SPEC CPU®2017 Integer Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL385 Gen11
(2.25 GHz, AMD EPYC 9634)

SPECspeed®2017_int_base = 13.9
SPECspeed®2017_int_peak = 14.1

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

Test Date: Dec-2022
Hardware Availability: Nov-2022
Software Availability: Dec-2022

Threads

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
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<tbody>
<tr>
<td>600.perlbench_s</td>
<td>8.35</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>8.36</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>10.3</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>20.1</td>
</tr>
<tr>
<td>623.xalancbmk_s</td>
<td>21.0</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>6.94</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>6.94</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>5.84</td>
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<tr>
<td>648.exchange2_s</td>
<td>25.8</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>26.1</td>
</tr>
</tbody>
</table>

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Hardware

CPU Name: AMD EPYC 9634
Max MHz: 3700
Nominal: 2250
Enabled: 168 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: 384 MB I+D on chip per chip, 32 MB shared / 7 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: Ubuntu 22.04.1 LTS
Kernel 5.15.0-56-generic
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

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SPECspeed®2017_int_base (13.9)
SPECspeed®2017_int_peak (14.1)
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tr>
<td>600.perlbench_s</td>
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<td>14.3</td>
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<td><strong>10.3</strong></td>
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<td>160</td>
<td>10.2</td>
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**SPECspeed®2017_int_base = 13.9**

**SPECspeed®2017_int_peak = 14.1**

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

## Compiler Notes


## 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.

(Continued on next page)
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Test Sponsor: HPE
Tested by: HPE

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 = "0-167"
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 = "168"

Environment variables set by runcpu during the 600.perlbench_s peak run:
GOMP_CPU_AFFINITY = "15"

Environment variables set by runcpu during the 605.mcf_s peak run:
GOMP_CPU_AFFINITY = "15"

Environment variables set by runcpu during the 623.xalancbmk_s peak run:
GOMP_CPU_AFFINITY = "15"

Environment variables set by runcpu during the 657.xz_s peak run:
GOMP_CPU_AFFINITY = "0-167"
LIBOMP_NUM_HIDDEN_HELPER_THREADS = "8"

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.
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ProLiant DL385 Gen11
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Tested by: HPE

Test Date: Dec-2022
Hardware Availability: Dec-2022
Software Availability: Nov-2022

**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
- ACPI 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 0xa10110e 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 982a61ec0915b55891ef0e16aca64d
running on admin1 Mon Jun 27 18:46:21 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 9634 84-Core Processor
- 168 "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: 84
  - siblings: 84
- physical 0: cores 0 1 2 3 4 5 6 16 17 18 19 20 21 22 32 33 34 35 36 37 38 48 49 50
- physical 1: cores 0 1 2 3 4 5 6 16 17 18 19 20 21 22 32 33 34 35 36 37 38 48 49 50

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

(Continued on next page)
Platform Notes (Continued)

CPU(s): 168
On-line CPU(s) list: 0-167
Vendor ID: AuthenticAMD
Model name: AMD EPYC 9634 84-Core Processor
CPU family: 25
Model: 17
Thread(s) per core: 1
Core(s) per socket: 84
Socket(s): 2
Stepping: 1
Frequency boost: enabled
CPU max MHz: 3701.0000
CPU min MHz: 400.0000
BogoMIPS: 4493.27
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 noplapl nonstop_tsc cpuid extd_apicid aperfmperf r apl pni pclmulqdq monitor ssse3 fma cx16 pcmid sse4_1 sse4_2 x2apic movbe popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extatic cr8_legacy abm sse4a misalignsse 3dnowprefetch osfw ibs skinit wdt tce topoext perfctr_core perfctr_nb bext perfctr_llc mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsqsave gsavlocal bsavlocal msr pae mce cx8 apic sep mtrr
Virtualization: AMD-V
L1d cache: 5.3 MiB (168 instances)
L1i cache: 5.3 MiB (168 instances)
L2 cache: 168 MiB (168 instances)
L3 cache: 768 MiB (24 instances)
NUMA node(s): 24
NUMA node0 CPU(s): 0-6
NUMA node1 CPU(s): 28-34
NUMA node2 CPU(s): 56-62
NUMA node3 CPU(s): 42-48
NUMA node4 CPU(s): 70-76
NUMA node5 CPU(s): 21-27
NUMA node6 CPU(s): 49-55
NUMA node7 CPU(s): 77-83
NUMA node8 CPU(s): 7-13
NUMA node9 CPU(s): 35-41
NUMA node10 CPU(s): 63-69

