



# SPEC CPU®2017 Integer Rate Result

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## Hewlett Packard Enterprise

(Test Sponsor: HPE)

### ProLiant DL365 Gen11

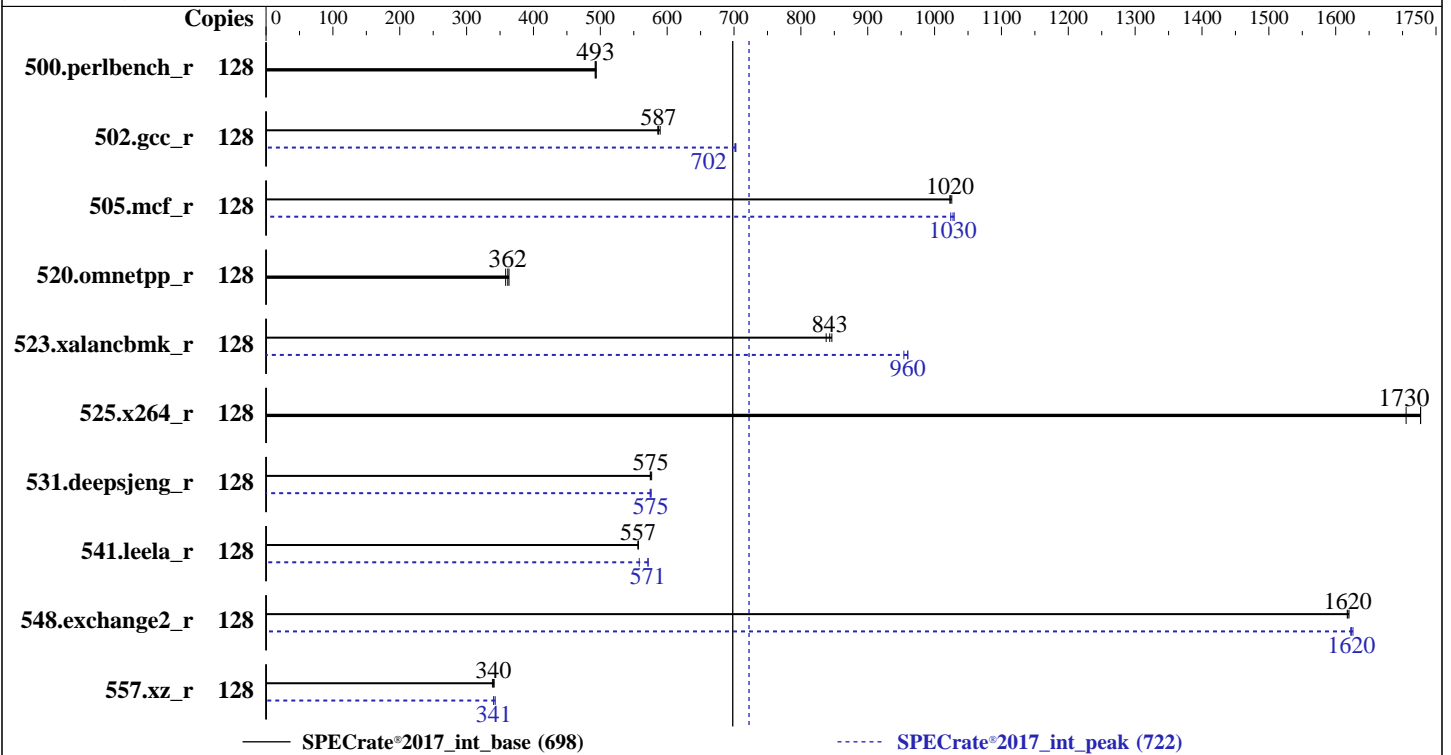
(2.70 GHz, AMD EPYC 9334)

SPECrate®2017\_int\_base = 698

SPECrate®2017\_int\_peak = 722

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

Test Date: Jan-2023  
Hardware Availability: Dec-2022  
Software Availability: Nov-2022



