### Software

<table>
<thead>
<tr>
<th>OS:</th>
<th>Red Hat Enterprise Linux Server release 7.7 (Maipo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kernel:</td>
<td>3.10.0-1062.1.1.el7.x86_64</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compiler:</th>
<th>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</th>
</tr>
</thead>
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<table>
<thead>
<tr>
<th>Parallel:</th>
<th>Yes</th>
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<table>
<thead>
<tr>
<th>Firmware:</th>
<th>NEC BIOS Version U32 v2.32 03/09/2020 released Jun-2020</th>
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<table>
<thead>
<tr>
<th>File System:</th>
<th>ext4</th>
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<table>
<thead>
<tr>
<th>System State:</th>
<th>Run level 3 (multi-user)</th>
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<table>
<thead>
<tr>
<th>Base Pointers:</th>
<th>64-bit</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Peak Pointers:</th>
<th>64-bit</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Other:</th>
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<table>
<thead>
<tr>
<th>Power Management:</th>
<th>BIOS set to prefer performance at the cost of additional power usage.</th>
</tr>
</thead>
</table>

### Hardware

<table>
<thead>
<tr>
<th>CPU Name:</th>
<th>Intel Xeon Gold 6244</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Max MHz:</th>
<th>4400</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Nominal:</th>
<th>3600</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Enabled:</th>
<th>16 cores, 2 chips, 2 threads/core</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Orderable:</th>
<th>1.2 chips</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Cache L1:</th>
<th>32 KB I + 32 KB D on chip per core</th>
</tr>
</thead>
</table>

| L2: | 1 MB I+D on chip per core |
| L3: | 24.75 MB I+D on chip per chip |

<table>
<thead>
<tr>
<th>Other:</th>
<th>None</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Memory:</th>
<th>384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Storage:</th>
<th>1 x 1 TB SATA, 7200 RPM, RAID 0</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Other:</th>
<th>None</th>
</tr>
</thead>
</table>

### SPEC CPU®2017 Floating Point Speed Result

**NEC Corporation**

<table>
<thead>
<tr>
<th>Express5800/R120h-1M (Intel Xeon Gold 6244)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base = 93.9</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_peak = 98.8</th>
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<table>
<thead>
<tr>
<th>CPU2017 License:</th>
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</tr>
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<table>
<thead>
<tr>
<th>Test Sponsor:</th>
<th>NEC Corporation</th>
</tr>
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<table>
<thead>
<tr>
<th>Tested by:</th>
<th>NEC Corporation</th>
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<table>
<thead>
<tr>
<th>Test Date:</th>
<th>Oct-2020</th>
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<table>
<thead>
<tr>
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<table>
<thead>
<tr>
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<table>
<thead>
<tr>
<th>Threads</th>
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<table>
<thead>
<tr>
<th>603.bwaves_s 16</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>607.cactuBSSN_s 16</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>619.lbm_s 16</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>621.wrf_s 16</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>627.cam4_s 16</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>628.pop2_s 16</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>638.imagick_s 16</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>644.nab_s 16</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>649.fotonik3d_s 16</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>654.roms_s 16</th>
</tr>
</thead>
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---

**Hardware**

**Software**

---

**SPEC CPU®2017 Floating Point Speed Result**

Copyright 2017-2020 Standard Performance Evaluation Corporation
## 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>
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<tbody>
<tr>
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<td>386</td>
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<td>607.cactusBSSN_s</td>
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<td>63.7</td>
<td>190</td>
<td>62.6</td>
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<tr>
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<tr>
<td>654.roms_s</td>
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<td>98.9</td>
<td>161</td>
<td>98.1</td>
<td>157</td>
<td>100</td>
</tr>
</tbody>
</table>

SPECSpeed®2017_fp_base = 93.9
SPECSpeed®2017_fp_peak = 98.8

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,1,0"
- 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 6244)

| SPECspeed®2017_fp_base = 93.9 |
| SPECspeed®2017_fp_peak = 98.8 |

| SPECspeed®2017_fp_base = 93.9 |
| SPECspeed®2017_fp_peak = 98.8 |

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

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

Platform Notes

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

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbl6e46a485a0011
running on r120h1m Wed Oct 14 18:28:38 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 6244 CPU @ 3.60GHz
  2 "physical id"s (chips)
  32 "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 : 8
siblings : 16
physical 0: cores 3 4 8 17 18 24 25 27
physical 1: cores 2 8 9 18 19 20 25 26

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 32
On-line CPU(s) list: 0-31
Thread(s) per core: 2
Core(s) per socket: 8
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6244 CPU @ 3.60GHz
Stepping: 6
CPU MHz: 3600.000
BogoMIPS: 7200.00
Virtualization: VT-x

