Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen11
(2.90 GHz, AMD EPYC 9254)

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

Hardware
CPU Name: AMD EPYC 9254
Max MHz: 4150
Nominal: 2900
Enabled: 24 cores, 1 chip
Orderable: 1 chip
Cache L1: 32 KB I + 32 KB D on chip per core
L2: 1 MB I+D on chip per core
L3: 128 MB I+D on chip per chip,
    32 MB shared / 6 cores
Other: None
Memory: 384 GB (12 x 32 GB 2Rx8 PC5-4800B-R)
Storage: 1 x 1.6 TB NVMe SSD, RAID 0
Other: None

Software
OS: Red Hat Enterprise Linux 9.0 (Plow)
Compiler: C/C++/Fortran: Version 4.0.0 of AOCC
Parallel: Yes
Firmware: HPE BIOS Version v1.12 11/24/2022 released
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

SPECs2017_int_base = 15.3
SPECs2017_int_peak = 15.5
Hewlett Packard Enterprise
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<td>25.6</td>
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SPECspeed®2017_int_base = 15.3
SPECspeed®2017_int_peak = 15.5

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.
**SPEC CPU®2017 Integer Speed Result**

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**SPECspeed®2017_int_base = 15.3**  
**SPECspeed®2017_int_peak = 15.5**

---

**Operating System Notes (Continued)**

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.

---

**Environment Variables Notes**

Environment variables set by runcpu before the start of the run:

- GOMP_CPU_AFFINITY = "0-23"
- 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 = "24"

Environment variables set by runcpu during the 605.mcf_s peak run:

- GOMP_CPU_AFFINITY = "15"

Environment variables set by runcpu during the 623.xalancbk_m_s peak run:

- GOMP_CPU_AFFINITY = "15"

---

**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  
NUMA memory domains per socket set to Four memory domains per socket  
Last-Level Cache (LLC) as NUMA Node set to Enabled

(Continued on next page)
SPEC CPU®2017 Integer Speed Result

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CPU2017 License: 3

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Hardware Availability: Dec-2022

Software Availability: Nov-2022

Platform Notes (Continued)

ACPI CST C2 Latency set to 18 microseconds
Memory PStates set to Disabled
Thermal Configuration set to Maximum Cooling

The system ROM used for this result contains microcode version 0x0A10110e for the
AMD EPYC 9nn4X family of processors. The reference code/AGESA version used in this
ROM is version GenoaPI 1.0.0.1-L6

Sysinfo program /home/CPU2017/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aca6c64d
running on localhost.localdomain Thu Apr 7 05:31:30 2022

SUT (System Under Test) info as seen by some common utilities.
For more information on this section, see
https://www.spec.org/cpu2017/Docs/config.html#sysinfo

From /proc/cpuinfo

model name : AMD EPYC 9254 24-Core Processor
1 "physical id"s (chips)
24 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The following
excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
cpu cores : 24
siblings : 24
physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29

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): 24
On-line CPU(s) list: 0-23
Vendor ID: AuthenticAMD
BIOS Vendor ID: Advanced Micro Devices, Inc.
Model name: AMD EPYC 9254 24-Core Processor
BIOS Model name: AMD EPYC 9254 24-Core Processor
CPU family: 25
Model: 17
Thread(s) per core: 1
Core(s) per socket: 24
Socket(s): 1
Stepping: 1
BogoMIPS: 5791.35
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

(Continued on next page)
Platform Notes (Continued)

aperfmerper r apl p clmul dq monitor ss e3 f ma cx1 6 pc id se4_1 se4_2 x2ap ic movbe popcnt aer x sa ve x f16c r drand la h f_l m cmp_ legacy sv m ext a pic cr8_ legacy abm se4 a misalign se 3dn w prefetch os w vs i b sk init w dt t c e topo ext perfc tr_core perfc tr nb bpe xt perfc tr_llc m w ai tx cb p ca t_l3 c dp_l3 in vp c id_s i ngle h w p state ss bd mba ib rs ib bp stibp vmm c al fgsb as e b mi l axv2 sm ep b mi l2 er m s invpc id c q m r dt_a axv512f axv512dq rdseed ad x sm ap axv512ifma c l f l us ho pt clw b axv512cd sha_ni axv512bw axv512v1 x sa veo pt x sa ve c x g etb v1 x sa ves c q m_ll c c q m_occ u p_ll c c q m_mb m_t o t al c q m_m b m_local axv512_bf16 c lzer o irperf x sa v eerp tr r dp r w bno invd am d_prin ar ar at n pt l brv sv m _lo c k n rip_sav e ts c_sca le vmc b _cle a n fl us hby a si d d ec o dea ss is ts pu s e filter p fthr reshold av ic v_v msav e_vm lo ad v g if v_v s ec _c trl axv512vbmi u mpi k u ov pe axv512_vbm i2 g fn i va es v p clmul dq axv512_vn ni axv512_bita lg axv512_vpopcntdq la57 r dp id o v er fl ow_reco v suc cor sm ca f srm fl ush_lld