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CPU2017 License: 3  
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**Platform Notes (Continued)**

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<tr>
<th>NUMA node12 CPU(s):</th>
<th>84-90</th>
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<tbody>
<tr>
<td>NUMA node13 CPU(s):</td>
<td>112-118</td>
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<td>NUMA node14 CPU(s):</td>
<td>140-146</td>
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<td>NUMA node15 CPU(s):</td>
<td>98-104</td>
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<td>NUMA node16 CPU(s):</td>
<td>126-132</td>
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<td>NUMA node17 CPU(s):</td>
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<td>NUMA node18 CPU(s):</td>
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<td>NUMA node19 CPU(s):</td>
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<td>NUMA node20 CPU(s):</td>
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<td>NUMA node21 CPU(s):</td>
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<td>NUMA node22 CPU(s):</td>
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</tr>
<tr>
<td>NUMA node23 CPU(s):</td>
<td>147-153</td>
</tr>
</tbody>
</table>

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 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   5.3M  8 Data  1   64   1   64
L1i  32K   5.3M  8 Instruction  1   64   1   64
L2   1M   168M  8 Unified  2  2048  1   64
L3   32M   768M 16 Unified  3 32768  1   64
```

/proc/cpuinfo cache data  
```
cache size: 1024 KB
```

From numactl --hardware
```
WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 24 nodes (0-23)
node 0 cpus: 0 1 2 3 4 5 6
node 0 size: 64199 MB
node 0 free: 63876 MB
node 1 cpus: 28 29 30 31 32 33 34
node 1 size: 64510 MB
node 1 free: 64233 MB
node 2 cpus: 56 57 58 59 60 61 62
```
## Platform Notes (Continued)

- node 2 size: 64510 MB
- node 2 free: 64223 MB
- node 3 cpus: 14 15 16 17 18 19 20
- node 3 size: 64510 MB
- node 3 free: 64336 MB
- node 4 cpus: 42 43 44 45 46 47 48
- node 4 size: 64510 MB
- node 4 free: 64387 MB
- node 5 cpus: 70 71 72 73 74 75 76
- node 5 size: 64474 MB
- node 5 free: 64325 MB
- node 6 cpus: 21 22 23 24 25 26 27
- node 6 size: 64510 MB
- node 6 free: 64371 MB
- node 7 cpus: 49 50 51 52 53 54 55
- node 7 size: 64510 MB
- node 7 free: 64360 MB
- node 8 cpus: 77 78 79 80 81 82 83
- node 8 size: 64510 MB
- node 8 free: 64393 MB
- node 9 cpus: 7 8 9 10 11 12 13
- node 9 size: 64510 MB
- node 9 free: 64378 MB
- node 10 cpus: 35 36 37 38 39 40 41
- node 10 size: 64510 MB
- node 10 free: 64365 MB
- node 11 cpus: 63 64 65 66 67 68 69
- node 11 size: 64510 MB
- node 11 free: 64397 MB
- node 12 cpus: 84 85 86 87 88 89 90
- node 12 size: 64510 MB
- node 12 free: 64404 MB
- node 13 cpus: 112 113 114 115 116 117 118
- node 13 size: 64510 MB
- node 13 free: 64400 MB
- node 14 cpus: 140 141 142 143 144 145 146
- node 14 size: 64510 MB
- node 14 free: 64390 MB
- node 15 cpus: 98 99 100 101 102 103 104
- node 15 size: 64510 MB
- node 15 free: 64407 MB
- node 16 cpus: 126 127 128 129 130 131 132
- node 16 size: 64510 MB
- node 16 free: 64408 MB
- node 17 cpus: 154 155 156 157 158 159 160
- node 17 size: 64510 MB
- node 17 free: 64413 MB

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Platform Notes (Continued)

| node  | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| node  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 0:    | 10  | 11  | 11  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  |
| 1:    | 11  | 10  | 11  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  |
| 2:    | 11  | 11  | 10  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  |
| 3:    | 12  | 12  | 12  | 10  | 11  | 11  | 12  | 12  | 12  | 12  | 12  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  |
| 4:    | 12  | 12  | 12  | 11  | 10  | 11  | 12  | 12  | 12  | 12  | 12  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  |
| 5:    | 12  | 12  | 12  | 11  | 11  | 10  | 12  | 12  | 12  | 12  | 12  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  |
| 6:    | 12  | 12  | 12  | 12  | 12  | 12  | 10  | 11  | 11  | 12  | 12  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  |
| 7:    | 12  | 12  | 12  | 12  | 12  | 11  | 10  | 11  | 11  | 12  | 12  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  |
| 8:    | 12  | 12  | 12  | 12  | 12  | 11  | 11  | 10  | 12  | 12  | 12  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  |
| 9:    | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 10  | 11  | 11  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  |
| 10:   | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 11  | 10  | 11  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  |
| 11:   | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 11  | 11  | 10  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  |
| 12:   | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 32  | 10  | 11  | 11  | 12  | 12  | 12  | 12  | 12  | 12  | 12  |
