



# SPEC CPU®2017 Integer Speed Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

## ASUSTeK Computer Inc.

ASUS RS520A-E12(K14PA-U24) Server System  
2.40 GHz, AMD EPYC 9654

SPECspeed®2017\_int\_base = 14.1

SPECspeed®2017\_int\_peak = 14.3

CPU2017 License: 9016

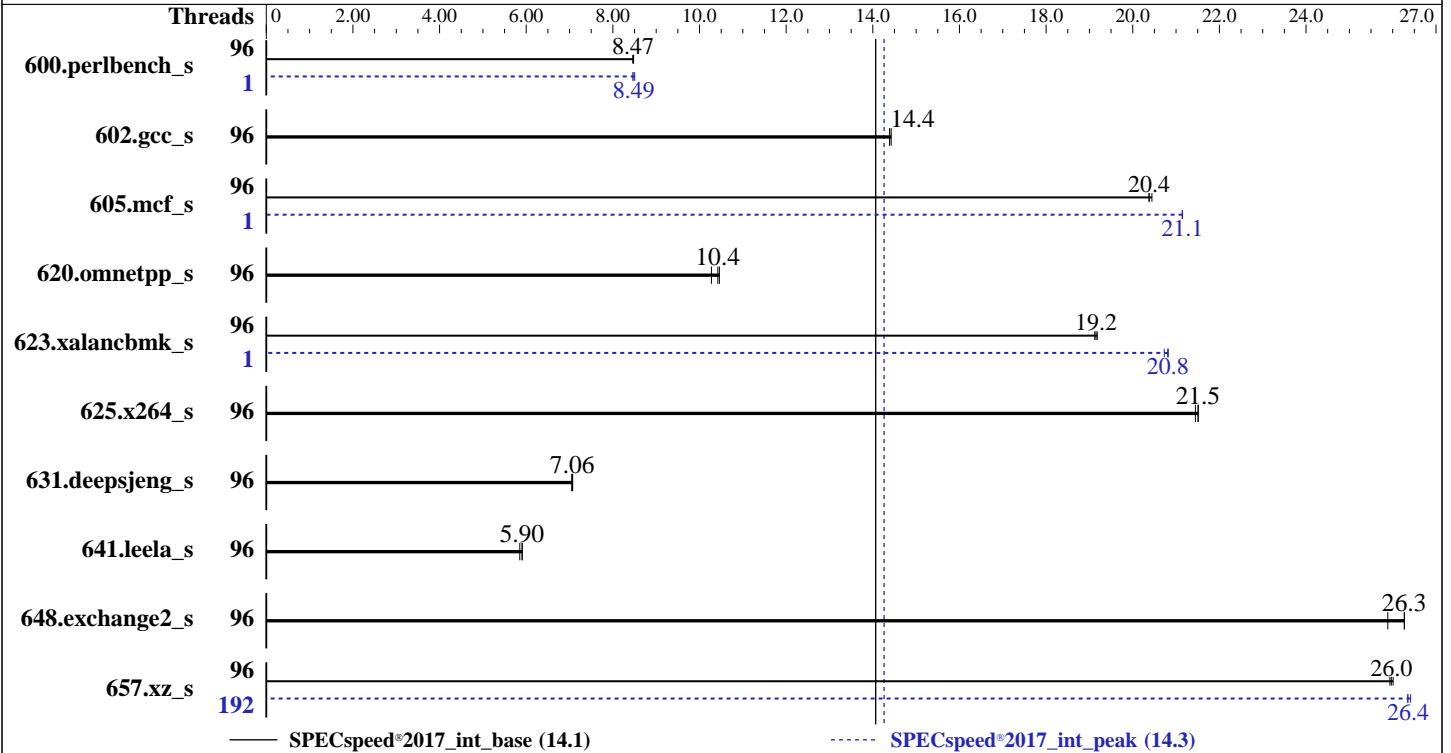
Test Sponsor: ASUSTeK Computer Inc.

Tested by: ASUSTeK Computer Inc.

