## SPEC CPU®2017 Floating Point Speed Result

### Dell Inc.

**PowerEdge R7515 (AMD EPYC 7773X)**

<table>
<thead>
<tr>
<th>Test Sponsor:</th>
<th>Dell Inc.</th>
<th>Test Date:</th>
<th>Feb-2022</th>
</tr>
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<tr>
<td>Tested by:</td>
<td>Dell Inc.</td>
<td>Hardware Availability:</td>
<td>Mar-2022</td>
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</table>

### SPECspeed®2017 fp_base = 182

| SPECspeed®2017 fp_peak = 184 |

### CPU2017 License: 55

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<th>Software Availability:</th>
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### Test Sponsor:

**Dell Inc.**

### Hardware

**CPU Name:** AMD EPYC 7773X  
**Max MHz:** 3500  
**Nominal:** 2200  
**Enabled:** 64 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:** 768 MB I+D on chip per core, 96 MB shared / 8 cores  
**Other:** None  
**Memory:** 1 TB (8 x 128 GB 4Rx4 PC4-3200AA-L)  
**Storage:** 125 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 3.2.0 of AOCC  
**Parallel:** Yes  
**Firmware:** Version 2.6.5 released Dec-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.

### SPECspeed 2017 Floating Point Speed Results

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<th>Threads</th>
<th>SPECspeed®2017_fp_base</th>
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<tr>
<td>603.bwaves_s</td>
<td>64</td>
<td>415</td>
<td>415</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>64</td>
<td>409</td>
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</tr>
<tr>
<td>619.lbm_s</td>
<td>64</td>
<td>80.2</td>
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</tr>
<tr>
<td>621.wrf_s</td>
<td>64</td>
<td>192</td>
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<tr>
<td>627.cam4_s</td>
<td>64</td>
<td>158</td>
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<tr>
<td>628.pop2_s</td>
<td>64</td>
<td>83.7</td>
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<tr>
<td>638.imagick_s</td>
<td>64</td>
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<tr>
<td>644.nab_s</td>
<td>64</td>
<td>388</td>
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</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>64</td>
<td>75.7</td>
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<td>654.roms_s</td>
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Dell Inc.
PowerEdge R7515 (AMD EPYC 7773X)

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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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Dell Inc.
PowerEdge R7515 (AMD EPYC 7773X)

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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 = "0-63"
LD_LIBRARY_PATH =
    "/mnt/ramdisk/cpu2017-1.1.8-aocc320-A1/amd_speed_aocc320_milanx_A_lib/lib32;"
LIBOMP_NUM_HIDDEN_HELPER_THREADS = "0"
MALLOCONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "64"

Environment variables set by runcpu during the 603.bwaves_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 619.lbm_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 621.wrf_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 644.nab_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 654.roms_s peak run:
GOMP_CPU_AFFINITY = "0-63"

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)
Dell Inc.  
PowerEdge R7515 (AMD EPYC 7773X) 

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General Notes (Continued)

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 125 GB ramdisk created with the cmd: "mount -t tmpfs -o size=125G 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-aocc320-A1/bin/sysinfo  
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aca64d  
running on rhel-8-3-amd Thu Feb 24 10:21:17 2022

SUT (System Under Test) info as seen by some common utilities.  
For more information on this section, see  
https://www.spec.org/cpu2017/Docs/config.html#sysinfo

From /proc/cpuinfo  
model name: AMD EPYC 7773X 64-Core Processor

1 "physical id"s (chips)
64 "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

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Platform Notes (Continued)

From lscpu from util-linux 2.32.1:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 64
On-line CPU(s) list: 0-63
Thread(s) per core: 1
Core(s) per socket: 64
Socket(s): 1
NUMA node(s): 8
Vendor ID: AuthenticAMD
CPU family: 25
Model: 1
Model name: AMD EPYC 7773X 64-Core Processor
Stepping: 2
CPU MHz: 1910.120
BogoMIPS: 4391.69
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 98304K
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
Flags: fpu vme de pse tsc msr pae mce cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtsscp 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 extsys cr8_legacy abm sse4a misalignsse 3dnowprefetch osvw sse2 k[t] wdt tce topoext perfctr_core perfctr_nb bpid 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 cmqm rdr_a rdseed adx smap clflushopt clwb sha_ni xsaveopt xsave xgetbv1 xsaves cmqm_llc cmqm_occu_i_llc cmqm_mbm_total cmqm_mbm_local clzero irperf xsaveprptr wbnoinvd amd_pbr arat npt lbv svm_lock nrip_save tsc_scale vmcb_clean flushbyasis decodeassist pftreshold pftreshold vfsvmsave_vmmload vgif umip pku ospke vaes vpclmulqdq rdpid overflow_reov succor smca

/proc/cpuinfo cache data

cache size: 512 KB

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### Platform Notes (Continued)

