### SPEC CPU®2017 Floating Point Rate Result

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

**ProLiant DL110 Gen11**
(2.10 GHz, Intel Xeon Gold 5412U)

**SPECrater®2017_fp_base = 280**
**SPECrater®2017_fp_peak = 289**

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name: Intel Xeon Gold 5412U</td>
<td>OS: Red Hat Enterprise Linux 9.0 (Plow)</td>
</tr>
<tr>
<td>Max MHz: 3900</td>
<td>Kernel 5.14.0-70.13.1.el9_0.x86_64</td>
</tr>
<tr>
<td>Nominal: 2100</td>
<td>Compiler: C/C++: Version 2023.0 of Intel oneAPI DPC++/C++</td>
</tr>
<tr>
<td>Enabled: 24 cores, 1 chip, 2 threads/core</td>
<td>Compiler for Linux;</td>
</tr>
<tr>
<td>Orderable: 1 Chip</td>
<td>Fortran: Version 2023.0 of Intel Fortran Compiler</td>
</tr>
<tr>
<td>Cache L1: 32 KB I + 48 KB D on chip per core</td>
<td>Parallel: No</td>
</tr>
<tr>
<td>L2: 2 MB I+D on chip per core</td>
<td>Firmware: HPE BIOS Version v1.50 (07/12/2023) released</td>
</tr>
<tr>
<td>L3: 45 MB I+D on chip per chip</td>
<td>Jul-2023</td>
</tr>
<tr>
<td>Other: None</td>
<td>File System: xfs</td>
</tr>
<tr>
<td>Memory: 256 GB (8 x 32 GB 2Rx8 PC5-4800B-R, running at 4400)</td>
<td>System State: Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Storage: 1 x 480 GB Embedded SATA M.2 drive</td>
<td>Base Pointers: 64-bit</td>
</tr>
<tr>
<td>Other: None</td>
<td>Peak Pointers: 64-bit</td>
</tr>
<tr>
<td>Power Management: BIOS and OS set to prefer performance at the cost of additional power usage</td>
<td></td>
</tr>
</tbody>
</table>

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**CPU2017 License:** 3  
**Test Sponsor:** HPE  
**Tested by:** HPE  
**Hardware Availability:** Oct-2023  
**Software Availability:** Dec-2022  
**Test Date:** Sep-2023  
**Hardware**

| Software | | |
|----------|----------|
| OS: Red Hat Enterprise Linux 9.0 (Plow) | Compiler: C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ |
| Kernel 5.14.0-70.13.1.el9_0.x86_64 | Compiler for Linux; |
| Compiler: C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ | Fortran: Version 2023.0 of Intel Fortran Compiler for Linux; |
| Parallel: No | Firmware: HPE BIOS Version v1.50 (07/12/2023) released |
| File System: xfs | Jul-2023 |
| System State: Run level 3 (multi-user) | Base Pointers: 64-bit |
| Base Pointers: 64-bit | Peak Pointers: 64-bit |
| Other: jemalloc memory allocator V5.0.1 | Other: |
| Power Management: BIOS and OS set to prefer performance at the cost of additional power usage | |
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>503.bwaves_r</td>
<td>48</td>
<td>341</td>
<td>1410</td>
<td>340</td>
<td>1420</td>
<td><strong>340</strong></td>
<td><strong>1410</strong></td>
<td>48</td>
<td>341</td>
<td>1410</td>
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<td>507.cactuBSSN_r</td>
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<td>340</td>
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<td>341</td>
<td><strong>179</strong></td>
<td><strong>340</strong></td>
<td>24</td>
<td><strong>82.2</strong></td>
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<td>371</td>
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<tr>
<td>508.namd_r</td>
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<td><strong>293</strong></td>
<td><strong>156</strong></td>
<td>292</td>
<td>156</td>
<td>293</td>
<td>156</td>
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<td><strong>293</strong></td>
<td><strong>156</strong></td>
<td>292</td>
<td>156</td>
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<tr>
<td>510.parest_r</td>
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<td>861</td>
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<td>251</td>
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<td><strong>448</strong></td>
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<td>433</td>
<td>259</td>
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<td>519.lbm_r</td>
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<tr>
<td>544.nab_r</td>
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<td>478</td>
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<td>478</td>
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<td>478</td>
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<tr>
<td>549.fotonik3d_r</td>
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<td>840</td>
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<td><strong>841</strong></td>
<td>222</td>
<td>842</td>
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<td>48</td>
<td>840</td>
<td>223</td>
<td><strong>841</strong></td>
<td>222</td>
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<tr>
<td>554.roms_r</td>
<td>48</td>
<td>627</td>
<td>122</td>
<td><strong>627</strong></td>
<td>122</td>
<td>629</td>
<td>121</td>
<td>24</td>
<td>273</td>
<td>140</td>
<td>273</td>
<td>140</td>
</tr>
</tbody>
</table>

