SPEC CPU®2017 Floating Point Rate Result

NEC Corporation

Express5800/R120h-2M (Intel Xeon Silver 4216)

SPECrate®2017_fp_base = 166
SPECrate®2017_fp_peak = 176

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

Test Date: Mar-2020
Hardware Availability: Dec-2019
Software Availability: Sep-2019

Hardware

- CPU Name: Intel Xeon Silver 4216
- Max MHz: 3200
- Nominal: 2100
- Enabled: 32 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: 22 MB I+D on chip per chip
- Other: None
- Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R, running at 2400)
- 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: No
- Firmware: NEC BIOS Version U30 v2.22 11/13/2019 released Mar-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.
NEC Corporation
Express5800/R120h-2M (Intel Xeon Silver 4216)

SPECratenew2017_fp_base = 166
SPECratenew2017_fp_peak = 176

Results Table

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<td>92.9</td>
<td>558</td>
<td>91.1</td>
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</tr>
</tbody>
</table>

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"

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64"

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
runcpu command invoked through numactl i.e.:
General Notes (Continued)

numactl --interleave=all runcpu <etc>

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.

Platform Notes

BIOS Settings:
Thermal Configuration: Maximum Cooling
Workload Profile: General Throughput Compute
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

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d76d1e6e46a485a0011
running on r120h2m Thu Mar 26 07:47:56 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) Silver 4216 CPU @ 2.10GHz
  2 "physical id"s (chips)
  64 "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 : 16
siblings : 32
  physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
  physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 64
NEC Corporation

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**CPU2017 License:** 9006

**Test Sponsor:** NEC Corporation

**Test Date:** Mar-2020

**Tested by:** NEC Corporation

**Hardware Availability:** Dec-2019

**Software Availability:** Sep-2019

### Platform Notes (Continued)

- **On-line CPU(s) list:** 0-63
- **Thread(s) per core:** 2
- **Core(s) per socket:** 16
- **Socket(s):** 2
- **NUMA node(s):** 4
- **Vendor ID:** GenuineIntel
- **CPU family:** 6
- **Model:** 85
- **Model name:** Intel (R) Xeon(R) Silver 4216 CPU @ 2.10GHz
- **Stepping:** 6
- **CPU MHz:** 2100.000
- **BogoMIPS:** 4200.00
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 1024K
- **L3 cache:** 22528K
- **NUMA node0 CPU(s):** 0-7,32-39
- **NUMA node1 CPU(s):** 8-15,40-47
- **NUMA node2 CPU(s):** 16-23,48-55
- **NUMA node3 CPU(s):** 24-31,56-63

### 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  rdtps
- cl  lm  constant_tsc  arch_perfmon  pebs  bts  rep_good  xtopology  nonstop_tsc
- aperfmperf  eagerfpu  pni  pclmulqdq  dtes64  monitor  ds_cpl  vmx  smx  est  tm2  ssse3  sdbg
- fma  cx16  xtpm  pdcm  pclid  dca  sse4_1  sse4_2  x2apic  movbe  popcnt  tsc_deadline_timer  aes
- xsave  avx  f16c  rdrand  lahf_lm  abm  3nowprefetch  epb  cat_l3  cdq  cdq qcd  single
- intel_pnpi  intel_pt  ssbd  mba  ibrs  ibrs_enabled  tpr_shadow  vnmi
- flexpriority  ept  vpid  fsgsbase  tsc_adjust  bml1  hle  avx2  smep  bmi2  erms  invpcid  rtm
- cmq  mxp  rdt_a  avx512f  avx512dq  rdseed  adx  smap  clflushopt  clwb  avx512cd  avx512bw
- avx512vl  xsaveopt  xsaveprec  xgetbv1  cmq_llc  cmq_occmap_llc  cmq_mbb_total  cmq_mbb_local
dtherm  ida  atar  pin  pts  pku  ospke  avx512_vnni  md_clear  spec_ctrl  intel_stibp
- flush_lld  arch_capabilities

