** SPEC CPU®2017 Integer Rate Result **

Dell Inc.  
PowerEdge C6420 (Intel Xeon Gold 5220R, 2.20 GHz)  

| SPECrate®2017_int_base = 295 | SPECrate®2017_int_peak = 307 |

CPU2017 License: 55  
Test Sponsor: Dell Inc.  
Tested by: Dell Inc.  

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</table>

**Hardware**

- **CPU Name:** Intel Xeon Gold 5220R  
- **Max MHz:** 4000  
- **Nominal:** 2200  
- **Enabled:** 48 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:** 35.75 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R, running at 2666)  
- **Storage:** 1 x 1.6 TB SATA SSD  
- **Other:** None

**Software**

- **OS:** Red Hat Enterprise Linux 8.4 (Ootpa)  
- **Compiler:**  
  - C/C++: Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux;  
  - Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux;  
  - C/C++: Version 2021.1 of Intel C/C++ Compiler Classic Build 20201112 for Linux  
- **Parallel:** No  
- **Firmware:** Version 2.11.2 released Apr-2021  
- **File System:** xfs  
- **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 and OS set to prefer performance at the cost of additional power usage.
## SPEC CPU®2017 Integer Rate Result

### Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 5220R, 2.20 GHz)

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
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#### SPECrate®2017_int_base = 295

#### SPECrate®2017_int_peak = 307

### Results Table

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</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 = 
MALLOCS_CONF = "retain:true"
```

### General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Red Hat Enterprise Linux 8.1

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
```

(Continued on next page)
Dell Inc. PowerEdge C6420 (Intel Xeon Gold 5220R, 2.20 GHz)

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CPU2017 License: 55
Test Sponsor: Dell Inc.
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Test Date: Nov-2021
Hardware Availability: Apr-2019
Software Availability: May-2021

General Notes (Continued)

runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>
jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

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:
  Sub NUMA Cluster : 2-Way Clustering
  Virtualization Technology : Disabled
  System Profile : Custom
  CPU Power Management : Maximum Performance
    C1E : Disabled
    C States : Autonomous
  Memory Patrol Scrub : Disabled
  Energy Efficiency Policy : Performance
  CPU Interconnect Bus Link
    Power Management : Disabled
  PCI ASPM L1 Link
    Power Management : Disabled

Sysinfo program /root/cpu2017-1.1.8-ic2021.1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf6d4
running on localhost.localdomain Wed Nov 17 12:22:40 2021

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 5220R CPU @ 2.20GHz
  2 "physical id"s (chips)
  96 "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 : 24

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

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CPU2017 License: 55
Test Sponsor: Dell Inc.
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Platform Notes (Continued)

siblings : 48
physical 0: cores 0 1 2 3 4 5 6 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 1: cores 0 1 2 3 4 5 6 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29

From lscpu from util-linux 2.32.1:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 96
On-line CPU(s) list: 0-95
Thread(s) per core: 2
Core(s) per socket: 24
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
BIOS Vendor ID: Intel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 5220R CPU @ 2.20GHz
BIOS Model name: Intel(R) Xeon(R) Gold 5220R CPU @ 2.20GHz
Stepping: 7
CPU MHz: 3494.134
CPU max MHz: 4000.0000
CPU min MHz: 1000.0000
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 36608K
NUMA node0 CPU(s):
0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60,64,68,72,76,80,84,88,92
NUMA node1 CPU(s):
1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61,65,69,73,77,81,85,89,93
NUMA node2 CPU(s):
2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62,66,70,74,78,82,86,90,94
NUMA node3 CPU(s):
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clflush dtc 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 cpuid aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtrr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_13 cdp_13
invpcid_single intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced fsgsbase tsc_adjust
bm1 hle avx2 smep bmi2 erts invpcid cqm mpx rd_t_a avx512f avx512dq rdseed adx smap
clflushopt clwb intel_pt avx512dav1 avx512bw avx512vl xsaveopt xsaves

