### SPEC CPU®2017 Integer Rate Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant DL325 Gen10 Plus v2  
(2.75 GHz, AMD EPYC 7453)

**SPECrate®2017_int_base = 220**  
**SPECrate®2017_int_peak = 229**

<table>
<thead>
<tr>
<th>Test Date:</th>
<th>Apr-2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware Availability:</td>
<td>Jul-2021</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Mar-2021</td>
</tr>
</tbody>
</table>

#### Hardware

<table>
<thead>
<tr>
<th>CPU Name:</th>
<th>AMD EPYC 7453</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max MHz:</td>
<td>3450</td>
</tr>
<tr>
<td>Nominal:</td>
<td>2750</td>
</tr>
<tr>
<td>Enabled:</td>
<td>28 cores, 1 chip, 2 threads/core</td>
</tr>
<tr>
<td>Orderable:</td>
<td>1 chip</td>
</tr>
<tr>
<td>Cache L1:</td>
<td>32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>L2:</td>
<td>512 KB I+D on chip per core</td>
</tr>
<tr>
<td>L3:</td>
<td>64 MB I+D on chip per chip, 16 MB shared / 7 cores</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
</tr>
<tr>
<td>Memory:</td>
<td>1 TB (8 x 128 GB 4Rx4 PC4-3200AA-L)</td>
</tr>
<tr>
<td>Storage:</td>
<td>1 x 800 GB SAS SSD, RAID 0</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
</tr>
</tbody>
</table>

#### Software

| OS: | Ubuntu 20.04.1 LTS (x86_64) |
| Compiler: | Kernel 5.4.0-54-generic |
| Parallel: | No |
| Firmware: | C/C++/Fortran: Version 3.0.0 of AOCC |
| File System: | No |
| System State: | HPE BIOS Version A43 v2.42 04/15/2021 released Apr-2021 |
| Power Management: | ext4 |
| Other: | run level 5 (multi-user, GUI disabled) |
| Base Pointers: | 64-bit |
| Peak Pointers: | 32/64-bit |
| Other: | BIOS and OS set to prefer performance at the cost of additional power usage |

#### SPECrate®2017_int_base = 220

| SPECrate®2017_int_peak = 229 |

<table>
<thead>
<tr>
<th>Copies</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
</tr>
<tr>
<td>502.gcc_r</td>
</tr>
<tr>
<td>505.mcf_r</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
</tr>
<tr>
<td>523.xalancbmk_r</td>
</tr>
<tr>
<td>525.x264_r</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
</tr>
<tr>
<td>541.leela_r</td>
</tr>
<tr>
<td>548.exchange2_r</td>
</tr>
<tr>
<td>557.xz_r</td>
</tr>
</tbody>
</table>

| 0 | 30.0 | 60.0 | 90.0 | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 330 | 360 | 390 | 420 | 450 | 480 | 510 | 540 | 570 |
| 56 | 155 | 163 | 157 | 195 | 328 | 330 | 240 | 273 | 489 | 563 | 56 |

---

**Note:** The table above shows the SPEC CPU®2017 Integer Rate Result for the specified system configuration. The tables and graphs illustrate the performance of various benchmarks and applications, highlighting the system's capabilities in terms of computational intensity.
## SPEC CPU®2017 Integer Rate Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL325 Gen10 Plus v2
(2.75 GHz, AMD EPYC 7453)

### Specification
- CPU2017 License: 3
- Test Sponsor: HPE
- Tested by: HPE

### Results Table

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<tr>
<th>Benchmark</th>
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<th>Seconds</th>
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<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>56</td>
<td>574</td>
<td>155</td>
<td>573</td>
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<td>97.1</td>
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<td>97.9</td>
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<td>214</td>
<td>438</td>
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</tr>
<tr>
<td>548.exchange2_r</td>
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<td>261</td>
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<td>563</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>56</td>
<td>504</td>
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<td>507</td>
<td>119</td>
<td>504</td>
<td>120</td>
<td>56</td>
<td>120</td>
<td>504</td>
<td>120</td>
</tr>
</tbody>
</table>

### 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
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 8 > /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.
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root for peak

(Continued on next page)
Operating System Notes (Continued)
integer runs and all FP runs to enable Transparent Hugepages (THP).
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root for base
integer runs to enable THP only on request.