Test Date: Oct-2022

Hardware Availability: Nov-2022

Software Availability: Nov-2022



### Hardware

CPU Name: AMD EPYC 9654  
 Max MHz: 3700  
 Nominal: 2400  
 Enabled: 96 cores, 1 chip, 2 threads/core  
 Orderable: 1 chip  
 Cache L1: 32 KB I + 32 KB D on chip per core  
 L2: 1 MB I+D on chip per core  
 L3: 384 MB I+D on chip per chip,  
 32 MB shared / 8 cores  
 Other: None  
 Memory: 768 GB (12 x 64 GB 2Rx4 PC5-4800B-R)  
 Storage: 1 x 3.84 TB PCIE NVME SSD  
 Other: None

### Software

OS: SUSE Linux Enterprise Server 15 SP4 (x86\_64)  
 Kernel 5.14.21-150400.22-default  
 Compiler: C/C++/Fortran: Version 4.0.0 of AOCC  
 Parallel: Yes  
 Firmware: Version 0401 released Oct-2022  
 File System: xfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: 64-bit  
 Other: None  
 Power Management: BIOS and OS 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
600.perlbench_s	96	210	8.46	209	8.48	<b>210</b>	<b>8.47</b>	1	<b>209</b>	<b>8.49</b>	209	8.50	210	8.46
602.gcc_s	96	276	14.4	277	14.4	<b>277</b>	<b>14.4</b>	96	276	14.4	277	14.4	<b>277</b>	<b>14.4</b>
605.mcf_s	96	<b>232</b>	<b>20.4</b>	232	20.4	231	20.4	1	223	21.1	<b>223</b>	<b>21.1</b>	223	21.1
620.omnetpp_s	96	159	10.3	<b>156</b>	<b>10.4</b>	156	10.5	96	159	10.3	<b>156</b>	<b>10.4</b>	156	10.5
623.xalancbmk_s	96	73.9	19.2	74.1	19.1	<b>74.0</b>	<b>19.2</b>	1	<b>68.1</b>	<b>20.8</b>	68.1	20.8	68.4	20.7
625.x264_s	96	<b>82.0</b>	<b>21.5</b>	82.0	21.5	82.3	21.4	96	<b>82.0</b>	<b>21.5</b>	82.0	21.5	82.3	21.4
631.deepsjeng_s	96	203	7.07	203	7.05	<b>203</b>	<b>7.06</b>	96	203	7.07	203	7.05	<b>203</b>	<b>7.06</b>
641.leela_s	96	289	5.91	<b>289</b>	<b>5.90</b>	292	5.85	96	289	5.91	<b>289</b>	<b>5.90</b>	292	5.85
648.exchange2_s	96	<b>112</b>	<b>26.3</b>	112	26.3	114	25.9	96	<b>112</b>	<b>26.3</b>	112	26.3	114	25.9
657.xz_s	96	238	25.9	238	26.0	<b>238</b>	<b>26.0</b>	192	234	26.4	<b>235</b>	<b>26.4</b>	235	26.3

SPECspeed®2017\_int\_base = **14.1**

SPECspeed®2017\_int\_peak = **14.3**

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 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>
To limit dirty cache to 8% of memory, 'sysctl -w vm.dirty_ratio=8' run as root.
To limit swap usage to minimum necessary, 'sysctl -w vm.swappiness=1' run as root.
To free node-local memory and avoid remote memory usage,
'sysctl -w vm.zone_reclaim_mode=1' run as root.
To clear filesystem caches, 'sync; sysctl -w vm.drop_caches=3' run as root.
To disable address space layout randomization (ASLR) to reduce run-to-run
variability, 'sysctl -w kernel.randomize_va_space=0' run as root.
```

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 = "0-191"  
LD_LIBRARY_PATH = "/spec2017b1/amd_speed_aocc400_genoa_B_lib/lib:"  
LIBOMP_NUM_HIDDEN_HELPER_THREADS = "0"  
MALLOCONF = "oversize_threshold:0,retain:true"  
OMP_DYNAMIC = "false"  
OMP_SCHEDULE = "static"  
OMP_STACKSIZE = "128M"  
OMP_THREAD_LIMIT = "192"
```

Environment variables set by runcpu during the 600.perlbench\_s peak run:

```
GOMP_CPU_AFFINITY = "15"
```

Environment variables set by runcpu during the 605.mcf\_s peak run:

```
GOMP_CPU_AFFINITY = "15"
```

Environment variables set by runcpu during the 623.xalancbmk\_s peak run:

```
GOMP_CPU_AFFINITY = "15"
```

Environment variables set by runcpu during the 657.xz\_s peak run:

```
GOMP_CPU_AFFINITY = "0-191"  
LIBOMP_NUM_HIDDEN_HELPER_THREADS = "8"
```

## General Notes

Binaries were compiled on a system with 2x AMD EPYC 9174F CPU + 1.5TiB Memory using RHEL 8.6

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.



