



SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

Quanta Cloud Technology

(Test Sponsor: Quanta Computer Inc.)

QuantaGrid D43K-1U

(AMD EPYC 7742 64-Core, 2.25GHz)

SPECspeed®2017_fp_base = 205

SPECspeed®2017_fp_peak = Not Run

CPU2017 License: 9050

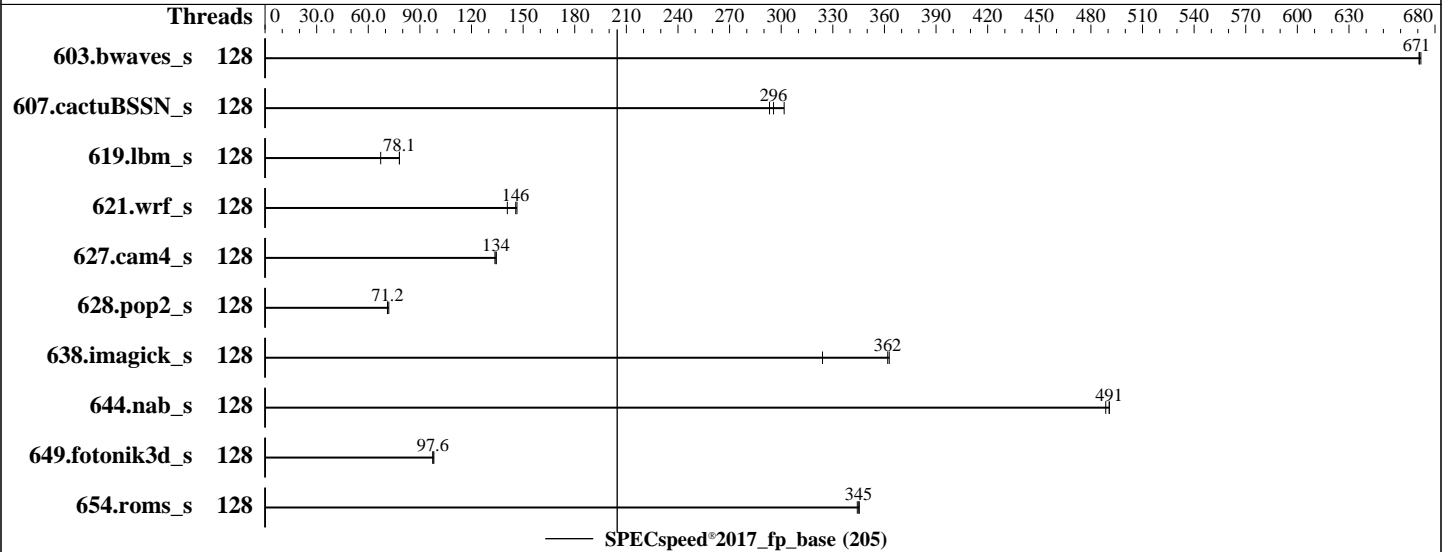
Test Sponsor: Quanta Computer Inc.

Tested by: Quanta Computer Inc.

Test Date: Dec-2019

Hardware Availability: Aug-2019

Software Availability: Aug-2019



Hardware

CPU Name: AMD EPYC 7742
 Max MHz: 3400
 Nominal: 2250
 Enabled: 128 cores, 2 chips, 2 threads/core
 Orderable: 1,2 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 / 4 cores
 Other: None
 Memory: 512 GB (16 x 32 GB 2Rx4 PC4-3200AA-R)
 Storage: 1 x 512GB SATA M.2 SSD
 Other: None

Software

OS: Ubuntu 19.10
 Kernel 5.3.0-18-generic
 Compiler: C/C++/Fortran: Version 2.0.0 of AOCC
 Parallel: Yes
 Firmware: BIOS version 3A07.06 released Nov-2019
 File System: ext4
 System State: Run level 5 (multi-user)
 Base Pointers: 64-bit
 Peak Pointers: Not Applicable
 Other: jemalloc: jemalloc memory allocator library v5.1.0
 Power Management: OS power management: 'cpupower governor is performance', BIOS set to prefer performance at the cost of additional power usage.



