## NEC Corporation

**Express5800/R120h-2M (Intel Xeon Gold 5120)**

<table>
<thead>
<tr>
<th>License</th>
<th>CPU2017 License: 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>Jul-2018</td>
</tr>
<tr>
<td>Hardware Availability</td>
<td>Jun-2018</td>
</tr>
<tr>
<td>Software Availability</td>
<td>Mar-2018</td>
</tr>
</tbody>
</table>

### 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 18.0.2.199 of Intel C/C++
  Compiler for Linux:
  Fortran: Version 18.0.2.199 of Intel Fortran
  Compiler for Linux
- Parallel: Yes
- Firmware: NEC BIOS Version U30 02/15/2018 released Mar-2018
- File System: ext4
- System State: Run level 3 (multi-user)
- Base Pointers: 64-bit
- Peak Pointers: 64-bit
- Other: jemalloc memory allocator V5.0.1

### Hardware
- **CPU Name:** Intel Xeon Gold 5120
- **Max MHz.:** 3200
- **Nominal:** 2200
- **Enabled:** 28 cores, 2 chips
- **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:** 19.25 MB I+D on chip per chip
- **Other:** None
- **Memory:** 192 GB (24 x 8 GB 2Rx8 PC4-2666V-R, running at 2400)
- **Storage:** 1 x 1 TB SATA, 7200 RPM, RAID 0
- **Other:** None

### SPECspeed2017_fp_results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>89.6</td>
<td>90.6</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>89.6</td>
<td>90.6</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>89.6</td>
<td>90.6</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>89.6</td>
<td>90.6</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>89.6</td>
<td>90.6</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>89.6</td>
<td>90.6</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>89.6</td>
<td>90.6</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>89.6</td>
<td>90.6</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>89.6</td>
<td>90.6</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>89.6</td>
<td>90.6</td>
</tr>
</tbody>
</table>

### Additional Information
- Threads Table:
<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>SPECspeed2017_fp_peak (90.6)</td>
<td></td>
</tr>
</tbody>
</table>

---

**Note:** The results are consistent with the SPEC2017_fp benchmark suite.
Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</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>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>28</td>
<td>141</td>
<td>418</td>
<td>141</td>
<td>417</td>
<td>142</td>
<td>417</td>
<td>28</td>
<td>141</td>
<td>418</td>
<td>141</td>
<td>142</td>
<td>417</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>28</td>
<td>144</td>
<td>116</td>
<td>139</td>
<td>120</td>
<td>140</td>
<td>119</td>
<td>28</td>
<td>144</td>
<td>116</td>
<td>139</td>
<td>140</td>
<td>119</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>28</td>
<td>134</td>
<td>39.0</td>
<td>134</td>
<td>39.0</td>
<td>134</td>
<td>39.1</td>
<td>28</td>
<td>134</td>
<td>39.0</td>
<td>134</td>
<td>134</td>
<td>39.1</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>28</td>
<td>193</td>
<td>68.6</td>
<td>193</td>
<td>68.5</td>
<td>193</td>
<td>68.4</td>
<td>28</td>
<td>181</td>
<td>73.1</td>
<td>181</td>
<td>182</td>
<td>72.8</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>28</td>
<td>146</td>
<td>60.8</td>
<td>146</td>
<td>60.7</td>
<td>146</td>
<td>60.6</td>
<td>28</td>
<td>146</td>
<td>60.8</td>
<td>146</td>
<td>146</td>
<td>60.6</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>28</td>
<td>226</td>
<td>52.5</td>
<td>225</td>
<td>52.8</td>
<td>225</td>
<td>52.7</td>
<td>28</td>
<td>218</td>
<td>54.4</td>
<td>217</td>
<td>216</td>
<td>55.0</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>28</td>
<td>191</td>
<td>75.7</td>
<td>193</td>
<td>74.7</td>
<td>191</td>
<td>75.6</td>
<td>28</td>
<td>190</td>
<td>76.0</td>
<td>203</td>
<td>191</td>
<td>75.6</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>28</td>
<td>118</td>
<td>148</td>
<td>118</td>
<td>148</td>
<td>118</td>
<td>148</td>
<td>28</td>
<td>118</td>
<td>148</td>
<td>118</td>
<td>118</td>
<td>148</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>28</td>
<td>124</td>
<td>73.7</td>
<td>127</td>
<td>71.6</td>
<td>124</td>
<td>73.8</td>
<td>28</td>
<td>124</td>
<td>73.7</td>
<td>127</td>
<td>124</td>
<td>73.8</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>28</td>
<td>165</td>
<td>95.6</td>
<td>163</td>
<td>96.5</td>
<td>164</td>
<td>96.1</td>
<td>28</td>
<td>163</td>
<td>96.5</td>
<td>164</td>
<td>163</td>
<td>96.4</td>
</tr>
</tbody>
</table>

