



# SPEC CPU®2017 Integer Rate Result

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## NEC Corporation

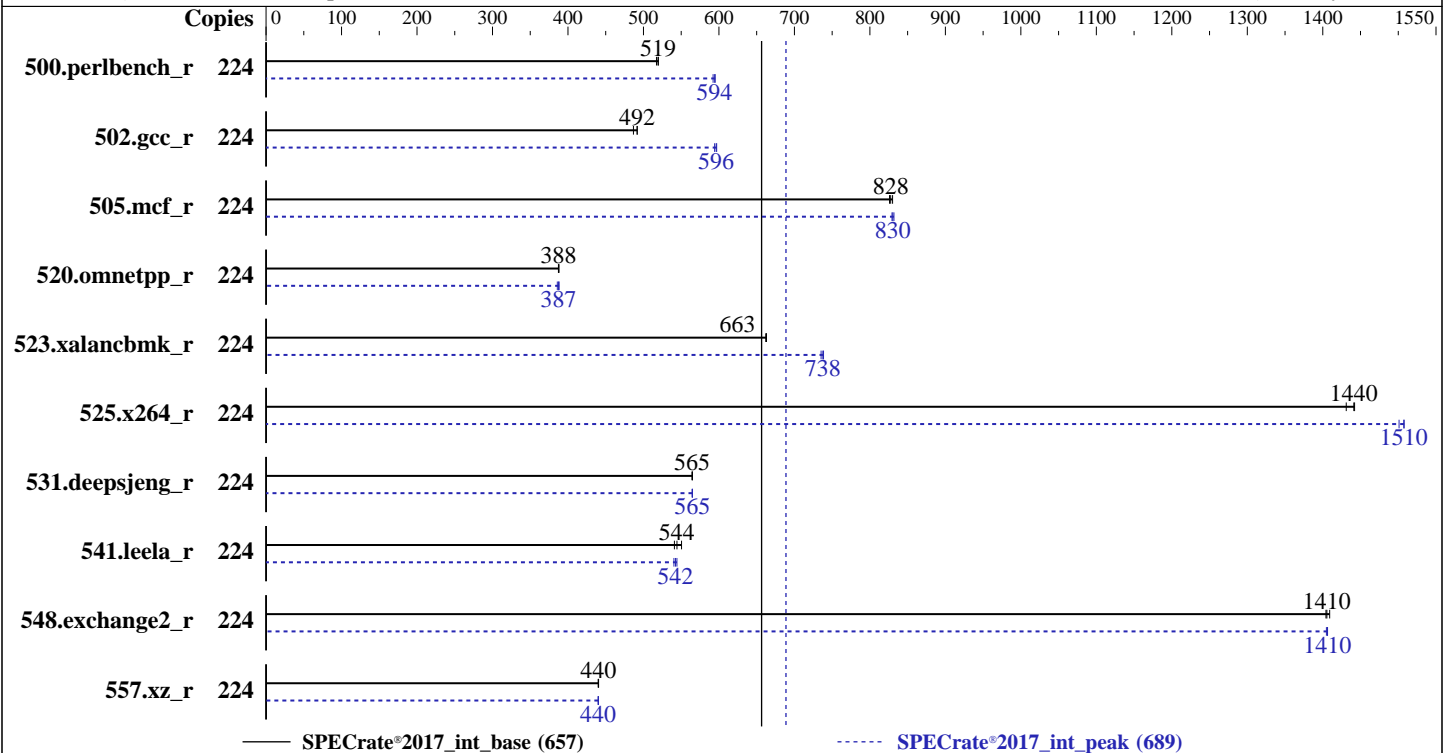
NX7700x/A5012M-4 v2  
(Intel Xeon Platinum 8280, 2.70GHz)

