



# SPEC CPU®2017 Floating Point Speed Result

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**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

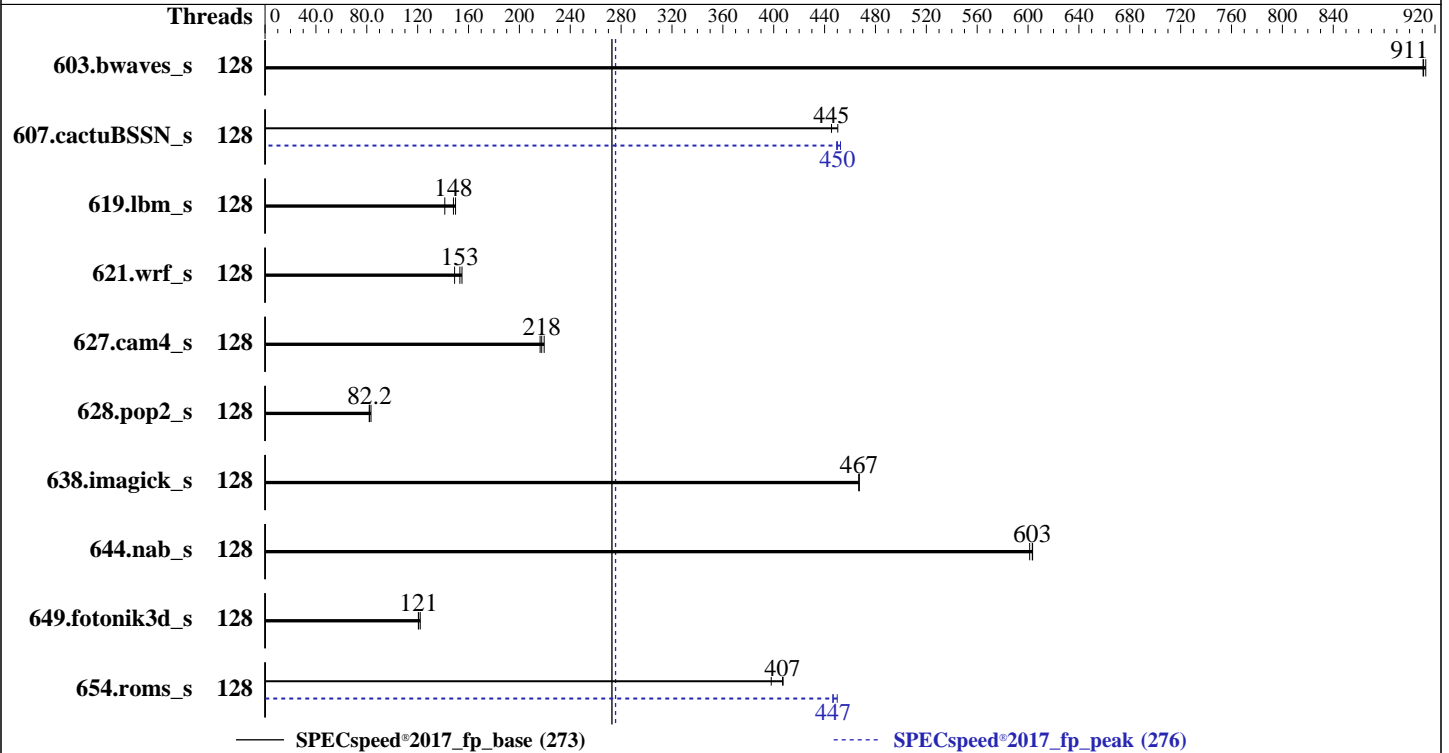
ProLiant DL385 Gen10 Plus v2  
(2.20 GHz, AMD EPYC 7773X)

SPECspeed®2017\_fp\_base = 273

SPECspeed®2017\_fp\_peak = 276

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

Test Date: Feb-2022  
Hardware Availability: Mar-2022  
Software Availability: Jan-2022



