## SPEC CPU®2017 Integer Rate Result

### NEC Corporation

**Express5800/R120i-1M (Intel Xeon Gold 5320)**

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base = 362</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate®2017_int_peak = 375</td>
</tr>
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### CPU2017 License: 9006

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<td>Tested by: NEC Corporation</td>
</tr>
<tr>
<td>Test Date: Jul-2021</td>
</tr>
<tr>
<td>Hardware Availability: Dec-2020</td>
</tr>
</tbody>
</table>

#### Hardware

- **CPU Name:** Intel Xeon Gold 5320
- **Max MHz:** 3400
- **Nominal:** 2200
- **Enabled:** 52 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:** 39 MB I+D on chip per chip
- **Other:** None
- **Memory:** 1 TB (32 x 32 GB 2Rx4 PC4-3200A-AA-R, running at 2933)
- **Storage:** 1 x 800 GB SAS SSD, RAID 0
- **Other:** None

#### Software

- **OS:** Red Hat Enterprise Linux release 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:** NEC BIOS Version U46 v1.40 04/28/2021 released Jul-2021
- **File System:** ext4
- **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.

### Copies

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base (362)</th>
<th>SPECrate®2017_int_peak (375)</th>
</tr>
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<tbody>
<tr>
<td>500.perlbench_r 104</td>
<td></td>
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<tr>
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<td></td>
</tr>
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<td></td>
</tr>
<tr>
<td>548.exchange2_r 104</td>
<td></td>
</tr>
<tr>
<td>557.xz_r 104</td>
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</tr>
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</table>
Results Table

<table>
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<tr>
<th>Benchmark</th>
<th>Base Copies</th>
<th>Base Seconds</th>
<th>Base Ratio</th>
<th>Peak Copies</th>
<th>Peak Seconds</th>
<th>Peak Ratio</th>
</tr>
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<tbody>
<tr>
<td>500.perlbench_r</td>
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<td>672</td>
<td>246</td>
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<td>505</td>
<td>292</td>
<td>104</td>
<td>430</td>
<td>342</td>
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<tr>
<td>505.mcf_r</td>
<td>104</td>
<td>272</td>
<td>619</td>
<td>104</td>
<td>272</td>
<td>619</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
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<tr>
<td>523.xalancbmk_r</td>
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<td>241</td>
<td>456</td>
<td>104</td>
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<td>456</td>
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<tr>
<td>525.x264_r</td>
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<td>745</td>
<td>104</td>
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<td>781</td>
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<td>541.leela_r</td>
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<td>735</td>
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<td>203</td>
<td>104</td>
<td>554</td>
<td>203</td>
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</table>

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 = "/home/cpu2017/lib/intel64:/home/cpu2017/lib/ia32:/home/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 Red Hat Enterprise Linux 8.1

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)
<table>
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**Test Date:** Jul-2021  
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**Software Availability:** Dec-2020

---

**General Notes (Continued)**

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.

This benchmark result is intended to provide perspective on past performance using the historical software and/or firmware described on this result page.

The system as described on this result page was formerly generally available. At the time of this publication, it may not be shipping, and/or may not be supported, and/or may fail to meet other tests of General Availability described in the SPEC OSG Policy document, [http://www.spec.org/osg/policy.html](http://www.spec.org/osg/policy.html)  
This measured result may not be representative of the result that would be measured were this benchmark run with software and firmware available as of the publication date.

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.:  
umactl --interleave=all runcpu <etc>  
jemalloc, a general purpose malloc implementation  

---

**Platform Notes**

**BIOS Settings:**  
Thermal Configuration: Maximum Cooling  
Workload Profile: General Throughput Compute  
Advanced Memory Protection: Advanced ECC Support  
Memory Patrol Scrubbing: Disabled  
Minimum Processor Idle Power Core C-State: C6 State  
LLC Dead Line Allocation: Disabled  
Enhanced Processor Performance: Enabled  
XPT Prefetcher: Enabled  
Intel UPI Link Enablement: Single Link Operation  
Intel UPI Link Frequency: Min UPI Speed  
Direct To UPI (D2K): Disabled  
Workload Profile: Custom  
Adjacent Sector Prefetch: Disabled  
DCU Stream Prefetcher: Disabled  
Intel UPI Link Power Management: Enabled  
Energy Efficient Turbo: Enabled

(Continued on next page)
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Platform Notes (Continued)

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aaca064d
running on r120i1m Wed Jul 21 09:37:05 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) Gold 5320 CPU @ 2.20GHz
  2 "physical id"s (chips)
  104 "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 : 26
siblings : 52
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
  25
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
  25

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): 104
On-line CPU(s) list: 0-103
Thread(s) per core: 2
Core(s) per socket: 26
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Gold 5320 CPU @ 2.20GHz
Stepping: 6
CPU MHz: 1543.990
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 39936K
NUMA node0 CPU(s): 0-12,52-64
NUMA node1 CPU(s): 13-25,65-77
NUMA node2 CPU(s): 26-38,78-90

(Continued on next page)
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**Software Availability:** Dec-2020

