## SPEC CPU®2017 Floating Point Speed Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant DL345 Gen11  
(4.10 GHz, AMD EPYC 9174F)

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>SPECspeed®2017_fp_peak</th>
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</thead>
<tbody>
<tr>
<td>165</td>
<td>169</td>
</tr>
</tbody>
</table>

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

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### Hardware

- **CPU Name:** AMD EPYC 9174F  
- **Max MHz:** 4400  
- **Nominal:** 4100  
- **Enabled:** 16 cores, 1 chip  
- **Orderable:** 1 chip  
- **Cache L1:** 32 KB I + 32 KB D on chip per core  
- **Cache L2:** 1 MB I+D on chip per core  
- **Cache L3:** 256 MB I+D on chip per chip, 32 MB shared / 2 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:** Ubuntu 22.04.1 LTS  
- **Compiler:** C/C++/Fortran: Version 4.0.0 of AOCC  
- **Parallel:** Yes  
- **Firmware:** HPE BIOS Version v1.12 11/24/2022 released  
- **File System:** ext4  
- **System State:** Run level 5 (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>
<thead>
<tr>
<th>Benchmark</th>
<th>TIME</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>819</td>
<td></td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>16</td>
<td></td>
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<tr>
<td>619.lbm_s</td>
<td></td>
<td>89.0</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td></td>
<td>145</td>
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<tr>
<td>627.cam4_s</td>
<td></td>
<td>82.8</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td></td>
<td>93.9</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td></td>
<td>139</td>
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<tr>
<td>644.nab_s</td>
<td></td>
<td>128</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td></td>
<td>134</td>
</tr>
<tr>
<td>654.roms_s</td>
<td></td>
<td>217</td>
</tr>
</tbody>
</table>
**SPEC CPU®2017 Floating Point Speed Result**

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Hewlett Packard Enterprise
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ProLiant DL345 Gen11
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**SPECspeed®2017_fp_base = 165**

**SPECspeed®2017_fp_peak = 169**

| CPU2017 License: | 3 |
| Test Sponsor: | HPE |
| Tested by: | HPE |
| Test Date: | Feb-2023 |
| Hardware Availability: | Nov-2022 |
| Software Availability: | Nov-2022 |

## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Base</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak</th>
<th>Seconds</th>
<th>Ratio</th>
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</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
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<tr>
<td>607.cactuBSSN_s</td>
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<td>89.0</td>
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<tr>
<td>621.wrf_s</td>
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<td>91.1</td>
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<td>91.1</td>
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<tr>
<td>627.cam4_s</td>
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<td>628.pop2_s</td>
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<tr>
<td>638.imagick_s</td>
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<tr>
<td>644.nab_s</td>
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<tr>
<td>649.fotonik3d_s</td>
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<td>71.4</td>
<td>128</td>
<td>71.5</td>
<td>127</td>
<td>68.8</td>
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<tr>
<td>654.roms_s</td>
<td>16</td>
<td>72.5</td>
<td>217</td>
<td>72.6</td>
<td>217</td>
<td>73.3</td>
<td>215</td>
<td>70.6</td>
<td>223</td>
</tr>
</tbody>
</table>

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.
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.
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:
'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 = "0-15"
LD_LIBRARY_PATH = "/home/cpu2017/amd_speed_aocc400_genoa_B_lib/lib;"
LIBOMP_NUM_HIDDEN_HELPER_THREADS = "0"
MALLOCONF = "oversize_threshold:0,retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "16"

Environment variables set by runcpu during the 603.bwaves_s peak run:
GOMP_CPU_AFFINITY = "0-15"

Environment variables set by runcpu during the 607.cactuBSSN_s peak run:
GOMP_CPU_AFFINITY = "0-15"

Environment variables set by runcpu during the 619.lbm_s peak run:
GOMP_CPU_AFFINITY = "0-15"

Environment variables set by runcpu during the 621.wrf_s peak run:
GOMP_CPU_AFFINITY = "0-15"

Environment variables set by runcpu during the 627.cam4_s peak run:
GOMP_CPU_AFFINITY = "0-15"

