SPEC CPU®2017 Floating Point Speed Result

NEC Corporation

Express5800/R120h-1M (Intel Xeon Gold 5220)

SPECspeed®2017_fp_base = 121
SPECspeed®2017_fp_peak = 122

CPU2017 License: 9006
Test Sponsor: NEC Corporation
Test Date: Aug-2020
Tested by: NEC Corporation
CPU Name: Intel Xeon Gold 5220
Max MHz: 3900
Nominal: 2200
Enabled: 36 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: 24.75 MB I+D on chip per chip
Other: None
Memory: 384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R, running at 2666)
Storage: 1 x 1 TB SATA, 7200 RPM, RAID 0
Other: None

Software
OS: Red Hat Enterprise Linux Server release 7.7 (Maipo)
Kernel 3.10.0-1062.1.1.el7.x86_64
Compiler: C/C++: Version 19.0.4.227 of Intel C/C++ Compiler Build 20190416 for Linux;
Fortran: Version 19.0.4.227 of Intel Fortran Compiler Build 20190416 for Linux
Parallel: Yes
Firmware: NEC BIOS Version U32 v2.32 03/09/2020 released Jun-2020
File System: ext4
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: None
Power Management: BIOS set to prefer performance at the cost of additional power usage.

Hardware

603.bwaves_s 36
607.cactuBSSN_s 36
619.lbm_s 36
621.wrf_s 36
627.cam4_s 36
628.pop2_s 36
638.imagick_s 36
644.nab_s 36
649.fotonik3d_s 36
654.roms_s 36

Threads

0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480

SPECspeed®2017_fp_base (121) SPECspeed®2017_fp_peak (122)
### SPEC CPU®2017 Floating Point Speed Result

**NEC Corporation**

Express5800/R120h-1M (Intel Xeon Gold 5220)

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Base</th>
<th>Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Seconds</td>
<td>Seconds</td>
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<tr>
<td></td>
<td></td>
<td>Ratio</td>
<td>Seconds</td>
</tr>
<tr>
<td>603.bwaves_s</td>
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<tr>
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<td>489</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>36</td>
<td>123</td>
<td>122</td>
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<tr>
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<tr>
<td>619.lbm_s</td>
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<td>55.5</td>
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<td>94.4</td>
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<td>621.wrf_s</td>
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<tr>
<td>627.cam4_s</td>
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<td>628.pop2_s</td>
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<td>65.1</td>
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<td>638.imagick_s</td>
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<td>181</td>
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<td>649.fotonik3d_s</td>
<td>36</td>
<td>109</td>
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<tr>
<td>654.roms_s</td>
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<td>139</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td></td>
<td>114</td>
<td>114</td>
</tr>
</tbody>
</table>

**SPECspeed®2017_fp_base = 121**

**SPECspeed®2017_fp_peak = 122**

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"

### Environment Variables Notes

Environment variables set by runcpu before the start of the run:

- KMP_AFFINITY = "granularity=fine,compact"
- LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64"
- OMP_STACKSIZE = "192M"

