## SPEC CPU®2017 Integer Speed Result

**ASUSTeK Computer Inc.**

ASUS RS520A-E11(KMPA-U16) Server System
2.30 GHz, AMD EPYC 7643

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**SPECspeed®2017_int_base = 12.3**  
**SPECspeed®2017_int_peak = 12.4**

---

### Test Details

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

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### Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Specspeed2017_int_base</th>
<th>Specspeed2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>perlbench_s</td>
<td>48</td>
<td>6.80</td>
<td>13.5</td>
</tr>
<tr>
<td>gcc_s</td>
<td>48</td>
<td>8.64</td>
<td>20.7</td>
</tr>
<tr>
<td>mcf_s</td>
<td>48</td>
<td>8.65</td>
<td>20.7</td>
</tr>
<tr>
<td>omnetpp_s</td>
<td>48</td>
<td>13.9</td>
<td>20.7</td>
</tr>
<tr>
<td>xalanchmk_s</td>
<td>48</td>
<td>14.0</td>
<td>20.7</td>
</tr>
<tr>
<td>x264_s</td>
<td>48</td>
<td>6.55</td>
<td>16.9</td>
</tr>
<tr>
<td>deepsjeng_s</td>
<td>48</td>
<td>5.67</td>
<td>16.9</td>
</tr>
<tr>
<td>leela_s</td>
<td>48</td>
<td>5.70</td>
<td>23.1</td>
</tr>
<tr>
<td>exchange2_s</td>
<td>48</td>
<td></td>
<td>24.6</td>
</tr>
<tr>
<td>xz_s</td>
<td>48</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### Hardware

- **CPU Name:** AMD EPYC 7643  
- **Max MHz:** 3600  
- **Nominal:** 2300  
- **Enabled:** 48 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 / 6 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.
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>48</td>
<td>261</td>
<td>6.80</td>
<td>261</td>
<td>6.80</td>
<td>263</td>
<td>6.76</td>
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<tr>
<td>602.gcc_s</td>
<td>48</td>
<td>296</td>
<td>13.5</td>
<td>296</td>
<td>13.5</td>
<td>296</td>
<td>13.5</td>
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<tr>
<td>605.mcf_s</td>
<td>48</td>
<td>220</td>
<td>20.7</td>
<td>220</td>
<td>20.7</td>
<td>228</td>
<td>20.7</td>
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<tr>
<td>620.omnetpp_s</td>
<td>48</td>
<td>191</td>
<td>8.64</td>
<td>189</td>
<td>8.64</td>
<td>189</td>
<td>8.64</td>
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<tr>
<td>623.xalanchmk_s</td>
<td>48</td>
<td>102</td>
<td>13.9</td>
<td>102</td>
<td>13.9</td>
<td>101</td>
<td>13.9</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>48</td>
<td>104</td>
<td>16.9</td>
<td>104</td>
<td>16.9</td>
<td>104</td>
<td>16.9</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>48</td>
<td>218</td>
<td>6.56</td>
<td>220</td>
<td>6.52</td>
<td>219</td>
<td>6.55</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>48</td>
<td>301</td>
<td>5.67</td>
<td>301</td>
<td>5.67</td>
<td>300</td>
<td>5.69</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>48</td>
<td>127</td>
<td>23.1</td>
<td>127</td>
<td>23.1</td>
<td>127</td>
<td>23.1</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>48</td>
<td>251</td>
<td>24.6</td>
<td>253</td>
<td>24.5</td>
<td>251</td>
<td>24.6</td>
</tr>
</tbody>
</table>

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

### Compiler Notes


### 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.
- 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,
ASUSTeK Computer Inc.  
ASUS RS520A-E11(KMPA-U16) Server System  
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SPECspeed®2017_int_base = 12.3  
SPECspeed®2017_int_peak = 12.4

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 = "0-95"
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 = "96"

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 605.mcf_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 623.xalancbmk_s peak run:
GOMP_CPU_AFFINITY = "0"

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

Environment variables set by runcpu during the 641.leela_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.
General Notes (Continued)

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

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 /cpu18/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aca6c64d
running on localhost Wed Jul 7 22:09:09 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 7643 48-Core Processor
  1 "physical id"s (chips)
  96 "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 3 4 5 6 7 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
  32 33 34 35 36 37 40 41 42 43 44 45 48 49 50 51 52 53 56 57 58 59 60 61

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): 96
On-line CPU(s) list: 0-95
Thread(s) per core: 2

(Continued on next page)
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<table>
<thead>
<tr>
<th>Column</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPU2017 License</strong>:</td>
<td>9016</td>
</tr>
<tr>
<td><strong>Test Sponsor</strong>:</td>
<td>ASUSTeK Computer Inc.</td>
</tr>
<tr>
<td><strong>Tested by</strong>:</td>
<td>ASUSTeK Computer Inc.</td>
</tr>
<tr>
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</tr>
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<td>May-2021</td>
</tr>
<tr>
<td><strong>Software Availability</strong>:</td>
<td>Mar-2021</td>
</tr>
</tbody>
</table>