From `numactl --hardware`

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

- available: 8 nodes (0-7)
- node 0 cpus: 0 1 2 3 4 5 6 7
- node 0 size: 128547 MB
- node 0 free: 128361 MB
- node 1 cpus: 8 9 10 11 12 13 14 15
- node 1 size: 129019 MB
- node 1 free: 128914 MB
- node 2 cpus: 16 17 18 19 20 21 22 23
- node 2 size: 129021 MB
- node 2 free: 128842 MB
- node 3 cpus: 24 25 26 27 28 29 30 31
- node 3 size: 129021 MB
- node 3 free: 128876 MB
- node 4 cpus: 32 33 34 35 36 37 38 39
- node 4 size: 129021 MB
- node 4 free: 128624 MB
- node 5 cpus: 40 41 42 43 44 45 46 47
- node 5 size: 129021 MB
- node 5 free: 128872 MB
- node 6 cpus: 48 49 50 51 52 53 54 55
- node 6 size: 129019 MB
- node 6 free: 128863 MB
- node 7 cpus: 56 57 58 59 60 61 62 63
- node 7 size: 116906 MB
- node 7 free: 113380 MB

**node distances:**

- node 0 distances:
  - 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

- node 0 distances:
  - 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: 1044059292 kB
- HugePages_Total: 0
- Hugepagesize: 2048 kB

/sbin/tuned-adm active

Current active profile: throughput-performance

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Platform Notes (Continued)

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

os-release:
NAME="Red Hat Enterprise Linux"
VERSION="8.3 (Ootpa)"
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): Mitigation: Speculative Store
CVE-2018-3639 (Speculative Store Bypass): 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 Feb 24 07:47

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.8-aoc320-A1
Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 125G 3.3G 122G 3% /mnt/ramdisk

From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge R7515
Product Family: PowerEdge
Serial: 1234567

(Continued on next page)
**Platform Notes (Continued)**

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:
8x 802C8632802C 72ASS16G72LZ-3G2B3 128 GB 4 rank 3200
8x Not Specified Not Specified

**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

```
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
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Dell Inc.  
PowerEdge R7515 (AMD EPYC 7773X)  
SPECspeed®2017_fp_base = 182  
SPECspeed®2017_fp_peak = 184  

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### Compiler Version Notes (Continued)

Thread model: posix  
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin

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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 | | |
|          |----------------------------------------------------------------------------|

### 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
Dell Inc.

PowerEdge R7515 (AMD EPYC 7773X)

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Test Sponsor: Dell Inc.
Tested by: Dell Inc.
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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 -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-lcm-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-lcm-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 -fopenmp -Mrecursive
-mllvm -fuse-tile-inner-loop -funroll-loops
-mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop
-mllvm -enable-lcm-vrp -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -enable-loopterchange
-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-lcm-vrp -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6

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

Benchmarks using both Fortran and C (continued):
-W1,-mllvm -W1,-reduce-array-computations=3 -O3 -march=znver3
-fvcc -Wl,-mllvm -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-licmp-vrp -mllvm -reduce-array-computations=3 -Hz,1,0x1
-Mrecursive -mllvm -functor-tile-inner-loop -funroll-loops
-mllvm -extra-vectorizer-passes -mllvm -lslr-in-nested-loop
-mllvm -enable-loopinterchange -mllvm -compute-interchange-order
-2 muldefs -DSPEC_OPENMP -fopenmp=libomp -lomp -lamdlibm -ljemalloc
-lflang

Benchmarks using Fortran, C, and C++:
-m64 -W1,-mllvm -W1,-x86-use-vzeroupper=false
-W1,-mllvm -W1,-region-vectorize -W1,-mllvm -W1,-function-specialize
-W1,-mllvm -W1,-align-all-noallthru-blocks=6
-W1,-mllvm -W1,-reduce-array-computations=3 -O3 -march=znver3
-fvcc -Wl,-mllvm -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-licmp-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 -functor-tile-inner-loop -funroll-loops
-mllvm -lslr-in-nested-loop -mllvm -enable-loopinterchange
-mllvm -compute-interchange-order -2 muldefs -DSPEC_OPENMP
-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
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## Base Other Flags (Continued)

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

## Peak Optimization Flags

C benchmarks:

```
```

638.imagick_s: basepeak = yes

(Continued on next page)
Peak Optimization Flags (Continued)

644.nab_s: -m64 -Wl,-allow-multiple-definition
-Wl,-mllvm -Wl,-enable-licm-vrp
-Wl,-mllvm -Wl,-do-block-reorder=aggressive
-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 -Ofast
-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
-mllvm -do-block-reorder=aggressive -DSPEC_OPENMP
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang

Fortran benchmarks:

603.bwaves_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
-1flang

649.fotonik3d_s: basepeak = yes

654.roms_s: Same as 603.bwaves_s

Benchmarks using both Fortran and C:

621.wrf_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
-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

(Continued on next page)
Peak Optimization Flags (Continued)

621.wrf_s (continued):
-mlir -reduce-array-computations=3 -Hz,1,0x1 -Mrecursive
-mlir -fuse-tile-inner-loop -funroll-loops
-mlir -extra-vectorizer-passes -mlir -lar-in-nested-loop
-mlir -enable-loopinterchange
-mlir -compute-interchange-order -DSPEC_OPENMP
-fopenmp=libomp -lomp -lamlb -ljemalloc -lflang

627.cam4_s: basepeak = yes

628.pop2_s: basepeak = yes

Benchmarks using Fortran, C, and C++:

607.cactuBSSN_s: basepeak = yes

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++:
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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:
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