SPEC CPU®2017 Integer Rate Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

Fujitsu
(Test Sponsor: Fujitsu)

PRIMERGY RX2450 M1, AMD EPYC 7642, 2.30 GHz

$SPECrate^{®}2017\_int\_base =$ 576

$SPECrate^{®}2017\_int\_peak =$ Not Run

CPU2017 License: 19

Test Sponsor: Fujitsu

Tested by: Fujitsu

Test Date: Mar-2021

Hardware Availability: Apr-2021

Software Availability: Jul-2020

Copies	Result
500.perlbench_r 192	447
502.gcc_r 192	462
505.mcf_r 192	636
520.omnetpp_r 192	289
523.xalancbmk_r 192	521
525.x264_r 192	1250
531.deepsjeng_r 192	543
541.leela_r 192	537
548.exchange2_r 192	1470
557.xz_r 192	377

SPECrate®2017_int_base (576)

Hardware

CPU Name: AMD EPYC 7642

Max MHz: 3300

Nominal: 2300

Enabled: 96 cores, 2 chips, 2 threads/core

Orderable: 2 chips

Cache L1: 32 KB I + 32 KB D on chip per core

L2: 512 KB I+D on chip per core

L3: 256 MB I+D on chip per chip, 16 MB shared / 3 cores

Other: None

Memory: 2 TB (32 x 64 GB 4Rx4 PC4-3200V-L)

Storage: 1 x PCIe SSD, 2TB

Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP2 (x86_64) kernel version 5.3.18-22-default

Compiler: C/C++/Fortran: Version 2.0.0 of AOCC

Parallel: No

Firmware: Fujitsu BIOS Version 1.2.V1 Released Apr-2021 tested as Dec-2020

File System: xfs

System State: Run level 3 (multi-user)

Base Pointers: 64-bit

Peak Pointers: Not Applicable

Other: jemalloc: jemalloc memory allocator library v5.2.0

Power Management: BIOS set to prefer performance at the cost of additional power usage

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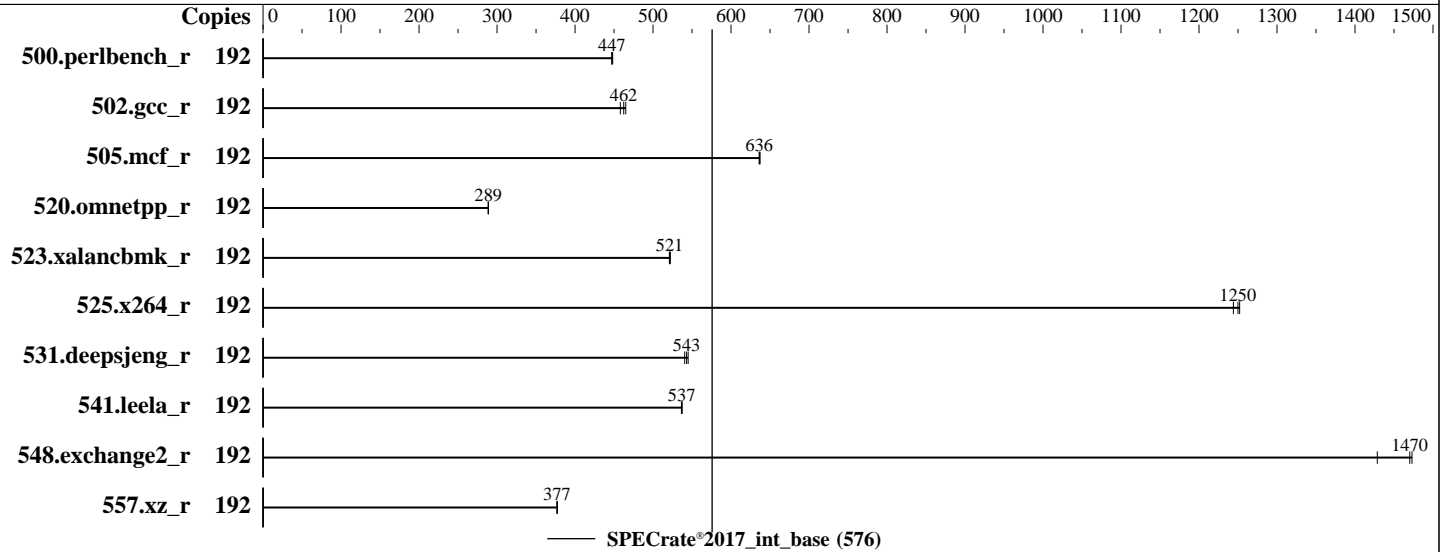
CPU2017 License: 19
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Results Table