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## Platform Notes

BIOS Configuration:

SR-IOV Support = Disabled

SVM Mode = Disabled

NUMA nodes per socket = NPS4

Determinism Control = Manual

Determinism Enable = Power

Engine Boost = Aggressive

TDP Control = Manual

TDP = 400

PPT Control = Manual

PPT = 400

BMC Configuration:

Fan mode = Full speed mode

Sysinfo program /spec2017bl/bin/sysinfo

Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d

running on localhost Fri Oct 21 06:19:05 2022

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 9654 96-Core Processor

1 "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 : 96

siblings : 192

physical 0: cores 0 1 2 3 4 5 6 7 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 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

From lscpu from util-linux 2.37.2:

Architecture: x86\_64

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

Address sizes: 52 bits physical, 57 bits virtual

Byte Order: Little Endian

CPU(s): 192

On-line CPU(s) list: 0-191

Vendor ID: AuthenticAMD

Model name: AMD EPYC 9654 96-Core Processor

CPU family: 25

Model: 17

Thread(s) per core: 2

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### Platform Notes (Continued)

```

Core(s) per socket:          96
Socket(s):                   1
Stepping:                    1
Frequency boost:             enabled
CPU max MHz:                  3707.8120
CPU min MHz:                  1500.0000
BogoMIPS:                     4848.13
Flags:                        fpu vme de pse tsc msr pae mce cx8 apic sep mtrr
pge mca cmov pat pse36 clflush mmx fxsr sse2 ht syscall nx mmxext fxsr_opt
pdpe1gb rdtscp lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid
aperfmpperf rapl pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic 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 invpcid_single hw_pstate ssbd mba ibrs
ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 erms invpcid cqm rdt_a avx512f
avx512dq rdseed adx smap avx512ifma clflushopt clwb avx512cd sha_ni avx512bw
avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
cqm_mbm_local avx512_bf16 clzero irperf xsaveerptr rdpru wbnoinvd amd_ppin arat npt
lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter
pfthreshold avic v_vmsave_vmload vgif v_spec_ctrl avx512vbmi umip pku ospke
avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg avx512_vpopcntdq la57
rdpid overflow_recov succor smca fsrm flush_lld
Virtualization:              AMD-V
L1d cache:                    3 MiB (96 instances)
L1i cache:                    3 MiB (96 instances)
L2 cache:                     96 MiB (96 instances)
L3 cache:                     384 MiB (12 instances)
NUMA node(s):                 4
NUMA node0 CPU(s):           0-23,96-119
NUMA node1 CPU(s):           24-47,120-143
NUMA node2 CPU(s):           48-71,144-167
NUMA node3 CPU(s):           72-95,168-191
Vulnerability Itlb multihit:  Not affected
Vulnerability L1tf:           Not affected
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; Retpolines, IBPB conditional, IBRS_FW,
STIBP always-on, RSB filling
Vulnerability Srbds:           Not affected
Vulnerability Tsx async abort: Not affected

```

From lscpu --cache:

NAME ONE-SIZE ALL-SIZE WAYS TYPE LEVEL SETS PHY-LINE COHERENCY-SIZE

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### Platform Notes (Continued)

L1d	32K	3M	8 Data	1	64	1	64
L1i	32K	3M	8 Instruction	1	64	1	64
L2	1M	96M	8 Unified	2	2048	1	64
L3	32M	384M	16 Unified	3	32768	1	64

```
/proc/cpuinfo cache data
cache size : 1024 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 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 96 97 98 99
100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119
```

```
node 0 size: 193272 MB
```

```
node 0 free: 191701 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
120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141
142 143
```

```
node 1 size: 193396 MB
```

```
node 1 free: 192810 MB
```

```
node 2 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71
144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165
166 167
```

```
node 2 size: 193519 MB
```

```
node 2 free: 192916 MB
```

```
node 3 cpus: 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
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 3 size: 193485 MB
```

```
node 3 free: 192779 MB
```

```
node distances:
```

```
node  0  1  2  3
0:  10  12  12  12
1:  12  10  12  12
2:  12  12  10  12
3:  12  12  12  10
```

```
From /proc/meminfo
```

```
MemTotal: 792243244 kB
```

```
HugePages_Total: 0
```

```
Hugepagesize: 2048 kB
```

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

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

```
os-release:
```

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### Platform Notes (Continued)

```

NAME="SLES"
VERSION="15-SP4"
VERSION_ID="15.4"
PRETTY_NAME="SUSE Linux Enterprise Server 15 SP4"
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15:sp4"

```

```

uname -a:
Linux localhost 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18
UTC 2022 (49db222) 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/swapgs barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2):	Mitigation: Retpolines, 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 Oct 20 16:58

SPEC is set to: /spec2017b1

```

Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/nvme0n1p4 xfs   2.0T   46G  2.0T   3% /

```

