SPEC CPU®2017 Floating Point Speed Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

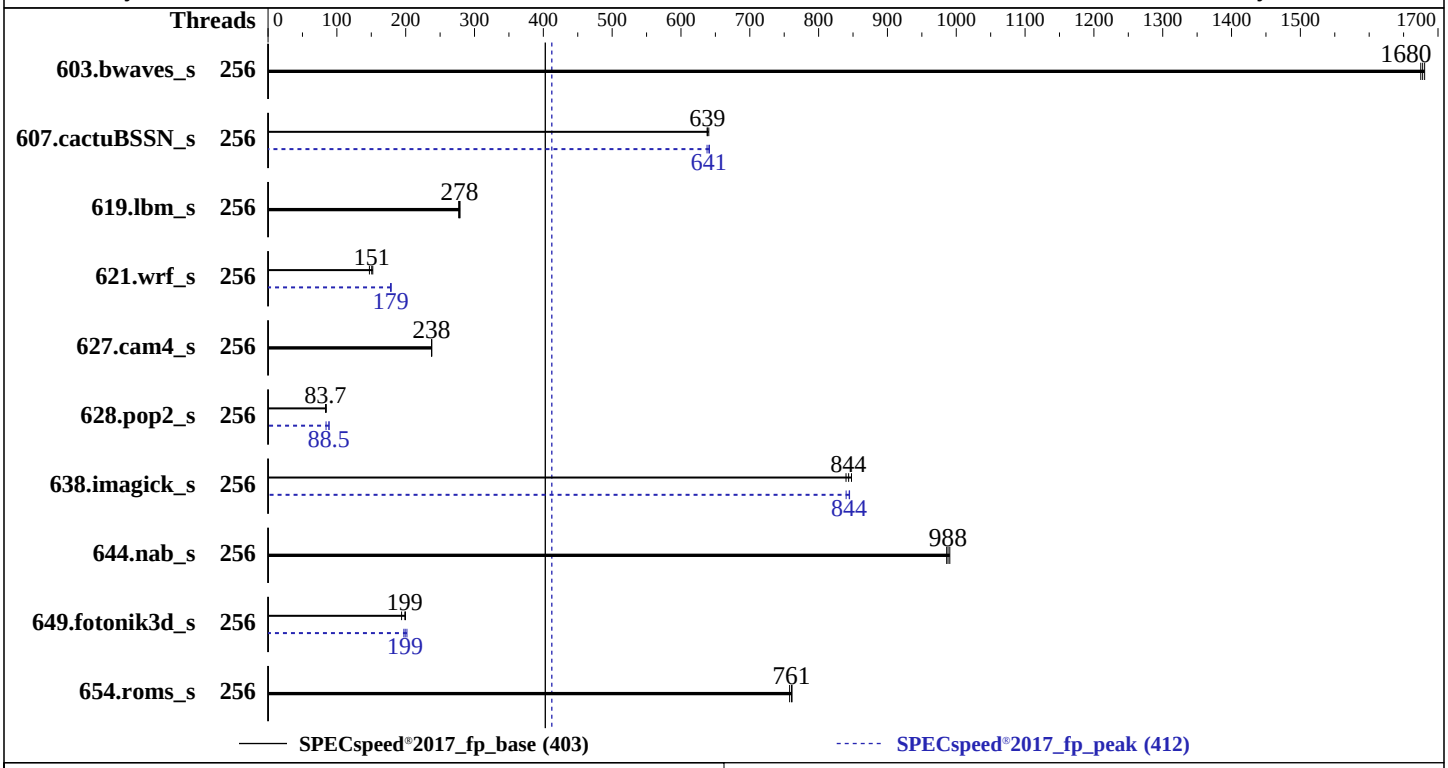
ProLiant DL385 Gen11
(2.25 GHz, AMD EPYC 9754)

SPECspeed®2017_fp_base = 403

SPECspeed®2017_fp_peak = 412

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

Test Date: May-2023
Hardware Availability: Jun-2023
Software Availability: Nov-2022



