Dell Inc.

PowerEdge R7515 (AMD EPYC 7543P 32-Core Processor)

SPEC CPU® 2017 Integer Speed Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

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

Dell Inc.

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

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed®2017_int_base</th>
<th>SPECspeed®2017_int_peak</th>
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<tr>
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<tr>
<td>600.perlbench_s</td>
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<tr>
<td>602.gcc_s</td>
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<td>605.mcf_s</td>
<td>8.28</td>
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<tr>
<td>620.omnetpp_s</td>
<td>8.31</td>
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<tr>
<td>623.xalancbmk_s</td>
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<tr>
<td>625.x264_s</td>
<td>17.3</td>
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<td>631.deepsjeng_s</td>
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<tr>
<td>641.leela_s</td>
<td>5.84</td>
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<tr>
<td>648.exchange2_s</td>
<td>23.7</td>
<td></td>
</tr>
<tr>
<td>657.xz_s</td>
<td>25.1</td>
<td></td>
</tr>
</tbody>
</table>

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Hardware

CPU Name: AMD EPYC 7543P
Max MHz: 3700
Nominal: 2800
Enabled: 32 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 / 4 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) 4.18.0-240.22.1.el8_3.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

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<tr>
<th>Benchmark</th>
<th>Threads</th>
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<td>244</td>
<td>25.3</td>
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SPECspeed®2017_int_base = 12.4
SPECspeed®2017_int_peak = 12.5

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.

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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.

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-31"
LD_LIBRARY_PATH = 
"/mnt/ramdisk/cpu2017-1.1.7-aocc300/amd_speed_aocc300_milan_B_lib/64;" 
"/mnt/ramdisk/cpu2017-1.1.7-aocc300/amd_speed_aocc300_milan_B_lib/32;"
MALLOC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "32"

Environment variables set by runcpu during the 600.perlbench_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 602.gcc_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 605.mcf_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 620.omnetpp_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 625.x264_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 631.deepsjeng_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 641.leela_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 657.xz_s peak run:
GOMP_CPU_AFFINITY = "0-31"
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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.
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 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

Sysinfo program /mnt/ramdisk/cpu2017-1.1.7-aocc300/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on rhel-8-3-amd Tue May  4 13:37:55 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 7543P 32-Core Processor
1 "physical id"s (chips)
32 "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 : 32

(Continued on next page)
Platform Notes (Continued)

siblings : 32
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

From lscpu:
Architecture:       x86_64
CPU op-mode(s):     32-bit, 64-bit
Byte Order:         Little Endian
CPU(s):             32
On-line CPU(s) list: 0-31
Thread(s) per core: 1
Core(s) per socket: 32
Socket(s):          1
NUMA node(s):       8
Vendor ID:          AuthenticAMD
CPU family:         25
Model:              1
Model name:         AMD EPYC 7543P 32-Core Processor
Stepping:           1
CPU MHz:            1900.462
BogoMIPS:           5589.44
Virtualization:     AMD-V
L1d cache:          32K
L1i cache:          32K
L2 cache:           512K
L3 cache:           32768K
NUMA node0 CPU(s):  0-3
NUMA node1 CPU(s):  4-7
NUMA node2 CPU(s):  8-11
NUMA node3 CPU(s):  12-15
NUMA node4 CPU(s):  16-19
NUMA node5 CPU(s):  20-23
NUMA node6 CPU(s):  24-27
NUMA node7 CPU(s):  28-31
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 fxsr_opt pdpe1gb rdtscp lm
constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid aperfmpref perf
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
bpxext perfctr_llc mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate
sm mba sev ibs ibp bb stibp vmmcall fsgsbase bni avx2 smep bmi2 invpcid
cqm rdt_a rdseed adx smap clflushopt c1wb sha ni xsaveopt xsave xgetbv1
xsaves cqm_llc cqm_occupp_llc cqm_mbb_total cqm_mbb_local czero
irperf xsaveerptr wboinvd amd_ppin arat npt lbrv svm_lock nrip_save
tsc_scale vmcb_clean flushbyaid decodeassist pfthreshold
v_vmsave_vmload vgif umip pkv ospe vaes vpclmulqdq rdpid
overflow_recov succor smca

