Dell Inc.

PowerEdge C6525 (AMD EPYC 7343 16-Core Processor)

SPEC CPU®2017 Integer Speed Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

Dell Inc.

Test Date: Mar-2021

Hardware Availability: Mar-2021

Test Sponsor: Dell Inc.

Software Availability: Mar-2021

Tested by: Dell Inc.

CPU2017 License: 55

Software

OS: Red Hat Enterprise Linux 8.3 (Ootpa)

Compiler: C/C++/Fortran: Version 3.0.0 of AOCC

Parallel: Yes

Firmware: Version 2.2.2 released Mar-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.

Software

CPU: AMD EPYC 7343

Max MHz: 3900

Nominal: 3200

Enabled: 32 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 core, 32 MB shared / 4 cores

Other: None

Memory: 2 TB (16 x 128 GB 4Rx4 PC4-3200AA-L)

Storage: 1002 GB on tmpfs

Other: None

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SPECspeed®2017_int_base = 13.0

SPECspeed®2017_int_peak = 13.1

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Threads

<table>
<thead>
<tr>
<th>Test</th>
<th>Threads</th>
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</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>32</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>32</td>
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<tr>
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<tr>
<td>623.xalancbmk_s</td>
<td>32</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>32</td>
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<tr>
<td>631.deepsjeng_s</td>
<td>32</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>32</td>
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<tr>
<td>648.exchange2_s</td>
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</tr>
<tr>
<td>657.xz_s</td>
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</tr>
</tbody>
</table>

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Hardware

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Software

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SPECspeed®2017_int_base (13.0)

SPECspeed®2017_int_peak (13.1)
Dell Inc. PowerEdge C6525 (AMD EPYC 7343 16-Core Processor)

CPU2017 License: 55
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Results Table

<table>
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<td>25.7</td>
<td>32</td>
<td>241</td>
<td>25.7</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)
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PowerEdge C6525 (AMD EPYC 7343 16-Core Processor)  SPECspeed®2017_int_base = 13.0
SPECspeed®2017_int_peak = 13.1

CPU2017 License: 55  Test Date: Mar-2021
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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 = "/dev/shm/cpu2017-1.1.5/amd_speed_aocc300_milan_B_lib/64;/dev/shm/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 = "32"

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 623.xalancbmk_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 641.leela_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 648.exchange2_s peak run:
GOMP_CPU_AFFINITY = "0"

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

General Notes

Binaries were compiled on a system with 2x AMD EPYC 7742 CPU + 1TiB Memory using openSUSE 15.2

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

Dell Inc.

PowerEdge C6525 (AMD EPYC 7343 16-Core Processor)

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General Notes (Continued)

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 1002 GB ramdisk created with the cmd: "mount -t tmpfs -o size=1002G 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: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on rhel-8-3-amd Thu Mar 18 13:01:59 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 7343 16-Core Processor
- 2 "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: 16
  - siblings: 16
  - physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
  - physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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| Dell Inc. | SPECspeed®2017_int_base = 13.0 |
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**Hardware Availability:** Mar-2021  
**Tested by:** Dell Inc.  
**Software Availability:** Mar-2021

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**Platform Notes (Continued)**

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: 16
- Socket(s): 2
- NUMA node(s): 8
- Vendor ID: AuthenticAMD
- CPU family: 25
- Model: 1
- Model name: AMD EPYC 7343 16-Core Processor
- Stepping: 1
- CPU MHz: 1869.050
- BogoMIPS: 6388.21
- 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 mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall 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 extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch osvw ibr sinit wdt tce topoext perfctr_core perfctr_nb bpext 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 cmov rt a rseed adx smap clflushopt clwb sha ni xsaveopt xsavec xgetbv1 xsaves cqmg llc cqmg_occup_llc cqmg_mbm_total cqmg_mbm_local clzero irperf xsaveerpr wbnoinvd amd_ppin arat npt lbrv svm_lock nrip save tsc_scale vmcb_clean flushbyasid decodeassists pausetime pfthreshold v_vmsave_vmload vgif umip pku ospev vaes vpclmulqdq rdpid overflow_recover succor smca

/proc/cpuinfo cache data
- cache size: 512 KB

(Continued on next page)
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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
  node 0 size: 257595 MB
  node 0 free: 257493 MB
  node 1 cpus:  4  5  6  7
  node 1 size: 258016 MB
  node 1 free: 257787 MB
  node 2 cpus:  8  9 10 11
  node 2 size: 258016 MB
  node 2 free: 257938 MB
  node 3 cpus: 12 13 14 15
  node 3 size: 245915 MB
  node 3 free: 245817 MB
  node 4 cpus: 16 17 18 19
  node 4 size: 257984 MB
  node 4 free: 257904 MB
  node 5 cpus: 20 21 22 23
  node 5 size: 258022 MB
  node 5 free: 257866 MB
  node 6 cpus: 24 25 26 27
  node 6 size: 258016 MB
  node 6 free: 251991 MB
  node 7 cpus: 28 29 30 31
  node 7 size: 258032 MB
  node 7 free: 257819 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:        2101028888 kB
  HugePages_Total:       0
  Hugepagesize:       2048 kB