| node  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |

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

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL385 Gen11
(2.25 GHz, AMD EPYC 9634)

SPECspeed®2017_int_base = 13.9
SPECspeed®2017_int_peak = 14.1

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

<table>
<thead>
<tr>
<th>Platform Notes (Continued)</th>
</tr>
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<tbody>
<tr>
<td>12 12 12 12</td>
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<tr>
<td>14: 32 32 32 32 32 32 32 32 32 32 32 32 11 11 10 12 12 12 12 12</td>
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<td>16: 32 32 32 32 32 32 32 32 32 32 32 32 12 12 12 11 10 11 12 12</td>
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<td>11 12 12 12</td>
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<td>19: 32 32 32 32 32 32 32 32 32 32 32 32 12 12 12 12 12 12 12 11 10</td>
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<td>11 12 12 12</td>
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<td>10 12 12 12</td>
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<td>12 10 11 11</td>
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<td>22: 32 32 32 32 32 32 32 32 32 32 32 32 12 12 12 12 12 12 12 12 12</td>
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<tr>
<td>12 11 10 11</td>
</tr>
<tr>
<td>23: 32 32 32 32 32 32 32 32 32 32 32 32 12 12 12 12 12 12 12 12 12</td>
</tr>
<tr>
<td>12 11 11 10</td>
</tr>
</tbody>
</table>

From /proc/meminfo
MemTotal: 1584992784 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/sbin/tuned-adm active
Current active profile: throughput-performance

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has performance

/usr/bin/lsb_release -d
Ubuntu 22.04.1 LTS

From /etc/*release* /etc/*version*
debian_version: bookworm/sid
os-release:
  PRETTY_NAME="Ubuntu 22.04.1 LTS"
  NAME="Ubuntu"
  VERSION_ID="22.04"
  VERSION="22.04.1 LTS (Jammy Jellyfish)"
  VERSION_CODENAME=jammy
  ID=ubuntu
  ID_LIKE=debian

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

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL385 Gen11
(2.25 GHz, AMD EPYC 9634)

| SPECspeed®2017_int_base = 13.9 |
| SPECspeed®2017_int_peak = 14.1 |

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

Test Date: Dec-2022
Hardware Availability: Dec-2022
Software Availability: Nov-2022

---

**Platform Notes (Continued)**

**HOME_URL**="https://www.ubuntu.com/"

uname -a:
   Linux admin1 5.15.0-56-generic #62-Ubuntu SMP Tue Nov 22 19:54:14 UTC 2022 x86_64
   x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

- CVE-2018-12207: (iTLB Multihit): Not affected
- CVE-2018-3620: (L1 Terminal Fault): Not affected
- Microarchitectural Data Sampling: Not affected
- CVE-2017-5754 (Meltdown): Not affected
- mmio_stale_data: Not affected
- retbleed: Not affected
- CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
- CVE-2017-5753 (Spectre variant 1): Mitigation: usercopy/swapgs barriers and __user pointer sanitization
- CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
- CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 5 Jun 27 18:30

SPEC is set to: /home/cpu2017

---

From /sys/devices/virtual/dmi/id

Vendor:         HPE
Product:        ProLiant DL385 Gen11
Product Family: ProLiant
Serial:         DL385GEN11-003

---

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:
   13x Hynix HMCG94MEBRA121N 64 GB 2 rank 4800
   11x Hynix HMCG94MEBRA123N 64 GB 2 rank 4800

---

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

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**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

**ProLiant DL385 Gen11**

(2.25 GHz, AMD EPYC 9634)

**SPECspeed®2017_int_base = 13.9**

**SPECspeed®2017_int_peak = 14.1**

---

**CPU2017 License:** 3

**Test Sponsor:** HPE

**Tested by:** HPE

---

Platform Notes (Continued)

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)

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

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>perlbench_s</td>
<td>-DSPEC_LINUX_X64 -DSPEC_LP64</td>
</tr>
<tr>
<td>gcc_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>mcf_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>omnetpp_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>xalancbmk_s</td>
<td>-DSPEC_LINUX -DSPEC_LP64</td>
</tr>
<tr>
<td>x264_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>deepsjeng_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>leela_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>exchange2_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>xz_s</td>
<td>-DSPEC_LP64</td>
</tr>
</tbody>
</table>

## 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 -fstrip-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 -ffinline-aggressive
-mllvm -loop-unschedule-threshold=200000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-fvirtual-function-elimination -fvisibility=hidden -fopenmp=libomp
```