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Platform Notes (Continued)

/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
  node 0 size: 128422 MB
  node 0 free: 128269 MB
  node 1 cpus: 4 5 6 7
  node 1 size: 129020 MB
  node 1 free: 128907 MB
  node 2 cpus: 8 9 10 11
  node 2 size: 129018 MB
  node 2 free: 128793 MB
  node 3 cpus: 12 13 14 15
  node 3 size: 129012 MB
  node 3 free: 128874 MB
  node 4 cpus: 16 17 18 19
  node 4 size: 129012 MB
  node 4 free: 128893 MB
  node 5 cpus: 20 21 22 23
  node 5 size: 129022 MB
  node 5 free: 125085 MB
  node 6 cpus: 24 25 26 27
  node 6 size: 129016 MB
  node 6 free: 128890 MB
  node 7 cpus: 28 29 30 31
  node 7 size: 116909 MB
  node 7 free: 116720 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:  1043937164 kB
  HugePages_Total:       0
  Hugepagesize: 2048 kB

/sbin/tuned-adm active

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Platform Notes (Continued)

Current active profile: throughput-performance

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

```
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 4.18.0-240.22.1.el8_3.x86_64 #1 SMP Thu Mar 25 14:36:04 EDT 2021
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/swapps barriers and __user pointer sanitization
- CVE-2017-5753 (Spectre variant 1):
- 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 Nov 25 11:35

```
SPEC is set to: /mnt/ramdisk/cpu2017-1.1.7-aocc300
```

Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 125G 3.7G 122G 3% /mnt/ramdisk

From /sys/devices/virtual/dmi/id

