



# SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

## Lenovo Global Technology

ThinkSystem SR630 V3  
(2.00 GHz, Intel Xeon Gold 6438N)

SPECspeed®2017\_fp\_base = 302

SPECspeed®2017\_fp\_peak = Not Run

CPU2017 License: 9017

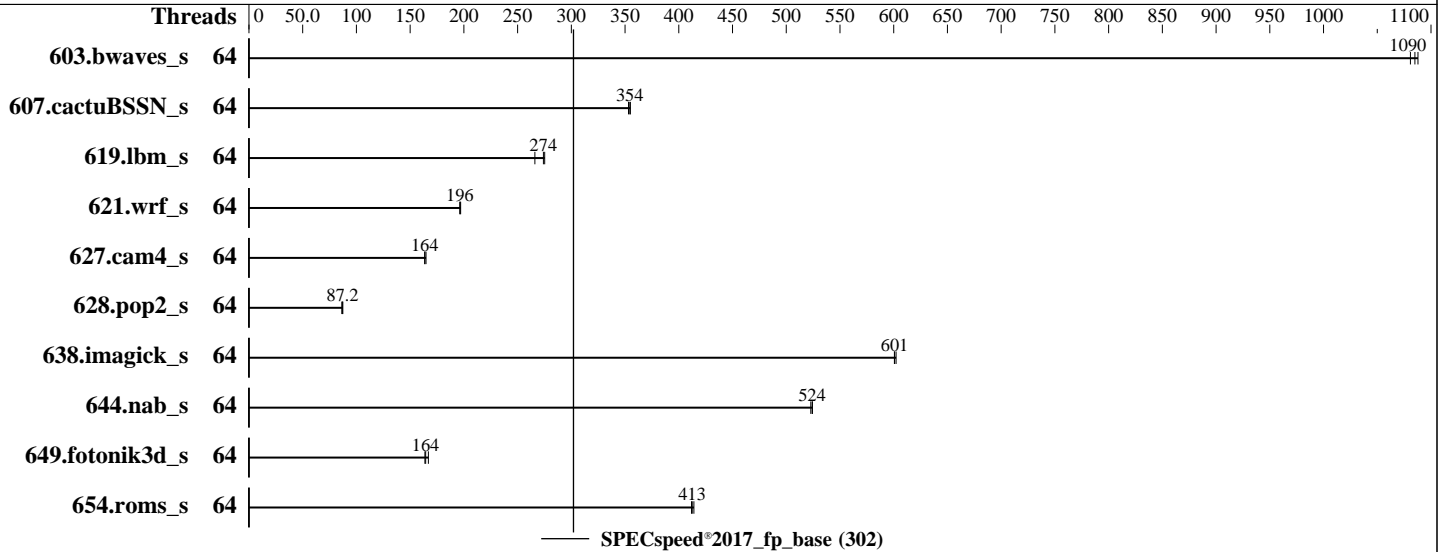
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Feb-2023

Hardware Availability: Feb-2023

Software Availability: Dec-2022



### Hardware

CPU Name: Intel Xeon Gold 6438N  
 Max MHz: 3600  
 Nominal: 2000  
 Enabled: 64 cores, 2 chips  
 Orderable: 1,2 chips  
 Cache L1: 32 KB I + 48 KB D on chip per core  
 L2: 2 MB I+D on chip per core  
 L3: 60 MB I+D on chip per chip  
 Other: None  
 Memory: 512 GB (16 x 32 GB 2Rx8 PC5-4800B-R)  
 Storage: 1 x 960 GB SATA SSD  
 Other: None

### Software

OS: SUSE Linux Enterprise Server 15 SP4 (x86\_64)  
 Kernel 5.14.21-150400.22-default  
 Compiler: C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ Compiler for Linux;  
 Fortran: Version 2023.0 of Intel Fortran Compiler Classic for Linux;  
 C/C++: Version 2023.0 of Intel C/C++ Compiler Classic for Linux  
 Parallel: Yes  
 Firmware: Lenovo BIOS Version ESE109L 1.10 released Jan-2023  
 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



