



SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Lenovo Global Technology

ThinkSystem SR630 V3
(1.70 GHz, Intel Xeon Platinum 8470N)

SPECspeed®2017_fp_base = 324

SPECspeed®2017_fp_peak = Not Run

CPU2017 License: 9017

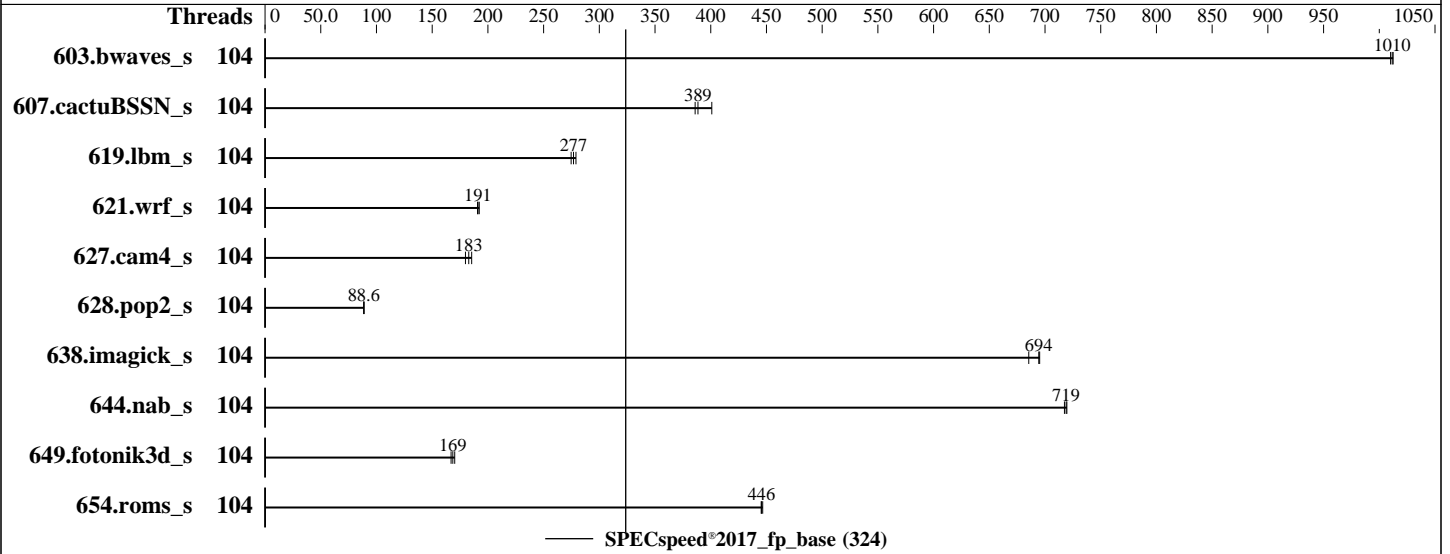
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Mar-2023

Hardware Availability: Feb-2023

Software Availability: Dec-2022



Hardware

CPU Name: Intel Xeon Platinum 8470N
 Max MHz: 3600
 Nominal: 1700
 Enabled: 104 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: 97.5 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 | 104 | 58.3 | 1010 | 58.4 | 1010 | <u>58.3</u> | <u>1010</u> | | | | | | | |
| 607.cactuBSSN_s | 104 | 41.6 | 401 | 43.2 | 386 | <u>42.9</u> | <u>389</u> | | | | | | | |
| 619.lbm_s | 104 | <u>18.9</u> | <u>277</u> | 18.8 | 279 | 19.1 | 275 | | | | | | | |
| 621.wrf_s | 104 | 68.8 | 192 | 69.4 | 191 | <u>69.2</u> | <u>191</u> | | | | | | | |
| 627.cam4_s | 104 | 49.3 | 180 | 47.8 | 185 | <u>48.5</u> | <u>183</u> | | | | | | | |
| 628.pop2_s | 104 | <u>134</u> | <u>88.6</u> | 134 | 88.6 | 134 | 88.8 | | | | | | | |
| 638.imagick_s | 104 | 20.8 | 695 | 21.0 | 685 | <u>20.8</u> | <u>694</u> | | | | | | | |
| 644.nab_s | 104 | 24.3 | 720 | <u>24.3</u> | <u>719</u> | 24.4 | 717 | | | | | | | |
| 649.fotonik3d_s | 104 | <u>54.1</u> | <u>169</u> | 53.6 | 170 | 54.6 | 167 | | | | | | | |
| 654.roms_s | 104 | 35.3 | 447 | <u>35.3</u> | <u>446</u> | 35.4 | 445 | | | | | | | |

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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 localhost Wed Mar 15 23:28:56 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
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1. uname -a

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Platform Notes (Continued)

