



# SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

## Dell Inc.

SPECspeed®2017\_fp\_base = 152

PowerEdge R6515 (AMD EPYC 7643 48-Core Processor)

SPECspeed®2017\_fp\_peak = 153

CPU2017 License: 55

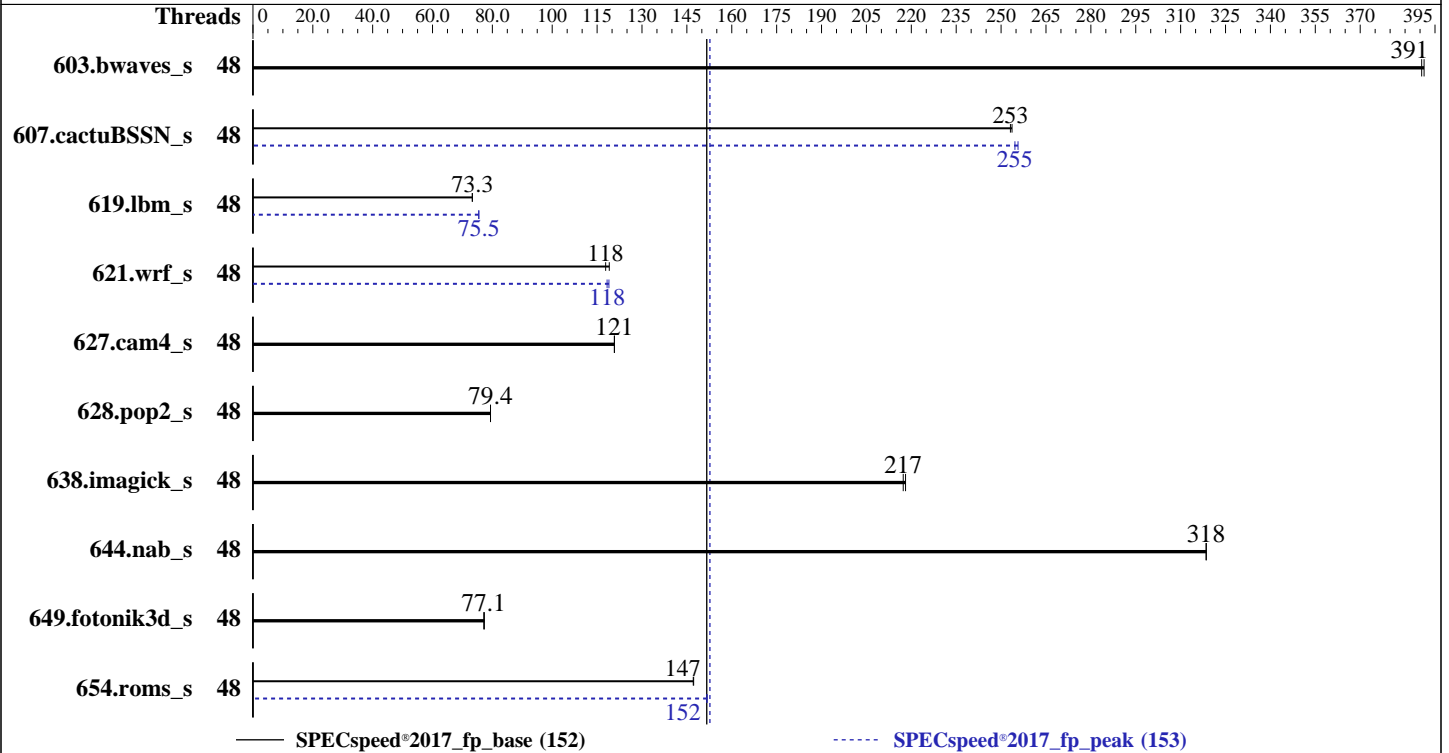
Test Date: Jun-2021

Test Sponsor: Dell Inc.

Hardware Availability: Jul-2021

Tested by: Dell Inc.

