**SPEC CPU®2017 Floating Point Speed Result**

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**Hewlett Packard Enterprise**
(Test Sponsor: HPE)
ProLiant DL325 Gen11
(3.85 GHz, AMD EPYC 9374F)

**SPECspeed®2017_fp_base =**

**SPECspeed®2017_fp_peak =**

<table>
<thead>
<tr>
<th>CPU2017 License: 3</th>
<th>Test Date: Jan-2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor: HPE</td>
<td>Hardware Availability: Dec-2022</td>
</tr>
<tr>
<td>Tested by: HPE</td>
<td>Software Availability: Nov-2022</td>
</tr>
</tbody>
</table>

**Non-Compliant**

SPEC has determined that this result does not comply with the SPEC CPU 2017 run and reporting rules. Specifically, the test sponsor notified SPEC that the results were measured on an unsupported configuration.

**Threads**

| 603.bwaves_s |
| 607.cactuBSSN_s |
| 619.lbm_s |
| 621.wrf_s |
| 627.cam4_s |
| 628.pop2_s |
| 638.imagick_s |
| 644.nab_s |
| 649.fotonik3d_s |
| 654.roms_s |

**Hardware**

CPU Name: AMD EPYC 9374F

| Nominal: 3850 |
| Enabled: 32 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: 256 MB I+D on chip per chip, 32 MB shared / 4 cores |
| Other: None |
| Memory: 768 GB (12 x 64 GB 2Rx4 PC5-4800B-R) |
| Storage: 1 x 960 GB SATA SSD |
| Other: None |

**Software**

OS: Red Hat Enterprise Linux 9.0 (Plow)
Kernel 5.14.0-70.13.1.el9_0.x86_64
Compiler: C/C++/Fortran: Version 4.0.0 of AOCC
Parallel: Yes
Firmware: HPE BIOS Version v1.12 11/24/2022 released Nov-2022
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
SPEC has determined that this result does not comply with the SPEC CPU 2017 run and reporting rules. Specifically, the test sponsor notified SPEC that the results were measured on an unsupported configuration.

### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
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<td>NC</td>
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<tr>
<td>607.cactuBSSN_s</td>
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<td>NC</td>
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<tr>
<td>627.cam4_s</td>
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<tr>
<td>628.pop2_s</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
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<td>NC</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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<td>NC</td>
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<tr>
<td>649.fotonik3d_s</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
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<td>NC</td>
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<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
</tr>
</tbody>
</table>

SPECspeed®2017_fp_base = SPECspeed®2017_fp_peak =

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.

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 numaclt 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.
SPECL has determined that this result does not comply with the SPEC CPU 2017 run and reporting rules. Specifically, the test sponsor notified SPECL that the results were measured on an unsupported configuration.

Operating System Notes (Continued)

To disable address space layout randomization (ASLR) to reduce run-to-run variability, ‘sysctl -w kernel.randomize_va_space=0’ run as root.

To enable Transparent Hugepages (THP) for all allocations:
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.

To always enable THP for peak runs of:
603.bwaves_s, 607.cactuBSSN_s, 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 = "0-31"
LD_LIBRARY_PATH = "/Library/Developer/CommandLineTools/usr/lib/
LIBOMP_NUM_HIDDEN_THREADS = "0"
MALLOCC_CONF = "oversize_threshold:0,retain:true"
OMP_DYNAMIC = "true"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128K"
OMP_THREAD_LIMIT = "32"

Environment variables set by runcpu during the 603.bwaves_s peak run:
GOMP_CPU_AFFINITY = "0-31"
PGHPF_ZMEM = "yes"

Environment variables set by runcpu during the 621.wrf_s peak run:
GOMP_CPU_AFFINITY = "0-31"
PGHPF_ZMEM = "yes"

Environment variables set by runcpu during the 627.cam4_s peak run:
GOMP_CPU_AFFINITY = "0-31"

Environment variables set by runcpu during the 628.pop2_s peak run:
GOMP_CPU_AFFINITY = "0-31"
SPEC has determined that this result does not comply with the SPEC CPU 2017 run and reporting rules. Specifically, the test sponsor notified SPEC that the results were measured on an unsupported configuration.
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Platform Notes (Continued)

| Vulnerability Spec store bypass: Mitigation; Spec store bypass disabled via prctl |
|---------------------------------|---------------------------------|
| Vulnerability Spectre v1:       Mitigation; usercopy/swapgs barriers and __user pointer sanitization |
| Vulnerability Spectre v2:       Mitigation; Retpolines, IBPS conditional, IBRS_FW, STIBP disabled, RSB filling |
| Vulnerability Srbds:            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>1M</td>
<td>8</td>
<td>Data</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L1i</td>
<td>32K</td>
<td>1M</td>
<td>8</td>
<td>Instruction</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L2</td>
<td>1M</td>
<td>32M</td>
<td>16</td>
<td>Unified</td>
<td>2</td>
<td>2048</td>
<td>1</td>
<td>64</td>
</tr>
<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>

/proc/cpuinfo cache data

cache size : 1024 KB

From numactl --hardware

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

node 0 cpus: 0 1 2 3
node 0 size: 96524 MB
node 0 free: 96374 MB
node 1 cpus: 16 17 18 19
node 1 size: 96766 MB
node 1 free: 96634 MB
node 2 cpus: 8 9 10 11
node 2 size: 96730 MB
node 2 free: 96556 MB
node 3 cpus: 24 25 26 27
node 3 size: 96766 MB
node 3 free: 96570 MB
node 4 cpus: 12 13 14 15
node 4 size: 96766 MB
node 4 free: 96624 MB
node 5 cpus: 28 29 30 31
node 5 size: 96718 MB
node 5 free: 96326 MB
node 6 cpus: 4 5 6 7
node 6 size: 96766 MB
node 6 free: 96537 MB
node 7 cpus: 20 21 22 23
node 7 size: 96766 MB
node 7 free: 96542 MB
node distances:

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

(Continued on next page)
SPEC has determined that this result does not comply with the SPEC CPU 2017 run and reporting rules. Specifically, the test sponsor notified SPEC that the results were measured on an unsupported configuration.