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## Results Table

Benchmark	Base						Peak							
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	64	54.2	1090	<u>54.4</u>	<u>1090</u>	54.6	1080							
607.cactuBSSN_s	64	<b>47.0</b>	<b>354</b>	47.0	355	47.2	353							
619.lbm_s	64	19.0	275	19.7	266	<u>19.1</u>	<u>274</u>							
621.wrf_s	64	<b>67.3</b>	<b>196</b>	67.1	197	67.4	196							
627.cam4_s	64	<b>54.2</b>	<b>164</b>	53.8	165	54.2	164							
628.pop2_s	64	136	87.2	137	86.4	<u>136</u>	<u>87.2</u>							
638.imagick_s	64	24.0	601	24.0	602	<u>24.0</u>	<u>601</u>							
644.nab_s	64	33.3	524	33.4	523	<u>33.3</u>	<u>524</u>							
649.fotonik3d_s	64	55.7	164	<b>55.4</b>	<b>164</b>	54.6	167							
654.roms_s	64	38.0	414	<b>38.2</b>	<b>413</b>	38.2	412							

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

## 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:  
KMP\_AFFINITY = "granularity=fine,compact"  
LD\_LIBRARY\_PATH =  
"/home/cpu2017-1.1.9-ic2023.0/lib/intel64:/home/cpu2017-1.1.9-ic2023.0/j  
e5.0.1-64"  
MALLOC\_CONF = "retain:true"  
OMP\_STACKSIZE = "192M"

## General Notes

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB 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  
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.

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### General Notes (Continued)

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  
Hyper-Threading set to Disabled  
C-state set to Legacy

Sysinfo program /home/cpu2017-1.1.9-ic2023.0/bin/sysinfo  
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197  
running on test1 Fri Feb 10 15:50:16 2023

SUT (System Under Test) info as seen by some common utilities.

-----  
Table of contents  
-----

1. uname -a
2. w
3. Username
4. ulimit -a
5. sysinfo process ancestry
6. /proc/cpuinfo
7. lscpu
8. numactl --hardware
9. /proc/meminfo
10. who -r
11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. sysctl
16. /sys/kernel/mm/transparent\_hugepage
17. /sys/kernel/mm/transparent\_hugepage/khugepaged
18. OS release
19. Disk information
20. /sys/devices/virtual/dmi/id
21. dmidecode
22. BIOS

-----  
1. uname -a

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### Platform Notes (Continued)

```
Linux test1 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18 UTC 2022 (49db222) x86_64
x86_64 x86_64 GNU/Linux
```

```
-----
2. w
   15:50:16 up 3 min,  1 user,  load average: 0.02, 0.04, 0.01
USER      TTY      FROM          LOGIN@   IDLE   JCPU   PCPU   WHAT
root      tty1    -             15:49    6.00s  0.83s  0.00s  -bash
```

```
-----
3. Username
   From environment variable $USER:  root
```

```
-----
4. ulimit -a
   core file size          (blocks, -c) unlimited
   data seg size           (kbytes, -d) unlimited
   scheduling priority     (-e) 0
   file size               (blocks, -f) unlimited
   pending signals        (-i) 2062625
   max locked memory       (kbytes, -l) 64
   max memory size        (kbytes, -m) unlimited
   open files              (-n) 1024
   pipe size               (512 bytes, -p) 8
   POSIX message queues    (bytes, -q) 819200
   real-time priority      (-r) 0
   stack size              (kbytes, -s) unlimited
   cpu time                (seconds, -t) unlimited
   max user processes      (-u) 2062625
   virtual memory          (kbytes, -v) unlimited
   file locks              (-x) unlimited
```

```
-----
5. sysinfo process ancestry
   /usr/lib/systemd/systemd --switched-root --system --deserialize 30
   login -- root
   -bash
   -bash
   runcpu --nobuild --action validate --define default-platform-flags -c
     ic2023.0-lin-sapphirerapids-speed-20221201.cfg --define cores=64 --tune base -o all --define drop_caches
     fpspeed
   runcpu --nobuild --action validate --define default-platform-flags --configfile
     ic2023.0-lin-sapphirerapids-speed-20221201.cfg --define cores=64 --tune base --output_format all --define
     drop_caches --nopower --runmode speed --tune base --size refspeed fpspeed --nopreenv --note-preenv
     --logfile $SPEC/tmp/CPU2017.039/templogs/preenv.fpspeed.039.0.log --lognum 039.0 --from_runcpu 2
   specperl $SPEC/bin/sysinfo
   $SPEC = /home/cpu2017-1.1.9-ic2023.0
```