Software Availability: Mar-2021



### Hardware

CPU Name: AMD EPYC 7643  
 Max MHz: 3600  
 Nominal: 2300  
 Enabled: 48 cores, 1 chip  
 Orderable: 1 chip  
 Cache L1: 32 KB I + 32 KB D on chip per core  
 L2: 512 KB I+D on chip per core  
 L3: 256 MB I+D on chip per chip, 32 MB shared / 6 cores  
 Other: None  
 Memory: 1 TB (8 x 128 GB 4Rx4 PC4-3200AA-L)  
 Storage: 128 GB on tmpfs  
 Other: None

### Software

OS: Red Hat Enterprise Linux 8.3 (Ootpa)  
 4.18.0-240.el8.x86\_64  
 Compiler: C/C++/Fortran: Version 3.0.0 of AOCC  
 Parallel: Yes  
 Firmware: Version 2.2.4 released Apr-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							
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	48	151	391	<u>151</u>	<u>391</u>			48	151	391	<u>151</u>	<u>391</u>		
607.cactuBSSN_s	48	65.7	254	<u>65.9</u>	<u>253</u>			48	65.2	256	<u>65.5</u>	<u>255</u>		
619.lbm_s	48	<u>71.5</u>	<u>73.3</u>	71.4	73.3			48	69.4	75.5	<u>69.4</u>	<u>75.5</u>		
621.wrf_s	48	111	119	<u>112</u>	<u>118</u>			48	111	119	<u>112</u>	<u>118</u>		
627.cam4_s	48	<u>73.4</u>	<u>121</u>	73.4	121			48	<u>73.4</u>	<u>121</u>	73.4	121		
628.pop2_s	48	<u>150</u>	<u>79.4</u>	150	79.4			48	<u>150</u>	<u>79.4</u>	150	79.4		
638.imagick_s	48	<u>66.4</u>	<u>217</u>	66.2	218			48	<u>66.4</u>	<u>217</u>	66.2	218		
644.nab_s	48	54.8	319	<u>54.9</u>	<u>318</u>			48	54.8	319	<u>54.9</u>	<u>318</u>		
649.fotonik3d_s	48	118	77.3	<u>118</u>	<u>77.1</u>			48	118	77.3	<u>118</u>	<u>77.1</u>		
654.roms_s	48	107	147	<u>107</u>	<u>147</u>			48	<u>104</u>	<u>152</u>	104	152		

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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,

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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, and 638.imagick_s,
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root.
To disable THP for peak runs of 627.cam4_s, 644.nab_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 = "0-47"
```

```
LD_LIBRARY_PATH =
```

```
"/mnt/ramdisk/cpu2017-1.1.8-aocc300-B2/amd_speed_aocc300_milan_B_lib/lib
;/mnt/ramdisk/cpu2017-1.1.8-aocc300-B2/amd_speed_aocc300_milan_B_lib/lib
32:"
```

```
MALLOC_CONF = "retain:true"
```

```
OMP_DYNAMIC = "false"
```

```
OMP_SCHEDULE = "static"
```

```
OMP_STACKSIZE = "128M"
```

```
OMP_THREAD_LIMIT = "48"
```

Environment variables set by runcpu during the 607.cactuBSSN\_s peak run:

```
GOMP_CPU_AFFINITY = "0-47"
```

Environment variables set by runcpu during the 619.lbm\_s peak run:

```
GOMP_CPU_AFFINITY = "0-47"
```

Environment variables set by runcpu during the 621.wrf\_s peak run:

```
GOMP_CPU_AFFINITY = "0-47"
```

Environment variables set by runcpu during the 654.roms\_s peak run:

```
GOMP_CPU_AFFINITY = "0-47"
```

## 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.

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## General Notes (Continued)

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 128 GB ramdisk created with the cmd: "mount -t tmpfs -o size=128G tmpfs /mnt/ramdisk"

## Platform Notes

BIOS settings:

Logical Processor : Disabled

L3 Cache as NUMA Domain : Enabled

Virtualization Technology : Disabled

DRAM Refresh Delay : Performance

System Profile : Custom

CPU Power Management : Maximum Performance

Memory Patrol Scrub : Disabled

PCI ASPM L1 Link

Power Management : Disabled

Algorithm Performance

Boost Disable (ApbDis): Enabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.8-aocc300-B2/bin/sysinfo

Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d

running on rhel-8-3-amd Wed Jun 23 08:51:25 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 7643 48-Core Processor

1 "physical id"s (chips)

48 "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 : 48

siblings : 48

physical 0: cores 0 1 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29 32 33 34  
35 36 37 40 41 42 43 44 45 48 49 50 51 52 53 56 57 58 59 60 61

From lscpu from util-linux 2.32.1:

Architecture: x86\_64

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## Platform Notes (Continued)

