SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

Lenovo Global Technology

SPECrate®2017_fp_base =   466

ThinkSystem SR850 V2
(2.50 GHz, Intel Xeon Gold 5318H)
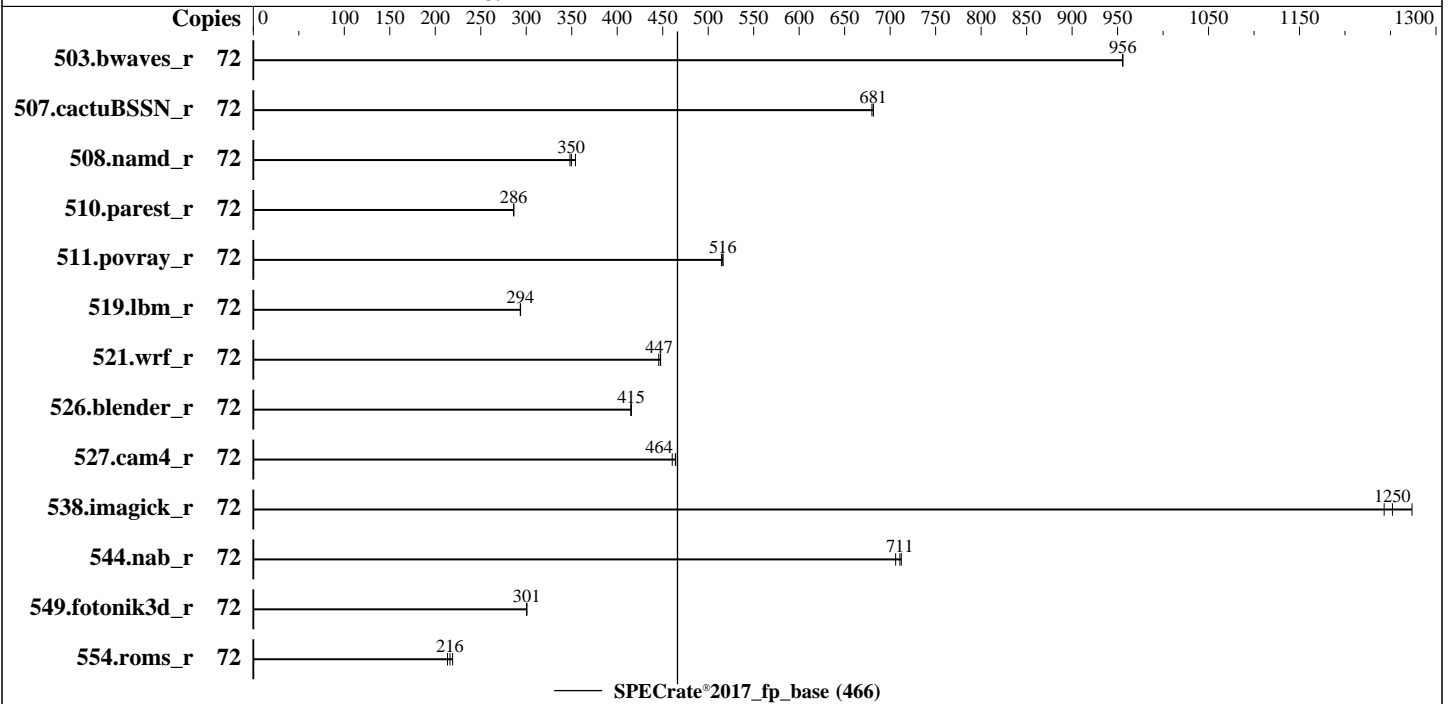
SPECrate®2017_fp_peak = Not Run

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

Test Date: Jun-2021
Hardware Availability: Nov-2020
Software Availability: Dec-2020

Benchmark	Copies	Result
503.bwaves_r	72	956
507.cactuBSSN_r	72	681
508.namd_r	72	350
510.parest_r	72	286
511.povray_r	72	516
519.lbm_r	72	294
521.wrf_r	72	447
526.blender_r	72	415
527.cam4_r	72	464
538.imagick_r	72	1250
544.nab_r	72	711
549.fotonik3d_r	72	301
554.roms_r	72	216

SPECrate®2017_fp_base (466)