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### Platform Notes (Continued)

```

6. /proc/cpuinfo
   model name      : Intel(R) Xeon(R) Gold 6438N
   vendor_id       : GenuineIntel
   cpu family      : 6
   model           : 143
   stepping        : 8
   microcode       : 0x2b000161
   bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
   cpu cores       : 32
   siblings        : 32
   2 physical ids (chips)
   64 processors (hardware threads)
   physical id 0: core ids 0-31
   physical id 1: core ids 0-31
   physical id 0: apicids
   0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54,56,58,60,62
   physical id 1: apicids
   128,130,132,134,136,138,140,142,144,146,148,150,152,154,156,158,160,162,164,166,168,170,172,174,176,178,1
   80,182,184,186,188,190

```

Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for virtualized systems. Use the above data carefully.

#### 7. lscpu

From lscpu from util-linux 2.37.2:

```

Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Address sizes:         46 bits physical, 57 bits virtual
Byte Order:            Little Endian
CPU(s):                64
On-line CPU(s) list:   0-63
Vendor ID:             GenuineIntel
Model name:            Intel(R) Xeon(R) Gold 6438N
CPU family:            6
Model:                 143
Thread(s) per core:    1
Core(s) per socket:    32
Socket(s):             2
Stepping:              8
BogoMIPS:              4000.00
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 tsc_known_freq pni pclmulqdq dtes64 monitor

```

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### Platform Notes (Continued)

```

ds_cpl vmx smx est tm2 sse3 sdbg fma cx16 xtpr pdcn 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 cat_l2 cdp_l3
invpcid_single intel_ppin cdp_l2 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 rtm cqm rdt_a avx512f avx512dq rdseed adx smap
avx512ifma clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl
xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
cqm_mbm_local split_lock_detect avx_vnni avx512_bf16 wbnoinvd dtherm ida
arat pln pts avx512vbmi umip pku ospke waitpkg avx512_vbmi2 gfni vaes
vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid
bus_lock_detect cldemote movdiri movdir64b enqcmd fsrm md_clear serialize
tsxldtrk pconfig arch_lbr avx512_fp16 amx_tile flush_lld arch_capabilities

```

```

Virtualization: VT-x
L1d cache: 3 MiB (64 instances)
L1i cache: 2 MiB (64 instances)
L2 cache: 128 MiB (64 instances)
L3 cache: 120 MiB (2 instances)
NUMA node(s): 2
NUMA node0 CPU(s): 0-31
NUMA node1 CPU(s): 32-63
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp
Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
Vulnerability Srbds: Not affected
Vulnerability Tsx async abort: Not affected

```

From lscpu --cache:

NAME	ONE-SIZE	ALL-SIZE	WAYS	TYPE	LEVEL	SETS	PHY-LINE	COHERENCY-SIZE
L1d	48K	3M	12	Data	1	64	1	64
L1i	32K	2M	8	Instruction	1	64	1	64
L2	2M	128M	16	Unified	2	2048	1	64
L3	60M	120M	15	Unified	3	65536	1	64