Environment variables set by runcpu during the 628.pop2_s peak run:
GOMP_CPU_AFFINITY = "0-15"

Environment variables set by runcpu during the 638.imagick_s peak run:
GOMP_CPU_AFFINITY = "0-15"
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SPECspeed®2017_fp_base = 165
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<tr>
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<th>Test Date</th>
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<tbody>
<tr>
<td>3</td>
<td>Feb-2023</td>
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</table>

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<thead>
<tr>
<th>Test Sponsor</th>
<th>Hardware Availability</th>
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<tbody>
<tr>
<td>HPE</td>
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</thead>
<tbody>
<tr>
<td>HPE</td>
<td>Nov-2022</td>
</tr>
</tbody>
</table>

Environment Variables Notes (Continued)

Environment variables set by runcpu during the 644.nab_s peak run:
GOMP_CPU_AFFINITY = "0-15"

Environment variables set by runcpu during the 649.fotonik3d_s peak run:
GOMP_CPU_AFFINITY = "0-15"
PGHPF_ZMEM = "yes"

Environment variables set by runcpu during the 654.roms_s peak run:
GOMP_CPU_AFFINITY = "0 8 1 9 2 10 3 11 4 12 5 13 6 14 7 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
Last-Level Cache (LLC) as NUMA Node set to Enabled
ACPI CST C2 Latency set to 18 microseconds
Memory PStates set to Disabled
Thermal Configuration set to Maximum Cooling
Workload Profile set to Custom
Power Regulator set to OS Control Mode

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: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on admin1 Mon Jun 27 18:31:54 2022

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Platform Notes (Continued)

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

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7. lscpu
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10. who -r
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12. Failed units, from systemctl list-units --state=failed
13. Services, from systemctl list-unit-files
14. Linux kernel boot-time arguments, from /proc/cmdline
15. cpupower frequency-info
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20. OS release
21. Disk information
22. /sys/devices/virtual/dmi/id
23. dmidecode
24. BIOS

-----------------------------
1. uname -a
Linux admin1 5.15.0-53-generic #59-Ubuntu SMP Mon Oct 17 18:53:30 UTC 2022 x86_64 x86_64 x86_64 GNU/Linux

-----------------------------
2. w
18:31:54 up 3 min, 2 users, load average: 0.04, 0.05, 0.02
USER   TTY           FROM     LOGIN@   IDLE   JCPU   PCPU WHAT
admin1 pts/0    172.16.0.100 18:31  32.00s  0.00s  0.00s sshd: admin1 [priv]
admin1 pts/1    172.16.0.100 18:31 10.00s  0.77s  0.00s sudo -ii

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

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

4. ulimit -a
   - time(seconds): unlimited
   - file(blocks): unlimited
   - data(kbytes): unlimited
   - stack(kbytes): unlimited
   - coredump(blocks): 0
   - memory(kbytes): unlimited
   - locked memory(kbytes): 2097152
   - process: 1546279
   - nofiles: 1024
   - vmemory(kbytes): unlimited
   - locks: unlimited
   - rtprio: 0

5. sysinfo process ancestry
   - /sbin/init
   - sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
   - sshd: admin1 [priv]
   - sshd: admin1@pts/0
   - sudo -i
   - sudo -i
   - 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/CPU2017.004/templogs/preenv.fpspeed.004.0.log --lognum 004.0 --from_runcpu
   - specperl $SPEC/bin/sysinfo
   - $SPEC = /home/cpu2017

6. /proc/cpuinfo
   - model name: AMD EPYC 9174F 16-Core Processor
   - vendor_id: AuthenticAMD
   - cpu family: 25
   - model: 17
   - stepping: 1
   - microcode: 0xa10110e
   - bugs: sysret_ss_atrs spectre_v1 spectre_v2 spec_store_bypass
   - TLB size: 3584 4K pages
   - cpu cores: 16
   - siblings: 16
   - 1 physical ids (chips)

(Continued on next page)
Platform Notes (Continued)

16 processors (hardware threads)
physical id 0: core ids 0-15
physical id 0: apicids 0-15

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

7. lscpu

From lscpu from util-linux 2.37.2:

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Address sizes: 52 bits physical, 57 bits virtual
Byte Order: Little Endian
CPU(s): 16
On-line CPU(s) list: 0-15
Vendor ID: AuthenticAMD
Model name: AMD EPYC 9174F 16-Core Processor
CPU family: 25
Model: 17
Thread(s) per core: 1
Core(s) per socket: 16
Socket(s): 1
Stepping: 1
Frequency boost: enabled
CPU max MHz: 4409.0000
CPU min MHz: 400.0000
BogoMIPS: 8187.52

Flags: fpu vmx de pse tsc msr pae 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 rpl
pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe
popcnt aes xsave avx f16c rdrand lahf_lmlahf_lm cmp_legacy svm extapic cr8_legacy
abm sse4a misalignsse 3dnowprefetch osxsave lbskinit tce topoext
perfcnt_core perfcnt_nb bpfent perfctr_l1c perfctr_l2c mwaitx cpb cat_l3 cdp_l3
invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall bm12 avx2 sse m12 emms invpcid cmqm rdt_a
avx512f avx512dq rsseed adx smap
avx512ifma clflushopt clwb avx512cd sha ni avx512bw avx512vvl xsaveopt
xsavec xgetbv1 xsaves cmq_llc cmq_occum_llc cmq_mbb_total cmq_mbb_local
avx512_lf16 clzero irperf xsaveerptr rdrpr wboinovd amd_pipp cpcr arat np
lbrv svm_lock nrip_save tsc_scale vmbc_clean flushbyasid decodeaists
pausefilter pfthreshold avic vosave vmload vgif v_spec_ctrl avx512v bmi
umip pku ospe avx512_vbmi2 gvn vaes vpcmullqdx avx512_vnmi avx512_bitalg
avx512_vpopcntdqa la57 rdwid overflow_recov succor smca fasm flush_l1d

Virtualization: AMD-V
L1d cache: 512 KiB (16 instances)
L1i cache: 512 KiB (16 instances)
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Platform Notes (Continued)

L2 cache: 16 MiB (16 instances)
L3 cache: 256 MiB (8 instances)
NUMA node(s): 8
NUMA node0 CPU(s): 0,1
NUMA node1 CPU(s): 8,9
NUMA node2 CPU(s): 4,5
NUMA node3 CPU(s): 12,13
NUMA node4 CPU(s): 6,7
NUMA node5 CPU(s): 14,15
NUMA node6 CPU(s): 2,3
NUMA node7 CPU(s): 10,11
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Mmio stale data: Not affected
Vulnerability Retbleed: Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp
Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Retpolines, IBPB conditional, IBRS_FW, STIBP disabled, RSB filling, PBRSB-eIBRS Not affected
Vulnerability Srbd: Not affected
Vulnerability Tsx async abort: Not affected

From lscpu --cache:

<table>
<thead>
<tr>
<th>NAME</th>
<th>ONE-SIZE</th>
<th>ALL-SIZE</th>
<th>WAYS</th>
<th>TYPE</th>
<th>LEVEL</th>
<th>SETS</th>
<th>PHY-LINE</th>
<th>COHERENCY-SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1d</td>
<td>32K</td>
<td>512K</td>
<td>8</td>
<td>Data</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
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<tr>
<td>L1i</td>
<td>32K</td>
<td>512K</td>
<td>8</td>
<td>Instruction</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
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<tr>
<td>L2</td>
<td>1M</td>
<td>16M</td>
<td>8</td>
<td>Unified</td>
<td>2</td>
<td>2048</td>
<td>1</td>
<td>64</td>
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<tr>
<td>L3</td>
<td>32M</td>
<td>256M</td>
<td>16</td>
<td>Unified</td>
<td>3</td>
<td>32768</td>
<td>1</td>
<td>64</td>
</tr>
</tbody>
</table>

8. numactl --hardware

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

available: 8 nodes (0-7)
node 0 cpus: 0-1
node 0 size: 48072 MB
node 0 free: 47918 MB
node 1 cpus: 8-9
node 1 size: 48383 MB
node 1 free: 48296 MB
node 2 cpus: 4-5
node 2 size: 48383 MB
node 2 free: 48215 MB
node 3 cpus: 12-13
node 3 size: 48383 MB
node 3 free: 48215 MB

