SPEC CPU®2017 Integer Rate Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

Dell Inc.

PowerEdge R650xs (Intel Xeon Silver 4309Y, 2.80 GHz)

SPECrate®2017_int_base = 129

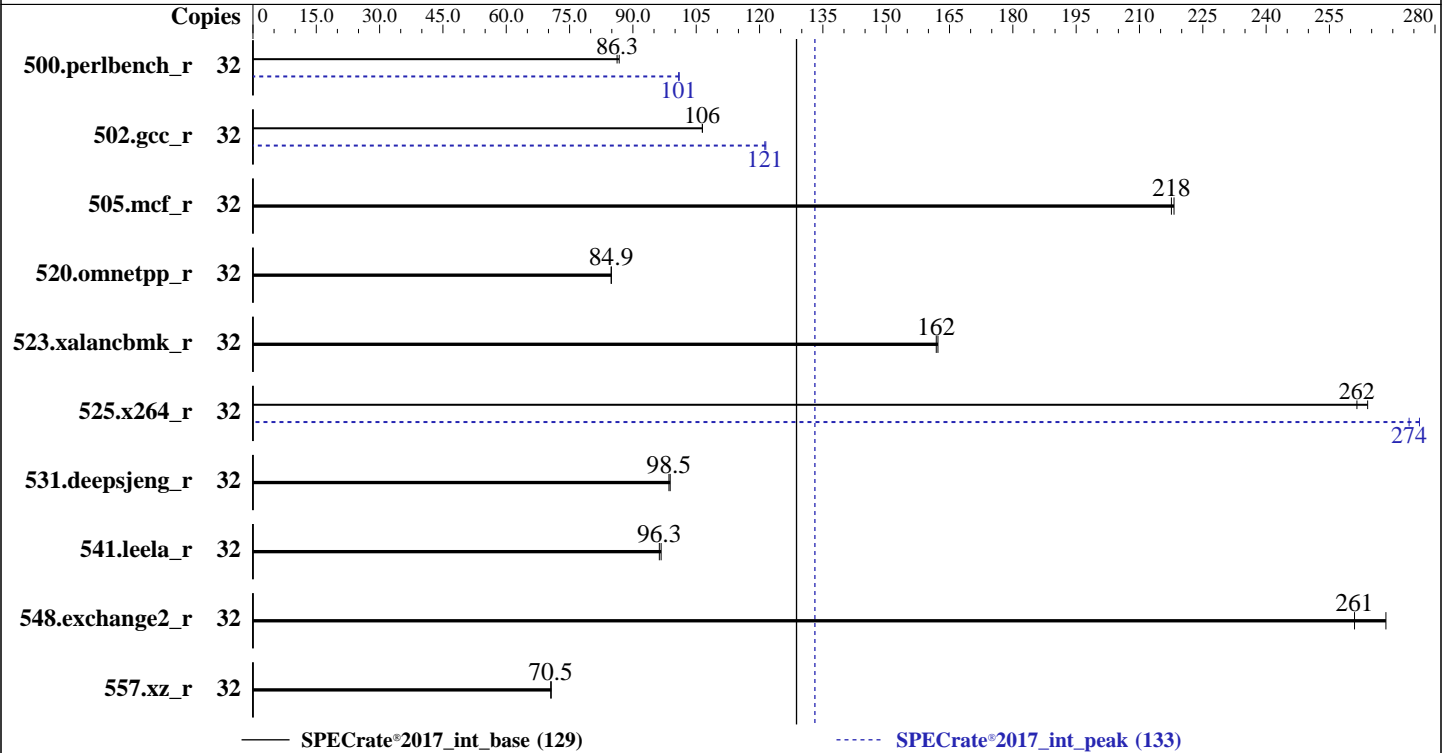SPECrate®2017_int_peak = 133

CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: Sep-2021
Hardware Availability: Jul-2021
Software Availability: Dec-2020

Benchmark	Copies	Base	Peak
500.perlbench_r	32	86.3	101
502.gcc_r	32	106	121
505.mcf_r	32	218	
520.omnetpp_r	32	84.9	
523.xalancbmk_r	32	162	
525.x264_r	32	262	274
531.deepsjeng_r	32	98.5	
541.leela_r	32	96.3	
548.exchange2_r	32	261	
557.xz_r	32	70.5	

SPECrate®2017_int_base (129)   SPECrate®2017_int_peak (133)

Hardware

CPU Name: Intel Xeon Silver 4309Y
 Max MHz: 3600
 Nominal: 2800
Enabled: 16 cores, 2 chips, 2 threads/core
Orderable: 1,2 chips
Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 1.25 MB I+D on chip per core
 L3: 12 MB I+D on chip per chip
 Other: None
Memory: 512 GB (16 x 32 GB 2Rx4 PC4-3200AA-R, running at 2666)
Storage: 225 GB on tmpfs
Other: None

Software

OS: Red Hat Enterprise Linux 8.3 (Ootpa) 4.18.0-240.el8.x86_64
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; C/C++: Version 2021.1 of Intel C/C++ Compiler Classic Build 20201112 for Linux
Parallel: No
Firmware: Version 1.2.1 released May-2021
File System: tmpfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other: jemalloc memory allocator V5.0.1
Power Management: BIOS and OS set to prefer performance at the cost of additional power usage.