8. numactl --hardware

NOTE: a numactl 'node' might or might not correspond to a physical chip.

```

available: 2 nodes (0-1)
node 0 cpus: 0-31
node 0 size: 257703 MB
node 0 free: 256707 MB
node 1 cpus: 32-63
node 1 size: 257976 MB

```

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### Platform Notes (Continued)

```
node 1 free: 257525 MB
node distances:
node 0 1
  0: 10 21
  1: 21 10
```

9. /proc/meminfo  
MemTotal: 528056512 kB

10. who -r  
run-level 3 Feb 10 15:48

11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)  
Default Target Status  
multi-user running

12. Services, from systemctl list-unit-files

STATE	UNIT FILES
enabled	YaST2-Firstboot YaST2-Second-Stage apparmor auditd cron getty@ haveged irqbalance iscsi issue-generator kbdsettings klog lvm2-monitor nscd postfix purge-kernels rollback rsyslog smartd sshd wicked wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny
enabled-runtime	systemd-remount-fs
disabled	autofs autoyast-initscripts blk-availability boot-sysctl ca-certificates chrony-wait chronyd console-getty cups cups-browsed debug-shell ebttables exchange-bmc-os-info firewalld gpm grub2-once haveged-switch-root ipmi ipmievd iscsi-init iscsid iscsiui issue-add-ssh-keys kexec-load lunmask man-db-create multipathd nfs nfs-blkmap nmb rdisc rpcbnd rpmconfigcheck rsyncd serial-getty@ smartd_generate_opts smb snmpd snmptrapd systemd-boot-check-no-failures systemd-network-generator systemd-sysext systemd-time-wait-sync systemd-timesyncd
generated	ntp_sync
indirect	wickedd

13. Linux kernel boot-time arguments, from /proc/cmdline  
BOOT\_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default  
root=UUID=f976c541-a329-4c54-ba84-4bel6556ee18  
splash=silent  
mitigations=auto  
quiet  
security=apparmor

14. cpupower frequency-info

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### Platform Notes (Continued)

```

analyzing CPU 0:
  Unable to determine current policy
  boost state support:
    Supported: yes
    Active: yes

```

-----  
15. sysctl

```

kernel.numa_balancing          1
kernel.randomize_va_space     2
vm.compaction_proactiveness   20
vm.dirty_background_bytes     0
vm.dirty_background_ratio     10
vm.dirty_bytes                 0
vm.dirty_expire_centisecs     3000
vm.dirty_ratio                 20
vm.dirty_writeback_centisecs  500
vm.dirtytime_expire_seconds   43200
vm.extfrag_threshold          500
vm.min_unmapped_ratio         1
vm.nr_hugepages                0
vm.nr_hugepages_mempolicy     0
vm.nr_overcommit_hugepages    0
vm.swappiness                   60
vm.watermark_boost_factor     15000
vm.watermark_scale_factor     10
vm.zone_reclaim_mode          0

```

-----  
16. /sys/kernel/mm/transparent\_hugepage

```

defrag          always defer defer+madvice [madvice] never
enabled         [always] madvice never
hpage_pmd_size  2097152
shmem_enabled   always within_size advise [never] deny force

```

-----  
17. /sys/kernel/mm/transparent\_hugepage/khugepaged

```

alloc_sleep_millisecs  60000
defrag                  1
max_ptes_none          511
max_ptes_shared        256
max_ptes_swap          64
pages_to_scan          4096
scan_sleep_millisecs  10000

```

-----  
18. OS release

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### Platform Notes (Continued)

From /etc/\*-release /etc/\*-version  
os-release SUSE Linux Enterprise Server 15 SP4

-----  
19. Disk information

SPEC is set to: /home/cpu2017-1.1.9-ic2023.0  
Filesystem Type Size Used Avail Use% Mounted on  
/dev/sda2 xfs 894G 92G 803G 11% /

