Filesystem page cache synced and cleared with:
 sync; echo 3>       /proc/sys/vm/drop_caches
 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.
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.
```

Platform Notes

```
BIOS configuration:
Choose Operating Mode set to Maximum Performance
Trusted Execution Technology set to Enable
SNC set to Enable
 Sysinfo program /home/cpu2017-1.0.5-ic19.0u4/bin/sysinfo
 Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
 running on linux-qcq6 Thu Sep  5 18:01:14 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) Platinum 8276 CPU @ 2.20GHz
       4  "physical id"s (chips)
       224 "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 : 28
       siblings  : 56
       physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
       28 29 30
       physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
       28 29 30
       physical 2: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
       28 29 30
       physical 3: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
       28 29 30
```

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Platform Notes (Continued)

```
From lscpu:
      Architecture:          x86_64
      CPU op-mode(s):        32-bit, 64-bit
      Byte Order:            Little Endian
      CPU(s):                224
      On-line CPU(s) list:   0-223
      Thread(s) per core:    2
      Core(s) per socket:    28
      Socket(s):             4
      NUMA node(s):          8
      Vendor ID:             GenuineIntel
      CPU family:            6
      Model:                 85
      Model name:            Intel(R) Xeon(R) Platinum 8276 CPU @ 2.20GHz
      Stepping:              6
      CPU MHz:               2200.000
      CPU max MHz:           4000.0000
      CPU min MHz:           1000.0000
      BogoMIPS:              4400.00
      Virtualization:        VT-x
      L1d cache:             32K
      L1i cache:             32K
      L2 cache:              1024K
      L3 cache:              39424K
      NUMA node0 CPU(s):     0-3,7-9,14-17,21-23,112-115,119-121,126-129,133-135
      NUMA node1 CPU(s):     4-6,10-13,18-20,24-27,116-118,122-125,130-132,136-139
      NUMA node2 CPU(s):     28-31,35-37,42-45,49-51,140-143,147-149,154-157,161-163
      NUMA node3 CPU(s):     32-34,38-41,46-48,52-55,144-146,150-153,158-160,164-167
      NUMA node4 CPU(s):     56-59,63-65,70-73,77-79,168-171,175-177,182-185,189-191
      NUMA node5 CPU(s):     60-62,66-69,74-76,80-83,172-174,178-181,186-188,192-195
      NUMA node6 CPU(s):     84-87,91-93,98-101,105-107,196-199,203-205,210-213,217-219
      NUMA node7 CPU(s):     88-90,94-97,102-104,108-111,200-202,206-209,214-216,220-223
      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 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 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 dtherm ida arat pln
      pts pku ospke avx512_vnni flush_l1d arch_capabilities

/proc/cpuinfo cache data
   cache size : 39424 KB
```

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Platform Notes (Continued)

```
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 1 2 3 7 8 9 14 15 16 17 21 22 23 112 113 114 115 119 120 121 126 127 128
  129 133 134 135
  node 0 size: 193133 MB
  node 0 free: 192609 MB
  node 1 cpus: 4 5 6 10 11 12 13 18 19 20 24 25 26 27 116 117 118 122 123 124 125 130 131
  132 136 137 138 139
  node 1 size: 193525 MB
  node 1 free: 180967 MB
  node 2 cpus: 28 29 30 31 35 36 37 42 43 44 45 49 50 51 140 141 142 143 147 148 149 154
  155 156 157 161 162 163
  node 2 size: 193525 MB
  node 2 free: 193048 MB
  node 3 cpus: 32 33 34 38 39 40 41 46 47 48 52 53 54 55 144 145 146 150 151 152 153 158
  159 160 164 165 166 167
  node 3 size: 193525 MB
  node 3 free: 193239 MB
  node 4 cpus: 56 57 58 59 63 64 65 70 71 72 73 77 78 79 168 169 170 171 175 176 177 182
  183 184 185 189 190 191
  node 4 size: 193525 MB
  node 4 free: 192790 MB
  node 5 cpus: 60 61 62 66 67 68 69 74 75 76 80 81 82 83 172 173 174 178 179 180 181 186
  187 188 192 193 194 195
  node 5 size: 193525 MB
  node 5 free: 193276 MB
  node 6 cpus: 84 85 86 87 91 92 93 98 99 100 101 105 106 107 196 197 198 199 203 204 205
  210 211 212 213 217 218 219
  node 6 size: 193525 MB
  node 6 free: 193260 MB
  node 7 cpus: 88 89 90 94 95 96 97 102 103 104 108 109 110 111 200 201 202 206 207 208
  209 214 215 216 220 221 222 223
  node 7 size: 193493 MB
  node 7 free: 193250 MB
  node distances:
  node   0   1   2   3   4   5   6   7
    0:  10  11  21  21  21  21  21  21
    1:  11  10  21  21  21  21  21  21
    2:  21  21  10  11  21  21  21  21
    3:  21  21  11  10  21  21  21  21
    4:  21  21  21  21  10  11  21  21
    5:  21  21  21  21  11  10  21  21
    6:  21  21  21  21  21  21  10  11
    7:  21  21  21  21  21  21  11  10

From /proc/meminfo
```

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Platform Notes (Continued)

```
    MemTotal:       1584927052 kB
    HugePages_Total:       0
    Hugepagesize:       2048 kB

  From /etc/*release* /etc/*version*
    SuSE-release:
       SUSE Linux Enterprise Server 12 (x86_64)
       VERSION = 12
       PATCHLEVEL = 4
       # 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-SP4"
       VERSION_ID="12.4"
       PRETTY_NAME="SUSE Linux Enterprise Server 12 SP4"
       ID="sles"
       ANSI_COLOR="0;32"
       CPE_NAME="cpe:/o:suse:sles:12:sp4"

  uname -a:
    Linux linux-qcq6 4.12.14-94.41-default #1 SMP Wed Oct 31 12:25:04 UTC 2018 (3090901)
    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: __user pointer sanitization
  CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation,
  IBPB, IBRS_FW

  run-level 3 Sep 5 17:55

  SPEC is set to: /home/cpu2017-1.0.5-ic19.0u4
    Filesystem     Type   Size  Used Avail Use% Mounted on
    tmpfs          tmpfs  800G  8.3G  792G   2% /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)
```

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 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++     | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
        | 541.leela_r(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 | 548.exchange2_r(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:
`icc -m64 -std=c11`

C++ benchmarks:
`icpc -m64`

Fortran benchmarks:
`ifort -m64`

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:
-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

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:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2019-04-02.html
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/Intel-ic18.0-official-linux64.2019-04-02.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-D.xml

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