# SPEC CPU®2017 Integer Speed Result

## ASUSTeK Computer Inc.

**ASUS RS520A-E11(KMPA-U16) Server System**  
**2.45 GHz, AMD EPYC 7763**

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed\textsuperscript{®}2017\textsubscript{int} \textsuperscript{peak}</th>
<th>SPECspeed\textsuperscript{®}2017\textsubscript{int} \textsuperscript{base}</th>
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</thead>
<tbody>
<tr>
<td>64</td>
<td>12.2</td>
<td>12.2</td>
</tr>
</tbody>
</table>

- **CPU2017 License:** 9016  
- **Test Sponsor:** ASUSTeK Computer Inc.  
- **Tested by:** ASUSTeK Computer Inc.  
- **Test Date:** May-2021  
- **Hardware Availability:** May-2021  
- **Software Availability:** Mar-2021

## Hardware

- **CPU Name:** AMD EPYC 7763  
- **Max MHz:** 3500  
- **Nominal:** 2450  
- **Enabled:** 64 cores, 1 chip, 2 threads/core  
- **Orderable:** 1 chip  
- **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 / 8 cores  
- **Other:** None  
- **Memory:** 512 GB (8 x 64 GB 2Rx4 PC4-3200AA-R)  
- **Storage:** 1 x 240 GB SATA SSD  
- **Other:** None

## Software

- **OS:** SUSE Linux Enterprise Server 15 SP2 (x86_64)  
- **Kernel:** 5.3.18-22-default  
- **Compiler:** C/C++/Fortran: Version 3.0.0 of AOCC  
- **Parallel:** Yes  
- **Firmware:** Version 0401 released Apr-2021  
- **File System:** xfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** 64-bit  
- **Other:** jemalloc: jemalloc memory allocator library v5.1.0  
- **Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage.
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Results Table

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<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<tbody>
<tr>
<td>600.perlbench_s</td>
<td>64</td>
<td>265</td>
<td>6.70</td>
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<td>602.mcf_s</td>
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<td>300</td>
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<td>8.66</td>
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<td>24.5</td>
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<td>252</td>
<td>24.5</td>
<td>253</td>
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</table>

SPECspeed®2017_int_base = 12.2
SPECspeed®2017_int_peak = 12.2

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
OS set to performance mode via cpupower frequency-set -g performance
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.
To enable Transparent Hugepages (THP) for all allocations,
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Operating System Notes (Continued)

'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:
GOMP_CPU_AFFINITY = "0-127"
LD_LIBRARY_PATH =
"/cpu118/amd_speed_aocc300_milan_B_lib/64;/cpu118/amd_speed_aocc300_milan_B_lib/32:"
MALLOC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "128"

Environment variables set by runcpu during the 600.perlbench_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 602.gcc_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 620.omnetpp_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 625.x264_s peak run:
GOMP_CPU_AFFINITY = "0"

General Notes

Binaries were compiled on a system with 2x AMD EPYC 7742 CPU + 1TiB 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
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Platform Notes

BIOS Configuration:
- DLWM Support = Disabled
- SVM Mode = Disabled
- NUMA nodes per socket = NPS2
- APBDIS = 1
- Fix SOC P-state = P0
- Engine Boost = Enabled
- IOMMU = Disabled

Sysinfo program /cpu118/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aca64d
running on localhost Mon May 17 15:00:11 2021

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 7763 64-Core Processor
  1 "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: 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

From lscpu from util-linux 2.33.1:
- 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: 64
- Socket(s): 1
- NUMA node(s): 2
- Vendor ID: AuthenticAMD
- CPU family: 25
- Model: 1
- Model name: AMD EPYC 7763 64-Core Processor
- Stepping: 1
- CPU MHz: 2023.053
- CPU max MHz: 2450.0000

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Software Availability: Mar-2021

Platform Notes (Continued)

CPU min MHz: 1500.0000
BogoMIPS: 4948.75
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 32768K
NUMA node0 CPU(s): 0-31,64-95
NUMA node1 CPU(s): 32-63,96-127
Flags: fpu vme de pse tsc msr pae mca cmov
      pat pse3 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtsscp 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 svmվlegacy abm sse4a misalignsse 3nowprefetch osfw
      ibs skinit wdt tce topoext perfctr_core perfctr_nb bpxext perfctr_llc mwaitx cpb
      cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmcall fsgsbase
      bmi1 avx2 smep bmi2 erva invvpicid cmp_qrdt_a rdseed adv smap clflushopt clwb sha ni
      xsaveopt xsavecr3 ebx savecr3 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 rpuid overflow_recover 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 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
  node 0 size: 257843 MB
  node 0 free: 256876 MB
  node 1 cpus: 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 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
  node 1 size: 257984 MB
  node 1 free: 257379 MB
  node distances:
  node 0 1
  0: 10 12
  1: 12 10

From /proc/meminfo
  MemTotal: 528207784 KB
  HugePages_Total: 0
  Hugepagesize: 2048 KB

(Continued on next page)
Platform Notes (Continued)

/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) 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/swapsgs barriers and __user pointer sanitation
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 3 May 17 14:58

SPEC is set to: /cpu118
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 199G 25G 175G 13% /

