SPEC® CPU2017 Integer Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)
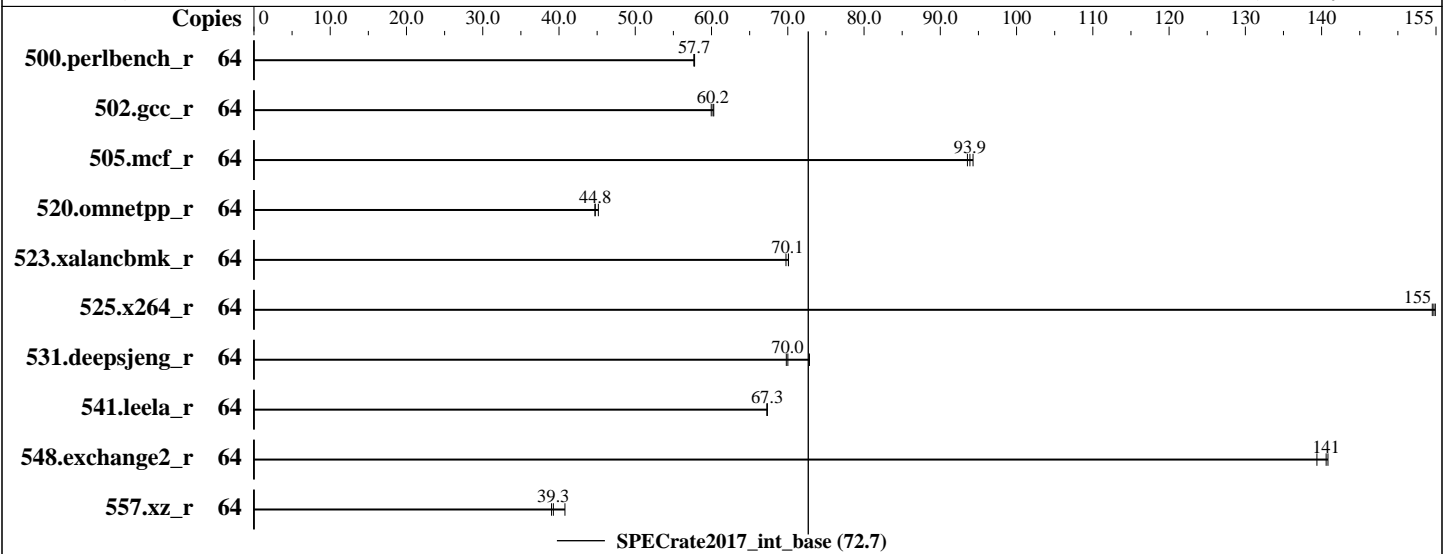
ProLiant DL325 Gen10
(2.10 GHz, AMD EPYC 7281)

$SPECrate2017\_int\_base =$ 72.7

$SPECrate2017\_int\_peak =$ Not Run

CPU2017 License: 3　　　　　　　　　　　　　　　　　**Test Date:** Jun-2018
Test Sponsor: HPE　　　　　　　　　　　　　　**Hardware Availability:** Jul-2018
Tested by: HPE　　　　　　　　　　　　　　**Software Availability:** May-2018

Copies		Value
500.perlbench_r	64	57.7
502.gcc_r	64	60.2
505.mcf_r	64	93.9
520.omnetpp_r	64	44.8
523.xalancbmk_r	64	70.1
525.x264_r	64	155
531.deepsjeng_r	64	70.0
541.leela_r	64	67.3
548.exchange2_r	64	141
557.xz_r	64	39.3

SPECrate2017_int_base (72.7)

Hardware

CPU Name: AMD EPYC 7281
 Max MHz.: 2700
 Nominal: 2100
Enabled: 16 cores, 1 chip, 2 threads/core
Orderable: 1 chip
Cache L1: 64 KB I + 32 KB D on chip per core
 L2: 512 KB I+D on chip per core
 L3: 32 MB I+D on chip per chip, 4 MB shared / 2 cores
 Other: None
Memory: 128 GB (8 x 16 GB 1Rx4 PC4-2666V-R, running at 2400)
Storage: 1 x 480 GB SATA SSD, RAID 0
Other: None

Software

OS: SUSE Linux Enterprise Server 12 (x86_64) SP3 Kernel 4.4.131-94.25-default
Compiler: C/C++: Version 1.0.0 of AOCC Fortran: Version 4.8.2 of GCC
Parallel: No
Firmware: HPE BIOS Version A41 04/06/2018 released Jul-2018
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: jemalloc: general purpose malloc implementation v4.5.0

