Dell Inc.

PowerEdge R6615 (AMD EPYC 9124 16-Core Processor)

<table>
<thead>
<tr>
<th>SPECrate®2017 int_base</th>
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<tbody>
<tr>
<td>SPECrate®2017 int_peak</td>
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<table>
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<tr>
<th>Copies</th>
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<tr>
<td>500.perlbench_r</td>
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<tr>
<td>502.gcc_r</td>
<td>152</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>261</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>93</td>
</tr>
<tr>
<td>523.xalancbmk_r</td>
<td>117</td>
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<tr>
<td>525.x264_r</td>
<td>429</td>
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<tr>
<td>531.deepsjeng_r</td>
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<td>541.leela_r</td>
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<tr>
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<td>405</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>85.7</td>
</tr>
</tbody>
</table>

**Hardware**

CPU Name: AMD EPYC 9124
Max MHz: 3700
Nominal: 3000
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: 64 MB I+D on chip per chip, 16 MB shared / 4 cores
Other: None
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.
SPECPower®2017 Integer Rate Result

Dell Inc.

PowerEdge R6615 (AMD EPYC 9124 16-Core Processor)

SPECrater®2017_int_base = 177
SPECrater®2017_int_peak = Not Run

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

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

Results Table

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<tr>
<td>520.omnetpp_r</td>
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<td>225</td>
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<td>146</td>
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<td>85.7</td>
<td>403</td>
<td>85.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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)
SPEC CPU®2017 Integer Rate Result

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---

**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:

```bash
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)
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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 982a61ec0915b55891ef0e16aca8c64d
running on amd-sut Sat Dec 3 19:30:39 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 9124 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 2 3 8 9 10 11 16 17 18 19 24 25 26 27

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 9124 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: 3713.0000
CPU min MHz: 400.0000
BogoMIPS: 6002.00
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
aperfmonperf rafi pni pclmulqdq monitor ssse3 fma cx16 pdcd 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 ibr skinit wdt tce topoext perfctr_core perfctr_nb

(Continued on next page)
SPEC CPU®2017 Integer Rate Result

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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 fsqsgbase bml1 avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb avx512cd sha_ni avx512bw avx512vl xsaveopt xsaves xgetbv1 xsavees cqm_llc cqm_occu05_llc cqm_mb_total cqm_mb_local avx512_bf16 clzero irperf xsavepptr rdpru wboinvd amd_pinn ccpp arat npt lbrv svm_lock nrp_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold avic v_vmsave_vmload vgfl v_spec_ctr1 avx512vbmi umip pku ospke avx512_vbm2 gfin vaes vpcxmuldq avx512_vnni avx512_bitalg avx512_vpopcntdq l3a57 rdfid overflow_reco0 succor smca farm flush_lld

Virtualization:

    AMD-V

    L1d cache:
    512 KiB (16 instances)

    L1i cache:
    512 KiB (16 instances)

    L2 cache:
    16 MiB (16 instances)

    L3 cache:
    64 MiB (4 instances)

    NUMA node(s):
    4

    NUMA node0 CPU(s):
    0-3,16-19

    NUMA node1 CPU(s):
    8-11,24-27

    NUMA node2 CPU(s):
    12-15,28-31

    NUMA node3 CPU(s):
    4-7,20-23

Vulnerability Itlb multihit:
Not affected

Vulnerability L1tf:
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 sanitization

Vulnerability Spectre v2:
Mitigation; Retpolines, IBPF conditional, IBRS_FW, STIBP always-on, RSB filling

Vulnerability Srbsd:
Not affected

Vulnerability Txs 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>
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<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>16M</td>
<td>64M</td>
<td>16</td>
<td>Unified</td>
<td>3</td>
<td>16384</td>
<td>1</td>
<td>64</td>
</tr>
</tbody>
</table>

From numactl --hardware

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

available: 4 nodes (0-3)
Platform Notes (Continued)

node 0 cpus: 0 1 2 3 16 17 18 19
node 0 size: 193079 MB
node 0 free: 192649 MB
node 1 cpus: 8 9 10 11 24 25 26 27
node 1 size: 193497 MB
node 1 free: 193058 MB
node 2 cpus: 12 13 14 15 28 29 30 31
node 2 size: 193533 MB
node 2 free: 189537 MB
node 3 cpus: 4 5 6 7 20 21 22 23
node 3 size: 193497 MB
node 3 free: 193081 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:       792174584 kB
HugePages_Total:       0
Hugepagesize:       2048 kB

/sbin/tuned-adm active
Current active profile: latency-performance

/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

(Continued on next page)
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Platform Notes (Continued)

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: 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 Dec 3 19:22
SPEC is set to: /mnt/ramdisk/cpu2017-1.1.8-aocc400-B1b
Filesystem     Type   Size  Used Avail Use% Mounted on
tmpfs          tmpfs  125G  3.4G  122G   3% /mnt/ramdisk
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

(Continued on next page)
Platform Notes (Continued)

(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

==============================================================================
| 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++

(Continued on next page)
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Base Compiler Invocation (Continued)

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 -W1,-mlllvm -W1,-align-all-nofallthru-blocks=6
-W1,-mlllvm -W1,-reduce-array-computations=3
-W1,-mlllvm -W1,-ldist-scalar-expand -fenable-aggressive-gather
-z muldefs -O3 -march=znver4 -ffast-math
-fstruct-layout=7 -mlllvm -unroll-threshold=50
-mlllvm -inline-threshold=1000 -fremap-arrays -fstrip-mining
-mlllvm -reduce-array-computations=3 -zopt -lamdlibm -lflang
-lamdaloc

C++ benchmarks:
-m64 -flto -W1,-mlllvm -W1,-align-all-nofallthru-blocks=6
-W1,-mlllvm -W1,-reduce-array-computations=3 -z muldefs -O3
-march=znver4 -ffast-math
-mlllvm -unroll-threshold=100 -finline-aggressive
-mlllvm -loop-unswitch-threshold=200000
-mlllvm -reduce-array-computations=3 -zopt
-fvirtual-function-elimination -fvisibility=hidden -lamdlibm -lflang
-lamdaloc-ext

Fortran benchmarks:
-m64 -flto -W1,-mlllvm -W1,-align-all-nofallthru-blocks=6
-W1,-mlllvm -W1,-reduce-array-computations=3
-W1,-mlllvm -W1,-inline-recursion=4 -W1,-mlllvm -W1,-lsr-in-nested-loop

(Continued on next page)
**SPEC CPU®2017 Integer Rate Result**

**Dell Inc.**

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**Base Optimization Flags (Continued)**

Fortran benchmarks (continued):
- `-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:

You can also download the XML flags sources by saving the following links:
- http://www.spec.org/cpu2017/flags/aocc400-flags.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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