SPEC CPU®2017 Integer Rate Result

Copyright 2017-2022 Standard Performance Evaluation Corporation

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL560 Gen10
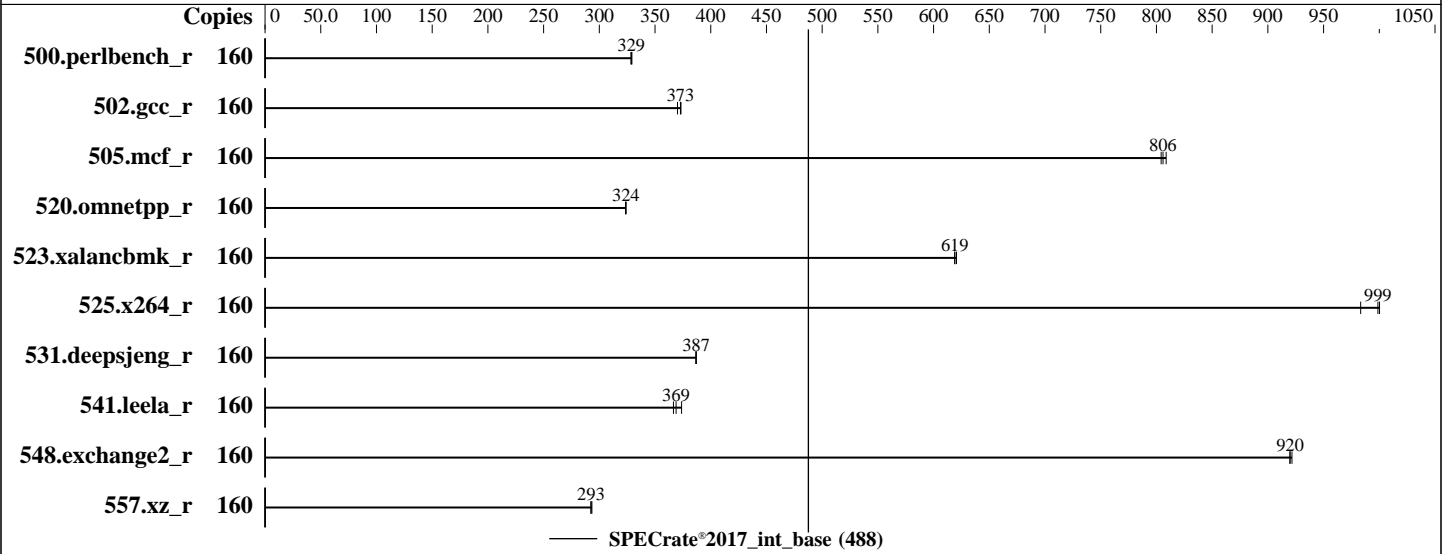(2.30 GHz, Intel Xeon Gold 6230N)

$SPECrate®2017\_int\_base =$ 488

$SPECrate®2017\_int\_peak =$ Not Run

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: May-2022

Hardware Availability: Feb-2022

Software Availability: Jun-2021

Copies		
500.perlbench_r	160	329
502.gcc_r	160	373
505.mcf_r	160	806
520.omnetpp_r	160	324
523.xalancbmk_r	160	619
525.x264_r	160	999
531.deepsjeng_r	160	387
541.leela_r	160	369
548.exchange2_r	160	920
557.xz_r	160	293

SPECrate®2017_int_base (488)

Hardware

CPU Name: Intel Xeon Gold 6230N
 Max MHz: 3500
 Nominal: 2300
Enabled: 80 cores, 4 chips, 2 threads/core
Orderable: 1, 2, 4 chip(s)
Cache L1: 32 KB I + 32 KB D on chip per core
 L2: 1 MB I+D on chip per core
 L3: 27.5 MB I+D on chip per chip
 Other: None
Memory: 1536 GB (48 x 32 GB 2Rx4 PC4-2933Y-R, running at 2666)
Storage: 1 x 800 GB SAS SSD
Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP3 (x86_64)
 Kernel 5.3.18-57-default
Compiler: C/C++: Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux;
 Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux;
Parallel: No
Firmware: HPE BIOS Version U34 v2.62 02/23/2022 released Feb-2022
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None
Power Management: BIOS set to prefer performance at the cost of additional power usage

Standard Performance Evaluation Corporation (info@spec.org)

https://www.spec.org/

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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	160	776	328	774	329	**775**	**329**							
502.gcc_r	160	**608**	**373**	612	370	607	373							
505.mcf_r	160	321	804	320	809	**321**	**806**							
520.omnetpp_r	160	648	324	649	324	**648**	**324**							
523.xalancbmk_r	160	273	619	272	621	**273**	**619**							
525.x264_r	160	**280**	**999**	280	1000	285	983							
531.deepsjeng_r	160	**474**	**387**	474	387	474	387							
541.leela_r	160	723	367	**718**	**369**	709	374							
548.exchange2_r	160	455	922	**456**	**920**	456	920							
557.xz_r	160	589	293	**591**	**293**	591	292							
SPECrate®2017_int_base =	**488**													
SPECrate®2017_int_peak =	**Not Run**													

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit'
was used to generate numactl commands to bind each copy to a specific processor.
For details, please see the config file.

Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"
Transparent Huge Pages enabled by default
Prior to runcpu invocation
Filesystem page cache synced and cleared with:
sync; echo 3 >   /proc/sys/vm/drop_caches
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
     "/home/cpu2017/lib/intel64:/home/cpu2017/lib/ia32:/home/cpu2017/je5.0.1-
     32"
MALLOC_CONF = "retain:true"

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General Notes

```
Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM
memory using Red Hat Enterprise Linux 8.1
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.
```

Platform Notes

```
BIOS Configuration:
 Thermal Configuration set to Maximum Cooling
 Memory Patrol Scrubbing set to Disabled
 LLC Prefetch set to Enabled
 Last Level Cache (LLC) Dead Line Allocation set to Disabled
 Enhanced Processor Performance set to Enabled
 Workload Profile set to General Throughput Compute
 Advanced Memory Protection set to Advanced ECC
  Workload Profile set to Custom
  Energy/Performance Bias set to Balanced Performance


 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
 running on localhost Mon May 23 17:41:30 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 : Intel(R) Xeon(R) Gold 6230N CPU @ 2.30GHz
       4  "physical id"s (chips)
       160 "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 : 20
       siblings  : 40
       physical 0: cores 0 1 2 3 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
       physical 1: cores 0 1 2 3 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
       physical 2: cores 0 1 2 3 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
       physical 3: cores 0 1 2 3 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28

 From lscpu from util-linux 2.36.2:
    Architecture:               x86_64
    CPU op-mode(s):             32-bit, 64-bit
```

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Platform Notes (Continued)

```
          Byte Order:                  Little Endian
          Address sizes:               46 bits physical, 48 bits virtual
          CPU(s):                      160
          On-line CPU(s) list:         0-159
          Thread(s) per core:          2
          Core(s) per socket:          20
          Socket(s):                   4
          NUMA node(s):                8
          Vendor ID:                   GenuineIntel
          CPU family:                  6
          Model:                       85
          Model name:                  Intel(R) Xeon(R) Gold 6230N CPU @ 2.30GHz
          Stepping:                    7
          CPU MHz:                     1000.049
          BogoMIPS:                    4600.00
          Virtualization:              VT-x
          L1d cache:                   2.5 MiB
          L1i cache:                   2.5 MiB
          L2 cache:                    80 MiB
          L3 cache:                    110 MiB
          NUMA node0 CPU(s):           0-9,80-89
          NUMA node1 CPU(s):           10-19,90-99
          NUMA node2 CPU(s):           20-29,100-109
          NUMA node3 CPU(s):           30-39,110-119
          NUMA node4 CPU(s):           40-49,120-129
          NUMA node5 CPU(s):           50-59,130-139
          NUMA node6 CPU(s):           60-69,140-149
          NUMA node7 CPU(s):           70-79,150-159
          Vulnerability Itlb multihit: KVM: Mitigation: VMX disabled
          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; Enhanced IBRS, IBPB conditional, RSB
          filling
          Vulnerability Srbds:         Not affected
          Vulnerability Tsx async abort:   Mitigation; Clear CPU buffers; SMT vulnerable
          Flags:                           fpu vme de pse tsc msr pae mce cx8 apic sep mtrr
          pge mca cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx
          pdpe1gb rdtscp lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology
          nonstop_tsc cpuid aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2
          ssse3 sdbg fma cx16 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt
          tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault
          epb cat_l3 cdp_l3 invpcid_single intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced
```

