SPEC CPU®2017 Integer Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)
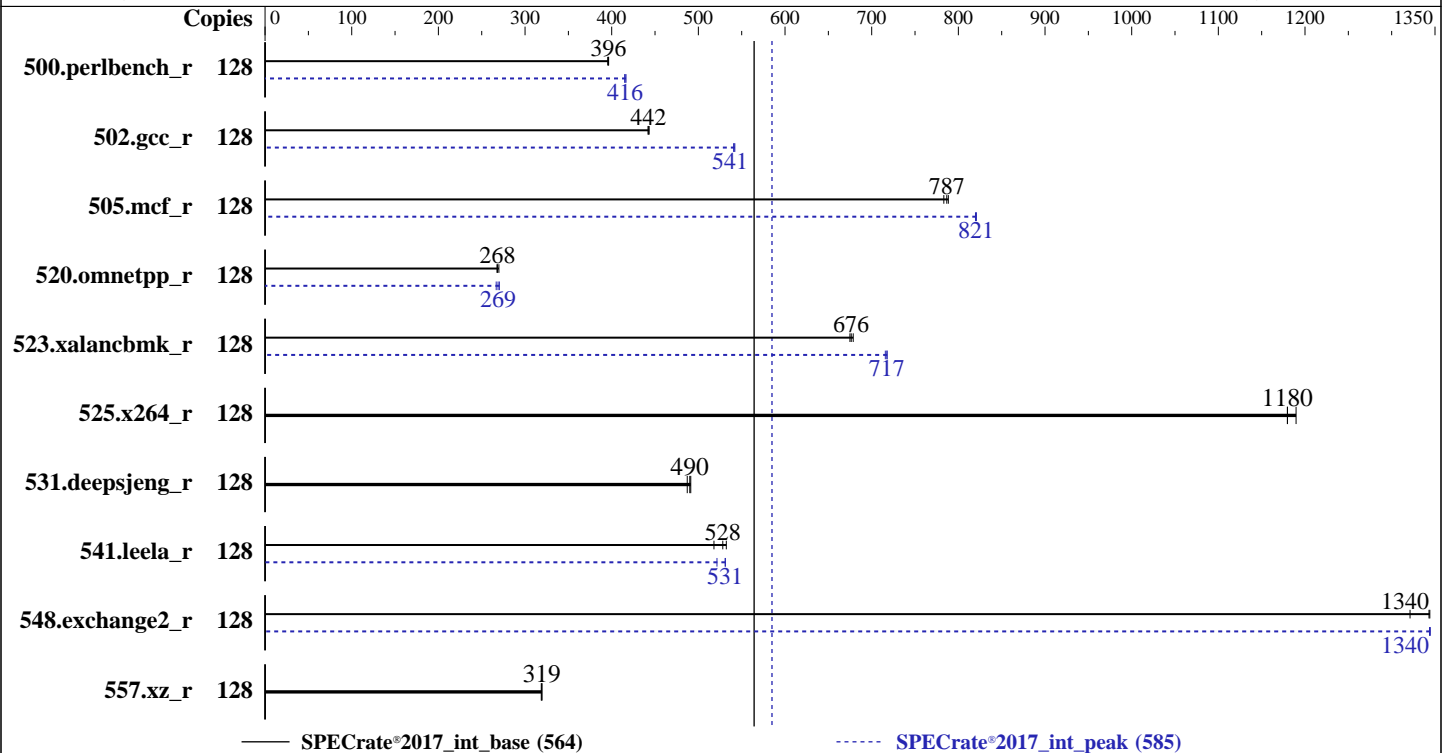
ProLiant DL385 Gen10 Plus v2
(2.95 GHz, AMD EPYC 75F3)

$SPECrate®2017\_int\_base = 564$

$SPECrate®2017\_int\_peak = 585$

CPU2017 License: 3   **Test Date:** May-2021

Test Sponsor: HPE   **Hardware Availability:** Apr-2021

Tested by: HPE   **Software Availability:** Mar-2021

Benchmark	Copies	base	peak
500.perlbench_r	128	396	416
502.gcc_r	128	442	541
505.mcf_r	128	787	821
520.omnetpp_r	128	268	269
523.xalancbmk_r	128	676	717
525.x264_r	128	1180	
531.deepsjeng_r	128	490	
541.leela_r	128	528	531
548.exchange2_r	128	1340	1340
557.xz_r	128	319	

