# SPEC® CPU2017 Integer Rate Result

## NEC Corporation

**Express5800/D120h (Intel Xeon Gold 6138)**

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>9006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor:</td>
<td>NEC Corporation</td>
</tr>
<tr>
<td>Tested by:</td>
<td>NEC Corporation</td>
</tr>
<tr>
<td>Test Date:</td>
<td>Apr-2018</td>
</tr>
<tr>
<td>Hardware Availability:</td>
<td>Jan-2018</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Mar-2018</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** Intel Xeon Gold 6138
- **Max MHz.:** 3700
- **Nominal:** 2000
- **Enabled:** 40 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:** 27.5 MB I+D on chip per chip
- **Other:** None
- **Memory:** 384 GB (12 x 32 GB 2Rx4 PC4-2666V-R)
- **Storage:** 1 x 1 TB SATA, 7200 RPM
- **Other:** None

### Software

- **OS:** Red Hat Enterprise Linux Server release 7.4 (Maipo) Kernel 3.10.0-693.21.1.el7.x86_64
- **Compiler:** C/C++: Version 18.0.0.128 of Intel C/C++ Compiler for Linux; Fortran: Version 18.0.0.128 of Intel Fortran Compiler for Linux
- **Parallel:** No
- **Firmware:** Version F21 02/22/2018 released Apr-2018
- **File System:** ext4
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 32/64-bit
- **Other:** jemalloc memory allocator library V5.0.1

### Benchmarks

- **SPECrate2017_int_base = 180**
- **SPECrate2017_int_peak = 193**

### Copies

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>SPECrate2017_int_base</th>
<th>SPECrate2017_int_peak</th>
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</thead>
<tbody>
<tr>
<td>perlbench_r</td>
<td>141</td>
<td>171</td>
<td>213</td>
</tr>
<tr>
<td>gcc_r</td>
<td>185</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mcf_r</td>
<td>114</td>
<td></td>
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<td>omnetpp_r</td>
<td></td>
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<tr>
<td>xalancbmk_r</td>
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<tr>
<td>x264_r</td>
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<tr>
<td>deepsjeng_r</td>
<td>162</td>
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<tr>
<td>leela_r</td>
<td>415</td>
<td></td>
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<tr>
<td>exchange2_r</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xz_r</td>
<td>125</td>
<td></td>
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</tr>
</tbody>
</table>

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**Note:** The results are rounded to the nearest integer.
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SPECrate2017_int_base = 180
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CPU2017 License: 9006
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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>80</td>
<td>893</td>
<td>143</td>
<td>900</td>
<td>141</td>
<td>901</td>
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<td>502.gcc_r</td>
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<td>730</td>
<td>155</td>
<td>729</td>
<td>155</td>
<td>734</td>
<td>154</td>
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<td>505.mcf_r</td>
<td>80</td>
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<td>520.omnetpp_r</td>
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<td>385</td>
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<td>384</td>
<td>365</td>
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<td>531.deepsjeng_r</td>
<td>80</td>
<td>557</td>
<td>165</td>
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<td>162</td>
<td>573</td>
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<tr>
<td>541.leela_r</td>
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<td>885</td>
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<tr>
<td>548.exchange2_r</td>
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<td>557.xz_r</td>
<td>80</td>
<td>637</td>
<td>136</td>
<td>690</td>
<td>125</td>
<td>690</td>
<td>125</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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SPECrate2017_int_peak = 193

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 i7-4790 CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.4
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: configured and built at default for 32bit (i686) and 64bit (x86_64) targets;
jemalloc: built with the RedHat Enterprise 7.4, and the system compiler gcc 4.8.5;

(Continued on next page)
General Notes (Continued)

Yes: 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.