SPECrate®2017\_int\_base = 657

SPECrate®2017\_int\_peak = 689

**CPU2017 License:** 9006  
**Test Sponsor:** NEC Corporation  
**Tested by:** NEC Corporation

**Test Date:** Aug-2019  
**Hardware Availability:** Oct-2019  
**Software Availability:** May-2019



### Hardware

CPU Name: Intel Xeon Platinum 8280  
Max MHz: 4000  
Nominal: 2700  
Enabled: 112 cores, 4 chips, 2 threads/core  
Orderable: 2,3,4 chips  
Cache L1: 32 KB I + 32 KB D on chip per core  
L2: 1 MB I+D on chip per core  
L3: 38.5 MB I+D on chip per chip  
Other: None  
Memory: 1536 GB (48 x 32 GB 2Rx4 PC4-2666V-R)  
Storage: 800 GB tmpfs  
Other: None

### Software

OS: Red Hat Enterprise Linux Server release 7.6 (Maipo)  
Kernel 3.10.0-957.10.1.el7.x86\_64  
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: NEC BIOS Version 5.7.0207 06/11/2019 released Oct-2019  
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: --



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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	224	686	520	<b>687</b>	<b>519</b>	689	517	224	602	592	599	595	<b>600</b>	<b>594</b>
502.gcc_r	224	645	492	652	487	<b>645</b>	<b>492</b>	224	<b>532</b>	<b>596</b>	531	597	534	594
505.mcf_r	224	436	830	438	826	<b>437</b>	<b>828</b>	224	437	829	<b>436</b>	<b>830</b>	435	832
520.omnetpp_r	224	<b>758</b>	<b>388</b>	757	388	759	387	224	762	386	757	388	<b>758</b>	<b>387</b>
523.xalancbmk_r	224	<b>357</b>	<b>663</b>	357	662	357	663	224	322	735	<b>321</b>	<b>738</b>	320	739
525.x264_r	224	<b>272</b>	<b>1440</b>	274	1430	272	1440	224	<b>260</b>	<b>1510</b>	261	1500	260	1510
531.deepsjeng_r	224	<b>455</b>	<b>565</b>	455	564	454	565	224	<b>455</b>	<b>565</b>	455	564	454	565
541.leela_r	224	674	550	686	541	<b>681</b>	<b>544</b>	224	<b>684</b>	<b>542</b>	681	544	686	540
548.exchange2_r	224	416	1410	418	1400	<b>418</b>	<b>1410</b>	224	418	1400	<b>417</b>	<b>1410</b>	417	1410
557.xz_r	224	550	440	<b>549</b>	<b>440</b>	549	441	224	<b>550</b>	<b>440</b>	550	440	550	440

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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"
Tmpfs filesystem can be set with:
mount -t tmpfs -o size=800g tmpfs /home
cpupower -c all frequency-set -g performance
VM Dirty ratio was set to 40 using "echo 40 > /proc/sys/vm/dirty_ratio"
Set Kernel Boot Parameter : nohz_full=1-223
irqbalance disabled with "service irqbalance stop"
echo 0 > /proc/sys/kernel/numa_balancing
```

## General Notes

Environment variables set by runcpu before the start of the run:  
LD\_LIBRARY\_PATH = "/home/SPEC/lib/intel64:/home/SPEC/lib/ia32:/home/SPEC/je5.0.1-32"

Binaries compiled on a system with 1x Intel Core i9-799X CPU + 32GB RAM  
memory using Redhat Enterprise Linux 7.5  
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

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### General Notes (Continued)

runcpu command invoked through numactl i.e.:  
numactl --interleave=all runcpu <etc>

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.  
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:  
Memory RAS Mode: SDDC mode  
VT-x : Disabled  
Processor C6 Report : Disabled  
OS Performance Tuning : Disabled  
Energy Performance : Performance  
Patrol Scrub : Disabled  
DCU Streamer Prefetcher : Disabled  
Memory P.E. Retry : Disabled  
Sub NUMA Clustering : Enabled  
Turbo Boost : Enabled  
Sysinfo program /home/SPEC/bin/sysinfo  
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9  
running on ithw149018.nect.nec.co.jp Thu Aug 22 01:35:39 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) Platinum 8280 CPU @ 2.70GHz  
4 "physical id"s (chips)  
224 "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 : 28  
siblings : 56  
physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30  
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30

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### Platform Notes (Continued)

physical 2: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27  
28 29 30

physical 3: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27  
28 29 30

From lscpu:

```

Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
CPU(s):                224
On-line CPU(s) list:   0-223
Thread(s) per core:    2
Core(s) per socket:    28
Socket(s):             4
NUMA node(s):         8
Vendor ID:             GenuineIntel
CPU family:            6
Model:                 85
Model name:            Intel(R) Xeon(R) Platinum 8280 CPU @ 2.70GHz
Stepping:              7
CPU MHz:               2701.000
CPU max MHz:           2701.0000
CPU min MHz:           1000.0000
BogoMIPS:              5400.00
Virtualization:        VT-x
L1d cache:             32K
L1i cache:             32K
L2 cache:              1024K
L3 cache:              39424K
NUMA node0 CPU(s):    0-3,7-9,14-17,21-23,112-115,119-121,126-129,133-135
NUMA node1 CPU(s):    4-6,10-13,18-20,24-27,116-118,122-125,130-132,136-139
NUMA node2 CPU(s):    28-31,35-37,42-45,49-51,140-143,147-149,154-157,161-163
NUMA node3 CPU(s):    32-34,38-41,46-48,52-55,144-146,150-153,158-160,164-167
NUMA node4 CPU(s):    56-59,63-65,70-73,77-79,168-171,175-177,182-185,189-191
NUMA node5 CPU(s):    60-62,66-69,74-76,80-83,172-174,178-181,186-188,192-195
NUMA node6 CPU(s):    84-87,91-93,98-101,105-107,196-199,203-205,210-213,217-219
NUMA node7 CPU(s):    88-90,94-97,102-104,108-111,200-202,206-209,214-216,220-223
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
aperfmpperf eagerfpu 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 epb cat_l3 cdp_l3 intel_pt 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 avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1
cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local dtherm ida arat pln pts pku ospke

```

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### Platform Notes (Continued)

avx512\_vnni spec\_ctrl intel\_stibp flush\_lld arch\_capabilities

