SPEC CPU®2017 Integer Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

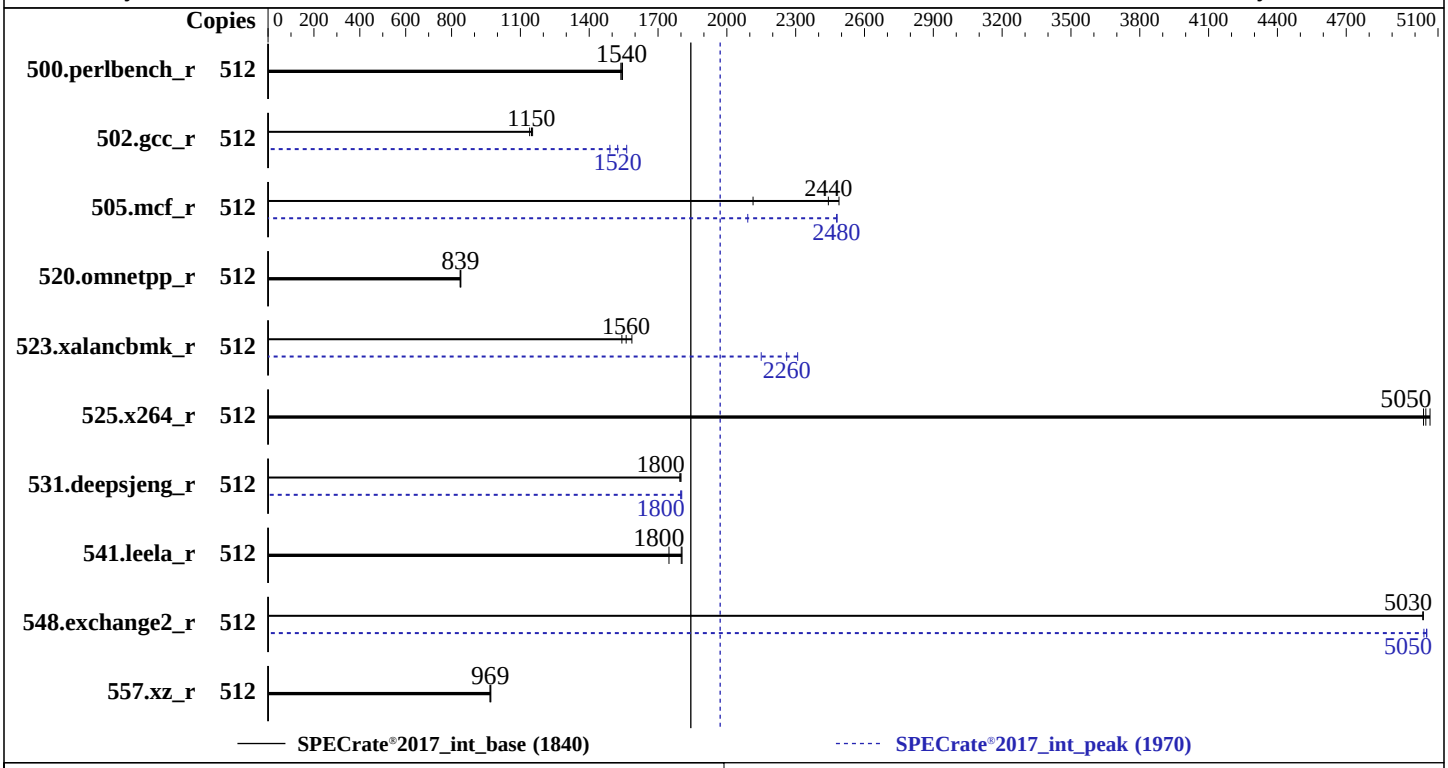
ProLiant DL385 Gen11
(2.25 GHz, AMD EPYC 9754)

SPECrate®2017_int_base = 1840

SPECrate®2017_int_peak = 1970

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, 2 threads/core
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:	No
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:	32/64-bit
Other:	None
Power Management:	BIOS and OS set to prefer performance at the cost of additional power usage

