



# SPEC CPU®2017 Floating Point Rate Result

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## Supermicro

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

SPECrate®2017\_fp\_base = 1260

SPECrate®2017\_fp\_peak = Not Run

CPU2017 License: 001176

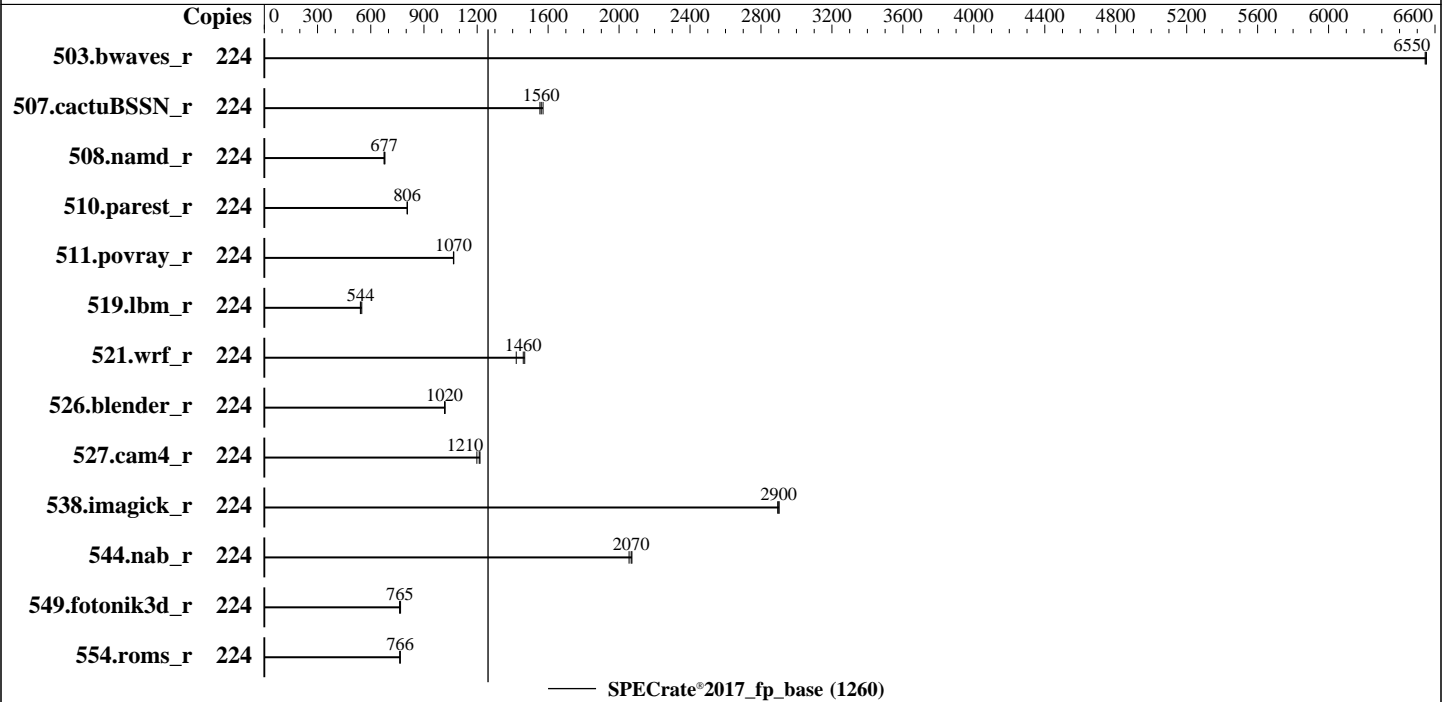
Test Sponsor: Supermicro

Tested by: Supermicro

Test Date: Jul-2023

Hardware Availability: Jun-2023

Software Availability: Dec-2022



### 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;  
 Parallel: No  
 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						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	224	343	6550	<b>343</b>	<b>6550</b>	343	6540							
507.cactuBSSN_r	224	<b>182</b>	<b>1560</b>	183	1550	180	1570							
508.namd_r	224	313	680	<b>314</b>	<b>677</b>	315	675							
510.parest_r	224	726	807	727	806	<b>727</b>	<b>806</b>							
511.povray_r	224	<b>490</b>	<b>1070</b>	491	1070	490	1070							
519.lbm_r	224	430	549	<b>434</b>	<b>544</b>	436	541							
521.wrf_r	224	342	1470	353	1420	<b>344</b>	<b>1460</b>							
526.blender_r	224	336	1020	335	1020	<b>336</b>	<b>1020</b>							
527.cam4_r	224	322	1220	327	1200	<b>323</b>	<b>1210</b>							
538.imagick_r	224	192	2890	192	2900	<b>192</b>	<b>2900</b>							
544.nab_r	224	<b>182</b>	<b>2070</b>	183	2060	182	2070							
549.fotonik3d_r	224	1145	763	<b>1142</b>	<b>765</b>	1136	768							
554.roms_r	224	466	763	<b>465</b>	<b>766</b>	465	766							