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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	64	1766	57.7	**1765**	**57.7**	1763	57.8							
502.gcc_r	64	1503	60.3	1511	60.0	**1506**	**60.2**							
505.mcf_r	64	**1102**	**93.9**	1097	94.3	1105	93.6							
520.omnetpp_r	64	1859	45.2	**1876**	**44.8**	1878	44.7							
523.xalancbmk_r	64	964	70.1	969	69.8	**964**	**70.1**							
525.x264_r	64	723	155	**724**	**155**	725	155							
531.deepsjeng_r	64	1007	72.8	1051	69.8	**1048**	**70.0**							
541.leela_r	64	1575	67.3	1575	67.3	**1575**	**67.3**							
548.exchange2_r	64	**1193**	**141**	1191	141	1203	139							
557.xz_r	64	1695	40.8	**1760**	**39.3**	1771	39.0							
SPECrate2017_int_base =		**72.7**												
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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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
'ulimit -l 2097152' was used to set environment locked pages in memory limit

runspec command invoked through numactl i.e.:
numactl --interleave=all runspec <etc>

Set dirty_ratio=8 to limit dirty cache to 8% of memory
Set swappiness=1 to swap only if necessary
Set zone_reclaim_mode=1 to free local node memory and avoid remote memory
sync then drop_caches=3 to reset caches before invoking runcpu
Linux governor set to performance with cpupower "cpupower frequency-set -r -g performance"
dirty_ratio, swappiness, zone_reclaim_mode and drop_caches were
all set using privileged echo (e.g. echo 1 > /proc/sys/vm/swappiness).
Transparent huge pages were enabled for this run (OS default)
Huge pages were not configured for this run.
IRQ balance service stopped using "systemctl stop irqbalance.service"
Tuned profile set with "tuned-adm profile throughput-performance"
```

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General Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017/amd1704-rate-libs-revC/64;/home/cpu2017/amd1704-rate-libs-revC/32:"
MALLOC_CONF = "lg_chunk:26"

The AMD64 AOCC Compiler Suite is available at
http://developer.amd.com/amd-aocc/


Binaries were compiled on a system with 2x AMD EPYC 7601 CPU + 512GB Memory using RHEL 7.4



The AOCC Gold Linker plugin was installed and used for the link stage.


The AOCC Fortran Plugin version 1.0 was used to leverage AOCC optimizers
with gfortran. It is available here:
http://developer.amd.com/amd-aocc/


 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.
jemalloc, a general purpose malloc implementation, was obtained at
https://github.com/jemalloc/jemalloc/releases/download/4.5.0/jemalloc-4.5.0.tar.bz2
jemalloc was built with GCC v4.8.5 in RHEL v7.2 under default conditions.
jemalloc uses environment variable MALLOC_CONF with values narenas and lg_chunk:
  narenas: sets the maximum number of arenas to use for automatic multiplexing
           of threads and arenas.
  lg_chunk: set the virtual memory chunk size (log base 2). For example,
            lg_chunk:21 sets the default chunk size to 2^21 = 2MiB.
```

Platform Notes

```
 BIOS Configuration:
  Thermal Configuration set to Maximum Cooling
  Memory Patrol Scrubbing set to Disabled
  Performance Determinism set to Power Deterministic
  Processor Power and Utilization Monitoring set to Disabled
  Workload Profile set to General Throughput Compute
    Minimum Processor Idle Power Core C-State set to C6 State
 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
 running on dl325g10-7501 Thu Jun 21 12:00:55 2018

 SUT (System Under Test) info as seen by some common utilities.
 For more information on this section, see
```

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Platform Notes (Continued)

```
   https://www.spec.org/cpu2017/Docs/config.html#sysinfo

From /proc/cpuinfo
   model name : AMD EPYC 7281 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 4 5 8 9 12 13 16 17 20 21 24 25 28 29

From lscpu:
   Architecture:          x86_64
   CPU op-mode(s):        32-bit, 64-bit
   Byte Order:            Little Endian
   CPU(s):                32
   On-line CPU(s) list:   0-31
   Thread(s) per core:    2
   Core(s) per socket:    16
   Socket(s):             1
   NUMA node(s):          4
   Vendor ID:             AuthenticAMD
   CPU family:            23
   Model:                 1
   Model name:            AMD EPYC 7281 16-Core Processor
   Stepping:              2
   CPU MHz:               2100.000
   CPU max MHz:           2100.0000
   CPU min MHz:           1200.0000
   BogoMIPS:              4191.79
   Virtualization:        AMD-V
   L1d cache:             32K
   L1i cache:             64K
   L2 cache:              512K
   L3 cache:              4096K
   NUMA node0 CPU(s):     0-3,16-19
   NUMA node1 CPU(s):     4-7,20-23
   NUMA node2 CPU(s):     8-11,24-27
   NUMA node3 CPU(s):     12-15,28-31
   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 extd_apicid amd_dcm aperfmperf eagerfpu pni
   pclmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx f16c
   rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch
   osvw skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_l2 mwaitx arat cpb
   hw_pstate rds retpoline retpoline_amd npt lbrv svm_lock nrip_save tsc_scale
```