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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	512	528	1550	530	1540	**529**	**1540**	512	528	1550	530	1540	**529**	**1540**
502.gcc_r	512	629	1150	**631**	**1150**	636	1140	512	464	1560	**476**	**1520**	487	1490
505.mcf_r	512	391	2110	**339**	**2440**	332	2490	512	334	2480	**334**	**2480**	396	2090
520.omnetpp_r	512	**801**	**839**	799	841	802	837	512	**801**	**839**	799	841	802	837
523.xalancbmk_r	512	351	1540	341	1590	**346**	**1560**	512	234	2310	**239**	**2260**	252	2150
525.x264_r	512	178	5040	**178**	**5050**	177	5070	512	178	5040	**178**	**5050**	177	5070
531.deepsjeng_r	512	326	1800	**326**	**1800**	327	1790	512	**326**	**1800**	326	1800	325	1800
541.leela_r	512	470	1800	485	1750	**471**	**1800**	512	470	1800	485	1750	**471**	**1800**
548.exchange2_r	512	266	5030	266	5040	**266**	**5030**	512	**266**	**5050**	266	5050	266	5040
557.xz_r	512	569	971	571	968	**571**	**969**	512	569	971	571	968	**571**	**969**

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SPECrate®2017_int_peak = 1970

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) only on request for base runs,
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root.
To enable THP for all allocations for peak runs,
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
      "/home/cpu2017/amd_rate_aocc400_genoa_B_lib/lib:/home/cpu2017/amd_rate_aocc400_genoa_B_lib/lib32:"
MALLOC_CONF = "retain:true"

Environment variables set by runcpu during the 523.xalancbmk_r peak run:
MALLOC_CONF = "thp:never"
```

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 Throughput Compute
 Determinism Control set to Manual
 Performance Determinism set to Power Deterministic
 Last-Level Cache (LLC) as NUMA Node set to Enabled
 NUMA memory domains per socket set to Four memory domains per socket
 ACPI CST C2 Latency set to 18 microseconds
 Thermal Configuration set to Maximum Cooling
 Data Fabric C-State Enable set to Force Enabled
 Workload Profile set to Custom
  Power Regulator set to OS Control Mode

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost.localdomain Thu May 18 11:16:08 2023

 SUT (System Under Test) info as seen by some common utilities.

 ------------------------------------------------------------
 Table of contents
 ------------------------------------------------------------
  1. uname -a
  2. w
  3. Username
  4. ulimit -a
  5. sysinfo process ancestry
  6. /proc/cpuinfo
  7. lscpu
  8. numactl --hardware
  9. /proc/meminfo
 10. who -r
 11. Systemd service manager version: systemd 250 (250-6.el9_0)
 12. Services, from systemctl list-unit-files
 13. Linux kernel boot-time arguments, from /proc/cmdline
 14. cpupower frequency-info
```

(Continued on next page)

Platform Notes (Continued)

```
 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
   11:16:08 up 27 min,  2 users,  load average: 0.14, 0.03, 0.01
  USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
  root     tty1      07Apr22 406days  0.00s  0.00s -bash
  root     pts/0     07Apr22 16.00s  1.38s  0.09s /bin/bash ./amd_rate_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
  data seg size               (kbytes, -d) unlimited
  scheduling priority                 (-e) 0
  file size                   (blocks, -f) unlimited
  pending signals                     (-i) 6190826
  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) 6190826
  virtual memory              (kbytes, -v) unlimited
  file locks                          (-x) unlimited

------------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd --switched-root --system --deserialize 28
 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
 sshd: root [priv]
 sshd: root@pts/0
 -bash
 python3 ./run_intrate.py
 /bin/bash ./amd_rate_aocc400_genoa_B1.sh
 runcpu --config amd_rate_aocc400_genoa_B1.cfg --tune all --reportable --iterations 3 intrate
 runcpu --configfile amd_rate_aocc400_genoa_B1.cfg --tune all --reportable --iterations 3 --nopower --runmode
   rate --tune base:peak --size test:train:refrate intrate --nopreenv --note-preenv --logfile
   $SPEC/tmp/CPU2017.001/templogs/preenv.intrate.001.0.log --lognum 001.0 --from_runcpu 2
```