Environment Variables Notes
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
"/cpu2017/amd_rate_aocc300_milan_A_lib/64;/cpu2017/amd_rate_aocc300_milan_A_lib/32:""MALLOC_CONF = "retain:true"

Environment variables set by runcpu during the 523.xalancbmk_r peak run:
MALLOC_CONF = "thp:never"

General Notes
Binaries were compiled on a system with 2x AMD EPYC 7742 CPU + 512GiB 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.

tumalloc: configured and built with GCC v4.8.2 in RHEL 7.4 (No options specified)
tumalloc 5.1.0 is available here:
https://github.com/jemalloc/jemalloc/releases/download/5.1.0/jemalloc-5.1.0.tar.bz2

Submitted by: "Bucek, James" <james.bucek@hpe.com>
Submitted: Mon May 24 19:05:31 EDT 2021
Submission: cpu2017-20210524-26570.sub

Platform Notes
BIOS Configuration
Workload Profile set to General Throughput Compute
Determinism Control set to Manual
Performance Determinism set to Power Deterministic
Last-Level Cache (LLC) as NUMA Node set to Enabled
Memory PStates set to Disabled
Data Fabric C-State Enable set to Force Enabled

(Continued on next page)
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Hardware Availability: Jul-2021
CPU2017 License: 3
Test Date: Apr-2021
Tested by: HPE
Software Availability: Mar-2021

**Platform Notes (Continued)**

Thermal Configuration set to Maximum Cooling
Workload Profile set to Custom
    Infinity Fabric Power Management set to Disabled
    Infinity Fabric Performance State set to P0
L2 HW Prefetcher set to Disabled

The system ROM used for this result contains AMD microcode version 0xa00111d
for the AMD EPYC 7453 processor.

Sysinfo program /cpu2017/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aca6c4d64d
running on dl325gen10plus Wed Apr 1 12:24:42 2020

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 7453 28-Core Processor
    1 "physical id"s (chips)
    56 "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 : 28
    siblings : 56
    physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
    28 29 30

From lscpu from util-linux 2.34:
    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): 56
    On-line CPU(s) list: 0-55
    Thread(s) per core: 2
    Core(s) per socket: 28
    Socket(s): 1
    NUMA node(s): 4
    Vendor ID: AuthenticAMD
    CPU family: 25
    Model: 1
    Model name: AMD EPYC 7453 28-Core Processor
    Stepping: 1
    CPU MHz: 3447.714
    BogoMIPS: 5489.84
    Virtualization: AMD-V

(Continued on next page)
### Platform Notes (Continued)