```
/proc/cpuinfo cache data
cache size : 39424 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 7 8 9 14 15 16 17 21 22 23 112 113 114 115 119 120 121 126 127 128
129 133 134 135
node 0 size: 195208 MB
node 0 free: 190278 MB
node 1 cpus: 4 5 6 10 11 12 13 18 19 20 24 25 26 27 116 117 118 122 123 124 125 130 131
132 136 137 138 139
node 1 size: 196608 MB
node 1 free: 189645 MB
node 2 cpus: 28 29 30 31 35 36 37 42 43 44 45 49 50 51 140 141 142 143 147 148 149 154
155 156 157 161 162 163
node 2 size: 196608 MB
node 2 free: 192121 MB
node 3 cpus: 32 33 34 38 39 40 41 46 47 48 52 53 54 55 144 145 146 150 151 152 153 158
159 160 164 165 166 167
node 3 size: 196608 MB
node 3 free: 191167 MB
node 4 cpus: 56 57 58 59 63 64 65 70 71 72 73 77 78 79 168 169 170 171 175 176 177 182
183 184 185 189 190 191
node 4 size: 196608 MB
node 4 free: 192134 MB
node 5 cpus: 60 61 62 66 67 68 69 74 75 76 80 81 82 83 172 173 174 178 179 180 181 186
187 188 192 193 194 195
node 5 size: 196608 MB
node 5 free: 191689 MB
node 6 cpus: 84 85 86 87 91 92 93 98 99 100 101 105 106 107 196 197 198 199 203 204 205
210 211 212 213 217 218 219
node 6 size: 196608 MB
node 6 free: 192154 MB
node 7 cpus: 88 89 90 94 95 96 97 102 103 104 108 109 110 111 200 201 202 206 207 208
209 214 215 216 220 221 222 223
node 7 size: 196608 MB
node 7 free: 191642 MB
node distances:
node 0 1 2 3 4 5 6 7
0: 10 11 15 15 15 15 15 15
1: 11 10 15 15 15 15 15 15
2: 15 15 10 11 15 15 15 15
3: 15 15 11 10 15 15 15 15
4: 15 15 15 15 10 11 15 15
```

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### Platform Notes (Continued)

5:	15	15	15	15	11	10	15	15
6:	15	15	15	15	15	15	10	11
7:	15	15	15	15	15	15	11	10

From /proc/meminfo

MemTotal: 1583652944 kB  
HugePages\_Total: 0  
Hugepagesize: 2048 kB

From /etc/\*release\* /etc/\*version\*

os-release:

NAME="Red Hat Enterprise Linux Server"  
VERSION="7.6 (Maipo)"  
ID="rhel"  
ID\_LIKE="fedora"  
VARIANT="Server"  
VARIANT\_ID="server"  
VERSION\_ID="7.6"  
PRETTY\_NAME="Red Hat Enterprise Linux Server 7.6 (Maipo)"

redhat-release: Red Hat Enterprise Linux Server release 7.6 (Maipo)  
system-release: Red Hat Enterprise Linux Server release 7.6 (Maipo)  
system-release-cpe: cpe:/o:redhat:enterprise\_linux:7.6:ga:server

uname -a:

Linux ithw149018.nect.nec.co.jp 3.10.0-957.10.1.el7.x86\_64 #1 SMP Thu Feb 7 07:12:53 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: Load fences, \_\_user pointer sanitization  
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS

run-level 3 Aug 22 01:07

SPEC is set to: /home/SPEC

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
tmpfs	tmpfs	800G	4.2G	796G	1%	/home

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 American Megatrends Inc. 5.7.0207 06/11/2019

Memory:

48x Samsung M393A4K40BB2-CTD 32 GB 2 rank 2666

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### Platform Notes (Continued)

(End of data from sysinfo program)

### Compiler Version Notes

=====  
C | 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.  
-----

=====  
C | 500.perlbench\_r(base, peak) 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,  
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-----

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

Intel(R) C Intel(R) 64 Compiler for applications running on IA-32, Version  
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-----

=====  
C | 500.perlbench\_r(base, peak) 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 19.0.4.227 Build 20190416  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
-----

=====  
C++ | 523.xalancbmk\_r(peak)  
-----

Intel(R) C++ Intel(R) 64 Compiler for applications running on IA-32, Version  
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### Compiler Version Notes (Continued)

```
=====  
C++      | 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.

```
=====  
C++      | 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.

```
=====  
C++      | 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.

```
=====  
Fortran  | 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

Fortran benchmarks:  
ifort -m64





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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:

```
-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
```

```
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
```

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## Peak Compiler Invocation (Continued)

```
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.perlbenc_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.perlbenc_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  
-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
```

(Continued on next page)



# SPEC CPU®2017 Integer Rate Result

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## NEC Corporation

NX7700x/A5012M-4 v2  
(Intel Xeon Platinum 8280, 2.70GHz)

SPECrate®2017\_int\_base = 657

SPECrate®2017\_int\_peak = 689

**CPU2017 License:** 9006  
**Test Sponsor:** NEC Corporation  
**Tested by:** NEC Corporation

**Test Date:** Aug-2019  
**Hardware Availability:** Oct-2019  
**Software Availability:** May-2019

## Peak Optimization Flags (Continued)

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-ic19.0u1-official-linux64.2019-07-09.html>

<http://www.spec.org/cpu2017/flags/NEC-Platform-Settings-SPECcpu2017-Flags-V1.2-CLX-A5012M-4-RevB.html>

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

<http://www.spec.org/cpu2017/flags/Intel-ic19.0u1-official-linux64.2019-07-09.xml>

<http://www.spec.org/cpu2017/flags/NEC-Platform-Settings-SPECcpu2017-Flags-V1.2-CLX-A5012M-4-RevB.xml>

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