# SPEC CPU®2017 Integer Rate Result

## Dell Inc.
PowerEdge R840 (Intel Xeon Platinum 8276, 2.20 GHz)

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>653</th>
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</thead>
<tbody>
<tr>
<td>SPECrate®2017_int_peak</td>
<td>Not Run</td>
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</table>

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

<table>
<thead>
<tr>
<th>Copies</th>
<th>SPECrate®2017_int_base (653)</th>
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<tr>
<td>500.perlbench_r</td>
<td>224</td>
</tr>
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</tr>
<tr>
<td>557.xz_r</td>
<td>224</td>
</tr>
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</table>

**Hardware**

- **CPU Name:** Intel Xeon Platinum 8276  
- **Max MHz:** 4000  
- **Nominal:** 2200  
- **Enabled:** 112 cores, 4 chips, 2 threads/core  
- **Orderable:** 1,2,4 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:** 1536 GB (48 x 32 GB 2Rx4 PC4-3200AA-R, running at 2933)  
- **Storage:** 125 GB on tmpfs  
- **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;  
- **Parallel:** No  
- **File System:** tmpfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** Not Applicable  
- **Other:** None  
- **Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage.
Dell Inc.  
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### Results Table

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<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds Base</th>
<th>Ratio Base</th>
<th>Seconds PEAK</th>
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<td>523.xalancbmk_r</td>
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<td>603</td>
<td>401</td>
<td>604</td>
<td>401</td>
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### 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:

```
MALLOC_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)
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General Notes (Continued)

runcpu command invoked through numactl i.e.: 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.

Benchmark run from a 125 GB ramdisk created with the cmd: "mount -t tmpfs -o size=125G tmpfs /mnt/ramdisk"

Platform Notes

BIOS settings:
- Sub NUMA Cluster : Enabled
- 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 982a61ec0915b55891ef0e16acaf64d
running on localhost.localdomain Thu Nov 11 14:43:44 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) Platinum 8276 CPU @ 2.20GHz
- 4 "physical id"s (chips)
- 224 "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

(Continued on next page)
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Platform Notes (Continued)

physical 0: cores 0 1 2 3 4 5 6 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 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
physical 2: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
physical 3: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30

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): 224
On-line CPU(s) list: 0-223
Thread(s) per core: 2
Core(s) per socket: 28
Socket(s): 4
NUMA node(s): 8
Vendor ID: GenuineIntel
BIOS Vendor ID: Intel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Platinum 8276 CPU @ 2.20GHz
BIOS Model name: Intel(R) Xeon(R) Platinum 8276 CPU @ 2.20GHz
Stepping: 7
CPU MHz: 2989.545
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: 39424K
NUMA node0 CPU(s): 0, 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96, 104, 112, 120, 128, 136, 144, 152, 160, 168, 176, 184, 192, 200, 208, 216
NUMA node1 CPU(s): 1, 9, 17, 25, 33, 41, 49, 57, 65, 73, 81, 89, 97, 105, 113, 121, 129, 137, 145, 153, 161, 169, 177, 185, 193, 201, 209, 217
NUMA node2 CPU(s): 2, 10, 18, 26, 34, 42, 50, 58, 66, 74, 82, 90, 98, 106, 114, 122, 130, 138, 146, 154, 162, 170, 178, 186, 194, 202, 210, 218

(Continued on next page)
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Platform Notes (Continued)

NUMA node 4 CPU(s):
4, 12, 20, 28, 36, 44, 52, 60, 68, 76, 84, 92, 100, 108, 116, 124, 132, 140, 148, 156, 164, 172, 180, 188, 196, 204, 212, 220

NUMA node 5 CPU(s):
5, 13, 21, 29, 37, 45, 53, 61, 69, 77, 85, 93, 101, 109, 117, 125, 133, 141, 149, 157, 165, 173, 181, 189, 197, 205, 213, 221

NUMA node 6 CPU(s):
6, 14, 22, 30, 38, 46, 54, 62, 70, 78, 86, 94, 102, 110, 118, 126, 134, 142, 150, 158, 166, 174, 182, 190, 198, 206, 214, 222

NUMA node 7 CPU(s):

Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clfush ts 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 cpuid aperfmpref pni pclmulqdq dtes64 monitor ds cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr 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 cat13 cdp13 invpcid_single intel_pinn ssbd mba ibrs ibp ibrs enhanced fsqsbxe tsc_adjust bmi1 hle avx2 smep bmi2 erm sipvcd cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pit avx512cd avx512bw avx512vl xsaveopt xsaves cqm llc cqm_occنق llc cqm_mbb_total cqm_mbb_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush lld arch_capabilities