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Platform Notes (Continued)

```
     vmcb_clean flushbyasid decodeassists pausefilter pfthreshold vmmcall avic fsgsbase
     bmi1 avx2 smep bmi2 rdseed adx smap clflushopt sha_ni xsaveopt xsavec xgetbv1 clzero
     irperf ibpb 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: 4 nodes (0-3)
   node 0 cpus: 0 1 2 3 16 17 18 19
   node 0 size: 32002 MB
   node 0 free: 31852 MB
   node 1 cpus: 4 5 6 7 20 21 22 23
   node 1 size: 32254 MB
   node 1 free: 32112 MB
   node 2 cpus: 8 9 10 11 24 25 26 27
   node 2 size: 32254 MB
   node 2 free: 32116 MB
   node 3 cpus: 12 13 14 15 28 29 30 31
   node 3 size: 32133 MB
   node 3 free: 31991 MB
   node distances:
   node   0   1   2   3
     0:  10  16  16  16
     1:  16  10  16  16
     2:  16  16  10  16
     3:  16  16  16  10

 From /proc/meminfo
    MemTotal:       131731036 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

 /usr/bin/lsb_release -d
    SUSE Linux Enterprise Server 12 SP3

 From /etc/*release* /etc/*version*
    SuSE-release:
       SUSE Linux Enterprise Server 12 (x86_64)
       VERSION = 12
       PATCHLEVEL = 3
       # This file is deprecated and will be removed in a future service pack or release.
       # Please check /etc/os-release for details about this release.
    os-release:
       NAME="SLES"
       VERSION="12-SP3"
```

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Platform Notes (Continued)

```
        VERSION_ID="12.3"
        PRETTY_NAME="SUSE Linux Enterprise Server 12 SP3"
        ID="sles"
        ANSI_COLOR="0;32"
        CPE_NAME="cpe:/o:suse:sles:12:sp3"

  uname -a:
     Linux dl325g10-7501 4.4.131-94.25-default #1 SMP Mon May 7 11:22:19 UTC 2018 (9700bac)
     x86_64 x86_64 x86_64 GNU/Linux

  run-level 3 Jun 21 11:58

  SPEC is set to: /home/cpu2017
     Filesystem      Type  Size  Used Avail Use% Mounted on
     /dev/sdc3       xfs   407G  6.0G  401G   2% /home

  Additional information from dmidecode 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.
    BIOS HPE A41 04/06/2018
    Memory:
     8x UNKNOWN NOT AVAILABLE
     8x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2666, configured at 2400

  (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
  CC  500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base) 525.x264_r(base)
      557.xz_r(base)
------------------------------------------------------------------------------
AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM
  AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin
------------------------------------------------------------------------------


==============================================================================
  CXXC 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
       541.leela_r(base)
------------------------------------------------------------------------------
AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM
  AOCC.LLVM.4.0.0.B35.2017_04_26)
```

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Compiler Version Notes (Continued)

```
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin
------------------------------------------------------------------------


==============================================================================
  FC  548.exchange2_r(base)
------------------------------------------------------------------------
GNU Fortran (GCC) 4.8.2
Copyright (C) 2013 Free Software Foundation, Inc.
GNU Fortran comes with NO WARRANTY, to the extent permitted by law.
You may redistribute copies of GNU Fortran
under the terms of the GNU General Public License.
For more information about these matters, see the file named COPYING
------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

Fortran benchmarks:
clang gfortran

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
```

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Base Optimization Flags

C benchmarks:
```
-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop
-disable-vect-cmp -O3 -ffast-math -march=znver1 -fstruct-layout=2
-mllvm -unroll-threshold=100 -fremap-arrays -mno-avx2
-inline-threshold=1000 -z muldefs -ljemalloc
```

C++ benchmarks:
```
-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop
-disable-vect-cmp -O3 -march=znver1 -mllvm -unroll-threshold=100
-finline-aggressive -fremap-arrays -inline-threshold=1000 -z muldefs
-ljemalloc
```

Fortran benchmarks:
```
-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop
-disable-vect-cmp -O3 -mavx -madx -funroll-loops -ffast-math
-z muldefs -Ofast -fdefault-integer-8 -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=" -enable-iv-split
-inline-threshold:1000 -disable-vect-cmp" -ljemalloc -lgfortran
-lamdlibm
```

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-revD.html
http://www.spec.org/cpu2017/flags/aocc100-flags-revC-I.2018-02-16.html
http://www.spec.org/cpu2017/flags/gcc.2018-02-16.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-revD.xml
http://www.spec.org/cpu2017/flags/aocc100-flags-revC-I.2018-02-16.xml
http://www.spec.org/cpu2017/flags/gcc.2018-02-16.xml

For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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