



# SPEC CPU®2017 Integer Rate Result

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## Lenovo Global Technology

ThinkSystem SR860 V2  
(2.60 GHz, Intel Xeon Platinum 8376HL)

SPECrate®2017\_int\_base = 631  
SPECrate®2017\_int\_energy\_base = 803  
SPECrate®2017\_int\_peak = Not Run  
SPECrate®2017\_int\_energy\_peak = Not Run

CPU2017 License: 9017

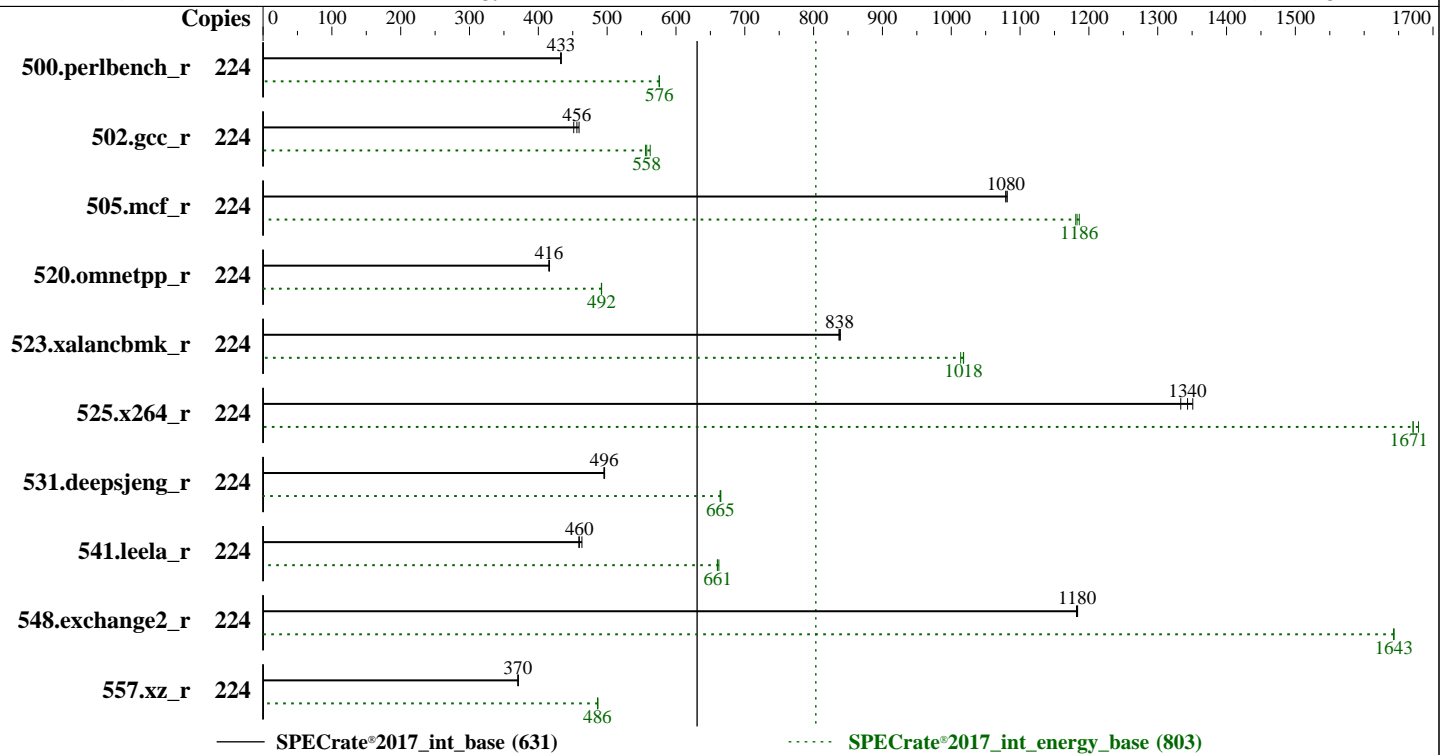
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Dec-2020

