Dell Inc.

PowerEdge R7525 (AMD EPYC 73F3 16-Core Processor)

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

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

**SPECspeed®2017_int_base = 13.4**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed®2017_int_peak</th>
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</thead>
<tbody>
<tr>
<td>perlbench_s</td>
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<td>gcc_s</td>
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<td>mcf_s</td>
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<td>x264_s</td>
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<td>leela_s</td>
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<tr>
<td>exchange2_s</td>
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</tr>
<tr>
<td>xz_s</td>
<td>32</td>
<td>25.7</td>
</tr>
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</table>

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**Hardware**

- **CPU Name:** AMD EPYC 73F3
- **Max MHz:** 4000
- **Nominal:** 3500
- **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:** 256 MB I+D on chip per chip, 32 MB shared / 2 cores
- **Other:** None
- **Memory:** 2 TB (16 x 128 GB 4Rx4 PC4-3200AA-L)
- **Storage:** 225 GB on tmpfs
- **Other:** None

**Software**

- **OS:** Red Hat Enterprise Linux 8.3 (Ootpa)
  4.18.0-240.10.1.el8_3.x86_64
- **Compiler:** C/C++/Fortran: Version 3.0.0 of AOCC
- **Parallel:** Yes
- **Firmware:** Version 2.0.3 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.
## Results Table

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**SPECspeed®2017_int_base = 13.4**

**SPECspeed®2017_int_peak = 13.4**

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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# SPEC CPU®2017 Integer Speed Result

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**Test Sponsor:** Dell Inc.  
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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 = 
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  

- `MALLOCONF = "retain:true"`
- `OMP_DYNAMIC = "false"`
- `OMP_SCHEDULE = "static"`
- `OMP_STACKSIZE = "128M"`
- `OMP_THREAD_LIMIT = "32"`

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 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"`

---

## 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

(Continued on next page)
General Notes (Continued)

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 225 GB ramdisk created with the cmd: "mount -t tmpfs -o size=225G 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/cpu2017-1.1.5/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c

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 73F3 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

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

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Platform Notes (Continued)

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): 16
Vendor ID: AuthenticAMD
CPU family: 25
Model: 1
Model name: AMD EPYC 73F3 16-Core Processor
Stepping: 1
CPU MHz: 1639.165
BogoMIPS: 6987.06
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 32768K
NUMA node0 CPU(s): 0,1
NUMA node1 CPU(s): 2,3
NUMA node2 CPU(s): 4,5
NUMA node3 CPU(s): 6,7
NUMA node4 CPU(s): 8,9
NUMA node5 CPU(s): 10,11
NUMA node6 CPU(s): 12,13
NUMA node7 CPU(s): 14,15
NUMA node8 CPU(s): 16,17
NUMA node9 CPU(s): 18,19
NUMA node10 CPU(s): 20,21
NUMA node11 CPU(s): 22,23
NUMA node12 CPU(s): 24,25
NUMA node13 CPU(s): 26,27
NUMA node14 CPU(s): 28,29
NUMA node15 CPU(s): 30,31

Flags:

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</tr>
</tbody>
</table>

**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: 16 nodes (0-15)
  node 0 cpus: 0 1
  node 0 size: 128583 MB
  node 0 free: 128513 MB
  node 1 cpus: 2 3
  node 1 size: 129015 MB
  node 1 free: 128971 MB
  node 2 cpus: 4 5
  node 2 size: 129019 MB
  node 2 free: 128966 MB
  node 3 cpus: 6 7
  node 3 size: 129021 MB
  node 3 free: 128919 MB
  node 4 cpus: 8 9
  node 4 size: 129013 MB
  node 4 free: 128913 MB
  node 5 cpus: 10 11
  node 5 size: 129015 MB
  node 5 free: 128906 MB
  node 6 cpus: 12 13
  node 6 size: 129021 MB
  node 6 free: 128950 MB
  node 7 cpus: 14 15
  node 7 size: 129023 MB
  node 7 free: 128888 MB
  node 8 cpus: 16 17
  node 8 size: 129017 MB
  node 8 free: 128860 MB
  node 9 cpus: 18 19
  node 9 size: 128983 MB
  node 9 free: 128888 MB
  node 10 cpus: 20 21
  node 10 size: 129023 MB
  node 10 free: 128931 MB
  node 11 cpus: 22 23
  node 11 size: 129021 MB
  node 11 free: 128974 MB
  node 12 cpus: 24 25
  node 12 size: 129017 MB
  node 12 free: 128976 MB
  node 13 cpus: 26 27
```

(Continued on next page)
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Copyright 2017-2021 Standard Performance Evaluation Corporation

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Platform Notes (Continued)

node 13 size: 129021 MB
node 13 free: 128978 MB
node 14 cpus: 28 29
node 14 size: 129023 MB
node 14 free: 128982 MB
node 15 cpus: 30 31
node 15 size: 129018 MB
node 15 free: 128975 MB
node distances:

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</table>

From /proc/meminfo
MemTotal: 2101020360 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)"
ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)

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Platform Notes (Continued)

system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

uname -a:
    Linux localhost.localdomain 4.18.0-240.10.1.el8_3.x86_64 #1 SMP Wed Dec 16 03:30:52 EST 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 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 Mar 24 07:21 last=5

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.5
Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 225G 4.8G 221G 3% /mnt/ramdisk

From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge R7525
Product Family: PowerEdge
Serial: 48LN333

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 802C8632802C 72ASS16G72LZ-3G2B3 128 GB 4 rank 3200
16x Not Specified Not Specified

BIOS:
BIOS Vendor: Dell Inc.
BIOS Version: 2.0.3

(Continued on next page)
### Dell Inc. PowerEdge R7525 (AMD EPYC 73F3 16-Core Processor)

<table>
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<tr>
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| CPU2017 License:          | 55   |
| Test Sponsor:             | Dell Inc. |
| Tested by:                | Dell Inc. |
| Test Date:                | Mar-2021 |
| Hardware Availability:    | Jun-2021 |
| Software Availability:    | Mar-2021 |

#### Platform Notes (Continued)

- BIOS Date: 01/15/2021
- BIOS Revision: 2.0

(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

---

#### Base Compiler Invocation

- C benchmarks:
  - `clang`

(Continued on next page)
Dell Inc.  
PowerEdge R7525 (AMD EPYC 73F3 16-Core Processor)  

**SPEC CPU®2017 Integer Speed Result**

| SPECspeed®2017_int_base = 13.4 |
| SPECspeed®2017_int_peak = 13.4 |

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

**Base Compiler Invocation (Continued)**

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,-mllvm -W1,-enable-licm-vrp -W1,-mllvm -W1,-region-vectorize  
- -W1,-mllvm -W1,-function-specialize  
- -W1,-mllvm -W1,-align-all-nofallthru-blocks=6  
- -W1,-mllvm -W1,-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  
- -W1,-mllvm -W1,-do-block-reorder=aggressive  
- -W1,-mllvm -W1,-region-vectorize -W1,-mllvm -W1,-function-specialize  
- -W1,-mllvm -W1,-align-all-nofallthru-blocks=6  
- -W1,-mllvm -W1,-reduce-array-computations=3 -O3 -march=znver3  
- -fveclib=AMDLIBM -ffast-math -flto -mllvm -enable-partial-unswitch

(Continued on next page)
SPEC CPU®2017 Integer Speed Result
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Dell Inc.
PowerEdge R7525 (AMD EPYC 73F3 16-Core Processor)

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Hardware Availability: Jun-2021
Software Availability: Mar-2021

Base Optimization Flags (Continued)

C++ benchmarks (continued):
-mllvm -unroll-threshold=100 -finline-aggressive
-llvm-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

Fortran benchmarks:
-Wno-return-type

Peak Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

(Continued on next page)
Dell Inc.

PowerEdge R7525 (AMD EPYC 73F3 16-Core Processor)

SPEC CPU®2017 Integer Speed Result
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CPU2017 License: 55
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SPECspeed®2017_int_base = 13.4
SPECspeed®2017_int_peak = 13.4

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

Peak Compiler Invocation (Continued)

Fortran benchmarks:
flang

Peak Portability Flags
Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

600.perlbench_s: basepeak = yes

602.gcc_s: -m64 -mno-adx -mno-sse4a -Wl,-allow-multiple-definition
-Wl,-mllvm -Wl,-enable-licm-vrp
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -ffast-math -flto
-fstruct-layout=5 -mllvm -unroll-threshold=50
-freemap-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 -lmlibm -ljemalloc -lflang

605.mcf_s: Same as 602.gcc_s

625.x264_s: Same as 602.gcc_s

657.xz_s: basepeak = yes

C++ benchmarks:

620.omnetpp_s: basepeak = yes

623.xalancbmk_s: -m64 -std=++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

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### SPEC CPU®2017 Integer Speed Result

**Dell Inc.**

PowerEdge R7525 (AMD EPYC 73F3 16-Core Processor)  

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<td>Software Availability: Mar-2021</td>
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#### Peak Optimization Flags (Continued)

623.xalancbmk_s (continued):
- `-march=znver3`  
- `-fveclib=AMDLIBM`  
- `-ffast-math`  
- `-flto`  
- `-finline-aggressive`  
- `-mllvm -unroll-threshold=100`  
- `-mlvm-function-specialization`  
- `-mllvm -enable-lcm-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`  
- `-DSPEC_OPENMP`  
- `-fopenmp`  
- `-fopenmp=libomp`  
- `-lomp`  
- `-lamdlibm`  
- `-ljemalloc`  
- `-lflang`

631.deepsjeng_s: `basepeak = yes`

641.leela_s: Same as 623.xalancbmk_s

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,-function-specialize`  
- `-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`  
- `-Wl,-mllvm -Wl,-reduce-array-computations=3`  
- `-mllvm -m64`  
- `-mllvm -ffast-math`  
- `-mllvm -unroll-aggressive`  
- `-mllvm -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`

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The flags files that were used to format this result can be browsed at

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**PowerEdge R7525 (AMD EPYC 73F3 16-Core Processor)**

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**Software Availability:** Mar-2021

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


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