From /sys/devices/virtual/dmi/id
    Vendor: ASUSTeK COMPUTER INC.
    Product: RS520A-E11-RS24U
    Product Family: Server

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Platform Notes (Continued)

Serial: 333366669999

Additional information from dmidecode 3.2 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:
8x Samsung M393A8G40AB2-CWE 64 GB 2 rank 3200
8x Unknown Unknown

BIOS:
BIOS Vendor: American Megatrends Inc.
BIOS Version: 0401
BIOS Date: 04/14/2021
BIOS Revision: 4.1

(End of data from sysinfo program)

Compiler Version Notes

C
600.perlbench_s(base, peak) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_s(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++
620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak) 631.deepsjeng_s(base, peak) 641.leela_s(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
648.exchange2_s(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

(Continued on next page)
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

600.perlbench_s: -DSPEC_LINUX_X64 -DSPEC_LP64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LINUX -DSPEC_LP64
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-m64 -mno-adx -mno-sse4a -Wl,-allow-multiple-definition
-W1,-mllvm -W1,-enable-licm-vrp -W1,-mllvm -W1,-region-vectorize
-W1,-mllvm -W1,-function-specialize
-W1,-mllvm -W1,-align-all-nofallthru-blocks=6
-W1,-mllvm -W1,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-arrays -mllvm -function-specialize -flv-function-specialization

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### 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
- `--DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc`
- `-lflang -lflangrti`

C++ benchmarks:
- `--m64 -std=c++98 -mno-adx -mno-sse4a`
- `--Wl,-mllvm -Wl,-do-block-reorder=aggressive`
- `--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 -march=znver3`
- `--fveclib=AMDLIBM -ffast-math -flto -mllvm -enable-partial-unswitch`
- `--mllvm -unroll-threshold=100 -finline-aggressive`
- `--mllvm -loop-unswitch=threshold=200000`
- `--mllvm -reroil-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 -DSPEC_OPENMP`
- `--fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang`
- `-lflangrti`

Fortran benchmarks:
- `--m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-inline-recursion=4`
- `--Wl,-mllvm -Wl,-lsr-in-nested-loop -Wl,-mllvm -Wl,-enable-iv-split`
- `--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 -march=znver3`
- `--fveclib=AMDLIBM -ffast-math -flto -z muldefs`
- `--mllvm -unroll-aggressive -mllvm -unroll-threshold=150 -DSPEC_OPENMP`
- `--fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang`
- `-lflangrti`

### Base Other Flags

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

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

Fortran benchmarks:
- `-Wno-return-type`
Peak Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

Fortran benchmarks:
flang

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

600.perlbench_s: -m64 -mno-adx -mno-sse4a -Wl,-allow-multiple-definition
-Wl,-mllvm -Wl,-enable-licm-vrp
-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 -ffast-math -flto
-fstruct-layout=5 -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 -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang

602.gcc_s: Same as 600.perlbench_s

605.mcf_s: basepeak = yes

625.x264_s: Same as 600.perlbench_s

657.xz_s: basepeak = yes

C++ benchmarks:

(Continued on next page)
ASUSTeK Computer Inc.
ASUS RS520A-E11(KMPA-U16) Server System
2.45 GHz, AMD EPYC 7763

SPEC CPU® 2017 Integer Speed Result
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SPECspeed® 2017_int_base = 12.2
SPECspeed® 2017_int_peak = 12.2

CPU2017 License: 9016
Test Sponsor: ASUSTeK Computer Inc.
Tested by: ASUSTeK Computer Inc.
Test Date: May-2021
Hardware Availability: May-2021
Software Availability: Mar-2021

Peak Optimization Flags (Continued)

620.omnetpp_s: -m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mlllvm -Wl,-do-block-reorder=aggressive
-Wl,-mlllvm -Wl,-function-specialize
-Wl,-mlllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mlllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver3 -mllvm -Wl,-mllvm=-fveclib=AMDLIBM -ffast-math -flto
-finline-aggressive -mlllvm -unroll-threshold=100
-flv-function-specialization -mlllvm -enable-licm-vrp
-mlllvm -reroll-loops -mlllvm -aggressive-loop-unswitch
-mlllvm -reduce-array-computations=3
-mlllvm -global-vectorize-slp=true
-mlllvm -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm
-ljemalloc -llflag

623.xalancbmk_s: basepeak = yes
631.deepsjeng_s: basepeak = yes
641.reeal_s: basepeak = yes

Fortran benchmarks:
648.exchange2_s: basepeak = yes

Peak Other Flags

C benchmarks:
-Wno-unused-command-line-argument -Wno-return-type

C++ benchmarks:
-Wno-unused-command-line-argument -Wno-return-type

Fortran benchmarks:
-Wno-return-type

The flags files that were used to format this result can be browsed at
<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_int_base</td>
<td>12.2</td>
</tr>
<tr>
<td>SPECspeed®2017_int_peak</td>
<td>12.2</td>
</tr>
</tbody>
</table>

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You can also download the XML flags sources by saving the following links:
- [ASUSTekPlatform-Settings-AMD-Milan-V1.3.xml](http://www.spec.org/cpu2017/flags/ASUSTekPlatform-Settings-AMD-Milan-V1.3.xml)

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

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