## SPEC CPU®2017 Integer Rate Result

**Dell Inc.**

PowerEdge R6615 (AMD EPYC 9174F 16-Core Processor)

<table>
<thead>
<tr>
<th>CPU2017 License: 6573</th>
<th>Test Date: Dec-2022</th>
</tr>
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<tbody>
<tr>
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<td>Hardware Availability: Dec-2022</td>
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<tr>
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<td>Software Availability: Nov-2022</td>
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### SPECrate®2017_int_base = 221

### SPECrate®2017_int_peak = Not Run

<table>
<thead>
<tr>
<th>SPEC Benchmark</th>
<th>CPM</th>
<th>Speedup</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>32</td>
<td>157</td>
<td>197</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>32</td>
<td>116</td>
<td>314</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>32</td>
<td>4</td>
<td>116</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>32</td>
<td>323</td>
<td></td>
</tr>
<tr>
<td>523.xalancbmk_r</td>
<td>32</td>
<td>512</td>
<td></td>
</tr>
<tr>
<td>525.x264_r</td>
<td>32</td>
<td>171</td>
<td></td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
<td>32</td>
<td>166</td>
<td></td>
</tr>
<tr>
<td>541.leela_r</td>
<td>32</td>
<td>482</td>
<td></td>
</tr>
<tr>
<td>548.exchange2_r</td>
<td>32</td>
<td>112</td>
<td></td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** AMD EPYC 9174F
- **Max MHz:** 4400
- **Nominal:** 4100
- **Enabled:** 16 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:** 256 MB I+D on chip per chip, 32 MB shared / 2 cores
- **Memory:** 768 GB (12 x 64 GB 2Rx4 PC5-4800B-R)
- **Storage:** 125 GB on tmpfs
- **Other:** None

### Software

- **OS:** Ubuntu 22.04.1 LTS 5.15.0-46-generic
- **Compiler:** C/C++/Fortran: Version 4.0.0 of AOCC
- **Parallel:** No
- **Firmware:** Version 1.1.0 released Nov-2022
- **File System:** tmpfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** Not Applicable
- **Other:** None

**Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage.
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### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds Base</th>
<th>Ratio Base</th>
<th>Seconds Peak</th>
<th>Ratio Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>32</td>
<td>325</td>
<td>157</td>
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<td>32</td>
<td>229</td>
<td>198</td>
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<td>32</td>
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<td>314</td>
<td>165</td>
<td>314</td>
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<tr>
<td>520.omnetpp_r</td>
<td>32</td>
<td>362</td>
<td>116</td>
<td>359</td>
<td>117</td>
</tr>
<tr>
<td>523.xalancbmk_r</td>
<td>32</td>
<td>105</td>
<td>323</td>
<td>105</td>
<td>323</td>
</tr>
<tr>
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<td>32</td>
<td>109</td>
<td>512</td>
<td>109</td>
<td>513</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
<td>32</td>
<td>214</td>
<td>172</td>
<td>214</td>
<td>171</td>
</tr>
<tr>
<td>541.leela_r</td>
<td>32</td>
<td>319</td>
<td>166</td>
<td>320</td>
<td>166</td>
</tr>
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<td>32</td>
<td>174</td>
<td>482</td>
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<td>32</td>
<td>310</td>
<td>112</td>
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<td>112</td>
</tr>
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</table>

### 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

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.

(Continued on next page)
Dell Inc.

PowerEdge R6615 (AMD EPYC 9174F 16-Core Processor)

SPECrate®2017_int_base = 221
SPECrate®2017_int_peak = Not Run

Operating System Notes (Continued)

To enable Transparent Hugepages (THP) only on request for base runs,
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root.
To enable THP for all allocations for peak runs,
'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:
LD_LIBRARY_PATH =
"/mnt/ramdisk/cpu2017-1.1.8-aocc400-B1b/amd_rate_aocc400_genoa_B_lib/lib
:/mnt/ramdisk/cpu2017-1.1.8-aocc400-B1b/amd_rate_aocc400_genoa_B_lib/lib
32:
"

MALLOC_CONF = "retain:true"

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.