```
Vendor: Dell Inc.
Product: PowerEdge R7515
```

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Platform Notes (Continued)

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:
- 8x 80CE80B380CE M386AAG40AM3-CWE 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

| 600.perlbench_s(base, peak) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_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++

| 620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak) 631.deepsjeng_s(base, peak) 641.leela_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

| 648.exchange2_s(base, peak) |

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#### Compiler Version Notes (Continued)

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
- **C++ benchmarks:** clang+
- **Fortran benchmarks:** flang

#### Base Portability Flags

- 600.perlbench_s: -DSPEC_LINUX_X64 -DSPEC_LP64
- 602.gcc_s: -DSPEC_LP64
- 605.mcf_s: -DSPEC_LP64
- 620.omnetpp_s: -DSPEC_LP64
- 623.xalancbmk_s: -DSPEC_LINUX -DSPEC_LP64
- 625.x264_s: -DSPEC_LP64
- 631.deepsjeng_s: -DSPEC_LP64
- 641.leela_s: -DSPEC_LP64
- 648.exchange2_s: -DSPEC_LP64
- 657.xz_s: -DSPEC_LP64

#### Base Optimization Flags

- **C benchmarks:**
  - -m64 -mno-adx -mno-sse4a -W1,-allow-multiple-definition
  - -W1,-mlllvm -W1,-enable-licm-vrp -W1,-mlllvm -W1,-region-vectorize
  - -W1,-mlllvm -W1,-function-specialize
  - -W1,-mlllvm -W1,-align-all-nofallthru-blocks=6
  - -W1,-mlllvm -W1,-reduce-array-computations=3 -O3 -march=znver3
  - -fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
  - -mlllvm -unroll-threshold=50 -mlllvm -inline-threshold=1000

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### Base Optimization Flags (Continued)

C benchmarks (continued):
- `-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`  

C++ benchmarks:
- `-m64 -std=c++98 -mno-adx -mno-sse4a`  
- `-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 -O3 -march=znver3`  
- `-fveclib=AMDLIBM -ffast-math -flto -mllvm -enable-partial-unswitch`  
- `-mllvm -unroll-threshold=100 -finline-aggressive`  
- `-flv-function-specialization -mllvm -loop-unswitch-threshold=200000`  
- `-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch`  
- `-mllvm -extra-vectorizer-passes -mllvm -reduce-array-computations=3`  
- `-mllvm -global-vectorize-slp=true -mllvm -convert-pow-exp-to-int=false`  
- `-z muldefs -mllvm -do-block-reorder=aggressive`  
- `-fvirtual-function-elimination -fvisibility=hidden -DSPEC_OPENMP`  
- `-fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc`  
- `-lflang -lflangrti`

Fortran benchmarks:
- `-m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-inline-recursion=4`  
- `-Wl,-mllvm -Wl,-lsr-in-nested-loop -Wl,-mllvm -Wl,-enable-iv-split`  
- `-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 -z muldefs`  
- `-mllvm -unroll-aggressive -mllvm -unroll-threshold=150 -DSPEC_OPENMP`  
- `-fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc`  
- `-lflang -lflangrti`

### Base Other Flags

C benchmarks:
- `-Wno-unused-command-line-argument -Wno-return-type`

C++ benchmarks:
- `-Wno-unused-command-line-argument -Wno-return-type`

(Continued on next page)
# SPEC CPU®2017 Integer Speed Result

## Dell Inc.

**PowerEdge R7515 (AMD EPYC 7543P 32-Core Processor)**

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base = 12.4</th>
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<tr>
<td>SPECspeed®2017_int_peak = 12.5</td>
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<tr>
<th>CPU2017 License: 55</th>
<th>Test Date: May-2021</th>
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</tr>
</tbody>
</table>

### Base Other Flags (Continued)

- Fortran benchmarks:
- `-Wno-return-type`

### Peak Compiler Invocation

- C benchmarks:
  - `clang`

- C++ benchmarks:
  - `clang++`

- Fortran benchmarks:
  - `flang`

### Peak Portability Flags

- Same as Base Portability Flags

### Peak Optimization Flags

- C benchmarks:
  - `-m64 -mno-adx -mno-sse4a -Wl,-allow-multiple-definition`
  - `-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`
  - `-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
  - `-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast -march=znver3`

- C++ benchmarks:
  - `620.omnetpp_s -m64 -std=c++98 -mno-adx -mno-sse4a`
  - `-Wl,-mllvm -Wl,-do-block-reorder-aggressive`
  - `-Wl,-mllvm -Wl,-function-specialize`
  - `-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
  - `-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast`

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

Dell Inc.

PowerEdge R7515 (AMD EPYC 7543P 32-Core Processor)

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Peak Optimization Flags (Continued)

620.omnetpp_s (continued):
- -march=znver3 -fveclib=AMDLIBM -ffast-math -flto
- -finline-aggressive -mllvm -unroll-threshold=100
- -flv-function-specialization -mllvm -enable-licm-vrp
- -mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
- -mllvm -reduce-array-computations=3
- -mllvm -global-vectorize-slp=true
- -mllvm -do-block-reorder=aggressive
- -fvirtual-function-elimination -fvisibility=hidden
- -DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm
- -ljemalloc -lflang

623.xalancbmk_s: basepeak = yes
631.deepsjeng_s: Same as 620.omnetpp_s
641.leela_s: Same as 620.omnetpp_s

Fortran benchmarks:
648.exchange2_s: basepeak = yes

Peak Other Flags

C benchmarks:
- -Wno-unused-command-line-argument -Wno-return-type

C++ benchmarks:
- -Wno-unused-command-line-argument -Wno-return-type

Fortran benchmarks:
- -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:
Dell Inc.

PowerEdge R7515 (AMD EPYC 7543P 32-Core Processor)

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