### Hardware

CPU Name: AMD EPYC 7773X  
 Max MHz: 3500  
 Nominal: 2200  
 Enabled: 128 cores, 2 chips  
 Orderable: 1, 2 chip(s)  
 Cache L1: 32 KB I + 32 KB D on chip per core  
 L2: 512 KB I+D on chip per core  
 L3: 768 MB I+D on chip per chip,  
 96 MB shared / 8 cores  
 Other: None  
 Memory: 2 TB (16 x 128 GB 4Rx4 PC4-3200AA-L)  
 Storage: 1 x 400 GB SAS SSD  
 Other: None

### Software

OS: Ubuntu 20.04.2 LTS (x86\_64)  
 Kernel 5.11.0-41-generic  
 Compiler: C/C++/Fortran: Version 3.2.0 of AOCC  
 Parallel: Yes  
 Firmware: HPE BIOS Version A42 v2.56 02/10/2022 released Feb-2022  
 File System: ext4  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: 64-bit  
 Other: jemalloc: jemalloc memory allocator library v5.1.0  
 Power Management: BIOS set to prefer performance at the cost of additional power usage



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## Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	128	64.8	911	64.6	913	<b>64.8</b>	<b>911</b>	128	64.8	911	64.6	913	<b>64.8</b>	<b>911</b>
607.cactuBSSN_s	128	37.4	445	<b>37.4</b>	<b>445</b>	37.0	450	128	36.8	452	<b>37.0</b>	<b>450</b>	37.1	449
619.lbm_s	128	37.1	141	35.0	150	<b>35.4</b>	<b>148</b>	128	37.1	141	35.0	150	<b>35.4</b>	<b>148</b>
621.wrf_s	128	<b>86.3</b>	<b>153</b>	88.7	149	85.4	155	128	<b>86.3</b>	<b>153</b>	88.7	149	85.4	155
627.cam4_s	128	40.4	219	41.0	216	<b>40.7</b>	<b>218</b>	128	40.4	219	41.0	216	<b>40.7</b>	<b>218</b>
628.pop2_s	128	145	81.9	143	83.3	<b>145</b>	<b>82.2</b>	128	145	81.9	143	83.3	<b>145</b>	<b>82.2</b>
638.imagick_s	128	30.9	467	30.9	467	<b>30.9</b>	<b>467</b>	128	30.9	467	30.9	467	<b>30.9</b>	<b>467</b>
644.nab_s	128	29.1	601	28.9	604	<b>29.0</b>	<b>603</b>	128	29.1	601	28.9	604	<b>29.0</b>	<b>603</b>
649.fotonik3d_s	128	74.7	122	75.6	121	<b>75.5</b>	<b>121</b>	128	74.7	122	75.6	121	<b>75.5</b>	<b>121</b>
654.roms_s	128	38.6	407	<b>38.7</b>	<b>407</b>	39.6	398	128	35.3	446	35.0	450	<b>35.2</b>	<b>447</b>

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

## Compiler Notes

The AMD64 AOCC Compiler Suite is available at  
<http://developer.amd.com/amd-aocc/>

## Submit Notes

The config file option 'submit' was used.  
'numactl' was used to bind copies to the cores.  
See the configuration file for details.

## Operating System Notes

'ulimit -s unlimited' was used to set environment stack size limit  
'ulimit -l 2097152' was used to set environment locked pages in memory limit

runcpu command invoked through numactl i.e.:  
numactl --interleave=all runcpu <etc>

To limit dirty cache to 8% of memory, 'sysctl -w vm.dirty\_ratio=8' run as root.  
To limit swap usage to minimum necessary, 'sysctl -w vm.swappiness=1' run as root.  
To free node-local memory and avoid remote memory usage,  
'sysctl -w vm.zone\_reclaim\_mode=1' run as root.  
To clear filesystem caches, 'sync; sysctl -w vm.drop\_caches=3' run as root.  
To disable address space layout randomization (ASLR) to reduce run-to-run  
variability, 'sysctl -w kernel.randomize\_va\_space=0' run as root.