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#### Platform Notes (Continued)

```
cqm_llc  cqm_occup_llc  cqm_mbm_total  cqm_mbm_local  dtherm  ida  arat  pln  pts  pku  ospke
avx512_vnni  md_clear  flush_l1d  arch_capabilities
```

```
/proc/cpuinfo cache data
  cache size: 36608 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 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92
  node 0 size: 95304 MB
  node 0 free: 94928 MB
  node 1 cpus: 1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93
  node 1 size: 96762 MB
  node 1 free: 88264 MB
  node 2 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62 66 70 74 78 82 86 90 94
  node 2 size: 96762 MB
  node 2 free: 96324 MB
  node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63 67 71 75 79 83 87 91 95
  node 3 size: 96725 MB
  node 3 free: 96521 MB
  node distances:
    node 0  1  2  3
    0: 10  21  11  21
    1: 21  10  21  11
    2: 11  21  10  21
    3: 21  11  21  10

From /proc/meminfo
  MemTotal: 394808252 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

/sbin/tuned-adm active
  Current active profile: throughput-performance

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
  performance

From /etc/*release* /etc/*version*
  os-release:
    NAME="Red Hat Enterprise Linux"
    VERSION="8.4 (Ootpa)"
    ID="rhel"
    ID_LIKE="fedora"
    VERSION_ID="8.4"
    PLATFORM_ID="platform:el8"
```

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Platform Notes (Continued)

PRETTY_NAME="Red Hat Enterprise Linux 8.4 (Ootpa)"
ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.4 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.4 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.4:ga

uname –a:
    Linux localhost.localdomain 4.18.0-305.el8.x86_64 #1 SMP Thu Apr 29 08:54:30 EDT 2021
    x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multihit):
    KVM: Mitigation: Split huge pages
    Not affected
CVE-2018-3620 (L1 Terminal Fault):
    Not affected
Microarchitectural Data Sampling:
    Not affected
CVE-2017-5754 (Meltdown):
    Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2018-3639 (Speculative Store Bypass):
    Mitigation: usercopy/swapgs barriers and __user pointer sanitation
CVE-2017-5753 (Spectre variant 1):
    Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
CVE-2017-5715 (Spectre variant 2):
    Not affected
CVE-2020-0543 (Special Register Buffer Data Sampling):
CVE-2019-11135 (TSX Asynchronous Abort):
    Mitigation: TSX disabled

run-level 3 Nov 17 12:18

SPEC is set to: /root/cpu2017-1.1.8-ic2021.1

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 xfs 693G 20G 673G 3% /

From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge C6420
Product Family: PowerEdge

Additional information from dmidecode 3.2 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:
    1x 002C069D002C 36ASF4G72PZ-2G9E2 32 GB 2 rank 2933, configured at 2666
    4x 00AD00B300AD HMA84GR7CJ8N-3W 32 GB 2 rank 2933, configured at 2666
    6x 00AD063200AD HMA84GR7CJR4N-3W 32 GB 2 rank 2933, configured at 2666
    1x 00AD069D00AD HMA84GR7CJR4N-3W 32 GB 2 rank 2933, configured at 2666

(Continued on next page)
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Platform Notes (Continued)

BIOS:
- BIOS Vendor: Dell Inc.
- BIOS Version: 2.11.2
- BIOS Date: 04/22/2021
- BIOS Revision: 2.11

(End of data from sysinfo program)

Compiler Version Notes

-=C|= 500.perlbench_r(peak) 557.xz_r(peak)
-=------------------------------------------------------------------=
-Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
  64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
-=------------------------------------------------------------------=
-Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version
  2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
-=------------------------------------------------------------------=
-Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
-=------------------------------------------------------------------=
-Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
  64, Version 2021.1 Build 20201112_000000
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-=------------------------------------------------------------------=
-Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version
  2021.1 Build 20201113
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-Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
  64, Version 2021.1 Build 20201112_000000
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(Continued on next page)
**Compiler Version Notes (Continued)**

Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2021.1 Build 20201113
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---------------------------------------------------------------------
| C       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak) 557.xz_r(base) |
---------------------------------------------------------------------