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Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	128	87.9	671	87.8	672	88.0	671							
607.cactuBSSN_s	128	55.3	302	56.9	293	56.4	296							
619.lbm_s	128	77.9	67.2	67.1	78.1	67.1	78.1							
621.wrf_s	128	93.9	141	90.8	146	90.3	146							
627.cam4_s	128	66.0	134	66.3	134	66.0	134							
628.pop2_s	128	165	71.9	167	71.2	167	71.2							
638.imagick_s	128	39.8	363	44.5	324	39.9	362							
644.nab_s	128	35.6	491	35.8	489	35.6	491							
649.fotonik3d_s	128	93.5	97.5	93.4	97.6	92.9	98.1							
654.roms_s	128	45.6	345	45.6	345	45.7	344							

SPECspeed®2017_fp_base = 205

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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
'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).

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



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Environment Variables Notes

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

GOMP_CPU_AFFINITY = "0-255"

LD_LIBRARY_PATH =

"/root/speccpull10/amd_speed_aocc200_rome_C_lib/64;/root/speccpull10/amd_speed_aocc200_rome_C_lib/32:"

MALLOC_CONF = "retain:true"

OMP_DYNAMIC = "false"

OMP_SCHEDULE = "static"

OMP_STACKSIZE = "128M"

OMP_THREAD_LIMIT = "256"

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 5.1.0 is available here:

<https://github.com/jemalloc/jemalloc/releases/download/5.1.0/jemalloc-5.1.0.tar.bz2>

Platform Notes

BIOS settings:

SMT Control is Auto

NUMA nodes per socket is Auto

cTDP Control is Manual

cTDP set to 240

Package Power Limit Control is Manual

Package Power Limit set to 240

Determinism Control is Manual

Determinism Slider set to Power

APBDIS set to 1

Sysinfo program /root/speccpull10/bin/sysinfo

Rev: r6365 of 2019-08-21 295195f888a3d7edble6e46a485a0011

running on ubuntu Thu Dec 19 19:36:39 2019

SUT (System Under Test) info as seen by some common utilities.

(Continued on next page)



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Platform Notes (Continued)

For more information on this section, see
<https://www.spec.org/cpu2017/Docs/config.html#sysinfo>

From /proc/cpuinfo

model name : AMD EPYC 7742 64-Core Processor

2 "physical id"s (chips)

256 "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 : 64

siblings : 128

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 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
53 54 55 56 57 58 59 60 61 62 63

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 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
53 54 55 56 57 58 59 60 61 62 63

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): 256
On-line CPU(s) list: 0-255
Thread(s) per core: 2
Core(s) per socket: 64
Socket(s): 2
NUMA node(s): 2
Vendor ID: AuthenticAMD
CPU family: 23
Model: 49
Model name: AMD EPYC 7742 64-Core Processor
Stepping: 0
Frequency boost: enabled
CPU MHz: 1746.221
CPU max MHz: 2250.0000
CPU min MHz: 1500.0000
BogoMIPS: 4491.56
Virtualization: AMD-V
L1d cache: 4 MiB
L1i cache: 4 MiB
L2 cache: 64 MiB
L3 cache: 512 MiB
NUMA node0 CPU(s): 0-63,128-191
NUMA node1 CPU(s): 64-127,192-255
Vulnerability L1tf: Not affected

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Platform Notes (Continued)

