### Dell Inc.

PowerEdge C6525 (AMD EPYC 7413 24-Core Processor)  
SPECspeed\textsuperscript{TM}2017_fp_base = 182  
SPECspeed\textsuperscript{TM}2017_fp_peak = 188

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed\textsuperscript{TM}2017_fp_base (182)</th>
<th>SPECspeed\textsuperscript{TM}2017_fp_peak (188)</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>48</td>
<td>290</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>48</td>
<td>284</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>48</td>
<td>108</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>48</td>
<td>160</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>48</td>
<td>136</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>48</td>
<td>56.2</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>48</td>
<td>242</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>48</td>
<td>341</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>48</td>
<td>108</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>48</td>
<td>200</td>
</tr>
</tbody>
</table>

#### Hardware

- **CPU Name:** AMD EPYC 7413  
  - Max MHz: 3600  
  - Nominal: 2650  
  - Enabled: 48 cores, 2 chips  
  - 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 / 6 cores  
  - Other: None  
- **Memory:** 1 TB (16 x 64 GB 2Rx4 PC4-3200AA-R)  
- **Storage:** 504 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 2.2.0 released Jan-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.
SPEC CPU®2017 Floating Point Speed Result

Dell Inc.

PowerEdge C6525 (AMD EPYC 7413 24-Core Processor)

SPECspeed®2017_fp_base = 182
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Results Table

<table>
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<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Base Seconds</th>
<th>Base Ratio</th>
<th>Peak Seconds</th>
<th>Peak Ratio</th>
</tr>
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<tr>
<td>603.bwaves_s</td>
<td>48</td>
<td>97.8</td>
<td>603</td>
<td>98.3</td>
<td>600</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>48</td>
<td><strong>57.4</strong></td>
<td>290</td>
<td>56.7</td>
<td>294</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>48</td>
<td><strong>48.4</strong></td>
<td>108</td>
<td>45.5</td>
<td>115</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>48</td>
<td>81.7</td>
<td>162</td>
<td>82.7</td>
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<tr>
<td>627.cam4_s</td>
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<td><strong>65.3</strong></td>
<td>136</td>
<td>64.8</td>
<td>137</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>48</td>
<td><strong>211</strong></td>
<td>56.2</td>
<td>207</td>
<td>57.4</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>48</td>
<td>59.5</td>
<td>243</td>
<td>59.6</td>
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<td>48</td>
<td>76.2</td>
<td>207</td>
<td>78.7</td>
<td>200</td>
</tr>
</tbody>
</table>

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>

'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)
Dell Inc. PowerEdge C6525 (AMD EPYC 7413 24-Core Processor)  

**SPECspeed®2017_fp_base = 182**  
**SPECspeed®2017_fp_peak = 188**

<table>
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<th>Test Date: Mar-2021</th>
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</tr>
</tbody>
</table>

### Operating System Notes (Continued)

To enable Transparent Hugepages (THP) for all allocations,  
'echo always > /sys/kernel/mm/transparent_hugepage/enable' 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/enable' 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/enable' 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 =  
"/dev/shm/cpu2017-1.1.5/amd_speed_aocc300_milan_B_lib/64;/dev/shm/cpu201  
7-1.1.5/amd_speed_aocc300_milan_B_lib/32:"  
MALLOCS_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 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

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

NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.

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

Dell Inc.

PowerEdge C6525 (AMD EPYC 7413 24-Core Processor)

SPECspeed®2017_fp_peak = 188
SPECspeed®2017_fp_base = 182

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

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

General Notes (Continued)

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.

Benchmark run from a 504 GB ramdisk created with the cmd: "mount -t tmpfs -o size=504G 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

Sysinfo program /dev/shm/cpu2017-1.1.5/bin/sysinfo
Rev: 6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on rhel-8-3-amd Thu Mar 4 09:53:35 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 7413 24-Core Processor
- 2 "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: 24
    - siblings: 24
    - physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
    - physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29

From lscpu:
- Architecture: x86_64
- 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

(Continued on next page)
Dell Inc.