To enable Transparent Hugepages (THP) for all allocations,

(Continued on next page)



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## Operating System Notes (Continued)

```
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and  
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.  
To enable THP only on request for peak runs of 628.pop2_s:  
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root.  
To disable THP for peak runs of 627.cam4_s, 649.fotonik3d_s, and 654.roms_s,  
'echo never > /sys/kernel/mm/transparent_hugepage/enabled' run as root.
```

## Environment Variables Notes

Environment variables set by runcpu before the start of the run:  
GOMP\_CPU\_AFFINITY = "0-127"  
LD\_LIBRARY\_PATH =  
"/home/cpu2017/amd\_speed\_aocc320\_milanx\_A\_lib/lib;/home/cpu2017/amd\_spee  
d\_aocc320\_milanx\_A\_lib/lib32:"  
LIBOMP\_NUM\_HIDDEN\_HELPER\_THREADS = "0"  
MALLOCF\_CONF = "retain:true"  
OMP\_DYNAMIC = "false"  
OMP\_SCHEDULE = "static"  
OMP\_STACKSIZE = "128M"  
OMP\_THREAD\_LIMIT = "128"

Environment variables set by runcpu during the 607.cactuBSSN\_s peak run:  
GOMP\_CPU\_AFFINITY = "0-127"

Environment variables set by runcpu during the 654.roms\_s peak run:  
GOMP\_CPU\_AFFINITY = "0-127"

## General Notes

Binaries were compiled on a system with 2x AMD EPYC 7742 CPU + 1TiB Memory using openSUSE 15.2

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.

jemalloc: configured and built with GCC v4.8.2 in RHEL 7.4 (No options specified)

jemalloc 5.1.0 is available here:

<https://github.com/jemalloc/jemalloc/releases/download/5.1.0/jemalloc-5.1.0.tar.bz2>



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## Platform Notes

### BIOS Configuration

Workload Profile set to General Peak Frequency Compute  
AMD SMT Option set to Disabled  
Determinism Control set to Manual  
Performance Determinism set to Power Deterministic  
Last-Level Cache (LLC) as NUMA Node set to Enabled  
NUMA memory domains per socket set to One memory domain per socket  
Thermal Configuration set to Maximum Cooling  
Infinity Fabric Power Management set to Disabled  
Infinity Fabric Performance State set to P0  
Workload Profile set to Custom  
Power Regulator set to OS Control Mode

The system date and time as discovered by sysinfo is incorrect as the time was not updated prior to the run. The test\_date field shows an accurate date for the result.

The system ROM used for this result contains microcode version 0x 0A001227h for the AMD EPYC 7nn3X family of processors. The reference code/AGESA version used in this ROM is version MilanPI 1.0.0.8

sysinfo program /home/cpu2017/bin/sysinfo  
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d  
running on oem-ProLiant-DL385-Gen10-Plus Thu Jul 22 00:33:03 2021

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 7773X 64-Core Processor
 2 "physical id"s (chips)
128 "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 : 64
siblings : 64
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
53 54 55 56 57 58 59 60 61 62 63
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
53 54 55 56 57 58 59 60 61 62 63
```

### From lscpu from util-linux 2.34:

Architecture: x86\_64  
CPU op-mode(s): 32-bit, 64-bit  
Byte Order: Little Endian

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## Platform Notes (Continued)

