



SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Supermicro

SuperServer SYS-221H-TNR
(X13DEM , Intel Xeon Max 9480)

SPECspeed®2017_fp_base = 332

SPECspeed®2017_fp_peak = Not Run

CPU2017 License: 001176

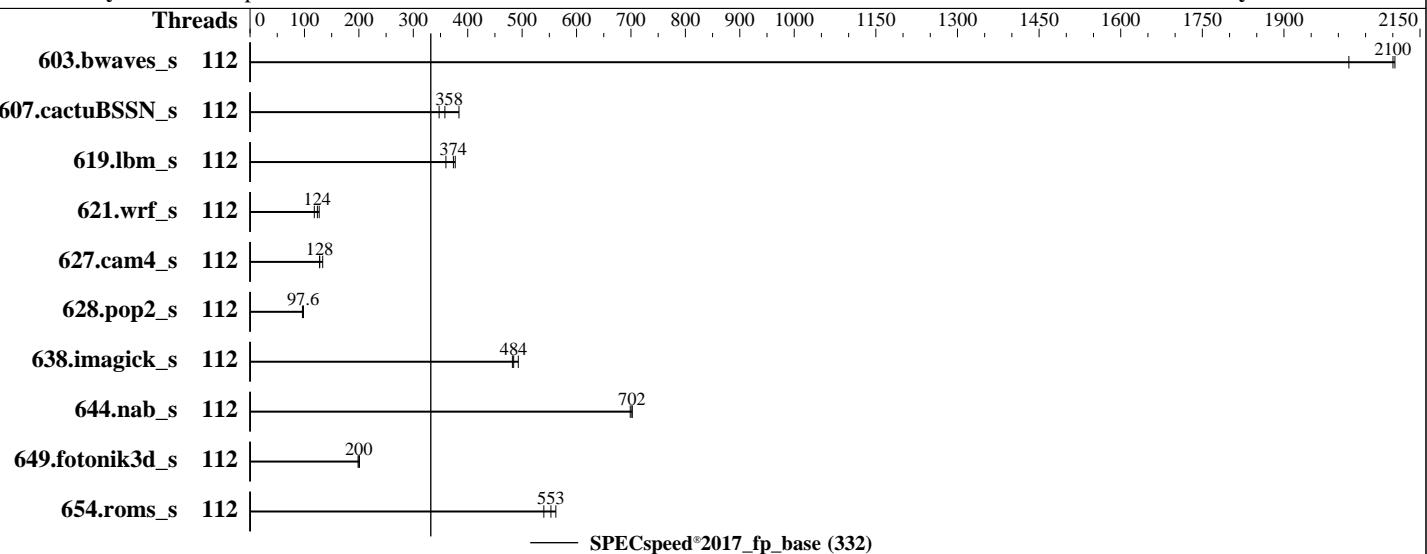
Test Date: Jul-2023

Test Sponsor: Supermicro

Hardware Availability: Jun-2023

Tested by: Supermicro

Software Availability: Dec-2022



Hardware

CPU Name: Intel Xeon Max 9480
Max MHz: 3500
Nominal: 1900
Enabled: 112 cores, 2 chips, 2 threads/core
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: 112.5 MB I+D on chip per chip
Other: None
Memory: 1152 GB (16 x 64 GB 2Rx4 PC5-4800B-R + 2 x 64 GB HBM)
Storage: 1 x 1.9 TB M.2 NVMe SSD
Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP4 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 for Linux;
C/C++: Version 2023.0 of Intel C/C++ Compiler for Linux
Parallel: Yes
Firmware: Version 1.3 released Jun-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 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	Threads	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds
603.bwaves_s	112	29.2	2020	28.0	2100	28.1	2100							
607.cactuBSSN_s	112	48.0	347	46.6	358	43.4	384							
619.lbm_s	112	14.6	360	13.9	377	14.0	374							
621.wrf_s	112	107	124	112	118	104	127							
627.cam4_s	112	69.2	128	66.4	134	69.4	128							
628.pop2_s	112	121	98.0	122	97.6	123	96.3							
638.imagick_s	112	29.9	482	29.8	484	29.3	493							
644.nab_s	112	24.9	702	25.0	699	24.9	702							
649.fotonik3d_s	112	45.6	200	45.9	199	45.3	201							
654.roms_s	112	29.2	540	28.0	562	28.5	553							

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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,1,0"

LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64:/home/cpu2017/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 Settings:

Power Performance Tuning = BIOS Controls EPB
ENERGY_PERF_BIAS_CFG mode = Extreme Performance
DCU Streamer Prefetcher = Disable
SNC = Enable SNC4 (4-clusters)
LLC Dead Line Alloc = Disable