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Results Table

Benchmark	Base Copies	Base Seconds	Base Ratio	Base Seconds	Base Ratio	Base Seconds	Base Ratio	Peak Copies	Peak Seconds	Peak Ratio	Peak Seconds	Peak Ratio	Peak Seconds	Peak Ratio
500.perlbench_r	32	**591**	**86.3**	587	86.8			32	**505**	**101**	505	101		
502.gcc_r	32	**426**	**106**	426	106			32	**374**	**121**	373	121		
505.mcf_r	32	**238**	**218**	237	218			32	**238**	**218**	237	218		
520.omnetpp_r	32	495	84.9	**495**	**84.9**			32	495	84.9	**495**	**84.9**		
523.xalancbmk_r	32	**209**	**162**	208	162			32	**209**	**162**	208	162		
525.x264_r	32	**214**	**262**	212	264			32	203	276	**205**	**274**		
531.deepsjeng_r	32	**372**	**98.5**	371	98.8			32	**372**	**98.5**	371	98.8		
541.leela_r	32	**550**	**96.3**	548	96.7			32	**550**	**96.3**	548	96.7		
548.exchange2_r	32	312	268	**321**	**261**			32	312	268	**321**	**261**		
557.xz_r	32	489	70.7	**490**	**70.5**			32	489	70.7	**490**	**70.5**		
SPECrate®2017_int_base =		**129**												
SPECrate®2017_int_peak =		**133**												

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"
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
    "/mnt/ramdisk/cpu2017-1.1.8-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.
    1.8-ic2021.1/lib/ia32:/mnt/ramdisk/cpu2017-1.1.8-ic2021.1/je5.0.1-32"
MALLOC_CONF = "retain:true"
```

General Notes

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

(Continued on next page)

Standard Performance Evaluation Corporation (info@spec.org) https://www.spec.org/

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CPU2017 License: 55

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General Notes (Continued)

```
numactl --interleave=all runcpu <etc>
jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5
sources available from jemalloc.net or https://github.com/jemalloc/jemalloc/releases

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 225 GB ramdisk created with the cmd: "mount -t tmpfs -o size=225G tmpfs /mnt/ramdisk"
```

Platform Notes

```
BIOS settings:
              Sub NUMA Cluster : Disabled
      Virtualization Technology : Disabled

                System Profile : Custom
         CPU Power Management : Maximum Performance
                           C1E : Disabled
                      C States : Autonomous
          Memory Patrol Scrub : Disabled
       Energy Efficiency Policy : Performance
   CPU Interconnect Bus Link
              Power Management : Disabled
           PCI ASPM L1 Link
              Power Management : Disabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.8-ic2021.1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
running on r650xs.1b86kd3.inside.dell.com Thu Sep  2 17:43:28 2021

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) Silver 4309Y CPU @ 2.80GHz
      2  "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.)
```

(Continued on next page)

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Platform Notes (Continued)

```
      cpu cores : 8
      siblings  : 16
      physical 0: cores 0 1 2 3 4 5 6 7
      physical 1: cores 0 1 2 3 4 5 6 7

 From lscpu from util-linux 2.32.1:
      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:   8
      Socket(s):            2
      NUMA node(s):         2
      Vendor ID:            GenuineIntel
      CPU family:           6
      Model:                106
      Model name:           Intel(R) Xeon(R) Silver 4309Y CPU @ 2.80GHz
      Stepping:             6
      CPU MHz:              3527.783
      BogoMIPS:             5600.00
      Virtualization:       VT-x
      L1d cache:            48K
      L1i cache:            32K
      L2 cache:             1280K
      L3 cache:             12288K
      NUMA node0 CPU(s):    0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30
      NUMA node1 CPU(s):    1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31
      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 invpcid_single
    intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced fsgsbase tsc_adjust bmi1 hle avx2
    smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma
    clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt xsavec xgetbv1
    xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local split_lock_detect wbnoinvd
    dtherm ida arat pln pts avx512vbmi umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq
    avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid md_clear pconfig flush_l1d
    arch_capabilities

 /proc/cpuinfo cache data
    cache size : 12288 KB

 From numactl --hardware
```

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CPU2017 License:	55	**Test Date:**	Sep-2021
Test Sponsor:	Dell Inc.	**Hardware Availability:**	Jul-2021
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Platform Notes (Continued)

```
WARNING: a numactl 'node' might or might not correspond to a physical chip.
  available: 2 nodes (0-1)
  node 0 cpus: 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
  node 0 size: 251182 MB
  node 0 free: 256596 MB
  node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31
  node 1 size: 251545 MB
  node 1 free: 248463 MB
  node distances:
  node   0   1
    0:  10  20
    1:  20  10


