



# SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

## Dell Inc.

SPECrate®2017\_fp\_base = 407

PowerEdge C6525 (AMD EPYC 7513 32-Core Processor)

SPECrate®2017\_fp\_peak = 434

CPU2017 License: 6573

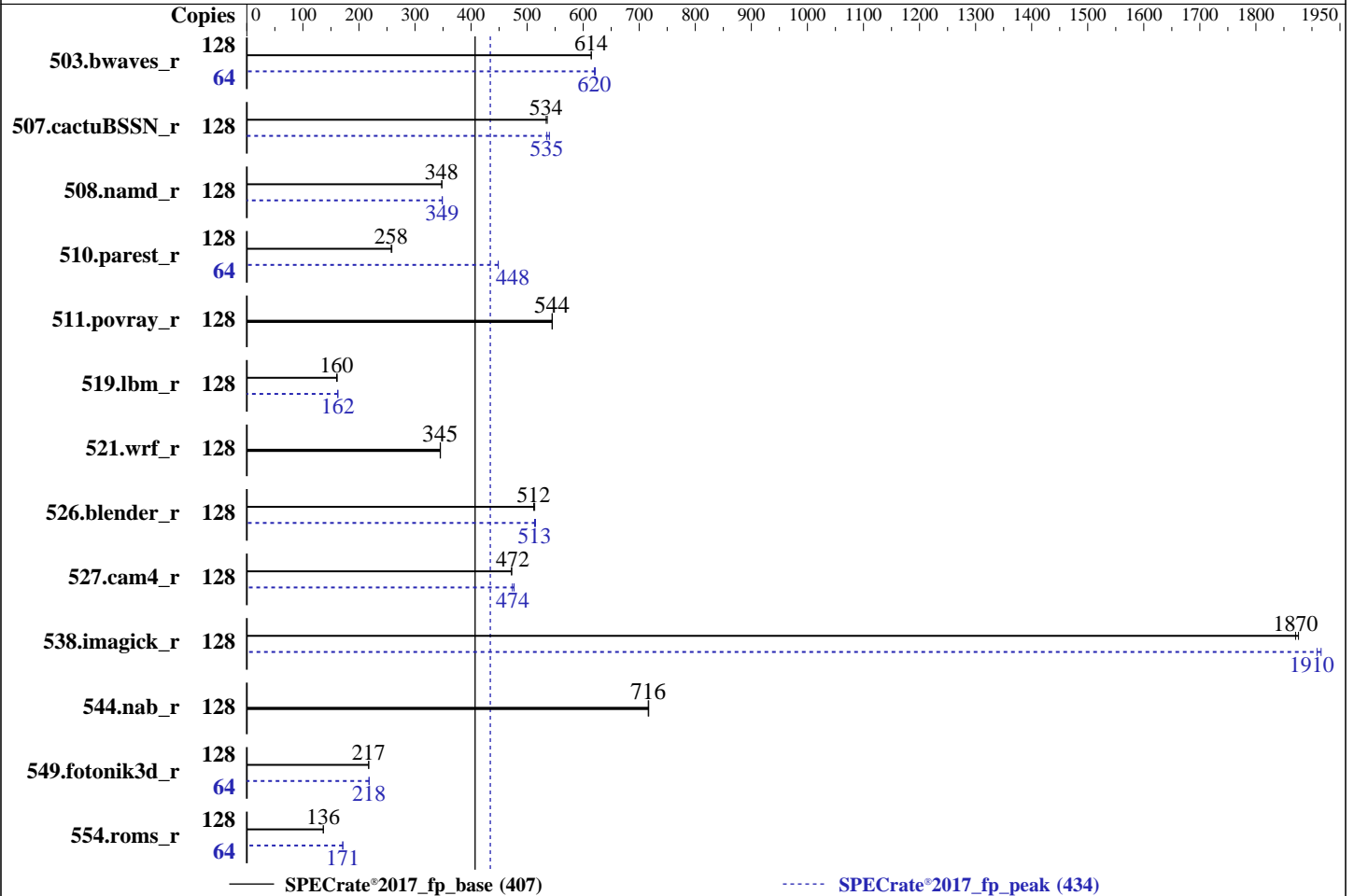
Test Date: Apr-2024

Test Sponsor: Dell Inc.

Hardware Availability: Jun-2021

Tested by: Dell Inc.