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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/lib/intel64:/home/cpu2017/je5.0.1-64"  
MALLOC\_CONF = "retain:true"

## General Notes

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM memory using Red Hat Enterprise Linux 8.4  
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  
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)

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## General Notes (Continued)

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 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 Fri Jul 14 15:12:28 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

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### Platform Notes (Continued)

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  
15:12:28 up 3:35, 1 user, load average: 170.96, 211.67, 218.23  
USER TTY FROM LOGIN@ IDLE JCPU PCPU WHAT  
root tty1 - 11:38 3:30m 1.51s 0.01s -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) 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 --define numcopies=224 -c  
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=112 --define physicalfirst  
--define invoke\_with\_interleave --define drop\_caches --tune base -o all fprate  
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=224 --configfile  
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=112 --define physicalfirst  
--define invoke\_with\_interleave --define drop\_caches --tune base --output\_format all --nopower --runmode  
rate --tune base --size refrate fprate --nopreenv --note-preenv --logfile  
\$SPEC/tmp/CPU2017.030/templogs/preenv.fprate.030.0.log --lognum 030.0 --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

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### Platform Notes (Continued)

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

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 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 fsrm md_clear serialize
                        tsxldtrk pconfig arch_lbr avx512_fp16 amx_tile flush_l1d arch_capabilities
Virtualization:        VT-x
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

```

(Continued on next page)



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### Platform Notes (Continued)

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/swaps 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
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: 118735 MB
node 1 cpus: 14-27,126-139
node 1 size: 129016 MB
node 1 free: 122953 MB
node 2 cpus: 28-41,140-153
node 2 size: 129016 MB
node 2 free: 122944 MB
node 3 cpus: 42-55,154-167
node 3 size: 129016 MB
node 3 free: 122690 MB
node 4 cpus: 56-69,168-181
node 4 size: 129016 MB
node 4 free: 122926 MB
node 5 cpus: 70-83,182-195
node 5 size: 129016 MB
node 5 free: 122962 MB
node 6 cpus: 84-97,196-209
node 6 size: 128982 MB
node 6 free: 122921 MB
node 7 cpus: 98-111,210-223
node 7 size: 128648 MB
node 7 free: 122612 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: 1056045296 kB

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### Platform Notes (Continued)

10. who -r  
run-level 3 Jul 14 11:38

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

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 nvme-fc-boot-connections postfix purge-kernels rollback rsyslog sep5  
smartd sshd wicked 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 chronyd console-getty cups  
cups-browsed debug-shell ebttables exchange-bmc-os-info 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 nvme-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=2b95edbf-a8ba-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

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### Platform Notes (Continued)

```

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

```

```

-----
17. /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

```

```

-----
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 HMC94MEBRA109N 64 GB 2 rank 4800

```

23. BIOS

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(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'

### 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 2023.0.0 Build 20221201  
Copyright (C) 1985-2022 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 2023.0.0 Build 20221201  
Copyright (C) 1985-2022 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 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.  
=====

=====  
C++, C, Fortran | 507.cactuBSSN\_r(base)  
=====

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) 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  
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=====

=====  
Fortran | 503.bwaves\_r(base) 549.fotonik3d\_r(base) 554.roms\_r(base)  
=====

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201  
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=====

=====  
Fortran, C | 521.wrf\_r(base) 527.cam4\_r(base)  
=====

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# SPEC CPU®2017 Floating Point Rate Result

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## Supermicro

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

SPECrate®2017\_fp\_base = 1260

SPECrate®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

## Compiler Version Notes (Continued)

### Base Compiler Invocation

C benchmarks:

icx

C++ benchmarks:

icpx

Fortran benchmarks:

ifx

Benchmarks using both Fortran and C:

ifx icx

Benchmarks using both C and C++:

icpx icx

Benchmarks using Fortran, C, and C++:

icpx icx ifx

### 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 -xsapphirerapids -Ofast -ffast-math

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## Base Optimization Flags (Continued)

C benchmarks (continued):

```
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4  
-Wno-implicit-int -mprefer-vector-width=512 -ljemalloc  
-L/usr/local/jemalloc64-5.0.1/lib
```

C++ benchmarks:

```
-w -std=c++14 -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast  
-ffast-math -flto -mfpmath=sse -funroll-loops  
-qopt-mem-layout-trans=4 -mprefer-vector-width=512 -ljemalloc  
-L/usr/local/jemalloc64-5.0.1/lib
```

Fortran benchmarks:

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

Benchmarks using both Fortran and C:

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

Benchmarks using both C and C++:

```
-w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast  
-ffast-math -flto -mfpmath=sse -funroll-loops  
-qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512  
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using Fortran, C, and C++:

```
-w -m64 -std=c++14 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast  
-ffast-math -flto -mfpmath=sse -funroll-loops  
-qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512  
-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-ic2023-official-linux64.html>

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

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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For questions about this result, please contact the tester. For other inquiries, please contact [info@spec.org](mailto:info@spec.org).

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