```

CPU op-mode(s):      32-bit, 64-bit
Byte Order:          Little Endian
CPU(s):              48
On-line CPU(s) list: 0-47
Thread(s) per core: 1
Core(s) per socket: 48
Socket(s):           1
NUMA node(s):       8
Vendor ID:           AuthenticAMD
CPU family:          25
Model:               1
Model name:          AMD EPYC 7643 48-Core Processor
Stepping:            1
CPU MHz:             1794.570
BogoMIPS:            4591.28
Virtualization:     AMD-V
L1d cache:           32K
L1i cache:           32K
L2 cache:            512K
L3 cache:            32768K
NUMA node0 CPU(s):  0,8,16,24,32,40
NUMA node1 CPU(s):  1,9,17,25,33,41
NUMA node2 CPU(s):  2,10,18,26,34,42
NUMA node3 CPU(s):  3,11,19,27,35,43
NUMA node4 CPU(s):  4,12,20,28,36,44
NUMA node5 CPU(s):  5,13,21,29,37,45
NUMA node6 CPU(s):  6,14,22,30,38,46
NUMA node7 CPU(s):  7,15,23,31,39,47
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 sme ssbd mba sev 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 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

```

```

/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: 8 nodes (0-7)

```

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## Platform Notes (Continued)

```

node 0 cpus: 0 8 16 24 32 40
node 0 size: 128587 MB
node 0 free: 128458 MB
node 1 cpus: 1 9 17 25 33 41
node 1 size: 129018 MB
node 1 free: 128859 MB
node 2 cpus: 2 10 18 26 34 42
node 2 size: 128982 MB
node 2 free: 128781 MB
node 3 cpus: 3 11 19 27 35 43
node 3 size: 129016 MB
node 3 free: 124562 MB
node 4 cpus: 4 12 20 28 36 44
node 4 size: 129022 MB
node 4 free: 128874 MB
node 5 cpus: 5 13 21 29 37 45
node 5 size: 129018 MB
node 5 free: 128879 MB
node 6 cpus: 6 14 22 30 38 46
node 6 size: 129020 MB
node 6 free: 128910 MB
node 7 cpus: 7 15 23 31 39 47
node 7 size: 116909 MB
node 7 free: 116799 MB
node distances:
node  0  1  2  3  4  5  6  7
  0:  10  11  11  11  11  11  11  11
  1:  11  10  11  11  11  11  11  11
  2:  11  11  10  11  11  11  11  11
  3:  11  11  11  10  11  11  11  11
  4:  11  11  11  11  10  11  11  11
  5:  11  11  11  11  11  10  11  11
  6:  11  11  11  11  11  11  10  11
  7:  11  11  11  11  11  11  11  10

```

```

From /proc/meminfo
MemTotal:      1044062768 kB
HugePages_Total:      0
Hugepagesize:    2048 kB

```

```

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

```

```

From /etc/*release* /etc/*version*
os-release:
NAME="Red Hat Enterprise Linux"
VERSION="8.3 (Ootpa)"

```

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## Platform Notes (Continued)

```

ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.3"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
ANSI_COLOR="0;31"

```

```

redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

```

uname -a:

```

Linux rhel-8-3-amd 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020 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: disabled, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling):	Not affected
CVE-2019-11135 (TSX Asynchronous Abort):	Not affected

run-level 3 Jun 23 06:08

```

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.8-aocc300-B2
Filesystem      Type      Size  Used Avail Use% Mounted on
tmpfs            tmpfs    128G   4.0G  125G   4% /mnt/ramdisk

```

```

From /sys/devices/virtual/dmi/id
Vendor:          Dell Inc.
Product:         PowerEdge R6515
Product Family: PowerEdge
Serial:          HTDRG13

```

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

(Continued on next page)



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## Platform Notes (Continued)

frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.