Hardware

CPU Name:	AMD EPYC 9754
Max MHz:	3100
Nominal:	2250
Enabled:	256 cores, 2 chips
Orderable:	1,2 chips
Cache L1:	32 KB I + 32 KB D on chip per core
L2:	1 MB I+D on chip per core
L3:	256 MB I+D on chip per chip, 16 MB shared / 8 cores
Other:	None
Memory:	1536 GB (24 x 64 GB 2Rx4 PC5-4800B-R)
Storage:	1 x 480 GB SATA 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++/Fortran: Version 4.0.0 of AOCC
Parallel:	Yes
Firmware:	HPE BIOS Version v1.30 03/06/2023 released Mar-2023
File System:	xfs
System State:	Run level 3 (multi-user)
Base Pointers:	64-bit
Peak Pointers:	64-bit
Other:	None
Power Management:	BIOS and OS set to prefer performance at the cost of additional power usage

Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	256	35.1	1680	**35.2**	**1680**	35.2	1670	256	35.1	1680	**35.2**	**1680**	35.2	1670
607.cactuBSSN_s	256	26.1	638	**26.1**	**639**	26.0	640	256	26.1	638	**26.0**	**641**	26.0	641
619.lbm_s	256	18.8	279	18.9	277	**18.8**	**278**	256	18.8	279	18.9	277	**18.8**	**278**
621.wrf_s	256	86.9	152	89.8	147	**87.8**	**151**	256	74.3	178	**74.1**	**179**	74.0	179
627.cam4_s	256	**37.3**	**238**	37.3	238	37.3	237	256	**37.3**	**238**	37.3	238	37.3	237
628.pop2_s	256	140	84.6	142	83.6	**142**	**83.7**	256	141	84.3	**134**	**88.5**	134	88.7
638.imagick_s	256	**17.1**	**844**	17.2	840	17.0	848	256	17.2	840	**17.1**	**844**	17.1	845
644.nab_s	256	17.7	986	17.6	991	**17.7**	**988**	256	17.7	986	17.6	991	**17.7**	**988**
649.fotonik3d_s	256	45.6	200	**45.9**	**199**	47.0	194	256	45.2	202	**45.7**	**199**	46.2	197
654.roms_s	256	20.7	761	**20.7**	**761**	20.8	758	256	20.7	761	**20.7**	**761**	20.8	758

SPECspeed®2017_fp_base = 403

SPECspeed®2017_fp_peak = 412

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Compiler Notes

```
The AMD64 AOCC Compiler Suite is available at
http://developer.amd.com/amd-aocc/
```

Submit Notes

```
The config file option 'submit' was used.
'numactl' was used to bind copies to the cores.
See the configuration file for details.
```

Operating System Notes

```
'ulimit -s unlimited' was used to set environment stack size limit
'ulimit -l 2097152' was used to set environment locked pages in memory limit

runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>

To limit dirty cache to 8% of memory, 'sysctl -w vm.dirty_ratio=8' run as root.
To limit swap usage to minimum necessary, 'sysctl -w vm.swappiness=1' run as root.
To free node-local memory and avoid remote memory usage,
'sysctl -w vm.zone_reclaim_mode=1' run as root.
To clear filesystem caches, 'sync; sysctl -w vm.drop_caches=3' run as root.
To disable address space layout randomization (ASLR) to reduce run-to-run
variability, 'sysctl -w kernel.randomize_va_space=0' run as root.

To enable Transparent Hugepages (THP) for all allocations,
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.
To always enable THP for peak runs of:
603.bwaves_s, 607.cactuBSSN_s, 619.lbm_s, 627.cam4_s, 628.pop2_s, 638.imagick_s, 644.nab_s, 649.fotonik3d_s:
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled; echo always > /sys/kernel/mm/transparent_hugepage/defrag'
run as root.
To disable THP for peak runs of 621.wrf_s:
```

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Operating System Notes (Continued)

```
'echo never > /sys/kernel/mm/transparent_hugepage/enabled; echo always > /sys/kernel/mm/transparent_hugepage/defrag'
run as root.
To enable THP only on request for peak runs of 654.roms_s:
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled; echo madvise > /sys/kernel/mm/transparent_hugepage/defrag'
run as root.
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-255"
LD_LIBRARY_PATH = "/home/cpu2017/amd_speed_aocc400_genoa_B_lib/lib:"
LIBOMP_NUM_HIDDEN_HELPER_THREADS = "0"
MALLOC_CONF = "oversize_threshold:0,retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "256"

Environment variables set by runcpu during the 607.cactuBSSN_s peak run:
GOMP_CPU_AFFINITY = "0-255"

Environment variables set by runcpu during the 621.wrf_s peak run:
GOMP_CPU_AFFINITY = "0-255"

Environment variables set by runcpu during the 628.pop2_s peak run:
GOMP_CPU_AFFINITY = "0-255"

Environment variables set by runcpu during the 638.imagick_s peak run:
GOMP_CPU_AFFINITY = "0-255"

Environment variables set by runcpu during the 649.fotonik3d_s peak run:
GOMP_CPU_AFFINITY = "0-255"
PGHPF_ZMEM = "yes"
```