From `numactl --hardware`

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

```
available: 4 nodes (0-3)
node 0 cpus: 0 1 2 3 4 5 6 7 32 33 34 35 36 37 38 39
node 0 size: 196265 MB
node 0 free: 191751 MB
node 1 cpus: 8 9 10 11 12 13 14 15 40 41 42 43 44 45 46 47
node 1 size: 196608 MB
node 1 free: 192199 MB
node 2 cpus: 16 17 18 19 20 21 22 23 48 49 50 51 52 53 54 55
```

(Continued on next page)
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Platform Notes (Continued)

node 2 size: 196608 MB
node 2 free: 192150 MB
node 3 cpus: 24 25 26 27 28 29 30 31 56 57 58 59 60 61 62 63
node 3 size: 196607 MB
node 3 free: 192186 MB
node distances:
node 0 1 2 3
0: 10 21 31 31
1: 21 10 31 31
2: 31 31 10 21
3: 31 31 21 10

From /proc/meminfo
MemTotal: 792280800 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*

os-release:
NAME="Red Hat Enterprise Linux Server"
VERSION="7.7 (Maipo)"
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 r120h2m 3.10.0-1062.1.1.el7.x86_64 #1 SMP Tue Aug 13 18:39:59 UTC 2019 x86_64
x86_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 sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full retpoline, IBPB

run-level 3 Mar 26 07:42

(Continued on next page)
NEC Corporation
Express5800/R120h-2M (Intel Xeon Silver 4216)

SPECrate®2017_fp_base = 166
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Platform Notes (Continued)

SPEC is set to: /home/cpu2017
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 ext4 908G 89G 773G 11% /

From /sys/devices/virtual/dmi/id
BIOS: NEC U30 11/13/2019
Vendor: NEC
Product: Express5800/R120h-2M
Serial: JPNLMCROUF

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 SM BIOS" standard.
Memory:
24x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2933

(End of data from sysinfo program)
Regarding the sysinfo display about the memory speed, the correct configured memory speed is 2400 MT/s. The dmidecode description should be as follows: 24x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2933, configured at 2400

Compiler Version Notes

==============================================================================
C               | 519.lbm_r(base, peak) 538.imagick_r(base, peak)
| 544.nab_r(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          | 511.povray_r(base, peak) 526.blender_r(base, peak)
==============================================================================
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
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==============================================================================

(Continued on next page)
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Version 19.0.4.227 Build 20190416
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C++, C, Fortran | 507.cactuBSSN_r(base, peak)

Intel (R) C++ Intel (R) 64 Compiler for applications running on Intel (R) 64,
Version 19.0.4.227 Build 20190416
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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
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Fortran | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base, peak)

Intel (R) Fortran Intel (R) 64 Compiler for applications running on Intel (R)
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Fortran, C | 521.wrf_r(base, peak) 527.cam4_r(base, peak)

Intel (R) Fortran Intel (R) 64 Compiler for applications running on Intel (R)
64, Version 19.0.4.227 Build 20190416
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Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

(Continued on next page)
Base Compiler Invocation (Continued)

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

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

Benchmarks using both C and C++:
icpc -m64 icc -m64 -std=c11

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

Base Portability Flags

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4

C++ benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4

(Continued on next page)
Base Optimization Flags (Continued)

Fortran benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte

Benchmarks using both Fortran and C:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte

Benchmarks using both C and C++:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4

Benchmarks using Fortran, C, and C++:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte

Peak Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

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

Benchmarks using both C and C++:
icpc -m64 icc -m64 -std=c11

Benchmarks using Fortran, C, and C++:
icpc -m64 icc -m64 -std=c11 ifort -m64
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Copyright 2017-2020 Standard Performance Evaluation Corporation

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

519.lbm_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4

538.imagick_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4

544.nab_r: Same as 538.imagick_r

C++ benchmarks:

508.namd_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4

510.parest_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4

Fortran benchmarks:

503.bwaves_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -auto
-nostandard-realloc-lhs -align array32byte

549.fotonik3d_r: Same as 503.bwaves_r

554.roms_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte

Benchmarks using both Fortran and C:

-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte

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

NEC Corporation

Express5800/R120h-2M (Intel Xeon Silver 4216)

SPECrate®2017_fp_base = 166
SPECrate®2017_fp_peak = 176

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

Peak Optimization Flags (Continued)

Benchmarks using both C and C++:

511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4

526.blender_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4

Benchmarks using Fortran, C, and C++:

-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte

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

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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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