### SPEC CPU®2017 Integer Rate Result

**NEC Corporation**

Express5800/R120h-2E (Intel Xeon Gold 5222)

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base = 33.3</th>
<th>SPECrate®2017_int_peak = 34.2</th>
</tr>
</thead>
</table>

**CPU2017 License:** 9006  
**Test Sponsor:** NEC Corporation  
**Tested by:** NEC Corporation  
**Test Date:** Aug-2019  
**Hardware Availability:** Jul-2019  
**Software Availability:** May-2019

### Hardware

- **CPU Name:** Intel Xeon Gold 5222  
- **Max MHz:** 3900  
- **Nominal:** 3800  
- **Enabled:** 4 cores, 1 chip, 2 threads/core  
- **Orderable:** 1.2 chips  
- **Cache L1:** 32 KB I + 32 KB D on chip per core  
- **Cache L2:** 1 MB I+D on chip per core  
- **Cache L3:** 16.5 MB I+D on chip per chip  
- **Memory:** 192 GB (6 x 32 GB 2Rx4 PC4-2933Y-R)  
- **Storage:** 1 x 480 GB SATA SSD, RAID 0  
- **Other:** None

### Software

- **OS:** Red Hat Enterprise Linux Server release 7.6 (Maipo)  
  - Kernel 3.10.0-957.5.1.el7.x86_64  
- **Compiler:** C/C++: Version 19.0.4.227 of Intel C/C++ Compiler for Linux;  
  - Fortran: Version 19.0.4.227 of Intel Fortran Compiler for Linux  
- **Parallel:** No  
- **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:** --
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
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<th>Seconds</th>
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<td>8</td>
<td>520</td>
<td>24.5</td>
<td>523</td>
<td>24.4</td>
<td>517</td>
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<td>505.mcf_r</td>
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</tr>
</tbody>
</table>

**SPECrate®2017_int_base = 33.3**  
**SPECrate®2017_int_peak = 34.2**

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/intel64:/home/cpu2017/lib/ia32:/home/cpu2017/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  
runcpu command invoked through numactl i.e.:  
umactl --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.

(Continued on next page)
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Tested by: NEC Corporation

Test Date: Aug-2019
Hardware Availability: Jul-2019
Software Availability: May-2019

General Notes (Continued)

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

Platform Notes

BIOS Settings:
- Thermal Configuration: Maximum Cooling
- Workload Profile: General Throughput Compute
- Memory Patrol Scrubbing: Disabled
- LLC Dead Line Allocation: Disabled
- LLC Prefetch: Enabled
- Workload Profile: Custom
- Advanced Memory Protection: Advanced ECC Support

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on r120h2e Thu Aug 22 07:12:57 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 5222 CPU @ 3.80GHz
   1 "physical id"s (chips)
     8 "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 : 4
siblings : 8
physical 0: cores 1 5 8 13

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 8
On-line CPU(s) list: 0-7
Thread(s) per core: 2
Core(s) per socket: 4
Socket(s): 1
NUMA node(s): 2
Vendor ID: GenuineIntel

(Continued on next page)
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Platform Notes (Continued)

CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 5222 CPU @ 3.80GHz
Stepping: 6
CPU MHz: 3800.000
BogoMIPS: 7600.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 16896K
NUMA node0 CPU(s): 0,1,4,5
NUMA node1 CPU(s): 2,3,6,7

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 ntopstop_tsc
aperfperf 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 ebxp cat_13 cdp_13 intel_pmln
intel_pt ssbd mba ibrs ibp stibp ibrs_enhanced tpr_shadow vmmi 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_mbb_total cqm_mbb_local dtherm ida arat pln
pts pku ospke avx512_vnni spec_ctrl intel_stibp flush_l1d arch_capabilities

From /proc/cpuinfo cache data
cache size : 16896 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 4 5
node 0 size: 97953 MB
node 0 free: 95560 MB
node 1 cpus: 2 3 6 7
node 1 size: 98303 MB
node 1 free: 95899 MB

From /proc/meminfo
MemTotal: 197740140 kB
HugePages_Total:    0
Hugepagesize: 2048 kB

(Continued on next page)
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Platform Notes (Continued)

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)

uname -a:
   Linux r120h2e 3.10.0-957.5.1.el7.x86_64 #1 SMP Wed Dec 19 10:46:58 EST 2018 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 07:10

SPEC is set to: /home/cpu2017
   Filesystem Type Size Used Avail Use% Mounted on
   /dev/sda3 ext4 432G 21G 390G 5% /

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 NEC U31 05/21/2019
   Memory:
      10x UNKNOWN NOT AVAILABLE
      6x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2933

(End of data from sysinfo program)

Compiler Version Notes

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

(Continued on next page)
NEC Corporation
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SPECratenia2017_int_base = 33.3
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Compiler Version Notes (Continued)

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) |
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| C       | 502.gcc_r(peak) |
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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) |
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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
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(Continued on next page)
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Tested by: NEC Corporation

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Compiler Version Notes (Continued)

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
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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

(Continued on next page)
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Base Portability Flags (Continued)

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


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
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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.leea_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  
-O3 -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  
-O3 -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  
-O3 -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

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Peak Optimization Flags (Continued)

523.xalancbmk_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -03 -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:
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-R120h-RevD.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/NEC-Platform-Settings-V1.2-R120h-RevD.xml

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