Software Availability: Mar-2024



### Hardware

CPU Name: AMD EPYC 7513  
 Max MHz: 3650  
 Nominal: 2600  
 Enabled: 64 cores, 2 chips, 2 threads/core  
 Orderable: 1,2 chips  
 Cache L1: 32 KB I + 32 KB D on chip per core  
 L2: 512 KB I+D on chip per core  
 L3: 128 MB I+D on chip per chip, 32 MB shared / 8 cores  
 Other: None  
 Memory: 1 TB (16 x 64 GB 2Rx4 PC4-3200AA-R)  
 Storage: 80 GB on tmpfs  
 Other: CPU Cooling: Air

### Software

OS: Ubuntu 22.04.4 LTS  
 5.15.0-102-generic  
 Compiler: C/C++/Fortran: Version 3.2.0 of AOCC  
 Parallel: No  
 Firmware: Version 2.5.6 released Oct-2021  
 File System: tmpfs  
 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 and OS set to prefer performance at the cost of additional power usage.



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## Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	128	2089	615	<b><u>2090</u></b>	<b><u>614</u></b>			64	<b><u>1035</u></b>	<b><u>620</u></b>	1032	622		
507.cactuBSSN_r	128	<b><u>303</u></b>	<b><u>534</u></b>	302	536			128	<b><u>303</u></b>	<b><u>535</u></b>	300	540		
508.namd_r	128	349	348	<b><u>350</u></b>	<b><u>348</u></b>			128	349	349	<b><u>349</u></b>	<b><u>349</u></b>		
510.parest_r	128	1294	259	<b><u>1300</u></b>	<b><u>258</u></b>			64	<b><u>373</u></b>	<b><u>448</u></b>	373	449		
511.povray_r	128	<b><u>549</u></b>	<b><u>544</u></b>	548	545			128	<b><u>549</u></b>	<b><u>544</u></b>	548	545		
519.lbm_r	128	836	161	<b><u>842</u></b>	<b><u>160</u></b>			128	<b><u>832</u></b>	<b><u>162</u></b>	830	162		
521.wrf_r	128	<b><u>831</u></b>	<b><u>345</u></b>	830	345			128	<b><u>831</u></b>	<b><u>345</u></b>	830	345		
526.blender_r	128	380	514	<b><u>381</u></b>	<b><u>512</u></b>			128	379	515	<b><u>380</u></b>	<b><u>513</u></b>		
527.cam4_r	128	474	473	<b><u>474</u></b>	<b><u>472</u></b>			128	470	477	<b><u>473</u></b>	<b><u>474</u></b>		
538.imagick_r	128	170	1880	<b><u>170</u></b>	<b><u>1870</u></b>			128	<b><u>167</u></b>	<b><u>1910</u></b>	166	1920		
544.nab_r	128	<b><u>301</u></b>	<b><u>716</u></b>	300	717			128	<b><u>301</u></b>	<b><u>716</u></b>	300	717		
549.fotonik3d_r	128	2293	218	<b><u>2296</u></b>	<b><u>217</u></b>			64	1144	218	<b><u>1144</u></b>	<b><u>218</u></b>		
554.roms_r	128	1490	136	<b><u>1491</u></b>	<b><u>136</u></b>			64	594	171	<b><u>594</u></b>	<b><u>171</u></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.

## Environment Variables Notes

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

```
LD_LIBRARY_PATH =  
    "/mnt/ramdisk/cpu2017-1.1.9-aocc320-A1/amd_rate_aocc320_milanx_A_lib/lib:/mnt/ramdisk/cpu2017-1.1.9-ao  
    cc320-A1/amd_rate_aocc320_milanx_A_lib/lib32:"  
MALLOC_CONF = "retain:true"
```

## 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>

Benchmark run from a 80 GB ramdisk created with the cmd: "mount -t tmpfs -o size=80G tmpfs /mnt/ramdisk"

## Platform Notes

BIOS settings:

DRAM Refresh Delay : Performance

Memory Interleaving : Disabled

DIMM Self Healing on

Uncorrectable Memory Error : Disabled

Virtualization Technology : Disabled

NUMA Nodes per Socket : 4

L3 cache as NUMA Domain : Enabled

System Profile : Custom

CPU Power Management : Maximum Performance

Memory Patrol Scrub : Disabled

PCI ASPM L1 Link

Power Management : Disabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.9-aocc320-A1/bin/sysinfo  
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197  
running on amd-sut Thu Apr 11 19:27:12 2024

