



SPEC® CPU2017 Integer Rate Result

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GIGA-BYTE TECHNOLOGY CO., LTD

(Test Sponsor: GIGA-BYTE TECHNOLOGY CO., LTD.)

R151-Z30

(AMD EPYC 7601, 2.20 GHz)

SPECrate2017_int_base = 142

SPECrate2017_int_peak = 156

CPU2017 License: 4872

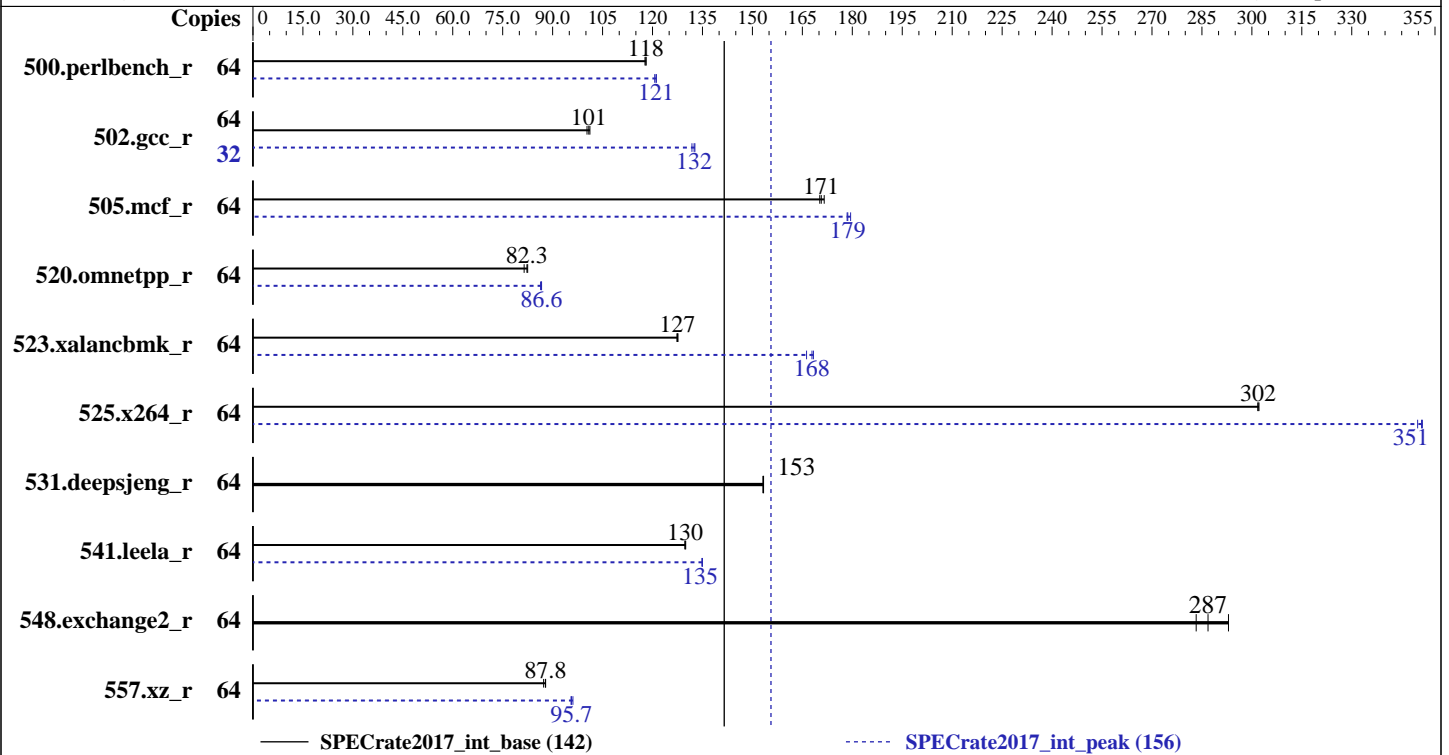
Test Sponsor: GIGA-BYTE TECHNOLOGY CO., LTD.

Tested by: GIGA-BYTE TECHNOLOGY CO., LTD.

