



SPEC CPU®2017 Integer Rate Result

Copyright 2017-2022 Standard Performance Evaluation Corporation

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL365 Gen10 Plus v2

AMD EPYC 7373X

SPECrate®2017_int_base = 328

SPECrate®2017_int_peak = 342

CPU2017 License: 3

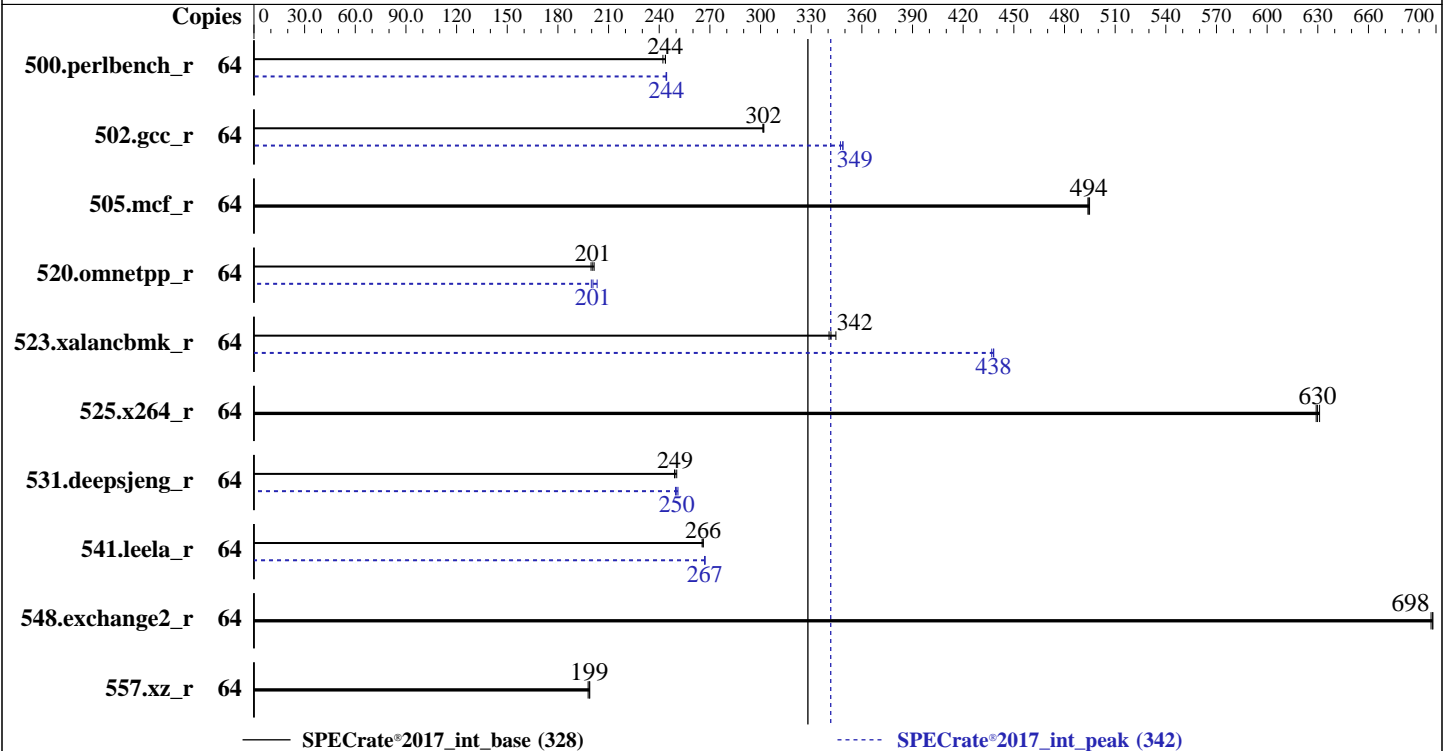
Test Sponsor: HPE

Tested by: HPE

Test Date: Apr-2022

Hardware Availability: Mar-2022

Software Availability: Jan-2022



Hardware

CPU Name: AMD EPYC 7373X
 Max MHz: 3800
 Nominal: 3050
 Enabled: 32 cores, 2 chips, 2 threads/core
 Orderable: 1, 2 chip(s)
 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 / 2 cores
 Other: None
 Memory: 2 TB (16 x 128 GB 4Rx4 PC4-3200AA-L)
 Storage: 1 x 500 GB SAS SSD, RAID 0
 Other: None

