



SPEC® CPU2017 Floating Point Rate Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

Lenovo Global Technology

ThinkSystem SR950
(2.20 GHz, Intel Xeon Platinum 8276)

SPECrate2017_fp_base = 1040

SPECrate2017_fp_peak = Not Run

CPU2017 License: 9017

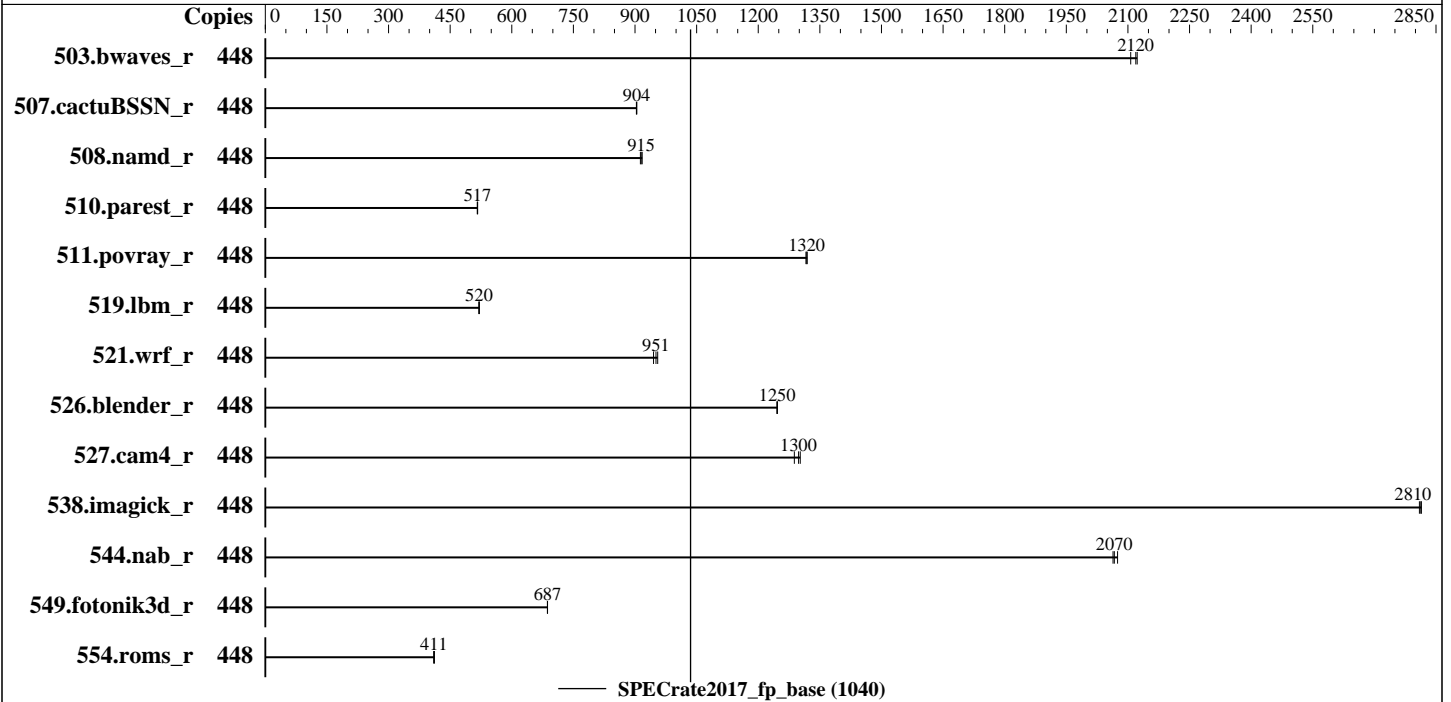
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Apr-2019

Hardware Availability: Apr-2019

Software Availability: Dec-2018



Hardware

CPU Name: Intel Xeon Platinum 8276
 Max MHz.: 4000
 Nominal: 2200
 Enabled: 224 cores, 8 chips, 2 threads/core
 Orderable: 2,3,4,6,8 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: 3 TB (96 x 32 GB 2Rx4 PC4-2933Y-R)
 Storage: 960 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 19.0.1.144 of Intel C/C++
 Compiler Build 20181018 for Linux;
 Fortran: Version 19.0.1.144 of Intel Fortran
 Compiler Build 20181018 for Linux
 Parallel: No
 Firmware: Lenovo BIOS Version PSE121C 1.50 released Jan-2019
 File System: tmpfs
 System State: Run level 3 (multi-user)
 Base Pointers: 64-bit
 Peak Pointers: Not Applicable
 Other: None



