# SPEC CPU®2017 Floating Point Rate Result

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## Hewlett Packard Enterprise
(Test Sponsor: HPE)

$SPECrate^{®}2017\_fp\_base = 455$

ProLiant DL380a Gen11
(2.00 GHz, Intel Xeon Silver 4416+)

$SPECrate^{®}2017\_fp\_peak = 469$

**CPU2017 License:** 3

**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** Jul-2023

**Hardware Availability:** Jun-2023

**Software Availability:** Dec-2022

Copies

| Benchmark | Copies | Base | Peak |
|-----------|--------|------|------|
| 503.bwaves_r | 80 | 2320 | |
| 507.cactuBSSN_r | 80 / 40 | 561 | 572 |
| 508.namd_r | 80 | 254 | |
| 510.parest_r | 80 / 40 | 231 | 284 |
| 511.povray_r | 80 / 40 | 402 | 417 |
| 519.lbm_r | 80 | 254 | |
| 521.wrf_r | 80 | 407 | |
| 526.blender_r | 80 | 387 | |
| 527.cam4_r | 80 | 449 | |
| 538.imagick_r | 80 | 1080 | |
| 544.nab_r | 80 | 782 | |
| 549.fotonik3d_r | 80 | 393 | |
| 554.roms_r | 80 / 40 | 198 | 221 |

——— SPECrate®2017_fp_base (455)   - - - - SPECrate®2017_fp_peak (469)

## Hardware

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 chip
 Other: None
Memory: 512 GB (16 x 32 GB 2Rx8 PC5-4800B-R, running at 4000)
Storage: 1 x 1.6 TB NVMe SSD
Other: None

## Software

OS: Red Hat Enterprise Linux 9.0 (Plow)
 Kernel 5.14.0-70.13.1.el9_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 v1.40 06/1/2023 released Jun-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

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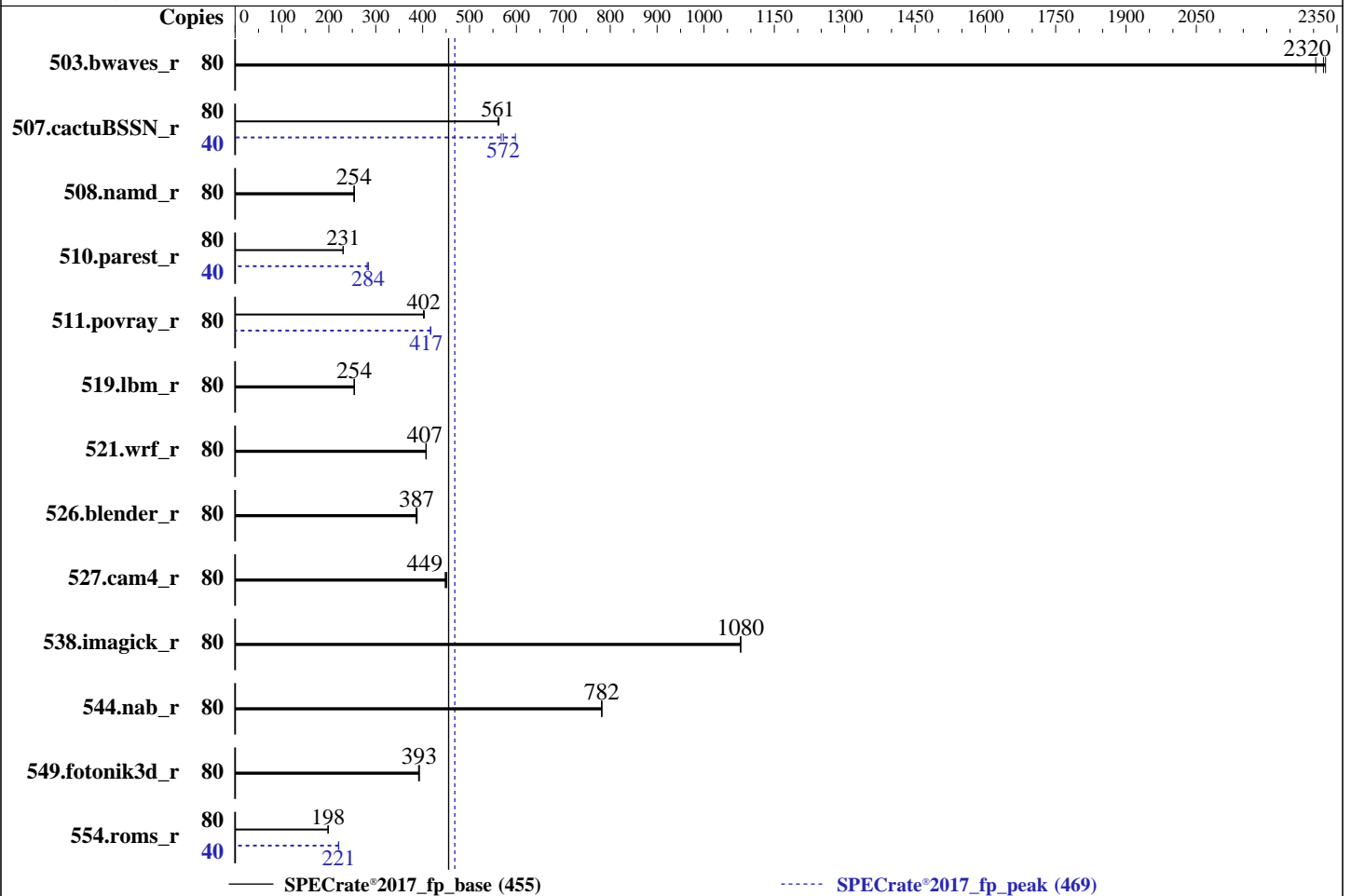(Test Sponsor: HPE)