General Notes

```
Binaries were compiled on a system with 2x AMD EPYC 9174F CPU + 1.5TiB Memory using RHEL 8.6

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

```
BIOS Configuration
 Workload Profile set to General Peak Frequency Compute
 Determinism Control set to Manual
 Performance Determinism set to Power Deterministic
 AMD SMT Option set to Disabled
 Last-Level Cache (LLC) as NUMA Node set to Enabled
 ACPI CST C2 Latency set to 18 microseconds
```

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Platform Notes (Continued)

```
 Thermal Configuration set to Maximum Cooling
 Workload Profile set to Custom
   Power Regulator set to OS Control Mode
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 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost.localdomain Thu Apr  7 05:38:12 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
  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
 ------------------------------------------------------------

 ------------------------------------------------------------
 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
    05:38:12 up 8 min,  2 users,  load average: 0.00, 0.06, 0.05
   USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
   root     tty1      05:32    5:47   0.00s  0.00s -bash
   root     pts/0     05:32   12.00s  1.14s  0.05s /bin/bash ./amd_speed_aocc400_genoa_B1.sh

 ------------------------------------------------------------
 3. Username
   From environment variable $USER:  root

 ------------------------------------------------------------
 4. ulimit -a
   real-time non-blocking time  (microseconds, -R) unlimited
   core file size              (blocks, -c) 0
```

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Platform Notes (Continued)

```
   data seg size               (kbytes, -d) unlimited
   scheduling priority                 (-e) 0
   file size                   (blocks, -f) unlimited
   pending signals                     (-i) 6191076
   max locked memory           (kbytes, -l) 2097152
   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) 6191076
   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@pts/0
 -bash
 python3 ./run_fpspeed.py
 /bin/bash ./amd_speed_aocc400_genoa_B1.sh
 runcpu --config amd_speed_aocc400_genoa_B1.cfg --tune all --reportable --iterations 3 fpspeed
 runcpu --configfile amd_speed_aocc400_genoa_B1.cfg --tune all --reportable --iterations 3 --nopower
   --runmode speed --tune base:peak --size test:train:refspeed fpspeed --nopreenv --note-preenv --logfile
   $SPEC/tmp/CPU2017.002/templogs/preenv.fpspeed.002.0.log --lognum 002.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017

------------------------------------------------------------
6. /proc/cpuinfo
    model name      : AMD EPYC 9754 128-Core Processor
    vendor_id       : AuthenticAMD
    cpu family      : 25
    model           : 160
    stepping        : 2
    bugs            : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
    TLB size        : 3584 4K pages
    cpu cores       : 128
    siblings        : 128
    2 physical ids (chips)
    256 processors (hardware threads)
    physical id 0: core ids
    0-7,16-23,32-39,48-55,64-71,80-87,96-103,112-119,128-135,144-151,160-167,176-183,192-199,208-215,224-231,
    240-247
    physical id 1: core ids
    0-7,16-23,32-39,48-55,64-71,80-87,96-103,112-119,128-135,144-151,160-167,176-183,192-199,208-215,224-231,
    240-247
    physical id 0: apicids
    0-7,16-23,32-39,48-55,64-71,80-87,96-103,112-119,128-135,144-151,160-167,176-183,192-199,208-215,224-231,
    240-247
    physical id 1: apicids
    256-263,272-279,288-295,304-311,320-327,336-343,352-359,368-375,384-391,400-407,416-423,432-439,448-455,4
    64-471,480-487,496-503
  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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Platform Notes (Continued)

