Dell Inc.

PowerEdge R7515 (AMD EPYC 7763 64-Core Processor)

**CPU2017 License:** 55

**Test Sponsor:** Dell Inc.

**Test Date:** Mar-2021

**Hardware Availability:** Apr-2021

**Tested by:** Dell Inc.

**Software Availability:** Mar-2021

---

**Threads**

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base = 171</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_fp_peak = 173</td>
</tr>
</tbody>
</table>

---

### Hardware

**CPU Name:** AMD EPYC 7763

**Max MHz:** 3500

**Nominal:** 2450

**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:** 256 MB I+D on chip per chip, 32 MB shared / 8 cores

**Other:** None

**Memory:** 1 TB (8 x 128 GB 4Rx4 PC4-3200AA-R)

**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 3.0.0 of AOCC

**Parallel:** Yes

**Firmware:** Version 2.1.4 released Feb-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.
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tr>
<td>603.bwaves_s</td>
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<td>654.roms_s</td>
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<td>177</td>
<td>88.7</td>
<td>177</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Compiler Notes


### 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>

'echo 8 > /proc/sys/vm/dirty_ratio' run as root to limit dirty cache to 8% of memory.
'echo 1 > /proc/sys/vm/swappiness' run as root to limit swap usage to minimum necessary.
'echo 1 > /proc/sys/vm/zone_reclaim_mode' run as root to free node-local memory and avoid remote memory usage.
'sync; echo 3 > /proc/sys/vm/drop_caches' run as root to reset filesystem caches.
'sysctl -w kernel.randomize_va_space=0' run as root to disable address space layout randomization (ASLR) to reduce run-to-run variability.

(Continued on next page)
SPEC CPU®2017 Floating Point Speed Result

Dell Inc.

PowerEdge R7515 (AMD EPYC 7763 64-Core Processor)  

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>CPU2017 License:</td>
<td>55</td>
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<tr>
<td>Test Sponsor:</td>
<td>Dell Inc.</td>
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<tr>
<td>Tested by:</td>
<td>Dell Inc.</td>
</tr>
<tr>
<td>SPECspeed®2017_fp_base =</td>
<td>171</td>
</tr>
<tr>
<td>SPECspeed®2017_fp_peak =</td>
<td>173</td>
</tr>
<tr>
<td>Test Date:</td>
<td>Mar-2021</td>
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<td>Hardware Availability:</td>
<td>Apr-2021</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Mar-2021</td>
</tr>
</tbody>
</table>

Operating System Notes (Continued)

To enable Transparent Hugepages (THP) for all allocations,
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.
To 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 = "0-63"
LD_LIBRARY_PATH =
"/mnt/ramdisk/cpu2017-1.1.5/amd_speed_aocc300_milan_B_lib/64;/mnt/ramdisk/cpu2017-1.1.5/amd_speed_aocc300_milan_B_lib/32;"
MALLOCONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREADLIMIT = "64"

Environment variables set by runcpu during the 607.cactuBSSN_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 627.cam4_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) 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.
General Notes (Continued)

Benchmark run from a 125 GB ramdisk created with the cmd: "mount -t tmpfs -o size=125G tmpfs /mnt/ramdisk"

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

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

Sysinfo program /mnt/ramdisk/cpu2017-1.1.5/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on rhel-8-3-amd Sun Mar 21 20:13:05 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 7763 64-Core Processor
- 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
- 53 54 55 56 57 58 59 60 61 62 63

From lscpu:
- Architecture: x86_64
- CPU op-mode(s): 32-bit, 64-bit
- Byte Order: Little Endian

(Continued on next page)
Dell Inc.

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SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

SPECspeed®2017_fp_base = 171

SPECspeed®2017_fp_peak = 173

CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

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

Platform Notes (Continued)

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 7763 64-Core Processor
Stepping: 1
CPU MHz: 1849.127
BogoMIPS: 4890.80
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 32768K
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 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
rdseed lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch
osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb pexists perfctr_llc mwaitx cpb
cat_l3 cdp_l3 invpcid_single hw_pstate sme ssbd mba sev ibrs ibpb stibp vmmcall
fsqsb maa avx2 smep bmi2 invpcid cmqm rdt_a rdseed adx smap clflushopt clwb
sha ni xsaveopt xsavec xgetbv1 xsavees cmqm_llc cmqm_occup_llc cmqm_mbm_total
cqm_mbm_local clzero irperf xsaveeptr wbnoinvd amd_ppin arat npt lbv svm_lock
nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pfsfilter pffile
v_vmsave_vmload vgif umip pkus vaes vpclmulqdq rdpid overflow_recover 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)
  node 0 cpus: 0 1 2 3 4 5 6 7
  node 0 size: 128449 MB

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

<table>
<thead>
<tr>
<th>Node</th>
<th>CPUs</th>
<th>Size</th>
<th>Free</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10 11 11 11 11 11 11 11</td>
<td>128305 MB</td>
<td>128305 MB</td>
</tr>
<tr>
<td>1</td>
<td>11 10 11 11 11 11 11 11</td>
<td>129017 MB</td>
<td>129017 MB</td>
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<tr>
<td>2</td>
<td>11 11 10 11 11 11 11 11</td>
<td>124097 MB</td>
<td>124097 MB</td>
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<td>11 11 11 10 11 11 11 11</td>
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<tr>
<td>7</td>
<td>11 11 11 11 11 11 11 11</td>
<td>128711 MB</td>
<td>128711 MB</td>
</tr>
</tbody>
</table>

From `/proc/meminfo`

MemTotal: 1043928188 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)"
ID="rhel"
ID_LIKE="fedora"
Dell Inc.