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

C++ benchmarks (continued):
- `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`
- `-mllvm -unroll-aggressive` `-mllvm -unroll-threshold=150` `-fopenmp=libomp`
- `-lomp` `-lamdlibm` `-lflang` `-lamdalloc`

## 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
<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>perlbench_s</td>
<td>-m64 -W1,-mllvm -W1,-align-all-nofallthru-blocks=6</td>
</tr>
<tr>
<td></td>
<td>-W1,-mllvm -W1,-reduce-array-computations=3</td>
</tr>
<tr>
<td></td>
<td>-W1,-allow-multiple-definition -Ofast -march=znver4</td>
</tr>
<tr>
<td></td>
<td>-fveclib=AMDLIBM -ffast-math -fopenmp -flto</td>
</tr>
<tr>
<td></td>
<td>-fstruct-layout=9 -mllvm -unroll-threshold=50</td>
</tr>
<tr>
<td></td>
<td>-fremap-arrays -fstrip-mining</td>
</tr>
<tr>
<td></td>
<td>-mllvm -inline-threshold=1000</td>
</tr>
<tr>
<td></td>
<td>-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt</td>
</tr>
<tr>
<td></td>
<td>-fopenmp=libomp -lomp -lamdlibm -lamdalloc -liflagon</td>
</tr>
<tr>
<td>mcf_s</td>
<td>Same as 600.perlbench_s</td>
</tr>
<tr>
<td>x264_s</td>
<td>basepeak = yes</td>
</tr>
<tr>
<td>xz_s</td>
<td>Same as 600.perlbench_s</td>
</tr>
<tr>
<td>xz_s</td>
<td>basepeak = yes</td>
</tr>
<tr>
<td>x264_s</td>
<td>basepeak = yes</td>
</tr>
<tr>
<td>exchange2_s</td>
<td>basepeak = yes</td>
</tr>
<tr>
<td>leela_s</td>
<td>basepeak = yes</td>
</tr>
<tr>
<td>leela_s</td>
<td>basepeak = yes</td>
</tr>
<tr>
<td>deepsjeng_s</td>
<td>basepeak = yes</td>
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<tr>
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</tr>
<tr>
<td>exchange2_s</td>
<td>basepeak = yes</td>
</tr>
</tbody>
</table>

**Peak Optimization Flags**

**C benchmarks:**

- **perlbench_s:**
  - -m64 -W1,-mllvm -W1,-align-all-nofallthru-blocks=6
  - -W1,-mllvm -W1,-reduce-array-computations=3
  - -W1,-allow-multiple-definition -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 -liflagon

- **mcf_s:**
  - Same as 600.perlbench_s
  - basepeak = yes

- **x264_s:**
  - Same as 600.perlbench_s
  - basepeak = yes

**C++ benchmarks:**

- **xalancbmk_s:**
  - -m64 -W1,-mllvm -W1,-align-all-nofallthru-blocks=6
  - -W1,-mllvm -W1,-reduce-array-computations=3
  - -W1,-mllvm -W1,-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 -liflagon

- **leela_s:**
  - basepeak = yes

- **leela_s:**
  - basepeak = yes

**Fortran benchmarks:**

- **exchange2_s:**
  - basepeak = yes

- **exchange2_s:**
  - basepeak = yes
### SPEC CPU®2017 Integer Speed Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant DL385 Gen11  
(2.25 GHz, AMD EPYC 9634)  

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

---

### 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:  

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/HPE-Platform-Flags-AMD-Genoa-rev2.1.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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