**SPECspeed®2017_int_base** = 12.3  
**SPECspeed®2017_int_peak** = 12.4

**Platform Notes (Continued)**

- Core(s) per socket: 48
- Socket(s): 1
- NUMA node(s): 2
- Vendor ID: AuthenticAMD
- CPU family: 25
- Model: 1
- Model name: AMD EPYC 7643 48-Core Processor
- Stepping: 1
- CPU MHz: 3452.669
- CPU max MHz: 2300.0000
- CPU min MHz: 1500.0000
- BogoMIPS: 4591.65
- Virtualization: AMD-V
- L1d cache: 32K
- L1i cache: 32K
- L2 cache: 512K
- L3 cache: 32768K
- NUMA node0 CPU(s): 0-23,48-71
- NUMA node0 CPU(s): 24-47,72-95
- 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 avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch oswi ibs skinit wdt tce topoext perfctr_core perfctr_nb perfctr_llc mwAITx cpb cat_13 cdp_13 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsgsbase bm1l avx2 smep bmi2 erms invpcid cqm rdt_a rdseed adx smap clflushopt clwb sha ni xsaveopt xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local clzero irperfr xsaveerptr wbinvd 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
```

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 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71  
node 0 size: 257813 MB  
node 0 free: 257029 MB  
node 1 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 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: 258021 MB  
node 1 free: 257494 MB  
node distances:

(Continued on next page)
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SPECspeed®2017_int_base = 12.3
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CPU2017 License: 9016
Test Date: Jul-2021
Test Sponsor: ASUSTeK Computer Inc.
 Hardware Availability: May-2021
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Platform Notes (Continued)

node  0  1
  0:  10  12
  1:  12  10

From /proc/meminfo
  MemTotal:       528214964 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) 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/swaps barriers and __user pointer sanitation
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retpoline, IBFB: 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 Jul 7 14:41

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Platform Notes (Continued)

SPEC is set to: /cpu118
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 199G 26G 174G 13% /

From /sys/devices/virtual/dmi/id
Vendor: ASUSTeK COMPUTER INC.
Product: RS520A-E11-RS24U
Product Family: Server
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) 692.speed_s(base, peak) 694.soplex_s(base, peak) 696.spec_cint_s(base, peak) 698.spec_cint_s(peak) 700.spec_cint_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) 692.speed_s(base, peak) 694.soplex_s(base, peak) 696.spec_cint_s(base, peak) 698.spec_cint_s(peak) 700.spec_cint_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

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Compiler Version Notes (Continued)

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

==============================================================================

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
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C benchmarks:
- -m64 -mno-adx -mno-sse4a -Wl,-allow-multiple-definition
- -Wl,-mllvm -Wl,-enable-licm-vrp -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 -fstruct-layout=5
- -mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
- -freemap-arrays -mllvm -function-specialize -flv-function-specialization
- -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
- -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 -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
## SPEC CPU®2017 Integer Speed Result

ASUSTeK Computer Inc.  
ASUS RS520A-E11(KMPA-U16) Server System  
2.30 GHz, AMD EPYC 7643

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base</th>
<th>12.3</th>
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<td>SPECspeed®2017_int_peak</td>
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**CPU2017 License:** 9016  
**Test Sponsor:** ASUSTeK Computer Inc.  
**Tested by:** ASUSTeK Computer Inc.

**Test Date:** Jul-2021  
**Hardware Availability:** May-2021

**Software Availability:** Mar-2021

### 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 -unnroll-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
```

(Continued on next page)
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## Peak Optimization Flags (Continued)

600.perlbench_s (continued):
- -fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang

602.gcc_s: Same as 600.perlbench_s

605.mcf_s: Same as 600.perlbench_s

625.x264_s: Same as 600.perlbench_s

657.xz_s: basepeak = yes

### C++ benchmarks:

620.omnetpp_s: -m64 -std=c++98 -mno-adx -mno-sse4a  
- W1,-mllvm -W1,-do-block-reorder=aggressive  
- W1,-mllvm -W1,-function-specialize  
- W1,-mllvm -W1,-align-all-nofallthru-blocks=6  
- W1,-mllvm -W1,-reduce-array-computations=3 -Ofast  
- march=znver3 -fveclib=AMDLIBM -ffast-math -flto  
- finline-aggressive -mllvm -unroll-threshold=100  
- fvl-function-specialization -mllvm -enable-llicm-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  
- DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm  
- ljemalloc -lflang

623.xalancbmk_s: Same as 620.omnetpp_s

631.deepsjeng_s: basepeak = yes

641.leela_s: Same as 640.omnetpp_s

### Fortran benchmarks:

648.exchange2_s: basepeak = yes

## Peak Other Flags

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

(Continued on next page)
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Peak Other Flags (Continued)

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

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/ASUSTekPlatform-Settings-AMD-Milan-V1.3.2021-07-06.xml

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