```

Address sizes:                48 bits physical, 48 bits virtual
CPU(s):                       128
On-line CPU(s) list:         0-127
Thread(s) per core:          1
Core(s) per socket:          64
Socket(s):                    2
NUMA node(s):                 16
Vendor ID:                    AuthenticAMD
CPU family:                   25
Model:                        1
Model name:                   AMD EPYC 7773X 64-Core Processor
Stepping:                     2
Frequency boost:              enabled
CPU MHz:                      2200.000
CPU max MHz:                  2200.0000
CPU min MHz:                  1500.0000
BogoMIPS:                     4391.99
Virtualization:              AMD-V
L1d cache:                    4 MiB
L1i cache:                    4 MiB
L2 cache:                     64 MiB
L3 cache:                     1.5 GiB
NUMA node0 CPU(s):           0-7
NUMA node1 CPU(s):           8-15
NUMA node2 CPU(s):           16-23
NUMA node3 CPU(s):           24-31
NUMA node4 CPU(s):           32-39
NUMA node5 CPU(s):           40-47
NUMA node6 CPU(s):           48-55
NUMA node7 CPU(s):           56-63
NUMA node8 CPU(s):           64-71
NUMA node9 CPU(s):           72-79
NUMA node10 CPU(s):          80-87
NUMA node11 CPU(s):          88-95
NUMA node12 CPU(s):          96-103
NUMA node13 CPU(s):          104-111
NUMA node14 CPU(s):          112-119
NUMA node15 CPU(s):          120-127
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 and seccomp
Vulnerability Spectre v1:      Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2:      Mitigation; Full AMD retpoline, IBPB conditional,

```

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## Platform Notes (Continued)

IBRS\_FW, STIBP disabled, RSB filling  
 Vulnerability Srbds: Not affected  
 Vulnerability Tsx async abort: Not affected  
 Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr  
 pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr\_opt  
 pdpe1gb rdtscp lm constant\_tsc rep\_good nopl nonstop\_tsc cpuid extd\_apicid  
 aperfmperf pni pclmulqdq monitor ssse3 fma cx16 pcid sse4\_1 sse4\_2 x2apic movbe  
 popcnt aes xsave avx f16c rdrand lahf\_lm cmp\_legacy svm extapic cr8\_legacy abm sse4a  
 misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext perfctr\_core perfctr\_nb  
 bpext perfctr\_llc mwaitx cpb cat\_l3 cdp\_l3 invpcid\_single hw\_pstate ssbd mba ibrs  
 ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 invpcid cqm rdt\_a rdseed adx smap  
 clflushopt clwb sha\_ni xsaveopt xsavec xgetbv1 xsaves cqm\_llc cqm\_occup\_llc  
 cqm\_mbm\_total cqm\_mbm\_local clzero irperf xsaveerptr rdpru wbnoinvd amd\_ppin arat  
 npt lbrv svm\_lock nrip\_save tsc\_scale vmcb\_clean flushbyasid decodeassists  
 pausefilter pfthreshold v\_vmsave\_vmload vgif umip pku ospke vaes vpclmulqdq rdpid  
 overflow\_recov succor smca

From lscpu --cache:

NAME	ONE-SIZE	ALL-SIZE	WAYS	TYPE	LEVEL
L1d	32K	4M	8	Data	1
L1i	32K	4M	8	Instruction	1
L2	512K	64M	8	Unified	2
L3	96M	1.5G	16	Unified	3

/proc/cpuinfo cache data  
cache size : 512 KB

From numactl --hardware

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

available: 16 nodes (0-15)  
 node 0 cpus: 0 1 2 3 4 5 6 7  
 node 0 size: 128710 MB  
 node 0 free: 128436 MB  
 node 1 cpus: 8 9 10 11 12 13 14 15  
 node 1 size: 129022 MB  
 node 1 free: 128908 MB  
 node 2 cpus: 16 17 18 19 20 21 22 23  
 node 2 size: 129022 MB  
 node 2 free: 128903 MB  
 node 3 cpus: 24 25 26 27 28 29 30 31  
 node 3 size: 129022 MB  
 node 3 free: 128898 MB  
 node 4 cpus: 32 33 34 35 36 37 38 39  
 node 4 size: 129022 MB  
 node 4 free: 128895 MB  
 node 5 cpus: 40 41 42 43 44 45 46 47  
 node 5 size: 129022 MB

(Continued on next page)



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## Platform Notes (Continued)