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Platform Notes (Continued)

```
 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        : 256
    2 physical ids (chips)
    512 processors (hardware threads)
    physical id 0: core ids 0-127
    physical id 1: core ids 0-127
    physical id 0: apicids 0-255
    physical id 1: apicids 256-511
  Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
  virtualized systems.  Use the above data carefully.

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

From lscpu from util-linux 2.37.4:
  Architecture:                    x86_64
  CPU op-mode(s):                  32-bit, 64-bit
  Address sizes:                   52 bits physical, 57 bits virtual
  Byte Order:                      Little Endian
  CPU(s):                          512
  On-line CPU(s) list:             0-511
  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:              2
  Core(s) per socket:              128
  Socket(s):                       2
  Stepping:                        2
  Frequency boost:                 enabled
  CPU max MHz:                     2250.0000
  CPU min MHz:                     1500.0000
  BogoMIPS:                        4493.10
  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
```

(Continued on next page)

Platform Notes (Continued)

```
                        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):    0-7,256-263
  NUMA node1 CPU(s):    8-15,264-271
  NUMA node2 CPU(s):    64-71,320-327
  NUMA node3 CPU(s):    72-79,328-335
  NUMA node4 CPU(s):    32-39,288-295
  NUMA node5 CPU(s):    40-47,296-303
  NUMA node6 CPU(s):    96-103,352-359
  NUMA node7 CPU(s):    104-111,360-367
  NUMA node8 CPU(s):    48-55,304-311
  NUMA node9 CPU(s):    56-63,312-319
  NUMA node10 CPU(s):   112-119,368-375
  NUMA node11 CPU(s):   120-127,376-383
  NUMA node12 CPU(s):   16-23,272-279
  NUMA node13 CPU(s):   24-31,280-287
  NUMA node14 CPU(s):   80-87,336-343
  NUMA node15 CPU(s):   88-95,344-351
  NUMA node16 CPU(s):   128-135,384-391
  NUMA node17 CPU(s):   136-143,392-399
  NUMA node18 CPU(s):   192-199,448-455
  NUMA node19 CPU(s):   200-207,456-463
  NUMA node20 CPU(s):   160-167,416-423
  NUMA node21 CPU(s):   168-175,424-431
  NUMA node22 CPU(s):   224-231,480-487
  NUMA node23 CPU(s):   232-239,488-495
  NUMA node24 CPU(s):   176-183,432-439
  NUMA node25 CPU(s):   184-191,440-447
  NUMA node26 CPU(s):   240-247,496-503
  NUMA node27 CPU(s):   248-255,504-511
  NUMA node28 CPU(s):   144-151,400-407
  NUMA node29 CPU(s):   152-159,408-415
  NUMA node30 CPU(s):   208-215,464-471
  NUMA node31 CPU(s):   216-223,472-479
  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 always-on, 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

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

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Platform Notes (Continued)

