



# SPEC CPU®2017 Integer Rate Result

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## Nettrix

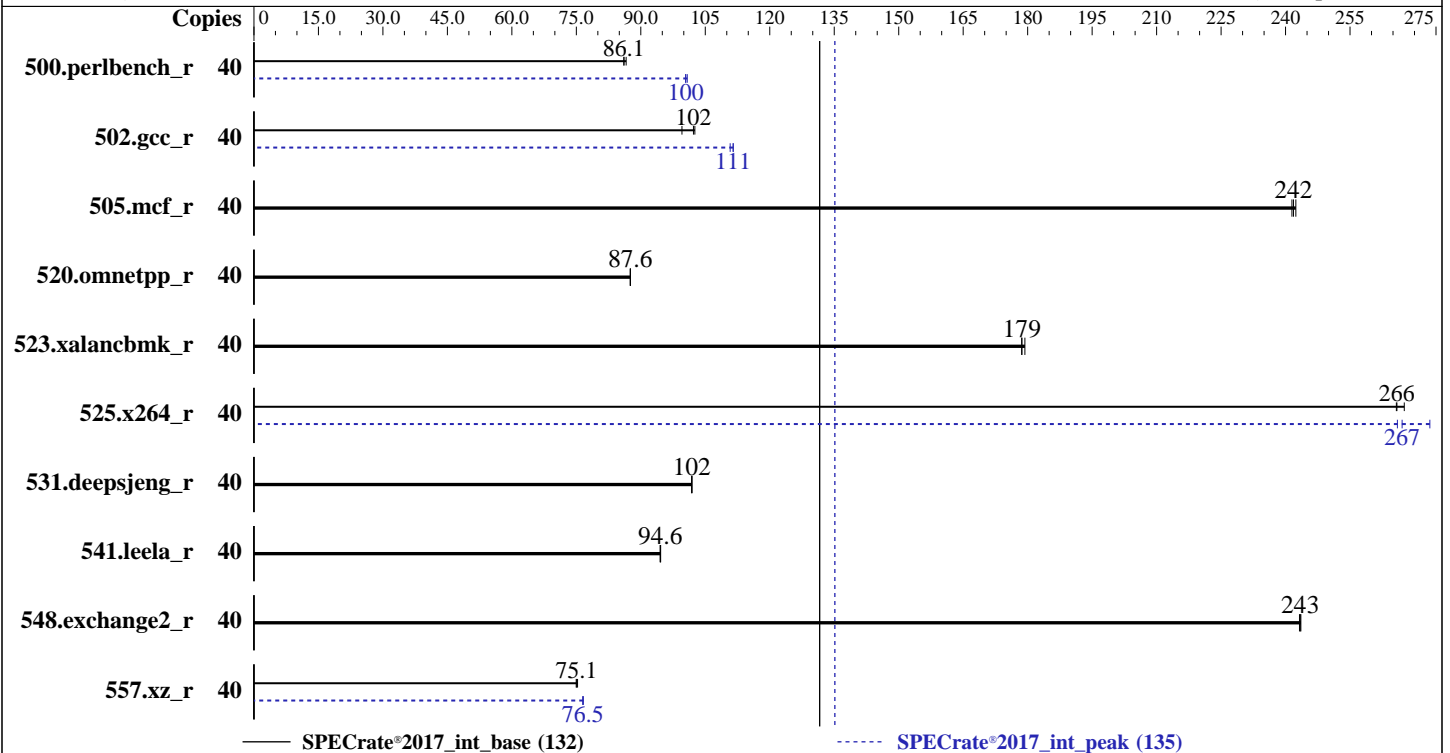
SPECrate®2017\_int\_base = 132

## R620 G30 (Intel Xeon Silver 4210R)

SPECrate®2017\_int\_peak = 135

CPU2017 License: 6138  
Test Sponsor: Nettrix  
Tested by: Nettrix

Test Date: Jul-2020  
Hardware Availability: May-2020  
Software Availability: Apr-2020



