# SPEC CPU®2017 Floating Point Rate Result

## Supermicro

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

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>001176</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor:</td>
<td>Supermicro</td>
</tr>
<tr>
<td>Tested by:</td>
<td>Supermicro</td>
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### Hardware

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>CPU Name:</td>
<td>Intel Xeon Max 9480</td>
</tr>
<tr>
<td>Max MHz:</td>
<td>3500</td>
</tr>
<tr>
<td>Nominal:</td>
<td>1900</td>
</tr>
<tr>
<td>Enabled:</td>
<td>112 cores, 2 chips, 2 threads/core</td>
</tr>
<tr>
<td>Orderable:</td>
<td>1,2 chips</td>
</tr>
<tr>
<td>Cache L1:</td>
<td>32 KB I + 48 KB D on chip per core</td>
</tr>
<tr>
<td>L2:</td>
<td>2 MB I+D on chip per core</td>
</tr>
<tr>
<td>L3:</td>
<td>112.5 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
</tr>
<tr>
<td>Memory:</td>
<td>1152 GB (16 x 64 GB 2Rx4 PC5-4800B-R + 2 x 64 GB HBM)</td>
</tr>
<tr>
<td>Storage:</td>
<td>1 x 1.9 TB M.2 NVMe SSD</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
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</table>

### Software

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>OS:</td>
<td>SUSE Linux Enterprise Server 15 SP4 5.14.21-150400.22-default</td>
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<tr>
<td>Compiler:</td>
<td>C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ Compiler for Linux; Fortran: Version 2023.0 of Intel Fortran Compiler for Linux;</td>
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<tr>
<td>Parallel:</td>
<td>No</td>
</tr>
<tr>
<td>Firmware:</td>
<td>Version 1.3 released Jun-2023</td>
</tr>
<tr>
<td>File System:</td>
<td>xfs</td>
</tr>
<tr>
<td>System State:</td>
<td>Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers:</td>
<td>64-bit</td>
</tr>
<tr>
<td>Peak Pointers:</td>
<td>Not Applicable</td>
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<tr>
<td>Power Management:</td>
<td>BIOS set to prefer performance at the cost of additional power usage.</td>
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<td>Other:</td>
<td>jemalloc memory allocator V5.0.1</td>
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### SPECrate®2017 fp_base = 1260

**SPECrate®2017 fp_peak = Not Run**

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<tr>
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<td>526.blender_r</td>
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<tr>
<td>554.roms_r</td>
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</tbody>
</table>

### Hardware Details

- **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 Details

- **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  
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage.  
- **Other:** jemalloc memory allocator V5.0.1
## Results Table

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</tbody>
</table>

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### 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)

(Continued on next page)
**SPEC CPU®2017 Floating Point Rate Result**

**Supermicro**

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

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<tbody>
<tr>
<td>SPECrate®2017_fp_peak</td>
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<td>Tested by:</td>
<td>Supermicro</td>
</tr>
<tr>
<td>Test Date:</td>
<td>Jul-2023</td>
</tr>
<tr>
<td>Hardware Availability:</td>
<td>Jun-2023</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Dec-2022</td>
</tr>
</tbody>
</table>

**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

**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 fe91c09b7ed5c36ae2c92cc097bec197
running on 102-241 Fri Jul 14 15:12:28 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 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/ itemCount
19. OS release
20. Disk information
21. /sys/devices/virtual/dmi/id
22. dmidecode
23. BIOS

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<tr>
<th><strong>SPECrate®2017_fp_base</strong></th>
<th>1260</th>
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</thead>
<tbody>
<tr>
<td><strong>SPECrate®2017_fp_peak</strong></td>
<td>Not Run</td>
</tr>
</tbody>
</table>

**Test Date:** Jul-2023  
**Hardware Availability:** Jun-2023  
**Software Availability:** Dec-2022

### Platform Notes (Continued)

2. **w**

```plaintext
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**

```plaintext
core file size (blocks, -c) unlimited
data seg size (kbytes, -d) unlimited
 scheduling priority (-e) 0
 file size (blocks, -f) unlimited
 pending signals (-l) 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**

```plaintext
$spec = /home/cpu2017
$SPEC = /home/cpu2017
$SPECtmp = /home/cpu2017
$SPEC = /home/cpu2017
```

6. **/proc/cpuinfo**

```plaintext
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 swaps
```

(Continued on next page)
## 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.

