



# SPEC CPU®2017 Integer Rate Result

Copyright 2017-2022 Standard Performance Evaluation Corporation

## Dell Inc.

SPECrate®2017\_int\_base = 450

PowerEdge R6525 (AMD EPYC 7473X 24-Core Processor)

SPECrate®2017\_int\_peak = 467

CPU2017 License: 55

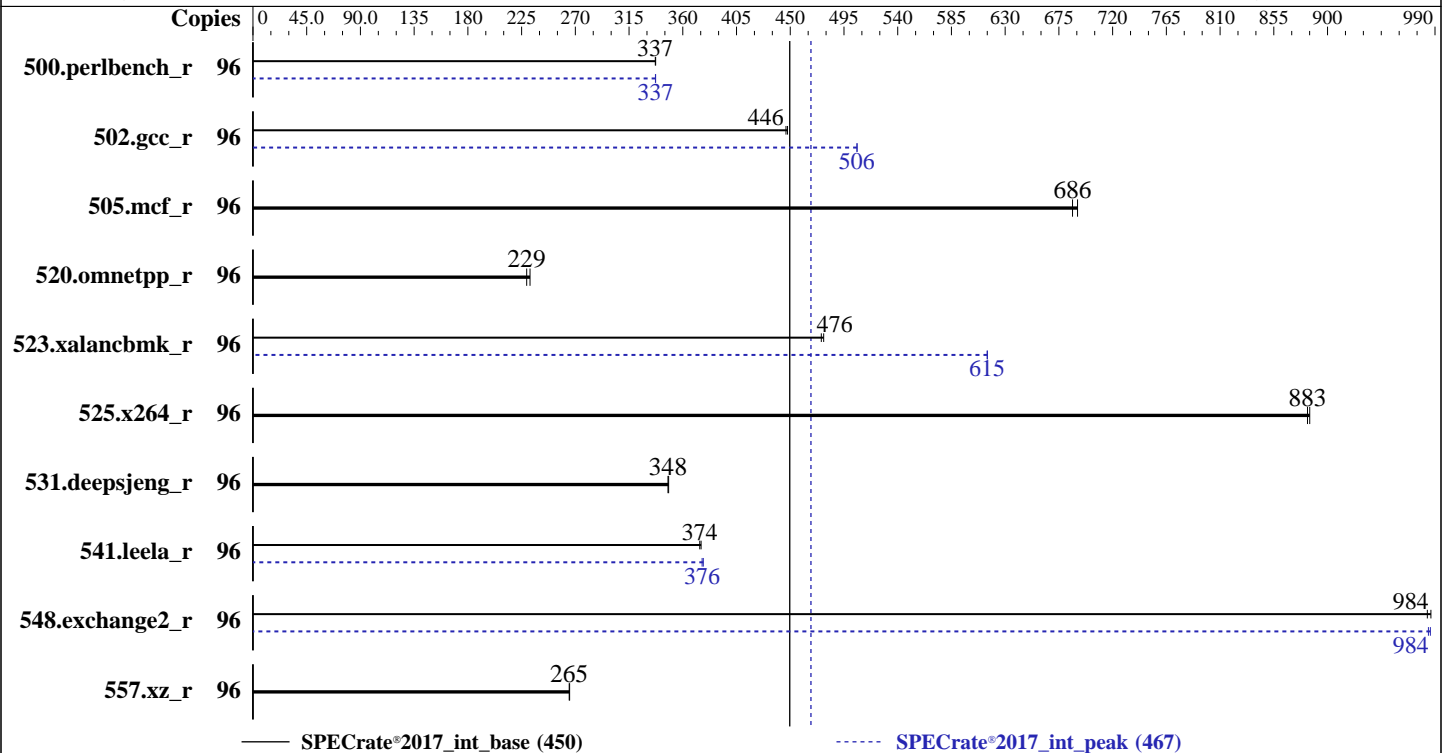
Test Date: Feb-2022

Test Sponsor: Dell Inc.

Hardware Availability: Mar-2022

Tested by: Dell Inc.