### Hardware

CPU Name: Intel Xeon Silver 4210R  
 Max MHz: 3200  
 Nominal: 2400  
 Enabled: 20 cores, 2 chips, 2 threads/core  
 Orderable: 1,2 Chips  
 Cache L1: 32 KB I + 32 KB D on chip per core  
 L2: 1 MB I+D on chip per core  
 L3: 13.75 MB I+D on chip per chip  
 Other: None  
 Memory: 384 GB (24 x 16 GB 2Rx8 PC4-3200AA-R, running at 2400)  
 Storage: 1x 960 GB SATA SSD  
 Other: None

### Software

OS: Red Hat Enterprise Linux release 8.0 (Ootpa)  
 4.18.0-80.el8.x86\_64  
 Compiler: C/C++: Version 19.1.1.217 of Intel C/C++ Compiler for Linux Build 20200306;  
 Fortran: Version 19.1.1.217 of Intel Fortran Compiler for Linux Build 20200306;  
 Parallel: No  
 Firmware: Nettrix BIOS Version NJGS041227 released May-2020  
 File System: xfs  
 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 set to prefer performance at the cost of additional power usage.



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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 | 40     | <b>740</b> | <b>86.1</b> | 735        | 86.6        | 740        | 86.1        | 40     | 632        | 101        | <b>634</b> | <b>100</b>  | 634        | 100         |
| 502.gcc_r       | 40     | <b>554</b> | <b>102</b>  | 569        | 99.6        | 552        | 103         | 40     | <b>508</b> | <b>111</b> | 508        | 112         | 511        | 111         |
| 505.mcf_r       | 40     | 267        | 242         | <b>267</b> | <b>242</b>  | 268        | 241         | 40     | 267        | 242        | <b>267</b> | <b>242</b>  | 268        | 241         |
| 520.omnetpp_r   | 40     | 600        | 87.5        | 599        | 87.6        | <b>599</b> | <b>87.6</b> | 40     | 600        | 87.5       | 599        | 87.6        | <b>599</b> | <b>87.6</b> |
| 523.xalancbmk_r | 40     | 236        | 179         | 237        | 179         | <b>236</b> | <b>179</b>  | 40     | 236        | 179        | 237        | 179         | <b>236</b> | <b>179</b>  |
| 525.x264_r      | 40     | <b>263</b> | <b>266</b>  | 262        | 268         | 264        | 266         | 40     | 256        | 274        | <b>262</b> | <b>267</b>  | 263        | 266         |
| 531.deepsjeng_r | 40     | <b>450</b> | <b>102</b>  | 450        | 102         | 450        | 102         | 40     | <b>450</b> | <b>102</b> | 450        | 102         | 450        | 102         |
| 541.leela_r     | 40     | 701        | 94.5        | <b>700</b> | <b>94.6</b> | 700        | 94.6        | 40     | 701        | 94.5       | <b>700</b> | <b>94.6</b> | 700        | 94.6        |
| 548.exchange2_r | 40     | <b>431</b> | <b>243</b>  | 430        | 244         | 431        | 243         | 40     | <b>431</b> | <b>243</b> | 430        | 244         | 431        | 243         |
| 557.xz_r        | 40     | 576        | 75.0        | <b>575</b> | <b>75.1</b> | 574        | 75.3        | 40     | 565        | 76.5       | <b>564</b> | <b>76.5</b> | 564        | 76.6        |

SPECrate®2017\_int\_base = **132**

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

### Compiler Notes

The inconsistent Compiler version information under Compiler Version section is due to a discrepancy in Intel Compiler. The correct version of C/C++ compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux  
The correct version of Fortran compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux

### 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"

Tuning Kernel Parameters:

```
sched_migration_cost_ns=1000
sched_rt_runtime_us=990000
sched_latency_ns=24000000
sched_min_granularity_ns=8000000
dirty_background_ratio=10
dirty_ratio=40
dirty_writeback_centisecs=1500
dirty_expire_centisecs=10000
swappiness=10
numa_balancing=0
```



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## Environment Variables Notes

Environment variables set by runcpu before the start of the run:  
LD\_LIBRARY\_PATH =  
"/home/admin/benchmarks/cpu2017/lib/intel64:/home/admin/benchmarks/cpu2017/lib/ia32:/home/admin/benchmarks/cpu2017/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 Redhat Enterprise Linux 8.0  
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>