<table>
<thead>
<tr>
<th>Type</th>
<th>Size</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1d cache</td>
<td>896 KiB</td>
<td></td>
</tr>
<tr>
<td>L1i cache</td>
<td>896 KiB</td>
<td></td>
</tr>
<tr>
<td>L2 cache</td>
<td>14 MiB</td>
<td>3</td>
</tr>
<tr>
<td>L3 cache</td>
<td>64 MiB</td>
<td>3</td>
</tr>
<tr>
<td>NUMA node0 CPU(s):</td>
<td>0-6,28-34</td>
<td></td>
</tr>
<tr>
<td>NUMA node1 CPU(s):</td>
<td>7-13,35-41</td>
<td></td>
</tr>
<tr>
<td>NUMA node2 CPU(s):</td>
<td>14-20,42-48</td>
<td></td>
</tr>
<tr>
<td>NUMA node3 CPU(s):</td>
<td>21-27,49-55</td>
<td></td>
</tr>
<tr>
<td>Vulnerability Itlb multihit:</td>
<td>Not affected</td>
<td></td>
</tr>
<tr>
<td>Vulnerability L1f:</td>
<td>Not affected</td>
<td></td>
</tr>
<tr>
<td>Vulnerability Mds:</td>
<td>Not affected</td>
<td></td>
</tr>
<tr>
<td>Vulnerability Meltdown:</td>
<td>Not affected</td>
<td></td>
</tr>
<tr>
<td>Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vulnerability Spectre v2: Mitigation; Full AMD retpoline, IBPB conditional, IBRS_FW, STIBP always-on, RSB filling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vulnerability Srbds:</td>
<td>Not affected</td>
<td></td>
</tr>
<tr>
<td>Vulnerability Tsx async abort:</td>
<td>Not affected</td>
<td></td>
</tr>
<tr>
<td>Flags:</td>
<td>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 xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3nowprefetch osvw skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_l1l mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fgsgbase bml1 avx2 smep bmi2 invpcid cqm rdt_a rdseed adx smap clflushopt clwb sha ni xsaveopt xsavec xgetbv1 xsave xsaves cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local clzero iperf xsaverpr wbenoinvd arat npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold v_vmsave_vmr save vpclmulqdq rdpid overflow_recov succor smca</td>
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</tr>
</tbody>
</table>

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>
</tr>
</thead>
<tbody>
<tr>
<td>L1d</td>
<td>32K</td>
<td>896K</td>
<td>8</td>
<td>Data</td>
<td>1</td>
</tr>
<tr>
<td>L1i</td>
<td>32K</td>
<td>896K</td>
<td>8</td>
<td>Instruction</td>
<td>1</td>
</tr>
<tr>
<td>L2</td>
<td>512K</td>
<td>14M</td>
<td>8</td>
<td>Unified</td>
<td>2</td>
</tr>
<tr>
<td>L3</td>
<td>16M</td>
<td>64M</td>
<td>16</td>
<td>Unified</td>
<td>3</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)

node 0 cpus: 0 1 2 3 4 5 6 28 29 30 31 32 33 34
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<th>Apr-2021</th>
</tr>
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<tbody>
<tr>
<td>Test Sponsor: HPE</td>
<td>Hardware Availability:</td>
<td>Jul-2021</td>
</tr>
<tr>
<td>Tested by: HPE</td>
<td>Software Availability:</td>
<td>Mar-2021</td>
</tr>
</tbody>
</table>

Platform Notes (Continued)

```
node 0 size: 257772 MB
node 0 free: 257073 MB
node 1 cpus: 7 8 9 10 11 12 13 35 36 37 38 39 40 41
node 1 size: 258044 MB
node 1 free: 257738 MB
node 2 cpus: 14 15 16 17 18 19 20 42 43 44 45 46 47 48
node 2 size: 258044 MB
node 2 free: 257766 MB
node 3 cpus: 21 22 23 24 25 26 27 49 50 51 52 53 54 55
node 3 size: 258031 MB
node 3 free: 257745 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:       1056658040 kB
  HugePages_Total:       0
  Hugepagesize:       2048 kB

/usr/bin/lsb_release -d
  Ubuntu 20.04.1 LTS

From /etc/*release* /etc/*version*
  debian_version: bullseye/sid
  os-release:
    NAME="Ubuntu"
    VERSION="20.04.1 LTS (Focal Fossa)"
    ID=ubuntu
    ID_LIKE=debian
    PRETTY_NAME="Ubuntu 20.04.1 LTS"
    VERSION_ID="20.04"
    HOME_URL="https://www.ubuntu.com/"
    SUPPORT_URL="https://help.ubuntu.com/"

uname -a:
  Linux dl325gen10plus 5.4.0-54-generic #60-Ubuntu SMP Fri Nov 6 10:37:59 UTC 2020
  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
```