PowerEdge C6525 (AMD EPYC 7413 24-Core Processor)

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Software Availability: Mar-2021

Platform Notes (Continued)

Core(s) per socket: 24
Socket(s): 2
NUMA node(s): 8
Vendor ID: AuthenticAMD
CPU family: 25
Model: 1
Model name: AMD EPYC 7413 24-Core Processor
Stepping: 1
CPU MHz: 1789.131
BogoMIPS: 5290.12
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 32768K
NUMA node0 CPU(s): 0-5
NUMA node1 CPU(s): 6-11
NUMA node2 CPU(s): 12-17
NUMA node3 CPU(s): 18-23
NUMA node4 CPU(s): 24-29
NUMA node5 CPU(s): 30-35
NUMA node6 CPU(s): 36-41
NUMA node7 CPU(s): 42-47
Flags: fpu vme de pse tsc msr pae mce 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 kINIT wdt tce topoextperfctr_core perfctr_nb bpext perfctr_llc mwaitx cpb cat_13 cpd_13 invpcid_single hw_pstate sme ssbd mba sev ibrs stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 invpcid cmq rdt_a rdseed adx smap clflushopt clwb sha_ni xsaves xsaveopt xsaveopt xgetbv1 xsaveas cqmm llc cqmm_occup llc cqmm_mbb total cqmm_mbb_local clzero irperf xsaveerptr wbnoinvd amd_pmem arat rnt pbr svr lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassist pfthreshold v_vmsave_vmload vgif umip pku ospke vaes vpcmldq 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)
  node 0 cpus: 0 1 2 3 4 5
  node 0 size: 128580 MB
  node 0 free: 128356 MB
  node 1 cpus: 6 7 8 9 10 11
  node 1 size: 129012 MB

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Platform Notes (Continued)

node 1 free: 122966 MB
node 2 cpus: 12 13 14 15 16 17
node 2 size: 128976 MB
node 2 free: 128735 MB
node 3 cpus: 18 19 20 21 22 23
node 3 size: 128992 MB
node 3 free: 128750 MB
node 4 cpus: 24 25 26 27 28 29
node 4 size: 129010 MB
node 4 free: 128941 MB
node 5 cpus: 30 31 32 33 34 35
node 5 size: 128998 MB
node 5 free: 128942 MB
node 6 cpus: 36 37 38 39 40 41
node 6 size: 129002 MB
node 6 free: 128943 MB
node 7 cpus: 42 43 44 45 46 47
node 7 size: 128997 MB
node 7 free: 128940 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

From /proc/meminfo
   MemTotal:       1056447212 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"
   VERSION_ID="8.3"
   PLATFORM_ID="platform:el8"
   PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"

(Continued on next page)
Dell Inc.

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CPU2017 License: 55
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Tested by: Dell Inc.

Platform Notes (Continued)

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 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, IBFB: 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 Nov 30 05:34
SPEC is set to: /dev/shm/cpu2017-1.1.5
Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 504G 5.7G 499G 2% /dev/shm

From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge C6525
Product Family: PowerEdge

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:
16x 80AD863280AD HMAA8GR7AJR4N-XN 64 GB 2 rank 3200

BIOS:
BIOS Vendor: Dell Inc.
Dell Inc.  

