



SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Lenovo Global Technology

ThinkSystem SR650 V3
(2.00 GHz, Intel Xeon Platinum 8480CL)

SPECspeed®2017_fp_base = 351

SPECspeed®2017_fp_peak = Not Run

CPU2017 License: 9017

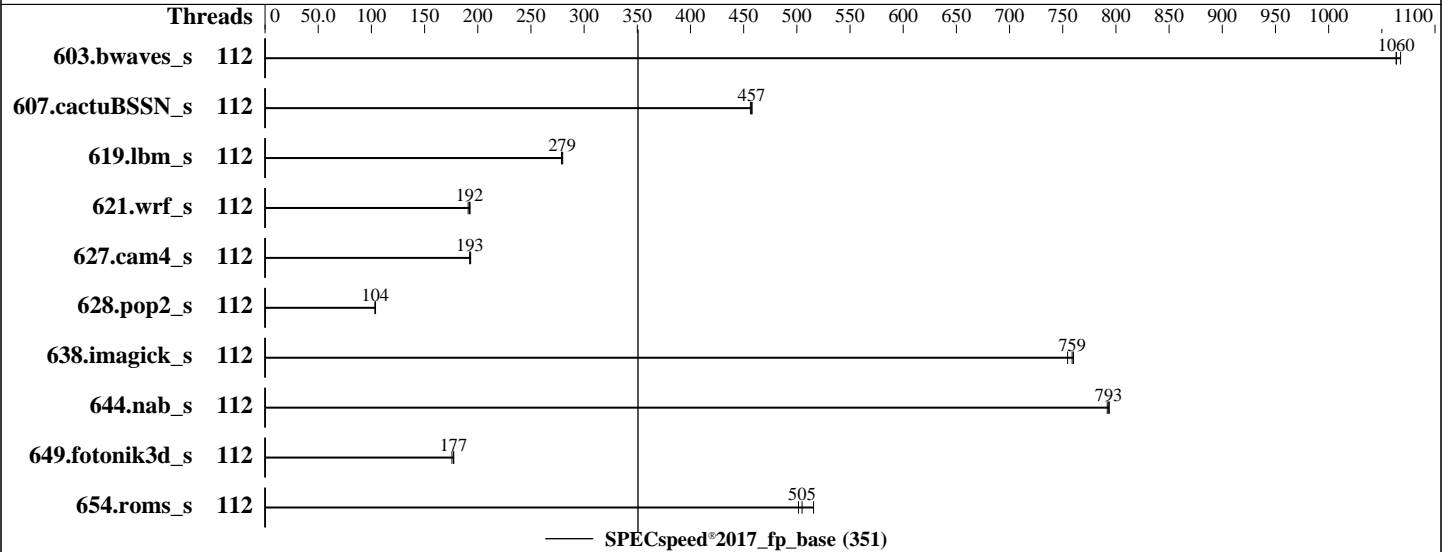
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Oct-2023

Hardware Availability: Nov-2023

Software Availability: May-2023



Hardware

CPU Name: Intel Xeon Platinum 8480CL
 Max MHz: 3800
 Nominal: 2000
 Enabled: 112 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: 105 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: Red Hat Enterprise Linux 9.2 (Plow) (x86_64)
 Kernel 5.14.0-284.11.1.el9_2.x86_64
 Compiler: C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ Compiler for Linux;
 Fortran: Version 2023.0 of Intel Fortran Compiler for Linux;
 Parallel: Yes
 Firmware: Lenovo BIOS Version ESE117F 2.22 released Aug-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	112	<u>55.5</u>	<u>1060</u>	55.5	1060	55.3	1070							
607.cactuBSSN_s	112	36.5	456	36.4	458	<u>36.4</u>	<u>457</u>							
619.lbm_s	112	18.8	279	<u>18.8</u>	<u>279</u>	18.7	280							
621.wrf_s	112	68.6	193	<u>68.8</u>	<u>192</u>	69.3	191							
627.cam4_s	112	46.1	192	45.8	193	<u>46.0</u>	<u>193</u>							
628.pop2_s	112	115	103	<u>115</u>	<u>104</u>	114	104							
638.imagick_s	112	19.0	760	<u>19.0</u>	<u>759</u>	19.1	755							
644.nab_s	112	22.0	794	<u>22.0</u>	<u>793</u>	22.1	792							
649.fotonik3d_s	112	51.4	177	<u>51.5</u>	<u>177</u>	51.9	176							
654.roms_s	112	30.5	516	31.4	502	<u>31.2</u>	<u>505</u>							

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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-ic2023.0-2/lib/intel64:/home/cpu2017-1.1.9-ic2023.0-2/je5.0.1-64"

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.