/sbin/tuned-adm active
  Current active profile: throughput-performance

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

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Platform Notes (Continued)

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): 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/swapsps barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retropoline, 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 11:39

SPEC is set to: /dev/shm/cpu2017-1.1.5

Filesystem  Type  Size  Used Avail Use% Mounted on
tmpfs  tmpfs 1002G 5.7G 997G 1% /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

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

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 802C8632802C 72ASS16G72LZ-3G2B3 128 GB 4 rank 3200

**BIOS:**
- **BIOS Vendor:** Dell Inc.
- **BIOS Version:** 2.2.2
- **BIOS Date:** 03/02/2021
- **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.xalanchmk_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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**Compiler Version Notes (Continued)**

**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,-mlirvm -Wl,-enable-lcm-vrp -Wl,-mlirvm -Wl,-region-vectorize 
  -Wl,-mlirvm -Wl,-function-specialize 
  -Wl,-mlirvm -Wl,-align-all-nofallthru-blocks=6 
  -Wl,-mlirvm -Wl,-reduce-array-computations=3 -O3 -march=znver3 
  -mveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5 
  -mlirvm -unroll-threshold=50 -mlirvm -inline-threshold=1000 
  -freemap-arrays -mlirvm -function-specialize -flv-function-specialization 
  -mlirvm -enable-gvn-hoist -mlirvm -global-vectorize-slp=true 
  -mlirvm -enable-lcm-vrp -mlirvm -reduce-array-computations=3 -z muldefs 
  -DSPEC\_OPENMP -fopenmp fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc 
  -lflang -lflangrni

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

Dell Inc.

PowerEdge C6525 (AMD EPYC 7343 16-Core Processor)

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

SPECspeed®2017_int_base = 13.0
SPECspeed®2017_int_peak = 13.1

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

Base Optimization Flags (Continued)

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
- -mlllvm -unroll-threshold=100 -finline-aggressive
- -flv-function-specialization -mlllvm -loop-unswitch-threshold=200000
- -mlllvm -reroll-loops -mlllvm -aggressive-loop-unswitch
- -mlllvm -extra-vectorizer-passes -mlllvm -reduce-array-computations=3
- -mlllvm -global-vectorize-slp=true -mlllvm -convert-pow-exp-to-int=false
- -z muldefs -mlllvm -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
- -mlllvm -unroll-aggressive -mlllvm -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

Fortran benchmarks:
- -Wno-return-type
Dell Inc.

PowerEdge C6525 (AMD EPYC 7343 16-Core Processor)  

**SPEC CPU®2017 Integer Speed Result**

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**Dell Inc.**

PowerEdge C6525 (AMD EPYC 7343 16-Core Processor)

**SPECspeed®2017_int_base = 13.0**

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**CPU2017 License:** 55

**Test Date:** Mar-2021

**Test Sponsor:** Dell Inc.

**Hardware Availability:** Mar-2021

**Tested by:** Dell Inc.

**Software Availability:** Mar-2021

### 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:**

600.perlbench_s: basepeak = yes

602.gcc_s: basepeak = yes


625.x264_s: Same as 605.mcf_s

657.xz_s: Same as 605.mcf_s

**C++ benchmarks:**

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

620.omnetpp_s: -m64 -std=c++98 -mno-adx -mno-sse4a  
-We, -mlllvm -We, -do-block-reorder=aggressive  
-We, -mlllvm -We, -function-specialize  
-We, -mlllvm -We, -align-all-nofallthru-blocks=6  
-We, -mlllvm -We, -reduce-array-computations=3 -Ofast  
-march=znver3 -fveclib=AMDLIBM -ffast-math -flto  
-finline-aggressive -mlllvm -unroll-threshold=100  
-fllvm-function-specialization -mlllvm -enable-licm-vrp  
-mlllvm -reroll-loops -mlllvm -aggressive-loop-unswitch  
-mlllvm -reduce-array-computations=3  
-mlllvm -global-vectorize-slp=true  
-mlllvm -do-block-reorder=aggressive  
-fvirtual-function-elimination -fvisibility=hidden  
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm  
-ljemalloc -lflang

623.xalancbmk_s: Same as 620.omnetpp_s

631.deepsjeng_s: basepeak = yes

641.leela_s: Same as 620.omnetpp_s

Fortran benchmarks:

- m64 -mno-adx -mno-sse4a -Wl, -mlllvm -Wl, -inline-recursion=4  
- Wl, -mlllvm -Wl, -lsr-in-nested-loop -Wl, -mlllvm -Wl, -enable-iv-split  
- Wl, -mlllvm -Wl, -function-specialize  
- Wl, -mlllvm -Wl, -align-all-nofallthru-blocks=6  
- Wl, -mlllvm -Wl, -reduce-array-computations=3 -O3 -march=znver3  
- fveclib=AMDLIBM -ffast-math -flto -mlllvm -unroll-aggressive  
- mlllvm -unroll-threshold=150 -DSPEC_OPENMP -fopenmp -fopenmp=libomp  
- lomp -lamdlibm -ljemalloc -lflang

## 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
SPEC CPU®2017 Integer Speed Result

Dell Inc.

PowerEdge C6525 (AMD EPYC 7343 16-Core Processor)

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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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