Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL380 Gen11
(2.00 GHz, Intel Xeon Silver 4416+)

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base = 454</th>
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</thead>
<tbody>
<tr>
<td>SPECrate®2017_fp_peak = 468</td>
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</tbody>
</table>

**CPU2017 License:** 3  
**Test Sponsor:** HPE  
**Tested by:** HPE

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Software</th>
</tr>
</thead>
</table>
| **CPU Name:** Intel Xeon Silver 4416+  
**Max MHz:** 3900  
**Nominal:** 2000  
**Enabled:** 40 cores, 2 chips, 2 threads/core  
**Orderable:** 1, 2 chip(s)  
**Cache L1:** 32 KB I + 48 KB D on chip per core  
**L2:** 2 MB I+D on chip per core  
**L3:** 37.5 MB I+D on chip per core  
**Other:** None  
**Memory:** 1 TB (16 x 64 GB 2Rx4 PC5-4800B-R, running at 4000)  
**Storage:** 1 x 960 GB SATA SSD  
**Other:** None | **OS:** Red Hat Enterprise Linux release 9.0 (Plow)  
**Kernel:** 5.14.0-70.13.1.e9_0.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:** No  
**Firmware:** HPE BIOS Version v1.30 03/01/2023 released Mar-2023  
**File System:** xfs  
**System State:** Run level 3 (multi-user)  
**Base Pointers:** 64-bit  
**Peak Pointers:** 64-bit  
**Other:** jemalloc memory allocator V5.0.1  
**Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage |

| Copies | 0 | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 | 2400 | 2500 |
|--------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 503.bwaves_r | 80 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 559  |
| 507.cactuBSSN_r | 80 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 585  |
| 508.namd_r | 80 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 255  |
| 510.parest_r | 80 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 284  |
| 511.povray_r | 80 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 402  |
| 519.lbm_r | 80 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 418  |
| 521.wrf_r | 80 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 401  |
| 526.blender_r | 80 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 387  |
| 527.cam4_r | 80 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 448  |
| 538.imagick_r | 80 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 1080 |
| 544.nab_r | 80 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 782  |
| 549.fotonik3d_r | 80 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 384  |
| 554.roms_r | 80 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 250  | 198  |

---

**Hardware**

**Software**

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# SPEC CPU®2017 Floating Point Rate Result

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(Test Sponsor: HPE)
ProLiant DL380 Gen11
(2.00 GHz, Intel Xeon Silver 4416+)

### CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

---

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SPECrate®2017_fp_peak = 468

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### Results 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"
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>
```
tuned-adm profile was set to Throughput-Performance using "tuned-adm profile throughput-performance"

---

### Environment Variables Notes

Environment variables set by runcpu before the start of the run:
```
LD_LIBRARY_PATH = "/home/cpu2017_19/lib/intel64:/home/cpu2017_19/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
NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)

(Continued on next page)
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.

Platform Notes

The system ROM used for this result contains Intel microcode version 0x2b0001b0 for the Intel Xeon Silver 4416+ processor.
BIOS Configuration:
Workload Profile set to General Throughput Compute
Thermal Configuration set to Maximum Cooling
Enhanced Processor Performance Profile set to Aggressive
Last Level Cache (LLC) Dead Line Allocation set to Disabled
Memory Patrol Scrubbing set to Disabled
Workload Profile set to Custom
DCU Stream Prefetcher set to Disabled
Adjacent Sector Prefetch set to Disabled
Minimum Processor Idle Power Package C-State set to Package C6 (non-retention) State

Sysinfo program /home/cpu2017_19/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc97bec197
running on localhost.localdomain Tue Jun 27 04:39:18 2023

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

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13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. tuned-adm active
16. systcl
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18. /sys/kernel/mm/transparent_hugepage/kgupleged
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22. dmidecode
23. BIOS

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### Platform Notes (Continued)

1. **uname -a**
   
   Linux localhost.localdomain 5.14.0-70.13.1.el9_0.x86_64 #1 SMP PREEMPT Thu Apr 14 12:42:38 EDT 2022 x86_64  
   x86_64 x86_64 GNU/Linux

2. **w**
   
   04:39:18 up 1 min, 0 users, load average: 0.21, 0.08, 0.03
   
   USER TTY LOGIN@ IDLE JCPU PCPU WHAT

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
   scheduling priority (-e) 0
   file size (blocks, -f) unlimited
   pending signals (-i) 4127203
   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) 4127203
   virtual memory (kbytes, -v) unlimited
   file locks (-x) unlimited