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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	448	2120	2120	2117	2120	2132	2110							
507.cactuBSSN_r	448	628	903	627	904	627	904							
508.namd_r	448	465	915	466	913	464	917							
510.parest_r	448	2268	517	2271	516	2268	517							
511.povray_r	448	793	1320	795	1320	794	1320							
519.lbm_r	448	907	521	907	520	908	520							
521.wrf_r	448	1051	955	1062	945	1055	951							
526.blender_r	448	547	1250	548	1250	547	1250							
527.cam4_r	448	602	1300	604	1300	608	1290							
538.imagick_r	448	396	2810	397	2810	396	2810							
544.nab_r	448	363	2070	365	2060	365	2070							
549.fotonik3d_r	448	2542	687	2542	687	2541	687							
554.roms_r	448	1730	412	1733	411	1736	410							

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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=960g 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
```

General Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017-1.0.5-ic19.0u1/lib/intel64"
Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.5
Transparent Huge Pages enabled by default
```

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General Notes (Continued)

```
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>
```

- 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.

Platform Notes

```
BIOS configuration:
Choose Operating Mode set to Maximum Performance
Choose Operating Mode set to Custom Mode
MONITORMWAIT set to Enable
SNC set to Enable
Patrol Scrub set to Disable
Stale AtoS set to Enable
LLC dead line alloc set to Disable
Sysinfo program /home/cpu2017-1.0.5-ic19.0u1/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on sles12sp4 Tue Apr 2 05:59:59 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
 8 "physical id"s (chips)
448 "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
```

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Platform Notes (Continued)

```

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
physical 4: 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 5: 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 6: 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 7: 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):                448
On-line CPU(s) list:   0-447
Thread(s) per core:    2
Core(s) per socket:    28
Socket(s):              8
NUMA node(s):          16
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):     0-3,7-9,14-17,21-23,224-227,231-233,238-241,245-247
NUMA node1 CPU(s):     4-6,10-13,18-20,24-27,228-230,234-237,242-244,248-251
NUMA node2 CPU(s):     28-31,35-37,42-45,49-51,252-255,259-261,266-269,273-275
NUMA node3 CPU(s):     32-34,38-41,46-48,52-55,256-258,262-265,270-272,276-279
NUMA node4 CPU(s):     56-59,63-65,70-73,77-79,280-283,287-289,294-297,301-303
NUMA node5 CPU(s):     60-62,66-69,74-76,80-83,284-286,290-293,298-300,304-307
NUMA node6 CPU(s):     84-87,91-93,98-101,105-107,308-311,315-317,322-325,329-331
NUMA node7 CPU(s):     88-90,94-97,102-104,108-111,312-314,318-321,326-328,332-335
NUMA node8 CPU(s):     112-115,119-121,126-129,133-135,336-339,343-345,350-353,357-359

```

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Platform Notes (Continued)

NUMA node9 CPU(s):
116-118,122-125,130-132,136-139,340-342,346-349,354-356,360-363

NUMA node10 CPU(s):
140-143,147-149,154-157,161-163,364-367,371-373,378-381,385-387

NUMA node11 CPU(s):
144-146,150-153,158-160,164-167,368-370,374-377,382-384,388-391

NUMA node12 CPU(s):
168-171,175-177,182-185,189-191,392-395,399-401,406-409,413-415

NUMA node13 CPU(s):
172-174,178-181,186-188,192-195,396-398,402-405,410-412,416-419

NUMA node14 CPU(s):
196-199,203-205,210-213,217-219,420-423,427-429,434-437,441-443

NUMA node15 CPU(s):
200-202,206-209,214-216,220-223,424-426,430-433,438-440,444-447