Software

OS: Ubuntu 20.04.3 LTS (x86_64)
 Kernel 5.13.0-28-generic
 Compiler: C/C++/Fortran: Version 3.2.0 of AOCC
 Parallel: No
 Firmware: HPE BIOS Version A42 v2.56 02/10/2022 released Feb-2022
 File System: ext4
 System State: Run level 5 (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	64	421	242	418	244	418	244	64	417	244	417	244	417	244
502.gcc_r	64	300	302	300	302	301	301	64	260	349	261	347	260	349
505.mcf_r	64	209	494	209	495	209	494	64	209	494	209	495	209	494
520.omnetpp_r	64	419	201	417	201	421	200	64	413	203	418	201	420	200
523.xalancbmk_r	64	198	342	196	345	198	341	64	155	437	154	438	154	438
525.x264_r	64	178	629	178	630	178	631	64	178	629	178	630	178	631
531.deepsjeng_r	64	293	250	295	249	294	249	64	292	251	293	250	294	250
541.leela_r	64	399	266	399	265	398	266	64	397	267	397	267	397	267
548.exchange2_r	64	241	697	240	698	240	698	64	241	697	240	698	240	698
557.xz_r	64	348	199	348	199	349	198	64	348	199	348	199	349	198

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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 =
"/home/cpu2017_rate/amd_rate_aocc320_milanx_A_lib/lib;/home/cpu2017_rate
/amd_rate_aocc320_milanx_A_lib/lib32:"
MALLOC_CONF = "retain:true"

Environment variables set by runcpu during the 523.xalancbmk_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>

Platform Notes

BIOS Configuration

Workload Profile set to General Throughput Compute

Determinism Control set to Manual

Performance Determinism set to Power Deterministic

Last-Level Cache (LLC) as NUMA Node set to Enabled

NUMA memory domains per socket set to Four memory domains per socket

Memory Interleaving set to Disabled

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Platform Notes (Continued)

Thermal Configuration set to Maximum Cooling
Infinity Fabric Power Management set to Disabled
Infinity Fabric Performance State set to P0
Workload Profile set to Custom
L2 HW Prefetcher set to Disabled

Sysinfo program /home/cpu2017_rate/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
running on admin1-ProLiant-DL365-Gen10-Plus Mon Jan 10 10:33:25 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 7373X 16-Core Processor
2 "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 : 16
siblings : 32
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 from util-linux 2.34:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
Address sizes: 48 bits physical, 48 bits virtual
CPU(s): 64
On-line CPU(s) list: 0-63
Thread(s) per core: 2
Core(s) per socket: 16
Socket(s): 2
NUMA node(s): 16
Vendor ID: AuthenticAMD
CPU family: 25
Model: 1
Model name: AMD EPYC 7373X 16-Core Processor
Stepping: 2
Frequency boost: enabled
CPU MHz: 3050.000
CPU max MHz: 3050.0000
CPU min MHz: 1500.0000
BogoMIPS: 6088.65
Virtualization: AMD-V