Software Availability: Dec-2021



### Hardware

CPU Name: AMD EPYC 7473X  
 Max MHz: 3700  
 Nominal: 2800  
 Enabled: 48 cores, 2 chips, 2 threads/core  
 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: 768 MB I+D on chip per chip, 96 MB shared / 3 cores  
 Other: None  
 Memory: 2 TB (16 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.el8.x86\_64  
 Compiler: C/C++/Fortran: Version 3.2.0 of AOCC  
 Parallel: No  
 Firmware: Version 2.6.5 released Dec-2021  
 File System: tmpfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: 32/64-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

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	96	453	337	<b>454</b>	<b>337</b>			96	453	337	<b>453</b>	<b>337</b>		
502.gcc_r	96	304	448	<b>305</b>	<b>446</b>			96	269	506	<b>269</b>	<b>506</b>		
505.mcf_r	96	<b>226</b>	<b>686</b>	225	691			96	<b>226</b>	<b>686</b>	225	691		
520.omnetpp_r	96	<b>549</b>	<b>229</b>	543	232			96	<b>549</b>	<b>229</b>	543	232		
523.xalancbmk_r	96	212	478	<b>213</b>	<b>476</b>			96	165	615	<b>165</b>	<b>615</b>		
525.x264_r	96	<b>190</b>	<b>883</b>	190	885			96	<b>190</b>	<b>883</b>	190	885		
531.deepsjeng_r	96	<b>317</b>	<b>348</b>	316	348			96	<b>317</b>	<b>348</b>	316	348		
541.leela_r	96	424	375	<b>425</b>	<b>374</b>			96	<b>423</b>	<b>376</b>	421	377		
548.exchange2_r	96	255	987	<b>256</b>	<b>984</b>			96	255	986	<b>255</b>	<b>984</b>		
557.xz_r	96	<b>391</b>	<b>265</b>	391	265			96	<b>391</b>	<b>265</b>	391	265		

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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>

To limit dirty cache to 8% of memory, 'sysctl -w vm.dirty\_ratio=8' run as root.  
To limit swap usage to minimum necessary, 'sysctl -w vm.swappiness=1' run as root.  
To free node-local memory and avoid remote memory usage,  
'sysctl -w vm.zone\_reclaim\_mode=1' run as root.  
To clear filesystem caches, 'sync; sysctl -w vm.drop\_caches=3' run as root.  
To disable address space layout randomization (ASLR) to reduce run-to-run  
variability, 'sysctl -w kernel.randomize\_va\_space=0' run as root.

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## Operating System Notes (Continued)

To enable Transparent Hugepages (THP) only on request for base runs,  
'echo madvise > /sys/kernel/mm/transparent\_hugepage/enabled' run as root.  
To enable THP for all allocations for peak runs,  
'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:

```
LD_LIBRARY_PATH =  
    "/mnt/ramdisk/cpu2017-1.1.8-aocc320-A1/amd_rate_aocc320_milanx_A_lib/lib  
    ;/mnt/ramdisk/cpu2017-1.1.8-aocc320-A1/amd_rate_aocc320_milanx_A_lib/lib  
    32:"  
MALLOC_CONF = "retain:true"
```

Environment variables set by runcpu during the 523.xalanxbmk\_r peak run:

```
MALLOC_CONF = "thp:never"
```

## 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.

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>

Benchmark run from a 125 GB ramdisk created with the cmd: "mount -t tmpfs -o size=125G tmpfs /mnt/ramdisk"

## Platform Notes

BIOS settings:

```
    NUMA Nodes per Socket : 4  
    L3 Cache as NUMA Domain : Enabled
```

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## Platform Notes (Continued)

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/cpu2017-1.1.8-aocc320-A1/bin/sysinfo  
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d  
running on rhel-8-3-amd Thu Feb 24 09:42:52 2022

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 7473X 24-Core Processor  
2 "physical id"s (chips)  
96 "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 : 48  
physical 0: cores 0 1 2 4 5 6 8 9 10 12 13 14 16 17 18 20 21 22 24 25 26 28 29 30  
physical 1: cores 0 1 2 4 5 6 8 9 10 12 13 14 16 17 18 20 21 22 24 25 26 28 29 30