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>



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Platform Notes

BIOS configuration:

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

CPU P-state Control set to Legacy

Hyper-Threading set to Disabled

AMP Prefetch set to Enable

Sysinfo program /home/cpu2017-1.1.9-ic2023.0-2/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Thu Oct 12 02:56:20 2023

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

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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 252 (252-13.e19_2)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. tuned-adm active
16. sysctl
17. /sys/kernel/mm/transparent_hugepage
18. /sys/kernel/mm/transparent_hugepage/khugepaged
19. OS release
20. Disk information
21. /sys/devices/virtual/dmi/id
22. dmidecode
23. BIOS

1. uname -a
Linux localhost.localdomain 5.14.0-284.11.1.e19_2.x86_64 #1 SMP PREEMPT_DYNAMIC Wed Apr 12 10:45:03 EDT
2023 x86_64 x86_64 x86_64 GNU/Linux

2. w
02:56:20 up 2 min, 1 user, load average: 0.00, 0.00, 0.00
USER TTY LOGIN@ IDLE JCPU PCPU WHAT
root tty1 02:56 11.00s 0.78s 0.00s -bash

3. Username
From environment variable \$USER: root

4. ulimit -a
real-time non-blocking time (microseconds, -R) unlimited
core file size (blocks, -c) 0
data seg size (kbytes, -d) unlimited

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Platform Notes (Continued)

```

scheduling priority          (-e) 0
file size                    (blocks, -f) unlimited
pending signals              (-i) 2062596
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) 2062596
virtual memory               (kbytes, -v) unlimited
file locks                   (-x) unlimited

```

```

-----
5. sysinfo process ancestry
/usr/lib/systemd/systemd rhgb --switched-root --system --deserialize 31
login -- root
-bash
-bash
runcpu --nobuild --action validate --define default-platform-flags -c
  ic2023.0-lin-sapphirerapids-speed-20221201.cfg --define cores=112 --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=112 --tune base --output_format all --define
  drop_caches --nopower --runmode speed --tune base --size refspeed fpspeed --nopreenv --note-preenv
  --logfile $SPEC/tmp/CPU2017.045/temlogs/preenv.fpspeed.045.0.log --lognum 045.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017-1.1.9-ic2023.0-2

```

```

-----
6. /proc/cpuinfo
model name      : Intel(R) Xeon(R) Platinum 8480CL
vendor_id      : GenuineIntel
cpu family     : 6
model          : 143
stepping      : 7
microcode     : 0x2b0004b1
bugs           : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
cpu cores     : 56
siblings      : 56
2 physical ids (chips)
112 processors (hardware threads)
physical id 0: core ids 0-55
physical id 1: core ids 0-55
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
,74,76,78,80,82,84,86,88,90,92,94,96,98,100,102,104,106,108,110
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
80,182,184,186,188,190,192,194,196,198,200,202,204,206,208,210,212,214,216,218,220,222,224,226,228,230,23
2,234,236,238
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 2.37.4:

```

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Platform Notes (Continued)

```

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):               112
On-line CPU(s) list: 0-111
Vendor ID:            GenuineIntel
BIOS Vendor ID:      Intel(R) Corporation
Model name:           Intel(R) Xeon(R) Platinum 8480CL
BIOS Model name:     Intel(R) Xeon(R) Platinum 8480CL
CPU family:           6
Model:                143
Thread(s) per core:  1
Core(s) per socket:  56
Socket(s):            2
Stepping:             7
CPU max MHz:          3800.0000
CPU min MHz:          800.0000
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
                    ds_cpl 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 fsgsbase
                    tsc_adjust bmi1 avx2 smep bmi2 erms invpcid 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 ibt amx_bf16
                    avx512_fp16 amx_tile amx_int8 flush_lld arch_capabilities

L1d cache:           5.3 MiB (112 instances)
L1i cache:           3.5 MiB (112 instances)
L2 cache:            224 MiB (112 instances)
L3 cache:            210 MiB (2 instances)
NUMA node(s):        2
NUMA node0 CPU(s):  0-55
NUMA node1 CPU(s):  56-111
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf:  Not affected
Vulnerability Mds:   Not affected
Vulnerability Meltdown: Not affected
Vulnerability Mmio stale data: Not affected
Vulnerability Retbleed: Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl
Vulnerability Spectre v1: Mitigation; usercopy/swaps barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling, PBRSE-eIBRS SW
                    sequence
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	5.3M	12	Data	1	64	1	64
L1i	32K	3.5M	8	Instruction	1	64	1	64

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Platform Notes (Continued)

L2	2M	224M	16 Unified	2	2048	1	64
L3	105M	210M	15 Unified	3	114688	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: 0-55
node 0 size: 257699 MB
node 0 free: 256979 MB
node 1 cpus: 56-111
node 1 size: 257991 MB
node 1 free: 256947 MB
node distances:
node  0  1
  0: 10 21
  1: 21 10
```

```
9. /proc/meminfo
MemTotal: 528067944 kB
```

```
10. who -r
run-level 3 Oct 12 02:53
```

```
11. Systemd service manager version: systemd 252 (252-13.el9_2)
Default Target Status
multi-user      running
```

```
12. Services, from systemctl list-unit-files
STATE UNIT FILES
enabled NetworkManager NetworkManager-dispatcher NetworkManager-wait-online atd auditd bluetooth
chronyd crond dbus-broker firewalld getty@ insights-client-boot irqbalance iscsi
iscsi-onboot kdump libstoragemgmt low-memory-monitor lvm2-monitor mcelog mdmonitor
microcode multipathd nis-domainname nvme-fc-boot-connections rhsmcertd rsyslog rtkit-daemon
selinux-autorelabel-mark smartd sshd sssd systemd-boot-update systemd-network-generator
tuned udisks2 upower
enabled-runtime systemd-remount-fs
disabled arp-ethers blk-availability canberra-system-bootup canberra-system-shutdown
canberra-system-shutdown-reboot chrony-wait console-getty cpupower debug-shell
dnf-system-upgrade iprdump iprinit iprupdate iscsid iscsiuiop kpatch kvm_stat ledmon
man-db-restart-cache-update nftables nvme-fc-autoconnect pesign psacct rdisc rhcd rhsm
rhsm-facts rpmbd-rebuild selinux-check-proper-disable serial-getty@ sshd-keygen@
systemd-boot-check-no-failures systemd-pstore systemd-sysext
indirect sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo systemd-sysupdate
systemd-sysupdate-reboot
```

```
13. Linux kernel boot-time arguments, from /proc/cmdline
BOOT_IMAGE=(hd3,gpt2)/vmlinuz-5.14.0-284.11.1.el9_2.x86_64
root=/dev/mapper/rhel-root
ro
resume=/dev/mapper/rhel-swap
rd.lvm.lv=rhel/root
rd.lvm.lv=rhel/swap
rhgb
quiet
```

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Platform Notes (Continued)

14. cpupower frequency-info

```

analyzing CPU 0:
  current policy: frequency should be within 3.80 GHz and 3.80 GHz.
                  The governor "performance" may decide which speed to use
                  within this range.
  boost state support:
    Supported: yes
    Active: yes

```

15. tuned-adm active

Current active profile: throughput-performance

16. 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                  40
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                    10
vm.watermark_boost_factor      15000
vm.watermark_scale_factor       10
vm.zone_reclaim_mode           0

```

17. /sys/kernel/mm/transparent_hugepage

```

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

```

18. /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

```

19. OS release

```

From /etc/*-release /etc/*-version
os-release      Red Hat Enterprise Linux 9.2 (Plow)
redhat-release  Red Hat Enterprise Linux release 9.2 (Plow)
system-release  Red Hat Enterprise Linux release 9.2 (Plow)

```

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Platform Notes (Continued)

20. Disk information
SPEC is set to: /home/cpu2017-1.1.9-ic2023.0-2
Filesystem Type Size Used Avail Use% Mounted on
/dev/mapper/rhel-home xfs 819G 22G 797G 3% /home

21. /sys/devices/virtual/dmi/id
Vendor: Lenovo
Product: ThinkSystem SR650 V3 MB,EGS,DDR5,SH,2U
Product Family: ThinkSystem
Serial: 1234567890

22. dmidecode
Additional information from dmidecode 3.3 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:
8x Samsung M321R4GA3BB0-CQKEG 32 GB 2 rank 4800
8x Samsung M321R4GA3BB0-CQKVG 32 GB 2 rank 4800

23. BIOS
(This section combines info from /sys/devices and dmidecode.)
BIOS Vendor: Lenovo
BIOS Version: ESE117F-2.22
BIOS Date: 08/29/2023
BIOS Revision: 2.22
Firmware Revision: 3.13

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.

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
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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
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Compiler Version Notes (Continued)

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

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

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SPECspeed®2017_fp_base = 351

ThinkSystem SR650 V3
(2.00 GHz, Intel Xeon Platinum 8480CL)

SPECspeed®2017_fp_peak = Not Run

CPU2017 License: 9017

Test Date: Oct-2023

Test Sponsor: Lenovo Global Technology

Hardware Availability: Nov-2023

Tested by: Lenovo Global Technology

Software Availability: May-2023

Base Optimization Flags (Continued)

C benchmarks (continued):

```
-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  
-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-AA.html>
http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64_revB.2023-10-11.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-AA.xml>
http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64_revB.2023-10-11.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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