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SPECspeed®2017_fp_base = 171
SPECspeed®2017_fp_peak = 173

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Platform Notes (Continued)

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 Bypass disabled via prctl and seccomp
CVE-2018-3639 (Speculative Store Bypass): Mitigation: usercopy/swapgs barriers and __user pointer sanitization
CVE-2017-5753 (Spectre variant 1): Mitigation: Full AMD retpoline, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling
CVE-2018-5715 (Spectre variant 2): Not affected
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Mar 21 17:33

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.5

Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 125G 4.6G 121G 4% /mnt/ramdisk

From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge R7515
Product Family: PowerEdge
Serial: 5MGPH13

Additional information from dmidecode 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:
## Dell Inc. PowerEdge R7515 (AMD EPYC 7763 64-Core Processor)

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### Platform Notes (Continued)

- 8x 80CE80B380CE M386AAG40AM3-CWE 128 GB 4 rank 3200
- 8x Not Specified Not Specified

<table>
<thead>
<tr>
<th>BIOS:</th>
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<tr>
<td>BIOS Vendor: Dell Inc.</td>
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<tr>
<td>BIOS Version: 2.1.4</td>
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<tr>
<td>BIOS Date: 02/17/2021</td>
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<tr>
<td>BIOS Revision: 2.1</td>
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(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)

**Target:** x86_64-unknown-linux-gnu
**Thread model:** posix
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---

### Fortran

| 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) |

(Continued on next page)
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---

**Compiler Version Notes (Continued)**

```
| 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  
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`

---

**Base Portability Flags**

- `603.bwaves_s: -DSPEC_LP64`
- `607.cactuBSSN_s: -DSPEC_LP64`

(Continued on next page)
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---

**Base Portability Flags (Continued)**

```
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
-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 -fopenmp=libomp -lomp -lamdlibm -ljemalloc
-llflang -llflangrti
```

**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 -llflang -llflangrti
```

**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
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
```

(Continued on next page)
Dell Inc. PowerEdge R7515 (AMD EPYC 7763 64-Core Processor) SPECspeed®2017_fp_base = 171

SPECspeed®2017_fp_peak = 173

CPU2017 License: 55
Test Sponsor: Dell Inc.
Test Date: Mar-2021
Tested by: Dell Inc.
Hardware Availability: Apr-2021
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Base Optimization Flags (Continued)
Benchmarks using both Fortran and C (continued):
-mlirv -unroll-threshold=50 -mlirv -inline-threshold=1000
-fremap-arrays -mlirv -function-specialize -flv-function-specialization
-mlirv -enable-gvn-hoist -mlirv -global-vectorize-slp=true
-mlirv -enable-licm-vrp -mlirv -reduce-array-computations=3 -Hz,1,0x1
-Mrecursive -mlirv -fuse-tile-inner-loop -funroll-loops
-mlirv -extra-vectorizer-passes -mlirv -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,-mlirv -Wl,-x86-use-vzeroupper=false
-Wl,-mlirv -Wl,-region-vectorize -Wl,-mlirv -Wl,-function-specialize
-Wl,-mlirv -Wl,-align-all-nofallthru-blocks=6
-Wl,-mlirv -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
-mlirv -unroll-threshold=50 -mlirv -inline-threshold=1000
-fremap-arrays -mlirv -function-specialize -flv-function-specialization
-mlirv -enable-gvn-hoist -mlirv -global-vectorize-slp=true
-mlirv -enable-licm-vrp -mlirv -reduce-array-computations=3
-mlirv -enable-partial-unswitch -mlirv -unroll-threshold=100
-finline-aggressive -mlirv -loop-unswitch-threshold=200000
-mlirv -reroil-loops -mlirv -aggressive-loop-unswitch
-mlirv -extra-vectorizer-passes -mlirv -convert-pow-exp-to-int=false
-Hz,1,0x1 -Mrecursive -mlirv -fuse-tile-inner-loop -funroll-loops
-mlirv -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
Dell Inc. PowerEdge R7515 (AMD EPYC 7763 64-Core Processor) SPECspeed®2017_fp_base = 171
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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
       -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 -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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Dell Inc.

PowerEdge R7515 (AMD EPYC 7763 64-Core Processor)

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**Peak Optimization Flags (Continued)**

649.fotonik3d_s: basepeak = yes

654.roms_s: -m64 -mno-adx -mno-sse4a
-W1,-mllvm -W1,-enable-X86-prefetching
-W1,-mllvm -W1,-enable-licm-vrp
-W1,-mllvm -W1,-function-specialize
-W1,-mllvm -W1,-align-all-noallthru-blocks=6
-W1,-mllvm -W1,-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: basepeak = yes

627.cam4_s: -m64 -mno-adx -mno-sse4a
-W1,-mllvm -W1,-enable-X86-prefetching
-W1,-mllvm -W1,-enable-licm-vrp
-W1,-mllvm -W1,-function-specialize
-W1,-mllvm -W1,-align-all-noallthru-blocks=6
-W1,-mllvm -W1,-reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -ffast-math -fllto
-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 -Mrecursive
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm
-ljemalloc -lflang

628.pop2_s: basepeak = yes

Benchmarks using Fortran, C, and C++:

-std=c++98
-W1,-mllvm -W1,-x86-use-vzeroupper=false -W1,-mllvm -W1,-enable-licm-vrp
-W1,-mllvm -W1,-function-specialize
-W1,-mllvm -W1,-align-all-noallthru-blocks=6
-W1,-mllvm -W1,-reduce-array-computations=3 -Ofast -march=znver3
-fveclib=AMDLIBM -ffast-math -fllto -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

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### Dell Inc.

**PowerEdge R7515 (AMD EPYC 7763 64-Core Processor)**

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#### Peak Optimization Flags (Continued)

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

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Report generated on 2021-04-14 14:14:36 by CPU2017 PDF formatter v6442.