NEC Corporation
Express5800/T110j (Intel Xeon E-2224)

SPEC®2017_int_base = 10.6
SPEC®2017_int_peak = 10.9

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

Test Date: Nov-2019
Hardware Availability: Nov-2019
Software Availability: Aug-2019

Threads

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<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed®2017_int_base</th>
<th>SPECspeed®2017_int_peak</th>
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<tr>
<td>perlbench</td>
<td>4</td>
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<td>8.91</td>
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<tr>
<td>gcc</td>
<td>4</td>
<td>7.04</td>
<td>8.91</td>
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<td>mcf</td>
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<td>7.15</td>
<td>12.0</td>
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<td>omnetpp</td>
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<td>12.3</td>
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<td>xalancbmk</td>
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<td>15.9</td>
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<td>x264</td>
<td>4</td>
<td>6.63</td>
<td>14.9</td>
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<tr>
<td>deepsjeng</td>
<td>4</td>
<td>5.55</td>
<td>17.5</td>
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<tr>
<td>leela</td>
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<td>9.13</td>
<td>20.1</td>
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<tr>
<td>exchange2</td>
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<td>xz</td>
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**Hardware**

<table>
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<tr>
<th>Feature</th>
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<tbody>
<tr>
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<td>Intel Xeon E-2224</td>
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<td>Max MHz</td>
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</tr>
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<td>Nominal</td>
<td>3400</td>
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<td>4 cores, 1 chip</td>
</tr>
<tr>
<td>Orderable</td>
<td>1 chip</td>
</tr>
<tr>
<td>Cache L1</td>
<td>32 KB I + 32 KB D on chip per core</td>
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<tr>
<td>L2</td>
<td>256 KB I+D on chip per core</td>
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<tr>
<td>L3</td>
<td>8 MB I+D on chip per chip</td>
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<tr>
<td>Other</td>
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<td>Memory</td>
<td>64 GB (4 x 16 GB 2Rx8 PC4-2666V-E)</td>
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<tr>
<td>Storage</td>
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**Software**

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<td>OS</td>
<td>Red Hat Enterprise Linux Server release 7.7 (Maipo)</td>
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<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>
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<td>File System</td>
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<td>System State</td>
<td>Run level 3 (multi-user)</td>
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<td>Base Pointers</td>
<td>64-bit</td>
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<tr>
<td>Peak Pointers</td>
<td>64-bit</td>
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<td>Other</td>
<td>jemalloc memory allocator V5.0.1</td>
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<tr>
<td>Power Management</td>
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## SPEC CPU®2017 Integer Speed Result

### NEC Corporation

**Express5800/T110j (Intel Xeon E-2224)**

**Copyright 2017-2019 Standard Performance Evaluation Corporation**

**NEC Corporation**  
**Test Sponsor:** NEC Corporation  
**Tested by:** NEC Corporation  

**CPU2017 License:** 9006  
**Test Date:** Nov-2019

**Hardware Availability:** Nov-2019  
**Software Availability:** Aug-2019

### Results Table

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<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>
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<td>7.55</td>
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<td>605.mcf_s</td>
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<td><strong>17.5</strong></td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
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<td><strong>20.1</strong></td>
</tr>
</tbody>
</table>

**SPECspeed®2017_int_base = 10.6**  
**SPECspeed®2017_int_peak = 10.9**

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,scatter"
- LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-64"
- OMP_STACKSIZE = "192M"

### General Notes

Binaries compiled on a system with 1x Intel Core i9-799X 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.

jemalloc, a general purpose malloc implementation

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

**NEC Corporation**

Express5800/T110j (Intel Xeon E-2224)

<table>
<thead>
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<th>SPECspeed®2017_int_peak = 10.9</th>
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**CPU2017 License:** 9006  
**Test Sponsor:** NEC Corporation  
**Test Date:** Nov-2019  
**Tested by:** NEC Corporation  
**Hardware Availability:** Nov-2019  
**Software Availability:** Aug-2019

**SPECspeed®2017_int_base = 10.6**

**SPECspeed®2017_int_peak = 10.9**

General Notes (Continued)

Built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5


**Platform Notes**

BIOS Settings:
- VT-x: Disabled
- Energy Efficient P-state: Disabled
- Energy Efficient Turbo: Disabled

