



# SPEC® CPU2017 Integer Rate Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

## Dell Inc.

SPECrate2017\_int\_base = 521

PowerEdge R940 (Intel Xeon Gold 6252, 2.10GHz)

SPECrate2017\_int\_peak = 543

CPU2017 License: 55

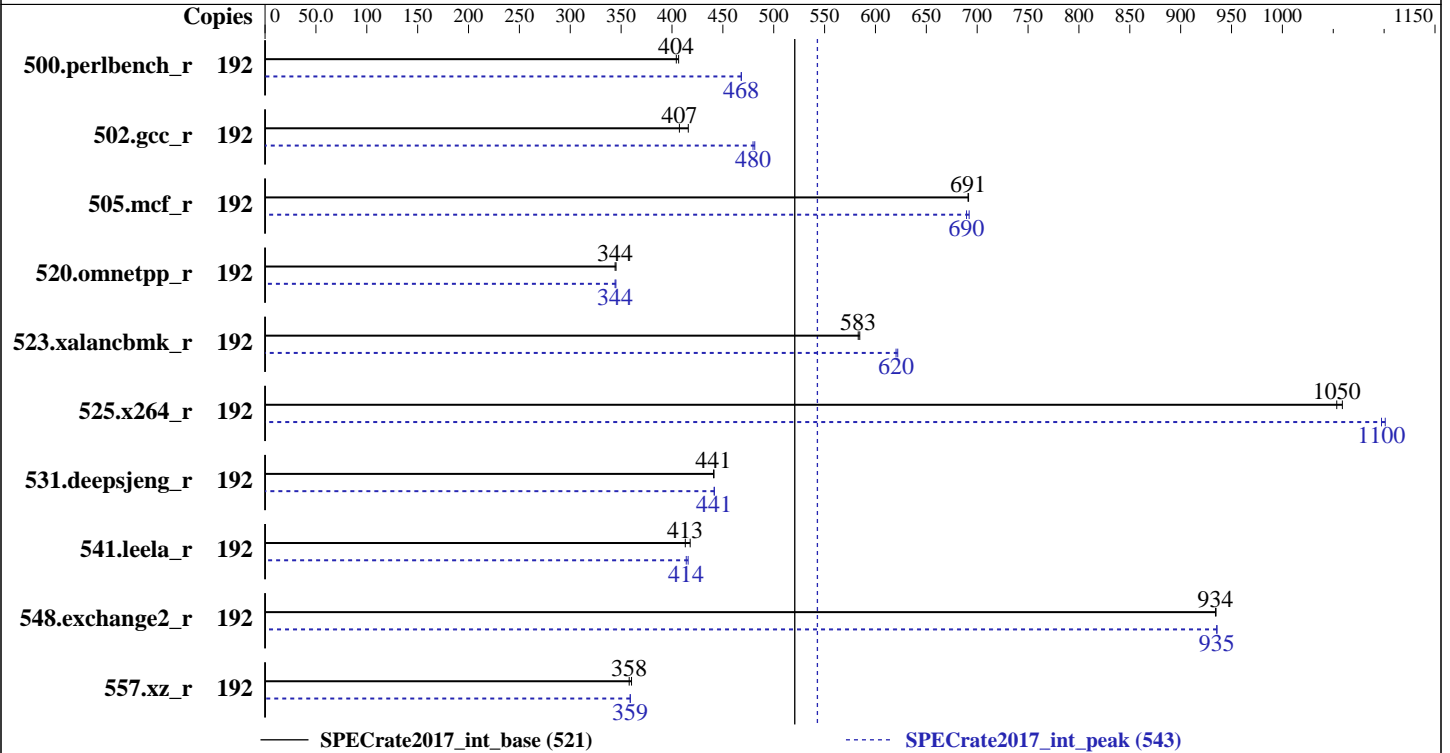
Test Date: Jun-2019

Test Sponsor: Dell Inc.

Hardware Availability: Apr-2019

Tested by: Dell Inc.