Hardware

CPU Name: Intel Xeon Gold 5318H
 Max MHz: 3800
 Nominal: 2500
Enabled: 72 cores, 4 chips
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: 24.75 MB I+D on chip per chip
 Other: None
Memory: 3 TB (48 x 64 GB 2Rx4 PC4-3200AA-R, running at 2666)
Storage: 1 x 960 GB SATA SSD
Other: None

Software

OS: Red Hat Enterprise Linux 8.3 (Ootpa)
 Kernel 4.18.0-240.el8.x86_64
Compiler: C/C++: Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux; Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux;
Parallel: No
Firmware: Lenovo BIOS Version M5E111G 1.20 released Apr-2021
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: jemalloc memory allocator V5.0.1
Power Management: BIOS and OS set to prefer performance at the cost of additional power usage

Standard Performance Evaluation Corporation (info@spec.org)   https://www.spec.org/

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SPECrate®2017_fp_base =　　466

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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	72	756	955	**755**	**956**	755	956							
507.cactuBSSN_r	72	**134**	**681**	134	682	134	680							
508.namd_r	72	197	348	**196**	**350**	193	354							
510.parest_r	72	658	286	**658**	**286**	658	286							
511.povray_r	72	326	516	**326**	**516**	327	515							
519.lbm_r	72	258	294	259	294	**258**	**294**							
521.wrf_r	72	360	448	362	446	**360**	**447**							
526.blender_r	72	264	415	264	415	**264**	**415**							
527.cam4_r	72	271	464	273	460	**271**	**464**							
538.imagick_r	72	141	1270	144	1240	**143**	**1250**							
544.nab_r	72	172	706	**171**	**711**	170	712							
549.fotonik3d_r	72	934	300	**934**	**301**	933	301							
554.roms_r	72	522	219	**529**	**216**	536	213							

SPECrate®2017_fp_base =　　**466**

SPECrate®2017_fp_peak =　　**Not Run**

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/cpu2017-1.1.8-ic2021.1-revB/lib/intel64:/home/cpu2017-1.1.8-ic202
　　1.1-revB/je5.0.1-64"
MALLOC_CONF = "retain:true"

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM
memory using Red Hat Enterprise Linux 8.1
Transparent Huge Pages enabled by default

(Continued on next page)

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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>
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.
 jemalloc, a general purpose malloc implementation
 built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5
 sources available from jemalloc.net or https://github.com/jemalloc/jemalloc/releases
```

Platform Notes

```
BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
C-States set to Legacy
Hyper-Threading set to Disabled
SNC set to Enabled
Stale Atos set to Enable

 Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revB/bin/sysinfo
 Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
 running on localhost.localdomain Tue Jun 29 17:15:50 2021

 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) Gold 5318H CPU @ 2.50GHz
       4  "physical id"s (chips)
       72 "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 : 18
       siblings  : 18
       physical 0: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
       physical 1: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
       physical 2: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
       physical 3: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

 From lscpu from util-linux 2.32.1:
```

(Continued on next page)

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Platform Notes (Continued)

```
         Architecture:          x86_64
         CPU op-mode(s):        32-bit, 64-bit
         Byte Order:            Little Endian
         CPU(s):                72
         On-line CPU(s) list:   0-71
         Thread(s) per core:    1
         Core(s) per socket:    18
         Socket(s):             4
         NUMA node(s):          8
         Vendor ID:             GenuineIntel
         CPU family:            6
         Model:                 85
         Model name:            Intel(R) Xeon(R) Gold 5318H CPU @ 2.50GHz
         Stepping:              11
         CPU MHz:               3091.114
         CPU max MHz:           3800.0000
         CPU min MHz:           1000.0000
         BogoMIPS:              5000.00
         Virtualization:        VT-x
         L1d cache:             32K
         L1i cache:             32K
         L2 cache:              1024K
         L3 cache:              25344K
         NUMA node0 CPU(s):     0-2,5,6,9,10,14,15
         NUMA node1 CPU(s):     3,4,7,8,11-13,16,17
         NUMA node2 CPU(s):     18-20,23,24,27,28,32,33
         NUMA node3 CPU(s):     21,22,25,26,29-31,34,35
         NUMA node4 CPU(s):     36-38,41,42,45,46,50,51
         NUMA node5 CPU(s):     39,40,43,44,47-49,52,53
         NUMA node6 CPU(s):     54-56,59,60,63,64,68,69
         NUMA node7 CPU(s):     57,58,61,62,65-67,70,71
         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 ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms
       invpcid 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 : 25344 KB
```

(Continued on next page)

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Test Date: Jun-2021
Hardware Availability: Nov-2020
Software Availability: Dec-2020

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 5 6 9 10 14 15
    node 0 size: 380060 MB
    node 0 free: 386362 MB
    node 1 cpus: 3 4 7 8 11 12 13 16 17
    node 1 size: 379709 MB
    node 1 free: 386853 MB
    node 2 cpus: 18 19 20 23 24 27 28 32 33
    node 2 size: 379679 MB
    node 2 free: 386820 MB
    node 3 cpus: 21 22 25 26 29 30 31 34 35
    node 3 size: 379767 MB
    node 3 free: 386885 MB
    node 4 cpus: 36 37 38 41 42 45 46 50 51
    node 4 size: 380031 MB
    node 4 free: 386762 MB
    node 5 cpus: 39 40 43 44 47 48 49 52 53
    node 5 size: 379795 MB
    node 5 free: 386894 MB
    node 6 cpus: 54 55 56 59 60 63 64 68 69
    node 6 size: 380233 MB
    node 6 free: 386797 MB
    node 7 cpus: 57 58 61 62 65 66 67 70 71
    node 7 size: 380244 MB
    node 7 free: 386876 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:       3170412688 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

  /sbin/tuned-adm active
      Current active profile: throughput-performance

  /sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
```