## Platform Notes

Application Performance Profile Set to Computing Throughput Mode  
Hyper-Threading set to Enabled  
MONITOR/MWAIT set to Enabled  
Autonomous Core C-State set to Enabled  
SNC set to Enabled  
IMC set to 1-Way Interleaving  
XPT Prefetch set to Enabled  
KTI Prefetch set to Disabled  
Stale AtoS set to Enabled  
Patrol Scrub set to Disabled  
LLC Dead Line Allocation set to Disabled  
BMC Settings:  
Cooling Policy set to Manual Mode  
Fan Duty set to 95  
  
Sysinfo program /home/admin/benchmarks/cpu2017/bin/sysinfo  
Rev: r6365 of 2019-08-21 295195f888a3d7edble6e46a485a0011

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## Platform Notes (Continued)

running on localhost.localdomain Thu Jul 23 10:19:48 2020

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 4210R CPU @ 2.40GHz
 2 "physical id"s (chips)
 40 "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 : 10
  siblings  : 20
  physical 0: cores 0 1 2 3 4 8 9 10 11 12
  physical 1: cores 0 1 2 3 4 8 9 10 11 12
```

From lscpu:

```
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
CPU(s):                40
On-line CPU(s) list:   0-39
Thread(s) per core:    2
Core(s) per socket:    10
Socket(s):              2
NUMA node(s):          2
Vendor ID:              GenuineIntel
CPU family:             6
Model:                  85
Model name:             Intel(R) Xeon(R) Silver 4210R CPU @ 2.40GHz
Stepping:               7
CPU MHz:                1700.405
CPU max MHz:           3200.0000
CPU min MHz:           1000.0000
BogoMIPS:               4800.00
Virtualization:        VT-x
L1d cache:              32K
L1i cache:              32K
L2 cache:               1024K
L3 cache:               14080K
NUMA node0 CPU(s):     0-9,20-29
NUMA node1 CPU(s):     10-19,30-39
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
aperfmpperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
```

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## Platform Notes (Continued)

xtpr pdc m pcid dca sse4\_1 sse4\_2 x2apic movbe popcnt tsc\_deadline\_timer aes xsave  
avx fl6c 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 : 14080 KB
```

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.

```
available: 2 nodes (0-1)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 20 21 22 23 24 25 26 27 28 29
node 0 size: 192804 MB
node 0 free: 179894 MB
node 1 cpus: 10 11 12 13 14 15 16 17 18 19 30 31 32 33 34 35 36 37 38 39
node 1 size: 193506 MB
node 1 free: 182839 MB
node distances:
node  0  1
  0:  10  21
  1:  21  10
```

```
From /proc/meminfo
MemTotal:          395583092 kB
HugePages_Total:      0
Hugepagesize:       2048 kB
```

```
From /etc/*release* /etc/*version*
os-release:
NAME="Red Hat Enterprise Linux"
VERSION="8.0 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.0"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.0 (Ootpa)"
ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.0 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.0 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.0:ga
```

```
uname -a:
Linux localhost.localdomain 4.18.0-80.el8.x86_64 #1 SMP Wed Mar 13 12:02:46 UTC 2019
```

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## Platform Notes (Continued)

x86\_64 x86\_64 x86\_64 GNU/Linux

Kernel self-reported vulnerability status:

|   |   |
|---|---|
| CVE-2018-3620 (L1 Terminal Fault):        | Not affected  |
| Microarchitectural Data Sampling:         | No status reported  |
| 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: __user pointer sanitization                             |
| CVE-2017-5715 (Spectre variant 2):        | Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling           |

run-level 3 Jul 22 09:42

SPEC is set to: /home/admin/benchmarks/cpu2017

| Filesystem | Type | Size | Used | Avail | Use% | Mounted on |
|------------|------|------|------|-------|------|------------|
| /dev/sda5  | xfs  | 877G | 139G | 738G  | 16%  | /home      |

From /sys/devices/virtual/dmi/id

```

BIOS: American Megatrends Inc. NJGS041227 05/16/2020
Vendor: Nettrix
Product: R620 G30
Product Family: Rack
Serial: 302000666

```

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.