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

From lscpu from util-linux 2.37.4:
  Architecture:                    x86_64
  CPU op-mode(s):                  32-bit, 64-bit
  Address sizes:                   52 bits physical, 57 bits virtual
  Byte Order:                      Little Endian
  CPU(s):                          256
  On-line CPU(s) list:             0-255
  Vendor ID:                       AuthenticAMD
  BIOS Vendor ID:                  Advanced Micro Devices, Inc.
  Model name:                      AMD EPYC 9754 128-Core Processor
  BIOS Model name:                 AMD EPYC 9754 128-Core Processor
  CPU family:                      25
  Model:                           160
  Thread(s) per core:              1
  Core(s) per socket:              128
  Socket(s):                       2
  Stepping:                        2
  Frequency boost:                 enabled
  CPU max MHz:                     2250.0000
  CPU min MHz:                     1500.0000
  BogoMIPS:                        4493.40
  Flags:                           fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36
                                   clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp lm
                                   constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid aperfmperf rapl
                                   pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe
                                   popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy
                                   abm sse4a misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext
                                   perfctr_core perfctr_nb bpext perfctr_llc mwaitx cpb cat_l3 cdp_l3
                                   invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsgsbase bmi1
                                   avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap
                                   avx512ifma clflushopt clwb avx512cd sha_ni avx512bw avx512vl xsaveopt
                                   xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
                                   avx512_bf16 clzero irperf xsaveerptr rdpru wbnoinvd amd_ppin arat npt lbrv
                                   svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists
                                   pausefilter pfthreshold avic v_vmsave_vmload vgif v_spec_ctrl avx512vbmi
                                   umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg
                                   avx512_vpopcntdq la57 rdpid overflow_recov succor smca fsrm flush_l1d
  Virtualization:                  AMD-V
  L1d cache:                       8 MiB (256 instances)
  L1i cache:                       8 MiB (256 instances)
  L2 cache:                        256 MiB (256 instances)
  L3 cache:                        512 MiB (32 instances)
  NUMA node(s):                    32
  NUMA node0 CPU(s):               0-7
  NUMA node1 CPU(s):               8-15
  NUMA node2 CPU(s):               64-71
  NUMA node3 CPU(s):               72-79
  NUMA node4 CPU(s):               32-39
  NUMA node5 CPU(s):               40-47
  NUMA node6 CPU(s):               96-103
  NUMA node7 CPU(s):               104-111
  NUMA node8 CPU(s):               48-55
  NUMA node9 CPU(s):               56-63
  NUMA node10 CPU(s):              112-119
  NUMA node11 CPU(s):              120-127
  NUMA node12 CPU(s):              16-23
  NUMA node13 CPU(s):              24-31
```

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Platform Notes (Continued)

```
  NUMA node14 CPU(s):              80-87
  NUMA node15 CPU(s):              88-95
  NUMA node16 CPU(s):              128-135
  NUMA node17 CPU(s):              136-143
  NUMA node18 CPU(s):              192-199
  NUMA node19 CPU(s):              200-207
  NUMA node20 CPU(s):              160-167
  NUMA node21 CPU(s):              168-175
  NUMA node22 CPU(s):              224-231
  NUMA node23 CPU(s):              232-239
  NUMA node24 CPU(s):              176-183
  NUMA node25 CPU(s):              184-191
  NUMA node26 CPU(s):              240-247
  NUMA node27 CPU(s):              248-255
  NUMA node28 CPU(s):              144-151
  NUMA node29 CPU(s):              152-159
  NUMA node30 CPU(s):              208-215
  NUMA node31 CPU(s):              216-223
  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; Retpolines, IBPB conditional, IBRS_FW, STIBP disabled, 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       32K       8M    8 Data            1    64        1             64
     L1i       32K       8M    8 Instruction     1    64        1             64
     L2         1M     256M    8 Unified         2  2048        1             64
     L3        16M     512M   16 Unified         3 16384        1             64

------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
  available: 32 nodes (0-31)
  node 0 cpus: 0-7
  node 0 size: 48135 MB
  node 0 free: 47914 MB
  node 1 cpus: 8-15
  node 1 size: 48382 MB
  node 1 free: 48228 MB
  node 2 cpus: 64-71
  node 2 size: 48382 MB
  node 2 free: 48236 MB
  node 3 cpus: 72-79
  node 3 size: 48382 MB
  node 3 free: 48238 MB
  node 4 cpus: 32-39
  node 4 size: 48382 MB
  node 4 free: 48179 MB
  node 5 cpus: 40-47
  node 5 size: 48382 MB
  node 5 free: 48036 MB
  node 6 cpus: 96-103
  node 6 size: 48382 MB
```

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Platform Notes (Continued)