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Platform Notes (Continued)

```

L1d cache:                1 MiB
L1i cache:                1 MiB
L2 cache:                 16 MiB
L3 cache:                 1.5 GiB
NUMA node0 CPU(s):       0,1,32,33
NUMA node1 CPU(s):       2,3,34,35
NUMA node2 CPU(s):       4,5,36,37
NUMA node3 CPU(s):       6,7,38,39
NUMA node4 CPU(s):       8,9,40,41
NUMA node5 CPU(s):       10,11,42,43
NUMA node6 CPU(s):       12,13,44,45
NUMA node7 CPU(s):       14,15,46,47
NUMA node8 CPU(s):       16,17,48,49
NUMA node9 CPU(s):       18,19,50,51
NUMA node10 CPU(s):      20,21,52,53
NUMA node11 CPU(s):      22,23,54,55
NUMA node12 CPU(s):      24,25,56,57
NUMA node13 CPU(s):      26,27,58,59
NUMA node14 CPU(s):      28,29,60,61
NUMA node15 CPU(s):      30,31,62,63
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf:       Not affected
Vulnerability Mds:       Not affected
Vulnerability Meltdown:  Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp
Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Full AMD retpoline, IBPB conditional, IBRS_FW, STIBP always-on, RSB filling
Vulnerability Srbds:     Not affected
Vulnerability Tsx async abort: Not affected
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 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 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 bpext perfctr_llc mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba 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 rdpru wbnoinvd amd_ppin arat npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold v_vmsave_vmload vgif v_spec_ctrl umip pku ospke vaes vpclmulqdq rdpid overflow_recov succor smca

```

From lscpu --cache:

(Continued on next page)



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Platform Notes (Continued)

NAME	ONE-SIZE	ALL-SIZE	WAYS	TYPE	LEVEL
Lld	32K	1M	8	Data	1
Lli	32K	1M	8	Instruction	1
L2	512K	16M	8	Unified	2
L3	96M	1.5G	16	Unified	3

```
/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 32 33
node 0 size: 128711 MB
node 0 free: 128066 MB
node 1 cpus: 2 3 34 35
node 1 size: 129020 MB
node 1 free: 128890 MB
node 2 cpus: 4 5 36 37
node 2 size: 129022 MB
node 2 free: 128933 MB
node 3 cpus: 6 7 38 39
node 3 size: 129021 MB
node 3 free: 128960 MB
node 4 cpus: 8 9 40 41
node 4 size: 129022 MB
node 4 free: 128731 MB
node 5 cpus: 10 11 42 43
node 5 size: 129021 MB
node 5 free: 128758 MB
node 6 cpus: 12 13 44 45
node 6 size: 129022 MB
node 6 free: 128966 MB
node 7 cpus: 14 15 46 47
node 7 size: 129009 MB
node 7 free: 128942 MB
node 8 cpus: 16 17 48 49
node 8 size: 129022 MB
node 8 free: 128956 MB
node 9 cpus: 18 19 50 51
node 9 size: 129021 MB
node 9 free: 128942 MB
node 10 cpus: 20 21 52 53
node 10 size: 129022 MB
node 10 free: 128949 MB
node 11 cpus: 22 23 54 55
node 11 size: 129021 MB
```

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Platform Notes (Continued)

```

node 11 free: 128956 MB
node 12 cpus: 24 25 56 57
node 12 size: 128989 MB
node 12 free: 128920 MB
node 13 cpus: 26 27 58 59
node 13 size: 129021 MB
node 13 free: 128946 MB
node 14 cpus: 28 29 60 61
node 14 size: 129022 MB
node 14 free: 128864 MB
node 15 cpus: 30 31 62 63
node 15 size: 129018 MB
node 15 free: 128850 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 12 32 32 32 32 32 32 32
  2:  12 12 10 11 12 12 12 12 12 32 32 32 32 32 32 32
  3:  12 12 11 10 12 12 12 12 12 32 32 32 32 32 32 32
  4:  12 12 12 12 10 11 12 12 12 32 32 32 32 32 32 32
  5:  12 12 12 12 11 10 12 12 12 32 32 32 32 32 32 32
  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 32 10 11 12 12 12 12 12
  9:  32 32 32 32 32 32 32 32 32 11 10 12 12 12 12 12
 10:  32 32 32 32 32 32 32 32 32 12 12 10 11 12 12 12
 11:  32 32 32 32 32 32 32 32 32 12 12 11 10 12 12 12
 12:  32 32 32 32 32 32 32 32 32 12 12 12 12 10 11 12
 13:  32 32 32 32 32 32 32 32 32 12 12 12 12 11 10 12
 14:  32 32 32 32 32 32 32 32 32 12 12 12 12 12 10 11
 15:  32 32 32 32 32 32 32 32 32 12 12 12 12 12 11 10