### General Notes

Binaries compiled on a system with 1x Intel Core i9-7900X 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
```

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.

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.
SPEC CPU®2017 Floating Point Speed Result

NEC Corporation
Express5800/R120h-1M (Intel Xeon Gold 5220)

SPECspeed®2017_fp_base = 121
SPECspeed®2017_fp_peak = 122

CPU2017 License: 9006
Test Sponsor: NEC Corporation
Test Date: Aug-2020
CPU2017 License: 9006
Test Sponsor: NEC Corporation
Tested by: NEC Corporation
Hardware Availability: Dec-2019
Software Availability: Sep-2019

Platform Notes

BIOS Settings:
Thermal Configuration: Maximum Cooling
Workload Profile: General Peak Frequency Compute
Intel Hyper-Threading: Disabled
Memory Patrol Scrubbing: Disabled
LLC Dead Line Allocation: Disabled
LLC Prefetch: Enabled
Enhanced Processor Performance: Enabled
Workload Profile: Custom
Advanced Memory Protection: Advanced ECC Support
NUMA Group Size Optimization: Flat

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbl6e6e46a485a0011
running on r120h1m Sun Aug 30 20:06:29 2020

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 5220 CPU @ 2.20GHz
  2 "physical id"s (chips)
  36 "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 : 18
siblings : 18
physical 0: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
physical 1: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 36
On-line CPU(s) list: 0-35
Thread(s) per core: 1
Core(s) per socket: 18
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 5220 CPU @ 2.20GHz
Stepping: 6
CPU MHz: 2200.000

(Continued on next page)
SPEC CPU®2017 Floating Point Speed Result

NEC Corporation

Express5800/R120h-1M (Intel Xeon Gold 5220)

Copyright 2017-2020 Standard Performance Evaluation Corporation

SPECspeed®2017_fp_base = 121
SPECspeed®2017_fp_peak = 122

Platform Notes (Continued)

BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 25344K
NUMA node0 CPU(s): 0-17
NUMA node1 CPU(s): 18-35
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
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 epb cat_l3 cdp_l3 invpcid_single
intel_pinn intel_pl ssbd mba ibrs ibpb stibp ibrs enhancesd tpr_shadow vnmi
flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm
cqm mpx rdt_a avx512fq avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw
avx512vl xsaveopt xsave xstate xgetbv1 cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
dtherm ida arat pins pku ospke avx512_vnni md_clear spec_ctrl intel_stibp
flush_l1d arch_capabilities

/cache/cpuinfo cache data
cache size : 25344 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 14 15 16 17
node 0 size: 196264 MB
node 0 free: 191606 MB
node 1 cpus: 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
node 1 size: 196607 MB
node 1 free: 192111 MB
node distances:
node 0 1
0: 10 21
1: 21 10

From /proc/meminfo
MemTotal: 395923500 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
    os-release:
        NAME="Red Hat Enterprise Linux Server"
        VERSION="7.7 (Maipo)"

(Continued on next page)
Platform Notes (Continued)

ID="rhel"
ID_LIKE="fedora"
VARIANT="Server"
VARIANT_ID="server"
VERSION_ID="7.7"
PRETTY_NAME="Red Hat Enterprise Linux Server 7.7 (Maipo)"
redhat-release: Red Hat Enterprise Linux Server release 7.7 (Maipo)
system-release: Red Hat Enterprise Linux Server release 7.7 (Maipo)
system-release-cpe: cpe:/o:redhat:enterprise_linux:7.7:ga:server
uname -a:
Linux r120h1m 3.10.0-1062.1.1.el7.x86_64 #1 SMP Tue Aug 13 18:39:59 UTC 2019 x86_64
gx86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected
CVE-2017-5754 (Meltdown): Not affected
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2017-5753 (Spectre variant 1): Mitigation: Load fences, usercopy/swapgs barriers and __user pointer sanitation
CVE-2017-5715 (Spectre variant 2): Mitigation: Full retpoline, IBPB

run-level 3 Aug 30 20:00

SPEC is set to: /home/cpu2017

From /sys/devices/virtual/dmi/id
BIOS: NEC U32 03/09/2020
Vendor: NEC
Product: Express5800/R120h-1M
Serial: JPN0084094

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.

Memory:
24x HPE P03050-091 16 GB 2 rank 2933

Regarding the sysinfo display about the memory speed, the correct configured memory speed is 2666 MT/s. The dmidecode description should be as follows:
NEC Corporation

Express5800/R120h-1M (Intel Xeon Gold 5220)

**SPECspeed®2017_fp_base = 121**

**SPECspeed®2017_fp_peak = 122**

---

**Platform Notes (Continued)**

24x HPE P03050-091 16 GB 2 rank 2933, configured at 2666

---

**Compiler Version Notes**

```
C
  619.lbm_s(base, peak) 638.imagick_s(base, peak)
  644.nab_s(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.

C++, C, Fortran
  607.cactuBSSN_s(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.
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.
Intel(R) Fortran 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
  603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak)
  654.roms_s(base, peak)

Intel(R) Fortran 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, C
  621.wrf_s(base, peak) 627.cam4_s(base, peak)
  628.pop2_s(base, peak)

Intel(R) Fortran 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.
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.
```

(Continued on next page)
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:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

Fortran benchmarks:
-DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-nostandard-realloc-lhs
SPEC CPU®2017 Floating Point Speed Result

NEC Corporation
Express5800/R120h-1M (Intel Xeon Gold 5220)

| SPECspeed®2017_fp_base = 121 |
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CPU2017 License: 9006
Test Sponsor: NEC Corporation
Tested by: NEC Corporation
Test Date: Aug-2020
Hardware Availability: Dec-2019
Software Availability: Sep-2019

Base Optimization Flags (Continued)

Benchmarks using both Fortran and C:
-xCORE-AVX512
-ipo
-03
-no-prec-div
-qopt-prefetch
-ffinite-math-only
-qopt-mem-layout-trans=4
-qopenmp
-DSPEC_OPENMP
-nostandard-realloc-lhs

Benchmarks using Fortran, C, and C++:
-xCORE-AVX512
-ipo
-03
-no-prec-div
-qopt-prefetch
-ffinite-math-only
-qopt-mem-layout-trans=4
-qopenmp
-DSPEC_OPENMP
-nostandard-realloc-lhs

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-AVX512
-ipo
-03
-no-prec-div
-qopt-prefetch
-ffinite-math-only
-qopt-mem-layout-trans=4
-qopenmp
-DSPEC_OPENMP

644.nab_s: Same as 638.imagick_s

(Continued on next page)
PEC CPU®2017 Floating Point Speed Result

NEC Corporation
Express5800/R120h-1M (Intel Xeon Gold 5220)

SPECspeed®2017_fp_base = 121
SPECspeed®2017_fp_peak = 122

CPU2017 License: 9006
Test Sponsor: NEC Corporation
Test Date: Aug-2020
Hardware Availability: Dec-2019
Tested by: NEC Corporation
Software Availability: Sep-2019

Peak Optimization Flags (Continued)

Fortran benchmarks:
603.bwaves_s: basepeak = yes
649.fotonik3d_s: basepeak = yes
654.roms_s: -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
-qopenmp -nostandard-realloc-lhs

Benchmarks using both Fortran and C:
621.wrf_s: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX512
-qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div
-qopt-mem-layout-trans=4 -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++:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs

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-RevE.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-RevE.xml