# SPEC® CPU2017 Floating Point Speed Result

## NEC Corporation

**Express5800/R120h-1E (Intel Xeon Gold 5122)**

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
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<tr>
<td>53.9</td>
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**CPU2017 License**: 9006  
**Test Sponsor**: NEC Corporation  
**Tested by**: NEC Corporation  
**Test Date**: Dec-2018  
**Hardware Availability**: Nov-2017  
**Software Availability**: Mar-2018

### Threads

<table>
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<tr>
<td>603.bwaves_s</td>
<td>8</td>
<td>54.7</td>
<td></td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>8</td>
<td>32.7</td>
<td></td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>8</td>
<td>47.4</td>
<td></td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>8</td>
<td>29.7</td>
<td></td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>8</td>
<td>42.8</td>
<td>43.0</td>
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<tr>
<td>638.imagick_s</td>
<td>8</td>
<td>33.1</td>
<td>33.7</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>8</td>
<td>66.1</td>
<td></td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>8</td>
<td>60.0</td>
<td></td>
</tr>
<tr>
<td>654.roms_s</td>
<td>8</td>
<td>53.9</td>
<td>54.3</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name**: Intel Xeon Gold 5122  
- **Max MHz.**: 3700  
- **Nominal**: 3600  
- **Enabled**: 8 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**: 16.5 MB I+D on chip per chip  
- **Memory**: 192 GB (12 x 16 GB 2Rx8 PC4-2666V-R)  
- **Storage**: 1 x 1 TB SATA, 7200 RPM, RAID 0  
- **Other**: None

### Software

- **OS**: Red Hat Enterprise Linux Server release 7.4 (Maipo)  
- **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 U31 06/20/2018 released Sep-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
### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Base</th>
<th>Peak</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Seconds</td>
<td>Seconds/Ratio</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>603.bwaves_s</td>
<td>8</td>
<td>216/274</td>
<td>216/273</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>8</td>
<td>303/55.0</td>
<td><strong>305/54.7</strong></td>
</tr>
<tr>
<td>619.lbm_s</td>
<td><strong>160</strong></td>
<td>32.7</td>
<td><strong>160/32.7</strong></td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>8</td>
<td>276/48.0</td>
<td><strong>279/47.4</strong></td>
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<td>627.cam4_s</td>
<td>8</td>
<td>299/29.6</td>
<td><strong>298/29.7</strong></td>
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<td>276/43.0</td>
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<td>8</td>
<td>435/33.1</td>
<td><strong>435/33.1</strong></td>
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<tr>
<td>644.nab_s</td>
<td>8</td>
<td>264/66.1</td>
<td><strong>264/66.1</strong></td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>8</td>
<td>153/59.7</td>
<td><strong>152/60.0</strong></td>
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<td>654.roms_s</td>
<td>8</td>
<td>289/54.4</td>
<td><strong>292/53.9</strong></td>
</tr>
</tbody>
</table>

**SPECspeed2017_fp_base = 53.9**

**SPECspeed2017_fp_peak = 55.0**

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.

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<table>
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<tr>
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<tr>
<td>55.0</td>
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**Test Date:** Dec-2018  
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**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  
runtime on r120h1e Thu Dec 6 10:24:29 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 5122 CPU @ 3.60GHz
  - 2 "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 : 4
  - physical 0: cores 2 3 4 10
  - physical 1: cores 0 5 9 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: 1
- Core(s) per socket: 4
- Socket(s): 2
- NUMA node(s): 2
- Vendor ID: GenuineIntel
- CPU family: 6
- Model: 85
- Model name: Intel(R) Xeon(R) Gold 5122 CPU @ 3.60GHz
- Stepping: 4
- CPU MHz: 3600.000
- BogoMIPS: 7200.00

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

<table>
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<tr>
<th>Virtualization:</th>
<th>VT-x</th>
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<tbody>
<tr>
<td>L1d cache:</td>
<td>32K</td>
</tr>
<tr>
<td>L1i cache:</td>
<td>32K</td>
</tr>
<tr>
<td>L2 cache:</td>
<td>1024K</td>
</tr>
<tr>
<td>L3 cache:</td>
<td>16896K</td>
</tr>
<tr>
<td>NUMA node0 CPU(s):</td>
<td>0-3</td>
</tr>
<tr>
<td>NUMA node1 CPU(s):</td>
<td>4-7</td>
</tr>
<tr>
<td>Flags:</td>
<td>fpu vme de pse tsc mr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpec1gb rdtscp lm constant_tast arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc aperfmperf eagerfpu fmimgldq dtex64 monitor ds_cpl vmx smx est tm2 ssse3 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_13 cdle_13 invpcid_single intel_pt spec_ctrl ibpb_support tpr_shadow vmx 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 xsaveic xgetbv1 cqm_llc cqm_occup_llc cqm_mmb_total cqm_mmb_local dtherm ida arat pln pts</td>
</tr>
</tbody>
</table>

/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 2 3  
node 0 size: 97953 MB  
node 0 free: 95429 MB  
node 1 cpus: 4 5 6 7  
node 1 size: 98303 MB  
node 1 free: 96038 MB  
node distances:  
node 0 1  
0: 10 21  
1: 21 10
```

From /proc/meminfo  
```
MemTotal:       197740608 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)
Platform Notes (Continued)

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 r120h1e 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 Dec 6 10:18

SPEC is set to: /home/cpu2017

Filesystem  Type  Size  Used Avail Use% Mounted on
/dev/sda3   ext4  909G  193G  670G  23% /

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 06/20/2018
Memory:
  4x UNKNOWN NOT AVAILABLE
  12x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2666

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
  CC  619.lbm_s(base) 638.imagick_s(base, peak) 644.nab_s(base, peak)□
  icc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
==============================================================================

(Continued on next page)
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PECspeed2017_fp_base = 53.9
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.Compiler Version Notes (Continued)

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

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

---------------------------------------------------------------
CC 621.wrf_s(peak) 628.pop2_s(peak)
---------------------------------------------------------------
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### Base Compiler Invocation

**C benchmarks:**

```bash
icc -m64 -std=c11
```

**Fortran benchmarks:**

```bash
ifort -m64
```

**Benchmarks using both Fortran and C:**

```bash
ifort -m64 icc -m64 -std=c11
```

**Benchmarks using Fortran, C, and C++:**

```bash
icpc -m64 icc -m64 -std=c11 ifort -m64
```

### Base Portability Flags

<table>
<thead>
<tr>
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</tr>
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<tbody>
<tr>
<td>603.bwaves_s: -DSPEC_LP64</td>
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<td>607.cactuBSSN_s: -DSPEC_LP64</td>
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<td>619.lbm_s: -DSPEC_LP64</td>
</tr>
<tr>
<td>621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian</td>
</tr>
<tr>
<td>627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG</td>
</tr>
<tr>
<td>628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian -assume byterecl</td>
</tr>
<tr>
<td>638.imagick_s: -DSPEC_LP64</td>
</tr>
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<td>644.nab_s: -DSPEC_LP64</td>
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### Base Optimization Flags

**C benchmarks:**

```bash
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -gopenmp -DSPEC_OPENMP -L/usr/local/je5.0.1-64/lib -ljemalloc
```

**Fortran benchmarks:**

```bash
```

**Benchmarks using both Fortran and C:**

```bash
```

(Continued on next page)
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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

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)
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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

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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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