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**Platform Notes (Continued)**

CVE-2017-5745 (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-2017-5753 (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 5 Apr 1 12:23

SPEC is set to: /cpu2017

<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>/dev/sdb2</td>
<td>ext4</td>
<td>733G</td>
<td>27G</td>
<td>669G</td>
<td>4%</td>
<td>/</td>
</tr>
</tbody>
</table>

From /sys/devices/virtual/dmi/id

Vendor: HPE
Product: ProLiant DL325 Gen10 Plus
Product Family: ProLiant
Serial: CN79290FKQ

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 M386AAG40AM3-CWE 128 GB 4 rank 3200
- 8x UNKNOWN NOT AVAILABLE

BIOS:
- BIOS Vendor: HPE
- BIOS Version: A43
- BIOS Date: 04/15/2021
- BIOS Revision: 2.42
- Firmware Revision: 2.40

(End of data from sysinfo program)

---

**Compiler Version Notes**

```
C   | 502.gcc_r(peak)
```

(Continued on next page)
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Compiler Version Notes (Continued)

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: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin

---------------------------
C       | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak)
        | 525.x264_r(base, peak) 557.xz_r(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       | 502.gcc_r(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: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin

---------------------------
C       | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak)
        | 525.x264_r(base, peak) 557.xz_r(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++      | 523.xalancbmk_r(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: i386-unknown-linux-gnu
Thread model: posix

(Continued on next page)
### Compiler Version Notes (Continued)

InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin

---

C++

<table>
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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++

| 523.xalancbmk_r(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: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin

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C++

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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 | 548.exchange2_r(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
SPEC CPU®2017 Integer Rate Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL325 Gen10 Plus v2
(2.75 GHz, AMD EPYC 7453)

SPECrate®2017_int_base = 220
SPECrate®2017_int_peak = 229

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Test Date: Apr-2021
Hardware Availability: Jul-2021
Software Availability: Mar-2021

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 -Wl,--allow-multiple-definition -Wl,-mllvm -Wl,-enable-licm-vrp
-fflto -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 -ffast-math
-march=znver3 -fveclib=AMDLIBM -fstruct-layout=5
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-caremap-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
-lamdlibm -ljemalloc -lflang -lflangrti

C++ benchmarks:
-m64 -std=c++98 -Wl,-mllvm -Wl,-do-block-reorder=aggressive -flto
-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 -ffast-math

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

**Hewlett Packard Enterprise**
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**CPU2017 License:** 3  
**Test Sponsor:** HPE  
**Tested by:** HPE

**Test Date:** Apr-2021  
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### Base Optimization Flags (Continued)

C++ benchmarks (continued):
- `march=znver3 -fveclib=AMDLIBM -mllvm -enable-partial-unswitch`  
- `mllvm -unroll-threshold=100 -finline-aggressive`  
- `fllvm-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 -lamdlibm`  
- `-ljemalloc -lflang -lflangrti`

Fortran benchmarks:
- `-m64 -Wl,-mllvm -Wl,-inline-recursion=4`  
- `-Wl,-mllvm -Wl,-lsr-in-nested-loop -Wl,-mllvm -Wl,-enable-iv-split`  
- `-flto -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 -ffast-math`  
- `-march=znver3 -fveclib=AMDLIBM -z muldefs -mllvm -unroll-aggressive`  
- `-mllvm -unroll-threshold=500 -lamdlibm -ljemalloc -lflang -lflangrti`

### Base Other Flags

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

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

### Peak Compiler Invocation

C benchmarks:
- `clang`

C++ benchmarks:
- `clang++`

Fortran benchmarks:
- `flang`
**SPEC CPU®2017 Integer Rate Result**

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---

### Peak Portability Flags

- `500.perlbench_r`  
  -DSPEC_LINUX_X64  
  -DSPEC_LP64

- `502.gcc_r`  
  -D_FILE_OFFSET_BITS=64

- `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

(Continued on next page)