(Continued on next page)

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Test Date: Jun-2021

Hardware Availability: Nov-2020

Software Availability: Dec-2020

Platform Notes (Continued)

```
    performance

 From /etc/*release* /etc/*version*
    os-release:
        NAME="Red Hat Enterprise Linux"
        VERSION="8.3 (Ootpa)"
        ID="rhel"
        ID_LIKE="fedora"
        VERSION_ID="8.3"
        PLATFORM_ID="platform:el8"
        PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
        ANSI_COLOR="0;31"
    redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
    system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
    system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

 uname -a:
    Linux localhost.localdomain 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020
    x86_64 x86_64 x86_64 GNU/Linux

 Kernel self-reported vulnerability status:

 CVE-2018-12207 (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
 CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
 CVE-2019-11135 (TSX Asynchronous Abort):             Not affected

 run-level 3 Jun 29 17:14

 SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revB
    Filesystem     Type  Size  Used Avail Use% Mounted on
    /dev/sda4      xfs   819G   81G  738G  10% /home

 From /sys/devices/virtual/dmi/id
     Vendor:        Lenovo
     Product:       ThinkSystem SR850 V2
     Product Family: ThinkSystem
```

(Continued on next page)

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Platform Notes (Continued)

```
      Serial:          none

 Additional information from dmidecode 3.2 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 Samsung M393A8G40AB2-CWE 64 GB 2 rank 3200, configured at 2666

 BIOS:
    BIOS Vendor:      Lenovo
    BIOS Version:     M5E111G-1.20
    BIOS Date:        04/28/2021
    BIOS Revision:    1.20
    Firmware Revision: 1.30

 (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C               | 519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++             | 508.namd_r(base) 510.parest_r(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++, C          | 511.povray_r(base) 526.blender_r(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
```

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Compiler Version Notes (Continued)

```
==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
  Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran        | 503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
  Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran, C     | 521.wrf_r(base) 527.cam4_r(base)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
  Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

(Continued on next page)

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Base Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
```
ifort icx
```

Benchmarks using both C and C++:
```
icpx icx
```

Benchmarks using Fortran, C, and C++:
```
icpx icx ifort
```

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:
```
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

C++ benchmarks:
```
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

Fortran benchmarks:
```
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div
-qopt-prefetch -ffinite-math-only
```

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CPU2017 License: 9017		**Test Date:**	Jun-2021
Test Sponsor:	Lenovo Global Technology	**Hardware Availability:**	Nov-2020
Tested by:	Lenovo Global Technology	**Software Availability:**	Dec-2020

Base Optimization Flags (Continued)

Fortran benchmarks (continued):
```
-qopt-multiple-gather-scatter-by-shuffles -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using both Fortran and C:
```
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-mbranches-within-32B-boundaries -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using both C and C++:
```
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using Fortran, C, and C++:
```
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-mbranches-within-32B-boundaries -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.html
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Cooperlake-B.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Cooperlake-B.xml

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

Tested with SPEC CPU®2017 v1.1.8 on 2021-06-29 05:15:49-0400.
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