```

From /sys/devices/virtual/dmi/id
Vendor:          ASUSTeK COMPUTER INC.
Product:         RS520A-E12-RS12U
Product Family:  Server
Serial:          265227000405

```

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.

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### Platform Notes (Continued)

Memory:

12x Samsung M321R8GA0BB0-CQKVG 64 GB 2 rank 4800

BIOS:

BIOS Vendor: American Megatrends Inc.

BIOS Version: 0401

BIOS Date: 10/04/2022

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 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
=====

```

```

=====
C++       | 620.omnetpp_s(base, peak) 623.xalanbmk_s(base, peak)
          | 631.deepsjeng_s(base, peak) 641.leela_s(base, peak)
=====

```

```

AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
=====

```

```

=====
Fortran   | 648.exchange2_s(base, peak)
=====

```

```

AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
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## 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 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-allow-multiple-definition -O3 -march=znver4 -fveclib=AMDLIBM
-ffast-math -fopenmp -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -zopt -fopenmp=libomp -lomp -lamdlibm -lflang
-lamdalloc
```

C++ benchmarks:

```
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto
-mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-fvirtual-function-elimination -fvisibility=hidden -fopenmp=libomp
```

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## Base Optimization Flags (Continued)

C++ benchmarks (continued):

-lomp -lamdlibm -lflang -lamdalloc-ext

Fortran benchmarks:

-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3  
-Wl,-mllvm -Wl,-inline-recursion=4 -Wl,-mllvm -Wl,-lsr-in-nested-loop  
-Wl,-mllvm -Wl,-enable-iv-split -O3 -march=znver4 -fveclib=AMDLIBM  
-ffast-math -fopenmp -flto -mllvm -optimize-strided-mem-cost  
-mllvm -unroll-aggressive -mllvm -unroll-threshold=150 -fopenmp=libomp  
-lomp -lamdlibm -lflang -lamdalloc

## Base Other Flags

C benchmarks:

-Wno-return-type -Wno-unused-command-line-argument

C++ benchmarks:

-Wno-unused-command-line-argument

Fortran benchmarks:

-Wno-unused-command-line-argument

## Peak Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

flang

## Peak Portability Flags

Same as Base Portability Flags



# SPEC CPU®2017 Integer Speed Result

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**ASUSTeK Computer Inc.**

ASUS RS520A-E12(K14PA-U24) Server System  
2.40 GHz, AMD EPYC 9654

SPECspeed®2017\_int\_base = 14.1

SPECspeed®2017\_int\_peak = 14.3

**CPU2017 License:** 9016

**Test Sponsor:** ASUSTeK Computer Inc.

**Tested by:** ASUSTeK Computer Inc.

**Test Date:** Oct-2022

**Hardware Availability:** Nov-2022

**Software Availability:** Nov-2022

## Peak Optimization Flags

C benchmarks:

```
600.perlbench_s: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-allow-multiple-definition -Ofast -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto
-fstruct-layout=9 -mllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang
```

602.gcc\_s: basepeak = yes

605.mcf\_s: Same as 600.perlbench\_s

625.x264\_s: basepeak = yes

657.xz\_s: Same as 600.perlbench\_s

C++ benchmarks:

620.omnetpp\_s: basepeak = yes

```
623.xalancbmk_s: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-do-block-reorder=aggressive -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -finline-aggressive -mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-mllvm -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden
-fopenmp=libomp -lomp -lamdlibm -lamdalloc-ext -lflang
```

631.deepsjeng\_s: basepeak = yes

641.leela\_s: basepeak = yes

Fortran benchmarks:

648.exchange2\_s: basepeak = yes



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**Software Availability:** Nov-2022

## Peak Other Flags

C benchmarks:

-Wno-return-type -Wno-unused-command-line-argument

C++ benchmarks:

-Wno-unused-command-line-argument

Fortran benchmarks:

-Wno-unused-command-line-argument

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

<http://www.spec.org/cpu2017/flags/ASUSTekPlatform-Settings-AMD-K14-V1.0.html>

<http://www.spec.org/cpu2017/flags/aocc400-flags.html>

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

<http://www.spec.org/cpu2017/flags/ASUSTekPlatform-Settings-AMD-K14-V1.0.xml>

<http://www.spec.org/cpu2017/flags/aocc400-flags.xml>

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Tested with SPEC CPU®2017 v1.1.8 on 2022-10-20 18:19:05-0400.

Report generated on 2023-03-03 15:03:19 by CPU2017 PDF formatter v6442.

Originally published on 2022-11-11.