SPEC CPU®2017 Floating Point Rate Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL560 Gen11
(2.90 GHz, Intel Xeon Platinum 8444H)

SPECrate®2017_fp_base = 896
SPECrate®2017_fp_peak = 913

<table>
<thead>
<tr>
<th>Copies</th>
<th>SPECrate®2017_fp_base (896)</th>
<th>SPECrate®2017_fp_peak (913)</th>
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</tr>
<tr>
<td>507.cactuBSSN_r</td>
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<tr>
<td>554.roms_r</td>
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<td>451</td>
</tr>
</tbody>
</table>

Hardware

- CPU Name: Intel Xeon Platinum 8444H
- Max MHz: 4000
- Nominal: 2900
- Enabled: 64 cores, 4 chips, 2 threads/core
- Orderable: 1, 2, 4 chip(s)
- Cache L1: 32 KB I + 48 KB D on chip per core
- L2: 2 MB I+D on chip per core
- L3: 45 MB I+D on chip per chip
- Other: None
- Memory: 1 TB (32 x 32 GB 2Rx8 PC5-4800B-R)
- Storage: 1 x 480 GB SATA SSD
- Other: None

Software

- OS: Ubuntu 22.04.1 LTS
- 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: ext4
- System State: Run level 5 (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

### SPEC CPU®2017 Floating Point Rate Result

**ProLiant DL560 Gen11**  
(2.90 GHz, Intel Xeon Platinum 8444H)

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

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### Results Table

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**SPECrate®2017_fp_base = 896**  
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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

## Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor.

For details, please see the config file.