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

NEC Corporation

Express5800/R120h-1M (Intel Xeon Gold 6244)

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

SPECspeed®2017_fp_base = 93.9
SPECspeed®2017_fp_peak = 98.8

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

Platform Notes (Continued)

L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 2544K
NUMA node0 CPU(s): 0-7,16-23
NUMA node1 CPU(s): 8-15,24-31
Flags: fpu vme de pse tsc msr pae 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 apic sm mconcept nonstop_tsc
aperfmperf eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg
fma cx16 xtpre 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_pcp intel_pt ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi
flexpriority ept vpid fsgsbase tsc_adjust bm1 hle avx2 smep bmi2 erms invpcid rtm
cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw
avx512vl xsaveopt xsavec xgetbv1 cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
dtherm ida arat pln pts pku ospke avx512_vnni md_clear spec_ctrl intel_stibp
flush_l1d arch_capabilities

/proc/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 16 17 18 19 20 21 22 23
    node 0 size: 196264 MB
    node 0 free: 191650 MB
    node 1 cpus: 8 9 10 11 12 13 14 15 24 25 26 27 28 29 30 31
    node 1 size: 163839 MB
    node 1 free: 159956 MB
    node distances:
    node 0 1
    0: 10 21
    1: 21 10

From /proc/meminfo
MemTotal: 362893980 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"

(Continued on next page)
**NEC Corporation**

**Express5800/R120h-1M (Intel Xeon Gold 6244)**

| SPECspeed®2017_fp_base = 93.9 |
| SPECspeed®2017_fp_peak = 98.8 |

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

**Test Date:** Oct-2020  
**Hardware Availability:** Dec-2019  
**Software Availability:** Sep-2019

---

**Platform Notes (Continued)**

```plaintext
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  
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 Oct 14 18:22

SPEC is set to: /home/cpu2017

Filesystem Type Size Used Avail Use% Mounted on  
/dev/sda3 ext4 908G 186G 676G 22% /

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

(End of data from sysinfo program)
NEC Corporation

Express5800/R120h-1M (Intel Xeon Gold 6244)

SPECspeed®2017_fp_base = 93.9
SPECspeed®2017_fp_peak = 98.8

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

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
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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
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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
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## SPEC CPU®2017 Floating Point Speed Result

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<td>Express5800/R120h-1M (Intel Xeon Gold 6244)</td>
<td>SPECspeed®2017_fp_peak = 98.8</td>
</tr>
</tbody>
</table>

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

### 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>
<th>Benchmark</th>
<th>Flags</th>
</tr>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>-DSPEC_LP64</td>
</tr>
<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</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 -assume byterecl</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>644.nab_s</td>
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<td>-DSPEC_LP64</td>
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<tr>
<td>654.roms_s</td>
<td>-DSPEC_LP64</td>
</tr>
</tbody>
</table>

### Base Optimization Flags

**C benchmarks:**  
```bash  
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP  
```

**Fortran benchmarks:**  
```bash  
-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:**  
```bash  
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP -nostandard-realloc-lhs  
```
## NEC Corporation

### Express5800/R120h-1M (Intel Xeon Gold 6244)

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<thead>
<tr>
<th>SPEC Speed®2017_fp_base</th>
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<td>SPEC Speed®2017_fp_peak</td>
<td>98.8</td>
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**CPU2017 License:** 9006  
**Test Sponsor:** NEC Corporation  
**Test Date:** Oct-2020  
**Hardware Availability:** Dec-2019  
**Tested by:** NEC Corporation  
**Software Availability:** Sep-2019

### Base Optimization Flags (Continued)

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`

### 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:
- `xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch`
- `-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP`

#### Fortran benchmarks:
- `603.bwaves_s: -prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMP -DSPEC_OPENMP -O2 -xCORE-AVX512 -qopt-prefetch -ipo -O3`
- `-ffinite-math-only -no-prec-div -qopt-mem-layout-trans=4 -qopenmp -nostandard-realloc-lhs`
- `649.fotonik3d_s: Same as 603.bwaves_s`
- `654.roms_s: -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4`
SPEC CPU®2017 Floating Point Speed Result
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NEC Corporation
Express5800/R120h-1M (Intel Xeon Gold 6244)

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Peak Optimization Flags (Continued)

654.roms_s (continued):
-qopenmp -nostandard-realloc-lhs

Benchmarks using both Fortran and C:

621.wrf_s: -qopenmp -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: -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs

628.pop2_s: basepeak = yes

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
-ffinite-math-only -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

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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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