```
node 6 free: 48235 MB
node 7 cpus: 104-111
node 7 size: 48382 MB
node 7 free: 48234 MB
node 8 cpus: 48-55
node 8 size: 48382 MB
node 8 free: 48226 MB
node 9 cpus: 56-63
node 9 size: 48382 MB
node 9 free: 48224 MB
node 10 cpus: 112-119
node 10 size: 48382 MB
node 10 free: 48238 MB
node 11 cpus: 120-127
node 11 size: 48382 MB
node 11 free: 47825 MB
node 12 cpus: 16-23
node 12 size: 48382 MB
node 12 free: 48227 MB
node 13 cpus: 24-31
node 13 size: 48382 MB
node 13 free: 48176 MB
node 14 cpus: 80-87
node 14 size: 48382 MB
node 14 free: 48234 MB
node 15 cpus: 88-95
node 15 size: 48382 MB
node 15 free: 48019 MB
node 16 cpus: 128-135
node 16 size: 48382 MB
node 16 free: 48294 MB
node 17 cpus: 136-143
node 17 size: 48382 MB
node 17 free: 48270 MB
node 18 cpus: 192-199
node 18 size: 48345 MB
node 18 free: 48178 MB
node 19 cpus: 200-207
node 19 size: 48382 MB
node 19 free: 48240 MB
node 20 cpus: 160-167
node 20 size: 48382 MB
node 20 free: 48258 MB
node 21 cpus: 168-175
node 21 size: 48382 MB
node 21 free: 48236 MB
node 22 cpus: 224-231
node 22 size: 48382 MB
node 22 free: 48240 MB
node 23 cpus: 232-239
node 23 size: 48382 MB
node 23 free: 48242 MB
node 24 cpus: 176-183
node 24 size: 48382 MB
node 24 free: 48225 MB
node 25 cpus: 184-191
node 25 size: 48382 MB
node 25 free: 48255 MB
node 26 cpus: 240-247
node 26 size: 48382 MB
```

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Platform Notes (Continued)

```
node 26 free: 48235 MB
node 27 cpus: 248-255
node 27 size: 48309 MB
node 27 free: 48151 MB
node 28 cpus: 144-151
node 28 size: 48382 MB
node 28 free: 48287 MB
node 29 cpus: 152-159
node 29 size: 48382 MB
node 29 free: 48290 MB
node 30 cpus: 208-215
node 30 size: 48382 MB
node 30 free: 48223 MB
node 31 cpus: 216-223
node 31 size: 48382 MB
node 31 free: 48226 MB
node distances:
node   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24
25  26  27  28  29  30  31
  0:  10  11  11  11  11  11  11  11  11  11  11  11  11  11  11  11  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
  1:  11  10  11  11  11  11  11  11  11  11  11  11  11  11  11  11  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
  2:  11  11  10  11  11  11  11  11  11  11  11  11  11  11  11  11  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
  3:  11  11  11  10  11  11  11  11  11  11  11  11  11  11  11  11  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
  4:  11  11  11  11  10  11  11  11  11  11  11  11  11  11  11  11  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
  5:  11  11  11  11  11  10  11  11  11  11  11  11  11  11  11  11  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
  6:  11  11  11  11  11  11  10  11  11  11  11  11  11  11  11  11  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
  7:  11  11  11  11  11  11  11  10  11  11  11  11  11  11  11  11  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
  8:  11  11  11  11  11  11  11  11  10  11  11  11  11  11  11  11  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
  9:  11  11  11  11  11  11  11  11  11  10  11  11  11  11  11  11  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
 10:  11  11  11  11  11  11  11  11  11  11  10  11  11  11  11  11  32  32  32  32  32  32  32  32  32
 32  32  32  32  32  32  32
 11:  11  11  11  11  11  11  11  11  11  11  11  10  11  11  11  11  32  32  32  32  32  32  32  32  32
 32  32  32  32  32  32  32
 12:  11  11  11  11  11  11  11  11  11  11  11  11  10  11  11  11  32  32  32  32  32  32  32  32  32
 32  32  32  32  32  32  32
 13:  11  11  11  11  11  11  11  11  11  11  11  11  11  10  11  11  32  32  32  32  32  32  32  32  32
 32  32  32  32  32  32  32
 14:  11  11  11  11  11  11  11  11  11  11  11  11  11  11  10  11  32  32  32  32  32  32  32  32  32
 32  32  32  32  32  32  32
 15:  11  11  11  11  11  11  11  11  11  11  11  11  11  11  11  10  32  32  32  32  32  32  32  32  32
 32  32  32  32  32  32  32
 16:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  10  11  11  11  11  11  11  11  11
 11  11  11  11  11  11  11
 17:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  10  11  11  11  11  11  11  11
 11  11  11  11  11  11  11
 18:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  11  10  11  11  11  11  11  11
 11  11  11  11  11  11  11
 19:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  10  11  11  11  11  11
 11  11  11  11  11  11  11
 20:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  10  11  11  11  11
```

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Platform Notes (Continued)

