## SPEC® CPU2017 Floating Point Speed Result

**NEC Corporation**

**Express5800/R120h-2M (Intel Xeon Bronze 3104)**

| Test Date: | Nov-2018 |
| Test Sponsor: | NEC Corporation |
| Hardware Availability: | Aug-2017 |
| Software Availability: | Mar-2018 |

### SPECspeed2017_fp_base = 21.0

### SPECspeed2017_fp_peak = 21.5

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### Hardware

**CPU Name:** Intel Xeon Bronze 3104  
**Max MHz.:** 1700  
**Nominal:** 1700  
**Enabled:** 6 cores, 1 chip  
**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:** 8.25 MB I+D on chip per chip  
**Other:** None  
**Memory:** 192 GB (12 x 16 GB 2Rx8 PC4-2666V-R, running at 2133)  
**Storage:** 1 x 1 TB SATA, 7200 RPM, RAID 0  
**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 18.0.2.199 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

### SPECbenchmarks

<table>
<thead>
<tr>
<th>SPECbenchmarks</th>
<th>Threads</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
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<tr>
<td>603.bwaves_s</td>
<td>6</td>
<td>14.2</td>
<td>17.6</td>
</tr>
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<td>607.cactuBSSN_s</td>
<td>6</td>
<td>28.1</td>
<td>19.5</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>6</td>
<td>9.26</td>
<td>17.7</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>6</td>
<td>11.5</td>
<td>19.4</td>
</tr>
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</tr>
<tr>
<td>644.nab_s</td>
<td>6</td>
<td>23.3</td>
<td>SPECbenchmarks</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>6</td>
<td>26.6</td>
<td>SPECbenchmarks</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>6</td>
<td>19.4</td>
<td>SPECbenchmarks</td>
</tr>
</tbody>
</table>
Operating System 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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**CPU2017 License:** 9006  
**Test Sponsor:** NEC Corporation  
**Test Date:** Nov-2018  
**Hardware Availability:** Aug-2017  
**Tested by:** NEC Corporation  
**Software Availability:** Mar-2018

**Platform Notes**

- **BIOS Settings:**
  - Thermal Configuration: Maximum Cooling
  - Workload Profile: General Peak Frequency Compute
  - 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 Thu Nov 22 11:35:32 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) Bronze 3104 CPU @ 1.70GHz
  - 1 "physical id"s (chips)
  - 6 "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: 6
    - siblings: 6
    - physical 0: cores 0 1 2 3 4 5

- **From lscpu:**
  - Architecture: x86_64
  - CPU op-mode(s): 32-bit, 64-bit
  - Byte Order: Little Endian
  - CPU(s): 6
  - On-line CPU(s) list: 0-5
  - Thread(s) per core: 1
  - Core(s) per socket: 6
  - Socket(s): 1
  - NUMA node(s): 1
  - Vendor ID: GenuineIntel
  - CPU family: 6
  - Model: 85
  - Model name: Intel(R) Xeon(R) Bronze 3104 CPU @ 1.70GHz
  - Stepping: 4
  - CPU MHz: 1700.000
  - BogoMIPS: 3400.00
  - Virtualization: VT-x
  - L1d cache: 32K

(Continued on next page)
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Platform Notes (Continued)

L1i cache: 32K
L2 cache: 1024K
L3 cache: 8448K
NUMA node0 CPU(s): 0-5
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 nopl xtopology nonstop_tsc
aperfmperf eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 fma
cx16 xptr 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 cdп_13 invpcid_single
intel_pt spec_ctrl ibpb_support tpr_shadow vmi flexpriority ept vpid fsgsbase
tsc_adjust bmi1 hle avx2 smep bmi2 ets invpd rtm cqm mpx rdt_a avx512f avx512dq
rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt xsaves xgetbv1
cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local dtherm pin pln

/platforminfo cache data
    cache size : 8448 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
physical chip.
    available: 1 nodes (0)
    node 0 cpus: 0 1 2 3 4 5
    node 0 size: 196268 MB
    node 0 free: 191517 MB
    node distances:
    node 0
    0: 10

From /proc/meminfo
    MemTotal: 197753048 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

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Platform Notes (Continued)

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 Nov 22 11:29

SPEC is set to: /home/cpu2017
    Filesystem Type  Size  Used Avail Use% Mounted on
    /dev/sda3     ext4  909G  385G  478G  45% /

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: 12x UNKNOWN NOT AVAILABLE
    12x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2666, configured at 2133

(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>
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<tr>
<td>icc (ICC) 18.0.2 20180210</td>
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<tr>
<td>Copyright (C) 1985-2018 Intel Corporation. All rights reserved.</td>
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<th>CC  619.lbm_s(peak)</th>
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<th>FC  607.cactuBSSN_s(base, peak)</th>
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Compiler Version Notes (Continued)

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

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

Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

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**Base Compiler Invocation (Continued)**

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>
<th>Benchmark</th>
<th>Flags</th>
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<tr>
<td>603.bwaves_s</td>
<td>-DSPEC_LP64</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian -assume byterecl</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian</td>
</tr>
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</table>

**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 -qopenmp -DSPEC_OPENMP -L/usr/local/je5.0.1-64/lib -ljemalloc
```

Fortran benchmarks:
```bash
```

Benchmarks using both Fortran and C:
```bash
```

Benchmarks using Fortran, C, and C++:
```bash
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
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### Base Optimization Flags (Continued)

- `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:**  
`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:**  
603.bwave_s: `prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMP -DSPEC_OPENMP -O2 -xCORE-AVX2 -qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div -qopt-mem-layout-trans=3 -qopenmp -nostandard-realloc-lhs`

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Peak Optimization Flags (Continued)

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: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs

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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