**SPECrate®2017_fp_base = 280**

**SPECrate®2017_fp_peak = 289**

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"
- 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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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 0x2b0004b1 for
the Intel Xeon Gold 5412U 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 Wed Sep 27 13:55:38 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.e19_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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<table>
<thead>
<tr>
<th>CPU2017 License: 3</th>
<th>Test Date: Sep-2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor: HPE</td>
<td>Hardware Availability: Oct-2023</td>
</tr>
<tr>
<td>Tested by: HPE</td>
<td>Software Availability: Dec-2022</td>
</tr>
</tbody>
</table>

**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 GNU/Linux
   ```

2. `w`
   
   ```
   13:55:38 up 2 min, 0 users, load average: 0.02, 0.02, 0.00
   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) 102981
   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) 102981
   virtual memory (kbytes, -v) unlimited
   file locks (-x) unlimited
   ```

5. `sysinfo process ancestry`
   
   ```
   /usr/lib/systemd/systemd --switched-root --system --deserialize 18
   sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
   sshd: root [priv]
   sshd: root@notty
   bash -c cd $SPEC/fprate.sh
   runcpu --nobuild --action validate --define default-platform-flags --define numcopies=48 --c
   ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=24 --define physicalfirst
   --define no-numa --tune base,peak --all --define drop_caches fprate
   runcpu --nobuild --action validate --define default-platform-flags --define numcopies=48 --configfile
   ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=24 --define physicalfirst
   --define no-numa --tune base,peak --output_format all --define drop_caches --nopower --runmode rate --tune
   base:peak --size refrate fprate --nopreenv --note-preenv --logfile
   $SPEC/tmp/CP2017.002/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) Gold 5412U
   vendor_id : GenuineIntel
   cpu family : 6
   model : 143
   ```

(Continued on next page)
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| Tested by: | HPE |

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### Platform Notes (Continued)

- **stepping**: 7
- **microcode**: 0x2b0004b1
- **bugs**: spectre_v1 spectre_v2 spec_store_bypass swaps
- **cpu cores**: 24
- **siblings**: 48
- 1 physical id (chips)
- 48 processors (hardware threads)
- physical id 0: core ids 0-23
- physical id 0: apicids 0-47

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

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7. lscpu

From lscpu from util-linux 2.37.4:

- **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)**: 48
- **On-line CPU(s) list**: 0-47
- **Vendor ID**: GenuineIntel
- **BIOS Vendor ID**: Intel(R) Corporation
- **Model name**: Intel(R) Xeon(R) Gold 5412U
- **BIOS Model name**: Intel(R) Xeon(R) Gold 5412U
- **CPU family**: 6
- **Model**: 143
- **Thread(s) per core**: 2
- **Core(s) per socket**: 24
- **Socket(s)**: 1
- **Stepping**: 7
- **BogoMIPS**: 4200.00

**Flags**:

- fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36
- clflush dtc acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdscsp
- lm constant_tsc art arch_perfmon pebs bts rep_good nopl stpmt size_unaligned_store_cl invalidOpcode intdivision hardware_f Crosstalk
- nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor
- mtrr pge mca cmov pat pse36 master tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36
- clflush dtc acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdscsp
- lm constant_tsc art arch_perfmon pebs bts rep_good nopl stpmt size_unaligned_store_cl invalidOpcode intdivision
crosstalk
- nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor
- mtrr pge mca cmov pat pse36 master tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36

crosstalk

- **Virtualization**: VT-x
- **L1d cache**: 1.1 MiB (24 instances)
- **L1i cache**: 768 KiB (24 instances)
- **L2 cache**: 48 MiB (24 instances)
- **L3 cache**: 45 MiB (1 instance)
- **NUMA node(s)**: 1
- **NUMA node0 CPU(s)**: 0-47

Vulnerability Itlb multihit: Not affected
Vulnerability L1tf: Not affected
Vulnerability Mds: Not affected

(Continued on next page)
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Platform Notes (Continued)

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 Srbd: Not affected
Vulnerability Txs async abort: Not affected

From lscpu --cache:

<table>
<thead>
<tr>
<th>NAME</th>
<th>ONE-SIZE</th>
<th>ALL-SIZE</th>
<th>WAYS</th>
<th>TYPE</th>
<th>LEVEL</th>
<th>SETS</th>
<th>PHY-LINE</th>
<th>COHERENCY-SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1d</td>
<td>48K</td>
<td>1.1M</td>
<td>12</td>
<td>Data</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
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<tr>
<td>L1i</td>
<td>32K</td>
<td>768K</td>
<td>8</td>
<td>Instruction</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L2</td>
<td>2M</td>
<td>48M</td>
<td>16</td>
<td>Unified</td>
<td>2</td>
<td>2048</td>
<td>1</td>
<td>64</td>
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<tr>
<td>L3</td>
<td>45M</td>
<td>45M</td>
<td>15</td>
<td>Unified</td>
<td>3</td>
<td>49152</td>
<td>1</td>
<td>64</td>
</tr>
</tbody>
</table>

8. numactl --hardware

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

available: 1 nodes (0)
node 0 cpus: 0-47
node 0 size: 257492 MB
node 0 free: 256434 MB
node distances:
node 0
0: 10

9. /proc/meminfo

MemTotal: 263672508 kB

10. who -r

run-level 3 Sep 27 13:53

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 firewall@ getty@ irqbalance ldmd lvm2-monitor mdmonitor microcode
nfs-domainname rhsmcertd rsyslog selinux-autorelabel-mark sshd sshd
systemd-network-generator tuned udisks2
enabled-runtime systemd-remount-fs
disabled blk-availability cron wait console-getty cpupower debug-shell hwloc-dump-hwdata kvm_stat
man-db-restart-cache-update nftables powertop rdisc rsys-rhsm-facts rpmdb-rebuild
serial-getty@ sshd-keygen@ systemd-boot-check-no-failures systemd-notify systemd-syslog
indirect ssad-autofs ssad-ckm ssad-ns ssad-pac ssad-ssr sshd-sshd

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

(Continued on next page)
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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               0
   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)
   redhat-release Red Hat Enterprise Linux release 9.0 (Plow)
   system-release Red Hat Enterprise Linux release 9.0 (Plow)

20. Disk information

(Continued on next page)
Platform Notes (Continued)

SPEC is set to: /home/cpu2017
Filesystem  Type Size  Used Avail Use% Mounted on
/dev/mapper/rhel-home xfs   372G  89G  283G 24% /home

21. /sys/devices/virtual/dmi/id
Vendor:         HPE
Product:        ProLiant DL110 Gen11
Product Family: ProLiant
Serial:         7CE244P9LL

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 HMCG88MEBRA113N 32 GB 2 rank 4800, configured at 4400
1x Hynix HMCG88MEBRA115N 32 GB 2 rank 4800, configured at 4400

23. BIOS
(This section combines info from /sys/devices and dmidecode.)
BIOS Vendor:       HPE
BIOS Version:      1.50
BIOS Date:         07/12/2023
BIOS Revision:     1.50
Firmware Revision: 1.50

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

C++, C, Fortran | 507.cactuBSSN_r(base, peak)
(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL110 Gen11
(2.10 GHz, Intel Xeon Gold 5412U)

SPEC CPU®2017 Floating Point Rate Result
Copyright 2017-2023 Standard Performance Evaluation Corporation

SPECrater®2017_fp_base = 280
SPECrater®2017_fp_peak = 289

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