```

node 5 free: 128851 MB
node 6 cpus: 48 49 50 51 52 53 54 55
node 6 size: 129022 MB
node 6 free: 128098 MB
node 7 cpus: 56 57 58 59 60 61 62 63
node 7 size: 116909 MB
node 7 free: 116792 MB
node 8 cpus: 64 65 66 67 68 69 70 71
node 8 size: 129022 MB
node 8 free: 128911 MB
node 9 cpus: 72 73 74 75 76 77 78 79
node 9 size: 129022 MB
node 9 free: 128911 MB
node 10 cpus: 80 81 82 83 84 85 86 87
node 10 size: 129022 MB
node 10 free: 128909 MB
node 11 cpus: 88 89 90 91 92 93 94 95
node 11 size: 129022 MB
node 11 free: 128913 MB
node 12 cpus: 96 97 98 99 100 101 102 103
node 12 size: 129022 MB
node 12 free: 128914 MB
node 13 cpus: 104 105 106 107 108 109 110 111
node 13 size: 128990 MB
node 13 free: 128873 MB
node 14 cpus: 112 113 114 115 116 117 118 119
node 14 size: 129022 MB
node 14 free: 128880 MB
node 15 cpus: 120 121 122 123 124 125 126 127
node 15 size: 129013 MB
node 15 free: 128892 MB
node distances:
node  0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15
0:  10 11 11 11 11 11 11 11 32 32 32 32 32 32 32 32
1:  11 10 11 11 11 11 11 11 32 32 32 32 32 32 32 32
2:  11 11 10 11 11 11 11 11 32 32 32 32 32 32 32 32
3:  11 11 11 10 11 11 11 11 32 32 32 32 32 32 32 32
4:  11 11 11 11 10 11 11 11 32 32 32 32 32 32 32 32
5:  11 11 11 11 11 10 11 11 32 32 32 32 32 32 32 32
6:  11 11 11 11 11 11 10 11 32 32 32 32 32 32 32 32
7:  11 11 11 11 11 11 11 10 32 32 32 32 32 32 32 32
8:  32 32 32 32 32 32 32 32 10 11 11 11 11 11 11 11
9:  32 32 32 32 32 32 32 32 11 10 11 11 11 11 11 11
10: 32 32 32 32 32 32 32 32 11 11 10 11 11 11 11 11
11: 32 32 32 32 32 32 32 32 11 11 11 10 11 11 11 11
12: 32 32 32 32 32 32 32 32 11 11 11 11 10 11 11 11
13: 32 32 32 32 32 32 32 32 11 11 11 11 11 10 11 11

```

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## Platform Notes (Continued)

```
14: 32 32 32 32 32 32 32 32 32 11 11 11 11 11 11 10 11
15: 32 32 32 32 32 32 32 32 32 11 11 11 11 11 11 11 10
```

From /proc/meminfo

```
MemTotal:      2101132716 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 20.04.2 LTS

From /etc/\*release\* /etc/\*version\*

```
debian_version: bullseye/sid
os-release:
NAME="Ubuntu"
VERSION="20.04.2 LTS (Focal Fossa)"
ID=ubuntu
ID_LIKE=debian
PRETTY_NAME="Ubuntu 20.04.2 LTS"
VERSION_ID="20.04"
HOME_URL="https://www.ubuntu.com/"
SUPPORT_URL="https://help.ubuntu.com/"
```

uname -a:

```
Linux oem-ProLiant-DL385-Gen10-Plus 5.11.0-41-generic #45~20.04.1-Ubuntu SMP Wed Nov 10 10:20:10 UTC 2021 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 and seccomp
CVE-2017-5753 (Spectre variant 1):      Mitigation: usercopy/swapgs barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2):      Mitigation: Full AMD retpoline, IBPB: conditional, IBRS_FW, STIBP:
```

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## Platform Notes (Continued)

CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected  
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Jul 22 00:30

SPEC is set to: /home/cpu2017

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/sdb2	ext4	366G	75G	273G	22%	/

From /sys/devices/virtual/dmi/id

Vendor: HPE  
Product: ProLiant DL385 Gen10 Plus  
Product Family: ProLiant  
Serial: CN7931051F

Additional information from dmidecode 3.2 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:  
16x Samsung M386AAG40AM3-CWE 128 GB 4 rank 3200  
16x UNKNOWN NOT AVAILABLE