Platform Notes

BIOS Settings:
ENERGY_PERF_BIAS_CFG mode: Performance
SNC: Enable
IMC Interleaving: 1-way Interleave
Stale AtoS: Enable
LLC dead line alloc: Disable
Patrol Scrub: Disable
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on d120h Sun Apr 22 04:51:27 2018

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 6138 CPU @ 2.00GHz
  2 "physical id"s (chips)
  80 "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 : 20
siblings : 40
physical 0: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
physical 1: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 80
On-line CPU(s) list: 0-79
Thread(s) per core: 2
Core(s) per socket: 20
Socket(s): 2
NUMA node(s): 4

(Continued on next page)
### Platform Notes (Continued)

Vendor ID:             GenuineIntel  
CPU family:            6  
Model:                 85  
Model name:            Intel(R) Xeon(R) Gold 6138 CPU @ 2.00GHz  
Stepping:              4  
CPU MHz:               1259.609  
CPU max MHz:           3700.0000  
CPU min MHz:           1000.0000  
BogoMIPS:              4000.00  
Virtualization:        VT-x  
L1d cache:             32K  
L1i cache:             32K  
L2 cache:              1024K  
L3 cache:              28160K  
NUMA node0 CPU(s):     0-2,5,6,10-12,15,16,40-42,45,46,50-52,55,56  
NUMA node1 CPU(s):     3,4,7-9,13,14,17-19,43,44,47-49,53,54,57-59  
NUMA node2 CPU(s):     20-22,25,26,30-32,35,36,60-62,65,66,70-72,75,76  
NUMA node3 CPU(s):     23,24,27-29,33,34,37-39,63,64,67-69,73,74,77-79  
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 rdtsscp  
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc  
aperfmrperf eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 fma  
mxm cx16 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes  
xsave avx f16c rdrand lahf_lm abm 3nowprefetch epb cat_13 cdp_13 invpcid_single  
intel_pt spec_ctrl ibpb_support tpr_shadow vmmi flexpriority ept vpid fsgsbase  
tsc_adjust bmi1 hle avx2 smep bmi2 erms invpced 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 hwp  
hwp_act_window hwp_epp hwp_pkg

```
/cache data
cache size : 28160 KB
```

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

<table>
<thead>
<tr>
<th>Available</th>
<th>Node CPUs</th>
<th>Node Size</th>
<th>Node Free</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0-3</td>
<td>96932 MB</td>
<td>94341 MB</td>
</tr>
<tr>
<td>1</td>
<td>3-4</td>
<td>98304 MB</td>
<td>95948 MB</td>
</tr>
<tr>
<td>2</td>
<td>20-22</td>
<td>98304 MB</td>
<td>95990 MB</td>
</tr>
<tr>
<td>3</td>
<td>23-25</td>
<td>98304 MB</td>
<td>95990 MB</td>
</tr>
</tbody>
</table>

(Continued on next page)
## Platform Notes (Continued)

node 3 free: 95702 MB
node distances:

node 0 1 2 3
0:  10 11 21 21
1:  11 10 21 21
2:  21 21 10 11
3:  21 21 11 10

From /proc/meminfo
MemTotal:       394643600 kB
HugePages_Total:       0
Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
os-release:
NAME="Red Hat Enterprise Linux Server"
VERSION="7.4 (Maipo)"
ID="rhel"
ID_LIKE="fedora"
VARIANT="Server"
VARIANT_ID="server"
VERSION_ID="7.4"
PRETTY_NAME="Red Hat Enterprise Linux Server 7.4 (Maipo)"
redhat-release: Red Hat Enterprise Linux Server release 7.4 (Maipo)
system-release: Red Hat Enterprise Linux Server release 7.4 (Maipo)
system-release-cpe: cpe:/o:redhat:enterprise_linux:7.4:ga:server

uname -a:
Linux d120h 3.10.0-693.21.1.el7.x86_64 #1 SMP Fri Feb 23 18:54:16 UTC 2018 x86_64
x86_64 x86_64 GNU/Linux

run-level 3 Apr 22 04:45

SPEC is set to: /home/cpu2017
Filesystem    Type  Size  Used Avail Use% Mounted on
/dev/sda3      ext4  909G  289G  574G  34% /

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 GIGABYTE F21 02/22/2018
Memory:
4x NO DIMM NO DIMM
1x SK Hynix HMA84GR7AFR4N-VK 32 GB 2 rank 2666
11x Samsung M393A4K40BB2-CTD 32 GB 2 rank 2666

