Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL380 Gen11
(2.20 GHz, Intel Xeon Gold 6454S)

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Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL380 Gen11
(2.20 GHz, Intel Xeon Gold 6454S)

SPEC CPU®2017 Floating Point Rate Result

SPECrates: 2017_fp_base = 663 2017_fp_peak = 694

Test Date: Feb-2023
Hardware Availability: Jan-2023
Software Availability: May-2022

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

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<th>SPECrate 2017_fp_base</th>
<th>SPECrate 2017_fp_peak</th>
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<tbody>
<tr>
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</table>

## Hardware

- **CPU Name:** Intel Xeon Gold 6454S
- **Max MHz:** 3400
- **Nominal:** 2200
- **Enabled:** 64 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:** 60 MB I+D on chip per chip
- **Other:** None
- **Memory:** 1 TB (16 x 64 GB 2Rx4 PC5-4800B-R)
- **Storage:** 1 x 900 GB SATA SSD
- **Other:** None

## Software

- **OS:** Red Hat Enterprise Linux release 9.0 (Plow)
  Kernel 5.14.0-70.13.1.el9_0.x86_64
- **Compiler:** C/C++: Version 2022.1 of Intel oneAPI DPC++/C++ Compiler for Linux;
  Fortran: Version 2022.1 of Intel Fortran Compiler for Linux;
- **Parallel:** No
- **Firmware:** HPE BIOS Version v1.22 01/18/2023 released Jan-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
**Hewlett Packard Enterprise**  
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**CPU2017 License:** 3  
**Test Date:** Feb-2023  
**Test Sponsor:** HPE  
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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>`  
IRrq balance service was stopped using "systemctl stop irqbalance.service"  
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) 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 0x2b000161 for the Intel Xeon Gold 6454S processor.
The reported date by sysinfo is incorrect due to computer clock being not set correctly.
The correct test date is: Feb-2023.
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 No Package State

Sysinfo program /home/cpu2017_19/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Thu Apr 7 05:30:55 2022

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

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Platform Notes (Continued)

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/transparent
19. OS release
20. Disk information
21. /sys/devices/virtual/dmi/id
22. dmidecode
23. BIOS

--------------------------------------------------------------------------
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
05:30:55 up 1 min,  0 users, load average: 0.25, 0.10, 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) 4127158
 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

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Platform Notes (Continued)

max user processes (-u) 4127158
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/fprate.sh
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=128 --configfile ic2022.1-lin-core-avx512-rate-20220316.cfg --define smt-on --define cores=64 --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=128 --configfile ic2022.1-lin-core-avx512-rate-20220316.cfg --define smt-on --define cores=64 --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) Gold 6454S
vendor_id : GenuineIntel
cpu family : 6
model : 143
stepping : 8
microcode : 0x2b000161
bugs : spectre_v1 spectre_v2 spec_store_bypass swapgs
cpu cores : 32
siblings : 64
2 physical ids (chips)
128 processors (hardware threads)
physical id 0: core ids 0-31
physical id 1: core ids 0-31
physical id 0: apicids 0-63
physical id 1: apicids 128-191
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

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Platform Notes (Continued)

CPU op-mode(s): 32-bit, 64-bit
Address sizes: 46 bits physical, 57 bits virtual
Byte Order: Little Endian
CPU(s): 128
On-line CPU(s) list: 0-127
Vendor ID: GenuineIntel
BIOS Vendor ID: Intel(R) Corporation
Model name: Intel(R) Xeon(R) Gold 6454S
BIOS Model name: Intel(R) Xeon(R) Gold 6454S
CPU family: 6
Model: 143
Thread(s) per core: 2
Core(s) per socket: 32
Socket(s): 2
Stepping: 8
BogoMIPS: 4400.00

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 pclid dca sse4_1
sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand
lahf_lm abm 3dnowprefetch cpuid_fault epb cat_13 cat_12 cdp_13
invpcid_single cdp_12 ssbd mba ibs ibbp ibs_enhanced tpr_shadow
vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 avx2 smep bmi2
erm emms invpcid cmp rdtscp rdseed adx smap avx512fma
clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt xsaves
xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
split_lock_detect avx_vnni avx512_bf16 wboinvd dtherm ida arat pln pts
avx512vbmi umip pku ospe waitpkg avx512_vbmi gfn vs avx512vl dq
avx512vl生态圈 avx512_bitalsig tme avx512vpqcntdq lal7 rpid bus_lock_detect
cldemote movdiri movdir64b enqcmd farm md_clear serialize txslidtrk pconfign
arch_lbr avx512_fp16 amx_tile flush_l1d arch_capabilities