IPMI Settings:

Fan Mode: Full Speed
Enable Smart Power: OFF
Using upgraded fans at 16.8K RPM

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on 102-241 Mon Jul 17 11:14:31 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. Failed units, from systemctl list-units --state=failed
13. Services, from systemctl list-unit-files
14. Linux kernel boot-time arguments, from /proc/cmdline
15. cpupower frequency-info
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 102-241 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
11:14:31 up 1 day, 21:30, 1 user, load average: 0.19, 0.10, 0.03
USER TTY FROM LOGIN@ IDLE JCPU PCPU WHAT
root ttym1 - Sat13 7.00s 1.40s 0.00s -bash

3. Username
From environment variable \$USER: root

(Continued on next page)



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Platform Notes (Continued)

```
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) 4125080
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) 4125080
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=112 --tune base -o all --define smt-on
  --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
  smt-on --define drop_caches --nopower --runmode speed --tune base --size refspeed fpspeed --nopreenv
  --note-preenv --logfile $SPEC/tmp/CPU2017.033/templogs/preenv.fpspeed.033.0.log --lognum 033.0
  --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017
```

```
6. /proc/cpuinfo
model name      : Intel (R) Xeon (R) CPU Max 9480
vendor_id       : GenuineIntel
cpu family     : 6
model          : 143
stepping        : 8
microcode      : 0x2c0001d1
bugs           : spectre_v1 spectre_v2 spec_store_bypass swapgs
cpu cores      : 56
siblings        : 112
2 physical ids (chips)
224 processors (hardware threads)
physical id 0: core ids 0-55
physical id 1: core ids 0-55
physical id 0: apicids 0-111
physical id 1: apicids 128-239
Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
virtualized systems. Use the above data carefully.
```

```
7. lscpu
```

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Platform Notes (Continued)

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): 224
On-line CPU(s) list: 0-223
Vendor ID: GenuineIntel
Model name: Intel (R) Xeon (R) CPU Max 9480
CPU family: 6
Model: 143
Thread(s) per core: 2
Core(s) per socket: 56
Socket(s): 2
Stepping: 8
BogoMIPS: 3800.00
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 aperf fmpf perf tsc_known_freq pni pclmulqdq dtes64 monitor
      ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtrp pdcm pcid dca sse4_1
      sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand
     lahf_lm abm 3nowprefetch cpuid_fault epb cat_13 cat_12 cdp_13
      invpcid_single intel_ppin cdp_12 ssbd mba ibrs ibpb stibp ibrs_enhanced
      tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmil hle
      avx2 smep bmil2 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_vpocntdq 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
      VT-x
Virtualization:
L1d cache: 5.3 MiB (112 instances)
L1i cache: 3.5 MiB (112 instances)
L2 cache: 224 MiB (112 instances)
L3 cache: 225 MiB (2 instances)
NUMA node(s): 8
NUMA node0 CPU(s): 0-13,112-125
NUMA node1 CPU(s): 14-27,126-139
NUMA node2 CPU(s): 28-41,140-153
NUMA node3 CPU(s): 42-55,154-167
NUMA node4 CPU(s): 56-69,168-181
NUMA node5 CPU(s): 70-83,182-195
NUMA node6 CPU(s): 84-97,196-209
NUMA node7 CPU(s): 98-111,210-223
Vulnerability Itlb multihit: Not affected
Vulnerability Lltf: 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	5.3M	12	Data	1	64	1	64

(Continued on next page)



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Platform Notes (Continued)

L1i	32K	3.5M	8	Instruction	1	64	1	64
L2	2M	224M	16	Unified	2	2048	1	64
L3	112.5M	225M	15	Unified	3	122880	1	64

8. numactl --hardware

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

available: 8 nodes (0-7)

node 0 cpus: 0-13,112-125

node 0 size: 128578 MB

node 0 free: 119276 MB

node 1 cpus: 14-27,126-139

node 1 size: 128982 MB

node 1 free: 128496 MB

node 2 cpus: 28-41,140-153

node 2 size: 129016 MB

node 2 free: 128707 MB

node 3 cpus: 42-55,154-167

node 3 size: 129016 MB

node 3 free: 128717 MB

node 4 cpus: 56-69,168-181

node 4 size: 129016 MB

node 4 free: 128567 MB

node 5 cpus: 70-83,182-195

node 5 size: 129016 MB

node 5 free: 128722 MB

node 6 cpus: 84-97,196-209

node 6 size: 129016 MB

node 6 free: 128667 MB

node 7 cpus: 98-111,210-223

node 7 size: 128648 MB

node 7 free: 121451 MB

node distances:

node	0	1	2	3	4	5	6	7
0:	10	17	17	17	26	26	26	26
1:	17	10	17	17	26	26	26	26
2:	17	17	10	17	26	26	26	26
3:	17	17	17	10	26	26	26	26
4:	26	26	26	26	10	17	17	17
5:	26	26	26	26	17	10	17	17
6:	26	26	26	26	17	17	10	17
7:	26	26	26	26	17	17	17	10