From lscpu from util-linux 2.32.1:  
Architecture: x86\_64  
CPU op-mode(s): 32-bit, 64-bit  
Byte Order: Little Endian  
CPU(s): 96  
On-line CPU(s) list: 0-95  
Thread(s) per core: 2  
Core(s) per socket: 24  
Socket(s): 2  
NUMA node(s): 16  
Vendor ID: AuthenticAMD  
CPU family: 25  
Model: 1  
Model name: AMD EPYC 7473X 24-Core Processor  
Stepping: 2  
CPU MHz: 3119.609  
BogoMIPS: 5589.22  
Virtualization: AMD-V  
L1d cache: 32K

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## Platform Notes (Continued)

```

L1i cache:          32K
L2 cache:           512K
L3 cache:           98304K
NUMA node0 CPU(s): 0-2,48-50
NUMA node1 CPU(s): 3-5,51-53
NUMA node2 CPU(s): 6-8,54-56
NUMA node3 CPU(s): 9-11,57-59
NUMA node4 CPU(s): 12-14,60-62
NUMA node5 CPU(s): 15-17,63-65
NUMA node6 CPU(s): 18-20,66-68
NUMA node7 CPU(s): 21-23,69-71
NUMA node8 CPU(s): 24-26,72-74
NUMA node9 CPU(s): 27-29,75-77
NUMA node10 CPU(s): 30-32,78-80
NUMA node11 CPU(s): 33-35,81-83
NUMA node12 CPU(s): 36-38,84-86
NUMA node13 CPU(s): 39-41,87-89
NUMA node14 CPU(s): 42-44,90-92
NUMA node15 CPU(s): 45-47,93-95
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 nx mmxext fxsr_opt pdpelgb 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 fl6c
rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch
osvw ibs skinit 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 cqm rdt_a rdseed adx smap clflushopt clwb
sha_ni xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
cqm_mbm_local clzero irperf xsaveerptr wbnoinvd amd_ppin arat npt lbrv svm_lock
nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold
v_vmsave_vmload vgif umip pku ospke vaes vpclmulqdq 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: 16 nodes (0-15)
node 0 cpus: 0 1 2 48 49 50
node 0 size: 128487 MB
node 0 free: 128496 MB
node 1 cpus: 3 4 5 51 52 53
node 1 size: 128916 MB
node 1 free: 128941 MB
node 2 cpus: 6 7 8 54 55 56
node 2 size: 128930 MB
node 2 free: 128961 MB

```

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## Platform Notes (Continued)

```

node 3 cpus: 9 10 11 57 58 59
node 3 size: 128916 MB
node 3 free: 128951 MB
node 4 cpus: 12 13 14 60 61 62
node 4 size: 128948 MB
node 4 free: 128937 MB
node 5 cpus: 15 16 17 63 64 65
node 5 size: 128920 MB
node 5 free: 128956 MB
node 6 cpus: 18 19 20 66 67 68
node 6 size: 128938 MB
node 6 free: 128903 MB
node 7 cpus: 21 22 23 69 70 71
node 7 size: 128922 MB
node 7 free: 128944 MB
node 8 cpus: 24 25 26 72 73 74
node 8 size: 128976 MB
node 8 free: 128823 MB
node 9 cpus: 27 28 29 75 76 77
node 9 size: 128918 MB
node 9 free: 128844 MB
node 10 cpus: 30 31 32 78 79 80
node 10 size: 128966 MB
node 10 free: 125468 MB
node 11 cpus: 33 34 35 81 82 83
node 11 size: 128978 MB
node 11 free: 128914 MB
node 12 cpus: 36 37 38 84 85 86
node 12 size: 128956 MB
node 12 free: 128929 MB
node 13 cpus: 39 40 41 87 88 89
node 13 size: 128978 MB
node 13 free: 128786 MB
node 14 cpus: 42 43 44 90 91 92
node 14 size: 128982 MB
node 14 free: 128961 MB
node 15 cpus: 45 46 47 93 94 95
node 15 size: 128970 MB
node 15 free: 128946 MB
node distances:
node  0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15
  0: 10 11 12 12 12 12 12 12 32 32 32 32 32 32 32 32
  1: 11 10 12 12 12 12 12 12 32 32 32 32 32 32 32 32
  2: 12 12 10 11 12 12 12 12 32 32 32 32 32 32 32 32
  3: 12 12 11 10 12 12 12 12 32 32 32 32 32 32 32 32
  4: 12 12 12 12 10 11 12 12 32 32 32 32 32 32 32 32
  5: 12 12 12 12 11 10 12 12 32 32 32 32 32 32 32 32