Hardware Availability: Nov-2020

Software Availability: Aug-2020



### Hardware

CPU Name: Intel Xeon Platinum 8376HL  
 Max MHz: 4300  
 Nominal: 2600  
 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: 384 GB (24 x 16 GB 2Rx8 PC4-3200AA-R)  
 Storage: 1 x 960 GB SATA SSD  
 Other: None

### Software

OS: Red Hat Enterprise Linux release 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 M5E107I 1.01 released Nov-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 balance power and performance

### Power

Max. Power (W): 1132.4  
 Idle Power (W): 152.98  
 Min. Temperature (C): 22.94

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## Power (Continued)

Elevation (m): 43  
Line Standard: 220 V / 50 Hz / 1 phase / 3 wires  
Provisioning: Line-powered

### Power Settings

Management FW: Version 1.01 of TGBT07V  
Memory Mode: Normal

### Power-Relevant Hardware

Power Supply: 2 x 1100 W (non-redundant)  
Details: ThinkSystem 1100W Platinum Power Supply 4P57A26293  
Backplane: 8 x 2.5-inch HDD back plane  
Other Storage: None  
Storage Model #: 4XB7A17089  
NICs Installed: 1 x ThinkSystem Ethernet 4-port Adaptor @ 1 Gb  
NICs Enabled (FW/OS): 4 / 1  
NICs Connected/Speed: 1 @ 1 Gb  
Other HW Model #: 1 x ThinkSystem SR860 V2 Performance Fan Upgrade Kit

### Power Analyzer

Power Analyzer: WIN:9888  
Hardware Vendor: YOKOGAWA, Inc.  
Model: YokogawaWT310E  
Serial Number: C3UD17025E  
Input Connection: Default  
Metrology Institute: CNAS  
Calibration By: GUANG ZHOU GRG METROLOGY & TEST CO.,LTD.  
Calibration Label: J202009040176A-0001  
Calibration Date: 25-Sep-2020  
PTDaemon™ Version: 1.9.1 (a2d19f26; 2019-07-17)  
Setup Description: Connected to PSU1 and PSU2  
Current Ranges Used: 5A  
Voltage Range Used: 300V

### Temperature Meter

Temperature Meter: WIN:9889  
Hardware Vendor: Digi International, Inc.  
Model: DigiWATCHPORT\_H  
Serial Number: W62330963  
Input Connection: USB  
PTDaemon Version: 1.9.1 (a2d19f26; 2019-07-17)  
Setup Description: 50 mm in front of SUT main intake

## Base Results Table

Benchmark	Copies	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power
500.perlbench_r	224	<b>823</b>	<b>433</b>	<b>672</b>	<b>576</b>	<b>816</b>	<b>963</b>	825	432	672	575	815	979	823	433	672	576	816	988
502.gcc_r	224	<b>696</b>	<b>456</b>	<b>618</b>	<b>558</b>	<b>888</b>	<b>992</b>	703	451	620	556	882	991	691	459	612	563	886	986
505.mcf_r	224	335	1080	335	1180	1000	1110	335	1080	335	1180	1000	1120	<b>335</b>	<b>1080</b>	<b>334</b>	<b>1190</b>	<b>996</b>	<b>1120</b>
520.omnetpp_r	224	706	416	647	492	916	938	707	416	647	492	915	927	<b>707</b>	<b>416</b>	<b>647</b>	<b>492</b>	<b>915</b>	<b>926</b>
523.xalancbm_r	224	282	839	253	1010	896	1130	<b>282</b>	<b>838</b>	<b>252</b>	<b>1020</b>	<b>891</b>	<b>1120</b>	283	837	252	1020	891	1120
525.x264_r	224	<b>292</b>	<b>1340</b>	<b>254</b>	<b>1670</b>	<b>871</b>	<b>922</b>	294	1330	254	1670	865	931	290	1350	253	1680	872	929
531.deepsjeng_r	224	518	495	420	664	811	976	517	496	419	665	811	977	<b>518</b>	<b>496</b>	<b>420</b>	<b>665</b>	<b>811</b>	<b>973</b>
541.leela_r	224	801	463	606	662	757	854	808	459	608	660	752	852	<b>807</b>	<b>460</b>	<b>608</b>	<b>661</b>	<b>753</b>	<b>840</b>
548.exchange2_r	224	<b>496</b>	<b>1180</b>	<b>387</b>	<b>1640</b>	<b>780</b>	<b>790</b>	496	1180	387	1640	781	794	497	1180	387	1640	780	790
557.xz_r	224	652	371	541	486	829	924	653	370	541	486	828	913	<b>653</b>	<b>370</b>	<b>541</b>	<b>486</b>	<b>829</b>	<b>913</b>

