# SPEC CPU®2017 Integer Rate Result

**NEC Corporation**

Express5800/R120h-1M (Intel Xeon Platinum 8280)

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<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>327</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate®2017_int_peak</td>
<td>344</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>9006</th>
</tr>
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<tbody>
<tr>
<td>Test Sponsor:</td>
<td>NEC Corporation</td>
</tr>
<tr>
<td>Tested by:</td>
<td>NEC Corporation</td>
</tr>
<tr>
<td>Software:</td>
<td>Red Hat Enterprise Linux Server release 7.7 (Maipo)</td>
</tr>
<tr>
<td>OS:</td>
<td>Kernel 3.10.0-1062.1.1.el7.x86_64</td>
</tr>
<tr>
<td>Compiler:</td>
<td>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</td>
</tr>
<tr>
<td>Copyright:</td>
<td>Copyright 2017-2020 Standard Performance Evaluation Corporation</td>
</tr>
<tr>
<td>Hardware:</td>
<td>Intel Xeon Platinum 8280</td>
</tr>
<tr>
<td>Max MHz:</td>
<td>4000</td>
</tr>
<tr>
<td>Nominal:</td>
<td>2700</td>
</tr>
<tr>
<td>Enabled:</td>
<td>56 cores, 2 chips, 2 threads/core</td>
</tr>
<tr>
<td>Orderable:</td>
<td>1.2 chips</td>
</tr>
<tr>
<td>Cache L1:</td>
<td>32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>L2:</td>
<td>1 MB I+D on chip per core</td>
</tr>
<tr>
<td>L3:</td>
<td>38.5 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
</tr>
<tr>
<td>Memory:</td>
<td>384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R)</td>
</tr>
<tr>
<td>Storage:</td>
<td>1 x 1 TB SATA, 7200 RPM, RAID 0</td>
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<tr>
<td>Other:</td>
<td>None</td>
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<tr>
<td>Firmware:</td>
<td>NEC BIOS Version U32 v2.32 03/09/2020 released Jun-2020</td>
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<tr>
<td>File System:</td>
<td>ext4</td>
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<tr>
<td>System State:</td>
<td>Run level 3 (multi-user)</td>
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<tr>
<td>Base Pointers:</td>
<td>64-bit</td>
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<tr>
<td>Peak Pointers:</td>
<td>32/64-bit</td>
</tr>
<tr>
<td>Other:</td>
<td>jemalloc memory allocator V5.0.1</td>
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<tr>
<td>Power Management:</td>
<td>BIOS set to prefer performance at the cost of additional power usage.</td>
</tr>
</tbody>
</table>

---

## Hardware

- **CPU Name:** Intel Xeon Platinum 8280
- **Max MHz:** 4000
- **Nominal:** 2700
- **Enabled:** 56 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:** 38.5 MB I+D on chip per chip
- **Other:** None
- **Memory:** 384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R)
- **Storage:** 1 x 1 TB SATA, 7200 RPM, RAID 0
- **Other:** None

## Software

- **OS:** Red Hat Enterprise Linux Server release 7.7 (Maipo)
- **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
- **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:** 32/64-bit
- **Other:** jemalloc memory allocator V5.0.1
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage.
Results Table

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<tr>
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<th>Seconds</th>
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<th>Seconds</th>
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<tbody>
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<td>500.perlbench_r</td>
<td>112</td>
<td>697</td>
<td>256</td>
<td>699</td>
<td>255</td>
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<td>243</td>
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<td>505.mcf_r</td>
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<td>557.xz_r</td>
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<td>112</td>
<td>548</td>
<td>221</td>
<td>548</td>
<td>221</td>
</tr>
</tbody>
</table>

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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:/home/cpu2017/lib/ia32:/home/cpu2017/je5.0.1-32"

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 numaclt i.e.: 

(Continued on next page)
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.

jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

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 295195f888a3d7ed1e6e46a485a0011
running on r120h1m Fri Aug 21 11:45:05 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) Platinum 8280 CPU @ 2.70GHz
  2 "physical id"s (chips)
  112 "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 : 28
siblings : 56
physical 0: cores 0 1 2 3 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
physical 1: cores 0 1 2 3 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30

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

NEC Corporation

Express5800/R120h-1M (Intel Xeon Platinum 8280)

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SPECrate®2017_int_base = 327

SPECrate®2017_int_peak = 344

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

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

Platform Notes (Continued)

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 112
On-line CPU(s) list: 0-111
Thread(s) per core: 2
Core(s) per socket: 28
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Platinum 8280 CPU @ 2.70GHz
Stepping: 6
CPU MHz: 2700.000
BogoMIPS: 5400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 39424K
NUMA node0 CPU(s): 0-13,56-69
NUMA node1 CPU(s): 14-27,70-83
NUMA node2 CPU(s): 28-41,84-97
NUMA node3 CPU(s): 42-55,98-111

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
  lmconstant-tsc art constant_tsc arch_perfmon pebs bts rep_good nopl xtopology
  nonstop_tsc aperfmperf eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3
  sse2 mmx fdxprec pdcm pcid scsype mca l忙ore Experienced memLegacy tour
  nonstop_tsc asic spmif srm dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sse2 mmx fdxprec
  pdcm pcid scsype mca l忙ore Experienced memLegacy tour

/proc/cpuinfo cache data
  cache size : 39424 KB

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 8 9 10 11 12 13 56 57 58 59 60 61 62 63 64 65 66 67 68 69
    node 0 size: 97960 MB