(Continued on next page)
SPEC CPU2017 Integer Rate Result

NEC Corporation

Express5800/D120h (Intel Xeon Gold 6138)

SPECrate2017_int_base = 180
SPECrate2017_int_peak = 193

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

Test Date: Apr-2018
Hardware Availability: Jan-2018
Software Availability: Mar-2018

Platform Notes (Continued)

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
CC  500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
    525.x264_r(base, peak) 557.xz_r(base, peak)
==============================================================================
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

==============================================================================
CC  500.perlbench_r(peak) 502.gcc_r(peak)
==============================================================================
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

==============================================================================
CXXC 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
    541.leela_r(base)
==============================================================================
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

==============================================================================
CXXC 520.omnetpp_r(peak) 523.xalancbmk_r(peak) 531.deepsjeng_r(peak)
    541.leela_r(peak)
==============================================================================
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

==============================================================================
FC  548.exchange2_r(base, peak)
==============================================================================
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
SPEC CPU2017 Integer Rate Result

NEC Corporation
Express5800/D120h (Intel Xeon Gold 6138)

SPECraten777_int_base = 180
SPECraten777_int_peak = 193

CPU2017 License: 9006
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Tested by: NEC Corporation

Test Date: Apr-2018
Hardware Availability: Jan-2018
Software Availability: Mar-2018

Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Base Portability Flags

500.perlbuch_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-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc

C++ benchmarks:
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc

Fortran benchmarks:
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte
-L/usr/local/je5.0.1-64/lib -ljemalloc
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<td><strong>Software Availability:</strong> Mar-2018</td>
</tr>
</tbody>
</table>

#### Base Other Flags

- **C benchmarks:**
  - \(-m64\) \(-std=c11\)

- **C++ benchmarks:**
  - \(-m64\)

- **Fortran benchmarks:**
  - \(-m64\)

#### Peak Compiler Invocation

- **C benchmarks:**
  - \(\text{icc}\)

- **C++ benchmarks:**
  - \(\text{icpc}\)

- **Fortran benchmarks:**
  - \(\text{ifort}\)

#### Peak Portability Flags

500.perlb benchmark r: -DSPEC LP64 -DSPEC LINUX X64
502.gcc_r: -D_FILE_OFFSET_BITS=64
505.mcf_r: -DSPEC LP64
520.omnettp 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.perlb benchmark r: \(-Wl,-z,muldefs\) \(-prof-gen(pass 1)\) \(-prof-use(pass 2)\) \(-ipo\)
  - \(-xCORE-AVX2\) \(-O3\) \(-no-prec-div\) \(-qopt-mem-layout-trans=3\)
  - \(-fno-strict-overflow\) \(-L/usr/local/je5.0.1-64/lib\)

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Peak Optimization Flags (Continued)

500.perlbench_r (continued):
- ljemalloc

502.gcc_r -L/opt/intel/compilers_and_libraries_2018/linux/lib/ia32
- Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
- xCORE-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=3
- L/usr/local/je5.0.1-32/lib -ljemalloc

505.mcf_r: basepeak = yes

525.x264_r -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
- qopt-mem-layout-trans=3 -fno-alias
- L/usr/local/je5.0.1-64/lib -ljemalloc

557.xz_r: -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
- qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib
- ljemalloc

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: -L/opt/intel/compilers_and_libraries_2018/linux/lib/ia32
- Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
- xCORE-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=3
- L/usr/local/je5.0.1-32/lib -ljemalloc

531.deepsjeng_r: basepeak = yes

541.leela_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
- xCORE-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=3
- L/usr/local/je5.0.1-64/lib -ljemalloc

Fortran benchmarks:
- Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
- qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte
- L/usr/local/je5.0.1-64/lib -ljemalloc

Peak Other Flags

C benchmarks (except as noted below):
- m64 -std=c11

(Continued on next page)
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Peak Other Flags (Continued)

502.gcc_r: -m32 -std=c11

C++ benchmarks (except as noted below):
-m64

523.xalancbmk_r: -m32

Fortran benchmarks:
-m64

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-D120h-RevA.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-D120h-RevA.xml

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

Tested with SPEC CPU2017 v1.0.2 on 2018-04-21 15:51:27-0400.
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