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Platform Notes (Continued)

node 4 cpus: 6-7
node 4 size: 48347 MB
node 4 free: 48182 MB
node 5 cpus: 14-15
node 5 size: 48383 MB
node 5 free: 48210 MB
node 6 cpus: 2-3
node 6 size: 48383 MB
node 6 free: 48299 MB
node 7 cpus: 10-11
node 7 size: 48343 MB
node 7 free: 48184 MB
node distances:

```
node   0   1   2   3   4   5   6   7
0:  10  11  12  12  12  12  12  12
1:  11  10  12  12  12  12  12  12
2:  12  12  10  11  12  12  12  12
3:  12  12  11  10  12  12  12  12
4:  12  12  12  12  10  11  12  12
5:  12  12  12  12  11  10  12  12
6:  12  12  12  12  12  12  10  11
7:  12  12  12  12  12  12  11  10
```

9. /proc/meminfo

```
MemTotal: 395961172 kB
```

10. who -r

```
run-level 5 Jun 27 18:30
```

11. Systemd service manager version: systemd 249 (249.11-0ubuntu3.4)

```
Default Target  Status
graphical       degraded
```

12. Failed units, from systemctl list-units --state=failed

```
UNIT                 LOAD   ACTIVE SUB    DESCRIPTION
* systemd-networkd-wait-online.service loaded failed failed Wait for Network to be Configured
```

13. Services, from systemctl list-unit-files

```
STATE   UNIT FILES
enabled  ModemManager apparmor blk-availability cloud-config cloud-final cloud-init cloud-init-local console-setup cron dmesg e2scrub_reap finalrd getty@ gpu-manager grub-common grub-initrd-fallback irqbalance keyboard-setup lm-sensors lvm2-monitor
```

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen11
(4.10 GHz, AMD EPYC 9174F)

SPECspeed®2017_fp_base = 165
SPECspeed®2017_fp_peak = 169

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE
Hardware Availability: Nov-2022
Software Availability: Nov-2022

Platform Notes (Continued)

- lxd-agent multipathd networkd-dispatcher open-iscsi open-vm-tools pollinate rsyslog
- secureboot-db setvtrgb ssh systemd-networkd systemd-networkd-wait-online systemd-pstore
- systemd-resolved systemd-timesyncd thermald tuned ua-reboot-cmds ubuntu-advantage udisks2
- ufw vgauth

- enabled-runtime netplan-ovs-cleanup systemd-fsck-root systemd-remount-fs
- disabled console-getty debug-shell iscsid nftables rsync serial-getty@
- systemd-boot-check-no-failures systemd-network-generator systemd-sysext
- systemd-time-wait-sync upower

- generated apport
- indirect uidd
- masked cryptdisks cryptdisks-early hwclock lvm2 multipath-tools-boot rc rcS screen-cleanup sudo
- x11-common

14. Linux kernel boot-time arguments, from /proc/cmdline

- BOOT_IMAGE=/vmlinuz-5.15.0-53-generic
- root=/dev/mapper/ubuntu--vg-ubuntu--lv
- ro

15. cpupower frequency-info

- analyzing CPU 0:
  - current policy: frequency should be within 400 MHz and 4.41 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: 4100MHz

16. tuned-adm active

- Current active profile: throughput-performance

17. 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

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>vm.dirtytime_expire_seconds</td>
<td>43200</td>
</tr>
<tr>
<td>vm.extfrag_threshold</td>
<td>500</td>
</tr>
<tr>
<td>vm.min_unmapped_ratio</td>
<td>1</td>
</tr>
<tr>
<td>vm.nr_hugepages</td>
<td>0</td>
</tr>
<tr>
<td>vm.nr_hugepages_mempolicy</td>
<td>0</td>
</tr>
<tr>
<td>vm.nr_overcommit_hugepages</td>
<td>0</td>
</tr>
<tr>
<td>vm.swappiness</td>
<td>1</td>
</tr>
<tr>
<td>vm.watermark_boost_factor</td>
<td>15000</td>
</tr>
<tr>
<td>vm.watermark_scale_factor</td>
<td>10</td>
</tr>
<tr>
<td>vm.zone_reclaim_mode</td>
<td>1</td>
</tr>
</tbody>
</table>

