# SPEC® CPU2017 Integer Rate Result

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## Dell Inc.

PowerEdge R840 (Intel Xeon Gold 6248, 2.50GHz)

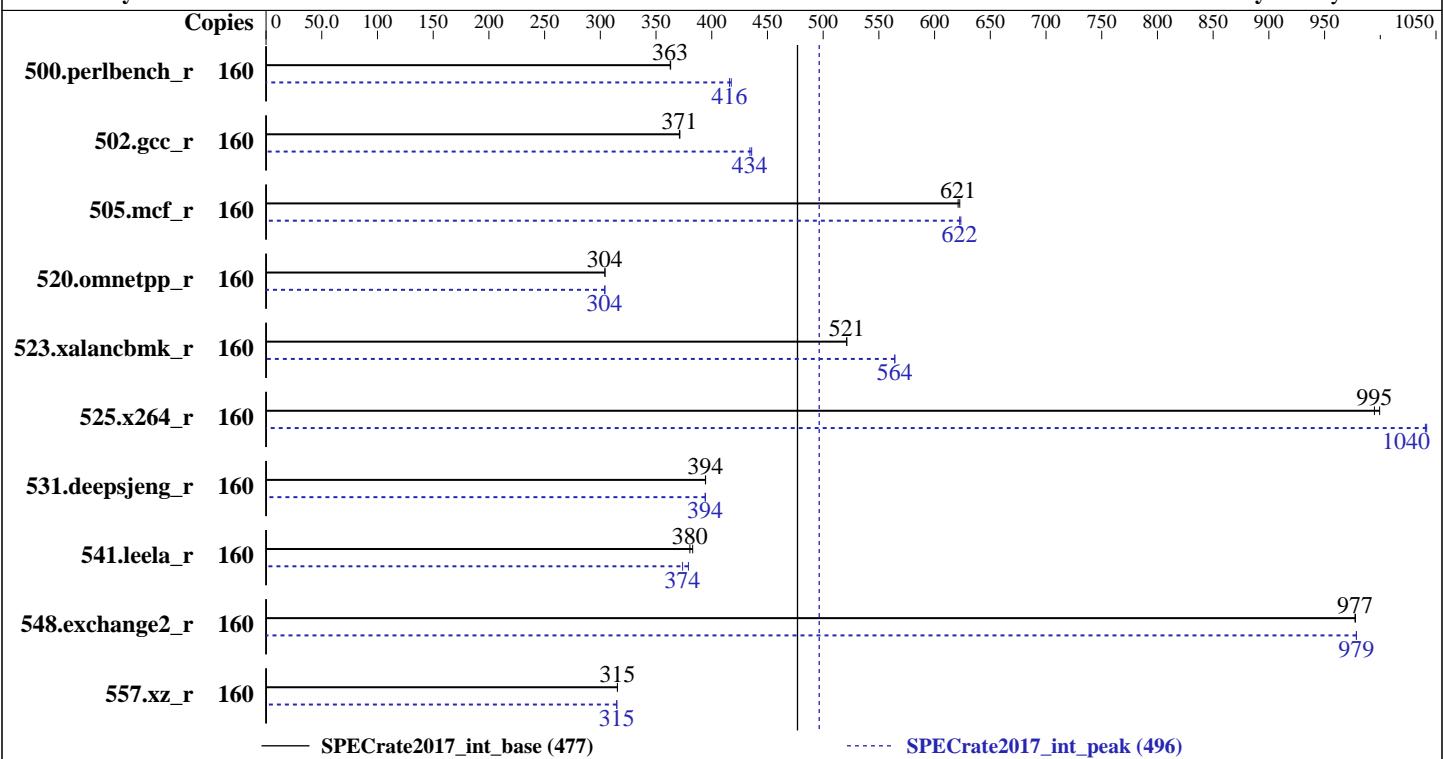SPECrate2017_int_base = 477

SPECrate2017_int_peak = 496

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

**Test Date:** Jul-2019  
**Hardware Availability:** Apr-2019  
**Software Availability:** May-2019

| Benchmark | Copies | Base | Peak |
|---|---|---|---|
| 500.perlbench_r | 160 | 363 | 416 |
| 502.gcc_r | 160 | 371 | 434 |
| 505.mcf_r | 160 | 621 | 622 |
| 520.omnetpp_r | 160 | 304 | 304 |
| 523.xalancbmk_r | 160 | 521 | 564 |
| 525.x264_r | 160 | 995 | 1040 |
| 531.deepsjeng_r | 160 | 394 | 394 |
| 541.leela_r | 160 | 380 | 374 |
| 548.exchange2_r | 160 | 977 | 979 |
| 557.xz_r | 160 | 315 | 315 |

SPECrate2017_int_base (477)    SPECrate2017_int_peak (496)

## Hardware

CPU Name: Intel Xeon Gold 6248  
 Max MHz.: 3900  
 Nominal: 2500  
Enabled: 80 cores, 4 chips, 2 threads/core  
Orderable: 2,4 chips  
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: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R)  
Storage: 1 x 960 GB SATA SSD  
Other: None

## Software

OS: Ubuntu 18.04.2 LTS  
 kernel 4.15.0-45-generic  
Compiler: C/C++: Version 19.0.4.227 of Intel C/C++  
 Compiler Build 20190416 for Linux;  
 Fortran: Version 19.0.4.227 of Intel Fortran  
 Compiler Build 20190416 for Linux  
Parallel: No  
Firmware: Version 2.2.9 released May-2019  
File System: ext4  
System State: Run level 5 (multi-user)  
Base Pointers: 64-bit  
Peak Pointers: 32/64-bit  
Other: jemalloc memory allocator V5.0.1

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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 | 701 | 363 | **702** | **363** | | | 160 | 610 | 418 | **612** | **416** | | |
| 502.gcc_r | 160 | **611** | **371** | 610 | 371 | | | 160 | **522** | **434** | 520 | 436 | | |
| 505.mcf_r | 160 | **416** | **621** | 415 | 623 | | | 160 | 415 | 624 | **415** | **622** | | |
| 520.omnetpp_r | 160 | **690** | **304** | 690 | 304 | | | 160 | **691** | **304** | 690 | 304 | | |
| 523.xalancbmk_r | 160 | **324** | **521** | 324 | 521 | | | 160 | 299 | 564 | **299** | **564** | | |