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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
- **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 mca cmov pat pse36
  clflush dtc 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 ssse4_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_cro cpuid_fault
  tpr_shadow vmx flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle
  avx2 smep bmi2 emms invpcid rtm cmp dtst_a avx512f avx512dq rsradd adx smap
  avx512sfma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl
  xsaveopt xsavec xgetbv1 xsaveav cqm12 cqm11c cqm12a cqm11a cqm11
  cqm12_local split_lock_dete avx vnni avx512 bfi16 wbnoinvd dtherm ida
  arat p1n pts avx512vbmi umip pku ospke waitpkg avx512_vbmi qfni vae
  vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpdpctdqa la57 rpdp
  bus_lock_detect clademote movdiri movdiri464 enqcmd fmd md_clear serialize
  tsi xdktrk pconfign 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)
Supermicro
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SPECreate®2017_fp_base = 1260
SPECreate®2017_fp_peak = Not Run

CPU2017 License: 001176
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Test Date: Jul-2023
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Hardware Availability: Jun-2023
Software Availability: Dec-2022

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/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 PHYS-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 17

9. /proc/meminfo
MemTotal: 1056045296 kB

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Software Availability: Dec-2022

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-boost-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 autos fatoryast-initscripts blk-availability
    bluetooth-mesh boot-ysystcl ca-certificates chrony-wait chrony-d console-getty cups
    cups-browsed debug-shell ebtables exchange-bmc-os-info gpm grub2-once haveged-switch-root
    ipmi ipmi-event iscsi-init iscsi-id iscsiinit issue-add-ssh-keys kexec-load lunmask
    man-db-create multipathd nfs nfs-blkmap nmv nfsm-autoconnect ostree-remount rdisc rpclbind
    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 wicked

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 supported:
      Supported: yes
      Active: yes

16. sysctl
    kernel.numa_balancing 1
    kernel.randomize_va_space 2
    vm.compression_proactive 20
    vm.dirty_background_bytes 0
    vm.dirty_background_ratio 10
    vm.dirty_bytes 0
    vm.dirty_expire_centisecs 3000
    vm.dirty_ratio 20

(Continued on next page)
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+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

(Continued on next page)
### SPEC CPU®2017 Floating Point Rate Result

**Supermicro**

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

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>001176</th>
<th>Test Date:</th>
<th>Jul-2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor:</td>
<td>Supermicro</td>
<td>Hardware Availability:</td>
<td>Jun-2023</td>
</tr>
<tr>
<td>Tested by:</td>
<td>Supermicro</td>
<td>Software Availability:</td>
<td>Dec-2022</td>
</tr>
</tbody>
</table>

**SPECrate®2017 fp_base = 1260**

**SPECrate®2017 fp_peak = Not Run**

### Platform Notes (Continued)

(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

<table>
<thead>
<tr>
<th>Environment</th>
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<tbody>
<tr>
<td>C</td>
<td>519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)</td>
<td>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.</td>
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<td>511.povray_r(base) 526.blender_r(base)</td>
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<td>507.cactuBSSN_r(base)</td>
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<td>503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)</td>
<td>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.</td>
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<td>Fortran, C</td>
<td>521.wrf_r(base) 527.cam5_r(base)</td>
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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

(Continued on next page)
### 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/Intel-ic2023-official-linux64.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/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.

Tested with SPEC CPU®2017 v1.1.9 on 2023-07-14 18:12:28-0400.
Report generated on 2023-08-02 16:33:10 by CPU2017 PDF formatter v6716.
Originally published on 2023-08-01.