SPECrate®2017_int_base (564)

SPECrate®2017_int_peak (585)

Hardware

CPU Name: AMD EPYC 75F3
 Max MHz: 4000
 Nominal: 2950
Enabled: 64 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: 256 MB I+D on chip per chip, 32 MB shared / 4
 cores
 Other: None
Memory: 2 TB (16 x 128 GB 4Rx4 PC4-3200AA-L)
Storage: 1 x 182 GB SATA SSD, RAID 0
Other: None

Software

OS: Ubuntu 20.04.1 LTS (x86_64)
 Kernel 5.4.0-42-generic
Compiler: C/C++/Fortran: Version 3.0.0 of AOCC
Parallel: No
Firmware: HPE BIOS Version A42 v2.42 04/29/2021 released
 Apr-2021
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 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	**514**	**396**	514	396	515	395	128	489	417	491	415	**490**	**416**
502.gcc_r	128	**410**	**442**	410	442	409	443	128	335	541	**335**	**541**	334	542
505.mcf_r	128	262	788	**263**	**787**	264	783	128	252	820	**252**	**821**	252	821
520.omnetpp_r	128	**626**	**268**	622	270	628	268	128	621	270	**625**	**269**	630	267
523.xalancbmk_r	128	199	679	**200**	**676**	200	675	128	189	716	188	718	**188**	**717**
525.x264_r	128	190	1180	**190**	**1180**	188	1190	128	190	1180	**190**	**1180**	188	1190
531.deepsjeng_r	128	299	491	301	487	**299**	**490**	128	299	491	301	487	**299**	**490**
541.leela_r	128	409	518	**401**	**528**	398	532	128	399	531	406	521	**399**	**531**
548.exchange2_r	128	250	1340	254	1320	**250**	**1340**	128	**249**	**1340**	250	1340	249	1340
557.xz_r	128	434	319	433	319	**433**	**319**	128	434	319	433	319	**433**	**319**
SPECrate®2017_int_base =		**564**												
SPECrate®2017_int_peak =		**585**												

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.
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
```

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Operating System Notes (Continued)

```
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root for peak
integer runs and all FP runs to enable Transparent Hugepages (THP).
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root for base
integer runs to enable THP only on request.
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
      "/home/cpu2017/amd_rate_aocc300_milan_A_lib/64;/home/cpu2017/amd_rate_ao
      cc300_milan_A_lib/32:"
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 + 512GiB 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

Submitted_by: "Bhatnagar, Prateek" <prateek.bhatnagar@hpe.com>
Submitted: Mon Jun  7 11:52:08 EDT 2021
Submission: cpu2017-20210607-26892.sub
```

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
 Thermal Configuration set to Maximum Cooling
```

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Platform Notes (Continued)

```
Memory PStates set to Disabled
Workload Profile set to Custom
 Infinity Fabric Power Management set to Disabled
   Infinity Fabric Performance State set to P0
 L2 HW Prefetcher set to Disabled


Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on dl385g10v2 Wed Apr  1 12:26:04 2020


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 75F3 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:
   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):                128
   On-line CPU(s) list:   0-127
   Thread(s) per core:    2
   Core(s) per socket:    32
   Socket(s):             2
   NUMA node(s):          16
   Vendor ID:             AuthenticAMD
   CPU family:            25
   Model:                 1
   Model name:            AMD EPYC 75F3 32-Core Processor
   Stepping:              1
   CPU MHz:               1796.619
   BogoMIPS:              5889.43
   Virtualization:        AMD-V
   L1d cache:             2 MiB
```

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Platform Notes (Continued)

```
   L1i cache:                       2 MiB
   L2 cache:                        32 MiB
   L3 cache:                        512 MiB
   NUMA node0 CPU(s):               0-3,64-67
   NUMA node1 CPU(s):               4-7,68-71
   NUMA node2 CPU(s):               8-11,72-75
   NUMA node3 CPU(s):               12-15,76-79
   NUMA node4 CPU(s):               16-19,80-83
   NUMA node5 CPU(s):               20-23,84-87
   NUMA node6 CPU(s):               24-27,88-91
   NUMA node7 CPU(s):               28-31,92-95
   NUMA node8 CPU(s):               32-35,96-99
   NUMA node9 CPU(s):               36-39,100-103
   NUMA node10 CPU(s):              40-43,104-107
   NUMA node11 CPU(s):              44-47,108-111
   NUMA node12 CPU(s):              48-51,112-115
   NUMA node13 CPU(s):              52-55,116-119
   NUMA node14 CPU(s):              56-59,120-123
   NUMA node15 CPU(s):              60-63,124-127
   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 wbnoinvd 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
```