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

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## Platform Notes (Continued)

### Table of contents

1. uname -a
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3. Username
4. ulimit -a
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6. /proc/cpuinfo
7. lscpu
8. numactl --hardware
9. /proc/meminfo
10. who -r
11. Systemd service manager version: systemd 249 (249.11-0ubuntu3.12)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. tuned-adm active
16. sysctl
17. /sys/kernel/mm/transparent\_hugepage
18. /sys/kernel/mm/transparent\_hugepage/khugepaged
19. OS release
20. Disk information
21. /sys/devices/virtual/dmi/id
22. dmidecode
23. BIOS

```
1. uname -a
Linux amd-sut 5.15.0-102-generic #112-Ubuntu SMP Tue Mar 5 16:50:32 UTC 2024 x86_64 x86_64 x86_64 GNU/Linux
```

```
2. w
19:27:13 up 4:59, 1 user, load average: 61.79, 108.90, 118.44
USER TTY FROM LOGIN@ IDLE JCPU PCPU WHAT
root ttyl - 14:28 4:58m 1.93s 0.45s /bin/bash ./amd_rate_aocc320_milanx_A1.sh
```

```
3. Username
From environment variable $USER: root
```

```
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 4126162
nofiles 1024
vmemory(kbytes) unlimited
locks unlimited
rtprio 0
```

```
5. sysinfo process ancestry
/sbin/init
```

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## Platform Notes (Continued)

```

/bin/login -p --
-bash
/bin/bash ./DELL_rate.sh
/bin/bash /home/DellFiles/bin/dell-run-main.sh rate
/bin/bash /home/DellFiles/bin/dell-run-main.sh rate
/bin/bash /home/DellFiles/bin/AMD/dell-run-specpcpu.sh rate --define DL-BIOSinc=Dell-BIOS_EPYC-3.inc --define
DL-BIOS-LogProc=1 --define DL-BIOS-adddcD=1 --define DL-VERS=5.2 --output_format html, pdf, txt
python3 ./run_amd_rate_aocc320_milanx_A1.py
/bin/bash ./amd_rate_aocc320_milanx_A1.sh
runcpu --config amd_rate_aocc320_milanx_A1.cfg --tune all --reportable --iterations 2 --define
DL-BIOS-L3NUMA=1 --define DL-BIOS-NPS=4 --define DL-BIOSinc=Dell-BIOS_EPYC-3.inc --define
DL-BIOS-LogProc=1 --define DL-BIOS-adddcD=1 --define DL-VERS=5.2 --output_format html, pdf, txt fprate
runcpu --configfile amd_rate_aocc320_milanx_A1.cfg --tune all --reportable --iterations 2 --define
DL-BIOS-L3NUMA=1 --define DL-BIOS-NPS=4 --define DL-BIOSinc=Dell-BIOS_EPYC-3.inc --define
DL-BIOS-LogProc=1 --define DL-BIOS-adddcD=1 --define DL-VERS=5.2 --output_format html, pdf, txt --nopower
--runmode rate --tune base:peak --size test:train:refrate fprate --nopreenv --note-preenv --logfile
$SPEC/tmp/CPU2017.002/templogs/preenv.fprate.002.0.log --lognum 002.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /mnt/ramdisk/cpu2017-1.1.9-aocc320-A1

```

```

-----
6. /proc/cpuinfo
model name      : AMD EPYC 7513 32-Core Processor
vendor_id      : AuthenticAMD
cpu family     : 25
model          : 1
stepping       : 1
microcode      : 0xa0011d1
bugs           : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass srso
TLB size       : 2560 4K pages
cpu cores      : 32
siblings       : 64
2 physical ids (chips)
128 processors (hardware threads)
physical id 0: core ids 0-31
physical id 1: core ids 0-31
physical id 0: apicids 0-63
physical id 1: apicids 64-127