### Hardware

CPU Name: AMD EPYC 9334  
 Max MHz: 3900  
 Nominal: 2700  
 Enabled: 64 cores, 2 chips, 2 threads/core  
 Orderable: 1,2 chips  
 Cache L1: 32 KB I + 32 KB D on chip per core  
 L2: 1 MB I+D on chip per core  
 L3: 128 MB I+D on chip per chip,  
 32 MB shared / 8 cores  
 Other: None  
 Memory: 1536 GB (24 x 64 GB 2Rx4 PC5-4800B-R)  
 Storage: 1 x 480 GB SATA SSD  
 Other: None

### Software

OS: Ubuntu 22.04.1 LTS  
 Kernel 5.15.0-43-generic  
 Compiler: C/C++/Fortran: Version 4.0.0 of AOCC  
 Parallel: No  
 Firmware: HPE BIOS Version v1.12 11/24/2022 released  
 Nov-2022  
 File System: ext4  
 System State: Run level 5 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: 32/64-bit  
 Other: None  
 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	128	414	492	<b>413</b>	<b>493</b>	413	494	128	414	492	<b>413</b>	<b>493</b>	413	494
502.gcc_r	128	309	586	<b>309</b>	<b>587</b>	307	590	128	258	701	258	703	<b>258</b>	<b>702</b>
505.mcf_r	128	202	1020	<b>202</b>	<b>1020</b>	202	1030	128	201	1030	202	1020	<b>201</b>	<b>1030</b>
520.omnetpp_r	128	469	358	<b>464</b>	<b>362</b>	462	363	128	469	358	<b>464</b>	<b>362</b>	462	363
523.xalancbmk_r	128	<b>160</b>	<b>843</b>	160	846	161	838	128	141	960	<b>141</b>	<b>960</b>	142	954
525.x264_r	128	<b>130</b>	<b>1730</b>	131	1710	130	1730	128	<b>130</b>	<b>1730</b>	131	1710	130	1730
531.deepsjeng_r	128	255	575	<b>255</b>	<b>575</b>	254	577	128	255	576	<b>255</b>	<b>575</b>	255	574
541.leela_r	128	<b>381</b>	<b>557</b>	381	557	381	556	128	380	558	<b>371</b>	<b>571</b>	371	572
548.exchange2_r	128	207	1620	<b>207</b>	<b>1620</b>	207	1620	128	206	1630	207	1620	<b>207</b>	<b>1620</b>
557.xz_r	128	408	339	<b>407</b>	<b>340</b>	405	341	128	<b>406</b>	<b>341</b>	406	340	403	343

SPECrate®2017\_int\_base = **698**

SPECrate®2017\_int\_peak = **722**

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/amd_rate_aocc400_genoa_B_lib/lib:/home/cpu2017/amd_rate_a  
    occ400_genoa_B_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 9174F CPU + 1.5TiB Memory using RHEL 8.6

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.

## 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

ACPI CST C2 Latency set to 18 microseconds

Thermal Configuration set to Maximum Cooling

Workload Profile set to Custom

Power Regulator set to OS Control Mode

(Continued on next page)



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## Platform Notes (Continued)

The system ROM used for this result contains microcode version 0xa10110e for the AMD EPYC 9nn4X family of processors. The reference code/AGESA version used in this ROM is version GenoaPI 1.0.0.1-L6

```
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
running on admin1 Fri Dec 9 12:40:00 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 9334 32-Core Processor
 2 "physical id"s (chips)
128 "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 : 32
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
physical 1: 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
```

```
From lscpu from util-linux 2.37.2:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Address sizes: 52 bits physical, 57 bits virtual
Byte Order: Little Endian
CPU(s): 128
On-line CPU(s) list: 0-127
Vendor ID: AuthenticAMD
Model name: AMD EPYC 9334 32-Core Processor
CPU family: 25
Model: 17
Thread(s) per core: 2
Core(s) per socket: 32
Socket(s): 2
Stepping: 1
Frequency boost: enabled
CPU max MHz: 3911.0000
CPU min MHz: 400.0000
BogoMIPS: 5391.90
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
```