```

From /proc/meminfo

```

MemTotal:      2113530868 kB
HugePages_Total:      0
Hugepagesize:    2048 kB

```

```

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

```

```

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
performance

```

```

/usr/bin/lsb_release -d
  Ubuntu 20.04.3 LTS

```

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

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Platform Notes (Continued)

```
debian_version: bullseye/sid
os-release:
  NAME="Ubuntu"
  VERSION="20.04.3 LTS (Focal Fossa)"
  ID=ubuntu
  ID_LIKE=debian
  PRETTY_NAME="Ubuntu 20.04.3 LTS"
  VERSION_ID="20.04"
  HOME_URL="https://www.ubuntu.com/"
  SUPPORT_URL="https://help.ubuntu.com/"
```

```
uname -a:
Linux admin1-ProLiant-DL365-Gen10-Plus 5.13.0-28-generic #31~20.04.1-Ubuntu SMP Wed
Jan 19 14:08:10 UTC 2022 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/swaggs barriers and __user pointer sanitization
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 5 Jan 10 10:27
```

```
SPEC is set to: /home/cpu2017_rate
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda2        ext4  439G   41G  376G  10% /
```

```
From /sys/devices/virtual/dmi/id
Vendor:          HPE
Product:         ProLiant DL365 Gen10 Plus
Product Family: ProLiant
Serial:          CN70430NKR
```

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

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Platform Notes (Continued)

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:

9x Hynix HMABAGL7ABR4N-XN 128 GB 4 rank 3200
7x Samsung M386AAG40AM3-CWE 128 GB 4 rank 3200
16x UNKNOWN NOT AVAILABLE

BIOS:

BIOS Vendor: HPE
BIOS Version: A42
BIOS Date: 02/10/2022
BIOS Revision: 2.56
Firmware Revision: 2.50

(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

=====
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 LLVM Mirror.Version.13.0.0)
Target: i386-unknown-linux-gnu
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Compiler Version Notes (Continued)

InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin

=====
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++ | 523.xalanbmk_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.xalanbmk_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

=====
C++ | 523.xalanbmk_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.xalanbmk_r(base)
=====

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Compiler Version Notes (Continued)

| 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++

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



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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL365 Gen10 Plus v2

AMD EPYC 7373X

SPECrate®2017_int_base = 328

SPECrate®2017_int_peak = 342

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Test Date: Apr-2022
Hardware Availability: Mar-2022
Software Availability: Jan-2022

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
-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
```

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Base Other Flags (Continued)

C++ benchmarks:

-Wno-unused-command-line-argument

Peak Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

flang

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

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Peak Optimization Flags (Continued)

500.perlbench_r (continued):

```
-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

557.xz_r: basepeak = yes

C++ benchmarks:

520.omnetpp_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
-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
-fvirtual-function-elimination -fvisibility=hidden
-lamdlibm -ljemalloc
```

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
-finline-aggressive -mllvm -unroll-threshold=100
-flv-function-specialization -mllvm -enable-licm-vrp
```

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Peak Optimization Flags (Continued)

523.xalancbmk_r (continued):

```
-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: Same as 520.omnetpp_r

541.leela_r: Same as 520.omnetpp_r

Fortran benchmarks:

548.exchange2_r: basepeak = yes

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/HPE-Platform-Flags-AMD-V1.2-EPYC-revR.html>

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

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

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revR.xml>

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



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