PowerEdge C6525 (AMD EPYC 7413 24-Core Processor)  

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**CPU2017 License:** 55

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**Test Date:** Mar-2021

**Tested by:** Dell Inc.

**Test Sponsor:** Dell Inc.

**Hardware Availability:** Mar-2021

**Software Availability:** Mar-2021

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**Platform Notes (Continued)**

- BIOS Version: 2.2.0
- BIOS Date: 01/21/2021
- 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)**

**Target:** x86_64-unknown-linux-gnu

**Thread model:** posix

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

---

**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

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Compiler Version Notes (Continued)

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)
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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
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

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Base Portability Flags (Continued)

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
-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
-Mrecursive -mllvm -fuse-tile-inner-loop -funroll-loops
-mllvm -extra-vectorizer-passes -mllvm -isr-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
-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

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

Benchmarks using both Fortran and C (continued):
-mlir -extra-vectorizer-passes -mlir -lsr-in-nested-loop -z muldefs
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlib -ljemalloc
-lflang -lflangrti

Benchmarks using Fortran, C, and C++:
-m64 -mno-adx -mno-sse4a -std=c++98
-Wl,-mlir -Wl,-x86-use-vzeroupper=false
-Wl,-mlir -Wl,-region-vectorize -Wl,-mlir -Wl,-function-specialize
-Wl,-mlir -Wl,-align-all-nofallthru-blocks=6
-Wl,-mlir -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
-mlir -unroll-threshold=50 -mlir -inline-threshold=1000
-fremap-arrays -mlir -function-specialize -flv-function-specialization
-mlir -enable-gvn-hoist -mlir -global-vectorize-slp=true
-mlir -enable-lcmm-vrp -mlir -reduce-array-computations=3
-mlir -enable-partial-unswitch -mlir -unroll-threshold=100
-finline-aggressive -mlir -loop-unswitch-threshold=200000
-mlir -reroll-loops -mlir -aggressive-loop-unswitch
-mlir -extra-vectorizer-passes -mlir -convert-pow-exp-to-int=false
-Hz,1,0x1 -Mrecursive -mlir -fuse-tile-inner-loop -funroll-loops
-mlir -lsr-in-nested-loop -z muldefs -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lamdlib -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

Peak Compiler Invocation

C benchmarks:
clang

(Continued on next page)
## Dell Inc.

**PowerEdge C6525 (AMD EPYC 7413 24-Core Processor)**

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<thead>
<tr>
<th>SPECspeed®2017_fp_base = 182</th>
<th>SPECspeed®2017_fp_peak = 188</th>
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</table>

### Peak Compiler Invocation (Continued)

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
- 619.lbm_s: -Wl,-mllvm -Wl,-function-specialize
- 619.lbm_s: -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
- 619.lbm_s: -Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
- 619.lbm_s: -march=znver3 -fveclib=AMDLIBM -ffast-math -flto
- 619.lbm_s: -fstruct-layout=5 -mllvm -unroll-threshold=50
- 619.lbm_s: -fremap-arrays -flv-function-specialization
- 619.lbm_s: -mllvm -inline-threshold=1000 -mllvm -enable-gvn-hoist
- 619.lbm_s: -mllvm -global-vectorize-slp=true
- 619.lbm_s: -mllvm -function-specialize -mllvm -enable-licm-vrp
- 619.lbm_s: -mllvm -reduce-array-computations=3 -DSPEC_OPENMP -fopenmp
- 619.lbm_s: -fopenmp=libomp -lp=-lomp -l lustrem -ljemalloc -lflang

- 638.imagick_s: basepeak = yes
- 644.nab_s: basepeak = yes

Fortran benchmarks:
- 603.bwaves_s: basepeak = yes
- 649.fotonik3d_s: basepeak = yes

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

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-nofallthru-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: basepeak = yes
628.pop2_s: basepeak = yes

Benchmarks using Fortran, C, and C++:

-m64 -mno-adx -mno-sse4a -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-nofallthru-blocks=6
-W1,-mllvm -W1,-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
-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

(Continued on next page)
Dell Inc.
PowerEdge C6525 (AMD EPYC 7413 24-Core Processor)  

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**Peak Other Flags (Continued)**

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:

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

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Tested with SPEC CPU\textsuperscript{\textregistered}2017 v1.1.5 on 2021-03-04 10:53:35-0500.  
Originally published on 2021-05-25.