```
 8. numactl --hardware
 NOTE: a numactl 'node' might or might not correspond to a physical chip.
   available: 32 nodes (0-31)
   node 0 cpus: 0-7,256-263
   node 0 size: 48133 MB
   node 0 free: 47478 MB
   node 1 cpus: 8-15,264-271
   node 1 size: 48380 MB
   node 1 free: 48190 MB
   node 2 cpus: 64-71,320-327
   node 2 size: 48380 MB
   node 2 free: 48116 MB
   node 3 cpus: 72-79,328-335
   node 3 size: 48380 MB
   node 3 free: 48203 MB
   node 4 cpus: 32-39,288-295
   node 4 size: 48380 MB
   node 4 free: 48052 MB
   node 5 cpus: 40-47,296-303
   node 5 size: 48380 MB
   node 5 free: 48075 MB
   node 6 cpus: 96-103,352-359
   node 6 size: 48380 MB
   node 6 free: 47642 MB
   node 7 cpus: 104-111,360-367
   node 7 size: 48380 MB
   node 7 free: 48089 MB
   node 8 cpus: 48-55,304-311
   node 8 size: 48380 MB
   node 8 free: 48105 MB
   node 9 cpus: 56-63,312-319
   node 9 size: 48380 MB
   node 9 free: 48145 MB
   node 10 cpus: 112-119,368-375
   node 10 size: 48380 MB
   node 10 free: 48166 MB
   node 11 cpus: 120-127,376-383
   node 11 size: 48380 MB
   node 11 free: 48137 MB
   node 12 cpus: 16-23,272-279
   node 12 size: 48380 MB
   node 12 free: 47711 MB
   node 13 cpus: 24-31,280-287
   node 13 size: 48380 MB
   node 13 free: 48157 MB
   node 14 cpus: 80-87,336-343
   node 14 size: 48380 MB
   node 14 free: 48140 MB
   node 15 cpus: 88-95,344-351
   node 15 size: 48380 MB
   node 15 free: 48136 MB
   node 16 cpus: 128-135,384-391
   node 16 size: 48344 MB
   node 16 free: 48074 MB
   node 17 cpus: 136-143,392-399
   node 17 size: 48380 MB
   node 17 free: 48101 MB
   node 18 cpus: 192-199,448-455
   node 18 size: 48380 MB
   node 18 free: 48229 MB
```

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Platform Notes (Continued)

```
node 19 cpus: 200-207,456-463
node 19 size: 48380 MB
node 19 free: 48238 MB
node 20 cpus: 160-167,416-423
node 20 size: 48380 MB
node 20 free: 48189 MB
node 21 cpus: 168-175,424-431
node 21 size: 48380 MB
node 21 free: 48106 MB
node 22 cpus: 224-231,480-487
node 22 size: 48380 MB
node 22 free: 48222 MB
node 23 cpus: 232-239,488-495
node 23 size: 48380 MB
node 23 free: 48228 MB
node 24 cpus: 176-183,432-439
node 24 size: 48380 MB
node 24 free: 48229 MB
node 25 cpus: 184-191,440-447
node 25 size: 48380 MB
node 25 free: 48241 MB
node 26 cpus: 240-247,496-503
node 26 size: 48380 MB
node 26 free: 48098 MB
node 27 cpus: 248-255,504-511
node 27 size: 48380 MB
node 27 free: 48117 MB
node 28 cpus: 144-151,400-407
node 28 size: 48380 MB
node 28 free: 48230 MB
node 29 cpus: 152-159,408-415
node 29 size: 48380 MB
node 29 free: 48129 MB
node 30 cpus: 208-215,464-471
node 30 size: 48380 MB
node 30 free: 48120 MB
node 31 cpus: 216-223,472-479
node 31 size: 48298 MB
node 31 free: 48166 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  12  12  12  12  12  12  12  12  12  12  12  12  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
  1:  11  10  11  11  12  12  12  12  12  12  12  12  12  12  12  12  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
  2:  11  11  10  11  12  12  12  12  12  12  12  12  12  12  12  12  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
  3:  11  11  11  10  12  12  12  12  12  12  12  12  12  12  12  12  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
  4:  12  12  12  12  10  11  11  11  12  12  12  12  12  12  12  12  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
  5:  12  12  12  12  11  10  11  11  12  12  12  12  12  12  12  12  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
  6:  12  12  12  12  11  11  10  11  12  12  12  12  12  12  12  12  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
  7:  12  12  12  12  11  11  11  10  12  12  12  12  12  12  12  12  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
  8:  12  12  12  12  12  12  12  12  10  11  11  11  12  12  12  12  32  32  32  32  32  32  32  32  32
  32  32  32  32  32  32  32
```

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Platform Notes (Continued)