Test Date: Apr-2018

Hardware Availability: Mar-2018

Software Availability: Apr-2018



Hardware

CPU Name: AMD EPYC 7601
 Max MHz.: 3200
 Nominal: 2200
 Enabled: 32 cores, 1 chip, 2 threads/core
 Orderable: 1 chip
 Cache L1: 64 KB I + 32 KB D on chip per core
 L2: 512 KB I+D on chip per core
 L3: 64 MB I+D on chip per chip, 8 MB shared / 4 cores
 Other: None
 Memory: 512 GB (8 x 64 GB 4Rx4 PC4-2667V-L)

Storage: 1 x 240 GB SATA SSD
 Other: None

Software

OS: Ubuntu 16.04.4 LTS
 kernel 4.4.0-116-generic

Compiler: C/C++: Version 1.0.0 of AOCC
 Fortran: Version 4.8.2 of GCC

Parallel: No
 Firmware: Version F07b released Apr-2018
 File System: ext4
 System State: Run Level 5 (multi-user, Graphical)
 Base Pointers: 64-bit
 Peak Pointers: 32/64-bit
 Other: jemalloc general purpose malloc implementation V4.5.0



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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	863	118	<u>863</u>	<u>118</u>	865	118	64	<u>842</u>	<u>121</u>	841	121	844	121
502.gcc_r	64	896	101	<u>899</u>	<u>101</u>	903	100	32	344	132	<u>342</u>	<u>132</u>	341	133
505.mcf_r	64	608	170	603	172	<u>606</u>	<u>171</u>	64	580	178	<u>579</u>	<u>179</u>	576	179
520.omnetpp_r	64	1031	81.4	1018	82.5	<u>1020</u>	<u>82.3</u>	64	969	86.7	972	86.4	<u>969</u>	<u>86.6</u>
523.xalancbmk_r	64	529	128	531	127	<u>530</u>	<u>127</u>	64	401	168	406	166	<u>403</u>	<u>168</u>
525.x264_r	64	371	302	371	302	<u>371</u>	<u>302</u>	64	319	351	320	350	<u>319</u>	<u>351</u>
531.deepsjeng_r	64	<u>478</u>	<u>153</u>	478	153	479	153	64	<u>478</u>	<u>153</u>	478	153	479	153
541.leela_r	64	<u>817</u>	<u>130</u>	815	130	817	130	64	786	135	<u>785</u>	<u>135</u>	785	135
548.exchange2_r	64	572	293	<u>585</u>	<u>287</u>	592	283	64	572	293	<u>585</u>	<u>287</u>	592	283
557.xz_r	64	792	87.3	786	87.9	<u>787</u>	<u>87.8</u>	64	724	95.5	719	96.1	<u>722</u>	<u>95.7</u>

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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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

runspec command invoked through numactl i.e.:
numactl --interleave=all runspec <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

Transparent huge pages were enabled for this run (OS default)

Huge pages were not configured for this run.



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General Notes

Environment variables set by runcpu before the start of the run:

```
LD_LIBRARY_PATH = "/home/amd/amd1704-rate-libs-revC/64;/home/amd/amd1704-rate-libs-revC/32:"  
MALLOCONF = "lg_chunk:26"
```

The AMD64 AOCC Compiler Suite is available at
<http://developer.amd.com/amd-aocc/>

Binaries were compiled on a system with 2x AMD EPYC 7601 CPU + 512GB Memory using RHEL 7.4

jemalloc, a general purpose malloc implementation, was obtained at
<https://github.com/jemalloc/jemalloc/releases/download/4.5.0/jemalloc-4.5.0.tar.bz2>
jemalloc was built with GCC v4.8.5 in RHEL v7.2 under default conditions.
jemalloc uses environment variable MALLOCONF with values narenas and lg_chunk:
narenas: sets the maximum number of arenas to use for automatic multiplexing
of threads and arenas.
lg_chunk: set the virtual memory chunk size (log base 2). For example,
lg_chunk:21 sets the default chunk size to 2^{21} = 2MiB.

The AOCC Gold Linker plugin was installed and used for the link stage.