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|---|---|---|---|---|
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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 | 80 | **346** | **2320** | 345 | 2330 | 348 | 2300 | 80 | **346** | **2320** | 345 | 2330 | 348 | 2300 |
| 507.cactuBSSN_r | 80 | **181** | **561** | 180 | 563 | 181 | 561 | 40 | 89.2 | 568 | 84.7 | 598 | **88.5** | **572** |
| 508.namd_r | 80 | 300 | 254 | 299 | 255 | **300** | **254** | 80 | 300 | 254 | 299 | 255 | **300** | **254** |
| 510.parest_r | 80 | 908 | 231 | **908** | **231** | 909 | 230 | 40 | 372 | 282 | 368 | 284 | **369** | **284** |
| 511.povray_r | 80 | 465 | 402 | 463 | 403 | **464** | **402** | 80 | 448 | 417 | 448 | 417 | **448** | **417** |
| 519.lbm_r | 80 | 331 | 255 | 332 | 254 | **332** | **254** | 80 | 331 | 255 | 332 | 254 | **332** | **254** |
| 521.wrf_r | 80 | **440** | **407** | 440 | 408 | 440 | 407 | 80 | **440** | **407** | 440 | 408 | 440 | 407 |
| 526.blender_r | 80 | 316 | 386 | **315** | **387** | 314 | 388 | 80 | 316 | 386 | **315** | **387** | 314 | 388 |
| 527.cam4_r | 80 | **312** | **449** | 312 | 448 | 310 | 451 | 80 | **312** | **449** | 312 | 448 | 310 | 451 |
| 538.imagick_r | 80 | 184 | 1080 | **185** | **1080** | 185 | 1080 | 80 | 184 | 1080 | **185** | **1080** | 185 | 1080 |
| 544.nab_r | 80 | 172 | 782 | 172 | 782 | **172** | **782** | 80 | 172 | 782 | 172 | 782 | **172** | **782** |
| 549.fotonik3d_r | 80 | **794** | **393** | 797 | 391 | 794 | 393 | 80 | **794** | **393** | 797 | 391 | 794 | 393 |
| 554.roms_r | 80 | 640 | 198 | **641** | **198** | 641 | 198 | 40 | 288 | 221 | **288** | **221** | 288 | 221 |
| SPECrate®2017_fp_base = | | 455 | | | | | | | | | | | | |
| SPECrate®2017_fp_peak = | | 469 | | | | | | | | | | | | |

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"
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>
IRQ balance service was stopped using "systemctl stop irqbalance.service"
tuned-adm profile was set to Throughput-Performance using "tuned-adm profile throughput-performance"
perf-bias for all the CPUs is set using "cpupower set -b 0"
```

## 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"
```

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| | | | |
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## 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)
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

The system ROM used for this result contains Intel microcode version 0x2b000461 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/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost.localdomain Sun Jul  9 03:50:01 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 250 (250-6.el9_0)
 12. Services, from systemctl list-unit-files
 13. Linux kernel boot-time arguments, from /proc/cmdline
 14. cpupower frequency-info
 15. tuned-adm active
 16. sysctl
 17. /sys/kernel/mm/transparent_hugepage
 18. /sys/kernel/mm/transparent_hugepage/khugepaged
 19. OS release
 20. Disk information
 21. /sys/devices/virtual/dmi/id
 22. dmidecode
 23. BIOS