Virtualization: VT-x
L1d cache: 3 MiB (64 instances)
L1i cache: 2 MiB (64 instances)
L2 cache: 128 MiB (64 instances)
L3 cache: 120 MiB (2 instances)
NUMA node(s): 8
NUMA node0 CPU(s): 0-7, 64-71
NUMA node1 CPU(s): 8-15, 72-79
NUMA node2 CPU(s): 16-23, 80-87
NUMA node3 CPU(s): 24-31, 88-95
NUMA node4 CPU(s): 32-39, 96-103
NUMA node5 CPU(s): 40-47, 104-111
NUMA node6 CPU(s): 48-55, 112-119
NUMA node7 CPU(s): 56-63, 120-127

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<tr>
<td>Tested by: HPE</td>
<td>Software Availability:</td>
<td>May-2022</td>
</tr>
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### Platform Notes (Continued)

- Vulnerability Itlb multihit: Not affected
- Vulnerability L1tf: Not affected
- 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, IBFB 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  3M  12 Data  1  64  1  64
L1i  32K  2M  8 Instruction  1  64  1  64
L2   2M  128M  16 Unified  2  2048  1  64
L3   60M  120M  15 Unified  3  65536  1  64
```

---

8. numactl --hardware

NOTE: a numactl 'node' might or might not correspond to a physical chip.
```
available: 8 nodes (0-7)
ode 0 cpus: 0-7,64-71
node 0 size: 128733 MB
node 0 free: 127875 MB
node 1 cpus: 8-15,72-79
node 1 size: 129020 MB
node 1 free: 128479 MB
node 2 cpus: 16-23,80-87
node 2 size: 129020 MB
node 2 free: 128675 MB
node 3 cpus: 24-31,88-95
node 3 size: 129020 MB
node 3 free: 128689 MB
node 4 cpus: 32-39,96-103
node 4 size: 128984 MB
node 4 free: 128630 MB
node 5 cpus: 40-47,104-111
node 5 size: 129020 MB
node 5 free: 128678 MB
node 6 cpus: 48-55,112-119
node 6 size: 129020 MB
node 6 free: 128643 MB
node 7 cpus: 56-63,120-127
node 7 size: 129009 MB
node 7 free: 128638 MB
node distances:
node 0 1 2 3 4 5 6 7
```

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Platform Notes (Continued)

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9. /proc/meminfo
   MemTotal: 1056593140 kB

10. who -r
    run-level 3 Apr 7 05:30

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 chronyd crond
dbus-broker firewalld getty@ irqbalance kdump 1vm2-monitor mdmonitor microcode
nis-domainname rhostcertd rsyslog selinux-autorelabel-mark sshd sssd systemd-network-generator tuned udisks2 upower
enabled-runtime systemd-remount-fs
disabled blk-availability canberra-system-bootup canberra-system-shutdown
canberra-system-shutdown-reboot chrony-wait console-getty cputpower debug-shell
hwloc-dump-hwdata ipsec kvm_stat man-db-restart-cache-update nftables powertop rdisc rshm
rhost-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/rhel00-root
    ro
    resume=/dev/mapper/rhel00-swap
    rd.lvm.lv=rhel00/root
    rd.lvm.lv=rhel00/swap

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Platform Notes (Continued)

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.extrfrag_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

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

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Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
ProLiant DL380 Gen11  
(2.20 GHz, Intel Xeon Gold 6454S)  

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**Platform Notes (Continued)**

- pages_to_scan: 4096
- scan_sleep_milliseconds: 10000

---

19. OS release
   From /etc/*-release /etc/*-version
   os-release Red Hat Enterprise Linux 9.0 (Plow)
   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_19
   Filesystem              Type  Size  Used  Avail  Use%  Mounted on
   /dev/mapper/rhel00-home  xfs   819G  140G  680G  18%  /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 Samsung M321R8GA0BB0-CQKD6 64 GB 2 rank 4800

---

23. BIOS
   (This section combines info from /sys/devices and dmidecode.)
   BIOS Vendor:       HPE
   BIOS Version:      1.22
   BIOS Date:         01/18/2023
   BIOS Revision:     1.22
   Firmware Revision: 1.30

---

**Compiler Version Notes**

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(Continued on next page)
## Compiler Version Notes (Continued)

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Test Date: Feb-2023
Hardware Availability: Jan-2023
Software Availability: May-2022

Compiler Version Notes (Continued)

Fortran, C      | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
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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

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.blm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char

(Continued on next page)
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Base Portability Flags (Continued)

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 -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -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 -xCORE-AVX512 -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 C and C++:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using Fortran, C, and C++:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -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
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
538.imagick_r: basepeak = yes
544.nab_r: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -qopt-zmm-usage=high -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:
508.namd_r: basepeak = yes
510.parest_r: -w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -ljemalloc

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

510.parest_r (continued):
-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 -xCORE-AVX512 -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: basepeak = yes
526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
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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-rev1.1.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-rev1.1.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 2022-04-06 20:00:54-0400.  
Report generated on 2023-03-29 18:08:18 by CPU2017 PDF formatter v6442.  
Originally published on 2023-03-29.