SPECspeed2017_fp_base = 89.6
SPECspeed2017_fp_peak = 90.6

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

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:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-32:/home/cpu2017/je5.0.1-64"
OMP_STACKSIZE = "192M"

Binaries compiled on a system with 1x Intel Core i7-6700K 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

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.

jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5
SPEC CPU2017 Floating Point Speed Result

NEC Corporation

Express5800/R120h-2M (Intel Xeon Gold 5120)

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>89.6</td>
<td>90.6</td>
</tr>
</tbody>
</table>

CPU2017 License: 9006
Test Sponsor: NEC Corporation
Test Date: Jul-2018
Hardware Availability: Jun-2018
Tested by: NEC Corporation
Software Availability: Mar-2018

Platform Notes

BIOS Settings:
Thermal Configuration: Maximum Cooling
Workload Profile: General Peak Frequency Compute
Intel Hyper-Threading: Disabled
Memory Patrol Scrubbing: Disabled
Energy/Performance Bias: Maximum Performance
LLC Dead Line Allocation: Disabled
Workload Profile: Custom
NUMA Group Size Optimization: Flat
Adjacent Sector Prefetch: Disabled
DCU Stream Prefetcher: Disabled
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on r120h2m Sun Jul  8 16:00:14 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 5120 CPU @ 2.20GHz
  2 "physical id"s (chips)
  28 "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 : 14
siblings : 14
physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 28
On-line CPU(s) list: 0-27
Thread(s) per core: 1
Core(s) per socket: 14
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 5120 CPU @ 2.20GHz
Stepping: 4
CPU MHz: 2200.000
BogoMIPS: 4400.00

(Continued on next page)
**SPEC CPU2017 Floating Point Speed Result**

**NEC Corporation**

Expression5800/R120h-2M (Intel Xeon Gold 5120)

| SPECspeed2017_fp_base | 89.6 |
| SPECspeed2017_fp_peak | 90.6 |

**CPU2017 License: 9006**

**Test Sponsor: NEC Corporation**

**Test Date: Jul-2018**

**Tested by: NEC Corporation**

| Hardware Availability: Jun-2018 |
| Software Availability: Mar-2018 |

**Platform Notes (Continued)**

Virtualization: VT-x

L1d cache: 32K

L1i cache: 32K

L2 cache: 1024K

L3 cache: 19712K

NUMA node0 CPU(s): 0-13

NUMA node1 CPU(s): 14-27

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 arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc aperfmperf eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 fma cx16 xepic pdcid tscrc_parent静态 workload

From /proc/cpuinfo

```
cache size : 19712 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 10 11 12 13
node 0 size: 97964 MB
node 0 free: 95494 MB
node 1 cpus: 14 15 16 17 18 19 20 21 22 23 24 25 26 27
node 1 size: 98303 MB
node 1 free: 95947 MB
node distances:
node 0 1
0: 10 21
1: 21 10
```

From /proc/meminfo

```
MemTotal: 1977491888 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
```

(Continued on next page)
NEC Corporation

Express5800/R120h-2M (Intel Xeon Gold 5120)

| SPECspeed2017_fp_base = 89.6 |
| SPECspeed2017_fp_peak = 90.6 |

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

Platform Notes (Continued)

```plaintext
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 r120h2m 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

Kernel self-reported vulnerability status:

CVE-2017-5754 (Meltdown): Mitigation: PTI
CVE-2017-5753 (Spectre variant 1): Mitigation: Load fences
CVE-2017-5715 (Spectre variant 2): Mitigation: IBRS (kernel)

run-level 3 Jul 8 15:54

SPEC is set to: /home/cpu2017

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 ext4 909G 330G 533G 39% /

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 U30 02/15/2018
Memory:
24x HPE 876319-081 8 GB 2 rank 2666, configured at 2400

(End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
<table>
<thead>
<tr>
<th>CC  619.lbm_s(base) 638.imagick_s(base, peak) 644.nab_s(base, peak)</th>
</tr>
</thead>
<tbody>
<tr>
<td>icc (ICC) 18.0.2 20180210</td>
</tr>
</tbody>
</table>
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
==============================================================================

==============================================================================
<table>
<thead>
<tr>
<th>CC  619.lbm_s(peak)</th>
</tr>
</thead>
<tbody>
<tr>
<td>icc (ICC) 18.0.2 20180210</td>
</tr>
</tbody>
</table>
```