18. /sys/kernel/mm/transparent_hugepage

- defrag: [always] defer defer+madvise madvise never
- enabled: [always] madvise never

19. /sys/kernel/mm/transparent_hugepage/khugepaged

- alloc_sleep_millisecs: 60000
- defrag: 1
- max_ptes_none: 511
- max_ptes_shared: 256
- max_ptes_swap: 64
- pages_to_scan: 4096
- scan_sleep_millisecs: 10000

20. OS release

- From /etc/*-release /etc/*-version
- os-release Ubuntu 22.04.1 LTS

21. Disk information

SPEC is set to: /home/cpu2017

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/mapper/ubuntu--vg-ubuntu--lv ext4</td>
<td>98G</td>
<td>37G</td>
<td>57G</td>
<td>40%</td>
<td></td>
<td>/</td>
</tr>
</tbody>
</table>

22. /sys/devices/virtual/dmi/id

- Vendor: HPE
- Product: ProLiant DL345 Gen11
- Product Family: ProLiant
- Serial: DL345G11-002

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

23. dmidecode
Additional information from dmidecode 3.3 follows. WARNING: Use caution when you interpret this section. The 'dmidecode' program reads system data which is "intended to allow hardware to be accurately determined", but the intent may not be met, as there are frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.
Memory:
- 5x Hynix HMCG88AEBRA168N 32 GB 2 rank 4800
- 4x Hynix HMCG88MEBRA113N 32 GB 2 rank 4800
- 3x Hynix HMCG88MEBRA115N 32 GB 2 rank 4800

---

24. BIOS
(This section combines info from /sys/devices and dmidecode.)
- BIOS Vendor: HPE
- BIOS Version: 1.12
- BIOS Date: 11/24/2022
- BIOS Revision: 1.12
- Firmware Revision: 1.10

---

**Compiler Version Notes**

<table>
<thead>
<tr>
<th>C</th>
<th>619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base, peak)</th>
</tr>
</thead>
</table>

---

<table>
<thead>
<tr>
<th>AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) based on LLVM Mirror.Version.14.0.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target: x86_64-unknown-linux-gnu</td>
</tr>
<tr>
<td>Thread model: posix</td>
</tr>
<tr>
<td>InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>C++, C, Fortran</th>
<th>607.cactuBSSN_s(base, peak)</th>
</tr>
</thead>
</table>

---

<table>
<thead>
<tr>
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(Continued on next page)
Hewlett Packard Enterprise
ProLiant DL345 Gen11
(4.10 GHz, AMD EPYC 9174F)

SPECspeed®2017_fp_base = 165
SPECspeed®2017_fp_peak = 169

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Hewlett Packard Enterprise
Test Sponsor: HPE

ProLiant DL345 Gen11
(4.10 GHz, AMD EPYC 9174F)

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

Compiler Version Notes (Continued)
AMD clang version 14.0.6 (CLANG: AOCCT_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 |
| 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak)
| 654.roms_s(base, peak)

AMD clang version 14.0.6 (CLANG: AOCCT_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: AOCCT_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: AOCCT_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

(Continued on next page)
## Base Compiler Invocation (Continued)