```

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:      48 bits physical, 48 bits virtual
Byte Order:        Little Endian
CPU(s):            128
On-line CPU(s) list: 0-127
Vendor ID:         AuthenticAMD
Model name:        AMD EPYC 7513 32-Core Processor
CPU family:        25
Model:             1
Thread(s) per core: 2
Core(s) per socket: 32
Socket(s):         2
Stepping:          1
BogoMIPS:          5190.75

```

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## Platform Notes (Continued)

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 rapl 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 v\_spec\_ctrl umip pku ospke vaes vpclmulqdq rdpid overflow\_recov succor smca

Virtualization: AMD-V  
L1d cache: 2 MiB (64 instances)  
L1i cache: 2 MiB (64 instances)  
L2 cache: 32 MiB (64 instances)  
L3 cache: 256 MiB (8 instances)  
NUMA node(s): 8  
NUMA node0 CPU(s): 0-7,64-71  
NUMA node1 CPU(s): 8-15,72-79  
NUMA node2 CPU(s): 16-23,80-87  
NUMA node3 CPU(s): 24-31,88-95  
NUMA node4 CPU(s): 32-39,96-103  
NUMA node5 CPU(s): 40-47,104-111  
NUMA node6 CPU(s): 48-55,112-119  
NUMA node7 CPU(s): 56-63,120-127  
Vulnerability Gather data sampling: Not affected  
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 rstack overflow: Mitigation; safe RET  
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp  
Vulnerability Spectre v1: Mitigation; usercopy/swappgs barriers and \_\_user pointer sanitization  
Vulnerability Spectre v2: Mitigation; Retpolines, IBPB conditional, IBRS\_FW, STIBP always-on, RSB filling, PBRBS-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	2M	8	Data	1	64	1	64
L1i	32K	2M	8	Instruction	1	64	1	64
L2	512K	32M	8	Unified	2	1024	1	64
L3	32M	256M	16	Unified	3	32768	1	64

8. numactl --hardware  
NOTE: a numactl 'node' might or might not correspond to a physical chip.  
available: 8 nodes (0-7)  
node 0 cpus: 0-7,64-71  
node 0 size: 128537 MB  
node 0 free: 124334 MB  
node 1 cpus: 8-15,72-79  
node 1 size: 129019 MB

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## Platform Notes (Continued)

```

node 1 free: 128356 MB
node 2 cpus: 16-23,80-87
node 2 size: 129019 MB
node 2 free: 128365 MB
node 3 cpus: 24-31,88-95
node 3 size: 129004 MB
node 3 free: 128344 MB
node 4 cpus: 32-39,96-103
node 4 size: 129019 MB
node 4 free: 128377 MB
node 5 cpus: 40-47,104-111
node 5 size: 129019 MB
node 5 free: 128380 MB
node 6 cpus: 48-55,112-119
node 6 size: 129019 MB
node 6 free: 128381 MB
node 7 cpus: 56-63,120-127
node 7 size: 129011 MB
node 7 free: 128372 MB
node distances:
node  0  1  2  3  4  5  6  7
0:  10  11  11  11  32  32  32  32
1:  11  10  11  11  32  32  32  32
2:  11  11  10  11  32  32  32  32
3:  11  11  11  10  32  32  32  32
4:  32  32  32  32  10  11  11  11
5:  32  32  32  32  11  10  11  11
6:  32  32  32  32  11  11  10  11
7:  32  32  32  32  11  11  11  10

```

```

-----
9. /proc/meminfo
MemTotal:      1056413656 kB

```

```

-----
10. who -r
run-level 3 Apr 11 14:27

```

```

-----
11. Systemd service manager version: systemd 249 (249.11-0ubuntu3.12)
Default Target Status
multi-user      running

```

```

-----
12. Services, from systemctl list-unit-files
STATE UNIT FILES
enabled blk-availability console-setup cron dmesg e2scrub_reap finalrd getty@ gpu-manager
grub-common grub-initrd-fallback irqbalance keyboard-setup lm-sensors networkd-dispatcher
open-vm-tools pollinate rsyslog secureboot-db setvtrgb ssh systemd-networkd systemd-pstore
systemd-resolved systemd-timesyncd thermald tuned ua-reboot-cmds ubuntu-advantage udisks2
vgauth wpa_supplicant
enabled-runtime netplan-ovs-cleanup systemd-fsck-root systemd-remount-fs
disabled ModemManager apparmor console-getty debug-shell iscsid lvm2-monitor lxd-agent multipathd
nftables open-iscsi rsync serial-getty@ systemd-boot-check-no-failures
systemd-network-generator systemd-sysext systemd-time-wait-sync ufw upower
wpa_supplicant-nl80211@ wpa_supplicant-wired@ wpa_supplicant@
generated apport
indirect uidd
masked NetworkManager NetworkManager-dispatcher NetworkManager-wait-online cryptdisks
cryptdisks-early hwclock lvm2 multipath-tools-boot rc rcS screen-cleanup sudo

```

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## Platform Notes (Continued)

systemd-networkd-wait-online x11-common