### Peak Optimization Flags

**C benchmarks:**

- `500.perlbench_r`  
  -m64  
  -Wl,-allow-multiple-definition  
  -Wl,-mllvm  
  -Wl,-enable-llicm-vrp  
  -flto  
  -Wl,-mllvm  
  -Wl,-function-specialize  
  -Wl,-mllvm  
  -Wl,-align-all-nofallthru-blocks=6  
  -Wl,-mllvm  
  -Wl,-reduce-array-computations=3  
  -fprofile-instr-generate(pass 1)  
  -fprofile-instr-use(pass 2)  
  -Ofast  
  -march=znver3  
  -fveclib=AMDLIBM  
  -fstruct-layout=7  
  -mlvm -unroll-threshold=50  
  -fremap-arrays  
  -flv-function-specialization  
  -mlvm -inline-threshold=1000  
  -mlvm -enable-gvn-hoist  
  -mlvm -global-vectorize-slp=false  
  -mlvm -function-specialize  
  -mlvm -enable-llicm-vrp  
  -mlvm -reduce-array-computations=3  
  -lamdlibm -ljemalloc

- `502.gcc_r`  
  -m32  
  -Wl,-allow-multiple-definition  
  -Wl,-mllvm  
  -Wl,-enable-llicm-vrp  
  -flto  
  -Wl,-mllvm  
  -Wl,-function-specialize  
  -Ofast  
  -march=znver3  
  -fveclib=AMDLIBM  
  -fstruct-layout=7  
  -mlvm -unroll-threshold=50  
  -fremap-arrays  
  -flv-function-specialization  
  -mlvm -inline-threshold=1000  
  -mlvm -enable-gvn-hoist  
  -mlvm -global-vectorize-slp=true  
  -mlvm -function-specialize  
  -mlvm -enable-llicm-vrp  
  -mlvm -reduce-array-computations=3  
  -fgnu89-inline  
  -ljemalloc

- `505.mcf_r`  
  -m64  
  -Wl,-allow-multiple-definition  
  -Wl,-mllvm  
  -Wl,-enable-llicm-vrp  
  -flto  
  -Wl,-mllvm  
  -Wl,-function-specialize  
  -Wl,-mllvm  
  -Wl,-align-all-nofallthru-blocks=6
Peak Optimization Flags (Continued)

505.mcf_r (continued):
-W1,-mllvm -W1,-reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -fstrict-layout=7
-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 -lamdlibm -ljemalloc

525.x264_r: basepeak = yes

557.xz_r: basepeak = yes

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: -m32 -W1,-mllvm -W1,-do-block-reorder=aggressive -flto
-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 -finline-aggressive
-mllvm -unroll-threshold=100 -flv-function-specialization
-mllvm -enable-licm-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
-ljemalloc

531.deepsjeng_r: -m64 -std=c++98
-W1,-mllvm -W1,-do-block-reorder=aggressive -flto
-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 -finline-aggressive
-mllvm -unroll-threshold=100 -flv-function-specialization
-mllvm -enable-licm-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
-lamdlibm -ljemalloc

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CPU2017 License: 3
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Peak Optimization Flags (Continued)

541.leela_r: basepeak = yes
Fortran benchmarks:
548.exchange2_r: basepeak = yes

Peak Other Flags

C benchmarks (except as noted below):
-Wno-unused-command-line-argument
502.gcc_r -L/usr/lib -Wno-unused-command-line-argument
-L/sppo/bin/cpu2017v115aoccc3/amd_rate_aoccc300_milan_A_lib/32
C++ benchmarks (except as noted below):
-Wno-unused-command-line-argument
523.xalancbmk_r -L/usr/lib -Wno-unused-command-line-argument
-L/sppo/bin/cpu2017v115aoccc3/amd_rate_aoccc300_milan_A_lib/32

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revP.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revP.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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