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

### Base Portability Flags

```bash
603.bwaves_s: -DSPEC_LP64
607.cactusSSN_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
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:**
```bash
-m64 -W1, -mllvm -W1, -align-all-nofallthru-blocks=6
-W1, -mllvm -W1, -reduce-array-computations=3 -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -zopt -fopenmp=libomp -lomp -lamdllibm -lamdalloc
-1flang
```

**Fortran benchmarks:**
```bash
-m64 -W1, -mllvm -W1, -align-all-nofallthru-blocks=6
-W1, -mllvm -W1, -reduce-array-computations=3
-W1, -mllvm -W1, -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
-lamdllibm -lamdalloc -1flang
```

**Benchmarks using both Fortran and C:**
```bash
-m64 -W1, -mllvm -W1, -align-all-nofallthru-blocks=6
-W1, -mllvm -W1, -reduce-array-computations=3
-W1, -mllvm -W1, -enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
```

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

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen11
(4.10 GHz, AMD EPYC 9174F)

SPECspeed®2017_fp_base = 165
SPECspeed®2017_fp_peak = 169

CPU2017 License: 3
Test Sponsor: HPE
Test Date: Feb-2023
Tested by: HPE
Hardware Availability: Nov-2022
Software Availability: Nov-2022

Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):
- fremap-arrays -fstrip-mining -mlirvm -reduce-array-computations=3
- DSPEC_OPENMP -zopt -Mrecursive -funroll-loops
- mlirvm -lsr-in-nested-loop -fopenmp=libomp -lomp -lamdlibm -lamdaloc
- lflang

Benchmarks using Fortran, C, and C++:
- m64 -Wl,-mlirvm -Wl,-align-all-nofallthru-blocks=6
- Wl,-mlirvm -Wl,-reduce-array-computations=3
- Wl,-mlirvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
- fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=7
- mlirvm -unroll-threshold=50 -mlirvm -inline-threshold=1000
- fremap-arrays -fstrip-mining -mlirvm -reduce-array-computations=3
- DSPEC_OPENMP -zopt -mlirvm -unroll-threshold=100 -finline-aggressive
- mlirvm -loop-unswitch-threshold=200000 -Mrecursive -funroll-loops
- mlirvm -lsr-in-nested-loop -fopenmp=libomp -lomp -lamdlibm -lamdaloc
- 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

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

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: -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
-fremp-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -flang

638.imagick_s: Same as 619.lbm_s

644.nab_s: -m64 -Wl,-mllvm -Wl,-region-vectorize -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -fstruct-layout=9 -mllvm -unroll-threshold=50
-fremp-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -flang
```

Fortran benchmarks:
```
603.bwaves_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 -Mrecursive -mllvm -reduce-array-computations=3
-fvector-transform -fscalar-transform -fopenmp=libomp
-lomp -lamdlibm -lamdalloc -flang
```

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

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

654.roms_s: Same as 603.bwaves_s

Benchmarks using both Fortran and C:

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

627.cam4_s: -m64 -Wl,-mlllvm -Wl,-align-all-nofallthru-blocks=6
  -Wl,-mlllvm -Wl,-reduce-array-computations=3
  -Wl,-mlllvm -Wl,enable-X86-prefetching -Ofast
  -march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
  -flto -fstruct-layout=9 -mlllvm -unroll-threshold=50
  -fremap-arrays -fstrip-mining
  -mlllvm -inline-threshold=1000
  -mlllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
  -Mrecursive -fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang

628.pop2_s: -m64 -Wl,-mlllvm -Wl,-align-all-nofallthru-blocks=6
  -Wl,-mlllvm -Wl,-reduce-array-computations=3
  -Wl,-mlllvm -Wl,enable-X86-prefetching -Ofast
  -march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
  -flto -fstruct-layout=9 -mlllvm -unroll-threshold=50
  -fremap-arrays -fstrip-mining
  -mlllvm -inline-threshold=1000
  -mlllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
  -Mrecursive -fvector-transform -fscalar-transform
  -fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang

(Continued on next page)
Hewlett Packard Enterprise

ProLiant DL345 Gen11
(4.10 GHz, AMD EPYC 9174F)

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
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<tbody>
<tr>
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<td>169</td>
</tr>
</tbody>
</table>

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

**Peak Optimization Flags (Continued)**

Benchmarks using Fortran, C, and C++:
- -m64 -Wl,-mlllvm -Wl,-align-all-nofallthru-blocks=6
- -Wl,-mlllvm -Wl,-reduce-array-computations=3
- -Wl,-mlllvm -Wl,-x86-use-vzeroupper=false -Ofast -march=znver4
- -fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=9
- -mlllvm -unroll-threshold=50 -fremap-arrays -fstrip-mining
- -mlllvm -inline-threshold=1000 -mlllvm -reduce-array-computations=3
- -DSPEC_OPENMP -zopt -finline-aggressive -mlllvm -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-Genoa-rev2.2.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-Genoa-rev2.2.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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