*(Continued on next page)*

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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
       03:50:01 up 0 min,  0 users,  load average: 0.11, 0.04, 0.01
      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) 2062742
      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) 2062742
      virtual memory              (kbytes, -v) unlimited
      file locks                        (-x) unlimited

    --------------------------------------------------------
    5. sysinfo process ancestry
     /usr/lib/systemd/systemd --switched-root --system --deserialize 27
     sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
     sshd: root [priv]
     sshd: root@notty
     bash -c cd $SPEC/ && $SPEC/fprate.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/CPU2017.002/templogs/preenv.fprate.002.0.log --lognum 002.0 --from_runcpu 2
     specperl $SPEC/bin/sysinfo
    $SPEC = /home/cpu2017

    --------------------------------------------------------
    6. /proc/cpuinfo
        model name     : Intel(R) Xeon(R) Silver 4416+
        vendor_id      : GenuineIntel
        cpu family     : 6
        model          : 143
```

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## Platform Notes (Continued)

```
    stepping        : 7
    microcode       : 0x2b000461
    bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
    cpu cores       : 20
    siblings        : 40
    2 physical ids (chips)
    80 processors (hardware threads)
    physical id 0: core ids 0-19
    physical id 1: core ids 0-19
    physical id 0: apicids 0-39
    physical id 1: apicids 128-167
  Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
  virtualized systems.  Use the above data carefully.


  ------------------------------------------------------------
  7. lscpu

  From lscpu from util-linux 2.37.4:
    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 mce cx8 apic sep mtrr pge mca cmov pat pse36
                              clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp
                              lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology
                              nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor
                              ds_cpl smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid dca sse4_1 sse4_2
                              x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm
                              abm 3dnowprefetch cpuid_fault epb cat_l3 cat_l2 cdp_l3 invpcid_single
                              cdp_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced fsgsbase tsc_adjust bmi1
                              avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap
                              avx512ifma clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl
                              xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
                              cqm_mbm_local split_lock_detect avx_vnni avx512_bf16 wbnoinvd dtherm ida
                              arat pln pts avx512vbmi umip pku ospke waitpkg avx512_vbmi2 gfni vaes
                              vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid
                              bus_lock_detect cldemote movdiri movdir64b enqcmd fsrm md_clear serialize
                              tsxldtrk pconfig arch_lbr avx512_fp16 amx_tile flush_l1d arch_capabilities
    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 L1tf:             Not affected
```

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## Platform Notes (Continued)

```
   Vulnerability Mds:                Not affected
   Vulnerability Meltdown:           Not affected
   Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl
   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     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: 257696 MB
   node 0 free: 256924 MB
   node 1 cpus: 20-39,60-79
   node 1 size: 258028 MB
   node 1 free: 256922 MB
   node distances:
   node   0   1
     0:  10  20
     1:  20  10


   ------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       528102764 kB


   ------------------------------------------------------------
10. who -r
   run-level 3 Jul 9 03:49


   ------------------------------------------------------------
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           UNIT FILES
   enabled         NetworkManager NetworkManager-dispatcher NetworkManager-wait-online auditd crond
                   dbus-broker firewalld getty@ irqbalance kdump lvm2-monitor mdmonitor microcode
                   nis-domainname rhsmcertd rsyslog selinux-autorelabel-mark sshd sssd
                   systemd-network-generator tuned udisks2
   enabled-runtime systemd-remount-fs
   disabled        blk-availability chrony-wait chronyd console-getty cpupower debug-shell kvm_stat
                   man-db-restart-cache-update nftables powertop rdisc rhsm rhsm-facts rpmdb-rebuild
                   serial-getty@ sshd-keygen@ systemd-boot-check-no-failures systemd-pstore systemd-sysext
   indirect        sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo


   ------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
   BOOT_IMAGE=(hd0,gpt2)/vmlinuz-5.14.0-70.13.1.el9_0.x86_64
   root=/dev/mapper/rhel-root
```

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## Platform Notes (Continued)

```
    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+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      Red Hat Enterprise Linux 9.0 (Plow)
```

**(Continued on next page)**

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## Platform Notes (Continued)

```
    redhat-release Red Hat Enterprise Linux release 9.0 (Plow)
    system-release Red Hat Enterprise Linux release 9.0 (Plow)


    --------------------------------------------------------------
    20. Disk information
    SPEC is set to: /home/cpu2017
      Filesystem            Type  Size  Used Avail Use% Mounted on
      /dev/mapper/rhel-home xfs   1.4T  153G  1.3T  11% /home