```
-----
13. Linux kernel boot-time arguments, from /proc/cmdline
BOOT_IMAGE=/boot/vmlinuz-5.15.0-102-generic
root=UUID=593ab29a-c8fe-4d75-821a-b60d5c945311
ro
-----
```

```
-----
14. cpupower frequency-info
analyzing CPU 0:
  Unable to determine current policy
  boost state support:
    Supported: yes
    Active: yes
    Boost States: 0
    Total States: 3
    Pstate-P0: 2600MHz
-----
```

```
-----
15. tuned-adm active
Current active profile: latency-performance
-----
```

```
-----
16. sysctl
kernel.numa_balancing          1
kernel.randomize_va_space      0
vm.compaction_proactiveness    20
vm.dirty_background_bytes      0
vm.dirty_background_ratio      3
vm.dirty_bytes                 0
vm.dirty_expire_centisecs     3000
vm.dirty_ratio                 8
vm.dirty_writeback_centisecs   500
vm.dirtytime_expire_seconds    43200
vm.extfrag_threshold           500
vm.min_unmapped_ratio         1
vm.nr_hugepages                0
vm.nr_hugepages_mempolicy      0
vm.nr_overcommit_hugepages     0
vm.swappiness                   1
vm.watermark_boost_factor      15000
vm.watermark_scale_factor      10
vm.zone_reclaim_mode           1
-----
```

```
-----
17. /sys/kernel/mm/transparent_hugepage
defrag      [always] defer defer+madvise madvise never
enabled     [always] madvise never
hpage_pmd_size 2097152
shmem_enabled always within_size advise [never] deny force
-----
```

```
-----
18. /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
-----
```

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## Platform Notes (Continued)

scan\_sleep\_millisecs 10000

-----  
19. OS release  
From /etc/\*-release /etc/\*-version  
os-release Ubuntu 22.04.4 LTS  
-----

20. Disk information  
SPEC is set to: /mnt/ramdisk/cpu2017-1.1.9-aocc320-A1  
Filesystem Type Size Used Avail Use% Mounted on  
tmpfs tmpfs 80G 3.4G 77G 5% /mnt/ramdisk  
-----

21. /sys/devices/virtual/dmi/id  
Vendor: Dell Inc.  
Product: PowerEdge C6525  
Product Family: PowerEdge  
Serial: SL5C654  
-----

22. 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:  
16x 80AD869D80AD HMAA8GR7AJR4N-XN 64 GB 2 rank 3200  
-----

23. BIOS  
(This section combines info from /sys/devices and dmidecode.)  
BIOS Vendor: Dell Inc.  
BIOS Version: 2.5.6  
BIOS Date: 10/06/2021  
BIOS Revision: 2.5  
-----

## Compiler Version Notes

=====  
C | 519.lbm\_r(base, peak) 538.imagick\_r(base, peak) 544.nab\_r(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  
-----

=====  
C++ | 508.namd\_r(base, peak) 510.parest\_r(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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# SPEC CPU®2017 Floating Point Rate Result

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Dell Inc.

SPECrate®2017\_fp\_base = 407

PowerEdge C6525 (AMD EPYC 7513 32-Core Processor)

SPECrate®2017\_fp\_peak = 434

CPU2017 License: 6573  
Test Sponsor: Dell Inc.  
Tested by: Dell Inc.

Test Date: Apr-2024  
Hardware Availability: Jun-2021  
Software Availability: Mar-2024

## Compiler Version Notes (Continued)

```

C++, C          | 511.povray_r(base, peak) 526.blender_r(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
-----