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Platform Notes (Continued)

```
    tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep
    bmi2 erms invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb
    intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc
    cqm_occup_llc cqm_mbm_total cqm_mbm_local dtherm ida arat pln pts pku ospke
    avx512_vnni md_clear flush_l1d arch_capabilities

  From lscpu --cache:
    NAME ONE-SIZE ALL-SIZE WAYS TYPE          LEVEL   SETS PHY-LINE COHERENCY-SIZE
    L1d       32K     2.5M    8 Data              1     64        1             64
    L1i       32K     2.5M    8 Instruction       1     64        1             64
    L2         1M      80M   16 Unified           2   1024        1             64
    L3      27.5M     110M   11 Unified           3  40960        1             64

  /proc/cpuinfo cache data
    cache size : 28160 KB

  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 2 3 4 5 6 7 8 9 80 81 82 83 84 85 86 87 88 89
    node 0 size: 193124 MB
    node 0 free: 192603 MB
    node 1 cpus: 10 11 12 13 14 15 16 17 18 19 90 91 92 93 94 95 96 97 98 99
    node 1 size: 193531 MB
    node 1 free: 193199 MB
    node 2 cpus: 20 21 22 23 24 25 26 27 28 29 100 101 102 103 104 105 106 107 108 109
    node 2 size: 193531 MB
    node 2 free: 193266 MB
    node 3 cpus: 30 31 32 33 34 35 36 37 38 39 110 111 112 113 114 115 116 117 118 119
    node 3 size: 193531 MB
    node 3 free: 193332 MB
    node 4 cpus: 40 41 42 43 44 45 46 47 48 49 120 121 122 123 124 125 126 127 128 129
    node 4 size: 193531 MB
    node 4 free: 193355 MB
    node 5 cpus: 50 51 52 53 54 55 56 57 58 59 130 131 132 133 134 135 136 137 138 139
    node 5 size: 193531 MB
    node 5 free: 193344 MB
    node 6 cpus: 60 61 62 63 64 65 66 67 68 69 140 141 142 143 144 145 146 147 148 149
    node 6 size: 193497 MB
    node 6 free: 193322 MB
    node 7 cpus: 70 71 72 73 74 75 76 77 78 79 150 151 152 153 154 155 156 157 158 159
    node 7 size: 193529 MB
    node 7 free: 193350 MB
    node distances:
    node   0    1    2    3    4    5    6    7
      0:  10   21   31   31   31   31   31   31
      1:  21   10   31   31   31   31   31   31
```

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Platform Notes (Continued)

```
     2:  31  31  10  21  31  31  31  31
     3:  31  31  21  10  31  31  31  31
     4:  31  31  31  31  10  21  31  31
     5:  31  31  31  31  21  10  31  31
     6:  31  31  31  31  31  31  10  21
     7:  31  31  31  31  31  31  21  10

 From /proc/meminfo
    MemTotal:       1584953728 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

 From /etc/*release* /etc/*version*
    os-release:
       NAME="SLES"
       VERSION="15-SP3"
       VERSION_ID="15.3"
       PRETTY_NAME="SUSE Linux Enterprise Server 15 SP3"
       ID="sles"
       ID_LIKE="suse"
       ANSI_COLOR="0;32"
       CPE_NAME="cpe:/o:suse:sles:15:sp3"

 uname -a:
    Linux localhost 5.3.18-57-default #1 SMP Wed Apr 28 10:54:41 UTC 2021 (ba3c2e9) x86_64
    x86_64 x86_64 GNU/Linux

 Kernel self-reported vulnerability status:

 CVE-2018-12207 (iTLB Multihit):                      KVM: Mitigation: VMX disabled
 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: Enhanced IBRS, IBPB:
                                                      conditional, RSB filling
 CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
 CVE-2019-11135 (TSX Asynchronous Abort):             Mitigation: Clear CPU buffers; SMT
                                                      vulnerable

 run-level 3 May 23 17:37
```

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Platform Notes (Continued)

```
  SPEC is set to: /home/cpu2017
    Filesystem      Type  Size  Used Avail Use% Mounted on
    /dev/sda4       xfs   703G   38G  665G   6% /home

  From /sys/devices/virtual/dmi/id
     Vendor:          HPE
     Product:         ProLiant DL560 Gen10
     Product Family:  ProLiant
     Serial:          CN77110DQW

  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:
      48x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2933, configured at 2666

  BIOS:
     BIOS Vendor:       HPE
     BIOS Version:      U34
     BIOS Date:         02/23/2022
     BIOS Revision:     2.62
     Firmware Revision: 2.55

  (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)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++      | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
         | 541.leela_r(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
```

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Compiler Version Notes (Continued)

```
==============================================================================
Fortran | 548.exchange2_r(base)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
  Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

Base Portability Flags

500.perlbench_r: `-DSPEC_LP64 -DSPEC_LINUX_X64`
502.gcc_r: `-DSPEC_LP64`
505.mcf_r: `-DSPEC_LP64`
520.omnetpp_r: `-DSPEC_LP64`
523.xalancbmk_r: `-DSPEC_LP64 -DSPEC_LINUX`
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:
`-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math`
`-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4`
`-mbranches-within-32B-boundaries`
`-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin`
`-lqkmalloc`

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Base Optimization Flags (Continued)

C++ benchmarks:
```
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc
```

Fortran benchmarks:
```
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-auto -mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc
```

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.0-ICX-revH.html
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.0-ICX-revH.xml
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.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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