BIOS:  
BIOS Vendor: HPE  
BIOS Version: A42  
BIOS Date: 02/10/2022  
BIOS Revision: 2.56  
Firmware Revision: 2.55

(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 13.0.0 (CLANG: AOCC\_3.2.0-Build#128 2021\_11\_12) (based on LLVM Mirror.Version.13.0.0)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin  
-----

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=====  
C++, C, Fortran | 607.cactuBSSN\_s(base, peak)  
-----

AMD clang version 13.0.0 (CLANG: AOCC\_3.2.0-Build#128 2021\_11\_12) (based on LLVM Mirror.Version.13.0.0)

Target: x86\_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin

AMD clang version 13.0.0 (CLANG: AOCC\_3.2.0-Build#128 2021\_11\_12) (based on LLVM Mirror.Version.13.0.0)

Target: x86\_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin

AMD clang version 13.0.0 (CLANG: AOCC\_3.2.0-Build#128 2021\_11\_12) (based on LLVM Mirror.Version.13.0.0)

Target: x86\_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin  
-----

=====  
Fortran | 603.bwaves\_s(base, peak) 649.fotonik3d\_s(base, peak)  
654.roms\_s(base, peak)

AMD clang version 13.0.0 (CLANG: AOCC\_3.2.0-Build#128 2021\_11\_12) (based on LLVM Mirror.Version.13.0.0)

Target: x86\_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin  
-----

=====  
Fortran, C | 621.wrf\_s(base, peak) 627.cam4\_s(base, peak)  
628.pop2\_s(base, peak)

AMD clang version 13.0.0 (CLANG: AOCC\_3.2.0-Build#128 2021\_11\_12) (based on LLVM Mirror.Version.13.0.0)

Target: x86\_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin

AMD clang version 13.0.0 (CLANG: AOCC\_3.2.0-Build#128 2021\_11\_12) (based on LLVM Mirror.Version.13.0.0)

Target: x86\_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin  
-----



# SPEC CPU®2017 Floating Point Speed Result

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**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

**ProLiant DL385 Gen10 Plus v2**  
(2.20 GHz, AMD EPYC 7773X)

**SPECSpeed®2017\_fp\_base = 273**

**SPECSpeed®2017\_fp\_peak = 276**

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

**Test Date:** Feb-2022  
**Hardware Availability:** Mar-2022  
**Software Availability:** Jan-2022

## 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

## Base Portability Flags

603.bwaves\_s: -DSPEC\_LP64  
607.cactuBSSN\_s: -DSPEC\_LP64  
619.ibm\_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,-region-vectorize  
-Wl,-mllvm -Wl,-function-specialize  
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3  
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=5  
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000  
-fremap-arrays -mllvm -function-specialize -flv-function-specialization  
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true  
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3 -z muldefs  
-DSPEC\_OPENMP -fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang

Fortran benchmarks:

-m64 -Wl,-mllvm -Wl,-enable-X86-prefetching  
-Wl,-mllvm -Wl,-enable-licm-vrp -Wl,-mllvm -Wl,-region-vectorize

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## Base Optimization Flags (Continued)

Fortran benchmarks (continued):

```
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Hz,1,0x1 -O3
-march=znver3 -fveclib=AMDLIBM -ffast-math -fopenmp -Mrecursive
-mllvm -fuse-tile-inner-loop -funroll-loops
-mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -enable-loopinterchange
-mllvm -compute-interchange-order -z muldefs -DSPEC_OPENMP
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang
```

Benchmarks using both Fortran and C:

```
-m64 -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=5
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-arrays -mllvm -function-specialize -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3 -Hz,1,0x1
-Mrecursive -mllvm -fuse-tile-inner-loop -funroll-loops
-mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop
-mllvm -enable-loopinterchange -mllvm -compute-interchange-order
-z muldefs -DSPEC_OPENMP -fopenmp=libomp -lomp -lamdlibm -ljemalloc
-lflang
```