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
aperfmpperf 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 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_lld 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: 16 nodes (0-15)
node 0 cpus: 0 1 2 3 7 8 9 14 15 16 17 21 22 23 224 225 226 227 231 232 233 238 239 240
241 245 246 247
node 0 size: 193119 MB
node 0 free: 192305 MB
node 1 cpus: 4 5 6 10 11 12 13 18 19 20 24 25 26 27 228 229 230 234 235 236 237 242 243
244 248 249 250 251
node 1 size: 193530 MB
node 1 free: 192961 MB
node 2 cpus: 28 29 30 31 35 36 37 42 43 44 45 49 50 51 252 253 254 255 259 260 261 266
267 268 269 273 274 275
node 2 size: 193530 MB
node 2 free: 193281 MB
node 3 cpus: 32 33 34 38 39 40 41 46 47 48 52 53 54 55 256 257 258 262 263 264 265 270
271 272 276 277 278 279
node 3 size: 193501 MB
```

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Platform Notes (Continued)

```

node 3 free: 193248 MB
node 4 cpus: 56 57 58 59 63 64 65 70 71 72 73 77 78 79 280 281 282 283 287 288 289 294
295 296 297 301 302 303
node 4 size: 193530 MB
node 4 free: 193371 MB
node 5 cpus: 60 61 62 66 67 68 69 74 75 76 80 81 82 83 284 285 286 290 291 292 293 298
299 300 304 305 306 307
node 5 size: 193530 MB
node 5 free: 193352 MB
node 6 cpus: 84 85 86 87 91 92 93 98 99 100 101 105 106 107 308 309 310 311 315 316 317
322 323 324 325 329 330 331
node 6 size: 193530 MB
node 6 free: 193306 MB
node 7 cpus: 88 89 90 94 95 96 97 102 103 104 108 109 110 111 312 313 314 318 319 320
321 326 327 328 332 333 334 335
node 7 size: 193530 MB
node 7 free: 193288 MB
node 8 cpus: 112 113 114 115 119 120 121 126 127 128 129 133 134 135 336 337 338 339
343 344 345 350 351 352 353 357 358 359
node 8 size: 193530 MB
node 8 free: 193301 MB
node 9 cpus: 116 117 118 122 123 124 125 130 131 132 136 137 138 139 340 341 342 346
347 348 349 354 355 356 360 361 362 363
node 9 size: 193530 MB
node 9 free: 193289 MB
node 10 cpus: 140 141 142 143 147 148 149 154 155 156 157 161 162 163 364 365 366 367
371 372 373 378 379 380 381 385 386 387
node 10 size: 193530 MB
node 10 free: 193298 MB
node 11 cpus: 144 145 146 150 151 152 153 158 159 160 164 165 166 167 368 369 370 374
375 376 377 382 383 384 388 389 390 391
node 11 size: 193530 MB
node 11 free: 193343 MB
node 12 cpus: 168 169 170 171 175 176 177 182 183 184 185 189 190 191 392 393 394 395
399 400 401 406 407 408 409 413 414 415
node 12 size: 193530 MB
node 12 free: 180634 MB
node 13 cpus: 172 173 174 178 179 180 181 186 187 188 192 193 194 195 396 397 398 402
403 404 405 410 411 412 416 417 418 419
node 13 size: 193530 MB
node 13 free: 193375 MB
node 14 cpus: 196 197 198 199 203 204 205 210 211 212 213 217 218 219 420 421 422 423
427 428 429 434 435 436 437 441 442 443
node 14 size: 193530 MB
node 14 free: 193348 MB
node 15 cpus: 200 201 202 206 207 208 209 214 215 216 220 221 222 223 424 425 426 430
431 432 433 438 439 440 444 445 446 447

```

(Continued on next page)



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Platform Notes (Continued)

