## SPEC CPU®2017 Integer Rate Result

**Dell Inc.**

PowerEdge R750xs (Intel Xeon Silver 4310, 2.10 GHz)

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>SPECrate®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>168</td>
<td>173</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** Aug-2021  
**Hardware Availability:** Jul-2021  
**Software Availability:** Jun-2021

### Hardware

**CPU Name:** Intel Xeon Silver 4310  
**Max MHz:** 3300  
**Nominal:** 2100  
**Enabled:** 24 cores, 2 chips, 2 threads/core  
**Orderable:** 1.2 chips  
**Cache L1:** 32 KB I + 48 KB D on chip per core  
**L2:** 1.25 MB I+D on chip per core  
**L3:** 18 MB I+D on chip per chip  
**Other:** None  
**Memory:** 512 GB (4 x 32 GB 2Rx4 PC4-3200AA-R; 12 x 32 GB 2Rx8 PC4-3200AA-R, running at 2666)  
**Storage:** 512 GB on tmpfs  
**Other:** None

### Software

**OS:** Red Hat Enterprise Linux 8.4 (Ootpa)  
4.18.0-305.7.1.el8_4.x86_64  
**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 1.2.1 released May-2021  
**File System:** tmpfs  
**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.

### Results

<table>
<thead>
<tr>
<th>Test</th>
<th>SPECrate®2017_int_base</th>
<th>SPECrate®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>perlbench_r</td>
<td>111</td>
<td>130</td>
</tr>
<tr>
<td>gcc_r</td>
<td>146</td>
<td>163</td>
</tr>
<tr>
<td>mcf_r</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>omnetpp_r</td>
<td></td>
<td>211</td>
</tr>
<tr>
<td>xalancbmk_r</td>
<td></td>
<td>336</td>
</tr>
<tr>
<td>x264_r</td>
<td></td>
<td>352</td>
</tr>
<tr>
<td>deepsjeng_r</td>
<td></td>
<td>122</td>
</tr>
<tr>
<td>leela_r</td>
<td></td>
<td>119</td>
</tr>
<tr>
<td>exchange2_r</td>
<td></td>
<td>328</td>
</tr>
<tr>
<td>xz_r</td>
<td></td>
<td>94.0</td>
</tr>
</tbody>
</table>

---

**Compiled with 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.**
Dell Inc.

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SPECrate®2017_int_base = 168
SPECrate®2017_int_peak = 173

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</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>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>48</td>
<td>689</td>
<td>111</td>
<td>689</td>
<td>111</td>
<td>48</td>
<td>585</td>
<td>131</td>
<td>586</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>48</td>
<td>464</td>
<td>146</td>
<td>466</td>
<td>146</td>
<td>48</td>
<td>415</td>
<td>164</td>
<td>418</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>48</td>
<td>267</td>
<td>291</td>
<td>268</td>
<td>290</td>
<td>48</td>
<td>267</td>
<td>291</td>
<td>268</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>48</td>
<td>527</td>
<td>119</td>
<td>529</td>
<td>119</td>
<td>48</td>
<td>527</td>
<td>119</td>
<td>529</td>
</tr>
<tr>
<td>523.xalancbmk_r</td>
<td>48</td>
<td>240</td>
<td>211</td>
<td>239</td>
<td>212</td>
<td>48</td>
<td>240</td>
<td>211</td>
<td>239</td>
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<tr>
<td>525.x264_r</td>
<td>48</td>
<td>251</td>
<td>336</td>
<td>250</td>
<td>336</td>
<td>48</td>
<td>239</td>
<td>352</td>
<td>239</td>
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<tr>
<td>531.deepsjeng_r</td>
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<td>452</td>
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<td>541.leela_r</td>
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<td>119</td>
<td>669</td>
<td>119</td>
<td>48</td>
<td>670</td>
<td>119</td>
<td>669</td>
</tr>
<tr>
<td>548.exchange2_r</td>
<td>48</td>
<td>383</td>
<td>328</td>
<td>383</td>
<td>328</td>
<td>48</td>
<td>383</td>
<td>328</td>
<td>383</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>48</td>
<td>549</td>
<td>94.4</td>
<td>551</td>
<td>94.0</td>
<td>48</td>
<td>562</td>
<td>92.3</td>
<td>561</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 =
   
"/mnt/ramdisk/cpu2017-1.1.8-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.8-ic2021.1/lib/ia32:/mnt/ramdisk/cpu2017-1.1.8-ic2021.1/je5.0.1-32"
MALLOCONF = "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
runcpu command invoked through numactl i.e.:
Dell Inc.  
PowerEdge R750xs (Intel Xeon Silver 4310, 2.10 GHz)

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**Test Sponsor**: Dell Inc.  
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**Test Date**: Aug-2021  
**Hardware Availability**: Jul-2021  
**Software Availability**: Jun-2021

### General Notes (Continued)

- `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.