(Continued on next page)
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Platform Notes (Continued)

node 0 free: 95526 MB
node 1 cpus: 14 15 16 17 18 19 20 21 22 23 24 25 26 27 70 71 72 73 74 75 76 77 78 79 80 81 82 83
node 1 size: 98304 MB
node 1 free: 95915 MB
node 2 cpus: 28 29 30 31 32 33 34 35 36 37 38 39 40 41 84 85 86 87 88 89 90 91 92 93 94 95 96 97
node 2 size: 98304 MB
node 2 free: 95936 MB
node 3 cpus: 42 43 44 45 46 47 48 49 50 51 52 53 54 55 98 99 100 101 102 103 104 105 106 107 108 109 110 111
node 3 size: 98303 MB
node 3 free: 95955 MB
node distances:
node 0  1  2  3
  0: 10 21 21 21
  1: 21 10 21 21
  2: 21 21 10 21
  3: 21 21 21 10

From /proc/meminfo
MemTotal: 395911432 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 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

(Continued on next page)
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Platform Notes (Continued)

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 Aug 21 11:39
SPEC is set to: /home/cpu2017
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 ext4 908G 181G 682G 21% /

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)

Compiler Version Notes

==============================================================================
C | 502.gcc_r(peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on IA-32, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak) 557.xz_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.
(Continued on next page)
NEC Corporation

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Tested by: NEC Corporation
Test Date: Aug-2020
Hardware Availability: Dec-2019
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Compiler Version Notes (Continued)

| 502 | gcc_r(peak) |
--- | --- |
| Intel(R) C Intel(R) 64 Compiler for applications running on IA-32, Version 19.0.4.227 Build 20190416 |
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

| 500 | perlbench_r(base, peak) 502 | gcc_r(base) 505 | mcf_r(base, peak) 525 | x264_r(base, peak) 557 | xz_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.

| 523 | xalancbmk_r(peak) |
--- | --- |
| Intel(R) C++ Intel(R) 64 Compiler for applications running on IA-32, Version 19.0.4.227 Build 20190416 |
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

| 520 | omnetpp_r(base, peak) 523 | xalancbmk_r(base) 531 | deepsjeng_r(base, peak) 541 | leela_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.

| 523 | xalancbmk_r(peak) |
--- | --- |
| Intel(R) C++ Intel(R) 64 Compiler for applications running on IA-32, Version 19.0.4.227 Build 20190416 |
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| 520 | omnetpp_r(base, peak) 523 | xalancbmk_r(base) 531 | deepsjeng_r(base, peak) 541 | leela_r(base, peak) |
--- | --- | --- | --- | --- |
(Continued on next page)
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<td>Software Availability: Sep-2019</td>
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### Compiler Version Notes (Continued)

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.

Fortran | 548.exchange2_r(base, peak)

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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.

### Base Compiler Invocation

**C benchmarks:**  
`icc -m64 -std=c11`

**C++ benchmarks:**  
`icpc -m64`

**Fortran benchmarks:**  
`ifort -m64`

### Base Portability Flags

- 500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
- 502.gcc_r: -DSPEC_LP64
- 505.mcf_r: -DSPEC_LP64
- 520.omnetpp_r: -DSPEC_LP64
- 523.xalancbk_r: -DSPEC_LP64 -DSPEC_LINUX
- 525.x264_r: -DSPEC_LP64
- 531.deepsjeng_r: -DSPEC_LP64
- 541.leela_r: -DSPEC_LP64
- 548.exchange2_r: -DSPEC_LP64
- 557.xz_r: -DSPEC_LP64

### Base Optimization Flags

**C benchmarks:**  
`-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`

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

C benchmarks (continued):
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc

C++ benchmarks:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc

Fortran benchmarks:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc

Peak Compiler Invocation

C benchmarks (except as noted below):
icc -m64 -std=c11


C++ benchmarks (except as noted below):
icpc -m64

523.xalancbmk_r: icpc -m32 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/ia32_lin

Fortran benchmarks:
ifort -m64

Peak Portability Flags

500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
502.gcc_r: -D_FILE_OFFSET_BITS=64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -D_FILE_OFFSET_BITS=64 -DSPEC_LINUX
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64

(Continued on next page)
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### Peak Portability Flags (Continued)

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>541.leela_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>548.exchange2_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>-DSPEC_LP64</td>
</tr>
</tbody>
</table>

### Peak Optimization Flags

**C benchmarks:**

- `500.perlbench_r`: `-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4 -fno-strict-overflow -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64 -lqkmalloc`  
- `502.gcc_r`: `-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4 -L/usr/local/je5.0.1-32/lib -ljemalloc`  
- `557.xz_r`: Same as 505.mcf_r

**C++ benchmarks:**

- `523.xalancbmk_r`: `-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4 -L/usr/local/je5.0.1-32/lib -ljemalloc`  
- `531.deepsjeng_r`: Same as 520.omnetpp_r

(Continued on next page)
NEC Corporation

Express5800/R120h-1M (Intel Xeon Platinum 8280)

SPECrater®2017_int_base = 327
SPECrater®2017_int_peak = 344

CPU2017 License: 9096
Test Sponsor: NEC Corporation
Tested by: NEC Corporation

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

Peak Optimization Flags (Continued)

541.leela_r: Same as 520.omnetpp_r

Fortran benchmarks:
-Wl, -z, muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc

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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