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SPECrate®2017\_int\_energy\_base = **803**

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



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## 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"
MALLOCONF = "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
```

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 settings:

Choose Operating Mode set to Maximum Performance and then set it to Custom Mode

Turbo Mode set to Disabled

CPU P-state Control set to Cooperative with Legacy

C-States set to Legacy

Memory Power Management set to Automatic

(Continued on next page)



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## Platform Notes (Continued)

UPI Link Disable set to Disabled 1 Link  
Platform Controlled Type set to Minimal Power  
SNC set to Enabled  
DCU Streamer Prefetcher set to Disabled  
C1 Enhanced Mode set to Enabled  
LLC dead line alloc set to Disable

Sysinfo program /home/cpu2017-1.1.0-ic19.lu2/bin/sysinfo  
Rev: r6365 of 2019-08-21 295195f888a3d7edble6e46a485a0011  
running on localhost.localdomain Mon Dec 21 18:10:41 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 8376HL CPU @ 2.60GHz
 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
```

```
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
```

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## Platform Notes (Continued)

```

Model name: Intel(R) Xeon(R) Platinum 8376HL CPU @ 2.60GHz
Stepping: 11
CPU MHz: 1000.038
CPU max MHz: 2600.0000
CPU min MHz: 1000.0000
BogoMIPS: 5200.00
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
aperfperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
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 arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req
pku ospke avx512_vnni md_clear flush_l1d arch_capabilities

```

```

/proc/cpuinfo cache data
cache size : 39424 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 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: 47967 MB
node 0 free: 47581 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: 48377 MB

```

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## Platform Notes (Continued)

```

node 1 free: 48103 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: 48377 MB
node 2 free: 48237 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: 48377 MB
node 3 free: 48259 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: 48350 MB
node 4 free: 48220 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: 48377 MB
node 5 free: 48217 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: 48377 MB
node 6 free: 48171 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: 48375 MB
node 7 free: 48237 MB
node distances:
node  0  1  2  3  4  5  6  7
  0: 10 11 20 20 20 20 30 30
  1: 11 10 20 20 20 20 30 30
  2: 20 20 10 11 30 30 20 20
  3: 20 20 11 10 30 30 20 20
  4: 20 20 30 30 10 11 20 20
  5: 20 20 30 30 11 10 20 20
  6: 30 30 20 20 20 20 10 11
  7: 30 30 20 20 20 20 11 10

```

```

From /proc/meminfo
MemTotal:      395859796 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*

```

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## Platform Notes (Continued)

os-release:

```

NAME="Red Hat Enterprise Linux"
VERSION="8.2 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.2"
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 21 18:08

SPEC is set to: /home/cpu2017-1.1.0-ic19.1u2

```

Filesystem      Type      Size      Used Avail Use% Mounted on
/dev/sda3       xfs       892G      39G  854G   5% /

```

From /sys/devices/virtual/dmi/id

```

BIOS:      Lenovo M5E107I-1.01 11/02/2020
Vendor:    Lenovo
Product:   ThinkSystem SR860 V2
Product Family: ThinkSystem
Serial:    none

```

Additional information from dmidecode follows. WARNING: Use caution when you interpret

(Continued on next page)



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## Platform Notes (Continued)

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:

24x NO DIMM NO DIMM

24x SK Hynix HMA82GR7CJR8N-XN 16 GB 2 rank 3200

(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 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

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## Base Compiler Invocation (Continued)

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
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
```

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SPECrate®2017_int_energy_base =	803
SPECrate®2017_int_peak =	Not Run
SPECrate®2017_int_energy_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

## Base Optimization Flags (Continued)

Fortran benchmarks (continued):

```
-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/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/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](mailto:info@spec.org).

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