Benchmark run from a 125 GB ramdisk created with the cmd: "mount -t tmpfs -o size=125G tmpfs /mnt/ramdisk"

Platform Notes

BIOS settings:
- DRAM Refresh Delay : Performance
- DIMM Self Healing on
- Uncorrectable Memory Error : Disabled
- Virtualization Technology : Disabled
- NUMA Nodes per Socket : 4
- L3 Cache as NUMA Domain : Enabled
- System Profile : Custom
- Memory Patrol Scrub : Disabled

(Continued on next page)
Platform Notes (Continued)

PCI ASPM L1 Link
  Power Management : Disabled
  Determinism Slider : Power Determinism

Sysinfo program /mnt/ramdisk/cpu2017-1.1.8-aocc400-B1b/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aca6464d
running on amd-sut Tue Dec 6 12:05:39 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 9174F 16-Core Processor
  1 "physical id"s (chips)
  32 "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 : 16
siblings : 32
physical 0: cores 0 1 8 9 16 17 24 25 32 33 40 41 48 49 56 57

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): 32
  On-line CPU(s) list: 0-31
  Vendor ID: AuthenticAMD
  Model name: AMD EPYC 9174F 16-Core Processor
  CPU family: 25
  Model: 17
  Thread(s) per core: 2
  Core(s) per socket: 16
  Socket(s): 1
  Stepping: 1
  Frequency boost: enabled
  CPU max MHz: 4409.0000
  CPU min MHz: 400.0000
  BogoMIPS: 8202.56
  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 rpl 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 ssse3
  misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb

(Continued on next page)
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Platform Notes (Continued)

bpext perfctr_llc mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsqsbce bmmi avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb avx512cd sha ni avx512bw avx512vl xsaveopt xsave ctg avx512c xsave cqm llc cqm_occup llc cqm_mmb_total cqm_mbb_local avx512_bf16 clzero irperf xsaverprr rdpru wboinvd amd_ppin ccpp arat npt lbv svm_lock nrp_save tsc_scale vmcb_clean flushbyasid decodeassist pausefilter pfilter avic v_vmsave_vmload vgIf v_spec_ctrl avx512v bmi umip pku ospke avx512_vbmi2 gfn vaes vpclmuldq avx512_vnni avx512_vbitalg avx512_vpocntdq la57 rdpid overflow_recov succor smca farm flush_11d
Virtualization: AMD-V
L1d cache: 512 KiB (16 instances)
L1i cache: 512 KiB (16 instances)
L2 cache: 16 MiB (16 instances)
L3 cache: 256 MiB (8 instances)
NUMA node(s): 8
NUMA node0 CPU(s): 0,1,16,17
NUMA node1 CPU(s): 8,9,24,25
NUMA node2 CPU(s): 4,5,20,21
NUMA node3 CPU(s): 12,13,28,29
NUMA node4 CPU(s): 6,7,22,23
NUMA node5 CPU(s): 14,15,30,31
NUMA node6 CPU(s): 2,3,18,19
NUMA node7 CPU(s): 10,11,26,27
Vulnerability Itlb multihit: Not affected
Vulnerability LlItf: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Mmio stale data: Not affected
Vulnerability Retbleed: 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 sanitation
Vulnerability Spectre v2: Mitigation; Retpolines, IBPB conditional, IBRS_FW, STIBP always-on, RSB filling
Vulnerability Srbd: Not affected
Vulnerability Tsx async abort: Not affected

From lscpu --cache:

<table>
<thead>
<tr>
<th>NAME</th>
<th>ONE-SIZE</th>
<th>ALL-SIZE</th>
<th>WAYS</th>
<th>TYPE</th>
<th>LEVEL</th>
<th>SETS</th>
<th>PHY-LINE</th>
<th>COHERENCY-SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1d</td>
<td>32K</td>
<td>512K</td>
<td>8</td>
<td>Data</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L1i</td>
<td>32K</td>
<td>512K</td>
<td>8</td>
<td>Instruction</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L2</td>
<td>1M</td>
<td>16M</td>
<td>8</td>
<td>Unified</td>
<td>2</td>
<td>2048</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L3</td>
<td>32M</td>
<td>256M</td>
<td>16</td>
<td>Unified</td>
<td>3</td>
<td>32768</td>
<td>1</td>
<td>64</td>
</tr>
</tbody>
</table>

/proc/cpuinfo cache data

Cache size: 1024 KB

(Continued on next page)
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---

**Platform Notes (Continued)**

From numactl --hardware

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

available: 8 nodes (0-7)
node 0 cpus: 0 1 16 17
node 0 size: 96312 MB
node 0 free: 96045 MB
node 1 cpus: 8 9 24 25
node 1 size: 96765 MB
node 1 free: 96581 MB
node 2 cpus: 4 5 20 21
node 2 size: 96731 MB
node 2 free: 96503 MB
node 3 cpus: 12 13 28 29
node 3 size: 96765 MB
node 3 free: 96564 MB
node 4 cpus: 6 7 22 23
node 4 size: 96766 MB
node 4 free: 96493 MB
node 5 cpus: 14 15 30 31
node 5 size: 96765 MB
node 5 free: 96496 MB
node 6 cpus: 2 3 18 19
node 6 size: 96766 MB
node 6 free: 96471 MB
node 7 cpus: 10 11 26 27
node 7 size: 96729 MB
node 7 free: 94769 MB

node distances:

node   0   1   2   3   4   5   6   7
0:  10  11  12  12  12  12  12  12
1:  11  10  12  12  12  12  12  12
2:  12  12  10  11  12  12  12  12
3:  12  12  11  10  12  12  12  12
4:  12  12  12  12  10  11  12  12
5:  12  12  12  12  11  10  12  12
6:  12  12  12  12  12  12  10  11
7:  12  12  12  12  12  12  11  10