## Operating System Notes

- Stack size set to unlimited using "ulimit -s unlimited"
- 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"
MALLOCONF="retain:true"
```
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

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

Platform Notes

The system ROM used for this result contains Intel microcode version 0x2b0001b0 for
the Intel Xeon Platinum 8444H Processor
BIOS Configuration
Workload Profile set to General Throughput Compute
Memory Patrol Scrubbing set to Disabled
Last Level Cache (LLC) Dead Line Allocation set to Disabled
Enhanced Processor Performance Profile set to Aggressive
Thermal Configuration set to Maximum Cooling
Workload Profile set to Custom
Adjacent Sector Prefetch set to Disabled
DCU Stream Prefetcher set to Disabled
Minimum Processor Idle Power Package C-State set to Package C6 (non-retention) State
The reported date by sysinfo is incorrect due to computer clock being not set correctly.
The correct test date is: May-2023
SysInfo program /home/cpu2017/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc97bec197
running on admin1 Mon Jun 27 18:38:52 2022
SUT (System Under Test) info as seen by some common utilities.

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13. Services, from systemctl list-unit-files
14. Linux kernel boot-time arguments, from /proc/cmdline
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18. /sys/kernel/mm/transparent_hugepage
19. /sys/kernel/mm/transparent_hugepage/khugepaged
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21. Disk information

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Test Date: May-2023
Hardware Availability: May-2023
Software Availability: Dec-2022

Platform Notes (Continued)

22. /sys/devices/virtual/dmi/id
23. dmidecode
24. BIOS

------------------------------------------------------------
1. uname -a
   Linux admin1 5.15.0-43-generic #46-Ubuntu SMP Tue Jul 12 10:30:17 UTC 2022 x86_64 x86_64 x86_64 GNU/Linux

------------------------------------------------------------
2. w
   18:38:52 up 10 min,  3 users,  load average: 0.00, 0.01, 0.00
   USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
   admin1   tty1     -                18:35    3:32   0.03s  0.01s -bash
   admin1   pts/0    172.16.0.100     18:36    2:12   0.02s  0.02s  0.02s sshd: admin1 [priv]
   admin1   pts/1    172.16.0.100     18:36    9.00s  0.91s  0.02s sudo -i

------------------------------------------------------------
3. Username
   From environment variable $USER: root
   From the command 'logname': admin1

------------------------------------------------------------
4. ulimit -a
   time(seconds)        unlimited
   file(blocks)         unlimited
   data(kbytes)         unlimited
   stack(kbytes)        unlimited
   coredump(blocks)     0
   memory(kbytes)       unlimited
   locked memory(kbytes) 132058320
   process              4126384
  nofiles              1024
   vmemory(kbytes)      unlimited
   locks                unlimited
   rtprio               0

------------------------------------------------------------
5. sysinfo process ancestry
   /sbin/init
   sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
   sshd: admin1 [priv]
   sshd: admin1@pts/0
   -bash
   sudo -i
   sudo -i
   -bash
   -bash
   runcpu --nobuild --action validate --define default-platform-flags --define numcopies=128 --c
   ic2023.0-lin-sapphirerapids-rate-20221201.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
   ic2023.0-lin-sapphirerapids-rate-20221201.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/CPUCPU2017.006/templs/preenv.fprate.006.0.log --lgrnum 006.0 --from_runcpu 2
   specper1 $SPEC/bin/sysinfo
   $SPEC = /home/cpu2017

(Continued on next page)
Platform Notes (Continued)

6. /proc/cpuinfo

   model name      : Intel(R) Xeon(R) Platinum 8444H
   vendor_id       : GenuineIntel
   cpu family      : 6
   model           : 143
   stepping        : 6
   microcode       : 0x2b0001b0
   bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
   cpu cores       : 16
   siblings        : 32

   4 physical ids (chips)
   128 processors (hardware threads)
   physical id 0: core ids 0-15
   physical id 1: core ids 0-15
   physical id 2: core ids 0-15
   physical id 3: core ids 0-15
   physical id 0: apicids 0-31
   physical id 1: apicids 128-159
   physical id 2: apicids 256-287
   physical id 3: apicids 384-415

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

-----------------------------------------------------------------------------------------------------------------------

7. lscpu

From lscpu from util-linux 2.37.2:

   Architecture:                    x86_64
   CPU op-mode(s):                  32-bit, 64-bit
   Address sizes:                   46 bits physical, 57 bits virtual
   Byte Order:                      Little Endian
   CPU(s):                          128
   On-line CPU(s) list:             0-127
   Vendor ID:                       GenuineIntel
   Model name:                      Intel(R) Xeon(R) Platinum 8444H
   CPU family:                      6
   Model:                           143
   Thread(s) per core:              2
   Core(s) per socket:              16
   Socket(s):                       4
   Stepping:                        6
   BogoMIPS:                        5800.00

   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 pse syscall nx pdpe1gb rdscp
   lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology
   nonstop_tsc cpuid aperfmperf tscknown_freq pni pclmulqdq dtes64 monitor
   ds cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid dca sse4_1
   sse4_2 x2apic movbe popcnt ts Kemp tsc_deadline_timer aes xsave avx16c rdrand
   lahf_lm abm 3dnowprefetch cpuid_fault epb cat_13 cat_12 cmp_13
   invpcid_single cmp_12 ssbd mba ibrs ibpb stibp ibs_enhanced tpr_shadow
   arch_capabilities

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Test Sponsor: HPE
Hewlett Packard Enterprise

CPU2017 License: 3
Test Date: May-2023
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Tested by: HPE
Software Availability: Dec-2022

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  45M  180M  15 Unified  3  49152  1  64
```

8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.

Additional Platform Notes (Continued)

Virtualization: VT-x
L1d cache: 3 MiB (64 instances)
L1i cache: 2 MiB (64 instances)
L2 cache: 128 MiB (64 instances)
L3 cache: 180 MiB (4 instances)
NUMA node(s): 16
NUMA node0 CPU(s): 0-3, 64-67
NUMA node1 CPU(s): 4-7, 68-71
NUMA node2 CPU(s): 8-11, 72-75
NUMA node3 CPU(s): 12-15, 76-79
NUMA node4 CPU(s): 16-19, 80-83
NUMA node5 CPU(s): 20-23, 84-87
NUMA node6 CPU(s): 24-27, 88-91
NUMA node7 CPU(s): 28-31, 92-95
NUMA node8 CPU(s): 32-35, 96-99
NUMA node9 CPU(s): 36-39, 100-103
NUMA node10 CPU(s): 40-43, 104-107
NUMA node11 CPU(s): 44-47, 108-111
NUMA node12 CPU(s): 48-51, 112-115
NUMA node13 CPU(s): 52-55, 116-119
NUMA node14 CPU(s): 56-59, 120-123
NUMA node15 CPU(s): 60-63, 124-127
Vulnerability Itlb multihit: Not affected
Vulnerability L1f: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Mmio stale data: 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