Linux localhost 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
  23:28:56 up 1 min,  1 user,  load average: 0.75, 0.39, 0.15
USER      TTY      FROM          LOGIN@   IDLE   JCPU   PCPU   WHAT
root      tty1    -             23:28    6.00s  0.85s  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) 2062586
  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) 2062586
  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=104 --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=104 --tune base --output_format all --define
  drop_caches --nopower --runmode speed --tune base --size refspeed fpspeed --nopreenv --note-preenv
  --logfile $SPEC/tmp/CPU2017.245/templogs/preenv.fpspeed.245.0.log --lognum 245.0 --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) Platinum 8470N
   vendor_id      : GenuineIntel
   cpu family     : 6
   model         : 143
   stepping      : 8
   microcode     : 0x2b000161
   bugs          : spectre_v1 spectre_v2 spec_store_bypass swapgs
   cpu cores     : 52
   siblings      : 52
   2 physical ids (chips)
   104 processors (hardware threads)
   physical id 0 : core ids 0-51
   physical id 1 : core ids 0-51
   physical id 0 : apicids
   0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54,56,58,60,62,64,66,68,70,72
   ,74,76,78,80,82,84,86,88,90,92,94,96,98,100,102
   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
   80,182,184,186,188,190,192,194,196,198,200,202,204,206,208,210,212,214,216,218,220,222,224,226,228,230
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):                104
On-line CPU(s) list:   0-103
Vendor ID:             GenuineIntel
Model name:            Intel(R) Xeon(R) Platinum 8470N
CPU family:            6
Model:                 143
Thread(s) per core:    1
Core(s) per socket:    52
Socket(s):              2
Stepping:              8
BogoMIPS:              3400.00
Flags:                  fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36
                        clflush dts acpi mmx fxsr sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp
                        lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology

```

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Platform Notes (Continued)

```

nonstop_tsc cpuid aperfmperf tsc_known_freq 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 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 fstrm md_clear serialize
tsxldtrk pconfig arch_lbr avx512_fp16 amx_tile flush_lld arch_capabilities

```

```

Virtualization: VT-x
L1d cache: 4.9 MiB (104 instances)
L1i cache: 3.3 MiB (104 instances)
L2 cache: 208 MiB (104 instances)
L3 cache: 195 MiB (2 instances)
NUMA node(s): 2
NUMA node0 CPU(s): 0-51
NUMA node1 CPU(s): 52-103
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 | 4.9M | 12 | Data | 1 | 64 | 1 | 64 |
| L1i | 32K | 3.3M | 8 | Instruction | 1 | 64 | 1 | 64 |
| L2 | 2M | 208M | 16 | Unified | 2 | 2048 | 1 | 64 |
| L3 | 97.5M | 195M | 15 | Unified | 3 | 106496 | 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: 0-51
node 0 size: 257698 MB
node 0 free: 256547 MB
node 1 cpus: 52-103

```

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Platform Notes (Continued)

```
node 1 size: 257971 MB
node 1 free: 257471 MB
node distances:
node 0 1
  0: 10 21
  1: 21 10
```

```
-----
9. /proc/meminfo
   MemTotal:      528046560 kB
```

```
-----
10. who -r
    run-level 3 Mar 15 23:28
```

```
-----
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
               issue-generator kbdsettings klog lvm2-monitor nsd postfix purge-kernels rollback rsyslog
               smartd sshd wickd 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 issue-add-ssh-keys kexec-load
               lunmask man-db-create multipathd nfs nfs-blkmap rdisc rpcbind rpmconfigcheck rsyncd
               serial-getty@ smartd_generate_opts snmpd snmptrapd systemd-boot-check-no-failures
               systemd-network-generator systemd-sysextd systemd-time-wait-sync systemd-timesyncd
indirect       wickedd
```

```
-----
13. Linux kernel boot-time arguments, from /proc/cmdline
BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
root=UUID=efe3d3bb-d17b-48bc-af3c-7ee429916327
splash=silent
mitigations=auto
quiet
security=apparmor
```

```
-----
14. cpupower frequency-info
    analyzing CPU 0:
```

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Platform Notes (Continued)

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+madvise | [madvise] | never |
| enabled | [always] | madvise | 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

From /etc/*-release /etc/*-version

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Platform Notes (Continued)

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 65G 830G 8% /

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

Vendor: Lenovo
Product: ThinkSystem SR630 V3 MB,EGS,DDR5,NY,1U
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:
 2x Samsung M321R4GA3BB0-CQKMG 32 GB 2 rank 4800
 14x 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

Benchmarks using Fortran, C, and C++:

icpx icx ifx



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Hardware Availability: Feb-2023

Tested by: Lenovo Global Technology

Software Availability: Dec-2022

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 -xsaphirerapids -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 -xsaphirerapids -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 -xsaphirerapids -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 -xsaphirerapids -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
```

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-0.html>

<http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.html>



SPEC CPU®2017 Floating Point Speed Result

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Lenovo Global Technology

ThinkSystem SR630 V3
(1.70 GHz, Intel Xeon Platinum 8470N)

SPECspeed®2017_fp_base = 324

SPECspeed®2017_fp_peak = Not Run

CPU2017 License: 9017

Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Mar-2023

Hardware Availability: Feb-2023

Software Availability: Dec-2022

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-0.xml>

<http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml>

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