# SPEC CPU®2017 Integer Speed Result

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

<table>
<thead>
<tr>
<th>Test Date:</th>
<th>Mar-2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware Availability:</td>
<td>Apr-2021</td>
</tr>
<tr>
<td>Software Availability:</td>
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</tr>
</tbody>
</table>

**SPECspeed®2017_int_base** = 11.9  
**SPECspeed®2017_int_peak** = 11.9

---

## 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  
**Cache L2:** 512 KB I+D on chip per core  
**Cache L3:** 256 MB I+D on chip per core, 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)  
**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.
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SPECspeed®2017_int_base = 11.9
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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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<th>Ratio</th>
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<tbody>
<tr>
<td>600.perlbench_s</td>
<td>64</td>
<td>253</td>
<td>7.01</td>
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<td>602.gcc_s</td>
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<tr>
<td>605.mcf_s</td>
<td>64</td>
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<td>620.omnetpp_s</td>
<td>64</td>
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<td>625.x264_s</td>
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<tr>
<td>631.deepsjeng_s</td>
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<td>6.06</td>
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<td>648.exchange2_s</td>
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<tr>
<td>657.xz_s</td>
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<td>23.9</td>
<td>257</td>
<td>24.0</td>
<td>64</td>
<td>258</td>
</tr>
</tbody>
</table>

SPECspeed®2017_int_base = 11.9
SPECspeed®2017_int_peak = 11.9

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 R7515 (AMD EPYC 7763 64-Core Processor)  

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

Operating System Notes (Continued)

To enable Transparent Hugepages (THP) for all allocations,  
'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 = "0-63"  
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:"  
MALLOC_CONF = "retain:true"  
OMP_DYNAMIC = "false"  
OMP_SCHEDULER = "static"  
OMP_STACKSIZE = "128M"  
OMP_THREAD_LIMIT = "64"

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"

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.
Dell Inc. PowerEdge R7515 (AMD EPYC 7763 64-Core Processor)

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**Software Availability:** Mar-2021

**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: Disabled
- 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 17:35:20 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
  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
  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
CPU(s):             64
```
Dell Inc.  

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**Platform Notes (Continued)**

- **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:** 1943.555
- **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 mca cmov pat pse36 clflush mmx mxm xmm ext f7se fmu 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 extapicr cr8_legacy abm sse4a misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_llc mwaitx cpi cat l1d cdp l1i invpcid_single hw_pstate sme ssbd mba sev ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 invvpicid cqm rdt_a rdseed adx smap clflushopt clwb sha ni xsaveopt xsave xsavec xgetbv1 xsavees cqm_llc cqm_occu_p llc cqm_mmb_total cqm_mmb_local clzero irperf xsavesrptr wbnoinvd amd_ppin arat npt lbv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold v_vmsave_vmload vgif umip pku ospke vaes vpclmulqdq rdpid overflow_reco exit 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  
- node 0 free: 128309 MB

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**Platform Notes (Continued)**

```plaintext
node 1 cpus: 8 9 10 11 12 13 14 15
node 1 size: 129017 MB
node 1 free: 124099 MB
node 2 cpus: 16 17 18 19 20 21 22 23
node 2 size: 129021 MB
node 2 free: 128732 MB
node 3 cpus: 24 25 26 27 28 29 30 31
node 3 size: 129021 MB
node 3 free: 128855 MB
node 4 cpus: 32 33 34 35 36 37 38 39
node 4 size: 128974 MB
node 4 free: 128812 MB
node 5 cpus: 40 41 42 43 44 45 46 47
node 5 size: 129021 MB
node 5 free: 128915 MB
node 6 cpus: 48 49 50 51 52 53 54 55
node 6 size: 129019 MB
node 6 free: 128913 MB
node 7 cpus: 56 57 58 59 60 61 62 63
node 7 size: 116908 MB
node 7 free: 116785 MB
node distances:

<table>
<thead>
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<th>node</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>10</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*

```plaintext
os-release:
NAME="Red Hat Enterprise Linux"
VERSION="8.3 (Ootpa)"
ID=rhel
ID_LIKE="fedora"
VERSION_ID="8.3"
```

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

- 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

```bash
date
```

```bash
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

```bash
run-level 3 Mar 21 17:33
```

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

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>tmpfs</td>
<td>tmpfs</td>
<td>125G</td>
<td>4.6G</td>
<td>121G</td>
<td>4%</td>
<td>/mnt/ramdisk</td>
</tr>
</tbody>
</table>

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:**

8x 80CE80B380CE M386AAG40AM3-CWE 128 GB 4 rank 3200

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

8x Not Specified Not Specified

BIOS:
- BIOS Vendor: Dell Inc.
- BIOS Version: 2.1.4
- BIOS Date: 02/17/2021
- BIOS Revision: 2.1

(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) |

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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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 -Wl,-allow-multiple-definition
-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 -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

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

C++ benchmarks (continued):
- `-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`
- `-fllvm-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 -llflang`
- `-llflangrti`

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 -llflang`
- `-llflangrti`

### Base 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`

### Peak Compiler Invocation

C benchmarks:
- `clang`

(Continued on next page)
Peak Compiler Invocation (Continued)

C++ benchmarks:
clang++

Fortran benchmarks:
flang

Peak Portability Flags
Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:


602.gcc_s: Same as 600.perlbench_s

605.mcf_s: Same as 600.perlbench_s

625.x264_s: Same as 600.perlbench_s

657.xz_s: basepeak = yes

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

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

Dell Inc.
PowerEdge R7515 (AMD EPYC 7763 64-Core Processor)

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<tbody>
<tr>
<td>SPECspeed®2017_int_peak = 11.9</td>
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</table>

- **CPU2017 License:** 55
- **Test Sponsor:** Dell Inc.
- **Test Date:** Mar-2021
- **Test Sponsor:** Dell Inc.
- **Hardware Availability:** Apr-2021
- **Test Date:** Mar-2021
- **Software Availability:** Mar-2021

Peak Optimization Flags (Continued)

620.omnetpp_s (continued):
- -Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
- -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: basepeak = yes
641.leela_s: basepeak = yes

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

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