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Platform Notes (Continued)

```
 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 3 64 65 66 67
   node 0 size: 128775 MB
   node 0 free: 128594 MB
   node 1 cpus: 4 5 6 7 68 69 70 71
   node 1 size: 129020 MB
   node 1 free: 128884 MB
   node 2 cpus: 8 9 10 11 72 73 74 75
   node 2 size: 129022 MB
   node 2 free: 128852 MB
   node 3 cpus: 12 13 14 15 76 77 78 79
   node 3 size: 129021 MB
   node 3 free: 128797 MB
   node 4 cpus: 16 17 18 19 80 81 82 83
   node 4 size: 129022 MB
   node 4 free: 128786 MB
   node 5 cpus: 20 21 22 23 84 85 86 87
   node 5 size: 129021 MB
   node 5 free: 128856 MB
   node 6 cpus: 24 25 26 27 88 89 90 91
   node 6 size: 129022 MB
   node 6 free: 128761 MB
   node 7 cpus: 28 29 30 31 92 93 94 95
   node 7 size: 129009 MB
   node 7 free: 128866 MB
   node 8 cpus: 32 33 34 35 96 97 98 99
   node 8 size: 129022 MB
   node 8 free: 128906 MB
   node 9 cpus: 36 37 38 39 100 101 102 103
   node 9 size: 129021 MB
   node 9 free: 128911 MB
   node 10 cpus: 40 41 42 43 104 105 106 107
   node 10 size: 129022 MB
   node 10 free: 128910 MB
   node 11 cpus: 44 45 46 47 108 109 110 111
   node 11 size: 128996 MB
   node 11 free: 128884 MB
   node 12 cpus: 48 49 50 51 112 113 114 115
   node 12 size: 129022 MB
   node 12 free: 128908 MB
   node 13 cpus: 52 53 54 55 116 117 118 119
   node 13 size: 129021 MB
   node 13 free: 128906 MB
   node 14 cpus: 56 57 58 59 120 121 122 123
   node 14 size: 129022 MB
```

(Continued on next page)

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Platform Notes (Continued)

```
   node 14 free: 128908 MB
   node 15 cpus: 60 61 62 63 124 125 126 127
   node 15 size: 129019 MB
   node 15 free: 128896 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
     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:       2113597984 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

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

 /usr/bin/lsb_release -d
    Ubuntu 20.04.1 LTS

 From /etc/*release* /etc/*version*
    debian_version: bullseye/sid
    os-release:
      NAME="Ubuntu"
      VERSION="20.04.1 LTS (Focal Fossa)"
      ID=ubuntu
      ID_LIKE=debian
      PRETTY_NAME="Ubuntu 20.04.1 LTS"
      VERSION_ID="20.04"
      HOME_URL="https://www.ubuntu.com/"
      SUPPORT_URL="https://help.ubuntu.com/"

 uname -a:
```

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Platform Notes (Continued)

```
   Linux dl385g10v2 5.4.0-42-generic #46-Ubuntu SMP Fri Jul 10 00:24:02 UTC 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 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 Apr 1 12:23

SPEC is set to: /home/cpu2017
   Filesystem                       Type  Size  Used Avail Use% Mounted on
   /dev/mapper/ubuntu--vg-ubuntu--lv ext4  182G   53G  120G  31% /

From /sys/devices/virtual/dmi/id
   Vendor:          HPE
   Product:         ProLiant DL385 Gen10 Plus
   Product Family:  ProLiant
   Serial:          CN79340HC3

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 Samsung M386AAG40AM3-CWE 128 GB 4 rank 3200
    16x UNKNOWN NOT AVAILABLE

BIOS:
   BIOS Vendor:      HPE
   BIOS Version:     A42
   BIOS Date:        04/29/2021
   BIOS Revision:    2.42
   Firmware Revision: 2.40
```