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## Platform Notes (Continued)

aperfmpperf rapl 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 ibs skinit wdt tce topoext perfctr\_core perfctr\_nb  
bpxt perfctr\_llc mwaitx cpb cat\_l3 cdp\_l3 invpcid\_single hw\_pstate ssbd mba ibrs  
ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 erms invpcid cqm rdt\_a avx512f  
avx512dq rdseed adx smap avx512ifma clflushopt clwb avx512cd sha\_ni avx512bw  
avx512v1 xsaveopt xsavec xgetbv1 xsaves cqm\_llc cqm\_occup\_llc cqm\_mbm\_total  
cqm\_mbm\_local avx512\_bf16 clzero irperf xsaveerptr rdpru wbnoinvd amd\_ppin cppc arat  
npt lbrv svm\_lock nrip\_save tsc\_scale vmcb\_clean flushbyasid decodeassists  
pausefilter pfthreshold avic v\_vmsave\_vmload vgif v\_spec\_ctrl avx512vbmi umip pku  
ospke avx512\_vbmi2 gfni vaes vpclmulqdq avx512\_vnni avx512\_bitalg avx512\_vpopcntdq  
la57 rdpid overflow\_recov succor smca fsrm flush\_lld

Virtualization: AMD-V  
L1d cache: 2 MiB (64 instances)  
L1i cache: 2 MiB (64 instances)  
L2 cache: 64 MiB (64 instances)  
L3 cache: 256 MiB (8 instances)  
NUMA node(s): 8  
NUMA node0 CPU(s): 0-7,64-71  
NUMA node1 CPU(s): 16-23,80-87  
NUMA node2 CPU(s): 24-31,88-95  
NUMA node3 CPU(s): 8-15,72-79  
NUMA node4 CPU(s): 32-39,96-103  
NUMA node5 CPU(s): 48-55,112-119  
NUMA node6 CPU(s): 56-63,120-127  
NUMA node7 CPU(s): 40-47,104-111  
Vulnerability Itlb multihit: Not affected  
Vulnerability L1tf: Not affected  
Vulnerability Mds: Not affected  
Vulnerability Meltdown: Not affected  
Vulnerability Mmio stale data: 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; Retpolines, IBPB conditional, IBRS\_FW,  
STIBP always-on, RSB filling  
Vulnerability Srbds: Not affected  
Vulnerability Tsx async abort: Not affected

From lscpu --cache:

NAME	ONE-SIZE	ALL-SIZE	WAYS	TYPE	LEVEL	SETS	PHY-LINE	COHERENCY-SIZE
L1d	32K	2M	8	Data	1	64	1	64
L1i	32K	2M	8	Instruction	1	64	1	64
L2	1M	64M	8	Unified	2	2048	1	64
L3	32M	256M	16	Unified	3	32768	1	64

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## Platform Notes (Continued)

```
/proc/cpuinfo cache data
cache size : 1024 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 64 65 66 67 68 69 70 71
node 0 size: 193221 MB
node 0 free: 192821 MB
node 1 cpus: 16 17 18 19 20 21 22 23 80 81 82 83 84 85 86 87
node 1 size: 193498 MB
node 1 free: 193100 MB
node 2 cpus: 24 25 26 27 28 29 30 31 88 89 90 91 92 93 94 95
node 2 size: 193531 MB
node 2 free: 193007 MB
node 3 cpus: 8 9 10 11 12 13 14 15 72 73 74 75 76 77 78 79
node 3 size: 193531 MB
node 3 free: 193198 MB
node 4 cpus: 32 33 34 35 36 37 38 39 96 97 98 99 100 101 102 103
node 4 size: 193531 MB
node 4 free: 193245 MB
node 5 cpus: 48 49 50 51 52 53 54 55 112 113 114 115 116 117 118 119
node 5 size: 193531 MB
node 5 free: 193262 MB
node 6 cpus: 56 57 58 59 60 61 62 63 120 121 122 123 124 125 126 127
node 6 size: 193531 MB
node 6 free: 193255 MB
node 7 cpus: 40 41 42 43 44 45 46 47 104 105 106 107 108 109 110 111
node 7 size: 193486 MB
node 7 free: 193192 MB
node distances:
node 0 1 2 3 4 5 6 7
0: 10 12 12 12 32 32 32 32
1: 12 10 12 12 32 32 32 32
2: 12 12 10 12 32 32 32 32
3: 12 12 12 10 32 32 32 32
4: 32 32 32 32 10 12 12 12
5: 32 32 32 32 12 10 12 12
6: 32 32 32 32 12 12 10 12
7: 32 32 32 32 12 12 12 10
```