The AOCC Fortran Plugin version 1.0 was used to leverage AOCC optimizers
with gfortran. It is available here:
<http://developer.amd.com/amd-aocc/>

Yes: 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 Settings:

Determinism Slider = Power

cTDP Control = Manual

cTDP = 200

Sysinfo program /home/amd/cpu2017-1.0.2.tar/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on amd-ubuntu Wed Apr 18 13:49:40 2018

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 7601 32-Core Processor

(Continued on next page)



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Platform Notes (Continued)

1 "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 : 32

siblings : 64

physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

From lscpu:

Architecture: x86_64

CPU op-mode(s): 32-bit, 64-bit

Byte Order: Little Endian

CPU(s): 64

On-line CPU(s) list: 0-63

Thread(s) per core: 2

Core(s) per socket: 32

Socket(s): 1

NUMA node(s): 4

Vendor ID: AuthenticAMD

CPU family: 23

Model: 1

Model name: AMD EPYC 7601 32-Core Processor

Stepping: 2

CPU MHz: 2200.000

CPU max MHz: 2200.0000

CPU min MHz: 1200.0000

BogoMIPS: 4399.75

Virtualization: AMD-V

L1d cache: 32K

L1i cache: 64K

L2 cache: 512K

L3 cache: 8192K

NUMA node0 CPU(s): 0-7,32-39

NUMA node1 CPU(s): 8-15,40-47

NUMA node2 CPU(s): 16-23,48-55

NUMA node3 CPU(s): 24-31,56-63

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 extd_apicid amd_dcm aperfmperf eagerfpu 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 skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_l2 mwaitx hw_pstate retpoline retpoline_amd vmmcall fsgsbase bmi1 avx2 smep bmi2 rdseed adx smap clflushopt sha_ni xsaveopt xsavec xgetbv1 clzero ibpb arat npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold

/proc/cpuinfo cache data

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Platform Notes (Continued)

cache size : 512 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.

available: 4 nodes (0-3)

node 0 cpus: 0 1 2 3 4 5 6 7 32 33 34 35 36 37 38 39

node 0 size: 128895 MB

node 0 free: 128556 MB

node 1 cpus: 8 9 10 11 12 13 14 15 40 41 42 43 44 45 46 47

node 1 size: 129019 MB

node 1 free: 128704 MB

node 2 cpus: 16 17 18 19 20 21 22 23 48 49 50 51 52 53 54 55

node 2 size: 129019 MB

node 2 free: 128680 MB

node 3 cpus: 24 25 26 27 28 29 30 31 56 57 58 59 60 61 62 63

node 3 size: 129017 MB

node 3 free: 128705 MB

node distances:

node 0 1 2 3

0: 10 16 16 16

1: 16 10 16 16

2: 16 16 10 16

3: 16 16 16 10

From /proc/meminfo

MemTotal: 528334532 kB

HugePages_Total: 0

Hugepagesize: 2048 kB

/usr/bin/lsb_release -d

Ubuntu 16.04.4 LTS

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

debian_version: stretch/sid

os-release:

NAME="Ubuntu"

VERSION="16.04.4 LTS (Xenial Xerus)"

ID=ubuntu

ID_LIKE=debian

PRETTY_NAME="Ubuntu 16.04.4 LTS"

VERSION_ID="16.04"

HOME_URL="http://www.ubuntu.com/"

SUPPORT_URL="http://help.ubuntu.com/"

uname -a:

Linux amd-ubuntu 4.4.0-116-generic #140-Ubuntu SMP Mon Feb 12 21:23:04 UTC 2018 x86_64 x86_64 x86_64 GNU/Linux

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Platform Notes (Continued)

run-level 5 Apr 18 13:47

SPEC is set to: /home/amd/cpu2017-1.0.2.tar

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/sda2	ext4	219G	5.2G	203G	3%	/

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.

BIOS GIGABYTE F07b 04/02/2018

Memory:

8x Samsung M386A8K40BM2-CTD 64 GB 4 rank 2667

8x Unknown Unknown

(End of data from sysinfo program)

Compiler Version Notes

=====
CC 502.gcc_r(peak)

AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM

AOCC.LLVM.4.0.0.B35.2017_04_26)

Target: i386-unknown-linux-gnu

Thread model: posix

InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin

=====
CXXC 523.xalancbmk_r(peak)

AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM

AOCC.LLVM.4.0.0.B35.2017_04_26)

Target: i386-unknown-linux-gnu

Thread model: posix

InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin

=====
CC 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)

525.x264_r(base) 557.xz_r(base, peak)

AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM

AOCC.LLVM.4.0.0.B35.2017_04_26)

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Compiler Version Notes (Continued)

Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin

=====
CXXC 520.omnetpp_r(base, peak) 523.xalancbmk_r(base) 531.deepsjeng_r(base, peak) 541.leela_r(base)

=====
AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin

=====
CC 500.perlbench_r(peak) 525.x264_r(peak)