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Platform Notes (Continued)

```
 (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C        | 502.gcc_r(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: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/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 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        | 502.gcc_r(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: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/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 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)

```
==============================================================================
 C++     | 523.xalancbmk_r(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: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
------------------------------------------------------------------------------


==============================================================================
 C++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base)
         | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 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++     | 523.xalancbmk_r(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: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
------------------------------------------------------------------------------


==============================================================================
 C++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base)
         | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 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 | 548.exchange2_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
```

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SPEC CPU®2017 Integer Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL385 Gen10 Plus v2
(2.95 GHz, AMD EPYC 75F3)

SPECrate®2017_int_base = 564

SPECrate®2017_int_peak = 585

CPU2017 License: 3	**Test Date:** May-2021
Test Sponsor: HPE	**Hardware Availability:** Apr-2021
Tested by: HPE	**Software Availability:** Mar-2021

Compiler Version Notes (Continued)

```
  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
```

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`

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 -O3 -ffast-math
-march=znver3 -fveclib=AMDLIBM -fstruct-layout=5
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -mllvm -function-specialize -flv-function-specialization
```

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Hewlett Packard Enterprise
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ProLiant DL385 Gen10 Plus v2
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Test Sponsor: HPE
Tested by: HPE

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

Base Optimization Flags (Continued)

C benchmarks (continued):
```
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3 -z muldefs
-lamdlibm -ljemalloc -lflang -lflangrti
```

C++ benchmarks:
```
-m64 -std=c++98 -Wl,-mllvm -Wl,-do-block-reorder=aggressive -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 -O3 -ffast-math
-march=znver3 -fveclib=AMDLIBM -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
-z muldefs -mllvm -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden -lamdlibm
-ljemalloc -lflang -lflangrti
```

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 -O3 -ffast-math
-march=znver3 -fveclib=AMDLIBM -z muldefs -mllvm -unroll-aggressive
-mllvm -unroll-threshold=500 -lamdlibm -ljemalloc -lflang -lflangrti
```

Base Other Flags

C benchmarks:
```
-Wno-unused-command-line-argument
```

C++ benchmarks:
```
-Wno-unused-command-line-argument
```

Peak Compiler Invocation

C benchmarks:
```
clang
```

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SPEC CPU®2017 Integer Rate Result

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CPU2017 License: 3	**Test Date:** May-2021
Test Sponsor: HPE	**Hardware Availability:** Apr-2021
Tested by: HPE	**Software Availability:** Mar-2021

Peak Compiler Invocation (Continued)

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
-fveclib=AMDLIBM -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
```

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ProLiant DL385 Gen10 Plus v2
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

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

Peak Optimization Flags (Continued)

502.gcc_r (continued):
```
-fveclib=AMDLIBM -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:
```
-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 -Ofast
-march=znver3 -fveclib=AMDLIBM -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 -lamdlibm -ljemalloc
```

525.x264_r: basepeak = yes

557.xz_r: basepeak = yes

C++ benchmarks:

520.omnetpp_r:
```
-m64 -std=c++98
-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 -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
-mllvm -do-block-reorder=aggressive
-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
```

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Hewlett Packard Enterprise
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SPECrate®2017_int_base = 564

ProLiant DL385 Gen10 Plus v2
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SPECrate®2017_int_peak = 585

CPU2017 License: 3
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Software Availability: Mar-2021

Peak Optimization Flags (Continued)

523.xalancbmk_r (continued):
```
-march=znver3 -fveclib=AMDLIBM -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
-mllvm -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden
-ljemalloc
```

531.deepsjeng_r: `basepeak = yes`

541.leela_r: `Same as 520.omnetpp_r`

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 -ffast-math
-march=znver3 -fveclib=AMDLIBM -mllvm -unroll-aggressive
-mllvm -unroll-threshold=500 -lamdlibm -ljemalloc -lflang -lflangrti
```

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/cpu2017v115aocc3/amd_rate_aocc300_milan_A_lib/32`

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/cpu2017v115aocc3/amd_rate_aocc300_milan_A_lib/32`

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/aocc300-flags-A1.html
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revQ.html

SPEC CPU®2017 Integer Rate Result

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You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/aocc300-flags-A1.xml
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revQ.xml

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