From /proc/meminfo

```
MemTotal: 1585015040 kB
HugePages_Total: 0
Hugepagesize: 2048 kB
```

```
/sbin/tuned-adm active
```

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## Platform Notes (Continued)

Current active profile: throughput-performance

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

```
/usr/bin/lsb_release -d
Ubuntu 22.04.1 LTS
```

```
From /etc/*release* /etc/*version*
debian_version: bookworm/sid
os-release:
  PRETTY_NAME="Ubuntu 22.04.1 LTS"
  NAME="Ubuntu"
  VERSION_ID="22.04"
  VERSION="22.04.1 LTS (Jammy Jellyfish)"
  VERSION_CODENAME=jammy
  ID=ubuntu
  ID_LIKE=debian
  HOME_URL="https://www.ubuntu.com/"
```

```
uname -a:
Linux admin1 5.15.0-43-generic #46-Ubuntu SMP Tue Jul 12 10:30:17 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
mmio_stale_data:	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: Retpolines, 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 Dec 9 11:56
```

```
SPEC is set to: /home/cpu2017
Filesystem                               Type  Size  Used Avail Use% Mounted on
```

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## Platform Notes (Continued)

```
/dev/mapper/ubuntu--vg-ubuntu--lv ext4 98G 17G 77G 18% /
```

```
From /sys/devices/virtual/dmi/id
Vendor: HPE
Product: ProLiant DL365 Gen11
Product Family: ProLiant
Serial: DL365G11-003
```

Additional information from dmidecode 3.3 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:
  24x Hynix HMCG94AEBRA103N 64 GB 2 rank 4800
```

```
BIOS:
  BIOS Vendor: HPE
  BIOS Version: 1.12
  BIOS Date: 11/24/2022
  BIOS Revision: 1.12
  Firmware Revision: 1.10
```

(End of data from sysinfo program)

## Compiler Version Notes

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

```
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/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 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin  
-----
```

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525.x264\_r(base, peak) 557.xz\_r(base, peak)

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Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin  
-----

=====  
C++ | 523.xalancbmk\_r(peak)  
-----

AMD clang version 14.0.6 (CLANG: AOCC\_4.0.0-Build#389 2022\_10\_07) (based on LLVM Mirror.Version.14.0.6)  
Target: i386-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin  
-----

=====  
C++ | 520.omnetpp\_r(base, peak) 523.xalancbmk\_r(base)  
531.deepsjeng\_r(base, peak) 541.leela\_r(base, peak)

AMD clang version 14.0.6 (CLANG: AOCC\_4.0.0-Build#389 2022\_10\_07) (based on LLVM Mirror.Version.14.0.6)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin  
-----

=====  
C++ | 523.xalancbmk\_r(peak)  
-----

AMD clang version 14.0.6 (CLANG: AOCC\_4.0.0-Build#389 2022\_10\_07) (based on

(Continued on next page)



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## Compiler Version Notes (Continued)

```

LLVM Mirror.Version.14.0.6)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
-----

```

```

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

```

```

AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
-----

```

```

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

```

```

AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/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

```

(Continued on next page)



# SPEC CPU®2017 Integer Rate Result

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**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

ProLiant DL365 Gen11

(2.70 GHz, AMD EPYC 9334)

SPECrate®2017\_int\_base = 698

SPECrate®2017\_int\_peak = 722

**CPU2017 License:** 3

**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** Jan-2023

**Hardware Availability:** Dec-2022

**Software Availability:** Nov-2022

## Base Portability Flags (Continued)