(Continued on next page)
NEC Corporation

Express5800/R120h-2M (Intel Xeon Gold 5120)

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>89.6</td>
<td>90.6</td>
</tr>
</tbody>
</table>

CPU2017 License: 9006
Test Sponsor: NEC Corporation
Hardware Availability: Jun-2018

Test Date: Jul-2018
Tested by: NEC Corporation
Software Availability: Mar-2018

Compiler Version Notes (Continued)

Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

---

FC 607.cactuBSSN_s(base, peak)

icpc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
icc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

---

FC 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base, peak)

ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

---

FC 603.bwaves_s(peak) 649.fotonik3d_s(peak)

ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

---

CC 621.wrf_s(base) 627.cam4_s(base, peak) 628.pop2_s(base)

ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
icc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

---

CC 621.wrf_s(peak) 628.pop2_s(peak)

ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
icc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
NEC Corporation

Express5800/R120h-2M (Intel Xeon Gold 5120)

SPECspeed2017_fp_base = 89.6
SPECspeed2017_fp_peak = 90.6

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

Test Date: Jul-2018
Hardware Availability: Jun-2018
Software Availability: Mar-2018

Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

Fortran benchmarks:
ifort -m64

Benchmarks using both Fortran and C:
ifort -m64 icc -m64 -std=c11

Benchmarks using Fortran, C, and C++:
icpc -m64 icc -m64 -std=c11 ifort -m64

Base Portability Flags

603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian -assume byterecl
638.imagick_s: -DSPEC_LP64
644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-W1,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
-L/usr/local/je5.0.1-64/lib -ljemalloc

Fortran benchmarks:
-W1,-z,muldefs -DSPEC_OPENMP -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-nostandard-realloc-lhs -L/usr/local/je5.0.1-64/lib -ljemalloc

Benchmarks using both Fortran and C:
-W1,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs -L/usr/local/je5.0.1-64/lib -ljemalloc

(Continued on next page)
SPEC CPU2017 Floating Point Speed Result

NEC Corporation
Express5800/R120h-2M (Intel Xeon Gold 5120)

| SPECspeed2017_fp_base | 89.6 |
| SPECspeed2017_fp_peak | 90.6 |

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

| Test Date | Jul-2018 |
| Hardware Availability | Jun-2018 |
| Software Availability | Mar-2018 |

Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++:
- W1, -z, muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs -L/usr/local/je5.0.1-64/lib -ljemalloc

Peak Compiler Invocation

C benchmarks:
icc -m64 -std=c11

Fortran benchmarks:
ifort -m64

Benchmarks using both Fortran and C:
ifort -m64 icc -m64 -std=c11

Benchmarks using Fortran, C, and C++:
icpc -m64 icc -m64 -std=c11 ifort -m64

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
619.lbm_s: basepeak = yes

638.imagick_s: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-DSPEC_OPENMP

644.nab_s: basepeak = yes

Fortran benchmarks:

(Continued on next page)
SPEC CPU2017 Floating Point Speed Result

NEC Corporation

Express5800/R120h-2M (Intel Xeon Gold 5120)

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>89.6</td>
<td>90.6</td>
</tr>
</tbody>
</table>

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

Test Date: Jul-2018
Hardware Availability: Jun-2018
Software Availability: Mar-2018

Peak Optimization Flags (Continued)

603.bwaves_s: basepeak = yes
649.fotonik3d_s: basepeak = yes
654.roms_s: -DSPEC_OPENMP -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3
-qopenmp -nostandard-realloc-lhs
Benchmarks using both Fortran and C:
621.wrf_s: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX2
-qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div
-qopt-mem-layout-trans=3 -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs
627.cam4_s: basepeak = yes
628.pop2_s: Same as 621.wrf_s
Benchmarks using Fortran, C, and C++:
607.cactuBSSN_s: 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-RevB.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2017-12-21.xml
http://www.spec.org/cpu2017/flags/NEC-Platform-Settings-V1.2-R120h-RevB.xml

SPEC is a registered trademark of the Standard Performance Evaluation Corporation. All other brand and product names appearing in this result are trademarks or registered trademarks of their respective holders.

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