    --------------------------------------------------------------
    21. /sys/devices/virtual/dmi/id
        Vendor:        HPE
        Product:       ProLiant DL380a Gen11
        Product Family: ProLiant
        Serial:        CNX22602MZ


    --------------------------------------------------------------
    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:
        7x Hynix HMCG88AEBRA168N 32 GB 2 rank 4800, configured at 4000
        6x Hynix HMCG88MEBRA113N 32 GB 2 rank 4800, configured at 4000
        3x Hynix HMCG88MEBRA115N 32 GB 2 rank 4800, configured at 4000


    --------------------------------------------------------------
    23. BIOS
    (This section combines info from /sys/devices and dmidecode.)
      BIOS Vendor:       HPE
      BIOS Version:      1.40
      BIOS Date:         06/01/2023
      BIOS Revision:     1.40
      Firmware Revision: 1.30
```

## Compiler Version Notes

```
==================================================================================================
C               | 519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_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.
--------------------------------------------------------------------------------------------------


==================================================================================================
C++             | 508.namd_r(base, peak) 510.parest_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.
--------------------------------------------------------------------------------------------------


==================================================================================================
C++, C          | 511.povray_r(base, peak) 526.blender_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) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
```

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Standard Performance Evaluation Corporation (info@spec.org)                https://www.spec.org/

## Hewlett Packard Enterprise

(Test Sponsor: HPE)

### ProLiant DL380a Gen11
(2.00 GHz, Intel Xeon Silver 4416+)

$SPECrate^{®}2017\_fp\_base = 455$

$SPECrate^{®}2017\_fp\_peak = 469$

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

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

## Compiler Version Notes (Continued)

```
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------------------------

==================================================================================================
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) 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
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------------------------------------------------------------------------------------------------

==================================================================================================
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.
------------------------------------------------------------------------------------------------

==================================================================================================
Fortran, C     | 521.wrf_r(base, peak) 527.cam4_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.
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`

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`

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# SPEC CPU®2017 Floating Point Rate Result

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**Hewlett Packard Enterprise**
(Test Sponsor: HPE)

ProLiant DL380a Gen11
(2.00 GHz, Intel Xeon Silver 4416+)

SPECrate®2017_fp_base = 455

SPECrate®2017_fp_peak = 469

| **CPU2017 License:** 3 | | **Test Date:** | Jul-2023 |
|---|---|---|---|
| **Test Sponsor:** | HPE | **Hardware Availability:** | Jun-2023 |
| **Tested by:** | HPE | **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_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`

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# SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL380a Gen11
(2.00 GHz, Intel Xeon Silver 4416+)

SPECrate®2017_fp_base = 455

SPECrate®2017_fp_peak = 469

| **CPU2017 License:** 3 | | **Test Date:** | Jul-2023 |
|---|---|---|---|
| **Test Sponsor:** | HPE | **Hardware Availability:** | Jun-2023 |
| **Tested by:** | HPE | **Software Availability:** | Dec-2022 |

## 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`

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**Hewlett Packard Enterprise**
(Test Sponsor: HPE)

ProLiant DL380a Gen11
(2.00 GHz, Intel Xeon Silver 4416+)

SPECrate®2017_fp_base = 455

SPECrate®2017_fp_peak = 469

| | |
|---|---|
| **CPU2017 License:** 3 | **Test Date:** Jul-2023 |
| **Test Sponsor:** HPE | **Hardware Availability:** Jun-2023 |
| **Tested by:** HPE | **Software Availability:** Dec-2022 |

# Peak Optimization Flags (Continued)

538.imagick_r: `basepeak = yes`

544.nab_r: `basepeak = yes`

C++ benchmarks:

508.namd_r: `basepeak = yes`

510.parest_r: `-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:

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)**

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL380a Gen11
(2.00 GHz, Intel Xeon Silver 4416+)

SPECrate®2017_fp_base = 455

SPECrate®2017_fp_peak = 469

| | | | | |
|---|---|---|---|---|
| **CPU2017 License:** | 3 | | **Test Date:** | Jul-2023 |
| **Test Sponsor:** | HPE | | **Hardware Availability:** | Jun-2023 |
| **Tested by:** | HPE | | **Software Availability:** | Dec-2022 |

# 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/HPE-Platform-Flags-Intel-SPR-rev2.1.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/HPE-Platform-Flags-Intel-SPR-rev2.1.xml
http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml

For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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