```
    11  11  11  11  11  11  11
    21:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  10  11  11  11
    11  11  11  11  11  11  11
    22:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  11  10  11  11
    11  11  11  11  11  11  11
    23:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  11  11  10  11
    11  11  11  11  11  11  11
    24:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  11  11  11  10
    11  11  11  11  11  11  11
    25:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  11  11  11  11
    10  11  11  11  11  11  11
    26:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  11  11  11  11
    11  10  11  11  11  11  11
    27:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  11  11  11  11
    11  11  10  11  11  11  11
    28:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  11  11  11  11
    11  11  11  10  11  11  11
    29:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  11  11  11  11
    11  11  11  11  10  11  11
    30:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  11  11  11  11
    11  11  11  11  11  10  11
    31:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  11  11  11  11
    11  11  11  11  11  11  10

------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       1585022500 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 lvm2-monitor mdmonitor microcode
                   nis-domainname rhsmcertd 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 cni-dhcp console-getty cpupower debug-shell
                   hwloc-dump-hwdata ipsec kvm_stat man-db-restart-cache-update nftables podman
                   podman-auto-update podman-restart 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=(hd1,gpt2)/vmlinuz-5.14.0-70.13.1.el9_0.x86_64
  root=/dev/mapper/rhel-root
  ro
  resume=/dev/mapper/rhel-swap
  rd.lvm.lv=rhel/root
  rd.lvm.lv=rhel/swap
```

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Platform Notes (Continued)

```
------------------------------------------------------------
14. cpupower frequency-info
  analyzing CPU 0:
    current policy: frequency should be within 1.50 GHz and 2.25 GHz.
                    The governor "performance" may decide which speed to use
                    within this range.
    boost state support:
      Supported: yes
      Active: yes
      Boost States: 0
      Total States: 3
      Pstate-P0:  2250MHz

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

------------------------------------------------------------
16. sysctl
  kernel.numa_balancing               1
  kernel.randomize_va_space           0
  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                      8
  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                       1
  vm.watermark_boost_factor       15000
  vm.watermark_scale_factor          10
  vm.zone_reclaim_mode                1

------------------------------------------------------------
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
```

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Platform Notes (Continued)

```
  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
  Filesystem            Type  Size  Used Avail Use% Mounted on
  /dev/mapper/rhel-home xfs   372G  8.5G  363G   3% /home

------------------------------------------------------------
21. /sys/devices/virtual/dmi/id
    Vendor:         HPE
    Product:        ProLiant DL385 Gen11
    Product Family: ProLiant
    Serial:         DL385G11-003

------------------------------------------------------------
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:
    24x Hynix HMCG94AEBRA103N 64 GB 2 rank 4800


------------------------------------------------------------
23. BIOS
(This section combines info from /sys/devices and dmidecode.)
   BIOS Vendor:       HPE
   BIOS Version:      1.30
   BIOS Date:         03/06/2023
   BIOS Revision:     1.30
   Firmware Revision: 1.20
```

Compiler Version Notes

```
==============================================================================================================
C               | 619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base, peak)
--------------------------------------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
--------------------------------------------------------------------------------------------------------------

==============================================================================================================
C++, C, Fortran | 607.cactuBSSN_s(base, peak)
--------------------------------------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
```

(Continued on next page)

Compiler Version Notes (Continued)

```
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------------------------------------------------

==============================================================================================================
Fortran         | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(base, peak)
------------------------------------------------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------------------------------------------------

==============================================================================================================
Fortran, C      | 621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(base, peak)
------------------------------------------------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`clang`

Fortran benchmarks:
`flang`

Benchmarks using both Fortran and C:
`flang clang`

Benchmarks using Fortran, C, and C++:
`clang++ clang flang`

Base Portability Flags

603.bwaves_s: `-DSPEC_LP64`
607.cactuBSSN_s: `-DSPEC_LP64`
619.lbm_s: `-DSPEC_LP64`
621.wrf_s: `-DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64`
627.cam4_s: `-DSPEC_CASE_FLAG -DSPEC_LP64`