```
node 15 size: 193527 MB
node 15 free: 193347 MB
node distances:
node  0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15
 0:  10 11 21 21 31 31 21 21 21 21 31 31 31 31 31 31
 1:  11 10 21 21 31 31 21 21 21 21 31 31 31 31 31 31
 2:  21 21 10 11 21 21 31 31 31 31 21 21 31 31 31 31
 3:  21 21 11 10 21 21 31 31 31 31 21 21 31 31 31 31
 4:  31 31 21 21 10 11 21 21 31 31 31 31 21 21 31 31
 5:  31 31 21 21 11 10 21 21 31 31 31 31 21 21 31 31
 6:  21 21 31 31 21 21 10 11 31 31 31 31 31 31 21 21
 7:  21 21 31 31 21 21 11 10 31 31 31 31 31 31 21 21
 8:  21 21 31 31 31 31 31 31 10 11 21 21 21 21 31 31
 9:  21 21 31 31 31 31 31 31 11 10 21 21 21 21 31 31
10:  31 31 21 21 31 31 31 31 21 21 10 11 31 31 21 21
11:  31 31 21 21 31 31 31 31 21 21 11 10 31 31 21 21
12:  31 31 31 31 21 21 31 31 21 21 31 31 10 11 21 21
13:  31 31 31 31 21 21 31 31 21 21 31 31 11 10 21 21
14:  31 31 31 31 31 31 21 21 31 31 21 21 21 21 10 11
15:  31 31 31 31 31 31 21 21 31 31 21 21 21 21 11 10
```

```
From /proc/meminfo
MemTotal:      3170352164 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 sles12sp4 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:

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Platform Notes (Continued)

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 Apr 2 05:57

SPEC is set to: /home/cpu2017-1.0.5-ic19.0u1
Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 960G 8.3G 952G 1% /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 -[PSE121C-1.50]- 01/16/2019
Memory:
96x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

(End of data from sysinfo program)

Compiler Version Notes

=====
CC 519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)
=====

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
=====

=====
CXXC 508.namd_r(base) 510.parest_r(base)
=====

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
=====

=====
CC 511.povray_r(base) 526.blender_r(base)
=====

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

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Compiler Version Notes (Continued)

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
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Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

FC 507.cactuBSSN_r(base)

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018

Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018

Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.1.144 Build 20181018

Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

FC 503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.1.144 Build 20181018

Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

CC 521.wrf_r(base) 527.cam4_r(base)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.1.144 Build 20181018

Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018

Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:

icc -m64 -std=c11

C++ benchmarks:

icpc -m64

(Continued on next page)



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Base Compiler Invocation (Continued)

Fortran benchmarks:

```
ifort -m64
```

Benchmarks using both Fortran and C:

```
ifort -m64 icc -m64 -std=c11
```

Benchmarks using both C and C++:

```
icpc -m64 icc -m64 -std=c11
```

Benchmarks using Fortran, C, and C++:

```
icpc -m64 icc -m64 -std=c11 ifort -m64
```

Base Portability Flags

```
503.bwaves_r: -DSPEC_LP64
```

```
507.cactuBSSN_r: -DSPEC_LP64
```

```
508.namd_r: -DSPEC_LP64
```

```
510.parest_r: -DSPEC_LP64
```

```
511.povray_r: -DSPEC_LP64
```

```
519.lbm_r: -DSPEC_LP64
```

```
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
```

```
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char
```

```
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
```

```
538.imagick_r: -DSPEC_LP64
```

```
544.nab_r: -DSPEC_LP64
```

```
549.fotonik3d_r: -DSPEC_LP64
```

```
554.roms_r: -DSPEC_LP64
```

Base Optimization Flags

C benchmarks:

```
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
```

```
-ffinite-math-only -qopt-mem-layout-trans=4
```

C++ benchmarks:

```
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
```

```
-ffinite-math-only -qopt-mem-layout-trans=4
```

Fortran benchmarks:

```
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
```

```
-ffinite-math-only -qopt-mem-layout-trans=4 -auto
```

```
-nonstandard-realloc-lhs -align array32byte
```

(Continued on next page)



SPEC CPU2017 Floating Point Rate Result

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Lenovo Global Technology

ThinkSystem SR950
(2.20 GHz, Intel Xeon Platinum 8276)

SPECrate2017_fp_base = 1040

SPECrate2017_fp_peak = Not Run

CPU2017 License: 9017

Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Apr-2019

Hardware Availability: Apr-2019

Software Availability: Dec-2018

Base Optimization Flags (Continued)

Benchmarks using both Fortran and C:

```
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -auto
-nostandard-realloc-lhs -align array32byte
```

Benchmarks using both C and C++:

```
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4
```

Benchmarks using Fortran, C, and C++:

```
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -auto
-nostandard-realloc-lhs -align array32byte
```

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-A.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-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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