Memory:

```

24x Samsung M393A2K43DB2-CWE 16 GB 2 rank 3200

```

(End of data from sysinfo program)

## Compiler Version Notes

```

=====
C      | 502.gcc_r(peak)
=====

```

```

Intel(R) C Compiler for applications running on IA-32, Version 2021.1 NextGen
Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
=====

```

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## Compiler Version Notes (Continued)

C | 500.perlbench\_r(base) 502.gcc\_r(base) 505.mcf\_r(base, peak)  
| 525.x264\_r(base, peak) 557.xz\_r(base)

-----  
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
-----

=====  
C | 500.perlbench\_r(peak) 557.xz\_r(peak)  
-----

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.1.1.217 Build 20200306  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
-----

=====  
C | 502.gcc\_r(peak)  
-----

Intel(R) C Compiler for applications running on IA-32, Version 2021.1 NextGen  
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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)  
-----

Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
-----

=====  
C | 500.perlbench\_r(peak) 557.xz\_r(peak)  
-----

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
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Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
-----

=====  
C | 502.gcc\_r(peak)  
-----

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-----

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## Compiler Version Notes (Continued)

=====  
C | 500.perlbench\_r(base) 502.gcc\_r(base) 505.mcf\_r(base, peak)  
| 525.x264\_r(base, peak) 557.xz\_r(base)  
=====

-----  
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
-----

=====  
C | 500.perlbench\_r(peak) 557.xz\_r(peak)  
=====

-----  
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.1.1.217 Build 20200306  
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-----

=====  
C++ | 520.omnetpp\_r(base, peak) 523.xalanbmk\_r(base, peak)  
| 531.deepsjeng\_r(base, peak) 541.leela\_r(base, peak)  
=====

-----  
Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
-----

=====  
Fortran | 548.exchange2\_r(base, peak)  
=====

-----  
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
64, Version 19.1.1.217 Build 20200306  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
-----

## Base Compiler Invocation

C benchmarks:  
icc

C++ benchmarks:  
icpc

Fortran benchmarks:  
ifort





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## 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:

```
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX512 -O3 -ffast-math -flto -mfpmath=sse -funroll-loops
-fuse-ld=gold -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc
```

### C++ benchmarks:

```
-m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto -mfpmath=sse
-funroll-loops -fuse-ld=gold -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc
```

### Fortran benchmarks:

```
-m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -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/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc
```

## Peak Compiler Invocation

C benchmarks:  
icc

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## Peak Compiler Invocation (Continued)

C++ benchmarks:

icpc

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: -w1,-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/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

502.gcc_r: -m32
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/ia32_lin
-std=gnu89
-w1,-plugin-opt=-x86-branches-within-32B-boundaries
-w1,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profddata(pass 2) -xCORE-AVX512 -flto
-Ofast(pass 1) -O3 -ffast-math -qnextgen -fuse-ld=gold
-qopt-mem-layout-trans=4 -L/usr/local/jemalloc32-5.0.1/lib
-ljemalloc

505.mcf_r: basepeak = yes
```

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## Peak Optimization Flags (Continued)

```
525.x264_r: -m64 -qnextgen -std=c11  
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries  
-Wl,-z,muldefs -xCORE-AVX512 -flto -O3 -ffast-math  
-fuse-ld=gold -qopt-mem-layout-trans=4 -fno-alias  
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin  
-lqkmalloc
```

```
557.xz_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div  
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries  
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin  
-lqkmalloc
```

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-ic19.1ul-official-linux64\\_revA.html](http://www.spec.org/cpu2017/flags/Intel-ic19.1ul-official-linux64_revA.html)

<http://www.spec.org/cpu2017/flags/Nettrix-Platform-Settings-V3.0-CLX-revB.html>

You can also download the XML flags sources by saving the following links:

[http://www.spec.org/cpu2017/flags/Intel-ic19.1ul-official-linux64\\_revA.xml](http://www.spec.org/cpu2017/flags/Intel-ic19.1ul-official-linux64_revA.xml)

<http://www.spec.org/cpu2017/flags/Nettrix-Platform-Settings-V3.0-CLX-revB.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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