Software Availability: Feb-2019



### Hardware

CPU Name: Intel Xeon Gold 6252  
 Max MHz.: 3700  
 Nominal: 2100  
 Enabled: 96 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: 35.75 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 19.0.1.144 of Intel C/C++  
 Compiler Build 20181018 for Linux;  
 Fortran: Version 19.0.1.144 of Intel Fortran  
 Compiler Build 20181018 for Linux  
 Parallel: No  
 Firmware: Version 2.1.8 released Apr-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	192	<b>756</b>	<b>404</b>	752	407			192	<b>653</b>	<b>468</b>	653	468		
502.gcc_r	192	654	416	<b>668</b>	<b>407</b>			192	<b>567</b>	<b>480</b>	565	481		
505.mcf_r	192	449	692	<b>449</b>	<b>691</b>			192	448	692	<b>450</b>	<b>690</b>		
520.omnetpp_r	192	730	345	<b>732</b>	<b>344</b>			192	<b>732</b>	<b>344</b>	730	345		
523.xalancbmk_r	192	<b>348</b>	<b>583</b>	347	585			192	<b>327</b>	<b>620</b>	326	622		
525.x264_r	192	317	1060	<b>319</b>	<b>1050</b>			192	305	1100	<b>306</b>	<b>1100</b>		
531.deepsjeng_r	192	499	441	<b>499</b>	<b>441</b>			192	<b>498</b>	<b>441</b>	498	442		
541.leela_r	192	761	418	<b>770</b>	<b>413</b>			192	<b>768</b>	<b>414</b>	765	416		
548.exchange2_r	192	538	935	<b>538</b>	<b>934</b>			192	<b>538</b>	<b>935</b>	538	936		
557.xz_r	192	576	360	<b>579</b>	<b>358</b>			192	578	359	<b>578</b>	<b>359</b>		

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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"

## General Notes

Environment variables set by runcpu before the start of the run:

LD\_LIBRARY\_PATH = "/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-32:/home/cpu2017/je5.0.1-64"

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>
```

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## General Notes (Continued)

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>

## Platform Notes

BIOS settings  
ADDDC setting disabled  
Sub NUMA Cluster enabled  
Virtualization Technology disabled  
DCU Streamer Prefetcher disabled  
System Profile set to Custom  
CPU Performance set to Maximum Performance  
C States set to Autonomous  
ClE 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 Thu Jun 13 15:51:13 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 6252 CPU @ 2.10GHz

4 "physical id"s (chips)

192 "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 : 24

siblings : 48

physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29

physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29

physical 2: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29

physical 3: cores 0 1 2 3 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 25 26 27 28 29

From lscpu:

Architecture: x86\_64

CPU op-mode(s): 32-bit, 64-bit

Byte Order: Little Endian

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## Platform Notes (Continued)

```

CPU(s): 192
On-line CPU(s) list: 0-191
Thread(s) per core: 2
Core(s) per socket: 24
Socket(s): 4
NUMA node(s): 8
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6252 CPU @ 2.10GHz
Stepping: 6
CPU MHz: 1731.753
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 36608K
NUMA node0 CPU(s):
0, 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96, 104, 112, 120, 128, 136, 144, 152, 160, 168, 176, 184
NUMA node1 CPU(s):
1, 9, 17, 25, 33, 41, 49, 57, 65, 73, 81, 89, 97, 105, 113, 121, 129, 137, 145, 153, 161, 169, 177, 185
NUMA node2 CPU(s):
2, 10, 18, 26, 34, 42, 50, 58, 66, 74, 82, 90, 98, 106, 114, 122, 130, 138, 146, 154, 162, 170, 178, 186
NUMA node3 CPU(s):
3, 11, 19, 23, 27, 35, 43, 51, 59, 67, 83, 91, 99, 107, 115, 119, 123, 131, 139, 147, 155, 163, 179, 187
NUMA node4 CPU(s):
4, 12, 20, 28, 36, 44, 52, 60, 68, 76, 84, 92, 100, 108, 116, 124, 132, 140, 148, 156, 164, 172, 180, 188
NUMA node5 CPU(s):
5, 13, 21, 29, 37, 45, 53, 61, 69, 77, 85, 93, 101, 109, 117, 125, 133, 141, 149, 157, 165, 173, 181, 189
NUMA node6 CPU(s):
6, 14, 22, 30, 38, 46, 54, 62, 70, 78, 86, 94, 102, 110, 118, 126, 134, 142, 150, 158, 166, 174, 182, 190
NUMA node7 CPU(s):
7, 15, 31, 39, 47, 55, 63, 71, 75, 79, 87, 95, 103, 111, 127, 135, 143, 151, 159, 167, 171, 175, 183, 191
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
aperfperf 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 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_lld arch_capabilities

```

/proc/cpuinfo cache data

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## Platform Notes (Continued)

cache size : 36608 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 96 104 112 120 128 136 144 152 160 168 176 184

node 0 size: 95145 MB

node 0 free: 94882 MB

node 1 cpus: 1 9 17 25 33 41 49 57 65 73 81 89 97 105 113 121 129 137 145 153 161 169 177 185

node 1 size: 96763 MB

node 1 free: 96573 MB

node 2 cpus: 2 10 18 26 34 42 50 58 66 74 82 90 98 106 114 122 130 138 146 154 162 170 178 186

node 2 size: 96763 MB

node 2 free: 96555 MB

node 3 cpus: 3 11 19 23 27 35 43 51 59 67 83 91 99 107 115 119 123 131 139 147 155 163 179 187

node 3 size: 96763 MB

node 3 free: 94682 MB

node 4 cpus: 4 12 20 28 36 44 52 60 68 76 84 92 100 108 116 124 132 140 148 156 164 172 180 188

node 4 size: 96763 MB

node 4 free: 96564 MB

node 5 cpus: 5 13 21 29 37 45 53 61 69 77 85 93 101 109 117 125 133 141 149 157 165 173 181 189

node 5 size: 96763 MB

node 5 free: 96373 MB

node 6 cpus: 6 14 22 30 38 46 54 62 70 78 86 94 102 110 118 126 134 142 150 158 166 174 182 190

node 6 size: 96763 MB

node 6 free: 94623 MB

node 7 cpus: 7 15 31 39 47 55 63 71 75 79 87 95 103 111 127 135 143 151 159 167 171 175 183 191

node 7 size: 96761 MB

node 7 free: 96524 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

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## Platform Notes (Continued)

From /proc/meminfo