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Platform Notes (Continued)

node 5 size: 64509 MB
node 5 free: 64374 MB
node 6 cpus: 24-27,88-91
node 6 size: 64509 MB
node 6 free: 64350 MB
node 7 cpus: 28-31,92-95
node 7 size: 64509 MB
node 7 free: 64310 MB
node 8 cpus: 32-35,96-99
node 8 size: 64509 MB
node 8 free: 64342 MB
node 9 cpus: 36-39,100-103
node 9 size: 64476 MB
node 9 free: 64284 MB
node 10 cpus: 40-43,104-107
node 10 size: 64509 MB
node 10 free: 64347 MB
node 11 cpus: 44,47,108-111
node 11 size: 64509 MB
node 11 free: 64343 MB
node 12 cpus: 48-51,112-115
node 12 size: 64509 MB
node 12 free: 64313 MB
node 13 cpus: 52-55,116-119
node 13 size: 64509 MB
node 13 free: 64265 MB
node 14 cpus: 56-59,120-123
node 14 size: 64509 MB
node 14 free: 64334 MB
node 15 cpus: 60-63,124-127
node 15 size: 64503 MB
node 15 free: 64285 MB
node distances:
node 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
0: 10 20 30 30 30 30 30 30 30 30 30 30 30 30 30
1: 20 30 40 30 30 30 30 30 30 30 30 30 30 30 30
2: 30 40 30 20 30 30 30 30 30 30 30 30 30 30 30
3: 30 30 20 30 30 30 30 30 30 30 30 30 30 30 30
4: 30 30 30 30 10 20 30 30 30 30 30 30 30 30 30
5: 30 30 30 30 10 20 30 30 30 30 30 30 30 30 30
6: 30 30 30 30 10 20 30 30 30 30 30 30 30 30 30
7: 30 30 30 30 20 10 30 30 30 30 30 30 30 30 30
8: 30 30 30 30 30 20 10 30 30 30 30 30 30 30 30
9: 30 30 30 30 30 30 20 10 30 30 30 30 30 30 30
10: 30 30 30 30 30 30 30 20 10 30 30 30 30 30 30
11: 30 30 30 30 30 30 30 20 10 30 30 30 30 30 30
12: 30 30 30 30 30 30 30 20 10 30 30 30 30 30 30
13: 30 30 30 30 30 30 30 20 10 30 30 30 30 30 30
14: 30 30 30 30 30 30 30 20 10 30 30 30 30 30 30
15: 30 30 30 30 30 30 30 20 10 30 30 30 30 30 30

9. /proc/meminfo
MemTotal: 1056466568 kB

10. who -r
run-level 5 Jun 27 18:30

(Continued on next page)
Platform Notes (Continued)

11. Systemd service manager version: systemd 249 (249.11-0ubuntu3.4)
   Default Target Status
   graphical degraded

12. Failed units, from systemctl list-units --state=failed
   UNIT LOAD ACTIVE SUB DESCRIPTION
   * systemd-networkd-wait-online.service loaded failed failed Wait for Network to be Configured