| 525.x264_r | 160 | **282** | **995** | 280 | 999 | | | 160 | **269** | **1040** | 269 | 1040 | | |
| 531.deepsjeng_r | 160 | **465** | **394** | 465 | 394 | | | 160 | **465** | **394** | 465 | 394 | | |
| 541.leela_r | 160 | 692 | 383 | **697** | **380** | | | 160 | **709** | **374** | 699 | 379 | | |
| 548.exchange2_r | 160 | **429** | **977** | 429 | 978 | | | 160 | 428 | 979 | **428** | **979** | | |
| 557.xz_r | 160 | **548** | **315** | 548 | 315 | | | 160 | 549 | 315 | **549** | **315** | | |
| SPECrate2017_int_base = | | 477 | | | | | | | | | | | | |
| SPECrate2017_int_peak = | | 496 | | | | | | | | | | | | |

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.

## General 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"
Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.5
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.
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>
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

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## Platform Notes

```
   BIOS settings:
   ADDDC setting disabled
   Virtualization Technology disabled
   DCU Streamer Prefetcher disabled
   System Profile set to Custom
   CPU Performance set to Maximum Performance
   C States set to Autonomous
   C1E disabled
   Uncore Frequency set to Dynamic
   Energy Efficiency Policy set to Performance
   Memory Patrol Scrub disabled
   Logical Processor enabled
   CPU Interconnect Bus Link Power Management disabled
   PCI ASPM L1 Link Power Management disabled
   Sysinfo program /home/cpu2017/bin/sysinfo
   Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
   running on intel-sut Fri Jul 12 05:04:37 2019

   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 6248 CPU @ 2.50GHz
         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 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
         physical 1: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
         physical 2: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
         physical 3: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28

   From lscpu:
      Architecture:        x86_64
      CPU op-mode(s):      32-bit, 64-bit
      Byte Order:          Little Endian
      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
```