```

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 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-ldist-scalar-expand -fenable-aggressive-gather
-z muldefs -O3 -march=znver4 -fveclib=AMDLIBM -ffast-math
-fstruct-layout=7 -mllvm -unroll-threshold=50
-mllvm -inline-threshold=1000 -fremap-arrays -fstrip-mining
-mllvm -reduce-array-computations=3 -zopt -lamdlibm -lflang
-lamdalloc

```

C++ benchmarks:

```

-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -z muldefs -O3
-march=znver4 -fveclib=AMDLIBM -ffast-math
-mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -zopt
-fvirtual-function-elimination -fvisibility=hidden -lamdlibm -lflang
-lamdalloc-ext

```

Fortran benchmarks:

```

-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-inline-recursion=4 -Wl,-mllvm -Wl,-lsr-in-nested-loop
-Wl,-mllvm -Wl,-enable-iv-split -z muldefs -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fepilog-vectorization-of-inductions
-mllvm -optimize-strided-mem-cost -floop-transform
-mllvm -unroll-aggressive -mllvm -unroll-threshold=500 -lamdlibm
-lflang -lamdalloc

```



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## Base Other Flags

C benchmarks:

-Wno-unused-command-line-argument

C++ benchmarks:

-Wno-unused-command-line-argument

Fortran 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: basepeak = yes

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## Peak Optimization Flags (Continued)

```
502.gcc_r: -m32 -flto -z muldefs -Ofast -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -fgnu89-inline
-lamdalloc
```

```
505.mcf_r: -m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math
-fstruct-layout=7 -mllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lflang -lamdalloc
```

525.x264\_r: basepeak = yes

557.xz\_r: Same as 505.mcf\_r

C++ benchmarks:

520.omnetpp\_r: basepeak = yes

```
523.xalancbmk_r: -m32 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-do-block-reorder=aggressive
-fno-loop-reroll -Ofast -march=znver4 -fveclib=AMDLIBM
-ffast-math -finline-aggressive
-mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -zopt
-mllvm -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden
-lamdalloc-ext
```

```
531.deepsjeng_r: -m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3
-march=znver4 -fveclib=AMDLIBM -ffast-math
-mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -zopt
-fvirtual-function-elimination -fvisibility=hidden
-lamdlibm -lamdalloc-ext
```

```
541.leela_r: -m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
```

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## Peak Optimization Flags (Continued)

541.leela\_r (continued):

```
-march=znver4 -fveclib=AMDLIBM -ffast-math
-inline-aggressive -mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -zopt
-fvirtual-function-elimination -fvisibility=hidden
-lamdlibm -lflang -lamdalloc-ext
```

Fortran benchmarks:

```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-inline-recursion=4 -Wl,-mllvm -Wl,-lsr-in-nested-loop
-Wl,-mllvm -Wl,-enable-iv-split -O3 -march=znver4 -fveclib=AMDLIBM
-ffast-math -fepilog-vectorization-of-inductions
-mllvm -optimize-strided-mem-cost -floop-transform
-mllvm -unroll-aggressive -mllvm -unroll-threshold=500 -lamdlibm
-lflang -lamdalloc
```

## Peak Other Flags

C benchmarks (except as noted below):

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

502.gcc\_r: -L/usr/lib32 -Wno-unused-command-line-argument

```
-L/home/work/cpu2017/v118/aocc4/b1/rate/amd_rate_aocc400_genoa_B_lib/lib32
```

C++ benchmarks (except as noted below):

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

523.xalancbmk\_r: -L/usr/lib32 -Wno-unused-command-line-argument

```
-L/home/work/cpu2017/v118/aocc4/b1/rate/amd_rate_aocc400_genoa_B_lib/lib32
```

Fortran benchmarks:

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

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

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-Genoa-rev2.1.html>

<http://www.spec.org/cpu2017/flags/aocc400-flags.html>

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

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-Genoa-rev2.1.xml>

<http://www.spec.org/cpu2017/flags/aocc400-flags.xml>



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