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 conditional, RSB filling
 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 x2apic movbe popcnt aes xsave avx fl6c 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: 2 nodes (0-1)
node 0 cpus: 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 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56
57 58 59 60 61 62 63 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143
144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165
166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187
188 189 190 191
node 0 size: 257838 MB
node 0 free: 255500 MB
node 1 cpus: 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112
113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 192 193 194 195 196 197 198
199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220
221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242
243 244 245 246 247 248 249 250 251 252 253 254 255
node 1 size: 258013 MB
node 1 free: 256193 MB
node distances:
node 0 1
0: 10 32
1: 32 10
```

(Continued on next page)



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Platform Notes (Continued)

From /proc/meminfo

MemTotal: 528232380 kB

HugePages_Total: 0

Hugepagesize: 2048 kB

/usr/bin/lsb_release -d

Ubuntu 19.10

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

debian_version: buster/sid

os-release:

NAME="Ubuntu"

VERSION="19.10 (Eoan Ermine)"

ID=ubuntu

ID_LIKE=debian

PRETTY_NAME="Ubuntu 19.10"

VERSION_ID="19.10"

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

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

uname -a:

Linux ubuntu 5.3.0-18-generic #19-Ubuntu SMP Tue Oct 8 20:14:06 UTC 2019 x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

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/swaps barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2):	Mitigation: Full AMD retpoline, IBPB: conditional, IBRS_FW, STIBP: conditional, RSB filling

run-level 5 Dec 19 16:59

SPEC is set to: /root/speccpu110

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/sda2	ext4	468G	11G	434G	3%	/

From /sys/devices/virtual/dmi/id

BIOS: American Megatrends Inc. 3A07.06 11/07/2019

Vendor: Quanta Cloud Technology Inc.

(Continued on next page)



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Platform Notes (Continued)

Product: QuantaGrid D43K-1U

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 SK Hynix HMA84GR7CJR4N-XN 32 GB 2 rank 3200

16x Unknown Unknown

(End of data from sysinfo program)

Compiler Version Notes

=====
C | 619.lbm_s(base) 638.imagick_s(base) 644.nab_s(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

=====
C++, C, Fortran | 607.cactuBSSN_s(base)

AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
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Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

=====
Fortran | 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)

(Continued on next page)



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Compiler Version Notes (Continued)

```
-----
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Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
-----
```

```
=====
Fortran, C      | 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base)
-----
```

```
AOCCLLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCCLLVM.2.0.0.B191.2019_07_19) (based on LLVM AOCCLLVM.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
AOCCLLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCCLLVM.2.0.0.B191.2019_07_19) (based on LLVM AOCCLLVM.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

Fortran benchmarks:

flang

Benchmarks using both Fortran and C:

flang clang

Benchmarks using Fortran, C, and C++:

clang++ clang flang

Base Portability Flags

```
603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64
```

(Continued on next page)



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Base Portability Flags (Continued)

```
627.cam4_s: -DSPEC_CASE_FLAG -DSPEC_LP64
628.pop2_s: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64
638.imagick_s: -DSPEC_LP64
644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -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
-freemap-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 -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lpthread -ldl -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 -O3 -march=znver2
-funroll-loops -Mrecursive -mllvm -vector-library=LIBMVEC -z muldefs
-Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp -fopenmp=libomp
-lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc -lflang
```

Benchmarks using both Fortran and C:

```
-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
-freemap-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 -funroll-loops -Mrecursive -z muldefs
-Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp -fopenmp=libomp
-lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc -lflang
```

Benchmarks using Fortran, C, and C++:

```
-std=c++98 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
```

(Continued on next page)



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Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):

```
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-suppress-fmas -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 -mllvm -loop-unswitch-threshold=200000
-mllvm -unroll-threshold=100 -mllvm -enable-partial-unswitch
-funroll-loops -Mrecursive -z muldefs -Kieee -fno-finite-math-only
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lpthread -ldl -lmvec
-lamdlibm -ljemalloc -lflang
```

Base Other Flags

C benchmarks:

```
-Wno-return-type
```

Fortran benchmarks:

```
-Wno-return-type
```

Benchmarks using both Fortran and C:

```
-Wno-return-type
```

Benchmarks using Fortran, C, and C++:

```
-Wno-return-type
```

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

<http://www.spec.org/cpu2017/flags/aocc200-flags-C3.html>

http://www.spec.org/cpu2017/flags/Quanta-Computer-Inc-amd-speccpu-setting-v3_AMD_ROME.html

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

<http://www.spec.org/cpu2017/flags/aocc200-flags-C3.xml>

http://www.spec.org/cpu2017/flags/Quanta-Computer-Inc-amd-speccpu-setting-v3_AMD_ROME.xml

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