Platform Notes (Continued)

5:  11 11 11 11 11 11 11 11
7:  11 11 11 11 11 11 11 10

From /proc/meminfo
MemTotal:       792375840 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

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 Multihit): Not affected
CVE-2018-3620 (L1 Terminal Fault): Not affected
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/swaps barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Retpolines, IBPB: conditional, IBRS_FW, STIBF: disabled, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

(Continued on next page)
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Platform Notes (Continued)

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  82G  737G  11% /home

From /sys/devices/virtual/dmi/id
Vendor:         HPE
Product:        ProLiant DL325 Gen11
Product Family: ProLiant
Serial:         DL325G11-01

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:
10x Hynix HMCG94AEBRA103N 64 GB 2 rank 4800
2x Hynix HMCG94MEBRA121N 64 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                                  | 619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base, peak)
----------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86-64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

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

(Continued on next page)
SPEC has determined that this result does not comply with the SPEC CPU 2017 run and reporting rules. Specifically, the test sponsor notified SPEC that the results were measured on an unsupported configuration.

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### Compiler Version Notes (Continued)

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

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### Base Compiler Invocation

#### C benchmarks:
- `clang`

#### Fortran benchmarks:
- `flang`

#### Benchmarks using both Fortran and C:
- `flang clang`

#### Benchmarks using Fortran, C, and C++:
- `clang++ clang flang`
SPEC has determined that this result does not comply with the SPEC CPU 2017 run and reporting rules. Specifically, the test sponsor notified SPEC that the results were measured on an unsupported configuration.

**Base Portability Flags**

- 603.bwaves_s: -DSPEC_LP64
- 607.cactuBSSN_s: -DSPEC_LP64
- 619.lbm_s: -DSPEC_LP64
- 621.wrf_s: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64
- 627.cam4_s: -DSPEC_CASE_FLAG -DSPEC_LP64
- 628.pop2_s: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64
- 638.imagick_s: -DSPEC_LP64
- 644.nab_s: -DSPEC_LP64
- 649.fotonik3d_s: -DSPEC_LP64
- 654.roms_s: -DSPEC_LP64

**Base Optimization Flags**

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

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

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

(Continued on next page)
SPEC has determined that this result does not comply with the SPEC CPU 2017 run and reporting rules. Specifically, the test sponsor notified SPEC that the results were measured on an unsupported configuration.

Base Optimization Flags (Continued)

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

Benchmarks using Fortran, C, and C++:
- m64 -Wl,-mllvm -Wl,-align all-nofallthrough-blocks=6
- Wl,-mllvm -Wl,-reduce-array-computations=3
- Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
- fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=7
- mllvm -unroll-threshold=500 -mllvm -inline-threshold=1000
- freemap-arrays -fstrip-mining -mllvm -mreduce-array-computations=3
- DSPEC_OPENMP -zopt -mllvm -unroll-threshold=100 -finline-aggressive
- mllvm -loop-unswitch-threshold=200000 -Mrecursive -funroll-loops
- mllvm -lsr-in-nested-loop -fopenmp=libomp -lomp -lamdlibm -lamdalloc
- lflang

Base Other Flags

C benchmarks:
- Wno-return-type -Wno-unused-command-line-argument
- 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
SPEC has determined that this result does not comply with the SPEC CPU 2017 run and reporting rules. Specifically, the test sponsor notified SPEC that the results were measured on an unsupported configuration.

Peak Compiler Invocation

C benchmarks:
clang

Fortran benchmarks:
flang

Benchmarks using both Fortran and C:
flang clang

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

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
619.lbm_s: basepeak = yes
638.imagick_s: basepeak = yes
644.nab_s: basepeak = yes

Fortran benchmarks:

(Continued on next page)
SPEC has determined that this result does not comply with the SPEC CPU 2017 run and reporting rules. Specifically, the test sponsor notified SPEC that the results were measured on an unsupported configuration.

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 -lamlb -lamlb -lflang

654.roms_s: Same as 603.bwaves

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 -lsr-in-nested-loop
-fopenmp=libomp -lomp -lamlb -lamlb -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
SPEC has determined that this result does not comply with the SPEC CPU 2017 run and reporting rules. Specifically, the test sponsor notified SPEC that the results were measured on an unsupported configuration.

### Peak Optimization Flags (Continued)

```
628.pop2_s (continued):
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -fstruct-layout=9 -mllv -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllv -inline-threshold=1000
-mllv -reduce-array-computations=3 -DSPEC_ILPENMP -zopt
-Mrecursive -fvector-transform -fscalar-transform
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang
```

Benchmarks using Fortran, C, and C++:

```
607.cactuBSSN_s: basepeak = yes
```

### 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`

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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)
**SPEC CPU®2017 Floating Point Speed Result**

Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
ProLiant DL325 Gen11  
(3.85 GHz, AMD EPYC 9374F)  

| SPECspeed®2017_fp_peak = | SPECspeed®2017_fp_base = |

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

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

SPEC has determined that this result does not comply with the SPEC CPU 2017 run and reporting rules. Specifically, the test sponsor notified SPEC that the results were measured on an unsupported configuration.

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