### Platform Notes (Continued)

**NUMA node3 CPU(s):** 39-51,91-103

**Flags:**
- fpu
- vme
- de
- mce
- cmov
- cmov
- pat
- pse
- 36 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
- xtrp
- pdcm
- pcid
- dca
- sse4_1
- sse4_2
- x2apic
- movbe
- popcnt
- tsc_deadline_timer
- aes
- xsave
- avx
- f16c
- rdrand
- lahf_lm
- abm
- 3nowprefetch
- cpuid_fault
- epb
- cat_13
- invpcid_single
- ssbd
- mba
- ibrs
- ibpb
- stibp
- ibrs_enhanced
- tpr_shadow
- vnumi
- flexpriority
- ept
- vpid
- ept_ad
- fsgsbase
- tsc_adjust
- bmi1
- hle
- avx2
- smep
- bmi2
- erms
- invpcid
- cgq
- rdt_a
- avx512f
- avx512dq
- rdseed
- adx
- smap
- avx512ifma
- clflushopt
- clwb
- intel_pt
- avx512cd
- sha
- ni
- avx512bw
- avx512vl
- xsaveopt
- xsavec
- xgetbv1
- xsaves
- cgq _llc
- cgq _occup_llc
- cgq _mbm _total
- cgq _mbm _local
- split _lock _detect
- wbeno invd
- 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 : 39936 KB

**From numactl --hardware**

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

- available: 4 nodes (0-3)
  - node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 52 53 54 55 56 57 58 59 60 61 62 63 64
  - node 0 size: 251878 MB
  - node 0 free: 257052 MB
  - node 1 cpus: 13 14 15 16 17 18 19 20 21 22 23 24 25 65 66 67 68 69 70 71 72 73 74 75 76 77
  - node 1 size: 252486 MB
  - node 1 free: 257695 MB
  - node 2 cpus: 26 27 28 29 30 31 32 33 34 35 36 37 38 78 79 80 81 82 83 84 85 86 87 88 89 90
  - node 2 size: 252517 MB
  - node 2 free: 257513 MB
  - node 3 cpus: 39 40 41 42 43 44 45 46 47 48 49 50 51 91 92 93 94 95 96 97 98 99 100 101 102 103
  - node 3 size: 252459 MB
  - node 3 free: 257698 MB
  - node distances:
    - node 0 1 2 3
    - 0: 10 20 30 30
    - 1: 20 10 30 30
    - 2: 30 30 10 20
    - 3: 30 30 20 10

**From /proc/meminfo**

- MemTotal: 1056514708 kB
- HugePages_Total: 0
- Hugepagesize: 2048 kB

(Continued on next page)
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Platform Notes (Continued)

/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 r120i1m 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020 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): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2018-3639 (Speculative Store Bypass): Mitigation: usercopy/swaps barriers and __user pointer sanitation
CVE-2017-5753 (Spectre variant 1): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
CVE-2017-5715 (Spectre variant 2): Not affected
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Jul 21 09:35

SPEC is set to: /home/cpu2017
   Filesystem      Type  Size  Used Avail Use% Mounted on
   /dev/sda3      ext4   724G  173G  514G  26% /

   From /sys/devices/virtual/dmi/id
   Vendor: NEC

(Continued on next page)
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Copyright 2017-2023 Standard Performance Evaluation Corporation

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Platform Notes (Continued)

Product: Express5800/R120i-1M
Product Family: Express5800
Serial: CN70450X8H

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:
32x Hynix HMA84GR7CJR4N-XN 32 GB 2 rank 3200, configured at 2933

BIOS:
BIOS Vendor: NEC
BIOS Version: U46
BIOS Date: 04/28/2021
BIOS Revision: 1.40
Firmware Revision: 2.44

(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.
==============================================================================

C | 502.gcc_r(peak)
==============================================================================
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version
2021.1 Build 20201113
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==============================================================================

C | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
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**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**

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**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**

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---

### Base Compiler Invocation

**C benchmarks:**

- icx

**C++ benchmarks:**

- icpx

**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
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### Base Portability Flags (Continued)

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`

### Peak Compiler Invocation

**C benchmarks (except as noted below):**

- `icx`
- `500.perlbench_r: icc`

**C++ benchmarks:**

- `icpx`

**Fortran benchmarks:**

- `ifort`
**SPEC CPU®2017 Integer Rate Result**

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NEC Corporation

Express5800/R120i-1M (Intel Xeon Gold 5320)

SPECrater®2017_int_base = 362
SPECrater®2017_int_peak = 375

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

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

---

**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

505.mcf_r: basepeak = yes

520.omnetpp_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

(Continued on next page)
# SPEC CPU®2017 Integer Rate Result

## NEC Corporation

Express5800/R120i-1M (Intel Xeon Gold 5320)

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>SPECrate®2017_int_peak</th>
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<td>362</td>
<td>375</td>
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</tbody>
</table>

**CPU2017 License:** 9006  
**Test Sponsor:** NEC Corporation  
**Tested by:** NEC Corporation  
**Test Date:** Jul-2021  
**Hardware Availability:** Jul-2021  
**Software Availability:** Dec-2020

### Peak Optimization Flags (Continued)

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/NEC-Platform-Settings-V1.2-R120i-RevE.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/NEC-Platform-Settings-V1.2-R120i-RevE.xml

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

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