```
     9:  12  12  12  12  12  12  12  12  11  10  11  11  12  12  12  12  32  32  32  32  32  32  32  32  32
    32  32  32  32  32  32  32  32
    10:  12  12  12  12  12  12  12  12  11  11  10  11  12  12  12  12  32  32  32  32  32  32  32  32  32
    32  32  32  32  32  32  32  32
    11:  12  12  12  12  12  12  12  12  11  11  11  10  12  12  12  12  32  32  32  32  32  32  32  32  32
    32  32  32  32  32  32  32  32
    12:  12  12  12  12  12  12  12  12  12  12  12  12  10  11  11  11  32  32  32  32  32  32  32  32  32
    32  32  32  32  32  32  32  32
    13:  12  12  12  12  12  12  12  12  12  12  12  12  11  10  11  11  32  32  32  32  32  32  32  32  32
    32  32  32  32  32  32  32  32
    14:  12  12  12  12  12  12  12  12  12  12  12  12  11  11  10  11  32  32  32  32  32  32  32  32  32
    32  32  32  32  32  32  32  32
    15:  12  12  12  12  12  12  12  12  12  12  12  12  11  11  11  10  32  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  12  12  12  12  12
    12  12  12  12  12  12  12
    17:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  10  11  11  12  12  12  12  12
    12  12  12  12  12  12  12
    18:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  11  10  11  12  12  12  12  12
    12  12  12  12  12  12  12
    19:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  10  12  12  12  12  12
    12  12  12  12  12  12  12
    20:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  10  11  11  11  12
    12  12  12  12  12  12  12
    21:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  11  10  11  11  12
    12  12  12  12  12  12  12
    22:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  11  11  10  11  12
    12  12  12  12  12  12  12
    23:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  11  11  11  10  12
    12  12  12  12  12  12  12
    24:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  12  12  12  12  10
    11  11  11  12  12  12  12
    25:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  12  12  12  12  11
    10  11  11  12  12  12  12
    26:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  12  12  12  12  11
    11  10  11  12  12  12  12
    27:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  12  12  12  12  11
    11  11  10  12  12  12  12
    28:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  12  12  12  12  12
    12  12  12  10  11  11  11
    29:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  12  12  12  12  12
    12  12  12  11  10  11  11
    30:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  12  12  12  12  12
    12  12  12  11  11  10  11
    31:  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  12  12  12  12  12
    12  12  12  11  11  11  10

------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       1584958704 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
```

(Continued on next page)

Platform Notes (Continued)

```
------------------------------------------------------------
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
  enabled-runtime   systemd-remount-fs
  disabled          blk-availability chrony-wait console-getty cpupower debug-shell hwloc-dump-hwdata kvm_stat
                    man-db-restart-cache-update nftables powertop rdisc rhsm rhsm-facts rpmdb-rebuild
                    serial-getty@ sshd-keygen@ systemd-boot-check-no-failures systemd-pstore systemd-sysext
  indirect          sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo

------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
  BOOT_IMAGE=(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

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

(Continued on next page)

Platform Notes (Continued)

```
------------------------------------------------------------
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
SPEC is set to: /home/cpu2017
  Filesystem            Type  Size  Used Avail Use% Mounted on
  /dev/mapper/rhel-home xfs   372G  9.4G  363G   3% /home

------------------------------------------------------------
21. /sys/devices/virtual/dmi/id
    Vendor:         HPE
    Product:        ProLiant DL385 Gen11
    Product Family: ProLiant
    Serial:         DL385G11-006

------------------------------------------------------------
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 HMCG94AEBRA103N 64 GB 2 rank 4800
    15x Hynix HMCG94MEBRA121N 64 GB 2 rank 4800
    2x Samsung M321R8GA0BB0-CQKDG 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: 1.10
```

Compiler Version Notes

```
==============================================================================================================
C       | 502.gcc_r(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: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
--------------------------------------------------------------------------------------------------------------

==============================================================================================================
C       | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak)
        | 557.xz_r(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       | 502.gcc_r(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: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
--------------------------------------------------------------------------------------------------------------

==============================================================================================================
C       | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak)
        | 557.xz_r(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++     | 523.xalancbmk_r(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: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
--------------------------------------------------------------------------------------------------------------

==============================================================================================================
C++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base) 531.deepsjeng_r(base, peak) 541.leela_r(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++     | 523.xalancbmk_r(peak)
--------------------------------------------------------------------------------------------------------------
```