Compiler Version Notes (Continued)

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)

---

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)

---

Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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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.cactusBSSN_r: -DSPEC_LP64

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL110 Gen11
(2.10 GHz, Intel Xeon Gold 5412U)

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Hewlett Packard Enterprise
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ProLiant DL110 Gen11
(2.10 GHz, Intel Xeon Gold 5412U)

SPECrate®2017_fp_base = 280
SPECrate®2017_fp_peak = 289

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

Test Date: Sep-2023
Hardware Availability: Oct-2023
Software Availability: Dec-2022

Base Portability Flags (Continued)

508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.libm_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
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

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

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL110 Gen11
(2.10 GHz, Intel Xeon Gold 5412U)  

SPECrater®2017_fp_base = 280
SPECrater®2017_fp_peak = 289

CUP2017 License: 3
Test Sponsor: HPE
Tested by: HPE
Test Date: Sep-2023
Hardware Availability: Oct-2023
Software Availability: Dec-2022

Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++:
-w -m64 -std=c++14 -std=cl11 -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
538.imagick_r: basepeak = yes

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

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Optimization Flags</th>
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<tbody>
<tr>
<td>544.nab_r</td>
<td>basepeak = yes</td>
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<tr>
<td>C++ benchmarks:</td>
<td></td>
</tr>
<tr>
<td>508.namd_r</td>
<td>basepeak = yes</td>
</tr>
<tr>
<td>510.parest_r</td>
<td>-w -std=c++14 -m64 -W1,-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</td>
</tr>
<tr>
<td>Fortran benchmarks:</td>
<td></td>
</tr>
<tr>
<td>503.bwaves_r</td>
<td>basepeak = yes</td>
</tr>
<tr>
<td>549.fotonik3d_r</td>
<td>basepeak = yes</td>
</tr>
<tr>
<td>554.roms_r</td>
<td>-w -m64 -W1,-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</td>
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<tr>
<td>Benchmarks using both Fortran and C:</td>
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<td>521.wrf_r</td>
<td>basepeak = yes</td>
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<tr>
<td>527.cam4_r</td>
<td>basepeak = yes</td>
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<tr>
<td>Benchmarks using both C and C++:</td>
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</tr>
<tr>
<td>511.povray_r</td>
<td>-w -std=c++14 -m64 -std=c11 -W1,-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</td>
</tr>
<tr>
<td>526.blender_r</td>
<td>basepeak = yes</td>
</tr>
<tr>
<td>Benchmarks using Fortran, C, and C++:</td>
<td></td>
</tr>
</tbody>
</table>
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL110 Gen11
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SPEC CPU®2017 Floating Point Rate Result
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<th>Test Date:</th>
<th>Sep-2023</th>
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<tr>
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<td>Tested by: HPE</td>
<td>Software Availability:</td>
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</table>

**SPECrate®2017_fp_base = 280**
**SPECrate®2017_fp_peak = 289**

**Peak Optimization Flags (Continued)**

Benchmarks using Fortran, C, and C++ (continued):
- -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-rev2.4.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-rev2.4.xml

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