Benchmark	Copies	Base Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Peak Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	192	**683**	**447**	684	447	682	448							
502.gcc_r	192	**588**	**462**	585	465	594	458							
505.mcf_r	192	487	637	**488**	**636**	488	636							
520.omnetpp_r	192	**872**	**289**	873	289	872	289							
523.xalancbmk_r	192	388	522	389	521	**389**	**521**							
525.x264_r	192	270	1240	**269**	**1250**	269	1250							
531.deepsjeng_r	192	**405**	**543**	404	545	407	541							
541.leela_r	192	592	537	593	536	**592**	**537**							
548.exchange2_r	192	352	1430	**342**	**1470**	341	1470							
557.xz_r	192	**550**	**377**	550	377	549	377							
SPECrate®2017_int_base =		**576**												
SPECrate®2017_int_peak =		**Not Run**												

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
'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>

Set dirty_ratio=8 to limit dirty cache to 8% of memory
Set swappiness=1 to swap only if necessary
Set zone_reclaim_mode=1 to free local node memory and avoid remote memory
sync then drop_caches=3 to reset caches before invoking runcpu

dirty_ratio, swappiness, zone_reclaim_mode and drop_caches were
all set using privileged echo (e.g. echo 1 > /proc/sys/vm/swappiness).
```

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Operating System Notes (Continued)

Transparent huge pages set to 'always' for this run (OS default)

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
      "/home/Benchmark/speccpu/amd_rate_aocc200_rome_C_lib/64;/home/Benchmark/
      speccpu/amd_rate_aocc200_rome_C_lib/32:"
MALLOC_CONF = "retain:true"

General Notes

Binaries were compiled on a system with 2x AMD EPYC 7601 CPU + 512GB Memory using Fedora 26

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 v9.1.0 in Ubuntu 19.04 with -O3 -znver2 -flto
jemalloc 5.2.0 is available here:
https://github.com/jemalloc/jemalloc/releases/download/5.2.0/jemalloc-5.2.0.tar.bz2

Platform Notes

 BIOS configuration:
 cTDP = 240
 Determinism Slider = Power
 Package Power Limit = 240
 SVM Mode = Disabled
 NUMA Nodes Per Socket = NPS4
 L1 Stream HW Prefetcher = Enabled
 L2 Stream HW Prefetcher = Enabled
 DRAM Scrub Time = Disabled

 Sysinfo program /home/Benchmark/speccpu/bin/sysinfo
 Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
 running on localhost Thu Dec 24 03:43:46 2020

 SUT (System Under Test) info as seen by some common utilities.
 For more information on this section, see

(Continued on next page)

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CPU2017 License:	19	**Test Date:**	Mar-2021
Test Sponsor:	Fujitsu	**Hardware Availability:**	Apr-2021
Tested by:	Fujitsu	**Software Availability:**	Jul-2020

Platform Notes (Continued)

```
     https://www.spec.org/cpu2017/Docs/config.html#sysinfo

  From /proc/cpuinfo
     model name : AMD EPYC 7642 48-Core Processor
        2  "physical id"s (chips)
        192 "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 : 48
        siblings  : 96
        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
        32 33 34 36 37 38 40 41 42 44 45 46 48 49 50 52 53 54 56 57 58 60 61 62
        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
        32 33 34 36 37 38 40 41 42 44 45 46 48 49 50 52 53 54 56 57 58 60 61 62

  From lscpu:
     Architecture:        x86_64
     CPU op-mode(s):      32-bit, 64-bit
     Byte Order:          Little Endian
     Address sizes:       43 bits physical, 48 bits virtual
     CPU(s):              192
     On-line CPU(s) list: 0-191
     Thread(s) per core:  2
     Core(s) per socket:  48
     Socket(s):           2
     NUMA node(s):        8
     Vendor ID:           AuthenticAMD
     CPU family:          23
     Model:               49
     Model name:          AMD EPYC 7642 48-Core Processor
     Stepping:            0
     CPU MHz:             1816.854
     CPU max MHz:         2300.0000
     CPU min MHz:         1500.0000
     BogoMIPS:            4600.21
     Virtualization:      AMD-V
     L1d cache:           32K
     L1i cache:           32K
     L2 cache:            512K
     L3 cache:            16384K
     NUMA node0 CPU(s):   0-11,96-107
     NUMA node1 CPU(s):   12-23,108-119
     NUMA node2 CPU(s):   24-35,120-131
     NUMA node3 CPU(s):   36-47,132-143
     NUMA node4 CPU(s):   48-59,144-155
     NUMA node5 CPU(s):   60-71,156-167
     NUMA node6 CPU(s):   72-83,168-179
```

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Platform Notes (Continued)