(Continued on next page)

Base Portability Flags (Continued)

628.pop2_s: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64
638.imagick_s: -DSPEC_LP64
644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -zopt -fopenmp=libomp -lomp -lamdlibm -lamdalloc
-lflang

Fortran benchmarks:
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -DSPEC_OPENMP -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -Mrecursive
-funroll-loops -mllvm -lsr-in-nested-loop
-mllvm -reduce-array-computations=3 -zopt -fopenmp=libomp -lomp
-lamdlibm -lamdalloc -lflang

Benchmarks using both Fortran and C:
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -zopt -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -fopenmp=libomp -lomp -lamdlibm -lamdalloc
-lflang

Benchmarks using Fortran, C, and C++:
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3

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Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
`-DSPEC_OPENMP -zopt -mllvm -unroll-threshold=100 -finline-aggressive -mllvm -loop-unswitch-threshold=200000 -Mrecursive -funroll-loops -mllvm -lsr-in-nested-loop -fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang`

Base Other Flags

C benchmarks:
`-Wno-return-type -Wno-unused-command-line-argument`

Fortran benchmarks:
`-Wno-unused-command-line-argument`

Benchmarks using both Fortran and C:
`-Wno-return-type -Wno-unused-command-line-argument`

Benchmarks using Fortran, C, and C++:
`-Wno-return-type -Wno-unused-command-line-argument`

Peak Compiler Invocation

C benchmarks:
`clang`

Fortran benchmarks:
`flang`

Benchmarks using both Fortran and C:
`flang clang`

Benchmarks using Fortran, C, and C++:
`clang++ clang flang`

Peak Portability Flags

`Same as Base Portability Flags`

Peak Optimization Flags

C benchmarks:

619.lbm_s: `basepeak = yes`

638.imagick_s: `-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6 -Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast -march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=9 -mllvm -unroll-threshold=50 -fremap-arrays -fstrip-mining -mllvm -inline-threshold=1000 -mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt -fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang`

644.nab_s: `basepeak = yes`

Fortran benchmarks:

603.bwaves_s: `basepeak = yes`

649.fotonik3d_s: `-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6 -Wl,-mllvm -Wl,-reduce-array-computations=3 -Wl,-mllvm -Wl,-enable-X86-prefetching -DSPEC_OPENMP -Ofast -march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp -flto -Mrecursive -mllvm -reduce-array-computations=3 -zopt -fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang`

654.roms_s: `basepeak = yes`

Benchmarks using both Fortran and C:

621.wrf_s: `-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6 -Wl,-mllvm -Wl,-reduce-array-computations=3 -Wl,-mllvm -Wl,-enable-X86-prefetching -Ofast -march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=9 -mllvm -unroll-threshold=50 -fremap-arrays -fstrip-mining -mllvm -inline-threshold=1000 -mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt -O3 -Mrecursive -funroll-loops -mllvm -lsr-in-nested-loop -fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang`

627.cam4_s: `basepeak = yes`

628.pop2_s: `-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6 -Wl,-mllvm -Wl,-reduce-array-computations=3`

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Peak Optimization Flags (Continued)

628.pop2_s (continued):
-Wl,-mllvm -Wl,-enable-X86-prefetching -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -fstruct-layout=9 -mllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-Mrecursive -fvector-transform -fscalar-transform
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang

Benchmarks using Fortran, C, and C++:
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Ofast -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=9
-mllvm -unroll-threshold=50 -fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000 -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -zopt -finline-aggressive -mllvm -unroll-threshold=100
-Mrecursive -fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang

Peak Other Flags

C benchmarks:
-Wno-return-type -Wno-unused-command-line-argument

Fortran benchmarks:
-Wno-unused-command-line-argument

Benchmarks using both Fortran and C:
-Wno-return-type -Wno-unused-command-line-argument

Benchmarks using Fortran, C, and C++:
-Wno-return-type -Wno-unused-command-line-argument

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-Bergamo-rev1.0.html
http://www.spec.org/cpu2017/flags/aocc400-flags.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-Bergamo-rev1.0.xml
http://www.spec.org/cpu2017/flags/aocc400-flags.xml

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Tested with SPEC CPU®2017 v1.1.9 on 2022-04-06 20:08:12-0400.
Report generated on 2023-06-13 15:15:13 by CPU2017 PS formatter v6716.
Originally published on 2023-06-13.