13. Services, from systemctl list-unit-files
   STATE UNIT FILES
   enabled ModemManager apparmor blk-availability cloud-config cloud-final cloud-init
cloud-init-local console-setup cron dmesg e2fsck_reap finalrd getty@ gpu-manager
   grub-common grub-initrd-fallback irqbalance keyboard-setup lvm2-monitor ixd-agent
   multipathd networkd-dispatcher open-iscsi open-vm-tools pollinate rsyslog secureboot-db
   setvtrgb snapd ssh systemd-networkd systemd-networkd-wait-online systemd-pstore
   systemd-resolved systemd-timesyncd thermal tuned ua-reboot-cmds ubuntu-advantage udisks2
   ufw unattended-upgrades vgauth
   enabled-runtime netplan-ovs-clean systemd-fsck-root systemd-remount-fs
   disabled console-getty debug-shell isciddm nftables powertop rsync serial-getty@
   systemd-boot-check-no-failures systemd-network-generator systemd-sysexit
   systemd-time-wait-sync upower
   generated apport
   indirect uuidd
   masked cryptdisks cryptdisks-early hwclock lvm2 multipath-tools-boot rc rcS screen-cleanup sudo
   xll-common

14. Linux kernel boot-time arguments, from /proc/cmdline
   BOOT_IMAGE=/vmlinuz-5.15.0-43-generic
   root=/dev/mapper/ubuntu--vg-ubuntu--lv

15. cpupower frequency-info
   analyzing CPU 0:
   Unable to determine current policy
   boost state support: Supported: yes
   Active: yes

16. tuned-adm active
   Current active profile: throughput-performance

17. sysct1
   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

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

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Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL560 Gen11
(2.90 GHz, Intel Xeon Platinum 8444H)

SPECrate®2017_fp_base = 896
SPECrate®2017_fp_peak = 913

Platform Notes (Continued)

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

18. /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

19. /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

20. OS release
    From /etc/*-release /etc/*-version
    os-release Ubuntu 22.04.1 LTS

21. Disk information
    SPEC is set to: /home/cpu2017
    Filesystem Type Size Used Avail Use% Mounted on
    /dev/mapper/ubuntu--vg-ubuntu--lv ext4 437G 210G 209G 51% /

22. /sys/devices/virtual/dmi/id
    Vendor: HPE
    Product: ProLiant DL560 Gen11
    Product Family: ProLiant
    Serial: CNX22605RZ

23. 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:
    28x Hynix HMCGB88AEBA16BN 32 GB 2 rank 4800
    3x Hynix HMCGB88MEBRA11SN 32 GB 2 rank 4800
    1x Hynix HMCGB88MEBRA11SN 32 GB 2 rank 4800
    32x UNKNOWN NOT AVAILABLE

24. BIOS
    (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor: HPE

(Continued on next page)
Hewlett Packard Enterprise
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<table>
<thead>
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<th>CPU2017 License: 3</th>
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<td>Hardware Availability: May-2023</td>
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<tr>
<td>Tested by: HPE</td>
<td>Software Availability: Dec-2022</td>
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**Platform Notes (Continued)**

- BIOS Version: 1.30
- BIOS Date: 03/01/2023
- BIOS Revision: 1.30
- Firmware Revision: 1.20

**Compiler Version Notes**

```plaintext
<table>
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<tr>
<th>C</th>
<th>519.1bm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak)</th>
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<th>511.povray_r(base, peak) 526.blender_r(base, peak)</th>
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</table>
```
### 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.cactusBSSN_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 -gopt-mem-layout-trans=4
- -Wno-implicit-int -mprefer-vector-width=512 -ljemalloc
- -L/usr/local/jemalloc64-5.0.1/lib

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

Hewlett Packard Enterprise
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Base Optimization Flags (Continued)

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

Peak Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifx

Benchmarks using both Fortran and C:
ifx icx

(Continued on next page)
**Peak Compiler Invocation (Continued)**

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`: basepeak = yes

C++ benchmarks:
- `508.namd_r`: basepeak = yes

Fortran benchmarks:
- `503.bwaves_r`: basepeak = yes
- `549.fotonik3d_r`: basepeak = yes
- `554.roms_r`: basepeak = yes

Benchmarks using both Fortran and C:

(Continued on next page)
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Tested by: HPE
Software Availability: Dec-2022

Peak Optimization Flags (Continued)

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
 -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-rev1.2.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-rev1.2.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.

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