5. **sysinfo process ancestry**
   
   /usr/lib/systemd/systemd --switched-root --system --deserialize 30
   sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
   sshd: root [priv]
   sshd: root@notty
   bash -c cd $SPEC/ & $SPEC/ftpserialize.sh
   runcpu --nobuild --action validate --define default-platform-flags --define numcopies=80 -c
   ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=40 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base,peak -o all fprate
   runcpu --nobuild --action validate --define default-platform-flags --define numcopies=80 --configfile
   ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=40 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base,peak --output_format all --nopower
   --runmode rate --tune base:peak --size refrate fprate --nopreenv --note-preenv --logfile
   $SPEC/tmp/CPU2017.001/templogs/preenv.fprate.001.0.log --lognum 001.0 --from_runcpu 2
   specperl $SPEC/bin/sysinfo
   $SPEC = /home/cpu2017_19

6. **/proc/cpuinfo**
   
   model name : Intel(R) Xeon(R) Silver 4416+
   vendor_id : GenuineIntel
   cpu family : 6
   model : 143
   stepping : 7
   microcode : 0x2b0001b0
   bugs : spectre_v1 spectre_v2 spec_store_bypass swapgs

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### Platform Notes (Continued)

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<td>physical id 1</td>
<td>apicids 128-167</td>
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</table>

Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for virtualized systems. Use the above data carefully.

### lscpu

```
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):                            80
On-line CPU(s) list:               0-79
Vendor ID:                         GenuineIntel
BIOS Vendor ID:                    Intel(R) Corporation
Model name:                        Intel(R) Xeon(R) Silver 4416+
BIOS Model name:                   Intel(R) Xeon(R) Silver 4416+
CPU family:                        6
Model:                             143
Thread(s) per core:                2
Core(s) per socket:                20
Socket(s):                         2
Stepping:                          7
BogoMIPS:                          4000.00
Flags:                             fpu vme de pse tsc msr pae mca cmov pat pse36
                                  clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdscp
                                  lm constant_tsc cpuidaperfmon pebs bts rep_good nopl xtopology
                                  nonstop_tsc cpuid aperf perf tsc_known_freq pni pclmulqdq dtes64 monitor
des_cpl vmx 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 _l1d cat _l1e cat _l2c cat _l3
desc_l2 invpcid_single cdp_l2 ssbd mba ibrs liphb stibp ibrs_enhanced tpr_shadow
                                  vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 avx2 smep bmi2
                                  erms invpcid cqm rdr_t avx512f avx512dq rdseed adx avx512sfma
                                  clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt xsave
                                  xgetbv1 xsaves cqm_llc cqm_occup llc cqm_mmb_total cqm_mbb_local
                                  split_lock_detect avx_vnni avx512 bvif avx512 16w dthm ida arat pin pts
                                  avx512vlmi umip pku ospe waitpkg avx512_vhmi2 gfni vaeo vpclmulqdq
                                  avx512_vnni avx512_bitsalg tms avx512 vpocntdq la57 rapid_bus_lock_detect
                                  oldemote movdiri movdir64b enqcmd fmsd cmd_clear serialize tsxidtrk pconf
                                  arch lbr avx512_fp16 amx_tile flush lld arch_capabilities
                                  Virtualization:                   VT-x
                                  L1d cache:                        1.9 MiB (40 instances)
                                  L1i cache:                        1.3 MiB (40 instances)
                                  L2 cache:                         80 MiB (40 instances)
                                  L3 cache:                         75 MiB (2 instances)
                                  NUMA node(s):                     2
                                  NUMA node0 CPU(s):               0-19,40-59
                                  NUMA node1 CPU(s):               20-39,60-79
                                  Vulnerability Itlb multihit:     Not affected
                                  Vulnerability L1f:               Not affected
                                  Vulnerability Mds:               Not affected
                                  (Continued on next page)```
Hewlett Packard Enterprise
ProLiant DL380 Gen11
(2.00 GHz, Intel Xeon Silver 4416+)

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Test Sponsor: HPE
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SPEC CPU®2017 Floating Point Rate Result
Copyright 2017-2023 Standard Performance Evaluation Corporation

SPECrate®2017_fp_base = 454
SPECrate®2017_fp_peak = 468

Platform Notes (Continued)

Vulnerability Meltdown: Not affected
Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
Vulnerability Srbd: Not affected
Vulnerability Tx async abort: Not affected

From lscpu --cache:

NAME ONE-SIZE ALL-SIZE WAYS TYPE LEVEL SETS PHY-LINE COHERENCY-SIZE
L1d  48K  1.9M  12 Data       1  64 1  64
L1i  32K  1.3M   8 Instruction  1  64 1  64
L2    2M   80M   16 Unified    2 2048 1  64
L3  37.5M  75M   15 Unified   3 40960 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: 0-19,40-59
node 0 size: 515763 MB
node 0 free: 514181 MB
node 1 cpus: 20-39,60-79
node 1 size: 516076 MB
node 1 free: 515063 MB
node distances:
node   0   1
0: 10  20
1: 20  10

9. /proc/meminfo
MemTotal: 1056604440 kB

10. who -r
run-level 3 Jun 27 04:38

11. Systemd service manager version: systemd 250 (250-6.el9_0)
Default Target Status
multi-user running

12. Services, from systemctl list-unit-files
STATE NAME FILES
enabled NetworkManager NetworkManager-dispatcher NetworkManager-wait-online auditd crond
dbus-broker firewalld getty@ iopingbalance kdump lvm2-monitor mdmonitor microcode
nis-domainname rsyslogd rsyslog selinux-autorelabel-mark sshd ssd
systemd-network-generator tuned uris s2 udisks2
enabled-runtime systemd-remount-fs
disabled blk-availability canberra-system-bootup canberra-system-shutdown
canberra-system-shutdown-reboot chrony-wait chrony-key cache-update nftables powertop rdisc rham
rham-facts rpmdb-rebuild serial-getty@ sshd-keygen@ systemd-boot-check-no-failures
systemd-pstore systemd-sysex
direct
ssd-autofs sssd-kms sssd-ns sssd-pac sssd-pam sssd-ssh sssd-sudo

13. Linux kernel boot-time arguments, from /proc/cmdline
BOOT_IMAGE=(hd0,gpt2)/vmlinuz-5.14.0-70.13.1.e19.0.x86_64

(Continued on next page)
Platform Notes (Continued)

root=/dev/mapper/rhel-root
ro
resume=/dev/mapper/rhel-swap
rd.lvm.lv=rhel/root
rd.lvm.lv=rhel/swap

14. cpupower frequency-info
   analyzing CPU 0:
   Unable to determine current policy
   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 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

(Continued on next page)
Platform Notes (Continued)

os-release Red Hat Enterprise Linux 9.0 (Flow)
redhat-release Red Hat Enterprise Linux release 9.0 (Flow)
system-release Red Hat Enterprise Linux release 9.0 (Flow)

20. Disk information
SPEC is set to: /home/cpu2017_19
Filesystem Type Size Used Avail Use% Mounted on
/dev/mapper/rhel-home xfs 819G 348G 472G 43% /home

21. /sys/devices/virtual/dmi/id
Vendor: HPE
Product: ProLiant DL380 Gen11
Product Family: ProLiant
Serial: CNX21000G7

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:
16x Hynix HMCG94MEBRA121N 64 GB 2 rank 4800, configured at 4000

23. BIOS
(This section combines info from /sys/devices and dmidecode.)
BIOS Vendor: HPE
BIOS Version: 1.30
BIOS Date: 03/01/2023
BIOS Revision: 1.30
Firmware Revision: 1.30

Compiler Version Notes

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) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

ProLiant DL380 Gen11

(2.00 GHz, Intel Xeon Silver 4416+)

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**Compiler Version Notes (Continued)**