**(Continued on next page)**

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## Platform Notes (Continued)

```
        Model:                 85
        Model name:            Intel(R) Xeon(R) Gold 6248 CPU @ 2.50GHz
        Stepping:              6
        CPU MHz:               2659.938
        BogoMIPS:              5000.00
        Virtualization:        VT-x
        L1d cache:             32K
        L1i cache:             32K
        L2 cache:              1024K
        L3 cache:              28160K
        NUMA node0 CPU(s):
        0,8,16,24,32,40,48,56,64,72,80,88,96,104,112,120,128,136,144,152
        NUMA node1 CPU(s):
        1,9,17,25,33,41,49,57,65,73,81,89,97,105,113,121,129,137,145,153
        NUMA node2 CPU(s):
        2,10,18,26,34,42,50,58,66,74,82,90,98,106,114,122,130,138,146,154
        NUMA node3 CPU(s):
        3,11,19,27,35,43,51,59,67,75,83,91,99,107,115,123,131,139,147,155
        NUMA node4 CPU(s):
        4,12,20,28,36,44,52,60,68,76,84,92,100,108,116,124,132,140,148,156
        NUMA node5 CPU(s):
        5,13,21,29,37,45,53,61,69,77,85,93,101,109,117,125,133,141,149,157
        NUMA node6 CPU(s):
        6,14,22,30,38,46,54,62,70,78,86,94,102,110,118,126,134,142,150,158
        NUMA node7 CPU(s):
        7,15,23,31,39,47,55,63,71,79,87,95,103,111,119,127,135,143,151,159
        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 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 tpr_shadow vnmi flexpriority ept vpid
        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 flush_l1d arch_capabilities

 /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 8 16 24 32 40 48 56 64 72 80 88 96 104 112 120 128 136 144 152
    node 0 size: 95146 MB
    node 0 free: 94860 MB
```

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## Platform Notes (Continued)

```
   node 1 cpus: 1 9 17 25 33 41 49 57 65 73 81 89 97 105 113 121 129 137 145 153
   node 1 size: 96764 MB
   node 1 free: 96571 MB
   node 2 cpus: 2 10 18 26 34 42 50 58 66 74 82 90 98 106 114 122 130 138 146 154
   node 2 size: 96743 MB
   node 2 free: 96560 MB
   node 3 cpus: 3 11 19 27 35 43 51 59 67 75 83 91 99 107 115 123 131 139 147 155
   node 3 size: 96764 MB
   node 3 free: 96562 MB
   node 4 cpus: 4 12 20 28 36 44 52 60 68 76 84 92 100 108 116 124 132 140 148 156
   node 4 size: 96764 MB
   node 4 free: 96509 MB
   node 5 cpus: 5 13 21 29 37 45 53 61 69 77 85 93 101 109 117 125 133 141 149 157
   node 5 size: 96764 MB
   node 5 free: 96568 MB
   node 6 cpus: 6 14 22 30 38 46 54 62 70 78 86 94 102 110 118 126 134 142 150 158
   node 6 size: 96764 MB
   node 6 free: 96578 MB
   node 7 cpus: 7 15 23 31 39 47 55 63 71 79 87 95 103 111 119 127 135 143 151 159
   node 7 size: 96762 MB
   node 7 free: 96527 MB
   node distances:
   node   0    1    2    3    4    5    6    7
     0:  10   21   21   21   11   21   21   21
     1:  21   10   21   21   21   11   21   21
     2:  21   21   10   21   21   21   11   21
     3:  21   21   21   10   21   21   21   11
     4:  11   21   21   21   10   21   21   21
     5:  21   11   21   21   21   10   21   21
     6:  21   21   11   21   21   21   10   21
     7:  21   21   21   11   21   21   21   10

  From /proc/meminfo
    MemTotal:       791012844 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

  /usr/bin/lsb_release -d
    Ubuntu 18.04.2 LTS

  From /etc/*release* /etc/*version*
    debian_version: buster/sid
    os-release:
      NAME="Ubuntu"
      VERSION="18.04.2 LTS (Bionic Beaver)"
      ID=ubuntu
      ID_LIKE=debian
```