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
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---------------------------------------------------------------------
| C       | 500.perlbench_r(peak) 557.xz_r(peak) |
---------------------------------------------------------------------

Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
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---------------------------------------------------------------------
| C       | 502.gcc_r(peak) |
---------------------------------------------------------------------

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

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
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---------------------------------------------------------------------
| C++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak) 531.deepsjeng_r(base, peak) 541.leela_r(base, peak) |
---------------------------------------------------------------------

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
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(Continued on next page)
## SPEC CPU®2017 Integer Rate Result

**Dell Inc.**

PowerEdge C6420 (Intel Xeon Gold 5220R, 2.20 GHz)

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base = 295</th>
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<tbody>
<tr>
<td>SPECrate®2017_int_peak = 307</td>
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<tr>
<th>CPU2017 License: 55</th>
<th>Test Date: Nov-2021</th>
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<td>Hardware Availability: Apr-2019</td>
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<td>Software Availability: May-2021</td>
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</table>

### Compiler Version Notes (Continued)

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Fortran | 548.exchange2_r(base, peak)

---

Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
Intel(R) 64, Version 2021.1 Build 20201112_000000
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### Base Compiler Invocation

- **C benchmarks:** icx
- **C++ benchmarks:** icpx
- **Fortran benchmarks:** ifort

### 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.xalancbmk_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:**
- -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX2 -O3 -ffast-math -flto
- -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
- -mbranches-within-32B-boundaries
- -L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin

(Continued on next page)
Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 5220R, 2.20 GHz)

SPEC®CPU2017 Integer Rate Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

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C benchmarks (continued):
- lqkmalloc

C++ benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX2 -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -gopt-mem-layout-trans=4
-mbranchswithin-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX2 -O3 -ipo -no-prec-div
-goopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-auto -mbrancheswithin-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc

Peak Compiler Invocation

C benchmarks (except as noted below):
icx

500.perlbench_r: icc

557.xz_r: icc

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

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: -DSPEC_LP64 -DSPEC_LINUX
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64

(Continued on next page)
### Dell Inc.

**PowerEdge C6420 (Intel Xeon Gold 5220R, 2.20 GHz)**

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- **Test Sponsor:** Dell Inc.
- **Hardware Availability:** Apr-2019
- **Software Availability:** May-2021
- **Tested by:** Dell Inc.

### Peak Portability Flags (Continued)

- 541.leela_r: -DSPEC_LP64
- 548.exchange2_r: -DSPEC_LP64
- 557.xz_r: -DSPEC_LP64

### Peak Optimization Flags

**C benchmarks:**

- 500.perlbench_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
- -xCORE-AVX2 -ipo -O3 -no-prec-div
- -qopt-mem-layout-trans=4 -fno-strict-overflow
- -mbranches-within-32B-boundaries
- -L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
- -lqkmalloc

- 502.gcc_r: -m32
- -L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/ia32_lin
- -std=gnu89 -Wl,-z,muldefs -fprofile-generate(pass 1)
- -fprofile-use=default.profdata(pass 2) -xCORE-AVX2 -flto
- -Ofast(pass 1) -O3 -ffast-math -qopt-mem-layout-trans=4
- -mbranches-within-32B-boundaries
- -L/usr/local/jemalloc32-5.0.1/lib -ljemalloc

- 505.mcf_r: basepeak = yes

- 525.x264_r: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX2 -flto -O3
- -ffast-math -qopt-mem-layout-trans=4 -fno-alias
- -mbranches-within-32B-boundaries
- -L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
- -lqkmalloc

- 557.xz_r: -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
- -qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
- -L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
- -lqkmalloc

**C++ benchmarks:**

- 520.omnetpp_r: basepeak = yes

- 523.xalancbmk_r: basepeak = yes

- 531.deepsjeng_r: basepeak = yes

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

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**Peak Optimization Flags (Continued)**

- 541.leela_r: basepeak = yes
- Fortran benchmarks:
  - 548.exchange2_r: basepeak = yes

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.

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