```
C++, C, Fortran | 507.cactubssn_r(base, peak)  

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         | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base, peak)  

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.

--------------------------------------------------------------
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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
SPEC CPU®2017 Floating Point Rate Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL380 Gen11
(2.00 GHz, Intel Xeon Silver 4416+)

SPECrate®2017_fp_base = 454
SPECrate®2017_fp_peak = 468

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Test Date: Jun-2023
Hardware Availability: Apr-2023
Software Availability: Dec-2022

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_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
-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

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL380 Gen11
(2.00 GHz, Intel Xeon Silver 4416+)

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<td>Software Availability:</td>
<td>Dec-2022</td>
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</table>

**SPECrate®2017_fp_base = 454**  
**SPECrate®2017_fp_peak = 468**

### Base Optimization Flags (Continued)

Benchmarks using both C and C++ (continued):
- `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`

### Peak 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`

### Peak Portability Flags

Same as Base Portability Flags

### Peak Optimization Flags

C benchmarks:

519.lbm_r: basepeak = yes

(Continued on next page)
Peak Optimization Flags (Continued)

538.imagick_r.basepeak = yes

544.nab_r.basepeak = yes

C++ benchmarks:

508.namd_r.basepeak = yes


Fortran benchmarks:

503.bwaves_r.basepeak = yes

549.fotonik3d_r.basepeak = yes

554.roms_r -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:

521.wrf_r.basepeak = yes

527.cam4_r.basepeak = yes

Benchmarks using both C and C++:

511.povray_r -w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -fprofile-generate(pass 1) -fprofile-use=default.profdata(pass 2) -xCORE-AVX2(pass 1) -flto -Ofast -xCORE-AVX512 -ffast-math -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

526.blender_r.basepeak = yes

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

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

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL380 Gen11
(2.00 GHz, Intel Xeon Silver 4416+)

SPECrater®2017_fp_base = 454
SPECrater®2017_fp_peak = 468

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
-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/HPE-Platform-Flags-Intel-SPR-rev2.1.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/HPE-Platform-Flags-Intel-SPR-rev2.1.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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