```
MemTotal:      791028572 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
  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 Jun 13 15:02

SPEC is set to: /home/cpu2017

```
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda2       ext4  439G   28G  389G   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. 2.1.8 04/30/2019
Memory:
12x 002C069D002C 36ASF4G72PZ-2G9E2 32 GB 2 rank 2933
12x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
24x Not Specified Not Specified
```

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## Platform Notes (Continued)

(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  
19.0.1.144 Build 20181018  
Copyright (C) 1985-2018 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)

-----  
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.1.144 Build 20181018  
Copyright (C) 1985-2018 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 19.0.1.144 Build 20181018  
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.  
-----

=====  
CXXC 523.xalanbmk\_r(peak)

-----  
Intel(R) C++ Intel(R) 64 Compiler for applications running on IA-32, Version  
19.0.1.144 Build 20181018  
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.  
-----

=====  
CXXC 520.omnetpp\_r(base, peak) 523.xalanbmk\_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,  
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## Compiler Version Notes (Continued)

=====  
FC 548.exchange2\_r(base, peak)  
=====

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
64, Version 19.0.1.144 Build 20181018  
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.  
=====

## Base Compiler Invocation

C benchmarks:

icc -m64 -std=c11

C++ benchmarks:

icpc -m64

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\_2019.1.144/linux/compiler/lib/intel64  
-lqkmalloc

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## Base Optimization Flags (Continued)

C++ benchmarks:

```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div  
-qopt-mem-layout-trans=4  
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64  
-lqkmallocc
```

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_2019.1.144/linux/compiler/lib/intel64  
-lqkmallocc
```

## Peak Compiler Invocation

C benchmarks (except as noted below):

```
icc -m64 -std=c11
```

```
502.gcc_r: icc -m32 -std=c11 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/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_2019.1.144/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
```



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## 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_2019.1.144/linux/compiler/lib/intel64
-lqkmallocc
```

```
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 -ljemallocc
```

```
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_2019.1.144/linux/compiler/lib/intel64
-lqkmallocc
```

```
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_2019.1.144/linux/compiler/lib/intel64
-lqkmallocc
```

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_2019.1.144/linux/compiler/lib/intel64
-lqkmallocc
```

```
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 -ljemallocc
```

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_2019.1.144/linux/compiler/lib/intel64
-lqkmallocc
```



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**Software Availability:** Feb-2019

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-revE2.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-revE2.xml>

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For questions about this result, please contact the tester. For other inquiries, please contact [info@spec.org](mailto:info@spec.org).

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