From /proc/meminfo
   MemTotal:       527551072 kB
   HugePages_Total:        0
   Hugepagesize:        2048 kB


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


From /etc/*release* /etc/*version*
   os-release:
      NAME="Red Hat Enterprise Linux"
      VERSION="8.3 (Ootpa)"
      ID="rhel"
      ID_LIKE="fedora"
      VERSION_ID="8.3"
      PLATFORM_ID="platform:el8"
      PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
      ANSI_COLOR="0;31"
   redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
   system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
   system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

uname -a:
   Linux r650xs.1b86kd3.inside.dell.com 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10
   EDT 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
CVE-2017-5754 (Meltdown):                       Not affected
CVE-2018-3639 (Speculative Store Bypass):       Mitigation: Speculative Store
                                                Bypass disabled via prctl and
```

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Platform Notes (Continued)

```
                                        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):              Not affected

run-level 3 Sep 2 17:41

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.8-ic2021.1
   Filesystem      Type   Size  Used Avail Use% Mounted on
   tmpfs           tmpfs  225G  4.4G  221G   2% /mnt/ramdisk

From /sys/devices/virtual/dmi/id
    Vendor:          Dell Inc.
    Product:         PowerEdge R650xs
    Product Family:  PowerEdge
    Serial:          1B86KD3

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:
    16x 00AD063200AD HMA84GR7DJR4N-XN 32 GB 2 rank 3200, configured at 2666

BIOS:
   BIOS Vendor:      Dell Inc.
   BIOS Version:     1.2.1
   BIOS Date:        05/28/2021
   BIOS Revision:    1.2

(End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C        | 500.perlbench_r(peak)
------------------------------------------------------------------------------
Intel(R) C 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.
------------------------------------------------------------------------------
```

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Test Sponsor: Dell Inc.		**Hardware Availability:** Jul-2021
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Compiler Version Notes (Continued)

```
==============================================================================
C          | 502.gcc_r(peak)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version
  2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C          | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
           | 525.x264_r(base, peak) 557.xz_r(base, peak)
------------------------------------------------------------------------------
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          | 500.perlbench_r(peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
  64, Version 2021.1 Build 20201112_000000
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------------------------------------------------------------------------------


==============================================================================
C          | 502.gcc_r(peak)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version
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------------------------------------------------------------------------------


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


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------------------------------------------------------------------------------
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```

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Compiler Version Notes (Continued)

```
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
--------------------------------------------------------------------------------


==============================================================================
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--------------------------------------------------------------------------------
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--------------------------------------------------------------------------------


==============================================================================
C         | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
          | 525.x264_r(base, peak) 557.xz_r(base, peak)
--------------------------------------------------------------------------------
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, peak) 523.xalancbmk_r(base, peak)
          | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
--------------------------------------------------------------------------------
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.
--------------------------------------------------------------------------------


==============================================================================
Fortran | 548.exchange2_r(base, peak)
--------------------------------------------------------------------------------
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

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Base Compiler Invocation (Continued)

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
```

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
```

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Peak Compiler Invocation

C benchmarks (except as noted below):
`icx`

 500.perlbench_r: `icc`

C++ benchmarks:
`icpx`

Fortran benchmarks:
`ifort`

Peak Portability Flags

    500.perlbench_r: `-DSPEC_LP64 -DSPEC_LINUX_X64`
    502.gcc_r: `-D_FILE_OFFSET_BITS=64`
    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`

Peak Optimization Flags

C benchmarks:

    500.perlbench_r: `-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)`
`-xCORE-AVX512 -ipo -O3 -no-prec-div`
`-qopt-mem-layout-trans=4 -fno-strict-overflow`
`-mbranches-within-32B-boundaries`
`-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin`
`-lqkmalloc`

    502.gcc_r: `-m32`
`-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/ia32_lin`
`-std=gnu89 -Wl,-z,muldefs -fprofile-generate(pass 1)`
`-fprofile-use=default.profdata(pass 2) -xCORE-AVX512 -flto`
`-Ofast(pass 1) -O3 -ffast-math -qopt-mem-layout-trans=4`
`-mbranches-within-32B-boundaries`
`-L/usr/local/jemalloc32-5.0.1/lib -ljemalloc`

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Peak Optimization Flags (Continued)

505.mcf_r: basepeak = yes

525.x264_r: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -flto
-O3 -ffast-math -qopt-mem-layout-trans=4 -fno-alias
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc

557.xz_r: basepeak = yes

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: basepeak = yes

531.deepsjeng_r: basepeak = yes

541.leela_r: basepeak = yes

Fortran benchmarks:

548.exchange2_r: basepeak = yes

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.html
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-ICX-rev1.4.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-ICX-rev1.4.xml

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

Tested with SPEC CPU®2017 v1.1.8 on 2021-09-02 18:43:27-0400.
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