-----  
20. /sys/devices/virtual/dmi/id

Vendor: Lenovo  
Product: ThinkSystem SR630 V3  
Product Family: ThinkSystem  
Serial: 1234567890

-----  
21. dmidecode

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:  
1x Samsung M321R4GA3BB0-CQKEG 32 GB 2 rank 4800  
5x Samsung M321R4GA3BB0-CQKMG 32 GB 2 rank 4800  
10x Samsung M321R4GA3BB0-CQKVG 32 GB 2 rank 4800

-----  
22. BIOS

(This section combines info from /sys/devices and dmidecode.)

BIOS Vendor: Lenovo  
BIOS Version: ESE109L-1.10  
BIOS Date: 01/07/2023  
BIOS Revision: 1.10  
Firmware Revision: 1.0

### Compiler Version Notes

=====  
C | 619.lbm\_s(base) 638.imagick\_s(base) 644.nab\_s(base)  
-----

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,  
Version 2023.0.0 Build 20221201  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.  
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## Compiler Version Notes (Continued)

=====  
C++, C, Fortran | 607.cactuBSSN\_s(base)  
=====

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,  
Version 2023.0.0 Build 20221201  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.  
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,  
Version 2023.0.0 Build 20221201  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.  
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version  
2023.0.0 Build 20221201  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.

=====  
Fortran | 603.bwaves\_s(base) 649.fotonik3d\_s(base) 654.roms\_s(base)  
=====

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version  
2023.0.0 Build 20221201  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.

=====  
Fortran, C | 621.wrf\_s(base) 627.cam4\_s(base) 628.pop2\_s(base)  
=====

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version  
2023.0.0 Build 20221201  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.  
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,  
Version 2023.0.0 Build 20221201  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.

## Base Compiler Invocation

C benchmarks:

icx

Fortran benchmarks:

ifx

Benchmarks using both Fortran and C:

ifx icx

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## Base Compiler Invocation (Continued)

Benchmarks using Fortran, C, and C++:

icpx icx ifx

## Base Portability Flags

```

603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
-assume byterecl
638.imagick_s: -DSPEC_LP64
644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -DSPEC_LP64

```

## Base Optimization Flags

C benchmarks:

```

-m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -Wno-implicit-int -mprefer-vector-width=512
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

```

Fortran benchmarks:

```

-m64 -Wl,-z,muldefs -DSPEC_OPENMP -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fiopenmp -nostandard-realloc-lhs
-align array32byte -auto -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

```

Benchmarks using both Fortran and C:

```

-m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -Wno-implicit-int -mprefer-vector-width=512
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

```

Benchmarks using Fortran, C, and C++:

```

-m64 -std=c++14 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fiopenmp -DSPEC_OPENMP -Wno-implicit-int

```

(Continued on next page)



# SPEC CPU®2017 Floating Point Speed Result

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**Lenovo Global Technology**

SPECspeed®2017\_fp\_base = 302

ThinkSystem SR630 V3  
(2.00 GHz, Intel Xeon Gold 6438N)

SPECspeed®2017\_fp\_peak = Not Run

CPU2017 License: 9017

Test Date: Feb-2023

Test Sponsor: Lenovo Global Technology

Hardware Availability: Feb-2023

Tested by: Lenovo Global Technology

Software Availability: Dec-2022

## Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):

```
-mprefer-vector-width=512 -nostandard-realloc-lhs -align array32byte  
-auto -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

The flags files that were used to format this result can be browsed at

<http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Eaglestream-N.html>  
<http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.html>

You can also download the XML flags sources by saving the following links:

<http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Eaglestream-N.xml>  
<http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.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).

Tested with SPEC CPU®2017 v1.1.9 on 2023-02-10 02:50:16-0500.  
Report generated on 2023-03-02 11:26:40 by CPU2017 PDF formatter v6442.  
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