Virtualization: AMD-V
L1d cache: 768 KiB (24 instances)
L1i cache: 768 KiB (24 instances)
L2 cache: 24 MiB (24 instances)
L3 cache: 128 MiB (4 instances)
NUMA node(s): 4
NUMA node0 CPU(s): 0-5
NUMA node1 CPU(s): 12-17
NUMA node2 CPU(s): 18-23
NUMA node3 CPU(s): 6-11
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 768K 8 Data 1 64 1 64
L1i 32K 768K 8 Instruction 1 64 1 64
L2 1M 24M 8 Unified 2 2048 1 64
L3 32M 128M 16 Unified 3 32768 1 64

From numactl --hardware
WARNING: a numactl 'node' might or might not correspond to a physical chip.
SPEC CPU®2017 Integer Speed Result
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SPECspeed®2017_int_base = 15.3
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Tested by: HPE

Platform Notes (Continued)

available: 4 nodes (0-3)
node 0 cpus: 0 1 2 3 4 5
node 0 size: 96520 MB
node 0 free: 96248 MB
node 1 cpus: 12 13 14 15 16 17
node 1 size: 96766 MB
node 1 free: 96573 MB
node 2 cpus: 18 19 20 21 22 23
node 2 size: 96766 MB
node 2 free: 96462 MB
node 3 cpus: 6 7 8 9 10 11
node 3 size: 96683 MB
node 3 free: 96243 MB
node distances:
 node 0 1 2 3
 0: 10 12 12 12
 1: 12 10 12 12
 2: 12 12 10 12
 3: 12 12 12 10

From /proc/meminfo
  MemTotal:       396018752 kB
  HugePages_Total:       0
  Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
  os-release:
    NAME="Red Hat Enterprise Linux"
    VERSION="9.0 (Plow)"
    ID="rhel"
    ID_LIKE="fedora"
    VERSION_ID="9.0"
    PLATFORM_ID="platform:el9"
    PRETTY_NAME="Red Hat Enterprise Linux 9.0 (Plow)"
    ANSI_COLOR="0;31"
  redhat-release: Red Hat Enterprise Linux release 9.0 (Plow)
  system-release: Red Hat Enterprise Linux release 9.0 (Plow)
  system-release-cpe: cpe:/o:redhat:enterprise_linux:9::baseos

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

Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multithit): Not affected
CVE-2018-3620 (L1 Terminal Fault): Not affected

(Continued on next page)
### Platform Notes (Continued)

Microarchitectural Data Sampling: Not affected
CVE-2017-5754 (Meltdown): Not affected
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl
CVE-2017-5753 (Spectre variant 1): Mitigation: usercopy/swapgs barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Retpolines, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Apr 7 05:30

SPEC is set to: /home/CPU2017

Filesystem | Type | Size | Used | Avail | Use% | Mounted on
--- | --- | --- | --- | --- | --- | ---
/dev/mapper/rhel-home | xfs | 819G | 23G | 796G | 3% | /home

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:
12x Hynix HMCG88MEBRA113N 32 GB 2 rank 4800

BIOS:
- BIOS Vendor: HPE
- BIOS Version: 1.12
- BIOS Date: 11/24/2022
- BIOS Revision: 1.12
- Firmware Revision: 1.10

(End of data from sysinfo program)

### Compiler Version Notes

| C | 600.perlbench_s(base, peak) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_s(base, peak) |

(Continued on next page)
SPECCPU®2017 Integer Speed Result

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CPU2017 License: 3
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Test Date: Jan-2023
Hardware Availability: Dec-2022
Software Availability: Nov-2022

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

-----------------------------------------------
C++   | 620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak)
      | 631.deepsjeng_s(base, peak) 641.leela_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 | 648.exchange2_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

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

Base Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

Fortran benchmarks:
flang

Base Portability Flags

600.perlbench_s: -DSPEC_LINUX_X64 -DSPEC_LP64

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

602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LINUX -DSPEC_LP64
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

Base Optimization Flags

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

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
-mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-fvirtual-function-elimination -fvisibility=hidden -fopenmp=libomp
-lomp -lamdlibm -lflang -lamdalloc-ext

Fortran benchmarks:
-m64 -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-lv-split -O3 -march=znver4 -fveclib=AMDLIBM
-ffast-math -fopenmp -flto -mllvm -optimize-strided-mem-cost
-mllvm -unroll-aggressive -mllvm -unroll-threshold=150 -fopenmp=libomp
-lomp -lamdlibm -lflang -lamdalloc
## Spec CPU®2017 Integer Speed Result

### Hewlett Packard Enterprise

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### Base Other Flags

- C benchmarks: 
  - `-Wno-return-type -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

Same as Base Portability Flags

### Peak Optimization Flags

- C benchmarks:
  - `600.perlbench_s: basepeak = yes`
  - `602.gcc_s: basepeak = yes`

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

605.mcf_s (continued):
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang

625.x264_s: basepeak = yes
657.xz_s: basepeak = yes

C++ benchmarks:
620.omnetpp_s: basepeak = yes
623.xalancbmk_s: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-do-block-reorder=aggressive -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -finline-aggressive -mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-mllvm -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden
-fopenmp=libomp -lomp -lamdlibm -lamdalloc-ext -lflang

631.deepsjeng_s: basepeak = yes
641.leela_s: basepeak = yes

Fortran benchmarks:
648.exchange2_s: basepeak = yes

Peak Other Flags

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

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

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-Genoa-rev2.1.html
http://www.spec.org/cpu2017/flags/aocc400-flags.html
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-Genoa-rev2.1.xml
http://www.spec.org/cpu2017/flags/aocc400-flags.xml

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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