```

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## Platform Notes (Continued)

6:	12	12	12	12	12	12	10	11	32	32	32	32	32	32	32	32
7:	12	12	12	12	12	12	11	10	32	32	32	32	32	32	32	32
8:	32	32	32	32	32	32	32	32	10	11	12	12	12	12	12	12
9:	32	32	32	32	32	32	32	32	11	10	12	12	12	12	12	12
10:	32	32	32	32	32	32	32	32	12	12	10	11	12	12	12	12
11:	32	32	32	32	32	32	32	32	12	12	11	10	12	12	12	12
12:	32	32	32	32	32	32	32	32	12	12	12	12	10	11	12	12
13:	32	32	32	32	32	32	32	32	12	12	12	12	11	10	12	12
14:	32	32	32	32	32	32	32	32	12	12	12	12	12	12	10	11
15:	32	32	32	32	32	32	32	32	12	12	12	12	12	12	11	10

From /proc/meminfo

MemTotal: 2113388792 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)

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/swaps

(Continued on next page)



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## Platform Notes (Continued)

barriers and \_\_user pointer sanitization  
 Mitigation: Full AMD retpoline, IBPB: conditional, IBRS\_FW, STIBP: always-on, RSB filling

CVE-2017-5715 (Spectre variant 2):  
 Mitigation: Full AMD retpoline, IBPB: conditional, IBRS\_FW, STIBP: always-on, RSB filling

CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected  
 CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Feb 24 09:39

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.8-aocc320-A1

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
tmpfs	tmpfs	125G	3.3G	122G	3%	/mnt/ramdisk

From /sys/devices/virtual/dmi/id

Vendor: Dell Inc.  
 Product: PowerEdge R6525  
 Product Family: PowerEdge  
 Serial: C3JTPX2

Additional information from dmidecode 3.2 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: 2.6.5  
 BIOS Date: 12/28/2021  
 BIOS Revision: 2.6

(End of data from sysinfo program)

## Compiler Version Notes

```
=====
C      | 502.gcc_r(peak)
-----
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on
LLVM Mirror.Version.13.0.0)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
```

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## Compiler Version Notes (Continued)

```
=====
C          | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak)
          | 525.x264_r(base, peak) 557.xz_r(base, peak)
-----
```

```
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on
LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
-----
```

```
=====
C          | 502.gcc_r(peak)
-----
```

```
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on
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```
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C          | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak)
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-----
```

```
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on
LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
-----
```

```
=====
C++       | 523.xalancbmk_r(peak)
-----
```

```
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on
LLVM Mirror.Version.13.0.0)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
-----
```

```
=====
C++       | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base)
          | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
-----
```

(Continued on next page)



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Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
-----

```

```

=====
C++      | 523.xalancbmk_r(peak)
-----

```

```

AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on
  LLVM Mirror.Version.13.0.0)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
-----

```

```

=====
C++      | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base)
          | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
-----

```

```

AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on
  LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
-----

```

```

=====
Fortran  | 548.exchange2_r(base, peak)
-----

```

```

AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on
  LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
-----

```

## Base Compiler Invocation

C benchmarks:  
clang

C++ benchmarks:  
clang++

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# SPEC CPU®2017 Integer Rate Result

Copyright 2017-2022 Standard Performance Evaluation Corporation

Dell Inc.

SPECrate®2017\_int\_base = 450

PowerEdge R6525 (AMD EPYC 7473X 24-Core Processor)

SPECrate®2017\_int\_peak = 467

CPU2017 License: 55

Test Date: Feb-2022

Test Sponsor: Dell Inc.

Hardware Availability: Mar-2022

Tested by: Dell Inc.

Software Availability: Dec-2021

## Base Compiler Invocation (Continued)

Fortran benchmarks:

flang

## Base Portability Flags

```
500.perlbench_r: -DSPEC_LINUX_X64 -DSPEC_LP64
502.gcc_r: -DSPEC_LP64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LINUX -DSPEC_LP64
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64
```

## Base Optimization Flags

C benchmarks:

```
-m64 -Wl,-allow-multiple-definition -Wl,-mllvm -Wl,-enable-licm-vrp
-flto -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
-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM
-ffast-math -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
-mllvm -enable-loop-fusion -z muldefs -lamdlibm -ljemalloc -lflang
```

C++ benchmarks:

```
-m64 -std=c++98 -flto -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
-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM
-ffast-math -mllvm -enable-partial-unswitch
-mllvm -unroll-threshold=100 -finline-aggressive
```

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## Base Optimization Flags (Continued)

C++ benchmarks (continued):

```
-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
-mllvm -enable-loop-fusion -z muldefs -fvirtual-function-elimination
-fvisibility=hidden -lamdlibm -ljemalloc -lflang
```

Fortran benchmarks:

```
-m64 -Wl,-mllvm -Wl,-inline-recursion=4
-Wl,-mllvm -Wl,-lsr-in-nested-loop -Wl,-mllvm -Wl,-enable-iv-split
-flto -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
-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM
-ffast-math -z muldefs -mllvm -unroll-aggressive
-mllvm -unroll-threshold=500 -lamdlibm -ljemalloc -lflang
```

## Base Other Flags

C benchmarks:

```
-Wno-unused-command-line-argument
```

C++ benchmarks:

```
-Wno-unused-command-line-argument
```

## Peak Compiler Invocation

C benchmarks:

```
clang
```

C++ benchmarks:

```
clang++
```

Fortran benchmarks:

```
flang
```



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## Peak Portability Flags

```

500.perlbench_r: -DSPEC_LINUX_X64 -DSPEC_LP64
502.gcc_r: -D_FILE_OFFSET_BITS=64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LINUX -DSPEC_LP64
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64

```

## Peak Optimization Flags

C benchmarks:

```

500.perlbench_r: -m64 -Wl,-allow-multiple-definition
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-fprofile-instr-generate(pass 1)
-fprofile-instr-use(pass 2) -Ofast -march=znver3
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -fremap-arrays
-flv-function-specialization -mllvm -inline-threshold=1000
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=false
-mllvm -function-specialize -mllvm -enable-licm-vrp
-mllvm -reduce-array-computations=3 -lamdlibm -ljemalloc

502.gcc_r: -m32 -Wl,-allow-multiple-definition
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-Wl,-mllvm -Wl,-function-specialize -Ofast -march=znver3
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-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 -fgnu89-inline
-ljemalloc

505.mcf_r: basepeak = yes

525.x264_r: basepeak = yes

```

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## Peak Optimization Flags (Continued)

557.xz\_r: basepeak = yes

C++ benchmarks:

520.omnetpp\_r: basepeak = yes

```
523.xalancbmk_r: -m32 -Wl,-mllvm -Wl,-do-block-reorder=aggressive -flto
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -ffast-math
-inline-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
-ljemalloc
```

531.deepsjeng\_r: basepeak = yes

```
541.leela_r: -m64 -std=c++98 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -ffast-math
-inline-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
-fvirtual-function-elimination -fvisibility=hidden
-lamdlibm -ljemalloc
```

Fortran benchmarks:

```
-m64 -Wl,-mllvm -Wl,-inline-recursion=4
-Wl,-mllvm -Wl,-lsr-in-nested-loop -Wl,-mllvm -Wl,-enable-iv-split
-flto -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 -mllvm -unroll-aggressive
-mllvm -unroll-threshold=500 -lamdlibm -ljemalloc -lflang
```



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## Peak Other Flags

C benchmarks (except as noted below):

-Wno-unused-command-line-argument

502.gcc\_r: -L/usr/lib -Wno-unused-command-line-argument

-L/sppo/bin/cpu2017v118-aocc3-milanX/amd\_rate\_aocc320\_milanx\_A\_lib/lib32

C++ benchmarks (except as noted below):

-Wno-unused-command-line-argument

523.xalancbmk\_r: -L/usr/lib -Wno-unused-command-line-argument

-L/sppo/bin/cpu2017v118-aocc3-milanX/amd\_rate\_aocc320\_milanx\_A\_lib/lib32

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

<http://www.spec.org/cpu2017/flags/aocc320-flags-A1.html>

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-AMD-Milan-rev2.4.html>

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

<http://www.spec.org/cpu2017/flags/aocc320-flags-A1.xml>

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-AMD-Milan-rev2.4.xml>

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