C++, C, Fortran | 507.cactuBSSN_r(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          | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(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       | 521.wrf_r(base, peak) 527.cam4_r(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
-----

```

## Base Compiler Invocation

C benchmarks:  
clang

(Continued on next page)



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Test Sponsor: Dell Inc.

Tested by: Dell Inc.

Test Date: Apr-2024

Hardware Availability: Jun-2021

Software Availability: Mar-2024

## Base Compiler Invocation (Continued)

C++ benchmarks:

clang++

Fortran benchmarks:

flang

Benchmarks using both Fortran and C:

flang clang

Benchmarks using both C and C++:

clang++ clang

Benchmarks using Fortran, C, and C++:

clang++ clang flang

## Base Portability Flags

503.bwaves\_r: -DSPEC\_LP64  
 507.cactuBSSN\_r: -DSPEC\_LP64  
 508.namd\_r: -DSPEC\_LP64  
 510.parest\_r: -DSPEC\_LP64  
 511.povray\_r: -DSPEC\_LP64  
 519.lbm\_r: -DSPEC\_LP64  
 521.wrf\_r: -DSPEC\_CASE\_FLAG -Mbyteswapio -DSPEC\_LP64  
 526.blender\_r: -funsigned-char -D\_\_BOOL\_DEFINED -DSPEC\_LP64  
 527.cam4\_r: -DSPEC\_CASE\_FLAG -DSPEC\_LP64  
 538.imagick\_r: -DSPEC\_LP64  
 544.nab\_r: -DSPEC\_LP64  
 549.fotonik3d\_r: -DSPEC\_LP64  
 554.roms\_r: -DSPEC\_LP64

## Base Optimization Flags

C benchmarks:

-m64 -flto -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  
 -Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM  
 -ffast-math -fstruct-layout=5 -mllvm -unroll-threshold=50  
 -mllvm -inline-threshold=1000 -fremap-arrays  
 -mllvm -function-specialize -flv-function-specialization

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Hardware Availability: Jun-2021

Software Availability: Mar-2024

## Base Optimization Flags (Continued)

C benchmarks (continued):

```
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3
-mllvm -enable-loop-fusion -z muldefs -lamdlibm -ljemalloc -lflang
```

C++ benchmarks:

```
-m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -flto
-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
-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM
-ffast-math -mllvm -enable-partial-unswitch
-mllvm -unroll-threshold=100 -finline-aggressive
-flv-function-specialization -mllvm -loop-unswitch-threshold=200000
-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
-mllvm -extra-vectorizer-passes -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -convert-pow-exp-to-int=false
-mllvm -enable-loop-fusion -z muldefs -lamdlibm -ljemalloc -lflang
```

Fortran benchmarks:

```
-m64 -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -flto -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
-Wl,-mllvm -Wl,-enable-loop-fusion -Hz,1,0x1 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -Kieee -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-loop-fusion
-mllvm -enable-loopinterchange -mllvm -compute-interchange-order
-z muldefs -lamdlibm -ljemalloc -lflang
```

Benchmarks using both Fortran and C:

```
-m64 -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -flto -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
-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM
-ffast-math -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
```

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## Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):

```
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3
-mllvm -enable-loop-fusion -Hz,1,0x1 -Kieee -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 -lamdlibm -ljemalloc -lflang
```

Benchmarks using both C and C++:

```
-m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -flto
-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
-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM
-ffast-math -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
-mllvm -enable-loop-fusion -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 -z muldefs -lamdlibm -ljemalloc
-lflang
```

Benchmarks using Fortran, C, and C++:

```
-m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -flto
-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
-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM
-ffast-math -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
-mllvm -enable-loop-fusion -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 -Kieee -Mrecursive
-mllvm -fuse-tile-inner-loop -funroll-loops -mllvm -lsr-in-nested-loop
-mllvm -enable-loopinterchange -mllvm -compute-interchange-order
```

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**Test Sponsor:** Dell Inc.

**Tested by:** Dell Inc.

**Test Date:** Apr-2024

**Hardware Availability:** Jun-2021

**Software Availability:** Mar-2024

## Base Optimization Flags (Continued)

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

`-z muldefs -lamdlibm -ljemalloc -lflang`

## Base Other Flags

C benchmarks:

`-Wno-unused-command-line-argument`

C++ benchmarks:

`-Wno-unused-command-line-argument`

Fortran benchmarks:

`-Wno-unused-command-line-argument`

Benchmarks using both Fortran and C:

`-Wno-unused-command-line-argument`

Benchmarks using both C and C++:

`-Wno-unused-command-line-argument`

Benchmarks using Fortran, C, and C++:

`-Wno-unused-command-line-argument`

## Peak Compiler Invocation

C benchmarks:

`clang`

C++ benchmarks:

`clang++`

Fortran benchmarks:

`flang`

Benchmarks using both Fortran and C:

`flang clang`

Benchmarks using both C and C++:

`clang++ clang`

Benchmarks using Fortran, C, and C++:

`clang++ clang flang`



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Test Date: Apr-2024

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Software Availability: Mar-2024

## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

C benchmarks:

```
519.lbm_r: -m64 -flto -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
-fstruct-layout=7 -mllvm -unroll-threshold=50
-freemap-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 -lamdlibm -ljemalloc
```

538.imagick\_r: Same as 519.lbm\_r

544.nab\_r: basepeak = yes

C++ benchmarks:

```
508.namd_r: -m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-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
-finline-aggressive -mllvm -unroll-threshold=100
-flv-function-specialization -mllvm -enable-licm-vrp
-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -lamdlibm -ljemalloc
```

```
510.parest_r: -m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-Wl,-mllvm -Wl,-suppress-fmas
-Wl,-mllvm -Wl,-function-specialize -Ofast -march=znver3
-fveclib=AMDLIBM -ffast-math -finline-aggressive
-mllvm -unroll-threshold=100 -flv-function-specialization
-mllvm -enable-licm-vrp -mllvm -reroll-loops
```

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Tested by: Dell Inc.

Test Date: Apr-2024

Hardware Availability: Jun-2021

Software Availability: Mar-2024

## Peak Optimization Flags (Continued)

510.parest\_r (continued):

```
-mllvm -aggressive-loop-unswitch
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -lamdlibm -ljemalloc
```

Fortran benchmarks:

```
503.bwaves_r: -m64 -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-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 -Mrecursive
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -enable-licm-vrp
-lamdlibm -ljemalloc -lflang
```

```
549.fotonik3d_r: -m64 -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-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 -Kieee
-Mrecursive -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -enable-licm-vrp
-lamdlibm -ljemalloc -lflang
```

```
554.roms_r: -m64 -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-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 -Mrecursive
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -enable-licm-vrp
-Hz,1,0x1 -mllvm -fuse-tile-inner-loop -lamdlibm
-ljemalloc -lflang
```

Benchmarks using both Fortran and C:

521.wrf\_r: basepeak = yes

```
527.cam4_r: -m64 -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-force-vector-interleave=1 -Ofast
```

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Hardware Availability: Jun-2021

Tested by: Dell Inc.

Software Availability: Mar-2024

## Peak Optimization Flags (Continued)

527.cam4\_r (continued):

```

-march=znver3 -fveclib=AMDLIBM -ffast-math
-fstruct-layout=7 -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 -O3 -funroll-loops
-mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop
-Mrecursive -Hz,1,0x1 -mllvm -enable-loopinterchange
-mllvm -compute-interchange-order -lamdlibm -ljemalloc
-lflang

```

Benchmarks using both C and C++:

511.povray\_r: basepeak = yes

```

526.blender_r: -m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-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
-fstruct-layout=7 -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
-mllvm -aggressive-loop-unswitch -lamdlibm -ljemalloc

```

Benchmarks using Fortran, C, and C++:

```

-m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Wl,-mllvm -Wl,-enable-licm-vrp
-flto -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 -fstruct-layout=7
-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
-mllvm -unroll-threshold=100 -mllvm -loop-unswitch-threshold=200000
-finline-aggressive -mllvm -reroll-loops

```

(Continued on next page)



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Hardware Availability: Jun-2021

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## Peak Optimization Flags (Continued)

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

-mllvm -aggressive-loop-unswitch -mllvm -extra-vectorizer-passes  
-mllvm -convert-pow-exp-to-int=false -Mrecursive -lamdlibm -ljemalloc  
-lflang

## Peak Other Flags

C benchmarks:

-Wno-unused-command-line-argument

C++ benchmarks:

-Wno-unused-command-line-argument

Fortran benchmarks:

-Wno-unused-command-line-argument

Benchmarks using both Fortran and C:

-Wno-unused-command-line-argument

Benchmarks using both C and C++:

-Wno-unused-command-line-argument

Benchmarks using Fortran, C, and C++:

-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/aocc320-flags-A1.html>

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-AMD-EPYC-v1.2.html>

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

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

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-AMD-EPYC-v1.2.xml>

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For questions about this result, please contact the tester. For other inquiries, please contact [info@spec.org](mailto:info@spec.org).

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