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Compiler Version Notes (Continued)

```
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: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------------------------------------

============================================================================================================
C++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base) 531.deepsjeng_r(base, peak) 541.leela_r(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 | 548.exchange2_r(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
------------------------------------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

Fortran benchmarks:
flang

Base Portability Flags

500.perlbench_r: -DSPEC_LINUX_X64 -DSPEC_LP64
502.gcc_r: -DSPEC_LP64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LINUX -DSPEC_LP64
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-ldist-scalar-expand -fenable-aggressive-gather
-z muldefs -O3 -march=znver4 -fveclib=AMDLIBM -ffast-math
-fstruct-layout=7 -mllvm -unroll-threshold=50
-mllvm -inline-threshold=1000 -fremap-arrays -fstrip-mining
-mllvm -reduce-array-computations=3 -zopt -lamdlibm -lflang
-lamdalloc
```

C++ benchmarks:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -z muldefs -O3
-march=znver4 -fveclib=AMDLIBM -ffast-math
-mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -zopt
-fvirtual-function-elimination -fvisibility=hidden -lamdlibm -lflang
-lamdalloc-ext
```

Fortran benchmarks:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-inline-recursion=4 -Wl,-mllvm -Wl,-lsr-in-nested-loop
-Wl,-mllvm -Wl,-enable-iv-split -z muldefs -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fepilog-vectorization-of-inductions
-mllvm -optimize-strided-mem-cost -floop-transform
-mllvm -unroll-aggressive -mllvm -unroll-threshold=500 -lamdlibm
-lflang -lamdalloc
```

Base Other Flags

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

C++ benchmarks:
```
-Wno-unused-command-line-argument
```

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

Peak Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

Fortran benchmarks:
flang

Peak Portability Flags

500.perlbench_r: -DSPEC_LINUX_X64 -DSPEC_LP64
502.gcc_r: -D_FILE_OFFSET_BITS=64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LINUX -DSPEC_LP64
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64

Peak Optimization Flags

C benchmarks:

500.perlbench_r: basepeak = yes

502.gcc_r: -m32 -flto -z muldefs -Ofast -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -fgnu89-inline
-lamdalloc

505.mcf_r: -m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math
-fstruct-layout=7 -mllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm

(Continued on next page)

Peak Optimization Flags (Continued)

505.mcf_r (continued):
-lflang -lamdalloc

525.x264_r: basepeak = yes

557.xz_r: basepeak = yes

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: -m32 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-do-block-reorder=aggressive
-fno-loop-reroll -Ofast -march=znver4 -fveclib=AMDLIBM
-ffast-math -finline-aggressive
-mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -zopt
-mllvm -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden
-lamdalloc-ext

531.deepsjeng_r: -m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3
-march=znver4 -fveclib=AMDLIBM -ffast-math
-mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -zopt
-fvirtual-function-elimination -fvisibility=hidden
-lamdlibm -lamdalloc-ext

541.leela_r: basepeak = yes

Fortran benchmarks:
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-inline-recursion=4 -Wl,-mllvm -Wl,-lsr-in-nested-loop
-Wl,-mllvm -Wl,-enable-iv-split -O3 -march=znver4 -fveclib=AMDLIBM
-ffast-math -fepilog-vectorization-of-inductions
-mllvm -optimize-strided-mem-cost -floop-transform
-mllvm -unroll-aggressive -mllvm -unroll-threshold=500 -lamdlibm
-lflang -lamdalloc

Peak Other Flags

C benchmarks (except as noted below):
`-Wno-unused-command-line-argument`

502.gcc_r: `-L/usr/lib32 -Wno-unused-command-line-argument`
`-L/home/work/cpu2017/v118/aocc4/b1/rate/amd_rate_aocc400_genoa_B_lib/lib32`

C++ benchmarks (except as noted below):
`-Wno-unused-command-line-argument`

523.xalancbmk_r: `-L/usr/lib32 -Wno-unused-command-line-argument`
`-L/home/work/cpu2017/v118/aocc4/b1/rate/amd_rate_aocc400_genoa_B_lib/lib32`

Fortran benchmarks:
`-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 2023-05-18 01:46:07-0400.
Report generated on 2023-06-13 15:16:29 by CPU2017 PS formatter v6716.
Originally published on 2023-06-13.