Sysinfo program `/home/cpu2017/bin/sysinfo`
Rev: r6365 of 2019-08-21 295195f888a3d7ed3b1e6e46a485a0011
running on t110j Tue Nov 5 22:56:01 2019

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](https://www.spec.org/cpu2017/Docs/config.html#sysinfo)

From `/proc/cpuinfo`
```
model name : Intel(R) Xeon(R) E-2224 CPU @ 3.40GHz
  1 "physical id"s (chips)
  4 "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 : 4
  siblings : 4
  physical 0: cores 0 1 2 3
```

From `lscpu`:
```
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 4
On-line CPU(s) list: 0-3
Thread(s) per core: 1
Core(s) per socket: 4
Socket(s): 1
NUMA node(s): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 158
Model name: Intel(R) Xeon(R) E-2224 CPU @ 3.40GHz
Stepping: 10
CPU MHz: 4369.116
CPU max MHz: 4600.0000
CPU min MHz: 800.0000
```
SPEC CPU®2017 Integer Speed Result

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NEC Corporation

Express5800/T110j (Intel Xeon E-2224)

SPECspeed®2017_int_base = 10.6

SPECspeed®2017_int_peak = 10.9

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

Platform Notes (Continued)

BogoMIPS: 6816.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 256K
L3 cache: 8192K
NUMA node0 CPU(s): 0-3
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 xtopology nonstop_tsc aperfmperf eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch intel_pt ssbd ibpb stibp tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bm1 hle avx2 smep bmi2 erms invpcid rtm mpx rdseed adx smap clflushopt xsaveopt xsavec xgetbv1 dtherm ida arat pln pts hwp hwp_notif hwp_act_window hwp_epp md_clear spec_ctrl intel_stibp flush_l1d

/proc/cpuinfo cache data
  cache size : 8192 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
  node 0 size: 65441 MB
  node 0 free: 63558 MB
  node distances:
    node 0
      0: 10

From /proc/meminfo
  MemTotal: 65880068 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)
NEC Corporation

Express5800/T110j (Intel Xeon E-2224)

**SPEC CPU®2017 Integer Speed Result**

Copyright 2017-2019 Standard Performance Evaluation Corporation

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base</th>
<th>SPECspeed®2017_int_peak</th>
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<tr>
<td>10.6</td>
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</table>

**CPU2017 License:** 9006

**Test Sponsor:** NEC Corporation

**Tested by:** NEC Corporation

**Test Date:** Nov-2019

**Hardware Availability:** Nov-2019

**Software Availability:** Aug-2019

---

### Platform Notes (Continued)

- system-release: Red Hat Enterprise Linux Server release 7.7 (Maipo)

```
uname -a:
    Linux t110j 3.10.0-1062.el7.x86_64 #1 SMP Thu Jul 18 20:25:13 UTC 2019 x86_64 x86_64 x86_64 GNU/Linux
```

**Kernel self-reported vulnerability status:**

- CVE-2018-3620 (L1 Terminal Fault): Mitigation: PTE Inversion
- Microarchitectural Data Sampling: Mitigation: Clear CPU buffers; SMT disabled
- CVE-2017-5754 (Meltdown): Mitigation: PTI
- CVE-2017-5753 (Spectre variant 1): Mitigation: Load fences, __user pointer sanitation
- CVE-2017-5715 (Spectre variant 2): Mitigation: Full retpoline, IBPB

```
run-level 3 Nov 5 22:50
```

**SPEC is set to:** /home/cpu2017

```
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 ext4 1.8T 56G 1.7T 4% /
```

**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 SMI BIOS" standard.**

**Memory:**

- 4x Samsung M391A2K43BB1-CTD 16 GB 2 rank 2667

*(End of data from sysinfo program)*

---

### Compiler Version Notes

```
C | 600.perlbench_s(base, peak) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_s(base, peak)
```

**Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,**

*(Continued on next page)*
NEC Corporation
Express5800/T110j (Intel Xeon E-2224)

SPEC CPU®2017 Integer Speed Result
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SPECSpeed®2017_int_base = 10.6
SPECSpeed®2017_int_peak = 10.9

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

Test Date: Nov-2019
Hardware Availability: Nov-2019
Software Availability: Aug-2019

Compiler Version Notes (Continued)
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

-----------------------------------------------
C++ | 620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak)
     | 631.deepsjeng_s(base, peak) 641.leela_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.