Benchmarks using Fortran, C, and C++:

```
-m64 -Wl,-mllvm -Wl,-x86-use-vzeroupper=false
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=5
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-arrays -mllvm -function-specialize -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3
-mllvm -enable-partial-unswitch -mllvm -unroll-threshold=100
-finline-aggressive -mllvm -loop-unswitch-threshold=200000
-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
-mllvm -extra-vectorizer-passes -mllvm -convert-pow-exp-to-int=false
-Hz,1,0x1 -Mrecursive -mllvm -fuse-tile-inner-loop -funroll-loops
-mllvm -lsr-in-nested-loop -mllvm -enable-loopinterchange
-mllvm -compute-interchange-order -z muldefs -DSPEC_OPENMP
```

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## Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):

-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang

## Base Other Flags

C benchmarks:

-Wno-unused-command-line-argument -Wno-return-type

Fortran benchmarks:

-Wno-unused-command-line-argument -Wno-return-type

Benchmarks using both Fortran and C:

-Wno-unused-command-line-argument -Wno-return-type

Benchmarks using Fortran, C, and C++:

-Wno-unused-command-line-argument -Wno-return-type

## 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



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**Test Sponsor:** HPE  
**Tested by:** HPE

**Test Date:** Feb-2022  
**Hardware Availability:** Mar-2022  
**Software Availability:** Jan-2022

## Peak Optimization Flags

C benchmarks:

619.lbm\_s: basepeak = yes

638.imagick\_s: basepeak = yes

644.nab\_s: basepeak = yes

Fortran benchmarks:

603.bwaves\_s: basepeak = yes

649.fotonik3d\_s: basepeak = yes

654.roms\_s: -m64 -Wl,-mllvm -Wl,-enable-X86-prefetching  
-Wl,-mllvm -Wl,-enable-licm-vrp  
-Wl,-mllvm -Wl,-function-specialize  
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast  
-march=znver3 -fveclib=AMDLIBM -ffast-math -fopenmp  
-Mrecursive -mllvm -reduce-array-computations=3  
-mllvm -global-vectorize-slp=true -mllvm -enable-licm-vrp  
-DSPEC\_OPENMP -fopenmp=libomp -lomp -lamdlibm -ljemalloc  
-lflang

Benchmarks using both Fortran and C:

621.wrf\_s: basepeak = yes

627.cam4\_s: basepeak = yes

628.pop2\_s: basepeak = yes

Benchmarks using Fortran, C, and C++:

-m64 -Wl,-mllvm -Wl,-x86-use-vzeroupper=false  
-Wl,-mllvm -Wl,-enable-licm-vrp  
-Wl,-mllvm -Wl,-do-block-reorder=aggressive  
-Wl,-mllvm -Wl,-function-specialize  
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast -march=znver3  
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=5  
-mllvm -unroll-threshold=50 -fremap-arrays -flv-function-specialization  
-mllvm -inline-threshold=1000 -mllvm -enable-gvn-hoist  
-mllvm -global-vectorize-slp=true -mllvm -function-specialize  
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3  
-finline-aggressive -mllvm -unroll-threshold=100 -mllvm -reroll-loops

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## Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):

```
-mllvm -aggressive-loop-unswitch -Mrecursive  
-mllvm -do-block-reorder=aggressive -DSPEC_OPENMP -fopenmp=libomp  
-lomp -lamdlibm -ljemalloc -lflang
```

## Peak Other Flags

C benchmarks:

```
-Wno-unused-command-line-argument -Wno-return-type
```

Fortran benchmarks:

```
-Wno-unused-command-line-argument -Wno-return-type
```

Benchmarks using both Fortran and C:

```
-Wno-unused-command-line-argument -Wno-return-type
```

Benchmarks using Fortran, C, and C++:

```
-Wno-unused-command-line-argument -Wno-return-type
```

The flags files that were used to format this result can be browsed at

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revR.html>

<http://www.spec.org/cpu2017/flags/aocc320-flags-A1.html>

You can also download the XML flags sources by saving the following links:

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revR.xml>

<http://www.spec.org/cpu2017/flags/aocc320-flags-A1.xml>

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