```
      NUMA node7 CPU(s):     84-95,180-191
      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 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 hw_pstate sme ssbd mba sev ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep
   bmi2 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 avic v_vmsave_vmload vgif umip 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: 8 nodes (0-7)
   node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 96 97 98 99 100 101 102 103 104 105 106 107
   node 0 size: 257774 MB
   node 0 free: 257327 MB
   node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23 108 109 110 111 112 113 114 115 116
   117 118 119
   node 1 size: 258040 MB
   node 1 free: 257630 MB
   node 2 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 120 121 122 123 124 125 126 127 128
   129 130 131
   node 2 size: 258040 MB
   node 2 free: 257615 MB
   node 3 cpus: 36 37 38 39 40 41 42 43 44 45 46 47 132 133 134 135 136 137 138 139 140
   141 142 143
   node 3 size: 258028 MB
   node 3 free: 257609 MB
   node 4 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 144 145 146 147 148 149 150 151 152
   153 154 155
   node 4 size: 258040 MB
   node 4 free: 257534 MB
   node 5 cpus: 60 61 62 63 64 65 66 67 68 69 70 71 156 157 158 159 160 161 162 163 164
   165 166 167
   node 5 size: 258040 MB
   node 5 free: 257573 MB
   node 6 cpus: 72 73 74 75 76 77 78 79 80 81 82 83 168 169 170 171 172 173 174 175 176
   177 178 179
   node 6 size: 258040 MB
   node 6 free: 257432 MB
```

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Platform Notes (Continued)

```
   node 7 cpus: 84 85 86 87 88 89 90 91 92 93 94 95 180 181 182 183 184 185 186 187 188
   189 190 191
   node 7 size: 257766 MB
   node 7 free: 257326 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:       2113299720 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

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

 From /etc/*release* /etc/*version*
    os-release:
       NAME="SLES"
       VERSION="15-SP2"
       VERSION_ID="15.2"
       PRETTY_NAME="SUSE Linux Enterprise Server 15 SP2"
       ID="sles"
       ID_LIKE="suse"
       ANSI_COLOR="0;32"
       CPE_NAME="cpe:/o:suse:sles:15:sp2"

 uname -a:
    Linux localhost 5.3.18-22-default #1 SMP Wed Jun 3 12:16:43 UTC 2020
    (720aeba/lp-1a956f1) 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
```

(Continued on next page)

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Platform Notes (Continued)

```
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:
                                                          conditional, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort):               Not affected


run-level 3 Dec 23 20:11


SPEC is set to: /home/Benchmark/speccpu
   Filesystem      Type  Size  Used Avail Use% Mounted on
   /dev/nvme1n1p3 xfs   1.3T   16G  1.3T   2% /home


From /sys/devices/virtual/dmi/id
   Vendor:          FUJITSU
   Product:         PRIMERGY RX2450 M1
   Serial:          MACUxxxxxx


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:
    32x Samsung M386A8K40DM2-CWE 64 GB 4 rank 3200


BIOS:
   BIOS Vendor:      American Megatrends Inc.
   BIOS Version:     1.2.V1
   BIOS Date:        12/22/2020
   BIOS Revision:    5.14


(End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C        | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base)
         | 525.x264_r(base) 557.xz_r(base)
------------------------------------------------------------------------------
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
```

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Compiler Version Notes (Continued)

```
--------------------------------------------------------------------------


==========================================================================
C++      | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
         | 541.leela_r(base)
--------------------------------------------------------------------------
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
--------------------------------------------------------------------------


==========================================================================
Fortran | 548.exchange2_r(base)
--------------------------------------------------------------------------
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/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`

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Base Portability Flags (Continued)

541.leela_r: `-DSPEC_LP64`
548.exchange2_r: `-DSPEC_LP64`
557.xz_r: `-DSPEC_LP64`

Base Optimization Flags

C benchmarks:

```
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver2 -fstruct-layout=3 -mllvm -unroll-threshold=50
-fremap-arrays -mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp
-mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000
-flv-function-specialization -z muldefs -lmvec -lamdlibm -ljemalloc
-lflang
```

C++ benchmarks:

```
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-suppress-fmas -O3 -ffast-math -march=znver2
-mllvm -loop-unswitch-threshold=200000 -mllvm -vector-library=LIBMVEC
-mllvm -unroll-threshold=100 -flv-function-specialization
-mllvm -enable-partial-unswitch -z muldefs -lmvec -lamdlibm
-ljemalloc -lflang
```

Fortran benchmarks:

```
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -ffast-math
-Wl,-mllvm -Wl,-inline-recursion=4 -Wl,-mllvm -Wl,-lsr-in-nested-loop
-Wl,-mllvm -Wl,-enable-iv-split -O3 -march=znver2 -funroll-loops
-Mrecursive -mllvm -vector-library=LIBMVEC -z muldefs
-mllvm -disable-indvar-simplify -mllvm -unroll-aggressive
-mllvm -unroll-threshold=150 -lmvec -lamdlibm -ljemalloc -lflang
```

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

http://www.spec.org/cpu2017/flags/aocc200-flags-C4.html
http://www.spec.org/cpu2017/flags/Fujitsu-Platform-Settings-V1.0-ROME-RevE.html

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

http://www.spec.org/cpu2017/flags/aocc200-flags-C4.xml
http://www.spec.org/cpu2017/flags/Fujitsu-Platform-Settings-V1.0-ROME-RevE.xml

For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU®2017 v1.1.5 on 2020-12-23 13:43:45-0500.
Report generated on 2021-04-27 16:20:14 by CPU2017 PDF formatter v6442.
Originally published on 2021-04-27.