Memory:

8x 802C8632802C 72ASS16G72LZ-3G2B3 128 GB 4 rank 3200

8x Not Specified Not Specified

BIOS:

BIOS Vendor: Dell Inc.

BIOS Version: 2.2.4

BIOS Date: 04/12/2021

BIOS Revision: 2.2

(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 12.0.0 (CLANG: AOCC\_3.0.0-Build#78 2020\_12\_10) (based on LLVM Mirror.Version.12.0.0)

Target: x86\_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin

```

=====
C++, C, Fortran | 607.cactuBSSN_s(base, peak)
=====

```

AMD clang version 12.0.0 (CLANG: AOCC\_3.0.0-Build#78 2020\_12\_10) (based on LLVM Mirror.Version.12.0.0)

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## Compiler Version Notes (Continued)

```

=====
Fortran          | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak)
                  | 654.roms_s(base, peak)
=====

```

```

AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
=====

```

```

=====
Fortran, C       | 621.wrf_s(base, peak) 627.cam4_s(base, peak)
                  | 628.pop2_s(base, peak)
=====

```

```

AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
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LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
=====

```

## 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



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## 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 -mno-adx -mno-sse4a -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 -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 -z muldefs
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc
-lflang -lflangrti

```

### Fortran benchmarks:

```

-m64 -mno-adx -mno-sse4a -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 -Hz,1,0x1 -O3
-march=znver3 -fveclib=AMDLIBM -ffast-math -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 -z muldefs -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang -lflangrti

```

### Benchmarks using both Fortran and C:

```

-m64 -mno-adx -mno-sse4a -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

```

(Continued on next page)



# SPEC CPU®2017 Floating Point Speed Result

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Dell Inc.

SPECspeed®2017\_fp\_base = 152

PowerEdge R6515 (AMD EPYC 7643 48-Core Processor)

SPECspeed®2017\_fp\_peak = 153

CPU2017 License: 55

Test Sponsor: Dell Inc.

Tested by: Dell Inc.

Test Date: Jun-2021

Hardware Availability: Jul-2021

Software Availability: Mar-2021

## Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):

```
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -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 -Hz,1,0x1
-Mrecursive -mllvm -fuse-tile-inner-loop -funroll-loops
-mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop -z muldefs
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc
-lflang -lflangrti
```

Benchmarks using Fortran, C, and C++:

```
-m64 -mno-adx -mno-sse4a -std=c++98
-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 -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
-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 -z muldefs -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang -lflangrti
```

## 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



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## 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: -m64 -mno-adx -mno-sse4a
-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 -flto
-fstruct-layout=5 -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 -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang
```

638.imagick\_s: basepeak = yes

644.nab\_s: basepeak = yes

Fortran benchmarks:

603.bwaves\_s: basepeak = yes

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## Peak Optimization Flags (Continued)

649.fotonik3d\_s: basepeak = yes

```

654.roms_s: -m64 -mno-adx -mno-sse4a
-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 -Mrecursive
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -enable-licm-vrp
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm
-ljemalloc -lflang

```

Benchmarks using both Fortran and C:

```

621.wrf_s: -m64 -mno-adx -mno-sse4a
-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 -flto
-fstruct-layout=5 -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 -Hz,1,0x1 -O3
-Mrecursive -mllvm -fuse-tile-inner-loop -funroll-loops
-mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm
-ljemalloc -lflang

```

627.cam4\_s: basepeak = yes

628.pop2\_s: basepeak = yes

Benchmarks using Fortran, C, and C++:

```

-m64 -mno-adx -mno-sse4a -std=c++98
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -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 -flto -fstruct-layout=5
-mllvm -unroll-threshold=50 -freemap-arrays -flv-function-specialization

```

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## Peak Optimization Flags (Continued)

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

```
-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 -Mrecursive -DSPEC_OPENMP -fopenmp  
-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/aocc300-flags-A1.html>

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-AMD-Milan-rev2.3.html>

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

<http://www.spec.org/cpu2017/flags/aocc300-flags-A1.xml>

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-AMD-Milan-rev2.3.xml>

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