From /proc/meminfo

MemTotal:       792171852 kB
HugePages_Total:       0
Hugepagesize:       2048 kB

/sbin/tuned-adm active

Current active profile: latency-performance

(Continued on next page)
Platform Notes (Continued)

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

/usr/bin/lsb_release -d
Ubuntu 22.04.1 LTS

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

debian_version: bookworm/sid
os-release:
  PRETTY_NAME="Ubuntu 22.04.1 LTS"
  NAME="Ubuntu"
  VERSION_ID="22.04"
  VERSION="22.04.1 LTS (Jammy Jellyfish)"
  VERSION_CODENAME=jammy
  ID=ubuntu
  ID_LIKE=debian
  HOME_URL="https://www.ubuntu.com/"

uname -a:
Linux amd-sut 5.15.0-46-generic #49-Ubuntu SMP Thu Aug 4 18:03:25 UTC 2022 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
mmio_stale_data: Not affected
retbleed: Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2018-3639 (Speculative Store Bypass):
CVE-2017-5753 (Spectre variant 1):
CVE-2017-5715 (Spectre variant 2):
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected
run-level 3 Nov 25 18:05

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.8-aocc400-B1b

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>tmpfs</td>
<td>tmpfs</td>
<td>125G</td>
<td>3.4G</td>
<td>122G</td>
<td>3%</td>
<td>/mnt/ramdisk</td>
</tr>
</tbody>
</table>
Platform Notes (Continued)

From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge R6615
Product Family: PowerEdge
Serial: GLM4030

Additional information from dmidecode 3.3 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:
12x 80AD000080AD HMCG94MEBRA109N 64 GB 2 rank 4800

BIOS:
BIOS Vendor: Dell Inc.
BIOS Version: 1.1.0
BIOS Date: 11/25/2022
BIOS Revision: 1.1

(End of data from sysinfo program)

Compiler Version Notes

==============================================
C
500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base)
525.x264_r(base) 557.xz_r(base)

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++
520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
541.leela_r(base)

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

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Compiler Version Notes (Continued)
==============================================================================
Fortran | 548.exchange2_r(base)
------------------------------------------------------------------------------
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
==============================================================================

Base Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

Fortran benchmarks:
flang

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:
-m64 -flto -Wl,-mllvm -Wl, -align-all-nofallthru-blocks=6
-Wl, -mllvm -Wl, -reduce-array-computations=3
-Wl, -mllvm -Wl, -ldist-scalar-expand -fenable-aggressive-gather
-z muldefs -O3 -march=znver4 -fveclib=AMDLIBM -ffast-math

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

**C** benchmarks (continued):
- `fstruct-layout=7` `-mllvm -unroll-threshold=50`
- `mllvm -inline-threshold=1000` `-fremap-arrays -fstrip-mining`
- `mllvm -reduce-array-computations=3` `-zopt -lamdlibm -lflang`
- `lamdalloc`

**C++** benchmarks:
- `-m64` `-flto` `-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
- `-Wl,-mllvm -Wl,-reduce-array-computations=3` `-z muldefs -O3`
- `-march=znver4` `-fveclib=AMDLIBM -ffast-math`
- `-mllvm -unroll-threshold=100` `-finline-aggressive`
- `-mllvm -loop-unswitch-threshold=200000`
- `-mllvm -reduce-array-computations=3` `-zopt`
- `-fvirtual-function-elimination` `-fvisibility=hidden` `-lamdlibm -lflang`
- `lamdalloc-ext`

**Fortran** benchmarks:
- `-m64` `-flto` `-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 -z muldefs -O3` `-march=znver4`
- `-fveclib=AMDLIBM -ffast-math -fepilog-vectorization-of-inductions`
- `-mllvm -optimize-strided-mem-cost -floop-transform`
- `-mllvm -unroll-aggressive` `-mllvm -unroll-threshold=500` `-lamdlibm`
- `-lflang` `-lamdalloc`

## Base Other Flags

**C** benchmarks:
- `-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
### SPEC CPU®2017 Integer Rate Result

**Dell Inc.**

PowerEdge R6615 (AMD EPYC 9174F 16-Core Processor)  

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| CPU2017 License  | 6573 |
| Test Sponsor     | Dell Inc. |
| Tested by        | Dell Inc. |

| Test Date         | Dec-2022 |
| Hardware Availability | Dec-2022 |
| Software Availability | Nov-2022 |

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


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