9. /proc/meminfo

MemTotal: 1056045292 kB

10. who -r

run-level 3 Jul 15 13:45

11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)

Default Target Status
multi-user degraded

12. Failed units, from systemctl list-units --state=failed

UNIT LOAD ACTIVE SUB DESCRIPTION

* sep5.service loaded failed failed systemd script to load sep5 driver at boot time

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Platform Notes (Continued)

```
13. Services, from systemctl list-unit-files
STATE          UNIT FILES
enabled        YaST2-Firstboot YaST2-Second-Stage apparmor auditd bluetooth cron display-manager
                firewalld getty@ haveged irqbalance iscsi issue-generator kbdsettings kdump kdump-early
                klog lvm2-monitor nscd nvmefc-boot-connections postfix purge-kernels rollback rsyslog sep5
                smartd sshd wickedd wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny
enabled-runtime systemd-remount-fs
disabled       accounts-daemon appstream-sync-cache autofs autoyast-initscripts blk-availability
                bluetooth-mesh boot-sysctl ca-certificates chrony-wait chronyrd console-getty cups
                cups-browsed debug-shell ebtables exchange-bmc-os-info gpm grub2-once haveged-switch-root
                ipmi ipmiev4l iscsi-init iscsid iscsiuio issue-add-ssh-keys kexec-load lunmask
                man-db-create multipathd nfs nfs-blkmap nmb nvmf-autoconnect ostree-remount rdisc rpcbind
                rpmconfigcheck rsyncd rtkit-daemon serial-getty@ smartd_generate_opts smb snmpd snmptrapd
                speech-dispatcherd systemd-boot-check-no-failures systemd-network-generator systemd-sysext
                systemd-time-wait-sync systemd-timesyncd udisks2 upower
indirect        wickedd

14. Linux kernel boot-time arguments, from /proc/cmdline
BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
root=UUID=2b95edbfa8ba-4a27-b211-c1f03f86601f
splash=silent
mitigations=auto
quiet
security=apparmor
crashkernel=321M,high
crashkernel=72M,low

15. cpupower frequency-info
analyzing CPU 0:
  Unable to determine current policy
  boost state support:
    Supported: yes
    Active: yes

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                  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
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(Continued on next page)



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Platform Notes (Continued)

17. /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

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 SUSE Linux Enterprise Server 15 SP4

20. Disk information
SPEC is set to: /home/cpu2017
Filesystem Type Size Used Avail Use% Mounted on
/dev/nvme0n1p3 xfs 1.1T 262G 865G 24% /home

21. /sys/devices/virtual/dmi/id
Vendor: Supermicro
Product: Super Server
Product Family: Family
Serial: 0123456789

22. 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:
8x Intel 16 GB 1 rank 3200
16x SK Hynix HMCG94MEBRA109N 64 GB 2 rank 4800

23. BIOS
(This section combines info from /sys/devices and dmidecode.)
BIOS Vendor: American Megatrends International, LLC.
BIOS Version: 1.3
BIOS Date: 06/01/2023
BIOS Revision: 5.31

Each Intel Xeon CPU Max 9480 is configured with 64 GB of High Bandwidth Memory (HBM) in-package. dmidecode is additionally reporting the capacity of the CPU in-package HBM stack as: '8x Intel 16 GB 1 rank 3200'



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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
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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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 -fopenmp
-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 -fopenmp -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 -fopenmp
-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 -fopenmp -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/Intel-ic2023-official-linux64.html>

<http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-SPR-revC.2023-05-23.html>



SPEC CPU®2017 Floating Point Speed Result

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Supermicro

SuperServer SYS-221H-TNR
(X13DEM , Intel Xeon Max 9480)

SPECspeed®2017_fp_base = 332

SPECspeed®2017_fp_peak = Not Run

CPU2017 License: 001176

Test Sponsor: Supermicro

Tested by: Supermicro

Test Date: Jul-2023

Hardware Availability: Jun-2023

Software Availability: Dec-2022

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

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

<http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-SPR-revC.2023-05-23.xml>

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