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## Platform Notes (Continued)

```
        PRETTY_NAME="Ubuntu 18.04.2 LTS"
        VERSION_ID="18.04"
        HOME_URL="https://www.ubuntu.com/"
        SUPPORT_URL="https://help.ubuntu.com/"

 uname -a:
    Linux intel-sut 4.15.0-45-generic #48-Ubuntu SMP Tue Jan 29 16:28:13 UTC 2019 x86_64
    x86_64 x86_64 GNU/Linux

 Kernel self-reported vulnerability status:

 CVE-2017-5754 (Meltdown):             Not affected
 CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
 CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB

 run-level 5 Jul 12 04:55

 SPEC is set to: /home/cpu2017
    Filesystem      Type  Size  Used Avail Use% Mounted on
    /dev/sda2       ext4  439G   29G  388G   7% /

 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 Dell Inc. 2.2.9 05/08/2019
    Memory:
     24x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
     24x Not Specified Not Specified

 (End of data from sysinfo program)
```

## Compiler Version Notes

```
==============================================================================
 CC   502.gcc_r(peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on IA-32, Version
  19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


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

**(Continued on next page)**

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## Compiler Version Notes (Continued)

```
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------


==============================================================================
CC   500.perlbench_r(peak)
------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------


==============================================================================
CXXC 523.xalancbmk_r(peak)
------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on IA-32, Version
  19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------


==============================================================================
 CXXC 520.omnetpp_r(base, peak) 523.xalancbmk_r(base) 531.deepsjeng_r(base,
      peak) 541.leela_r(base, peak)
------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------


==============================================================================
 FC   548.exchange2_r(base, peak)
------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------
```

## Base Compiler Invocation

C benchmarks:
`icc -m64 -std=c11`

C++ benchmarks:
`icpc -m64`

**(Continued on next page)**

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## Base Compiler Invocation (Continued)

Fortran benchmarks:
`ifort -m64`

## 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:
```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc
```

C++ benchmarks:
```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc
```

Fortran benchmarks:
```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc
```

## Peak Compiler Invocation

C benchmarks (except as noted below):
`icc -m64 -std=c11`

**(Continued on next page)**

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# Peak Compiler Invocation (Continued)

502.gcc_r: `icc -m32 -std=c11 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/ia32_lin`

C++ benchmarks (except as noted below):
`icpc -m64`

523.xalancbmk_r: `icpc -m32 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/ia32_lin`

Fortran benchmarks:
`ifort -m64`

# 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: `-D_FILE_OFFSET_BITS=64 -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) -ipo -xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4 -fno-strict-overflow -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64 -lqkmalloc`

502.gcc_r: `-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4 -L/usr/local/je5.0.1-32/lib -ljemalloc`

505.mcf_r: `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64`

**(Continued on next page)**

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# Peak Optimization Flags (Continued)

505.mcf_r (continued):
```
-lqkmalloc
```

525.x264_r: `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
`-qopt-mem-layout-trans=4 -fno-alias`
`-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64`
`-lqkmalloc`

557.xz_r: `Same as 505.mcf_r`

C++ benchmarks:

520.omnetpp_r: `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
`-qopt-mem-layout-trans=4`
`-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64`
`-lqkmalloc`

523.xalancbmk_r: `-Wl,-z,muldefs -prof-gen`(pass 1) `-prof-use`(pass 2) `-ipo`
`-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4`
`-L/usr/local/je5.0.1-32/lib -ljemalloc`

531.deepsjeng_r: `Same as 520.omnetpp_r`

541.leela_r: `Same as 520.omnetpp_r`

Fortran benchmarks:
```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc
```

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2019-04-02.html
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge14G-revE3.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2019-04-02.xml
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge14G-revE3.xml

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

Tested with SPEC CPU2017 v1.0.5 on 2019-07-12 01:04:36-0400.
Report generated on 2019-08-06 17:56:31 by CPU2017 PDF formatter v6067.
Originally published on 2019-08-06.