/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: 8 nodes (0-7)
node 0 cpus: 0 8 16 24 32 40 48 56 64 72 80 88 96 104 112 120 128 136 144 152 160 168 176 184 192 200 208 216
node 0 size: 191395 MB
node 0 free: 191031 MB
node 1 cpus: 1 9 17 25 33 41 49 57 65 73 81 89 97 105 113 121 129 137 145 153 161 169 177 185 193 201 209 217
node 1 size: 19395 MB
node 1 free: 191031 MB
node 2 cpus: 2 10 18 26 34 42 50 58 66 74 82 90 98 106 114 122 130 138 146 154 162 170 178 186 194 202 210 218
node 2 size: 193529 MB
node 2 free: 193279 MB
node 3 cpus: 3 11 19 27 35 43 51 59 67 75 83 91 99 107 115 123 131 139 147 155 163 171 179 187 195 203 211 219
node 3 size: 193529 MB
node 3 free: 184849 MB
node 4 cpus: 4 12 20 28 36 44 52 60 68 76 84 92 100 108 116 124 132 140 148 156 164 172

(Continued on next page)
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### Platform Notes (Continued)

180 188 196 204 212 220  
node 4 size: 193492 MB  
node 4 free: 193230 MB  
node 5 cpus: 5 13 21 29 37 45 53 61 69 77 85 93 101 109 117 125 133 141 149 157 165 173  
181 189 197 205 213 221  
node 5 size: 193529 MB  
node 5 free: 193145 MB  
node 6 cpus: 6 14 22 30 38 46 54 62 70 78 86 94 102 110 118 126 134 142 150 158 166 174  
182 190 198 206 214 222  
node 6 size: 193529 MB  
node 6 free: 193268 MB  
node 7 cpus: 7 15 23 31 39 47 55 63 71 79 87 95 103 111 119 127 135 143 151 159 167 175  
183 191 199 207 215 223  
node 7 size: 193527 MB  
node 7 free: 193278 MB  
node distances:

<table>
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<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<th>7</th>
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<td>11</td>
<td>21</td>
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</tr>
</tbody>
</table>

From /proc/meminfo

- MemTotal: 1583169660 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"
  - PRETTY_NAME="Red Hat Enterprise Linux 8.4 (Ootpa)"
  - ANSI_COLOR="0;31"

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Platform Notes (Continued)

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
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: usercopy/swapgs barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2):
    Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort):
    Mitigation: TSX disabled

run-level 3 Nov 11 14:38

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.8-ic2021.1
Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 125G 4.1G 121G 4% /mnt/ramdisk

From /sys/devices/virtual/dmi/id
    Vendor: Dell Inc.
    Product: PowerEdge R840
    Product Family: PowerEdge
    Serial: H8BMXMX2

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:
    48x 00CE063200CE M393A4K40DB3-CWE 32 GB 2 rank 3200, configured at 2933

BIOS:
    BIOS Vendor: Dell Inc.
    BIOS Version: 2.12.2

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**Platform Notes (Continued)**

- BIOS Date: 07/12/2021  
- BIOS Revision: 2.12

(End of data from sysinfo program)

**Compiler Version Notes**

```plaintext
==============================================================================
C       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base)  
| 525.x264_r(base) 557.xz_r(base)
==============================================================================
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++     | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)  
| 541.leela_r(base)
==============================================================================
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)
==============================================================================
Intel(R) Fortran 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.
------------------------------------------------------------------------------
```

**Base Compiler Invocation**

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

**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`
- `-lqkmalloc`

**Fortran benchmarks:**
- `-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div`
- `-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte`
- `-auto -mbranches-within-32B-boundaries`
- `-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin`
- `-lqkmalloc`

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:
# Dell Inc.

**PowerEdge R840 (Intel Xeon Platinum 8276, 2.20 GHz)**

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<th>SPECrate®2017_int_base</th>
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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** Nov-2021  
**Hardware Availability:** Apr-2019  
**Software Availability:** May-2021

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