=====
AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin

=====
CXXC 541.leela_r(peak)

=====
AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin

=====
FC 548.exchange2_r(base, peak)

=====
GNU Fortran (GCC) 4.8.2
Copyright (C) 2013 Free Software Foundation, Inc.
GNU Fortran comes with NO WARRANTY, to the extent permitted by law.
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under the terms of the GNU General Public License.
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Base Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

clang gfortran

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:

```
-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop
-disable-vect-cmp -O3 -ffast-math -march=znver1 -fstruct-layout=2
-mlvm -unroll-threshold=100 -fremap-arrays -mno-avx2
-inline-threshold=1000 -z muldefs -ljemalloc
```

C++ benchmarks:

```
-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop
-disable-vect-cmp -O3 -march=znver1 -mlvm -unroll-threshold=100
-finline-aggressive -fremap-arrays -inline-threshold=1000 -z muldefs
-ljemalloc
```

Fortran benchmarks:

```
-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop
-disable-vect-cmp -O3(gfortran) -O3(clang) -mavx -madox
-funroll-loops -ffast-math -z muldefs -Ofast -fdefault-integer-8
-fplugin=dragonegg.so -fplugin-arg-dragonegg-llvm-option="
-enable-iv-split -inline-threshold:1000 -disable-vect-cmp" -ljemalloc
```

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Base Optimization Flags (Continued)

Fortran benchmarks (continued):

-lgfortran -lamdlibm

Peak Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

clang gfortran

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 -D_FILE_OFFSET_BITS=64
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: -flto -Wl, -plugin-opt= -merge-constant
-lsr-in-nested-loop -fprofile-instr-generate(pass 1)
-fprofile-instr-use(pass 2) -Ofast -march=znver1
-fstruct-layout=3 -mllvm -vectorize-memory-aggressively
-mno-avx2 -unroll-threshold=100 -fremap-arrays
-inline-threshold=1000 -ljemalloc
```

```
502.gcc_r: -m32 -flto -Wl, -plugin-opt= -merge-constant
-lsr-in-nested-loop -Ofast -march=znver1
```

(Continued on next page)



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Peak Optimization Flags (Continued)

502.gcc_r (continued):

```
-fstruct-layout=3 -mllvm -vectorize-memory-aggressively
-mno-avx2 -unroll-threshold=100 -fremap-arrays
-inline-threshold=1000 -fgnu89-inline
-L/root/work/lib/jemalloc/lib32 -ljemalloc
```

```
505.mcf_r: -flto -Wl, -plugin-opt= -merge-constant
-lsr-in-nested-loop -Ofast -march=znver1
-fstruct-layout=3 -mllvm -vectorize-memory-aggressively
-mno-avx2 -unroll-threshold=100 -fremap-arrays
-inline-threshold=1000 -ljemalloc
```

525.x264_r: Same as 500.perlbench_r

557.xz_r: Same as 505.mcf_r

C++ benchmarks:

```
520.omnetpp_r: -flto -Wl, -plugin-opt= -merge-constant
-lsr-in-nested-loop -Ofast -march=znver1
-finline-aggressive -mllvm -unroll-threshold=100
-fremap-arrays -inline-threshold=1000 -ljemalloc
```

```
523.xalancbmk_r: -m32 -flto -Wl, -plugin-opt= -merge-constant
-lsr-in-nested-loop -Ofast -march=znver1
-finline-aggressive -mllvm -unroll-threshold=100
-fremap-arrays -inline-threshold=1000
-L/root/work/lib/jemalloc/lib32 -ljemalloc
```

531.deepsjeng_r: basepeak = yes

```
541.leela_r: -flto -Wl, -plugin-opt= -merge-constant
-lsr-in-nested-loop -fprofile-instr-generate(pass 1)
-fprofile-instr-use(pass 2) -Ofast -march=znver1 -mllvm
-unroll-count=8 -unroll-threshold=100 -ljemalloc
```

Fortran benchmarks:

548.exchange2_r: basepeak = yes

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

<http://www.spec.org/cpu2017/flags/gcc.2018-02-16.html>

<http://www.spec.org/cpu2017/flags/aoccl100-flags-revC-I.2018-02-16.html>



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

<http://www.spec.org/cpu2017/flags/gcc.2018-02-16.xml>

<http://www.spec.org/cpu2017/flags/aocc100-flags-revC-I.2018-02-16.xml>

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