Benchmark run from a 512 GB ramdisk created with the cmd: "mount -t tmpfs -o size=512G tmpfs /mnt/ramdisk"

### 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 /mnt/ramdisk/cpu2017-1.1.8-ic2021.1/bin/sysinfo  
Rev: r6622 of 2021-04-07 982a61ec0915b55891e6e862a6153d6d4  
running on R750xs.9xbzted3.inside.dell.com Mon Aug 23 09:20:36 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) Silver 4310 CPU @ 2.10GHz
- 2 "physical id"s (chips)
- 48 "processors"

cores, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)

(Continued on next page)
CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Platform Notes (Continued)

cpu cores : 12
siblings : 24
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11

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): 48
On-line CPU(s) list: 0-47
Thread(s) per core: 2
Core(s) per socket: 12
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
BIOS Vendor ID: Intel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Silver 4310 CPU @ 2.10GHz
BIOS Model name: Intel(R) Xeon(R) Silver 4310 CPU @ 2.10GHz
Stepping: 6
CPU MHz: 3000.355
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 18432K
NUMA node0 CPU(s): 0,4,8,12,16,20,24,28,32,36,40,44
NUMA node1 CPU(s): 2,6,10,14,18,22,26,30,34,38,42,46
NUMA node2 CPU(s): 1,5,9,13,17,21,25,29,33,37,41,45
NUMA node3 CPU(s): 3,7,11,15,19,23,27,31,35,39,43,47
Flags:
pu vme de pse tsc msr pae mce cmov
pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdelgb rdtscp
lm constant_tsc art 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
xtr 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_l3 invpcid_single
intel_ppt ssbd mba ibrs ibpb stibp ibrs_enabled fsgsbase tsc_adjust bmi1 hle avx2
smep bmi2 erms invpcid cmp qrdt_a avx512f avx512dq rdseed adx smap avx512ifma
clfshopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt xsave xgetbv1
xsaves cmp_l1c cmp_occup_l1c cmp_mb_total cmp_mb_local split_lock_detect wnoinvd
dtherm ida arat pls avx512vbm uimp pupe avx512_vbmi gfni vaes vpcm1ldq avx512_vnni
avx512_bitalg tme avx512_vpoptndq la57 rdrpid fsg md_clear pconfi
flush_l1d arch_capabilities

(Continued on next page)
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Platform Notes (Continued)

/proc/cpuinfo cache data
  cache size : 18432 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
  node 0 size: 128159 MB
  node 0 free: 127842 MB
  node 1 cpus: 2 6 10 14 18 22 26 30 34 38 42 46
  node 1 size: 129021 MB
  node 1 free: 128574 MB
  node 2 cpus: 1 5 9 13 17 21 25 29 33 37 41 45
  node 2 size: 129021 MB
  node 2 free: 122289 MB
  node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47
  node 3 size: 128981 MB
  node 3 free: 125980 MB
  node distances:
    node   0   1   2   3
    0:  10  11  20  20
    1:  11  10  20  20
    2:  20  20  10  11
    3:  20  20  11  10

From /proc/meminfo
  MemTotal:       527547876 kB
  HugePages_Total:       0
  Hugepagesize:       2048 kB
  /sbin/tuned-adm active
    Current active profile: throughput-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"
    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

(Continued on next page)
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Platform Notes (Continued)

uname -a:
    Linux R750xs.9xbztd3.inside.dell.com 4.18.0-305.7.1.el8_4.x86_64 #1 SMP Mon Jun 14 17:25:42 EDT 2021 x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multihit): 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 sanitization
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): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Aug 23 09:12

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

Filesystem     Type   Size  Used Avail Use% Mounted on
    tmpfs        tmpfs  512G  4.4G  508G   1% /mnt/ramdisk

From /sys/devices/virtual/dmi/id
Vendor:         Dell Inc.
Product:        PowerEdge R750xs
Product Family: PowerEdge
Serial:         9XBZTD3

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:
    12x 002C069D002C 18ASF4G72PDZ-3G2E1 32 GB 2 rank 3200, configured at 2666
    4x 00AD063200AD HMA84GR7JR4N-XN 32 GB 2 rank 3200, configured at 2666

BIOS:
    BIOS Vendor:      Dell Inc.
    BIOS Version:    1.2.1
    BIOS Date:       05/28/2021
    BIOS Revision:   1.2

(Continued on next page)
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Platform Notes (Continued)
(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.
==============================================================================

C | 502.gcc_r(peak)
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.
==============================================================================

C | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak) 557.xz_r(base)
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(Continued on next page)
## Compiler Version Notes (Continued)

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<tr>
<th>Language</th>
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<tbody>
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<td>C</td>
<td>500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak) 557.xz_r(base)</td>
</tr>
</tbody>
</table>
| 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. |
| C        | 500.perlbench_r(peak) 557.xz_r(peak) |
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| 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. |
| 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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Compiler Version Notes (Continued)
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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-AVX512 -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
-1qkmalloc

C++ benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -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)
## Base Optimization Flags (Continued)

C++ benchmarks (continued):
- `lqkmalloc`

Fortran benchmarks:

## 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
541.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64
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Peak Optimization Flags

C benchmarks:

500.perlbench_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
-xCORE-AVX512 -ipo -O3 -no-prec-div
-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-AVX512 -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-AVX512 -flto
-03 -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-AVX512 -ipo -03 -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

541.leela_r: basepeak = yes

Fortran benchmarks:

548.exchange2_r: basepeak = yes
Dell Inc.
PowerEdge R750xs (Intel Xeon Silver 4310, 2.10 GHz)

SPECrate®2017_int_base = 168
SPECrate®2017_int_peak = 173

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

Test Date: Aug-2021
Hardware Availability: Jul-2021
Software Availability: Jun-2021

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:
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-ICX-rev1.4.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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