-----------------------------------------------
Fortran | 648.exchange2_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.

Base Portability Flags
600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64

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

NEC Corporation
Express5800/T110j (Intel Xeon E-2224)

SPECspeed®2017_int_base = 10.6
SPECspeed®2017_int_peak = 10.9

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NEC Corporation

Test Date: Nov-2019
Hardware Availability: Nov-2019
Software Availability: Aug-2019

Base Portability Flags (Continued)

657.xz_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-L/usr/local/je5.0.1-64/lib -ljemalloc

C++ benchmarks:
-Wl,-z,muldefs -xCORE-AVX2 -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:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs

Peak Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

Peak Portability Flags

Same as Base Portability Flags
**SPEC CPU®2017 Integer Speed Result**

**NEC Corporation**

Express5800/T110j (Intel Xeon E-2224)

---

**SPECspeed®2017_int_base = 10.6**

**SPECspeed®2017_int_peak = 10.9**

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<table>
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<tr>
<th>CPU2017 License: 9006</th>
<th>Test Date: Nov-2019</th>
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<tr>
<td>Test Sponsor: NEC Corporation</td>
<td>Hardware Availability: Nov-2019</td>
</tr>
<tr>
<td>Tested by: NEC Corporation</td>
<td>Software Availability: Aug-2019</td>
</tr>
</tbody>
</table>

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### Peak Optimization Flags

**C benchmarks:**

600.perlbench_s: -Wl, -z, muldefs -prof-gen(pass 1) -prof-use(pass 2) -O2
-xCORE-AVX2 -qopt-mem-layout-trans=4 -ipo -O3
-no-prec-div -DSPEC_SUPPRESS_OPENMP -gopenmp
-DSPEC_OPENMP -fno-strict-overflow
-L/usr/local/jc5.0.1-64/lib -ljemalloc

602.gcc_s: -Wl, -z, muldefs -prof-gen(pass 1) -prof-use(pass 2) -O2
-xCORE-AVX2 -qopt-mem-layout-trans=4 -ipo -O3
-no-prec-div -DSPEC_SUPPRESS_OPENMP
-L/usr/local/jc5.0.1-64/lib -ljemalloc

605.mcf_s: -Wl, -z, muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=4
-DSPEC_SUPPRESS_OPENMP -gopenmp -DSPEC_OPENMP
-L/usr/local/jc5.0.1-64/lib -ljemalloc

625.x264_s: -Wl, -z, muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -gopenmp -DSPEC_OPENMP
-L/usr/local/jc5.0.1-64/lib -ljemalloc

657.xz_s: -Wl, -z, muldefs -prof-gen(pass 1) -prof-use(pass 2) -O2
-xCORE-AVX2 -qopt-mem-layout-trans=4 -ipo -O3
-no-prec-div -DSPEC_SUPPRESS_OPENMP -gopenmp
-DSPEC_OPENMP -L/usr/local/jc5.0.1-64/lib -ljemalloc

**C++ benchmarks:**

620.omnetpp_s: -Wl, -z, muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=4
-DSPEC_SUPPRESS_OPENMP
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-ijemalloc

623.xalancbmk_s: -Wl, -z, muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-ijemalloc

631.deepsjeng_s: Same as 623.xalancbmk_s

641.leela_s: basepeak = yes

**Fortran benchmarks:**

-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4

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

## NEC Corporation

**Express5800/T110j (Intel Xeon E-2224)**

<table>
<thead>
<tr>
<th>SPECspeed(^\circ)2017_int_base</th>
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<td>SPECspeed(^\circ)2017_int_peak</td>
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</table>

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**Test Date:** Nov-2019  
**Hardware Availability:** Nov-2019  
**Software Availability:** Aug-2019

### Peak Optimization Flags (Continued)

Fortran benchmarks (continued):
- `nostandard-realloc-lhs`

The flags files that were used to format this result can be browsed at


You can also download the XML flags sources by saving the following links:


---

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU®2017 v1.1.0 on 2019-11-05 08:56:01-0500.  